Amplify Desmos Math FLORIDA

Teacher Edition

ACC 6

Volume 1

Amplify Desmos Math FLORIDA

Accelerated 6

Volume 1: Units 1–5

Teacher Edition

About Amplify

Amplify is dedicated to collaborating with educators to create learning experiences that are rigorous and riveting for all students. Amplify creates K–12 core and supplemental curriculum, assessment, and intervention programs for today's students.

A pioneer in K–12 education since 2000, Amplify is leading the way in next-generation curriculum and assessment. All of our programs provide teachers with powerful tools that help them understand and respond to the needs of every student.

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Amplify gratefully acknowledges the work of distinguished program advisors from English Learners Success Forum (ELSF), who have been integral in the development of Amplify Desmos Math. ELSF is a 501(c)(3) nonprofit organization whose mission is to expand educational equity for multilingual learners by increasing the supply of high-quality instructional materials that center their cultural and linguistic assets.

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Dear Teacher,

Welcome to Amplify Desmos Math Florida! We're so excited your school has chosen our program this year. Your hard work plays an essential role in your students' math experience, so we wanted to reach out to introduce ourselves.

We developed the program around the idea that a structured approach to problem-based instruction builds on students' curiosity to develop lasting grade-level understanding for each and every member of your classroom. Each lesson offers opportunities for you to build on students' understanding, connect their ideas, develop their skill fluency, and empower them to ask questions, explore, and make discoveries. This year, our mission is for your students to learn math — and to love learning math!

Here's what you can expect:

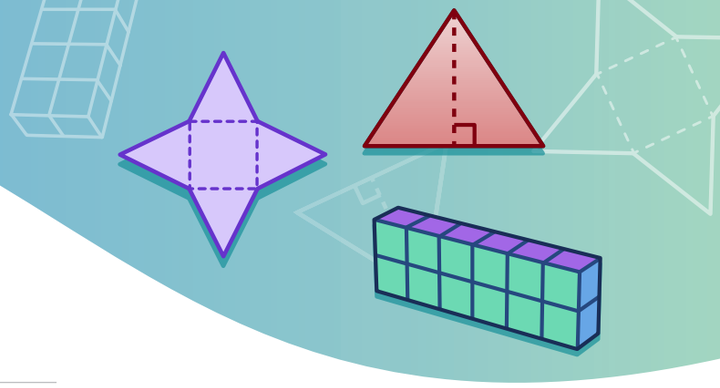
- A program designed around the **Florida B.E.S.T. Standards for Mathematics**, grounded in the strands, standards, and benchmarks, and the importance of student exploration and investigation.
- **Deep and intentional alignment** to the Florida B.E.S.T. standards, Florida English Language Arts standards for K-12 Mathematics, and Florida English Language Development Standards related to the Language of Mathematics.
- **Interactive lessons** that blend paper-based and digital learning, including:
  - » Lessons that drive classroom discussions so students can work toward a shared understanding and sense of community.
  - » Manipulatives, visual models, discussions, and drawings to encourage perseverance and revision.
  - » Easy-to-follow lesson plans, with clear teaching suggestions, strategies, and Math Language Routines.
- **Lesson practice** to support fluency, help students review previous topics, and gain experience with FAST Assessment problem types.
- **Recommended differentiation moves** that meet the needs of all learners.
- **Diagnostic, formative, and summative assessments** along with lesson-level checks for understanding.
- **A caregiver resource** for each unit that includes explanations of key math concepts and problems to try with your student.

We hope your students enjoy using technology to explore math, working with classmates to solve problems, and learning new and interesting concepts. We also hope you love experiencing it with them!

—The Amplify Desmos Math Florida team

Unit 1 Area and Surface Area

Students learn to calculate areas of polygons using formulas and areas of composite figures by decomposing, rearranging, enclosing, and composing shapes. They also represent polyhedra with nets and calculate their surface areas.



Pre-Unit Check 1L

Sub-Unit 1 Area 2

		B.E.S.T. Benchmark Connection
1.01	Triangles and Rectangles | Generalizing the Area of a Triangle 3A	**1.01: MA.6.GR.2.1,** MTR.5.1
1.02	Exploring Triangles | Triangles on a Grid 10A	**1.02: MA.6.GR.2.1,** MTR.5.1
1.03	Off the Grid | Applying the Formula for the Area of a Triangle 16A	**1.03: MA.6.GR.2.1,** MTR.3.1, MTR.6.1
1.04	Letters | Area Strategies 24A	**1.04: MA.6.GR.2.1, MA.6.GR.2.2,** MTR.4.1, MTR.5.1
1.05	Breaking Down | Calculating Areas of Composite Figures Using the Area of Rectangles and Triangles 31A	**1.05: MA.6.GR.2.1, MA.6.GR.2.2,** MTR.5.1
1.06	Access to All Areas | Investigating Areas of Special Quadrilaterals 39A	**1.06: MA.7.GR.1.1,** MTR.1.1, MTR.2.1, MTR.5.1
1.07	Pile of Polygons | Investigating Polygons and Their Areas 46A	**1.07: MA.7.GR.1.2,** MTR.1.1, MTR.4.1, MTR.5.1
1.08	Shapes Inside Shapes | Area of Composite Figures 53A	**1.08: MA.7.GR.1.1, MA.7.GR.1.2,** MTR.2.1, MTR.4.1, MTR.7.1

Sub-Unit Quiz 59A

Sub-Unit 2 Surface Area 60

		B.E.S.T. Benchmark Connection
1.09	Renata's Stickers | Intro to Surface Area 61A	**1.09: MA.6.GR.2.4,** MTR.1.1, MTR.6.1
1.10	Prisms and Pyramids | Polyhedra and Their Faces 69A	**1.10: MA.6.GR.2.4,** MTR.4.1, MTR.6.1
1.11	Nothing But Nets | Nets and Surface Area on a Grid 77A	**1.11: MA.6.GR.2.4,** MTR.4.1

End-of-Unit Assessment 82B

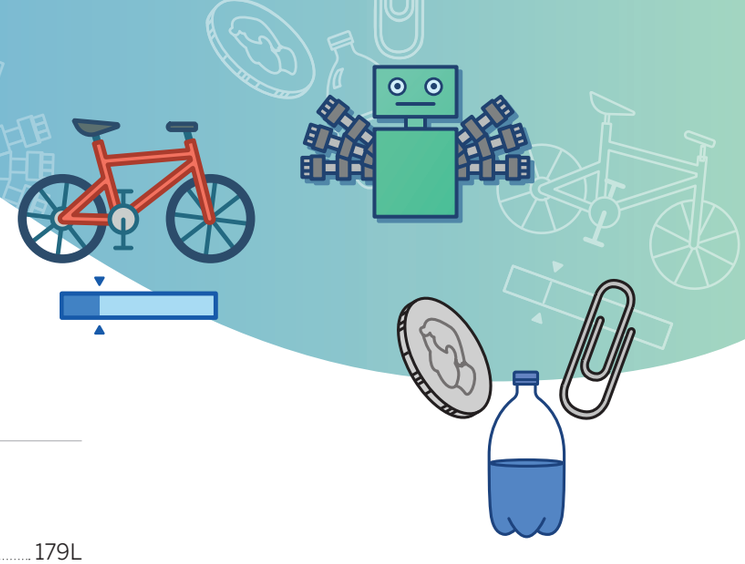
Unit 2 Introducing Ratios

Students are introduced to the concept of ratios. They represent ratios using double number lines, tables, and tape diagrams and use ratio reasoning to solve problems.

		B.E.S.T. Benchmark Connection
Pre-Unit Check	83L	
Sub-Unit 1 Ratios	84	B.E.S.T. Benchmark Connection
2.01 Ratio Relationships | Describing Ratios	85A	**2.01: MA.6.AR.3.1,** MTR.5.1
2.02 Rice Ratios | Introduction to Equivalent Ratios	93A	**2.02: MA.6.AR.3.1, MA.6.AR.3.5,** MTR.5.1
2.03 Fruit Lab | Creating Equivalent Ratios	100A	**2.03: MA.6.AR.3.3,** MTR.1.1, MTR.4.1, MTR.5.1
2.04 Balancing Act | Introduction to Double Number Lines	107A	**2.04: MA.6.AR.3.3, MA.6.AR.3.5,** MTR.4.1
2.05 Table It | Part-to-Part-to-Whole Ratio Tables	115A	**2.05: MA.6.AR.3.3,** MTR.4.1, MTR.5.1, MTR.7.1
Sub-Unit Quiz	121A	
Sub-Unit 2 Common Factors and Multiples	122	B.E.S.T. Benchmark Connection
2.06 Common Multiples | Investigating Least Common Multiple	123A	**2.06: MA.6.NSO.3.1,** MTR.1.1
2.07 Common Factors | Investigating Greatest Common Factor	131A	**2.07: MA.6.NSO.3.1,** MTR.4.1
2.08 Mixing Paint | Comparing Ratios	139A	**2.08: MA.6.AR.3.5,** MTR.4.1, MTR.6.1
Sub-Unit 3 Solving Problems With Ratios	146	B.E.S.T. Benchmark Connection
2.09 Disaster Preparation | Using Ratio Tables With Large Quantities	147A	**2.09: MA.6.AR.3.3,** MTR.2.1, MTR.7.1
2.10 Balloons | Solving Ratio Problems	155A	**2.10: MA.6.AR.3.3,** MTR.2.1, MTR.5.1
2.11 Community Life | Solving Equivalent Ratio Problems in Context	164A	**2.11: MA.6.AR.3.3,** MTR.1.1
2.12 Lunch Waste | Applying Ratio Strategies	171A	**2.12: MA.6.AR.3.5, MA.7.AR.3.2,** MTR.4.1, MTR.7.1
End-of-Unit Assessment	177A	

Unit 3 Unit Rates and Percentages

Students apply ratio reasoning from Unit 2 to unit rates and recognize that equivalent ratios have the same unit rates. They use a variety of strategies and representations of percentages to determine missing percentages, parts, and wholes.



Pre-Unit Check 179L

Sub-Unit 1 Units and Measurement 180

B.E.S.T. Benchmark Connection
3.01: Building Toward MA.6.AR.3.5, MTR.4.1
3.02: MA.6.AR.3.5, MTR.1.1, MTR.5.1

3.01 Many Measurements | Everyday Measurements 181A

3.02 Counting Classrooms | Measuring With Different Units 187A

Sub-Unit 2 Unit Rates 194

B.E.S.T. Benchmark Connection
3.03: MA.6.AR.3.2, MA.6.AR.3.5, MTR.4.1
3.04: MA.6.AR.3.2, MA.6.AR.3.5, MTR.4.1
3.05: MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MTR.4.1
3.06: MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MTR.5.1
3.07: MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MA.7.AR.3.2, MTR.1.1, MTR.4.1, MTR.5.1

3.03 World Records | Comparing Speeds 195A

3.04 Model Trains | Comparing Rates 202A

3.05 Soft Serve | Two Unit Rates 209A

3.06 Welcome to the Robot Factory | Using Unit Rates 216A

3.07 More Soft Serve | Solving Rate Problems 224A

Sub-Unit Quiz 230B

Sub-Unit 3 Percentages 231–232

B.E.S.T. Benchmark Connection
3.08: MA.6.NSO.3.5, MA.6.AR.3.4, MTR.1.1, MTR.3.1, MTR.4.1
3.09: MA.6.NSO.3.5, MA.6.AR.3.4, MTR.2.1, MTR.4.1
3.10: MA.6.NSO.3.5, MA.6.AR.3.4, MTR.5.1
3.11: MA.6.NSO.3.5, MA.6.AR.3.4, MTR.3.1, MTR.4.1
3.12: MA.6.NSO.3.5, MA.6.AR.3.4, MTR.3.1, MTR.4.1
3.13: MA.6.NSO.3.5, MA.6.AR.3.4, MA.7.AR.3.2, MTR.1.1, MTR.7.1

3.08 Lucky Duckies | Benchmark Percentages 233A

3.09 Bicycle Goals | Friendly Percentages 241A

3.10 What's Missing? | Solving Percentage Problems 248A

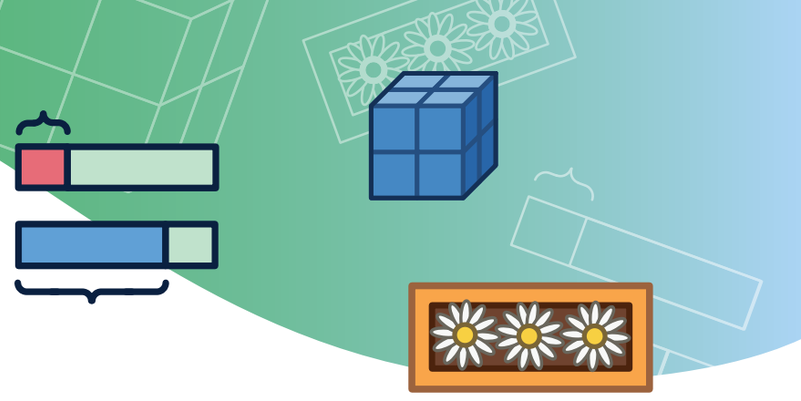
3.11 Cost Breakdown | Any Percentage of a Number 254A

3.12 More Bicycle Goals | Unknown Percentages 263A

3.13 A County as a Village | Applying Ratios, Rates, and Percentages 271A

End-of-Unit Assessment 276B

Unit 4 Multiplying and Dividing Fractions



Students extend what they learned about multiplying and dividing whole numbers to multiply and divide fractions by fractions. They answer questions like "How many groups?" or "How many in 1 group?" They use a variety of strategies, such as making tape diagrams, creating common denominators, and rewriting problems using the distributive property or the reciprocal.

Pre-Unit Check 277L

Sub-Unit 1 Multiplying Fractions 278

			B.E.S.T. Benchmark Connection
4.01	Modeling Products	Multiplying Fractions 279A	4.01: MA.6.NSO.2.2, MTR.2.1, MTR.5.1, MTR.6.1
4.02	Mixing It Up	Multiplying Mixed Numbers 286A	4.02: MA.6.NSO.2.2, MTR.2.1, MTR.5.1, MTR.6.1

Sub-Unit 2 Dividing Fractions 294

			B.E.S.T. Benchmark Connection
4.03	Flour Planner	How Many Groups?, Part 1 ..... 295A	4.03: MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1
4.04	Flower Planters	How Many in Each Group? 303A	4.04: MA.6.NSO.2.3, MTR.1.1, MTR.3.1, MTR.4.1
4.05	Garden Bricks	How Many Groups?, Part 2 ..... 311A	4.05: MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1, MTR.4.1
4.06	Fill the Gap	More or Less Than One Group? 318A	4.06: MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.1.1, MTR.4.1, MTR.5.1
4.07	Break It Down	Using Common Denominators to Divide Fractions 326A	4.07: MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.3.1, MTR.4.1, MTR.6.1
4.08	Potting Soil	Dividing by Unit Fractions 333A	4.08: MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1, MTR.3.1
4.09	Division Challenges	Two Strategies for Dividing Fractions 341A	4.09: MA.6.NSO.2.2, MTR.3.1
4.10	Action Fractions	Relating Fraction Division to Multiplication 350A	4.10: MA.6.NSO.2.2, MTR.1.1, MTR.3.1, MTR.4.1
4.11	Swap Meet	Division of Fractions in Context 358A	4.11: MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.1.1, MTR.2.1, MTR.5.1

Sub-Unit Quiz 364B

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			B.E.S.T. Benchmark Connection
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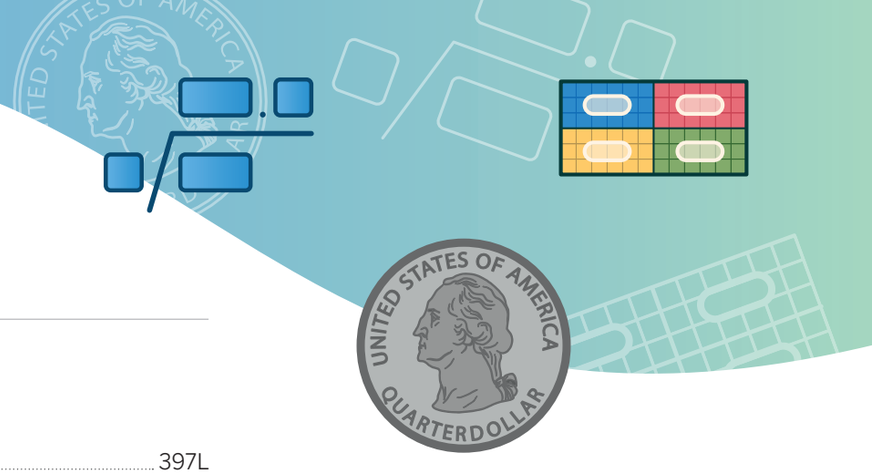
4.14	Volume Challenges	Volumes With Fractional Dimensions 382A	4.14: MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.3, MTR.4.1
4.15	Planter Planner	Applying Fraction Division 389A	4.15: MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.3, MTR.4.1, MTR.7.1

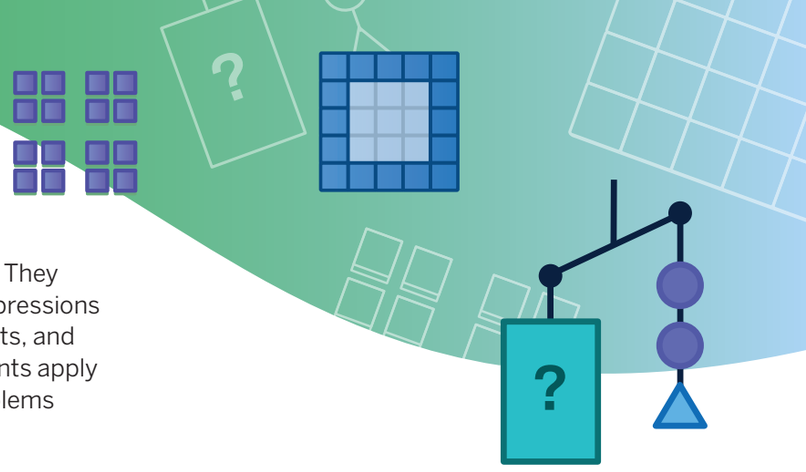
End-of-Unit Assessment 395A

Unit 5 Decimal Arithmetic

Students develop and use a variety of strategies for multiplying and dividing decimals.



		B.E.S.T. Benchmark Connection
Pre-Unit Check	397L	
Sub-Unit 1 Multiplying Decimals	398	B.E.S.T. Benchmark Connection
5.01 Decimal Multiplication | Introduction to Multiplying Decimals	399A	**5.01: MA.6.NSO.2.1,** MTR.2.1
5.02 Garden Arrangements | Factors and Expressions	407A	**5.02: MA.6.NSO.3.2,** MTR.2.1
5.03 Multiplying With Areas | Using Area Models to Multiply Decimals	415A	**5.03: MA.6.NSO.2.1,** MTR.2.1, MTR.6.1
5.04 Multiplication Methods | Using Place Value to Multiply Decimals	423A	**5.04: MA.6.NSO.2.1,** MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1
Sub-Unit Quiz 1	429A	
Sub-Unit 2 Dividing Decimals	430	B.E.S.T. Benchmark Connection
5.05 Division Diagrams | Making Sense of Decimal Division	431A	**5.05: MA.6.NSO.2.1,** MTR.2.1
5.06 Long Division and Other Strategies | Long Division With Decimal Quotients	440A	**5.06: MA.6.NSO.2.1,** MTR.2.1
5.07 Movie Time | Dividing Decimals in Context	447A	**5.07: MA.6.NSO.2.1, MA.6.NSO.2.3,** MTR.1.1, MTR.3.1, MTR.4.1
Sub-Unit Quiz 2	452B	
Sub-Unit 3 Solving Problems With Decimals	453–454	B.E.S.T. Benchmark Connection
5.08 Budget Vehicles | Operations With Decimals in Context	455A	**5.08: MA.6.NSO.2.1, MA.6.NSO.2.3,** MTR.3.1, MTR.5.1, MTR.6.1, MTR.7.1
5.09 Coining New Representations | Percentages, Decimals, and Fractions	461A	**5.09: MA.6.NSO.2.1, MA.6.NSO.2.3, MA.6.NSO.3.5,** MTR.2.1, MTR.3.1
5.10 Grocery Prices | Percentages as Decimals	468A	**5.10: MA.6.NSO.3.5,** MTR.1.1, MTR.2.1, MTR.4.1
End-of-Unit Assessment	474B	



Unit 6 Expressions and Equations

Students reason about expressions and equations involving variables. They solve equations of the forms $x + p = q$ and $px = q$, write equivalent expressions using variables, make sense of variable expressions involving exponents, and create representations for relationships between two variables. Students apply what they know about ratios, proportions, and equations to solve problems involving percent change.

Pre-Unit Check 475L

Sub-Unit 1 Solving Equations 476

6.01	Weight for It	Reasoning About Unknown Values	477A
6.02	Five Equations	Tape Diagrams, Equations, Situations	485A
6.03	Hanging Around	Introduction to Balanced Hangers	491A
6.04	Swap and Solve	Solving Equations in Context	499A
6.05	Solutions of a Different Kind	Solving Equations with Decimals and Fractions	505A

B.E.S.T. Benchmark Connection

6.01: **MA.6.AR.2.2, MA.6.AR.2.3,** MTR.2.1, MTR.4.1, MTR.5.1

6.02: **MA.6.AR.2.1, MA.6.AR.2.2, MA.6.AR.2.3,** MTR.2.1, MTR.4.1, MTR.5.1

6.03: **MA.6.AR.2.2, MA.6.AR.2.3,** MTR.2.1, MTR.4.1, MTR.5.1

6.04: **MA.6.AR.2.1, MA.6.AR.2.2, MA.6.AR.2.3,** MTR.2.1, MTR.4.1, MTR.5.1

6.05: **MA.6.AR.2.4,** MTR.3.1, MTR.4.1, MTR.5.1

Sub-Unit 2 Equivalent Expressions 514

6.06	Vari-apples	Introduction to Variable Expressions	515A
6.07	Border Tiles	Equivalent Expressions	524A
6.08	Products and Sums	Distributive Property, Part 1	532A
6.09	Equivalent Expressions	Distributive Property, Part 2	539A

Sub-Unit Quiz 544B

B.E.S.T. Benchmark Connection

6.06: **MA.6.AR.1.1, MA.6.AR.1.3,** MTR.2.1, MTR.4.1, MTR.5.1, MTR.7.1

6.07: **MA.6.AR.1.4, MA.7.AR.1.2,** MTR.2.1, MTR.4.1, MTR.5.1

6.08: **MA.6.AR.1.4,** MTR.4.1

6.09: **MA.6.AR.1.4, MA.7.AR.1.2,** MTR.4.1

Sub-Unit 3 Expressions Involving Exponents 545–546

6.10	Powers	What Are Exponents?	547A
6.11	Exponent Expressions	Exponents and Order of Operations	557A

B.E.S.T. Benchmark Connection

6.10: **MA.6.NSO.3.3, MA.6.NSO.3.4,** MTR.2.1, MTR.3.1

6.11: **MA.6.NSO.3.3,** MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1

Sub-Unit 4 Applying Percentages 564

6.12	More and Less	Percent Increase and Decrease With Tape Diagrams	565A
6.13	All the Equations	Percent Increase and Decrease With Equations	573A
6.14	100%	Percent Increase and Decrease With Double Number Lines	580A
6.15	Tax, Tips, and Fees	Multistep Percent Problems	587A
6.16	How Simple, How Interesting	Calculating Simple Interest Using a Formula	595A
6.17	Bookcase Builder	Percent Error	601A

End-of-Unit Assessment 609A

B.E.S.T. Benchmark Connection

6.12: **MA.6.NSO.3.5, MA.7.AR.3.1,** MTR.2.1

6.13: **MA.6.NSO.3.5, MA.7.AR.3.1,** MTR.1.1

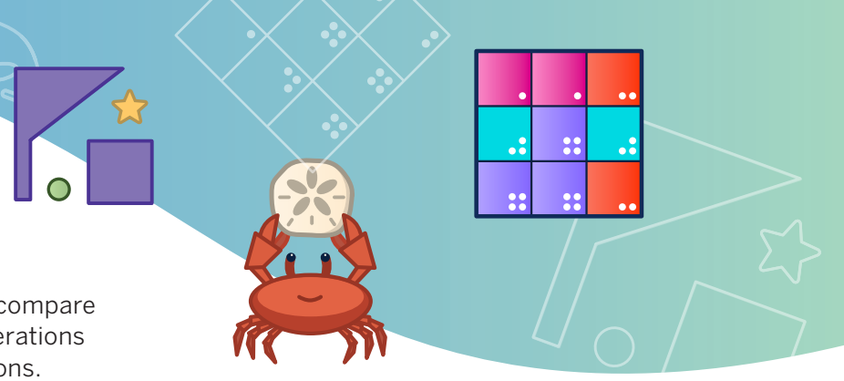
6.14: **MA.6.NSO.1.2, MA.7.AR.3.1,** MTR.1.1, MTR.2.1

6.15: **MA.6.NSO.3.5, MA.7.AR.3.1,** MTR.3.1, MTR.4.1

6.16: **MA.6.NSO.3.5, MA.7.AR.3.1,** MTR.3.1, MTR.7.1

6.17: **MA.7.NSO.3.5, MA.7.AR.3.1,** MTR.3.1, MTR.4.1

Unit 7 Positive and Negative Numbers

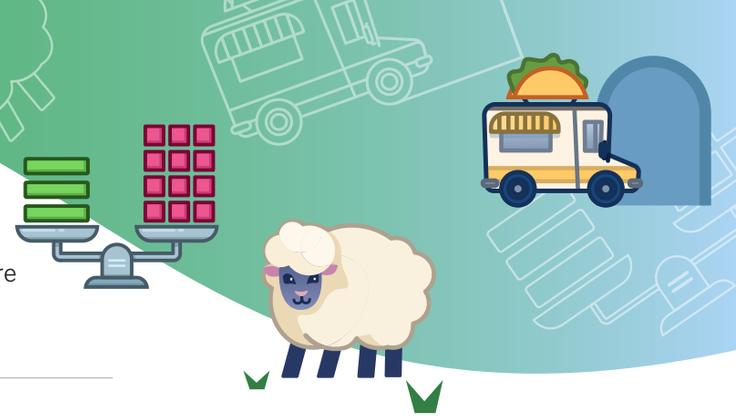


Students explore positive and negative numbers in several ways: on a number line, in expressions, and on the coordinate plane. They compare these numbers, as well as their absolute values, and use order of operations to evaluate numerical expressions and generate equivalent expressions.

			B.E.S.T. Benchmark Connection
	Pre-Unit Check	611N	
Sub-Unit 1	Signed Numbers and Absolute Values	612	**B.E.S.T. Benchmark Connection**
7.01	Can You Dig It? | Positive and Negative Numbers	613A	**7.01: MA.6.NSO.1.1, MA.6.NSO.1.2, MA.6.NSO.4.1,** MTR.1.1, MTR.5.1
7.02	Digging Deeper | Positions on the Number Line	620A	**7.02: MA.6.NSO.1.1, MA.6.NSO.1.2,** MTR.1.1, MTR.4.1
7.03	Sub-Zero | Positive and Negative Numbers in Context	627A	**7.03: MA.6.NSO.1.1, MA.6.NSO.1.2,** MTR.2.1, MTR.3.1, MTR.6.1
7.04	Order in the Class | Comparing Numbers	634A	**7.04: MA.6.NSO.1.1, MA.6.NSO.1.2, MA.6.NSO.3.5,** MTR.1.1, MTR.4.1
7.05	Distance on the Number Line | Introduction to Absolute Value	641A	**7.05: MA.6.NSO.1.1, MA.6.NSO.1.4,** MTR.2.1, MTR.3.1
7.06	We've Got Game(s) | Comparing Numbers and Distances From Zero	649A	**7.06: MA.6.NSO.1.1, MA.6.NSO.1.2, MA.6.NSO.1.3, MA.6.NSO.1.4,** MTR.2.1, MTR.3.1
7.07	Floats and Anchors | Representing Adding and Subtracting	656A	**7.07: MA.6.NSO.4.1,** MTR.1.1, MTR.4.1, MTR.5.1
7.08	More Floats and Anchors | Adding and Subtracting Positive and Negative Numbers	664A	**7.08: MA.6.NSO.4.1,** MTR.1.1, MTR.3.1, MTR.5.1
7.09	Up, Up, and Away! | Multiplying and Dividing Integers	671A	**7.09: MA.6.NSO.4.2,** MTR.2.1
	Sub-Unit Quiz	679A	
Sub-Unit 2	Operations With Rational Numbers	680	**B.E.S.T. Benchmark Connection**
7.10	Bumpers | Adding and Subtracting on the Number Line	681A	**7.10: MA.7.NSO.2.2,** MTR.3.1, MTR.4.1, MTR.5.1
7.11	Back in Time | Position, Rate, and Time	688A	**7.11: MA.7.NSO.2.1, MA.7.NSO.2.2, MA.7.NSO.2.3,** MTR.3.1, MTR.5.1, MTR.7.1
7.12	Speeding Turtles | Dividing Rational Numbers	696A	**7.12: MA.7.NSO.2.2, MA.7.NSO.2.3,** MTR.3.1, MTR.5.1, MTR.7.1
7.13	Order Matters | Evaluating Numerical Expressions	703A	**7.13: MA.7.NSO.2.1, MA.7.NSO.2.2, MA.7.NSO.2.3,** MTR.1.1, MTR.5.1
7.14	The Same but Different | Determining Whether Expressions Are Equivalent	711A	**7.14: MA.7.NSO.2.1, MA.7.NSO.2.2, MA.7.AR.1.2,** MTR.2.1, MTR.4.1
7.15	Collect the Squares | Adding and Subtracting Expressions	718A	**7.15: MA.7.NSO.2.1, MA.7.NSO.2.2, MA.7.AR.1.1,** MTR.3.1, MTR.4.1, MTR.5.1
Sub-Unit 3	The Coordinate Plane	726	**B.E.S.T. Benchmark Connection**
7.16	Sand Dollar Search | Points in the Coordinate Plane	727A	**7.16: MA.6.GR.1.1,** MTR.1.1, MTR.4.1
7.17	The A-maze-ing Coordinate Plane | Practice Plotting	735A	**7.17: MA.6.GR.1.1,** MTR.1.1, MTR.4.1
7.18	Polygon Maker | Polygons in the Plane	744A	**7.18: MA.6.GR.1.1, MA.6.GR.1.2, MA.6.GR.1.3,** MTR.1.1, MTR.4.1
7.19	Graph Telephone | The Coordinate Plane in Context	752A	**7.19: MA.6.GR.1.1, MA.6.GR.1.3,** MTR.4.1, MTR.5.1, MTR.7.1
	End-of-Unit Assessment	757A	

Unit 8 Equations and Inequalities With Integers

Students solve equations with positive and negative numbers. They explore solutions to inequalities and graph the solutions on a number line.



Pre-Unit Check 759L

Sub-Unit 1 Equations 760

			B.E.S.T. Benchmark Connection
8.01	Plus or Minus	Solving Equations Involving Addition and Subtraction 761A	**8.01: MA.6.AR.2.2,** MTR.2.1, MTR.5.1, MTR.7.1
8.02	Multiply, Divide, and Conquer	Solving Equations Involving Multiplication and Division 768A	**8.02: MA.6.AR.2.3,** MTR.2.1, MTR.7.1

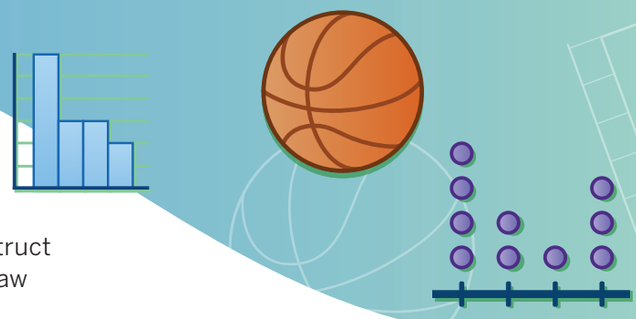
Sub-Unit Quiz 774B

Sub-Unit 2 Inequalities 775–776

			B.E.S.T. Benchmark Connection
8.03	Tunnel Travels	Graphing Inequalities 777A	**8.03: MA.6.AR.1.2,** MTR.2.1, MTR.3.1
8.04	Shira's Solutions	Solutions to Inequalities 784A	**8.04: MA.6.NSO.1.1, MA.6.AR.1.2, MA.6.AR.2.1,** MTR.2.1, MTR.3.1
8.05	Comparing Weights	Writing Inequalities 792A	**8.05: MA.6.AR.1.2, MA.6.AR.2.1,** MTR.1.1, MTR.4.1
8.06	Unbalanced Hangers	Solving Inequalities 800A	**8.06: MA.7.NSO.2.2, MA.7.AR.2.1,** MTR.2.1, MTR.3.1, MTR.4.1
8.07	Shira the Sheep	Solving Inequalities With Positive and Negative Numbers 808A	**8.07: MA.7.NSO.2.2, MA.7.AR.2.1,** MTR.3.1, MTR.4.1, MTR.6.1

End-of-Unit Assessment 815A

Unit 9 Describing Data



Students visualize data using dot plots and histograms before calculating measures of center — mean, mode, and median — and measures of variability — range and interquartile range (IQR). They construct box plots and interpret these measures in context and use samples to draw conclusions about and compare populations.

Pre-Unit Check 817N

Sub-Unit 1 Visualizing Data 818

B.E.S.T. Benchmark Connection
9.01 Screen Time | Asking Questions, Collecting Data, and Making Claims ..... 819A — **9.01: MA.6.DP.1.1,** MTR.1.1, MTR.4.1
9.02 Survey Says . . . | Using Data to Generate Statistical Questions ..... 827A — **9.02: MA.6.DP.1.1,** MTR.1.1, MTR.4.1
9.03 The Plot Thickens | Introduction to Histograms ..... 834A — **9.03: MA.6.DP.1.5,** MTR.4.1, MTR.6.1
9.04 What Does It All Mean? | Describing and Interpreting Histograms and Dot Plots ..... 841A — **9.04: MA.6.DP.1.4,** MTR.4.1, MTR.7.1
9.05 DIY Histograms | Creating Histograms ..... 848A — **9.05: MA.6.DP.1.4, MA.6.DP.1.5,** MTR.4.1, MTR.5.1, MTR.7.1

Sub-Unit Quiz 845B

Sub-Unit 2 Measuring Data: Mean, Median, Mode, IQR, and Range 855–856

B.E.S.T. Benchmark Connection
9.06 Snack Time | Introduction to the Mean ..... 857A — **9.06: MA.6.DP.1.2,** MTR.2.1, MTR.3.1, MTR.6.1
9.07 Modes of Weather | Introducing the Mode ..... 865A — **9.07: MA.6.DP.1.2,** MTR.4.1, MTR.7.1
9.08 Toy Cars | Introducing the Median ..... 872A — **9.08: MA.6.DP.1.2,** MTR.2.1, MTR.3.1, MTR.6.1
9.09 In the News | Comparing Measures of Center ..... 879A — **9.09: MA.6.DP.1.6,** MTR.1.1, MTR.4.1
9.10 Hoops | Calculating and Interpreting the Range ..... 887A — **9.10: MA.6.DP.1.2, MA.6.DP.1.6,** MTR.4.1, MTR.5.1, MTR.7.1
9.11 Pumpkin Patch | Introduction to Quartiles ..... 894A — **9.11: MA.6.DP.1.3,** MTR.1.1, MTR.4.1
9.12 Car, Plane, Bus, or Train? | Box Plots, IQR, and Range ..... 903A — **9.12: MA.6.DP.1.3, MA.6.DP.1.5, MA.6.DP.1.6,** MTR.1.1, MTR.4.1

Sub-Unit Quiz 910B

Sub-Unit 3 Sampling 911–912

B.E.S.T. Benchmark Connection
9.13 Car, Bike, or Train? | Using Mean, Median, and Range to Compare Groups ..... 913A — **9.13: MA.7.NSO.2.2, MA.7.NSO.2.3, MA.7.DP.1.1, MA.7.DP.1.2,** MTR.4.1, MTR.7.1
9.14 Crab Island | Sampling From Large Populations ..... 920A — **9.14: MA.7.DP.1.3,** MTR.1.1, MTR.4.1, MTR.7.1
9.15 Flower Power | Using Percentages to Predict Populations ..... 928A — **9.15: MA.7.NSO.2.2, MA.7.NSO.2.3, MA.7.AR.3.2, MA.7.AR.4.5, MA.7.DP.1.3,** MTR.4.1, MTR.5.1, MTR.6.1
9.16 Plots and Samples | Using Statistical Measures to Make Predictions ..... 935A — **9.16: MA.7.DP.1.1, MA.7.DP.1.2,** MTR.5.1, MTR.6.1
9.17 School Newspaper | Comparing Populations ..... 943A — **9.17: MA.7.DP.1.2,** MTR.4.1, MTR.7.1

End-of-Unit Assessment 949A

Unit 10 Probability

Students learn about probability as a way to describe the likelihood of unknown events and estimate the probability of real-world situations.

Pre-Unit Check 951L

Sub-Unit 1 Probability 952

10.01 How Likely? | Chance Experiments 953A

10.02 Prob-bear-bilities | Intro to Probability 959A

10.03 Mystery Bag | Predicting Sample Spaces 968A

10.04 Spin Class | Repeated Experiments 976A

10.05 Is It Fair? | Comparing Probabilities and Experiments 984A

End-of-Unit Assessment 991A

B.E.S.T. Benchmark Connection
10.01: MA.7.DP.2.1, MTR.2.1, MTR.3.1
10.02: MA.7.DP.2.1, MA.7.DP.2.2, MA.7.DP.2.3, MTR.2.1, MTR.3.1
10.03: MA.6.NSO.3.5, MA.7.DP.2.2, MA.7.DP.2.3, MA.7.DP.2.4, MTR.3.1, MTR.6.1
10.04: MA.6.NSO.3.5, MA.7.DP.2.2, MA.7.DP.2.3, MA.7.DP.2.4, MTR.1.1, MTR.4.1
10.05: MA.6.NSO.3.5, MA.7.DP.2.3, MA.7.DP.2.4, MTR.5.1, MTR.6.1

A curiosity-driven program that builds students' lifelong math proficiency

As we developed Amplify Desmos Math Florida, we asked ourselves: how can we support teachers in creating a collaborative classroom of learners excited about math?

With that question in mind, we built the program around four core tenets:

A structured approach to problem-based learning

The program thoughtfully combines conceptual understanding, procedural fluency, and application. Each lesson is designed to tell a story by posing problems that invite a variety of approaches before guiding students to synthesize their understanding of the learning goals.

The Teacher Edition provides guidance for teachers to anticipate and monitor strategies students may use, select and sequence students' ideas, and orchestrate productive discussions to help students make connections between their own ideas and those of their classmates.[1]

Proficiency Progression

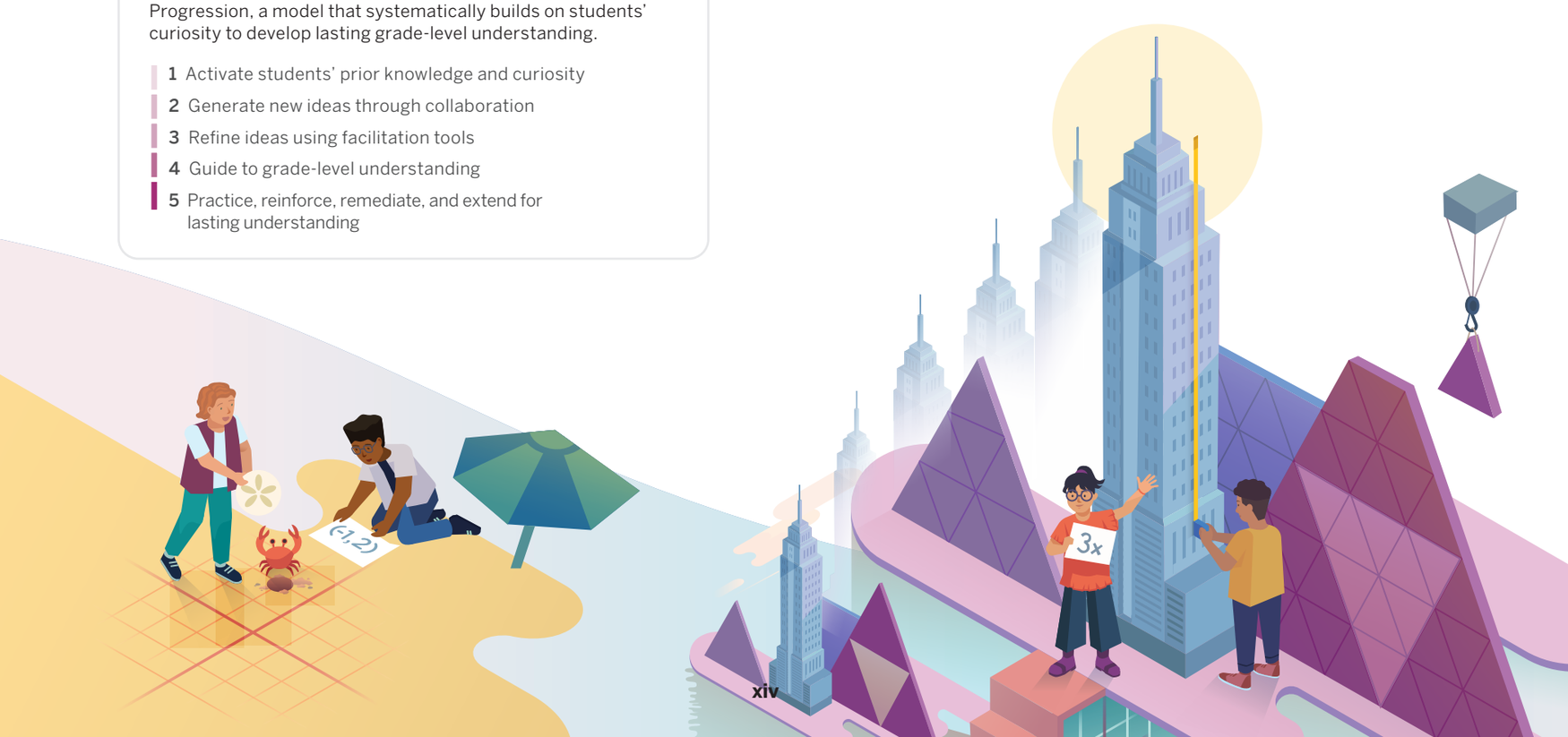
Lessons are designed around what we call the Proficiency Progression, a model that systematically builds on students' curiosity to develop lasting grade-level understanding.

1. Activate students' prior knowledge and curiosity
2. Generate new ideas through collaboration
3. Refine ideas using facilitation tools
4. Guide to grade-level understanding
5. Practice, reinforce, remediate, and extend for lasting understanding

Access to grade-level math for every student, every day

Tasks in each lesson are thoughtfully sequenced so that all students can engage with the math each day without any roadblocks. Every lesson includes suggestions for accessibility and differentiation to support, strengthen, and stretch students' understanding.

We also provide additional resources that integrate seamlessly with core instruction, including a suite of assessments, tailored practice resources that adjust to students' learning, and other intervention solutions. Cohesive differentiation and intervention resources support and challenge students on their path toward deeper understanding of the learning goals, ensuring all students a path toward a deeper understanding of the learning goals of the course.



Student thinking is valuable and can be made evident

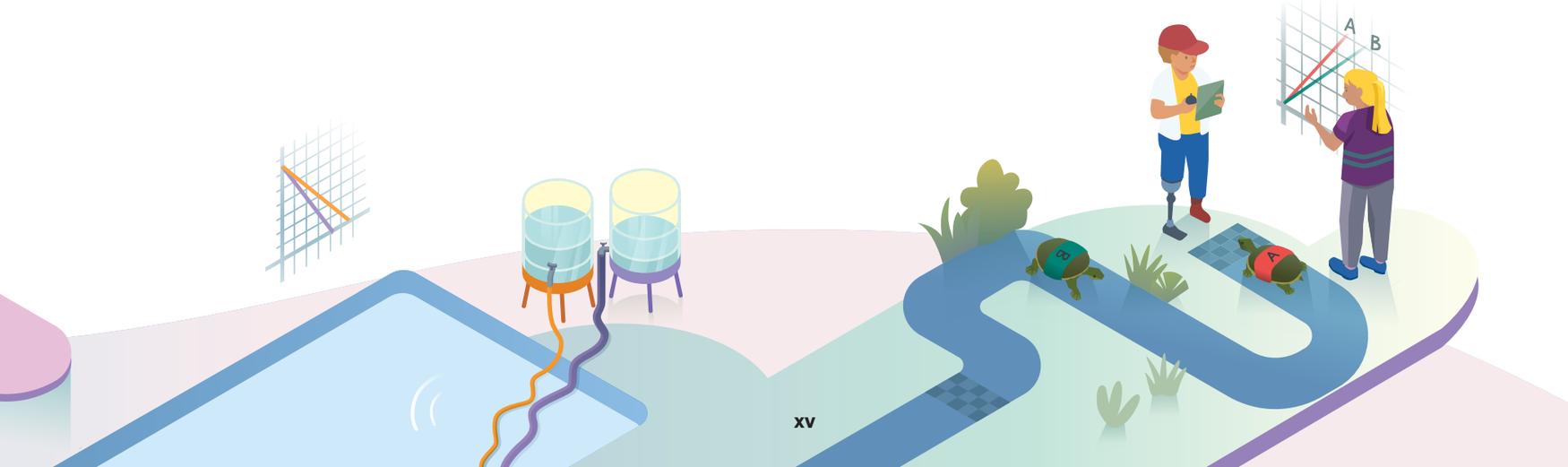
Students take an active role in developing their own ideas first and then synthesize them as a class. To guide the learning process, students see each other's thinking, engage in conversations, and connect to each other through the understanding that they can use math to make sense of the world. This fuels classroom conversations and a shared understanding of math.

Math that motivates students

Picture a classroom where students are so eagerly engaged in a lesson, they wish it would not end. It is buzzing with the sounds of natural curiosity.

Our curriculum supports collaborative classrooms, invites mathematical creativity, and evokes wonder, empowering students to see themselves and their classmates as having brilliant mathematical ideas.

[1] Smith, M.S., & Stein, M.K. (2018). *5 practices for orchestrating productive mathematics discussions* (2nd ed.). SAGE Publications.



Scope and Sequence | Grade 6–Accelerated 6

Volume 1

	Unit 1	Unit 2	Unit 3	Unit 4
Grade 6 127 days	Area and Surface Area 8 instructional days 3 assessment days	Introducing Ratios 12 instructional days 3 assessment days, Math in Action	Unit Rates and Percentages 13 instructional days 3 assessment days	Multiplying and Dividing Fractions 15 instructional days 3 assessment days, Math in Action
Grade 7 116 days	Scale Drawings 10 instructional days 3 assessment days	Introducing Proportional Relationships 13 instructional days 4 assessment days, Math in Action	Measuring Circles 6 instructional days 3 assessment days	Proportional Relationships and Percentages 12 instructional days 4 assessment days, Math in Action
Grade 8 120 days	Rigid Transformations and Congruence 10 instructional days 3 assessment days	Dilations, Similarity, and Slope 10 instructional days 4 assessment days, Math in Action	Proportional and Linear Relationships 11 instructional days 3 assessment days	Linear Equations and Linear Systems 10 instructional days 4 assessment days, Math in Action
Algebra 1 130 days	Linear Equations and Inequalities 18 instructional days 4 assessment days, Math in Action	Describing Data 17 instructional days 3 assessment days	Describing Functions 12 instructional days 4 assessment days, Math in Action	Describing Functions 10 instructional days 3 assessment days

Volume 1

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Accelerated 6 160 days	Area and Surface Area 11 instructional days 3 assessment days 14 days total	Introducing Ratios 12 instructional days 4 assessment days, Math in Action 16 days total	Unit Rates and Percentages 13 instructional days 3 assessment days 16 days total	Multiplying and Dividing Fractions 15 instructional days 4 assessment days, Math in Action 19 days total	Decimal Arithmetic 10 instructional days 4 assessment days 14 days total
Accelerated 7 164 days	Rigid Transformations and Congruence 10 instructional days 3 assessment Days 13 days total	Scale Factors, Dilations, Similarity, and Slope 16 instructional days 5 assessment days, Math in Action 21 days total	Introducing Proportional Relationships 11 instructional days 3 assessment Days 14 days total	Linear Relationships and Equations 8 instructional days 4 assessment days, Math in Action 12 days total	Linear Equations and Linear Systems 15 instructional days 3 assessment Days 18 days total

Volume 2

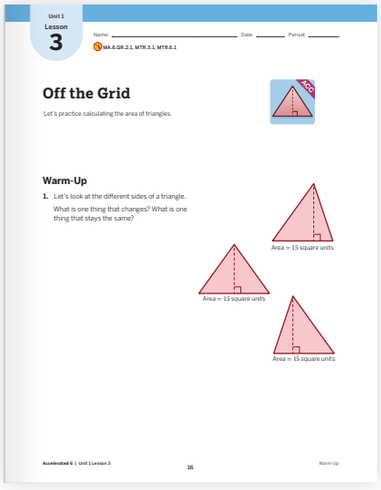
Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Decimal Arithmetic 10 instructional days 3 assessment Days	Expressions and Equations 11 instructional days 4 assessment Days, Math in Action	Positive and Negative Numbers 18 instructional days 3 assessment Days	Describing Data 12 instructional days 4 assessment Days, Math in Action	
Positive and Negative Rational Numbers 10 instructional days 3 assessment days	Equations, Expressions, and Inequalities 16 instructional days 4 assessment days, Math in Action	Polygons and Cylinders 8 instructional days 3 assessment days	Probability and Sampling 13 instructional days 4 assessment days, Math in Action	
Functions 7 instructional days 3 assessment days	Associations in Data 9 instructional days 4 assessment days, Math in Action	Exponents and Scientific Notation 13 instructional days 3 assessment days	The Pythagorean Theorem and Irrational Numbers 15 instructional days 4 assessment days, Math in Action	Probability 5 instructional days 2 assessment days
Exponential Functions 15 instructional days 4 assessment days, Math in Action	Quadratic Functions 15 instructional days 3 assessment days	Quadratic Equations 18 instructional days 4 assessment days, Math in Action		

Volume 2

Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11
Expressions and Equations 17 instructional days 4 assessment days, Math in Action 21 days total	Positive and Negative Numbers 19 instructional days 3 assessment days 22 days total	Equations and Inequalities with Integers 7 instructional days 4 assessment days, Math in Action 11 days total	Positive and Negative Numbers 17 instructional days 3 assessment days 20 days total	Describing Data 5 instructional days 2 assessment days 7 days total	
Functions 7 instructional days 4 assessment days, Math in Action 11 days total	Circles and Cylinders 9 instructional days 3 assessment Days 12 days total	Data 12 instructional days 4 assessment days, Math in Action 16 days total	The Pythagorean Theorem and Irrational Numbers 18 instructional days 3 assessment Days 21 days total	Polygons and Cylinders 16 instructional days 3 assessment days 19 days total	Probability 5 instructional days 2 assessment Days 7 days total

Program Resources

For Students


Unit 1
Lesson 3

Name: _____ Date: _____ Period: _____

MA.6.GR.2.1, MTR.3.1, MTR.6.1

Off the Grid

Let's practice calculating the area of triangles.

ACC

Warm-Up

1. Let's look at the different sides of a triangle.
   What is one thing that changes? What is one thing that stays the same?

Area = 15 square units

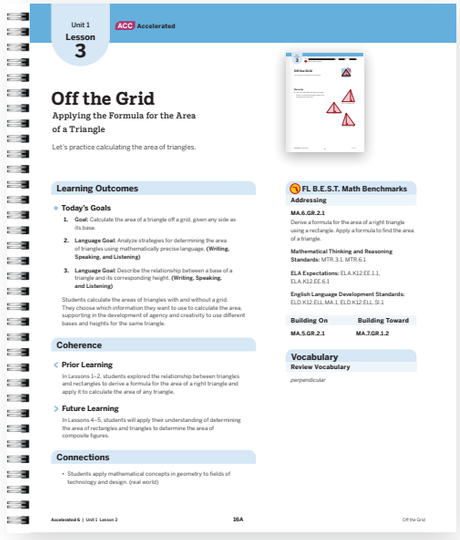
Area = 15 square units

Area = 15 square units

Accelerated 6 | Unit 1 Lesson 3 16 Warm-Up

- Student Edition (two-volume)

For Teachers


Unit 1
Lesson 3

ACC Accelerated

Off the Grid

Applying the Formula for the Area of a Triangle

Let's practice calculating the area of triangles.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate the area of a triangle off a grid, given any side as its base.
2. **Language Goal:** Analyze strategies for determining the area of triangles using mathematically precise language. **(Writing, Speaking, and Listening)**
3. **Language Goal:** Describe the relationship between a base of a triangle and its corresponding height. **(Writing, Speaking, and Listening)**

Students calculate the areas of triangles with and without a grid. They choose which information they want to use to calculate the area, supporting in the development of agency and creativity to use different bases and heights for the same triangle.

Coherence

Prior Learning

In Lessons 1–2, students explored the relationship between triangles and rectangles to derive a formula for the area of a right triangle and apply it to calculate the area of any triangle.

Future Learning

In Lessons 4–5, students will apply their understanding of determining the area of rectangles and triangles to determine the area of composite figures.

Connections

- Students apply mathematical concepts in geometry to fields of technology and design. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.1

Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.

Mathematical Thinking and Reasoning Standards: MTR.3.1, MTR.6.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.1.2

Vocabulary

Review Vocabulary

perpendicular

Accelerated 6 | Unit 1 Lesson 3 16A Off the Grid

- Teacher Edition (two-volume)

Additional Resources

Assessment and Lesson Resources

- Unit Assessments
- Show What You Know Lesson Assessments
- Rubrics and Teacher Answer Keys
- Activity Sheets and Cards

Intervention and Extension Resources

- Mini-Lessons
- Prior grade Mini-Lessons
- Extensions

Optional: Manipulative Kits

hand2mind

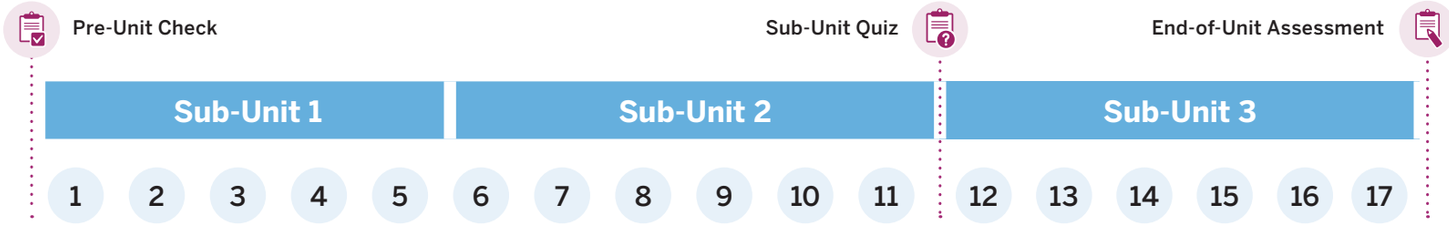
Program Architecture

Course

UNIT 1	UNIT 2	UNIT 3	UNIT 4	UNIT 5	UNIT 6	UNIT 7	UNIT 8	UNIT 9	UNIT 10
14 days	16 days	16 days	19 days	14 days	21 days	22 days	10 days	21 days	7 days

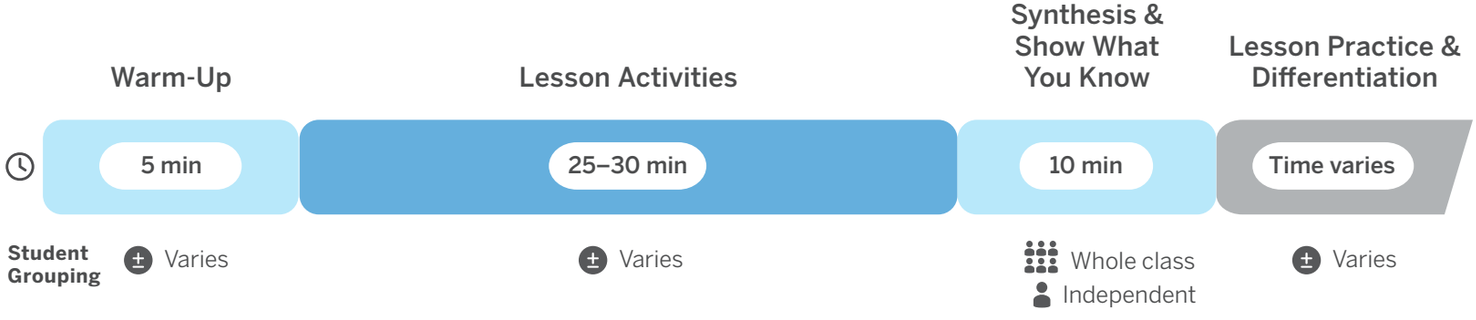
Note: The number of lessons varies from unit to unit. See Scope and Sequence pages for the full program scope.

Unit



Note: The number of sub-units, quizzes, and lessons within each unit varies. This depiction shows the general structure of a unit. See the course Table of Contents for more details.

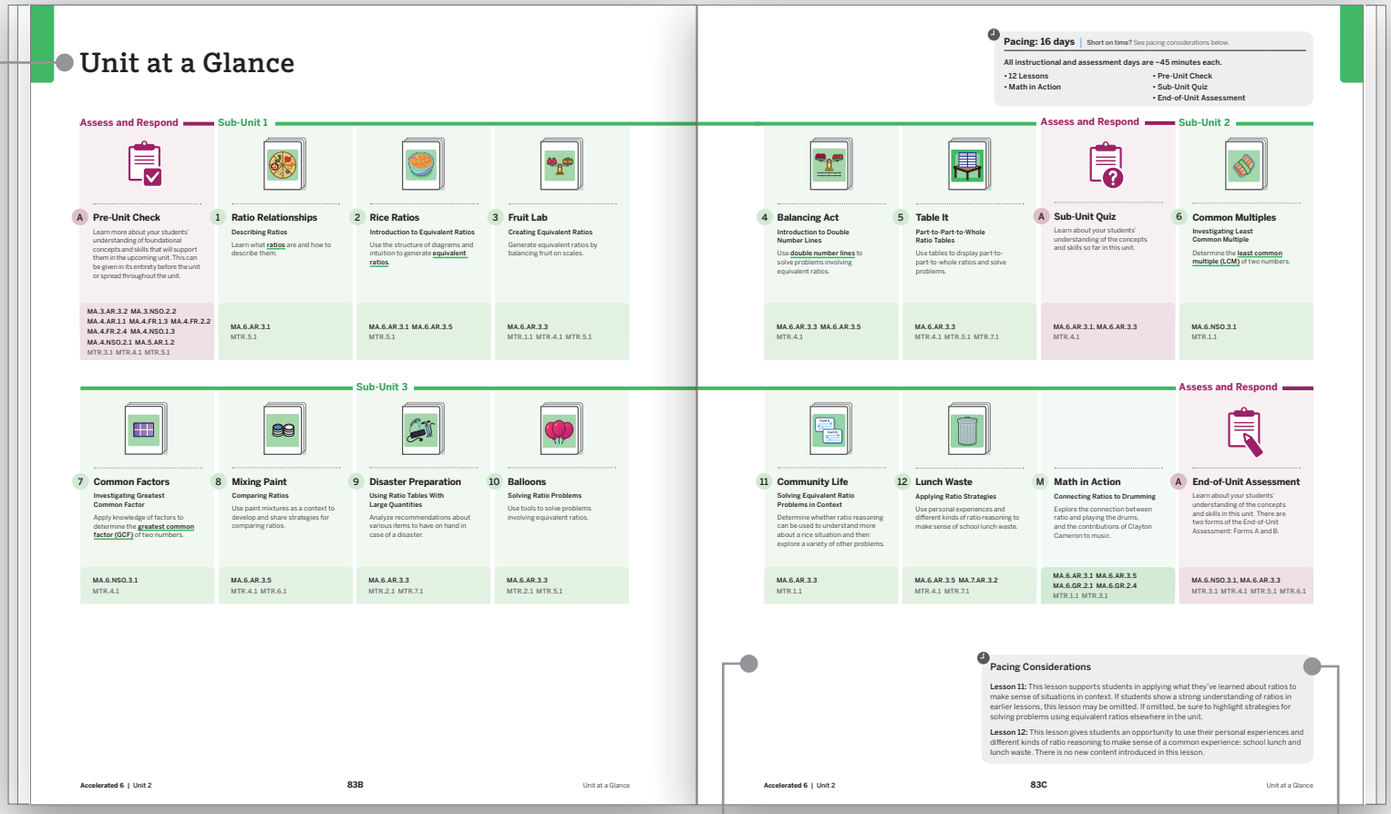
Lesson



Navigating This Program

Unit & Sub-Unit Resources

Each unit includes a range of resources designed to support teachers in thinking through the progression of mathematics that students will engage with over the course of the unit. These resources can support teachers in their unit planning, as well as choices they make in response to students' thinking, strengths, and needs that arise over the course of the unit.



Unit at a Glance

Pacing: 16 days | **Short on time?** See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 12 Lessons
- Math in Action
- Pre-Unit Check
- Sub-Unit Quiz
- End-of-Unit Assessment

Assess and Respond

A Pre-Unit Check
Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.
MA.3.AR.3.2 MA.3.NSO.2.2 MA.4.AR.1.1 MA.4.FR.1.3 MA.4.FR.2.2 MA.4.FR.2.4 MA.4.NSO.1.3 MA.4.NSO.2.1 MA.5.AR.1.2 MTR.3.1 MTR.4.1 MTR.5.1

Sub-Unit 1

1 Ratio Relationships
Describing Ratios
Learn what ratios are and how to describe them.
MA.6.AR.3.1 MTR.5.1

2 Rice Ratios
Introduction to Equivalent Ratios
Use the structure of diagrams and intuition to generate equivalent ratios.
MA.6.AR.3.1 MA.6.AR.3.5 MTR.5.1

3 Fruit Lab
Creating Equivalent Ratios
Generate equivalent ratios by balancing fruit on scales.
MA.6.AR.3.3 MTR.1.1 MTR.4.1 MTR.5.1

Sub-Unit 2

4 Balancing Act
Introduction to Double Number Lines
Use double number lines to solve problems involving equivalent ratios.
MA.6.AR.3.3 MA.6.AR.3.5 MTR.4.1

5 Table It
Part-to-Part-to-Whole Ratio Tables
Use tables to display part-to-part-to-whole ratios and solve problems.
MA.6.AR.3.3 MTR.4.1 MTR.5.1 MTR.7.1

Assess and Respond

A Sub-Unit Quiz
Learn about your students' understanding of the concepts and skills so far in this unit.
MA.6.AR.3.1, MA.6.AR.3.3 MTR.4.1

Sub-Unit 2

6 Common Multiples
Investigating Least Common Multiple
Determine the least common multiple (LCM) of two numbers.
MA.6.NSO.3.1 MTR.1.1

Sub-Unit 3

7 Common Factors
Investigating Greatest Common Factor
Apply knowledge of factors to determine the greatest common factor (GCF) of two numbers.
MA.6.NSO.3.1 MTR.4.1

8 Mixing Paint
Comparing Ratios
Use paint mixtures as a context to develop and share strategies for comparing ratios.
MA.6.AR.3.5 MTR.4.1 MTR.6.1

9 Disaster Preparation
Using Ratio Tables With Large Quantities
Analyze recommendations about various items to have on hand in case of a disaster.
MA.6.AR.3.3 MTR.2.1 MTR.7.1

10 Balloons
Solving Ratio Problems
Use tools to solve problems involving equivalent ratios.
MA.6.AR.3.3 MTR.2.1 MTR.5.1

Assess and Respond

11 Community Life
Solving Equivalent Ratio Problems in Context
Determine whether ratio reasoning can be used to understand more about a rice situation and then explore a variety of other problems.
MA.6.AR.3.3 MTR.1.1

12 Lunch Waste
Applying Ratio Strategies
Use personal experiences and different kinds of ratio reasoning to make sense of school lunch waste.
MA.6.AR.3.5 MA.7.AR.3.2 MTR.4.1 MTR.7.1

M Math in Action
Connecting Ratios to Drumming
Explore the connection between ratio and playing the drums, and the contributions of Clayton Cameron to music.
MA.6.AR.3.1 MA.6.AR.3.5 MA.6.GR.2.1 MA.6.GR.2.4 MTR.1.1 MTR.3.1

A End-of-Unit Assessment
Learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.
MA.6.NSO.3.1, MA.6.AR.3.3 MTR.3.1 MTR.4.1 MTR.5.1 MTR.6.1

Pacing Considerations

Lesson 11: This lesson supports students in applying what they've learned about ratios to make sense of situations in context. If students show a strong understanding of ratios in earlier lessons, this lesson may be omitted. If omitted, be sure to highlight strategies for solving problems using equivalent ratios elsewhere in the unit.

Lesson 12: This lesson gives students an opportunity to use their personal experiences and different kinds of ratio reasoning to make sense of a common experience: school lunch and lunch waste. There is no new content introduced in this lesson.

Accelerated 6 | Unit 2 83B Unit at a Glance

Accelerated 6 | Unit 2 83C Unit at a Glance

Every unit has a **Unit at a Glance** page that shows teachers everything they need to know to get started planning out their upcoming unit.

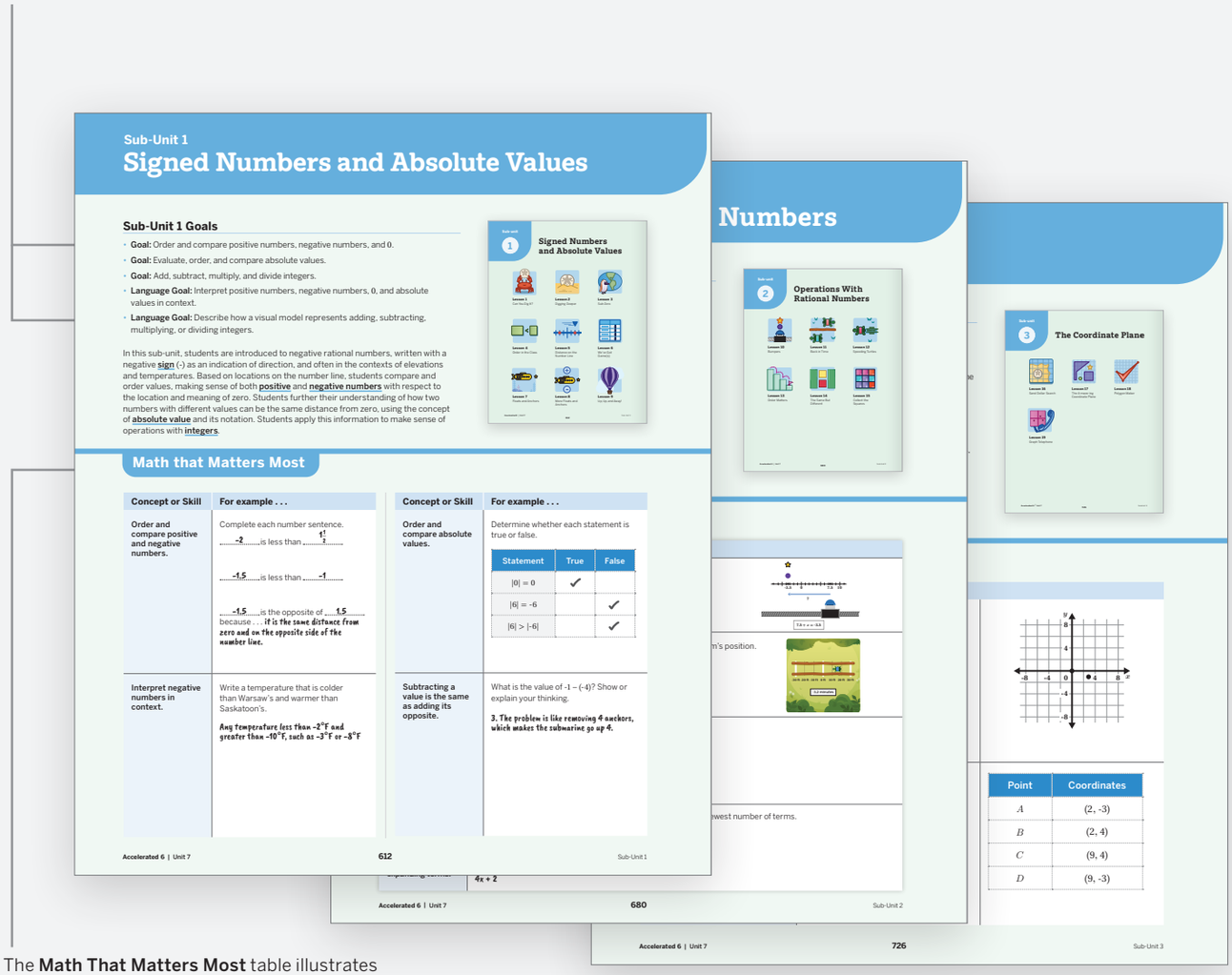
This overview of **concept development** supports teachers in making decisions about potential intervention points during the unit. It indicates at which point students have had multiple opportunities to focus on each key concept or skill. It does not necessarily mean there are no further opportunities to strengthen and develop these skills.

Teachers are provided with thoughtful **pacing considerations** for how they can adjust the pacing of the unit as needed without compromising unit learning goals.

Unit Overview pages

Teachers will find a comprehensive set of resources for each unit, including an overview of the math of the unit, a visual summary of the Unit at a Glance, a preview of each of the unit assessments, and guidance about differentiation, accessibility, language development, materials, technology, and connections to future learning. Each Unit Overview also includes a professional development activity and a formative Pre-Unit Check that teachers can use to learn more about students' understanding of foundational concepts and skills that will support them in the upcoming unit.

The **Sub-Unit Overview** page summarizes the **key goals** and **vocabulary** for this part of the unit.



The **Math That Matters Most** table illustrates for teachers the most important progressions of strategies, skills, and language that develop over the course of the sub-unit.

Sub-Unit Overview pages

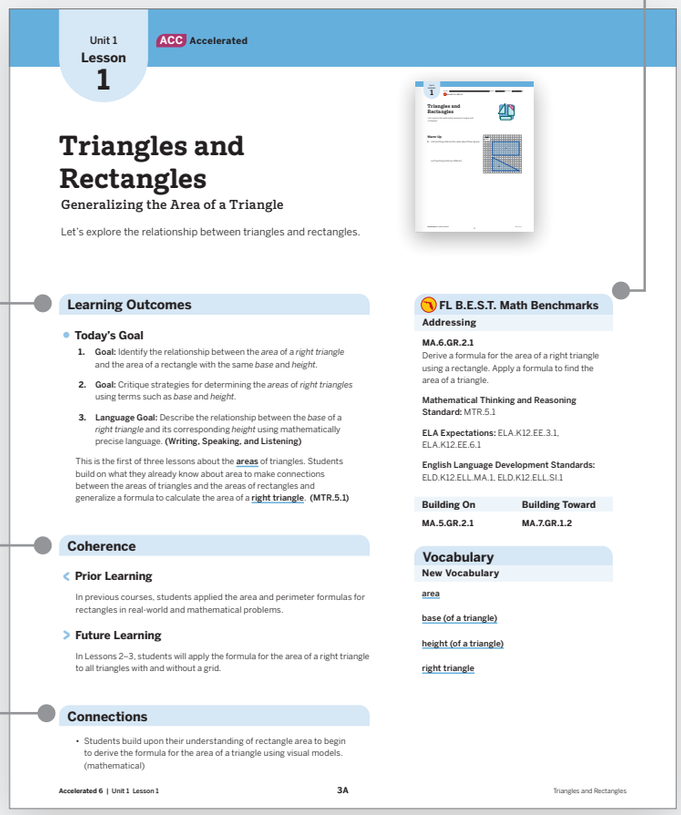
The lessons within each unit are grouped into sub-units that address a related group of concepts. All sub-units include lesson practice and Show What You Know formative assessments, and targeted sub-units include a quiz.

Navigating This Program

Lesson Supports

Throughout this Teacher Edition, lesson guidance for teachers is organized clearly and consistently so that they have all of the information they need at their fingertips.

The **Florida B.E.S.T. Math Benchmarks** section will list all standards addressed in this lesson, including the **Mathematical Thinking and Reasoning Standards,** the **ELA Expectations,** and the **English Language Development Standards.** This section shows the standards the lesson builds on and the standards the lesson builds toward.



The **Learning Outcome**s section is where teachers will find the goals of the lesson, including language goals

In the **Coherence** section, teachers will find information on prior learning that has built to the math in this lesson, as well as future learning that this lesson is helping build to.

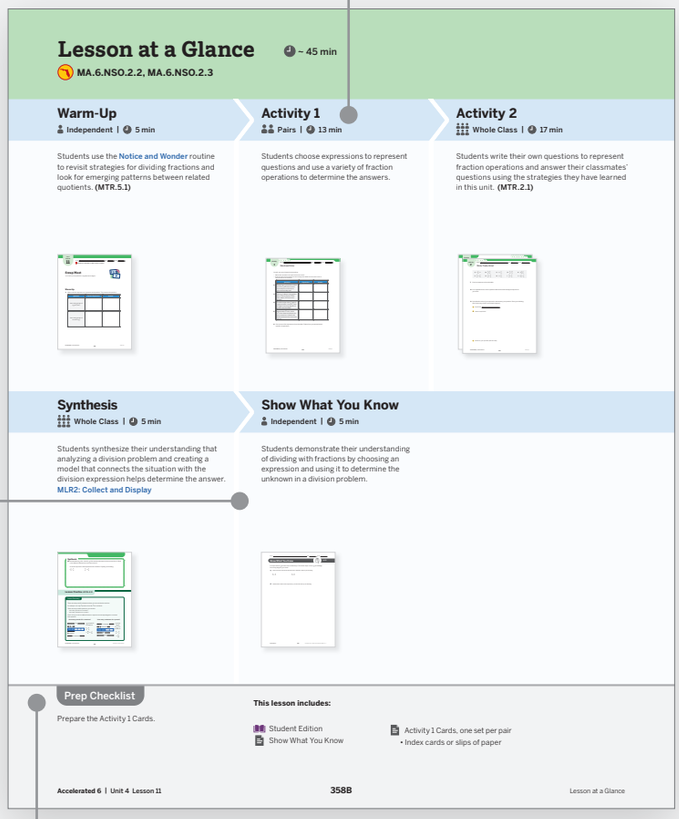
In the **Connections** section, teachers will find opportunities to help their students make connections cross-curricularly, to the real world, or to other mathematical learning.

Lesson Overview

This introductory page orients teachers to the topic, standards, and key learning goals of the lesson, including any new vocabulary terms that will be introduced.

The **Key Takeaways** and **Lesson Takeaway** summarize the most important ideas in the lesson.

The **time frame** and suggested **student grouping** is listed for each part of the lesson.



Lesson at a Glance

~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up
Independent | 5 min

Students use the Notice and Wonder routine to revisit strategies for dividing fractions and look for emerging patterns between related quotients. **(MTR.5.1)**

Activity 1
Pairs | 13 min

Students choose expressions to represent questions and use a variety of fraction operations to determine the answers.

Activity 2
Whole Class | 17 min

Students write their own questions to represent fraction operations and answer their classmates' questions using the strategies they have learned in this unit. **(MTR.2.1)**

Synthesis
Whole Class | 5 min

Students synthesize their understanding that analyzing a division problem and creating a model that connects the situation with the division expression helps determine the answer.
MLR2: Collect and Display

Show What You Know
Independent | 5 min

Students demonstrate their understanding of dividing with fractions by choosing an expression and using it to determine the unknown in a division problem.

Prep Checklist

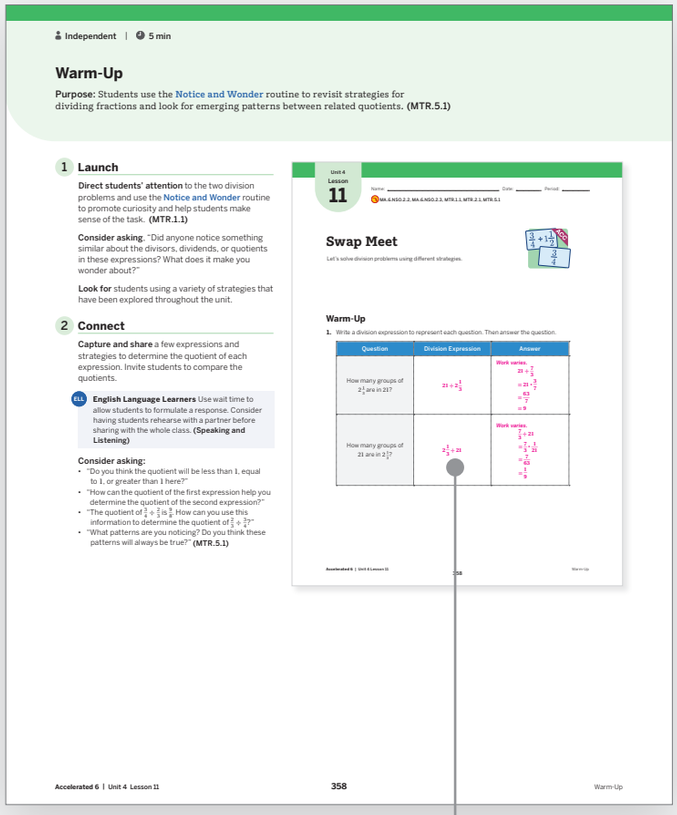
Prepare the Activity 1 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one set per pair
  - Index cards or slips of paper

Accelerated 6 | Unit 4 Lesson 11 358B Lesson at a Glance

The **Prep Checklist** displays all materials students will need for the lesson.



Independent | 5 min

Warm-Up

Purpose: Students use the Notice and Wonder routine to revisit strategies for dividing fractions and look for emerging patterns between related quotients. **(MTR.5.1)**

1 Launch

Direct students' attention to the two division problems and use the Notice and Wonder routine to promote curiosity and help students make sense of the task. **(MTR.1.1)**

Consider asking, "Did anyone notice something similar about the divisors, dividends, or quotients in these expressions? What does it make you wonder about?"

Look for students using a variety of strategies that have been explored throughout the unit.

2 Connect

Capture and share a few expressions and strategies to determine the quotient of each expression. Invite students to compare the quotients.

ELL **English Language Learners** Use wait time to allow students to formulate a response. Consider having students rehearse with a partner before sharing with the whole class. **(Speaking and Listening)**

Consider asking:

- "Do you think the quotient will be less than 1, equal to 1, or greater than 1 here?"
- "How can the quotient of the first expression help you determine the quotient of the second expression?"
- "The quotient of $\frac{3}{4} \div \frac{2}{3}$ is $\frac{9}{8}$. How can you use this information to determine the quotient of $\frac{1}{4} \div \frac{1}{3}$?"
- "What patterns are you noticing? Do you think these patterns will always be true?" **(MTR.5.1)**

Unit 4 Lesson 11 — Swap Meet

Warm-Up

1. Write a division expression to represent each question. Then answer the question.

Question	Division Expression	Answer
How many groups of $2\frac{1}{3}$ are in 21?	$21 \div 2\frac{1}{3}$	Work varies. $21 \div \frac{7}{3}$ $= 21 \cdot \frac{3}{7}$ $= \frac{63}{7}$ $= 9$
How many groups of 21 are in $2\frac{1}{3}$?	$2\frac{1}{3} \div 21$	Work varies. $\frac{7}{3} \div 21$ $= \frac{7}{3} \cdot \frac{1}{21}$ $= \frac{7}{63}$ $= \frac{1}{9}$

Accelerated 6 | Unit 4 Lesson 11 358 Warm-Up

Sample student responses to the Warm-Up prompt are provided to help teachers prepare to facilitate the conversation.

Lesson at a Glance

The Lesson at a Glance page describes the purpose of the Warm-Up, Activities, Synthesis, and Show What You Know. Teachers will find suggested timing for each part of the lesson, as well as guidance on whether students should work individually, in pairs, in small groups, or with the whole class. The page also lists any hands-on materials that may be needed.

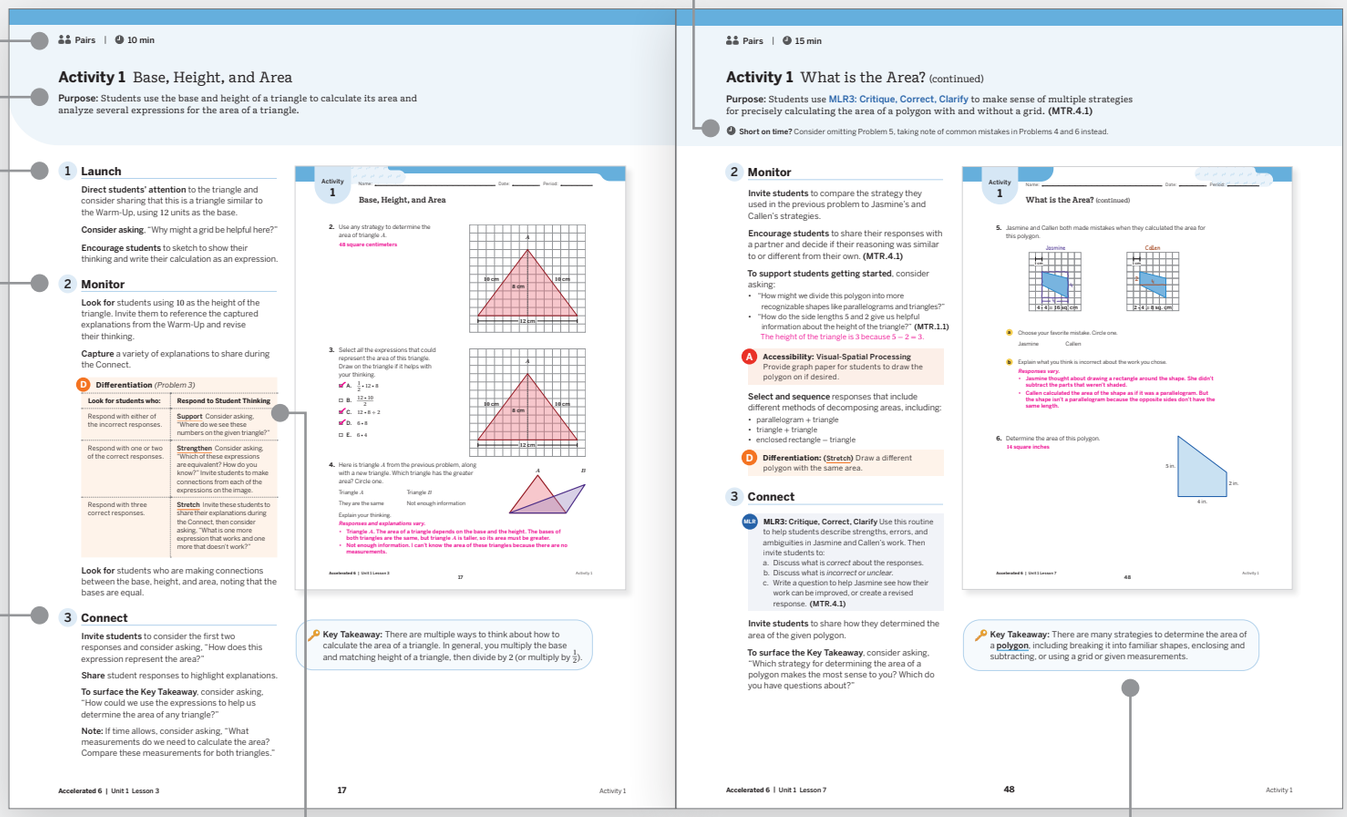
Warm-Up

Every Amplify Desmos Math Florida lesson begins with a Warm-Up to help draw students into the lesson. It might elicit information from their personal experience, remind them of a context they have seen before, invite them to think about the previous lesson, or preview a calculation that will appear in the current lesson.

Navigating This Program

The **Purpose** of each activity is highlighted here, as well as suggestions for the **student grouping** and **time frame** for the activity.

Teachers are provided with thoughtful **Short on time?** suggestions for how they can adjust their facilitation of the lesson as needed without compromising lesson goals.



Pairs | 10 min

Activity 1 Base, Height, and Area

Purpose: Students use the base and height of a triangle to calculate its area and analyze several expressions for the area of a triangle.

1 Launch

Direct students' attention to the triangle and consider sharing that this is a triangle similar to the Warm-Up, using 12 units as the base.

Consider asking. "Why might a grid be helpful here?"

Encourage students to sketch to show their thinking and write their calculation as an expression.

2 Monitor

Look for students using 10 as the height of the triangle. Invite them to reference the captured explanations from the Warm-Up and revise their thinking.

Capture a variety of explanations to share during the Connect.

D Differentiation *(Problem 3)*

Look for students who:	Respond to Student Thinking
Respond with either of the incorrect responses.	**Support** Consider asking, "Where do we see these numbers on the given triangle?"
Respond with one or two of the correct responses.	**Strengthen** Consider asking, "Which of these expressions are equivalent? How do you know?" Invite students to make connections from each of the expressions on the image.
Respond with three correct responses.	**Stretch** Invite these students to share their explanations during the Connect, then consider asking, "What is one more expression that works and one more that doesn't work?"

Look for students who are making connections between the base, height, and area, noting that the bases are equal.

3 Connect

Invite students to consider the first two responses and consider asking, "How does this expression represent the area?"

Share student responses to highlight explanations.

To surface the Key Takeaway, consider asking, "How could we use the expressions to help us determine the area of any triangle?"

Note: If time allows, consider asking, "What measurements do we need to calculate the area? Compare these measurements for both triangles."

Accelerated 6 | Unit 1 Lesson 3 17 Activity 1

Activity 1 Base, Height, and Area

2. Use any strategy to determine the area of triangle *A*.
48 square centimeters

3. Select all the expressions that could represent the area of this triangle. Draw on the triangle if it helps with your thinking.
- A. $\frac{1}{2} \cdot 12 \cdot 8$
- B. $\frac{12 \cdot 10}{2}$
- C. $12 \cdot 8 \div 2$
- D. $6 \cdot 8$
- E. $6 \cdot 6$

4. Here is triangle *A* from the previous problem, along with a new triangle. Which triangle has the greater area? Circle one.
Triangle *A* Triangle *B*
They are the same Not enough information
Explain your thinking.
Responses and explanations vary.
- *Triangle A. The area of a triangle depends on the base and the height. The bases of both triangles are the same, but triangle A is taller, so its area must be greater.*
- *Not enough information. I can't know the area of these triangles because there are no measurements.*

Key Takeaway: There are multiple ways to think about how to calculate the area of a triangle. In general, you multiply the base and matching height of a triangle, then divide by 2 (or multiply by $\frac{1}{2}$).

Pairs | 15 min

Activity 1 What is the Area? (continued)

Purpose: Students use **MLR3: Critique, Correct, Clarify** to make sense of multiple strategies for precisely calculating the area of a polygon with and without a grid. **(MTR.4.1)**

Short on time? Consider omitting Problem 5, taking note of common mistakes in Problems 4 and 6 instead.

2 Monitor

Invite students to compare the strategy they used in the previous problem to Jasmine's and Callen's strategies.

Encourage students to share their responses with a partner and decide if their reasoning was similar to or different from their own. **(MTR.4.1)**

To support students getting started, consider asking:
- "How might we divide this polygon into more recognizable shapes like parallelograms and triangles?"
- "How do the side lengths 5 and 2 give us helpful information about the height of the triangle?" **(MTR.1.1)**
The height of the triangle is 3 because $5 - 2 = 3$.

A Accessibility: Visual-Spatial Processing
Provide graph paper for students to draw the polygon on if desired.

Select and sequence responses that include different methods of decomposing areas, including:
- parallelogram + triangle
- triangle + triangle
- enclosed rectangle – triangle

D Differentiation: (Stretch) Draw a different polygon with the same area.

3 Connect

MLR MLR3: Critique, Correct, Clarify Use this routine to help students describe strengths, errors, and ambiguities in Jasmine and Callen's work. Then invite students to:
a. Discuss what is *correct* about the responses.
b. Discuss what is *incorrect* or *unclear*.
c. Write a question to help Jasmine see how their work can be improved, or create a revised response. **(MTR.4.1)**

Invite students to share how they determined the area of the given polygon.

To surface the Key Takeaway, consider asking, "Which strategy for determining the area of a polygon makes the most sense to you? Which do you have questions about?"

Activity 1 What is the Area? (continued)

5. Jasmine and Callen both made mistakes when they calculated the area for this polygon.
Jasmine: 4 × 4 = 16 sq. cm
Callen: 2 × 4 = 8 sq. cm
Choose your favorite mistake. Circle one.
Jasmine Callen
Explain what you think is incorrect about the work you chose.
Responses vary.
- *Jasmine thought about drawing a rectangle around the shape. She didn't subtract the parts that weren't shaded.*
- *Callen calculated the area of the shape as if it was a parallelogram. But the shape isn't a parallelogram because the opposite sides don't have the same length.*

6. Determine the area of this polygon.
14 square inches
5 in. 2 in. 4 in.

Key Takeaway: There are many strategies to determine the area of a polygon, including breaking it into familiar shapes, enclosing and subtracting, or using a grid or given measurements.

Accelerated 6 | Unit 1 Lesson 7 48 Activity 1

In the **Launch**, **Monitor**, **Connect** guidance, teachers will find ways to help students get started, suggested facilitation moves, and discussion questions.

The guidance for every lesson includes a **D Differentiation** table to support teachers in meeting the needs of all students during the activity. This table can help teachers anticipate the ways students may approach the activity, and provides prompts that they can use during the lesson to **Support**, **Strengthen**, and **Stretch** individual students in their thinking.

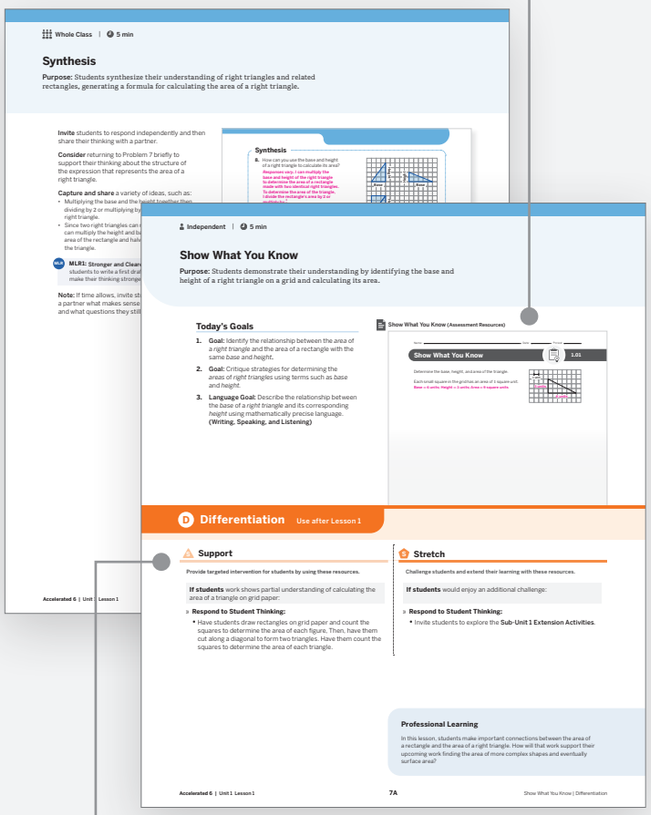
The **Key Takeaway** is called out to highlight the learning goal of the activity and provide teachers with an example of how to frame the big idea of the activity for students.

Activities

Each lesson includes one, two, or three activities. These activities are the heart of each lesson. Students notice, wonder, explore, calculate, predict, measure, explain their thinking, settle disputes, create challenges for their classmates, and more.

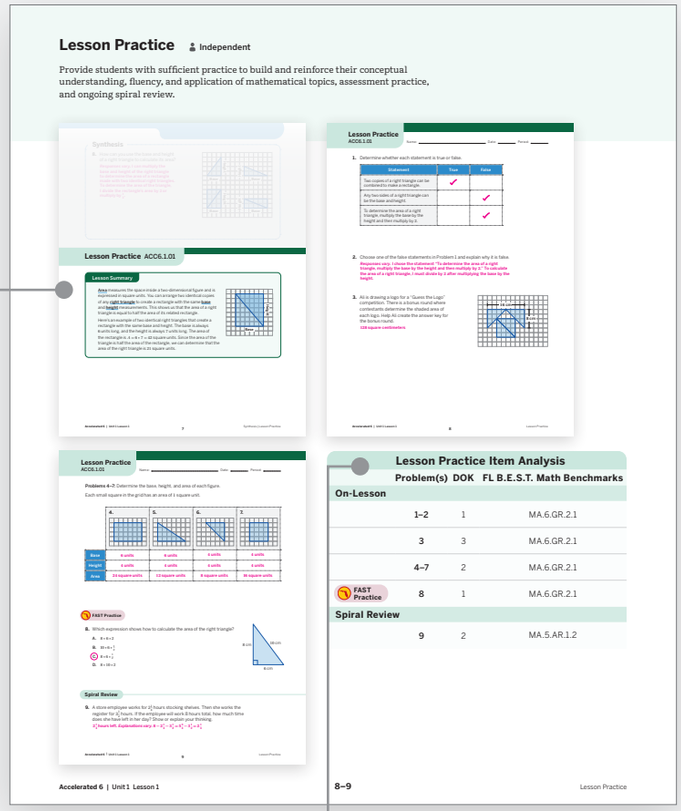
Guidance is provided to help teachers Launch, Monitor, and Connect students' thinking over the course of each activity. Teachers will also find suggestions for pacing, facilitation moves, discussion questions, examples of early student thinking, ideas for students who may enjoy a challenge, and ways to increase access to the language and content. The suggestions for facilitation provide comprehensive support for teachers as they prepare for and teach lessons.

Lessons conclude with the **Show What You Know**, which presents an opportunity for students to reflect on the main learning goals of the lesson. This is a great way for both students and teachers to access a formative check for understanding.



Each Show What You Know is accompanied by a table with suggestions in three categories: students who need **support**, would benefit from more practice to **strengthen** their understanding, or are interested in a **stretch** to deepen or extend their thinking.

Each **Lesson Practice** begins with a **Summary** of the big ideas in the lesson, often including a worked example. Students can highlight parts of the summary or share it with a caregiver or classmate.



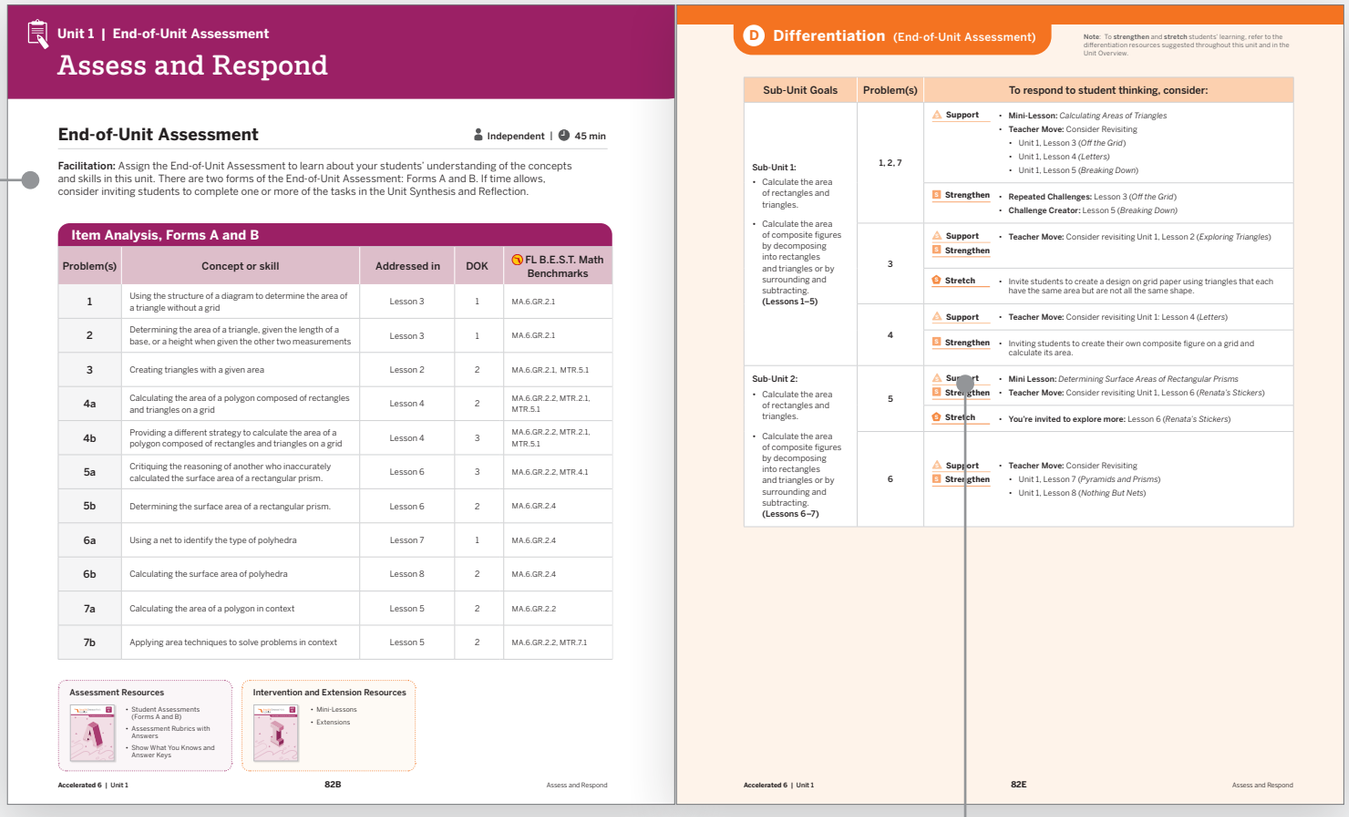
A **Practice Problem Item Analysis** table breaks down the problems by type, Depth of Knowledge (DOK), and corresponding B.E.S.T. Math Benchmarks.

Synthesis

The Synthesis is an opportunity for students to put the key ideas from the lesson into their own words. There is typically an open-ended prompt followed by a discussion for students to consolidate and refine their ideas about the learning goals. If time allows, it is also an opportunity for students to revise their responses after the discussion.

Lesson Practice

Daily practice problems for the day's lesson are included both online and in the print Student Edition, including Fluency, FAST Practice, and Spiral Review.



Unit 1 | End-of-Unit Assessment

Assess and Respond

End-of-Unit Assessment

Independent | 45 min

Facilitation: Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Using the structure of a diagram to determine the area of a triangle without a grid	Lesson 3	1	MA.6.GR.2.1
2	Determining the area of a triangle, given the length of a base, or a height when given the other two measurements	Lesson 3	1	MA.6.GR.2.1
3	Creating triangles with a given area	Lesson 2	2	MA.6.GR.2.1, MTR.5.1
4a	Calculating the area of a polygon composed of rectangles and triangles on a grid	Lesson 4	2	MA.6.GR.2.2, MTR.2.1, MTR.5.1
4b	Providing a different strategy to calculate the area of a polygon composed of rectangles and triangles on a grid	Lesson 4	3	MA.6.GR.2.2, MTR.2.1, MTR.5.1
5a	Critiquing the reasoning of another who inaccurately calculated the surface area of a rectangular prism.	Lesson 6	3	MA.6.GR.2.2, MTR.4.1
5b	Determining the surface area of a rectangular prism.	Lesson 6	2	MA.6.GR.2.4
6a	Using a net to identify the type of polyhedra	Lesson 7	1	MA.6.GR.2.4
6b	Calculating the surface area of polyhedra	Lesson 8	2	MA.6.GR.2.4
7a	Calculating the area of a polygon in context	Lesson 5	2	MA.6.GR.2.2
7b	Applying area techniques to solve problems in context	Lesson 5	2	MA.6.GR.2.2, MTR.7.1

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Accelerated 6 | Unit 1 82B Assess and Respond

Differentiation (End-of-Unit Assessment)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:

Sub-Unit 1:
• Calculate the area of rectangles and triangles.
• Calculate the area of composite figures by decomposing into rectangles and triangles or by surrounding and subtracting.
(Lessons 1–5)
	1, 2, 7	**Support**
		• **Mini-Lesson:** *Calculating Areas of Triangles*
		• **Teacher Move:** Consider Revisiting
		  • Unit 1, Lesson 3 (*Off the Grid*)
		  • Unit 1, Lesson 4 (*Letters*)
		  • Unit 1, Lesson 5 (*Breaking Down*)
		Strengthen
		• **Repeated Challenges:** Lesson 3 (*Off the Grid*)
		• **Challenge Creator:** Lesson 5 (*Breaking Down*)

	3	**Support** **Strengthen** • **Teacher Move:** Consider revisiting Unit 1, Lesson 2 (*Exploring Triangles*) **Stretch** • Invite students to create a design on grid paper using triangles that each have the same area but are not all the same shape.
	4	**Support** • **Teacher Move:** Consider revisiting Unit 1: Lesson 4 (*Letters*) **Strengthen** • Inviting students to create their own composite figure on a grid and calculate its area.
Sub-Unit 2: • Calculate the area of rectangles and triangles. • Calculate the area of composite figures by decomposing into rectangles and triangles or by surrounding and subtracting. **(Lessons 6–7)**	5	**Support** **Strengthen** • **Mini-Lesson:** *Determining Surface Areas of Rectangular Prisms* • **Teacher Move:** Consider revisiting Unit 1, Lesson 6 (*Renata's Stickers*) **Stretch** • **You're invited to explore more:** Lesson 6 (*Renata's Stickers*)

	6	**Support**
		Strengthen
		• **Teacher Move:** Consider Revisiting
		  • Unit 1, Lesson 7 (*Pyramids and Prisms*)
		  • Unit 1, Lesson 8 (*Nothing But Nets*)

Accelerated 6 | Unit 1 82E Assess and Respond

An **Item Analysis** is provided to show what concepts and skills are assessed in each problem.

A **Differentiation** table suggests specific materials from the unit to **Support**, **Strengthen**, or **Stretch** students' understanding based on their responses to different assessment problems.

Assess and Respond

Each unit typically includes one or two Sub-Unit Quizzes. Quizzes are designed for students to show what they know and can do based on what they have learned so far in the unit. Each unit includes Assess and Respond guidance for the Pre-Unit Check, Sub-Unit Quizzes, and End-of-Unit Assessment.

Facilitating Lesson Activities

Launch, Monitor, Connect

Amplify Desmos Math Florida is designed with a structured approach to problem-based learning that systematically builds on students' curiosity. Students are first invited to explore problems that create an intellectual need for new mathematical ideas. Then the teacher builds on strategies used by students and connects their ideas to the learning goals of the lesson. This approach is an interpretation of Smith and Stein's *5 Practices for Orchestrating Productive Mathematics Discussions*.

1 Launch

The Launch is a short, whole-class conversation that creates a need or excitement, provides clarity, or helps students connect to their prior knowledge or personal experience, which ensures that everyone has access to the upcoming work.

Considerations for Launching

- Try to keep it short. Set students up to get started with a clear and catchy invitation to the math.
- Wait to model a specific way to solve. Leave space for a variety of different student approaches.
- Pair up. Encourage small groups of students to talk through their thinking as they work.

2 Monitor

As students work individually, in pairs, or in groups, teachers explore students' thinking, ask questions, and provide support to help move the conversations closer to the intended math learning goal.

Considerations for Monitoring

- Look for students' strategies and check in with students as they work.
- Ask questions to learn what students are thinking. The suggested differentiation moves can be used to support, strengthen, and stretch their ideas.
- Use the Differentiation table to help select and sequence student ideas to highlight during the Connect discussion.

3 Connect

Teachers connect students' ideas to the key learning goals of the lesson, facilitating class discussions that help students synthesize and solidify the big ideas.

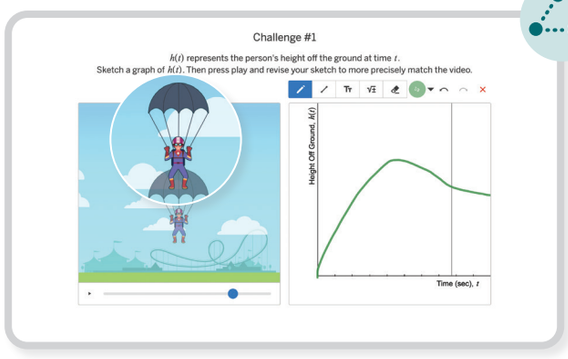
Considerations for Connecting

- Save a few minutes at the end of each lesson activity to bring students back together to discuss.
- It is okay to start the class discussion before all students have finished the activity.
- Students will be able to contribute to the discussion and learn from their classmates based on their in-progress work.
- Center discussions on students' ideas by displaying one or more of their responses and connecting the responses to the Key Takeaway of the activity.

Smith, M.S., & Stein, M.K. (2018). *5 practices for orchestrating productive mathematics discussions* (2nd ed.). SAGE Publications.

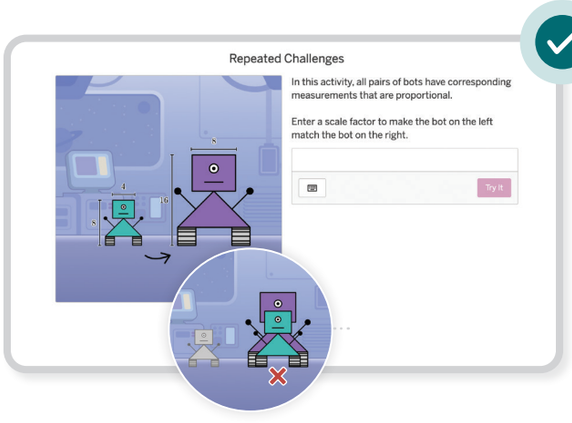
The Power of Digital

Amplify Desmos Math Florida provides the option for teachers to deliver lessons using the power of digital technology. This includes the use of visual and dynamic interactions that pique students' interest and invite all students to engage in the mathematics. These interactions and animations allow students to test predictions, get feedback, share ideas, and connect representations.



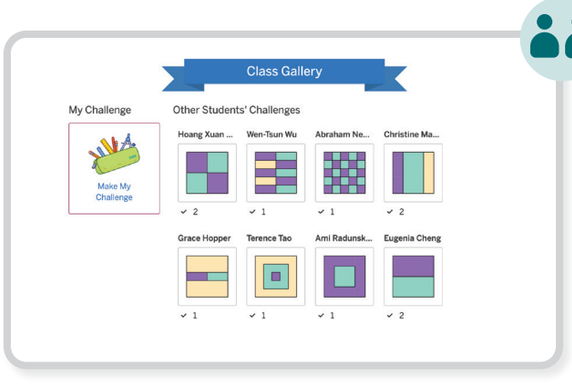
Delightful, engaging interactions

The digital interactions included in lesson activities are designed to elicit students' thinking in a way that feels fun and inviting. As students play and explore math concepts, teachers can highlight the ideas that students share, connect those ideas to other students' ideas, and build on their thinking through productive class discussion.



Responsive Feedback™

In Amplify Desmos Math Florida, students are invited to try their thinking out — even if that thinking is still in the "rough draft" phase. As students interact with the digital screens, they see visuals and simulations that respond faithfully to their inputs. This meaningful feedback allows students to experience the joy of causing the animation to react to their mathematical ideas. As a result, students may notice interesting things about both correct and incorrect answers more readily.

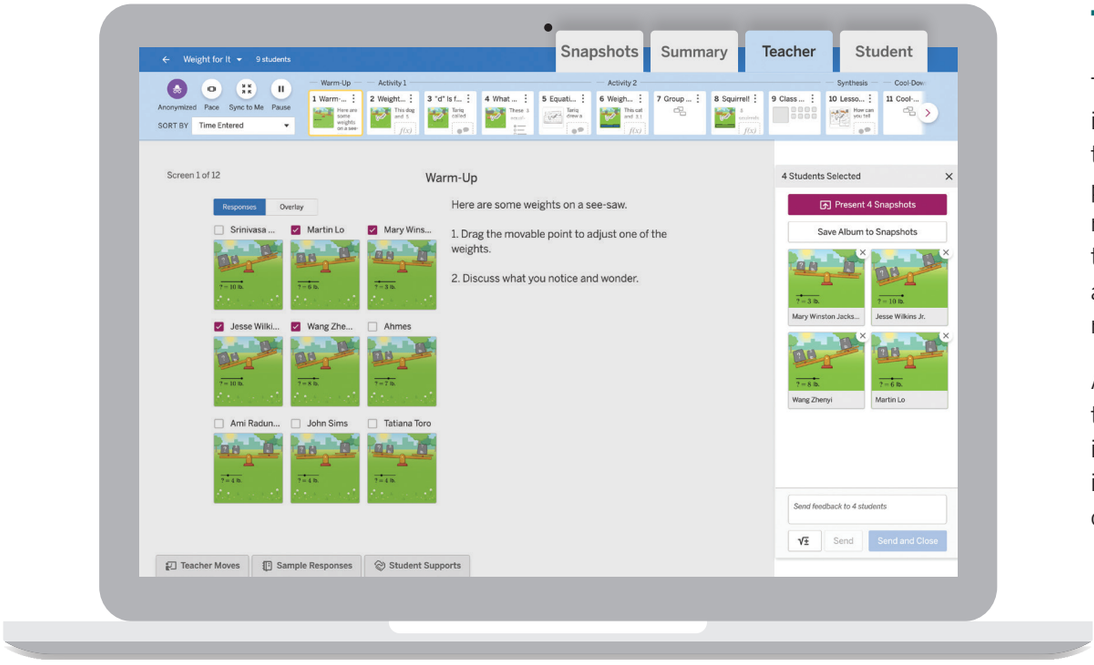


Collaborative experiences

Digital tools allow students to interact with each other's mathematical ideas in a variety of ways. Students can use the "Share With Class" button to exchange mathematical thinking with each other directly on an activity screen. Activities like Challenge Creator and Polygraph offer fun ways for students to play with the math together. Whether working solo or in tandem on devices, students are never alone as they work through activities.

Digital Facilitation Tools

Amplify Desmos Math Florida includes a suite of digital facilitation tools. These tools foster collaborative classrooms and help teachers share their students' thinking.



Teacher Dashboard

The dashboard gives the teacher insight into students' thinking in real time. Teachers can zoom in on a particular student or view all students' responses at once. This can help to identify students that may need additional support and those who are ready for extensions.

After reviewing students' thinking, teachers can select and display specific ideas or the distribution of responses to invite students into productive, student-centered discussions.

Snapshot View

Select and sequence students' work to connect mathematical ideas. Teachers can even add their own questions to prompt further thinking.

Summary View

Monitor students' progress or accuracy for a set of screens. Click into any box to see a specific student's work on that screen.

Teacher View

Answer questions such as:

- How did all students answer this question?
- What answers were most common?

Student View

Preview screens for students. For example, the teacher might work through a screen with the class or talk through upcoming screens before students work on their own.

A powerful conversation toolkit

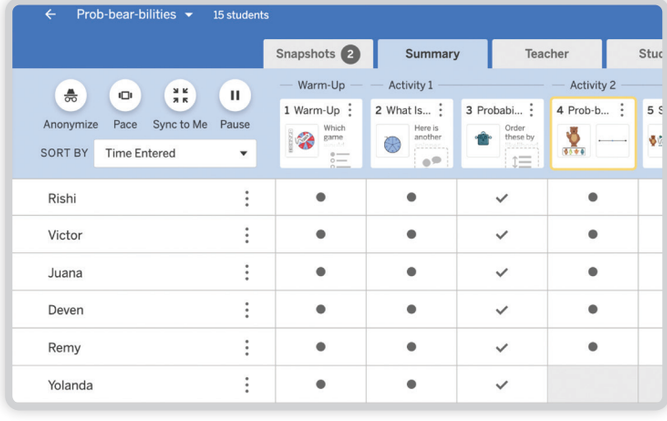
Pacing, pausing, and sync tools can support teachers as they encourage mathematical discourse and collaborative thinking in their classes.

Anonymize swaps out students' names to help them feel more comfortable sharing their ideas. Students' names are replaced by the names of famous mathematicians.

Pace allows the teacher to make a certain number of screens available for students to work on.

Sync to Me enables the teacher to bring all students to the same screen.

Pause stops students from working so that the teacher can gather everyone's attention for discussion.



Math in Action

Each Math in Action feature highlights an individual whose work in the field of mathematics, or a connected field, have made an impact on American society. These features can be used to help make connections between the mathematical content of the grade and how math shows up in a wide variety of careers.

Career Connections

Amplify Desmos Math Florida intentionally celebrates traditional mathematics fields as well as elevates work that engages mathematics in unique ways.

Representation of Mathematicians

Students can read about the contributions and work of a variety of individuals.

Unit 2 | Math in Action

Career Connection

How can ratios help drummers "keep the beat"?

Music is measured by ratios called *time signatures*, such as $\frac{4}{4}$ or $\frac{3}{4}$. The first number tells how many beats to count. The second number tells the kind of note. If the second number is 4, the notes are quarter notes. A $\frac{4}{4}$ time signature would count 1, 2, 3, 4, 1, 2, 3, 4, and so on. A $\frac{3}{4}$ measure of music would count 1, 2, 3, 1, 2, 3, and so on.

AleksKo/Shutterstock.com

Drummers keep the beat of a song by using ratios to maintain a steady rhythm, which helps other musicians playing with them. They can change the beat to give different feelings to the sound.

B.E.S.T. Mathematics Benchmark Connection

Believe it or not, musicians apply math extensively in their work. For example, the music scale and timing of different music arrangements are based on ratios (MA.6.AR.3.1, MA.6.AR.3.5) to create a certain sound, decide what speed to play certain songs, and more. Engineers and people who make musical instruments need to use their knowledge about geometry (MA.6.GR.2.1, MA.6.GR.2.4) as they cut out pieces for a musical instrument so that it makes the sound that a musician wants.

Mathematical Thinking and Reasoning Connection

People who are involved with music use thinking and reasoning skills like the ones you use for your math work! For example, they discuss their work with people they collaborate with, such as a writer, or fellow musicians in a band (MTR.1.1). When musicians study arrangements for performances such as a concert, they learn to complete the tasks of organizing and displaying the sheet music, attachments for their instruments, and other details with fluency (MTR.3.1).

Clayton Cameron

Born in Los Angeles, California, Clayton Cameron is a lecturer on Global Jazz Studies at the UCLA Herb Alpert School of Music. After receiving a degree in music from California State University at Northridge, he became a rising star in the music industry, performing as a percussionist with many award-winning acts. He led a TED Talk called "A-rhythm-etic. The Math Behind the Beats" to explain the mathematical ratios behind his drumming techniques.

Accelerated 6 | Unit 2 177

Clayton Cameron

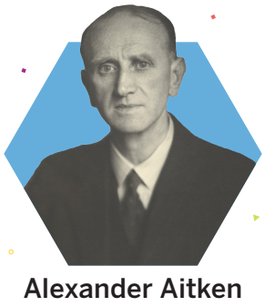
Math and music? Clayton Cameron found a way to combine his interest in both, using ratios to refine his drumming techniques.

Laura Máiz-Tomé

Math and ecology? Laura Máiz-Toméfound a way to combine her interest in both, using percentages to preserve freshwater ecosystems around the world.

Sir Jagadish Chandra Bose

Math and radio waves? Sir Jagadish Chandra Bose found a way to combine his interest in both, using mathematics and problem solving to identify patterns in radio waves.



Alexander Aitken

Math and data? Alexander Aitken found a way to combine his interest in both, using special equations to analyze data.

Facilitating Meaningful Conversations

Amplify Desmos Math Florida is designed to support interactive and collaborative classrooms, where students make sense of mathematics by sharing their thinking in paired, small-group, and whole-class conversations.

Classroom conversations are an opportunity for students to connect and share their experiences, strengths, and knowledge for the benefit of the entire class. Students are encouraged to share their early thinking, consider the ideas of others, and appreciate different approaches and changing one's mind. Lessons celebrate math as a source of joy and as a tool for analyzing and making sense of the world. Teachers will find structures and tips to support them in facilitating meaningful conversations throughout each lesson.

Centering Personal Connections

Teachers are encouraged to consider the experiences of the students in their classes and what connections they might have to various math topics and contexts. The Teacher Edition offers support for building conversations around the real-world and mathematical experiences that students bring to the classroom.

Use the Tell a Story routine to help students make sense of the turtle race animation. Invite students to write a story about the animation using their experiences, perspectives, and creativity.

In the **Turtle Time Trials** lesson, students are invited to use the Tell a Story routine to create their own narratives about what the turtles in the animation are doing and why. This is a chance for students to use their creativity while engaging deeply in the math.

1 Launch

Direct students' attention to the images of the rice dishes.

To surface connections, consider asking, "What is your favorite rice dish? When or where do you eat it?"

In the **Rice Ratios** lesson, students are introduced to the concept of equivalent ratios in the context of making rice. The Teacher Edition provides teachers with prompts they can use to help students connect the rice dishes in the activities to their own lives.

Supporting Student Collaboration

Different kinds of **groupings** are suggested for different phases of a lesson, including **whole-class** discussions and **pair** work. The conversations that these groupings encourage are opportunities for students to share their thinking and listen to each others' perspectives.

How will you support student collaboration?

- Discuss what supporting each other without giving answers could look or sound like.
- Invite a student from each group to read the task aloud.

The Teacher Edition provides suggestions for intentional groupings to support access and language development and help students support their partners without simply sharing answers. Digital activities usually suggest that pairs of students share a single device. This 2:1 structure allows students to talk through tasks together in ways that inform each other's thinking.

Celebrating Different Perspectives

Many lesson activities invite students to consider a variety of different responses, including early or unfinished thinking.

Use the Which One Doesn't Belong? routine to support students in comparing structures of two-variable equations.

Encourage students to look for more than one possibility.

In the **Subway Seats** lesson, students use the Which One Doesn't Belong? routine to begin exploring two-variable equations. Classroom conversations about activities like this are a way for teachers to elicit different kinds of student brilliance. The Teacher Edition provides suggestions for how teachers can engage students in conversation and reinforce the idea that each student has something uniquely valuable to contribute.

Accessibility

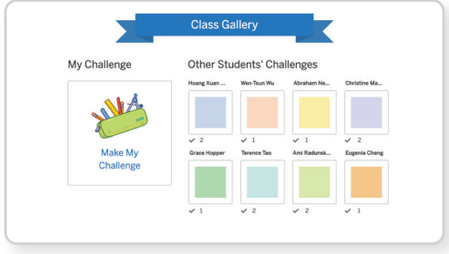
Amplify Desmos Math Florida is built to support all students in accessing and participating in meaningful and challenging learning. This support is incorporated into the curriculum structure, lesson-level guidance, and digital tools.

Universal Design for Learning

Each lesson incorporates opportunities for engagement, representation, action, and expression based on the guidelines of Universal Design for Learning (UDL). UDL is a research-based framework designed to ensure meaningful learning experiences for all students.[1]

Multiple Means of Engagement

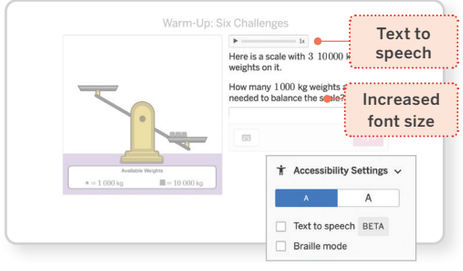
Individuals are each motivated in different ways, at different times, and in different contexts. Lessons are designed to welcome student interests, support sustaining effort and persistence, and develop an awareness of others.



Sustaining Effort and Persistence: Students are invited to build their own challenge for other students to solve, which provides opportunities for choice and autonomy, as well as joy and play.

Multiple Means of Representation

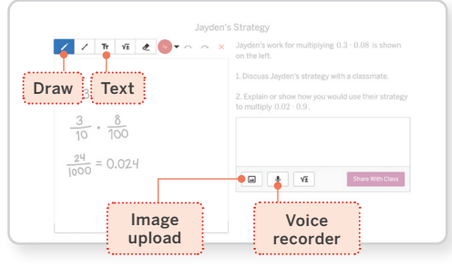
Learners make sense of information differently. Amplify Desmos Math Florida includes options for presenting information in multiple ways to support comprehension and understanding of language.



Present Information in Multiple Ways: Students and teachers can use digital tools such as text to speech, enlarged font, and dynamic visuals.

Multiple Means of Action and Expression

Learners differ in how they navigate learning environments and express what they know. Amplify Desmos Math Florida ensures that materials and interactions are accessible, support multiple means of students' expression and communication, and scaffold executive functioning.



Support Multiple Means of Student Expression and Communication: Students can communicate their ideas in multiple ways, including sketching, uploading photos, or responding with audio.

Lesson Facilitation Supports

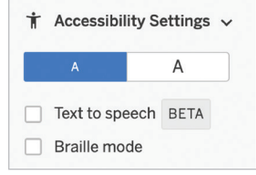
Every lesson includes at least one specific suggestion the teacher can use to increase access to the lesson without reducing the mathematical demand of the tasks. These suggestions address the following areas:

- Conceptual Processing
- Visual-Spatial Processing
- Executive Functioning
- Memory and Attention
- Fine Motor Skills
- Affective Functioning

A **Accessibility: Memory and Attention** To support keeping track of information, invite students to record the dimensions they try and whether or not they created a scaled copy.

Accessibility Tools

Students have the ability to control accessibility tools so that each learning experience is customized to their individual needs. In many instances, these tools can be turned on or off at any point of instruction.



Text to speech: Reads text instructions to students in multiple languages.

Enlarged font: Increases the size of all text on screen.

Braille mode: Includes narration of digital interactions.

Language selection: Toggles between languages.

[1] https://udlguidelines.cast.org/

Differentiation

Differentiation in Amplify Desmos Math Florida enables teachers to ensure all students have access to grade-level math content. This support is organized for teachers into three categories:

Support

Provide targeted intervention for students by using these resources.

Strengthen

Reinforce students' understanding of the concepts assessed by using these resources.

Stretch

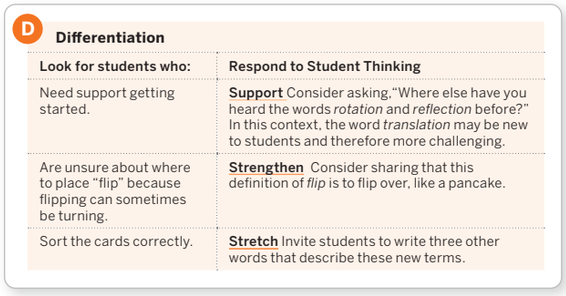
Challenge students and extend their learning with these resources.

Differentiation: In-Lesson Teacher Moves

Within every lesson activity, teachers can use the **Differentiation** suggestions to provide **in-the-moment instructional support** to learners as they engage in the work of the lesson.

Teachers are provided with clear student actions and understandings to look for, each matched with immediately usable suggestions for how to respond to the student thinking illustrated in each row of the table.

In addition to using these suggestions in the moment as teachers monitor student work, teachers can review the Differentiation table in advance to help them anticipate how students are likely to approach the activity.



Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Where else have you heard the words *rotation* and *reflection* before?" In this context, the word *translation* may be new to students and therefore more challenging.
Are unsure about where to place "flip" because flipping can sometimes be turning.	**Strengthen** Consider sharing that this definition of *flip* is to flip over, like a pancake.
Sort the cards correctly.	**Stretch** Invite students to write three other words that describe these new terms.

Differentiation: Beyond the Lesson

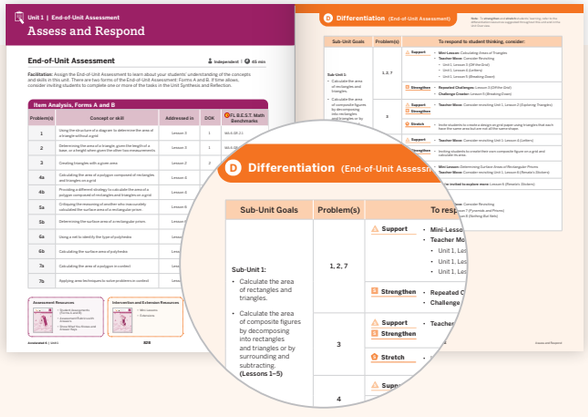
In each lesson, students' understanding of the learning goals is broken down for teachers into three categories: students who need support to understand the learning goals, students who need to continue strengthening their understanding of the learning goals, and students who are ready to stretch their learning.

Each **Support**, **Strengthen**, and **Stretch** resource is designed to take 15 minutes:

- **Mini-Lessons:** Targeted intervention for students who need additional support or need more time.
- **Extensions:** Small group or independent challenges.

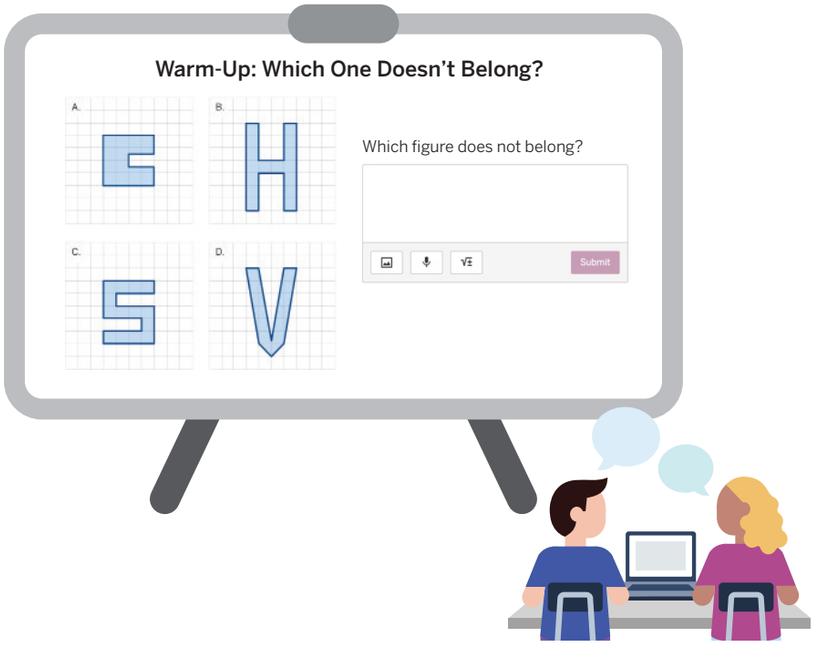
Differentiation: Assess and Respond

At each assessment point in a unit, teachers have the opportunity to respond to student understanding. For each assessment item, teachers are provided with clear suggestions for how to support, strengthen, or stretch student understanding of the corresponding concept based on their assessment responses.



Instructional Routines

Instructional routines that are used repeatedly create efficiencies for teachers so that they can attend to student thinking and communicate what is important in their classroom. Instead of focusing on the directions of an activity, students can focus on making sense of and communicating about the math.



Here are some examples:

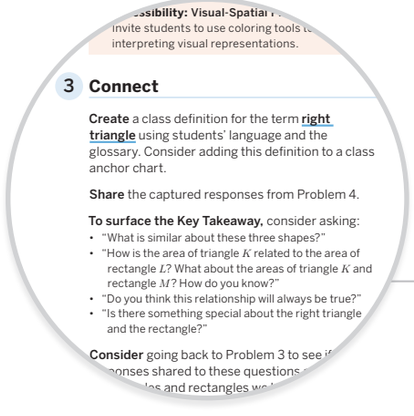
- The **Which One Doesn't Belong?** routine communicates to students that their ideas have value, that there are many ways to be correct in math, and that they can learn math by sharing their math thinking with each other.
- The **Stronger and Clearer Each Time** routine communicates the importance of feedback and creates an opportunity for students to learn from each other as they construct and refine their viable arguments.

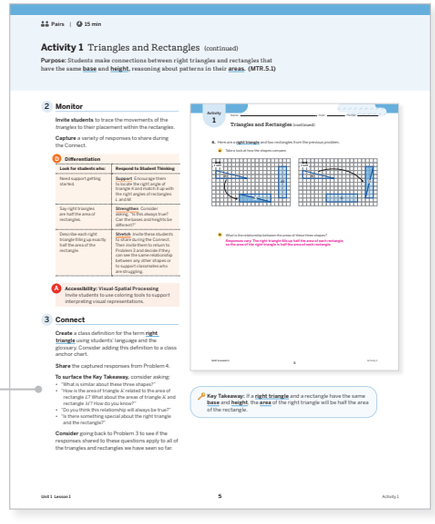
Each instructional routine included in an Amplify Desmos Math Florida lesson creates opportunities for conversations and supports meaningful discussion. Implementing these routines can be a practical tool for establishing a classroom learning community that values students' mathematical thinking.

Instructional Routines Embedded in the Curriculum

Instructional routines can be found throughout each lesson in the Teacher Edition. Here is a list of the instructional routines used in the Amplify Desmos Math Florida curriculum:

- **MLR1:** Stronger and Clearer Each Time
- **MLR2:** Collect and Display
- **MLR3:** Critique, Correct, Clarify
- **MLR5:** Co-Craft Questions
- **MLR6:** Three Reads
- **MLR7:** Compare and Connect
- Decide and Defend
- Notice and Wonder
- Number Talk
- Tell a Story
- Think-Pair-Share
- Which One Doesn't Belong?





For more information about the Instructional Routines embedded in the Amplify Desmos Math Florida curriculum, see the Routine Facilitation Guide in the Professional Development Library.

Math Language Development

At Amplify Desmos Math Florida, we acknowledge that there is a strong interconnection between mathematical content, practices, and language. We believe that developing mathematical language is critical for all learners, while recognizing and supporting the unique needs of English Language Learners.

Our approach to math language development focuses on when, how, and why students are using language to make sense of and share their mathematical ideas. Every lesson in Amplify Desmos Math Florida includes opportunities for all students to develop mathematical language as they experience the content, while providing intentional support for English Language Learners. We purposefully progress language throughout the units by cultivating students' language and supporting students in making their arguments and explanations stronger, clearer, and more precise as they progress from lesson to lesson.

Here are four ways we support students with developing mathematical language:

Vocabulary

Units and lessons build connections between students' language and the new vocabulary for that unit. This honors the language assets that students bring into their learning.

Some **new vocabulary** is marked as *optional*; these are terms students may encounter in other settings, but are not essential for them to access the lesson. Vocabulary is *review* if has been introduced and defined in a prior unit or course. The Unit Overview also lists **contextual vocabulary**, which are context-specific non-mathematical terms critical for students to understand the lesson.

Create class definitions for the terms **pre-image** and **image**, and support students in making sense of *prime notation* (′). To help generate student language, consider asking:

- "How are the labels different on the two figures?"
- "What does *pre* mean? How is that connected to the term *pre-image*?"
- "Do you think the placement of A', B', C', and D' on the image matters?"

Language Goals

Language goals attend to the mathematics students are learning and are written through the lens of one or more of four language modalities: **Reading**, **Writing**, **Speaking**, and **Listening**. They describe how students will grow their ability to analyze, compare, critique, describe, discuss, explain, interpret, and justify. Language goals appear at both the lesson and sub-unit level.

- **Today's Goals**
  1. **Goal:** Calculate the area of a parallelogram on a grid using a variety of strategies.
  2. **Language Goal:** Compare and contrast strategies for determining the area of a parallelogram. **(Writing, Speaking, and Listening)**
  3. **Language Goal:** Describe parallelograms using precise mathematical language. **(Speaking and Listening)**

Math Language Routines (MLR)

MLR **Math Language Routines**[1] are used within lessons to do one or more of the following: highlight student-developed language and ideas, cultivate conversation, support mathematical sense-making, and promote meta-cognition. Tips for facilitating MLRs are included when they would be helpful within lessons.

MLR **MLR7: Compare and Connect** Invite students to analyze each strategy, compare them, and then connect to their strategy. Consider asking:

- "Who used a strategy similar to Omari's? Ivory's?"
- "Where is the constant difference in each strategy?"
- "Why did different strategies lead to the same outcome?"

English Language Learners Support

Supports for ELL **English Language Learners** are called out at intentional points within each lesson. These suggested supports are specific, targeted actions that are beneficial for English Language Learners. They often describe a modification to increase access to the task or support with contextual or mathematical language development that can often be supportive of all learners. English Language Learner supports may also be attached to MLRs.

ELL **English Language Learners** Encourage students to paraphrase each other's ideas to help them make connections and incorporate vocabulary from the unit. **(Speaking and Listening)**

[1] Zwiers, J., Dieckmann, J., Rutherford-Quach, S., Daro, V., Skarin, R., Weiss, S., & Malamut, J. (2017). Principles for the Design of Mathematics Curricula: Promoting Language and Content Development. Retrieved from Stanford University, UL/SCALE website: http://ell.stanford.edu/content/mathematics-resources-additional-resources

Developing Fluency

Procedural fluency is the ability to apply procedures efficiently, flexibly, and accurately; to transfer procedures to different problems and contexts; to build or modify procedures from other procedures; and to recognize when one strategy or procedure is more appropriate to apply than another*.

In Accelerated 6, Florida students are expected to perform all four operations with rational numbers with procedural fluency.

Expectation

Exploration

To develop understanding through the use of manipulatives, visual models, discussions, estimation and drawings.

Procedural Reliability

To utilize skills to develop an accurate, reliable method that aligns with the student's understanding and learning style.

Procedural Fluency

To utilize skills to become fluent with an efficient, generalizable and accurate procedure, including a standard algorithm.

How Amplify Desmos Math Florida Supports the Expectation

- Manipulatives and visual models and diagrams are used extensively to support student's exploration of new concepts.
- Discussions are strongly encouraged in each lesson, including 💬 Discuss prompts in the student edition as well as suggested discussion prompts in the teacher's edition.
- Students are encouraged to estimate and compare estimations to actual answers to support reasonableness of problem solving solutions.
- Students are often asked to analyze a drawing or to make a drawing to explain their reasoning and strengthen their understanding of the math concepts being studied.

- Frequently in each course, students are asked to analyze and evaluate work presented in their student edition that represents work done by other students for accuracy, preference to learning style, and for efficiency.

- Program features such as practice, spiral reviews, mini lessons, and pre-unit assessments are all designed to assist students with achieving procedural fluency.

*National Research Council [2001, 2005, 2012]; Star [2005]

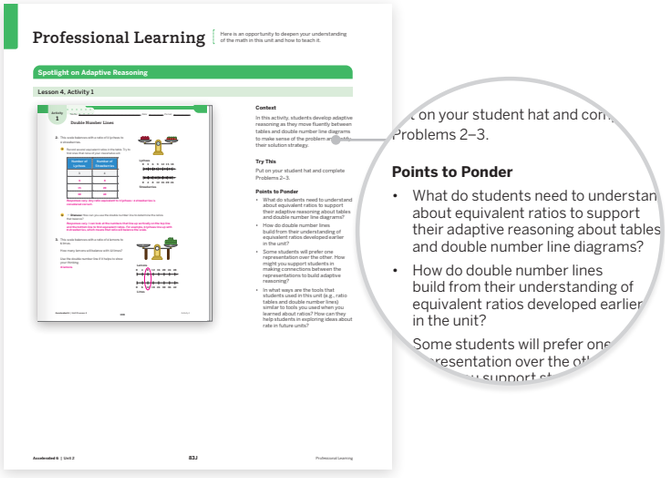
Professional Learning

The Amplify Desmos Math Florida program includes regular opportunities for teachers to deepen their understanding while they teach.

Embedded Professional Development

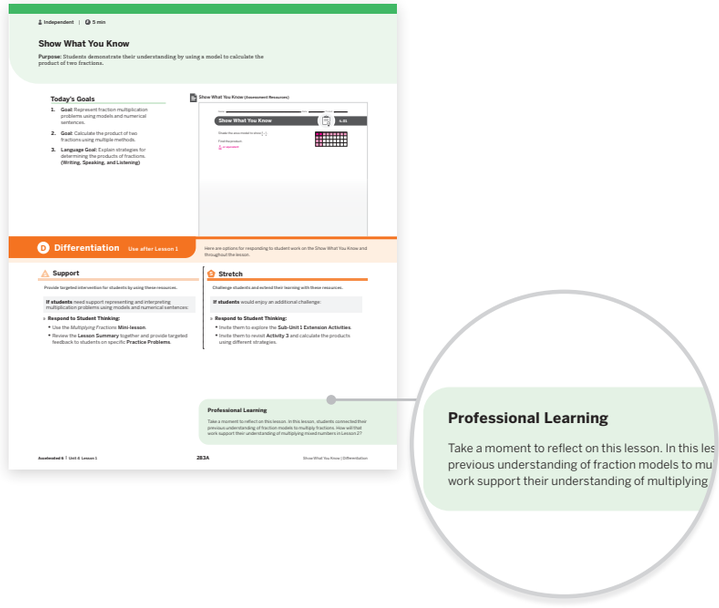
Unit-Level Professional Development

The Unit Overview for each unit includes a Professional Development page, which lists opportunities for teachers to deepen their understanding of the math in the unit and how to teach it.



Lesson-Level Professional Development

Each lesson provides a moment of professional learning as an opportunity for teachers to reflect on how well the lesson went. These professional learning moments can relate to principles, instruction, pedagogy, or program content.



Professional Development Sessions

Amplify's professional development team supports both teachers and administrators throughout their entire implementation journey. These sessions are available as on-site or virtual options.

Launch

Launch sessions introduce Amplify programs and support strong implementation. After learning about the program's foundational principles, you'll practice implementing the program in a collaborative environment.

Strengthen

Strengthen sessions deepen understanding of the program. These offerings are targeted and are meant to take your practice – and your students' learning to the next level.

Coach

These sessions are tailored to elevate instructional practices and meet the unique needs of teachers and leaders. These sessions can be customized leveraging our menu of supports.

Professional learning on your schedule

The PD Library serves as a centralized location where educators can access an ever-growing collection of professional learning resources and courses designed to support the implementation of Amplify Desmos Math Florida. Educators will find bite-sized how to videos, unit and lesson planning guides and templates, resources for leaders, and so much more!

Program Assessments

A variety of performance data in Amplify Desmos Math Florida provides evidence of student learning while helping students bolster their skills and understanding.

Throughout lessons, units, and the entire program, you will find summative and formative assessments meant to provide insights into students' conceptual understandings. Student learning is never a surprise at the end of a unit — with Amplify Desmos Math Florida, understanding is made continually visible.

Lesson-Level Assessments

Amplify Desmos Math Florida lessons are centered around sense-making and in-the-moment feedback. Daily moments of assessment provide insights into students' understandings of concepts and skills.

Show What You Know

Each lesson has a daily formative assessment focused on one of the **key concepts** in the lesson. Show What You Know moments are opportunities for students to show their teacher what they understand and what they are still learning.

Unit-Level Assessments

Our **embedded unit assessments** offer key insights into students' conceptual understanding of math. These assessments provide regular, actionable information about how students are thinking about and processing math, with both **auto-scoring** and **in-depth rubrics** that help teachers anticipate and respond to students' learning needs.

Pre-Unit Check

Each unit begins with a check to determine students' **proficiency** with **prerequisite skills** that are helpful for success in the upcoming unit. This check serves as an affirmation of the knowledge and skills with which students come into the unit.

Sub-Unit Quizzes

In Sub-Unit Quizzes, students are assessed on a subset of **conceptual understandings and procedural fluencies** from the unit, with rubrics that help illuminate students' current understanding and provides guidance for responding to student thinking.

End-of-Unit Assessment

Students engage with rigorous grade-level mathematics through a variety of formats and tasks in the End-of-Unit Assessment. A combination of auto-scored and rubric-scored items provide deep conceptual insight. Two forms are included to help facilitate assessment administration in the classroom.

Florida's B.E.S.T. Standards for Mathematics

The following correlations show the alignment of Amplify Desmos Math Florida to the FL B.E.S.T. Mathematics Standards and Benchmarks for Grade 6.

Benchmark	B.E.S.T Mathematics Benchmark	Amplify Desmos Math Lesson(s)
	Number Sense and Operations	
MA.6.NSO.1.1	Extend previous understanding of numbers to define rational numbers. Plot, order and compare rational numbers.	**Unit 7** Lessons 1, 2, 3, 4, 5, 6 **Unit 8** Lesson 4
MA.6.NSO.1.2	Given a mathematical or real-world context, represent quantities that have opposite direction using rational numbers. Compare them on a number line and explain the meaning of zero within its context.	**Unit 7** Lessons 1, 2, 3, 4, 6
MA.6.NSO.1.3	Given a mathematical or real-world context, interpret the absolute value of a number as the distance from zero on a number line. Find the absolute value of rational numbers.	**Unit 7** Lesson 6
MA.6.NSO.1.4	Solve mathematical and real-world problems involving absolute value, including the comparison of absolute value.	**Unit 7** Lessons 5, 6
MA.6.NSO.2.1	Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.	**Unit 5** Lessons 1, 3, 4, 5, 6, 7, 8, 9
MA.6.NSO.2.2	Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.	**Unit 4** Lessons 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 **Unit 8** Lesson 6
MA.6.NSO.2.3	Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.	**Unit 4** Lessons 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15 **Unit 5** Lessons 7, 8, 9
MA.6.NSO.3.1	Given a mathematical or real-world context, find the greatest common factor and least common multiple of two whole numbers.	**Unit 2** Lessons 6, 7
MA.6.NSO.3.2	Rewrite the sum of two composite whole numbers having a common factor, as a common factor multiplied by the sum of two whole numbers.	**Unit 5** Lesson 2
MA.6.NSO.3.3	Evaluate positive rational numbers and integers with natural number exponents.	**Unit 6** Lessons 10, 11
MA.6.NSO.3.4	Express composite whole numbers as a product of prime factors with natural number exponents.	**Unit 6** Lesson 10
MA.6.NSO.3.5	Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.	**Unit 3** Lessons 8, 9, 10, 11, 12, 13 **Unit 5** Lessons 9, 10 **Unit 6** Lessons 12, 13, 14, 15, 16, 17 **Unit 7** Lesson 4 **Unit 10** Lessons 3, 4, 5
MA.6.NSO.4.1	Apply and extend previous understandings of operations with whole numbers to add and subtract integers with procedural fluency.	**Unit 7** Lessons 1, 7, 8
MA.6.NSO.4.2	Apply and extend previous understandings of operations with whole numbers to multiply and divide integers with procedural fluency.	**Unit 7** Lesson 9

Florida's B.E.S.T. Standards for Mathematics

MA.7.NSO.2.1	Solve mathematical problems using multi-step order of operations with rational numbers including grouping symbols, whole-number exponents and absolute value.	**Unit 7** Lessons 11, 13, 14, 15
MA.7.NSO.2.2	Add, subtract, multiply and divide rational numbers with procedural fluency.	**Unit 7** Lessons 10, 11, 12, 13, 14, 15 **Unit 8** Lessons 6, 7 **Unit 9** Lesson 15
MA.7.NSO.2.3	Solve real-world problems involving any of the four operations with rational numbers.	**Unit 7** Lessons 11, 12, 13 **Unit 9** Lesson 15
	Algebraic Reasoning	
MA.6.AR.1.1	Given a mathematical or real-world context, translate written descriptions into algebraic expressions and translate algebraic expressions into written descriptions.	**Unit 6** Lesson 6
MA.6.AR.1.2	Translate a real-world written description into an algebraic inequality in the form of $x > a$, $x < a$, $x \geq a$ or $x \leq a$. Represent the inequality on a number line.	**Unit 6** Lessons 7, 9 **Unit 8** Lessons 3, 4, 5
MA.6.AR.1.3	Evaluate algebraic expressions using substitution and order of operations.	**Unit 6** Lesson 6
MA.6.AR.1.4	Apply the properties of operations to generate equivalent algebraic expressions with integer coefficients.	**Unit 6** Lessons 7, 8, 9
MA.6.AR.2.1	Given an equation or inequality and a specified set of integer values, determine which values make the equation or inequality true or false.	**Unit 6** Lessons 2, 4 **Unit 8** Lessons 4, 5
MA.6.AR.2.2	Write and solve one-step equations in one variable within a mathematical or real-world context using addition and subtraction, where all terms and solutions are integers.	**Unit 6** Lessons 1, 2, 3, 4 **Unit 8** Lesson 1
MA.6.AR.2.3	Write and solve one-step equations in one variable within a mathematical or real-world context using multiplication and division, where all terms and solutions are integers.	**Unit 6** Lessons 1, 2, 3, 4 **Unit 8** Lesson 2
MA.6.AR.2.4	Determine the unknown decimal or fraction in an equation involving any of the four operations, relating three numbers, with the unknown in any position.	**Unit 6** Lesson 5
MA.6.AR.3.1	Given a real-world context, write and interpret ratios to show the relative sizes of two quantities using appropriate notation: a/b, a to b, or $a : b$ where $b \neq 0$.	**Unit 2** Lessons 1, 2
MA.6.AR.3.2	Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate.	**Unit 3** Lessons 3, 4, 5, 6, 7
MA.6.AR.3.3	Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.	**Unit 2** Lessons 3, 4, 5, 9, 10, 11 **Unit 3** Lessons 5, 6, 7
MA.6.AR.3.4	Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.	**Unit 3** Lessons 8, 9, 10, 11, 12, 13

Florida's B.E.S.T. Standards for Mathematics

MA.6.AR.3.5	Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.	**Unit 2** Lessons 2, 4, 8, 12 **Unit 3** Lessons 1, 2, 3, 4, 5, 6, 7
MA.7.AR.1.1	Apply properties of operations to add and subtract linear expressions with rational coefficients.	**Unit 7** Lesson 15
MA.7.AR.1.2	Determine whether two linear expressions are equivalent.	**Unit 7** Lesson 14
MA.7.AR.2.1	Write and solve one-step inequalities in one variable within a mathematical context and represent solutions algebraically or graphically.	**Unit 8** Lessons 6, 7
MA.7.AR.3.1	Apply previous understanding of percentages and ratios to solve multi-step real-world percent problems.	**Unit 6** Lessons 12, 13, 14, 15, 16, 17
MA.7.AR.3.2	Apply previous understanding of ratios to solve real-world problems involving proportions.	**Unit 2** Lesson 12 **Unit 3** Lessons 7, 13
MA.7.AR.4.5	Solve real-world problems involving proportional relationships.	**Unit 9** Lesson 15
	Geometric Reasoning	
MA.6.GR.1.1	Extend previous understanding of the coordinate plane to plot rational number ordered pairs in all four quadrants and on both axes. Identify the x- or y-axis as the line of reflection when two ordered pairs have an opposite x- or y-coordinate.	**Unit 1** Lesson 2 **Unit 7** Lessons 16, 17, 18, 19
MA.6.GR.1.2	Find distances between ordered pairs, limited to the same x-coordinate or the same y-coordinate, represented on the coordinate plane.	**Unit 1** Lesson 7 **Unit 7** Lesson 18
MA.6.GR.1.3	Solve mathematical and real-world problems by plotting points on a coordinate plane, including finding the perimeter or area of a rectangle.	**Unit 7** Lessons 18, 19
MA.6.GR.2.1	Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.	**Unit 1** Lessons 1, 2, 3, 4, 5 **Unit 4** Lesson 13
MA.6.GR.2.2	Solve mathematical and real-world problems involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.	**Unit 1** Lessons 4, 5 **Unit 4** Lesson 13
MA.6.GR.2.3	Solve mathematical and real-world problems involving the volume of right rectangular prisms with positive rational number edge lengths using a visual model and a formula.	**Unit 4** Lessons 14, 15
MA.6.GR.2.4	Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.	**Unit 1** Lessons 9, 10, 11
MA.7.GR.1.1	Apply formulas to find the areas of trapezoids, parallelograms and rhombi.	**Unit 1** Lessons 6, 8
MA.7.GR.1.2	Solve mathematical or real-world problems involving the area of polygons or composite figures by decomposing them into triangles or quadrilaterals.	**Unit 1** Lessons 7, 8

Florida's B.E.S.T. Standards for Mathematics

Data Analysis and Probability		
MA.6.DP.1.1	Recognize and formulate a statistical question that would generate numerical data.	**Unit 9** Lessons 1, 2
MA.6.DP.1.2	Given a numerical data set within a real-world context, find and interpret mean, median, mode and range.	**Unit 9** Lessons 6, 7, 8, 10
MA.6.DP.1.3	Given a box plot within a real-world context, determine the minimum, the lower quartile, the median, the upper quartile and the maximum. Use this summary of the data to describe the spread and distribution of the data.	**Unit 9** Lessons 11, 12
MA.6.DP.1.4	Given a histogram or line plot within a real-world context, qualitatively describe and interpret the spread and distribution of the data, including any symmetry, skewness, gaps, clusters, outliers and the range.	**Unit 9** Lessons 4, 5
MA.6.DP.1.5	Create box plots and histograms to represent sets of numerical data within real-world contexts.	**Unit 9** Lessons 3, 5, 12
MA.6.DP.1.6	Given a real-world scenario, determine and describe how changes in data values impact measures of center and variation.	**Unit 9** Lessons 9, 10, 12
MA.7.DP.1.1	Determine an appropriate measure of center or measure of variation to summarize numerical data, represented numerically or graphically, taking into consideration the context and any outliers.	**Unit 9** Lessons 13, 16
MA.7.DP.1.2	Given two numerical or graphical representations of data, use the measure(s) of center and measure(s) of variability to make comparisons, interpret results and draw conclusions about the two populations.	**Unit 9** Lessons 13, 16, 17
MA.7.DP.1.3	Given categorical data from a random sample, use proportional relationships to make predictions about a population.	**Unit 9** Lessons 14, 15
MA.7.DP.2.1	Determine the sample space for a simple experiment.	**Unit 10** Lessons 1, 2
MA.7.DP.2.2	Given the probability of a chance event, interpret the likelihood of it occurring. Compare the probabilities of chance events.	**Unit 10** Lessons 2, 3, 4
MA.7.DP.2.3	Find the theoretical probability of an event related to a simple experiment.	**Unit 10** Lessons 2, 3, 4, 5
MA.7.DP.2.4	Use a simulation of a simple experiment to find experimental probabilities and compare them to theoretical probabilities.	**Unit 10** Lessons 3, 4, 5

Mathematical Thinking and Reasoning Standards

The following correlations show the alignment of Amplify Desmos Math Florida to the Mathematical Thinking and Reasoning Standards.

MA.K12.MTR.1.1 Actively participate in effortful learning both individually and collectively.

Unit 1 Lessons 6, 7, 9
Unit 2 Lessons 3, 6, 11
Unit 3 Lessons 2, 7, 8, 13
Unit 4 Lessons 4, 6, 10, 11, 12, 13
Unit 5 Lessons 4, 7, 10
Unit 6 Lessons 11, 13, 14
Unit 7 Lessons 1, 2, 4, 7, 8, 13, 16, 17, 18
Unit 8 Lesson 5
Unit 9 Lessons 1, 2, 9, 11, 12, 14
Unit 10 Lesson 4

MA.K12.MTR.2.1 Demonstrate understanding by representing problems in multiple ways.

Unit 1 Lessons 6, 8
Unit 2 Lessons 9, 10
Unit 3 Lesson 9
Unit 4 Lessons 1, 2, 3, 5, 8, 11
Unit 5 Lessons 1, 2, 3, 4, 5, 6, 9, 10
Unit 6 Lessons 1, 2, 3, 4, 6, 7, 10, 11, 12, 14
Unit 7 Lessons 3, 5, 6, 9, 14
Unit 8 Lessons 1, 2, 3, 4, 6
Unit 9 Lessons 6, 8
Unit 10 Lessons 1, 2

MA.K12.MTR.3.1 Complete tasks with mathematical fluency.

Unit 1 Lesson 3
Unit 3 Lessons 8, 11, 12
Unit 4 Lessons 4, 7, 8, 9, 10
Unit 5 Lessons 4, 7, 8, 9
Unit 6 Lessons 5, 10, 11, 15, 16, 17
Unit 7 Lessons 3, 5, 6, 8, 10, 11, 12, 15
Unit 8 Lessons 3, 4, 6, 7
Unit 9 Lessons 6, 8
Unit 10 Lessons 1, 2, 3

MA.K12.MTR.4.1 Engage in discussions that reflect on the mathematical thinking of self and others.

Unit 1 Lessons 4, 7, 8, 10, 11
Unit 2 Lessons 3, 4, 5, 7, 8, 12
Unit 3 Lessons 1, 3, 4, 5, 7, 8, 9, 11, 12
Unit 4 Lessons 4, 5, 6, 7, 10, 12, 14, 15
Unit 5 Lessons 4, 7, 10
Unit 6 Lessons 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 15, 17
Unit 7 Lessons 2, 4, 7, 10, 14, 15, 16, 17, 18, 19
Unit 8 Lessons 5, 6, 7
Unit 9 Lessons 1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, 14, 15, 17
Unit 10 Lesson 4

MA.K12.MTR.5.1 Use patterns and structure to help understand and connect mathematical concepts.

Unit 1 Lessons 1, 2, 4, 5, 6, 7
Unit 2 Lessons 1, 2, 3, 5, 10
Unit 3 Lessons 2, 6, 7, 10
Unit 4 Lessons 1, 2, 6, 11
Unit 5 Lesson 8
Unit 6 Lessons 1, 2, 3, 4, 5, 6, 7
Unit 7 Lessons 1, 7, 8, 10, 11, 12, 13, 15, 19
Unit 8 Lesson 1
Unit 9 Lessons 5, 10, 15, 16
Unit 10 Lesson 5

MA.K12.MTR.6.1 Assess the reasonableness of solutions.

Unit 1 Lessons 3, 9, 10
Unit 2 Lesson 8
Unit 4 Lessons 1, 2, 7
Unit 5 Lessons 3, 8
Unit 7 Lesson 3
Unit 8 Lesson 7
Unit 9 Lessons 3, 6, 8, 15, 16
Unit 10 Lessons 3, 5

MA.K12.MTR.7.1 Apply mathematics to real-world contexts.

Unit 1 Lesson 8
Unit 2 Lessons 5, 9, 12
Unit 3 Lesson 13
Unit 4 Lesson 15
Unit 5 Lesson 8
Unit 6 Lessons 6, 16
Unit 7 Lessons 11, 12, 19
Unit 8 Lessons 1, 2
Unit 9 Lessons 4, 5, 7, 10, 13, 14, 17

English Language Arts B.E.S.T. Standards

ELA.K12.EE.1.1 Cite evidence to explain and justify reasoning.

Unit 1 Lessons 3, 8, 9
Unit 2 Lessons 4, 5
Unit 3 Lessons 4, 8, 12
Unit 4 Lessons 4, 6, 9, 12, 14
Unit 5 Lessons 2, 3, 7, 10
Unit 6 Lessons 1, 5, 6, 10, 11, 15, 17
Unit 7 Lessons 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 17, 19
Unit 8 Lessons 1, 3, 5, 6
Unit 9 Lessons 2, 3, 5, 6, 7, 8, 9, 10, 12, 14, 15, 16, 17
Unit 10 Lessons 3, 4

ELA.K12.EE.2.1 Read and comprehend grade-level complex texts proficiently.

Unit 2 Lessons 3, 6, 11
Unit 4 Lesson 1
Unit 6 Lessons 2, 4

ELA.K12.EE.3.1 Make inferences to support comprehension.

Unit 1 Lessons 1, 4
Unit 2 Lessons 1, 2, 4, 10
Unit 3 Lessons 2, 7, 8, 9, 10, 11, 12, 13
Unit 4 Lessons 2, 3, 8, 10, 11, 13
Unit 6 Lessons 1, 2, 3, 14
Unit 7 Lessons 1, 2, 19
Unit 8 Lessons 2, 3
Unit 9 Lessons 1, 15

ELA.K12.EE.4.1 Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Unit 1 Lessons 6, 7
Unit 2 Lesson 9
Unit 3 Lessons 1, 2, 3
Unit 4 Lesson 9
Unit 5 Lessons 2, 3, 6, 9
Unit 6 Lessons 2, 4, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16
Unit 7 Lessons 5, 9, 11, 14
Unit 8 Lessons 1, 6
Unit 9 Lessons 3, 4, 13, 14

ELA.K12.EE.5.1 Use the accepted rules governing a specific format to create quality work.

Unit 1 Lessons 2, 4, 6, 7, 8, 9, 10, 11
Unit 2 Lessons 4, 5, 8, 9, 10, 11
Unit 3 Lessons 4, 6, 8, 9, 10, 11, 13
Unit 4 Lessons 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Unit 5 Lessons 1, 2, 3, 4, 5, 6, 8, 9
Unit 6 Lessons 7, 8, 12, 15
Unit 7 Lessons 1, 3, 4, 5, 6, 11, 12, 14, 15, 16, 17, 18
Unit 8 Lessons 4, 7
Unit 9 Lessons 3, 4, 6, 7, 8, 11, 12, 13, 14, 16
Unit 10 Lessons 1, 2, 3, 5

ELA.K12.EE.6.1 Use appropriate voice and tone when speaking or writing.

Unit 1 Lessons 1, 3, 5, 8, 10
Unit 2 Lessons 1, 2, 3, 6, 7, 12
Unit 3 Lessons 1, 3, 4, 7, 12
Unit 4 Lessons 3, 4, 15
Unit 6 Lessons 4, 5, 6, 7, 13, 16, 17
Unit 7 Lessons 2, 9, 12, 13, 18
Unit 9 Lessons 1, 2, 7, 8, 17

English Language Development Standards

ELD.K12.ELL.MA.1 English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

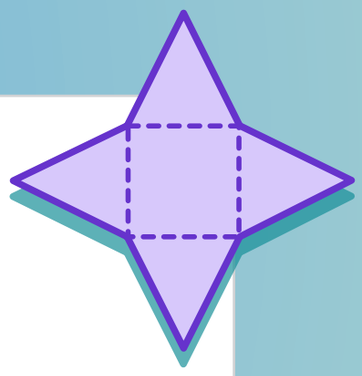
Unit 1, Lessons - All lessons
Unit 2, Lessons - All lessons
Unit 3, Lessons - All lessons
Unit 4, Lessons - All lessons
Unit 5, Lessons - All lessons
Unit 6, Lessons - All lessons
Unit 7, Lessons - All lessons
Unit 8, Lessons - All lessons
Unit 9, Lessons - All lessons
Unit 10, Lessons - All lessons

ELD.K12.ELL.SI.1 English language learners communicate for social and instructional purposes within the school setting.

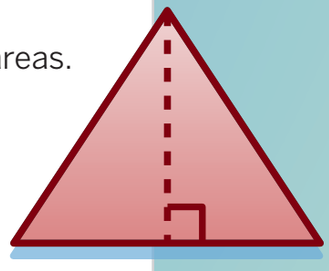
Unit 1, Lessons - All lessons
Unit 2, Lessons - All lessons
Unit 3, Lessons - All lessons
Unit 4, Lessons - All lessons
Unit 5, Lessons - All lessons
Unit 6, Lessons - All lessons
Unit 7, Lessons - All lessons
Unit 8, Lessons - All lessons
Unit 9, Lessons - All lessons
Unit 10, Lessons - All lessons

UNIT 1

Area and Surface Area



Students learn to calculate areas of polygons using formulas and the areas of composite figures by decomposing, rearranging, enclosing, and composing shapes. They also represent polyhedra with nets and calculate their surface areas.



Essential Questions

- What does it mean for two shapes to have the same area?
- How are the area formulas for rectangles, triangles, parallelograms, rhombi, and trapezoids related?
- When is it more efficient to subtract the area of a composite figure from a larger figure instead of decomposing the figure?
- How are the surface area of polyhedra and the area of polygons related?

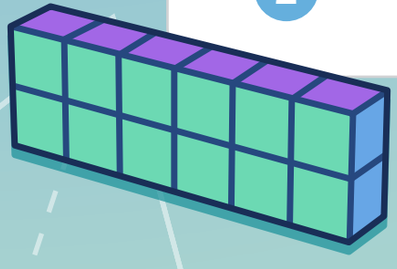
Sub-Unit Goals

Sub-Unit 1

- Calculate the areas of rectangles, triangles, parallelograms, rhombi, and trapezoids.
- Calculate the area of composite figures by decomposing them into smaller shapes or by enclosing and subtracting.

Sub-Unit 2

- Connect polyhedra with nets that represent them.
- Calculate the surface area of a prism or pyramid.



The Math of the Unit

Unit Outcomes Telling a story that narrows and deepens with the grade

Florida B.E.S.T. Standards for Mathematics

Model and solve problems involving two-dimensional figures and three-dimensional figures. **(MA.6.GR.2)**

Solve problems involving two-dimensional figures, including circles. **(MA.7.GR.1)**

Benchmarks Addressed in This Unit: MA.6.GR.2.1 MA.6.GR.2.2 MA.6.GR.2.4 MA.7.GR.1.1 MA.7.GR.1.2

Mathematical Thinking and Reasoning Standards

- Actively participate in effortful learning both individually and collectively. (**MTR.1.1**)
- Complete tasks with mathematical fluency. (**MTR.3.1**)
- Engage in discussions that reflect on the mathematical thinking of self and others. (**MTR.4.1**)
- Use patterns and structure to help understand and connect mathematical concepts. **(MTR.5.1)**

Also Addressed: **MTR.2.1, MTR.7.1**

Coherence Telling a story within and across grades

In this Unit

Students develop strategies for calculating the area of polygons and composite figures, including generalizing and using formulas. They make connections between prisms and pyramids and nets that represent them, then use those nets to calculate the surface area.

Prior Learning

- Areas of rectangles **(MA.3.GR.2.1, MA.3.GR.2.2, MA.3.GR.2.3, MA.4.GR.2, MA.5.GR.2.1)**
- Classifying two-dimensional and three-dimensional figures such as quadrilaterals, right triangles, pyramids, and prisms **(MA.3.GR.1.2, MA.5.GR.1)**
- Volumes of rectangular prisms **(MA.5.GR.3)**

Future Learning

- Area and circumference of circles **(MA.7.GR.1.3, MA.7.GR.1.4)**
- Volume and surface area of cylinders **(MA.7.GR.2)**
- Volume and surface area of cones and spheres **(MA.912.GR.4.5, MA.912.GR.4.6)**

See the Connections to Future Learning page for more information, including explanations and examples.

Rigor and Balance Integrating the aspects of rigor in ways that support one another

Here are examples of the aspects of rigor and balance in this unit. See the first page of each lesson's Teacher Edition for more information.

Conceptual Understanding

In **Lessons 9–11**, students develop a conceptual understanding of surface area and begin to visualize the relationship between polyhedra and their nets.

Strategic Competence

In **Lesson 6**, students consider and choose between different methods to find areas of parallelograms and triangles.

Procedural Fluency

In **Lessons 3–4**, students calculate the areas of parallelograms and triangles with and without the use of a grid.

Adaptive Reasoning

In **Lesson 5**, students determine what to measure on a parallelogram to help them find the area and draw connections between areas of parallelograms and areas of triangles.

Application

In **Lesson 10**, students apply their learning about surface area to stickers on a prism.

Productive Disposition

In **Lessons 1–2**, students create strategies for determining area and have their strategies used and celebrated by their classmates.

Unit at a Glance

Assess and Respond

A Pre-Unit Check

Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

MA.3.GR.2 MA.3.GR.2.1 MA.4.GR.1.1 MA.4.GR.2.1 MA.GR.5.1.1 MA.5.GR.3.1
MTR.3.1 MTR.5.1

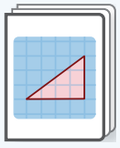
Sub-Unit 1

1 Triangles and Rectangles

Generalizing the Area of a Triangle

Make connections between the areas of rectangles and the areas of triangles.

MA.6.GR.2.1
MTR.5.1



2 Exploring Triangles

Triangles on a Grid

Make sense of different strategies for calculating the area of triangles on a grid by looking for and making use of a triangle's structure.

MA.6.GR.2.1
MTR.5.1

3 Off the Grid

Applying the Formula for the Area of a Triangle

Calculate the areas of triangles with and without a grid.

MA.6.GR.2.1
MTR.3.1 MTR.6.1

Assess and Respond

8 Shapes Inside Shapes

Area of Composite Figures

Use different strategies to determine the area of composite figures.

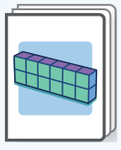
MA.7.GR.1.1 MA.7.GR.1.2
MTR.2.1 MTR.4.1 MTR.7.1

A Sub-Unit Quiz

Learn about your students' understanding of the concepts and skills so far in this unit.

MA.6.GR.2.1 MA.6.GR.2.2
MTR.2.1 MTR.3.1 MTR.5.1

Sub-Unit 2



9 Renata's Stickers

Intro to Surface Area

Understand surface area as a measure of three-dimensional solids.

MA.6.GR.2.4
MTR.1.1 MTR.6.1

10 Prisms and Pyramids

Polyhedra and Their Faces

Analyze and define the features of prisms and pyramids using mathematical vocabulary.

MA.6.GR.2.4
MTR.4.1 MTR.6.1

Pacing: 14 days | **Short on time?** See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 11 Lessons
- Pre-Unit Check
- Sub-Unit Quiz
- End-of-Unit Assessment

4 Letters

Area Strategies

Develop and name strategies for calculating the area of more complex shapes.

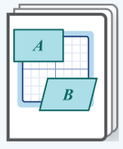
MA.6.GR.2.1 MA.6.GR.2.2
MTR.4.1 MTR.5.1

5 Breaking Down

Calculating Areas of Composite Figures Using the Area of Rectangles and Triangles

Apply prior knowledge of the areas of rectangles and triangles to calculate the areas of **composite figures**.

MA.6.GR.2.1 MA.6.GR.2.2
MTR.5.1



6 Access to All Areas

Investigating Areas of Special Quadrilaterals

Derive the area formulas for a parallelogram, rhombus, and trapezoid and determine the areas of these quadrilaterals.

MA.7.GR.1.1
MTR.1.1 MTR.2.1 MTR.5.1

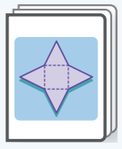
7 Pile of Polygons

Investigating Polygons and Their Areas

Apply knowledge of area to a new category of shapes: **polygons**.

MA.7.GR.1.2
MTR.1.1 MTR.4.1 MTR.5.1

Assess and Respond



11 Nothing But Nets

Nets and Surface Area on a Grid

Practice identifying **polyhedra** from their **nets** and calculating surface area.

MA.6.GR.2.4
MTR.4.1

A End-of-Unit Assessment

Learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

MA.6.GR.2.1 MA.6.GR.2.2
MA.6.GR.2.4 MA.7.GR.1.2
MTR.2.1 MTR.4.1 MTR.5.1 MTR.7.1

Pacing Considerations

Lesson 3: This lesson can be condensed for time by reducing the number of problems in Problem 10 of Activity 3.

Lessons 4 and 5: These lessons can be condensed into one lesson by completing Activity 2 of Lesson 4 along with the Warm Up, Activity 2, and Activity 3 from Lesson 5.

Lesson Materials and Prep

Here are the materials and resources needed within each lesson, how to prepare them, and where to find them.

Lesson 1	Lesson 2	Lesson 3	Lesson 4
Copy: Show What You Know	**Copy:** Show What You Know, Activity 1 Sheet (*one per pair*), Activity 2 Sheet (*one per student*) **Materials:** scissors, tracing paper	**Copy:** Show What You Know **Materials:** coloring tools	**Copy:** Show What You Know
Lesson 5	**Lesson 6**	**Lesson 7**	**Lesson 8**
Copy: Show What You Know, Activity 1 Sheet (*one per pair*) **Materials:** rulers	**Copy:** Show What You Know	**Copy:** Show What You Know, Activity 2 Sheet *(one per student)* **Materials:** graph paper / straightedges *(optional)*	**Copy:** Show What You Know
Lesson 9	**Lesson 10**	**Lesson 11**	
Copy: Show What You Know	**Copy:** Show What You Know, Warm-Up Sheet (*one set per pair*)	**Copy:** Show What You Know, Activity 2 Sheet (*one per student*) **Cut:** Activity 1 Cards *(one set per pair)* **Materials:** graph paper, rulers, scissors, tape	

Resource Books

Assessment and Lesson Resources

- Pre-Unit Check
- Sub-Unit Quizzes
- End-of-Unit Assessment, Forms A & B
- Assessment Rubrics
- Show What You Knows
- Activity Sheets and Cards

Intervention and Extension Resources

- Mini-Lessons
- Prior Grade Mini-Lessons
- Extensions

Caregiver Support

These resources can be shared with students' caregivers. They provide background on the mathematics in this unit, as well as suggestions for supporting students at home.

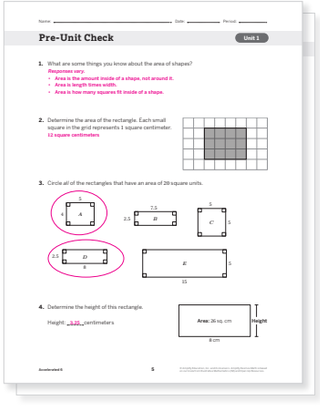
Assessments

Every unit includes a variety of formative and summative assessments designed to highlight students' understanding of a variety of concepts and skills.

Pre-Unit Check

Assign the **Pre-Unit Check** to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

Standards assessed: MA.3.GR.2, MA.3.GR.2.1, MA.4.GR.1.1, MA.4.GR.2.1, MA.GR.5.1.1, MA.5.GR.3.1


Name _____ Date _____ Period _____

Pre-Unit Check Unit 1

1. What are some things you know about the area of shapes?
Responses vary.
- Area is the amount inside of a shape, not around it.
- Area is length times width.
- Area is how many squares fit inside of a shape.

2. Determine the area of the rectangle. Each small square in the grid represents 1 square centimeter.
12 square centimeters

3. Circle all of the rectangles that have an area of 28 square units.

4. Determine the height of this rectangle.
Height: 3.25 centimeters

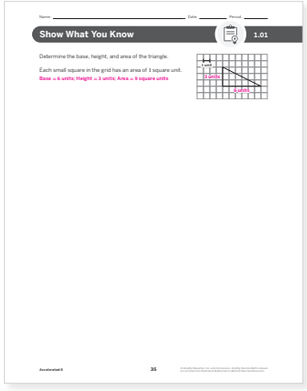
Area: 26 sq. cm, 8 cm, Height

Accelerated 6 5

Lesson | Show What You Know

Use the **Show What You Know** for each lesson to learn more about your students' progress toward the lesson goal(s). Here is one example from this unit.

Standards assessed on Lesson 1 Show What You Know: MA.6.GR.2.1


Name _____ Date _____ Period _____

Show What You Know 1.01

Determine the base, height, and area of the triangle.

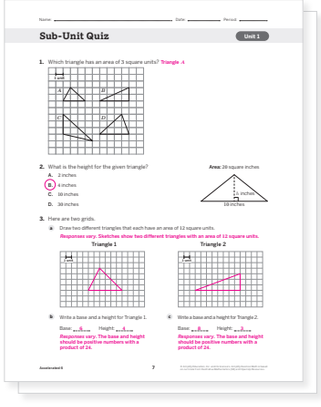
Each small square in the grid has an area of 1 square unit.
Base = 6 units; Height = 3 units; Area = 9 square units

Accelerated 6 35

Sub-Unit Quiz

Assign the **Sub-Unit Quiz** to learn about your students' understanding of the concepts and skills so far in this unit.

Standards assessed: MA.6.GR.2.1, MA.6.GR.2.2


Name _____ Date _____ Period _____

Sub-Unit Quiz Unit 1

1. Which triangle has an area of 3 square units? Triangle A

2. What is the height for the given triangle?
A. 2 inches
B. 4 inches
C. 16 inches
D. 38 inches
Area: 28 square inches, 14 inches, 10 inches

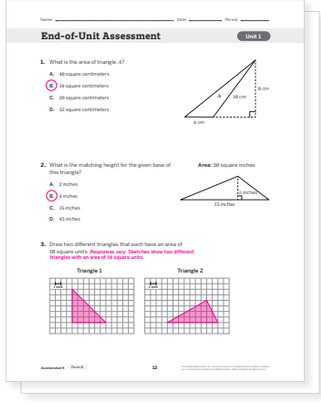
3. Here are two grids.
a. Draw two different triangles that each have an area of 12 square units.
Responses vary. Sketches show two different triangles with an area of 12 square units.
Triangle 1 Triangle 2
b. Write a base and a height for Triangle 1.
Base: 8 Height: 3
Responses vary. The base and height should be positive numbers with a product of 24.
c. Write a base and a height for Triangle 2.
Base: 8 Height: 3
Responses vary. The base and height should be positive numbers with a product of 24.

Accelerated 6 7

End-of-Unit Assessment

Assign the **End-of-Unit Assessment** to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

Standards assessed: MA.6.GR.2.1, MA.6.GR.2.2, MA.6.GR.2.4, MA.7.GR.1.2


Name _____ Date _____ Period _____

End-of-Unit Assessment Unit 1

1. What is the area of triangle A?
A. 48 square centimeters
B. 16 square centimeters
C. 28 square centimeters
D. 32 square centimeters
8 cm, 4 cm

2. What is the matching height for the given base of this triangle?
A. 2 inches
B. 4 inches
C. 15 inches
D. 45 inches
Area: 30 square inches, 4 inches, 15 inches

3. Draw two different triangles that each have an area of 18 square units. Responses vary. Sketches show two different triangles with an area of 18 square units.
Triangle 1 Triangle 2

Accelerated 6 Form B 12

Differentiation

Every unit includes additional resources to support, strengthen, and stretch student learning.

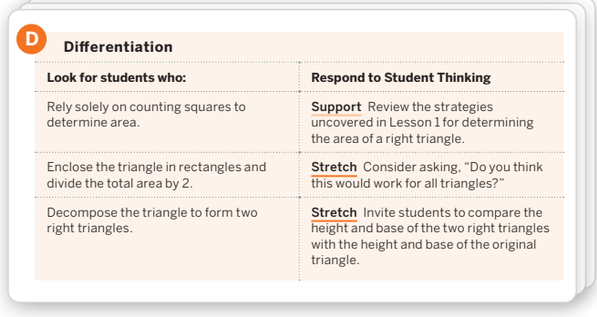
Differentiation Across the Unit

	Support	Strengthen	Stretch
	Provide targeted intervention for students by using these resources.	Reinforce students' understanding of the concepts assessed by using these resources.	Challenge students and extend their learning with these resources.
Sub-Unit 1 (Lessons 1–8) • Calculate the areas of rectangles, triangles, parallelograms, rhombi, and trapezoids. • Calculate the area of composite figures by decomposing into smaller shapes or by enclosing and subtracting.	**Mini-Lesson** • *Calculating Areas of Triangles* • *Calculating the Area of Parallelograms*	**Repeated Challenges** • Lesson 3 (*Off the Grid*) • Lesson 5 (*Breaking Down*) **Challenge Creator** • Lesson 5 (*Breaking Down*) • Lesson 7 (*Pile of Polygons*) **Practice** • Lessons 1–8	**DOK3 Practice** • Lesson 1–3, 5, 8
Sub-Unit 2 (Lessons 9–11) • Connect polyhedra with nets that represent them. • Calculate the surface area of a prism or pyramid.	**Mini-Lesson** • *Determining Surface Areas of Rectangular Prisms*	**Practice** • Lessons 9–11	**You're invited to explore more.** • Lesson 9 (*Renata's Stickers*) **DOK3 Practice** • Lesson 9

Differentiation Within the Lesson

Each Teacher Edition includes point-of-use differentiation suggestions to modify or adjust instruction during the lesson to accommodate the needs of all learners.

Here is one example from **Lesson 2**, where students determine the area of a triangle on a grid.



Differentiation

Look for students who:	Respond to Student Thinking
Rely solely on counting squares to determine area.	**Support** Review the strategies uncovered in Lesson 1 for determining the area of a right triangle.
Enclose the triangle in rectangles and divide the total area by 2.	**Stretch** Consider asking, "Do you think this would work for all triangles?"
Decompose the triangle to form two right triangles.	**Stretch** Invite students to compare the height and base of the two right triangles with the height and base of the original triangle.

Accessibility

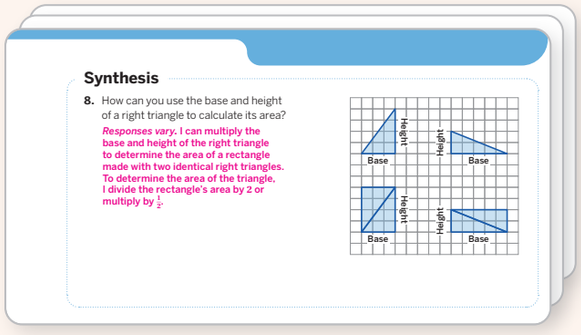
Every lesson is designed using the principles of Universal Design for Learning. Every lesson also includes support suggestions that build on students' strengths.

Universal Design for Learning

Here is one example from a lesson designed to support Engagement.

Spotlight on Sustaining Effort & Persistence . . .

Lesson 1: Students provide their perspectives and receive feedback throughout the lesson as they build toward generalizing an area formula. Students then reflect on the feedback to make their thinking stronger and clearer.



Just-In-Time Accommodations and Supports

Each Teacher Edition includes suggested supports based on the areas of cognitive function from the Education Development Center (EDC).

Spotlight on Fine Motor Skills . . .

Here are two suggestions in this unit for supporting students with tasks that require small muscle movement and coordination such as manipulating objects.

Lesson 8, Activity 2

A **Accessibility: Fine Motor Skills** Consider providing ways to decompose the figure and labeling one or more measurements in the figure so students can focus on determining the area.

Lesson 11, Activity 2

A **Accessibility: Fine Motor Skills** Consider strategically pairing students with different strengths to support the use of physical manipulatives.

Language Development

Every lesson includes opportunities for all students to develop fluency with mathematical language.

Vocabulary

New Vocabulary	Lesson(s)
area **base (of a triangle)** **height (of a triangle)** **right triangle**	1
composite figure	5
base (of a parallelogram) **height (of a parallelogram)**	6
polygon	7
surface area **volume**	9
base (of a pyramid or prism) **face** **net** **polyhedron** **prism** **pyramid**	10

Review Vocabulary
parallelogram
perpendicular
quadrilateral
rhombus
trapezoid

Additional Vocabulary
decompose
edge
rearrange

Math Language Routines and Language Goals

Math Language Routine	Lesson(s)
MLR1: Stronger and Clearer Each Time	1, 8, 10
MLR2: Collect and Display	2–5, 7–11
MLR3: Critique, Correct, Clarify	7
MLR7: Compare and Connect	4, 6

Sub-Unit Language Goals

- Describe the relationship between a base of a triangle and its corresponding height using mathematically precise language.
- Analyze strategies for determining the areas of polygons and composite figures using mathematically precise language.
- Describe the polyhedron that can be assembled from a given net using mathematically precise language, including terms such as *face*, *edge*, *prism*, and *pyramid*.
- Analyze strategies for determining the surface area of polyhedra using mathematically precise language, including terms such as *face*, *edge*, *base*, and *height*.

English Language Learners Support

Every Teacher Edition includes suggestions for supporting the needs of students learning English.

Here is one example from **Lesson 4**, where students are focusing on additional vocabulary.

ELL **English Language Learners** Use gestures to illustrate the meaning of the term *rearrange*. **(Reading and Listening)**

Connections to Future Learning

Here is how the content in this unit connects to where your students are headed in their math journeys.

Area and Circumference of Circles

In this unit, students determine the area of triangles and composite figures made of rectangles and triangles. **In a future course**, students will extend their understanding of area to circles.

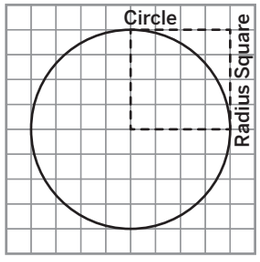
FL B.E.S.T. Math Benchmarks:
MA.7.GR.1.3, MA.7.GR.1.4

Example:

This circle's area would be a little more than $3 \cdot 4^2 = 48$ square units.

The relationship between the radius and area of a circle is exactly $A = \pi r^2$.

The area of this circle is $\pi(4)^2 = 16\pi \approx 50.27$ square units.



Volume and Surface Area of Cylinders

In this unit, students connect the surface area of a prism to the sum of the areas of its net. **In a future course**, students will calculate the surface area and the volume of cylinders.

FL B.E.S.T. Math Benchmarks:
MA.7.GR.2.1, MA.7.GR.2.2, MA.7.GR.2.3

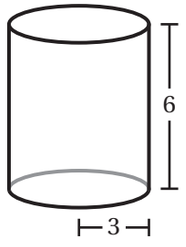
Example:

The volume of this cylinder is:

$V = B \cdot h = \pi r^2 \cdot h = \pi \cdot (3)^2 \cdot (6) = 9 \cdot 6 \cdot \pi = 54\pi$ cubic units

The surface area of this cylinder is:

$SA = 2\pi rh + 2\pi r^2 = 2\pi(3)(6) + 2\pi(3)^2 =$
$36\pi + 18\pi = 54\pi$ square units



Volume and Surface Area of Cones and Spheres

In this unit, students determine the volume and surface area of rectangular prisms. **In a future course**, students will determine the volumes and surface areas of cones and spheres.

FL B.E.S.T. Math Benchmarks:
MA.912.GR.4.5, MA.912.GR.4.6

Example:

The volume of a hemisphere is half the volume of a sphere.

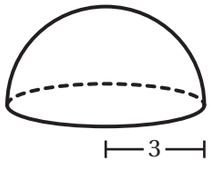
$V = \frac{1}{2}(\frac{4}{3}\pi r^3)$

$V = \frac{2}{3}\pi r^3 = \frac{2}{3}\pi(3)^3 = 18\pi$

The surface area of a hemisphere is half the surface area of a sphere plus the area of the circular base.

$SA = \frac{1}{2}(4\pi r^2) + \pi r^2$

$SA = 3\pi r^2 = 3\pi(3)^2 = 27\pi$

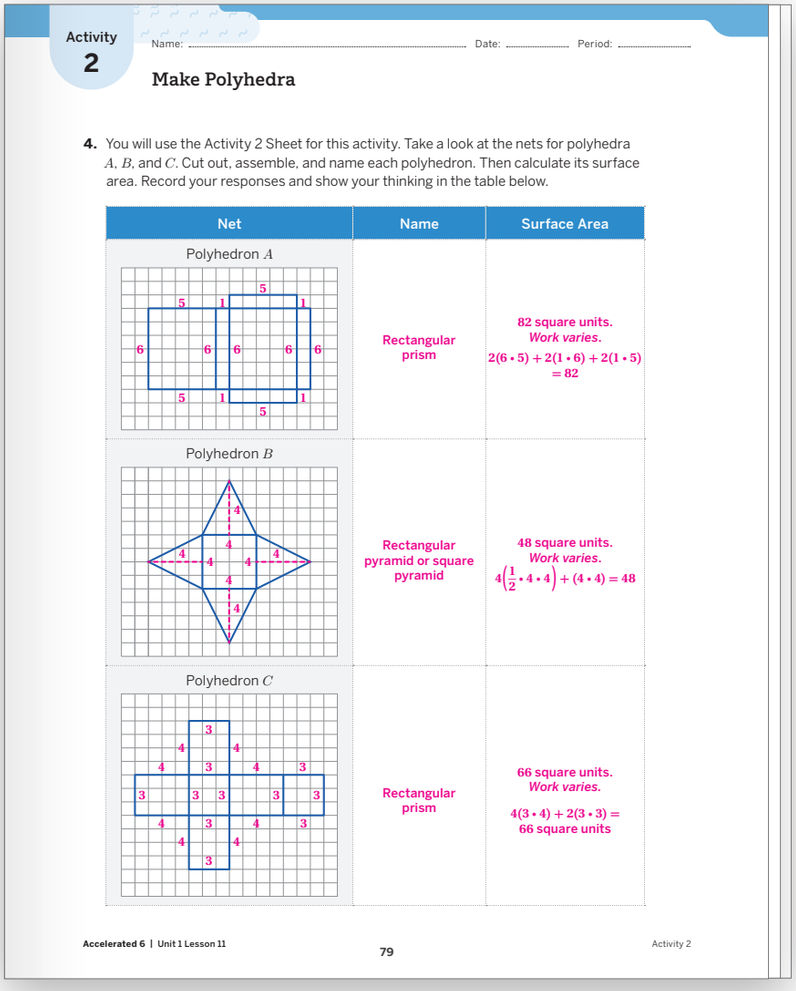


Professional Learning

Here is an opportunity to deepen your understanding of the math in this unit and how to teach it.

Spotlight on Strategic Competence

Lesson 11, Activity 2, Problem 4



Activity 2

Name: Date: Period:

Make Polyhedra

4. You will use the Activity 2 Sheet for this activity. Take a look at the nets for polyhedra A, B, and C. Cut out, assemble, and name each polyhedron. Then calculate its surface area. Record your responses and show your thinking in the table below.

Net	Name	Surface Area
Polyhedron A	Rectangular prism	82 square units. *Work varies.* $2(6 \cdot 5) + 2(1 \cdot 6) + 2(1 \cdot 5) = 82$
Polyhedron B	Rectangular pyramid or square pyramid	48 square units. *Work varies.* $4\left(\frac{1}{2} \cdot 4 \cdot 4\right) + (4 \cdot 4) = 48$
Polyhedron C	Rectangular prism	66 square units. *Work varies.* $4(3 \cdot 4) + 2(3 \cdot 3) =$ 66 square units

Accelerated 6 | Unit 1 Lesson 11 79 Activity 2

Context

In this activity, students strengthen their understanding of how nets can be used to determine the surface area of prisms and pyramids.

Try This

Put on your student hat and complete Problem 4.

Points to Ponder

- Some students may miscalculate the surface area by not considering all of the surfaces representing the net. How might you support students in making connections between the net of a figure and all of the surfaces of the figure?
- How will nets support their understanding of calculating the surface area of figures in the future?

Notes:

Assess and Respond

Pre-Unit Check

Independent | 45 min

Facilitation: Assign the Pre-Unit Check to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Preparation for	DOK	FL B.E.S.T. Math Benchmarks
1	Describing what students already know about the concept of area	Lesson 1	1	MA.3.GR.2
2	Calculating area using the structure of a grid	Lesson 1	1	MA.3.GR.2.1, MTR.5.1
3	Calculating areas of rectangles without a grid	Lesson 3	2	MA.5.GR.2.1
4	Determining the height of a rectangle when given the area and length	Lesson 4	2	MA.4.GR.2.1
5	Identifying right triangles	Lesson 2	1	MA.4.GR.1.1, MA.5.GR.1.1, MTR.3.1
6	Determining the volume of a rectangular prism	Lesson 9	1	MA.5.GR.3.1, MTR.5.1
7	Applying the concept of volume to real-world contexts	Lesson 9	2	MA.5.GR.3.1

Assessment and Lesson Resources

- Student Assessments
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Pre-Unit Check

Unit 1

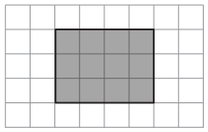
1. What are some things you know about the area of shapes?

Responses vary.

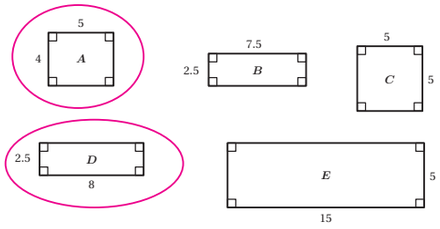
- Area is the amount inside of a shape, not around it.
- Area is length times width.
- Area is how many squares fit inside of a shape.

2. Determine the area of the rectangle. Each small square in the grid represents 1 square centimeter.

12 square centimeters



3. Circle *all* of the rectangles that have an area of 20 square units.



4. Determine the height of this rectangle.

Height: 3.25 centimeters

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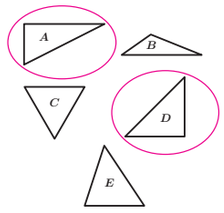
Name: ..... Date: ..... Period: .....

Pre-Unit Check (continued)

Unit 1

5. Here are several figures. Circle *all* the figures that look like right triangles.



Show or explain your thinking.

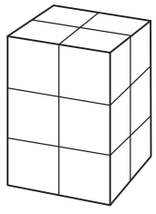
Explanations vary. Figures A and D each have one angle that looks to be 90 degrees.

6. Determine the volume of this prism.

Volume: 12 cubic units

Show or explain your thinking.

Explanations vary. Volume is the number of cubic units in a prism, so I counted all the cubes and got 12.



7. Which measure could be found by calculating the volume of an object?

A. The amount of paint needed to cover a box

B. How many cubes will fit in a box

C. How much a box weighs

D. How many faces a box has

D Differentiation (Pre-Unit Check)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

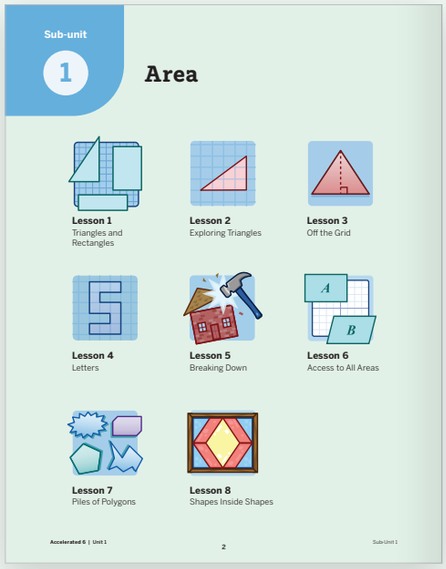
Sub-Unit Goals	Problem(s)	Respond to Student Thinking
Preparation for Sub-Unit 1: • Calculate the area of rectangles and triangles. • Calculate the area of composite figures by decomposing into rectangles and triangles or by surrounding and subtracting. **(Lessons 1–5)**	1, 2	**Support** • **Teacher Move:** Before **Lesson 1**, consider inviting students to share strategies they used to calculate the area of the rectangle.
	3, 4	**Support** • **Mini-Lesson:** *Multiplying Two Decimals Greater Than 1* • **Mini-Lesson:** *Solving Problems Involving Area and Perimeter* • **Teacher Move:** Before **Lesson 3**, consider inviting students to share the relationship between the base, height, and area of a rectangle.
	5	**Support** • **Teacher Move:** After **Lesson 2's** *Warm-Up*, consider reviewing this problem and adding to any anchor charts.
	6, 7	**Support** • **Mini-Lesson:** *Using the Structure of Rectangular Prisms to Determine Volume* • **Teacher Move:** Before **Lesson 9's** *Warm-Up*, consider reviewing this problem as a class. Invite students to share strategies and create an anchor chart as a class with the definition of volume. • **Teacher Move:** During **Lesson 9**, consider using physical objects like unit cubes or tissue boxes to discuss the difference between volume and surface area as it arises during the lesson.

Area

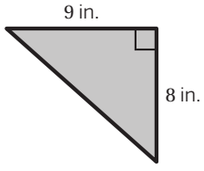
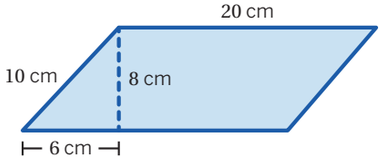
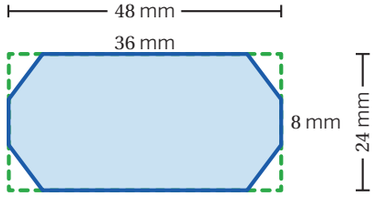
Sub-Unit 1 Goals

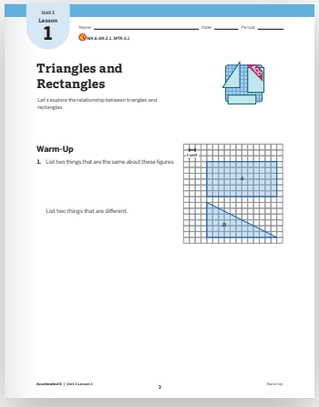
- **Goal:** Calculate the areas of rectangles, triangles, parallelograms, rhombi, and trapezoids.
- **Goal:** Calculate the area of composite figures by decomposing into smaller shapes or by surrounding and subtracting.
- **Language Goal:** Describe the relationship between a base of a triangle and its corresponding height using mathematically precise language.
- **Language Goal:** Analyze strategies for determining the areas of polygons and composite figures using mathematically precise language.

In this sub-unit, students develop strategies for calculating the **areas** of triangles and other **polygons**, including generalizing and using formulas involving the **base** and **height** of these figures.



Math That Matters Most

Concept or Skill	For example . . .
Use a formula to calculate the area of a right triangle.	Use a formula to determine the area of the triangle.  $A = \frac{1}{2}bh = \frac{1}{2} \cdot 9 \cdot 8 = 36$ square inches
Calculate the area of a parallelogram.	Determine the area of the parallelogram.  160 square centimeters
Calculate the area of a composite figure.	Determine the area of the composite figure. Draw on the image if it helps your thinking. We can decompose the figure into 1 rectangle and 2 identical trapezoids. Area of rectangle: $A = 36 \cdot 24 = 864$ Area of trapezoid: $A = \frac{1}{2}(6)(8 + 24) = 96$ Area of composite figure: $A = 864 + 96 + 96 = 1056$ square millimeters 


Unit 1
Lesson
1

Name: _____ Date: _____ Period: _____

MA.6.GR.2.1, MTR.5.1

Triangles and Rectangles

Let's explore the relationship between triangles and rectangles.

Warm-Up

1. List two things that are the same about these figures.

List two things that are different.

Accelerated 6 | Unit 1 Lesson 1 3 Warm-Up

Triangles and Rectangles

Generalizing the Area of a Triangle

Let's explore the relationship between triangles and rectangles.

Learning Outcomes

Today's Goal

1. **Goal:** Identify the relationship between the *area* of a *right triangle* and the area of a rectangle with the same *base* and *height*.
2. **Goal:** Critique strategies for determining the *areas* of *right triangles* using terms such as *base* and *height*.
3. **Language Goal:** Describe the relationship between the *base* of a *right triangle* and its corresponding *height* using mathematically precise language. **(Writing, Speaking, and Listening)**

This is the first of three lessons about the **areas** of triangles. Students build on what they already know about area to make connections between the areas of triangles and the areas of rectangles and generalize a formula to calculate the area of a **right triangle**. **(MTR.5.1)**

Coherence

Prior Learning

In previous courses, students applied the area and perimeter formulas for rectangles in real-world and mathematical problems.

Future Learning

In Lessons 2–3, students will apply the formula for the area of a right triangle to all triangles with and without a grid.

Connections

- Students build upon their understanding of rectangle area to begin to derive the formula for the area of a triangle using visual models. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.1
Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.1.2

Vocabulary

New Vocabulary

area

base (of a triangle)

height (of a triangle)

right triangle

Lesson at a Glance

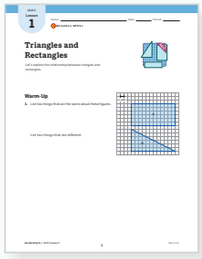
~ 45 min

MA.6.GR.2.1

Warm-Up

Pairs | 5 min

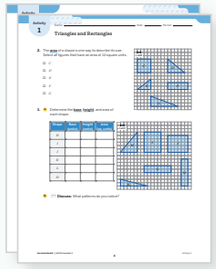
Students make connections between a **right triangle** and a rectangle using the Think-Pair-Share routine.



Activity 1

Pairs | 15 min

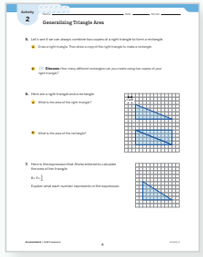
Students make connections between right triangles and rectangles that have the same **base** and **height**, reasoning about patterns in their **areas**. **(MTR.5.1)**



Activity 2

Pairs | 15 min

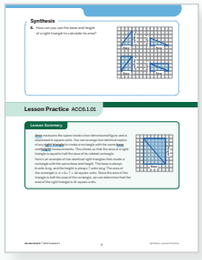
Students generalize the relationship between right triangles and rectangles to determine the area of a right triangle. **(MTR.5.1)**



Synthesis

Whole Class | 5 min

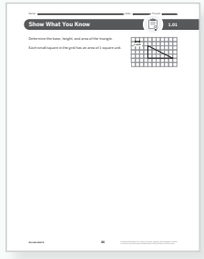
Students synthesize their understanding of right triangles and related rectangles, generating a formula for calculating the area of a right triangle. MLR1: Stronger and Clearer Each Time



Show What You Know

Independent | 5 min

Students demonstrate their understanding by identifying the base and height of a right triangle on a grid and calculating its area.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students make connections between a **right triangle** and a rectangle using the Think-Pair-Share routine.

1 Launch

Use the Think-Pair-Share routine to support student-to-student discourse. Invite students to think independently and then take turns sharing with a partner. Invite several students to share their or their partner's thinking with the class.

To encourage movement, invite students to find a partner in a different location.

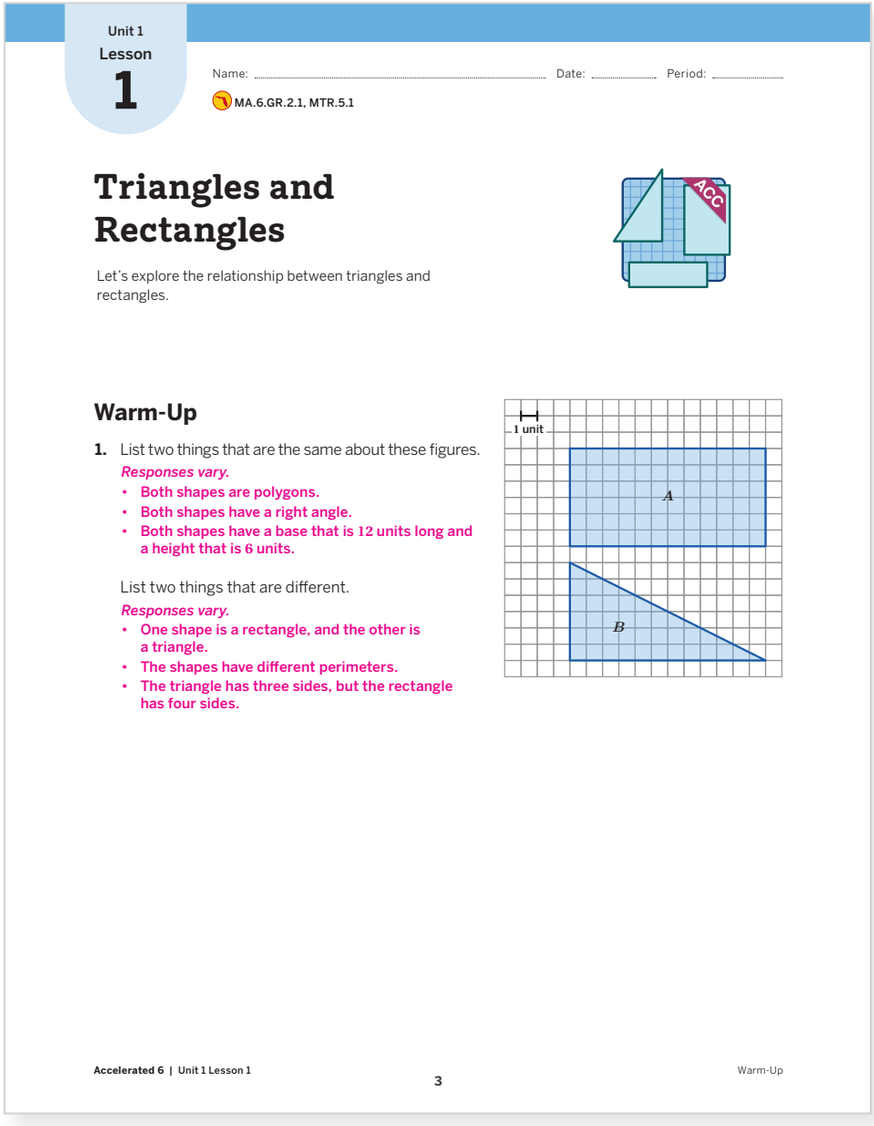
Encourage students to find things that they think none of their classmates will notice.

2 Connect

Consider asking:

- "What is similar about the two shapes? What is different?"
- "What do you think the base of the triangle is? How do you know?"
- "What do you think the height of the triangle is? How do you know?"

Note: If no student mentions area, consider asking, "Did anyone think about the area of these shapes? How might we calculate the area of figure A or figure B?"



Unit 1
Lesson
1

Name: ..... Date: ..... Period: .....

MA.6.GR.2.1, MTR.5.1

Triangles and Rectangles

Let's explore the relationship between triangles and rectangles.

Warm-Up

1. List two things that are the same about these figures.

Responses vary.

- Both shapes are polygons.
- Both shapes have a right angle.
- Both shapes have a base that is 12 units long and a height that is 6 units.

List two things that are different.

Responses vary.

- One shape is a rectangle, and the other is a triangle.
- The shapes have different perimeters.
- The triangle has three sides, but the rectangle has four sides.

Accelerated 6 | Unit 1 Lesson 1 3 Warm-Up

Pairs | 15 min

Activity 1 Triangles and Rectangles

Purpose: Students make connections between right triangles and rectangles that have the same **base** and **height**, reasoning about patterns in their **areas**. **(MTR.5.1)**

1 Launch

Invite students to share with a partner or the class what **area** means in their own words.

Demonstrate how to combine partial square units that equal 1 whole square unit when counting square units to find area.

Create a class definition for the terms **base** and **height (of a triangle)** using students' language and the glossary.

ELL **English Language Learners** Use gestures to illustrate the meaning of the terms *area*, *base*, and *height*. **(Reading and Listening)**

2 Monitor

Encourage students to use patterns they notice to determine the area of each shape. **(MTR.5.1)**

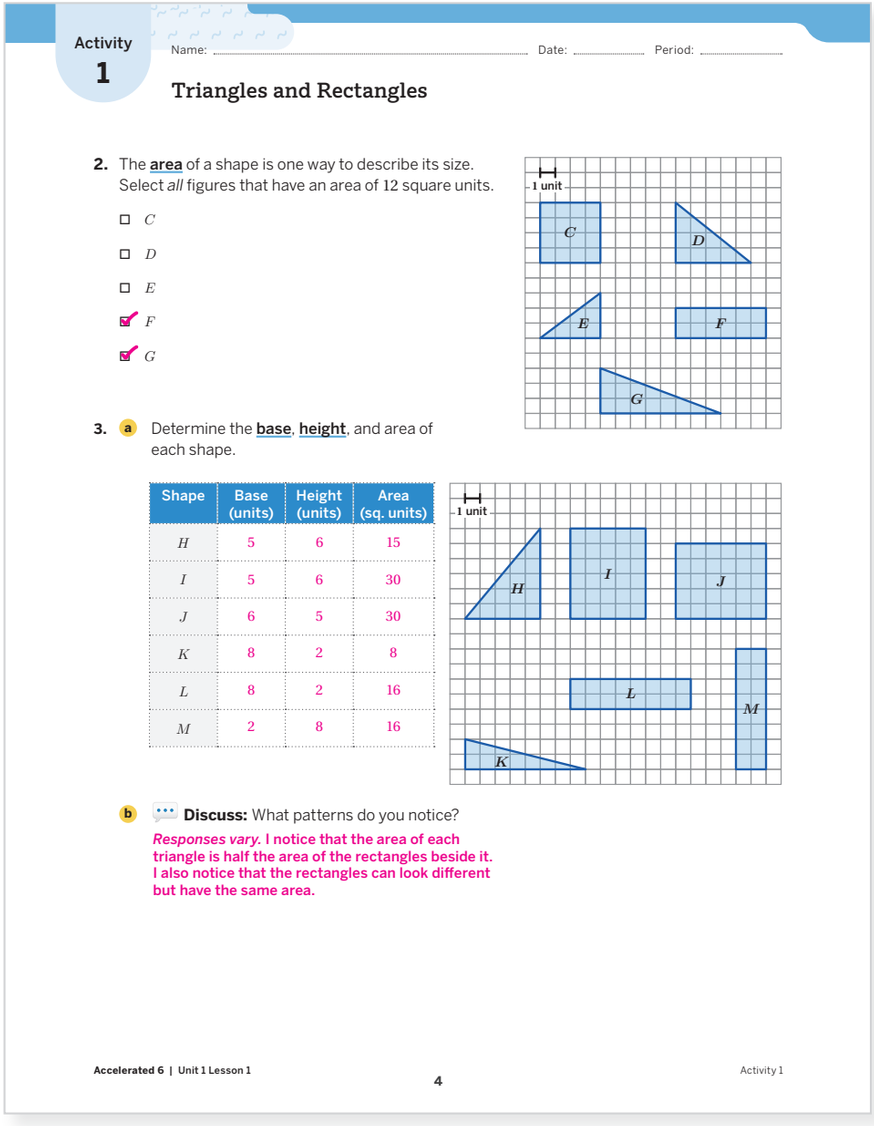
To support students getting started, invite them to compare their heights with a partner before filling in the table.

Listen for a variety of responses to share during the Connect.

A **Accessibility: Executive Functioning** Chunk this activity into more manageable parts by inviting students to look at each shape one at a time and asking themselves, "What is the height of this shape?"

Listen for patterns that students notice that they might share during the Connect, particularly ones that discuss how the base and height columns connect to the area column.

Activity 1 continued >



Activity 1

Name: Date: Period:

Triangles and Rectangles

2. The **area** of a shape is one way to describe its size. Select *all* figures that have an area of 12 square units.

- ☐ *C*
- ☐ *D*
- ☐ *E*
- ☑ *F*
- ☑ *G*

3. a Determine the **base**, **height**, and area of each shape.

Shape	Base (units)	Height (units)	Area (sq. units)
H	5	6	15
I	5	6	30
J	6	5	30
K	8	2	8
L	8	2	16
M	2	8	16

b **Discuss:** What patterns do you notice?

Responses vary. I notice that the area of each triangle is half the area of the rectangles beside it. I also notice that the rectangles can look different but have the same area.

Accelerated 6 | Unit 1 Lesson 1 4 Activity 1

Pairs | 15 min

Activity 1 Triangles and Rectangles (continued)

Purpose: Students make connections between right triangles and rectangles that have the same **base** and **height**, reasoning about patterns in their **areas**. **(MTR.5.1)**

2 Monitor

Invite students to trace the movements of the *triangles* to their placement within the *rectangles*.

Capture a variety of responses to share during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to locate the right angle of triangle K and match it up with the right angles of rectangles L and M.
Say right triangles are half the area of rectangles.	**Strengthen** Consider asking, "Is this always true? Can the bases and heights be different?"
Describe each right triangle filling up exactly half the area of the rectangle.	**Stretch** Invite these students to share during the Connect. Then invite them to return to Problem 3 and decide if they can see the same relationship between any other shapes or to support classmates who are struggling.

A Accessibility: Visual-Spatial Processing

Invite students to use coloring tools to support interpreting visual representations.

3 Connect

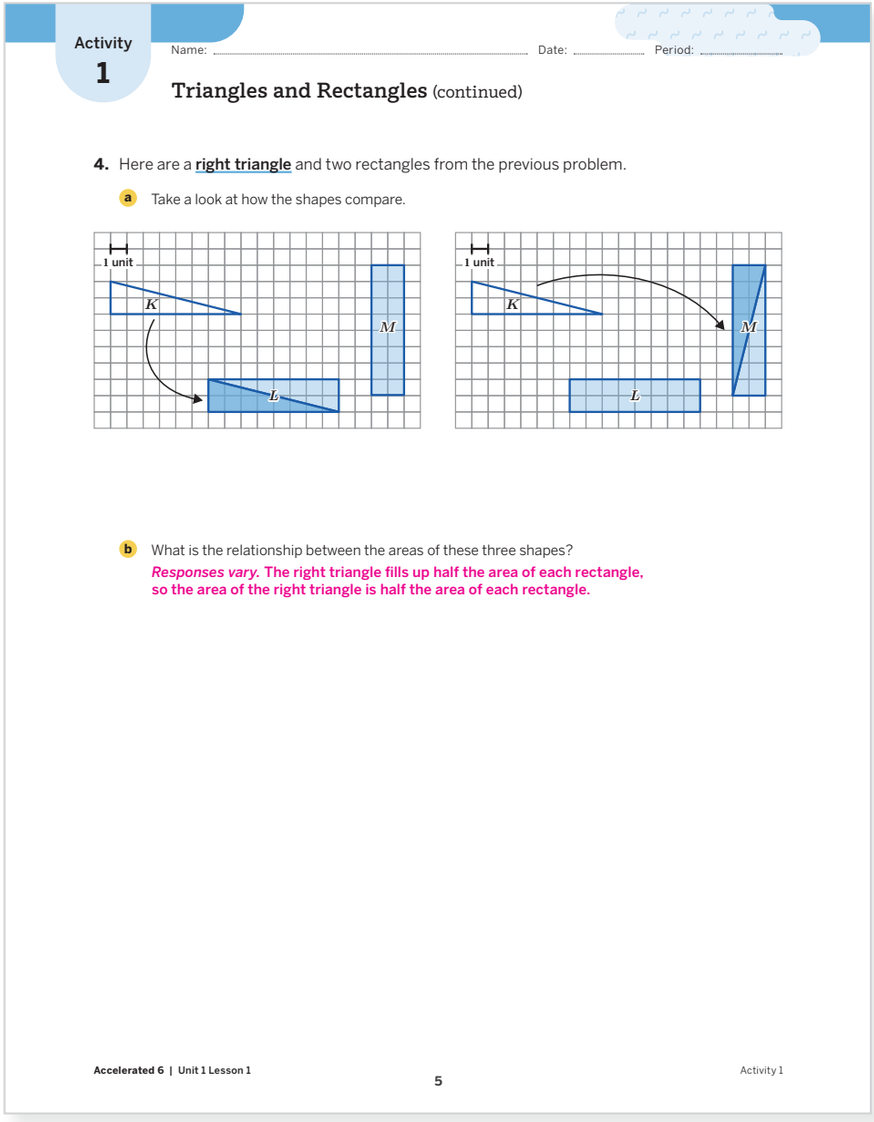
Create a class definition for the term **right triangle** using students' language and the glossary. Consider adding this definition to a class anchor chart.

Share the captured responses from Problem 4.

To surface the Key Takeaway, consider asking:

- "What is similar about these three shapes?"
- "How is the area of triangle K related to the area of rectangle L? What about the areas of triangle K and rectangle M? How do you know?"
- "Do you think this relationship will always be true?"
- "Is there something special about the right triangle and the rectangle?"

Consider going back to Problem 3 to see if the responses shared to these questions apply to all of the triangles and rectangles we have seen so far.



Activity 1

Name: Date: Period:

Triangles and Rectangles (continued)

4. Here are a **right triangle** and two rectangles from the previous problem.

a. Take a look at how the shapes compare.

b. What is the relationship between the areas of these three shapes?

Responses vary. The right triangle fills up half the area of each rectangle, so the area of the right triangle is half the area of each rectangle.

Accelerated 6 | Unit 1 Lesson 1 5 Activity 1

Key Takeaway: If a **right triangle** and a rectangle have the same **base** and **height**, the **area** of the right triangle will be half the area of the rectangle.

Pairs | 15 min

Activity 2 Generalizing Triangle Area

Purpose: Students generalize the relationship between right triangles and rectangles to determine the area of a right triangle. **(MTR.5.1)**

Short on time? Consider omitting Problem 6.

1 Launch

To generate excitement, consider asking, "Where have you seen right triangles in the real world? Can you spot any in this classroom?"

Consider asking, "Do you think you can always combine two copies of a right triangle to form a rectangle?"

2 Monitor

Capture several different triangle and rectangle groupings and consider asking, "Does changing the orientation of the base and height of the rectangle create a different rectangle?"

Invite students to apply the strategies and patterns they have discovered to determine the areas of the figures.

D Differentiation

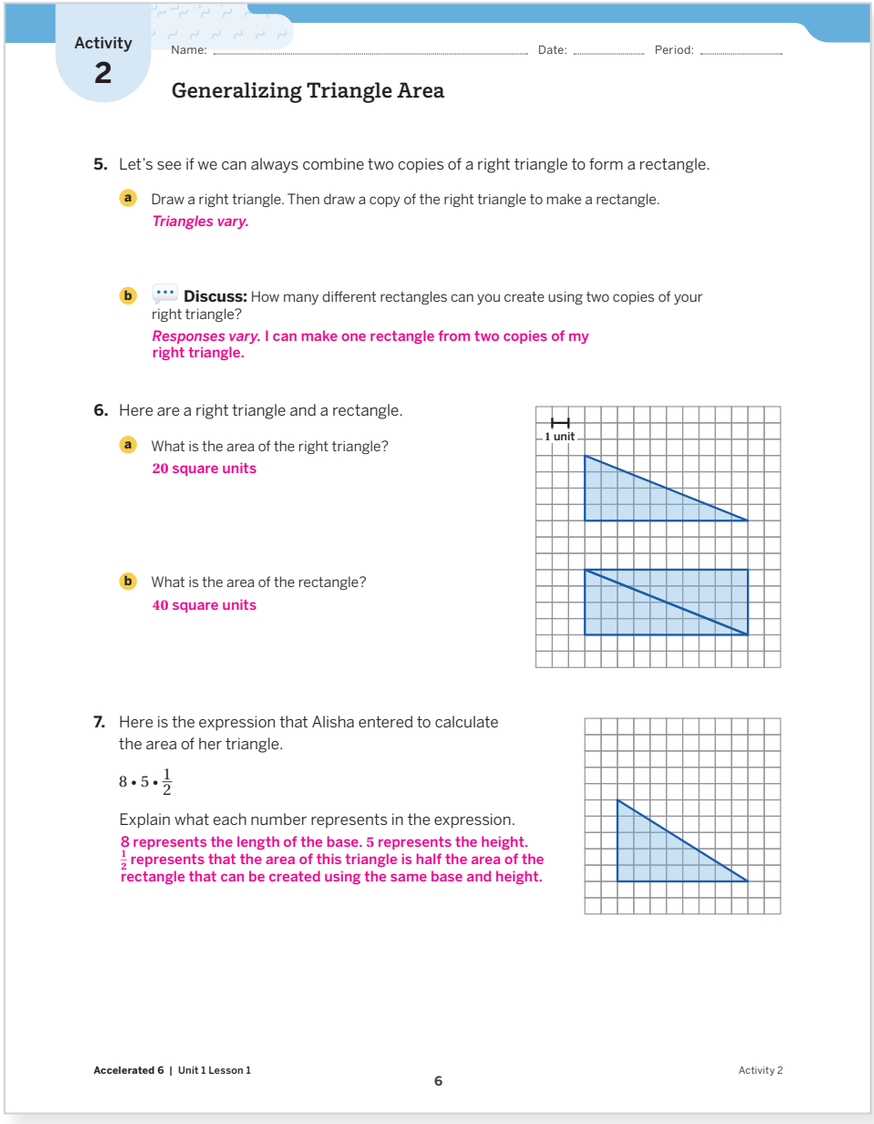
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider inviting students to identify the base and height of each shape by locating the right angle and asking, "How can you use the base and height to calculate the area?
Notice that the area of the triangle is half the area of the rectangle.	**Strengthen** Consider asking, "Do you think this relationship is always true?" Invite students to check with a partner.
Say that the area of a triangle is always half of a rectangle if they have the same base and height.	**Stretch** Consider celebrating that they are noticing calculations being repeated and are looking for general methods and shortcuts.

Encourage students to read others' responses after they share their response with the class and decide if others' thinking was similar to or different from their own.

3 Connect

Consider asking:

- "What do you notice about the area of the rectangle and the area of the right triangle?"
- "Why does this make sense to you?"
- "Is the relationship true for all the rectangles and right triangles we created?"
- "How can we use an expression to write a general formula for a right triangle?"



Activity 2

Name: _____ Date: _____ Period: _____

Generalizing Triangle Area

5. Let's see if we can always combine two copies of a right triangle to form a rectangle.

a. Draw a right triangle. Then draw a copy of the right triangle to make a rectangle.
Triangles vary.

b. **Discuss:** How many different rectangles can you create using two copies of your right triangle?
Responses vary. I can make one rectangle from two copies of my right triangle.

6. Here are a right triangle and a rectangle.

a. What is the area of the right triangle?
20 square units

b. What is the area of the rectangle?
40 square units

7. Here is the expression that Alisha entered to calculate the area of her triangle.

$8 \cdot 5 \cdot \frac{1}{2}$

Explain what each number represents in the expression.
8 represents the length of the base. 5 represents the height. $\frac{1}{2}$ represents that the area of this triangle is half the area of the rectangle that can be created using the same base and height.

Accelerated 6 | Unit 1 Lesson 1 6 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of right triangles and related rectangles, generating a formula for calculating the area of a right triangle.

Invite students to respond independently and then share their thinking with a partner.

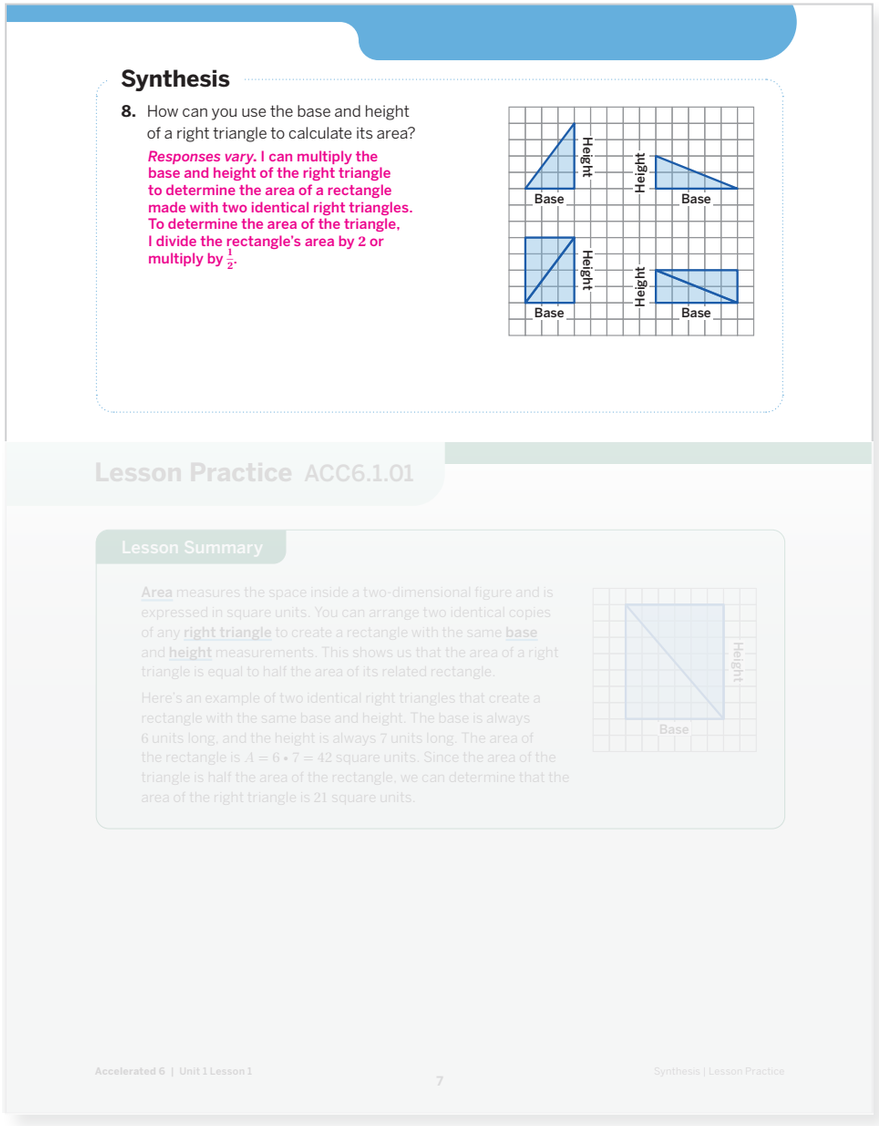
Consider returning to Problem 7 briefly to support their thinking about the structure of the expression that represents the area of a right triangle.

Capture and share a variety of ideas, such as:

- Multiplying the base and the height together then dividing by 2 or multiplying by $\frac{1}{2}$ to get the area of the right triangle.
- Since two right triangles can make a rectangle, you can multiply the height and base to calculate the area of the rectangle and halve it to get the area of the triangle.

MLR **MLR1: Stronger and Clearer Each Time** Invite students to write a first draft and use feedback to make their thinking stronger and clearer.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

8. How can you use the base and height of a right triangle to calculate its area?

Responses vary. I can multiply the base and height of the right triangle to determine the area of a rectangle made with two identical right triangles. To determine the area of the triangle, I divide the rectangle's area by 2 or multiply by $\frac{1}{2}$.

Lesson Practice ACC6.1.01

Lesson Summary

Area measures the space inside a two-dimensional figure and is expressed in square units. You can arrange two identical copies of any right triangle to create a rectangle with the same base and height measurements. This shows us that the area of a right triangle is equal to half the area of its related rectangle.

Here's an example of two identical right triangles that create a rectangle with the same base and height. The base is always 6 units long, and the height is always 7 units long. The area of the rectangle is $A = 6 \cdot 7 = 42$ square units. Since the area of the triangle is half the area of the rectangle, we can determine that the area of the right triangle is 21 square units.

Accelerated 6 | Unit 1 Lesson 1 7 Synthesis | Lesson Practice

Lesson Takeaway: If a **right triangle** and a rectangle have the same **base** and **height**, the **area** of the right triangle will be exactly $\frac{1}{2}$ the area of the rectangle. Generally, the area of a right triangle can be calculated by multiplying the base times the height and dividing by 2 (or multiplying by $\frac{1}{2}$).

Independent | 5 min

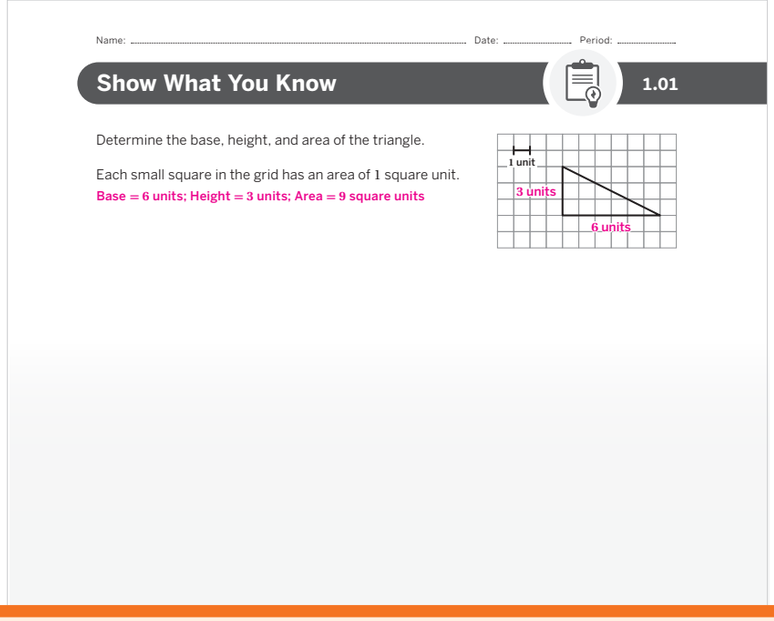
Show What You Know

Purpose: Students demonstrate their understanding by identifying the base and height of a right triangle on a grid and calculating its area.

Today's Goals

1. **Goal:** Identify the relationship between the *area* of a *right triangle* and the area of a rectangle with the same *base* and *height*.
2. **Goal:** Critique strategies for determining the *areas* of *right triangles* using terms such as *base* and *height*.
3. **Language Goal:** Describe the relationship between the *base* of a *right triangle* and its corresponding *height* using mathematically precise language. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 1.01

Determine the base, height, and area of the triangle.

Each small square in the grid has an area of 1 square unit.

Base = 6 units; Height = 3 units; Area = 9 square units

D Differentiation Use after Lesson 1

Support

Provide targeted intervention for students by using these resources.

If students work shows partial understanding of calculating the area of a triangle on grid paper:

» **Respond to Student Thinking:**

- Have students draw rectangles on grid paper and count the squares to determine the area of each figure, Then, have them cut along a diagonal to form two triangles. Have them count the squares to determine the area of each triangle.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

In this lesson, students make important connections between the area of a rectangle and the area of a right triangle. How will that work support their upcoming work finding the area of more complex shapes and eventually surface area?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

8. How can you use the base and height of a right triangle to calculate its area?

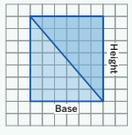
Responses vary. I can multiply the base and height of the right triangle to determine the area of a rectangle made with two identical right triangles. To determine the area of the triangle, I divide the rectangle's area by 2 or multiply by $\frac{1}{2}$.

Lesson Practice ACC6.1.01

Lesson Summary

Area measures the space inside a two-dimensional figure and is expressed in square units. You can arrange two identical copies of any **right triangle** to create a rectangle with the same **base** and **height** measurements. This shows us that the area of a right triangle is equal to half the area of its related rectangle.

Here's an example of two identical right triangles that create a rectangle with the same base and height. The base is always 6 units long, and the height is always 7 units long. The area of the rectangle is $A = 6 \cdot 7 = 42$ square units. Since the area of the triangle is half the area of the rectangle, we can determine that the area of the right triangle is 21 square units.



Lesson Practice ACC6.1.01

Name: _____ Date: _____ Period: _____

1. Determine whether each statement is true or false.

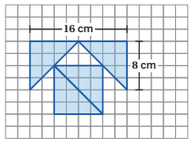
Statement	True	False
Two copies of a right triangle can be combined to make a rectangle.	✓	
Any two sides of a right triangle can be the base and height.		✓
To determine the area of a right triangle, multiply the base by the height and then multiply by 2.		✓

2. Choose one of the false statements in Problem 1 and explain why it is false.

Responses vary. I chose the statement "To determine the area of a right triangle, multiply the base by the height and then multiply by 2." To calculate the area of a right triangle, I must divide by 2 after multiplying the base by the height.

3. Ali is drawing a logo for a "Guess the Logo" competition. There is a bonus round where contestants determine the shaded area of each logo. Help Ali create the answer key for the bonus round.

128 square centimeters

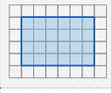
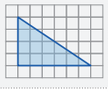
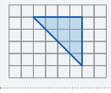


Lesson Practice ACC6.1.01

Name: _____ Date: _____ Period: _____

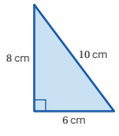
Problems 4–7: Determine the base, height, and area of each figure.

Each small square in the grid has an area of 1 square unit.

	4.	5.	6.	7.
				
Base	6 units	6 units	4 units	4 units
Height	4 units	4 units	4 units	4 units
Area	24 square units	12 square units	8 square units	16 square units

FAST Practice

8. Which expression shows how to calculate the area of the right triangle?



A. $8 \cdot 6 \cdot 2$

B. $10 \cdot 6 \cdot \frac{1}{2}$

C. $8 \cdot 6 \cdot \frac{1}{2}$

D. $8 \cdot 10 \cdot 2$

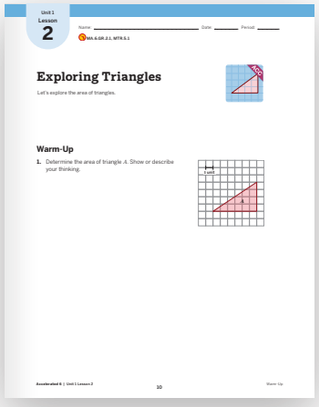
Spiral Review

9. A store employee works for $2\frac{1}{4}$ hours stocking shelves. Then she works the register for $3\frac{1}{2}$ hours. If the employee will work 8 hours total, how much time does she have left in her day? Show or explain your thinking.

$2\frac{1}{4}$ hours left. *Explanations vary.* $8 - 2\frac{1}{4} - 3\frac{1}{2} = 5\frac{4}{4} - 3\frac{1}{2} = 2\frac{1}{4}$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–2	1	MA.6.GR.2.1
	3	3	MA.6.GR.2.1
	4–7	2	MA.6.GR.2.1
FAST Practice	8	1	MA.6.GR.2.1
Spiral Review			
	9	2	MA.5.AR.1.2


Unit 1
Lesson
2
Name _____ Date _____ Period _____
MA.6.GR.2.1, MTR.5.1
Exploring Triangles
Let's explore the area of triangles.
Warm-Up
1. Determine the area of triangle A. Show or describe your thinking.
A
Accelerated 6 | Unit 1 Lesson 2
10
Warm-Up

Exploring Triangles

Triangles on a Grid

Let's explore the area of triangles.

Learning Outcomes

Today's Goals

1. **Goal:** Use a variety of strategies to determine the area of a triangle on a grid.
2. **Language Goal:** Compare and contrast strategies for determining the areas of triangles. **(Speaking and Listening)**

This is the second of three lessons about the area of triangles. Students will make sense of different strategies for calculating the area of triangles on a grid by looking for and making use of a triangle's structure and the formula for the area of a right triangle. **(MTR.5.1)**

Coherence

Prior Learning

In Lesson 1, students calculated the areas of right triangles and derived the formula for the area of a right triangle, $A = \frac{1}{2}bh$.

Future Learning

In Lesson 3, students will find the area of triangles without the help of a grid. Students will generate and apply the formula for the area of any triangle throughout Lesson 3.

Connections

- Students continue to build upon their understanding of rectangle area to derive the formula for the area of a triangle using visual models. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.1
Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.1.2

Lesson at a Glance

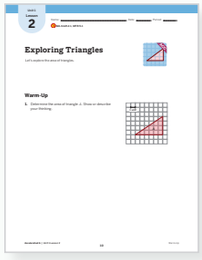
~ 45 min

MA.6.GR.2.1

Warm-Up

Pairs | 5 min

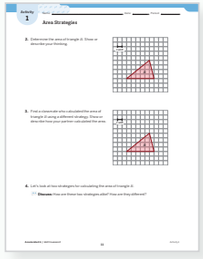
Students surface strategies for determining the area of a right triangle. **Routine:** Think-Pair-Share



Activity 1

Pairs | 10 min

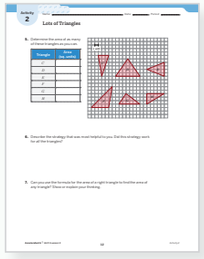
Students surface more strategies for determining the areas of triangles, including decomposing and enclosing.
MLR2: Collect and Display **(MTR.5.1)**



Activity 2

Pairs | 20 min

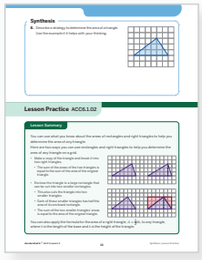
Students apply strategies they have learned to determine the area of different triangles. **(MTR.5.1)**



Synthesis

Whole Class | 5 min

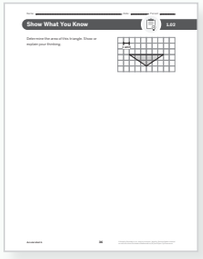
Students synthesize their understanding of different strategies (decomposing, enclosing, and using a formula) to help determine the area of a triangle.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the area of a triangle on a grid.



Prep Checklist

Prepare Activity 1 and Activity 2 Sheets

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Sheet, one per pair
- Activity 2 Sheet, one per student
  - Scissors / tracing paper

Pairs | 5 min

Warm-Up

Purpose: Students surface strategies for determining the area of a right triangle.

1 Launch

Direct students' attention to the triangle and invite students to use the **Think-Pair-Share** routine to help them shape their ideas about finding the area.

Invite several students to share their or their partner's thinking with the class.

Consider asking, "Why might a grid be helpful here?"

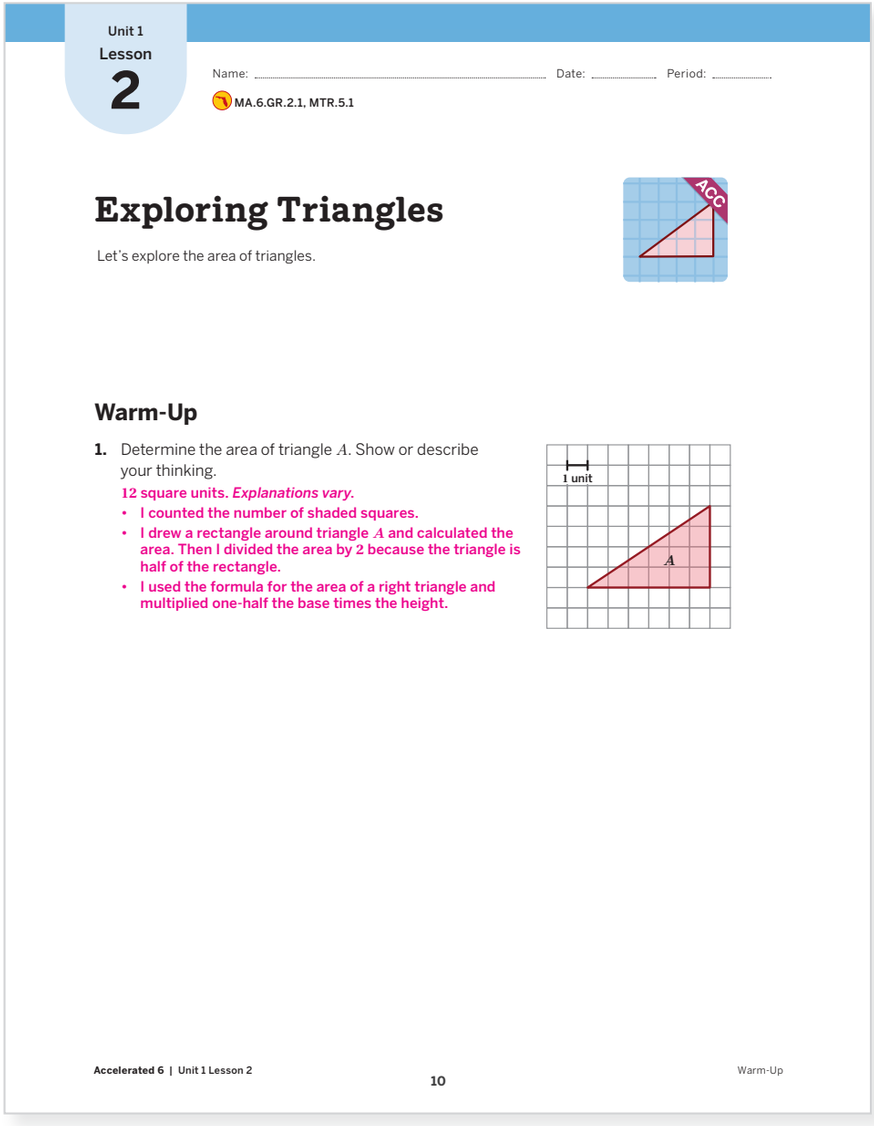
Look for students adding helpful annotations onto their image and capture a variety of student responses to share during the Connect.

2 Connect

Display captured responses and invite students to share their explanations.

Consider asking:

- "What do you notice about triangle A?" Triangle A is a right triangle because it has one right angle.
- "How does your knowledge of rectangles help you find the area of triangle A?"
- "What are the units? How do you know?"



Unit 1
Lesson
2

Name: ..... Date: ..... Period: .....

MA.6.GR.2.1, MTR.5.1

Exploring Triangles

Let's explore the area of triangles.

Warm-Up

1. Determine the area of triangle A. Show or describe your thinking.

   12 square units. *Explanations vary.*
   - I counted the number of shaded squares.
   - I drew a rectangle around triangle A and calculated the area. Then I divided the area by 2 because the triangle is half of the rectangle.
   - I used the formula for the area of a right triangle and multiplied one-half the base times the height.

Pairs | 10 min

Activity 1 Area Strategies

Purpose: Students surface more strategies for determining the areas of triangles, including decomposing and enclosing. **(MTR.5.1)**

1 Launch

Direct students' attention to triangle B and invite students to share what they notice about it.

Invite students to draw on the figures on their graph paper. Consider asking, "What strategies from finding areas of right triangles might help us reason about calculating the area of this triangle?"

2 Monitor

Select and sequence a variety of strategies to share during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Rely solely on counting squares to determine area.	**Support** Review the strategies uncovered in Lesson 1 for determining the area of a right triangle.
Enclose the triangle in rectangles and divide the total area by 2.	**Stretch** Consider asking, "Do you think this would work for all triangles?"
Decompose the triangle to form two right triangles.	**Stretch** Invite students to compare the height and base of the two right triangles with the height and base of the original triangle.

Listen for strategies to share and invite students to say more.

ELL English Language Learners Provide students time to rehearse and formulate their responses before sharing them with the class. **(Speaking and Listening)**

3 Connect

Distribute one Activity 1 Sheet to each pair of students.

MLR MLR2: Collect and Display Use this routine to collect students' strategies as they discuss with a partner. Display for students to reference and add to for the rest of the lesson.

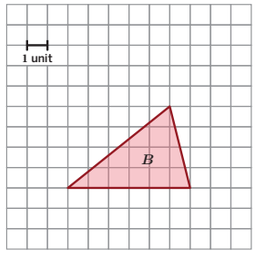
Activity 1

Name: Date: Period:

Area Strategies

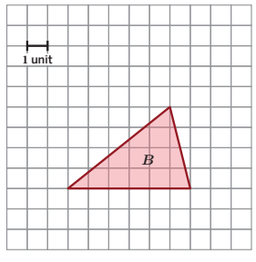
2. Determine the area of triangle B. Show or describe your thinking.

12 square units. *Explanations vary.* I drew a vertical line to make 2 right triangles. One triangle has a base of 5 units, and the other has a base of 1 unit. I know the area of a right triangle is $\frac{1}{2}bh$, so the area of one triangle is 10 square units and the other is 2 square units. The sum of the areas of the right triangle is the area of triangle B.



3. Find a classmate who calculated the area of triangle B using a different strategy. Show or describe how your partner calculated the area.

Responses vary. My partner drew two rectangles around the triangle and calculated the area of each rectangle. He divided each area by 2 because the triangle is half of the rectangle. Then he added the two smaller triangle areas together to find the area of the larger triangle.



4. Let's look at two strategies for calculating the area of triangle B.

Discuss: How are these two strategies alike? How are they different?

Responses vary. Both strategies use the triangle to build other shapes. The first strategy surrounds the triangle using two rectangles. The second strategy divides the triangle into two right triangles.

Accelerated 6 | Unit 1 Lesson 2 11 Activity 1

Pairs | 20 min

Activity 2 Lots of Triangles

Purpose: Students apply strategies they have learned to determine the area of different triangles. **(MTR.5.1)**

Short on time? Consider inviting students to find the area of a few of the triangles for Problem 5.

1 Launch

Distribute one Activity 2 Sheet and scissors to each student and invite them to cut out the triangles from the bottom set. Encourage students to move the triangles to form rectangles or to further cut the triangles into right triangles to support them in finding areas in Problem 5.

A **Accessibility: Executive Functioning** Chunk this activity into more manageable parts by dividing the triangles into groups. Invite students to choose which triangle they want to start with.

2 Monitor

D **Differentiation**

Look for students who:	Respond to Student Thinking
Play with the cut out triangles but haven't yet put them together in a way that supports finding the area.	Support Give students plain graph paper and invite them to trace the triangles and try the different strategies.
Cut the triangles into separate right triangles.	Stretch Invite students to consider if there are other ways to decompose the triangles to make right triangles. Invite these students to share during the Connect.
Apply a formula to find the area of each triangle.	Stretch Invite students to draw their own triangle and determine its area using the area formula. Consider asking, "How can you check that your answer makes sense?" Invite those students to share during the Connect.

3 Connect

To surface the Key Takeaway, consider asking:

- "Did you develop any new strategies?"
- "Which strategy is most efficient for triangle E? Triangle F? Triangle H?" Triangle E is symmetric, so it can be sliced down the middle and rearranged to make a rectangle. Triangle F can be rotated and decomposed to make two right triangles. Triangle H can be easily enclosed in a rectangle that is twice the area of the triangle.
- "What similarities and differences does triangle H have with the other triangles?" Triangle H is a right triangle, but the other triangles do not have right angles. All the triangles have a base length and height.

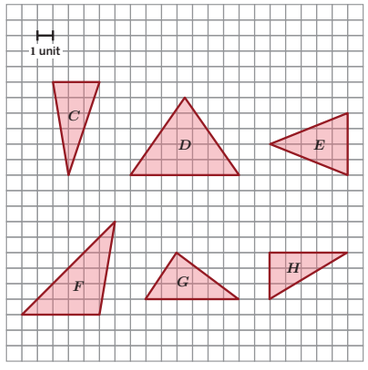
Activity 2

Name: Date: Period:

Lots of Triangles

5. Determine the area of as many of these triangles as you can.

Triangle	Area (sq. units)
C	9
D	17.5
E	10
F	15
G	9
H	7.5



6. Describe the strategy that was most helpful to you. Did this strategy work for *all* the triangles?

Responses vary. I drew one or more rectangles around the triangles. I found the total area and then divided the total area by 2. My strategy didn't work for triangle F.

7. Can you use the formula for the area of a right triangle to find the area of any triangle? Show or explain your thinking.

Yes. *Explanations vary.* Using the rectangle method to determine the area shows that the area of any triangle is one half the area of the rectangle that surrounds it. So the formula $A = \frac{1}{2}bh$ works for any triangle.

Accelerated 6 | Unit 1 Lesson 2 12 Activity 2

Key Takeaway: There are a variety of strategies to find the area of a triangle on a grid, including enclosing the triangle in a rectangle with the same base and height or decomposing the triangle to form two right triangles. Depending on the structure of the triangle, some strategies are more efficient than others. These strategies show that the formula for the area of a right triangle will work with any triangle.

Whole Class | 5 min

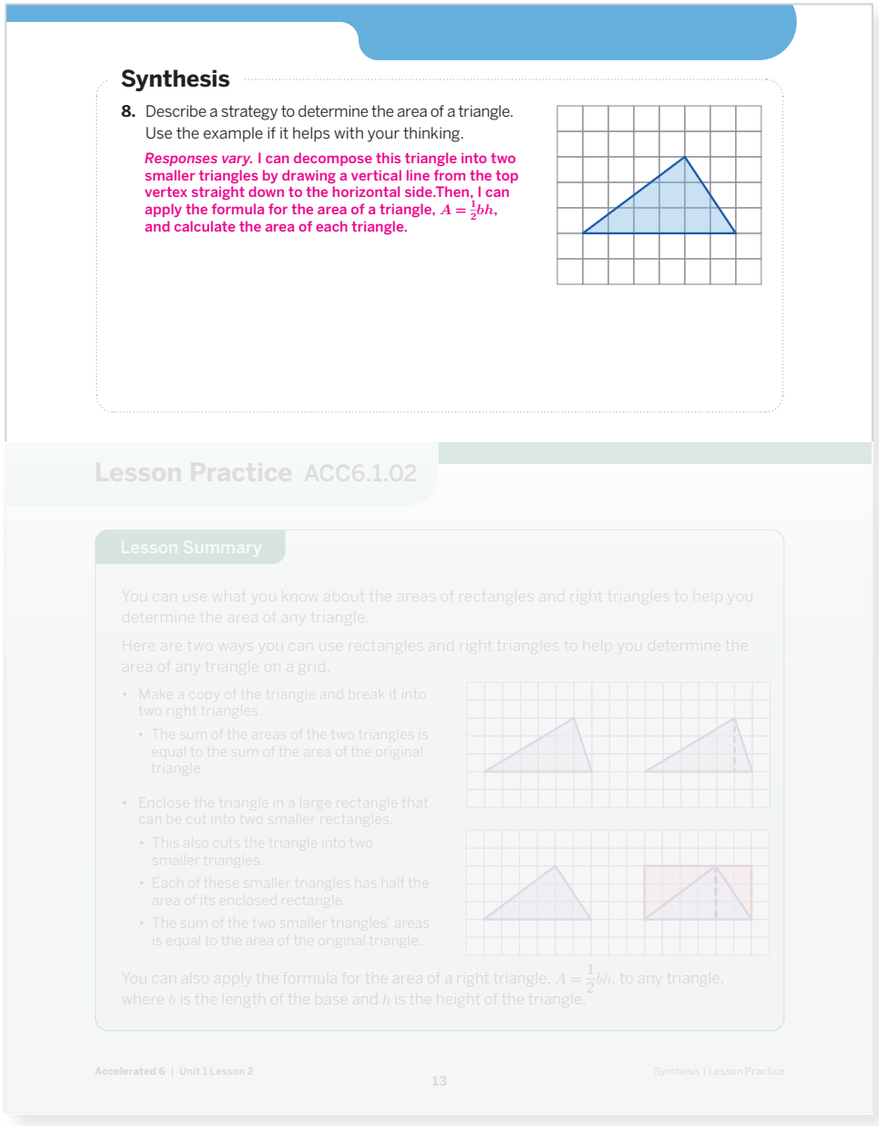
Synthesis

Purpose: Students synthesize their understanding of different strategies (decomposing, enclosing, and using a formula) to help determine the area of a triangle.

Invite students to respond independently, and then share their thinking with a partner.

Listen for and share a variety of ideas, such as:

- Cutting the triangle so that it is two right triangles.
- Enclosing the triangle in a rectangle, then subtracting the empty area.
- Applying the formula for the area of a right triangle.



Synthesis

8. Describe a strategy to determine the area of a triangle. Use the example if it helps with your thinking.

Responses vary. I can decompose this triangle into two smaller triangles by drawing a vertical line from the top vertex straight down to the horizontal side.Then, I can apply the formula for the area of a triangle, $A = \frac{1}{2}bh$, and calculate the area of each triangle.

Lesson Practice ACC6.1.02

Lesson Summary

You can use what you know about the areas of rectangles and right triangles to help you determine the area of any triangle.

Here are two ways you can use rectangles and right triangles to help you determine the area of any triangle on a grid.

- Make a copy of the triangle and break it into two right triangles.
  - The sum of the areas of the two triangles is equal to the sum of the area of the original triangle.
- Enclose the triangle in a large rectangle that can be cut into two smaller rectangles.
  - This also cuts the triangle into two smaller triangles.
  - Each of these smaller triangles has half the area of its enclosed rectangle.
  - The sum of the two smaller triangles' areas is equal to the area of the original triangle.

You can also apply the formula for the area of a right triangle, $A = \frac{1}{2}bh$, to any triangle, where b is the length of the base and h is the height of the triangle.

Accelerated 6 | Unit 1 Lesson 2 13 Synthesis | Lesson Practice

Lesson Takeaway: There are a variety of strategies to find the area of a triangle on a grid:

- Enclose the triangle in a rectangle with the same base and height.
- Cut the triangle so that it is two right triangles.
- Use a formula.

Independent | 5 min

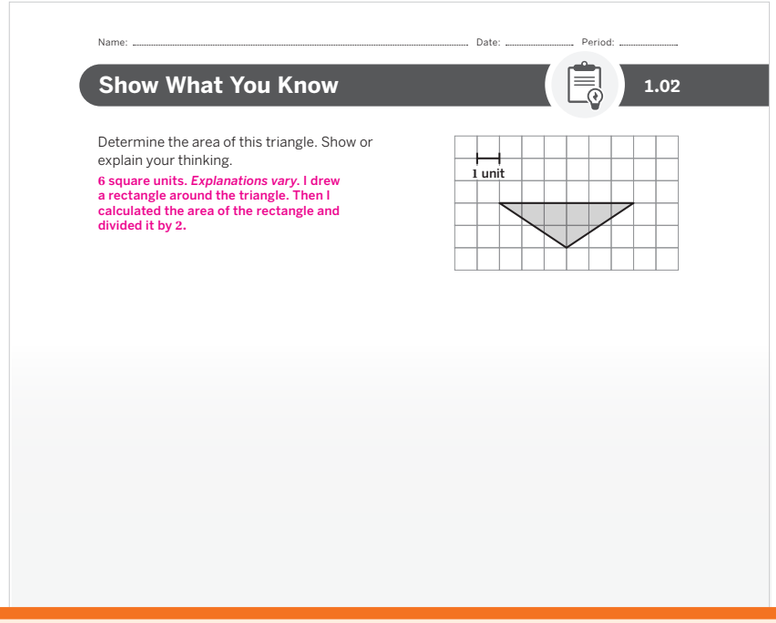
Show What You Know

Purpose: Students demonstrate their understanding by determining the area of a triangle on a grid.

Today's Goals

1. **Goal:** Use a variety of strategies to determine the area of a triangle on a grid.
2. **Language Goal:** Compare and contrast strategies for determining the areas of triangles. **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 1.02

Determine the area of this triangle. Show or explain your thinking.

6 square units. *Explanations vary.* I drew a rectangle around the triangle. Then I calculated the area of the rectangle and divided it by 2.

D Differentiation Use after Lesson 2

Support

Provide targeted intervention for students by using these resources.

If students need additional support with the relationship between triangles and rectangles:

» **Respond to Student Thinking:**

- Have the students practice marking the vertical and horizontal segments on grid paper that would enclose right and non-right triangles.

Stretch

Challenge students and extend their learning with these resources.

If students would like to explore the area of triangles in more depth:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Take a moment to reflect on the strategies students used in this lesson. What opportunities were there to celebrate specific students' strategies for finding the area of a triangle? What opportunities might there be in future lessons to connect back to the strategies students shared?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

8. Describe a strategy to determine the area of a triangle. Use the example if it helps with your thinking.

Responses vary. I can decompose this triangle into two smaller triangles by drawing a vertical line from the top vertex straight down to the horizontal side.Then, I can apply the formula for the area of a triangle, $A = \frac{1}{2}bh$, and calculate the area of each triangle.

Lesson Practice ACC6.1.02

Lesson Summary

You can use what you know about the areas of rectangles and right triangles to help you determine the area of any triangle.

Here are two ways you can use rectangles and right triangles to help you determine the area of any triangle on a grid.

- Make a copy of the triangle and break it into two right triangles.
  - The sum of the areas of the two triangles is equal to the sum of the area of the original triangle.
- Enclose the triangle in a large rectangle that can be cut into two smaller rectangles.
  - This also cuts the triangle into two smaller triangles.
  - Each of these smaller triangles has half the area of its enclosed rectangle.
  - The sum of the two smaller triangles' areas is equal to the area of the original triangle.

You can also apply the formula for the area of a right triangle, $A = \frac{1}{2}bh$, to any triangle, where b is the length of the base and h is the height of the triangle.

Lesson Practice
ACC6.1.02

Name: _____ Date: _____ Period: _____

Problems 1–4: Determine the area of each triangle.

Each small square in the grid has an area of 1 square unit.

1.
10 square units

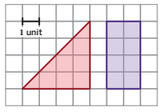
2.
10 square units

3.
8 square units

4.
8 square units

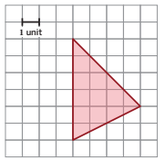
5. Aki thinks that these two shapes have the same area. Is Aki's thinking correct?

Yes. Explanations vary. The triangle is half of a square that has a side length of 4 units and has been cut diagonally. The rectangle is also half of a square that has a side length of 4 units but has been cut vertically.



6. Determine the area of this triangle. Show or explain your thinking.

12 square units. *Explanations vary.* I drew a rectangle around the triangle. Then I calculated the area of the rectangle and divided it by 2.

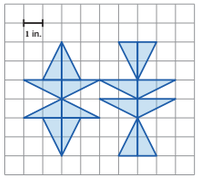


Lesson Practice
ACC6.1.02

Name: _____ Date: _____ Period: _____

7. Alice used triangle tiles to make a design on an 8-by-8 inch area. Determine the total area, in square inches, that is covered by the triangle tiles in her design.

16 square inches



FAST Practice

8. What is the area, in square centimeters, of the shaded part of this rectangle?

A. 15.5
B. 62
C. 84
D. 168

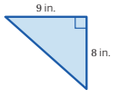
Spiral Review

9. Select *all* of the expressions that have the same value as $8 \div 2$.

- [x] A. $\frac{8}{2}$
- [ ] B. $8 \cdot 2$
- [ ] C. $2 \div 8$
- [x] D. $\frac{1}{2} \cdot 8$
- [ ] E. $\frac{2}{8}$

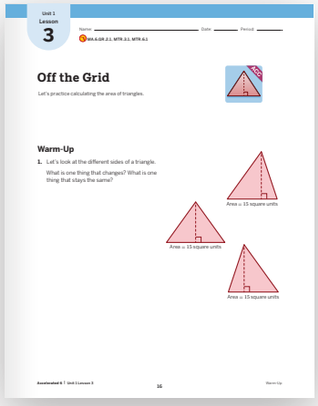
10. Use a formula to determine the area of the triangle. Show or describe your thinking.

$A = \frac{1}{2}bh = \frac{1}{2} \cdot 9 \cdot 8 = 36$ square inches



Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–7	2	MA.6.GR.2.1
FAST Practice	8	2	MA.6.GR.2.1
Spiral Review			
	9	1	MA.5.FR.1.1 MA.5.FR.2.4
	10	3	MA.6.GR.2.1


Unit 1
Lesson
3

Off the Grid

Let's practice calculating the area of triangles.

Warm-Up

1. Let's look at the different sides of a triangle.
   What is one thing that changes? What is one thing that stays the same?

Area = 15 square units
Area = 15 square units
Area = 15 square units

Off the Grid

Applying the Formula for the Area of a Triangle

Let's practice calculating the area of triangles.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate the area of a triangle off a grid, given any side as its base.
2. **Language Goal:** Analyze strategies for determining the area of triangles using mathematically precise language. **(Writing, Speaking, and Listening)**
3. **Language Goal:** Describe the relationship between a base of a triangle and its corresponding height. **(Writing, Speaking, and Listening)**

Students calculate the areas of triangles with and without a grid. They choose which information they want to use to calculate the area, supporting in the development of agency and creativity to use different bases and heights for the same triangle.

Coherence

Prior Learning

In Lessons 1–2, students explored the relationship between triangles and rectangles to derive a formula for the area of a right triangle and apply it to calculate the area of any triangle.

Future Learning

In Lessons 4–5, students will apply their understanding of determining the area of rectangles and triangles to determine the area of composite figures.

Connections

- Students apply mathematical concepts in geometry to fields of technology and design. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.1
Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.

Mathematical Thinking and Reasoning Standards: MTR.3.1, MTR.6.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.1.2

Vocabulary

Review Vocabulary

perpendicular

Lesson at a Glance

~ 45 min

MA.6.GR.2.1

Warm-Up

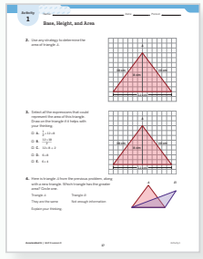
Pairs | 5 min

Students observe that any side of a triangle can be the base and that each base has a matching height. MLR2: Collect and Display

Activity 1

Pairs | 10 min

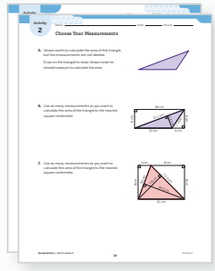
Students use the base and height of a triangle to calculate its area and analyze several expressions for the area of a triangle.



Activity 2

Pairs | 12 min

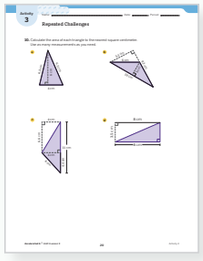
Students calculate the areas of triangles without a grid and determine a missing dimension when given the area.



Activity 3

Pairs | 8 min

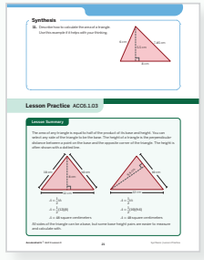
Students complete a variety of challenges, measuring and calculating the area of triangles. Students can use repeated reasoning to help them with each challenge. **(MTR.3.1)**



Synthesis

Whole Class | 5 min

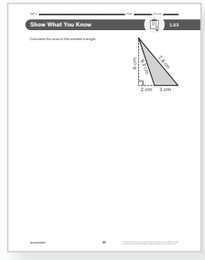
Students synthesize their understanding of triangles having more than one base-height pair. The height of the triangle must be *perpendicular* to the base of the triangle. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by finding the area of a triangle without a grid.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Coloring tools

Pairs | 5 min

Warm-Up

Purpose: Students observe that any side of a triangle can be the base and that each base has a matching height.

1 Launch

Direct students' attention to the triangles.

Consider asking:
- "What do we typically call the solid line?"
- "What do we call the dotted line?"
- "How are the two lines connected?"
- "How do you know that is the matching height?"

Invite students to use patty paper to trace the first triangle and then rotate the traced triangle to match the second triangle and the third triangle. Encourage students to draw the base and height for each rotation.

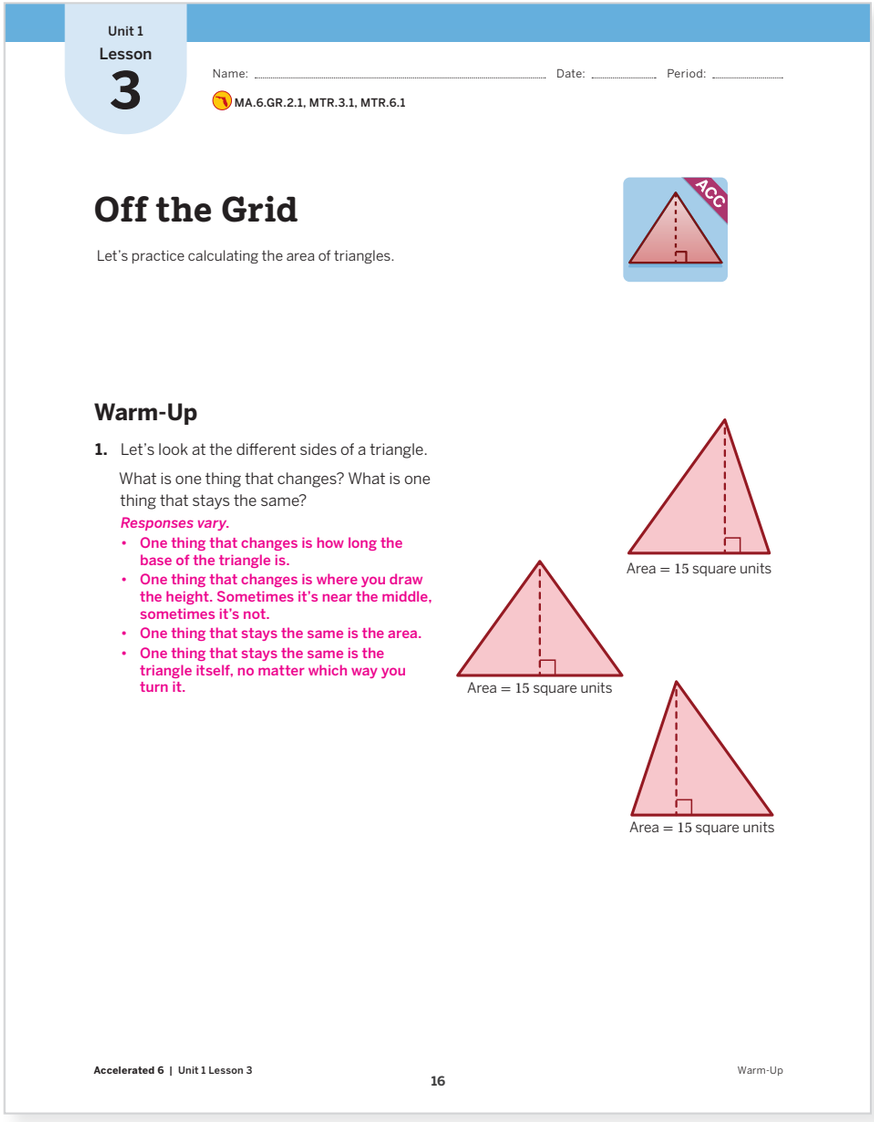
2 Connect

Capture and share a variety of responses.

Consider asking, "What happens to the triangle's area as you change which side is the base?"

MLR **MLR2: Collect and Display** Use this routine to collect students' language as they discuss the bases and heights of the triangle. Display for students to reference and add to for the rest of the lesson.

To surface the Key Takeaway, consider inviting students to share how they would define the base of a triangle and its matching height.



Unit 1
Lesson
3

Name: _____ Date: _____ Period: _____

MA.6.GR.2.1, MTR.3.1, MTR.6.1

Off the Grid

ACC

Let's practice calculating the area of triangles.

Warm-Up

1. Let's look at the different sides of a triangle.

What is one thing that changes? What is one thing that stays the same?

Responses vary.
- One thing that changes is how long the base of the triangle is.
- One thing that changes is where you draw the height. Sometimes it's near the middle, sometimes it's not.
- One thing that stays the same is the area.
- One thing that stays the same is the triangle itself, no matter which way you turn it.

Area = 15 square units

Area = 15 square units

Area = 15 square units

Accelerated 6 | Unit 1 Lesson 3 16 Warm-Up

Key Takeaway: Any side of a triangle can be the base. The corresponding height of a selected base is *perpendicular* to that base.

Pairs | 10 min

Activity 1 Base, Height, and Area

Purpose: Students use the base and height of a triangle to calculate its area and analyze several expressions for the area of a triangle.

1 Launch

Direct students' attention to the triangle and consider sharing that this is a triangle similar to the Warm-Up, using 12 units as the base.

Consider asking, "Why might a grid be helpful here?"

Encourage students to sketch to show their thinking and write their calculation as an expression.

2 Monitor

Look for students using 10 as the height of the triangle. Invite them to reference the captured explanations from the Warm-Up and revise their thinking.

Capture a variety of explanations to share during the Connect.

D Differentiation *(Problem 3)*

Look for students who:	Respond to Student Thinking
Respond with either of the incorrect responses.	**Support** Consider asking, "Where do we see these numbers on the given triangle?"
Respond with one or two of the correct responses.	**Strengthen** Consider asking, "Which of these expressions are equivalent? How do you know?" Invite students to make connections from each of the expressions on the image.
Respond with three correct responses.	**Stretch** Invite these students to share their explanations during the Connect, then consider asking, "What is one more expression that works and one more that doesn't work?"

Look for students who are making connections between the base, height, and area, noting that the bases are equal.

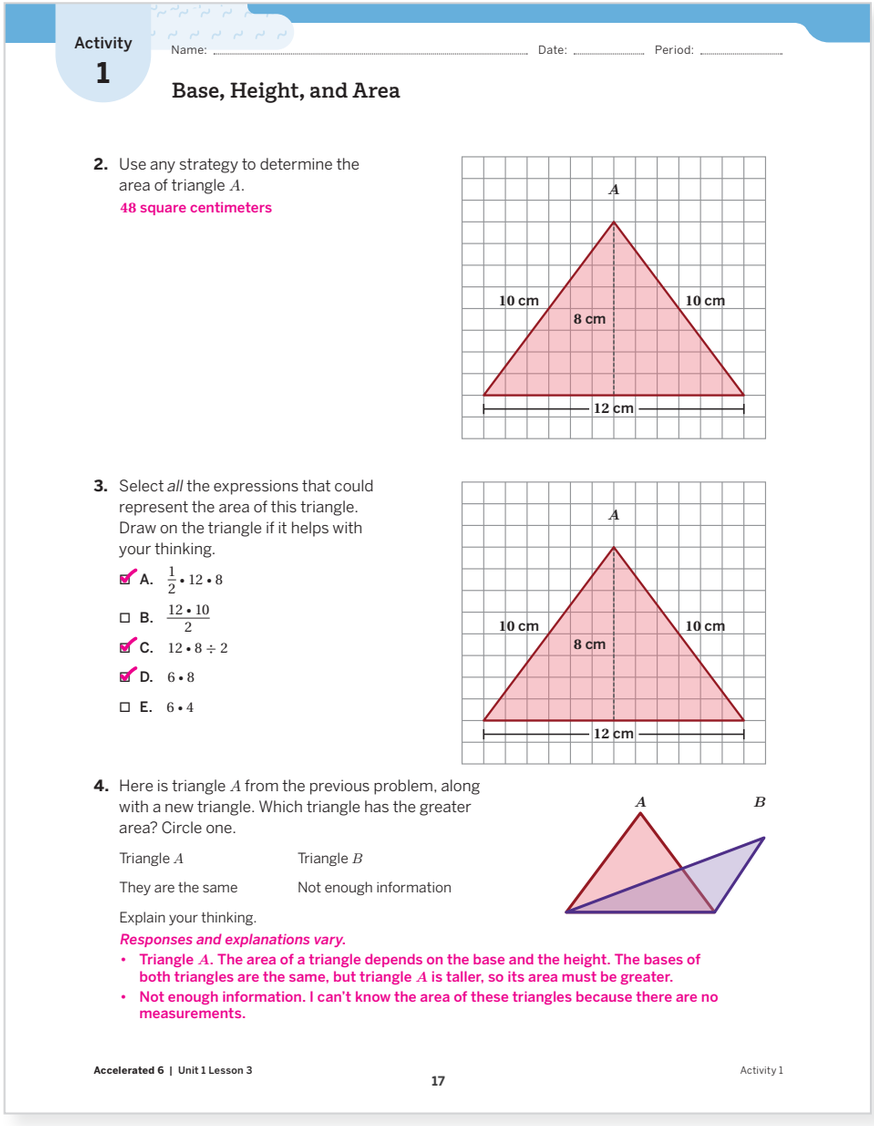
3 Connect

Invite students to consider the first two responses and consider asking, "How does this expression represent the area?"

Share student responses to highlight explanations.

To surface the Key Takeaway, consider asking, "How could we use the expressions to help us determine the area of any triangle?"

Note: If time allows, consider asking, "What measurements do we need to calculate the area? Compare these measurements for both triangles."



Activity 1

Name: Date: Period:

Base, Height, and Area

2. Use any strategy to determine the area of triangle A.

48 square centimeters

3. Select *all* the expressions that could represent the area of this triangle. Draw on the triangle if it helps with your thinking.

- ☑ A. $\frac{1}{2} \cdot 12 \cdot 8$
- ☐ B. $\frac{12 \cdot 10}{2}$
- ☑ C. $12 \cdot 8 \div 2$
- ☑ D. $6 \cdot 8$
- ☐ E. $6 \cdot 4$

4. Here is triangle A from the previous problem, along with a new triangle. Which triangle has the greater area? Circle one.

Triangle A Triangle B

They are the same Not enough information

Explain your thinking.

Responses and explanations vary.

- Triangle A. The area of a triangle depends on the base and the height. The bases of both triangles are the same, but triangle A is taller, so its area must be greater.
- Not enough information. I can't know the area of these triangles because there are no measurements.

Accelerated 6 | Unit 1 Lesson 3 17 Activity 1

Key Takeaway: There are multiple ways to think about how to calculate the area of a triangle. In general, you multiply the base and matching height of a triangle, then divide by 2 (or multiply by $\frac{1}{2}$).

Pairs | 12 min

Activity 2 Choose Your Measurements

Purpose: Students calculate the areas of triangles without a grid and determine a missing dimension when given the area.

1 Launch

Encourage students to annotate so that others can understand their thinking.

2 Monitor

Look for students whose measurement choices include:

- Heights that are not perpendicular.
- Heights that do not match the base.
- Multiple bases.

Invite them to revisit the Warm-Up and revise their thinking.

Capture students' measurements and consider asking, "Which of these measurements help us calculate area? How do you know?"

Invite students to select from the variety of measurements to calculate the area.

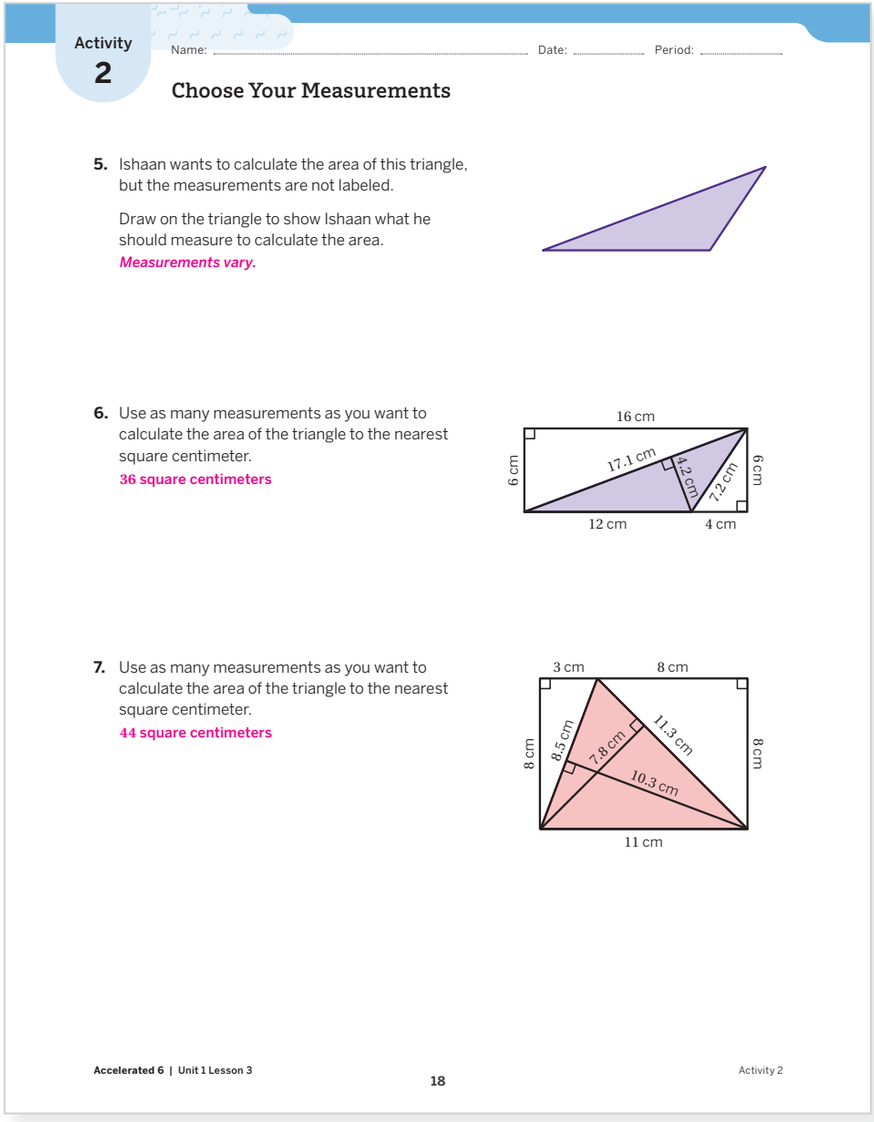
A **Accessibility: Conceptual Processing** Assist students in recognizing connections between new problems and prior work by inviting them to share any similar triangles they have calculated the area of in this lesson or in previous lessons. Invite students to think about how this triangle is similar to and different from the triangle in Problem 2.

Encourage students to revise their thinking and to try different ways to measure a base and a height.

Consider asking, "How many measurements do you need to calculate the area? Are there different ways to draw the measurements?"

Listen for students who say the area of the triangle is 44. Consider asking them, "What are there 44 of?" This will strengthen their understanding that area is a measurement of square units.

Activity 2 continued >



Activity 2

Name: Date: Period:

Choose Your Measurements

5. Ishaan wants to calculate the area of this triangle, but the measurements are not labeled.

Draw on the triangle to show Ishaan what he should measure to calculate the area.

Measurements vary.

6. Use as many measurements as you want to calculate the area of the triangle to the nearest square centimeter.

36 square centimeters

7. Use as many measurements as you want to calculate the area of the triangle to the nearest square centimeter.

44 square centimeters

Accelerated 6 | Unit 1 Lesson 3 18 Activity 2

Pairs | 12 min

Activity 2 Choose Your Measurements (continued)

Purpose: Students calculate the areas of triangles without a grid and determine a missing dimension when given the area.

2 Monitor

Look for trends in responses.

D Differentiation

Look for students who:	Respond to Student Thinking
Write that both are correct because all of the measurements are correct.	**Support** Consider asking, "Do you think you would get the same area using both Aki's and Miriam's measurements?"
Write that neither are correct because the area is not shown.	**Strengthen** Consider asking, "How could we use the information given to find the area?"
Write that Miriam's is correct because the height is perpendicular to the selected base.	**Stretch** Consider asking, "Where would you draw the height if we used Aki's measurement of 8.7 centimeters as the base?"

ELL English Language Learners Provide sentence frames to help students explain their thinking (e.g., I agree/disagree with Aki's measurements because _____.).

A Accessibility: Conceptual Processing Allow students to use a multiplication table to ensure inclusive participation.

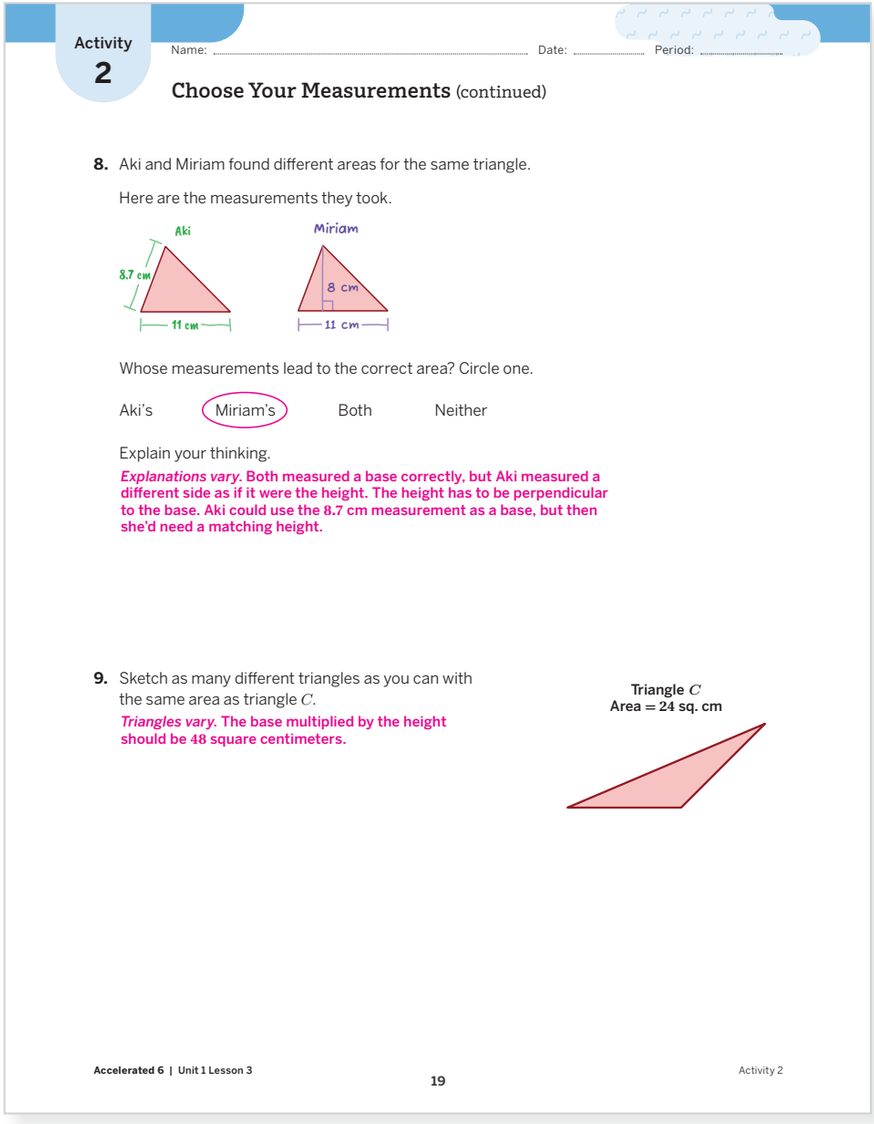
Capture a variety of triangles that correctly find an area of 24 square centimeters in Problem 9.

3 Connect

Display the captured triangles.

Consider asking:

- "How did you determine which bases and heights would work for finding an area of 24 centimeters?" I created base-height pairs that multiply to 48 because I know the area of a triangle will be half of that.
- "What do all of our triangles have in common, besides their area?"
- "What advice would you give someone who wants to find the area of a triangle?"



Activity 2

Name: Date: Period:

Choose Your Measurements (continued)

8. Aki and Miriam found different areas for the same triangle.

Here are the measurements they took.

Whose measurements lead to the correct area? Circle one.

Aki's (Miriam's) Both Neither

Explain your thinking.

Explanations vary. Both measured a base correctly, but Aki measured a different side as if it were the height. The height has to be perpendicular to the base. Aki could use the 8.7 cm measurement as a base, but then she'd need a matching height.

9. Sketch as many different triangles as you can with the same area as triangle C.

Triangles vary. The base multiplied by the height should be 48 square centimeters.

Triangle C
Area = 24 sq. cm

Pairs | 8 min

Activity 3 Repeated Challenges

Purpose: Students complete a variety of challenges, measuring and calculating the area of triangles. Students can use repeated reasoning to help them with each challenge. **(MTR.3.1)**

Short on time? Consider omitting the Repeated Challenges here and giving students extra time on the practice problems.

1 Launch

Invite students to solve as many challenges as they have time for. Share that sense-making is more important than speed. Students should compare their solutions to problems with a partner.

2 Monitor

Listen for the mathematical language students use in discussing how to solve the problems, such as using the terms *base*, *height*, and *perpendicular*. **(MTR.3.1)**

Note: Look for how many problems each student has completed correctly.

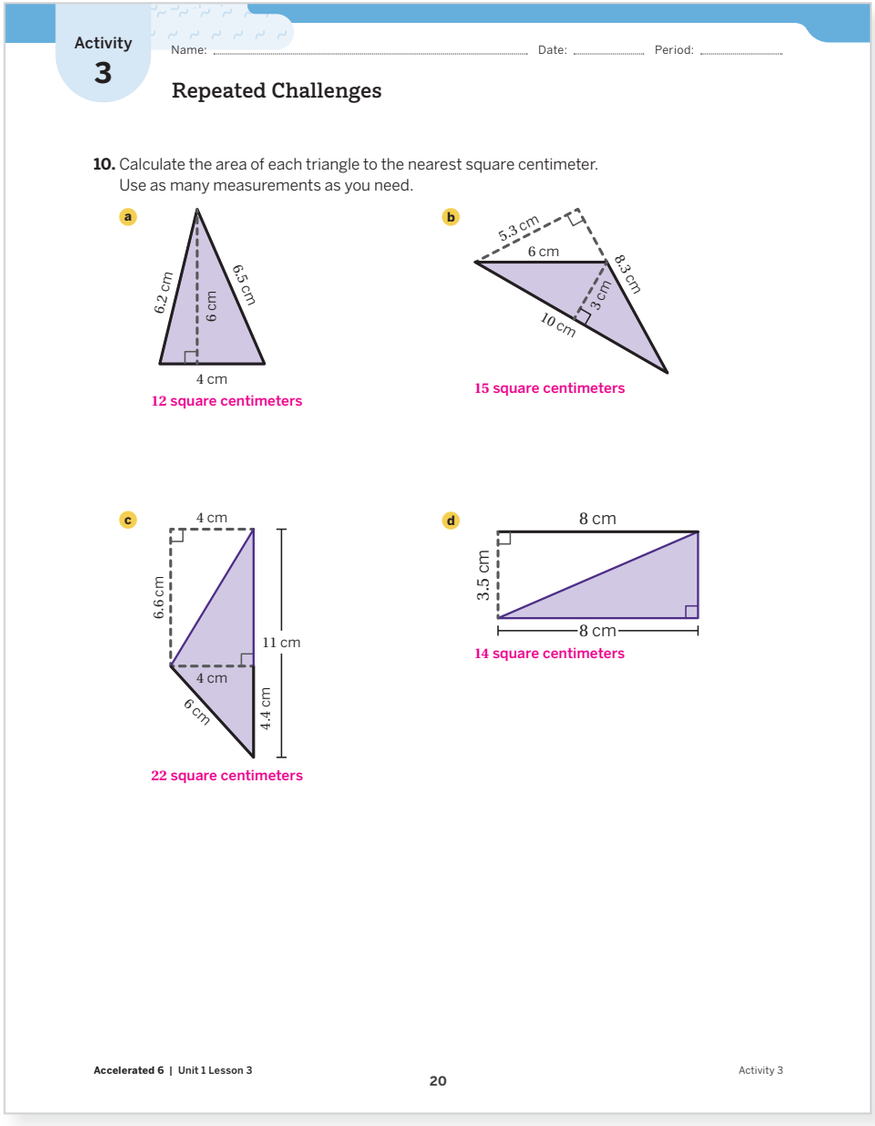
A **Accessibility: Conceptual Processing** Begin by walking through the first problem to provide access to students who benefit from clear and explicit instructions. Check in with individual students, as needed, to assess for comprehension as they complete the Repeated Challenges.

ELL **English Language Learners** Give students time to rehearse their ideas with a partner before they are expected to share their ideas with others.

Provide sentence frames to help students explain their thinking (e.g., The measurements you need to calculate the area of a triangle are _____.).

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.



Activity 3

Name: Date: Period:

Repeated Challenges

10. Calculate the area of each triangle to the nearest square centimeter. Use as many measurements as you need.

a

12 square centimeters

b

15 square centimeters

c

22 square centimeters

d

14 square centimeters

Accelerated 6 | Unit 1 Lesson 3 20 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of triangles having more than one base-height pair. The height of the triangle must be *perpendicular* to the base of the triangle.

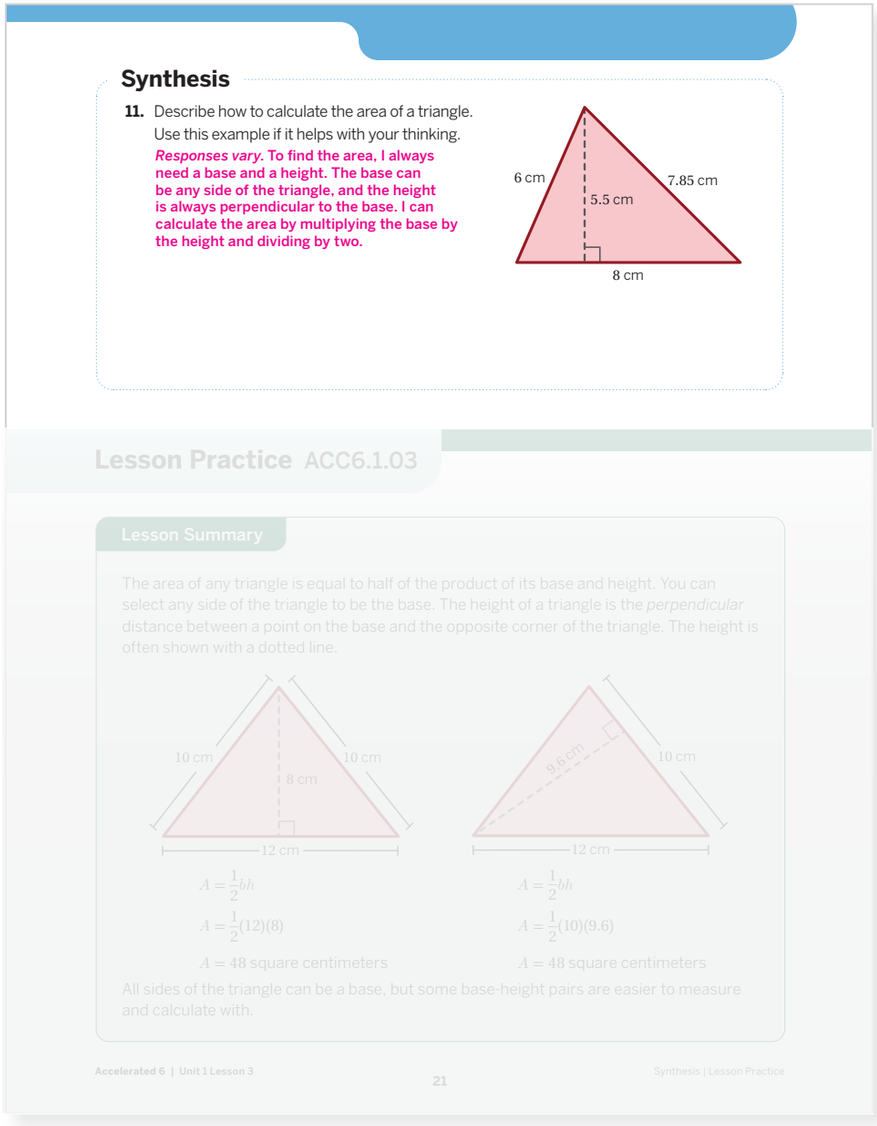
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- I always need a base and a height to calculate the area.
- The base can be any side of the triangle, but the height is always perpendicular to the base.
- To find the area of any triangle, multiply the base times the height, then divide it by 2.

MLR **MLR2: Collect and Display** Use this routine to formalize the formula for calculating the area of a triangle using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

11. Describe how to calculate the area of a triangle. Use this example if it helps with your thinking.

Responses vary. To find the area, I always need a base and a height. The base can be any side of the triangle, and the height is always perpendicular to the base. I can calculate the area by multiplying the base by the height and dividing by two.

Lesson Practice ACC6.1.03

Lesson Summary

The area of any triangle is equal to half of the product of its base and height. You can select any side of the triangle to be the base. The height of a triangle is the *perpendicular* distance between a point on the base and the opposite corner of the triangle. The height is often shown with a dotted line.

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(12)(8)$

$A = 48$ square centimeters

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(10)(9.6)$

$A = 48$ square centimeters

All sides of the triangle can be a base, but some base-height pairs are easier to measure and calculate with.

Lesson Takeaway: To calculate the area of a triangle, multiply the base times the *perpendicular* height and then divide it by 2.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by finding the area of a triangle without a grid.

Today's Goals

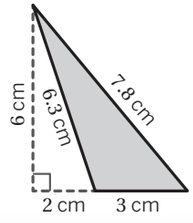
1. **Goal:** Calculate the area of a triangle off a grid, given any side as its base.
2. **Language Goal:** Analyze strategies for determining the area of triangles using mathematically precise language. **(Writing, Speaking, and Listening)**
3. **Language Goal:** Describe the relationship between a base of a triangle and its corresponding height. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 1.03

Calculate the area of the shaded triangle.
9 square centimeters



D Differentiation Use after Lesson 3

Support

Provide targeted intervention for students by using these resources.

If students need additional support with calculating the area of a triangle:

» **Respond to Student Thinking:**

- Use the ***Calculating the Area of Triangles*** **Mini-lesson**.
- Use manipulatives that students can measure to better understand there is a difference between a side length and the height in non-right triangles.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Reflect on how students found the area of triangles today. How did they talk about mistakes? Were they able to notice the correct and incorrect parts of each student's work? How can you support students in valuing learning from both correct and incorrect thinking?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

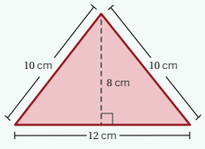
11. Describe how to calculate the area of a triangle. Use this example if it helps with your thinking.

Responses vary. To find the area, I always need a base and a height. The base can be any side of the triangle, and the height is always perpendicular to the base. I can calculate the area by multiplying the base by the height and dividing by two.

Lesson Practice ACC6.1.03

Lesson Summary

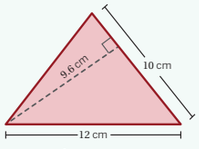
The area of any triangle is equal to half of the product of its base and height. You can select any side of the triangle to be the base. The height of a triangle is the *perpendicular* distance between a point on the base and the opposite corner of the triangle. The height is often shown with a dotted line.



$A = \frac{1}{2}bh$

$A = \frac{1}{2}(12)(8)$

$A = 48$ square centimeters



$A = \frac{1}{2}bh$

$A = \frac{1}{2}(10)(9.6)$

$A = 48$ square centimeters

All sides of the triangle can be a base, but some base-height pairs are easier to measure and calculate with.

Lesson Practice ACC6.1.03

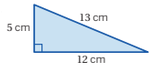
Name: _____ Date: _____ Period: _____

1. Select *all* of the triangles that have an area of 8 square units. Each small square in the grid has an area of 1 square unit.

☑ A. ☑ B. ☐ C. ☐ D. ☐ E.

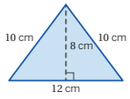
Problems 2–4: Determine the area of each triangle in square centimeters.

2.



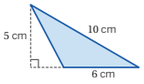
30 square centimeters

3.



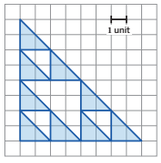
48 square centimeters

4.



15 square centimeters

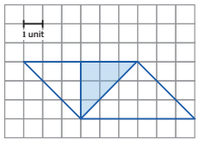
5. Motion capture is a technology that records an actor's movements and transfers them onto a computer-generated character. Actors wear special suits covered in a specific pattern of sensors. One common pattern is called the Sierpiński triangle. Take a look at this Sierpiński triangle. Determine the area of the shaded region, and explain your thinking.



18 square units. *Explanations vary.* The area of each 2-by-2 triangle is $\frac{1}{2} \cdot 2 \cdot 2 = 2$ square units. There are 9 shaded triangles, so the total area is 18 square units.

6. A company is designing a new logo that consists of a shaded triangle inside of a parallelogram. What fraction of the parallelogram's area is shaded?

$\frac{1}{4}$



Lesson Practice ACC6.1.03

Name: _____ Date: _____ Period: _____

FAST Practice

7. Here are three triangles drawn inside three identical rectangles. Mariam states that all three triangles have the same area. Is Mariam correct? Explain your thinking.

Select **ONE** correct answer in each box to complete the sentences.

All three triangles have [A. different / B. the same] base and height lengths,

so their areas are [A. different / B. the same].

Spiral Review

8. A rectangle has an area of 12 square units and a base of 9 units. What is the matching height?

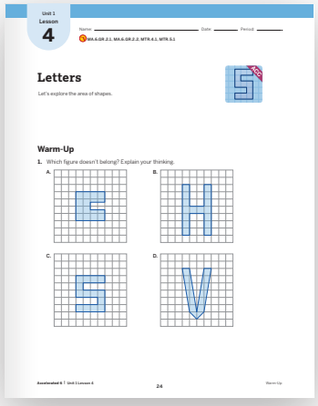
$1\frac{1}{3}$ units (or equivalent)

9. A rectangle has an area of 7 square units and a height of $\frac{1}{4}$ units. What is the matching base?

28 units

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.GR.2.1
	2–4, 6	2	MA.6.GR.2.1
	5	3	MA.6.GR.2.1
FAST Practice	7	2	MA.6.GR.2.1
Spiral Review			
	8–9	2	MA.5.GR.2.1



Letters

Area Strategies

Let's explore the area of shapes.

Learning Outcomes

Today's Goals

1. **Goal:** Determine the area of a non-rectangular shape on a grid using a variety of strategies, including counting whole and partial tiles, decomposing and rearranging, and surrounding and subtracting.
2. **Goal:** Recognize that decomposing a shape and rearranging the pieces without overlap creates a shape with the same area.
3. **Language Goal:** Compare and contrast strategies for determining the area of a polygon. **(Speaking and Listening)**

Students begin to develop and name strategies for calculating the area of more complex shapes. These strategies include decomposing and rearranging and surrounding and subtracting. **(MTR.5.1)**

Coherence

Prior Learning

In Lessons 1–3, students revisited their understanding of the area of a rectangle and explored strategies for determining the areas of triangles.

Future Learning

In Lesson 5, students will apply the strategies explained in this lesson to determine the area of composite figures off a grid. In Lesson 8, students will expand on these strategies to decompose composite figures.

Connections

- Students develop a foundational understanding of spatial relationships and measurement through area of letter shapes that are applicable in real-world fields such as architecture, graphic design and engineering. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.1
Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.

MA.6.GR.2.2
Solve mathematical and real-world problems involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.

Mathematical Thinking and Reasoning Standards: MTR.4.1, MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.1.2

Vocabulary

Additional Vocabulary

decompose

rearrange

Lesson at a Glance

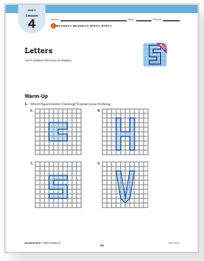
~ 45 min

MA.6.GR.2.1, MA.6.GR.2.2

Warm-Up

Pairs | 8 min

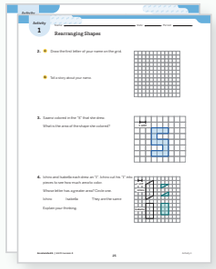
Students look for structure in shapes to decide which one doesn't belong based on some criteria. **Routine:** Which One Doesn't Belong **(MTR.5.1)**



Activity 1

Pairs | 15 min

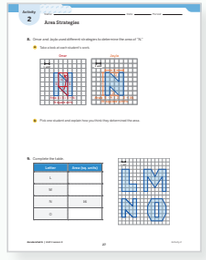
Students calculate the area of different block letters on a grid, precisely showing two areas are equivalent by decomposing and rearranging the pieces. **(MTR.4.1)**



Activity 2

Pairs | 12 min

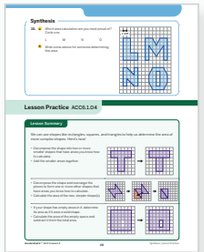
Students use MLR7: Compare and Connect to analyze two strategies for calculating the area of block letters and create and share their own strategies. **(MTR.5.1)**



Synthesis

Whole Class | 5 min

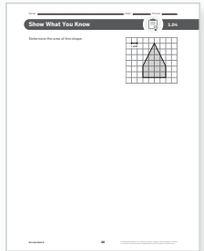
Students synthesize their strategies for determining the areas of figures on a grid. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by decomposing and rearranging to determine the area of a given figure.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 8 min

Warm-Up

Purpose: Students look for structure in shapes to decide which one doesn't belong based on some criteria. **(MTR.5.1)**

1 Launch

Use the Which One Doesn't Belong routine to support students in looking for structure in shapes and justifying their thinking. **(MTR.5.1)**

Consider sharing that each letter does not belong in some way. Encourage students to look for more than one possibility.

Invite students who finish early to draw an additional figure that will belong based on the criteria they selected.

2 Connect

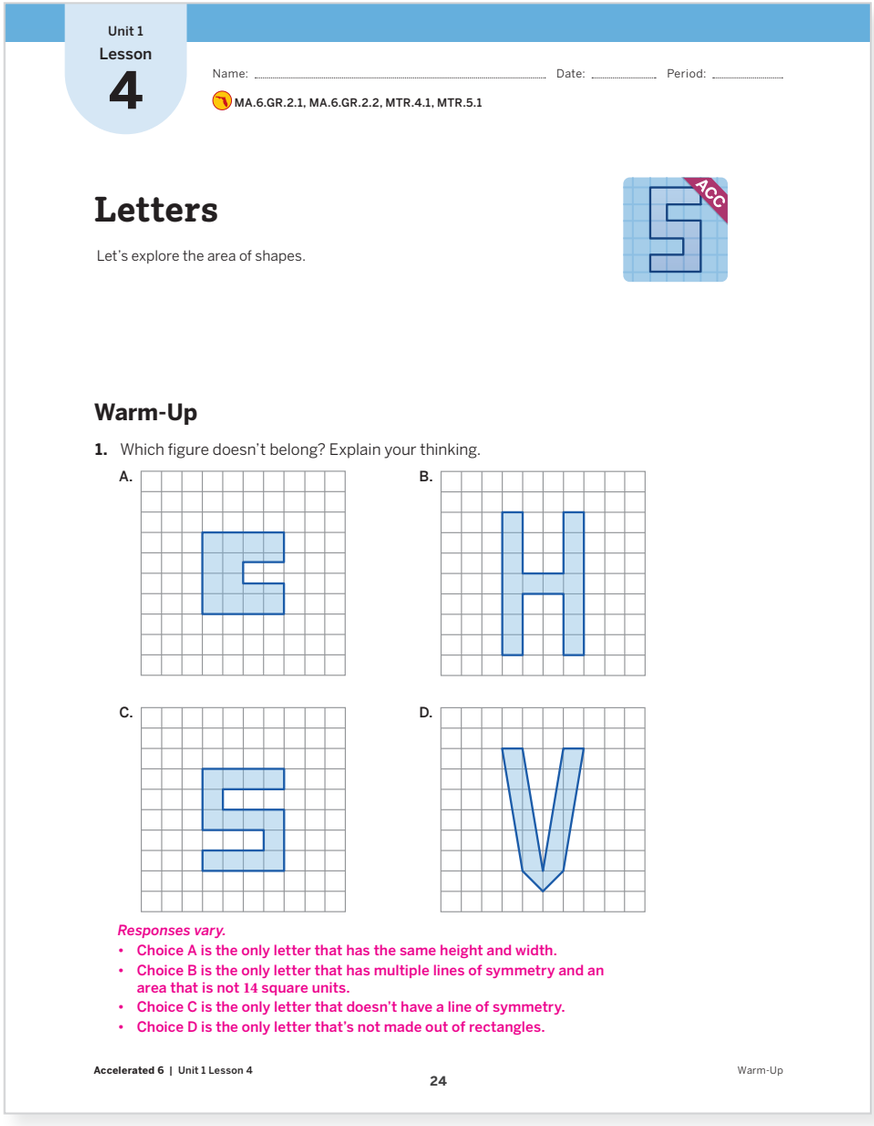
Discuss why each letter doesn't belong, asking students to justify their choice.

ELL **English Language Learners** Provide sentence frames (e.g., "_____ doesn't belong because _____." or " _____ is the only one that has/ doesn't have _____."). **(Writing and Speaking)**

Create a record of why each representation doesn't belong, along with the name of the student who shared the reasoning.

Consider asking:

- "How is Choice A alike/different from the other shapes?"
- "What is another way to say why Choice B doesn't belong?"
- "Is there another reason why Choice B doesn't belong?"
- "What do you notice about the areas of these shapes?"



Unit 1
Lesson
4

Name: _____ Date: _____ Period: _____

MA.6.GR.2.1, MA.6.GR.2.2, MTR.4.1, MTR.5.1

Letters

Let's explore the area of shapes.

ACC

Warm-Up

1. Which figure doesn't belong? Explain your thinking.

A.

B.

C.

D.

Responses vary.

- Choice A is the only letter that has the same height and width.
- Choice B is the only letter that has multiple lines of symmetry and an area that is not 14 square units.
- Choice C is the only letter that doesn't have a line of symmetry.
- Choice D is the only letter that's not made out of rectangles.

Accelerated 6 | Unit 1 Lesson 4 24 Warm-Up

Pairs | 15 min

Activity 1 Rearranging Shapes

Purpose: Students calculate the area of different block letters on a grid, precisely showing two areas are equivalent by decomposing and rearranging the pieces. **(MTR.4.1)**

Short on time? Consider omitting Problem 5.

1 Launch

To surface connections, consider sharing a story about your name before inviting students to work individually on sketching their letter and writing about their name.

2 Monitor

To support students getting started, invite students to share what they recall about area with a partner.

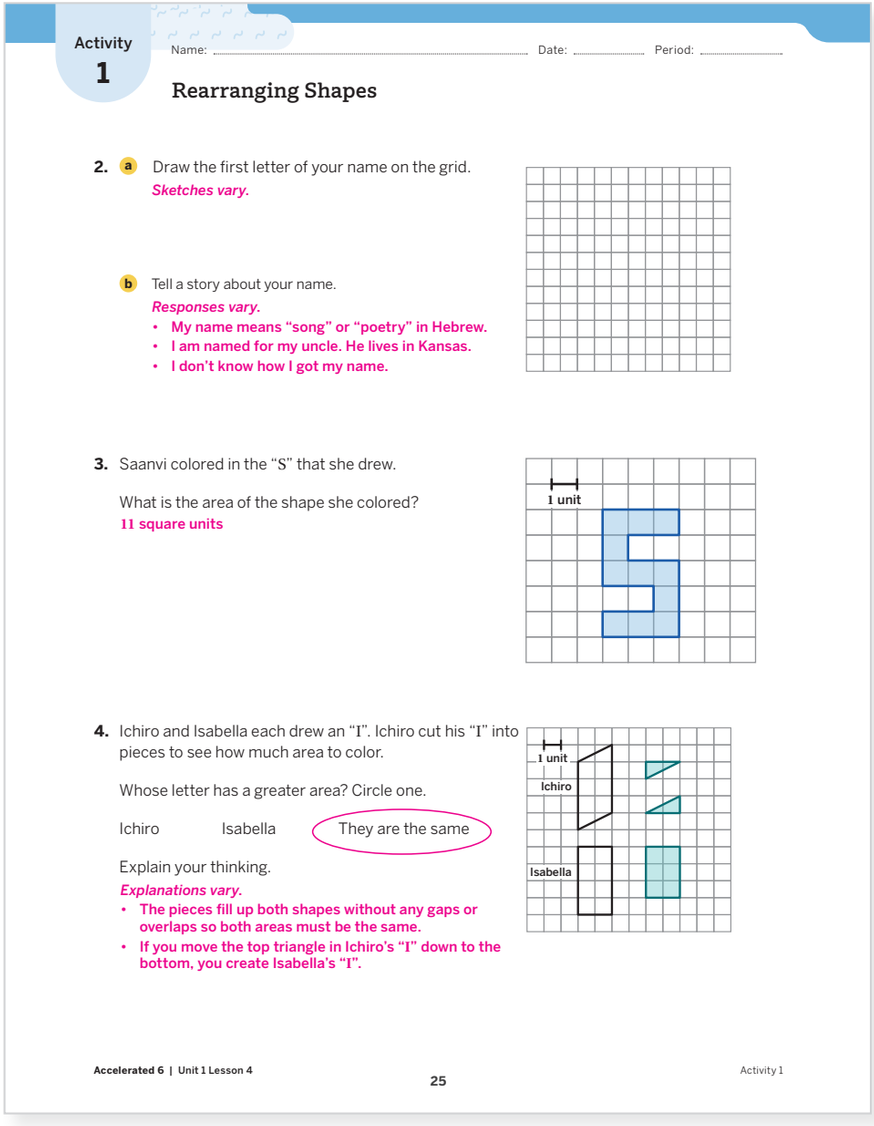
Consider asking, "How do the pieces on the right side help us compare the area of Ichiro and Isabella's shapes?"

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to start with Isabella's shape and count how many unit squares are in the letter.
Respond with either "Ichiro" or "Isabella."	**Support** Consider asking, "How did you decide whose area is larger? How might Ichiro's pieces help you convince someone else?"
Respond with "They are the same" and give an explanation like, "They are both 8."	**Strengthen** Support students in connecting to units by asking, "What are there 8 of?"
Respond with "They are the same" and give a robust explanation.	**Stretch** Consider asking, "Will all shapes made from those three pieces always have the same area?" Invite these students to share before moving to Problem 5. **(MTR.5.1)**

Pause briefly to share the distribution of responses, inviting a few students who marked "They are the same" to share their thinking. Invite students who marked "Ichiro" or "Isabella" to revise their thinking based on what they hear.

Activity 1 continued >



Activity 1

Name: Date: Period:

Rearranging Shapes

2. a Draw the first letter of your name on the grid.

Sketches vary.

b Tell a story about your name.

Responses vary.

- My name means "song" or "poetry" in Hebrew.
- I am named for my uncle. He lives in Kansas.
- I don't know how I got my name.

3. Saanvi colored in the "S" that she drew.

What is the area of the shape she colored?

11 square units

1 unit

4. Ichiro and Isabella each drew an "I". Ichiro cut his "I" into pieces to see how much area to color.

Whose letter has a greater area? Circle one.

Ichiro Isabella They are the same

Explain your thinking.

Explanations vary.

- The pieces fill up both shapes without any gaps or overlaps so both areas must be the same.
- If you move the top triangle in Ichiro's "I" down to the bottom, you create Isabella's "I".

1 unit

Ichiro

Isabella

Accelerated 6 | Unit 1 Lesson 4 25 Activity 1

Pairs | 15 min

Activity 1 Rearranging Shapes (continued)

Purpose: Students calculate the area of different block letters on a grid, precisely showing two areas are equivalent by decomposing and rearranging the pieces. **(MTR.4.1)**

Short on time? Consider omitting Problem 5.

2 Monitor

Look for students who rearrange the pieces to make a square or rectangle. Invite them to share their strategy with students around them.

ELL **English Language Learners** Use gestures to illustrate the meaning of the term *rearrange*. **(Reading and Listening)**

Look for trends in students' work. If there is a lack of consensus, invite students to share their justification why each letter does or does not have the same area as Zola's "Z."

Consider asking, "How can breaking a shape into parts and rearranging it help determine its area?"

A **Accessibility: Visual-Spatial Processing** Pair students and invite a partner to label the overlapping part of the "I" to support processing visual information.

Look for students who are counting by one and encourage them to consider other ways of finding the area.

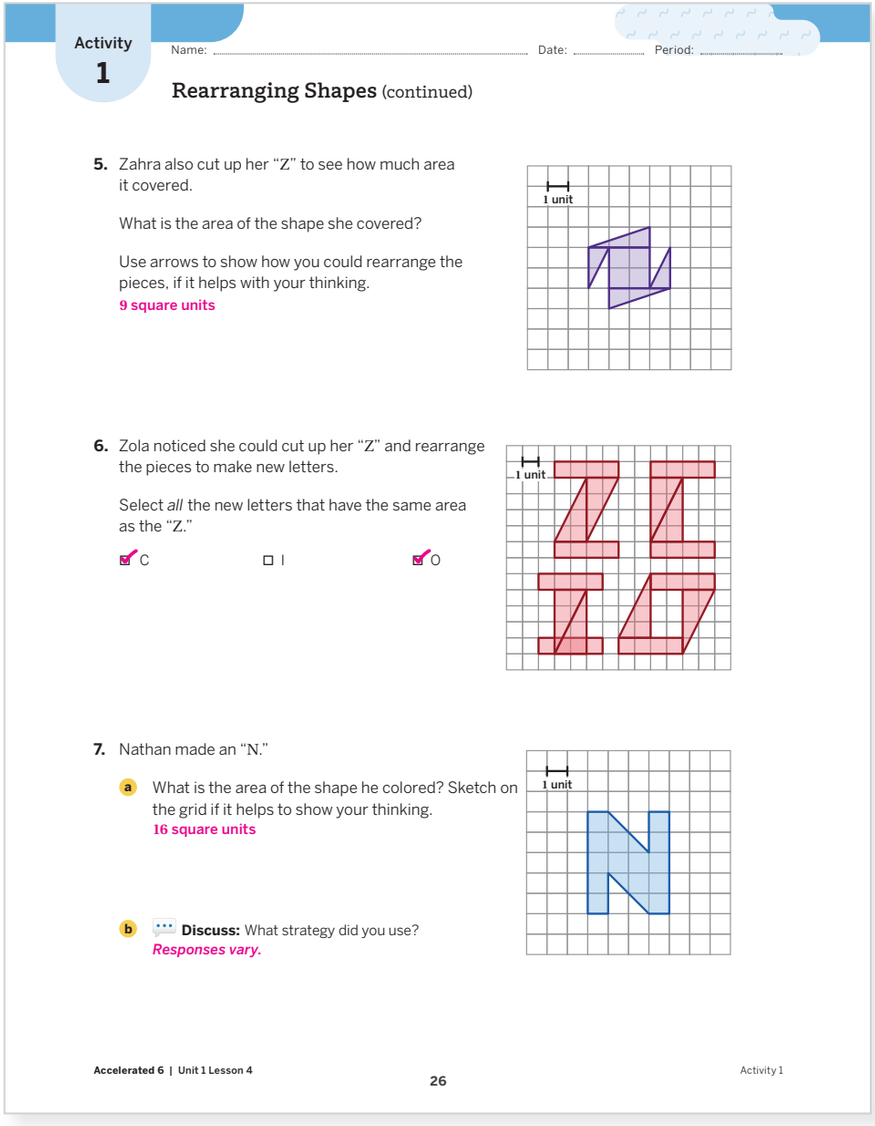
Capture strategies similar to Omar's and Jayla's (from Problem 8) or other creative strategies. Invite these students to share during the Connect.

3 Connect

Display the distribution of responses, inviting one student to justify each letter. Listen for students using words like *decompose* or *break apart* and *rearrange* and write these words on the board to create opportunities for connections.

Display the captured strategies, inviting students to talk through their thinking.

To surface the Key Takeaway, consider asking, "How are our strategies similar and how are they different?"



Activity 1

Name: Date: Period:

Rearranging Shapes (continued)

5. Zahra also cut up her "Z" to see how much area it covered.

What is the area of the shape she covered?

Use arrows to show how you could rearrange the pieces, if it helps with your thinking.

9 square units

6. Zola noticed she could cut up her "Z" and rearrange the pieces to make new letters.

Select *all* the new letters that have the same area as the "Z."

☑ C ☐ I ☑ O

7. Nathan made an "N."

a. What is the area of the shape he colored? Sketch on the grid if it helps to show your thinking.

16 square units

b. **Discuss:** What strategy did you use?

Responses vary.

Accelerated 6 | Unit 1 Lesson 4 26 Activity 1

Key Takeaway: To find the area of complex shapes, break the shape apart (decompose) and rearrange it into a simpler shape (like a rectangle).

Pairs | 12 min

Activity 2 Area Strategies

Purpose: Students use **MLR7: Compare and Connect** to analyze two strategies for calculating the area of block letters and create and share their own strategies. **(MTR.5.1)**

1 Launch

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to a previous strategy.

Consider asking:

- "What did Omar do to find the area? Jayla?"
- "How are their strategies similar to one another?"
- "Did anyone use a different strategy than Omar's or Jayla's?"
- "Did anybody use the same strategy as Omar or Jayla?"

Note: This may be the first time students see the • symbol used to represent multiplication.

2 Monitor

Encourage students to reference Omar and Jayla's annotations to make their thinking about structure visible. **(MTR.5.1)**

A **Accessibility: Executive Functioning** Chunk this activity into more manageable parts by inviting students to choose the letter they want to start with and calculating its area.

Capture a few students' annotated letters to share during the Connect.

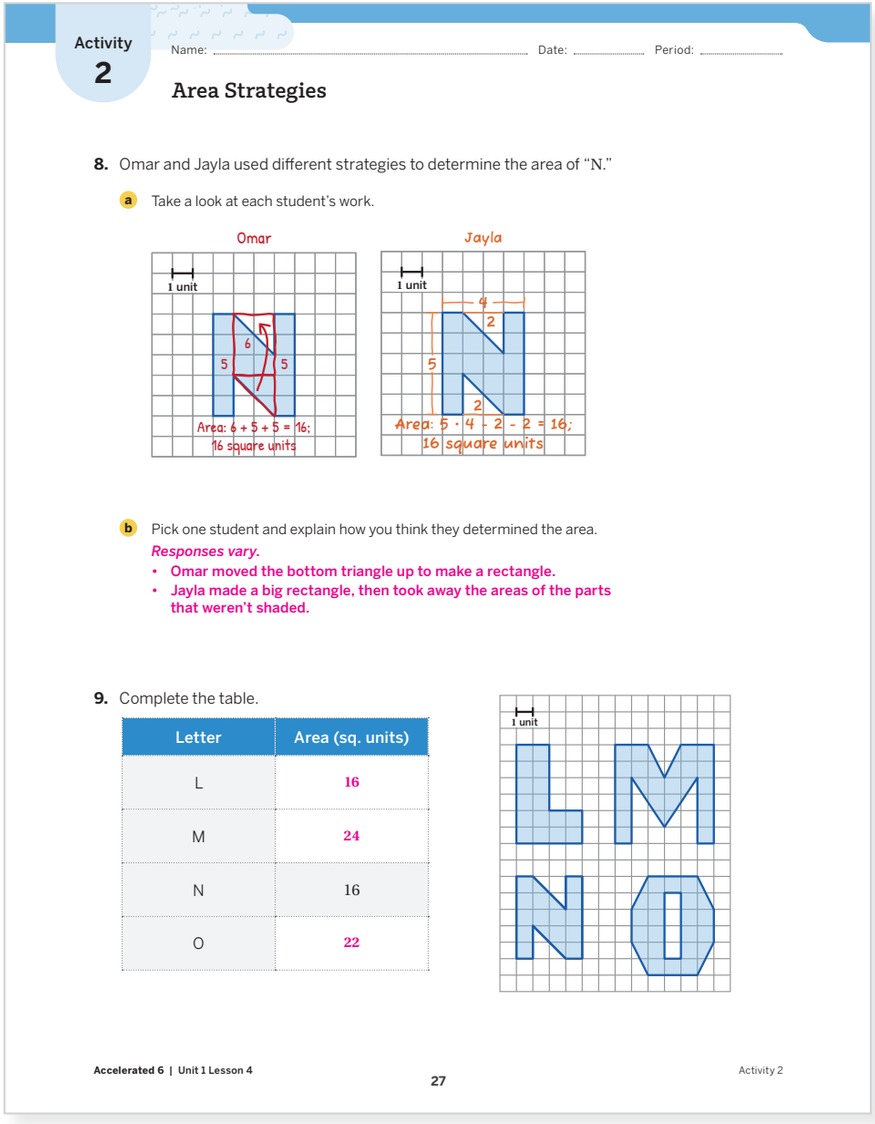
D **Differentiation: (Stretch)** Invite students to draw another letter and determine its area on a piece of graph paper.

3 Connect

Display the annotated diagrams.

To surface the Key Takeaway, consider asking, "What strategy did you prefer for determining the area of the 'L'? The 'M'? The 'O'?" Subtracting area is generally helpful when the shape can be easily enclosed in a square or rectangle. Adding is helpful when you can see simple shapes to break a more complex shape into. Counting whole or partial tiles always works but might be less efficient.

Invite students to revise their responses after hearing from their peers.



Activity 2

Name: Date: Period:

Area Strategies

8. Omar and Jayla used different strategies to determine the area of "N."

a. Take a look at each student's work.

Omar

Jayla

b. Pick one student and explain how you think they determined the area.

Responses vary.

- Omar moved the bottom triangle up to make a rectangle.
- Jayla made a big rectangle, then took away the areas of the parts that weren't shaded.

9. Complete the table.

Letter	Area (sq. units)
L	16
M	24
N	16
O	22

Accelerated 6 | Unit 1 Lesson 4 27 Activity 2

Key Takeaway: Two helpful strategies for finding the area of complex shapes are decomposing and rearranging, and surrounding and subtracting.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their strategies for determining the areas of figures on a grid.

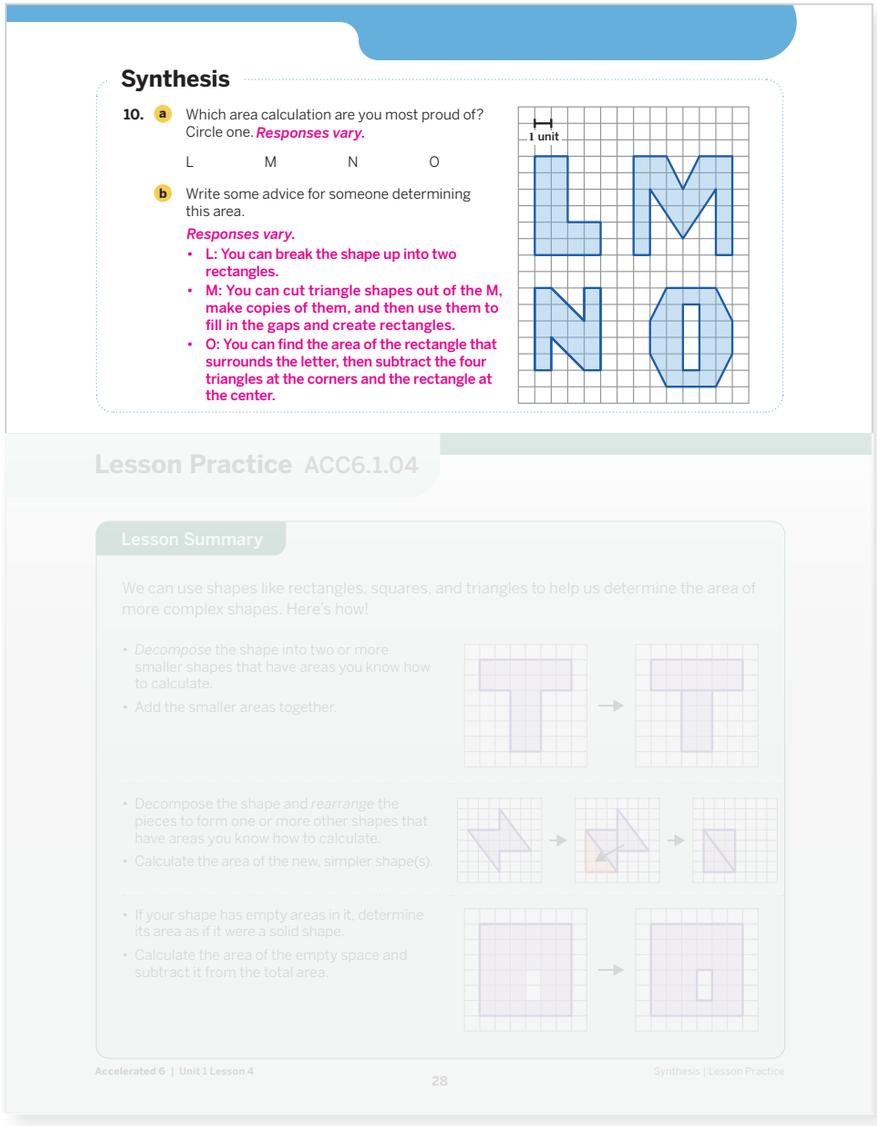
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- L: You can break up the shape into two rectangles.
- M: You can put two identical triangles together to make a rectangle.
- N: You can enclose it in a rectangle, then subtract off the two triangles (that can be arranged to be a square).
- O: You can find the area of the rectangle that surrounds the letter, then subtract the four triangles at the corners and the rectangle at the center.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they share during the Connect. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

10. **a** Which area calculation are you most proud of? Circle one. *Responses vary.*

L M N O

b Write some advice for someone determining this area.

Responses vary.

- L: You can break the shape up into two rectangles.
- M: You can cut triangle shapes out of the M, make copies of them, and then use them to fill in the gaps and create rectangles.
- O: You can find the area of the rectangle that surrounds the letter, then subtract the four triangles at the corners and the rectangle at the center.

Lesson Practice ACC6.1.04

Lesson Summary

We can use shapes like rectangles, squares, and triangles to help us determine the area of more complex shapes. Here's how!

- *Decompose* the shape into two or more smaller shapes that have areas you know how to calculate.
- Add the smaller areas together.

- Decompose the shape and *rearrange* the pieces to form one or more other shapes that have areas you know how to calculate.
- Calculate the area of the new, simpler shape(s).

- If your shape has empty areas in it, determine its area as if it were a solid shape.
- Calculate the area of the empty space and subtract it from the total area.

Accelerated 6 | Unit 1 Lesson 4 28 Synthesis | Lesson Practice

Lesson Takeaway: There are a variety of strategies to find the area of complex shapes, including counting whole and partial tiles, decomposing and rearranging, and surrounding and subtracting.

Independent | 5 min

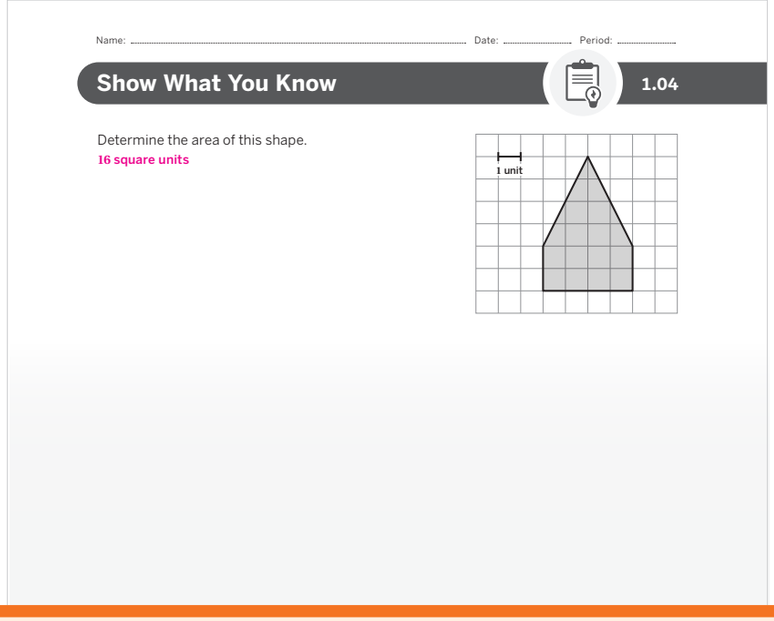
Show What You Know

Purpose: Students demonstrate their understanding by decomposing and rearranging to determine the area of a given figure.

Today's Goals

1. **Goal:** Determine the area of a non-rectangular shape on a grid using a variety of strategies, including counting whole and partial tiles, decomposing and rearranging, and surrounding and subtracting.
2. **Goal:** Recognize that decomposing a shape and rearranging the pieces without overlap creates a shape with the same area.
3. **Language Goal:** Compare and contrast strategies for determining the area of a polygon. **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: Date: Period:

Show What You Know 1.04

Determine the area of this shape.

16 square units

D Differentiation Use after Lesson 4

Support

Provide targeted intervention for students by using these resources.

If students need additional support with finding the area of irregular shapes:

» **Respond to Student Thinking:**

- Model the use of manipulative shapes to reinforce the sides of the pieces that make up a decomposed figure.
- Use the ***Calculating Areas of Triangles*** **Mini-lesson**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

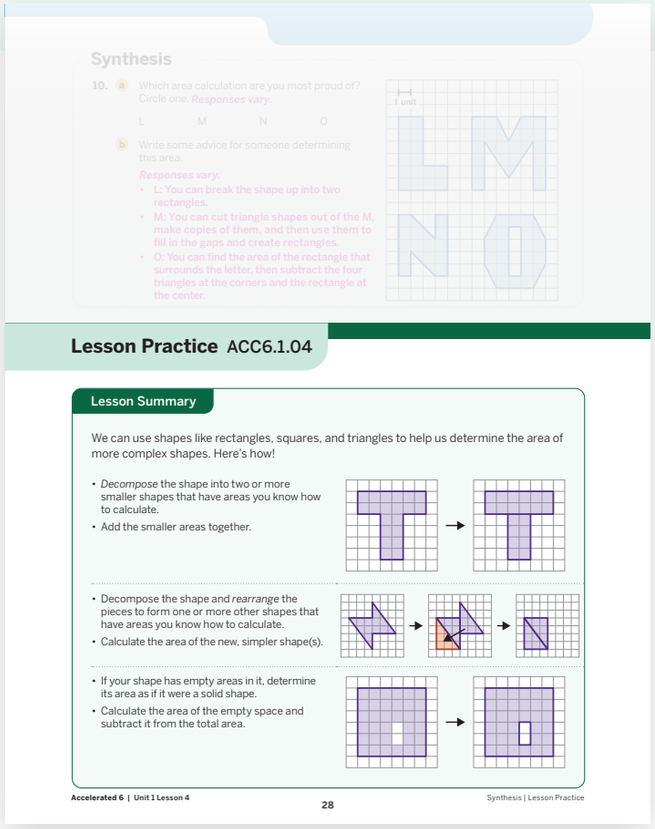
Professional Learning

Reflect on the facilitation of the **Which One Doesn't Belong** routine in this lesson. Who shared in the whole class discussion? Who did not? What follow up questions did you ask to help students deepen their thinking? How did you push students' to think about multiple "right answers?"

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

10. a Which area calculation are you most proud of? Circle one. *Responses vary.*

L M N O

b Write some advice for someone determining this area.

Responses vary.

- L: You can break the shape up into two rectangles.
- M: You can cut triangle shapes out of the M, make copies of them, and then use them to fill in the gaps and create rectangles.
- O: You can find the area of the rectangle that surrounds the letter, then subtract the four triangles at the corners and the rectangle at the center.

1 unit

L M N O

Lesson Practice ACC6.1.04

Lesson Summary

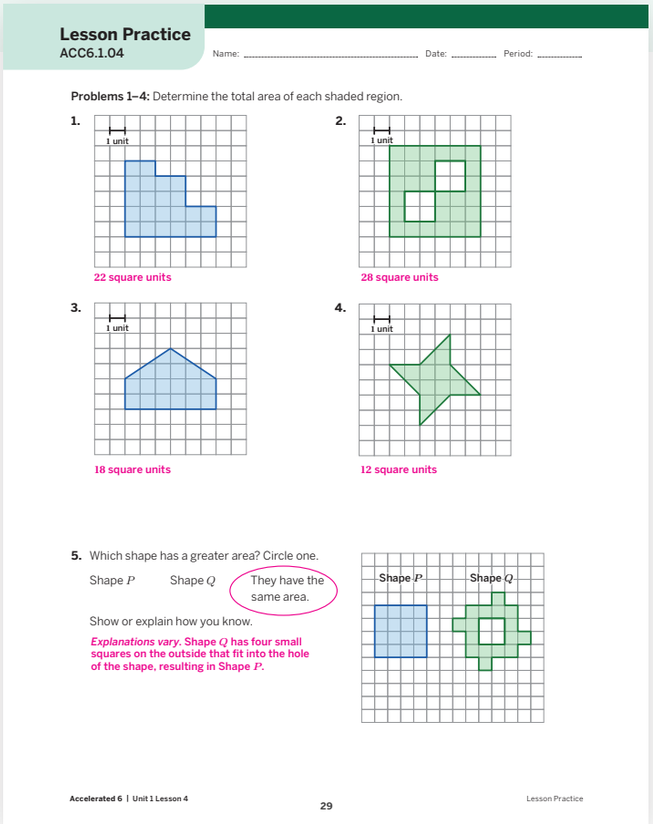
We can use shapes like rectangles, squares, and triangles to help us determine the area of more complex shapes. Here's how!

- *Decompose* the shape into two or more smaller shapes that have areas you know how to calculate.
- Add the smaller areas together.

- Decompose the shape and *rearrange* the pieces to form one or more other shapes that have areas you know how to calculate.
- Calculate the area of the new, simpler shape(s).

- If your shape has empty areas in it, determine its area as if it were a solid shape.
- Calculate the area of the empty space and subtract it from the total area.

Accelerated 6 | Unit 1 Lesson 4 28 Synthesis | Lesson Practice



Lesson Practice
ACC6.1.04

Name: _____ Date: _____ Period: _____

Problems 1–4: Determine the total area of each shaded region.

1. 1 unit

22 square units

2. 1 unit

28 square units

3. 1 unit

18 square units

4. 1 unit

12 square units

5. Which shape has a greater area? Circle one.

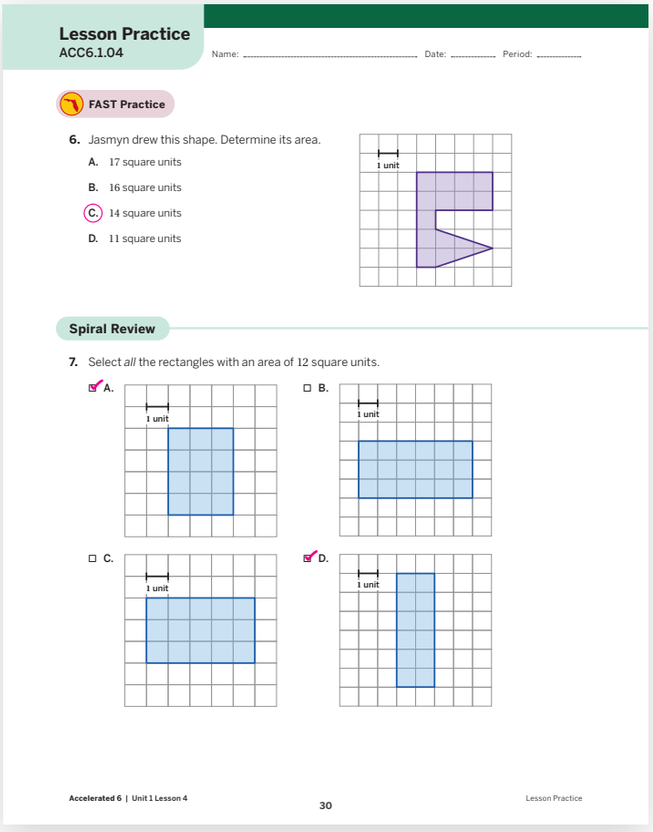
Shape P Shape Q They have the same area.

Show or explain how you know.

Explanations vary. Shape Q has four small squares on the outside that fit into the hole of the shape, resulting in Shape P.

Shape P Shape Q

Accelerated 6 | Unit 1 Lesson 4 29 Lesson Practice



Lesson Practice
ACC6.1.04

Name: _____ Date: _____ Period: _____

FAST Practice

6. Jasmyn drew this shape. Determine its area.

A. 17 square units
B. 16 square units
C. 14 square units
D. 11 square units

1 unit

Spiral Review

7. Select *all* the rectangles with an area of 12 square units.

☑ A. 1 unit

☐ B. 1 unit

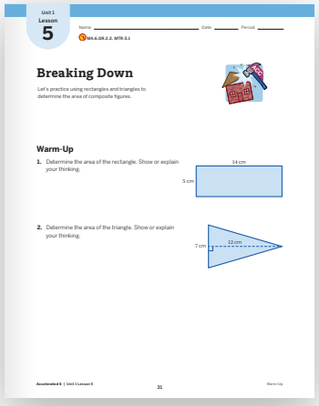
☐ C. 1 unit

☑ D. 1 unit

Accelerated 6 | Unit 1 Lesson 4 30 Lesson Practice

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–5	2	MA.6.GR.2.1, MA.6.GR.2.2
FAST Practice	6	2	MA.6.GR.2.2
Spiral Review			
	7	1	MA.5.GR.2.1


Unit 1
Lesson
5

Name: _____ Date: _____ Period: _____

MA.6.GR.2.2, MTR.5.1

Breaking Down

Let's practice using rectangles and triangles to determine the area of composite figures.

Warm-Up

1. Determine the area of the rectangle. Show or explain your thinking.

14 cm

5 cm

2. Determine the area of the triangle. Show or explain your thinking.

7 cm

12 cm

Accelerated 6 | Unit 1 Lesson 5

31

Warm-Up

Breaking Down

Calculating Areas of Composite Figures

Let's practice determining the area of composite figures.

Learning Outcomes

Today's Goal

1. **Goal:** Calculate the area of a *composite figure* using the areas of triangles and rectangles.
2. **Goal:** Determine a missing dimension of a *composite figure*.
3. **Language Goal:** Compare and contrast strategies for determining the areas of *composite figures*. **(Speaking and Listening)**

Students apply what they know about the areas of rectangles and triangles to calculate the areas of **composite figures**. They analyze the features of the figures to inform the way they choose to decompose them. They use strategies including decomposing a figure into triangles and rectangles and surrounding and subtracting. **(MTR.5.1)**

Coherence

Prior Learning

In Lessons 1–3, students used what they know about the area of a rectangle to derive and apply the formula for calculating the area of a triangle by composing and decomposing. In Lesson 4, students began to develop strategies for calculating the area of more complex shapes.

Future Learning

In Lessons 6–7, students will apply what they know about area to calculate the areas of parallelograms, rhombi, trapezoids, and other polygons. In Lesson 8, students will extend their thinking to calculate the area of more complex composite figures.

Connections

- Students explore how composing and decomposing figures allows for accurate area calculations in various real-world situations such as the area of the walkway around a pool. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.2
Solve mathematical and real-world problems involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.

Also Addressing: **MA.6.GR.2.1**

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectation: ELA.K12.EE.6.1

English Language Development Standard: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.1.2

Vocabulary

New Vocabulary

composite figure

Lesson at a Glance

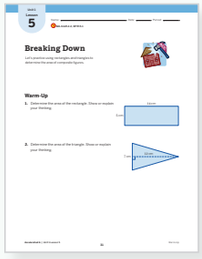
~ 45 min

MA.6.GR.2.1, MA.6.GR.2.2

Warm-Up

Pairs | 5 min

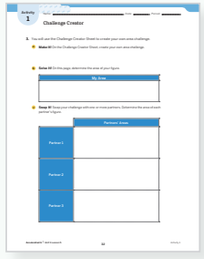
Students use what they know about rectangles and triangles to calculate their areas.



Activity 1

Pairs | 10 min

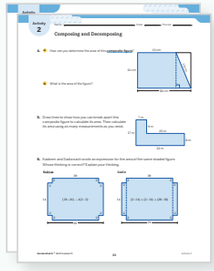
Students create their own figure and calculate its area. They then challenge themselves to calculate the area of their classmates' figures.



Activity 2

Pairs | 10 min

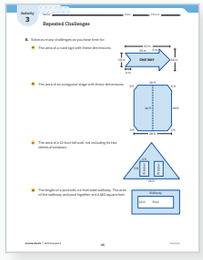
Students calculate the areas of **composite figures** and determine missing side lengths using a variety of strategies including composing and decomposing.
MLR2: Collect and Display **(MTR.5.1)**



Activity 3

Pairs | 10 min

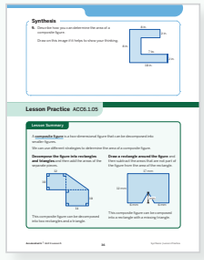
Students build procedural fluency in solving problems with composite figures.



Synthesis

Whole Class | 5 min

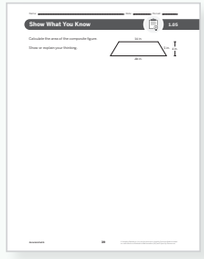
Students synthesize their understanding of how to calculate the area of a composite figure. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating the area of a composite figure.



Prep Checklist

Prepare Activity 1 Sheets

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Sheet, one per student
- Rulers

Pairs | 5 min

Warm-Up

Purpose: Students use what they know about rectangles and triangles to calculate their areas.

1 Launch

Invite students to share what they remember about the areas of rectangles and triangles.

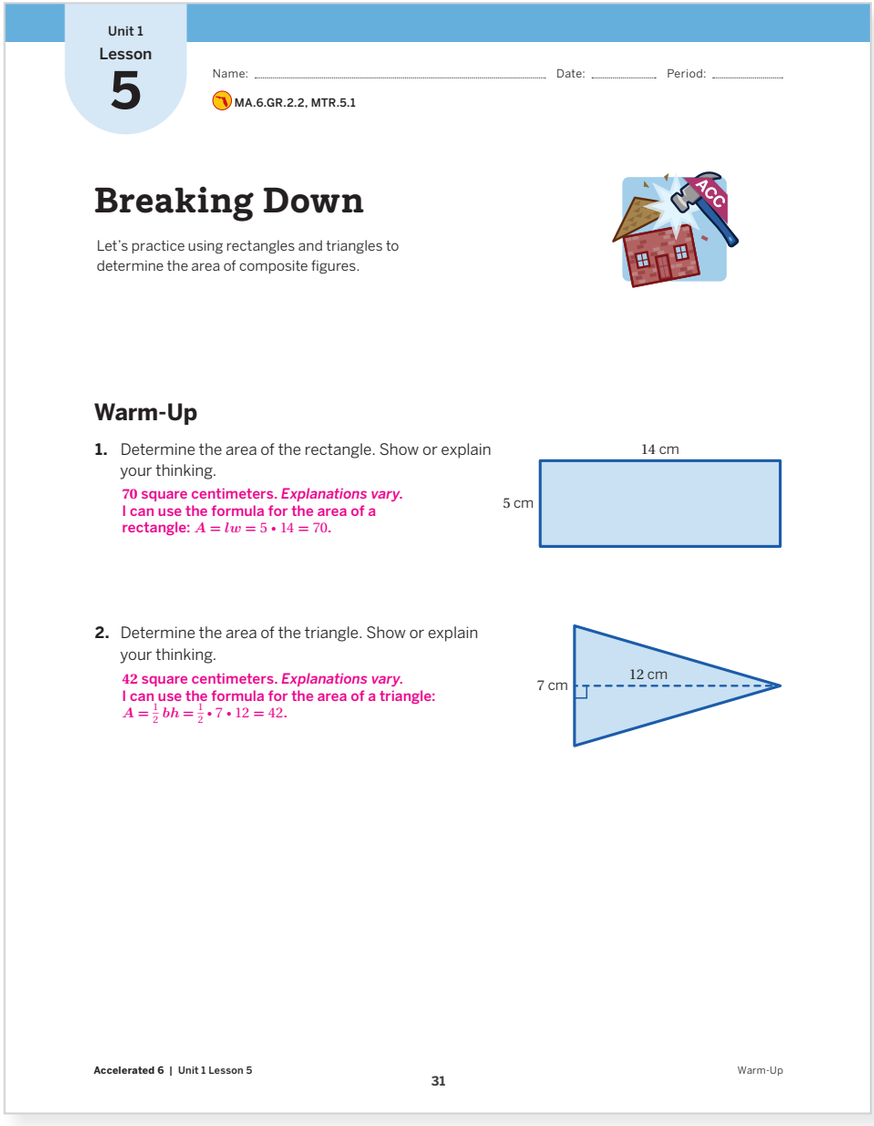
2 Connect

Invite students to share their thinking. Discuss different strategies students used.

Consider asking:

- "How can you use rectangles or right triangles to calculate the area of any triangle?"
- "Are there formulas that can help you determine the areas of rectangles and triangles?"

Create a record of the formulas for the area of a rectangle and the area of a triangle for students to reference throughout the lesson.



Unit 1
Lesson
5

Name: ..... Date: ..... Period: .....

MA.6.GR.2.2, MTR.5.1

Breaking Down

Let's practice using rectangles and triangles to determine the area of composite figures.

Warm-Up

1. Determine the area of the rectangle. Show or explain your thinking.

70 square centimeters. *Explanations vary.*
I can use the formula for the area of a rectangle: $A = lw = 5 \cdot 14 = 70$.

2. Determine the area of the triangle. Show or explain your thinking.

42 square centimeters. *Explanations vary.*
I can use the formula for the area of a triangle: $A = \frac{1}{2}bh = \frac{1}{2} \cdot 7 \cdot 12 = 42$.

Accelerated 6 | Unit 1 Lesson 5 31 Warm-Up

Pairs | 10 min

Activity 1 Challenge Creator

Purpose: Students create their own figure and calculate its area. They then challenge themselves to calculate the area of their classmates' figures.

1 Launch

Invite students to create and calculate the area of their own figure and then create a challenge for others to solve. Demonstrate how students can create a figure using the shapes provided.

Distribute the Activity 1 Sheet so students can create their figure area challenge.

Invite students to try as many challenges as they can with the given time and to use multiple strategies.

2 Monitor

A **Accessibility: Executive Functioning** Invite students to work together on a challenge before trying one independently.

Listen for students discussing how to solve for the area, including decomposing or surrounding and subtracting.

Encourage students to annotate their shapes to show their area-calculating strategies so that they can be shared with the class.

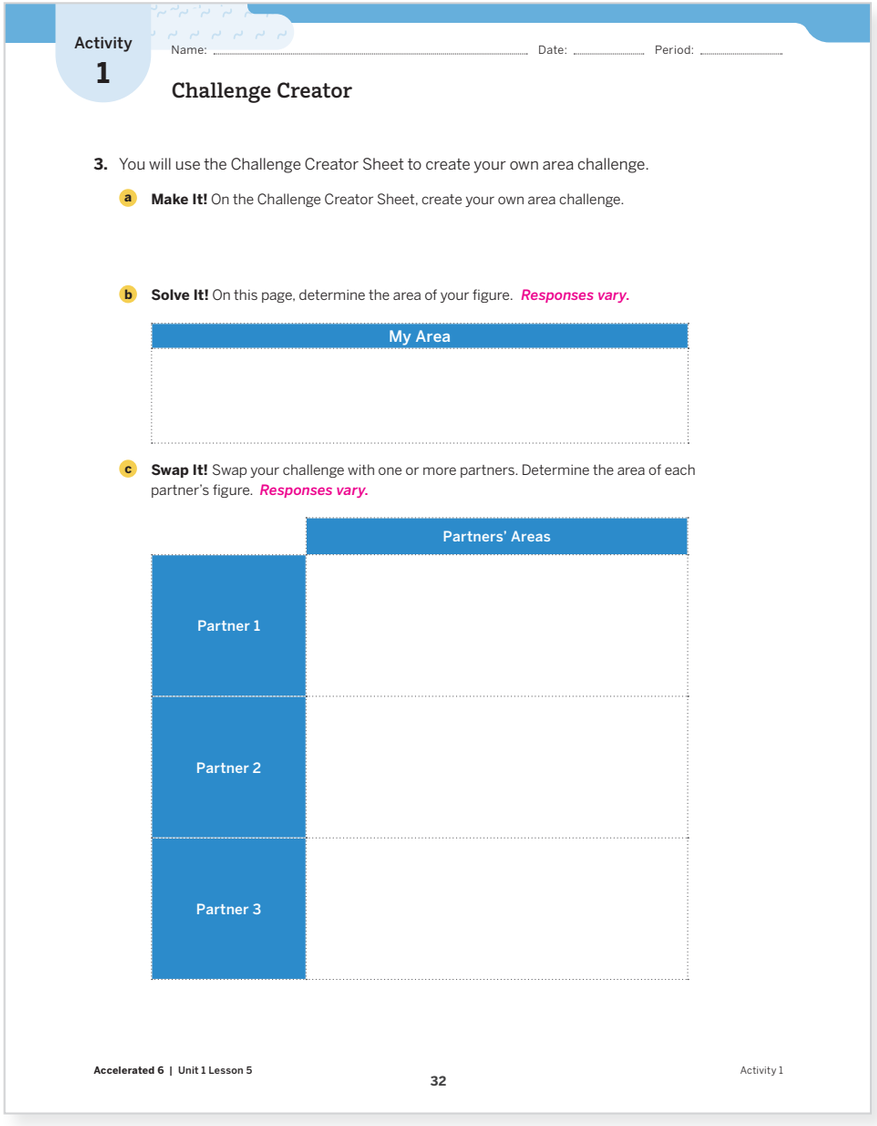
Capture several creative challenges and strategies to share during the Connect.

3 Connect

Share the captured figures. Invite students to discuss their figure and what was most challenging about calculating the area of it.

Consider asking:

- "How did you pick the challenges you wanted to solve?"
- "What made some challenges more complex than others?"
- "How did you decide which strategy to use for each challenge?"



Activity 1

Name: _____ Date: _____ Period: _____

Challenge Creator

3. You will use the Challenge Creator Sheet to create your own area challenge.

a **Make It!** On the Challenge Creator Sheet, create your own area challenge.

b **Solve It!** On this page, determine the area of your figure. *Responses vary.*

My Area

c **Swap It!** Swap your challenge with one or more partners. Determine the area of each partner's figure. *Responses vary.*

	Partners' Areas
Partner 1	
Partner 2	
Partner 3	

Accelerated 6 | Unit 1 Lesson 5 32 Activity 1

Pairs | 10 min

Activity 2 Composing and Decomposing

Purpose: Students calculate the areas of **composite figures** and determine missing side lengths using a variety of strategies including composing and decomposing. **(MTR.5.1)**

1 Launch

Support students getting started by inviting them to describe ways they can compose and decompose the figures.

ELL **MLR2: Collect and Display** Use this routine to create a class definition of **composite figure** using students' language. Display any new language, examples, or diagrams for students to reference later.

2 Monitor

Invite students to use a ruler to help annotate as they determine the area of each figure.

D **Differentiation** *(Problem 6)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What are the length and width of the rectangle in Kadeem's strategy?"
Identify only one student's thinking as correct.	**Support** Invite them to share how they decided each student's thinking is correct or incorrect. Have students listen to the thinking of others and allow them to revise their own thinking.
Describe both students' thinking as correct.	**Stretch** Consider asking, "Are there other strategies Kadeem and Sadia could have used to determine the area of the composite figure?" Capture these responses to share during the Connect.

Pause briefly to share the distribution of responses. Invite students who said that both students were correct to share their thoughts. Invite students who said that only one student or neither student was correct to revise their thinking.

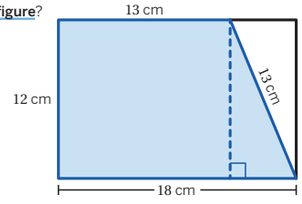
Activity 2

Name: Date: Period:

Composing and Decomposing

4. a How can you determine the area of this **composite figure**?

Responses vary. I can calculate the area of the rectangle on the right and then divide by two to determine the area of the triangle within. Then I can add that area to the area of the rectangle on the left.

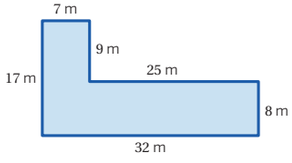


b What is the area of the figure?

186 square centimeters

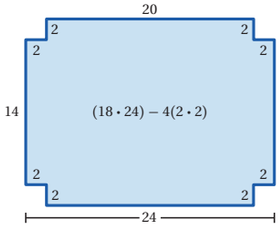
5. Draw lines to show how you can break apart this composite figure to calculate its area. Then calculate its area using as many measurements as you need.

Drawings vary. 319 square meters.

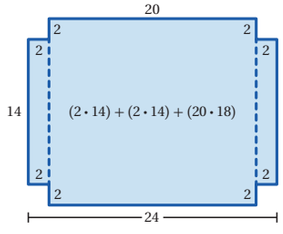


6. Kadeem and Sadia each wrote an expression for the area of the same shaded figure. Whose thinking is correct? Explain your thinking.

Kadeem



Sadia



Both students are correct. *Responses vary.* Kadeem drew a rectangle around the figure and subtracted the areas that are not shaded. Sadia separated the shaded area into three rectangles and added their areas.

Accelerated 6 | Unit 1 Lesson 5 33 Activity 2

Pairs | 10 min

Activity 2 Composing and Decomposing (continued)

Purpose: Students calculate the areas of **composite figures** and determine missing side lengths using a variety of strategies including composing and decomposing. **(MTR.5.1)**

2 Monitor

Look for students who creatively describe their thinking to share during the Connect.

Consider asking:

- "What shapes can you identify in this composite figure?"
- "What information do you need to know to determine the length of the entire right side of the figure?"
- "What formulas can you apply to determine the unknown information?"

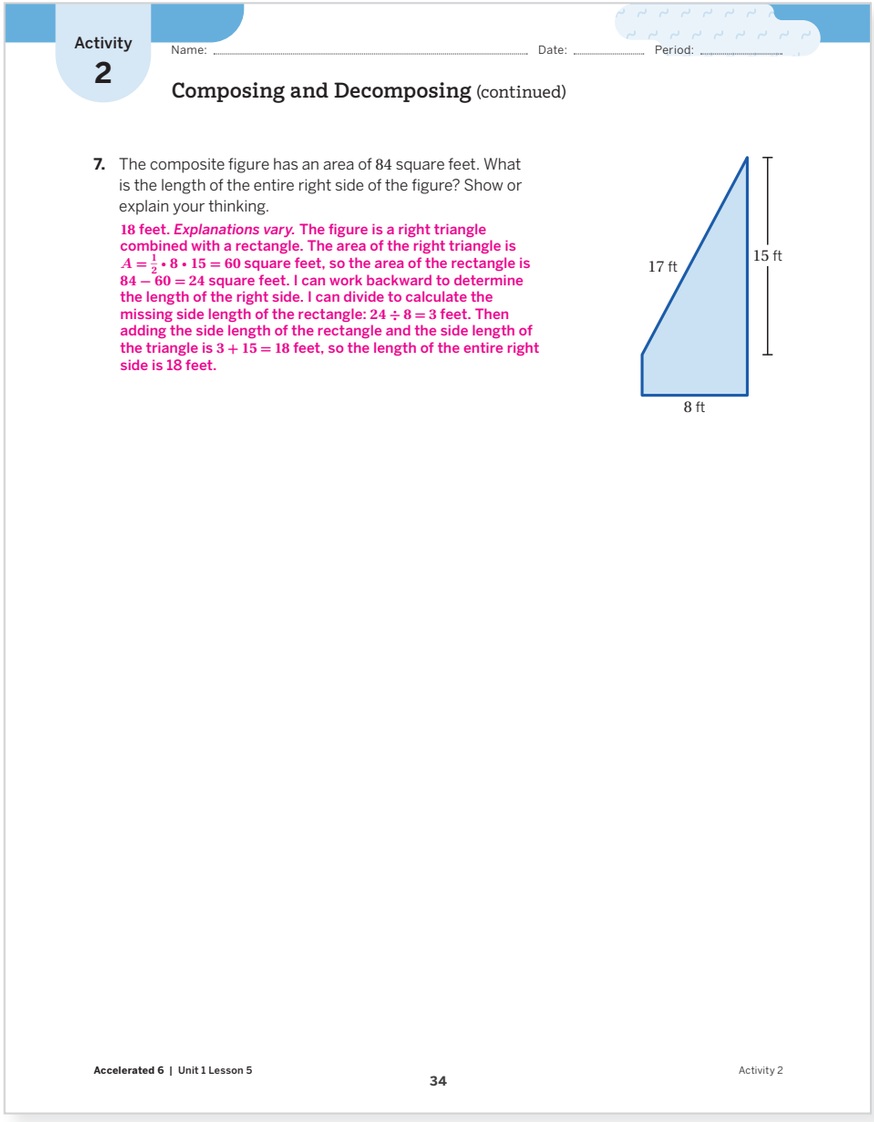
A **Accessibility: Executive Functioning** Chunk this problem into more manageable parts by inviting students to describe what they know about each decomposed shape of the composite figure.

3 Connect

Display the strategies that students used to determine the area of each figure, inviting students to talk through their reasoning. **(MTR.5.1)**

Discuss a variety of students' descriptions for determining the length of the right side of the figure.

To surface the Key Takeaway, consider asking, "How did you know that both students' strategies for determining the area in Problem 6 were correct?"



Activity 2

Name: Date: Period:

Composing and Decomposing (continued)

7. The composite figure has an area of 84 square feet. What is the length of the entire right side of the figure? Show or explain your thinking.

18 feet. *Explanations vary.* The figure is a right triangle combined with a rectangle. The area of the right triangle is $A = \frac{1}{2} \cdot 8 \cdot 15 = 60$ square feet, so the area of the rectangle is $84 - 60 = 24$ square feet. I can work backward to determine the length of the right side. I can divide to calculate the missing side length of the rectangle: $24 \div 8 = 3$ feet. Then adding the side length of the rectangle and the side length of the triangle is $3 + 15 = 18$ feet, so the length of the entire right side is 18 feet.

Accelerated 6 | Unit 1 Lesson 5 34 Activity 2

Key Takeaway: There are multiple ways to determine the areas of **composite figures**, including decomposing them into rectangles and triangles and surrounding and subtracting.

Pairs | 10 min

Activity 3 Repeated Challenges

Purpose: Students build procedural fluency in solving problems with composite figures.

Short on time? Consider inviting students to complete fewer challenges.

1 Launch

Invite students to solve as many challenges as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly.

Encourage students to draw lines and add previously unlabeled dimensions to show their thinking.

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

2 Monitor

To support students getting started, invite them to revisit Kadeem's and Sadia's strategies.

Listen for strategies students use in discussing how to solve the problems, such as:

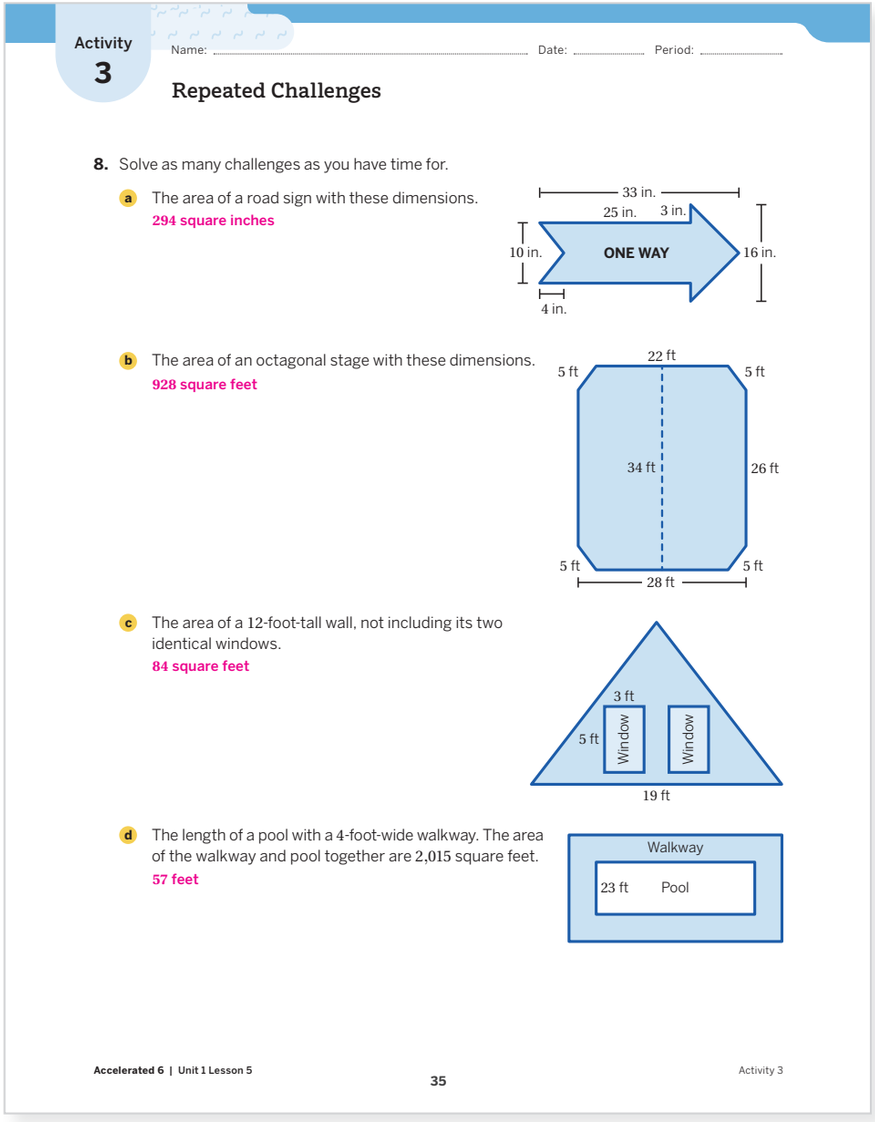
- Decomposing the figure into smaller rectangles and triangles.
- Adding areas of a decomposed figure.
- Surrounding the figure with a rectangle and then subtracting pieces that are not part of the figure.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.

Consider asking:

- "What characteristics of a composite figure make it easier to use a surround and subtract method?
- "What characteristics make it easier to decompose a figure?"



Activity 3

Name: Date: Period:

Repeated Challenges

8. Solve as many challenges as you have time for.

a. The area of a road sign with these dimensions.
294 square inches

b. The area of an octagonal stage with these dimensions.
928 square feet

c. The area of a 12-foot-tall wall, not including its two identical windows.
84 square feet

d. The length of a pool with a 4-foot-wide walkway. The area of the walkway and pool together are 2,015 square feet.
57 feet

Accelerated 6 | Unit 1 Lesson 5 35 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of how to calculate the area of a composite figure.

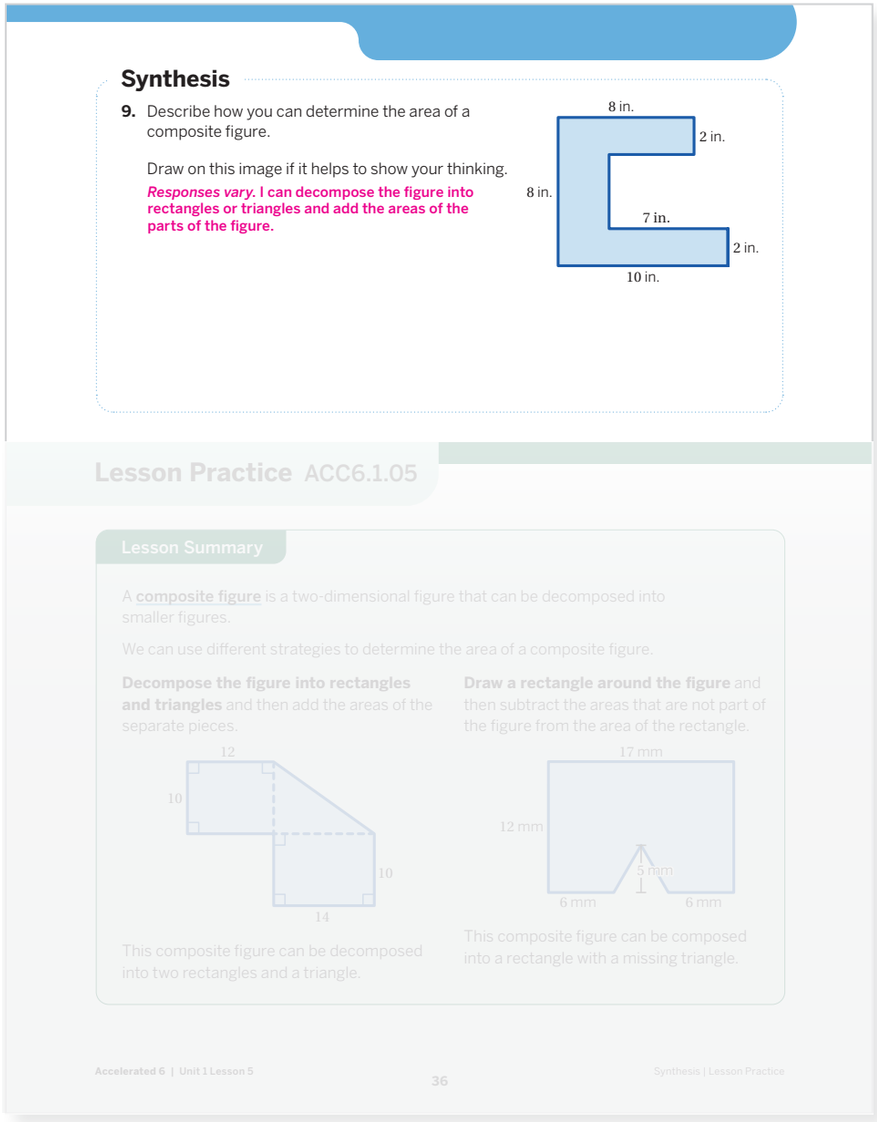
Invite students to respond independently and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- I can decompose the figure into rectangles or triangles.
- I can add the areas of decomposed parts of the figure.
- I can enclose the figure with a rectangle and then subtract out the parts that are not shaded.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for determining the areas of composite figures using students' language. Display any new language, examples, or diagrams publicly for students to reference later.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

9. Describe how you can determine the area of a composite figure.

Draw on this image if it helps to show your thinking.

Responses vary. I can decompose the figure into rectangles or triangles and add the areas of the parts of the figure.

Lesson Practice ACC6.1.05

Lesson Summary

A composite figure is a two-dimensional figure that can be decomposed into smaller figures.

We can use different strategies to determine the area of a composite figure.

Decompose the figure into rectangles and triangles and then add the areas of the separate pieces.

This composite figure can be decomposed into two rectangles and a triangle.

Draw a rectangle around the figure and then subtract the areas that are not part of the figure from the area of the rectangle.

This composite figure can be composed into a rectangle with a missing triangle.

Accelerated 6 | Unit 1 Lesson 5 36 Synthesis | Lesson Practice

Lesson Takeaway: A composite figure is a two-dimensional figure that can be decomposed into smaller figures.There are many strategies to determine the area of a composite figure, including breaking it into familiar shapes or enclosing and subtracting.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by calculating the area of a composite figure. **(MTR.5.1)**

Today's Goals

1. **Goal:** Calculate the area of a *composite figure* using the areas of triangles and rectangles.
2. **Goal:** Determine a missing dimension of a *composite figure*.
3. **Language Goal:** Compare and contrast strategies for determining the areas of *composite figures*. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 1.05

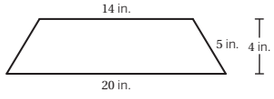
Calculate the area of the composite figure.

Show or explain your thinking.

68 square inches. *Responses vary.*

I divided the figure into a rectangle and two right triangles.

Then, I calculated the total area of the figure by adding the areas of the rectangle and triangles.



D Differentiation Use after Lesson 5

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to use an efficient strategy to calculate the area of composite figures:

» **Respond to Student Thinking:**

- Use the ***Finding Area of Composite Figures Without Grids*** **Prerequisite Mini-Lesson**.
- Model the use of manipulative shapes to reinforce the sides of the pieces that make up a decomposed figure.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Consider how you will teach the next three lessons. How will students' work calculating the area of rectangles and triangles prepare them for determining the area of parallelograms, rhombi, trapezoids, and other polygons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. Describe how you can determine the area of a composite figure.

Draw on this image if it helps to show your thinking.

Responses vary. I can decompose the figure into rectangles or triangles and add the areas of the parts of the figure.

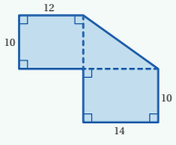
Lesson Practice ACC6.1.05

Lesson Summary

A **composite figure** is a two-dimensional figure that can be decomposed into smaller figures.

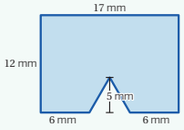
We can use different strategies to determine the area of a composite figure.

Decompose the figure into rectangles and triangles and then add the areas of the separate pieces.



This composite figure can be decomposed into two rectangles and a triangle.

Draw a rectangle around the figure and then subtract the areas that are not part of the figure from the area of the rectangle.



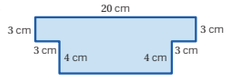
This composite figure can be composed into a rectangle with a missing triangle.

Lesson Practice ACC6.1.05

Name: _____ Date: _____ Period: _____

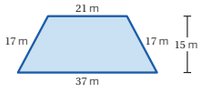
Problems 1–4: Calculate the area of each composite figure.

1.



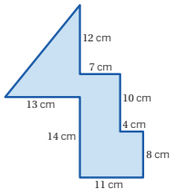
116 square centimeters

2.



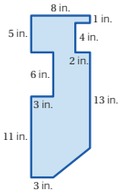
435 square meters

3.



262 square centimeters

4.



140 square inches

5. Describe two different strategies you can use to calculate the area of the figure in Problem 4.

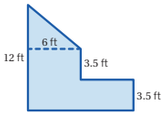
Responses vary. I can decompose the figure into four rectangles and one triangle and add their areas, or I can calculate the area of a rectangle that surrounds the figure and then subtract the areas of two rectangles and one triangle.

Lesson Practice ACC6.1.05

Name: _____ Date: _____ Period: _____

6. What is the length of the base of the composite figure if the area of the figure is 78 square feet?

12 feet



FAST Practice

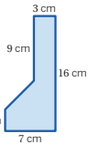
7. Which expression shows how to calculate the area of the composite figure?

A. $(16 \cdot 7) - (13 \cdot 4)$

B. $(16 \cdot 7) - (13 \cdot 4) - \left(\frac{1}{2} \cdot 4 \cdot 4\right)$

C. $(16 \cdot 3) + (3 \cdot 7) + \left(\frac{1}{2} \cdot 4 \cdot 4\right)$

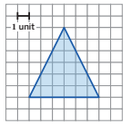
D. $(16 \cdot 3) + (3 \cdot 4) + \left(\frac{1}{2} \cdot 4 \cdot 4\right)$



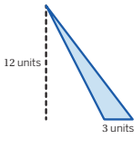
Spiral Review

8. Select *all* the triangles with an area of 18 square units.

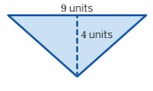
A.



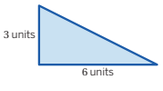
B.



C.

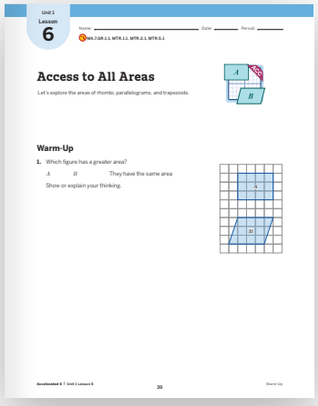


D.



Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	2	MA.6.GR.2.2
	5–6	3	MA.6.GR.2.2
FAST Practice	7	2	MA.6.GR.2.2
Spiral Review			
	8	1	MA.6.GR.2.1


Unit 1
Lesson 6
Access to All Areas
Let's explore the areas of rhombi, parallelograms, and trapezoids.
Warm-Up
1. Which figure has a greater area?
A
B
They have the same area
Show or explain your thinking.

Access to All Areas

Investigating Areas of Special Quadrilaterals

Let's explore the areas of rhombi, parallelograms, and trapezoids.

Learning Outcomes

Today's Goals

1. **Goal:** Derive the formula for the area of a parallelogram from the formula of a rectangle and determine areas of parallelograms and rhombi.
2. **Goal:** Derive the formula for the area of a trapezoid from the formula for a parallelogram and determine the areas of trapezoids.
3. **Language Goal:** Compare and contrast strategies for determining the areas of a parallelogram, a rhombus, and a trapezoid. **(Speaking and Listening)**

Students decompose *parallelograms*, *rhombi*, and *trapezoids* into squares, rectangles, and triangles to explore the areas of these quadrilaterals. Students use the measurements of the **base** and the **height** to derive area formulas for parallelograms and trapezoids and then apply those formulas to calculate areas.

Coherence

Prior Learning

In Lessons 2–3, students calculated the areas of triangles and rectangles using formulas. In Lessons 4–5, they calculated the areas of composite figures by decomposing them into triangles and rectangles.

Future Learning

In Lesson 7, students will determine areas of polygons by decomposing them into triangles and quadrilaterals.

Connections

- Students extend their understanding of the area of rectangles and decomposing them to find the area of rhombi, parallelograms, and trapezoids on a grid. (mathematical)
- Students generate formulas for the areas of parallelograms and trapezoids by relating them to the area formula of a rectangle. (mathematical)

FL B.E.S.T. Math Benchmarks

Building Toward

MA.7.GR.1.1
Apply formulas to find the areas of trapezoids, parallelograms and rhombi.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.2.1, MTR.5.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.6.GR.2.1	**MA.7.GR.1.2**
MA.6.GR.2.2	**MA.912.GR.3.4**
	MA.912.GR.4.4

Vocabulary

New Vocabulary

base (of a parallelogram)
height (of a parallelogram)

Review Vocabulary

parallelogram	*quadrilateral*
rhombus	*trapezoid*

Lesson at a Glance

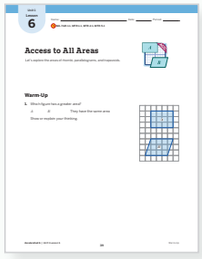
~ 45 min

MA.7.GR.1.1

Warm-Up

Pairs | 5 min

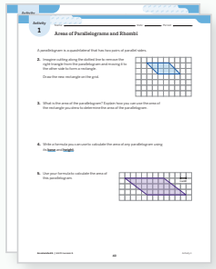
Students determine whether a rectangle or a *parallelogram* has the greater area.
Routine: Think-Pair-Share



Activity 1

Pairs | 15 min

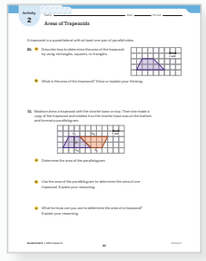
Students explore strategies for determining the areas of parallelograms and *rhombi* and then write a general formula to determine the area of any parallelogram.



Activity 2

Pairs | 15 min

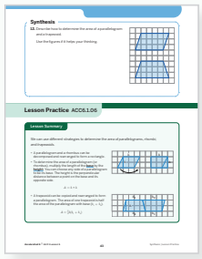
Students explore strategies for determining the area of a *trapezoid* and write a general formula to determine the area of any trapezoid. MLR7: Compare and Connect



Synthesis

Whole Class | 5 min

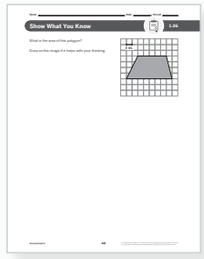
Students synthesize their understanding of how to use different strategies to determine the areas of a parallelogram and a trapezoid.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the area of the parallelograms, rhombi, and trapezoids using different approaches.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students determine whether a rectangle or a *parallelogram* has the greater area.

1 Launch

Direct students' attention to figures *A* and *B*. Consider asking, "How could you describe these shapes?"

Use the Think-Pair-Share routine to help students shape their ideas about which figure has a greater area. Invite students to think independently and then take turns sharing with a partner.

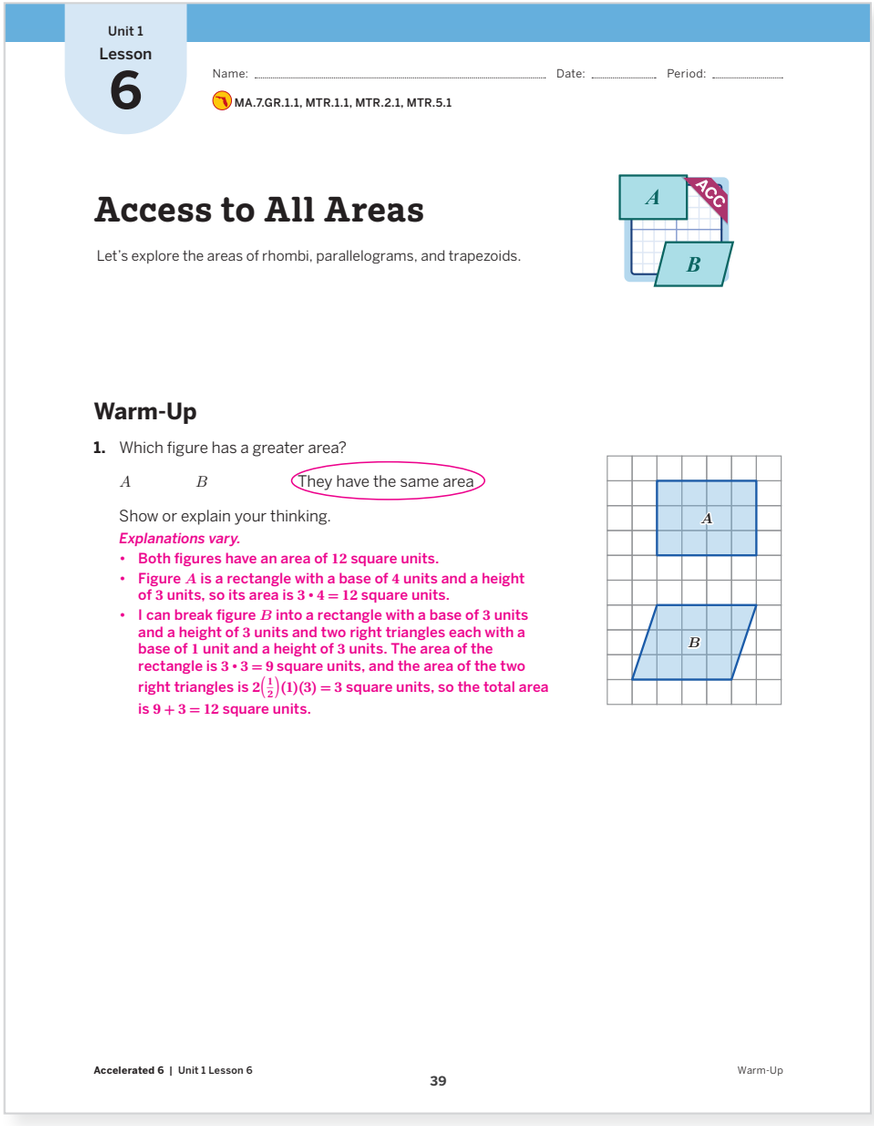
A **Accessibility: Memory and Attention** To support students in surfacing prior knowledge, create or review an anchor chart that displays area formulas for rectangles and triangles.

2 Connect

Invite students to share their responses about their strategies for determining the area of each figure.

Consider asking:

- "What is the formula for the area of a rectangle?"
- "How can you break apart figure B into simpler shapes to use area formulas that you know?"



Unit 1
Lesson
6

Name: ..... Date: ..... Period: .....

MA.7.GR.1.1, MTR.1.1, MTR.2.1, MTR.5.1

Access to All Areas

Let's explore the areas of rhombi, parallelograms, and trapezoids.

Warm-Up

1. Which figure has a greater area?

A *B* They have the same area

Show or explain your thinking.

Explanations vary.

- Both figures have an area of 12 square units.
- Figure A is a rectangle with a base of 4 units and a height of 3 units, so its area is $3 \cdot 4 = 12$ square units.
- I can break figure B into a rectangle with a base of 3 units and a height of 3 units and two right triangles each with a base of 1 unit and a height of 3 units. The area of the rectangle is $3 \cdot 3 = 9$ square units, and the area of the two right triangles is $2\left(\frac{1}{2}\right)(1)(3) = 3$ square units, so the total area is $9 + 3 = 12$ square units.

Accelerated 6 | Unit 1 Lesson 6 39 Warm-Up

Pairs | 15 min

Activity 1 Areas of Parallelograms and Rhombi

Purpose: Students explore strategies for determining the areas of parallelograms and *rhombi* and then write a general formula to determine the area of any parallelogram.

1 Launch

To surface prior knowledge, consider asking, "What are the names and characteristics of the special quadrilaterals that you know?"

Note: If it does not come up naturally, revisit the characteristics of a *parallelogram*, rectangle, square, *rhombus*, and *trapezoid*.

Create an anchor chart with students' descriptions for the properties of special quadrilaterals.

ELL **English Language Learners** Provide a reference that includes descriptions and visuals of geometric shapes, including *quadrilateral*, *rectangle*, *parallelogram*, *rhombus/rhombi*, and *trapezoid*, that students can refer to during the lesson.

2 Monitor

Look for correct explanations of how students explain how to determine the area of the parallelogram using the area of a rectangle to share during the Connect. **(MTR.2.1)**

Consider asking, "How can breaking a shape into parts and rearranging it help determine its area?"

Pause briefly so students can share their formula for the area of a parallelogram.

Create a class definition for the terms **base** and **height** (**of a parallelogram**) using students' language and the glossary.

Consider sharing that the base of a parallelogram can be any one of its sides. The height is the perpendicular distance from the chosen base to the opposite side.

Activity 1 continued >

Activity 1

Name: Date: Period:

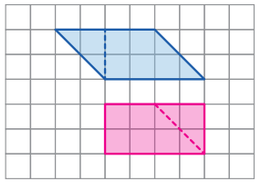
Areas of Parallelograms and Rhombi

A *parallelogram* is a *quadrilateral* that has two pairs of parallel sides.

2. Imagine cutting along the dotted line to remove the right triangle from the parallelogram and moving it to the other side to form a rectangle.

Draw the new rectangle on the grid.

Responses vary. Sample shown on grid.



3. What is the area of the parallelogram? Explain how you can use the area of the rectangle you drew to determine the area of the parallelogram.

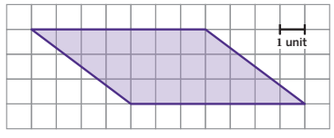
8 square units. *Explanations vary.* The parallelogram and the rectangle have the same base and height. By removing a triangle from the left side of the parallelogram and moving it to the right side of the parallelogram, it forms a rectangle. The rectangle and parallelogram have the same area, which can be found by multiplying the length of the base and the height.

4. Write a formula you can use to calculate the area of any parallelogram using its **base** and **height**.

$A = b \cdot h$

5. Use your formula to calculate the area of this parallelogram.

21 square units



Accelerated 6 | Unit 1 Lesson 6 40 Activity 1

Pairs | 15 min

Activity 1 Areas of Parallelograms and Rhombi (continued)

Purpose: Students explore strategies for determining the areas of parallelograms and *rhombi* and then write a general formula to determine the area of any parallelogram.

2 Monitor

Consider asking, "How can breaking a shape into parts and rearranging it help determine its area?"

D Differentiation *(Problems 6–7)*

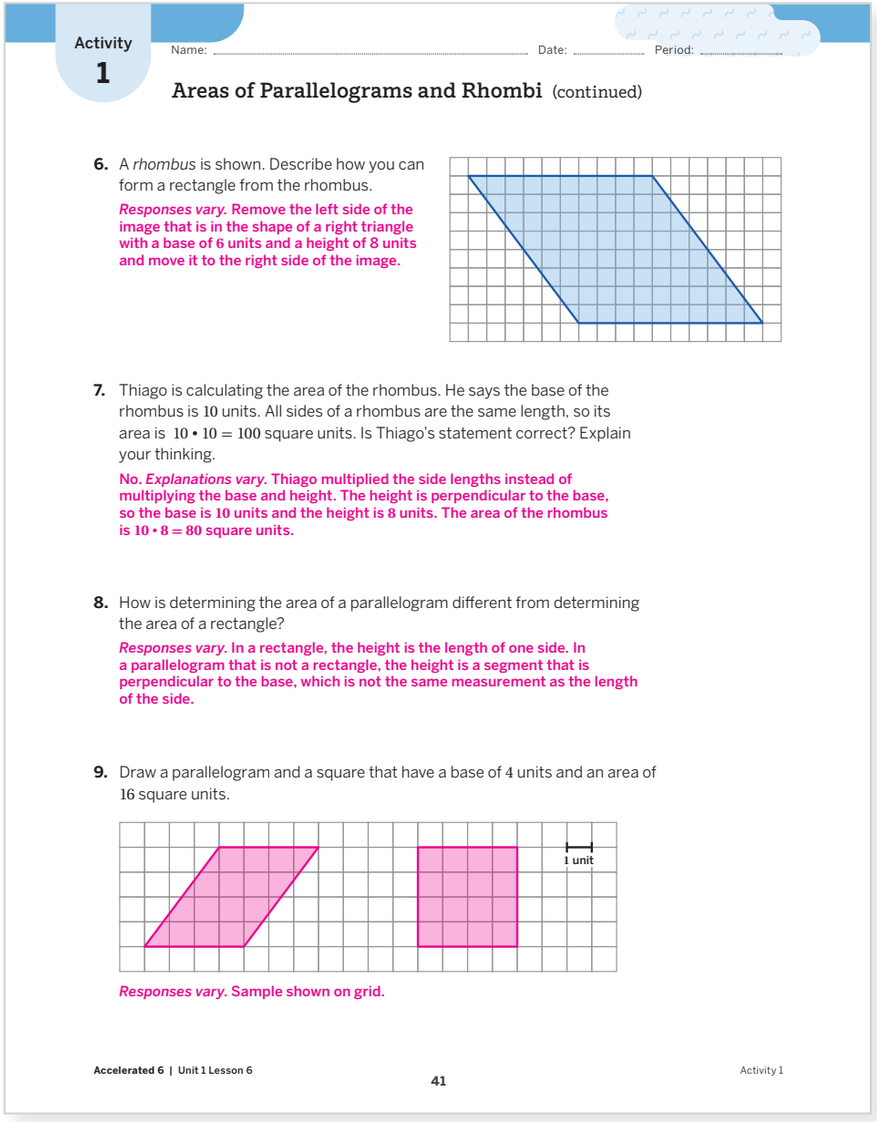
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to draw the height on the rhombus.
Think that the side length and height have the same measure.	**Support** Invite them to measure the side length and the height with a ruler.
Identify the error in Thiago's statement.	**Stretch** Encourage students to use a lateral side as a base, draw the height, and confirm the height is the same regardless of which side is used as the base.

3 Connect

Invite students to share their responses. Consider asking, "Why don't you need to draw a line to represent the height of a rectangle?"

Invite students to share their drawings. Consider asking, "Is the parallelogram you drew also a rhombus?"

To surface the Key Takeaway, consider asking, "What are the differences and similarities between determining the area of a rectangle and the areas of a parallelogram and a rhombus?" **(MTR.5.1)**



Activity 1

Name: Date: Period:

Areas of Parallelograms and Rhombi (continued)

6. A *rhombus* is shown. Describe how you can form a rectangle from the rhombus.

Responses vary. Remove the left side of the image that is in the shape of a right triangle with a base of 6 units and a height of 8 units and move it to the right side of the image.

7. Thiago is calculating the area of the rhombus. He says the base of the rhombus is 10 units. All sides of a rhombus are the same length, so its area is $10 \cdot 10 = 100$ square units. Is Thiago's statement correct? Explain your thinking.

No. *Explanations vary.* Thiago multiplied the side lengths instead of multiplying the base and height. The height is perpendicular to the base, so the base is 10 units and the height is 8 units. The area of the rhombus is $10 \cdot 8 = 80$ square units.

8. How is determining the area of a parallelogram different from determining the area of a rectangle?

Responses vary. In a rectangle, the height is the length of one side. In a parallelogram that is not a rectangle, the height is a segment that is perpendicular to the base, which is not the same measurement as the length of the side.

9. Draw a parallelogram and a square that have a base of 4 units and an area of 16 square units.

1 unit

Responses vary. Sample shown on grid.

Accelerated 6 | Unit 1 Lesson 6 41 Activity 1

Key Takeaway: To calculate the area of a *parallelogram*, multiply the **base** by its **height**: $A = b \cdot h$.

Pairs | 15 min

Activity 2 Areas of Trapezoids

Purpose: Students explore strategies for determining the area of a *trapezoid* and write a general formula to determine the area of any trapezoid.

Short on time? Consider completing Problem 11 as a class.

1 Launch

Consider sharing that the trapezoids in Problems 10 and 11 have the same dimensions.

Consider asking, "How do you know which sides are the bases in a trapezoid?

2 Monitor

Look and listen for students making sense of each strategy.

Consider asking, "Can you think of another strategy to determine the area of the trapezoid?" **(MTR.1.1)**

Note: If it does not come up naturally, discuss the strategy of drawing a rectangle around the trapezoid and subtracting the parts that aren't in the trapezoid.

3 Connect

MLR **MLR7: Compare and Connect** Invite students to analyze and compare both strategies for determining the area of a trapezoid. Consider asking:

- "What was helpful about each strategy?"
- "Can you think of another strategy for determining the area of a trapezoid?"

To surface connections, consider discussing why the height of the parallelogram is the same as the height of the trapezoid and the base of the parallelogram is the same as the sum of the two bases of the trapezoid. **(MTR.5.1)**

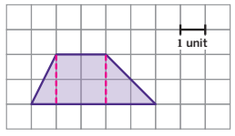
Activity 2

Name: Date: Period:

Areas of Trapezoids

A *trapezoid* is a quadrilateral with at least one pair of parallel sides.

10. a. Describe how to determine the area of the trapezoid by using rectangles, squares, or triangles.

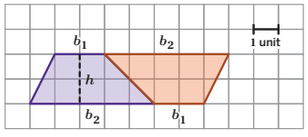


Responses vary. I can draw two vertical lines to form a square and two right triangles and then add the areas of each part.

b. What is the area of the trapezoid? Show or explain your thinking.

7 square units. *Responses vary.* The area of the rectangle is $2 \cdot 2 = 4$ square units, the area of the right triangle on the left is $\left(\frac{1}{2}\right)(2)(1) = 1$ square unit, and the area of the right triangle on the right is $\left(\frac{1}{2}\right)(2)(2) = 2$ square units, so the total area of the trapezoid is $4 + 1 + 2 = 7$ square units.

11. Madison drew a trapezoid with the shorter base on top. Then she made a copy of the trapezoid and rotated it so the shorter base was on the bottom and formed a parallelogram.



a. Determine the area of the parallelogram.

$A = b \cdot h$

$A = 7 \cdot 2$

$A = 14$ square units

b. Use the area of the parallelogram to determine the area of one trapezoid. Explain your reasoning.

7 square units, *Explanations vary.* The area of one trapezoid is equal to half the area of the parallelogram. $\frac{1}{2} \cdot 14 = 7$ square units

c. What formula can you use to determine the area of a trapezoid? Explain your reasoning.

$A = \frac{1}{2}h(b_1 + b_2)$. *Explanations vary.* The height of the trapezoid is the same as the height of the parallelogram. The base of the parallelogram is the sum of b_1 and b_2. The area of one trapezoid is half the area of the parallelogram.

Accelerated 6 | Unit 1 Lesson 6 42 Activity 2

Key Takeaway: The area of a *trapezoid* is half the product of the sum of its bases and its height: $A = \frac{1}{2}h(b_1 \cdot b_2)$.

Whole Class | 5 min

Synthesis

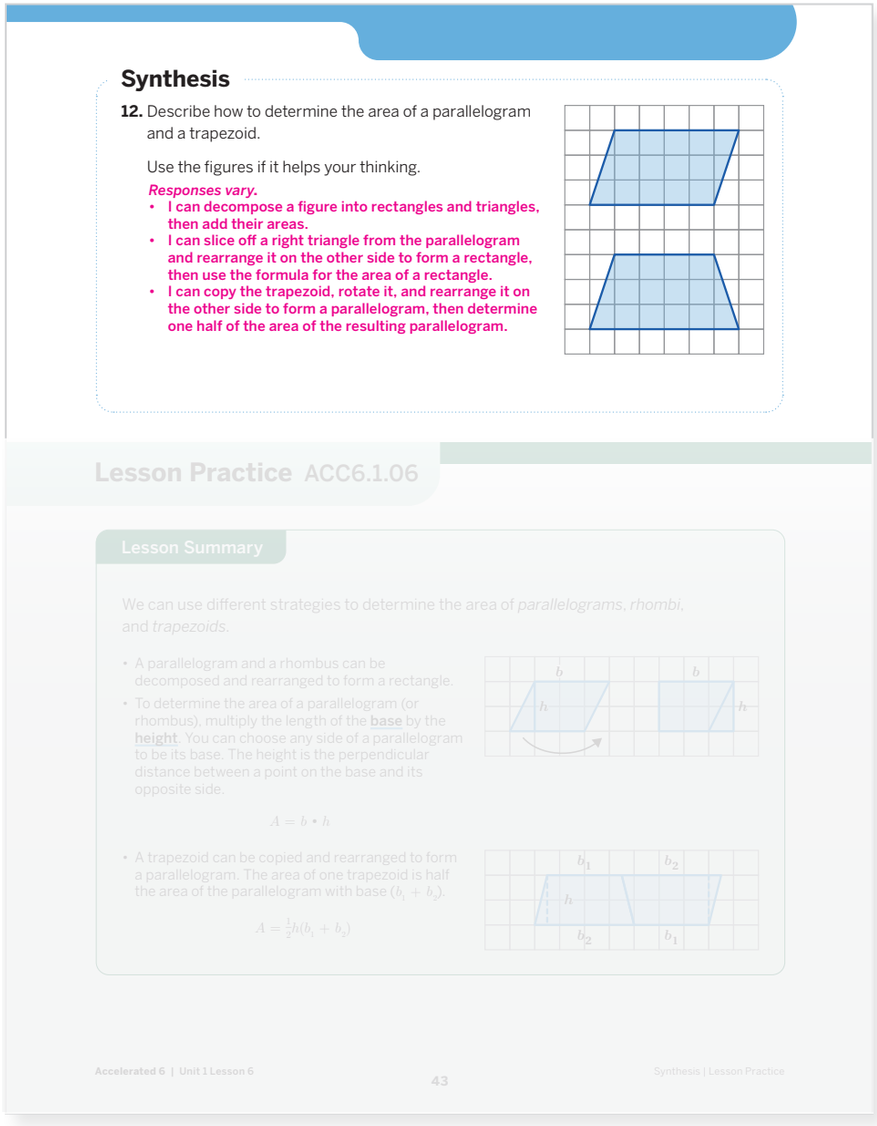
Purpose: Students synthesize their understanding of how to use different strategies to determine the areas of a parallelogram and a trapezoid.

Invite students to respond independently, and then share their thinking with a partner.

Look for and share a variety of ideas, such as:

- Decomposing and rearranging is a helpful strategy for determining areas of quadrilaterals.
- A parallelogram and a rhombus have the same area as a rectangle with the same base and height.
- Two copies of a trapezoid can form a parallelogram, so you can halve the area of the parallelogram to get the area of the trapezoid.

Create an anchor chart with images and formulas determining the areas of special quadrilaterals. Use different colors to connect the dimensions in the figures to the variables in the formulas.



Synthesis

12. Describe how to determine the area of a parallelogram and a trapezoid.

Use the figures if it helps your thinking.

Responses vary.

- I can decompose a figure into rectangles and triangles, then add their areas.
- I can slice off a right triangle from the parallelogram and rearrange it on the other side to form a rectangle, then use the formula for the area of a rectangle.
- I can copy the trapezoid, rotate it, and rearrange it on the other side to form a parallelogram, then determine one half of the area of the resulting parallelogram.

Lesson Practice ACC6.1.06

Lesson Summary

We can use different strategies to determine the area of *parallelograms*, *rhombi*, and *trapezoids*.

- A parallelogram and a rhombus can be decomposed and rearranged to form a rectangle.
- To determine the area of a parallelogram (or rhombus), multiply the length of the base by the height. You can choose any side of a parallelogram to be its base. The height is the perpendicular distance between a point on the base and its opposite side.

$A = b \cdot h$

- A trapezoid can be copied and rearranged to form a parallelogram. The area of one trapezoid is half the area of the parallelogram with base $(b_1 + b_2)$.

$A = \frac{1}{2}h(b_1 + b_2)$

Accelerated 6 | Unit 1 Lesson 6 43 Synthesis | Lesson Practice

Lesson Takeaway: To calculate the area A of a parallelogram, use the formula $A = b \cdot h$, where b represents the length of the **base** and h represents the length of the corresponding **height**. To calculate the area A of a trapezoid, use the formula $A = \frac{1}{2}h(b_1 \cdot b_2)$, where b_1 and b_2 are its bases and h is its height.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by determining the area of the parallelograms, rhombi, and trapezoids using different approaches.

Today's Goals

1. **Goal:** Derive the formula for the area of a parallelogram from the formula of a rectangle and determine areas of parallelograms and rhombi.
2. **Goal:** Derive the formula for the area of a trapezoid from the formula for a parallelogram and determine the areas of trapezoids.
3. **Language Goal:** Compare and contrast strategies for determining the areas of a parallelogram, a rhombus, and a trapezoid. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

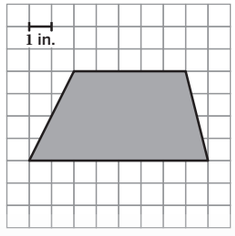
Name: _____ Date: _____ Period: _____

Show What You Know 1.06

What is the area of this polygon?

Draw on the image if it helps with your thinking.

26 square inches



Differentiation Use after Lesson 6

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to calculate the area of parallelograms, rhombi and trapezoids:

» **Respond to Student Thinking:**

- Use ***Calculating the Area of Parallelograms Mini-lesson***.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Reflect on the facilitation of the Compare and Connect routine in this lesson. Who shared in the whole class discussion? Who did not? What follow up questions did you ask to help students deepen their thinking? How did you push students to think about multiple strategies?"

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

12. Describe how to determine the area of a parallelogram and a trapezoid.

Use the figures if it helps your thinking.

Responses vary.

- I can decompose a figure into rectangles and triangles, then add their areas.
- I can slice off a right triangle from the parallelogram and rearrange it on the other side to form a rectangle, then use the formula for the area of a rectangle.
- I can copy the trapezoid, rotate it, and rearrange it on the other side to form a parallelogram, then determine one half of the area of the resulting parallelogram.

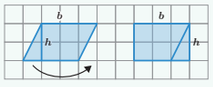
Lesson Practice ACC6.1.06

Lesson Summary

We can use different strategies to determine the area of *parallelograms*, *rhombi*, and *trapezoids*.

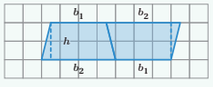
- A parallelogram and a rhombus can be decomposed and rearranged to form a rectangle.
- To determine the area of a parallelogram (or rhombus), multiply the length of the **base** by the **height**. You can choose any side of a parallelogram to be its base. The height is the perpendicular distance between a point on the base and its opposite side.

$$A = b \cdot h$$



- A trapezoid can be copied and rearranged to form a parallelogram. The area of one trapezoid is half the area of the parallelogram with base $(b_1 + b_2)$.

$$A = \frac{1}{2}h(b_1 + b_2)$$

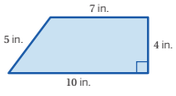


Lesson Practice ACC6.1.06

Name: _____ Date: _____ Period: _____

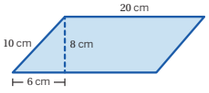
Problems 1–4: Determine the area of each figure.

1.



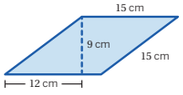
34 square inches

2.



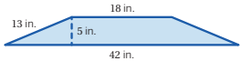
160 square centimeters

3.



135 square centimeters

4.



150 square inches

5. A wall tile in the shape of a parallelogram has horizontal side lengths of 4 inches and diagonal side lengths of 2.5 inches. The height of the tile is 1.5 inches. What is the area of the wall tile in square inches?

6 square inches

6. A sign is in the shape of a rhombus. Each side length is 28 centimeters with a height of 12 centimeters. What is the area of the sign in square centimeters?

336 square centimeters

Lesson Practice ACC6.1.06

Name: _____ Date: _____ Period: _____

7. The shape of a park resembles a trapezoid with bases 15 miles and 20 miles and a height of 10 miles. What is the area of the park in square miles?

175 square miles

FAST Practice

8. The parallel sides of an isosceles trapezoid are 20 millimeters and 56 millimeters. The congruent sides are 30 millimeters. The height of the trapezoid is 24 millimeters. What is the area in square millimeters?

A. 912 square millimeters

B. 1,140 square millimeters

C. 1,824 square millimeters

D. 2,280 square millimeters

Spiral Review

Problems 9–12: Evaluate each expression.

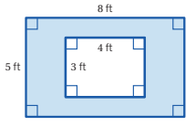
9. $0.384 - 0.106 = 0.278$

10. $45.7 + 3.59 = 49.29$

11. $2\frac{3}{4} + \frac{5}{8} = 3\frac{3}{8}$

12. $4\frac{1}{2} - 1\frac{1}{5} = 3\frac{3}{10}$

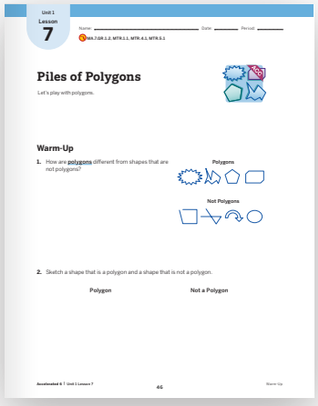
13. Calculate the area of the shaded region. Show or explain your thinking.



28 square feet. *Explanations vary.* **I subtracted the area of the small rectangle from the area of the large rectangle.** $(5 \cdot 8) - (3 \cdot 4) = 40 - 12 = 28$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.7.GR.1.1
	5–7	2	MA.7.GR.1.1
FAST Practice	**8**	2	MA.7.GR.1.1
Spiral Review			
	9–10	1	MA.5.NSO.2.3
	11–12	1	MA.5.FR.2.1
	13	2	MA.6.GR.2.2


Unit 1
Lesson 7
Piles of Polygons
Let's play with polygons.
Warm-Up
1. How are polygons different from shapes that are not polygons?
Polygons
Not Polygons
2. Sketch a shape that is a polygon and a shape that is not a polygon.
Polygon
Not a Polygon
46

Pile of Polygons

Investigating Polygons and Their Areas

Let's play with polygons.

Learning Outcomes

Today's Goals

1. **Goal:** Determine the area of a *polygon* with and without a grid using the areas of rectangles and triangles.
2. **Language Goal:** Describe strategies for determining the area of polygons using precise mathematical language. **(Writing, Speaking, and Listening)**
3. **Language Goal:** Describe polygons using their characteristics. **(Writing, Speaking, and Listening)**

Students apply what they've learned about calculating the areas of quadrilaterals and triangles to a new category of shapes: **polygons**. They first define the characteristics of polygons, then develop strategies for calculating their areas with and without a grid. They analyze the features of shapes to inform the way they choose to decompose a figure.

Coherence

Prior Learning

In Lesson 6, students explored strategies for determining the areas of parallelograms, trapezoids, and rhombi.

Future Learning

In Lesson 8, students will solve problems involving areas of composite figures by decomposing them into triangles and quadrilaterals.

Connections

- Students explore visuals of the areas of polygons given it's vertices on a coordinate plane. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.7.GR.1.2

Solve mathematical or real-world problems involving the area of polygons or composite figures by decomposing them into triangles or quadrilaterals.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.4.1, MTR.5.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.6.GR.2.2	MA.912.GR.3.4, MA.912.GR.4.4

Vocabulary

New Vocabulary

polygon

Lesson at a Glance

~ 45 min

MA.7.GR.1.2

Warm-Up

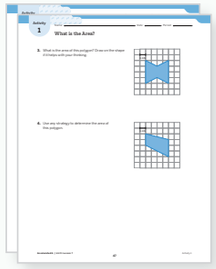
Pairs | 5 min

Students identify features of **polygons** by looking at examples and non-examples before drawing one of each. MLR2: Collect and Display

Activity 1

Pairs | 15 min

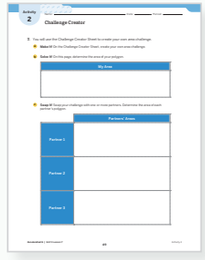
Students use MLR3: Critique, Correct, Clarify to make sense of multiple strategies for precisely calculating the area of a polygon with and without a grid. **(MTR.4.1)**



Activity 2

Pairs | 15 min

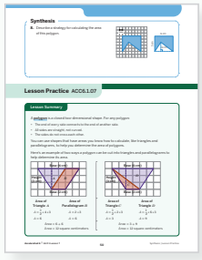
Students create their own polygon and calculate its area. They then challenge themselves to calculate the area of their classmates' polygons.



Synthesis

Whole Class | 5 min

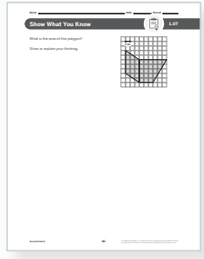
Students synthesize their understanding of how to calculate the area of a polygon with and without a grid. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating the area of a polygon.



Prep Checklist

Prepare copies of the Warm-Up Sheet and the Activity 2

This lesson includes:

- Student Edition
- Show What You Know
- Graph paper / straightedges (optional)

Pairs | 5 min

Warm-Up

Purpose: Students identify features of **polygons** by looking at examples and non-examples before drawing one of each.

1 Launch

Direct students' attention to the shapes labeled "Polygons" and "Not Polygons." Consider sharing that *polygon* is a word that describes some types of shapes but not others, and that students' task is to figure out what makes a shape a polygon.

Listen for students who mention the traditional characteristics of polygons (straight sides, closed shapes, no intersections) as well as creative or unique characteristics, and display these ideas during the Connect.

2 Connect

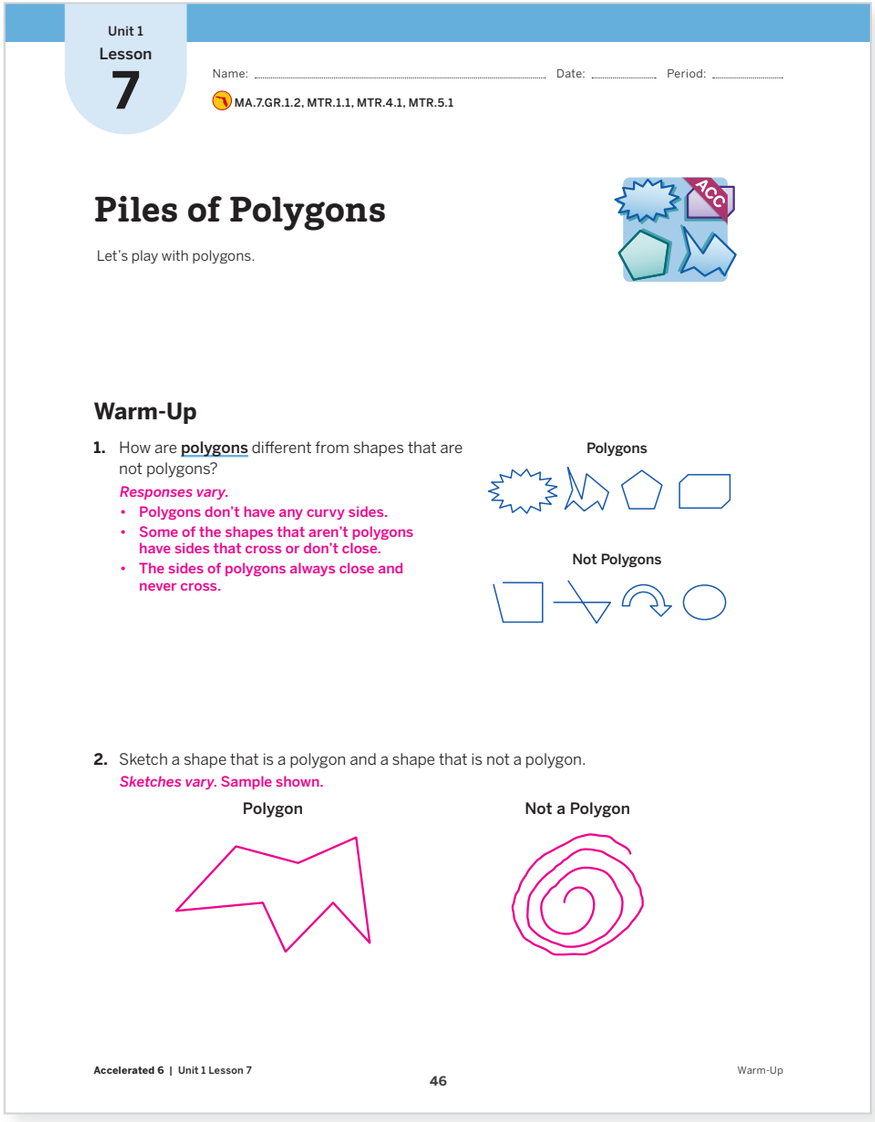
Invite students to share their sketches. Look for a variety of polygons and non-polygons.

MLR **MLR2: Collect and Display** Use this routine to collect students' language as they share words to describe polygons and their polygon examples. Display for students to reference and add to for the rest of the lesson.

Pause briefly to draw a cube and consider asking, "Would a 3-D shape like a cube be considered a polygon?" No, polygons are 2-D shapes.

Create a class definition for the term **polygon** using students' language and the glossary. Consider asking, "What words are most important to include in our definition?"

Display sketched polygons and invite students to decide if they meet the class-created definition of polygons.



Unit 1
Lesson
7

Name: Date: Period:

MA.7.GR.1.2, MTR.1.1, MTR.4.1, MTR.5.1

Piles of Polygons

Let's play with polygons.

Warm-Up

1. How are **polygons** different from shapes that are not polygons?

Responses vary.

- Polygons don't have any curvy sides.
- Some of the shapes that aren't polygons have sides that cross or don't close.
- The sides of polygons always close and never cross.

Polygons

Not Polygons

2. Sketch a shape that is a polygon and a shape that is not a polygon.

Sketches vary. Sample shown.

Polygon

Not a Polygon

Accelerated 6 | Unit 1 Lesson 7 46 Warm-Up

Key Takeaway: A **polygon** is a closed 2-D shape with straight sides that do not cross each other.

Pairs | 15 min

Activity 1 What is the Area?

Purpose: Students use MLR3: Critique, Correct, Clarify to make sense of multiple strategies for precisely calculating the area of a polygon with and without a grid. **(MTR.4.1)**

Short on time? Consider omitting Problem 5, taking note of common mistakes in Problems 4 and 6 instead.

1 Launch

Direct students' attention to the image and consider inviting students to discuss the following with their peers:

- "How would you describe the shape?"
- "How does the structure of the shape influence what strategy you might use to calculate the area?" **(MTR.5.1)**

2 Monitor

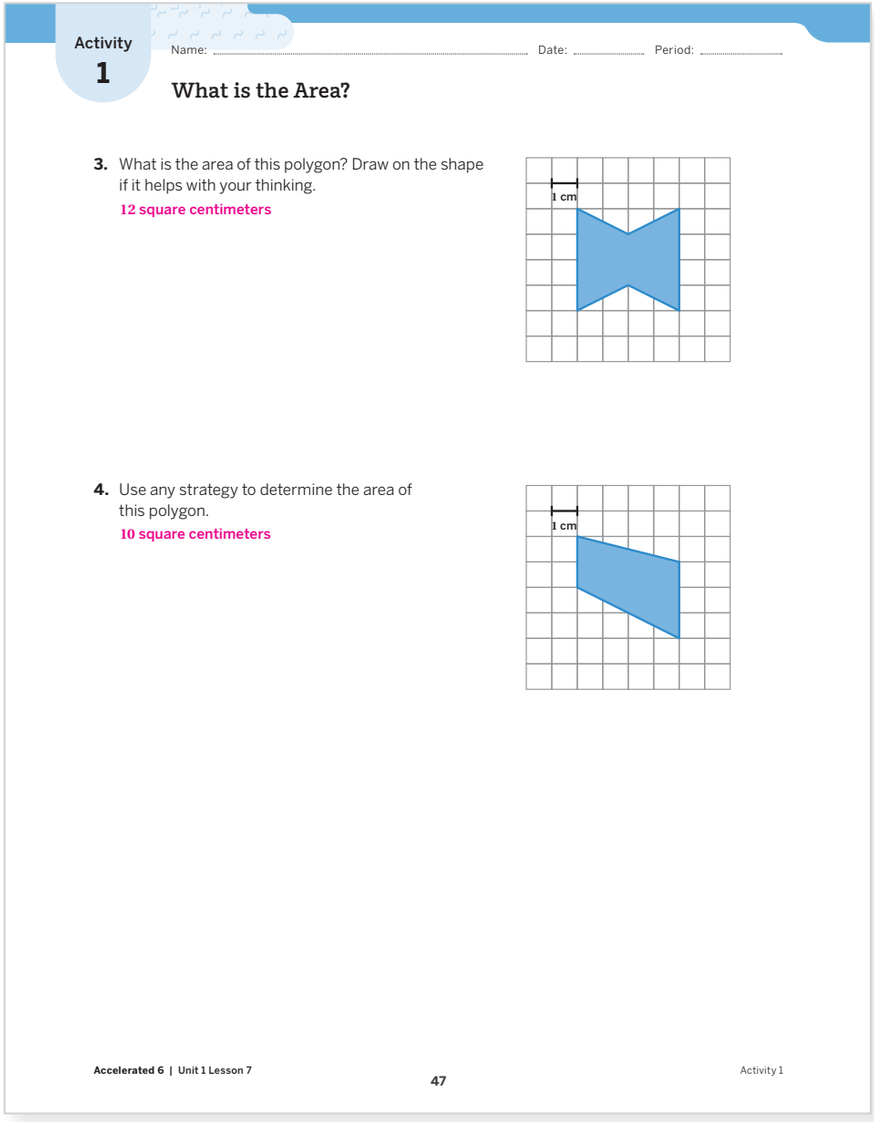
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to use the grid to support their thinking. Consider asking: • "How is this polygon similar to one you know how to determine the area of?" • "Can you cut the polygon into pieces that would be helpful?"
Calculate the area by counting one by one.	**Strengthen** Consider asking, "What would a more efficient strategy look like to determine the area?"
Calculate the area by breaking the shape into triangles and parallelograms.	**Stretch** Invite students to share their strategy with a peer and consider asking, "Are there other ways to decompose this shape? Can you prove it would give you the same area?" **(MTR.1.1)**
Calculate the area by enclosing the shape in a rectangle.	

A Accessibility: Visual-Spatial Processing

Pair students and invite them to record any known measurements (like the vertical side length) before calculating the area of the polygon in order to support students who struggle with visual-spatial processing.

Activity 1 continued >



Activity 1

Name: Date: Period:

What is the Area?

3. What is the area of this polygon? Draw on the shape if it helps with your thinking.

12 square centimeters

4. Use any strategy to determine the area of this polygon.

10 square centimeters

Accelerated 6 | Unit 1 Lesson 7 47 Activity 1

Pairs | 15 min

Activity 1 What is the Area? (continued)

Purpose: Students use MLR3: Critique, Correct, Clarify to make sense of multiple strategies for precisely calculating the area of a polygon with and without a grid. **(MTR.4.1)**

Short on time? Consider omitting Problem 5, taking note of common mistakes in Problems 4 and 6 instead.

2 Monitor

Invite students to compare the strategy they used in the previous problem to Jasmine's and Callen's strategies.

Encourage students to share their responses with a partner and decide if their reasoning was similar to or different from their own. **(MTR.4.1)**

To support students getting started, consider asking:

- "How might we divide this polygon into more recognizable shapes like parallelograms and triangles?"
- "How do the side lengths 5 and 2 give us helpful information about the height of the triangle?" **(MTR.1.1)**

  The height of the triangle is 3 because $5 - 2 = 3$.

A **Accessibility: Visual-Spatial Processing** Provide graph paper for students to draw the polygon on if desired.

Select and sequence responses that include different methods of decomposing areas, including:

- parallelogram + triangle
- triangle + triangle
- enclosed rectangle − triangle

D **Differentiation: (Stretch)** Draw a different polygon with the same area.

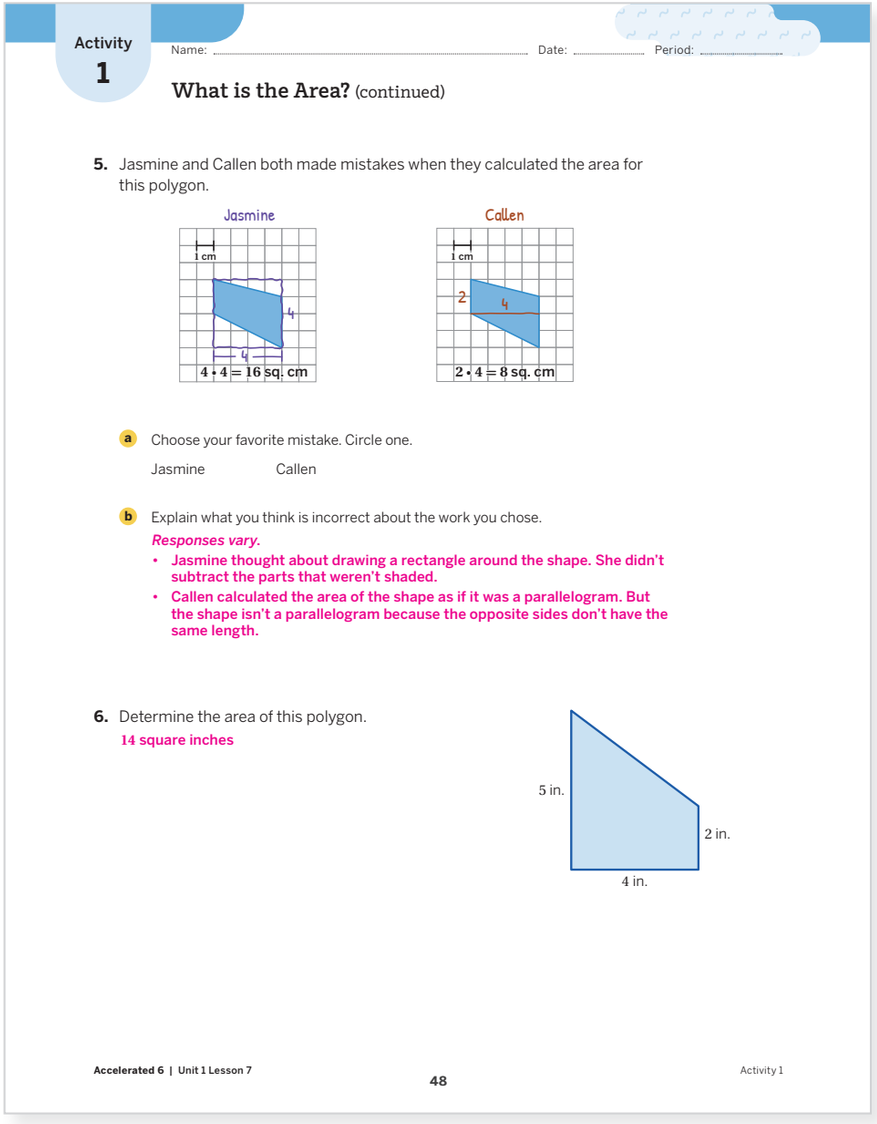
3 Connect

MLR **MLR3: Critique, Correct, Clarify** Use this routine to help students describe strengths, errors, and ambiguities in Jasmine and Callen's work. Then invite students to:

a. Discuss what is *correct* about the responses.
b. Discuss what is *incorrect* or *unclear*.
c. Write a question to help Jasmine see how their work can be improved, or create a revised response. **(MTR.4.1)**

Invite students to share how they determined the area of the given polygon.

To surface the Key Takeaway, consider asking, "Which strategy for determining the area of a polygon makes the most sense to you? Which do you have questions about?"



Activity 1

Name: Date: Period:

What is the Area? (continued)

5. Jasmine and Callen both made mistakes when they calculated the area for this polygon.

Jasmine

Callen

a. Choose your favorite mistake. Circle one.

Jasmine Callen

b. Explain what you think is incorrect about the work you chose.

Responses vary.

- Jasmine thought about drawing a rectangle around the shape. She didn't subtract the parts that weren't shaded.
- Callen calculated the area of the shape as if it was a parallelogram. But the shape isn't a parallelogram because the opposite sides don't have the same length.

6. Determine the area of this polygon.

14 square inches

Accelerated 6 | Unit 1 Lesson 7 48 Activity 1

Key Takeaway: There are many strategies to determine the area of a **polygon**, including breaking it into familiar shapes, enclosing and subtracting, or using a grid or given measurements.

Pairs | 15 min

Activity 2 Challenge Creator

Purpose: Students create their own polygon and calculate its area. They then challenge themselves to calculate the area of their classmates' polygons.

1 Launch

Invite students to create and calculate the area of their own polygon and then create a challenge for others to solve.

Distribute the Activity 2 Sheet so students can create their polygon challenge. Students will need one or more partners for this activity.

Invite students to try as many challenges as they can with the given time and to use multiple strategies.

2 Monitor

A **Accessibility: Executive Functioning** Invite students to work together on a challenge before trying one independently.

Listen for students discussing how to solve for the areas, including decomposing and rearranging or enclosing and subtracting.

Encourage students to annotate their shapes to show their area-calculating strategies so that they can be shared and celebrated with the class.

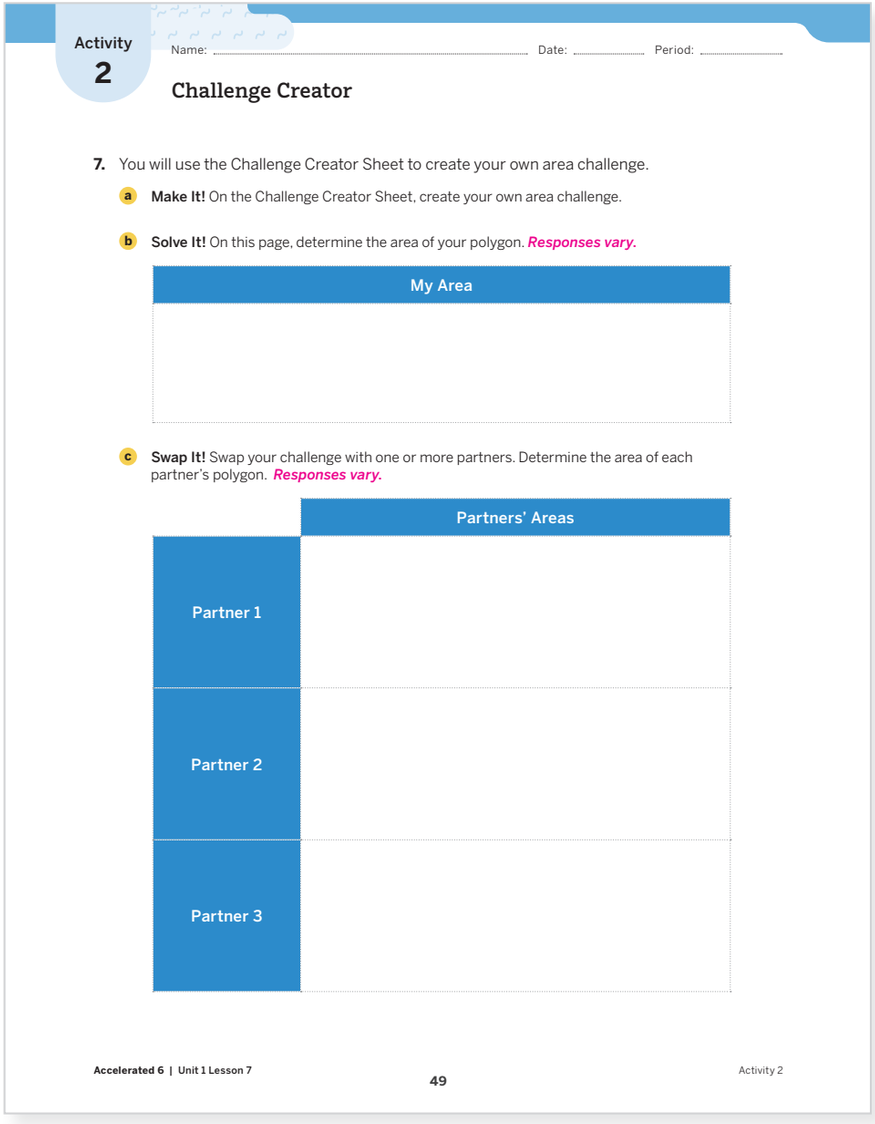
Look for several creative challenges and strategies to share during the Connect.

3 Connect

Share the polygons. Invite students to discuss their shape and what was most challenging about calculating its area.

Consider asking:

- "How did you pick the challenges you wanted to solve?"
- "What made some challenges more complex than others?"
- "How do you decide which strategy to choose?"
- "Would your strategy change if there was no grid? If so, how?"



Activity 2

Name: _____ Date: _____ Period: _____

Challenge Creator

7. You will use the Challenge Creator Sheet to create your own area challenge.

a **Make It!** On the Challenge Creator Sheet, create your own area challenge.

b **Solve It!** On this page, determine the area of your polygon. ***Responses vary.***

My Area

c **Swap It!** Swap your challenge with one or more partners. Determine the area of each partner's polygon. ***Responses vary.***

	Partners' Areas
Partner 1	
Partner 2	
Partner 3	

Accelerated 6 | Unit 1 Lesson 7 49 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of how to calculate the area of a polygon with and without a grid.

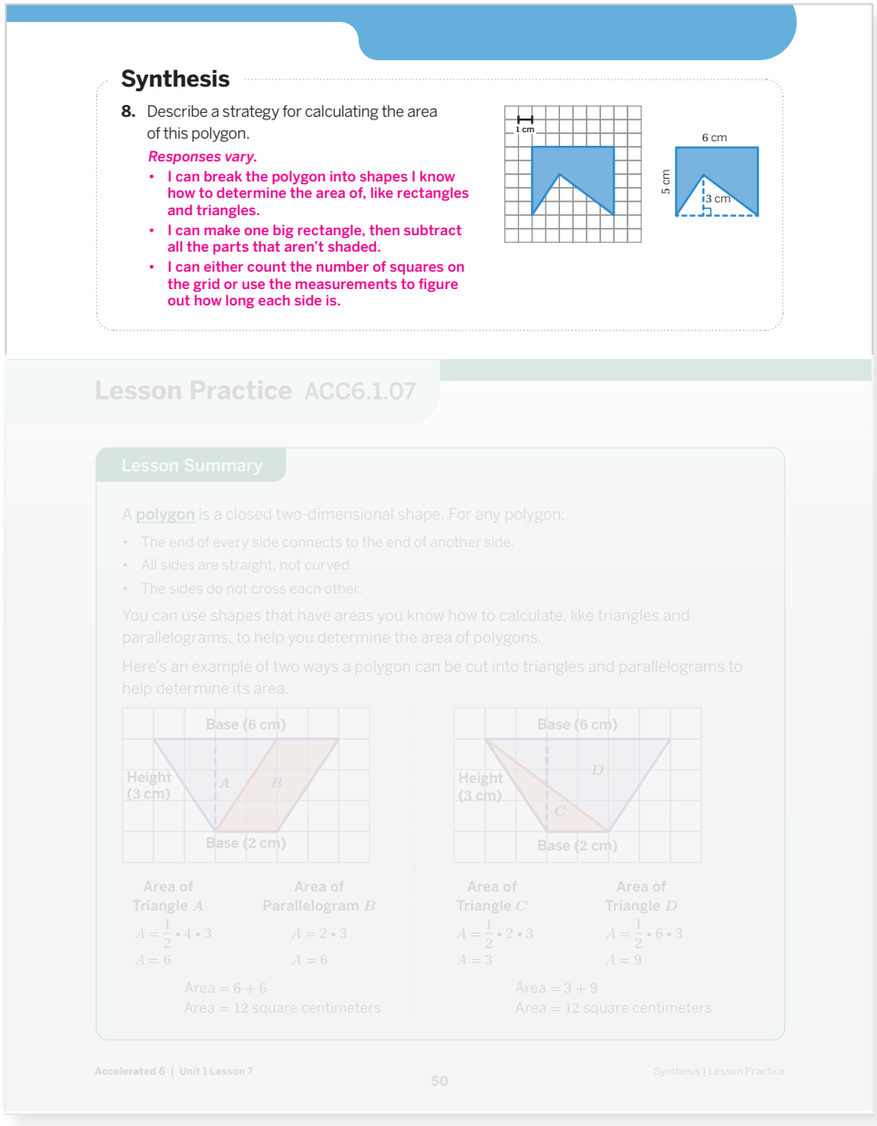
Invite students to respond independently, and then share their thinking with a partner.

ELL **English Language Learners** Give students time to rehearse their ideas with a partner before they are expected to share their ideas with others. Provide sentence frames to help students explain their thinking (e.g., To determine the area of this polygon, first _____. Then, _____.).

Look for and share a variety of ideas, such as:

- I can break the polygon into familiar shapes like rectangles and triangles.
- I can make one big rectangle, then subtract all the parts that are not shaded.
- I can either count the number of squares on the grid or use measurements to figure out how long each side is.

MLR **MLR2: Collect and Display** Use this routine to add strategies for calculating the area of a polygon to the anchor chart created during the Warm-Up.



Synthesis

8. Describe a strategy for calculating the area of this polygon.

Responses vary.

- I can break the polygon into shapes I know how to determine the area of, like rectangles and triangles.
- I can make one big rectangle, then subtract all the parts that aren't shaded.
- I can either count the number of squares on the grid or use the measurements to figure out how long each side is.

Lesson Practice ACC6.1.07

Lesson Summary

A polygon is a closed two-dimensional shape. For any polygon:

- The end of every side connects to the end of another side.
- All sides are straight, not curved.
- The sides do not cross each other.

You can use shapes that have areas you know how to calculate, like triangles and parallelograms, to help you determine the area of polygons.

Here's an example of two ways a polygon can be cut into triangles and parallelograms to help determine its area.

Area of Triangle A: $A = \frac{1}{2} \cdot 4 \cdot 3$, $A = 6$

Area of Parallelogram B: $A = 2 \cdot 3$, $A = 6$

Area $= 6 + 6$

Area $= 12$ square centimeters

Area of Triangle C: $A = \frac{1}{2} \cdot 2 \cdot 3$, $A = 3$

Area of Triangle D: $A = \frac{1}{2} \cdot 6 \cdot 3$, $A = 9$

Area $= 3 + 9$

Area $= 12$ square centimeters

Accelerated 6 | Unit 1 Lesson 7 50 Synthesis | Lesson Practice

Key Takeaway: A **polygon** is a closed 2-D shape with straight sides that do not cross each other. There are many strategies to determine the area of a polygon, including breaking it into familiar shapes, enclosing and subtracting, or using a grid or given measurements.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by calculating the area of a polygon.

Today's Goals

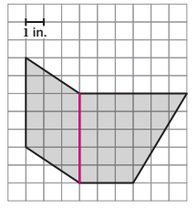
1. **Goal:** Determine the area of a *polygon* with and without a grid using the areas of rectangles and triangles.
2. **Language Goal:** Describe strategies for determining the area of polygons using precise mathematical language. **(Writing, Speaking, and Listening)**
3. **Language Goal:** Describe polygons using their characteristics. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 1.07

What is the area of this polygon?



Show or explain your thinking.

37.5 square inches

Explanations may vary. I divided the figure into a parallelogram and a trapezoid. The parallelogram had a base of 5 inches and a height of 3 inches. The trapezoid had bases of 6 inches and 3 inches and a height of 5 inches. The parallelogram has an area of $A = 5 \times 3 = 15$ square inches. The trapezoid has an area of $A = \frac{(6+3)}{2} \times 5 = 22.5$ square inches. $15 + 22.5 = 37.5$ square inches.

D Differentiation Use after Lesson 7

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to make sense of different strategies:

» **Respond to Student Thinking:**

- Revisit the Challenge Creator in Activity 2 and invite students to solve additional problems.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Reflect on the connections students made between polygons and area strategies. Students will continue making connections in the next lesson. How did students show and describe connections? How can they apply what they've discovered when determining the areas of more complex shapes?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

8. Describe a strategy for calculating the area of this polygon.

Responses vary.

- I can break the polygon into shapes I know how to determine the area of, like rectangles and triangles.
- I can make one big rectangle, then subtract all the parts that aren't shaded.
- I can either count the number of squares on the grid or use the measurements to figure out how long each side is.

Lesson Practice ACC6.1.07

Lesson Summary

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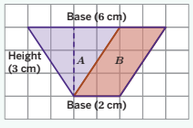


Area of Triangle A

$A = \frac{1}{2} \cdot 4 \cdot 3$

$A = 6$

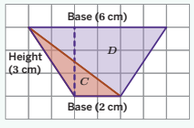
Area of Parallelogram B

$A = 2 \cdot 3$

$A = 6$

Area $= 6 + 6$

Area $= 12$ square centimeters



Area of Triangle C

$A = \frac{1}{2} \cdot 2 \cdot 3$

$A = 3$

Area of Triangle D

$A = \frac{1}{2} \cdot 6 \cdot 3$

$A = 9$

Area $= 3 + 9$

Area $= 12$ square centimeters

Lesson Practice ACC6.1.07

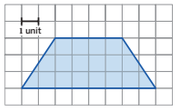
Name: _____ Date: _____ Period: _____

1. Select *all* the polygons.

- ☑ A.
- ☐ B.
- ☑ C.
- ☐ D.
- ☐ E.
- ☐ F.

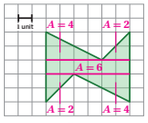
2. Determine the area of this polygon. Each square has an area of 1 square unit.

18 square units



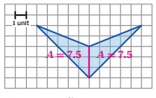
Problems 3–4: Determine the area of each polygon. Show your thinking.

3.



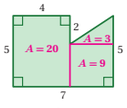
18 square units

4.



15 square units

5. Clare is reviewing the blueprint for a new addition to her home. What is the area for the addition if each unit represents 1 square foot?



32 square feet

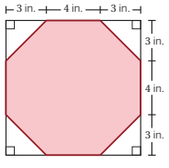
Lesson Practice ACC6.1.07

Name: _____ Date: _____ Period: _____

FAST Practice

6. What is the total area of the shaded figure in square inches?

- A. 16
- B. 64
- C. 82
- D. 100



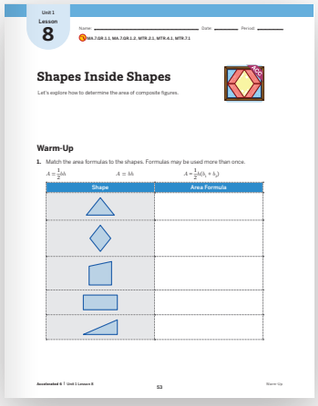
Spiral Review

7. Select *all* the expressions that are equivalent to $18 + 20 \div 2 - 6$.

- ☑ A. $28 - 6$
- ☐ B. $38 \div 2 - 6$
- ☑ C. 22
- ☑ D. $18 + 10 - 6$
- ☐ E. 13

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.7.GR.1.2
	2–5	2	MA.7.GR.1.2
FAST Practice	6	2	MA.7.GR.1.2
Spiral Review			
	7	2	MA.5.AR.2.2


Unit 1
Lesson 8

Shapes Inside Shapes

Let's explore how to determine the area of composite figures.

Warm-Up

1. Match the area formulas to the shapes. Formulas may be used more than once.

Shape	Area Formula

53

Shapes Inside Shapes

Area of Composite Figures

Let's explore how to determine the area of composite figures.

Learning Outcomes

Today's Goals

1. **Goal:** Decompose composite figures to determine the total area.
2. **Goal:** Decompose composite figures to determine the area of shaded parts.
3. **Language Goal:** Describe how decomposition can be used to calculate area of composite figures and area of shaded parts in composite figures. **(Reading, Writing, and Speaking)**

Students use their knowledge of determining the area of triangles and quadrilaterals to determine the total area of composite figures and the area of shaded parts of composite figures. They apply this knowledge to solve real-world problems involving composite figures. **(MTR.2.1, MTR.7.1)**

Coherence

Prior Learning

In Lesson 6, students used formulas to determine the areas of trapezoids, parallelograms, and rhombi. In Lesson 7, students used decomposition to determine the area of quadrilaterals.

Future Learning

In a future course, students will apply strategies for determining the areas of composite figures to calculate the areas of complex shapes composed of parts of circles and squares.

Connections

- Students connect the concept of real-world scenarios involving area calculations, such as finding the area of a deck by breaking them down into simpler shapes like rectangles and triangles. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.7.GR.1.2
Solve mathematical or real-world problems involving the area of polygons or composite figures by decomposing them into triangles or quadrilaterals.

Also Addressing: **MA.7.GR.1.1**

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.4.1, MTR.7.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.6.GR.2.2	**MA.912.GR.3.4**
	MA.912.GR.4.4

Lesson at a Glance

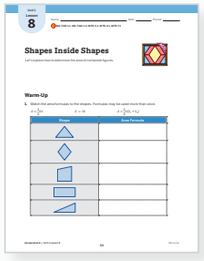
~ 45 min

MA.7.GR.1.1, MA.7.GR.1.2

Warm-Up

Pairs | 5 min

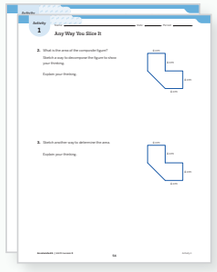
Students match area formulas to different figures.



Activity 1

Pairs | 15 min

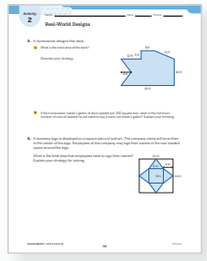
Students decompose figures in more than one way and analyze different strategies to determine the area of composite figures.
Routine: Decide and Defend **(MTR.2.1)**



Activity 2

Pairs | 15 min

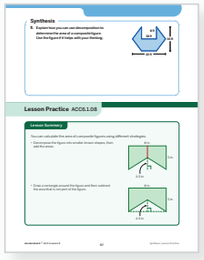
Students determine the total area of a composite figure and the area of a shaded region to solve real-world problems. MLR1: Stronger and Clearer Each Time **(MTR.7.1)**



Synthesis

Whole Class | 5 min

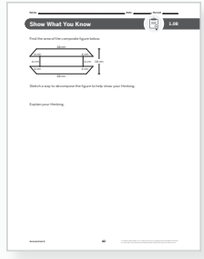
Students synthesize their understanding of how to calculate the area of composite figures.
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by of finding area by decomposing composite figures.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students match area formulas to different figures.

Short on time? Consider omitting the Warm-Up

1 Launch

To support students getting started, consider asking them to describe and categorize the figures named.

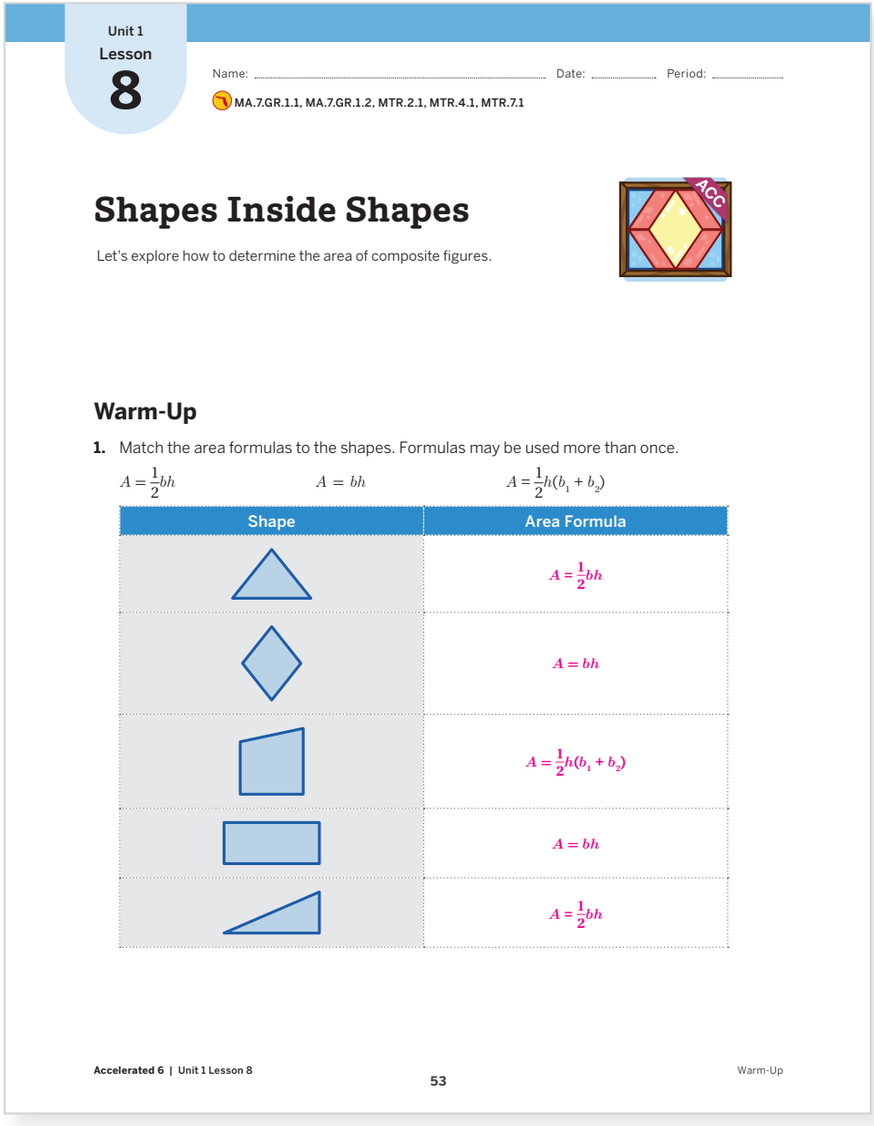
A **Accessibility: Memory and Attention** Encourage students who struggle with understanding what the variables represent in the formulas to write out the words next to the variables. For example, students would write "height" for h and "base 1" for b_1.

2 Connect

Look for and share students' matches, inviting each pair to share their method for determining the matches.

Consider asking:

- "What do the variables represent in the formulas?"
- "How are the formulas similar and different?"



Unit 1
Lesson
8

Name: ..... Date: ..... Period: .....

MA.7.GR.1.1, MA.7.GR.1.2, MTR.2.1, MTR.4.1, MTR.7.1

Shapes Inside Shapes

Let's explore how to determine the area of composite figures.

Warm-Up

1. Match the area formulas to the shapes. Formulas may be used more than once.

$A = \frac{1}{2}bh$ $A = bh$ $A = \frac{1}{2}h(b_1 + b_2)$

Shape	Area Formula
	$A = \frac{1}{2}bh$
	$A = bh$
	$A = \frac{1}{2}h(b_1 + b_2)$
	$A = bh$
	$A = \frac{1}{2}bh$

Accelerated 6 | Unit 1 Lesson 8 53 Warm-Up

Pairs | 15 min

Activity 1 Any Way You Slice It

Purpose: Students decompose figures in more than one way and analyze different strategies to determine the area of composite figures. **(MTR.2.1)**

1 Launch

To support students getting started, consider asking:

- "What are some shapes for which you know their area formulas?"
- "Do you see a way to decompose the figure into these shapes?"

2 Monitor

Listen for students discussing how to decompose the figure using different strategies and shapes.

D Differentiation *(Problem 3)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to draw lines to determine the different shapes included in the figure.
Use a wrong formula when solving.	**Strengthen** Encourage students to write down the possible area formulas they may need to solve.
Get a different area when solving this second way.	**Strengthen** Consider asking, "Does the area in the figure change when you change how you break it up?"
Would like to explore more ways to decompose the figure.	**Stretch** Challenge students to decompose the figure into different types of shapes such as a parallelogram or an isosceles triangle.

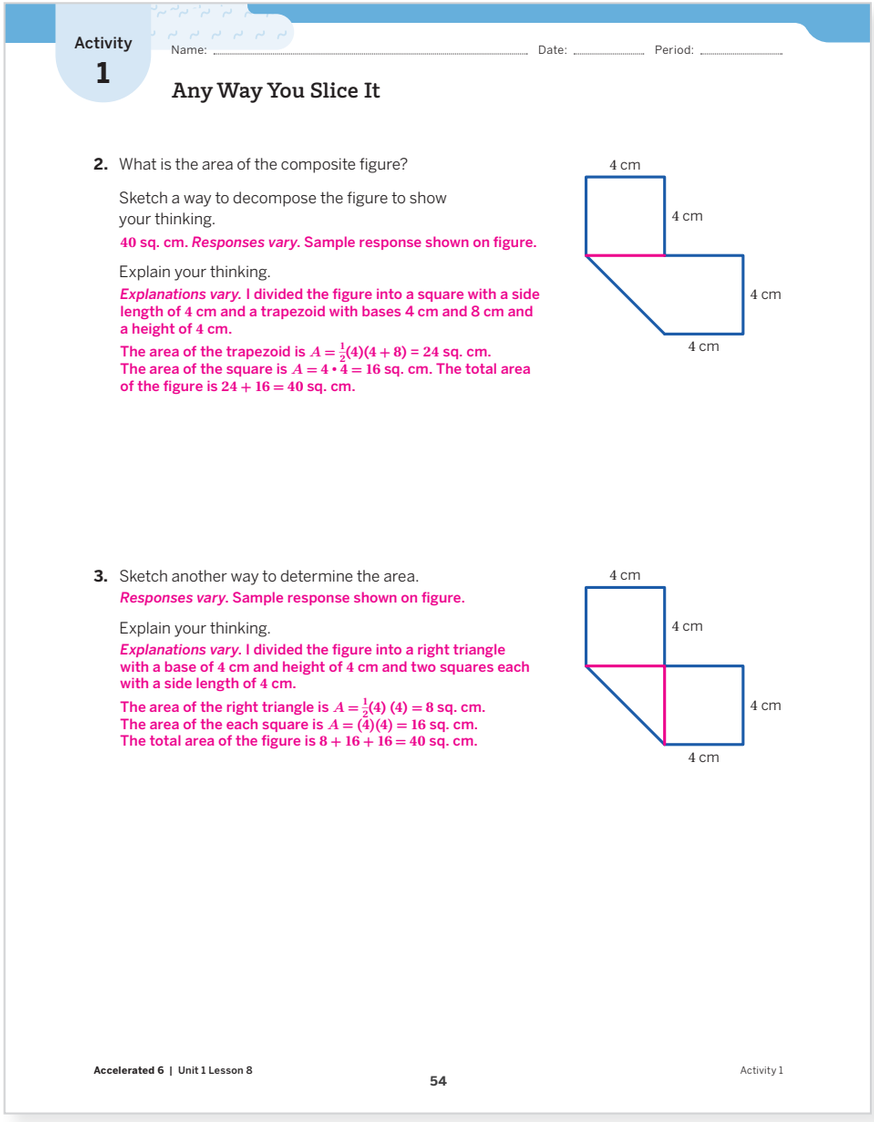
ELL English Language Learners Invite students to share what the word decompose means to them in their own words. Encourage them to create different drawings to illustrate the meaning of the word.

3 Connect

Invite students to share their strategies for decomposing the composite figure. Consider sharing different ways to decompose the figure if they do not come up during the discussion. **(MTR.2.1)**

Consider asking, "How does performing this second decomposition validate your original answer?"

Activity 1 continued >



Activity 1

Name: Date: Period:

Any Way You Slice It

2. What is the area of the composite figure?

Sketch a way to decompose the figure to show your thinking.

40 sq. cm. *Responses vary.* Sample response shown on figure.

Explain your thinking.

Explanations vary. I divided the figure into a square with a side length of 4 cm and a trapezoid with bases 4 cm and 8 cm and a height of 4 cm.

The area of the trapezoid is $A = \frac{1}{2}(4)(4 + 8) = 24$ sq. cm.
The area of the square is $A = 4 \cdot 4 = 16$ sq. cm. The total area of the figure is $24 + 16 = 40$ sq. cm.

3. Sketch another way to determine the area.

Responses vary. Sample response shown on figure.

Explain your thinking.

Explanations vary. I divided the figure into a right triangle with a base of 4 cm and height of 4 cm and two squares each with a side length of 4 cm.

The area of the right triangle is $A = \frac{1}{2}(4)(4) = 8$ sq. cm.
The area of the each square is $A = (4)(4) = 16$ sq. cm.
The total area of the figure is $8 + 16 + 16 = 40$ sq. cm.

Accelerated 6 | Unit 1 Lesson 8 54 Activity 1

Pairs | 15 min

Activity 1 Any Way You Slice It (continued)

Purpose: Students decompose figures in more than one way and analyze different strategies to determine the area of composite figures. **(MTR.2.1)**

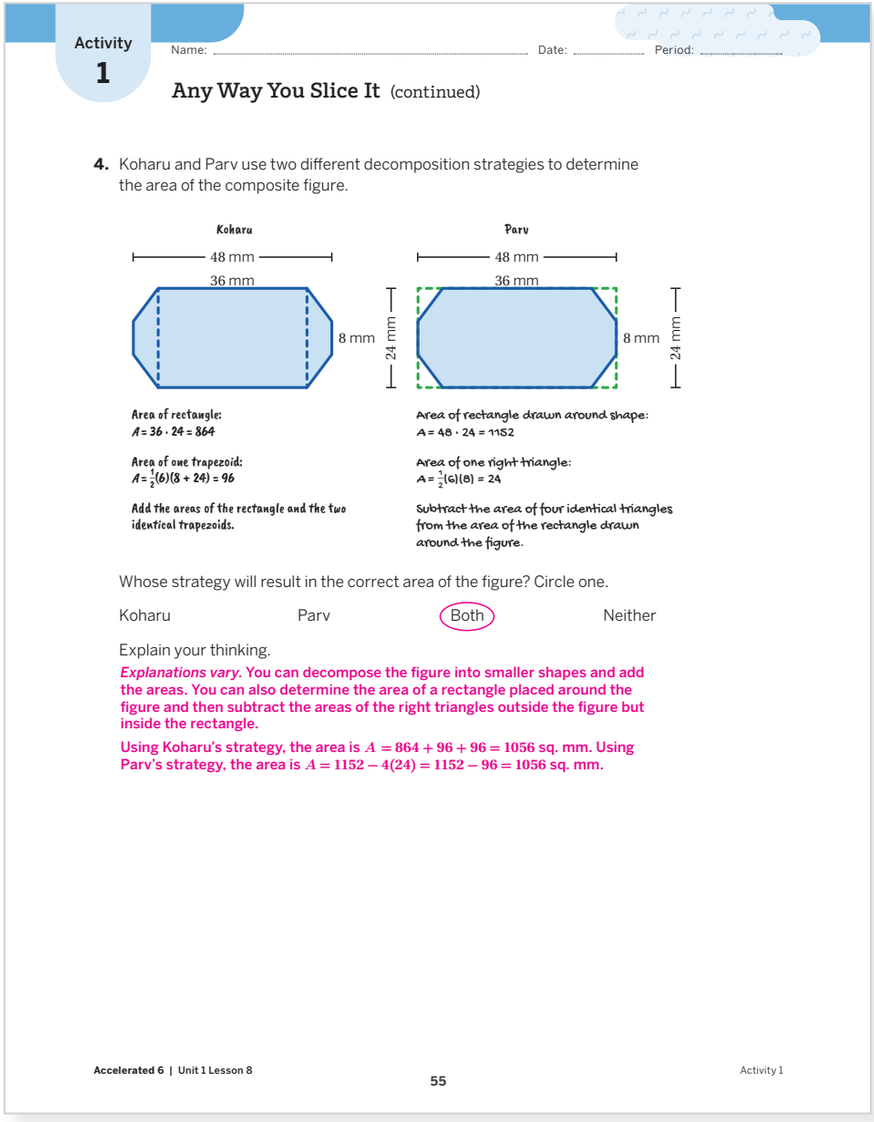
3 Connect

Display the distribution of responses by polling the class.

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others. **(MTR.4.1)**

Invite students who made different choices to use reasoning to convince their classmates.

To surface the Key Takeaway, consider asking, "Which shapes are involved in the two strategies for solving?" **(MTR.2.1)**



Activity 1

Name: Date: Period:

Any Way You Slice It (continued)

4. Koharu and Parv use two different decomposition strategies to determine the area of the composite figure.

Koharu

Area of rectangle:
$A = 36 \cdot 24 = 864$

Area of one trapezoid:
$A = \frac{1}{2}(6)(8 + 24) = 96$

Add the areas of the rectangle and the two identical trapezoids.

Parv

Area of rectangle drawn around shape:
$A = 48 \cdot 24 = 1152$

Area of one right triangle:
$A = \frac{1}{2}(6)(8) = 24$

Subtract the area of four identical triangles from the area of the rectangle drawn around the figure.

Whose strategy will result in the correct area of the figure? Circle one.

Koharu Parv Both Neither

Explain your thinking.

Explanations vary. You can decompose the figure into smaller shapes and add the areas. You can also determine the area of a rectangle placed around the figure and then subtract the areas of the right triangles outside the figure but inside the rectangle.

Using Koharu's strategy, the area is $A = 864 + 96 + 96 = 1056$ sq. mm. Using Parv's strategy, the area is $A = 1152 - 4(24) = 1152 - 96 = 1056$ sq. mm.

Accelerated 6 | Unit 1 Lesson 8 55 Activity 1

Key Takeaway: The area of a composite figure can be determined by using decomposition into smaller shapes and adding or by surrounding the figure and subtracting.

Pairs | 15 min

Activity 2 Real-World Designs

Purpose: Students determine the total area of a composite figure and the area of a shaded region to solve real-world problems. **(MTR.7.1)**

1 Launch

Direct students' attention to the design of the deck. Consider asking, "How can you draw lines on the figure to break it into smaller shapes?"

2 Monitor

Look for students who are able to show multiple ways of decomposing the figure to solve.

A **Accessibility: Fine Motor Skills** Consider providing ways to decompose the figure and labeling one or more measurements in the figure so students can focus on determining the area.

Pause to have students discuss their method for decomposing the figure, calculating the area, and determining how many cans of sealant are needed. **(MTR.7.1)**

Listen for students who notice that they need to determine the area of the larger square first, then determine the area of the shaded parts, and finally subtract those areas to determine the area of the non-shaded region.

MLR **MLR1: Stronger and Clearer Each Time** Consider using this routine to support students in developing precise language when explaining how they determined the area that could be used for writing employees' names. Invite students to meet with other groups, give feedback on each other's explanations, and then use the feedback to write a second clearer explanation. See the Routine Facilitation Guide for more information.

3 Connect

Invite students to share how they determined the minimum number of cans of sealant needed to cover the deck. **(MTR.7.1)**

Create a class summary statement that describes how to use decomposition of composite figures to solve mathematical and real-world problems, including those that ask for total area and those that ask for partial area. Record the statement for students to refer back to later in the unit.

Activity 2

Name: Date: Period:

Real-World Designs

5. A homeowner designs this deck.

a. What is the total area of the deck?

534 sq. ft

Describe your strategy.

Responses vary. I drew a line to separate the trapezoid from the bottom portion. I drew a 32 by 16 rectangle around the bottom portion and subtracted the area of the triangle. Then I added the area of the trapezoid.

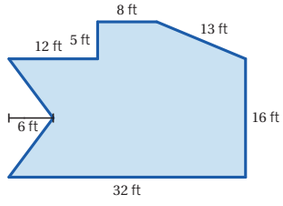
Area of rectangle: $A = 32 \cdot 16 = 512$ sq. ft.

Area of missing triangle: $A = \frac{1}{2}(16)(6) = 48$ sq. ft.

Area of bottom portion: $A = 512 - 48 = 464$ sq. ft.

Area of trapezoid: $A = \frac{1}{2}(5)(8 + 20) = 70$ sq. ft.

Total area: $A = 464 + 70 = 534$ sq. ft.



b. If the homeowner needs 1 gallon of deck sealant per 250 square feet, what is the minimum number of cans of sealant he will need to buy if each can holds 1 gallon? Explain your thinking.

3 cans. *Responses vary.* The homeowner needs $534 \div 250 = 2.136$ gallons of sealant. Since each can is 1 gallon, the homeowner will need a minimum of 3 cans to cover the deck.

6. A business logo is displayed on a square piece of wall art. The company name will be written in the center of the logo. Employees at the company may sign their names in the non-shaded space around the logo.

What is the total area that employees have to sign their names? Explain your strategy for solving.

112 sq. in. *Responses vary.* I determined the area of the larger square, then subtracted the area of the shaded region.

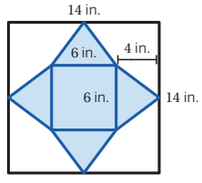
Area of the larger square: $A = 14 \cdot 14 = 196$ sq. in.

Area of the smaller shaded square: $A = 6 \cdot 6 = 36$ sq. in.

Area of one shaded triangle: $A = \frac{1}{2}(6)(4) = 12$ sq. in.

Total shaded area: $A = 36 + 4(12) = 84$ sq. in.

Area of unshaded space: $A = 196 - 84 = 112$ sq. in.



Accelerated 6 | Unit 1 Lesson 8 56 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of how to calculate the area of composite figures.

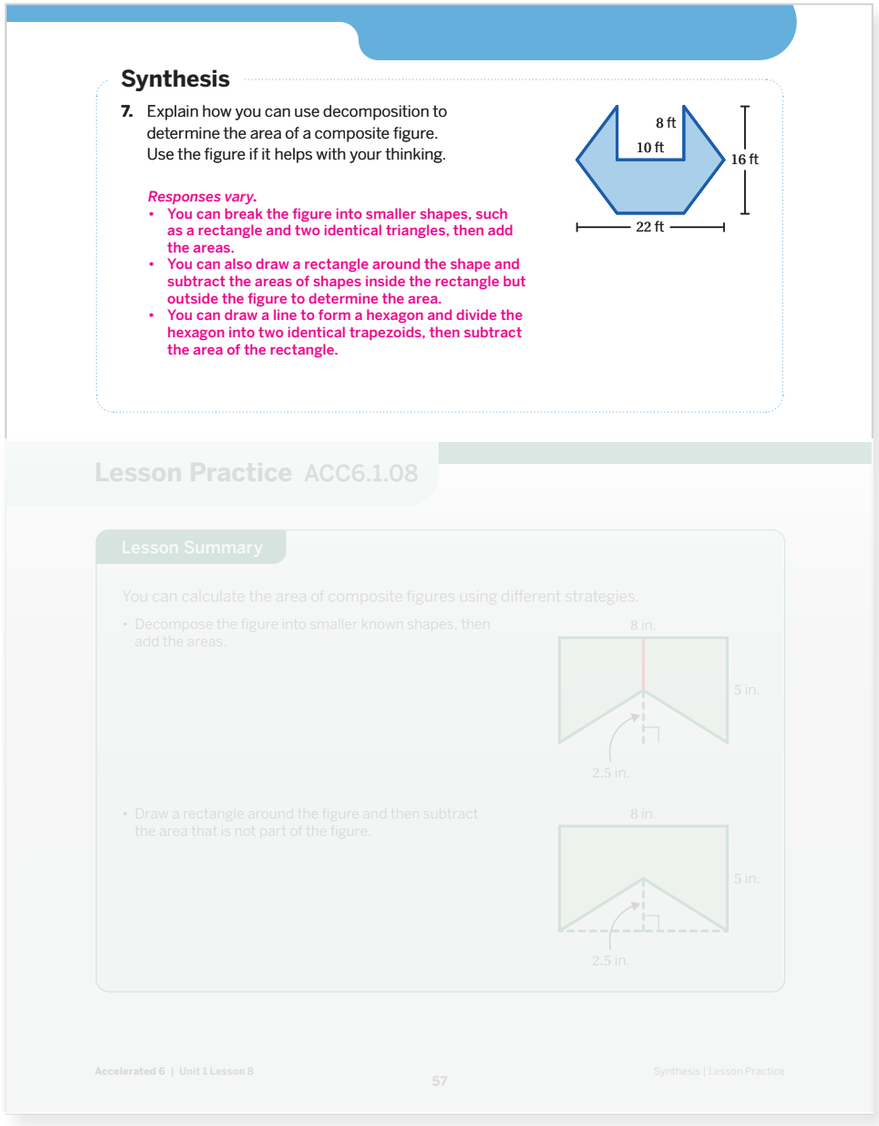
Invite students to respond independently, and then share their thinking with a partner.

Look for and share a variety of ideas, such as:

- Decomposing the figure into smaller shapes such as a rectangle and 2 identical isosceles triangles.
- Decomposing the figure into smaller shapes such as a trapezoid and 2 identical right triangles.
- Drawing a rectangle around the shape and subtracting the parts that aren't shaded.
- Drawing a line to form a hexagon, then decomposing the hexagon into 2 identical trapezoids and subtracting the part that isn't shaded.

MLR **MLR1: Collect and Display** Use this routine to collect students' ideas about calculating the area of a composite figure. Display any new language, examples, or diagrams publicly for students to reference later.

Note: If time allows, invite students to discuss with a partner when it might be more efficient to draw a rectangle around a portion of the figure and subtract areas, instead of adding smaller areas.



Synthesis

7. Explain how you can use decomposition to determine the area of a composite figure. Use the figure if it helps with your thinking.

Responses vary.

- You can break the figure into smaller shapes, such as a rectangle and two identical triangles, then add the areas.
- You can also draw a rectangle around the shape and subtract the areas of shapes inside the rectangle but outside the figure to determine the area.
- You can draw a line to form a hexagon and divide the hexagon into two identical trapezoids, then subtract the area of the rectangle.

Lesson Practice ACC6.1.08

Lesson Summary

You can calculate the area of composite figures using different strategies.

- Decompose the figure into smaller known shapes, then add the areas.

- Draw a rectangle around the figure and then subtract the area that is not part of the figure.

Accelerated 6 | Unit 1 Lesson 8 57 Synthesis | Lesson Practice

Lesson Takeaway: Composite figures can be decomposed into familiar shapes to determine the total area of the figure and to solve problems that require using the area of shaded parts to solve.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of finding area by decomposing composite figures.

Today's Goals

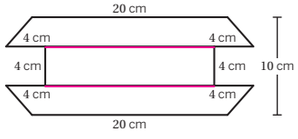
1. **Goal:** Decompose composite figures to determine the total area.
2. **Goal:** Decompose composite figures to determine the area of shaded parts.
3. **Language Goal:** Describe how decomposition can be used to calculate area of composite figures and area of shaded parts in composite figures. **(Reading, Writing, and Speaking)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 1.08

Find the area of the composite figure below.



Sketch a way to decompose the figure to help show your thinking.

224 sq. cm. *Responses vary*. Sample response shown on figure.

Explain your thinking.

Explanations vary. I divided the figure into a rectangle with a length of 20 cm and a width of 4 cm. The other parts of the figure are two congruent trapezoids with bases 20 cm and 28 cm and a height of 3 cm. The area of the rectangle is $A = (20)(4) = 80$ sq. cm. The area of each trapezoid is $A = \frac{1}{2}(3)(20 + 28) = 72$ sq. cm. The total area of the figure is $2(72) + 80 = 224$ sq. cm.

Differentiation Use after Lesson 8

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to use decomposition to determine the area of a composite figure:

» **Respond to Student Thinking:**

- Select a few related Practice Problems and give individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Take a moment to reflect on this lesson. In this lesson, students connected their previous understanding of calculating areas of triangles and quadrilaterals to determine areas of composite figures. How will students' work calculating the area of composite figures prepare them for determining the surface area of three-dimensional figures?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

7. Explain how you can use decomposition to determine the area of a composite figure. Use the figure if it helps with your thinking.

Responses vary.

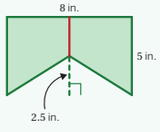
- You can break the figure into smaller shapes, such as a rectangle and two identical triangles, then add the areas.
- You can also draw a rectangle around the shape and subtract the areas of shapes inside the rectangle but outside the figure to determine the area.
- You can draw a line to form a hexagon and divide the hexagon into two identical trapezoids, then subtract the area of the rectangle.

Lesson Practice ACC6.1.08

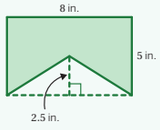
Lesson Summary

You can calculate the area of composite figures using different strategies.

- Decompose the figure into smaller known shapes, then add the areas.



- Draw a rectangle around the figure and then subtract the area that is not part of the figure.

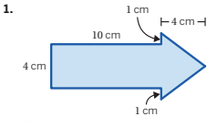


Lesson Practice
ACC6.1.08

Name: _____ Date: _____ Period: _____

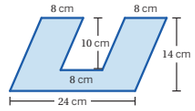
Problems 1–2: Determine the area of the composite figure.

1.



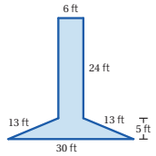
52 sq. cm

2.



256 sq. cm

3. The design of a stage and fashion runway is shown.



What is the total area of the stage and fashion runway? Explain your thinking.

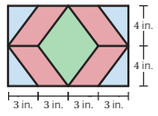
234 sq. ft. *Explanations vary.* You can decompose the figure into a rectangle with sides 6 ft and 24 ft and a trapezoid with bases 6 ft and 30 ft and a height of 5 ft.

Area of the rectangle: $A = 6 \cdot 24 = 144$ sq. ft.

Area of trapezoid: $A = \frac{1}{2}(5)(6 + 30) = 90$ sq. ft.

Total area: $A = 144 + 90 = 234$ sq. ft.

Problems 4–5: An artist drew a design for a piece of stained glass. The design is composed of 4 identical right triangles, 4 identical parallelograms, and a rhombus in the center.



4. Determine the total area for each part of the design.

Outer rectangle: 96 sq. in.

Right triangles: 24 sq. in.

Parallelograms: 48 sq. in.

5. Use two different strategies to determine the area of the rhombus. Show or explain your thinking.

Explanations vary. I can subtract the areas of the right triangles and parallelograms from the outer rectangle: $A = 96 - 24 - 48 = 24$ sq. in. I can decompose the rhombus into 2 identical triangles with a base of 6 in. and a height of 4 in.: $A = 2 \cdot \left(\frac{1}{2}\right)(6)(4) = 24$ sq. in.

Lesson Practice
ACC6.1.08

Name: _____ Date: _____ Period: _____

FAST Practice

6. The shaded region in the figure represents the section of a small garden marked off for flowers. The unshaded region will be covered with rocks.

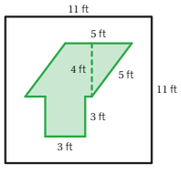
What is the area of the garden that will be covered with rocks?

A. 72 sq. ft

B. 92 sq. ft

C. 98 sq. ft

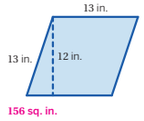
D. 101 sq. ft



Spiral Review

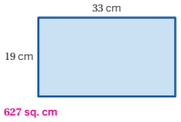
Problems 7–10: Determine the area of each figure.

7.



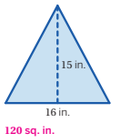
156 sq. in.

8.



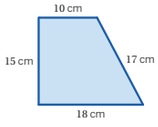
627 sq. cm

9.



120 sq. in.

10.



210 sq. cm

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–3	2	MA.7.GR.1.1, MA.7.GR.1.2
	4–5	3	MA.7.GR.1.1, MA.7.GR.1.2
FAST Practice	6	2	MA.7.GR.1.1, MA.7.GR.1.2
Spiral Review			
	7, 10	1	MA.7.GR.1.1
	8–9	1	MA.6.GR.2.1

Assess and Respond

Sub-Unit Quiz 1

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Identifying the area of triangles on a grid	Lesson 2	1	MA.6.GR.2.1 MTR.5.1
2	Determining the area of a triangle, the length of a base, or a height given the other two measurements	Lesson 3	1	MA.6.GR.2.1
3a	Creating triangles given the area	Lesson 3	3	MA.6.GR.2.1 MTR.5.1
3b, 3c	Identifying the base and height of triangles	Lesson 4	1	MA.6.GR.2.1
4	Calculating the area of a polygon composed of rectangles and triangles on a grid	Lesson 5	2	MA.6.GR.2.2 MTR.2.1
5	Calculating the area of a polygon composed of rectangles and triangles without a grid	Lesson 5	2	MA.6.GR.2.2 MTR.3.1

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

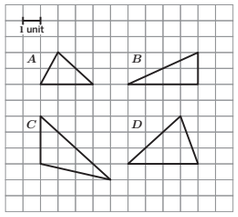
- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Sub-Unit Quiz

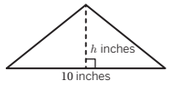
Unit 1

1. Which triangle has an area of 3 square units? Triangle *A*



2. What is the height for the given triangle?

Area: 20 square inches



A. 2 inches
B. 4 inches
C. 10 inches
D. 30 inches

3. Here are two grids.

a. Draw two different triangles that each have an area of 12 square units.

Responses vary. Sketches show two different triangles with an area of 12 square units.

Triangle 1

Triangle 2

b. Write a base and a height for Triangle 1.

Base: 6 Height: 4

Responses vary. The base and height should be positive numbers with a product of 24.

c. Write a base and a height for Triangle 2.

Base: 8 Height: 3

Responses vary. The base and height should be positive numbers with a product of 24.

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Name: ..... Date: ..... Period: .....

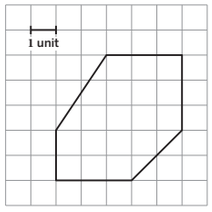
Sub-Unit Quiz (continued)

Unit 1

4. Here is a polygon.

a. Determine the area of this polygon.

Area: 20 square units

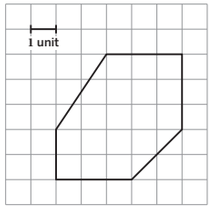


Show or explain your thinking.

Responses vary. I divided the polygon into a square, a rectangle, and two triangles. The area of the square was 9 and the rectangle was 6. I found the area of each triangle and added everything together to get 20.

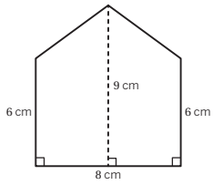
b. Show or explain a different way to determine the area of the same polygon.

Responses vary. I drew a box around the shape and found its area to be 25 square units. Then I subtracted the areas of the two triangles and got 20.



5. Determine the area of this polygon.

Area: 60 square centimeters



D Differentiation (Sub-Unit Quiz 1)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	
Sub-Unit 1: • Calculate the area of rectangles and triangles. • Calculate the area of composite figures by decomposing into rectangles and triangles or by surrounding and subtracting. **(Lessons 1–5)**	2	Support	• **Mini-Lesson:** *Calculating Areas of Triangles* • **Teacher Move:** Consider revisiting Lesson 3 (*Off the Grid*)
		Strengthen	• **Repeated Challenges:** Lesson 3 (*Off the Grid*)
	3	Support Strengthen	• **Teacher Move:** Consider revisiting Lesson 2 (*Exploring Triangles*)
		Stretch	• **You're invited to explore more:** Lesson 2 (*Exploring Triangles*)
	1	Support Strengthen	• **Teacher Move:** Consider revisiting Lesson 2 (*Exploring Triangles*)

	4, 5	Support	• **Teacher Move:** Consider revisiting:
			  • Lesson 4 (*Letters*)
			  • Lesson 5 (*Breaking Down*)

		Strengthen	• **Challenge Creator:** Lesson 5 (*Breaking Down*)

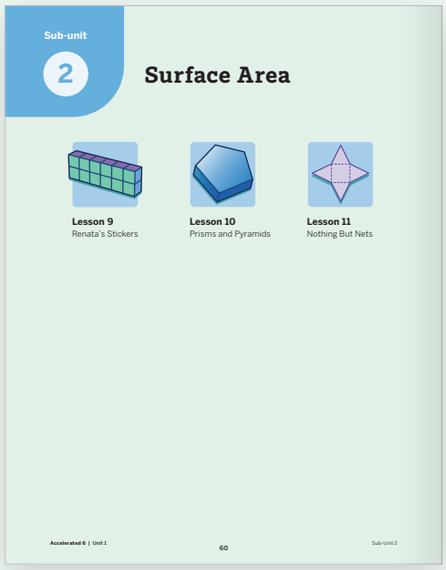
Sub-Unit 2

Surface Area

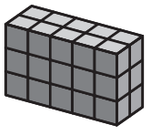
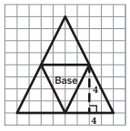
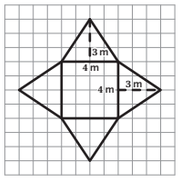
Sub-Unit 2 Goals

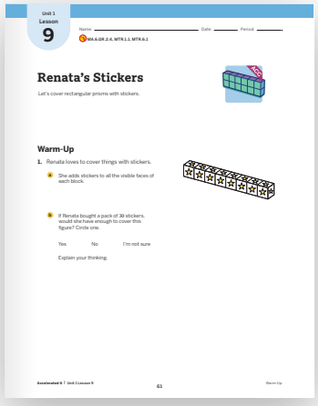
- **Goal:** Connect polyhedra with nets that represent them.
- **Goal:** Calculate the surface area of a prism or pyramid.
- **Language Goal:** Describe the polyhedron that can be assembled from a given net using mathematically precise language, including terms such as *face, edge, prism,* and *pyramid*.
- **Language Goal:** Analyze strategies for determining the surface area of polyhedra using mathematically precise language, including terms such as *face, edge, base*, and *height*.

In this sub-unit, students make connections between three-dimensional **polyhedra** and the **nets** that represent them. They then use those nets to calculate the **surface area** of prisms and pyramids.



Math That Matters Most

Concept or Skill	For example . . .
Calculate the surface area of a rectangular prism.	What is the surface area of this rectangular prism?  62 square units
Describe the prism or pyramid from a given net.	What type of polyhedron does this net create when folded?  Pyramid
Use nets to calculate surface area.	What is the surface area of this pyramid?  40 square meters


Unit 1
Lesson 9

Name _____ Date _____ Period _____

MA.6.GR.2.4, MTR.1.1, MTR.6.1

Renata's Stickers

Let's cover rectangular prisms with stickers.

Warm-Up

1. Renata loves to cover things with stickers.

a. She adds stickers to all the visible faces of each block.

b. If Renata bought a pack of 36 stickers, would she have enough to cover this figure? Circle one.

Yes No I'm not sure

Explain your thinking.

Accelerated 6 | Unit 1 Lesson 9 61 Warm-Up

Renata's Stickers

Intro to Surface Area

Let's cover rectangular prisms with stickers.

Learning Outcomes

Today's Goals

1. **Goal:** Recognize that the *surface area* of a figure is the number of square units it takes to cover all the faces of a three-dimensional object.
2. **Goal:** Calculate the *surface area* of a rectangular prism.
3. **Language Goal:** Describe strategies for determining the *surface area* of rectangular prisms. **(Speaking and Listening)**

Students extend their work with the area of two-dimensional shapes to understand **surface area** as a measure of three-dimensional solids. They make connections between surface area and covering a figure. They then generate strategies for calculating the surface area of rectangular prisms. **(MTR.1.1)**

Coherence

Prior Learning

In previous courses, students calculated the area of rectangles and the volume of rectangular prisms by tiling with unit squares (area) or packing with unit cubes (volume).

Future Learning

In Lesson 10, students will define and classify polyhedra as prisms or pyramids. In Lesson 11, they will extend previous work with determining the area of polygons to interpret and draw nets to calculate the surface area of prisms and pyramids.

Connections

- Student understanding of surface area allows for more efficient use of materials in various real world situations. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.4
Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.6.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.2.2

Vocabulary

New Vocabulary

surface area

volume

Lesson at a Glance

~ 45 min

MA.6.GR.2.4

Warm-Up

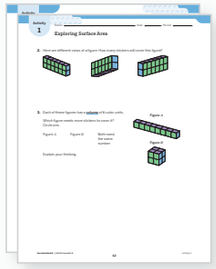
Pairs | 5 min

Students use the Think-Pair-Share routine to create a shared definition of what it means to cover a figure.

Activity 1

Pairs | 15 min

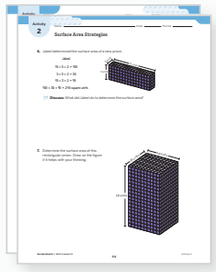
Students make sense of **surface area** and generate strategies for calculating it when the **volume** is given. **(MTR.1.1)**



Activity 2

Pairs | 15 min

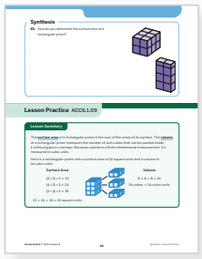
Students use structure to develop a more efficient strategy for determining the surface area of rectangular prisms. **(MTR.1.1)**



Synthesis

Whole Class | 5 min

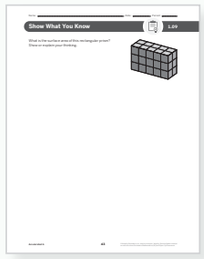
Students synthesize their understanding that the surface area of a rectangular prism is the sum of the areas of all its faces. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating the surface area of a rectangular prism.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use the Think-Pair-Share routine to create a shared definition of what it means to cover a figure.

1 Launch

Direct students' attention to the stickers on all the visible faces of each block.

To surface connections, invite students to share stories about stickers or other situations that this reminds them of.

Use the Think-Pair-Share routine to help students shape their ideas about what it means to cover a rectangular prism with stickers. Invite students to think independently and then take turns sharing with a partner.

Note: *Prism* was defined in a previous course. However if the term is unfamiliar to your students, consider reviewing. Students will explore prisms more deeply in the next lesson.

A **Accessibility: Visual-Spatial Processing** Provide unit cubes or other 3-D models for students to reason with as they make sense of the prisms in this lesson.

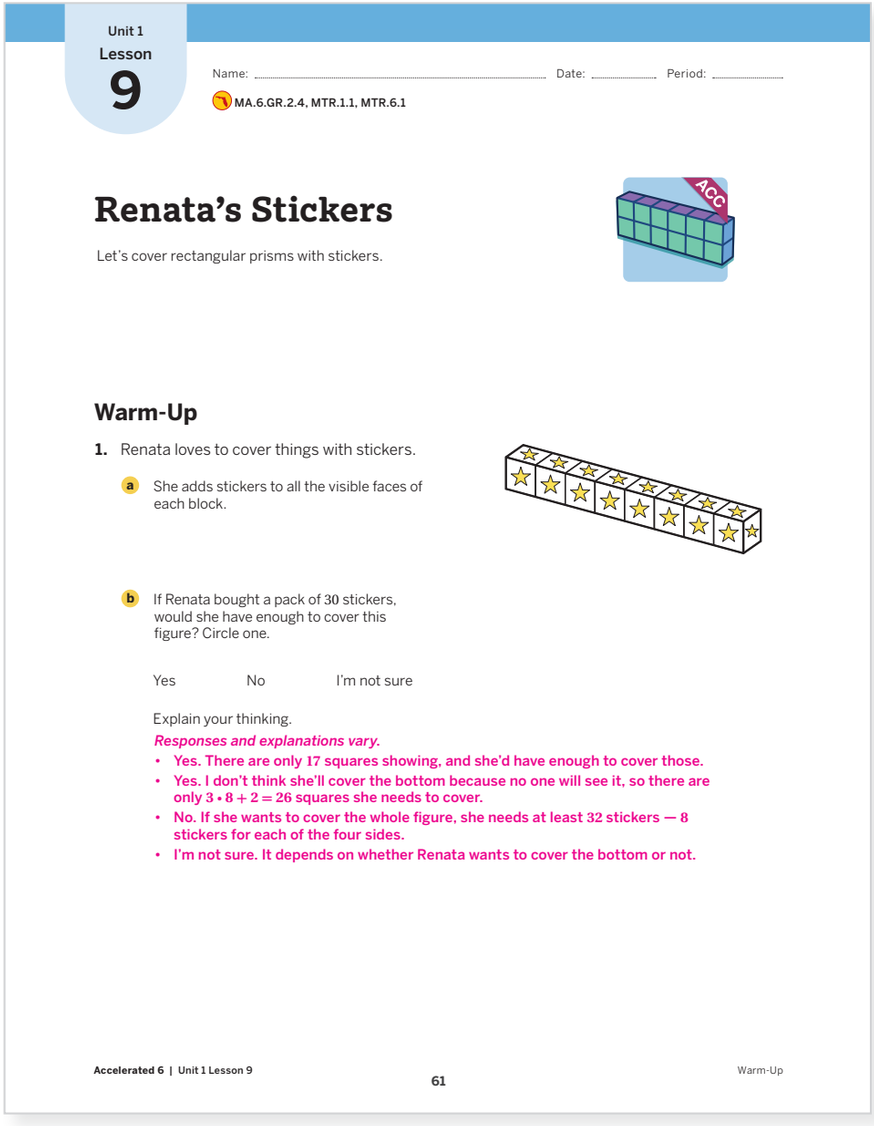
D **Differentiation: (Stretch)** Invite students to design a figure built with cubes that takes exactly 30 stickers to cover.

2 Connect

Capture and share a student explanation that goes with each of the three responses.

To surface the Key Takeaway, consider asking:
- "What might someone who responded differently have been thinking?"
- "What does it mean to 'cover' the shape?"

Create a class definition of "to cover" using student language.



Unit 1
Lesson 9

Name: _____ Date: _____ Period: _____

MA.6.GR.2.4, MTR.1.1, MTR.6.1

Renata's Stickers

Let's cover rectangular prisms with stickers.

Warm-Up

1. Renata loves to cover things with stickers.

a She adds stickers to all the visible faces of each block.

b If Renata bought a pack of 30 stickers, would she have enough to cover this figure? Circle one.

Yes No I'm not sure

Explain your thinking.

Responses and explanations vary.
- Yes. There are only 17 squares showing, and she'd have enough to cover those.
- Yes. I don't think she'll cover the bottom because no one will see it, so there are only $3 \cdot 8 + 2 = 26$ squares she needs to cover.
- No. If she wants to cover the whole figure, she needs at least 32 stickers — 8 stickers for each of the four sides.
- I'm not sure. It depends on whether Renata wants to cover the bottom or not.

Accelerated 6 | Unit 1 Lesson 9 61 Warm-Up

Key Takeaway: "Covering" a figure means laying stickers on all faces without overlapping them.

Pairs | 15 min

Activity 1 Exploring Surface Area

Purpose: Students make sense of **surface area** and generate strategies for calculating it when the **volume** is given. **(MTR.1.1)**

1 Launch

Direct students' attention to the different views of the figure.

A **Accessibility: Memory and Attention** Invite students to record how many stickers are needed for each face as they calculate it. This supports students who struggle to hold multiple pieces of information in their heads.

2 Monitor

Look for students who count the number of stickers they see. Encourage students to check their work and consider why they didn't have enough stickers or had too many.

Pause briefly to invite students to discuss with a partner what **volume** means and how they can see that each figure has a volume of 8 cubic units. Volume is the number of unit cubes needed to fill a 3-D shape without gaps or overlaps.

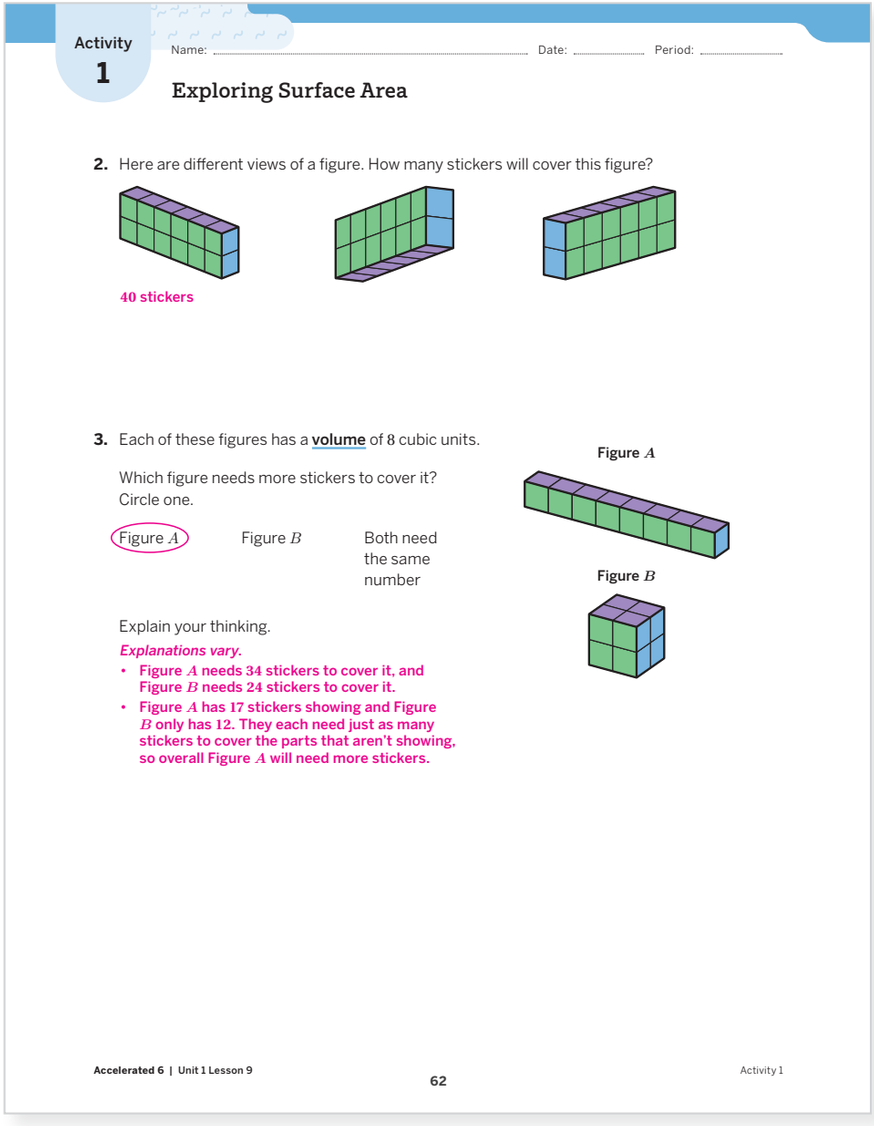
Look for and celebrate students who are making sense of the problem aloud and persevering in solving through moments of uncertainty. **(MTR.1.1)**

D **Differentiation: (Support)** Look for students who may notice that both figures are made from 8 cubes and say that they need the same number of stickers to cover them. Then consider asking, "How many stickers are needed to cover the visible part of each figure? Why do you think those numbers are different?"

ELL **English Language Learners** Provide sentence frames to help students explain their thinking (e.g., Figure ___ needs more stickers to cover it because _____.).

Look for students with unclear explanations or incorrect responses and follow up individually by inviting them to say more about their reasoning.

Activity 1 continued >



Activity 1

Name: Date: Period:

Exploring Surface Area

2. Here are different views of a figure. How many stickers will cover this figure?

40 stickers

3. Each of these figures has a **volume** of 8 cubic units.

Which figure needs more stickers to cover it? Circle one.

Figure A | Figure B | Both need the same number

Figure A

Figure B

Explain your thinking.

Explanations vary.

- Figure A needs 34 stickers to cover it, and Figure B needs 24 stickers to cover it.
- Figure A has 17 stickers showing and Figure B only has 12. They each need just as many stickers to cover the parts that aren't showing, so overall Figure A will need more stickers.

Accelerated 6 | Unit 1 Lesson 9 62 Activity 1

Pairs | 15 min

Activity 1 Exploring Surface Area (continued)

Purpose: Students make sense of **surface area** and generate strategies for calculating it when the **volume** is given. **(MTR.1.1)**

2 Monitor

Look for students using different strategies to find the surface area and invite them to share during the Connect.

D Differentiation

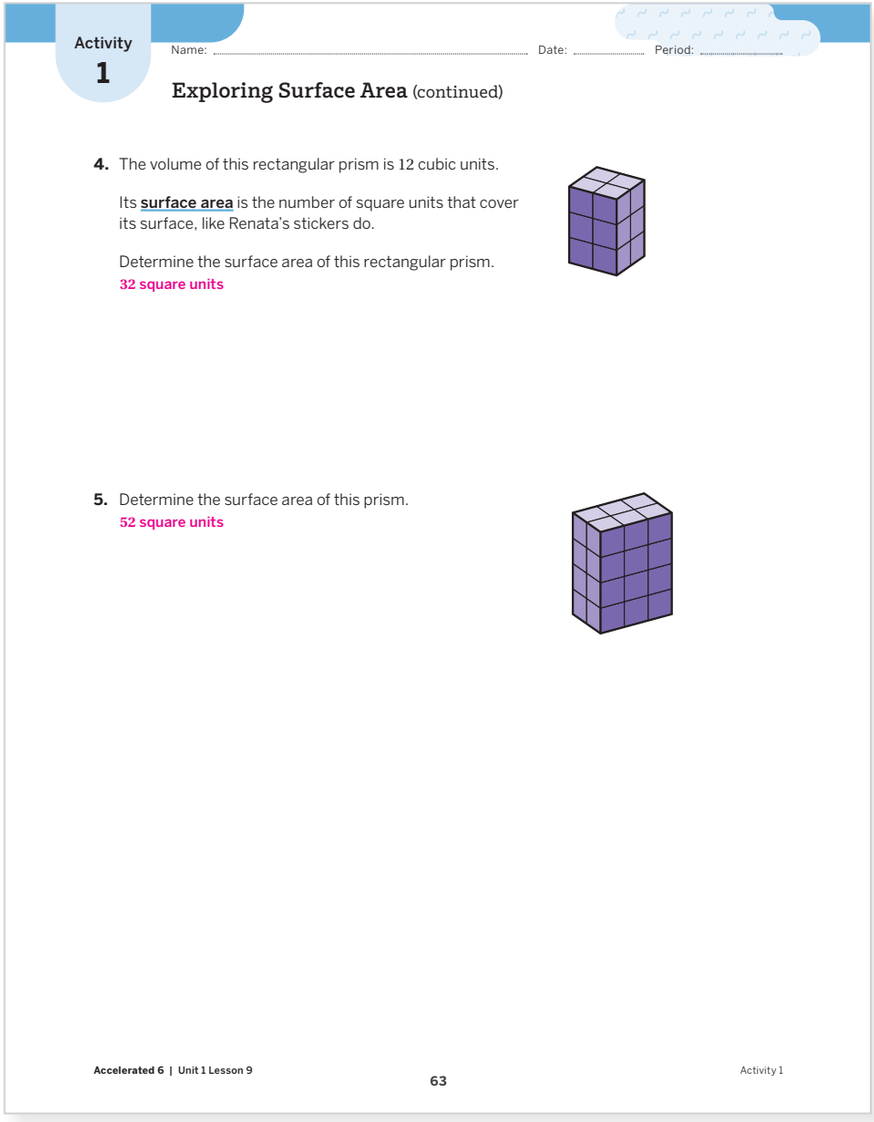
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to respond with a guess they think is close. Then consider asking, "How does determining the surface area compare to determining how many stickers were needed to cover the figure?"
Count only visible unit squares one by one.	**Support** Consider asking, "How many sides does each shape have?"
Count all unit squares one by one.	**Strengthen** Consider asking, "Are there ways we might find the surface area more efficiently?"
Use prior knowledge of the area of rectangles to calculate the whole side before adding them all up.	**Stretch** Consider asking, "Is it possible to find another shape with the same volume that has a different surface area?"

3 Connect

Create a class definition for **surface area** using students' language and the glossary.

Consider asking, "How are volume and surface area similar? How are they different?" They are both ways of describing the size of a 3-D figure. Surface area is measured in square units, and volume is measured in cubic units.

To surface the Key Takeaway, consider asking, "What information is needed to calculate the surface area of a shape?"



Activity 1

Name: Date: Period:

Exploring Surface Area (continued)

4. The volume of this rectangular prism is 12 cubic units.

Its **surface area** is the number of square units that cover its surface, like Renata's stickers do.

Determine the surface area of this rectangular prism.

32 square units

5. Determine the surface area of this prism.

52 square units

Accelerated 6 | Unit 1 Lesson 9 63 Activity 1

Key Takeaway: The **surface area** of a rectangular prism is the sum of the areas of its faces. 3-D figures with the same **volume** can have different surface areas.

Pairs | 15 min

Activity 2 Surface Area Strategies

Purpose: Students use structure to develop a more efficient strategy for determining the surface area of rectangular prisms. **(MTR.1.1)**

Short on time? Consider omitting Problem 8 and connecting on Problem 7 instead.

1 Launch

Encourage students to annotate Jaleel's thinking and image to help them make use of the structure presented in the calculations and image. **(MTR.1.1)**

ELL **English Language Learners** Pair students to aid them in describing what Jaleel did to find the surface area.

Consider asking:

- "What different size rectangles do you see?"
- "Why do you think Jaleel multiplied 15 by 5?"
- "Why did he then multiply by 2?"
- "Why does Jaleel add only three values together?"
- "How would Jaleel's work be different if the prism were 6 units tall instead of 5?"

A **Accessibility: Executive Functioning** Chunk this activity into more manageable parts by inviting students to discuss each line of Jaleel's strategy one at a time.

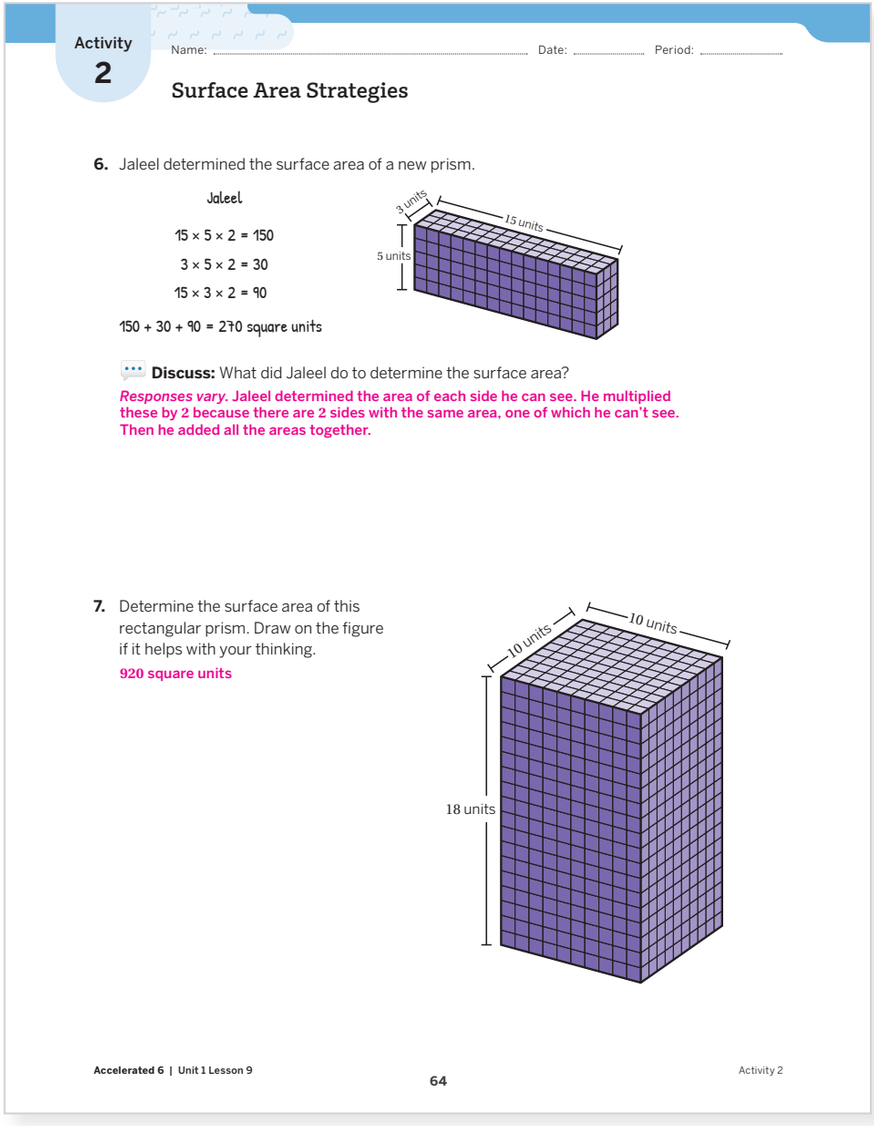
2 Monitor

Look for students in need of support and invite them to step out their ideas on paper to help make their thinking visible.

Consider asking, "Could Jaleel's strategy help us calculate the surface area here more efficiently?"

A **Accessibility: Executive Functioning** Provide students with a graphic organizer to record each area they calculate.

Activity 2 continued >



Activity 2

Name: Date: Period:

Surface Area Strategies

6. Jaleel determined the surface area of a new prism.

Jaleel

15 × 5 × 2 = 150

3 × 5 × 2 = 30

15 × 3 × 2 = 90

150 + 30 + 90 = 270 square units

Discuss: What did Jaleel do to determine the surface area?

Responses vary. Jaleel determined the area of each side he can see. He multiplied these by 2 because there are 2 sides with the same area, one of which he can't see. Then he added all the areas together.

7. Determine the surface area of this rectangular prism. Draw on the figure if it helps with your thinking.

920 square units

Pairs | 15 min

Activity 2 Surface Area Strategies (continued)

Purpose: Students use structure to develop a more efficient strategy for determining the surface area of rectangular prisms. **(MTR.1.1)**

Short on time? Consider omitting Problem 8 and connecting on Problem 7 instead.

2 Monitor

Note: This may be students' first exposure to shapes with non-integer dimensions. Consider inviting students to share what they think the dimensions of figure B are.

Select and sequence explanations to share during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What is the length of each side of the prism? How do we write the length of a side with a half unit square?" Invite students to write the lengths on the figures in their Student Edition.
Write 12.5 square units because they only counted visible units.	**Support** Consider asking, "How many sides does figure B have? How do you use that information to help you calculate surface area?"
Write 27 square units because figure A has 22 square units and 5 extra square units are added to the top.	**Support** Invite them to label the sides. Consider asking, "What sides have stayed the same? What sides are different?"
Share an answer of 25 square units with sparse annotations and an incomplete explanation.	**Strengthen** Invite students to reference Jaleel's strategy and use similar structure to justify their thinking. Consider asking, "How can you write your calculation to express your strategy?"
Share an answer of 25 square units with thorough annotations and explanations.	**Stretch** Capture these explanations to share during the Connect. Consider asking, "What would happen if we made the shape a half unit wider instead of taller?"

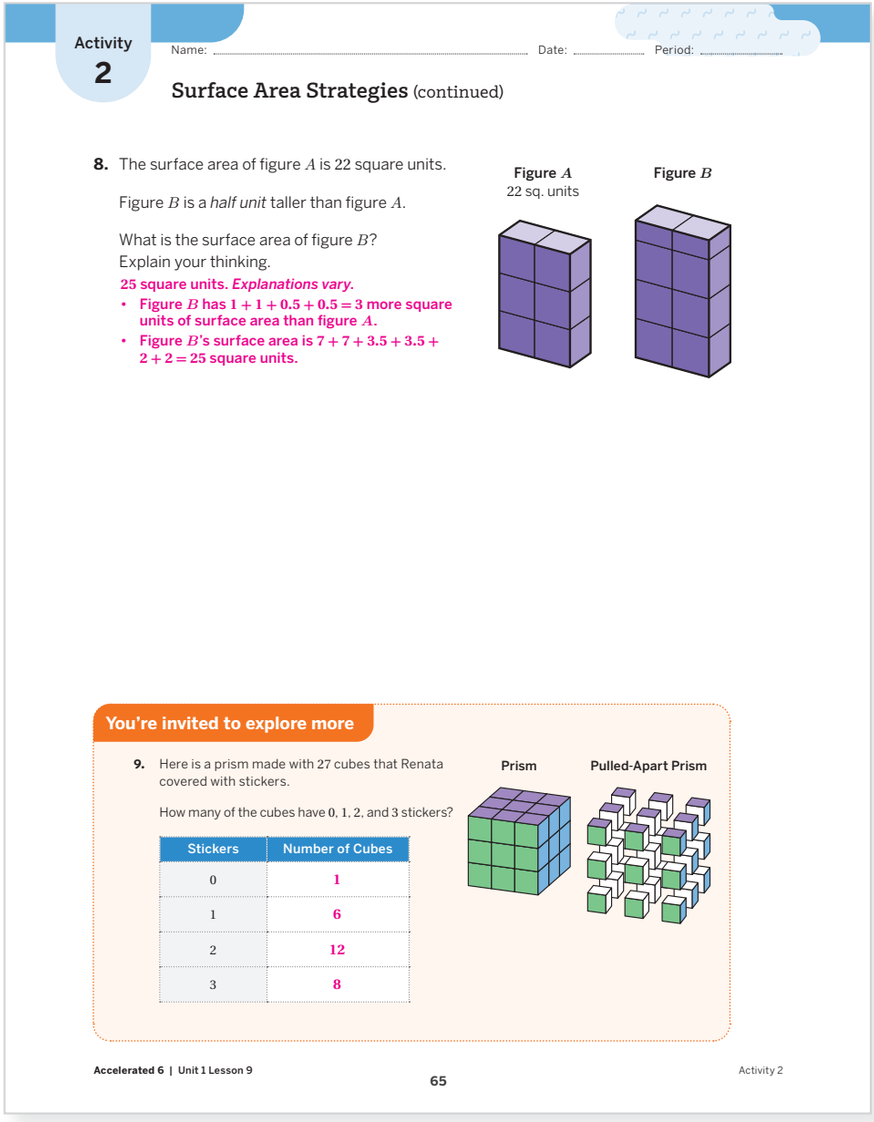
D Differentiation: You're invited to explore more. (Stretch) Invite students who would like to explore surface area further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Display the distribution of responses and captured explanations. Invite students to justify their own thinking and build off each other's thinking.

To surface the Key Takeaway, consider asking:

- "How many square units more is the surface area of figure B?"
- "How did Jaleel's strategy help calculate this surface area more efficiently than counting squares?"



Activity 2

Name: Date: Period:

Surface Area Strategies (continued)

8. The surface area of figure A is 22 square units.

Figure B is a *half unit* taller than figure A.

What is the surface area of figure B?
Explain your thinking.

25 square units. *Explanations vary.*

- Figure B has $1 + 1 + 0.5 + 0.5 = 3$ more square units of surface area than figure A.
- Figure B's surface area is $7 + 7 + 3.5 + 3.5 + 2 + 2 = 25$ square units.

Figure A
22 sq. units

Figure B

You're invited to explore more

9. Here is a prism made with 27 cubes that Renata covered with stickers.

How many of the cubes have 0, 1, 2, and 3 stickers?

Stickers	Number of Cubes
0	1
1	6
2	12
3	8

Prism

Pulled-Apart Prism

Accelerated 6 | Unit 1 Lesson 9 65 Activity 2

Key Takeaway: To find the surface area more efficiently, calculate the area of each side and add them together. Take note of sides that are duplicated to make your calculations more efficient.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that the surface area of a rectangular prism is the sum of the areas of all its faces.

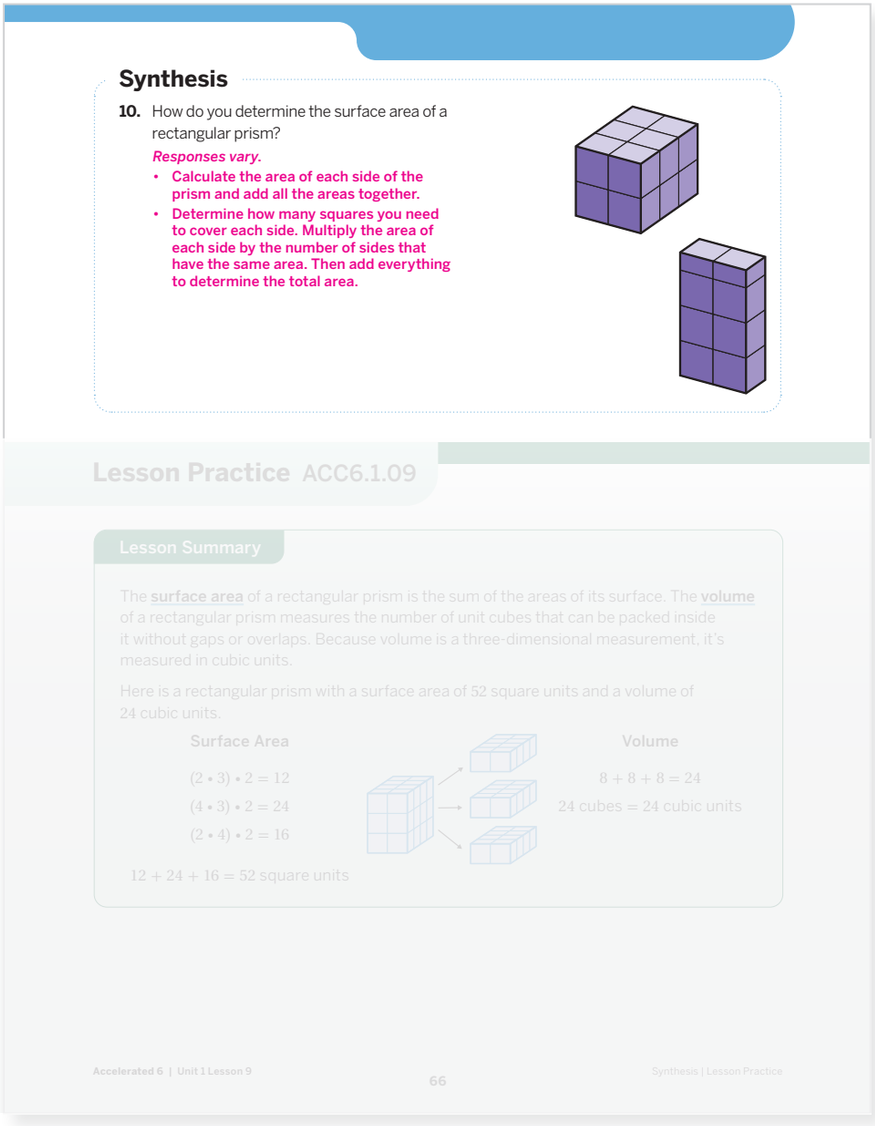
Invite students to respond independently, and then share their thinking with a partner.

Listen for and share a variety of ideas, such as:

- Calculating the area of each side of the prism and adding all the areas together.
- Determining how many squares are needed to cover the rectangular prism by determining how many squares are needed to cover each side. Sometimes sides have the same number of squares, so the area of one side can be multiplied by however many sides have the same area.

MLR **MLR2: Collect and Display** Use this routine to collect students' ideas as they discuss with a partner. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

10. How do you determine the surface area of a rectangular prism?

Responses vary.

- Calculate the area of each side of the prism and add all the areas together.
- Determine how many squares you need to cover each side. Multiply the area of each side by the number of sides that have the same area. Then add everything to determine the total area.

Lesson Takeaway: The surface area of a rectangular prism is the sum of the areas of its faces and is measured in square units. The most efficient strategy to calculate the surface area is to find the area of each side of the shape and add the areas together.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by calculating the surface area of a rectangular prism.

Today's Goals

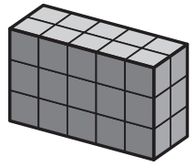
1. **Goal:** Recognize that the *surface area* of a figure is the number of square units it takes to cover all the faces of a three-dimensional object.
2. **Goal:** Calculate the *surface area* of a rectangular prism.
3. **Language Goal:** Describe strategies for determining the *surface area* of rectangular prisms. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 1.09

What is the surface area of this rectangular prism? Show or explain your thinking.



62 square units. *Responses vary.* I counted that there were 2 sides that were 3 by 5 rectangles, 2 sides that were 2 by 3 rectangles, and 2 sides that were 2 by 5 rectangles. Then, I multiplied each group and added them up: $2(3 \times 5) = 30$, $2(2 \times 3) = 12$, and $2(2 \times 5) = 20$. $30 + 12 + 20 = 62$ square units.

D Differentiation Use after Lesson 9

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to calculate the surface area of a rectangular prism:

» **Respond to Student Thinking:**

- Use the ***Determining Surface Areas of Rectangular Prisms* Mini-lesson**.
- Provide models of 3-D prisms and allow students to color code each pair of similar opposite sides.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

What strengths did your students exhibit today? How can you build from those strengths as students continue learning about surface area?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. How do you determine the surface area of a rectangular prism?

Responses vary.

- Calculate the area of each side of the prism and add all the areas together.
- Determine how many squares you need to cover each side. Multiply the area of each side by the number of sides that have the same area. Then add everything to determine the total area.

Lesson Practice ACC6.1.09

Lesson Summary

The **surface area** of a rectangular prism is the sum of the areas of its surface. The **volume** of a rectangular prism measures the number of unit cubes that can be packed inside it without gaps or overlaps. Because volume is a three-dimensional measurement, it's measured in cubic units.

Here is a rectangular prism with a surface area of 52 square units and a volume of 24 cubic units.

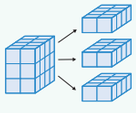
Surface Area

$(2 \cdot 3) \cdot 2 = 12$

$(4 \cdot 3) \cdot 2 = 24$

$(2 \cdot 4) \cdot 2 = 16$

$12 + 24 + 16 = 52$ square units



Volume

$8 + 8 + 8 = 24$

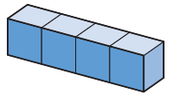
24 cubes $= 24$ cubic units

Lesson Practice ACC6.1.09

Name: _____ Date: _____ Period: _____

Problems 1–2: Determine the surface area and volume of each rectangular prism.

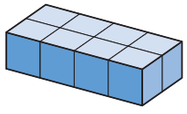
1.



Surface area: 18 square units

Volume: 4 cubic units

2.



Surface area: 28 square units

Volume: 8 cubic units

3. Explain the difference between *volume* and *surface area*.

Responses vary. The surface area of a shape is the sum of the areas of all its surfaces. The volume is how much the shape could hold if it were a container.

4. Select *all* of the calculations that surface area might help with.

- ☐ **A.** How many blocks fit in a container
- ☑ **B.** How much wrapping paper a gift will need
- ☐ **C.** How heavy a gift is
- ☐ **D.** How much milk fits in a container
- ☑ **E.** How much cardboard it takes to make a milk container

5. Compare the surface areas of figure A and figure B. Explain your thinking.

Responses vary. Both figures have a surface area of 22 square units. I calculated this by doubling the number of squares I can see to account for the number of squares I can't see.

Figure A: 5 front squares + 3 top squares + 3 right squares = 11 squares showing. $11 \cdot 2 = 22$ square units.

Figure B: 3 front squares + 5 top squares + 3 right squares = 11 squares showing. $11 \cdot 2 = 22$ square units.

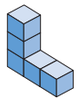


Figure A

Figure B

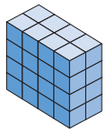
Lesson Practice ACC6.1.09

Name: _____ Date: _____ Period: _____

FAST Practice

6. This rectangular prism is 4 units high, 4 units wide, and 2 units long. What is its surface area?

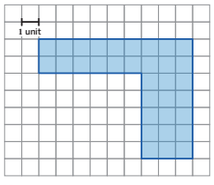
- **A.** 16 square units
- **B.** 32 square units
- **C.** 48 square units
- **D.** 64 square units



Spiral Review

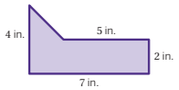
Problems 7–8: Determine the area of each shaded figure.

7.



33 square units

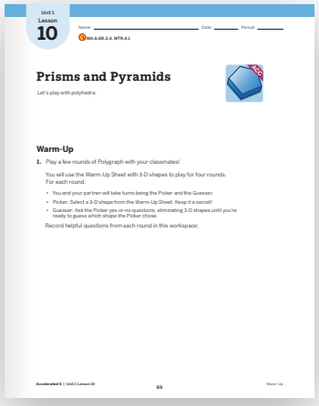
8.



16 square inches

Lesson Practice Item Analysis

Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson		
1–4	2	MA.6.GR.2.4
5	3	MA.6.GR.2.4
FAST Practice 6	2	MA.6.GR.2.4
Spiral Review		
7	1	MA.6.GR.2.2
8	2	MA.6.GR.2.2


Unit 1
Lesson
10

Prisms and Pyramids

Let's play with polyhedra.

Warm-Up

1. Play a few rounds of Polygraph with your classmates!

Prisms and Pyramids

Polyhedra and Their Faces

Let's play with polyhedra.

Learning Outcomes

Today's Goals

1. **Goal:** Recognize that a *net* is a two-dimensional figure that can be assembled into a *polyhedron*.
2. **Language Goal:** Compare and contrast features of *prisms* and *pyramids* using the terms *face* and *base*. **(Speaking and Listening)**
3. **Language Goal:** Describe the *polyhedron* that can be assembled from a given *net*, using the terms *face* and *base*. **(Speaking and Listening)**

Students extend previous work with rectangular prisms to analyze and define the features of **prisms** and **pyramids** using mathematical vocabulary. They visualize the **polyhedron** that could be assembled from a given **net**, use characteristics to identify polyhedra as prisms or pyramids, and name them by the shape of their **base**.

Coherence

Prior Learning

In Lesson 9, students defined surface area as a measure of three-dimensional solids and explored how it is distinct from volume. They used tiling of unit squares and the formula for the area of a rectangle to calculate the surface area.

Future Learning

In Lesson 11, students will interpret and draw nets to calculate the surface area of prisms and pyramids.

Connections

- Students expand their understanding of geometric figures using new vocabulary and visual models. (mathematical, cross-curricular)

FL B.E.S.T. Math Benchmarks

Building Toward

MA.6.GR.2.4

Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.

Mathematical Thinking and Reasoning Standards: MTR.4.1, MTR.6.1

ELA Expectations: ELA.K12.EE.5.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.2.2

Vocabulary

New Vocabulary

base (of a pyramid or prism)	polyhedron
face	prism
net	pyramid

Lesson at a Glance

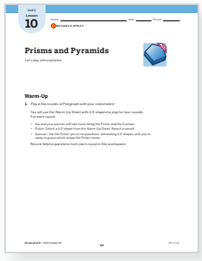
~ 45 min

MA.6.GR.2.4

Warm-Up

Pairs | 8 min

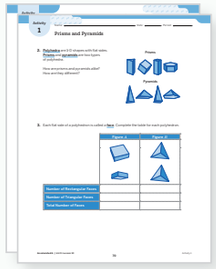
Students generate language to describe characteristics of prisms and pyramids by playing a game of Polygraph.



Activity 1

Pairs | 12 min

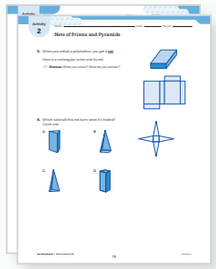
Students investigate characteristics of **prisms** and **pyramids** and name them according to the shape of the **bases** using accurate mathematical vocabulary. MLR1: Stronger and Clearer Each Time (MTR.4.1)



Activity 2

Pairs | 15 min

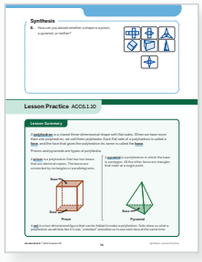
Students match **polyhedra** with their **nets** by reasoning about their attributes.
MLR1: Stronger and Clearer Each Time



Synthesis

Whole Class | 5 min

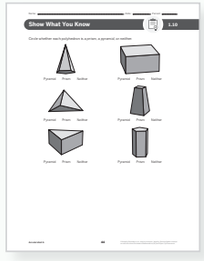
Students synthesize their understanding that prisms and pyramids are classified by their bases and types of **faces**. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by classifying polyhedra as prisms, pyramids, or neither.



Prep Checklist

Prepare Warm-Up Sheets

This lesson includes:

- Student Edition
- Show What You Know
- Warm-Up Sheet, one set per pair

Pairs | 8 min

Warm-Up

Purpose: Students generate language to describe characteristics of prisms and pyramids by playing a game of Polygraph.

1 Launch

Invite students to work with a partner.

Distribute Warm-Up Sheets so that one partner has A and one has B. Invite one partner to be the Picker and the other to be the Guesser in the first round, and then switch roles for the next round.

A **Accessibility: Executive Functioning** To support carrying out multiple steps, encourage students to focus on one image at a time when they are determining which images they can eliminate.

Note: Students will learn the terms *base*, *net*, *prisms*, and *pyramids* to describe polyhedra later in the lesson.

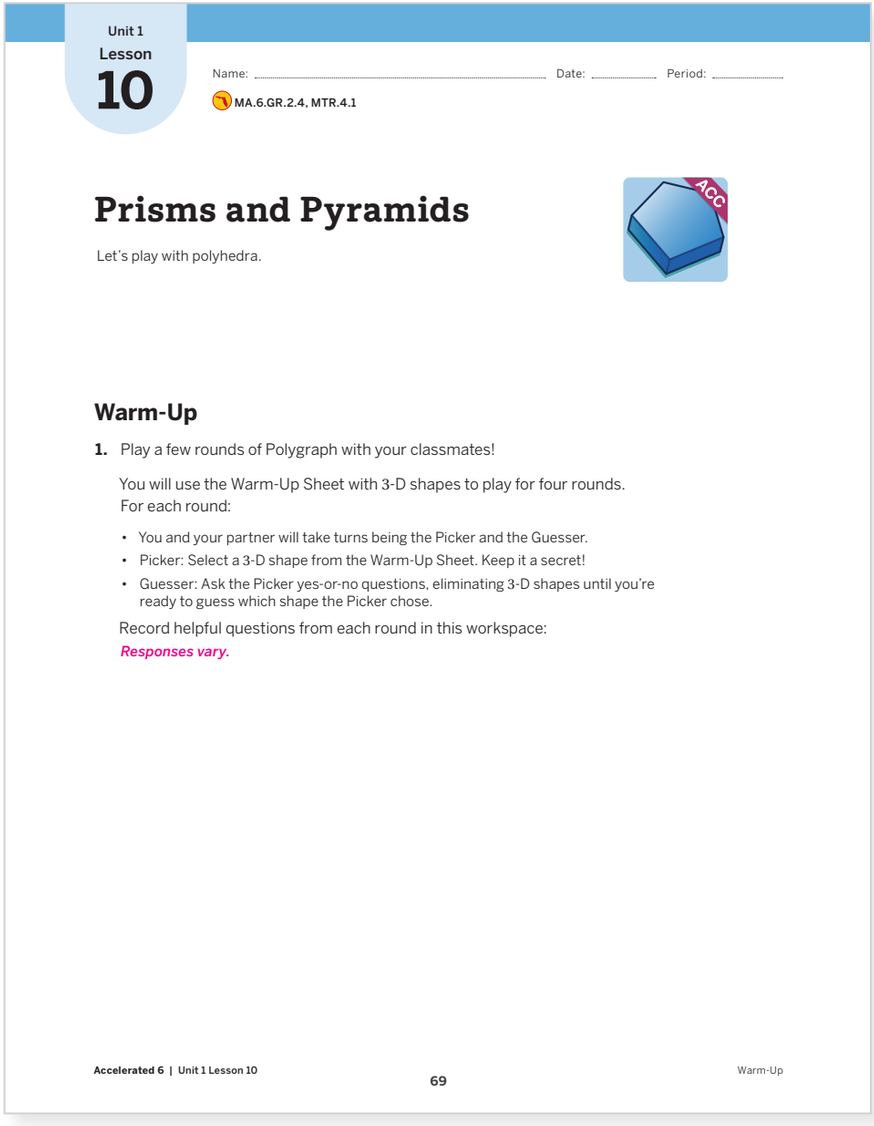
Pause briefly after a few rounds to discuss common questions and terms that students are using. Consider publicly displaying words or phrases that students use for others to reference.

2 Connect

Share interesting or effective questions in students' work, including ones about the bases, edges, and faces.

Consider asking:

- "What were you paying attention to as you wrote your questions?"
- "What words or phrases did you find particularly helpful?"



Unit 1
Lesson
10

Name: _____ Date: _____ Period: _____

MA.6.GR.2.4, MTR.4.1

Prisms and Pyramids

Let's play with polyhedra.

Warm-Up

1. Play a few rounds of Polygraph with your classmates!

   You will use the Warm-Up Sheet with 3-D shapes to play for four rounds. For each round:

   - You and your partner will take turns being the Picker and the Guesser.
   - Picker: Select a 3-D shape from the Warm-Up Sheet. Keep it a secret!
   - Guesser: Ask the Picker yes-or-no questions, eliminating 3-D shapes until you're ready to guess which shape the Picker chose.

   Record helpful questions from each round in this workspace:

   Responses vary.

Accelerated 6 | Unit 1 Lesson 10 69 Warm-Up

Pairs | 12 min

Activity 1 Prisms and Pyramids

Purpose: Students investigate characteristics of **prisms** and **pyramids** and name them according to the shape of the **bases** using accurate mathematical vocabulary. **(MTR.4.1)**

1 Launch

Direct students' attention to the image of prisms and pyramids and invite students in pairs to create a first draft definition of the terms *pyramid*, *prism*, *base*, and *face* using student's language.

Invite students to read the definition of **polyhedra** and rephrase it in their own words.

Consider asking:

- "What kinds of polygons do you see in prisms? Pyramids?"
- "What do you think the terms *face* and *base* refer to on the shapes?" (**Note:** These terms will be defined in the Connect.)

MLR **MLR1: Stronger and Clearer Each Time** Invite students to write a first draft and use feedback to make their thinking stronger and clearer. **(MTR.4.1)**

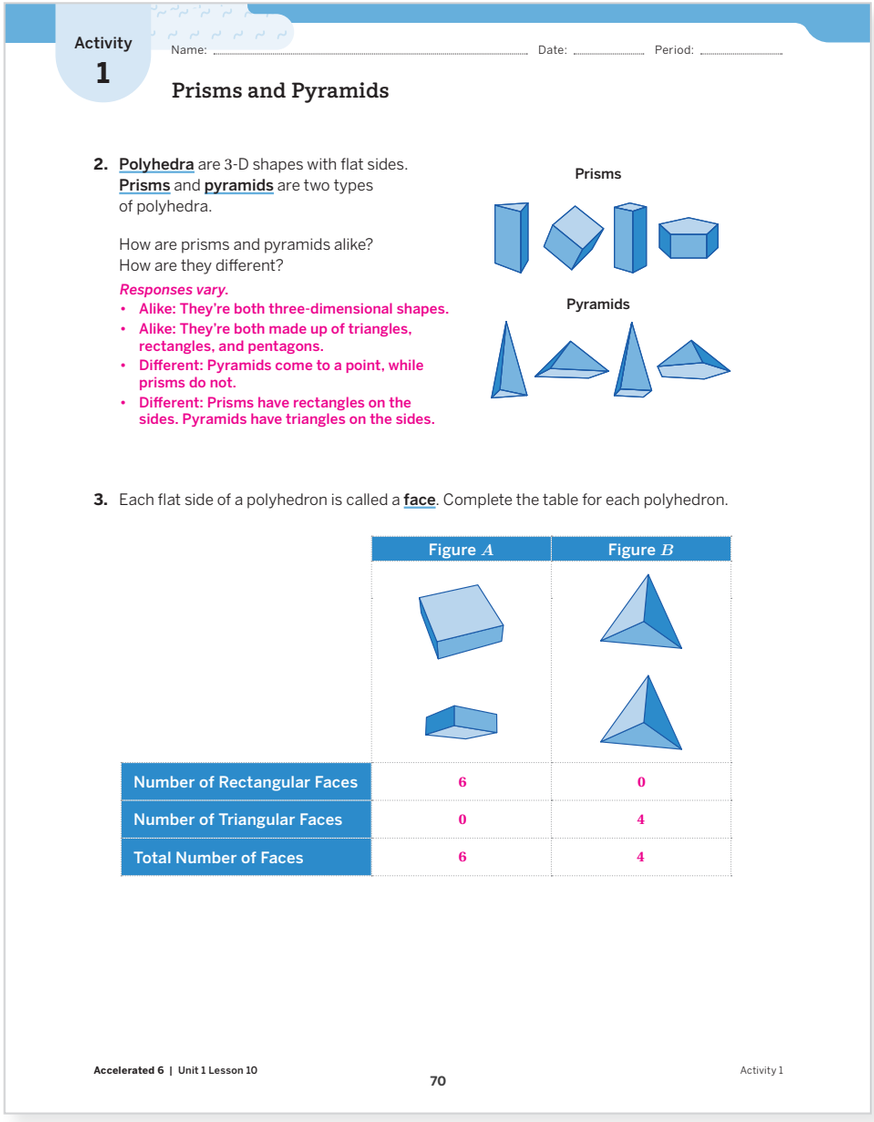
2 Monitor

Invite students to observe figure A and discuss with a peer where they see rectangular faces, triangular faces, and total faces.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How do you think about the term *face* when discussing three-dimensional shapes?"
Are missing some of the faces (12 for figure A and 8 for figure B).	**Support** Encourage them to examine both views of the polyhedron.
Have correct responses in the table.	**Strengthen** Consider asking them to justify their responses.
Have thorough justifications for their responses.	**Stretch** Consider asking, "Are there other shapes that would have the same values as one of the rows in the table?"

Activity 1 continued >



Activity 1

Name: Date: Period:

Prisms and Pyramids

2. **Polyhedra** are 3-D shapes with flat sides. **Prisms** and **pyramids** are two types of polyhedra.

How are prisms and pyramids alike? How are they different?

Responses vary.

- Alike: They're both three-dimensional shapes.
- Alike: They're both made up of triangles, rectangles, and pentagons.
- Different: Pyramids come to a point, while prisms do not.
- Different: Prisms have rectangles on the sides. Pyramids have triangles on the sides.

Prisms

Pyramids

3. Each flat side of a polyhedron is called a **face**. Complete the table for each polyhedron.

	Figure A	Figure B
Number of Rectangular Faces	6	0
Number of Triangular Faces	0	4
Total Number of Faces	6	4

Accelerated 6 | Unit 1 Lesson 10 70 Activity 1

Pairs | 12 min

Activity 1 Prisms and Pyramids (continued)

Purpose: Students investigate characteristics of **prisms** and **pyramids** and name them according to the shape of the **bases** using accurate mathematical vocabulary. **(MTR.4.1)**

2 Monitor

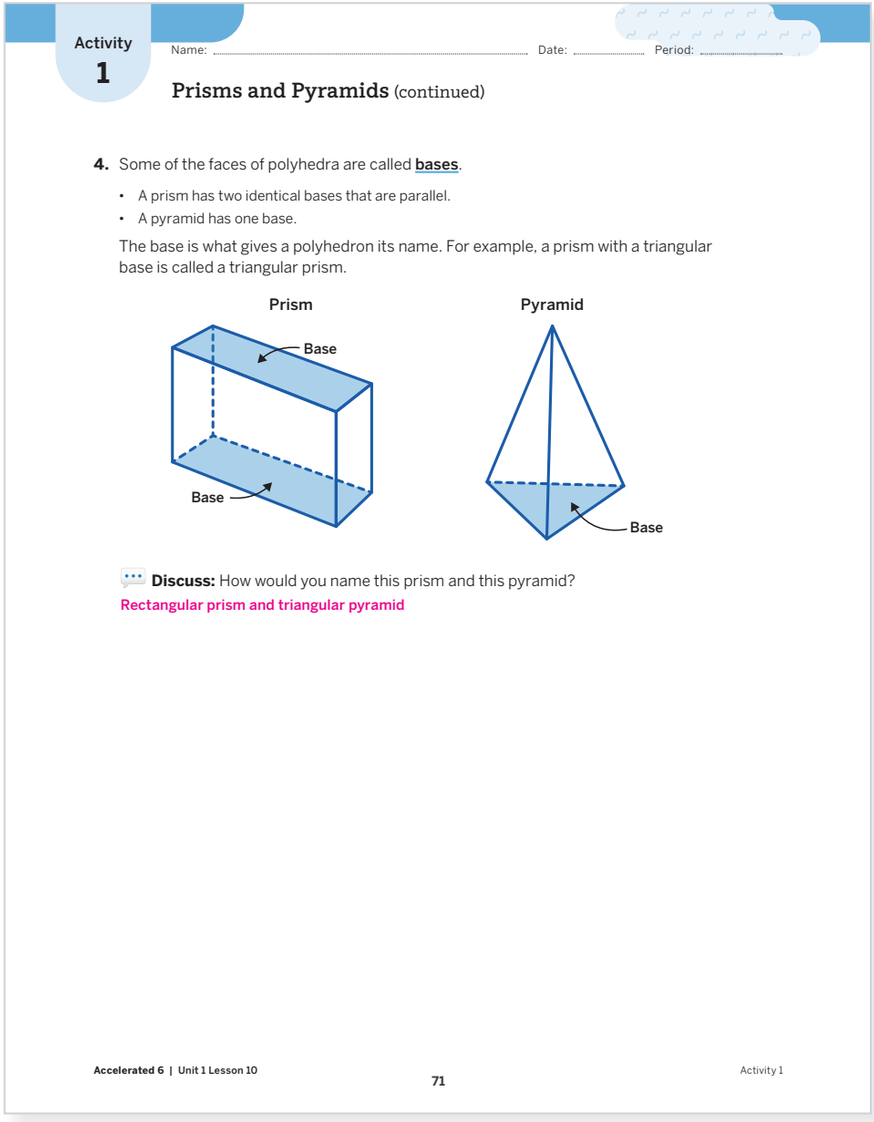
Listen for a variety of responses and justifications to share during the Connect.

ELL **English Language Learners** Consider creating an anchor chart about each of the new vocabulary words from this activity. Add student ideas and language to the chart throughout the lesson.

3 Connect

To surface the Key Takeaway, consider asking, "How can we use our new terms *face* and *base* to create more precise definitions of **pyramids** and **prisms**?"

Create a refined class definition for the terms **face** and **base (of a pyramid or prism)** using students' language and the glossary. Each flat side of a polyhedron is called a face. The base of a pyramid or prism is a polygon that gives the solid its name. A prism has two identical bases that are parallel. A pyramid has one base.



Activity 1

Name: Date: Period:

Prisms and Pyramids (continued)

4. Some of the faces of polyhedra are called **bases**.

- A prism has two identical bases that are parallel.
- A pyramid has one base.

The base is what gives a polyhedron its name. For example, a prism with a triangular base is called a triangular prism.

Prism

Pyramid

Discuss: How would you name this prism and this pyramid?

Rectangular prism and triangular pyramid

Key Takeaway: **Prisms** and **pyramids** are named by the shape of their **base**. Prisms have two identical bases, and pyramids have one base and triangular sides that meet at a single point.

Pairs | 15 min

Activity 2 Nets of Prisms and Pyramids

Purpose: Students match **polyhedra** with their **nets** by reasoning about their attributes.

Short on time? Consider omitting Problem 7.

1 Launch

Direct students' attention to the prism and its net.

Invite students to share what they notice with their partner, then write a first draft definition of a **net**.

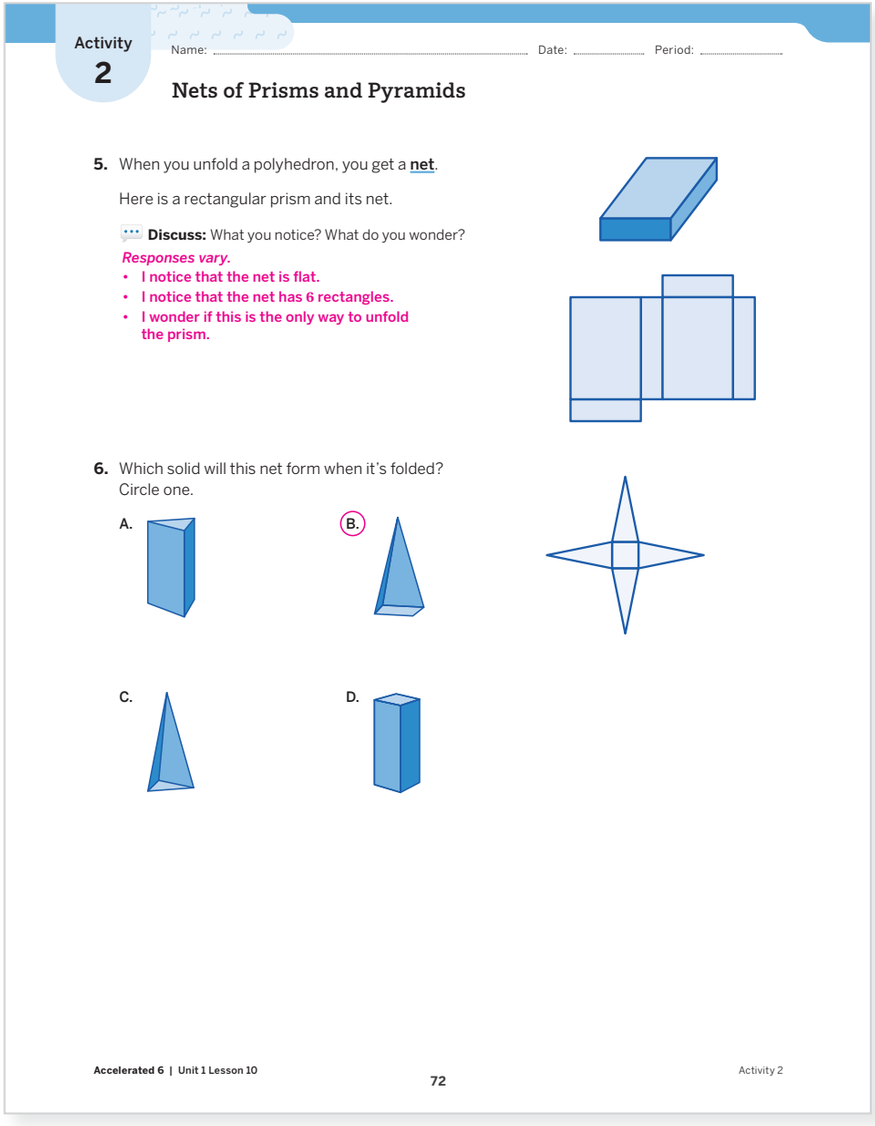
2 Monitor

Invite students to justify their choice with a peer to verify their thinking or make revisions.

Listen for students who are determining polyhedra from their nets. Invite these students to share during the Connect.

A **Accessibility: Visual-Spatial Aids** If possible, provide 3-D models of common prisms and pyramids for students to reference throughout the lesson and unit. These can be created out of paper.

Activity 2 continued >



Activity 2

Name: Date: Period:

Nets of Prisms and Pyramids

5. When you unfold a polyhedron, you get a **net**.

Here is a rectangular prism and its net.

Discuss: What you notice? What do you wonder?

Responses vary.

- I notice that the net is flat.
- I notice that the net has 6 rectangles.
- I wonder if this is the only way to unfold the prism.

6. Which solid will this net form when it's folded? Circle one.

A. B. C. D.

Accelerated 6 | Unit 1 Lesson 10 72 Activity 2

Pairs | 15 min

Activity 2 Nets of Prisms and Pyramids (continued)

Purpose: Students match **polyhedra** with their **nets** by reasoning about their attributes.

Short on time? Consider omitting Problem 7.

2 Monitor

Listen for students reading the instructions out loud and consider elevating students who notice that they will have one net left over.

Encourage students to reach an agreement together before making each match.

Look and listen for a variety of student thinking.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What types of shapes do you see in the nets? What types of shapes do you see in the polyhedron?"
Have an inaccurate match.	**Support** Consider asking, "Which net did you have left over? What would that polyhedron look like? Does that make sense with any of your current matches?"
Have all accurate matches.	**Strengthen** Consider asking, "What type of polyhedron does each net make? How do you know?"
	Stretch Invite students to share their reasoning during the Connect. Encourage them to draw the polyhedra for the remaining net.

3 Connect

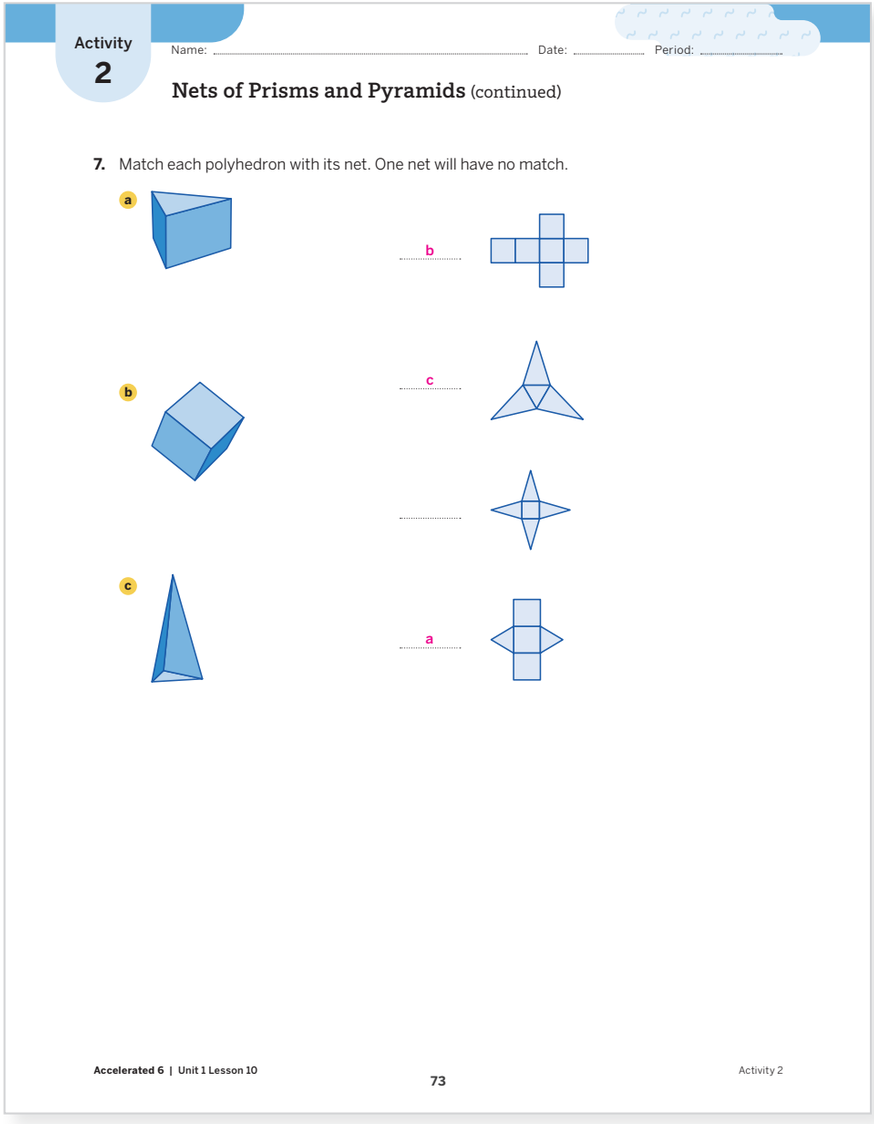
Invite pairs to compare their matches, explain their reasoning, and make revisions based on their conversation.

MLR **MLR1: Stronger and Clearer Each Time** Invite students to write a first draft of the definition of a *net* and use feedback to make their thinking stronger and clearer. **(MTR.4.1)**

To surface the Key Takeaway, consider asking:

- "How is the net different from the bases and faces of a polyhedron?"
- "How can you use a net to identify the polyhedra it makes?"

Note: It is okay if students are unsure at this stage. Students will be exploring nets in more detail in the next lesson.



Activity 2

Name: Date: Period:

Nets of Prisms and Pyramids (continued)

7. Match each polyhedron with its net. One net will have no match.

a

b

c

b

c

a

Accelerated 6 | Unit 1 Lesson 10 73 Activity 2

Key Takeaway: A **net** is a 2-D representation of a 3-D shape. It can be folded to make a **polyhedron**.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that prisms and pyramids are classified by their bases and types of **faces**.

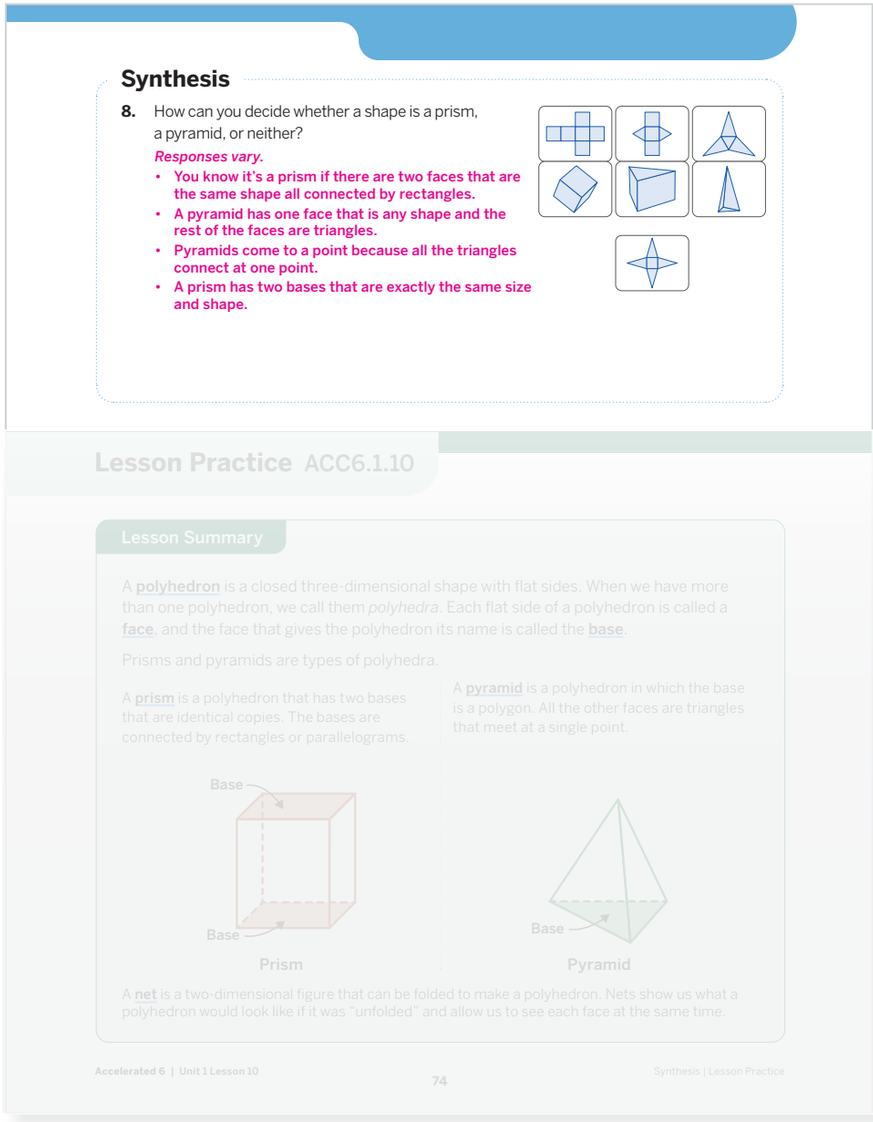
Invite students to respond independently, and then share their thinking with a partner.

Listen for and share a variety of ideas, such as:

- You know it is a prism if there are two faces that are the same shape all connected by rectangles.
- A pyramid has one face that is any shape and the rest of the faces are triangles.
- Pyramids come to a point because all the triangles connect at one point.
- You can look at the net to see if faces that fold up from the base are triangles (making the polyhedron a pyramid) or rectangles (making the polyhedron a prism).

MLR **MLR2: Collect and Display** Use this routine to revisit the definitions in this lesson using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

8. How can you decide whether a shape is a prism, a pyramid, or neither?

Responses vary.

- You know it's a prism if there are two faces that are the same shape all connected by rectangles.
- A pyramid has one face that is any shape and the rest of the faces are triangles.
- Pyramids come to a point because all the triangles connect at one point.
- A prism has two bases that are exactly the same size and shape.

Lesson Practice ACC6.1.10

Lesson Summary

A polyhedron is a closed three-dimensional shape with flat sides. When we have more than one polyhedron, we call them *polyhedra*. Each flat side of a polyhedron is called a face, and the face that gives the polyhedron its name is called the base.

Prisms and pyramids are types of polyhedra.

A prism is a polyhedron that has two bases that are identical copies. The bases are connected by rectangles or parallelograms.

Base

Base

Prism

A pyramid is a polyhedron in which the base is a polygon. All the other faces are triangles that meet at a single point.

Base

Pyramid

A net is a two-dimensional figure that can be folded to make a polyhedron. Nets show us what a polyhedron would look like if it was "unfolded" and allow us to see each face at the same time.

Accelerated 6 | Unit 1 Lesson 10 74 Synthesis | Lesson Practice

Lesson Takeaway: **Prisms** and **pyramids** are classified by their **bases** and types of **faces**. They may be represented in 3-D as solids or in 2-D using **nets**.

Independent | 5 min

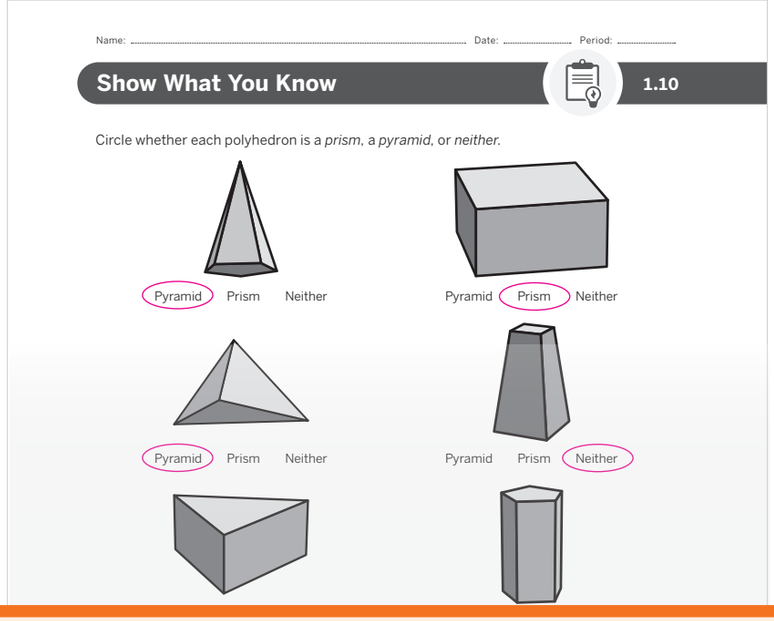
Show What You Know

Purpose: Students demonstrate their understanding by classifying polyhedra as prisms, pyramids, or neither.

Today's Goals

1. **Goal:** Recognize that a *net* is a two-dimensional figure that can be assembled into a *polyhedron*.
2. **Language Goal:** Compare and contrast features of *prisms* and *pyramids* using the terms *face* and *base*. **(Speaking and Listening)**
3. **Language Goal:** Describe the *polyhedron* that can be assembled from a given *net*, using the terms *face* and *base*. **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: Date: Period:

Show What You Know 1.10

Circle whether each polyhedron is a *prism*, a *pyramid*, or *neither*.

Pyramid Prism Neither

Pyramid Prism Neither

Pyramid Prism Neither

Pyramid Prism Neither

D Differentiation Use after Lesson 10

Support

Provide targeted intervention for students by using these resources.

If students need additional support matching a net to a polyhedron:

» **Respond to Student Thinking:**

- Provide nets of 3-D figures and have students fold them into the polyhedra to make sense of how faces connect.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.

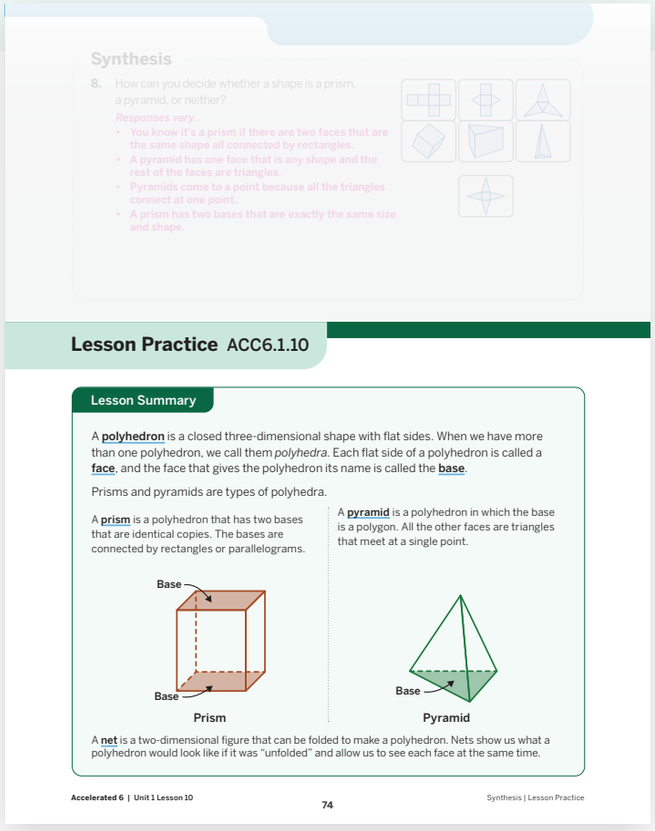
Professional Learning

In this lesson, students developed early ideas about a lot of vocabulary related to 3-D shapes. In what ways were they describing these ideas in their own words, and how will you honor their conceptions while supporting connections to the conventional mathematical language for these ideas in the next lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

8. How can you decide whether a shape is a prism, a pyramid, or neither?

Responses vary.

- You know it's a prism if there are two faces that are the same shape all connected by rectangles.
- A pyramid has one face that is any shape and the rest of the faces are triangles.
- Pyramids come to a point because all the triangles connect at one point.
- A prism has two bases that are exactly the same size and shape.

Lesson Practice ACC6.1.10

Lesson Summary

A **polyhedron** is a closed three-dimensional shape with flat sides. When we have more than one polyhedron, we call them *polyhedra*. Each flat side of a polyhedron is called a **face**, and the face that gives the polyhedron its name is called the **base**.

Prisms and pyramids are types of polyhedra.

A **prism** is a polyhedron that has two bases that are identical copies. The bases are connected by rectangles or parallelograms.

Base

Base

Prism

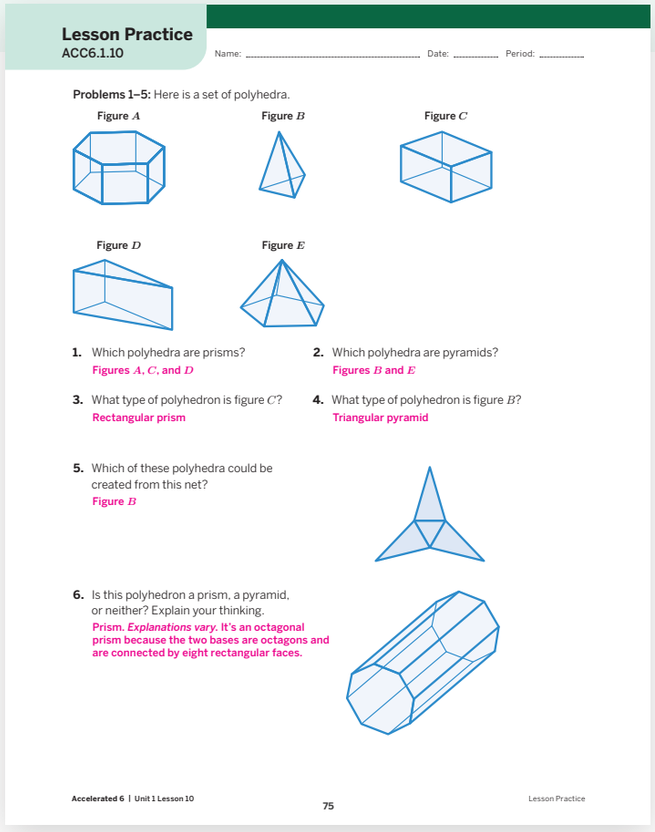
A **pyramid** is a polyhedron in which the base is a polygon. All the other faces are triangles that meet at a single point.

Base

Pyramid

A **net** is a two-dimensional figure that can be folded to make a polyhedron. Nets show us what a polyhedron would look like if it was "unfolded" and allow us to see each face at the same time.

Accelerated 6 | Unit 1 Lesson 10 74 Synthesis | Lesson Practice



Lesson Practice
ACC6.1.10

Name: _____ Date: _____ Period: _____

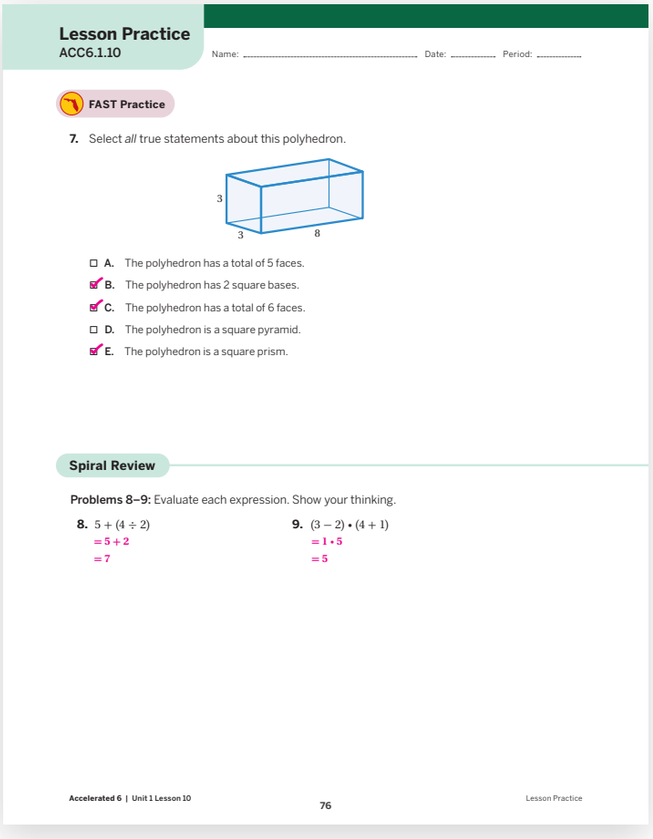
Problems 1–5: Here is a set of polyhedra.

Figure A Figure B Figure C

Figure D Figure E

1. Which polyhedra are prisms?
   Figures A, C, and D
2. Which polyhedra are pyramids?
   Figures B and E
3. What type of polyhedron is figure C?
   Rectangular prism
4. What type of polyhedron is figure B?
   Triangular pyramid
5. Which of these polyhedra could be created from this net?
   Figure B
6. Is this polyhedron a prism, a pyramid, or neither? Explain your thinking.
   Prism. *Explanations vary.* It's an octagonal prism because the two bases are octagons and are connected by eight rectangular faces.

Accelerated 6 | Unit 1 Lesson 10 75 Lesson Practice



Lesson Practice
ACC6.1.10

Name: _____ Date: _____ Period: _____

FAST Practice

7. Select *all* true statements about this polyhedron.

3
3
8

- ☐ A. The polyhedron has a total of 5 faces.
- ☑ B. The polyhedron has 2 square bases.
- ☑ C. The polyhedron has a total of 6 faces.
- ☐ D. The polyhedron is a square pyramid.
- ☑ E. The polyhedron is a square prism.

Spiral Review

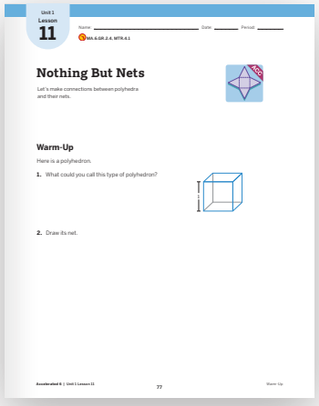
Problems 8–9: Evaluate each expression. Show your thinking.

8. $5 + (4 \div 2)$
   $= 5 + 2$
   $= 7$
9. $(3 - 2) \cdot (4 + 1)$
   $= 1 \cdot 5$
   $= 5$

Accelerated 6 | Unit 1 Lesson 10 76 Lesson Practice

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–5	1	MA.6.GR.2.4
	6	2	MA.6.GR.2.4
FAST Practice	7	2	MA.6.GR.2.4
Spiral Review			
	8–9	1	MA.5.AR.2.2


Unit 1
Lesson
11

Nothing But Nets

Let's make connections between polyhedra and their nets.

Warm-Up

Here is a polyhedron.

1. What could you call this type of polyhedron?

2. Draw its net.

Nothing But Nets

Nets and Surface Area on a Grid

Let's make connections between polyhedra and their nets.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate the surface area of a prism or pyramid using a net on a grid.
2. **Goal:** Draw a net for a given prism or pyramid.
3. **Language Goal:** Describe the prisms and pyramids that can be assembled from a given net. **(Speaking and Listening)**

Students build on their knowledge of names of polyhedra and practice identifying polyhedra from their nets. They cut out and fold nets to create right rectangular prisms and right rectangular pyramids, calculate their surface areas, and draw their own nets from a given 2-D drawing of a polyhedron. They then compare strategies for determining surface area and drawing nets. **(MTR.4.1)**

Coherence

Prior Learning

Earlier in the unit, students learned to calculate the area of triangles, describe a polyhedron based on its faces, classify polyhedra into prisms and pyramids, understand that the word *net* refers to a two-dimensional figure that can be assembled into a polyhedron, and calculate surface area.

Future Learning

In a future course, students will calculate the surface areas of cylinders.

Connections

- Students use a variety of visual representations of geometric figures to understand their features. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.GR.2.4
Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.GR.2.1	MA.7.GR.2.2

Vocabulary

Additional Vocabulary

edge

Lesson at a Glance

~ 45 min

MA.6.GR.2.4

Warm-Up

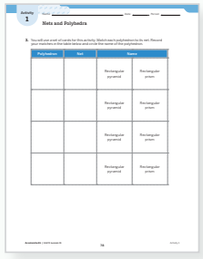
Pairs | 5 min

Students draw a net of a polyhedron to explore their connections.

Activity 1

Pairs | 10 min

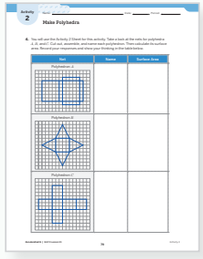
Students match polyhedra and their nets using a card sort, justifying each match as they work. **(MTR.4.1)**



Activity 2

Pairs | 20 min

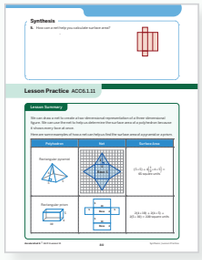
Students cut and fold nets to create polyhedra and calculate their surface areas.



Synthesis

Whole Class | 5 min

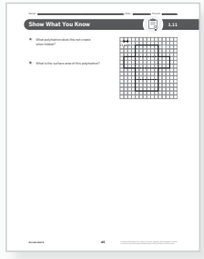
Students synthesize their understanding that nets of a polyhedron can show you all the faces at once which is helpful when determining the surface area. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by identifying what polyhedron a net represents and calculating its surface area.



Prep Checklist

Prepare Activity 1 Cards and Activity 2 Sheets

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one set per pair, pre-cut
- Activity 2 Sheet, one per student
  - Graph paper / rulers / scissors / tape

Pairs | 5 min

Warm-Up

Purpose: Students draw a net of a polyhedron to explore their connections.

1 Launch

To surface prior knowledge, consider asking:
- "What is a net? What do nets generally look like?"
- "What type of polyhedra is this?"
- "What shapes do you think its net will have?"

Consider sharing that there are many accurate nets that can be drawn.

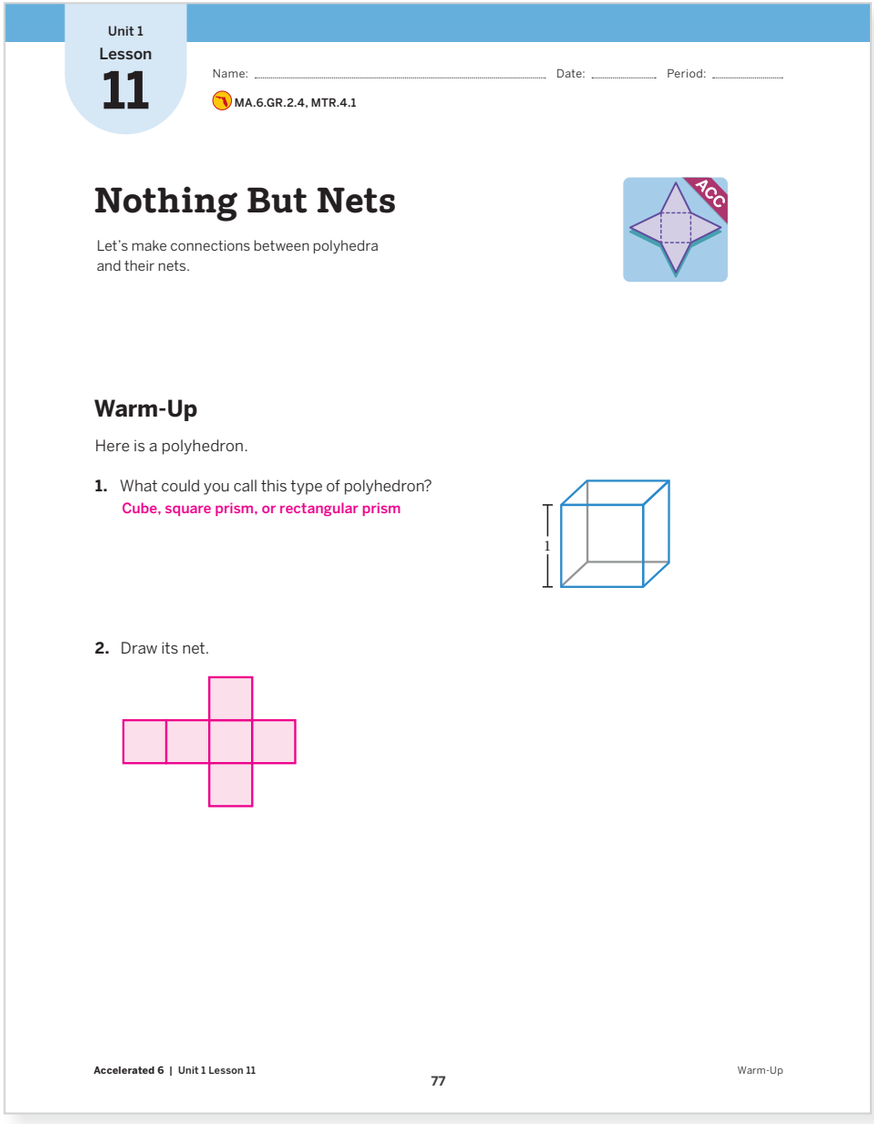
Encourage students to draw more than one possible net.

2 Connect

Look for and share a variety of responses and invite students to explain their reasoning.

Invite students to share why naming polyhedra might be useful in this class or outside of this class.

To surface the Key Takeaway, consider asking:
- "Why can there be multiple accurate nets drawn?"
- "What are the key features to check if a net is accurately drawn?"
- "What advice would you give someone that is trying to draw a net for a polyhedron?"
- "What is the name of this polyhedron? How can the name of the polyhedron help you draw its net?"



Unit 1
Lesson
11

Name: Date: Period:

MA.6.GR.2.4, MTR.4.1

Nothing But Nets

Let's make connections between polyhedra and their nets.

Warm-Up

Here is a polyhedron.

1. What could you call this type of polyhedron?
Cube, square prism, or rectangular prism

1

2. Draw its net.

Accelerated 6 | Unit 1 Lesson 11 77 Warm-Up

Key Takeaway: The same polyhedron can have a variety of correct names and nets.

Pairs | 10 min

Activity 1 Nets and Polyhedra

Purpose: Students match polyhedra and their nets using a card sort, justifying each match as they work. **(MTR.4.1)**

1 Launch

Distribute the Activity 1 Cards, pre-cut, one set per pair.

Direct students' attention to the nets and invite students to share their hypotheses about which will become prisms and which will become pyramids.

Encourage students to justify their matches with a partner and work together to reach an agreement about how to sort the polyhedra and nets. **(MTR.4.1)**

2 Monitor

Listen for students who are referencing the places where the net would be folded as an edge. Consider displaying a definition of *edge* on the board using student language and the glossary. An edge is a segment (or curve) where two faces of a 3-D figure meet.

Invite students to document their matches on their Student Edition and circle the appropriate name as they work.

ELL **English Language Learners** Encourage students to discuss how to group the cards in their primary language, clarifying any unknown words.

A **Accessibility: Executive Function** Invite students to focus on one card at a time to support students in carrying out multiple steps.

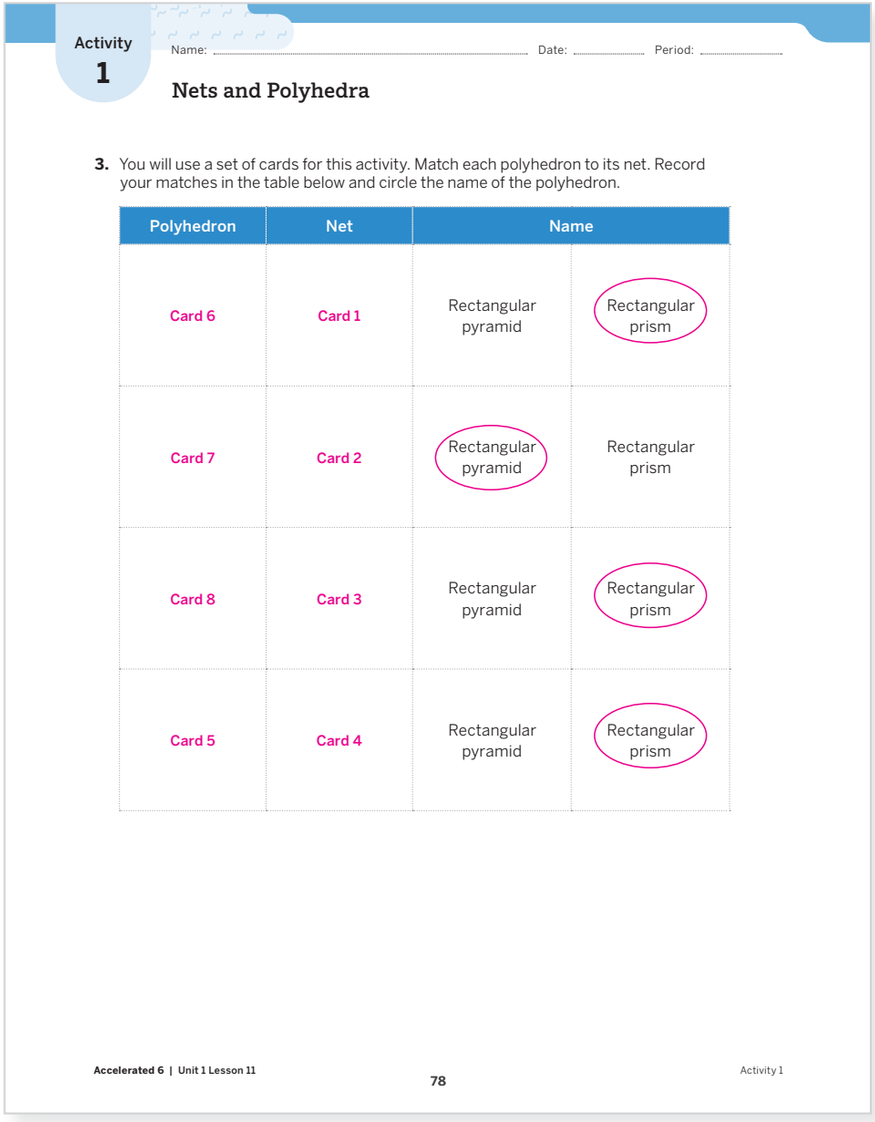
D **Differentiation: (Stretch)** Invite students to draw another net variation for each polyhedron.

3 Connect

Invite pairs to compare their matches, justify their thinking, and make revisions based on their conversation. If any pairs do not have consensus, invite them to share their question aloud with the class and poll the class to see what they think.

To surface the Key Takeaway, consider asking:

- "How does the name of the polyhedron relate to its net?"
- "What did you look for in determining your polyhedron and net matches? Try using terms like *face*, *edge*, and *base*."



Activity 1

Name: _____ Date: _____ Period: _____

Nets and Polyhedra

3. You will use a set of cards for this activity. Match each polyhedron to its net. Record your matches in the table below and circle the name of the polyhedron.

Polyhedron	Net	Name	
Card 6	Card 1	Rectangular pyramid	(Rectangular prism)
Card 7	Card 2	(Rectangular pyramid)	Rectangular prism
Card 8	Card 3	Rectangular pyramid	(Rectangular prism)
Card 5	Card 4	Rectangular pyramid	(Rectangular prism)

Accelerated 6 | Unit 1 Lesson 11 78 Activity 1

Key Takeaway: Prisms and pyramids can be assembled from a given net by considering where to fold the edges and what face become the base.

Pairs | 20 min

Activity 2 Make Polyhedra

Purpose: Students cut and fold nets to create polyhedra and calculate their surface areas.

Short on time? Consider omitting assembly of the nets and having students simply calculate the surface area on their paper.

1 Launch

Direct students' attention to the nets on the grid and accompanying instructions.

Distribute the Activity 2 Sheet, scissors, and tape and consider working through polyhedron A as a class or having it already constructed as an example for the class.

Demonstrate what it means to cut on the solid lines and fold on the dashed lines and then model how to make thinking visible when calculating surface area and documenting it in the Student Edition.

A **Accessibility: Fine Motor Skills** Consider strategically pairing students with different strengths to support the use of physical manipulatives.

2 Monitor

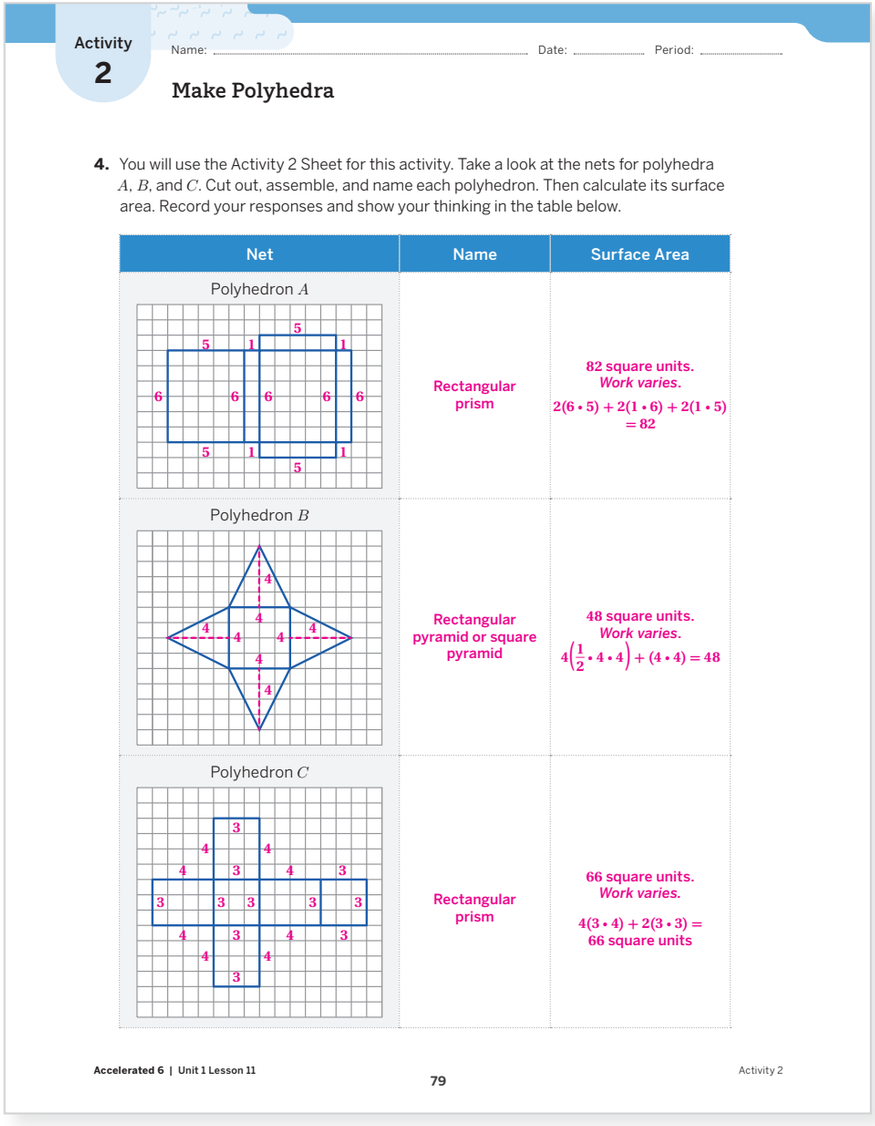
Look for a variety of student thinking.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support calculating the surface area.	**Support** Consider asking, "What measurements might be helpful to annotate?" Invite them to reference relevant anchor charts.
Write surface area values without accurate units.	**Strengthen** Consider asking, "How can you show that your solution represents surface area?"
Finish early and have already verified their thinking with students around them.	**Stretch** Invite these students to share during the Connect. Encourage them to create their own polyhedra and net, or make another net variation of polyhedra A, B, and C.

3 Connect

Invite selected students to share their polyhedra names and accompanying calculations for surface area. After each student shares, consider asking, "What did you appreciate about this student's thinking?"



Activity 2

Name: Date: Period:

Make Polyhedra

4. You will use the Activity 2 Sheet for this activity. Take a look at the nets for polyhedra A, B, and C. Cut out, assemble, and name each polyhedron. Then calculate its surface area. Record your responses and show your thinking in the table below.

Net	Name	Surface Area
Polyhedron A	Rectangular prism	82 square units. *Work varies.* $2(6 \cdot 5) + 2(1 \cdot 6) + 2(1 \cdot 5) = 82$
Polyhedron B	Rectangular pyramid or square pyramid	48 square units. *Work varies.* $4\left(\frac{1}{2} \cdot 4 \cdot 4\right) + (4 \cdot 4) = 48$
Polyhedron C	Rectangular prism	66 square units. *Work varies.* $4(3 \cdot 4) + 2(3 \cdot 3) =$ 66 square units

Accelerated 6 | Unit 1 Lesson 11 79 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that nets of a polyhedron can show you all the faces at once which is helpful when determining the surface area.

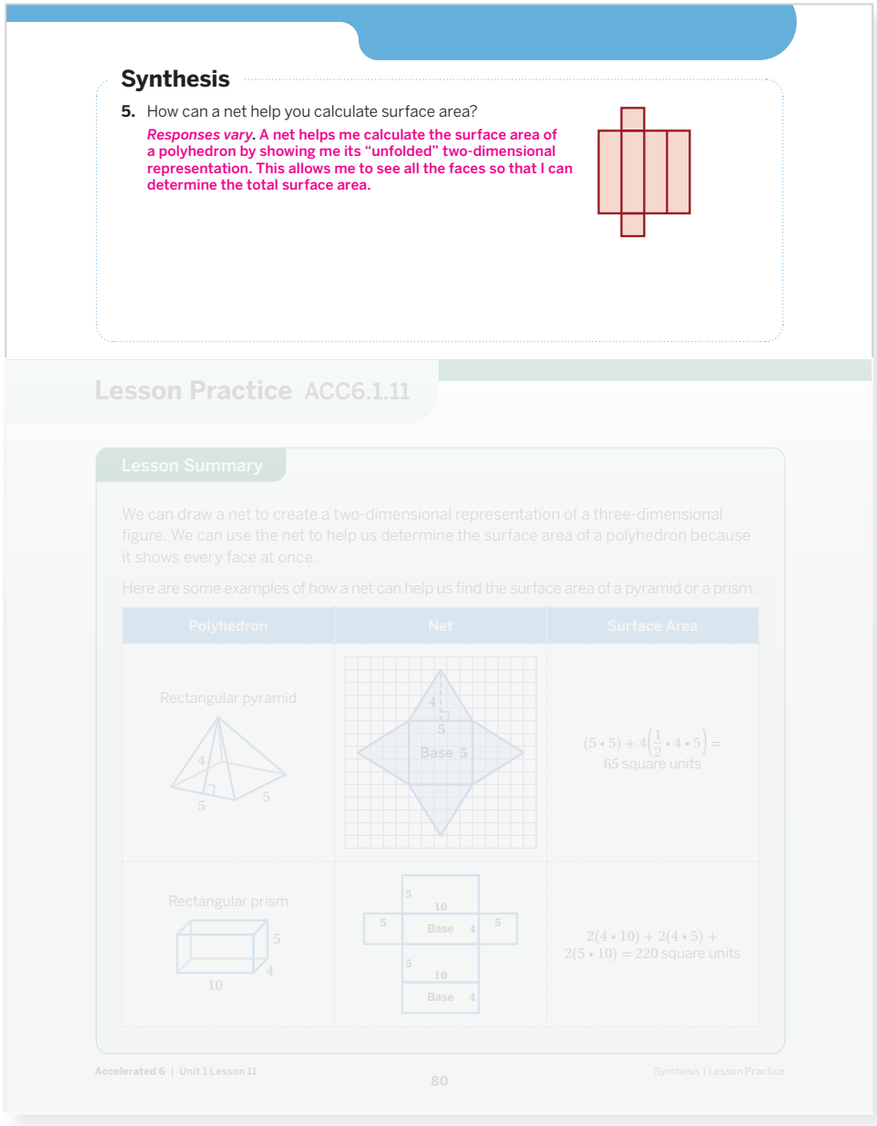
Invite students to respond independently, and then share their thinking with a partner.

Listen for and share a variety of ideas, such as:

- It shows all of the sides in an unfolded way.
- I can see more clearly which shapes are duplicated to help make my calculations more efficient.
- I can combine smaller shapes into larger shapes to help reduce my calculations.
- I can label each edge with the length and find the area with those.
- I can label all of the areas to help me keep track of them before adding them.

MLR **MLR2: Collect and Display** Use this routine to collect students' ideas as they discuss the connections between nets and surface area with a partner. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

5. How can a net help you calculate surface area?

Responses vary. A net helps me calculate the surface area of a polyhedron by showing me its "unfolded" two-dimensional representation. This allows me to see all the faces so that I can determine the total surface area.

Lesson Takeaway: A net can help you calculate the surface area of a polyhedron by showing the "unfolded" two-dimensional representation. This helps you to see all the faces needed to determine the total surface area at one time.

Independent | 5 min

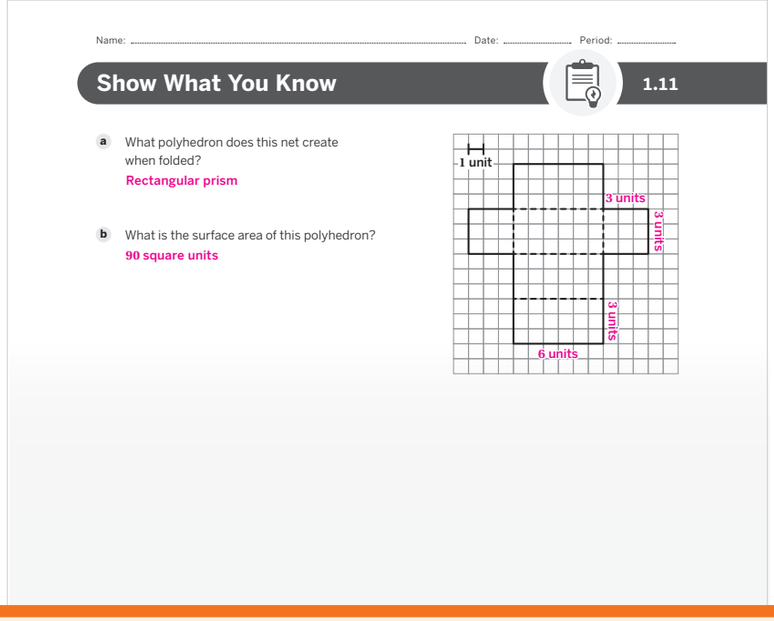
Show What You Know

Purpose: Students demonstrate their understanding by identifying what polyhedron a net represents and calculating its surface area.

Today's Goals

1. **Goal:** Calculate the surface area of a prism or pyramid using a net on a grid.
2. **Goal:** Draw a net for a given prism or pyramid.
3. **Language Goal:** Describe the prisms and pyramids that can be assembled from a given net. **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 1.11

a. What polyhedron does this net create when folded?
Rectangular prism

b. What is the surface area of this polyhedron?
90 square units

D Differentiation Use after Lesson 11

Support

Provide targeted intervention for students by using these resources.

If students need additional support classifying polyhedra:

» **Respond to Student Thinking:**

- Provide nets of 3-D figures and model and color code each similar shape from the net to the 3-D model. This will help students properly identify each shape to find the area to calculate surface area

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.
- Distribute graph paper and invite students to create their own nets.

Professional Learning

Take a moment to reflect on how students' understanding of the terms *surface area* and *net* have developed throughout the past few lessons. How have their connections between these ideas deepened? What new connections still need to be made?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

5. How can a net help you calculate surface area?

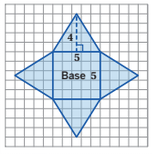
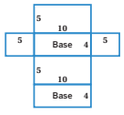
Responses vary. A net helps me calculate the surface area of a polyhedron by showing me its "unfolded" two-dimensional representation. This allows me to see all the faces so that I can determine the total surface area.

Lesson Practice ACC6.1.11

Lesson Summary

We can draw a net to create a two-dimensional representation of a three-dimensional figure. We can use the net to help us determine the surface area of a polyhedron because it shows every face at once.

Here are some examples of how a net can help us find the surface area of a pyramid or a prism.

Polyhedron	Net	Surface Area
Rectangular pyramid		$(5 \cdot 5) + 4\left(\frac{1}{2} \cdot 4 \cdot 5\right) =$ 65 square units
Rectangular prism		$2(4 \cdot 10) + 2(4 \cdot 5) +$ $2(5 \cdot 10) = 220$ square units

Lesson Practice ACC6.1.11

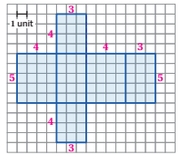
Name: _____ Date: _____ Period: _____

1. Select *all* the units that can be used to describe surface area.

☑ A. Square meters ☐ B. Feet ☐ C. Centimeters

☐ D. Cubic inches ☑ E. Square inches ☑ F. Square feet

Problems 2–3: Here is a net.



2. Name the type of polyhedron that can be created from this net. Explain your thinking.

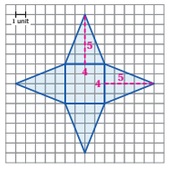
Rectangular prism. ***Explanations vary.*** **Two identical rectangles are the bases, connected by four rectangular sides.**

3. Determine the surface area of this polyhedron. Show or explain your thinking.

94 square units. ***Work varies.***

$2(5 \cdot 4) + 2(5 \cdot 3) + 2(3 \cdot 4) = 94$ **square units**

Problems 4–5: Here is a new net.



4. Name the type of polyhedron that can be created from this net. Show or explain your thinking.

Square pyramid. ***Explanations vary.**** **The square is the base, and the four triangular faces connect at a common point.**

5. Determine the surface area of this polyhedron. Show your thinking.

56 square units. ***Work varies.***

$4\left(\frac{1}{2} \cdot 4 \cdot 5\right) + (4 \cdot 4) = 56$

Lesson Practice ACC6.1.11

Name: _____ Date: _____ Period: _____

FAST Practice

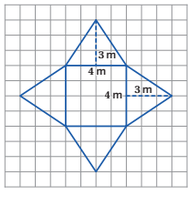
6. The Pyramid Platform company would like to include a statue near the entrance of their building. A builder has designed this plan for the statue. What is the surface area of the statue?

A. 22 square meters

B. 36 square meters

C. 40 square meters

D. 64 square meters



Spiral Review

Problems 7–10: Complete each equation.

7. $3 \cdot \boxed{5} = 15$

8. $4 \cdot \boxed{6} = 24$

9. $15 \cdot \boxed{\frac{1}{3}} = 5$

10. $24 \cdot \boxed{\frac{1}{6}} = 4$

11. Take a look at the triangles in this pattern. What is the fewest number of these triangles needed to cover this pattern completely? Explain your thinking.

32 triangles. ***Explanations vary.*** **There's a repeated pattern made up of 2 rhombuses, 1 triangle, and 1 trapezoid. I need 2 triangles to cover each rhombus and 3 triangles to cover each trapezoid. That makes a total of 8 triangles. Since the pattern is repeated 4 times, I need $8 \cdot 4 = 32$ triangles.**

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.GR.2.4
	2–5	2	MA.6.GR.2.4
FAST Practice	6	2	MA.6.GR.2.4
Spiral Review			
	7–10	1	MA.4.FR.2.4
	11	2	MA.6.GR.2.2

Assess and Respond

End-of-Unit Assessment

Independent | 45 min

Facilitation: Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Using the structure of a diagram to determine the area of a triangle without a grid	Lesson 3	1	MA.6.GR.2.1
2	Determining the area of a triangle, given the length of a base, or a height when given the other two measurements	Lesson 3	1	MA.6.GR.2.1
3	Creating triangles with a given area	Lesson 2	2	MA.6.GR.2.1, MTR.5.1
4a	Calculating the area of a polygon composed of rectangles and triangles on a grid	Lesson 4	2	MA.6.GR.2.2, MTR.2.1, MTR.5.1
4b	Providing a different strategy to calculate the area of a polygon composed of rectangles and triangles on a grid	Lesson 4	3	MA.6.GR.2.2, MTR.2.1, MTR.5.1
5a	Critiquing the reasoning of another who inaccurately calculated the surface area of a rectangular prism.	Lesson 6	3	MA.6.GR.2.2, MTR.4.1
5b	Determining the surface area of a rectangular prism.	Lesson 6	2	MA.6.GR.2.4
6a	Using a net to identify the type of polyhedra	Lesson 7	1	MA.6.GR.2.4
6b	Calculating the surface area of polyhedra	Lesson 8	2	MA.6.GR.2.4
7a	Calculating the area of a polygon in context	Lesson 5	2	MA.6.GR.2.2
7b	Applying area techniques to solve problems in context	Lesson 5	2	MA.6.GR.2.2, MTR.7.1

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Know and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

End-of-Unit Assessment

Unit 1

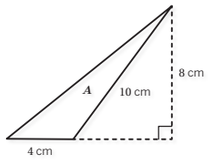
1. What is the area of triangle A?

A. 40 square centimeters

B. 16 square centimeters

C. 20 square centimeters

D. 32 square centimeters



2. What is the matching height for the given base of this triangle?

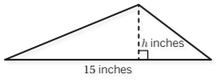
A. 2 inches

B. 4 inches

C. 15 inches

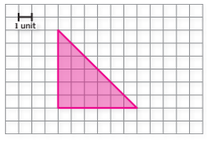
D. 45 inches

Area: 30 square inches

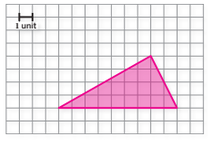


3. Draw two different triangles that each have an area of 18 square units. *Responses vary.* Sketches show two different triangles with an area of 18 square units.

Triangle 1



Triangle 2



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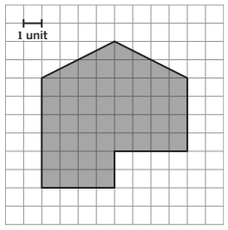
Name: ..... Date: ..... Period: .....

End-of-Unit Assessment (continued)

Unit 1

4. Here is a shape.



a What is the area of this shape?

Area: 48 square units

Show or explain your thinking.

Responses vary. I divided the shape into two rectangles and a triangle. For the rectangles, I calculated $b \times h$ for each and then added them together and I got 40 square units. For the triangle, I calculated $b \times h \div 2$ and got 8 square units. The total area is $40 + 8 = 48$.

b Show or explain a different way to determine the area of the same shape.

Responses vary. I drew a square around the shape and used $b \times h$ to determine its area is 64 square units. Then I calculated the area of each triangle to subtract using $b \times h \div 2$ and got 4 square units per triangle. Next, I counted the squares in the remaining rectangle and got 8 square units. The area is $64 - 4 - 4 - 8 = 48$ square units.

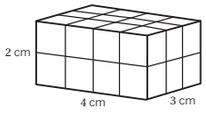
5. Here is the expression Sol wrote to calculate the surface area of this rectangular prism.

Sol

L x W x H

4 x 2 x 3

24 square centimeters



a Describe the mistake that Sol made.

Responses vary. Sol calculated the volume of the prism instead of the surface area. He should have calculated the area of each face and added them together.

b What is the surface area of this prism?

52 square centimeters

Show or explain your thinking.

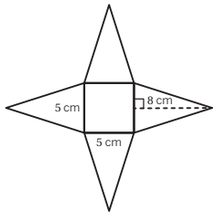
Responses vary. There are two faces whose areas are 8 square centimeters, two faces whose areas are 6 square centimeters, and two faces whose areas are 12 square centimeters. So the surface area is $8 + 8 + 6 + 6 + 12 + 12 = 52$ square centimeters.

Name: ..... Date: ..... Period: .....

End-of-Unit Assessment (continued)

Unit 1

6. Here is a net made of four identical triangles and a square.



a If this net were folded, what type of polyhedron would it make?

Square pyramid or rectangular pyramid

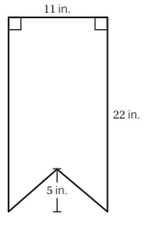
b What is the surface area of that polyhedron?

105 square centimeters

Show or explain your thinking.

Responses vary. The area of the square base is $l \times w = 25$ square centimeters. There are four triangles whose areas are $b \times h \div 2 = 20$ square centimeters each. The surface area is $20 + 20 + 20 + 20 + 25 = 105$ square centimeters.

7. Joel is going to use this board to make a sign.



a What is the area of the front of Joel's sign?

214.5 square inches

Show or explain your thinking.

Responses vary. I made a rectangle around the sign whose area is $b \times h = 11 \times 22 = 242$ square inches. Then I subtracted the area of the missing triangle, $b \times h \div 2 = 27.5$, to get 214.5 square inches.

b Joel found a kit of rainbow paints that covers 100 square inches.

How many kits would he need to cover the front and back of the sign?

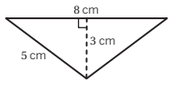
5 kits or 4.29 kits. Students' responses depend on their responses in Problem 7a.

Name: Date: Period:

End-of-Unit Assessment

Unit 1

1. What is the area of this triangle?



A. 12 square centimeters

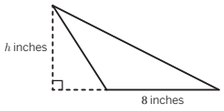
B. 16 square centimeters

C. 24 square centimeters

D. 40 square centimeters

2. What is the matching height for the given base of this triangle?

Area: 24 square inches



A. 3 inches

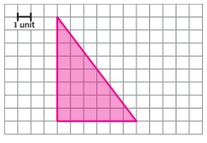
B. 6 inches

C. 96 inches

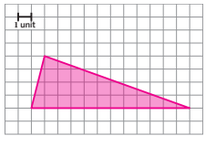
D. 192 inches

3. Draw two different triangles that each have an area of 24 square units. *Responses vary*. Sketches show two different triangles with an area of 24 square units.

Triangle 1



Triangle 2



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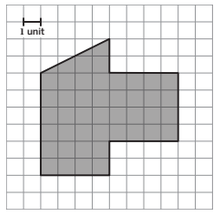
Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 1

4. Here is a shape.



a What is the area of this shape?

Area: 44 square units

Show or explain your thinking.

Responses vary. I divided the shape into two rectangles and a triangle. For the rectangles, I calculated $b \times h$ for each and then added them together and I got 40 square units. For the triangle, I calculated $b \times h \div 2$ and got 4 square units. The total area is $40 + 4 = 44$ square units.

b Show or explain a different way to determine the area of the same shape.

Responses vary. I drew a square around the shape and used $b \times h$ to determine its area is 64 square units. Then I calculated the area of the triangle to subtract using $b \times h \div 2$ and got 4 square units. Next, I counted the squares in the remaining rectangles and got 16 square units. The area is $64 - 4 - 16 = 44$ square units.

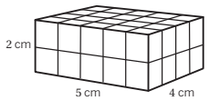
5. Here is the expression Evan wrote to calculate the surface area of this rectangular prism.

Evan

h · L + h · W + L · W

10 + 8 + 20

38 square centimeters



a Describe the mistake that Evan made.

Responses vary. Evan calculated the area of the visible faces only. He should have multiplied the area of each face by 2.

b What is the surface area of this prism?

76 square centimeters

Show or explain your thinking.

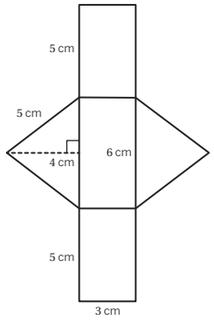
Responses vary. There are two faces whose areas are 10 square centimeters, two faces whose areas are 8 square centimeters, and two faces whose areas are 20 square centimeters. So the surface area is $8 + 8 + 10 + 10 + 20 + 20 = 76$ square centimeters.

Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 1

6. Here is a net made of three rectangles and two identical triangles.



a If this net were folded, what type of polyhedron would it make?

Triangular prism

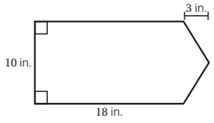
b What is the surface area of that polyhedron?

72 square centimeters

Show or explain your thinking.

Responses vary. There are two rectangles with an area of $l \times w = 15$ square centimeters and one rectangle with an area of $l \times w = 18$ square centimeters. There are two triangles whose areas are $b \times h \div 2 = 12$ square centimeters each. The surface area is $15 + 15 + 18 + 12 + 12 = 72$ square centimeters.

7. Charlie is going to use this board to make a sign.



a What is the area of the front of Charlie's sign?

195 square inches

Show or explain your thinking.

Responses vary. The sign is the combination of a rectangle and a triangle. The rectangle's area is $b \times h = 10 \times 18 = 180$ square inches. Then I added the area of the triangle, $b \times h \div 2 = 15$, to get 195 square inches.

b Charlie wants to cover the front and the back of the sign.

The store sells bottles of paint. Each bottle of paint covers 50 square inches.

How many of these bottles will he need?

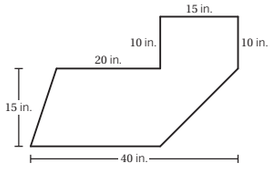
8 bottles or 7.8 bottles. Students' responses depend on their responses in Problem 7a.

Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 1

8. Calculate the area of the composite figures below.



$A_{tri1} = \frac{1}{2}bh = \frac{1}{2}(5)(15) = 37.5 \text{ in}^2$

$A_{tri2} = \frac{1}{2}bh = \frac{1}{2}(15)(15) = 112.5 \text{ in}^2$

$A_{rect1} = bh = 20 \cdot 15 = 300 \text{ in}^2$

$A_{rect2} = bh = 10 \cdot 15 = 150 \text{ in}^2$

$A_{total} = 37.5 + 112.5 + 300 + 150 = 600 \text{ in}^2$

D Differentiation (End-of-Unit Assessment)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	

Sub-Unit 1:
• Calculate the area of rectangles and triangles.
• Calculate the area of composite figures by decomposing into rectangles and triangles or by surrounding and subtracting.
(Lessons 1–5)
	1, 2, 7	**Support**	• **Mini-Lesson:** *Calculating Areas of Triangles*
			• **Teacher Move:** Consider Revisiting
			  • Unit 1, Lesson 3 (*Off the Grid*)
			  • Unit 1, Lesson 4 *(Letters)*
			  • Unit 1, Lesson 5 (*Breaking Down*)

		Strengthen	• **Repeated Challenges:** Lesson 3 (*Off the Grid*) • **Challenge Creator:** Lesson 5 (*Breaking Down)*
	3	**Support** **Strengthen**	• **Teacher Move:** Consider revisiting Unit 1, Lesson 2 (*Exploring Triangles*)
		Stretch	• Invite students to create a design on grid paper using triangles that each have the same area but are not all the same shape.
	4	**Support**	• **Teacher Move:** Consider revisiting Unit 1: Lesson 4 (*Letters*)
		Strengthen	• Inviting students to create their own composite figure on a grid and calculate its area.
Sub-Unit 2: • Calculate the area of rectangles and triangles. • Calculate the area of composite figures by decomposing into rectangles and triangles or by surrounding and subtracting. **(Lessons 6–7)**	5	**Support** **Strengthen**	• **Mini Lesson:** *Determining Surface Areas of Rectangular Prisms* • **Teacher Move:** Consider revisiting Unit 1, Lesson 6 (*Renata's Stickers*)
		Stretch	• **You're invited to explore more:** Lesson 6 (*Renata's Stickers*)

	6	**Support**
		Strengthen
			• **Teacher Move:** Consider Revisiting
			  • Unit 1, Lesson 7 (*Pyramids and Prisms*)
			  • Unit 1, Lesson 8 (*Nothing But Nets*)

UNIT 2

Introducing Ratios

Students are introduced to the concept of ratios. They represent ratios using double number lines, tables, and tape diagrams and use ratio reasoning to solve problems.

Essential Questions

- What does a ratio say about the relationship between quantities?
- How can ratios help you get the same taste, texture, or color every time you make a recipe?
- How can ratios help us consider issues in real-world situations?

Sub-Unit Goals

Sub-Unit 1

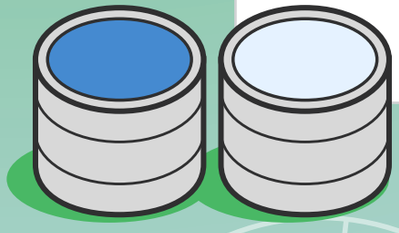
- Use tables, double number line diagrams, and ratios per 1 to solve problems with equivalent ratios.

Sub-Unit 2

- Determine the least common multiple and greatest common factor of two numbers.

Sub-Unit 3

- Use a variety of strategies to compare ratios in context.
- Use double number line diagrams and tables of equivalent ratios to solve real-world and mathematical problems.



The Math of the Unit

Unit Outcomes Telling a story that narrows and deepens with the grade

Florida B.E.S.T. Standards for Mathematics

Apply properties of operations to rewrite numbers in equivalent forms. **(MA.6.NSO.3)**

Understand ratio and unit rate concepts and use them to solve problems. **(MA.6.AR.3)**

Use percentages and proportional reasoning to solve problems. **(MA.7.AR.3)**

Benchmarks Addressed in This Unit: MA.6.NSO.3.1 MA.6.AR.3.1 MA.6.AR.3.3 MA.6.AR.3.4 MA.6.AR.3.5 MA.7.AR.3.2

Mathematical Thinking and Reasoning Standards

- Actively participate in effortful learning both individually and collectively. **(MTR.1.1)**
- Use patterns and structure to help understand and connect mathematical concepts. **(MTR.5.1)**
- Assess the reasonableness of solutions. **(MTR.6.1)**
- Apply mathematics to real-world contexts. **(MTR.7.1)**

Also Addressed: **MTR.2.1, MTR.4.1**

Coherence Telling a story within and across grades

In this Unit

Students are introduced to ratios, learn a variety of tools to make sense of equivalent ratios (including tables and double number lines), and solve a variety of problems using those tools.

Prior Learning

- Two-column tables **(MA.5.AR.3.2)**
- Equivalent fractions **(MA.3.FR.2.2, MA.4.FR.1.1, MA.4.FR.1.3)**
- Multiplicative relationships **(MA.4.AR.1.1)**
- Interpreting fractions **(MA.5.FR.1.1)**

Future Learning

- **Unit 3:** Unit conversions, rates and percentages **(MA.6.AR.3.2, MA.6.AR.3.4, MA.6.AR.3.5, MA.7.AR.3.2)**
- Proportional relationships **(MA.7.AR.3.2, MA.7.AR.4)**

Rigor and Balance Integrating the aspects of rigor in ways that support one other

Here are examples of the aspects of rigor and balance in this unit. See the first page of each lesson's Teacher Edition for more information.

Conceptual Understanding

In **Lesson 1–5**, students explore equivalent ratios by scaling recipes and making sense of them using a variety of ratio reasoning tools.

Strategic Competence

In **Lessons 10–11**, students use a variety of representations and language to solve problems about ratios in and out of context.

Procedural Fluency

In **Lesson 5**, students develop fluency in representing ratios using double number lines. In **Lesson 6**, students develop their fluency in determining the least common multiple of two numbers.

Adaptive Reasoning

In **Lessons 3–4**, students move between tables and double number line diagrams to make sense of problems and show their thinking.

Application

In **Lesson 12**, students apply their understanding of equivalent ratios to the practical context of lunch waste.

Productive Disposition

In **Lesson 1**, students have opportunities to develop a productive disposition as they design their own pizza and use it to describe ratios.

Unit at a Glance

Assess and Respond

A Pre-Unit Check

Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

MA.3.AR.3.2 MA.3.NSO.2.2 MA.4.AR.1.1 MA.4.FR.1.3 MA.4.FR.2.2 MA.4.FR.2.4 MA.4.NSO.1.3 MA.4.NSO.2.1 MA.5.AR.1.2
MTR.3.1 MTR.4.1 MTR.5.1

Sub-Unit 1

1 Ratio Relationships

Describing Ratios

Learn what **ratios** are and how to describe them.

MA.6.AR.3.1
MTR.5.1

2 Rice Ratios

Introduction to Equivalent Ratios

Use the structure of diagrams and intuition to generate **equivalent ratios**.

MA.6.AR.3.1 MA.6.AR.3.5
MTR.5.1

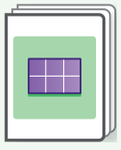
3 Fruit Lab

Creating Equivalent Ratios

Generate equivalent ratios by balancing fruit on scales.

MA.6.AR.3.3
MTR.1.1 MTR.4.1 MTR.5.1

Sub-Unit 3



7 Common Factors

Investigating Greatest Common Factor

Apply knowledge of factors to determine the **greatest common factor (GCF)** of two numbers.

MA.6.NSO.3.1
MTR.4.1

8 Mixing Paint

Comparing Ratios

Use paint mixtures as a context to develop and share strategies for comparing ratios.

MA.6.AR.3.5
MTR.4.1 MTR.6.1

9 Disaster Preparation

Using Ratio Tables With Large Quantities

Analyze recommendations about various items to have on hand in case of a disaster.

MA.6.AR.3.3
MTR.2.1 MTR.7.1

10 Balloons

Solving Ratio Problems

Use tools to solve problems involving equivalent ratios.

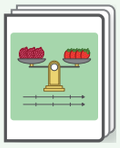
MA.6.AR.3.3
MTR.2.1 MTR.5.1

Pacing: 16 days | **Short on time?** See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 12 Lessons
- Math in Action
- Pre-Unit Check
- Sub-Unit Quiz
- End-of-Unit Assessment

Sub-Unit 2



4 Balancing Act

Introduction to Double Number Lines

Use **double number lines** to solve problems involving equivalent ratios.

MA.6.AR.3.3 MA.6.AR.3.5
MTR.4.1

5 Table It

Part-to-Part-to-Whole Ratio Tables

Use tables to display part-to-part-to-whole ratios and solve problems.

MA.6.AR.3.3
MTR.4.1 MTR.5.1 MTR.7.1

Assess and Respond

A Sub-Unit Quiz

Learn about your students' understanding of the concepts and skills so far in this unit.

MA.6.AR.3.1, MA.6.AR.3.3
MTR.4.1

Sub-Unit 2

6 Common Multiples

Investigating Least Common Multiple

Determine the **least common multiple (LCM)** of two numbers.

MA.6.NSO.3.1
MTR.1.1

Assess and Respond

11 Community Life

Solving Equivalent Ratio Problems in Context

Determine whether ratio reasoning can be used to understand more about a rice situation and then explore a variety of other problems.

MA.6.AR.3.3
MTR.1.1

12 Lunch Waste

Applying Ratio Strategies

Use personal experiences and different kinds of ratio reasoning to make sense of school lunch waste.

MA.6.AR.3.5 MA.7.AR.3.2
MTR.4.1 MTR.7.1

M Math in Action

Connecting Ratios to Drumming

Explore the connection between ratios and playing the drums, and the contributions of Clayton Cameron to music.

MA.6.AR.3.1 MA.6.AR.3.5
MA.6.GR.2.1 MA.6.GR.2.4
MTR.1.1 MTR.3.1

A End-of-Unit Assessment

Learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

MA.6.NSO.3.1 MA.6.AR.3.3
MTR.3.1 MTR.4.1 MTR.5.1 MTR.6.1

Pacing Considerations

Lesson 11: This lesson supports students in applying what they've learned about ratios to make sense of situations in context. If students show a strong understanding of ratios in earlier lessons, this lesson may be omitted. If omitted, be sure to highlight strategies for solving problems using equivalent ratios elsewhere in the unit.

Lesson 12: This lesson gives students an opportunity to use their personal experiences and different kinds of ratio reasoning to make sense of a common experience: school lunch and lunch waste. There is no new content introduced in this lesson.

Lesson Materials and Prep

Here are the materials and resources needed within each lesson, how to prepare them, and where to find them.

Lesson 1	Lesson 2	Lesson 3	Lesson 4
Copy: Show What You Know **Cut:** Activity 1 Cards *(one set for the whole class)*	**Copy:** Show What You Know	**Copy:** Show What You Know, Activity 2 Sheet *(one per student)*	**Copy:** Show What You Know
Lesson 5	**Lesson 6**	**Lesson 7**	**Lesson 8**
Copy: Show What You Know	**Copy:** Show What You Know, More Multiples Sheet *(one per student)* **Materials:** coloring tools, highlighters, or small chips	**Copy:** Show What You Know, More Multiples Sheet *(as needed)* **Materials:** calculators *(optional)*, multiplication table *(optional)*	**Copy:** Show What You Know **Materials:** coloring tools
Lesson 9	**Lesson 10**	**Lesson 11**	**Lesson 12**
Copy: Show What You Know **Materials:** posters *(one per group)*, coloring tools	**Copy:** Show What You Know	**Copy:** Show What You Know, Activity 1 Sheet *(one per pair)*, Activities 2 & 3 Sheet *(one per pair)*	**Copy:** Show What You Know

Resource Books

Assessment and Lesson Resources

- Pre-Unit Check
- Sub-Unit Quizzes
- End-of-Unit Assessment, Forms A & B
- Assessment Rubrics
- Show What You Knows
- Activity Sheets and Cards

Intervention and Extension Resources

- Mini-Lessons
- Prior Grade Mini-Lessons
- Extensions

Caregiver Support

These resources can be shared with students' caregivers. They provide background on the mathematics in this unit, as well as suggestions for supporting students at home.

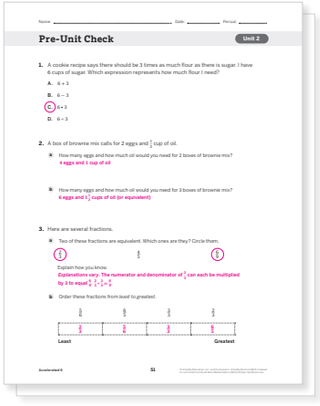
Assessments

Every unit includes a variety of formative and summative assessments designed to highlight students' understanding of a variety of concepts and skills.

Pre-Unit Check

Assign the **Pre-Unit Check** to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

Standards assessed: MA.3.AR.3.2, MA.3.NSO.2.2, MA.4.AR.1.1, MA.4.FR.1.3, MA.4.FR.2.2, MA.4.FR.2.4, MA.4.NSO.1.3, MA.4.NSO.2.1, MA.5.AR.1.2


Pre-Unit Check

Unit 2

1. A cookie recipe says there should be 3 times as much flour as there is sugar. I have 6 cups of sugar. Which expression represents how much flour I need?

A. 6 + 3
B. 6 − 3
C. 6 × 3
D. 6 ÷ 3

2. A box of brownie mix calls for 2 eggs and $\frac{1}{2}$ cup of oil.

a. How many eggs and how much oil would you need for 2 boxes of brownie mix?
4 eggs and 1 cup of oil

b. How many eggs and how much oil would you need for 3 boxes of brownie mix?
6 eggs and 1$\frac{1}{2}$ cups of oil (or equivalent)

3. Here are several fractions.

a. Two of these fractions are equivalent. Which ones are they? Circle them.

Explain how you know.
Explanations vary. The numerator and denominator of $\frac{1}{2}$ can each be multiplied by 3 to equal $\frac{3}{6}$. $\frac{1}{2} \cdot \frac{3}{3} = \frac{3}{6}$

b. Order these fractions from least to greatest.

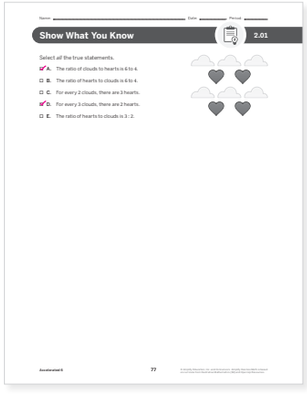
Least Greatest

Accelerated 6 51

Lesson | Show What You Know

Use the **Show What You Know** for each lesson to learn more about your students' progress toward the lesson goal(s). Here is one example from this unit.

Standards assessed on Lesson 1 Show What You Know: MA.6.AR.3.1


Show What You Know

2.01

Select all the true statements.

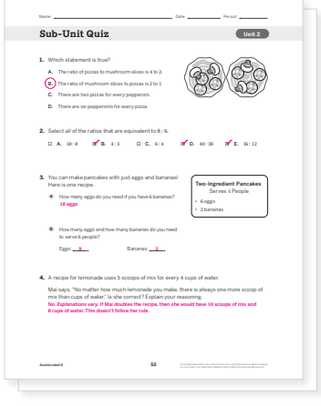
- [x] A. The ratio of clouds to hearts is 4 to 4.
- [ ] B. The ratio of hearts to clouds is 4 to 4.
- [ ] C. For every 2 clouds, there are 3 hearts.
- [x] D. For every 3 clouds, there are 2 hearts.
- [ ] E. The ratio of hearts to clouds is 3 : 2.

Accelerated 6 77

Sub-Unit Quiz

Assign the **Sub-Unit Quiz** to learn about your students' understanding of the concepts and skills so far in this unit.

Standards assessed: MA.6.AR.3.1, MA.6.AR.3.3


Sub-Unit Quiz

Unit 2

1. Which statement is true?

A. The ratio of pizzas to mushroom slices is 4 to 2.
B. The ratio of mushroom slices to pizzas is 2 to 1.
C. There are two pizzas for every pepperoni.
D. There are six pepperonis for every pizza.

2. Select all of the ratios that are equivalent to 8 : 6.

- [ ] A. 10 : 8
- [x] B. 4 : 3
- [ ] C. 6 : 4
- [x] D. 40 : 30
- [x] E. 16 : 12

3. You can make pancakes with just eggs and bananas! Here is one recipe.

Two-Ingredient Pancakes
Serves 4 People
- 4 eggs
- 2 bananas

a. How many eggs do you need if you have 6 bananas?
18 eggs

b. How many eggs and how many bananas do you need to serve 6 people?
Eggs: 9 Bananas: 3

4. A recipe for lemonade uses 5 scoops of mix for every 4 cups of water.

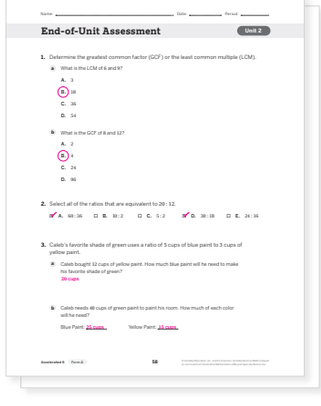
Mai says, "No matter how much lemonade you make, there is always one more scoop of mix than cups of water." Is she correct? Explain your reasoning.
No. Explanations vary. If Mai doubles the recipe, then she would have 10 scoops of mix and 8 cups of water. This doesn't follow her rule.

Accelerated 6 53

End-of-Unit Assessment

Assign the **End-of-Unit Assessment** to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

Standards assessed: MA.6.NSO.3.1, MA.6.AR.3.3


End-of-Unit Assessment

Unit 2

1. Determine the greatest common factor (GCF) or the least common multiple (LCM).

a. What is the LCM of 6 and 9?

A. 3
B. 18
C. 36
D. 54

b. What is the GCF of 8 and 12?

A. 2
B. 4
C. 24
D. 96

2. Select all of the ratios that are equivalent to 28 : 12.

- [x] A. 49 : 35
- [ ] B. 30 : 2
- [ ] C. 5 : 2
- [x] D. 30 : 18
- [ ] E. 24 : 16

3. Caleb's favorite shade of green uses a ratio of 5 cups of blue paint to 3 cups of yellow paint.

a. Caleb bought 12 cups of yellow paint. How much blue paint will he need to make his favorite shade of green?
20 cups

b. Caleb needs 48 cups of green paint to paint his room. How much of each color will he need?

Blue Paint: 30 cups Yellow Paint: 18 cups

Accelerated 6 Form A 58

Differentiation

Every unit includes additional resources to support, strengthen, and stretch student learning.

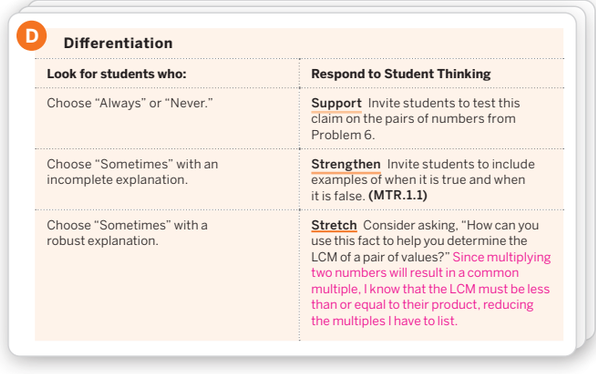
Differentiation Across the Unit

	Support	Strengthen	Stretch
	Provide targeted intervention for students by using these resources.	Reinforce students' understanding of the concepts assessed by using these resources.	Challenge students and extend their learning with these resources.
Sub-Unit 1 (Lessons 1–5) • Use tables, double number line diagrams, and ratios per 1 to solve problems with equivalent ratios.	**Mini-Lesson** • *Generating Equivalent Ratios*	**Practice** • Lessons 1–5	**You're invited to explore more.** • Lesson 3 (*Fruit Lab*) • Lesson 4 (*Balancing Act*) **DOK3 Practice** • Lesson 5
Sub-Unit 2 (Lessons 6–8) • Determine the least common multiple and greatest common factor of two numbers.	**Mini-Lesson** • *Comparing Ratios*	**Repeated Challenges** • Lesson 7 (*Common Factors*) **Practice** • Lessons 6–8	**You're invited to explore more.** • Lesson 6 (*Common Multiples*) • Lesson 7 (*Common Factors*) **DOK3 Practice** • Lesson 7
Sub-Unit 3 (Lessons 9–12) • Use a variety of strategies to compare ratios in context. • Use double number line diagrams and tables of equivalent ratios to solve real-world and mathematical problems.	**Mini-Lesson** • *Using Ratio Tables to Solve Problems*	**Repeated Challenges** • Lesson 10 (*Balloons*) **Practice** • Lessons 9–12	**You're invited to explore more.** • Lesson 11 (*Community Life*) **DOK3 Practice** • Lesson 10

Differentiation Within the Lesson

Each Teacher Edition includes point-of-use differentiation suggestions to modify or adjust instruction during the lesson to accommodate the needs of all learners.

Here is one example from **Lesson 6**, where students analyze the statement "To find the least common multiple of two numbers, just multiply them together" and determine whether it is always, sometimes, or never true.



Differentiation

Look for students who:	Respond to Student Thinking
Choose "Always" or "Never."	**Support** Invite students to test this claim on the pairs of numbers from Problem 6.
Choose "Sometimes" with an incomplete explanation.	**Strengthen** Invite students to include examples of when it is true and when it is false. **(MTR.1.1)**
Choose "Sometimes" with a robust explanation.	**Stretch** Consider asking, "How can you use this fact to help you determine the LCM of a pair of values?" Since multiplying two numbers will result in a common multiple, I know that the LCM must be less than or equal to their product, reducing the multiples I have to list.

Accessibility

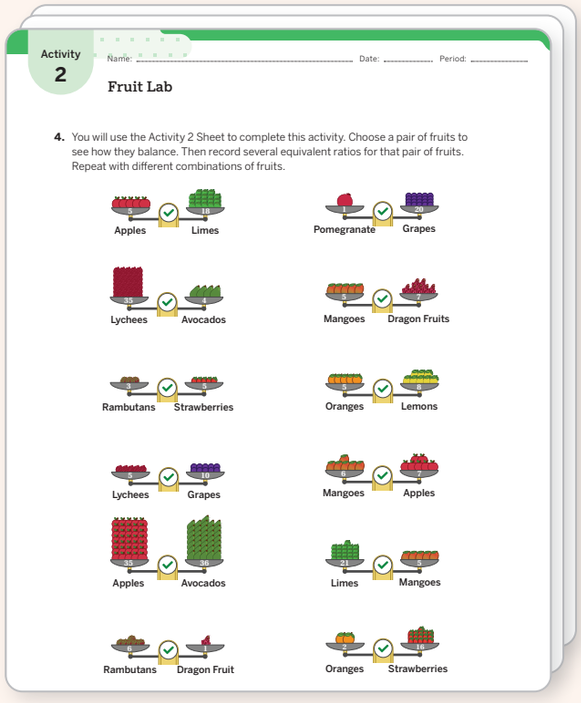
Every lesson is designed using the principles of Universal Design for Learning. Every lesson also includes support suggestions that build on students' strengths.

Universal Design for Learning

Here is one example from a lesson designed to support Engagement.

Spotlight on Providing Opportunities for Student Choice and Engagement

Lesson 3: Students are provided with an opportunity to choose a pair of fruits to see how they balance, which supports student engagement.



Just-In-Time Accommodations and Supports

Each Teacher Edition includes suggested supports based on the areas of cognitive function from the Education Development Center (EDC).

Spotlight on Conceptual Processing

Here are two suggestions in this unit for supporting students with complex tasks that require understanding the context before beginning.

Lesson 9, Warm-Up

Accessibility: Conceptual Processing Read the prompt aloud for students who benefit from extra processing time.

Lesson 11, Activity 1

Accessibility: Conceptual Processing To provide access, begin with a demonstration of Problem A. Check in with individual students as needed to assess for comprehension as they sort each card.

Language Development

Every lesson includes opportunities for all students to develop fluency with mathematical language.

Vocabulary

New Vocabulary	Lesson(s)
ratio	1
equivalent ratio	2
table	3
double number line	4
common multiple least common multiple	6
common factor greatest common factor	7

Review Vocabulary
factor (of a number)

Math Language Routines and Language Goals

Math Language Routine	Lesson(s)
MLR1: Stronger and Clearer Each Time	12
MLR2: Collect and Display	1–8, 11
MLR3: Critique, Correct, Clarify	8
MLR6: Three Reads	11
MLR7: Compare and Connect	9–11

Sub-Unit Language Goals

- Describe ratio relationships between two quantities using appropriate notation and mathematically precise language.
- Analyze strategies for solving problems involving equivalent ratios, including using tables and double number line diagrams.
- Interpret different representations of a ratio relationship to make sense of a situation in context.
- Interpret least common multiples and greatest common factors in mathematical and real-world situations.

English Language Learners Support

Every Teacher Edition includes suggestions for supporting the needs of students learning English.

Here is one example from **Lesson 5**, where students are provided sentence frames to support in explaining their strategy.

ELL **English Language Learners** Provide sentence frames to help students explain their strategy (e.g., "I noticed that _____, so I _____." or "First, I _____ because _____."). **(Writing and Speaking)**

Connections to Future Learning

Here is how the content in this unit connects to where your students are headed in their math journeys.

Unit Conversions

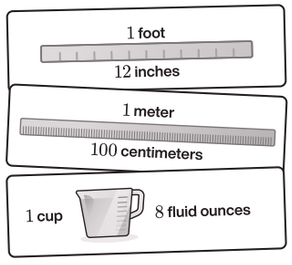
In this unit, students study ratios. **In Unit 3**, students will use ratios to help them convert between units.

FL B.E.S.T. Math Benchmark:
MA.6.AR.3.5

Example:

To determine how many inches are in 4 feet multiply $12 \cdot 4 = 48$ inches.

To determine how many feet are in 30 inches, multiply $30 \cdot \frac{1}{12} = 2.5$ feet.



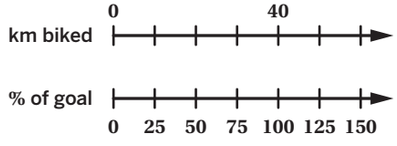
Percentages

In this unit, students use ratio strategies like tape diagrams, double number lines, and tables. In **Unit 3**, students will apply these strategies to reason about percentages.

FL B.E.S.T. Math Benchmark:
MA.6.AR.3.4

Example:

If Binta's goal is to ride 40 kilometers, I can create a double number line where 40 kilometers lines up with 100%. Then 50% of the ride is 20 kilometers and 75% is 30 kilometers.



Proportional Relationships

In this unit, students learn about ratios and determine a ratio for one of each quantity. **In a future course**, students will use ratios to write and compare proportional relationships.

FL B.E.S.T. Math Benchmarks:
MA.7.AR.3.2, MA.7.AR.4.1, MA.7.AR.4.2

Example:

Carpets are sold at a price per square foot, so the ratios for amount of carpet to the cost are all equal.
$\frac{15}{10} = \frac{30}{20} = \frac{75}{50} = \$1.50$ per square foot

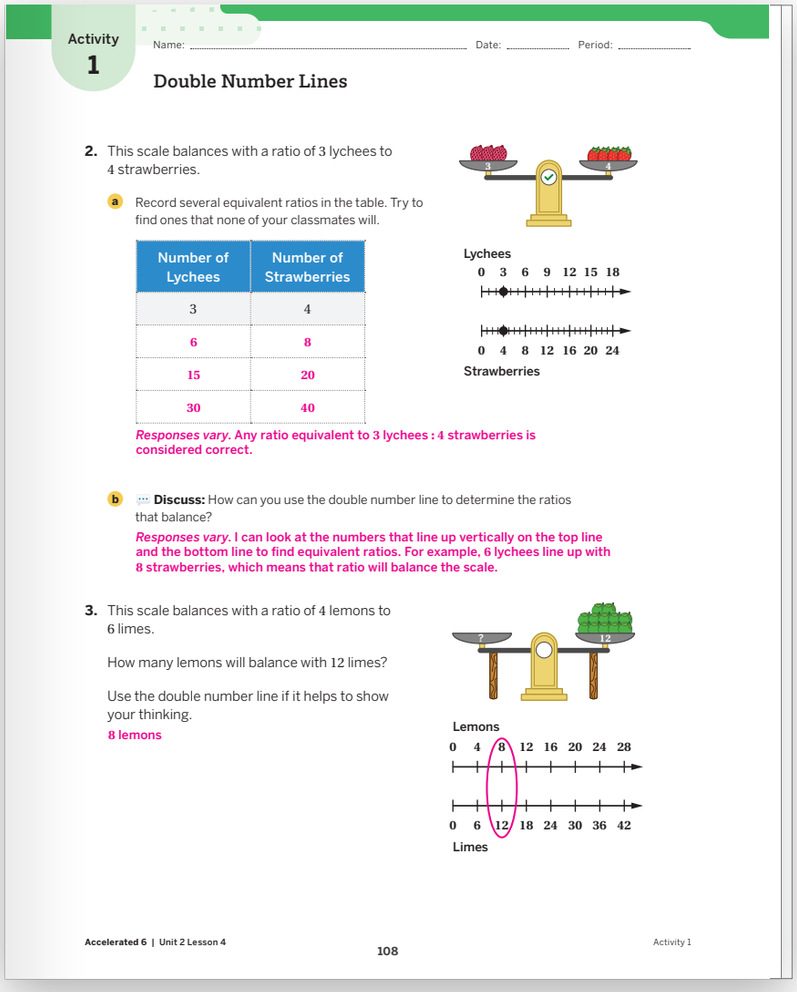
Carpet (sq. ft)	Cost (dollars)
10	15.00
20	30.00
50	75.00

Professional Learning

Here is an opportunity to deepen your understanding of the math in this unit and how to teach it.

Spotlight on Adaptive Reasoning

Lesson 4, Activity 1



Activity 1

Name: _____ Date: _____ Period: _____

Double Number Lines

2. This scale balances with a ratio of 3 lychees to 4 strawberries.

a. Record several equivalent ratios in the table. Try to find ones that none of your classmates will.

Number of Lychees	Number of Strawberries
3	4
6	8
15	20
30	40

Responses vary. Any ratio equivalent to 3 lychees : 4 strawberries is considered correct.

b. **Discuss:** How can you use the double number line to determine the ratios that balance?

Responses vary. I can look at the numbers that line up vertically on the top line and the bottom line to find equivalent ratios. For example, 6 lychees line up with 8 strawberries, which means that ratio will balance the scale.

3. This scale balances with a ratio of 4 lemons to 6 limes.

How many lemons will balance with 12 limes?

Use the double number line if it helps to show your thinking.

8 lemons

Accelerated 6 | Unit 2 Lesson 4 108 Activity 1

Context

In this activity, students develop adaptive reasoning as they move fluently between tables and double number line diagrams to make sense of the problem and justify their solution strategy.

Try This

Put on your student hat and complete Problems 2–3.

Points to Ponder

- What do students need to understand about equivalent ratios to support their adaptive reasoning about tables and double number line diagrams?
- How do double number lines build from their understanding of equivalent ratios developed earlier in the unit?
- Some students will prefer one representation over the other. How might you support students in making connections between the representations to build adaptive reasoning?
- In what ways are the tools that students used in this unit (e.g., ratio tables and double number lines) similar to tools you used when you learned about ratios? How can they help students in exploring ideas about rate in future units?

Notes:

Assess and Respond

Pre-Unit Check

Independent | 45 min

Facilitation: Assign the Pre-Unit Check to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Preparation for	DOK	FL B.E.S.T. Math Benchmarks
1	Representing situations of multiplicative comparisons as expressions	Lesson 1	1	MA.4.AR.1.1
2	Multiplying or dividing to solve problems involving multiplicative comparison	Lesson 2	1	MA.4.AR.1.1, MA.5.AR.1.2
3a	Identifying and explaining why two fractions are equivalent	Lesson 2	2	MA.4.FR.2.2 MTR.4.1
3b	Ordering fractions from least to greatest	Lesson 2	1	MA.4.FR.1.3
4	Labeling the missing values of equally-spaced tick marks on a number line diagram	Lesson 4	1	MA.4.NSO.1.3 MTR.3.1
5	Identifying the factors of a number from a list	Lesson 7	1	MA.4.NSO.2.1
6	Determining unknown values of equations by understanding the effects of multiplying by a whole number versus a fraction	Lesson 10	2	MA.4.FR.2.4
7a	Identifying the multiples of a number from a list	Lesson 6	1	MA.3.AR.3.2 MTR.5.1
7b	Identifying the factors of a number from a list	Lesson 7	1	MA.3.NSO.2.2 MTR.5.1

Assessment and Lesson Resources

- Student Assessments
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Pre-Unit Check

Unit 2

1. A cookie recipe says there should be 3 times as much flour as there is sugar. I have 6 cups of sugar. Which expression represents how much flour I need?

A. $6 + 3$

B. $6 - 3$

C. $6 \cdot 3$

D. $6 \div 3$

2. A box of brownie mix calls for 2 eggs and $\frac{1}{2}$ cup of oil.

a How many eggs and how much oil would you need for 2 boxes of brownie mix?

4 eggs and 1 cup of oil

b How many eggs and how much oil would you need for 3 boxes of brownie mix?

6 eggs and $1\frac{1}{2}$ cups of oil (or equivalent)

3. Here are several fractions.

a Two of these fractions are equivalent. Which ones are they? Circle them.

$\frac{2}{3}$ $\quad$ $\frac{4}{5}$ $\quad$ $\frac{6}{9}$

Explain how you know.

***Explanations vary*. The numerator and denominator of $\frac{2}{3}$ can each be multiplied by 3 to equal $\frac{6}{9}$. $\frac{2}{3} \cdot \frac{3}{3} = \frac{6}{9}$.**

b Order these fractions from *least* to *greatest*.

$\frac{5}{6}$ $\quad$ $\frac{6}{5}$ $\quad$ $\frac{3}{3}$ $\quad$ $\frac{2}{3}$

$\frac{2}{3}$ $\quad$ $\frac{5}{6}$ $\quad$ $\frac{3}{3}$ $\quad$ $\frac{6}{5}$

Least $\qquad$ **Greatest**

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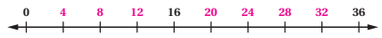
Name: ..... Date: ..... Period: .....

Pre-Unit Check (continued)

Unit 2

4. Label the value of each tick mark on the number line.



5. The number 2 is a factor of 12. Circle all of the other factors of 12 from the list below.

(1) (2) (3) (4) 5 (6) 7 8 9 10 11 (12)

6. Complete each equation with a number that makes it true.

a $4 \cdot \underline{5} = 20$

b $8 \cdot \underline{4} = 32$

c $32 \cdot \underline{\frac{1}{4}} = 8$ **(or equivalent)**

d $20 \cdot \underline{\frac{1}{5}} = 4$ **(or equivalent)**

7. Each grid shows the numbers from 1 to 30.

a Circle all the *multiples* of 6.

1	2	3	4	5	(6)	7	8	9	10
11	(12)	13	14	15	16	17	(18)	19	20
21	22	23	(24)	25	26	27	28	29	(30)

b Circle all the *factors* of 24.

(1)	(2)	(3)	(4)	5	(6)	7	(8)	9	10
11	(12)	13	14	15	16	17	18	19	20
21	22	23	(24)	25	26	27	28	29	30

D Differentiation (Pre-Unit Check)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

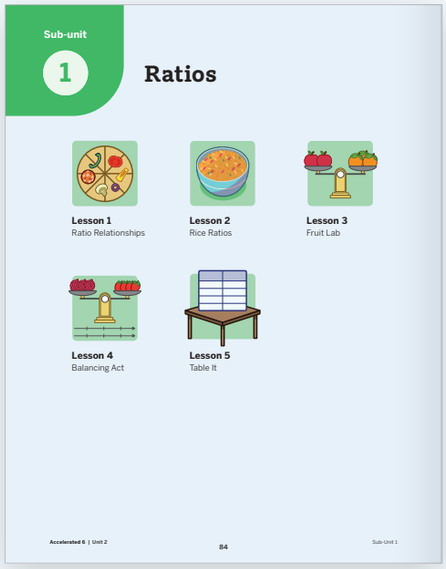
Sub-Unit Goals	Problem(s)	Respond to Student Thinking
Preparation for Sub-Unit 1: • Use tables, double number line diagrams, and ratios per 1 to solve problems with equivalent ratios. **(Lessons 1–5)**	1	**Support** • **Teacher Move:** After **Lesson 1**, consider revisiting this problem and asking, "What changes to the prompt will result in __ being the solution?"
	2, 3	**Support** • **Mini-Lesson:** *Identifying Equivalent Fractions Using Factors and Multiples* • **Teacher Move:** After **Lesson 2**, consider making connections between strategies students used with equivalent ratios and equivalent fractions.
	4	**Support** • **Teacher Move:** Before **Lesson 4**, consider writing an inaccurate solution and using the routine **MLR3: Critique, Correct, Clarify**.
Preparation for Sub-Unit 2: • Determine the least common multiple and greatest common factor of two numbers. **(Lessons 6–8)**	5, 7b	**Support** • **Teacher Move:** Before **Lesson 7**, consider revisiting this problem and invite students to share their strategies for determining factors of numbers.
	7a	**Support** • **Mini-Lesson:** *Identifying Multiples* • **Teacher Move:** Before **Lesson 6**, consider revisiting this problem and invite students to share how they used the structure of this problem to determine the multiples of a number.
	6	**Support** • **Teacher Move:** Before **Lesson 8**, consider revisiting this problem and asking, "How are the second and third equations related?"

Ratios

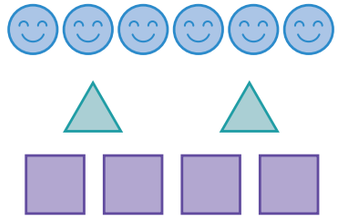
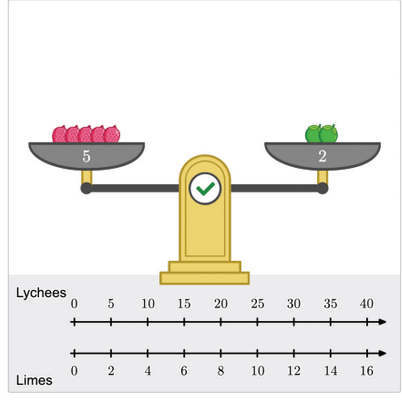
Sub-Unit 1 Goals

- **Goal:** Use tables, double number line diagrams, and ratios per 1 to solve problems with equivalent ratios.
- **Language Goal:** Describe ratio relationships between two quantities using appropriate notation and mathematically precise language.
- **Language Goal:** Analyze strategies for solving problems involving equivalent ratios, including using tables and double number line diagrams.

Students learn what **ratios** are, how to describe them, and how to generate equivalent ratios. Students are introduced to **double number lines** and part-to-part-to-whole ratio **tables** as tools for solving problems with **equivalent ratios**.



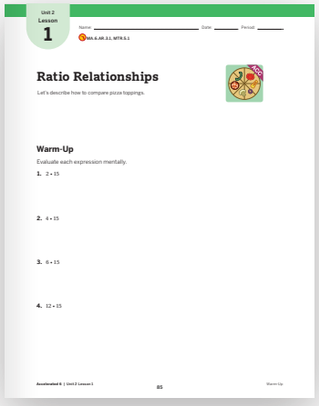
Math that Matters Most

Concept or Skill	For example . . .
Write ratios.	**The ratio of smiley faces to triangles is 3 to 1.** 
Create equivalent ratios.	This scale balances with a ratio of 5 lychees to 2 limes. How many lychees will balance with 10 limes? **25 lychees** 
Complete a table to display equivalent ratios.	For every 7 laps that a puppy completes in a pen, a rabbit completes 4 laps. Complete the table of equivalent ratios.

Puppy Laps	Rabbit	Total Laps
7	4	**11**
14	**8**	**22**

Unit 2
Lesson
1

ACC Accelerated


Unit 2
Lesson
1

Name _____ Date _____ Period _____

MA.6.AR.3.1, MTR.5.1

Ratio Relationships

Let's describe how to compare pizza toppings.

Warm-Up

Evaluate each expression mentally.

1. $2 \cdot 15$

2. $4 \cdot 15$

3. $6 \cdot 15$

4. $12 \cdot 15$

Accelerated 6 | Unit 2 Lesson 1 85 Warm-Up

Ratio Relationships

Describing Ratios

Let's describe how to compare pizza toppings.

Learning Outcomes

Today's Goal

1. **Language Goal:** Describe ratio relationships between two quantities using the mathematical language, "For every a of these, there are b of those," and, "The ratio of these to those is $a : b$ (read a to b)." **(Reading, Writing, Speaking, and Listening)**

Students learn what **ratios** are and how to describe them. Three sentence structures for describing ratio relationships are introduced: "For every a of these, there are b of those"; "The ratio of these to those is a to b"; and, "The ratio of these to those is $a : b$." Students also analyze and create descriptions of ratios in various contexts.

Coherence

Prior Learning

In Lesson 1, students created their own pizzas and used them to explore ratio concepts. Students began to surface strategies for solving ratio problems. In a previous course, students interpreted a multiplication equation as a comparison and represented verbal statements of multiplicative comparisons as multiplication equations.

Future Learning

In Lesson 2, students will build on their knowledge of ratio language as they learn about equivalent ratios.

Connections

- Students model and describe ratio relationships as they choose ingredients for making pizza. (real-world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.1

Given a real-world context, write and interpret ratios to show the relative sizes of two quantities using appropriate notation: $\frac{a}{b}$, a to b, or $a : b$ where $b \neq 0$.

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On

4.OA.A.1

Vocabulary

New Vocabulary

ratio

Lesson at a Glance

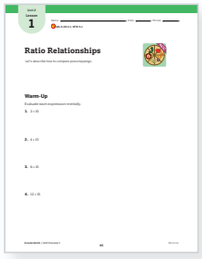
~ 45 min

FL MA.6.AR.3.1

Warm-Up

Whole Class | 5 min

Students surface strategies for multiplying whole numbers using the **Number Talk** routine.



Activity 1

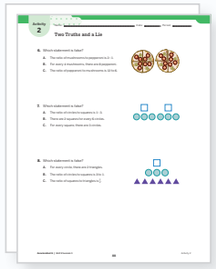
Pairs | 15 min

Students are introduced to **ratio** language and notation by working with sentences that describe the relative amounts of pizza toppings.
MLR2: Collect and Display

Activity 2

Pairs | 15 min

Students analyze descriptions of ratios and write their own.



Synthesis

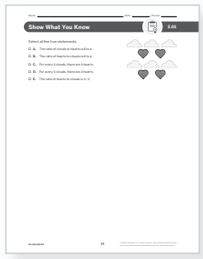
Whole Class | 5 min

Students synthesize their understanding of three ways to describe ratios in words. **MLR2: Collect and Display**

Show What You Know

Independent | 5 min

Students demonstrate their understanding by selecting all the statements that are true of the given diagram.



Prep Checklist

Prepare the Activity 1 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one copy per class, one card per student, pre-cut

Whole Class | 5 min

Warm-Up

Purpose: Students surface strategies for multiplying whole numbers using the Number Talk routine.

1 Launch

Direct students' attention to each problem one at a time.

Use the Number Talk routine to support students' ability to think flexibly about multiplying whole numbers.

Invite students to evaluate the expressions independently and then share their strategies aloud. Encourage them to consider how they can communicate their ideas in ways others can understand, and share that everyone is responsible for trying to understand each other's ideas.

Create a record of each strategy that students share, along with the name of the student who shared it.

Consider asking:
- "Who thought about it in a different way?"
- "Can someone explain ___'s strategy in their own words?"

Note: Repeat this structure for each expression in the Number Talk.

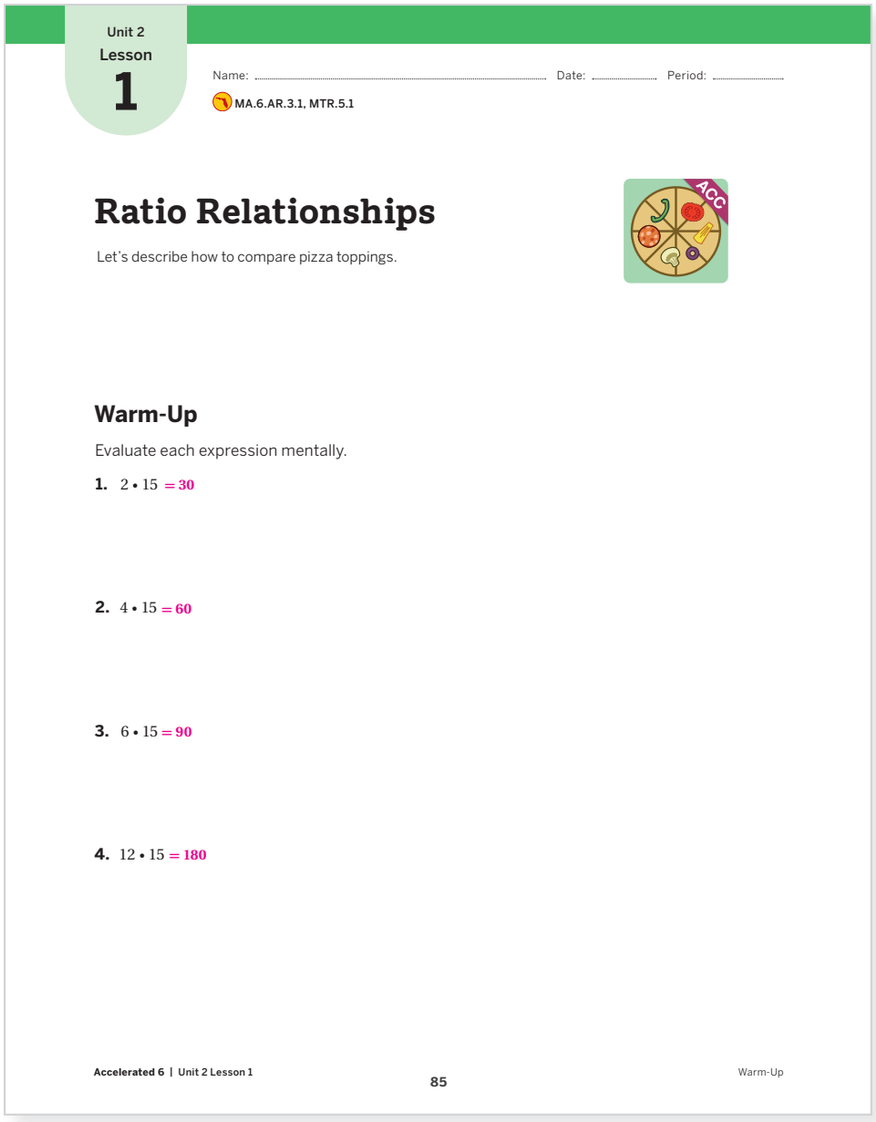
Encourage students to inconspicuously signal with their fingers in front of their chest the number of strategies they've come up with. Invite students with fewer strategies to share first.

ELL **English Language Learners** Provide a word bank to support students in expressing their strategies, with words such as: *multiply*, *groups*, *factors*, *multiples*, and *times*. **(Speaking)**

2 Connect

Invite students to compare and contrast the different ways of evaluating the multiplication problems.

Consider asking:
- "How are your strategies alike? How are your strategies different?"
- "What connections do you notice among the strategies we've discussed?"
- "What connections do you notice among the different expressions?"
- "How did these connections relate to the value of the expressions?"



Unit 2
Lesson
1

Name: ..... Date: ..... Period: .....

MA.6.AR.3.1, MTR.5.1

Ratio Relationships

Let's describe how to compare pizza toppings.

Warm-Up

Evaluate each expression mentally.

1. $2 \cdot 15 = 30$
2. $4 \cdot 15 = 60$
3. $6 \cdot 15 = 90$
4. $12 \cdot 15 = 180$

Accelerated 6 | Unit 2 Lesson 1 85 Warm-Up

Pairs | 15 min

Activity 1 Ratio Rounds

Purpose: Students are introduced to **ratio** language and notation by working with sentences that describe the relative amounts of pizza toppings.

1 Launch

Invite students to share their favorite pizza toppings briefly before beginning the activity.

Consider asking, "What other ratios could we write? What do you think the word *ratio* means?"

Create a class definition for the term **ratio** using students' language and the glossary. *Responses vary.* A ratio $a : b$ is a relationship between two quantities. For every a of the first quantity, there are b of the second quantity.

Distribute one card from the Activity 1 Cards to each student.

Read the Round 1 Instructions to the class.

Invite students to share what they notice about their card with a partner before completing as many statements as possible in their Student Edition.

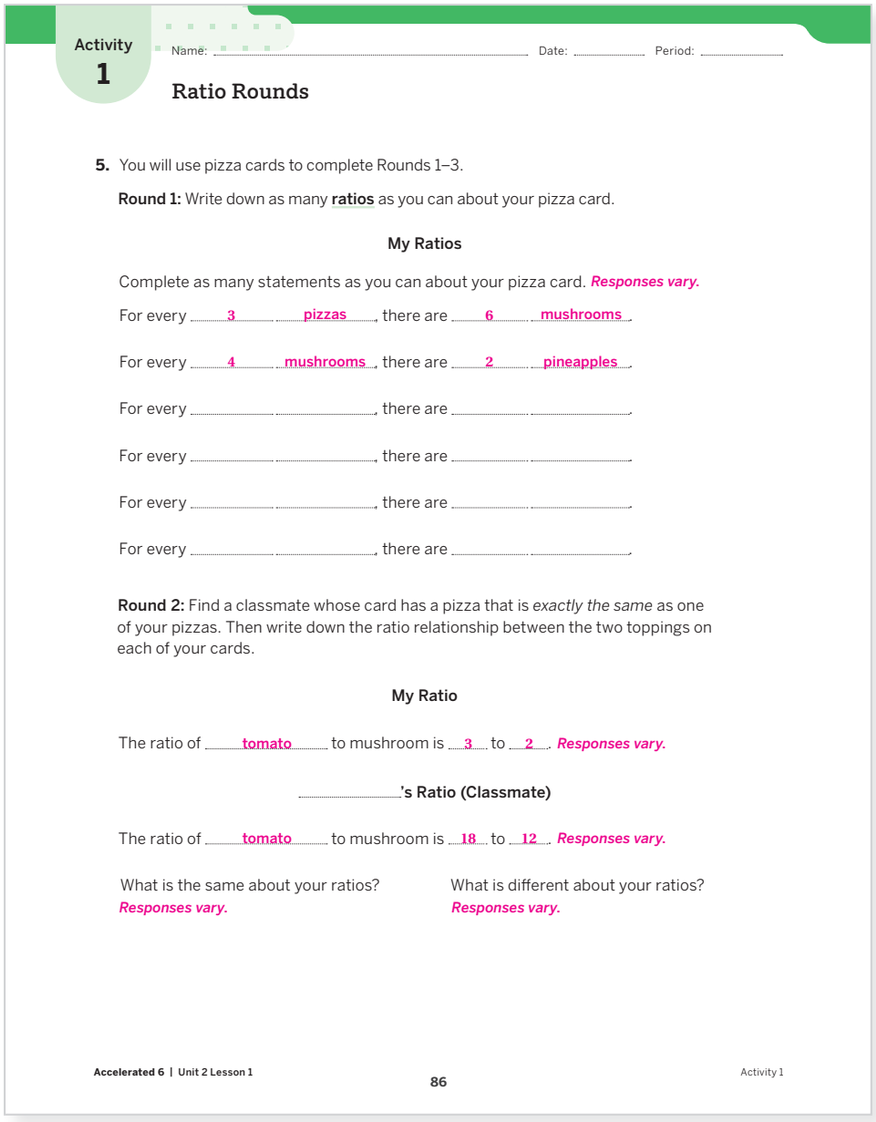
A **Accessibility: Visual-Spatial Processing**
To support students in interpreting spatial representations, provide a small table for students to tally the different toppings as they count.

2 Monitor

For Round 2, remind students that they should record their work in their Student Edition.

Note: If students are unable to find a partner in a given round (e.g., if there is an odd number of students, etc.), invite them to join a pair of students and have each student compare two different numbers.

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Ratio Rounds

5. You will use pizza cards to complete Rounds 1–3.

Round 1: Write down as many **ratios** as you can about your pizza card.

My Ratios

Complete as many statements as you can about your pizza card. ***Responses vary.***

For every 3 pizzas, there are 6 mushrooms.

For every 4 mushrooms, there are 2 pineapples.

For every _____, there are _____.

For every _____, there are _____.

For every _____, there are _____.

For every _____, there are _____.

Round 2: Find a classmate whose card has a pizza that is *exactly the same* as one of your pizzas. Then write down the ratio relationship between the two toppings on each of your cards.

My Ratio

The ratio of tomato to mushroom is 3 to 2. ***Responses vary.***

_____'s Ratio (Classmate)

The ratio of tomato to mushroom is 18 to 12. ***Responses vary.***

What is the same about your ratios?
Responses vary.

What is different about your ratios?
Responses vary.

Accelerated 6 | Unit 2 Lesson 1 86 Activity 1

Pairs | 15 min

Activity 1 Ratio Rounds (continued)

Purpose: Students are introduced to ratio language and notation by working with sentences that describe the relative amounts of pizza toppings.

2 Monitor

For Round 3, invite one student to read the instructions aloud.

Invite students to find their groups and take some time to individually document their ratios before comparing.

Look for unique ratios (including comparisons involving slices and number of pizzas) and invite students to share during the Connect.

Listen for students using ratio language, such as "for every" or "for each," and using "to" when reading statements aloud. Invite these students to share during the Connect.

ELL **English Language Learners** Encourage students to paraphrase each other's ideas to help make connections and incorporate ratio language. **(Speaking and Listening)**

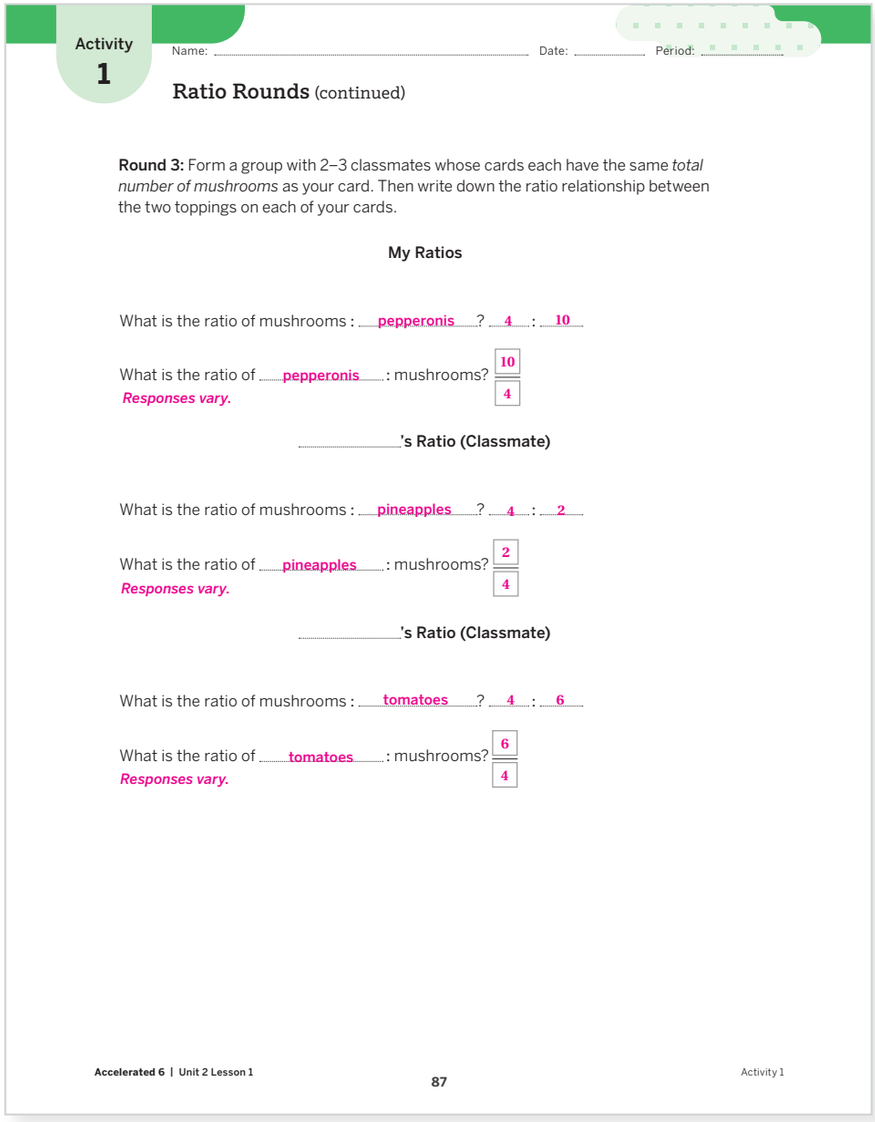
3 Connect

Display the pizza and the three ratios.

To surface the Key Takeaway, consider asking:

- "What is similar about all of the ways to write ratios? What is different?"
- "Which way of writing ratios do you prefer? Why?"

MLR **MLR2: Collect and Display** Use this routine to create a more precise class definition of *ratio* using students' language, adding to it the three different ways of writing ratios. Consider displaying for students to reference later throughout the unit. **(MLR.2)**



Activity 1

Name: Date: Period:

Ratio Rounds (continued)

Round 3: Form a group with 2–3 classmates whose cards each have the same *total number of mushrooms* as your card. Then write down the ratio relationship between the two toppings on each of your cards.

My Ratios

What is the ratio of mushrooms : pepperonis ? 4 : 10

What is the ratio of pepperonis : mushrooms? $\frac{10}{4}$

Responses vary.

's Ratio (Classmate)

What is the ratio of mushrooms : pineapples ? 4 : 2

What is the ratio of pineapples : mushrooms? $\frac{2}{4}$

Responses vary.

's Ratio (Classmate)

What is the ratio of mushrooms : tomatoes ? 4 : 6

What is the ratio of tomatoes : mushrooms? $\frac{6}{4}$

Responses vary.

Accelerated 6 | Unit 2 Lesson 1 87 Activity 1

Key Takeaway: A ratio $a : b$ is a relationship between two quantities. For every a of the first quantity, there are b of the second. There are several ways to describe ratios:

- For every _____ , there are _____.
- _____ to _____.
- _____ : _____.

Pairs | 15 min

Activity 2 Two Truths and a Lie

Purpose: Students analyze descriptions of ratios and write their own.

Short on time? Consider omitting Problem 10 and invite students to create their own challenge on their own time. Consider inviting them to share their challenge with a family member.

1 Launch

Consider asking, "Have you ever played two truths and a lie? How does it work?" *Responses vary.* You are given three sentences, two of which are true and one of which is false. You need to figure out which sentence is false.

A **Accessibility: Visual-Spatial Processing**
As students interpret visual representations, allow them 1–2 minutes of think time to formulate what they will be sharing.

Invite students to consider each answer choice before selecting a response for each question. Consider asking, "How do you know your response is correct?"

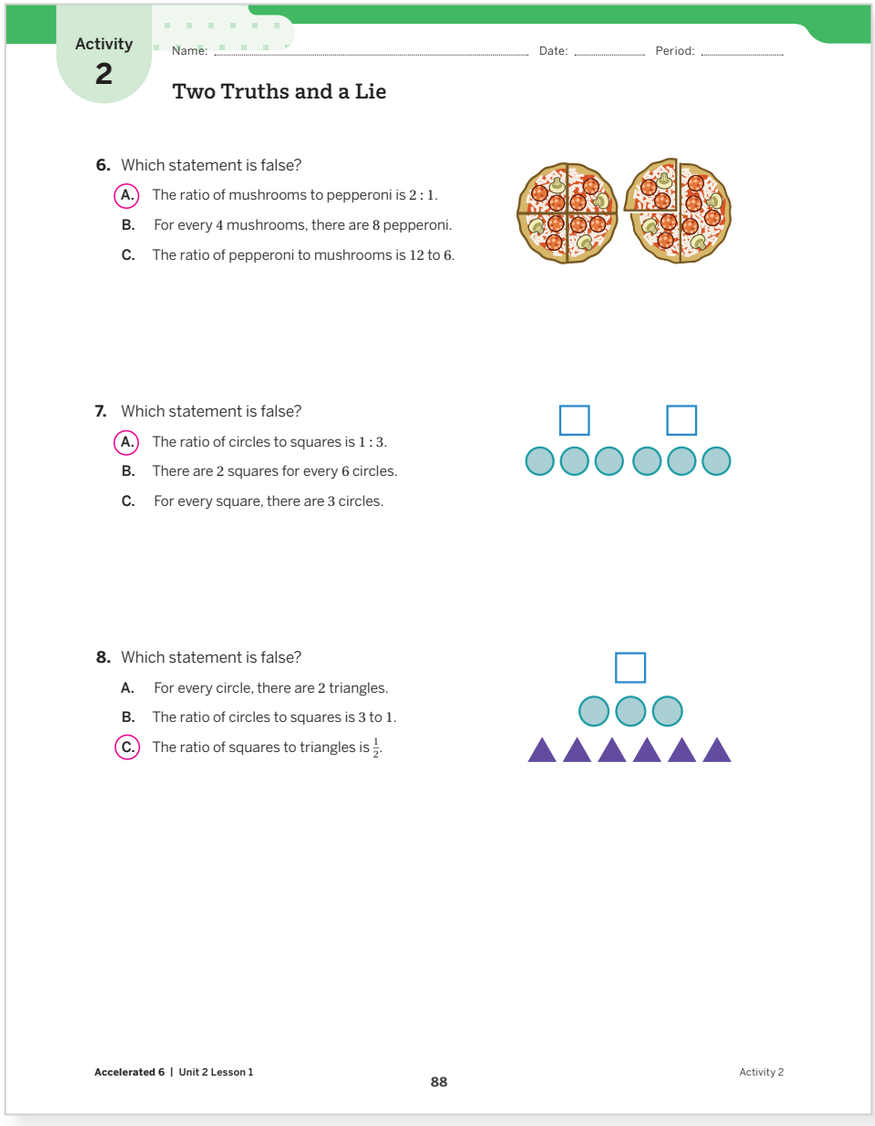
2 Monitor

Look and listen for a variety of strategies.

D **Differentiation** (*Problems 6–8*)

Look for students who:	Respond to Student Thinking
Focus only on the exact quantities in the ratio relationship without considering equivalent ratios.	**Support** Invite students to use "for every" ratio language to identify equivalent ratios. Consider providing students with the sentence frame, "For every _____, there are _____."
Identify incorrect false statements.	**Support** Consider asking, "Why do you think this statement is false?"
Identify all correct false statements.	**Stretch** Invite students to write another false response.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Two Truths and a Lie

6. Which statement is false?

(A.) The ratio of mushrooms to pepperoni is 2 : 1.

B. For every 4 mushrooms, there are 8 pepperoni.

C. The ratio of pepperoni to mushrooms is 12 to 6.

7. Which statement is false?

(A.) The ratio of circles to squares is 1 : 3.

B. There are 2 squares for every 6 circles.

C. For every square, there are 3 circles.

8. Which statement is false?

A. For every circle, there are 2 triangles.

B. The ratio of circles to squares is 3 to 1.

(C.) The ratio of squares to triangles is $\frac{1}{2}$.

Accelerated 6 | Unit 2 Lesson 1 88 Activity 2

Pairs | 15 min

Activity 2 Two Truths and a Lie (continued)

Purpose: Students analyze descriptions of ratios and write their own.

Short on time? Consider omitting Problem 10 and invite students to create their own challenge on their own time. Consider inviting them to share their challenge with a family member.

2 Monitor

Select and sequence responses that increase in their level of precision.

D Differentiation *(Problems 9–10)*

Look for students who:	Respond to Student Thinking
Need support getting started. (*Problem 9*)	**Support** Encourage them to start by listing the quantities of each shape separately, then decide which to compare. Consider asking them to write three true statements first, then change one slightly to make it false.
Write statements and reverse the numbers in the ratios (e.g., the ratio of squares to triangles is 2 : 3). (*Problem 9*)	**Support** Invite students to decide on an order and make sure the order stays the same when written with words and with numbers and colons. Consider asking, "Why is this written as 3 to 2 and not 2 to 3?"
Carefully craft ratio statements that accurately represent drawings. (*Problem 10*)	**Stretch** Invite them to share during the Connect. Invite students to complete Problem 10 multiple times with their partner, considering increasingly creative or complex drawings and ratios.
Recognize a multiplicative relationship between two quantities. (*Problem 10*)	

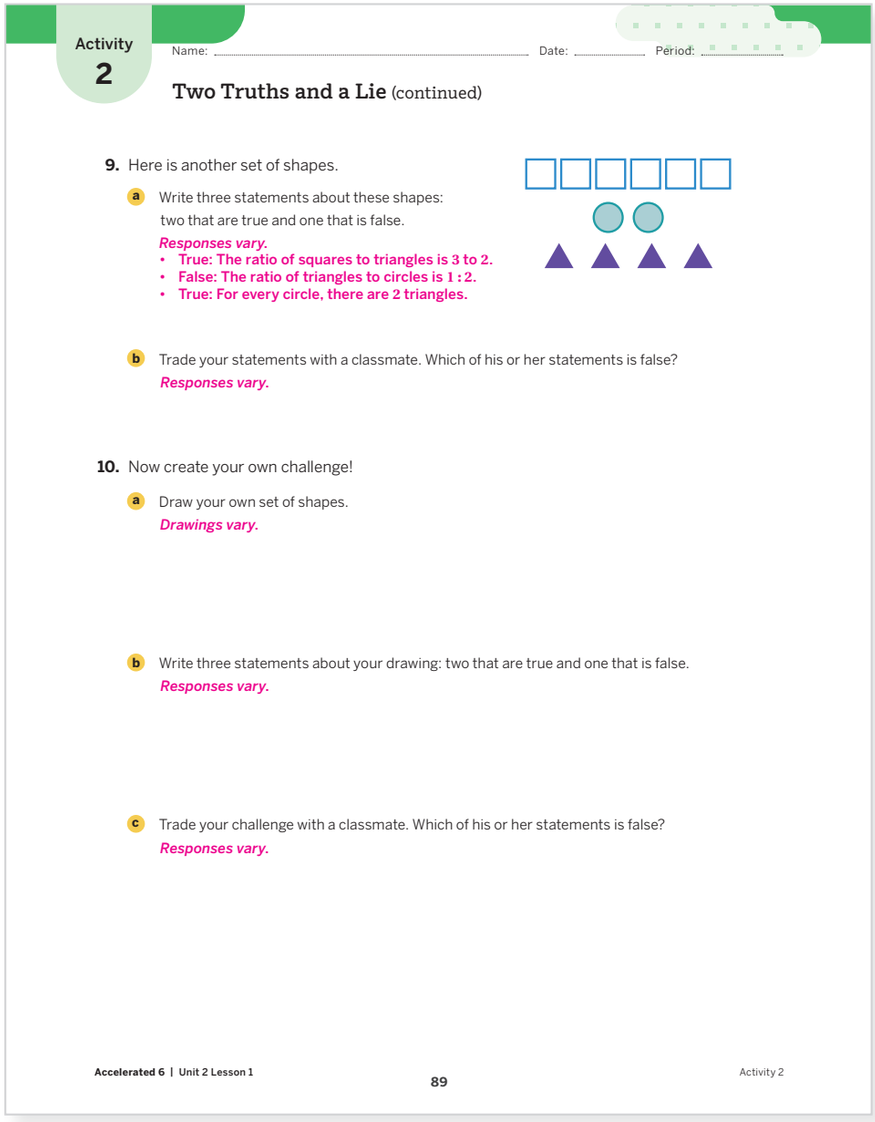
ELL English Language Learners Strategically pair students with partners who speak the same primary language. Allow students to share and receive feedback in their primary language.

3 Connect

Invite pairs of students to share their strategies for determining whether a statement is true or false.

Display captured responses for Problem 10, including one example with two ratios that show the relationship between ratios and multiplication.

To surface the Key Takeaway, consider asking:
- "Can the ratio 4 : 2 and 2 : 1 represent the same drawing?"
- "How many ratio relationships can there be in one diagram?"



Activity 2

Name: _____ Date: _____ Period: _____

Two Truths and a Lie (continued)

9. Here is another set of shapes.

a. Write three statements about these shapes: two that are true and one that is false.

Responses vary.
- True: The ratio of squares to triangles is 3 to 2.
- False: The ratio of triangles to circles is 1 : 2.
- True: For every circle, there are 2 triangles.

b. Trade your statements with a classmate. Which of his or her statements is false?

Responses vary.

10. Now create your own challenge!

a. Draw your own set of shapes.

Drawings vary.

b. Write three statements about your drawing: two that are true and one that is false.

Responses vary.

c. Trade your challenge with a classmate. Which of his or her statements is false?

Responses vary.

Accelerated 6 | Unit 2 Lesson 1 89 Activity 2

Key Takeaway: There can be multiple ratio relationships in a diagram. It is important to make sure that, if the numbers change, the ratio relationship between the values changes accordingly.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of three ways to describe ratios in words.

Invite students to respond independently, and then share their thinking with a partner.

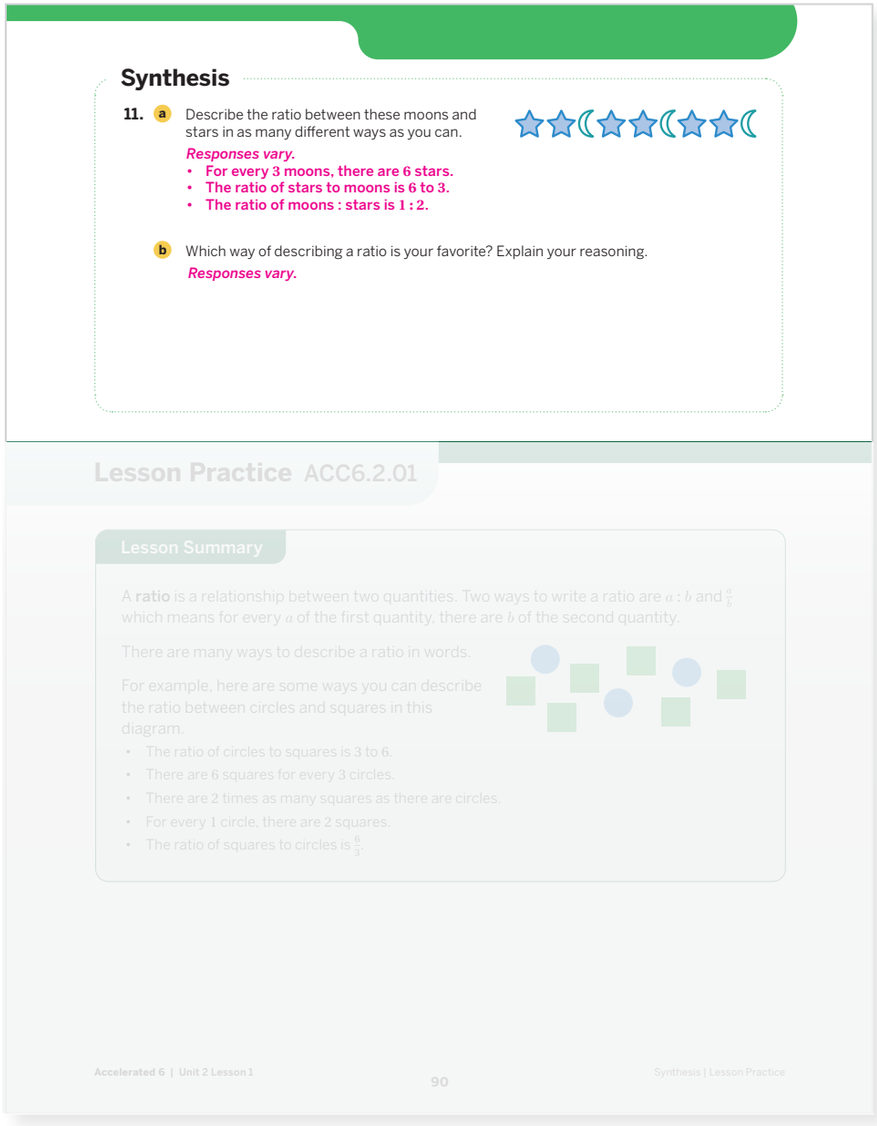
Consider asking:
- "What other ratios do you see in the Synthesis diagram?" The ratio of moons to stars is $1:2$.
- "What is helpful about using the colon?" The colon is an efficient way to express a ratio.
- "What is helpful about saying 'for every'?" Using "for every" is helpful when finding a smaller ratio within the total diagram or counting each shape in smaller groups.

Capture and share a variety of ideas, such as:
- For every 3 moons, there are 6 stars.
- The ratio of stars to moons is 6 to 3.
- The ratio of moons : stars is $1:2$.

Create a record of the different language students use to describe ratios.

MLR **MLR2: Collect and Display** Use this routine to collect students' language as they discuss ratios. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to share with a partner what makes sense about each description and what questions they still have.



Synthesis

11. **a** Describe the ratio between these moons and stars in as many different ways as you can.

Responses vary.
- For every 3 moons, there are 6 stars.
- The ratio of stars to moons is 6 to 3.
- The ratio of moons : stars is 1 : 2.

b Which way of describing a ratio is your favorite? Explain your reasoning.

Responses vary.

Lesson Practice ACC6.2.01

Lesson Summary

A **ratio** is a relationship between two quantities. Two ways to write a ratio are $a:b$ and $\frac{a}{b}$ which means for every a of the first quantity, there are b of the second quantity.

There are many ways to describe a ratio in words.

For example, here are some ways you can describe the ratio between circles and squares in this diagram.
- The ratio of circles to squares is 3 to 6.
- There are 6 squares for every 3 circles.
- There are 2 times as many squares as there are circles.
- For every 1 circle, there are 2 squares.
- The ratio of squares to circles is $\frac{6}{3}$.

Accelerated 6 | Unit 2 Lesson 1 90 Synthesis | Lesson Practice

Lesson Takeaway: A **ratio** $a:b$ is a relationship between two quantities in which for every a of the first quantity, there are b of the second quantity.

There are many ways to write ratios and many ratios that can be written about any situation. Some ways to write ratios are:
- The ratio of circles to squares is 3 to 6.
- There are 6 squares for every 3 circles.
- The ratio of circles to squares is $3:6$.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by selecting all the statements that are true of the given diagram.

Today's Goal

1. **Language Goal:** Describe ratio relationships between two quantities using the mathematical language, "For every a of these, there are b of those," and, "The ratio of these to those is $a : b$ (read a to b)." **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 2.01

Select *all* the true statements.

- ☑ **A.** The ratio of clouds to hearts is 6 to 4.
- ☐ **B.** The ratio of hearts to clouds is 6 to 4.
- ☐ **C.** For every 2 clouds, there are 3 hearts.
- ☑ **D.** For every 3 clouds, there are 2 hearts.
- ☐ **E.** The ratio of hearts to clouds is 3 : 2.

D Differentiation Use after Lesson 1

Support

Provide targeted intervention for students by using these resources.

If students need support with different ways of expressing ratios:

» **Respond to Student Thinking:**

- Select a few related **Practice Problems** and provide individualized feedback before Lesson 2.
- Review the **Lesson Summary**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.
- Invite them to consider **Problem 10** in new and different situations, including situations in their life.

Professional Learning

Reflect on the facilitation of the Number Talk routine in this lesson. Students will use this routine again in the next lesson. Who shared in the whole class discussion? Who did not? What about the routine felt successful? What are some areas for growth next time your class uses this routine?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. a. Describe the ratio between these moons and stars in as many different ways as you can.

Responses vary.

- For every 3 moons, there are 6 stars.
- The ratio of stars to moons is 6 to 3.
- The ratio of moons : stars is 1 : 2.

b. Which way of describing a ratio is your favorite? Explain your reasoning.

Responses vary.

Lesson Practice ACC6.2.01

Lesson Summary

A **ratio** is a relationship between two quantities. Two ways to write a ratio are $a : b$ and $\frac{a}{b}$ which means for every a of the first quantity, there are b of the second quantity.

There are many ways to describe a ratio in words.

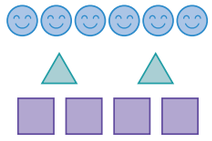
For example, here are some ways you can describe the ratio between circles and squares in this diagram.

- The ratio of circles to squares is 3 to 6.
- There are 6 squares for every 3 circles.
- There are 2 times as many squares as there are circles.
- For every 1 circle, there are 2 squares.
- The ratio of squares to circles is $\frac{6}{3}$.

Lesson Practice
ACC6.2.01

Name: ..... Date: ..... Period: .....

Problems 1–4: Here is a set of smiley faces, triangles, and squares.



1. The ratio of smiley faces to triangles is ___3___ to ___1___. (or equivalent)
2. The ratio of squares to triangles is ___2___ : ___1___. (or equivalent)
3. For every 2 triangles, there are ___4___ squares.
4. Which statement is false?
   - (A.) The ratio of smiley faces to squares is 4 : 6.
   - B. The ratio of squares to triangles is 4 : 2.
   - C. There are 3 smiley faces for every 1 triangle.
   - D. The ratio of triangles to squares is $\frac{2}{4}$.

Problems 5–8: There are 9 bananas, 4 apples, and 3 plums in a fruit basket.

5. The ratio of bananas to apples is ___9___ : ___4___.
6. The ratio of plums to apples is $\frac{3}{4}$.
7. For every ___4___ apples, there are ___3___ plums.
8. For every 3 bananas, there is ___1___ plum.

FAST Practice

9. Which **two** ratio statements are true for this situation?

   For every 3 sports cars in the parking lot, there are 2 electric cars.

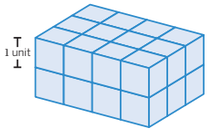
   - ☐ A. The ratio of sports cars to electric cars is 2 : 3.
   - ☑ B. The ratio of sports cars to electric cars is $\frac{3}{2}$.
   - ☑ C. The ratio of electric cars to sports cars 2 : 3.
   - ☐ D. The ratio of sports cars to the total number of cars is $\frac{3}{2}$.

Lesson Practice
ACC6.2.01

Name: ..... Date: ..... Period: .....

Spiral Review

Problems 10–11: Here is a rectangular prism.



10. Determine the volume of the prism. Show or explain your thinking.

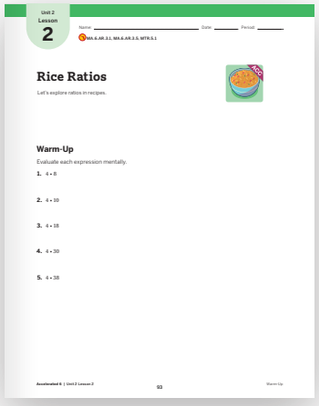
    24 cubic units. *Explanations vary.* The base of the prism measures 3 • 4 = 12 square units and the height is 2 units. 12 • 2 = 24 cubic units.

11. Determine the surface area of the prism. Show or explain your thinking.

    52 square units. *Explanations vary.* The prism has 6 faces. The area of the 3 faces I can see is (3 • 4) + (2 • 3) + (4 • 2) = 26 square units. There are 2 of each face, so the total surface area is 2 • 26 = 52 square units.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–3	1	MA.6.AR.3.1
	4–8	2	MA.6.AR.3.1
FAST Practice	9	2	MA.6.AR.3.1
Spiral Review			
	10–11	2	MA.5.GR.3.1


Unit 2
Lesson
2
Name _____ Date _____ Period _____
MA.6.AR.3.1, MA.6.AR.3.5, MTR.5.1
Rice Ratios
Let's explore ratios in recipes.
Warm-Up
Evaluate each expression mentally.
1. 4 • 8
2. 4 • 10
3. 4 • 18
4. 4 • 30
5. 4 • 38
Accelerated 6 | Unit 2 Lesson 2
93
Warm-Up

Rice Ratios

Introduction to Equivalent Ratios

Let's explore ratios in recipes.

Learning Outcomes

Today's Goals

1. **Goal:** Understand what *equivalent ratios* are and identify them in context.
2. **Language Goal:** Describe strategies for solving problems involving *equivalent ratios*, including multiplying or dividing each amount by the same number. **(Writing, Speaking, and Listening)**

This lesson introduces students to the term **equivalent ratios**, meaning two ratios that have the same relationship but different quantities. Students use the structure of given diagrams and intuition to generate equivalent ratios. **(MTR.5.1)**

Coherence

Prior Learning

In Lesson 1, students learned what ratios are and several ways to describe them. In a previous course, students solved word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.

Future Learning

In Lesson 3, students will formalize strategies for creating equivalent ratios. In Lessons 9 and 11, students will use ratio and rate reasoning to solve real-world and mathematical problems.

Connections

- Students explore real-world connections through scaling up or down baking recipes by using equivalent ratios. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.1

Given a real-world context, write and interpret ratios to show the relative sizes of two quantities using appropriate notation: $\frac{a}{b}$, a to b, or $a : b$ where $b \neq 0$.

Also Addressing: **MA.6.AR.3.5**

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.FR.1.3	MA.6.AR.3.3
MA.4.AR.1.1	MA.6.AR.3.2

Vocabulary

New Vocabulary

equivalent ratio

Lesson at a Glance

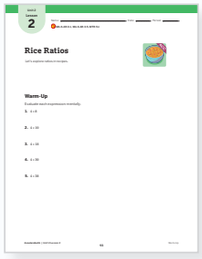
~ 45 min

MA.6.AR.3.1, MA.6.AR.3.5

Warm-Up

Whole Class | 5 min

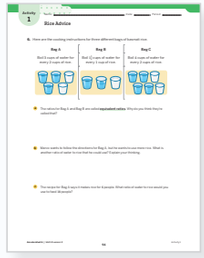
Students use the **Number Talk** routine to surface strategies using structure to multiply whole numbers. **(MTR.5.1)**



Activity 1

Pairs | 15 min

Students are introduced to the concept of **equivalent ratios** as they look for patterns in the context of making rice. **(MTR.5.1)**



Activity 2

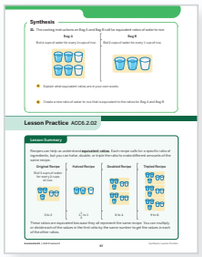
Pairs | 15 min

Students use equivalent ratios to adapt rice recipes from around the world.

Synthesis

Whole Class | 5 min

Students synthesize their understanding that equivalent ratios are generated by multiplying or dividing each quantity by the same value. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by identifying equivalent ratios.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Whole Class | 5 min

Warm-Up

Purpose: Students use the **Number Talk routine** to surface strategies using structure to multiply whole numbers. **(MTR.5.1)**

1 Launch

Direct students' attention to each problem one at a time.

Use the Number Talk routine to support students' ability to think flexibly about multiplying whole numbers.

Invite students to evaluate the expression independently and then share their strategies aloud. Encourage them to consider how they can communicate their ideas in ways others can understand, and share that everyone is responsible for trying to understand each others' ideas.

Create a record of each strategy that students share, along with the name of the student who shared it.

Consider asking:
- "Who thought about it in a different way?"
- "Can someone explain ___'s strategy in their own words?"

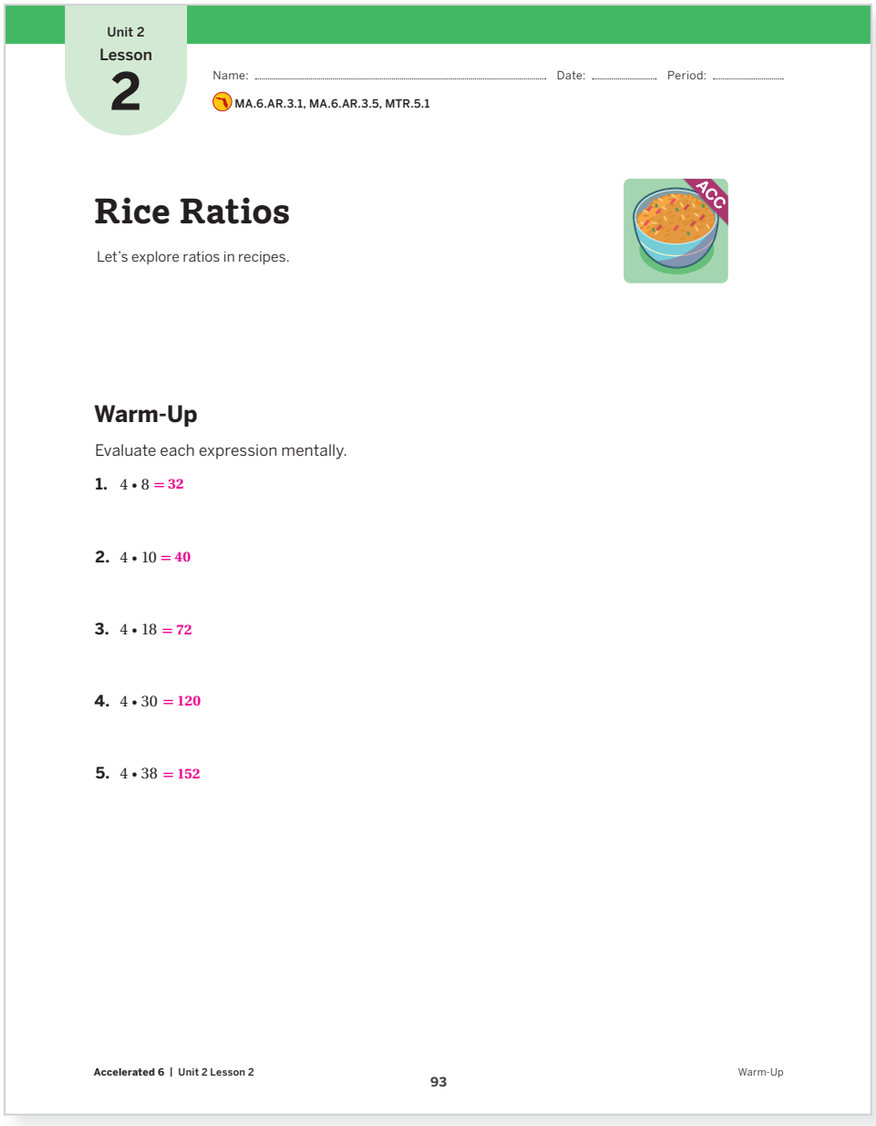
Note: Repeat this structure for each expression in the Number Talk.

2 Connect

Invite students to compare and contrast each expression, making note of how the structure of each problem supported their reasoning. **(MTR.5.1)**

ELL **English Language Learners** Encourage students to paraphrase each other's strategies. **(Speaking and Listening)**

Consider asking:
- "What connections do you notice among the strategies we've discussed?"
- "What connections do you notice among the different expressions?"
- "How did these connections relate to the value of the expressions?"



Unit 2
Lesson
2

Name: ..... Date: ..... Period: .....

MA.6.AR.3.1, MA.6.AR.3.5, MTR.5.1

Rice Ratios

Let's explore ratios in recipes.

ACC

Warm-Up

Evaluate each expression mentally.

1. $4 \cdot 8 = 32$
2. $4 \cdot 10 = 40$
3. $4 \cdot 18 = 72$
4. $4 \cdot 30 = 120$
5. $4 \cdot 38 = 152$

Accelerated 6 | Unit 2 Lesson 2 93 Warm-Up

Pairs | 15 min

Activity 1 Rice Advice

Purpose: Students are introduced to the concept of equivalent ratios as they look for patterns in the context of making rice. **(MTR.5.1)**

1 Launch

To surface connections, consider inviting students to share stories of people in their family making rice, or if they have ever made rice.

Direct students' attention to the instructions from the bags of basmati rice. Consider reading the question aloud and inviting students to share their thinking with a partner before having a class discussion about what is similar and what is different.

A **Accessibility: Visual-Spatial Processing**
As students interpret visual representations, consider providing colored pencils or highlighters and suggest they use color coding to draw or annotate key features of Bags A, B, and C that they may be helpful.

2 Monitor

Select and sequence a variety of explanations about equivalent ratios to share during the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How many cups of water would you need for Bag B if you wanted to double the recipe?"
Share that equivalent ratios are when you double each amount.	**Strengthen** Consider asking, "Do you think it has to be doubled? Would they be equivalent if they were tripled?"
Add 12 to each of the quantities because there are 12 more people.	**Support** Consider asking, "How does the increase change the ratio relationship between water and rice?"
Multiply or divide each quantity by the same number.	**Stretch** Consider asking, "What are some equivalent ratios for Bag C? How do you know?" Invite these students to share during the Connect.

3 Connect

Invite students to share patterns they noticed. **(MTR.5.1)**

Create a class definition of **equivalent ratios** using students' language and the glossary. Consider displaying this definition for reference and revision throughout the rest of the lesson. *Responses vary.* Two ratios are equivalent ratios if you can multiply each quantity in one ratio by the same number to get the other ratio.

To surface the Key Takeaway, consider asking, "How did your definition of equivalent ratios help you think about parts b and c?"

Activity 1

Name: _____ Date: _____ Period: _____

Rice Advice

6. Here are the cooking instructions for three different bags of basmati rice.

Bag A	Bag B	Bag C
Boil 3 cups of water for every 2 cups of rice.	Boil $1\frac{1}{2}$ cups of water for every 1 cup of rice.	Boil 4 cups of water for every 2 cups of rice.

a. The ratios for Bag A and Bag B are called **equivalent ratios**. Why do you think they're called that?

Responses vary. They're called equivalent ratios because the relationship between rice and water is the same in each set of instructions. The instructions for Bag A uses double the amount of water and rice as the instructions for Bag B.

b. Marco wants to follow the directions for Bag A, but he wants to use more rice. What is another ratio of water to rice that he could use? Explain your thinking.

Responses and explanations vary. Marco could use 6 cups of water and 4 cups of rice. That's the same as cooking twice as much as the original instructions suggest.

c. The recipe for Bag A says it makes rice for 6 people. What ratio of water to rice would you use to feed 18 people?

9 cups of water to 6 cups of rice

Accelerated 6 | Unit 2 Lesson 2 94 Activity 1

Key Takeaway: Two ratios are **equivalent ratios** if you can multiply each of the values in the first ratio by the same number to get the values in the second ratio.

Pairs | 15 min

Activity 2 Rice Around the World

Purpose: Students use equivalent ratios to adapt rice recipes from around the world.

Short on time? Invite partners to pick two of the four recipes to modify.

1 Launch

Direct students' attention to the images of the rice dishes.

To surface connections, consider asking, "What is your favorite rice dish? When or where do you eat it?"

2 Monitor

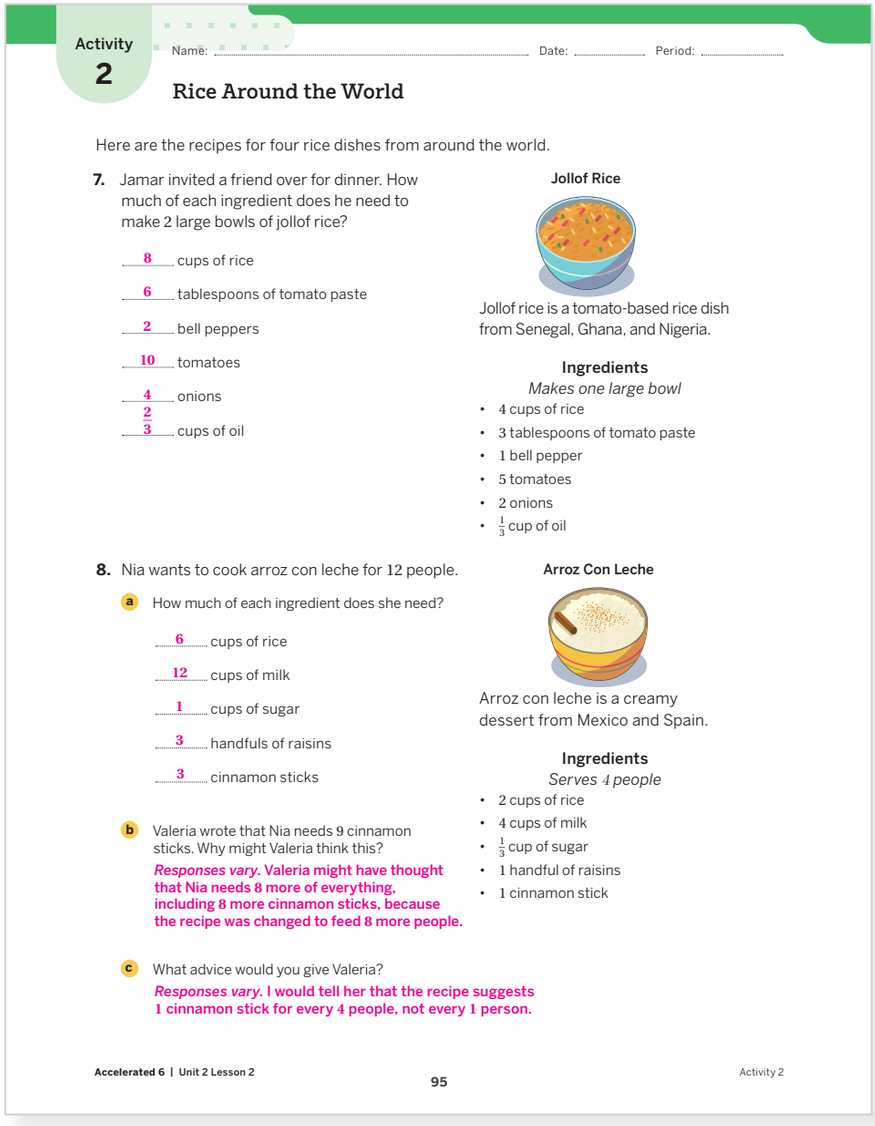
Look and listen for a variety of strategies.

D Differentiation *(Problems 7–8)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How many bowls does the jollof rice recipe make? How many does Jamar need?"
Add 1 to each ingredient because the servings need to go up by 1.	**Support** Invite students to try the division themselves to see if the ratios are equivalent. Consider asking, "Will the recipe taste the same? How could we make sure that the ingredients stay at equivalent ratios?"
Use multiplication or division to halve, double, or triple the recipe.	**Stretch** Invite them to share during the Connect. Consider asking, "Would the same strategy work for even larger quantities? Smaller quantities? How do you know?"

A Accessibility: Visual-Spatial Processing
To support students in carrying out multiple steps, chunk these problems into more manageable parts by inviting them to use a scrap piece of paper to cover up parts of each recipe so that only one or two ingredients are showing.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Rice Around the World

Here are the recipes for four rice dishes from around the world.

7. Jamar invited a friend over for dinner. How much of each ingredient does he need to make 2 large bowls of jollof rice?

8 cups of rice
6 tablespoons of tomato paste
2 bell peppers
10 tomatoes
4 onions
$\frac{2}{3}$ cups of oil

Jollof Rice

Jollof rice is a tomato-based rice dish from Senegal, Ghana, and Nigeria.

Ingredients
Makes one large bowl
- 4 cups of rice
- 3 tablespoons of tomato paste
- 1 bell pepper
- 5 tomatoes
- 2 onions
- $\frac{1}{3}$ cup of oil

8. Nia wants to cook arroz con leche for 12 people.

a How much of each ingredient does she need?

6 cups of rice
12 cups of milk
1 cups of sugar
3 handfuls of raisins
3 cinnamon sticks

b Valeria wrote that Nia needs 9 cinnamon sticks. Why might Valeria think this?

Responses vary. Valeria might have thought that Nia needs 8 more of everything, including 8 more cinnamon sticks, because the recipe was changed to feed 8 more people.

c What advice would you give Valeria?

Responses vary. I would tell her that the recipe suggests 1 cinnamon stick for every 4 people, not every 1 person.

Arroz Con Leche

Arroz con leche is a creamy dessert from Mexico and Spain.

Ingredients
Serves 4 people
- 2 cups of rice
- 4 cups of milk
- $\frac{1}{3}$ cup of sugar
- 1 handful of raisins
- 1 cinnamon stick

Accelerated 6 | Unit 2 Lesson 2 95 Activity 2

Pairs | 15 min

Activity 2 Rice Around the World (continued)

Purpose: Students use equivalent ratios to adapt rice recipes from around the world.

Short on time? Invite partners to pick two of the four recipes to modify.

2 Monitor

To support students in getting started with the champorado recipe, consider asking:

- "How much sugar is in the original recipe?" The original recipe has 2 cups of sugar.
- "What is the ratio between Julian's 1 cup of sugar and the original recipe?" The ratio between the original recipe and Julian's recipe is 1 cup to 2 cups.
- "How does this ratio help us think about the rest of the ingredients?" *Responses vary.* All of the ingredients will be halved (divided by 2).

Listen for students who are curious about how much smaller to make the risotto recipe. Invite them to select any amount they want, considering what values might be easier for them or might challenge them if they are feeling ready for it. Invite each student in the pair to choose a different way of decreasing and compare their responses.

Capture a variety of responses about the risotto recipe to share during the Connect, particularly looking for students who create a list of ingredients for half of the recipe or a third of the recipe.

D **Differentiation: (Stretch)** Encourage students to choose one of the recipes and determine the amount of ingredients needed to make the dish for the whole class.

3 Connect

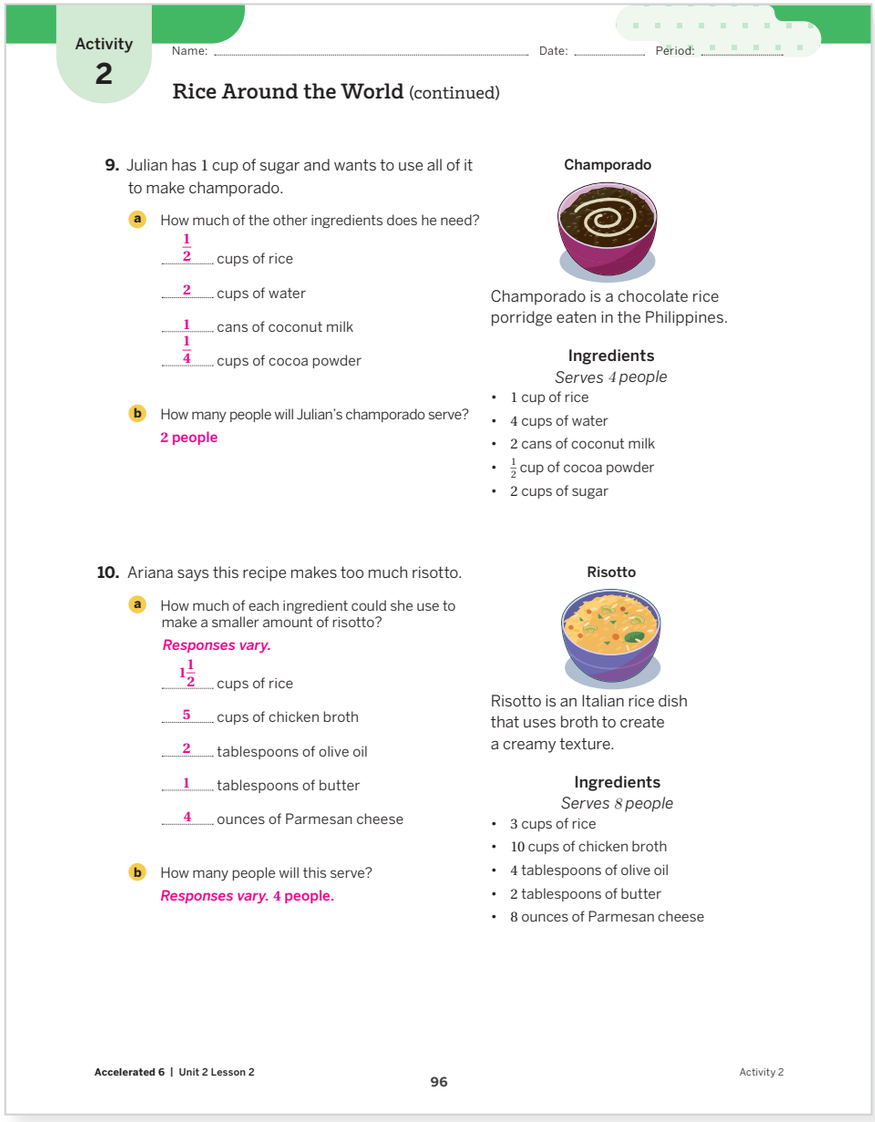
Direct students' attention to the risotto recipe and questions in the Student Edition.

Share the captured responses and invite students to explain their thinking.

Consider asking:

- "How much smaller did you decide to make the recipe? Why?"
- "What are the equivalent ratios in this situation?"
- "How many different versions of the recipe could we make while keeping the recipe tasting the same?" There could be infinite equivalent recipes as long as you have equivalent ratios of ingredients to the original recipe.

To surface the Key Takeaway, consider asking, "How do you know if a recipe will have the same taste and consistency when you increase or decrease the amount of servings?"



Activity 2

Name: _____ Date: _____ Period: _____

Rice Around the World (continued)

9. Julian has 1 cup of sugar and wants to use all of it to make champorado.

a. How much of the other ingredients does he need?

- $\frac{1}{2}$ cups of rice
- 2 cups of water
- 1 cans of coconut milk
- $\frac{1}{4}$ cups of cocoa powder

b. How many people will Julian's champorado serve?

2 people

Champorado

Champorado is a chocolate rice porridge eaten in the Philippines.

Ingredients

Serves 4 people

- 1 cup of rice
- 4 cups of water
- 2 cans of coconut milk
- $\frac{1}{2}$ cup of cocoa powder
- 2 cups of sugar

10. Ariana says this recipe makes too much risotto.

a. How much of each ingredient could she use to make a smaller amount of risotto?

Responses vary.

- $1\frac{1}{2}$ cups of rice
- 5 cups of chicken broth
- 2 tablespoons of olive oil
- 1 tablespoons of butter
- 4 ounces of Parmesan cheese

b. How many people will this serve?

Responses vary. 4 people.

Risotto

Risotto is an Italian rice dish that uses broth to create a creamy texture.

Ingredients

Serves 8 people

- 3 cups of rice
- 10 cups of chicken broth
- 4 tablespoons of olive oil
- 2 tablespoons of butter
- 8 ounces of Parmesan cheese

Accelerated 6 | Unit 2 Lesson 2 96 Activity 2

Key Takeaway: When generating equivalent ratios in recipes, multiply or divide the ingredients by the same factor. The taste and consistency will remain the same, but the amount of food the recipe makes will change.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that equivalent ratios are generated by multiplying or dividing each quantity by the same value.

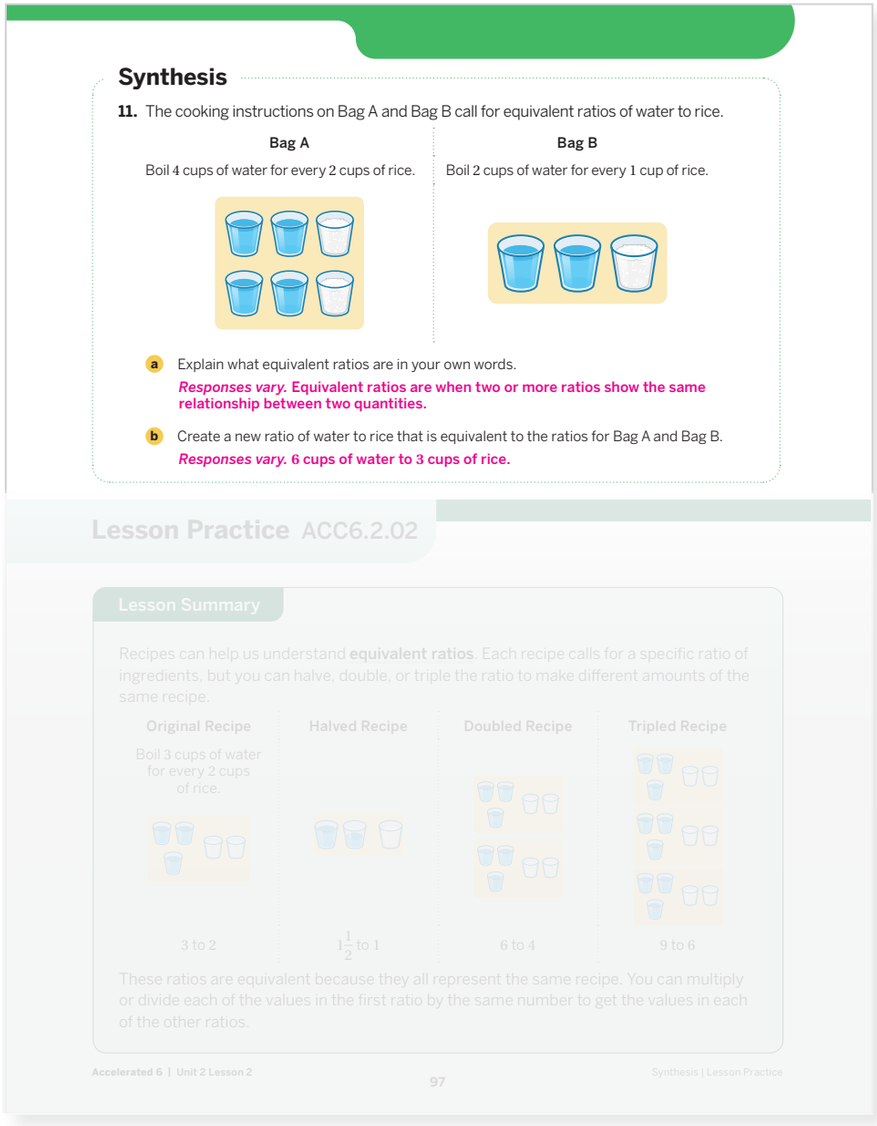
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Equivalent ratios are when two or more ratios show the same relationship between two quantities.
- 6 cups of water to 3 cups of rice is equivalent to the ratios of water to rice in Bags A and B.

MLR **MLR2: Collect and Display** Use this routine to formalize the definition of *equivalent ratios*. Display any new language, examples, or diagrams publicly for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

11. The cooking instructions on Bag A and Bag B call for equivalent ratios of water to rice.

Bag A	Bag B
Boil 4 cups of water for every 2 cups of rice.	Boil 2 cups of water for every 1 cup of rice.

a. Explain what equivalent ratios are in your own words.

Responses vary. Equivalent ratios are when two or more ratios show the same relationship between two quantities.

b. Create a new ratio of water to rice that is equivalent to the ratios for Bag A and Bag B.

Responses vary. 6 cups of water to 3 cups of rice.

Lesson Practice ACC6.2.02

Lesson Summary

Recipes can help us understand **equivalent ratios**. Each recipe calls for a specific ratio of ingredients, but you can halve, double, or triple the ratio to make different amounts of the same recipe.

Original Recipe	Halved Recipe	Doubled Recipe	Tripled Recipe
Boil 3 cups of water for every 2 cups of rice.			
3 to 2	$1\frac{1}{2}$ to 1	6 to 4	9 to 6

These ratios are equivalent because they all represent the same recipe. You can multiply or divide each of the values in the first ratio by the same number to get the values in each of the other ratios.

Accelerated 6 | Unit 2 Lesson 2 97 Synthesis | Lesson Practice

Lesson Takeaway: When generating **equivalent ratios** for ingredients in a recipe, multiply or divide the ingredients by the same number.

Independent | 5 min

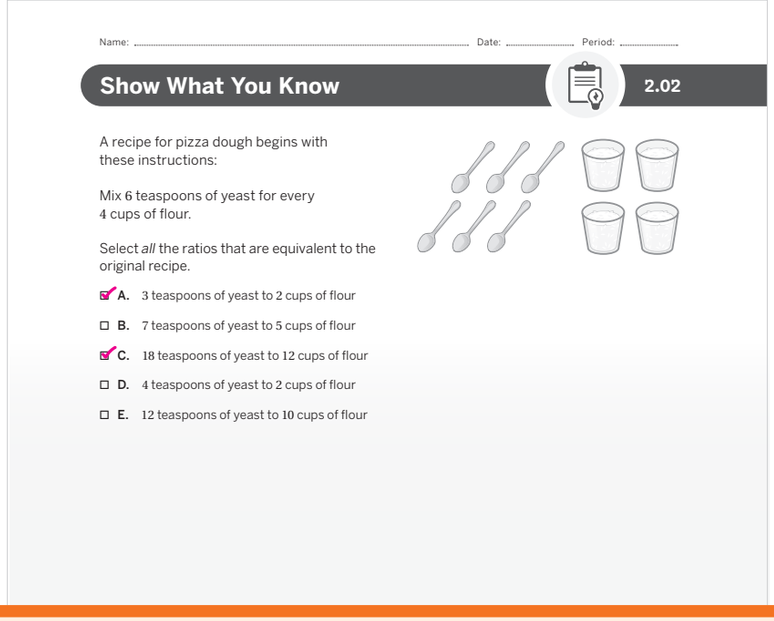
Show What You Know

Purpose: Students demonstrate their understanding by identifying equivalent ratios.

Today's Goals

1. **Goal:** Understand what *equivalent ratios* are and identify them in context.
2. **Language Goal:** Describe strategies for solving problems involving *equivalent ratios*, including multiplying or dividing each amount by the same number. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 2.02

A recipe for pizza dough begins with these instructions:

Mix 6 teaspoons of yeast for every 4 cups of flour.

Select *all* the ratios that are equivalent to the original recipe.

- ☑ **A.** 3 teaspoons of yeast to 2 cups of flour
- ☐ **B.** 7 teaspoons of yeast to 5 cups of flour
- ☑ **C.** 18 teaspoons of yeast to 12 cups of flour
- ☐ **D.** 4 teaspoons of yeast to 2 cups of flour
- ☐ **E.** 12 teaspoons of yeast to 10 cups of flour

D Differentiation Use after Lesson 2

Support

Provide targeted intervention for students by using these resources.

If students need additional support with ratios:

» **Respond to Student Thinking:**

- Use the *Identifying Equivalent Fractions* ***Using Fraction Strips*** **Mini-lesson.**
- Use the *Identifying Equivalent Fractions Using Factors and Multiples* **Mini-Lesson.**

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities.**
- Invite students to look for other real-world examples of ratios and challenge them to write more equivalent ratios to match.

Professional Learning

How did the way in which you learned about ratios in rice making around the world inform how you planned for the lesson? How did it impact how you taught the lesson? How can you continue to support students in using real-world contexts and their personal experiences to support their reasoning about ratios in future lessons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. The cooking instructions on Bag A and Bag B call for equivalent ratios of water to rice.

Bag A	Bag B
Boil 4 cups of water for every 2 cups of rice.	Boil 2 cups of water for every 1 cup of rice.

a. Explain what equivalent ratios are in your own words.

Responses vary. Equivalent ratios are when two or more ratios show the same relationship between two quantities.

b. Create a new ratio of water to rice that is equivalent to the ratios for Bag A and Bag B.

Responses vary. 6 cups of water to 3 cups of rice.

Lesson Practice ACC6.2.02

Lesson Summary

Recipes can help us understand **equivalent ratios**. Each recipe calls for a specific ratio of ingredients, but you can halve, double, or triple the ratio to make different amounts of the same recipe.

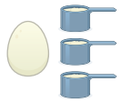
Original Recipe	Halved Recipe	Doubled Recipe	Tripled Recipe
Boil 3 cups of water for every 2 cups of rice.			
3 to 2	$1\frac{1}{2}$ to 1	6 to 4	9 to 6

These ratios are equivalent because they all represent the same recipe. You can multiply or divide each of the values in the first ratio by the same number to get the values in each of the other ratios.

Lesson Practice ACC6.2.02

Name: _____ Date: _____ Period: _____

Problems 1–2: There are many recipes for pasta. Some suggest a ratio of 1 egg for every 3 ounces of flour.



1. Draw a picture that shows how many ounces of flour you would need for 2 eggs. Then write the ratio of eggs to flour that represents your drawing.

2 : 6. Sample drawing shown.

2. Complete the table to create equivalent ratios.

Eggs	Flour (oz)
4	12
5	15

3. A bakery uses a ratio of 3 cups of water for every 5 cups of flour to bake bread. List 2 other ratios of water to flour they could use to bake the same bread.

Responses vary.

- $1\frac{1}{2}$ cups of water : $2\frac{1}{2}$ cups of flour
- 6 cups of water : 10 cups of flour
- 9 cups of water : 15 cups of flour

Problems 4–7: Koharu's pie dough recipe uses 6 ounces of flour, 4 ounces of butter, and 2 ounces of water. Complete the sentences to describe the ratios in her recipe.

4. For every 2 ounces of water there are 6 ounces of flour.

5. The ratio of flour to water is 6 : 2.

6. The ratio of butter to flour is 2 : 3.

7. The ratio of flour to butter is 3 : 2.

Lesson Practice ACC6.2.02

Name: _____ Date: _____ Period: _____

FAST Practice

8. Koharu made a new batch of pie dough with 3 ounces of flour, 2 ounces of butter, and 1 ounce of water. Will her pie dough taste the same as the original recipe? Explain your thinking.

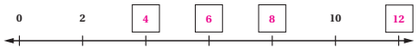
(A.) Yes. **B.** No.

The ratios of all the ingredients (A.) are **B.** are not equivalent to the original recipe. Koharu used half the amount of (A.) all **B.** some ingredients.

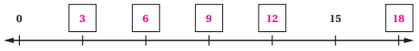
Spiral Review

Problems 9–10: Fill in the blanks on each number line.

9.

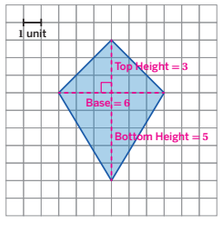


10.



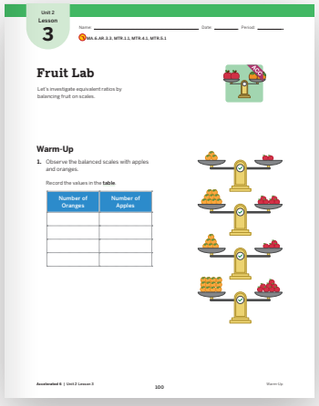
11. Determine the area of this polygon. Show or explain your thinking.

24 square units. *Explanations vary.* The area of the top triangle is $\frac{1}{2}(6 \cdot 3) = 9$ square units, and the area of the bottom triangle is $\frac{1}{2}(6 \cdot 5) = 15$ square units. That means the total area of the polygon is $9 + 15 = 24$ square units.



Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–3	2	MA.6.AR.3.1
	4–7	1	MA.6.AR.3.1
FAST Practice	8	2	MA.6.AR.3.1
Spiral Review			
	9–10	1	MA.3.AR.3.3
	11	2	MA.6.GR.2.2


Unit 2
Lesson
3

Fruit Lab

Let's investigate equivalent ratios by balancing fruit on scales.

Warm-Up

1. Observe the balanced scales with apples and oranges.

Record the values in the table.

Number of Oranges	Number of Apples

Fruit Lab

Creating Equivalent Ratios

Let's investigate equivalent ratios by balancing fruit on scales.

Learning Outcomes

Today's Goals

1. **Goal:** Generate equivalent ratios by multiplying or dividing by the same number.
2. **Language Goal:** Justify whether two ratios are equivalent using mathematically precise language. **(Writing, Speaking, and Listening)**

Students explore how to generate equivalent ratios in the context of balancing fruit on scales. Students use the structure of **tables** to discover that multiplying or dividing both quantities in ratio by the same number yields an equivalent ratio. **(MTR.5.1)**

Coherence

Prior Learning

In Lesson 2, students learned about equivalent ratios in the context of recipes.

Future Learning

In Lesson 4, students will build on their knowledge of generating equivalent ratios by representing them on double number line diagrams.

Connections

- Students apply the concept of balance and describe scale models to build understanding of ratios. (mathematical, real-world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3
Extend previous understanding of fractions and numerical patterns to generate or complete a two-or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.4.1, MTR.5.1

ELA Expectations: ELA.K12.EE.2.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.AR.3.2	**MA.7.AR.3.2** **MA.7.AR.4.1** **MA.7.AR.4.2** **MA.7.AR.4.3** **MA.7.AR.4.4**

Vocabulary

New Vocabulary

table

Lesson at a Glance

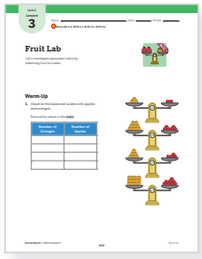
~ 45 min

MA.6.AR.3.3

Warm-Up

Pairs | 5 min

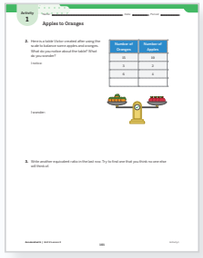
Students explore the context of observing fruit balanced on a scale and record the equivalent ratios.



Activity 1

Pairs | 10 min

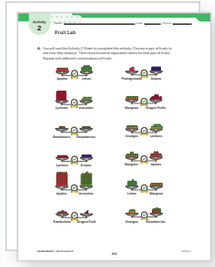
Students analyze and generate equivalent ratios. **Routine:** Notice and Wonder



Activity 2

Pairs | 20 min

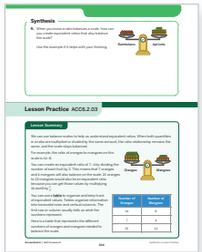
Students explore strategies for generating equivalent ratios and determining whether two ratios are equivalent.



Synthesis

Whole Class | 5 min

Students synthesize their understanding of creating equivalent ratios. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by identifying equivalent ratios.

Prep Checklist

Prepare copies of the Activity 2 Sheet.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 2 Sheet, one per student

Pairs | 5 min

Warm-Up

Purpose: Students explore the context of observing fruit balanced on a scale and record the equivalent ratios.

1 Launch

Direct students' attention to the balanced scales.

Invite students to share what they notice about the scales.

A **Accessibility: Visual-Spatial Processing** To support distinguishing among scales, invite pairs to describe each scale aloud and discuss how they are similar and different.

2 Connect

Invite a few students to share their thinking.

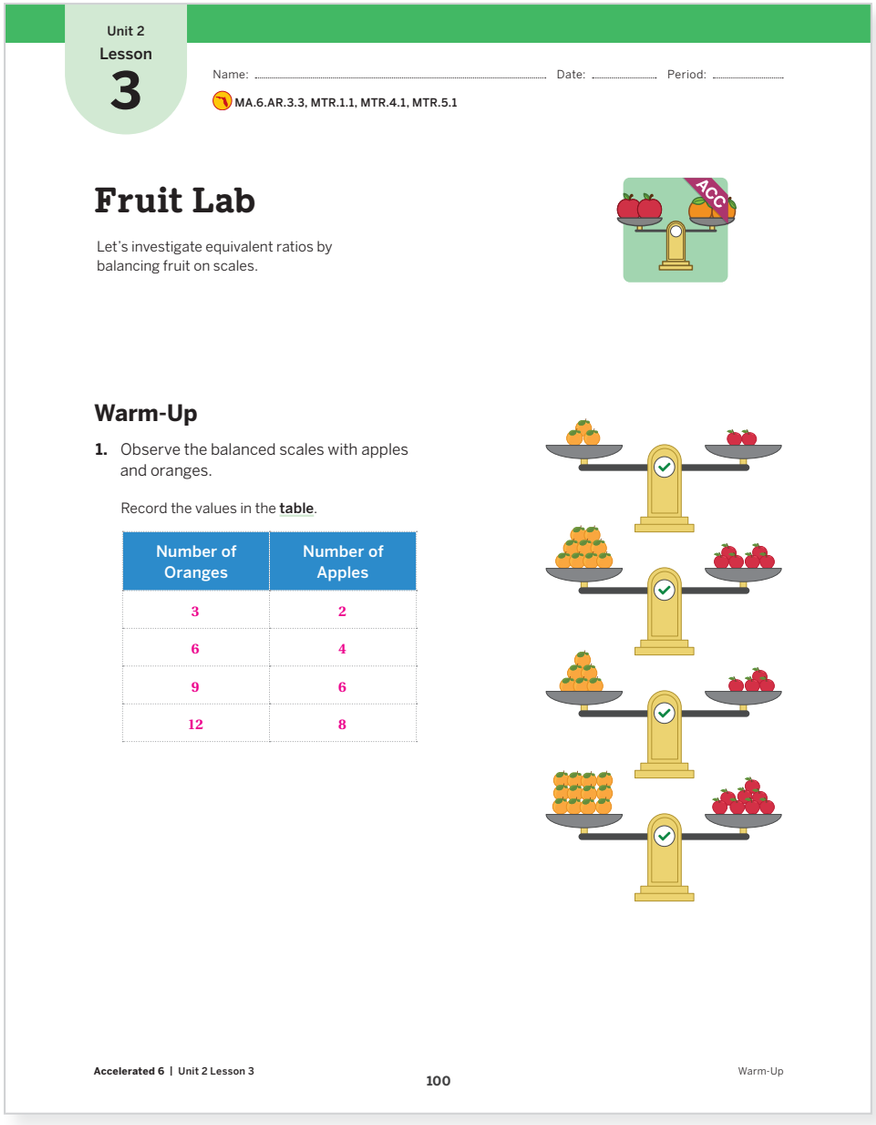
Consider asking:

- "How did you determine what numbers to record in the table?"
- "Why might it help to write successful combinations like this?"

Create a class definition for the term **table** using students' language and the glossary. *Responses vary.* A table organizes information into horizontal rows and vertical columns. The first row or column usually tells us what the numbers represent.

Note: In previous courses, students used multiplication tables. This is their first time using tables in this way.

ELL **English Language Learners** Invite students to share different meanings of the term *table*. Clarify which meaning this word will have for this course. **(Reading and Listening)**



Unit 2
Lesson
3

Name: ..... Date: ..... Period: .....

MA.6.AR.3.3, MTR.1.1, MTR.4.1, MTR.5.1

Fruit Lab

Let's investigate equivalent ratios by balancing fruit on scales.

Warm-Up

1. Observe the balanced scales with apples and oranges.

   Record the values in the **table**.

Number of Oranges	Number of Apples
3	2
6	4
9	6
12	8

Accelerated 6 | Unit 2 Lesson 3 100 Warm-Up

Pairs | 10 min

Activity 1 Apples to Oranges

Purpose: Students analyze and generate equivalent ratios.

1 Launch

Use the Notice and Wonder routine to promote curiosity and help students make sense of the table. Create a record of observations students noticed and wondered, along with the names of those who shared them. **(MTR.1.1)** *Responses vary.* I notice he found similar combinations that we found. I notice all of the numbers on this side are divisible by 3. I wonder if there are patterns.

2 Monitor

Select and sequence a variety of student responses.

D Differentiation

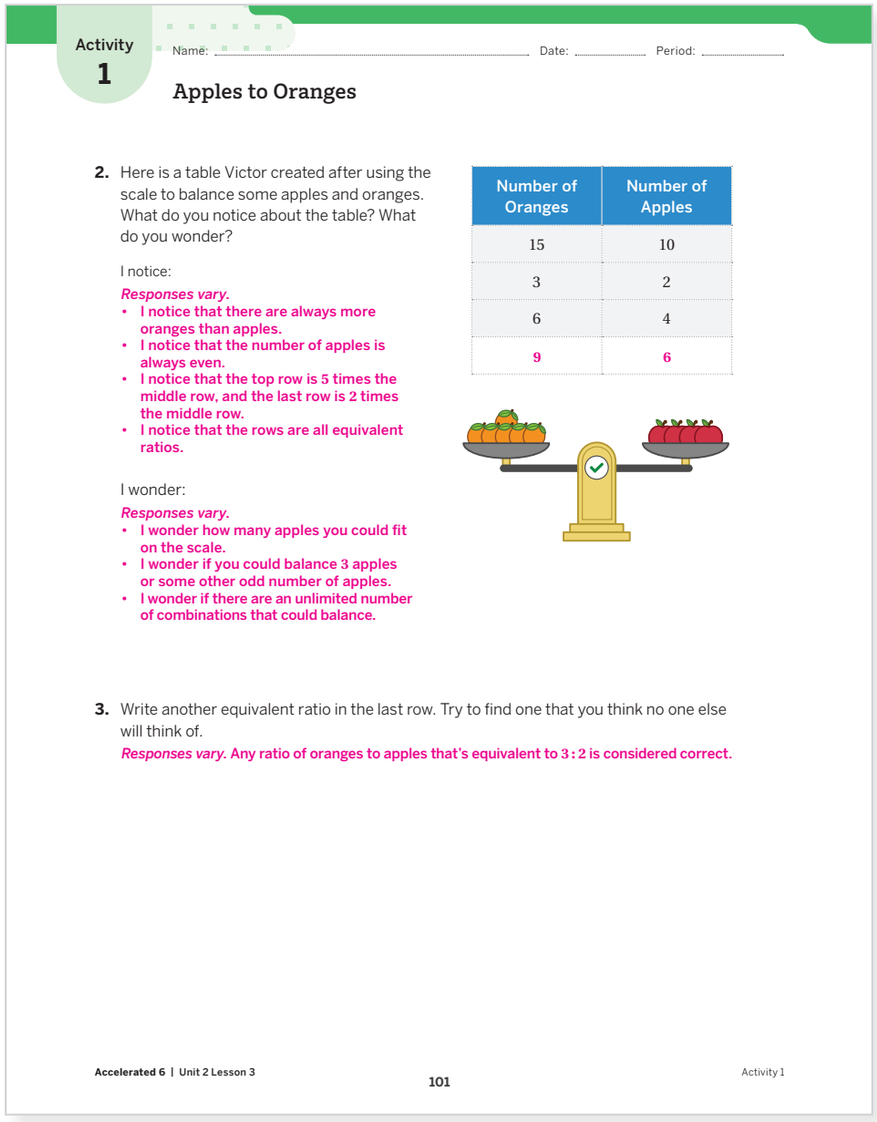
Look for students who:	Respond to Student Thinking
Need support getting started. Use guess-and-check strategies.	**Support** Consider asking, "How can we use some of the patterns from Victor's table to create a new row?"
Determine correct ratios that are small, direct multiples of the rows (e.g., $9:6$ or $30:20$).	**Strengthen** Invite students to describe a strategy that would generate other ratios that would balance the scale. Invite students to share their reasoning during the Connect.
Determine correct equivalent ratios that use larger numbers or parts of numbers (e.g., $900:600$, $87:58$, or $7.5:5$).	**Stretch** Consider asking, "How many apples would balance 1 orange? How many oranges would balance 1 apple?" Invite students to share their reasoning during the Connect.

3 Connect

Invite students to share and explain their thinking.

To surface the Key Takeaway, consider asking:

- "What patterns did you notice in the table? How did that help us create new rows?"
- "How might Victor have started with the ratio $15:10$ and then gotten $3:2$?"
- "How did organizing the information in a table help us understand Victor's thinking?" **(MTR.5.1)**



Activity 1

Name: _____ Date: _____ Period: _____

Apples to Oranges

2. Here is a table Victor created after using the scale to balance some apples and oranges. What do you notice about the table? What do you wonder?

Number of Oranges	Number of Apples
15	10
3	2
6	4
9	6

I notice:

Responses vary.
- I notice that there are always more oranges than apples.
- I notice that the number of apples is always even.
- I notice that the top row is 5 times the middle row, and the last row is 2 times the middle row.
- I notice that the rows are all equivalent ratios.

I wonder:

Responses vary.
- I wonder how many apples you could fit on the scale.
- I wonder if you could balance 3 apples or some other odd number of apples.
- I wonder if there are an unlimited number of combinations that could balance.

3. Write another equivalent ratio in the last row. Try to find one that you think no one else will think of.

Responses vary. Any ratio of oranges to apples that's equivalent to $3:2$ is considered correct.

Accelerated 6 | Unit 2 Lesson 3 101 Activity 1

Key Takeaway: Tables display information in ways that make it easier to find patterns in equivalent ratios.

Pairs | 20 min

Activity 2 Fruit Lab

Purpose: Students explore strategies for generating equivalent ratios and determining whether two ratios are equivalent.

Short on time? Consider omitting Problem 7.

1 Launch

To surface connections, invite students to share their favorite fruits and why they enjoy them.

Distribute one Activity 2 Sheet to each student. Encourage students to record their equivalent ratios on this sheet to help them notice patterns and develop strategies. **(MTR.5.1)**

2 Monitor

Encourage students to share strategies they are using with their partner and test them on new pairs of fruits.

Listen for a variety of student thinking.

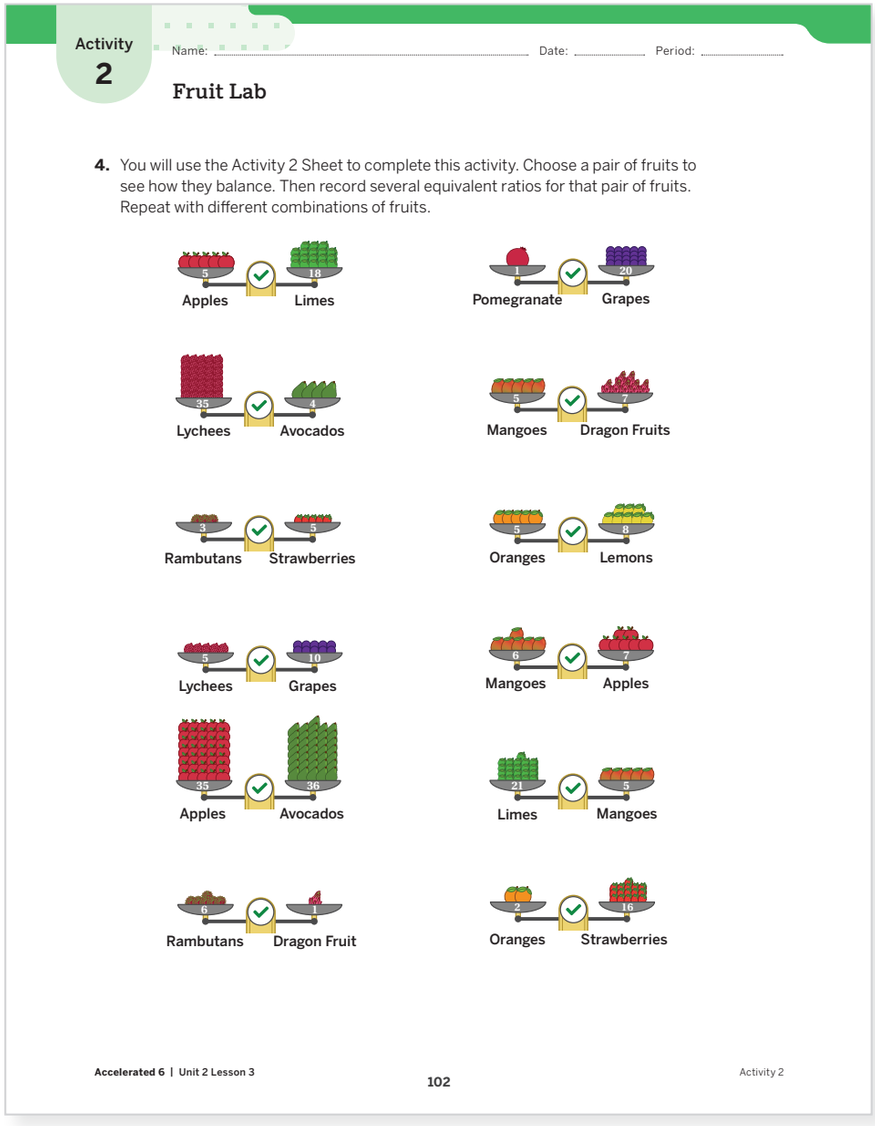
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started. Use guess-and-check strategies.	**Support** Invite students to write the given ratio on their Activity 2 Sheet. Consider asking, "How can we use some of the patterns from Victor's table here?"
Fill in tables by adding the same number of both fruits that are not in the same ratio (e.g., 2 oranges and 2 apples).	**Support** Consider asking, "What strategy can you use to find a combination that definitely balances?"
Complete one or two tables correctly.	**Stretch** Encourage students to find equivalent ratios in between whole numbers (e.g., 2 oranges : 3.5 mangoes). **Stretch** Encourage students to find equivalent ratios of apples and avocados (in the ratio 35 : 36).

Look for students who claim Ella is correct or aren't sure, in Problem 5. Consider asking these students:

- "How many grapes would balance the extra dragon fruit?"
- "What was Ella's misconception?"
- "Can we always add the same number of fruits to both sides to keep it balanced? Why or why not?"

Activity 2 continued >



Activity 2

Name: Date: Period:

Fruit Lab

4. You will use the Activity 2 Sheet to complete this activity. Choose a pair of fruits to see how they balance. Then record several equivalent ratios for that pair of fruits. Repeat with different combinations of fruits.

5 Apples — 18 Limes

1 Pomegranate — 20 Grapes

35 Lychees — 4 Avocados

5 Mangoes — 7 Dragon Fruits

3 Rambutans — 5 Strawberries

5 Oranges — 8 Lemons

5 Lychees — 10 Grapes

6 Mangoes — 7 Apples

35 Apples — 36 Avocados

21 Limes — 5 Mangoes

6 Rambutans — 1 Dragon Fruit

2 Oranges — 16 Strawberries

Pairs | 20 min

Activity 2 Fruit Lab (continued)

Purpose: Students explore strategies for generating equivalent ratios and determining whether two ratios are equivalent.

Short on time? Consider omitting Problem 7.

2 Monitor

Encourage students to share strategies with their partner. Listen for students justifying their responses and invite them to share during the Connect. **(MTR.4.1)**

D Differentiation

Look for students who:	Respond to Student Thinking
Claim the given ratio of $10 : 6$ is equivalent to $7 : 3$, $20 : 16$, and/or $11 : 7$.	**Support** Invite students to look at their Activity 2 Sheet. Consider asking, "What strategy did you use to make equivalent ratios? Does the same strategy work here?"
Do *not* select the option that claims $10 : 6$ is equivalent to $5 : 3$.	**Support** Consider asking, "In Activity 1, we were given the ratio $6 : 4$ and discovered that $3 : 2$ would also balance. Why did this make sense? How might we use this strategy here?"
Select all correct options ($50 : 30$ and $5 : 3$).	**Stretch** Encourage students to create new ratios of fruits, trade with a classmate, and write equivalent ratios.

Look for students who claim that Dyani's claim is wrong, in Problem 6. Consider asking, "Is there a factor we can multiply our original ratio of $2 : 5$ by to get to $22 : 55$?"

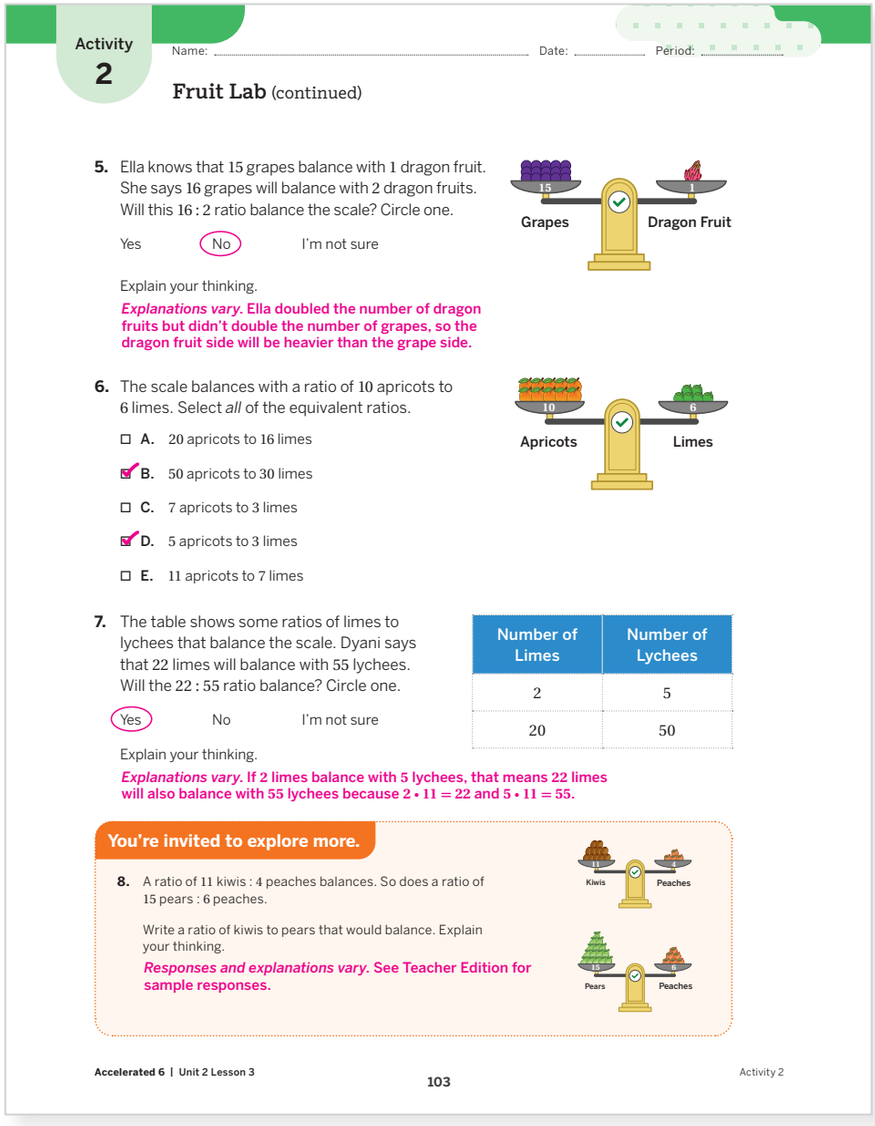
D Differentiation: You're invited to explore more. (Stretch) Invite students who would like to explore ratios further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Display the distribution of responses, calling attention to any conflict or consensus.

To surface the Key Takeaway, consider asking:

- "How can we prove that 50 apricots and 30 limes will balance the scale?"
- "Does the same technique work when we consider 20 apricots and 16 limes? Why or why not?"
- "How did identifying patterns help us discover a process for finding new equivalent ratios?" **(MTR.5.1)**



Activity 2

Name: Date: Period:

Fruit Lab (continued)

5. Ella knows that 15 grapes balance with 1 dragon fruit. She says 16 grapes will balance with 2 dragon fruits. Will this $16 : 2$ ratio balance the scale? Circle one.

Yes (No) I'm not sure

Explain your thinking.

Explanations vary. Ella doubled the number of dragon fruits but didn't double the number of grapes, so the dragon fruit side will be heavier than the grape side.

6. The scale balances with a ratio of 10 apricots to 6 limes. Select *all* of the equivalent ratios.

- ☐ A. 20 apricots to 16 limes
- ☑ B. 50 apricots to 30 limes
- ☐ C. 7 apricots to 3 limes
- ☑ D. 5 apricots to 3 limes
- ☐ E. 11 apricots to 7 limes

7. The table shows some ratios of limes to lychees that balance the scale. Dyani says that 22 limes will balance with 55 lychees. Will the $22 : 55$ ratio balance? Circle one.

Yes (No) I'm not sure

Number of Limes	Number of Lychees
2	5
20	50

Explain your thinking.

Explanations vary. If 2 limes balance with 5 lychees, that means 22 limes will also balance with 55 lychees because $2 \cdot 11 = 22$ and $5 \cdot 11 = 55$.

You're invited to explore more.

8. A ratio of 11 kiwis : 4 peaches balances. So does a ratio of 15 pears : 6 peaches.

Write a ratio of kiwis to pears that would balance. Explain your thinking.

Responses and explanations vary. See Teacher Edition for sample responses.

Accelerated 6 | Unit 2 Lesson 3 103 Activity 2

Key Takeaway: When we start with a balanced scale, we know it will stay balanced if we can multiply or divide both quantities by the same number.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of creating equivalent ratios.

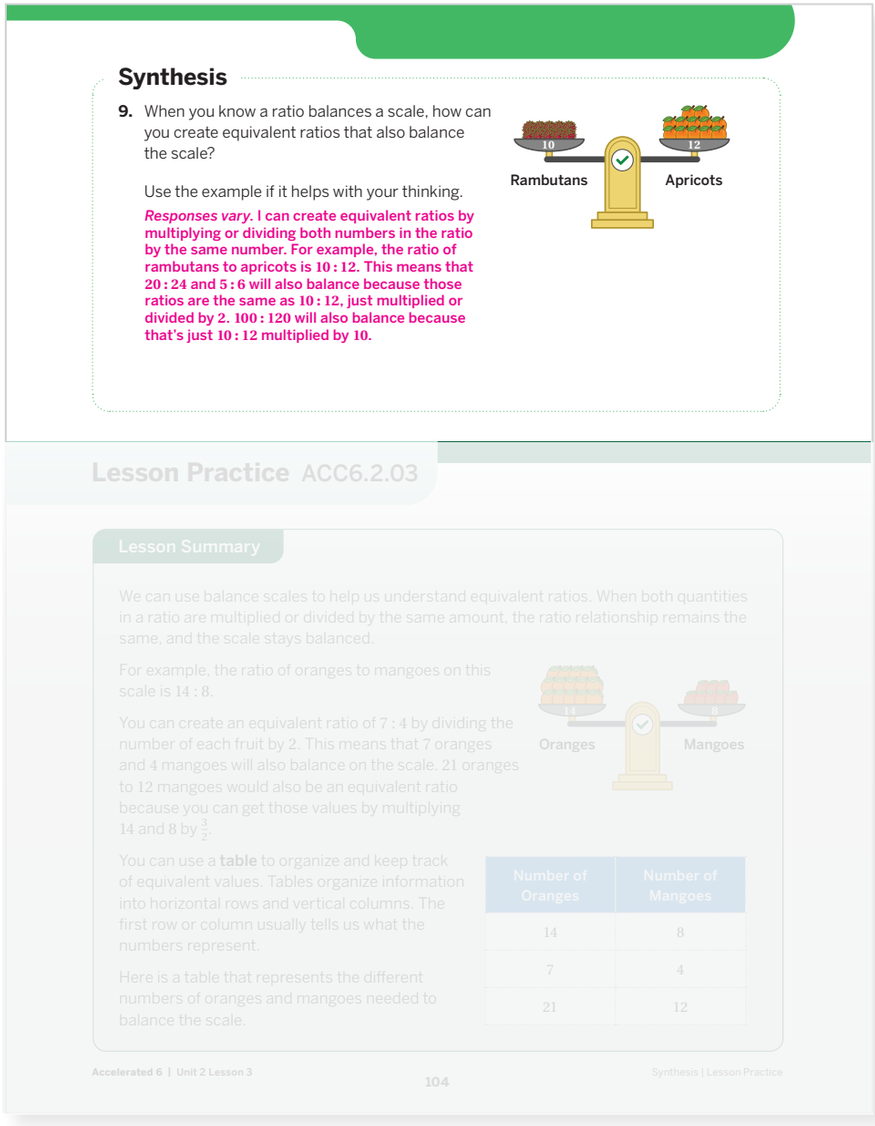
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Doubling, tripling, or halving the given amounts on both sides of a balanced scale to obtain an equivalent ratio.
- Multiplying or dividing the same number to both quantities to create a new equivalent ratio.
- Proving two ratios are equivalent by finding a number that we can multiply or divide by.

MLR **MLR2: Collect and Display** Use this routine to formalize strategies for creating equivalent ratios using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

9. When you know a ratio balances a scale, how can you create equivalent ratios that also balance the scale?

Use the example if it helps with your thinking.

Responses vary. I can create equivalent ratios by multiplying or dividing both numbers in the ratio by the same number. For example, the ratio of rambutans to apricots is $10:12$. This means that $20:24$ and $5:6$ will also balance because those ratios are the same as $10:12$, just multiplied or divided by 2. $100:120$ will also balance because that's just $10:12$ multiplied by 10.

Lesson Practice ACC6.2.03

Lesson Summary

We can use balance scales to help us understand equivalent ratios. When both quantities in a ratio are multiplied or divided by the same amount, the ratio relationship remains the same, and the scale stays balanced.

For example, the ratio of oranges to mangoes on this scale is $14:8$.

You can create an equivalent ratio of $7:4$ by dividing the number of each fruit by 2. This means that 7 oranges and 4 mangoes will also balance on the scale. 21 oranges to 12 mangoes would also be an equivalent ratio because you can get those values by multiplying 14 and 8 by $\frac{3}{2}$.

You can use a **table** to organize and keep track of equivalent values. Tables organize information into horizontal rows and vertical columns. The first row or column usually tells us what the numbers represent.

Here is a table that represents the different numbers of oranges and mangoes needed to balance the scale.

Number of Oranges	Number of Mangoes
14	8
7	4
21	12

Accelerated 6 | Unit 2 Lesson 3 104 Synthesis | Lesson Practice

Lesson Takeaway: We can prove that one ratio is equivalent to another by finding a single number that multiplies or divides the first ratio to obtain the second.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by identifying equivalent ratios.

Today's Goals

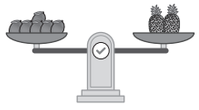
1. **Goal:** Generate equivalent ratios by multiplying or dividing by the same number.
2. **Language Goal:** Justify whether two ratios are equivalent using mathematically precise language. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: ..... Date: ..... Period: .....

Show What You Know 2.03

The scale balances with a ratio of 6 mangoes to 2 pineapples.



Select *all* of the combinations that will balance the scale.

- ☑ **A.** 3 mangoes and 1 pineapple
- ☐ **B.** 7 mangoes and 3 pineapples
- ☐ **C.** 10 mangoes and 6 pineapples
- ☑ **D.** 24 mangoes and 8 pineapples
- ☑ **E.** 60 mangoes and 20 pineapples

D Differentiation Use after Lesson 3

Support

Provide targeted intervention for students by using these resources.

If students need more support creating equivalent ratios using multiplication and division:

» **Respond to Student Thinking:**

- Use the ***Generating Equivalent Ratios*** **Mini-lesson.**
- Revisit the **Warm-Up** and discuss how adding the same amount to a balanced scale creates an imbalance.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities.**

Professional Learning

Reflect on the lesson you just taught. How did the feedback students received during today's lesson support student engagement? How can you continue to support students' reasoning about equivalent ratios?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. When you know a ratio balances a scale, how can you create equivalent ratios that also balance the scale?

Use the example if it helps with your thinking.

Responses vary. I can create equivalent ratios by multiplying or dividing both numbers in the ratio by the same number. For example, the ratio of rambutans to apricots is 10 : 12. This means that 20 : 24 and 5 : 6 will also balance because those ratios are the same as 10 : 12, just multiplied or divided by 2. 100 : 120 will also balance because that's just 10 : 12 multiplied by 10.

Lesson Practice ACC6.2.03

Lesson Summary

We can use balance scales to help us understand equivalent ratios. When both quantities in a ratio are multiplied or divided by the same amount, the ratio relationship remains the same, and the scale stays balanced.

For example, the ratio of oranges to mangoes on this scale is 14 : 8.

You can create an equivalent ratio of 7 : 4 by dividing the number of each fruit by 2. This means that 7 oranges and 4 mangoes will also balance on the scale. 21 oranges to 12 mangoes would also be an equivalent ratio because you can get those values by multiplying 14 and 8 by $\frac{3}{2}$.

You can use a **table** to organize and keep track of equivalent values. Tables organize information into horizontal rows and vertical columns. The first row or column usually tells us what the numbers represent.

Here is a table that represents the different numbers of oranges and mangoes needed to balance the scale.

Number of Oranges	Number of Mangoes
14	8
7	4
21	12

Lesson Practice ACC6.2.03

Name: _____ Date: _____ Period: _____

Problems 1–3: A package of red drink mix says to combine 3 scoops of red drink mix and 5 cups of water.

1. Complete the table with several ratios of red drink mix to water that are equivalent to the package instructions.

Responses vary. Samples shown in table.

Red Drink Mix (scoops)	Water (cups)
3	5
6	10
9	15
12	20
15	25

2. Choose one of your ratios and explain how you know it's equivalent. Draw a diagram if it helps with your thinking.

Responses vary. If I divide both values in the ratio 12 : 20 by 4, then it equals 3 : 5. That means 12 : 20 and 3 : 5 are equivalent.

3. Jaylin drew this diagram for one of her ratios. Will this mix taste the same as the original? Show or explain your thinking.

Yes. *Explanations vary.* For every 3 scoops of red drink mix, there are 5 cups of water.

4. Select *all* of the ratios that are equivalent to 4 : 5.

- ☐ A. 3 : 4
- ☑ B. 8 : 10
- ☐ C. 1 : 2.5
- ☐ D. 9 : 10
- ☑ E. 20 : 25

5. Write a different ratio that is equivalent to 4 : 5.

Responses vary. 1 : 1.25.

Lesson Practice ACC6.2.03

Name: _____ Date: _____ Period: _____

Problems 6–7: You can make a certain color of green paint by mixing 10 ounces of green paint with 2 gallons of white paint.

6. Draw a diagram to represent this ratio.

Responses vary. Sample diagram shown.

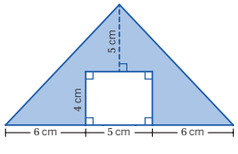
FAST Practice

7. Select *all* the true statements.

- ☑ A. For every 5 ounces of green paint, you need 1 gallon of white paint.
- ☐ B. The ratio of green paint to white paint is 1 : 5.
- ☑ C. For every gallon of white paint, you need 5 ounces of green paint.
- ☐ D. For every ounce of green paint, you need 5 gallons of white paint.
- ☐ E. The ratio of white paint to green paint is 10 : 2.

Spiral Review

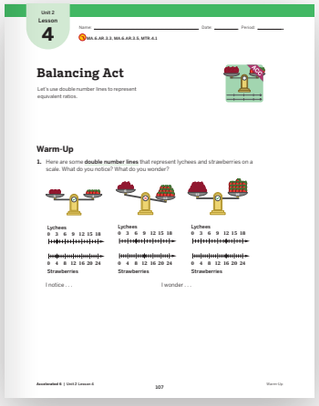
8. Determine the area of the shaded region. Explain your thinking.



56.5 square centimeters. *Explanations vary.* I found the area of the rectangle first: 4 • 5 = 20 square centimeters. Then I found the area of the triangle by determining that the base is 17 centimeters and the height is 9 centimeters and multiplying them: $\frac{1}{2}(17 \cdot 9) = 76.5$ square centimeters. Finally, I subtracted the area of the rectangle from the area of the triangle to determine the area of the shaded region: 76.5 − 20 = 56.5 square centimeters.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1, 5–6	1	MA.6.AR.3.3
	2–3	2	MA.6.AR.3.3
	4	1	MA.6.AR.3.3
FAST Practice	7	1	MA.6.AR.3.3
Spiral Review			
	8	2	MA.6.GR.2.2



Balancing Act

Introduction to Double Number Lines

Let's use double number lines to represent equivalent ratios.

Learning Outcomes

Today's Goals

1. **Goal:** Label and interpret a double number line to represent a situation involving equivalent ratios.
2. **Goal:** Use double number lines to solve problems involving equivalent ratios.
3. **Language Goal:** Compare and contrast tables and double number lines as representations of the same ratio relationship. **(Speaking and Listening)**

Students are introduced to the **double number line** as a tool for completing tables and solving problems involving equivalent ratios. Students use completed double number lines and use precision to fill in partially completed ones to answer questions about balancing different fruits.

Coherence

Prior Learning

In Lesson 2, students defined equivalent ratios through the context of recipes. In Lesson 3, students developed strategies for generating equivalent ratios by balancing fruit on a scale.

Future Learning

In Lessons 9–12, students will use double number lines as a possible strategy for solving a variety of ratio problems, including many modeling situations.

Connections

- Students use visual representations of double number lines to solve problems involving ratios and proportional relationships. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3
Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

Also Addressing: **MA.6.AR.3.5**

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.AR.3.2	**MA.7.AR.3.2** **MA.7.AR.4.1** **MA.7.AR.4.2** **MA.7.AR.4.3** **MA.7.AR.4.4**

Vocabulary

New Vocabulary

double number line

Lesson at a Glance

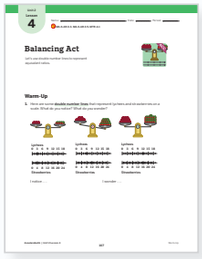
~ 45 min

MA.6.AR.3.3, MA.6.AR.3.5

Warm-Up

Pairs | 10 min

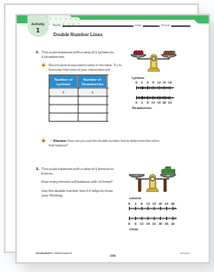
Students are introduced to **double number lines** by connecting them with the context of balancing fruit on a scale. **Routine:** Notice and Wonder



Activity 1

Pairs | 10 min

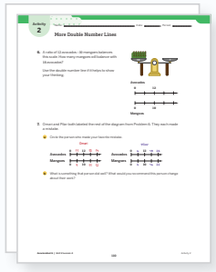
Students interpret fully labeled double number lines to solve problems about equivalent ratios. **Routine:** Decide and Defend



Activity 2

Pairs | 15 min

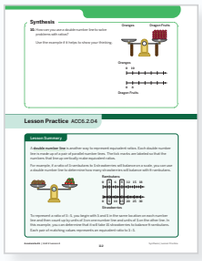
Students use precision in labeling incomplete double number lines, which they use to solve problems about equivalent ratios. **(MTR.4.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that a double number line can be a useful and efficient tool for reasoning about equivalent ratios. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by interpreting a fully labeled double number line to solve a problem about equivalent ratios.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 10 min

Warm-Up

Purpose: Students are introduced to **double number lines** by connecting them with the context of balancing fruit on a scale.

1 Launch

Direct students' attention to the fruit balance of lychees and strawberries.

Consider asking, "Why do you think this might be called a double number line?"

ELL **English Language Learners** Invite students to share what a new term reminds them of. (e.g., "When I hear 'double number line,' I think . . .")

Use the Notice and Wonder routine to have students explore and share what else they notice about the double number line.

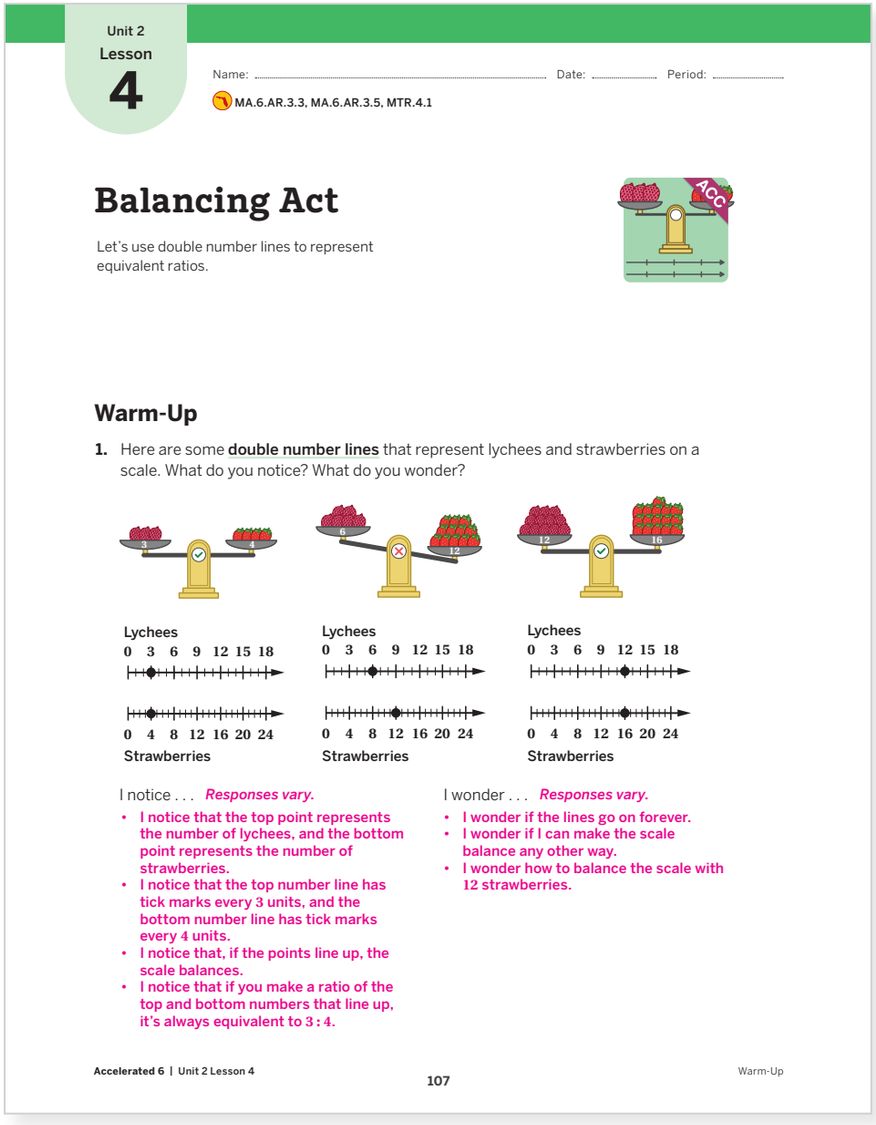
Capture the attributes of the double number line students noticed, along with the name of the students who shared them. *Responses vary.* I see that only the multiples of each number are listed. I notice that numbers on top of each other are equivalent ratios.

2 Connect

Share the captured noticings and wonderings. Consider highlighting:

- The number lines are labeled horizontally with multiples of the first number.
- Each vertical pair of numbers can form an equivalent ratio.

Create a class definition for the term **double number line** using students' language and the glossary. *Responses vary.* A double number line is a pair of parallel number lines showing equivalent ratios.



Unit 2
Lesson
4

Name: ..... Date: ..... Period: .....

MA.6.AR.3.3, MA.6.AR.3.5, MTR.4.1

Balancing Act

Let's use double number lines to represent equivalent ratios.

Warm-Up

1. Here are some **double number lines** that represent lychees and strawberries on a scale. What do you notice? What do you wonder?

Lychees
0 3 6 9 12 15 18
0 4 8 12 16 20 24
Strawberries

Lychees
0 3 6 9 12 15 18
0 4 8 12 16 20 24
Strawberries

Lychees
0 3 6 9 12 15 18
0 4 8 12 16 20 24
Strawberries

I notice . . . *Responses vary.*

- I notice that the top point represents the number of lychees, and the bottom point represents the number of strawberries.
- I notice that the top number line has tick marks every 3 units, and the bottom number line has tick marks every 4 units.
- I notice that, if the points line up, the scale balances.
- I notice that if you make a ratio of the top and bottom numbers that line up, it's always equivalent to 3 : 4.

I wonder . . . *Responses vary.*

- I wonder if the lines go on forever.
- I wonder if I can make the scale balance any other way.
- I wonder how to balance the scale with 12 strawberries.

Accelerated 6 | Unit 2 Lesson 4 107 Warm-Up

Pairs | 10 min

Activity 1 Double Number Lines

Purpose: Students interpret fully labeled double number lines to solve problems about equivalent ratios.

1 Launch

Direct students' attention to the scale with lychees and strawberries.

Consider asking, "How many unique ways can we find to balance the scale?"

Invite students to discuss their strategies with their partners and with another pair.

ELL **English Language Learners** Give students time to think independently before sharing their ideas verbally. **(Speaking)**

2 Monitor

Look for students who need support getting started. Consider asking:

- "Where do we see 3 lychees balancing 4 strawberries on the double number line?"
- "Where else on the double number line do you think we should check?"
- "How does this connect with what we've been discussing with equivalent ratios?"

D **Differentiation: (Support)** Look for students who provide an answer of 18 lemons (instead of 8), indicating they referred to the number line for lemons (instead of limes). Consider asking, "Since some of the numbers repeat on both number lines, how can we tell which one we need?"

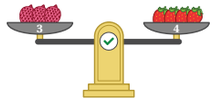
Activity 1 continued >

Activity 1

Name: Date: Period:

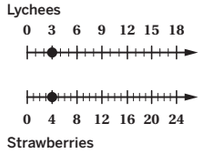
Double Number Lines

2. This scale balances with a ratio of 3 lychees to 4 strawberries.



a. Record several equivalent ratios in the table. Try to find ones that none of your classmates will.

Number of Lychees	Number of Strawberries
3	4
6	8
15	20
30	40



Responses vary. Any ratio equivalent to 3 lychees : 4 strawberries is considered correct.

b. **Discuss:** How can you use the double number line to determine the ratios that balance?

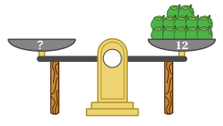
Responses vary. I can look at the numbers that line up vertically on the top line and the bottom line to find equivalent ratios. For example, 6 lychees line up with 8 strawberries, which means that ratio will balance the scale.

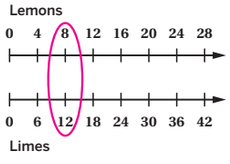
3. This scale balances with a ratio of 4 lemons to 6 limes.

How many lemons will balance with 12 limes?

Use the double number line if it helps to show your thinking.

8 lemons





Accelerated 6 | Unit 2 Lesson 4 108 Activity 1

Pairs | 10 min

Activity 1 Double Number Lines (continued)

Purpose: Students interpret fully labeled double number lines to solve problems about equivalent ratios.

2 Monitor

Listen for and celebrate the different ways that students explain their reasoning.

D Differentiation

Look for students who:	Respond to Student Thinking
Claim that we can't fill in the last row because 32 isn't on either number line.	**Support** Consider asking, "How can we use what we know about equivalent ratios to help us solve this problem?"
Use guess-and-check strategies.	**Strengthen** Consider asking, "How can we use the double number line to help us obtain an answer the first time?"
Complete the entire table.	**Stretch** Consider asking, "What are some ratios we can find on our double number line that aren't labeled?"

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others. **(MTR.4.1)**

ELL **English Language Learners** Encourage students to paraphrase each other's ideas to help make connections and incorporate vocabulary from the unit such as *equivalent ratios*, *table*, and *double number line*. **(Speaking and Listening)**

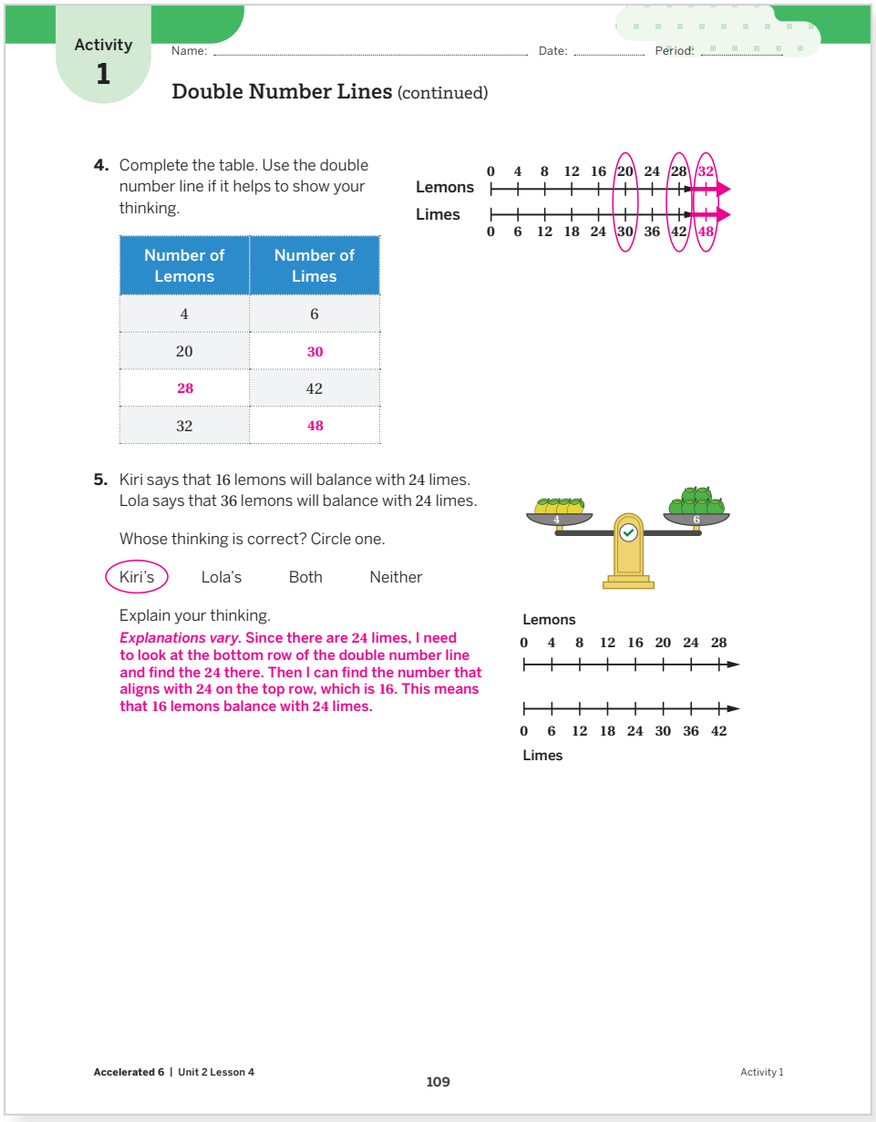
3 Connect

Collect and display student responses, calling attention to any conflict or consensus.

Note: If everyone is in agreement, consider making a class argument using different students' reasoning.

To surface the Key Takeaway, consider asking:

- "How did the double number line help us find answers that balance the scale?"
- "How does this connect to what we've been learning about equivalent ratios?"



Activity 1

Name: _____ Date: _____ Period: _____

Double Number Lines (continued)

4. Complete the table. Use the double number line if it helps to show your thinking.

Number of Lemons	Number of Limes
4	6
20	30
28	42
32	48

5. Kiri says that 16 lemons will balance with 24 limes. Lola says that 36 lemons will balance with 24 limes.

Whose thinking is correct? Circle one.

Kiri's Lola's Both Neither

Explain your thinking.

Explanations vary. Since there are 24 limes, I need to look at the bottom row of the double number line and find the 24 there. Then I can find the number that aligns with 24 on the top row, which is 16. This means that 16 lemons balance with 24 limes.

Accelerated 6 | Unit 2 Lesson 4 109 Activity 1

Key Takeaway: **Double number lines** show equivalent ratios that enable us to find unknown quantities, including ones not listed on the diagram.

Pairs | 15 min

Activity 2 More Double Number Lines

Purpose: Students use precision in labeling incomplete double number lines, which they use to solve problems about equivalent ratios. **(MTR.4.1)**

Short on time? Consider omitting Problem 7.

1 Launch

Consider asking, "What do you notice about this double number line compared to the other ones we've looked at so far?" *Responses vary.* The double number lines before were filled in while this one is mostly blank.

To surface connections, consider asking, "How can we use what we know to help us in this new situation?"

2 Monitor

Listen for students who divide both quantities in the ratio by 2 (to $6:5$) and then multiply by 3. Invite these students to share this strategy with other pairs around them.

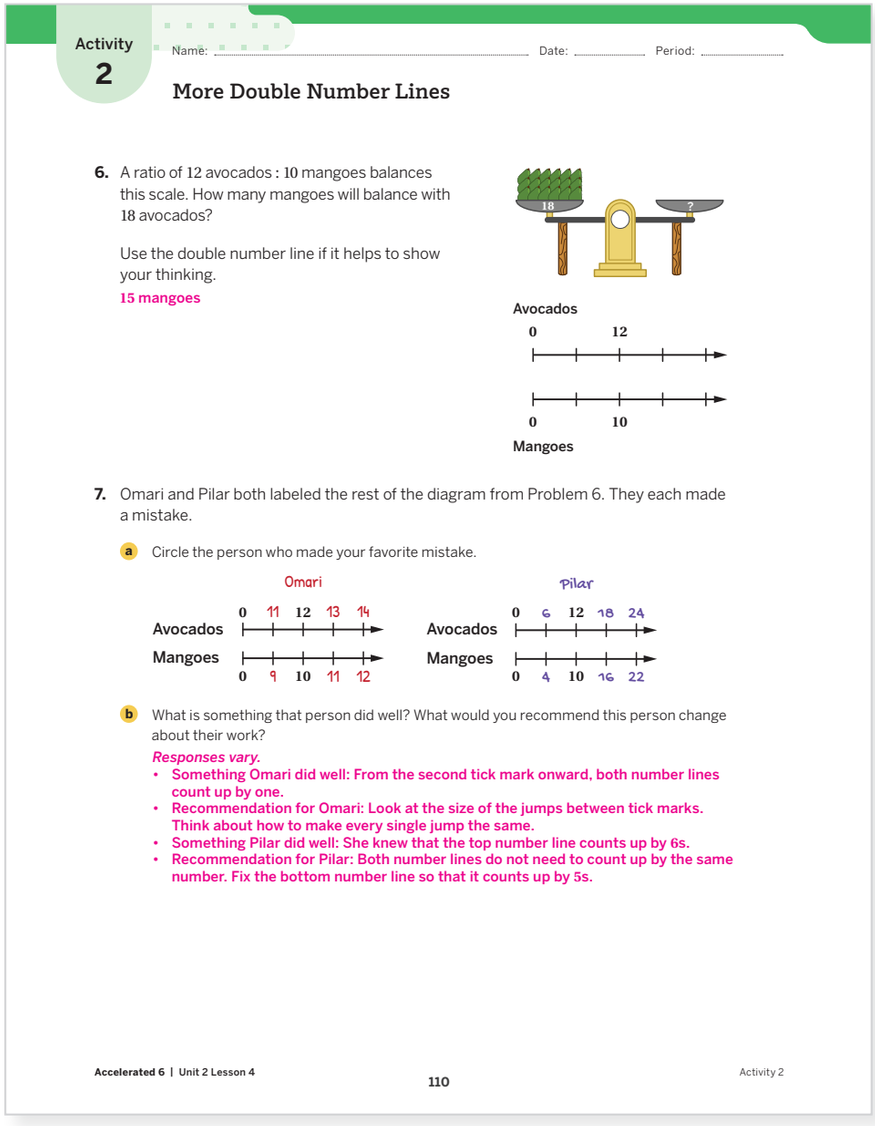
Note: Some students may correctly recognize they can multiply the quantities by 1.5 or $\frac{3}{2}$ to find the number of avocados, but this strategy becomes harder to implement with more challenging numbers. Since multiplying by 1.25 or $\frac{5}{4}$ will be less intuitive, consider asking, "How might we determine the number of mangos that would be needed to balance 15 avocados?" Invite students to answer this new question using the double number line.

Listen for a variety of strategies and invite students to share with their classmates.

D **Differentiation: (Support)** Look for students who claim that Omari's mistake is that he did not count all the way down to 0 or that Pilar did not make any mistake at all. Invite students to verify whether ratios in their (incorrect) diagrams are equivalent.

A **Accessibility: Visual-Spatial Processing** Invite students to answer a more concrete question first to support interpreting visual representations. Consider asking, "What would happen if we put tick marks on their number lines each time we count by 1?"

Activity 2 continued >



Activity 2

Name: Date: Period:

More Double Number Lines

6. A ratio of 12 avocados : 10 mangoes balances this scale. How many mangoes will balance with 18 avocados?

Use the double number line if it helps to show your thinking.

15 mangoes

7. Omari and Pilar both labeled the rest of the diagram from Problem 6. They each made a mistake.

a Circle the person who made your favorite mistake.

b What is something that person did well? What would you recommend this person change about their work?

Responses vary.

- Something Omari did well: From the second tick mark onward, both number lines count up by one.
- Recommendation for Omari: Look at the size of the jumps between tick marks. Think about how to make every single jump the same.
- Something Pilar did well: She knew that the top number line counts up by 6s.
- Recommendation for Pilar: Both number lines do not need to count up by the same number. Fix the bottom number line so that it counts up by 5s.

Accelerated 6 | Unit 2 Lesson 4 110 Activity 2

Pairs | 15 min

Activity 2 More Double Number Lines (continued)

Purpose: Students use precision in labeling incomplete double number lines, which they use to solve problems about equivalent ratios. **(MTR.4.1)**

Short on time? Consider omitting Problem 7.

2 Monitor

Select and sequence student work based on the precision and accuracy of the double number line.

D Differentiation

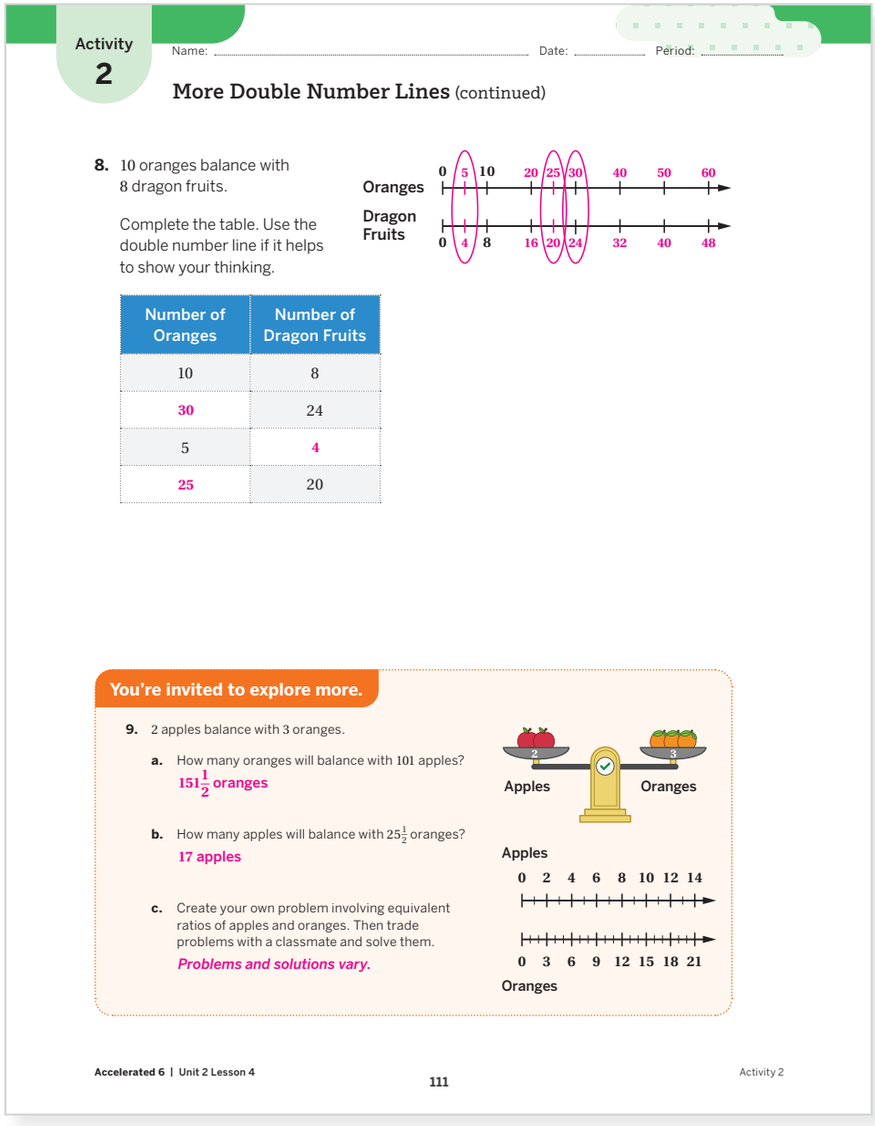
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How could we fill in some numbers on the double number line?"
Fill in the tick marks of the double number line correctly but do not fill in between (e.g., 5 : 4).	**Strengthen** Consider asking, "Where would 5 oranges be on our double number line?" Invite students to share their reasoning during the Connect.
Complete all the number line tick marks, including 5 : 4 and 25 : 20.	**Strengthen** Invite students to describe their reasoning in completing the values in between tick marks. Invite students to share their reasoning during the Connect.
Do not complete the double number line at all but complete the table correctly.	**Strengthen** Invite students to describe how they completed the table without using the double number line at all. Invite students to share their reasoning during the Connect.

D Differentiation: You're invited to explore more. (Stretch) Invite students who would like to explore double number lines further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Share the captured double number line. Invite students to share the strategies they used. **(MTR.4.1)**

To surface the Key Takeaway, consider asking, "If we know the ratio and the number of one specific fruit, how can we determine how many of the other fruit there are?"



Activity 2

Name: Date: Period:

More Double Number Lines (continued)

8. 10 oranges balance with 8 dragon fruits.

Complete the table. Use the double number line if it helps to show your thinking.

Number of Oranges	Number of Dragon Fruits
10	8
30	24
5	4
25	20

You're invited to explore more.

9. 2 apples balance with 3 oranges.

a. How many oranges will balance with 101 apples?
$151\frac{1}{2}$ oranges

b. How many apples will balance with $25\frac{1}{2}$ oranges?
17 apples

c. Create your own problem involving equivalent ratios of apples and oranges. Then trade problems with a classmate and solve them.
Problems and solutions vary.

Accelerated 6 | Unit 2 Lesson 4 111 Activity 2

Key Takeaway: We can fill in missing components of the double number line to find missing quantities in a ratio relationship.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that a double number line can be a useful and efficient tool for reasoning about equivalent ratios.

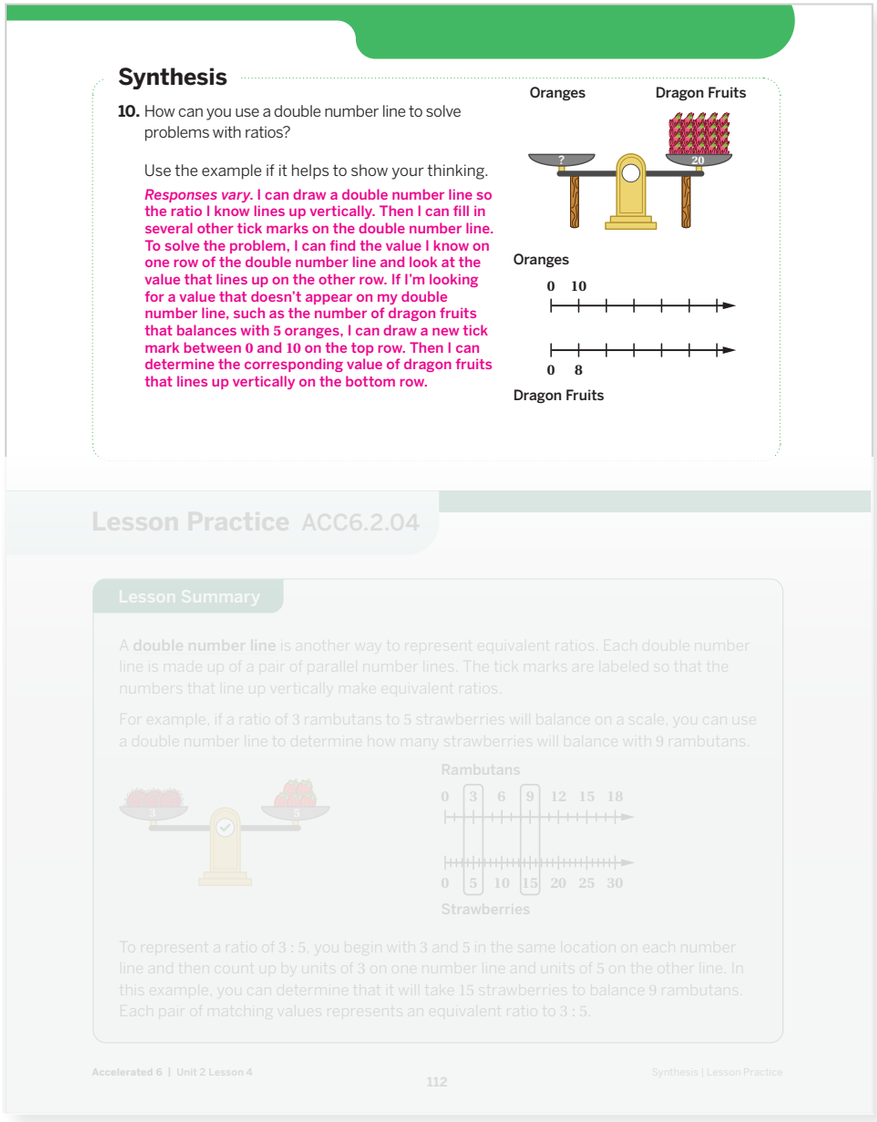
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Filling in the tick marks by adding the same numbers repeatedly on each number line.
- Multiplying and dividing the given ratio on both number lines by the same number.
- Figuring out where the known quantity is on one number line and figuring out the corresponding number that belongs with it on the other.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategy for finding missing quantities with double number lines using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

10. How can you use a double number line to solve problems with ratios?

Use the example if it helps to show your thinking.

Responses vary. I can draw a double number line so the ratio I know lines up vertically. Then I can fill in several other tick marks on the double number line. To solve the problem, I can find the value I know on one row of the double number line and look at the value that lines up on the other row. If I'm looking for a value that doesn't appear on my double number line, such as the number of dragon fruits that balances with 5 oranges, I can draw a new tick mark between 0 and 10 on the top row. Then I can determine the corresponding value of dragon fruits that lines up vertically on the bottom row.

Lesson Practice ACC6.2.04

Lesson Summary

A **double number line** is another way to represent equivalent ratios. Each double number line is made up of a pair of parallel number lines. The tick marks are labeled so that the numbers that line up vertically make equivalent ratios.

For example, if a ratio of 3 rambutans to 5 strawberries will balance on a scale, you can use a double number line to determine how many strawberries will balance with 9 rambutans.

To represent a ratio of 3 : 5, you begin with 3 and 5 in the same location on each number line and then count up by units of 3 on one number line and units of 5 on the other line. In this example, you can determine that it will take 15 strawberries to balance 9 rambutans. Each pair of matching values represents an equivalent ratio to 3 : 5.

Accelerated 6 | Unit 2 Lesson 4 112 Synthesis | Lesson Practice

Lesson Takeaway: We can use the **double number line** as a tool for solving problems involving equivalent ratios.

Independent | 5 min

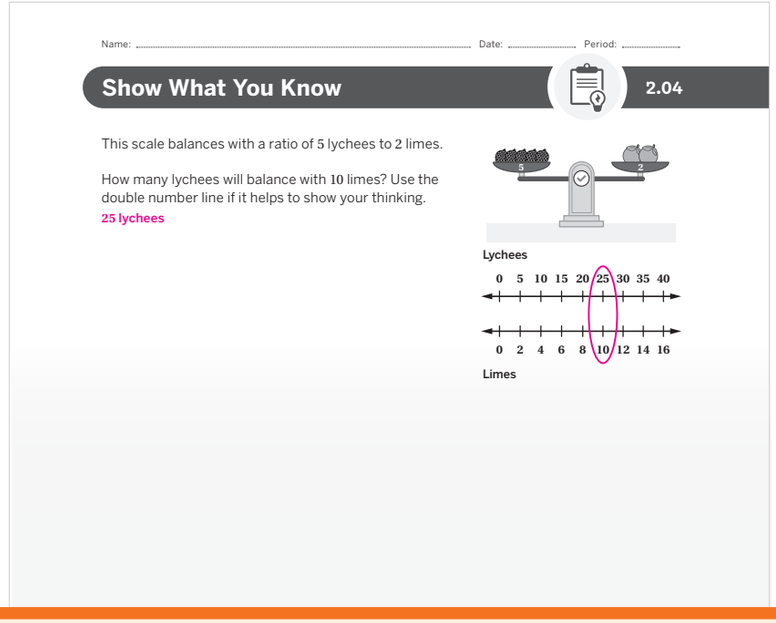
Show What You Know

Purpose: Students demonstrate their understanding by interpreting a fully labeled double number line to solve a problem about equivalent ratios.

Today's Goals

1. **Goal:** Label and interpret a double number line to represent a situation involving equivalent ratios.
2. **Goal:** Use double number lines to solve problems involving equivalent ratios.
3. **Language Goal:** Compare and contrast tables and double number lines as representations of the same ratio relationship. **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: Date: Period:

Show What You Know 2.04

This scale balances with a ratio of 5 lychees to 2 limes.

How many lychees will balance with 10 limes? Use the double number line if it helps to show your thinking.

25 lychees

D Differentiation Use after Lesson 4

Support

Provide targeted intervention for students by using these resources.

If students need support with using double number lines:

» **Respond to Student Thinking:**

- Select a few related **Practice Problems** and provide individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities.**

Professional Learning

In this lesson, students are introduced to a model (the **double number line**) that supports their understanding of equivalent ratios. How does this model integrate with other representations of ratios?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. How can you use a double number line to solve problems with ratios?

Use the example if it helps to show your thinking.

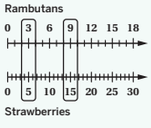
Responses vary. I can draw a double number line so the ratio I know lines up vertically. Then I can fill in several other tick marks on the double number line. To solve the problem, I can find the value I know on one row of the double number line and look at the value that lines up on the other row. If I'm looking for a value that doesn't appear on my double number line, such as the number of dragon fruits that balances with 5 oranges, I can draw a new tick mark between 0 and 10 on the top row. Then I can determine the corresponding value of dragon fruits that lines up vertically on the bottom row.

Lesson Practice ACC6.2.04

Lesson Summary

A **double number line** is another way to represent equivalent ratios. Each double number line is made up of a pair of parallel number lines. The tick marks are labeled so that the numbers that line up vertically make equivalent ratios.

For example, if a ratio of 3 rambutans to 5 strawberries will balance on a scale, you can use a double number line to determine how many strawberries will balance with 9 rambutans.



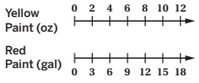
To represent a ratio of 3 : 5, you begin with 3 and 5 in the same location on each number line and then count up by units of 3 on one number line and units of 5 on the other line. In this example, you can determine that it will take 15 strawberries to balance 9 rambutans. Each pair of matching values represents an equivalent ratio to 3 : 5.

Lesson Practice
ACC6.2.04

Name: _____ Date: _____ Period: _____

1. You can make a certain orange paint by mixing 2 ounces of yellow paint with 3 gallons of red paint.

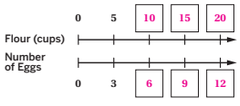
List two other combinations of yellow paint and red paint that can create this shade of orange. ***Responses vary.***



Yellow Paint (oz)	Red Paint (gal)
20	30
12	18

Problems 2–5: This double number line represents the amount of flour and eggs needed for a cookie recipe.

2. Complete the double number line.
Sample shown on diagram.



3. What is the ratio of cups of flour to number of eggs?
5 : 3

4. How much flour do you need for 12 eggs?
20 cups

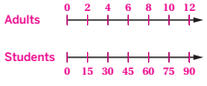
5. How many eggs do you need for 15 cups of flour?
9 eggs

Lesson Practice
ACC6.2.04

Name: _____ Date: _____ Period: _____

Problems 6–8: Metropolis Elementary recommends 2 adults join for every 15 students on a field trip.

6. Draw a double number line to represent this situation.



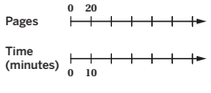
7. How many adults need to go on a field trip with 75 students?
10 adults

8. How many adults need to go on a trip with 50 students? Explain your thinking.
6 or 7 adults. *Explanations vary.* The number of adults required for 45 students is 6, so I would want another adult to join for the last 5 students.

FAST Practice

9. Neo can read 20 pages in 10 minutes. Use the double number line to determine how many pages he can read in 1 hour.

120 pages



Spiral Review

10. Diego estimates that there will need to be 3 pizzas for every 7 kids at his party. Select *all* the statements that represent this ratio.

- ☑ **A.** The ratio of kids to pizzas is 7 : 3.
- ☑ **B.** The ratio of pizzas to kids is 3 : 7.
- ☐ **C.** The ratio of kids to pizzas is 3 : 7.
- ☐ **D.** The ratio of pizzas to kids is 7 : 3.
- ☑ **E.** For every 7 kids, there needs to be 3 pizzas.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1	1	MA.6.AR.3.3
	2–7	1	MA.6.AR.3.5
	8	2	MA.6.AR.3.5
FAST Practice	9	1	MA.6.AR.3.5
Spiral Review			
	10	1	MA.6.AR.3.1

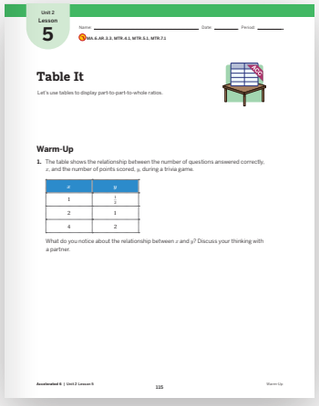

Unit 2
Lesson
5

Table It

Let's use tables to display part-to-part-to-whole ratios.

Warm-Up

1. The table shows the relationship between the number of questions answered correctly, x, and the number of points scored, y, during a trivia game.

x	y
1	1
2	3
4	7

What do you notice about the relationship between x and y? Discuss your thinking with a partner.

115

Table It

Part-to-Part-to-Whole Ratio Tables

Let's use tables to display part-to-part-to-whole ratios.

Learning Outcomes

Today's Goal

1. **Goal:** Generate or complete two- or three-column tables to display part-to-part-to-whole ratios.
2. **Goal:** Use the relationship between quantities in ratio tables to solve contextual problems.
3. **Language Goal:** Explain patterns in a table. **(Speaking, Listening, and Writing)**

Students use tables to display part-to-part-to-whole ratios. They analyze the relationships between quantities and use equivalent ratios to solve problems. They relate previously learned concepts to uncover patterns to help understand ratio relationships. **(MTR.5.1)**

Coherence

Prior Learning

In Lesson 3, students generated equivalent ratios in tables. In Lesson 4, students extended strategies for determining equivalent ratios by using double number lines.

Future Learning

In Lessons 8 and 11, students will use a variety of strategies to compare ratios and solve problems in context. In Unit 3, students will apply ratio reasoning to solve problems.

Connections

- Students use ratio tables and part-part-whole relationships as a tool to understand proportional reasoning with real-world examples such as comparing ingredients in a recipe. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3

Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

Mathematical Thinking and Reasoning Standards: MTR.4.1, MTR.5.1, MTR.7.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1	MA.7.AR.3.2
MA.5.FR.2.1	MA.7.AR.4.1
MA.5.FR.2.2	MA.7.AR.4.2
MA.5.AR.3.2	MA.7.AR.4.3
	MA.7.AR.4.4

Lesson at a Glance

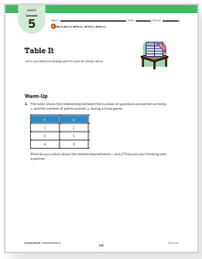
~ 45 min

MA.6.AR.3.3

Warm-Up

Pairs | 5 min

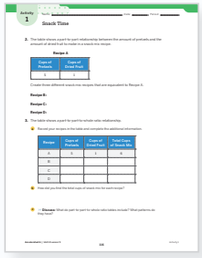
Students use **the Think-Pair-Share routine** to reason about the relationship between two variables. **(MTR.4.1)**



Activity 1

Pairs | 15 min

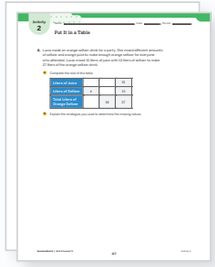
Students use tables to determine equivalent ratios and compare parts to a whole. **(MTR.4.1, MTR.5.1, MTR.7.1)**



Activity 2

Pairs | 15 min

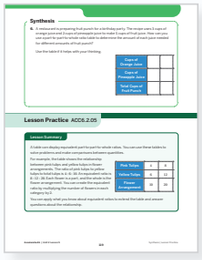
Students complete part-to-part-to-whole ratio tables to generate equivalent ratios. **(MTR.5.1, MTR.7.1)**



Synthesis

Whole Class | 5 min

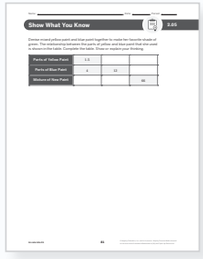
Students synthesize their understanding of part-to-part-to-whole ratio tables.
MLR2: Collect and Display **(MTR.4.1)**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by completing a part-to-part-whole ratio table about mixing paint colors.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use **the Think-Pair-Share routine** to reason about the relationship between two variables. **(MTR.4.1)**

1 Launch

Direct students' attention to the table.

Encourage students to ask their partner questions if they need help getting started.

Use the Think-Pair-Share routine to support student-to-student discourse. See the Routine Facilitation Guide for more information. **(MTR.4.1)**

ELL **English Language Learners** Encourage students to paraphrase each other's ideas to help them make connections and incorporate vocabulary from the unit. **(Speaking and Listening)**

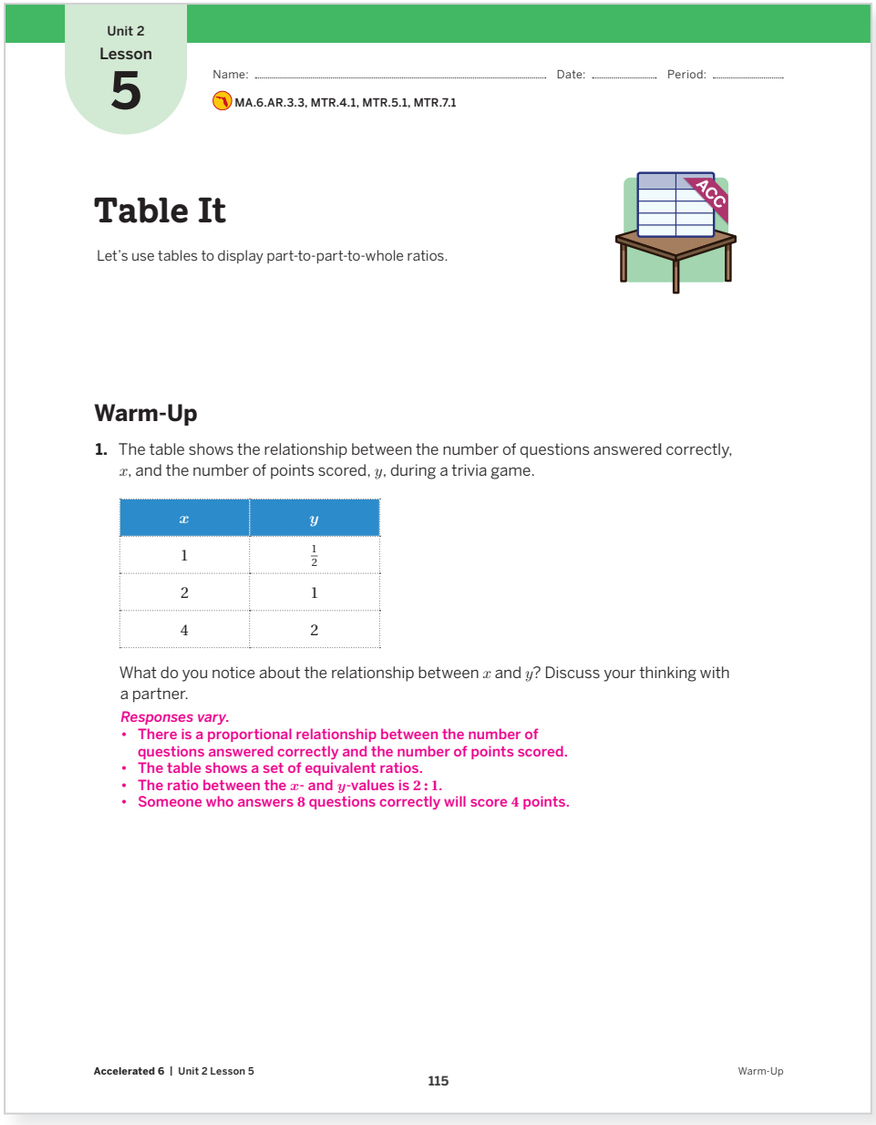
Look for student ideas to highlight during the Connect.

2 Connect

Capture and share a few student ideas. Also, consider sharing misconceptions that you may hear during discussions so that students can work through their thinking together.

Consider asking:

- "What number can you multiply or divide by 1 to get $\frac{1}{2}$?"
- "What number can you multiply or divide by 2 to get 1?"
- "What number can you multiply or divide by 4 to get 2?"
- "Can you multiply or divide the *x*-values by the same number to get the *y*-values?"



Unit 2
Lesson
5

Name: _____ Date: _____ Period: _____

MA.6.AR.3.3, MTR.4.1, MTR.5.1, MTR.7.1

Table It

Let's use tables to display part-to-part-to-whole ratios.

Warm-Up

1. The table shows the relationship between the number of questions answered correctly, x, and the number of points scored, y, during a trivia game.

x	y
1	$\frac{1}{2}$
2	1
4	2

What do you notice about the relationship between x and y? Discuss your thinking with a partner.

Responses vary.
- There is a proportional relationship between the number of questions answered correctly and the number of points scored.
- The table shows a set of equivalent ratios.
- The ratio between the x- and y-values is $2:1$.
- Someone who answers 8 questions correctly will score 4 points.

Accelerated 6 | Unit 2 Lesson 5 115 Warm-Up

Pairs | 15 min

Activity 1 Snack Time

Purpose: Students use tables to determine equivalent ratios and compare parts to a whole. **(MTR.4.1, MTR.5.1, MTR.7.1)**

Short on time? Consider limiting the number of additional equivalent recipes in Problem 2.

1 Launch

To generate excitement, consider asking, "What types of foods would you include in a snack mix? Is there a certain food you'd want more or less of than another in the mix?"

A **Accessibility: Memory and Attention** Invite students to refer back to notes they took earlier on equivalent ratios to activate prior knowledge.

2 Monitor

Encourage students to think about patterns and relationships between quantities throughout the activity.

To support students getting started on Problem 2, consider asking:

- "How many times greater is the number of cups of pretzels than the number of cups of dried fruit used in the recipe?"

Encourage students to first think independently when finding equivalent recipes, then consult with their partner.

Invite students to think about what the *whole* means in a part-to-part-to-whole ratio.

Listen for explanations of student thinking and invite students to share more. Also, remind students there are multiple correct answers.

Listen for students using relevant math vocabulary such as *ratio* or *equivalent* throughout the activity.

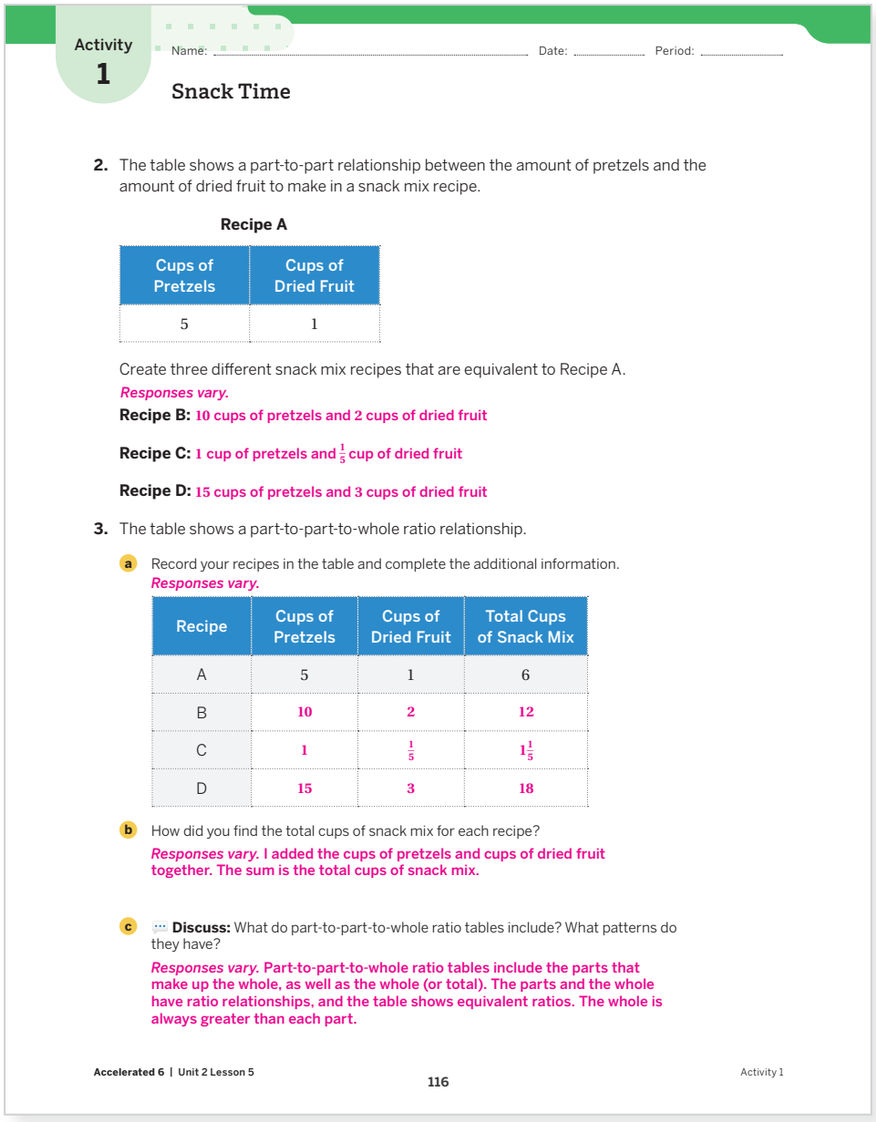
ELL **English Language Learners** Invite a student to share an example response, then display it for reference. **(Writing and Speaking)**

3 Connect

Invite students to share some equivalent recipes that they created.

To surface the Key Takeaway, consider asking:

- "Can you give an example of another situation where we might use a part-to-part-to-whole ratio table?"
- "How can you use a ratio table to determine the total amount from the parts?"
- "How does the total change if each part doubles?"



Activity 1

Name: _____ Date: _____ Period: _____

Snack Time

2. The table shows a part-to-part relationship between the amount of pretzels and the amount of dried fruit to make in a snack mix recipe.

Recipe A

Cups of Pretzels	Cups of Dried Fruit
5	1

Create three different snack mix recipes that are equivalent to Recipe A.

Responses vary.

Recipe B: 10 cups of pretzels and 2 cups of dried fruit

Recipe C: 1 cup of pretzels and $\frac{1}{5}$ cup of dried fruit

Recipe D: 15 cups of pretzels and 3 cups of dried fruit

3. The table shows a part-to-part-to-whole ratio relationship.

a. Record your recipes in the table and complete the additional information.

Responses vary.

Recipe	Cups of Pretzels	Cups of Dried Fruit	Total Cups of Snack Mix
A	5	1	6
B	10	2	12
C	1	$\frac{1}{5}$	$1\frac{1}{5}$
D	15	3	18

b. How did you find the total cups of snack mix for each recipe?

Responses vary. I added the cups of pretzels and cups of dried fruit together. The sum is the total cups of snack mix.

c. **Discuss:** What do part-to-part-to-whole ratio tables include? What patterns do they have?

Responses vary. Part-to-part-to-whole ratio tables include the parts that make up the whole, as well as the whole (or total). The parts and the whole have ratio relationships, and the table shows equivalent ratios. The whole is always greater than each part.

Accelerated 6 | Unit 2 Lesson 5 116 Activity 1

Key Takeaway: A part-to-part-to-whole ratio table shows equivalent ratios among parts and the whole, where the whole is the sum of the parts.

Pairs | 15 min

Activity 2 Put It in a Table

Purpose: Students complete part-to-part-to-whole ratio tables to generate equivalent ratios. **(MTR.5.1, MTR.7.1)**

Short on time? Consider omitting Problem 4b and having students discuss strategies while completing Problem 5.

1 Launch

To surface connections, consider inviting students to share their favorite colors or a favorite drink they like to make. Explain that some colors can be made by mixing two or more different colors together.

2 Monitor

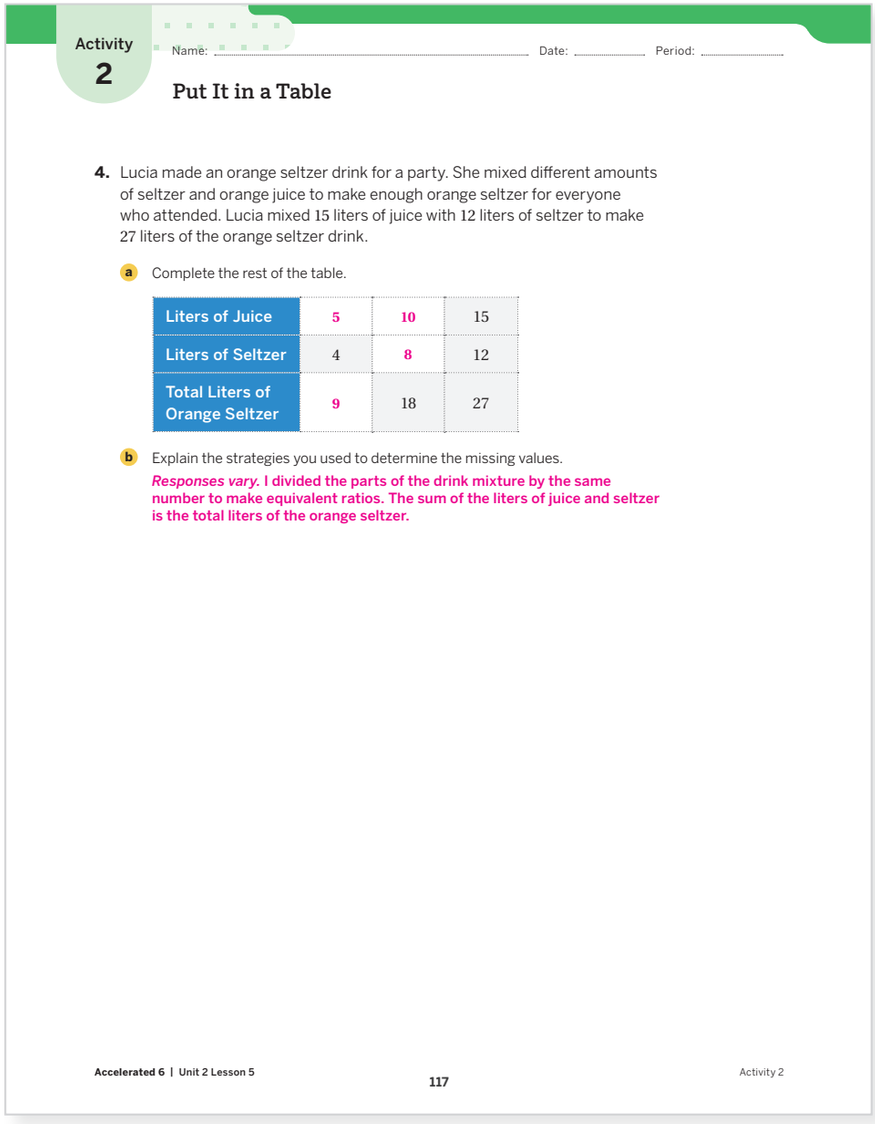
Encourage students to share strategies they are using with their partner to determine the missing values from the table.

D Differentiation *(Problems 4–5)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage students to use guess-and-check strategies. **Support** Invite the class to share strategies they use to determine equivalent ratios.
Complete portions of the tables correctly.	**Support** Celebrate the structure they noticed. Invite these students to identify the strategy they used and encourage them to consider how to apply a similar or different strategy to other cells of the table. **Support** Consider asking, "Can you use different strategies to complete different parts of the table?"
Complete the tables correctly.	**Stretch** Invite students to add columns to the ratio table and generate additional equivalent ratios.

ELL English Language Learners Provide sentence frames to help students explain their strategy (e.g., "I noticed that _____, so I _____." or "First, I _____ because _____."). **(Writing and Speaking)**

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Put It in a Table

4. Lucia made an orange seltzer drink for a party. She mixed different amounts of seltzer and orange juice to make enough orange seltzer for everyone who attended. Lucia mixed 15 liters of juice with 12 liters of seltzer to make 27 liters of the orange seltzer drink.

a. Complete the rest of the table.

Liters of Juice	5	10	15
Liters of Seltzer	4	8	12
Total Liters of Orange Seltzer	9	18	27

b. Explain the strategies you used to determine the missing values.

Responses vary. I divided the parts of the drink mixture by the same number to make equivalent ratios. The sum of the liters of juice and seltzer is the total liters of the orange seltzer.

Accelerated 6 | Unit 2 Lesson 5 117 Activity 2

Pairs | 15 min

Activity 2 Put It in a Table (continued)

Purpose: Students complete part-to-part-to-whole ratio tables to generate equivalent ratios. **(MTR.5.1, MTR.7.1)**

Short on time? Consider omitting Problem 4b and having students discuss strategies while completing Problem 5.

2 Monitor

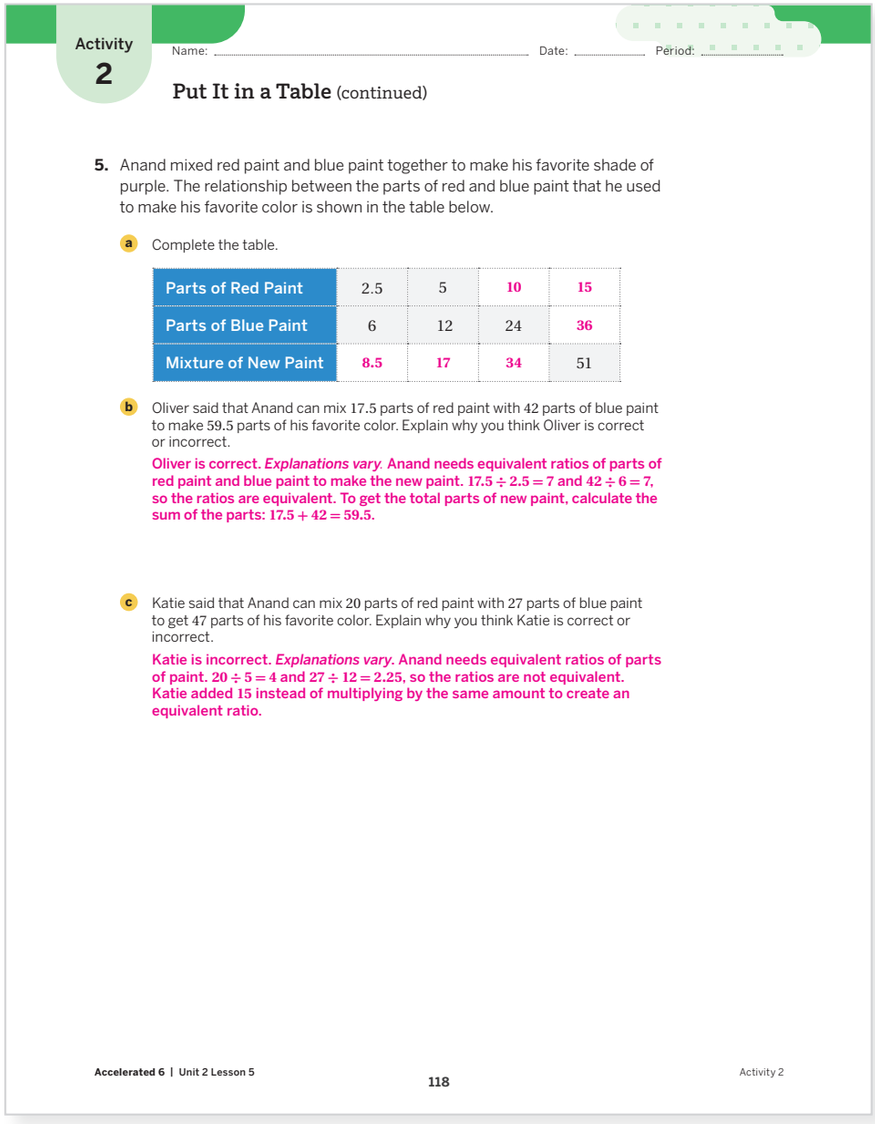
Listen for partner discussions for student ideas to highlight in the Connect.

Consider asking, "What operations are used to identify equivalent ratios?"

3 Connect

Invite pairs of students to share their thinking about Oliver's and Katie's paint mixtures.

To surface the Key Takeaway, consider inviting students to share their strategies to complete both tables with the class. After polling the class, write down any similar strategies and display them for the class to see. Some examples might be: *constant multiplication across rows, scaling up or down, using double number lines*.



Activity 2

Name: Date: Period:

Put It in a Table (continued)

5. Anand mixed red paint and blue paint together to make his favorite shade of purple. The relationship between the parts of red and blue paint that he used to make his favorite color is shown in the table below.

a. Complete the table.

Parts of Red Paint	2.5	5	10	15
Parts of Blue Paint	6	12	24	36
Mixture of New Paint	8.5	17	34	51

b. Oliver said that Anand can mix 17.5 parts of red paint with 42 parts of blue paint to make 59.5 parts of his favorite color. Explain why you think Oliver is correct or incorrect.

Oliver is correct. *Explanations vary.* Anand needs equivalent ratios of parts of red paint and blue paint to make the new paint. $17.5 \div 2.5 = 7$ and $42 \div 6 = 7$, so the ratios are equivalent. To get the total parts of new paint, calculate the sum of the parts: $17.5 + 42 = 59.5$.

c. Katie said that Anand can mix 20 parts of red paint with 27 parts of blue paint to get 47 parts of his favorite color. Explain why you think Katie is correct or incorrect.

Katie is incorrect. *Explanations vary.* Anand needs equivalent ratios of parts of paint. $20 \div 5 = 4$ and $27 \div 12 = 2.25$, so the ratios are not equivalent. Katie added 15 instead of multiplying by the same amount to create an equivalent ratio.

Accelerated 6 | Unit 2 Lesson 5 118 Activity 2

Key Takeaway: We can use strategies for determining equivalent ratios to complete part-to-part-to-whole ratio tables.

Whole Class | 5 min

Synthesis

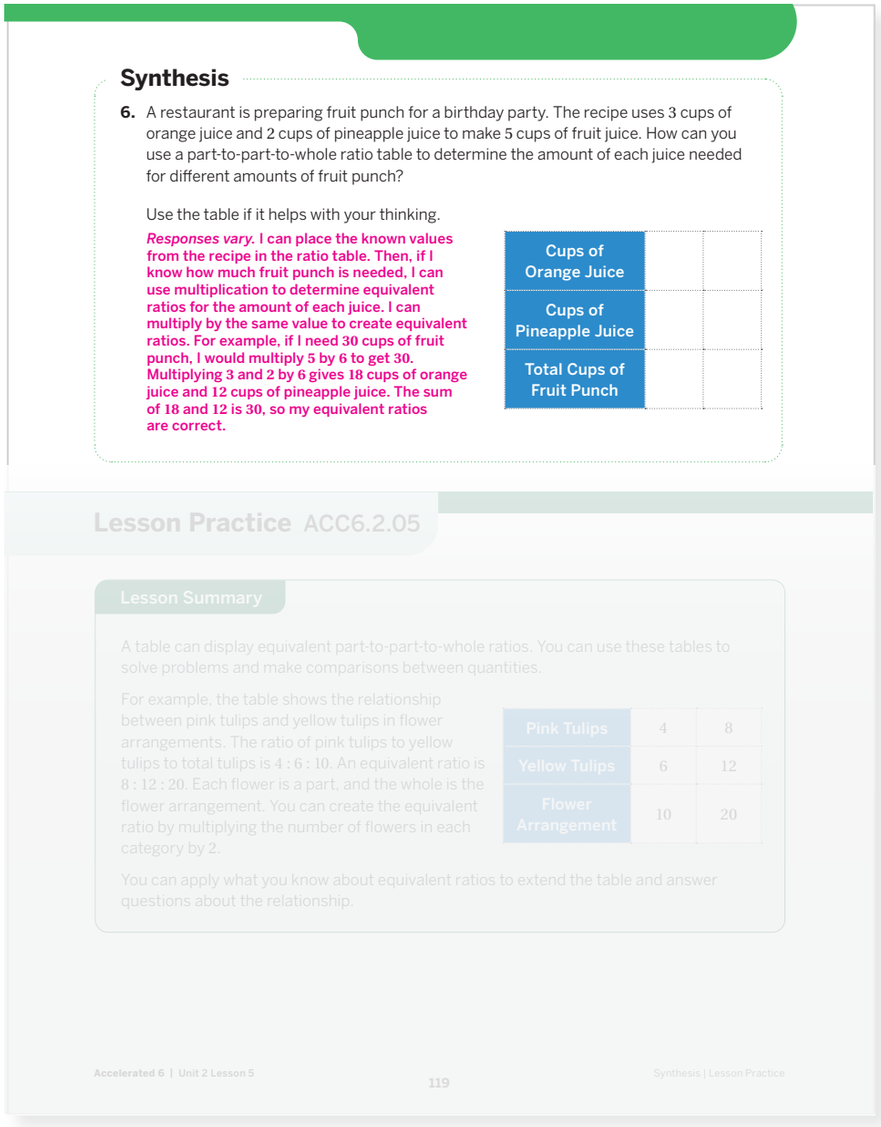
Purpose: Students synthesize their understanding of part-to-part-to-whole ratio tables.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:
- The sum of the parts must equal the whole.
- Doubling the recipe to generate new amounts for each juice.
- Using repeated multiplication to generate new ratios.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they share during the Connect. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

6. A restaurant is preparing fruit punch for a birthday party. The recipe uses 3 cups of orange juice and 2 cups of pineapple juice to make 5 cups of fruit juice. How can you use a part-to-part-to-whole ratio table to determine the amount of each juice needed for different amounts of fruit punch?

Use the table if it helps with your thinking.

Responses vary. I can place the known values from the recipe in the ratio table. Then, if I know how much fruit punch is needed, I can use multiplication to determine equivalent ratios for the amount of each juice. I can multiply by the same value to create equivalent ratios. For example, if I need 30 cups of fruit punch, I would multiply 5 by 6 to get 30. Multiplying 3 and 2 by 6 gives 18 cups of orange juice and 12 cups of pineapple juice. The sum of 18 and 12 is 30, so my equivalent ratios are correct.

Cups of Orange Juice		
Cups of Pineapple Juice		
Total Cups of Fruit Punch		

Lesson Practice ACC6.2.05

Lesson Summary

A table can display equivalent part-to-part-to-whole ratios. You can use these tables to solve problems and make comparisons between quantities.

For example, the table shows the relationship between pink tulips and yellow tulips in flower arrangements. The ratio of pink tulips to yellow tulips to total tulips is 4 : 6 : 10. An equivalent ratio is 8 : 12 : 20. Each flower is a part, and the whole is the flower arrangement. You can create the equivalent ratio by multiplying the number of flowers in each category by 2.

Pink Tulips	4	8
Yellow Tulips	6	12
Flower Arrangement	10	20

You can apply what you know about equivalent ratios to extend the table and answer questions about the relationship.

Accelerated 6 | Unit 2 Lesson 5 119 Synthesis | Lesson Practice

Lesson Takeaway: We can use tables to show equivalent part-to-part-to-whole ratio relationships.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by completing a part-to-part-whole ratio table about mixing paint colors.

Today's Goal

1. **Goal:** Generate or complete two- or three-column tables to display part-to-part-to-whole ratios.
2. **Goal:** Use the relationship between quantities in ratio tables to solve contextual problems.
3. **Language Goal:** Explain patterns in a table. **(Speaking, Listening, and Writing)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 2.05

Denise mixed yellow paint and blue paint together to make her favorite shade of green. The relationship between the parts of yellow and blue paint that she used is shown in the table. Complete the table. Show or explain your thinking.

Parts of Yellow Paint	1.5	4.5	18
Parts of Blue Paint	4	12	48
Mixture of New Paint	5.5	16.5	66

Responses vary. The ratio of yellow to blue paint (1.5:4) is used to find the amount of yellow for any given amount of blue.The total mixture was obtained by adding the corresponding parts of yellow and blue paint.

D Differentiation Use after Lesson 5

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to complete a table of part-part-whole ratios:

» **Respond to Student Thinking:**

- Select a few related **Practice Problems** and provide individualized feedback.
- Review the **Lesson Summary.**

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities.**

Professional Learning

In what ways are students taking risks when trying out new strategies for completing part-to-part-to-whole ratio tables? How could students be encouraged to think about new and efficient strategies even after developing a strategy?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

6. A restaurant is preparing fruit punch for a birthday party. The recipe uses 3 cups of orange juice and 2 cups of pineapple juice to make 5 cups of fruit juice. How can you use a part-to-part-to-whole ratio table to determine the amount of each juice needed for different amounts of fruit punch?

Use the table if it helps with your thinking.

Responses vary. I can place the known values from the recipe in the ratio table. Then, if I know how much fruit punch is needed, I can use multiplication to determine equivalent ratios for the amount of each juice. I can multiply by the same value to create equivalent ratios. For example, if I need 30 cups of fruit punch, I would multiply 5 by 6 to get 30. Multiplying 3 and 2 by 6 gives 18 cups of orange juice and 12 cups of pineapple juice. The sum of 18 and 12 is 30, so my equivalent ratios are correct.

Cups of Orange Juice		
Cups of Pineapple Juice		
Total Cups of Fruit Punch		

Lesson Practice ACC6.2.05

Lesson Summary

A table can display equivalent part-to-part-to-whole ratios. You can use these tables to solve problems and make comparisons between quantities.

For example, the table shows the relationship between pink tulips and yellow tulips in flower arrangements. The ratio of pink tulips to yellow tulips to total tulips is $4 : 6 : 10$. An equivalent ratio is $8 : 12 : 20$. Each flower is a part, and the whole is the flower arrangement. You can create the equivalent ratio by multiplying the number of flowers in each category by 2.

Pink Tulips	4	8
Yellow Tulips	6	12
Flower Arrangement	10	20

You can apply what you know about equivalent ratios to extend the table and answer questions about the relationship.

Lesson Practice
ACC6.2.05

Name: _____ Date: _____ Period: _____

Problems 1–3: For every 7 laps that a puppy completes in a pen, a rabbit completes 4 laps.

1. Complete the table with equivalent ratios.

Responses vary, but all ratios should be equivalent.

Puppy Laps	Rabbit Laps	Total Laps
7	4	11
14	8	22
17.5	10	27.5

2. Choose one of your sets of equivalent ratios and explain how you know it's equivalent.

Responses vary. If I multiply each value in the original ratio by 2, then I get 14, 8, and 22. That means that the sets of ratios are equivalent.

3. If the rabbit completes 16 laps and the total number of laps is 44, what are two strategies you can use to determine the number of laps the puppy completes?

Responses vary. The sum of the number of laps each animal completes is the total number of laps. So I can subtract 16 from 44 to know that the puppy completes 28 laps. I also can use multiplication. Because 4 times 4 is 16, I can multiply 7 by 4 to get 28.

Problems 4–7: A fruit salad recipe calls for $\frac{3}{4}$ cup of blueberries for every 1 cup of strawberries.

Cups of Strawberries	1	5	8	10
Cups of Blueberries	$\frac{3}{4}$	$3\frac{3}{4}$	6	$7\frac{1}{2}$
Cups of Fruit Salad	$1\frac{3}{4}$	$8\frac{3}{4}$	14	$17\frac{1}{2}$

4. Complete the table for different amounts of fruit salad.

5. Describe one strategy you used to complete the table.

Responses vary. I divided 6 by $\frac{3}{4}$ to get 8. Then I multiplied 1 by 8 to determine that the recipe calls for 8 cups of strawberries when there are 6 cups of blueberries. Then I added 6 and 8 to get 14 total cups of fruit salad.

Lesson Practice
ACC6.2.05

Name: _____ Date: _____ Period: _____

6. Describe any patterns you notice in the table.

Responses vary. The number of cups of strawberries is always greater than the number of cups of blueberries in a recipe. Similarly, the number of cups of fruit salad is always greater than the number of cups of either strawberries or blueberries in a recipe. As the number of cups of strawberries increases, so do the number of cups of blueberries and the number of cups of fruit salad.

7. Binta uses 2 cups of strawberries to make 4 cups of fruit salad. Does Binta's fruit salad use the same recipe? Show or explain your thinking.

Binta's fruit salad does not use the same recipe. *Explanations vary.* The ratio $2 : 4$ is not equivalent to the ratio $8 : 14$.

FAST Practice

8. Which statement about the table is true?

A. For every 1.5 parts of black paint, you make 4 parts of new paint.

B. For every 6 parts of white paint, you need 2.25 parts of black paint.

C. For every 16.5 parts of new paint, you need 3.5 parts of black paint.

D. For every 6 parts of white paint, you make 7.5 parts of new paint.

Parts of Black Paint	1.5		
Parts of White Paint	4	6	12
New Paint Mixture			16.5

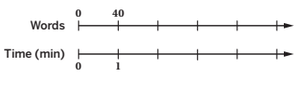
Spiral Review

9. Which ratio is equivalent to $3 : 4$?

A. $3 : 7$ B. $4 : 3$ C. $9 : 12$ D. $30 : 44$

10. Tiam can type 40 words in 1 minute. Use the double number line to determine how many words Tiam can type in 5 minutes.

200 words



Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1, 4	1	MA.6.AR.3.3
	2, 5–6	2	MA.6.AR.3.3
	3, 7	3	MA.6.AR.3.3
FAST Practice	8	2	MA.6.AR.3.3
Spiral Review			
	9	1	MA.6.AR.3.1
	10	2	MA.6.AR.3.2

Assess and Respond

Sub-Unit Quiz

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Identifying accurate statements that describe ratios in context	Lesson 1	1	MA.6.AR.3.1
2	Identifying equivalent ratios	Lesson 2	1	MA.6.AR.3.3
3a	Determining an unknown value in a ratio relationship in context	Lesson 2	1	MA.6.AR.3.3
3b	Determining an equivalent ratio in context	Lesson 3	1	MA.6.AR.3.3
4	Critiquing the reasoning of another who inaccurately applies a ratio	Lesson 4	2	MA.6.AR.3.1 , MTR.4.1
5a	Labeling the units of a double number line	Lesson 4	1	MA.6.AR.3.3
5b	Using the structure of a double number line to label missing values of equally-spaced tick marks	Lesson 4	1	MA.6.AR.3.3
5c	Writing a ratio problem that can be solved using a double number line	Lesson 4	3	MA.6.AR.3.3
5d	Solving a ratio problem using a double number line	Lesson 4	3	MA.6.AR.3.3
6	Completing a table of part-to-part-to-whole relationships in context	Lesson 5	2	MA.6.AR.3.3

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

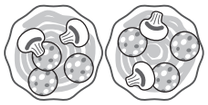
- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Sub-Unit Quiz

Unit 2

1. Which statement is true?



A. The ratio of pizzas to mushroom slices is 4 to 2.

B. The ratio of mushroom slices to pizzas is 2 to 1.

C. There are two pizzas for every pepperoni.

D. There are six pepperonis for every pizza.

2. Select *all* of the ratios that are equivalent to 8 : 6.

☐ A. 10 : 8 ☑ B. 4 : 3 ☐ C. 6 : 4 ☑ D. 40 : 30 ☑ E. 16 : 12

3. You can make pancakes with just eggs and bananas! Here is one recipe.

Two-Ingredient Pancakes
Serves 4 People
- 6 eggs
- 2 bananas

a. How many eggs do you need if you have 6 bananas?
18 eggs

b. How many eggs and how many bananas do you need to serve 6 people?

Eggs: 9 Bananas: 3

4. A recipe for lemonade uses 5 scoops of mix for every 4 cups of water.

Mai says, "No matter how much lemonade you make, there is always one more scoop of mix than cups of water." Is she correct? Explain your reasoning.
No. *Explanations vary.* If Mai doubles the recipe, then she would have 10 scoops of mix and 8 cups of water. This doesn't follow her rule.

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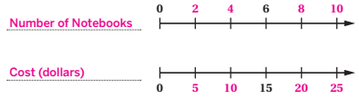
Name: ..... Date: ..... Period: .....

Sub-Unit Quiz (continued)

Unit 2

5. At the stationery store, it costs $15 for 6 notebooks.



a. Label each number line with a title and units to represent the situation.

b. Fill in the missing values on the double number line.

c. Write a question you could answer using the double number line.
Responses vary.
- How many notebooks can I buy for $20?
- How much does it cost to buy 10 notebooks?

d. Answer your question.
Responses vary depending on students' questions from 5c.

6. A trail mix recipe calls for $\frac{1}{4}$ cup of peanuts for every 1 cup of granola. Complete the table to show equivalent ratios.

Cups of Peanuts	Cups of Granola	Cups of Trail Mix
$\frac{1}{2}$	2	$2\frac{1}{2}$
$\frac{3}{4}$	3	$3\frac{3}{4}$
1	4	5

D Differentiation (Sub-Unit Quiz 1)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	
Solve problems with equivalent ratios using tables, double number lines, and calculations. Use tables to display part-to-part-to-whole relationships **(Lessons 1–5)**	1	Support Strengthen	• **Teacher Move:** Consider revisiting Lesson 1 *(Describing Ratios)*

	2, 4	Support
		Strengthen
			• **Mini-Lesson:** *Generating Equivalent Ratios*
			• **Teacher Move:** Consider revisiting
			  • Lesson 2 *(Rice Ratios)*
			  • Lesson 3 *(Fruit Lab)*

		Stretch	• **You're invited to explore more:** Lesson 3 *(Fruit Lab)*

	3, 5	Support
		Strengthen
			• **Teacher Move:** Consider revisiting:
			  • Lesson 2 *(Rice Ratios)*
			  • Lesson 3 *(Fruit Lab)*
			  • Lesson 4 *(Balancing Act)*

		Stretch	• **You're Invited to Explore More:** Lesson 4 *(Balancing Act)*
	6	Support Strengthen	• **Teacher Move:** Consider revisiting Lesson 5 *(Table It)*

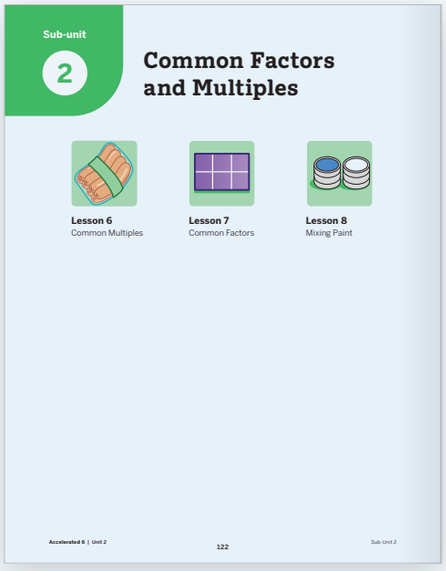
Sub-Unit 2

Common Factors and Multiples

Sub-Unit 2 Goals

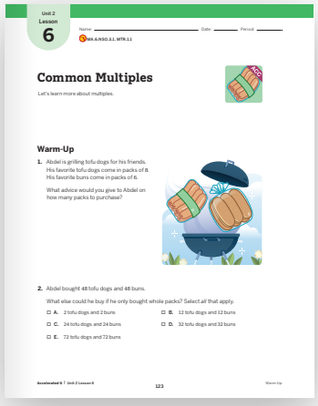
- **Goal:** Determine the least common multiple and greatest common factor of two numbers.
- **Language Goal:** Interpret least common multiples and greatest common factors in mathematical and real-world situations.

In this sub-unit, students build fluency with **common factors**, **greatest common factor (GCF)**, **common multiples**, and **least common multiple (LCM)**.



Math that Matters Most

Concept or Skill	For example . . .
Determine the least common multiple.	What is the least common multiple of 10 and 6? **30**
Determine the greatest common factor.	What is the greatest common factor of 24 and 40? **8**


Unit 2
Lesson 6
Common Multiples
Let's learn more about multiples.
Warm-Up
1. Abdel is grilling tofu dogs for his friends. His favorite tofu dogs come in packs of 8. His favorite buns come in packs of 6.
What advice would you give to Abdel on how many packs to purchase?
2. Abdel bought 48 tofu dogs and 48 buns.
What else could he buy if he only bought whole packs? Select all that apply.
A. 2 tofu dogs and 2 buns
B. 12 tofu dogs and 12 buns
C. 24 tofu dogs and 24 buns
D. 32 tofu dogs and 32 buns
E. 72 tofu dogs and 72 buns
123

Common Multiples

Investigating Least Common Multiple

Let's learn more about multiples.

Learning Outcomes

Today's Goals

1. **Goal:** Determine the least common multiple of two numbers.
2. **Language Goal:** Explain what the least common multiple of two numbers means. **(Speaking and Listening)**

Students learn how to determine the **least common multiple (LCM)** of two numbers. They make sense of what a least common multiple is, then develop fluency in determining the LCM of two numbers and respond to conjectures about them. **(MTR.1.1)**

Coherence

Prior Learning

In a previous course, students determined factor pairs for a whole number from 0 to 144 and whether that whole number is prime, composite, or neither.

Future Learning

In Lesson 7, students will determine common factors and the greatest common factor of two whole numbers and apply this in mathematical and real-world problems.

Connections

- Students use a 100's chart to help visualize and understand the concept of the Least Common Multiple (LCM) in a real-world scenario. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.1
Given a mathematical or real-world context, find the greatest common factor and least common multiple of two whole numbers.

Mathematical Thinking and Reasoning Standard: MTR.1.1

ELA Expectations: ELA.K12.EE.2.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.AR.3.1	MA.7.NSO.2.2 MA.7.AR.1.2

Vocabulary

New Vocabulary

common multiple

least common multiple (LCM)

Lesson at a Glance

~ 45 min

MA.6.NSO.3.1

Warm-Up

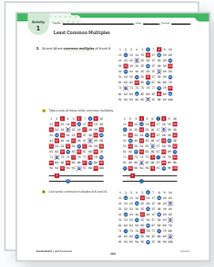
Pairs | 5 min

Students are introduced to the idea of **common multiples** in a familiar context.

Activity 1

Pairs | 15 min

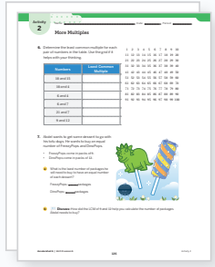
Students develop an understanding of the meaning of common multiples and extend that understanding to **least common multiples**.



Activity 2

Pairs | 15 min

Students develop fluency in determining the least common multiple of two numbers and apply their understanding to make sense of a real-world scenario and conjectures. **(MTR.1.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that the least common multiple of two numbers is the smallest shared multiple. **MLR2: Collect and Display**

Show What You Know

Independent | 5 min

Students demonstrate their understanding by finding the least common multiple of two numbers.

Prep Checklist

Prepare copies of the More Multiples Sheet and coloring tools, highlighters, or small chips.

This lesson includes:

- Student Edition
- Show What You Know
- Prepare More Multiples Sheets, one per student
  - coloring tools, highlighters, or small chips

Pairs | 5 min

Warm-Up

Purpose: Students are introduced to the idea of **common multiples** in a familiar context.

1 Launch

Invite students to read the text aloud and consider asking, "What problem is Abdel facing?"

Consider sharing that the tofu dogs and buns had to be purchased in whole packs.

Look for students who selected each possible combination, and invite them to share their reasoning during the Connect.

D Differentiation

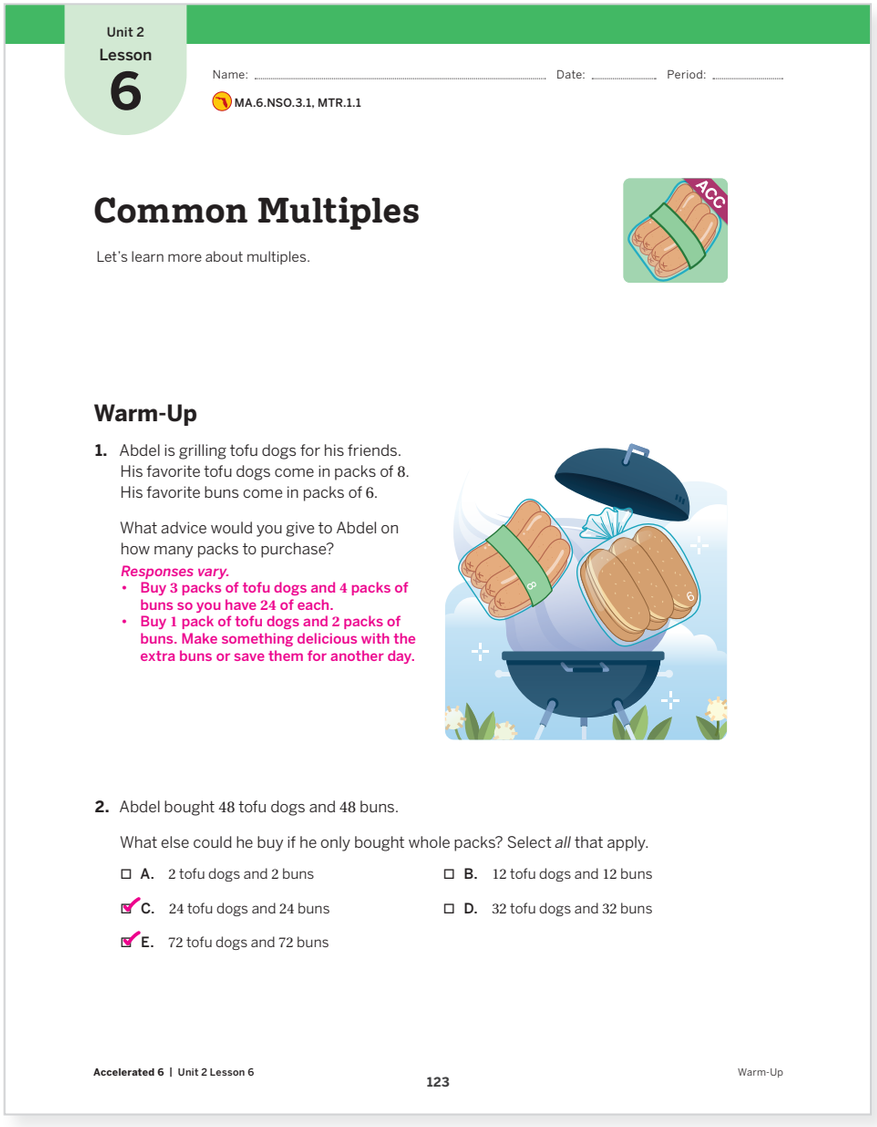
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider reviewing the first choice (2 of each) and asking, "Is it possible to only buy 2 tofu dogs and 2 buns? Why or why not?"
Select inaccurate combinations.	**Support** Consider asking, "How many tofu dogs and buns would Abdel have if he bought 2 packs? 3? 4?"
Select accurate combinations.	**Stretch** Consider asking, "What are two other combinations that Abdel can buy? Can you come up with a rule about how you can know if Abdel can buy a combination or not?"

2 Connect

Invite students to share their reasoning for their selections.

Consider asking:

- "What patterns did you notice in the combinations of tofu dogs and buns Abdel can buy?"
- "How many packs of each item should Abdel purchase? What was important to you when you decided?"



Unit 2
Lesson
6

Name: ..... Date: ..... Period: .....

MA.6.NSO.3.1, MTR.1.1

Common Multiples

Let's learn more about multiples.

Warm-Up

1. Abdel is grilling tofu dogs for his friends. His favorite tofu dogs come in packs of 8. His favorite buns come in packs of 6.

What advice would you give to Abdel on how many packs to purchase?

Responses vary.

- Buy 3 packs of tofu dogs and 4 packs of buns so you have 24 of each.
- Buy 1 pack of tofu dogs and 2 packs of buns. Make something delicious with the extra buns or save them for another day.

2. Abdel bought 48 tofu dogs and 48 buns.

What else could he buy if he only bought whole packs? Select *all* that apply.

- ☐ **A.** 2 tofu dogs and 2 buns
- ☐ **B.** 12 tofu dogs and 12 buns
- ☑ **C.** 24 tofu dogs and 24 buns
- ☐ **D.** 32 tofu dogs and 32 buns
- ☑ **E.** 72 tofu dogs and 72 buns

Accelerated 6 | Unit 2 Lesson 6 123 Warm-Up

Pairs | 15 min

Activity 1 Least Common Multiples

Purpose: Students develop an understanding of the meaning of common multiples and extend that understanding to **least common multiples**.

1 Launch

To surface prior knowledge, consider asking:

- "What do you think is meant by *multiple*?"
- "How does the picture show the multiples?"

ELL **English Language Learners** Invite students to share what each word in the new term *common multiples* reminds them of (e.g., "When I hear the word *common*, I think..." or "When I hear the word *multiple*, I think of..."). Then invite students to share what they think it means when the two words are used together. **(Listening and Speaking)**

Distribute the More Multiples Sheet, one per student, and highlighters, coloring tools, or small chips for students to use as they identify the multiples throughout the remainder of the lesson.

2 Monitor

Invite students to check their multiples with a partner.

Listen for students' draft definitions of **common multiples** and potential comparison to factors.

Activity 1 continued >

Activity 1

Name: _____ Date: _____ Period: _____

Least Common Multiples

3. 24 and 48 are **common multiples** of 8 and 6.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

a. Take a look at these other common multiples.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

3, 8

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

4, 7

b. List some common multiples of 6 and 15.

Responses vary. 30, 60, 90, . . .

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Accelerated 6 | Unit 2 Lesson 6 124 Activity 1

Activity 1 Least Common Multiples (continued)

Purpose: Students develop an understanding of the meaning of common multiples and extend that understanding to **least common multiples**.

2 Monitor

Encourage students to explain their strategy to a partner.

Invite students to use coloring tools or different shapes to mark the hundreds chart.

Capture particularly creative or clear descriptions of student strategies to show during the Connect.

D Differentiation

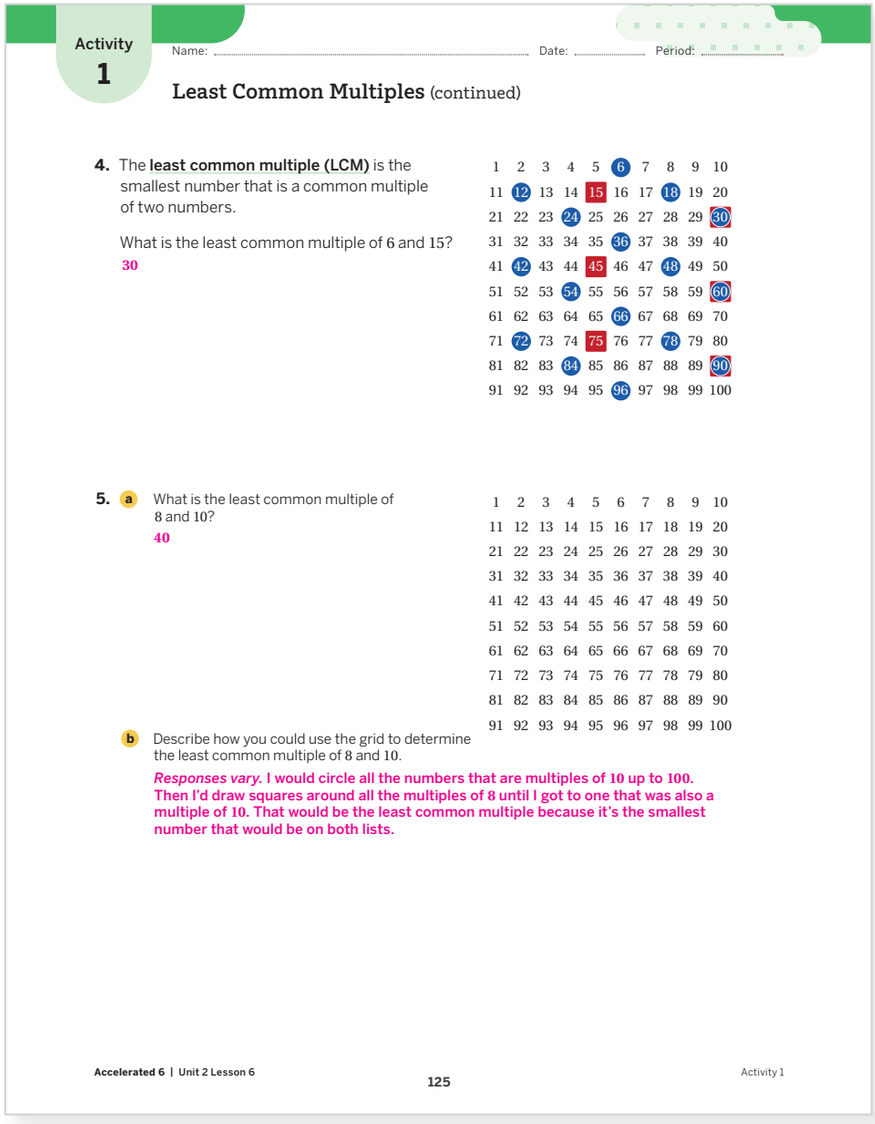
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking: • "If 8 is red, what other numbers will also be red?" • "If 10 is blue, what other numbers will also be blue?"
Have an accurate LCM but an incomplete description.	**Support** Invite them to explain their strategy orally or visually to a classmate. Then have them capture the strategy in writing together.
Have an accurate LCM and a robust description.	**Stretch** Consider asking, "What other pairs of numbers have an LCM of 30? List as many as you can."

3 Connect

Share the captured strategies. Encourage students to use a variety of these strategies throughout the lesson.

Create a class definition of **least common multiple (LCM)** by using the information in Problem 4 and adding specific student language and strategies.

To surface the Key Takeaway, consider asking:
- "What calculations are involved in determining the multiples of a number?"
- "What strategy do you like to use to calculate the LCM?"
- "Are there advantages to starting with the smaller number? The larger number?"



Activity 1

Name: Date: Period:

Least Common Multiples (continued)

4. The **least common multiple (LCM)** is the smallest number that is a common multiple of two numbers.

What is the least common multiple of 6 and 15?

30

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

5. a. What is the least common multiple of 8 and 10?

40

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

b. Describe how you could use the grid to determine the least common multiple of 8 and 10.

Responses vary. I would circle all the numbers that are multiples of 10 up to 100. Then I'd draw squares around all the multiples of 8 until I got to one that was also a multiple of 10. That would be the least common multiple because it's the smallest number that would be on both lists.

Accelerated 6 | Unit 2 Lesson 6 125 Activity 1

Key Takeaway: Repeated addition or multiplication can be used to calculate the multiples of a number. The **least common multiple (LCM)** is the smallest number that is a **common multiple** of two numbers.

Pairs | 15 min

Activity 2 More Multiples

Purpose: Students develop fluency in determining the least common multiple of two numbers and apply their understanding to make sense of a real-world scenario and conjectures. **(MTR.1.1)**

Short on time? Consider having students complete half of the table in Problem 6 or omitting Problem 8.

1 Launch

Invite students to make a plan to determine the LCM of each pair of numbers and justify each solution to a partner. **(MTR.1.1)**

2 Monitor

Invite students to check their LCM with a partner.

Encourage students to use strategies shared by their classmates from the previous problem.

A **Accessibility: Memory and Attention** For students who would benefit from having more time to think deeply on fewer problems, invite them to complete fewer challenges. To access the discussion in the Connect, it will be helpful for all students to interact with the first half of the table.

Listen for connections between the LCM and this situation to share during the Pause.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to revisit the Warm-Up and consider asking, "How does this situation compare to the Warm-Up's situation?" **(MTR.1.1)**
Write 8 packs and 6 packs.	**Support** Consider asking, "How do you know a common multiple is the LCM?"
Write an accurate number of packs.	**Stretch** Invite students to revisit the Warm-Up and ask, "What is the least number of packs of tofu dogs and buns Abdel needs to buy to have an equal number of each?"

Pause briefly and consider asking, "What do the common multiples tell you about the situation? How about the LCM?" The common multiples will tell you how many of each item you can buy and have the same number of both items, but the LCM will tell you the smallest common amount.

Activity 2 continued >

Activity 2

Name: _____ Date: _____ Period: _____

More Multiples

6. Determine the least common multiple for each pair of numbers in the table. Use the grid if it helps with your thinking.

Numbers	Least Common Multiple
10 and 15	30
10 and 4	20
6 and 4	12
6 and 7	42
21 and 7	21
9 and 12	36

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

7. Abdel wants to get some dessert to go with his tofu dogs. He wants to buy an equal number of FreezyPops and DinoPops.

- FreezyPops come in packs of 9.
- DinoPops come in packs of 12.

a. What is the least number of packages he will need to buy to have an equal number of each dessert?

FreezyPops: 4 packages

DinoPops: 3 packages

b. **Discuss:** How did the LCM of 9 and 12 help you calculate the number of packages Abdel needs to buy?

Responses vary. Calculating the LCM of 9 and 12, which is 36, helped me determine the least number of FreezyPops and DinoPops Abdel will need to buy so that there's an equal number of each dessert. That equals 4 packages of FreezyPops and 3 packages of DinoPops.

Accelerated 6 | Unit 2 Lesson 6 126 Activity 2

Pairs | 15 min

Activity 2 More Multiples (continued)

Purpose: Students develop fluency in determining the least common multiple of two numbers and apply their understanding to make sense of a real-world scenario and conjectures. **(MTR.1.1)**

Short on time? Consider having students complete half of the table in Problem 6 or omitting Problem 8.

2 Monitor

Consider sharing that more than one response may be correct.

A **Accessibility: Executive Functioning** Consider chunking this activity by inviting students to annotate the multiples of one number at a time.

Select and sequence explanations to share during the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Choose "Always" or "Never."	**Support** Invite students to test this claim on the pairs of numbers from Problem 6.
Choose "Sometimes" with an incomplete explanation.	**Strengthen** Invite students to include examples of when it is true and when it is false. **(MTR.1.1)**
Choose "Sometimes" with a robust explanation.	**Stretch** Consider asking, "How can you use this fact to help you determine the LCM of a pair of values?" Since multiplying two numbers will result in a common multiple, I know that the LCM must be less than or equal to their product, reducing the multiples I have to list.

D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore LCM further to complete this optional task. Encourage them to discuss their thinking with a partner.

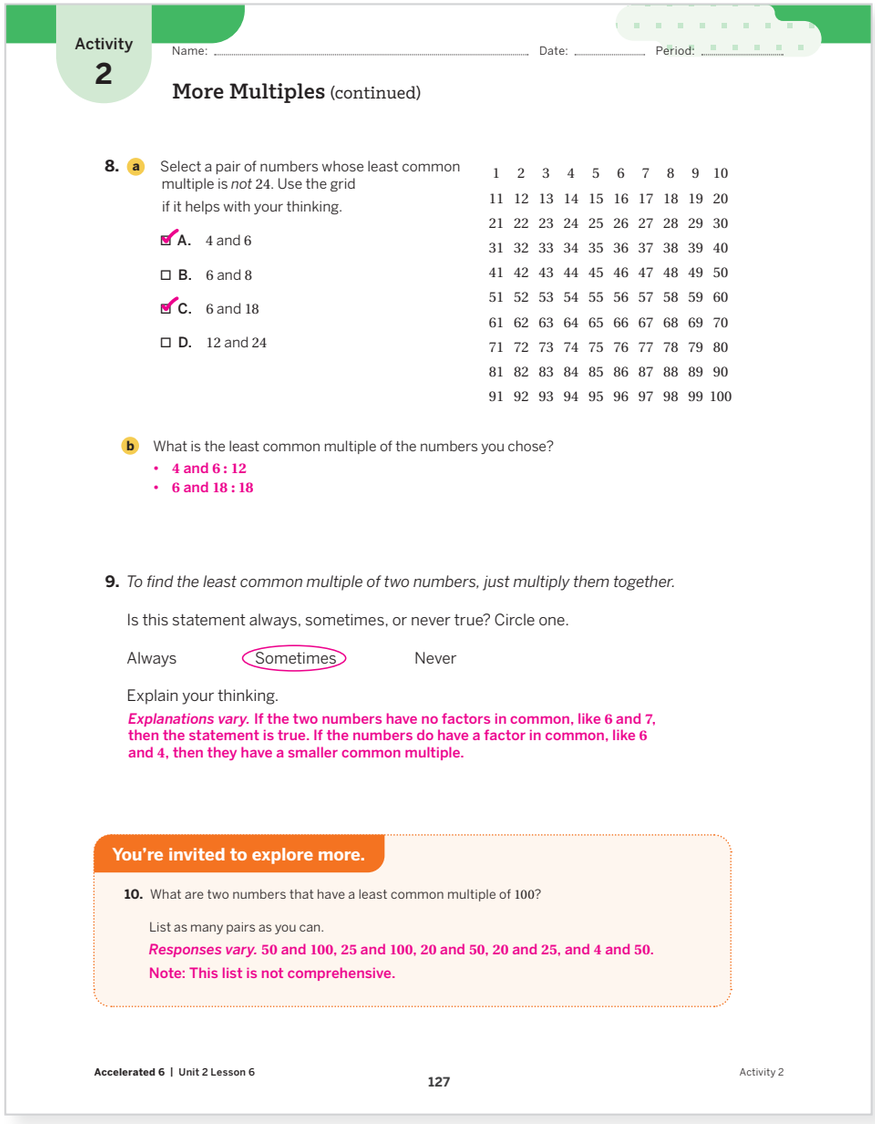
3 Connect

Invite students to share their justification for why they chose "Always," "Never," or "Sometimes," in Problem 9.

Discuss an example of two numbers whose LCM is their product and an example of two numbers whose LCM is less than their product.

Consider asking:

- "Why might someone think the LCM is the product of the two numbers?"
- "What does the product of two numbers tell you about their multiples? The least common multiple?" The product will tell you a common multiple. The LCM will either be that product or a common multiple less than the product.



Activity 2

Name: Date: Period:

More Multiples (continued)

8. a Select a pair of numbers whose least common multiple is *not* 24. Use the grid if it helps with your thinking.

- ☑ **A.** 4 and 6
- ☐ **B.** 6 and 8
- ☑ **C.** 6 and 18
- ☐ **D.** 12 and 24

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

b What is the least common multiple of the numbers you chose?

- **4 and 6 : 12**
- **6 and 18 : 18**

9. *To find the least common multiple of two numbers, just multiply them together.*

Is this statement always, sometimes, or never true? Circle one.

Always (Sometimes) Never

Explain your thinking.

Explanations vary. **If the two numbers have no factors in common, like 6 and 7, then the statement is true. If the numbers do have a factor in common, like 6 and 4, then they have a smaller common multiple.**

You're invited to explore more.

10. What are two numbers that have a least common multiple of 100?

List as many pairs as you can.

Responses vary. **50 and 100, 25 and 100, 20 and 50, 20 and 25, and 4 and 50.**

Note: This list is not comprehensive.

Accelerated 6 | Unit 2 Lesson 6 127 Activity 2

Whole Class | 5 min

Synthesis

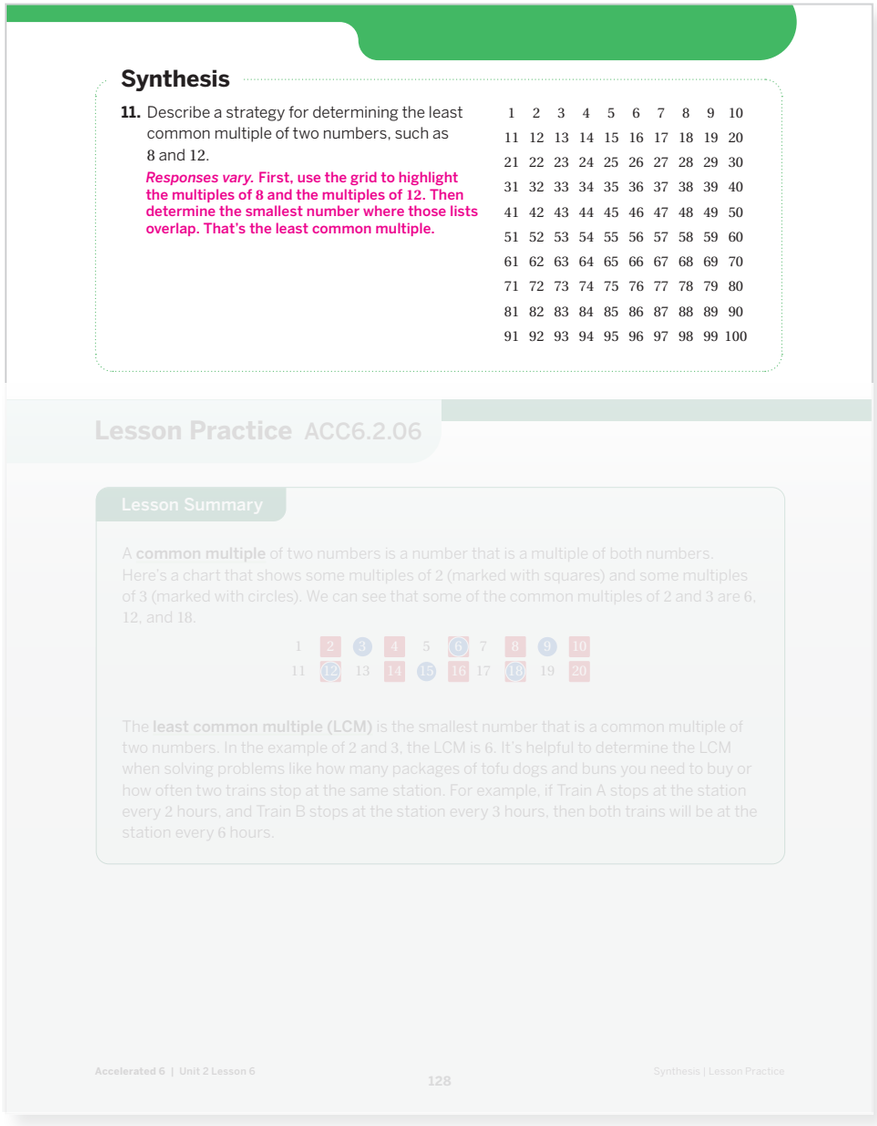
Purpose: Students synthesize their understanding that the least common multiple of two numbers is the smallest shared multiple.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Listing the multiples of each number and finding the smallest multiple they have in common.
- Listing a few multiples of the larger number, then doing the same for the smaller number.
- Taking the product of two numbers to get a common multiple, then checking for smaller common multiples.
- Keeping track of multiples using a 100 grid to help identify common multiples and the least common multiple.
- Focusing on finding multiples that are less than 50 to reduce the amount of multiples you need to list.

MLR **MLR2: Collect and Display** Use this routine to formalize the definitions of *common multiples* and *least common multiple* and strategies for determining them using students' language. Display any new language, examples, or diagrams for students to reference later.



Synthesis

11. Describe a strategy for determining the least common multiple of two numbers, such as 8 and 12.

Responses vary. First, use the grid to highlight the multiples of 8 and the multiples of 12. Then determine the smallest number where those lists overlap. That's the least common multiple.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Lesson Practice ACC6.2.06

Lesson Summary

A **common multiple** of two numbers is a number that is a multiple of both numbers. Here's a chart that shows some multiples of 2 (marked with squares) and some multiples of 3 (marked with circles). We can see that some of the common multiples of 2 and 3 are 6, 12, and 18.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

The **least common multiple (LCM)** is the smallest number that is a common multiple of two numbers. In the example of 2 and 3, the LCM is 6. It's helpful to determine the LCM when solving problems like how many packages of tofu dogs and buns you need to buy or how often two trains stop at the same station. For example, if Train A stops at the station every 2 hours, and Train B stops at the station every 3 hours, then both trains will be at the station every 6 hours.

Accelerated 6 | Unit 2 Lesson 6 128 Synthesis | Lesson Practice

Lesson Takeaway: The **least common multiple (LCM)** of two numbers is the smallest number that is a multiple of both values. Strategies to determine the LCM include listing multiples, using a 100 grid, and using reasoning to limit what multiples to check.

Independent | 5 min

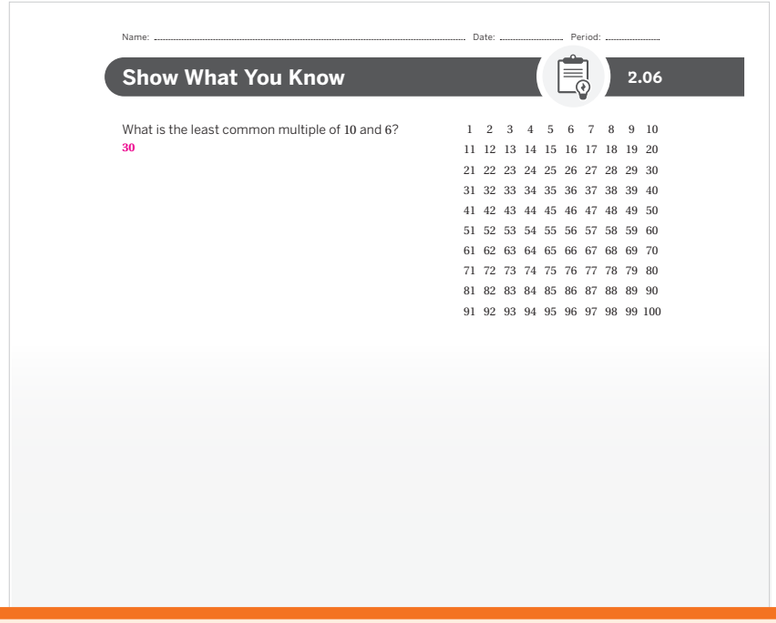
Show What You Know

Purpose: Students demonstrate their understanding by finding the least common multiple of two numbers.

Today's Goals

1. **Goal:** Determine the least common multiple of two numbers.
2. **Language Goal:** Explain what the least common multiple of two numbers means. **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: ..... Date: ..... Period: .....

Show What You Know 2.06

What is the least common multiple of 10 and 6?

30

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Differentiation Use after Lesson 6

Support

Provide targeted intervention for students by using these resources.

If students need support determining the least common multiple of two numbers:

» **Respond to Student Thinking:**

- Invite students to use the *More Multiples* charts to identify common multiples of each number in a different color.
- Use the *Identifying Multiples* **Mini-lesson.**
- Revisiting **Activity 1** before providing individualized feedback on the relevant **Practice** Problems.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities.**

Professional Learning

Take a moment to reflect on the strategies students used in this lesson. What opportunities were there to celebrate specific students' strategies for finding the **least common multiple**? What opportunities might there be in future lessons to connect back to the strategies students shared?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. Describe a strategy for determining the least common multiple of two numbers, such as 8 and 12.

Responses vary. First, use the grid to highlight the multiples of 8 and the multiples of 12. Then determine the smallest number where those lists overlap. That's the least common multiple.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Lesson Practice ACC6.2.06

Lesson Summary

A **common multiple** of two numbers is a number that is a multiple of both numbers. Here's a chart that shows some multiples of 2 (marked with squares) and some multiples of 3 (marked with circles). We can see that some of the common multiples of 2 and 3 are 6, 12, and 18.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

The **least common multiple (LCM)** is the smallest number that is a common multiple of two numbers. In the example of 2 and 3, the LCM is 6. It's helpful to determine the LCM when solving problems like how many packages of tofu dogs and buns you need to buy or how often two trains stop at the same station. For example, if Train A stops at the station every 2 hours, and Train B stops at the station every 3 hours, then both trains will be at the station every 6 hours.

Lesson Practice ACC6.2.06

Name: ..... Date: ..... Period: .....

Problems 1–3: Here is a grid.

1	2	3	4	5	6	7	8	9	10
11	(12)	13	14	[15]	16	17	18	19	20
21	22	23	(24)	25	26	27	28	29	[30]
31	32	33	34	35	(36)	37	38	39	40
41	42	43	44	[45]	46	47	(48)	49	50
51	52	53	54	55	56	57	58	59	[60]
61	62	63	64	65	66	67	68	69	70
71	(72)	73	74	[75]	76	77	78	79	80
81	82	83	(84)	85	86	87	88	89	[90]
91	92	93	94	95	(96)	97	98	99	100

1. Circle the multiples of 12.
Response shown on grid.

2. Draw a square around the multiples of 15.
Response shown on grid.

3. What is the least common multiple of 12 and 15?
60

Problems 4–5: Lucia wants to buy the same number of cups and plates, but cups are sold in packs of 8 and plates are sold in packs of 12.

4. List *at least* three combinations of cups and plates that Lucia could buy so she has the same number of each.
Responses vary. 24 cups and 24 plates, 48 cups and 48 plates, 72 cups and 72 plates.

5. What is the fewest number of cups she could buy while also buying an equal number of plates?
24 cups

6. A green light blinks every 4 seconds and a yellow light blinks every 5 seconds. When will both lights blink at the same time?
Responses vary. They'll both blink at 20, 40, 60, 80, and 100 seconds (and so on) because those are all common multiples of 4 and 5.

Lesson Practice ACC6.2.06

Name: ..... Date: ..... Period: .....

FAST Practice

7. A red light blinks every 12 seconds and a blue light blinks every 9 seconds. When will both lights blink at the same time?

Select *all* the correct values.

- ☑ **A.** Every 36 seconds
- ☐ **B.** Every 48 seconds
- ☑ **C.** Every 72 seconds
- ☐ **D.** Every 90 seconds
- ☑ **E.** Every 108 seconds

Spiral Review

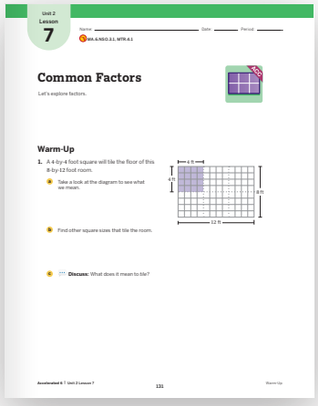
8. 10 bananas cost $4.50. What is the price for one banana?
$0.45

9. If 20 cookies cost $5, what is the price for 25 cookies?
$6.25

10. 4.5 pounds of potatoes cost $12. What is the price for 3 pounds of potatoes?
$8

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–2	1	MA.6.NSO.3.1
	3–6	2	MA.6.NSO.3.1
Test Practice	7	2	MA.6.NSO.3.1
Spiral Review			
	8–10	1	MA.6.AR.3.5


Unit 2 Lesson 7

Common Factors

Let's explore factors.

Warm-Up

1. A 4-by-4 foot square will tile the floor of this 8-by-12 foot room.

Common Factors

Investigating Greatest Common Factor

Let's explore factors.

Learning Outcomes

Today's Goals

1. **Goal:** Determine the greatest common factor of two numbers.
2. **Goal:** Distinguish between situations that call for common factors and those that call for common multiples.
3. **Language Goal:** Interpret least common multiples and greatest common factors in mathematical and real-world situations. **(Reading and Writing)**

Students apply their prior knowledge of *factors* to determine the greatest common factor (GCF) of two numbers. They use the analogy of tiling a rectangle to make sense of what a greatest common factor is, then develop fluency with determining the least common multiple (LCM) and greatest common factor of two numbers.

Coherence

Prior Learning

In Lesson 6, students determined common multiples and the least common multiple of two whole numbers and applied this in mathematical and real-world problems.

Future Learning

In Lesson 8, students will use their understanding of the greatest common factor and least common multiple to develop and share strategies for comparing ratios.

Connections

- Students relate tiling a floor to determining the Greatest Common Factor (GCF). (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.1
Given a mathematical or real-world context, find the greatest common factor and least common multiple of two whole numbers.

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectation: ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.AR.3.1	MA.7.NSO.2.2 MA.7.AR.1.2

Vocabulary

New Vocabulary

common factor

greatest common factor (GCF)

Review Vocabulary

factor (of a number)

Lesson at a Glance

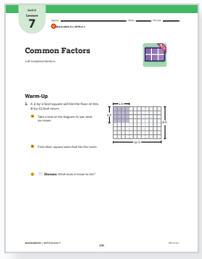
~ 45 min

MA.6.NSO.3.1

Warm-Up

Pairs | 5 min

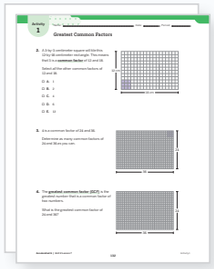
Students are introduced to the idea of **common factors** using the context of tiling a rectangle.



Activity 1

Pairs | 13 min

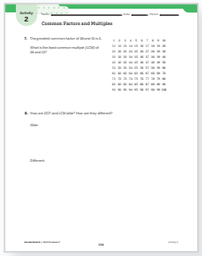
Students use both rectangular models and lists to determine the **greatest common factor (GCF)** of two numbers.



Activity 2

Pairs | 7 min

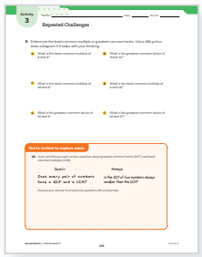
Students use real-world scenarios to compare and contrast the least common multiple and greatest common factor.



Activity 3

Independent | 10 min

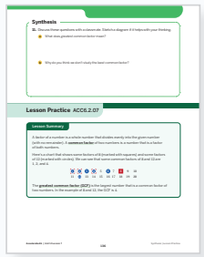
Students develop fluency with determining the LCM and GCF of two numbers.



Synthesis

Whole Class | 5 min

Students synthesize their understanding that the greatest common factor of any two numbers is the largest value that is a factor of both. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the greatest common factor of two numbers.

Prep Checklist

Prepare More Multiple Sheets and Multiplication Tables

This lesson includes:

- Student Edition
- Show What You Know
- Activity Sheet
  - Calculators (optional)

Pairs | 5 min

Warm-Up

Purpose: Students are introduced to the idea of **common factors** using the context of tiling a rectangle.

1 Launch

Direct students' attention to the diagram.

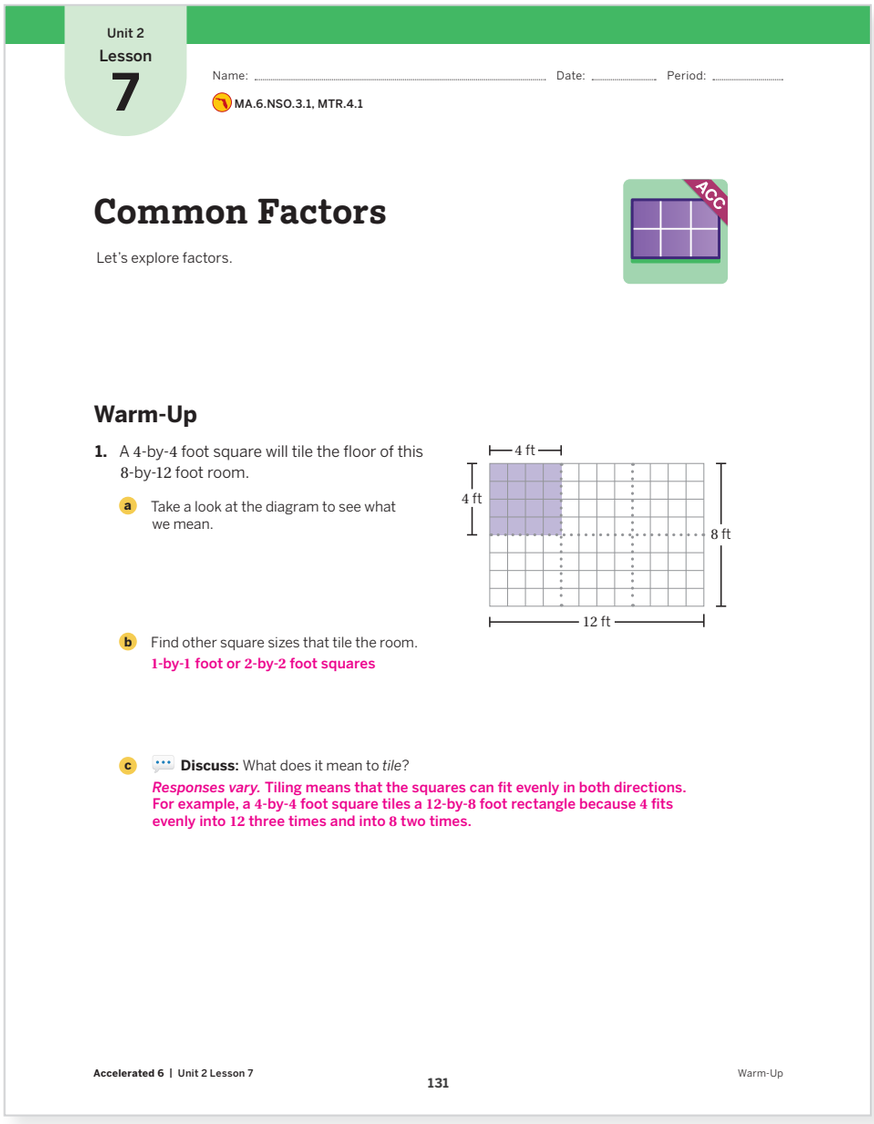
To generate excitement, invite students to measure the same amount of space within the classroom to help visualize the size of the floor in the diagram.

2 Connect

Capture and share a few student ideas that work and don't work for tiling.

To surface the Key Takeaway, consider asking:

- "What does it mean to tile a rectangle?"
- "How would you convince someone that a 4-by-4 foot square tiles this rectangle?"**(MTR.4.1)**
- "What is a square size that would tile the rectangle in one direction but not in the other?"**(MTR.4.1)**



Unit 2
Lesson
7

Name: Date: Period:

MA.6.NSO.3.1, MTR.4.1

Common Factors

Let's explore factors.

ACC

Warm-Up

1. A 4-by-4 foot square will tile the floor of this 8-by-12 foot room.

a. Take a look at the diagram to see what we mean.

b. Find other square sizes that tile the room.

1-by-1 foot or 2-by-2 foot squares

c. **Discuss:** What does it mean to *tile*?

Responses vary. Tiling means that the squares can fit evenly in both directions. For example, a 4-by-4 foot square tiles a 12-by-8 foot rectangle because 4 fits evenly into 12 three times and into 8 two times.

Accelerated 6 | Unit 2 Lesson 7 131 Warm-Up

Key Takeaway: Tiling a rectangle means that squares can fit evenly in both directions.

Pairs | 13 min

Activity 1 Greatest Common Factors

Purpose: Students use both rectangular models and lists to determine the **greatest common factor (GCF)** of two numbers.

Short on time? Consider omitting Problem 3.

1 Launch

To surface prior knowledge, consider creating a class anchor chart about how to find factors for students to refer to throughout the lesson by asking:

- "What do you know about the word *factors*?" A factor of a number is a whole number that divides evenly into the given number (with no remainder).
- "What are the factors of 18? How do you know?" **(MTR.4.1)**

Invite students to use a calculator as needed.

Consider distributing the More Multiples Sheet and multiplication tables as needed.

2 Monitor

Invite students to check their factors with a partner during the lesson.

Encourage students to keep track of the common factors they find and any patterns they notice.

Differentiation: (Support) Look for students who wrote a factor that is not shared by both numbers, like 8 or 9. Consider asking, "How can you check whether a number is a common factor?"

Look for students who use strategies similar to the ones in the next problem or other creative strategies. Invite these students to share their thinking during the Connect about Problems 5–6.

Differentiation: (Stretch) Consider asking, "What other two numbers have a greatest common factor of 12? How many pairs are there?"

Pause briefly to invite students to read the definitions of **common factor** and **greatest common factor (GCF)** and rephrase them in their own words.

Consider asking, "Why do you think the greatest common factor is a more interesting number than the least common factor?" The least common factor of two integers will always be 1, which doesn't tell you much.

Activity 1 continued >

Activity 1

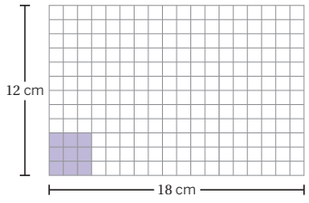
Name: Date: Period:

Greatest Common Factors

2. A 3-by-3 centimeter square will tile this 12-by-18 centimeter rectangle. This means that 3 is a **common factor** of 12 and 18.

Select *all* the other common factors of 12 and 18.

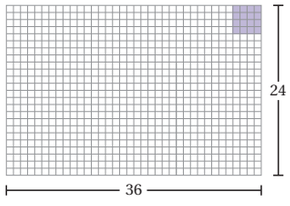
- [x] **A.** 1
- [x] **B.** 2
- [ ] **C.** 4
- [x] **D.** 6
- [ ] **E.** 12



3. 4 is a common factor of 24 and 36.

Determine as many common factors of 24 and 36 as you can.

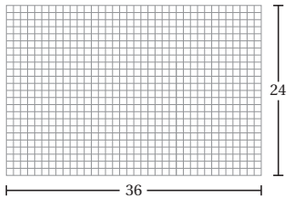
Responses vary. **Common factors of 24 and 36: 1, 2, 3, 4, 6, 12.**



4. The **greatest common factor (GCF)** is the greatest number that is a common factor of two numbers.

What is the greatest common factor of 24 and 36?

12



Accelerated 6 | Unit 2 Lesson 7 132 Activity 1

Pairs | 13 min

Activity 1 Greatest Common Factors (continued)

Purpose: Students use both rectangular models and lists to determine the greatest common factor (GCF) of two numbers.

2 Monitor

Invite students to explore the two strategies and see if either one is like the strategy they used in the previous problem.

Listen for advantages and disadvantages that you can share during the Connect.

Capture a variety of student thinking to share during the Connect.

D Differentiation *(Problem 6)*

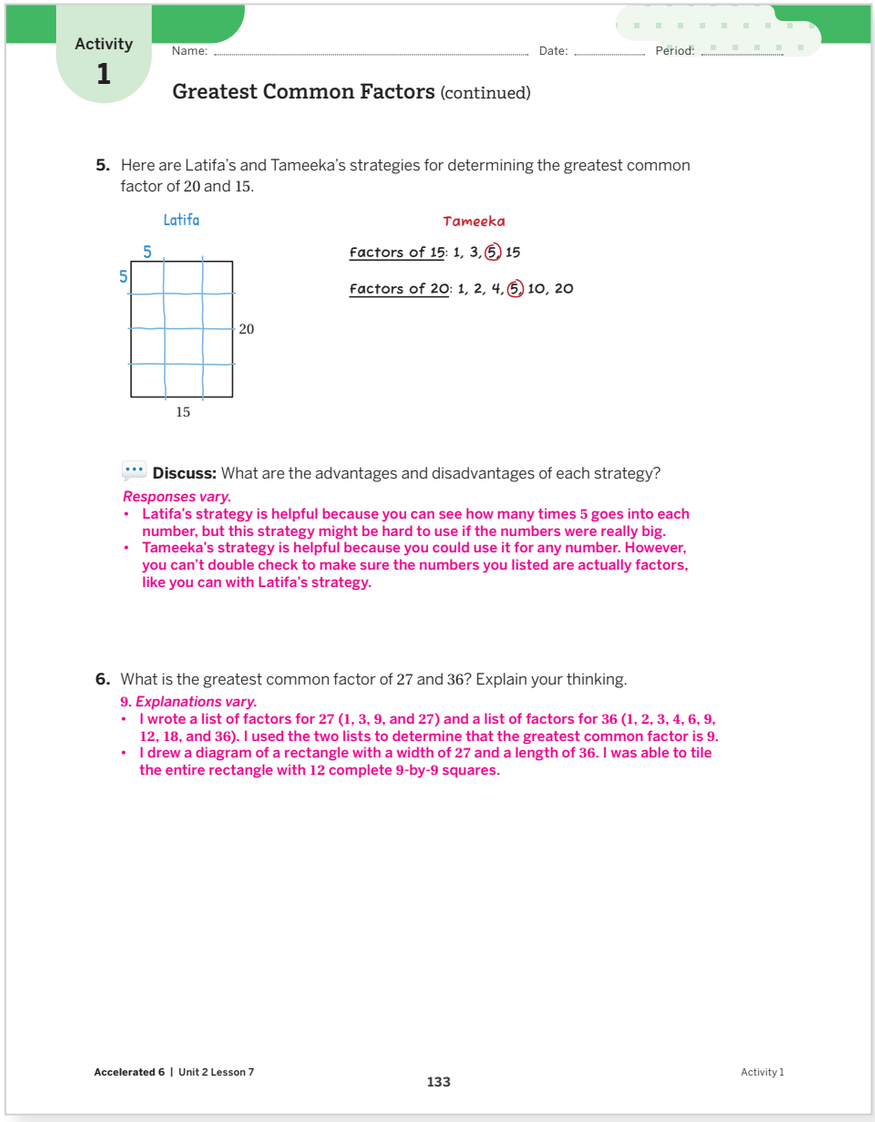
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to either: • Use a calculator. • List the factors of each number. • Use a multiplication table. • Sketch a rectangle of size 27-by-36 and try to draw the largest squares that can tile it.
Write a common factor that is not the greatest, like 1 or 3.	**Support** Invite students to check for other possible factors using a multiplication table or a calculator.
Write the accurate GCF with an incomplete explanation or no thinking shown.	**Strengthen** Consider asking, "How can your work show your strategy and convince a classmate that your solution is the GCF?" **(MTR.4.1)**
Write the accurate GCF with a robust explanation or clear thinking shown.	**Stretch** Consider asking, "How can you improve your strategy to find the GCF more efficiently?"

3 Connect

Share captured sketches showing strategies like Latifa's and Tameeka's and invite those students to share about their strategy.

To surface the Key Takeaway, consider asking:

- "Where do you see the greatest common factor in each strategy?"
- "How are these strategies alike?"
- "Which strategy do you prefer? Why?"
- "Is there a third strategy?"



Activity 1

Name: Date: Period:

Greatest Common Factors (continued)

5. Here are Latifa's and Tameeka's strategies for determining the greatest common factor of 20 and 15.

Latifa

Tameeka

Factors of 15: 1, 3, (5), 15

Factors of 20: 1, 2, 4, (5), 10, 20

Discuss: What are the advantages and disadvantages of each strategy?

Responses vary.

- Latifa's strategy is helpful because you can see how many times 5 goes into each number, but this strategy might be hard to use if the numbers were really big.
- Tameeka's strategy is helpful because you could use it for any number. However, you can't double check to make sure the numbers you listed are actually factors, like you can with Latifa's strategy.

6. What is the greatest common factor of 27 and 36? Explain your thinking.

9. *Explanations vary.*

- I wrote a list of factors for 27 (1, 3, 9, and 27) and a list of factors for 36 (1, 2, 3, 4, 6, 9, 12, 18, and 36). I used the two lists to determine that the greatest common factor is 9.
- I drew a diagram of a rectangle with a width of 27 and a length of 36. I was able to tile the entire rectangle with 12 complete 9-by-9 squares.

Accelerated 6 | Unit 2 Lesson 7 133 Activity 1

Key Takeaway: The **greatest common factor** of any two numbers is the largest value that is a *factor* of both. Strategies include listing factor pairs, tiling a rectangle, and using a calculator or multiplication chart.

Pairs | 7 min

Activity 2 Common Factors and Multiples

Purpose: Students use real-world scenarios to compare and contrast the least common multiple and greatest common factor.

Short on time? Consider showing what the LCM is to remind students how it is calculated.

1 Launch

Invite students to share what they know about the least common multiple of two numbers.

To surface connections, consider asking:
- "How are multiples and factors similar? Different?"
- "How do you remember which one is which?"

2 Monitor

Encourage students to be precise with their use of the terms *least*, *greatest*, *factor*, and *multiple*.

Select and sequence responses to share during the Connect.

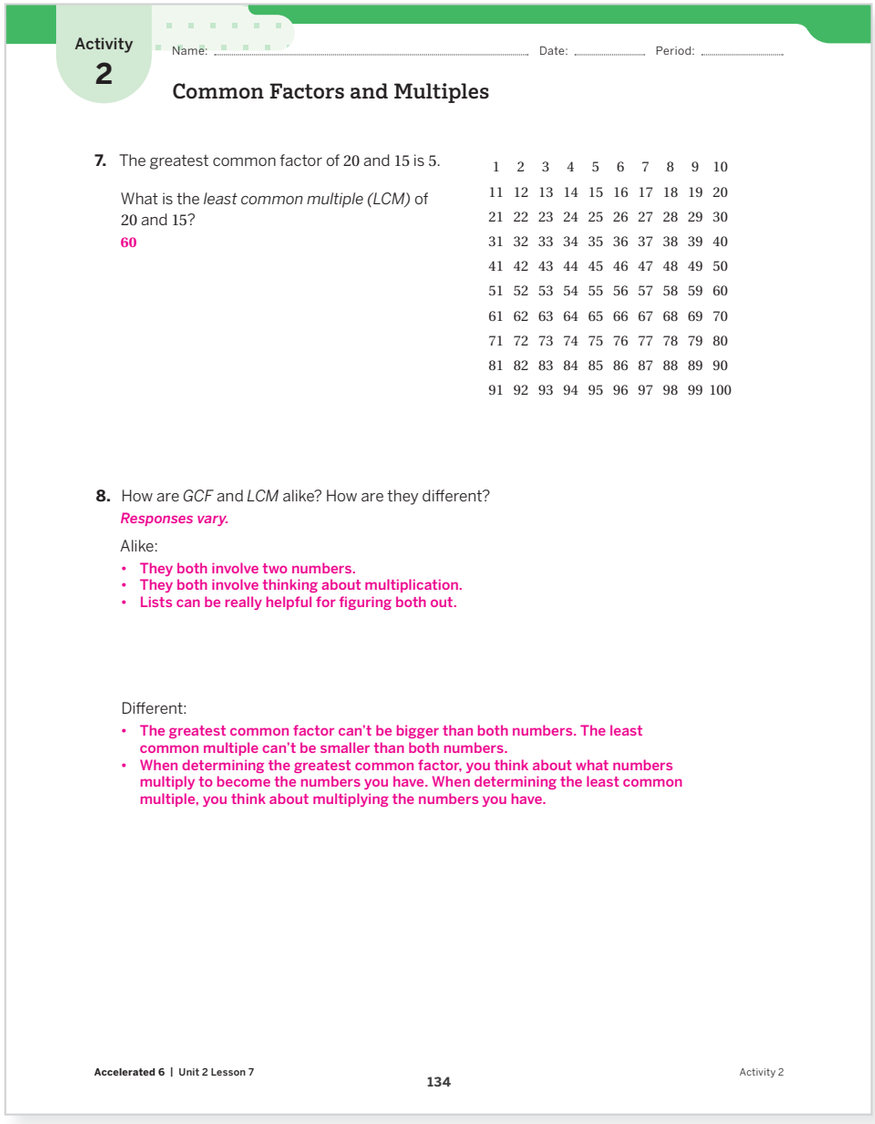
D Differentiation *(Problem 8)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What do GCF and LCM stand for? Try comparing each word and use the examples of 8 and 12 to help you with your thinking."
Write an inaccurate comparison.	**Support** Encourage students to read others' responses and decide if what others noticed is similar to or different from what they did. If they notice a contradiction, encourage them to ask a question.
Write accurate comparisons.	**Strengthen** Consider asking, "What can be confusing about LCM and GCF? How can you prevent confusion?"

3 Connect

Share the captured responses that highlight strategies, operations, how to use a calculator, and how the value of the GCF can't be larger than both numbers, while the LCM can't be smaller than both numbers.

Consider asking:
- "Can the GCF and LCM ever be the same?"
- "How does the value of the GCF compare to the two numbers? The LCM?"
- "What real-world situations might you need to find the GCF? LCM?"



Activity 2

Name: _____ Date: _____ Period: _____

Common Factors and Multiples

7. The greatest common factor of 20 and 15 is 5.

What is the *least common multiple (LCM)* of 20 and 15?

60

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

8. How are *GCF* and *LCM* alike? How are they different?

Responses vary.

Alike:
- They both involve two numbers.
- They both involve thinking about multiplication.
- Lists can be really helpful for figuring both out.

Different:
- The greatest common factor can't be bigger than both numbers. The least common multiple can't be smaller than both numbers.
- When determining the greatest common factor, you think about what numbers multiply to become the numbers you have. When determining the least common multiple, you think about multiplying the numbers you have.

Accelerated 6 | Unit 2 Lesson 7 134 Activity 2

Independent | 10 min

Activity 3 Repeated Challenges

Purpose: Students develop fluency with determining the LCM and GCF of two numbers.

1 Launch

Consider sharing that they will see a mixture of LCM and GCF problems.

Invite students to share their strategies with a classmate.

Encourage students to use a variety of strategies and tools such as a diagram, calculator, or multiplication table.

A **Accessibility: Memory and Attention** Provide students with a graphic organizer to support them with keeping track of LCM and GCF strategies.

2 Monitor

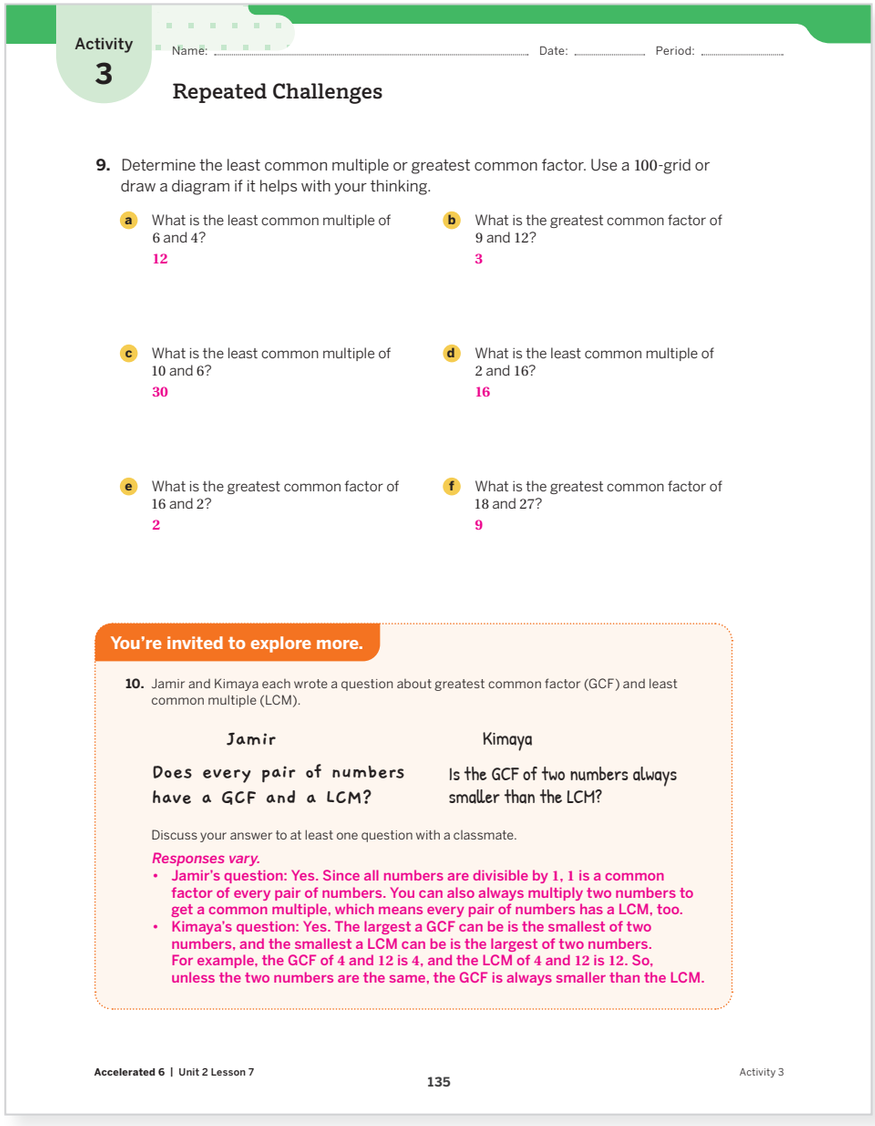
Listen for students mixing up or combining strategies from the GCF and LCM together.

Note: Check student work to see how many challenges each student has completed correctly.

D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore GCF and LCM further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Invite students to share strategies they found helpful or mistakes they made while solving these challenges.



Activity 3

Name: Date: Period:

Repeated Challenges

9. Determine the least common multiple or greatest common factor. Use a 100-grid or draw a diagram if it helps with your thinking.

a. What is the least common multiple of 6 and 4?
12

b. What is the greatest common factor of 9 and 12?
3

c. What is the least common multiple of 10 and 6?
30

d. What is the least common multiple of 2 and 16?
16

e. What is the greatest common factor of 16 and 2?
2

f. What is the greatest common factor of 18 and 27?
9

You're invited to explore more.

10. Jamir and Kimaya each wrote a question about greatest common factor (GCF) and least common multiple (LCM).

Jamir: Does every pair of numbers have a GCF and a LCM?

Kimaya: Is the GCF of two numbers always smaller than the LCM?

Discuss your answer to at least one question with a classmate.

Responses vary.

- Jamir's question: Yes. Since all numbers are divisible by 1, 1 is a common factor of every pair of numbers. You can also always multiply two numbers to get a common multiple, which means every pair of numbers has a LCM, too.
- Kimaya's question: Yes. The largest a GCF can be is the smallest of two numbers, and the smallest a LCM can be is the largest of two numbers. For example, the GCF of 4 and 12 is 4, and the LCM of 4 and 12 is 12. So, unless the two numbers are the same, the GCF is always smaller than the LCM.

Accelerated 6 | Unit 2 Lesson 7 135 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that the greatest common factor of any two numbers is the largest value that is a factor of both.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- The GCF is the largest factor that two numbers share.
- The GCF is the largest number that divides into both numbers evenly.
- Visually, the GCF represents the largest square that can be used to tile a rectangle that can fit evenly in both directions.
- 1 is a factor of all numbers.

MLR **MLR2: Collect and Display** Use this routine to formalize the definition of *GCF*, strategies for determining the GCF, and how it compares to LCM using students' language. Display any new language, examples, or diagrams for students to reference later.

Synthesis

11. Discuss these questions with a classmate. Sketch a diagram if it helps with your thinking.

a. What does *greatest common factor* mean?

Responses vary. **The greatest common factor of two numbers is the largest number that divides into both numbers evenly.**

b. Why do you think we don't study the *least* common factor?

Responses vary. **The least common factor is not that interesting because 1 divides evenly into all numbers, so the least common factor is always 1.**

Lesson Practice ACC6.2.07

Lesson Summary

A *factor* of a number is a whole number that divides evenly into the given number (with no remainder). A **common factor** of two numbers is a number that is a factor of both numbers.

Here's a chart that shows some factors of 8 (marked with squares) and some factors of 12 (marked with circles). We can see that some *common* factors of 8 and 12 are 1, 2, and 4.

1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20

The **greatest common factor (GCF)** is the largest number that is a common factor of two numbers. In the example of 8 and 12, the GCF is 4.

Accelerated 6 | Unit 2 Lesson 7 136 Synthesis | Lesson Practice

Lesson Takeaway: The **greatest common factor** of any two numbers is the largest value that is a *factor* of both. When determining the GCF, you think about what numbers multiply to become the numbers you have. For the LCM, you think about multiplying the numbers you have together.

Independent | 5 min

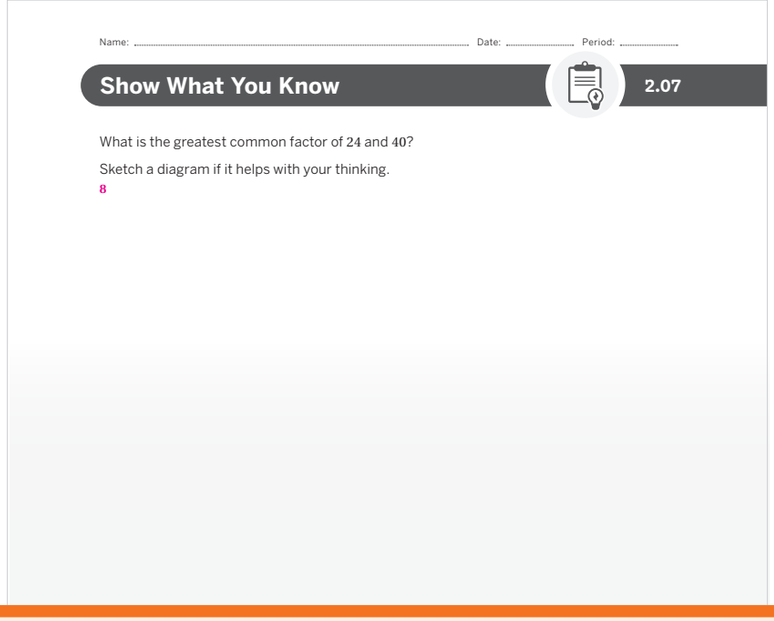
Show What You Know

Purpose: Students demonstrate their understanding by determining the greatest common factor of two numbers.

Today's Goals

1. **Goal:** Determine the greatest common factor of two numbers.
2. **Goal:** Distinguish between situations that call for common factors and those that call for common multiples.
3. **Language Goal:** Interpret least common multiples and greatest common factors in mathematical and real-world situations. **(Reading and Writing)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 2.07

What is the greatest common factor of 24 and 40?

Sketch a diagram if it helps with your thinking.

8

D Differentiation Use after Lesson 7

Support

Provide targeted intervention for students by using these resources.

If students need support with determining greatest common factors of two numbers:

» **Respond to Student Thinking:**

- Invite students to differentiate multiples of numbers using the *More Multiples* Chart, and factors using *Multiplication Tables*.
- Use the *Identifying Factor Pairs* **Mini-lesson**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

Did the order in which you sequenced student ideas support the learning goals of the lesson? What might you change next time?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. Discuss these questions with a classmate. Sketch a diagram if it helps with your thinking.

a. What does *greatest common factor* mean?

Responses vary. The greatest common factor of two numbers is the largest number that divides into both numbers evenly.

b. Why do you think we don't study the *least* common factor?

Responses vary. The least common factor is not that interesting because 1 divides evenly into all numbers, so the least common factor is always 1.

Lesson Practice ACC6.2.07

Lesson Summary

A *factor* of a number is a whole number that divides evenly into the given number (with no remainder). A **common factor** of two numbers is a number that is a factor of both numbers.

Here's a chart that shows some factors of 8 (marked with squares) and some factors of 12 (marked with circles). We can see that some *common* factors of 8 and 12 are 1, 2, and 4.

(1)	(2)	(3)	(4)	5	(6)	7	[8]	9	10
11	(12)	13	14	15	16	17	18	19	20

The **greatest common factor (GCF)** is the largest number that is a common factor of two numbers. In the example of 8 and 12, the GCF is 4.

Lesson Practice
ACC6.2.07

Name: ..... Date: ..... Period: .....

1. What is the greatest common factor of 12 and 44?

4

2. What is the greatest common factor of 4 and 6?

2

3. What is the least common multiple of 4 and 6?

12

Problems 4–6: Jayla's parents are replacing their bathroom floor with square tiles. The tiles will be laid side by side to cover the entire floor with no gaps, and none of the tiles can be cut. The floor is a rectangle that measures 48-by-60 inches.

4. What is the side length of the largest possible tile Jayla's parents could use?

12 inches

5. How many of these tiles do they need?

20 tiles

6. List *three* other whole-number tile sizes that could cover the bathroom floor.

Responses vary. 1 inch, 2 inches, 3 inches, 4 inches, 6 inches.

Problems 7–8: There are 90 sixth graders and 75 seventh graders in a school chorus. The music director wants to make groups of performers, with the same combination of sixth graders and seventh graders in each group. She wants to form as many groups as possible.

7. What is the greatest number of groups that could be formed? Show your thinking.

15 groups. *Work varies.*
Factors of 90: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90
Factors of 75: 1, 3, 5, 15, 25, 75

8. Using your answer from the previous problem, determine how many students of each grade would be in each group.

6 sixth graders and 5 seventh graders

Lesson Practice
ACC6.2.07

Name: ..... Date: ..... Period: .....

FAST Practice

9. Saanvi has two rolls of ribbon. The red-colored roll is 60 inches long, and the green-colored roll is 105 inches long. She wants to cut the rolls into equal lengths without wasting any ribbon. What is the greatest length she can cut each piece of ribbon?

A. 3 inches
B. 5 inches
C. 15 inches
D. 30 inches

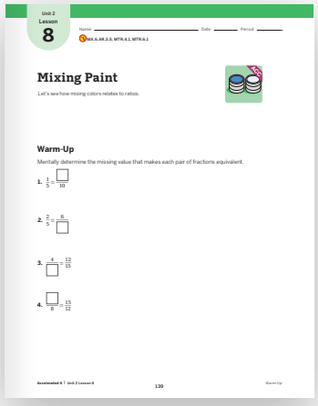
Spiral Review

Problems 10–12: Circle the expression that has the greater value.

10.	$5 \cdot 0.4$	$500 \cdot 0.04$	They have the same value.
11.	$14.2 - 2.35$	$142 - 23.5$	They have the same value.
12.	$1.82 + 33.3$	$18.2 + 3.33$	They have the same value.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–3	1	MA.6.NSO.3.1
	4–8	3	MA.6.NSO.3.1
FAST Practice	9	2	MA.6.NSO.3.1
Spiral Review			
	10	2	MA.6.NSO.2.1
	11–12	2	MA.5.NSO.2.3


Unit 2
Lesson
8
Name _____ Date _____ Period _____
MA.6.AR.3.5, MTR.4.1, MTR.6.1
Mixing Paint
Let's see how mixing colors relates to ratios.
Warm-Up
Mentally determine the missing value that makes each pair of fractions equivalent.
1. $\frac{1}{5} = \frac{\square}{10}$
2. $\frac{2}{5} = \frac{6}{\square}$
3. $\frac{4}{\square} = \frac{12}{15}$
4. $\frac{\square}{9} = \frac{15}{12}$
Accelerated 6 | Unit 2 Lesson 8
139
Warm-Up

Mixing Paint

Comparing Ratios

Let's see how mixing colors relates to ratios.

Learning Outcomes

Today's Goals

1. **Goal:** Use a variety of strategies to compare two ratios in context.
2. **Language Goal:** Justify whether two ratios are equivalent by transforming them so that they have one value in common (e.g., $a : b$ and $a : c$, or $x : z$ and $y : z$). **(Speaking and Listening)**

Students use paint mixtures as a context to develop and share strategies for comparing ratios. This lesson is designed to elicit several different strategies, including but not limited to comparing rates per 1 and creating equal amounts of one quantity.

Coherence

Prior Learning

In Lessons 2–5, students reasoned about equivalent ratios and used double number line diagrams and other strategies to solve problems with equivalent ratios.

Future Learning

In Lesson 10, students will use tables of equivalent ratios and double number line diagrams to compare ratios and determine missing values.

Connections

- Students use real world scenarios of mixing paint colors to compare ratios. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Mathematical Thinking and Reasoning Standards: MTR.4.1, MTR.6.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1	MA.7.AR.3.1
MA.5.AR.1.2	MA.7.AR.3.2
MA.5.AR.1.3	

Lesson at a Glance

~ 45 min

MA.6.AR.3.5

Warm-Up

Whole Class | 5 min

Students use the **Number Talk** routine to revisit strategies for creating equivalent fractions to prepare them to compare ratios in context.

Activity 1

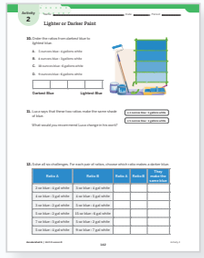
Pairs | 15 min

Students develop and name several strategies for comparing two ratios.

Activity 2

Pairs | 15 min

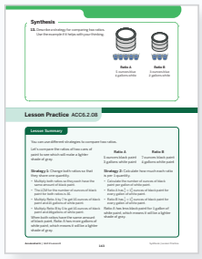
Students develop fluency comparing ratios using strategies from Activity 1 and new strategies they develop. **MLR3: Critique, Correct, Clarify**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that there are many strategies to compare two ratios. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by comparing two ratios.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Coloring tools

Whole Class | 5 min

Warm-Up

Purpose: Students use the Number Talk routine to revisit strategies for creating equivalent fractions to prepare them to compare ratios in context.

1 Launch

Use the Number Talk routine to support students in writing equivalent fractions by making use of structure. See the Routine Facilitation Guide for more information. **(MTR.4.1)**

Invite students to determine the first missing value independently. Then record a variety of strategies, along with the name of the students who shared them.

Consider asking, "Who thought about it in a different way?"

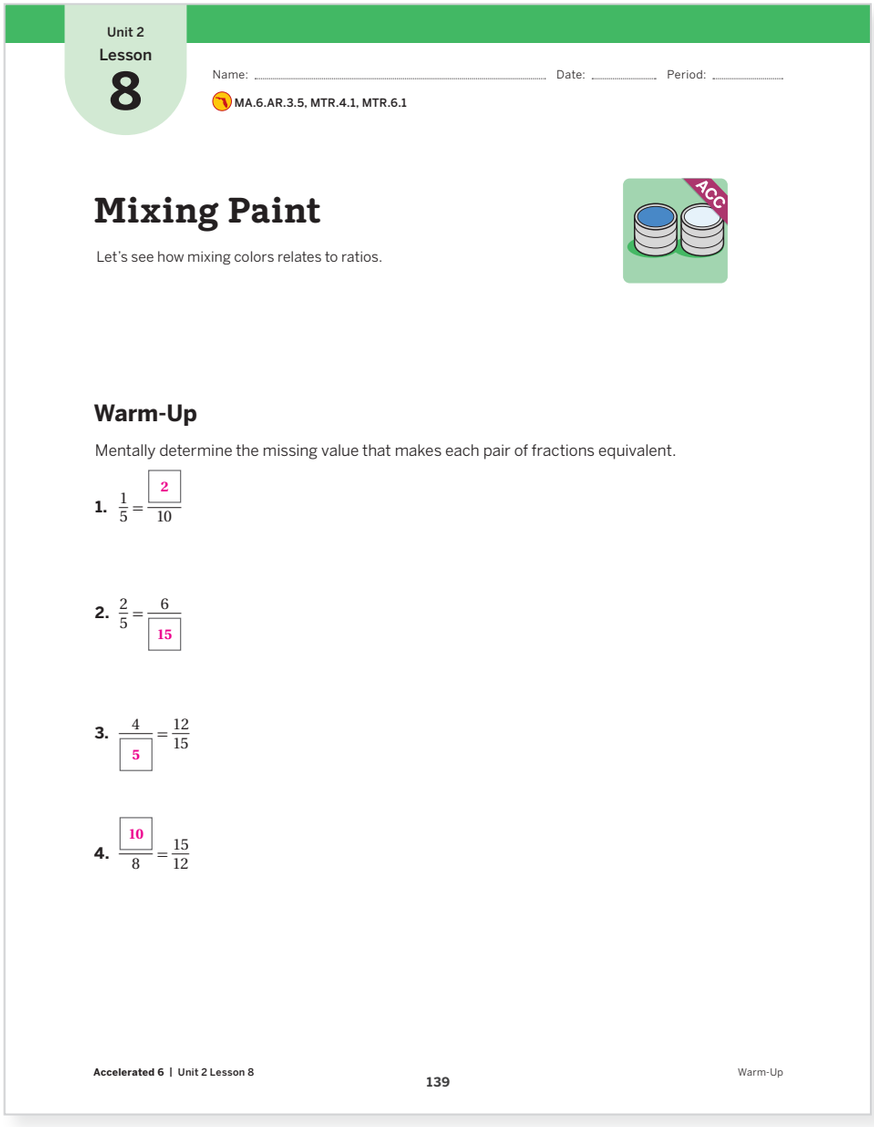
Note: This structure is repeated for each problem in the Number Talk.

2 Connect

Invite students to compare and contrast the different strategies they used.

Consider asking:

- "What does it mean for two fractions to be equivalent?"
- "What are your favorite strategies for creating equivalent fractions? Which strategies feel most confusing?"
- "How do equivalent fractions connect to our work with multiples and factors?" 3 is a factor of 15 and 12, which means you can rewrite $\frac{15}{12}$ as $\frac{5}{4}$. You can then multiply each value in the fraction by 2 to get $\frac{10}{8}$.



Unit 2
Lesson
8

Name: ..... Date: ..... Period: .....

MA.6.AR.3.5, MTR.4.1, MTR.6.1

Mixing Paint

Let's see how mixing colors relates to ratios.

ACC

Warm-Up

Mentally determine the missing value that makes each pair of fractions equivalent.

1. $\frac{1}{5} = \frac{\boxed{2}}{10}$

2. $\frac{2}{5} = \frac{6}{\boxed{15}}$

3. $\frac{4}{\boxed{5}} = \frac{12}{15}$

4. $\frac{\boxed{10}}{8} = \frac{15}{12}$

Accelerated 6 | Unit 2 Lesson 8 139 Warm-Up

Pairs | 15 min

Activity 1 Comparing Ratios

Purpose: Students develop and name several strategies for comparing two ratios.

Short on time? Consider omitting Problem 9 or discuss it as a class.

1 Launch

To generate excitement, consider asking:

- "If you could choose any color, what color would you choose and why?"
- "What experiences do you have with mixing paint?"

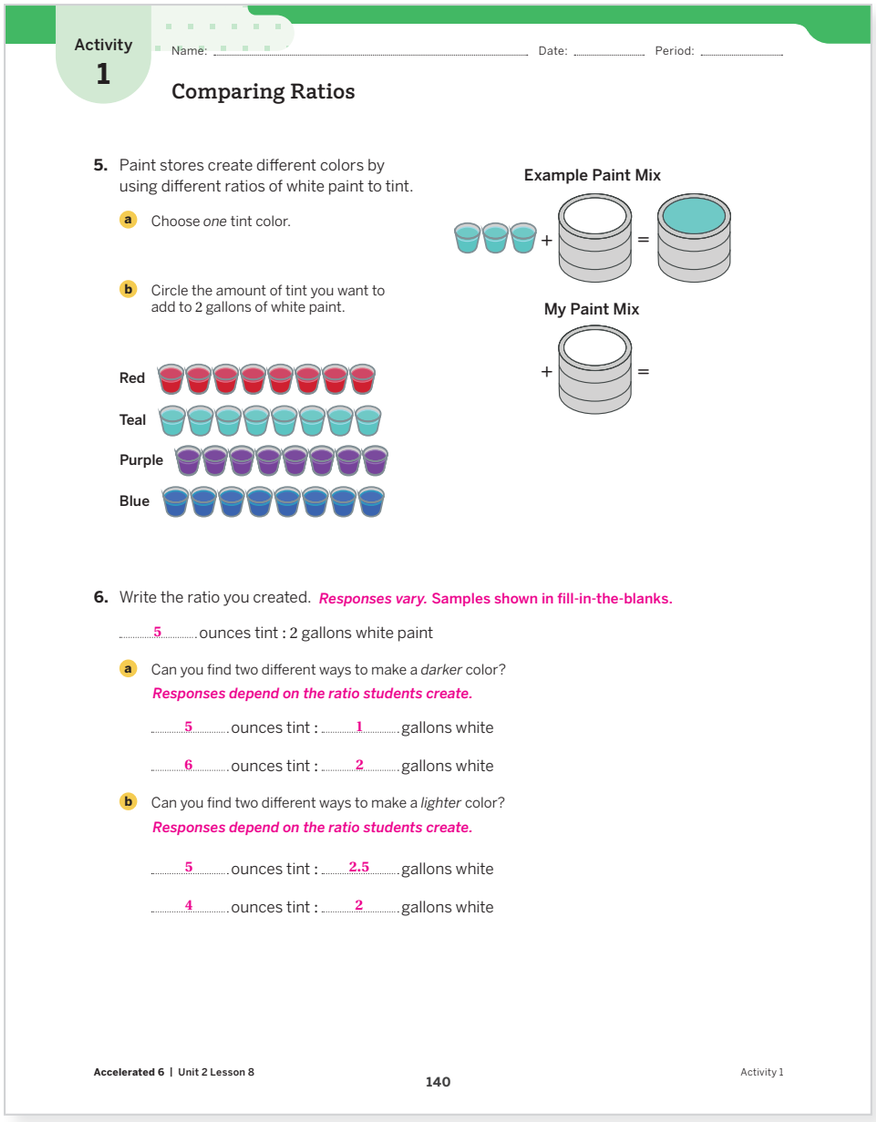
Consider sharing that adding white paint to a color creates a lighter shade.

2 Monitor

Pause briefly to discuss multiple strategies for creating a darker color. If it doesn't come up naturally, consider asking:

- "What happens if you keep the tint the same and change the amount of white paint?" **(MTR.4.1)**
- "How can we change our ratio to create a darker color? A lighter color?" **(MTR.4.1)**
- "How could I make a larger quantity of the same color?" Use ratios equivalent to 1 : 2 such as 2 : 4, 3 : 6, 4 : 8, etc.

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Comparing Ratios

5. Paint stores create different colors by using different ratios of white paint to tint.

a. Choose *one* tint color.

b. Circle the amount of tint you want to add to 2 gallons of white paint.

Red

Teal

Purple

Blue

Example Paint Mix

My Paint Mix

6. Write the ratio you created. ***Responses vary.*** **Samples shown in fill-in-the-blanks.**

5 ounces tint : 2 gallons white paint

a. Can you find two different ways to make a *darker* color?
Responses depend on the ratio students create.

5 ounces tint : 1 gallons white

6 ounces tint : 2 gallons white

b. Can you find two different ways to make a *lighter* color?
Responses depend on the ratio students create.

5 ounces tint : 2.5 gallons white

4 ounces tint : 2 gallons white

Accelerated 6 | Unit 2 Lesson 8 140 Activity 1

Pairs | 15 min

Activity 1 Comparing Ratios (continued)

Purpose: Students develop and name several strategies for comparing two ratios.

Short on time? Consider omitting Problem 9 or discuss it as a class.

2 Monitor

Look for students who show their thinking in different ways or use different strategies, such as calculating a ratio per 1 or creating equal amounts of blue tint or white paint (using common multiples or factors) to share during the Connect.

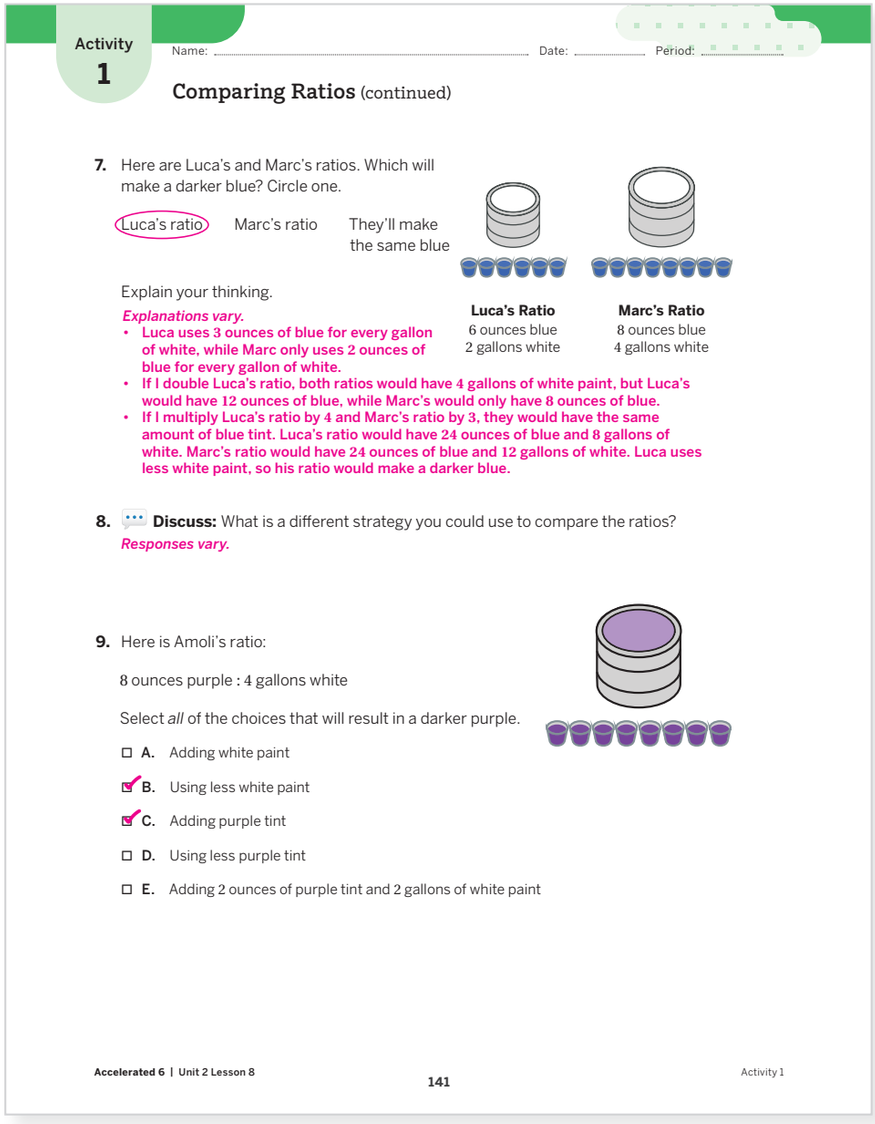
D Differentiation *(Problem 7)*

Look for students who:	Respond to Student Thinking
Select "Marc's ratio" or "They'll make the same blue."	**Support** Consider asking whether more or less blue paint per 1 gallon of white paint will create a darker blue. Then invite students to revise their thinking.
Select "Luca's ratio" with an incomplete explanation.	**Strengthen** Invite students to compare their strategy with a peer and make their explanation stronger and clearer. **(MTR.4.1)**
Select "Luca's ratio" with a robust explanation.	**Stretch** Consider asking, "What is a different way to explain why Luca's ratio makes a darker blue?"

Listen for a variety of student thinking to respond to.

D Differentiation *(Problem 9)*

Look for students who:	Respond to Student Thinking
Select "Adding 2 ounces of purple tint and 2 gallons of white paint."	**Support** Consider asking, "If I added 2 ounces of purple and 2 gallons of white paint, how much purple would there be per gallon of white paint? How does this compare to the original ratio?"
Select "Adding purple tint" and "Using less white paint."	**Stretch** Encourage students to think of amounts of purple tint and white paint they could add to create the same purple.



Activity 1

Name: Date: Period:

Comparing Ratios (continued)

7. Here are Luca's and Marc's ratios. Which will make a darker blue? Circle one.

Luca's ratio Marc's ratio They'll make the same blue

Explain your thinking.

Explanations vary.

- Luca uses 3 ounces of blue for every gallon of white, while Marc only uses 2 ounces of blue for every gallon of white.
- If I double Luca's ratio, both ratios would have 4 gallons of white paint, but Luca's would have 12 ounces of blue, while Marc's would only have 8 ounces of blue.
- If I multiply Luca's ratio by 4 and Marc's ratio by 3, they would have the same amount of blue tint. Luca's ratio would have 24 ounces of blue and 8 gallons of white. Marc's ratio would have 24 ounces of blue and 12 gallons of white. Luca uses less white paint, so his ratio would make a darker blue.

Luca's Ratio	Marc's Ratio
6 ounces blue	8 ounces blue
2 gallons white	4 gallons white

8. **Discuss:** What is a different strategy you could use to compare the ratios?

Responses vary.

9. Here is Amoli's ratio:

8 ounces purple : 4 gallons white

Select *all* of the choices that will result in a darker purple.

- ☐ A. Adding white paint
- ☑ B. Using less white paint
- ☑ C. Adding purple tint
- ☐ D. Using less purple tint
- ☐ E. Adding 2 ounces of purple tint and 2 gallons of white paint

Accelerated 6 | Unit 2 Lesson 8 141 Activity 1

3 Connect

To surface the Key Takeaway, share explanations showing unique or creative strategies to compare the ratios.

Note: If time allows, consider discussing some student responses, calling attention to any conflict or consensus you see.

Key Takeaway: You can compare two ratios using a variety of strategies, such as calculating a rate per 1 or using multiples and factors to create equivalent ratios that have one of the same values.

Pairs | 15 min

Activity 2 Lighter or Darker Paint

Purpose: Students develop fluency comparing ratios using strategies from Activity 1 and new strategies they develop.

Short on time? Discuss Problem 11 as a class.

1 Launch

Encourage students to order the paint colors using a variety of strategies or to develop a new strategy.

2 Monitor

Encourage students to use their Student Edition and/or additional paper to show their thinking.

A **Accessibility: Executive Functioning** Consider chunking this activity by inviting students to only compare two ratios at a time.

Pause briefly to analyze Luca's reasoning in Problem 11 after most students have responded. **(MTR.4.1)**

MLR **MLR3: Critique, Correct, Clarify** Use this routine to help students describe strengths, errors, and ambiguities in Luca's work. As a class:
- Discuss why Luca might have thought these were the same shade of blue.
- Discuss what is *incorrect* about their thinking.
- Create a *clear* explanation about why they are not the same shade of blue. **(MTR.6.1)**

Invite students to share their reasoning for each challenge with a classmate and to solve as many challenges as they have time for. Share that sense-making is more important than speed.

Look and listen for strategies that include:
- Creating equal amounts of white paint.
- Creating equal amounts of blue paint.
- Using common multiples, common factors, the LCM, or the GCF to help rewrite ratios with common values.
- Comparing ratios per 1.

3 Connect

Consider asking:
- "What is your preferred strategy? Why?"
- "Does your strategy change depending on the structure of the ratios? If so, how?" **(MTR.4.1)**

Activity 2

Name: Date: Period:

Lighter or Darker Paint

10. Order the ratios from *darkest* blue to *lightest* blue.

A. 5 ounces blue : 4 gallons white

B. 4 ounces blue : 3 gallons white

C. 10 ounces blue : 6 gallons white

D. 9 ounces blue : 6 gallons white

C	D	B	A

Darkest Blue Lightest Blue

11. Luca says that these two ratios make the same shade of blue.

≡ 4 ounces blue : 3 gallons white

≡ 5 ounces blue : 4 gallons white

What would you recommend Luca change in his work?

Responses vary.
- It's easier to compare the colors when they have the same amount of white paint or blue tint. You could make both colors have 12 gallons of white by multiplying the first ratio by 4 and the second ratio by 3.
- You can figure out if the colors are the same shade by calculating how much blue there is for every gallon of white. The first color has $\frac{4}{3}$ or about 1.333 ounces of blue for every gallon of white. The second color has $\frac{5}{4}$ or 1.25 ounces of blue for every gallon of white.

12. Solve all six challenges. For each pair of ratios, choose which ratio makes a darker blue.

Ratio A	Ratio B	Ratio A	Ratio B	They make the same blue
2 oz blue : 4 gal white	3 oz blue : 4 gal white		✓	
4 oz blue : 3 gal white	4 oz blue : 5 gal white	✓		
3 oz blue : 2 gal white	5 oz blue : 4 gal white	✓		
5 oz blue : 2 gal white	15 oz blue : 6 gal white			✓
7 oz blue : 3 gal white	5 oz blue : 2 gal white		✓	
5 oz blue : 4 gal white	9 oz blue : 7 gal white		✓	

Accelerated 6 | Unit 2 Lesson 8 142 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that there are many strategies to compare two ratios.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Making both ratios have the same number of one quantity.
- Calculating how much each ratio is per 1.
- Using the LCM to help find a shared number to create.
- Using the GCF to help rewrite ratios.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they share during the Connect. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.

Synthesis

13. Describe a strategy for comparing two ratios. Use the example if it helps with your thinking.

Responses vary.

- I can compare two ratios by making both ratios have the same quantity for one of its numbers. In this example, I could multiply Ratio B by 2 so that both Ratio A and Ratio B have the same amount of white paint. Then I can compare the number of ounces of blue tint.
- I can compare ratios by calculating how much blue tint each has for every gallon of white. Here, Ratio A has $\frac{5}{4} = 1.25$ ounces of blue for each gallon of white, and Ratio B has $\frac{3}{2} = 1.5$ ounces of blue for each gallon of white.

Lesson Practice ACC6.2.08

Lesson Summary

You can use different strategies to compare two ratios.

Let's compare the ratios of two cans of paint to see which will make a lighter shade of gray.

Ratio A	Ratio B
5 ounces black paint 3 gallons white paint	7 ounces black paint 4 gallons white paint

Strategy 1: Change both ratios so that they share one quantity.

- Multiply both ratios so they each have the same amount of black paint.
- The *LCM* for the number of ounces of black paint for both ratios is 35.
- Multiply Ratio A by 7 to get 35 ounces of black paint and 21 gallons of white paint.
- Multiply Ratio B by 5 to get 35 ounces of black paint and 20 gallons of white paint.

When both ratios have the same amount of black paint, Ratio A has more gallons of white paint, which means it will be a lighter shade of gray.

Strategy 2: Calculate how much each ratio is per 1 quantity.

- Calculate the number of ounces of black paint per gallon of white paint.
- Ratio A has $\frac{5}{3} = 1\frac{2}{3}$ ounces of black paint for every gallon of white paint.
- Ratio B has $\frac{7}{4} = 1\frac{3}{4}$ ounces of black paint for every gallon of white paint.

Ratio A has less black paint for 1 gallon of white paint, which means it will be a lighter shade of gray.

Accelerated 6 | Unit 2 Lesson 8 143 Synthesis | Lesson Practice

Lesson Takeaway: Rewriting ratios per 1 or so that one of the quantities is the same is helpful for comparing ratios.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by comparing two ratios.

Today's Goals

1. **Goal:** Use a variety of strategies to compare two ratios in context.
2. **Language Goal:** Justify whether two ratios are equivalent by transforming them so that they have one value in common (e.g., $a : b$ and $a : c$, or $x : z$ and $y : z$). **(Speaking and Listening)**

Show What You Know (Assessment Resources)

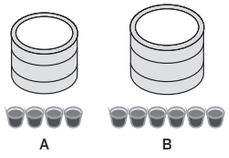
Name: ..... Date: ..... Period: .....

Show What You Know 2.08

Here are two new ratios of red tint to white paint:

Ratio A: 4 ounces red : 3 gallons white

Ratio B: 6 ounces red : 4 gallons white



Which ratio will make a darker red? Circle one.

Ratio A (Ratio B) They'll make the same red

Explain your thinking.

Explanations vary.

- Ratio B has 1.5 ounces of red for each gallon of white, and Ratio A has about 1.33 ounces of red for each gallon of white. More red tint means a darker red.
- If you multiply both ratios so they each have 12 ounces of red, Ratio A uses $3 \cdot 3 = 9$ gallons of white paint, while Ratio B only uses $4 \cdot 2 = 8$ gallons of white. Less white paint means a darker red.

D Differentiation Use after Lesson 8

Support

Provide targeted intervention for students by using these resources.

If students need support with comparing two ratios using a variety of strategies:

» **Respond to Student Thinking:**

- Use the *Comparing Ratios* **Mini-lesson.**

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities.**

Professional Learning

In what ways are students taking risks when trying out new strategies for comparing ratios? What types of questions might encourage students to explore new strategies even after they developed a strategy?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

13. Describe a strategy for comparing two ratios. Use the example if it helps with your thinking.

Responses vary.

- I can compare two ratios by making both ratios have the same quantity for one of its numbers. In this example, I could multiply Ratio B by 2 so that both Ratio A and Ratio B have the same amount of white paint. Then I can compare the number of ounces of blue tint.
- I can compare ratios by calculating how much blue tint each has for every gallon of white. Here, Ratio A has $\frac{5}{4} = 1.25$ ounces of blue for each gallon of white, and Ratio B has $\frac{3}{2} = 1.5$ ounces of blue for each gallon of white.

Ratio A
5 ounces blue
4 gallons white

Ratio B
3 ounces blue
2 gallons white

Lesson Practice ACC6.2.08

Lesson Summary

You can use different strategies to compare two ratios.

Let's compare the ratios of two cans of paint to see which will make a lighter shade of gray.

Ratio A	Ratio B
5 ounces black paint 3 gallons white paint	7 ounces black paint 4 gallons white paint

Strategy 1: Change both ratios so that they share one quantity.

- Multiply both ratios so they each have the same amount of black paint.
- The *LCM* for the number of ounces of black paint for both ratios is 35.
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- Multiply Ratio B by 5 to get 35 ounces of black paint and 20 gallons of white paint.

When both ratios have the same amount of black paint, Ratio A has more gallons of white paint, which means it will be a lighter shade of gray.

Strategy 2: Calculate how much each ratio is per 1 quantity.

- Calculate the number of ounces of black paint per gallon of white paint.
- Ratio A has $\frac{5}{3} = 1\frac{2}{3}$ ounces of black paint for every gallon of white paint.
- Ratio B has $\frac{7}{4} = 1\frac{3}{4}$ ounces of black paint for every gallon of white paint.

Ratio A has less black paint for 1 gallon of white paint, which means it will be a lighter shade of gray.

Lesson Practice
ACC6.2.08

Name: _____ Date: _____ Period: _____

Problems 1–3: To make 1 can of sky blue paint, Ama mixes 2 ounces of blue tint with 3 gallons of white paint.

1. Write a ratio of blue tint to white paint that would make the *same* color blue.

Responses vary. **4 ounces of blue tint : 6 gallons of white paint.**

2. Write a ratio of blue tint to white paint that would make a *darker* blue.

Responses vary. **3 ounces of blue tint : 2 gallons of white paint.**

3. Write a ratio of blue tint to white paint that would make a *lighter* blue.

Responses vary. **1 ounce of blue tint : 3 gallons of white paint.**

4. If you blend 2 scoops of chocolate frozen yogurt with 1 cup of milk, you will make a milkshake with a stronger chocolate flavor than if you blended 3 scoops of chocolate frozen yogurt with 2 cups of milk. Show or explain why this is true.

Responses vary. **The first milkshake has a stronger chocolate flavor because it uses 4 scoops of chocolate frozen yogurt for 2 cups of milk, while the second milkshake only uses 3 scoops for the same 2 cups of milk.**

Frozen Yogurt (scoops)	Milk (cups)
2	1
4	2

5. There are two mixtures of light purple paint.

- Mixture A is made with 5 cups of purple paint and 2 cups of white paint.
- Mixture B is made with 15 cups of purple paint and 8 cups of white paint.

Which mixture makes a lighter shade of purple? Explain your thinking.

Mixture B. ***Explanations vary.*** **I multiplied the numbers in each ratio to determine if the ratios are equivalent. Then I compared the amount of purple and white paint in each mixture. When both mixtures had 15 cups of purple paint, Mixture A had 6 cups of white paint, and Mixture B had 8 cups, which means Mixture B is lighter. When they both had 8 cups of white paint, Mixture A had 20 cups of purple paint and Mixture B had 15 cups, so again, Mixture B is a lighter shade.**

Lesson Practice
ACC6.2.08

Name: _____ Date: _____ Period: _____

FAST Practice

6. Order these mixtures from *lightest* green to *darkest* green.

A. 2 gallons white : 4 ounces green **B.** 3 gallons white : 5 ounces green

C. 5 gallons white : 8 ounces green

C	B	A
Lightest green		**Darkest green**

Spiral Review

Problems 7–9: Here are two recipes for lemonade.

- **Recipe A:** Mix 3 cups of lemon juice with 2 cups of water.
- **Recipe B:** Mix 3 cups of lemon juice with 3 cups of water.

7. What fraction of Recipe A is lemon juice?

$\frac{3}{5}$

8. What fraction of Recipe B is lemon juice?

$\frac{3}{6}$

9. Which recipe has a stronger lemon flavor? Explain your thinking.

Recipe A. ***Explanations vary.*** **Recipe A has a stronger lemon flavor because $\frac{3}{5}$ is greater than $\frac{3}{6}$.**

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–5	2	MA.6.AR.3.5
FAST Practice	6	2	MA.6.AR.3.5
Spiral Review			
	7–8	1	MA.3.FR.1.2
	9	1	MA.3.FR.2.1

Sub-Unit 3

Solving Problems With Ratios

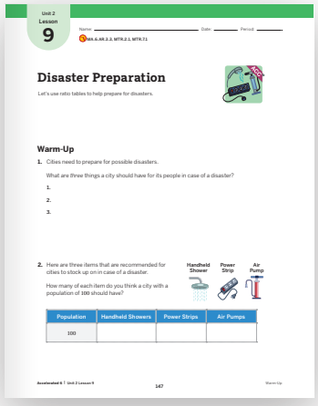
Sub-Unit 3 Goals

- **Goal:** Use a variety of strategies to compare ratios in context.
- **Goal:** Use double number line diagrams and tables of equivalent ratios to solve real-world and mathematical problems.
- **Language Goal:** Describe strategies for comparing ratios in context using mathematically precise language.
- **Language Goal:** Interpret different representations of a ratio relationship to make sense of a situation in context.

Students develop and use strategies to compare ratios in context. Students use double number line diagrams and tables of equivalent ratios to solve real-world and mathematical problems.

Math that Matters Most

Concept or Skill	For example . . .
Determine missing values in ratio relationships.	Red balloons float orange marbles at a ratio of $12 : 8$. How many red balloons will float 10 orange marbles? *15 red balloons*
Solve real-world ratio problems.	In their school, Maria and Hoang determined that 25 students threw away 10 pounds of lunch trash in 1 day. How much lunch trash would 400 students in their school create in a day? *160 pounds of trash*


Unit 2
Lesson
9

Disaster Preparation

Let's use ratio tables to help prepare for disasters.

Warm-Up

1. Cities need to prepare for possible disasters.

What are three things a city should have for its people in case of a disaster?

1.
2.
3.

2. Here are three items that are recommended for cities to stock up on in case of a disaster.

Handheld Shower | Power Strip | Air Pump

How many of each item do you think a city with a population of 100 should have?

Population	Handheld Showers	Power Strips	Air Pumps
100			

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Disaster Preparation

Using Ratio Tables With Large Quantities

Let's use ratio tables to help prepare for disasters.

Learning Outcomes

Today's Goals

1. **Goal:** Use tables to determine missing values in a ratio situation that involves large numbers.
2. **Language Goal:** Describe strategies for determining missing values in a ratio situation that involves large numbers, including choosing multipliers strategically. **(Writing, Speaking, and Listening)**

Students analyze recommendations about various items to have on hand in case of a disaster. They use tables of equivalent ratios to determine large unknown values in the context of disaster preparation. Students calculate a recommended amount of each item and decide how they might alter those recommendations based on their own intuition or lived experiences. **(MTR.2.1, MTR.7.1)**

Coherence

Prior Learning

In Lesson 3, students were introduced to using ratio tables to organize, interpret, and generate equivalent ratios.

Future Learning

In Lesson 11, students will extend their understanding of ratio tables to determine missing values in equivalent ratio tables using strategies such as determining the amount per 1 or strategically multiplying or dividing by a series of values.

Connections

- Students use ratio tables to help visualize and understand proportional relationships between resources needed for disaster preparedness and the population they are intended to serve. (cross-curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3

Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.7.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.AR.3.2	**MA.7.AR.3.2**
MA.6.NSO.2.3	**MA.7.AR.4.1**
	MA.7.AR.4.2
	MA.7.AR.4.3
	MA.7.AR.4.4

Lesson at a Glance

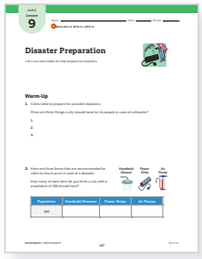
~ 45 min

MA.6.AR.3.3

Warm-Up

Pairs | 5 min

Students use the Think-Pair-Share routine to engage in a discussion about items that cities may need in case of a natural disaster.



Activity 1

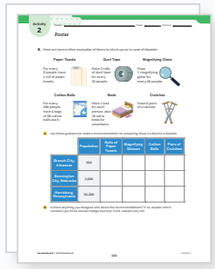
Pairs | 10 min

Students apply equivalent ratios to calculate the number of handheld showers, power strips, and air pumps needed for cities of different sizes in case of a natural disaster. **(MTR.2.1, MTR.7.1)**

Activity 2

Small Groups | 20 min

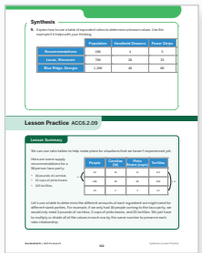
Students calculate the recommended amount of other items for new cities and then create a poster describing the number of each item needed for a city of their choice.
Routines: Gallery Tour, MLR7: Compare and Connect **(MTR.2.1, MTR.7.1)**



Synthesis

Whole Class | 5 min

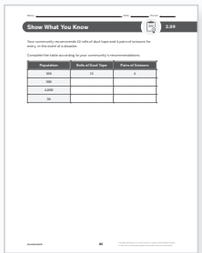
Students synthesize their understanding that tables of equivalent ratios can be used to determine large unknown values.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by completing a table of equivalent ratios.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Posters, one per group
- coloring tools

Pairs | 5 min

Warm-Up

Purpose: Students use the Think-Pair-Share routine to engage in a discussion about items that cities may need in case of a natural disaster.

1 Launch

To surface prior knowledge, consider asking:

- "What natural disasters have you heard of on the news or in our community?" Flooding, fires, and earthquakes are all examples of natural disasters. I have heard of these when we do fire drills.
- "Why might people in the same area be impacted by natural disasters in different ways?" Some people might have more access to life-saving materials.
- "What are some norms for us to consider when discussing natural disasters today?" Different people in the class may have different experiences with natural disasters, so monitor student conversation so that discussion is thoughtful.

Use the Think-Pair-Share routine to support student-to-student discourse about disasters. Invite students to think independently and then take turns sharing with a partner. Invite students to document their or their partner's thinking

Invite students to consider why handheld showers, power strips, and air pumps might be useful in case of a disaster before estimating how many a city of 100 should have. Air pumps are particularly useful for wheelchair wheels.

A **Accessibility: Conceptual Processing** Read the prompt aloud for students who benefit from extra processing time.

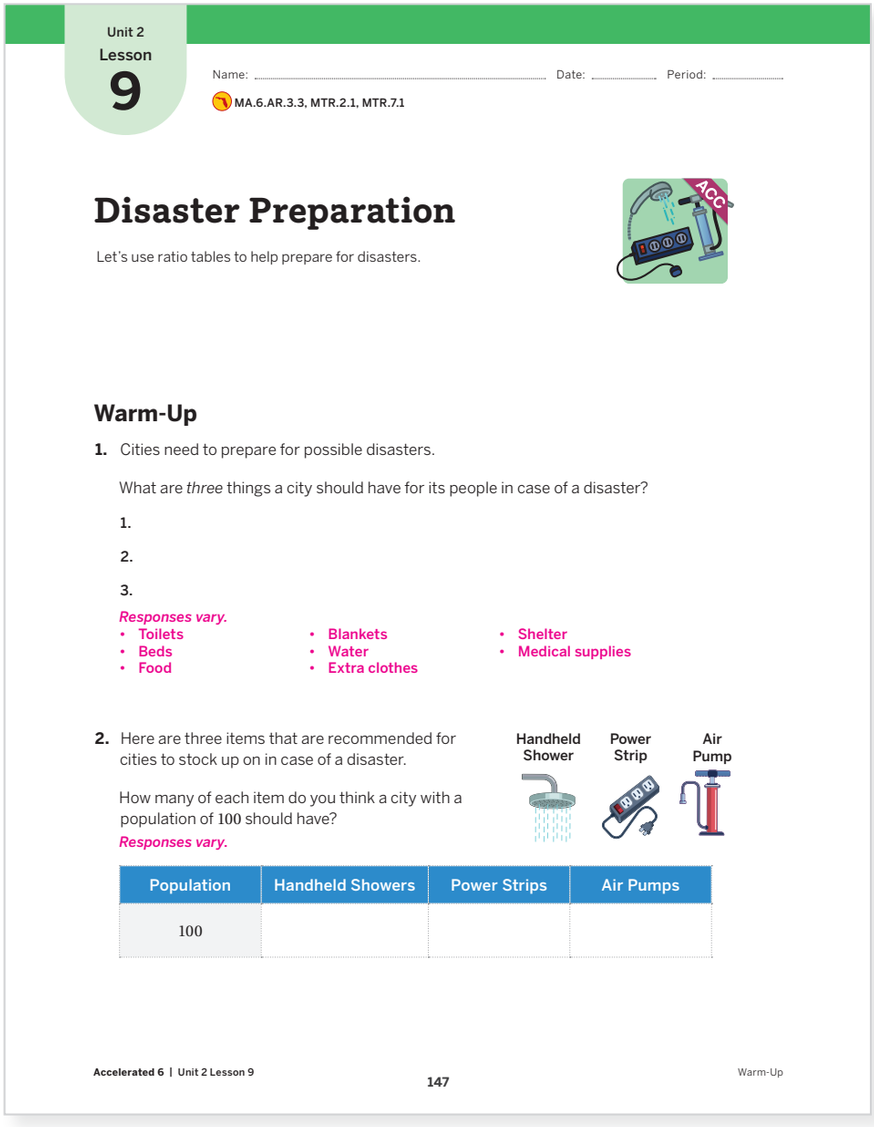
2 Connect

Invite students to share their estimates and the reasons for them.

Consider asking:

- "Why do you think the items on this list were chosen?"
- "Why is having enough of each item important?"
- "Why is it useful not to have too many?"

Consider sharing that the topic of natural disasters can affect students differently based on their and their community's experiences. Consider discussing disasters generally using the norms students generated.



Unit 2
Lesson
9

Name: ..... Date: ..... Period: .....

MA.6.AR.3.3, MTR.2.1, MTR.7.1

Disaster Preparation

Let's use ratio tables to help prepare for disasters.

Warm-Up

1. Cities need to prepare for possible disasters.

   What are *three* things a city should have for its people in case of a disaster?

   1.

   2.

   3.

   Responses vary.
   - Toilets
   - Beds
   - Food
   - Blankets
   - Water
   - Extra clothes
   - Shelter
   - Medical supplies

2. Here are three items that are recommended for cities to stock up on in case of a disaster.

   How many of each item do you think a city with a population of 100 should have?

   Responses vary.

Handheld Shower | Power Strip | Air Pump

Population	Handheld Showers	Power Strips	Air Pumps
100			

Accelerated 6 | Unit 2 Lesson 9 147 Warm-Up

Pairs | 10 min

Activity 1 Shower, Power, and Air

Purpose: Students apply equivalent ratios to calculate the number of handheld showers, power strips, and air pumps needed for cities of different sizes in case of a natural disaster. **(MTR.2.1, MTR.7.1)**

1 Launch

Direct students' attention to the FEMA recommendations and invite students to discuss with a partner how these recommendations compare to theirs and if any recommendations surprised them.

Encourage students to share their reasoning with a partner and work together to reach an agreement about how many of each item is needed for each location.

2 Monitor

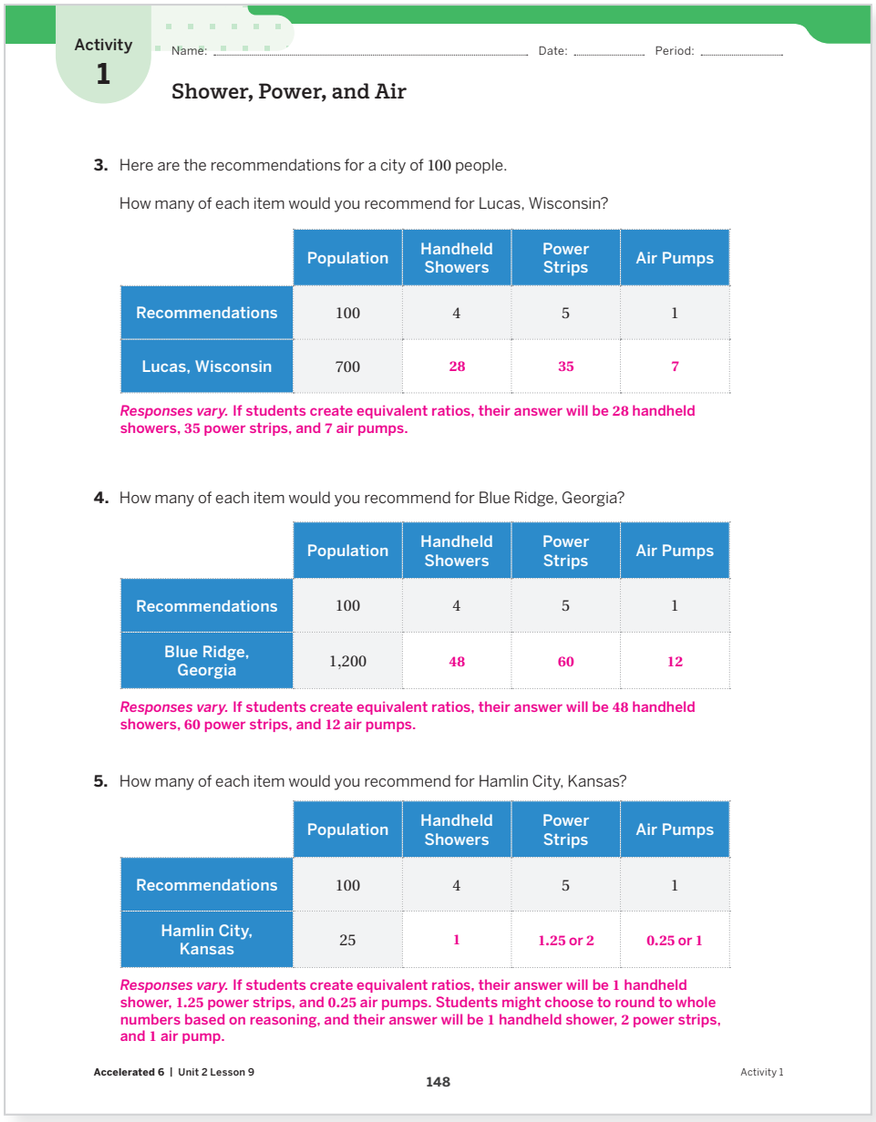
Look and listen for a variety of student thinking.

D Differentiation *(Problems 3–5)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How many groups of 100 are in 700? What does this tell us about what we should multiply each item by?"
Guess rather than use reasoning to determine their estimates.	**Support** Consider asking, "How would you know if your estimate is enough? Too much?"
Input correct answers into the table.	**Strengthen** Invite students to justify how they figured out their answers and explain why their responses make sense to another student.
Input correct answers and verify their thinking with another student.	**Stretch** Invite students to reference their community or state's list of recommendations. Some details have been modified to fit this lesson.

Pause briefly and consider asking, "Why do you think the number of air pumps might be different from the number of handheld showers or power strips?"

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Shower, Power, and Air

3. Here are the recommendations for a city of 100 people.

How many of each item would you recommend for Lucas, Wisconsin?

	Population	Handheld Showers	Power Strips	Air Pumps
Recommendations	100	4	5	1
Lucas, Wisconsin	700	28	35	7

Responses vary. If students create equivalent ratios, their answer will be 28 handheld showers, 35 power strips, and 7 air pumps.

4. How many of each item would you recommend for Blue Ridge, Georgia?

	Population	Handheld Showers	Power Strips	Air Pumps
Recommendations	100	4	5	1
Blue Ridge, Georgia	1,200	48	60	12

Responses vary. If students create equivalent ratios, their answer will be 48 handheld showers, 60 power strips, and 12 air pumps.

5. How many of each item would you recommend for Hamlin City, Kansas?

	Population	Handheld Showers	Power Strips	Air Pumps
Recommendations	100	4	5	1
Hamlin City, Kansas	25	1	1.25 or 2	0.25 or 1

Responses vary. If students create equivalent ratios, their answer will be 1 handheld shower, 1.25 power strips, and 0.25 air pumps. Students might choose to round to whole numbers based on reasoning, and their answer will be 1 handheld shower, 2 power strips, and 1 air pump.

Accelerated 6 | Unit 2 Lesson 9 148 Activity 1

Pairs | 10 min

Activity 1 Shower, Power, and Air (continued)

Purpose: Students apply equivalent ratios to calculate the number of handheld showers, power strips, and air pumps needed for cities of different sizes in case of a natural disaster. **(MTR.2.1, MTR.7.1)**

2 Monitor

Invite students to explore Problems 6–7.

Listen for students who agree and disagree with different parts of Taylor's thinking. Encourage students with different responses to share with one another while they work.

Select and sequence student thinking to share during the Connect.

D Differentiation *(Problems 6–7)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How were the recommendations for 100 people used to calculate each of these quantities?"
Say that the values in this table multiplies and divides by the same number.	**Strengthen** Invite students to use ratio language to describe the information on the table. The recommended list uses equivalent ratios from the recommendations for 100 people.
Say that a *ratio per one item* is used to calculate the amounts needed.	**Stretch** Invite students to consider other supplies that might be helpful in an emergency and how many might be needed.
Connect their knowledge of the supplies to the responses on the table.	

A Accessibility: Affective Functioning To support students in sharing their thinking, ask students in advance if they, you, or a classmate can share their thinking during the whole-class discussion.

3 Connect

Invite several students to share their recommendations.

To surface the Key Takeaway, consider asking:

- "How can one table be used to compare multiple ratio relationships?'**(MTR.2.1)**
- "What would you do to calculate the number of handheld showers in a different city?"
- "What should we do when our solutions are not whole numbers?"

Activity 1

Name: Date: Period:

Shower, Power, and Air (continued)

6. Taylor recommended that Hamlin City, Kansas should buy 1 handheld shower, 1 power strip, and 1 air pump.

	Population	Handheld Showers	Power Strips	Air Pumps
Recommendations	100	4	5	1
Lucas, Wisconsin	700	28	35	7
Blue Ridge, Georgia	1,200	48	60	12
Hamlin City, Kansas	25	1	1	1

a. **Discuss:** Why do you think Taylor made this recommendation?

Responses vary. I think Taylor wants to ensure that Hamlin City has at least one of each item, even though it's not equivalent to the recommendations for a city of 25 people.

b. What do you agree with about Taylor's recommendations? What do you disagree with?

Responses vary. I agree with Taylor that Hamlin City should have 1 handheld shower. I disagree with her about the air pumps, though. I don't think Hamlin City needs any air pumps since only 25 people live there.

7. Here are the actual recommendations for Lucas, Wisconsin; Blue Ridge, Georgia; and Hamlin City, Kansas.

Discuss: What is the strategy for calculating the number of each item? Are there any recommendations you disagree with?

	Population	Handheld Showers	Power Strips	Air Pumps
Lucas, Wisconsin	700	28	35	7
Blue Ridge, Georgia	1,200	48	60	12
Hamlin City, Kansas	25	1	2	1

Responses vary.
- The strategy is to use equivalent ratios to their recommendations for 100 people.
- I think 60 power strips feel like a lot. You need outlets for all of them to plug into and finding 60 outlets seems tough.

Accelerated 6 | Unit 2 Lesson 9 149 Activity 1

Key Takeaway: Use equivalent ratios to calculate the number of handheld showers, power strips, and air pumps needed for cities of different sizes in case of a natural disaster.

Small Groups | 20 min

Activity 2 Poster

Purpose: Students calculate the recommended amount of other items for new cities and then create a poster describing the number of each item needed for a city of their choice. **(MTR.2.1, MTR.7.1)**

Short on time? Consider inviting students to choose only two items for their selected city.

1 Launch

Direct students' attention to the items to stock up on for disasters. Consider sharing that FEMA provides guidance for other items for cities to stock up on as well, but in this lesson, we will just be exploring a few.

Invite students to clarify any objects that they are not sure about by asking one another or the teacher.

2 Monitor

Listen for students using strategies from the previous activity. **(MTR.2.1)**

Note: Students can either count the number of cotton balls or the number of bags of cotton balls. This is left intentionally ambiguous.

Pause briefly and invite students to share their thinking for Problems 8a and 8b. Encourage them to revise their recommendations and discuss the reasoning. **(MTR.7.1)**

Activity 2 continued >

Activity 2

Name: _____ Date: _____ Period: _____

Poster

8. Here are some other examples of items to stock up on in case of disaster.

Paper Towels

For every 5 people, have 1 roll of paper towels.

Duct Tape

Have 3 rolls of duct tape for every 25 people.

Magnifying Glass

Have 1 magnifying glass for every 50 people.

Cotton Balls

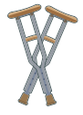
For every 100 people, have 4 bags of 50 cotton balls each.

Beds

Have 1 bed for each person, plus 10 extra beds for volunteers.

Crutches

Have 6 pairs of crutches.



a. Use these guidance to make a recommendation for preparing these 3 cities for a disaster.

	Population	Rolls of Paper Towels	Magnifying Glasses	Cotton Balls	Pairs of Crutches
Branch City, Arkansas	300	60	6	600 cotton balls (or 12 bags)	6
Bennington City, Nebraska	2,000	400	40	4,000 cotton balls (or 80 bags)	6
Harrisburg, Pennsylvania	50,200	10,040	1,004	100,400 cotton balls (or 2,008 bags)	6

b. Is there anything you disagree with about the recommendations? If so, explain which numbers you think should change and why. If not, explain why not.

Responses vary.

- I don't think Harrisburg really needs 1,004 magnifying glasses. I can understand keeping a few magnifying glasses in every city, but I'm not sure a city needs 1 for every 50 people.
- The guidance for crutches seems like a mistake. There should be a ratio between the number of crutches and the number of people, like 6 pairs of crutches for every 100 people.

Accelerated 6 | Unit 2 Lesson 9 150 Activity 2

Activity 2 Poster (continued)

Purpose: Students calculate the recommended amount of other items for new cities and then create a poster describing the number of each item needed for a city of their choice. **(MTR.2.1, MTR.7.1)**

Short on time? Consider inviting students to choose only two items for their selected city.

2 Monitor

Invite students to choose a city and create a poster with their recommendations based on their current model. **(MTR.7.1)**

Look for students who are spending time creating beautiful work that is both precise and includes thorough justifications. Consider highlighting this work to encourage more students to create work that they are proud of.

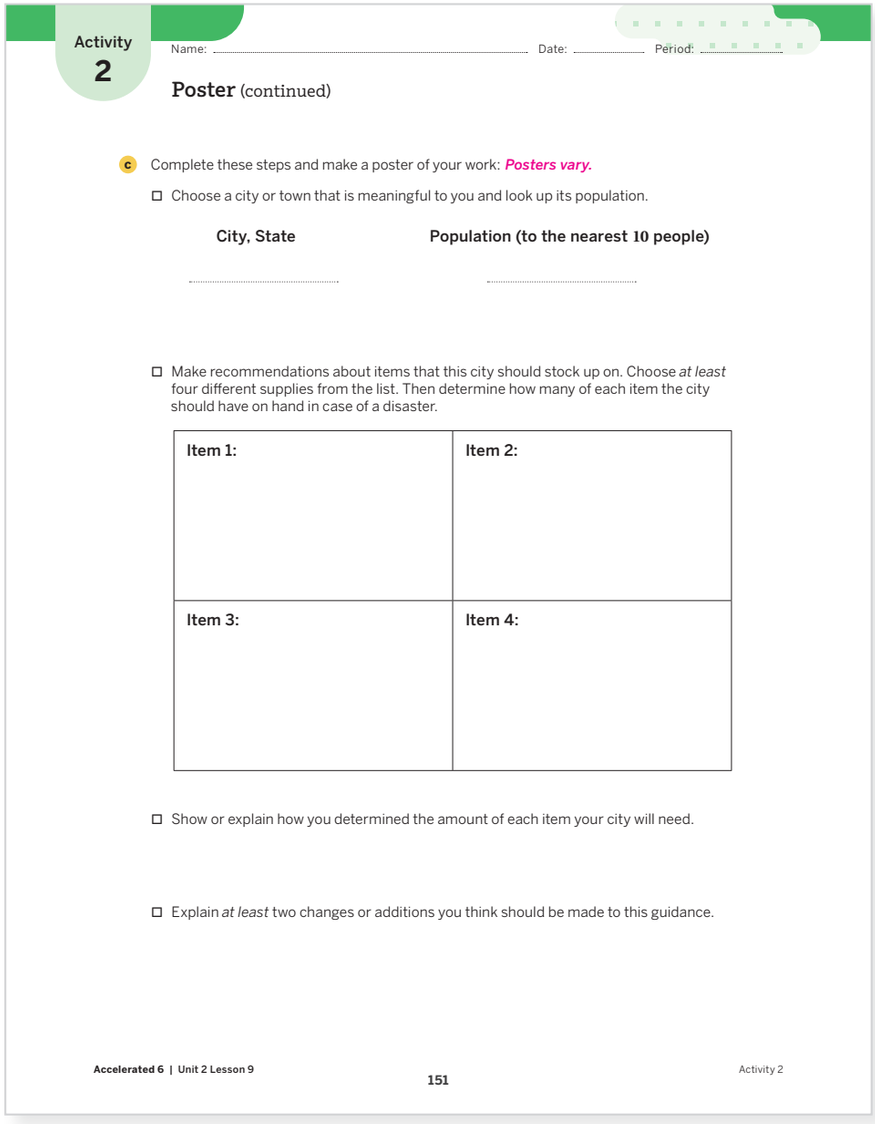
A **Accessibility: Executive Functioning** Encourage students who benefit from support with organizational skills to chunk this activity into more manageable parts (e.g., dividing the poster into sections and working on one part at a time).

D **Differentiation: (Stretch)** Invite students to select a city that experienced a natural disaster in recent years and research the ways that the city responded to the disaster. Consider asking, "How might cities support all of their residents in being prepared for disasters like this?"

3 Connect

Invite students to share their posters through a Gallery Tour. Encourage them to silently view their classmates' work and leave feedback. Then give each group time to review the feedback left on their work.

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to their group's strategies. See the Routine Facilitation Guide for more information.



Activity 2

Name: ..... Date: ..... Period: .....

Poster (continued)

C Complete these steps and make a poster of your work: ***Posters vary.***

☐ Choose a city or town that is meaningful to you and look up its population.

City, State	Population (to the nearest 10 people)
.....	.....

☐ Make recommendations about items that this city should stock up on. Choose *at least* four different supplies from the list. Then determine how many of each item the city should have on hand in case of a disaster.

Item 1:	**Item 2:**
Item 3:	**Item 4:**

☐ Show or explain how you determined the amount of each item your city will need.

☐ Explain *at least* two changes or additions you think should be made to this guidance.

Accelerated 6 | Unit 2 Lesson 9 151 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that tables of equivalent ratios can be used to determine large unknown values.

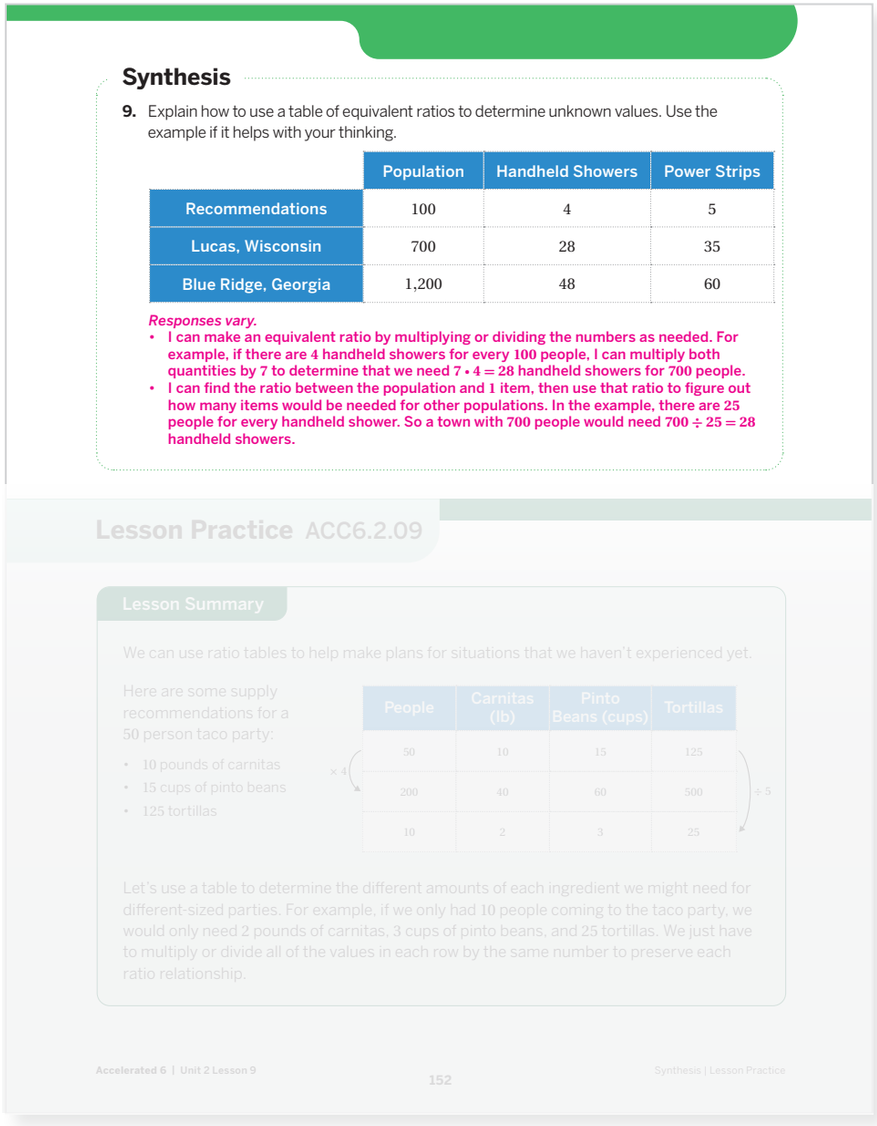
Invite students to respond independently, and then share their thinking with a partner.

ELL **English Language Learners** Give students time to rehearse their ideas with a partner before they are expected to share their ideas with others. **(Speaking and Listening)**

Capture and share a variety of ideas, such as:

- Making an equivalent ratio by multiplying or dividing the numbers as needed. For example, if there are 4 handheld showers for every 100 people, I can multiply both quantities by 7 to determine that we need 28 handheld showers for 700 people.
- Finding how many I need for one person and then using that to figure out how many would be needed for any number of people. In the example, there are 25 people for every one handheld shower.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

9. Explain how to use a table of equivalent ratios to determine unknown values. Use the example if it helps with your thinking.

	Population	Handheld Showers	Power Strips
Recommendations	100	4	5
Lucas, Wisconsin	700	28	35
Blue Ridge, Georgia	1,200	48	60

Responses vary.

- I can make an equivalent ratio by multiplying or dividing the numbers as needed. For example, if there are 4 handheld showers for every 100 people, I can multiply both quantities by 7 to determine that we need $7 \cdot 4 = 28$ handheld showers for 700 people.
- I can find the ratio between the population and 1 item, then use that ratio to figure out how many items would be needed for other populations. In the example, there are 25 people for every handheld shower. So a town with 700 people would need $700 \div 25 = 28$ handheld showers.

Lesson Practice ACC6.2.09

Lesson Summary

We can use ratio tables to help make plans for situations that we haven't experienced yet.

Here are some supply recommendations for a 50 person taco party:

- 10 pounds of carnitas
- 15 cups of pinto beans
- 125 tortillas

People	Carnitas (lb)	Pinto Beans (cups)	Tortillas
50	10	15	125
200	40	60	500
10	2	3	25

× 4 ÷ 5

Let's use a table to determine the different amounts of each ingredient we might need for different-sized parties. For example, if we only had 10 people coming to the taco party, we would only need 2 pounds of carnitas, 3 cups of pinto beans, and 25 tortillas. We just have to multiply or divide all of the values in each row by the same number to preserve each ratio relationship.

Accelerated 6 | Unit 2 Lesson 9 152 Synthesis | Lesson Practice

Lesson Takeaway: Tables can be used to determine missing values in a ratio situation that involves large numbers. A strategy for doing this is solving for the ratio per one unit and then multiplying or dividing as needed.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by completing a table of equivalent ratios.

Today's Goals

1. **Goal:** Use tables to determine missing values in a ratio situation that involves large numbers.
2. **Language Goal:** Describe strategies for determining missing values in a ratio situation that involves large numbers, including choosing multipliers strategically. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 2.09

Your community recommends 12 rolls of duct tape and 4 pairs of scissors for every, in the event of a disaster.

Complete the table according to your community's recommendations.

Population	Rolls of Duct Tape	Pairs of Scissors
100	12	4
300	36	12
4,000	480	160
50	6	2

D Differentiation Use after Lesson 9

Support

Provide targeted intervention for students by using these resources.

If students need additional support calculating missing quantities using equivalent ratios:

» **Respond to Student Thinking:**

- Revisit **Lesson 4, Activity 1,** and invite students to use double number lines to solve the problems, and connect their reasoning to using ratio tables.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.
- Invite students to research more about their local community or state's recommendations and how they came up with them.

Professional Learning

Consider the important issues raised in this lesson. Take a moment to reflect on how students applied what they've learned about ratios to disaster preparation. In what ways were students able to make connections between math ideas and communities in this lesson? How might you support students in making connections between the math they learn and their world at other points in the school year?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. Explain how to use a table of equivalent ratios to determine unknown values. Use the example if it helps with your thinking.

	Population	Handheld Showers	Power Strips
Recommendations	100	4	5
Lucas, Wisconsin	700	28	35
Blue Ridge, Georgia	1,200	48	60

Responses vary.

- I can make an equivalent ratio by multiplying or dividing the numbers as needed. For example, if there are 4 handheld showers for every 100 people, I can multiply both quantities by 7 to determine that we need $7 \cdot 4 = 28$ handheld showers for 700 people.
- I can find the ratio between the population and 1 item, then use that ratio to figure out how many items would be needed for other populations. In the example, there are 25 people for every handheld shower. So a town with 700 people would need $700 \div 25 = 28$ handheld showers.

Lesson Practice ACC6.2.09

Lesson Summary

We can use ratio tables to help make plans for situations that we haven't experienced yet.

Here are some supply recommendations for a 50 person taco party:

- 10 pounds of carnitas
- 15 cups of pinto beans
- 125 tortillas

People	Carnitas (lb)	Pinto Beans (cups)	Tortillas
50	10	15	125
200	40	60	500
10	2	3	25

× 4 ÷ 5

Let's use a table to determine the different amounts of each ingredient we might need for different-sized parties. For example, if we only had 10 people coming to the taco party, we would only need 2 pounds of carnitas, 3 cups of pinto beans, and 25 tortillas. We just have to multiply or divide all of the values in each row by the same number to preserve each ratio relationship.

Lesson Practice
ACC6.2.09

Name: _____ Date: _____ Period: _____

Problems 1–3: A recipe for tropical fruit juice says to combine 4 cups of pineapple juice with 5 cups of orange juice.

1. Complete the table to determine how much of each type of juice you need for 1, 2, 3, and 4 batches of the recipe.

Batches	Pineapple Juice (cups)	Orange Juice (cups)	Lime Juice (cups)
1	4	5	$\frac{1}{3}$
2	8	10	$\frac{2}{3}$
3	12	15	1
4	16	20	$1\frac{1}{3}$

2. The recipe also calls for $\frac{1}{3}$ cup of lime juice for every 5 cups of orange juice. Add an additional column of values to the table to represent the amount of lime juice for 1, 2, 3, and 4 batches of the recipe.

Response shown in table.

3. If you use 12 cups of pineapple juice with 20 cups of orange juice, will the recipe taste the same? Explain your reasoning.

No. *Explanations vary.* It won't taste the same because 12 : 20 and 4 : 5 are not equivalent ratios.

Problems 4–5: It takes about 9 kilograms of olives to make 2 liters of olive oil.

4. Complete the table to determine how much olive oil each orchard made.

	Olives (kg)	Olive Oil (L)
Ratio	9	2
Orchard A	9,000	2,000
Orchard B	5,400	1,200

5. Afia claims that to make 4 liters of olive oil, you need 11 kilograms of olives. Is she correct? Explain your thinking.

No. *Explanations vary.* 4 liters is $2 \cdot 2$, so she'll need $9 \cdot 2 = 18$ kilograms of olives.

Lesson Practice
ACC6.2.09

Name: _____ Date: _____ Period: _____

FAST Practice

6. Determine the unknown values in the table.

Number of Loaves	Bananas	Butter (cups)	Sugar (cups)	Eggs	Flour (cups)
4	12	2	3	8	6
2	6	1	1.5	4	3

Spiral Review

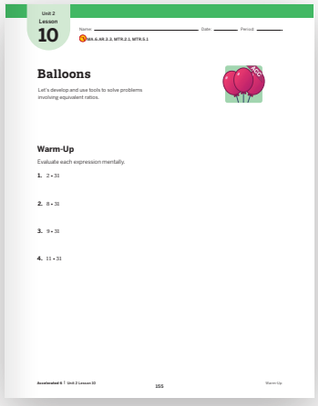
Problems 7–8: Determine each product. Show your thinking.

7.
$$\begin{array}{r} 680 \\ \times\ 502 \\ \hline 1360 \\ 0000 \\ +\,3400\,| \\ \hline 341360 \end{array} \rightarrow 341{,}360$$

8.
$$\begin{array}{r} 401 \\ \times\ 285 \\ \hline 2005 \\ 3208 \\ +\ 802\,| \\ \hline 114285 \end{array} \rightarrow 114{,}285$$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–5	2	MA.6.AR.3.3
FAST Practice	6	2	MA.6.AR.3.3
Spiral Review			
	7–8	1	MA.5.NSO.2.1


Unit 2
Lesson
10
Name: _____ Date: _____ Period: _____
MA.6.AR.3.3, MTR.2.1, MTR.5.1
Balloons
Let's develop and use tools to solve problems involving equivalent ratios.
Warm-Up
Evaluate each expression mentally.
1. 2 • 31
2. 8 • 31
3. 9 • 31
4. 11 • 31
Accelerated 6 | Unit 2 Lesson 10
155
Warm-Up

Balloons

Solving Ratio Problems

Let's develop and use tools to solve problems involving equivalent ratios.

Learning Outcomes

Today's Goals

1. **Goal:** Use multiple steps to determine an unknown value in a ratio relationship.
2. **Language Goal:** Compare and contrast strategies for determining missing values in a ratio relationship. **(Writing, Speaking, and Listening)**

Students develop and use tools to solve problems involving equivalent ratios. They determine missing values in equivalent ratios using double number line diagrams, tables, and other tools. This lesson surfaces strategies such as calculating a ratio per 1 and multiplying up to a common multiple, then dividing.

Coherence

Prior Learning

In Lesson 9, students used tables of equivalent ratios to determine large unknown values in the disaster preparation context.

Future Learning

In Lesson 11, students will practice strategies and apply everything they have learned about ratios to make sense of situations. They will decide whether the answer of the problem can be determined using equivalent ratios.

Connections

- Students make connections to science by comparing the lifting capacity to different balloons or the number of balloons needed to lift an object. (cross-curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3

Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1	MA.7.AR.3.2
MA.5.FR.2.1	MA.7.AR.4.1
MA.5.FR.2.2	MA.7.AR.4.2
MA.5.AR.3.2	MA.7.AR.4.3
	MA.7.AR.4.4

Lesson at a Glance

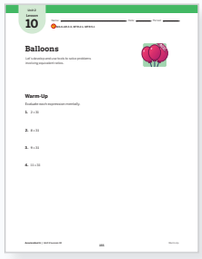
~ 45 min

MA.6.AR.3.3

Warm-Up

Whole Class | 8 min

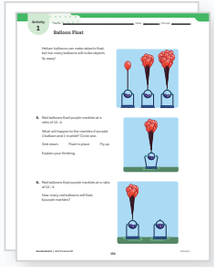
Students use the **Number Talk** routine to strengthen their multiplication strategies to prepare them for solving problems involving equivalent ratios.



Activity 1

Pairs | 10 min

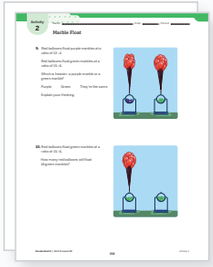
Students suggest and analyze tools for solving problems involving equivalent ratios. **MLR7: Compare and Connect** **(MTR.2.1)**



Activity 2

Pairs | 7 min

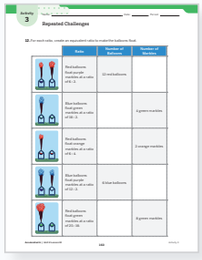
Students use **MLR7: Compare and Connect** to compare two strategies for solving ratio problems. **(MTR.2.1)**



Activity 3

Independent | 10 min

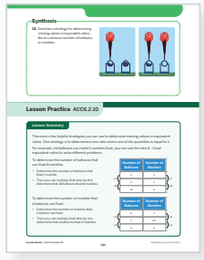
Students develop fluency in using equivalent ratios to solve ratio problems.



Synthesis

Whole Class | 5 min

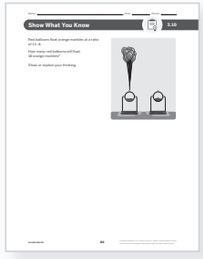
Students synthesize their understanding of how to determine an unknown value in a ratio relationship.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by using any strategy to determine an unknown value in a ratio relationship.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Whole Class | 8 min

Warm-Up

Purpose: Students use the Number Talk routine to strengthen their multiplication strategies to prepare them for solving problems involving equivalent ratios.

1 Launch

Use the Number Talk routine to support students in strengthening their multiplication strategies by making use of structure. See the Routine Facilitation Guide for more information. **(MTR.5.1)**

Invite students to evaluate the first expression independently. Then record a variety of strategies, along with the name of the students who shared them.

Consider asking, "Who thought about it in a different way?"

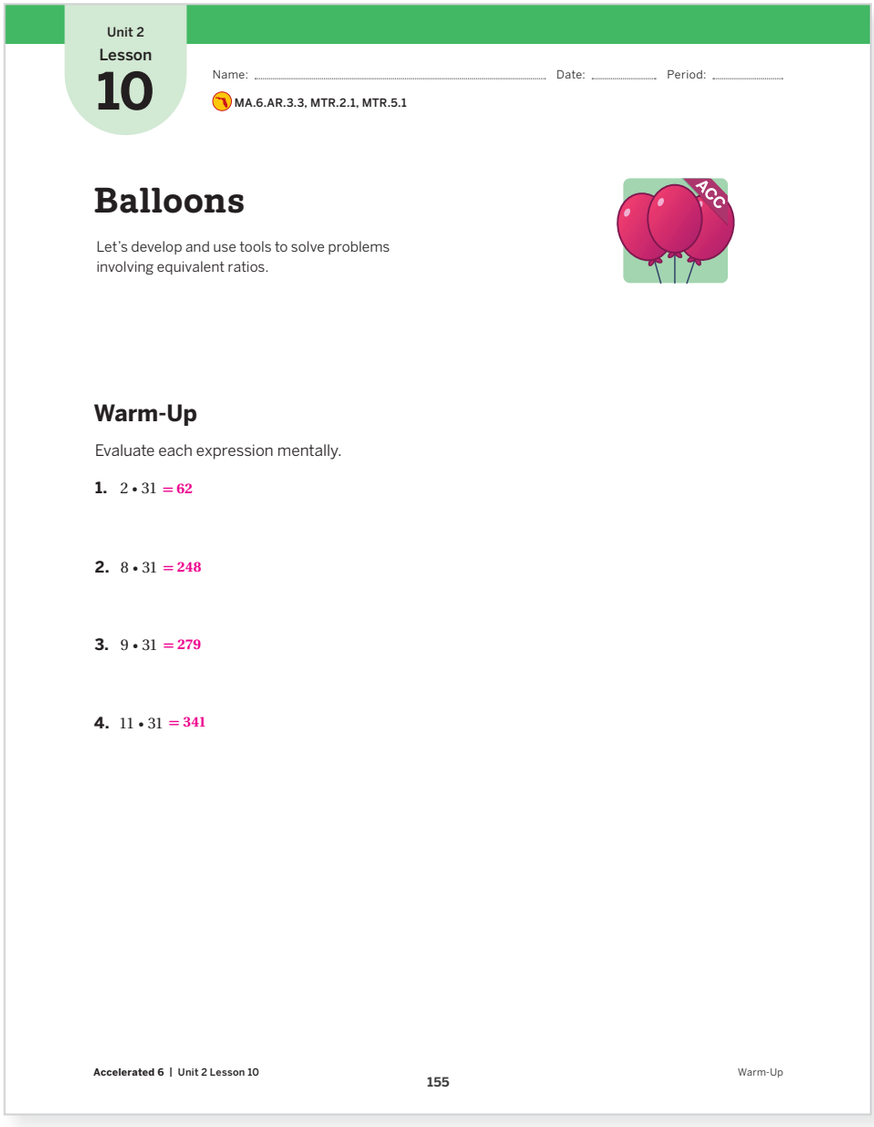
Note: This structure is repeated for each problem in the Number Talk.

ELL **English Language Learners** Provide a word bank to support students in expressing their ideas with words such as: *product, sum, doubled, tripled, half*, etc. **(Writing and Speaking)**

2 Connect

Invite students to compare and contrast the different strategies they used.

Consider sharing that today's activity will involve multiplying by a variety of factors and many of the strategies mentioned during the Warm-Up will be useful throughout the lesson.



Unit 2
Lesson
10

Name: ..... Date: ..... Period: .....

MA.6.AR.3.3, MTR.2.1, MTR.5.1

Balloons

Let's develop and use tools to solve problems involving equivalent ratios.

Warm-Up

Evaluate each expression mentally.

1. $2 \cdot 31 = 62$
2. $8 \cdot 31 = 248$
3. $9 \cdot 31 = 279$
4. $11 \cdot 31 = 341$

Accelerated 6 | Unit 2 Lesson 10 155 Warm-Up

Pairs | 10 min

Activity 1 Balloon Float

Purpose: Students suggest and analyze tools for solving problems involving equivalent ratios. **(MTR.2.1)**

Short on time? Consider omitting Problem 6.

1 Launch

To generate excitement, invite students to imagine how many helium balloons it would take to lift a few marbles. Encourage students to share their guesses.

2 Monitor

Note: This is the first time students have seen a unitless ratio. They may need time to determine which number represents balloons and which represents marbles.

D **Differentiation:** (Support) Look for students who need support or have an inaccurate response, and consider asking:

- "Which weighs more, a red balloon or a purple marble? How do you know?"
- "What would happen if you just had 1 balloon and 1 marble?"

Invite students to get feedback from a partner throughout the lesson.

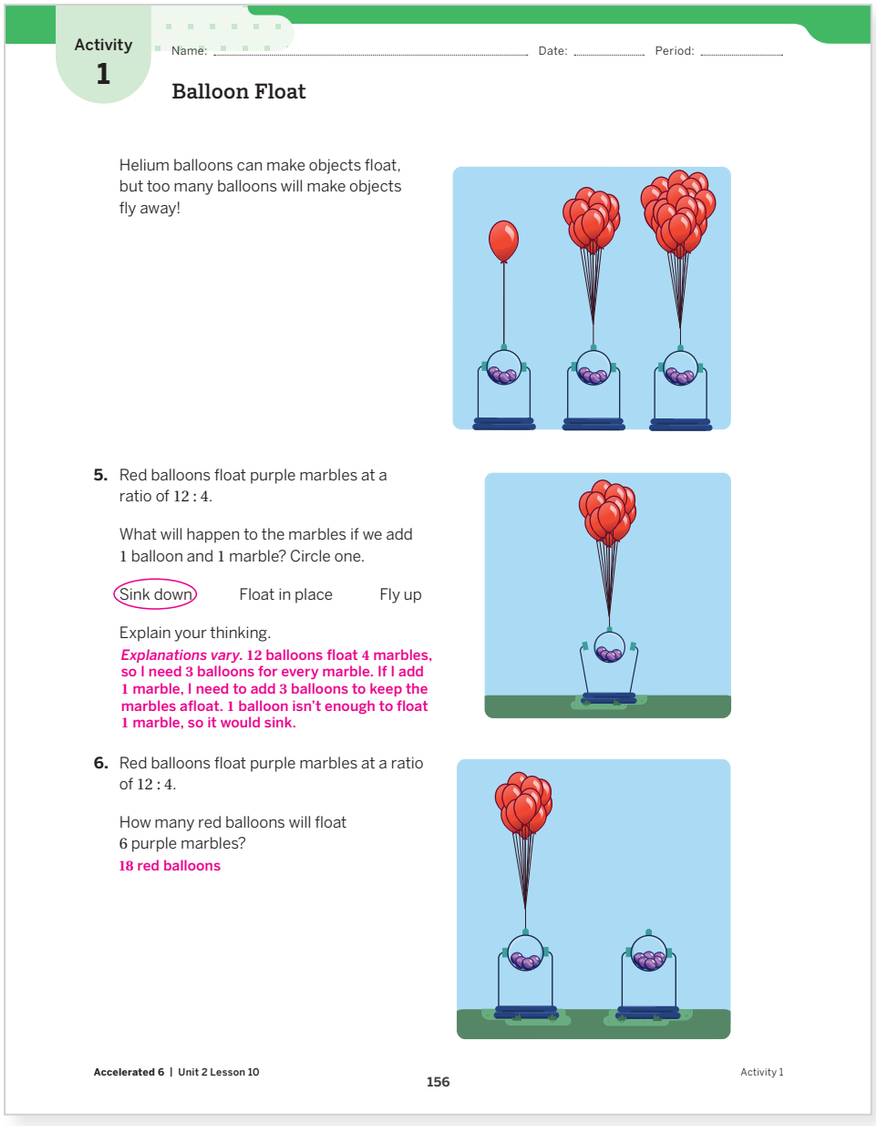
Look and listen for strategies to highlight during the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Write 2 balloons because they recognize that 6 is half of 12 and 2 is half of 4.	**Support** Consider asking, "What information is missing: balloons or marbles?"
Use strategies similar to Charlie's and Daeja's thinking (in Problem 7) or other creative strategies.	**Strengthen** Consider inviting students to think about how they will share their thinking during the Connect.

A **Accessibility: Visual-Spatial Processing** Provide blank double number line templates for students to draw on to increase access to the task.

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Balloon Float

Helium balloons can make objects float, but too many balloons will make objects fly away!

5. Red balloons float purple marbles at a ratio of 12 : 4.

What will happen to the marbles if we add 1 balloon and 1 marble? Circle one.

Sink down Float in place Fly up

Explain your thinking.

Explanations vary. 12 balloons float 4 marbles, so I need 3 balloons for every marble. If I add 1 marble, I need to add 3 balloons to keep the marbles afloat. 1 balloon isn't enough to float 1 marble, so it would sink.

6. Red balloons float purple marbles at a ratio of 12 : 4.

How many red balloons will float 6 purple marbles?

18 red balloons

Accelerated 6 | Unit 2 Lesson 10 156 Activity 1

Pairs | 10 min

Activity 1 Balloon Float (continued)

Purpose: Students suggest and analyze tools for solving problems involving equivalent ratios. **(MTR.2.1)**

2 Monitor

Capture responses to share during the Connect.

ELL **English Language Learners** Provide a word bank to support students in expressing their ideas with words such as: *equivalent ratio, multiple, factor*, etc. **(Writing and Speaking)**

Look and listen for students who may need individual support to be comfortable with at least one strategy.

D **Differentiation** *(Problem 8)*

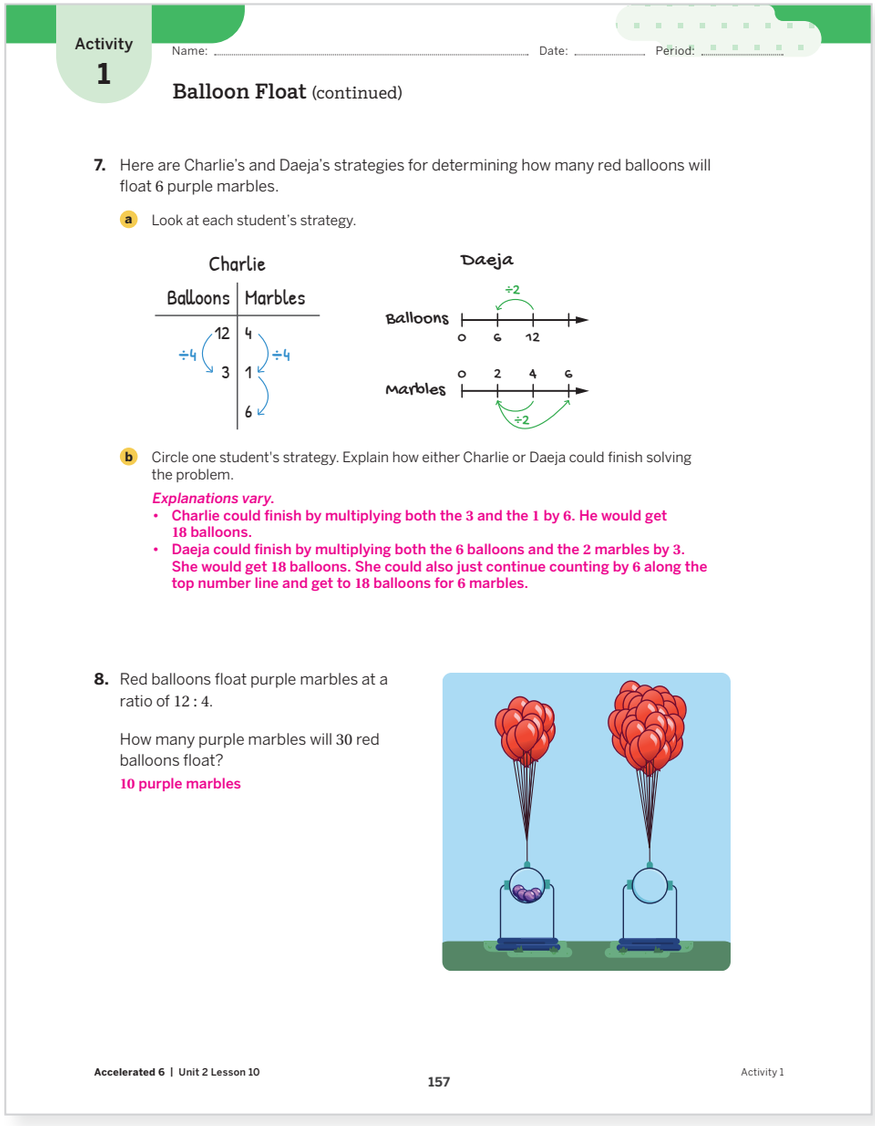
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to try Charlie's or Daeja's strategy.
Write a value greater than 30.	**Support** Consider asking, "What information is missing: balloons or marbles? Why must the number of marbles be less than 30?"
Use strategies similar to Charlie's and Daeja's thinking in the previous problem or other creative strategies.	**Strengthen** Encourage students to use another strategy.

3 Connect

Share the captured responses for each strategy. **(MTR.2.1)**

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to their strategy. Consider asking:

- "How would you describe Charlie's strategy in your own words? Daeja's?"
- "What are the advantages of using Daeja's strategy? Charlie's?"
- "Could you use Charlie's strategy on a double number line?"
- "Could you use Daeja's strategy in a table?"



Activity 1

Name: Date: Period:

Balloon Float (continued)

7. Here are Charlie's and Daeja's strategies for determining how many red balloons will float 6 purple marbles.

a. Look at each student's strategy.

Charlie

Balloons	Marbles
12	4
3	1
6	

(÷4 from 12 to 3; ÷4 from 4 to 1)

Daeja

b. Circle one student's strategy. Explain how either Charlie or Daeja could finish solving the problem.

Explanations vary.

- Charlie could finish by multiplying both the 3 and the 1 by 6. He would get 18 balloons.
- Daeja could finish by multiplying both the 6 balloons and the 2 marbles by 3. She would get 18 balloons. She could also just continue counting by 6 along the top number line and get to 18 balloons for 6 marbles.

8. Red balloons float purple marbles at a ratio of 12 : 4.

How many purple marbles will 30 red balloons float?

10 purple marbles

Accelerated 6 | Unit 2 Lesson 10 157 Activity 1

Key Takeaway: To determine an unknown value in an equivalent ratio, create a double number line or table to help find other equivalent ratios that are easier to scale up or down.

Pairs | 7 min

Activity 2 Marble Float

Purpose: Students use **MLR7: Compare and Connect** to compare two strategies for solving ratio problems. **(MTR.2.1)**

Short on time? Consider omitting Problem 10.

1 Launch

To surface connections, consider inviting students to think about when they have compared two ratios.

Consider asking, "What strategies can we use to compare two ratios?"

ELL **English Language Learners** Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

2 Monitor

Look and listen for students who may need individual support to be comfortable with at least one strategy.

D **Differentiation** *(Problem 10)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Brainstorm or write a list of tools students may find helpful, such as a calculator, table, or double number line. Invite students to try a tool.
Notice that 10 is $\frac{2}{3}$ of 15 and calculate $\frac{2}{3}$ of 6 marbles.	**Support** Consider asking, "Is the 10 related to the 15 balloons or to the 6 marbles?"
Use strategies similar to Charlie's and Daeja's thinking or other creative strategies.	**Stretch** Encourage students to try another strategy.

Activity 2 continued >

Activity 2

Name: Date: Period:

Marble Float

9. Red balloons float purple marbles at a ratio of $12 : 4$.

Red balloons float green marbles at a ratio of $15 : 6$.

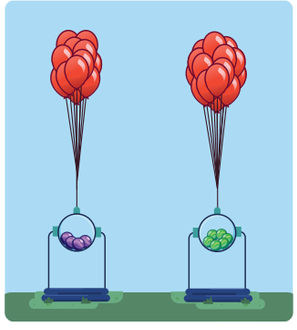
Which is heavier: a purple marble or a green marble?

(Purple) Green They're the same

Explain your thinking.

Explanations vary.

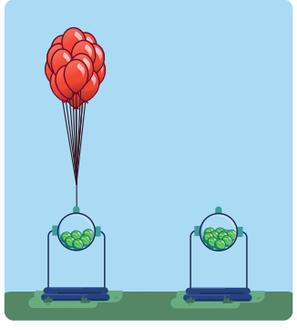
- I need $\frac{12}{4} = 3$ balloons to float every purple marble but only $\frac{15}{6} = 2.5$ balloons to float every green marble.
- I would need $12 \cdot 3 = 36$ balloons to float 12 purple marbles and only $15 \cdot 2 = 30$ balloons to float 12 green marbles.



10. Red balloons float green marbles at a ratio of $15 : 6$.

How many red balloons will float 10 green marbles?

25 red balloons



Accelerated 6 | Unit 2 Lesson 10 158 Activity 2

Pairs | 7 min

Activity 2 Marble Float (continued)

Purpose: Students use **MLR7: Compare and Connect** to compare two strategies for solving ratio problems. **(MTR.2.1)**

2 Monitor

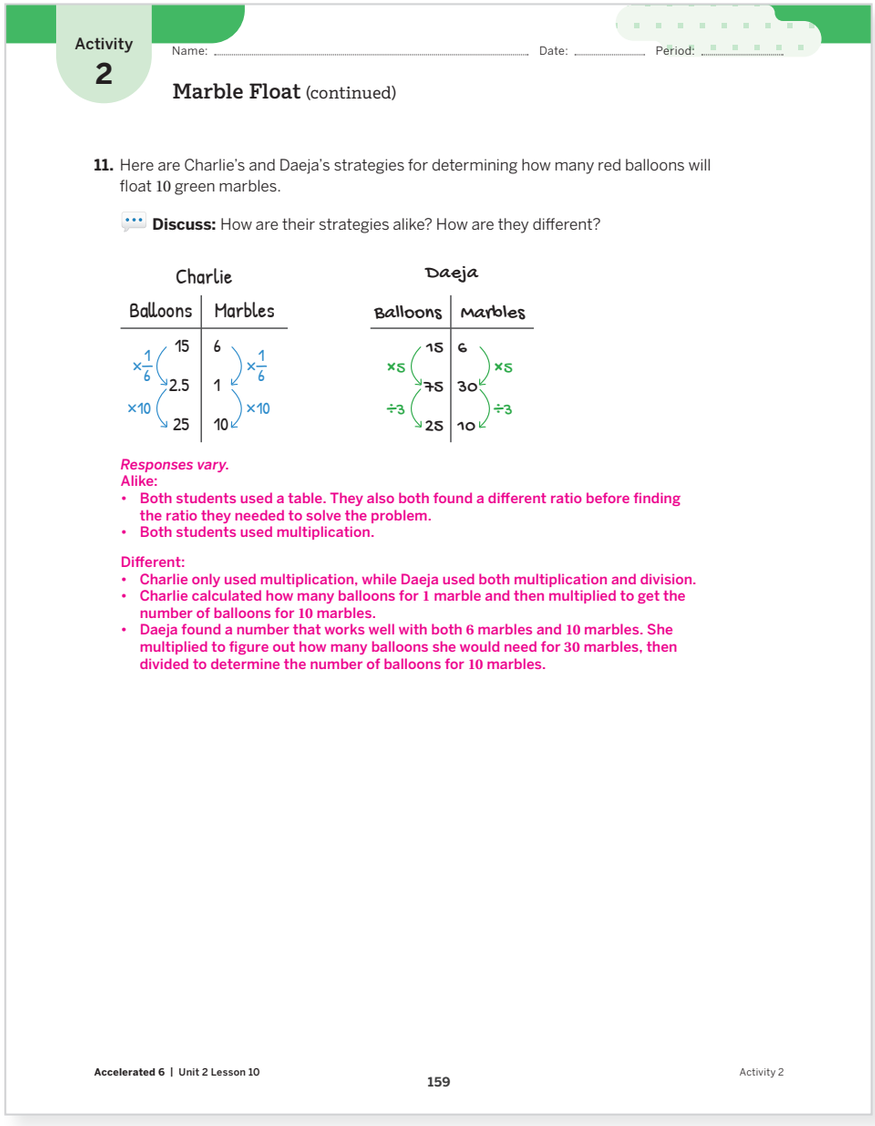
Look and listen for students making sense of each strategy, including referencing other strategies that are not pictured here. **(MTR.2.1)**

3 Connect

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to their strategy. See the Routine Facilitation Guide for more information.

To surface the Key Takeaway, consider asking:

- "Why do you think Daeja figured out how many balloons she needed for 30 marbles?"
- "How does what you see in Daeja's strategy connect with what you see in Charlie's?"
- "How are these two strategies connected? How can you see equivalent ratios in both representations?"
- "What are other strategies besides Charlie's and Daeja's?"



Activity 2

Name: Date: Period:

Marble Float (continued)

11. Here are Charlie's and Daeja's strategies for determining how many red balloons will float 10 green marbles.

Discuss: How are their strategies alike? How are they different?

Charlie

Balloons	Marbles
15	6
2.5	1
25	10

(×1/6, ×1/6, ×10, ×10)

Daeja

Balloons	Marbles
15	6
75	30
25	10

(×5, ×5, ÷3, ÷3)

Responses vary.

Alike:

- Both students used a table. They also both found a different ratio before finding the ratio they needed to solve the problem.
- Both students used multiplication.

Different:

- Charlie only used multiplication, while Daeja used both multiplication and division.
- Charlie calculated how many balloons for 1 marble and then multiplied to get the number of balloons for 10 marbles.
- Daeja found a number that works well with both 6 marbles and 10 marbles. She multiplied to figure out how many balloons she would need for 30 marbles, then divided to determine the number of balloons for 10 marbles.

Accelerated 6 | Unit 2 Lesson 10 159 Activity 2

Key Takeaway: To determine an unknown value in an equivalent ratio, consider using multiplication or division to make one of the values 1 or finding a common multiple of the original and desired values.

Independent | 10 min

Activity 3 Repeated Challenges

Purpose: Students develop fluency in using equivalent ratios to solve ratio problems.

1 Launch

Invite students to solve as many challenges as they have time for. Share that sense-making is more important than speed. **(MTR.5.1)**

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

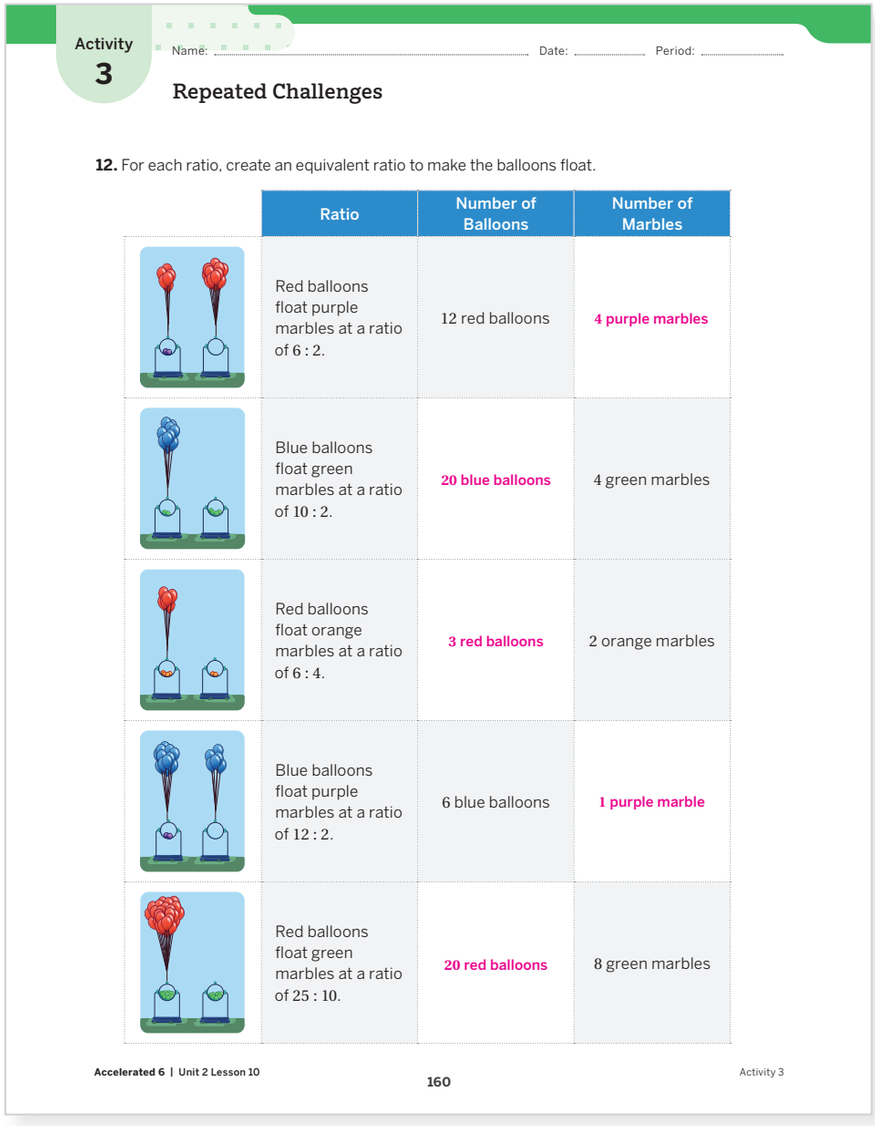
2 Monitor

Look and listen for strategies students use when discussing how to solve the problems, such as tables, double number lines, or calculators.

A **Accessibility: Memory and Attention** Invite students to use their Student Edition, additional paper, or a calculator to support students with performing calculations.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.



Activity 3

Name: Date: Period:

Repeated Challenges

12. For each ratio, create an equivalent ratio to make the balloons float.

	Ratio	Number of Balloons	Number of Marbles
	Red balloons float purple marbles at a ratio of 6 : 2.	12 red balloons	4 purple marbles
	Blue balloons float green marbles at a ratio of 10 : 2.	20 blue balloons	4 green marbles
	Red balloons float orange marbles at a ratio of 6 : 4.	3 red balloons	2 orange marbles
	Blue balloons float purple marbles at a ratio of 12 : 2.	6 blue balloons	1 purple marble
	Red balloons float green marbles at a ratio of 25 : 10.	20 red balloons	8 green marbles

Accelerated 6 | Unit 2 Lesson 10 160 Activity 3

Whole Class | 5 min

Synthesis

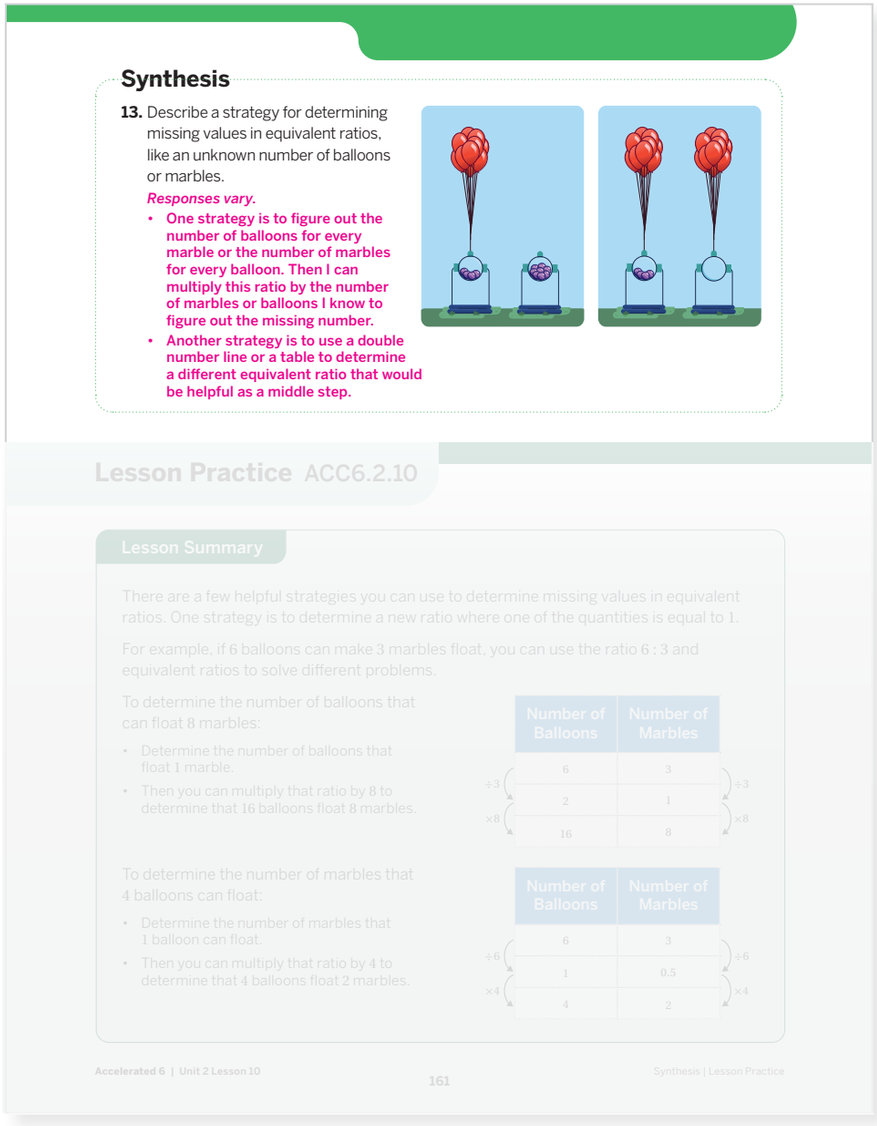
Purpose: Students synthesize their understanding of how to determine an unknown value in a ratio relationship.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Using a table or double number line to find equivalent ratios to use as a middle step.
- Making one of the values a 1 can be a helpful equivalent ratio that can be used as a middle step.
- Using a common multiple of the original and desired values can be helpful to find a ratio that can be used as a middle step.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

13. Describe a strategy for determining missing values in equivalent ratios, like an unknown number of balloons or marbles.

Responses vary.

- One strategy is to figure out the number of balloons for every marble or the number of marbles for every balloon. Then I can multiply this ratio by the number of marbles or balloons I know to figure out the missing number.
- Another strategy is to use a double number line or a table to determine a different equivalent ratio that would be helpful as a middle step.

Lesson Practice ACC6.2.10

Lesson Summary

There are a few helpful strategies you can use to determine missing values in equivalent ratios. One strategy is to determine a new ratio where one of the quantities is equal to 1.

For example, if 6 balloons can make 3 marbles float, you can use the ratio 6 : 3 and equivalent ratios to solve different problems.

To determine the number of balloons that can float 8 marbles:

- Determine the number of balloons that float 1 marble.
- Then you can multiply that ratio by 8 to determine that 16 balloons float 8 marbles.

Number of Balloons	Number of Marbles
6	3
2	1
16	8

(÷3, ÷3, ×8, ×8)

To determine the number of marbles that 4 balloons can float:

- Determine the number of marbles that 1 balloon can float.
- Then you can multiply that ratio by 4 to determine that 4 balloons float 2 marbles.

Number of Balloons	Number of Marbles
6	3
1	0.5
4	2

(÷6, ÷6, ×4, ×4)

Accelerated 6 | Unit 2 Lesson 10 161 Synthesis | Lesson Practice

Lesson Takeaway: To determine an unknown value in an equivalent ratio, consider using multiple strategies, such as creating a table or double number line where you can multiply or divide one of the values to be 1 or creating an equivalent ratio using a common multiple of the original and desired values.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by using any strategy to determine an unknown value in a ratio relationship.

Today's Goals

1. **Goal:** Use multiple steps to determine an unknown value in a ratio relationship.
2. **Language Goal:** Compare and contrast strategies for determining missing values in a ratio relationship. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: ..... Date: ..... Period: .....

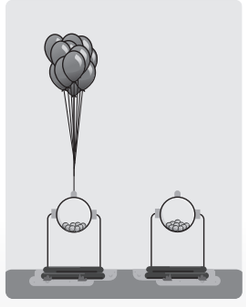
Show What You Know 2.10

Red balloons float orange marbles at a ratio of 12 : 8.

How many red balloons will float 10 orange marbles?

Show or explain your thinking.

15 red balloons. Responses vary. I divided 12 by 8 to determine the number of balloons it would take to float one orange marble. $\frac{12}{8} = 1.5$. Then, I multiplied 1.5 and 10 to get 15, the number of balloons needed to float 10 orange marbles.



D Differentiation Use after Lesson 10

Support

Provide targeted intervention for students by using these resources.

If students need support calculating missing quantities using equivalent ratios:

» **Respond to Student Thinking:**

- Use the *Using Ratio* Tables *to Solve Problems* **Mini-lesson.**
- Select a few related **Practice Problems** and provide individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities.**
- Encourage them to measure ramps at local buildings and use ratios to verify they are compliant.

Professional Learning

Reflect on your facilitation of MLR7: Compare and Connect in this lesson. How did students engage in the routine? What about how you facilitated the routine enhanced student engagement? How might you facilitate it differently in the future?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

13. Describe a strategy for determining missing values in equivalent ratios, like an unknown number of balloons or marbles.

Responses vary.

- One strategy is to figure out the number of balloons for every marble or the number of marbles for every balloon. Then I can multiply this ratio by the number of marbles or balloons I know to figure out the missing number.
- Another strategy is to use a double number line or a table to determine a different equivalent ratio that would be helpful as a middle step.

Lesson Practice ACC6.2.10

Lesson Summary

There are a few helpful strategies you can use to determine missing values in equivalent ratios. One strategy is to determine a new ratio where one of the quantities is equal to 1.

For example, if 6 balloons can make 3 marbles float, you can use the ratio 6 : 3 and equivalent ratios to solve different problems.

To determine the number of balloons that can float 8 marbles:

- Determine the number of balloons that float 1 marble.
- Then you can multiply that ratio by 8 to determine that 16 balloons float 8 marbles.

Number of Balloons	Number of Marbles
6	3
2	1
16	8

(×3, ÷3; ×8, ×8)

To determine the number of marbles that 4 balloons can float:

- Determine the number of marbles that 1 balloon can float.
- Then you can multiply that ratio by 4 to determine that 4 balloons float 2 marbles.

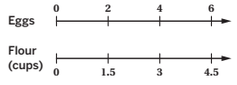
Number of Balloons	Number of Marbles
6	3
1	0.5
4	2

(÷6, ÷6; ×4, ×4)

Lesson Practice
ACC6.2.10

Name: _____ Date: _____ Period: _____

Problems 1–2: Here is a double number line showing the ratio of eggs to flour for different-sized cakes.



1. How much flour do you need for each egg in this recipe?

$\frac{3}{4}$ of a cup

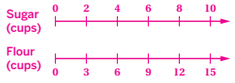
2. How many eggs would you need for 18 cups of flour?

24 eggs

Problems 3–5: The same cake recipe uses 2 cups of sugar for every 3 cups of flour.

3. Draw a double number line to represent this situation.

Sample response shown.



4. How much sugar do you need for 18 cups of flour?

12 cups

5. Which representation do you prefer to help you answer the previous question: a table, a double number line, or some other tool? Explain your thinking.

Responses vary. I prefer to use a table to help me answer the previous question. I can multiply down the table to find an equivalent ratio for the cups of sugar I need when using 18 cups of flour.

6. Raven and Tiana are both training for a swimming competition in the same pool. Raven can swim 6 laps in 3 minutes. Tiana can swim 3 laps in 2 minutes. If both swimmers maintain their pace, which statement is *not* true?

A. Raven can swim 2 laps per minute.

B. Tiana can swim 1.5 laps in one minute.

C. In 6 minutes, Raven can swim 3 more laps than Tiana.

D. In 12 minutes, Tiana swims 8 fewer laps than Raven.

Lesson Practice
ACC6.2.10

Name: _____ Date: _____ Period: _____

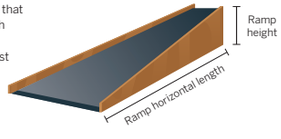
7. Inola is making personal pizzas for her birthday party. For 4 pizzas, she uses 10 ounces of cheese. Complete the table using this ratio.

Number of Pizzas	Cheese (oz)
12	30
22	55
11	27.5

FAST Practice

8. A builder is following a set of instructions that states that the maximum height-to-length ratio of a curb ramp is 1 : 12. That means for every 1 inch of ramp height, there must be at least 12 inches of ramp length.

Chloe measured the height of this ramp as 30 inches. What's the minimum horizontal length of the ramp?



360 inches

Spiral Review

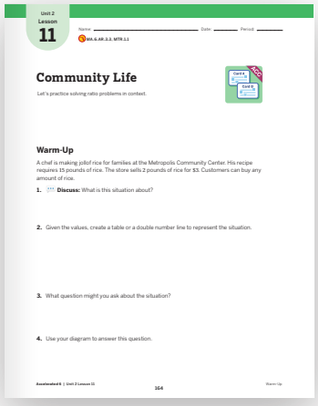
9. Fill in each blank using the numbers 1 to 12 only once to make each expression true.

Sample responses shown.

$\frac{7}{10} < \frac{3}{4}$ $\quad \frac{6}{8} = \frac{9}{12}$ $\quad \frac{1}{2} > \frac{5}{11}$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–2, 4–5, 7	2	MA.6.AR.3.3
	3	1	MA.6.AR.3.3
	6	3	MA.6.AR.3.3
FAST Practice	8	2	MA.6.AR.3.3
Spiral Review			
	9	1	MA.4.FR.1.4


Unit 2
Lesson
11
Name _____ Date _____ Period _____
MA.6.AR.3.3, MTR.1.1
Community Life
Let's practice solving ratio problems in context.
Warm-Up
A chef is making jollof rice for families at the Metropolis Community Center. His recipe requires 15 pounds of rice. The store sells 2 pounds of rice for $3. Customers can buy any amount of rice.
1. Discuss: What is this situation about?
2. Given the values, create a table or a double number line to represent the situation.
3. What question might you ask about the situation?
4. Use your diagram to answer this question.
Accelerated 6 | Unit 2 Lesson 11
164
Warm-Up

Community Life

Solving Equivalent Ratio Problems in Context

Let's practice solving ratio problems in context.

Learning Outcomes

Today's Goals

1. **Goal:** Use a variety of strategies to solve problems involving ratios.
2. **Language Goal:** Justify whether ratio reasoning can be applied to solve problems in context. **(Writing, Speaking, and Listening)**

Students make sense of a situation involving jollof rice using **MLR6: Three Reads**. They determine whether ratio reasoning can be used to understand more about the rice situation and then explore a variety of other problems, considering whether or not each one can be solved using ratios. Lastly, they solve for the unknown value in two of the situations by using any method and representation they choose.

Coherence

Prior Learning

In Lesson 10, students compared ratios and solved problems by reasoning about tables of equivalent ratios and double number line diagrams to calculate the missing number of balloons or marbles in different ratios.

Future Learning

In Lesson 12, students will apply their understanding of ratio reasoning to analyze lunch waste.

Connections

- Students use ratio reasoning to solve problems involving the cost of rice per pound of rice and the number of people compared to the number of hospitals in a city. (cross-curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3

Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

Mathematical Thinking and Reasoning Standard: MTR.1.1

ELA Expectations: ELA.K12.EE.2.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.AR.3.2	**MA.7.AR.3.2**
MA.6.NSO.2.3	**MA.7.AR.4.1**
	MA.7.AR.4.2
	MA.7.AR.4.3
	MA.7.AR.4.4

Lesson at a Glance

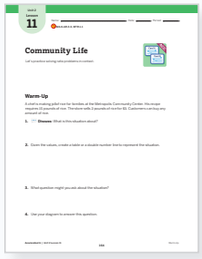
~ 45 min

MA.6.AR.3.3

Warm-Up

Pairs | 5 min

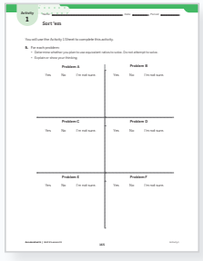
Students use MLR6: Three Reads to make sense of a situation described in words. **(MTR.1.1)**



Activity 1

Pairs | 10 min

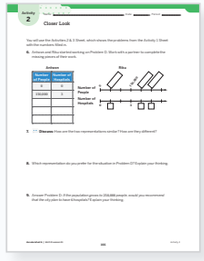
Students use MLR7: Compare and Connect to determine which problems from a variety of situations could be solved using equivalent ratios.



Activity 2

Pairs | 10 min

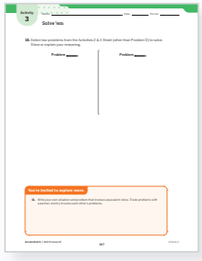
Students analyze tools for solving Problem D before solving the other problems on their own in Activity 3. **Routine:** Think-Pair-Share **(MTR.1.1)**



Activity 3

Pairs | 10 min

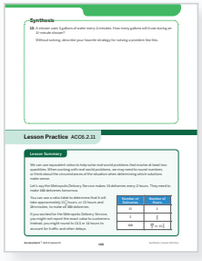
Students solve problems about situations involving equivalent ratios by strategically selecting a tool.



Synthesis

Whole Class | 5 min

Students synthesize their understanding of the association between the quantities in a situation and if the problem can be solved using equivalent ratios. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the problem that can be solved using equivalent ratios by analyzing the association between the quantities.

Prep Checklist

Prepare copies of the Activity 1 Sheet and Activities 2 & 3 Sheet.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Sheet, one per student.
  - Calculator
- Activity 2 & 3 Sheet, one per student

Pairs | 5 min

Warm-Up

Purpose: Students use MLR6: Three Reads to make sense of a situation described in words. **(MTR.1.1)**

1 Launch

MLR **MLR6: Three Reads** Invite students to read the next three problems, each with a particular focus, to support students in making sense of the situation. **(MTR.1.1)**

Invite a student to read the problem aloud, then discuss the prompt.

To surface connections, invite students to share a personal experience they have with the context (e.g., a time they've made food for a crowd or purchased food at an event).

Direct students' attention to Problem 2, then invite students to write their response in the Student Edition.

Invite students to share what new information they have about the situation after this read.

Direct students' attention to Problem 3. Invite students to share their questions with the class and write them for all to see.

Encourage students to answer a question that a classmate shared in addition to their own.

D **Differentiation: (Stretch)** Invite students to determine the cost of 8.5 pounds of rice.

2 Connect

Invite students to share the questions they asked about the situation and their solutions.

Consider asking:

- "Do you have enough information to solve the question that was asked?"
- "What else do you need to know to answer the question?"
- "Where do we see equivalent ratios in our diagram?"
- "Did you hear any questions that could be answered with equivalent ratios?"

Unit 2
Lesson
11

Name: _____ Date: _____ Period: _____

MA.6.AR.3.3, MTR.1.1

Community Life

Let's practice solving ratio problems in context.

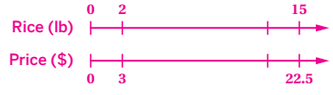
Warm-Up

A chef is making jollof rice for families at the Metropolis Community Center. His recipe requires 15 pounds of rice. The store sells 2 pounds of rice for $3. Customers can buy any amount of rice.

1. **Discuss:** What is this situation about?
   Responses vary. The situation is about a chef making a rice dish for many families and a store that sells rice.

2. Given the values, create a table or a double number line to represent the situation.

Rice (lbs)	Price ($)
2	3
15	22.5



3. What question might you ask about the situation?
   Responses vary. How much would the chef pay for 15 pounds of rice?

4. Use your diagram to answer this question.
   Responses vary. I calculated the cost of 1 pound of rice as $3 \div 2 = \$1.50$. Then I determined the price for 15 pounds of rice as $1.50 \cdot 15 = \$22.50$.

Accelerated 6 | Unit 2 Lesson 11 164 Warm-Up

Pairs | 10 min

Activity 1 Sort 'em

Purpose: Students use **MLR7: Compare and Connect** to determine which problems from a variety of situations could be solved using equivalent ratios.

1 Launch

Distribute the Activity 1 Sheet. Invite students to read each problem and reach an agreement about using equivalent ratios to solve. Encourage students to write the information they are given in the boxes on the Student Edition.

2 Monitor

Select and sequence a variety of responses to share during the Connect.

D Differentiation

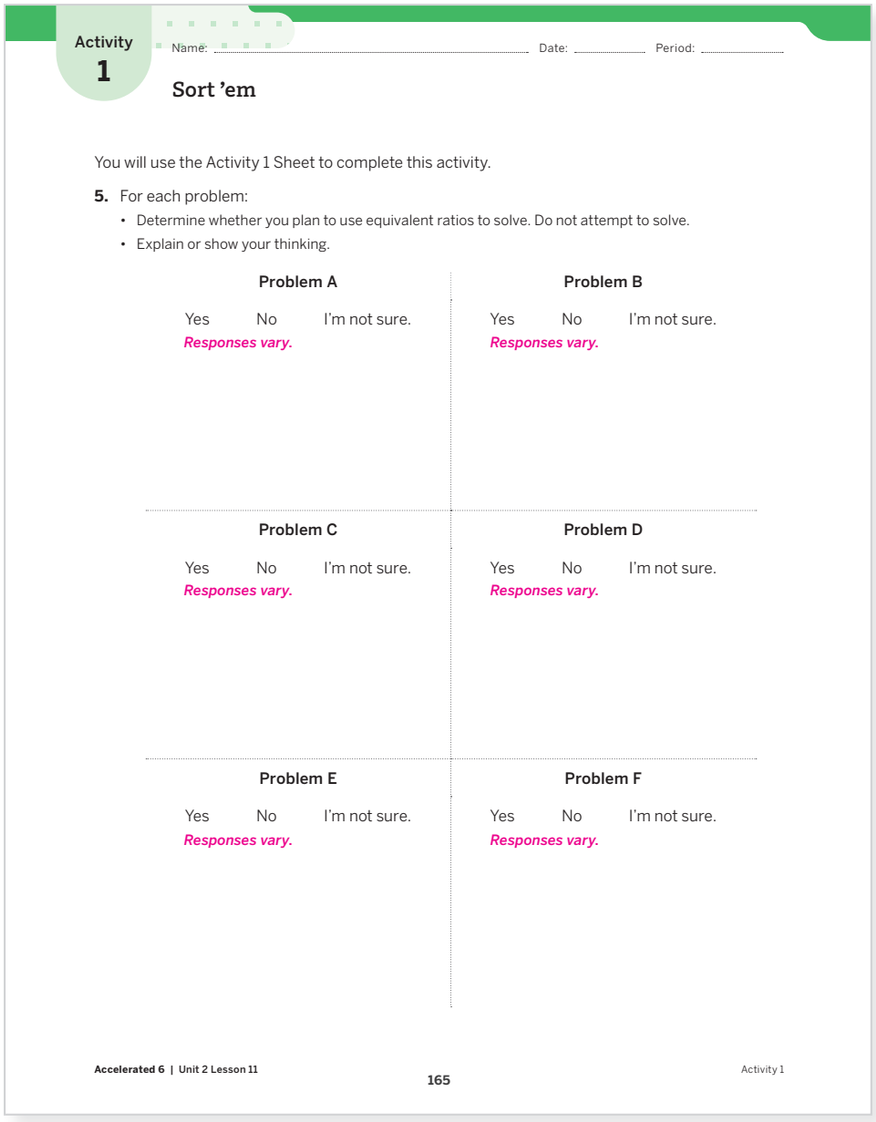
Look for students who:	Respond to Student Thinking
Think that it is not possible to decide about the problems because there are no numbers.	**Support** Encourage students to make sense of the situation in each problem by writing down the quantities rather than focusing on numbers.
Record the quantities that have ratio relationships in each problem.	**Strengthen** Consider asking, "How do these quantities help me determine if this is a situation involving equivalent ratios? What would the relationship look like?"
Identify relevant information by asking, "Do I have enough information to determine the answer?"	

A Accessibility: Conceptual Processing To provide access, begin with a demonstration of Problem A. Check in with individual students as needed to assess for comprehension as they sort each card.

3 Connect

MLR MLR7: Compare and Connect Invite students to analyze and compare each problem, and then connect to the other problems.

To surface the Key Takeaway, consider asking, "How can you tell if a problem will use equivalent ratios?"



Activity 1

Name: _____ Date: _____ Period: _____

Sort 'em

You will use the Activity 1 Sheet to complete this activity.

5. For each problem:
   - Determine whether you plan to use equivalent ratios to solve. Do not attempt to solve.
   - Explain or show your thinking.

Problem A

Yes No I'm not sure.

Responses vary.

Problem B

Yes No I'm not sure.

Responses vary.

Problem C

Yes No I'm not sure.

Responses vary.

Problem D

Yes No I'm not sure.

Responses vary.

Problem E

Yes No I'm not sure.

Responses vary.

Problem F

Yes No I'm not sure.

Responses vary.

Accelerated 6 | Unit 2 Lesson 11 165 Activity 1

Key Takeaway: If the quantities have a ratio relationship, then equivalent ratios can be used to determine the precise answer in each scenario.

Pairs | 10 min

Activity 2 Closer Look

Purpose: Students analyze tools for solving Problem D before solving the other problems on their own in Activity 3. **(MTR.1.1)**

1 Launch

Distribute the Activities 2 & 3 Sheet. Students will focus on Problem D in this activity and will choose two other problems to solve in Activity 3.

Direct students' attention to Problem D and invite students to read the prompt aloud before looking at Antwon's and Riku's work.

Use the **Think-Pair-Share routine** to support student-to-student discourse about Antwon's and Riku's work and how they are similar and different. Invite students to think independently and then take turns sharing with a partner. Invite several students to share their or their partner's thinking with the class.

2 Monitor

Look and listen for a variety of student thinking.

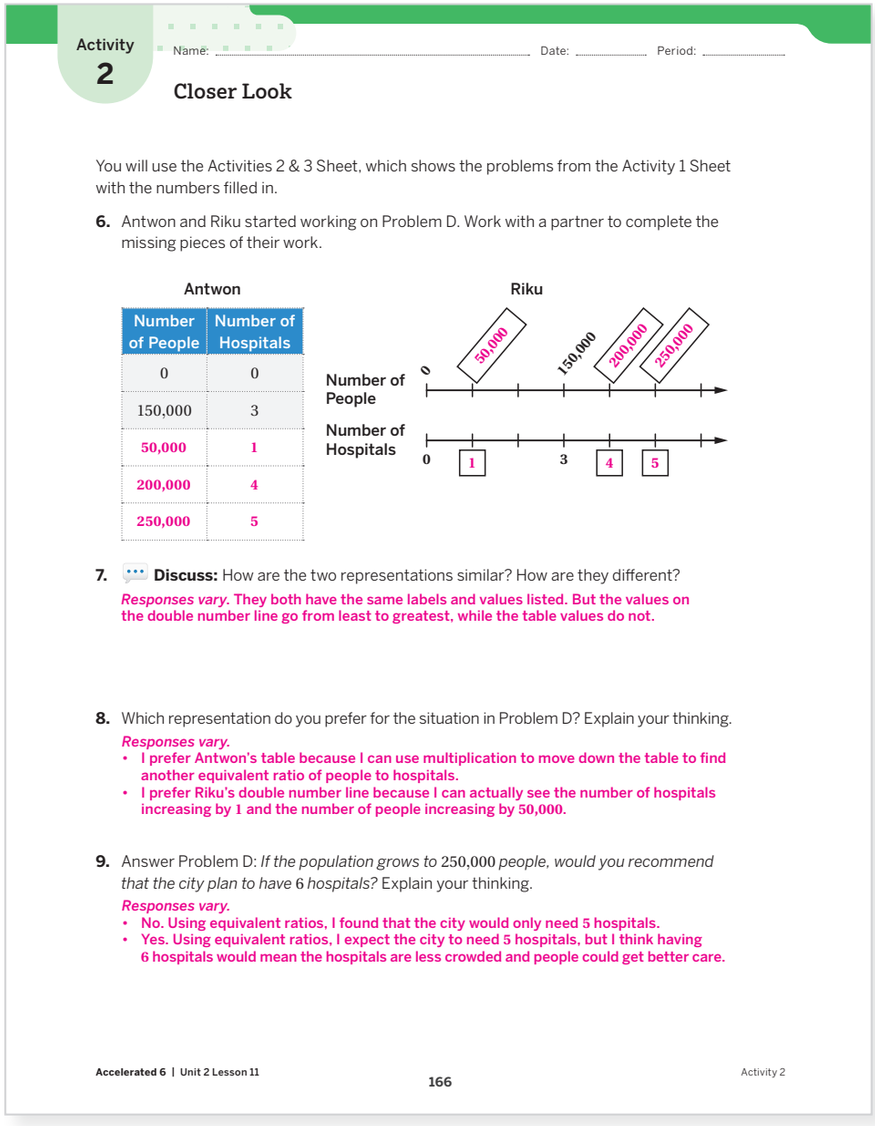
D Differentiation *(Problem 6)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking: • "What equivalent ratios do you see in Antwon's work? In Riku's work?" • "What other equivalent ratios can be made?" • "How can we check if two ratios are equivalent?"
Double the numbers as they go down the columns of the table.	**Strengthen** Consider asking, "How many people can be accommodated by only 1 hospital? How could this help us determine whether recommending 6 hospitals is enough?"
Determine the number of people for 1 hospital to calculate the number of hospitals needed for 250,000 people.	**Stretch** Encourage students who finish early to begin Activity 3.

3 Connect

Invite students to share their reasoning in Problem 8 after polling the class to see the distribution of responses. **(MTR.1.1)**

To surface the Key Takeaway, consider asking:
- "How did you decide if 6 hospitals are reasonable?"
- "How could you use the table to decide if 6 hospitals are reasonable? The double number line diagram?"



Activity 2

Name: _____ Date: _____ Period: _____

Closer Look

You will use the Activities 2 & 3 Sheet, which shows the problems from the Activity 1 Sheet with the numbers filled in.

6. Antwon and Riku started working on Problem D. Work with a partner to complete the missing pieces of their work.

Antwon

Number of People	Number of Hospitals
0	0
150,000	3
50,000	1
200,000	4
250,000	5

Riku

7. **Discuss:** How are the two representations similar? How are they different?

Responses vary. They both have the same labels and values listed. But the values on the double number line go from least to greatest, while the table values do not.

8. Which representation do you prefer for the situation in Problem D? Explain your thinking.

Responses vary.
- I prefer Antwon's table because I can use multiplication to move down the table to find another equivalent ratio of people to hospitals.
- I prefer Riku's double number line because I can actually see the number of hospitals increasing by 1 and the number of people increasing by 50,000.

9. Answer Problem D: *If the population grows to 250,000 people, would you recommend that the city plan to have 6 hospitals?* Explain your thinking.

Responses vary.
- No. Using equivalent ratios, I found that the city would only need 5 hospitals.
- Yes. Using equivalent ratios, I expect the city to need 5 hospitals, but I think having 6 hospitals would mean the hospitals are less crowded and people could get better care.

Accelerated 6 | Unit 2 Lesson 11 166 Activity 2

Key Takeaway: Equivalent ratios can help you to determine unknown values. Interpreting these values helps make sense of the situation.

Pairs | 10 min

Activity 3 Solve 'em

Purpose: Students solve problems about situations involving equivalent ratios by strategically selecting a tool.

Short on time? Consider asking students to only solve one problem in Activity 3.

1 Launch

Direct students' attention to the five problems and invite students to select two that they would like to solve with a partner.

A **Accessibility: Conceptual Processing** To support students in applying concepts to new situations, encourage them to identify the "for each" relationship in every problem. Then invite students to determine a ratio per unit item for each problem before solving.

2 Monitor

To support students getting started, encourage them to select the tool they think will help them solve each problem (ratio tables, double number lines, dividing to determine a ratio per unit item, etc.).

Encourage students to try multiple tools to compare their results.

ELL **English Language Learners** Encourage students to use gestures or hand motions to help them verbally describe their preferred representation and why they prefer it. **(Speaking)**

Look and listen for students using a variety of different tools to solve problems and invite them to share during the Connect. Consider focusing on one problem that multiple students chose.

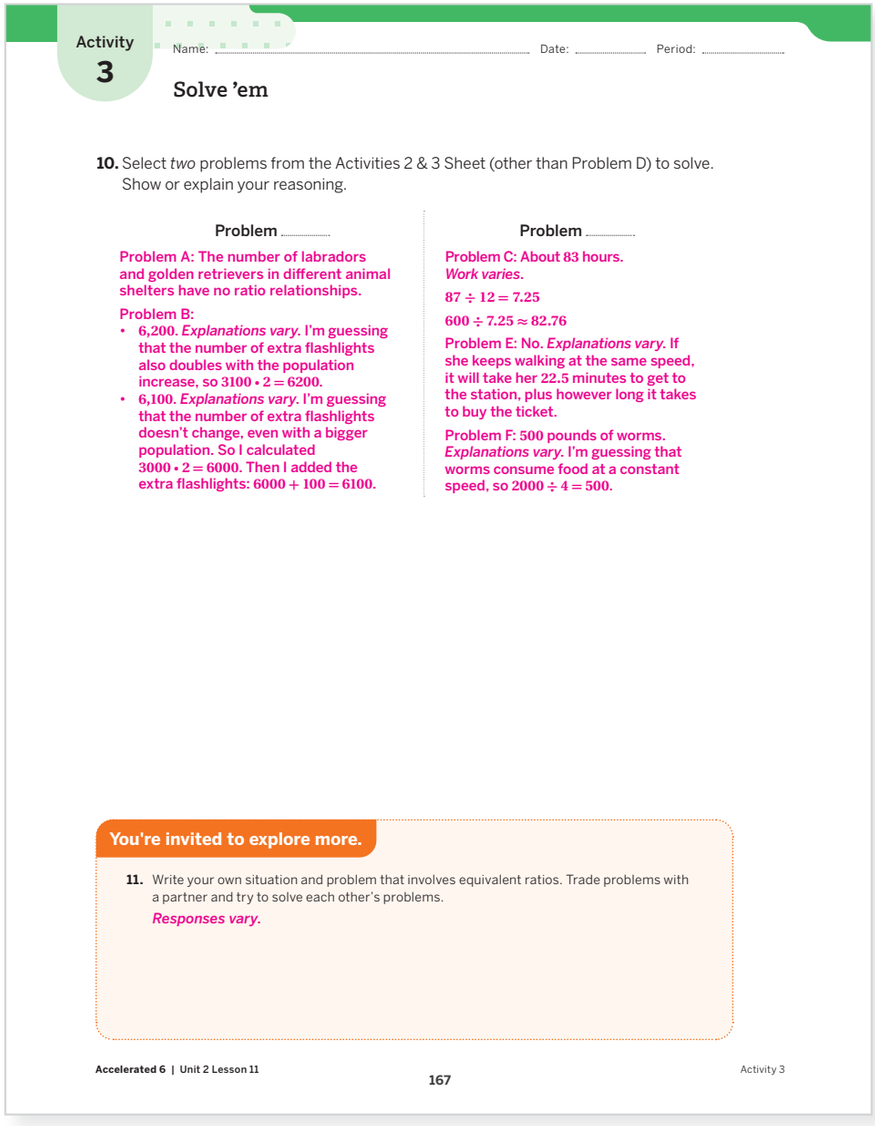
D **Differentiation: You're invited to explore more. (Stretch)** Invite students to explore equivalent ratios further with this optional problem.

3 Connect

Invite students to share how they used their chosen representation to solve the problems.

Consider asking:

- "Which problem do you think is most challenging to solve?"
- "What tools would be most helpful in solving this problem?"
- "Where else in your community might you see equivalent ratios?"



Activity 3

Name: Date: Period:

Solve 'em

10. Select *two* problems from the Activities 2 & 3 Sheet (other than Problem D) to solve. Show or explain your reasoning.

Problem

Problem A: The number of labradors and golden retrievers in different animal shelters have no ratio relationships.

Problem B:

- 6,200. *Explanations vary.* I'm guessing that the number of extra flashlights also doubles with the population increase, so $3100 \cdot 2 = 6200$.
- 6,100. *Explanations vary.* I'm guessing that the number of extra flashlights doesn't change, even with a bigger population. So I calculated $3000 \cdot 2 = 6000$. Then I added the extra flashlights: $6000 + 100 = 6100$.

Problem

Problem C: About 83 hours. *Work varies.*

$87 \div 12 = 7.25$

$600 \div 7.25 \approx 82.76$

Problem E: No. *Explanations vary.* If she keeps walking at the same speed, it will take her 22.5 minutes to get to the station, plus however long it takes to buy the ticket.

Problem F: 500 pounds of worms. *Explanations vary.* I'm guessing that worms consume food at a constant speed, so $2000 \div 4 = 500$.

You're invited to explore more.

11. Write your own situation and problem that involves equivalent ratios. Trade problems with a partner and try to solve each other's problems.

Responses vary.

Accelerated 6 | Unit 2 Lesson 11 167 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of the association between the quantities in a situation and if the problem can be solved using equivalent ratios.

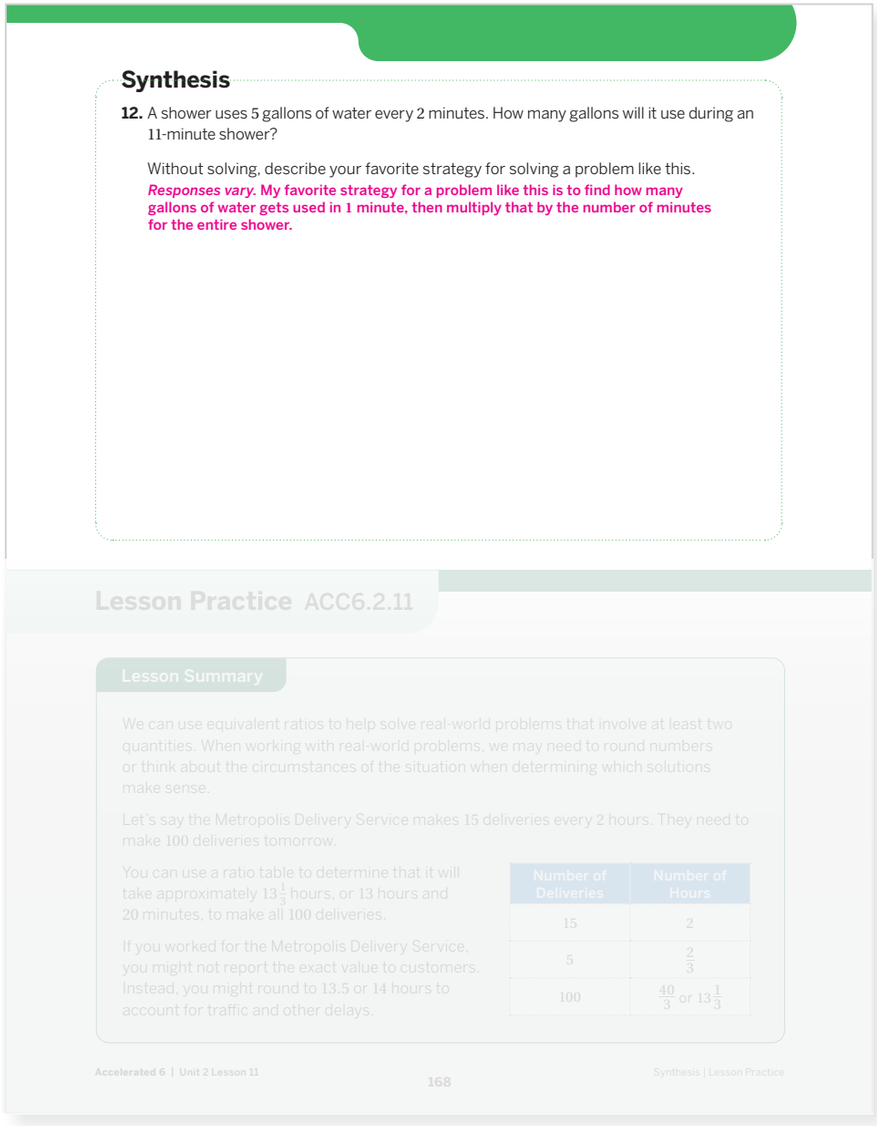
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Finding a unit rate of gallons per one minute and multiplying by 11.
- Using a double number line to create a variety of equivalent ratios.
- Using a ratio table to create a variety of equivalent ratios.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they discuss equivalent ratios. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

12. A shower uses 5 gallons of water every 2 minutes. How many gallons will it use during an 11-minute shower?

Without solving, describe your favorite strategy for solving a problem like this.

Responses vary. My favorite strategy for a problem like this is to find how many gallons of water gets used in 1 minute, then multiply that by the number of minutes for the entire shower.

Lesson Practice ACC6.2.11

Lesson Summary

We can use equivalent ratios to help solve real-world problems that involve at least two quantities. When working with real-world problems, we may need to round numbers or think about the circumstances of the situation when determining which solutions make sense.

Let's say the Metropolis Delivery Service makes 15 deliveries every 2 hours. They need to make 100 deliveries tomorrow.

You can use a ratio table to determine that it will take approximately $13\frac{1}{3}$ hours, or 13 hours and 20 minutes, to make all 100 deliveries.

Number of Deliveries	Number of Hours
15	2
5	$\frac{2}{3}$
100	$\frac{40}{3}$ or $13\frac{1}{3}$

If you worked for the Metropolis Delivery Service, you might not report the exact value to customers. Instead, you might round to 13.5 or 14 hours to account for traffic and other delays.

Accelerated 6 | Unit 2 Lesson 11 168 Synthesis | Lesson Practice

Lesson Takeaway: There are a variety of strategies to solve problems involving ratios, including finding a ratio per one item, using ratio tables, and using double number lines. Different strategies are helpful for visualizing and solving different problems in context.

Independent | 5 min

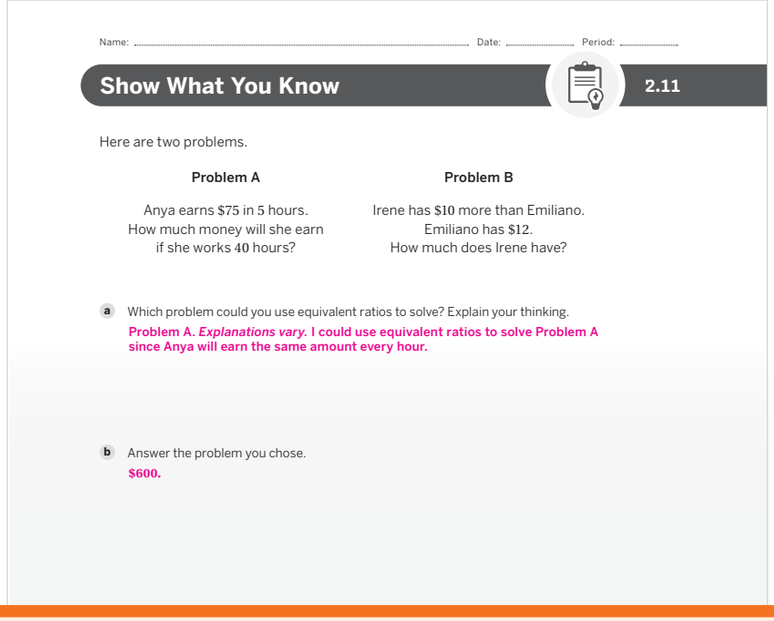
Show What You Know

Purpose: Students demonstrate their understanding by determining the problem that can be solved using equivalent ratios by analyzing the association between the quantities.

Today's Goals

1. **Goal:** Use a variety of strategies to solve problems involving ratios.
2. **Language Goal:** Justify whether ratio reasoning can be applied to solve problems in context. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 2.11

Here are two problems.

Problem A	Problem B
Anya earns $75 in 5 hours. How much money will she earn if she works 40 hours?	Irene has $10 more than Emiliano. Emiliano has $12. How much does Irene have?

a. Which problem could you use equivalent ratios to solve? Explain your thinking.

Problem A. *Explanations vary.* I could use equivalent ratios to solve Problem A since Anya will earn the same amount every hour.

b. Answer the problem you chose.

$600.

Differentiation Use after Lesson 11

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to use ratio tables and number lines to calculate missing quantities:

» **Respond to Student Thinking:**

- Use the *Using Ratio Tables to Solve Problems* **Mini-lesson.**
- Selecting a few related **Practice Problems** and giving individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to research the number of hospitals in different communities and countries. Invite them to compare their data to Antwon's and Riku's work in **Activity 2**.

Professional Learning

Take a moment to reflect on this lesson. How did **MLR6: Three Reads** support students in establishing a shared understanding of the jollof rice situation?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

12. A shower uses 5 gallons of water every 2 minutes. How many gallons will it use during an 11-minute shower?

Without solving, describe your favorite strategy for solving a problem like this.

Responses vary. My favorite strategy for a problem like this is to find how many gallons of water gets used in 1 minute, then multiply that by the number of minutes for the entire shower.

Lesson Practice ACC6.2.11

Lesson Summary

We can use equivalent ratios to help solve real-world problems that involve at least two quantities. When working with real-world problems, we may need to round numbers or think about the circumstances of the situation when determining which solutions make sense.

Let's say the Metropolis Delivery Service makes 15 deliveries every 2 hours. They need to make 100 deliveries tomorrow.

You can use a ratio table to determine that it will take approximately $13\frac{1}{3}$ hours, or 13 hours and 20 minutes, to make all 100 deliveries.

Number of Deliveries	Number of Hours
15	2
5	$\frac{2}{3}$
100	$\frac{40}{3}$ or $13\frac{1}{3}$

If you worked for the Metropolis Delivery Service, you might not report the exact value to customers. Instead, you might round to 13.5 or 14 hours to account for traffic and other delays.

Lesson Practice
ACC6.2.11

Name: ..... Date: ..... Period: .....

Problems 1–2: Julian is paid $90 for 8 hours of work at a restaurant.

1. Complete the table to determine the amount of money Julian is paid.

Response shown in table.

Hours of Work	Amount Paid ($)
24	270
10	112.50
3	33.75

2. Wey Wey is paid $56 for 5 hours of work. Is she being paid the same as Julian? Show or explain your thinking.

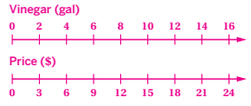
No. *Explanations vary.* Julian is getting $56.25 for 5 hours of work.

Problems 3–6: A chef needs 15 gallons of vinegar to make pickles. A store sells 2 gallons of vinegar for $3 and allows customers to buy any amount of vinegar they want.

3. Make a table to represent this situation.

Vinegar (gal)	Price ($)
2	3
1	1.5
15	22.5

4. Draw a double number line to represent this situation.



5. Use any representation to determine how much the 15 gallons of vinegar will cost.

$22.50

6. Which representation did you prefer in this situation? Explain your thinking.

Responses vary.
- I prefer the table because I can put the numbers in any order.
- I prefer the double number line because I can use the number lines to make sure my answer makes sense.

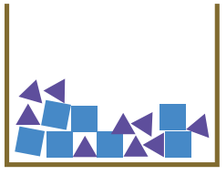
Lesson Practice
ACC6.2.11

Name: ..... Date: ..... Period: .....

FAST Practice

7. Tyler has a box with square and triangle building blocks in it. How many blocks of each kind would Tyler need to add so that the ratio of square blocks to triangle blocks is 5 : 7?

Tyler would need [3] square blocks and [5] triangle blocks.



Spiral Review

Problems 8–11: Write in a number to make each equation true.

8. $4 \cdot [6] = 24$

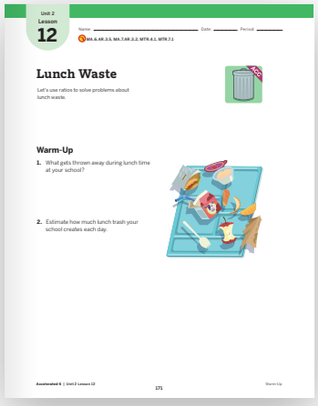
9. $24 \cdot [\frac{1}{6}] = 4$

10. $\frac{1}{6} \cdot 6 = [1]$

11. $6 \cdot [\frac{1}{6}] = 1$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–6	2	MA.6.AR.3.3
FAST Practice	7	2	MA.6.AR.3.3
Spiral Review			
	8–11	1	MA.4.FR.2.4


Unit 2
Lesson
12

Lunch Waste

Let's use ratios to solve problems about lunch waste.

Warm-Up

1. What gets thrown away during lunch time at your school?

2. Estimate how much lunch trash your school creates each day.

171

Lunch Waste

Applying Ratio Strategies

Let's use ratios to solve problems about lunch waste.

Learning Outcomes

Today's Goals

1. **Goal:** Apply ratio reasoning to answer questions about a real-world situation.
2. **Language Goal:** Describe the relationship between ratios in context using mathematically precise language. **(Writing, Speaking, and Listening)**

Students use their personal experiences and the different kinds of ratio reasoning they have learned to make sense of school lunch waste. This lesson surfaces ideas of equivalent ratios and part-part-whole ratios, giving students the flexibility to choose their own strategies as they determine how much waste is generated and analyze solutions for reducing the amount of lunch waste. **(MTR.7.1)**

Coherence

Prior Learning

In Lesson 11, students used equivalent ratio tables and double number line diagrams to solve ratio problems.

Future Learning

In Unit 3, students will extend their work with ratios to focus on the concept of rates, particularly unit rates (per 1) and percentages (per 100).

Connections

- Students use ratios and proportions to determine the best solutions to reduce the amount of waste in their schools by composting and using recycling programs. (cross-curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.5

Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

MA.7.AR.3.2

Apply previous understanding of ratios to solve real-world problems involving proportions.

Mathematical Thinking and Reasoning Standards: MTR.4.1, MTR.7.1

ELA Expectation: ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.AR.1.3 **MA.6.AR.3.3**	**MA.7.AR.3.2**

Lesson at a Glance

~ 45 min

MA.6.AR.3.5, MA.7.AR.3.2

Warm-Up

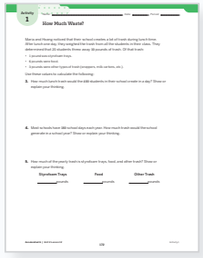
Pairs | 5 min

Students begin thinking about how much gets thrown away at lunch time using a Think-Pair-Share routine.

Activity 1

Small Groups | 15 min

Students use ratio relationships to determine how much trash is created at a school.



Activity 2

Small Groups | 15 min

Students use ratio strategies to analyze ways to reduce lunch waste. MLR1: Stronger and Clearer Each Time

Synthesis

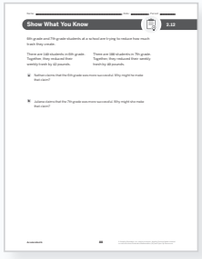
Whole Class | 5 min

Students synthesize their understanding that different strategies can be applied to solve real-world ratio problems.

Show What You Know

Independent | 5 min

Students demonstrate their understanding by justifying solutions that compare total amounts and other comparisons involving ratios. **(MTR.4.1)**



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students begin thinking about how much gets thrown away at lunch time using a Think-Pair-Share routine.

1 Launch

Direct students' attention to the picture of the lunch tray and invite students to read the questions to a partner.

A **Accessibility: Conceptual Processing** To support students in accessing the context of this activity, invite them to first write down everything they do during their lunch period, starting with getting in line. Consider asking, "What are some things you pick up in the lunch line? What are some things you pick up before you sit down? How many of those things do you throw away?"

Use the Think-Pair-Share routine to help students shape their ideas about what counts as lunch waste. Invite students to think independently and then take turns sharing with a partner. Invite several students to share their or their partner's thinking with the class.

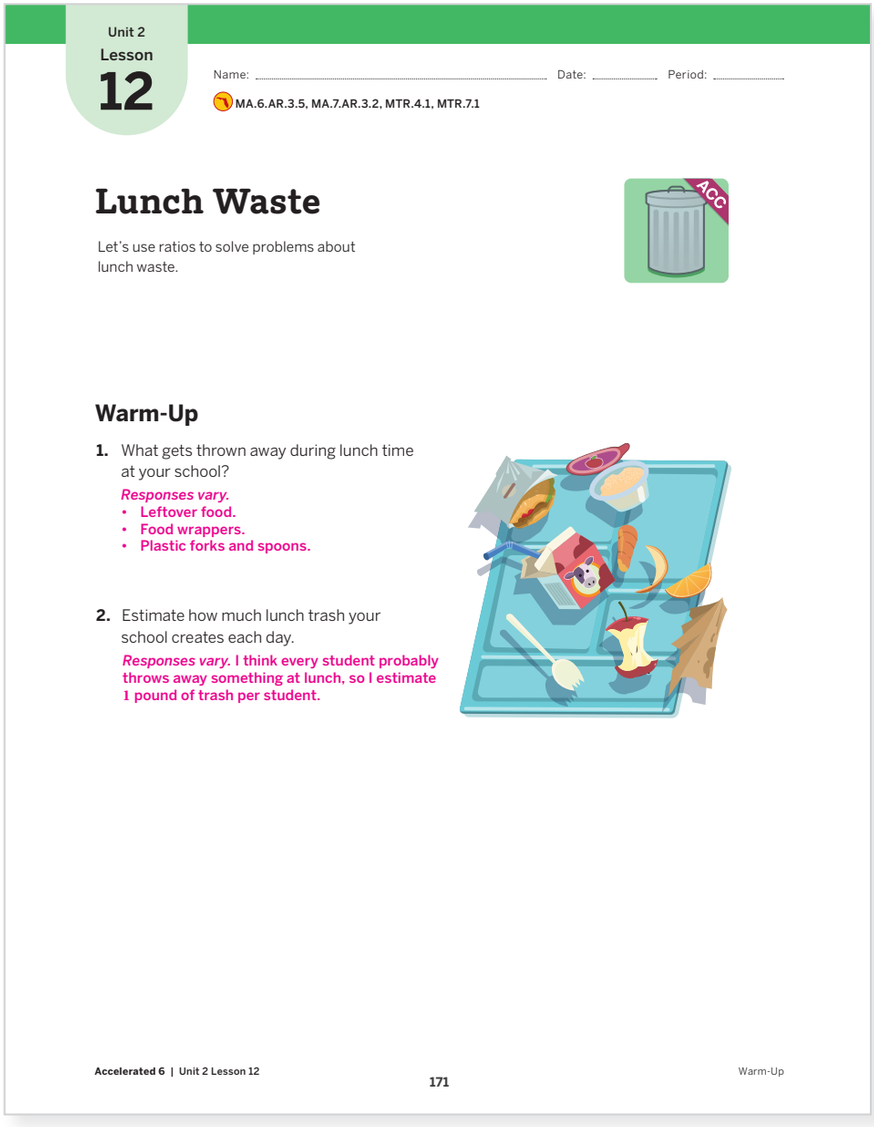
D **Differentiation: (Stretch)** Encourage students to phrase their answer as a ratio that is "per 1" student. Then have them estimate how much trash would be produced by their class.

2 Connect

Invite students to share their lists of waste and estimates of how much of each is thrown out each day at lunch. Consider writing a list of lunch trash and a range of student estimates on the board to refer back to during Activities 1 and 2.

Consider asking:

- "How do you feel about the amount of trash thrown away at lunch time?" *Responses vary.* I don't like it when food gets thrown away because it is very wasteful, and some people don't have enough food in the world so we shouldn't waste it.
- "Do you think this is more or less than the amount of trash created at home? At other schools? Why?" *Responses vary.* At home we eat off of dishes that we wash and save our leftovers, so we use less waste.



Unit 2
Lesson
12

Name: _____ Date: _____ Period: _____

MA.6.AR.3.5, MA.7.AR.3.2, MTR.4.1, MTR.7.1

Lunch Waste

Let's use ratios to solve problems about lunch waste.

ACC

Warm-Up

1. What gets thrown away during lunch time at your school?

   Responses vary.
   - Leftover food.
   - Food wrappers.
   - Plastic forks and spoons.

2. Estimate how much lunch trash your school creates each day.

   Responses vary. I think every student probably throws away something at lunch, so I estimate 1 pound of trash per student.

Accelerated 6 | Unit 2 Lesson 12 171 Warm-Up

Small Groups | 15 min

Activity 1 How Much Waste?

Purpose: Students use ratio relationships to determine how much trash is created at a school.

1 Launch

Invite one student to read the prompt and then invite all students to restate the situation to a partner.

Encourage students to ask a question about anything that doesn't make sense before they begin their work.

2 Monitor

Capture responses where students selected different tools (double number lines, tape diagrams, ratio tables) to solve the problems.

D Differentiation *(Problems 3–5)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What does the 400 represent about the situation? Do you have any other information like that to help you write a ratio?"
Choose the appropriate tool (a ratio table, tape diagram, or double number line diagram) to represent each scenario.	**Strengthen** Invite them to explain their reasoning for selecting each tool. Consider asking, "Could you use a different tool? Why or why not?"
Divide the total by 1, 6, and 3 to determine the amount of each type of trash.	**Strengthen** Encourage students to draw a tape diagram to model the part-part-part-whole ratio.
Have precise double number lines and tape diagrams with explanations of their reasoning.	**Stretch** Invite these students to share during the Connect. Encourage students to determine the "per one" ratios of styrofoam trays per student, food waste per student, and other trash per student.

3 Connect

Invite several students to share their thinking for Problems 3 and 5. Consider asking, "Why did you choose this representation for this problem?"

To surface the Key Takeaway, consider asking:
- "What tools were helpful as you considered each of these problems?"
- "Do you think your answer for the total amount of waste at this school is accurate? Why or why not?"

Activity 1

Name: _____ Date: _____ Period: _____

How Much Waste?

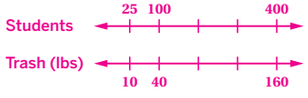
Maria and Hoang noticed that their school creates a lot of trash during lunch time. After lunch one day, they weighed the trash from all the students in their class. They determined that 25 students threw away 10 pounds of trash. Of that trash:

- 1 pound was styrofoam trays.
- 6 pounds were food.
- 3 pounds were other types of trash (wrappers, milk cartons, etc.).

Use these values to calculate the following:

3. How much lunch trash would the 400 students in their school create in a day? Show or explain your thinking.

160 pounds of trash. *Work varies.*



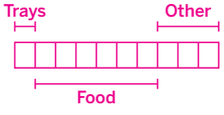
4. Most schools have 180 school days each year. How much trash would the school generate in a school year? Show or explain your thinking.

28,800 pounds of trash. *Work varies.* $160 \cdot 180 = 28800$

5. How much of the yearly trash is styrofoam trays, food, and other trash? Show or explain your thinking.

Styrofoam Trays	Food	Other Trash
2,880 pounds	17,280 pounds	8,640 pounds

Explanations vary.
- The ratio of styrofoam trays to total trash is 1 : 10, and $28800 \div 10 = 2880$.
- The ratio of styrofoam trays to food is 1 : 6, and $2880 \cdot 6 = 17280$.
- The ratio of food to other trash is 2 : 1, and $17280 \div 2 = 8640$.



Accelerated 6 | Unit 2 Lesson 12 172 Activity 1

Key Takeaway: Double number lines and ratio tables are helpful for solving problems involving equivalent ratios. Tape diagrams are helpful for making sense of part-part-whole ratios. All of these tools are helpful for accurately analyzing real-world situations.

Small Groups | 15 min

Activity 2 Cutting Waste

Purpose: Students use ratio strategies to analyze ways to reduce lunch waste.

Short on time? Consider omitting Problems 8–9 and engage the class in a short discussion about plans instead.

1 Launch

Direct students' attention to the questions about reducing waste and invite students to generate ideas for how to reduce waste in a school. If it does not come up naturally, consider discussing what composting, recycling, and reusable trays are.

ELL **English Language Learners** Display photos of styrofoam trays, reusable containers, and composting bins and invite students to annotate them with words in English and in their primary language. **(Reading, Writing, Listening, and Speaking)**

2 Monitor

Look and listen for a variety of student thinking.

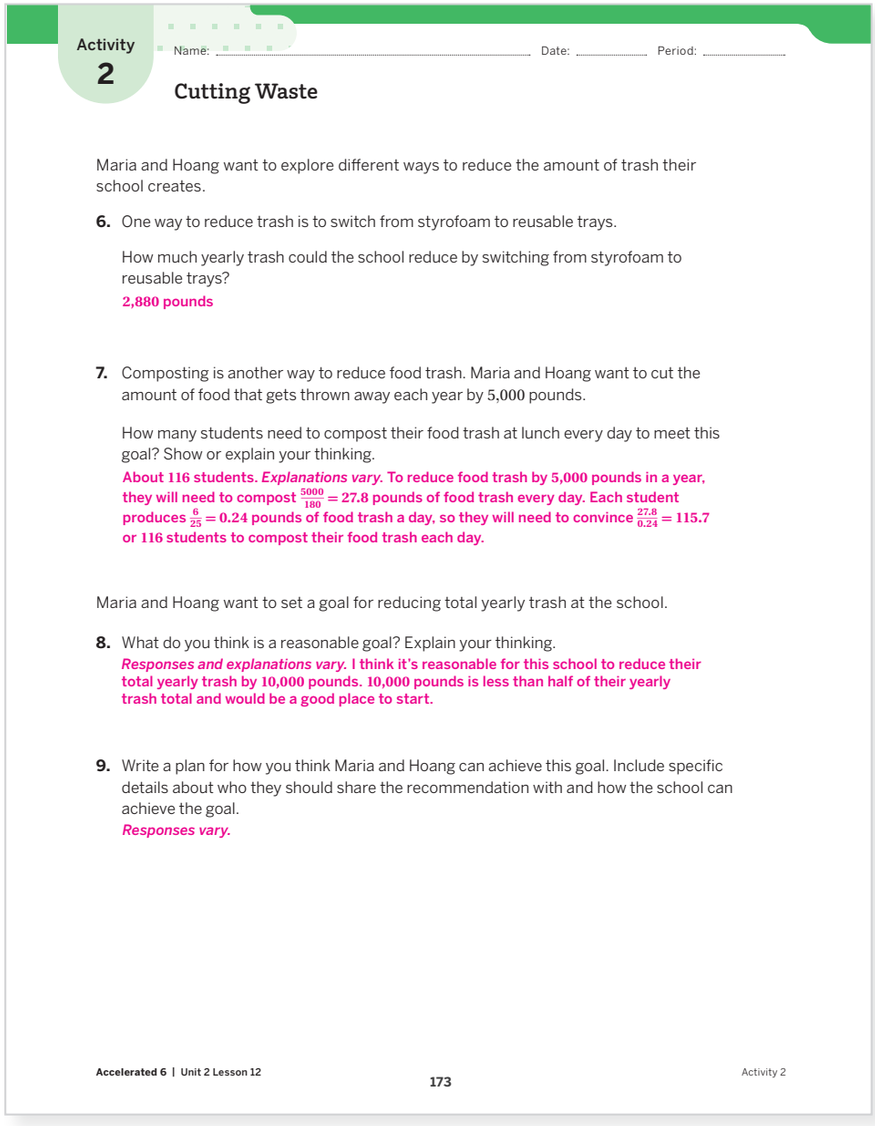
D **Differentiation** *(Problems 6–7)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How much needs to be composted each day? How many pounds of trash do students produce each day? How can you connect those quantities?"
Use the ratios from Activity 1 to support their recommendations.	**Strengthen** Consider asking, "How much food waste would 25 students have annually? What tool could you use to understand this situation better?"

3 Connect

Invite students to share their plan for reducing yearly trash, including how they interpreted answers with decimals. **(MTR.4.1)**

MLR **MLR1: Stronger and Clearer Each Time** Invite students to write a first draft of a plan and use feedback to make their thinking stronger and clearer.



Activity 2

Name: _____ Date: _____ Period: _____

Cutting Waste

Maria and Hoang want to explore different ways to reduce the amount of trash their school creates.

6. One way to reduce trash is to switch from styrofoam to reusable trays.

How much yearly trash could the school reduce by switching from styrofoam to reusable trays?

2,880 pounds

7. Composting is another way to reduce food trash. Maria and Hoang want to cut the amount of food that gets thrown away each year by 5,000 pounds.

How many students need to compost their food trash at lunch every day to meet this goal? Show or explain your thinking.

About 116 students. *Explanations vary.* To reduce food trash by 5,000 pounds in a year, they will need to compost $\frac{5000}{180} = 27.8$ pounds of food trash every day. Each student produces $\frac{6}{25} = 0.24$ pounds of food trash a day, so they will need to convince $\frac{27.8}{0.24} = 115.7$ or 116 students to compost their food trash each day.

Maria and Hoang want to set a goal for reducing total yearly trash at the school.

8. What do you think is a reasonable goal? Explain your thinking.

***Responses and explanations vary.* I think it's reasonable for this school to reduce their total yearly trash by 10,000 pounds. 10,000 pounds is less than half of their yearly trash total and would be a good place to start.**

9. Write a plan for how you think Maria and Hoang can achieve this goal. Include specific details about who they should share the recommendation with and how the school can achieve the goal.

Responses vary.

Accelerated 6 | Unit 2 Lesson 12 173 Activity 2

Whole Class | 5 min

Synthesis

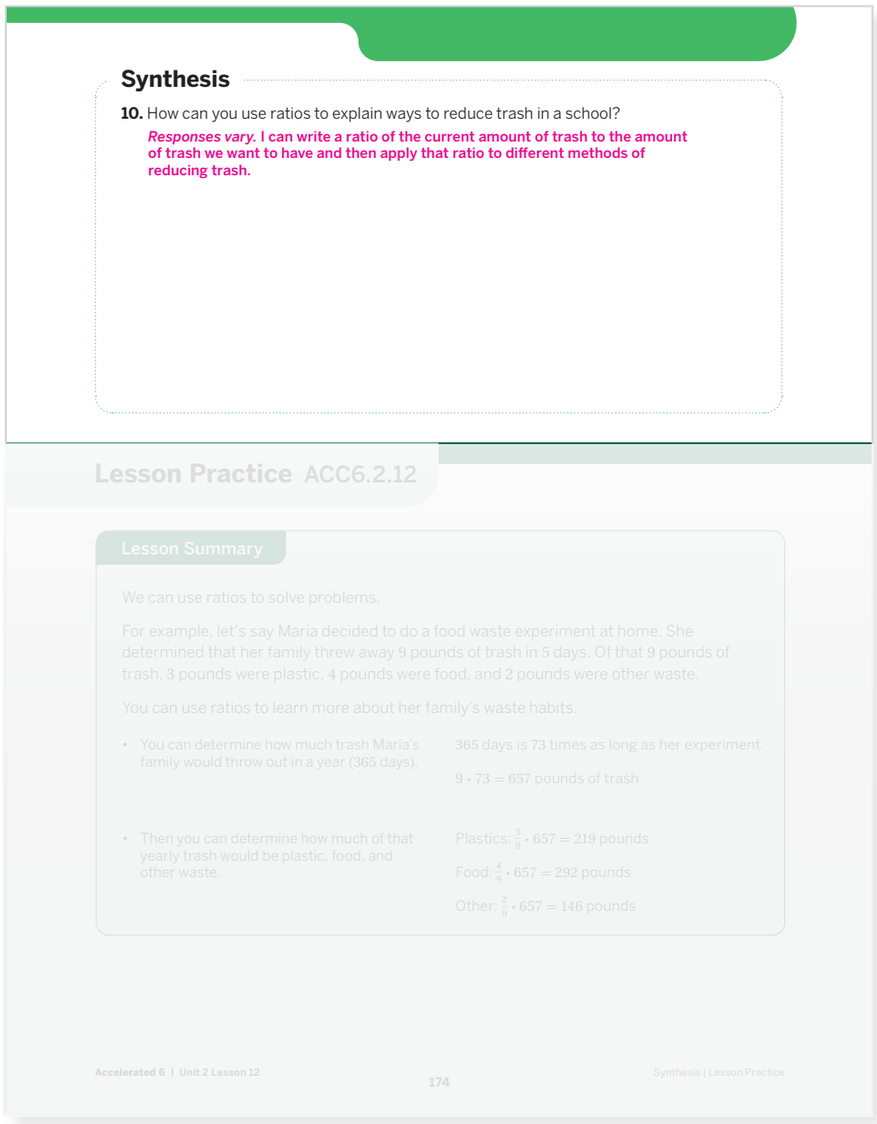
Purpose: Students synthesize their understanding that different strategies can be applied to solve real-world ratio problems.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Comparing a current trash amount to a decrease in trash.
- Comparing a current trash amount to a method for decreasing trash.
- Comparing a number of disposable containers to a number of reusable containers.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

10. How can you use ratios to explain ways to reduce trash in a school?

Responses vary. I can write a ratio of the current amount of trash to the amount of trash we want to have and then apply that ratio to different methods of reducing trash.

Lesson Practice ACC6.2.12

Lesson Summary

We can use ratios to solve problems.

For example, let's say Maria decided to do a food waste experiment at home. She determined that her family threw away 9 pounds of trash in 5 days. Of that 9 pounds of trash, 3 pounds were plastic, 4 pounds were food, and 2 pounds were other waste.

You can use ratios to learn more about her family's waste habits.

- You can determine how much trash Maria's family would throw out in a year (365 days).
  - 365 days is 73 times as long as her experiment.
  - $9 \cdot 73 = 657$ pounds of trash
- Then you can determine how much of that yearly trash would be plastic, food, and other waste.
  - Plastics: $\frac{3}{9} \cdot 657 = 219$ pounds
  - Food: $\frac{4}{9} \cdot 657 = 292$ pounds
  - Other: $\frac{2}{9} \cdot 657 = 146$ pounds

Accelerated 6 | Unit 2 Lesson 12 174 Synthesis | Lesson Practice

Lesson Takeaway: Double number lines, ratio tables, and tape diagrams are helpful tools for making sense of real-world problems and analyzing proposed solutions.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by justifying solutions that compare total amounts and other comparisons involving ratios. **(MTR.4.1)**

Today's Goals

1. **Goal:** Apply ratio reasoning to answer questions about a real-world situation.
2. **Language Goal:** Describe the relationship between ratios in context using mathematically precise language. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 2.12

6th grade and 7th grade students at a school are trying to reduce how much trash they create.

There are 140 students in 6th grade. Together, they reduced their weekly trash by 42 pounds.

There are 100 students in 7th grade. Together, they reduced their weekly trash by 40 pounds.

a. Nathan claims that the 6th grade was more successful. Why might he make that claim?

Responses vary. Nathan might claim that the 6th grade was more successful because they reduced the most amount of trash overall.

b. Juliana claims that the 7th grade was more successful. Why might she make that claim?

Responses vary. Juliana might claim that the 7th grade was more successful because those students reduced more trash per person.

D Differentiation Use after Lesson 12

Support

Provide targeted intervention for students by using these resources.

If students need support determining missing quantities using equivalent ratios:

» **Respond to Student Thinking:**

- Use the *Using Ratio Tables to Solve Problems* **Mini-lesson**.
- Revisit **Activity 1** and provide individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to gather data about waste in their school lunchroom.

Professional Learning

How did the way in which students explored ratios in this unit influence how you planned for the lesson and anticipated their responses? In what ways are the tools that students used in this unit (e.g., ratio tables and double number lines) similar to tools you used when you learned about ratios?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. How can you use ratios to explain ways to reduce trash in a school?

Responses vary. I can write a ratio of the current amount of trash to the amount of trash we want to have and then apply that ratio to different methods of reducing trash.

Lesson Practice ACC6.2.12

Lesson Summary

We can use ratios to solve problems.

For example, let's say Maria decided to do a food waste experiment at home. She determined that her family threw away 9 pounds of trash in 5 days. Of that 9 pounds of trash, 3 pounds were plastic, 4 pounds were food, and 2 pounds were other waste.

You can use ratios to learn more about her family's waste habits.

- You can determine how much trash Maria's family would throw out in a year (365 days).
  - 365 days is 73 times as long as her experiment.
  - $9 \cdot 73 = 657$ pounds of trash
- Then you can determine how much of that yearly trash would be plastic, food, and other waste.
  - Plastics: $\frac{3}{9} \cdot 657 = 219$ pounds
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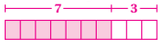
  - Other: $\frac{2}{9} \cdot 657 = 146$ pounds

Lesson Practice ACC6.2.12

Name: _____ Date: _____ Period: _____

Problems 1–3: Oscar wants to both spend and save the money he earns. For every $7 he puts in his wallet, he puts $3 in savings.

1. Draw a tape diagram to represent this situation.



2. If Oscar put $70 in his wallet, how much money would he put into savings? Show your thinking.

$30. *Work varies.* $70 \div 7 = 10$

3. If Oscar earns $70 total, how much will be put into savings? Show your thinking.

$21. *Work varies.* $70 \div 10 = 7$

4. The first floor of a doll house contains the living room, kitchen, and dining room. The combined area of these three rooms is 189 square inches. The areas of the living room, kitchen, and dining room are in the ratio 4 : 3 : 2.

What is the area of each room? Show or explain your thinking.

The area of the living room is 84 square inches, the kitchen is 63 square inches, and the dining room is 42 square inches.

Living Room (sq. in.)	Kitchen (sq. in.)	Dining Room (sq. in.)	Total Area (sq. in.)
4	3	2	9
84	63	42	189

Lesson Practice ACC6.2.12

Name: _____ Date: _____ Period: _____

FAST Practice

5. Some friends are making a fruit salad for a party. The recipe for one family bowl calls for 3 cups of apples, 2 cups of grapes, and 4 cups of strawberries. A family bowl feeds 4 individuals. How many cups of each ingredient does the group need to feed 12 individuals?

- [9] apples
- [6] grapes
- [12] strawberries

Spiral Review

Problems 6–9: Here are some pairs of equivalent ratios. Show or explain how you know they are equivalent.

6. 15 : 6 and 10 : 4

Responses vary. Both sides of the ratio 10 : 4 can be multiplied by 1.5 to become 15 : 6.

7. 40 : 15 and 8 : 3

Responses vary. Both sides of the ratio 8 : 3 can be multiplied by 5 to become 40 : 15.

8. 40 : 15 and 200 : 75

Responses vary. Both sides of the ratio 40 : 15 can be multiplied by 5 to become 200 : 75.

9. A class of 30 students shares a set of 150 crayons. Which statement is true on a day with 5 absent students?

- **A.** For every 5 students, there is 1 crayon.
- **B.** For every 6 students, there is 1 crayon.
- **C.** There are 5 crayons for each student.
- **(D.)** There are 6 crayons for each student.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–4	2	MA.6.AR.3.5
FAST Practice	5	2	MA.6.AR.3.5
Spiral Review			
	6–8	1	MA.6.AR.3.3
	9	2	MA.6.AR.3.5

Math in Action

Purpose: Students consider the math they learned in this unit and how it applies to the workplace, their world, and communities.

In this Unit

Students were introduced to the concept of ratios. They represented ratios using double number lines, tables, and tape diagrams and used ratio reasoning to solve problems.

Career Connection | Meet Clayton Cameron

Invite students to read about how jazz drummer Clayton Cameron has used ratios to refine his drumming techniques and how thinking about ratios can help drummers, and other musicians, keep the beat of a song.

Consider asking:

- "Do you play a musical instrument? If so, how do you think about musical time signatures?"
- "What are some other ways that math and music might be connected?"

B.E.S.T. Benchmark Connections

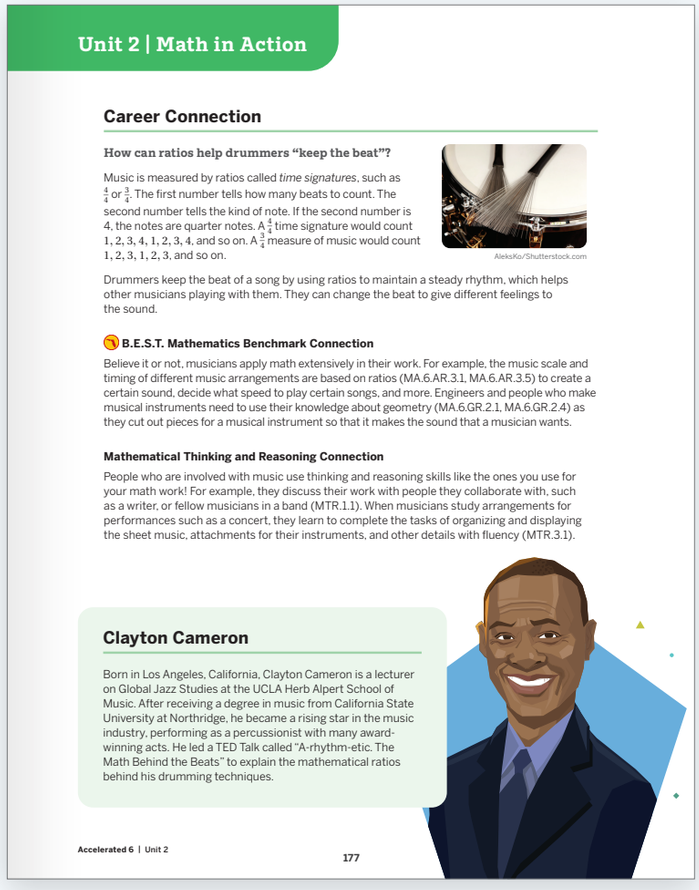
Consider asking:

- "What other math concepts have you studied in Units 1 and 2 that you could apply to music?" Sample response: Designing musical instruments involves geometry so that you use the right shapes and make them the right size. (MA.6.GR.2.4)

Mathematical Thinking and Reasoning Connections

Consider asking:

- "If you visit a store that sells musical instruments, you will find many different types of each kind. How would this apply to Mathematical Thinking and Reasoning standard MTR.7.1 in the work that people who design and make musical instruments do ?" Sample response: Many musical instruments come in different shapes and sizes. These characteristics are often decided when the designer or musician wants to make an instrument create a special sound, handle in a certain way, or use new technology.



Unit 2 | Math in Action

Career Connection

How can ratios help drummers "keep the beat"?

Music is measured by ratios called *time signatures*, such as $\frac{4}{4}$ or $\frac{3}{4}$. The first number tells how many beats to count. The second number tells the kind of note. If the second number is 4, the notes are quarter notes. A $\frac{4}{4}$ time signature would count 1, 2, 3, 4, 1, 2, 3, 4, and so on. A $\frac{3}{4}$ measure of music would count 1, 2, 3, 1, 2, 3, and so on.

AleksKo/Shutterstock.com

Drummers keep the beat of a song by using ratios to maintain a steady rhythm, which helps other musicians playing with them. They can change the beat to give different feelings to the sound.

B.E.S.T. Mathematics Benchmark Connection

Believe it or not, musicians apply math extensively in their work. For example, the music scale and timing of different music arrangements are based on ratios (MA.6.AR.3.1, MA.6.AR.3.5) to create a certain sound, decide what speed to play certain songs, and more. Engineers and people who make musical instruments need to use their knowledge about geometry (MA.6.GR.2.1, MA.6.GR.2.4) as they cut out pieces for a musical instrument so that it makes the sound that a musician wants.

Mathematical Thinking and Reasoning Connection

People who are involved with music use thinking and reasoning skills like the ones you use for your math work! For example, they discuss their work with people they collaborate with, such as a writer, or fellow musicians in a band (MTR.1.1). When musicians study arrangements for performances such as a concert, they learn to complete the tasks of organizing and displaying the sheet music, attachments for their instruments, and other details with fluency (MTR.3.1).

Clayton Cameron

Born in Los Angeles, California, Clayton Cameron is a lecturer on Global Jazz Studies at the UCLA Herb Alpert School of Music. After receiving a degree in music from California State University at Northridge, he became a rising star in the music industry, performing as a percussionist with many award-winning acts. He led a TED Talk called "A-rhythm-etic. The Math Behind the Beats" to explain the mathematical ratios behind his drumming techniques.

Accelerated 6 | Unit 2

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Assess and Respond

End-of-Unit Assessment

Independent | 45 min

Facilitation: Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B. Text to speech is available in the digital version. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Determining the greatest common factor or least common multiples of two numbers	Lessons 6, 7	1	MA.6.NSO.3.1, MTR.3.1
2	Identifying equivalent ratios	Lessons 2, 3	1	MA.6.AR.3.3, MTR.5.1
3a	Determining an unknown value in a ratio relationship in context	Lesson 4	1	MA.6.AR.3.3
3b	Solving part-part-whole ratio problems	Lesson 5	2	MA.6.AR.3.3
4	Determining an unknown value in a ratio relationship in context	Lesson 5	2	MA.6.AR.3.3
5	Comparing two ratios in context and justifying a claim	Lesson 8	2	MA.6.AR.3.3, MTR.4.1
6a	Critiquing the reasoning of another who inaccurately used equivalent ratios in context	Lessons 9–11	3	MA.6.AR.3.3, MTR.4.1
6b	Determining an unknown value in a ratio relationship in context	Lesson 10	2	MA.6.AR.3.3
7a	Solving part-part-whole ratio problems	Lessons 5, 12	2	MA.6.AR.3.3, MTR.6.1
7b	Writing a part-part-whole ratio problem	Lessons 5, 12	3	MA.6.AR.3.3, MTR.6.1

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: Date: Period:

End-of-Unit Assessment

Unit 2

1. Determine the greatest common factor (GCF) or the least common multiple (LCM).

a What is the LCM of 6 and 9?

A. 3

B. 18

C. 36

D. 54

b What is the GCF of 8 and 12?

A. 2

B. 4

C. 24

D. 96

2. Select *all* of the ratios that are equivalent to 20 : 12.

☑ **A.** 60 : 36 ☐ **B.** 10 : 2 ☐ **C.** 5 : 2 ☑ **D.** 30 : 18 ☐ **E.** 24 : 16

3. Caleb's favorite shade of green uses a ratio of 5 cups of blue paint to 3 cups of yellow paint.

a Caleb bought 12 cups of yellow paint. How much blue paint will he need to make his favorite shade of green?

20 cups

b Caleb needs 40 cups of green paint to paint his room. How much of each color will he need?

Blue Paint: 25 cups Yellow Paint: 15 cups

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Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 2

4. A sign at a store says 3 oranges cost $2.25.

a How much would 12 oranges cost?

$9

b How much would 7 oranges cost? Show or explain your thinking.

$5.25. *Explanations vary.* I figured out that it costs $0.75 for each orange, so 7 oranges would cost $0.75 • 7 = $5.25.

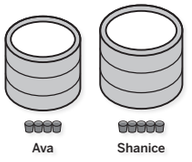
5. Ava and Shanice mixed different ratios of red and white paint.

Ava: 4 grams of red for every 6 liters of white.

Shanice: 5 grams of red for every 8 liters of white.

Whose mixture will make a darker red?

Ava's



Explain your thinking.

Explanations vary. If both mixtures use 24 liters of white, Ava's mixture uses 4 • 4 = 16 grams of red paint, while Shanice's mixture uses 5 • 3 = 15 grams of red paint.

6. Jayden is saving up for $100 concert tickets. For every 5 hours he works, he get paid $40. Jayden made a table to determine how many hours he needs to work to earn $100, but he made a mistake.

Hours	Dollars Earned
5	40
1	8
100	800

a What did Jayden do well? What mistake did Jayden make?

Responses vary.
- Something Jayden did well was correctly calculating how much he earns each hour correctly.
- Jayden's mistake was calculating how much he would earn from 100 hours of work instead of how many hours he would need to work to earn $100.

b Determine how many hours he needs to work to earn $100.

12.5 hours or 13 hours (if he can only work hour-long shifts)

Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 2

7. Metropolis requires that for every 5 plots of land used for buildings, 2 plots of land be used for green space.

a A company bought 70 plots of land. How many plots can it use for buildings?

50 plots of land

b Write a question about this ratio relationship that has the answer "30 plots of land."

Responses vary.
- How many building plots can you make if you used 12 plots for green space?
- How many building plots can you make from 42 plots of land?
- How many plots of green space do you need if you want 75 plots for buildings?

Name: Date: Period:

End-of-Unit Assessment

Unit 2

1. Determine the greatest common factor (GCF) or least common multiple (LCM).

a What is the GCF of 6 and 9?

A. 3

B. 18

C. 36

D. 54

b What is the LCM of 8 and 12?

A. 2

B. 4

C. 24

D. 96

2. Select *all* of the ratios that are equivalent to $8 : 20$.

☐ **A.** $3 : 15$ ☐ **B.** $4 : 5$ ☑ **C.** $12 : 30$ ☐ **D.** $16 : 28$ ☑ **E.** $24 : 60$

3. Riku's favorite shade of orange uses a ratio of 4 cups of red paint to 3 cups of yellow paint.

a Riku bought 12 cups of yellow paint. How much red paint will he need to make his favorite shade of orange?

16 cups

b Riku needs 42 cups of orange paint to paint his room. How much of each color will he need?

Red Paint: 24 cups Yellow Paint: 18 cups

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Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 2

4. A sign at a store says that 5 lemons cost $2.75.

a How much would 15 lemons cost?

$8.25

b How much would 7 lemons cost? Show or explain your thinking.

$3.85. *Explanations vary.* I figured out that it costs $0.55 for each lemon, so 7 lemons would cost $0.55 \cdot 7 = \$3.85$.

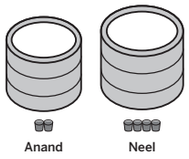
5. Anand and Neel mixed different ratios of blue and white paint.

Anand: 2 grams of blue for every 5 liters of white.

Neel: 4 grams of blue for every 6 liters of white.

Whose mixture will make a darker blue?

Neel's



Explain your thinking.

***Explanations vary.* If both mixtures use 30 liters of white, Anand's mixture uses $2 \cdot 6 = 12$ grams of blue paint, while Neel's mixture uses $4 \cdot 5 = 20$ grams of blue paint.**

6. Lukas is saving up for $120 sneakers. For every 4 hours he works, he gets paid $48. Lukas made a table to determine how many hours he would need to work to earn $120, but he made a mistake.

Hours	Dollars Earned
4	48
1	12
120	1,440

a What did Lukas do well? What mistake did Lukas make?

Responses vary.
- **Something Lukas did well was correctly calculating how much he earns each hour.**
- **Lukas's mistake was calculating how much he would earn from 120 hours of work instead of how many hours he would need to work to earn $120.**

b Determine how many hours Lukas needs to work to earn $120.

10 hours

Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 2

7. The town of Desville requires that for every 6 plots of land used for buildings, 2 plots of land be used for green space.

a A company bought 24 total plots of land. How many plots can it use for buildings?

18 plots of land

b Write a question about this ratio relationship that has the answer "30 plots of land."

Responses vary.
- **How many building plots can you make if you use 10 plots for green space?**
- **How many building plots can you make from 40 plots of land?**
- **How many plots of green space do you need if you want 90 plots for buildings?**

D Differentiation (End-of-Unit Assessment)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	

Sub-Unit 1:
 	
Solve problems with equivalent ratios using tables, double number lines, and calculations.
 	
(Lessons 1–5)
	1	**Support**
		Strengthen
			• **Mini-Lesson:** *Generating Equivalent Ratios*
			• **Teacher Move:** Consider revisiting:
			  • Lesson 2 *(Rice Ratios)*
			  • Lesson 3 *(Fruit Lab)*

		Stretch	• **You're invited to explore more:** Lesson 3 *(Fruit Lab)*

	3a, 4	**Support**
		Strengthen
			• **Mini-Lesson:** *Using Ratio Tables to Solve Problems*
			• **Teacher Move:** Consider revisiting:
			  • Lesson 4 *(Balancing Act)*
			  • Lesson 5 *(Table It)*

		Stretch	• **You're invited to explore more:** • Lesson 4 *(Balancing Act)*

Sub-Unit 2:
 	
Determine the least common multiple and greatest common factor of two numbers.
 	
(Lessons 6–8)
	1	**Support**	• **Teacher Move:** Consider revisiting:
			  • Lesson 6 *(Common Multiples)*
			  • Lesson 7 *(Common Factors)*

		Strengthen	• **Repeated Challenges:** Lesson 7 *(Common Factors)*

		Stretch	• **You're invited to explore more:**
			  • Lesson 6 *(Common Multiples)*
			  • Lesson 7 *(Common Factors)*

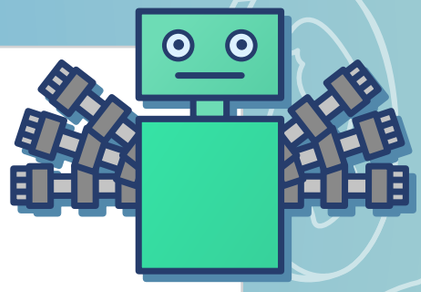
	5	**Support** **Strengthen**	• **Mini-Lesson:** *Comparing Ratios* • **Teacher Move:** Consider revisiting Lesson 8 *(Mixing Paint)*

Sub-Unit 3:
 	
• Compare ratios in context using a variety of strategies.
• Solve real-world and mathematical problems using double number line diagrams and tables of equivalent ratios.
 	
(Lessons 9–12)
	6	**Support**	• **Mini-Lesson:** *Using Ratio Tables to Solve Problems*
			• **Teacher Move:** Consider revisiting:
			  • Lesson 9 *(Disaster Preparation)*
			  • Lesson 10 *(Balloons)*

		Strengthen	• **Repeated Challenges:** Lesson 10 *(Balloons)*
		Stretch	• **You're invited to explore more:** • Lesson 11 *(Community Life)*
	3b, 7	**Support** **Strengthen**	• **Mini-Lesson:** *Using Ratio Tables to Solve Problems* • **Teacher Move:** Consider revisiting: • Lesson 12 *(Lunch Waste)*

UNIT 3

Unit Rates and Percentages

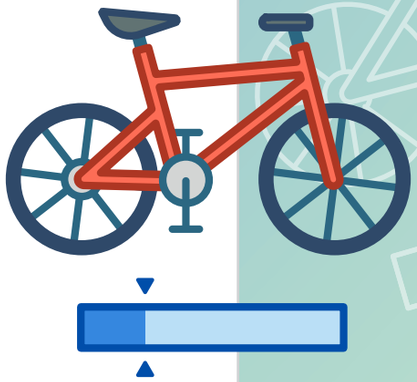


Students apply ratio reasoning from Unit 2 to unit rates and recognize that equivalent ratios have the same unit rates. They use a variety of strategies and representations of percentages to determine missing percentages, parts, and wholes.

Essential Questions

- How are the terms *same rate, constant rate*, and *unit rate* alike and different?
- What is the relationship between unit rates and percentages?
- How are percentages used to estimate and compare quantities?

Sub-Unit Goals



Sub-Unit 1

- Use ratio reasoning to convert between units of measurement.

Sub-Unit 2

- Recognize and calculate two unit rates for the same ratio relationship.
- Use unit rates to solve problems involving tables of equivalent ratios.

Sub-Unit 3

- Use ratio reasoning to determine unknown parts, wholes, and percentages.

The Math of the Unit

Unit Outcomes Telling a story that narrows and deepens with the grade

Florida B.E.S.T. Standards for Mathematics

Apply properties of operations to rewrite numbers in equivalent forms. **(MA.6.NSO.3)**

Understand ratio and unit rate concepts and use them to solve problems. **(MA.6.AR.3)**

Use percentages and proportional reasoning to solve problems. **(MA.7.AR.3)**

Benchmarks Addressed in This Unit: MA.6.NSO.3.5 MA.6.AR.3.2 MA.6.AR.3.3 MA.6.AR.3.4 MA.6.AR.3.5 MA.7.AR.3.2

Mathematical Thinking and Reasoning Standards

- Actively participate in effortful learning both individually and collectively. **(MTR.1.1)**
- Complete tasks with mathematical fluency. **(MTR.3.1)**
- Engage in discussions that reflect on the mathematical thinking of self and others. **(MTR.4.1)**
- Use patterns and structure to help understand and connect mathematical concepts. **(MTR.5.1)**

Also addressed: **MTR.2.1, MTR.7.1**

Coherence Telling a story within and across grades

In this Unit

Students apply ratio reasoning from Unit 2 to convert between units of measurement, solve problems using unit rates, and make sense of percentages.

Prior Learning

- Converting measurements **(MA.4.M.1.2, MA.5.M.1.1)**
- Multiplying fractions **(MA.5.FR.2.2)**
- Place value **(MA.4.NSO.2.5, MA.5.NSO.1.3, MA.5.NSO.2.4)**
- **Unit 2:** Ratio reasoning **(MA.6.AR.3.1, MA.6.AR.3.3, MA.6.AR.3.5)**

Future Learning

- **Unit 5:** Decimal operations **(MA.6.NSO.2.1, MA.6.NSO.2.3)**
- **Unit 6:** Percent change **(MA.7.AR.3.1)**
- Proportional relationships **(MA.7.AR.4)**

See the Connections to Future Learning page for more information, including explanations and examples.

Rigor and Balance Integrating the aspects of rigor in ways that support one another

Here are examples of the aspects of rigor and balance in this unit. See the first page of each lesson's Teacher Edition for more information.

Conceptual Understanding

In **Lesson 11**, students build conceptual understanding of parts, percentages, and wholes in real-world scenarios.

Procedural Fluency

In **Lesson 3**, students develop procedural fluency as they convert between units.

Application

In **Lesson 13**, students apply the concepts of equivalent ratios, rates, and percentages when analyzing data from various Florida counties.

Strategic Competence

In **Lesson 10**, students develop strategic competence as they compare different strategies for solving percent problems and make connections between them.

Adaptive Reasoning

In **Lesson 6**, students develop adaptive reasoning as they decide which unit rate is more useful to solve a given problem.

Productive Disposition

In **Lesson 8**, students have opportunities to develop a productive disposition as they create their own challenges, solve classmates' challenges, and see their own challenges being solved.

Unit at a Glance

Assess and Respond

A Pre-Unit Check

Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

MA.6.AR.3.4 MA.6.AR.3.5 MA.6.NSO.3.5
MTR.1.1 MTR.3.1 MTR.4.1 MTR.5.1 MTR.6.1

Sub-Unit 1

1 Many Measurements

Everyday Measurements

Apply prior knowledge about different units of measurement, what they measure, and their relative sizes.

Building Toward: MA.6.AR.3.5
MTR.4.1

2 Counting Classrooms

Measuring With Different Units

Begin to convert measurements from one system of measurement to another.

MA.6.AR.3.5
MTR.1.1 MTR.5.1

Sub-Unit 2

3 World Records

Comparing Speeds

Use the term **unit rate** to calculate and compare speeds.

MA.6.AR.3.2 MA.6.AR.3.5
MTR.4.1

Assess and Respond

A Sub-Unit Quiz

Learn about your students' understanding of the concepts and skills so far in this unit.

MA.6.AR.3.2 MA.6.AR.3.3 MA.6.AR.3.5 MTR.4.1 MTR.6.1

Sub-Unit 3

8 Lucky Duckies

Benchmark Percentages

Use the concept of **percent**, meaning for every 100, and the percent symbol %.

MA.6.NSO.3.5 MA.6.AR.3.4
MTR.1.1 MTR.3.1 MTR.4.1

9 Bicycle Goals

Friendly Percentages

Make connections between tape diagrams and double number line diagrams that represent percentages, then use these tools to solve problems involving friendly percentages.

MA.6.NSO.3.5 MA.6.AR.3.4
MTR.2.1 MTR.4.1

10 What's Missing?

Solving Percentage Problems

Create tape diagrams, double number lines, and tables to solve problems with percentages.

MA.6.NSO.3.5 MA.6.AR.3.4
MTR.5.1

Pacing: 16 days | **Short on time?** See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 13 Lessons
- Pre-Unit Check
- Sub-Unit Quiz
- End-of-Unit Assessment

4 Model Trains

Comparing Rates

Compare the speeds of model trains and discuss unit rates using the word *per*.

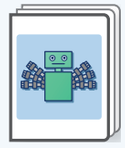
MA.6.AR.3.2 MA.6.AR.3.5
MTR.4.1

5 Soft Serve

Two Unit Rates

Determine the two unit rates, $\frac{a}{b}$ and $\frac{b}{a}$, associated with the ratio $a : b$.

MA.6.AR.3.2 MA.6.AR.3.3 MA.6.AR.3.5
MTR.4.1



6 Welcome to the Robot Factory

Using Unit Rates

In a table of equivalent ratios, the unit rates describe the relationship between quantities.

MA.6.AR.3.2 MA.6.AR.3.3 MA.6.AR.3.5
MTR.5.1

7 More Soft Serve

Solving Rate Problems

Practice using unit rates to make comparisons and calculate unknown values.

MA.6.AR.3.2 MA.6.AR.3.3 MA.6.AR.3.5 MA.7.AR.3.2
MTR.1.1 MTR.4.1 MTR.5.1

Assess and Respond

11 Cost Breakdown

Any Percentage of a Number

Develop and use strategies to calculate any percentage of a number.

MA.6.NSO.3.5 MA.6.AR.3.4
MTR.3.1 MTR.4.1

12 More Bicycle Goals

Unknown Percentages

Develop and use one or more strategies to calculate any unknown percentages, including percentages greater than 100.

MA.6.NSO.3.5 MA.6.AR.3.4
MTR.3.1 MTR.4.1

13 A County as a Village

Applying Ratios, Rates, and Percentages

Apply prior knowledge about rates and percentages to analyze characteristics of counties' populations.

MA.6.NSO.3.5 MA.6.AR.3.4 MA.7.AR.3.2
MTR.1.1 MTR.7.1

A End-of-Unit Assessment

Learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

MA.6.AR.3.4, MA.6.AR.3.5, MA.6.NSO.3.5
MTR.3.1 MTR.4.1 MTR.6.1

Pacing Considerations

Lesson 1: The purpose of this lesson is for students to practice working with the relative sizes of different units of measure. If students show a strong understanding of units of measure in Problem 1 of the Pre-Unit Check, this lesson may be omitted.

Lessons 2–3: These lessons can be condensed into one lesson if students show a strong proficiency in applying ratio reasoning to convert units.

Lesson 8: This lesson gives students an opportunity to practice using what they've learned about unit rates to make comparisons and calculate unknowns.

Lesson 13: This lesson gives students an opportunity to use what they've learned about rates and percentages to analyze data that compare various counties in Florida. There are no new concepts introduced in this lesson.

Lesson Materials and Prep

Here are the materials and resources needed within each lesson, how to prepare them, and where to find them.

Lesson 1

- **Copy:** Show What You Know
- **Cut:** Activity 1 Cards *(one per pair)*, Activity 2 Cards *(one per pair)*
- **Materials:** classroom items that represent measurements, such as a centimeter, an ounce, a cup, etc. *(as needed)*

Lesson 2

- **Copy:** Show What You Know
- **Materials:** meter sticks, centimeter rulers

Lesson 3

- **Copy:** Show What You Know
- **Materials:** calculators, stopwatches or other timers, tape

Lesson 4

- **Copy:** Show What You Know

Lesson 5

- **Copy:** Show What You Know

Lesson 6

- **Copy:** Show What You Know
- **Materials:** coloring tools *(as needed)*

Lesson 7

- **Copy:** Show What You Know, Activity 2 Sheet *(one per student)*

Lesson 8

- **Copy:** Show What You Know

Lesson 9

- **Copy:** Show What You Know

Lesson 10

- **Copy:** Show What You Know
- **Cut:** Activity 1 Cards *(one per four students)*
- **Materials:** graph paper (optional), tape or glue *(as needed)*

Lesson 11

- **Copy:** Show What You Know
- **Materials:** coloring tools *(as needed)*

Lesson 12

- **Copy:** Show What You Know

Lesson 13

- **Copy:** Show What You Know, Activity 2 Sheet *(one per pair)*
- **Materials:** ccoloring tools *(as needed)*, poster paper, straightedges *(as needed)*

Resource Books

Assessment and Lesson Resources

- Pre-Unit Check
- Sub-Unit Quizzes
- End-of-Unit Assessment, Forms A & B
- Assessment Rubrics
- Show What You Knows
- Activity Sheets and Cards

Intervention and Extension Resources

- Mini-Lessons
- Prior Grade Mini-Lessons
- Extensions

Caregiver Support

These resources can be shared with students' caregivers. They provide background on the mathematics in this unit, as well as suggestions for supporting students at home.

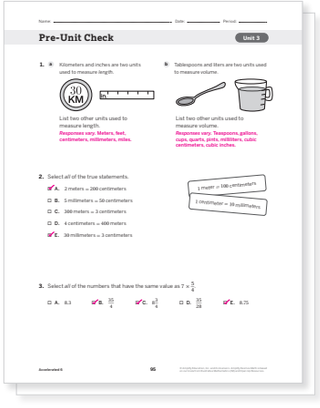
Assessments

Every unit includes a variety of formative and summative assessments designed to highlight students' understanding of a variety of concepts and skills.

Pre-Unit Check

Assign the **Pre-Unit Check** to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

Standards addressed: MA.6.AR.3.4, MA.6.AR.3.5, MA.6.NSO.3.5


Pre-Unit Check

Unit 3

1. Kilometers and inches are two units used to measure length.

List two other units used to measure length.

Responses vary. Meters, feet, centimeters, millimeters, miles.

Tablespoons and liters are two units used to measure volume.

List two other units used to measure volume.

Responses vary. Teaspoons, gallons, cups, quarts, pints, milliliters, cubic centimeters, cubic inches.

2. Select all of the true statements.

- ☑ A. 2 meters = 200 centimeters
- ☐ B. 5 millimeters = 50 centimeters
- ☐ C. 360 meters = 3 centimeters
- ☐ D. 4 centimeters = 400 meters
- ☑ E. 30 millimeters = 3 centimeters

1 meter = 100 centimeters

1 centimeter = 10 millimeters

3. Select all of the numbers that have the same value as $7 \times \frac{3}{4}$.

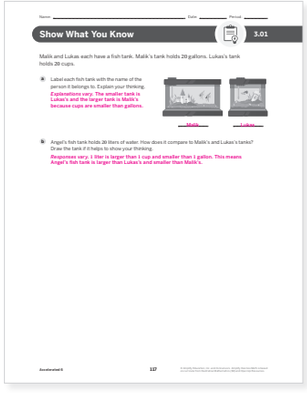
- ☐ A. 8.3
- ☑ B. $\frac{21}{4}$
- ☑ C. $5\frac{1}{4}$
- ☐ D. $\frac{13}{28}$
- ☑ E. 8.75

Accelerated 6 95

Lesson | Show What You Know

Use the **Show What You Know** for each lesson to learn more about your students' progress toward the lesson goal(s). Here is one example from this unit.

Standards assessed on Lesson 1 Show What You Know:
Building Toward MA.6.AR.3.5


Show What You Know

3.01

Malik and Lukas each have a fish tank. Malik's tank holds 20 gallons. Lukas's tank holds 20 cups.

a. Label each fish tank with the name of the person it belongs to. Explain your thinking.

Explanations vary. The smaller tank is Lukas's and the larger tank is Malik's because cups are smaller than gallons.

Malik's Lukas's

b. Angel's fish tank holds 20 liters of water. How does it compare to Malik's and Lukas's tanks? Draw the tank if it helps to show your thinking.

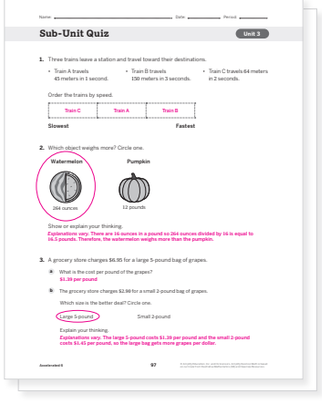
Responses vary. 1 liter is larger than 1 cup and smaller than 1 gallon. This means Angel's fish tank is larger than Lukas's and smaller than Malik's.

Accelerated 6 127

Sub-Unit Quiz

Assign the **Sub-Unit Quiz** to learn about your students' understanding of the concepts and skills so far in this unit.

Standards addressed: MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5


Sub-Unit Quiz

Unit 3

1. Three trains leave a station and travel toward their destinations.

- Train A travels 45 meters in 1 second.
- Train B travels 150 meters in 3 seconds.
- Train C travels 64 meters in 2 seconds.

Order the trains by speed.

Slowest: Train C, Train A, Train B :Fastest

2. Which object weighs more? Circle one.

Watermelon: 264 ounces

Pumpkin: 12 pounds

Show or explain your thinking.

Explanations vary. There are 16 ounces in a pound so 264 ounces divided by 16 is equal to 16.5 pounds. Therefore, the watermelon weighs more than the pumpkin.

3. A grocery store charges $6.95 for a large 5-pound bag of grapes.

a. What is the cost per pound of the grapes?

$1.39 per pound

b. The grocery store charges $2.90 for a small 2-pound bag of grapes.

Which size is the better deal? Circle one.

Large 5-pound Small 2-pound

Explain your thinking.

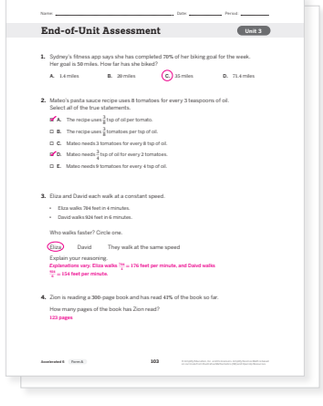
Explanations vary. The large 5-pound costs $1.39 per pound and the small 2-pound costs $1.45 per pound, so the large bag gets more grapes per dollar.

Accelerated 6 97

End-of-Unit Assessment

Assign the **End-of-Unit Assessment** to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

Standards addressed: MA.6.AR.3.4, MA.6.AR.3.5, MA.6.NSO.3.5


End-of-Unit Assessment

Unit 3

1. Sydney's fitness app says she has completed 78% of her biking goal for the week. Her goal is 50 miles. How far has she biked?

A. 1.4 miles B. 26 miles C. 35 miles D. 71.4 miles

2. Mateo's pasta sauce recipe uses 8 tomatoes for every 3 teaspoons of oil. Select all of the true statements.

- ☑ A. The recipe uses $\frac{3}{8}$ tsp of oil per tomato.
- ☐ B. The recipe uses $\frac{3}{8}$ tomatoes per tsp of oil.
- ☐ C. Mateo needs 3 tomatoes for every 8 tsp of oil.
- ☑ D. Mateo needs $2\frac{2}{3}$ tsp of oil for every 2 tomatoes.
- ☐ E. Mateo needs 9 tomatoes for every 4 tsp of oil.

3. Eliza and David each walk at a constant speed.

- Eliza walks 784 feet in 4 minutes.
- David walks 924 feet in 6 minutes.

Who walks faster? Circle one.

Eliza David They walk at the same speed

Explain your reasoning.

Explanations vary. Eliza walks $\frac{784}{4}$ = 176 feet per minute, and David walks $\frac{924}{6}$ = 154 feet per minute.

4. Zion is reading a 306-page book and has read 41% of the book so far.

How many pages of the book has Zion read?

125 pages

Accelerated 6 Form A 103

Differentiation

Every unit includes additional resources to support, strengthen, and stretch student learning.

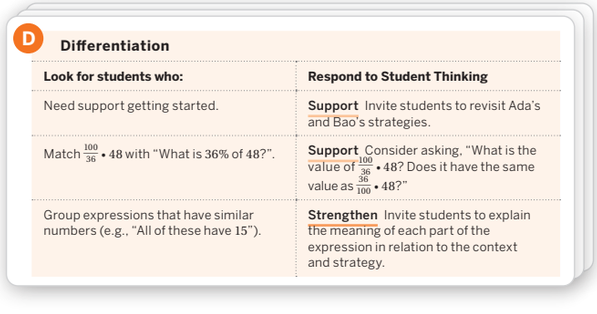
Differentiation Across the Unit

	Support	Strengthen	Stretch
	Provide targeted intervention for students by using these resources.	Reinforce students' understanding of the concepts assessed by using these resources.	Challenge students and extend their learning with these resources.
Sub-Unit 1 (Lessons 1–2) • Use ratio reasoning to convert between units of measurement.	**Mini-Lesson** • *Converting Measurements*	**Repeated Challenges** • Lesson 2 (*Counting Classrooms*) **Practice** • Lessons 1–2	
Sub-Unit 2 (Lessons 3–7) • Recognize and calculate two unit rates for the same ratio relationship. • Use unit rates to solve problems involving tables of equivalent ratios.	**Mini-Lesson** • *Calculating Unit Rates*	**Challenge Creator** • Lesson 7 (*More Soft Serve*) **Practice** • Lessons 3–7	**You're invited to explore more.** • Lesson 4 (*Model Trains*) • Lesson 6 (*Welcome to the Robot Factory*) **DOK3 Practice** • Lessons 3–4
Sub-Unit 3 (Lessons 8–13) • Use ratio reasoning to determine unknown parts, wholes, and percentages.	**Mini-Lesson** • *Calculating Unknown Percentages*	**Repeated Challenges** • Lesson 8 (*Lucky Duckies*) • Lesson 11 (*Cost Breakdown*) **Practice** • Lessons 8–13	**You're invited to explore more.** • Lesson 9 (*Bicycle Goals*) • Lesson 10 (*What's Missing?*) • Lesson 12 (*More Bicycle Goals*) **DOK3 Practice** • Lesson 11

Differentiation Within the Lesson

Each Teacher Edition includes point-of-use differentiation suggestions to modify or adjust instruction during the lesson to accommodate the needs of all learners.

Here is one example from **Lesson 11** where students match multiple expressions with a percentage question.



Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to revisit Ada's and Bao's strategies.
Match $\frac{100}{36} \cdot 48$ with "What is 36% of 48?".	**Support** Consider asking, "What is the value of $\frac{100}{36} \cdot 48$? Does it have the same value as $\frac{36}{100} \cdot 48$?"
Group expressions that have similar numbers (e.g., "All of these have 15").	**Strengthen** Invite students to explain the meaning of each part of the expression in relation to the context and strategy.

Accessibility

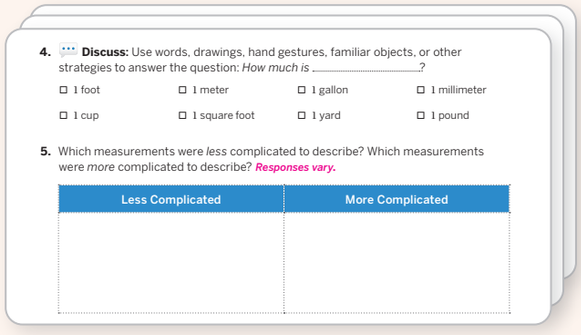
Every lesson is designed using the principles of Universal Design for Learning. Every lesson also includes support suggestions that build on students' strengths.

Universal Design for Learning

Here is one example from a lesson designed to support Action and Expression.

Spotlight on Interaction. . .

Lesson 1: Students can use a variety of tools, such as drawings, gestures, and physical objects, to support them in explaining or showing their thinking about measurements.



4. **Discuss:** Use words, drawings, hand gestures, familiar objects, or other strategies to answer the question: *How much is* _____?

☐ 1 foot	☐ 1 meter	☐ 1 gallon	☐ 1 millimeter
☐ 1 cup	☐ 1 square foot	☐ 1 yard	☐ 1 pound

5. Which measurements were *less* complicated to describe? Which measurements were *more* complicated to describe? ***Responses vary.***

Less Complicated	More Complicated

Just-In-Time Accommodations and Supports

Each Teacher Edition includes suggested supports based on the areas of cognitive function from the Education Development Center (EDC).

Spotlight on Visual-Spatial Processing. . .

Here are two suggestions in this unit for supporting students with visualizing or creating their own representations.

Lesson 1, Activity 1

Accessibility: Visual-Spatial Processing Provide access to a collection of classroom items that represent smaller measurements, such as a centimeter, an ounce, a cup, etc.

Lesson 9, Activity 1

Accessibility: Visual-Spatial Processing Invite students to draw in their Student Edition to support making connections between strategies.

Language Development

Every lesson includes opportunities for all students to develop fluency with mathematical language.

Vocabulary

New Vocabulary	Lesson(s)
rate unit rate	3
unit price	5
percent (percentage)	8

Additional Vocabulary
per
profit

Math Language Routines and Language Goals

Math Language Routine	Lesson(s)
MLR2: Collect and Display	1 and 3–12
MLR7: Compare and Connect	4, 9, and 13

Sub-Unit Language Goals

- Explain why it takes more of a smaller unit or fewer of a larger unit to measure the same quantity.
- Describe connections between units of measurement and the measurements of everyday objects.
- Identify and describe the two unit rates associated with a ratio, i.e., $\frac{a}{b}$ and $\frac{b}{a}$ for the ratio $a : b$.
- Describe connections between percentages, ratios, and rates.

English Language Learners Support

Every Teacher Edition includes suggestions for supporting the needs of students learning English.

Here is one example from **Lesson 8**, where students are introduced to the term *percent* and answer questions involving percentages.

ELL **English Language Learners** Invite students to share what a new term reminds them of. (e.g., "When I hear *percent*, I think . . .") This may help surface multiple meanings and encourage students to connect to their prior knowledge, including connections in their primary language. (e.g., In Spanish, *percent* translated means "por ciento," which means "for every hundred.") **(Reading and Listening)**

Connections to Future Learning

Here is how the content in this unit connects to where your students are headed in their math journeys.

Decimal Operations

In this unit, students use multiplication with unit rates to solve problems.
In Unit 5, students will apply this understanding to multiplying and dividing decimals.

FL B.E.S.T. Math Benchmark:
MA.6.NSO.2.1

Example:

When we write $0.3 \cdot 0.04$ as fractions, we can multiply the whole numbers in the numerators, then think about the place value.

$0.3 \cdot 0.04 = 3 \cdot 4 \cdot \frac{1}{10} \cdot \frac{1}{100} = 12 \cdot \frac{1}{1000} = 0.012$

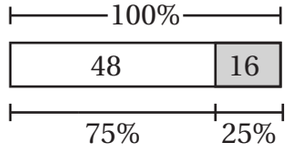
Percent Change

In this unit, students focus on calculating and using percentages.
In Unit 6, students will apply their understanding of percentages from this unit to percent increase and decrease.

FL B.E.S.T. Math Benchmark:
MA.7.AR.3.1

Example:

The computer club had 64 students. Then they lost 16 students. This is a 25% decrease because $\frac{16}{64} = 0.25$. The club now has 48 students, which is 75% of the starting amount: $0.75 \cdot 64 = 48$.



Proportional Relationships

In this unit, students continue their work with ratios and unit rates.
In a future course, students will apply these skills to proportional relationships with fractions.

FL B.E.S.T. Math Benchmarks:
MA.7.AR.4.2, MA.7.AR.4.4, MA.7.AR.4.5

Example:

A 4-inch by 6-inch photograph can be scaled and printed to be many different sizes. In the table, each value in the second column is $\frac{3}{2}$ times the length of the value in the first column.

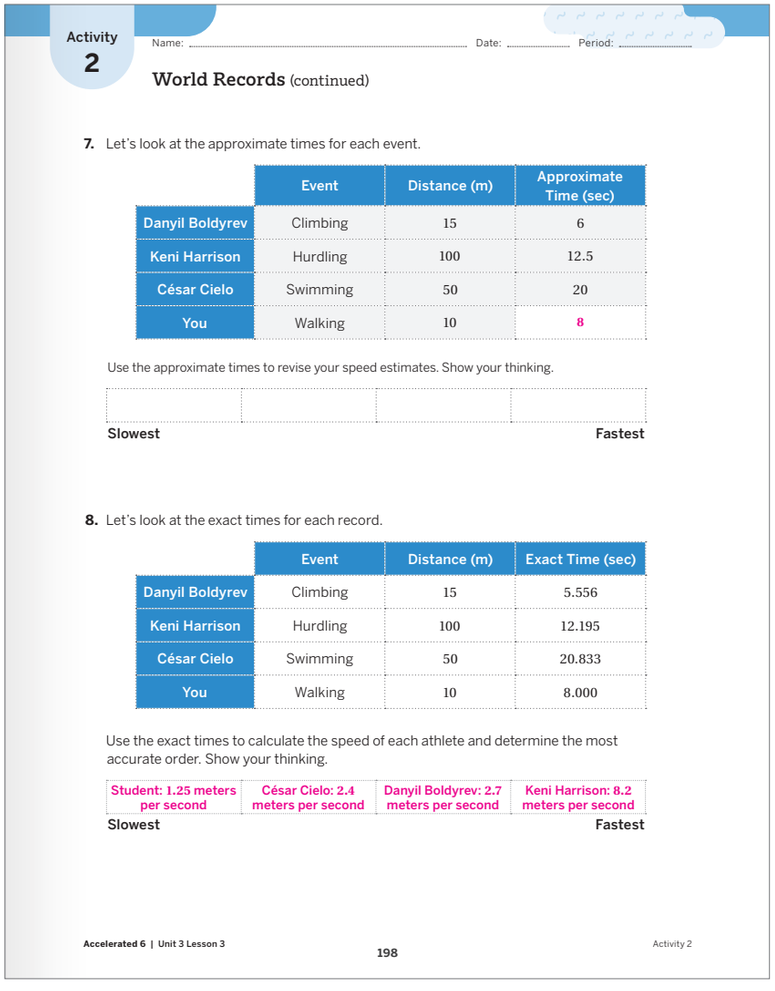
Height (in.)	Width (in.)
4	6
$1\frac{1}{2}$	$2\frac{1}{4}$
5	$7\frac{1}{2}$

Professional Learning

Here is an opportunity to deepen your understanding of the math in this unit and how to teach it.

Spotlight on Conceptual Understanding

Lesson 3, Activity 2



Activity 2

Name: Date: Period:

World Records (continued)

7. Let's look at the approximate times for each event.

	Event	Distance (m)	Approximate Time (sec)
Danyil Boldyrev	Climbing	15	6
Keni Harrison	Hurdling	100	12.5
César Cielo	Swimming	50	20
You	Walking	10	8

Use the approximate times to revise your speed estimates. Show your thinking.

Slowest Fastest

8. Let's look at the exact times for each record.

	Event	Distance (m)	Exact Time (sec)
Danyil Boldyrev	Climbing	15	5.556
Keni Harrison	Hurdling	100	12.195
César Cielo	Swimming	50	20.833
You	Walking	10	8.000

Use the exact times to calculate the speed of each athlete and determine the most accurate order. Show your thinking.

Student: 1.25 meters per second | César Cielo: 2.4 meters per second | Danyil Boldyrev: 2.7 meters per second | Keni Harrison: 8.2 meters per second

Slowest Fastest

Accelerated 6 | Unit 3 Lesson 3 198 Activity 2

Context

In this activity, students develop their conceptual understanding of unit rates by connecting equivalent ratios to speed.

Try This

Put on your student hat and complete Problems 7–8.

Points to Ponder

- What do students need to understand about equivalent ratios to support their conceptual understanding of rates and unit rates?
- How will unit rates support their understanding of percentages?

Notes:

Assess and Respond

Pre-Unit Check

Independent | 45 min

Facilitation: Assign the Pre-Unit Check to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Preparation for	DOK	FL B.E.S.T. Math Benchmarks
1	Describing measurements of length and volume	Lesson 1	1	MA.6.AR.3.5 MTR.4.1
2	Converting units of measurement	Lesson 2	1	MA.6.AR.3.5 MTR.1.1, MTR.5.1
3	Multiplying a whole number by a fraction	Lesson 11	1	MA.6.AR.3.4, MA.6.NSO.3.5
4	Using ratio and rate reasoning to solve real-world problems	Lesson 3	1	MA.6.AR.3.5 MTR.3.1
5	Describing percentages	Lesson 8	1	MA.6.AR.3.4 MTR.6.1
6	Multiplying a fraction by a whole number	Lesson 11	1	MA.6.NSO.3.5
7	Identifying equivalent expressions that include the multiplication of whole numbers, fractions, and decimals	Lesson 11	1	MA.6.AR.3.4 MA.6.NSO.3.5

Assessment and Lesson Resources

- Student Assessments
- Show What You Knows and Answer Keys

Intervention and Extension Resources

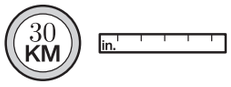
- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Pre-Unit Check

Unit 3

1. (a) Kilometers and inches are two units used to measure *length*.



List two other units used to measure length.

Responses vary. Meters, feet, centimeters, millimeters, miles.

(b) Tablespoons and liters are two units used to measure *volume*.

List two other units used to measure volume.

Responses vary. Teaspoons, gallons, cups, quarts, pints, milliliters, cubic centimeters, cubic inches.

2. Select *all* of the true statements.

- ☑ A. 2 meters = 200 centimeters
- ☐ B. 5 millimeters = 50 centimeters
- ☐ C. 300 meters = 3 centimeters
- ☐ D. 4 centimeters = 400 meters
- ☑ E. 30 millimeters = 3 centimeters

1 meter = 100 centimeters

1 centimeter = 10 millimeters

3. Select *all* of the numbers that have the same value as $7 \times \frac{5}{4}$.

☐ A. 8.3 ☑ B. $\frac{35}{4}$ ☑ C. $8\frac{3}{4}$ ☐ D. $\frac{35}{28}$ ☑ E. 8.75

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Name: ..... Date: ..... Period: .....

Pre-Unit Check (continued)

Unit 3

4. A bakery charges $3 for 8 cookies.

(a) How many cookies can you buy with $15?

40 cookies

(b) Dylan says that 10 cookies would cost $3.50. Is Dylan correct? Circle one.

Yes (No)

5. List anything you know about percentages.

Responses vary. Percentages help you find parts of numbers; like when something is on sale, you are only paying a portion of the price. Percentages are like fractions, where 50% is like half of something.

50% off

6. Complete each sentence or equation with a number that makes it true.

(a) $\frac{1}{4}$ of 24 is 6

(b) $\frac{3}{4}$ of 44 is 33

(c) $\frac{1}{10}$ of 300 is 30

(d) $\frac{1}{10}$ of 340 is 34

(e) $\frac{1}{10} \times 300 =$ 30

(f) $\frac{1}{100} \times 340 =$ 3.4

(g) $\frac{3}{100} \times 340 =$ 10.2

7. Select *all* of the expressions that have the same value.

☑ A. $\frac{1}{100} \times 400$ ☐ B. $\frac{1}{10} \times 400$ ☑ C. 400×0.01

☑ D. $\frac{400}{100}$ ☐ E. $\frac{1}{400} \times 100$

D Differentiation (Pre-Unit Check)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

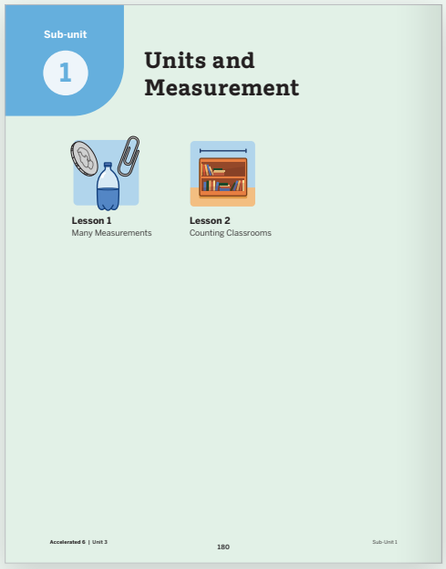
Sub-Unit Goals	Problem(s)	Respond to Student Thinking
Preparation for Sub-Unit 1: • Use ratio reasoning to convert between units of measurement. **(Lessons 1–2)**	1	**Support** • **Teacher Move:** Teacher Move: Before Lesson 1, create an anchor chart as a class with different units of measurement including ones shared.
	2	**Support** • **Teacher Move:** Before Lesson 2, consider revisiting this problem. Invite students to share the strategies they used for determining which measurements are equivalent.
	3	**Support** • **Mini-Lesson:** *Multiplying Whole Numbers by Fractions and Mixed Numbers* • **Teacher Move:** Before Lesson consider revisiting this problem and sharing with students how to verify using the Desmos calculator.
	4	**Support** **Support** • **Mini-Lesson:** • **Teacher Move:** Before Lesson 3, consider revisiting this problem and invite students to discuss what the cost per cookie is. Encourage students to use a table or double number line diagram to help with their thinking.
	5	**Support** • **Teacher Move:** After Lesson 8, consider having students revise their responses.
	6, 7	**Support** • **Teacher Move:** Before Lesson 11, consider inviting students to make connections between the word of as it relates to multiplication and between multiplying by $\frac{1}{100}$ and dividing by 100. Consider making an anchor chart for students to refer back to for the rest of the unit.

Units and Measurement

Sub-Unit 1 Goals

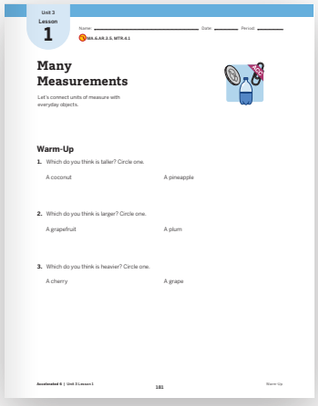
- **Goal:** Use ratio reasoning to convert between units of measurement.
- **Language Goal:** Explain why it takes more of a smaller unit or fewer of a larger unit to measure the same quantity.
- **Language Goal:** Describe connections between units of measurement and the measurements of everyday objects.

In this sub-unit, students use ratio reasoning to convert between units of measurement within systems of measurement.



Math That Matters Most

Concept or Skill	For example . . .
Convert within a system of measurement using a conversion that includes a 1.	The desk is 2.5 feet tall. How many inches is that? **30 inches** **1 foot = 12 inches**
Compare the sizes of units within a system of measurement.	**Milliliters is a smaller unit than liters because it takes more milliliters than liters to fill the same space.** 1 liter = 1000 milliliters


Unit 3
Lesson
1

Many Measurements

Let's connect units of measure with everyday objects.

Warm-Up

1. Which do you think is taller? Circle one.
   A coconut A pineapple
2. Which do you think is larger? Circle one.
   A grapefruit A plum
3. Which do you think is heavier? Circle one.
   A cherry A grape

Many Measurements

Everyday Measurements

Let's connect units of measure with everyday objects.

Learning Outcomes

Today's Goals

1. **Goal:** Determine whether a certain unit measures length, area, time, weight, or volume.
2. **Goal:** Compare the relative size of different units of measure for one attribute (i.e., length, volume, weight or mass).
3. **Language Goal:** Describe everyday objects using units of measure. **(Speaking and Listening)**

Students apply their prior knowledge about different units of measurement, what they measure, and their relative sizes. They describe different units of measurement and connect them with the measurements of everyday objects, such as the width of a finger or the weight of a slice of bread.

Coherence

Prior Learning

In a previous course, students measured and estimated lengths, volumes, and masses or weights in standard units. Later, they converted between units of measure within a given measurement system.

Future Learning

In Lesson 2, students will apply their background knowledge of units of measurement along with their prior understanding of ratio reasoning to convert within the same measurement system.

Connections

- Students apply their previous understanding of measurement using common objects. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On

MA.4.M.1.1

Lesson at a Glance

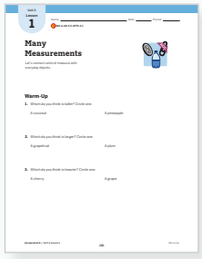
~ 45 min

MA.6.AR.3.5

Warm-Up

Pairs | 5 min

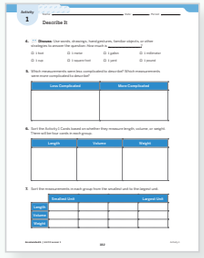
Students discuss ways of making comparisons based on measurements such as length, volume, and weight. **Routine:** Think-Pair-Share



Activity 1

Pairs | 18 min

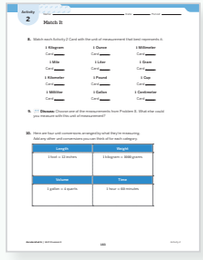
Students apply their background knowledge to describe and sort units of measurement using a variety of strategies. MLR2: Collect and Display



Activity 2

Pairs | 12 min

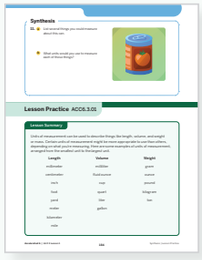
Students make connections between units of measurement and everyday objects.



Synthesis

Whole Class | 5 min

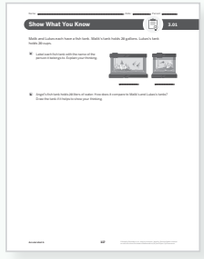
Students synthesize their understanding that units of measure are used to describe different attributes such as length, volume, and weight. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of units of measure by comparing measurements of volume.



Prep Checklist

Prepare the Activity 1 and Activity 2 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one per pair, pre-cut
- Activity 2 Cards, one per pair, pre-cut
- Classroom items that represent measurement, such as a centimeter, an ounce, a cup, etc. (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students discuss ways of making comparisons based on measurements such as length, volume, and weight.

1 Launch

Use the Think-Pair-Share routine to support student-to-student discourse about each question. See the Routine Facilitation Guide for more information.

Note: Formally, mass and weight are defined as separate attributes, where weight depends on gravity, while mass does not. For the purpose of this unit, mass and weight are both attributes that describe how heavy an object is on Earth.

2 Connect

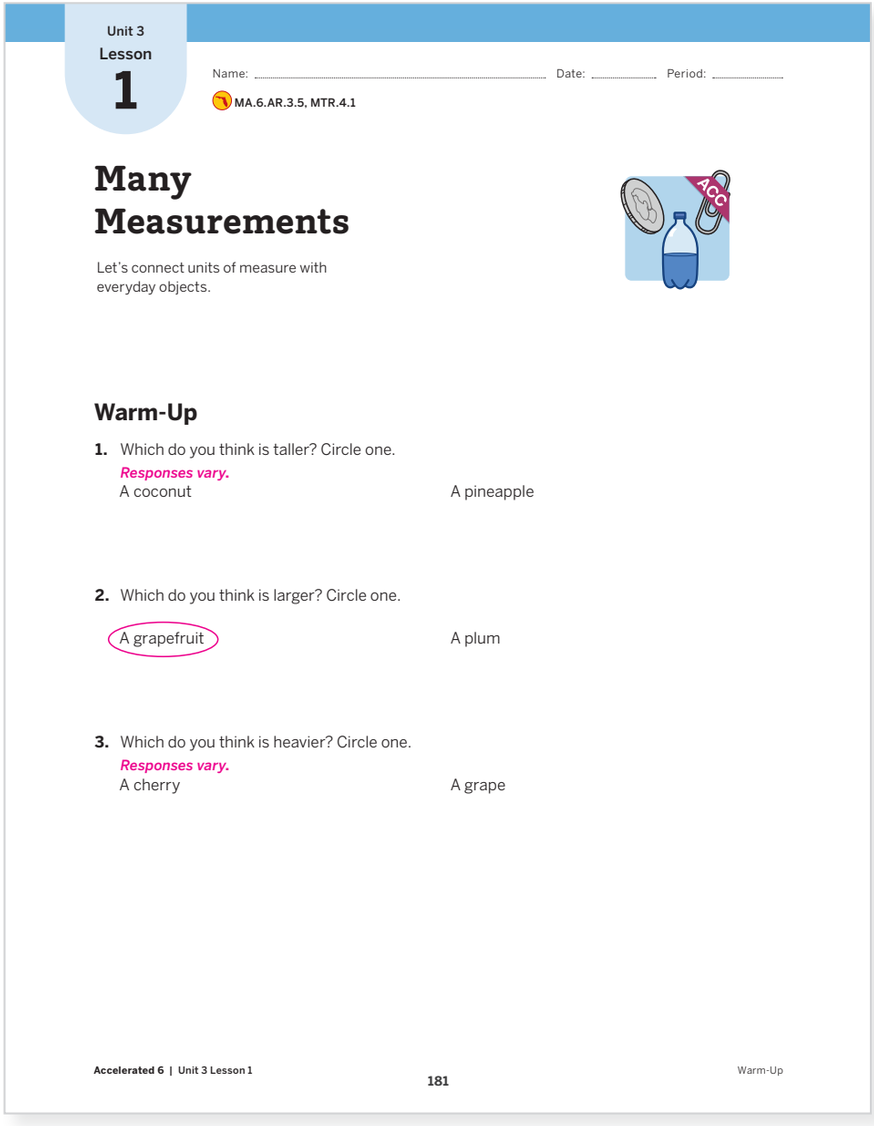
Direct students' attention to each question, one at a time, and poll the class to see the distribution of responses.

Invite students to share how they chose their response and what information they would need to be more certain.

Consider asking:

- "Which problems are asking about length? Weight? Volume?" **(MTR.4.1)**
- "What tools could be used to determine which item is taller, larger, or heavier?"

ELL **English Language Learners** Consider creating an anchor chart about length, weight, and volume. Add student ideas and language to the chart throughout the lesson, including comparison words that are specific to the type of unit (e.g., heavier is used to compare weights).



Unit 3
Lesson
1

Name: ..... Date: ..... Period: .....

MA.6.AR.3.5, MTR.4.1

Many Measurements

Let's connect units of measure with everyday objects.

Warm-Up

1. Which do you think is taller? Circle one.
   Responses vary.
   A coconut A pineapple

2. Which do you think is larger? Circle one.
   A grapefruit A plum

3. Which do you think is heavier? Circle one.
   Responses vary.
   A cherry A grape

Accelerated 6 | Unit 3 Lesson 1 181 Warm-Up

Pairs | 18 min

Activity 1 Describe It

Purpose: Students apply their background knowledge to describe and sort units of measurement using a variety of strategies.

1 Launch

Direct students' attention to the discussion question and encourage students to share multiple strategies with their partner for each unit of measurement.

Invite students to move around the classroom to reference items that can help them.

Distribute one set of pre-cut Activity 1 Cards to each pair and share with students that they will need them for Problems 6–7.

2 Monitor

Listen for strategies to highlight during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Have incomplete or inaccurate responses. *(Problems 4 and 6–7)*	Support Encourage them to ask for and receive feedback from their partner to refine their responses. **(MTR.4.1)**
Sort Card 2, "1 ounce", as volume instead of weight because they were thinking of fluid ounces. *(Problem 6)*	Support Consider sharing that fluid ounces are used to describe volume and add that to any anchor or reference chart.
Relate each unit of measure to familiar items. *(Problems 4 and 6–7)*	Stretch Invite them to add as many measurements as they can think of to each group.

A Accessibility: Visual-Spatial Processing Provide access to a collection of classroom items that represent smaller measurements, such as a centimeter, an ounce, a cup, etc.

3 Connect

Invite students to share their descriptions and strategies used for sorting their cards.

Consider asking, "Why do you think we have different units that measure the same thing (like feet or miles)?" **(MTR.4.1)**

MLR MLR2: Collect and Display Use this routine to collect students' ideas, language, or examples of the different types of measurements as they share during the Connect. Display for students to reference and add to for the rest of the unit.

Activity 1

Name: Date: Period:

Describe It

4. **Discuss:** Use words, drawings, hand gestures, familiar objects, or other strategies to answer the question: *How much is* ...?

- ☐ 1 foot
- ☐ 1 meter
- ☐ 1 gallon
- ☐ 1 millimeter
- ☐ 1 cup
- ☐ 1 square foot
- ☐ 1 yard
- ☐ 1 pound

5. Which measurements were *less* complicated to describe? Which measurements were *more* complicated to describe? ***Responses vary.***

Less Complicated	More Complicated

6. Sort the Activity 1 Cards based on whether they measure length, volume, or weight. There will be four cards in each group.

Length	Volume	Weight
Card 3 Card 4 Card 7 Card 12	Card 5 Card 9 Card 10 Card 11	Card 1 Card 2 Card 6 Card 8

7. Sort the measurements in each group from the *smallest* unit to the *largest* unit.

	Smallest Unit			Largest Unit
Length	1 millimeter	1 centimeter	1 kilometer	1 mile
Volume	1 milliliter	1 cup	1 liter	1 gallon
Weight	1 gram	1 ounce	1 pound	1 kilogram

Accelerated 6 | Unit 3 Lesson 1 182 Activity 1

Key Takeaway: Units of measure can be categorized by the attribute they measure: length, volume, or weight. Within each category, different units measure larger or smaller objects.

Pairs | 12 min

Activity 2 Match It

Purpose: Students make connections between units of measurement and everyday objects.

Short on time? Consider having students only match half of the cards.

1 Launch

Invite students to discuss the question, and consider sharing the differences between imperial and metric units.

Distribute one set of pre-cut Activity 2 Cards to each pair.

2 Monitor

Look and listen for a variety of student thinking.

D Differentiation

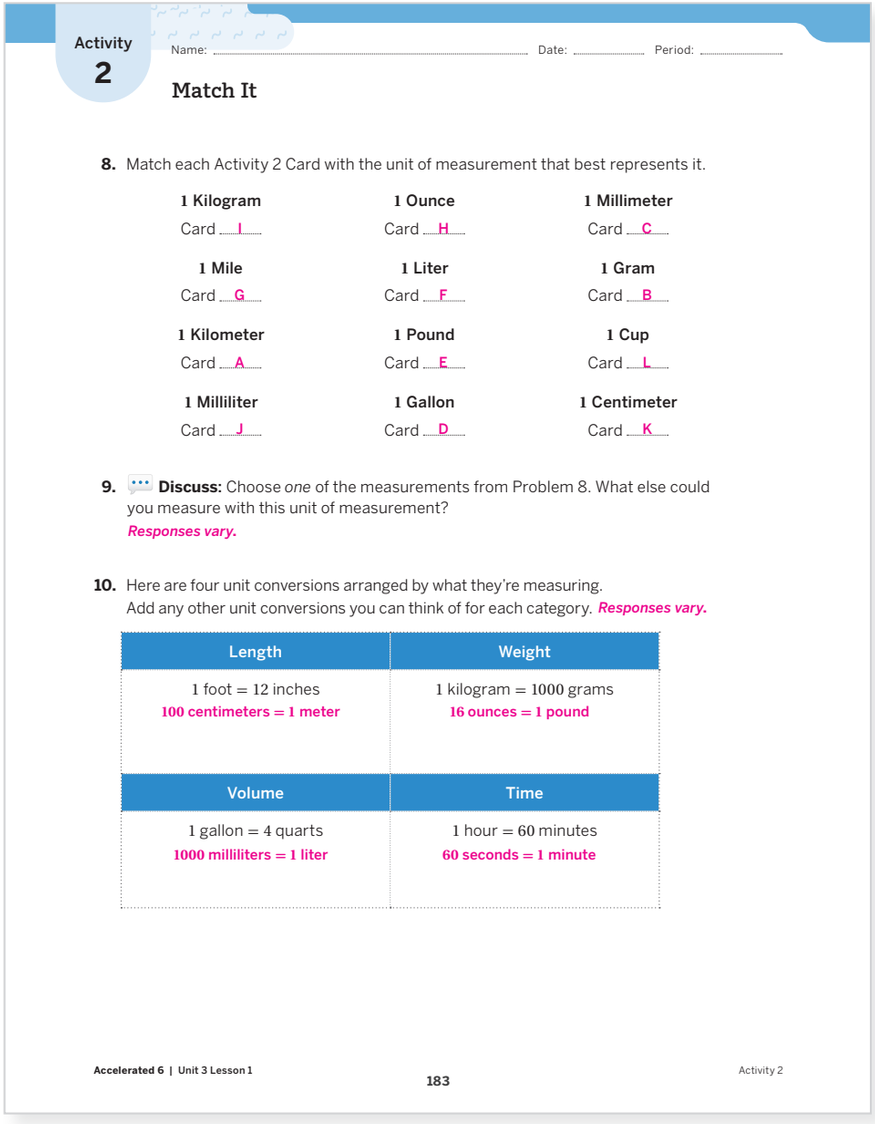
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to sort the cards they know first, then look for patterns in the names to sort any remaining cards.
Match inaccurate types of measurement (e.g., weight matched with volume).	**Support** Invite them to reference the anchor chart from Activity 1 to support their reasoning.
Mix up close measurements, such as ounce and gram, mile and kilometer, and kilogram and pound.	**Support** Invite them to use the solutions to Problem 7 to help decide between two cards.
Matches are not the "best." (e.g., You could measure the distance walked in 10 minutes in centimeters, it would just be a lot of centimeters.)	**Strengthen** Consider asking, "What do you think is meant by 'best?' Are your matches consistent with that?"

3 Connect

Invite students to compare their card sort with a partner, justify their card placement, and make revisions based on their conversation. **(MTR.4.1)**

Consider asking:

- "How did you define best? How did that impact the strategy you used?"
- "What other attributes could you measure about the dime? The slice of bread?"



Activity 2

Name: _____ Date: _____ Period: _____

Match It

8. Match each Activity 2 Card with the unit of measurement that best represents it.

1 Kilogram Card I	**1 Ounce** Card H	**1 Millimeter** Card C
1 Mile Card G	**1 Liter** Card F	**1 Gram** Card B
1 Kilometer Card A	**1 Pound** Card E	**1 Cup** Card L
1 Milliliter Card J	**1 Gallon** Card D	**1 Centimeter** Card K

9. **Discuss:** Choose *one* of the measurements from Problem 8. What else could you measure with this unit of measurement?
Responses vary.

10. Here are four unit conversions arranged by what they're measuring. Add any other unit conversions you can think of for each category. ***Responses vary.***

Length	Weight
1 foot = 12 inches **100 centimeters = 1 meter**	1 kilogram = 1000 grams **16 ounces = 1 pound**
Volume	**Time**
1 gallon = 4 quarts **1000 milliliters = 1 liter**	1 hour = 60 minutes **60 seconds = 1 minute**

Accelerated 6 | Unit 3 Lesson 1 183 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that units of measure are used to describe different attributes such as length, volume, and weight.

Invite students to respond independently, and then share their thinking with a partner.

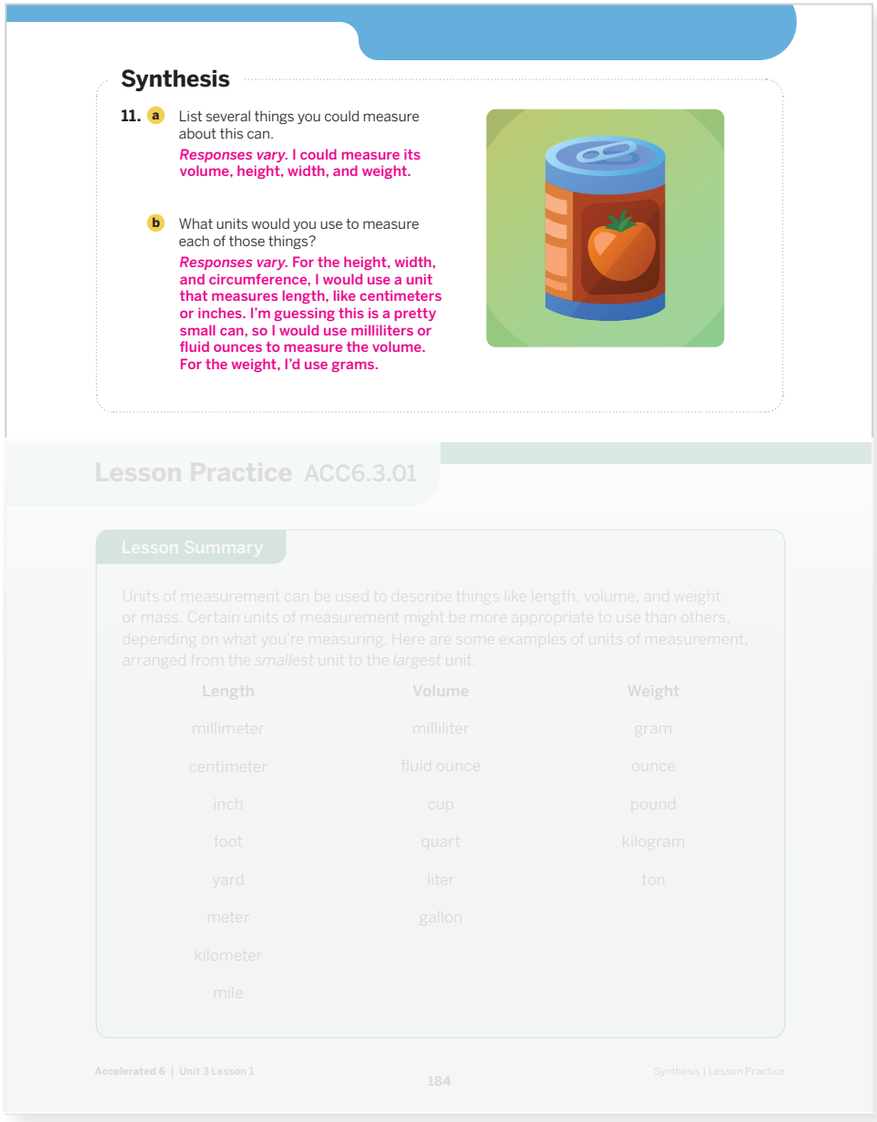
Capture and share a variety of ideas, such as:

- The can's weight can be measured using units that measure weight, such as ounces or grams.
- Although ounces and pounds can be used to measure the weight of the can, using ounces makes more sense because a can of soup would be a really small (fractional) amount of pounds.

MLR **MLR2: Collect and Display** Use this routine to revisit students' ideas about units of measure. Add any new ideas to the display for students to reference for the rest of the unit.

Consider asking:

- "Would you use ounces or pounds to measure the weight of a can of soup? Why?" Ounces. Using ounces makes more sense because a can of soup would be a really small (fractional) amount of pounds.
- "Would you use inches or feet to measure the length of a can of soup? Why?" Inches. Using feet makes more sense because a can of soup would be a really small (fractional) number of feet.



Synthesis

11. **a** List several things you could measure about this can.

Responses vary. **I could measure its volume, height, width, and weight.**

b What units would you use to measure each of those things?

Responses vary. **For the height, width, and circumference, I would use a unit that measures length, like centimeters or inches. I'm guessing this is a pretty small can, so I would use milliliters or fluid ounces to measure the volume. For the weight, I'd use grams.**

Lesson Takeaway: Different units can be used to measure the same real-world object depending on whether you are measuring its length, weight, or volume. An object can be measured with different units within that category, depending on which is needed or more appropriate (e.g., it's more appropriate to measure the weight of a car in tons, but it's more appropriate to measure the weight of a slice of bread in grams).

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of units of measure by comparing measurements of volume.

Today's Goals

1. **Goal:** Determine whether a certain unit measures length, area, time, weight, or volume.
2. **Goal:** Compare the relative size of different units of measure for one attribute (i.e., length, volume, weight or mass).
3. **Language Goal:** Describe everyday objects using units of measure. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 3.01

Malik and Lukas each have a fish tank. Malik's tank holds 20 gallons. Lukas's tank holds 20 cups.

a. Label each fish tank with the name of the person it belongs to. Explain your thinking.

Explanations vary. The smaller tank is Lukas's and the larger tank is Malik's because cups are smaller than gallons.

Malik Lukas

b. Angel's fish tank holds 20 liters of water. How does it compare to Malik's and Lukas's tanks? Draw the tank if it helps to show your thinking.

Responses vary. 1 liter is larger than 1 cup and smaller than 1 gallon. This means Angel's fish tank is larger than Lukas's and smaller than Malik's.

D Differentiation Use after Lesson 1

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to identify or compare units of measure:

» **Respond to Student Thinking:**

- Review the **Lesson Summary** together and make an anchor chart of real world objects that are measured in each unit.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

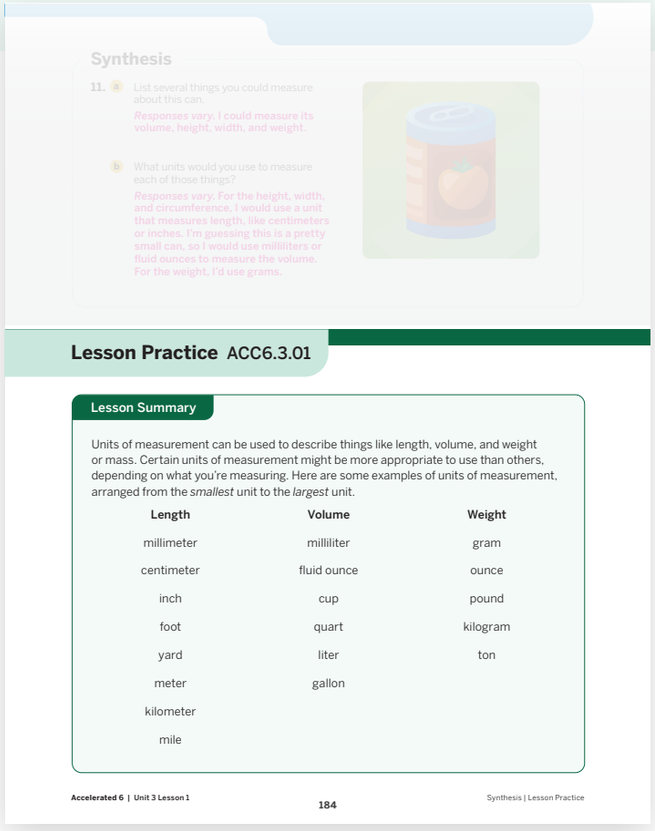
Professional Learning

Who participated and who did not participate in sorting and matching the cards today? What trends do you see in participation? What will you consider doing to disrupt these patterns in future lessons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

11. a. List several things you could measure about this can.

Responses vary. I could measure its volume, height, width, and weight.

b. What units would you use to measure each of those things?

Responses vary. For the height, width, and circumference, I would use a unit that measures length, like centimeters or inches. I'm guessing this is a pretty small can, so I would use milliliters or fluid ounces to measure the volume. For the weight, I'd use grams.

Lesson Practice ACC6.3.01

Lesson Summary

Units of measurement can be used to describe things like length, volume, and weight or mass. Certain units of measurement might be more appropriate to use than others, depending on what you're measuring. Here are some examples of units of measurement, arranged from the *smallest* unit to the *largest* unit.

Length	Volume	Weight
millimeter	milliliter	gram
centimeter	fluid ounce	ounce
inch	cup	pound
foot	quart	kilogram
yard	liter	ton
meter	gallon	
kilometer		
mile		

Lesson Practice
ACC6.3.01

Name: _____ Date: _____ Period: _____

Problems 1–3: For each pair, circle the larger unit of measurement.

1. A. Meter (B.) Kilometer
2. (A.) Yard B. Foot
3. (A.) Pound B. Ounce

4. Match each object with the unit you would most likely use to measure it.

a.	The height of a building.	f	Gallons
b.	The length of a fingernail.	b	Centimeters
c.	The weight of a paper clip.	c	Grams
d.	The distance between two cities.	e	Pounds
e.	The weight of a bowling ball.	a	Feet
f.	The volume of a water cooler.	d	Kilometers

Problems 5–6: Identify a unit that can be used to measure:

5. The length of a neighborhood road.
Responses vary. Miles.

6. The volume of a car's gas tank.
Responses vary. Gallons.

Lesson Practice
ACC6.3.01

Name: _____ Date: _____ Period: _____

FAST Practice

7. Determine whether each unit of measurement measures length, volume, or weight.

Unit	Length	Volume	Weight
Yard	☑	☐	☐
Milliliter	☐	☑	☐
Fluid Ounce	☐	☑	☐
Pound	☐	☐	☑
Ounce	☐	☐	☑

Spiral Review

Problems 8–9: Determine each quotient. Show or explain your thinking.

8. $1275 \div 15 = 85$
Explanations vary.

$$\begin{array}{r} 85 \\ 15\overline{)1275} \\ -120 \\ \hline 75 \\ -75 \\ \hline 0 \end{array}$$

9. $1500 \div 25 = 60$
Explanations vary.
$25 \cdot 4 = 100$
$100 \cdot 15 = 1500$
$4 \cdot 15 = 60$

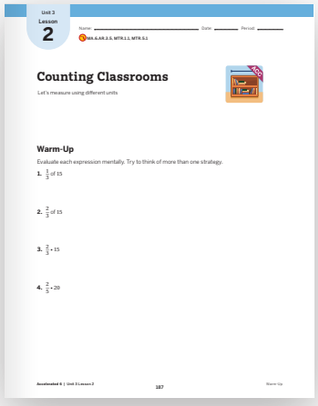
10. In a jazz orchestra, there is a horn section and a rhythm section. The ratio of horn players to rhythm players is 13 to 4. What is the ratio of rhythm players to total players?

A. 4 : 13 B. 13 : 17
C. 4 : 9 (D.) 4 : 17

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.6.AR.3.5*
	5–6	2	MA.6.AR.3.5*
FAST Practice	7	1	MA.6.AR.3.5*
Spiral Review			
	8–9	1	MA.5.NSO.2.2
	10	2	MA.6.AR.3.3

*This problem builds toward the standard shown.


Unit 3
Lesson 2
Name: Date: Period:
MA.6.AR.3.5, MTR.1.1, MTR.5.1
Counting Classrooms
Let's measure using different units
Warm-Up
Evaluate each expression mentally. Try to think of more than one strategy.
1. $\frac{1}{3}$ of 15
2. $\frac{2}{3}$ of 15
3. $\frac{2}{3} \cdot 15$
4. $\frac{7}{5} \cdot 20$
Accelerated 6 | Unit 3 Lesson 2
187
Warm-Up

Counting Classrooms

Measuring With Different Units

Let's measure using different units.

Learning Outcomes

Today's Goals

1. **Goal:** Convert measurements from one unit to another in different measurement systems.
2. **Language Goal:** Explain why it takes more of a smaller unit or fewer of a larger unit to measure the same quantity. **(Writing, Speaking, and Listening)**

Students begin thinking about converting measurements within the same system of measurement. They compare lengths of objects in their classroom across the same measurement system, explaining why it takes more of a smaller unit or fewer of a larger unit to measure the same quantity. They then use ratios in terms of 1 to convert between units.

Coherence

Prior Learning

In Lesson 1, students connected units of measure with everyday objects to get a sense of their relative size.

Future Learning

In a future course, students will use ratio reasoning and a variety of strategies, such as double number line diagrams, tables, and multiplication or division, to compare and convert values from one measurement system to another.

Connections

- Students use measurements for common objects to find simple conversions. (real-world, mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.4.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building Toward

MA.7.AR.3.1
MA.7.AR.3.2
MA.7.AR.3.3

Lesson at a Glance

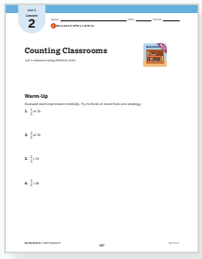
~ 45 min

MA.6.AR.3.5

Warm-Up

Whole Class | 7 min

Students surface strategies for multiplying whole numbers by fractions. **Routine:** Number Talk



Activity 1

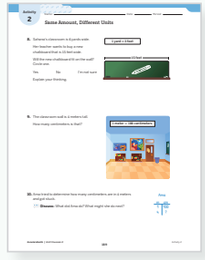
Pairs | 10 min

Students measure objects in different units to consider the relationship between the size of the unit and the amount needed to precisely measure an object. **(MTR.1.1)**

Activity 2

Pairs | 10 min

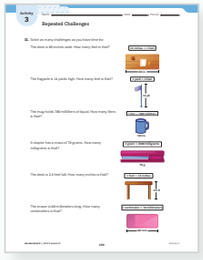
Students develop strategies to convert within measurement systems when given a ratio in terms of 1. **Routine:** Think-Pair-Share



Activity 3

Pairs | 8 min

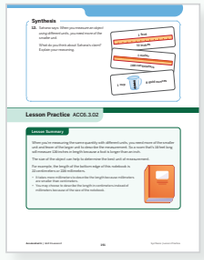
Students practice converting within measurement systems when given a ratio in terms of 1.



Synthesis

Whole Class | 5 min

Students synthesize their understanding that it will take more of a smaller unit than a larger unit to measure an object and ratios in terms of 1 can be used to convert measurements.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by converting a length from feet to yards.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Meter sticks
- Centimeter rulers

Whole Class | 7 min

Warm-Up

Purpose: Students surface strategies for multiplying whole numbers by fractions.

1 Launch

Use the Number Talk routine to support students in multiplying whole numbers by fractions. See the Routine Facilitation Guide for more information.

Invite students to mentally evaluate the first expression independently. Then record a variety of strategies, along with the name of the students who shared them.

Consider asking, "Who thought about it in a different way?"

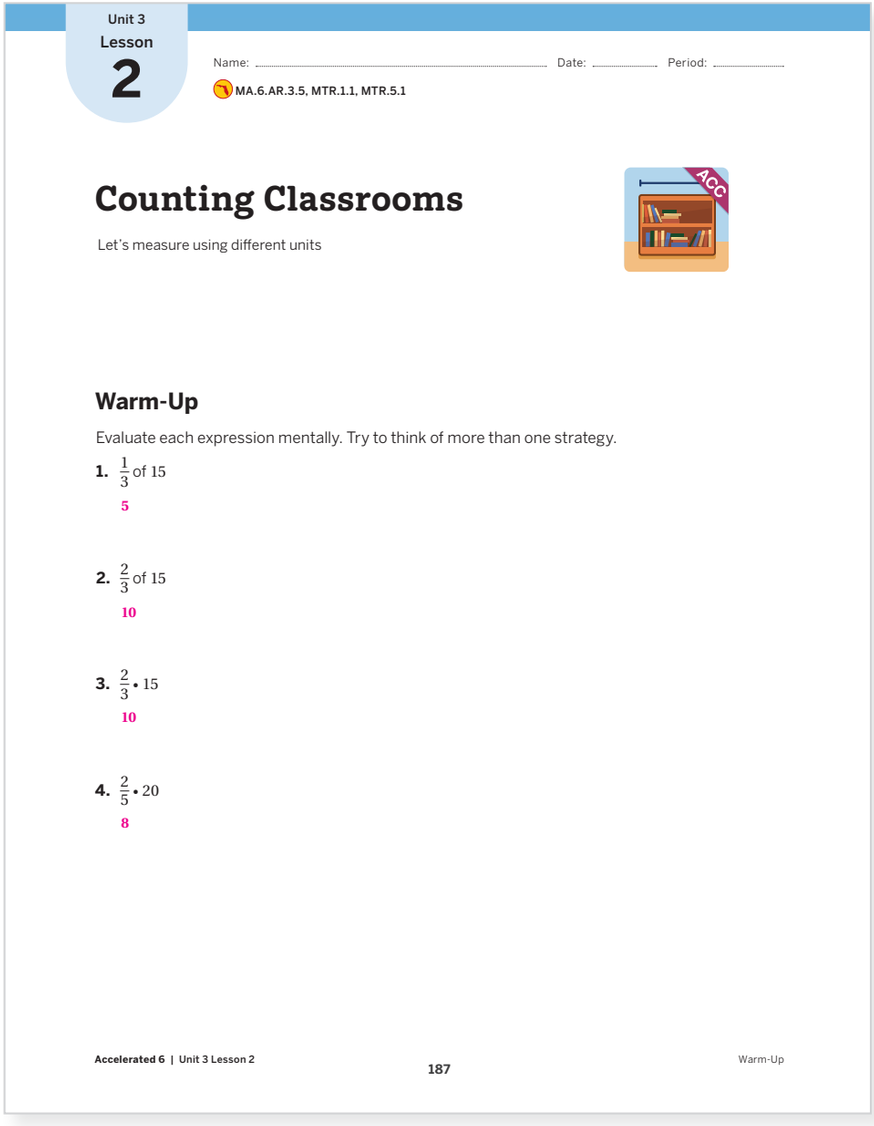
Note: This structure is repeated for each problem in the Number Talk.

2 Connect

Invite students to compare and contrast the different expressions and strategies.

Consider asking:

- "What connections do you notice among the strategies we've discussed?"
- "What connections do you notice among the different expressions?"
- "Why do the second and third problems have the same value?"



Unit 3
Lesson
2

Name: ..... Date: ..... Period: .....

MA.6.AR.3.5, MTR.1.1, MTR.5.1

Counting Classrooms

ACC

Let's measure using different units

Warm-Up

Evaluate each expression mentally. Try to think of more than one strategy.

1. $\frac{1}{3}$ of 15

   5

2. $\frac{2}{3}$ of 15

   10

3. $\frac{2}{3} \cdot 15$

   10

4. $\frac{2}{5} \cdot 20$

   8

Accelerated 6 | Unit 3 Lesson 2 187 Warm-Up

Pairs | 10 min

Activity 1 Classroom Lengths

Purpose: Students measure objects in different units to consider the relationship between the size of the unit and the amount needed to precisely measure an object. **(MTR.1.1)**

Short on time? Consider having students measure only two or three objects before moving on.

1 Launch

To support students getting started, invite them to identify an object in the room that is shorter than a ruler and an object that is longer than a ruler but shorter than a meter stick.

Invite students to predict how long an object will be before they measure it.

Invite students to share when they used each of the units, if time allows.

2 Monitor

Invite students to compare their card sort with a partner, justify their card placement, and make revisions based on their conversation. **(MTR.1.1)**

Listen for students who make the same error that is shown in the next problem.

D **Differentiation: (Stretch)** Look for students who have accurate matches and consider asking, "About how long will the pencil be in yards"?

Capture helpful ideas to share during the Connect.

3 Connect

To surface the Key Takeaway, consider asking:

- "Could we measure a pencil in kilometers? Would we need more or fewer than 0.2?"
- "Would we need more meters or more millimeters to measure a person's height?"
- "Which measurement do you think is most precise to measure a person's height? Which one is most useful?"

Activity 1

Name: Date: Period:

Classroom Lengths

5. a Choose a few objects in the classroom to measure. Try to use millimeters, centimeters, and meters. Record your findings below.

Measurements vary.

b **Discuss:** Which units were most useful for measuring each object?

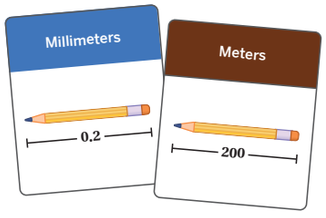
Responses vary. Centimeters were most useful for measuring the smaller objects, and meters were most helpful for measuring larger objects. Nothing in the classroom was small enough to measure using millimeters.

6. Here are some measurements for Sahana's pencil. Match each unit to the appropriate value. One unit will not have a match.

Feet	Inches	Yards
0.5	6	
Feet	Inches	

7. Amara incorrectly matched these two pairs of cards. What would you say to help her understand her mistake?

Responses vary. I would tell Amara that a pencil is less than 1 meter long, so the measurement in meters will be less than 1. Also, think about which unit is bigger: millimeters or meters. You need more of the smaller unit to measure the same distance.



Accelerated 6 | Unit 3 Lesson 2 188 Activity 1

Key Takeaway: When measuring an object, you need more of the smaller unit than the larger unit. Depending on the precision or use, different measurements may be more useful than others.

Pairs | 10 min

Activity 2 Same Amount, Different Units

Purpose: Students develop strategies to convert within measurement systems when given a ratio in terms of 1.

1 Launch

Use the Think-Pair-Share routine to help students shape their ideas about converting between units. See the Routine Facilitation Guide for more information.

Display the distribution of responses and consider asking, "How can you use multiplication to help determine the answer? Division?" You can divide 15 feet by 3 feet, to get 5 yards. You can ask what value multiplied by 3 feet gets you 15 feet, which is 5.

2 Monitor

Look for a variety of thinking and strategies.

D Differentiation

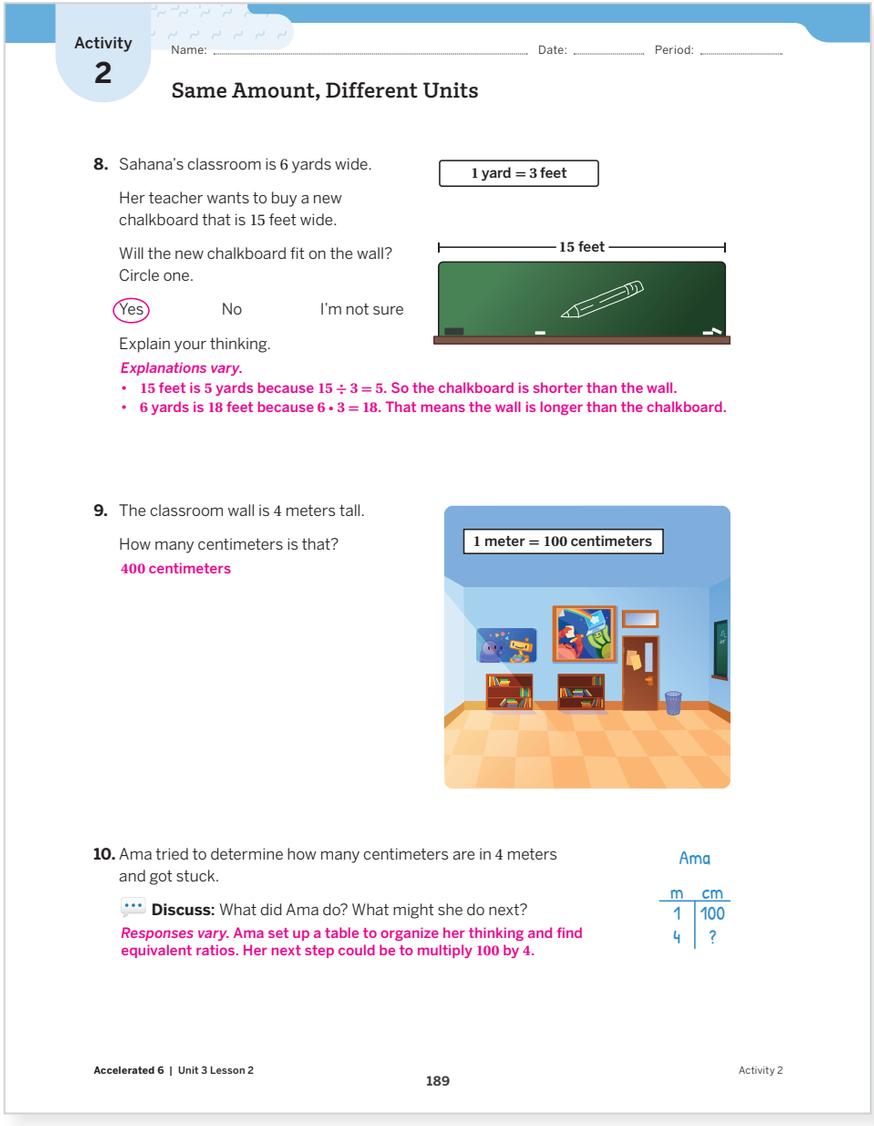
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to start by considering how many centimeters are in 1 meter, then 2, then 3.
Use $4 \times 1{,}000$ to get 4,000.	**Support** Consider asking, "Does this answer make sense? Why did you multiply 1,000 by 4? What is the relationship between 1 meter and 100 centimeters? How can we maintain that relationship?"
Use a strategy similar to Ama's in Problem 10 or other creative strategies.	**Stretch** Invite them to share their thinking during the Connect.

Listen for students who reference equivalent ratios or multiplying vertically on the table.

A Accessibility: Visual-Spatial Processing
Provide access to a meter stick.

3 Connect

To surface the Key Takeaway, consider asking:
- "How can a table be used to convert units?"
- "How are unit conversions related to equivalent ratios?"



Activity 2

Name: Date: Period:

Same Amount, Different Units

8. Sahana's classroom is 6 yards wide.

Her teacher wants to buy a new chalkboard that is 15 feet wide.

Will the new chalkboard fit on the wall? Circle one.

(Yes) No I'm not sure

Explain your thinking.

1 yard = 3 feet

15 feet

Explanations vary.
- 15 feet is 5 yards because $15 \div 3 = 5$. So the chalkboard is shorter than the wall.
- 6 yards is 18 feet because $6 \cdot 3 = 18$. That means the wall is longer than the chalkboard.

9. The classroom wall is 4 meters tall.

How many centimeters is that?

400 centimeters

1 meter = 100 centimeters

10. Ama tried to determine how many centimeters are in 4 meters and got stuck.

Ama

m	cm
1	100
4	?

Discuss: What did Ama do? What might she do next?

Responses vary. Ama set up a table to organize her thinking and find equivalent ratios. Her next step could be to multiply 100 by 4.

Accelerated 6 | Unit 3 Lesson 2 189 Activity 2

Key Takeaway: You can think about converting units as finding equivalent ratios. Use tables to organize ratios and determine unknown values of equivalent ratios by multiplying down the table.

Pairs | 8 min

Activity 3 Repeated Challenges

Purpose: Students practice converting within measurement systems when given a ratio in terms of 1.

Short on time? Consider having students complete only three problems.

1 Launch

Invite students to solve as many challenges as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly.

Accessibility: Memory and Attention Invite students who would benefit from having more time to think deeply to complete fewer challenges.

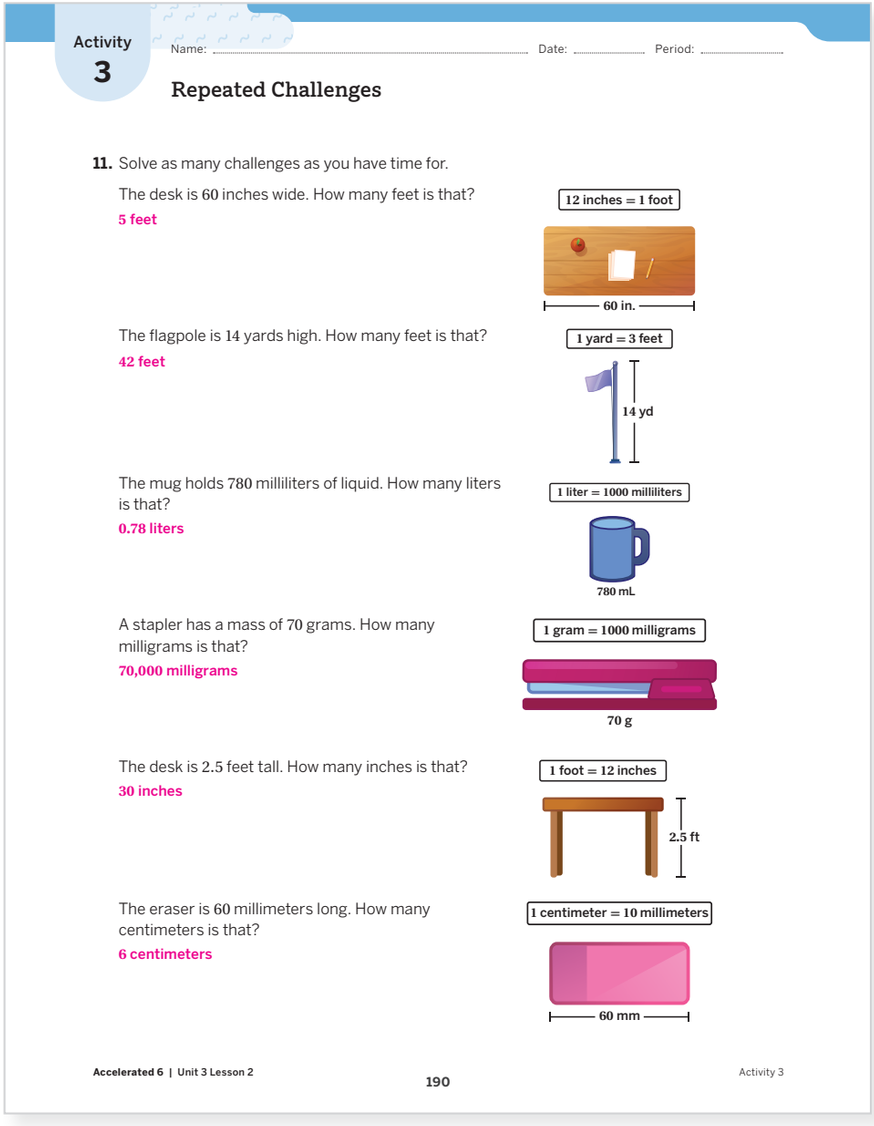
2 Monitor

Listen for students making connections between the units in the abstract and the quantitative measurements such as noticing if they are converting smaller units to larger units and vice versa. **(MTR.5.1)**

Students will need a partner for this activity. They will solve and compare their solutions to problems.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.



Activity 3

Name: Date: Period:

Repeated Challenges

11. Solve as many challenges as you have time for.

The desk is 60 inches wide. How many feet is that?

5 feet

12 inches = 1 foot

60 in.

The flagpole is 14 yards high. How many feet is that?

42 feet

1 yard = 3 feet

14 yd

The mug holds 780 milliliters of liquid. How many liters is that?

0.78 liters

1 liter = 1000 milliliters

780 mL

A stapler has a mass of 70 grams. How many milligrams is that?

70,000 milligrams

1 gram = 1000 milligrams

70 g

The desk is 2.5 feet tall. How many inches is that?

30 inches

1 foot = 12 inches

2.5 ft

The eraser is 60 millimeters long. How many centimeters is that?

6 centimeters

1 centimeter = 10 millimeters

60 mm

Accelerated 6 | Unit 3 Lesson 2 190 Activity 3

Whole Class | 5 min

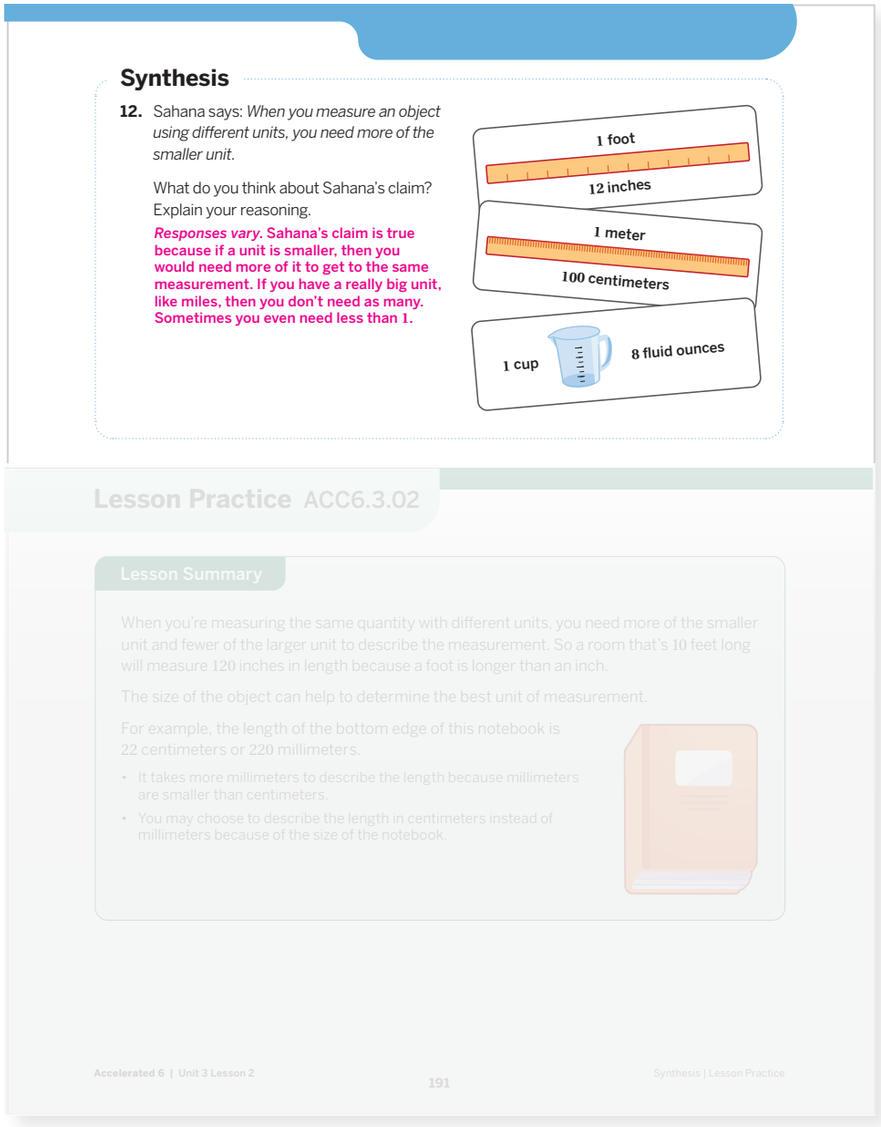
Synthesis

Purpose: Students synthesize their understanding that it will take more of a smaller unit than a larger unit to measure an object and ratios in terms of 1 can be used to convert measurements.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:
- A foot is larger than an inch, so you need less feet and more inches to measure the same object.
- This is true for all types of measurements, including weight, volume, length, etc.

Consider asking:
- "Why might choosing a larger or smaller unit be better for measuring something?"
- "How does knowing how much per 1 help you convert between units of measurement?"



Synthesis

12. Sahana says: *When you measure an object using different units, you need more of the smaller unit.*

What do you think about Sahana's claim? Explain your reasoning.

Responses vary. **Sahana's claim is true because if a unit is smaller, then you would need more of it to get to the same measurement. If you have a really big unit, like miles, then you don't need as many. Sometimes you even need less than 1.**

Lesson Practice ACC6.3.02

Lesson Summary

When you're measuring the same quantity with different units, you need more of the smaller unit and fewer of the larger unit to describe the measurement. So a room that's 10 feet long will measure 120 inches in length because a foot is longer than an inch.

The size of the object can help to determine the best unit of measurement.

For example, the length of the bottom edge of this notebook is 22 centimeters or 220 millimeters.

- It takes more millimeters to describe the length because millimeters are smaller than centimeters.
- You may choose to describe the length in centimeters instead of millimeters because of the size of the notebook.

Accelerated 6 | Unit 3 Lesson 2 191 Synthesis | Lesson Practice

Lesson Takeaway: It will always take more of the smaller unit than the larger unit to measure an attribute of a given object. Two measurements of the same object in different units form equivalent ratios. You can use ratios involving 1 to convert one measurement to another using multiplication or division.

Independent | 5 min

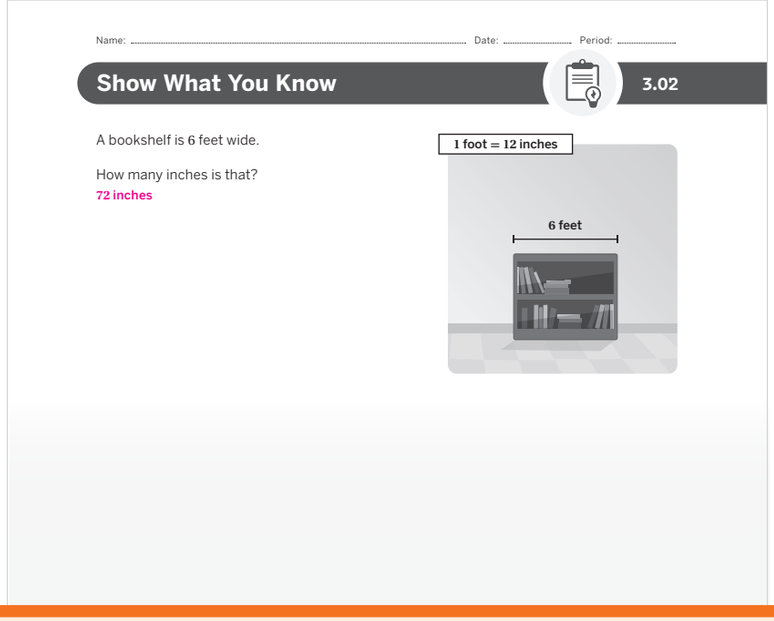
Show What You Know

Purpose: Students demonstrate their understanding by converting a length from feet to yards.

Today's Goals

1. **Goal:** Convert measurements from one unit to another in the same measurement system.
2. **Language Goal:** Explain why it takes more of a smaller unit or fewer of a larger unit to measure the same quantity. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)


Name: _____ Date: _____ Period: _____

Show What You Know 3.02

A bookshelf is 6 feet wide.

How many inches is that?

72 inches

1 foot = 12 inches

6 feet

D Differentiation Use after Lesson 2

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to convert between units of measure:

» **Respond to Student Thinking:**

- Use the *Converting Measurements* Mini-lesson.
- Use the *Applying Measurement Conversions to Compare Different Units* Mini-lesson.
- Review the **Lesson Summary**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

In this lesson, students deepened their understanding of equivalent ratios to support their understanding of converting within a measurement system. How were students able to apply their prior knowledge to this new concept? How can you support students in recognizing the connection between these two key math concepts?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

12. Sahana says: *When you measure an object using different units, you need more of the smaller unit.*

What do you think about Sahana's claim? Explain your reasoning.

Responses vary. Sahana's claim is true because if a unit is smaller, then you would need more of it to get to the same measurement. If you have a really big unit, like miles, then you don't need as many. Sometimes you even need less than 1.

Lesson Practice ACC6.3.02

Lesson Summary

When you're measuring the same quantity with different units, you need more of the smaller unit and fewer of the larger unit to describe the measurement. So a room that's 10 feet long will measure 120 inches in length because a foot is longer than an inch.

The size of the object can help to determine the best unit of measurement.

For example, the length of the bottom edge of this notebook is 22 centimeters or 220 millimeters.

- It takes more millimeters to describe the length because millimeters are smaller than centimeters.
- You may choose to describe the length in centimeters instead of millimeters because of the size of the notebook.

Lesson Practice ACC6.3.02

Name: _____ Date: _____ Period: _____

1. Juana says: *This classroom is 11 yards long. A yard is longer than a foot, so if I measure the length of this classroom in feet, I will get less than 11 feet.* Is Juana correct? Explain your thinking.

No. ***Explanations vary.*** **A yard is longer than a foot, so it takes more feet to measure the classroom. That means the number of feet will be greater than the number of yards.**

Problems 2–3: Use the conversion rate that makes the most sense to determine the approximate value of each missing quantity.

1 foot = 12 inches	1 yard = 3 feet
1 meter = 100 centimeters	1 yard = 36 inches

2. A room is 30 feet wide. How many yards is that?

10 yards

3. A door is 84 inches tall. How many feet is that?

7 feet

Problems 4–5: Use the conversion rate that makes the most sense to determine the approximate value of each missing quantity. Show or explain your thinking.

1 gallon = 4 quarts	1 liter = 1000 milliliters

4. 8 gallons = ____32____ quarts

Explanations vary. **8 • 4 = 32**

5. 5000 milliliters = ____5____ liters

Explanations vary. **5000 ÷ 1000 = 5**

FAST Practice

6. Tyron wants to mail a package that weighs $4\frac{1}{2}$ pounds. Which of the following could be the weight of the package in ounces? 1 pound = 16 ounces

A. 16.5 ounces **B.** 20.5 ounces **C.** 54 ounces **D.** 72 ounces

Lesson Practice ACC6.3.02

Name: _____ Date: _____ Period: _____

Spiral Review

7. Do each of these units measure length, volume, or weight?

Unit	Length	Volume	Weight
mile	✓		
cup		✓	
pound			✓
milliliter		✓	
yard	✓		
kilogram			✓
liter		✓	
centimeter	✓		

Problems 8–9: Identify a unit that can be used to measure each value.

8. The length of a calculator

inches

9. The volume of juice in a container

ounces

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	2	MA.6.AR.3.5
	2–5	1	MA.6.AR.3.5
FAST Practice	6	2	MA.6.AR.3.5
Spiral Review			
	7	2	MA.4.M.1.1
	8–9	1	MA.4.M.1.1

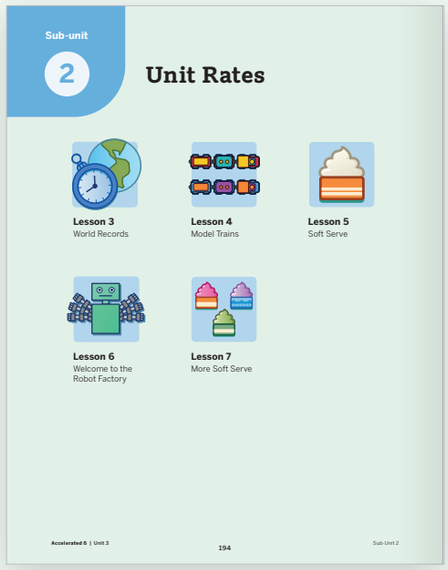
Sub-Unit 2

Unit Rates

Sub-Unit 2 Goals

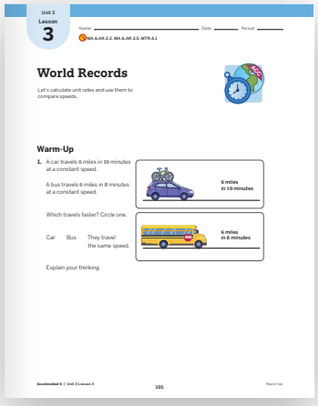
- **Goal:** Recognize and calculate two unit rates for the same ratio relationship.
- **Goal:** Use unit rates to solve problems involving tables of equivalent ratios.
- **Language Goal:** Identify and describe the two unit rates associated with a ratio, i.e., $\frac{a}{b}$ and $\frac{b}{a}$ for the ratio $a : b$.

In this sub-unit, students recognize that each ratio relationship has two **unit rates**. They use each of those unit rates to solve problems involving tables of equivalent ratios.



Math That Matters Most

Concept or Skill	For example . . .
Calculate a unit rate.	Two pounds of grapes cost \$5. Jordan says that the rate is 2.5 pounds per dollar. Emika says that it's 0.4 pounds per dollar. Which rate is correct? Explain your thinking. **0.4 pounds per dollar. Pounds per dollar means how many pounds for 1 dollar. Since 2 pounds cost \$5, dividing two pounds by 5 will give me the number of pounds for 1 dollar: $\frac{2}{5} = 0.4$.**
Use unit rates to solve problems.	Here are some new orders for Shop A. Complete the table. **Weight (oz)** / **Cost (dollars)** 9 / 3.60 4.5 / **1.80** **7.2** / 2.88


Unit 3
Lesson 3

World Records

Let's calculate unit rates and use them to compare speeds.

Warm-Up

1. A car travels 6 miles in 10 minutes at a constant speed.
   A bus travels 6 miles in 8 minutes at a constant speed.
   Which travels faster? Circle one.
   Car Bus They travel the same speed.
   Explain your thinking.

6 miles in 10 minutes

6 miles in 8 minutes

195

World Records

Comparing Speeds

Let's calculate unit rates and use them to compare speeds.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate the speed of an object as a *unit rate* for the distance the object travels over time.
2. **Language Goal:** Justify which of two objects is faster using mathematically precise language. **(Reading, Writing, Speaking, and Listening)**

Students are introduced to the term **unit rate** in the context of comparing speeds. Students measure the time it takes them to travel a predetermined distance. They then calculate and compare the speeds they traveled in meters per second. The idea of a constant speed relating the quantities of distance and time is foundational to the general idea of a constant rate and is important in developing students' abilities to reason abstractly about quantities.

Coherence

Prior Learning

In Lesson 2, students converted measurements from one unit to another in the same measurement system.

Future Learning

In Lesson 4, students will compare the speeds of model trains and discuss unit rates using the word per. They will start by considering what information is needed to determine which of two model trains is traveling faster, and then compare speeds of model trains given in different units of measurement.

Connections

- Students explore unit rate with various real world contexts such as car travel or walking speed. (real world, mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.2
Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate.

Also Addressing: **MA.6.AR.3.5**

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.4.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1 MA.6.NSO.2.1 MA.6.NSO.2.3	MA.7.AR.4.2

Vocabulary

New Vocabulary

rate

unit rate

Additional Vocabulary

per

Lesson at a Glance

~ 45 min

MA.6.AR.3.2, MA.6.AR.3.5

Warm-Up

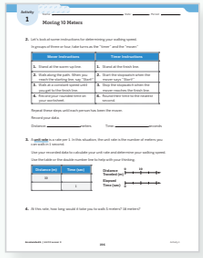
Pairs | 5 min

Students compare two vehicles that travel the same distance in different amounts of time.
Routine: Think-Pair-Share

Activity 1

Small Groups | 15 min

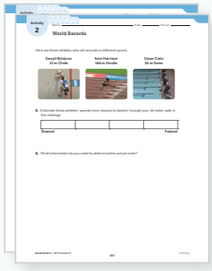
Students calculate their own walking speed from data they collect to develop their understanding of **unit rates**. MLR2: Collect and Display



Activity 2

Pairs | 15 min

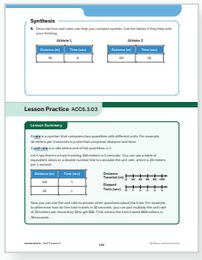
Students use unit rates to compare the speeds of world-record holders in different sports and justify their reasoning. **Routines:** Think-Pair-Share, Notice and Wonder **(MTR.4.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding of how unit rates can help determine and compare speeds. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining and comparing the speeds of two travelers.

Prep Checklist

Prepare the 10-meter paths of tape, calculators, and stopwatches.

This lesson includes:

- Student Edition
- Show What You Know

- Calculators
- Stopwatches or other timers
- Tape

Pairs | 5 min

Warm-Up

Purpose: Students compare two vehicles that travel the same distance in different amounts of time.

1 Launch

To surface connections, ask students if they have been in a race or watched a race. Invite them to share their experiences to lead a discussion about the relationship between time, speed, and distance.

Use the Think-Pair-Share routine to support student-to-student discourse. See the Routine Facilitation Guide for more information.

To support students getting started, consider rephrasing the problem as, "If there was a 6-mile race, which vehicle would arrive at the destination sooner?"

Note: Students may ask about the difference between speed and constant speed. Consider sharing that in the real world, a vehicle's speed fluctuates, but, for the purpose of comparison, we will assume the speed was constant.

2 Connect

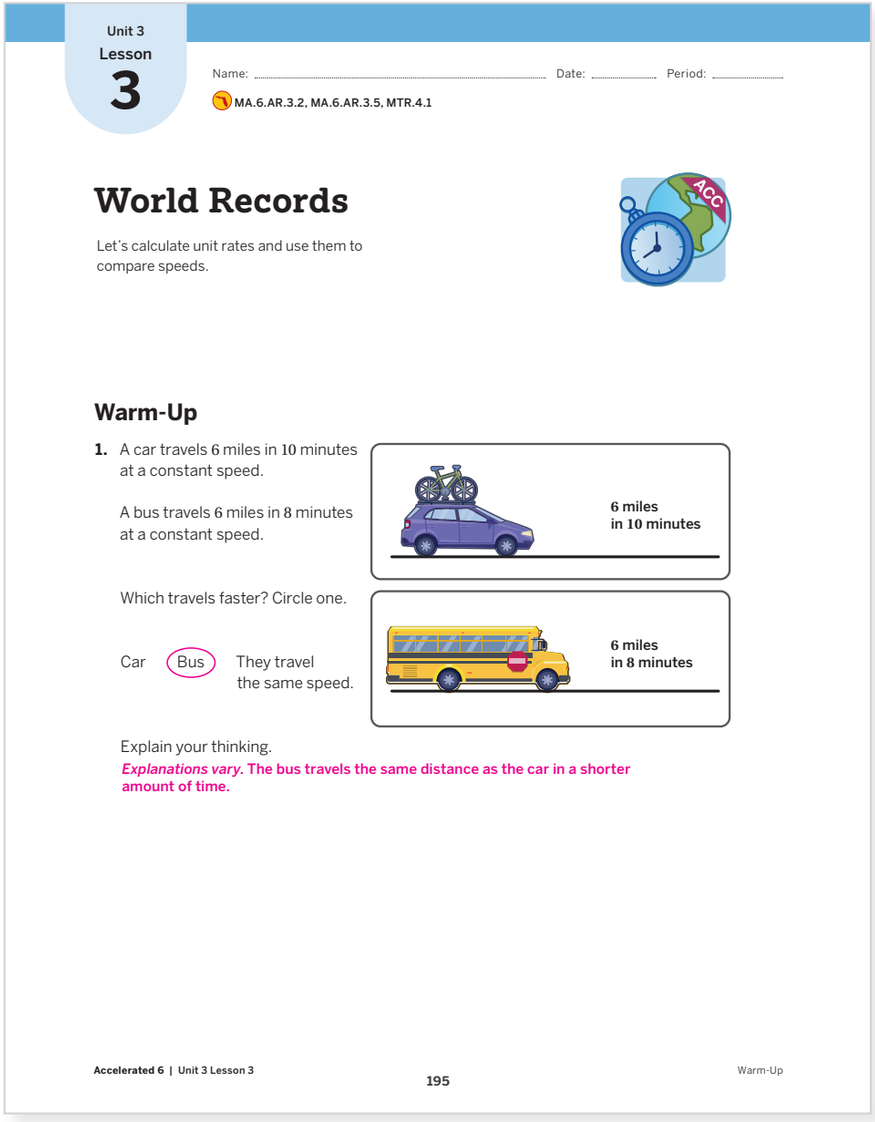
Invite students to share which vehicle they think is the fastest by polling the class to see the distribution of responses. Then invite students to share reasons why each vehicle might be faster.

Consider asking, "Why might someone have said the car? The bus? The same speed?"

To surface the Key Takeaway, consider asking:

- "How are distance, time, and speed connected?" If an object travels the same distance in a shorter amount of time, its speed is faster.
- "How can we determine the speed that an object travels if we have distance and time?"
- "6 miles in 10 minutes and 6 miles in 8 minutes are examples of rates, what do you think **rate** means?" A rate is a number that compares two quantities with different units.

D **Differentiation: (Stretch)** Ask students to determine the distance traveled in 1 minute by the car and by the bus. The car traveled 0.60 miles in 1 minute whereas the bus traveled 0.75 miles in 1 minute.



Unit 3
Lesson
3

Name: _____ Date: _____ Period: _____

MA.6.AR.3.2, MA.6.AR.3.5, MTR.4.1

World Records

Let's calculate unit rates and use them to compare speeds.

Warm-Up

1. A car travels 6 miles in 10 minutes at a constant speed.

   A bus travels 6 miles in 8 minutes at a constant speed.

   Which travels faster? Circle one.

   Car (Bus) They travel the same speed.

   Explain your thinking.

   Explanations vary. The bus travels the same distance as the car in a shorter amount of time.

Accelerated 6 | Unit 3 Lesson 3 195 Warm-Up

Key Takeaway: If two objects travel the same distance, the one that does it in less time will have traveled at the faster speed.

Pairs | 12 min

Activity 1 Moving 10 Meters

Purpose: Students calculate their own walking speed from data they collect to develop their understanding of **unit rates**.

Short on time? Consider having groups of three to four students use the data from one or two of the group members.

1 Launch

Direct students' attention to the "Mover" and "Timer" instructions and invite students to select one group member to be the first mover and one to be the first timer.

Note: Prior to the lesson, use tape to prepare multiple 10-meter paths. Divide the class into groups and assign each group to one of the paths. Provide access to stopwatches and calculators.

ELL **English Language Learners** Consider demonstrating what a constant speed looks like versus a non-constant speed. **(Writing and Speaking)**

2 Monitor

Look and listen for students who may need individual support.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started. (*Problem 2*)	**Support** Demonstrate one round of data collection by inviting a student to act as a mover while you act as a timer.
Write an inaccurate distance traveled in 1 second. (*Problem 3*)	**Support** Invite them to use the table. Consider asking, "How can we use division to determine the unit rate?"
Use either the table or the double number line to write accurate responses for their data. (*Problems 3–4*)	**Strengthen** Invite them to share their thinking during the Connect. **Stretch** Consider asking, "At this rate, how far can you walk in a minute? How long would it take you to walk a kilometer?"

3 Connect

Invite students to use language from the last unit like *ratio* and *per* as they discuss their results.

MLR **MLR2: Collect and Display** Use this routine to create a class definition of **unit rate** (a rate per 1) and how to calculate it using students' language.

Activity 1

Name: _____ Date: _____ Period: _____

Moving 10 Meters

2. Let's look at some instructions for determining your walking speed.

In groups of three or four, take turns as the "timer" and the "mover."

Mover Instructions	Timer Instructions
1. Stand at the warm-up line.	**1.** Stand at the finish line.
2. Walk along the path. When you reach the starting line, say "Start!"	**2.** Start the stopwatch when the mover says "Start!"
3. Walk at a constant speed until you get to the finish line.	**3.** Stop the stopwatch when the mover reaches the finish line.
4. Record your rounded time on your worksheet.	**4.** Round their time to the nearest second.

Repeat these steps until each person has been the mover.

Record your data. *Responses vary.*

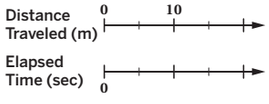
Distance: _____ meters Time: _____ seconds

3. A **unit rate** is a rate per 1. In this situation, the unit rate is the number of meters you can walk in 1 second.

Use your recorded data to calculate your unit rate and determine your walking speed.

Use the table or the double number line to help with your thinking.

Distance (m)	Time (sec)
10	
	1



Responses vary.

4. At this rate, how long would it take you to walk 5 meters? 18 meters?

Responses vary.

Accelerated 6 | Unit 3 Lesson 3 196 Activity 1

Key Takeaway: **Unit rate** is a rate where one of the numbers is 1. In the distance and time situation, an example of a unit rate is when the time is 1.

Pairs | 15 min

Activity 2 World Records

Purpose: Students use unit rates to compare the speeds of world-record holders in different sports and justify their reasoning. **(MTR.4.1)**

1 Launch

Direct students' attention to the images of the three athletes and invite students to share any experiences they have had with these three activities that might give them some insights into this prediction.

Use the Think-Pair-Share routine to help students shape their ideas about what information they may need to determine the actual order. Invite students to think independently and then take turns sharing with a partner. Invite several students to share their or their partner's thinking with the class.

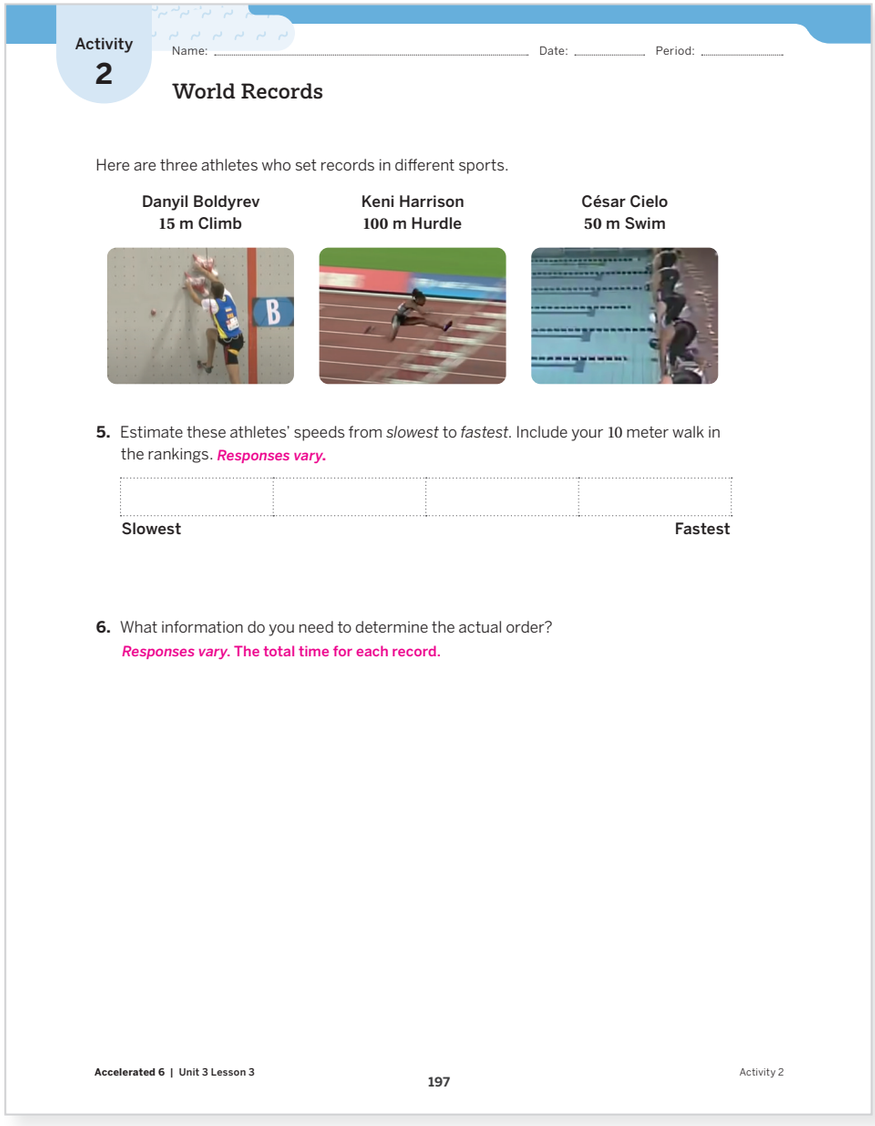
ELL **English Language Learners** Provide a word bank to support students in expressing their ideas, with words such as: *table*, *double number line*, *unit rate*, *ratios*, *equivalent ratios*, *per* 1, *speed*, etc. **(Writing and Speaking)**

2 Monitor

Invite students to justify their orders with their partner. **(MTR.4.1)**

Look and listen for students who justify their orders using terms from the lesson and unit and consider highlighting their thinking to the class to support other students in getting started. **(MTR.4.1)**

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

World Records

Here are three athletes who set records in different sports.

Danyil Boldyrev 15 m Climb	Keni Harrison 100 m Hurdle	César Cielo 50 m Swim

5. Estimate these athletes' speeds from *slowest* to *fastest*. Include your 10 meter walk in the rankings. *Responses vary.*

Slowest ____ ____ ____ Fastest

6. What information do you need to determine the actual order?
Responses vary. The total time for each record.

Accelerated 6 | Unit 3 Lesson 3 197 Activity 2

Pairs | 15 min

Activity 2 World Records (continued)

Purpose: Students use unit rates to compare the speeds of world-record holders in different sports and justify their reasoning. **(MTR.4.1)**

2 Monitor

Discuss the approximate times for each event.

Note: Invite students to use their walking speed or the walking speed of a classmate.

D **Differentiation: (Strengthen)** Look for students who notice that both the swimmer and the climber moved at the same speed using the approximate times. Consider asking, "What changes when we use approximate times versus exact times?"

Use the Notice and Wonder routine to promote curiosity and help students make sense of speeds. Invite students to share their ideas aloud before determining the most accurate order.

Direct students' attention to the list of exact times and invite students to calculate the exact speed of each athlete and justify their new order with their partner. **(MTR.4.1)**

A **Accessibility: Visual-Spatial Processing** Provide graph paper, blank tables, or tape diagram templates for students to draw on to increase access to the task.

Look for a variety of strategies.

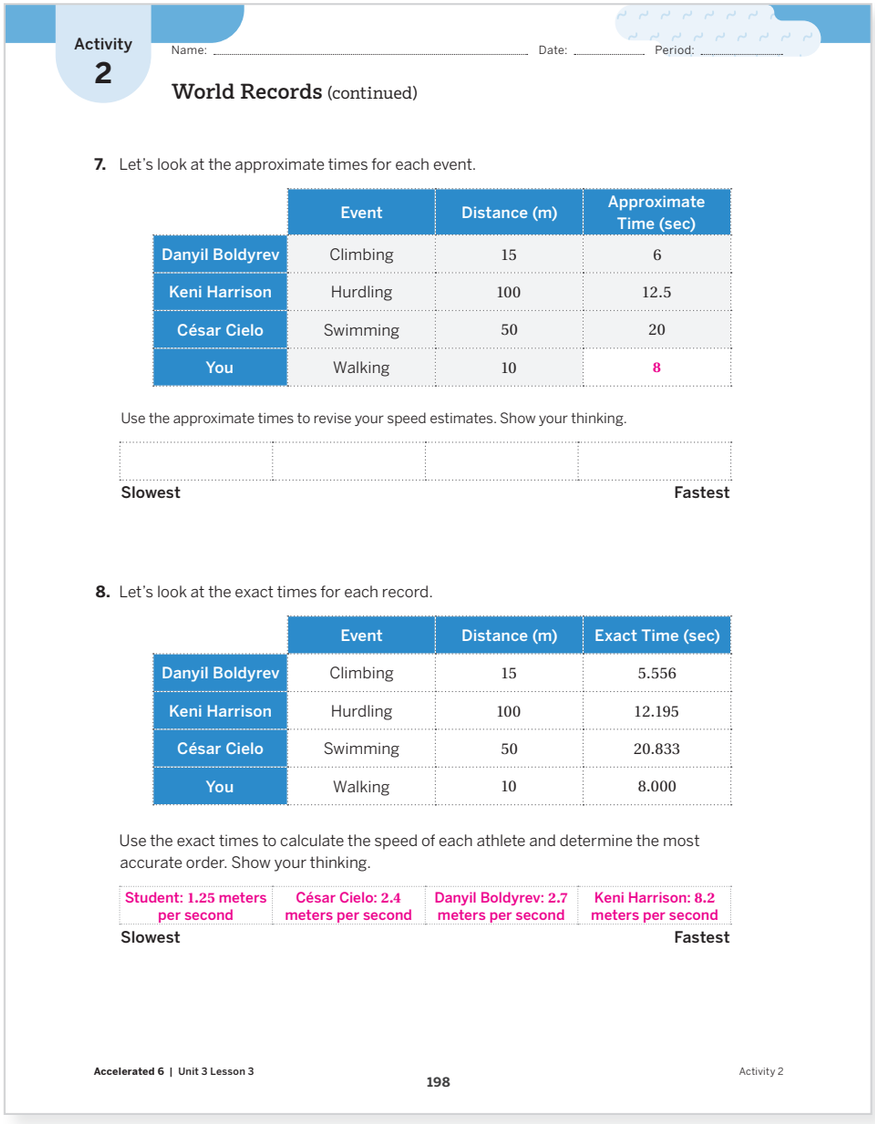
D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to represent their information on a table or double number line, and ask, "How do we calculate the unit rate for Danyil Boldyrev if he moved 15 m in 5.6 seconds?"
Divide the exact time by the distance.	**Support** Consider asking, "What do the quotients mean? Do they make sense in this situation?"
Use tables, double number lines, or other creative strategies to write an accurate order.	**Strengthen** Invite them to share their strategies during the Connect

3 Connect

Invite students to share their final order and compare it with their initial predictions.

Consider asking, "What strategies were most helpful for comparing speeds?"



Activity 2

Name: _____ Date: _____ Period: _____

World Records (continued)

7. Let's look at the approximate times for each event.

	Event	Distance (m)	Approximate Time (sec)
Danyil Boldyrev	Climbing	15	6
Keni Harrison	Hurdling	100	12.5
César Cielo	Swimming	50	20
You	Walking	10	8

Use the approximate times to revise your speed estimates. Show your thinking.

Slowest Fastest

8. Let's look at the exact times for each record.

	Event	Distance (m)	Exact Time (sec)
Danyil Boldyrev	Climbing	15	5.556
Keni Harrison	Hurdling	100	12.195
César Cielo	Swimming	50	20.833
You	Walking	10	8.000

Use the exact times to calculate the speed of each athlete and determine the most accurate order. Show your thinking.

Student: 1.25 meters per second | César Cielo: 2.4 meters per second | Danyil Boldyrev: 2.7 meters per second | Keni Harrison: 8.2 meters per second

Slowest Fastest

Accelerated 6 | Unit 3 Lesson 3 198 Activity 2

Whole Class | 5 min

Synthesis

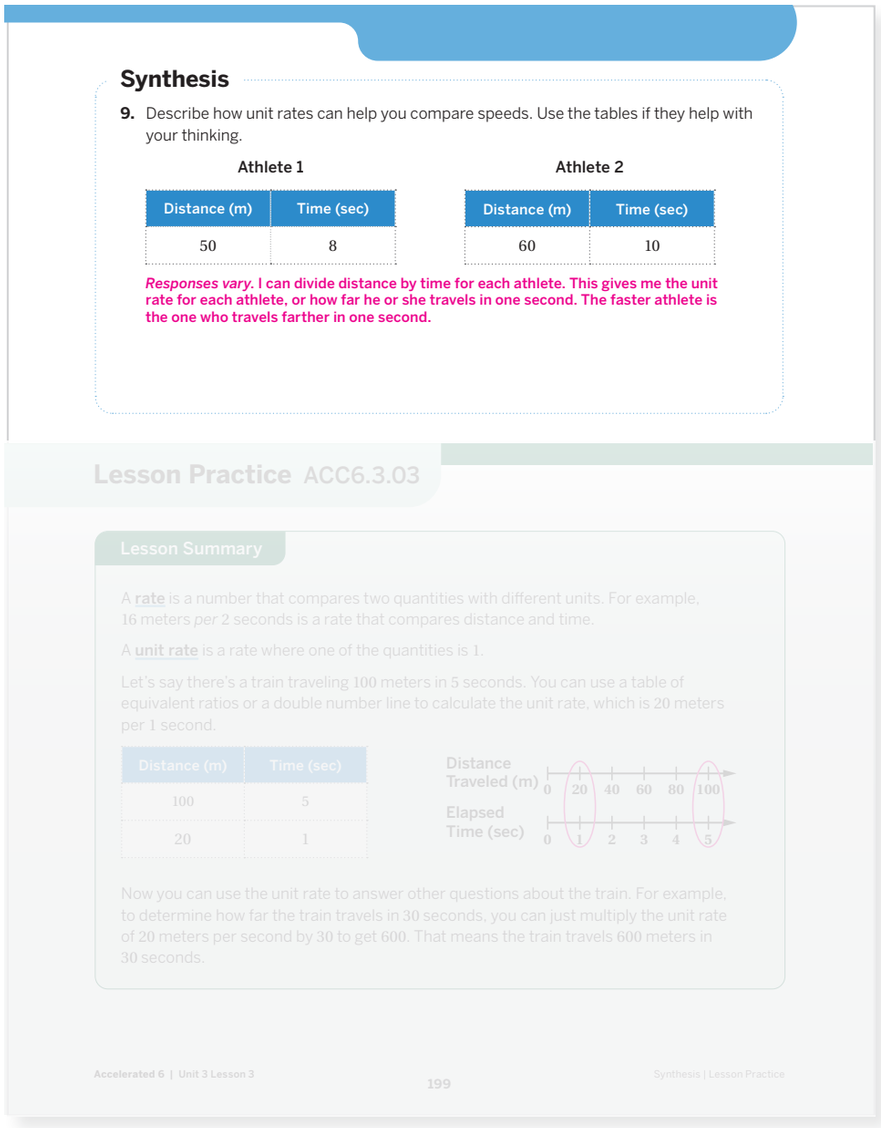
Purpose: Students synthesize their understanding of how unit rates can help determine and compare speeds.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- To determine speed, you need to know both the distance traveled and the time it took.
- A unit rate allows you to compare speeds more easily since you are comparing the distance traveled over the same period of time, such as 1 second, 1 minute, etc.
- A table or double number line can help organize distances and times and help you see how division can be used to calculate the unit rate.

MLR **MLR2: Collect and Display** Use this routine to revisit students' ideas about unit rates. Add any new ideas to the display for students to reference for the rest of the unit.



Synthesis

9. Describe how unit rates can help you compare speeds. Use the tables if they help with your thinking.

Athlete 1

Distance (m)	Time (sec)
50	8

Athlete 2

Distance (m)	Time (sec)
60	10

Responses vary. I can divide distance by time for each athlete. This gives me the unit rate for each athlete, or how far he or she travels in one second. The faster athlete is the one who travels farther in one second.

Lesson Practice ACC6.3.03

Lesson Summary

A rate is a number that compares two quantities with different units. For example, 16 meters *per* 2 seconds is a rate that compares distance and time.

A unit rate is a rate where one of the quantities is 1.

Let's say there's a train traveling 100 meters in 5 seconds. You can use a table of equivalent ratios or a double number line to calculate the unit rate, which is 20 meters per 1 second.

Distance (m)	Time (sec)
100	5
20	1

Now you can use the unit rate to answer other questions about the train. For example, to determine how far the train travels in 30 seconds, you can just multiply the unit rate of 20 meters per second by 30 to get 600. That means the train travels 600 meters in 30 seconds.

Accelerated 6 | Unit 3 Lesson 3 199 Synthesis | Lesson Practice

Lesson Takeaway: To determine the distance traveled in 1 unit of time, divide the distance by the time to determine the **unit rate**. This can help you compare speeds.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by determining and comparing the speeds of two travelers.

Today's Goals

1. **Goal:** Calculate the speed of an object as a *unit rate* for the distance the object travels over time.
2. **Language Goal:** Justify which of two objects is faster using mathematically precise language. **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 3.03

Eva traveled 15 meters in 1 second. Kanna traveled 80 meters in 4 seconds. Who traveled faster? Circle one.

Eva (Kanna) They traveled at the same speed.

Explain your thinking.

Explanations vary. Kanna traveled 20 meters per second because $80 \div 4 = 20$. Eva only traveled 15 meters per second, which means Kanna traveled faster.

D Differentiation Use after Lesson 3

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to calculate unit rates:

» **Respond to Student Thinking:**

- Use the *Calculating Unit Rates* Mini-lesson.
- Revisit **Unit 2, Lesson 8, Activity 2** (*Mixing Paint*). Invite students to make connections between unit rates and a paint's brightness (ounces of color per 1 gallon of white paint).

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to research records for running at various distances. Encourage them to compare unit rates, hypothesize about differences they notice, and share their results.

Professional Learning

Take a moment to reflect on this lesson. What routines enabled all students to do math in today's lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. Describe how unit rates can help you compare speeds. Use the tables if they help with your thinking.

Athlete 1

Distance (m)	Time (sec)
50	8

Athlete 2

Distance (m)	Time (sec)
60	10

Responses vary. I can divide distance by time for each athlete. This gives me the unit rate for each athlete, or how far he or she travels in one second. The faster athlete is the one who travels farther in one second.

Lesson Practice ACC6.3.03

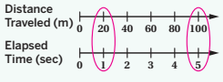
Lesson Summary

A **rate** is a number that compares two quantities with different units. For example, 16 meters *per* 2 seconds is a rate that compares distance and time.

A **unit rate** is a rate where one of the quantities is 1.

Let's say there's a train traveling 100 meters in 5 seconds. You can use a table of equivalent ratios or a double number line to calculate the unit rate, which is 20 meters per 1 second.

Distance (m)	Time (sec)
100	5
20	1



Now you can use the unit rate to answer other questions about the train. For example, to determine how far the train travels in 30 seconds, you can just multiply the unit rate of 20 meters per second by 30 to get 600. That means the train travels 600 meters in 30 seconds.

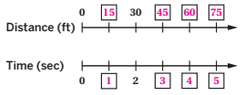
Lesson Practice
ACC6.3.03

Name: ..... Date: ..... Period: .....

Problems 1–3: A person on a scooter travels 30 feet in 2 seconds at a constant rate.

1. Fill in the missing values on the double number line.

Response shown on double number line.



2. What is the speed of the scooter in feet per second?

15 feet per second

3. At this rate, how long would it take the scooter to travel 105 feet?

7 seconds

4. Order these animals from *slowest* to *fastest*.

Galapagos Tortoise | Garden Snail | Three-Toed Sloth

16 meters in 3 minutes | 8 meters in 5 minutes | 9 meters in 2 minutes

Garden snail | Three-toed sloth | Galapagos tortoise

Slowest ... Fastest

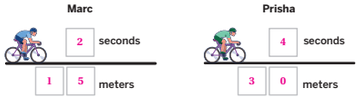
5. Alisha buys 6 muffins. She spends $24. If each muffin costs the same amount, how much does 1 muffin cost?

$4

Lesson Practice
ACC6.3.03

Name: ..... Date: ..... Period: .....

6. Fill in each blank using the numbers 0 to 9 only once so that Marc and Prisha have the same speed. *Responses vary.*



FAST Practice

7. Ariana gets paid $90 for every 5 hours of work in her neighbor's garden. Last summer, Lucy got paid $36 for every 2 hours of work in the same garden. Are they paid at the same rate? Explain your thinking.

(A.) Yes. B. No. Ariana's rate is A. $12 B. $15 (C.) $18 per hour, and Lucy's rate is A. $16 (B.) $18 C. $22 per hour.

Spiral Review

Problems 8–9: A recipe for pasta dough calls for 150 grams of flour per large egg.

8. How much flour do you need for 6 large eggs?

900 grams

9. How many large eggs do you need for 450 grams of flour?

3 eggs

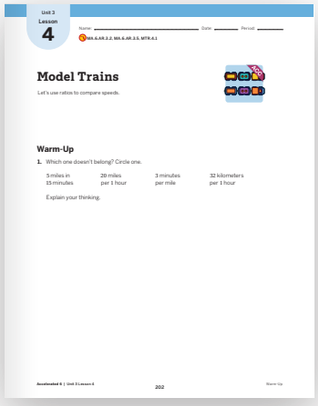
Problems 10–11: Mentally calculate each quotient.

10. $34 \div 10 = 3.4$

11. $3.4 \div 10 = 0.34$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.AR.3.5
	2, 5	2	MA.6.AR.3.2
	3–4	2	MA.6.AR.3.5
	6	3	MA.6.AR.3.5
FAST Practice	7	2	MA.6.AR.3.2
Spiral Review			
	8–9	2	MA.6.AR.3.5
	10–11	1	MA.6.NSO.2.1


Unit 3
Lesson
4

Model Trains

Let's use ratios to compare speeds.

Warm-Up

1. Which one doesn't belong? Circle one.

5 miles in 15 minutes | 28 miles per 1 hour | 3 minutes per mile | 32 kilometers per 1 hour

Explain your thinking.

202

Model Trains

Comparing Rates

Let's use ratios to compare speeds.

Learning Outcomes

Today's Goals

1. **Goal:** Use rate and ratio reasoning to compare rates expressed in different units.
2. **Language Goal:** Describe unit rates in context including comparing speeds. **(Writing, Speaking, and Listening)**

Students compare the speeds of model trains and discuss unit rates using the word *per*. They consider what information is needed to determine which model train is traveling faster. They then compare speeds of model trains with the same units of measurement and when units of measurement are different.

Coherence

Prior Learning

In Lesson 3, students used unit rates to compare speeds with the same units of measurement.

Future Learning

In Lesson 5, students will apply their understanding of unit rates to determine unit price and identify the two unit rates associated with any ratio.

Connections

- Students analyze various situations involving model trains to compare speeds. (cross-curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.2
Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate.

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1	MA.7.AR.3.1
MA.5.AR.1.1	MA.7.AR.3.2
MA.5.AR.1.2	MA.7.AR.3.3
MA.5.AR.1.3	MA.7.AR.4.2

Lesson at a Glance

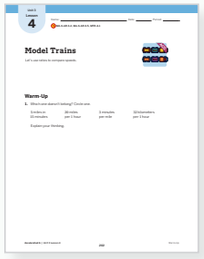
~ 45 min

MA.6.AR.3.2, MA.6.AR.3.5

Warm-Up

Independent | 5 min

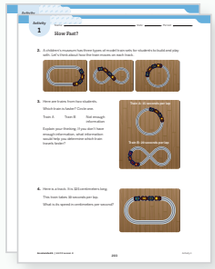
Students look for structure in different rates to decide which one doesn't belong based on some criteria. **Routine:** Which One Doesn't Belong?



Activity 1

Pairs | 15 min

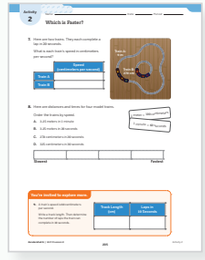
Students calculate equivalent ratios and unit rates to help them compare speeds of model trains. MLR7: Compare and Connect



Activity 2

Pairs | 15 min

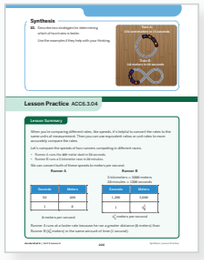
Students compare rates given in different measurement systems.



Synthesis

Whole Class | 5 min

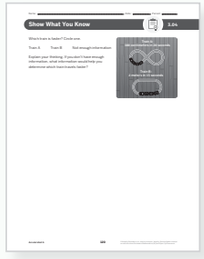
Students synthesize strategies for comparing speeds using unit rates and equivalent ratios. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining which train is traveling at a faster rate.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Independent | 5 min

Warm-Up

Purpose: Students look for structure in different rates to decide which one doesn't belong based on some criteria.

1 Launch

Use the Which One Doesn't Belong? routine to support students in comparing and contrasting rates and justifying their thinking precisely.

Consider sharing that each rate does not belong in some way. Encourage students to look for more than one possibility.

ELL **English Language Learners** Provide sentence frames (e.g., "_____ doesn't belong because _____." or " _____ is the only one that has/ doesn't have _____."). **(Writing and Speaking)**

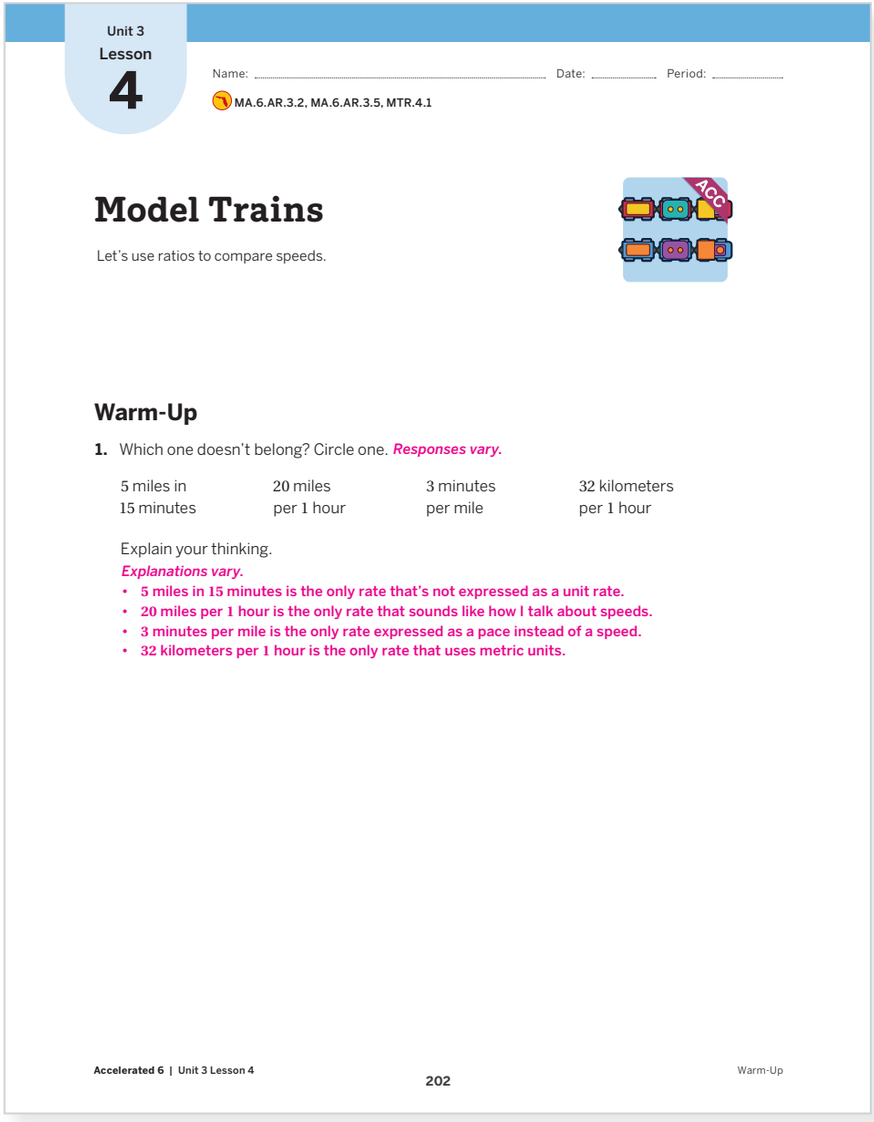
2 Connect

Invite students to share at least one reason why each rate doesn't belong.

Create a record of why each representation doesn't belong, along with the name of the student who shared the reasoning.

Consider asking:
- "How is ___ alike/different from the other rates?"
- "What is another way to say why ___ doesn't belong?"

Note: If it doesn't come up naturally, consider asking, "Are any of these rates equivalent?" The three rates involving miles are exactly equivalent. The rate expressed in metric units is approximately equivalent to the others.



Unit 3
Lesson
4

Name: _____ Date: _____ Period: _____

MA.6.AR.3.2, MA.6.AR.3.5, MTR.4.1

Model Trains

Let's use ratios to compare speeds.

Warm-Up

1. Which one doesn't belong? Circle one. *Responses vary.*

5 miles in 15 minutes	20 miles per 1 hour	3 minutes per mile	32 kilometers per 1 hour

Explain your thinking.
Explanations vary.
- 5 miles in 15 minutes is the only rate that's not expressed as a unit rate.
- 20 miles per 1 hour is the only rate that sounds like how I talk about speeds.
- 3 minutes per mile is the only rate expressed as a pace instead of a speed.
- 32 kilometers per 1 hour is the only rate that uses metric units.

Accelerated 6 | Unit 3 Lesson 4 202 Warm-Up

Key Takeaway: There are many different ways to write and to describe the same rate, such as using different language, different units, and equivalent ratios.

Pairs | 15 min

Activity 1 How Fast?

Purpose: Students calculate equivalent ratios and unit rates to help them compare speeds of model trains.

Short on time? Consider omitting Problem 2.

1 Launch

Direct students' attention to each track and discuss what would happen if all trains moved at the same speed. Spark further discussion by inviting students to contribute their reasoning for each scenario where the trains start together but travel at different speeds. **(MTR.4.1)**

2 Monitor

Look and listen for ideas related to unit rates, speed, and ratios.

D Differentiation

Look for students who:	Respond to Student Thinking
Select "Train A" because it completes one lap faster than Train B.	**Support** Consider asking, "What else might impact speed?"
Select "Train B" because the track's length looks almost twice as big and yet it only takes 20 seconds.	**Support** Celebrate them noticing that the length of the track matters. Consider asking, "How confident are you that Train B is faster? What information would make you absolutely sure?" **(MTR.4.1)**
Select "Not enough information" because the lap length is not known.	**Strengthen** Consider asking, "Why might someone think Train A is traveling faster? Train B?"

Encourage students to use feedback from their partners to help them revise their thinking.

Invite students to use a calculator or paper to help with their thinking throughout this lesson.

A **Accessibility: Conceptual Processing** To assist students in recognizing the connections between new problems and prior work, consider displaying a double number line or a table of equivalent ratios from Unit 2 Lesson 4. Consider asking students how they might represent the ratio for this problem, using a table or a double number line.

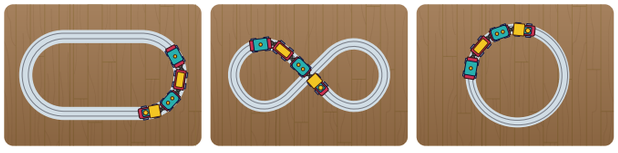
Activity 1 continued >

Activity 1

Name: Date: Period:

How Fast?

2. A children's museum has three types of model train sets for students to build and play with. Let's think about how the train moves on each track.



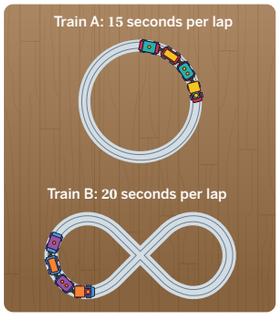
3. Here are trains from two students.

Which train is faster? Circle one.

Train A Train B Not enough information

Explain your thinking. If you don't have enough information, what information would help you determine which train travels faster?

Explanations vary. We can determine which train travels faster if we know how long each of the tracks is. If we know the length of each track, we can find and compare the speed of each train.

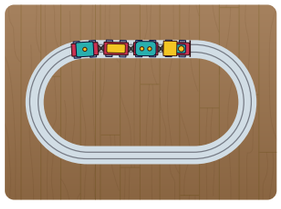


4. Here is a track. It is 325 centimeters long.

This train takes 10 seconds per lap.

What is its speed in centimeters per second?

32.5 centimeters per second



Accelerated 6 | Unit 3 Lesson 4 203 Activity 1

Pairs | 15 min

Activity 1 How Fast? (continued)

Purpose: Students calculate equivalent ratios and unit rates to help them compare speeds of model trains.

2 Monitor

Encourage students to read others' responses and to decide if others' strategies were similar to or different from their own. **(MTR.4.1)**

Look and listen for students who may need individual support to be comfortable with at least one strategy.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to use a table or double number line to help them with their thinking.
Think Train A is faster because it completes one lap faster. Think the trains go the same speed because they both complete one lap.	**Support** Invite them to revisit Problem 3, and consider asking, "Why did you need the length of the track to determine which train traveled faster?"
Use strategies similar to Amoli's and Tiam's in the next problem or other creative strategies.	**Strengthen** Invite them to share their thinking during the Connect. **Stretch** Invite students to determine how many seconds per lap Train B should travel so it is twice as fast as Train A.

3 Connect

Invite students that used similar strategies to Amoli's or Tiam's or other creative strategies to share.

MLR **MLR7: Compare and Connect** Invite students to analyze each representation, then find ways in which the representations are different (compare) and alike (connect). Consider asking:

- "How are Amoli's and Tiam's strategies alike? How are they different?"
- "Why do you think Amoli divided by 15 for Train A?"
- "How did Tiam get 1,140 centimeters in 60 seconds for Train B?"
- "Which student used a unit rate? Equivalent ratios? How do you know?"

Activity 1

Name: Date: Period:

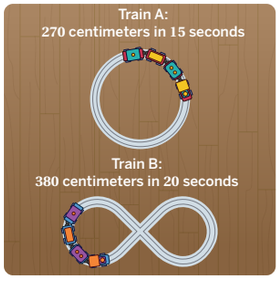
How Fast? (continued)

5. Which train is faster? Circle one.

Train A (Train B) They go the same speed

Explain your thinking.

Explanations vary. Train A is traveling $\frac{270}{15} = 18$ centimeters per second, and Train B is traveling $\frac{380}{20} = 19$ centimeters per second, so Train B is faster.



6. Amoli and Tiam used different strategies to determine which train was faster.

Discuss: How are their strategies alike? How are they different?

Amoli

Train A

270 ÷ 15 = 18 cm per sec

Train B

380 ÷ 20 = 19 cm per sec

Train B is faster.

Tiam

Train A		Train B	
cm	Sec	cm	Sec
270	15	380	20
1080	60	1140	60

Train B is faster.

Responses vary.

- Amoli divided the number of centimeters by the number of seconds to calculate how far each train travels in 1 second. This is called the unit rate.
- Tiam used equivalent ratios to determine how far each train travels in 60 seconds. The train that travels farther in 60 seconds is faster.

Accelerated 6 | Unit 3 Lesson 4 204 Activity 1

Key Takeaway: Speeds can be compared by determining the unit rate, which can be calculated by dividing, or by creating equivalent ratios where the distance or time are the same.

Pairs | 15 min

Activity 2 Which is Faster?

Purpose: Students compare rates given in different measurement systems.

Short on time? Consider ordering the trains together as a class in Problem 8.

1 Launch

Consider asking, "What does it mean to measure the speed of a train in 'centimeters per second' when you are given Train A's track length in meters and Train B's in centimeters?"

2 Monitor

Look and listen for a variety of reasoning and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How long would it take each train to do a lap if it were going 1 centimeter per second?"
Write that the speed of Train A is 0.45 centimeters per second.	**Support** Consider asking, "What is the difference between centimeters per second and meters per second?"
Convert Track A's length to centimeters but are not sure what to do next.	**Support** Encourage them to use a table or double number line to help them with their thinking.

To support students getting started, invite them to revisit Problem 7, and consider asking, "Why did you need to convert meters into centimeters?"

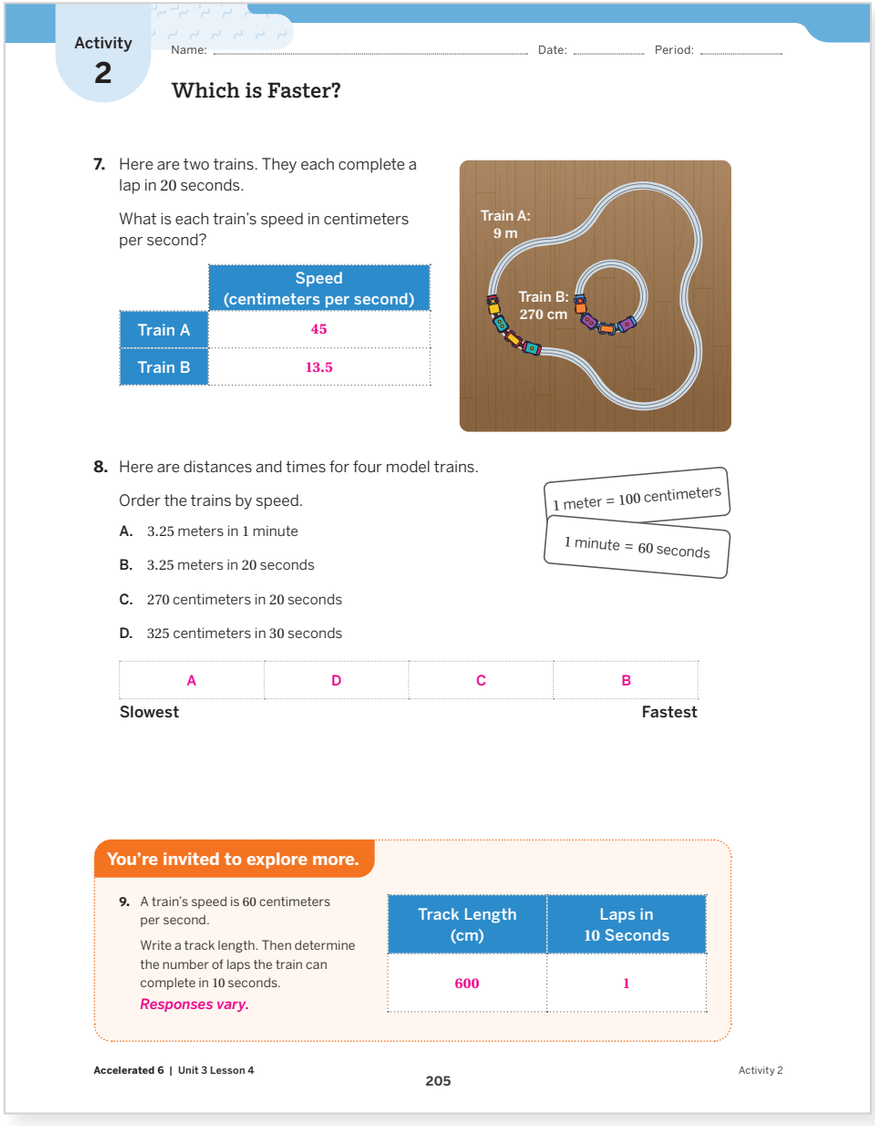
Look for students who convert the units of measurement so that both distance and time are in the same units. Consider celebrating their work and precision with units.

D Differentiation: You're invited to explore more. (Stretch) Invite students who would like to explore the relationship between distance, rate, and time further to complete this optional task. Encourage them to discuss their thinking with a partner. **(MTR.4.1)**

3 Connect

Invite students to share their strategies for comparing the speeds of the trains.

Consider asking, "When was calculating unit rates useful? When was using equivalent ratios useful?"



Activity 2

Name: Date: Period:

Which is Faster?

7. Here are two trains. They each complete a lap in 20 seconds.

What is each train's speed in centimeters per second?

	Speed (centimeters per second)
Train A	45
Train B	13.5

8. Here are distances and times for four model trains.

Order the trains by speed.

A. 3.25 meters in 1 minute

B. 3.25 meters in 20 seconds

C. 270 centimeters in 20 seconds

D. 325 centimeters in 30 seconds

A	D	C	B

Slowest Fastest

You're invited to explore more.

9. A train's speed is 60 centimeters per second.

Write a track length. Then determine the number of laps the train can complete in 10 seconds.

Responses vary.

Track Length (cm)	Laps in 10 Seconds
600	1

Accelerated 6 | Unit 3 Lesson 4 205 Activity 2

Whole Class | 5 min

Synthesis

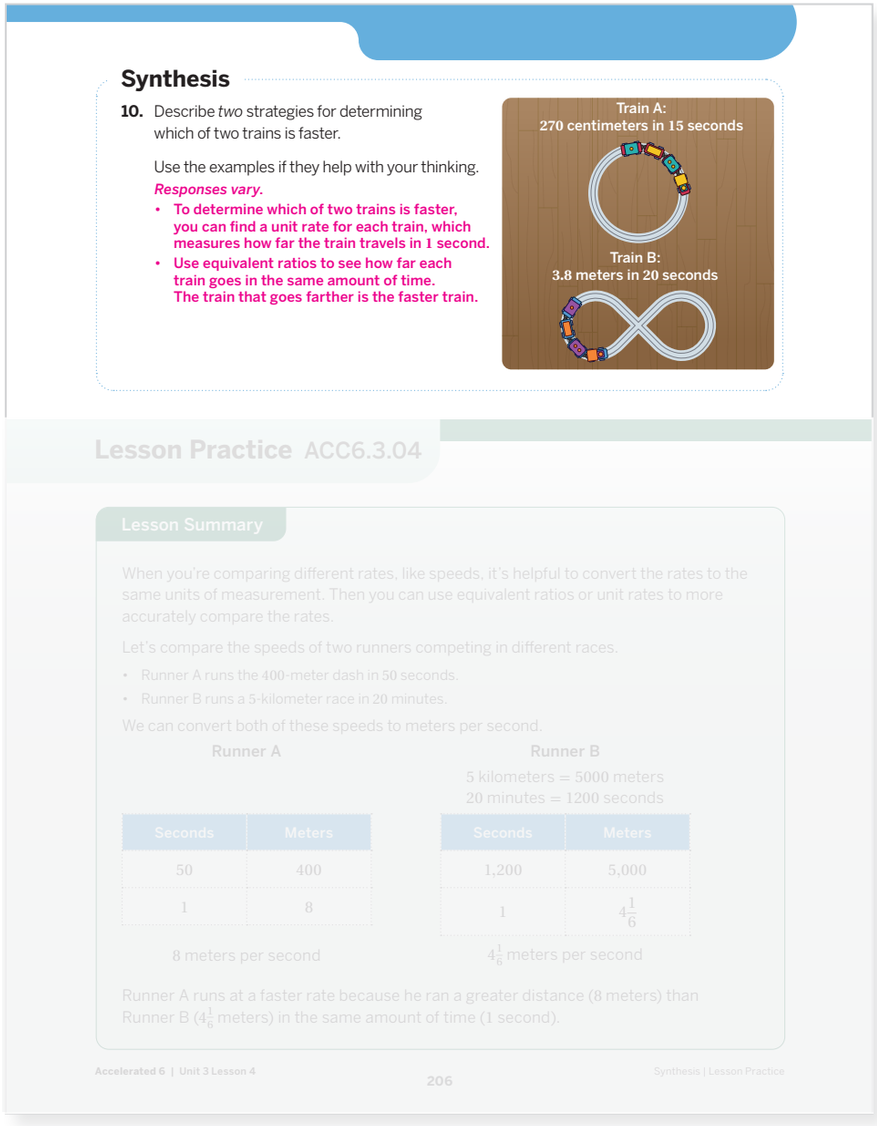
Purpose: Students synthesize strategies for comparing speeds using unit rates and equivalent ratios.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Calculating and then comparing the unit rate for each train.
- Dividing the distance by the time to get the speed per 1 unit of time.
- Using a table or double number line to help determine an equivalent ratio to see how far each train travels in the same amount of time.
- Making sure the trains' distances and times are in the same units and, if not, converting them so they are using the same units of measurement.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for comparing speeds using students' language. Display any new language, examples, or diagrams for students to reference later.



Synthesis

10. Describe *two* strategies for determining which of two trains is faster.

Use the examples if they help with your thinking.

Responses vary.

- To determine which of two trains is faster, you can find a unit rate for each train, which measures how far the train travels in 1 second.
- Use equivalent ratios to see how far each train goes in the same amount of time. The train that goes farther is the faster train.

Lesson Practice ACC6.3.04

Lesson Summary

When you're comparing different rates, like speeds, it's helpful to convert the rates to the same units of measurement. Then you can use equivalent ratios or unit rates to more accurately compare the rates.

Let's compare the speeds of two runners competing in different races.

- Runner A runs the 400-meter dash in 50 seconds.
- Runner B runs a 5-kilometer race in 20 minutes.

We can convert both of these speeds to meters per second.

Runner A

Seconds	Meters
50	400
1	8

8 meters per second

Runner B

5 kilometers = 5000 meters
20 minutes = 1200 seconds

Seconds	Meters
1,200	5,000
1	$4\frac{1}{6}$

$4\frac{1}{6}$ meters per second

Runner A runs at a faster rate because he ran a greater distance (8 meters) than Runner B ($4\frac{1}{6}$ meters) in the same amount of time (1 second).

Accelerated 6 | Unit 3 Lesson 4 206 Synthesis | Lesson Practice

Lesson Takeaway: To compare the speeds of different trains (or objects), both the distances and the times must be measured with the same units. Then equivalent ratios and unit rates can be used to compare speeds.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by determining which train is traveling at a faster rate.

Today's Goal

1. **Goal:** Use rate and ratio reasoning to compare rates expressed in different units.
2. **Language Goal:** Describe unit rates in context including comparing speeds. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 3.04

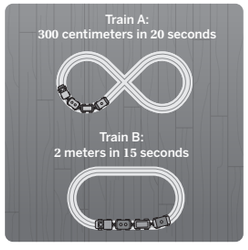
Which train is faster? Circle one.

Train A Train B Not enough information

Explain your thinking. If you don't have enough information, what information would help you determine which train travels faster?

Explanations vary.

- Train A travels $\frac{300}{20} = 15$ centimeters per second, while Train B only travels $\frac{200}{15} = 13\frac{1}{3}$ centimeters per second.
- Train A travels $300 \cdot 3 = 900$ centimeters in one minute and Train B travels $200 \cdot 4 = 800$ centimeters in one minute. Train A is faster because it travels farther in one minute.



Differentiation Use after Lesson 4

Support

Provide targeted intervention for students by using these resources.

If students need support comparing speeds:

» **Respond to Student Thinking:**

- Use the *Applying Measurement Conversions to Compare Different Units* Mini-lesson.
- Revisit **Activity 1 Connect** and invite students to share strategies for calculating unit rates.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to research and compare the time, distance, and money it takes to travel across various countries by train. Encourage them to compare using unit rates.

Professional Learning

What strengths did your students exhibit today? How can you build from those strengths as students continue learning about ratios and rates?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. Describe *two* strategies for determining which of two trains is faster.

Use the examples if they help with your thinking.

Responses vary.

- To determine which of two trains is faster, you can find a unit rate for each train, which measures how far the train travels in 1 second.
- Use equivalent ratios to see how far each train goes in the same amount of time. The train that goes farther is the faster train.

Lesson Practice ACC6.3.04

Lesson Summary

When you're comparing different rates, like speeds, it's helpful to convert the rates to the same units of measurement. Then you can use equivalent ratios or unit rates to more accurately compare the rates.

Let's compare the speeds of two runners competing in different races.

- Runner A runs the 400-meter dash in 50 seconds.
- Runner B runs a 5-kilometer race in 20 minutes.

We can convert both of these speeds to meters per second.

Runner A

Seconds	Meters
50	400
1	8

8 meters per second

Runner B

5 kilometers = 5000 meters
20 minutes = 1200 seconds

Seconds	Meters
1,200	5,000
1	$4\frac{1}{6}$

$4\frac{1}{6}$ meters per second

Runner A runs at a faster rate because he ran a greater distance (8 meters) than Runner B ($4\frac{1}{6}$ meters) in the same amount of time (1 second).

Lesson Practice ACC6.3.04

Name: _____ Date: _____ Period: _____

Problems 1–2: Mia and Liam were trying out new remote control cars. Mia's car traveled 135 feet in 3 seconds. Liam's car traveled 228 feet in 6 seconds. Both cars traveled at a constant speed.

1. Determine the speed of each remote control car in feet per second.

Mia's Car's Speed	Liam's Car's Speed
45 feet per second	38 feet per second

2. Whose car traveled faster?

Mia's

3. Emmanuel types 208 words in 4 minutes. Vihaan types 342 words in 6 minutes. Both type at a constant rate. Who types faster? Explain your thinking.

Vihaan. *Explanations vary.* Emmanuel types at a rate of 52 words per minute because $208 \div 4 = 52$. Vihaan types at a rate of 57 words per minute because $342 \div 6 = 57$. That means Vihaan can type 5 more words per minute than Emmanuel.

Problems 4–5: Penguin A walks 10 feet in 5 seconds. Penguin B walks 12 feet in 8 seconds. Each penguin keeps walking at those speeds.

4. How far does each penguin walk in 45 seconds?

Penguin A walks 90 feet. Penguin B walks 67.5 feet.

5. If the two penguins start at the same place and walk in the same direction, how far apart will the two penguins be after 2 minutes? Show or explain your thinking.

60 feet. *Explanations vary.* Penguin A will have walked 240 feet. Penguin B will have walked 180 feet. $240 - 180 = 60$.

Lesson Practice ACC6.3.04

Name: _____ Date: _____ Period: _____

FAST Practice

6. Here are the approximate distances and times for four Olympic swimmers in different events. Order the swimmers from *slowest* to *fastest*.

Swimmer A: 800 meters in 8 minutes	**Swimmer B:** 100 meters in 50 seconds
Swimmer C: 1.5 kilometers in 15.5 minutes	**Swimmer D:** 50 meters in 20 seconds

Slowest			Fastest
Swimmer C	Swimmer A	Swimmer B	Swimmer D

Spiral Review

Problems 7–8: There are 16 cups in 1 gallon, and there are 4 quarts in 1 gallon.

7. How many cups are in 3 gallons? Show or explain your thinking.

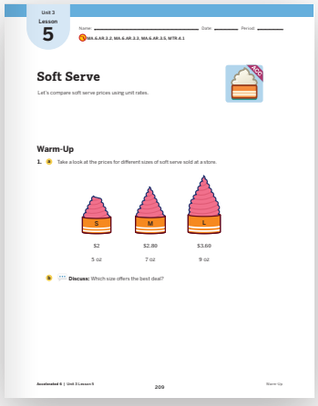
48 cups. *Work varies.* $16 \cdot 3 = 48$

8. How many cups are in 1 quart? Show or explain your thinking.

4 cups. *Work varies.* $16 \div 4 = 4$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	2	MA.6.AR.3.2
	2	2	MA.6.AR.3.5
	3–4	2	MA.6.AR.3.2, MA.6.AR.3.5
	5	3	MA.6.AR.3.5
FAST Practice	6	2	MA.6.AR.3.2, MA.6.AR.3.5
Spiral Review			
	7–8	2	MA.6.AR.3.5



Soft Serve

Two Unit Rates

Let's compare soft serve prices using unit rates.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate *unit price* and express it using the term *per*.
2. **Language Goal:** Interpret the two unit rates associated with a ratio (i.e., $\frac{a}{b}$ and $\frac{b}{a}$ for the ratio $a : b$). **(Speaking and Listening)**

Students determine the two unit rates, $\frac{a}{b}$ and $\frac{b}{a}$, associated with the ratio $a : b$. They calculate **unit prices** and use them to solve problems. Students explain which unit rate may be more useful in a situation.

Coherence

Prior Learning

In Lessons 3–4, students determined unit rates in the context of distance and time. They compared unit rates to determine which object is faster.

Future Learning

In Lesson 6, students will use a table of equivalent ratios, a given value, and a unit rate to calculate an unknown value.

Connections

- Students use units rates as they compare size and price of soft serve ice cream. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.2
Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate.

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Also Addressing: **MA.6.AR.3.3**

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectations: ELA.K12.EE.5.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.AR.3.1
MA.5.AR.1.2	MA.7.AR.3.2
MA.5.AR.1.3	MA.7.AR.3.3
MA.5.AR.3.2	MA.7.AR.4.1
MA.6.NSO.2.1	MA.7.AR.4.2
MA.6.NSO.2.3	MA.7.AR.4.3
	MA.7.AR.4.4

Vocabulary

New Vocabulary

unit price

Lesson at a Glance

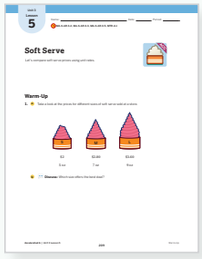
~ 45 min

MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5

Warm-Up

Pairs | 5 min

Students use unit rates to compare the prices of different-sized orders.



Activity 1

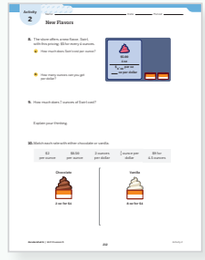
Pairs | 18 min

Students calculate and interpret the two unit rates for a relationship and use them to solve problems.

Activity 2

Pairs | 12 min

Students calculate two unit rates and choose one to use in a situation with unknown equivalent ratios.

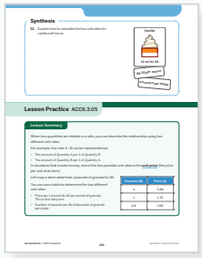


Synthesis

Whole Class | 5 min

Students synthesize their understanding that the two unit rates associated with every ratio can be used to determine an unknown value.

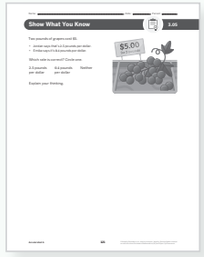
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of unit rates by determining and justifying the unit rate needed to solve a problem.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use unit rates to compare the prices of different-sized orders.

1 Launch

Direct students' attention to the different sizes of soft serve and their prices.

Consider asking:

- "What do you think the S, M, and L stand for?"
- "Do you have any personal experience with soft serve machines?"
- "How do you define best deal?"

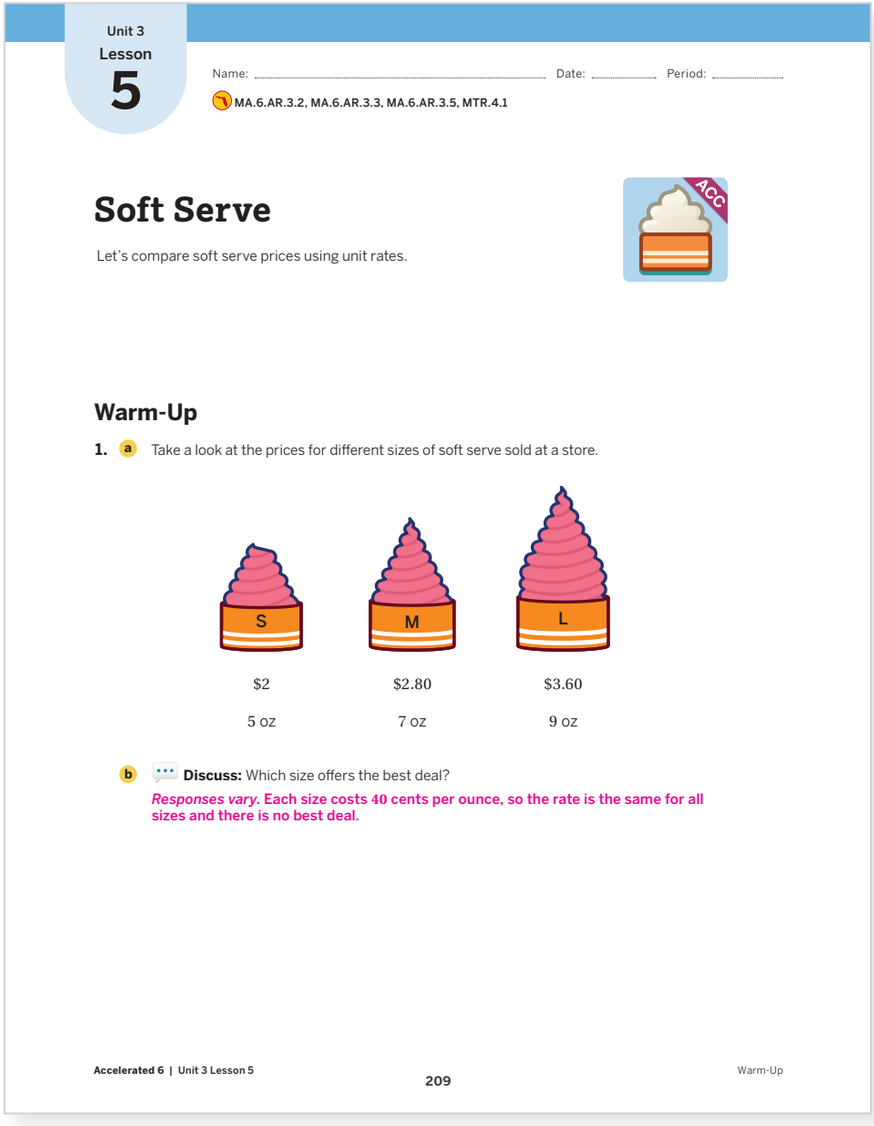
Invite students to think independently before discussing their ideas with a partner.

2 Connect

Invite students to share by polling the class and then inviting several students to share their reasoning.

Consider asking, "What strategy did you use to decide which was the best deal? How else could you know?"

Note: If it does not come up naturally, consider asking, "Could you make an argument that all three sizes are the same?" **(MTR.4.1)**



Unit 3
Lesson
5

Name: ..... Date: ..... Period: .....

MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MTR.4.1

Soft Serve

Let's compare soft serve prices using unit rates.

Warm-Up

1. a Take a look at the prices for different sizes of soft serve sold at a store.

S	M	L
$2	$2.80	$3.60
5 oz	7 oz	9 oz

b **Discuss:** Which size offers the best deal?

Responses vary. Each size costs 40 cents per ounce, so the rate is the same for all sizes and there is no best deal.

Accelerated 6 | Unit 3 Lesson 5 209 Warm-Up

Pairs | 18 min

Activity 1 Two Unit Rates

Purpose: Students calculate and interpret the two unit rates for a relationship and use them to solve problems.

Short on time? Consider omitting Problem 5 and having the discussion in Problem 4 instead.

1 Launch

To surface connections, invite students to share their experiences with an item that has a price that is dependent on its weight (e.g., produce, meat, pumpkins, shipping, etc.).

2 Monitor

Invite students to get feedback from a partner throughout the lesson.

Invite students to use a calculator or use paper to help with their thinking throughout this lesson.

To support students getting started, invite students to either make a table or double number line, and ask, "Where would the unit price of $0.40 per ounce go? Where would 8 ounces go?" **(MTR.4.1)**

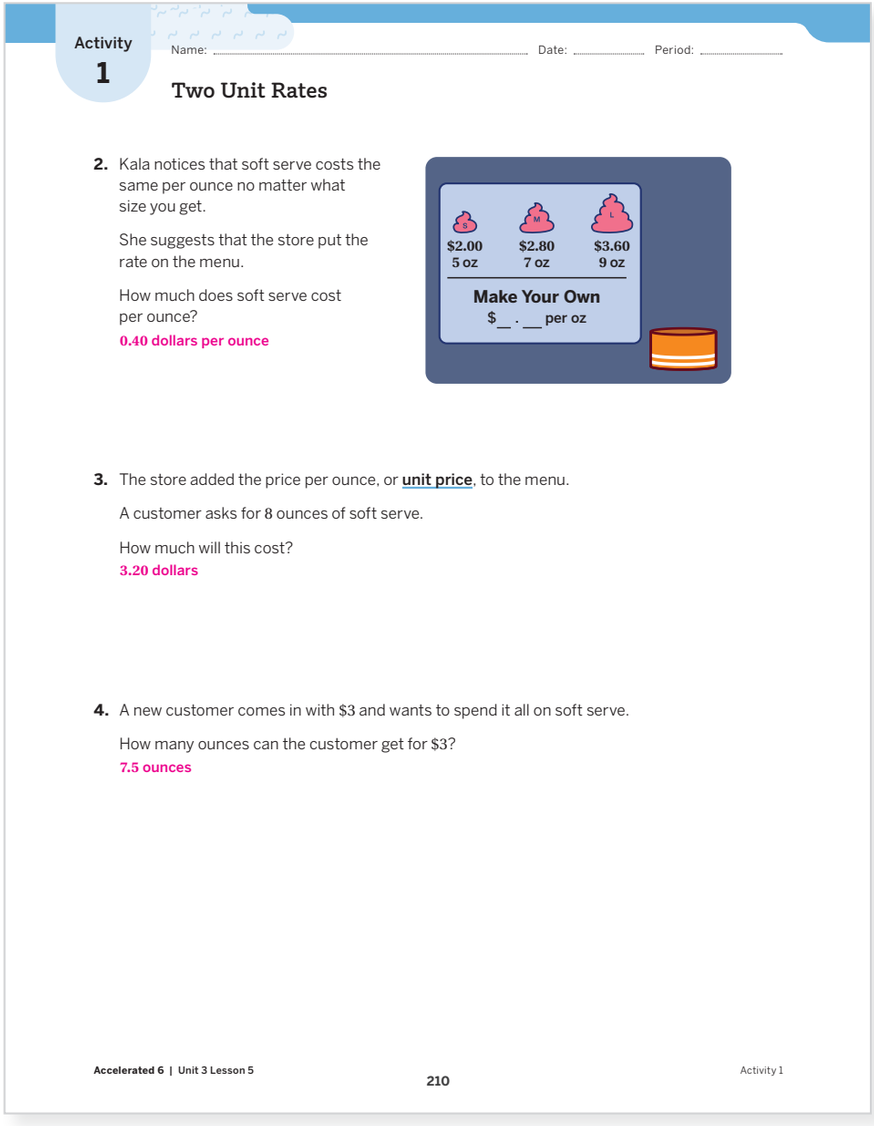
Create a class definition for the term **unit price** using students' language and the glossary.

Look and listen for a variety of thinking and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started	**Support** Invite students to look at the menu and estimate how much soft serve they think they can get for $3.
Write $3 \cdot 0.40 = 1.2$ ounces because they used the unit price they calculated earlier.	**Support** Encourage students to make a table and to record all the information. Consider asking, "Where would $3 go in your table? How much do you think 1.2 ounces would cost?"
Write an expression to get 7.5 ounces.	**Stretch** Invite students to use a double number line or table to support their reasoning.
Use a strategy similar to Neena's in the next problem or other creative strategies.	**Strengthen** Invite students to share their thinking during the Pause.

Activity 1 continued >



Activity 1

Name: Date: Period:

Two Unit Rates

2. Kala notices that soft serve costs the same per ounce no matter what size you get.

She suggests that the store put the rate on the menu.

How much does soft serve cost per ounce?

0.40 dollars per ounce

3. The store added the price per ounce, or **unit price**, to the menu.

A customer asks for 8 ounces of soft serve.

How much will this cost?

3.20 dollars

4. A new customer comes in with $3 and wants to spend it all on soft serve.

How many ounces can the customer get for $3?

7.5 ounces

Accelerated 6 | Unit 3 Lesson 5 210 Activity 1

Pairs | 18 min

Activity 1 Two Unit Rates (continued)

Purpose: Students calculate and interpret the two unit rates for a relationship and use them to solve problems.

Short on time? Consider omitting Problem 5 and having the discussion in Problem 4 instead.

2 Monitor

Pause briefly to share that the question is asking about "ounces per dollar" and not "price per ounce."

Consider asking:
- "Why do you think Neena divided by 2 as her first step?"
- "What does the 2.5 mean about the soft serve?" **(MTR.4.1)**

D **Differentiation: (Stretch)** Consider asking, "What do you think Neena would do to figure out how much soft serve you could get for \$5? \$6.75?"

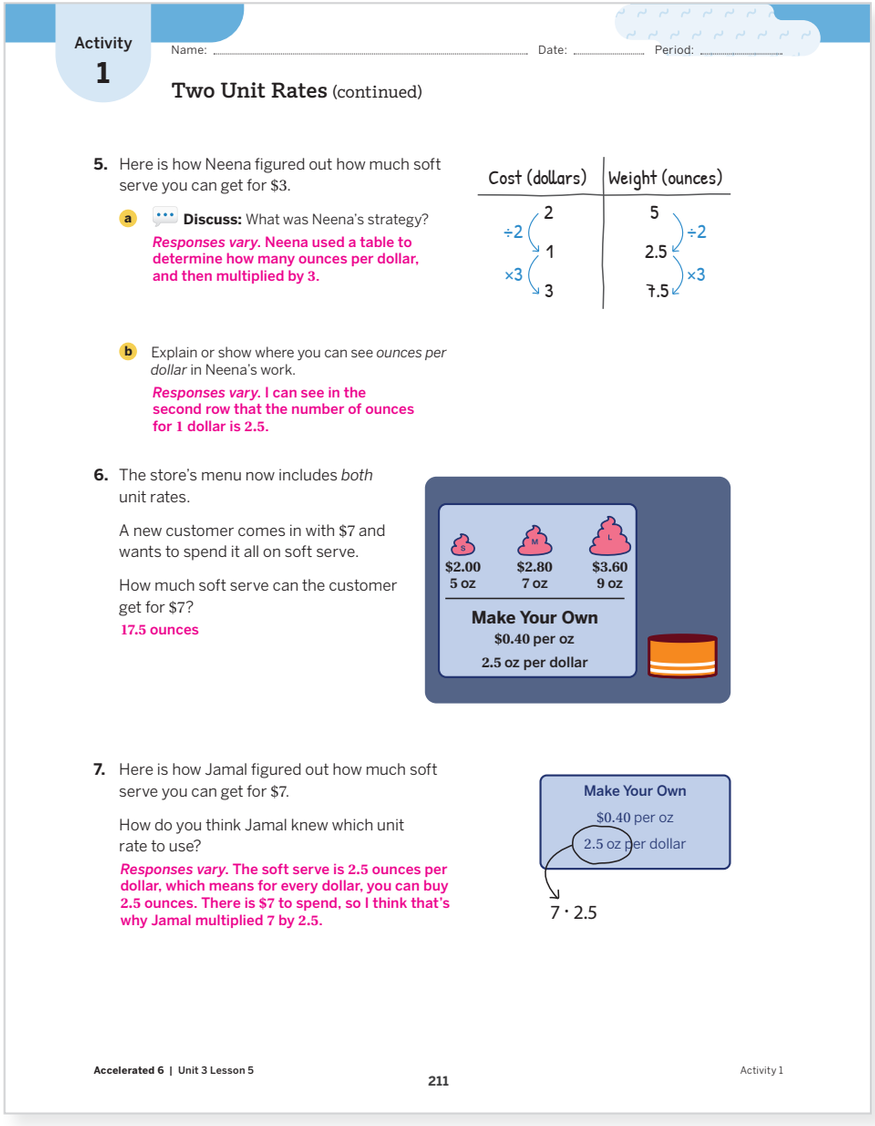
Look and listen for how students decide which unit rate is useful in this situation.

Select and sequence several student responses.

ELL **English Language Learners** Provide sentence frames (e.g., I think Jamal knew to multiply by the unit rate of ___ per ___ because _____.). **(Writing and Speaking)**

3 Connect

To surface the Key Takeaway, consider asking:
- "Why do you think Jamal multiplied by 2.5 ounces per dollar and not by \$0.40 per ounce?"
- "When would multiplying by 0.40 make sense?"
- "How might this apply to other situations that aren't about soft serve?" **(MTR.4.1)**



Activity 1

Name: Date: Period:

Two Unit Rates (continued)

5. Here is how Neena figured out how much soft serve you can get for \$3.

Cost (dollars)	Weight (ounces)
2	5
1	2.5
3	7.5

(÷2, ×3, ÷2, ×3)

a. **Discuss:** What was Neena's strategy?

Responses vary. Neena used a table to determine how many ounces per dollar, and then multiplied by 3.

b. Explain or show where you can see *ounces per dollar* in Neena's work.

Responses vary. I can see in the second row that the number of ounces for 1 dollar is 2.5.

6. The store's menu now includes *both* unit rates.

A new customer comes in with \$7 and wants to spend it all on soft serve.

How much soft serve can the customer get for \$7?

17.5 ounces

7. Here is how Jamal figured out how much soft serve you can get for \$7.

How do you think Jamal knew which unit rate to use?

Responses vary. The soft serve is 2.5 ounces per dollar, which means for every dollar, you can buy 2.5 ounces. There is \$7 to spend, so I think that's why Jamal multiplied 7 by 2.5.

Accelerated 6 | Unit 3 Lesson 5 211 Activity 1

Key Takeaway: Any ratio situation has two unit rates (e.g., dollars per ounce and ounces per dollar).

Pairs | 12 min

Activity 2 New Flavors

Purpose: Students calculate two unit rates and choose one to use in a situation with unknown equivalent ratios.

1 Launch

To generate excitement, consider asking, "What two-flavor soft serve swirl combination would you want to exist?"

Encourage students to get feedback from a partner to help them revise their thinking.

A **Accessibility: Visual-Spatial Processing**
Eliminate extraneous visual stimuli by creating a simpler version of the table that has cost (dollars) and weight (ounces) already labeled to support interpreting visual representations.

2 Monitor

D **Differentiation: (Support)** Look for students who initially write $0.80 per ounce and 1.25 ounces per dollar then switch them. Consider asking, "How can you know what unit rate you are calculating?" **(MTR.4.1)**

Encourage students to read others' responses and decide if others' strategies were similar to or different from their own.

D **Differentiation: (Support)** Look for students who write $5.60 because $\frac{7}{1.25} = 5.6$ or $7 \cdot \frac{4}{5} = 5.6$. Invite them to either make a table or double number line, and ask, "Where would the unit rates go? Where would 7 ounces go? Which unit rate will be most helpful to use?"

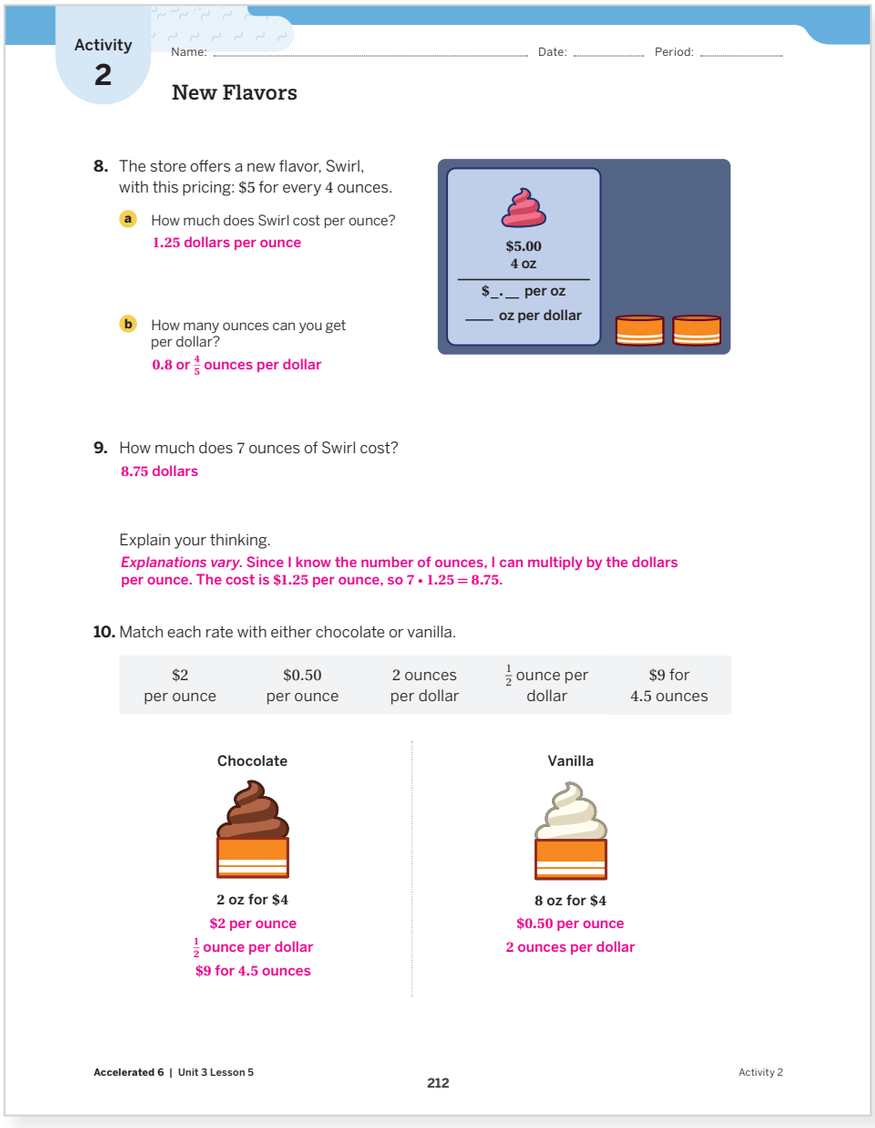
To support students getting started, invite them to look at one soft serve (chocolate or vanilla). Consider asking, "How much soft serve can you get for a dollar?"

Invite students to compare their responses with a partner, justify how they matched the rate with the soft serve, and make revisions based on their conversation. **(MTR.4.1)**

3 Connect

Invite students to share their responses and strategies to determine which ratios belong to which flavors.

Consider asking, "What is the difference between dividing ounces by dollars and dividing dollars by ounces?"



Activity 2

Name: Date: Period:

New Flavors

8. The store offers a new flavor, Swirl, with this pricing: $5 for every 4 ounces.

a. How much does Swirl cost per ounce?
1.25 dollars per ounce

b. How many ounces can you get per dollar?
0.8 or $\frac{4}{5}$ ounces per dollar

9. How much does 7 ounces of Swirl cost?
8.75 dollars

Explain your thinking.
Explanations vary. Since I know the number of ounces, I can multiply by the dollars per ounce. The cost is $1.25 per ounce, so $7 \cdot 1.25 = 8.75$.

10. Match each rate with either chocolate or vanilla.

$2 per ounce	$0.50 per ounce	2 ounces per dollar	$\frac{1}{2}$ ounce per dollar	$9 for 4.5 ounces

Chocolate

2 oz for $4
$2 per ounce
$\frac{1}{2}$ ounce per dollar
$9 for 4.5 ounces

Vanilla

8 oz for $4
$0.50 per ounce
2 ounces per dollar

Accelerated 6 | Unit 3 Lesson 5 212 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that the two unit rates associated with every ratio can be used to determine an unknown value.

Invite students to respond independently, and then share their thinking with a partner.

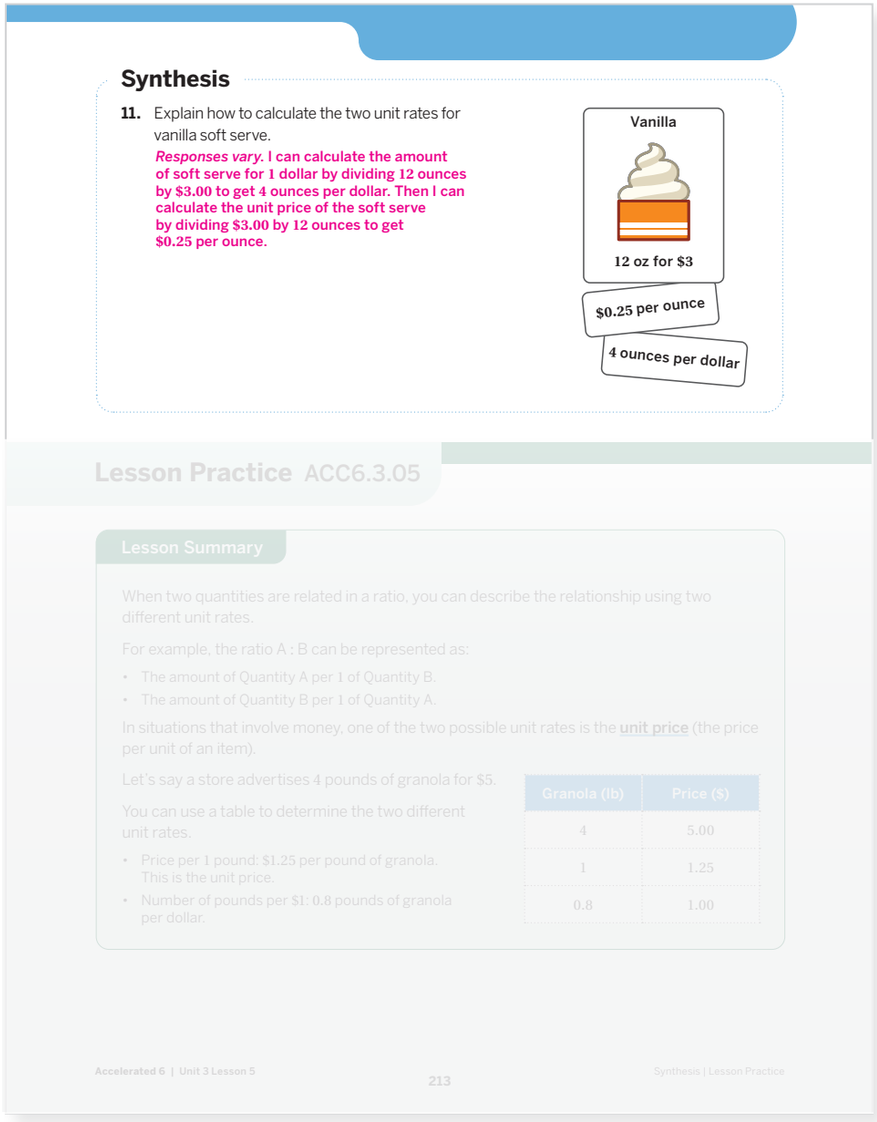
Capture and share a variety of ideas, such as:

- Every ratio has two unit rates that describe it.
- Using unit rates is a helpful strategy to calculate an unknown value in either unit.
- Label a table with dollars and ounces and write your given ratio. Then use either multiplication on division to make equivalent ratios that have 1 for each of the units.
- Divide the cost by the weight or weight by the cost to get the two unit rates. Your quotient units will match your calculations (e.g., $3 \div 12$ ounces $= \$0.25$ per ounce).

Consider asking:

- "How was the process similar and different for each one?"
- "How did you know what the first unit rate meant?"
- "How is it different from the second unit rate?"

MLR **MLR2: Collect and Display** Use this routine to formalize the definition of *unit price* and how to calculate the two unit rates using students' language. Display any new language, examples, or diagrams for students to reference later.



Synthesis

11. Explain how to calculate the two unit rates for vanilla soft serve.

Responses vary. I can calculate the amount of soft serve for 1 dollar by dividing 12 ounces by $3.00 to get 4 ounces per dollar. Then I can calculate the unit price of the soft serve by dividing $3.00 by 12 ounces to get $0.25 per ounce.

Lesson Practice ACC6.3.05

Lesson Summary

When two quantities are related in a ratio, you can describe the relationship using two different unit rates.

For example, the ratio A : B can be represented as:

- The amount of Quantity A per 1 of Quantity B.
- The amount of Quantity B per 1 of Quantity A.

In situations that involve money, one of the two possible unit rates is the unit price (the price per unit of an item).

Let's say a store advertises 4 pounds of granola for $5.

You can use a table to determine the two different unit rates.

- Price per 1 pound: $1.25 per pound of granola. This is the unit price.
- Number of pounds per $1: 0.8 pounds of granola per dollar.

Granola (lb)	Price ($)
4	5.00
1	1.25
0.8	1.00

Accelerated 6 | Unit 3 Lesson 5 213 Synthesis | Lesson Practice

Lesson Takeaway: There are two unit rates associated with every ratio. Which unit rate you use depends on the situation.

Independent | 5 min

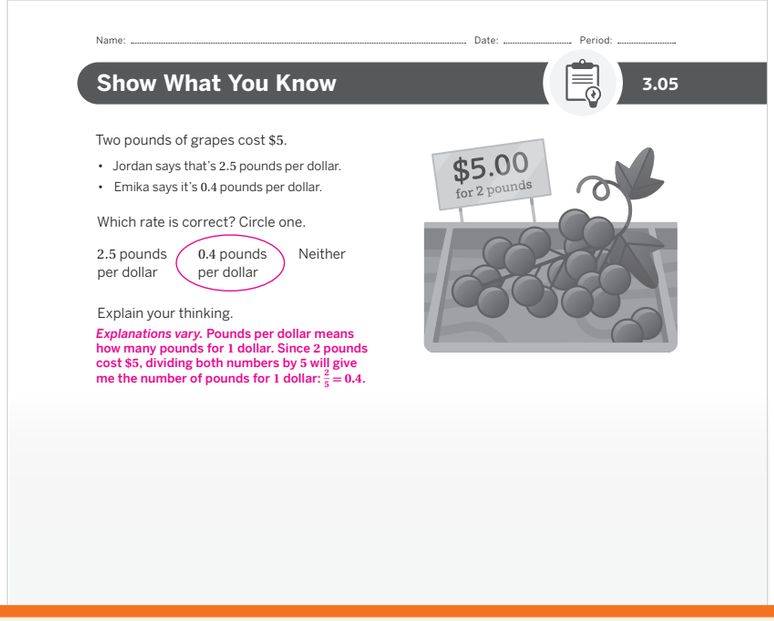
Show What You Know

Purpose: Students demonstrate their understanding of unit rates by determining and justifying the unit rate needed to solve a problem.

Today's Goal

1. **Goal:** Calculate *unit price* and express it using the term *per*.
2. **Language Goal:** Interpret the two unit rates associated with a ratio (i.e., $\frac{a}{b}$ and $\frac{b}{a}$ for the ratio $a : b$). **(Speaking and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 3.05

Two pounds of grapes cost $5.

- Jordan says that's 2.5 pounds per dollar.
- Emika says it's 0.4 pounds per dollar.

Which rate is correct? Circle one.

2.5 pounds per dollar | 0.4 pounds per dollar | Neither

Explain your thinking.

Explanations vary. Pounds per dollar means how many pounds for 1 dollar. Since 2 pounds cost $5, dividing both numbers by 5 will give me the number of pounds for 1 dollar: $\frac{2}{5} = 0.4$.

Differentiation Use after Lesson 5

Support

Provide targeted intervention for students by using these resources.

If students need support determining and justifying unit rates:

» **Respond to Student Thinking:**

- Use the *Calculating Unit Rates* Mini-lesson.
- Revisit **Activity 1** (particularly Neena's and Jamal's work) and invite students to share strategies for calculating unit price.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.
- Invite students to research ice cream brands. Encourage them to calculate the unit price and share their findings with their classmates.

Professional Learning

Take a moment to reflect on how students' understanding of the terms *rate* and *unit rates* has developed throughout this unit. How has their definition of unit rate expanded over the last few lessons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. Explain how to calculate the two unit rates for vanilla soft serve.

Responses vary. I can calculate the amount of soft serve for 1 dollar by dividing 12 ounces by $3.00 to get 4 ounces per dollar. Then I can calculate the unit price of the soft serve by dividing $3.00 by 12 ounces to get $0.25 per ounce.

Lesson Practice ACC6.3.05

Lesson Summary

When two quantities are related in a ratio, you can describe the relationship using two different unit rates.

For example, the ratio A : B can be represented as:

- The amount of Quantity A per 1 of Quantity B.
- The amount of Quantity B per 1 of Quantity A.

In situations that involve money, one of the two possible unit rates is the **unit price** (the price per unit of an item).

Let's say a store advertises 4 pounds of granola for $5.

You can use a table to determine the two different unit rates.

- Price per 1 pound: $1.25 per pound of granola. This is the unit price.
- Number of pounds per $1: 0.8 pounds of granola per dollar.

Granola (lb)	Price ($)
4	5.00
1	1.25
0.8	1.00

Lesson Practice ACC6.3.05

Name: _____ Date: _____ Period: _____

Problems 1–4: A copy machine can make 500 copies every 4 minutes.

1. How many copies can the copy machine make per minute?

125 copies per minute

2. How many minutes does it take per copy?

0.008 minutes

3. How many copies can the copy machine make in 10 minutes?

1,250 copies

4. A teacher made 700 copies. How long did it take?

5.6 minutes

Problems 5–7: Jamar's class painted 50 square feet of a mural using 4 cans of paint.

5. How many square feet did they paint per can of paint?

12.5 square feet

6. How many cans did they use per square foot?

0.08 cans

7. Jamar's class wants to paint a total of 310 square feet. Jamar calculated that they would need 3,875 cans of paint. Here is his work.

Jamar
12.5 square feet
310 · 12.5 = 3875

Is Jamar correct? Circle one.

Yes (No)

Explain your thinking.

Explanations vary. Jamar used the incorrect rate. He multiplied 310 by the number of square feet per can of paint, 12.5. Jamar should have multiplied 310 by the number of cans of paint per square foot, 0.08.

Lesson Practice ACC6.3.05

Name: _____ Date: _____ Period: _____

FAST Practice

8. Here are the prices for cans of juice at different stores. The cans are the same brand and size. Which store offers the best deal? Explain your thinking.

Store A	Store B	Store C
4 cans for $2.48	5 cans for $3.00	$0.59 per can

A. Store A B. Store B (C.) Store C offers the best deal. Cans are sold for

A. $0.60 (B.) $0.62 C. $1.60 each at Store A and (A.) $0.60 B. $0.62 C. $1.60 each at Store B.

Spiral Review

Problems 9–10: Evaluate each expression.

9. $\frac{1}{4}$ of 60

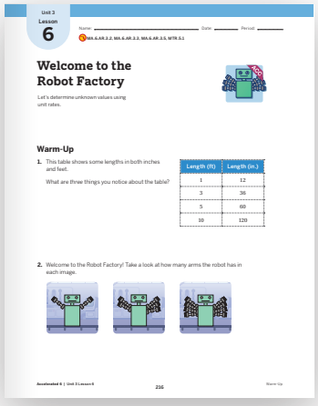
15

10. $\frac{3}{4}$ of 60

45

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–2, 5–6	2	MA.6.AR.3.2
	3–4, 7	2	MA.6.AR.3.5
FAST Practice	8	2	MA.6.AR.3.2
Spiral Review			
	9–10	1	MA.4.FR.2.4


Unit 3
Lesson 6

Welcome to the Robot Factory

Let's determine unknown values using unit rates.

Warm-Up

1. This table shows some lengths in both inches and feet.

Length (ft)	Length (in.)
1	12
3	36
5	60
10	120

What are three things you notice about the table?

2. Welcome to the Robot Factory! Take a look at how many arms the robot has in each image.

Welcome to the Robot Factory

Using Unit Rates

Let's determine unknown values using unit rates.

Learning Outcomes

Today's Goal

1. **Language Goal:** Explain how to use a unit rate to go from one value to another in a table of equivalent ratios. **(Writing, Speaking, and Listening)**

Students recognize that, in a table of equivalent ratios, the unit rates describe the relationship between quantities. They multiply by a unit rate to calculate one value from another, first examining the relationship between arms and fingers on each robot in a factory, then between the number of robots and the amount of paint needed to cover them.

Coherence

Prior Learning

In Lesson 5, students learned that every ratio relationship has two associated unit rates and that each unit rate is useful in different situations.

Future Learning

In Lesson 7, students will practice using what they have learned about unit rates to make comparisons and calculate unknowns.

Connections

- Students apply their understanding of equivalent ratios as they make decisions about parts and paint for robots. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3
Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Also Addressing: **MA.6.AR.3.2**

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1	MA.7.AR.3.1
MA.5.FR.2.2	MA.7.AR.3.2
MA.5.AR.1.2	MA.7.AR.3.3
MA.5.AR.1.3	MA.7.AR.4.1
MA.5.AR.3.2	MA.7.AR.4.2
	MA.7.AR.4.3
	MA.7.AR.4.4

Lesson at a Glance

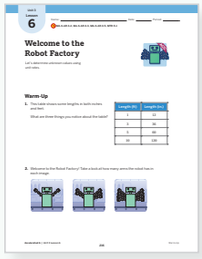
~ 45 min

MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5

Warm-Up

Pairs | 5 min

Students surface prior knowledge about tables of equivalent ratios using the familiar context of unit conversion.

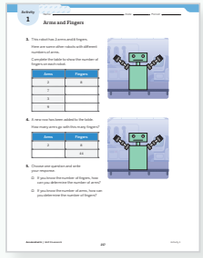

Welcome to the Robot Factory

Warm-Up

Activity 1

Pairs | 10 min

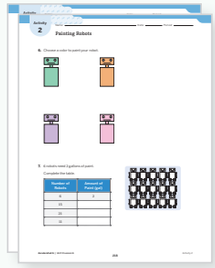
Students determine unknown values using unit rates and describe strategies to determine any number in a table of equivalent ratios.


Arms and Fingers

Activity 2

Pairs | 10 min

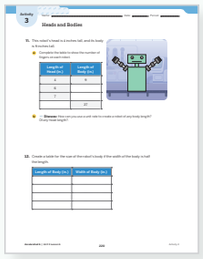
Students continue exploring how multiplying by a unit rate can help determine unknown values in a table of equivalent ratios.


Painting Robots

Activity 3

Pairs | 10 min

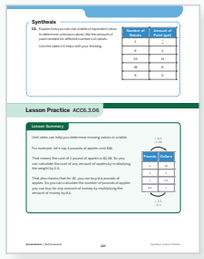
Students build procedural fluency in creating tables of equivalent ratios by comparing robot lengths.


Heads and Bodies

Synthesis

Whole Class | 5 min

Students synthesize strategies for using unit rates to determine unknown values in a table of equivalent ratios through multiplication and division. MLR2: Collect and Display


Synthesis

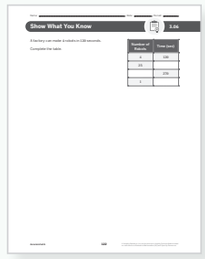
Lesson Practice

Lesson Summary

Show What You Know

Independent | 5 min

Students demonstrate their understanding of unit rates by using them to determine the unknown values in a table of equivalent ratios.


Show What You Know

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Coloring tools (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students surface prior knowledge about tables of equivalent ratios using the familiar context of unit conversion.

1 Launch

Invite students to share what they remember about measuring in inches and feet.

2 Connect

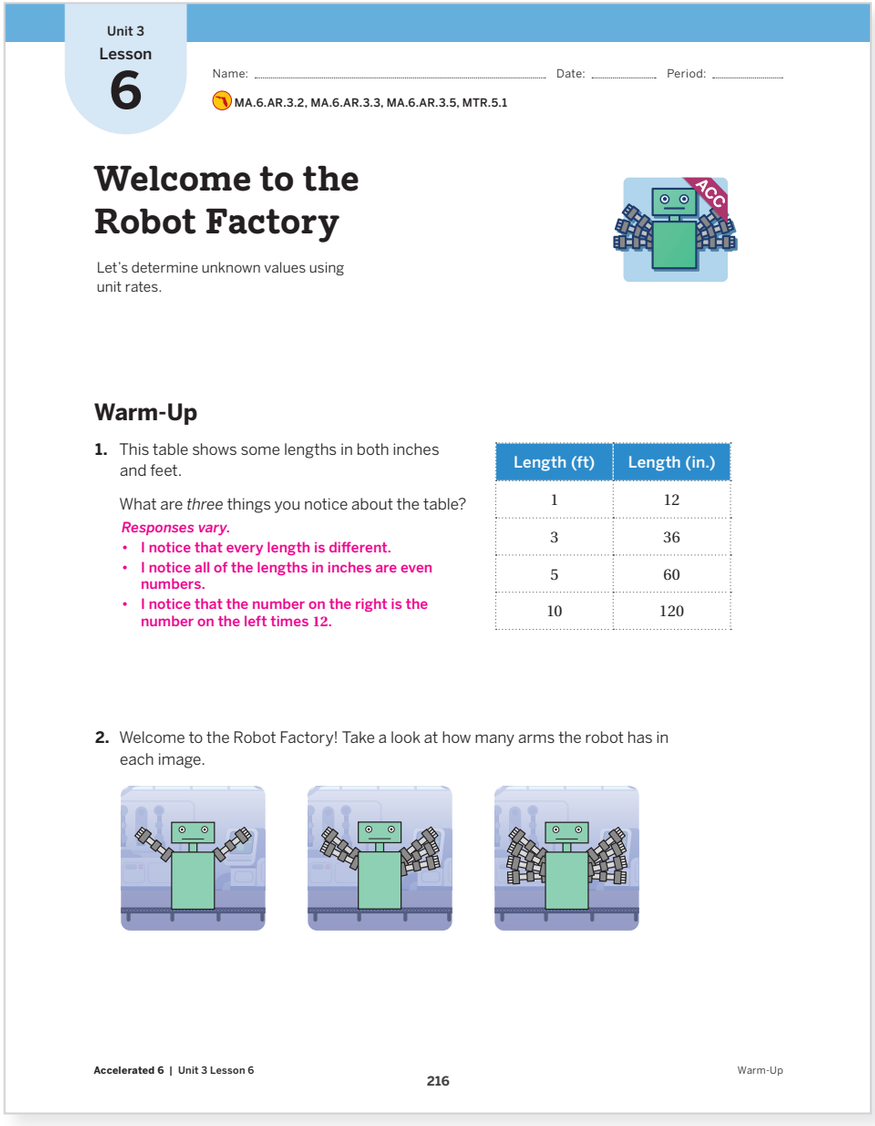
Invite students to share their noticings.

Consider asking:

- "What are the two different unit rates?"
- "What is the relationship between the numbers in each row? Do you think these patterns are true for other tables of equivalent ratios?" **(MTR.5.1)**

Direct students' attention to the images of robots.

Consider asking, "What do you think is the relationship between arms and fingers?"



Unit 3
Lesson
6

Name: _____ Date: _____ Period: _____

MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MTR.5.1

Welcome to the Robot Factory

Let's determine unknown values using unit rates.

Warm-Up

1. This table shows some lengths in both inches and feet.

What are *three* things you notice about the table?

Responses vary.

- I notice that every length is different.
- I notice all of the lengths in inches are even numbers.
- I notice that the number on the right is the number on the left times 12.

Length (ft)	Length (in.)
1	12
3	36
5	60
10	120

2. Welcome to the Robot Factory! Take a look at how many arms the robot has in each image.

Pairs | 10 min

Activity 1 Arms and Fingers

Purpose: Students determine unknown values using unit rates and describe strategies to determine any number in a table of equivalent ratios.

1 Launch

To generate excitement, consider asking, "If you created a robot, what tasks would you want it to complete?"

2 Monitor

Invite students to get feedback from a partner.

Invite students to write their expressions in the table or on separate paper to help with their thinking.

Look and listen for a variety of strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to estimate and revise their response based on the feedback. Consider asking, "What is the ratio of arms to fingers for any robot?"
Add the difference between the first row and second row.	**Support** Consider asking, "Is your new ratio of arms and fingers equivalent to the original?"
Multiply by 4 in Problem 3 or divide by 4 in Problem 4 to determine the missing value.	**Stretch** Consider asking, "Is it possible for this robot to have 50 fingers?"

Select and sequence several student responses. Look for students who mention unit rates or who describe different strategies (e.g., dividing by 4 versus multiplying by $\frac{1}{4}$, and multiplying by 4 versus dividing by $\frac{1}{4}$).

3 Connect

Share the captured responses.

To surface the Key Takeaway, consider asking, "Where do you see the unit rate in the table?"

Activity 1

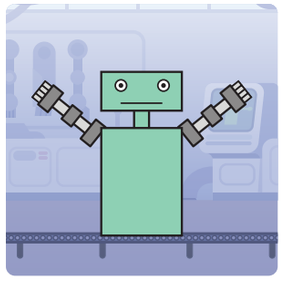
Name: Date: Period:

Arms and Fingers

3. This robot has 2 arms and 8 fingers.

Here are some other robots with different numbers of arms.

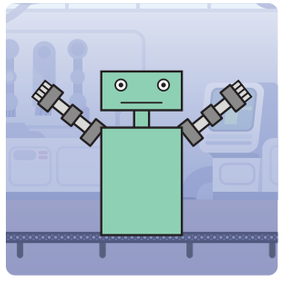
Complete the table to show the number of fingers on each robot.



Arms	Fingers
2	8
7	28
3	12
9	36

4. A new row has been added to the table.

How many arms go with this many fingers?



Arms	Fingers
2	8
11	44

5. Choose *one* question and write your response.

- ☐ If you know the number of *fingers*, how can you determine the number of arms?
- ☐ If you know the number of *arms*, how can you determine the number of fingers?

Responses vary.

- I can determine the number of arms by dividing by 4.
- I can determine the number of fingers by multiplying by 4.

Accelerated 6 | Unit 3 Lesson 6 217 Activity 1

Key Takeaway: The unit rates describe the relationship between columns in a table. Multiplying or dividing with unit rates can help determine an unknown value in the table.

Pairs | 10 min

Activity 2 Painting Robots

Purpose: Students continue exploring how multiplying by a unit rate can help determine unknown values in a table of equivalent ratios.

Short on time? Consider omitting Problem 6 and having students only complete one additional row of the table in Problem 9.

1 Launch

To generate excitement, encourage students to choose a name for their robot that starts with the same letter as the color they select (e.g., Giselle, Orion, Priscilla, Patrick, etc.).

Consider sharing that they will be determining how much paint they need to paint different-sized robots.

2 Monitor

Encourage students to write their responses as expressions or add rows to their table in the Student Edition if it helps their thinking.

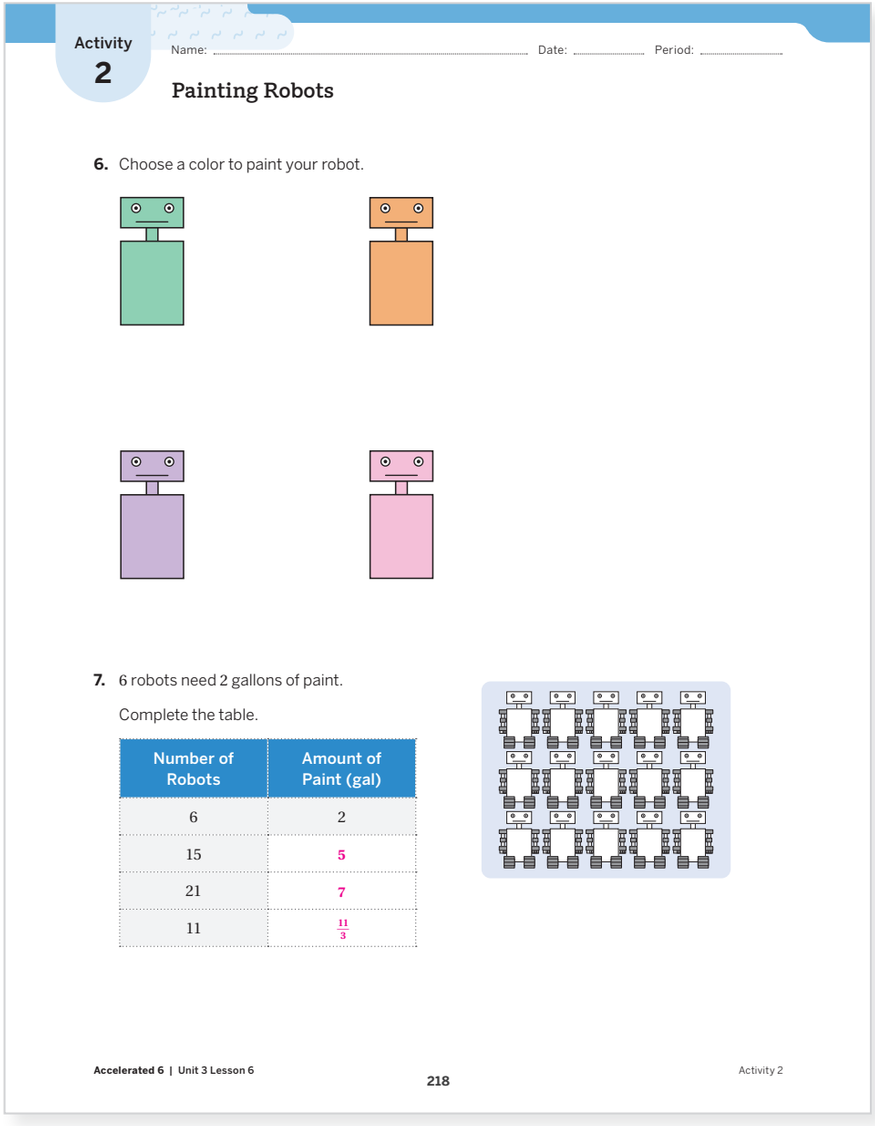
Look and listen for a variety of thinking and strategies including:

- Multiplying across by $\frac{1}{3}$.
- Dividing across by 3.
- Using the unit rate of $3 : 1$ to create equivalent ratios.
- Using the unit rate of $1 : \frac{1}{3}$ to create equivalent ratios.

D **Differentiation: (Support)** Look for students who struggle to determine the amount of paint needed for 11 robots using the unit rate 3 robots per gallon. Consider asking, "What is the other unit rate for this ratio? How many gallons of paint are needed per robot?"

A **Accessibility: Visual-Spatial Processing** Invite students to use coloring tools to support their thinking in the Student Edition. (e.g., Color in 6 robots for every 2 gallons of paint, or 3 robots for every 1 gallon of paint etc.)

Activity 2 continued >



Activity 2

Name: Date: Period:

Painting Robots

6. Choose a color to paint your robot.

7. 6 robots need 2 gallons of paint.

Complete the table.

Number of Robots	Amount of Paint (gal)
6	2
15	5
21	7
11	$\frac{11}{3}$

Accelerated 6 | Unit 3 Lesson 6 218 Activity 2

Pairs | 10 min

Activity 2 Painting Robots (continued)

Purpose: Students continue exploring how multiplying by a unit rate can help determine unknown values in a table of equivalent ratios.

Short on time? Consider omitting Problem 6 and having students only complete one additional row of the table in Problem 9.

2 Monitor

Select and sequence several student responses.

MLR **MLR1: Stronger and Clearer Each Time (optional)** Consider using this routine to support students in developing precise language. Invite students to meet with a partner, give feedback on each other's drafts, then use the feedback to write a second clearer draft. See the Routine Facilitation Guide for more information. **(EE.4.1)**

Look and listen for a variety of thinking and strategies.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to revisit Problem 8 and use their own or a classmates' instructions.
Write 13 gallons because $4 + 6 = 10$ and $7 + 6 = 13$.	**Support** Invite them to calculate the unit rates and to add them to their table.
Write 17.5 gallons as an expression (e.g., $10 \cdot \frac{7}{4}$, $7 \cdot 2.5$, $7 \cdot \left(\frac{10}{4}, \frac{70}{4}\right)$).	**Stretch** Invite them to revisit Problem 8 and revise their own instructions or provide feedback to their classmates' to make them stronger and clearer.

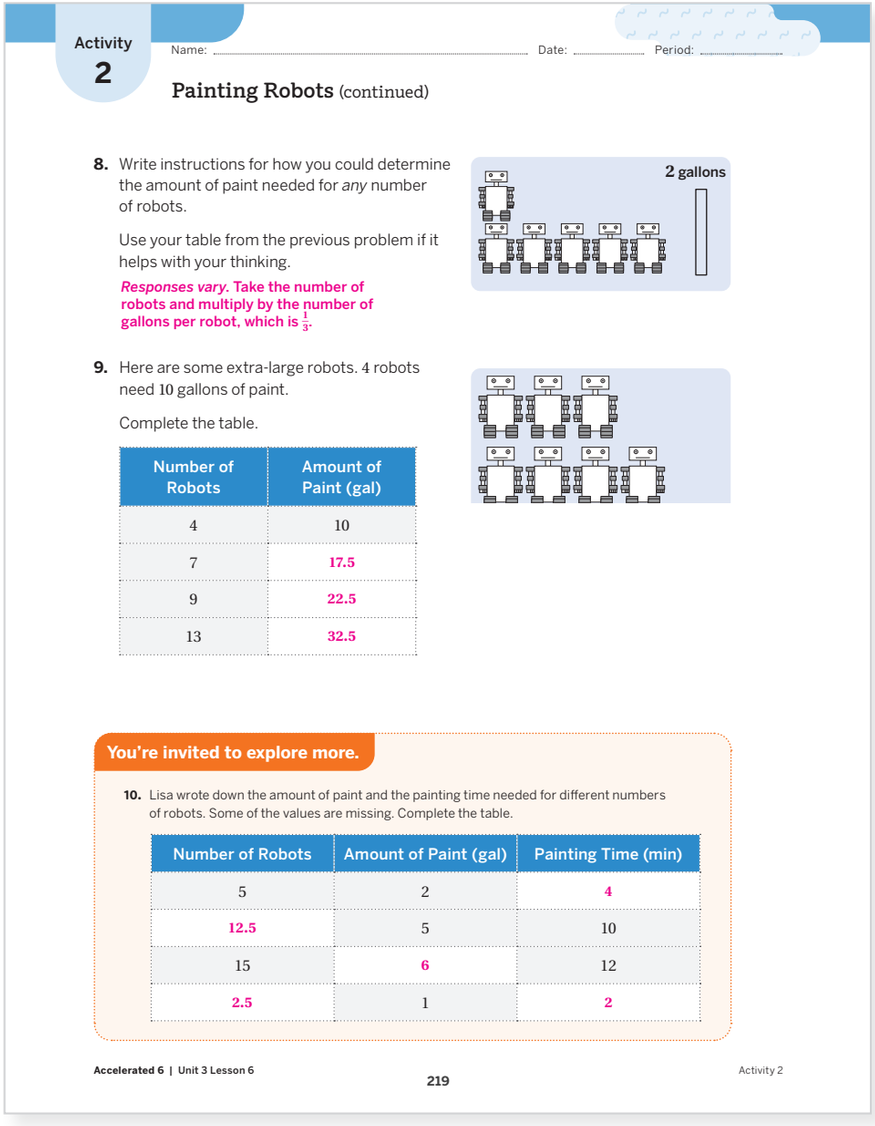
D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore using unit rates to determine unknown values further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Share captured strategies and make them stronger and clearer as a class.

Consider asking:

- "What do these instructions have in common?"
- "Where do we see unit rates in each of these instructions? In the tables and expressions?" **(MTR.5.1)**



Activity 2

Name: Date: Period:

Painting Robots (continued)

8. Write instructions for how you could determine the amount of paint needed for *any* number of robots.

Use your table from the previous problem if it helps with your thinking.

Responses vary. Take the number of robots and multiply by the number of gallons per robot, which is $\frac{1}{3}$.

9. Here are some extra-large robots. 4 robots need 10 gallons of paint.

Complete the table.

Number of Robots	Amount of Paint (gal)
4	10
7	17.5
9	22.5
13	32.5

You're invited to explore more.

10. Lisa wrote down the amount of paint and the painting time needed for different numbers of robots. Some of the values are missing. Complete the table.

Number of Robots	Amount of Paint (gal)	Painting Time (min)
5	2	4
12.5	5	10
15	6	12
2.5	1	2

Accelerated 6 | Unit 3 Lesson 6 219 Activity 2

Pairs | 10 min

Activity 3 Heads and Bodies

Purpose: Students build procedural fluency in creating tables of equivalent ratios by comparing robot lengths.

1 Launch

Direct students' attention to the table. Consider sharing that students will determine two body lengths and one head length.

2 Monitor

Look and listen for students using the same or a different strategy from the previous activities. Consider asking, "What made you choose this strategy for this table?"

A **Accessibility: Conceptual Processing** Invite students to revisit their work from the previous activities to help determine a strategy to apply to the given table.

Capture a variety of strategies and responses to highlight during the Connect.

To support students getting started, consider sharing that students can choose any length or any width and then calculate the other value.

3 Connect

Invite students to share their strategies to fill in the tables and create a robot of *any* size.

Consider asking:

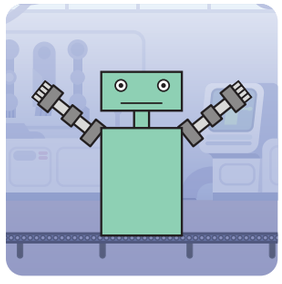
- "What is the unit rate of body length to body width? Of body width to body length?"
- "How did you decide which values to place in the table?" **(MTR.5.1)**

Activity 3

Name: Date: Period:

Heads and Bodies

11. This robot's head is 4 inches tall, and its body is 9 inches tall.



a. Complete the table to show the number of fingers on each robot.

Length of Head (in.)	Length of Body (in.)
4	9
6	13.5
7	15.75
12	27

b. **Discuss:** How can you use a unit rate to create a robot of *any* body length? Of *any* head length?

Responses vary. The length of the body when the head is 1 inch is $\frac{9}{4} = 2.25$ inches. I can calculate any body length by multiplying the head length by 2.25. The length of the head when the body is 1 inch is $\frac{4}{9}$ inches. I can calculate any head length by multiplying the body length by $\frac{4}{9}$.

12. Create a table for the size of the robot's body if the width of the body is half the length.

Length of Body (in.)	Width of Body (in.)
2	1
5	2.5
10	5
16	8

Table values vary but should show the ratio of length to width as 2 to 1.

Accelerated 6 | Unit 3 Lesson 6 220 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize strategies for using unit rates to determine unknown values in a table of equivalent ratios through multiplication and division.

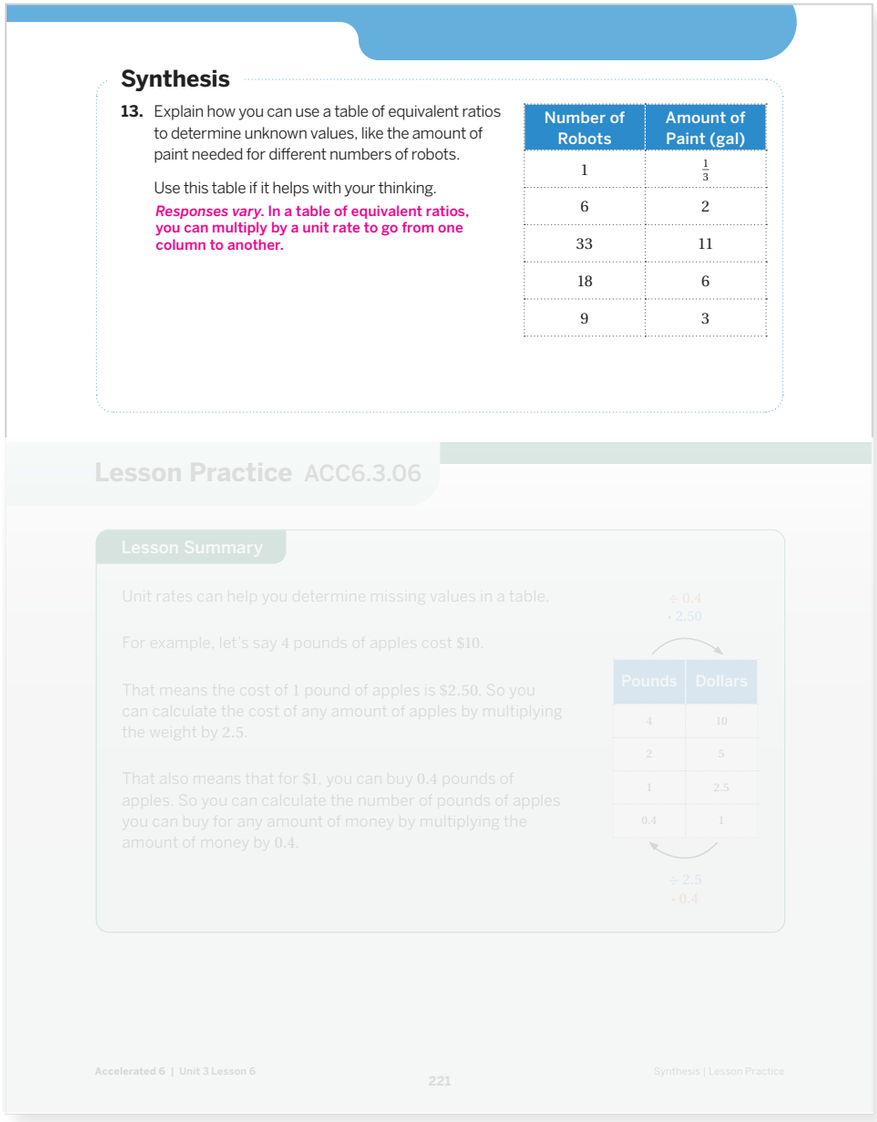
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Dividing the gallons by the number of robots to calculate the unit rate of gallons per robot.
- Dividing the number of robots by the number of gallons to calculate robots per gallon.
- Multiplying or dividing across a table by the unit rate to determine an unknown value (e.g., $6 \div 3 = 2$ or $6 \cdot \frac{1}{3} = 2$).

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for determining unknown values in a table of equivalent ratios using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

13. Explain how you can use a table of equivalent ratios to determine unknown values, like the amount of paint needed for different numbers of robots.

Use this table if it helps with your thinking.

Responses vary. In a table of equivalent ratios, you can multiply by a unit rate to go from one column to another.

Number of Robots	Amount of Paint (gal)
1	$\frac{1}{3}$
6	2
33	11
18	6
9	3

Lesson Practice ACC6.3.06

Lesson Summary

Unit rates can help you determine missing values in a table.

For example, let's say 4 pounds of apples cost $10.

That means the cost of 1 pound of apples is $2.50. So you can calculate the cost of any amount of apples by multiplying the weight by 2.5.

That also means that for $1, you can buy 0.4 pounds of apples. So you can calculate the number of pounds of apples you can buy for any amount of money by multiplying the amount of money by 0.4.

× 0.4
× 2.50

Pounds	Dollars
4	10
2	5
1	2.5
0.4	1

÷ 2.5
× 0.4

Accelerated 6 | Unit 3 Lesson 6 221 Synthesis | Lesson Practice

Lesson Takeaway: Unit rates can be used to determine unknown values in a table through multiplication and division.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of unit rates by using them to determine the unknown values in a table of equivalent ratios.

Today's Goal

1. **Language Goal:** Explain how to use a unit rate to go from one value to another in a table of equivalent ratios. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 3.06

A factory can make 4 robots in 120 seconds.

Complete the table.

Number of Robots	Time (sec)
4	120
25	750
9	270
1	30

D Differentiation Use after Lesson 6

Support

Provide targeted intervention for students by using these resources.

If students need support determining unknown values in a table with equivalent ratios:

» **Respond to Student Thinking:**

- Use the *Calculating Unit Rates* Mini-lesson.
- Revisit **Activity 2** with students before providing individualized feedback on the relevant **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

In this lesson, students used unit rates to go from one column to another in a ratio table. How will that work support their fluency and flexibility with using unit rates in the next lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

13. Explain how you can use a table of equivalent ratios to determine unknown values, like the amount of paint needed for different numbers of robots.

Use this table if it helps with your thinking.

Responses vary. In a table of equivalent ratios, you can multiply by a unit rate to go from one column to another.

Number of Robots	Amount of Paint (gal)
1	$\frac{1}{3}$
6	2
33	11
18	6
9	3

Lesson Practice ACC6.3.06

Lesson Summary

Unit rates can help you determine missing values in a table.

For example, let's say 4 pounds of apples cost $10.

That means the cost of 1 pound of apples is $2.50. So you can calculate the cost of any amount of apples by multiplying the weight by 2.5.

That also means that for $1, you can buy 0.4 pounds of apples. So you can calculate the number of pounds of apples you can buy for any amount of money by multiplying the amount of money by 0.4.

÷ 0.4
· 2.50

Pounds	Dollars
4	10
2	5
1	2.5
0.4	1

÷ 2.5
· 0.4

Lesson Practice
ACC6.3.06

Name: _____ Date: _____ Period: _____

Problems 1–4: This table shows how many onions and tomatoes you need to make different-sized batches of a salsa recipe.

Onions	Tomatoes
2	16
4	32
6	48

1. How many onions do you need for 40 tomatoes?
5 onions

2. How many tomatoes do you need for 3.5 onions?
28 tomatoes

3. One unit rate in this situation is 8. What does that represent?
Responses vary. **The number of tomatoes per onion.**

4. Another unit rate is $\frac{1}{8}$. What does that represent?
Responses vary. **The number of onions per tomato.**

Problems 5–6: For every 10 meters you walk forward, you move 15 meters forward shuffling sideways.

Distance Walked (m)	Distance Shuffled (m)
10	15

5. How far should you shuffle sideways if you walk forward 15 meters? Use the table if it helps with your thinking.
22.5 meters

6. How far should you walk forward if you shuffle sideways for 45 meters? Use the table if it helps with your thinking.
30 meters

Lesson Practice
ACC6.3.06

Name: _____ Date: _____ Period: _____

7. Liam walks 1 mile in 20 minutes. At this rate, how many miles could Liam walk in 1 hour 30 minutes?
4.5 miles

FAST Practice

8. A train is traveling at a constant rate. Complete the table to show the relationship between the train's travel time and its distance traveled.
Responses shown in table.

Time (hr)	Distance Traveled (mi)
2	110
1	**55**
0.5	27.5
$1\frac{1}{2}$	**82.5**
3	165

Spiral Review

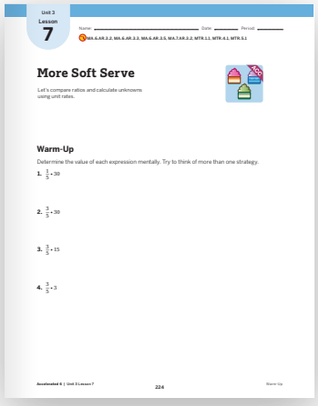
9. A sandwich is placed on a digital scale. The scale reads 4.3. What could be the unit of measurement?

A. Miles B. Ounces C. Pounds D. Inches

10. Lola's family is planning to purchase a car that is 176.5 inches long. They have a parking space that is 16.25 feet long. Could this car fit in the parking space? Explain your thinking.
Yes. ***Explanations vary.*** **The parking space is 195 inches long because 16.25 · 12 = 195.**

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–2, 5–7	2	MA.6.AR.3.5
	3–4	2	MA.6.AR.3.2
FAST Practice	8	2	MA.6.AR.3.3
Spiral Review			
	9	1	MA.4.M.1.1
	10	2	MA.6.AR.3.5


Unit 3
Lesson 7
Name: Date: Period:
MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MA.7.AR.3.2, MTR.1.1, MTR.4.1, MTR.5.1
More Soft Serve
Let's compare ratios and calculate unknowns using unit rates.
Warm-Up
Determine the value of each expression mentally. Try to think of more than one strategy.
1. $\frac{1}{5} \cdot 30$
2. $\frac{2}{5} \cdot 30$
3. $\frac{3}{5} \cdot 15$
4. $\frac{7}{5} \cdot 5$
Accelerated 6 | Unit 3 Lesson 7
224
Warm-Up

More Soft Serve

Solving Rate Problems

Let's compare ratios and calculate unknowns using unit rates.

Learning Outcomes

Today's Goals

1. **Goal:** Use unit rates to calculate unknown quantities.
2. **Language Goal:** Describe strategies for determining unknown quantities using ratio reasoning. **(Writing, Speaking, and Listening)**

Students practice using unit rates to make comparisons and calculate unknown values. They compare unit prices to determine which store offers the best deal and use unit prices to generate equivalent ratios. Students analyze situations to decide which unit rate to calculate and then multiply or divide with the unit rate to determine missing values.

Coherence

Prior Learning

In Lesson 6, students recognized that, in a table of equivalent ratios, they can multiply by a unit rate to go from one column to another.

Future Learning

In Lesson 8, students will build on their experiences with percentages to reason about the benchmark percentages: 10%, 25%, 50%, and 75%.

Connections

- Students soft serve ice cream situations and apply ratios to find missing values. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.3
Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.

MA.6.AR.3.5
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the same measurement system.

Also Addressing: **MA.6.AR.3.2, MA.7.AR.3.2**

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.4.1, MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.1.1	MA.7.AR.3.1
MA.5.FR.2.2	MA.7.AR.3.2
MA.5.AR.1.2	MA.7.AR.4.1
MA.5.AR.1.3	MA.7.AR.4.2
	MA.7.AR.4.3
	MA.7.AR.4.4

Lesson at a Glance

~ 45 min

MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MA.7.AR.3.2

Warm-Up

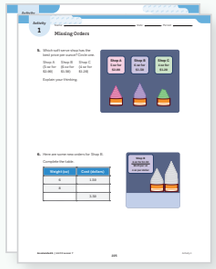
Whole Class | 5 min

Students surface strategies for multiplying whole numbers by fractions. **Routine:** Number Talk

Activity 1

Pairs | 18 min

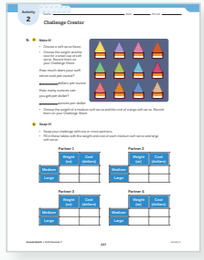
Students recognize that they can use multiplication to go both directions in a table. MLR2: Collect and Display



Activity 2

Pairs | 12 min

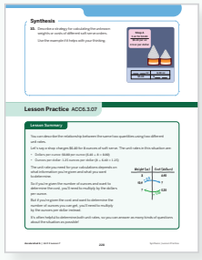
Students create their own soft serve challenge to trade with their classmates.



Synthesis

Whole Class | 5 min

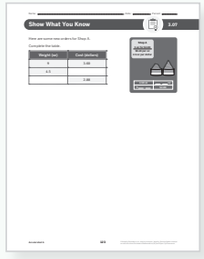
Students synthesize their understanding of how to flexibly use unit rates to determine unknown quantities in either column of a ratio table. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of unit rates by determining the unknown values in a ratio table.



Prep Checklist

Prepare copies of the Activity 2 Sheet.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 2 Sheet, one per student

Whole Class | 5 min

Warm-Up

Purpose: Students surface strategies for multiplying whole numbers by fractions.

1 Launch

Direct students' attention to the expressions one at a time.

Use the Number Talk routine to support students in multiplying whole numbers by fractions. **(MTR.1.1)**

Invite students to mentally evaluate the first expression independently. Then record a variety of strategies, along with the name of the students who shared them.

Consider asking, "Who thought about it in a different way?"

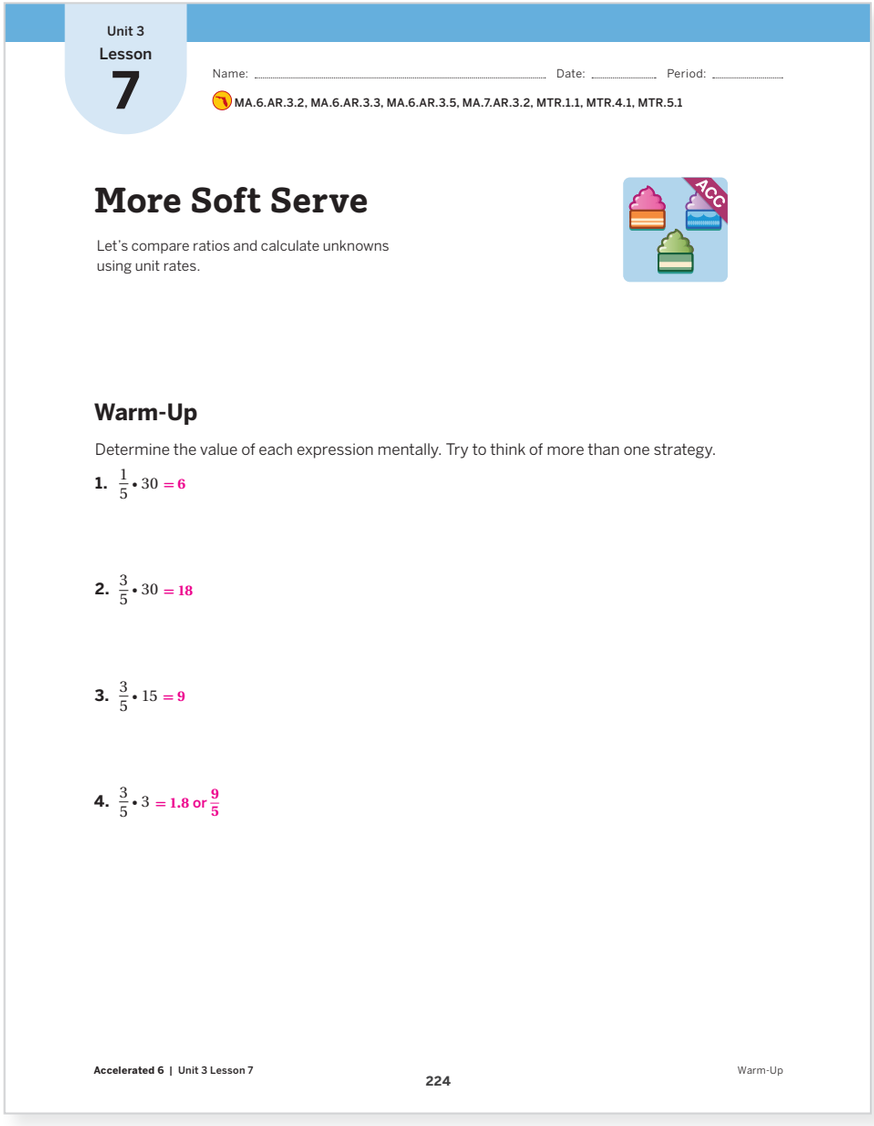
Note: This structure is repeated for each problem in the Number Talk.

2 Connect

Invite students to compare and contrast the different expressions and strategies.

Consider asking:

- "What connections do you notice among the strategies we've discussed?"
- "What connections do you notice among the different expressions?"
- "How might the first product help you determine the second one? Third one?"



Unit 3
Lesson
7

Name: Date: Period:

MA.6.AR.3.2, MA.6.AR.3.3, MA.6.AR.3.5, MA.7.AR.3.2, MTR.1.1, MTR.4.1, MTR.5.1

More Soft Serve

Let's compare ratios and calculate unknowns using unit rates.

ACC

Warm-Up

Determine the value of each expression mentally. Try to think of more than one strategy.

1. $\frac{1}{5} \cdot 30 = 6$

2. $\frac{3}{5} \cdot 30 = 18$

3. $\frac{3}{5} \cdot 15 = 9$

4. $\frac{3}{5} \cdot 3 = 1.8$ or $\frac{9}{5}$

Accelerated 6 | Unit 3 Lesson 7 224 Warm-Up

Pairs | 18 min

Activity 1 Missing Orders

Purpose: Students recognize that they can use multiplication to go both directions in a table.

Short on time? Consider omitting Problem 8.

1 Launch

To surface prior knowledge, invite students to share what they recall from the last lesson about soft serve.

Consider asking, "What strategies might help us decide which shop has the best price per ounce?"

2 Monitor

Invite students to get feedback from a partner throughout the lesson.

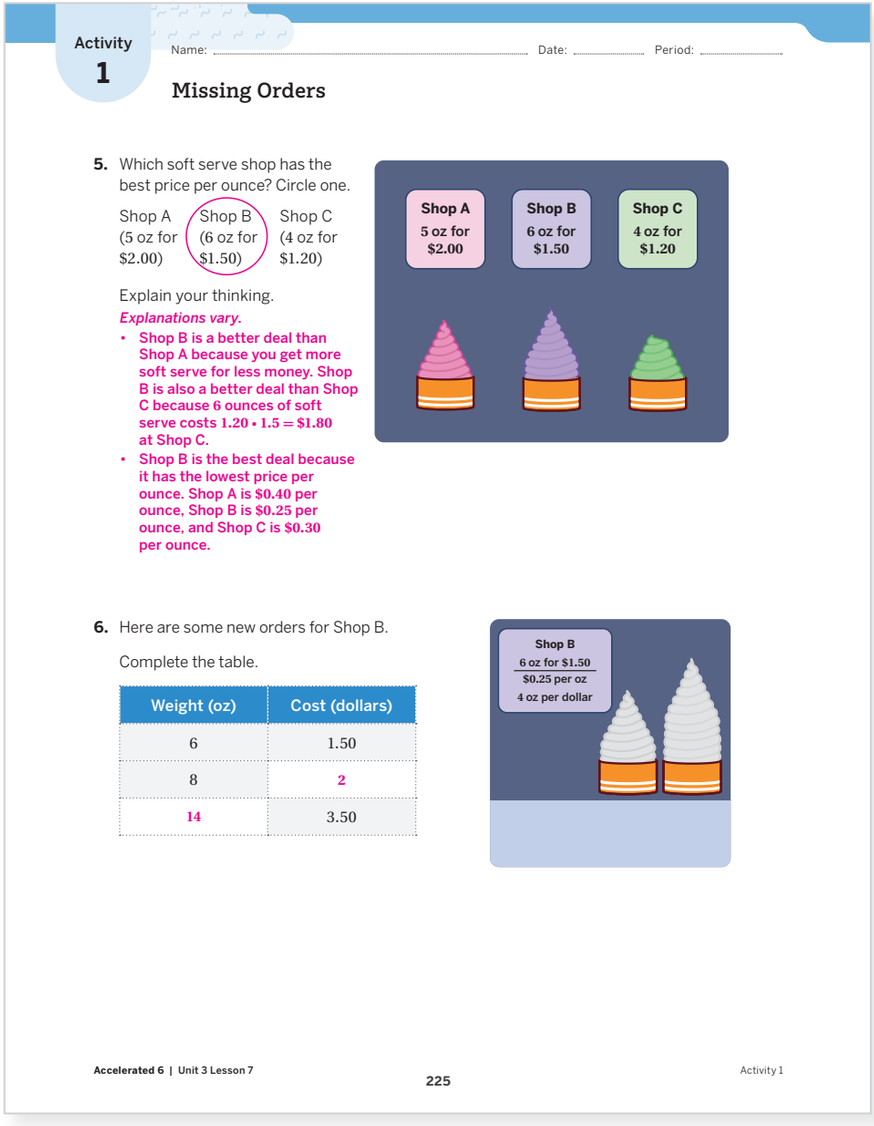
Invite students to write their expressions on paper to help with their thinking throughout this lesson.

Look and listen for a variety of thinking and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage students to use a ratio table. Consider asking, "Where would $0.25 per ounce go? Where would 4 ounces per dollar go?"
Multiply by 4 to determine the cost of 8 ounces of soft serve.	**Support** Consider asking, "How much does 1 ounce of soft serve cost? How much would 8 ounces cost?"
Divide by 4 to determine the weight of $3.50 worth of soft serve.	**Support** Consider asking, "How much does $1 worth of soft serve weigh? How much would $3.50 worth of soft serve weigh?"
Use a strategy similar to Riya's in the next problem or other creative strategies to get $2 and 14 ounces (e.g., $8 \div \frac{6}{1.5}$ or $0.25 \cdot 8$).	**Strengthen** Invite them to share their thinking during the Connect. **Stretch** Invite them to try another strategy.

Activity 1 continued >



Activity 1

Name: Date: Period:

Missing Orders

5. Which soft serve shop has the best price per ounce? Circle one.

Shop A (5 oz for $2.00) Shop B (6 oz for $1.50) Shop C (4 oz for $1.20)

Explain your thinking.

Explanations vary.

- Shop B is a better deal than Shop A because you get more soft serve for less money. Shop B is also a better deal than Shop C because 6 ounces of soft serve costs $1.20 \cdot 1.5 = \$1.80$ at Shop C.
- Shop B is the best deal because it has the lowest price per ounce. Shop A is $0.40 per ounce, Shop B is $0.25 per ounce, and Shop C is $0.30 per ounce.

6. Here are some new orders for Shop B.

Complete the table.

Weight (oz)	Cost (dollars)
6	1.50
8	2
14	3.50

Accelerated 6 | Unit 3 Lesson 7 225 Activity 1

Pairs | 18 min

Activity 1 Missing Orders (continued)

Purpose: Students recognize that they can use multiplication to go both directions in a table.

Short on time? Consider omitting Problem 8.

2 Monitor

Encourage students to write in their Student Edition if it helps with their thinking.

ELL **English Language Learners** Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

Encourage students to write their responses as expressions or add rows to their table in the Student Edition if it helps with their thinking.

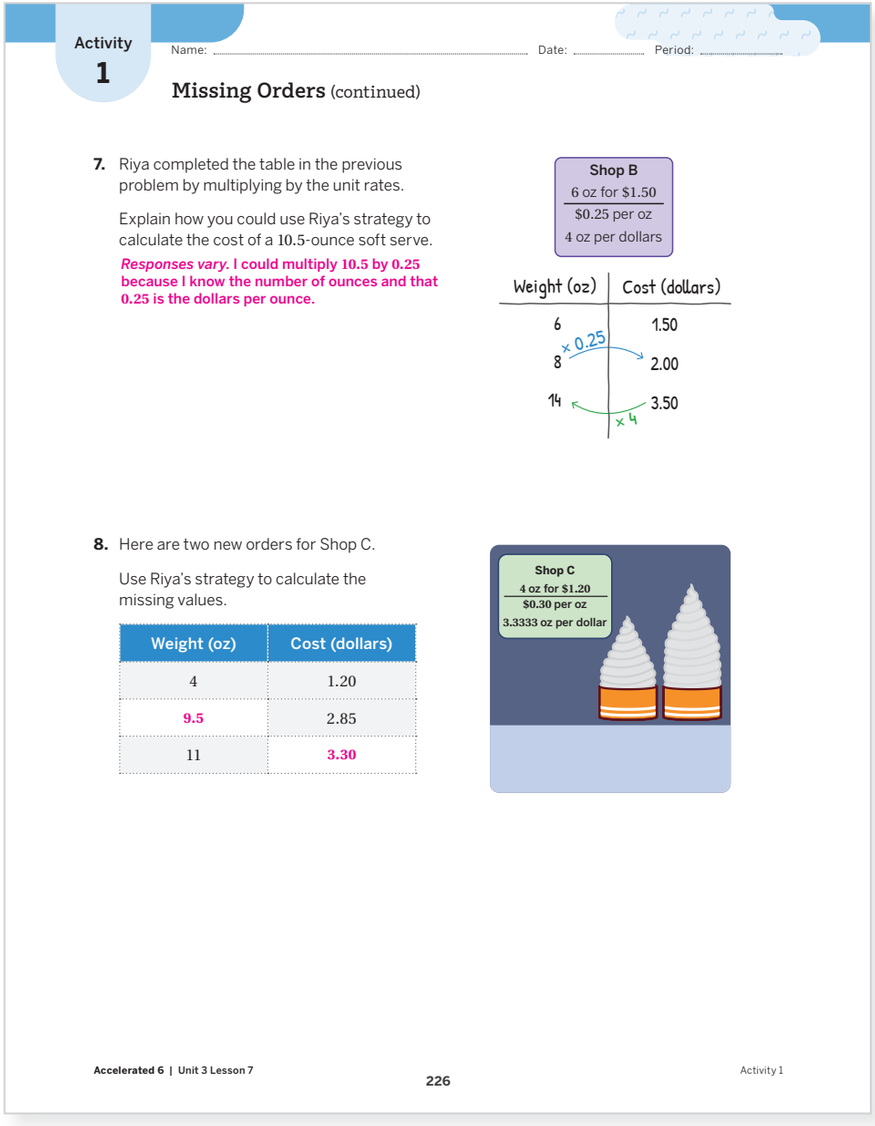
Look and listen for how students decide which unit rate is useful in this situation and expressions that show Riya's strategy (e.g., $2.85 \cdot 3.3333$ and $11 \cdot 0.3$). **(MTR.5.1)**

3 Connect

To surface the Key Takeaway, consider asking:

- "Why do you think Riya multiplied by different numbers for each question?" **(MTR.4.1)**
- "What other strategies could Riya have used to answer these questions?"
- "How is dividing by 4 related to multiplying by 0.25?" **(MTR.5.1)**

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they share during the Connect. Display for students to reference and add to for the rest of the unit.



Activity 1

Name: Date: Period:

Missing Orders (continued)

7. Riya completed the table in the previous problem by multiplying by the unit rates.

Explain how you could use Riya's strategy to calculate the cost of a 10.5-ounce soft serve.

Responses vary. I could multiply 10.5 by 0.25 because I know the number of ounces and that 0.25 is the dollars per ounce.

Shop B
6 oz for $1.50
$0.25 per oz
4 oz per dollars

Weight (oz)	Cost (dollars)
6	1.50
8	2.00
14	3.50

× 0.25, × 4

8. Here are two new orders for Shop C.

Use Riya's strategy to calculate the missing values.

Weight (oz)	Cost (dollars)
4	1.20
9.5	2.85
11	3.30

Shop C
4 oz for $1.20
$0.30 per oz
3.3333 oz per dollar

Accelerated 6 | Unit 3 Lesson 7 226 Activity 1

Key Takeaway: Unit rates can be used to help calculate unknown values. Each situation has two unit rates. To decide which unit rate to use, consider the unit of the unknown value. For example, if you know the ounces and want to know the cost, multiply by the cost per ounce. If you know the cost and want to know the ounces, multiply by the ounces per dollar.

Pairs | 12 min

Activity 2 Challenge Creator

Purpose: Students create their own soft serve challenge to trade with their classmates.

Short on time? Consider inviting students to complete fewer of their classmates' challenges.

1 Launch

Consider sharing that students will create their own soft serve challenge. They will set the cost and weight for a small soft serve, calculate both unit rates, and set the weight of a medium and the cost of a large soft serve helping. Then their classmates' will determine the missing parts. Demonstrate how students can create their soft serve challenge.

Note: Students might unintentionally select values for their medium and large soft serves that are less than their small soft serve values. Encourage students to be creative but intentional about their chosen values.

Distribute the Activity 2 Sheet to students so they can create their soft serve challenge. They will need one or more partners for this activity.

To encourage creativity, invite students to make a challenge they think will be different from ones their classmates create.

2 Monitor

Listen for strategies students use in discussing how to solve the problems, such as deciding which unit rate to use and how to use it. **(MTR.4.1)**

Capture several creative challenges and solutions to share during the Connect.

3 Connect

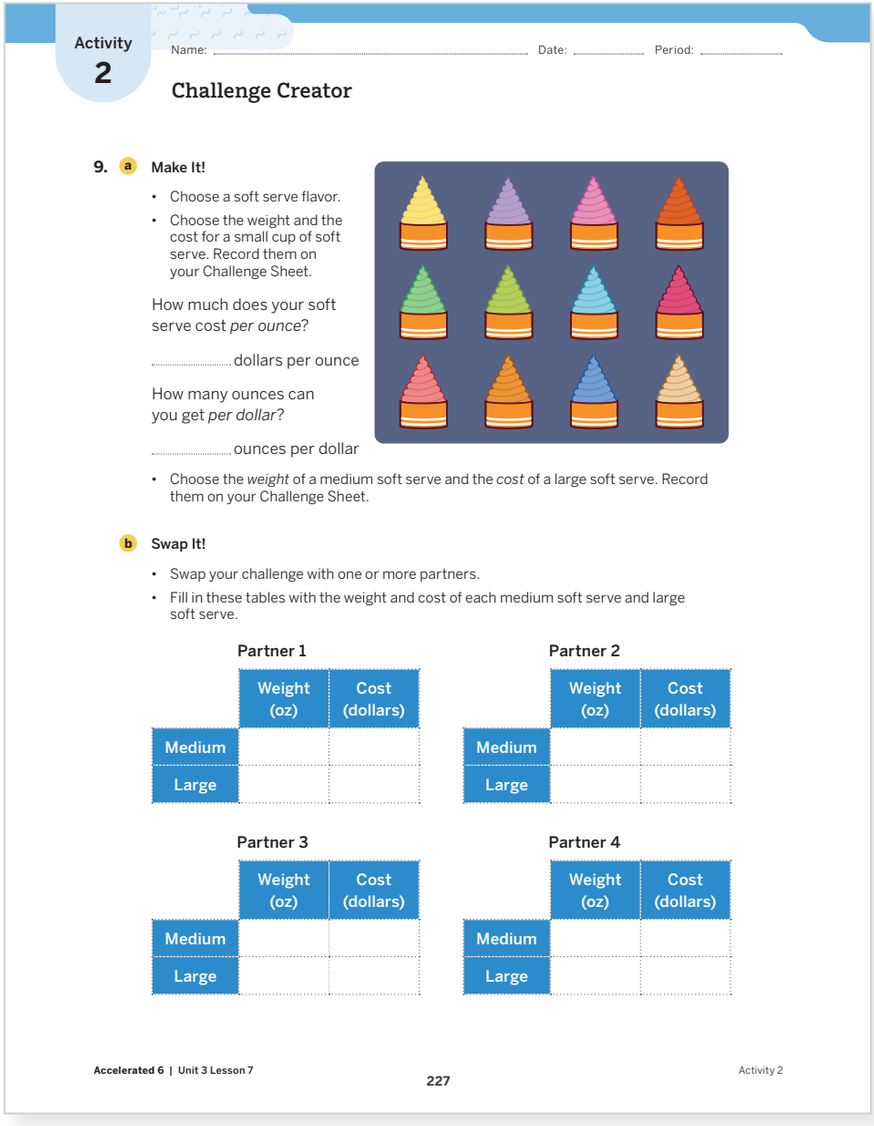
Share the captured soft serve challenges. Invite students to discuss how they decided on their unit rates. **(MTR.4.1)**

Invite students to share a variety of strategies for determining the unknown values.

Consider asking:

- "How did you pick the challenges you wanted to solve?"
- "What made some challenges more complex than others?"
- "Was there a strategy you heard that surprised you?"

Accessibility: Executive Functioning Invite students to work together on a challenge before trying one independently.



Activity 2

Name: Date: Period:

Challenge Creator

9. a **Make It!**

- Choose a soft serve flavor.
- Choose the weight and the cost for a small cup of soft serve. Record them on your Challenge Sheet.

How much does your soft serve cost *per ounce*?

.....dollars per ounce

How many ounces can you get *per dollar*?

.....ounces per dollar

- Choose the *weight* of a medium soft serve and the *cost* of a large soft serve. Record them on your Challenge Sheet.

b **Swap It!**

- Swap your challenge with one or more partners.
- Fill in these tables with the weight and cost of each medium soft serve and large soft serve.

Partner 1

	Weight (oz)	Cost (dollars)
Medium		
Large		

Partner 2

	Weight (oz)	Cost (dollars)
Medium		
Large		

Partner 3

	Weight (oz)	Cost (dollars)
Medium		
Large		

Partner 4

	Weight (oz)	Cost (dollars)
Medium		
Large		

Accelerated 6 | Unit 3 Lesson 7 227 Activity 2

Whole Class | 5 min

Synthesis

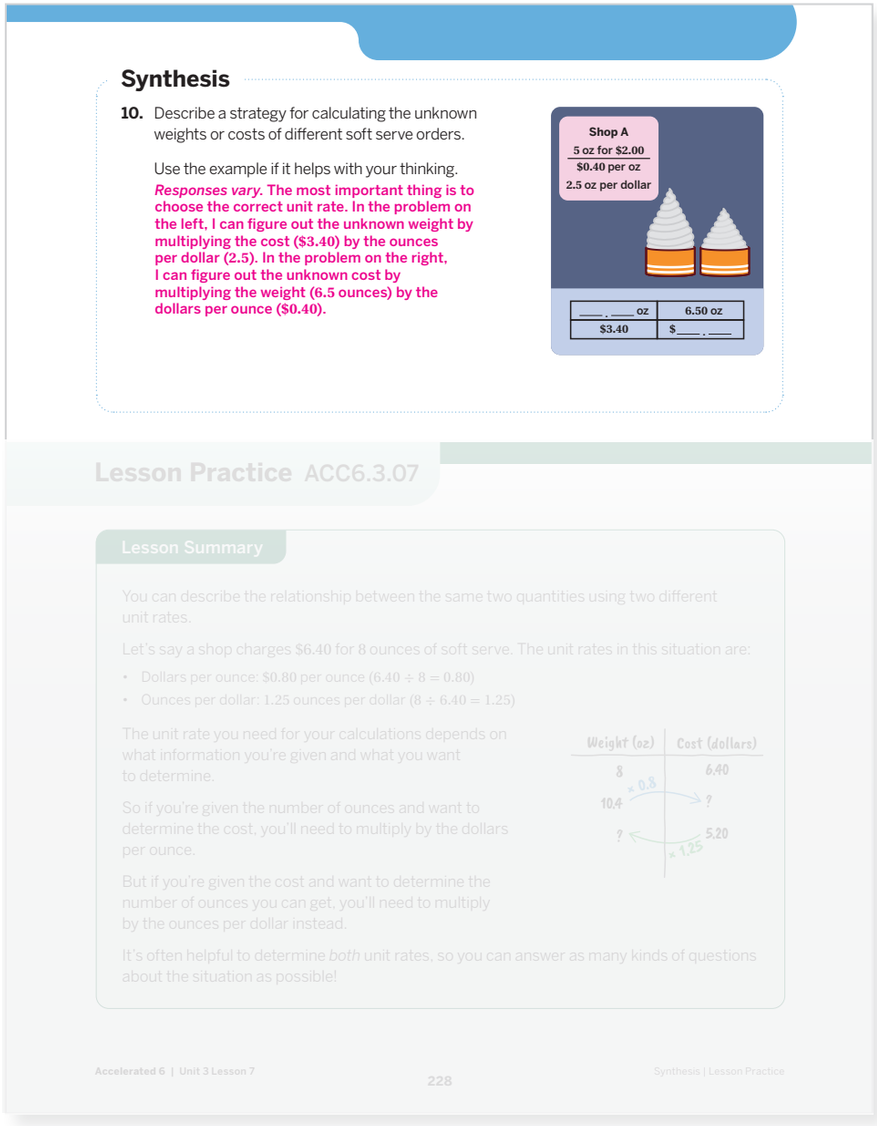
Purpose: Students synthesize their understanding of how to flexibly use unit rates to determine unknown quantities in either column of a ratio table.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Writing the unit rates in a ratio table and any given parts of a ratio in the correct column to help see which unit rate will be helpful to use.
- You can use both multiplication and division, however consider your desired units. You can do 6.5 ounces times $\$0.40$ per ounce or 6.5 ounces divided by 2.5 ounces per dollar to determine the unknown cost of 6.5 ounces.
- If you know the ounces and want to know the cost, multiply by the cost per ounce. If you know the cost and want to know the ounces, multiply by the ounces per dollar.

MLR **MLR2: Collect and Display** Use this routine to revisit students' strategies for using unit rates. Add any new ideas to the display for students to reference for the rest of the unit.



Synthesis

10. Describe a strategy for calculating the unknown weights or costs of different soft serve orders.

Use the example if it helps with your thinking.

Responses vary. The most important thing is to choose the correct unit rate. In the problem on the left, I can figure out the unknown weight by multiplying the cost ($3.40) by the ounces per dollar (2.5). In the problem on the right, I can figure out the unknown cost by multiplying the weight (6.5 ounces) by the dollars per ounce ($0.40).

Lesson Practice ACC6.3.07

Lesson Summary

You can describe the relationship between the same two quantities using two different unit rates.

Let's say a shop charges $\$6.40$ for 8 ounces of soft serve. The unit rates in this situation are:

- Dollars per ounce: $\$0.80$ per ounce $(6.40 \div 8 = 0.80)$
- Ounces per dollar: 1.25 ounces per dollar $(8 \div 6.40 = 1.25)$

The unit rate you need for your calculations depends on what information you're given and what you want to determine.

So if you're given the number of ounces and want to determine the cost, you'll need to multiply by the dollars per ounce.

But if you're given the cost and want to determine the number of ounces you can get, you'll need to multiply by the ounces per dollar instead.

It's often helpful to determine *both* unit rates, so you can answer as many kinds of questions about the situation as possible!

Accelerated 6 | Unit 3 Lesson 7 228 Synthesis | Lesson Practice

Lesson Takeaway: When two quantities have a ratio relationship, two unit rates can be written to help create equivalent ratios. You can use unit rates to compare ratios, such as finding the best deal, or to solve for unknown quantities in a ratio table.

Independent | 5 min

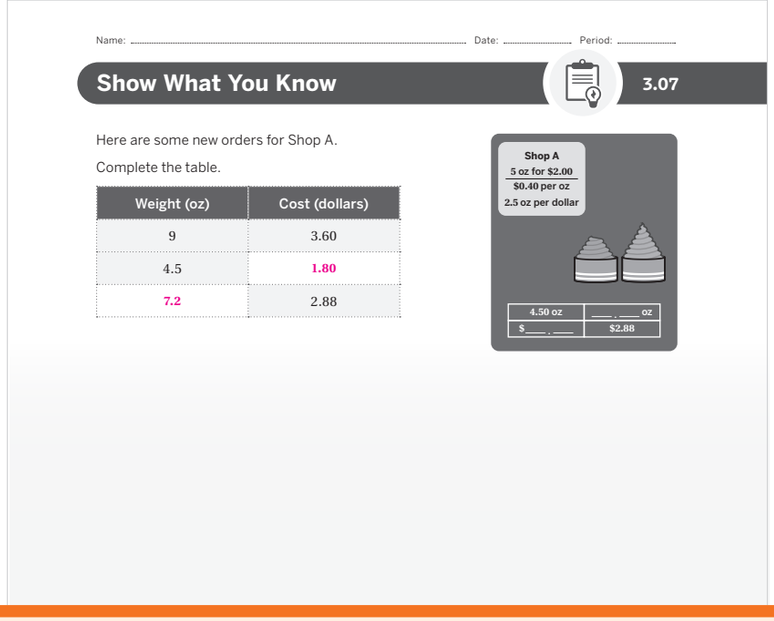
Show What You Know

Purpose: Students demonstrate their understanding of unit rates by determining the unknown values in a ratio table.

Today's Goals

1. **Goal:** Use unit rates to calculate unknown quantities.
2. **Language Goal:** Describe strategies for determining unknown quantities using ratio reasoning. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 3.07

Here are some new orders for Shop A.

Complete the table.

Weight (oz)	Cost (dollars)
9	3.60
4.5	1.80
7.2	2.88

Shop A
5 oz for $2.00
$0.40 per oz
2.5 oz per dollar

4.50 oz	___ . ___ oz
$___ . ___	$2.88

Differentiation Use after Lesson 7

Support

Provide targeted intervention for students by using these resources.

If students need support determining unknown values in a ratio table:

» **Respond to Student Thinking:**

- Select **Practice Problems** and give individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

Reflect on students' progress with equivalent ratios and unit rates in Sub-Units 1–2. In what ways have students' understanding and skills grown? What concepts do students need additional support with? How can you use students' strengths to help everyone feel prepared for their upcoming assessment?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. Describe a strategy for calculating the unknown weights or costs of different soft serve orders.

Use the example if it helps with your thinking.

Responses vary. The most important thing is to choose the correct unit rate. In the problem on the left, I can figure out the unknown weight by multiplying the cost ($3.40) by the ounces per dollar (2.5). In the problem on the right, I can figure out the unknown cost by multiplying the weight (6.5 ounces) by the dollars per ounce ($0.40).

Lesson Practice ACC6.3.07

Lesson Summary

You can describe the relationship between the same two quantities using two different unit rates.

Let's say a shop charges $6.40 for 8 ounces of soft serve. The unit rates in this situation are:

- Dollars per ounce: $0.80 per ounce ($6.40 \div 8 = 0.80$)
- Ounces per dollar: 1.25 ounces per dollar ($8 \div 6.40 = 1.25$)

The unit rate you need for your calculations depends on what information you're given and what you want to determine.

So if you're given the number of ounces and want to determine the cost, you'll need to multiply by the dollars per ounce.

But if you're given the cost and want to determine the number of ounces you can get, you'll need to multiply by the ounces per dollar instead.

It's often helpful to determine *both* unit rates, so you can answer as many kinds of questions about the situation as possible!

Lesson Practice ACC6.3.07

Name: _____ Date: _____ Period: _____

Problems 1–2: A kangaroo hops 2 kilometers in 3 minutes.

1. How long does it take the kangaroo to hop 5 kilometers?
   7.5 minutes

2. How far does the kangaroo hop in 2 minutes?
   About 1.33 kilometers

Problems 3–4: Neel buys 8 dog treats for $4.40.

3. What is the cost per dog treat?
   $0.55

4. Complete the table to show other numbers of dog treats he could buy at this rate.
   Responses shown in table.

Dog Treats	Cost ($)
8	4.40
18	**9.90**
25	**13.75**
11	6.05

5. Haru and Victor are racing on scooters. Haru travels 15 meters in 6 seconds. Victor travels 22 meters in 10 seconds. Who is moving faster?

   (A.) Haru B. Victor C. They are moving at the same speed

   Explain your thinking.

   Explanations vary. **Haru's speed is 2.5 meters per second because $\frac{15}{6} = 2.5$, while Victor's speed is 2.2 meters per second because $\frac{22}{10} = 2.2$.**

6. Sothy plans to walk 10,000 steps. He starts his walk at 8:00 AM. At 8:23 AM, his phone tells him that he has taken 2,000 steps. If he continues at this rate, when will he reach 10,000 steps?
   9:55 AM

Lesson Practice ACC6.3.07

Name: _____ Date: _____ Period: _____

7. A corn vendor at a farmers market is selling a bag of 8 ears of corn for $2.56. Another vendor is selling a bag of 12 ears of corn for $4.32. Which bag is the better deal? Show or explain your thinking.
   The bag of 8 is the better deal. ***Explanations vary.*** **$2.56 \div 8 = 0.32$, so each ear of corn in the bag of 8 costs $0.32. In the bag of 12, each ear of corn costs $0.36 because $4.32 \div 12 = 0.36$.**

FAST Practice

8. Select *all* the statements that represent a unit rate.
   - ☑ A. Cucumbers cost $2.00 per pound.
   - ☐ B. Eric buys 3 pairs of shorts for $75.00.
   - ☐ C. It takes Jose 4 hours to drive 180 miles.
   - ☑ D. A recipe calls for 3 eggs for every cup of flour.
   - ☑ E. A teacher groups her students so there are 5 students per group.

Spiral Review

Problems 9–10: Evaluate each expression.

9. $15 \div \frac{1}{5} = 75$

10. $\frac{1}{4} \div 12 = \frac{1}{48}$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–2, 5–7	2	MA.6.AR.3.5
	3	2	MA.6.AR.3.2
	4	2	MA.6.AR.3.3
FAST Practice	8	2	MA.6.AR.3.2
Spiral Review			
	9–10	1	MA.5.FR.2.4

Assess and Respond

Sub-Unit Quiz 1

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Using ratios and unit rates to make comparisons	Lessons 4, 5	1	MA.6.AR.3.2
2	Converting units of measurement from one unit to another within the same measurement system	Lesson 2	2	MA.6.AR.3.5, MTR.4.1
3a	Determining unit rates	Lesson 5	1	MA.6.AR.3.2
3b	Making and justifying comparisons using ratios and unit rates	Lesson 5	2	MA.6.AR.3.5, MTR.4.1
4a, 4b	Determining unit rates to describe a situation	Lesson 6	1	MA.6.AR.3.2, MA.6.AR.3.3
4c	Using unit rates to solve problems	Lesson 6	2	MA.6.AR.3.5, MTR.6.1
5a	Using unit rates to complete a table of equivalent ratios	Lessons 6, 7	1	MA.6.AR.3.5
5b. 5c	Writing and answering a question about ratios	Lesson 7	3	MA.6.AR.3.5

Assessment Resources

- Student Assessments
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: Date: Period:

Sub-Unit Quiz

Unit 3

1. Three trains leave a station and travel toward their destinations.

- Train A travels 45 meters in 1 second.
- Train B travels 150 meters in 3 seconds.
- Train C travels 64 meters in 2 seconds.

Order the trains by speed.

Train C	Train A	Train B

Slowest Fastest

2. Which object weighs more? Circle one.

Watermelon

264 ounces

Pumpkin

12 pounds

Show or explain your thinking.

Explanations vary. There are 16 ounces in a pound so 264 ounces divided by 16 is equal to 16.5 pounds. Therefore, the watermelon weighs more than the pumpkin.

3. A grocery store charges $6.95 for a large 5-pound bag of grapes.

a. What is the cost per pound of the grapes?
$1.39 per pound

b. The grocery store charges $2.90 for a small 2-pound bag of grapes.

Which size is the better deal? Circle one.

Large 5-pound Small 2-pound

Explain your thinking.

Explanations vary. The large 5-pound costs $1.39 per pound and the small 2-pound costs $1.45 per pound, so the large bag gets more grapes per dollar.

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Name: Date: Period:

Sub-Unit Quiz (continued)

Unit 3

4. A strawberry milk recipe uses 3 teaspoons of strawberry syrup for every 8 ounces of milk.

a. How many teaspoons of strawberry syrup per ounce of milk does this recipe use?
$\frac{3}{8}$ teaspoons (or equivalent)

b. How many ounces of milk are needed per teaspoon of strawberry syrup?
$\frac{8}{3}$ ounces (or equivalent)

c. There are 18 ounces of milk left in a container. How many teaspoons of strawberry syrup would you need if you used all the milk? Show or explain your thinking.
6.75 teaspoons. *Explanations vary.* The recipe uses $\frac{3}{8}$ teaspoons per ounce of milk, so you need $\frac{3}{8} \cdot 18 = \frac{54}{8}$ or 6.75 teaspoons.

5. Duri bought 4 gallons of gas for $10.

a. Complete the table for buying gas at this rate.

Gas (gallons)	Price (dollars)
4	10
5	12.50
15	37.50

b. Write a question you could answer using this table that would give you new information about this situation.
Responses vary.
- How much does 1 gallon of gas cost?
- How many gallons of gas can you buy with $20?

c. Answer the question you wrote.
Responses vary.

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D Differentiation (Sub-Unit Quiz 1)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	
Sub-Unit 1: Use ratio reasoning to convert between units of measurement. **(Lessons 1–2)**	2	**Support**	• **Mini-Lesson:** *Converting Measurements* • **Teacher Move:** Consider revisiting Lesson 2 (*Counting Classrooms*)
		Strengthen	• **Repeated Challenges:** Lesson 2 (*Counting Classrooms*)
Sub-Unit 2: • Recognize and calculate two unit rates for the same ratio relationship. • Use unit rates to solve problems involving tables of equivalent ratios. **(Lessons 3-7)**	1, 3, 4	**Support** **Strengthen**	• **Mini-Lesson:** *Calculating Unit Rates* • **Teacher Move:** Consider revisiting: • Lesson 3 (*World Records*) • Lesson 4 (*Model Trains*) • Lesson 5 (*Soft Serve*)
		Stretch	• **You're invited to explore more:** Lesson 4 (*Model Trains*)
	5	**Support**	• **Teacher Move:** Consider revisiting Lesson 7 (*More Soft Serve*)
		Strengthen	• **Challenge Creator:** Lesson 7 (*More Soft Serve*)
		Stretch	• **You're invited to explore more:** Lesson 6 (*Welcome to the Robot Factory*)

Sub-Unit 3

Percentages

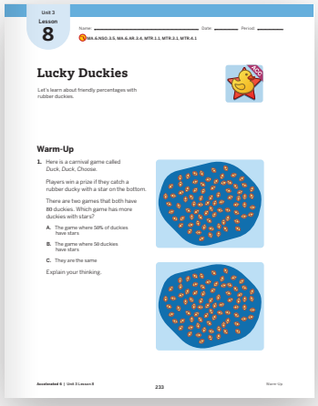
Sub-Unit 3 Goals

- **Goal:** Use ratio reasoning to determine unknown parts, wholes, and percentages.
- **Language Goal:** Describe connections between percentages, ratios, and rates.

In this sub-unit, students are introduced to the concept of **percent**. Students build on their knowledge of equivalent ratios and multiple representations of ratio reasoning to solve percentage problems where there are unknown parts, percentages, and wholes. Finally, students apply what they have learned about **rates** and percentages to analyze characteristics of Florida county populations.

Math That Matters Most

Concept or Skill	For example . . .
Solve problems using percentages.	Callen bought new sneakers for $60. Miko bought sneakers that cost 80% of that price. How much did Miko pay for his sneakers? **$48**
Calculate a percentage.	Daryl rode 15 kilometers of his 12-kilometer goal. What percentage of his goal did he ride? **125%**


Unit 3
Lesson 8

Lucky Duckies

Let's learn about friendly percentages with rubber duckies.

Warm-Up

1. Here is a carnival game called Duck, Duck, Choose.

Players win a prize if they catch a rubber ducky with a star on the bottom.

There are two games that both have 80 duckies. Which game has more duckies with stars?

A. The game where 58% of duckies have stars

B. The game where 58 duckies have stars

C. They are the same

Explain your thinking.

233

Lucky Duckies

Benchmark Percentages

Let's learn about friendly percentages with rubber duckies.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate A% of B where A is a benchmark *percentage* (e.g., 10%, 25%, 50%, or 75%).
2. **Language Goal:** Explain that the word *percent* and the symbol % mean "for every 100." **(Writing, Speaking, and Listening)**

Students are introduced to the concept of **percent**, meaning for every 100, and the percent symbol %. They build on personal experiences to reason about and develop strategies for determining these benchmark percentages: 10%, 25%, 50%, and 75%. This lesson also introduces tape diagrams as a model for representing percentages in the context of a ducky carnival game.

Coherence

Prior Learning

In Lesson 7, students practiced using unit rates to make comparisons and calculated unknown values. They completed a quiz to assess their understanding of using unit rates to generate multiple equivalent ratios.

Future Learning

In Lesson 9, students will make connections between percentages and ratios using tape diagrams and double number line diagrams to solve problems involving friendly percentages (multiples of benchmark percentages).

Connections

- Students are introduced to the concept of percents using a carnival game context. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

MA.6.AR.3.4
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.3.1, MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.2	MA.7.NSO.1.2
MA.5.FR.1.1	MA.7.AR.3.1
MA.5.AR.1.3	MA.7.AR.3.2

Vocabulary

New Vocabulary

percent (percentage)

Lesson at a Glance

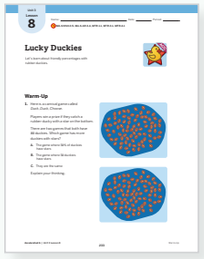
~ 45 min

MA.6.NSO.3.5, MA.6.AR.3.4

Warm-Up

Pairs | 5 min

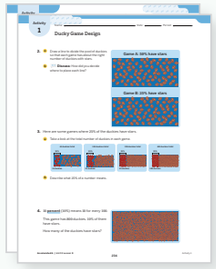
Students are introduced to the context of a ducky carnival game to surface what students already know about the concept of 50%.



Activity 1

Pairs | 15 min

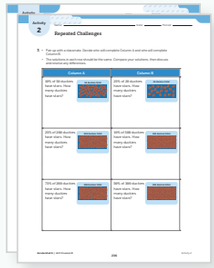
Students reason about the relationship between the **percentage** of winners, the number of winners, and the total number of duckies. MLR2: Collect and Display



Activity 2

Pairs | 15 min

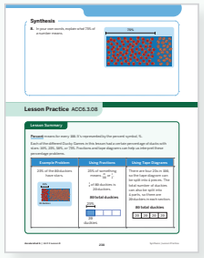
Students practice solving problems involving calculating the number of winners given a benchmark percentage and a total number of duckies.



Synthesis

Whole Class | 5 min

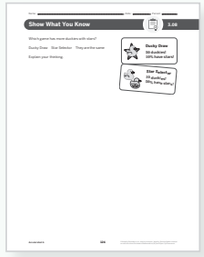
Students synthesize their understanding that percent means "for every 100" and of how to calculate benchmark percentages using fractions and tape diagrams. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating and comparing the value of two percentages.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students are introduced to the context of a ducky carnival game to surface what students already know about the concept of 50%.

1 Launch

To surface connections, consider asking, "What experiences have you had with similar games, carnivals, or school fairs?"

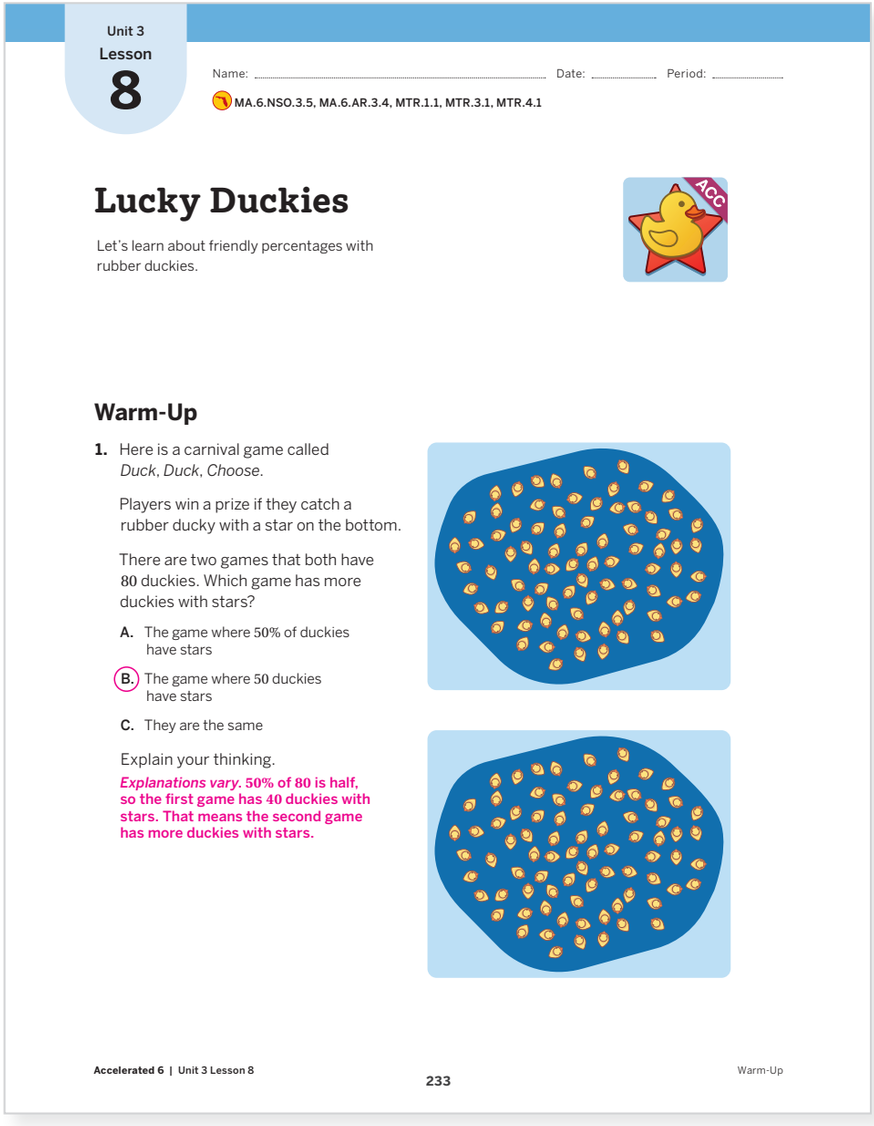
D **Differentiation: (Stretch)** Invite students to describe a way to change the ducky game so that each multiple choice option would be the correct answer.

2 Connect

Display the distribution of responses, calling attention to any conflict or consensus.

Consider asking:

- "How is 50 different from 50%?"
- "What does 50% mean?"
- "Would your answer change if there were 100 duckies? 150 duckies?"



Unit 3
Lesson
8

Name: Date: Period:

MA.6.NSO.3.5, MA.6.AR.3.4, MTR.1.1, MTR.3.1, MTR.4.1

Lucky Duckies

Let's learn about friendly percentages with rubber duckies.

ACC

Warm-Up

1. Here is a carnival game called *Duck*, *Duck*, *Choose*.

   Players win a prize if they catch a rubber ducky with a star on the bottom.

   There are two games that both have 80 duckies. Which game has more duckies with stars?

   A. The game where 50% of duckies have stars

   B. The game where 50 duckies have stars

   C. They are the same

   Explain your thinking.

   Explanations vary. 50% of 80 is half, so the first game has 40 duckies with stars. That means the second game has more duckies with stars.

Accelerated 6 | Unit 3 Lesson 8 233 Warm-Up

Pairs | 15 min

Activity 1 Ducky Game Design

Purpose: Students reason about the relationship between the **percentage** of winners, the number of winners, and the total number of duckies.

Short on time? Consider not pausing in Problem 3 and instead having the discussion during the Connect.

1 Launch

Consider sharing with students that they will be analyzing several different ducky games.

Demonstrate how students can use a vertical line to divide each pool of duckies.

2 Monitor

Listen for students who connect percentages and fractions (e.g., 25% as $\frac{1}{4}$ or 25% as $\frac{1}{2}$ of 50%). Invite these students to share their thinking during the discussion about Problem 3.

Encourage students to change the total number of duckies and to share anything they notice and wonder with a partner. **(MTR.1.1)**

Capture several student responses.

Pause briefly to share captured responses.

Consider asking:

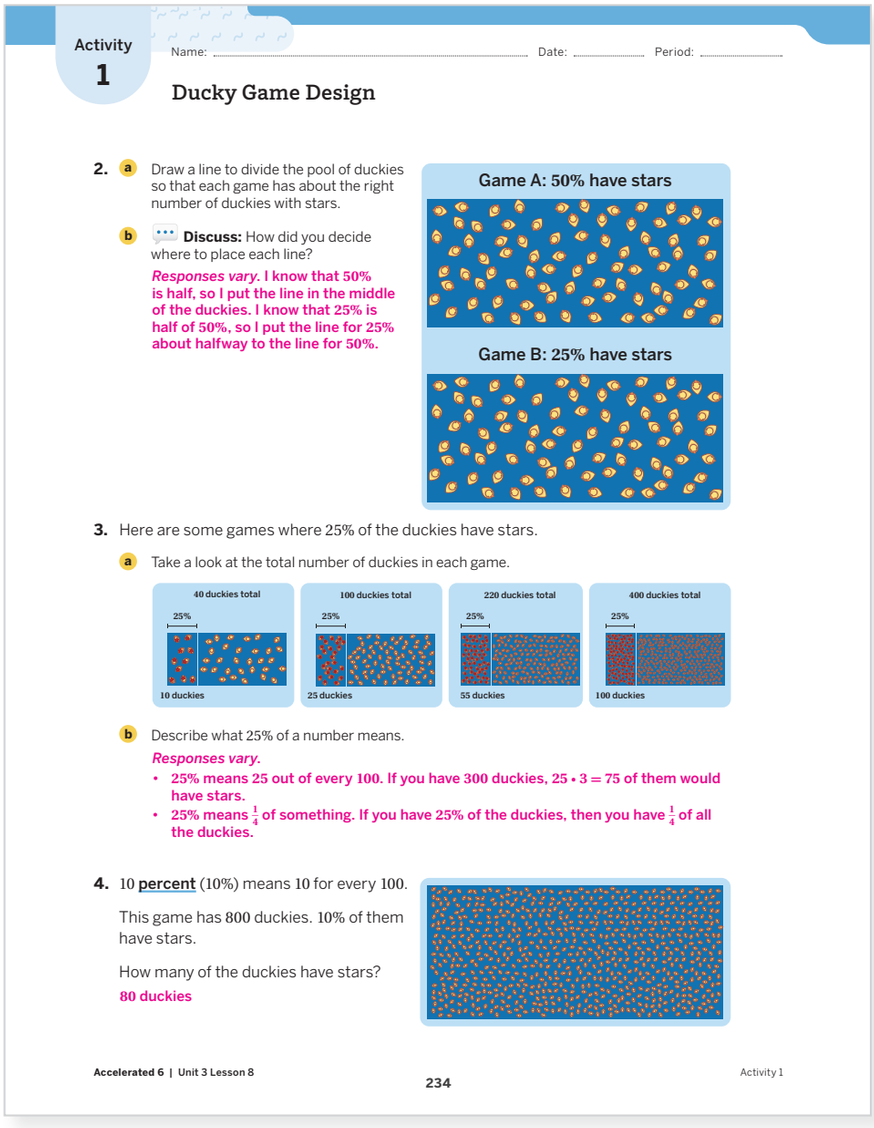
- "Why do you think there are 25 duckies with stars when there are 100 duckies total?"
- "What changes when you change the number of total duckies? What stays the same?"
- "Why do you think 25% takes up $\frac{1}{4}$ of the pool?"

Encourage students to use the feedback from their partner to help them revise their thinking.

MLR **MLR2: Collect and Display** Use this routine to create a class definition of **percent (percentage)** using students' language. Display any new language, examples, or diagrams for students to reference later.

ELL **English Language Learners** Invite students to share what a new term reminds them of (e.g., "When I hear *percent*, I think . . ."). This may help surface multiple meanings and encourage students to connect to their prior knowledge, including connections in their primary language. (e.g., In Spanish, *percent* translated means "por ciento," which means "for every hundred.") **(Reading and Listening)**

Activity 1 continued >



Activity 1

Name: Date: Period:

Ducky Game Design

2. a. Draw a line to divide the pool of duckies so that each game has about the right number of duckies with stars.

b. **Discuss:** How did you decide where to place each line?

Responses vary. I know that 50% is half, so I put the line in the middle of the duckies. I know that 25% is half of 50%, so I put the line for 25% about halfway to the line for 50%.

Game A: 50% have stars

Game B: 25% have stars

3. Here are some games where 25% of the duckies have stars.

a. Take a look at the total number of duckies in each game.

40 duckies total, 25%, 10 duckies

100 duckies total, 25%, 25 duckies

220 duckies total, 25%, 55 duckies

400 duckies total, 25%, 100 duckies

b. Describe what 25% of a number means.

Responses vary.

- 25% means 25 out of every 100. If you have 300 duckies, 25 • 3 = 75 of them would have stars.
- 25% means $\frac{1}{4}$ of something. If you have 25% of the duckies, then you have $\frac{1}{4}$ of all the duckies.

4. 10 **percent** (10%) means 10 for every 100.

This game has 800 duckies. 10% of them have stars.

How many of the duckies have stars?

80 duckies

Accelerated 6 | Unit 3 Lesson 8 234 Activity 1

Pairs | 15 min

Activity 1 Ducky Game Design (continued)

Purpose: Students reason about the relationship between the **percentage** of winners, the number of winners, and the total number of duckies.

Short on time? Consider not pausing in Problem 3 and instead having the discussion during the Connect.

2 Monitor

Encourage students to read others' responses and decide if others' descriptions were similar to or different from their own.

Select and sequence a variety of student explanations.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Where is the 800 represented in the diagram? The 10%? What does 80 mean in this situation?"
Write that Santiago divided by 10 because he was looking for 10%	**Support** Consider asking, "Would your explanation work for 25% as well?"
Reference: • 10 for every 100. • $\frac{10}{100}$ of 800. • $\frac{1}{10}$ of 800. • $\frac{800}{10}$.	**Strengthen** Invite students to share their thinking during the Connect. **Stretch** Invite students to share their strategy with a partner.

To support students getting started, invite them to look at one of the tape diagrams. Consider asking, "What percentage of the diagram is shaded green?"

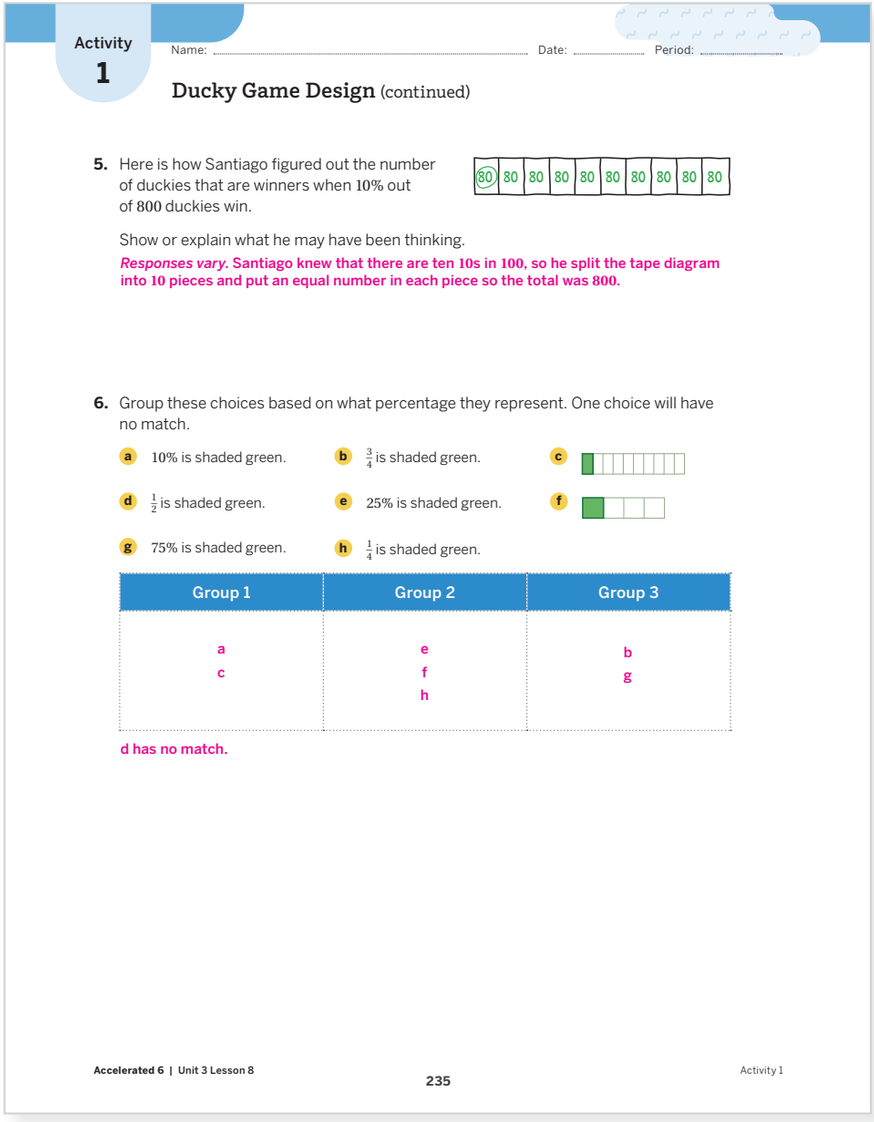
D Differentiation: (Support) Look for students who have not matched the fractions or have them matched inaccurately and consider asking, "How could this fraction be written with a denominator of 100?"

Invite students to compare their sort with a partner, justify their placement, and make revisions based on their conversation. **(MTR.4.1)**

3 Connect

Share captured responses and invite these students to share their thinking.

To surface the Key Takeaway, consider asking:
- "If 50% of the duckies had stars, how many duckies would have stars? What fraction would that be?"
- "What if 25% of the duckies had stars? 75%? How can a tape diagram represent this situation?" You can split the tape diagram into 4 pieces. Each piece would have 200 duckies. 25% would be 200 duckies, and 75% would be 600 duckies.



Activity 1

Name: Date: Period:

Ducky Game Design (continued)

5. Here is how Santiago figured out the number of duckies that are winners when 10% out of 800 duckies win.

Show or explain what he may have been thinking.

Responses vary. Santiago knew that there are ten 10s in 100, so he split the tape diagram into 10 pieces and put an equal number in each piece so the total was 800.

6. Group these choices based on what percentage they represent. One choice will have no match.

a. 10% is shaded green.
b. $\frac{3}{4}$ is shaded green.
c.
d. $\frac{1}{2}$ is shaded green.
e. 25% is shaded green.
f.
g. 75% is shaded green.
h. $\frac{1}{4}$ is shaded green.

Group 1	Group 2	Group 3
a c	e f h	b g

d has no match.

Accelerated 6 | Unit 3 Lesson 8 235 Activity 1

Key Takeaway: Fractions and tape diagrams can be used to determine friendly **percentages**. For example, 10% means 10 for every 100 and can be represented with a tape diagram divided into 10 pieces.

Pairs | 15 min

Activity 2 Repeated Challenges

Purpose: Students practice solving problems involving calculating the number of winners given a benchmark percentage and a total number of duckies.

Short on time? Consider having students complete only four problems.

1 Launch

Invite students to set a goal for how many challenges they want to solve. Share that it's more important to make sense of the challenges than it is to work quickly.

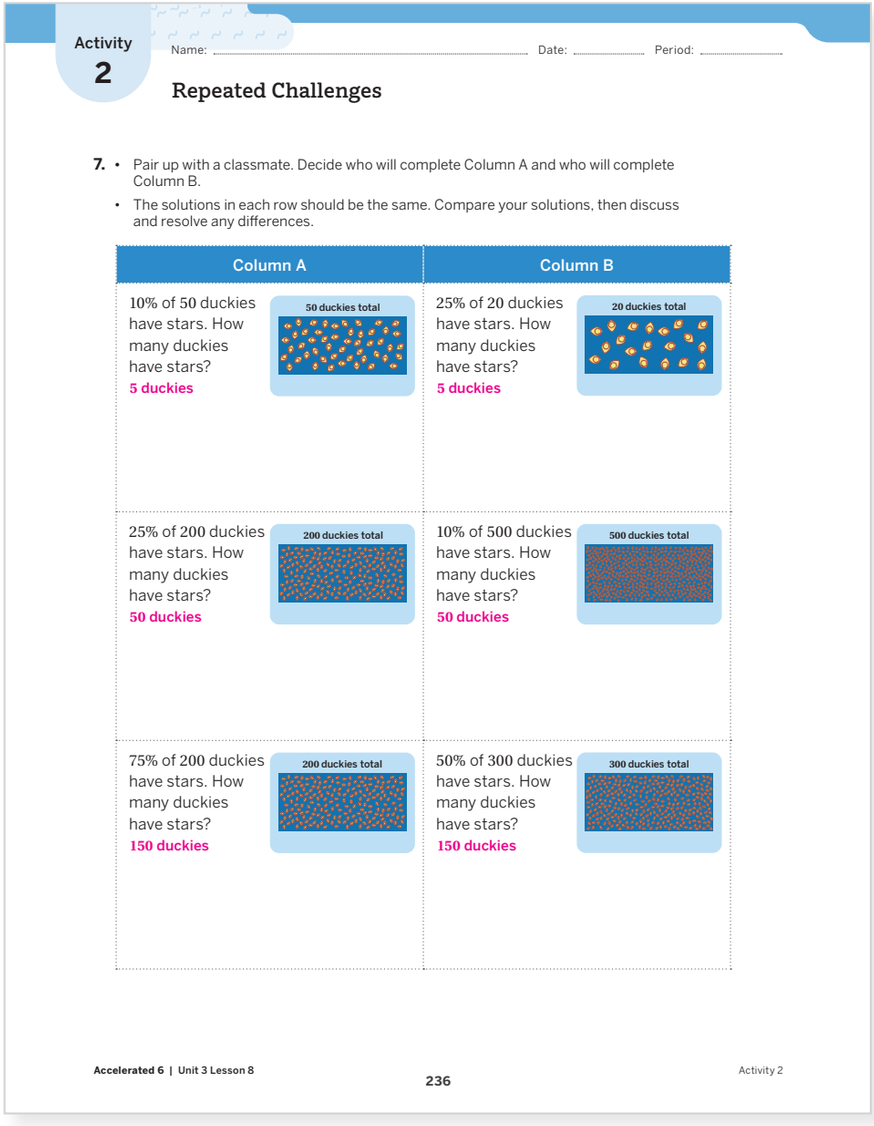
Encourage students to use fractions and tape diagrams to help their thinking.

A **Accessibility: Memory and Attention** Invite students to use their Student Edition, additional paper, or a calculator to support students with performing calculations.

2 Monitor

Look and listen for strategies students use in discussing how to solve the problems, such as using fractions and tape diagrams.

Activity 2 continued >



Activity 2

Name: Date: Period:

Repeated Challenges

7.
- Pair up with a classmate. Decide who will complete Column A and who will complete Column B.
- The solutions in each row should be the same. Compare your solutions, then discuss and resolve any differences.

Column A	Column B
10% of 50 duckies have stars. How many duckies have stars? **5 duckies**	25% of 20 duckies have stars. How many duckies have stars? **5 duckies**
25% of 200 duckies have stars. How many duckies have stars? **50 duckies**	10% of 500 duckies have stars. How many duckies have stars? **50 duckies**
75% of 200 duckies have stars. How many duckies have stars? **150 duckies**	50% of 300 duckies have stars. How many duckies have stars? **150 duckies**

Accelerated 6 | Unit 3 Lesson 8 236 Activity 2

Pairs | 15 min

Activity 2 Repeated Challenges (continued)

Purpose: Students practice solving problems involving calculating the number of winners given a benchmark percentage and a total number of duckies.

Short on time? Consider having students complete only four problems.

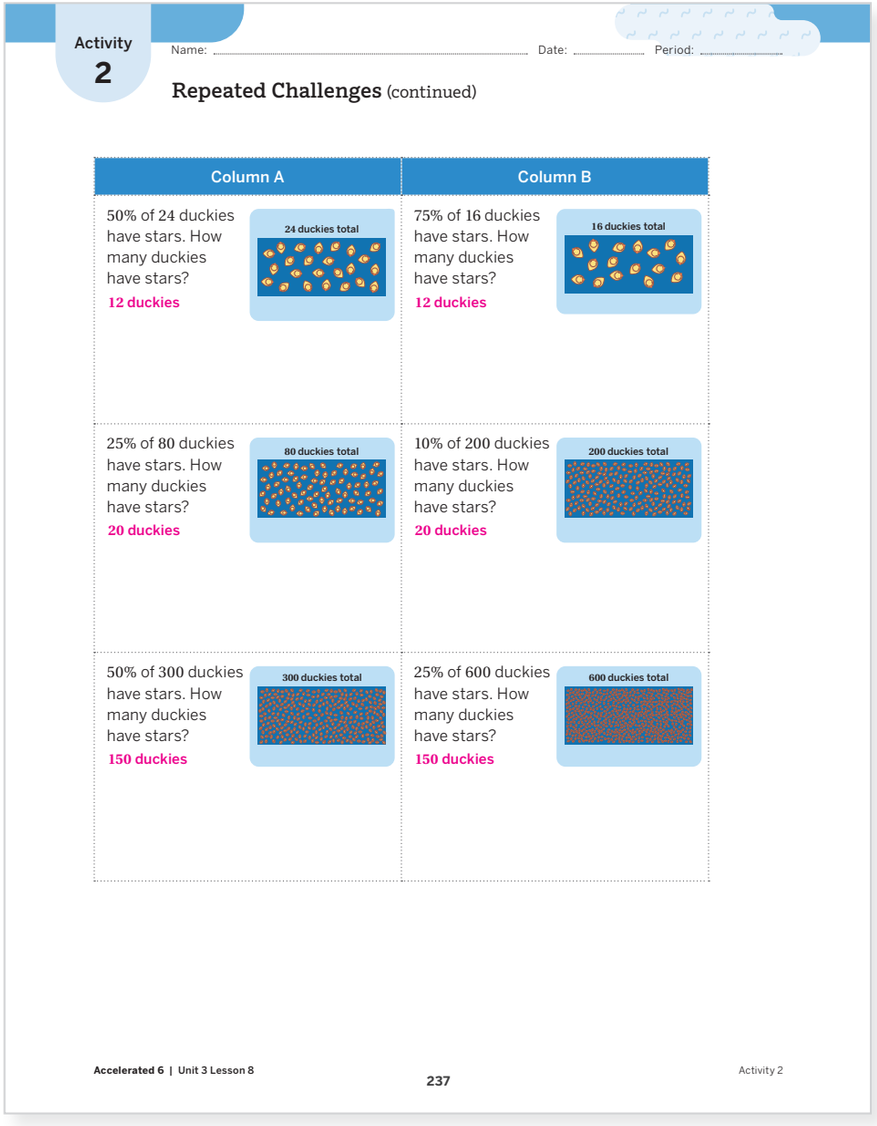
2 Monitor

Encourage students to reflect on their choices before trying a new strategy if you notice them guessing and checking.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.

Consider asking, "Can you describe another way to figure out 50% or 75% if you already know 25%?" **(MTR.3.1)**



Activity 2

Name: Date: Period:

Repeated Challenges (continued)

Column A	Column B
50% of 24 duckies have stars. How many duckies have stars? **12 duckies**	75% of 16 duckies have stars. How many duckies have stars? **12 duckies**
25% of 80 duckies have stars. How many duckies have stars? **20 duckies**	10% of 200 duckies have stars. How many duckies have stars? **20 duckies**
50% of 300 duckies have stars. How many duckies have stars? **150 duckies**	25% of 600 duckies have stars. How many duckies have stars? **150 duckies**

Accelerated 6 | Unit 3 Lesson 8 237 Activity 2

Whole Class | 5 min

Synthesis

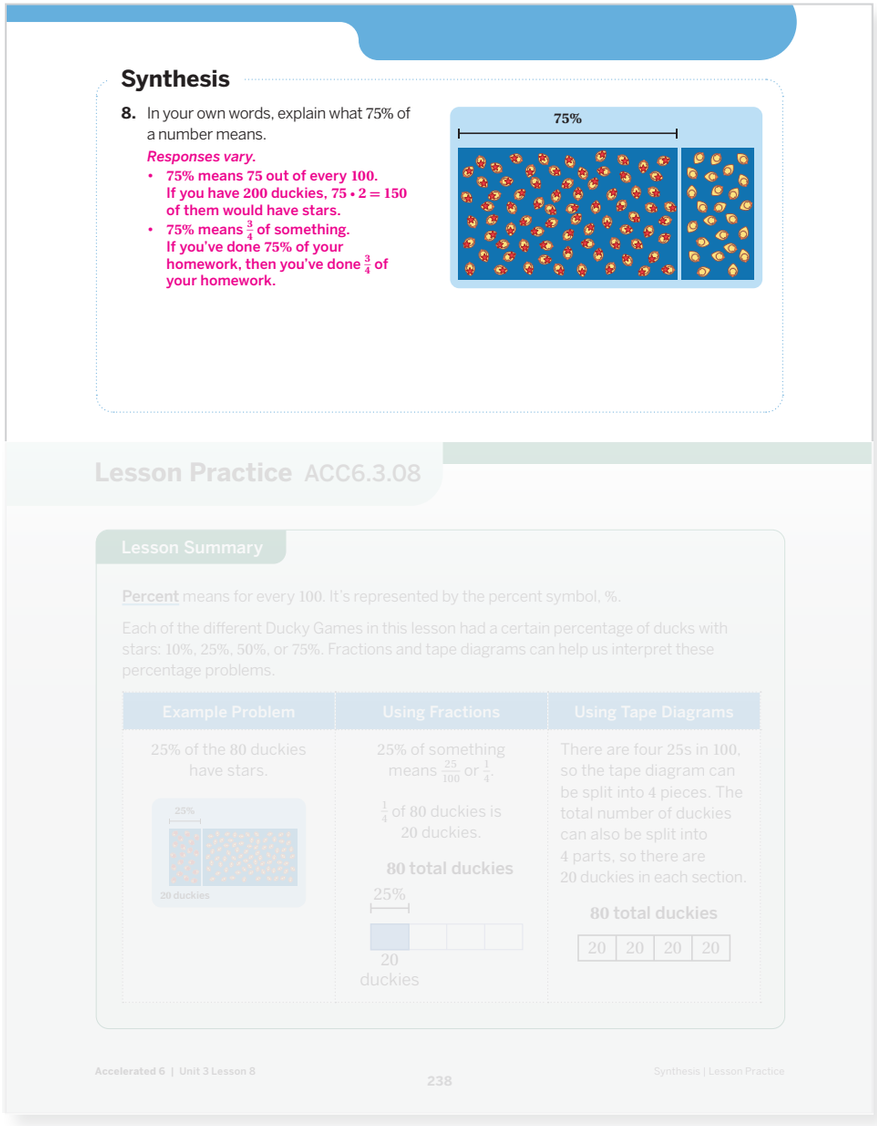
Purpose: Students synthesize their understanding that percent means "for every 100" and of how to calculate benchmark percentages using fractions and tape diagrams.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- 75% means 75 for every 100.
- You can use a tape diagram to represent the total amount. Then break down the total into fourths or quarters, and take the sum of three fourths.
- A percent is always connected to a total.
- A percent can be written as a fraction, which can help you visualize what fraction of the total you want to determine.

MLR **MLR2: Collect and Display** Use this routine to revisit students' ideas about percent. Add any new ideas to the display for students to reference for the rest of the unit.



Synthesis

8. In your own words, explain what 75% of a number means.

Responses vary.

- 75% means 75 out of every 100. If you have 200 duckies, $75 \cdot 2 = 150$ of them would have stars.
- 75% means $\frac{3}{4}$ of something. If you've done 75% of your homework, then you've done $\frac{3}{4}$ of your homework.

Lesson Practice ACC6.3.08

Lesson Summary

Percent means for every 100. It's represented by the percent symbol, %.

Each of the different Ducky Games in this lesson had a certain percentage of ducks with stars: 10%, 25%, 50%, or 75%. Fractions and tape diagrams can help us interpret these percentage problems.

Example Problem	Using Fractions	Using Tape Diagrams
25% of the 80 duckies have stars.	25% of something means $\frac{25}{100}$ or $\frac{1}{4}$. $\frac{1}{4}$ of 80 duckies is 20 duckies. 80 total duckies; 25%; 20 duckies	There are four 25s in 100, so the tape diagram can be split into 4 pieces. The total number of duckies can also be split into 4 parts, so there are 20 duckies in each section. 80 total duckies: 20 | 20 | 20 | 20

Accelerated 6 | Unit 3 Lesson 8 238 Synthesis | Lesson Practice

Lesson Takeaway: **Percent** means "for every 100" and is represented by the % symbol. Fractions and tape diagrams can be helpful when calculating friendly percentages.

Independent | 5 min

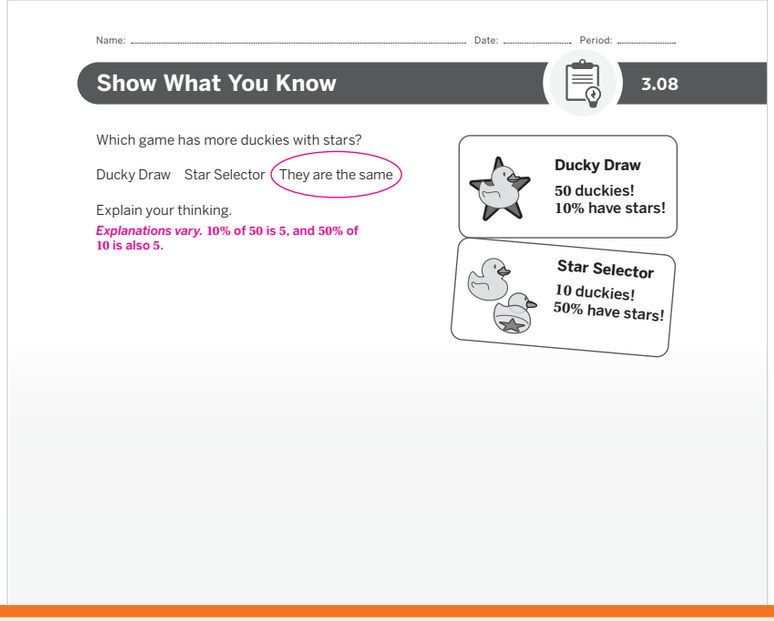
Show What You Know

Purpose: Students demonstrate their understanding by calculating and comparing the value of two percentages.

Today's Goals

1. **Goal:** Calculate A% of B where A is a benchmark *percentage* (e.g., 10%, 25%, 50%, or 75%).
2. **Language Goal:** Explain that the word *percent* and the symbol % mean "for every 100." **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 3.08

Which game has more duckies with stars?

Ducky Draw Star Selector They are the same

Explain your thinking.

Explanations vary. 10% of 50 is 5, and 50% of 10 is also 5.

Ducky Draw
50 duckies!
10% have stars!

Star Selector
10 duckies!
50% have stars!

D Differentiation Use after Lesson 8

Support

Provide targeted intervention for students by using these resources.

If students need support calculating A% of B where A is a benchmark percentage:

» **Respond to Student Thinking:**

- Revisiting **Activity 1** with students before providing individualized feedback on the relevant **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.

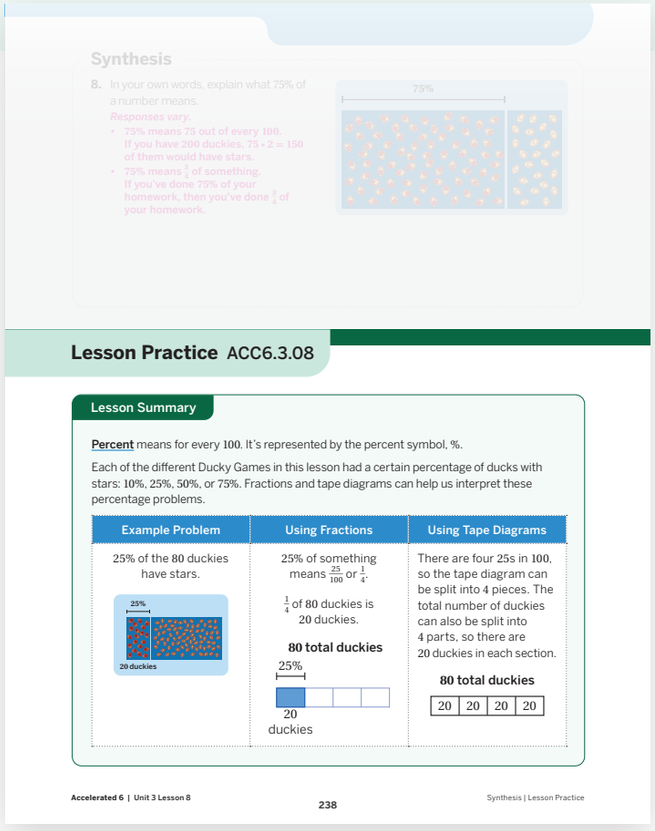
Professional Learning

Take a moment to reflect on this lesson. In this lesson, students developed early ideas about **percentages**. How will their understanding of this concept build over the next several lessons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

8. In your own words, explain what 75% of a number means.

Responses vary.

- 75% means 75 out of every 100. If you have 200 duckies, 75 • 2 = 150 of them would have stars.
- 75% means $\frac{3}{4}$ of something. If you've done 75% of your homework, then you've done $\frac{3}{4}$ of your homework.

75%

Lesson Practice ACC6.3.08

Lesson Summary

Percent means for every 100. It's represented by the percent symbol, %.

Each of the different Ducky Games in this lesson had a certain percentage of ducks with stars: 10%, 25%, 50%, or 75%. Fractions and tape diagrams can help us interpret these percentage problems.

Example Problem	Using Fractions	Using Tape Diagrams
25% of the 80 duckies have stars.	25% of something means $\frac{25}{100}$ or $\frac{1}{4}$. $\frac{1}{4}$ of 80 duckies is 20 duckies. **80 total duckies** 25% 20 duckies	There are four 25s in 100, so the tape diagram can be split into 4 pieces. The total number of duckies can also be split into 4 parts, so there are 20 duckies in each section. **80 total duckies** 20 | 20 | 20 | 20

Lesson Practice ACC6.3.08

Name: Date: Period:

1. Here are 24 stars. Circle 25% of these stars.

Responses vary. 6 stars should be circled.

2. Evan made 40 muffins. 50% of the muffins are chocolate. How many muffins are chocolate?

20 muffins

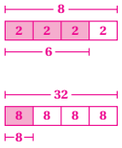
3. Which greater? Show or explain your thinking.

A. 75% of 8

B. 25% of 32

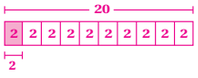
C. They are the same.

Explanations vary. Sample response shown.

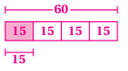


Problems 4–5: Complete each statement. Make a tape diagram if it helps with your thinking.

4. 10% of 20 is 2



5. 25% of 60 is 15



6. Explain how you could mentally calculate 10% of any number.

Responses vary. Divide the number by 10, or multiply the number by $\frac{1}{10}$.

Lesson Practice ACC6.3.08

Name: Date: Period:

FAST Practice

7. Which group shows 75% of the lightning bolts shaded?

A.

B.

C.

D.

Spiral Review

8. Abdel paid $13 for 3 books. Jayden bought 12 books priced at the same rate. How much did Jayden pay for the 12 books? Explain your thinking.

$52. *Explanations vary.* Jayden paid $52 for the 12 books because he bought 4 times as many books as Abdel did at the same rate. 13 • 4 = 52

Money Paid (dollars)	Number of Books
13	3
52	12

Problems 9–11: Determine whether each product will be *less than*, *greater than*, or *equal to* 40.

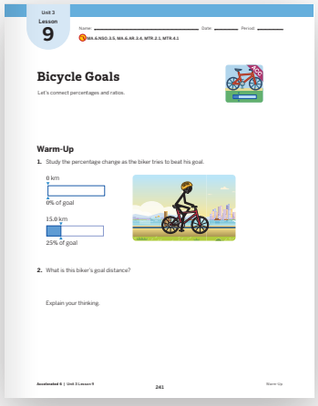
9. $\left(\frac{6}{4}\right) \cdot 40$ Greater than

10. $\left(\frac{8}{8}\right) \cdot 40$ Equal to

11. $\left(\frac{1}{2}\right) \cdot 40$ Less than

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–2, 4–5	1	MA.6.AR.3.4
	3	2	MA.6.AR.3.4
	6	2	MA.6.NSO.3.5
FAST Practice	7	1	MA.6.AR.3.4
Spiral Review			
	8	2	MA.6.AR.3.5
	9–11	1	MA.5.FR.2.3


Unit 3
Lesson
9

Bicycle Goals

Let's connect percentages and ratios.

Warm-Up

1. Study the percentage change as the biker tries to beat his goal.

0 km
0% of goal
15.0 km
25% of goal

2. What is this biker's goal distance?

Explain your thinking.

241

Bicycle Goals

Friendly Percentages

Let's connect percentages and ratios.

Learning Outcomes

Today's Goals

1. **Goal:** Use a double number line diagram, tape diagram, or table to determine unknown parts or wholes, given friendly percentages.
2. **Language Goal:** Describe the connections between percentages and ratios. **(Writing, Speaking, and Listening)**

Students make connections between tape diagrams and double number line diagrams that represent percentages, and then use these tools to solve problems involving friendly percentages (i.e., multiples of benchmark percentages). This is the first lesson in which students consider percentages greater than 100% and will subdivide the double number line diagrams on their own.

Coherence

Prior Learning

In Lesson 8, students were introduced to percent and the percent symbol % as they calculated benchmark percentages. In Unit 2, students used double number line diagrams to solve problems with ratios.

Future Learning

In Lesson 10, students will solve percentage problems in which the part, the percentage, or the whole is unknown by using multiple representations, such as tape diagrams and double number line diagrams.

Connections

- Students make connections between ratios and percents while describing travel by bicycle. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

MA.6.AR.3.4
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.4.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.1.2
MA.5.NSO.2.2	MA.7.AR.3.1

Lesson at a Glance

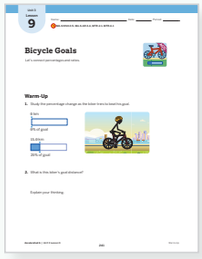
~ 45 min

MA.6.NSO.3.5, MA.6.AR.3.4

Warm-Up

Pairs | 5 min

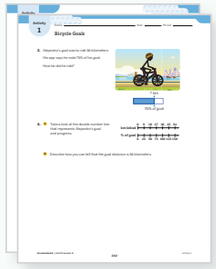
Students use a tape diagram to determine a biker's goal distance starting from a given benchmark percentage of his goal.



Activity 1

Pairs | 20 min

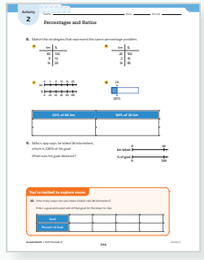
Students use double number line diagrams, tables, and other strategies to solve problems involving friendly percentages and unknown parts and wholes. **Routines:** Notice and Wonder, MLR7: Compare and Connect (MTR.2.1)



Activity 2

Pairs Sharing a Device | 10 min

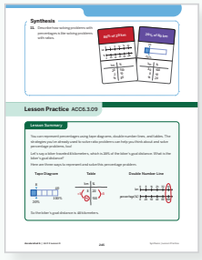
Students apply the strategies for determining an unknown whole or part to more percentage problems.



Synthesis

Whole Class | 5 min

Students synthesize their understanding that percentage problems are similar to ratio problems and can be solved using tables, double number lines, and tape diagrams. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the value of the part given the whole and the percentage.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use a tape diagram to determine a biker's goal distance starting from a given benchmark percentage of his goal.

1 Launch

Direct students' attention to the progress bars that show the percentage change.

To surface connections, consider inviting students to share where they have seen progress bars like this one before or what the longest distance they have ever biked is.

2 Connect

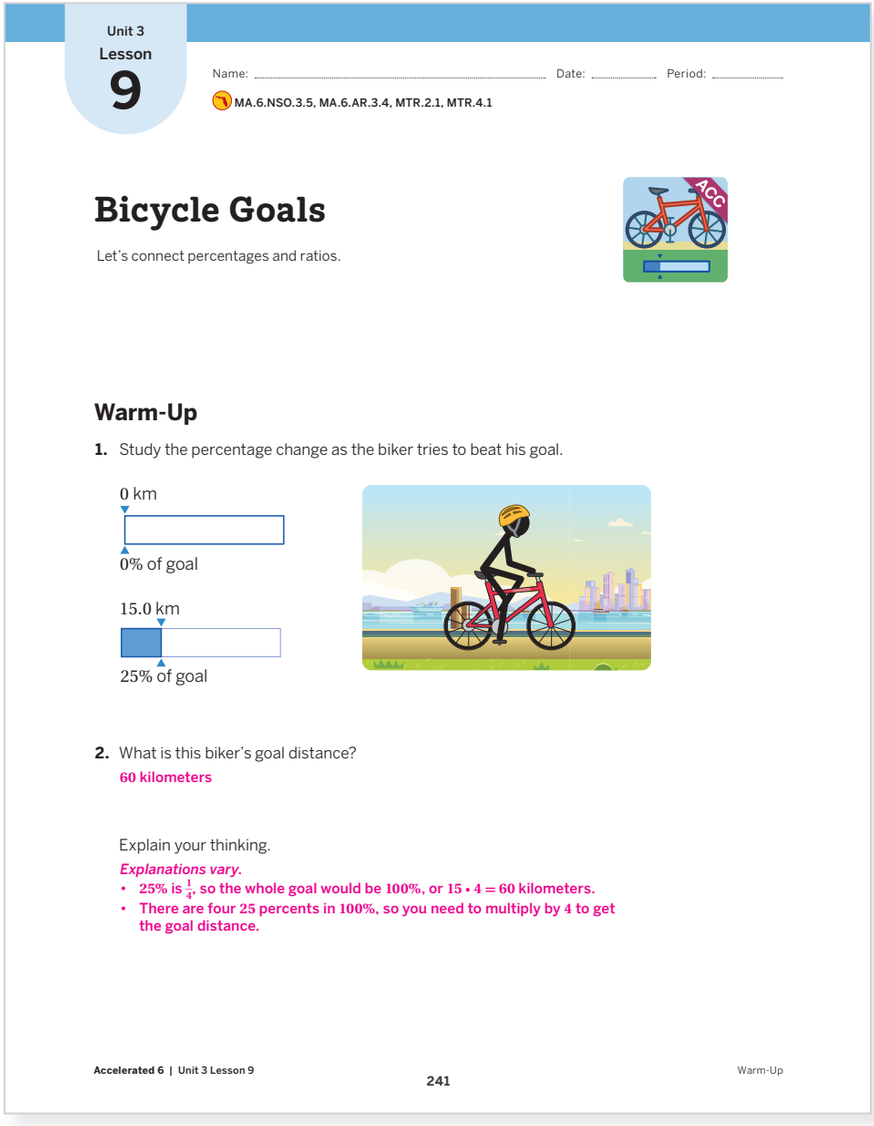
Look for students who used different types of reasoning to get to 60 kilometers.

ELL **English Language Learners** Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

Consider asking:

- "How is this situation similar to the duckies lesson? How is it different?"
- "What does 100% mean in this situation? Where do we see it on the progress bar?"
- "How is the progress bar like a tape diagram?" Progress bars are very similar to tape diagrams. The entire width of the progress bar represents 100%.

D **Differentiation: (Stretch)** Encourage students to determine how far the biker would have gone if he had ridden 75% or 125% of their goal.



Unit 3
Lesson
9

Name: Date: Period:

MA.6.NSO.3.5, MA.6.AR.3.4, MTR.2.1, MTR.4.1

Bicycle Goals

Let's connect percentages and ratios.

Warm-Up

1. Study the percentage change as the biker tries to beat his goal.

0 km

0% of goal

15.0 km

25% of goal

2. What is this biker's goal distance?

60 kilometers

Explain your thinking.

Explanations vary.

- 25% is $\frac{1}{4}$, so the whole goal would be 100%, or $15 \cdot 4 = 60$ kilometers.
- There are four 25 percents in 100%, so you need to multiply by 4 to get the goal distance.

Accelerated 6 | Unit 3 Lesson 9 241 Warm-Up

Pairs | 20 min

Activity 1 Bicycle Goals

Purpose: Students use double number line diagrams, tables, and other strategies to solve problems involving friendly percentages and unknown parts and wholes. **(MTR.2.1)**

Short on time? Consider omitting the short discussion in Problem 4 and instead Connect in Problem 7.

1 Launch

Invite students to read the prompt aloud, then restate it in their own words.

Consider asking, "Where would the 36 go on the progress bar?"

Invite students to estimate the answer by asking, "Should it be more or less than 36 kilometers? About how much more/less?"

2 Monitor

Invite students to get feedback from a partner throughout the lesson.

Encourage students to write expressions on paper to help with their thinking throughout this lesson.

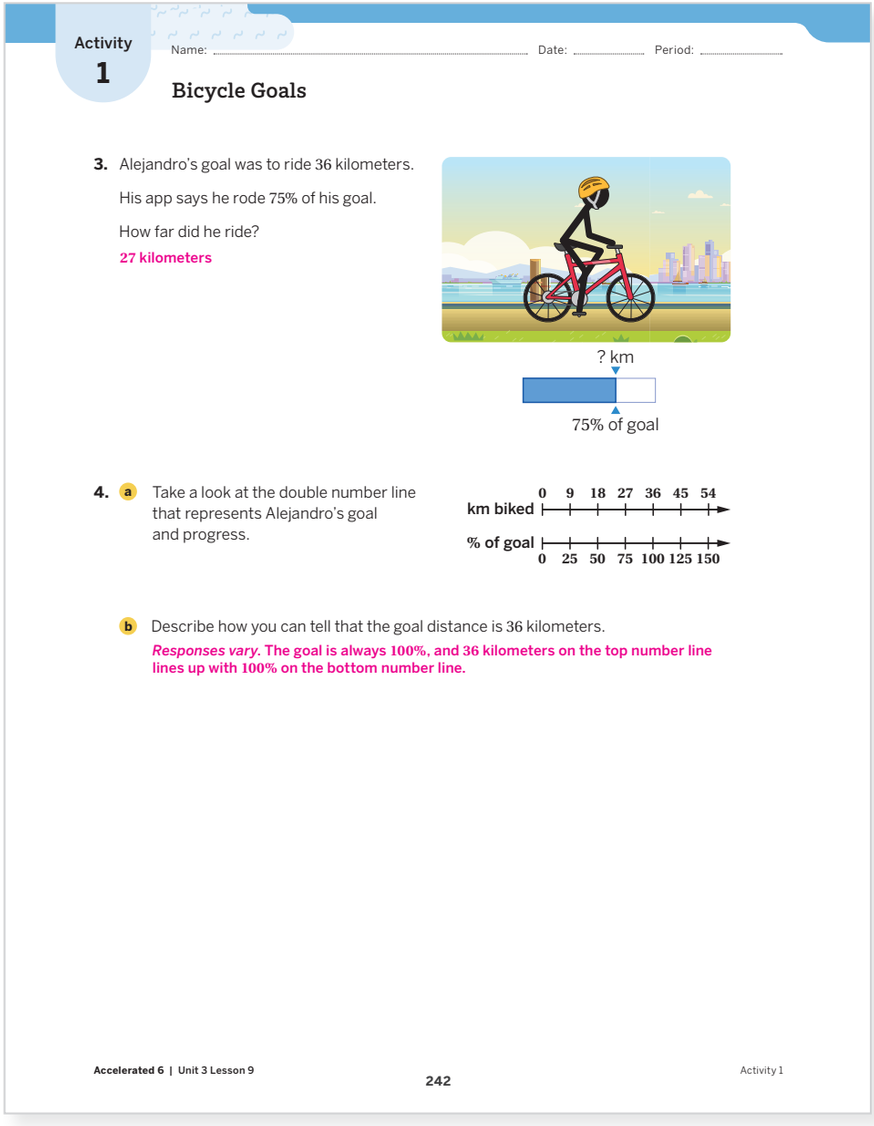
Encourage students to read others' responses and decide if others' descriptions are similar to or different from their own.

Pause briefly and consider using the Notice and Wonder routine to promote curiosity and help students make sense of the task. Consider asking:

- "Where do you see Alejandro's goal on the double number line?"
- "What does the 150 on the double number line mean? What would 150% of a goal mean?" **(MTR.4.1)**
- "How could a progress bar be helpful? A double number line?"

D **Differentiation: (Stretch)** Invite students to use the double number line to calculate 40% of the goal and 120% of the goal.

Activity 1 continued >



Activity 1

Name: Date: Period:

Bicycle Goals

3. Alejandro's goal was to ride 36 kilometers.

His app says he rode 75% of his goal.

How far did he ride?

27 kilometers

? km

75% of goal

4. a. Take a look at the double number line that represents Alejandro's goal and progress.

km biked: 0 9 18 27 36 45 54

% of goal: 0 25 50 75 100 125 150

b. Describe how you can tell that the goal distance is 36 kilometers.

Responses vary. The goal is always 100%, and 36 kilometers on the top number line lines up with 100% on the bottom number line.

Accelerated 6 | Unit 3 Lesson 9 242 Activity 1

Pairs | 20 min

Activity 1 Bicycle Goals (continued)

Purpose: Students use double number line diagrams, tables, and other strategies to solve problems involving friendly percentages and unknown parts and wholes. **(MTR.2.1)**

Short on time? Consider omitting the short discussion in Problem 4 and instead Connect in Problem 7.

2 Monitor

To support students getting started, consider asking, "How could we determine 50% of the goal? What might a fraction over 100% mean?"

Note: This is the first time students are asked to reason with percentages over 100%.

Look and listen for a variety of thinking and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to start with an estimate and use what they learn from the feedback to reason about a revised response.
Write 1.6 kilometers because they calculated 20% of 8.	**Support** Encourage students to fill out the entire double number line. Consider asking, "What does the 8 represent about the biker? What would come after the 8? What percentage would that be?"
Use strategies similar to Melissa's or Darryl's in the next problem or other creative strategies.	**Strengthen** Invite students to share their thinking during the Connect.

Look for annotations that describe or compare strategies. **(MTR.2.1)**

A Accessibility: Visual-Spatial Processing Invite students to draw in their Student Edition to support making connections between strategies.

D Differentiation: (Stretch) Invite students to figure out what the goal was if 8 kilometers was 40% of the goal instead. What about 5% of the goal?

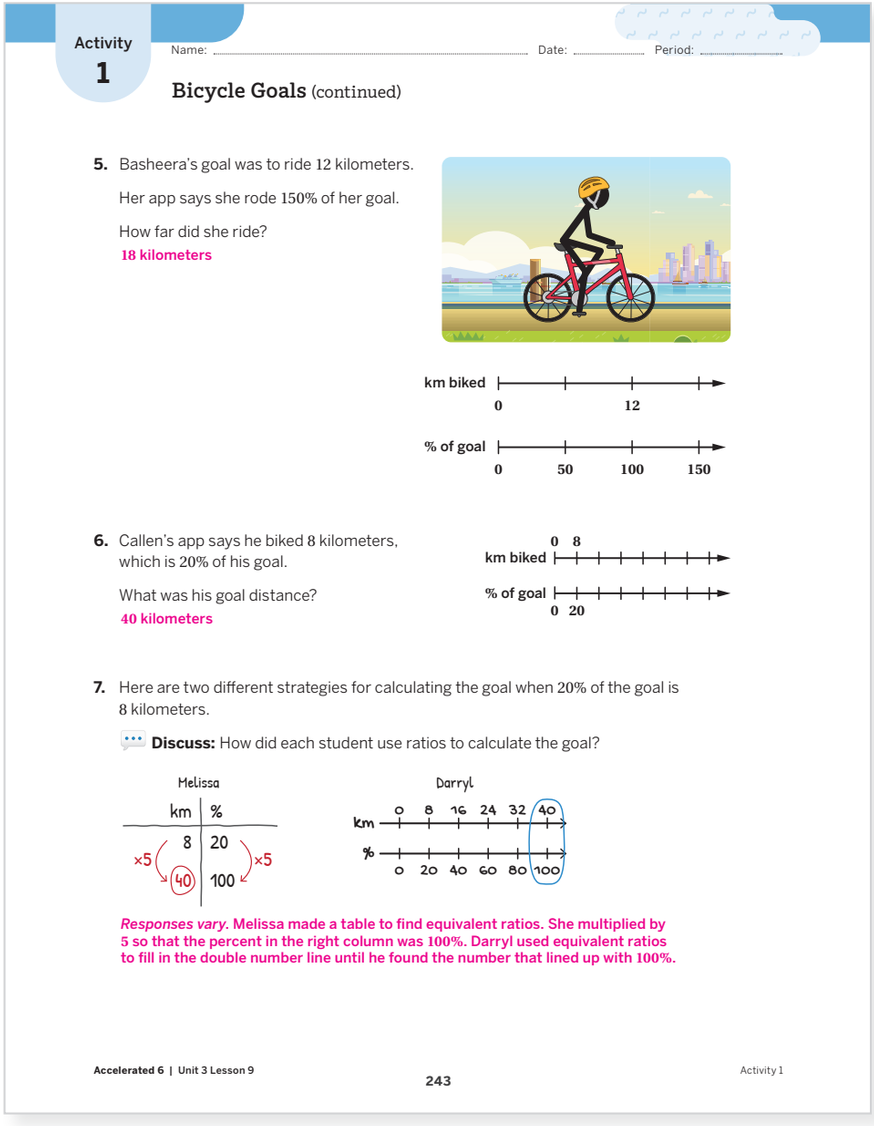
3 Connect

MLR MLR7: Compare and Connect Invite students to analyze and compare each strategy, and then connect to their strategy or previous strategies.

Share captured strategies and consider renaming Melissa's and Darryl's strategies after students in the class who used them.

To surface the Key Takeaway, consider asking:

- "Where do you see the goal distance in the table? On the double number line?"
- "How can you use a table to figure out a goal? A double number line?"
- "How are these strategies alike? How are they different?"



Activity 1

Name: Date: Period:

Bicycle Goals (continued)

5. Basheera's goal was to ride 12 kilometers.

Her app says she rode 150% of her goal.

How far did she ride?

18 kilometers

6. Callen's app says he biked 8 kilometers, which is 20% of his goal.

What was his goal distance?

40 kilometers

7. Here are two different strategies for calculating the goal when 20% of the goal is 8 kilometers.

Discuss: How did each student use ratios to calculate the goal?

Responses vary. Melissa made a table to find equivalent ratios. She multiplied by 5 so that the percent in the right column was 100%. Darryl used equivalent ratios to fill in the double number line until he found the number that lined up with 100%.

Accelerated 6 | Unit 3 Lesson 9 243 Activity 1

Key Takeaway: You can treat percentages as ratios where the "whole" or the "goal" is out of 100. A table or double number line can be used to figure out the unknown part.

Pairs | 10 min

Activity 2 Percentages and Ratios

Purpose: Students apply the strategies for determining an unknown whole or part to more percentage problems.

Short on time? Consider matching the strategies as a class.

1 Launch

Invite students to compare their responses with a partner, justify their strategies, and make revisions based on their conversation. **(MTR.4.1)**

Note: If time allows, invite pairs to compare their matches, justify their thinking, and make revisions based on their conversation.

2 Monitor

Look and listen for a variety of thinking and strategies.

D Differentiation

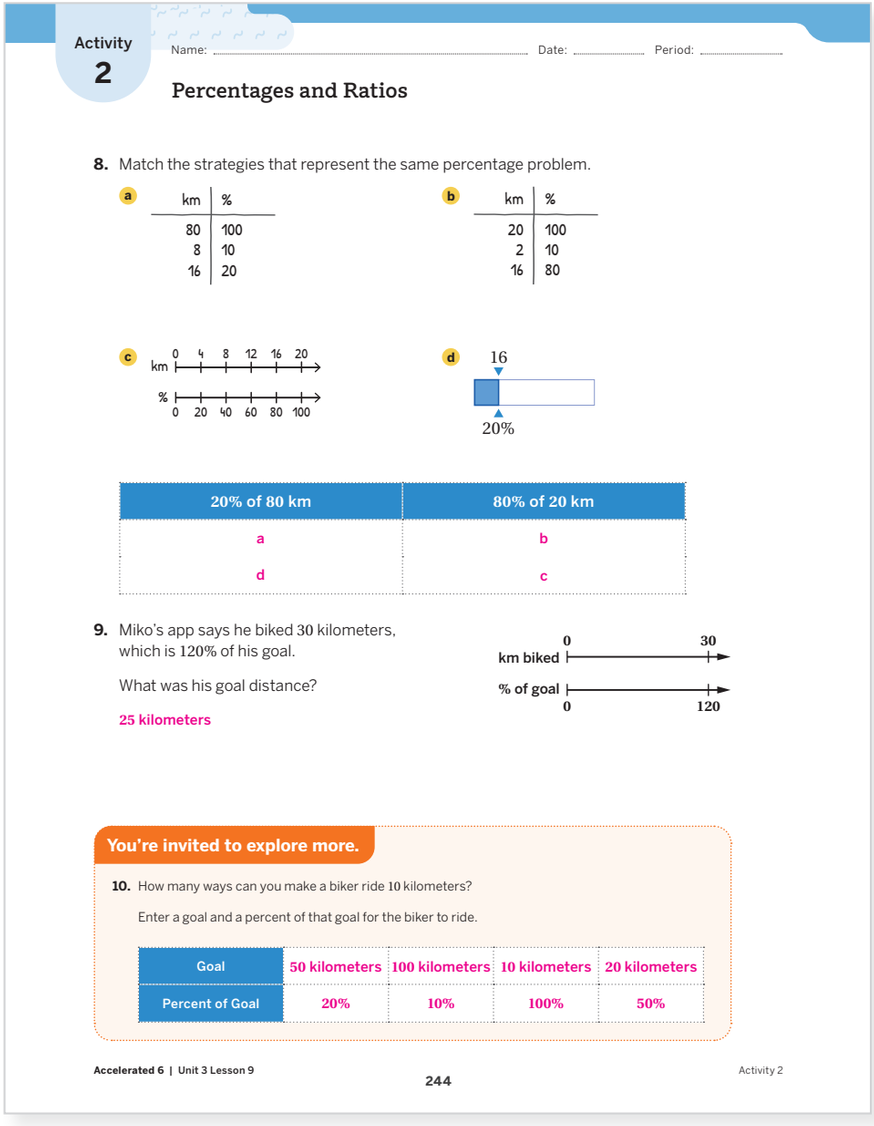
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Do you think Miko's goal was more or less than 30 kilometers?"
Attempt to multiply or divide 30 and 120% using a guess and check method.	**Support** Encourage them to use either a table or double number line. Invite them to determine equivalent ratios and place them in their table or on their double number line."
Write 30 because they think of 120 as 100% so they create tick marks at 6, 12, 18, and 24.	**Support** Celebrate their use of the double number line. Consider asking, "What would the other values of the double number line mean? Do they make sense with the overall situation?"
Use a table, double number line, or other creative strategies to write 25 kilometers.	**Strengthen** Invite them to share their thinking during the Connect. **Stretch** Encourage students to try another strategy.

Note: This is the first double number line that is not subdivided for students.

D Differentiation: You're invited to explore more. (Stretch) Invite students who would like to explore percentages further to complete this optional task. Encourage them to discuss their thinking with a partner.

Invite students who used tables, double number lines, or other creative strategies to share. **(MTR.2.1)**

Consider asking, "How do percentage problems compare to ratio problems?"



Activity 2

Name: Date: Period:

Percentages and Ratios

8. Match the strategies that represent the same percentage problem.

a

km	%
80	100
8	10
16	20

b

km	%
20	100
2	10
16	80

c

km: 0 4 8 12 16 20

%: 0 20 40 60 80 100

d

16

20%

20% of 80 km	80% of 20 km
a	b
d	c

9. Miko's app says he biked 30 kilometers, which is 120% of his goal.

What was his goal distance?

25 kilometers

You're invited to explore more.

10. How many ways can you make a biker ride 10 kilometers?

Enter a goal and a percent of that goal for the biker to ride.

Goal	50 kilometers	100 kilometers	10 kilometers	20 kilometers
Percent of Goal	20%	10%	100%	50%

Accelerated 6 | Unit 3 Lesson 9 244 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that percentage problems are similar to ratio problems and can be solved using tables, double number lines, and tape diagrams.

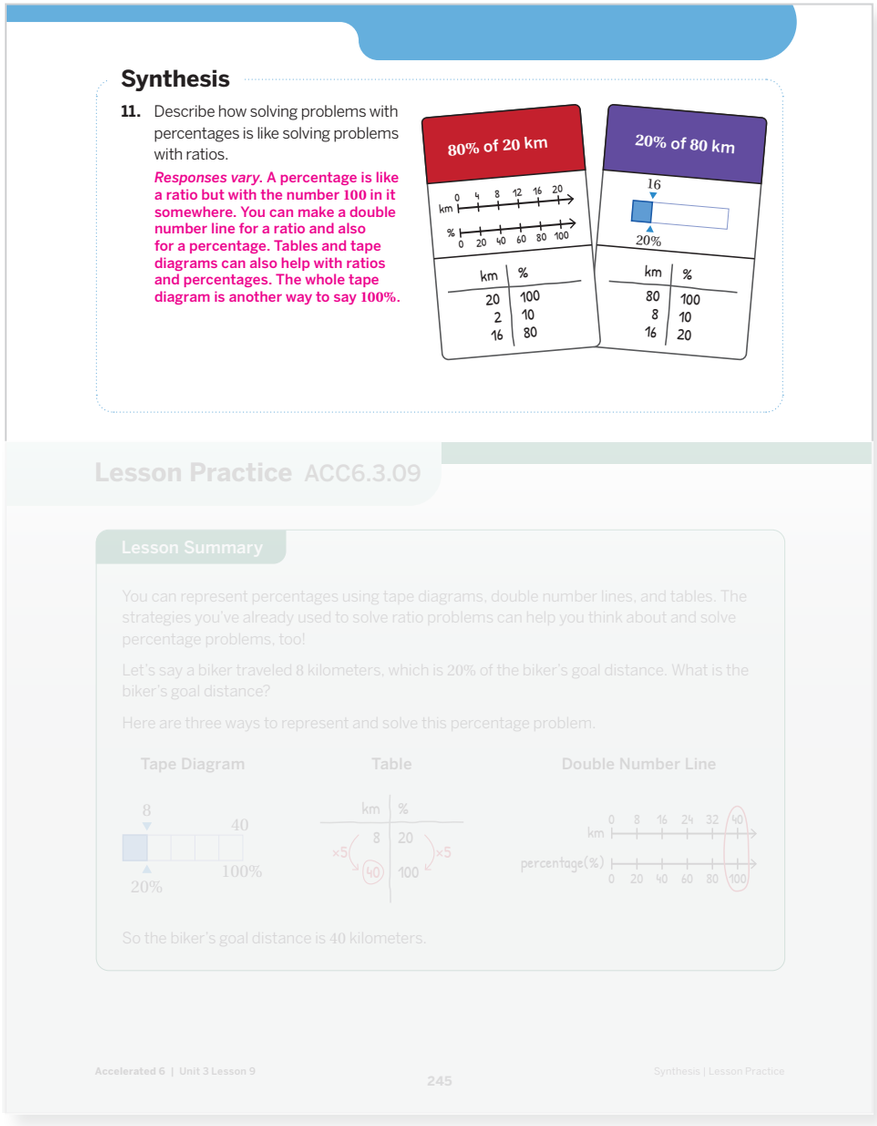
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Treat percent problems like ratio problems, where one of the table columns or number lines represent percentages.
- A percentage is essentially a ratio relationship that includes 100.
- Use a table or double number line to organize the percent ratios given and help calculate unknown values.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for solving percentage problems using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

11. Describe how solving problems with percentages is like solving problems with ratios.

Responses vary. A percentage is like a ratio but with the number 100 in it somewhere. You can make a double number line for a ratio and also for a percentage. Tables and tape diagrams can also help with ratios and percentages. The whole tape diagram is another way to say 100%.

Lesson Practice ACC6.3.09

Lesson Summary

You can represent percentages using tape diagrams, double number lines, and tables. The strategies you've already used to solve ratio problems can help you think about and solve percentage problems, too!

Let's say a biker traveled 8 kilometers, which is 20% of the biker's goal distance. What is the biker's goal distance?

Here are three ways to represent and solve this percentage problem.

Tape Diagram | Table | Double Number Line

So the biker's goal distance is 40 kilometers.

Accelerated 6 | Unit 3 Lesson 9 245 Synthesis | Lesson Practice

Lesson Takeaway: Percentage problems are similar to ratio problems and can be solved using tables, double number line diagrams, and tape diagrams.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by determining the value of the part given the whole and the percentage.

Today's Goals

1. **Goal:** Use a double number line diagram, tape diagram, or table to determine unknown parts or wholes, given friendly percentages.
2. **Language Goal:** Describe the connections between percentages and ratios. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 3.09

Callen bought new sneakers for $60.

Miko bought sneakers that cost 80% of that price.

Show or explain your thinking.

$48. *Responses vary.* I created a tape diagram with dollars on the top and percentage on the bottom. I lined up the 0's on each line and the 60 and 100 on each line. Then, since I was trying to determine 80% of 60, I counted by $\frac{100}{5}$, which is 20, on the percent line and $\frac{60}{5}$, which is 12, on the dollars number line so I would get the same number of values will line up. The 80% lined up under $48, so 80% of $60 is $48.

D Differentiation Use after Lesson 9

Support

Provide targeted intervention for students by using these resources.

If students need support determining the value of a part given the whole and the percentage:

» **Respond to Student Thinking:**

- Revisiting **Activity 1** with students before providing individualized feedback on the relevant **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to set a goal for the number of times they will do something in the next week and calculate benchmark percentages.

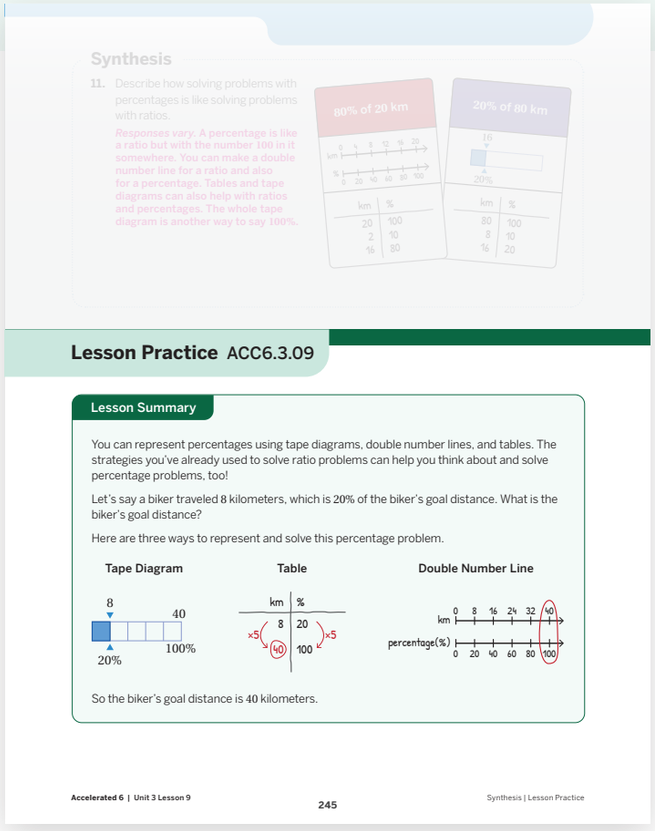
Professional Learning

In this lesson, students connected solving percentage problems with ratio problems. How will that work support their calculations of unknown percentages when the percentages are not "friendly" in upcoming lessons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

11. Describe how solving problems with percentages is like solving problems with ratios.

Responses vary. A percentage is like a ratio but with the number 100 in it somewhere. You can make a double number line for a ratio and also for a percentage. Tables and tape diagrams can also help with ratios and percentages. The whole tape diagram is another way to say 100%.

80% of 20 km

20% of 80 km

Lesson Practice ACC6.3.09

Lesson Summary

You can represent percentages using tape diagrams, double number lines, and tables. The strategies you've already used to solve ratio problems can help you think about and solve percentage problems, too!

Let's say a biker traveled 8 kilometers, which is 20% of the biker's goal distance. What is the biker's goal distance?

Here are three ways to represent and solve this percentage problem.

Tape Diagram

8 | 40 | 20% | 100%

Table

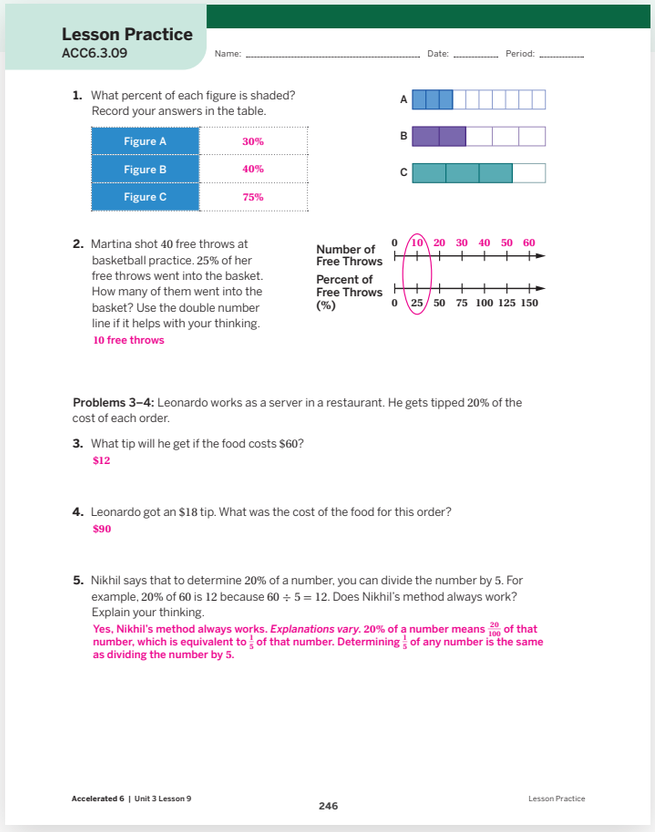
km	%
8	20
40	100

Double Number Line

km: 0 8 16 24 32 40

percentage(%): 0 20 40 60 80 100

So the biker's goal distance is 40 kilometers.



Lesson Practice
ACC6.3.09

Name: _____ Date: _____ Period: _____

1. What percent of each figure is shaded? Record your answers in the table.

Figure A	30%
Figure B	40%
Figure C	75%

A

B

C

2. Martina shot 40 free throws at basketball practice. 25% of her free throws went into the basket. How many of them went into the basket? Use the double number line if it helps with your thinking.

10 free throws

Number of Free Throws: 0 10 20 30 40 50 60

Percent of Free Throws (%): 0 25 50 75 100 125 150

Problems 3–4: Leonardo works as a server in a restaurant. He gets tipped 20% of the cost of each order.

3. What tip will he get if the food costs $60?

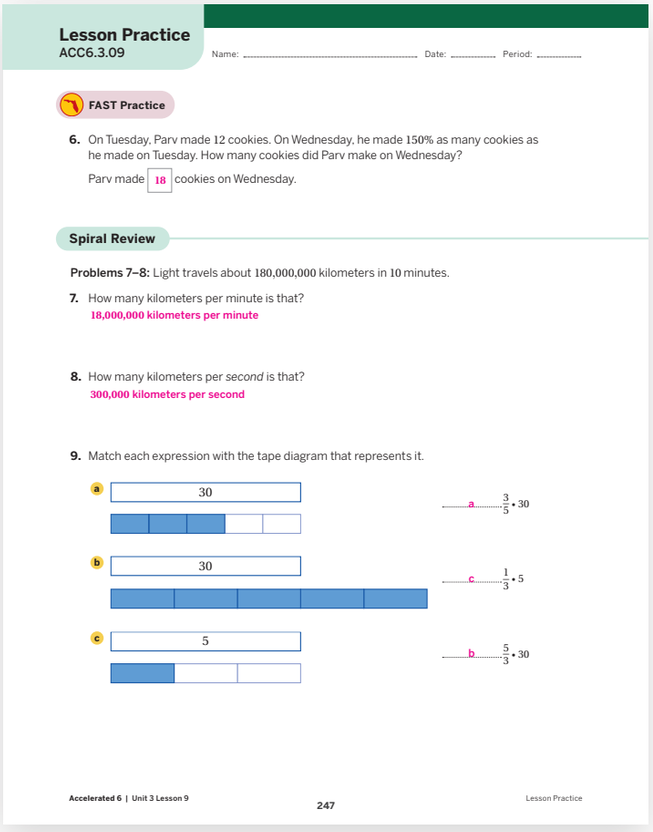
$12

4. Leonardo got an $18 tip. What was the cost of the food for this order?

$90

5. Nikhil says that to determine 20% of a number, you can divide the number by 5. For example, 20% of 60 is 12 because $60 \div 5 = 12$. Does Nikhil's method always work? Explain your thinking.

Yes, Nikhil's method always works. *Explanations vary.* 20% of a number means $\frac{20}{100}$ of that number, which is equivalent to $\frac{1}{5}$ of that number. Determining $\frac{1}{5}$ of any number is the same as dividing the number by 5.



Lesson Practice
ACC6.3.09

Name: _____ Date: _____ Period: _____

FAST Practice

6. On Tuesday, Parv made 12 cookies. On Wednesday, he made 150% as many cookies as he made on Tuesday. How many cookies did Parv make on Wednesday?

Parv made 18 cookies on Wednesday.

Spiral Review

Problems 7–8: Light travels about 180,000,000 kilometers in 10 minutes.

7. How many kilometers per minute is that?

18,000,000 kilometers per minute

8. How many kilometers per *second* is that?

300,000 kilometers per second

9. Match each expression with the tape diagram that represents it.

a. 30

b. 30

c. 5

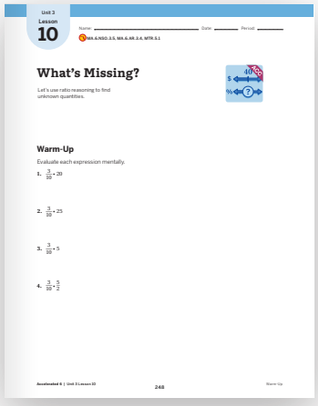
a. $\frac{3}{5} \cdot 30$

c. $\frac{1}{3} \cdot 5$

b. $\frac{5}{3} \cdot 30$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.NSO.3.5
	2–5	2	MA.6.AR.3.4
FAST Practice	6	2	MA.6.AR.3.4
Spiral Review			
	7–8	2	MA.6.AR.3.2
	9	2	MA.4.FR.2.4


Unit 3
Lesson
10
What's Missing?
Warm-Up
248

What's Missing?

Solving Percentage Problems

Let's use ratio reasoning to find unknown quantities.

Learning Outcomes

Today's Goals

1. **Goal:** Create tape diagrams, double number line diagrams, or tables to determine unknown parts, percentages, or wholes.
2. **Language Goal:** Analyze problems with unknown parts, percentages, and wholes. **(Reading, Writing, Speaking, and Listening)**

Students create tape diagrams, double number line diagrams, and tables to solve problems with percentages. The focus of this lesson is on determining which quantity is missing (the part, percentage, or whole), and then choosing a representation to make sense of the situation and answer the question.

Coherence

Prior Learning

In Lessons 7–8, students worked with benchmark percentages and friendly percentages (i.e., multiples of benchmark percentages) to solve for unknown parts and wholes.

Future Learning

In Lesson 11, students will develop and use strategies for calculating any percentage of a number.

Connections

- Students find unknown values using ratios in the context of purchasing items at various prices. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.AR.3.4
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

Mathematical Thinking and Reasoning Standard: MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.FR.1.2	**MA.7.NSO.1.2**
MA.5.NSO.2.1	**MA.7.AR.3.1**
MA.5.NSO.2.2	
MA.5.FR.1.1	

Lesson at a Glance

~ 45 min

MA.6.AR.3.4, MA.6.NSO.3.5

Warm-Up

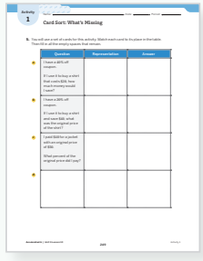
Whole Class | 5 min

Students engage in the **Number Talk** routine to strengthen strategies around multiplication involving fractions.

Activity 1

Pairs | 15 min

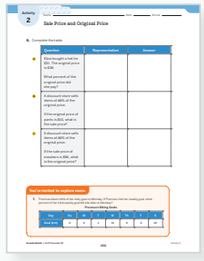
Students make connections between situations, representations, and answers involving percentages. **(MTR.5.1)**



Activity 2

Pairs | 15 min

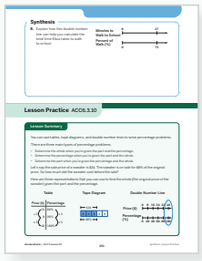
Students practice creating representations to solve problems with unknown parts, percentages, and wholes. **MLR2: Collect and Display**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that tables, tape diagrams, and double number lines can be used to determine unknown parts, percentages, and wholes. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by using a table, tape diagram, and/or double number line to determine an unknown whole given a part and a percentage.

Prep Checklist

Prepare the Activity 1 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one per four students
- Graph paper (optional)
- Tape or glue (as needed)

Whole Class | 5 min

Warm-Up

Purpose: Students engage in the Number Talk routine to strengthen strategies around multiplication involving fractions.

1 Launch

Direct students' attention to each expression one at a time.

Use the Number Talk routine to help students look for and make use of structure in the expressions to develop and name strategies. **(MTR.5.1)**

Invite students to mentally evaluate the first expression independently. Then record a variety of strategies, along with the name of the students who shared them.

Consider asking, "Who thought about it in a different way?"

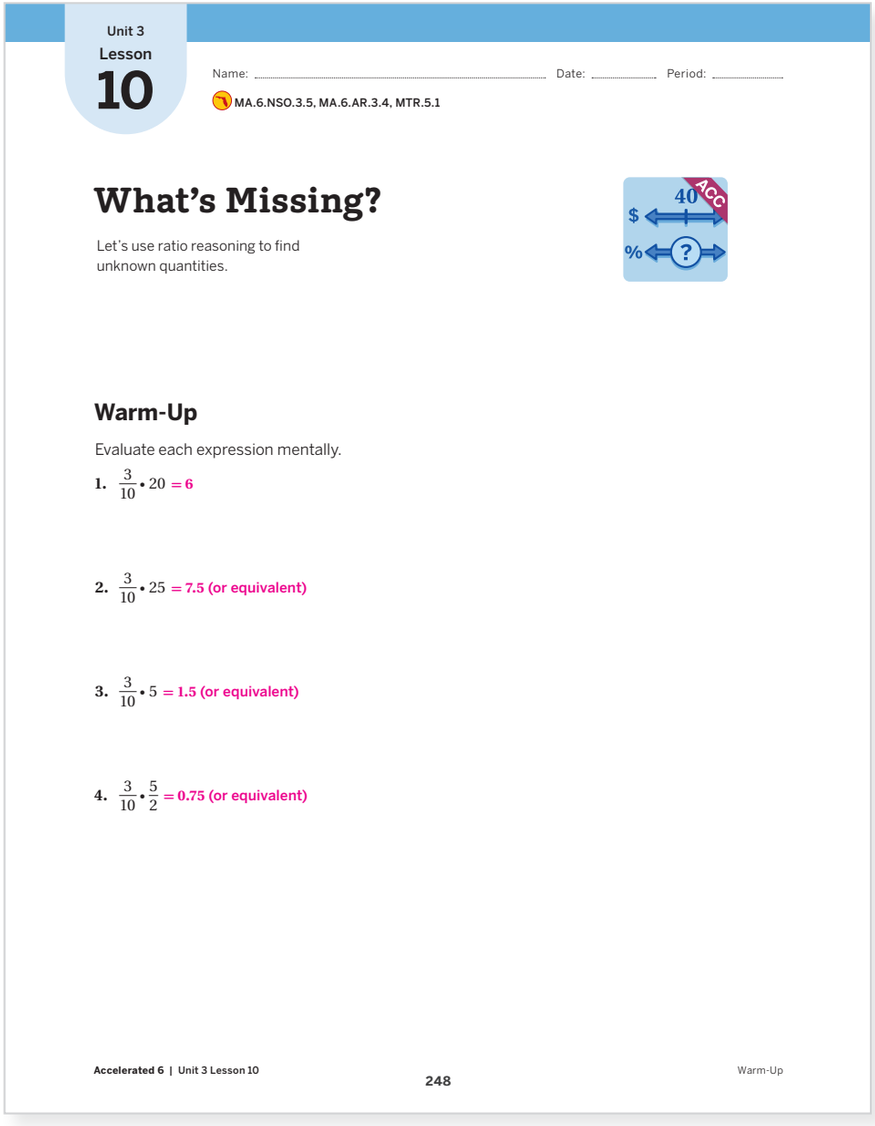
Note: This structure is repeated for each problem in the Number Talk.

2 Connect

Invite students to compare and contrast the different expressions and strategies.

Consider asking:

- "What connections do you notice among the different expressions?"
- "What connections do you notice among the strategies we've discussed?"
- "How might the first product help you determine the second one? Third one?"



Unit 3
Lesson
10

Name: Date: Period:

MA.6.NSO.3.5, MA.6.AR.3.4, MTR.5.1

What's Missing?

Let's use ratio reasoning to find unknown quantities.

Warm-Up

Evaluate each expression mentally.

1. $\frac{3}{10} \cdot 20 = 6$

2. $\frac{3}{10} \cdot 25 = 7.5$ (or equivalent)

3. $\frac{3}{10} \cdot 5 = 1.5$ (or equivalent)

4. $\frac{3}{10} \cdot \frac{5}{2} = 0.75$ (or equivalent)

Accelerated 6 | Unit 3 Lesson 10 248 Warm-Up

Pairs | 15 min

Activity 1 Card Sort: What's Missing

Purpose: Students make connections between situations, representations, and answers involving percentages. **(MTR.5.1)**

Short on time? Consider filling the empty spaces as a class.

1 Launch

Direct students' attention to the instructions for the card sort.

Distribute one set of pre-cut Activity 1 Cards to each pair.

2 Monitor

Look and listen for a variety of strategies.

D Differentiation

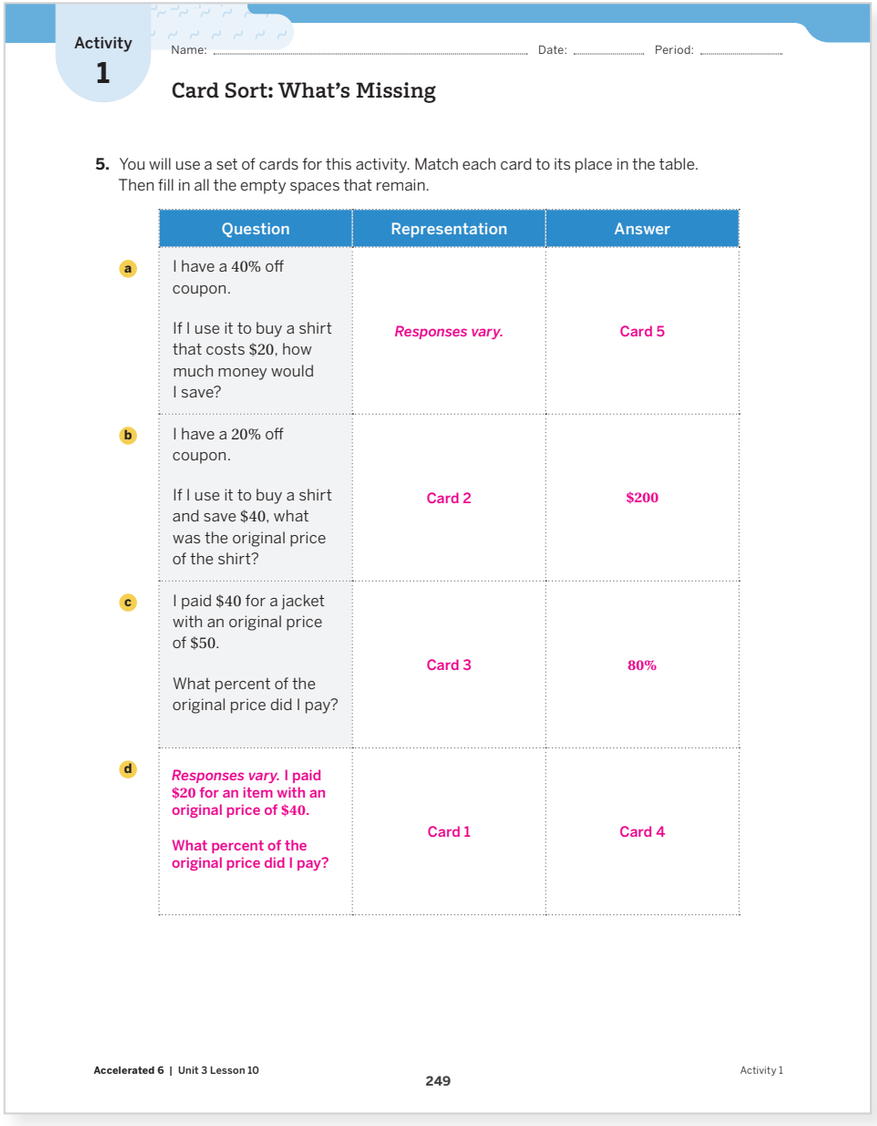
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Does this problem give you the part, percentage, or whole?"
Match Card 2 to Problem 5a.	**Support** Consider asking, "What does each number on the diagram represent?"
Label the parts, percentages, and wholes of the problems.	**Strengthen** Invite students to share their thinking during the Connect.
Estimate prior to solving.	**Stretch** Encourage students to draw another representation. (e.g., If a table is represented, encourage students to draw a double number line or a tape diagram.)
Use friendly percentages to scale up and down.	
Fill the empty spaces in a clear and/or creative way.	

A Accessibility: Executive Function Invite students to focus on one card at a time to support students in carrying out multiple steps.

3 Connect

Invite students to share how they placed the cards and filled in the empty spaces.

To surface the Key Takeaway, consider asking, "How did you know whether you were looking for the part, percentage, or whole?"



Activity 1

Name: Date: Period:

Card Sort: What's Missing

5. You will use a set of cards for this activity. Match each card to its place in the table. Then fill in all the empty spaces that remain.

	Question	Representation	Answer
a	I have a 40% off coupon. If I use it to buy a shirt that costs $20, how much money would I save?	*Responses vary.*	Card 5
b	I have a 20% off coupon. If I use it to buy a shirt and save $40, what was the original price of the shirt?	Card 2	$200
c	I paid $40 for a jacket with an original price of $50. What percent of the original price did I pay?	Card 3	80%
d	*Responses vary.* I paid $20 for an item with an original price of $40. What percent of the original price did I pay?	Card 1	Card 4

Accelerated 6 | Unit 3 Lesson 10 249 Activity 1

Key Takeaway: Percentage problems can ask for a part, percentage, or whole, and the first step in solving them is to consider which of these you are given and which you are looking for.

Pairs | 15 min

Activity 2 Sale Price and Original Price

Purpose: Students practice creating representations to solve problems with unknown parts, percentages, and wholes.

1 Launch

Invite students to use the cards from Activity 1 as examples.

ELL **English Language Learners** Invite students to ensure that everyone in the group can explain the representation and answer. Vary who is called on to represent the work of the group. **(Writing, Speaking, and Listening)**

2 Monitor

Look and listen for a variety of strategies.

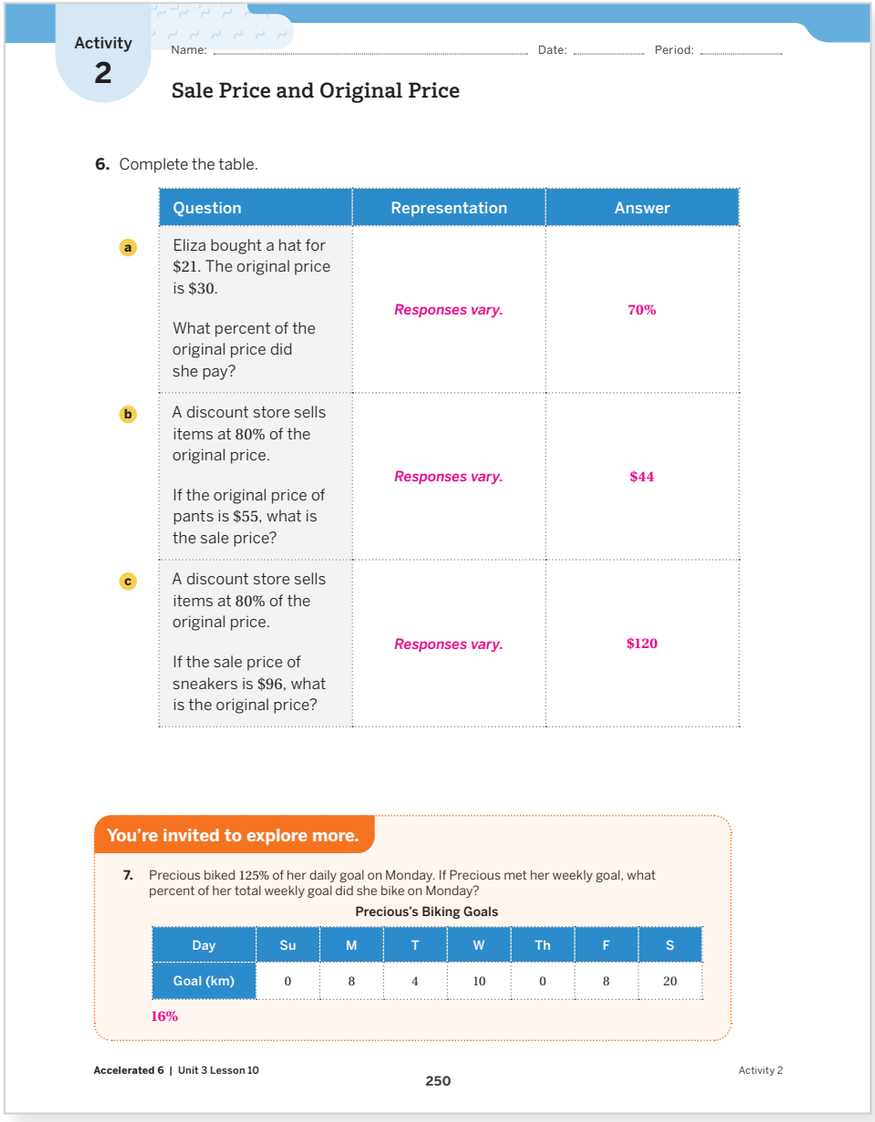
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Which one of the questions from Activity 1 is this most like?"
Label the part as the whole or the whole as the part. *(Problems 6b–c)*	**Support** Invite students to read the problem out loud and point to what they think the part is and what they think the whole is.
Label the parts, percentages, and wholes of the problems.	**Strengthen** Invite students to share their thinking during the Connect.
Use tables or double number lines.	**Stretch** You're invited to explore more. Invite students who would like to explore percentages further to complete this optional task. Encourage them to discuss their thinking with a partner.
Scale down to a benchmark percentage, then scale up to determine the unknown percent.	

3 Connect

Invite students to share how they used tables and double number lines to solve percentage problems.

MLR **MLR2: Collect and Display** Use this routine to synthesize strategies for solving percentage problems using students' language. Display any new language, examples, or diagrams for students to reference later.



Activity 2

Name: _____ Date: _____ Period: _____

Sale Price and Original Price

6. Complete the table.

	Question	Representation	Answer
a	Eliza bought a hat for $21. The original price is $30. What percent of the original price did she pay?	*Responses vary.*	70%
b	A discount store sells items at 80% of the original price. If the original price of pants is $55, what is the sale price?	*Responses vary.*	$44
c	A discount store sells items at 80% of the original price. If the sale price of sneakers is $96, what is the original price?	*Responses vary.*	$120

You're invited to explore more.

7. Precious biked 125% of her daily goal on Monday. If Precious met her weekly goal, what percent of her total weekly goal did she bike on Monday?

Precious's Biking Goals

Day	Su	M	T	W	Th	F	S
Goal (km)	0	8	4	10	0	8	20

16%

Accelerated 6 | Unit 3 Lesson 10 250 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that tables, tape diagrams, and double number lines can be used to determine unknown parts, percentages, and wholes.

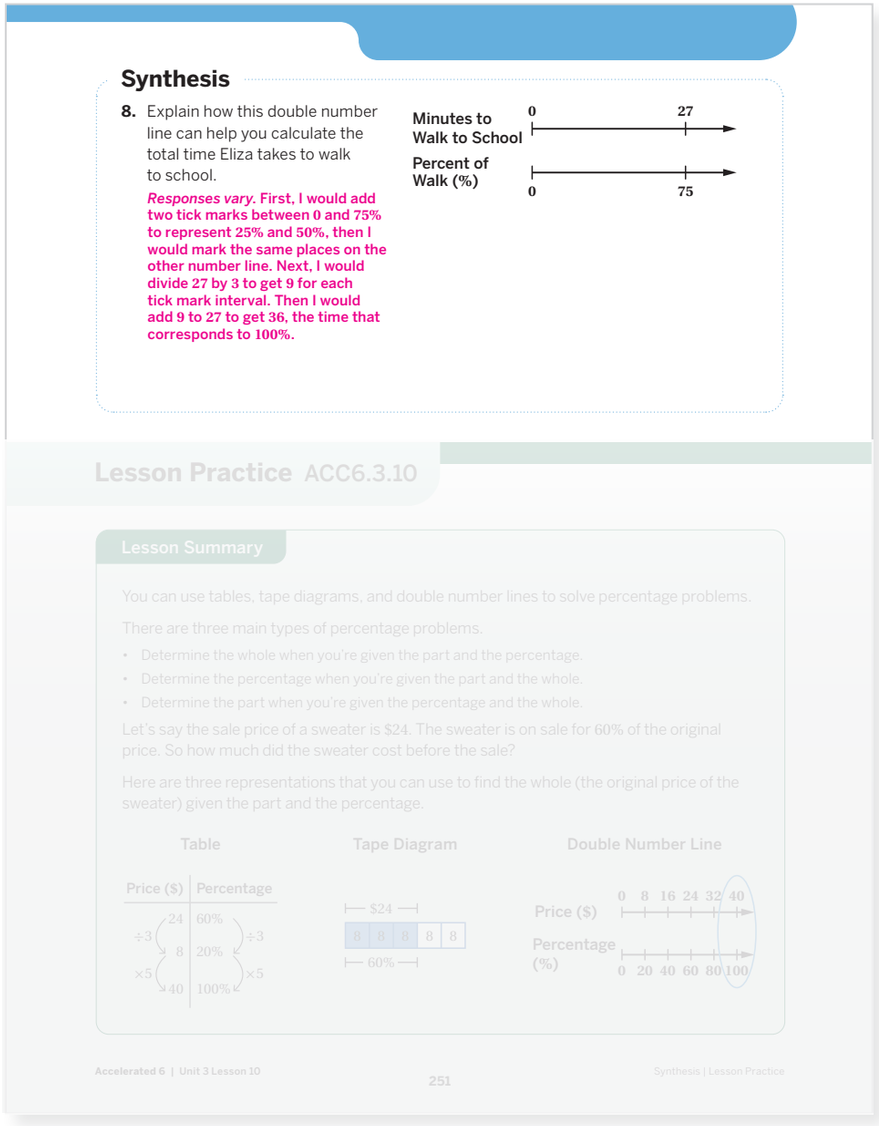
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Identify the given information as a part, percentage, or whole.
- Use a table or double number line to organize any given part, percentage, or whole.
- The whole represents 100%.
- Given a part and a percentage, you can determine the whole.
- Scale to friendly percentages to get desired equivalent ratios.

MLR **MLR2: Collect and Display** Use this routine to revisit students' ideas about how to solve percentage problems. Add any new ideas to the display for students to reference for the rest of the unit.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

8. Explain how this double number line can help you calculate the total time Eliza takes to walk to school.

Responses vary. First, I would add two tick marks between 0 and 75% to represent 25% and 50%, then I would mark the same places on the other number line. Next, I would divide 27 by 3 to get 9 for each tick mark interval. Then I would add 9 to 27 to get 36, the time that corresponds to 100%.

Lesson Practice ACC6.3.10

Lesson Summary

You can use tables, tape diagrams, and double number lines to solve percentage problems.

There are three main types of percentage problems.

- Determine the whole when you're given the part and the percentage.
- Determine the percentage when you're given the part and the whole.
- Determine the part when you're given the percentage and the whole.

Let's say the sale price of a sweater is $24. The sweater is on sale for 60% of the original price. So how much did the sweater cost before the sale?

Here are three representations that you can use to find the whole (the original price of the sweater) given the part and the percentage.

Table

Price ($)	Percentage
24	60%
8	20%
40	100%

(×5, ÷3 between rows)

Tape Diagram

$24

8 | 8 | 8 | 8 | 8

60%

Double Number Line

Price ($): 0 8 16 24 32 40

Percentage (%): 0 20 40 60 80 100

Accelerated 6 | Unit 3 Lesson 10 251 Synthesis | Lesson Practice

Lesson Takeaway: You can determine an unknown part, percentage, or whole when given the other two. Use a table, tape diagram, or double number line to organize the information, and use strategies like scaling to benchmark percentages to create equivalent ratios.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by using a table, tape diagram, and/or double number line to determine an unknown whole given a part and a percentage.

Today's Goals

1. **Goal:** Create tape diagrams, double number line diagrams, or tables to determine unknown parts, percentages, or wholes.
2. **Language Goal:** Analyze problems with unknown parts, percentages, and wholes. **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 3.10

It takes Emiliano 20 minutes to walk 80% of the way to school.

How long does it take in total for Emiliano to walk to school?

Show or explain your thinking.

25 minutes. Responses vary. I created a table of Time(min) and Percentage. In the first row, I wrote 20 under time and 80 under percentage. I divided them both by 4 to get 5 minutes and 20%. Then, to get 100%, I multiplied them both by 5 to get 25 minutes and 100%.

D Differentiation Use after Lesson 10

Support

Provide targeted intervention for students by using these resources.

If students need support determining an unknown while given a part and a percentage:

» **Respond to Student Thinking:**

- Revisit **Lesson 9, Activity 1**. Encourage students to use a model to represent their reasoning. Then, encourage them to create a problem where multiplying 80% by 20 is a correct strategy.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.

Professional Learning

What strengths did your students exhibit today? How can you build from those strengths as students continue learning about percentages?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

8. Explain how this double number line can help you calculate the total time Eliza takes to walk to school.

Responses vary. First, I would add two tick marks between 0 and 75% to represent 25% and 50%, then I would mark the same places on the other number line. Next, I would divide 27 by 3 to get 9 for each tick mark interval. Then I would add 9 to 27 to get 36, the time that corresponds to 100%.

Lesson Practice ACC6.3.10

Lesson Summary

You can use tables, tape diagrams, and double number lines to solve percentage problems.

There are three main types of percentage problems.

- Determine the whole when you're given the part and the percentage.
- Determine the percentage when you're given the part and the whole.
- Determine the part when you're given the percentage and the whole.

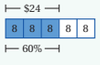
Let's say the sale price of a sweater is $24. The sweater is on sale for 60% of the original price. So how much did the sweater cost before the sale?

Here are three representations that you can use to find the whole (the original price of the sweater) given the part and the percentage.

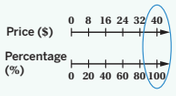
Table

Price ($)	Percentage
24 (÷3)	60% (÷3)
8 (×5)	20% (×5)
40	100%

Tape Diagram



Double Number Line



Lesson Practice ACC6.3.10

Name: _____ Date: _____ Period: _____

Problems 1–4: Evaluate each percentage problem.

1. 100% of 40
40

2. 50% of 40
20

3. 150% of 40
60

4. 10% of 40
4

Problems 5–6: A hardware store offers customers a coupon for $25 off.

5. The original price of a power drill is $125. If a customer uses the coupon, what percent will he save?
20%

6. The original price of a ladder is $250. If a customer uses the coupon, what percent will he save?
10%

Problems 7–8: Kiri is curious how many people think it will rain tomorrow. She asks 30 students in her class.

7. 12 students in Kiri's class say they think it will rain tomorrow. What percent of the class is that?
40%

8. Kiri's older brother also asks the 25 students in his class. 11 students say they think it will rain tomorrow. Which class has a greater percent of students who think that it will rain tomorrow?

A. Kiri's class **B.** Kiri's brother's class **C.** Same percent

Explain your thinking.

Explanations vary. 44% of Kiri's brother's class said they think it will rain tomorrow, which is 4% more than Kiri's class.

Lesson Practice ACC6.3.10

Name: _____ Date: _____ Period: _____

FAST Practice

9. Match the correct price with each situation.

Situation	$30	$50
A jacket is on sale for 25% off its original price of $40. What is the sale price?	☑	☐
A sweater costs $35, which is 30% off its original price. What was the original price?	☐	☑
A store has a 40% discount on all items. If the original price of a customer's items is $75, how much money will she save?	☑	☐

Spiral Review

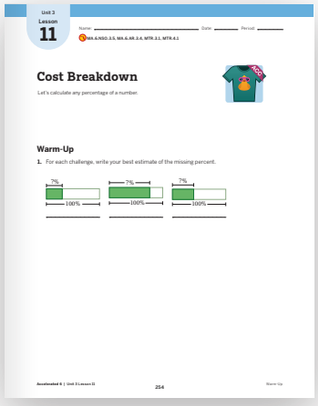
Problems 10–11: Afia is 1,422 millimeters tall. Note: 10 millimeters = 1 centimeter.

10. What is Afia's height in centimeters?
142.2 centimeters

11. What is her height in meters?
1.422 meters

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.6.AR.3.4
	5–8	2	MA.6.AR.3.4
FAST Practice	9	2	MA.6.AR.3.4
Spiral Review			
	10–11	2	MA.6.AR.3.5


Unit 3
Lesson
11
Cost Breakdown
Let's calculate any percentage of a number.
Warm-Up
1. For each challenge, write your best estimate of the missing percent.
254

Cost Breakdown

Any Percentage of a Number

Let's calculate any percentage of a number.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate any percentage of a number (e.g., 32% of 40).
2. **Language Goal:** Explain why $A\%$ of B can be calculated as $\frac{B}{100} \cdot A$ or $\frac{A}{100} \cdot B$. **(Writing, Speaking, and Listening)**

Students develop and use strategies to calculate any percentage of a number. They investigate the percent breakdown of money spent on clothing and calculate the amount of money that goes toward expenses, profit, and inventory for various items. As they make repeated calculations, students look for and express regularity in their work. They make connections between strategies for calculating unknown parts and expressions, such as $\frac{A}{100} \cdot B$ and $\frac{B}{100} \cdot A$. **(MTR.3.1)**

Coherence

Prior Learning

In Lesson 10, students practiced using tables, tape diagrams, and double number line diagrams to find unknown parts, percentages, and wholes.

Future Learning

In Lesson 12, students will develop and use one or more strategies to calculate unknown percentages.

Connections

- Students analyze various methods, including models, of finding percents. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

MA.6.AR.3.4
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.

Mathematical Thinking and Reasoning Standards: MTR.3.1, MTR.4.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.1.2
MA.5.NSO.2.2	MA.7.AR.3.1
MA.5.FR.1.1	

Vocabulary

Additional Vocabulary

profit

Lesson at a Glance

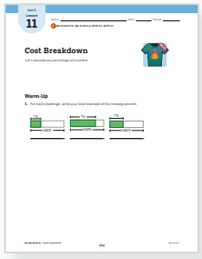
~ 45 min

MA.6.NSO.3.5, MA.6.AR.3.4

Warm-Up

Pairs | 5 min

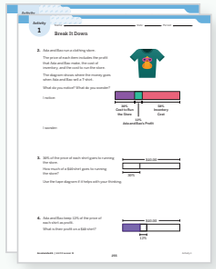
Students reason about percentages given a visual representation.



Activity 1

Pairs | 10 min

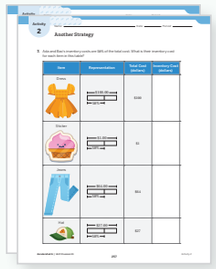
Students explore how to calculate A% of B by determining the amount for 1% and then multiplying by the percentage. **Routine:** Notice and Wonder



Activity 2

Pairs | 10 min

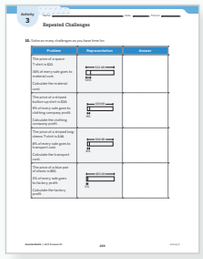
Students explore how to calculate A% of B by thinking of the percentage as that many cents per dollar, then multiplying by the whole.



Activity 3

Pairs | 10 min

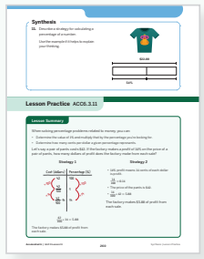
Students build procedural fluency in solving problems with any percentage. **(MTR.3.1)**



Synthesis

Whole Class | 5 min

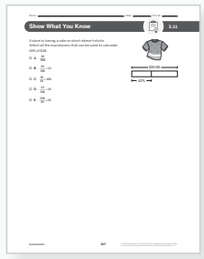
Students synthesize strategies for calculating any percentage of a number. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by identifying the expressions that can be used to calculate any percentage.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Coloring tools (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students reason about percentages given a visual representation.

1 Launch

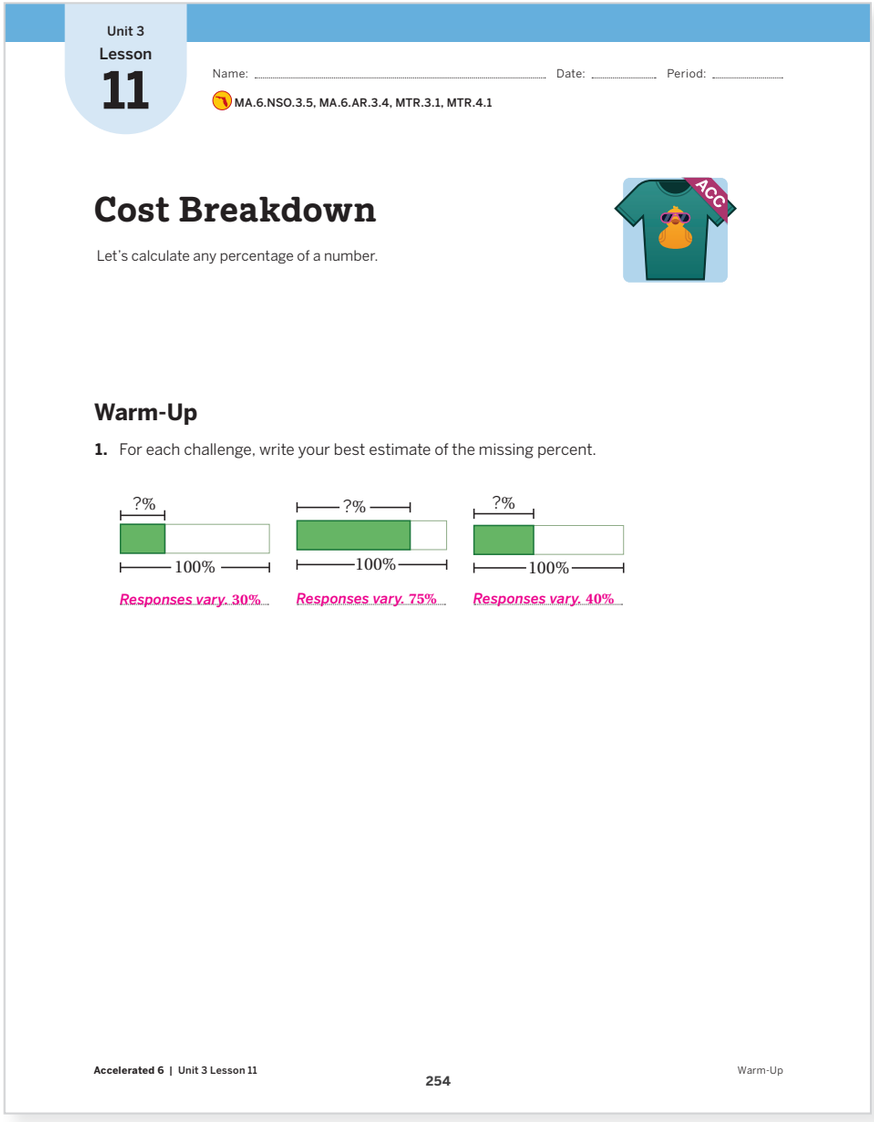
Consider doing the first estimation together as a class.

Invite students to get feedback from a partner throughout the lesson.

2 Connect

Invite pairs of students to share their strategies for determining their estimate of the missing percent.

Consider asking, "What percentages were helpful to use as a reference?" I can visualize 10%, 25%, 50%, and 75% and compare what I am looking at to those percentages.



Unit 3
Lesson
11

Name: Date: Period:

MA.6.NSO.3.5, MA.6.AR.3.4, MTR.3.1, MTR.4.1

Cost Breakdown

Let's calculate any percentage of a number.

Warm-Up

1. For each challenge, write your best estimate of the missing percent.

?% — 100%
Responses vary. 30%

?% — 100%
Responses vary. 75%

?% — 100%
Responses vary. 40%

Accelerated 6 | Unit 3 Lesson 11 254 Warm-Up

Pairs | 10 min

Activity 1 Break It Down

Purpose: Students explore how to calculate A% of B by determining the amount for 1% and then multiplying by the percentage.

Short on time? Consider omitting the short discussion in Problem 5 and instead Connect in Problem 5.

1 Launch

Use the Notice and Wonder routine to promote curiosity and help students make sense of the task. See the Routine Facilitation Guide for more information.

To surface connections, consider asking:

- "What do these categories mean? What might they include?"
- "What does the whole represent? What is the sum of these percentages? Why does that make sense?"

Note: If it does not come up naturally, consider sharing with students what *profit* and *inventory* mean.

2 Monitor

To support students getting started, consider asking:

- "If 10% of the price of each shirt went toward running the store, how much of a $40 shirt goes toward running the store?"
- "What representations could you use to make sense of this situation?"

A Accessibility: Visual-Spatial Processing As students interpret visual representations, provide coloring tools and suggest they color code each tape diagram to help with their estimations or calculations throughout the lesson.

Look and listen for a variety of thinking and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What is a number you know is too low? Too high?"
Use 10% as a benchmark and respond with answers slightly above $4.	**Strengthen** Celebrate students' use of estimation. Encourage students to use a table or double number line. Consider asking, "What ratios can you include in your representation?"
Use strategies similar to Ada's strategy in Problem 8.	**Strengthen** Invite students to compare strategies with a partner who got the same answer.
Use strategies similar to Bao's in the next problem or other creative strategies.	**Strengthen** Invite students to share their thinking during the Pause.

Note: Students explore calculating A% of B using the expression $\frac{B}{100} \cdot A$ in Activity 1 and the expression $\frac{A}{100} \cdot B$ in Activity 2.

Activity 1 continued >

Activity 1

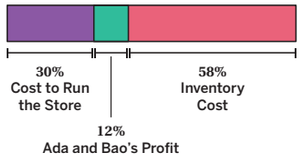
Name: Date: Period:

Break It Down

2. Ada and Bao run a clothing store.

The price of each item includes the profit that Ada and Bao make, the cost of inventory, and the cost to run the store.

The diagram shows where the money goes when Ada and Bao sell a T-shirt.



What do you notice? What do you wonder?

Responses vary.

I notice:

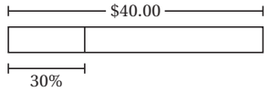
- I notice that the profit is the smallest percentage.
- I notice that they all add up to 100%.
- I notice that the inventory cost is the biggest percentage.

I wonder:

- I wonder how much of the cost to run the store goes to paying the people who work at the store.
- I wonder if Ada and Bao share the profit equally.

3. 30% of the price of each shirt goes to running the store.

How much of a $40 shirt goes to running the store?



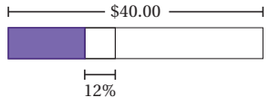
Use the tape diagram if it helps with your thinking.

$12

4. Ada and Bao keep 12% of the price of each shirt as profit.

What is their profit on a $40 shirt?

$4.80



Accelerated 6 | Unit 3 Lesson 11 255 Activity 1

Pairs | 10 min

Activity 1 Break It Down (continued)

Purpose: Students explore how to calculate A% of B by determining the amount for 1% and then multiplying by the percentage.

Short on time? Consider omitting the short discussion in Problem 5 and instead Connect in Problem 5.

2 Monitor

Pause briefly to invite students who used similar strategies to Bao or other creative strategies to share their thinking.

Encourage students to use Bao's strategy to calculate the different categories.

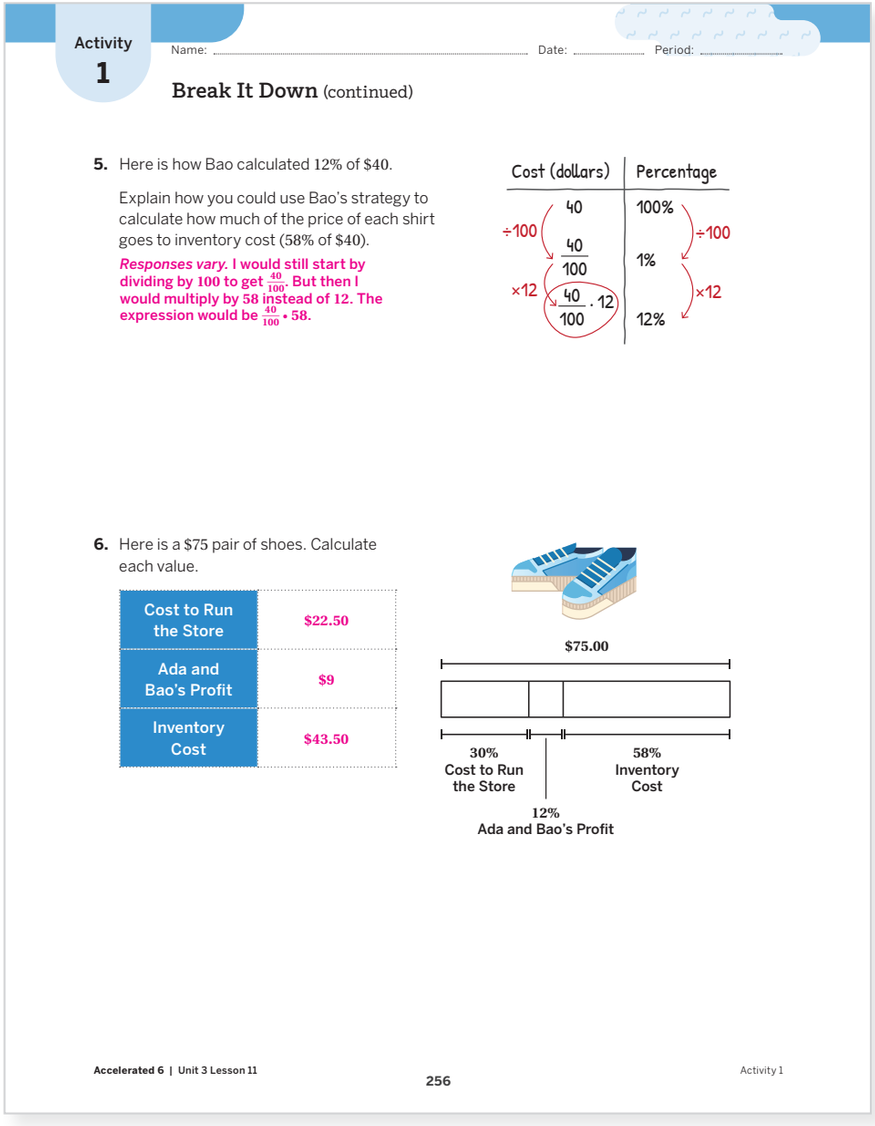
Look for students who multiply the percent by the denominator (e.g., $\frac{75}{100 \cdot 30}$). Invite them to use estimation to check the result.

3 Connect

To surface the Key Takeaway, consider asking:

- "What was Bao's first step? Why was it helpful?"
- "What does the $\frac{40}{100}$ mean in this situation?"
- "Which parts of the expression will be the same for calculating 58% of 40? Which parts will be different?" **(MTR.4.1)**

MLR **MLR1: Stronger and Clearer Each Time (optional)** Consider using this routine to support students in developing precise language. Invite students to meet with a partner, give feedback on each other's drafts, then use the feedback to write a second clearer draft. See the Routine Facilitation Guide for more information.



Activity 1

Name: Date: Period:

Break It Down (continued)

5. Here is how Bao calculated 12% of $40.

Explain how you could use Bao's strategy to calculate how much of the price of each shirt goes to inventory cost (58% of $40).

Responses vary. I would still start by dividing by 100 to get $\frac{40}{100}$. But then I would multiply by 58 instead of 12. The expression would be $\frac{40}{100} \cdot 58$.

6. Here is a $75 pair of shoes. Calculate each value.

Cost to Run the Store	$22.50
Ada and Bao's Profit	$9
Inventory Cost	$43.50

Accelerated 6 | Unit 3 Lesson 11 256 Activity 1

Key Takeaway: You can calculate A% of B by determining the amount for 1% and then multiplying by the percentage: $\frac{B}{100} \cdot A$.

Pairs | 10 min

Activity 2 Another Strategy

Purpose: Students explore how to calculate A% of B by thinking of the percentage as that many cents per dollar, then multiplying by the whole.

Short on time? Consider omitting the short discussion in Problem 8 and instead Connect in Problem 8.

1 Launch

Consider sharing with students that they are going to focus on inventory cost for several different items. Invite students to use any patterns they notice to help them.

Encourage students to use their Student Edition to show their thinking.

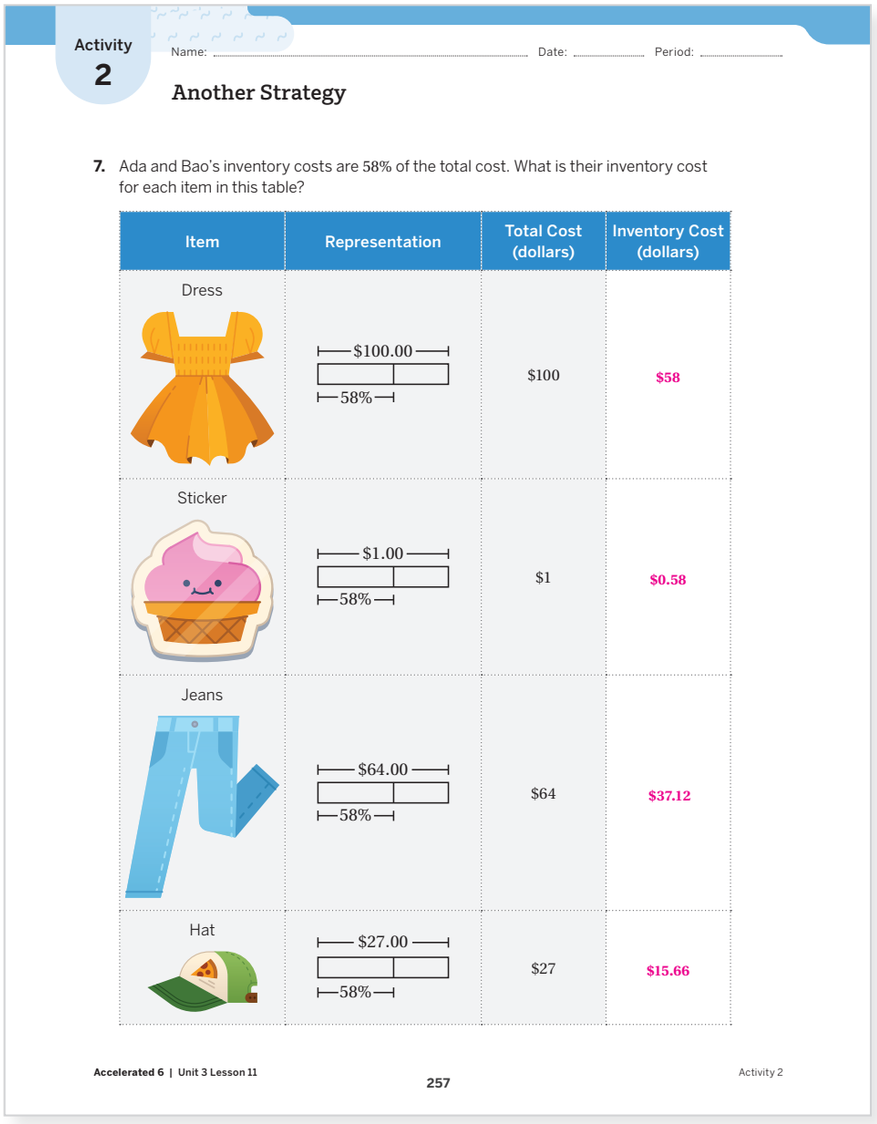
2 Monitor

Look and listen for a variety of thinking and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What does 58% mean?" Invite them to review any anchor charts or consider sharing that 58% means 58 for every 100.
Need support getting started on Jeans.	**Support** Consider asking, "What if the item were $2? $5?"
Use Bao's strategy (e.g., $\frac{64}{100} \cdot 58$).	**Strengthen** Celebrate their strategy and invite them to try another strategy. Consider asking, "How can you use the inventory cost of stickers to determine the cost of the jeans and hat?"
Write an expression using decimals to calculate the cost of the jeans and the hat (e.g., $0.58 \cdot 64$).	**Strengthen** Consider asking, "How does the decimal you wrote relate to the percentage?"
Use strategies similar to Ada's in the next problem or other creative strategies.	**Strengthen** Invite students to share their thinking during the Pause.

Activity 2 continued >



Activity 2

Name: Date: Period:

Another Strategy

7. Ada and Bao's inventory costs are 58% of the total cost. What is their inventory cost for each item in this table?

Item	Representation	Total Cost (dollars)	Inventory Cost (dollars)
Dress	$100.00, 58%	$100	$58
Sticker	$1.00, 58%	$1	$0.58
Jeans	$64.00, 58%	$64	$37.12
Hat	$27.00, 58%	$27	$15.66

Accelerated 6 | Unit 3 Lesson 11 257 Activity 2

Pairs | 10 min

Activity 2 Another Strategy (continued)

Purpose: Students explore how to calculate A% of B by thinking of the percentage as that many cents per dollar, then multiplying by the whole.

Short on time? Consider omitting the short discussion in Problem 8 and instead Connect in Problem 8.

2 Monitor

Pause briefly to invite students who used similar strategies to Ada or other creative strategies to share their thinking. Consider asking, "How is Ada's strategy different from Bao's strategy?" **(MTR.4.1)**

ELL **English Language Learners** Give students time to rehearse their ideas with a partner before they are expected to share their ideas with others. **(Reading, Writing, Speaking, and Listening)**

Invite students to explain Ada's strategy and how they would use it to calculate 36% of 15.

Listen for a variety of student thinking.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to revisit Ada's and Bao's strategies.
Match $\frac{100}{36} \cdot 48$ with "What is 36% of 48?"	**Support** Consider asking, "What is the value of $\frac{100}{36} \cdot 48$? Does it have the same value as $\frac{36}{100} \cdot 48$?"
Group expressions that have similar numbers (e.g., "All of these have 15.").	**Strengthen** Invite students to explain the meaning of each part of the expression in relation to the context and strategy.

Invite students to compare their responses with a partner, justify their matches, and make revisions based on their conversation. **(MTR.4.1)**

A **Accessibility: Executive Functioning** Chunk this activity into more manageable parts by inviting students to choose one question at a time and asking, "How might Ada solve this problem? What about Bao?"

3 Connect

To surface the Key Takeaway, consider asking:

- "Why do you think Ada divided by 100 as a first step? Why did Ada then multiply by 64?"
- "What does the $\frac{58}{100}$ mean in this situation?"
- "Which parts of the expression will be the same for calculating 36% of 15? Which parts will be different?" **(MTR.4.1)**

Activity 2

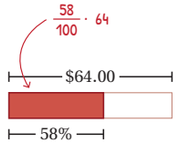
Name: Date: Period:

Another Strategy (continued)

8. Ada thinks of 58% as 58 cents for every dollar. So he writes $\frac{58}{100} \cdot 64$ to calculate 58% of \$64.

Describe how Ada might calculate 36% of \$15.

Responses vary. He would still start by dividing by 100 to get $\frac{36}{100}$. But then he would multiply by 15 instead of 64. The expression would be $\frac{36}{100} \cdot 15$.



9. Match each expression with a question. One expression will have no match.

a. $\frac{36}{100} \cdot 70$ b. $\frac{15}{100} \cdot 36$ c. $\frac{100}{36} \cdot 48$

d. $\frac{36}{100} \cdot 15$ e. $70 \div 100 \cdot 36$ f. $\frac{36}{100} \cdot 48$

What is 36% of \$15?	What is 36% of \$48?	What is 36% of \$70?
b	f	a
d		e

c has no match.

Accelerated 6 | Unit 3 Lesson 11 258 Activity 2

Key Takeaway: You can calculate A% of B by rewriting the percentage as a fraction with a denominator of 100, then multiplying by the whole: $\frac{A}{100} \cdot B$.

Pairs | 10 min

Activity 3 Repeated Challenges

Purpose: Students build procedural fluency in solving problems with any percentage. **(MTR.3.1)**

Short on time? Consider inviting students to complete fewer challenges.

1 Launch

Invite students to solve as many challenges as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly.

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

2 Monitor

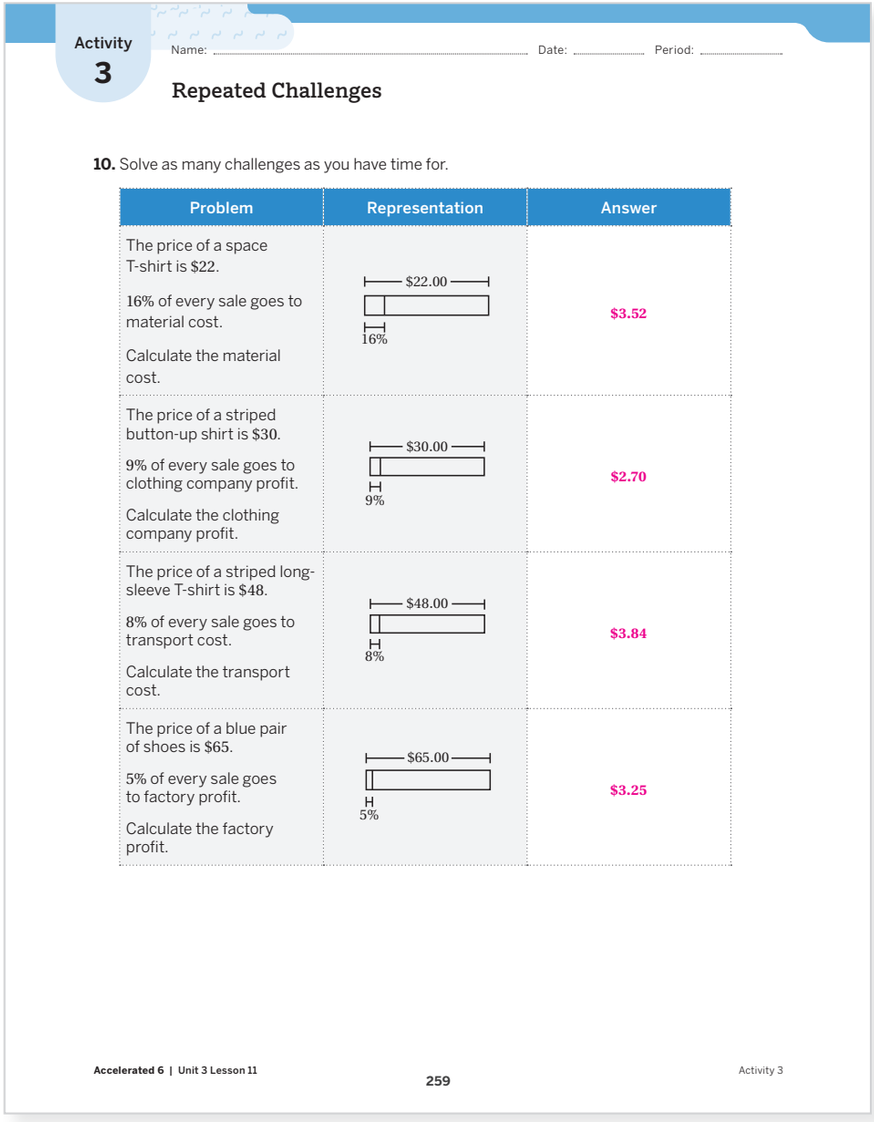
To support students getting started, invite them to revisit Ada's and Bao's strategies.

Listen for strategies students use in discussing how to solve the problems, such as:

- Dividing the whole by 100 and multiplying by the given percentage.
- Expressing the given percentage as a fraction over 100 and multiplying by the whole.
- Using various scaled percentages to determine the value of the given percentage (e.g., $24\% = 25\% - 1\%$).

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges. **(MTR.3.1)**



Activity 3

Name: Date: Period:

Repeated Challenges

10. Solve as many challenges as you have time for.

Problem	Representation	Answer
The price of a space T-shirt is \$22. 16% of every sale goes to material cost. Calculate the material cost.	\$22.00 16%	\$3.52
The price of a striped button-up shirt is \$30. 9% of every sale goes to clothing company profit. Calculate the clothing company profit.	\$30.00 9%	\$2.70
The price of a striped long-sleeve T-shirt is \$48. 8% of every sale goes to transport cost. Calculate the transport cost.	\$48.00 8%	\$3.84
The price of a blue pair of shoes is \$65. 5% of every sale goes to factory profit. Calculate the factory profit.	\$65.00 5%	\$3.25

Accelerated 6 | Unit 3 Lesson 11 259 Activity 3

Whole Class | 5 min

Synthesis

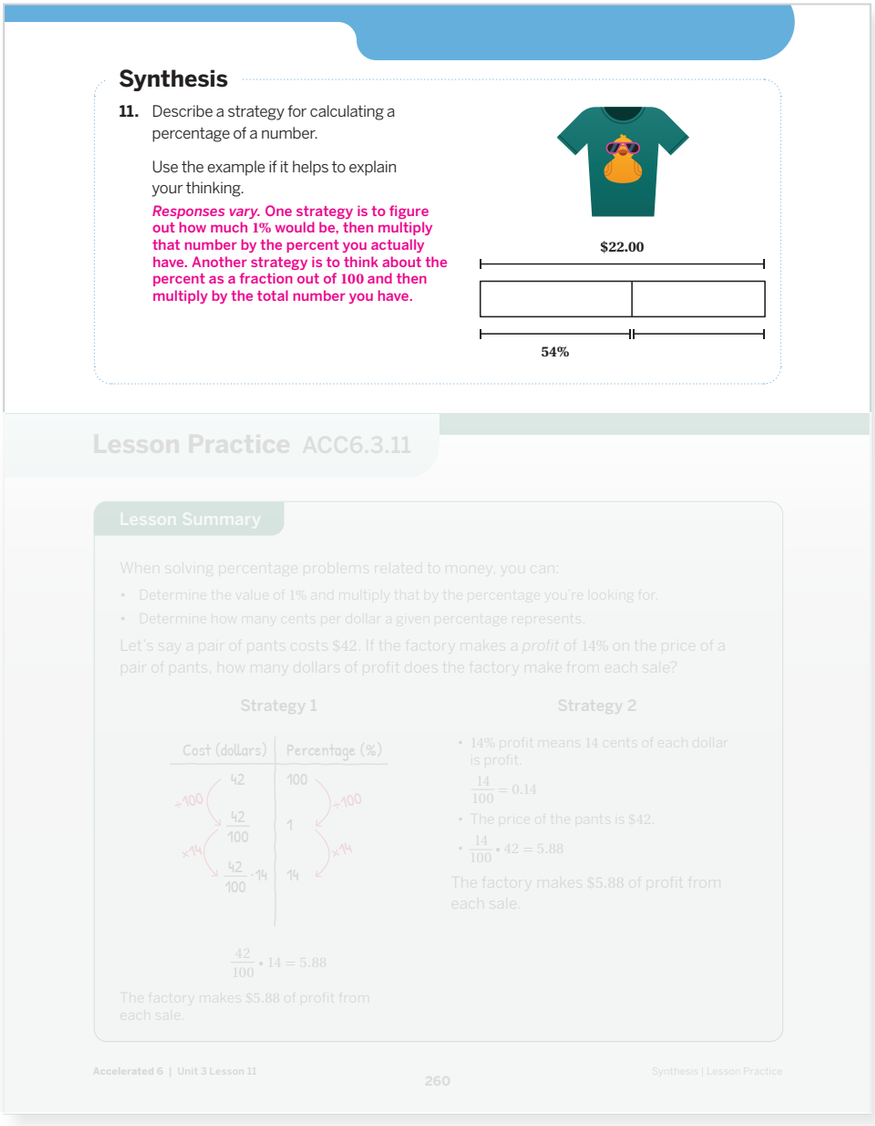
Purpose: Students synthesize strategies for calculating any percentage of a number.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Converting the percentage into a fraction with a denominator of 100 and multiplying it by the whole.
- Calculating 1% using unit rates, then multiplying by the desired percentage.
- Switching the whole and percentage will result in the same value. (e.g., 54% of 22 = 22% of 54).

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for calculating a percentage of a number using students' language. Display any new language, examples, or diagrams for students to reference later.



Synthesis

11. Describe a strategy for calculating a percentage of a number.

Use the example if it helps to explain your thinking.

Responses vary. One strategy is to figure out how much 1% would be, then multiply that number by the percent you actually have. Another strategy is to think about the percent as a fraction out of 100 and then multiply by the total number you have.

Lesson Practice ACC6.3.11

Lesson Summary

When solving percentage problems related to money, you can:

- Determine the value of 1% and multiply that by the percentage you're looking for.
- Determine how many cents per dollar a given percentage represents.

Let's say a pair of pants costs $42. If the factory makes a *profit* of 14% on the price of a pair of pants, how many dollars of profit does the factory make from each sale?

Strategy 1

Cost (dollars)	Percentage (%)
42	100
$\frac{42}{100}$	1
$\frac{42}{100} \cdot 14$	14

$\frac{42}{100} \cdot 14 = 5.88$

The factory makes $5.88 of profit from each sale.

Strategy 2

- 14% profit means 14 cents of each dollar is profit.
- $\frac{14}{100} = 0.14$
- The price of the pants is $42.
- $\frac{14}{100} \cdot 42 = 5.88$

The factory makes $5.88 of profit from each sale.

Accelerated 6 | Unit 3 Lesson 11 260 Synthesis | Lesson Practice

Lesson Takeaway: There are multiple strategies to calculate A% of B. One way is by rewriting the percentage as a fraction with a denominator of 100, then multiplying by the whole: $\frac{A}{100} \cdot B$. Another is by determining the amount for 1% and then multiplying by the percentage: $\frac{B}{100} \cdot A$.

Independent | 5 min

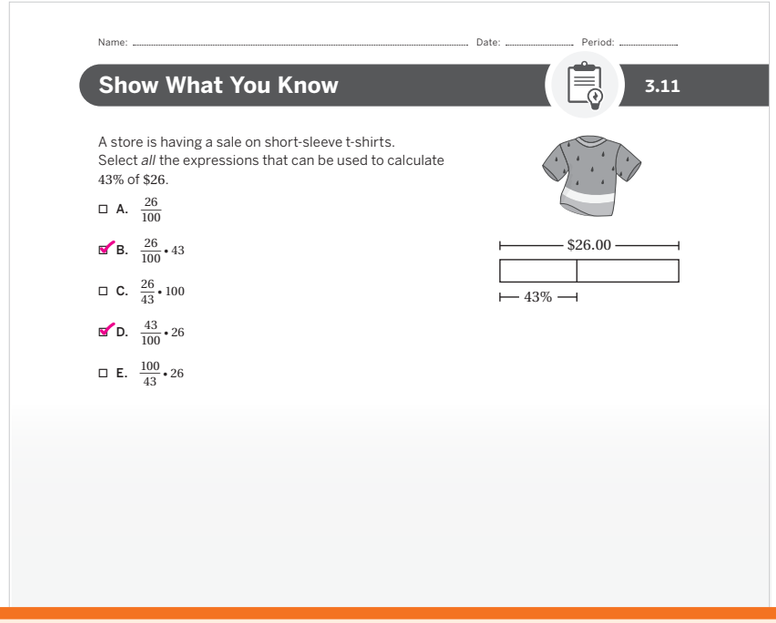
Show What You Know

Purpose: Students demonstrate their understanding by identifying the expressions that can be used to calculate any percentage.

Today's Goal

1. **Goal:** Calculate any percentage of a number (e.g., 32% of 40).
2. **Language Goal:** Explain why A% of B can be calculated as $\frac{B}{100} \cdot A$ or $\frac{A}{100} \cdot B$. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 3.11

A store is having a sale on short-sleeve t-shirts.
Select *all* the expressions that can be used to calculate 43% of $26.

- ☐ A. $\frac{26}{100}$
- ☑ B. $\frac{26}{100} \cdot 43$
- ☐ C. $\frac{26}{43} \cdot 100$
- ☑ D. $\frac{43}{100} \cdot 26$
- ☐ E. $\frac{100}{43} \cdot 26$

D Differentiation Use after Lesson 11

Support

Provide targeted intervention for students by using these resources.

If students need support calculating the percentage of any number:

» **Respond to Student Thinking:**

- Revisit Bao's Strategy in **Activity 1** or Ada's Strategy in **Activity 2** and invite students to apply one of these strategies to a new problem.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to interview an entrepreneur in their community. Encourage them to ask about specific expenses and percentages that are used in their work.

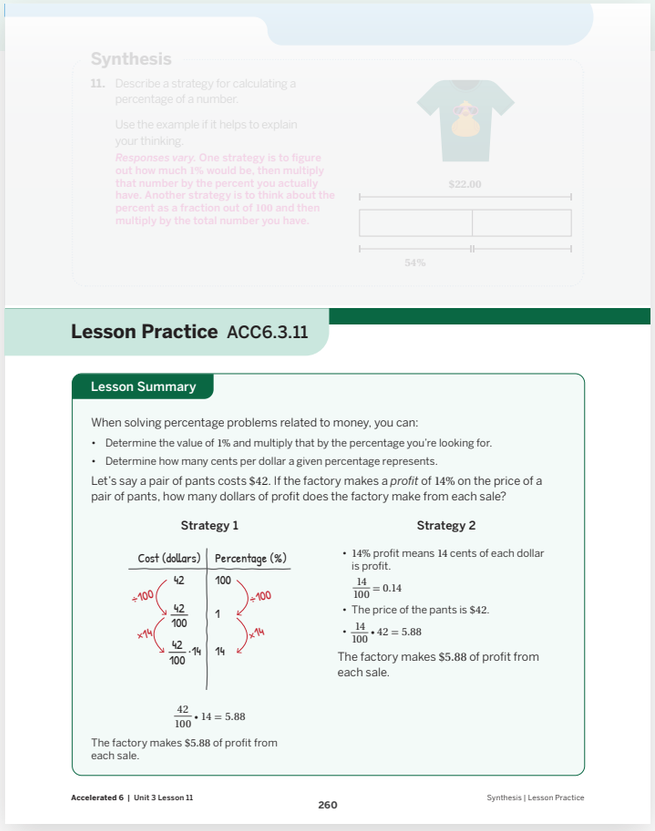
Professional Learning

Consider the next several lessons you will teach. How will students' work today in Activity 1 and Activity 2 prepare them for calculating an unknown percentage in Lesson 12? What are ways that you might refer back to students' strategies from this lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

11. Describe a strategy for calculating a percentage of a number.

Use the example if it helps to explain your thinking.

Responses vary. One strategy is to figure out how much 1% would be, then multiply that number by the percent you actually have. Another strategy is to think about the percent as a fraction out of 100 and then multiply by the total number you have.

Lesson Practice ACC6.3.11

Lesson Summary

When solving percentage problems related to money, you can:

- Determine the value of 1% and multiply that by the percentage you're looking for.
- Determine how many cents per dollar a given percentage represents.

Let's say a pair of pants costs $42. If the factory makes a *profit* of 14% on the price of a pair of pants, how many dollars of profit does the factory make from each sale?

Strategy 1

Cost (dollars)	Percentage (%)
42	100
$\frac{42}{100}$	1
$\frac{42}{100} \cdot 14$	14

÷100 ×100 ×14

$\frac{42}{100} \cdot 14 = 5.88$

The factory makes $5.88 of profit from each sale.

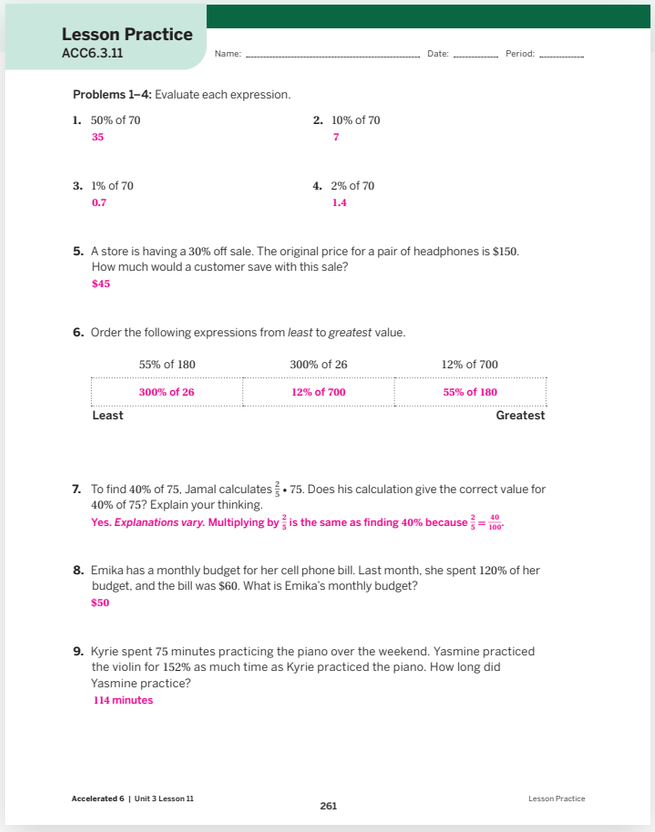
Strategy 2

- 14% profit means 14 cents of each dollar is profit.

$\frac{14}{100} = 0.14$

- The price of the pants is $42.
- $\frac{14}{100} \cdot 42 = 5.88$

The factory makes $5.88 of profit from each sale.



Lesson Practice ACC6.3.11

Name: _____ Date: _____ Period: _____

Problems 1–4: Evaluate each expression.

1. 50% of 70
   35
2. 10% of 70
   7
3. 1% of 70
   0.7
4. 2% of 70
   1.4

5. A store is having a 30% off sale. The original price for a pair of headphones is $150. How much would a customer save with this sale?
   $45

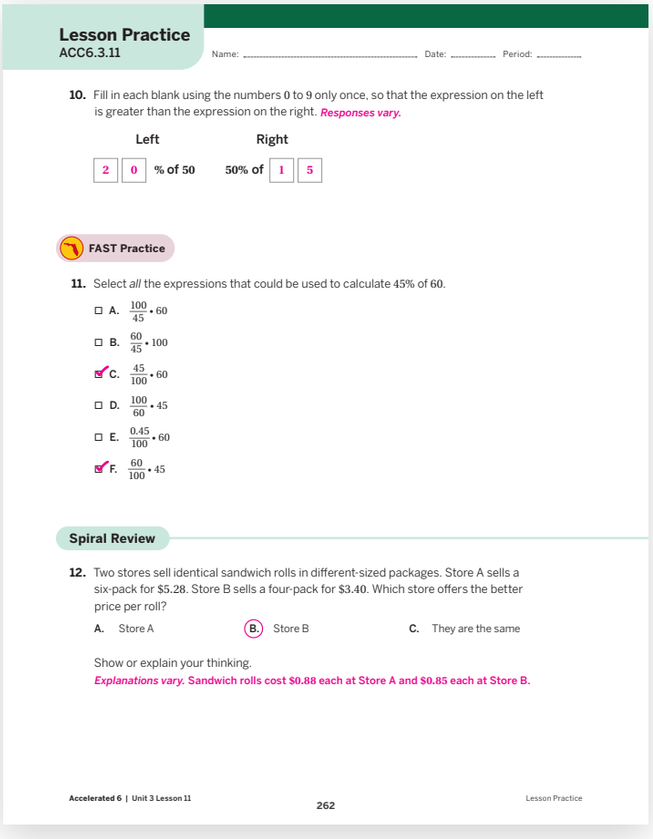
6. Order the following expressions from *least* to *greatest* value.

55% of 180	300% of 26	12% of 700
300% of 26	**12% of 700**	**55% of 180**
Least		**Greatest**

7. To find 40% of 75, Jamal calculates $\frac{2}{5} \cdot 75$. Does his calculation give the correct value for 40% of 75? Explain your thinking.
   Yes. *Explanations vary.* Multiplying by $\frac{2}{5}$ is the same as finding 40% because $\frac{2}{5} = \frac{40}{100}$.

8. Emika has a monthly budget for her cell phone bill. Last month, she spent 120% of her budget, and the bill was $60. What is Emika's monthly budget?
   $50

9. Kyrie spent 75 minutes practicing the piano over the weekend. Yasmine practiced the violin for 152% as much time as Kyrie practiced the piano. How long did Yasmine practice?
   114 minutes



Lesson Practice ACC6.3.11

Name: _____ Date: _____ Period: _____

10. Fill in each blank using the numbers 0 to 9 only once, so that the expression on the left is greater than the expression on the right. *Responses vary.*

Left			Right		
2	0	% of 50	50% of	1	5

FAST Practice

11. Select *all* the expressions that could be used to calculate 45% of 60.

- ☐ A. $\frac{100}{45} \cdot 60$
- ☐ B. $\frac{60}{45} \cdot 100$
- ☑ C. $\frac{45}{100} \cdot 60$
- ☐ D. $\frac{100}{60} \cdot 45$
- ☐ E. $\frac{0.45}{100} \cdot 60$
- ☑ F. $\frac{60}{100} \cdot 45$

Spiral Review

12. Two stores sell identical sandwich rolls in different-sized packages. Store A sells a six-pack for $5.28. Store B sells a four-pack for $3.40. Which store offers the better price per roll?

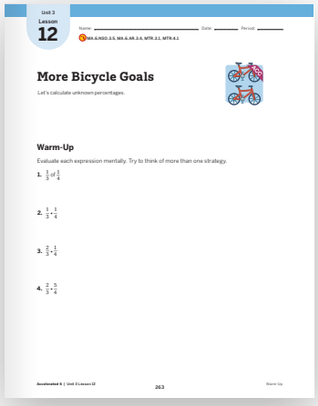
A. Store A (B.) Store B C. They are the same

Show or explain your thinking.

Explanations vary. **Sandwich rolls cost $0.88 each at Store A and $0.85 each at Store B.**

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.6.AR.3.4
	5–9	2	MA.6.AR.3.4
	10	3	MA.6.AR.3.4
FAST Practice	11	2	MA.6.AR.3.4
Spiral Review			
	12	1	MA.6.AR.3.5


Unit 3
Lesson
12
Name: _____ Date: _____ Period: _____
MA.6.NSO.3.5, MA.6.AR.3.4, MTR.3.1, MTR.4.1
More Bicycle Goals
Let's calculate unknown percentages.
Warm-Up
Evaluate each expression mentally. Try to think of more than one strategy.
1. $\frac{1}{2}$ of $\frac{1}{4}$
2. $\frac{1}{2} - \frac{1}{4}$
3. $\frac{3}{4} + \frac{1}{4}$
4. $\frac{2}{3} \cdot \frac{3}{4}$
Accelerated 6 | Unit 3 Lesson 12
263
Warm-Up

More Bicycle Goals

Unknown Percentages

Let's calculate unknown percentages.

Learning Outcomes

Today's Learning

1. **Goal:** Calculate an unknown percentage (e.g., 32 is what percent of 40?).
2. **Language Goal:** Analyze different expressions for calculating a percentage. **(Reading and Writing)**

Students continue to develop and use one or more strategies to calculate any unknown percentages, including percentages greater than 100. They make connections between strategies for calculating unknown percentages and expressions. They work with their peers to analyze the mathematical processes of others as they explore writing expressions for percentages.

Coherence

Prior Learning

In Lesson 10, students analyzed problems with unknown percentages that were less than 100%. In Lesson 11, students developed and used a variety of strategies for calculating any percentage of a number.

Future Learning

In Lesson 13, students will apply strategies to calculate unknown percentages to analyze characteristics of a Florida county's population.

Connections

- Students make connections between ratios and percents while revisiting travel by bicycle. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

MA.6.AR.3.4
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.

Mathematical Thinking and Reasoning Standards: MTR.3.1, MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.3.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.FR.1.2	MA.7.NSO.1.2
MA.5.NSO.2.1	MA.7.AR.3.1
MA.5.NSO.2.2	
MA.5.FR.1.1	

Lesson at a Glance

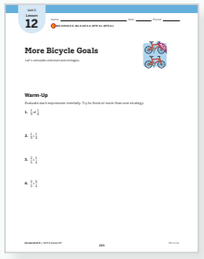
~ 45 min

MA.6.NSO.3.5, MA.6.AR.3.4

Warm-Up

Whole Class | 5 min

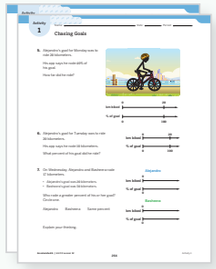
Students discuss strategies for multiplying fractions by fractions. **Routine:** Number Talk **(MTR.4.1)**



Activity 1

Pairs | 15 min

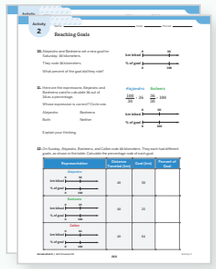
Students explore strategies to calculate an unknown percentage.



Activity 2

Pairs | 15 min

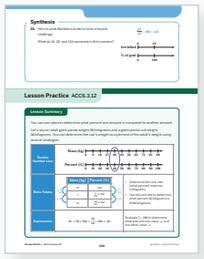
Students make connections between strategies for calculating an unknown percentage, including ones greater than 100%. **Routine:** Decide and Defend



Synthesis

Whole Class | 5 min

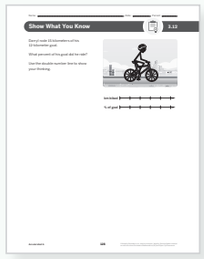
Students synthesize their understanding of calculating the percent of a number using a variety of strategies including double number lines, tables, and expressions. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by using a double number line diagram to determine a percentage greater than 100%.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Whole Class | 5 min

Warm-Up

Purpose: Students discuss strategies for multiplying fractions by fractions. **(MTR.4.1)**

1 Launch

Direct students' attention to the expressions one at a time.

Use the Number Talk routine to support students in multiplying whole numbers by fractions.

Invite students to mentally evaluate the first expression independently. Then record a variety of strategies, along with the name of the students who shared them.

Consider asking, "Who thought about it in a different way?" **(MTR.4.1)**

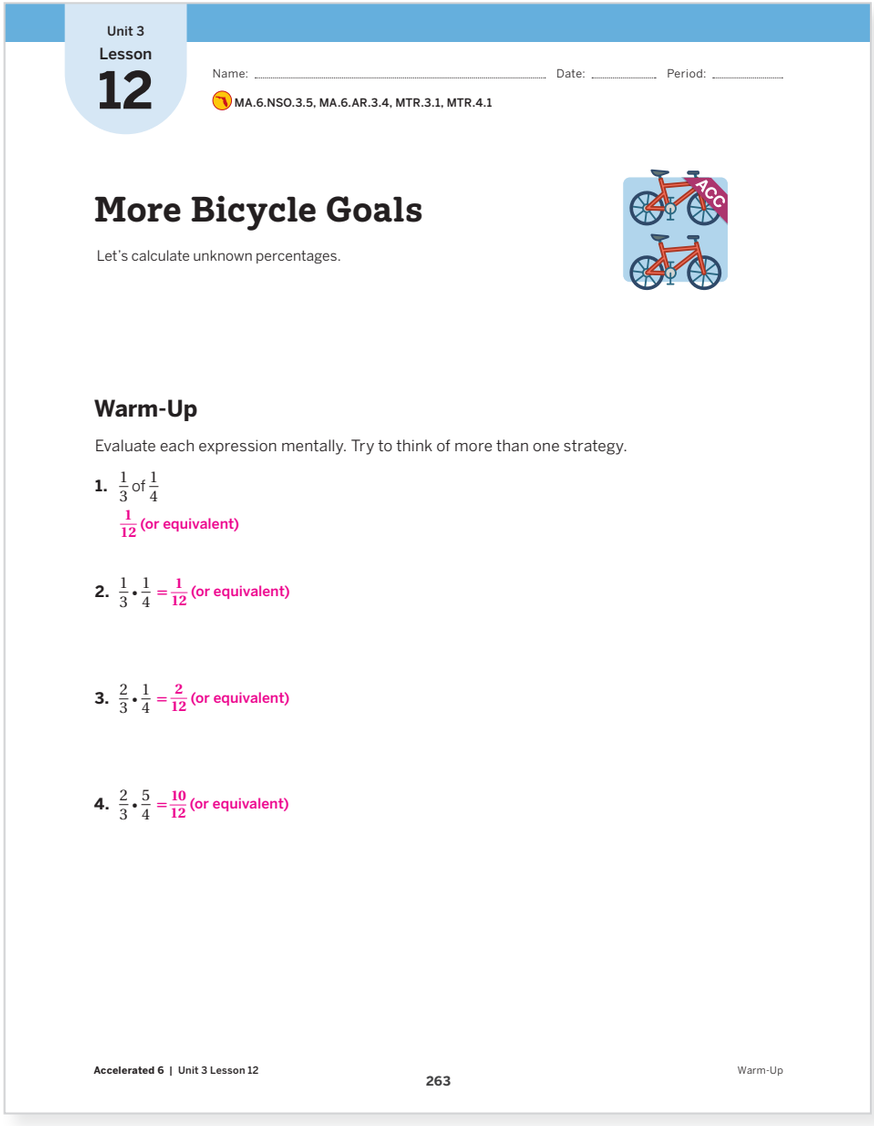
Note: This structure is repeated for each problem in the Number Talk.

2 Connect

Invite students to compare and contrast the different expressions and strategies.

Consider asking:

- "What connections do you notice among the strategies we've discussed?"
- "What connections do you notice among the different expressions?"
- "How might the second product help you determine the third one? Fourth one?"



Unit 3
Lesson
12

Name: _____ Date: _____ Period: _____

MA.6.NSO.3.5, MA.6.AR.3.4, MTR.3.1, MTR.4.1

More Bicycle Goals

Let's calculate unknown percentages.

Warm-Up

Evaluate each expression mentally. Try to think of more than one strategy.

1. $\frac{1}{3}$ of $\frac{1}{4}$

   $\frac{1}{12}$ (or equivalent)

2. $\frac{1}{3} \cdot \frac{1}{4} = \frac{1}{12}$ (or equivalent)

3. $\frac{2}{3} \cdot \frac{1}{4} = \frac{2}{12}$ (or equivalent)

4. $\frac{2}{3} \cdot \frac{5}{4} = \frac{10}{12}$ (or equivalent)

Accelerated 6 | Unit 3 Lesson 12 263 Warm-Up

Pairs | 15 min

Activity 1 Chasing Goals

Purpose: Students explore strategies to calculate an unknown percentage.

Short on time? Consider omitting the short discussion in Problem 7 and instead Connect in Problem 9.

1 Launch

To surface prior knowledge, invite students to share what they recall about bicycle goals from Lesson 9.

Invite students to get feedback from a partner throughout the lesson.

Encourage students to use their calculator or Student Edition to show their thinking.

2 Monitor

To support students getting started, consider asking, "What fraction of Alejandro's goal did he ride?"

Look and listen for a variety of strategies.

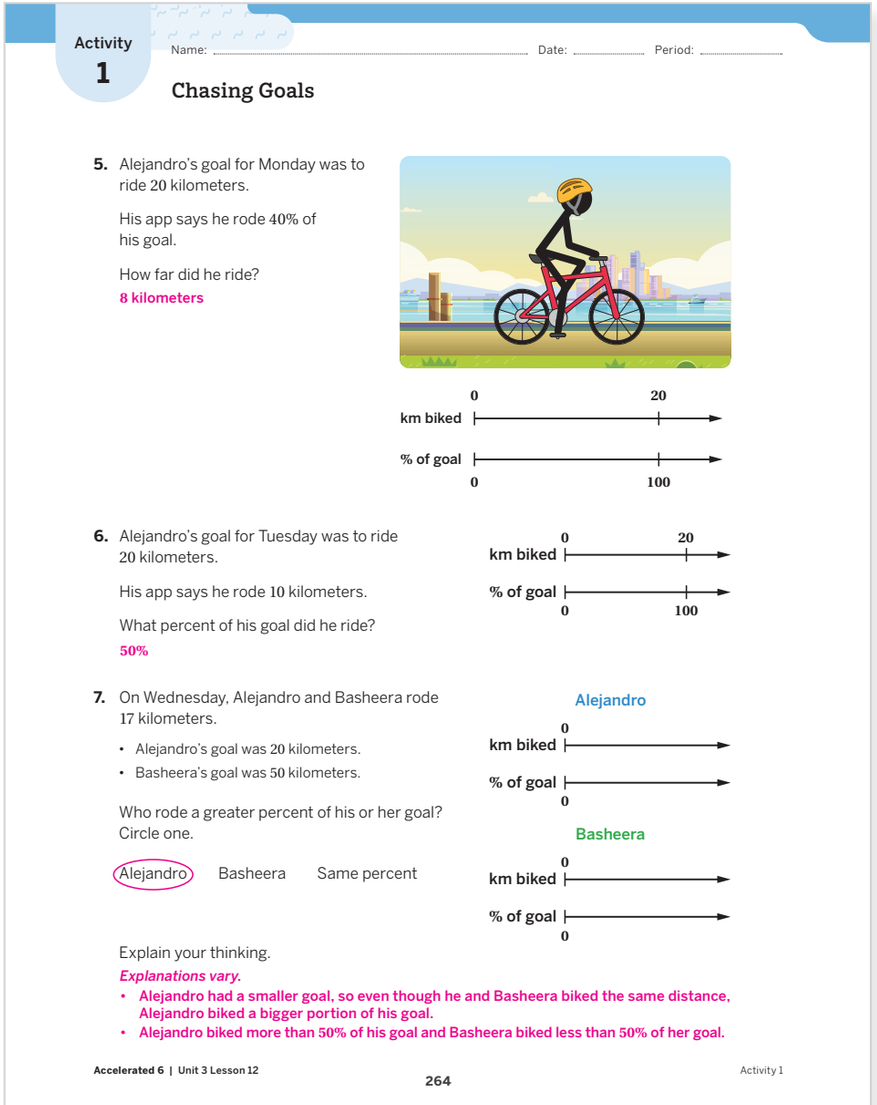
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Where would you put the goal on each of the double number lines? What percent would it be?"
Think they need to calculate Alejandro's and Basheera's percentage to answer the question.	**Support** Consider asking, "Do you need to know the exact percentage to decide whose was greater?"
Select "Alejandro" with an incomplete explanation.	**Strengthen** Invite students to compare their thinking with a peer and make their explanation stronger and clearer. **(MTR.4.1)**
Select "Alejandro" with a robust explanation.	**Stretch** Consider asking, "How far would Basheera need to travel to reach the same percent of her goal as Alejandro?"

Pause briefly to display the distribution of responses, calling attention to any conflict or consensus you see.

Note: In the next problem, students will attempt to determine Alejandro's exact percentage. Consider focusing this discussion on using reasoning instead of exact percentages.

Activity 1 continued >



Activity 1

Name: Date: Period:

Chasing Goals

5. Alejandro's goal for Monday was to ride 20 kilometers.

His app says he rode 40% of his goal.

How far did he ride?

8 kilometers

6. Alejandro's goal for Tuesday was to ride 20 kilometers.

His app says he rode 10 kilometers.

What percent of his goal did he ride?

50%

7. On Wednesday, Alejandro and Basheera rode 17 kilometers.

- Alejandro's goal was 20 kilometers.
- Basheera's goal was 50 kilometers.

Who rode a greater percent of his or her goal? Circle one.

(Alejandro) Basheera Same percent

Alejandro

Basheera

Explain your thinking.

Explanations vary.

- Alejandro had a smaller goal, so even though he and Basheera biked the same distance, Alejandro biked a bigger portion of his goal.
- Alejandro biked more than 50% of his goal and Basheera biked less than 50% of her goal.

Accelerated 6 | Unit 3 Lesson 12 264 Activity 1

Pairs | 15 min

Activity 1 Chasing Goals (continued)

Purpose: Students explore strategies to calculate an unknown percentage.

Short on time? Consider omitting the short discussion in Problem 7 and instead Connect in Problem 9.

2 Monitor

To support students getting started, consider asking, "What is a number you know is too low? Too high?"

Note: In the next problem, students will be presented with one strategy for solving problems like these. It is okay if students use reasoning or guess-and-check strategies here.

Look for students who use strategies similar to Alejandro's in the next problem or other creative strategies. Invite these students to share their thinking during the Connect.

Select and sequence several student responses.

D **Differentiation: (Stretch)** Encourage students to calculate 13 out of 20 as a percentage in one or two other ways.

3 Connect

To surface the Key Takeaway, consider asking:

- "Why do you think Alejandro multiplied by $\frac{1}{20}$ as a first step? Why did he then multiply by 17?"
- "What does the $\frac{100}{20}$ mean in the situation?"
- "Which parts of the expression will be the same for calculating 13 out of 20? Which parts will be different?" **(MTR.4.1)**

A **Accessibility: Memory and Attention** Use MLR2: Collect and Display to capture students' words and sketches for them to reference to activate prior knowledge.

MLR **MLR1: Stronger and Clearer Each Time (optional)** Consider using this routine to support students in developing precise language. Invite students to meet with a partner, give feedback on each other's drafts, then use the feedback to write a second clearer draft. See the Routine Facilitation Guide for more information.

Activity 1

Name: Date: Period:

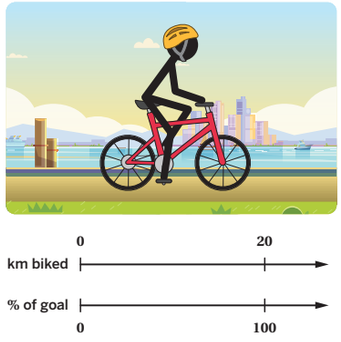
Chasing Goals (continued)

8. On Wednesday, Alejandro and Basheera rode 17 kilometers.

Alejandro's goal was 20 kilometers.

What percent of his goal did he ride?

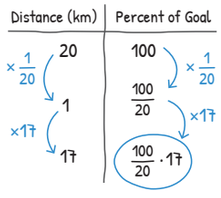
85%



9. Here is how Alejandro calculated 17 out of 20 as a percentage.

Explain how you could use Alejandro's strategy to calculate 13 out of 20 as a percentage.

Responses vary. You would still start by dividing 100 by 20 to determine what percent of the goal 1 kilometer is. Since you want to know what percent of the goal 13 kilometers is, you would multiply by 13 instead of 17. The expression would be $\frac{100}{20} \cdot 13$.



Accelerated 6 | Unit 3 Lesson 12 265 Activity 1

Key Takeaway: You can express A out of B as a percentage by determining the unit rate then multiplying by A: $\frac{100}{B} \cdot A$.

Pairs | 15 min

Activity 2 Reaching Goals

Purpose: Students make connections between strategies for calculating an unknown percentage, including ones greater than 100%.

Short on time? Consider completing Problem 13 as a class.

1 Launch

Direct students' attention to the prompt and read it aloud as a class.

Consider inviting students to share how this situation is similar to and different from the previous one.

2 Monitor

To support students getting started, consider asking, "Do you think they biked less or more than 100% of their goal? How do you know?"

Note: This is the first problem in which students calculate a percentage over 100%.

Look for students who enter both expressions in the calculator and get the same value. Encourage these students to make sense of each part of the expressions and consider asking, "Will Basheera's strategy work for any two numbers?" **(MTR.3.1, MTR.4.1)**

Look and listen for a variety of thinking and strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to estimate where 40 kilometers is on each of the three number lines and to calculate the number of kilometers for other friendly percentages.
Use 40 as a denominator (e.g., $\frac{100}{40} \cdot 50$ or $\frac{50}{40} \cdot 100$).	**Support** Invite students to revisit Alejandro's strategy in the previous problem.
Accurately determine all three percentages.	**Stretch** Invite students to use a different strategy for each row and reflect on whether the values affect the type of strategy they use or prefer.

Activity 2 continued >

Activity 2

Name: Date: Period:

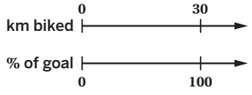
Reaching Goals

10. Alejandro and Basheera set a new goal for Saturday: 30 kilometers.

They rode 36 kilometers.

What percent of the goal did they ride?

120%



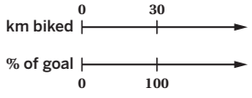
11. Here are the expressions Alejandro and Basheera used to calculate 36 out of 30 as a percentage.

Alejandro: $\frac{100}{30} \cdot 36$ Basheera: $\frac{36}{30} \cdot 100$

Whose expression is correct? Circle one.

Alejandro Basheera

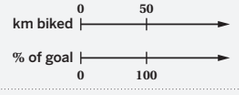
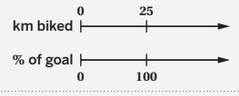
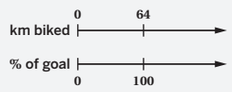
Both Neither



Explain your thinking.

Explanations vary. Even though their expressions look different, they have the same value (120). Both expressions multiply 36 and 100 and divide by 30.

12. On Sunday, Alejandro, Basheera, and Callen rode 40 kilometers. They each had different goals, as shown in the table. Calculate the percentage rode of each goal.

Representation	Distance Traveled (km)	Goal (km)	Percent of Goal
Alejandro 	40	50	80%
Basheera 	40	25	160%
Callen 	40	64	62.5%

Accelerated 6 | Unit 3 Lesson 12 266 Activity 2

Pairs | 15 min

Activity 2 Reaching Goals (continued)

Purpose: Students make connections between strategies for calculating an unknown percentage, including ones greater than 100%.

Short on time? Consider completing Problem 13 as a class.

2 Monitor

Invite students to compare their responses with a partner, justify their matches, and make revisions based on their conversation. **(MTR.4.1)**

A **Accessibility: Executive Function** Invite students to focus on one choice at a time to support students in carrying out multiple steps.

D **Differentiation: (Stretch)** Invite students to write a percentage question and double number line that will match the remaining choice.

D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore percentages over 100% further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Display the distribution of responses.

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others.

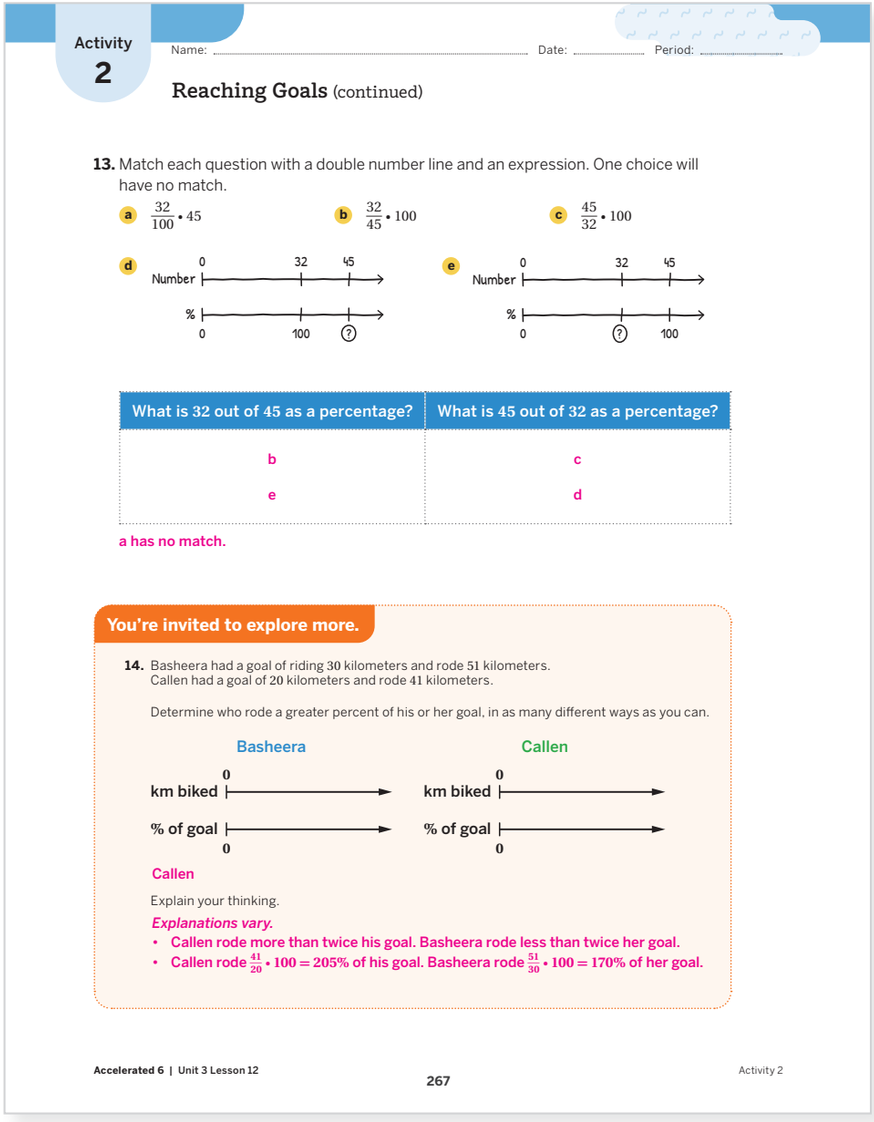
ELL **English Language Learners** Invite students to rehearse their ideas with a partner before they share them with others. **(Writing and Speaking)**

Invite students who made different choices to use reasoning to convince their classmates of their choice.

Note: If everyone is in agreement, consider making a class argument using different students' reasoning.

Consider asking:

- "What reasoning or evidence supports your claim?"
- "Which expression do you prefer? Why?"
- "How could you convince someone that the expression $\frac{30}{36} \cdot 100$ is incorrect?"



Activity 2

Name: Date: Period:

Reaching Goals (continued)

13. Match each question with a double number line and an expression. One choice will have no match.

a. $\frac{32}{100} \cdot 45$ b. $\frac{32}{45} \cdot 100$ c. $\frac{45}{32} \cdot 100$

d.

e.

What is 32 out of 45 as a percentage?	What is 45 out of 32 as a percentage?
b	c
e	d

a has no match.

You're invited to explore more.

14. Basheera had a goal of riding 30 kilometers and rode 51 kilometers. Callen had a goal of 20 kilometers and rode 41 kilometers.

Determine who rode a greater percent of his or her goal, in as many different ways as you can.

Basheera

Callen

Callen

Explain your thinking.

Explanations vary.

- Callen rode more than twice his goal. Basheera rode less than twice her goal.
- Callen rode $\frac{41}{20} \cdot 100 = 205\%$ of his goal. Basheera rode $\frac{51}{30} \cdot 100 = 170\%$ of her goal.

Accelerated 6 | Unit 3 Lesson 12 267 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of calculating the percent of a number using a variety of strategies including double number lines, tables, and expressions.

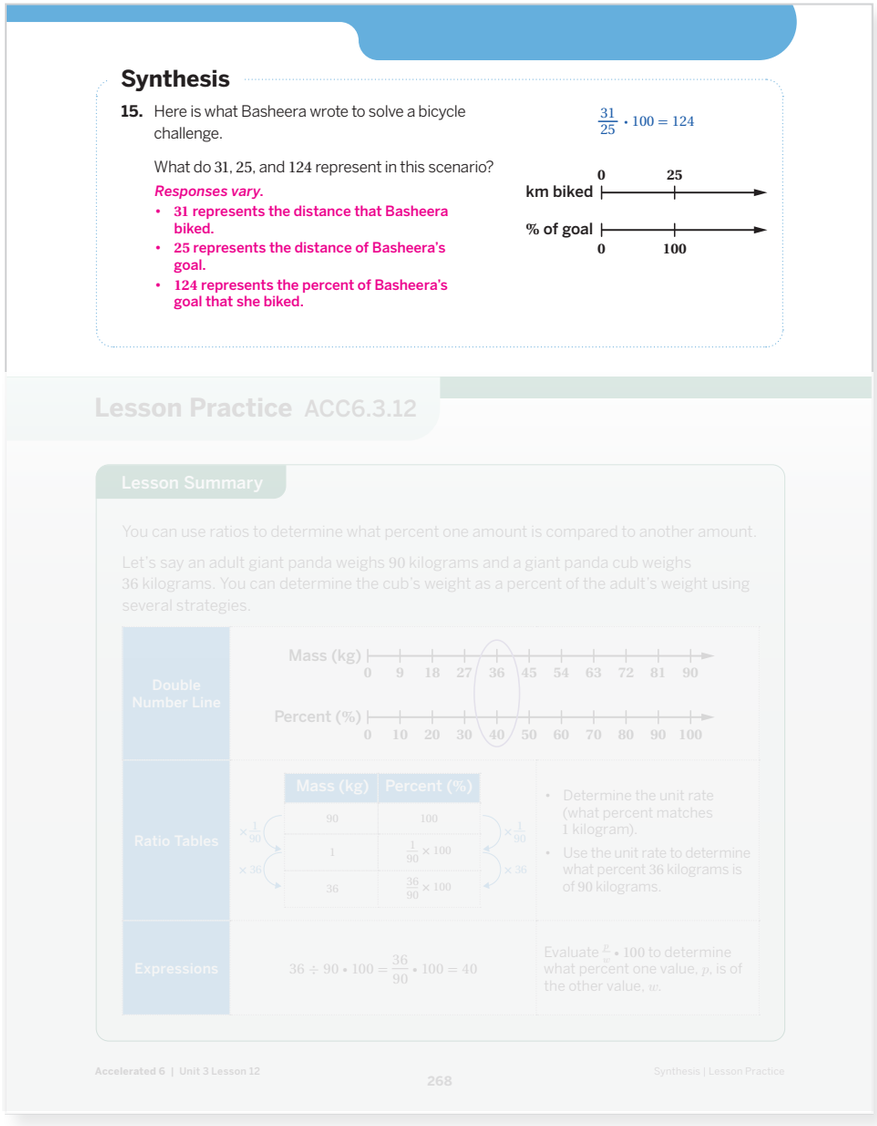
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Since 31 is greater than 25, the percentage will be greater than 100%.
- Both expressions $\frac{100}{25} \cdot 31$ and $\frac{31}{25} \cdot 100$ can be used to determine the percent of Basheera's goal that she biked.
- This expression answers the question, "What is 31 out of 25?".

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for calculating the percent of a number using students' language. Display any new language, examples, or diagrams for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

15. Here is what Basheera wrote to solve a bicycle challenge.

$\frac{31}{25} \cdot 100 = 124$

What do 31, 25, and 124 represent in this scenario?

Responses vary.

- 31 represents the distance that Basheera biked.
- 25 represents the distance of Basheera's goal.
- 124 represents the percent of Basheera's goal that she biked.

Lesson Practice ACC6.3.12

Lesson Summary

You can use ratios to determine what percent one amount is compared to another amount.

Let's say an adult giant panda weighs 90 kilograms and a giant panda cub weighs 36 kilograms. You can determine the cub's weight as a percent of the adult's weight using several strategies.

Double Number Line

Ratio Tables

Mass (kg)	Percent (%)
90	100
1	$\frac{1}{90} \times 100$
36	$\frac{36}{90} \times 100$

- Determine the unit rate (what percent matches 1 kilogram).
- Use the unit rate to determine what percent 36 kilograms is of 90 kilograms.

Expressions

$36 \div 90 \cdot 100 = \frac{36}{90} \cdot 100 = 40$

Evaluate $\frac{p}{w} \cdot 100$ to determine what percent one value, p, is of the other value, w.

Accelerated 6 | Unit 3 Lesson 12 268 Synthesis | Lesson Practice

Lesson Takeaway: There are many ways to calculate the percent of a number, including using double number lines, equivalent ratios, tables, and expressions — even if the percentage is over 100%.

Independent | 5 min

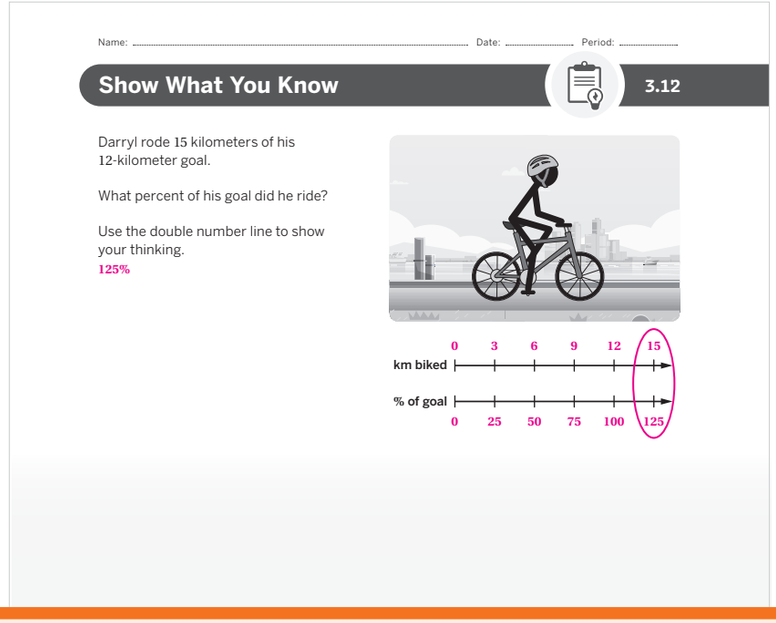
Show What You Know

Purpose: Students demonstrate their understanding by using a double number line diagram to determine a percentage greater than 100%.

Today's Goal

1. **Goal:** Calculate an unknown percentage (e.g., 32 is what percent of 40?).
2. **Language Goal:** Analyze different expressions for calculating a percentage. **(Reading and Writing)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 3.12

Darryl rode 15 kilometers of his 12-kilometer goal.

What percent of his goal did he ride?

Use the double number line to show your thinking.

125%

D Differentiation Use after Lesson 12

Support

Provide targeted intervention for students by using these resources.

If students need support calculating an unknown percentage:

» **Respond to Student Thinking:**

- Use the *Calculating Unknown Percentages* Mini-lesson.
- Revisit **Activity 2** and invite students to share strategies for calculating percentages.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to interview an entrepreneur in their community. Encourage them to ask about specific expenses and percentages that are used in their work.

Professional Learning

Take a moment to reflect on this lesson. In this lesson, students analyzed different expressions to calculate an unknown percentage. How will that work support multiplying and dividing fractions in the next unit?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

15. Here is what Basheera wrote to solve a bicycle challenge.

$\frac{31}{25} \cdot 100 = 124$

What do 31, 25, and 124 represent in this scenario?

Responses vary.

- 31 represents the distance that Basheera biked.
- 25 represents the distance of Basheera's goal.
- 124 represents the percent of Basheera's goal that she biked.

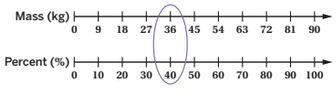
Lesson Practice ACC6.3.12

Lesson Summary

You can use ratios to determine what percent one amount is compared to another amount.

Let's say an adult giant panda weighs 90 kilograms and a giant panda cub weighs 36 kilograms. You can determine the cub's weight as a percent of the adult's weight using several strategies.

Double Number Line



Ratio Tables

Mass (kg)	Percent (%)
90	100
1	$\frac{1}{90} \times 100$
36	$\frac{36}{90} \times 100$

$\times \frac{1}{90}$, $\times 36$

- Determine the unit rate (what percent matches 1 kilogram).
- Use the unit rate to determine what percent 36 kilograms is of 90 kilograms.

Expressions

$36 \div 90 \cdot 100 = \frac{36}{90} \cdot 100 = 40$

Evaluate $\frac{p}{w} \cdot 100$ to determine what percent one value, p, is of the other value, w.

Lesson Practice ACC6.3.12

Name: _____ Date: _____ Period: _____

1. At a hardware store, a tool set normally costs $80. During a sale this week, the tool set costs $12 less than normal. What percent of the original price can a customer save? Show or explain your thinking.

15%. *Explanations vary.* The savings is 15% of the normal price because $\frac{12}{80} \cdot 100 = 15$.

Problems 2–4: A 6th grade class did a weekend fitness challenge. Each student set a goal for 75 minutes of exercise.

2. Luca exercised for 54 minutes. What percent of the goal did she complete?

72%

3. Brianna completed 64% of her goal. How many minutes did she exercise for?

48 minutes

4. Amari exercised for 78 minutes. What percent of the goal did she complete?

104%

FAST Practice

5. Select *all* the expressions that represent what percent 19 is of 20.

- ☑ A. $\frac{19}{20} \cdot 100$
- ☐ B. $\frac{19}{20} \div 100$
- ☐ C. $\frac{20}{19} \cdot 100$
- ☑ D. $19 \cdot \frac{100}{20}$
- ☐ E. $\frac{19}{100} \cdot 20$

Lesson Practice ACC6.3.12

Name: _____ Date: _____ Period: _____

Spiral Review

Problems 6–9: Determine each product.

6. $6.4 \cdot 0.1 = 0.64$

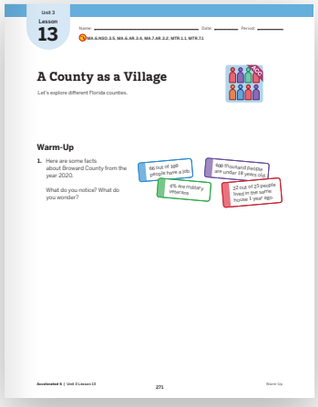
7. $6.4 \cdot 0.01 = 0.064$

8. $6.4 \div 0.1 = 64$

9. $6.4 \div 0.01 = 640$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	2	MA.6.AR.3.4
	2–4	1	MA.6.AR.3.4
FAST Practice	**5**	1	MA.6.AR.3.4
Spiral Review			
	6–9	1	MA.5.NSO.2.5



A County as a Village

Applying Ratios, Rates, and Percentages

Let's explore different Florida counties.

Learning Outcomes

Today's Learning

1. **Goal:** Use rates and percentages to solve real-world problems.
2. **Language Goal:** Interpret and describe rates and percentages within their real-world context. **(Reading and Writing)**

Students apply prior knowledge about rates and percentages to analyze characteristics of counties' populations. They imagine Florida counties as villages of 100 people and consider what the demographics of the village might look like by analyzing facts, like the number of people who are military veterans or the number of people who are under 18 years old.

Coherence

Prior Learning

In this unit, students used ratio reasoning to convert between units of measurement. They calculated two unit rates for the same ratio relationship and made connections between percentages, ratios, and rates.

Future Learning

In Unit 4, students will use diagrams to represent dividing fractions and use a variety of strategies to solve fraction problems.

Connections

- Students analyze data as they apply ratio concepts to compare various Florida counties. (cross-curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

MA.6.AR.3.4
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities.

MA.7.AR.3.2
Apply previous understanding of ratios to solve real-world problems involving proportions.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.7.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.1.2
MA.5.NSO.2.2	MA.7.AR.3.1
MA.5.NSO.2.5	

Lesson at a Glance

~ 45 min

MA.6.NSO.3.5, MA.6.AR.3.4, MA.7.AR.3.2

Warm-Up

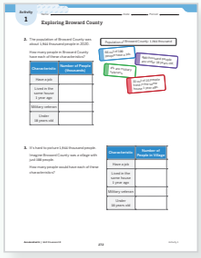
Pairs | 5 min

Students use the **Notice and Wonder** routine to engage with the types of facts they will be using throughout the lesson.

Activity 1

Pairs | 10 min

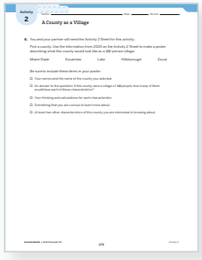
Students analyze facts about Broward County as if it were a village of 100 people to make sense of percentages involving very large numbers.



Activity 2

Pairs | 20 min

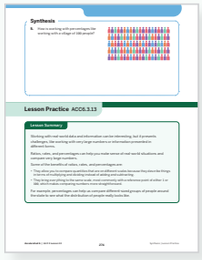
Students apply their understanding of rates and percentages to imagine a Florida county as a village of 100 people. **MLR7: Compare and Connect**



Synthesis

Whole Class | 5 min

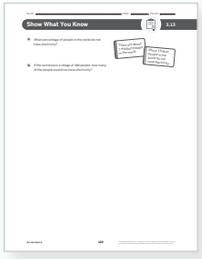
Students synthesize their understanding that working with percentages is like working with a village of 100 people.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining a percent when given data from large populations.



Prep Checklist

Prepare the Activity 2 Sheet.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 2 Sheet, one per pair
- Coloring tools (as needed)
- Poster paper
- Straightedges (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students use the Notice and Wonder routine to engage with the types of facts they will be using throughout the lesson.

1 Launch

Use the Notice and Wonder routine to promote curiosity and help students make sense of each fact. **(MTR.1.1)**

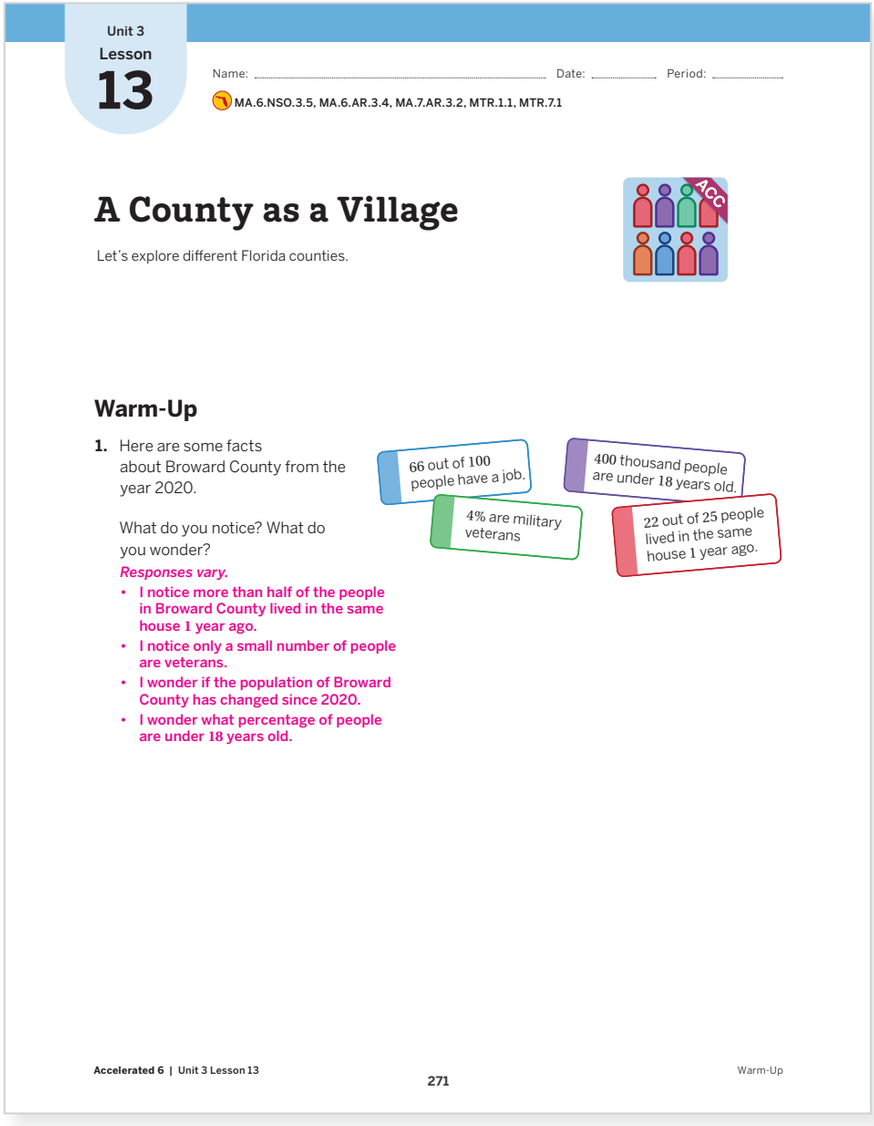
Discuss where Broward County is in Florida and its size compared to other counties in the state. Consider showing students on a map.

Consider asking, "What else do you know about Broward County?"

2 Connect

Consider asking:

- "These facts are all written differently. How are the ways that they are written alike? How are they different?"
- "What form was most impactful to you? Why?"
- "Do you think 400 thousand people under the age of 18 is a lot or a little? A majority? How can we know?"



Unit 3
Lesson
13

Name: Date: Period:

MA.6.NSO.3.5, MA.6.AR.3.4, MA.7.AR.3.2, MTR.1.1, MTR.7.1

A County as a Village

Let's explore different Florida counties.

Warm-Up

1. Here are some facts about Broward County from the year 2020.

   66 out of 100 people have a job.

   400 thousand people are under 18 years old.

   4% are military veterans

   22 out of 25 people lived in the same house 1 year ago.

   What do you notice? What do you wonder?

   Responses vary.

   - I notice more than half of the people in Broward County lived in the same house 1 year ago.
   - I notice only a small number of people are veterans.
   - I wonder if the population of Broward County has changed since 2020.
   - I wonder what percentage of people are under 18 years old.

Accelerated 6 | Unit 3 Lesson 13 271 Warm-Up

Pairs | 10 min

Activity 1 Exploring Broward County

Purpose: Students analyze facts about Broward County as if it were a village of 100 people to make sense of percentages involving very large numbers.

1 Launch

Consider asking:

- "How might the population of Broward County be useful?"
- "What strategies have you used so far to solve problems involving rates, ratios, or percentages?"

Encourage students to write their expressions in their Student Edition to show their thinking.

2 Monitor

Look and listen for a variety of strategies.

D Differentiation

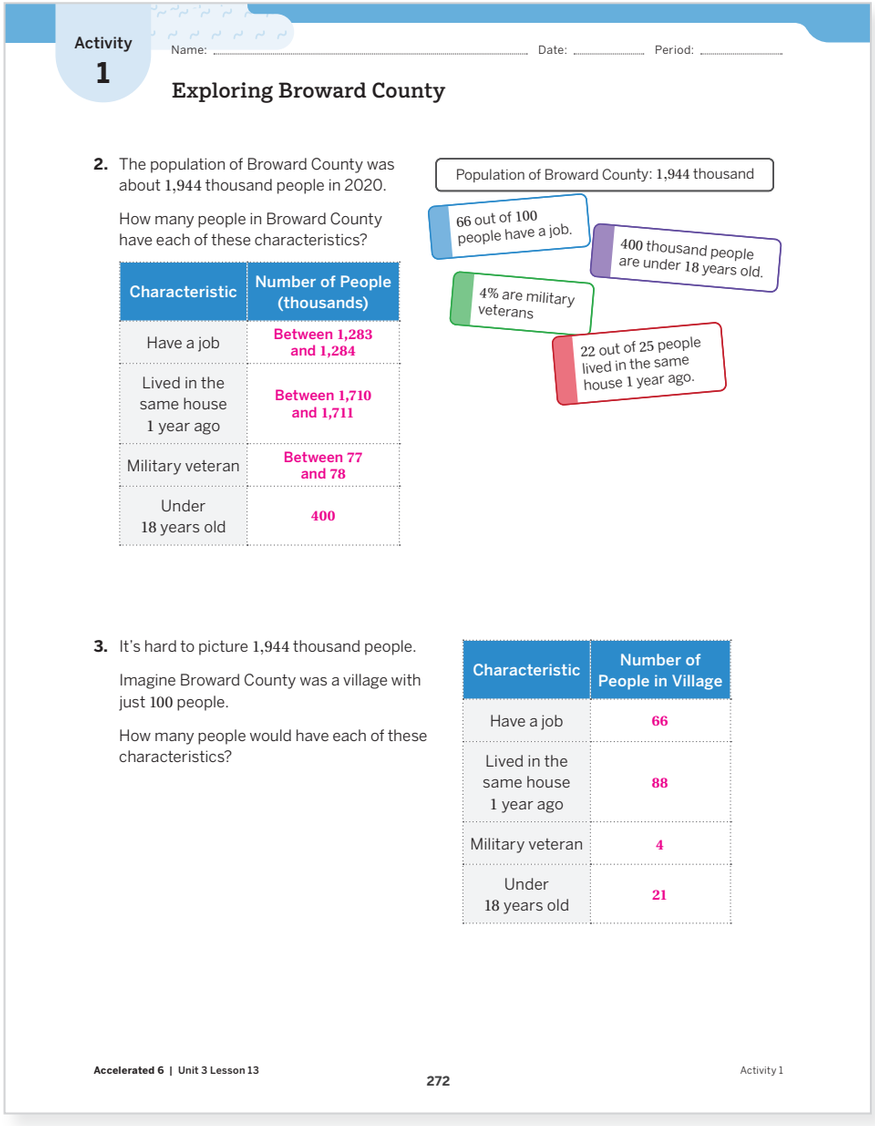
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Is this a ratio? If so, how can you represent the ratio on a ratio table or double number line?"
Draw a table or double number line, but are not sure how to use the given fact.	**Support** Consider asking, "What does ___ mean? Does that represent a part, a whole, or a percent? Let's label that on your diagram."
Enter the full number instead of the number in thousands (e.g., 1,944,000 vs 1,944).	**Support** Consider sharing that the number of people is measured in thousands and practice interpreting some values like 0.1, 1, and 100. **(MTR.7.1)**
Write expressions (e.g., $\frac{66}{100} \cdot 1944$).	**Strengthen** Invite students to use a ratio table or draw a double number line to visualize their thinking.

Look for students that round any decimal answers to represent people. **(MTR.7.1)**

3 Connect

Consider asking:

- "How is finding a percentage like determining the number of people in a 100-person village?"
- "Which of these facts were easier to figure out? More challenging? Why do you think so?"
- "What does the answer 20.6 mean in the fourth row? Should we round that? If so, how?"



Activity 1

Name: Date: Period:

Exploring Broward County

2. The population of Broward County was about 1,944 thousand people in 2020.

How many people in Broward County have each of these characteristics?

Characteristic	Number of People (thousands)
Have a job	Between 1,283 and 1,284
Lived in the same house 1 year ago	Between 1,710 and 1,711
Military veteran	Between 77 and 78
Under 18 years old	400

Population of Broward County: 1,944 thousand

66 out of 100 people have a job.

400 thousand people are under 18 years old.

4% are military veterans

22 out of 25 people lived in the same house 1 year ago.

3. It's hard to picture 1,944 thousand people.

Imagine Broward County was a village with just 100 people.

How many people would have each of these characteristics?

Characteristic	Number of People in Village
Have a job	66
Lived in the same house 1 year ago	88
Military veteran	4
Under 18 years old	21

Accelerated 6 | Unit 3 Lesson 13 272 Activity 1

Key Takeaway: You can use the idea of a village of 100 people to make sense of how characteristics might look in the real world.

Pairs | 20 min

Activity 2 A County as a Village

Purpose: Students apply their understanding of rates and percentages to imagine a Florida county as a village of 100 people.

Short on time? Consider having students only represent the facts about having a job and people under 18 years old.

1 Launch

Discuss the locations and sizes of the Florida counties. Consider showing students on a map.

Distribute the Activity 2 Sheet and poster making supplies.

Encourage students to use a variety of strategies and to create clear diagrams so that anyone looking at their poster would understand their work.

A **Accessibility: Memory and Attention** Provide students with a graphic organizer to support them in keeping track of each characteristic they calculate.

2 Monitor

Select and sequence strategies, expressions, and diagrams.

D **Differentiation**

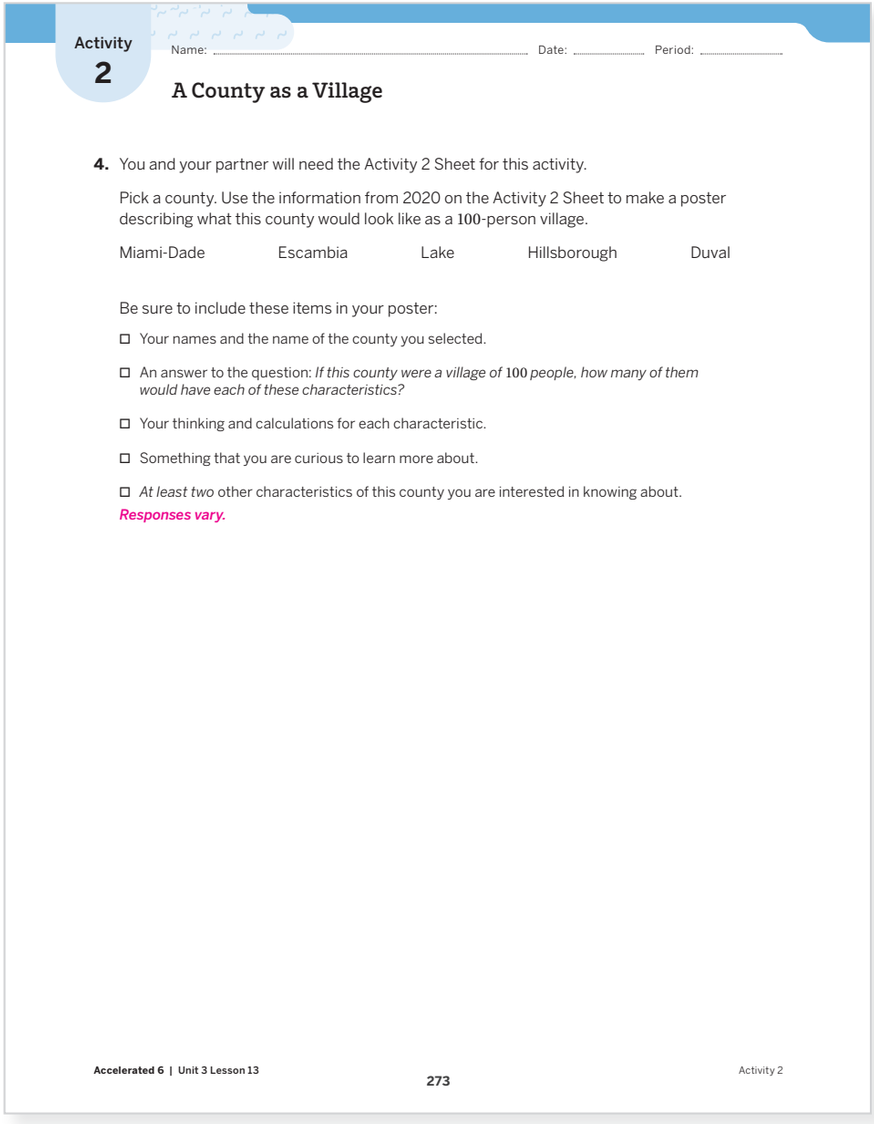
Look for students who:	Respond to Student Thinking
Need support with the calculations.	**Support** Revisit Problems 2–3 and discuss their thinking together.
Have unclear or incomplete thinking shown.	**Strengthen** Invite the group to compare their thinking with another group's thinking to make their explanation stronger and clearer. **(MTR.1.1)**
Create a poster that meets all the criteria and has explanations.	**Stretch** Encourage students to compare characteristics about the county they chose to the facts provided for another county.

3 Connect

Invite students to share their posters through a Gallery Tour. Encourage them to silently view their classmates' work and leave feedback. Then give each group time to review the feedback left on their work.

MLR **MLR7: Compare and Connect** Invite students to share the similarities and differences in how they described their counties as 100-person villages. Consider providing these sentence starters to support their discussion:

- To determine the _____, a lot of students _____.
- My strategy was different because _____.



Activity 2

Name: Date: Period:

A County as a Village

4. You and your partner will need the Activity 2 Sheet for this activity.

Pick a county. Use the information from 2020 on the Activity 2 Sheet to make a poster describing what this county would look like as a 100-person village.

Miami-Dade Escambia Lake Hillsborough Duval

Be sure to include these items in your poster:

- ☐ Your names and the name of the county you selected.
- ☐ An answer to the question: *If this county were a village of 100 people, how many of them would have each of these characteristics?*
- ☐ Your thinking and calculations for each characteristic.
- ☐ Something that you are curious to learn more about.
- ☐ *At least two* other characteristics of this county you are interested in knowing about.

Responses vary.

Accelerated 6 | Unit 3 Lesson 13 273 Activity 2

Whole Class | 5 min

Synthesis

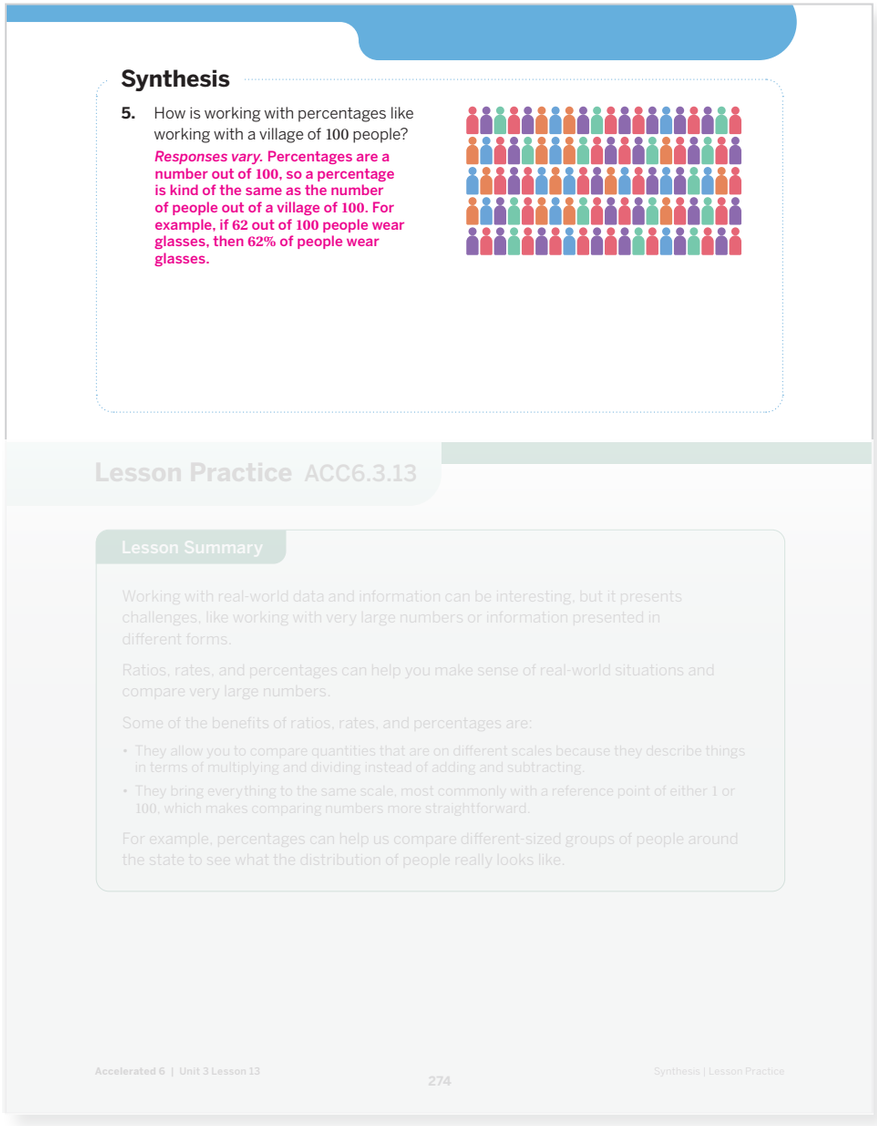
Purpose: Students synthesize their understanding that working with percentages is like working with a village of 100 people.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- You need to know a total to determine a percentage.
- Imagining a village of 100 people can help you visualize what a percentage might mean in a real-world setting.
- If you have two different population sizes, analyzing percentages of characteristics can make them easier to compare.
- When thinking about percentages as a village of 100 people, you may need to round your values since you cannot have partial people.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

5. How is working with percentages like working with a village of 100 people?

Responses vary. Percentages are a number out of 100, so a percentage is kind of the same as the number of people out of a village of 100. For example, if 62 out of 100 people wear glasses, then 62% of people wear glasses.

Lesson Practice ACC6.3.13

Lesson Summary

Working with real-world data and information can be interesting, but it presents challenges, like working with very large numbers or information presented in different forms.

Ratios, rates, and percentages can help you make sense of real-world situations and compare very large numbers.

Some of the benefits of ratios, rates, and percentages are:

- They allow you to compare quantities that are on different scales because they describe things in terms of multiplying and dividing instead of adding and subtracting.
- They bring everything to the same scale, most commonly with a reference point of either 1 or 100, which makes comparing numbers more straightforward.

For example, percentages can help us compare different-sized groups of people around the state to see what the distribution of people really looks like.

Accelerated 6 | Unit 3 Lesson 13 274 Synthesis | Lesson Practice

Lesson Takeaway: Data about large populations can be challenging to visualize and understand. You can communicate and interpret data by thinking about percentages representing a village of 100 people.

Independent | 5 min

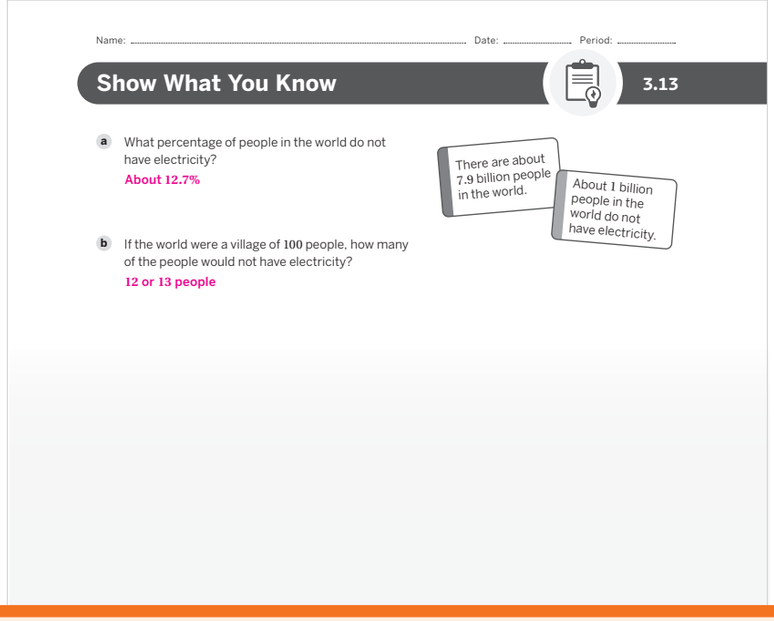
Show What You Know

Purpose: Students demonstrate their understanding by determining a percent when given data from large populations.

Today's Goal

1. **Goal:** Use rates and percentages to solve real-world problems.
2. **Language Goal:** Interpret and describe rates and percentages within their real-world context. **(Writing, Reading, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 3.13

a. What percentage of people in the world do not have electricity?

About 12.7%

There are about 7.9 billion people in the world.

About 1 billion people in the world do not have electricity.

b. If the world were a village of 100 people, how many of the people would not have electricity?

12 or 13 people

Differentiation Use after Lesson 13

Support

Provide targeted intervention for students by using these resources.

If students need support understanding how to determine unknown quantities using percentages:

» **Respond to Student Thinking:**

- Select a few related **Practice Problems** and give individual feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite students to explore the **Sub-Unit 3 Extension Activities.**

Professional Learning

Take a moment to reflect on how students applied what they've learned about percentages to the characteristics of counties' populations. In what ways were students able to make connections between math ideas and Florida counties in this lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

5. How is working with percentages like working with a village of 100 people?

Responses vary. Percentages are a number out of 100, so a percentage is kind of the same as the number of people out of a village of 100. For example, if 62 out of 100 people wear glasses, then 62% of people wear glasses.

Lesson Practice ACC6.3.13

Lesson Summary

Working with real-world data and information can be interesting, but it presents challenges, like working with very large numbers or information presented in different forms.

Ratios, rates, and percentages can help you make sense of real-world situations and compare very large numbers.

Some of the benefits of ratios, rates, and percentages are:

- They allow you to compare quantities that are on different scales because they describe things in terms of multiplying and dividing instead of adding and subtracting.
- They bring everything to the same scale, most commonly with a reference point of either 1 or 100, which makes comparing numbers more straightforward.

For example, percentages can help us compare different-sized groups of people around the state to see what the distribution of people really looks like.

Lesson Practice
ACC6.3.13

Name: _____ Date: _____ Period: _____

Problems 1–3: The sale price of every item in a store is 85% of its original price. Complete the table to show the prices of each item.

	Item	Original Price ($)	Sale Price ($)
1.	Backpack	30.00	25.50
2.	Soccer Ball	18.00	15.30
3.	Jacket	24.80	21.08

Problems 4–6: Last Sunday, an amusement park had 1,575 visitors.

4. 56% of the visitors were adults. Calculate the number of adults that visited the park.
   882 adults

5. 16% of the visitors were teenagers. Calculate the number of teenagers that visited the park.
   252 teenagers

6. 28% of the visitors were children ages 12 and under. Calculate the number of children ages 12 and under that visited the park.
   441 children

Lesson Practice
ACC6.3.13

Name: _____ Date: _____ Period: _____

FAST Practice

7. A veterinarian examined 45 animals on Wednesday. Of the animals she examined, 20% were cats. How many cats did the veterinarian examine on Wednesday?

   A. 18
   B. 9
   C. 5
   D. 14

Spiral Review

Problems 8–10: Fill in each blank to complete the sentence.

8. 5% of 70 is __3.5__.

9. 25% of __24__ is 6.

10. 12% of 700 is __84__.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–6	2	MA.6.AR.3.4
FAST Practice	7	1	MA.6.AR.3.4
Spiral Review			
	8–10	1	MA.6.AR.3.4

Assess and Respond

End-of-Unit Assessment

Independent | 45 min

Facilitation: Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Identifying an unknown part given friendly percentages	Lessons 8-9	1	MA.6.AR.3.4
2	Interpreting and identifying unit rates and equivalent ratios	Lessons 3-5	1	MA.6.AR.3.5, MTR.3.1
3	Using ratios and unit rates to make and explain comparisons	Lessons 3-5	2	MA.6.AR.3.5, MTR.4.1
4	Determining the percent of a quantity for an percentage	Lesson 11	1	MA.6.AR.3.4
5	Converting units of measurement from one unit to another within the same measurement system	Lesson 2	2	MA.6.AR.3.5, MTR.4.1
6	Determining an unknown percentage and using rate reasoning to solve problems	Lessons 4, 12	2	MA.6.AR.3.4, MTR.6.1
7a	Determining an unknown whole given a part and the percent	Lessons 10, 11	1	MA.6.AR.3.4
7b	Interpreting an expression related to a percent situation and writing a question about it	Lessons 10, 11	3	MA.6.AR.3.4, MA.6.NSO.3.5

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

End-of-Unit Assessment

Unit 3

1. Sydney's fitness app says she has completed 70% of her biking goal for the week. Her goal is 50 miles. How far has she biked?

A. 1.4 miles **B.** 20 miles **C.** 35 miles **D.** 71.4 miles

2. Mateo's pasta sauce recipe uses 8 tomatoes for every 3 teaspoons of oil. Select *all* of the true statements.

- ☑ **A.** The recipe uses $\frac{3}{8}$ tsp of oil per tomato.
- ☐ **B.** The recipe uses $\frac{3}{8}$ tomatoes per tsp of oil.
- ☐ **C.** Mateo needs 3 tomatoes for every 8 tsp of oil.
- ☑ **D.** Mateo needs $\frac{3}{4}$ tsp of oil for every 2 tomatoes.
- ☐ **E.** Mateo needs 9 tomatoes for every 4 tsp of oil.

3. Eliza and David each walk at a constant speed.

- Eliza walks 704 feet in 4 minutes.
- David walks 924 feet in 6 minutes.

Who walks faster? Circle one.

(Eliza) David They walk at the same speed

Explain your reasoning.

Explanations vary. **Eliza walks $\frac{704}{4} = 176$ feet per minute, and Daivd walks $\frac{924}{6} = 154$ feet per minute.**

4. Zion is reading a 300-page book and has read 41% of the book so far.

How many pages of the book has Zion read?

123 pages

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5. An amusement park has a ride that only allows passengers who are 5 feet tall or taller.

Fabiana is 64 inches tall. Is she tall enough to ride? Circle one.

(Yes) No

Explain your thinking.

Explanations vary. **There are 12 inches in 1 foot. The ride requires that passengers are 5 feet tall or taller. 5 feet $\times$ 12 inches = 60 inches. Fabiana is 64 inches tall and 64 is greater than 60, so she can ride this ride.**

6. It took Amari 2 hours to paint the first 14 feet of a 70-foot-long fence.

a What percent of the fence has she painted so far?

20%

b At this rate, how long would it take Amari to paint the entire fence?

10 hours

7. Afia bought shoes that were on sale for 30% off the regular price. Afia saved $12.

a What was the regular price of the shoes?

$40

b Afia entered this expression into a calculator at the store: $\frac{30}{100} \cdot 56$.

Write a question Afia could answer about prices at the store using this expression.

Responses vary.

- **How many dollars will you save on a $56 item that is 30% off?**
- **How many dollars will you save on a $30 item that is 56% off?**
- **How much does a $56 item cost that is discounted 70%?**

Name: ..... Date: ..... Period: .....

End-of-Unit Assessment

Unit 3

1. Oscar set a goal of doing 50 push-ups each week. He has completed 40% of his goal for the week. How many push-ups has he done?

A. 80 push-ups **B.** 20 push-ups **C.** 10 push-ups **D.** 125 push-ups

2. Elena's salad dressing recipe calls for 4 tbsp of oil for every 3 tbsp of vinegar. Select *all* of the true statements.

- ☑ **A.** She needs 2 tbsp of oil for every $\frac{3}{2}$ tbsp of vinegar.
- ☐ **B.** She needs 3 tbsp of oil for every 4 tbsp of vinegar.
- ☐ **C.** She needs 5 tbsp of oil for every 4 tbsp of vinegar.
- ☐ **D.** The recipe uses $\frac{3}{4}$ tbsp of oil per 1 tbsp of vinegar.
- ☑ **E.** The recipe uses $\frac{3}{4}$ tbsp of vinegar per 1 tbsp of oil.

3. Vihaan and Natalia each walk at a constant speed.

- Vihaan walks 40 feet in 10 seconds.
- Natalia walks 23 feet in 4 seconds.

Who walks faster? Circle one.

Vihaan Natalia They walk at the same speed

Explain your reasoning.

Explanations vary. Vihaan walks $\frac{40}{10} = 4$ feet per second, and Natalia walks $\frac{23}{4} = 5.75$ feet per second.

4. Terrance's family set a goal of doing 400 hours of volunteer work. They have done 35% of their volunteer work.

How many hours have they worked so far?

140 hours

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5. A store sells pajamas in two sizes.

- The child size is for people less than 60 inches tall.
- The adult size is for people 60 inches tall or taller.

Juan is 4 feet 8 inches tall. Does he fit the child or adult size? Circle one.

Child Adult

Explain your thinking.

Explanations vary. There are 12 inches in a foot. Adult size pajamas are for people that are 60 inches or taller. Juan's height is 4 feet and 8 inches. I can find Juan's height in inches: $4 \times 12 = 48$. And $48 + 8 = 56$. Since Juan is 56 inches tall, he would fit the child size.

6. Xavier is chopping 60 brussels sprouts for dinner. It took 3 minutes to chop the first 15.

a. What percent of the brussels sprouts has he chopped so far?

25%

b. At this rate, how long would it take Xavier to chop all 60 brussels sprouts?

12 minutes

7. Bao bought a jacket that was on sale for 20% off the regular price. Bao saved $14.

a. What was the regular price of the jacket?

$70

b. Bao entered this expression into a calculator at the store: $\frac{20}{100} \cdot 64$.

Write a question he could answer about prices at the store using this expression.

Responses vary.

- How many dollars will you save on a $64 item that is 20% off?
- How many dollars will you save on a $20 item that is 64% off?
- How much does a $64 item cost that is discounted 80%?

D Differentiation (End-of-Unit Assessment)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	
Sub-Unit 1: Use ratio reasoning to convert between units of measurement. **(Lessons 1-2)**	5	**Support**	• **Mini-Lesson:** *Converting Measurements* • **Teacher Move:** Consider revisiting: Lesson 2 (*Counting Classrooms*)
		Strengthen	• **Repeated Challenges:** Lesson 2 (*Counting Classrooms*)
Sub-Unit 2: • Recognize and calculate two unit rates for the same ratio relationship. • Use unit rates to solve problems involving tables of equivalent ratios. **(Lessons 3-7)**	2	**Support** **Strengthen**	• **Mini-Lesson:** *Calculating Unit Rates* • **Teacher Move:** Consider revisiting: Lesson 5 (*Soft Serve*)

	3	**Support**	• **Teacher Move:** Consider revisiting:
			  • Lesson 3 *(World Records)*
			  • Lesson 4 *(Model Trains)*

		Strengthen	• **Challenge Creator:** Lesson 7 *(More Soft Serve)*
		Stretch	• **You're invited to explore more:** Lesson 4 *(Model Trains)*
Sub-Unit 3: Use ratio reasoning to determine unknown parts, wholes, and percentages. **(Lessons 8-13)**	1	**Support**	• **Teacher Move:** Consider revisiting: • Lesson 9 (*Bicycle Goals*)
		Strengthen	• **Repeated Challenges:** Lesson 8 (*Lucky Duckies*)
		Stretch	• **You're invited to explore more:** • Lesson 9 *(Bicycle Goals)*

	4, 7	**Support**	• **Teacher Move:** Consider revisiting:
			  • Lesson 10 (*What's Missing?*)
			  • Lesson 11 (*Cost Breakdown*)

		Strengthen	• **Repeated Challenges:** Lesson 11 (Cost Breakdown)
		Stretch	• **You're invited to explore more:** Lesson 10 *(What's Missing?)*

	6	**Support**
		Strengthen
			• **Mini-Lesson:** Calculating Unknown Percentages
			• **Teacher Move:** Consider revisiting:
			  • Lesson 12 (*More Bicycle Goals*)
			  • Lesson 13 (*A County as a Village*)

		Stretch	• **You're invited to explore more:** Lesson 12 *(More Bicycle Goals)*

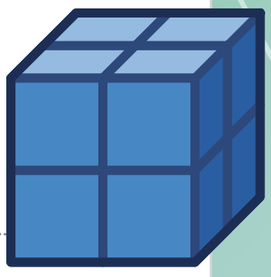
UNIT 4

Multiplying and Dividing Fractions

Students extend what they learned about multiply and dividing whole numbers to multiply and divide fractions by fractions. They answer questions like "How many groups?" or "How many in 1 group?" They use a variety of strategies, such as making tape diagrams, creating common denominators, and rewriting problems using the distributive property or the reciprocal.

Essential Questions

- What are two ways to think about multiplying by a fraction?
- How are division and multiplication related to each other?
- In what situations would there be fraction-sized groups or a number of groups that is a fraction?



Sub-Unit Goals

Sub-Unit 1

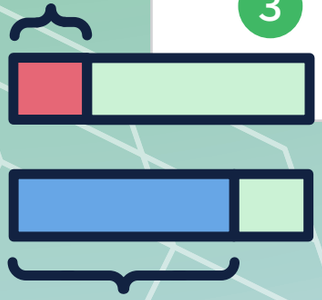
- Represent fraction multiplication using models and numerical sentences.
- Use multiple strategies to multiply fractions and mixed numbers.

Sub-Unit 2

- Use a variety of strategies to calculate quotients of fractions.
- Solve problems that involve dividing fractions.

Sub-Unit 3

- Use division of fractions to compare lengths.
- Solve problems about areas and volumes with fractional dimensions.



The Math of the Unit

Unit Outcomes Telling a story that narrows and deepens with the grade

Florida B.E.S.T. Standards for Mathematics

Add, subtract, multiply and divide positive rational numbers. **(MA.6.NSO.2)**

Model and solve problems involving two-dimensional and three-dimensional figures. **(MA.6.GR.2)**

Benchmarks Addressed in This Unit: MA.6.NSO.2.2 MA.6.NSO.2.3 MA.6.GR.2.1 MA.6.GR.2.2 MA.6.GR.2.3

Mathematical Thinking and Reasoning Standards

- Demonstrate understanding by representing problems in multiple ways. **(MTR.2.1)**
- Complete tasks with mathematical fluency. **(MTR.3.1)**
- Use patterns and structure to help understand and connect mathematical concepts. **(MTR.5.1)**
- Assess the reasonableness of solutions. **(MTR.6.1)**

Also Addressed: **MTR.1.1, MTR.4.1, MTR.7.1**

Coherence Telling a story within and across grades

In this Unit

Students interpret and create diagrams that represent multiplying and dividing with fractions. They solve problems about areas and volumes with fractional dimensions.

Prior Learning

- Understand multiplication and division **(MA.3.NSO.2.2)**
- Calculate the volume of rectangular prisms **(MA.5.GR.3)**
- Connect division to fractions **(MA.5.FR.1.1, MA.5.FR.2.4)**
- Multiply fractions **(MA.5.FR.2.2)**
- **Unit 1:** Calculate areas of composite figures **(MA.6.GR.2.2)**

Future Learning

- **Unit 6:** Solve equations with fractions **(MA.6.AR.2.4)**
- **Unit 7:** Operations with positive and negative rational numbers **(MA.7.NSO.2)**
- Scale drawings and scaled areas **(MA.7.GR.1.5)**

See the Connections to Future Learning page for more information, including explanations and examples.

Rigor and Balance Integrating the aspects of rigor in ways that support one another

Here are examples of the aspects of rigor and balance in this unit. See the first page of each lesson's Teacher Edition for more information.

Conceptual Understanding

In **Lessons 3–8**, students reason about what it means to divide by a fraction.

Strategic Competence

In **Lessons 3, 5, 9, 11, and 13–14**, students choose from a variety of strategies to solve problems involving division of fractions.

Procedural Fluency

In **Lessons 7, 9–10, and 12**, students build procedural fluency in using common denominators and other strategies to divide fractions.

Adaptive Reasoning

In **Lessons 4, 6, and 10**, students use responsive feedback to support their reasoning.

Application

In **Lessons 11–15**, students apply the division of fractions to compare lengths and answer "How many times as long?" questions.

Productive Disposition

In **Lessons 8 and 15**, students have opportunities to develop a productive disposition as they see division of fractions as useful.

Unit at a Glance

Assess and Respond

A Pre-Unit Check

Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

MA.5.FR.2.1 MA.5.FR.2.2 MA.5.FR.2.4 MA.5.AR.1.2 MA.5.AR.1.3 MA.5.GR.3.2 MA.5.GR.3.3

Sub-Unit 1

1 Modeling Products

Multiplying Fractions

Use multiple methods to represent fraction multiplication problems and calculate products of two fractions.

MA.6.NSO.2.2
MTR.2.1 MTR.5.1 MTR.6.1

2 Mixing It Up

Multiplying Mixed Numbers

Apply the understanding of multiplying fractions to multiply mixed numbers.

MA.6.NSO.2.2
MTR.2.1 MTR.5.1 MTR.6.1

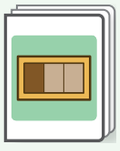
Sub-Unit 2

3 Flour Planner

How Many Groups?, Part 1

Make connections between drawings, tape diagrams, and multiplication and division expressions to answer the question "How many groups?"

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.2.1



8 Potting Soil

Dividing by Unit Fractions

Explore a strategy for dividing by a unit fraction by asking the question "How many in 1 group?"

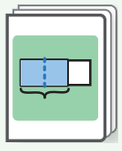
MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.2.1 MTR.3.1

9 Division Challenges

Two Strategies for Dividing Fractions

Develop fluency with at least one method for dividing fractions.

MA.6.NSO.2.2
MTR.3.1

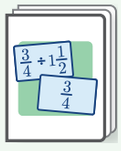


10 Action Fractions

Relating Fraction Division to Multiplication

Develop an algorithm for fraction division.

MA.6.NSO.2.2
MTR.1.1 MTR.3.1 MTR.4.1



11 Swap Meet

Division of Fractions in Context

Apply earlier strategies to answer questions in context.

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.1.1 MTR.2.1 MTR.5.1

15 Planter Planner

Applying Fraction Division

Apply prior knowledge about fraction division, area, and volume to solve problems about building a garden.

MA.6.NSO.2.2 MA.6.NSO.2.3 MA.6.GR.2.3
MTR.4.1 MTR.7.1

M Math in Action

Connecting Percents to Fresh Water Ecology

Explore the connection between percents and fresh water fish and plants, and the contributions of ecologists like Laura Máiz-Tomé.

MA.6.AR.3.4 MA.6.NSO.3.5
MTR.1.1 MTR.5.1

Assess and Respond

A End-of-Unit Assessment

Learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.4.1 MTR.5.1 MTR.6.1

Pacing: 19 days | **Short on time?** See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 15 Lessons
- Math in Action
- Pre-Unit Check
- Sub-Unit Quiz
- End-of-Unit Assessment

4 Flower Planters

How Many in Each Group?

Extend prior knowledge about whole numbers to answer the question "How many in 1 group?" when the number of groups is a fraction.

MA.6.NSO.2.3
MTR.1.1 MTR.3.1 MTR.4.1

5 Garden Bricks

How Many Groups?, Part 2

Build on prior work using tape diagrams to answer the question "How many groups?"

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.2.1 MTR.4.1

6 Fill the Gap

More or Less Than One Group?

Extend earlier strategies to calculate an unknown number of groups when there is less than 1 group.

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.1.1 MTR.4.1 MTR.5.1

7 Break It Down

Using Common Denominators to Divide Fractions

Develop fluency in using common denominators to divide fractions.

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.3.1 MTR.4.1 MTR.6.1

Assess and Respond

A Sub-Unit Quiz

Learn about your students' understanding of the concepts and skills so far in this unit.

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.5.1 MTR.6.1 MTR.7.1

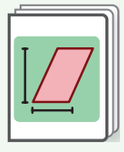
Sub-Unit 3

12 Classroom Comparisons

Comparing Fractional Lengths

Practice dividing fractions by comparing lengths and answering "How many times as long?" questions.

MA.6.NSO.2.2 MA.6.NSO.2.3
MTR.1.1 MTR.4.1



13 Puzzling Areas

Areas With Fractional Dimensions

Apply prior knowledge about multiplying and dividing fractions to a familiar context: calculating area.

MA.6.NSO.2.2 MA.6.NSO.2.3
MA.6.GR.2.1 MA.6.GR.2.2
MTR.1.1

14 Volume Challenges

Volumes With Fractional Dimensions

Extend prior knowledge to calculate volumes of rectangular prisms with fractional dimensions.

MA.6.NSO.2.2 MA.6.NSO.2.3
MA.6.GR.2.3
MTR.4.1

Pacing Considerations

Lessons 6–7: These lessons can be merged into one lesson by having students complete the Lesson 7 Warm-Up, Activity 2 from Lesson 6, and Activity 1 from Lesson 7. Consider assigning Activity 2 from Lesson 7 as additional practice.

Lesson 15: This final lesson may be omitted, but in addition to offering a fun and challenging application of the work of the unit, this particular lesson also offers closure to the narrative story embedded throughout this unit.

Lesson Materials and Prep

Here are the materials and resources needed within each lesson, how to prepare them, and where to find them.

Lesson 1
- **Copy:** Show What You Know

Lesson 2
- **Copy:** Show What You Know

Lesson 3
- **Copy:** Show What You Know
- **Materials:** various measuring scoops, flour, a large container *(optional)*

Lesson 4
- **Copy:** Show What You Know

Lesson 5
- **Copy:** Show What You Know, Tape Diagram Sheet *(as needed)*
- **Materials:** coloring tools *(as needed)*

Lesson 6
- **Copy:** Show What You Know
- **Materials:** cut-out rectangles *(as needed)*

Lesson 7
- **Copy:** Show What You Know

Lesson 8
- **Copy:** Show What You Know

Lesson 9
- **Copy:** Show What You Know
- **Materials:** coloring tools

Lesson 10
- **Copy:** Show What You Know
- **Cut:** Activity 2 Cards *(one per pair)*

Lesson 11
- **Copy:** Show What You Know
- **Cut:** Activity 1 Cards *(one set per pair)*
- **Materials:** index cards or slips of paper

Lesson 12
- **Copy:** Show What You Know, Activity 2 Sheet *(one per group)*
- **Materials:** coloring tools *(optional)*, classroom objects *(optional)*

Lesson 13
- **Copy:** Show What You Know
- **Materials:** coloring tools *(as needed)*

Lesson 14
- **Copy:** Show What You Know
- **Materials:** unit cubes *(as needed)*, a classroom object in the form of a rectangular prism *(as needed)*

Lesson 15
- **Copy:** Show What You Know, Activities 1 & 2 Sheet *(one per pair)*
- **Materials:** coloring tools, graph paper, poster paper

Resource Books

Assessment and Lesson Resources

- Pre-Unit Check
- Sub-Unit Quizzes
- End-of-Unit Assessment, Forms A & B
- Assessment Rubrics
- Show What You Knows
- Activity Sheets and Cards

Intervention and Extension Resources

- Mini-Lessons
- Prior Grade Mini-Lessons
- Extensions

Caregiver Support

These resources can be shared with students' caregivers. They provide background on the mathematics in this unit, as well as suggestions for supporting students at home.

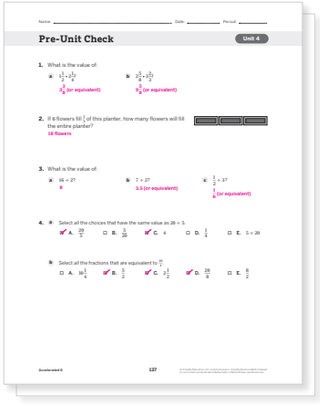
Assessments

Every unit includes a variety of formative and summative assessments designed to highlight students' understanding of a variety of concepts and skills.

Pre-Unit Check

Assign the **Pre-Unit Check** to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

Standards assessed: MA.5.FR.2.1, MA.5.FR.2.2, MA.5.FR.2.4, MA.5.AR.1.2, MA.5.AR.1.3, MA.5.GR.3.2, MA.5.GR.3.3

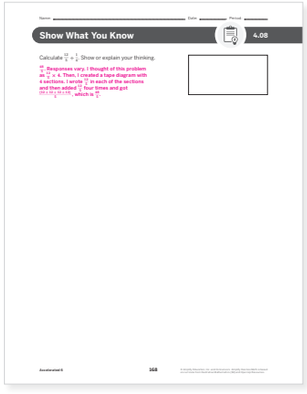

Pre-Unit Check

Unit 4

Lesson | Show What You Know

Use the **Show What You Know** for each lesson to learn more about your students' progress toward the lesson goal(s). Here is one example from this unit.

Standards assessed on Lesson 8 Show What You Know: MA.6.NSO.2.2, MA.6.NSO.2.3

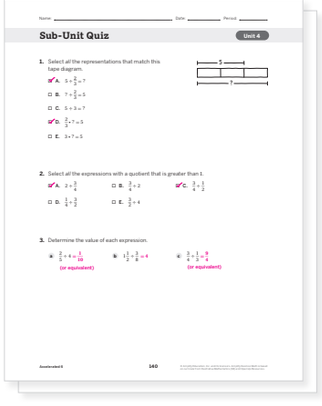

Show What You Know

4.08

Sub-Unit Quiz

Assign the **Sub-Unit Quiz** to learn about your students' understanding of the concepts and skills so far in this unit.

Standard assessed: MA.6.NSO.2.2, MA.6.NSO.2.3

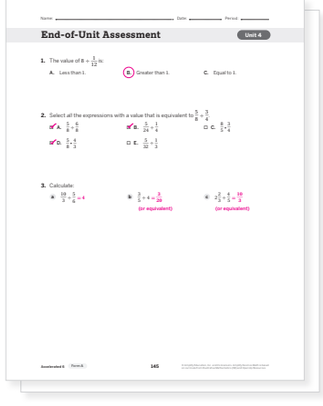

Sub-Unit Quiz

Unit 4

End-of-Unit Assessment

Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

Standards assessed: MA.6.NSO.2.2, MA.6.NSO.2.3


End-of-Unit Assessment

Unit 4

Differentiation

Every unit includes additional resources to support, strengthen, and stretch student learning.

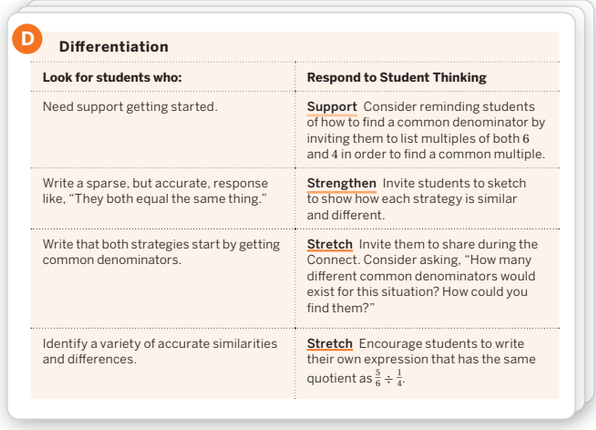
Differentiation Across the Unit

	Support	Strengthen	Stretch
	Provide targeted intervention for students by using these resources.	Reinforce students' understanding of the concepts assessed by using these resources.	Challenge students and extend their learning with these resources.
Sub-Unit 1 (Lessons 1–2) • Represent fraction multiplication using models and numerical sentences. • Use multiple strategies to multiply fractions and mixed numbers.	**Mini-Lesson** • *Multiplying Fractions*	**Repeated Challenges** • Lesson 1 (*Modeling Products*) **Practice** • Lessons 1–2	**DOK3 Practice** • Lessons 1–2
Sub-Unit 2 (Lessons 3–11) • Use a variety of strategies to calculate quotients of fractions. • Solve problems that involve dividing fractions.	**Mini-Lesson** • *Determining How Many in Each Group* • *Dividing Fractions With Common Denominators*	**Repeated Challenges** • Lesson 4 (*Flower Planters*) • Lesson 7 (*Break It Down*) • Lesson 9 (*Division Challenges*) **Practice** • Lessons 3–11	**You're invited to explore more.** • Lesson 4 (*Flower Planters*) • Lesson 5 (*Garden Bricks*) **DOK3 Practice** • Lessons 3 and 7
Sub-Unit 3 (Lessons 12–15) • Use division of fractions to compare lengths. • Solve problems about areas and volumes with fractional dimensions.	**Mini-Lesson** • *Determining the Volume of Prisms With Fractional Dimensions*	**Repeated Challenges** • Lesson 12 (*Classroom Comparisons*) • Lesson 13 (*Puzzling Areas*) **Practice** • Lessons 12–15	**You're invited to explore more.** • Lesson 14 (*Volume Challenges*) • Lesson 15 (*Planter Planner*) **DOK3 Practice** • Lesson 13

Differentiation Within the Lesson

Each Teacher Edition includes point-of-use differentiation suggestions to modify or adjust instruction during the lesson to accommodate the needs of all learners.

Here is one example from **Lesson 7**, where students justify why the common denominator strategy works for dividing fractions.



Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider reminding students of how to find a common denominator by inviting them to list multiples of both 6 and 4 in order to find a common multiple.
Write a sparse, but accurate, response like, "They both equal the same thing."	**Strengthen** Invite students to sketch to show how each strategy is similar and different.
Write that both strategies start by getting common denominators.	**Stretch** Invite them to share during the Connect. Consider asking, "How many different common denominators would exist for this situation? How could you find them?"
Identify a variety of accurate similarities and differences.	**Stretch** Encourage students to write their own expression that has the same quotient as $\frac{5}{6} \div \frac{1}{4}$.

Accessibility

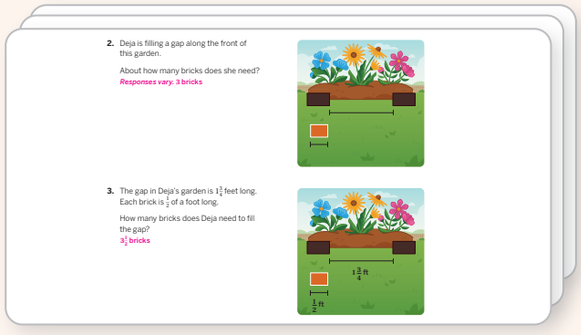
Every lesson is designed using the principles of Universal Design for Learning. Every lesson also includes support suggestions that build on students' strengths.

Universal Design for Learning

Here is one example from a lesson designed to support Representation.

Spotlight on Building Knowledge. . .

Lesson 6: Students use models to make sense of dividing with fractions, which guides information processing and visualization.



Just-In-Time Accommodations and Supports

Each Teacher Edition includes suggested supports based on the areas of cognitive function from the Education Development Center (EDC).

Spotlight on Visual-Spatial Processing . . .

Here are two suggestions in this unit for supporting students with interpreting visual representations.

Lesson 6, Activity 1

A **Accessibility: Visual-Spatial Processing** As students interpret visual representations, consider providing cut-out rectangles or other equal-sized objects they can use to represent the size of each brick. Invite them to physically manipulate the rectangles or objects to make sense of how many bricks are needed to fill the gap.

Lesson 9, Warm-Up

A **Accessibility: Visual-Spatial Processing** To support students as they interpret visual representations, invite them to consider why each diagram is divided into a given number of equal-sized sections, yet the label on the shaded number of sections does not represent the fraction of the diagram that is shaded.

Language Development

Every lesson includes opportunities for all students to develop fluency with mathematical language.

Vocabulary

New Vocabulary	Lesson(s)
distributive property	2
quotient	3
common denominator	6
reciprocal	10

Review Vocabulary
product
volume

Math Language Routines and Language Goals

Math Language Routine	Lesson(s)
MLR1: Stronger and Clearer Each Time	4
MLR2: Collect and Display	1–2, 5–13, and 15
MLR3: Critique, Correct, Clarify	1, 5, and 7
MLR7: Compare and Connect	2, 9, and 13–14

Sub-Unit Language Goals

- Explain strategies for determining products of fractions and mixed numbers.
- Analyze strategies for determining the quotients of fractions using mathematically precise language.
- Describe a division problem involving fractions as "How many groups?" or "How many in 1 group?" and explain a solution method.
- Analyze strategies for solving problems involving fractional lengths using mathematically precise language.

English Language Learners Support

Every Teacher Edition includes suggestions for supporting the needs of students learning English.

Here is one example from **Lesson 7**, where students are making sense of common denominators.

ELL **English Language Learners** Students can annotate that there are 12 equal-sized sections in each tape diagram and that the common denominator is 12. Write the phrase *common denominator* as you point to 12 or reference an anchor chart from a previous lesson. **(Reading, Speaking, and Listening)**

Connections to Future Learning

Here is how the content in this unit connects to where your students are headed in their math journeys.

Solving Equations with Fractions

In this unit, students learn to multiply and divide fractions fluently using a variety of strategies. **In Unit 6**, students will use reasoning and number sense to solve equations with fractions.

FL B.E.S.T. Math Benchmark:
MA.6.AR.2.4

Example:

The equation $\frac{1}{2}x = \frac{3}{8}$ can be solved using fact families.

$$\frac{1}{2}x = \frac{3}{8}$$

$$1 \cdot 3 = 3 \text{ and } 2 \cdot 4 = 8$$

$$x = \frac{3}{4}$$

Operations with Positive and Negative Rational Numbers

In this unit, students learn to multiply and divide fractions fluently using a variety of strategies. **In Unit 7**, students will make sense of operations with positive and negative rational numbers.

FL B.E.S.T. Math Benchmarks:
MA.7.NSO.2.1, MA.7.NSO.2.2

Example:

The relationship among rate, time, and position can be used to determine the unknown time when the initial position is 0 feet. Divide the change in position by the rate to get a time of $2\frac{1}{2}$ minutes. The time is positive because a negative number divided by a negative number is a positive number.

Rate (ft/min)	Time (min)	Position (ft)
$-5\frac{3}{5}$		-14

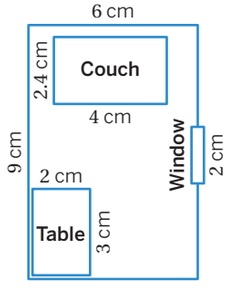
Scale Drawings and Scaled Areas

In this unit, students learn to multiply and divide fractions fluently using a variety of strategies. **In a future course**, students will use fractions to make sense of scaled areas.

FL B.E.S.T. Math Benchmark:
MA.7.GR.1.5

Example:

The couch in a scale drawing of a living room is 4 centimeters in length. The scale of the drawing is 3 centimeters to 2 meters, so the actual length of the couch is $2\frac{2}{3}$ meters.



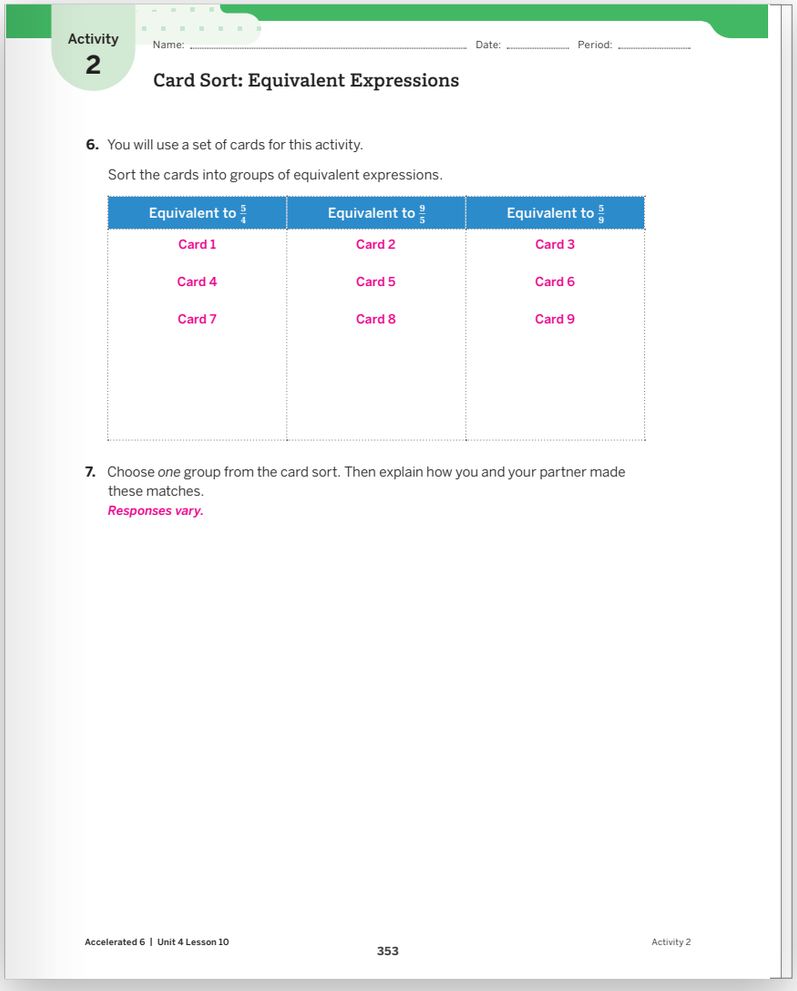
Scale: 3 cm to 2 m

Professional Learning

Here is an opportunity to deepen your understanding of the math in this unit and how to teach it.

Spotlight on Adaptive Reasoning

Lesson 10, Activity 2



Activity 2

Name: _____ Date: _____ Period: _____

Card Sort: Equivalent Expressions

6. You will use a set of cards for this activity.

Sort the cards into groups of equivalent expressions.

Equivalent to $\frac{3}{4}$	Equivalent to $\frac{9}{5}$	Equivalent to $\frac{5}{9}$
Card 1	Card 2	Card 3
Card 4	Card 5	Card 6
Card 7	Card 8	Card 9

7. Choose *one* group from the card sort. Then explain how you and your partner made these matches.

Responses vary.

Accelerated 6 | Unit 4 Lesson 10 353 Activity 2

Context

In this activity, students make connections between tape diagrams, division expressions, and multiplication expressions in a card sort.

Try This

Put on your student hat and complete Problems 6–7.

Points to Ponder

- What do students need to understand about equivalent expressions to support their understanding of this new strategy?
- Some students may oversimplify by saying "flip the second fraction." How might you support students in using mathematically accurate language and understanding that they are writing an equivalent expression?
- How does multiplying by the reciprocal build from their understanding of fraction division using tape diagrams and common denominators?

Notes:

Assess and Respond

Pre-Unit Check

Independent | 45 min

Facilitation: Assign the Pre-Unit Check to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Preparation for	DOK	FL B.E.S.T. Math Benchmarks
1	Multiplying fractions with fractions	Lesson 1	1	MA.5.FR.2.2
2	Applying understanding of fractions and division to solve a problem in context	Lesson 1	1	MA.5.AR.1.2, MA.5.FR.2.4
3	Dividing whole numbers and fractions by whole numbers	Lesson 8	2	MA.5.AR.1.3
4	Representing division in different ways, as fractions, mixed numbers, or expressions using the symbol	Lesson 5	2	MA.5.FR.2.1
5	Representing equivalent fractions on an empty tape diagram	Lesson 6	1	MA.5.AR.1.2, MA.5.FR.2.1
6	Multiplying unit fractions by whole numbers or other fractions	Lesson 10	1	MA.5.FR.2.2
7	Describing and determining the volume of a rectangular prism and constructing an argument about adding volumes	Lesson 14	2	MA.5.GR.3.2, MA.5.GR.3.3

Assessment and Lesson Resources

- Student Assessments
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Pre-Unit Check

Unit 4

1. What is the value of:

a. $1\frac{1}{2} \cdot 2\frac{1}{4}$?

$3\frac{3}{8}$ (or equivalent)

b. $2\frac{5}{8} \cdot 3\frac{2}{3}$?

$9\frac{5}{8}$ (or equivalent)

2. If 6 flowers fill $\frac{1}{3}$ of this planter, how many flowers will fill the entire planter?

18 flowers

3. What is the value of:

a. $16 \div 2$?

8

b. $7 \div 2$?

3.5 (or equivalent)

c. $\frac{1}{2} \div 3$?

$\frac{1}{6}$ (or equivalent)

4. a. Select *all* the choices that have the same value as $20 \div 5$.

- ☑ A. $\frac{20}{5}$
- ☐ B. $\frac{5}{20}$
- ☑ C. 4
- ☐ D. $\frac{1}{4}$
- ☐ E. $5 \div 20$

b. Select *all* the fractions that are equivalent to $\frac{10}{4}$.

- ☐ A. $10\frac{1}{4}$
- ☑ B. $\frac{5}{2}$
- ☑ C. $2\frac{1}{2}$
- ☑ D. $\frac{20}{8}$
- ☐ E. $\frac{8}{2}$

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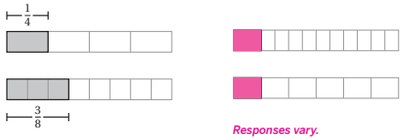
Name: ..... Date: ..... Period: .....

Pre-Unit Check (continued)

Unit 4

5. The tape diagrams on the left show that $\frac{1}{4}$ and $\frac{3}{8}$ *are not* equivalent fractions. Use the empty tape diagrams to draw two fractions that *are* equivalent.



Responses vary.

$\frac{2}{12}$ and $\frac{1}{6}$

6. What is the value of:

a. $9 \cdot \frac{1}{2}$?

$\frac{9}{2}$ (or equivalent)

b. $\frac{1}{2} \cdot \frac{3}{4}$?

$\frac{3}{8}$ (or equivalent)

D Differentiation (Pre-Unit Check)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	Respond to Student Thinking
Preparation for Sub-Unit 1: • Create and interpret diagrams that represent dividing whole numbers by fractions. **(Lessons 1–2)**	1, 2, 3	**Support** • **Teacher Move:** After Lesson consider revisiting these problems and asking, "Will this problem result in a number that's greater or less than 1? How do you know?
	4	**Support** • **Teacher Move:** Before Lesson 5, consider revisiting this problem and asking, "How did you decide if each choice did or did not have the same value as the original?"
	5	**Support** • **Teacher Move:** Before Lesson 6, consider showing accurate students' tape diagrams and inviting them to share their reasoning.
	6	**Support** • **Teacher Move:** Before Lesson 10, consider reviewing these problems and creating an anchor chart that shows strategies for multiplying fractions to refer back to throughout the unit.
	7	**Support** • **Mini-Lesson:** *Writing Expressions to Represent the Volume of a Figure* **Support** • **Teacher Move:** During Lesson 14, consider using models of rectangular prisms, such as tissue boxes or shoe boxes, to demonstrate how to calculate volume.

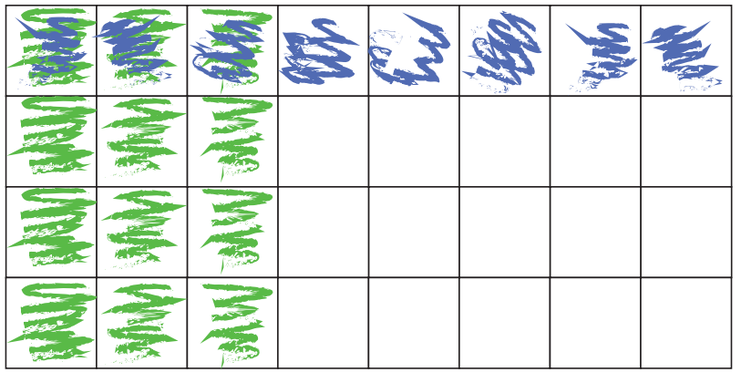
Multiplying Fractions

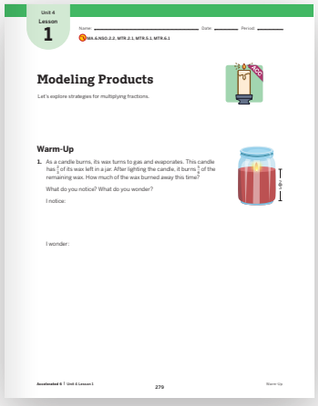
Sub-Unit 1 Goals

- **Goal:** Represent fraction multiplication using models and numerical sentences.
- **Goal:** Use multiple strategies to multiply fractions and mixed numbers.
- **Language Goal:** Explain strategies for determining products of fractions and mixed numbers.

In this sub-unit, students model fraction multiplication and develop strategies for multiplying fractions and mixed numbers, including using the **distributive property**. Students apply these strategies to solve problems.

Math that Matters Most

Concept or Skill	For example . . .
Represent fraction multiplication in multiple ways.	Write a numerical expression that the model represents. Then calculate the product. $\frac{3}{8} \cdot \frac{1}{4} = \frac{3}{32}$ 
Use the distributive property to multiply with mixed numbers.	$1\frac{3}{10} \cdot \frac{1}{2}$ $\left(1 + \frac{3}{10}\right)\frac{1}{2}$ $\frac{1}{2} + \frac{3}{20}$ $\frac{10}{20} + \frac{3}{20}$ $\frac{13}{20}$


Unit 4
Lesson
1

Modeling Products

Let's explore strategies for multiplying fractions.

Warm-Up

1. As a candle burns, its wax turns to gas and evaporates. This candle has $\frac{1}{2}$ of its wax left in a jar. After lighting the candle, it burns $\frac{1}{3}$ of the remaining wax. How much of the wax burned away this time?

What do you notice? What do you wonder?

I notice:

I wonder:

279

Modeling Products

Multiplying Fractions

Let's explore strategies for multiplying fractions.

Learning Outcomes

Today's Goals

1. **Goal:** Represent fraction multiplication problems using models and numerical sentences.
2. **Goal:** Calculate the product of two fractions using multiple methods.
3. **Language Goal:** Explain strategies for determining the products of fractions. **(Writing, Speaking, and Listening)**

Students use area models, tape diagrams, number lines, and numerical expressions to represent fraction multiplication problems. They calculate *products* of two fractions using a variety of strategies, including the standard algorithm. They also evaluate the reasonableness of products. **(MTR.2.1, MTR.6.1)**

Coherence

Prior Learning

In a previous course, students multiplied fractions using manipulatives, drawings, and the properties of operations and predicted the relative size of products without calculating.

Future Learning

In Lesson 2, students will apply what they know about multiplying fractions to multiply mixed numbers.

Connections

- Students use multiple representations to model the combustion process where solid wax from a burning candle converts to gas. (cross curricular, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.5.1, MTR.6.1

ELA Expectations: ELA.K12.EE.2.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2

Vocabulary

Review Vocabulary

product

Lesson at a Glance

~ 45 min

MA.6.NSO.2.2

Warm-Up

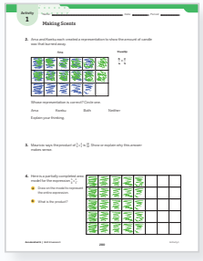
Pairs | 5 min

Students use the **Notice and Wonder** routine to analyze a real-world situation involving fractions.

Activity 1

Pairs | 10 min

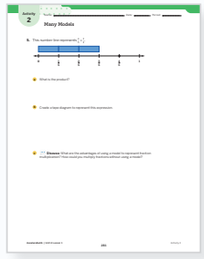
Students relate area models to fraction multiplication and make sense of their *products*. **MLR3: Critique, Correct, Clarify**
(MTR.2.1, MTR.5.1, MTR.6.1)



Activity 2

Pairs | 10 min

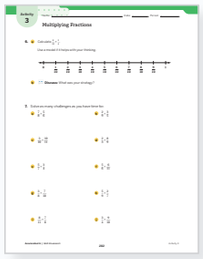
Students extend their understanding and apply a variety of strategies to multiply fractions.
(MTR.2.1, MTR.5.1)



Activity 3

Pairs | 10 min

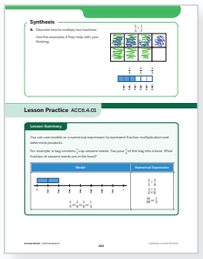
Students practice multiplying fractions using any strategy.



Synthesis

Whole Class | 5 min

Students synthesize their understanding of multiplying fractions. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by using a model to calculate the product of two fractions.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use the Notice and Wonder routine to analyze a real-world situation involving fractions.

1 Launch

Direct students' attention to the word problem. Invite a student to read the problem aloud.

To generate excitement, consider having students share their favorite candle scent.

Use the Notice and Wonder routine to promote curiosity and help students make sense of the real-world situation.

A **Accessibility: Memory and Attention:** Invite students to sketch their thinking on the image of the candle to increase access to the task and aid in creating a written or verbal response.

2 Connect

Consider asking:

- "If $\frac{2}{3}$ of the wax is left, how much has already been used?"
- "What do you notice about the sizes of the fractions?"
- "If $\frac{5}{6}$ of the remaining wax is burned away, what fraction of the remaining wax is not burned away?"

Unit 4
Lesson
1

Name: ..... Date: ..... Period: .....

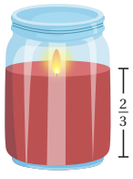
MA.6.NSO.2.2, MTR.2.1, MTR.5.1, MTR.6.1

Modeling Products

Let's explore strategies for multiplying fractions.

Warm-Up

1. As a candle burns, its wax turns to gas and evaporates. This candle has $\frac{2}{3}$ of its wax left in a jar. After lighting the candle, it burns $\frac{5}{6}$ of the remaining wax. How much of the wax burned away this time?



What do you notice? What do you wonder? *Responses vary.*

I notice:

- I notice that $\frac{2}{3}$ of the candle wax is left in the jar.
- I notice that the candle will burn more and there will be less than $\frac{2}{3}$ left in the end.
- I notice that $\frac{2}{3}$ and $\frac{5}{6}$ are each less than 1 whole.

I wonder:

- I wonder how much of the wax shown in the jar will be gone after more wax burns away.
- I wonder what operation I can use to calculate the amount of wax that burned away.
- I wonder how the fractions $\frac{2}{3}$ and $\frac{5}{6}$ relate.

Accelerated 6 | Unit 4 Lesson 1 279 Warm-Up

Pairs | 10 min

Activity 1 Making Scents

Purpose: Students relate area models to fraction multiplication and make sense of their products. **(MTR.2.1, MTR.5.1, MTR.6.1)**

1 Launch

To support prior knowledge, consider asking, "What does shading in an area model represent?"

Encourage students to justify their thinking with a partner and work together to reach an agreement about whose representation is correct.

A **Accessibility: Visual-Spatial Processing** Invite students to use fractional parts to count and label each column and each row of the models. **(MTR.5.1)**

2 Monitor

D **Differentiation** (*Problem 2–3*)

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How many columns and rows does the area model have? What does the shading in the columns represent? In the rows?"
Think that only Ama's or Kweku's representation is correct. (*Problem 2*)	**Support** Consider asking, "What operation does the area model represent?"
Use number sense to explain why Mauricio is correct. (*Problem 3*) **(MTR.6.1)**	**Strengthen** Invite students to justify their response with a second example.
Understand that multiplication describes the situation and explain the overlapping of the area model as the product of $\frac{5}{6}$ and $\frac{2}{3}$. (*Problems 2–3*)	**Stretch** Invite these students to share their thinking during the Connect.

Capture a variety of explanations and drawings to share during the Connect. **(MTR.2.1)**

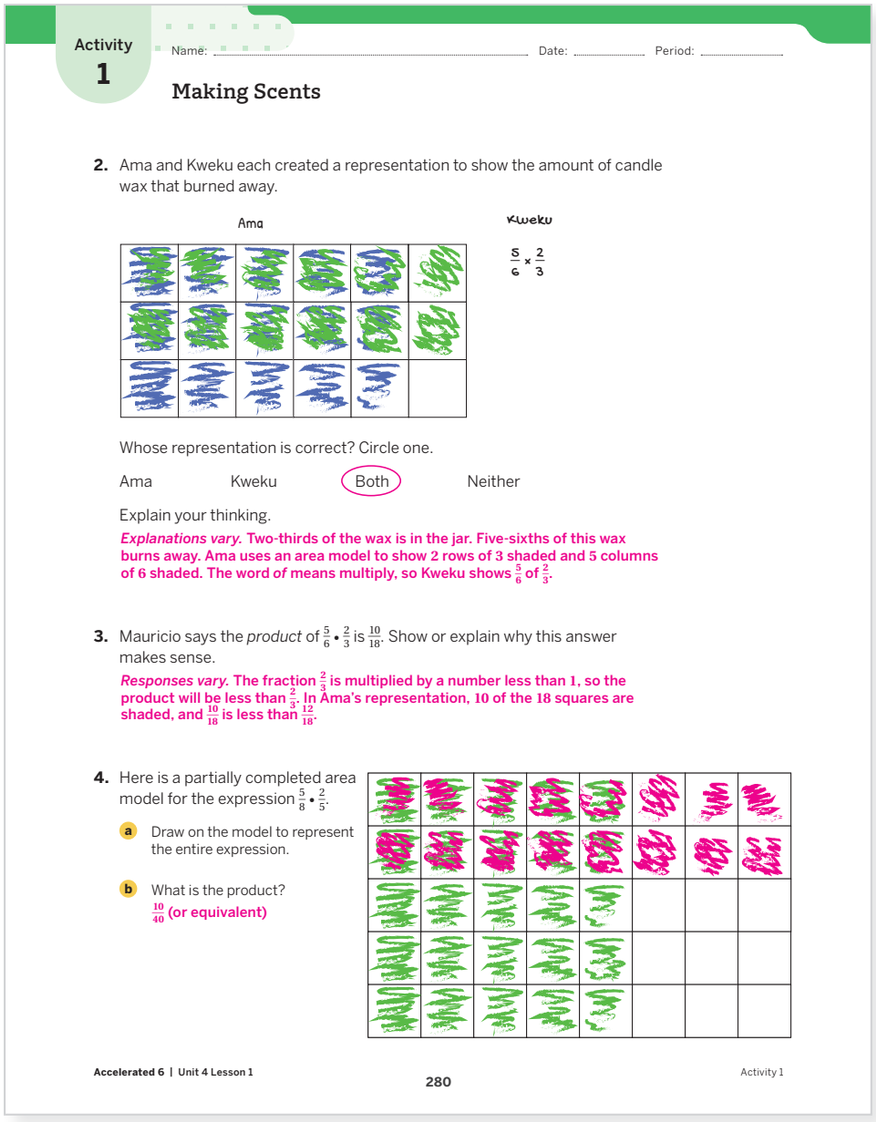
3 Connect

Share captured explanations and drawings.

MLR **MLR3: Critique, Correct, Clarify** Use this routine to help students describe strengths, errors, and ambiguities in their thinking. Then invite students to:

- Discuss what is *correct* about the response.
- Discuss what is *incorrect* or *unclear*.
- Create a revised response.

To surface the Key Takeaway, consider asking: "What do the shaded parts of the models represent?" **(MTR.5.1)**



Activity 1

Name: _____ Date: _____ Period: _____

Making Scents

2. Ama and Kweku each created a representation to show the amount of candle wax that burned away.

Ama

Kweku

$\frac{5}{6} \times \frac{2}{3}$

Whose representation is correct? Circle one.

Ama Kweku (Both) Neither

Explain your thinking.

Explanations vary. Two-thirds of the wax is in the jar. Five-sixths of this wax burns away. Ama uses an area model to show 2 rows of 3 shaded and 5 columns of 6 shaded. The word *of* means multiply, so Kweku shows $\frac{5}{6}$ of $\frac{2}{3}$.

3. Mauricio says the *product* of $\frac{5}{6} \cdot \frac{2}{3}$ is $\frac{10}{18}$. Show or explain why this answer makes sense.

Responses vary. The fraction $\frac{2}{3}$ is multiplied by a number less than 1, so the product will be less than $\frac{2}{3}$. In Ama's representation, 10 of the 18 squares are shaded, and $\frac{10}{18}$ is less than $\frac{12}{18}$.

4. Here is a partially completed area model for the expression $\frac{5}{8} \cdot \frac{2}{5}$.

a. Draw on the model to represent the entire expression.

b. What is the product?

$\frac{10}{40}$ (or equivalent)

Accelerated 6 | Unit 4 Lesson 1 280 Activity 1

Key Takeaway: You can use an area model to represent fraction multiplication and calculate *products*.

Pairs | 10 min

Activity 2 Many Models

Purpose: Students extend their understanding and apply a variety of strategies to multiply fractions. **(MTR.2.1, MTR.5.1)**

Short on time? Consider completing the tape diagram as a whole class.

1 Launch

Direct students' attention to the number line. To support students getting started, consider asking them to describe what they notice.

2 Monitor

Invite students to work with a partner to create a tape diagram. **(MTR.5.1)**

Listen for students who are able to make connections between the number line representation, the tape diagram, and using a standard algorithm to multiply fractions. **(MTR.2.1, MTR.5.1)**

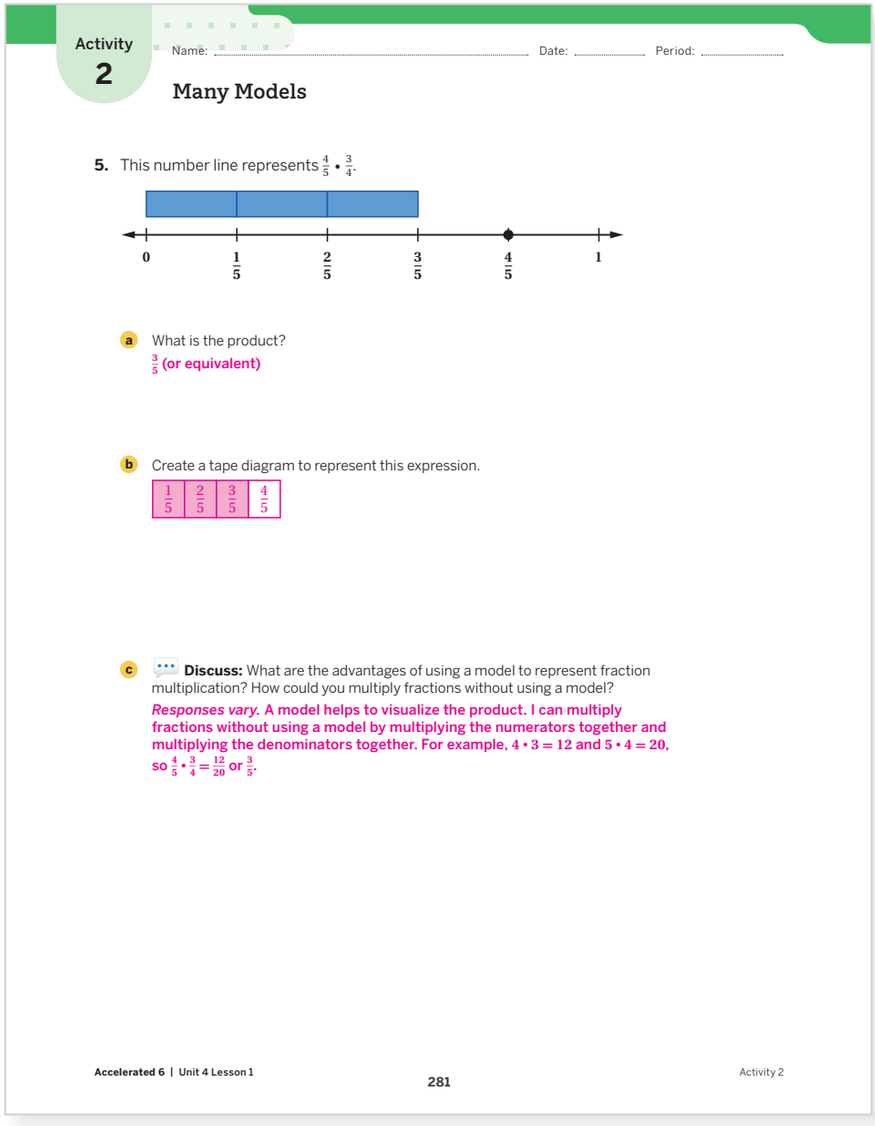
3 Connect

Invite students to share their tape diagrams and explain how they created them. **(MTR.5.1)**

ELL **English Language Learners** Discuss the everyday use of the term *advantage* and invite students to share their own examples of advantages. **(Speaking)**

To surface the Key Takeaway, consider asking:

- "How are the number line and tape diagram alike?"
- "What do you notice when you compare the multiplication expression and the product?"
- "What are some fractions equivalent to $\frac{3}{5}$?" **(MTR.5.1)**



Activity 2

Name: Date: Period:

Many Models

5. This number line represents $\frac{4}{5} \cdot \frac{3}{4}$.

a. What is the product?

$\frac{3}{5}$ (or equivalent)

b. Create a tape diagram to represent this expression.

$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$

c. **Discuss:** What are the advantages of using a model to represent fraction multiplication? How could you multiply fractions without using a model?

Responses vary. A model helps to visualize the product. I can multiply fractions without using a model by multiplying the numerators together and multiplying the denominators together. For example, $4 \cdot 3 = 12$ and $5 \cdot 4 = 20$, so $\frac{4}{5} \cdot \frac{3}{4} = \frac{12}{20}$ or $\frac{3}{5}$.

Accelerated 6 | Unit 4 Lesson 1 281 Activity 2

Key Takeaway: Other strategies for multiplying fractions are using a number line, drawing a tape diagram, or multiplying numerators and multiplying denominators using a numerical expression.

Pairs | 10 min

Activity 3 Multiplying Fractions

Purpose: Students practice multiplying fractions using any strategy. **(MTR.5.1)**

Short on time? Consider inviting students to complete fewer challenges.

1 Launch

Invite students to predict whether the product will be greater or less than $\frac{8}{10}$ before calculating. Consider asking, "How might your prediction help you?" **(MTR.6.1)**

Encourage students to use a variety of strategies to solve the problems. **(MTR.2.1)**

2 Monitor

Encourage students to get feedback from a partner.

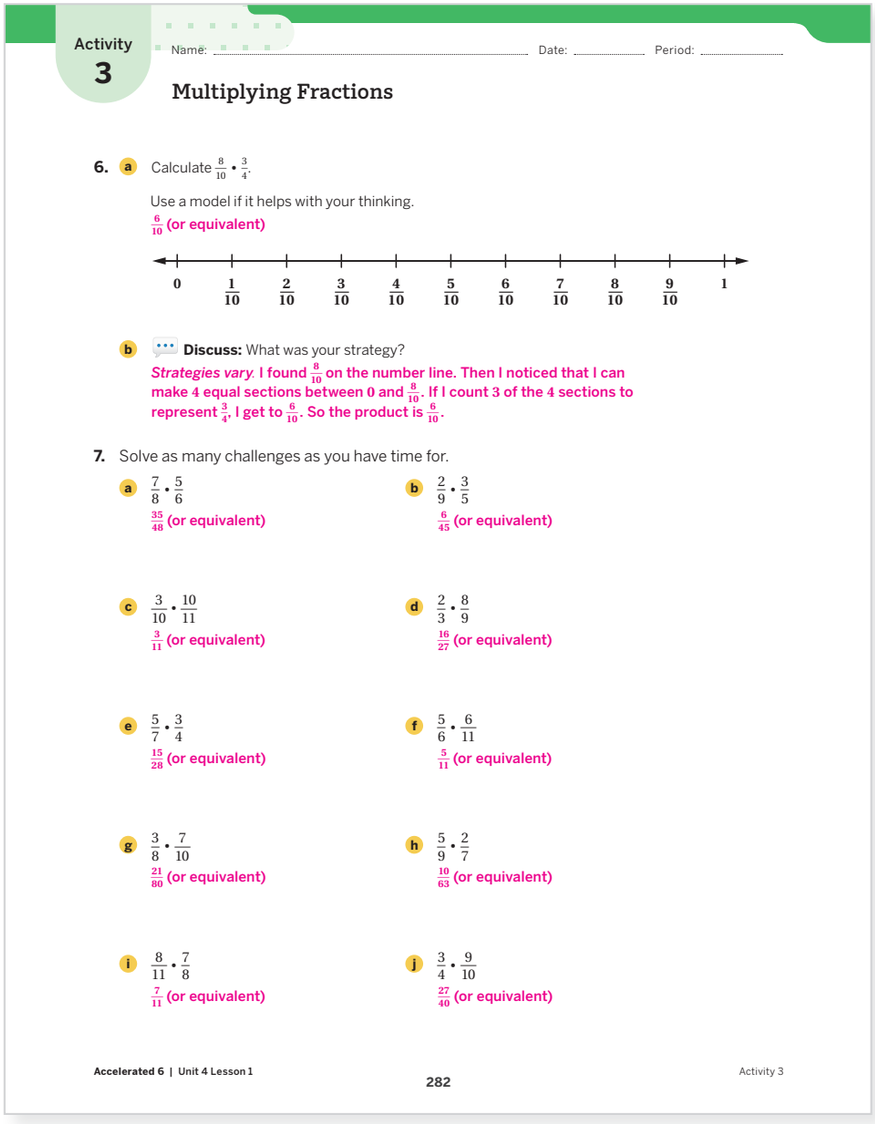
Invite students to solve as many challenges as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly. Encourage students to compare their solutions to problems with a partner.

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

Look for how many problems each student has completed correctly

3 Connect

Invite students to share strategies they found helpful or what they learned from the mistakes they made while solving these challenges. **(MTR.2.1, MTR.5.1)**



Activity 3

Name: _____ Date: _____ Period: _____

Multiplying Fractions

6. a. Calculate $\frac{8}{10} \cdot \frac{3}{4}$.

Use a model if it helps with your thinking.

$\frac{6}{10}$ (or equivalent)

b. **Discuss:** What was your strategy?

Strategies vary. I found $\frac{8}{10}$ on the number line. Then I noticed that I can make 4 equal sections between 0 and $\frac{8}{10}$. If I count 3 of the 4 sections to represent $\frac{3}{4}$, I get to $\frac{6}{10}$. So the product is $\frac{6}{10}$.

7. Solve as many challenges as you have time for.

a. $\frac{7}{8} \cdot \frac{5}{6}$ — $\frac{35}{48}$ (or equivalent)

b. $\frac{2}{9} \cdot \frac{3}{5}$ — $\frac{6}{45}$ (or equivalent)

c. $\frac{3}{10} \cdot \frac{10}{11}$ — $\frac{3}{11}$ (or equivalent)

d. $\frac{2}{3} \cdot \frac{8}{9}$ — $\frac{16}{27}$ (or equivalent)

e. $\frac{5}{7} \cdot \frac{3}{4}$ — $\frac{15}{28}$ (or equivalent)

f. $\frac{5}{6} \cdot \frac{6}{11}$ — $\frac{5}{11}$ (or equivalent)

g. $\frac{3}{8} \cdot \frac{7}{10}$ — $\frac{21}{80}$ (or equivalent)

h. $\frac{5}{9} \cdot \frac{2}{7}$ — $\frac{10}{63}$ (or equivalent)

i. $\frac{8}{11} \cdot \frac{7}{8}$ — $\frac{7}{11}$ (or equivalent)

j. $\frac{3}{4} \cdot \frac{9}{10}$ — $\frac{27}{40}$ (or equivalent)

Accelerated 6 | Unit 4 Lesson 1 282 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of multiplying fractions.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Multiplying the numerators and multiplying the denominators of a numerical expression.
- The overlap of shading in an area model represents the product.
- Using a tape diagram, the entire diagram can represent the first fraction, the shading can represent the second fraction, and where the shading ends represents the product.

MLR **MLR2: Collect and Display** Use this routine to collect students' ideas about multiplying fractions using different methods. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to revise their previous thinking based on the discussion.

Synthesis

8. Describe how to multiply two fractions.

Use the examples if they help with your thinking.

Responses vary. I can use an area model, a tape diagram, a number line, or a numerical expression to help multiply fractions. For example, using an area model, I can show the first fraction in columns and the second fraction in rows. The product is the number of overlapping parts over the total number of parts. Using a numerical model, I can multiply the numerators and multiply the denominators.

$\frac{3}{4} \cdot \frac{1}{2}$

$\frac{1}{4}$ $\frac{2}{4}$ $\frac{3}{4}$

$\frac{1}{8}$ $\frac{2}{8}$ $\frac{3}{8}$ $\frac{4}{8}$ $\frac{5}{8}$ $\frac{6}{8}$

Lesson Practice ACC6.4.01

Lesson Summary

You can use models or a numerical expression to represent fraction multiplication and determine *products*.

For example, a bag contains $\frac{2}{5}$ cup sesame seeds. You pour $\frac{5}{8}$ of the bag into a bowl. What fraction of sesame seeds are in the bowl?

Model	Numerical Expression
0 $\frac{1}{8}$ $\frac{2}{8}$ $\frac{3}{8}$ $\frac{4}{8}$ $\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$ 1	$\frac{2}{5} \cdot \frac{5}{8}$ $\frac{2 \cdot 5}{5 \cdot 8}$ $\frac{10}{40}$ or $\frac{1}{4}$

$\frac{2}{5}$ of $\frac{5}{8}$ is $\frac{2}{8}$ or $\frac{1}{4}$

Accelerated 6 | Unit 4 Lesson 1 283 Synthesis | Lesson Practice

Lesson Takeaway: There are many strategies for multiplying fractions, such as using area models, tape diagrams, number lines, or numerical expressions. To multiply two fractions using a numerical expression, multiply the numerators and multiply the denominators.

Independent | 5 min

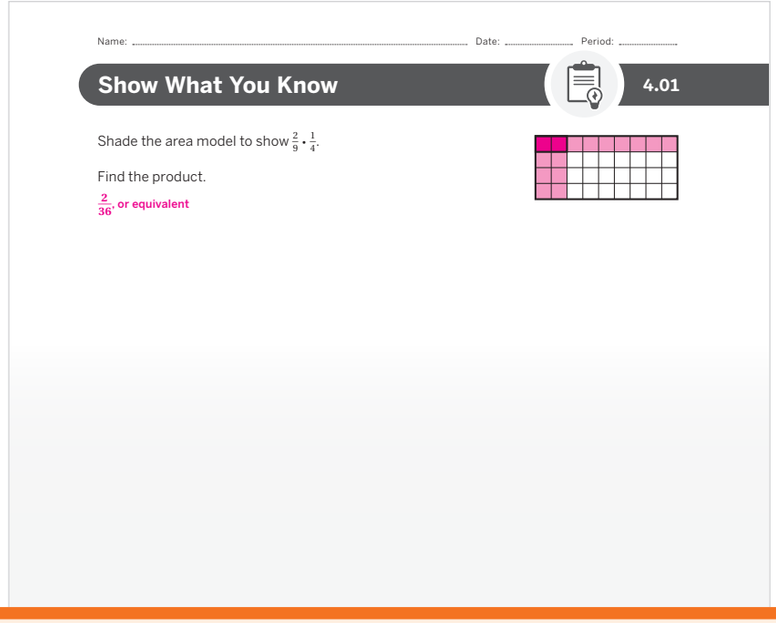
Show What You Know

Purpose: Students demonstrate their understanding by using a model to calculate the product of two fractions.

Today's Goals

1. **Goal:** Represent fraction multiplication problems using models and numerical sentences.
2. **Goal:** Calculate the product of two fractions using multiple methods.
3. **Language Goal:** Explain strategies for determining the products of fractions. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 4.01

Shade the area model to show $\frac{2}{9} \cdot \frac{1}{4}$.

Find the product.

$\frac{2}{36}$, or equivalent

D Differentiation Use after Lesson 1

Here are options for responding to student work on the Show What You Know and throughout the lesson.

Support

Provide targeted intervention for students by using these resources.

If students need support representing and interpreting multiplication problems using models and numerical sentences:

» **Respond to Student Thinking:**

- Use the *Multiplying Fractions* **Mini-lesson**.
- Review the **Lesson Summary** together and provide targeted feedback to students on specific **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 1 Extension Activities**.
- Invite them to revisit **Activity 3** and calculate the products using different strategies.

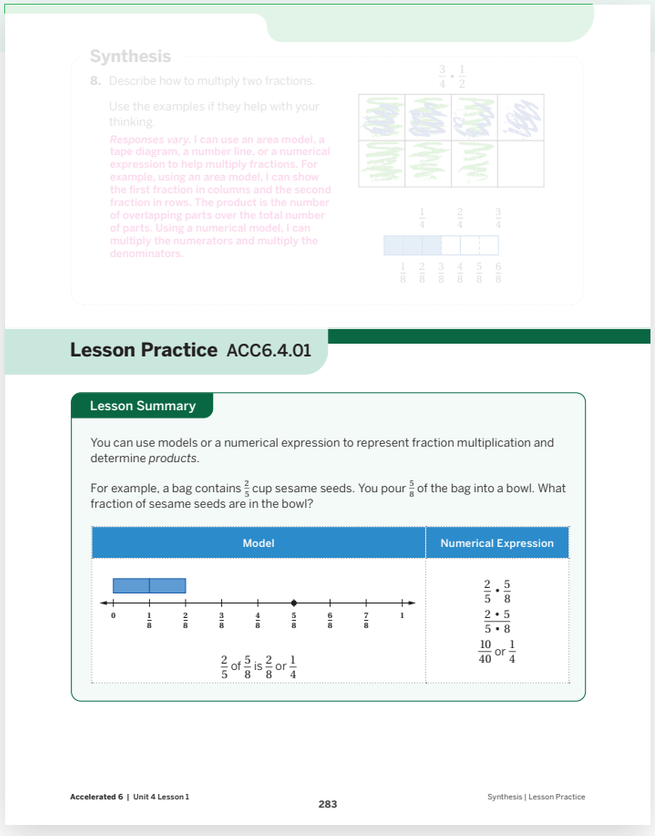
Professional Learning

Take a moment to reflect on this lesson. In this lesson, students connected their previous understanding of fraction models to multiply fractions. How will that work support their understanding of multiplying mixed numbers in Lesson 2?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

8. Describe how to multiply two fractions.

Use the examples if they help with your thinking.

Responses vary. I can use an area model, a tape diagram, a number line, or a numerical expression to help multiply fractions. For example, using an area model, I can show the first fraction in columns and the second fraction in rows. The product is the number of overlapping parts over the total number of parts. Using a numerical model, I can multiply the numerators and multiply the denominators.

$\frac{3}{4} \cdot \frac{1}{2}$

Lesson Practice ACC6.4.01

Lesson Summary

You can use models or a numerical expression to represent fraction multiplication and determine *products*.

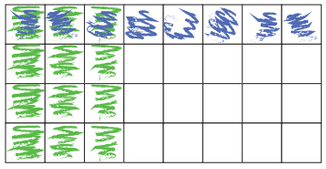
For example, a bag contains $\frac{2}{5}$ cup sesame seeds. You pour $\frac{5}{8}$ of the bag into a bowl. What fraction of sesame seeds are in the bowl?

Model	Numerical Expression
0, $\frac{1}{8}$, $\frac{2}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{6}{8}$, $\frac{7}{8}$, 1 $\frac{2}{5}$ of $\frac{5}{8}$ is $\frac{2}{8}$ or $\frac{1}{4}$	$\frac{2}{5} \cdot \frac{5}{8}$ $\frac{2 \cdot 5}{5 \cdot 8}$ $\frac{10}{40}$ or $\frac{1}{4}$

Lesson Practice
ACC6.4.01

Name: _____ Date: _____ Period: _____

Problems 1–2: Here is an area model.



1. Write a numerical expression that the model represents.
   $\frac{3}{8} \cdot \frac{1}{4}$
2. Calculate the product.
   $\frac{3}{32}$

3. Here is Mauricio's work for calculating $\frac{7}{9} \cdot \frac{4}{7}$. Explain why you think his work makes sense.

   Responses vary. When I multiply a number by a fraction less than 1, the product will be less than the original number, and this product is less than $\frac{7}{9}$. If I break $\frac{7}{9}$ into seven equal parts of size $\frac{1}{9}$, then four of the seven parts is $\frac{4}{9}$.

Mauricio

$\frac{7}{9} \cdot \frac{4}{7}$

$\frac{7 \cdot 4}{9 \cdot 7}$

$\frac{28}{63} = \frac{4}{9}$

Problems 4–7: Calculate each product. Use a model if it helps with your thinking.

4. $\frac{5}{6} \cdot \frac{3}{4}$
   $\frac{15}{24}$ (or equivalent)
5. $\frac{2}{3} \cdot \frac{2}{3}$
   $\frac{4}{9}$ (or equivalent)
6. $\frac{3}{10} \cdot \frac{3}{4}$
   $\frac{9}{40}$ (or equivalent)
7. $\frac{4}{11} \cdot \frac{3}{4}$
   $\frac{3}{11}$ (or equivalent)

Lesson Practice
ACC6.4.01

Name: _____ Date: _____ Period: _____

FAST Practice

8. A car's gasoline tank is $\frac{3}{4}$ full. Then $\frac{2}{5}$ of this amount is used.

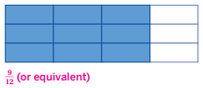
   Write an expression to describe the amount of gasoline used.

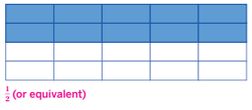
   $\frac{3}{4} \cdot \frac{2}{5}$ (or equivalent)

Spiral Review

Problems 9–11: Determine the fraction of each model that is shaded.

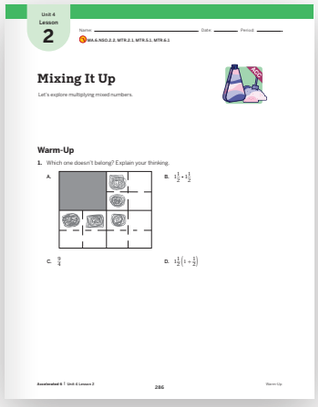
9.
   $\frac{5}{6}$

10. 
    $\frac{9}{12}$ (or equivalent)

11. 
    $\frac{1}{2}$ (or equivalent)

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1, 4–7	2	MA.6.NSO.2.2
	2	1	MA.6.NSO.2.2
	3	3	MA.6.NSO.2.2
FAST Practice	8	2	MA.6.NSO.2.2
Spiral Review			
	9–11	1	MA.3.FR.1.2


Unit 4
Lesson
2

Mixing It Up

Let's explore multiplying mixed numbers.

Warm-Up

1. Which one doesn't belong? Explain your thinking.

Mixing It Up

Multiplying Mixed Numbers

Let's explore multiplying mixed numbers.

Learning Outcomes

Today's Goals

1. **Goal:** Multiply fractions and mixed numbers using multiple strategies, including the *distributive property*.
2. **Language Goal:** Describe how to use the *distributive property* to multiply mixed numbers. **(Writing, Speaking, and Listening)**

Students apply their understanding of multiplying fractions to multiply mixed numbers. They use models to represent the multiplication of mixed numbers and relate the multiplication of mixed numbers to the standard algorithm and the distributive property. **(MTR.2.1, MTR.5.1)**

Coherence

Prior Learning

In Lesson 1, students used a variety of strategies to model and solve fraction multiplication problems.

Future Learning

In Lessons 3–11, students will apply what they know about fractions to divide fractions. In Lesson 10, they will formally relate fraction division to multiplication.

Connections

- Students make connections to the color combinations of art pieces as the model multiplying mixed numbers. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.5.1, MTR.6.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2

Vocabulary

New Vocabulary

distributive property

Lesson at a Glance

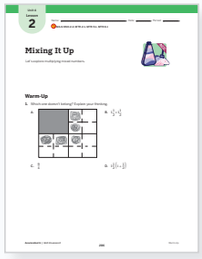
~ 45 min

MA.6.NSO.2.2

Warm-Up

Pairs | 5 min

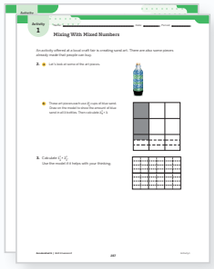
Students look for structure in representations of mixed number multiplication to decide which one doesn't belong based on some criteria.
Routine: Which One Doesn't Belong **(MTR.5.1)**



Activity 1

Pairs | 15 min

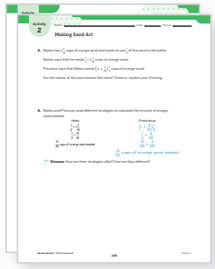
Students use area models and tape diagrams to multiply with mixed numbers. **(MTR.2.1)**



Activity 2

Pairs | 15 min

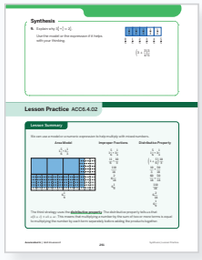
Students analyze two strategies for calculating the product of a fraction and a mixed number and apply strategies to solve problems and determine the reasonableness of solutions.
MLR7: Compare and Connect **(MTR.5.1, MTR.6.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding of multiplying mixed numbers. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by explaining how to calculate the product of two mixed fractions using an area model.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students look for structure in representations of mixed number multiplication to decide which one doesn't belong based on some criteria. **(MTR.5.1)**

1 Launch

Direct students' attention to the four representations and invite students to discuss which image doesn't belong.

Use the Which One Doesn't Belong routine to support students in looking for structure in representations of mixed number multiplication. **(MTR.5.1)**

Consider sharing that each representation does not belong in some way. Encourage students to look for more than one possibility and/or use their creativity to create another representation that doesn't belong, based on the criteria they selected.

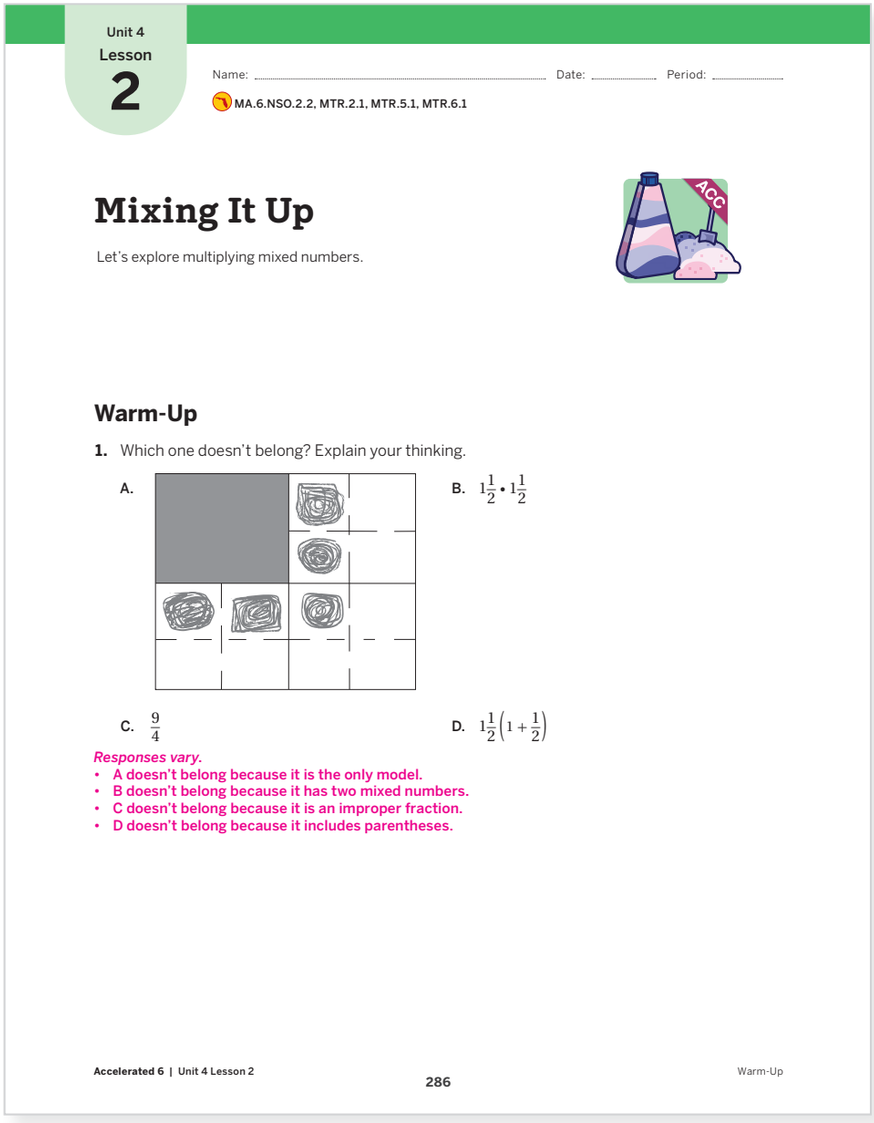
ELL **English Language Learners** Provide sentence frames (e.g., "_____ doesn't belong because _____." or "_____ is the only one that has/doesn't have _____."). **(Writing and Speaking)**

2 Connect

Discuss why each representation doesn't belong, asking students to justify their choice.

Consider asking:

- "How is _____ like/different from the other representations?"
- "What is another way to say why _____ doesn't belong?"



Unit 4
Lesson
2

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MTR.2.1, MTR.5.1, MTR.6.1

Mixing It Up

Let's explore multiplying mixed numbers.

Warm-Up

1. Which one doesn't belong? Explain your thinking.

A.

B. $1\frac{1}{2} \cdot 1\frac{1}{2}$

C. $\frac{9}{4}$

D. $1\frac{1}{2}\left(1+\frac{1}{2}\right)$

Responses vary.

- A doesn't belong because it is the only model.
- B doesn't belong because it has two mixed numbers.
- C doesn't belong because it is an improper fraction.
- D doesn't belong because it includes parentheses.

Accelerated 6 | Unit 4 Lesson 2 286 Warm-Up

Pairs | 15 min

Activity 1 Mixing With Mixed Numbers

Purpose: Students use area models and tape diagrams to multiply with mixed numbers. **(MTR.2.1)**

1 Launch

Direct students' attention to the sand art. Invite students to share what they notice and wonder about the bottles of sand art.

To generate excitement, consider asking, "What colors would you include if you created a bottle of sand art?"

2 Monitor

To support students getting started, invite them to discuss how the word problem, expression, and area model relate. Consider asking, "What does the shading in the area model represent?" **(MTR.2.1, MTR.5.1)**

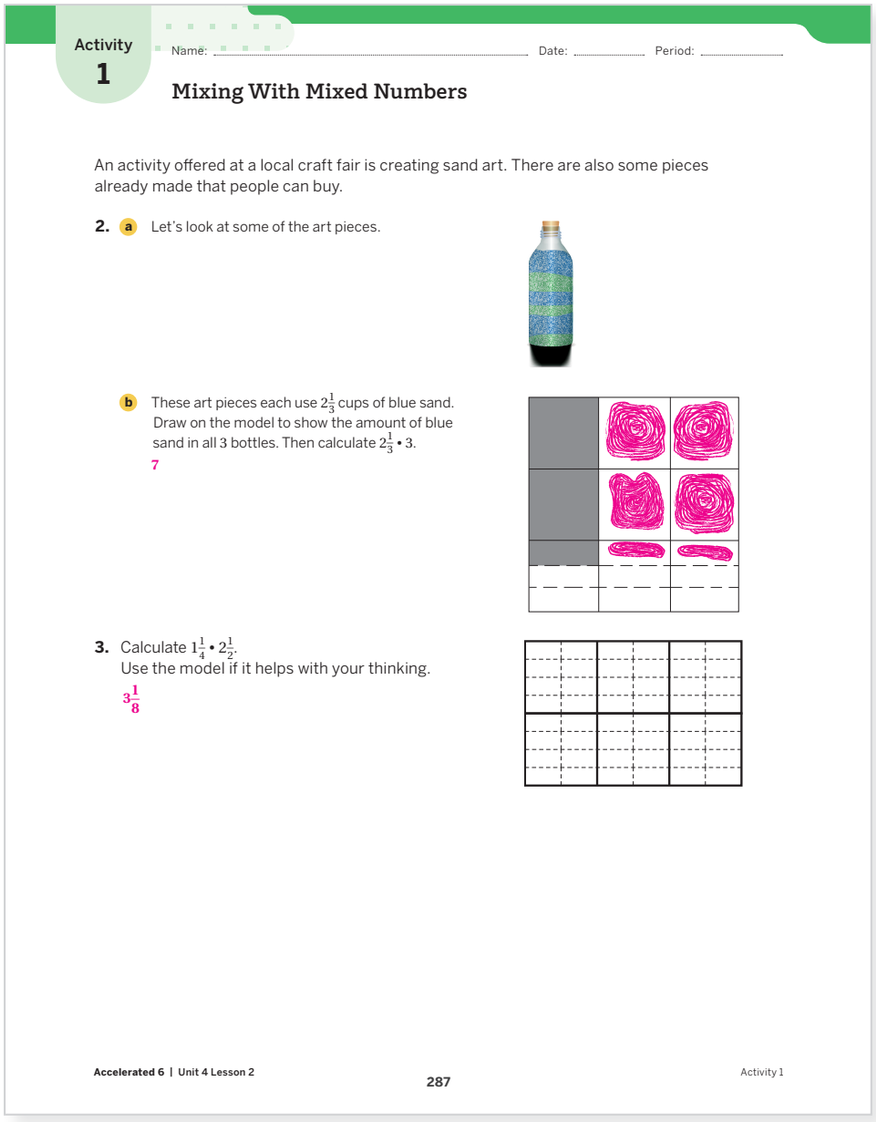
Encourage students to analyze the blank model and then discuss with a partner how the model can help them calculate the product. **(MTR.2.1)**

Look and listen for a variety of student thinking and support as needed.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How can you show $1\frac{1}{4}$ using the area model?"
Incorrectly determine the product from a correct model.	**Support** Invite students to explain how they created their model. Consider asking, "What fraction does each piece of a section represent?"
Draw a correct model.	**Strengthen** Invite students to share their models during the Connect.
Describe how the model, expression, and product relate.	**Stretch** Invite students to create a different type of model that can represent the same product.

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Mixing With Mixed Numbers

An activity offered at a local craft fair is creating sand art. There are also some pieces already made that people can buy.

2. a Let's look at some of the art pieces.

b These art pieces each use $2\frac{1}{3}$ cups of blue sand. Draw on the model to show the amount of blue sand in all 3 bottles. Then calculate $2\frac{1}{3} \cdot 3$.

7

3. Calculate $1\frac{1}{4} \cdot 2\frac{1}{2}$.
Use the model if it helps with your thinking.

$3\frac{1}{8}$

Accelerated 6 | Unit 4 Lesson 2 287 Activity 1

Pairs | 15 min

Activity 1 Mixing With Mixed Numbers (continued)

Purpose: Students use area models and tape diagrams to multiply with mixed numbers. **(MTR.2.1)**

2 Monitor

Direct students' attention to the tape diagram and invite students to compare the expression and the model and discuss their thinking with a partner.

A **Accessibility: Conceptual Processing** Invite students to revisit their work in Lesson 1 to help apply concepts to new situations.

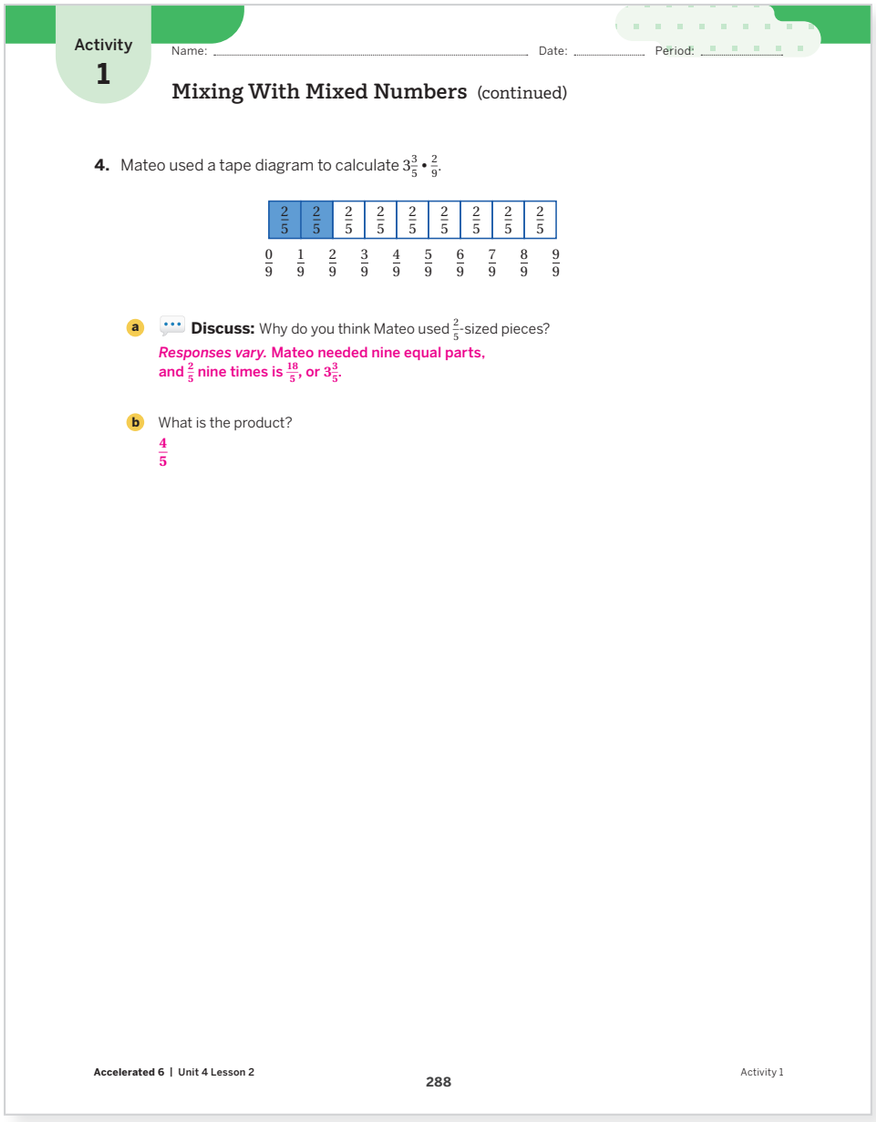
Capture a variety of student responses to share during the Connect.

3 Connect

Invite students to share their responses and explain their thinking.

To surface the Key Takeaway, consider asking:

- "How are Problems 3 and 4 alike? How are they different?"
- "When would a tape diagram be preferable to an area model to represent mixed number multiplication?" **(MTR.2.1, MTR.5.1)**



Activity 1

Name: _____ Date: _____ Period: _____

Mixing With Mixed Numbers (continued)

4. Mateo used a tape diagram to calculate $3\frac{3}{5} \cdot \frac{2}{9}$.

a. **Discuss:** Why do you think Mateo used $\frac{2}{5}$-sized pieces?

Responses vary. Mateo needed nine equal parts, and $\frac{2}{5}$ nine times is $\frac{18}{5}$, or $3\frac{3}{5}$.

b. What is the product?

$\frac{4}{5}$

Accelerated 6 | Unit 4 Lesson 2 288 Activity 1

Key Takeaway: An area model or tape diagram can help to visually determine the products of fractions and mixed numbers.

Pairs | 15 min

Activity 2 Making Sand Art

Purpose: Students analyze two strategies for calculating the product of a fraction and a mixed number and apply strategies to solve problems and determine the reasonableness of solutions. **(MTR.5.1, MTR.6.1)**

Short on time? Consider omitting Problem 8.

1 Launch

Invite students to read the problem aloud and then restate the problem to their partner.

Encourage students to make their thinking visible by sketching in their Student Edition.

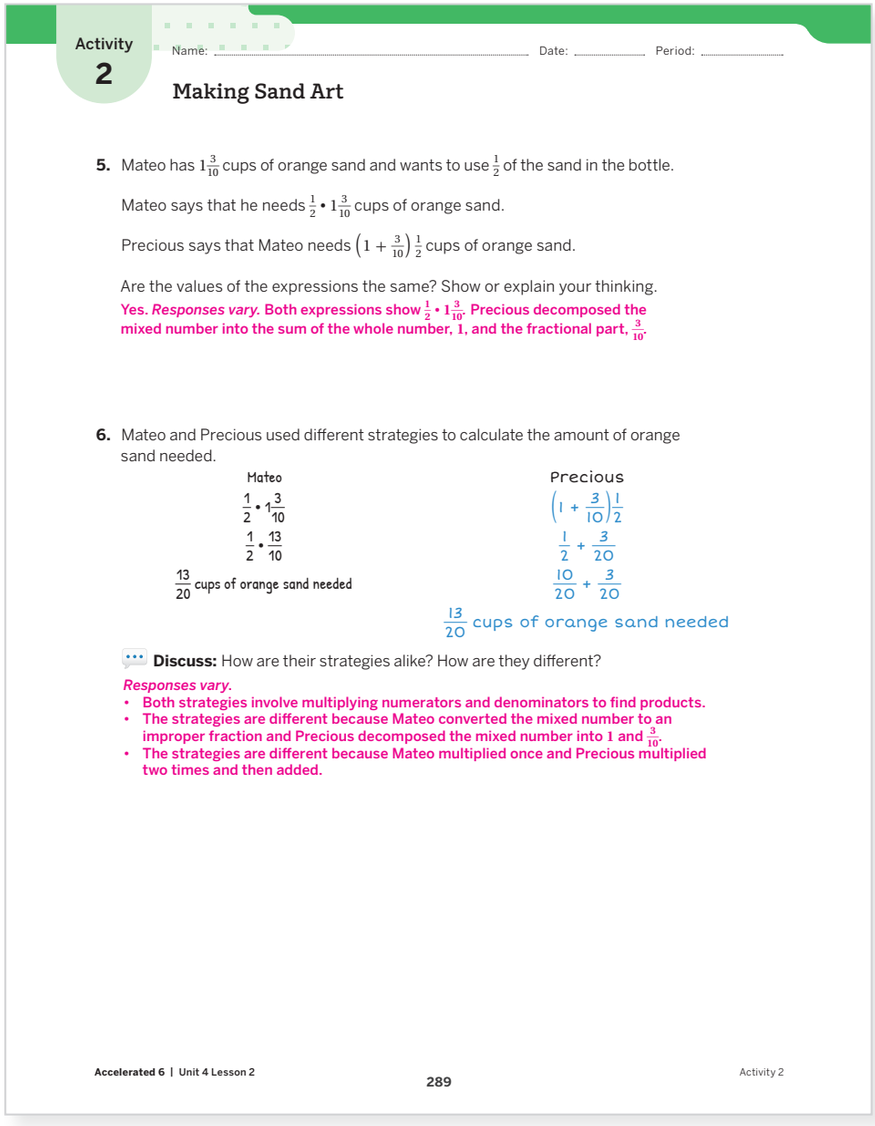
2 Monitor

Listen for the mathematical language students use in discussing how the strategies compare, such as using the terms *improper fractions* and *decompose*. **(MTR.5.1)**

ELL **English Language Learners** Invite students to rehearse their ideas with a partner before they share their ideas with others. **(Writing and Speaking)**

Pause briefly to invite students to share their thinking with the class.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Making Sand Art

5. Mateo has $1\frac{3}{10}$ cups of orange sand and wants to use $\frac{1}{2}$ of the sand in the bottle.

Mateo says that he needs $\frac{1}{2} \cdot 1\frac{3}{10}$ cups of orange sand.

Precious says that Mateo needs $\left(1 + \frac{3}{10}\right)\frac{1}{2}$ cups of orange sand.

Are the values of the expressions the same? Show or explain your thinking.

Yes. *Responses vary.* Both expressions show $\frac{1}{2} \cdot 1\frac{3}{10}$. Precious decomposed the mixed number into the sum of the whole number, 1, and the fractional part, $\frac{3}{10}$.

6. Mateo and Precious used different strategies to calculate the amount of orange sand needed.

Mateo

$\frac{1}{2} \cdot 1\frac{3}{10}$

$\frac{1}{2} \cdot \frac{13}{10}$

$\frac{13}{20}$ cups of orange sand needed

Precious

$\left(1 + \frac{3}{10}\right)\frac{1}{2}$

$\frac{1}{2} + \frac{3}{20}$

$\frac{10}{20} + \frac{3}{20}$

$\frac{13}{20}$ cups of orange sand needed

Discuss: How are their strategies alike? How are they different?

Responses vary.

- Both strategies involve multiplying numerators and denominators to find products.
- The strategies are different because Mateo converted the mixed number to an improper fraction and Precious decomposed the mixed number into 1 and $\frac{3}{10}$.
- The strategies are different because Mateo multiplied once and Precious multiplied two times and then added.

Accelerated 6 | Unit 4 Lesson 2 289 Activity 2

Pairs | 15 min

Activity 2 Making Sand Art (continued)

Purpose: Students analyze two strategies for calculating the product of a fraction and a mixed number and apply strategies to solve problems and determine the reasonableness of solutions. **(MTR.5.1, MTR.6.1)**

Short on time? Consider omitting Problem 8.

2 Monitor

Direct students' attention to the problem. Consider inviting students to restate Mateo's and Precious's strategies for multiplying with mixed numbers in their own words.

A **Accessibility: Executive Functioning** To support initiating complex tasks, identify possible places to start.

Consider asking, "When will the product of two numbers be less than or greater than the original number?" **(MTR.6.1)**

Look and listen for a variety of student responses to share during the Connect.

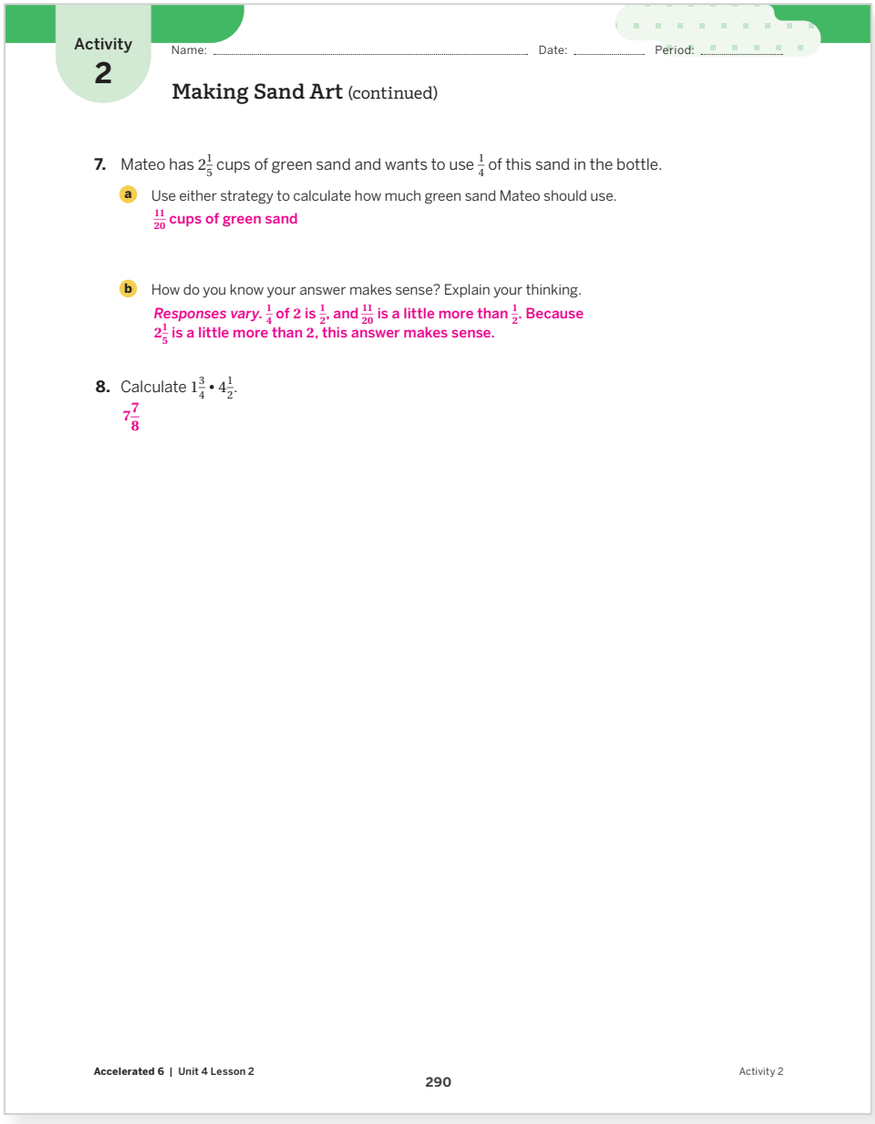
3 Connect

Invite students to share what they noticed about the two strategies.

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy and then connect to their own strategy.

Invite students to share their responses. If time allows, challenge students to create models to illustrate the products. **(MTR.2.1)**

To surface the Key Takeaway, invite students to explain the strategy they used in Problem 7. **(MTR.5.1)**



Activity 2

Name: _____ Date: _____ Period: _____

Making Sand Art (continued)

7. Mateo has $2\frac{1}{5}$ cups of green sand and wants to use $\frac{1}{4}$ of this sand in the bottle.

a. Use either strategy to calculate how much green sand Mateo should use.

$\frac{11}{20}$ cups of green sand

b. How do you know your answer makes sense? Explain your thinking.

Responses vary. $\frac{1}{4}$ of 2 is $\frac{1}{2}$, and $\frac{11}{20}$ is a little more than $\frac{1}{2}$. Because $2\frac{1}{5}$ is a little more than 2, this answer makes sense.

8. Calculate $1\frac{3}{4} \cdot 4\frac{1}{2}$.

$7\frac{7}{8}$

Accelerated 6 | Unit 4 Lesson 2 290 Activity 2

Key Takeaway: You can decompose mixed numbers or rewrite them as improper fractions to help multiply them.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of multiplying mixed numbers.

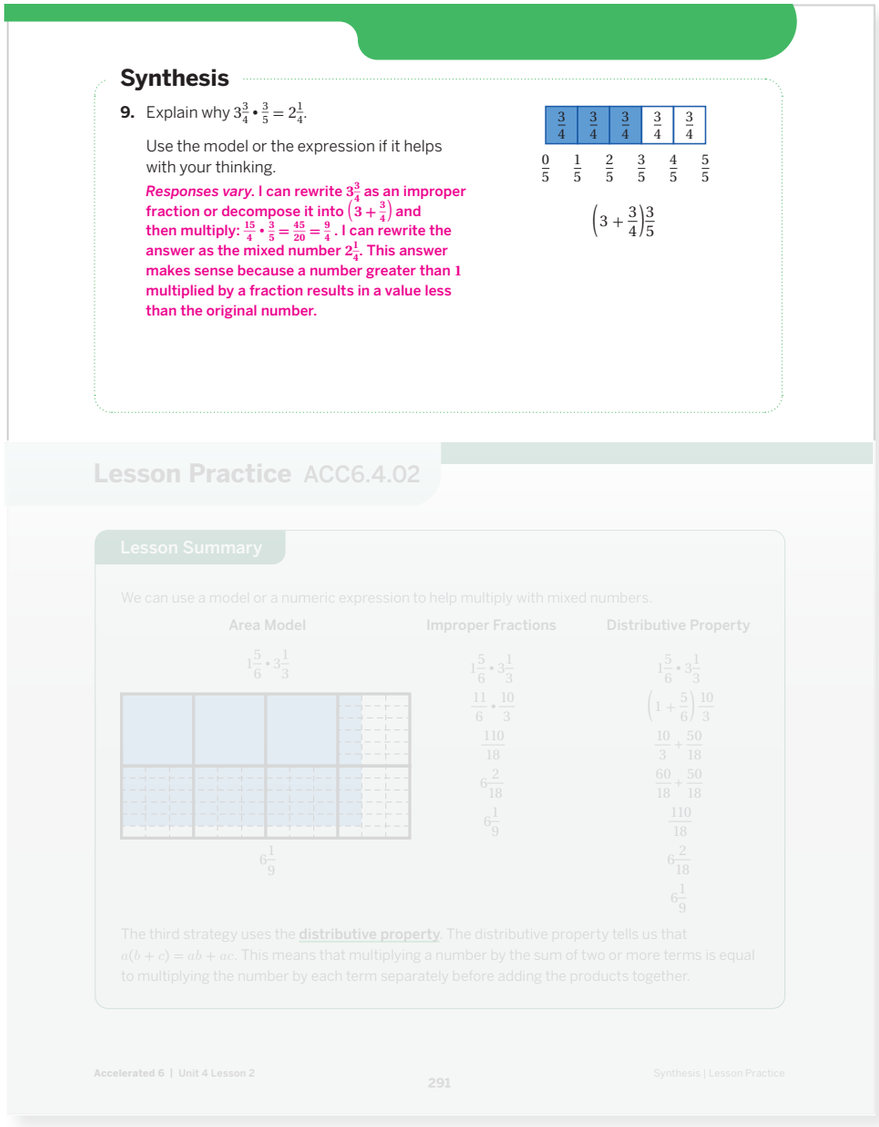
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- I can rewrite mixed numbers as improper fractions.
- After I decompose a mixed number into a whole and a fractional part, I must multiply the number outside parentheses with each number inside parentheses and then add.
- When I multiply by a number less than 1, the product will be less than the original number. When I multiply by a number greater than 1, the product will be greater than the original number.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies for multiplying mixed numbers and synthesize the class definition of the term *distributive property* using students' language. Display the information for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

9. Explain why $3\frac{3}{4} \cdot \frac{3}{5} = 2\frac{1}{4}$.

Use the model or the expression if it helps with your thinking.

Responses vary. I can rewrite $3\frac{3}{4}$ as an improper fraction or decompose it into $\left(3+\frac{3}{4}\right)$ and then multiply: $\frac{15}{4} \cdot \frac{3}{5} = \frac{45}{20} = \frac{9}{4}$. I can rewrite the answer as the mixed number $2\frac{1}{4}$. This answer makes sense because a number greater than 1 multiplied by a fraction results in a value less than the original number.

Lesson Practice ACC6.4.02

Lesson Summary

We can use a model or a numeric expression to help multiply with mixed numbers.

Area Model

$1\frac{5}{6} \cdot 3\frac{1}{3}$

$6\frac{1}{9}$

Improper Fractions

$1\frac{5}{6} \cdot 3\frac{1}{3}$

$\frac{11}{6} \cdot \frac{10}{3}$

$\frac{110}{18}$

$6\frac{2}{18}$

$6\frac{1}{9}$

Distributive Property

$1\frac{5}{6} \cdot 3\frac{1}{3}$

$\left(1+\frac{5}{6}\right)\frac{10}{3}$

$\frac{10}{3} + \frac{50}{18}$

$\frac{60}{18} + \frac{50}{18}$

$\frac{110}{18}$

$6\frac{2}{18}$

$6\frac{1}{9}$

The third strategy uses the distributive property. The distributive property tells us that $a(b+c) = ab + ac$. This means that multiplying a number by the sum of two or more terms is equal to multiplying the number by each term separately before adding the products together.

Accelerated 6 | Unit 4 Lesson 2 291 Synthesis | Lesson Practice

Lesson Takeaway: You can use a model or a numeric process to calculate products of mixed numbers. When you decompose a mixed number into the whole and the fractional part, you can use the **distributive property** to multiply each quantity separately before adding the products together.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by explaining how to calculate the product of two mixed fractions using an area model.

Today's Goals

1. **Goal:** Multiply fractions and mixed numbers using multiple strategies, including the *distributive property*.
2. **Language Goal:** Describe how to use the *distributive property* to multiply mixed numbers. **(Writing, Speaking, and Listening)**

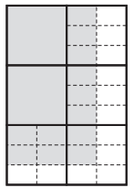
Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.02

Complete the multiplication equation using the area model.

$2\frac{2}{3} \cdot 1\frac{1}{2} = 4$



Show or explain your thinking.

Responses vary.

The first number is $2\frac{2}{3}$ since $2\frac{2}{3}$ of the rows are shaded.

I can multiply by changing the mixed numbers to improper fractions to have $\frac{8}{3} \cdot \frac{3}{2}$ and then multiply to have $\frac{24}{6}$ which is 4.

Differentiation Use after Lesson 2

Here are options for responding to student work on the Show What You Know and throughout the lesson.

Support

Provide targeted intervention for students by using these resources.

If students need support multiplying fractions and mixed numbers:

» **Respond to Student Thinking:**

- Use the *Multiplying With Fractions and Mixed Numbers* **Mini-lesson**.
- Use the *Multiplying Fractions* **Mini-lesson**.
- Review the **Lesson Summary** together and provide targeted feedback to students on specific **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Take a moment to reflect on this lesson. In this lesson, students connected their previous understanding of multiplying fractions using models and an algorithm to multiply mixed numbers using models, an algorithm, and the distributive property. How will that work support their understanding of dividing fractions later in the unit?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. Explain why $3\frac{3}{4} \cdot \frac{3}{5} = 2\frac{1}{4}$.

Use the model or the expression if it helps with your thinking.

Responses vary. I can rewrite $3\frac{3}{4}$ as an improper fraction or decompose it into $\left(3 + \frac{3}{4}\right)$ and then multiply: $\frac{15}{4} \cdot \frac{3}{5} = \frac{45}{20} = \frac{9}{4}$. I can rewrite the answer as the mixed number $2\frac{1}{4}$. This answer makes sense because a number greater than 1 multiplied by a fraction results in a value less than the original number.

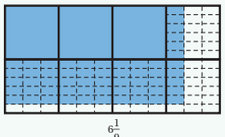
Lesson Practice ACC6.4.02

Lesson Summary

We can use a model or a numeric expression to help multiply with mixed numbers.

Area Model

$1\frac{5}{6} \cdot 3\frac{1}{3}$



$6\frac{1}{9}$

Improper Fractions

$1\frac{5}{6} \cdot 3\frac{1}{3}$

$\frac{11}{6} \cdot \frac{10}{3}$

$\frac{110}{18}$

$6\frac{2}{18}$

$6\frac{1}{9}$

Distributive Property

$1\frac{5}{6} \cdot 3\frac{1}{3}$

$\left(1 + \frac{5}{6}\right)\frac{10}{3}$

$\frac{10}{3} + \frac{50}{18}$

$\frac{60}{18} + \frac{50}{18}$

$\frac{110}{18}$

$6\frac{2}{18}$

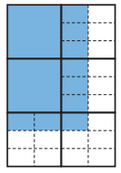
$6\frac{1}{9}$

The third strategy uses the **distributive property**. The distributive property tells us that $a(b + c) = ab + ac$. This means that multiplying a number by the sum of two or more terms is equal to multiplying the number by each term separately before adding the products together.

Lesson Practice
ACC6.4.02

Name: _____ Date: _____ Period: _____

1. Select *all* the expressions that the model represents.



- [x] A. $2\frac{1}{3} \cdot 1\frac{1}{2}$
- [x] B. $\left(2 + \frac{1}{3}\right)\frac{3}{2}$
- [ ] C. $3\frac{2}{3}$
- [ ] D. $\left(2 \cdot \frac{1}{3}\right)\frac{3}{2}$
- [x] E. $3\frac{3}{6}$

2. What is the product of $5\frac{1}{4} \cdot \frac{3}{7}$? Show or explain your thinking.

$2\frac{1}{4}$. *Responses vary.*

$\frac{0}{7}$ $\frac{1}{7}$ $\frac{2}{7}$ $\frac{3}{7}$ $\frac{4}{7}$ $\frac{5}{7}$ $\frac{6}{7}$ $\frac{7}{7}$

Problems 3–6: Calculate each product.

3. $3\frac{3}{4} \cdot \frac{2}{3}$

$2\frac{1}{2}$

4. $6\frac{2}{5} \cdot \frac{5}{6}$

$5\frac{1}{3}$

5. $4\frac{4}{5} \cdot 3\frac{5}{8}$

$17\frac{2}{5}$

6. $3\frac{7}{10} \cdot 2\frac{3}{5}$

$9\frac{31}{50}$

Lesson Practice
ACC6.4.02

Name: _____ Date: _____ Period: _____

Problems 7–9: On Monday, Station 1 in a cooking class uses $2\frac{3}{4}$ cups of flour. Station 2 uses $3\frac{1}{2}$ times as much flour.

7. Use a model or a numeric expression to represent the problem.

Responses vary. $2\frac{3}{4} \cdot 3\frac{1}{2}$

8. How much flour does Station 2 use?

$9\frac{5}{8}$ cups of flour

9. How do you know your answer makes sense? Explain your thinking.

Responses vary. Because the first number is being multiplied by a value greater than 1, the solution must be greater than the first number. $2\frac{3}{4}$ is a little less than 3. $3 \cdot 3 = 9$ and $3 \cdot 4 = 12$. So a solution between 9 and 12 makes sense.

FAST Practice

10. What is the product of $6\frac{1}{4} \cdot \frac{9}{10}$?

A. $5\frac{13}{20}$ B. $5\frac{1}{2}$ (C.) $5\frac{5}{8}$ D. $5\frac{2}{5}$

Spiral Review

Problems 11–13: Calculate each product.

11. $\frac{2}{5} \cdot \frac{1}{4}$

$\frac{1}{10}$

12. $\frac{5}{9} \cdot \frac{4}{5}$

$\frac{4}{9}$

13. $\frac{3}{8} \cdot \frac{7}{10}$

$\frac{21}{80}$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1, 3–6	1	MA.6.NSO.2.2
	2, 7–8	2	MA.6.NSO.2.2
	9	3	MA.6.NSO.2.2
FAST Practice	10	1	MA.6.NSO.2.2
Spiral Review			
	11–13	1	MA.6.NSO.2.2

Sub-Unit 2

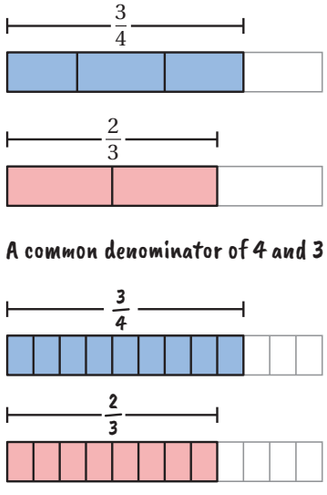
Dividing Fractions

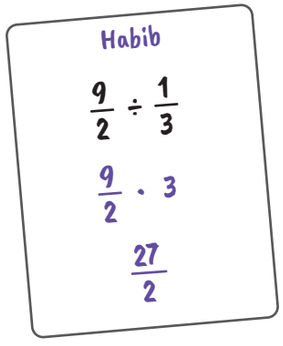
Sub-Unit 2 Goals

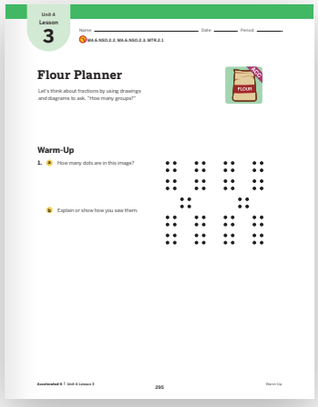
- **Goal:** Use a variety of strategies to calculate quotients of fractions.
- **Goal:** Solve problems that involve dividing fractions.
- **Language Goal:** Analyze strategies for determining the quotients of fractions using mathematically precise language.
- **Language Goal:** Describe connections between division problems, diagrams, and questions asking, "How many groups?" or "How much in 1 group?" and explain a solution method using mathematically precise language.

In this sub-unit, students develop strategies for calculating **quotients** of two fractions, including the use of **common denominators**. Students then use what they know about dividing fractions to solve problems.

Math that Matters Most

Concept or Skill	For example . . .
Use tape diagrams with common denominators to solve division problems asking, "How many groups?"	$\frac{3}{4} \div \frac{2}{3} =$  A common denominator of 4 and 3 is 12.
Divide fractions by rewriting them with common denominators.	Ahmed: $\frac{5}{6} \div \frac{1}{4}$, $\frac{10}{12} \div \frac{3}{12}$, $10 \div 3$, $\frac{10}{3}$ Zoe: $\frac{5}{6} \div \frac{1}{4}$, $\frac{20}{24} \div \frac{6}{24}$, $20 \div 6$, $\frac{20}{6}$

Concept or Skill	For example . . .
Rewrite division problems with a unit fraction $\frac{1}{a}$ as multiplying by a.	 Habib $\frac{9}{2} \div \frac{1}{3}$ $\frac{9}{2} \cdot 3$ $\frac{27}{2}$
Divide fractions by multiplying by the reciprocal.	$\frac{5}{6} \div \frac{2}{3}$ Multiply by the reciprocal of the second fraction. $= \frac{5}{6} \cdot \frac{3}{2}$ $= \frac{15}{12}$ $= \frac{5}{4}$


Unit 4
Lesson
3

Flour Planner

Let's think about fractions by using drawings and diagrams to ask, "How many groups?"

Warm-Up

1. How many dots are in this image?

Explain or show how you saw them.

295

Flour Planner

How Many Groups?, Part 1

Let's think about fractions by using drawings and diagrams to ask "How many groups?"

Learning Outcomes

Today's Goals

1. **Goal:** Use diagrams to represent and solve a problem asking "How many groups?" when the size of each group is a fraction.
2. **Language Goal:** Interpret a division problem as a question asking "How many groups?" **(Speaking and Listening)**

Students make connections between drawings, tape diagrams, and multiplication and division expressions to answer the question "How many groups?" when the size of each group is a fraction. They consider these representations in the context of scoops of flour and make sense of the context and the decontextualized expressions that represent it. **(MTR.2.1)**

Coherence

Prior Learning

In Lessons 1–2, students learned how to multiply fractions and mixed numbers.

Future Learning

In Lesson 4, students will continue to use a variety of strategies to answer the question "How many in 1 group?"

Connections

- Students explore the ingredients of a cake mix to model "How many groups". (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standard: MTR.2.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.4	MA.7.NSO.2.2
MA.5.AR.1.1	MA.7.NSO.2.3
MA.5.AR.1.3	

Vocabulary

New Vocabulary

quotient

Lesson at a Glance

~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

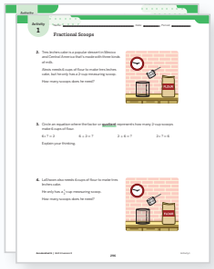
Independent | 5 min

Students use the **Number Talk** routine to reason multiplicatively about an unknown number of dots.

Activity 1

Pairs | 10 min

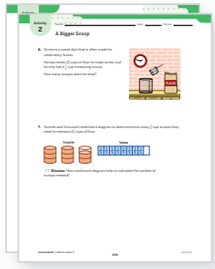
Students extend what they know about dividing by a whole number to dividing by a fraction to determine an unknown number of groups in a situation about cake. **(MTR.2.1)**



Activity 2

Pairs | 20 min

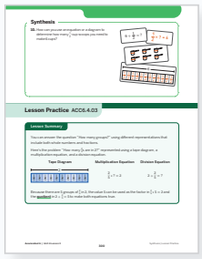
Students determine an unknown number of groups when the group size is a non-unit fraction.



Synthesis

Whole Class | 5 min

Students synthesize their understanding that there are multiple strategies to answer the question "How many groups?"



Show What You Know

Independent | 5 min

Students demonstrate their understanding by solving a problem asking "How many groups?" when the size of each group is a fraction.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Various measuring scoops
- Flour
- A large container

Independent | 5 min

Warm-Up

Purpose: Students use the **Number Talk** routine to reason multiplicatively about an unknown number of dots.

1 Launch

Use the Number Talk routine to support students' ability to think flexibly about counting groups using multiplication.

Note: This is not a traditional Number Talk prompt, but the same type of facilitation will work for this prompt.

Consider sharing that there are many ways to think about a problem and that the goal in this instance is to find multiple strategies that aren't counting one by one.

A **Accessibility: Visual-Spatial Processing** As students interpret visual representations, provide coloring tools and invite them to use color coding to group sets of dots together. Consider asking, "How many dots are in your group? How many groups do you see?"

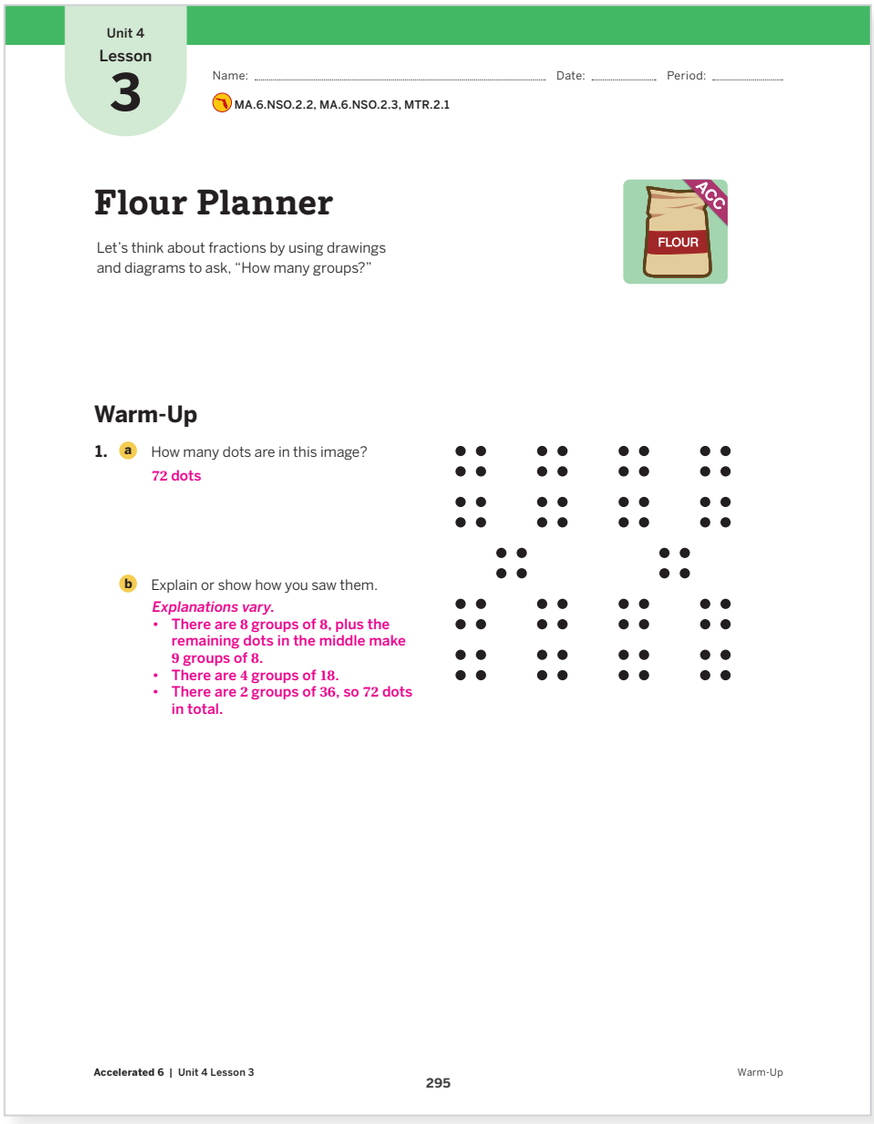
ELL **English Language Learners** Provide students time to rehearse and formulate their responses before sharing them with the class. **(Speaking and Listening)**

2 Connect

Invite pairs of students to share their grouping strategy with the class. Invite them to share how many groups they counted and the number of dots in each group. Record strategies for all to see, along with the name of the student who shared each one.

Consider asking:

- "What are other unique and efficient ways to count the dots?"
- "What is the same and what is different about these two expressions?"



Unit 4
Lesson
3

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1

Flour Planner

Let's think about fractions by using drawings and diagrams to ask, "How many groups?"

Warm-Up

1. a How many dots are in this image?

72 dots

b Explain or show how you saw them.

Explanations vary.

- There are 8 groups of 8, plus the remaining dots in the middle make 9 groups of 8.
- There are 4 groups of 18.
- There are 2 groups of 36, so 72 dots in total.

Accelerated 6 | Unit 4 Lesson 3 295 Warm-Up

Pairs | 10 min

Activity 1 Fractional Scoops

Purpose: Students extend what they know about dividing by a whole number to dividing by a fraction to determine an unknown number of groups in a situation about cake. **(MTR.2.1)**

1 Launch

To surface connections, consider asking "Have you ever had tres leches cake?" If many students are unfamiliar, share a picture of the cake and that it is the national pastry of Nicaragua and is very popular throughout Latin America.

2 Monitor

Invite students to circle their equations. Consider polling the class to determine the distribution of responses.

Create a class definition for the term **quotient** using students' language and the glossary.

Consider asking, "In division problems, what do we call each of the other terms? Do you think the quotient is always smaller than the divisor in a division problem?"

ELL **English Language Learners** Consider creating an anchor chart with the quotient, divisor, and dividend labeled in a sample equation. Invite students to reference the anchor chart throughout the lesson as these words come up.

Look for a variety of strategies and representations including tape diagrams, sketching the problem, writing an equation, etc. **(MTR.2.1)**

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Do you think the answer is greater than 10? Why?"
Write 3 scoops because 3 is half of 6.	**Support** Consider asking, "How much flour would you have with three $\frac{1}{2}$-cup scoops?"
Write 12 scoops without showing any thinking.	**Strengthen** Invite students to include a drawing, tape diagram, or an equation that represents their thinking.
Write 12 scoops with thinking shown.	**Stretch** Invite students to write an equation that can represent this scenario. $6 \div \frac{1}{2} = 12$

A **Accessibility: Conceptual Processing** As students think abstractly, provide access to physical measuring scoops and large containers to help bridge the gap between concrete representations and abstract thinking. Consider bringing in water or flour and demonstrate both scenarios. **(MTR.2.1)**

Activity 1 continued >

Activity 1

Name: _____ Date: _____ Period: _____

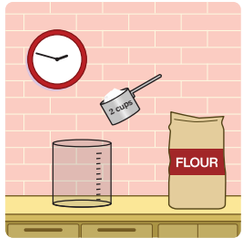
Fractional Scoops

2. Tres leches cake is a popular dessert in Mexico and Central America that's made with three kinds of milk.

Alexis needs 6 cups of flour to make tres leches cake, but he only has a 2-cup measuring scoop.

How many scoops does he need?

3 scoops



3. Circle an equation where the factor or **quotient** represents how many 2-cup scoops make 6 cups of flour.

$6 \cdot ? = 2$ $6 \div 2 = ?$ $2 \div 6 = ?$ $2 \cdot ? = 6$

Explain your thinking.

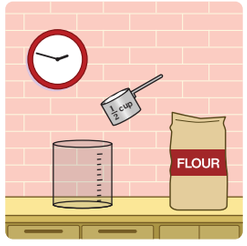
Responses and explanations vary.
- $6 \div 2 = ?$ because I want to know how many 2s go into 6.
- $2 \cdot ? = 6$ because I want to know how many groups of 2 make 6.

4. LaShawn also needs 6 cups of flour to make tres leches cake.

He only has a $\frac{1}{2}$-cup measuring scoop.

How many scoops does he need?

12 scoops



Accelerated 6 | Unit 4 Lesson 3 296 Activity 1

Pairs | 10 min

Activity 1 Fractional Scoops (continued)

Purpose: Students extend what they know about dividing by a whole number to dividing by a fraction to determine an unknown number of groups in a situation about cake. **(MTR.2.1)**

2 Monitor

Direct students' attention to LaShawn's strategy.

ELL **English Language Learners** Provide sentence frames to help students explain their thinking. For example, "LaShawn determined he needed 12 scoops by _____." **(Reading and Speaking)**

D **Differentiation: (Stretch)** If students explain that the diagram shows how many half-cup scoops are in 6 cups, encourage students to write another similar situation and draw a tape diagram for that.

Capture a variety of explanations to share during the Connect.

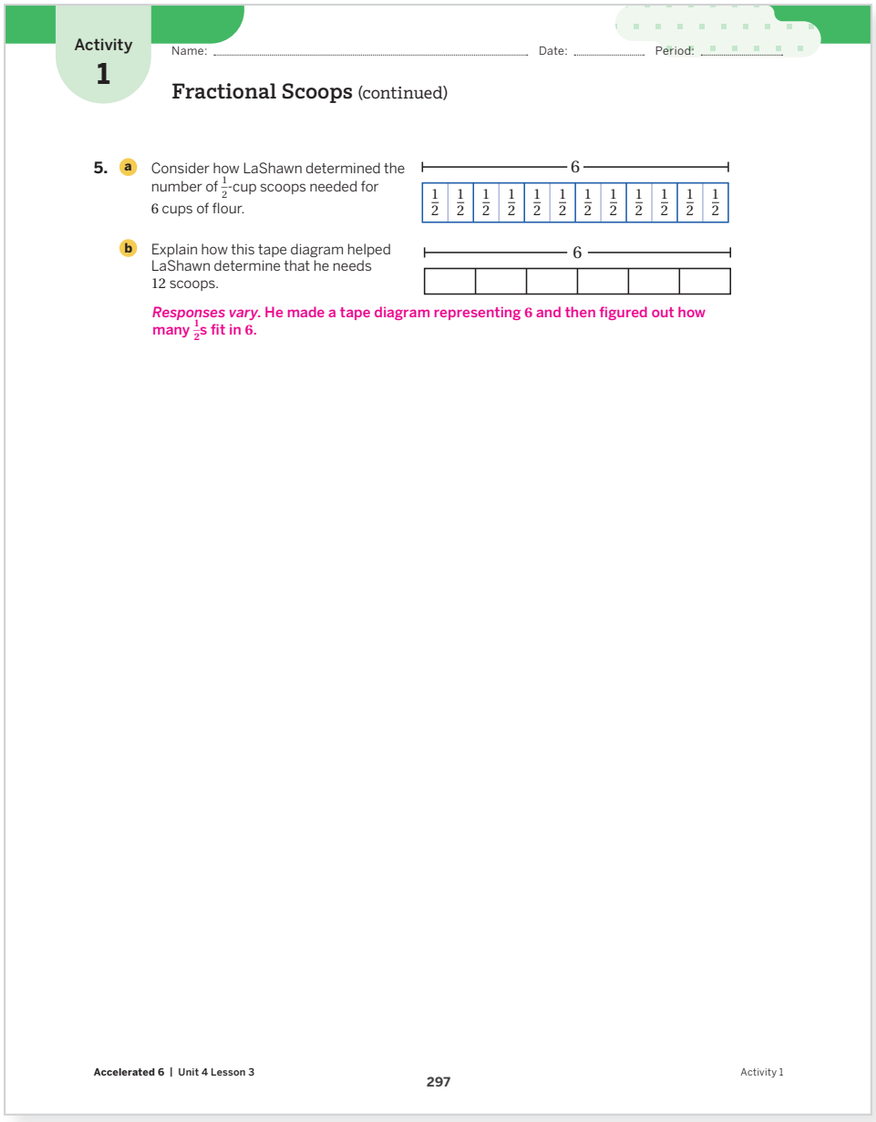
3 Connect

Consider asking:

- "How does the tape diagram connect to the situation with LaShawn's tres leches cake?" **(MTR.2.1)**
- "How is this tape diagram similar to ones we have seen before? How is it different?" The size of each group is a fraction.
- "Where do we see the 12 scoops in the diagram?" There are 12 sections of the tape diagram, and each section represents $\frac{1}{2}$ cup.

To surface the key takeaway, consider asking:

- "What division or multiplication equation might represent this situation?" $\frac{1}{2} \cdot ? = 6$ or $6 \div \frac{1}{2} = ?$
- "When dividing by $\frac{1}{2}$, why is the quotient larger than the amount of scoops you need total (the dividend)?" It takes more fractional pieces to complete the tape diagram than it would "whole pieces."



Activity 1

Name: _____ Date: _____ Period: _____

Fractional Scoops (continued)

5. **a** Consider how LaShawn determined the number of $\frac{1}{2}$-cup scoops needed for 6 cups of flour.

b Explain how this tape diagram helped LaShawn determine that he needs 12 scoops.

Responses vary. He made a tape diagram representing 6 and then figured out how many $\frac{1}{2}$s fit in 6.

Accelerated 6 | Unit 4 Lesson 3 297 Activity 1

Key Takeaway: The amount of $\frac{1}{2}$-cup scoops that fit into 6 cups can be represented with the expression $6 \div \frac{1}{2}$. The **quotient** is larger than the dividend because it takes more fractional pieces than whole pieces to get to 6.

Pairs | 20 min

Activity 2 A Bigger Scoop

Purpose: Students determine an unknown number of groups when the group size is a non-unit fraction.

Short on time? Consider doing Problem 9 as a class instead of in pairs.

1 Launch

Invite students to read the prompt aloud and then restate the problem to their partner.

To surface connections, invite students to share any experiences they have with sirnee or other celebratory dishes.

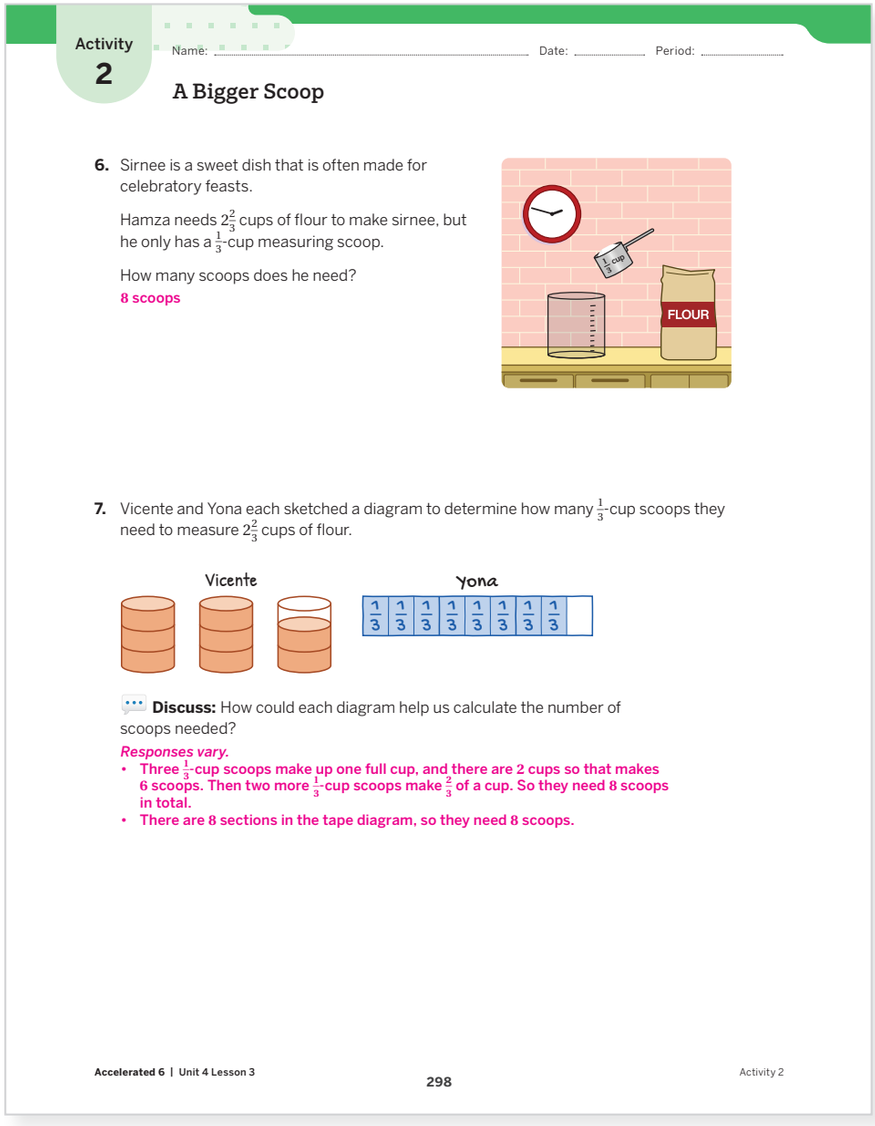
Encourage students to check their thinking with a partner.

2 Monitor

Invite students to annotate on each of the diagrams as they discuss with a partner.

MLR **MLR7: Compare and Connect (optional)**
Consider inviting students to analyze each representation, then find ways in which the representations are different (compare) and alike (connect). Pause briefly and invite students to share which representation they prefer.

Activity 2 continued >



Activity 2

Name: Date: Period:

A Bigger Scoop

6. Sirnee is a sweet dish that is often made for celebratory feasts.

Hamza needs $2\frac{2}{3}$ cups of flour to make sirnee, but he only has a $\frac{1}{3}$-cup measuring scoop.

How many scoops does he need?

8 scoops

7. Vicente and Yona each sketched a diagram to determine how many $\frac{1}{3}$-cup scoops they need to measure $2\frac{2}{3}$ cups of flour.

Discuss: How could each diagram help us calculate the number of scoops needed?

Responses vary.

- Three $\frac{1}{3}$-cup scoops make up one full cup, and there are 2 cups so that makes 6 scoops. Then two more $\frac{1}{3}$-cup scoops make $\frac{2}{3}$ of a cup. So they need 8 scoops in total.
- There are 8 sections in the tape diagram, so they need 8 scoops.

Accelerated 6 | Unit 4 Lesson 3 298 Activity 2

Pairs | 20 min

Activity 2 A Bigger Scoop (continued)

Purpose: Students determine an unknown number of groups when the group size is a non-unit fraction.

Short on time? Consider Problem 9 as a class instead of in pairs.

2 Monitor

Look and listen for a variety of annotations, responses, and explanations. **(MTR.2.1)**

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to use the "Cups" and "Tape Diagram" representations and find similarities and differences.
Write 16 scoops because, since $\frac{2}{3}$ is two $\frac{1}{3}$s, the answer would be twice as much.	**Support** Invite students draw sixteen $\frac{2}{3}$ cups, count the total amount, and compare to what's given.
Rephrase this question as "How many $\frac{2}{3}$-size groups fit into $2\frac{2}{3}$?"	**Stretch** Invite students to write an equation that can represent each scenario in the blank area before moving on to the equations in the next problem.

Encourage students to rephrase each equation as "How many groups of _____ are in _____?" as they consider which choices might match.

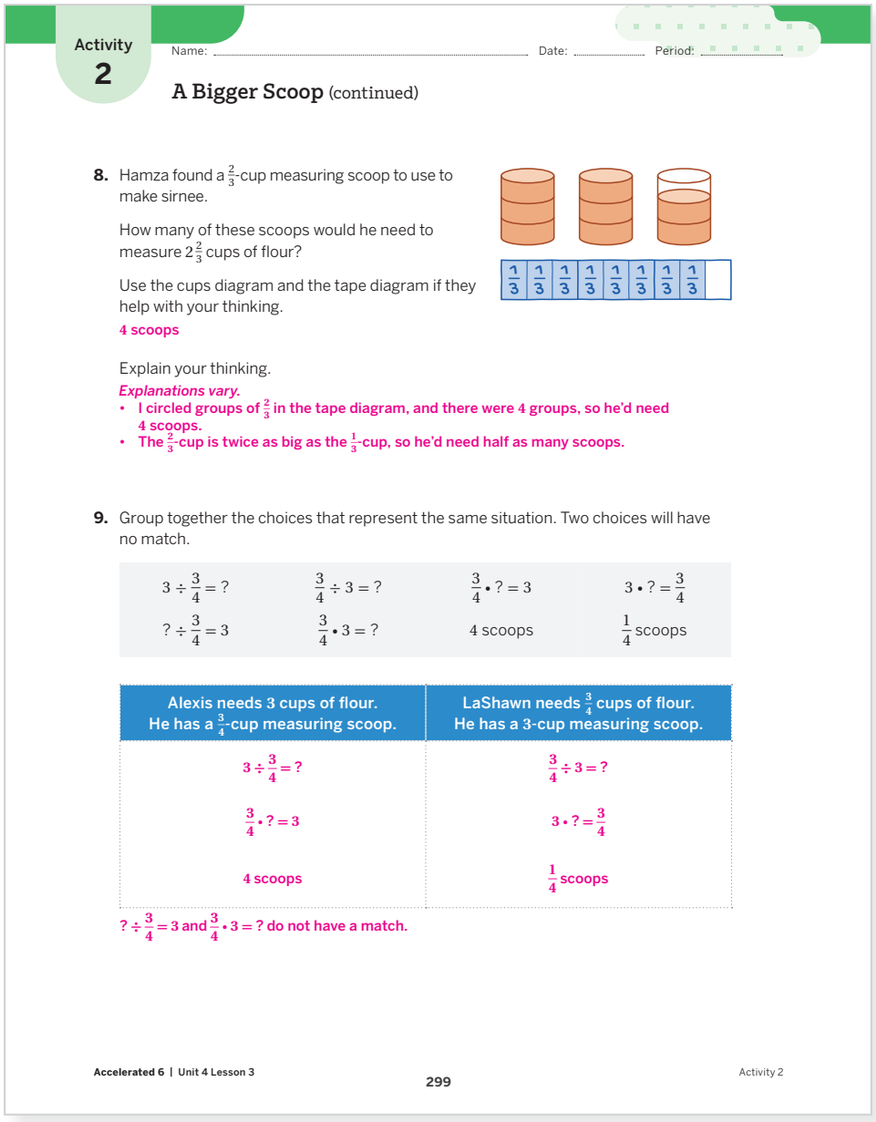
A Accessibility: Executive Function Invite students to focus on one choice/equation at a time to support students in carrying out multiple steps.

D Differentiation: (Stretch) Invite students to write their own scenarios that represent the two remaining choices. *Responses vary.*

3 Connect

Invite students to compare their matches with other pairs, justify their thinking, and make revisions based on their conversation. Invite them to share which of the choices they feel most confident about and which feel most confusing.

To surface the Key Takeaway, consider asking, "How can you determine the number of groups if the group size is a fraction?"



Activity 2

Name: _____ Date: _____ Period: _____

A Bigger Scoop (continued)

8. Hamza found a $\frac{2}{3}$-cup measuring scoop to use to make sirnee.

How many of these scoops would he need to measure $2\frac{2}{3}$ cups of flour?

Use the cups diagram and the tape diagram if they help with your thinking.

4 scoops

Explain your thinking.

Explanations vary.
- I circled groups of $\frac{2}{3}$ in the tape diagram, and there were 4 groups, so he'd need 4 scoops.
- The $\frac{2}{3}$-cup is twice as big as the $\frac{1}{3}$-cup, so he'd need half as many scoops.

9. Group together the choices that represent the same situation. Two choices will have no match.

$3 \div \frac{3}{4} = ?$	$\frac{3}{4} \div 3 = ?$	$\frac{3}{4} \cdot ? = 3$	$3 \cdot ? = \frac{3}{4}$
$? \div \frac{3}{4} = 3$	$\frac{3}{4} \cdot 3 = ?$	4 scoops	$\frac{1}{4}$ scoops

Alexis needs 3 cups of flour. He has a $\frac{3}{4}$-cup measuring scoop.	LaShawn needs $\frac{3}{4}$ cups of flour. He has a 3-cup measuring scoop.
$3 \div \frac{3}{4} = ?$	$\frac{3}{4} \div 3 = ?$
$\frac{3}{4} \cdot ? = 3$	$3 \cdot ? = \frac{3}{4}$
4 scoops	$\frac{1}{4}$ scoops

$? \div \frac{3}{4} = 3$ and $\frac{3}{4} \cdot 3 = ?$ do not have a match.

Accelerated 6 | Unit 4 Lesson 3 299 Activity 2

Key Takeaway: To determine an unknown number of groups when the group size is a fraction, you can use a tape diagram, a multiplication equation, or a division equation.

Whole Class | 5 min

Synthesis

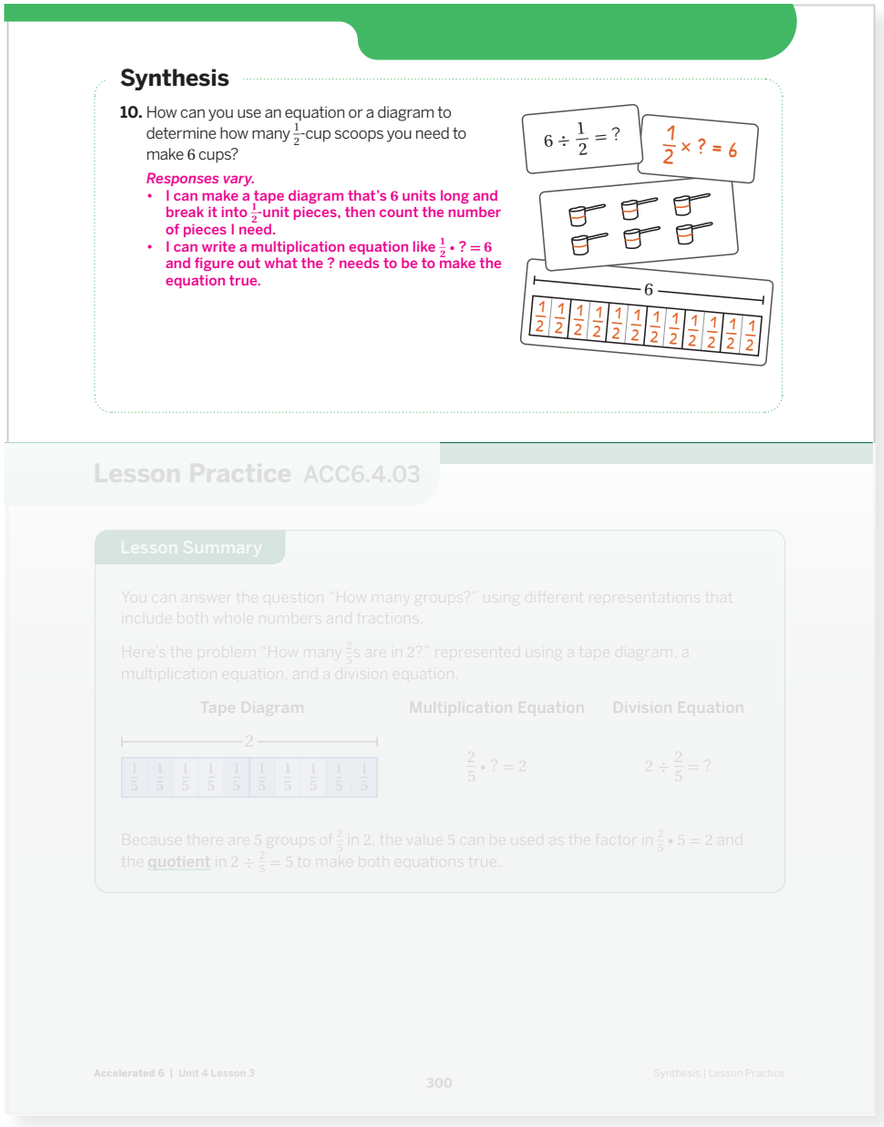
Purpose: Students synthesize their understanding that there are multiple strategies to answer the question "How many groups?"

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Make a tape diagram that is 6 units long, break it into $\frac{1}{2}$-sized pieces, and then count the number of pieces.
- Write a multiplication equation like $\frac{1}{2} \cdot ? = 6$ and figure out what the ? needs to be to make the equation true.
- Draw the total number of cups and divide them in half to represent the half cups.

Note: If time allows, invite students to share with a partner what makes sense about each representation and what questions they still have.



Synthesis

10. How can you use an equation or a diagram to determine how many $\frac{1}{2}$-cup scoops you need to make 6 cups?

Responses vary.

- I can make a tape diagram that's 6 units long and break it into $\frac{1}{2}$-unit pieces, then count the number of pieces I need.
- I can write a multiplication equation like $\frac{1}{2} \cdot ? = 6$ and figure out what the ? needs to be to make the equation true.

Lesson Practice ACC6.4.03

Lesson Summary

You can answer the question "How many groups?" using different representations that include both whole numbers and fractions.

Here's the problem "How many $\frac{2}{5}$s are in 2?" represented using a tape diagram, a multiplication equation, and a division equation.

Tape Diagram	Multiplication Equation	Division Equation
2	$\frac{2}{5} \cdot ? = 2$	$2 \div \frac{2}{5} = ?$

Because there are 5 groups of $\frac{2}{5}$ in 2, the value 5 can be used as the factor in $\frac{2}{5} \cdot 5 = 2$ and the quotient in $2 \div \frac{2}{5} = 5$ to make both equations true.

Accelerated 6 | Unit 4 Lesson 3 300 Synthesis | Lesson Practice

Lesson Takeaway: To answer the question "How many groups?", it can be helpful to draw a visual, like a tape diagram or the actual item, or to write a division or equivalent multiplication equation that represents the situation.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by solving a problem asking "How many groups?" when the size of each group is a fraction.

Today's Goals

1. **Goal:** Use diagrams to represent and solve a problem asking "How many groups?" when the size of each group is a fraction.
2. **Language Goal:** Interpret a division problem as a question asking "How many groups?" **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.03

Emmanuel needs 6 tablespoons of sugar to make lemonade. His measuring scoop is $\frac{3}{4}$ of a tablespoon.

How many scoops will he need?

Show or explain your thinking.

8 scoops. Responses vary. I used a division equation of $6 \div \frac{3}{4} = ?$ and changed it to the multiplication problem $6 \times \frac{4}{3} = ?$. Then, I made a an equation $6\left(1 + \frac{1}{3}\right)$ and used the Distributive property to find the answer: $6\left(1 + \frac{1}{3}\right) = 6(1) + 6\left(\frac{1}{3}\right) = 6 + 2 = 8$.

Differentiation Use after Lesson 3

Support

Provide targeted intervention for students by using these resources.

If students need support using tape diagrams to make sense of division problems with fractions:

» **Respond to Student Thinking:**

- Use the *Representing Dividing Whole Numbers by Unit Fractions* Mini-lesson.
- Revisit **Activity 2** with students before providing individualized feedback on the relevant **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to choose a dessert recipe. Encourage them to calculate how much $our and sugar they would need as well as how many ⅓ -cup and ⅔ -cup scoops they would need to make the recipe.

Professional Learning

Reflect on your facilitation of Problem 9 in this lesson. How did students engage in the routine? What about how you facilitated the routine enhanced student engagement? How did you support students who struggled to make matches? How might you facilitate it differently in the future?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. How can you use an equation or a diagram to determine how many $\frac{1}{2}$-cup scoops you need to make 6 cups?

Responses vary.

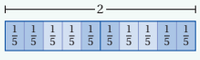
- I can make a tape diagram that's 6 units long and break it into $\frac{1}{2}$-unit pieces, then count the number of pieces I need.
- I can write a multiplication equation like $\frac{1}{2} \cdot ? = 6$ and figure out what the ? needs to be to make the equation true.

Lesson Practice ACC6.4.03

Lesson Summary

You can answer the question "How many groups?" using different representations that include both whole numbers and fractions.

Here's the problem "How many $\frac{2}{5}$s are in 2?" represented using a tape diagram, a multiplication equation, and a division equation.

Tape Diagram	Multiplication Equation	Division Equation
	$\frac{2}{5} \cdot ? = 2$	$2 \div \frac{2}{5} = ?$

Because there are 5 groups of $\frac{2}{5}$ in 2, the value 5 can be used as the factor in $\frac{2}{5} \cdot 5 = 2$ and the **quotient** in $2 \div \frac{2}{5} = 5$ to make both equations true.

Lesson Practice
ACC6.4.03

Name: _____ Date: _____ Period: _____

Problems 1–4: Biryani is a rice dish from South Asia. Three students made Alisha's biryani recipe using different-sized scoops. If the recipe calls for 4 cups of rice, how many scoops of rice does each student need?

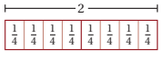
1. Alisha: 2-cup scoop
2 scoops

2. Lukas: $\frac{1}{2}$-cup scoop
8 scoops

3. Emma: $\frac{1}{3}$-cup scoop
12 scoops

4. Explain how the equation $4 \div \frac{1}{3} = ?$ represents Emma's situation.
Responses vary. The equation $4 \div \frac{1}{3} = ?$ represents the question "How many $\frac{1}{3}$-cup scoops are in 4 cups?"

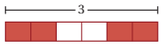
5. Lukas drew this diagram to represent the question "How many $\frac{1}{4}$s make 2?" Write a division equation to represent Lukas's diagram.



Responses vary. $2 \div \frac{1}{4} = 8$

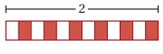
FAST Practice

6. Allison has a 2-pound bag of cat food. She has 6 cats. Her cats eat $\frac{2}{3}$ pounds of cat food per day. Which model best represents how many days her 2-pound bag of food will last?

A. 

B.

C.

D. 

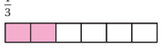
Lesson Practice
ACC6.4.03

Name: _____ Date: _____ Period: _____

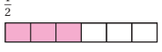
Spiral Review

Problems 7–9: Shade the boxes to represent each fraction.

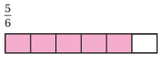
7. $\frac{1}{3}$



8. $\frac{1}{2}$



9. $\frac{5}{6}$



10. *When you multiply one number by another, the result will be larger than the first number.*

Is this statement *always*, *sometimes*, or *never* true? Circle one.

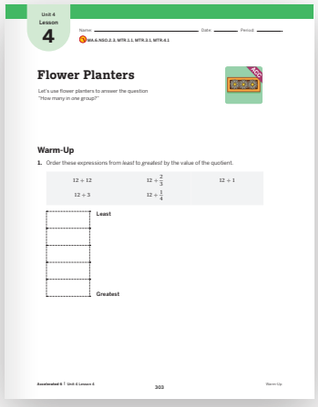
Always (Sometimes) Never

Explain your thinking.

Explanations vary. If you're multiplying a number by another number that's greater than 1, then the product will be greater than the first number. For example, $4 \cdot 3 = 12$. If you're multiplying a number by another number that's less than 1, then the product will be smaller than the first number. For example, $4 \cdot \frac{3}{4} = 3$.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–5	2	MA.6.NSO.2.2, MA.6.NSO.2.3
FAST Practice	6	2	MA.6.NSO.2.2, MA.6.NSO.2.3
Spiral Review			
	7–9	1	MA.3.FR.1.1
	10	3	MA.5.FR.2.3


Unit 4
Lesson
4

Flower Planters

Let's use flower planters to answer the question "How many in one group?"

Warm-Up

1. Order these expressions from least to greatest by the value of the quotient.

$12 \div 12$ $12 \div \frac{2}{3}$ $12 \div 1$

$12 \div 3$ $12 \div \frac{1}{4}$

Least

Greatest

303

Flower Planters

How Many in Each Group?

Let's use flower planters to answer the question "How many in *one* group?"

Learning Outcomes

Today's Goals

1. **Goal:** Use diagrams to represent and solve a division problem asking "How many in 1 group?" when a whole number is divided by a fraction.
2. **Language Goal:** Interpret a division problem as a question asking "How many in 1 group?" **(Speaking and Listening)**

Students will extend what they know about whole numbers to answer the question "How many in 1 group?" when the number of groups is a fraction. Students make sense of situations involving the division of whole numbers and the division of fractions by asking "How many flowers are in 1 planter?" **(MTR.1.1)**

Coherence

Prior Learning

In Lesson 3, students made connections between tape diagrams and division expressions to answer the question "How many groups?"

Future Learning

In Lessons 5–9, students will make connections between expressions and diagrams to answer the question "How many groups?" when dividing fractions.

Connections

- Students use multiple representations to solve division problems as they explore planting a garden. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.3.1, MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.AR.1.1 **MA.5.AR.1.3**	**MA.7.NSO.2.3**

Lesson at a Glance

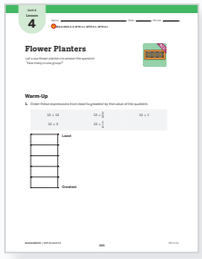
~ 45 min

MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

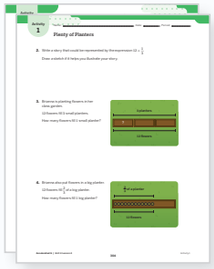
Students use reasoning to predict the relative values of quotients when the divisor is a fraction.



Activity 1

Pairs | 15 min

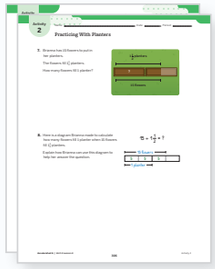
Students make sense of problems involving division by a fraction by connecting drawings, tape diagrams, and division expressions. **(MTR.1.1)**



Activity 2

Pairs | 15 min

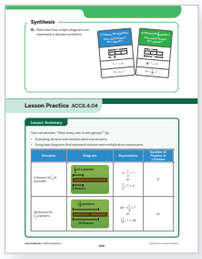
Students explain precisely how to use tape diagrams to answer division problems involving fractional divisors and practice using them to find quotients. MLR1: Stronger and Clearer Each Time **(MTR.3.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that tape diagrams model the division of fractions.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by solving a division problem asking "How many in 1 group?"

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use reasoning to predict the relative values of quotients when the divisor is a fraction.

1 Launch

Consider reminding students that the smallest quotients should be at the top of their lists.

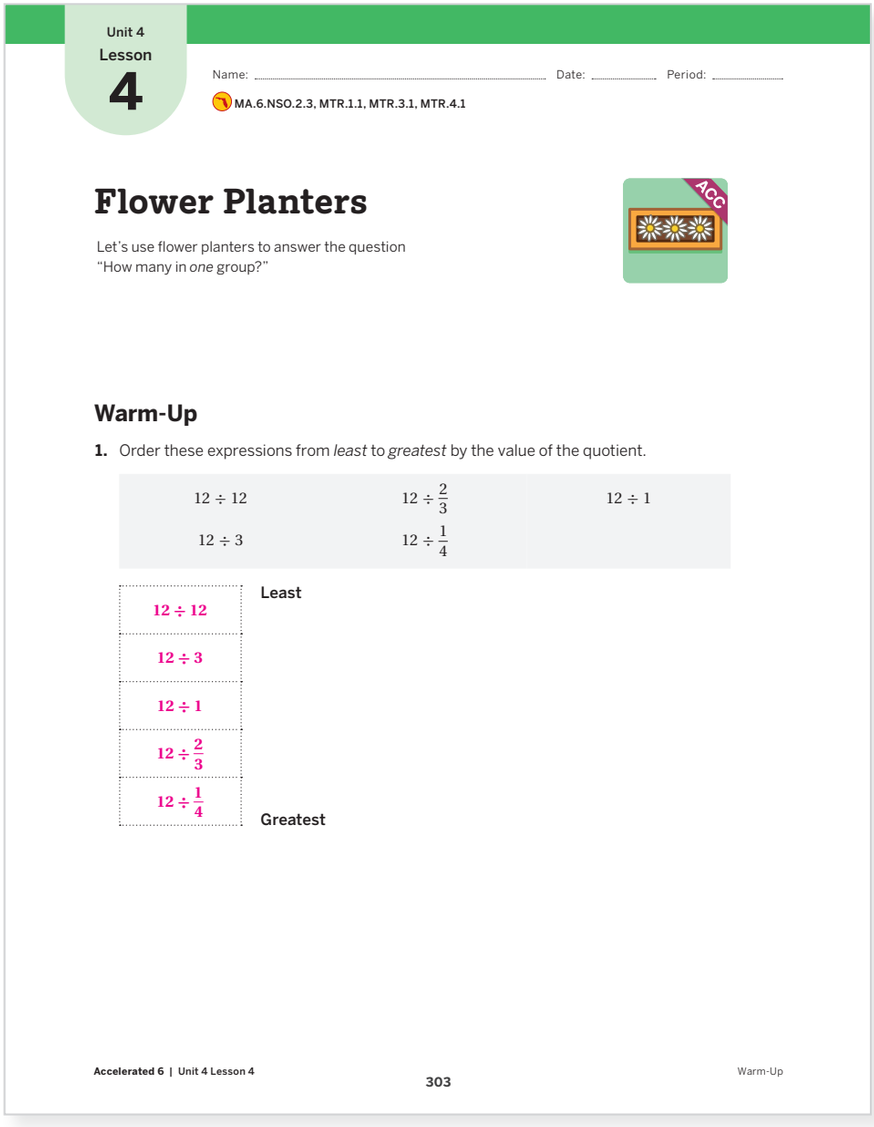
A **Accessibility: Memory and Attention**
Invite students to use their Student Edition or additional paper to support them with performing calculations.

2 Connect

Invite students to share the strategies they used to order the expressions.

Consider asking:

- "Which expression did you place first?"
- "How can we find the order even if we don't know all of the quotients exactly?"
- "What did you notice about the value of the quotient when we divided by a number less than 1?" **(MTR.4.1)**



Unit 4
Lesson
4

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.3, MTR.1.1, MTR.3.1, MTR.4.1

Flower Planters

Let's use flower planters to answer the question "How many in *one* group?"

Warm-Up

1. Order these expressions from *least* to *greatest* by the value of the quotient.

$12 \div 12$ $\quad$ $12 \div \frac{2}{3}$ $\quad$ $12 \div 1$

$12 \div 3$ $\quad$ $12 \div \frac{1}{4}$

Least

$12 \div 12$

$12 \div 3$

$12 \div 1$

$12 \div \frac{2}{3}$

$12 \div \frac{1}{4}$

Greatest

Accelerated 6 | Unit 4 Lesson 4 303 Warm-Up

Pairs | 15 min

Activity 1 Plenty of Planters

Purpose: Students make sense of problems involving division by a fraction by connecting drawings, tape diagrams, and division expressions. **(MTR.1.1)**

1 Launch

Direct students' attention to the question. Invite students to think about it on their own and then share their answers with a partner.

To support students getting started, invite them to consider a context for $12 \div 3$. Consider asking, "In your situation, what would it mean if we changed the amount in each group or number of groups to $\frac{1}{3}$?"

Invite students to share their scenarios out loud. Consider asking, "What does $\frac{1}{3}$ represent in your expression?" *Responses vary.* Each person receives $\frac{1}{3}$ of an item. There are 12 cookies on $\frac{1}{3}$ of a plate.

To surface prior knowledge, consider asking, "What do you know about gardening? What do plants need to grow?" Consider sharing that, since plants need space so sunlight can get to them, we often use planters to separate them.

Consider sharing that students will determine how many flowers will fit in one planter.

2 Monitor

Consider asking, "Can you write an expression to represent your answer?"

Look for a variety of student strategies as they make sense of the problem. **(MTR.1.1)**

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Will the answer be greater than or less than 12? Why?" **(MTR.4.1)**
Calculate $\frac{2}{3}$ of 12, which is 8.	
Use a large number of guesses before arriving at 18.	**Strengthen** Encourage students to sketch in their Student Edition to show why their answer is correct. Consider asking, "Are there other ways to break apart this group of flowers that could be helpful?"

Activity 1 continued >

Activity 1

Name: _____ Date: _____ Period: _____

Plenty of Planters

2. Write a story that could be represented by the expression $12 \div \frac{1}{3}$.

Draw a sketch if it helps you illustrate your story.

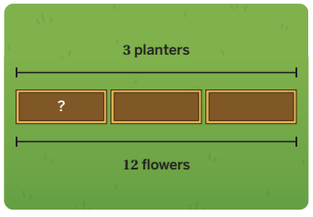
Responses vary. Every day, I eat $\frac{1}{3}$ of a chocolate bar. How long will it take me to eat 12 chocolate bars?

3. Brianna is planting flowers in her class garden.

12 flowers fill 3 small planters.

How many flowers fill 1 small planter?

4 flowers

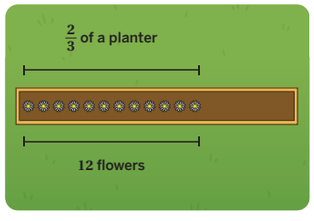


4. Brianna also put flowers in a big planter.

12 flowers fill $\frac{2}{3}$ of a big planter.

How many flowers fill 1 big planter?

18 flowers



Accelerated 6 | Unit 4 Lesson 4 304 Activity 1

Pairs | 15 min

Activity 1 Plenty of Planters (continued)

Purpose: Students make sense of problems involving division by a fraction by connecting drawings, tape diagrams, and division expressions. **(MTR.1.1)**

2 Monitor

Encourage students to share their reasoning with a partner and work together to reach an agreement about how to match the equations and tape diagrams. If time allows, invite pairs to compare their responses, justify their thinking, and make revisions based on their conversation. **(MTR.1.1, MTR.4.1)**

Capture ideas to share during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Reference observations, such as both expressions having a 12 and a 3.	**Support** Consider asking, "When you divided, how were the processes alike? How were they different?"
Notice both quotients are greater than 1.	**Strengthen** Invite students to think about how they might share their observations during the Connect.
Notice that dividing by $\frac{2}{3}$ results in a larger quotient than dividing by 3.	
Notice that we divided 12 by 3 in the first problem and start by dividing by the numerator in the second problem.	**Stretch** Invite students to create and solve their own problems involving flowers which take up a fractional part of a planter. Encourage students to answer each other's problems.

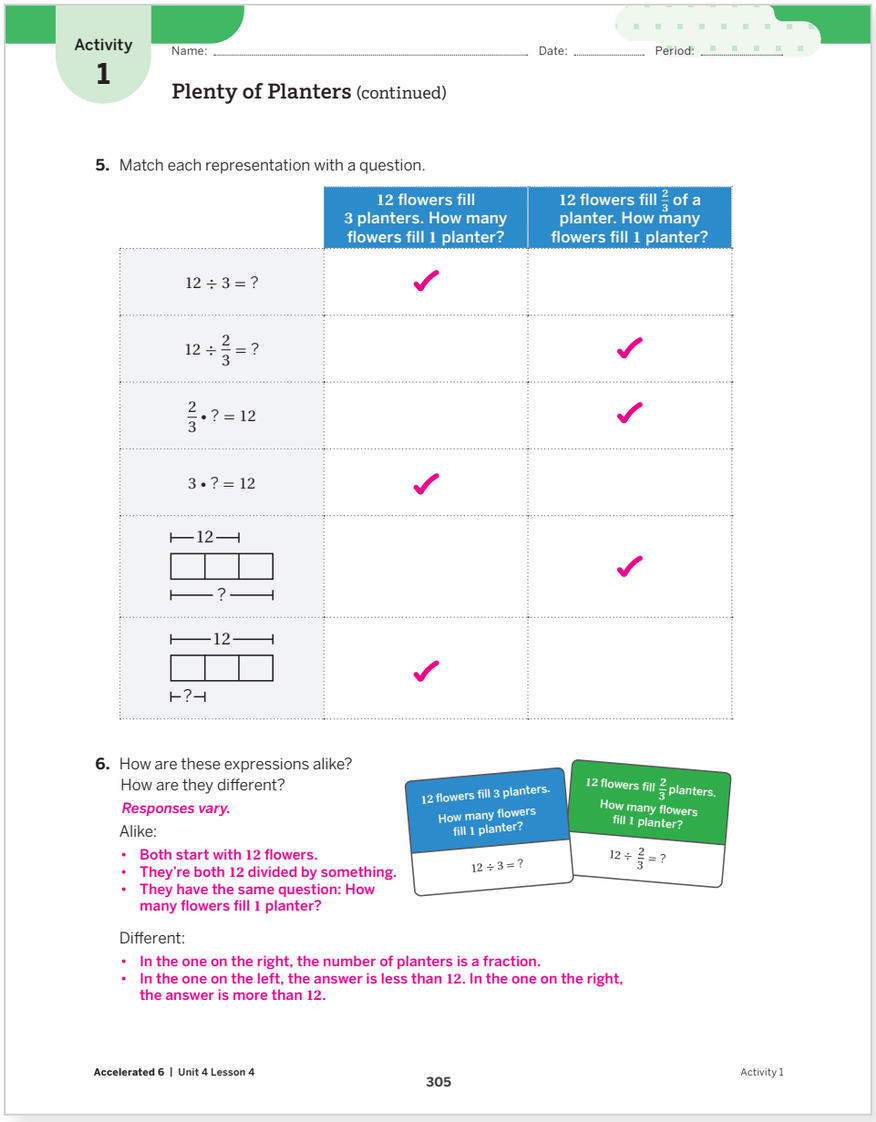
ELL **English Language Learners** Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

3 Connect

Share student responses. Invite students to elaborate on their thinking.

To surface the Key Takeaway, consider asking:

- "What does the tape diagram for $12 \div \frac{2}{3}$ look like?"
- "How can we tell from the tape diagram whether the quotient will be bigger than or less than 12?"



Activity 1

Name: _____ Date: _____ Period: _____

Plenty of Planters (continued)

5. Match each representation with a question.

	12 flowers fill 3 planters. How many flowers fill 1 planter?	12 flowers fill $\frac{2}{3}$ of a planter. How many flowers fill 1 planter?
$12 \div 3 = ?$	✓	
$12 \div \frac{2}{3} = ?$		✓
$\frac{2}{3} \cdot ? = 12$		✓
$3 \cdot ? = 12$	✓	
12 / ?		✓
12 / ?	✓	

6. How are these expressions alike? How are they different?

Responses vary.

Alike:

- Both start with 12 flowers.
- They're both 12 divided by something.
- They have the same question: How many flowers fill 1 planter?

Different:

- In the one on the right, the number of planters is a fraction.
- In the one on the left, the answer is less than 12. In the one on the right, the answer is more than 12.

Accelerated 6 | Unit 4 Lesson 4 305 Activity 1

Key Takeaway: A tape diagram can represent a whole number divided by a fraction. For example, $12 \div \frac{2}{3}$ can be modeled by labeling $\frac{2}{3}$ of the tape with 12 and then determining the amount of the entire tape.

Pairs | 15 min

Activity 2 Practicing With Planters

Purpose: Students explain precisely how to use tape diagrams to answer division problems involving fractional divisors and practice using them to find quotients. **(MTR.3.1)**

Short on time? Consider inviting students to complete fewer challenges.

1 Launch

Consider asking, "How is this problem different from the one we just explored? What strategy might you try first?"

Encourage students to sketch in their Student Edition to represent their thinking.

2 Monitor

To support students getting started, consider asking, "How could we split up the planters and flowers? How many flowers should go in each section?"

Look for a variety of explanations. Encourage students to make connections between the problem, the tape diagram, and a division equation.

MLR **MLR1: Stronger and Clearer Each Time** Invite students to write a first draft and use feedback to make their thinking stronger and clearer. **(MTR.1.1)**

Encourage students to use the feedback they got from their partner to write a second draft that is stronger or clearer. To encourage movement, invite students to find partners in a different location.

Pause to discuss student explanations of Brianna's thinking. Invite students to explain their thinking for Brianna's tape diagram and how they might use her strategy for related problems.

Activity 2 continued >

Activity 2

Name: Date: Period:

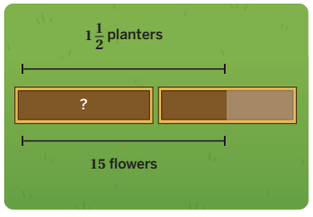
Practicing With Planters

7. Brianna has 15 flowers to put in her planters.

The flowers fill $1\frac{1}{2}$ planters.

How many flowers fill 1 planter?

10 flowers

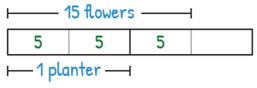


8. Here is a diagram Brianna made to calculate how many flowers fill 1 planter when 15 flowers fill $1\frac{1}{2}$ planters.

Explain how Brianna can use this diagram to help her answer the question.

***Responses vary.* Brianna figured out that there were 5 flowers in each $\frac{1}{2}$ of a planter. Since there are two $\frac{1}{2}$s in 1 planter, that means that there are 10 flowers in 1 planter.**

$15 \div 1\frac{1}{2} = ?$



Accelerated 6 | Unit 4 Lesson 4 306 Activity 2

Pairs | 15 min

Activity 2 Practicing With Planters (continued)

Purpose: Students explain precisely how to use tape diagrams to answer division problems involving fractional divisors and practice using them to find quotients. **(MTR.3.1)**

Short on time? Consider inviting students to complete fewer challenges.

2 Monitor

Capture students' strategies, such as drawing tape diagrams, subdividing the planter, using equivalent ratios, or creating ratio tables. Invite these students to share during the Connect.

Students will need a partner for this part of the activity. They will solve and compare their solutions to the problems.

D **Differentiation: (Strengthen)** Look for students who use guess and check strategies. Consider asking, "How can we use Brianna's strategy to solve these problems?"

D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore the division of fractions further to complete this optional task. Encourage them to discuss their thinking with a partner.

3 Connect

Share the captured tape diagrams and invite students to share their strategies.

Consider asking:

- "What were some common ideas or steps that came up in your solutions?" **(MTR.3.1)**
- "How did using tape diagrams help us solve these problems?"

Activity 2

Name: _____ Date: _____ Period: _____

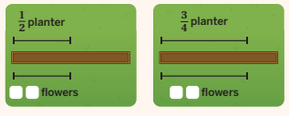
Practicing With Planters (continued)

9. Solve as many challenges as you have time for.

	Situation	Diagram	How many flowers fill 1 planter?
a	8 flowers fill 4 planters.	4 planters; 8 flowers	2
b	8 flowers fill $\frac{1}{3}$ of a planter.	$\frac{1}{3}$ of a planter; 8 flowers	24
c	12 flowers fill $\frac{3}{4}$ of a planter.	$\frac{3}{4}$ of a planter; 12 flowers	16
d	18 flowers fill $1\frac{1}{2}$ planters.	$1\frac{1}{2}$ planters; 18 flowers	12
e	26 flowers fill $2\frac{8}{9}$ of a planter.	$2\frac{8}{9}$ planters; 26 flowers	9

You're invited to explore more.

10. Fill in each blank using the numbers 0 to 9 only once, so that the same number of flowers fill each planter.



Responses vary.

- Left planter: 18 flowers
- Right planter: 27 flowers

Accelerated 6 | Unit 4 Lesson 4 307 Activity 2

Whole Class | 5 min

Synthesis

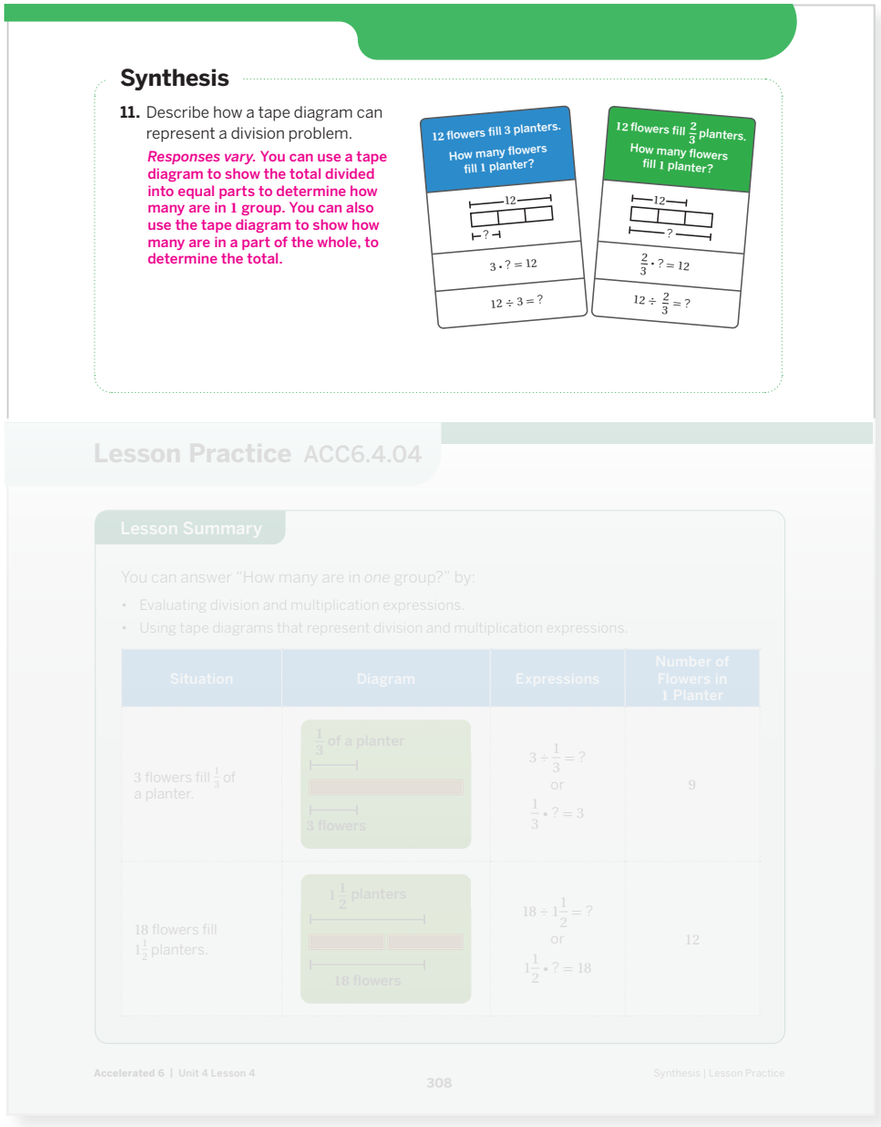
Purpose: Students synthesize their understanding that tape diagrams model the division of fractions.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- The first number in a division expression can tell us the number of items, and the second number can represent how many groups.
- The second number can represent parts of a full group when it is a fraction. For example, if we have $20 \div \frac{2}{3}$, we could fill in two-thirds of a group to represent 20 and try to figure out how much is in 1 full group.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

11. Describe how a tape diagram can represent a division problem.

Responses vary. You can use a tape diagram to show the total divided into equal parts to determine how many are in 1 group. You can also use the tape diagram to show how many are in a part of the whole, to determine the total.

Lesson Practice ACC6.4.04

Lesson Summary

You can answer "How many are in *one* group?" by:

- Evaluating division and multiplication expressions.
- Using tape diagrams that represent division and multiplication expressions.

Situation	Diagram	Expressions	Number of Flowers in 1 Planter
3 flowers fill $\frac{1}{3}$ of a planter.	$\frac{1}{3}$ of a planter; 3 flowers	$3 \div \frac{1}{3} = ?$ or $\frac{1}{3} \cdot ? = 3$	9
18 flowers fill $1\frac{1}{2}$ planters.	$1\frac{1}{2}$ planters; 18 flowers	$18 \div 1\frac{1}{2} = ?$ or $1\frac{1}{2} \cdot ? = 18$	12

Accelerated 6 | Unit 4 Lesson 4 308 Synthesis | Lesson Practice

Lesson Takeaway: Tape diagrams are useful tools to determine how many are in 1 group when dividing by a fraction. For example, $16 \div \frac{3}{4}$ can be thought of as "If there are 16 in $\frac{3}{4}$ of a group, how many are there in 1 group?"

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by solving a division problem asking "How many in 1 group?"

Today's Goals

1. **Goal:** Use diagrams to represent and solve a division problem asking "How many in 1 group?" when a whole number is divided by a fraction.
2. **Language Goal:** Interpret a division problem as a question asking "How many in 1 group?" **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.04

6 flowers fill $\frac{3}{5}$ of a planter.

How many flowers are in 1 planter? Show or explain your thinking. Draw a diagram if it helps with your thinking.

10 flowers. Responses vary. I created a tape diagram creating 5 sections of 1 planter, where 3 of the 5 sections matched up with the 6 flowers. This would put 2 flowers in each of these sections and $2 \times 5 = 10$ flowers in a whole planter.

D Differentiation Use after Lesson 4

Support

Provide targeted intervention for students by using these resources.

If students need support with division by a fraction:

» **Respond to Student Thinking:**

- Use the *Determining How Many in Each Group* Mini-lesson.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.

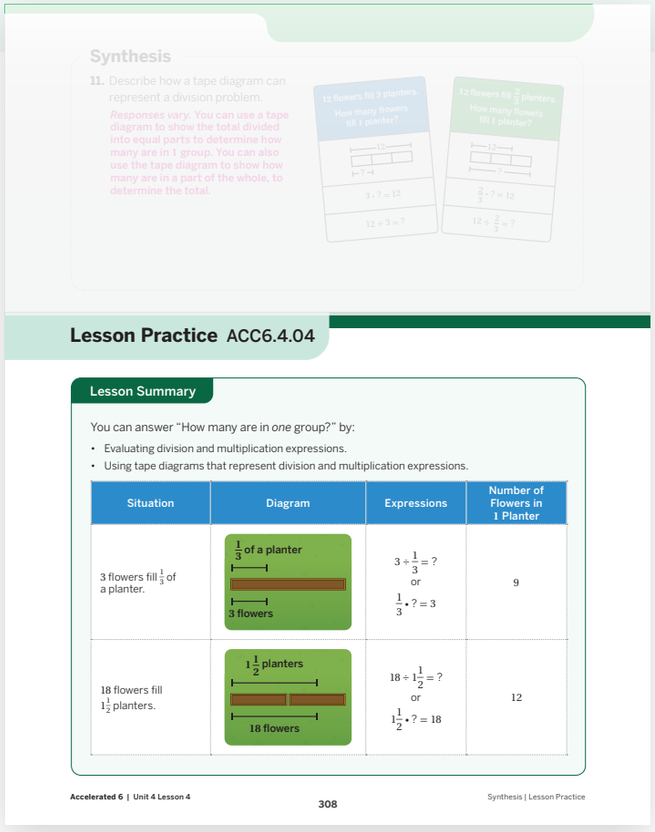
Professional Learning

Take a moment to reflect on how students engaged in MTR.1.1 and MTR.3.1. in today's lesson. What evidence did students give that they were engaged in communicating their ideas precisely?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

11. Describe how a tape diagram can represent a division problem.

Responses vary. You can use a tape diagram to show the total divided into equal parts to determine how many are in 1 group. You can also use the tape diagram to show how many are in a part of the whole, to determine the total.

Lesson Practice ACC6.4.04

Lesson Summary

You can answer "How many are in *one* group?" by:

- Evaluating division and multiplication expressions.
- Using tape diagrams that represent division and multiplication expressions.

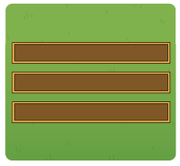
Situation	Diagram	Expressions	Number of Flowers in 1 Planter
3 flowers fill $\frac{1}{3}$ of a planter.	$\frac{1}{3}$ of a planter; 3 flowers	$3 \div \frac{1}{3} = ?$ or $\frac{1}{3} \cdot ? = 3$	9
18 flowers fill $1\frac{1}{2}$ planters.	$1\frac{1}{2}$ planters; 18 flowers	$18 \div 1\frac{1}{2} = ?$ or $1\frac{1}{2} \cdot ? = 18$	12

Lesson Practice
ACC6.4.04

Name: _____ Date: _____ Period: _____

Problems 1–4: Abena is planting vegetables in her backyard. Determine how many of each vegetable plant Abena can fit in 1 planter.

Use the diagrams if they help with your thinking.



1. Onion plants, if 10 onion plants fill $\frac{1}{2}$ of a planter
   20 onion plants
2. Asparagus crowns, if 8 asparagus crowns fill $\frac{2}{3}$ of a planter
   12 asparagus crowns
3. Potato plants, if 6 potato plants fill $\frac{3}{4}$ of a planter
   8 potato plants
4. Abena wrote the expression $6 \div \frac{3}{4}$ to represent how many potato plants fill 1 planter. Describe a situation that represents the expression $8 \div \frac{4}{5}$.
   ***Responses vary.* 8 flowers fill $\frac{4}{5}$ of a planter.**

Problems 5–6: Ashley picks 9 strawberries from her backyard, which fill $\frac{3}{4}$ of a cup.

5. Label the tape diagram to represent Ashley's situation.
   Response shown on tape diagram.

6. Determine how many strawberries fill 1 cup. Use the tape diagram if it helps with your thinking.
   12 strawberries

FAST Practice

7. George is painting a mural. He uses 3 gallons of paint for $\frac{3}{5}$ of the mural. How many gallons of paint would he need to paint the whole mural?

   8 gallons

Lesson Practice
ACC6.4.04

Name: _____ Date: _____ Period: _____

Spiral Review

Problems 8–9: Karima made 9 pairs of earrings in 6 hours.

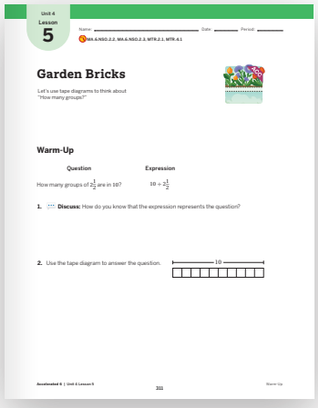
8. How long will it take Karima to make 12 pairs of earrings?
   8 hours
9. How many pairs of earrings can Karima make in 10 hours?
   15 pairs of earrings

Problems 10–12: Calculate each unknown number.

10. 5 is 50% of what number?
    10
11. 300 is 10% of what number?
    3,000
12. 18 is 150% of what number?
    12

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–6	2	MA.6.NSO.2.3
FAST Practice	7	2	MA.6.NSO.2.3
Spiral Review			
	8–9	2	MA.6.AR.3.5
	10–12	1	MA.6.AR.3.4


Unit 4
Lesson 5

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1, MTR.4.1

Garden Bricks

Let's use tape diagrams to think about "How many groups?"

Warm-Up

Question	Expression
How many groups of $2\frac{1}{2}$ are in 10?	$10 \div 2\frac{1}{2}$

1. Discuss: How do you know that the expression represents the question?

2. Use the tape diagram to answer the question. 10

Accelerated 6 | Unit 4 Lesson 5 311 Warm-Up

Garden Bricks

How Many Groups?, Part 2

Let's use tape diagrams to think about "How many groups?"

Learning Outcomes

Today's Goals

1. **Goal:** Use tape diagrams to represent and solve division problems asking, "How many groups?" when there are a fractional number of groups.

2. **Language Goal:** Interpret a division problem as a question asking, "How many groups?" using mathematically precise language. **(Reading, Writing, Speaking, and Listening)**

This lesson builds on students' work using tape diagrams to answer questions asking, "How many groups?" Students encounter situations in which the total amount and/or the number of groups is not a whole number, and they must attend to the whole when representing the answer as a fraction. They use the context of placing bricks in a garden to reason about the leftover number of groups and apply this understanding to solve problems out of context. **(MTR.2.1)**

Coherence

Prior Learning

In Lessons 3–4, students reviewed interpretations of division and the relationships among values in division and multiplication equations.

Future Learning

In Lesson 6, students will continue to work with division situations and will leverage tape diagrams and other models to explore "How many groups?" questions, including those with non-unit fraction dividends and quotients.

Connections

- Student use tape diagrams to represent and solve division problems as they continue updating their class garden by added bricks. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.4.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	**MA.7.NSO.2.2**
MA.5.FR.2.4	**MA.7.NSO.2.3**
MA.5.AR.1.1	
MA.5.AR.1.3	

Lesson at a Glance

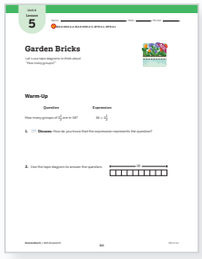
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

Students make and explain connections between expressions and tape diagrams that represent the question "How many groups?" **(MTR.2.1)**



Activity 1

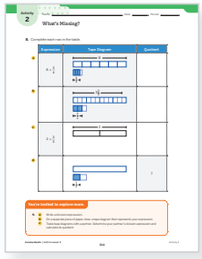
Small Groups | 20 min

Students use the context of placing bricks in a garden to solve division problems when the length of each brick is a fraction. MLR3: Critique, Correct, Clarify

Activity 2

Pairs | 10 min

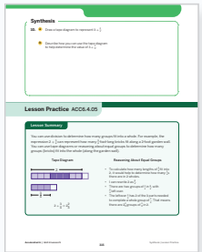
Students create and use tape diagrams to divide whole numbers by fractions and to divide two fractions that have the same denominator. **(MTR.2.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that tape diagrams can be used to determine an unknown number of groups when the number of groups is a fraction. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by using a tape diagram to determine a fractional quotient.

Prep Checklist

Prepare the Tape Diagram Sheets.

This lesson includes:

- Student Edition
- Show What You Know
- Tape Diagram Sheet (*as needed*)
- Coloring tools (*as needed*)

Pairs | 5 min

Warm-Up

Purpose: Students make and explain connections between expressions and tape diagrams that represent the question "How many groups?" **(MTR.2.1)**

1 Launch

Direct students' attention to the question and expression. Invite students to discuss the first problem in pairs before making their thinking visible on the provided tape diagram.

Listen for students making connections to earlier lessons like the scoops of flour from Lesson 3 or flower planters from Lesson 4.

A **Accessibility: Visual-Spatial Processing** To support students as they use and create visual representations, provide access to blank tape diagrams that have not been divided into 10 equal-sized sections. This will allow students who may want to divide the tape diagram in a different way — such as 20 equal-sized sections — but are distracted by the 10 sections.

2 Connect

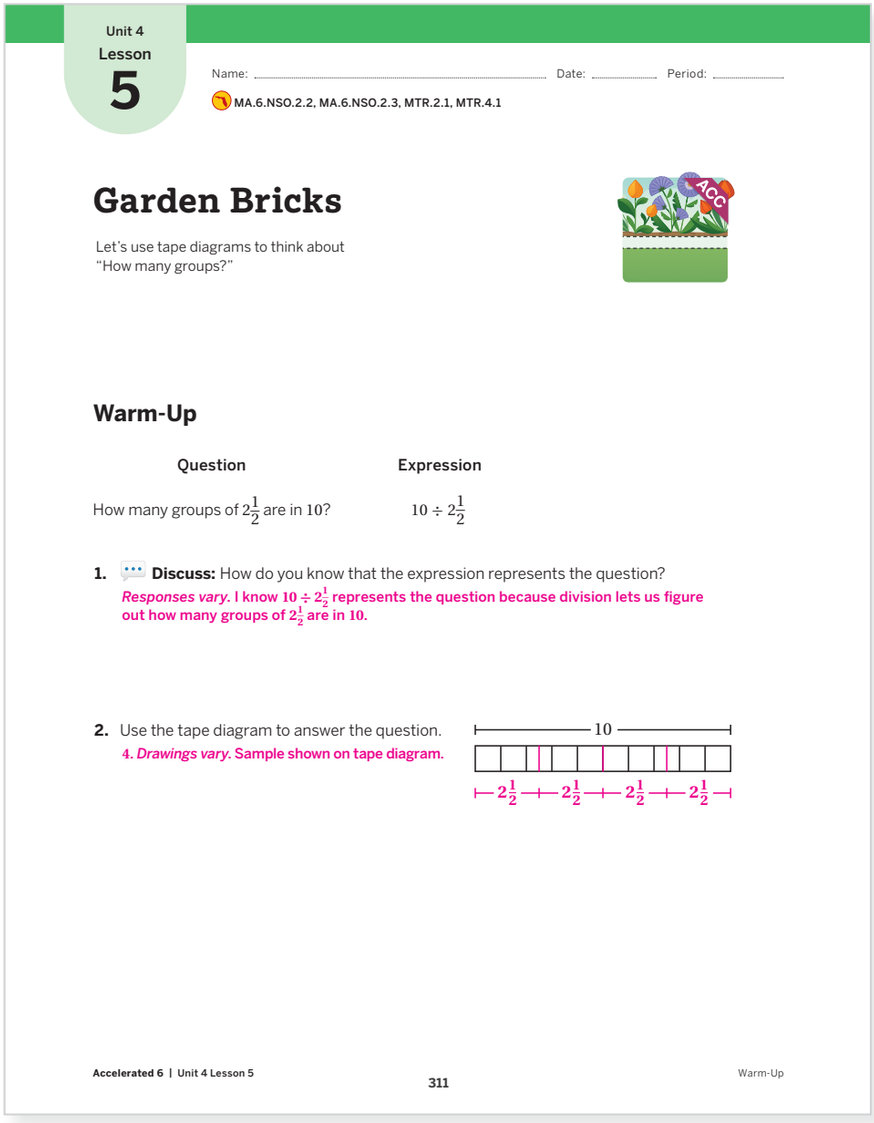
Invite students to share their thinking for each question, particularly focusing on how students connected the tape diagram to the question and expression. **(MTR.2.1, MTR.4.1)**

Consider asking:

- "How did you decide how many groups there were?"
- "How is this situation similar to and different from the ones you have seen so far in this unit?" In Lesson 3, we asked, "How many groups?" when the size of each group was a fraction (e.g., $6 \div \frac{3}{4}$), and, in this lesson, we are looking at groups that are mixed numbers.

Note: Consider revisiting the SWYK from previous lessons to support students in making these connections.

To surface the Key Takeaway, consider asking, "How can we use tape diagrams to help us answer the question 'How many groups?'"



Unit 4
Lesson
5

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1, MTR.4.1

Garden Bricks

Let's use tape diagrams to think about "How many groups?"

Warm-Up

Question	Expression
How many groups of $2\frac{1}{2}$ are in 10?	$10 \div 2\frac{1}{2}$

1. **Discuss:** How do you know that the expression represents the question?
Responses vary. I know $10 \div 2\frac{1}{2}$ represents the question because division lets us figure out how many groups of $2\frac{1}{2}$ are in 10.

2. Use the tape diagram to answer the question.
4. *Drawings vary.* Sample shown on tape diagram.

Accelerated 6 | Unit 4 Lesson 5 311 Warm-Up

Key Takeaway: Tape diagrams can help us visualize division problems by showing the whole and how many groups of a given size make up that whole.

Small Groups | 20 min

Activity 1 How Many Bricks?

Purpose: Students use the context of placing bricks in a garden to solve division problems when the length of each brick is a fraction.

1 Launch

To surface prior knowledge, consider asking if anyone has experience working in a garden. To support students' understanding of the context, it may be helpful to draw a diagram or display an image showing bricks sitting next to one another with no mortar in between.

ELL **English Language Learners** Invite students to research how to say the terms *divisor, dividend*, and *quotient* in other languages. Create an anchor chart with the terms in multiple languages, along with examples to be used throughout this lesson. **(Reading and Listening)**.

2 Monitor

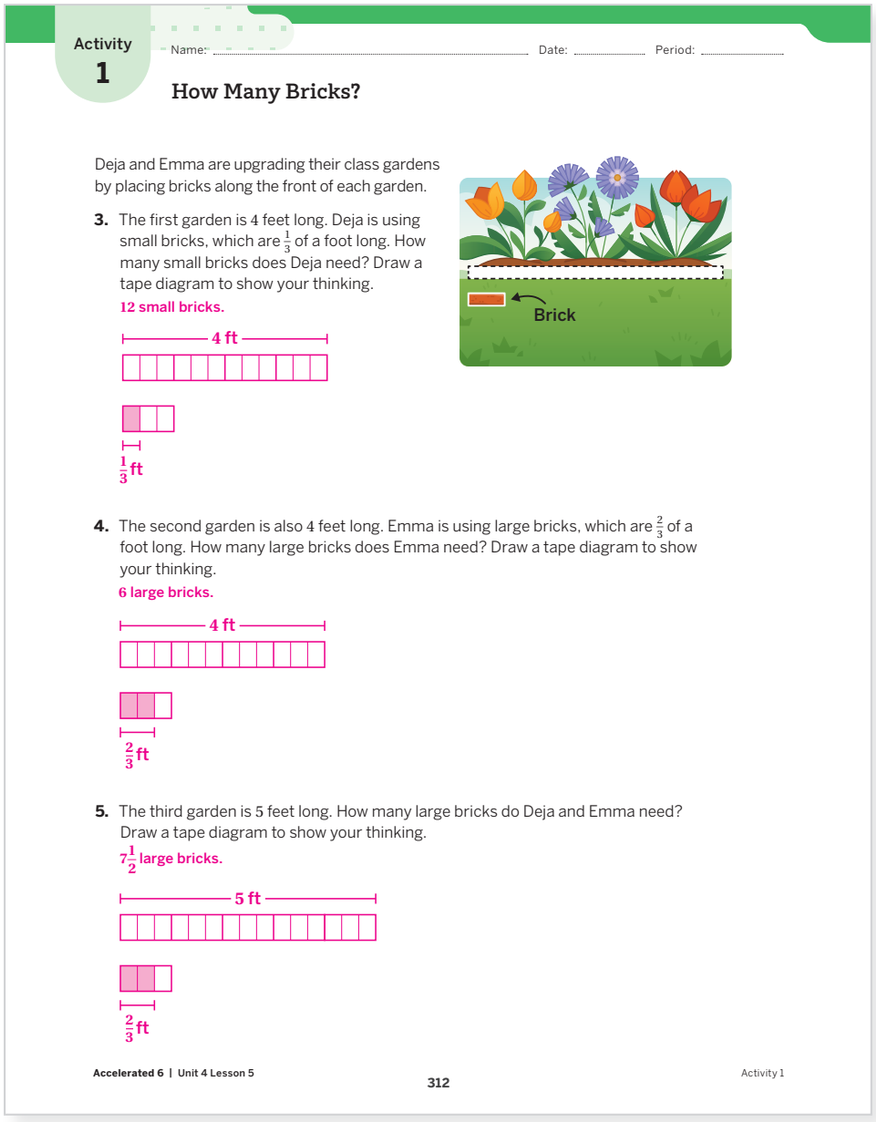
A **Accessibility: Conceptual Processing** To support students in making sense of the size of bricks that Deja and Emma are using, invite students to draw a bar that represents 1 foot and ask, "How can you represent $\frac{1}{3}$ of a foot on this bar? How can you represent $\frac{2}{3}$ of a foot?"

Look for a variety of strategies and invite students to share their strategies with one another for support and to deepen each other's connections between their solutions, drawings, and the situation. **(MTR.2.1, MTR.4.1)**

D **Differentiation**

Look for students who:	Respond to Student Thinking
Create tape diagrams with unfriendly pieces. *(Problems 3–5)*	**Support** Invite students to start their diagram by only representing whole numbers. Then consider asking: • "What values do you need to represent?" 4 and $\frac{1}{3}$ • "Which value represents the amount in one group?" $\frac{1}{3}$ • "How can you break up the parts of the tape diagram to be able to represent both of those values?" Break the tape into thirds.
Write 7 and a partial set of bricks that is not $7\frac{1}{2}$. *(Problem 5)*	**Strengthen** Invite these students compare the remainder to the size of one group. There is $\frac{1}{3}$ remaining, and the size of the group is $\frac{2}{3}$, so the remainder is $\frac{1}{2}$.
Have accurate responses and tape diagrams. *(Problems 3–5)*	**Stretch** Invite students to look for patterns between their responses and then consider what would happen if there was another garden that was 6 feet long? 7 feet long?

Activity 1 continued >



Activity 1

Name: Date: Period:

How Many Bricks?

Deja and Emma are upgrading their class gardens by placing bricks along the front of each garden.

3. The first garden is 4 feet long. Deja is using small bricks, which are $\frac{1}{3}$ of a foot long. How many small bricks does Deja need? Draw a tape diagram to show your thinking.

12 small bricks.

4. The second garden is also 4 feet long. Emma is using large bricks, which are $\frac{2}{3}$ of a foot long. How many large bricks does Emma need? Draw a tape diagram to show your thinking.

6 large bricks.

5. The third garden is 5 feet long. How many large bricks do Deja and Emma need? Draw a tape diagram to show your thinking.

$7\frac{1}{2}$ large bricks.

Accelerated 6 | Unit 4 Lesson 5 312 Activity 1

Activity 1 How Many Bricks? (continued)

Purpose: Students use the context of placing bricks in a garden to solve division problems when the length of each brick is a fraction.

2 Monitor

Invite students to compare their strategies for determining the number of bricks needed to Deja's and Emma's strategies. **(MTR.4.1)**

Select and sequence a few response for Problem 6 and then one correct response for Problem 7 to reference during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Do not see a mistake in Deja's or Emma's work. *(Problem 6)*	**Support** Encourage them to read the instructions and look for inaccurate parts.
Know the answer should be $7\frac{1}{2}$ but are not sure what question to ask. *(Problem 6)*	**Strengthen** Consider asking, "Where does the $\frac{1}{2}$ come from in the $7\frac{1}{2}$ bricks in Problem 5? Is there another way to explain it? What do you think is helpful to remember from Deja's work? Emma's work?"
Have an inaccurate tape diagram or interpretation. *(Problem 7)*	**Stretch** Invite students to apply the strategy they used to Problem 7.
Have an accurate tape diagram and solution. *(Problem 7)*	**Stretch** Prepare these students to share their thinking during the Connect by inviting them to explain their thinking to a partner first.

3 Connect

Direct students' attention to Deja's and Emma's work in the Student Edition.

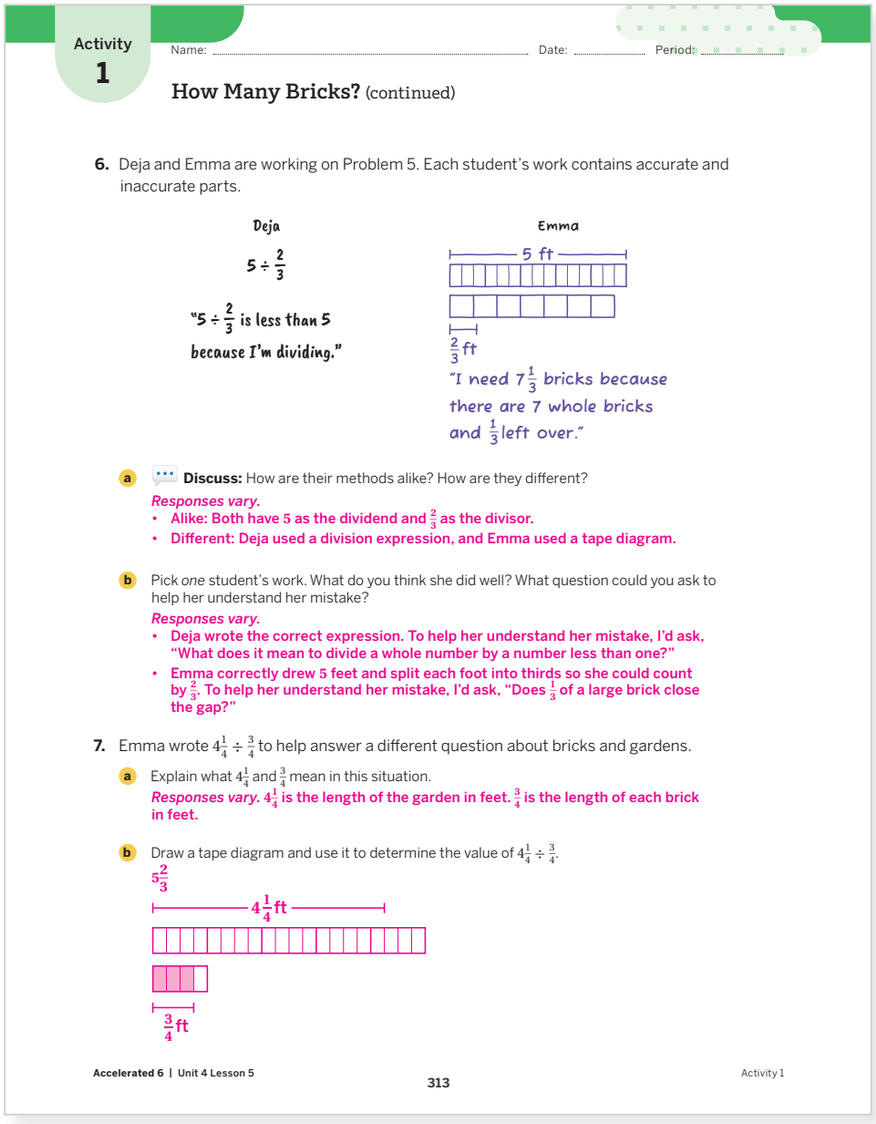
MLR **MLR3: Critique, Correct, Clarify** Invite students to share strengths, errors, and ambiguities in Deja's and Emma's work. Support student sharing with the following sentence starters:

- Deja decided to ___. Emma decided to ___.
- Did ___ think about ___? Why did ___?

If time allows, create one revised response as a class. Consider connecting this revised response to students' responses to Problem 7.

To surface the Key Takeaway, consider asking:

- "Where does $\frac{1}{2}$ come from in $7\frac{1}{2}$ bricks in Problem 5?"
- "How do you determine the remainder when dividing by fractions? How can a tape diagram be helpful?"
- "How does this connect to your response from Problem 7?"



Activity 1

Name: ..... Date: ..... Period: .....

How Many Bricks? (continued)

6. Deja and Emma are working on Problem 5. Each student's work contains accurate and inaccurate parts.

Deja

$5 \div \frac{2}{3}$

"$5 \div \frac{2}{3}$ is less than 5 because I'm dividing."

Emma

"I need $7\frac{1}{3}$ bricks because there are 7 whole bricks and $\frac{1}{3}$ left over."

a. **Discuss:** How are their methods alike? How are they different?

Responses vary.

- Alike: Both have 5 as the dividend and $\frac{2}{3}$ as the divisor.
- Different: Deja used a division expression, and Emma used a tape diagram.

b. Pick *one* student's work. What do you think she did well? What question could you ask to help her understand her mistake?

Responses vary.

- Deja wrote the correct expression. To help her understand her mistake, I'd ask, "What does it mean to divide a whole number by a number less than one?"
- Emma correctly drew 5 feet and split each foot into thirds so she could count by $\frac{2}{3}$. To help her understand her mistake, I'd ask, "Does $\frac{1}{3}$ of a large brick close the gap?"

7. Emma wrote $4\frac{1}{4} \div \frac{3}{4}$ to help answer a different question about bricks and gardens.

a. Explain what $4\frac{1}{4}$ and $\frac{3}{4}$ mean in this situation.

Responses vary. $4\frac{1}{4}$ is the length of the garden in feet. $\frac{3}{4}$ is the length of each brick in feet.

b. Draw a tape diagram and use it to determine the value of $4\frac{1}{4} \div \frac{3}{4}$.

$5\frac{2}{3}$

Accelerated 6 | Unit 4 Lesson 5 313 Activity 1

Key Takeaway: To determine the remainder when dividing by fractions, compare the amount remaining to the divisor.

Pairs | 10 min

Activity 2 What's Missing?

Purpose: Students create and use tape diagrams to divide whole numbers by fractions and to divide two fractions that have the same denominator. **(MTR.2.1)**

Short on time? Consider having students divide the four rows up between each partner and, then, compare their thinking to another pair of students to check their answers.

1 Launch

Direct students' attention to the first expression and tape diagram.

Invite students to make an estimation before they start each problem.

Consider asking, "How can the tape diagram help you to determine the quotient more precisely?" **(MTR.4.1)**

A **Accessibility: Visual-Spatial Processing**
To support students as they make connections, provide access to coloring tools and invite them to color code where they see each quantity in each representation.

2 Monitor

Select and sequence responses to share during the Connect.

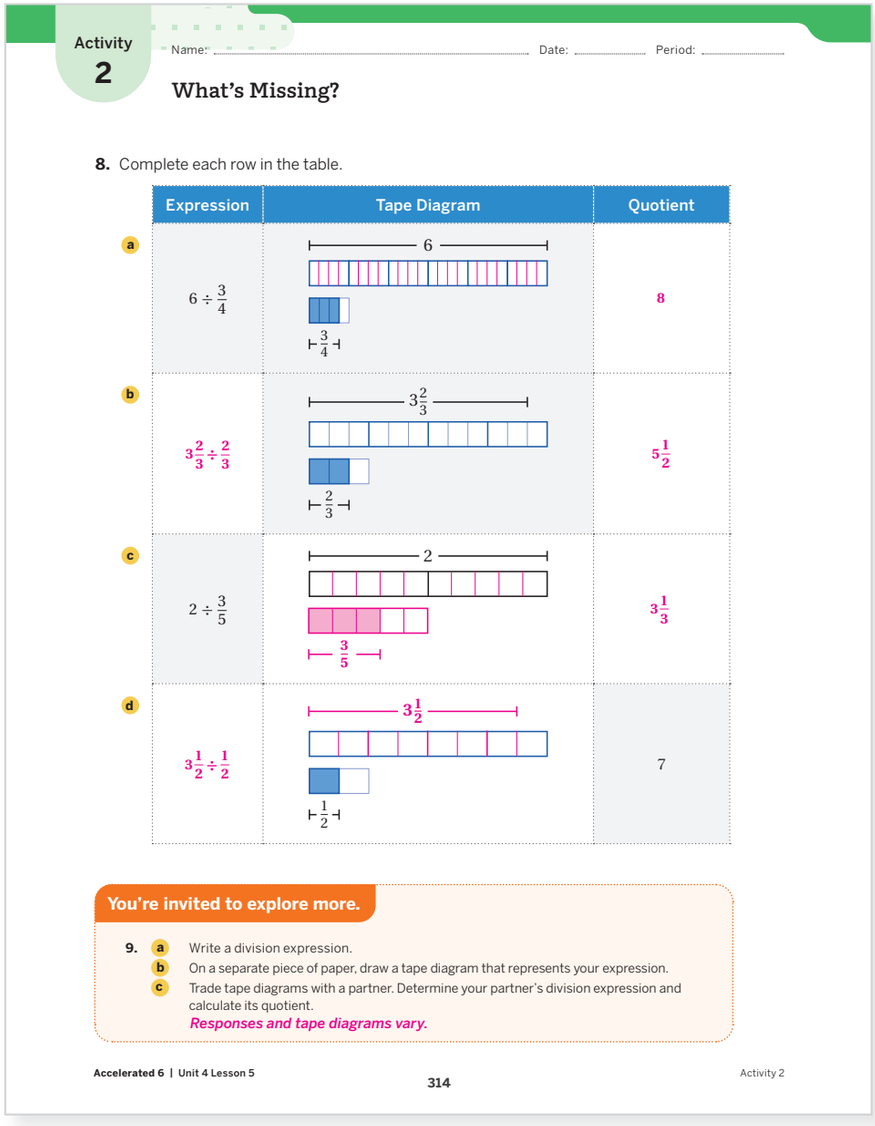
D **Differentiation** *(Problem 8)*

Look for students who:	Respond to Student Thinking
Draw an inaccurate tape diagram.	**Support** Invite students to represent only one quantity or number at a time, encouraging them to start with the dividend.
Write an inaccurate expression for each scenario.	**Support** Consider asking, "Which value should be the dividend? The divisor?"
Need support writing the remainder.	**Support** Consider asking, "How many pieces are left? Out of groups of how many?"
Respond to each question with precision, including a clearly labeled tape diagram.	**Stretch** **You're invited to explore more.** Invite students to explore division expressions and tape diagrams further with this optional problem shown in the Student Edition.

3 Connect

Direct students' attention to the table in the Student Edition, and invite students to share their tape diagrams and quotients. **(MTR.2.1)**

Consider asking:
- "How do the expression, tape diagram, and quotient show the same information?"
- "How do tape diagrams help determine the quotient when the number of groups isn't a whole number?"



Activity 2

Name: Date: Period:

What's Missing?

8. Complete each row in the table.

	Expression	Tape Diagram	Quotient
a	$6 \div \frac{3}{4}$	6; $\frac{3}{4}$	8
b	$3\frac{2}{3} \div \frac{2}{3}$	$3\frac{2}{3}$; $\frac{2}{3}$	$5\frac{1}{2}$
c	$2 \div \frac{3}{5}$	2; $\frac{3}{5}$	$3\frac{1}{3}$
d	$3\frac{1}{2} \div \frac{1}{2}$	$3\frac{1}{2}$; $\frac{1}{2}$	7

You're invited to explore more.

9. a. Write a division expression.
b. On a separate piece of paper, draw a tape diagram that represents your expression.
c. Trade tape diagrams with a partner. Determine your partner's division expression and calculate its quotient.

Responses and tape diagrams vary.

Accelerated 6 | Unit 4 Lesson 5 314 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that tape diagrams can be used to determine an unknown number of groups when the number of groups is a fraction.

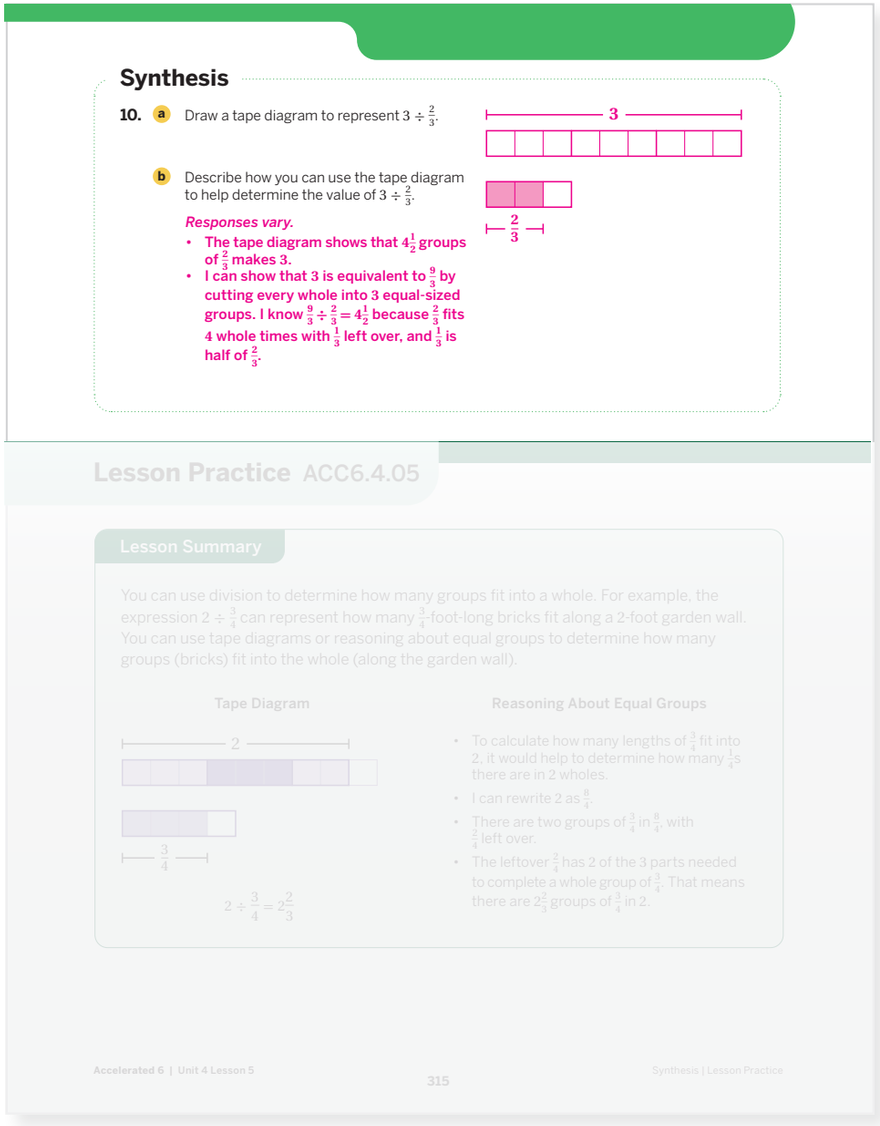
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Students who expect the quotient to be more than 1 after restating the problem as "How many groups of $\frac{2}{3}$ make up 3 wholes?"
- Students who make two tape diagrams and break them into the same-sized pieces.
- Students who reason about the remainder by referencing the size of the pieces.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they share during the Connect. Display for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

10. a. Draw a tape diagram to represent $3 \div \frac{2}{3}$.

3

b. Describe how you can use the tape diagram to help determine the value of $3 \div \frac{2}{3}$.

$\frac{2}{3}$

Responses vary.

- The tape diagram shows that $4\frac{1}{2}$ groups of $\frac{2}{3}$ makes 3.
- I can show that 3 is equivalent to $\frac{9}{3}$ by cutting every whole into 3 equal-sized groups. I know $\frac{9}{3} \div \frac{2}{3} = 4\frac{1}{2}$ because $\frac{2}{3}$ fits 4 whole times with $\frac{1}{3}$ left over, and $\frac{1}{3}$ is half of $\frac{2}{3}$.

Lesson Practice ACC6.4.05

Lesson Summary

You can use division to determine how many groups fit into a whole. For example, the expression $2 \div \frac{3}{4}$ can represent how many $\frac{3}{4}$-foot-long bricks fit along a 2-foot garden wall. You can use tape diagrams or reasoning about equal groups to determine how many groups (bricks) fit into the whole (along the garden wall).

Tape Diagram

2

$\frac{3}{4}$

$2 \div \frac{3}{4} = 2\frac{2}{3}$

Reasoning About Equal Groups

- To calculate how many lengths of $\frac{3}{4}$ fit into 2, it would help to determine how many $\frac{1}{4}$s there are in 2 wholes.
- I can rewrite 2 as $\frac{8}{4}$.
- There are two groups of $\frac{3}{4}$ in $\frac{8}{4}$, with $\frac{2}{4}$ left over.
- The leftover $\frac{2}{4}$ has 2 of the 3 parts needed to complete a whole group of $\frac{3}{4}$. That means there are $2\frac{2}{3}$ groups of $\frac{3}{4}$ in 2.

Accelerated 6 | Unit 4 Lesson 5 315 Synthesis | Lesson Practice

Lesson Takeaway: You can interpret and solve a division problem by asking, "How many groups?" and making a tape diagram. To start, draw one diagram with the dividend and another with the divisor and break them into same-sized pieces to compare. To determine the remainder, compare the number of remaining pieces from the dividend to the divisor's tape diagram.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by using a tape diagram to determine a fractional quotient.

Today's Goals

1. **Goal:** Use tape diagrams to represent and solve division problems asking, "How many groups?" when there are a fractional number of groups.
2. **Language Goal:** Interpret a division problem as a question asking, "How many groups?" using mathematically precise language. **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.05

Determine the value of $3 \div \frac{4}{5}$. Show or explain your thinking.

$3\frac{3}{4}$ (or equivalent) *Explanations vary.* 3 is equivalent to $\frac{15}{5}$. There are 3 groups of $\frac{4}{5}$ with $\frac{3}{5}$ left over. The leftover group has 3 of the 4 parts needed to complete the group, which means there are $3\frac{3}{4}$ groups of $\frac{4}{5}$ in 3.

Differentiation Use after Lesson 5

Support

Provide targeted intervention for students by using these resources.

If students need support using tape diagrams to represent and solve division problems:

» **Respond to Student Thinking:**

- Use the *Representing Dividing Whole Numbers by Unit Fractions* Mini-lesson.
- Use the *Determining How Many in Each Group* Mini-lesson.
- Revisit Deja's and Emma's strategies in **Activity 1** and invite students to practice applying each method to select **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

Take a moment to reflect on this lesson. In this lesson, students used tape diagrams to make sense of a fractional quotient. How will that work support upcoming computational strategies like dividing with a common denominator or multiplying by the reciprocal?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. a. Draw a tape diagram to represent $3 \div \frac{2}{3}$.

b. Describe how you can use the tape diagram to help determine the value of $3 \div \frac{2}{3}$.

Responses vary.

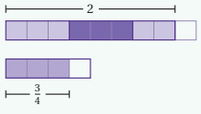
- The tape diagram shows that $4\frac{1}{2}$ groups of $\frac{2}{3}$ makes 3.
- I can show that 3 is equivalent to $\frac{9}{3}$ by cutting every whole into 3 equal-sized groups. I know $\frac{9}{3} \div \frac{2}{3} = 4\frac{1}{2}$ because $\frac{2}{3}$ fits 4 whole times with $\frac{1}{3}$ left over, and $\frac{1}{3}$ is half of $\frac{2}{3}$.

Lesson Practice ACC6.4.05

Lesson Summary

You can use division to determine how many groups fit into a whole. For example, the expression $2 \div \frac{3}{4}$ can represent how many $\frac{3}{4}$-foot-long bricks fit along a 2-foot garden wall. You can use tape diagrams or reasoning about equal groups to determine how many groups (bricks) fit into the whole (along the garden wall).

Tape Diagram



$2 \div \frac{3}{4} = 2\frac{2}{3}$

Reasoning About Equal Groups

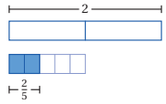
- To calculate how many lengths of $\frac{3}{4}$ fit into 2, it would help to determine how many $\frac{1}{4}$s there are in 2 wholes.
- I can rewrite 2 as $\frac{8}{4}$.
- There are two groups of $\frac{3}{4}$ in $\frac{8}{4}$, with $\frac{2}{4}$ left over.
- The leftover $\frac{2}{4}$ has 2 of the 3 parts needed to complete a whole group of $\frac{3}{4}$. That means there are $2\frac{2}{3}$ groups of $\frac{3}{4}$ in 2.

Lesson Practice
ACC6.4.05

Name: _____ Date: _____ Period: _____

1. How many $\frac{2}{5}$s are in 2? Use the diagram if it helps with your thinking.

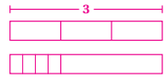
5



Problems 2–3: Think about how many $\frac{1}{4}$s are in 3.

2. Draw a tape diagram to represent the situation.

Sample response shown.



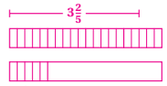
3. Determine how many $\frac{1}{4}$s are in 3.

12

Problems 4–5: Think about the expression $3\frac{2}{5} \div \frac{4}{5}$.

4. Draw a tape diagram to represent this expression.

Sample response shown.



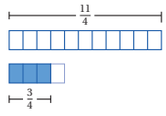
5. Calculate the quotient.

$4\frac{1}{4}$ (or equivalent)

Problems 6–7: Here is a tape diagram.

6. What expression does this tape diagram represent?

$\frac{11}{4} \div \frac{3}{4}$



7. Calculate the quotient for this expression.

$3\frac{2}{3}$ (or equivalent)

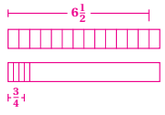
Lesson Practice
ACC6.4.05

Name: _____ Date: _____ Period: _____

Problems 8–9: Think about the expression $6\frac{1}{2} \div \frac{3}{4}$.

8. Draw a tape diagram to represent this expression.

Sample response shown.



9. Calculate the quotient.

$8\frac{2}{3}$ (or equivalent)

FAST Practice

10. Kayleen buys one 3-pound bag of rice. Her family eats about $\frac{3}{4}$ of a pound every week. How many weeks does one bag last? Use a tape diagram if it helps you with your thinking.

One bag lasts [4] weeks.

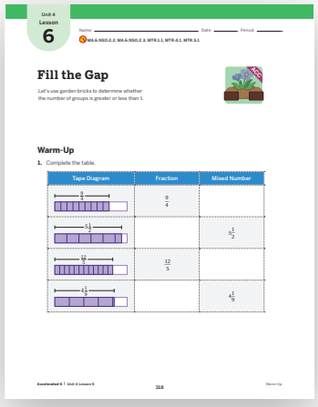
Spiral Review

11. Complete the table.

Fraction	Decimal	Percent
$\frac{1}{4}$	0.25	25%
$\frac{1}{10}$	0.1	10%
$\frac{1}{5}$	0.2	20%
$1\frac{4}{10}$ or $1\frac{2}{5}$	1.4	140%

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–9	1	MA.6.NSO.2.2
FAST Practice	10	2	MA.6.NSO.2.3
Spiral Review			
	11	1	MA.6.NSO.3.5


Unit 4
Lesson
6

Fill the Gap

Let's use garden bricks to determine whether the number of groups is greater or less than 1.

Warm-Up

1. Complete the table.

Tape Diagram	Fraction	Mixed Number
	$\frac{9}{4}$	
		$1\frac{1}{2}$
	$\frac{12}{5}$	
		$4\frac{1}{5}$

Fill the Gap

More or Less Than One Group?

Let's use garden bricks to determine whether the number of groups is greater or less than 1.

Learning Outcomes

Today's Goals

1. **Goal:** Use tape diagrams with *common denominators* to solve division problems asking, "How many groups?"
2. **Goal:** Determine whether the number of groups in a division problem is greater than or less than 1.
3. **Language Goal:** Describe strategies for using diagrams and common denominators to determine the quotients of fractions. **(Writing, Speaking, and Listening)**

The purpose of this lesson is for students to extend strategies they developed in Lessons 3 and 5 to calculate an unknown number of groups when there is less than 1 group. Students use tape diagrams with common denominators to divide fractional quantities.

Coherence

Prior Learning

In Lesson 5, students encountered situations in which the total amount and/or the number of groups was not a whole number, and they had to attend to the whole when representing the answer as a fraction.

Future Learning

In Lesson 7, students will develop fluency in using common denominators to divide fractions.

Connections

- Students continue to explore with their class garden to solve division problems using tap diagrams with common denominators. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.4.1, MTR.5.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2
MA.5.FR.2.3	MA.7.NSO.2.3
MA.5.FR.2.4	
MA.5.AR.1.2	
MA.5.AR.1.3	

Vocabulary

New Vocabulary

common denominator

Lesson at a Glance

~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

Students practice converting between mixed numbers and fractions greater than 1.

Activity 1

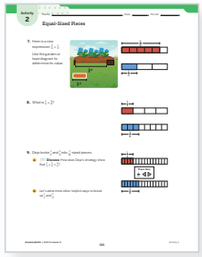
Pairs | 13 min

Students reason about and justify whether quotients will be greater than, less than, or equal to 1, both in a gardening context and abstractly. **Routines:** Notice and Wonder, Decide and Defend **(MTR.1.1, MTR.5.1)**

Activity 2

Pairs | 10 min

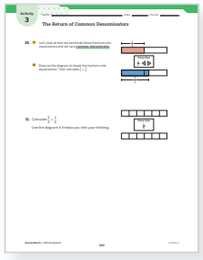
Students break both fractions in a division situation into equal-sized pieces.



Activity 3

Pairs | 7 min

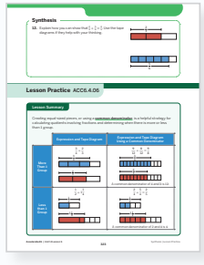
Students use **common denominators** to divide fractions.



Synthesis

Whole Class | 5 min

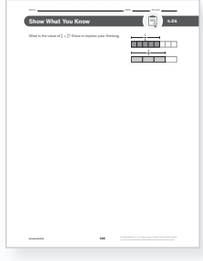
Students synthesize their understanding that tape diagrams can help visualize common denominators to help determine the quotient of a fraction divided by a fraction. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of dividing fractions by using tape diagrams with common denominators.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Cut-out rectangles (*as needed*)

Pairs | 5 min

Warm-Up

Purpose: Students practice converting between mixed numbers and fractions greater than 1.

1 Launch

To surface connections, consider asking, "What do you recall about mixed numbers and fractions? What strategies can we use to convert between them?" We can use the denominator to determine the number of parts in one whole when converting to a mixed number or to break a whole into equal parts when converting to a fraction.

To support students getting started, consider asking:

- "If there are 9 parts and 4 parts make one whole, how many wholes are there?" 2 wholes
- "How many parts are left over?" 1 part out of 4

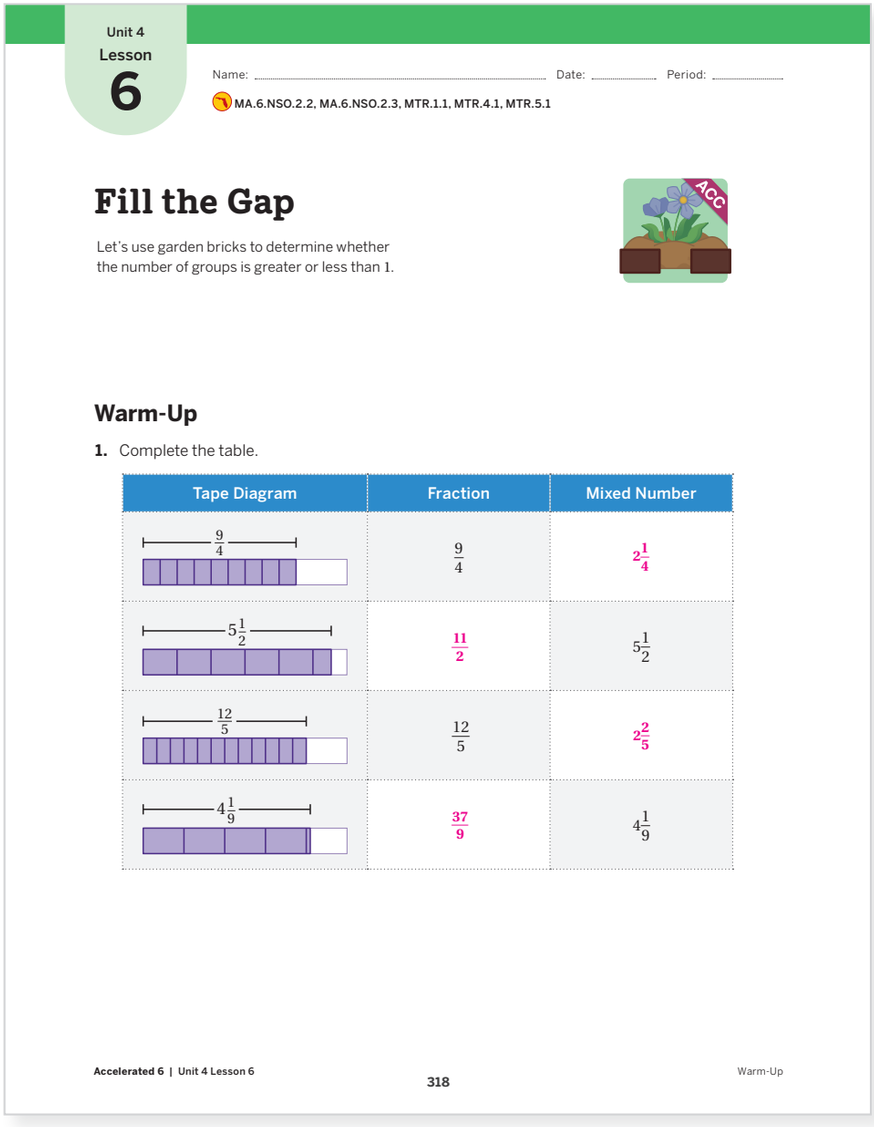
ELL **English Language Learners** Use intentional grouping so that students with different English language proficiency levels can interact and have an opportunity to listen to peers with more advanced proficiency. **(Speaking and Listening)**.

Invite students to solve as many rows in the table as they have time for. Share that sense-making is more important than speed.

2 Connect

Consider asking, "Why do you think it's helpful to be able to write numbers in multiple ways?" **(MTR.4.1)**

Note: As students explore the division of fractions, consider the ways that you are supporting conceptual understanding through tape diagrams and common denominators. Avoid procedural statements like "flip and multiply" or "divide straight across."



Unit 4
Lesson
6

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.1.1, MTR.4.1, MTR.5.1

Fill the Gap

Let's use garden bricks to determine whether the number of groups is greater or less than 1.

Warm-Up

1. Complete the table.

Tape Diagram	Fraction	Mixed Number
$\frac{9}{4}$	$\frac{9}{4}$	$2\frac{1}{4}$
$5\frac{1}{2}$	$\frac{11}{2}$	$5\frac{1}{2}$
$\frac{12}{5}$	$\frac{12}{5}$	$2\frac{2}{5}$
$4\frac{1}{9}$	$\frac{37}{9}$	$4\frac{1}{9}$

Accelerated 6 | Unit 4 Lesson 6 318 Warm-Up

Pairs | 13 min

Activity 1 More or Less Than One Group

Purpose: Students reason about and justify whether quotients will be greater than, less than, or equal to 1, both in a gardening context and abstractly. **(MTR.1.1, MTR.5.1)**

Short on time? Consider skipping Problem 5 and inviting students to start on Problem 6.

1 Launch

Direct students' attention to the image of the garden and brick and invite students to estimate how many bricks are needed. Consider using the **Notice and Wonder** routine to promote curiosity and help students make sense of the situation. **(MTR.1.1)**

Direct students' attention to the measurements and invite students to sketch in their Student Edition as they calculate how many bricks are needed.

2 Monitor

A **Accessibility: Visual-Spatial Processing** As students interpret visual representations, consider providing cut-out rectangles or other equal-sized objects they can use to represent the size of each brick. Invite them to physically manipulate the rectangles or objects to make sense of how many bricks are needed to fill the gap.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to start with an incorrect answer and use what they learn from the feedback.
Write $2\frac{1}{4}$ because there is $\frac{1}{4}$ left over.	**Support** Consider asking, "What is the size of the bricks? How much of the full brick do we need for the remaining gap?"
Use a strategy similar to Deja's or Emma's in the next problem.	**Strengthen** Consider asking, "How do you know your expression matches the situation?" Invite them to share their reasoning during the Pause.

Pause briefly and consider polling the class to hear students' responses.

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others, if time allows. **(MTR.4.1)**

Invite students who made different choices to use reasoning to convince their classmates, then encourage students to revise their responses based on their classmates' reasoning.

Consider asking, "Which expression will be more than 1? Which expression will be less than 1? How do you know?"

Activity 1 continued >

Activity 1

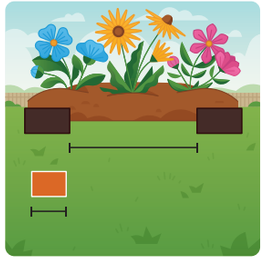
Name: _____ Date: _____ Period: _____

More or Less Than One Group

2. Deja is filling a gap along the front of this garden.

About how many bricks does she need?

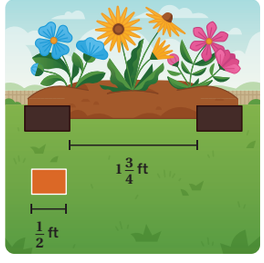
Responses vary. 3 bricks



3. The gap in Deja's garden is $1\frac{3}{4}$ feet long. Each brick is $\frac{1}{2}$ of a foot long.

How many bricks does Deja need to fill the gap?

$3\frac{1}{2}$ bricks



4. Deja and Emma each wrote an expression to represent the number of bricks needed to fill the gap.

Deja wrote $1\frac{3}{4} \div \frac{1}{2}$. Emma wrote $\frac{1}{2} \div 1\frac{3}{4}$. Whose expression is correct? Circle one.

(Deja's) Emma's Both Neither

Explain your thinking.

Explanations vary.

- The first number in the expression is how long the gap is and the second is how big the brick is. For example, $6 \div 2$ would be like putting 2-foot bricks into a 6-foot gap.
- The gap is longer than the brick, so more than one brick fits into the gap. Deja's expression also shows that the answer is more than 1.

Accelerated 6 | Unit 4 Lesson 6 319 Activity 1

Pairs | 13 min

Activity 1 More or Less Than One Group (continued)

Purpose: Students reason about and justify whether quotients will be greater than, less than, or equal to 1, both in a gardening context and abstractly. **(MTR.1.1, MTR.5.1)**

Short on time? Consider skipping Problem 5 and inviting students to start on Problem 6.

2 Monitor

Invite students to sketch their representations before making their estimation.

D **Differentiation: (Support)** Look for students who need support getting started and consider asking, "What does that $\frac{1}{2}$ represent in the situation? $1\frac{3}{4}$? How can you interpret this expression as a 'How many groups?' question?" How many groups of $1\frac{3}{4}$ are in $\frac{1}{2}$?

A **Accessibility: Fine Motor Skills** To support students with creating representations, provide access to blank templates of a garden structure — with a gap and a brick — for them to use to make sense of and complete Problem 5a.

Encourage students to share their reasoning with a partner and work together to reach an agreement about how to sort the expressions. **(MTR.1.1, MTR.4.1)**

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started or estimate quotients inaccurately.	**Support** Consider asking, "How could we read the expression out loud using the brick context?"
Estimate $\frac{1}{4} \div \frac{3}{8}$, $\frac{5}{4} \div 1\frac{1}{4}$, or $\frac{3}{8} \div \frac{1}{4}$ inaccurately.	**Support** Invite students to sketch a garden or tape diagram or rewrite the fractions with denominators that are the same size.
Sort the expressions accurately and justify their thinking to a partner.	**Stretch** Invite students to create their own division expressions, one for each category.

3 Connect

To surface the Key Takeaway, consider asking:

- "Why might it be helpful to ask whether the value is less than, greater than, or equal to 1?"
- "How can you use the structure of a tape diagram to estimate the value of a division expression?" **(MTR.5.1)**

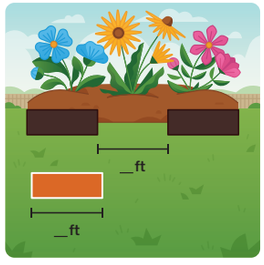
Activity 1

Name: _____ Date: _____ Period: _____

More or Less Than One Group (continued)

5. Here is Emma's expression: $\frac{1}{2} \div 1\frac{3}{4}$.

a Draw a sketch to represent this expression in the garden situation.



b The value of $\frac{1}{2} \div 1\frac{3}{4}$ is:

Less than 1 | Greater than 1 | Equal to 1

6. Sort these expressions by the value of their quotient.

$2\frac{1}{4} \div \frac{3}{4}$ $\quad \frac{1}{4} \div \frac{3}{8}$ $\quad \frac{3}{8} \div \frac{1}{4}$ $\quad 1 \div \frac{1}{4}$

$\frac{5}{4} \div 1\frac{1}{4}$ $\quad \frac{3}{8} \div \frac{3}{8}$ $\quad 1 \div 4$

Less than 1	Greater than 1	Equal to 1
$1 \div 4$	$1 \div \frac{1}{4}$	$\frac{5}{4} \div 1\frac{1}{4}$
$\frac{1}{4} \div \frac{3}{8}$	$\frac{3}{8} \div \frac{1}{4}$	$\frac{3}{8} \div \frac{3}{8}$
	$2\frac{1}{4} \div \frac{3}{4}$	

Accelerated 6 | Unit 4 Lesson 6 320 Activity 1

Key Takeaway: A garden diagram (or tape diagram) can help to visually determine if the quotient is less than 1, greater than 1, or equal to 1. When the dividend is larger than the divisor, the quotient will be greater than 1.

Pairs | 10 min

Activity 2 Equal-Sized Pieces

Purpose: Students break both fractions in a division situation into equal-sized pieces.

1 Launch

Encourage students to sketch in their Student Edition to make their thinking visible.

Consider asking, "How would you rephrase this expression in terms of bricks in a garden? In terms of groups?" How many $\frac{1}{3}$-foot bricks would fit in a gap that is $\frac{5}{6}$ feet wide? How many groups of $\frac{1}{3}$ are in $\frac{5}{6}$?

2 Monitor

To support students getting started, consider rephrasing the expression in terms of bricks in a garden to help them determine if the quotient will be greater than or less than 1.

A **Accessibility: Visual-Spatial Processing** As students make connections between the two tape diagrams, consider asking, "Why are the two tape diagrams the same length?" They represent the same whole.

Select and sequence a variety of helpful piece sizes to share during the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to rephrase their partners' reasoning to help them make sense of what they are saying. Provide sentence frames, such as, "I think you are saying ___. Is that correct?" or "You think Deja ___ because ___. Is that correct?"
Share that piece sizes of $\frac{1}{8}$, $\frac{1}{24}$, and $\frac{1}{32}$ are all helpful.	**Strengthen** Consider asking, "Why are those pieces helpful? Why are some piece sizes unhelpful?" Invite these students to share during the Connect.
Want to explore changing the piece sizes further.	**Stretch** Invite students to look back at each expression from the activity and use Deja's strategy of splitting the tape diagrams into equal-sized pieces.

3 Connect

Consider asking, "Why is it helpful to have tape diagrams with the same-sized pieces? What other helpful ways are there to break up each fraction?" **(MTR.4.1)**

Activity 2

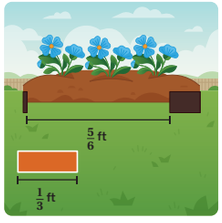
Name: Date: Period:

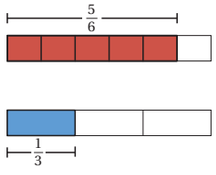
Equal-Sized Pieces

7. Here is a new expression: $\frac{5}{6} \div \frac{1}{3}$.

Use the garden or tape diagram to determine its value.

$\frac{5}{2}$ (or equivalent)

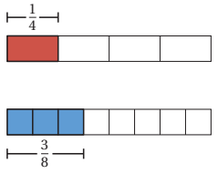




8. What is $\frac{1}{4} \div \frac{3}{8}$?

$\frac{2}{3}$ (or equivalent)

Note: Responses between 0.66 and 0.67 are considered correct.



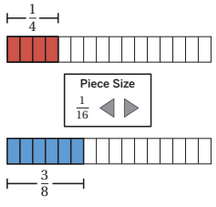
9. Deja broke $\frac{1}{4}$ and $\frac{3}{8}$ into $\frac{1}{16}$-sized pieces.

a. **Discuss:** How does Deja's strategy show that $\frac{1}{4} \div \frac{3}{8} = \frac{4}{6}$?

Responses vary. When the pieces are the same size, you can count how many of one fit in the other.

b. Let's determine other helpful ways to break up $\frac{1}{4}$ and $\frac{3}{8}$.

Responses vary. Other helpful ways to break up each fraction include $\frac{1}{8}$, $\frac{1}{24}$, $\frac{1}{32}$, etc.



Accelerated 6 | Unit 4 Lesson 6 321 Activity 2

Pairs | 7 min

Activity 3 The Return of Common Denominators

Purpose: Students use **common denominators** to divide fractions.

1 Launch

Direct students' attention to the tape diagrams and demonstrate how to change the piece size. Consider asking, "How might we decide what piece size is most helpful?"

Create a class definition for the term **common denominator** using students' language and the glossary. Consider creating an anchor chart, connecting the term to tape diagrams and division problems.

2 Monitor

To support students getting started, consider asking, "How can we write $\frac{2}{3}$ and $\frac{1}{2}$ with a common denominator?"

Encourage students to draw the expression on the given tape diagram. **(MTR.5.1)**

Look for student sketches to highlight during the Connect.

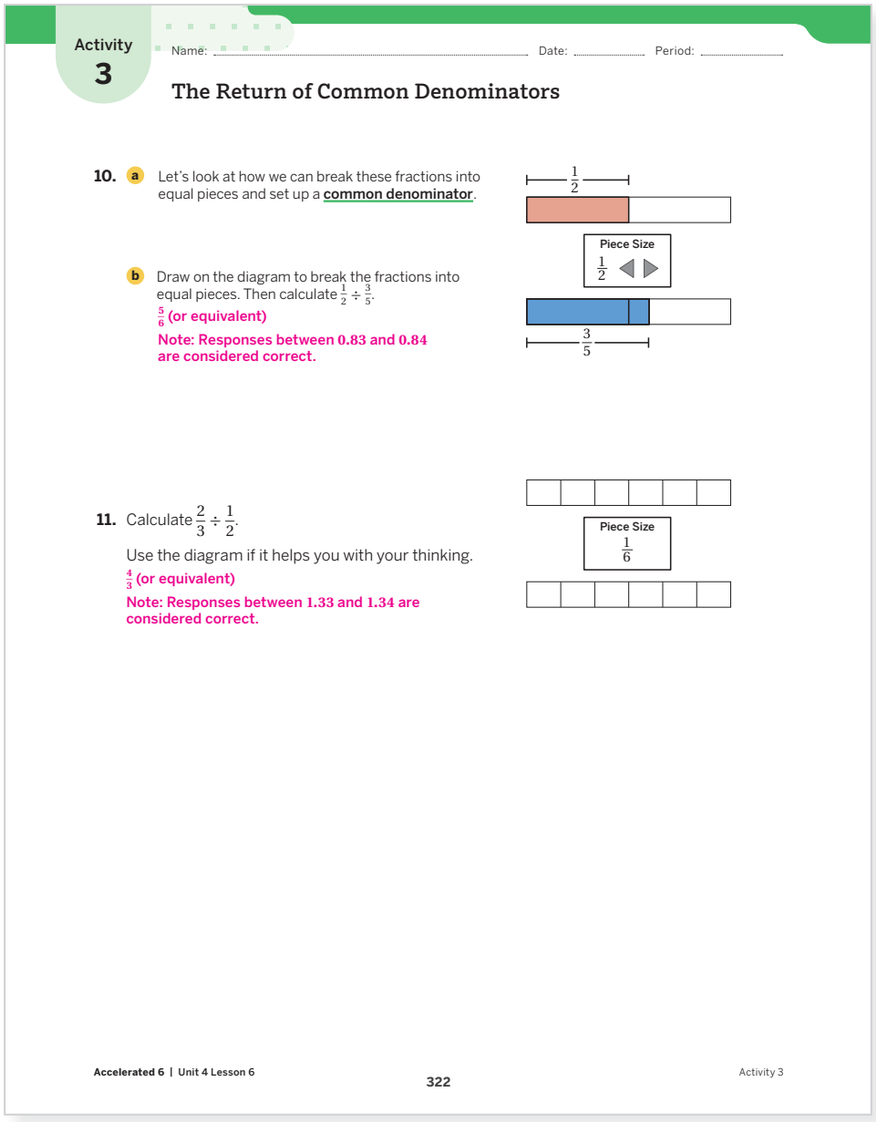
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to sketch $\frac{2}{3}$ and $\frac{1}{2}$ on the tape diagrams, then estimate if the quotient will be less than, equal to, or greater than 1.
Notice that the numerators are 2 and 1 and shade $\frac{2}{6}$ and $\frac{1}{6}$. **(MTR.5.1)**	**Strengthen** Consider asking, "How many $\frac{1}{6}$-sized pieces make up $\frac{1}{2}$? What about $\frac{2}{3}$?"
Want to explore division problems like this further.	**Stretch** Encourage students to calculate $\frac{1}{2} \div \frac{2}{3}$ and compare the results.

3 Connect

To surface the Key Takeaway, consider asking:

- "What size pieces were most helpful in this expression?"
- "What advice would you give someone trying to find helpful sized pieces to divide fractions?"



Activity 3

Name: Date: Period:

The Return of Common Denominators

10. a Let's look at how we can break these fractions into equal pieces and set up a **common denominator**.

b Draw on the diagram to break the fractions into equal pieces. Then calculate $\frac{1}{2} \div \frac{3}{5}$.

$\frac{5}{6}$ (or equivalent)

Note: Responses between 0.83 and 0.84 are considered correct.

11. Calculate $\frac{2}{3} \div \frac{1}{2}$.

Use the diagram if it helps you with your thinking.

$\frac{4}{3}$ (or equivalent)

Note: Responses between 1.33 and 1.34 are considered correct.

Accelerated 6 | Unit 4 Lesson 6 322 Activity 3

Key Takeaway: Finding a **common denominator** between two fractions can make finding a quotient much easier because the pieces you are comparing are the same size.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that tape diagrams can help visualize common denominators to help determine the quotient of a fraction divided by a fraction.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- If I break both fractions into $\frac{1}{6}$-sized pieces, I can see how many groups I need.
- The top tape diagram is $\frac{4}{6}$ and the bottom is $\frac{5}{6}$, so $\frac{4}{5}$ of the bottom will fit in the top.

MLR **MLR2: Collect and Display** Use this routine to collect students' diagrams and strategies as they share during the Connect. Display for students to reference and add to for the rest of the unit.

Synthesis

12. Explain how you can show that $\frac{2}{3} \div \frac{5}{6} = \frac{4}{5}$. Use the tape diagrams if they help with your thinking.

Responses vary. If you break both fractions into $\frac{1}{6}$-sized pieces, then you can see how many groups of $\frac{5}{6}$ you need. The top tape diagram is $\frac{4}{6}$ and the bottom is $\frac{5}{6}$, so $\frac{4}{5}$ of the bottom will fit in the top.

Lesson Practice ACC6.4.06

Lesson Summary

Creating equal-sized pieces, or using a common denominator, is a helpful strategy for calculating quotients involving fractions and determining when there is more or less than 1 group.

	Expression and Tape Diagram	Expression and Tape Diagram Using a Common Denominator
More Than 1 Group	$\frac{3}{4} \div \frac{2}{3}$	$\frac{9}{12} \div \frac{8}{12} = \frac{9}{8}$ A common denominator of 4 and 3 is 12.
Less than 1 Group	$\frac{1}{2} \div 1\frac{1}{4}$	$\frac{2}{4} \div \frac{5}{4} = \frac{2}{5}$ A common denominator of 2 and 4 is 4.

Accelerated 6 | Unit 4 Lesson 6 323 Synthesis | Lesson Practice

Lesson Takeaway: Tape diagrams with **common denominators** are helpful when solving division problems asking, "How many groups?"

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of dividing fractions by using tape diagrams with common denominators.

Today's Goals

1. **Goal:** Use tape diagrams with *common denominators* to solve division problems asking, "How many groups?"
2. **Goal:** Determine whether the number of groups in a division problem is greater than or less than 1.
3. **Language Goal:** Describe strategies for using diagrams and common denominators to determine the quotients of fractions. **(Writing, Speaking, and Listening)**

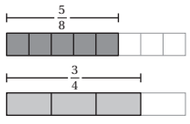
Show What You Know (Assessment Resources)

Name: ..... Date: ..... Period: .....

Show What You Know 4.06

What is the value of $\frac{5}{8} \div \frac{3}{4}$? Show or explain your thinking.

$\frac{5}{6}$ (or equivalent). Responses vary. I divided each of the $\frac{1}{4}$ sections of the $\frac{3}{4}$ tape diagram in half, so it was equal to $\frac{6}{8}$. Then, I know that $\frac{5}{8} \div \frac{3}{4}$ would be 5 shaded boxes to 6 shaded boxes, or $\frac{5}{6}$.



D Differentiation Use after Lesson 6

Support

Provide targeted intervention for students by using these resources.

If students need support using tape diagrams with common denominators to divide fractions:

» **Respond to Student Thinking:**

- Revisit **Activity 3** with students before providing individualized feedback on the relevant **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to measure the length of an empty space in the classroom. Encourage them to design a ¾ -inch tile and determine how many would be needed to line the space.

Professional Learning

Consider the next several lessons you will teach. How will students' work today in Activity 3 prepare them for connecting across a variety of strategies for dividing fractions in Lessons 7–10? What are ways that you might call back to students' strategies from this lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

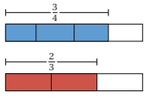
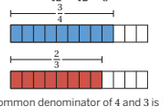
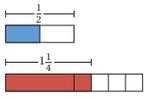
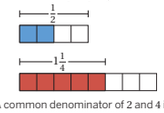
12. Explain how you can show that $\frac{2}{3} \div \frac{5}{6} = \frac{4}{5}$. Use the tape diagrams if they help with your thinking.

Responses vary. If you break both fractions into $\frac{1}{6}$-sized pieces, then you can see how many groups of $\frac{2}{3}$ you need. The top tape diagram is $\frac{4}{6}$ and the bottom is $\frac{5}{6}$, so $\frac{4}{5}$ of the bottom will fit in the top.

Lesson Practice ACC6.4.06

Lesson Summary

Creating equal-sized pieces, or using a **common denominator**, is a helpful strategy for calculating quotients involving fractions and determining when there is more or less than 1 group.

	Expression and Tape Diagram	Expression and Tape Diagram Using a Common Denominator
More Than 1 Group	$\frac{3}{4} \div \frac{2}{3}$ 	$\frac{9}{12} \div \frac{8}{12} = \frac{9}{8}$  A common denominator of 4 and 3 is 12.
Less than 1 Group	$\frac{1}{2} \div 1\frac{1}{4}$ 	$\frac{2}{4} \div \frac{5}{4} = \frac{2}{5}$  A common denominator of 2 and 4 is 4.

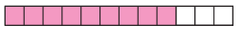
Lesson Practice ACC6.4.06

Name: _____ Date: _____ Period: _____

1. Afia uses a $\frac{1}{2}$-cup scoop for flour. How many scoops does Afia need for each amount of flour? Draw a diagram if it helps with your thinking.

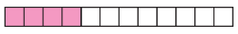
Flour (cups)	Number of Scoops
1	2
$\frac{1}{4}$	$\frac{1}{2}$
$\frac{3}{4}$	$1\frac{1}{2}$

Problems 2–3: Here is a diagram.



2. Determine if the value of $1\frac{1}{2} \div \frac{2}{3}$ is:

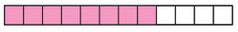
Less than 1 (Greater than 1)



3. Calculate the value of the expression in Problem 2.

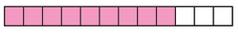
$\frac{9}{4}$ (or equivalent)

Problems 4–5: Here is a diagram.



4. Determine if the value of $\frac{4}{3} \div \frac{3}{2}$ is:

(Less than 1) Greater than 1



5. Calculate the value of the expression in Problem 4.

$\frac{8}{9}$ (or equivalent)

FAST Practice

6. Select *all* the expressions whose value is greater than 1.

☐ A. $\frac{2}{3} \div 5$ ☑ B. $5 \div \frac{2}{3}$ ☐ C. $\frac{5}{3} \div 4$ ☐ D. $\frac{1}{3} \div \frac{4}{5}$ ☑ E. $\frac{4}{5} \div \frac{1}{3}$

Lesson Practice ACC6.4.06

Name: _____ Date: _____ Period: _____

Spiral Review

Problems 7–9: Determine the missing value that creates a pair of equivalent fractions. Draw diagrams if it helps with your thinking.

7. $\frac{2}{3} = \frac{6}{9}$ **8.** $2\frac{1}{2} = \frac{20}{8}$ **9.** $\frac{4}{10} = \frac{10}{25}$

Problems 10–11: Your school is planning a Spring Sprung celebration and has a budget of $240 for all of the expenses.

10. The school wants to spend 40% of its budget on snacks. How much money will the school spend on snacks?

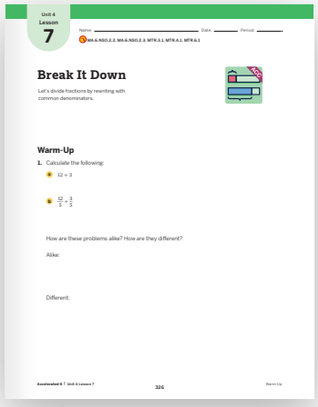
$96

11. The school spent $36 on decorations for the celebration. What percent of the Spring Sprung celebration budget is that?

15%

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1	2	MA.6.NSO.2.3
	2–5	1	MA.6.NSO.2.2
FAST Practice	6	1	MA.6.NSO.2.2
Spiral Review			
	7–9	1	MA.4.FR.1.3
	10–11	2	MA.6.AR.3.4


Unit 4
Lesson
7

Break It Down

Let's divide fractions by rewriting with common denominators.

Warm-Up

1. Calculate the following:

How are these problems alike? How are they different?

Alike:

Different:

326

Break It Down

Using Common Denominators to Divide Fractions

Let's divide fractions by rewriting with common denominators.

Learning Outcomes

Today's Goals

1. **Goal:** Divide fractions by rewriting them with common denominators.
2. **Language Goal:** Explain strategies for determining the quotients of fractions using common denominators. **(Writing, Speaking, and Listening)**

In this lesson, students develop fluency as they use common denominators to divide fractions. This is the third of three lessons that develops the strategy of using common denominators and supports a transition from tape diagrams to arithmetic operations to solve problems involving the division of fractions. **(MTR.3.1)**

Coherence

Prior Learning

In Lesson 6, students used tape diagrams with common denominators to solve division problems asking, "How many groups?"

Future Learning

In Lesson 8, students will interpret division expressions in which they divide a fraction by a unit fraction as a way to answer the question, "How many in 1 group?" In Lessons 9–10, students will continue to develop their fluency in fraction division using more strategies.

Connections

- Students apply their understanding of the common factors to writing equivalent fractions as a tool for dividing efficiently. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.3.1, MTR.4.1, MTR.6.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2
MA.5.FR.2.4	MA.7.NSO.2.3
MA.5.AR.1.2	
MA.5.AR.1.3	

Lesson at a Glance

~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

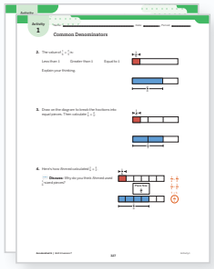
Pairs | 5 min

Students make connections between dividing whole numbers and dividing fractions with common denominators.

Activity 1

Pairs | 15 min

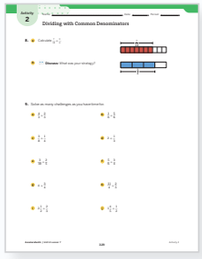
Students justify why the common denominator strategy works for dividing fractions using patterns and structure. MLR3: Critique, Correct, Clarify (MTR.4.1)



Activity 2

Pairs | 15 min

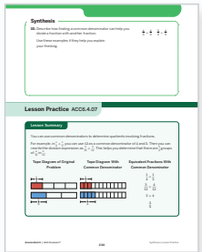
Students make connections between tape diagrams and arithmetic operations, and then use any strategy to divide fractions.



Synthesis

Whole Class | 5 min

Students synthesize their understanding that finding common denominators is a strategy to calculate the quotient of fractions.
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of calculating the quotient of a fraction division problem by using common denominators.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students make connections between dividing whole numbers and dividing fractions with common denominators.

1 Launch

Direct students' attention to the expressions and invite students to share their thinking about the similarities and differences with a partner before documenting their thinking in writing.

Invite students to draw diagrams to represent the two division expressions. Ask, "How many groups of 3 are in 12? How many groups of $\frac{3}{5}$ are in $\frac{12}{5}$?"

ELL **English Language Learners** Provide sentence frames to support students as they share the similarities and differences they noticed, such as:

- I noticed that _____.
- The problems are alike because _____.
- The problems are different because _____.

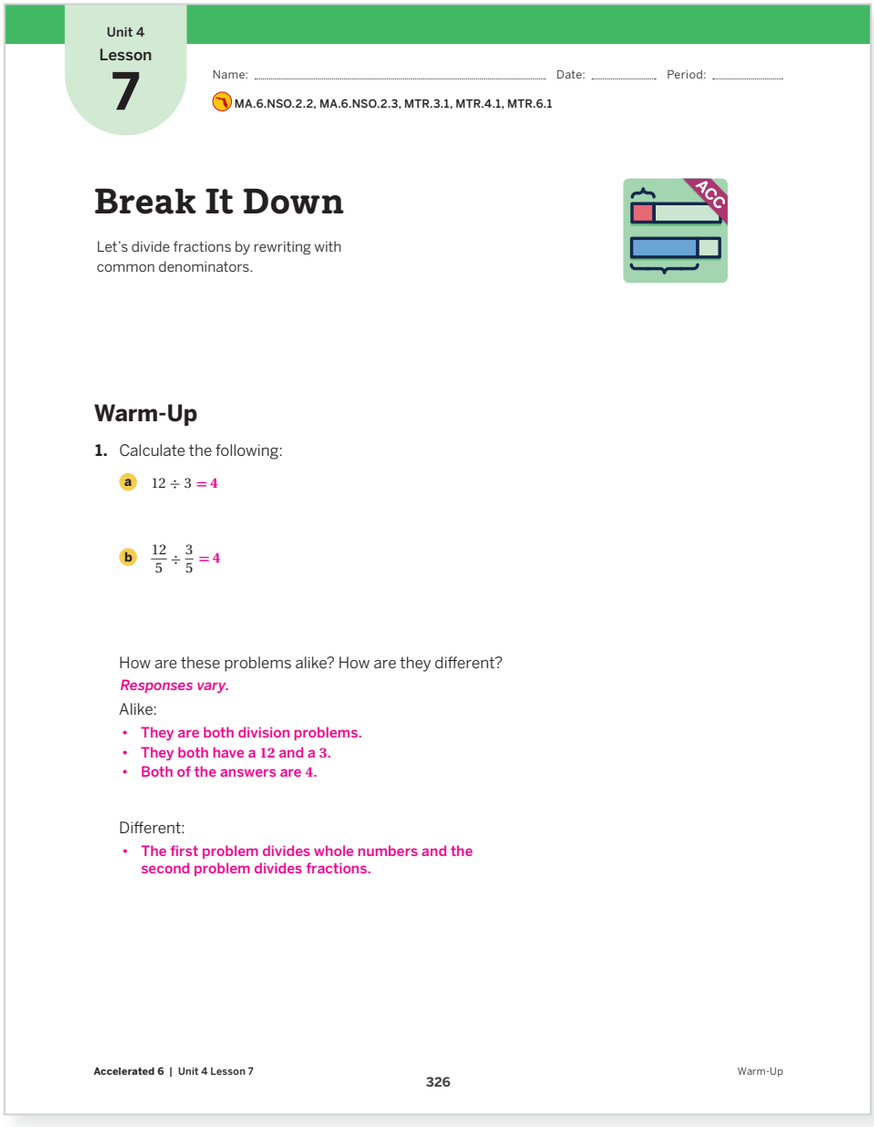
(Reading and Speaking)

2 Connect

Invite students to share similarities and differences with the class.

Consider asking:

- "Are the quotients equal? How do you know?"
- "What whole-number division problem would have the same value as $\frac{8}{3} \div \frac{2}{3}$? What about $\frac{9}{4} \div \frac{5}{4}$?"



Unit 4
Lesson
7

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.3.1, MTR.4.1, MTR.6.1

Break It Down

Let's divide fractions by rewriting with common denominators.

ACC

Warm-Up

1. Calculate the following:

a. $12 \div 3 = 4$

b. $\frac{12}{5} \div \frac{3}{5} = 4$

How are these problems alike? How are they different?

Responses vary.

Alike:

- They are both division problems.
- They both have a 12 and a 3.
- Both of the answers are 4.

Different:

- The first problem divides whole numbers and the second problem divides fractions.

Accelerated 6 | Unit 4 Lesson 7 326 Warm-Up

Pairs | 15 min

Activity 1 Common Denominators

Purpose: Students justify why the common denominator strategy works for dividing fractions using patterns and structure. **(MTR.4.1)**

1 Launch

Invite students to share what they recall about how to tell whether a quotient will be greater than or less than 1.

Consider asking, "Why might it be useful to decide if a quotient is greater than or less than 1 before calculating?"

ELL **English Language Learners** Students can annotate that there are 12 equal-sized sections in each tape diagram and that the common denominator is 12. Write the phrase *common denominator* as you point to 12 or reference an anchor chart from a previous lesson. **(Reading, Speaking, and Listening)**

Display the distribution of responses and invite students to justify their selection. Invite students with inaccurate responses to revise their thinking based on the class discussion before moving onto the next problem. **(MTR.4.1, MTR.6.1)**

A **Accessibility: Conceptual Processing** Invite students to think about the questions, "How does the $\frac{2}{3}$ compare to the $\frac{1}{6}$? What does that tell us about how many groups of $\frac{2}{3}$ are in $\frac{1}{6}$?"

2 Monitor

Invite students to share their diagrams.

D **Differentiation: (Stretch)** Students may notice that $\frac{2}{3}$ is 4 times as large as $\frac{1}{6}$ and write 4 as their response. Consider asking, "What do you think $\frac{1}{6} \div \frac{2}{3}$ is? How is this expression related to the first expression you solved?"

Note: If students are "dividing straight across" and writing $\frac{0.5}{2}$, consider inviting them to write the quotient in another way that connects to the visual.

Direct students' attention to Ahmed's strategy and pause briefly to make connections between the arithmetic steps and the tape diagram.

Activity 1 continued >

Activity 1

Name: _____ Date: _____ Period: _____

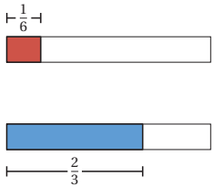
Common Denominators

2. The value of $\frac{1}{6} \div \frac{2}{3}$ is:

Less than 1 (circled) Greater than 1 Equal to 1

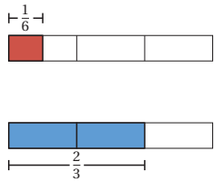
Explain your thinking.

Explanations vary. You're dividing a smaller number by a larger number, so there will be less than 1 group of $\frac{2}{3}$s that can fit into $\frac{1}{6}$.



3. Draw on the diagram to break the fractions into equal pieces. Then calculate $\frac{1}{6} \div \frac{2}{3}$.

$\frac{1}{4}$ (or equivalent)

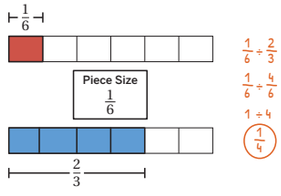


4. Here's how Ahmed calculated $\frac{1}{6} \div \frac{2}{3}$.

Discuss: Why do you think Ahmed used $\frac{1}{6}$-sized pieces?

Responses vary.

- Using $\frac{1}{6}$-sized pieces is helpful because both fractions can be broken into $\frac{1}{6}$s.
- If you write both fractions with the same denominator, then you turn the problem into a whole number division problem like in the Warm-Up.



Accelerated 6 | Unit 4 Lesson 7 327 Activity 1

Pairs | 15 min

Activity 1 Common Denominators (continued)

Purpose: Students justify why the common denominator strategy works for dividing fractions using patterns and structure. **(MTR.4.1)**

2 Monitor

To surface connections, consider asking, "Why does a piece size of $\frac{1}{4}$ make it difficult to determine the quotient?"

Look and listen for a variety of responses that might support **MLR3: Critique, Correct, Clarify** in the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider reminding students of how to find a common denominator by inviting them to list multiples of both 6 and 4 in order to find a common multiple.
Write a sparse, but accurate, response like, "They both equal the same thing."	**Strengthen** Invite students to sketch to show how each strategy is similar and different.
Write that both strategies start by getting common denominators.	**Stretch** Invite them to share during the Connect. Consider asking, "How many different common denominators would exist for this situation? How could you find them?"
Identify a variety of accurate similarities and differences.	**Stretch** Encourage students to write their own expression that has the same quotient as $\frac{5}{6} \div \frac{1}{4}$.

To support students getting started, consider asking, "Can we write 2 as a fraction? If so, how?"

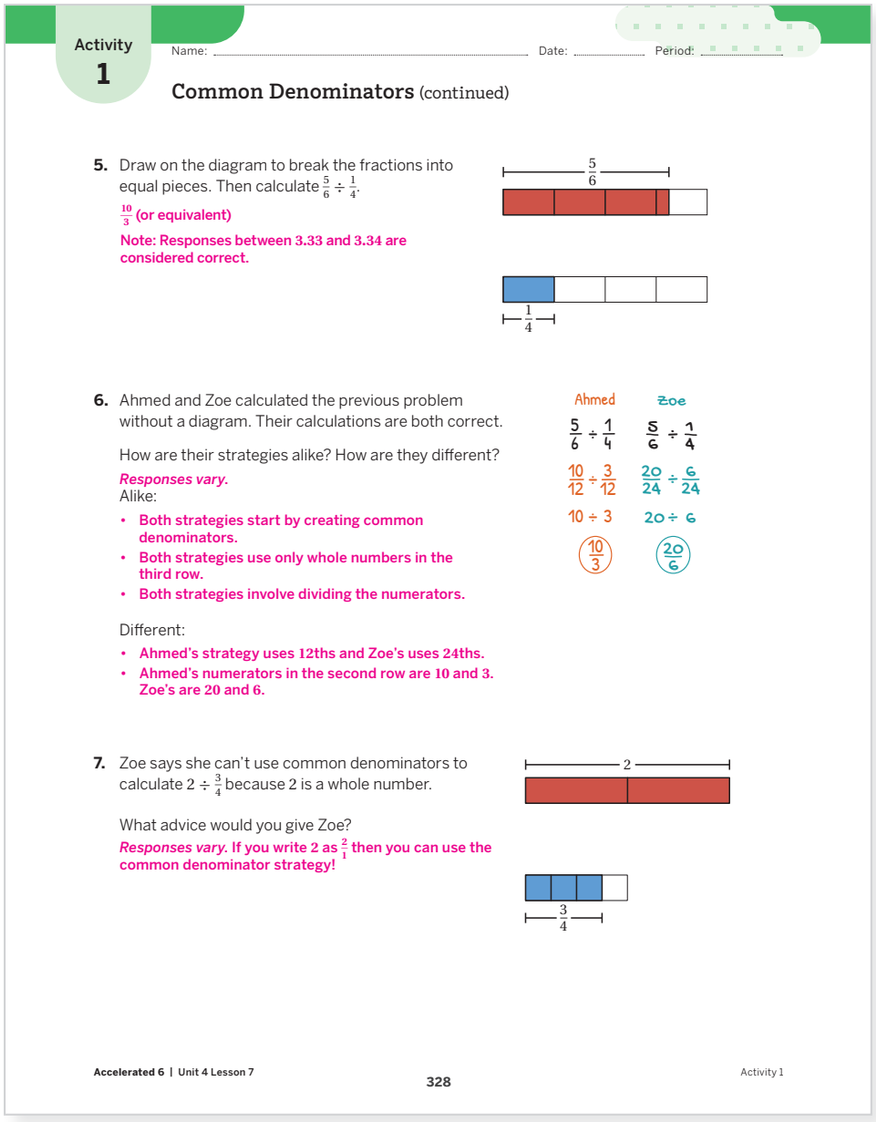
3 Connect

MLR3: Critique, Correct, Clarify Use this routine to help students describe strengths, errors, and ambiguities in Zoe's claim. Then invite students to:

a. Discuss what is *correct* and *incorrect*.

b. Write a question to help Zoe see how their work can be improved, or create a revised response. **(MTR.4.1, MTR.6.1)**

To surface the Key Takeaway, consider asking, "What other expressions involving division of fractions have the same value as $12 \div 3$?"



Activity 1

Name: Date: Period:

Common Denominators (continued)

5. Draw on the diagram to break the fractions into equal pieces. Then calculate $\frac{5}{6} \div \frac{1}{4}$.

$\frac{10}{3}$ (or equivalent)

Note: Responses between 3.33 and 3.34 are considered correct.

6. Ahmed and Zoe calculated the previous problem without a diagram. Their calculations are both correct.

How are their strategies alike? How are they different?

Responses vary.

Alike:

- Both strategies start by creating common denominators.
- Both strategies use only whole numbers in the third row.
- Both strategies involve dividing the numerators.

Different:

- Ahmed's strategy uses 12ths and Zoe's uses 24ths.
- Ahmed's numerators in the second row are 10 and 3. Zoe's are 20 and 6.

7. Zoe says she can't use common denominators to calculate $2 \div \frac{3}{4}$ because 2 is a whole number.

What advice would you give Zoe?

Responses vary. If you write 2 as $\frac{2}{1}$ then you can use the common denominator strategy!

Accelerated 6 | Unit 4 Lesson 7 328 Activity 1

Key Takeaway: Dividing fractions that have common denominators results in the same quotient as dividing just the numerators because the pieces in each situation are the same size.

Pairs | 15 min

Activity 2 Dividing with Common Denominators

Purpose: Students make connections between tape diagrams and arithmetic operations, and then use any strategy to divide fractions.

Short on time? Consider completing a few of the challenges as a class instead of in pairs.

1 Launch

Invite students to predict whether the quotient will be greater or less than 1 before calculating. Consider asking, "How might your prediction help you later?"

Encourage students to use paper to record their thinking.

2 Monitor

Look for students who are guessing and checking and encourage them to either sketch a tape diagram or find common denominators. Consider asking, "What size could I break both fractions into?"

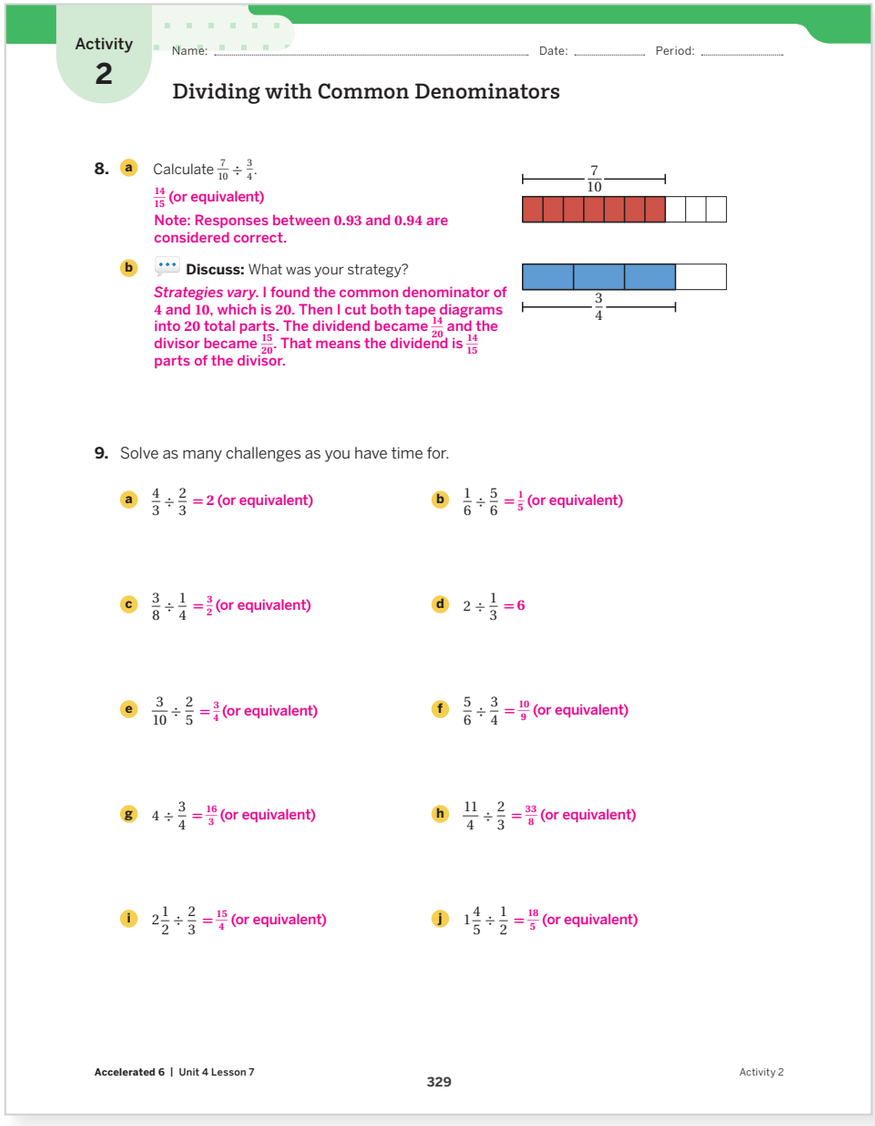
Invite students to solve as many challenges as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly. **(MTR.3.1)**

Encourage students to compare their solutions to problems with a partner.

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.



Activity 2

Name: Date: Period:

Dividing with Common Denominators

8. a. Calculate $\frac{7}{10} \div \frac{3}{4}$.

$\frac{14}{15}$ (or equivalent)

Note: Responses between 0.93 and 0.94 are considered correct.

b. Discuss: What was your strategy?

Strategies vary. I found the common denominator of 4 and 10, which is 20. Then I cut both tape diagrams into 20 total parts. The dividend became $\frac{14}{20}$ and the divisor became $\frac{15}{20}$. That means the dividend is $\frac{14}{15}$ parts of the divisor.

9. Solve as many challenges as you have time for.

a. $\frac{4}{3} \div \frac{2}{3} = 2$ (or equivalent)

b. $\frac{1}{6} \div \frac{5}{6} = \frac{1}{5}$ (or equivalent)

c. $\frac{3}{8} \div \frac{1}{4} = \frac{3}{2}$ (or equivalent)

d. $2 \div \frac{1}{3} = 6$

e. $\frac{3}{10} \div \frac{2}{5} = \frac{3}{4}$ (or equivalent)

f. $\frac{5}{6} \div \frac{3}{4} = \frac{10}{9}$ (or equivalent)

g. $4 \div \frac{3}{4} = \frac{16}{3}$ (or equivalent)

h. $\frac{11}{4} \div \frac{2}{3} = \frac{33}{8}$ (or equivalent)

i. $2\frac{1}{2} \div \frac{2}{3} = \frac{15}{4}$ (or equivalent)

j. $1\frac{4}{5} \div \frac{1}{2} = \frac{18}{5}$ (or equivalent)

Accelerated 6 | Unit 4 Lesson 7 329 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that finding common denominators is a strategy to calculate the quotient of fractions.

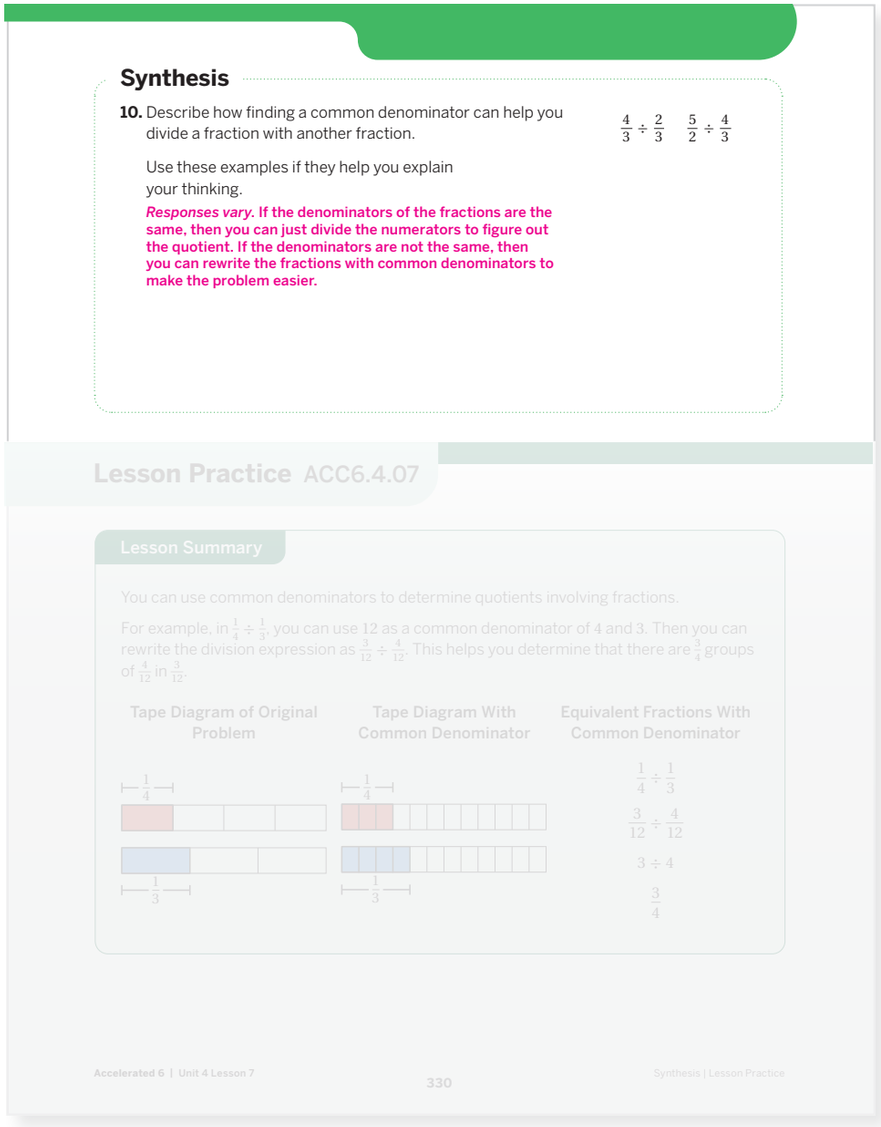
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- If the denominators are the same, like in the first expression, then you can divide the numerators to figure out the quotient.
- If the denominators are not the same, then you can rewrite the fractions with common denominators, then divide the numerators.

MLR **MLR2: Collect and Display** Use this routine to collect students' explanations of how to simplify each expression. Display the information for students to reference and add to for the rest of the unit.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

10. Describe how finding a common denominator can help you divide a fraction with another fraction.

$\frac{4}{3} \div \frac{2}{3}$ $\frac{5}{2} \div \frac{4}{3}$

Use these examples if they help you explain your thinking.

Responses vary. If the denominators of the fractions are the same, then you can just divide the numerators to figure out the quotient. If the denominators are not the same, then you can rewrite the fractions with common denominators to make the problem easier.

Lesson Practice ACC6.4.07

Lesson Summary

You can use common denominators to determine quotients involving fractions.

For example, in $\frac{1}{4} \div \frac{1}{3}$, you can use 12 as a common denominator of 4 and 3. Then you can rewrite the division expression as $\frac{3}{12} \div \frac{4}{12}$. This helps you determine that there are $\frac{3}{4}$ groups of $\frac{4}{12}$ in $\frac{3}{12}$.

Tape Diagram of Original Problem

Tape Diagram With Common Denominator

Equivalent Fractions With Common Denominator

$\frac{1}{4} \div \frac{1}{3}$

$\frac{3}{12} \div \frac{4}{12}$

$3 \div 4$

$\frac{3}{4}$

Accelerated 6 | Unit 4 Lesson 7 330 Synthesis | Lesson Practice

Lesson Takeaway: To divide fractions by fractions, first rewrite the fractions with a common denominator, then divide the numerators.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of calculating the quotient of a fraction division problem by using common denominators.

Today's Goals

1. **Goal:** Divide fractions by rewriting them with common denominators.
2. **Language Goal:** Explain strategies for determining the quotients of fractions using common denominators. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: ..... Date: ..... Period: .....

Show What You Know 4.07

Calculate $\frac{2}{3} \div \frac{5}{4}$. Show or explain your thinking. Draw a diagram if it helps with your thinking.

$\frac{8}{15}$ (or equivalent)

Responses vary. I created two tape diagrams - one for $\frac{2}{3}$ and one for $\frac{5}{4}$. I divided them into parts using the common denominator of 12 and shaded the equivalent parts of the original fractions. So, the $\frac{2}{3}$ was equivalent to $\frac{8}{12}$ and $\frac{5}{4}$ was equivalent to $\frac{15}{12}$. Therefore, the solution is $\frac{8}{15}$.

D Differentiation Use after Lesson 7

Support

Provide targeted intervention for students by using these resources.

If students need support dividing fractions using common denominators:

» **Respond to Student Thinking:**

- Use the *Dividing Fractions Using Common Denominators* Mini-lesson.
- Revisit **Activity 1** as a class and invite students to share strategies.
- Revisit **Unit 2, Lesson 6, Activity 1** (*Common Multiples*).

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.

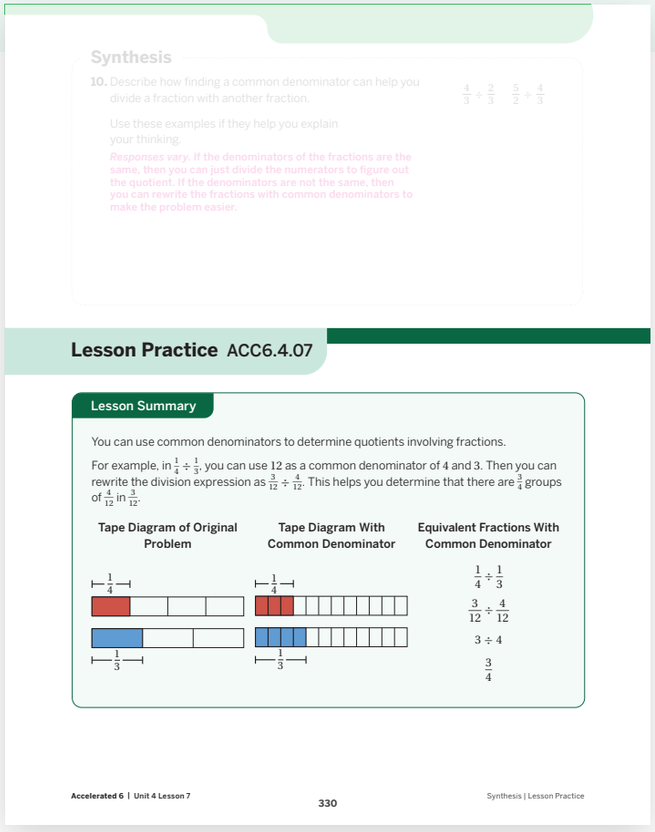
Professional Learning

Look at your students' responses. How might this data inform your upcoming lessons?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

10. Describe how finding a common denominator can help you divide a fraction with another fraction.

$\frac{4}{3} \div \frac{2}{3}$ $\frac{3}{2} \div \frac{4}{3}$

Use these examples if they help you explain your thinking.

Responses vary. If the denominators of the fractions are the same, then you can just divide the numerators to figure out the quotient. If the denominators are not the same, then you can rewrite the fractions with common denominators to make the problem easier.

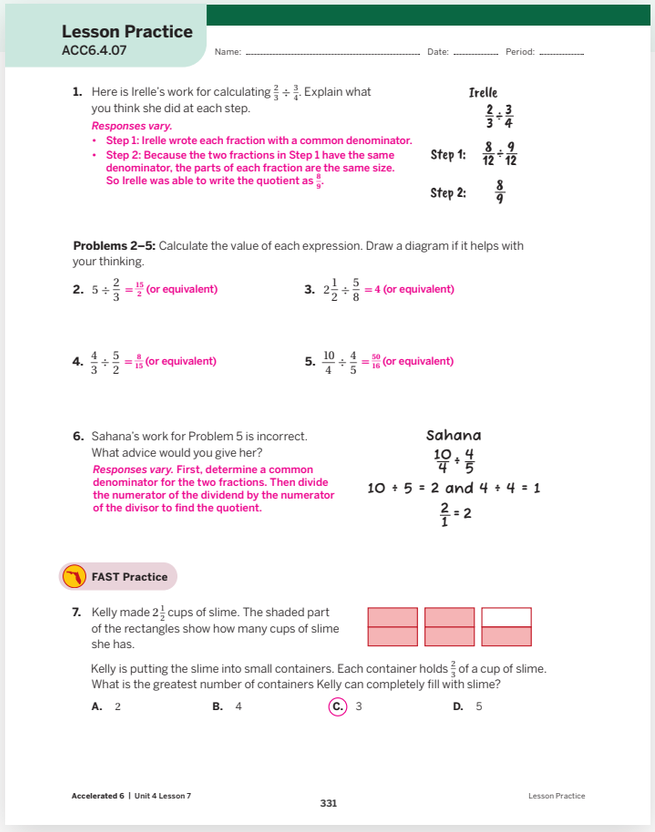
Lesson Practice ACC6.4.07

Lesson Summary

You can use common denominators to determine quotients involving fractions.

For example, in $\frac{1}{4} \div \frac{1}{3}$, you can use 12 as a common denominator of 4 and 3. Then you can rewrite the division expression as $\frac{3}{12} \div \frac{4}{12}$. This helps you determine that there are $\frac{3}{4}$ groups of $\frac{4}{12}$ in $\frac{3}{12}$.

Tape Diagram of Original Problem	Tape Diagram With Common Denominator	Equivalent Fractions With Common Denominator
$\frac{1}{4}$ $\frac{1}{3}$	$\frac{1}{4}$ $\frac{1}{3}$	$\frac{1}{4} \div \frac{1}{3}$
		$\frac{3}{12} \div \frac{4}{12}$
		$3 \div 4$
		$\frac{3}{4}$



Lesson Practice
ACC6.4.07

Name: ..... Date: ..... Period: .....

1. Here is Irelle's work for calculating $\frac{2}{3} \div \frac{3}{4}$. Explain what you think she did at each step.

Responses vary.
- Step 1: Irelle wrote each fraction with a common denominator.
- Step 2: Because the two fractions in Step 1 have the same denominator, the parts of each fraction are the same size. So Irelle was able to write the quotient as $\frac{8}{9}$.

Irelle
$\frac{2}{3} \div \frac{3}{4}$
Step 1: $\frac{8}{12} \div \frac{9}{12}$
Step 2: $\frac{8}{9}$

Problems 2–5: Calculate the value of each expression. Draw a diagram if it helps with your thinking.

2. $5 \div \frac{2}{3} = \frac{15}{2}$ (or equivalent)
3. $2\frac{1}{2} \div \frac{5}{8} = 4$ (or equivalent)
4. $\frac{4}{3} \div \frac{5}{2} = \frac{8}{15}$ (or equivalent)
5. $\frac{10}{4} \div \frac{4}{5} = \frac{50}{16}$ (or equivalent)

6. Sahana's work for Problem 5 is incorrect. What advice would you give her?

Responses vary. First, determine a common denominator for the two fractions. Then divide the numerator of the dividend by the numerator of the divisor to find the quotient.

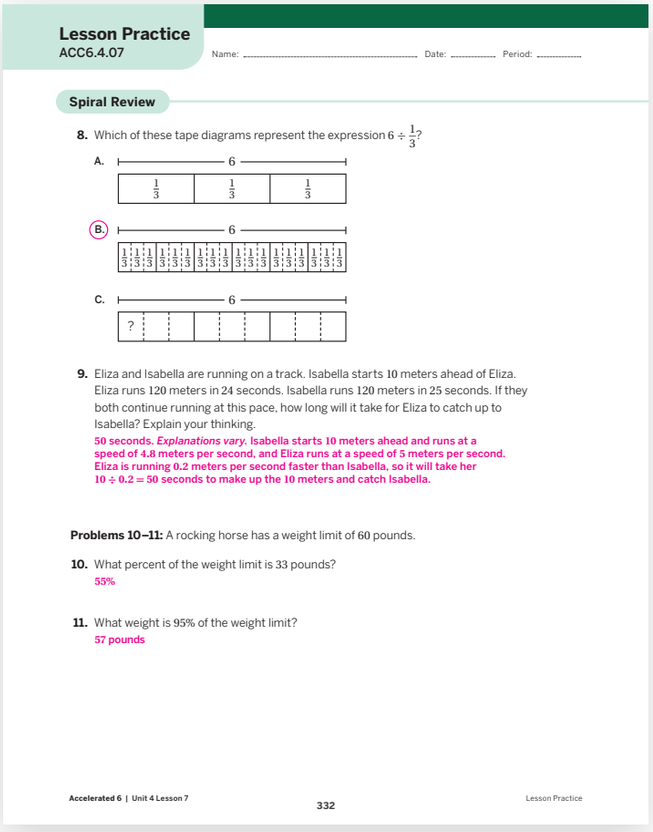
Sahana
$\frac{10}{4} \div \frac{4}{5}$
$10 \div 5 = 2$ and $4 \div 4 = 1$
$\frac{2}{1} = 2$

FAST Practice

7. Kelly made $2\frac{1}{2}$ cups of slime. The shaded part of the rectangles show how many cups of slime she has.

Kelly is putting the slime into small containers. Each container holds $\frac{2}{3}$ of a cup of slime. What is the greatest number of containers Kelly can completely fill with slime?

A. 2 B. 4 C. 3 D. 5



Lesson Practice
ACC6.4.07

Name: ..... Date: ..... Period: .....

Spiral Review

8. Which of these tape diagrams represent the expression $6 \div \frac{1}{3}$?

A. 6 — $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$

B. 6 — $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$

C. 6 — ? | | | |

9. Eliza and Isabella are running on a track. Isabella starts 10 meters ahead of Eliza. Eliza runs 120 meters in 24 seconds. Isabella runs 120 meters in 25 seconds. If they both continue running at this pace, how long will it take for Eliza to catch up to Isabella? Explain your thinking.

50 seconds. *Explanations vary.* Isabella starts 10 meters ahead and runs at a speed of 4.8 meters per second, and Eliza runs at a speed of 5 meters per second. Eliza is running 0.2 meters per second faster than Isabella, so it will take her $10 \div 0.2 = 50$ seconds to make up the 10 meters and catch Isabella.

Problems 10–11: A rocking horse has a weight limit of 60 pounds.

10. What percent of the weight limit is 33 pounds?

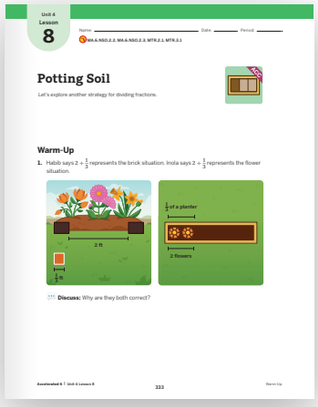
55%

11. What weight is 95% of the weight limit?

57 pounds

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1, 6	2	MA.6.NSO.2.2
	2–5	1	MA.6.NSO.2.2
FAST Practice	7	2	MA.6.NSO.2.3
Spiral Review			
	8	2	MA.6.NSO.2.2
	9	3	MA.6.AR.3.5
	10–11	2	MA.6.AR.3.4



Potting Soil

Dividing by Unit Fractions

Let's explore another strategy for dividing fractions.

Learning Outcomes

Today's Goals

1. **Goal:** Use tape diagrams to represent and solve division problems asking "How many groups?"
2. **Language Goal:** Explain why dividing by $\frac{1}{a}$ results in the same value as multiplying by a. **(Speaking and Listening)**

Students extend their knowledge of dividing a whole number by a unit fraction from a previous course to divide fractions by unit fractions. They explore a strategy for dividing by a unit fraction when asking the question "How many in 1 group?" They use patterns to form the idea that dividing by a unit fraction results in the same value as multiplying by the denominator of the unit fraction, thus deepening their understanding of the relationship between multiplication and division.

Coherence

Prior Learning

In a previous course, students divided whole numbers by unit fractions. In Lesson 4, students used diagrams to answer "How many plants were in 1 planter?"

Future Learning

In Lessons 9–10, students will bridge their learning to an additional strategy for dividing fractions: dividing by the numerator, then multiplying by the denominator of the second fraction.

Connections

- Students apply their understanding of fraction division prepare a garden planter with soil. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.3.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2
MA.5.FR.2.4	MA.7.NSO.2.3
MA.5.AR.1.1	
MA.5.AR.1.2	
MA.5.AR.1.3	

Lesson at a Glance

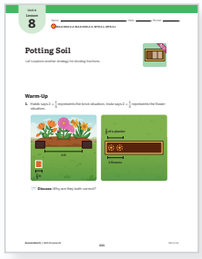
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

Students compare and contrast two different ways to represent the same division expression.



Activity 1

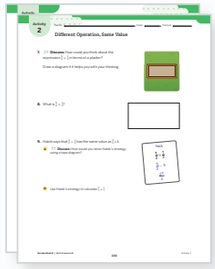
Pairs | 15 min

Students make connections between tape diagrams and expressions used to calculate the amount of soil needed to fill 1 planter.
Routine: Notice and Wonder **(MTR.2.1)**

Activity 2

Pairs | 15 min

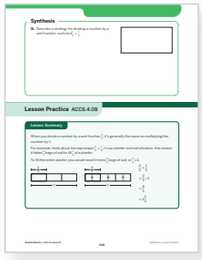
Students generalize a strategy for dividing a fraction by a unit fraction.



Synthesis

Whole Class | 5 min

Students synthesize their understanding that dividing by a unit fraction is the same as multiplying by the denominator of the unit fraction. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by evaluating a division problem with a unit fraction.

Prep Checklist

This lesson includes:

Student Edition
Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students compare and contrast two different ways to represent the same division expression.

1 Launch

To surface prior knowledge, invite students to share anything they remember about either the brick situation or the flower situation from earlier lessons.

Invite students to decide how each image represents $2 \div \frac{1}{3}$ by recording observations, then have them share their thinking with a partner.

A **Accessibility: Memory and Attention** To support students in activating prior knowledge, ask them what they remember about dividing a whole number by a unit fraction from a previous course, offering a sample tape diagram for them to make sense of. Consider displaying students' ideas and thinking for them to reference or revise throughout this lesson. Let them know they will extend this idea to dividing fractions by unit fractions.

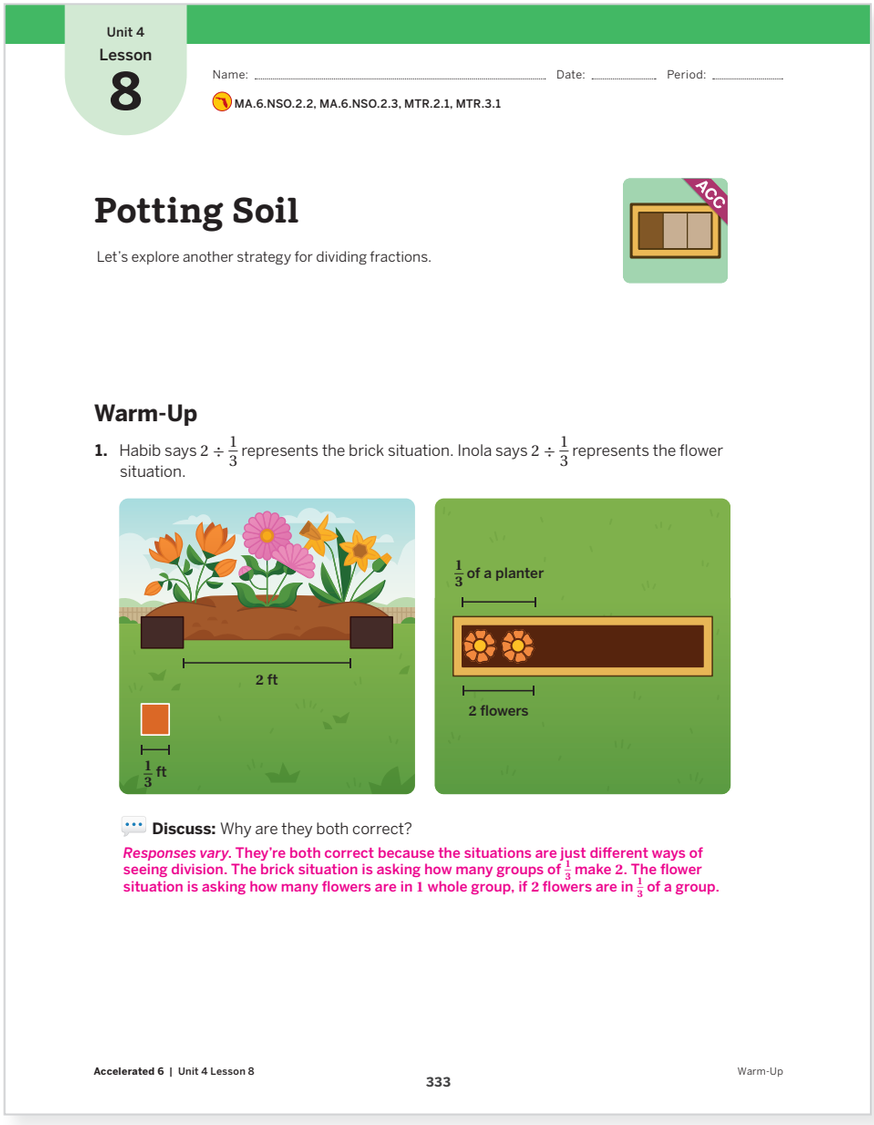
ELL **English Language Learners** Give students time to rehearse their ideas with a partner before they are expected to share their ideas with the larger group. **(Speaking)**

2 Connect

Invite several students to share how they see $2 \div \frac{1}{3}$ in each situation.

Consider asking:

- "Where do you see the 2?"
- "Where do you see the $\frac{1}{3}$?"
- "Which situation would you prefer to use to help you answer $2 \div \frac{1}{3}$? Why?"



Unit 4
Lesson
8

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.2.1, MTR.3.1

Potting Soil

Let's explore another strategy for dividing fractions.

Warm-Up

1. Habib says $2 \div \frac{1}{3}$ represents the brick situation. Inola says $2 \div \frac{1}{3}$ represents the flower situation.

Discuss: Why are they both correct?

Responses vary. They're both correct because the situations are just different ways of seeing division. The brick situation is asking how many groups of $\frac{1}{3}$ make 2. The flower situation is asking how many flowers are in 1 whole group, if 2 flowers are in $\frac{1}{3}$ of a group.

Accelerated 6 | Unit 4 Lesson 8 333 Warm-Up

Pairs | 15 min

Activity 1 Digging into Fraction Division

Purpose: Students make connections between tape diagrams and expressions used to calculate the amount of soil needed to fill 1 planter. **(MTR.2.1)**

1 Launch

To support students getting started, consider asking, "How is this situation similar to the bricks situation? How is it similar to the flowers?"

ELL **English Language Learners** Show a photo of a garden planter that is filled or partially filled with soil to support students' access to the context of this activity. **(Reading)**

Invite pairs of students to record their response and then compare to other responses in the class. Remind them that revising their thinking based on the other responses is an important part of math learning.

2 Monitor

Use the Notice and Wonder routine to promote curiosity and help students make sense of patterns. See the Routine Facilitation Guide for more information. Students will have six different soil situations to use to look for patterns, noticings, and wonderings.

Look for students who notice and wonder about the different parts of the scenario, including how the numbers in the division equation relate to the bags of soil.

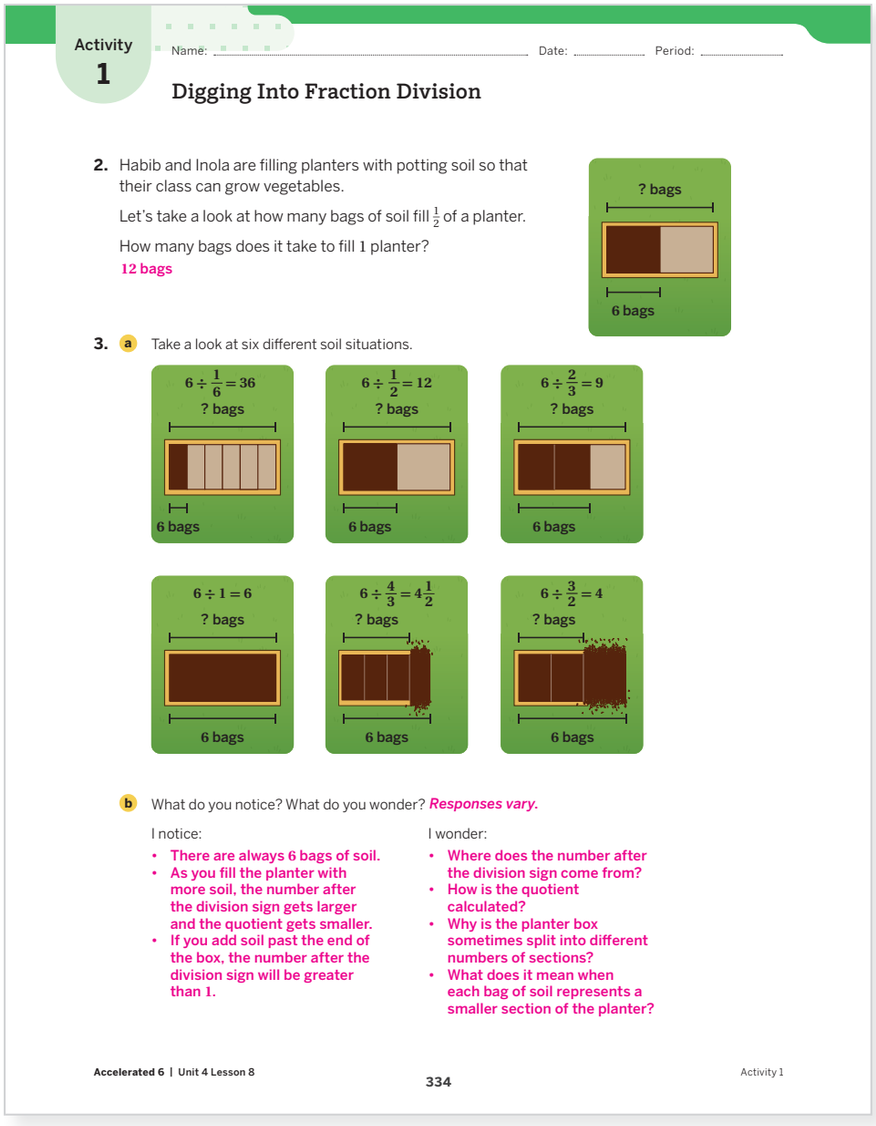
To support students getting started, consider asking:

- "Where do you see 6 in each diagram?"
- "Where do you see the fraction in each diagram?"
- "What happens to the quotient when the fraction increases?"

Pause briefly and highlight a few student responses that reference the connection between the equation and the context. **(MTR.2.1)**

D **Differentiation:** (Stretch) Encourage students to cover the right side of the equation and see if they can predict what the quotient will be.

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Digging Into Fraction Division

2. Habib and Inola are filling planters with potting soil so that their class can grow vegetables.

Let's take a look at how many bags of soil fill $\frac{1}{2}$ of a planter.

How many bags does it take to fill 1 planter?

12 bags

3. a Take a look at six different soil situations.

b What do you notice? What do you wonder? *Responses vary.*

I notice:

- There are always 6 bags of soil.
- As you fill the planter with more soil, the number after the division sign gets larger and the quotient gets smaller.
- If you add soil past the end of the box, the number after the division sign will be greater than 1.

I wonder:

- Where does the number after the division sign come from?
- How is the quotient calculated?
- Why is the planter box sometimes split into different numbers of sections?
- What does it mean when each bag of soil represents a smaller section of the planter?

Accelerated 6 | Unit 4 Lesson 8 334 Activity 1

Pairs | 15 min

Activity 1 Digging into Fraction Division (continued)

Purpose: Students make connections between tape diagrams and expressions used to calculate the amount of soil needed to fill 1 planter. **(MTR.2.1)**

2 Monitor

To support students getting started, consider asking, "If it took 2 bags of soil to fill $\frac{1}{4}$ of this planter, how many bags would it take to fill 1 whole planter?"

Encourage students to complete a sketch to make their thinking visible.

Select and sequence explanations for each part of the division expression to share during the Connect.

D Differentiation

Look for students who:	Respond to Student Thinking
Think that the $\frac{1}{4}$ of the planter that is shaded represents $\frac{1}{4}$ of a bag of soil.	**Support** Consider asking, "If it takes 2 bags of soil to fill $\frac{1}{4}$ of this planter, how many bags would fill 1 whole planter? How is this problem similar to and different from the problem where the number of bags is $\frac{2}{3}$?"
Say $\frac{2}{3}$ means the amount of soil in the planter.	**Strengthen** Consider asking, "$\frac{2}{3}$ of what is in the planter? What is Habib trying to figure out with his equation?"
Explain precisely what each part of the expression means.	**Stretch** Invite students to practice their explanations out loud to share during the Connect before they move on to applying their thinking to Problem 6.

Capture a couple of responses that connect to the expression and invite students to share during the Connect. **(MTR.2.1)**

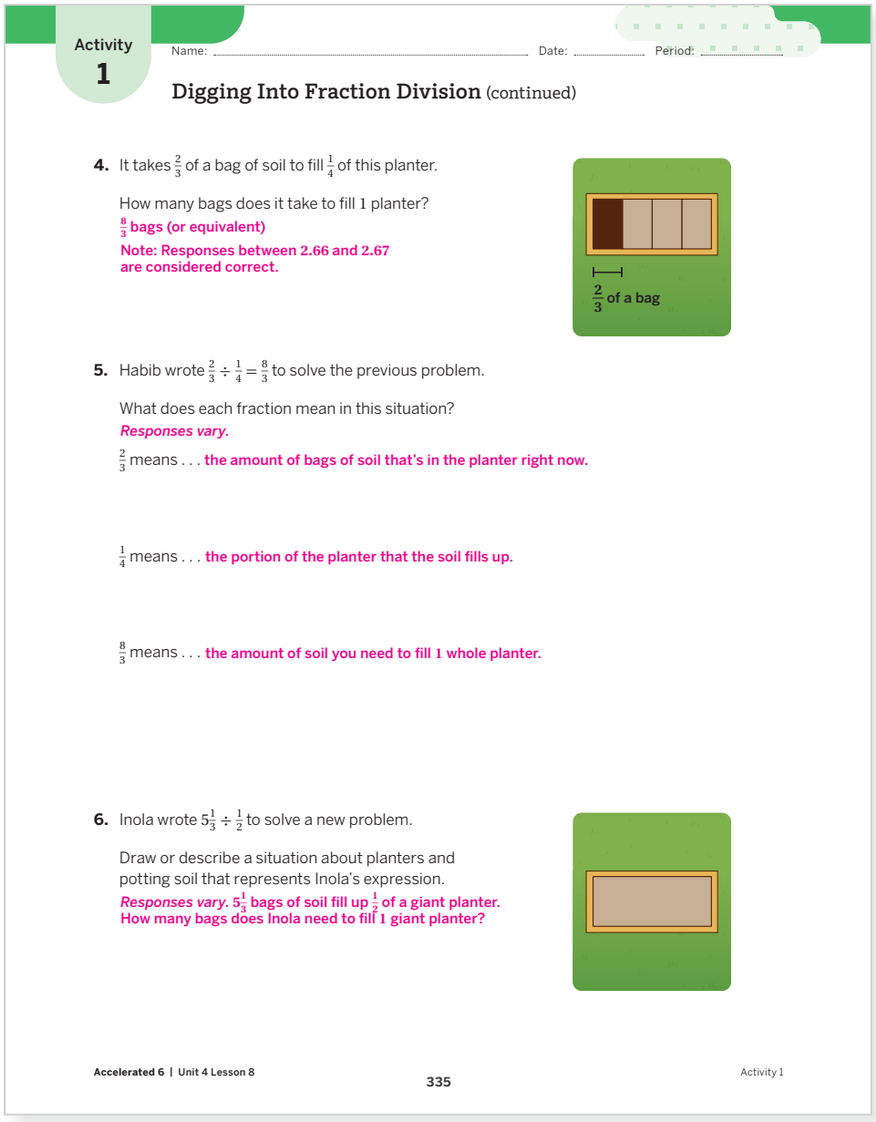
3 Connect

Invite pairs of students to share about Habib's equation.

Consider asking:

- "Where do you see the $\frac{2}{3}$ in the diagram? The $\frac{1}{4}$? The $\frac{8}{3}$?"
- "How would this diagram change if the expression were $\frac{5}{3} \div \frac{1}{4}$? What about $\frac{2}{3} \div \frac{1}{5}$?"

Share the captured situations and invite students to apply their reasoning from Problem 5 to these new situations. Consider returning to the conclusions from Problem 5 to gain consensus for each expression.



Activity 1

Name: _____ Date: _____ Period: _____

Digging Into Fraction Division (continued)

4. It takes $\frac{2}{3}$ of a bag of soil to fill $\frac{1}{4}$ of this planter.

How many bags does it take to fill 1 planter?

$\frac{8}{3}$ bags (or equivalent)

Note: Responses between 2.66 and 2.67 are considered correct.

5. Habib wrote $\frac{2}{3} \div \frac{1}{4} = \frac{8}{3}$ to solve the previous problem.

What does each fraction mean in this situation?

Responses vary.

$\frac{2}{3}$ means . . . the amount of bags of soil that's in the planter right now.

$\frac{1}{4}$ means . . . the portion of the planter that the soil fills up.

$\frac{8}{3}$ means . . . the amount of soil you need to fill 1 whole planter.

6. Inola wrote $5\frac{1}{3} \div \frac{1}{2}$ to solve a new problem.

Draw or describe a situation about planters and potting soil that represents Inola's expression.

Responses vary. $5\frac{1}{3}$ bags of soil fill up $\frac{1}{2}$ of a giant planter. How many bags does Inola need to fill 1 giant planter?

Accelerated 6 | Unit 4 Lesson 8 335 Activity 1

Pairs | 15 min

Activity 2 Different Operation, Same Value

Purpose: Students generalize a strategy for dividing a fraction by a unit fraction.

Short on time? Consider completing the table in Problem 10 as a class for the Connect.

1 Launch

Direct students' attention to the planter and prompt and invite students to make connections between the expression and a new drawing on the planter. **(MTR.2.1)**

To support students getting started, consider focusing on the $\frac{1}{3}$ and asking, "Does this represent the amount of soil you have or the amount of the planter that is filled?"

Look for students who are making their thinking visible and share this as an example of sense-making with the class. **(MTR.2.1)**

2 Monitor

Look for students who use strategies similar to Habib's in the next problem or use other creative strategies. Invite these students to share their thinking during the discussion in the next problem.

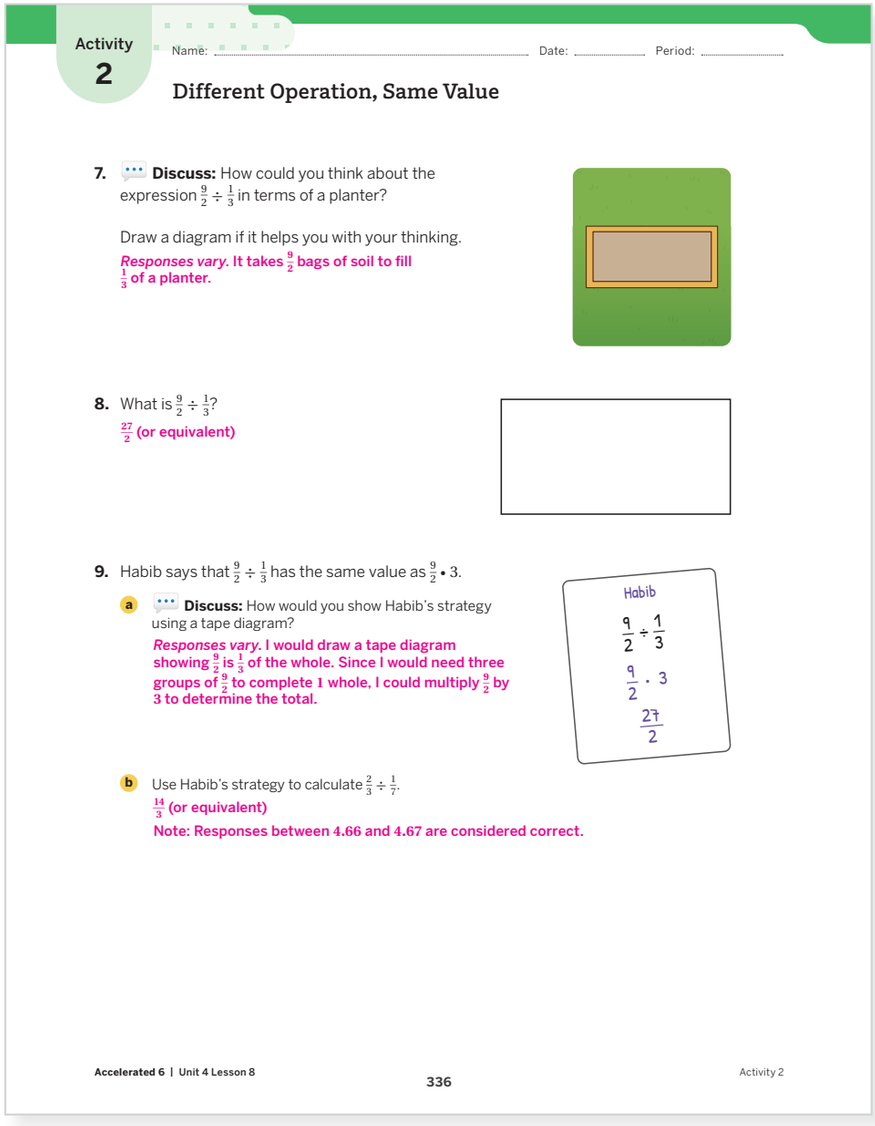
Invite students to share their explanations of Habib's strategy. Highlight that Habib's strategy can be used with division by any unit fraction.

A **Accessibility: Memory and Attention** Consider inviting students to record Habib's strategy on a piece of blank paper to refer to later in the lesson and unit.

Encourage students to invite feedback from one another on their responses and revise based on what is shared.

To support students getting started, consider asking what they know about the relationship between multiplication and division. For example, if $9 \div 13 =$ some number, then some number $\times\ 13 = 9$. Ask them how thinking about this relationship can help them when reasoning about dividing by unit fractions.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Different Operation, Same Value

7. **Discuss:** How could you think about the expression $\frac{9}{2} \div \frac{1}{3}$ in terms of a planter?

Draw a diagram if it helps you with your thinking.

Responses vary. It takes $\frac{9}{2}$ bags of soil to fill $\frac{1}{3}$ of a planter.

8. What is $\frac{9}{2} \div \frac{1}{3}$?

$\frac{27}{2}$ (or equivalent)

9. Habib says that $\frac{9}{2} \div \frac{1}{3}$ has the same value as $\frac{9}{2} \cdot 3$.

a. **Discuss:** How would you show Habib's strategy using a tape diagram?

Responses vary. I would draw a tape diagram showing $\frac{9}{2}$ is $\frac{1}{3}$ of the whole. Since I would need three groups of $\frac{9}{2}$ to complete 1 whole, I could multiply $\frac{9}{2}$ by 3 to determine the total.

Habib

$\frac{9}{2} \div \frac{1}{3}$

$\frac{9}{2} \cdot 3$

$\frac{27}{2}$

b. Use Habib's strategy to calculate $\frac{2}{3} \div \frac{1}{7}$.

$\frac{14}{3}$ (or equivalent)

Note: Responses between 4.66 and 4.67 are considered correct.

Accelerated 6 | Unit 4 Lesson 8 336 Activity 2

Pairs | 15 min

Activity 2 Different Operation, Same Value (continued)

Purpose: Students generalize a strategy for dividing a fraction by a unit fraction.

Short on time? Consider completing the table in Problem 10 as a class for the Connect.

2 Monitor

Look for a variety of equivalent responses and invite students to share if they agree with one another.

ELL **English Language Learners** Provide sentence frames to help students explain their strategy (e.g., First, _____. Then, _____.). **(Speaking)**

Look for students who are completing the table accurately and follow up with students who need additional support.

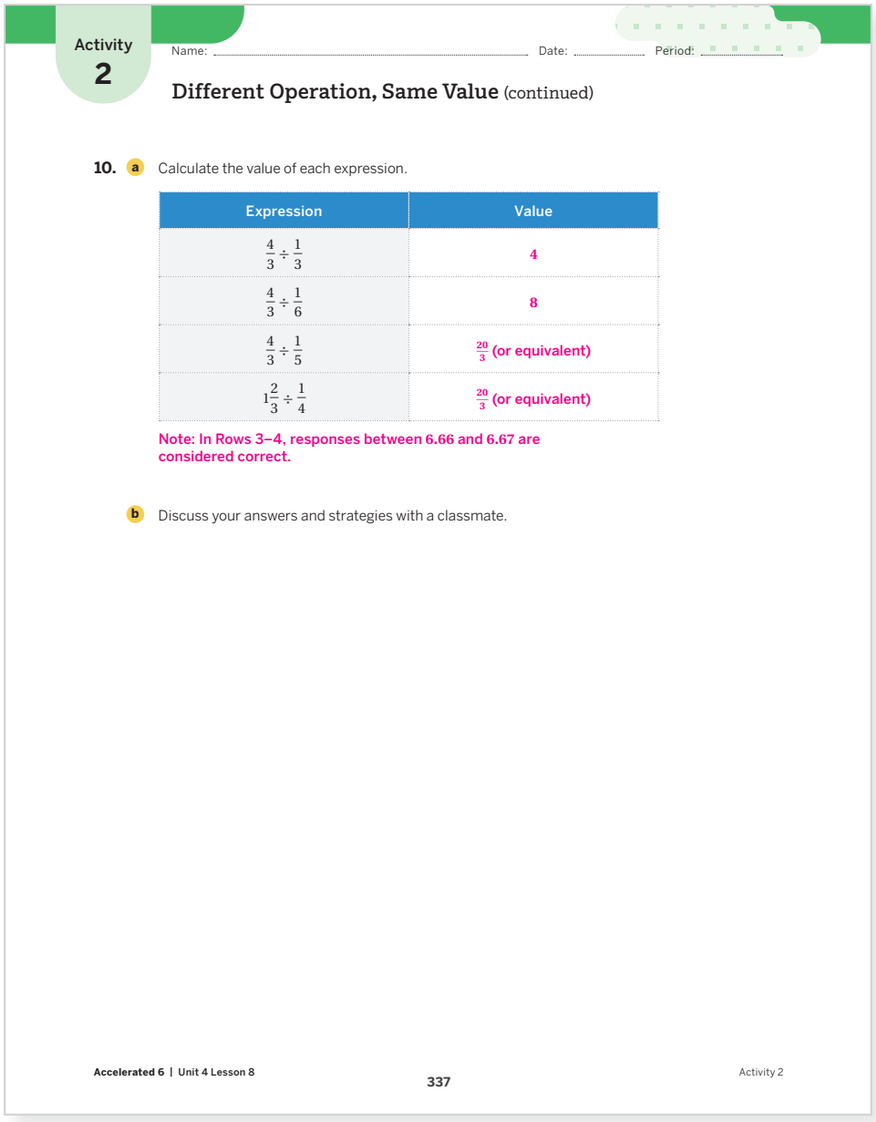
D **Differentiation: (Stretch)** Encourage students to write a different fraction division problem whose quotient is also $\frac{20}{3}$.

3 Connect

To surface the Key Takeaway, consider asking:

- "What makes sense to you about Habib's strategy? What is confusing?"
- "How can we write problems involving a fraction divided by a unit fraction as a multiplication problem? Why is this helpful?" **(MTR.3.1)**

Create an anchor chart of strategies for dividing a fraction by a unit fraction. If time allows, consider displaying the table from Problem 10 and invite students to explain how Habib's strategy connects to each of these problems.



Activity 2

Name: _____ Date: _____ Period: _____

Different Operation, Same Value (continued)

10. a Calculate the value of each expression.

Expression	Value
$\frac{4}{3} \div \frac{1}{3}$	4
$\frac{4}{3} \div \frac{1}{6}$	8
$\frac{4}{3} \div \frac{1}{5}$	$\frac{20}{3}$ (or equivalent)
$1\frac{2}{3} \div \frac{1}{4}$	$\frac{20}{3}$ (or equivalent)

Note: In Rows 3–4, responses between 6.66 and 6.67 are considered correct.

b Discuss your answers and strategies with a classmate.

Accelerated 6 | Unit 4 Lesson 8 337 Activity 2

Key Takeaway: Dividing a number by a unit fraction, $\frac{1}{a}$, is the same as multiplying it by a because there are a groups of that number that make up a whole.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that dividing by a unit fraction is the same as multiplying by the denominator of the unit fraction.

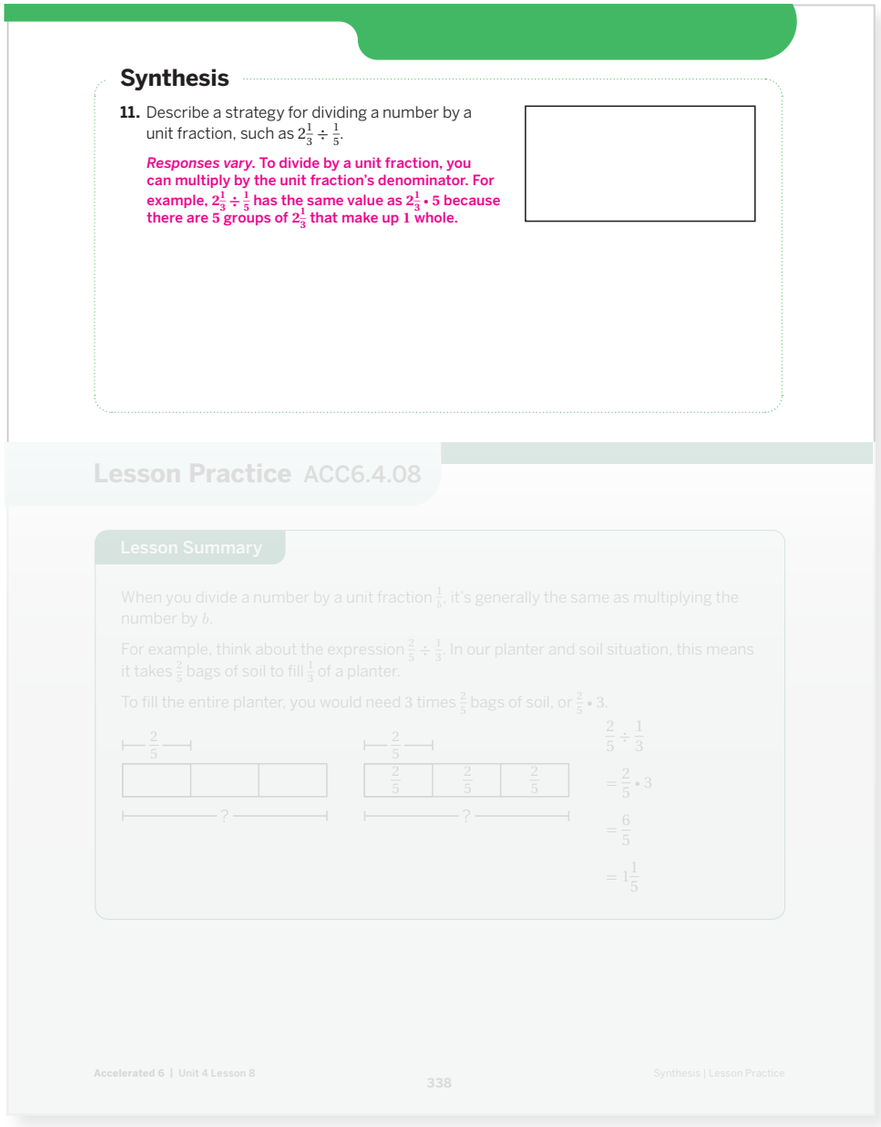
Invite students to respond independently before discussing each question with their partner.

Capture and share a variety of ideas, such as:

- I divided the rectangle into 5 pieces and labeled the first piece with $2\frac{1}{3}$.
- To divide by $\frac{1}{5}$, I can multiply by 5.
- I, first, rewrote $2\frac{1}{3}$ as $\frac{7}{3}$, then multiplied by 5.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategy for dividing by a unit fraction using students' language. Display any new language and examples, including connections to tape diagrams, for students to reference later.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

11. Describe a strategy for dividing a number by a unit fraction, such as $2\frac{1}{3} \div \frac{1}{5}$.

Responses vary. To divide by a unit fraction, you can multiply by the unit fraction's denominator. For example, $2\frac{1}{3} \div \frac{1}{5}$ has the same value as $2\frac{1}{3} \cdot 5$ because there are 5 groups of $2\frac{1}{3}$ that make up 1 whole.

Lesson Practice ACC6.4.08

Lesson Summary

When you divide a number by a unit fraction $\frac{1}{b}$, it's generally the same as multiplying the number by b.

For example, think about the expression $\frac{2}{5} \div \frac{1}{3}$. In our planter and soil situation, this means it takes $\frac{2}{5}$ bags of soil to fill $\frac{1}{3}$ of a planter.

To fill the entire planter, you would need 3 times $\frac{2}{5}$ bags of soil, or $\frac{2}{5} \cdot 3$.

$$\frac{2}{5} \div \frac{1}{3}$$
$$= \frac{2}{5} \cdot 3$$
$$= \frac{6}{5}$$
$$= 1\frac{1}{5}$$

Accelerated 6 | Unit 4 Lesson 8 338 Synthesis | Lesson Practice

Lesson Takeaway: When you divide a number by a unit fraction $\frac{1}{a}$, it is the same as multiplying the number by a. This can be seen on a tape diagram by dividing the tape diagram into a pieces and labeling one piece with the number.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by evaluating a division problem with a unit fraction.

Today's Goals

1. **Goal:** Use tape diagrams to represent and solve division problems asking, "How many groups?"
2. **Language Goal:** Explain why dividing by $\frac{1}{a}$ results in the same value as multiplying by a. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: ..... Date: ..... Period: .....

Show What You Know 4.08

Calculate $\frac{12}{5} \div \frac{1}{4}$. Show or explain your thinking.

$\frac{48}{5}$. Responses vary. I thought of this problem as $\frac{12}{5} \times 4$. Then, I created a tape diagram with 4 sections. I wrote $\frac{12}{5}$ in each of the sections and then added $\frac{12}{5}$ four times and got $\frac{(12+12+12+12)}{5}$, which is $\frac{48}{5}$.

Differentiation Use after Lesson 8

Support

Provide targeted intervention for students by using these resources.

If students need support dividing fractions by unit fractions:

» **Respond to Student Thinking:**

- Revisit **Activity 1** as a class and invite students to discuss with a partner before Lesson 9.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to create their own word problems like those in **Activity 2**. Encourage them to swap and solve each others' problems.

Professional Learning

What strengths did your students exhibit today? How can you build from those strengths as students continue learning about dividing by fractions?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. Describe a strategy for dividing a number by a unit fraction, such as $2\frac{1}{3} \div \frac{1}{5}$.

Responses vary. To divide by a unit fraction, you can multiply by the unit fraction's denominator. For example, $2\frac{1}{3} \div \frac{1}{5}$ has the same value as $2\frac{1}{3} \cdot 5$ because there are 5 groups of $2\frac{1}{3}$ that make up 1 whole.

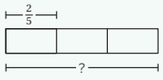
Lesson Practice ACC6.4.08

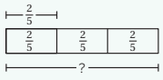
Lesson Summary

When you divide a number by a unit fraction $\frac{1}{b}$, it's generally the same as multiplying the number by b.

For example, think about the expression $\frac{2}{5} \div \frac{1}{3}$. In our planter and soil situation, this means it takes $\frac{2}{5}$ bags of soil to fill $\frac{1}{3}$ of a planter.

To fill the entire planter, you would need 3 times $\frac{2}{5}$ bags of soil, or $\frac{2}{5} \cdot 3$.





$$\frac{2}{5} \div \frac{1}{3}$$
$$= \frac{2}{5} \cdot 3$$
$$= \frac{6}{5}$$
$$= 1\frac{1}{5}$$

Lesson Practice
ACC6.4.08

Name: Date: Period:

1. Calculate $\frac{6}{5} \div \frac{1}{3}$. Use the tape diagram if it helps with your thinking.

$\frac{18}{5}$ (or equivalent)

Problems 2–3: Determine whether each statement is *always*, *sometimes*, or *never* true. Circle your answer and explain your thinking.

2. Dividing the same numbers in a different order keeps the value the same, like $2 \div 3 = 3 \div 2$.

Always (Sometimes) Never

Explanations vary. If the numbers are the same, then switching the order does not matter. For example, $2 \div 2 = 2 \div 2$. If the numbers are different, then switching the order changes the quotient from greater than 1 to less than 1 or the other way around. For example, $3 \div 2 > 1$ and $2 \div 3 < 1$.

3. Dividing a number by $\frac{1}{3}$ produces the same value as multiplying the number by 3.

(Always) Sometimes Never

Explanations vary. One way to think about dividing a number by $\frac{1}{3}$ is that $\frac{1}{3}$ of a container is full, and I need to figure out how much fills the whole container. To do that, I would need to multiply that number by 3.

4. $\frac{2}{5}$ of the student population walked to school on a given Friday. If 150 students walked to school that day, how many total students go to the school?

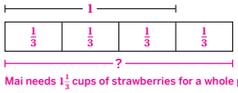
375

Lesson Practice
ACC6.4.08

Name: Date: Period:

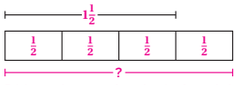
Problems 5–6: Complete the tape diagram to represent and solve each problem.

5. Mai picked 1 cup of strawberries, which is enough for $\frac{3}{4}$ of a pan of strawberry oatmeal bars. How many cups does she need for a whole pan?



Mai needs $1\frac{1}{3}$ cups of strawberries for a whole pan.

6. Prisha picked $1\frac{1}{2}$ cups of raspberries, which is enough for $\frac{3}{4}$ of a loaf of raspberry bread. How many cups does she need for a whole loaf?



Prisha needs 2 cups of raspberries for a whole loaf.

FAST Practice

7. $\frac{2}{3}$ cups of apple chips fill $\frac{1}{4}$ of a jar. Write and evaluate an expression to determine how many cups fill 1 jar.

Expression: $\frac{2}{3} \div \frac{1}{4}$

Number of cups that fill 1 jar: $\frac{8}{3}$ (or equivalent)

Spiral Review

Problems 8–10: Determine each quotient.

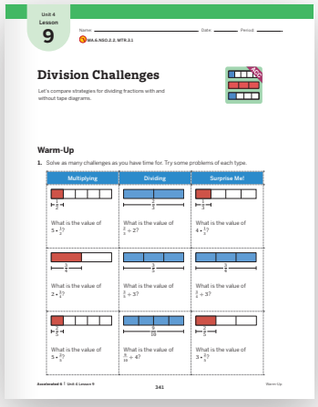
8. $6 \div \frac{1}{3} = 18$

9. $4 \div \frac{1}{9} = 36$

10. $\frac{1}{10} \div 8 = \frac{1}{80}$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1	1	MA.6.NSO.2.2
	2–3	2	MA.6.NSO.2.2
	4–6	2	MA.6.NSO.2.3
FAST Practice	**7**	2	MA.6.NSO.2.3
Spiral Review			
	8–10	1	MA.5.FR.2.4


Unit 4
Lesson
9

Division Challenges

Let's compare strategies for dividing fractions with and without tape diagrams.

Warm-Up

1. Solve as many challenges as you have time for. Try some problems of each type.

Multiplying	Dividing	Surprise Me!
What is the value of $3 \div \frac{1}{5}$?	What is the value of $\frac{1}{4} \div 2$?	What is the value of $4 \div \frac{1}{3}$?
What is the value of $2 \div \frac{1}{3}$?	What is the value of $\frac{1}{3} \div 3$?	What is the value of $\frac{1}{4} \div 3$?
What is the value of $5 \div \frac{1}{2}$?	What is the value of $\frac{5}{12} \div 4$?	What is the value of $3 \div \frac{1}{2}$?

341

Division Challenges

Two Strategies for Dividing Fractions

Let's compare strategies for dividing fractions with and without tape diagrams.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate the quotient of two fractions using multiple methods.
2. **Language Goal:** Compare and contrast strategies for determining the quotients of fractions using mathematically precise language. **(Writing, Speaking, and Listening)**

Students compare and contrast two powerful strategies, then use either strategy to approach a series of division problems. The first strategy involves creating common denominators, while the second strategy builds on the work from Lesson 8 (dividing the dividend by the numerator of the divisor and then multiplying by the denominator).

Coherence

Prior Learning

In Lessons 4–8, students developed a variety of strategies using diagrams to reason about and determine the quotient of two fractions.

Future Learning

In Lesson 10, students will connect the relationships among multiplication and division, fractions as division, and interpretations of division to develop the general algorithm for dividing fractions.

Connections

- Students demonstrate their level of fluency with fractions through a series of fraction challenges. (mathematical, fluency)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

Mathematical Thinking and Reasoning Standard: MTR.3.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2 **MA.5.FR.2.4**	**MA.7.NSO.2.2**

Lesson at a Glance

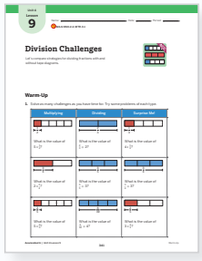
~ 45 min

MA.6.NSO.2.2

Warm-Up

Pairs | 5 min

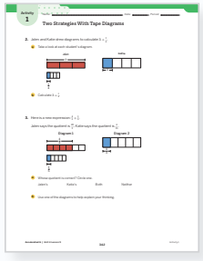
Students practice multiplying and dividing fractions by whole numbers.



Activity 1

Pairs | 7 min

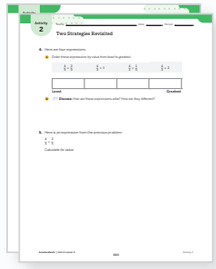
Students use the **Decide and Defend** routine to compare and contrast two methods for dividing a fraction by a unit fraction using tape diagrams.



Activity 2

Pairs | 13 min

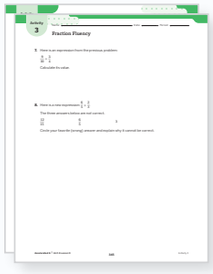
Students compare and contrast two methods for dividing any fractions, including dividing the dividend by the numerator of the divisor, then multiplying by the denominator. **MLR7: Compare and Connect**



Activity 3

Pairs | 10 min

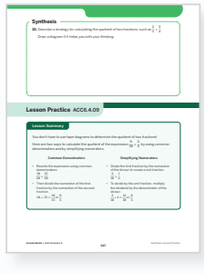
Students apply any strategy to build fluency in dividing fractions by fractions. **Routine: Think-Pair-Share** **(MTR.3.1)**



Synthesis

Whole Class | 5 min

Students synthesize multiple strategies for dividing with fractions without a diagram. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the quotient of two fractions without a diagram.

Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Coloring tools

Pairs | 5 min

Warm-Up

Purpose: Students practice multiplying and dividing fractions by whole numbers.

Short on time? Consider having students choose three to five problems from the Repeated Challenges.

1 Launch

To support students getting started, consider doing at least one problem together as a class before students begin on their own.

Encourage students to try at least a few of each problem type. Invite them to set a goal for how many problems they will solve during the Warm-Up.

A **Accessibility: Visual-Spatial Processing** To support students as they interpret visual representations, invite them to consider why each diagram is divided into a given number of equal-sized sections, yet the label on the shaded number of sections does not represent the fraction of the diagram that is shaded.

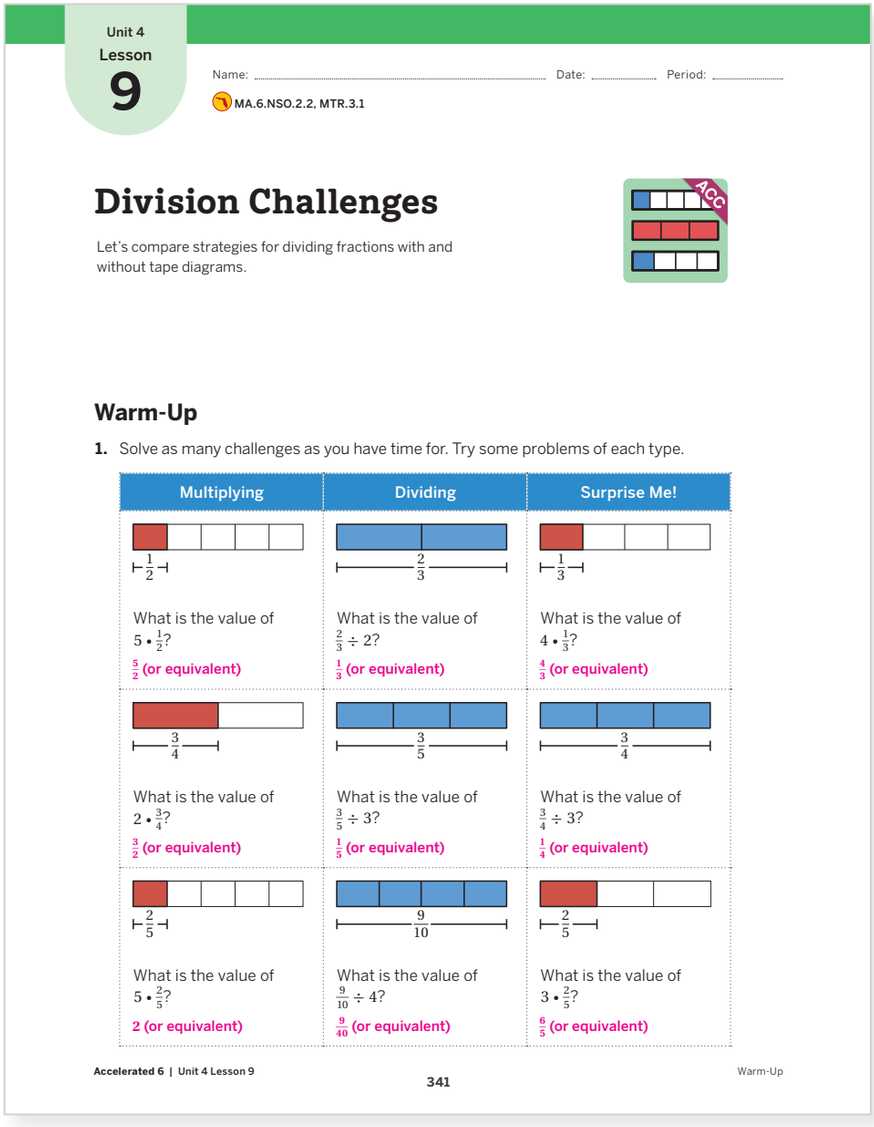
ELL **English Language Learners** Invite students to use language from the class display — if you have started one — to support developing mathematical language in this unit. For example, encourage them to use words and phrases such as *product*, *quotient*, *numerator*, *denominator*, *equal groups*, and *unit fraction*. **(Reading, Speaking, and Listening)**

Connect

Invite students to share strategies they found helpful for multiplying and dividing.

Consider asking:

- "What strategy did you use to multiply? To divide?"
- "How are the multiplication diagrams similar to or different from the division diagrams?"



Unit 4
Lesson 9

Name: Date: Period:

MA.6.NSO.2.2, MTR.3.1

Division Challenges

Let's compare strategies for dividing fractions with and without tape diagrams.

Warm-Up

1. Solve as many challenges as you have time for. Try some problems of each type.

Multiplying	Dividing	Surprise Me!
$\frac{1}{2}$ What is the value of $5 \cdot \frac{1}{2}$? $\frac{5}{2}$ (or equivalent)	$\frac{2}{3}$ What is the value of $\frac{2}{3} \div 2$? $\frac{1}{3}$ (or equivalent)	$\frac{1}{3}$ What is the value of $4 \cdot \frac{1}{3}$? $\frac{4}{3}$ (or equivalent)
$\frac{3}{4}$ What is the value of $2 \cdot \frac{3}{4}$? $\frac{3}{2}$ (or equivalent)	$\frac{3}{5}$ What is the value of $\frac{3}{5} \div 3$? $\frac{1}{5}$ (or equivalent)	$\frac{3}{4}$ What is the value of $\frac{3}{4} \div 3$? $\frac{1}{4}$ (or equivalent)
$\frac{2}{5}$ What is the value of $5 \cdot \frac{2}{5}$? 2 (or equivalent)	$\frac{9}{10}$ What is the value of $\frac{9}{10} \div 4$? $\frac{9}{40}$ (or equivalent)	$\frac{2}{5}$ What is the value of $3 \cdot \frac{2}{5}$? $\frac{6}{5}$ (or equivalent)

Accelerated 6 | Unit 4 Lesson 9 341 Warm-Up

Pairs | 7 min

Activity 1 Two Strategies With Tape Diagrams

Purpose: Students use the Decide and Defend routine to compare and contrast two methods for dividing a fraction by a unit fraction using tape diagrams.

1 Launch

Direct students' attention to the two diagrams. Poll the class to determine which diagram students prefer to represent the quotient of $3 \div \frac{1}{4}$.

Consider asking, "Where do you see the 3, $\frac{1}{4}$, and the division in each diagram?"

ELL **English Language Learners** Provide sentence frames to support students as they respond to the question. For example, "I see the 3 and $\frac{1}{4}$ in Jalen/Katie's diagram in the _____." **(Speaking)**

2 Monitor

Select and sequence a variety of responses to share during the Connect.

D Differentiation

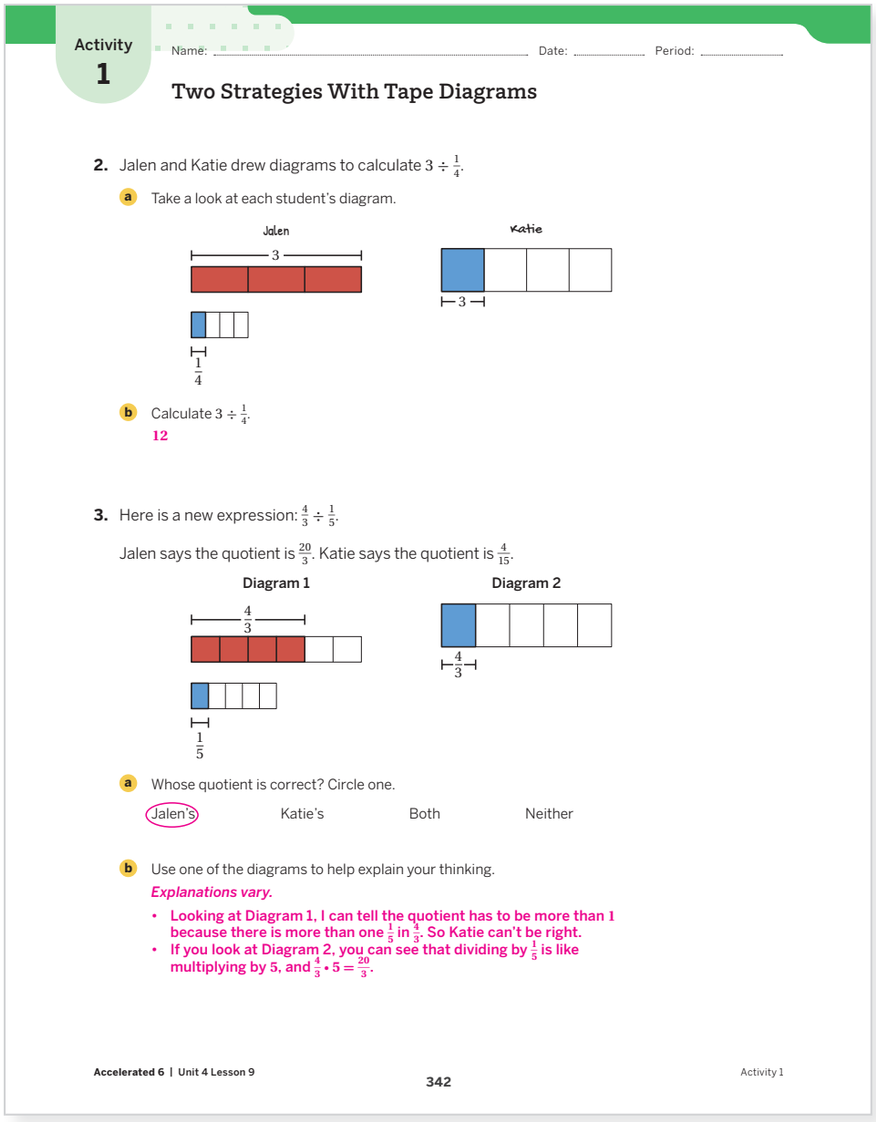
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How does the length of each section in the diagrams connect to the expression?"
Recognize how both diagrams can represent the quotient in each problem.	**Strengthen** Celebrate their noticing. Invite them to decide whose quotient is correct. Consider asking, "What error might Katie have made in her calculation?"
Select "Jalen" and justify their thinking using each diagram.	**Stretch** Prepare students to share during the Connect, then encourage them to write a problem for which the quotient is $\frac{4}{15}$.

3 Connect

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others. See the Routine Facilitation Guide for more information.

To surface the Key Takeaway, consider asking:

- "How can we use Diagram 1 to see that the quotient is $\frac{20}{3}$?"
- "How can we use Diagram 2 to see that the quotient is $\frac{20}{3}$?"
- "Which diagram do you prefer? Why?"



Activity 1

Name: _____ Date: _____ Period: _____

Two Strategies With Tape Diagrams

2. Jalen and Katie drew diagrams to calculate $3 \div \frac{1}{4}$.

a. Take a look at each student's diagram.

Jalen

Katie

b. Calculate $3 \div \frac{1}{4}$.

12

3. Here is a new expression: $\frac{4}{3} \div \frac{1}{5}$.

Jalen says the quotient is $\frac{20}{3}$. Katie says the quotient is $\frac{4}{15}$.

Diagram 1

Diagram 2

a. Whose quotient is correct? Circle one.

(Jalen's) Katie's Both Neither

b. Use one of the diagrams to help explain your thinking.

Explanations vary.

- Looking at Diagram 1, I can tell the quotient has to be more than 1 because there is more than one $\frac{1}{5}$ in $\frac{4}{3}$. So Katie can't be right.
- If you look at Diagram 2, you can see that dividing by $\frac{1}{5}$ is like multiplying by 5, and $\frac{4}{3} \cdot 5 = \frac{20}{3}$.

Accelerated 6 | Unit 4 Lesson 9 342 Activity 1

Key Takeaway: Tape diagrams can be used in two different ways to represent a division problem with a unit fraction as the divisor. The first is drawing each fraction on a tape diagram and asking "How many of the divisor fit into the dividend?" The second strategy is to draw the diagram with the amount of pieces in the denominator of the unit fraction and label one of the pieces with the dividend.

Pairs | 13 min

Activity 2 Two Strategies Revisited

Purpose: Students compare and contrast two methods for dividing any fractions, including dividing the dividend by the numerator of the divisor, then multiplying by the denominator.

1 Launch

Direct students' attention to the expressions and invite them to consider what is alike and different before ordering them.

Invite students to compare their work with the work of another pair of students, justify their ordering, and make revisions based on their conversation.

2 Monitor

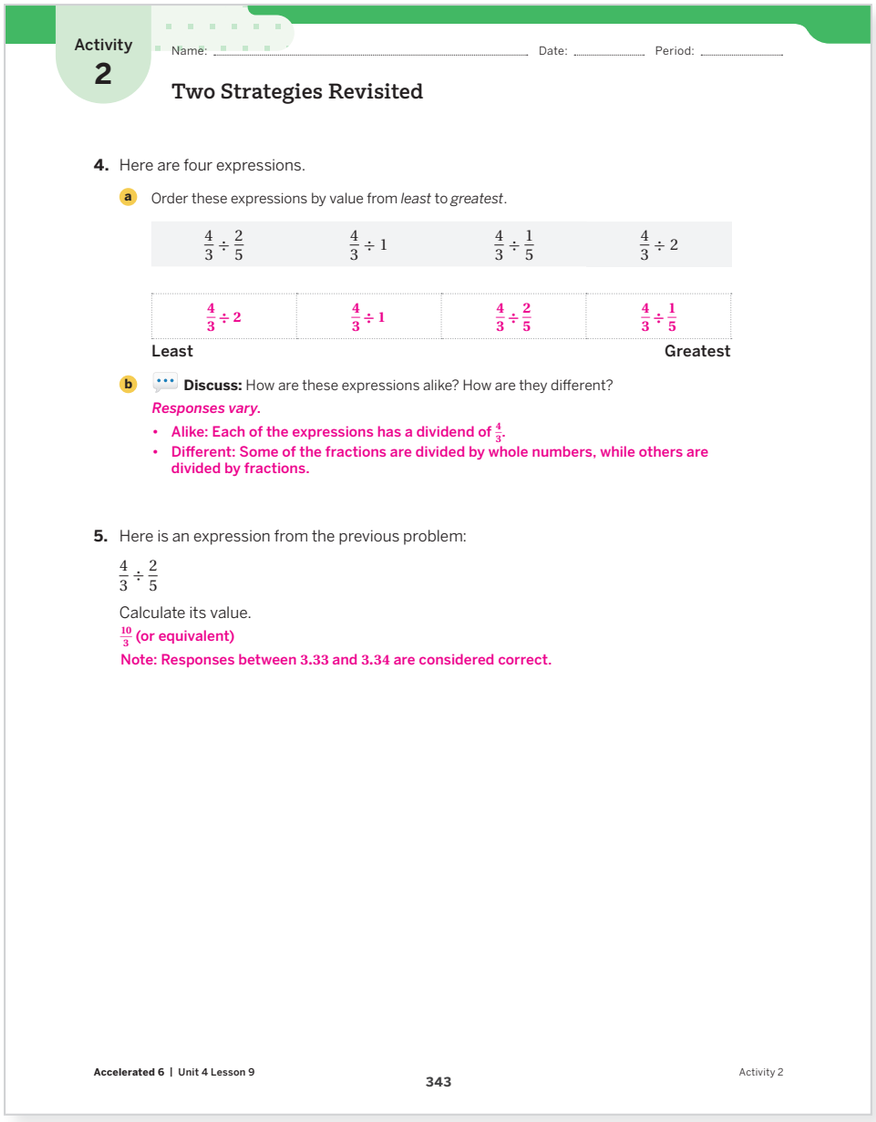
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Which has a greater value: $\frac{4}{3} \div \frac{1}{5}$ or $\frac{4}{3} \div \frac{2}{5}$? How did you decide?"
Share a minimal explanation like "They all have a 4."	**Strengthen** Encourage students to look for more things that the expressions have in common that could support them in predicting the order.
Order the expressions accurately and then describe similarities and differences between the expressions that support their thinking.	**Stretch** Encourage students to create a new similar expression and decide where it goes in the ordering, and then trade their expression with a classmate's.

To support students gettings started, consider asking, "How would a picture for $\frac{4}{3} \div \frac{2}{5}$ be similar? How would it be different?"

Look for students who use strategies similar to Jalen's and Katie's in the next problem or who use other creative strategies. Invite these students to share their thinking during the Connect.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Two Strategies Revisited

4. Here are four expressions.

a. Order these expressions by value from *least* to *greatest*.

$\frac{4}{3} \div \frac{2}{5}$ $\quad \frac{4}{3} \div 1$ $\quad \frac{4}{3} \div \frac{1}{5}$ $\quad \frac{4}{3} \div 2$

$\frac{4}{3} \div 2$	$\frac{4}{3} \div 1$	$\frac{4}{3} \div \frac{2}{5}$	$\frac{4}{3} \div \frac{1}{5}$

Least Greatest

b. **Discuss:** How are these expressions alike? How are they different?

Responses vary.

- Alike: Each of the expressions has a dividend of $\frac{4}{3}$.
- Different: Some of the fractions are divided by whole numbers, while others are divided by fractions.

5. Here is an expression from the previous problem:

$\frac{4}{3} \div \frac{2}{5}$

Calculate its value.

$\frac{10}{3}$ (or equivalent)

Note: Responses between 3.33 and 3.34 are considered correct.

Accelerated 6 | Unit 4 Lesson 9 343 Activity 2

Pairs | 13 min

Activity 2 Two Strategies Revisited (continued)

Purpose: Students compare and contrast two methods for dividing any fractions, including dividing the dividend by the numerator of the divisor, then multiplying by the denominator.

2 Monitor

A **Accessibility: Conceptual Processing** As students make sense of Jalen's and Katie's work, invite them to annotate each step with what each student might be thinking.

Look for a variety of student thinking to contribute to the discussion in the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What was Jalen's first step? What was Katie's first step?"
Select "Jalen's" and explain that their first step would be to find a common denominator by multiplying 10 and 4.	**Strengthen** Consider asking, "Is there another common denominator that would work?"
Select "Katie's" and explain that their first step would be to take half of the divisor.	**Strengthen** Acknowledge that Katie divided by 2 in the first expression to make the divisor a unit fraction. Consider asking, "What would we need to divide by to make the divisor a unit fraction?"

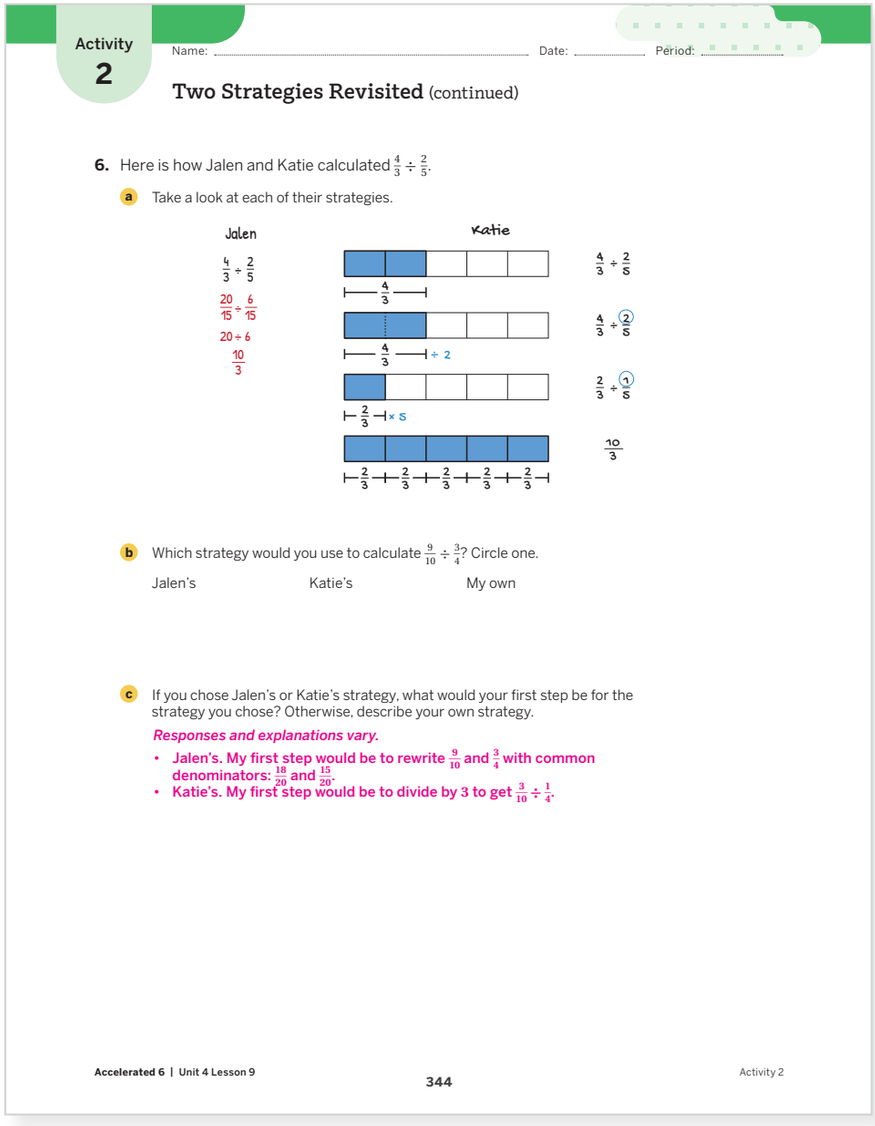
3 Connect

Invite students to share their responses and justify each response.

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to their strategy.

Consider asking:

- "Describe Jalen's strategy in your own words."
- "Describe Katie's strategy in your own words."
- "Why do the two strategies lead to the same quotient?"
- "Which strategy makes the most sense to you? Why?"



Activity 2

Name: Date: Period:

Two Strategies Revisited (continued)

6. Here is how Jalen and Katie calculated $\frac{4}{3} \div \frac{2}{5}$.

a Take a look at each of their strategies.

Jalen

$\frac{4}{3} \div \frac{2}{5}$

$\frac{20}{15} \div \frac{6}{15}$

$20 \div 6$

$\frac{10}{3}$

Katie

b Which strategy would you use to calculate $\frac{9}{10} \div \frac{3}{4}$? Circle one.

Jalen's Katie's My own

c If you chose Jalen's or Katie's strategy, what would your first step be for the strategy you chose? Otherwise, describe your own strategy.

Responses and explanations vary.

- Jalen's. My first step would be to rewrite $\frac{9}{10}$ and $\frac{3}{4}$ with common denominators: $\frac{18}{20}$ and $\frac{15}{20}$.
- Katie's. My first step would be to divide by 3 to get $\frac{3}{10} \div \frac{1}{4}$.

Accelerated 6 | Unit 4 Lesson 9 344 Activity 2

Pairs | 10 min

Activity 3 Fraction Fluency

Purpose: Students apply any strategy to build fluency in dividing fractions by fractions. **(MTR.3.1)**

Short on time? Consider having students choose three to five problems from the Repeated Challenges.

1 Launch

Use the Think-Pair-Share routine to help students shape their ideas about the expression. Invite students to think independently and then take turns sharing with a partner. Invite several students to share their or their partner's solving strategy with the class.

Invite students to find someone who used a different strategy than they did and have them explain their strategies to each other, if time allows.

2 Monitor

Look for trends in the strategies students feel more comfortable with for dividing fractions.

A **Accessibility: Executive Functioning** To support students as they keep track of prior information, invite them to record the strategies they have explored so far to divide fractions on a visual display that can be referenced for the remainder of the unit.

Look for trends in the distribution of responses and capture explanations for why certain answers can't be correct.

ELL **English Language Learners** Provide students time to rehearse and formulate their explanations before sharing them with the class. **(Speaking and Listening)**

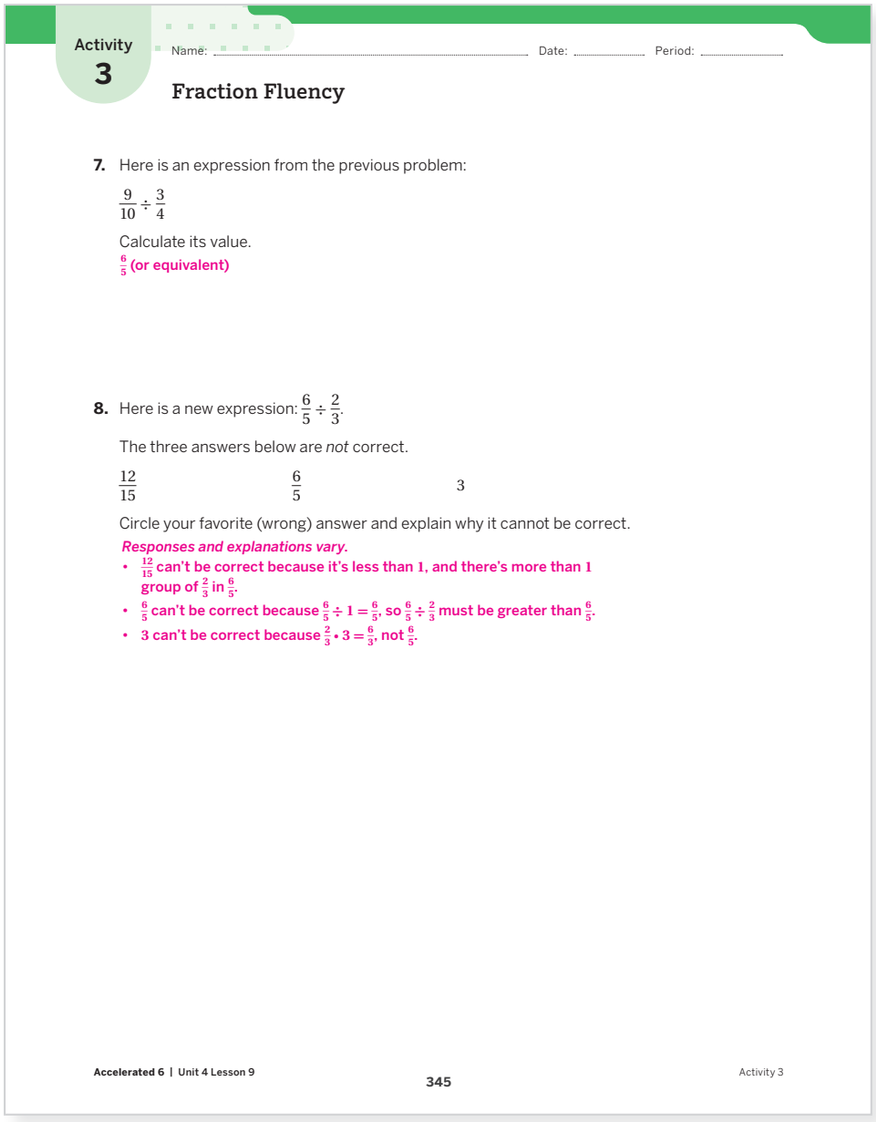
To support students getting started, encourage students to use either Jalen's or Katie's strategy and ask, "What would be a first step if you were using their strategy?"

Look for a variety of strategies like students:

- Rewriting whole numbers as fractions, where the numerator is greater than the denominator.
- Rewriting the two fractions with common denominators.
- Dividing the dividend by the numerator of the divisor, and then multiplying by the denominator.

Pause briefly and create a record of students' strategies for estimating an answer on a visual display for the class to refer back to when they are solving the Repeated Challenges in the next problem.

Activity 3 continued >



Activity 3

Name: _____ Date: _____ Period: _____

Fraction Fluency

7. Here is an expression from the previous problem:

$\frac{9}{10} \div \frac{3}{4}$

Calculate its value.

$\frac{6}{5}$ (or equivalent)

8. Here is a new expression: $\frac{6}{5} \div \frac{2}{3}$.

The three answers below are *not* correct.

$\frac{12}{15}$ $\frac{6}{5}$ 3

Circle your favorite (wrong) answer and explain why it cannot be correct.

Responses and explanations vary.

- $\frac{12}{15}$ can't be correct because it's less than 1, and there's more than 1 group of $\frac{2}{3}$ in $\frac{6}{5}$.
- $\frac{6}{5}$ can't be correct because $\frac{6}{5} \div 1 = \frac{6}{5}$, so $\frac{6}{5} \div \frac{2}{3}$ must be greater than $\frac{6}{5}$.
- 3 can't be correct because $\frac{2}{3} \cdot 3 = \frac{6}{3}$, not $\frac{6}{5}$.

Accelerated 6 | Unit 4 Lesson 9 345 Activity 3

Pairs | 10 min

Activity 3 Fraction Fluency (continued)

Purpose: Students apply any strategy to build fluency in dividing fractions by fractions. **(MTR.3.1)**

Short on time? Consider having students choose three to five problems from the Repeated Challenges.

2 Monitor

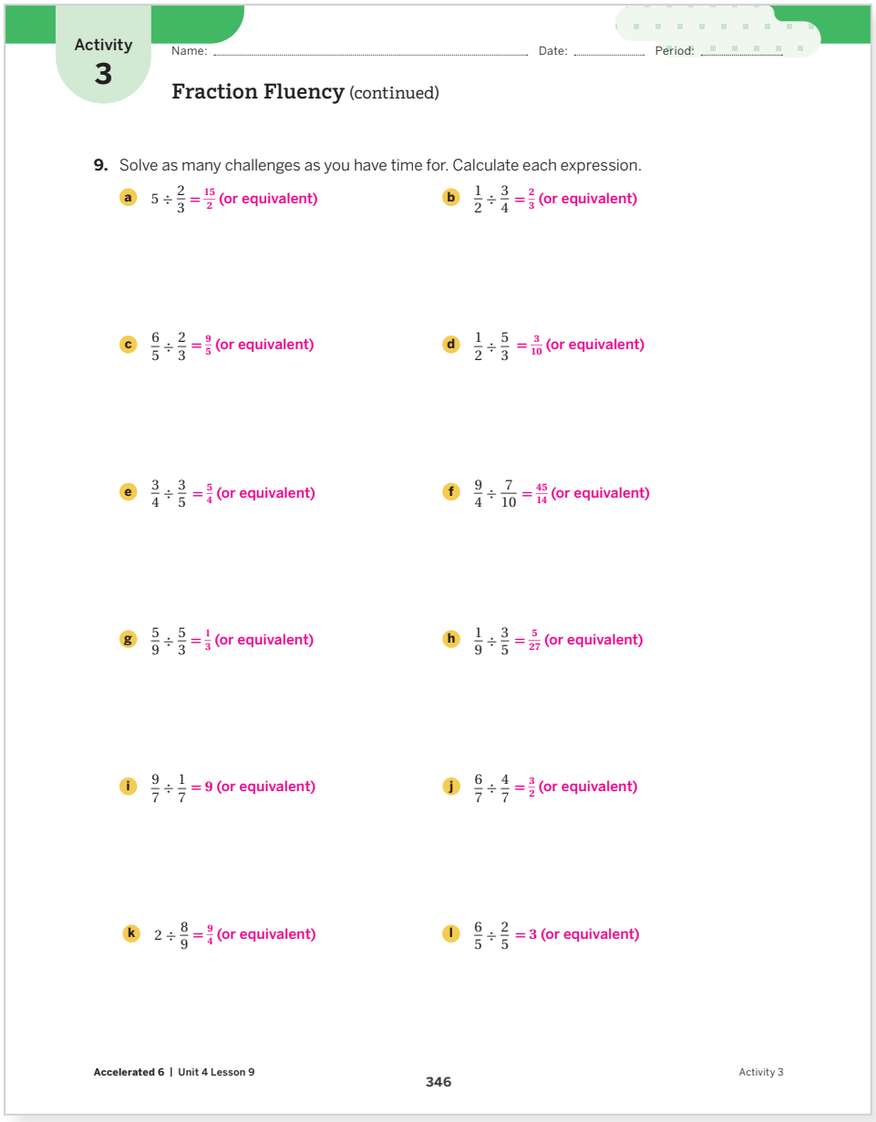
Invite students to set a goal for how many challenges they want to solve. Share that it's more important to make sense of the challenges than it is to work quickly.

Students will need a partner for this activity. They will solve and compare their solutions to problems. **(MTR.3.1)**

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges. Consider adding these strategies to the strategies recorded after Problem 8.



Activity 3

Name: _____ Date: _____ Period: _____

Fraction Fluency (continued)

9. Solve as many challenges as you have time for. Calculate each expression.

a. $5 \div \frac{2}{3} = \frac{15}{2}$ (or equivalent)

b. $\frac{1}{2} \div \frac{3}{4} = \frac{2}{3}$ (or equivalent)

c. $\frac{6}{5} \div \frac{2}{3} = \frac{9}{5}$ (or equivalent)

d. $\frac{1}{2} \div \frac{5}{3} = \frac{3}{10}$ (or equivalent)

e. $\frac{3}{4} \div \frac{3}{5} = \frac{5}{4}$ (or equivalent)

f. $\frac{9}{4} \div \frac{7}{10} = \frac{45}{14}$ (or equivalent)

g. $\frac{5}{9} \div \frac{5}{3} = \frac{1}{3}$ (or equivalent)

h. $\frac{1}{9} \div \frac{3}{5} = \frac{5}{27}$ (or equivalent)

i. $\frac{9}{7} \div \frac{1}{7} = 9$ (or equivalent)

j. $\frac{6}{7} \div \frac{4}{7} = \frac{3}{2}$ (or equivalent)

k. $2 \div \frac{8}{9} = \frac{9}{4}$ (or equivalent)

l. $\frac{6}{5} \div \frac{2}{5} = 3$ (or equivalent)

Accelerated 6 | Unit 4 Lesson 9 346 Activity 3

Whole Class | 5 min

Synthesis

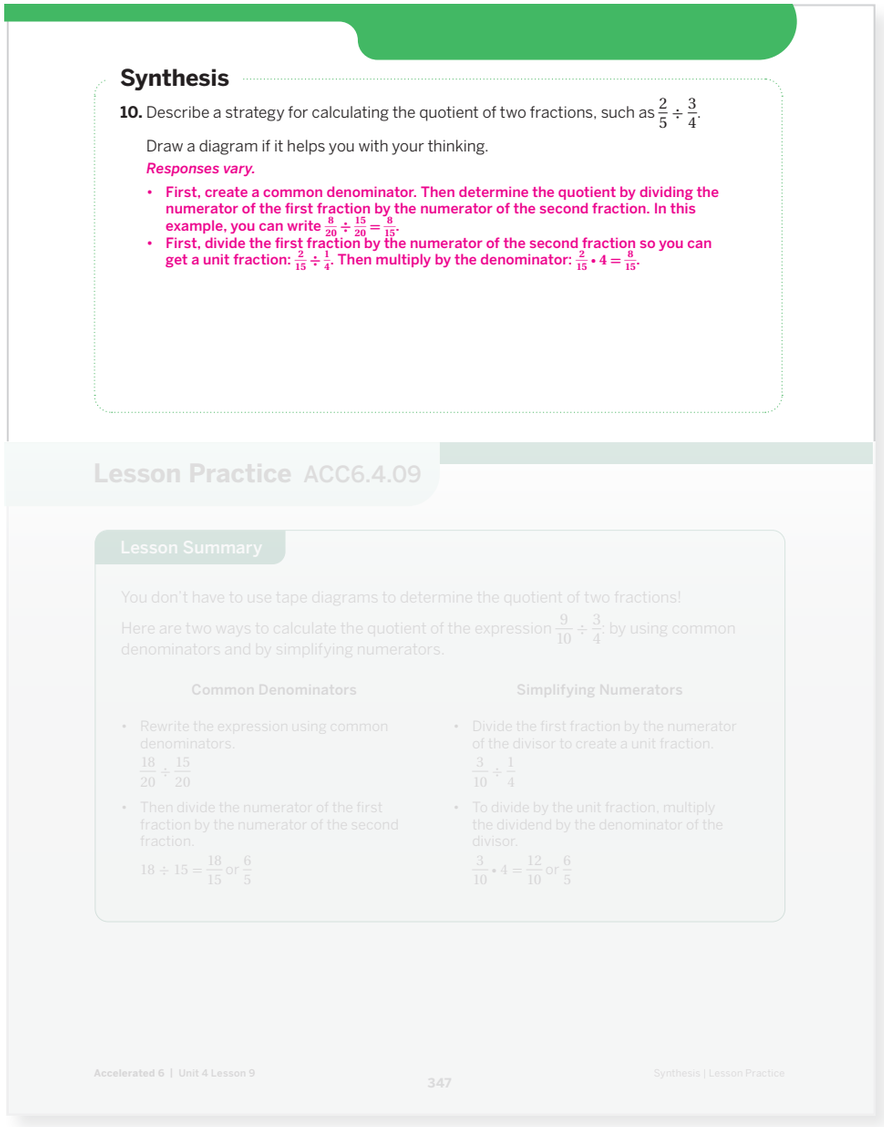
Purpose: Students synthesize multiple strategies for dividing with fractions without a diagram.

Invite students to respond independently before discussing each question with their partner.

Capture and share a variety of ideas, such as:

- Drawing tape diagrams to represent the situation.
- First, creating a common denominator. Then dividing the two fractions by dividing the numerators.
- First, dividing by the divisor's numerator so you can get a unit fraction. Then multiplying by its denominator.

MLR **MLR2: Collect and Display** Use this routine to revisit students' ideas about dividing with fractions. Add any new ideas to the display for students to reference for the rest of the unit.



Synthesis

10. Describe a strategy for calculating the quotient of two fractions, such as $\frac{2}{5} \div \frac{3}{4}$.

Draw a diagram if it helps you with your thinking.

Responses vary.

- First, create a common denominator. Then determine the quotient by dividing the numerator of the first fraction by the numerator of the second fraction. In this example, you can write $\frac{8}{20} \div \frac{15}{20} = \frac{8}{15}$.
- First, divide the first fraction by the numerator of the second fraction so you can get a unit fraction: $\frac{2}{15} \div \frac{1}{4}$. Then multiply by the denominator: $\frac{2}{15} \cdot 4 = \frac{8}{15}$.

Lesson Practice ACC6.4.09

Lesson Summary

You don't have to use tape diagrams to determine the quotient of two fractions!

Here are two ways to calculate the quotient of the expression $\frac{9}{10} \div \frac{3}{4}$ by using common denominators and by simplifying numerators.

Common Denominators	Simplifying Numerators
• Rewrite the expression using common denominators. $\frac{18}{20} \div \frac{15}{20}$	• Divide the first fraction by the numerator of the divisor to create a unit fraction. $\frac{3}{10} \div \frac{1}{4}$
• Then divide the numerator of the first fraction by the numerator of the second fraction. $18 \div 15 = \frac{18}{15}$ or $\frac{6}{5}$	• To divide by the unit fraction, multiply the dividend by the denominator of the divisor. $\frac{3}{10} \cdot 4 = \frac{12}{10}$ or $\frac{6}{5}$

Accelerated 6 | Unit 4 Lesson 9 347 Synthesis | Lesson Practice

Lesson Takeaway: There are various methods to calculate the quotient of a division problem with fractions without using a tape diagram. One strategy is finding a common denominator and dividing the numerators. The second is dividing by the numerator of the divisor to create a unit fraction, then multiplying by the denominator.

Independent | 5 min

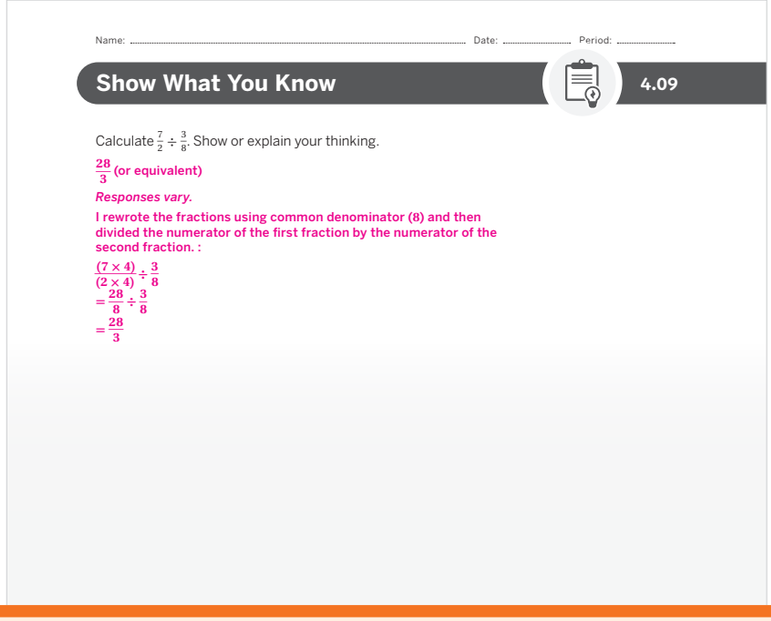
Show What You Know

Purpose: Students demonstrate their understanding by determining the quotient of two fractions without a diagram.

Today's Goals

1. **Goal:** Calculate the quotient of two fractions using multiple methods.
2. **Language Goal:** Compare and contrast strategies for determining the quotients of fractions using mathematically precise language. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: ..... Date: ..... Period: .....

Show What You Know 4.09

Calculate $\frac{7}{2} \div \frac{3}{8}$. Show or explain your thinking.

$\frac{28}{3}$ (or equivalent)

Responses vary.

I rewrote the fractions using common denominator (8) and then divided the numerator of the first fraction by the numerator of the second fraction. :

$\frac{(7 \times 4)}{(2 \times 4)} \div \frac{3}{8}$

$= \frac{28}{8} \div \frac{3}{8}$

$= \frac{28}{3}$

D Differentiation Use after Lesson 9

Support

Provide targeted intervention for students by using these resources.

If students need support with the simplifying numerators strategy:

» **Respond to Student Thinking:**

- Revisit **Activity 2**, particularly Jalen's and Katie's strategies. Connect Katie's tape diagram with dividing numerators, and invite students to use this strategy when the first numerator is divisible by the second.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to look for examples of fraction division in their world. Encourage them to write an expression and quotient for each example.

Professional Learning

Reflect on your facilitation of MLR7: Compare and Connect in this lesson. How did students engage in the routine? How did you help students in making sense of Katie's strategy? **Note:** Katie's strategy will be focused on in more depth in Lesson 10.

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. Describe a strategy for calculating the quotient of two fractions, such as $\frac{2}{5} \div \frac{3}{4}$.

Draw a diagram if it helps you with your thinking.

Responses vary.

- First, create a common denominator. Then determine the quotient by dividing the numerator of the first fraction by the numerator of the second fraction. In this example, you can write $\frac{8}{20} \div \frac{15}{20} = \frac{8}{15}$.
- First, divide the first fraction by the numerator of the second fraction so you can get a unit fraction: $\frac{2}{15} \div \frac{1}{4}$. Then multiply by the denominator: $\frac{2}{15} \cdot 4 = \frac{8}{15}$.

Lesson Practice ACC6.4.09

Lesson Summary

You don't have to use tape diagrams to determine the quotient of two fractions!

Here are two ways to calculate the quotient of the expression $\frac{9}{10} \div \frac{3}{4}$: by using common denominators and by simplifying numerators.

Common Denominators

- Rewrite the expression using common denominators.
  $\frac{18}{20} \div \frac{15}{20}$
- Then divide the numerator of the first fraction by the numerator of the second fraction.
  $18 \div 15 = \frac{18}{15}$ or $\frac{6}{5}$

Simplifying Numerators

- Divide the first fraction by the numerator of the divisor to create a unit fraction.
  $\frac{3}{10} \div \frac{1}{4}$
- To divide by the unit fraction, multiply the dividend by the denominator of the divisor.
  $\frac{3}{10} \cdot 4 = \frac{12}{10}$ or $\frac{6}{5}$

Lesson Practice
ACC6.4.09

Name: _____ Date: _____ Period: _____

Problems 1–4: Use any strategy to calculate each quotient.

1. $10 \div \frac{1}{5} = 50$

2. $10 \div \frac{3}{5} = \frac{50}{3}$ (or equivalent)

3. $3\frac{3}{4} \div \frac{3}{8} = 10$

4. $\frac{1}{2} \div \frac{5}{3} = \frac{3}{10}$ (or equivalent)

5. How many groups of $\frac{3}{4}$ are in $4\frac{1}{2}$?

6 groups

6. How many groups of $\frac{3}{4}$ are in $2\frac{2}{3}$?

$3\frac{5}{8}$ groups

7. Use the equation $2\frac{1}{2} \div \frac{1}{8} = 20$ to determine $2\frac{1}{2} \div \frac{5}{8}$. Explain your thinking.

4. *Explanations vary.* There are 20 groups of $\frac{1}{8}$ in $2\frac{1}{2}$. If the size of each group is multiplied by 5 (from $\frac{1}{8}$ to $\frac{5}{8}$), then the number of groups will be divided by 5. $20 \div 5 = 4$.

FAST Practice

8. A painter has $3\frac{1}{2}$ gallons of paint to paint some bathrooms. Each bathroom requires $\frac{2}{3}$ gallon of paint. How many bathrooms can he paint?

$5\frac{1}{4}$ bathrooms

Lesson Practice
ACC6.4.09

Name: _____ Date: _____ Period: _____

Spiral Review

9. Basheera has 90 songs on a playlist. She listened to 40% of the songs. How many songs did Basheera listen to?

36 songs

10. One batch of trail mix uses 2 cups of cereal, $\frac{1}{4}$ cups of raisins, and $\frac{2}{3}$ cups of almonds. Complete the table to show how much of each ingredient you would need to make 3 or 4 batches of trail mix.

	Cereal (cups)	Raisins (cups)	Almonds (cups)
3 Batches	6	$\frac{3}{4}$	2
4 Batches	8	1	$2\frac{2}{3}$ (or equivalent)

Problems 11–12: Here are three expressions.

$56 \div 8$ $56 \div 800$ $56 \div 0.08$

11. Without calculating, order the quotients from *least* to *greatest*.

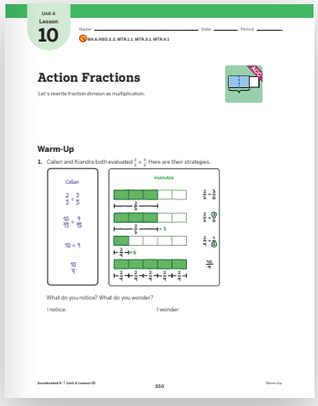
$56 \div 800$	$56 \div 8$	$56 \div 0.08$
Least		Greatest

12. Explain how you ordered the three quotients.

Responses vary. Because the dividends are the same, a greater divisor leads to a lesser quotient.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–4	1	MA.6.NSO.2.2
	5–7	2	MA.6.NSO.2.2
FAST Practice	8	2	MA.6.NSO.2.2
Spiral Review			
	9	2	MA.6.AR.3.4
	10	2	MA.6.AR.3.3
	11–12	2	MA.5.NSO.2.4


Unit 4
Lesson
10

Action Fractions

Let's rewrite fraction division as multiplication.

Warm-Up

Action Fractions

Relating Fraction Division to Multiplication

Let's rewrite fraction division as multiplication.

Learning Outcomes

Today's Goals

1. **Goal:** Identify and create equivalent expressions using division and multiplication with fractions.
2. **Language Goal:** Generalize a process for dividing a number n by a fraction $\frac{a}{b}$, and justify why this can be abstracted as $n \cdot \frac{b}{a}$. **(Writing, Speaking, and Listening)**.

Students compare and contrast two strategies for dividing fractions and then use this understanding to make sense of a new strategy: rewriting a division expression as a multiplication expression. They generalize this strategy and conclude that dividing any number by a fraction $\frac{a}{b}$ is the same as multiplying by the reciprocal, $\frac{b}{a}$. **(MTR.1.1, MTR.4.1)**

Coherence

Prior Learning

In Lesson 8, students reasoned that $\frac{a}{b} \div \frac{1}{n}$ was equivalent to $\frac{a}{b} \cdot n$. In Lesson 9, they divided the dividend by the numerator of the divisor, then multiplied by the denominator to find the quotient.

Future Learning

In Lessons 11–15, students will apply their understanding of fraction division to area and volume problems.

Connections

- Students apply appropriate fraction vocabulary as they are introduced to the term reciprocal. (cross-curricular, mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2

Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.3.1, MTR.4.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2 MA.5.FR.2.4	MA.7.NSO.2.2

Vocabulary

New Vocabulary

reciprocal

Lesson at a Glance

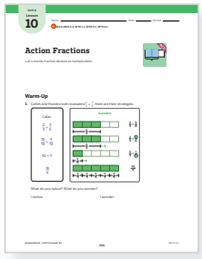
~ 45 min

MA.6.NSO.2.2

Warm-Up

Pairs | 5 min

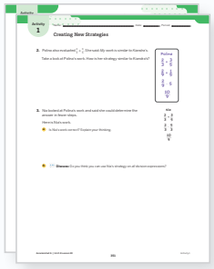
Students make sense of and compare two strategies for evaluating division expressions with fractions. **Routine:** Notice and Wonder **(MTR.1.1)**



Activity 1

Pairs | 12 min

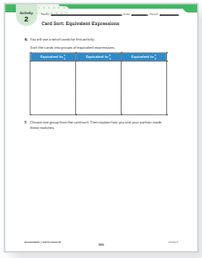
Students analyze the strategy of rewriting a division problem as a multiplication problem using the reciprocal. MLR2: Collect and Display



Activity 2

Pairs | 8 min

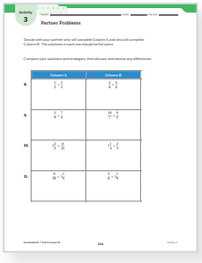
Students make connections between tape diagrams, division expressions, and multiplication expressions in a card sort.



Activity 3

Pairs | 10 min

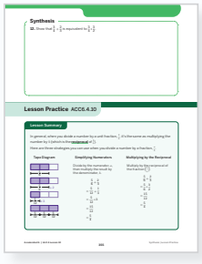
Students practice dividing fractions using any strategy with Partner Problems. **(MTR.3.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that dividing by a fraction $\frac{a}{b}$ is equivalent to multiplying by its reciprocal $\frac{b}{a}$. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of fraction division by determining which expressions are equivalent and evaluating them.

Prep Checklist

Prepare the Activity 2 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 2 Cards, one per pair

Pairs | 5 min

Warm-Up

Purpose: Students make sense of and compare two strategies for evaluating division expressions with fractions. **(MTR.1.1)**

1 Launch

Direct students' attention to Callen's and Kiandra's strategies.

Use the Notice and Wonder routine to promote curiosity and help students make sense of the two strategies for dividing fractions. **(MTR.1.1)**

Note: Kiandra's strategy is asking "How many groups?", building off the simplifying the numerator into a unit fraction strategy from Lesson 8 (*Potting Soil*). Callen's strategy is finding common denominators from Lesson 7 (*Break It Down*). If students are struggling to make sense of one of the strategies, consider referring back to the lesson or an anchor chart from the lesson.

2 Connect

ELL **English Language Learners** Provide sentence frames (e.g., "I notice. . ." or "I wonder. . ."). **(Writing and Speaking)**

Create a record of the things students noticed and wondered, along with the name of the students who shared them.

Note: If it doesn't come up naturally, consider asking, "Could you imagine solving this problem using either strategy with fewer steps?"

Unit 4
Lesson
10

Name: ..... Date: ..... Period: .....

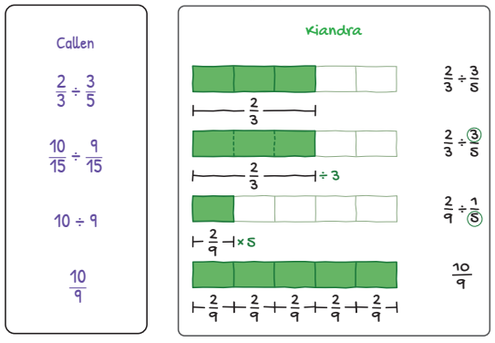
MA.6.NSO.2.2, MTR.1.1, MTR.3.1, MTR.4.1

Action Fractions

Let's rewrite fraction division as multiplication.

Warm-Up

1. Callen and Kiandra both evaluated $\frac{2}{3} \div \frac{3}{5}$. Here are their strategies.



What do you notice? What do you wonder? ***Responses vary.***

I notice:

- **Callen uses common denominators.**
- **When Kiandra divided by 3, the first fraction changed from $\frac{2}{3}$ to $\frac{2}{9}$. This is the same as multiplying the denominator by 3.**
- **When Kiandra divided by the unit fraction, she multiplied the fraction by 5.**

I wonder:

- **How could a tape diagram help support Callen's strategy?**
- **Could it be possible to evaluate the expression using Kiandra's strategy in fewer steps?**

Accelerated 6 | Unit 4 Lesson 10 350 Warm-Up

Pairs | 12 min

Activity 1 Creating New Strategies

Purpose: Students analyze the strategy of rewriting a division problem as a multiplication problem using the **reciprocal**.

1 Launch

Direct students' attention to Polina's and Kiandra's work and invite a student to read the prompt aloud.

Invite students to share their thinking with a partner before writing the similarities down on paper.

To surface connections, consider asking:

- "What did Polina do first?" Polina divided the dividend by the numerator of the divisor to create a unit fraction.
- "How did $\frac{2}{3}$ become $\frac{2}{9}$?" $\frac{2}{9}$ is the quotient of $\frac{2}{3}$ divided by 3.
- "What did Kiandra do first?" Kiandra did the same thing but she represented it on a tape diagram.

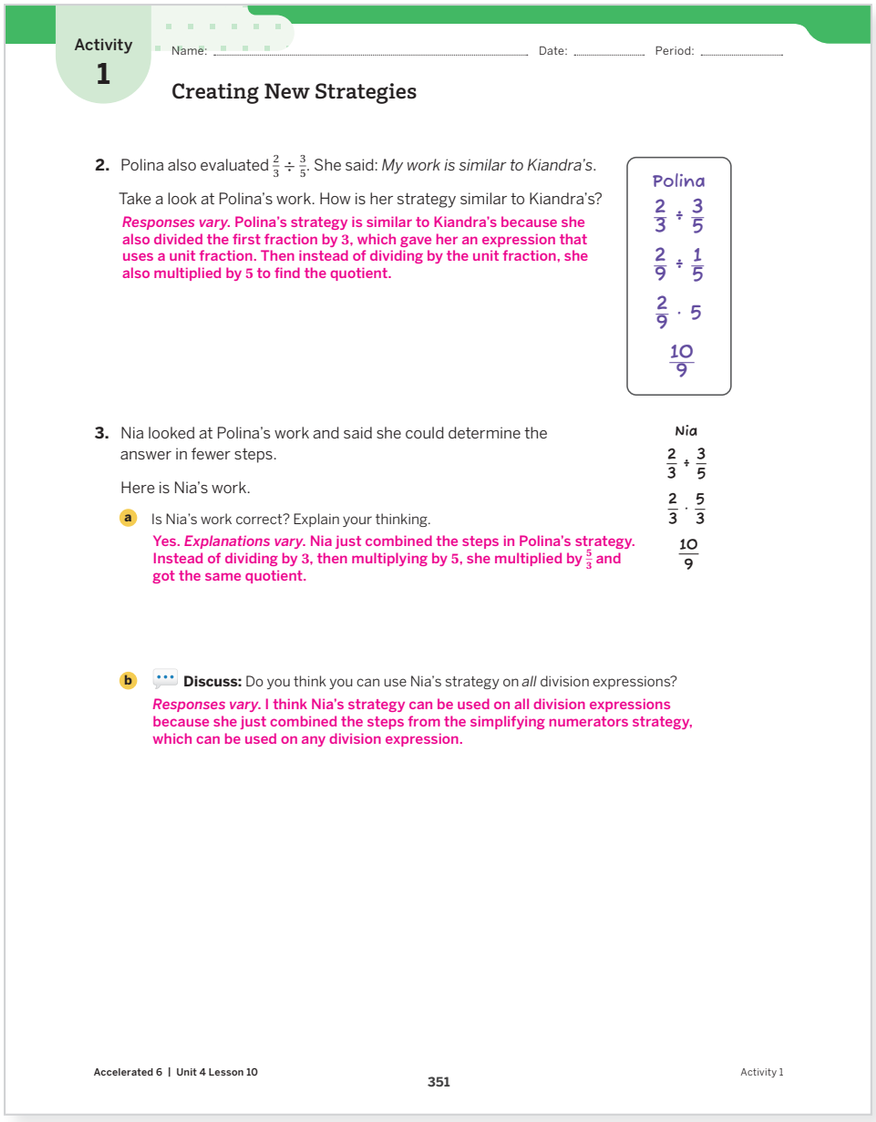
2 Monitor

Look and listen for a variety of student thinking and support as needed.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How would you describe Nia's strategy in your own words?"
Share that Nia's work is not correct because she forgot the first dividing step.	**Support** Consider asking, "How can we write 'divide by three' as a fraction?" Multiply by $\frac{1}{3}$.
Share that $\frac{3}{5}$ is $3 \cdot \frac{1}{5}$ so those numbers can be separated.	**Strengthen** Consider asking, "What quantity are we dividing by?" Remind students that, even if we break $\frac{3}{5}$ apart, we still need to divide both pieces.
Give a complete explanation of why dividing by three then multiplying by 5 is the same as multiplying by $\frac{5}{3}$.	**Stretch** Invite students to write a few more division expressions and see if this strategy works for other problems. Consider asking, "Why does this strategy work?"

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Creating New Strategies

2. Polina also evaluated $\frac{2}{3} \div \frac{3}{5}$. She said: *My work is similar to Kiandra's.*

Take a look at Polina's work. How is her strategy similar to Kiandra's?

Responses vary. Polina's strategy is similar to Kiandra's because she also divided the first fraction by 3, which gave her an expression that uses a unit fraction. Then instead of dividing by the unit fraction, she also multiplied by 5 to find the quotient.

Polina

$\frac{2}{3} \div \frac{3}{5}$

$\frac{2}{9} \div \frac{1}{5}$

$\frac{2}{9} \cdot 5$

$\frac{10}{9}$

3. Nia looked at Polina's work and said she could determine the answer in fewer steps.

Here is Nia's work.

Nia

$\frac{2}{3} \div \frac{3}{5}$

$\frac{2}{3} \cdot \frac{5}{3}$

$\frac{10}{9}$

a. Is Nia's work correct? Explain your thinking.

Yes. *Explanations vary.* Nia just combined the steps in Polina's strategy. Instead of dividing by 3, then multiplying by 5, she multiplied by $\frac{5}{3}$ and got the same quotient.

b. **Discuss:** Do you think you can use Nia's strategy on *all* division expressions?

Responses vary. I think Nia's strategy can be used on all division expressions because she just combined the steps from the simplifying numerators strategy, which can be used on any division expression.

Accelerated 6 | Unit 4 Lesson 10 351 Activity 1

Pairs | 12 min

Activity 1 Creating New Strategies (continued)

Purpose: Students analyze the strategy of rewriting a division problem as a multiplication problem using the **reciprocal**.

2 Monitor

Differentiation: (Support) Encourage students to turn back to the previous page and make connections between the parts of each expression (the divisor, the dividend, and the quotient). Consider asking, "How would you describe what is happening with the divisor in Nia's strategy?"

Look for strategies for Problem 4b from previous lessons to share during the Connect. Make note of students who:

- Find a common denominator and divide by the numerators.
- Simplify the divisor by dividing by its numerator first, like in Lesson 8 (*Potting Soil*).
- Draw tape diagrams and use those to reason toward an answer.

3 Connect

Share student work from those who used Nia's strategy correctly.

Consider asking, "How would you describe what is happening with the divisor in Nia's strategy?"

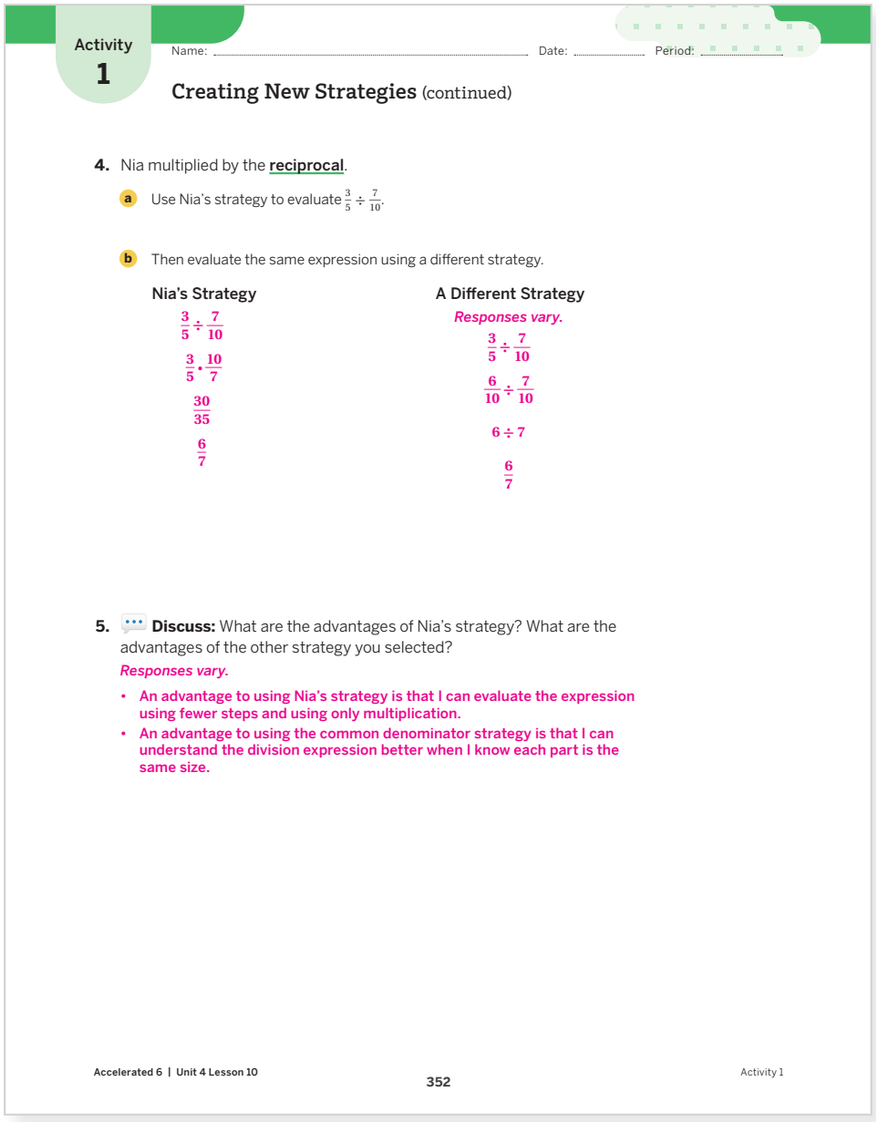
MLR2: Collect and Display Use this routine to create a class definition of **reciprocal** using students' language and the glossary. Display any new language, examples, or diagrams for students to reference later.

Consider asking, "How would you write a definition for the term *reciprocal*?" The reciprocal of the fraction $\frac{a}{b}$ is $\frac{b}{a}$. For example, $\frac{2}{3}$ and $\frac{3}{2}$ are reciprocals. The product of two fractions that are reciprocals of one another is 1 (e.g., $\frac{2}{3} \cdot \frac{3}{2} = 1$).

Invite students to share why the reciprocal is important for Nia's strategy for dividing fractions.

To surface the Key Takeaway, consider asking:

- "Describe Nia's strategy for dividing fractions in your own words."
- "What do you like about this strategy?"
- "What still feels confusing about this strategy?" **(MTR.4.1)**



Activity 1

Name: _____ Date: _____ Period: _____

Creating New Strategies (continued)

4. Nia multiplied by the **reciprocal**.

a. Use Nia's strategy to evaluate $\frac{3}{5} \div \frac{7}{10}$.

b. Then evaluate the same expression using a different strategy.

Nia's Strategy	A Different Strategy
$\frac{3}{5} \div \frac{7}{10}$	*Responses vary.*
$\frac{3}{5} \cdot \frac{10}{7}$	$\frac{3}{5} \div \frac{7}{10}$
$\frac{30}{35}$	$\frac{6}{10} \div \frac{7}{10}$
$\frac{6}{7}$	$6 \div 7$
	$\frac{6}{7}$

5. **Discuss:** What are the advantages of Nia's strategy? What are the advantages of the other strategy you selected?

Responses vary.

- An advantage to using Nia's strategy is that I can evaluate the expression using fewer steps and using only multiplication.
- An advantage to using the common denominator strategy is that I can understand the division expression better when I know each part is the same size.

Accelerated 6 | Unit 4 Lesson 10 352 Activity 1

Key Takeaway: Another strategy for dividing a fraction by a fraction $\frac{a}{b}$ is to multiply by its **reciprocal**, $\frac{b}{a}$.

Pairs | 8 min

Activity 2 Card Sort: Equivalent Expressions

Purpose: Students make connections between tape diagrams, division expressions, and multiplication expressions in a card sort.

Short on time? Consider completing the card sort together as a class.

1 Launch

Direct students' attention to the questions and invite students to read the questions aloud to a partner.

Distribute the Activity 2 Cards, pre-cut, one set per pair.

A **Accessibility: Executive Function** Invite students to focus on one card at a time to support students in carrying out multiple steps.

Note: There should be one tape diagram, one division expression, and one multiplication expression for each column.

2 Monitor

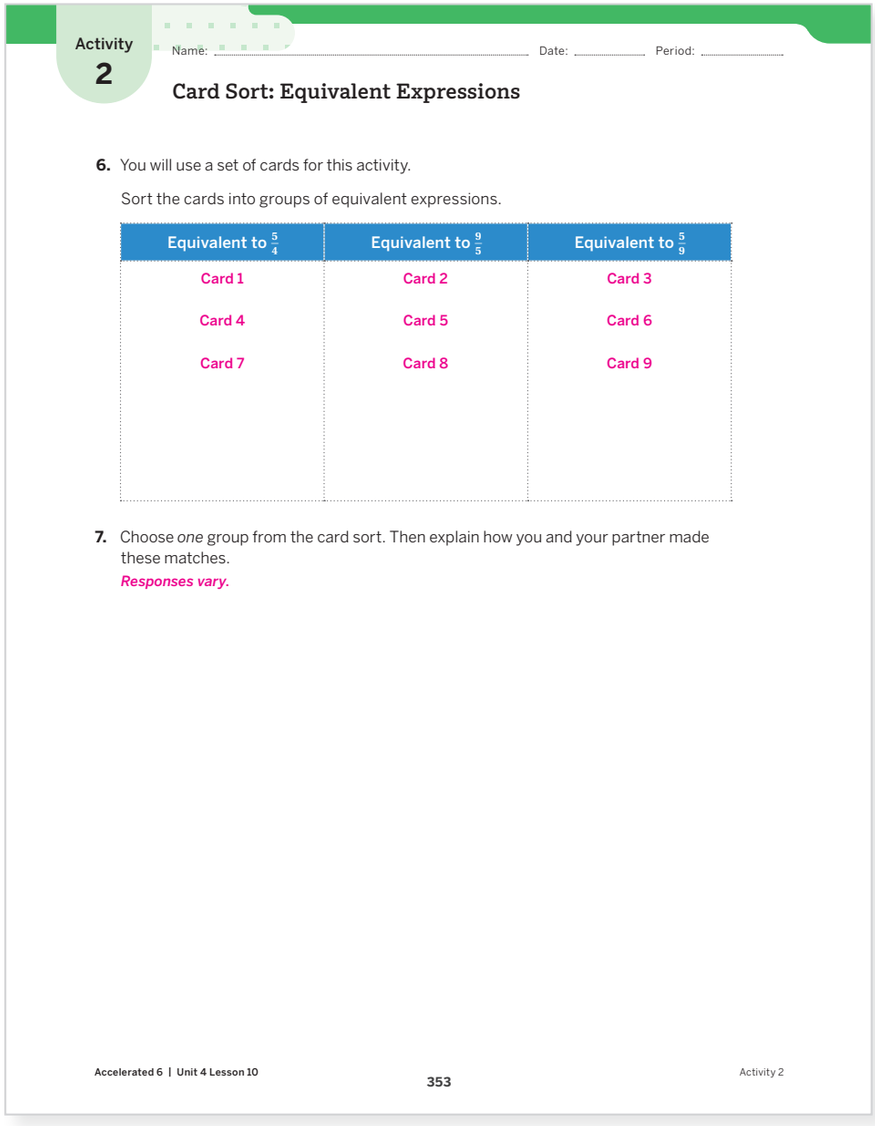
Invite students to compare their card sort with another set of partners, justify their card placement, and make revisions based on their conversation. **(MTR.1.1, MTR.4.1)**

Note: If time allows, invite pairs to compare their groups, justify their thinking, and make revisions based on their conversation.

3 Connect

Direct students' attention to the question and the cards that go with the expression $1\frac{1}{5} \div \frac{2}{3}$.

Invite students to share the connections they see between each expression and the tape diagram. Encourage students to talk through each step in the tape diagram and where they see it in the expressions.



Activity 2

Name: _____ Date: _____ Period: _____

Card Sort: Equivalent Expressions

6. You will use a set of cards for this activity.

Sort the cards into groups of equivalent expressions.

Equivalent to $\frac{3}{4}$	Equivalent to $\frac{9}{5}$	Equivalent to $\frac{5}{9}$
Card 1	Card 2	Card 3
Card 4	Card 5	Card 6
Card 7	Card 8	Card 9

7. Choose *one* group from the card sort. Then explain how you and your partner made these matches.

Responses vary.

Accelerated 6 | Unit 4 Lesson 10 353 Activity 2

Pairs | 8 min

Activity 3 Partner Problems

Purpose: Students practice dividing fractions using any strategy with Partner Problems. **(MTR.3.1)**

Short on time? Consider inviting students to select two to three problems to solve.

1 Launch

Direct students' attention to the instructions and invite students in each pair to determine who will be Partner A and Partner B.

2 Monitor

A **Accessibility: Executive Functioning** To support students with organization in problem solving, consider giving them lined paper or a graphic organizer to write their thinking on one step at a time.

Look for mathematical language students use when discussing and justifying their thinking, such as *reciprocal*, *equivalent expressions*, and students who ask, "Does this answer make sense?" **(MTR.3.1, MTR.4.1)**

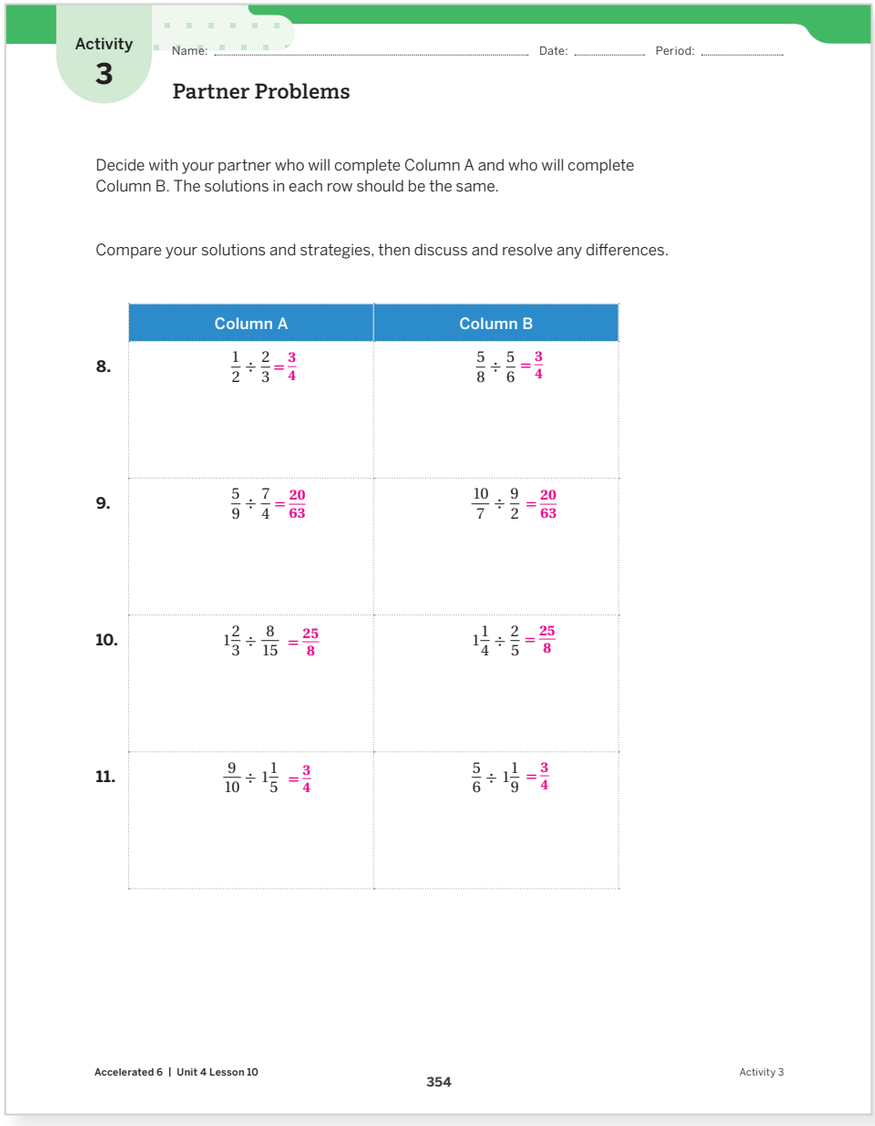
D **Differentiation**

Look for students who:	Respond to Student Thinking
Change the division symbol to multiplication.	**Support** Invite students to refer back to Nia's strategy in Problem 4. Consider asking, "What steps did Nia combine?"
Multiply by only the fraction part in mixed numbers.	**Support** Invite students to rewrite the mixed numbers as fractions before dividing.
Say, "I'm changing the problem to a multiplication problem" or "Flip and multiply."	**Strengthen** Encourage students to use the phrase "equivalent expressions." Consider reminding them that we aren't changing the problem, we are rewriting an equivalent problem that is more efficient to solve.
Rewrite the division expressions as multiplication expressions and solve them accurately.	**Stretch** Invite students to share their strategy during the Connect. Then encourage them to write a third set of problems that would have the same quotient as each row.

3 Connect

Direct students' attention to the set of problems and invite the class to choose ones to discuss.

Consider asking, "How would you describe the general strategy for dividing fractions in your own words?" **(MTR.3.1, MTR.4.1)**



Activity 3

Name: _____ Date: _____ Period: _____

Partner Problems

Decide with your partner who will complete Column A and who will complete Column B. The solutions in each row should be the same.

Compare your solutions and strategies, then discuss and resolve any differences.

	Column A	Column B
8.	$\frac{1}{2} \div \frac{2}{3} = \frac{3}{4}$	$\frac{5}{8} \div \frac{5}{6} = \frac{3}{4}$
9.	$\frac{5}{9} \div \frac{7}{4} = \frac{20}{63}$	$\frac{10}{7} \div \frac{9}{2} = \frac{20}{63}$
10.	$1\frac{2}{3} \div \frac{8}{15} = \frac{25}{8}$	$1\frac{1}{4} \div \frac{2}{5} = \frac{25}{8}$
11.	$\frac{9}{10} \div 1\frac{1}{5} = \frac{3}{4}$	$\frac{5}{6} \div 1\frac{1}{9} = \frac{3}{4}$

Accelerated 6 | Unit 4 Lesson 10 354 Activity 3

Whole Class | 5 min

Synthesis

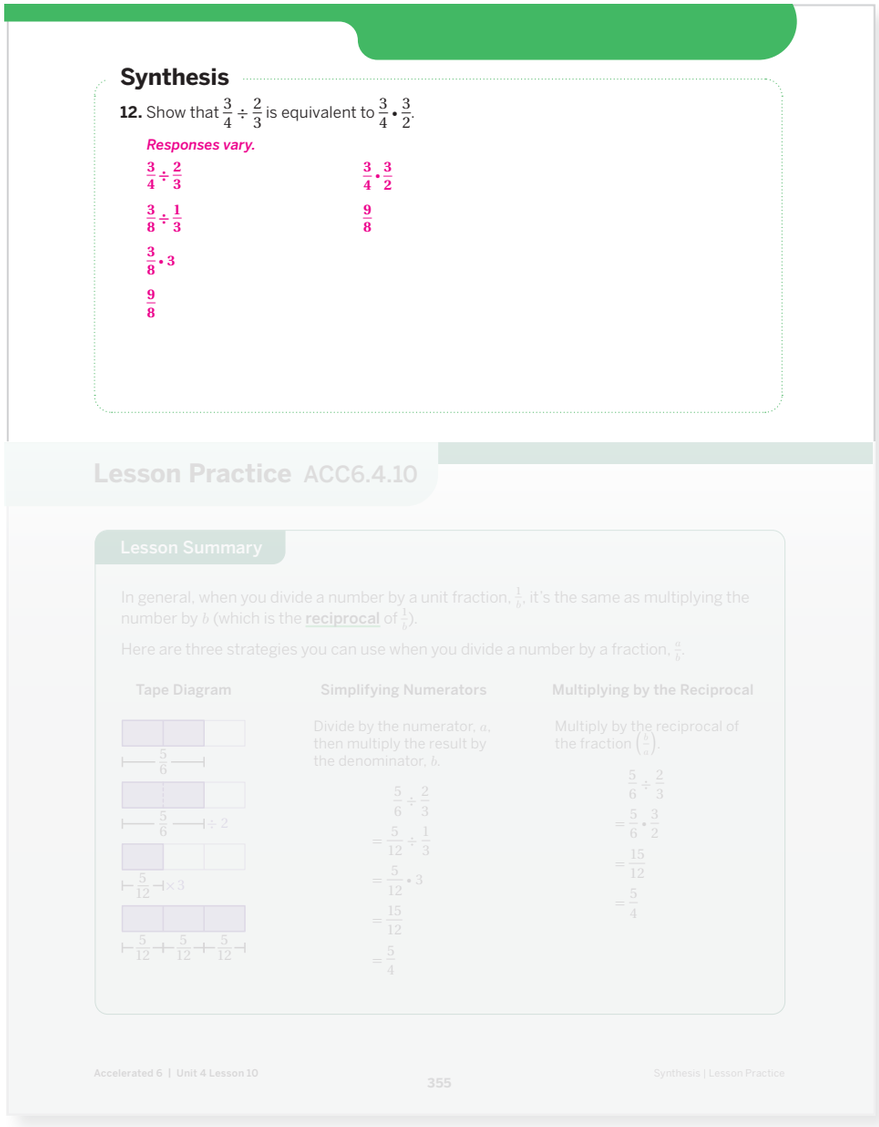
Purpose: Students synthesize their understanding that dividing by a fraction $\frac{a}{b}$ is equivalent to multiplying by its reciprocal $\frac{b}{a}$.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Using a tape diagram to solve the division problem visually.
- Using common denominators to solve the division problem.
- Dividing by the numerator of the divisor to create a unit fraction, then multiplying by its denominator.

MLR **MLR2: Collect and Display** Use this routine to collect students' language as they share their strategies. Display for students to reference and add to for the rest of the unit.



Synthesis

12. Show that $\frac{3}{4} \div \frac{2}{3}$ is equivalent to $\frac{3}{4} \cdot \frac{3}{2}$.

Responses vary.

$\frac{3}{4} \div \frac{2}{3}$

$\frac{3}{8} \div \frac{1}{3}$

$\frac{3}{8} \cdot 3$

$\frac{9}{8}$

$\frac{3}{4} \cdot \frac{3}{2}$

$\frac{9}{8}$

Lesson Practice ACC6.4.10

Lesson Summary

In general, when you divide a number by a unit fraction, $\frac{1}{b}$, it's the same as multiplying the number by b (which is the reciprocal of $\frac{1}{b}$).

Here are three strategies you can use when you divide a number by a fraction, $\frac{a}{b}$.

Tape Diagram

$\frac{5}{6}$

$\frac{5}{6} \div 2$

$\frac{5}{12} \times 3$

$\frac{5}{12}$ $\frac{5}{12}$ $\frac{5}{12}$

Simplifying Numerators

Divide by the numerator, a, then multiply the result by the denominator, b.

$\frac{5}{6} \div \frac{2}{3}$

$= \frac{5}{12} \div \frac{1}{3}$

$= \frac{5}{12} \cdot 3$

$= \frac{15}{12}$

$= \frac{5}{4}$

Multiplying by the Reciprocal

Multiply by the reciprocal of the fraction $\left(\frac{b}{a}\right)$.

$\frac{5}{6} \div \frac{2}{3}$

$= \frac{5}{6} \cdot \frac{3}{2}$

$= \frac{15}{12}$

$= \frac{5}{4}$

Accelerated 6 | Unit 4 Lesson 10 355 Synthesis | Lesson Practice

Lesson Takeaway: One strategy to divide by the fraction $\frac{a}{b}$ is to rewrite the division problem as an equivalent expression where you multiply by the **reciprocal**, $\frac{b}{a}$.

Independent | 5 min

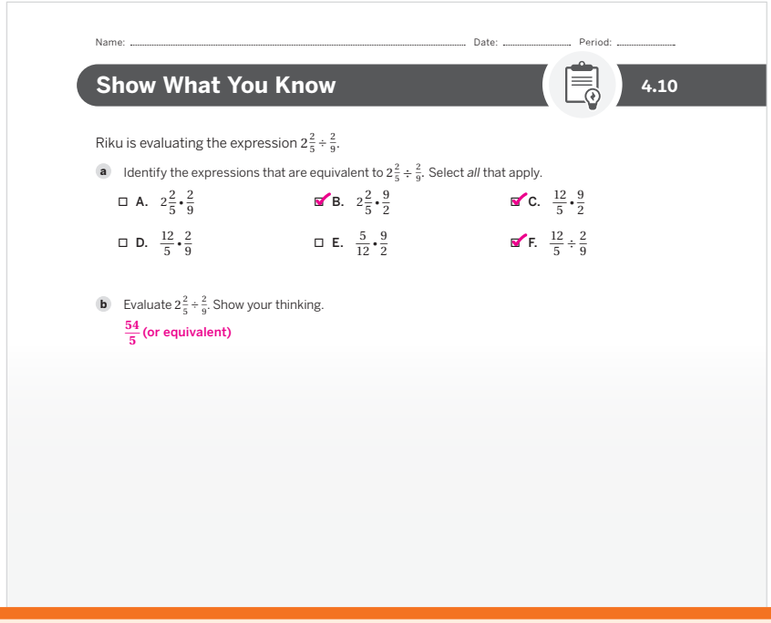
Show What You Know

Purpose: Students demonstrate their understanding of fraction division by determining which expressions are equivalent and evaluating them.

Today's Goals

1. **Goal:** Identify and create equivalent expressions using division and multiplication with fractions.
2. **Language Goal:** Generalize a process for dividing a number n by a fraction $\frac{a}{b}$, and justify why this can be abstracted as $n \cdot \frac{b}{a}$. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: ..... Date: ..... Period: .....

Show What You Know 4.10

Riku is evaluating the expression $2\frac{2}{5} \div \frac{2}{9}$.

a. Identify the expressions that are equivalent to $2\frac{2}{5} \div \frac{2}{9}$. Select *all* that apply.

- ☐ A. $2\frac{2}{5} \cdot \frac{2}{9}$
- ☑ B. $2\frac{2}{5} \cdot \frac{9}{2}$
- ☑ C. $\frac{12}{5} \cdot \frac{9}{2}$
- ☐ D. $\frac{12}{5} \cdot \frac{2}{9}$
- ☐ E. $\frac{5}{12} \cdot \frac{9}{2}$
- ☑ F. $\frac{12}{5} \div \frac{2}{9}$

b. Evaluate $2\frac{2}{5} \div \frac{2}{9}$. Show your thinking.

$\frac{54}{5}$ (or equivalent)

D Differentiation Use after Lesson 10

Support

Provide targeted intervention for students by using these resources.

If students need support dividing fractions using reciprocals:

» **Respond to Student Thinking:**

- Revisit **Activity 1** and give students individualized feedback. Encourage students to look for connections between Callen's, Kiandra's, Polina's, and Nia's work.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to create as many division expressions with a quotient of ⅔ as they can.

Professional Learning

Take a moment to reflect on how students engaged with repeated reasoning in today's lesson. How did students describe a general method for dividing a fraction by another fraction? How did students use that method to make future calculations more efficient?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

12. Show that $\frac{3}{4} \div \frac{2}{3}$ is equivalent to $\frac{3}{4} \cdot \frac{3}{2}$.

Responses vary.

$\frac{3}{4} \div \frac{2}{3}$

$\frac{3}{8} \div \frac{1}{3}$

$\frac{3}{8} \cdot 3$

$\frac{9}{8}$

$\frac{3}{4} \cdot \frac{3}{2}$

$\frac{9}{8}$

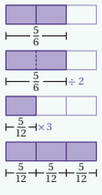
Lesson Practice ACC6.4.10

Lesson Summary

In general, when you divide a number by a unit fraction, $\frac{1}{b}$, it's the same as multiplying the number by b (which is the **reciprocal** of $\frac{1}{b}$).

Here are three strategies you can use when you divide a number by a fraction, $\frac{a}{b}$.

Tape Diagram



Simplifying Numerators

Divide by the numerator, a, then multiply the result by the denominator, b.

$$\frac{5}{6} \div \frac{2}{3} = \frac{5}{12} \div \frac{1}{3} = \frac{5}{12} \cdot 3 = \frac{15}{12} = \frac{5}{4}$$

Multiplying by the Reciprocal

Multiply by the reciprocal of the fraction $\left(\frac{b}{a}\right)$.

$$\frac{5}{6} \div \frac{2}{3} = \frac{5}{6} \cdot \frac{3}{2} = \frac{15}{12} = \frac{5}{4}$$

Lesson Practice ACC6.4.10

Name: _____ Date: _____ Period: _____

Problems 1–4: Determine the value of each expression. Show or explain your thinking.

1. $\frac{8}{9} \div 4 = \frac{2}{9}$ (or equivalent)

Work varies. $\frac{8}{9} \cdot \frac{1}{4} = \frac{2}{9}$

2. $\frac{3}{4} \div \frac{1}{2} = \frac{3}{2}$ (or equivalent)

Work varies. $\frac{3}{4} \cdot 2 = \frac{3}{2}$

3. $\frac{9}{2} \div \frac{3}{8} = 12$ (or equivalent)

Work varies. $\frac{9}{2} \cdot \frac{8}{3} = 12$

4. $3\frac{1}{3} \div \frac{2}{9} = 15$ (or equivalent)

Work varies. $\frac{10}{3} \cdot \frac{9}{2} = 15$

5. Clare incorrectly said that $\frac{4}{3} \div \frac{5}{2}$ is $\frac{10}{3}$ because $\frac{4}{3} \cdot 5 = \frac{20}{3}$ and $\frac{20}{3} \div 2 = \frac{10}{3}$. Determine the correct quotient for $\frac{4}{3} \div \frac{5}{2}$. Then explain why Clare's quotient and reasoning are incorrect.

The correct quotient is $\frac{8}{15}$. *Explanations vary.*

- Clare should have multiplied $\frac{4}{3}$ by 2 to determine how many groups of $\frac{1}{2}$ are in $\frac{4}{3}$, then divided the result by 5.
- Clare divided the fraction $\frac{4}{3}$ by the fraction $\frac{2}{5}$, instead of $\frac{5}{2}$.

6. Determine the quotient of $3\frac{1}{5}$ divided by $\frac{8}{9}$.

$3\frac{3}{5}$

FAST Practice

7. Select *all* the statements that provide the correct steps for evaluating the expression $\frac{14}{15} \div \frac{7}{5}$.

- [x] **A.** Multiply $\frac{14}{15}$ by $\frac{1}{7}$, then multiply by 5.
- [ ] **B.** Divide $\frac{14}{15}$ by 5, then multiply by $\frac{1}{7}$.
- [ ] **C.** Multiply $\frac{14}{15}$ by 7, then multiply by $\frac{1}{5}$.
- [x] **D.** Divide $\frac{14}{15}$ by 7, then multiply by 5.

Lesson Practice ACC6.4.10

Name: _____ Date: _____ Period: _____

Spiral Review

8. Without calculating, determine how the expressions $98 \cdot 25$ and $(100 \cdot 25) - (2 \cdot 25)$ are related. Explain your thinking.

Responses vary. They are related expressions that give the same product. $98 \cdot 25$ means 98 groups of 25. $(100 \cdot 25) - (2 \cdot 25)$ means 100 groups of 25 minus 2 groups of 25. That's a total of 98 groups of 25 because $100 - 2 = 98$, which is the same as the first expression.

9. Kiran and Nicolas are comparing the numbers $1{,}000$ and 10. Kiran says that $1{,}000$ is 100 times as large as 10. Nicolas says that 10 is $\frac{1}{100}$ times as large as $1{,}000$. Whose thinking is correct? Circle one.

Kiran's Nicolas's (Both) Neither

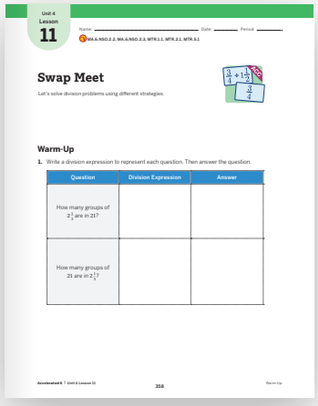
Explain your thinking.

Explanations vary.

- Because $10 \cdot 100 = 1000$, $1{,}000$ is 100 times as large as 10.
- 10 is 100 times smaller than $1{,}000$, which is the same as saying that 10 is $\frac{1}{100}$ times as large as $1{,}000$ and 10 is $\frac{1}{100}$ of $1{,}000$.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–4	1	MA.6.NSO.2.2
	5–6	2	MA.6.NSO.2.2
FAST Practice	7	2	MA.6.NSO.2.2
Spiral Review			
	8	2	MA.4.NSO.2.2, MA.4.NSO.2.5
	9	2	MA.4.NSO.2.6



Swap Meet

Division of Fractions in Context

Let's solve division problems using different strategies.

Learning Outcomes

Today's Goals

1. **Goal:** Write division expressions to represent problems in context.
2. **Language Goal:** Write questions asking "How many groups?" or "How many in 1 group?" to represent division expressions. **(Writing, Speaking, and Listening)**

Students determine the amount in one group and the number of groups by interpreting, representing, and solving real-world division problems. They write their own situations representing both the number of groups and the amount in each group. Students make sense of these problems by moving between the contexts, the equations, and the diagrams that represent the problems. **(MTR.2.1, MTR.5.1)**

Coherence

Prior Learning

In Lesson 10, students developed an algorithm for dividing fractions: dividing by a fraction $\frac{a}{b}$ is equivalent to multiplying by its reciprocal $\frac{b}{a}$.

Future Learning

In Lesson 12, students will practice dividing fractions by comparing lengths and answering questions asking "How many times as long?"

Connections

- Students analyze questions in context to write division expressions and use the expressions to answer the questions in a challenge format. (mathematical, real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.2.1, MTR.5.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	**MA.7.NSO.2.2**
MA.5.FR.2.4	**MA.7.NSO.2.3**
MA.5.AR.1.2	
MA.5.AR.1.3	

Lesson at a Glance

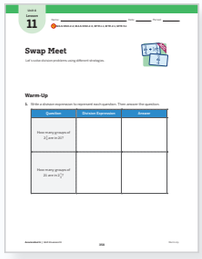
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

Independent | 5 min

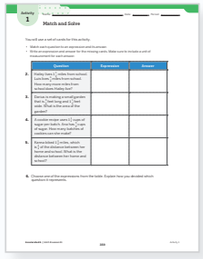
Students use the **Notice and Wonder** routine to revisit strategies for dividing fractions and look for emerging patterns between related quotients. **(MTR.5.1)**



Activity 1

Pairs | 13 min

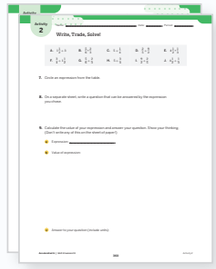
Students choose expressions to represent questions and use a variety of fraction operations to determine the answers.



Activity 2

Whole Class | 17 min

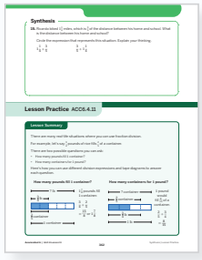
Students write their own questions to represent fraction operations and answer their classmates' questions using the strategies they have learned in this unit. **(MTR.2.1)**



Synthesis

Whole Class | 5 min

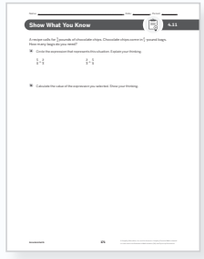
Students synthesize their understanding that analyzing a division problem and creating a model that connects the situation with the division expression helps determine the answer. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding of dividing with fractions by choosing an expression and using it to determine the unknown in a division problem.



Prep Checklist

Prepare the Activity 1 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one set per pair
  - Index cards or slips of paper

Independent | 5 min

Warm-Up

Purpose: Students use the **Notice and Wonder** routine to revisit strategies for dividing fractions and look for emerging patterns between related quotients. **(MTR.5.1)**

1 Launch

Direct students' attention to the two division problems and use the **Notice and Wonder** routine to promote curiosity and help students make sense of the task. **(MTR.1.1)**

Consider asking, "Did anyone notice something similar about the divisors, dividends, or quotients in these expressions? What does it make you wonder about?"

Look for students using a variety of strategies that have been explored throughout the unit.

2 Connect

Capture and share a few expressions and strategies to determine the quotient of each expression. Invite students to compare the quotients.

ELL **English Language Learners** Use wait time to allow students to formulate a response. Consider having students rehearse with a partner before sharing with the whole class. **(Speaking and Listening)**

Consider asking:

- "Do you think the quotient will be less than 1, equal to 1, or greater than 1 here?"
- "How can the quotient of the first expression help you determine the quotient of the second expression?"
- "The quotient of $\frac{3}{4} \div \frac{2}{3}$ is $\frac{9}{8}$. How can you use this information to determine the quotient of $\frac{2}{3} \div \frac{3}{4}$?"
- "What patterns are you noticing? Do you think these patterns will always be true?" **(MTR.5.1)**

Unit 4
Lesson
11

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.1.1, MTR.2.1, MTR.5.1

Swap Meet

Let's solve division problems using different strategies.

Warm-Up

1. Write a division expression to represent each question. Then answer the question.

Question	Division Expression	Answer
How many groups of $2\frac{1}{3}$ are in 21?	$21 \div 2\frac{1}{3}$	*Work varies.* $21 \div \frac{7}{3} = 21 \cdot \frac{3}{7} = \frac{63}{7} = 9$
How many groups of 21 are in $2\frac{1}{3}$?	$2\frac{1}{3} \div 21$	*Work varies.* $\frac{7}{3} \div 21 = \frac{7}{3} \cdot \frac{1}{21} = \frac{7}{63} = \frac{1}{9}$

Accelerated 6 | Unit 4 Lesson 11 358 Warm-Up

Pairs | 13 min

Activity 1 Match and Solve

Purpose: Students choose expressions to represent questions and use a variety of fraction operations to determine the answers.

1 Launch

Direct students' attention to Problem 2 and invite a student to read the situation out loud. Invite students to approximate a potential solution to the situation before solving it completely.

Distribute a set of the Activity 1 Cards to each pair, then read the instructions for the card sort at the top of the Student Edition page.

2 Monitor

A **Accessibility: Executive Functioning** Chunk this activity into more manageable parts by inviting students to choose any one of the problem scenarios to think about first.

Capture strategies and explanations to share during the Connect.

D **Differentiation**

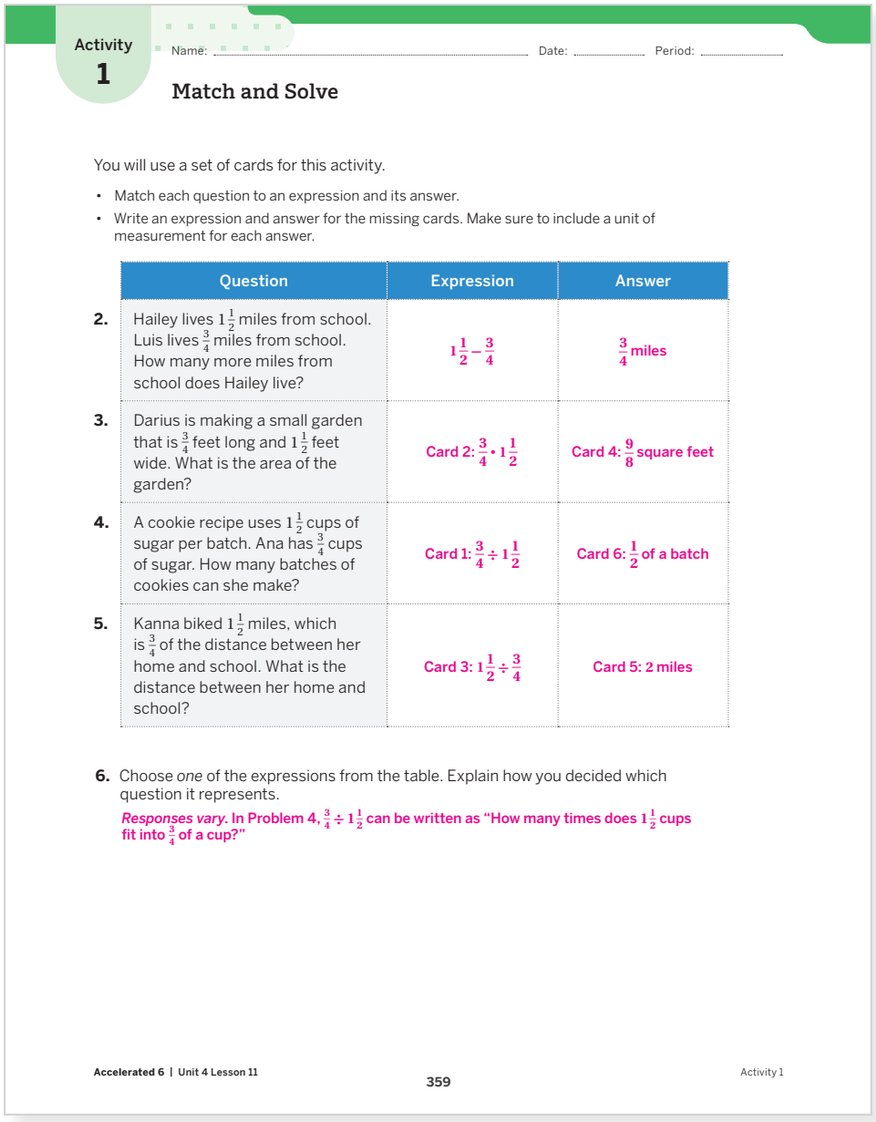
Look for students who:	Respond to Student Thinking
Model the scenario with an incorrect expression.	**Support** Invite students to model a similar problem with integers first.
Notice a relationship between the questions, expressions, and answers.	**Strengthen** Encourage students to extend the relationship to a pattern. **(MTR.5.1)**
Show the meaning of the quantities in the answer column and make note of patterns.	**Stretch** Invite these students to share during the Connect. Consider asking, "Can you write a new question, expression, and answer that involves these same numbers but uses a different operation and/or has a different answer?"

3 Connect

Direct students' attention to Problems 4–5 in the Student Edition.

Consider asking:

- "How did you decide what the dividend and divisor was in each of these situations?" **(MTR.1.1)**
- "Which problem is asking 'How many in one group?'" Problem 5 is asking what the total distance is from home to school, which is the one group, so $1\frac{1}{2}$ is the dividend.
- "Which is asking 'How many groups?'" Problem 4 is asking how many batches of cookies she can make, which is how many groups, so $1\frac{1}{2}$ is the divisor.



Activity 1

Name: _____ Date: _____ Period: _____

Match and Solve

You will use a set of cards for this activity.

- Match each question to an expression and its answer.
- Write an expression and answer for the missing cards. Make sure to include a unit of measurement for each answer.

	Question	Expression	Answer
2.	Hailey lives $1\frac{1}{2}$ miles from school. Luis lives $\frac{3}{4}$ miles from school. How many more miles from school does Hailey live?	$1\frac{1}{2}-\frac{3}{4}$	$\frac{3}{4}$ miles
3.	Darius is making a small garden that is $\frac{3}{4}$ feet long and $1\frac{1}{2}$ feet wide. What is the area of the garden?	Card 2: $\frac{3}{4}\cdot 1\frac{1}{2}$	Card 4: $\frac{9}{8}$ square feet
4.	A cookie recipe uses $1\frac{1}{2}$ cups of sugar per batch. Ana has $\frac{3}{4}$ cups of sugar. How many batches of cookies can she make?	Card 1: $\frac{3}{4}\div 1\frac{1}{2}$	Card 6: $\frac{1}{2}$ of a batch
5.	Kanna biked $1\frac{1}{2}$ miles, which is $\frac{3}{4}$ of the distance between her home and school. What is the distance between her home and school?	Card 3: $1\frac{1}{2}\div\frac{3}{4}$	Card 5: 2 miles

6. Choose *one* of the expressions from the table. Explain how you decided which question it represents.

Responses vary. In Problem 4, $\frac{3}{4}\div 1\frac{1}{2}$ can be written as "How many times does $1\frac{1}{2}$ cups fit into $\frac{3}{4}$ of a cup?"

Accelerated 6 | Unit 4 Lesson 11 359 Activity 1

Whole Class | 17 min

Activity 2 Write, Trade, Solve!

Purpose: Students write their own questions to represent fraction operations and answer their classmates' questions using the strategies they have learned in this unit. **(MTR.2.1)**

Short on time? Consider solving a few partner questions as a class instead of having the class trade with one another.

1 Launch

To generate excitement, consider asking, "If you could write a math question about multiplying and dividing fractions, what would the situation be about?"

Distribute one index card or slip of paper to each student. Consider modeling the first part of the activity (choosing an expression, writing a question on the slip of paper or index card, and then answering it in the Student Edition).

Invite students to write and answer their own question.

2 Monitor

Accessibility: Executive Functioning To support students who would benefit from more processing time, provide options of questions (without numbers) that students can choose from instead of crafting their own.

Look for a variety of student thinking.

Differentiation

Look for students who:	Respond to Student Thinking
Think they do not have enough information to write a question.	**Support** Encourage them to think about different situations from this unit (baking, flower planters, garden bricks, etc.) and how they can use those contexts in their question.
Evaluate the expression incorrectly.	**Support** Invite students to reference anchor charts from throughout the unit and pick a strategy that would be helpful for solving the expression they selected.
Interpret their question by answering "How many groups?" or "How many in each group?" to make sense of quantities and their relationships.	**Stretch** Invite them to solve their problem using another strategy to confirm that their solution makes sense. Encourage them to relate their answer back to the situation. **(MTR.2.1)**

Activity 2 continued >

Activity 2

Name: _____ Date: _____ Period: _____

Write, Trade, Solve!

A. $1\frac{1}{2} \div 3$	B. $\frac{5}{6} \cdot \frac{2}{3}$	C. $5 \div \frac{1}{4}$	D. $\frac{2}{5} \div \frac{9}{2}$	E. $4\frac{1}{2} \cdot \frac{1}{3}$
F. $\frac{3}{4} \div 1\frac{1}{2}$	G. $\frac{5}{6} \div \frac{2}{3}$	H. $5 \div \frac{3}{4}$	I. $\frac{9}{2} \div \frac{2}{5}$	J. $4\frac{1}{2} \div \frac{1}{3}$

7. Circle an expression from the table.

Responses vary.

8. On a separate sheet, write a question that can be answered by the expression you chose.

Responses vary. A gardener has enough potting soil to cover a planter with an area of $1\frac{1}{2}$ square meters. If one side of the planter is 3 meters, how long is the other side?

9. Calculate the value of your expression and answer your question. Show your thinking. (Don't write any of this on the sheet of paper!)

a. Expression: *Responses vary.*

b. Value of expression:

A. $\frac{1}{2}$ (or equivalent)	B. $\frac{5}{9}$ (or equivalent)	C. 20	D. $\frac{4}{45}$ (or equivalent)	E. $\frac{3}{2}$ (or equivalent)
F. $\frac{1}{2}$ (or equivalent)	G. $\frac{5}{4}$ (or equivalent)	H. $\frac{20}{3}$ (or equivalent)	I. $\frac{45}{4}$ (or equivalent)	J. $\frac{27}{2}$ (or equivalent)

Work varies.

$$1\frac{1}{2} \div 3 = \frac{3}{2} \div 3$$
$$= \frac{3}{2} \cdot \frac{1}{3}$$
$$= \frac{3}{6}$$
$$= \frac{1}{2}$$

c. Answer to your question (include units):

Responses vary. The width of the planter is $\frac{1}{2}$ of a meter.

Accelerated 6 | Unit 4 Lesson 11 360 Activity 2

Whole Class | 17 min

Activity 2 Write, Trade, Solve! (continued)

Purpose: Students write their own questions to represent fraction operations and answer their classmates' questions using the strategies they have learned in this unit. **(MTR.2.1)**

Short on time? Consider solving a few partner questions as a class instead of having the class trade with one another.

2 Monitor

Pause briefly and invite a student to read the instructions for the partner trade activity.

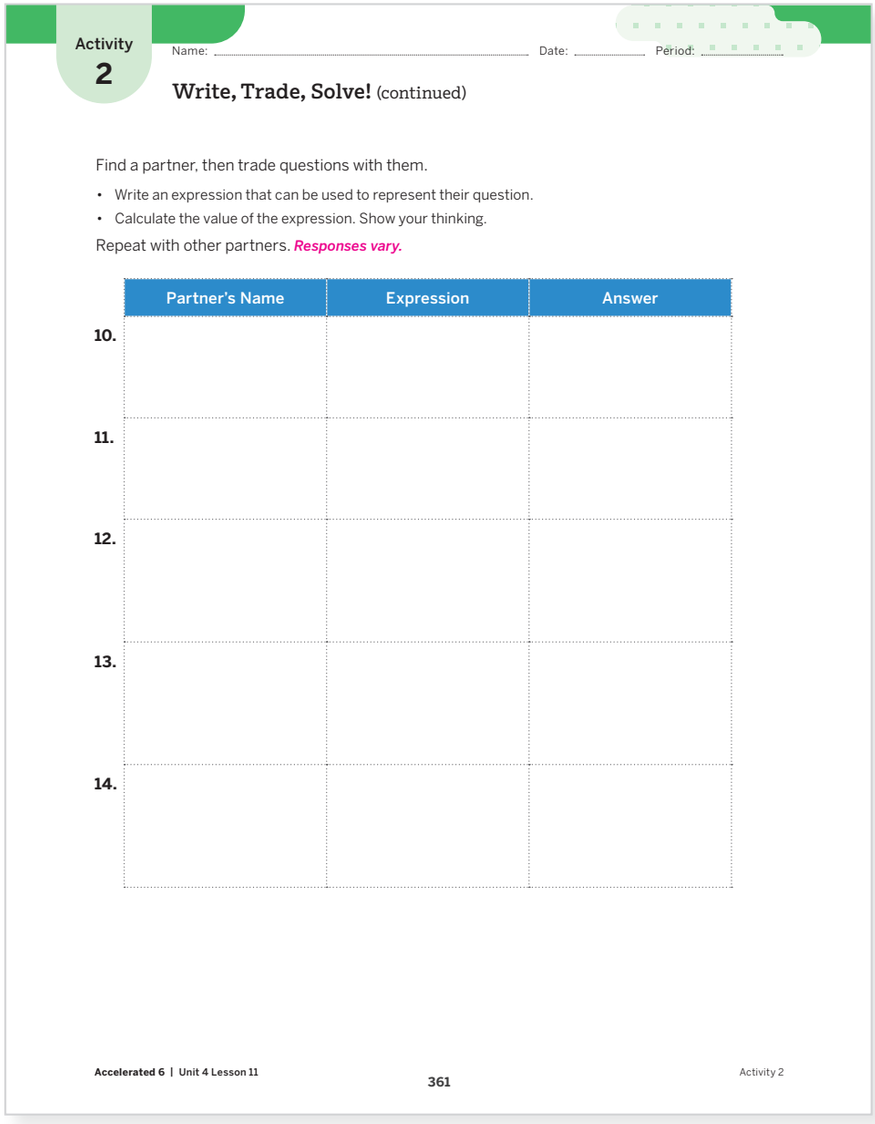
Invite students to find a partner to trade questions with, before writing an expression and answer for their partner's question in the table in their Student Edition. Repeat as many times as time allows.

To support students getting started, invite them to read their partner's question and then identify what is known and what is unknown in the situation.

D **Differentiation: (Stretch)** If students finish early, invite them to write another scenario, making it as creative as they possibly can. Invite them to post the creative problem in the classroom as a "challenge option" for their classmates throughout the rest of the unit.

3 Connect

To surface the Key Takeaway, consider asking, "What clues helped you determine what expression to write for each question?" **(MTR.1.1)**



Activity 2

Name: _____ Date: _____ Period: _____

Write, Trade, Solve! (continued)

Find a partner, then trade questions with them.

- Write an expression that can be used to represent their question.
- Calculate the value of the expression. Show your thinking.

Repeat with other partners. ***Responses vary.***

	Partner's Name	Expression	Answer
10.			
11.			
12.			
13.			
14.			

Accelerated 6 | Unit 4 Lesson 11 361 Activity 2

Key Takeaway: Sometimes it is not obvious whether a division problem involves determining the number of groups or the size of one group. The problem needs to be carefully analyzed in order to determine what is known and what is unknown to write and solve an accurate expression.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that analyzing a division problem and creating a model that connects the situation with the division expression helps determine the answer.

Invite students to respond independently, and then share their thinking with a partner.

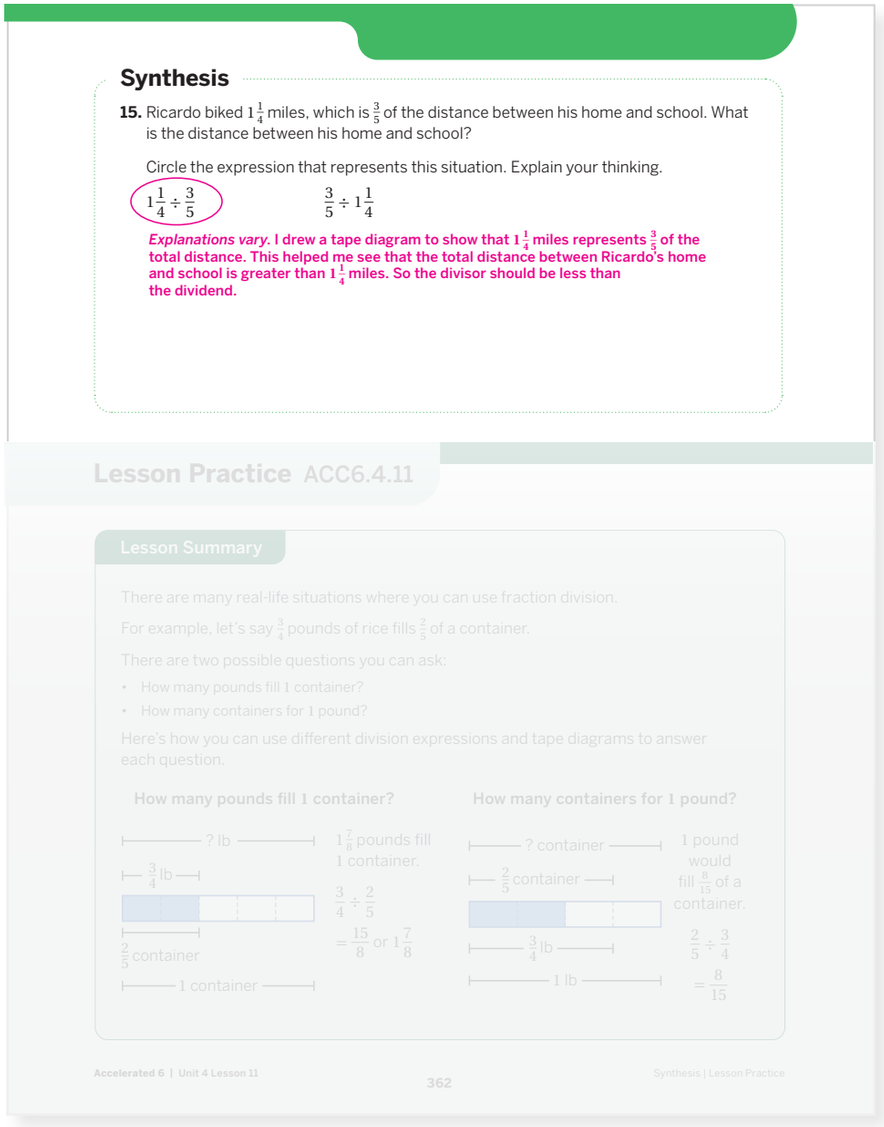
Capture and share a variety of ideas, such as:

- You can draw a tape diagram to help choose the correct expression.
- You can determine what is known and what is unknown.
- You can ask yourself if this question is looking for "How many groups?" or "How many in 1 group?"
- You can solve each equation and see which answer makes sense.

Consider asking:

- "What is alike and what is different about these two expressions?"
- "How can you determine when the unknown in a question is referring to the size of one group or the number of groups?"

MLR **MLR2: Collect and Display** Use this routine to collect students' ideas as they share their thinking. Display for students to reference and add to for the rest of the unit.



Synthesis

15. Ricardo biked $1\frac{1}{4}$ miles, which is $\frac{3}{5}$ of the distance between his home and school. What is the distance between his home and school?

Circle the expression that represents this situation. Explain your thinking.

$1\frac{1}{4} \div \frac{3}{5}$ $\quad\quad$ $\frac{3}{5} \div 1\frac{1}{4}$

Explanations vary. I drew a tape diagram to show that $1\frac{1}{4}$ miles represents $\frac{3}{5}$ of the total distance. This helped me see that the total distance between Ricardo's home and school is greater than $1\frac{1}{4}$ miles. So the divisor should be less than the dividend.

Lesson Practice ACC6.4.11

Lesson Summary

There are many real-life situations where you can use fraction division.

For example, let's say $\frac{3}{4}$ pounds of rice fills $\frac{2}{5}$ of a container.

There are two possible questions you can ask:

- How many pounds fill 1 container?
- How many containers for 1 pound?

Here's how you can use different division expressions and tape diagrams to answer each question.

How many pounds fill 1 container?

? lb; $\frac{3}{4}$ lb; $\frac{2}{5}$ container; 1 container

$1\frac{7}{8}$ pounds fill 1 container.

$\frac{3}{4} \div \frac{2}{5} = \frac{15}{8}$ or $1\frac{7}{8}$

How many containers for 1 pound?

? container; $\frac{2}{5}$ container; $\frac{3}{4}$ lb; 1 lb

1 pound would fill $\frac{8}{15}$ of a container.

$\frac{2}{5} \div \frac{3}{4} = \frac{8}{15}$

Accelerated 6 | Unit 4 Lesson 11 362 Synthesis | Lesson Practice

Lesson Takeaway: Analyzing problems in terms of what is known and what is unknown helps determine the expressions that would solve them. Once the expression is written, several strategies can be used to determine the answer.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of dividing with fractions by choosing an expression and using it to determine the unknown in a division problem.

Today's Goals

1. **Goal:** Write division expressions to represent problems in context.
2. **Language Goal:** Write questions asking "How many groups?" or "How many in 1 group?" to represent division expressions. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.11

A recipe calls for $\frac{5}{4}$ pounds of chocolate chips. Chocolate chips come in $\frac{2}{3}$-pound bags. How many bags do you need?

a. Circle the expression that represents this situation. Explain your thinking.

$\frac{5}{4} \div \frac{2}{3}$ $\quad$ $\frac{2}{3} \div \frac{5}{4}$

Explanations vary. I need to determine how many times $\frac{2}{3}$ fits into $\frac{5}{4}$ to know how many $\frac{2}{3}$-pound bags of chocolate chips I'll need for the recipe.

b. Calculate the value of the expression you selected. Show your thinking.

$\frac{15}{8}$ (or equivalent). *Work varies.*

$\frac{5}{4} \cdot \frac{3}{2} = \frac{15}{8}$

Note: Students may write they need 2 bags of chocolate chips for the recipe since you can't buy a fractional bag of chocolate chips.

D Differentiation Use after Lesson 11

Support

Provide targeted intervention for students by using these resources.

If students need support dividing mixed numbers:

» **Respond to Student Thinking:**

- Revisit **Lesson 10, Show What You Know** before Lesson 12.
- Revisit **Lessons 3–4**, and **6**, which explore contexts related to cookies, recipes, planters, and bricks.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

How did students tap into their creativity today when writing division situations? How did you recognize and encourage students' creativity?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

15. Ricardo biked $1\frac{1}{4}$ miles, which is $\frac{3}{5}$ of the distance between his home and school. What is the distance between his home and school?

Circle the expression that represents this situation. Explain your thinking.

$1\frac{1}{4} \div \frac{3}{5}$ $\quad\quad$ $\frac{3}{5} \div 1\frac{1}{4}$

Explanations vary. I drew a tape diagram to show that $1\frac{1}{4}$ miles represents $\frac{3}{5}$ of the total distance. This helped me see that the total distance between Ricardo's home and school is greater than $1\frac{1}{4}$ miles. So the divisor should be less than the dividend.

Lesson Practice ACC6.4.11

Lesson Summary

There are many real-life situations where you can use fraction division.

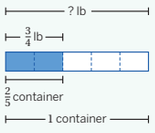
For example, let's say $\frac{3}{4}$ pounds of rice fills $\frac{2}{5}$ of a container.

There are two possible questions you can ask:

- How many pounds fill 1 container?
- How many containers for 1 pound?

Here's how you can use different division expressions and tape diagrams to answer each question.

How many pounds fill 1 container?

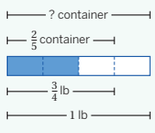


$1\frac{7}{8}$ pounds fill 1 container.

$\frac{3}{4} \div \frac{2}{5}$

$= \frac{15}{8}$ or $1\frac{7}{8}$

How many containers for 1 pound?



1 pound would fill $\frac{8}{15}$ of a container.

$\frac{2}{5} \div \frac{3}{4}$

$= \frac{8}{15}$

Lesson Practice ACC6.4.11

Name: _____ Date: _____ Period: _____

Problems 1–4: Use any strategy to calculate each quotient.

1. $2\frac{1}{2} \div \frac{5}{8} = 4$

2. $\frac{4}{3} \div \frac{5}{2} = \frac{8}{15}$

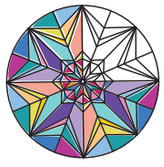
3. $3\frac{1}{2} \div \frac{1}{3} = 10\frac{1}{2}$ (or equivalent)

4. $3 \div \frac{2}{3} = 4\frac{1}{2}$ (or equivalent)

5. Write a situation that could be represented by the expression $3 \div \frac{2}{3}$. Explain what the quotient means in your situation.

Responses and explanations vary. 3 small bottles of water fill $\frac{2}{3}$ of my giant water bottle. How many small bottles do I need to completely fill the giant water bottle? $3 \div \frac{2}{3} = 4\frac{1}{2}$, which means I need $4\frac{1}{2}$ small water bottles to fill the giant water bottle to the top.

6. Elena has 5 tubes of blue glass paint to color her window. She used 4 tubes to paint $\frac{3}{4}$ of the window. Does she have enough blue paint to completely color her window? Show or explain your thinking.



No. *Work varies.* $4 \div \frac{3}{4} = 4 \cdot \frac{4}{3} = \frac{16}{3} = 5\frac{1}{3}$. She needs 6 tubes.

7. Engineers designed superchargers to decrease the amount of time needed to charge the battery of an electric car. A supercharger can charge $\frac{3}{4}$ of a car's battery in 25 minutes. What fraction of the battery gets charged every 5 minutes? Show or explain your thinking.

$\frac{3}{20}$. *Work varies.* Every 5 minutes, $\frac{3}{4} \div 5 = \frac{3}{20}$ of the car's battery gets charged.

Lesson Practice ACC6.4.11

Name: _____ Date: _____ Period: _____

FAST Practice

8. A recipe requires $1\frac{1}{3}$ cups of flour for every batch of cookies. Write and evaluate an expression to find how many full batches of cookies can be made with $6\frac{3}{4}$ cups of flour.

Expression: $6\frac{3}{4} \div 1\frac{1}{3}$

Solution: $5\frac{1}{16}$ (or equivalent)

Number of full batches: 5

Spiral Review

Problems 9–10: Ethan works as a server in a restaurant. He gets a 15% tip on the cost of every order.

9. What tip would he get if the order costs $50?

$7.50

10. Ethan got a $9 tip. What was the cost of the order?

$60

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–4	1	MA.6.NSO.2.2
	5–7	2	MA.6.NSO.2.3
FAST Practice	8	2	MA.6.NSO.2.3
Spiral Review			
	9–10	2	MA.6.AR.3.4

Assess and Respond

Sub-Unit Quiz 1 & 2

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Interpreting tape diagrams as multiplication or division expressions	Lessons 2, 4	1	MA.6.NSO.2.2
2	Estimating the value of quotients of fractions using the structure of division expressions	Lessons 3, 6	1	MA.6.NSO.2.2, MTR.5.1
3	Calculating quotients of fractions	Lesson 5, 6, 7	1	MA.6.NSO.2.2
4	Solving problems in context involving division of fractions by fractions	Lessons 8, 11	2	MA.6.NSO.2.3, MTR.7.1
5a	Creating contexts that represent division expressions involving fractions	Lessons 8,11	2	MA.6.NSO.2.3, MTR.7.1
5b	Calculating quotients and interpreting them in context	Lesson 8, 11	3	MA.6.NSO.2.3, MTR.6.1, MTR.7.1

Assessment Resources

- Student Assessments
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

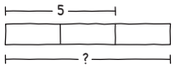
- Mini-Lessons
- Extensions

Name: Date: Period:

Sub-Unit Quiz

Unit 4

1. Select *all* the representations that match this tape diagram.



- ☑ A. $5 \div \frac{2}{3} = ?$
- ☐ B. $? \div \frac{2}{3} = 5$
- ☐ C. $5 \div 3 = ?$
- ☑ D. $\frac{2}{3} \cdot ? = 5$
- ☐ E. $3 \cdot ? = 5$

2. Select *all* the expressions with a quotient that is greater than 1.

- ☑ A. $2 \div \frac{3}{4}$
- ☐ B. $\frac{3}{4} \div 2$
- ☑ C. $\frac{3}{4} \div \frac{1}{2}$
- ☐ D. $\frac{1}{4} \div \frac{3}{2}$
- ☐ E. $\frac{3}{2} \div 4$

3. Determine the value of each expression.

a. $\frac{2}{5} \div 4 = \frac{1}{10}$ (or equivalent)

b. $1\frac{1}{2} \div \frac{3}{8} = 4$

c. $\frac{3}{4} \div \frac{1}{3} = \frac{9}{4}$ (or equivalent)

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Name: Date: Period:

Sub-Unit Quiz (continued)

Unit 4

4. a. Sai wants to make barbecue chicken. Each serving uses $\frac{2}{3}$ of a pound of chicken.

Sai has $4\frac{1}{3}$ pounds of chicken. How many servings can Sai make if he uses all the chicken?

$6\frac{1}{2}$ servings (or equivalent)

b. Sai wants to make a large pot of soup. $\frac{3}{5}$ of the pot will fill 15 bowls.

How many bowls will 1 pot of soup fill?

25 bowls

5. a. Describe a situation that could be represented by the expression $5 \div \frac{3}{4}$.

Responses vary.
- Cameron uses a $\frac{3}{4}$-cup scoop to feed the dog. How many scoops of dog food can he get out of a 5-cup bag?
- I've walked for 5 minutes and I'm $\frac{3}{4}$ of the distance to school. How long will my whole walk take?

b. Determine the value of $5 \div \frac{3}{4}$ and explain what it means in your situation.

$6\frac{2}{3}$. *Explanations vary.*
- $6\frac{2}{3}$ is the number of scoops of dog food in the bag.
- My whole walk to school will take $6\frac{2}{3}$ minutes.

D Differentiation (Sub-Unit Quiz 1 & 2)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:

Sub-Unit 1:
• Create and interpret diagrams that represent multiplying whole numbers by fractions.
	1	**Support**
		• **Mini-Lesson:** *Multiplying Fractions*
		• **Teacher Move:** Consider revisiting:
		  • Lesson 1 (*Modeling Products*)
		  • Lesson 2 (*Mixing it Up*)
		Strengthen
		• Revisit **Activity 3** in Lesson 1 (*Modeling Products*)

Sub-Unit 2: • Create and interpret diagrams that represent dividing whole numbers by fractions. • Analyze diagrams that represent dividing by fractions. • Use a variety of strategies to calculate quotients of fractions. • Solve problems that involve dividing fractions. **(Lessons 3–11)**	1	**Support** **Strengthen** • **Mini-Lesson:** *Determining How Many in Each Group* • **Teacher Move:** Consider revisiting Lesson 4 (*Flour Planters*)

	2	**Support**
		Strengthen
		• **Teacher Move:** Consider revisiting:
		  • Lesson 3 (*Flour Planner*)
		  • Lesson 6 (*Fill the Gap*)

	3	**Support**
		Strengthen
		• **Mini-Lesson:** *Dividing Fractions Using Common Denominators*
		• **Teacher Move:** Consider revisiting:
		  • Lesson 5 (*Garden Bricks*)
		  • Lesson 6 (*Fill the Gap*)
		  • Lesson 7 (*Break it Down*)
		Stretch
		• **You're invited to explore more:** Lesson 5 (*Garden Bricks*)

	4, 5	**Support**
		Strengthen
		• **Teacher Move:** Consider revisiting:
		  • Lesson 8 (*Potting Soil*)
		  • Lesson 11 (*Swap Meet*)
		Stretch
		• **Teacher Move:** Consider revisiting Activity 2 in Lesson 11 (*Swap Meet*)

Sub-Unit 3

Area and Volume With Fractions

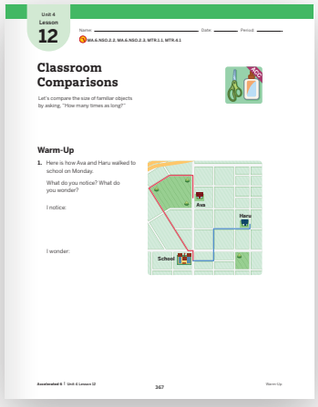
Sub-Unit 3 Goals

- **Goal:** Use division of fractions to compare lengths.
- **Goal:** Solve problems about areas and volumes with fractional dimensions.
- **Language Goal:** Analyze strategies for solving problems involving fractional lengths using mathematically precise language.

In this sub-unit, students use division and multiplication to solve problems about areas and volumes with dimensions that are fractions.

Math that Matters Most

Concept or Skill	For example . . .
Use fraction division to solve problems about comparing lengths.	**How many times longer is the second song than the first song?** $3\frac{3}{4} \div 1\frac{1}{2} = ?$ $= \frac{15}{4} \cdot \frac{2}{3}$ $= \frac{30}{12}$ or $2\frac{1}{2}$ The second song is $2\frac{1}{2}$ times as long as the first song. **What fraction of the second song is the first song?** $1\frac{1}{2} \div 3\frac{3}{4} = ?$ $= \frac{6}{4} \div \frac{15}{4}$ $= \frac{6}{15}$ or $\frac{2}{5}$ The first song is $\frac{2}{5}$ as long as the second song.
Use division to solve for unknown lengths in problems involving areas of polygons with fractional side lengths.	$89\frac{1}{4} \div 10\frac{1}{2} = 8\frac{1}{2}$ The missing side length is $8\frac{1}{2}$ inches. $10\frac{1}{2}$ in. ? $89\frac{1}{4}$ in.^{2}
Calculate the volume of a rectangular prism with fractional edge lengths.	Volume $= 4 \cdot \frac{3}{2} \cdot \frac{1}{2} = 3$ cubic units $\frac{3}{2}$ 4 $\frac{1}{2}$



Classroom Comparisons

Comparing Fractional Lengths

Let's compare the size of familiar objects by asking, "How many times as long?"

Learning Outcomes

Today's Goals

1. **Goal:** Use fraction division to solve problems about comparing lengths.
2. **Language Goal:** Interpret a division expression as a question asking, "How many times as long?" **(Reading, Writing, Speaking, and Listening)**

Students make sense of multiplicative comparisons by writing division equations to compare objects and distances with fractional lengths. They choose their strategies and representations for questions asking, "How many times as long?" **(MTR.1.1)**

Coherence

Prior Learning

In Lesson 11, students applied the strategies they used in Lessons 3–10 to answer problems involving fraction division. They represented situations with expressions and created their own situations to match given expressions.

Future Learning

In Lesson 13, students will apply multiplication and division of fractions to calculate the areas of the rectangles with fractional edge lengths. In Lessons 14–15, students will multiply fractions to find volumes and design planters.

Connections

- Students draw on their school experiences (such as route taken to school, various school supplies) to investigate fractional lengths. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2
MA.5.FR.2.4	MA.7.NSO.2.3
MA.5.AR.1.2	
MA.5.AR.1.3	

Lesson at a Glance

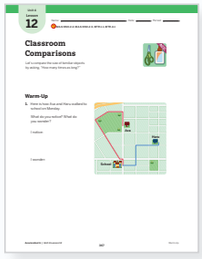
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

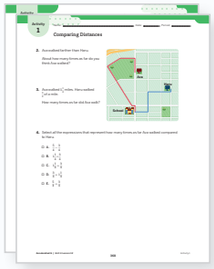
Students use the **Notice and Wonder** routine to analyze paths to school and discuss the differences between the questions "How much longer?" and "How many times longer?" **(MTR.4.1)**



Activity 1

Pairs | 15 min

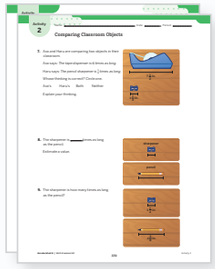
Students surface connections between fraction division and comparing lengths or distances. **(MTR.1.1)**



Activity 2

Pairs | 15 min

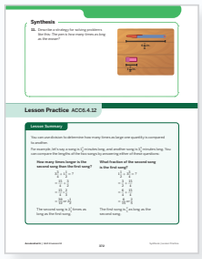
Students practice fraction division by comparing the lengths of classroom objects.
Routine: **Decide and Defend**



Synthesis

Whole Class | 5 min

Students synthesize their understanding that division helps determine how many times as long one object is compared to another.
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by writing and evaluating an expression for a multiplicative comparison scenario involving fractional lengths.

Prep Checklist

Prepare Activity 2 Sheets

This lesson includes:

- Student Edition
- Show What You Know
- Activity 2 Sheet, one per group
- Coloring tools (*optional*)
- Classroom objects (*optional*)

Pairs | 5 min

Warm-Up

Purpose: Students use the Notice and Wonder routine to analyze paths to school and discuss the differences between the questions "How much longer?" and "How many times longer?" **(MTR.4.1)**

1 Launch

To surface connections, consider asking, "Is there somewhere you like to walk to often? How do you choose which path you will take?"

Use the Notice and Wonder routine to promote curiosity and help students make sense of the context. **(MTR.1.1, MTR.4.1)**

2 Connect

Invite students to share by polling the class to determine who walked more.

Create a record of questions students ask about Ava and Haru's paths, such as:

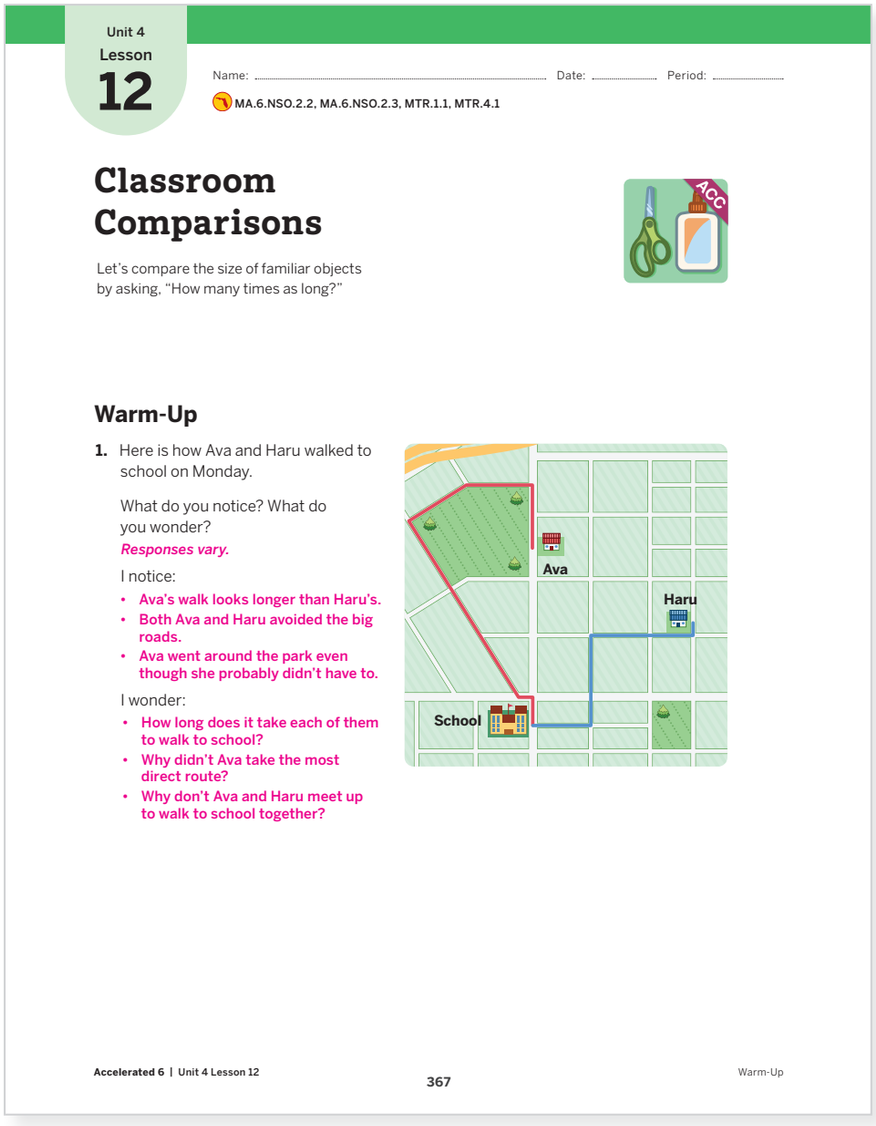
- "Who walked more?"
- "How much farther did Ava walk?"
- "How many times as far as Haru did Ava walk?"
- "What fraction of Ava's distance did Haru walk?"

ELL **English Language Learners** Create a list of words about the situation that students might not know, along with visuals or translations of each word in languages used by your students (words like *farther*, *how many times*, *what fraction*, etc.). **(Reading and Listening)**

To surface the Key Takeaway, consider asking:

- "If Ava walked 30 feet and Haru walked 10 feet, how much farther did Ava walk?"
- "How many times as far as Haru did Ava walk?"
- "What fraction of Ava's distance did Haru walk?"
- "How are these questions alike/different?"
- "How can we write expressions for each of these questions?"

Consider sharing that both questions are important, but today we'll be talking about "How many times as far?" questions.



Unit 4
Lesson
12

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.2, MA.6.NSO.2.3, MTR.1.1, MTR.4.1

Classroom Comparisons

Let's compare the size of familiar objects by asking, "How many times as long?"

Warm-Up

1. Here is how Ava and Haru walked to school on Monday.

   What do you notice? What do you wonder?

   Responses vary.

   I notice:
   - Ava's walk looks longer than Haru's.
   - Both Ava and Haru avoided the big roads.
   - Ava went around the park even though she probably didn't have to.

   I wonder:
   - How long does it take each of them to walk to school?
   - Why didn't Ava take the most direct route?
   - Why don't Ava and Haru meet up to walk to school together?

Accelerated 6 | Unit 4 Lesson 12 367 Warm-Up

Key Takeaway: Different questions can be asked to compare lengths. A subtraction expression helps to answer "How much farther/longer?", and a division expression helps to answer "How many times farther/longer?"

Pairs | 15 min

Activity 1 Comparing Distances

Purpose: Students surface connections between fraction division and comparing lengths or distances. **(MTR.1.1)**

1 Launch

To generate excitement, consider asking students to help demonstrate the concept of "How many times as far?" Invite Student A to take a few steps. Then invite Student B to walk twice as far, Student C to walk three times as far, and Student D to walk $1\frac{1}{2}$ times as far. **(MTR.1.1)**

Invite students to make their estimates, then consider asking, "What information do we need to figure out precisely how many times as far Ava walked?"

Note: Emphasize the range of student responses in this problem. It's okay — even desirable — to lack consensus at this stage. The activity will build toward consensus in the next problem, where students will get actual measurements.

2 Monitor

Encourage students to compare their responses with a partner. **(MTR.1.1)**

A **Accessibility: Conceptual Processing** To support students as they reason about language, invite them to swap out the fractions with whole numbers, keeping Ava's distance greater than Haru's. Consider asking, "Will the answer to the question be less than 1, greater than 1, or equal to 1? Why?"

Pause briefly and invite students to share their responses. Spend adequate time to ensure students can explain why both $1\frac{1}{4} \div \frac{3}{4}$ and $\frac{5}{4} \div \frac{3}{4}$ are correct. **(MTR.4.1)**

Share an incorrect answer and consider asking, "Could this expression answer 'How many times as far?' How do you know?"

Activity 1 continued >

Activity 1

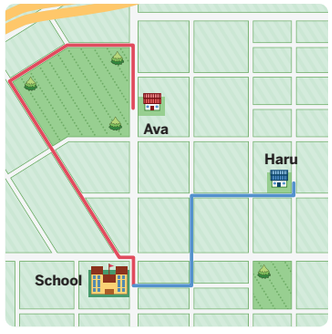
Name: _____ Date: _____ Period: _____

Comparing Distances

2. Ava walked farther than Haru.

About how many times as far do you think Ava walked?

Responses vary.



3. Ava walked $1\frac{1}{4}$ miles. Haru walked $\frac{3}{4}$ of a mile.

How many times as far did Ava walk?

$\frac{5}{3}$ times as far as Haru.

Note: Responses between 1.66 and 1.67 are considered correct.

4. Select *all* the expressions that represent how many times as far Ava walked compared to Haru.

- ☐ A. $\frac{5}{4} - \frac{3}{4}$
- ☐ B. $1\frac{1}{4} \cdot \frac{3}{4}$
- ☑ C. $1\frac{1}{4} \div \frac{3}{4}$
- ☐ D. $\frac{3}{4} \div 1\frac{1}{4}$
- ☑ E. $\frac{5}{4} \div \frac{3}{4}$

Accelerated 6 | Unit 4 Lesson 12 368 Activity 1

Pairs | 15 min

Activity 1 Comparing Distances (continued)

Purpose: Students surface connections between fraction division and comparing lengths or distances. **(MTR.1.1)**

2 Monitor

A **Accessibility: Conceptual Processing** To check for understanding, consider asking, "What is your goal in creating a path? Where are you trying to get to?"

Select and sequence a variety of responses to share during the Connect.

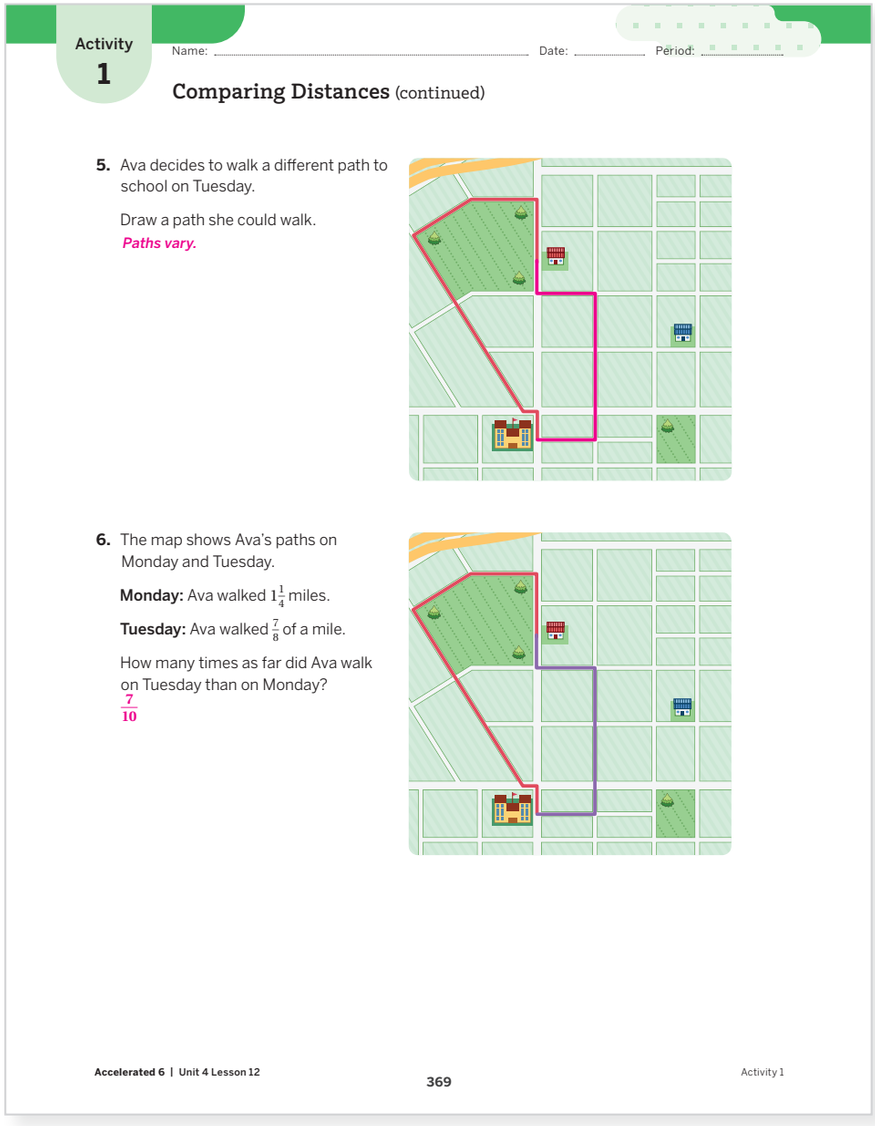
D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started. Reverse the dividend and divisor.	**Support** Invite them to swap out the fractions with whole numbers, while keeping Monday's distance longer. Consider asking, "Will this be less than 1, greater than 1, or equal to 1?"
Write a correct division expression but incorrectly divide the fractions.	**Strengthen** Consider asking, "What were some strategies we used to divide fractions?"
Write an accurate equation and solve it with precision, connecting their response back to the original problem.	**Strengthen** Invite them to share during the Connect. **Stretch** Encourage students to return to the previous problem and make a path they think will have a very different answer, then to return to this problem and check their thinking.

3 Connect

Invite students to share their paths and distances. Consider asking "How many times as far?" questions about these paths.

To surface the Key Takeaway, consider asking, "How can you determine how many times as far someone walked in two different instances?" **(MTR.4.1)**



Activity 1

Name: Date: Period:

Comparing Distances (continued)

5. Ava decides to walk a different path to school on Tuesday.

Draw a path she could walk.

Paths vary.

6. The map shows Ava's paths on Monday and Tuesday.

Monday: Ava walked $1\frac{1}{4}$ miles.

Tuesday: Ava walked $\frac{7}{8}$ of a mile.

How many times as far did Ava walk on Tuesday than on Monday?

$\frac{7}{10}$

Accelerated 6 | Unit 4 Lesson 12 369 Activity 1

Key Takeaway: To calculate how many times as far someone walked, create an expression where the original distance they walked is the divisor and the new distance of comparison is the dividend.

Pairs | 15 min

Activity 2 Comparing Classroom Objects

Purpose: Students practice fraction division by comparing the lengths of classroom objects.

Short on time? Consider having students complete two to three of the Repeated Challenges.

1 Launch

To surface connections, consider asking, "Have you ever seen a pencil sharpener or tape dispenser that looks like this?" If not, consider doing a brief online image search to give students concrete examples of what these objects look like.

Invite students to read the text aloud as a class before responding.

Invite students to share their responses, calling attention to any conflict or consensus you see.

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others. **(MTR.4.1)**

Consider asking, "How can both Ava and Haru be correct if their statements are different?"

2 Monitor

To support students getting started, consider asking, "Should the answer be greater than or less than 1? How do you know?" **(MTR.1.1)**

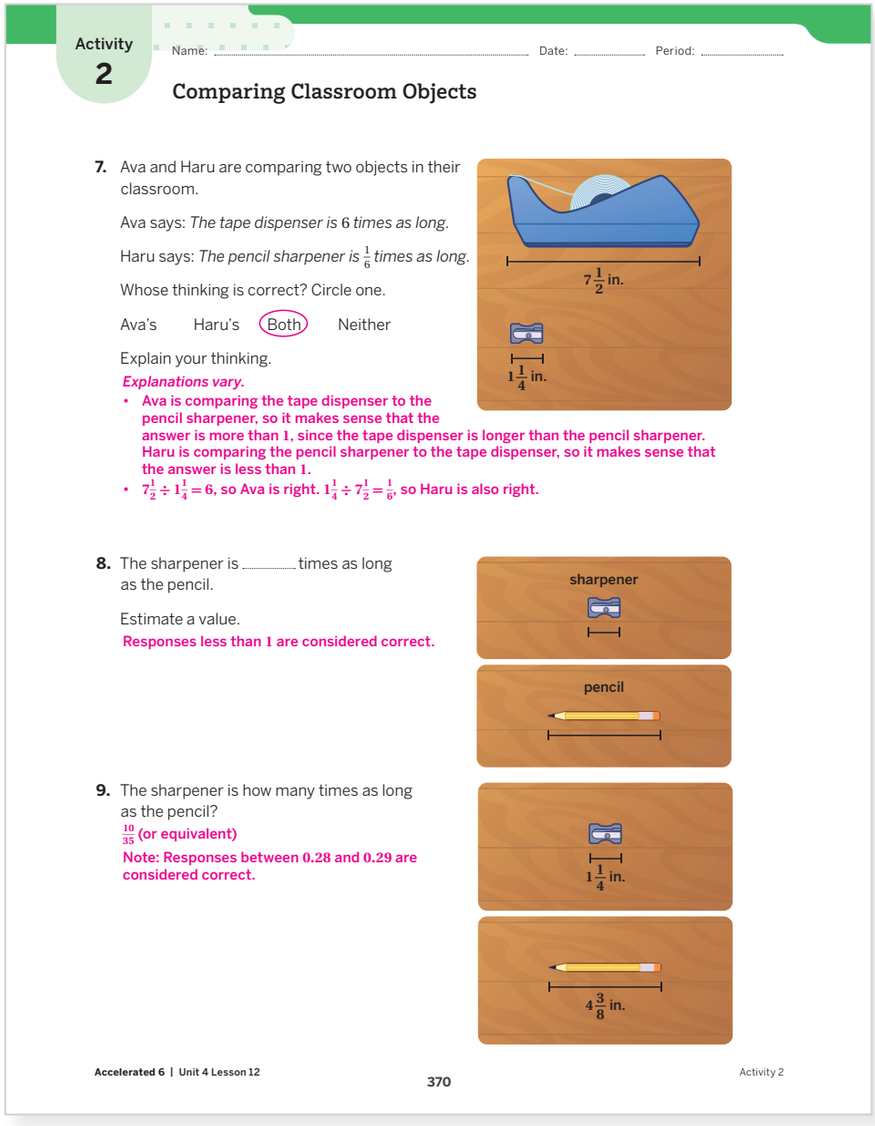
Encourage students to compare their estimates to their classmates', taking note of if both answers are greater than or less than 1.

A **Accessibility: Conceptual Processing** Use classroom objects, such as a pencil sharpener and a pencil, to demonstrate the situation described in this problem.

D **Differentiation: (Support)** Students may notice that the pencil is longer and estimate a value greater than 1. Consider asking, "Is this situation more similar to Ava's thinking or Haru's thinking in the previous problem?"

Encourage students to draw diagrams if it helps them with their thinking.

Activity 2 continued >



Activity 2

Name: Date: Period:

Comparing Classroom Objects

7. Ava and Haru are comparing two objects in their classroom.

Ava says: *The tape dispenser is 6 times as long.*

Haru says: *The pencil sharpener is $\frac{1}{6}$ times as long.*

Whose thinking is correct? Circle one.

Ava's Haru's Both Neither

Explain your thinking.

Explanations vary.

- Ava is comparing the tape dispenser to the pencil sharpener, so it makes sense that the answer is more than 1, since the tape dispenser is longer than the pencil sharpener. Haru is comparing the pencil sharpener to the tape dispenser, so it makes sense that the answer is less than 1.
- $7\frac{1}{2} \div 1\frac{1}{4} = 6$, so Ava is right. $1\frac{1}{4} \div 7\frac{1}{2} = \frac{1}{6}$, so Haru is also right.

8. The sharpener is ..... times as long as the pencil.

Estimate a value.

Responses less than 1 are considered correct.

9. The sharpener is how many times as long as the pencil?

$\frac{10}{35}$ (or equivalent)

Note: Responses between 0.28 and 0.29 are considered correct.

Accelerated 6 | Unit 4 Lesson 12 370 Activity 2

Pairs | 15 min

Activity 2 Comparing Classroom Objects (continued)

Purpose: Students practice fraction division by comparing the lengths of classroom objects.

Short on time? Consider having students complete two to three of the Repeated Challenges.

2 Monitor

Invite students to solve as many challenges as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly.

Consider distributing the optional Activity 2 Sheet. To support students getting started, consider asking, "Which two objects would you most like to have right now?"

A **Accessibility: Conceptual Processing** Consider reading the prompt aloud and inviting one or more students to paraphrase it in their own words.

Invite students to solve and compare their solutions to problems with a partner.

Look for student strategies, listen to small group discussions, and offer help or encouragement when needed.

ELL **English Language Learners** Provide sentence frames to help students explain their thinking (e.g., To figure out how many times longer one object is than another, first _____, then _____.). **(Reading, Writing, Speaking, and Listening)**

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while solving these challenges.

Activity 2

Name: _____ Date: _____ Period: _____

Comparing Classroom Objects (continued)

10. Here is a collection of classroom objects, along with their lengths (in inches).

Scissors	$6\frac{1}{4}$	Eraser	$1\frac{7}{8}$
Marker	$5\frac{5}{8}$	Stapler	5
Red Pen	$6\frac{7}{8}$	Pencil Sharpener	$1\frac{1}{4}$
Tape Dispenser	$7\frac{1}{2}$	Glue Bottle	$3\frac{1}{8}$
Highlighter	$3\frac{3}{4}$	Calculator	$2\frac{1}{2}$
Large Pencil	$8\frac{1}{8}$	Small Pencil	$4\frac{3}{8}$

Choose pairs of objects to compare. Write an expression and a statement comparing their lengths. Solve as many challenges as you have time for!

Responses vary.

	Objects	Expression	Statement
a	large pencil and stapler	$8\frac{1}{8} \div 5$	The large pencil is $1\frac{5}{8}$ times as long as the stapler
b	_____ and _____		The _____ is _____ times as long as the _____
c	_____ and _____		The _____ is _____ times as long as the _____
d	_____ and _____		The _____ is _____ times as long as the _____

Accelerated 6 | Unit 4 Lesson 12 371 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding that division helps determine how many times as long one object is compared to another.

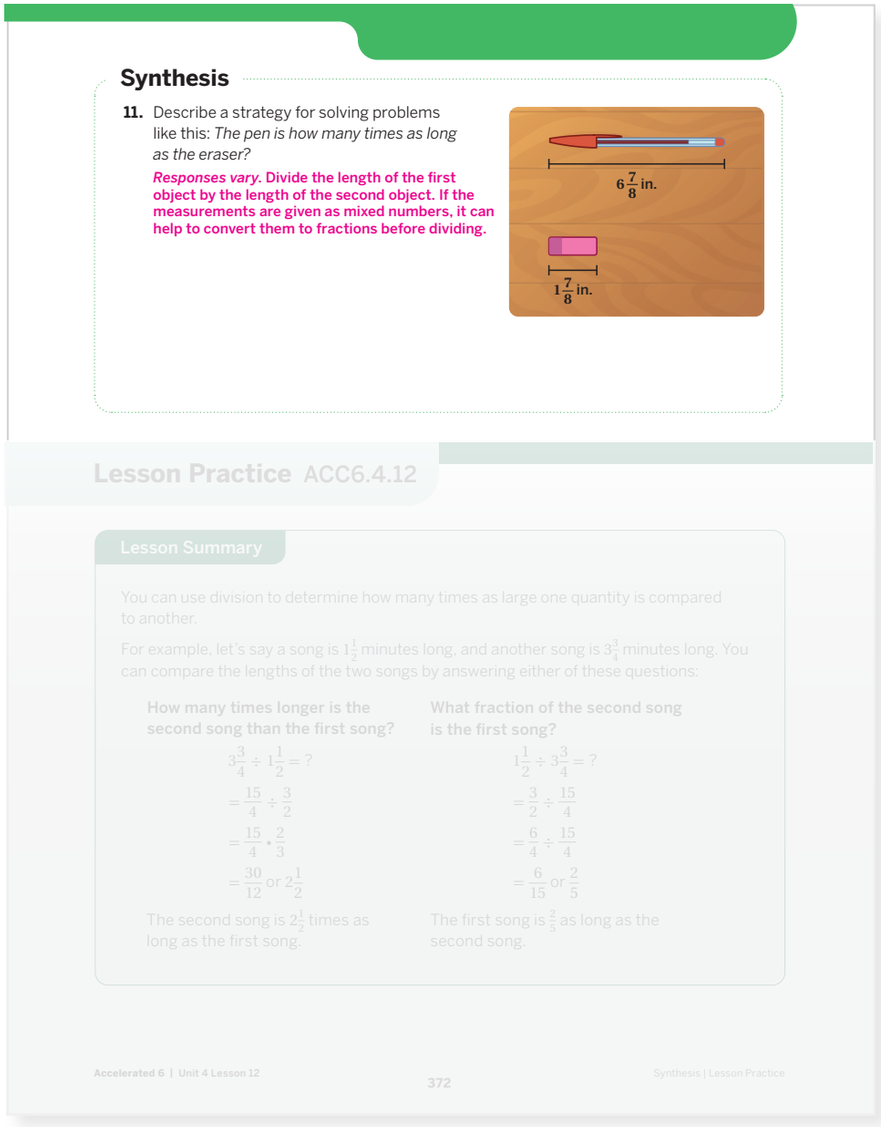
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Dividing the length of the first object by the length of the second object.
- Converting the mixed numbers to fractions before dividing.
- Writing the fractions with a common denominator and dividing the numerators by one another.
- Writing the division problem as a multiplication problem using the reciprocal.

Consider asking, "How do you decide which number is the divisor and which is the dividend?" The number that is the focus for the comparison is the dividend, and the one following the "times as long/many as" is the divisor.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they discuss with a partner. Display for students to reference and add to for the rest of the unit.



Synthesis

11. Describe a strategy for solving problems like this: *The pen is how many times as long as the eraser?*

Responses vary. Divide the length of the first object by the length of the second object. If the measurements are given as mixed numbers, it can help to convert them to fractions before dividing.

Lesson Practice ACC6.4.12

Lesson Summary

You can use division to determine how many times as large one quantity is compared to another.

For example, let's say a song is $1\frac{1}{2}$ minutes long, and another song is $3\frac{3}{4}$ minutes long. You can compare the lengths of the two songs by answering either of these questions:

How many times longer is the second song than the first song?

$3\frac{3}{4} \div 1\frac{1}{2} = ?$

$= \frac{15}{4} \div \frac{3}{2}$

$= \frac{15}{4} \cdot \frac{2}{3}$

$= \frac{30}{12}$ or $2\frac{1}{2}$

The second song is $2\frac{1}{2}$ times as long as the first song.

What fraction of the second song is the first song?

$1\frac{1}{2} \div 3\frac{3}{4} = ?$

$= \frac{3}{2} \div \frac{15}{4}$

$= \frac{6}{4} \div \frac{15}{4}$

$= \frac{6}{15}$ or $\frac{2}{5}$

The first song is $\frac{2}{5}$ as long as the second song.

Accelerated 6 | Unit 4 Lesson 12 372 Synthesis | Lesson Practice

Lesson Takeaway: Division helps us compare "how many times as long/many" two lengths are or "what fraction" one length is of another.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by writing and evaluating an expression for a multiplicative comparison scenario involving fractional lengths.

Today's Goals

1. **Goal:** Use fraction division to solve problems about comparing lengths.
2. **Language Goal:** Interpret a division expression as a question asking, "How many times as long?" **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.12

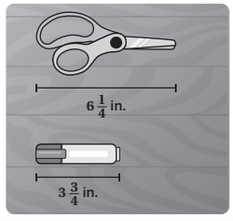
The pair of scissors is how many times as long as the highlighter? Show your thinking.

$\frac{25}{15}$ (or equivalent)

Responses vary.

$6\frac{1}{4} \div 3\frac{3}{4} = \frac{25}{4} \div \frac{15}{4}$

$= \frac{25}{15}$



D Differentiation Use after Lesson 12

Support

Provide targeted intervention for students by using these resources.

If students need support with "How many times as long/many?" problems:

» **Respond to Student Thinking:**

- Use the *Solving Multiplicative Comparison Problems* Mini-lesson.
- Review the **Lesson Summary**.
- Revisit **Lesson 10, Activity 1**. Invite students to explain Nia's process and thinking.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to calculate how many blocks it takes them to walk to school using mapping software. Encourage them to calculate the relative lengths of their commutes.

Professional Learning

Reflect on your facilitation of the **Decide and Defend routine** in this lesson. How did it support students in making arguments and critiquing the reasoning of others? What about your facilitation of the routine enhanced student engagement?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. Describe a strategy for solving problems like this: *The pen is how many times as long as the eraser?*

Responses vary. Divide the length of the first object by the length of the second object. If the measurements are given as mixed numbers, it can help to convert them to fractions before dividing.

Lesson Practice ACC6.4.12

Lesson Summary

You can use division to determine how many times as large one quantity is compared to another.

For example, let's say a song is $1\frac{1}{2}$ minutes long, and another song is $3\frac{3}{4}$ minutes long. You can compare the lengths of the two songs by answering either of these questions:

How many times longer is the second song than the first song?

$$3\frac{3}{4} \div 1\frac{1}{2} = ?$$
$$= \frac{15}{4} \div \frac{3}{2}$$
$$= \frac{15}{4} \cdot \frac{2}{3}$$
$$= \frac{30}{12} \text{ or } 2\frac{1}{2}$$

The second song is $2\frac{1}{2}$ times as long as the first song.

What fraction of the second song is the first song?

$$1\frac{1}{2} \div 3\frac{3}{4} = ?$$
$$= \frac{3}{2} \div \frac{15}{4}$$
$$= \frac{6}{4} \div \frac{15}{4}$$
$$= \frac{6}{15} \text{ or } \frac{2}{5}$$

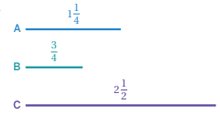
The first song is $\frac{2}{5}$ as long as the second song.

Lesson Practice ACC6.4.12

Name: ..... Date: ..... Period: .....

1. Segment A is $1\frac{1}{4}$ centimeters long. Segment B is $\frac{3}{4}$ centimeters long, and Segment C is $2\frac{1}{2}$ centimeters long.

Match each question with the expression that could be used to answer it.



a. How much longer is Segment A than Segment B? ..... b ..... $\frac{3}{4} \div 1\frac{1}{4}$

b. Segment B is how many times as long as Segment A? ..... e ..... $1\frac{1}{4} \div 2\frac{1}{2}$

c. Segment A is how many times as long as Segment B? ..... c ..... $1\frac{1}{4} \div \frac{3}{4}$

d. What fraction of Segment A is Segment C? ..... a ..... $1\frac{1}{4} - \frac{3}{4}$

e. What fraction of Segment C is Segment A? ..... d ..... $2\frac{1}{2} \div 1\frac{1}{4}$

Problems 2–3: Deiondre set a daily goal to ride his bicycle $4\frac{1}{2}$ miles.

2. On Monday, he biked 6 miles. How many times his goal did Deiondre ride?

$1\frac{1}{3}$ times his goal

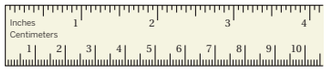
3. On Tuesday, he biked $1\frac{4}{5}$ miles. What fraction of his goal did Deiondre ride?

$\frac{2}{5}$ of his goal

Lesson Practice ACC6.4.12

Name: ..... Date: ..... Period: .....

Problems 4–6: When taking measurements, engineers in the U.S. use the U.S. customary system, while engineers in Canada use the metric system. On an international project, it's important to convert measurements precisely. For example, one inch is the same length as $2\frac{27}{50}$ centimeters.



4. How many centimeters long is 3 inches? Show or explain your thinking.

$7\frac{31}{50}$ centimeters. *Work varies.* $3 \cdot 2\frac{27}{50} = \frac{3}{1} \cdot \frac{127}{50} = \frac{381}{50} = 7\frac{31}{50}$

5. What fraction of 1 inch is 1 centimeter? Show or explain your thinking.

$\frac{50}{127}$. *Work varies.* $1 \div 2\frac{27}{50} = 1 \div \frac{127}{50} = \frac{50}{127}$

6. What question can you answer about this situation by determining the value of $10 \div 2\frac{27}{50}$?

How many inches are in 10 centimeters?

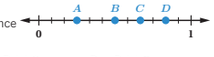
FAST Practice

7. A security guard works $9\frac{1}{2}$-hour-long shifts. At one point during a shift, the guard looks at the clock and realizes it has been $3\frac{3}{4}$ hours since the shift started. Calculate exactly how much of the shift the guard has worked.

The guard has worked $\frac{15}{38}$ of the shift.

Spiral Review

8. Here are four points plotted on a number line. Which point best represents $66\frac{2}{3}\%$ of the distance between 0 and 1?



A. Point A B. Point B C. Point C D. Point D

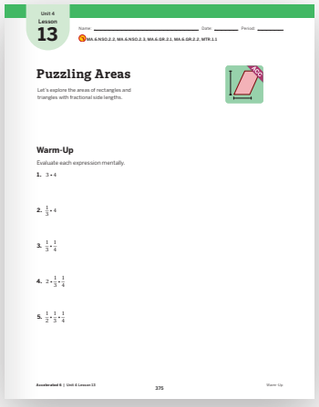
Problems 9–10: Determine each product.

9. $\frac{2}{3} \cdot \frac{9}{20} = \frac{3}{10}$ (or equivalent)

10. $1\frac{2}{5} \cdot \frac{3}{14} = \frac{3}{10}$ (or equivalent)

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1	2	MA.6.NSO.2.2
	2–6	2	MA.6.NSO.2.3
FAST Practice	7	2	MA.6.NSO.2.3
Spiral Review			
	8	2	MA.6.AR.3.4
	9–10	1	MA.5.FR.2.2


Unit 4
Lesson
13

Name _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.1, MA.6.GR.2.2, MTR.1.1

Puzzling Areas

Let's explore the areas of rectangles and triangles with fractional side lengths.

Warm-Up

Evaluate each expression mentally.

1. $3 \cdot 4$
2. $\frac{1}{3} \cdot 4$
3. $\frac{1}{3} \cdot \frac{1}{4}$
4. $2 \cdot \frac{1}{3} \cdot \frac{1}{4}$
5. $\frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{4}$

Accelerated 6 | Unit 4 Lesson 13 375 Warm-Up

Puzzling Areas

Areas With Fractional Dimensions

Let's explore the areas of rectangles and triangles with fractional side lengths.

Learning Outcomes

Today's Goals

1. **Goal:** Use division and multiplication to solve problems involving areas of polygons with fractional side lengths.
2. **Language Goal:** Describe strategies for solving area problems involving fractional side lengths. **(Speaking and Listening)**

Students apply what they know about multiplying and dividing fractions to a familiar context: calculating area. This lesson revisits work from Unit 1 and prepares students to calculate volumes with fractional dimensions in the following lesson. In Activity 2, students have the opportunity to make sense of problems and persevere in solving them as they solve a series of area puzzles. **(MTR.1.1)**

Coherence

Prior Learning

In Lessons 4–11, students developed several strategies for dividing with fractions. In Lesson 12, students applied their understanding of multiplying and dividing fractions to compare fractional lengths.

Future Learning

In Lessons 14–15, students will apply their understanding of multiplying and dividing fractions to reason about area and volume and to create plans for a garden.

Connections

- Students apply their knowledge of area to find missing fractional lengths. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.GR.2.2
Solve mathematical and real-world problems involving area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.

Also Addressing: **MA.6.NSO.2.3, MA.6.GR.2.1**

Mathematical Thinking and Reasoning Standard: MTR.1.1

ELA Expectations: ELA.K12.EE.3.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	**MA.7.NSO.2.2**
MA.5.FR.2.4	**MA.7.GR.1.2**
MA.5.GR.2.1	

Lesson at a Glance

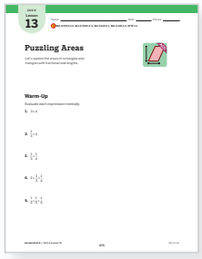
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.1, MA.6.GR.2.2

Warm-Up

Whole Class | 7 min

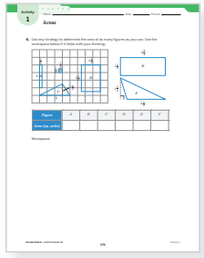
Students surface strategies for multiplying fractions. **Routine:** Number Talk



Activity 1

Small Groups | 13 min

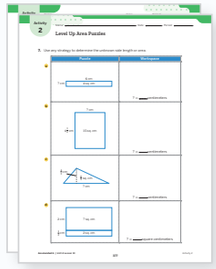
Students calculate areas of rectangles and triangles with fractional side lengths. MLR7: Compare and Connect



Activity 2

Pairs | 15 min

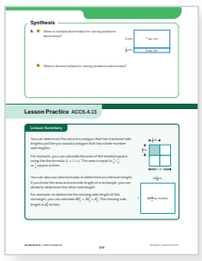
Students make sense of area puzzles to practice calculating missing side lengths and areas with fractional dimensions. **(MTR.1.1)**



Synthesis

Whole Class | 5 min

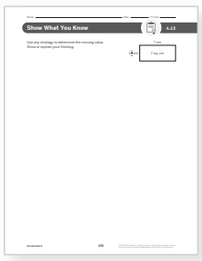
Students synthesize their understanding that multiplication and division can be used to find missing areas and side lengths of figures with fractional dimensions. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the missing side length of a rectangle with fractional dimensions.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Coloring tools (*as needed*)

Whole Class | 7 min

Warm-Up

Purpose: Students surface strategies for multiplying fractions.

1 Launch

Use the Number Talk routine to support students in surfacing strategies to multiply fractions. **(MTR.1.1)**

Invite students to evaluate the first expression independently. Then record a variety of strategies, along with the name of the students who shared them.

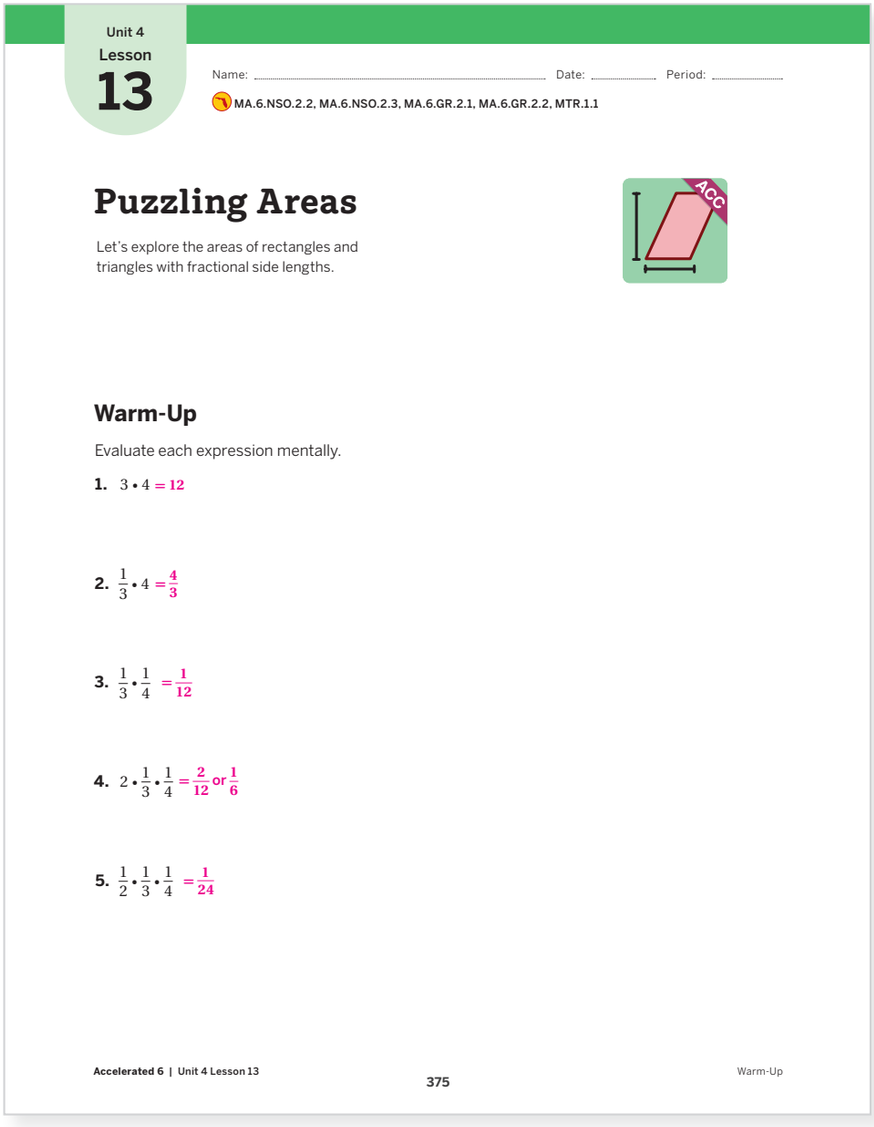
Consider asking, "Who thought about it in a different way?"

Note: This structure is repeated for each problem in the Number Talk.

2 Connect

Consider asking:

- "What connections do you notice among the different expressions?"
- "What connections do you notice among the strategies we've discussed?"



Unit 4
Lesson
13

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.1, MA.6.GR.2.2, MTR.1.1

Puzzling Areas

Let's explore the areas of rectangles and triangles with fractional side lengths.

Warm-Up

Evaluate each expression mentally.

1. $3 \cdot 4 = 12$
2. $\frac{1}{3} \cdot 4 = \frac{4}{3}$
3. $\frac{1}{3} \cdot \frac{1}{4} = \frac{1}{12}$
4. $2 \cdot \frac{1}{3} \cdot \frac{1}{4} = \frac{2}{12}$ or $\frac{1}{6}$
5. $\frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{4} = \frac{1}{24}$

Accelerated 6 | Unit 4 Lesson 13 375 Warm-Up

Small Groups | 13 min

Activity 1 Areas

Purpose: Students calculate areas of rectangles and triangles with fractional side lengths.

1 Launch

To surface prior knowledge, consider asking, "What do you remember about finding area?"

ELL **English Language Learners** Invite students to share what the term area reminds them of (e.g., "When I hear area, I think. . .").

Invite students to find the area of figure A and to share their strategies with the class.

Consider asking, "What are some strategies for finding the area of a triangle?" If it does not come up naturally, consider sharing that the area of a triangle is half the area of a rectangle with the same base and height.

2 Monitor

Look for a variety of strategies students use, including converting mixed numbers to fractions, decomposing rectangles, and using the distributive property.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to look at figure B. Consider asking, "Do you think the area is more than 1 square unit or less than 1 square unit? How might we calculate its area exactly?"
Estimate areas by counting boxes (*Figures A, B, C, and D*).	**Strengthen** Consider asking, "Will this strategy work for figures E and F? What is a strategy that could work for all six figures?" **(MTR.1.1)**
Multiply mixed numbers by multiplying their components, e.g., $3\frac{1}{2} \cdot 2\frac{1}{2} = 6\frac{1}{4}$ (*Figures D, E, and F*).	**Strengthen** Invite students to estimate by counting boxes for figure D and then compare their answers. Consider asking, "How can we make sure we've calculated the entire area?"

3 Connect

Share a variety of student strategies for correctly determining the area of rectangle E.

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy and connect this thinking to their own strategy.

To surface the Key Takeaway, consider asking, "What are the strengths of each approach?"

Activity 1

Name: _____ Date: _____ Period: _____

Areas

6. Use any strategy to determine the area of as many figures as you can. Use the workspace below if it helps with your thinking.

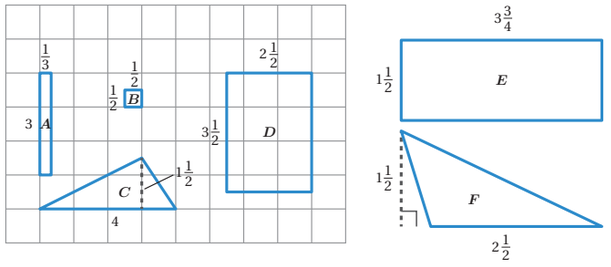


Figure	A	B	C	D	E	F
Area (sq. units)	1	$\frac{1}{4}$	3	$8\frac{3}{4}$	$5\frac{5}{8}$	$\frac{15}{8}$

Workspace:

Accelerated 6 | Unit 4 Lesson 13 376 Activity 1

Key Takeaway: Our strategies for finding the areas of polygons also work when the dimensions are fractions.

Pairs | 15 min

Activity 2 Level Up Area Puzzles

Purpose: Students make sense of area puzzles to practice calculating missing side lengths and areas with fractional dimensions. **(MTR.1.1)**

Short on time? Consider inviting students to complete fewer challenges.

1 Launch

Direct students' attention to the first puzzle and encourage them to consider it silently at first and then with a partner. **(MTR.1.1)**

Invite students to share their strategies with the class.

Consider sharing that we need to consider the relationship between measurements before choosing an operation.

2 Monitor

Look for a variety of strategies students use.

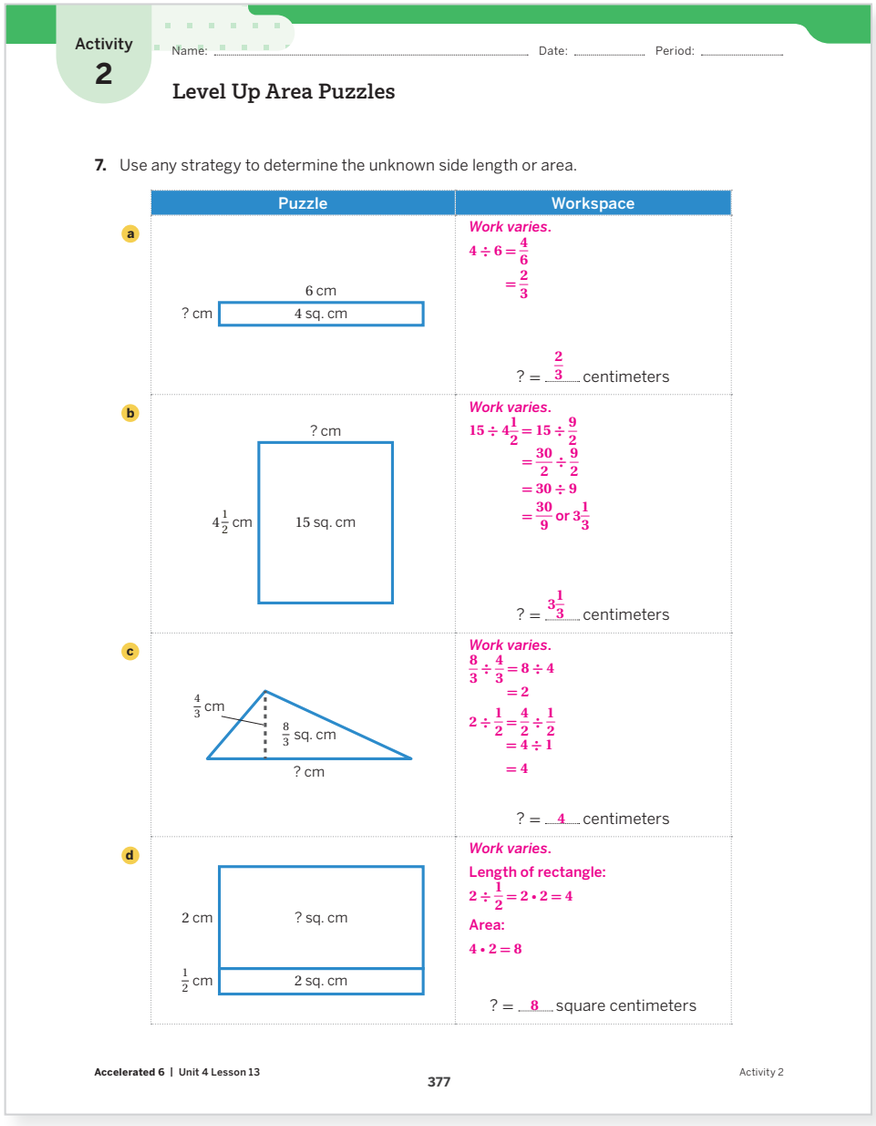
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What is the relationship between the dimensions of a rectangle and its area? How can we write an expression that represents the missing quantity?"
Multiply measurements such as the length and the area of a rectangle.	
Divide $\frac{8}{3}$ by $\frac{4}{3}$ to obtain 2 centimeters. *(Problem 7c)*	**Strengthen** Invite students to calculate the area of a triangle with the base and height they found. Consider asking, "How does the area you calculated compare to the area of the triangle? What does that tell us about the base?"
Claim the problem isn't solvable because we don't know the base of the rectangle. *(Problem 7d)*	**Strengthen** Invite students to share the information they would need to solve the problem. Consider asking, "Is there any way we can use what we know to find the information we need?"
Want to explore area problems further.	**Stretch** Invite students to complete all challenges in the next problem.

A Accessibility: Conceptual Processing Invite students to color-code features from the diagram and the formulas they write. Consider asking, "How can we use colors to set up relationships between measurements?"

Pause to discuss the strategies students use. Invite students to share their reasoning with the class. Encourage students to use related strategies when they attempt the challenges on the following page.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Level Up Area Puzzles

7. Use any strategy to determine the unknown side length or area.

	Puzzle	Workspace
a	? cm, 6 cm, 4 sq. cm	*Work varies.* $4 \div 6 = \frac{4}{6} = \frac{2}{3}$? = $\frac{2}{3}$ centimeters
b	? cm, $4\frac{1}{2}$ cm, 15 sq. cm	*Work varies.* $15 \div 4\frac{1}{2} = 15 \div \frac{9}{2} = \frac{30}{2} \div \frac{9}{2} = 30 \div 9 = \frac{30}{9}$ or $3\frac{1}{3}$? = $3\frac{1}{3}$ centimeters
c	$\frac{4}{3}$ cm, $\frac{8}{3}$ sq. cm, ? cm	*Work varies.* $\frac{8}{3} \div \frac{4}{3} = 8 \div 4 = 2$ $2 \div \frac{1}{2} = \frac{4}{2} \div \frac{1}{2} = 4 \div 1 = 4$? = 4 centimeters
d	2 cm, ? sq. cm, $\frac{1}{2}$ cm, 2 sq. cm	*Work varies.* Length of rectangle: $2 \div \frac{1}{2} = 2 \cdot 2 = 4$ Area: $4 \cdot 2 = 8$? = 8 square centimeters

Accelerated 6 | Unit 4 Lesson 13 377 Activity 2

Pairs | 15 min

Activity 2 Level Up Area Puzzles (continued)

Purpose: Students make sense of area puzzles to practice calculating missing side lengths and areas with fractional dimensions. **(MTR.1.1)**

Short on time? Consider inviting students to complete fewer challenges.

2 Monitor

Select and sequence strategies students use to make sense of the problems and invite them to share during the Connect. **(MTR.1.1)**

Note: Some students may need support with multi-step thinking. Consider sharing that they may need to obtain one piece of information and then use that as a clue to get to the next piece.

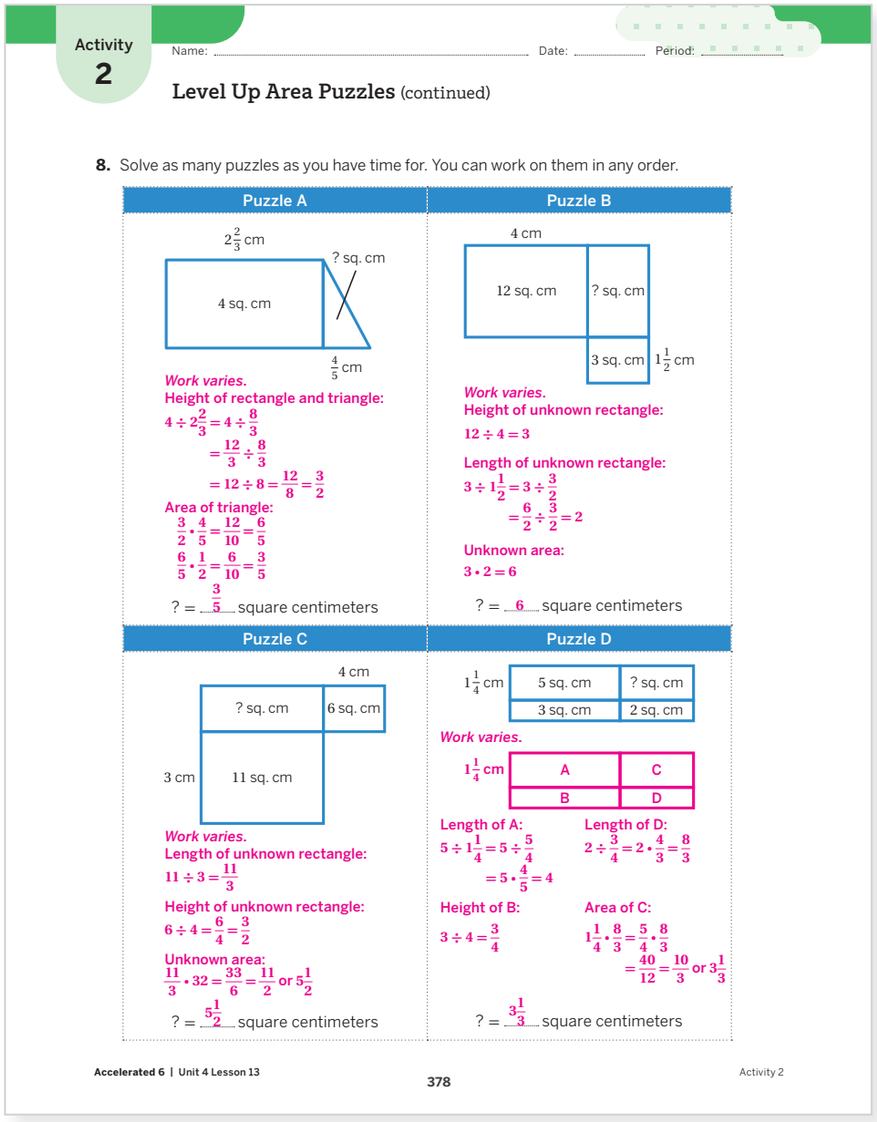
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to choose a problem. Consider asking, "What do you notice? How can we use that information to find the missing dimension?"
Represent corresponding quantities in diagrams or expressions using visuals or color-coding.	**Strengthen** Invite students to share their observations during the Connect. **Stretch** Invite students to create their own problems involving known area formulas. Encourage pairs of students to solve each other's problems.
Recognize that a side length can represent multiple things (e.g., the base of a rectangle is the height of a triangle).	
Connect the area puzzles with appropriate expressions and describe their thinking clearly.	

3 Connect

Share the captured strategies. Invite students to share their thinking to determine the missing side lengths and areas.

To surface the Key Takeaway, consider asking, "How can we find the measurement of the missing length?"



Activity 2

Name: _____ Date: _____ Period: _____

Level Up Area Puzzles (continued)

8. Solve as many puzzles as you have time for. You can work on them in any order.

Puzzle A

$2\frac{2}{3}$ cm; ? sq. cm; 4 sq. cm; $\frac{4}{5}$ cm

Work varies.

Height of rectangle and triangle:

$4 \div 2\frac{2}{3} = 4 \div \frac{8}{3}$

$= \frac{12}{3} \div \frac{8}{3}$

$= 12 \div 8 = \frac{12}{8} = \frac{3}{2}$

Area of triangle:

$\frac{3}{2} \cdot \frac{4}{5} = \frac{12}{10} = \frac{6}{5}$

$\frac{6}{5} \cdot \frac{1}{2} = \frac{6}{10} = \frac{3}{5}$

? = $\frac{3}{5}$ square centimeters

Puzzle B

4 cm; 12 sq. cm; ? sq. cm; 3 sq. cm; $1\frac{1}{2}$ cm

Work varies.

Height of unknown rectangle:

$12 \div 4 = 3$

Length of unknown rectangle:

$3 \div 1\frac{1}{2} = 3 \div \frac{3}{2}$

$= \frac{6}{2} \div \frac{3}{2} = 2$

Unknown area:

$3 \cdot 2 = 6$

? = 6 square centimeters

Puzzle C

4 cm; ? sq. cm; 6 sq. cm; 3 cm; 11 sq. cm

Work varies.

Length of unknown rectangle:

$11 \div 3 = \frac{11}{3}$

Height of unknown rectangle:

$6 \div 4 = \frac{6}{4} = \frac{3}{2}$

Unknown area:

$\frac{11}{3} \cdot 32 = \frac{33}{6} = \frac{11}{2}$ or $5\frac{1}{2}$

? = $5\frac{1}{2}$ square centimeters

Puzzle D

$1\frac{1}{4}$ cm; 5 sq. cm; ? sq. cm; 3 sq. cm; 2 sq. cm

Work varies.

$1\frac{1}{4}$ cm; A; C; B; D

Length of A:

$5 \div 1\frac{1}{4} = 5 \div \frac{5}{4}$

$= 5 \cdot \frac{4}{5} = 4$

Length of D:

$2 \div \frac{3}{4} = 2 \cdot \frac{4}{3} = \frac{8}{3}$

Height of B:

$3 \div 4 = \frac{3}{4}$

Area of C:

$1\frac{1}{4} \cdot \frac{8}{3} = \frac{5}{4} \cdot \frac{8}{3}$

$= \frac{40}{12} = \frac{10}{3}$ or $3\frac{1}{3}$

? = $3\frac{1}{3}$ square centimeters

Accelerated 6 | Unit 4 Lesson 13 378 Activity 2

Key Takeaway: To calculate the missing dimension of a rectangle, we can divide the area by the known dimension, even if the measurements are fractions.

Whole Class | 5 min

Synthesis

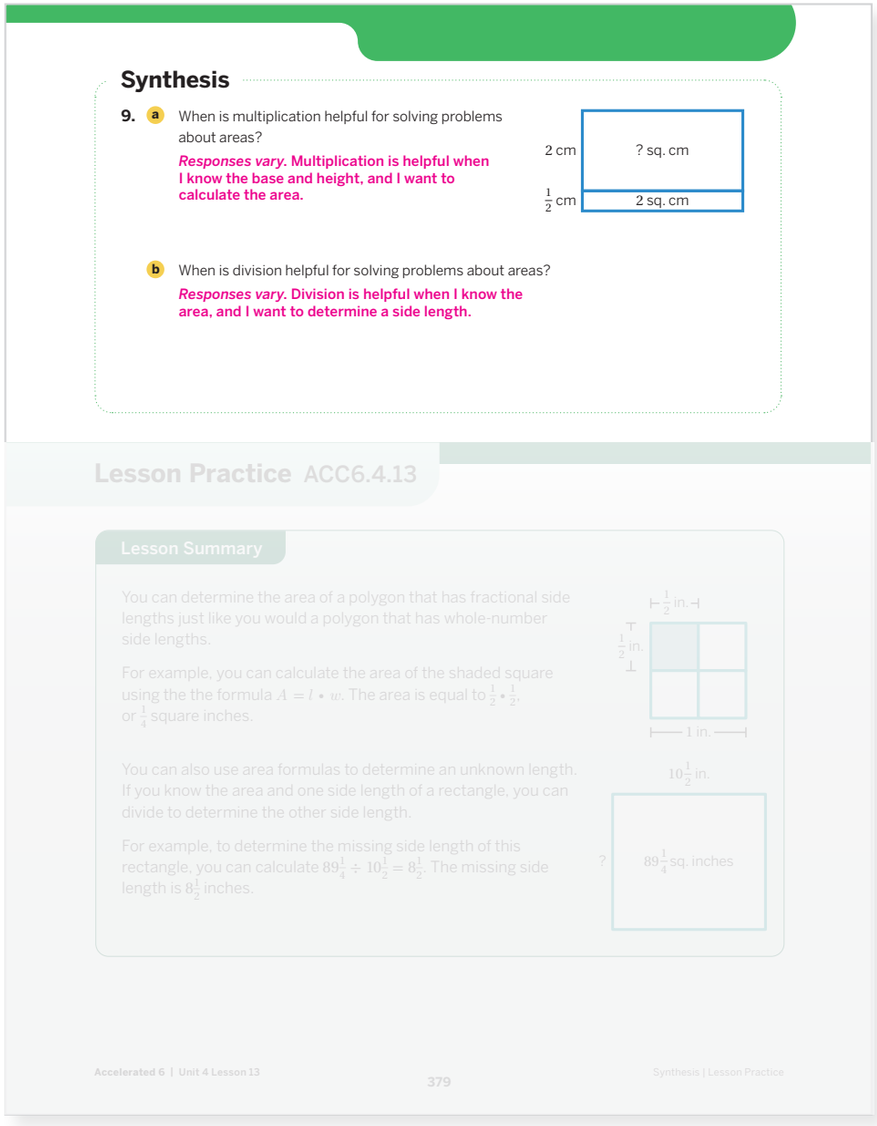
Purpose: Students synthesize their understanding that multiplication and division can be used to find missing areas and side lengths of figures with fractional dimensions.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- We can use an area formula when we have the measurements we need but don't know the area.
- We can use division when we know the area of a rectangle but we don't know one of the side lengths.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies and invite them to share. Display for students to reference and add to for the rest of the unit.



Synthesis

9. **a** When is multiplication helpful for solving problems about areas?

Responses vary. Multiplication is helpful when I know the base and height, and I want to calculate the area.

b When is division helpful for solving problems about areas?

Responses vary. Division is helpful when I know the area, and I want to determine a side length.

Lesson Practice ACC6.4.13

Lesson Summary

You can determine the area of a polygon that has fractional side lengths just like you would a polygon that has whole-number side lengths.

For example, you can calculate the area of the shaded square using the the formula $A = l \cdot w$. The area is equal to $\frac{1}{2} \cdot \frac{1}{2}$, or $\frac{1}{4}$ square inches.

You can also use area formulas to determine an unknown length. If you know the area and one side length of a rectangle, you can divide to determine the other side length.

For example, to determine the missing side length of this rectangle, you can calculate $89\frac{1}{4} \div 10\frac{1}{2} = 8\frac{1}{2}$. The missing side length is $8\frac{1}{2}$ inches.

Accelerated 6 | Unit 4 Lesson 13 379 Synthesis | Lesson Practice

Lesson Takeaway: The given measurements of a polygon can help determine missing side lengths or areas, even when these measurements include fractions.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by determining the missing side length of a rectangle with fractional dimensions.

Today's Goals

1. **Goal:** Use division and multiplication to solve problems involving areas of polygons with fractional side lengths.
2. **Language Goal:** Describe strategies for solving area problems involving fractional side lengths. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.13

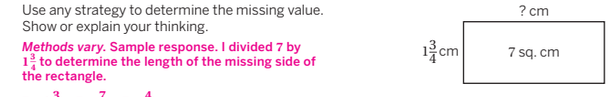
Use any strategy to determine the missing value. Show or explain your thinking.

Methods vary. Sample response. I divided 7 by $1\frac{3}{4}$ to determine the length of the missing side of the rectangle.

$7 \div 1\frac{3}{4} = 7 \div \frac{7}{4} = 7 \times \frac{4}{7}$

$= \frac{28}{7}$

$= 4$ cm



D Differentiation Use after Lesson 13

Support

Provide targeted intervention for students by using these resources.

If students need support finding the missing dimension:

» **Respond to Student Thinking:**

- Use the *Determining Missing Side Lengths in Area and Volume Problems* Mini-lesson.
- Revisit **Activity 2** as a class and invite students to share strategies for dividing fractions.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to create their own rectangle puzzles similar to those in **Activity 2**.

Professional Learning

Reflect on students' progress with dividing fractions in Sub-Unit 3. In what ways have students' understanding and skills grown? What concepts do students need additional support with? How can you use students' strengths to help everyone feel prepared for their upcoming assessment?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. a. When is multiplication helpful for solving problems about areas?

Responses vary. Multiplication is helpful when I know the base and height, and I want to calculate the area.

b. When is division helpful for solving problems about areas?

Responses vary. Division is helpful when I know the area, and I want to determine a side length.

Lesson Practice ACC6.4.13

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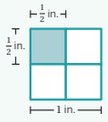
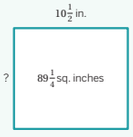


You can also use area formulas to determine an unknown length. If you know the area and one side length of a rectangle, you can divide to determine the other side length.

For example, to determine the missing side length of this rectangle, you can calculate $89\frac{1}{4} \div 10\frac{1}{2} = 8\frac{1}{2}$. The missing side length is $8\frac{1}{2}$ inches.



Lesson Practice ACC6.4.13

Name: _____ Date: _____ Period: _____

1. A rectangular lawn has an area of $7\frac{1}{3}$ square yards and a width of $2\frac{1}{5}$ yards. What is the length of the lawn, in yards?

A. $9\frac{8}{15}$ (B.) $3\frac{1}{3}$ C. $\frac{3}{10}$ D. $5\frac{2}{15}$

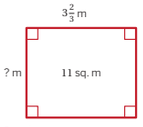
2. A television screen has a length of $16\frac{1}{2}$ inches, a width of w inches, and an area of 462 square inches. Select *all* the equations that represent the relationship between the dimensions of the television.

☐ A. $w \cdot 462 = 16\frac{1}{2}$ ☑ B. $16\frac{1}{2} \cdot w = 462$ ☑ C. $462 \div 16\frac{1}{2} = w$

☑ D. $462 \div w = 16\frac{1}{2}$ ☐ E. $16\frac{1}{2} \cdot 462 = w$

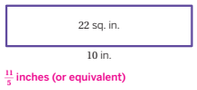
Problems 3–6: Determine the missing length or lengths in each figure.

3.



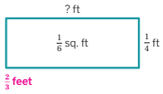
3 meters

4.



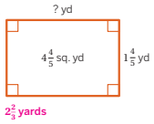
$\frac{11}{5}$ inches (or equivalent)

5.



$\frac{2}{3}$ feet

6.



$2\frac{2}{3}$ yards

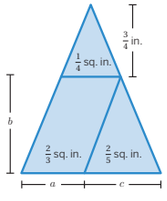
Lesson Practice ACC6.4.13

Name: _____ Date: _____ Period: _____

FAST Practice

7. Determine the missing lengths in this figure made up of a parallelogram and two triangles.

Unknown	Length (in.)
a	$\frac{2}{3}$
b	1
c	$\frac{4}{5}$



Spiral Review

Problems 8–9: A bookshelf is 42 inches long.

8. How many books will fit on the bookshelf if each book is $1\frac{1}{2}$ inches wide? Show your thinking.

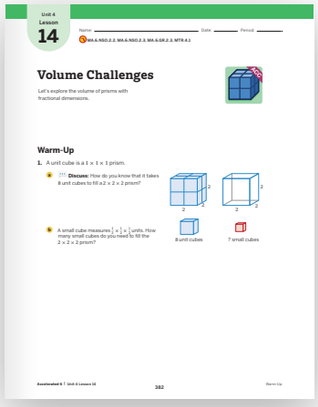
28 books. *Work varies.* $42 \div 1\frac{1}{2} = 28$

9. A bookcase has five of these 42-inch-long bookshelves. How many total feet of shelf space does the bookcase have? Show your thinking.

$17\frac{1}{2}$ feet. *Work varies.* $5 \cdot 42 = 210$ and $210 \div 12 = 17\frac{1}{2}$.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–2	2	MA.6.NSO.2.3, MA.6.GR.2.2
	3–6	2	MA.6.NSO.2.2, MA.6.GR.2.2
FAST Practice	7	3	MA.6.NSO.2.2, MA.6.GR.2.2
Spiral Review			
	8–9	2	MA.6.NSO.2.3


Unit 4
Lesson
14

Volume Challenges

Let's explore the volume of prisms with fractional dimensions.

Warm-Up

1. A unit cube is a 1 × 1 × 1 prism.

382

Volume Challenges

Volumes With Fractional Dimensions

Let's explore the volume of prisms with fractional dimensions.

Learning Outcomes

Today's Goals

1. **Goal:** Calculate the volume of a rectangular prism with fractional edge lengths.
2. **Language Goal:** Describe strategies for solving volume problems involving fractional lengths using mathematically precise language. **(Reading, Writing, Speaking, and Listening)**

Students extend their knowledge from a previous course and Lesson 13 to calculate *volumes* of rectangular prisms with fractional dimensions. They calculate the base's area and multiply by the height in order to calculate volume. This lesson also introduces the idea that, in a rectangular prism, any face can be considered the base.

Coherence

Prior Learning

In Lesson 13, students applied what they know about multiplying and dividing fractions to calculate the areas of rectangles and triangles with fractional lengths. In a previous course, students calculated volumes of rectangular prisms with whole-number edge lengths.

Future Learning

In Lesson 15, students will apply what they have learned about fraction division, area, and volume to solve problems about building a garden.

Connections

- Students apply their knowledge of volume to find missing fractional lengths. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.GR.2.3
Solve mathematical and real-world problems involving the volume of right rectangular prisms with positive rational number edge lengths using a visual model and a formula.

Also Addressing: **MA.6.NSO.2.3**

Mathematical Thinking and Reasoning Standard: MTR.4.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	MA.7.NSO.2.2
MA.5.AR.1.2	MA.7.NSO.2.3
MA.5.GR.2.1	MA.7.GR.2.3
MA.5.GR.3.1	
MA.5.GR.3.2	
MA.5.GR.3.3	

Vocabulary

Review Vocabulary

volume

Lesson at a Glance

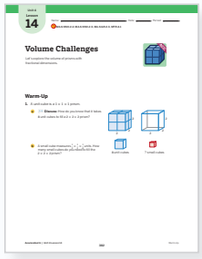
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.3

Warm-Up

Pairs | 5 min

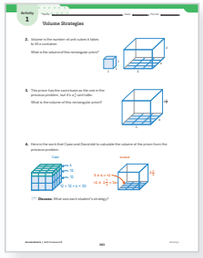
Students surface their prior knowledge about *volume* by determining the number of unit and unit fraction cubes that fill a larger cube.



Activity 1

Pairs | 10 min

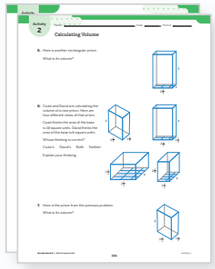
Students develop strategies for calculating the volume of a rectangular prism with fractional edge lengths. MLR7: Compare and Connect



Activity 2

Pairs | 20 min

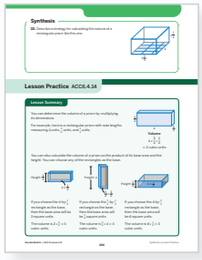
Students apply strategies for calculating volume with fractional dimensions and construct arguments about why any face of a rectangular prism can be the base. **Routine:** Decide and Defend **(MTR.4.1)**



Synthesis

Whole Class | 5 min

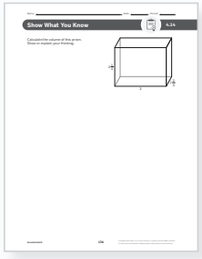
Students synthesize their understanding of calculating the volume of a rectangular prism with fractional edge lengths.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by determining the volume of a rectangular prism with fractional edge lengths.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

- Unit cubes (*as needed*)
- A classroom object in the form of a rectangular prism (*as needed*)

Pairs | 5 min

Warm-Up

Purpose: Students surface their prior knowledge about *volume* by determining the number of unit and unit fraction cubes that fill a larger cube.

1 Launch

To surface connections, consider asking, "Where have you seen diagrams like this before?"

To support students getting started, consider asking, "How many small cubes are there in one layer of the $2 \times 2 \times 2$ cube?"

A **Accessibility: Visual-Spatial Processing**
To support students in understanding spatial representations, provide examples of rectangular prisms or manipulatives, such as unit cubes, for students to hold or view.

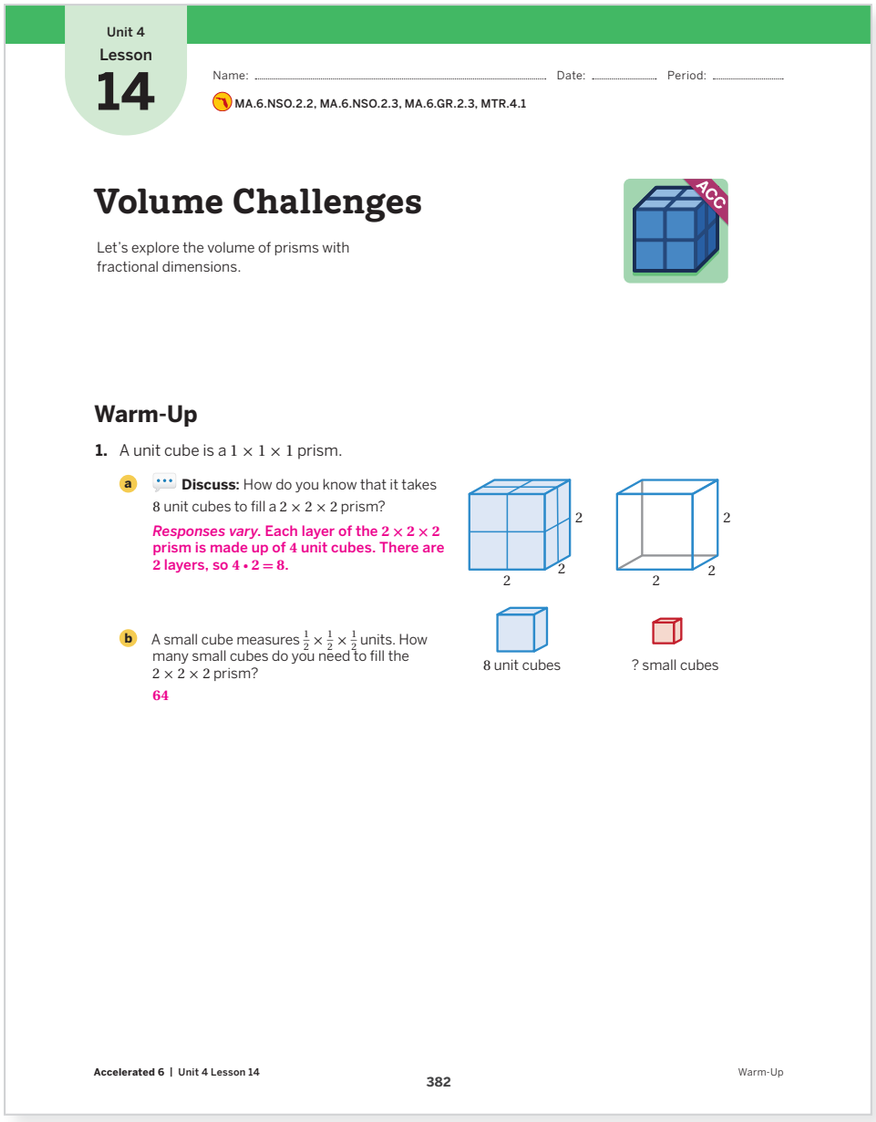
2 Connect

Invite students to share their strategies. Look for students who use strategies such as multiplying $4 \cdot 4 \cdot 4$, calculating the number of small cubes in 1 of the 8 unit cubes, and determining how many small cubes are in one layer of the larger cube, then multiplying by the number of layers.

Consider asking:

- "How many layers of small cubes will there be in the $2 \times 2 \times 2$ cube?"
- "How might we find the number of unit cubes that fit in an entire rectangular prism?"

Note: If it does not come up naturally, discuss the strategy of determining the number of cubes in one layer and multiplying by the number of layers.



Unit 4
Lesson
14

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.3, MTR.4.1

Volume Challenges

Let's explore the volume of prisms with fractional dimensions.

ACC

Warm-Up

1. A unit cube is a $1 \times 1 \times 1$ prism.

a. **Discuss:** How do you know that it takes 8 unit cubes to fill a $2 \times 2 \times 2$ prism?

Responses vary. Each layer of the $2 \times 2 \times 2$ prism is made up of 4 unit cubes. There are 2 layers, so $4 \cdot 2 = 8$.

b. A small cube measures $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ units. How many small cubes do you need to fill the $2 \times 2 \times 2$ prism?

64

8 unit cubes

? small cubes

Accelerated 6 | Unit 4 Lesson 14 382 Warm-Up

Pairs | 10 min

Activity 1 Volume Strategies

Purpose: Students develop strategies for calculating the volume of a rectangular prism with fractional edge lengths.

1 Launch

Consider asking, "What do you know about volume?" Invite students to discuss situations in which knowing the volume of something may be helpful. *Responses vary.* Volume is the number of unit cubes needed to fill a three-dimensional shape without overlap. Volume helps us describe how much space is in a container.

ELL **English Language Learners** Give students time to think independently before sharing their ideas verbally. **(Speaking)**

2 Monitor

To support students getting started, consider asking, "How many unit cubes might fit on the bottom of the rectangular prism? How can we use this to determine the volume?"

Invite students to should discuss their answers and strategies with a classmate.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage students to compare the prism to the previous problem. Consider asking, "How are these alike? How are they different?"
Submit many guesses.	**Strengthen** Consider asking, "How can we use what we know about prisms to find the volume in one calculation?"
Claim the volume is $24\frac{1}{2}$ since $3 \cdot 4 \cdot 2 = 24$ and $1 \cdot 1 \cdot \frac{1}{2} = \frac{1}{2}$.	**Strengthen** Consider asking, "What are the dimensions of the top most layer of the prism?"

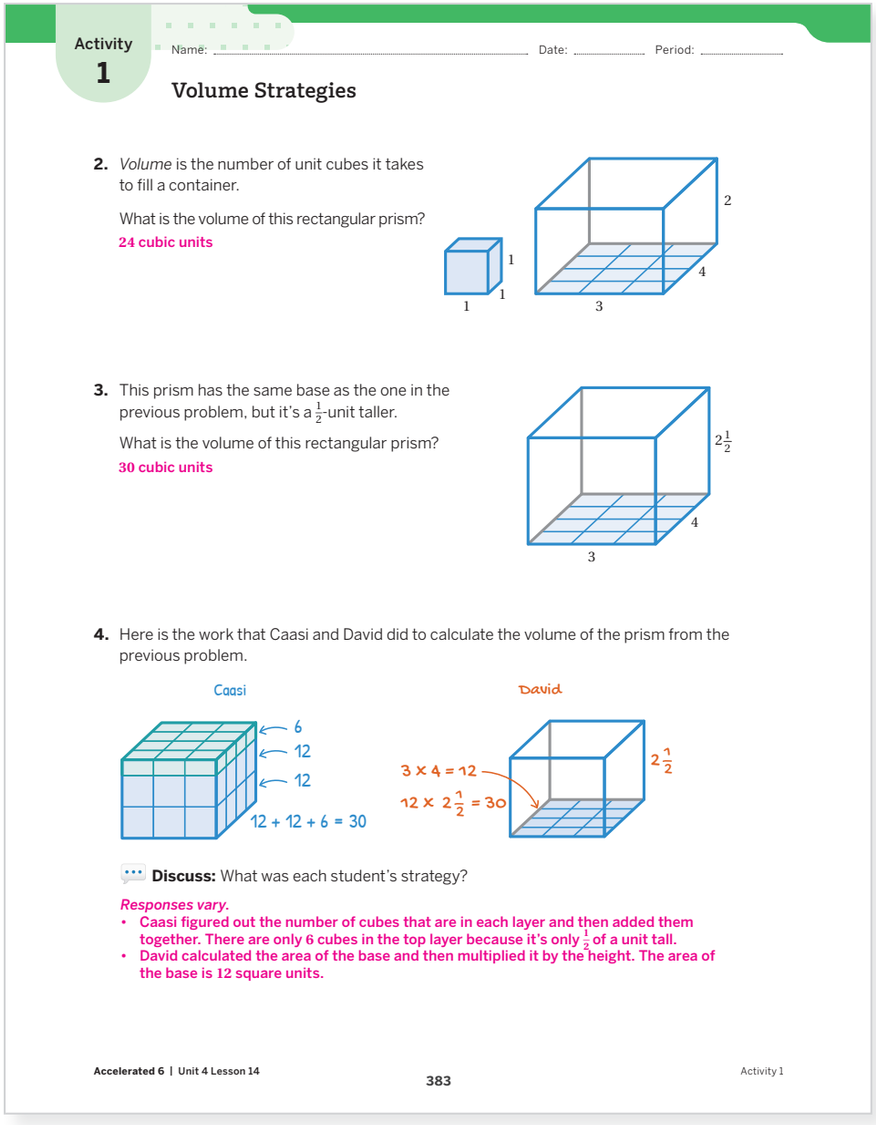
3 Connect

Invite students to share what they noticed about the two strategies.

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to their own strategy.

To surface the Key Takeaway, consider asking:

- "What did each student do?"
- "How are Caasi's and David's strategies alike? How are they different?"
- "Why did the different strategies lead to the same answer?"



Activity 1

Name: _____ Date: _____ Period: _____

Volume Strategies

2. *Volume* is the number of unit cubes it takes to fill a container.

What is the volume of this rectangular prism?

24 cubic units

3. This prism has the same base as the one in the previous problem, but it's a $\frac{1}{2}$-unit taller.

What is the volume of this rectangular prism?

30 cubic units

4. Here is the work that Caasi and David did to calculate the volume of the prism from the previous problem.

Discuss: What was each student's strategy?

Responses vary.

- Caasi figured out the number of cubes that are in each layer and then added them together. There are only 6 cubes in the top layer because it's only $\frac{1}{2}$ of a unit tall.
- David calculated the area of the base and then multiplied it by the height. The area of the base is 12 square units.

Accelerated 6 | Unit 4 Lesson 14 383 Activity 1

Key Takeaway: One way to calculate *volume* is to multiply the number of unit cubes in the base by the number of layers — even if there is a fractional amount of layers.

Pairs | 20 min

Activity 2 Calculating Volume

Purpose: Students apply strategies for calculating volume with fractional dimensions and construct arguments about why any face of a rectangular prism can be the base. **(MTR.4.1)**

Short on time? Consider completing Problem 5 as a class.

1 Launch

Direct students' attention to the prism. Consider asking, "How is this problem related to the previous one? How is it different?"

Direct students' attention to the prisms, noting that each image shows a different viewpoint of the same prism.

2 Monitor

To support students getting started, consider asking, "How might we find the base's area?"

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others. **(MTR.4.1)**

Look for students who select "Caasi's," "David's," or "Neither." Invite these students to consider a different view of the prism. Consider asking, "What is the base's area in this view? What if we selected a different view?"

Invite students to share their thinking with one another.

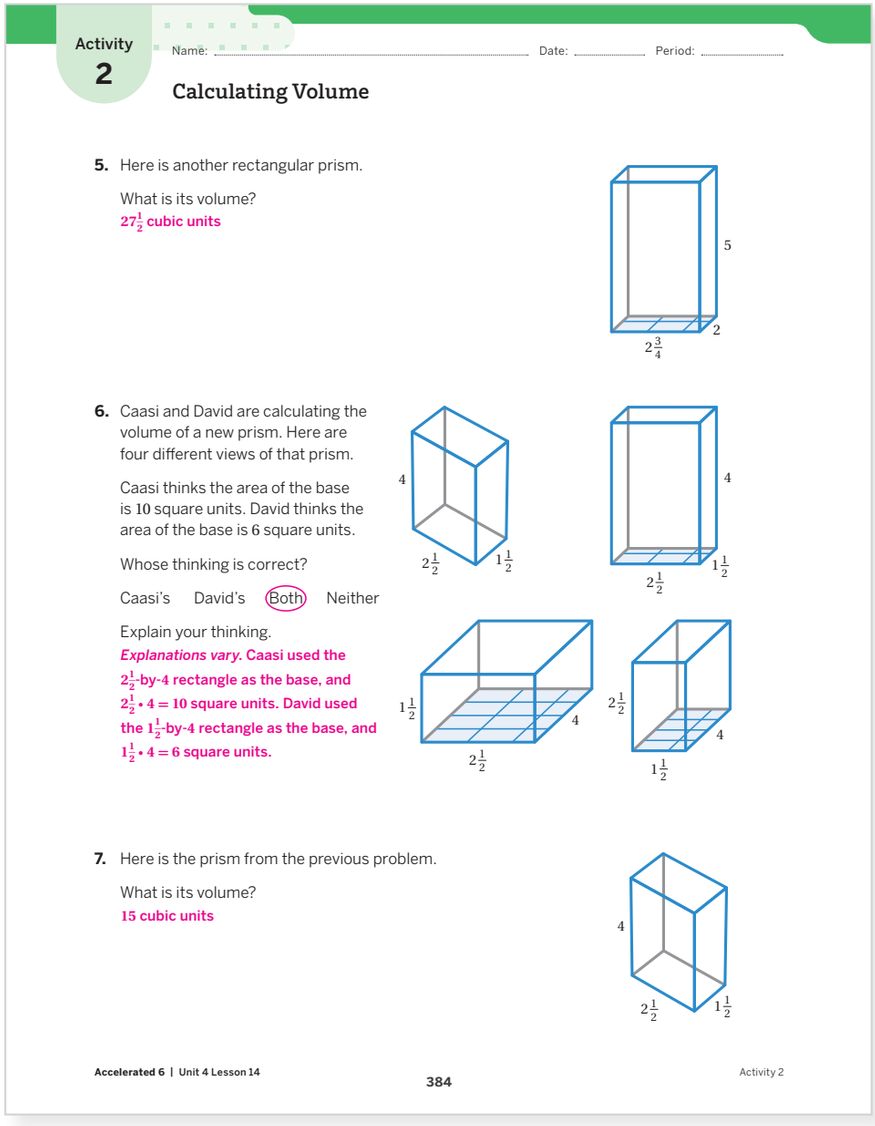
Look for a variety of strategies, including multiplying $2\frac{1}{2}$ by $1\frac{1}{2}$ first, rotating the shape so that the base's area would be $4 \cdot 1\frac{1}{2}$, or recognizing that $4 \cdot 2\frac{1}{2}$ is 10. Invite these students to share during the Pause.

Pause briefly to invite students to share their strategies with the class.

Consider asking:

- "How many pairs of parallel faces are there in this prism?"
- "Which of these faces could represent the base?"
- "What is a different way to calculate the area of the base of this prism?" *Responses vary.* Since prisms are defined by their parallel bases, we can use any face as our base. Multiplying the dimensions in different orders results in the same product.

Activity 2 continued >



Activity 2

Name: Date: Period:

Calculating Volume

5. Here is another rectangular prism.

What is its volume?

$27\frac{1}{2}$ cubic units

6. Caasi and David are calculating the volume of a new prism. Here are four different views of that prism.

Caasi thinks the area of the base is 10 square units. David thinks the area of the base is 6 square units.

Whose thinking is correct?

Caasi's David's (Both) Neither

Explain your thinking.

Explanations vary. **Caasi used the $2\frac{1}{2}$-by-4 rectangle as the base, and $2\frac{1}{2} \cdot 4 = 10$ square units. David used the $1\frac{1}{2}$-by-4 rectangle as the base, and $1\frac{1}{2} \cdot 4 = 6$ square units.**

7. Here is the prism from the previous problem.

What is its volume?

15 cubic units

Accelerated 6 | Unit 4 Lesson 14 384 Activity 2

Pairs | 20 min

Activity 2 Calculating Volume (continued)

Purpose: Students apply strategies for calculating volume with fractional dimensions and construct arguments about why any face of a rectangular prism can be the base. **(MTR.4.1)**

2 Monitor

Invite students to discuss their strategies and answers with a partner. **(MTR.4.1)**

A **Accessibility: Memory and Attention**
Invite students to use their Student Edition or additional paper to support students with performing calculations.

Select and sequence student strategies to share during the Connect.

D **Differentiation**

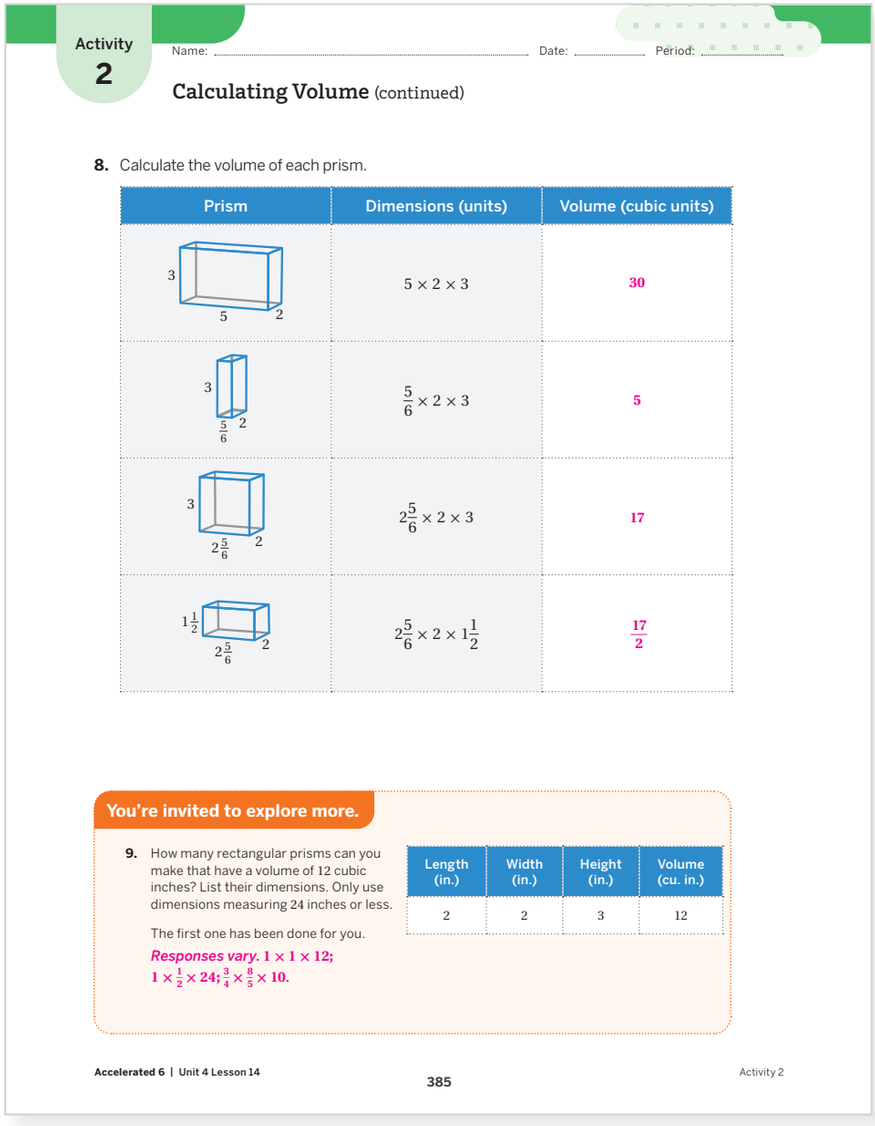
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Which face would you like to consider the base?"
Multiply the first two numbers together every time since they represent the base.	**Strengthen** Invite students to share their strategies during the Connect.
Multiply the numbers in an order that makes computation easier.	
Recognize and use relationships between the prisms to make computations easier (e.g., recognizing that the volume of third prism can be calculated as $5 + 2 \cdot 2 \cdot 3 = 17$).	

D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore volume further to complete this optional task. Encourage them to discuss their thinking with a partner. **(MTR.4.1)**

3 Connect

Invite students to share their strategies for finding the volumes of the rectangular prisms.

To surface the Key Takeaway, consider asking, "What were some strategies that you and your classmates used to make calculations easier?"



Activity 2

Name: _____ Date: _____ Period: _____

Calculating Volume (continued)

8. Calculate the volume of each prism.

Prism	Dimensions (units)	Volume (cubic units)
	$5 \times 2 \times 3$	30
	$\frac{5}{6} \times 2 \times 3$	5
	$2\frac{5}{6} \times 2 \times 3$	17
	$2\frac{5}{6} \times 2 \times 1\frac{1}{2}$	$\frac{17}{2}$

You're invited to explore more.

9. How many rectangular prisms can you make that have a volume of 12 cubic inches? List their dimensions. Only use dimensions measuring 24 inches or less.

The first one has been done for you.

Responses vary. $1 \times 1 \times 12$; $1 \times \frac{1}{2} \times 24$; $\frac{3}{4} \times \frac{8}{5} \times 10$.

Length (in.)	Width (in.)	Height (in.)	Volume (cu. in.)
2	2	3	12

Accelerated 6 | Unit 4 Lesson 14 385 Activity 2

Key Takeaway: Because all faces of a rectangular prism are rectangles, we can choose any face to represent the base.

Whole Class | 5 min

Synthesis

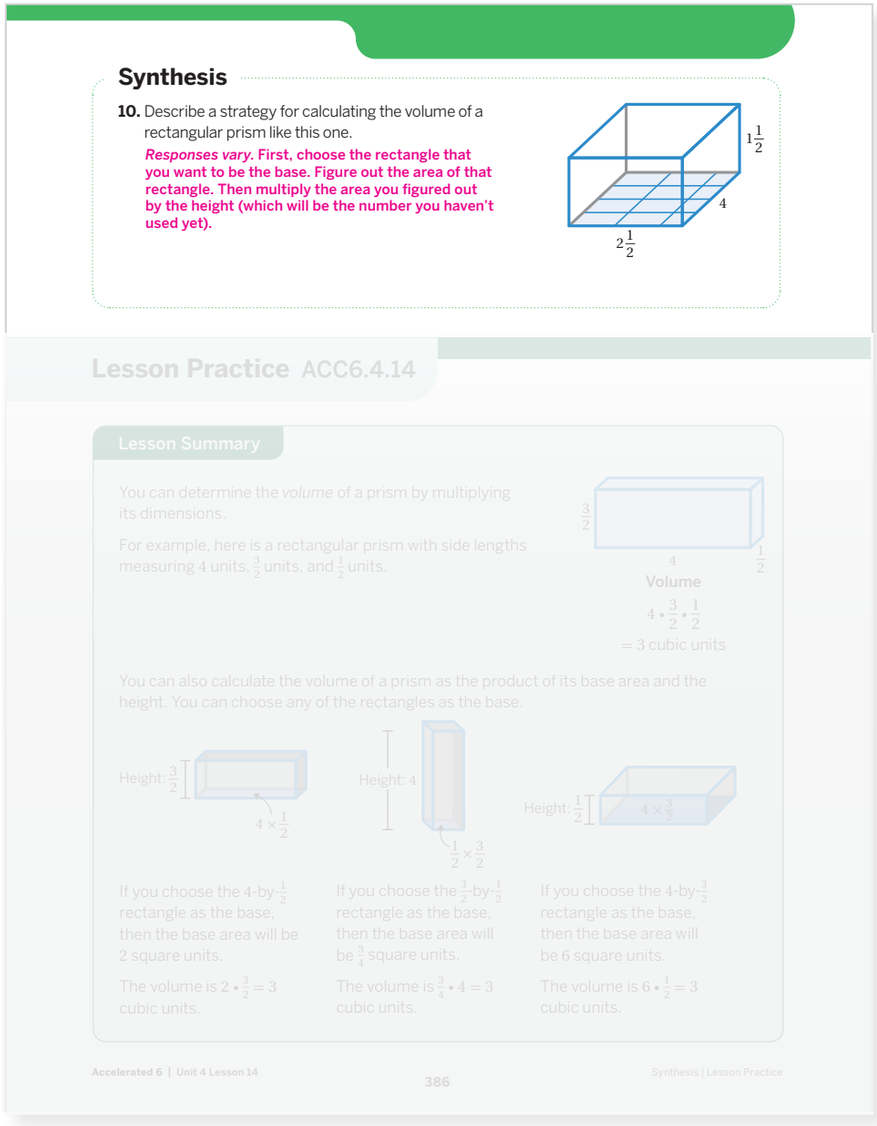
Purpose: Students synthesize their understanding of calculating the volume of a rectangular prism with fractional edge lengths.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- We can multiply the length, width, and height together to find the volume of a rectangular prism.
- If one of the dimensions has a fractional measurement, we can find the volume of the full layers, find the volume of the fractional layer, and add them together.
- First, we find the area of any face that makes calculations easier and then multiply by the other dimension.

Note: If time allows, invite students to revise their previous thinking based on the discussion.



Synthesis

10. Describe a strategy for calculating the volume of a rectangular prism like this one.

Responses vary. **First, choose the rectangle that you want to be the base. Figure out the area of that rectangle. Then multiply the area you figured out by the height (which will be the number you haven't used yet).**

Lesson Practice ACC6.4.14

Lesson Summary

You can determine the *volume* of a prism by multiplying its dimensions.

For example, here is a rectangular prism with side lengths measuring 4 units, $\frac{3}{2}$ units, and $\frac{1}{2}$ units.

Volume

$4 \cdot \frac{3}{2} \cdot \frac{1}{2}$

$= 3$ cubic units

You can also calculate the volume of a prism as the product of its base area and the height. You can choose any of the rectangles as the base.

If you choose the 4-by-$\frac{1}{2}$ rectangle as the base, then the base area will be 2 square units.

The volume is $2 \cdot \frac{3}{2} = 3$ cubic units.

If you choose the $\frac{3}{2}$-by-$\frac{1}{2}$ rectangle as the base, then the base area will be $\frac{3}{4}$ square units.

The volume is $\frac{3}{4} \cdot 4 = 3$ cubic units.

If you choose the 4-by-$\frac{3}{2}$ rectangle as the base, then the base area will be 6 square units.

The volume is $6 \cdot \frac{1}{2} = 3$ cubic units.

Accelerated 6 | Unit 4 Lesson 14 386 Synthesis | Lesson Practice

Lesson Takeaway: The *volume* of a rectangular prism is the product of the area of the base and the height — even if the measurements are fractions. There are many strategies to calculate volume, including choosing the base strategically or finding the volume of parts of the prism separately before adding them together.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by determining the volume of a rectangular prism with fractional edge lengths.

Today's Goals

1. **Goal:** Calculate the volume of a rectangular prism with fractional edge lengths.
2. **Language Goal:** Describe strategies for solving volume problems involving fractional lengths using mathematically precise language. **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.14

Calculate the volume of this prism.
Show or explain your thinking.

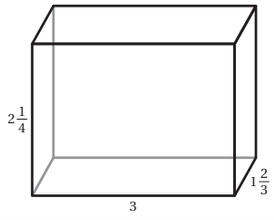
$11\frac{1}{4}$ (or equivalent) cubic units

Responses vary.

$2\frac{1}{4} \times 3 \times 1\frac{2}{3} = \frac{9}{4} \times 3 \times \frac{5}{3}$

$= \frac{135}{12}$

$= \frac{45}{4}$ cubic units



D Differentiation Use after Lesson 14

Support

Provide targeted intervention for students by using these resources.

If students need support calculating the volume of rectangular prisms:

» **Respond to Student Thinking:**

- Use the *Determining the Volume of Prisms With Fractional Dimensions* Mini-lesson.
- Revisit **Activity 2** as a class and invite students to share strategies for dividing fractions.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to measure the dimensions of two different rectangular prisms. Encourage them to determine how many times larger one volume is than the other.

Professional Learning

How did the way in which you learned about volume of prisms inform how you planned for the lesson? How did it impact how you taught the lesson?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. Describe a strategy for calculating the volume of a rectangular prism like this one.

Responses vary. First, choose the rectangle that you want to be the base. Figure out the area of that rectangle. Then multiply the area you figured out by the height (which will be the number you haven't used yet).

Lesson Practice ACC6.4.14

Lesson Summary

You can determine the *volume* of a prism by multiplying its dimensions.

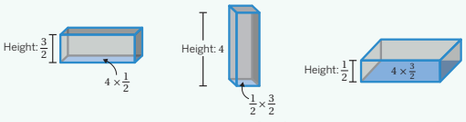
For example, here is a rectangular prism with side lengths measuring 4 units, $\frac{3}{2}$ units, and $\frac{1}{2}$ units.

Volume

$4 \cdot \frac{3}{2} \cdot \frac{1}{2}$

$= 3$ cubic units

You can also calculate the volume of a prism as the product of its base area and the height. You can choose any of the rectangles as the base.



If you choose the 4-by-$\frac{1}{2}$ rectangle as the base, then the base area will be 2 square units.

The volume is $2 \cdot \frac{3}{2} = 3$ cubic units.

If you choose the $\frac{3}{2}$-by-$\frac{1}{2}$ rectangle as the base, then the base area will be $\frac{3}{4}$ square units.

The volume is $\frac{3}{4} \cdot 4 = 3$ cubic units.

If you choose the 4-by-$\frac{3}{2}$ rectangle as the base, then the base area will be 6 square units.

The volume is $6 \cdot \frac{1}{2} = 3$ cubic units.

Lesson Practice ACC6.4.14

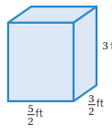
Name: _____ Date: _____ Period: _____

Problems 1–3: Determine the volume of these rectangular prisms.

1.

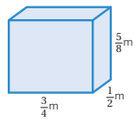
$\frac{3}{4}$ cubic inches (or equivalent)

2.



$11\frac{1}{4}$ cubic feet (or equivalent)

3.



$\frac{15}{64}$ cubic meters (or equivalent)

Problems 4–5: Complete the table for each rectangular prism.

	Base Area (sq. in.)	Height (in.)	Volume (cu. in.)
4.	4	$1\frac{1}{3}$	$5\frac{1}{3}$
5.	3	$2\frac{2}{3}$	8

6. Diego says that he needs 108 cubes, each with an edge length of $\frac{1}{3}$ inches, to fill a rectangular prism measuring 3-by-1-by-$1\frac{1}{3}$ inches. Do you agree with Diego? Explain your thinking.

Yes. *Explanations vary.* I agree because the volume of the rectangular prism is 4 cubic inches, and the volume of each cube is $\frac{1}{27}$ cubic inches. $4 \div \frac{1}{27} = 4 \cdot \frac{27}{1} = 108$.

Lesson Practice ACC6.4.14

Name: _____ Date: _____ Period: _____

Problems 7–8: A swimming pool used in the Olympics is 25 meters wide, 50 meters long, and about $2\frac{1}{2}$ meters deep.

7. Determine the volume of this swimming pool. Show your thinking.

3,125 cubic meters. *Work varies.*

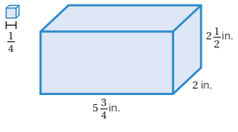
$25 \cdot 50 = 1250$ and $1250 \cdot \frac{5}{2} = 3125$.

8. There are 1,000 liters of water in 1 cubic meter. Calculate the number of liters needed to fill this pool.

3,125,000 liters of water

FAST Practice

9. How many small cubes with edge lengths measuring $\frac{1}{4}$ inches can be packed into this right rectangular prism?



1,840 small cubes

Spiral Review

10. Select *all* the fractions that are equivalent to $\frac{2}{3}$.

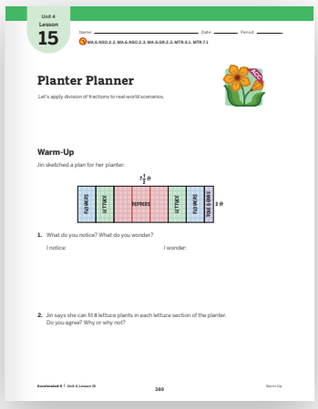
☑ A. $\frac{4}{6}$ ☐ B. $\frac{8}{15}$ ☐ C. $\frac{12}{13}$ ☑ D. $\frac{20}{30}$ ☑ E. $\frac{14}{21}$

11. A teacher wants to make a paste with flour and water. The table shows the ratio of the number of cups of flour to the number of cups of water she needs. Complete the table to show the other equivalent ratios.

Flour (cups)	Water (cups)
1	$\frac{1}{2}$
4	2
6	3
$\frac{1}{2}$	$\frac{1}{4}$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1–4	1	MA.6.NSO.2.2, MA.6.GR.2.3
	5–6	2	MA.6.NSO.2.2, MA.6.GR.2.3
	7–8	2	MA.6.NSO.2.3, MA.6.GR.2.3
FAST Practice	9	2	MA.6.NSO.2.2, MA.6.GR.2.3
Spiral Review			
	10	1	MA.4.FR.1.3
	11	2	MA.6.AR.3.3


Unit 4
Lesson
15

Planter Planner

Let's apply division of fractions to real-world scenarios.

Warm-Up

Jin sketched a plan for her planter.

1. What do you notice? What do you wonder?

I notice: I wonder:

2. Jin says she can fit 8 lettuce plants in each lettuce section of the planter. Do you agree? Why or why not?

389

Planter Planner

Applying Fraction Division

Let's apply division of fractions to real-world scenarios.

Learning Outcomes

Today's Goals

1. **Goal:** Use fraction division and multiplication to solve problems about area and volume in context.
2. **Language Goal:** Interpret situations involving area or volume as expressions with fraction multiplication or division. **(Reading and Writing)**

Students apply what they have learned about fraction division, area, and volume to solve problems about building a garden. Students consider the number of different types of plants they can fit into a planter, calculate precisely the number of bags of soil they will need to fill the planter, and then create a model for a garden that meets the constraints of the situation. **(MTR.7.1)**

Coherence

Prior Learning

In Lessons 13–14, students used division with fractions for missing length, area, and volume problems.

Future Learning

In Unit 5, students will develop and use a variety of strategies for representing, adding, and subtracting multi-digit decimals.

Connections

- Students apply their understanding of fraction division as they decide how to use a garden planter. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.2
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Also Addressing: **MA.6.GR.2.3**

Mathematical Thinking and Reasoning Standards: MTR.4.1, MTR.7.1

ELA Expectation: ELA.K12.EE.6.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.FR.2.2	**MA.7.NSO.2.2**
MA.5.FR.2.4	**MA.7.NSO.2.3**
MA.5.AR.1.2	**MA.7.GR.2.3**
MA.5.AR.1.3	
MA.5.GR.2.1	
MA.5.GR.3.2	

Lesson at a Glance

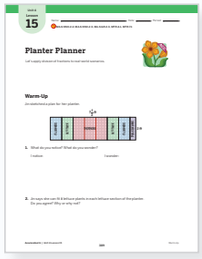
~ 45 min

MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.3

Warm-Up

Pairs | 5 min

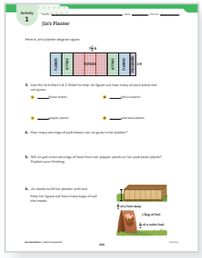
Students use the **Notice and Wonder** routine to surface prior knowledge about calculating area.



Activity 1

Pairs | 10 min

Students apply their knowledge of area, volume, and fraction operations to determine the number of plants that can fit in a given area.



Activity 2

Pairs | 20 min

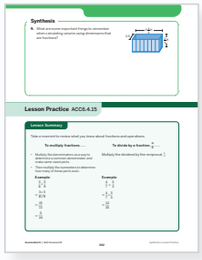
Students use mathematical modeling to design their own planter, calculate the amount of food they can grow, and determine how many bags of soil are needed. **(MTR.7.1)**

Synthesis

Whole Class | 5 min

Students synthesize their understanding of how to determine the volume of a rectangular prism when the dimensions include fractions.

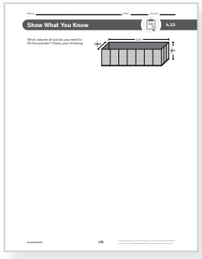
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating the volume of a rectangular prism with fractional edge lengths.



Prep Checklist

Prepare copies of the Activities 1 & 2 Sheet.

This lesson includes:

- Student Edition
- Show What You Know
- Activities 1 & 2 Sheet, one per pair
- Coloring tools
- Graph paper
- Poster paper

Pairs | 5 min

Warm-Up

Purpose: Students use the **Notice and Wonder** routine to surface prior knowledge about calculating area.

1 Launch

To surface connections, consider asking, "Have you ever planted a garden or visited a garden? What was planted in the garden?"

ELL **English Language Learners** Consider sharing a picture of a garden to increase access to the task. **(Reading and Listening)**

Invite students to look at the planter in their Student Edition. Use the **Notice and Wonder** routine to promote curiosity and help students make sense of the planter.

Consider sharing that different plants need their own amount of space to grow and take in sunlight and that this lesson will be about ensuring plants have the room they need.

Distribute the Activity Sheet, one per pair. Invite students to make sense of the information by asking, "What plant takes up the most space? What plant takes up the least?"

Invite students to make their thinking visible in their Student Edition as they determine if they agree or disagree with Jin.

2 Connect

Consider asking:

- "What were some of the strategies you used to determine if Jin was correct?"
- "How many units on the grid equal 1 foot in Jin's garden?"
- "How many squares on the grid represent one square foot?"

Unit 4
Lesson
15

Name: ..... Date: ..... Period: .....

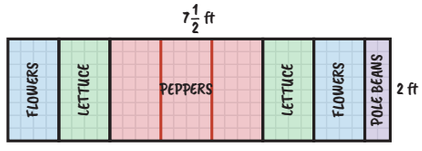
MA.6.NSO.2.2, MA.6.NSO.2.3, MA.6.GR.2.3, MTR.4.1, MTR.7.1

Planter Planner

Let's apply division of fractions to real-world scenarios.

Warm-Up

Jin sketched a plan for her planter.



1. What do you notice? What do you wonder?

I notice:

Responses vary.
- I notice that 4 units equals 1 foot.
- I notice that the planter has an area of 15 square feet.
- I notice that Jin is planning on growing many types of plants and vegetables.

I wonder:

Responses vary.
- I wonder how many plants Jin is going to grow.
- I wonder where this planter will be located.
- I wonder why Jin plans so much space for peppers and so little for pole beans.

2. Jin says she can fit 8 lettuce plants in each lettuce section of the planter. Do you agree? Why or why not?

I agree with Jin. *Explanations vary.* Each lettuce section is 2 square feet, and lettuce requires $\frac{1}{4}$ square feet per plant. That means 4 plants can fit in each square foot, or 8 plants total in each lettuce section.

Accelerated 6 | Unit 4 Lesson 15 389 Warm-Up

Pairs | 10 min

Activity 1 Jin's Planter

Purpose: Students apply their knowledge of area, volume, and fraction operations to determine the number of plants that can fit in a given area.

1 Launch

To surface prior knowledge, invite students to share their experiences with gardening and their favorite vegetables.

Consider sharing that students will be determining how many of each plant will fit in the planter.

2 Monitor

Listen for strategies for finding the areas of the sections and the number of plants that fit in each section. **(MTR.7.1)**

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How could we find the area of the flower sections? How much space do flowers take up?"
Calculate the number of flower or lettuce plants in 1 section, e.g., claiming there are 16 flower or 8 lettuce plants. (*Problems 3a–3b*)	**Strengthen** Invite students to point to where they see the flowers or lettuce in Jin's diagram. Consider asking, "Are there any other sections of this plant?"
Need support finding the number of servings. (*Problems 4–5*)	**Strengthen** Consider asking students, "Where have you heard the word serving before?"
Want to explore planter problems more.	**Stretch** Consider asking, "Which of these foods gives the most servings per square foot? Which gives the least?"

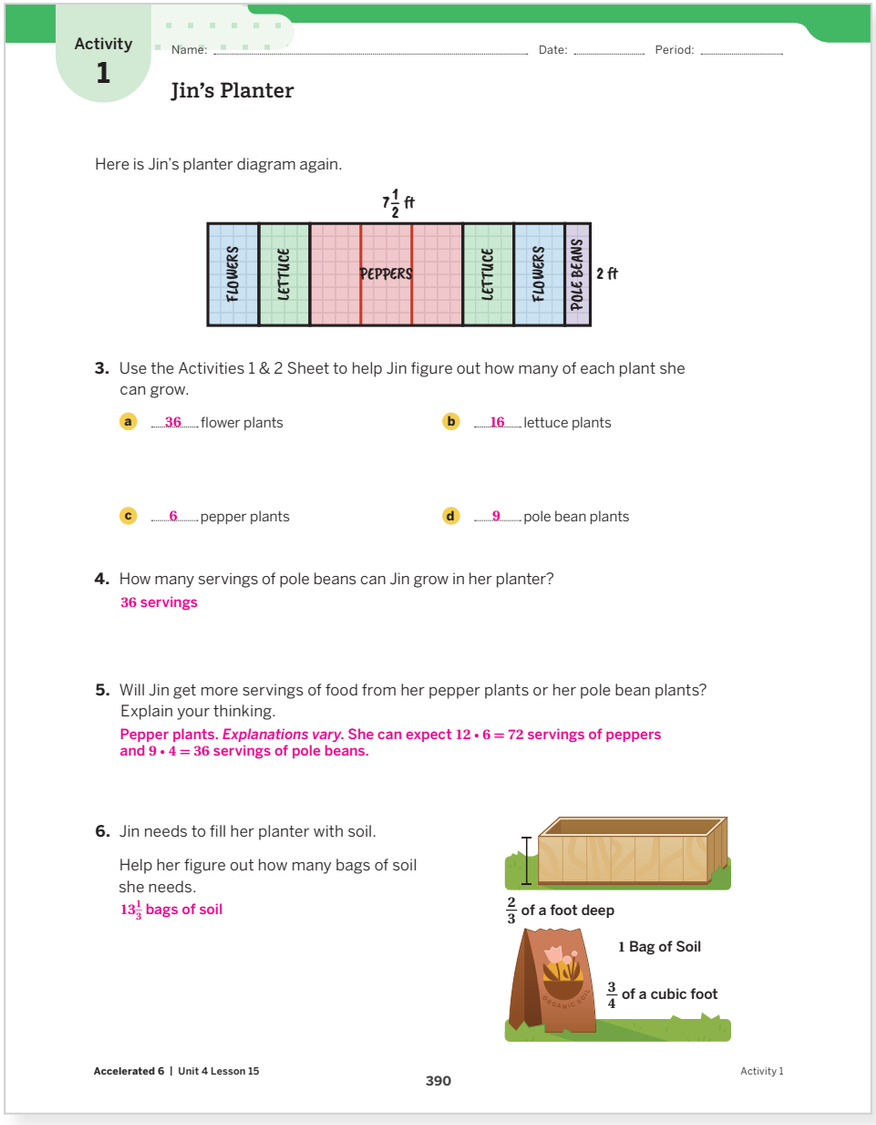
Look for strategies for finding the number of bags of soil. Invite these students to share during the Connect.

3 Connect

Invite students to share their thinking for determining the number of bags of soil needed.

Consider asking:

- "How was Problem 6 different from the others?"
- "How did we know we had to divide our volume by $\frac{3}{4}$?"
- "What does our solution $\left(13\frac{1}{3}\right)$ mean in terms of the gardening situation?" **(MTR.4.1)**



Activity 1

Name: _____ Date: _____ Period: _____

Jin's Planter

Here is Jin's planter diagram again.

3. Use the Activities 1 & 2 Sheet to help Jin figure out how many of each plant she can grow.

a. 36 flower plants

b. 16 lettuce plants

c. 6 pepper plants

d. 9 pole bean plants

4. How many servings of pole beans can Jin grow in her planter?

36 servings

5. Will Jin get more servings of food from her pepper plants or her pole bean plants? Explain your thinking.

Pepper plants. *Explanations vary.* She can expect $12 \cdot 6 = 72$ servings of peppers and $9 \cdot 4 = 36$ servings of pole beans.

6. Jin needs to fill her planter with soil.

Help her figure out how many bags of soil she needs.

$13\frac{1}{3}$ bags of soil

Accelerated 6 | Unit 4 Lesson 15 390 Activity 1

Pairs | 20 min

Activity 2 Build Your Own Planter

Purpose: Students use mathematical modeling to design their own planter, calculate the amount of food they can grow, and determine how many bags of soil are needed. **(MTR.7.1)**

Short on time? Consider having students only look at one to two other group posters before having them reflect.

1 Launch

Direct students' attention to the prompt and consider asking, "What are some important pieces of information to think about when designing a planter?" Invite students to respond to the discussion question in partners before sharing their responses with the class.

Consider asking, "What is your favorite plant on the list? How will you decide which plants to prioritize?"

Distribute poster making supplies and invite students to plan their planter in Problems 7a–7c before working on their posters.

2 Monitor

Look and listen for a variety of strategies students use to create their planter. **(MTR.7.1)**

D Differentiation *(Problem 7d)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to select plants whose square footage have the same denominator to make calculating the volume more efficient. Encourage students to use the checklist as they complete their posters.
Determine the size of the planter without calculating how much space each plant needs.	**Strengthen** Invite students to draw their planter and use the grid paper to lay out where each plant will go so they can accurately see what will fit.
Create a planter with creativity and precision and communicate their thinking clearly on a poster.	**Stretch** **You're invited to explore more.** Invite students to consider the situation with Xavier's planter and document their thinking on the back of their poster.

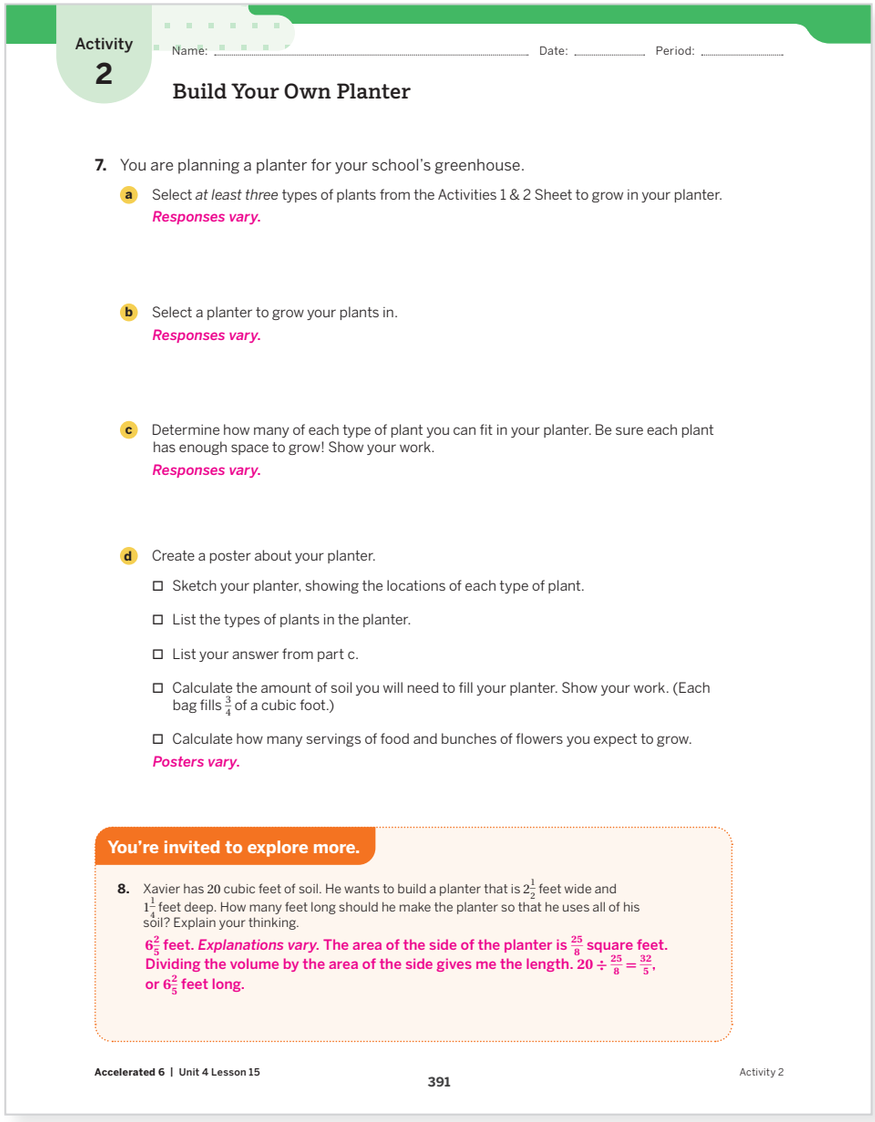
A Accessibility: Executive Functioning To support students in sharing and receiving feedback, model giving and receiving constructive feedback as a class.

3 Connect

Invite students to share their work through a Gallery Tour. Encourage them to silently view their classmates' work and leave feedback. Then give each pair time to review the feedback about their work.

Consider asking:

- "What was the most challenging part of planning your planter? What was surprising?"
- "Does your design make sense for the situation? How would you improve your model with more time?" **(MTR.4.1)**



Activity 2

Name: _____ Date: _____ Period: _____

Build Your Own Planter

7. You are planning a planter for your school's greenhouse.

a. Select *at least three* types of plants from the Activities 1 & 2 Sheet to grow in your planter.
Responses vary.

b. Select a planter to grow your plants in.
Responses vary.

c. Determine how many of each type of plant you can fit in your planter. Be sure each plant has enough space to grow! Show your work.
Responses vary.

d. Create a poster about your planter.
- ☐ Sketch your planter, showing the locations of each type of plant.
- ☐ List the types of plants in the planter.
- ☐ List your answer from part c.
- ☐ Calculate the amount of soil you will need to fill your planter. Show your work. (Each bag fills $\frac{3}{4}$ of a cubic foot.)
- ☐ Calculate how many servings of food and bunches of flowers you expect to grow.

Posters vary.

You're invited to explore more.

8. Xavier has 20 cubic feet of soil. He wants to build a planter that is $2\frac{1}{2}$ feet wide and $1\frac{1}{4}$ feet deep. How many feet long should he make the planter so that he uses all of his soil? Explain your thinking.

$6\frac{2}{5}$ feet. *Explanations vary.* The area of the side of the planter is $\frac{25}{8}$ square feet. Dividing the volume by the area of the side gives me the length. $20 \div \frac{25}{8} = \frac{32}{5}$, or $6\frac{2}{5}$ feet long.

Accelerated 6 | Unit 4 Lesson 15 391 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of how to determine the volume of a rectangular prism when the dimensions include fractions.

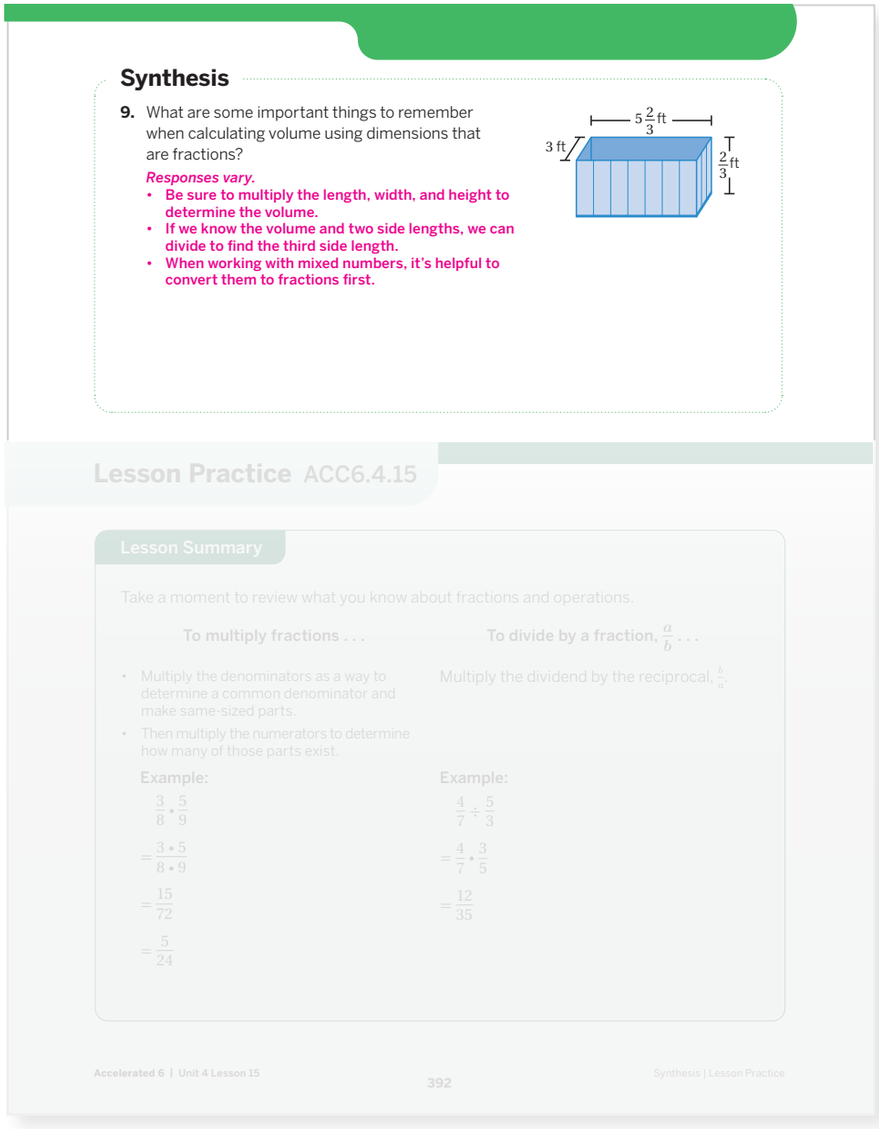
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- We can multiply the area of any base of a rectangular prism times the height to determine the volume.
- We can convert mixed numbers to fractions to help us with our calculations.
- We can draw models that help us understand partial groups.

MLR **MLR2: Collect and Display** Use this routine to collect students' ideas, language, examples, diagrams, or strategies as they discuss with a partner. Display for students to reference and add to for the rest of the lesson.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

9. What are some important things to remember when calculating volume using dimensions that are fractions?

Responses vary.

- Be sure to multiply the length, width, and height to determine the volume.
- If we know the volume and two side lengths, we can divide to find the third side length.
- When working with mixed numbers, it's helpful to convert them to fractions first.

Lesson Practice ACC6.4.15

Lesson Summary

Take a moment to review what you know about fractions and operations.

To multiply fractions . . .

- Multiply the denominators as a way to determine a common denominator and make same-sized parts.
- Then multiply the numerators to determine how many of those parts exist.

Example:

$$\frac{3}{8} \cdot \frac{5}{9}$$
$$= \frac{3 \cdot 5}{8 \cdot 9}$$
$$= \frac{15}{72}$$
$$= \frac{5}{24}$$

To divide by a fraction, $\frac{a}{b}$ . . .

Multiply the dividend by the reciprocal, $\frac{b}{a}$.

Example:

$$\frac{4}{7} \div \frac{5}{3}$$
$$= \frac{4}{7} \cdot \frac{3}{5}$$
$$= \frac{12}{35}$$

Accelerated 6 | Unit 4 Lesson 15 392 Synthesis | Lesson Practice

Lesson Takeaway: Calculating area and volume with fractions is important when modeling situations like gardening. Different people with the same information can create different designs depending on their priorities.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by calculating the volume of a rectangular prism with fractional edge lengths.

Today's Goals

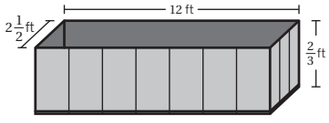
1. **Goal:** Use fraction division and multiplication to solve problems about area and volume in context.
2. **Language Goal:** Interpret situations involving area or volume as expressions with fraction multiplication or division. **(Reading and Writing)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 4.15

What volume of soil do you need to fill this planter? Show your thinking.



Responses vary.

$2\frac{1}{2} \times 12 \times \frac{2}{3} = \frac{5}{2} \times 12 \times \frac{2}{3}$

$= \frac{120}{6}$

$= 20$ cubic feet

Differentiation Use after Lesson 15

Support

Provide targeted intervention for students by using these resources.

If students need support multiplying and dividing fractions:

» **Respond to Student Thinking:**

- Review the **Lesson 13 Summary** and **Lesson 14 Summary**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 3 Extension Activities**.

Professional Learning

Take a moment to reflect on how students engaged in modeling with mathematics in today's lesson while creating their posters. What choices did they make in designing their planters and in communicating their thinking? What assumptions did they make and what revisions did they say they would make? How might you facilitate these choices in future lessons where they model?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

9. What are some important things to remember when calculating volume using dimensions that are fractions?

Responses vary.

- Be sure to multiply the length, width, and height to determine the volume.
- If we know the volume and two side lengths, we can divide to find the third side length.
- When working with mixed numbers, it's helpful to convert them to fractions first.

Lesson Practice ACC6.4.15

Lesson Summary

Take a moment to review what you know about fractions and operations.

To multiply fractions . . .

- Multiply the denominators as a way to determine a common denominator and make same-sized parts.
- Then multiply the numerators to determine how many of those parts exist.

Example:

$\frac{3}{8} \cdot \frac{5}{9}$

$= \frac{3 \cdot 5}{8 \cdot 9}$

$= \frac{15}{72}$

$= \frac{5}{24}$

To divide by a fraction, $\frac{a}{b}$ . . .

Multiply the dividend by the reciprocal, $\frac{b}{a}$.

Example:

$\frac{4}{7} \div \frac{5}{3}$

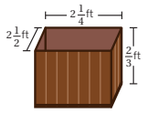
$= \frac{4}{7} \cdot \frac{3}{5}$

$= \frac{12}{35}$

Lesson Practice
ACC6.4.15

Name: _____ Date: _____ Period: _____

Problems 1–3: Raven is building a new planter for her class garden.



1. The base of her planter is $2\frac{1}{2}$ feet by $2\frac{1}{4}$ feet. What is its area?

$5\frac{5}{8}$ square feet

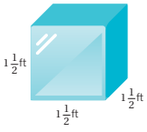
2. If the planter is $\frac{2}{3}$ feet high, what volume of soil does she need to fill it?

$3\frac{3}{4}$ cubic feet

3. Each bag holds $\frac{3}{4}$ cubic feet of soil. How many bags of soil does Raven need?

5 bags of soil

Problems 4–5: Before home freezers were introduced in the 1940s, some people had large blocks of ice delivered to their homes.



4. Delivery wagons held $7\frac{1}{2}$ feet by 6 feet by 6 feet of ice. What volume of ice could a delivery wagon hold?

270 cubic feet (or equivalent)

5. Each ice block was a $1\frac{1}{2}$-foot cube. How many ice blocks could fit in a delivery wagon? Explain your thinking.

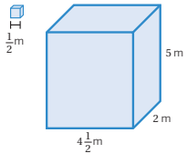
80 ice blocks. *Explanations vary.* I thought about how many blocks would fit along each dimension. Because the blocks are $1\frac{1}{2}$ feet on each side, 4 blocks fit along each of the 6-foot-long sides and 5 blocks fit along the $7\frac{1}{2}$-foot-long side. $4 \cdot 4 \cdot 5 = 80$ ice blocks.

Lesson Practice
ACC6.4.15

Name: _____ Date: _____ Period: _____

FAST Practice

6. A small cube has edge lengths measuring $\frac{1}{2}$ meter. How many small cubes could be packed into a rectangular prism that measures $4\frac{1}{2}$-by-2-by-5 meters?



A. 45 small cubes

B. 90 small cubes

C. 180 small cubes

D. 360 small cubes

Spiral Review

Problems 7–10: Determine each quotient.

7. $8 \div \frac{2}{9} = 36$

8. $\frac{5}{6} \div 15 = \frac{1}{18}$

9. $\frac{4}{7} \div \frac{8}{12} = \frac{6}{7}$ (or equivalent)

10. $\frac{23}{2} \div \frac{14}{5} = \frac{115}{28}$ (or equivalent)

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T Math Benchmarks
On-lesson			
	1	2	MA.6.NSO.2.3
	2–5	2	MA.6.NSO.2.3, MA.6.GR.2.3
FAST Practice	6	2	MA.6.NSO.2.2, MA.6.GR.2.3
Spiral Review			
	7–10	1	MA.6.NSO.2.2

Math in Action

Purpose: Students consider the math they learned in this unit and how it applies to the workplace, their world, and communities.

In this Unit

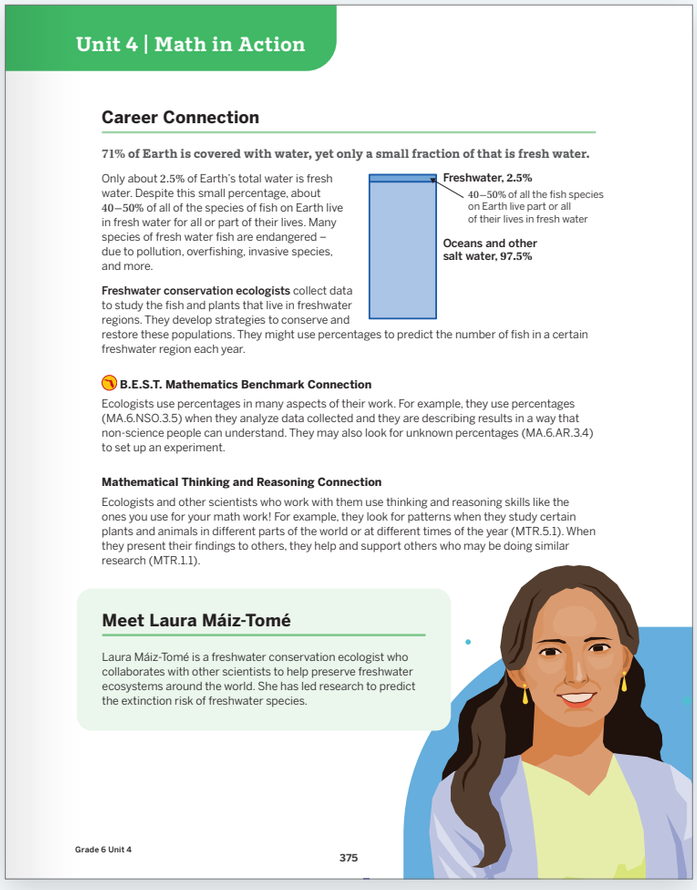
Students extended what they learned about dividing whole numbers to divide fractions by fractions. They used a variety of strategies, such as making tape diagrams, creating common denominators, and rewriting equivalent multiplication problems using the reciprocal.

Career Connection | Meet Laura Máiz-Tomé

Invite students to read about how only a small percentage of Earth's total water is fresh water, yet a large percentage of the fish on Earth depend on fresh water. Then invite them to read about freshwater conservation ecologist Laura Máiz-Tomé, who works to help conserve fresh water ecosystems around the world.

Consider asking:

- "What do you notice about the graphic? What do you wonder?"



B.E.S.T. Benchmark Connections

Consider asking:

- "What other math concepts have you studied in Units 1–4 that you could apply to the diagram shown?" Sample response: The diagram shows a complex figure made of two separate rectangles. You can break it down into two parts and calculate the area of each part and compare it to the percent each part represents (MA.6.GR.2.1, MA.6.GR.2.2).

Mathematical Thinking and Reasoning Connections

Consider asking:

- "Laura is a freshwater ecologist. What additional information would be helpful to know about the area that she collects her data from? How would utilizing the strategies of Mathematical Thinking and Reasoning standard MTR.6.1 help?" Sample response: Does she use benchmark percentages to see if her data collection and observations are reasonable?

Assess and Respond

End-of-Unit Assessment

Independent | 45 min

Facilitation: Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Estimating quotients of division expressions with fractions	Lesson 1	1	MA.6.NSO.2.2
2	Selecting equivalent expressions for a given division expression	Lesson 10	1	MA.6.NSO.2.2, MTR.5.1
3	Calculating quotients of division expressions involving fractions	Lessons 7, 9	1	MA.6.NSO.2.2
4	Applying division of fractions to compare lengths of objects	Lesson 12	1	MA.6.NSO.2.3
5	Reasoning about quotients when dividing fractions and critiquing the reasoning of others	Lessons 4, 5	2	MA.6.NSO.2.2, MTR.4.1
6	Calculating the area of the base and volume of a rectangular prism with fractional edge lengths	Lesson 14	1	MA.6.NSO.2.3
7a, 7b	Solving word problems involving division of fractions by fractions	Lesson 11	1	MA.6.NSO.2.3, MTR.6.1
7c	Creating contexts that represent division expressions with fractions	Lesson 11	3	MA.6.NSO.2.3, MTR.6.1

Assessment Resources

- Student Assessments (Forms A and B)
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: Date: Period:

End-of-Unit Assessment

Unit 4

1. The value of $8 \div \frac{1}{12}$ is:

A. Less than 1.

B. Greater than 1.

C. Equal to 1.

2. Select *all* the expressions with a value that is equivalent to $\frac{5}{8} \div \frac{3}{4}$.

- [x] A. $\frac{5}{8} \div \frac{6}{8}$
- [x] B. $\frac{5}{24} \div \frac{1}{4}$
- [ ] C. $\frac{8}{5} \cdot \frac{3}{4}$
- [x] D. $\frac{5}{8} \cdot \frac{4}{3}$
- [ ] E. $\frac{5}{32} \div \frac{1}{3}$

3. Calculate:

a. $\frac{10}{3} \div \frac{5}{6} = 4$

b. $\frac{3}{5} \div 4 = \frac{3}{20}$ (or equivalent)

c. $2\frac{2}{3} \div \frac{4}{5} = \frac{10}{3}$ (or equivalent)

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Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 4

4. Andrea biked $3\frac{1}{2}$ miles on Monday. On Tuesday, she biked $5\frac{1}{4}$ miles. How many times as far did Andrea bike on Tuesday than on Monday?

$1\frac{1}{2}$ times as far (or equivalent)

5. Neo and Oliver are working together to calculate $5 \div \frac{3}{5}$.

Neo says that it is equal to $8\frac{1}{3}$. Oliver says that it is equal to $8\frac{1}{5}$.

Who is correct? Circle one.

(Neo) Oliver Neither

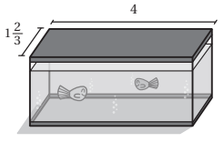
Show or explain your thinking.

Explanations vary.

- $\frac{25}{5} \div \frac{3}{5} = \frac{25}{3} = 8\frac{1}{3}$
- $5 = \frac{25}{5}$. 8 groups of $\frac{3}{5}$ make $\frac{24}{5}$, with $\frac{1}{3}$ of a group left over.

6. Andrea's class is getting a new fish tank.

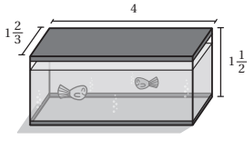
a. The base of the tank is a rectangle that is 4 feet by $1\frac{2}{3}$ feet. What is the area of the base?



$6\frac{2}{3}$ square feet (or equivalent)

b. The height of the tank is $1\frac{1}{2}$ feet.

How many cubic feet of water can the tank hold?



10 cubic feet

Name: Date: Period:

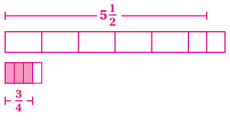
End-of-Unit Assessment (continued)

Unit 4

7. Amir and his grandma are making roti, an Indian bread. Amir's grandma uses a $\frac{3}{4}$-cup scoop. The recipe calls for $5\frac{1}{2}$ cups of flour.

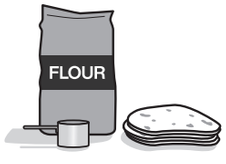
a. Write an expression *or* draw a diagram to represent how many scoops they need.

$5\frac{1}{2} \div \frac{3}{4}$ (or equivalent)



b. How many scoops of flour are needed?

$7\frac{1}{3}$ scoops (or equivalent)



c. Write a new question about Amir's grandma's $\frac{3}{4}$-cup scoop with an answer that is 4 scoops.

Responses vary. The recipe also uses 3 cups of water. How many scoops of water are needed?

Name: Date: Period:

End-of-Unit Assessment

Unit 4

1. The value of $\frac{1}{2} \div 3$ is:

A. Equal to 1. B. Less than 1. C. Greater than 1.

2. Select *all* the expressions with a value that is equivalent to $\frac{3}{7} \div \frac{2}{5}$.

- [x] A. $\frac{3}{14} \div \frac{1}{5}$
- [ ] B. $\frac{7}{3} \cdot \frac{2}{5}$
- [x] C. $\frac{3}{7} \cdot \frac{5}{2}$
- [ ] D. $\frac{3}{35} \div \frac{1}{2}$
- [x] E. $\frac{15}{35} \div \frac{14}{35}$

3. Calculate:

a. $\frac{8}{5} \div \frac{2}{10} = 8$

b. $\frac{3}{10} \div 6 = \frac{1}{20}$ (or equivalent)

c. $4\frac{1}{3} \div \frac{5}{2} = \frac{26}{15}$ (or equivalent)

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Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 4

4. Emma ran $1\frac{1}{2}$ miles. Neel ran $3\frac{3}{4}$ miles. How many times the length of Emma's run was Neel's run?

$2\frac{1}{2}$ times as far (or equivalent)

5. Lola and Tiam are working together to calculate $4 \div \frac{5}{7}$.

Lola says that it is equal to $5\frac{3}{7}$. Tiam says that it is equal to $5\frac{3}{5}$.

Who is correct? Circle one.

Lola (Tiam) Neither

Show or explain your thinking.

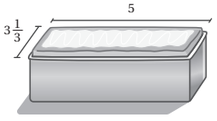
Explanations vary.

- $\frac{28}{7} \div \frac{5}{7} = \frac{28}{5} = 5\frac{3}{5}$
- $4 = \frac{28}{7}$. 5 groups of $\frac{5}{7}$ make $\frac{25}{7}$, with $\frac{3}{5}$ of a group left over.

6. Emma bought a new baking pan.

a. The base of the pan is a rectangle that is 5 inches by $3\frac{1}{3}$ inches. What is the area of the base?

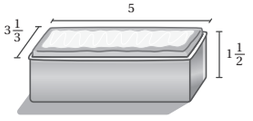
$16\frac{2}{3}$ square inches (or equivalent)



b. The height of the pan is $1\frac{1}{2}$ inches.

How many cubic inches can it hold?

25 cubic inches



Name: Date: Period:

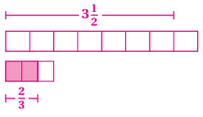
End-of-Unit Assessment (continued)

Unit 4

7. Dalia and her grandpa are making miso soup. They need $3\frac{1}{2}$ tablespoons of miso paste, but they only have a $\frac{2}{3}$-tablespoon scoop.

a. Write an expression *or* draw a diagram to represent how many scoops they need.

$3\frac{1}{2} \div \frac{2}{3}$ (or equivalent)



b. How many scoops do they need?

$5\frac{1}{4}$ scoops (or equivalent)

c. Write a new question about the $\frac{2}{3}$-tablespoon scoop with an answer that is 6 scoops.

Responses vary. The recipe also uses 4 tablespoons of water. How many scoops of water do they need?

D Differentiation (End-of-Unit Assessment)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	
Sub-Unit 1: • Represent fraction multiplication using models and numerical sentences. • Use multiple strategies to multiply fractions and mixed numbers.	1	**Support**	• **Mini-Lesson:** *Determining How Many in Each Group* • **Teacher Move:** Consider revisiting: • Lesson 1 *(Modeling Products)*
		Strengthen	• **Repeated Challenges:** • Lesson 1 *(Modeling Products)*
Sub-Unit 2: • Use a variety of strategies to calculate quotients of fractions. • Solve problems that involve dividing fractions. **(Lessons 3–11)**	5	**Support**	• **Teacher Move:** Consider revisiting Lesson 5 *(Garden Bricks)*
		Strengthen	• **Repeated Challenges:** • Lesson 4 *(Flower Planter)*

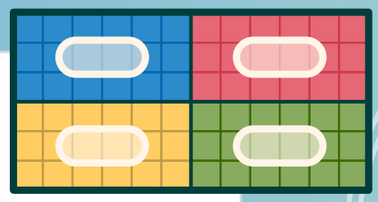
		Stretch	• **You're invited to explore more:**
			  • Lesson 4 *(Flour Planner)*
			  • Lesson 5 *(Garden Bricks)*

	2, 3	**Support**	• **Mini-Lesson:** *Dividing Fractions Using Common Denominators*
			• **Teacher Move:** Consider revisiting:
			  • Lesson 7 *(Break It Down)*
			  • Lesson 9 *(Division Challenges)*
			  • Lesson 10 *(Action Fractions)*

		Strengthen	• **Repeated Challenges:**
			  • Lesson 7 *(Break It Down)*
			  • Lesson 9 *(Division Challenges)*

	7	**Support** **Strengthen**	• **Teacher Move:** Consider revisiting Lesson 11 *(Swap Meet)*
		Stretch	• **Teacher Move:** Invite students to return to Lesson 11 *(Swap Meet)*. Encourage them to repeat Problems 7–9 for different expressions.
Sub-Unit 3: • Use division of fractions to compare lengths. • Solve problems about areas and volumes with fractional dimensions. **(Lessons 12–15)**	4	**Support**	• **Teacher Move:** Consider revisiting Lesson 12 *(Classroom Comparisons)*
		Strengthen	• **Repeated Challenges:** Lesson 12 *(Classroom Comparisons)*
	6	**Support** **Strengthen**	• **Mini-Lesson:** *Determining the Volume of Prisms With Fractional Dimensions* • **Teacher Move:** Consider revisiting: • Lesson 14 *(Volume Challenges)*

		Stretch	• **You're invited to explore more:**
			  • Lesson 14 *(Volume Challenges)*
			  • Lesson 15 *(Planter Partner)*



UNIT 5

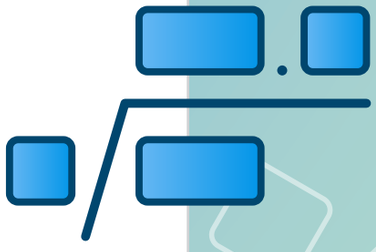
Decimal Arithmetic

Students develop and use a variety of strategies for multiplying and dividing decimals.

Essential Questions

- How do the place values in each decimal number in a calculation affect the place value of the result?
- How are strategies for multiplying decimals like strategies for dividing decimals? How are they different?

Sub-Unit Goals



Sub-Unit 1

- Multiply multi-digit decimals using a variety of strategies.

Sub-Unit 2

- Divide multi-digit decimals using a variety of strategies.

Sub-Unit 3

- Use decimal operations to solve problems in context.
- Make connections among percentages, decimals, and fractions.

The Math of the Unit

Unit Outcomes Telling a story that narrows and deepens with the grade

Florida B.E.S.T. Standards for Mathematics

Add, subtract, multiply and divide positive rational numbers. **(MA.6.NSO.2)**

Apply properties of operations to rewrite numbers in equivalent forms. **(MA.6.NSO.3)**

Benchmarks Addressed in This Unit: MA.6.NSO.2.1 MA.6.NSO.2.3 MA.6.NSO.3.2 MA.6.NSO.3.5

Mathematical Thinking and Reasoning Standards

- Demonstrate understanding by representing problems in multiple ways. **(MTR.2.1)**
- Complete tasks with mathematical fluency. **(MTR.3.1)**
- Assess the reasonableness of solutions. **(MTR.6.1)**
- Apply mathematics to real-world contexts. **(MTR.7.1)**

Also addressed: **MTR.1.1, MTR.4.1, MTR.5.1**

Coherence Telling a story within and across grades

In this Unit

Students multiply and divide using multi-digit decimals.

Prior Learning

- Multiply and divide whole numbers **(MA.3.NSO.2.2, MA.4.NSO.2.3, MA.4.NSO.2.5, MA.5.NSO.2.1, MA.5.NSO.2.2)**
- Represent decimals to the thousandths **(MA.5.NSO.1.2, MA.5.NSO.1.3)**
- Multiply and divide decimals to the hundredths place **(MA.5.NSO.2.4, MA.5.NSO.2.5)**

Future Learning

- **Unit 6:** Solve equations with decimals and fractions **(MA.6.AR.2.4)**
- **Unit 7:** Operations with positive and negative rational numbers **(MA.7.NSO.2)**
- Convert fractions to decimals **(MA.7.NSO.1.2)**

See the Connections to Future Learning page for more information, including explanations and examples.

Rigor and Balance Integrating the aspects of rigor in ways that support one another

Here are examples of the aspects of rigor and balance in this unit. See the first page of each lesson's Teacher Edition for more information.

Conceptual Understanding

In **Lessons 2 and 3**, students develop conceptual understanding between area models and multiplication involving the distributive property.

Strategic Competence

In **Lesson 5**, students compare different strategies to divide by tenths and hundredths.

Procedural Fluency

In **Lesson 6**, students use different strategies to divide decimals.

Adaptive Reasoning

In **Lesson 3**, students decide how to split rectangles and break down numbers.

Application

In **Lesson 8**, students apply their understanding of multi-digit decimal arithmetic to make decisions about buying a new car.

Productive Disposition

In **Lesson 9**, students see estimating with decimals as useful and worth learning.

Unit at a Glance

Assess and Respond

A Pre-Unit Check

Learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

MA.5.NSO.1.1 MA.5.NSO.2.4
MA.5.NSO.2.5 MA.5.GR.2.1

Sub-Unit 1

1 Decimal Multiplication

Introduction to Multiplying Decimals

Reason about place value when multiplying with one non-zero digit.

MA.6.NSO.2.1
MTR.2.1

2 Garden Arrangements

Factors and Expressions

Use area models to write equivalent expressions.

MA.6.NSO.3.2
MTR.2.1

3 Multiplying With Areas

Using Area Models to Multiply Decimals

Use area models to multiply decimals with more than one non-zero digit.

MA.6.NSO.2.1
MTR.2.1 MTR.6.1

Assess and Respond

7 Movie Time

Dividing Decimals in Context

Practice dividing decimals to solve problems.

MA.6.NSO.2.1 MA.6.NSO.2.3
MTR.1.1 MTR.3.1 MTR.4.1

A Sub-Unit Quiz 2

Learn about your students' understanding of the concepts and skills so far in this unit.

MA.6.NSO.2.1
MTR.4.1 MTR.5.1

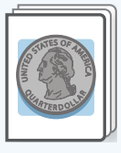
Sub-Unit 3

8 Budget Vehicles

Operations With Decimals in Context

Practice skills involving operations with decimals.

MA.6.NSO.2.1 MA.6.NSO.2.3
MTR.3.1 MTR.5.1 MTR.6.1 MTR.7.1



9 Coining New Representations

Percentages, Decimals, and Fractions

Solve problems using percents by rewriting them as decimals

MA.6.NSO.2.1 MA.6.NSO.2.3
MA.6.NSO.3.5
MTR.2.1 MTR.3.1

Pacing: 14 days | **Short on time?** See pacing considerations below.

All instructional and assessment days are ~45 minutes each.

- 10 Lessons
- Pre-Unit Check
- Sub-Unit Quizzes (2)
- End-of-Unit Assessment

Sub-Unit 2

4 Multiplication Methods

Using Place Value to Multiply Decimals

Make sense of multiplying decimals using multiple strategies.

MA.6.NSO.2.1
MTR.1.1 MTR.2.1 MTR.3.1 MTR.4.1

Assess and Respond

A Sub-Unit Quiz 1

Learn about your students' understanding of the concepts and skills so far in this unit.

MA.6.NSO.2.1
MTR.4.1

5 Division Diagrams

Making Sense of Decimal Division

Make sense of dividing decimals using tenths and hundredths charts.

MA.6.NSO.2.1
MTR.2.1

6 Long Division and Other Strategies

Long Division With Decimal Quotients

Rewrite decimal division expressions using whole numbers, then divide using long division or partial quotients.

MA.6.NSO.2.1
MTR.2.1

Assess and Respond

10 Grocery Prices

Percentages as Decimals

Apply knowledge about decimals and percentages to explore prices of groceries.

MA.6.NSO.3.5
MTR.1.1 MTR.2.1 MTR.4.1

A End-of-Unit Assessment

Learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

MA.6.NSO.2.1 MA.6.NSO.3.5
MTR.2.1 MTR.4.1 MTR.7.1

Pacing Considerations

Lesson 4: This lesson gives students an opportunity to apply the concepts they learned in this unit to help them make decisions about purchasing a car. There is no new content introduced in this lesson.

Lesson 12: This lesson gives students an opportunity to make connections between decimal operations and students' work with percentages from Unit 3. If students show a strong understanding of percentages and decimals in earlier lessons, this lesson may be omitted. If omitted, be sure to discuss how percentages and operations with decimals are related elsewhere in the unit.

Lesson Materials and Prep

Here are the materials and resources needed within each lesson, how to prepare them, and where to find them.

Lesson 1

- **Copy:** Show What You Know, Hundreds Chart Sheet *(as needed)*

Lesson 2

- **Copy:** Show What You Know
- **Materials:** counters *(42 per pair, as needed)*, graph paper *(as needed)*, straightedges *(as needed)*

Lesson 3

- **Copy:** Show What You Know

Lesson 4

- **Copy:** Show What You Know, Activity 3 Sheet *(one set for the whole class)*
- **Materials:** coloring tools *(as needed)*

Lesson 5

- **Copy:** Show What You Know
- **Materials:** calculators *(as needed)*

Lesson 6

- **Copy:** Show What You Know, Hundreds Chart Sheet *(optional)*
- **Cut:** Activity 2 Cards *(one per pair)*

Lesson 7

- **Copy:** Show What You Know

Lesson 8

- **Copy:** Show What You Know, Activity 1 Sheet *(one per pair)*
- **Materials:** coloring tools, posters

Lesson 9

- **Copy:** Show What You Know
- **Cut:** Activity 1 Cards *(one set per pair)*
- **Materials:** U.S. dollar bill *(as needed)*, 100 pennies *(as needed)*, several examples of U.S. coins *(as needed)*

Lesson 10

- **Copy:** Show What You Know, Activities 1 & 2 Sheet *(one per student)*

Resource Books

Assessment and Lesson Resources

- Pre-Unit Check
- Sub-Unit Quizzes
- End-of-Unit Assessment, Forms A & B
- Assessment Rubrics
- Show What You Knows
- Activity Sheets and Cards

Intervention and Extension Resources

- Mini-Lessons
- Prior Grade Mini-Lessons
- Extensions

Caregiver Support

These resources can be shared with students' caregivers. They provide background on the mathematics in this unit, as well as suggestions for supporting students at home.

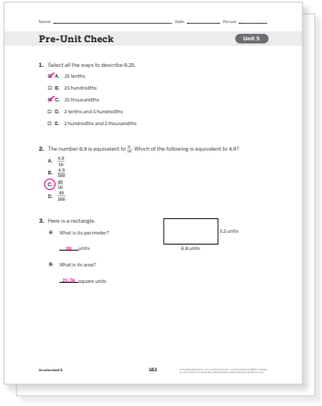
Assessments

Every unit includes a variety of formative and summative assessments, designed to highlight students' understanding of a variety of concepts and skills.

Pre-Unit Check

Assign the **Pre-Unit Check** to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit.

Standards assessed: MA.5.NSO.1.1, MA.5.NSO.2.4, MA.5.NSO.2.5, MA.5.GR.2.1


Pre-Unit Check

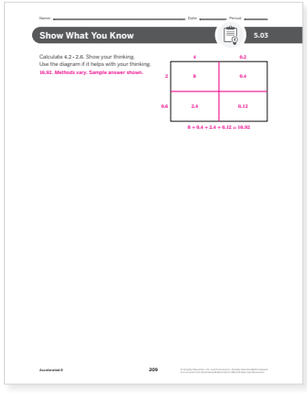
Unit 5

1. Select all the ways to describe 0.25.
   - [x] A. 25 tenths
   - [ ] B. 25 hundredths
   - [x] C. 25 thousandths
   - [ ] D. 2 tenths and 5 hundredths
   - [ ] E. 2 hundredths and 5 thousandths
2. The number 0.9 is equivalent to $\frac{9}{10}$. Which of the following is equivalent to 4.9?
   - A. $\frac{4.9}{10}$
   - B. $\frac{4.9}{100}$
   - C. $\frac{49}{10}$
   - D. $\frac{49}{100}$
3. Here is a rectangle.
   - What is its perimeter? 26 units
   - What is its area? 39.78 square units

Lesson | Show What You Know

Use the **Show What You Know** for each lesson to learn more about your students' progress toward the lesson goal(s). Here is one example from this unit.

Standard assessed on Lesson 3 Show What You Know: MA.6.NSO.2.1


Show What You Know

5.03

Calculate 4.2 • 2.6. Show your thinking. Use the diagram if it helps with your thinking.

10.92. Methods vary. Sample answer shown.

	4	0.2
2	8	0.4
0.6	2.4	0.12

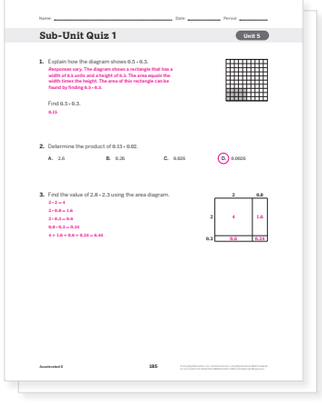
8 + 0.4 + 2.4 + 0.12 = 10.92

Sub-Unit Quizzes

Assign the **Sub-Unit Quizzes** to learn about your students' understanding of the concepts and skills so far in this unit.

Standard(s) addressed on

- **Sub-Unit Quiz 1:** MA.6.NSO.2.1
- **Sub-Unit Quiz 2:** MA.6.NSO.2.1


Sub-Unit Quiz 1

Unit 5

1. Explain how the diagram shows 0.5 • 0.3.

   Response vary. The diagram shows a rectangle that has a width of 0.5 units and a height of 0.3. The area equals the width times the height. The area of this rectangle can be found by finding 0.5 • 0.3.

   Find 0.5 • 0.3.

   0.15
2. Determine the product of 0.13 • 0.62.

   A. 2.6 B. 0.26 C. 0.026 D. 0.0806
3. Find the value of 2.8 • 2.3 using the area diagram.

   2 • 2 = 4

   2 • 0.8 = 1.6

   2 • 0.3 = 0.6

   0.5 • 0.3 = 0.24

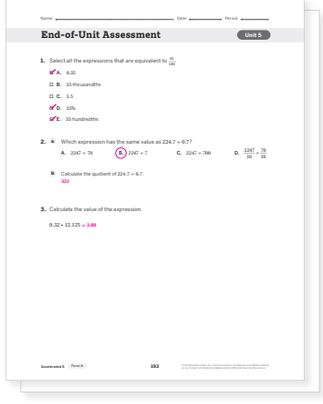
   4 + 1.6 + 0.6 + 0.24 = 6.44

	2	0.8
2	4	1.6
0.3	0.6	0.24

End-of-Unit Assessment

Assign the **End-of-Unit Assessment** to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B.

Standards assessed: MA.6.NSO.2.1, MA.6.NSO.3.5


End-of-Unit Assessment

Unit 5

1. Select all the expressions that are equivalent to $\frac{35}{100}$.
   - [x] A. 0.35
   - [ ] B. 35 thousandths
   - [ ] C. 3.5
   - [x] D. 35%
   - [x] E. 35 hundredths
2. A Which expression has the same value as 224.7 ÷ 0.7?

   A. 2247 ÷ 79 B. 2247 ÷ 7 C. 2247 ÷ 700 D. $\frac{2247}{10} \div \frac{79}{10}$

   B Calculate the quotient of 224.7 ÷ 0.7.

   321
3. Calculate the value of the expression.

   0.32 • 12.125 = 3.88

Differentiation

Every unit includes additional resources to support, strengthen, and stretch student learning.

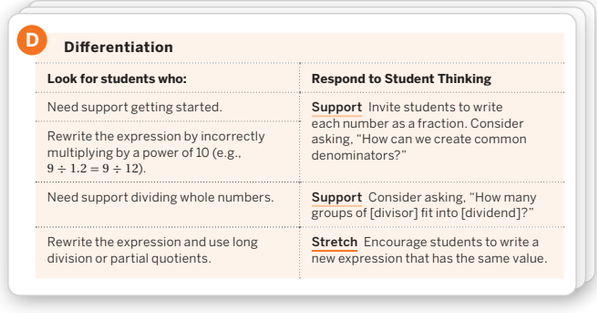
Differentiation Across the Unit

	Support	Strengthen	Stretch
	Provide targeted intervention for students by using these resources.	Reinforce students' understanding of the concepts assessed by using these resources.	Challenge students and extend their learning with these resources.
Sub-Unit 1 (Lessons 1–4) • Multiply multi-digit decimals using a variety of strategies.	**Mini-Lesson** • *Multiplying Decimals Using Area Models*	**Repeated Challenges** • Lesson 1 (*Decimal Multiplication*) **Practice** • Lessons 1–4	**DOK3 Practice** • Lesson 3
Sub-Unit 2 (Lessons 5–7) • Divide multi-digit decimals using a variety of strategies.	**Mini-Lesson** • *Dividing Decimals Using Long Division*	**Practice** • Lessons 5–7	**You're invited to explore more.** • Lesson 5 (*Division Diagrams*)
Sub-Unit 3 (Lessons 8–10) • Use decimal operations to solve problems in context. • Make connections among percentages, decimals, and fractions.	**Mini-Lesson** • *Converting Between Fractions, Percents, and Decimals*	**Practice** • Lessons 8–10	**You're invited to explore more.** • Lesson 10 (*Grocery Prices*)

Differentiation Within the Lesson

Each Teacher Edition includes point-of-use differentiation suggestions to modify or adjust instruction during the lesson to accommodate the needs of all learners.

Here is one example from **Lesson 6** where students apply strategies to divide with decimals and share their thinking with a partner.



Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to write each number as a fraction. Consider asking, "How can we create common denominators?"
Rewrite the expression by incorrectly multiplying by a power of 10 (e.g., $9 \div 1.2 = 9 \div 12$).	
Need support dividing whole numbers.	**Support** Consider asking, "How many groups of [divisor] fit into [dividend]?"
Rewrite the expression and use long division or partial quotients.	**Stretch** Encourage students to write a new expression that has the same value.

Accessibility

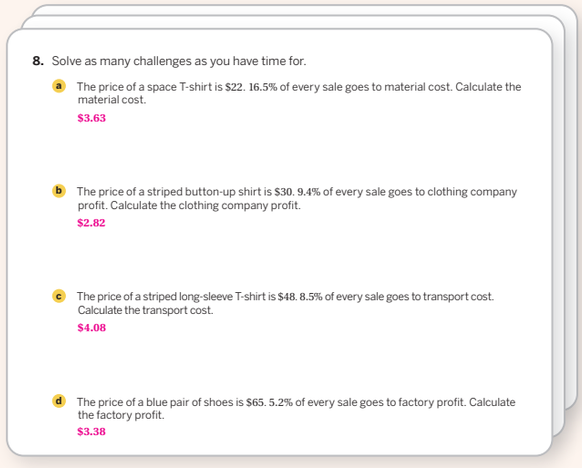
Every lesson is designed using the principles of Universal Design for Learning. Every lesson also includes support suggestions that build on students' strengths.

Universal Design for Learning

Here is one example from a lesson designed to support Action & Expression.

Spotlight on Expression & Communication . . .

Lesson 9: In this lesson, students build fluency with solving problems using percents by rewriting them as decimals and use Repeated Challenges to practice this skill.



8. Solve as many challenges as you have time for.

a. The price of a space T-shirt is $22. 16.5% of every sale goes to material cost. Calculate the material cost.
$3.63

b. The price of a striped button-up shirt is $30. 9.4% of every sale goes to clothing company profit. Calculate the clothing company profit.
$2.82

c. The price of a striped long-sleeve T-shirt is $48. 8.5% of every sale goes to transport cost. Calculate the transport cost.
$4.08

d. The price of a blue pair of shoes is $65. 5.2% of every sale goes to factory profit. Calculate the factory profit.
$3.38

Just-In-Time Accommodations and Supports

Each Teacher Edition includes suggested supports based on the areas of cognitive function from the Education Development Center (EDC).

Spotlight on Visual-Spatial Processing . . .

Here are two suggestions in this unit for supporting students with using manipulatives.

Lesson 2, Activity 2

A **Accessibility: Visual-Spatial Processing** Consider providing sets of counters to represent the cornstalks and peppers. Invite students to arrange the physical representations and record the results in their Student Edition.

Lesson 3, Warm-Up

A **Accessibility: Visual-Spacial Processing** Provide access to connecting cubes to allow students to create the area model.

Language Development

Every lesson includes opportunities for all students to develop fluency with mathematical language.

Vocabulary

New Vocabulary	Lesson	Review Vocabulary
long division	6	distributive property percent (percentage)

Math Language Routines and Language Goals

Math Language Routine	Lesson(s)
MLR2: Collect and Display	1–6, 8–9
MLR3: Critique, Correct, Clarify	3, 5, 9
MLR7: Compare and Connect	2, 4, 6

Sub-Unit Language Goals

- Compare and contrast different strategies for multiplying multi-digit decimals.
- Compare and contrast different strategies for dividing multi-digit decimals.
- Explain how operations with decimals relate to real-world problems.

English Language Learners Support

Every Teacher Edition includes suggestions for supporting the needs of students learning English.

Here is one example from **Lesson 6**, where students do a Think-Pair-Share to support discussion about division and place value.

ELL **English Language Learners** Encourage students to paraphrase each other's ideas to help them make connections and incorporate vocabulary from the unit. **(Speaking and Listening)**

Connections to Future Learning

Here is how the content in this unit connects to where your students are headed in their math journeys.

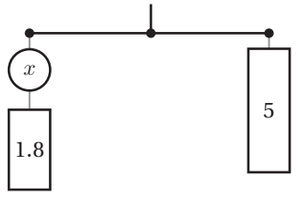
Solve Equations With Decimals and Fractions

In this unit, students extend their understanding of operations to include decimals. **In Unit 6**, students will work with one-step equations that include decimals and fractions.

FL B.E.S.T. Math Benchmark:
MA.6.AR.2.4

Example:

This hanger diagram can be used to determine the value of x in the equation $x + 1.8 = 5$. In this case, $x = 3.2$ because $3.2 + 1.8 = 5$.



Operations With Positive and Negative Rational Numbers

In this unit, students gain fluency in performing operations with decimals. **In Unit 7**, students will extend their understanding to include negative numbers.

FL B.E.S.T. Math Benchmarks:
MA.7.NSO.2.1, MA.7.NSO.2.2, MA.7.NSO.2.3

Example:

The relationship among rate, time, and position can be used to determine the unknown final position when the initial position is 0 feet. Multiply the rate by the time to get a final position of -22.8 feet. The position is negative because a positive number multiplied by a negative number is a negative number.

Rate (ft/min)	Time (min)	Position (ft)
-3.8	6	

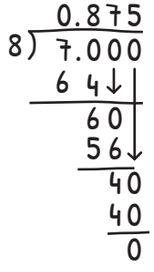
Convert Fractions to Decimals

In this unit, students use long division to divide decimal numbers. **In a future course**, students will use long division to convert fractions to decimals.

FL B.E.S.T. Math Benchmark:
MA.7.NSO.1.2

Example:

In this example, students convert $\frac{7}{8}$ to 0.875.

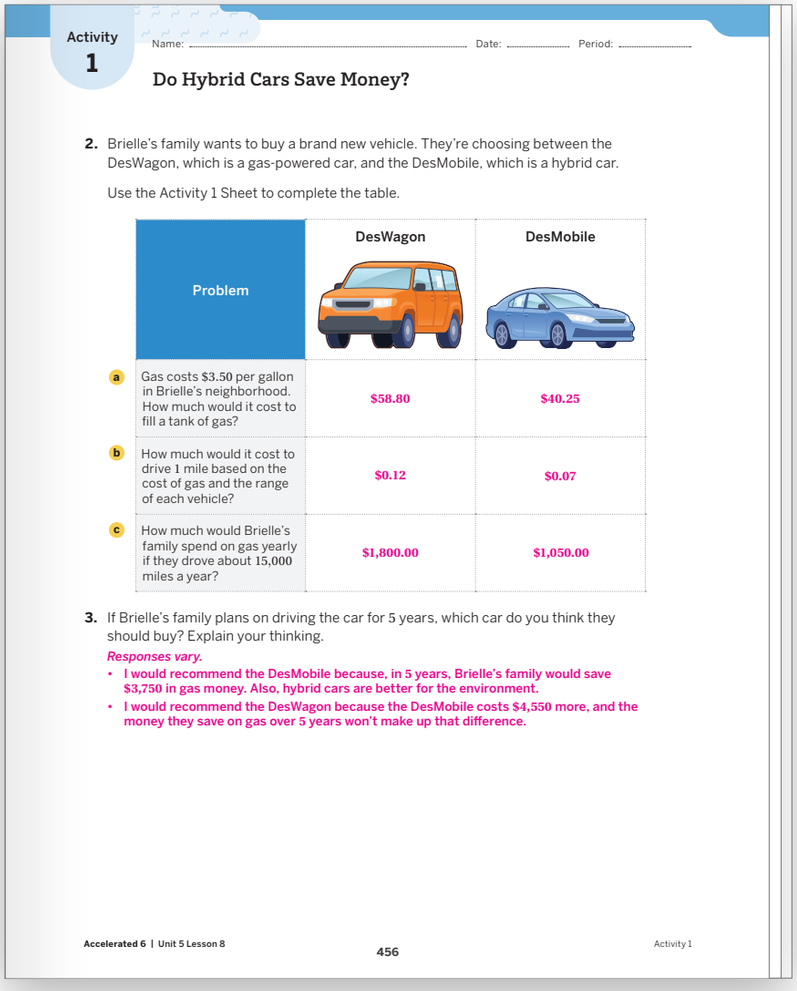


Professional Learning

Here is an opportunity to deepen your understanding of the math in this unit and how to teach it.

Spotlight on Strategic Competence

Lesson 8, Activity 1



Activity 1

Name: Date: Period:

Do Hybrid Cars Save Money?

2. Brielle's family wants to buy a brand new vehicle. They're choosing between the DesWagon, which is a gas-powered car, and the DesMobile, which is a hybrid car.

Use the Activity 1 Sheet to complete the table.

Problem	DesWagon	DesMobile
a. Gas costs $3.50 per gallon in Brielle's neighborhood. How much would it cost to fill a tank of gas?	$58.80	$40.25
b. How much would it cost to drive 1 mile based on the cost of gas and the range of each vehicle?	$0.12	$0.07
c. How much would Brielle's family spend on gas yearly if they drove about 15,000 miles a year?	$1,800.00	$1,050.00

3. If Brielle's family plans on driving the car for 5 years, which car do you think they should buy? Explain your thinking.

Responses vary.

- I would recommend the DesMobile because, in 5 years, Brielle's family would save $3,750 in gas money. Also, hybrid cars are better for the environment.
- I would recommend the DesWagon because the DesMobile costs $4,550 more, and the money they save on gas over 5 years won't make up that difference.

Accelerated 6 | Unit 5 Lesson 8 456 Activity 1

Context

In this activity, students use strategic competence as they choose which factors to consider when buying a car.

Try This

Put on your student hat and complete Activity 1.

Points to Ponder

- What do students need to understand about decimal operations to choose flexibly among different variables and propose a solution to a problem?
- Some students may select incorrect information from the data table or choose the wrong operation. How might you support students in making connections back to the situation so they can select the quantities and operations that make sense?
- How will their work with decimal operations in modeling situations support their understanding when exploring modeling problems in the future?

Notes:

Assess and Respond

Pre-Unit Check

Independent | 45 min

Facilitation: Assign the Pre-Unit Check to learn more about your students' understanding of foundational concepts and skills that will support them in the upcoming unit. This can be given in its entirety before the unit or spread throughout the unit. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Preparation for	DOK	FL B.E.S.T. Math Benchmarks
1	Representing decimals using tenths and hundredths	Lesson 1	1	MA.5.NSO.1.1
2	Connecting decimals to powers of 10	Lesson 1	1	MA.5.NSO.2.4, MA.5.NSO.2.5
3	Calculating the area and perimeter of a rectangle with decimal side lengths	Lesson 3	1	MA.5.GR.2.1
4	Multiplying or divide multi-digit whole numbers	Lesson 4	1	MA.5.NSO.2.1

Assessment and Lesson Resources

- Student Assessments
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Pre-Unit Check

Unit 5

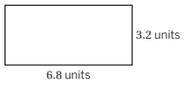
1. Select *all* the ways to describe 0.25.

- ☑ **A.** 25 tenths
- ☐ **B.** 25 hundredths
- ☑ **C.** 25 thousandths
- ☐ **D.** 2 tenths and 5 hundredths
- ☐ **E.** 2 hundredths and 5 thousandths

2. The number 0.9 is equivalent to $\frac{9}{10}$. Which of the following is equivalent to 4.9?

- **A.** $\frac{4.9}{10}$
- **B.** $\frac{4.9}{100}$
- **C.** $\frac{49}{10}$
- **D.** $\frac{49}{100}$

3. Here is a rectangle.



a. What is its perimeter?

20 units

b. What is its area?

21.76 square units

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Name: ..... Date: ..... Period: .....

Pre-Unit Check (continued)

Unit 5

4. DeAndre saved $\$254$ each month for 12 months. Gabriel saved $\$3{,}048$ in total in 12 months, saving the same amount each month. Who saved more? Circle one.

DeAndre Gabriel They both saved the same amount.

Explain your thinking.

Explanations vary. DeAndre saved a total of $254 \cdot 12 = \$3048$ in 12 months. Gabriel saved $3048 \div 12 = \$254$ each month. That means both DeAndre and Gabriel saved the same amount.

D Differentiation (Pre-Unit Check)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	Respond to Student Thinking
Preparation for Sub-Unit 1: • Multiply multi-digit decimals using a variety of strategies. **(Lessons 1–4)**	1	**Support** • **Teacher Move:** Consider writing the decimal, hundredths chart, or weight representation of each option.
	2	**Support** • **Teacher Move:** Consider spending extra time discussing the relationship between the fractions and their decimal representations. Consider writing the decimal representation of each choice as a class.
	3	**Support** • **Teacher Move:** After Lesson 3, consider revisiting this problem. Invite students to use the area model to solve the area problem and compare it with their original strategy for solving this problem.
	4	**Support** • **Teacher Move:** Invite students to use an area model or partial quotients to help solve this problem and compare it with their original strategy for solving this problem.

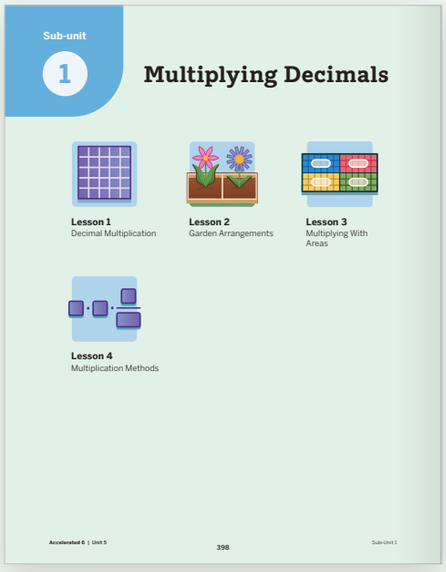
Sub-Unit 1

Multiplying Decimals

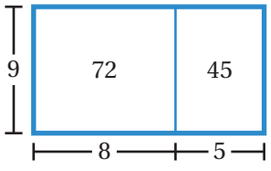
Sub-Unit 1 Goals

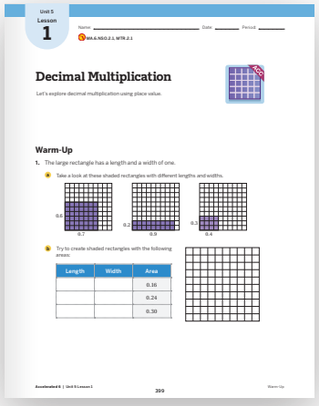
- **Goal:** Multiply multi-digit decimals using a variety of strategies.
- **Language Goal:** Compare and contrast different strategies for multiplying multi-digit decimals.

In this sub-unit, students revisit previously seen concrete models and strategies based on place value to formalize a standard algorithm for multiplying multi-digit decimals, including those with decimal places to the thousandths. They use area models to write equivalent expressions to express the area of rectangles.



Math That Matters Most

Concept or Skill	For example . . .
Multiply multi-digit decimals.	Calculate $1.6 \cdot 0.021$. **0.0336**
Write equivalent expressions to describe area.	Write two expressions to represent this area. **9(8 + 5) and 72 + 45** 


Unit 5
Lesson
1

Decimal Multiplication

Let's explore decimal multiplication using place value.

Warm-Up

1. The large rectangle has a length and a width of one.

Take a look at these shaded rectangles with different lengths and widths.

Try to create shaded rectangles with the following areas:

Length	Width	Area
		0.16
		0.24
		0.30

399

Decimal Multiplication

Introduction to Multiplying Decimals

Let's explore decimal multiplication using place value.

Learning Outcomes

Today's Goals

1. **Goal:** Use area, fractions, and place value to make sense of decimal multiplication with one non-zero digit.
2. **Language Goal:** Explain how to use fractions and place value to multiply decimals. **(Reading, Writing, Speaking, and Listening)**

Students use hundredths charts to reason about place value when multiplying decimals with one non-zero digit. Through repeated reasoning, they utilize connections between fractions and decimals to generalize a strategy that works for multiplying any decimals. **(MTR.2.1)**

Coherence

Prior Learning

In a previous course, students used a variety of strategies to explore multiplying decimals to the hundredths place.

Future Learning

In Lesson 2, students will use area models to help multiply multi-digit numbers. In Lesson 3, students will use area models to help them multiply decimals that have more than one non-zero digit. In Lesson 4, they will make connections between the area model and the standard algorithm.

Connections

- Students build upon their understanding of rectangle area models to begin their exploration of decimal multiplication. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

Mathematical Thinking and Reasoning Standard: MTR.2.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	**MA.7.NSO.2.2**
MA.5.NSO.2.2	
MA.5.NSO.2.4	
MA.5.NSO.2.5	

Lesson at a Glance

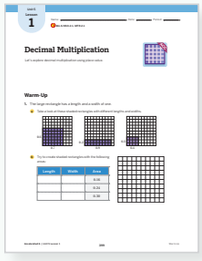
~ 45 min

MA.6.NSO.2.1

Warm-Up

Independent | 5 min

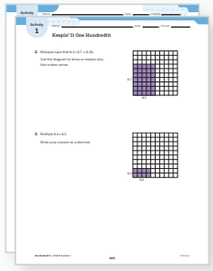
Students use a hundredths chart to explore the relationship between decimal side lengths and the area of a rectangle.



Activity 1

Pairs | 15 min

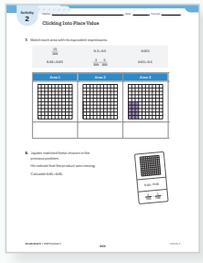
Students use area and fraction multiplication to make sense of multiplying decimals with one non-zero digit. **(MTR.2.1)**



Activity 2

Pairs | 10 min

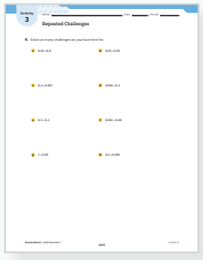
Students use repeated reasoning to develop a strategy for multiplying decimals with non-zero digits.



Activity 3

Pairs | 5 min

Students gain fluency in reasoning about place value and decimal multiplication.

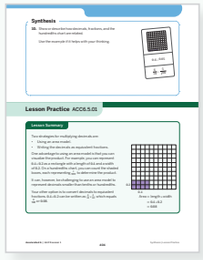


Synthesis

Whole Class | 5 min

Students synthesize strategies for multiplying decimals with one non-zero digit.

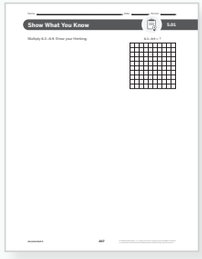
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by multiplying two decimals.



Prep Checklist

Prepare Hundredths Charts.

This lesson includes:

- Student Edition
- Show What You Know
- Hundredths Charts, one per student

Independent | 5 min

Warm-Up

Purpose: Students use a hundredths chart to explore the relationship between decimal side lengths and the area of a rectangle.

1 Launch

To surface prior knowledge, calculate the area of one rectangle as a class. Consider asking, "How many squares are shaded? What is the size of each square?"

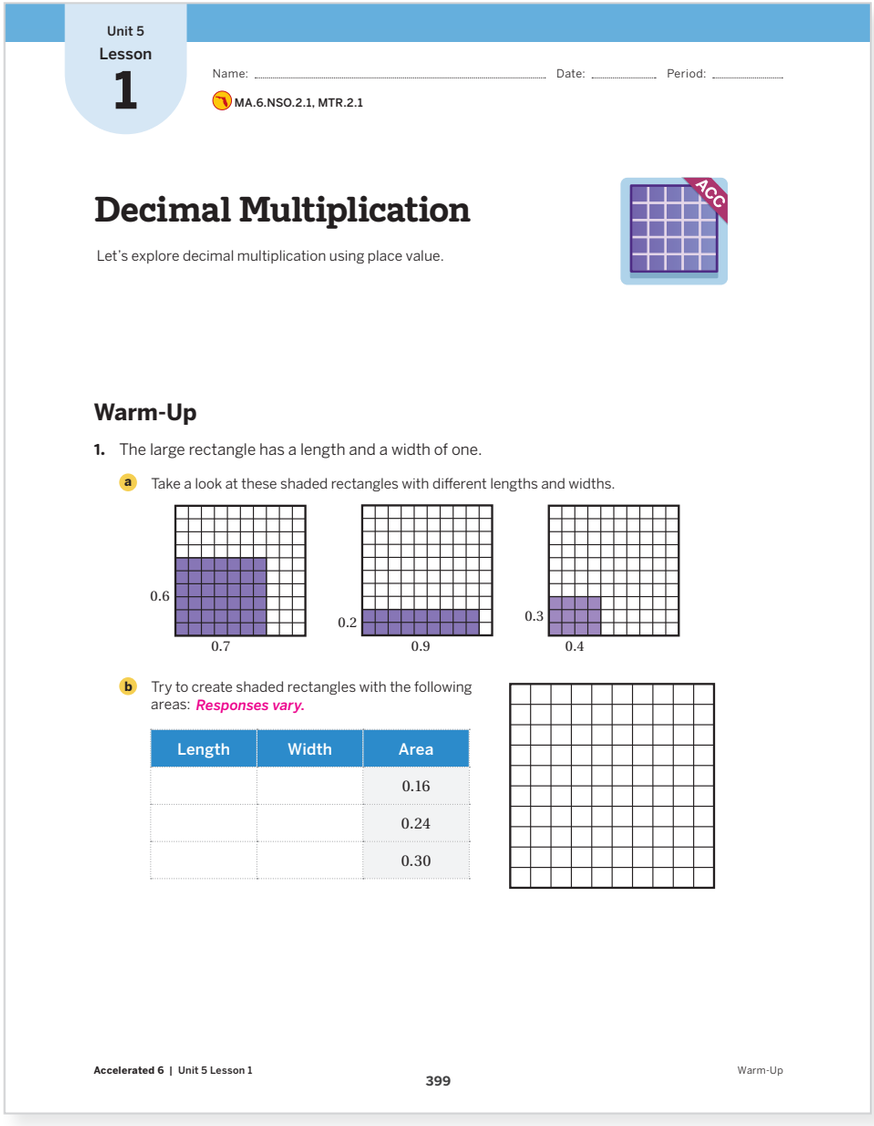
Consider sharing that there may be more than one rectangle with the given area. Encourage students to try to find all possibilities.

Invite students to get feedback from a partner throughout the lesson.

2 Connect

Invite students to share how they chose their rectangle's dimensions for each area.

Consider asking, "Why does it make sense that one area is 0.16 and not 1.6 or 0.016?"



Unit 5
Lesson
1

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.1, MTR.2.1

Decimal Multiplication

Let's explore decimal multiplication using place value.

ACC

Warm-Up

1. The large rectangle has a length and a width of one.

a. Take a look at these shaded rectangles with different lengths and widths.

b. Try to create shaded rectangles with the following areas: *Responses vary.*

Length	Width	Area
		0.16
		0.24
		0.30

Accelerated 6 | Unit 5 Lesson 1 399 Warm-Up

Pairs | 15 min

Activity 1 Keepin' It One Hundredth

Purpose: Students use area and fraction multiplication to make sense of multiplying decimals with one non-zero digit. **(MTR.2.1)**

1 Launch

To surface connections, consider asking, "Why do you think Makayla wrote a multiplication statement here instead of an addition or subtraction statement?"

2 Monitor

To support students getting started, consider asking:

- "According to Makayla, what is the area of the rectangle?"
- "Why is it 35 hundredths rather than 35 tenths or thousandths?"

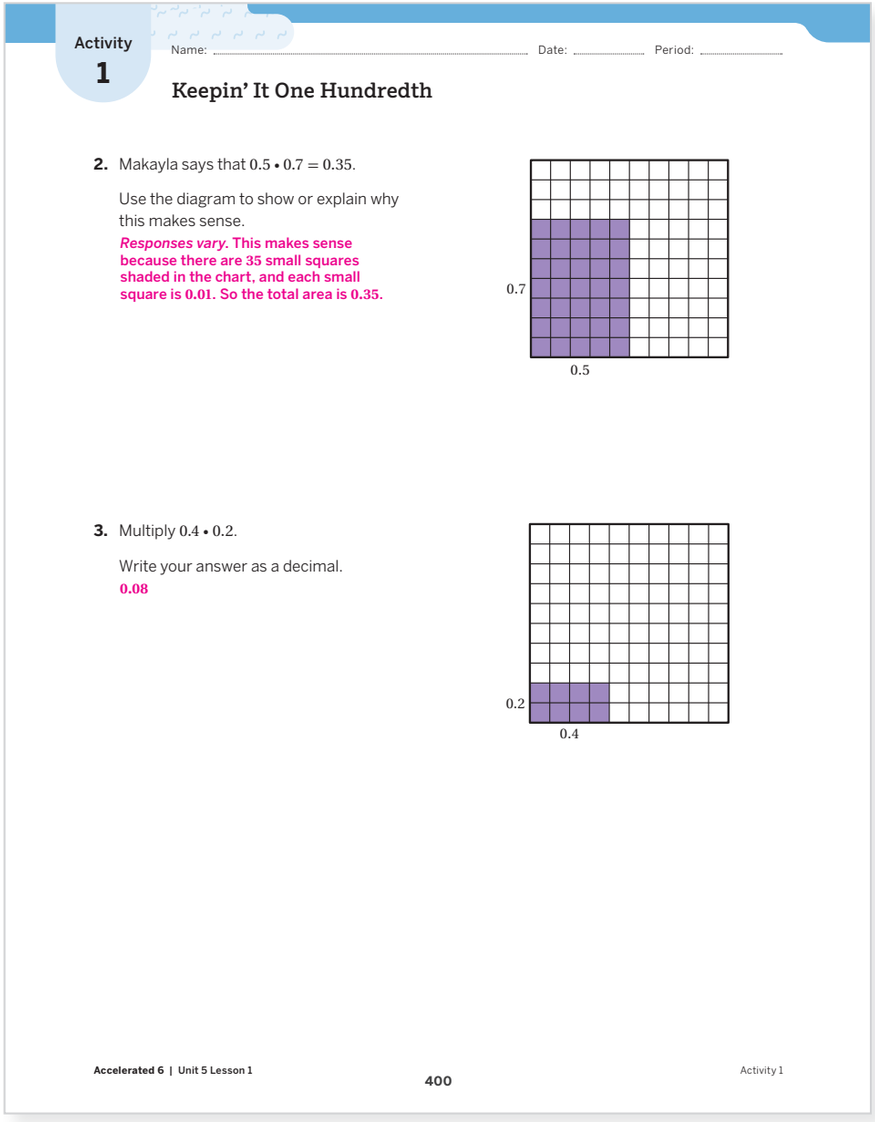
ELL **English Language Learners** Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

Invite students to share their reasoning with others.

D **Differentiation: (Support)** Look for students who submit an answer of 8 or 0.8. Consider reminding students that the entire hundredths chart represents one whole. Consider asking, "Are the size of the 8 pieces full units, tenths, or some other size?"

Note: Some students overgeneralize the strategy for multiplying numbers by "counting the zeros" (e.g., $100 \cdot 1000 = 100000$), but it is not universally applicable (e.g., $0.4 \cdot 0.2 \neq 0.8$). If you hear this reasoning throughout the lesson, point students back to this problem as a counterexample.

Activity 1 continued >



Activity 1

Name: Date: Period:

Keepin' It One Hundredth

2. Makayla says that $0.5 \cdot 0.7 = 0.35$.

Use the diagram to show or explain why this makes sense.

Responses vary. This makes sense because there are 35 small squares shaded in the chart, and each small square is 0.01. So the total area is 0.35.

3. Multiply $0.4 \cdot 0.2$.

Write your answer as a decimal.

0.08

Pairs | 15 min

Activity 1 Keeping It One Hundredth (continued)

Purpose: Students use area and fraction multiplication to make sense of multiplying decimals with one non-zero digit. **(MTR.2.1)**

2 Monitor

Invite students to share the commonalities and differences they noticed with other pairs.

To support students getting started, consider asking, "Are the small shaded rectangles hundredths? How many of them might fill up the unit square?"

Look and listen for students who may need individual support to be comfortable with at least one strategy.

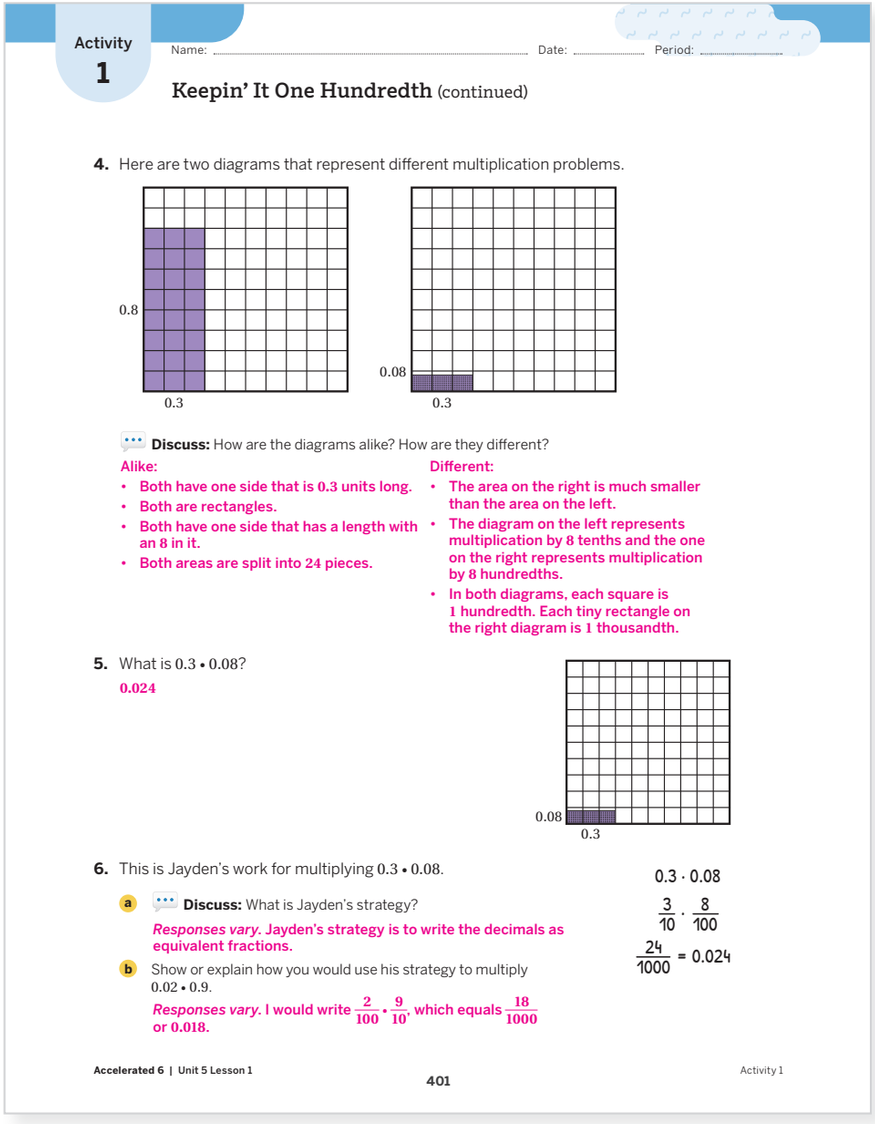
D Differentiation *(Problem 6)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking: • "Why did Jayden write $\frac{3}{10}$ and $\frac{8}{100}$ underneath 0.3 and 0.08?" • "How might he have gotten $\frac{24}{1000}$?"
Use the strategy of "counting the zeros."	**Support** Consider asking, "What was $0.4 \cdot 0.2$? Would your strategy work for this example?"
Write a power of 10 that is too small or too large (e.g., 1.8, 0.18, or 0.0018).	**Strengthen** Consider asking: • "How could we write each decimal as a fraction?" • "How can we express the product as a decimal?"
Use a hundredths chart.	
Use strategies to determine 0.018 such as: • Multiplying $\frac{2}{100}$ and $\frac{9}{10}$. • Reasoning that hundredths times tenths is thousandths.	**Strengthen** Invite students to think about how they would share their thinking during the Connect. **Stretch** Consider asking, "What are some other pairs of numbers that multiply to 0.018?"

3 Connect

Invite students to share their descriptions of Jayden's strategy and how they would use it to multiply $0.02 \cdot 0.9$ in Problem 6.

Consider asking, "When might Jayden's strategy be helpful? When might a hundredths chart be helpful?" **(MTR.2.1)** A hundredths chart makes multiplying more visual, but thousandths are very small and can be difficult to draw. Jayden's method works well with smaller decimals, but we have to turn decimals into fractions and then reverse back to decimals.



Activity 1

Name: Date: Period:

Keepin' It One Hundredth (continued)

4. Here are two diagrams that represent different multiplication problems.

Discuss: How are the diagrams alike? How are they different?

Alike:
- Both have one side that is 0.3 units long.
- Both are rectangles.
- Both have one side that has a length with an 8 in it.
- Both areas are split into 24 pieces.

Different:
- The area on the right is much smaller than the area on the left.
- The diagram on the left represents multiplication by 8 tenths and the one on the right represents multiplication by 8 hundredths.
- In both diagrams, each square is 1 hundredth. Each tiny rectangle on the right diagram is 1 thousandth.

5. What is $0.3 \cdot 0.08$?

0.024

6. This is Jayden's work for multiplying $0.3 \cdot 0.08$.

$0.3 \cdot 0.08$

$\frac{3}{10} \cdot \frac{8}{100}$

$\frac{24}{1000} = 0.024$

a. **Discuss:** What is Jayden's strategy?

Responses vary. Jayden's strategy is to write the decimals as equivalent fractions.

b. Show or explain how you would use his strategy to multiply $0.02 \cdot 0.9$.

Responses vary. I would write $\frac{2}{100} \cdot \frac{9}{10}$, which equals $\frac{18}{1000}$ or 0.018.

Accelerated 6 | Unit 5 Lesson 1 401 Activity 1

Pairs | 10 min

Activity 2 Clicking Into Place Value

Purpose: Students use repeated reasoning to develop a strategy for multiplying decimals with non-zero digits.

1 Launch

Invite students to make connections between the multiplication expressions, hundredths charts, and products. **(MTR.2.1)**

2 Monitor

Encourage students to share their reasoning with a partner and reach an agreement about how to sort the decimal expressions, hundredths charts, and fractional representations.

A **Accessibility: Executive Function** Invite students to focus on one expression at a time to support them in carrying out multiple steps.

Look for a variety of student thinking and invite students to share during the Connect.

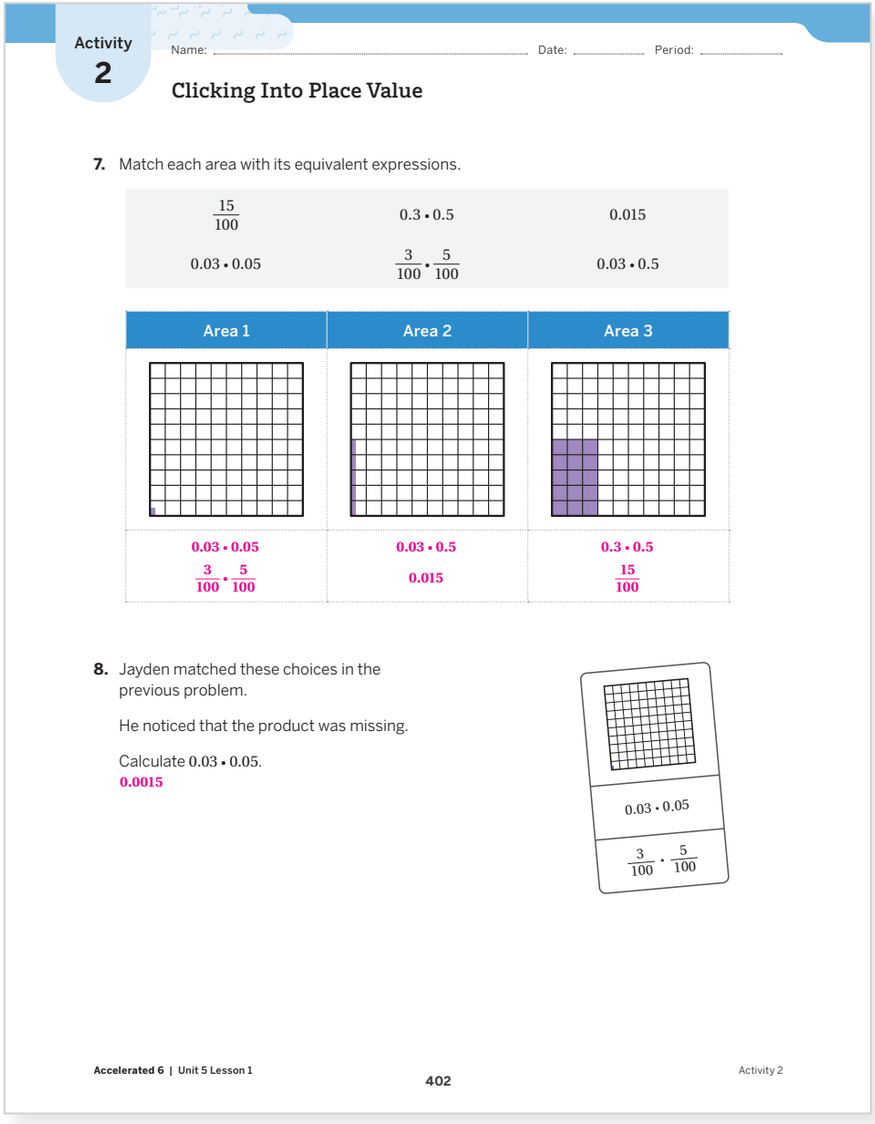
D **Differentiation** *(Problem 8)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How can we use fractions to multiply these decimals?"
Write a power of 10 that is too small or too large (e.g., 0.15, 0.015, or 0.00015).	**Strengthen** Consider asking, "How could we write $\frac{15}{10000}$ as a decimal?" Invite students to explore patterns they noticed in the sort.
Use fractions to obtain the correct answer of 0.0015.	**Stretch** Invite students to write other multiplication expressions with the same product.

3 Connect

Invite students to share their multiplication strategies.

To surface the Key Takeaway, consider asking, "How can fractions help us multiply decimals?"



Activity 2

Name: Date: Period:

Clicking Into Place Value

7. Match each area with its equivalent expressions.

$\frac{15}{100}$	$0.3 \cdot 0.5$	0.015
$0.03 \cdot 0.05$	$\frac{3}{100} \cdot \frac{5}{100}$	$0.03 \cdot 0.5$

Area 1	Area 2	Area 3
$0.03 \cdot 0.05$ $\frac{3}{100} \cdot \frac{5}{100}$	$0.03 \cdot 0.5$ 0.015	$0.3 \cdot 0.5$ $\frac{15}{100}$

8. Jayden matched these choices in the previous problem.

He noticed that the product was missing.

Calculate $0.03 \cdot 0.05$.

0.0015

Accelerated 6 | Unit 5 Lesson 1 402 Activity 2

Key Takeaway: We can use place value to multiply decimals. One strategy for multiplying decimals is to convert them to fractions, multiply the fractions, and convert the product back to a decimal.

Pairs | 5 min

Activity 3 Repeated Challenges

Purpose: Students gain fluency in reasoning about place value and decimal multiplication.

Short on time? Consider inviting students to complete fewer Repeated Challenges.

1 Launch

Invite students to solve as many problems as they have time for. Share that it's more important to make sense of the challenges than it is to work quickly. Provide the Hundredths Charts Sheet as needed.

A **Accessibility: Memory and Attention** Invite students who would benefit from having more time to think deeply to complete fewer challenges.

Invite students to work with a partner for this activity. They will solve and compare their solutions to problems.

2 Monitor

Capture student strategies and thinking. Invite these students to share during the Connect.

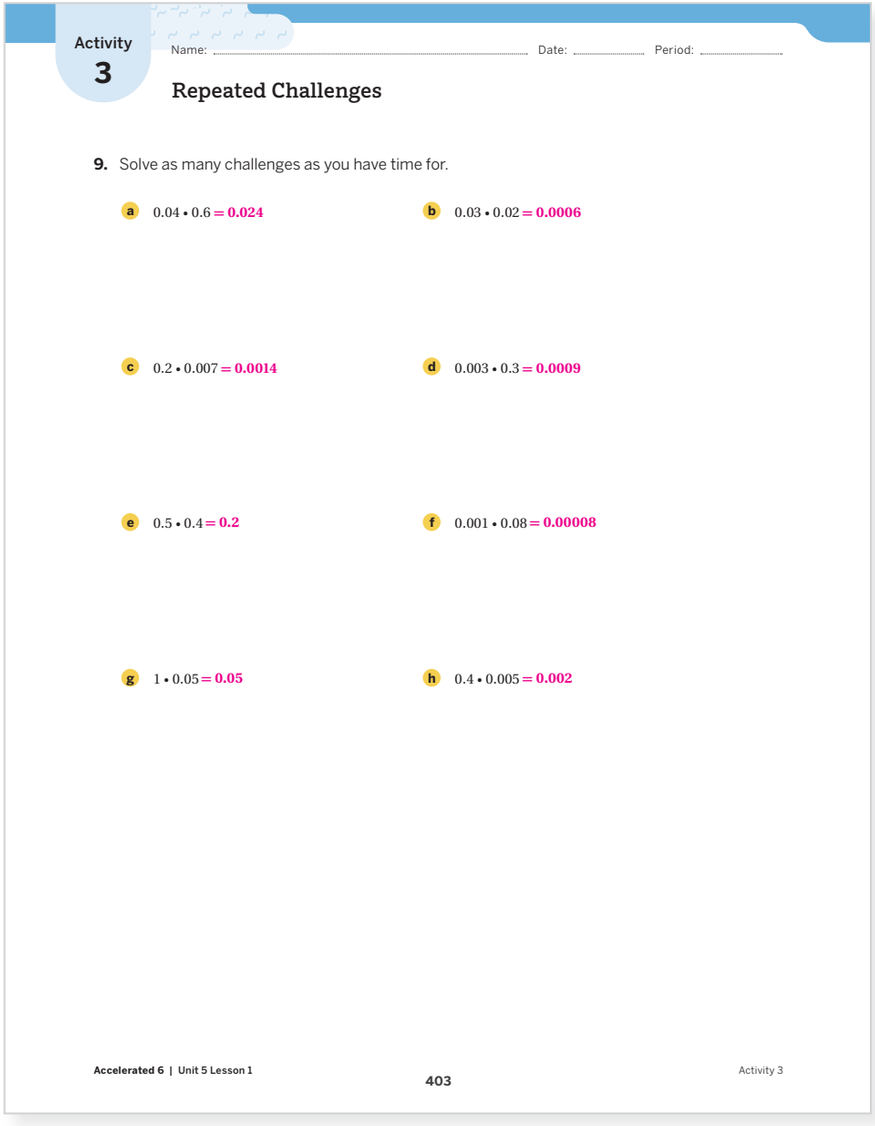
Note: Review student work to see how many problems each student has completed correctly.

3 Connect

Share the captured strategies. Invite students to share their approaches for multiplying decimals and their solutions. **(MTR.2.1)**

Consider asking:

- "What are some strategies for multiplying decimals?"
- "What are some benefits of each strategy?"



Activity 3

Name: Date: Period:

Repeated Challenges

9. Solve as many challenges as you have time for.

a. $0.04 \cdot 0.6 = 0.024$

b. $0.03 \cdot 0.02 = 0.0006$

c. $0.2 \cdot 0.007 = 0.0014$

d. $0.003 \cdot 0.3 = 0.0009$

e. $0.5 \cdot 0.4 = 0.2$

f. $0.001 \cdot 0.08 = 0.00008$

g. $1 \cdot 0.05 = 0.05$

h. $0.4 \cdot 0.005 = 0.002$

Accelerated 6 | Unit 5 Lesson 1 403 Activity 3

Whole Class | 5 min

Synthesis

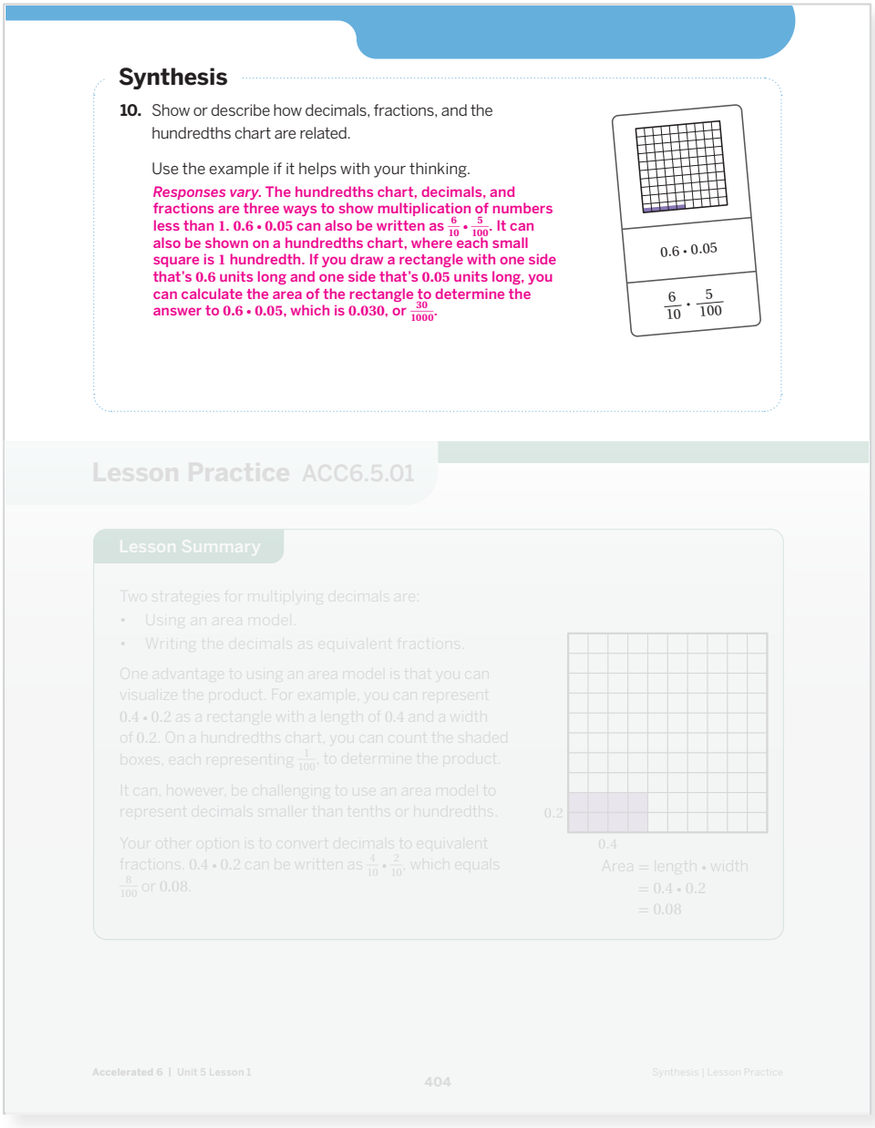
Purpose: Students synthesize strategies for multiplying decimals with one non-zero digit.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- We can use the factors to make a rectangle on a hundredths chart and count to find the area.
- We can convert the decimals to fractions, multiply them, and then convert back to a decimal.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies for multiplying decimals as they share. Display for students to reference and add to for the rest of the unit.



Synthesis

10. Show or describe how decimals, fractions, and the hundredths chart are related.

Use the example if it helps with your thinking.

Responses vary. The hundredths chart, decimals, and fractions are three ways to show multiplication of numbers less than 1. $0.6 \cdot 0.05$ can also be written as $\frac{6}{10} \cdot \frac{5}{100}$. It can also be shown on a hundredths chart, where each small square is 1 hundredth. If you draw a rectangle with one side that's 0.6 units long and one side that's 0.05 units long, you can calculate the area of the rectangle to determine the answer to $0.6 \cdot 0.05$, which is 0.030, or $\frac{30}{1000}$.

Lesson Practice ACC6.5.01

Lesson Summary

Two strategies for multiplying decimals are:

- Using an area model.
- Writing the decimals as equivalent fractions.

One advantage to using an area model is that you can visualize the product. For example, you can represent $0.4 \cdot 0.2$ as a rectangle with a length of 0.4 and a width of 0.2. On a hundredths chart, you can count the shaded boxes, each representing $\frac{1}{100}$, to determine the product.

It can, however, be challenging to use an area model to represent decimals smaller than tenths or hundredths.

Your other option is to convert decimals to equivalent fractions. $0.4 \cdot 0.2$ can be written as $\frac{4}{10} \cdot \frac{2}{10}$, which equals $\frac{8}{100}$ or 0.08.

Area = length • width
$= 0.4 \cdot 0.2$
$= 0.08$

Accelerated 6 | Unit 5 Lesson 1 404 Synthesis | Lesson Practice

Lesson Takeaway: We can use area models, fractions, and place value to multiply decimals. In any strategy, it is important to think about the size (tenths, hundredths, etc.) of each number.

Independent | 5 min

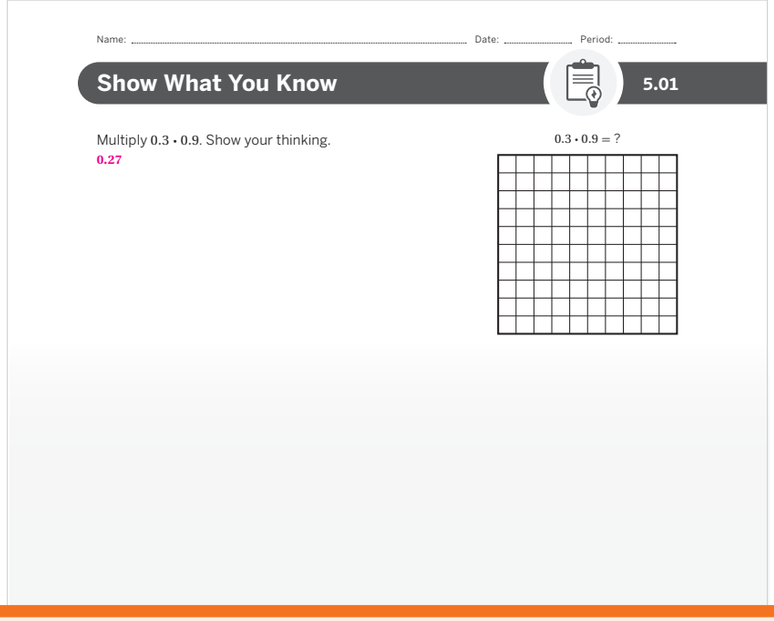
Show What You Know

Purpose: Students demonstrate their understanding by multiplying two decimals.

Today's Goals

1. **Goal:** Use area, fractions, and place value to make sense of decimal multiplication with one non-zero digit.
2. **Language Goal:** Explain how to use fractions and place value to multiply decimals. **(Reading, Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 5.01

Multiply $0.3 \cdot 0.9$. Show your thinking.

0.27

$0.3 \cdot 0.9 = ?$

Differentiation Use after Lesson 1

Support

Provide targeted intervention for students by using these resources.

If students need support with using place value to multiply single-digit decimals:

» **Respond to Student Thinking:**

- Use the *Representing Decimals on Grids* **Mini-lesson**.
- Use the *Multiplying Decimals Less Than 1* **Mini-lesson**.
- Select a few related **Practice Problems** and give individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 1 Extension Activities.**

Professional Learning

Take a moment to reflect on this lesson. What strengths did your students exhibit today? How can you build from those strengths as students continue learning about operations on decimals?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. Show or describe how decimals, fractions, and the hundredths chart are related.

Use the example if it helps with your thinking.

Responses vary. The hundredths chart, decimals, and fractions are three ways to show multiplication of numbers less than 1. $0.6 \cdot 0.05$ can also be written as $\frac{6}{10} \cdot \frac{5}{100}$. It can also be shown on a hundredths chart, where each small square is 1 hundredth. If you draw a rectangle with one side that's 0.6 units long and one side that's 0.05 units long, you can calculate the area of the rectangle to determine the answer to $0.6 \cdot 0.05$, which is 0.030, or $\frac{30}{1000}$.

Lesson Practice ACC6.5.01

Lesson Summary

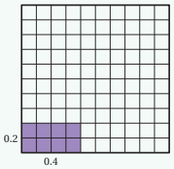
Two strategies for multiplying decimals are:

- Using an area model.
- Writing the decimals as equivalent fractions.

One advantage to using an area model is that you can visualize the product. For example, you can represent $0.4 \cdot 0.2$ as a rectangle with a length of 0.4 and a width of 0.2. On a hundredths chart, you can count the shaded boxes, each representing $\frac{1}{100}$, to determine the product.

It can, however, be challenging to use an area model to represent decimals smaller than tenths or hundredths.

Your other option is to convert decimals to equivalent fractions. $0.4 \cdot 0.2$ can be written as $\frac{4}{10} \cdot \frac{2}{10}$, which equals $\frac{8}{100}$ or 0.08.



Area = length • width
$= 0.4 \cdot 0.2$
$= 0.08$

Lesson Practice
ACC6.5.01

Name: _____ Date: _____ Period: _____

Problems 1–4: Determine the value of each expression.

1. $20 \cdot 40 = 800$

2. $200 \cdot 40 = 8000$

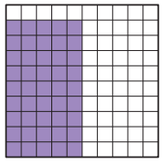
3. $2 \cdot 40 = 80$

4. $2 \cdot 0.4 = 0.8$

Problems 5–6: Here is an expression: $0.5 \cdot 0.9$.

5. Explain why the diagram represents $0.5 \cdot 0.9$.

Responses vary. The diagram shows a rectangle that has a length of 0.5 and a width of 0.9. Area equals length times width, so the area of this rectangle represents $0.5 \cdot 0.9$.



6. What is the value of $0.5 \cdot 0.9$?

0.45

Problems 7–8: Emiliano attempted to calculate $0.003 \cdot 0.007$. Here is his work.

$0.003 \cdot 0.00\overline{7} = \frac{3}{1000} \cdot \frac{\overline{7}}{1000}$

$= \frac{21}{1000} = 0.021$

7. What do you think Emiliano's mistake might be?

Responses vary. Emiliano's mistake is that he multiplied the numerators but not the denominators.

8. What is the value of $0.003 \cdot 0.007$?

0.000021

Lesson Practice
ACC6.5.01

Name: _____ Date: _____ Period: _____

Problems 9–10: Determine the value of each expression.

9. $0.3 \cdot 0.2 = 0.06$

10. $1.2 \cdot 5 = 6$

FAST Practice

11. Select *all* the expressions that have the same value as $0.05 \cdot 0.6$.

- [x] A. $5 \cdot \frac{1}{100} \cdot 6 \cdot \frac{1}{10}$
- [x] B. $5 \cdot 6 \cdot \frac{1}{1000}$
- [ ] C. $5 \cdot 0.001 \cdot 6 \cdot 0.01$
- [x] D. 0.03
- [ ] E. 0.003

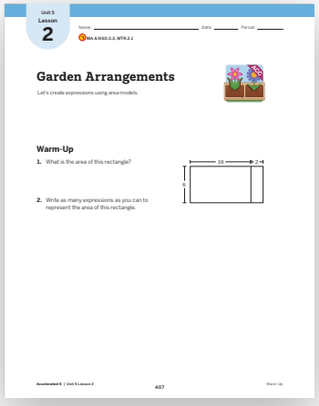
Spiral Review

12. A plumber has 52.2 meters of PVC pipe to use on a job. On the first day, she used 21.863 meters of the pipe. How many meters of pipe does she have left after the first day?

A. 30.663 (B.) 30.337 C. 30.763 D. 30.237

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.6.NSO.2.1
	5–10	2	MA.6.NSO.2.1
FAST Practice	11	2	MA.6.NSO.2.1
Spiral Review			
	12	2	MA.5.NSO.2.3


Unit 5
Lesson
2

Name _____ Date _____ Period _____

MA.6.NSO.3.2, MTR.2.1

Garden Arrangements

Let's create expressions using area models.

Warm-Up

1. What is the area of this rectangle?

10 | 2 | 4

2. Write as many expressions as you can to represent the area of this rectangle.

Accelerated 6 | Unit 5 Lesson 2 407 Warm-Up

Garden Arrangements

Factors and Expressions

Let's create expressions using area models.

Learning Outcomes

Today's Goals

1. **Goal:** Write expressions to represent the area of split rectangles using the distributive property.
2. **Language Goal:** Explain how numeric expressions related by the distributive property have the same value. **(Speaking and Listening)**

Students use area models to write equivalent expressions. They explore two methods of writing the area of a rectangle and the related expressions which illustrate the *distributive property*. They develop fluency in writing products in multiple ways. **(MTR.2.1)**

Note: This lesson is also appropriate to use between Unit 6, Lessons 6 and 7.

Coherence

Prior Learning

In Lesson 1, students used hundredths charts to develop strategies for multiplying decimals with one non-zero digit.

Future Learning

In Lessons 3–4, students will multiply decimals with multiple non-zero digits using area models. In Unit 6, students will use the distributive property to identify and generate equivalent algebraic expressions.

Connections

- Students apply multiplication models to the context of gardening. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.2

Rewrite the sum of two composite whole numbers having a common factor, as a common factor multiplied by the sum of two whole numbers.

Mathematical Thinking and Reasoning Standard: MTR.2.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.AR.3.1	MA.6.AR.1.4
MA.5.NSO.2.1	MA.7.AR.1.2
MA.5.NSO.2.2	

Vocabulary

Review Vocabulary

distributive property

Lesson at a Glance

~ 45 min

MA.6.NSO.3.2

Warm-Up

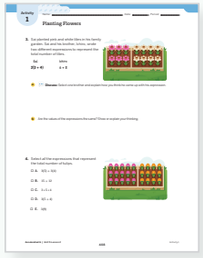
Pairs | 5 min

Students write expressions to represent the area of a split rectangle. **Routine:** Think-Pair-Share

Activity 1

Pairs | 8 min

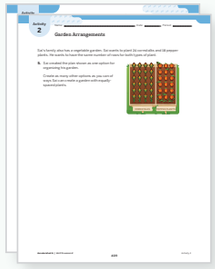
Students identify multiple ways of representing the number of objects in an area model. MLR7: Compare and Connect **(MTR.2.1)**



Activity 2

Pairs | 12 min

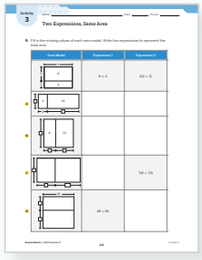
Students write multiple expressions to represent a garden arrangement and analyze the meaning of the expressions using the *distributive property*. **Routine:** Notice and Wonder **(MTR.2.1)**



Activity 3

Pairs | 10 min

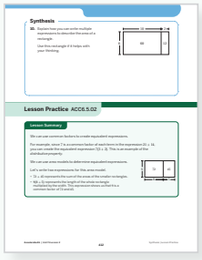
Students use area models and the distributive property to write equivalent expressions. **(MTR.2.1)**



Synthesis

Whole Class | 5 min

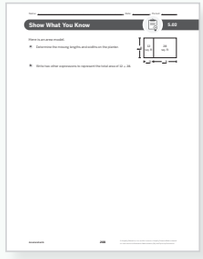
Students synthesize their understanding of using the distributive property to describe areas. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by completing an area model and writing expressions that represent it.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Counters, 42 per pair (as needed)
- Graph paper (as needed)
- Straightedges (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students write expressions to represent the area of a split rectangle.

1 Launch

Direct students' attention to the area model. Consider asking, "How could you describe this shape?"

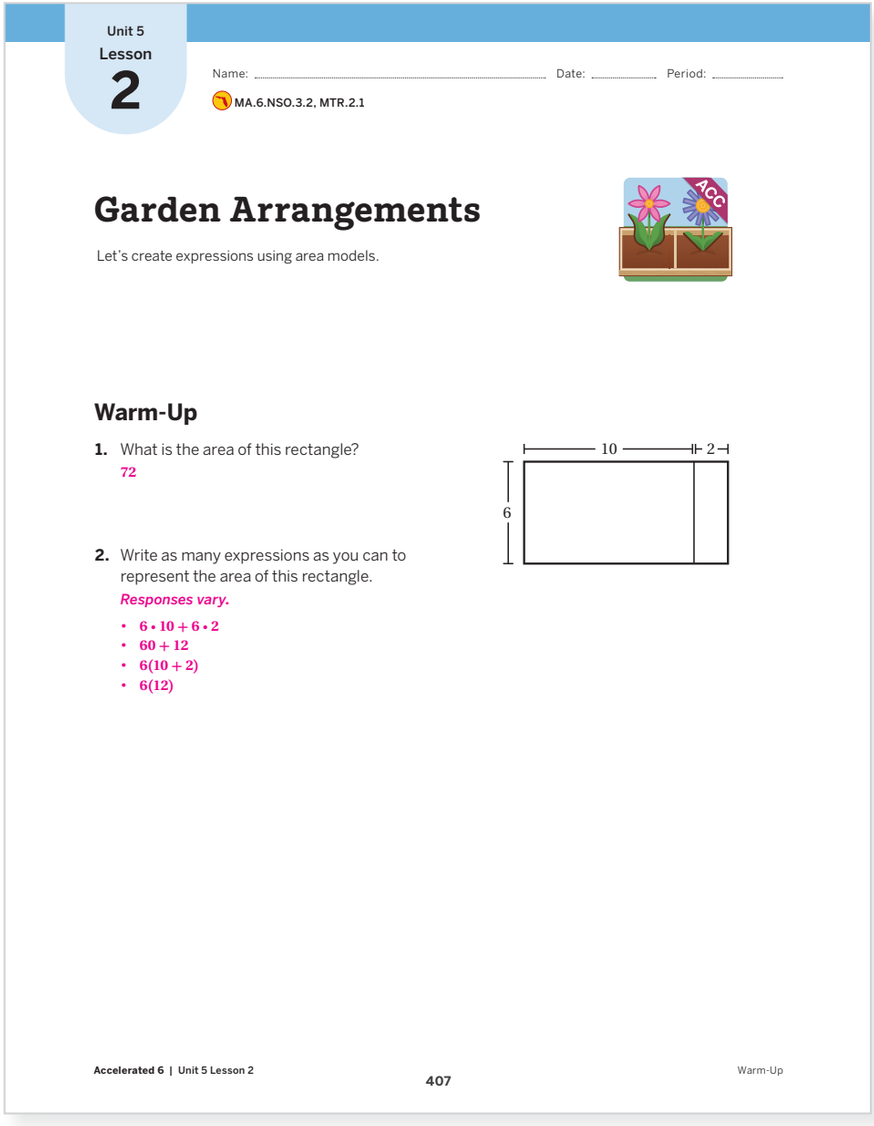
Use the Think-Pair-Share routine to help students surface their ideas about the area of the rectangle. Invite students to think independently and then take turns sharing with a partner. Invite several students to share their or their partner's thinking with the class.

2 Connect

Invite students to share their expressions and their thinking.

Note: If a student says they multiplied 6 by 12, consider asking them to explain where the 12 came from and recording both $6(10 + 2)$ and $6(12)$.

Consider asking, "How are these expressions alike? How are they different?"



Unit 5
Lesson
2

Name: Date: Period:

MA.6.NSO.3.2, MTR.2.1

Garden Arrangements

Let's create expressions using area models.

Warm-Up

1. What is the area of this rectangle?
   72

2. Write as many expressions as you can to represent the area of this rectangle.
   Responses vary.
   - $6 \cdot 10 + 6 \cdot 2$
   - $60 + 12$
   - $6(10 + 2)$
   - $6(12)$

Accelerated 6 | Unit 5 Lesson 2 407 Warm-Up

Pairs | 8 min

Activity 1 Planting Flowers

Purpose: Students identify multiple ways of representing the number of objects in an area model. **(MTR.2.1)**

1 Launch

Direct students' attention to the picture of Sai's garden and discuss the prompt. Invite students to share any questions they have.

2 Monitor

Look for ways students make sense of Sai's and Ichiro's expressions to share in the Connect.

D Differentiation

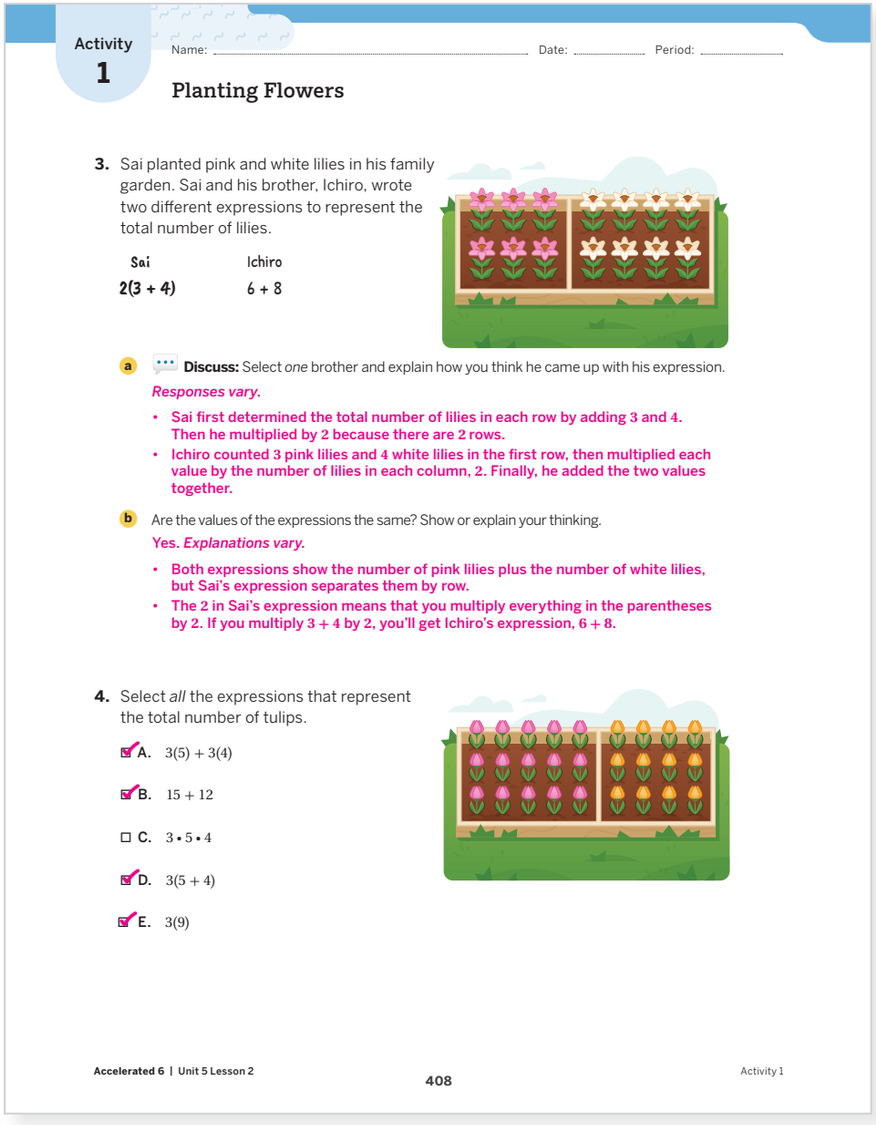
Look for students who:	Respond to Student Thinking
Need support getting started. *(Problem 3a)*	**Support** Invite them to consider the number of lilies in one section first. Consider asking, "How can we determine how many flowers are in both sections together?"
Claim Sai's and Ichiro's expressions are not the same since $2(3+4) = 6+4$. *(Problem 3b)*	**Support** Consider asking: • "Where might Sai have seen $3+4$ in the garden? What about 2?" • "Why did Sai put parentheses around both 3 and 4?"
Select Choice C. *(Problem 4)*	**Support** Consider asking, "What does $3 \cdot 5 \cdot 4$ equal? Are there 60 tulips in the garden?"
Select some (but not all) of Choices A, B, D, and E. *(Problem 4)*	**Strengthen** Invite them to look at the expressions they did not select. Consider asking, "Where can we see these numbers and relationships in the garden?"
Select Choices A, B, D, and E and can explain the relationship between the expressions and the garden. *(Problem 4)*	**Stretch** Invite them to write other expressions that represent the number of tulips.

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each expression.

3 Connect

Invite students to share by polling the class about each answer choice in Problem 4. Encourage students to share their reasoning.

To surface the Key Takeaway, consider asking:
- "Which expression in Problem 4 is most like Sai's? Most like Ichiro's?"
- "How are the expressions alike? How are they different?" **(MTR.2.1)**



Activity 1

Name: _____ Date: _____ Period: _____

Planting Flowers

3. Sai planted pink and white lilies in his family garden. Sai and his brother, Ichiro, wrote two different expressions to represent the total number of lilies.

Sai	Ichiro
$2(3+4)$	$6+8$

a. **Discuss:** Select *one* brother and explain how you think he came up with his expression.

Responses vary.
- Sai first determined the total number of lilies in each row by adding 3 and 4. Then he multiplied by 2 because there are 2 rows.
- Ichiro counted 3 pink lilies and 4 white lilies in the first row, then multiplied each value by the number of lilies in each column, 2. Finally, he added the two values together.

b. Are the values of the expressions the same? Show or explain your thinking.

Yes. *Explanations vary.*
- Both expressions show the number of pink lilies plus the number of white lilies, but Sai's expression separates them by row.
- The 2 in Sai's expression means that you multiply everything in the parentheses by 2. If you multiply $3+4$ by 2, you'll get Ichiro's expression, $6+8$.

4. Select *all* the expressions that represent the total number of tulips.

- ☑ A. $3(5)+3(4)$
- ☑ B. $15+12$
- ☐ C. $3 \cdot 5 \cdot 4$
- ☑ D. $3(5+4)$
- ☑ E. $3(9)$

Accelerated 6 | Unit 5 Lesson 2 408 Activity 1

Key Takeaway: We can determine the number of flowers in two ways — by calculating the amount in each section of the garden and adding them together, or by calculating the amount in one long row and multiplying by the number of rows.

Pairs | 12 min

Activity 2 Garden Arrangements

Purpose: Students write multiple expressions to represent a garden arrangement and analyze the meaning of the expressions using the *distributive property*. **(MTR.2.1)**

Short on time? Consider allowing students to create only one other option for Sai's garden in Problem 5.

1 Launch

Direct students' attention to the picture of Sai's vegetable garden.

To surface connections, invite students to share some of their favorite foods that use corn, peppers, or other vegetables.

Use the Notice and Wonder routine to promote curiosity and help students make sense of how the vegetables are arranged.

A **Accessibility: Visual-Spatial Processing** Consider providing sets of counters to represent the cornstalks and peppers. Invite students to arrange the physical representations and record the results in their Student Edition.

2 Monitor

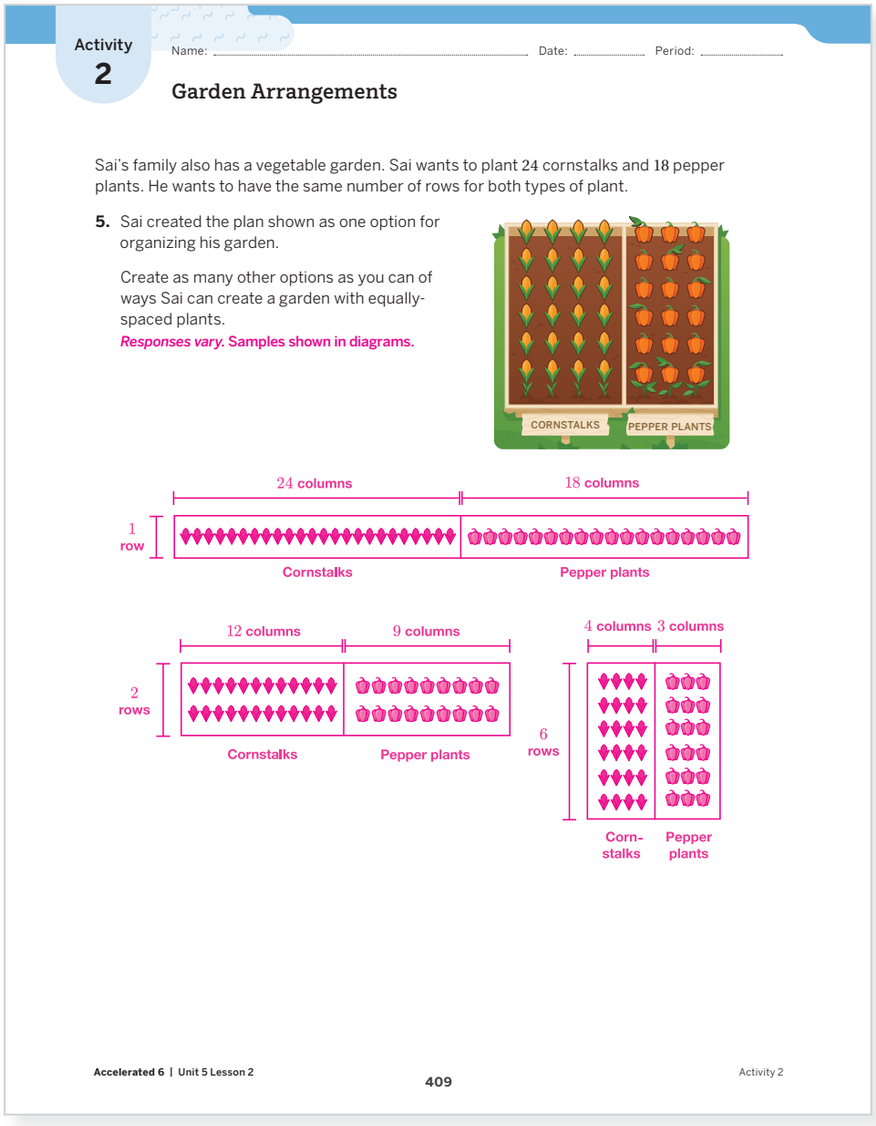
To support students getting started, invite them to consider how many rows they'd like to place the vegetables in. Consider asking, "How many cornstalks should we draw in each row? Peppers?"

A **Accessibility: Fine Motor Skills** Consider varying the task demands by providing straightedges and multiple copies of graph paper.

Invite students to share their pictures of the gardens with their classmates. Encourage students to look at others' gardens for commonalities and differences. **(MTR.2.1)**

Capture one student's example of a garden with 6 rows to support the conversation about Problems 6–8 in the Connect.

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Garden Arrangements

Sai's family also has a vegetable garden. Sai wants to plant 24 cornstalks and 18 pepper plants. He wants to have the same number of rows for both types of plant.

5. Sai created the plan shown as one option for organizing his garden.

Create as many other options as you can of ways Sai can create a garden with equally-spaced plants.

Responses vary. Samples shown in diagrams.

Accelerated 6 | Unit 5 Lesson 2 409 Activity 2

Pairs | 12 min

Activity 2 Garden Arrangements (continued)

Purpose: Students write multiple expressions to represent a garden arrangement and analyze the meaning of the expressions using the *distributive property*. **(MTR.2.1)**

Short on time? Consider allowing students to create only one other option for Sai's garden in Problem 5.

2 Monitor

Look for a variety of students' representations of the number of vegetables in the garden. **(MTR.2.1)**

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started. *(Problem 6)*	**Support** Invite students to choose any garden they drew. Consider asking, "How might Ichiro write an expression to represent your garden? What about Sai?"
Create one expression and need support creating another. *(Problem 6)*	
Need support forming an equation from the given values. *(Problem 7)*	**Strengthen** Consider asking: • "Based on your expressions, which numbers should we add together to get the total number of plants?" • "How can we arrange the remaining options to make the right side equal to 42 plants?"
Describe how the two expressions represent the same quantity in two different ways and discuss the advantages to each. *(Problems 6–8)*	**Stretch** Consider asking, "How many related pairs of expressions can we write for a different garden of 20 carrot plants and 30 tomato plants?"

ELL English Language Learners Invite students to share their responses to the discussion questions in their primary languages. Encourage students to use gestures and/or visuals as they share. **(Speaking and Listening)**

3 Connect

Display the captured student-generated garden with 6 rows and invite the student to explain their thinking.

Consider asking:
- "How does our equation in Problem 7 show us the number of vegetables in two ways?"
- "Is there a third way we can express the number of vegetables? How might Ichiro have determined the number of vegetables with 6 rows?" **(MTR.2.1)**

Direct students' attention to the picture of the garden from the previous page and the equation from Problem 7. Share that this is an example of the *distributive property*. Consider sharing that the number outside the parentheses is a common factor to both quantities on the right.

To surface the Key Takeaway, consider asking:
- "What do you notice about the two expressions?"
- "How can we use the distributive property to write $4(5+6)$ in a new way? $10(2)+10(3)$?"

Activity 2

Name: _____ Date: _____ Period: _____

Garden Arrangements (continued)

6. Choose *one* of the options that you created. Write as many expressions as you can to represent that garden arrangement.

Responses vary depending on which option students choose.

1 row:	2 rows:	6 rows:
• $24+18$	• $24+18$	• $24+18$
• $1(24+18)$	• $2(12+9)$	• $6(4+3)$

7. Fill in the blanks to show *two* different ways to represent the total number of cornstalks and pepper plants in Sai's garden. *Responses vary.*

3	4	6	18	24

18 + 24 = 6 (3 + 4)

8. **Discuss:**
- What does the left side of the equation tell you about Sai's garden? The right side?
- When would it be helpful to use the left side of the equation? The right side?

Responses vary.
- The left side of the equation can quickly help us find the total number of vegetable plants (24 cornstalks + 18 pepper plants = 42 plants total).
- The right side of the equation can quickly tell us the dimensions of the garden (6 rows by 7 columns) and how many of each plant there are per row.

Accelerated 6 | Unit 5 Lesson 2 410 Activity 2

Key Takeaway: The *distributive property* says that multiplying a number by the sum of two or more quantities is equal to multiplying the number by each quantity separately before adding the products together. For example, $10(2+3)=10(2)+10(3)$, and both expressions equal 50.

Pairs | 10 min

Activity 3 Two Expressions, Same Area

Purpose: Students use area models and the distributive property to write equivalent expressions. **(MTR.2.1)**

1 Launch

Direct students' attention to the area model in the first row of the table from the Student Edition.

To surface prior knowledge, consider asking:

- "How do we know $8 + 4$ represents the area of the figure? What about $4(2 + 1)$?"
- "What is the common factor in the second expression? Where can we see it in the area model?"

2 Monitor

Look for a variety of strategies students use to create equivalent expressions to represent the area models. **(MTR.2.1)**

D Differentiation *(Problem 9)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What does each value in the area model represent?"
Write valid expressions that accurately compute the area but aren't in the same format as the distributive property.	**Stretch** Celebrate their answers and creativity. Invite them to try to write expressions similar to those in the first row.
Use multiplicative reasoning to determine the missing dimensions in the rectangles.	**Stretch** Invite them to create new area models with missing lengths, and then to trade these with a classmate.

3 Connect

Direct students' attention to Problem 9 from the Student Edition and invite the class to choose area models to discuss.

Invite students to share how they determined the missing expressions and values in the area models.

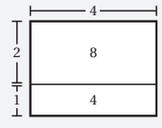
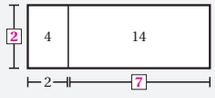
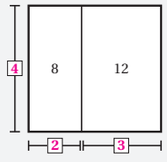
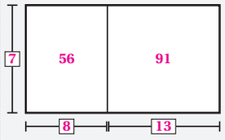
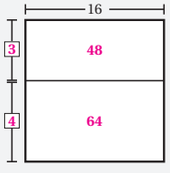
Consider asking, "Why might it be helpful to have two expressions to represent the same quantity?"

Activity 3

Name: _____ Date: _____ Period: _____

Two Expressions, Same Area

9. Fill in the missing values of each area model. Write two expressions to represent the total area.

	Area Model	Expression 1	Expression 2
		$8 + 4$	$4(2 + 1)$
a		$4 + 14$	$2(2 + 7)$
b		$8 + 12$	$4(2 + 3)$
c		$56 + 91$	$7(8 + 13)$
d		$48 + 64$	$16(3 + 4)$

Accelerated 6 | Unit 5 Lesson 2 411 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of using the distributive property to describe areas.

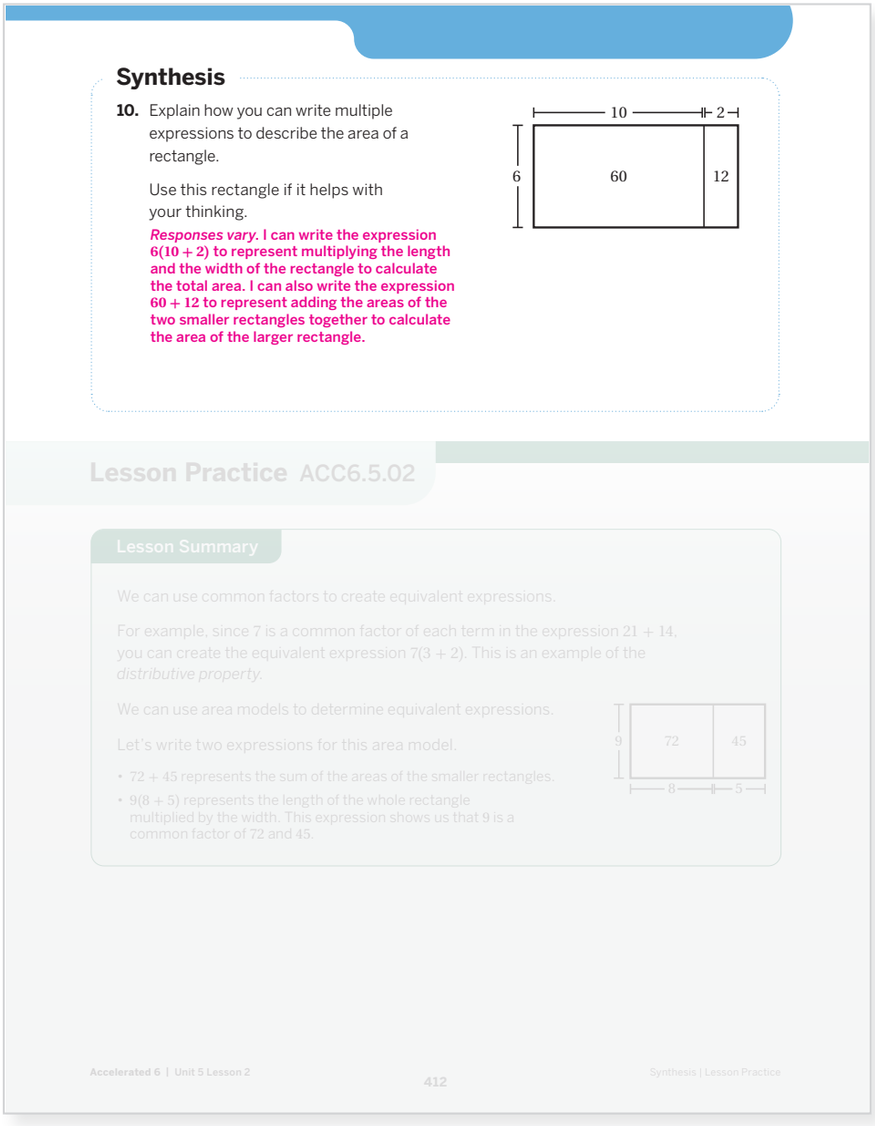
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- We can calculate the areas of each region and add them together — in this case, $6(10) + 6(2)$.
- We can multiply the common side of the rectangles by the length, which spans both smaller rectangles — in this case, $6(10 + 2)$.
- We can use the distributive property to write at least two different equivalent expressions that represent the area.

MLR **MLR2: Collect and Display** Use this routine to synthesize the class definition of the term *distributive property* using students' language. Display any new language, examples, or diagrams publicly for students to reference later.

Note: If time allows, invite students to share their explanations and lingering questions with a partner.



Synthesis

10. Explain how you can write multiple expressions to describe the area of a rectangle.

Use this rectangle if it helps with your thinking.

Responses vary. I can write the expression $6(10 + 2)$ to represent multiplying the length and the width of the rectangle to calculate the total area. I can also write the expression $60 + 12$ to represent adding the areas of the two smaller rectangles together to calculate the area of the larger rectangle.

Lesson Practice ACC6.5.02

Lesson Summary

We can use common factors to create equivalent expressions.

For example, since 7 is a common factor of each term in the expression $21 + 14$, you can create the equivalent expression $7(3 + 2)$. This is an example of the *distributive property*.

We can use area models to determine equivalent expressions.

Let's write two expressions for this area model.

- $72 + 45$ represents the sum of the areas of the smaller rectangles.
- $9(8 + 5)$ represents the length of the whole rectangle multiplied by the width. This expression shows us that 9 is a common factor of 72 and 45.

Accelerated 6 | Unit 5 Lesson 2 412 Synthesis | Lesson Practice

Lesson Takeaway: The *distributive property* says that multiplying a number by the sum of two or more quantities is equal to multiplying the number by each quantity separately before adding the products together. For example, $6(10 + 2) = 6(10) + 6(2)$, and both expressions equal 72.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by completing an area model and writing expressions that represent it.

Today's Goals

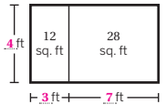
1. **Goal:** Write expressions to represent the area of split rectangles using the *distributive property.*
2. **Language Goal:** Explain how numeric expressions related by the distributive property have the same value. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.02

Here is an area model.



a. Determine the missing lengths and widths on the planter.
Responses vary. Sample shown on diagram.

b. Write two other expressions to represent the total area of $12 + 28$.
Responses vary.
- $4(3 + 7)$
- $4(3) + 4(7)$
- $2(6 + 14)$
- $2(6) + 2(14)$
- 40

D Differentiation Use after Lesson 2

Support

Provide targeted intervention for students by using these resources.

If students need support writing equivalent expressions using the distributive property:

» **Respond to Student Thinking:**

- Review the **Lesson Summary** together and provide targeted feedback to students on specific **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 1 Extension Activities**.
- Invite students to create new diagrams like those in **Activity 3**. Encourage them to write multiple area expressions for each diagram.

Professional Learning

Consider the next several lessons you will teach. How will students' work today with writing equivalent expressions prepare them for multiplying decimals in Lessons 3–4?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

10. Explain how you can write multiple expressions to describe the area of a rectangle.

Use this rectangle if it helps with your thinking.

Responses vary. I can write the expression $6(10 + 2)$ to represent multiplying the length and the width of the rectangle to calculate the total area. I can also write the expression $60 + 12$ to represent adding the areas of the two smaller rectangles together to calculate the area of the larger rectangle.

Lesson Practice ACC6.5.02

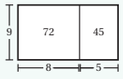
Lesson Summary

We can use common factors to create equivalent expressions.

For example, since 7 is a common factor of each term in the expression $21 + 14$, you can create the equivalent expression $7(3 + 2)$. This is an example of the *distributive property*.

We can use area models to determine equivalent expressions.

Let's write two expressions for this area model.



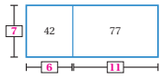
- $72 + 45$ represents the sum of the areas of the smaller rectangles.
- $9(8 + 5)$ represents the length of the whole rectangle multiplied by the width. This expression shows us that 9 is a common factor of 72 and 45.

Lesson Practice ACC6.5.02

Name: _____ Date: _____ Period: _____

Problems 1–4: Use the area models to rewrite each expression using parentheses.

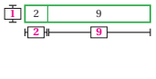
1. $42 + 77$



Responses vary.

7 (6 + 11)

2. $2 + 9$

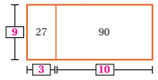


Responses vary.

1 (2 + 9)

3. $27 + 90$

Responses vary.

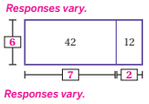


Responses vary.

9 (3 + 10)

4. $42 + 12$

Responses vary.

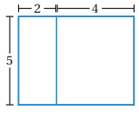


Responses vary.

6 (7 + 2)

5. Select *all* the expressions that represent the area of the largest rectangle in figure A.

Figure A



- ☑ **A.** $5(2 + 4)$
- ☐ **B.** $5 \cdot 2 + 4$
- ☑ **C.** $5 \cdot 2 + 5 \cdot 4$
- ☐ **D.** $5 \cdot 2 \cdot 4$
- ☐ **E.** $5 + 2 + 4$
- ☑ **F.** $5 \cdot 6$

Lesson Practice ACC6.5.02

Name: _____ Date: _____ Period: _____

FAST Practice

6. Which expression is equivalent to $54 + 66$ *and* uses the greatest common factor of the two numbers being added in the expression?

- **A.** $2(27 + 33)$
- **B.** $6(9 + 11)$
- **C.** $3(18 + 22)$
- **D.** $11(5 + 6)$

Spiral Review

Problems 7–10: Evaluate each expression.

7. $3.05 + 0.028 = 3.078$

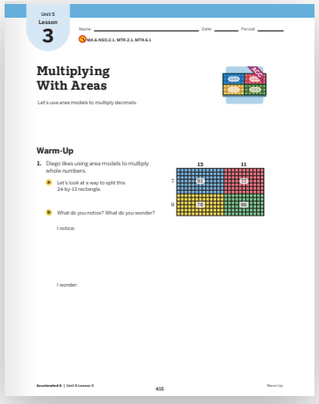
8. $6.15 - 1.045 = 5.105$

9. $3.4 - 0.005 = 3.395$

10. $4.5 + 0.009 = 4.509$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.6.NSO.3.2
	5	2	MA.6.NSO.3.2
FAST Practice	6	2	MA.6.NSO.3.2
Spiral Review			
	7–10	1	MA.5.NSO.2.3


Unit 5
Lesson
3
Name: Date: Period:
MA.6.NSO.2.1, MTR.2.1, MTR.6.1
Multiplying With Areas
Let's use area models to multiply decimals.
Warm-Up
1. Diego likes using area models to multiply whole numbers.
Let's look at a way to split this 24-by-13 rectangle.
What do you notice? What do you wonder?
I notice:
I wonder:
Accelerated 6 | Unit 5 Lesson 3
415
Warm-Up

Multiplying With Areas

Using Area Models to Multiply Decimals

Let's use area models to multiply decimals.

Learning Outcomes

Today's Goals

1. **Goal:** Use area models to represent and multiply decimals with two non-zero digits.
2. **Language Goal:** Explain how to use area models to multiply decimals. **(Writing, Speaking, and Listening)**

Students use area models to multiply decimals with more than one non-zero digit. They explore different ways to split rectangles and break down numbers by place value, as well as the relationships between those processes. Area models allow students to break one larger multiplication problem into smaller calculations focused on multiplying one digit at a time.

Coherence

Prior Learning

In Lesson 1, students used a hundredths chart and conversion to fractions to develop place value strategies for multiplying decimals.

Future Learning

In Lesson 4, students will explore the standard algorithm for multiplying decimals.

Connections

- Students build upon their understanding of rectangle area models to solve more complex multiplication problems. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.6.1

ELA Expectations: ELA.K12.EE.1.1, ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.2.2
MA.5.NSO.2.4	
MA.5.NSO.2.5	

Lesson at a Glance

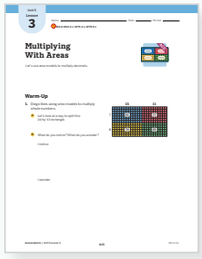
~ 45 min

MA.6.NSO.2.1

Warm-Up

Pairs | 5 min

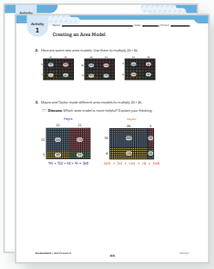
Students connect area models to multi-digit multiplication. **Routine:** Notice and Wonder



Activity 1

Pairs | 15 min

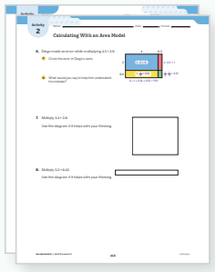
Students apply knowledge of multi-digit multiplication to create strategies for multiplying decimals with several non-zero digits.



Activity 2

Pairs | 15 min

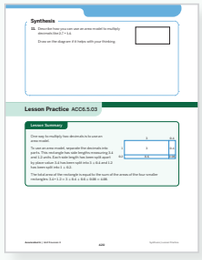
Students practice multiplying decimals with more than one non-zero digit and generalize their strategies when factors are less than 1.
MLR3: Critique, Correct, Clarify



Synthesis

Whole Class | 5 min

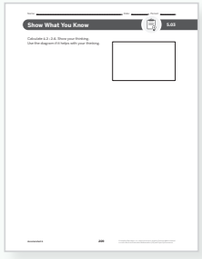
Students synthesize their understanding of using area models to multiply decimals.
MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by multiplying decimals with more than one non-zero digit.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students connect area models to multi-digit multiplication.

1 Launch

Use the Notice and Wonder routine to promote curiosity and help students make sense of how an area model could represent multiplication. **(MTR.2.1)**

A **Accessibility: Visual-Spatial Processing** Provide access to connecting cubes to allow students to create the area model.

Consider asking, "Can you think of another way to split this rectangle?"

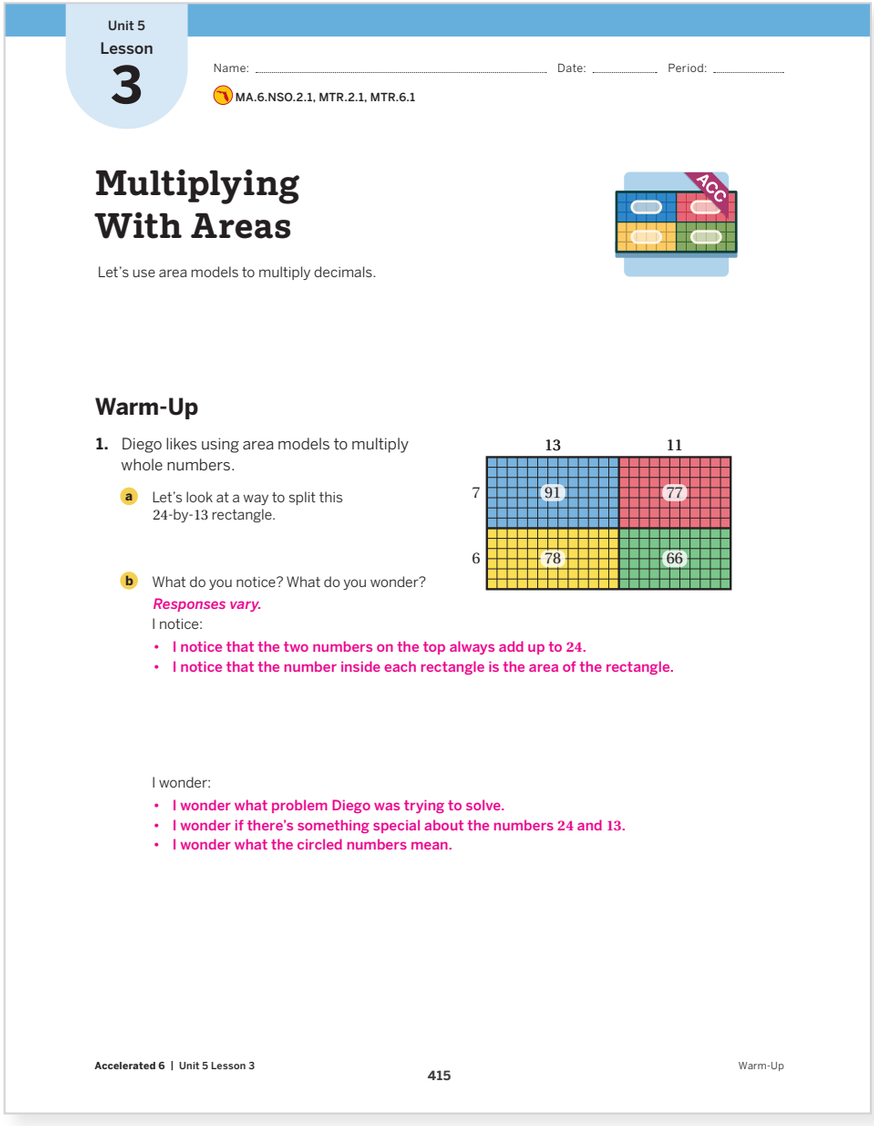
Note: If it does not come up naturally, consider sharing that we can split the area model into four sections, two sections, or one section.

2 Connect

Invite students to share what they noticed and wondered.

To surface the Key Takeaway, consider asking:

- "How does splitting the rectangle in different ways change the area of the entire 24-by-13 rectangle?"
- "How might Diego multiply 24 by 13 using this diagram?"



Unit 5
Lesson
3

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.1, MTR.2.1, MTR.6.1

Multiplying With Areas

Let's use area models to multiply decimals.

ACC

Warm-Up

1. Diego likes using area models to multiply whole numbers.

   a. Let's look at a way to split this 24-by-13 rectangle.

   b. What do you notice? What do you wonder?

Responses vary.

I notice:

- I notice that the two numbers on the top always add up to 24.
- I notice that the number inside each rectangle is the area of the rectangle.

I wonder:

- I wonder what problem Diego was trying to solve.
- I wonder if there's something special about the numbers 24 and 13.
- I wonder what the circled numbers mean.

Accelerated 6 | Unit 5 Lesson 3 415 Warm-Up

Key Takeaway: Area models help us multiply numbers. No matter how the rectangles are split, the large rectangle's area will equal the sum of the small rectangles' areas.

Pairs | 15 min

Activity 1 Creating an Area Model

Purpose: Students apply knowledge of multi-digit multiplication to create strategies for multiplying decimals with several non-zero digits.

1 Launch

Consider asking, "What does the area model have to do with $23 \cdot 16$?"

Invite students to select the area model that they think will be helpful for calculating the total area before they multiply $23 \cdot 16$.

2 Monitor

Differentiation: (Support) To support students getting started, consider asking, "How could we use the smaller rectangles to find the area of the larger 23-by-16 rectangle?"

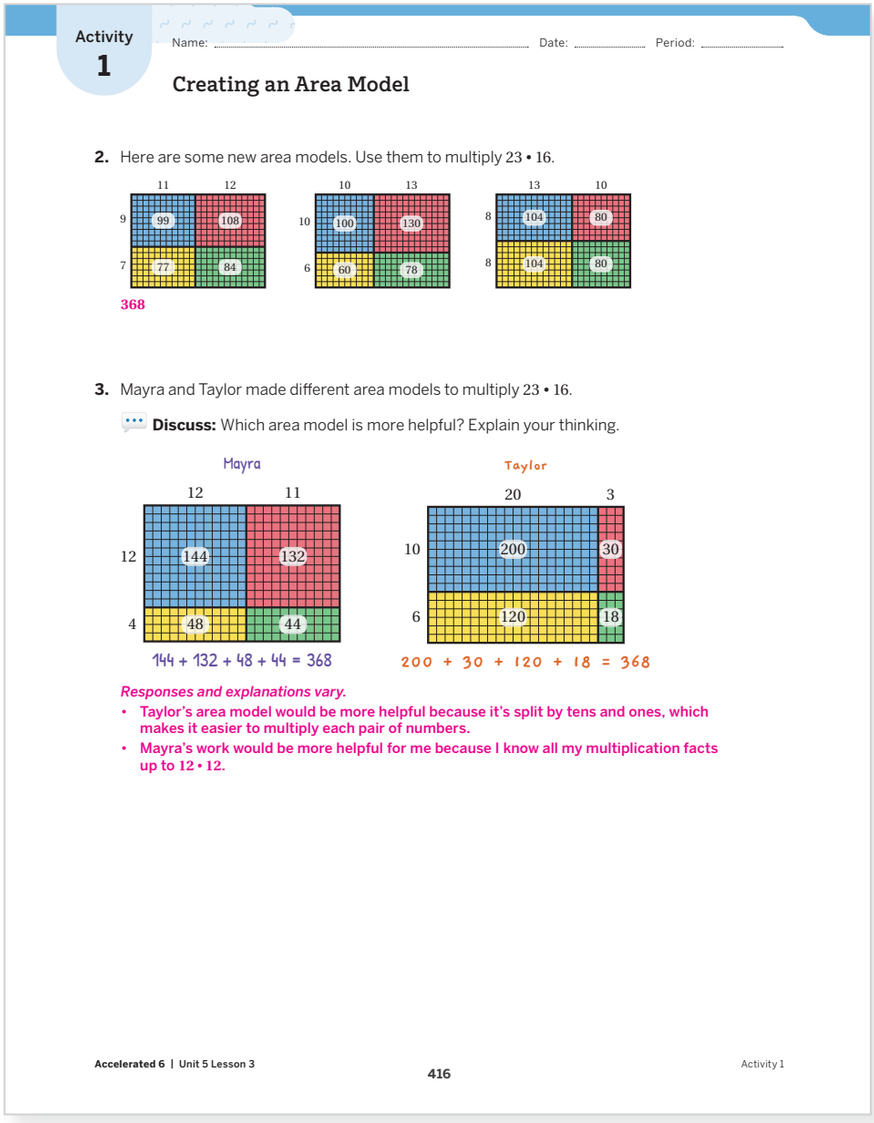
Listen for students who make connections between their own choice for splitting rectangles and Mayra's or Taylor's. Invite them to share during the Pause.

Pause briefly to poll the class about whether Mayra's or Taylor's way to split the rectangle was more helpful.

Consider asking:

- "What might Mayra have been thinking when she split her rectangle? What about Taylor?"
- "Which strategy would you be more likely to use for other multiplication problems? Why?" **(MTR.2.1)**

Activity 1 continued >



Activity 1

Name: Date: Period:

Creating an Area Model

2. Here are some new area models. Use them to multiply $23 \cdot 16$.

368

3. Mayra and Taylor made different area models to multiply $23 \cdot 16$.

Discuss: Which area model is more helpful? Explain your thinking.

Mayra

144 + 132 + 48 + 44 = 368

Taylor

200 + 30 + 120 + 18 = 368

Responses and explanations vary.

- Taylor's area model would be more helpful because it's split by tens and ones, which makes it easier to multiply each pair of numbers.
- Mayra's work would be more helpful for me because I know all my multiplication facts up to $12 \cdot 12$.

Accelerated 6 | Unit 5 Lesson 3 416 Activity 1

Pairs | 15 min

Activity 1 Creating an Area Model (continued)

Purpose: Students apply knowledge of multi-digit multiplication to create strategies for multiplying decimals with several non-zero digits.

2 Monitor

Select and sequence a variety of student thinking and ways to split the rectangle.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to reflect on Taylor's strategy from the previous problem. Consider asking, "How is multiplying $2.3 \cdot 1.6$ like multiplying $23 \cdot 16$?"
Split rectangles and are left with multiplication calculations they cannot complete.	
Split the large rectangle into 2 smaller rectangles instead of 4 (e.g., 1.6-by-2 and 1.6-by-0.3).	**Strengthen** Invite students to share during the Connect.
Draw a line vertically to split the rectangle in half with widths of 0.8 and 0.8.	
Break down the dimensions into the whole number component and a decimal less than 1.	

ELL English Language Learners Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

Look for students who guess-and-check or who need support with calculations. Consider inviting them to split their rectangle in a different way.

D Differentiation: (Support) Look for students who need support with adding decimals. Consider asking, "How might we write our decimals so that all place values are aligned?"

3 Connect

Invite students to share their rectangles and strategies for multiplying 2.3 by 1.6. **(MTR.2.1)**

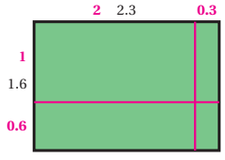
To surface the Key Takeaway, consider asking:
- "How did having a visual model help us?"
- "Of all the ways to split the rectangle, which was most helpful for you? Why?"

Activity 1

Name: _____ Date: _____ Period: _____

Creating an Area Model (continued)

4. Diego wonders if area models could also help him multiply decimals like $2.3 \cdot 1.6$.



a. Show how you would split this rectangle into smaller parts to multiply $2.3 \cdot 1.6$.

Responses vary. Sample shown on diagram.

b. Explain why you split it that way.

Explanations vary.
- I split the rectangle so that the ones were separate from the tenths, kind of like Taylor's diagram which is split by tens and ones.
- I split it in half (0.8 and 0.8) so that I could calculate the same area on each side.

5. Use your area model to calculate $2.3 \cdot 1.6$.

3.68

Accelerated 6 | Unit 5 Lesson 3 417 Activity 1

Key Takeaway: When multiplying decimals, we can break them into their place values (e.g., 2.3 can be broken down into 2 and 0.3). Using this strategy with area models creates smaller rectangles whose dimensions are multiplied one place value at a time.

Pairs | 15 min

Activity 2 Calculating With an Area Model

Purpose: Students practice multiplying decimals with more than one non-zero digit and generalize their strategies when factors are less than 1.

Short on time? Consider omitting Problem 6.

1 Launch

Invite students to estimate $4.5 \cdot 2.9$ and share their estimate with the class.

2 Monitor

Invite students to compare Diego's work with their estimates.

Pause to discuss Diego's work.

MLR **MLR3: Critique, Correct, Clarify** Use this routine to help students describe strengths, errors, and ambiguities in Diego's work. Then invite students to:

a. Discuss what is *correct* about the response.
b. Discuss what is *incorrect* or *unclear*.
c. Write a question to help Diego see how his work can be improved, or create a revised response. **(MTR.6.1)**

Look for a variety of multiplication strategies.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite them to label the dimensions of the rectangle and estimate the total area. Consider asking, "How might we break apart 3.4 and 2.8 using place value?"
Guess and check.	
Split the rectangle using place value but have incorrect areas.	**Strengthen** Consider asking, "How can we express the areas of the smaller rectangles using fractions?"
Calculate $3.4 \cdot 2.8$ using area models, place value, conversion to fractions, or another valid strategy.	**Stretch** Consider asking, "How could you use your work to determine what $34 \cdot 28$ equals? How might that help you find the product of the decimals?"

Activity 2 continued >

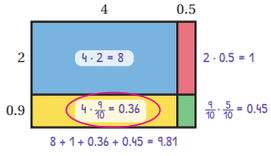
Activity 2

Name: _____ Date: _____ Period: _____

Calculating With an Area Model

6. Diego made an error while multiplying $4.5 \cdot 2.9$.

a. Circle the error in Diego's work.
Response shown on diagram.



b. What would you say to help him understand his mistake?
Responses vary.
- The yellow part is larger than the green part so you know that the area of the yellow part has to be more than 0.45.
- You wrote 36 hundredths, but you actually have 36 tenths.

7. Multiply $3.4 \cdot 2.8$.

Use the diagram if it helps with your thinking.
9.52

8. Multiply $5.2 \cdot 0.42$.

Use the diagram if it helps with your thinking.
2.184

Accelerated 6 | Unit 5 Lesson 3 418 Activity 2

Pairs | 15 min

Activity 2 Calculating With an Area Model (continued)

Purpose: Students practice multiplying decimals with more than one non-zero digit and generalize their strategies when factors are less than 1.

2 Monitor

To surface connections, encourage students to compare this problem to the previous problem in pairs. Invite students to estimate $5.2 \cdot 0.42$ before calculating it.

D Differentiation *(Problem 8)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking: • "Is the area greater than or less than 5.2? How do you know?" • "How might we break down 5.2 and 0.42 in helpful ways?"
Guess and check.	
Break up 5.2 and 0.42 appropriately but have an error involving place value.	**Strengthen** Invite them to review Diego's work from before the Pause. Consider asking, "How might we correctly use a related strategy?"
Calculate $5.2 \cdot 0.42$ using area models, place value, conversion to fractions, or another valid strategy.	**Strengthen** Invite them to share during the Connect.

Invite students to share their advantages and disadvantages with other pairs.

ELL English Language Learners Provide sentence frames (e.g., "Lucia's second draft is better because _____." or "The first draft was _____, but the second draft was _____."). **(Writing and Speaking)**

3 Connect

Invite students to share their strategies and area models for multiplying $5.2 \cdot 0.42$. **(MTR.2.1)**

To surface the Key Takeaway, consider asking:

- "How can we break down a number less than 1 into its place values?"
- "How can we draw an area model with numbers less than 1?"

Activity 2

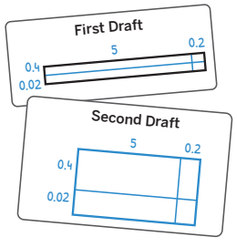
Name: _____ Date: _____ Period: _____

Calculating With an Area Model (continued)

9. Lucia made two drafts to calculate $5.2 \cdot 0.42$.

What are the advantages and disadvantages of Lucia's second draft?

Responses vary.



Advantages:

- It was easier for Lucia to write the area of each part inside because the areas are larger in the second draft.
- Lucia could use the same rectangle for other multiplication problems.

Disadvantages:

- It could be harder to estimate the total area because the rectangle doesn't really fit its measurements.
- This isn't what a rectangle with those measurements actually looks like.

10. Here is an area model that is missing some labels.

What multiplication problem could this help you solve? Explain your thinking.

Responses and explanations vary. 6.4 • 1.4, 3.2 • 2.8. I filled in the outside numbers with 6, 0.4, 1, and 0.4 so the area in each part was correct.

	?	?
?	6	0.4
?	2.4	0.16

Accelerated 6 | Unit 5 Lesson 3 419 Activity 2

Key Takeaway: As long as we use place value correctly, we don't have to draw side lengths to scale to multiply decimals using area models.

Whole Class | 5 min

Synthesis

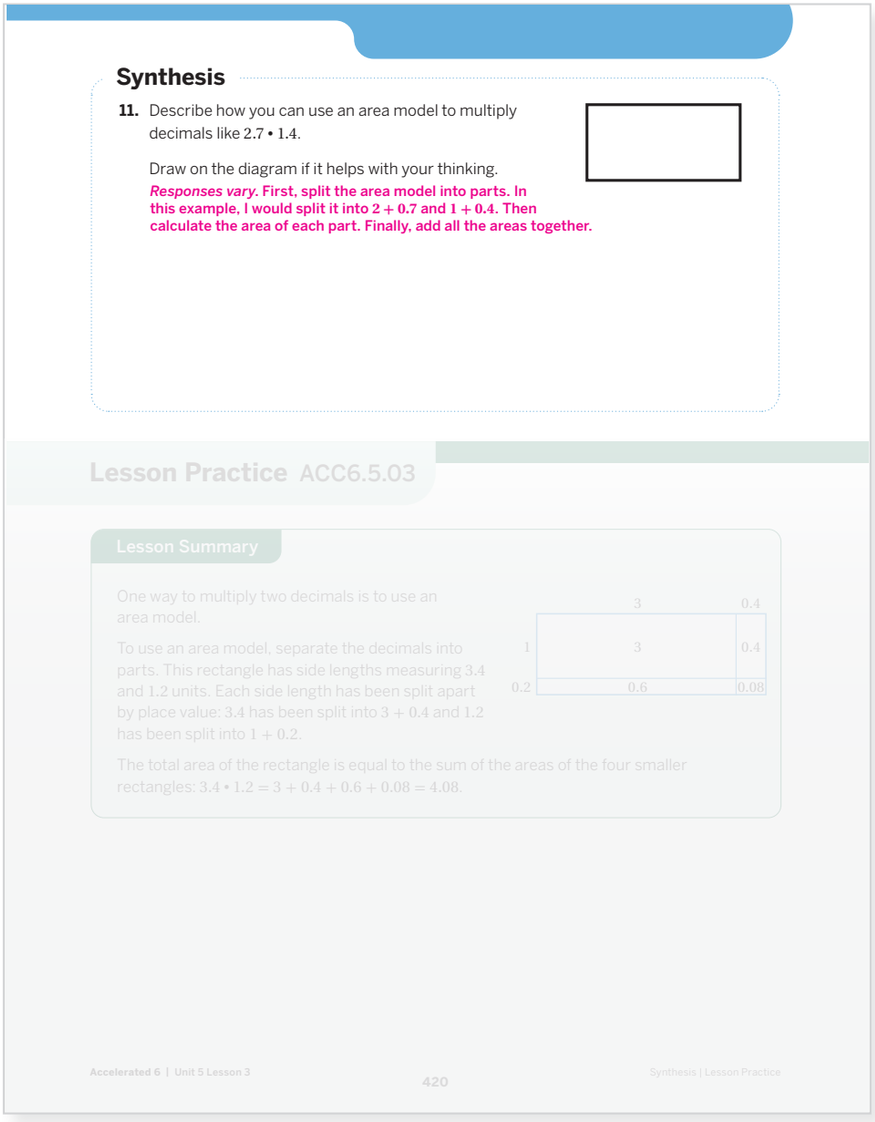
Purpose: Students synthesize their understanding of using area models to multiply decimals.

Invite students to respond independently, after discussing each question with their partner.

Capture and share a variety of ideas, such as:

- Creating an area model for a multiplication problem and splitting the rectangle helps us see and understand each of the pieces.
- Breaking down numbers by place value creates smaller rectangles, and we can add the areas of these smaller rectangles together to find the total area.
- Split rectangles do not have to be drawn to scale.

MLR **MLR2: Collect and Display** Use this routine to collect students' ideas and strategies as they discuss with a partner. Display for students to reference and add to for the remainder of the unit.



Synthesis

11. Describe how you can use an area model to multiply decimals like $2.7 \cdot 1.4$.

Draw on the diagram if it helps with your thinking.

Responses vary. First, split the area model into parts. In this example, I would split it into $2 + 0.7$ and $1 + 0.4$. Then calculate the area of each part. Finally, add all the areas together.

Lesson Practice ACC6.5.03

Lesson Summary

One way to multiply two decimals is to use an area model.

To use an area model, separate the decimals into parts. This rectangle has side lengths measuring 3.4 and 1.2 units. Each side length has been split apart by place value: 3.4 has been split into $3 + 0.4$ and 1.2 has been split into $1 + 0.2$.

	3	0.4
1	3	0.4
0.2	0.6	0.08

The total area of the rectangle is equal to the sum of the areas of the four smaller rectangles: $3.4 \cdot 1.2 = 3 + 0.4 + 0.6 + 0.08 = 4.08$.

Accelerated 6 | Unit 5 Lesson 3 420 Synthesis | Lesson Practice

Lesson Takeaway: We can use area models to multiply decimals. We can break down our numbers by place value to create smaller rectangles and add these areas together to find the total area.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by multiplying decimals with more than one non-zero digit.

Today's Goals

1. **Goal:** Use area models to represent and multiply decimals with two non-zero digits.
2. **Language Goal:** Explain how to use area models to multiply decimals. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.03

Calculate $4.2 \cdot 2.6$. Show your thinking.
Use the diagram if it helps with your thinking.

10.92. *Methods vary.* Sample answer shown.

	4	0.2
2	8	0.4
0.6	2.4	0.12

$8 + 0.4 + 2.4 + 0.12 = 10.92$

D Differentiation Use after Lesson 3

Support

Provide targeted intervention for students by using these resources.

If students need support multiplying decimals:

» **Respond to Student Thinking:**

- Use the *Multiplying Decimals Using Area Models* Mini-lesson.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 1 Extension Activities**.

Professional Learning

Take a moment to reflect on this lesson. In this lesson, students extended their thinking about multiplying multi-digit decimals using area models. How will that work support the next lesson's exploration of the standard (vertical) algorithm?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. Describe how you can use an area model to multiply decimals like $2.7 \cdot 1.4$.

Draw on the diagram if it helps with your thinking.

Responses vary. First, split the area model into parts. In this example, I would split it into $2 + 0.7$ and $1 + 0.4$. Then calculate the area of each part. Finally, add all the areas together.

Lesson Practice ACC6.5.03

Lesson Summary

One way to multiply two decimals is to use an area model.

To use an area model, separate the decimals into parts. This rectangle has side lengths measuring 3.4 and 1.2 units. Each side length has been split apart by place value: 3.4 has been split into $3 + 0.4$ and 1.2 has been split into $1 + 0.2$.

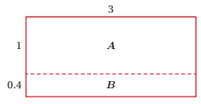
	3	0.4
1	3	0.4
0.2	0.6	0.08

The total area of the rectangle is equal to the sum of the areas of the four smaller rectangles: $3.4 \cdot 1.2 = 3 + 0.4 + 0.6 + 0.08 = 4.08$.

Lesson Practice ACC6.5.03

Name: _____ Date: _____ Period: _____

Problems 1–2: Here is a diagram that represents $3 \cdot 1.4$.



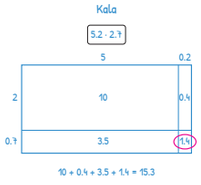
1. Determine the areas of A and B.

A	B
3	1.2

2. What is the value of $3 \cdot 1.4$?

4.2

Problems 3–4: Here is Kala's work for determining $5.2 \cdot 2.7$.



3. Kala made an error. Circle what you think the error is. Explain your thinking.

Response shown on diagram. *Explanations vary.* $0.2 \cdot 0.7 = 0.14$, not 1.4. I knew the value was incorrect because 0.2 and 0.7 are both less than 1, so it didn't make sense for the product to be greater than 1.

4. What is the value of $5.2 \cdot 2.7$? Show or explain your thinking.

14.04. *Work varies.* $10 + 0.4 + 3.5 + 0.14 = 14.04$

5. Draw an area diagram that represents $2.5 \cdot 1.4$. *Drawings vary.*

	2	0.5
1	2	0.5
0.4	0.8	0.2

6. Determine the product of $2.5 \cdot 1.4$. Use your area diagram from Problem 5 if it helps with your thinking.

3.5

Lesson Practice ACC6.5.03

Name: _____ Date: _____ Period: _____

FAST Practice

7. Determine the value of $0.34 \cdot 0.02$.

0.0068

Spiral Review

8. Tariq buys a granola bar that costs $1.59. He pays with seven quarters, for a total of $1.75. How much change should he get?

$0.16

Problems 9–10: Fill in the blanks with the missing digits that make each problem true.

9.

$$\begin{array}{r} 4.3\boxed{7} \\ +\ \boxed{2}.1\ 5 \\ \hline 6.\boxed{5}2 \end{array}$$

10.

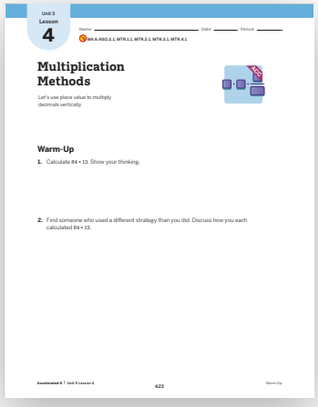
$$\begin{array}{r} 1.5\boxed{6} \\ +\ \boxed{0}.3\ 8 \\ \hline 1.\boxed{9}4 \end{array}$$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–2	1	MA.6.NSO.2.1
	3	3	MA.6.NSO.2.1
	4–6	2	MA.6.NSO.2.1
FAST Practice	7	2	MA.6.NSO.2.1
Spiral Review			
	8	2	MA.5.M.2.1
	9–10	3	MA.5.NSO.2.3

Unit 5
Lesson
4

ACC Accelerated


Unit 5
Lesson
4
Name _____ Date _____ Period _____
MA.6.NSO.2.1, MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1
Multiplication Methods
Let's use place value to multiply decimals vertically.
Warm-Up
1. Calculate 84 • 13. Show your thinking.
2. Find someone who used a different strategy than you did. Discuss how you each calculated 84 • 13.
Accelerated 6 | Unit 5 Lesson 4
423
Warm-Up

Multiplication Methods

Using Place Value to Multiply Decimals

Let's use place value to multiply decimals vertically.

Learning Outcomes

Today's Goals

1. **Goal:** Use multiplication of whole numbers and fractions to multiply decimals vertically.
2. **Language Goal:** Compare and contrast different strategies for multiplying decimals. **(Writing, Speaking, and Listening)**

Students compare and contrast two strategies for multiplication: area models and vertical calculations. They extend their knowledge of these methods to decimal multiplication. They learn to rewrite decimals as whole numbers multiplied by a fraction that represents its place value, multiply each part, and write the product as a decimal. Students develop fluency with multiplying decimals through a scavenger hunt.

Coherence

Prior Learning

In Lesson 3, students used area models to multiply decimals with non-zero digits.

Future Learning

In Lessons 5–6, students will use a similar strategy of converting to fractions to divide decimals. In Lessons 8–10, they multiply decimals to solve real-world problems.

Connections

- Students apply their understanding of multiplication models to understand algorithms. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.2.2
MA.5.NSO.2.4	
MA.5.NSO.2.5	

Lesson at a Glance

~ 45 min

MA.6.NSO.2.1

Warm-Up

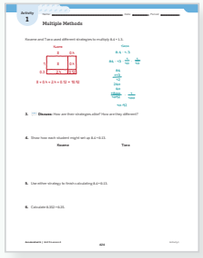
Pairs | 8 min

Students explore several strategies for multiplying whole numbers.

Activity 1

Pairs | 10 min

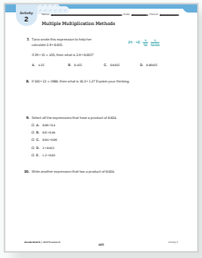
Students multiply decimals using area models and vertical calculations. MLR7: Compare and Connect (MTR.2.1)



Activity 2

Pairs | 7 min

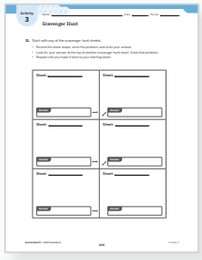
Students use place value and fractions to multiply decimals.



Activity 3

Small Groups | 10 min

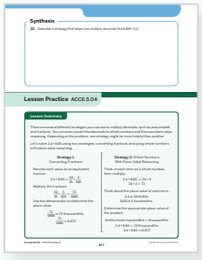
Students develop fluency in multiplying decimals by completing a scavenger hunt. (MTR.3.1)



Synthesis

Whole Class | 5 min

Students synthesize strategies for multiplying decimals. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by multiplying decimals.

Prep Checklist

Prepare the Activity 3 Sheets.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 3 Sheets, one or two sets per class
  - Coloring tools (as needed)

Pairs | 8 min

Warm-Up

Purpose: Students explore several strategies for multiplying whole numbers.

1 Launch

Direct students' attention to the problem. Invite students to multiply $84 \cdot 13$.

Invite students to look for someone who used a different strategy. Invite students to discuss their strategies and why they chose them, and encourage students to consider how they can communicate their ideas. **(MTR.2.1, MTR.4.1)**

ELL **English Language Learners** Provide sentence frames to help students explain their strategy (e.g., "First, I _____ because _____."). **(Writing and Speaking)**

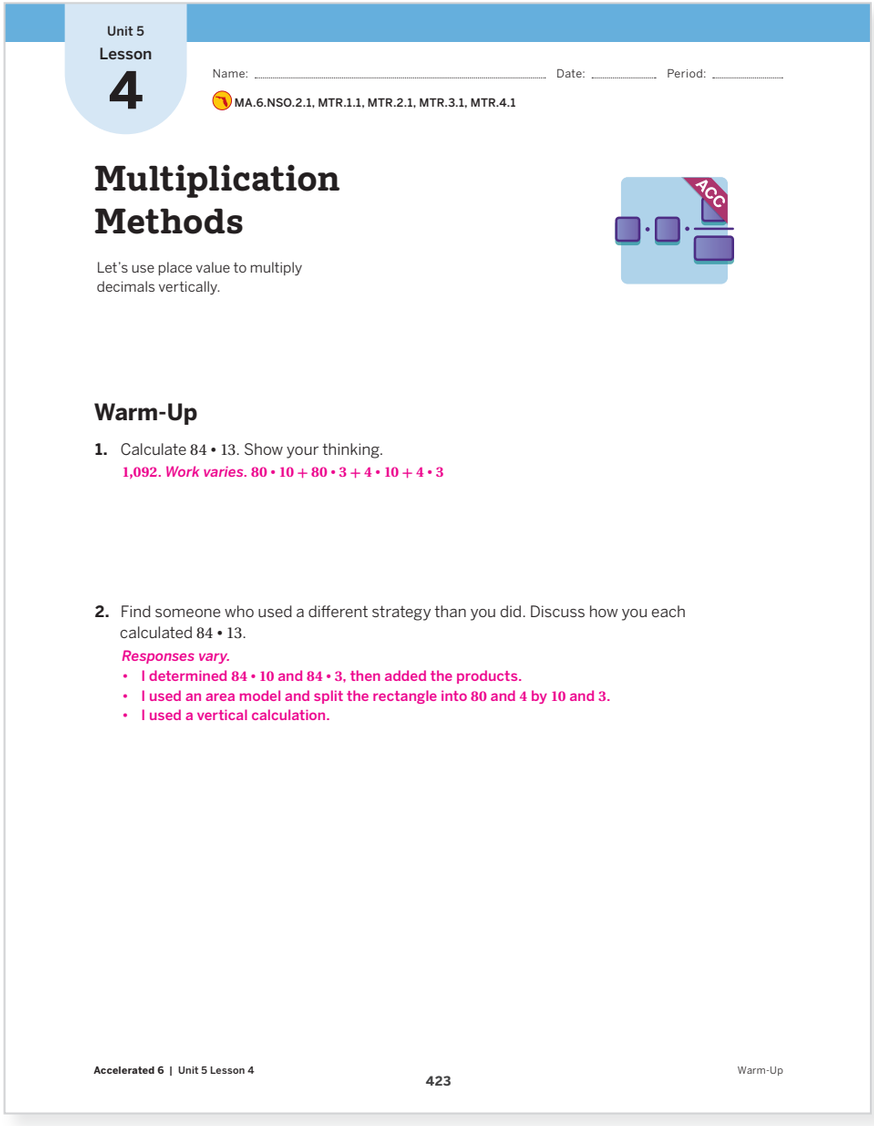
2 Connect

Create a record of each strategy that students share, along with the name of the student who shared it.

Invite students to share the strategies their partner used.

Consider asking:

- "What are some of the benefits to one of the strategies you heard?"
- "What connections do you notice among the strategies we've discussed?" **(MTR.1.1)**



Unit 5
Lesson
4

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.1, MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1

Multiplication Methods

Let's use place value to multiply decimals vertically.

ACC

Warm-Up

1. Calculate $84 \cdot 13$. Show your thinking.
   1,092. Work varies. $80 \cdot 10 + 80 \cdot 3 + 4 \cdot 10 + 4 \cdot 3$

2. Find someone who used a different strategy than you did. Discuss how you each calculated $84 \cdot 13$.
   Responses vary.
   - I determined $84 \cdot 10$ and $84 \cdot 3$, then added the products.
   - I used an area model and split the rectangle into 80 and 4 by 10 and 3.
   - I used a vertical calculation.

Accelerated 6 | Unit 5 Lesson 4 423 Warm-Up

Pairs | 10 min

Activity 1 Multiple Methods

Purpose: Students multiply decimals using area models and vertical calculations. **(MTR.2.1)**

1 Launch

Direct students' attention to Kwame's and Tiara's strategies for multiplying $84 \cdot 13$. Consider asking, "How are these strategies alike? How are they different?"

MLR **MLR7: Compare and Connect** Invite students to analyze and compare each strategy, and then connect to the strategies they used in the Warm-Up. **(MTR.1.1)**

2 Monitor

Listen for student thinking about Kwame's and Tiara's strategies for multiplying $8.4 \cdot 1.3$.

A **Accessibility: Visual-Spatial Processing** Invite students to use coloring tools to support making connections between representations.

D **Differentiation: (Support)** Look for students who need support applying Tiara's strategy. Consider asking, "Why is $8.4 \cdot 1.3$ equal to $84 \cdot 13 \cdot \frac{1}{10} \cdot \frac{1}{10}$? How did Tiara multiply $84 \cdot 13$?"

Select and sequence strategies to share during the Connect.

D **Differentiation**

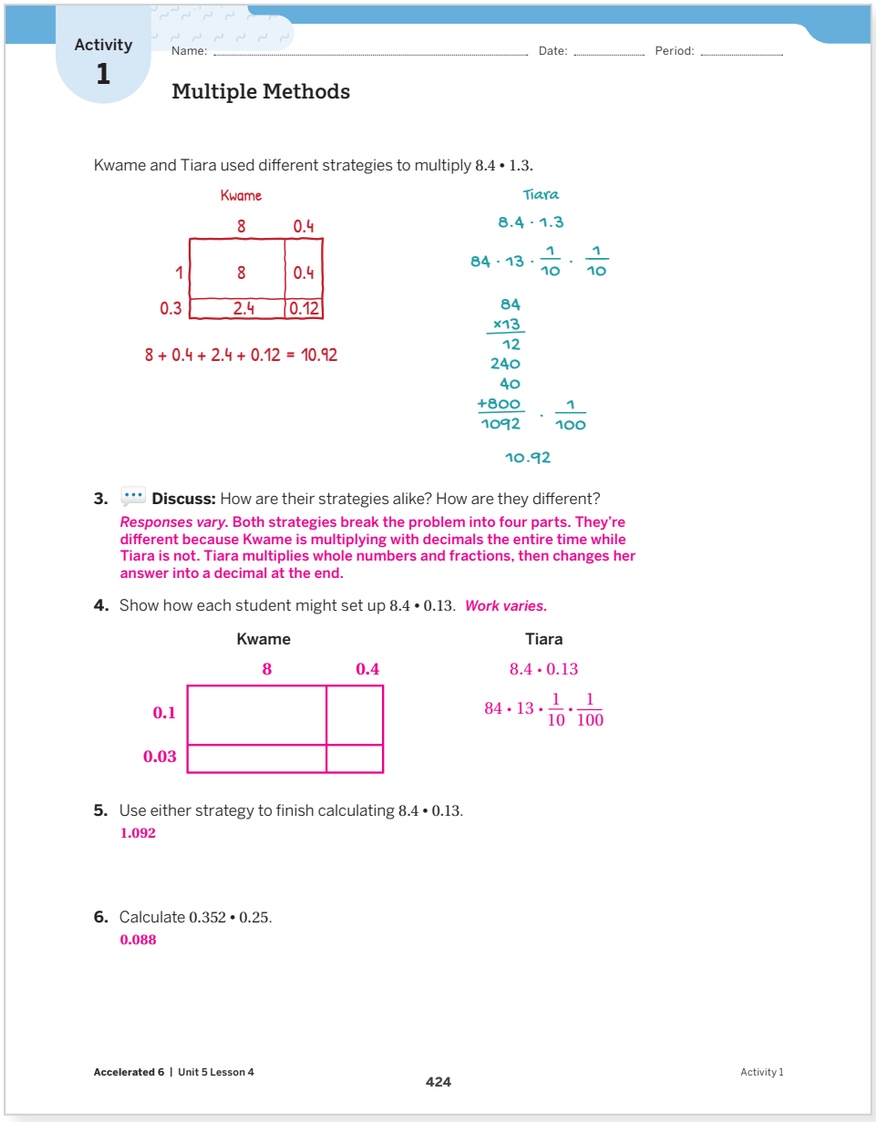
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to try using Tiara's strategy. Consider asking, "How can we write these decimals as whole numbers and fractions?"
Prefer the area model but do not know how to break up 0.352.	
Use the area model to obtain a product of 0.088.	**Strengthen** Invite students to share during the Connect.
Use vertical calculation to obtain a product of 0.088.	**Strengthen** Encourage students to multiply using the other method.

3 Connect

Invite students to share the sequenced strategies. **(MTR.2.1)**

Note: If it does not come up naturally, consider sharing that we can use area models to multiply $0.352 \cdot 0.25$. We could break up 0.352 into columns of 0.3, 0.05, and 0.002 and draw a 3-by-2 rectangle.

To surface the Key Takeaway, consider asking:
- "What are some advantages of using Kwame's strategy? Tiara's strategy?"
- "How might you decide which strategy to use?" **(MTR.4.1)**



Activity 1

Name: Date: Period:

Multiple Methods

Kwame and Tiara used different strategies to multiply $8.4 \cdot 1.3$.

Kwame

	8	0.4
1	8	0.4
0.3	2.4	0.12

$8 + 0.4 + 2.4 + 0.12 = 10.92$

Tiara

$8.4 \cdot 1.3$

$84 \cdot 13 \cdot \frac{1}{10} \cdot \frac{1}{10}$

84 ×13 → 12, 240, 40, +800 → 1092 · $\frac{1}{100}$

10.92

3. **Discuss:** How are their strategies alike? How are they different?

Responses vary. Both strategies break the problem into four parts. They're different because Kwame is multiplying with decimals the entire time while Tiara is not. Tiara multiplies whole numbers and fractions, then changes her answer into a decimal at the end.

4. Show how each student might set up $8.4 \cdot 0.13$. *Work varies.*

Kwame

	8	0.4
0.1		
0.03		

Tiara

$8.4 \cdot 0.13$

$84 \cdot 13 \cdot \frac{1}{10} \cdot \frac{1}{100}$

5. Use either strategy to finish calculating $8.4 \cdot 0.13$.

1.092

6. Calculate $0.352 \cdot 0.25$.

0.088

Accelerated 6 | Unit 5 Lesson 4 424 Activity 1

Key Takeaway: We can multiply decimals by rewriting the expression as a product of whole numbers and fractions, multiplying, and writing the product as a decimal.

Pairs | 7 min

Activity 2 Multiple Multiplication Methods

Purpose: Students use place value and fractions to multiply decimals.

1 Launch

Direct students' attention to Tiara's expression. Consider asking:

- "Why was she able to write this expression?"
- "What would your next step be?"

2 Monitor

Look for a variety of student thinking to provide support for students using Tiara's strategy for multiplying decimals.

D Differentiation

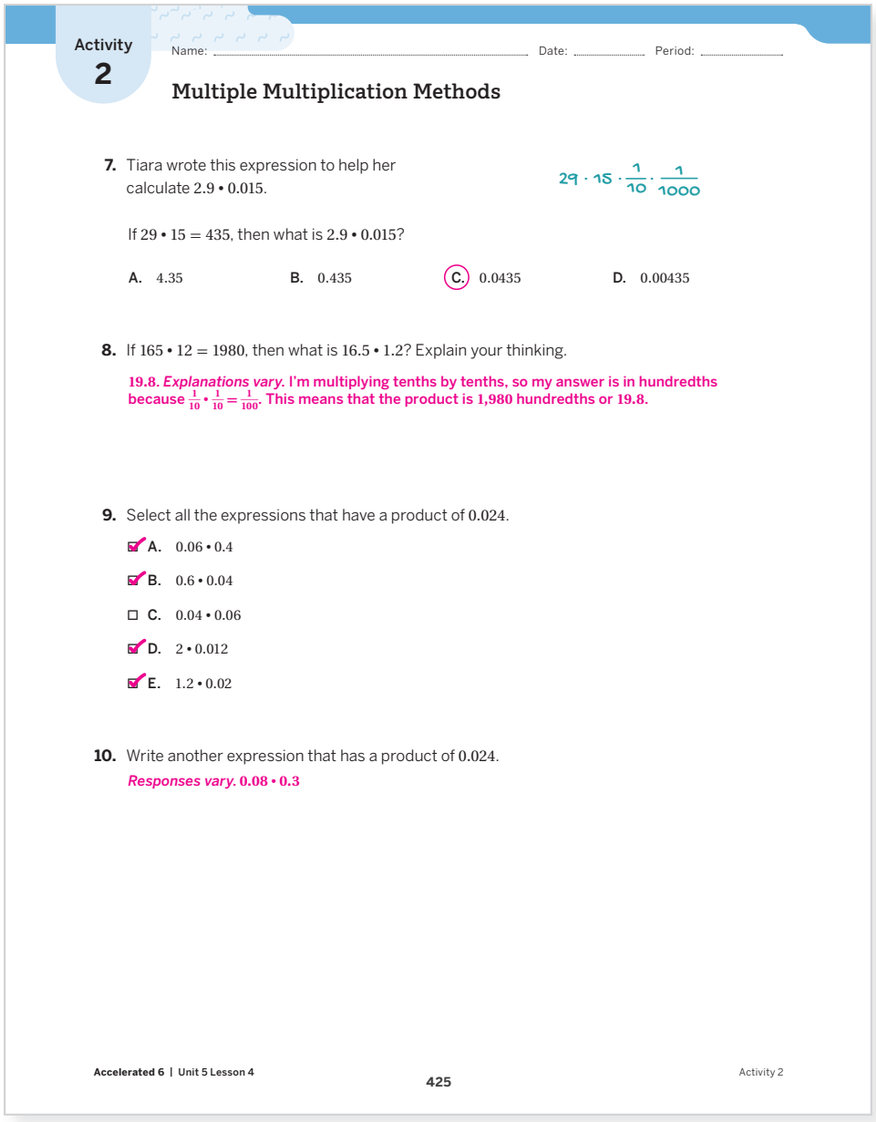
Look for students who:	Respond to Student Thinking
Need support getting started. (*Problem 7*)	**Support** Consider asking, "How can knowing the product of $29 \cdot 15$ help us determine the product of $2.9 \cdot 0.015$?"
Put the decimal point in the wrong place. (*Problems 7–8*)	
Select some of the correct answers (Choices A, B, D, and E) but not all. (*Problem 9*)	**Strengthen** Invite students to rewrite the decimal as a product of whole numbers and fractions that tell the place value. Consider asking, "How can these products help us multiply the decimals?"
Use place value to correctly multiply decimals. (*Problems 7–10*)	**Stretch** Invite students to write their own "select all" problem involving decimal multiplication. Invite them to share and solve each others' problems.

3 Connect

Encourage students to share by polling the class for each expression with a product of 0.024 in Problem 9. Invite pairs of students to share their reasoning about why they selected one of the choices.

Consider asking:

- "What did the expressions for Choices A, B, D, and E all have in common that made their products equivalent?" **(MTR.4.1)**
- "How can we tell what place value the answer should be?"



Activity 2

Name: _____ Date: _____ Period: _____

Multiple Multiplication Methods

7. Tiara wrote this expression to help her calculate $2.9 \cdot 0.015$.

$29 \cdot 15 \cdot \frac{1}{10} \cdot \frac{1}{1000}$

If $29 \cdot 15 = 435$, then what is $2.9 \cdot 0.015$?

A. 4.35 B. 0.435 C. 0.0435 D. 0.00435

8. If $165 \cdot 12 = 1980$, then what is $16.5 \cdot 1.2$? Explain your thinking.

19.8. Explanations vary. I'm multiplying tenths by tenths, so my answer is in hundredths because $\frac{1}{10} \cdot \frac{1}{10} = \frac{1}{100}$. This means that the product is 1,980 hundredths or 19.8.

9. Select all the expressions that have a product of 0.024.

- ☑ A. $0.06 \cdot 0.4$
- ☑ B. $0.6 \cdot 0.04$
- ☐ C. $0.04 \cdot 0.06$
- ☑ D. $2 \cdot 0.012$
- ☑ E. $1.2 \cdot 0.02$

10. Write another expression that has a product of 0.024.

Responses vary. $0.08 \cdot 0.3$

Accelerated 6 | Unit 5 Lesson 4 425 Activity 2

Small Groups | 10 min

Activity 3 Scavenger Hunt

Purpose: Students develop fluency in multiplying decimals by completing a scavenger hunt. **(MTR.3.1)**

Short on time? Invite students to complete three problems, and discuss how all six problems relate during the Connect.

1 Launch

Note: Before this activity begins, shuffle the Activity 3 Sheets and post them at stations around the classroom.

Direct students' attention to the directions for the scavenger hunt and review them as a class.

Consider placing equally-sized groups of students at each station. Invite students to record the sheet shape in their Student Edition and solve the problem at their station.

Invite students to search for their answer at the top of another scavenger hunt sheet and then solve the problem on that sheet. Consider sharing that this scavenger hunt is complete when students solve 6 different problems and finish where they started.

2 Monitor

To support students getting started, invite them to discuss their strategies with their group.

Encourage students to revise their work if their answer does not match one of the other scavenger hunt sheets.

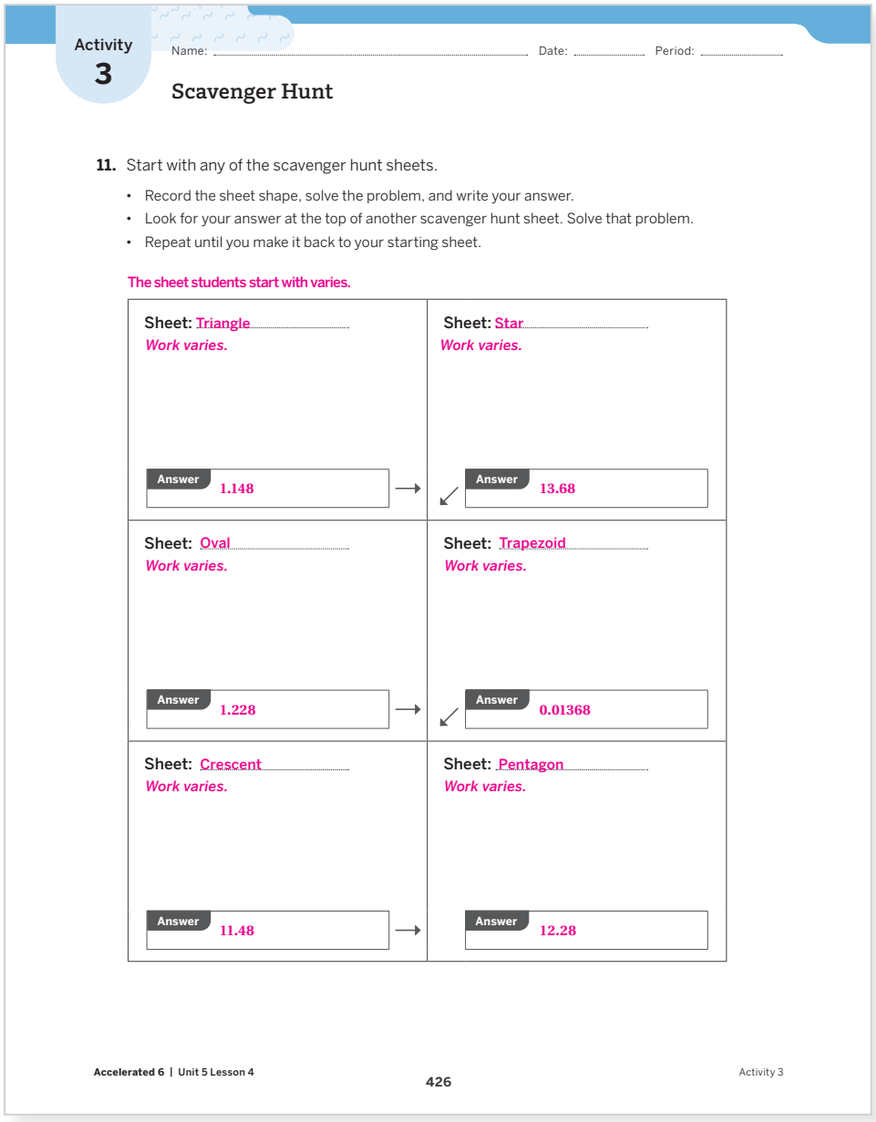
Look for a variety of student strategies, such as using area models, using place value methods, and recognizing connections between problems to discuss during the Connect. **(MTR.2.1)**

Note: Some of the expressions are related (e.g., $2.8 \cdot 0.41$ and $4.1 \cdot 2.8$). Consider inviting students to look for and make use of patterns they notice, especially if the class is short on time. **(MTR.1.1)**

3 Connect

Consider asking:

- "What strategies did your group use to multiply these decimals?"
- "What patterns did you notice in the expressions? How did they help multiply other decimals?" **(MTR.3.1)**



Activity 3

Name: _____ Date: _____ Period: _____

Scavenger Hunt

11. Start with any of the scavenger hunt sheets.

- Record the sheet shape, solve the problem, and write your answer.
- Look for your answer at the top of another scavenger hunt sheet. Solve that problem.
- Repeat until you make it back to your starting sheet.

The sheet students start with varies.

Sheet: Triangle *Work varies.* Answer 1.148 →	**Sheet:** Star *Work varies.* Answer 13.68 ↙
Sheet: Oval *Work varies.* Answer 1.228 →	**Sheet:** Trapezoid *Work varies.* Answer 0.01368 ↙
Sheet: Crescent *Work varies.* Answer 11.48 →	**Sheet:** Pentagon *Work varies.* Answer 12.28

Accelerated 6 | Unit 5 Lesson 4 426 Activity 3

Whole Class | 5 min

Synthesis

Purpose: Students synthesize strategies for multiplying decimals.

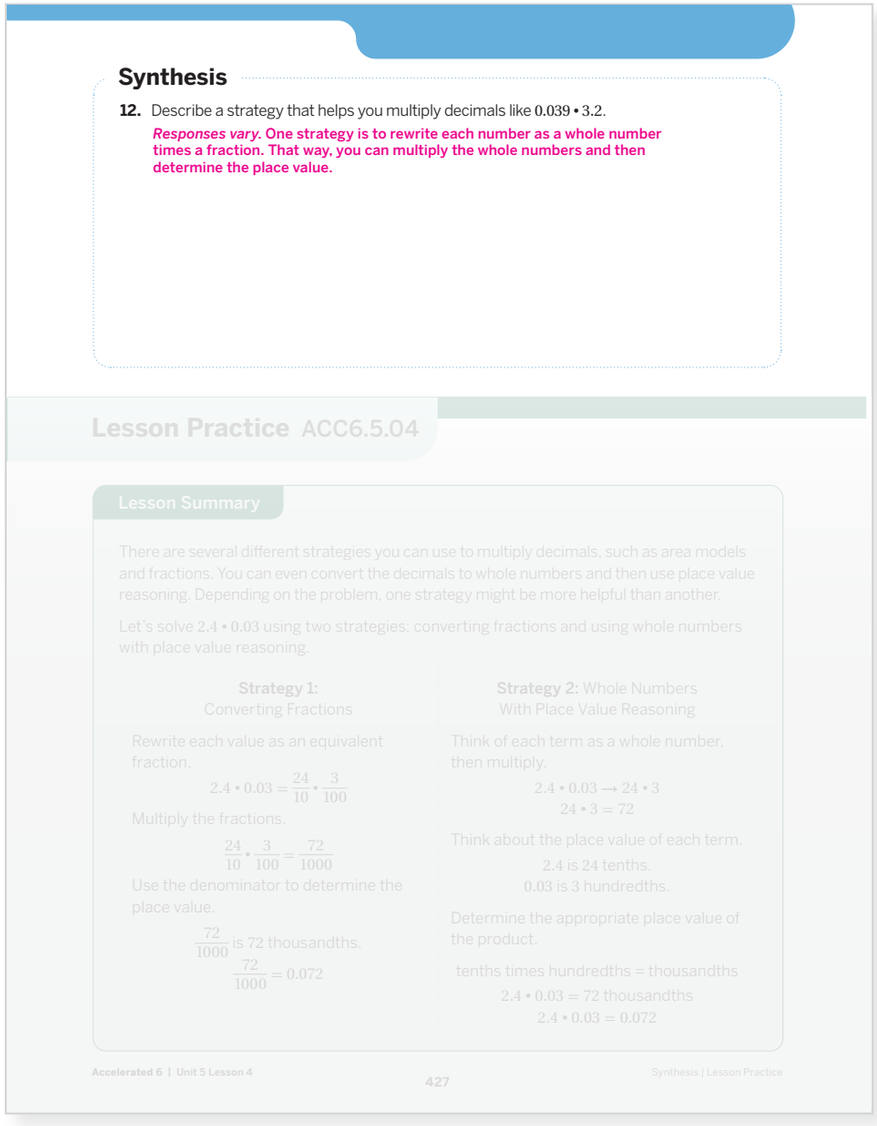
Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Creating an area model where the factors represent the dimensions of the split rectangles.
- Rewriting the expression as a product of whole numbers and fractions, multiplying, and writing the product as a decimal.

Create an anchor chart with students' ideas and strategies for multiplying decimals.

MLR **MLR2: Collect and Display** Use this routine to collect students' strategies as they share. Display for students to reference and add to for the rest of the unit.



Synthesis

12. Describe a strategy that helps you multiply decimals like $0.039 \cdot 3.2$.

Responses vary. One strategy is to rewrite each number as a whole number times a fraction. That way, you can multiply the whole numbers and then determine the place value.

Lesson Practice ACC6.5.04

Lesson Summary

There are several different strategies you can use to multiply decimals, such as area models and fractions. You can even convert the decimals to whole numbers and then use place value reasoning. Depending on the problem, one strategy might be more helpful than another.

Let's solve $2.4 \cdot 0.03$ using two strategies: converting fractions and using whole numbers with place value reasoning.

Strategy 1: Converting Fractions

Rewrite each value as an equivalent fraction.

$$2.4 \cdot 0.03 = \frac{24}{10} \cdot \frac{3}{100}$$

Multiply the fractions.

$$\frac{24}{10} \cdot \frac{3}{100} = \frac{72}{1000}$$

Use the denominator to determine the place value.

$\frac{72}{1000}$ is 72 thousandths.

$$\frac{72}{1000} = 0.072$$

Strategy 2: Whole Numbers With Place Value Reasoning

Think of each term as a whole number, then multiply.

$$2.4 \cdot 0.03 \rightarrow 24 \cdot 3$$
$$24 \cdot 3 = 72$$

Think about the place value of each term.

2.4 is 24 tenths.
0.03 is 3 hundredths.

Determine the appropriate place value of the product.

tenths times hundredths = thousandths

$$2.4 \cdot 0.03 = 72 \text{ thousandths}$$
$$2.4 \cdot 0.03 = 0.072$$

Accelerated 6 | Unit 5 Lesson 4 427 Synthesis | Lesson Practice

Lesson Takeaway: We have two methods for multiplying decimals. The first is area models, breaking up numbers using place value to split rectangles. The second is rewriting the expression as a product of whole numbers and fractions, multiplying, and writing the product as a decimal.

Independent | 5 min

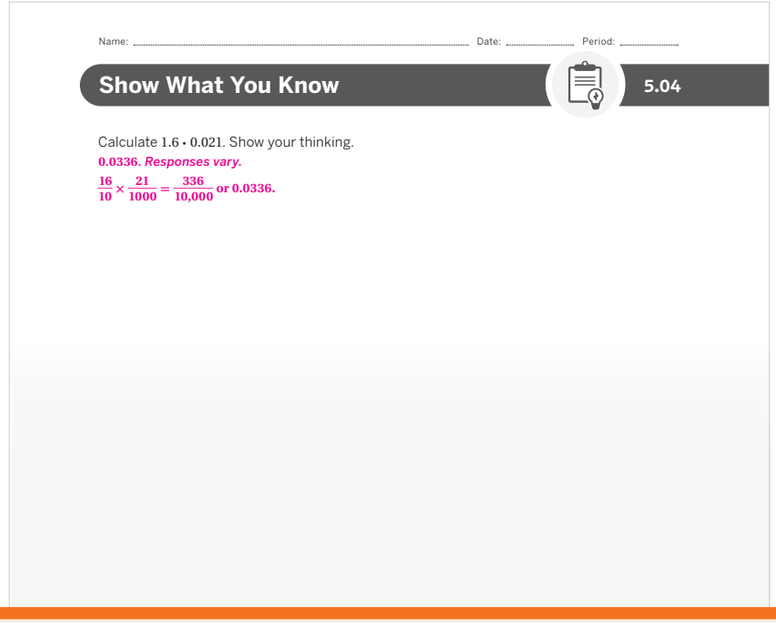
Show What You Know

Purpose: Students demonstrate their understanding by multiplying decimals.

Today's Goals

1. **Goal:** Use multiplication of whole numbers and fractions to multiply decimals vertically.
2. **Language Goal:** Compare and contrast different strategies for multiplying decimals. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 5.04

Calculate $1.6 \cdot 0.021$. Show your thinking.

0.0336. *Responses vary.*

$\frac{16}{10} \times \frac{21}{1000} = \frac{336}{10,000}$ or 0.0336.

D Differentiation Use after Lesson 4

Support

Provide targeted intervention for students by using these resources.

If students need support with multiplying decimals:

» **Respond to Student Thinking:**

- Use the *Multiplying Two Decimals Greater Than 1* Mini-lesson.
- Review the **Lesson Summary**.
- Revisit **Activity 1** and give students individualized feedback. Invite students to look for connections between Kwame's and Tiara's methods.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 1 Extension Activities**.
- Invite students to create their own scavenger hunt for the class to use as a review before the Sub-Unit Quiz.

Professional Learning

Reflect on students' progress with operations on decimals during Sub-Unit 1. In what ways has students' understanding grown? What concepts do students need additional support with? How can you use students' strengths to help everyone feel prepared for their upcoming assessment?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

12. Describe a strategy that helps you multiply decimals like $0.039 \cdot 3.2$.

Responses vary. One strategy is to rewrite each number as a whole number times a fraction. That way, you can multiply the whole numbers and then determine the place value.

Lesson Practice ACC6.5.04

Lesson Summary

There are several different strategies you can use to multiply decimals, such as area models and fractions. You can even convert the decimals to whole numbers and then use place value reasoning. Depending on the problem, one strategy might be more helpful than another.

Let's solve $2.4 \cdot 0.03$ using two strategies: converting fractions and using whole numbers with place value reasoning.

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Converting Fractions

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Multiply the fractions.

$$\frac{24}{10} \cdot \frac{3}{100} = \frac{72}{1000}$$

Use the denominator to determine the place value.

$\frac{72}{1000}$ is 72 thousandths.

$$\frac{72}{1000} = 0.072$$

Strategy 2: Whole Numbers With Place Value Reasoning

Think of each term as a whole number, then multiply.

$$2.4 \cdot 0.03 \rightarrow 24 \cdot 3$$
$$24 \cdot 3 = 72$$

Think about the place value of each term.

2.4 is 24 tenths.
0.03 is 3 hundredths.

Determine the appropriate place value of the product.

tenths times hundredths = thousandths

$$2.4 \cdot 0.03 = 72 \text{ thousandths}$$
$$2.4 \cdot 0.03 = 0.072$$

Lesson Practice ACC6.5.04

Name: _____ Date: _____ Period: _____

1. Explain how you could use $3 \cdot 65 = 195$ to determine $0.003 \cdot 0.65$.

Responses vary. Because 0.003 is 3 thousandths and 0.65 is 65 hundredths, 195 will need to be multiplied by $0.001 \cdot 0.01$ or 0.00001. In other words, the 195 represents the number of hundred-thousandths, which means the answer should be 0.00195.

2. Maia wrote this expression to help her calculate $4.5 \cdot 0.17$.

$$45 \cdot 17 \cdot \frac{1}{10} \cdot \frac{1}{100}$$

If $45 \cdot 17 = 765$, then what is $4.5 \cdot 0.17$?

0.765

3. Select *all* the expressions that have a product of 0.0042.

- ☑ A. $0.007 \cdot 0.6$
- ☑ B. $0.07 \cdot 0.06$
- ☐ C. $0.007 \cdot 0.06$
- ☐ D. $0.7 \cdot 0.06$
- ☑ E. $0.21 \cdot 0.02$

Problems 4–5: Determine the value of each expression using any strategy. Show or explain your thinking.

4. $5.4 \cdot 2.4 = 12.96$

Work varies.

	5	0.4
2	10	0.8
0.4	2	0.16

$5 \cdot 2 = 10$

$0.4 \cdot 2 = 4 \cdot 2 \cdot \frac{1}{10} = \frac{8}{10} = 0.8$

$0.4 \cdot 5 = 4 \cdot 5 \cdot \frac{1}{10} = \frac{20}{10} = 2$

$0.4 \cdot 0.4 = 4 \cdot 4 \cdot \frac{1}{10} \cdot \frac{1}{10} = \frac{16}{100} = 0.16$

$10 + 2 + 0.8 + 0.16 = 12.96$

5. $1.01 \cdot 0.00035 = 0.0003535$

Work varies.

$$101 \cdot 35 \cdot \frac{1}{100} \cdot \frac{1}{100000} = 101 \cdot 35 \cdot \frac{1}{10000000}$$

$101 \cdot 35 = (100 \cdot 35) + (1 \cdot 35) = 3500 + 35 = 3535$

So, $3535 \cdot \frac{1}{10000000} = \frac{3535}{10000000} = 0.0003535$

Lesson Practice ACC6.5.04

Name: _____ Date: _____ Period: _____

FAST Practice

6. A pound of blueberries costs \$3.50 and a pound of clementines costs \$2.50. What is the total cost of 0.6 pounds of blueberries and 1.8 pounds of clementines? Explain your thinking.

The cost of 0.6 pounds of blueberries is \$ 2.10, and the cost of 1.8 pounds of clementines is \$ 4.50. So the total cost is \$ 6.60.

Spiral Review

Problems 7–10: Determine the value of each expression.

7. $20 \cdot 5 = 100$

8. $20 \cdot 0.8 = 16$

9. $20 \cdot 0.04 = 0.8$

10. $20 \cdot 5.84 = 116.8$

Problems 11–12: Amari bought 12 mini muffins for \$5.40.

11. At this rate, what is the price of 4 mini muffins? Show or explain your thinking.

\$1.80. *Work varies.* Sample shown in table.

Number of Mini Muffins	Price (\$)	
12	5.40	÷ 6
2	0.90	÷ 6
4	1.80	• 2
		• 2

12. How many mini muffins can Amari buy with \$4.00? Explain your thinking.

8 mini muffins. *Explanations vary.* Because 2 mini muffins cost \$0.90, I know that 1 mini muffin costs $0.90 \div 2 = \$0.45$. That means 8 mini muffins cost $8 \cdot 0.45 = \$3.60$. 9 mini muffins cost $9 \cdot 0.45 = \$4.05$. That's more money than Amari has, so he can only buy 8 muffins.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.NSO.2.1
	2–5	2	MA.6.NSO.2.1
FAST Practice	6	2	MA.6.NSO.2.1
Spiral Review			
	7–10	1	MA.6.NSO.2.1
	11–12	2	MA.6.AR.3.3

Assess and Respond

Sub-Unit Quiz 1

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. Text to speech is available in the digital version. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Explains and demonstrates how to use a hundredths chart to reason about place value when multiplying decimals	Lesson 1	2	MA.6.NSO.2.1
2	Multiplying mult-digit decimals	Lessons 3–4	1	MA.6.NSO.2.1
3	Calculates the product of mult-digit decimals using the area model	Lesson 3	2	MA.6.NSO.2.1
4	Calculating the area of a rectangle with multi-digit decimal side lengths	Lesson 3	2	MA.6.NSO.2.1, MTR.4.1
5	Multiplying mult-digit decimals	Lessons 3–4	1	MA.6.NSO.2.1
6	Multiplying mult-digit decimals	Lessons 3–4	1	MA.6.NSO.2.1

Assessment Resources

- Student Assessments
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

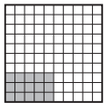
- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Sub-Unit Quiz 1

Unit 5

1. Explain how the diagram shows $0.5 \cdot 0.3$.



Responses vary. The diagram shows a rectangle that has a width of 0.5 units and a height of 0.3. The area equals the width times the height. The area of this rectangle can be found by finding $0.5 \cdot 0.3$.

Find $0.5 \cdot 0.3$.

0.15

2. Determine the product of $0.13 \cdot 0.02$.

A. 2.6 B. 0.26 C. 0.026 (D.) 0.0026

3. Find the value of $2.8 \cdot 2.3$ using the area diagram.

	2	0.8
2	4	1.6
0.3	0.6	0.24

$2 \cdot 2 = 4$

$2 \cdot 0.8 = 1.6$

$2 \cdot 0.3 = 0.6$

$0.8 \cdot 0.3 = 0.24$

$4 + 1.6 + 0.6 + 0.24 = 6.44$

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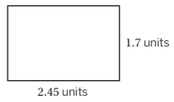
Name: ..... Date: ..... Period: .....

Sub-Unit Quiz 1 (continued)

Unit 5

4. What is the area of this rectangle?



4.165 square units

Show or explain your thinking.

Explanations vary. The area is equal to $1.7 \cdot 2.45$, which is like $\frac{170}{100} \cdot \frac{245}{100}$. This equals $\frac{41650}{10000}$ or 4.165 square units.

5. Find the value of $3.1 \cdot 5.2$ using any strategy.

Work varies.

$31 \cdot 52 \cdot \frac{1}{10} \cdot \frac{1}{10} = \frac{1612}{100} = 16.12$

6. Which expression has a value of 1.53?

(A.) $1.7 \cdot 0.9$

B. $0.17 \cdot 0.9$

C. $1.7 \cdot 0.09$

D. $17 \cdot 0.9$

D Differentiation (Sub-Unit Quiz 1)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:
Multiply multi-digit decimals using a variety of strategies. **(Lessons 1–4)**	1	**Support** • **Mini-Lesson:** *Representing Decimals on Grids* • **Mini-Lesson:** Multiplying Fractions • **Teacher Move:** Consider revisiting Lesson 1 (*Decimal Multiplication*)
		Strengthen • **Repeated Challenges:** Lesson 1 (*Decimal Multiplication*)

	2, 3, 4, 5	**Support**
		Strengthen
		• **Mini-Lesson:** *Multiplying Decimals Using Area Models*
		• **Teacher Move:** Consider revisiting:
		  • Lesson 3 (*Multiplying with Areas*)
		  • Lesson 4 (*Multiplication Methods*)

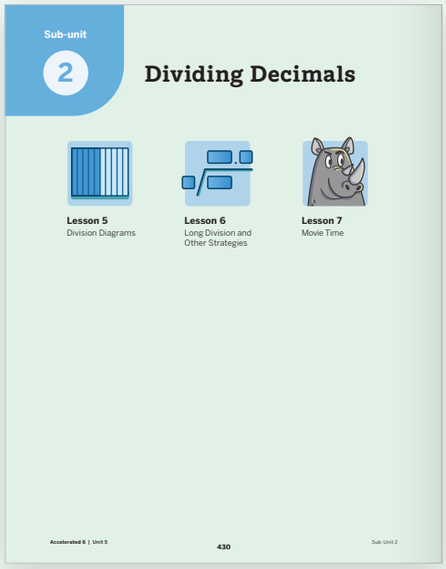
Sub-Unit 2

Dividing Decimals

Sub-Unit 2 Goals

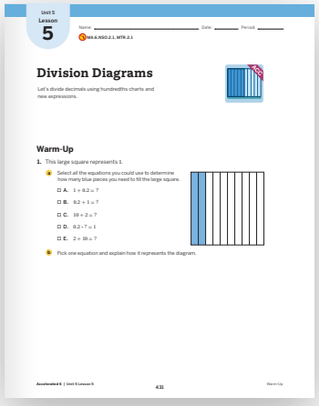
- **Goal:** Divide multi-digit decimals using a variety of strategies.
- **Language Goal:** Compare and contrast different strategies for dividing multi-digit decimals.

In this sub-unit, students divide multi-digit decimals, including those with decimal places to the thousandths. They apply **long division**, along with the properties of operations and the relationship between multiplication and division to solve problems with decimals.



Math That Matters Most

Concept or Skill	For example . . .
Relate decimal division to fraction division.	Use fractions to help calculate $1.5 \div 0.03$. $\frac{15}{10} \div \frac{3}{100} = \frac{150}{100} \div \frac{3}{100} = 150 \div 3 = 50$
Divide multi-digit numbers using long division.	Determine $9.9 \div 1.2$. Show your thinking. Rewrite 9.9 ÷ 1.2 as 99 ÷ 12. The quotient is 8.25. 8.25 12)99.00 −96 30 −24 60 −60 0


Unit 5
Lesson
5
Name: Date: Period:
MA.6.NSO.2.1, MTR.2.1
Division Diagrams
Let's divide decimals using hundredths charts and new expressions.
Warm-Up
1. This large square represents 1.
Select all the equations you could use to determine how many blue pieces you need to fill the large square.
A. 1 ÷ 0.2 = ?
B. 0.2 × 1 = ?
C. 10 ÷ 2 = ?
D. 0.2 · ? = 1
E. 2 ÷ 10 = ?
Pick one equation and explain how it represents the diagram.
Accelerated 6 | Unit 5 Lesson 5
431
Warm-Up

Division Diagrams

Making Sense of Decimal Division

Let's divide decimals using hundredths charts and new expressions.

Learning Outcomes

Today's Goals

1. **Goal:** Use reasoning with a hundredths chart and converting to fractions to divide multi-digit decimals.
2. **Language Goal:** Analyze different strategies to divide multi-digit decimals with whole-number quotients. **(Writing, Speaking, and Listening)**

Students make sense of dividing decimals using tenths and hundredths charts. They use a strategy similar to what they learned for dividing fractions: writing an equivalent division problem. They use this strategy to rewrite decimal division as whole-number division to calculate quotients. **(MTR.2.1)**

Coherence

Prior Learning

In Lesson 1, students used hundredths charts to make sense of multiplying decimals.

Future Learning

In Lesson 6, students will use long division to divide decimals.

Connections

- Students build upon their understanding of rectangle area models to begin their exploration of decimal division. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

Mathematical Thinking and Reasoning Standard: MTR.2.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.2	MA.7.NSO.2.2
MA.5.NSO.2.4	
MA.5.NSO.2.5	

Lesson at a Glance

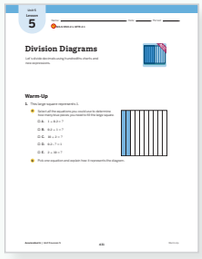
~ 45 min

MA.6.NSO.2.1

Warm-Up

Pairs | 5 min

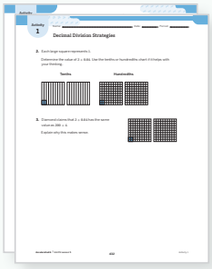
Students use a hundredths chart to reason about decimal division.



Activity 1

Pairs | 12 min

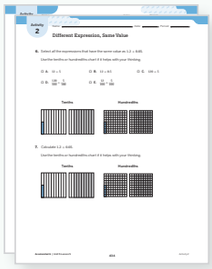
Students connect the strategies of using a hundredths chart and fraction conversion to divide decimals. **(MTR.2.1)**



Activity 2

Pairs | 10 min

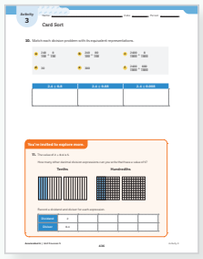
Students use equivalent expressions to divide decimals. MLR3: Critique, Correct, Clarify



Activity 3

Pairs | 8 min

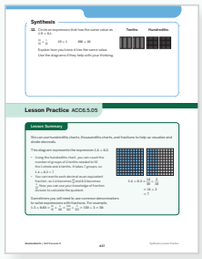
Students practice creating new expressions to divide decimals.



Synthesis

Whole Class | 5 min

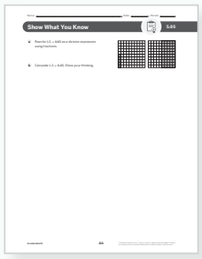
Students synthesize their strategies for creating equivalent expressions to divide decimals. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding of dividing decimals by writing equivalent fractions.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know
- Calculators (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students use a hundredths chart to reason about decimal division.

1 Launch

Consider asking, "How many blue pieces are there in our diagram? How many total pieces are there?"

Invite students to share what they notice about the options before selecting them.

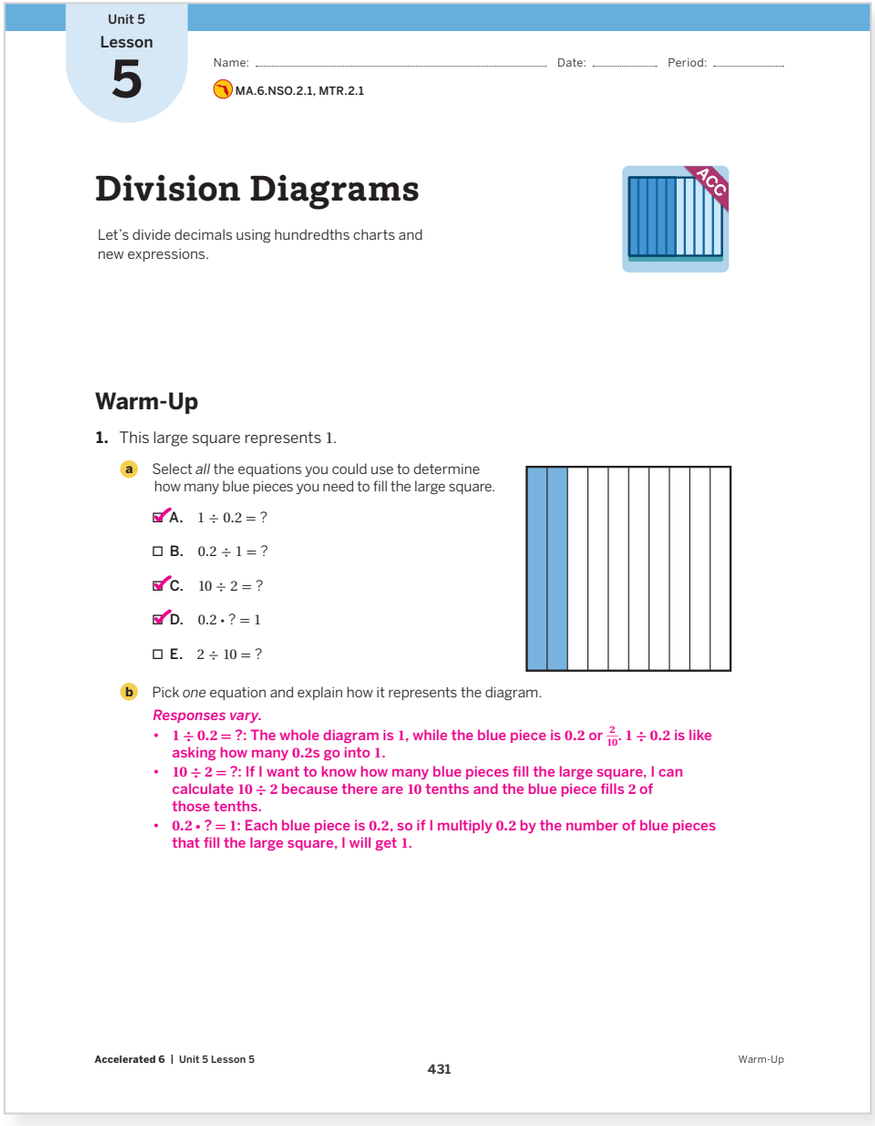
A **Accessibility: Executive Functioning** To support students with organization in problem solving, invite them to consider one choice at a time to determine if it has the same value as $1 \div 0.2$.

2 Connect

Display the distribution of responses by polling the class and invite students to share their reasoning for each option.

Note: If it does not come up naturally, consider asking, "What might a student who picked $1 \div 0.2$ be thinking? What about $10 \div 2$?"

To surface the Key Takeaway, consider asking, "Why might writing more than one expression be useful?"



Unit 5
Lesson 5

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.1, MTR.2.1

Division Diagrams

Let's divide decimals using hundredths charts and new expressions.

Warm-Up

1. This large square represents 1.

a. Select *all* the equations you could use to determine how many blue pieces you need to fill the large square.

- ☑ A. $1 \div 0.2 = ?$
- ☐ B. $0.2 \div 1 = ?$
- ☑ C. $10 \div 2 = ?$
- ☑ D. $0.2 \cdot ? = 1$
- ☐ E. $2 \div 10 = ?$

b. Pick *one* equation and explain how it represents the diagram.

Responses vary.

- $1 \div 0.2 = ?$: The whole diagram is 1, while the blue piece is 0.2 or $\frac{2}{10}$. $1 \div 0.2$ is like asking how many 0.2s go into 1.
- $10 \div 2 = ?$: If I want to know how many blue pieces fill the large square, I can calculate $10 \div 2$ because there are 10 tenths and the blue piece fills 2 of those tenths.
- $0.2 \cdot ? = 1$: Each blue piece is 0.2, so if I multiply 0.2 by the number of blue pieces that fill the large square, I will get 1.

Accelerated 6 | Unit 5 Lesson 5 431 Warm-Up

Key Takeaway: There are multiple ways we can express the same division expression.

Pairs | 12 min

Activity 1 Decimal Division Strategies

Purpose: Students connect the strategies of using a hundredths chart and fraction conversion to divide decimals. **(MTR.2.1)**

1 Launch

Direct students' attention to both the tenths and hundredths charts. Consider asking, "How are these alike? How are they different?"

Invite students to estimate $2 \div 0.04$ and to share their estimates with the class.

2 Monitor

Look for ways students use the tenths and hundredths charts to make sense of dividing 2 by 0.04. **(MTR.2.1)**

D **Differentiation:** (Support) Look for students who need support getting started. Consider asking:
- "Would you prefer to use the tenths or hundredths chart? Why?"
- "How many blue boxes would fill two tenths? One whole? Two?"

Select and sequence student explanations of Diamond's claim to share during the Pause.

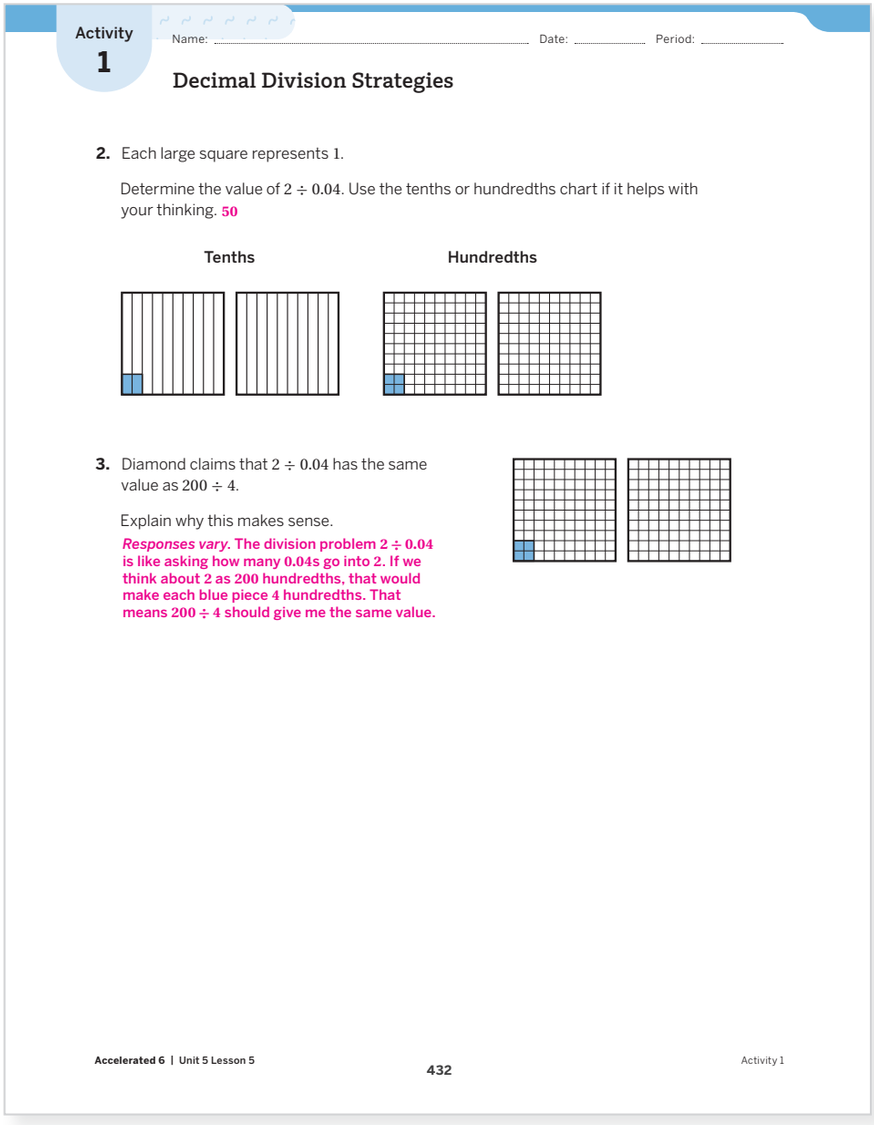
D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "Where might Diamond have seen the 4? What about the 200?"
Claim both the original and Diamond's expressions are equal to 50.	**Strengthen** Invite them to share during the Connect.
Recognize that there are 200 hundredths boxes and 4 blue boxes.	**Stretch** Invite them to create a third equivalent division expression to represent the diagram. **(MTR.2.1)**
Claim she may have written 2 and 0.04 as $\frac{2}{1}$ and $\frac{4}{100}$ and divided those fractions.	

Pause to share the selected explanations of Diamond's claim about equivalent expressions.

Consider asking:
- "Why do you think Diamond chose the hundredths chart for this expression?"
- "How might rewriting the expression Diamond's way be helpful?"

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Decimal Division Strategies

2. Each large square represents 1.

Determine the value of $2 \div 0.04$. Use the tenths or hundredths chart if it helps with your thinking. **50**

Tenths

Hundredths

3. Diamond claims that $2 \div 0.04$ has the same value as $200 \div 4$.

Explain why this makes sense.

Responses vary. **The division problem $2 \div 0.04$ is like asking how many 0.04s go into 2. If we think about 2 as 200 hundredths, that would make each blue piece 4 hundredths. That means $200 \div 4$ should give me the same value.**

Accelerated 6 | Unit 5 Lesson 5 432 Activity 1

Pairs | 12 min

Activity 1 Decimal Division Strategies (continued)

Purpose: Students connect the strategies of using a hundredths chart and fraction conversion to divide decimals. **(MTR.2.1)**

2 Monitor

Look for ways students use the tenths and hundredths charts to divide 2 by 0.04. Invite pairs of students to share their strategies with each other.

Listen for descriptions of Arjun's strategy, including converting decimals to fractions, making equivalent fractions, and dividing them. Invite these students to share during the Connect.

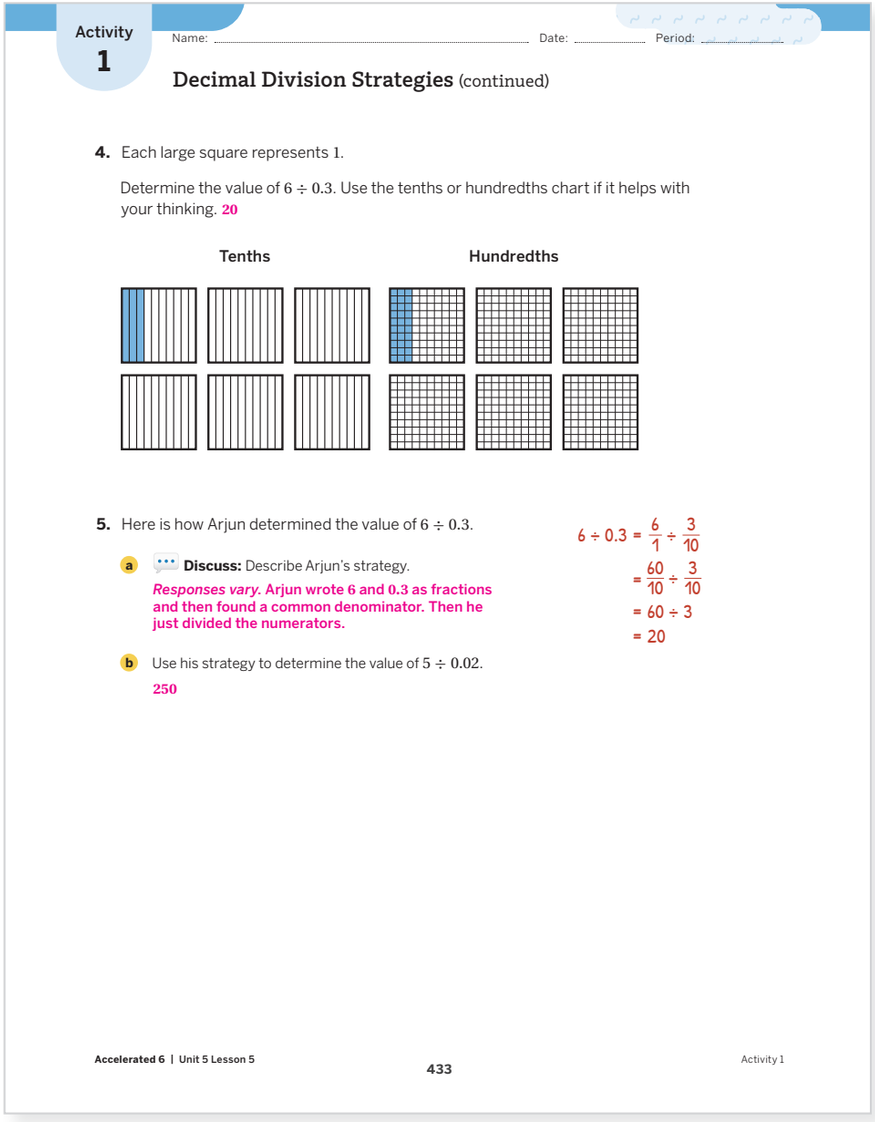
D Differentiation *(Problem 5)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to look at Arjun's work. Consider asking: • "Why might Arjun have written $\frac{6}{1} \div \frac{3}{10}$?" • "How is Arjun's work in Line 2 different than Line 1?"
Need support making equivalent fractions.	**Strengthen** Consider asking, "Why did Arjun multiply by 10? What would we multiply by in this problem?"
Need support dividing fractions.	**Strengthen** Invite them to refer to anchor charts about dividing fractions from Unit 4. Consider asking, "How many groups of 3 tenths are in 60 tenths?"
Use a hundredths chart.	**Stretch** Consider asking, "What would $5 \div 0.002$ equal? What about $0.05 \div 0.002$?"
Convert the decimals to fractions, write equivalent fractions with a common denominator, and divide to get 250.	

3 Connect

To surface the Key Takeaway, consider asking:
- "What were the steps Arjun took to calculate $6 \div 0.3$?"
- "How could we use Arjun's strategy to divide $5 \div 0.02$?"

Consider sharing that mathematicians often use the strategy of converting a new problem into a more familiar one.



Activity 1

Name: _____ Date: _____ Period: _____

Decimal Division Strategies (continued)

4. Each large square represents 1.

Determine the value of $6 \div 0.3$. Use the tenths or hundredths chart if it helps with your thinking. 20

Tenths Hundredths

5. Here is how Arjun determined the value of $6 \div 0.3$.

$6 \div 0.3 = \frac{6}{1} \div \frac{3}{10}$
$= \frac{60}{10} \div \frac{3}{10}$
$= 60 \div 3$
$= 20$

a. **Discuss:** Describe Arjun's strategy.
Responses vary. Arjun wrote 6 and 0.3 as fractions and then found a common denominator. Then he just divided the numerators.

b. Use his strategy to determine the value of $5 \div 0.02$.
250

Accelerated 6 | Unit 5 Lesson 5 433 Activity 1

Key Takeaway: When dividing decimals, it helps to convert them into fractions and divide them. This strategy helps rewrite decimal division as division with whole numbers.

Pairs | 10 min

Activity 2 Different Expression, Same Value

Purpose: Students use equivalent expressions to divide decimals.

Short on time? Consider limiting the discussion about Raven's work in Problem 9.

1 Launch

To support students getting started, consider asking, "How might using both the tenths and hundredths charts help us understand expressions?" **(MTR.2.1)**

2 Monitor

Look for a variety of student thinking about expressions representing $1.2 \div 0.05$ to ensure students are ready to divide in the rest of this activity.

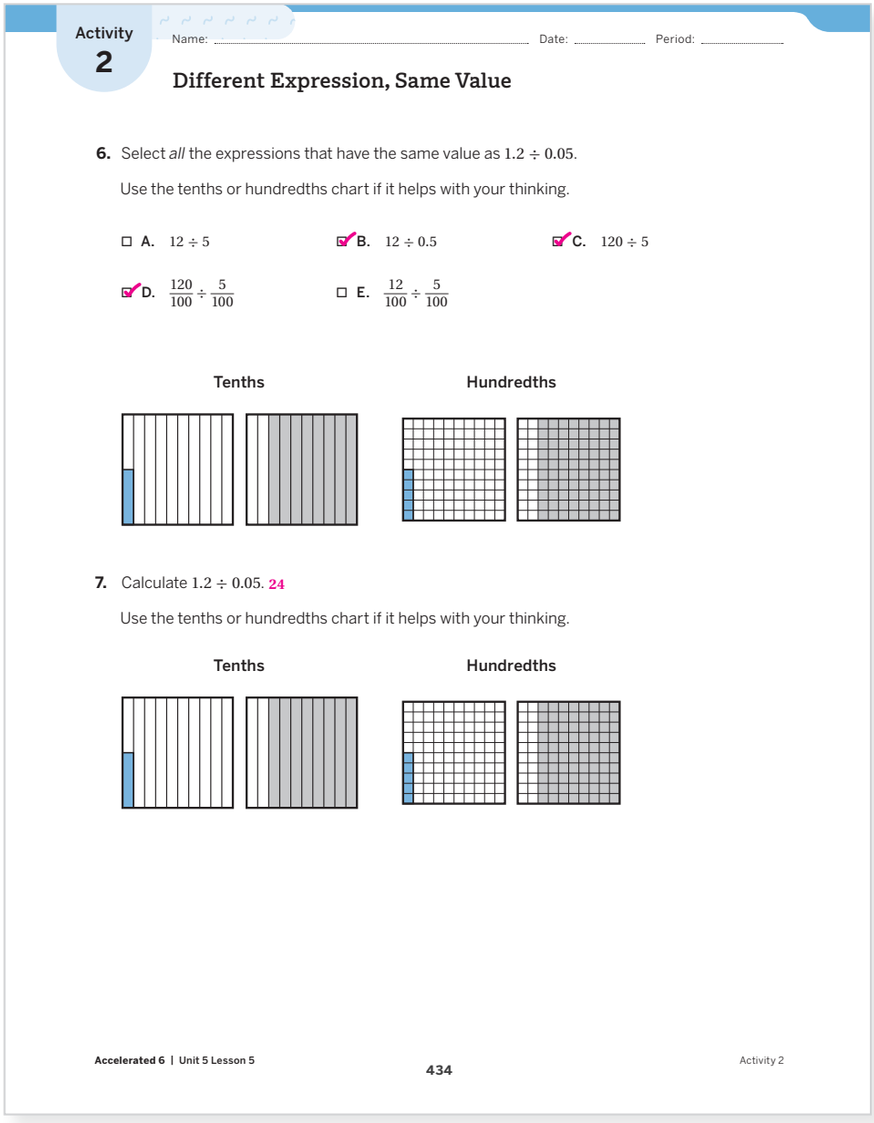
D Differentiation *(Problem 6)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking: • "How many tenths are there in 1.2? How many tenths are shaded blue?" • "How might we use the same logic with the hundredths chart?"
Select Choice A or Choice E.	**Support** Encourage them to collaborate with another pair, share their reasoning, and come to consensus.
Select some of Choices B, C, and D but not all.	**Support** Invite them to use a calculator to evaluate the original expression and each option. Consider asking, "How can we show that $1.2 \div 0.05$ is the same as each expression?"
Select all of Choices B, C, and D.	**Stretch** Consider asking, "What might an equivalent expression look like with thousandths as the common denominator?"

Encourage students to discuss their strategies for dividing $1.2 \div 0.05$.

D Differentiation: (Support) Look for students who need support or who guess and check. Consider asking, "Which equivalent expression from the previous problem would you like to use? How can we calculate its value?"

Activity 2 continued >



Activity 2

Name: _____ Date: _____ Period: _____

Different Expression, Same Value

6. Select *all* the expressions that have the same value as $1.2 \div 0.05$.

Use the tenths or hundredths chart if it helps with your thinking.

☐ A. $12 \div 5$ ☑ B. $12 \div 0.5$ ☑ C. $120 \div 5$

☑ D. $\frac{120}{100} \div \frac{5}{100}$ ☐ E. $\frac{12}{100} \div \frac{5}{100}$

Tenths Hundredths

7. Calculate $1.2 \div 0.05$. 24

Use the tenths or hundredths chart if it helps with your thinking.

Tenths Hundredths

Accelerated 6 | Unit 5 Lesson 5 434 Activity 2

Pairs | 10 min

Activity 2 Different Expression, Same Value (continued)

Purpose: Students use equivalent expressions to divide decimals.

Short on time? Consider limiting the discussion about Raven's work in Problem 9.

2 Monitor

Look for students who may need individual support to be comfortable with converting to fractions.

D Differentiation *(Problem 8)*

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How could we use these strategies to create new expressions here?"
Write a non-equivalent expression (e.g., $36 \div 12$ or $360 \div 12$).	**Support** Consider asking: • "How can we express 3.6 and 0.012 as fractions?" • "How can we rewrite equivalent fractions using a common denominator?"
Try to represent this expression with a hundredths chart.	**Strengthen** Consider asking, "How might you calculate the value of this expression? What is a common denominator that may leave us with whole numbers in our division problem?"
Write a fraction with two whole numbers that is equal to $\frac{3.6}{0.012}$.	**Stretch** Consider asking, "How could we use the same digits to create a larger product? A smaller one?"

Look for students who have identified correct elements of Raven's work, potentially incorrect steps, and specific recommendations they would make to improve her understanding. Invite students to share during the Connect.

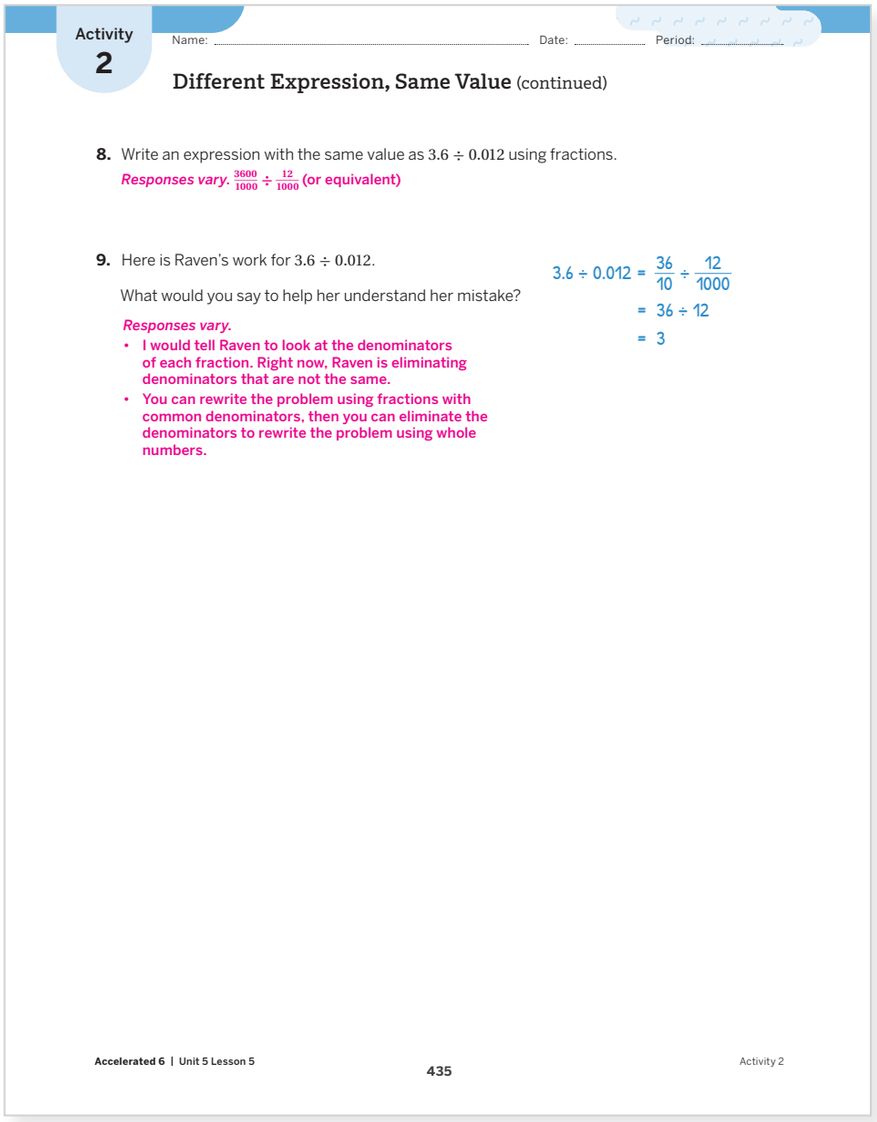
ELL English Language Learners Invite students to talk through their thinking with a partner before writing it down. **(Writing and Speaking)**

3 Connect

Invite students to share their thoughts about Raven's work.

MLR MLR3: Critique, Correct, Clarify Use this routine to help students describe strengths, errors, and ambiguities in Raven's work. As a class:
- Discuss what is *correct* about her response.
- Discuss what is *incorrect* or *unclear*.
- Create a *correct and clear* solution.

Consider asking:
- "What are some important ideas to keep in mind when dividing decimals?"
- "Why might someone choose Arjun's method over a hundredths chart for this problem? For a general decimal division problem?"



Activity 2

Name: _____ Date: _____ Period: _____

Different Expression, Same Value (continued)

8. Write an expression with the same value as $3.6 \div 0.012$ using fractions.

Responses vary. $\frac{3600}{1000} \div \frac{12}{1000}$ (or equivalent)

9. Here is Raven's work for $3.6 \div 0.012$.

$$3.6 \div 0.012 = \frac{36}{10} \div \frac{12}{1000}$$
$$= 36 \div 12$$
$$= 3$$

What would you say to help her understand her mistake?

Responses vary.
- I would tell Raven to look at the denominators of each fraction. Right now, Raven is eliminating denominators that are not the same.
- You can rewrite the problem using fractions with common denominators, then you can eliminate the denominators to rewrite the problem using whole numbers.

Accelerated 6 | Unit 5 Lesson 5 435 Activity 2

Pairs | 8 min

Activity 3 Card Sort

Purpose: Students practice creating new expressions to divide decimals.

1 Launch

Invite students to look at the each expression. Consider asking, "What kinds of expressions do you see?"

2 Monitor

Encourage students to share their reasoning with a partner and work together to reach an agreement about how to sort the expressions. **(MTR.2.1)**

ELL **English Language Learners** Provide sentence frames to help students explain their strategy (e.g., "I matched ___ with ___ because. . ." or "These two cards don't match because. . ."). **(Writing and Speaking)**

A **Accessibility: Executive Function** Invite students to focus on one of the division expressions shown at a time to support them in carrying out multiple steps.

Note: If time allows, invite pairs to compare their matches, justify their thinking, and make revisions based on their conversation.

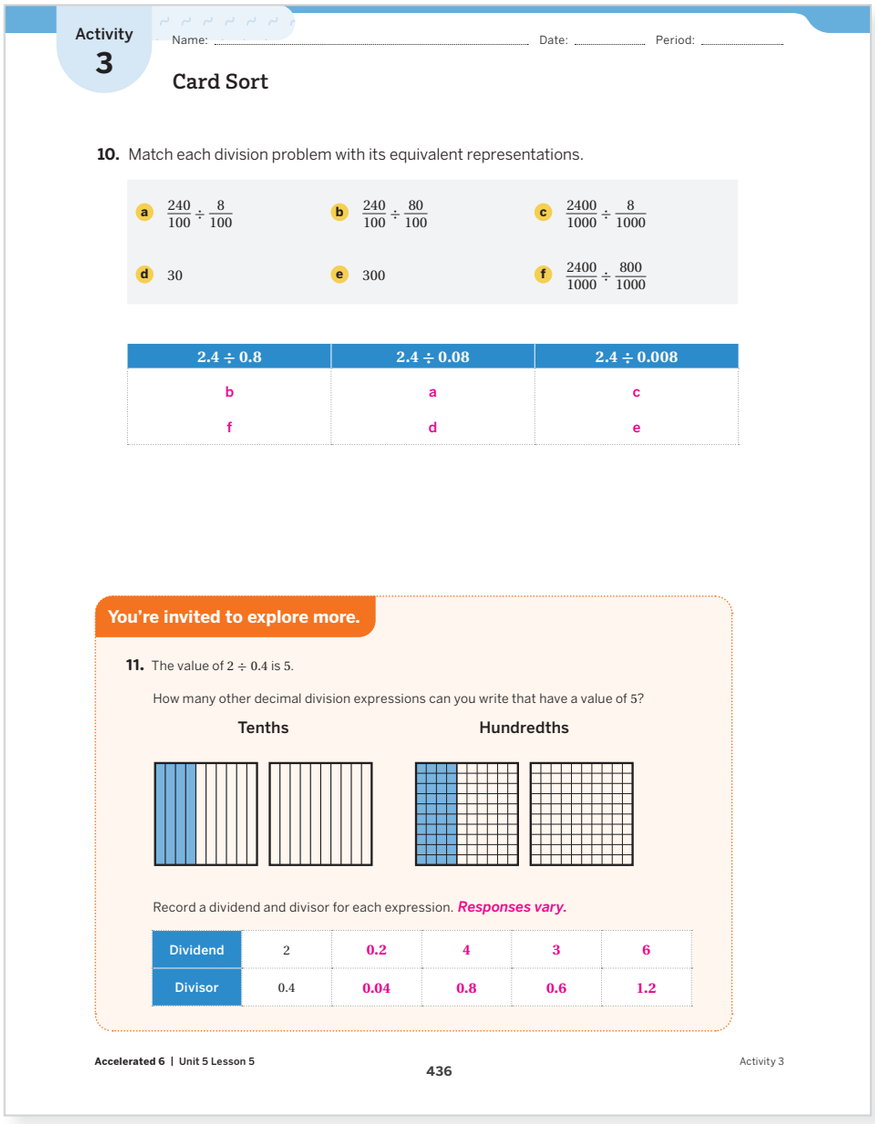
D **Differentiation: You're invited to explore more. (Stretch)** Invite students who would like to explore dividing decimals further to complete this optional task. Encourage them to discuss their thinking with a partner.

To encourage creativity, invite students to create as many expressions with decimals as they can.

3 Connect

Invite students to share their reasoning and justify how they sorted the representations.

Note: If it does not come up naturally, consider asking, "In the card sort, $2.4 \div 0.8$ matched with $\frac{240}{100} \div \frac{80}{100}$. What other equivalent expressions could we create to add to this group?"



Activity 3

Name: _____ Date: _____ Period: _____

Card Sort

10. Match each division problem with its equivalent representations.

a $\frac{240}{100} \div \frac{8}{100}$

b $\frac{240}{100} \div \frac{80}{100}$

c $\frac{2400}{1000} \div \frac{8}{1000}$

d 30

e 300

f $\frac{2400}{1000} \div \frac{800}{1000}$

$2.4 \div 0.8$	$2.4 \div 0.08$	$2.4 \div 0.008$
b	a	c
f	d	e

You're invited to explore more.

11. The value of $2 \div 0.4$ is 5.

How many other decimal division expressions can you write that have a value of 5?

Tenths Hundredths

Record a dividend and divisor for each expression. *Responses vary.*

Dividend	2	0.2	4	3	6
Divisor	0.4	0.04	0.8	0.6	1.2

Accelerated 6 | Unit 5 Lesson 5 436 Activity 3

Whole Class | 5 min

Synthesis

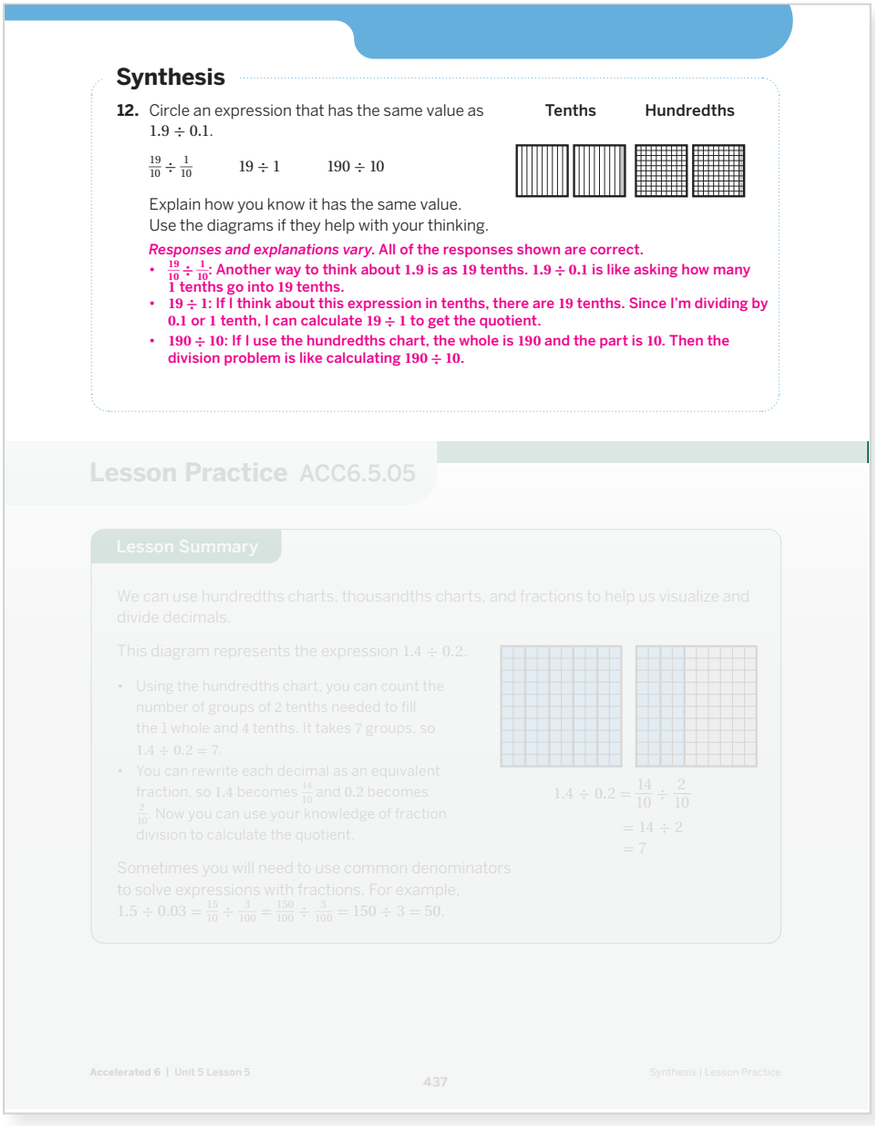
Purpose: Students synthesize their strategies for creating equivalent expressions to divide decimals.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Using a tenths or hundredths chart to count the number of times the divisor can fit into the dividend.
- Converting decimals to fractions, making equivalent fractions with a common denominator, and dividing the resulting numerators.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategy for dividing decimals using students' language. Display any new language, examples, or diagrams for students to reference and add to for the remainder of the unit.



Synthesis

12. Circle an expression that has the same value as $1.9 \div 0.1$.

$\frac{19}{10} \div \frac{1}{10}$ $19 \div 1$ $190 \div 10$

Tenths Hundredths

Explain how you know it has the same value.
Use the diagrams if they help with your thinking.

Responses and explanations vary. All of the responses shown are correct.

- $\frac{19}{10} \div \frac{1}{10}$: Another way to think about 1.9 is as 19 tenths. $1.9 \div 0.1$ is like asking how many 1 tenths go into 19 tenths.
- $19 \div 1$: If I think about this expression in tenths, there are 19 tenths. Since I'm dividing by 0.1 or 1 tenth, I can calculate $19 \div 1$ to get the quotient.
- $190 \div 10$: If I use the hundredths chart, the whole is 190 and the part is 10. Then the division problem is like calculating $190 \div 10$.

Lesson Practice ACC6.5.05

Lesson Summary

We can use hundredths charts, thousandths charts, and fractions to help us visualize and divide decimals.

This diagram represents the expression $1.4 \div 0.2$.

- Using the hundredths chart, you can count the number of groups of 2 tenths needed to fill the 1 whole and 4 tenths. It takes 7 groups, so $1.4 \div 0.2 = 7$.
- You can rewrite each decimal as an equivalent fraction, so 1.4 becomes $\frac{14}{10}$ and 0.2 becomes $\frac{2}{10}$. Now you can use your knowledge of fraction division to calculate the quotient.

$$1.4 \div 0.2 = \frac{14}{10} \div \frac{2}{10}$$
$$= 14 \div 2$$
$$= 7$$

Sometimes you will need to use common denominators to solve expressions with fractions. For example, $1.5 \div 0.03 = \frac{15}{10} \div \frac{3}{100} = \frac{150}{100} \div \frac{3}{100} = 150 \div 3 = 50$.

Accelerated 6 | Unit 5 Lesson 5 437 Synthesis | Lesson Practice

Lesson Takeaway: One strategy for dividing decimals is to convert them to fractions. Making equivalent fractions and dividing them creates a division expression with whole numbers.

Independent | 5 min

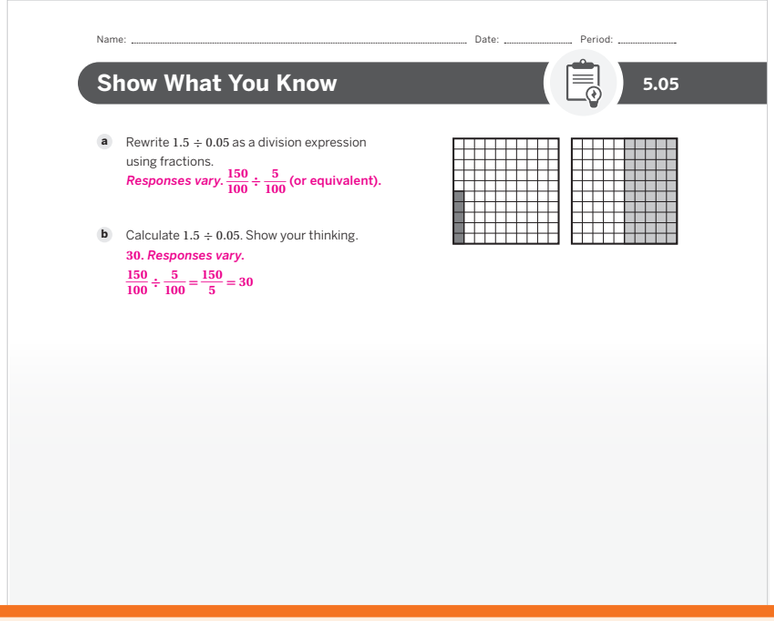
Show What You Know

Purpose: Students demonstrate their understanding of dividing decimals by writing equivalent fractions.

Today's Goals

1. **Goal:** Use reasoning with a hundredths chart and converting to fractions to divide multi-digit decimals.
2. **Language Goal:** Analyze different strategies to divide multi-digit decimals with whole-number quotients. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)



Name: _____ Date: _____ Period: _____

Show What You Know 5.05

a. Rewrite $1.5 \div 0.05$ as a division expression using fractions.
Responses vary. $\frac{150}{100} \div \frac{5}{100}$ (or equivalent).

b. Calculate $1.5 \div 0.05$. Show your thinking.
30. *Responses vary.*
$\frac{150}{100} \div \frac{5}{100} = \frac{150}{5} = 30$

Differentiation Use after Lesson 5

Support

Provide targeted intervention for students by using these resources.

If students need support dividing decimals by a whole number:

» **Respond to Student Thinking:**

- Review the **Lesson Summary**.
- Revisit **Activity 1**, specifically Arjun's strategy, and give students individualized feedback on specific **Practice Problems**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

What strengths did your students exhibit today? How can you build from those strengths as students continue learning about dividing decimals?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

12. Circle an expression that has the same value as $1.9 \div 0.1$.

$\frac{19}{10} \div \frac{1}{10}$ $\quad 19 \div 1$ $\quad 190 \div 10$

Tenths Hundredths

Explain how you know it has the same value.
Use the diagrams if they help with your thinking.

Responses and explanations vary. All of the responses shown are correct.

- $\frac{19}{10} \div \frac{1}{10}$: Another way to think about 1.9 is as 19 tenths. $1.9 \div 0.1$ is like asking how many 1 tenths go into 19 tenths.
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Lesson Practice ACC6.5.05

Lesson Summary

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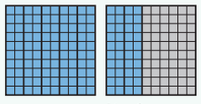
This diagram represents the expression $1.4 \div 0.2$.



- Using the hundredths chart, you can count the number of groups of 2 tenths needed to fill the 1 whole and 4 tenths. It takes 7 groups, so $1.4 \div 0.2 = 7$.
- You can rewrite each decimal as an equivalent fraction, so 1.4 becomes $\frac{14}{10}$ and 0.2 becomes $\frac{2}{10}$. Now you can use your knowledge of fraction division to calculate the quotient.

$$1.4 \div 0.2 = \frac{14}{10} \div \frac{2}{10}$$
$$= 14 \div 2$$
$$= 7$$

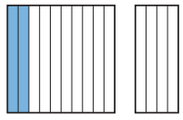
Sometimes you will need to use common denominators to solve expressions with fractions. For example, $1.5 \div 0.03 = \frac{15}{10} \div \frac{3}{100} = \frac{150}{100} \div \frac{3}{100} = 150 \div 3 = 50$.

Lesson Practice ACC6.5.05

Name: ..... Date: ..... Period: .....

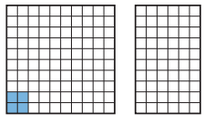
1. Determine the value of $1.4 \div 0.2$.

7



2. Determine the value of $1.6 \div 0.04$.

40



3. Select *all* the expressions that are equivalent to $3.5 \div 0.005$.

- ☐ A. $35 \div 5$
- ☑ B. $3500 \div 5$
- ☑ C. $35 \div 0.05$
- ☐ D. $\frac{35}{10} \div \frac{5}{100}$
- ☑ E. $\frac{35}{10} \div \frac{5}{1000}$

4. Calculate $3.5 \div 0.005$.

700

Problems 5–6: Remy says: *To determine the value of* $0.27 \div 0.003$, *I can divide* 270 by 3.

5. Is Remy correct? Explain your reasoning.

Yes. *Explanations vary.* Remy multiplied both the divisor and dividend by 1,000.

6. Calculate $0.27 \div 0.003$. Show or explain your thinking.

90. *Work varies.* $0.27 \div 0.003 = \frac{270}{1000} \div \frac{3}{1000} = 270 \div 3 = 90$

Lesson Practice ACC6.5.05

Name: ..... Date: ..... Period: .....

FAST Practice

7. Calculate $0.225 \div 0.005$.

Quotient: 45

Spiral Review

Problems 8–9: Xavier is multiplying $1.5 \cdot 0.82$. He knows that $15 \cdot 82 = 1230$.

8. What is $1.5 \cdot 0.82$? Show or explain your thinking.

A. 0.0123 B. 0.123 C. 1.23 D. 12.3

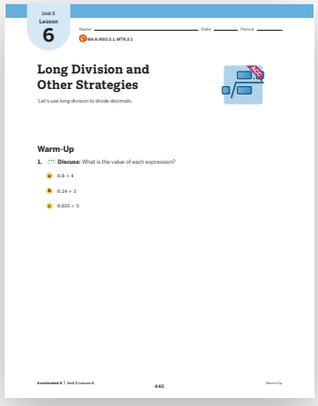
Explanations vary. The problem involves multiplying 15 tenths by 82 hundredths. This means that, after we multiply $15 \cdot 82$, we must also multiply by $\frac{1}{10}$ and $\frac{1}{100}$, and $1230 \cdot \frac{1}{10} \cdot \frac{1}{100} = \frac{1230}{1000} = 1.23$.

9. What is $0.15 \cdot 0.82$?

0.123

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–6	2	MA.6.NSO.2.1
FAST Practice	7	2	MA.6.NSO.2.1
Spiral Review			
	8–9	2	MA.6.NSO.2.1



Long Division and Other Strategies

Long Division With Decimal Quotients

Let's use long division to divide decimals.

Learning Outcomes

Today's Goals

1. **Goal:** Use *long division* to divide multi-digit decimals.
2. **Language Goal:** Compare strategies for dividing whole numbers and decimals. **(Speaking and Listening)**

Students combine their understanding of strategies for dividing decimals and using the standard algorithm to divide whole numbers. They develop fluency in converting division expressions with decimals into fraction division expressions, rewriting the quotient as a division of whole numbers, and using **long division** to calculate the quotient.

Note: In this course, students only explore quotients with terminating decimals. In a future course, students will use long division to convert fractions to decimals, including both repeating and terminating decimals.

Coherence

Prior Learning

In Lesson 5, students used fractions and place value to rewrite decimal division problems using whole numbers.

Future Learning

In Lessons 7–8 and 10, students will apply their work with decimal operations to real-world contexts.

Connections

- Students apply their understanding of division models to understand long division algorithms. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

Mathematical Thinking and Reasoning Standard: MTR.2.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.2	MA.7.NSO.2.2
MA.5.NSO.2.4	
MA.5.NSO.2.5	

Vocabulary

New Vocabulary

long division

Lesson at a Glance

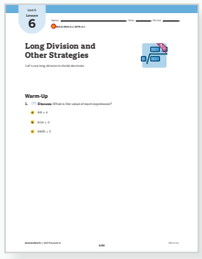
~ 45 min

MA.6.NSO.2.1

Warm-Up

Pairs | 5 min

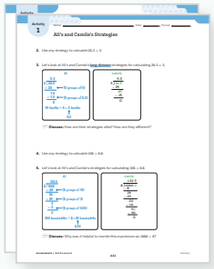
Students use place value to make sense of decimals divided by whole numbers.
Routine: Think-Pair-Share


Unit 5 Lesson 6
6
Long Division and Other Strategies
Let's use long division to divide decimals.
Warm-Up
1. Discuss: What is the value of each expression?
440

Activity 1

Pairs | 18 min

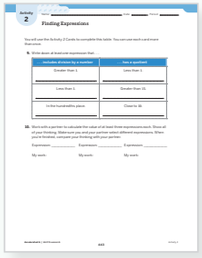
Students compare strategies for dividing decimals such as rewriting using whole numbers, then dividing using **long division** or partial quotients. MLR7: Compare and Connect


Activity 1
Ali's and Camila's Strategies
2. Use any strategy to calculate 36.4 ÷ 5.
3. Let's look at Ali's and Camila's long division strategies for calculating 36.4 ÷ 5.
Ali
Camila
Discuss: How are these strategies alike? How are they different?
4. Use any strategy to calculate 156 ÷ 0.6.
5. Let's look at Ali's and Camila's strategies for calculating 156 ÷ 0.6.
Ali
Camila
Discuss: Why was it helpful to rewrite this expression as 1560 ÷ 6?
441

Activity 2

Pairs | 12 min

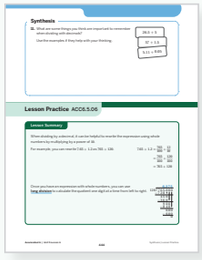
Students develop fluency in dividing by decimals using a variety of strategies. **(MTR.2.1)**


Activity 2
Finding Expressions
You will use the Activity 2 Cards to complete this table. You can use each card more than once.
9. Write down at least one expression that:
Evaluates to a number
Uses a quotient
Greater than 1
Less than 1
Less than 1
Greater than 10
Is the hundredths place
Closest to 10
10. Work with a partner to calculate the value of at least three expressions each. Show all of your thinking. Make sure you and your partner select different expressions. When you're finished, compare your thinking with your partner.
Expression
Expression
Expression
My work:
My work:
My work:
442

Synthesis

Whole Class | 5 min

Students synthesize their understanding of strategies for dividing by decimals. MLR2: Collect and Display


Synthesis
Lesson Practice ACCELS.OG
Lesson Summary
443

Show What You Know

Independent | 5 min

Students demonstrate their understanding by dividing decimals whose quotient is also a decimal.

Show What You Know
5.06
Calculate 6.072 ÷ 0.48. Show your thinking.
444

Prep Checklist

Prepare the Activity 2 Cards and Hundredths Charts Sheets.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 2 set of cards, one set per pair, pre-cut
- Hundredths Charts Sheets (optional)

Pairs | 5 min

Warm-Up

Purpose: Students use place value to make sense of decimals divided by whole numbers.

1 Launch

Direct students' attention to the three expressions.

Consider distributing the Hundredths Charts Sheet.

To surface prior knowledge, consider asking, "What would the first expression look like on a hundredths chart?"

A **Accessibility: Conceptual Processing** Invite students to share how each problem is different from the previous one to help them apply their thinking to each expression.

2 Connect

Use the Think-Pair-Share routine to support student-to-student discourse about division and place value. Invite students to think independently and then take turns sharing with a partner.

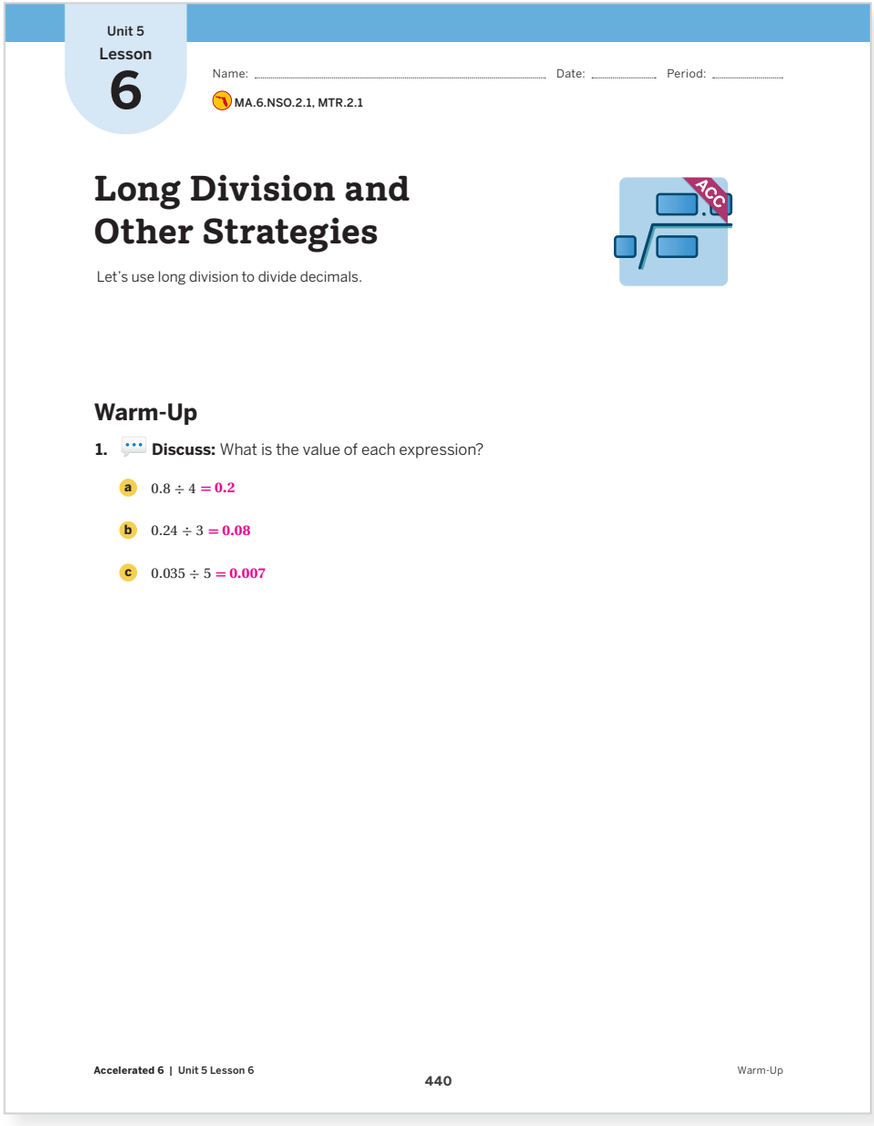
Listen for students who use tools, like a hundredths chart or place value, to reason about each quotient. **(MTR.2.1)**

Invite students to share their or their partner's strategies for dividing with the class.

Consider asking:

- "What was your strategy for dividing each expression?"
- "How was your strategy the same for each expression? How did it change?"

ELL **English Language Learners** Encourage students to paraphrase each other's ideas to help them make connections and incorporate vocabulary from the unit. **(Speaking and Listening)**



Unit 5
Lesson
6

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.1, MTR.2.1

Long Division and Other Strategies

Let's use long division to divide decimals.

Warm-Up

1. **Discuss:** What is the value of each expression?

   a. $0.8 \div 4 = 0.2$

   b. $0.24 \div 3 = 0.08$

   c. $0.035 \div 5 = 0.007$

Accelerated 6 | Unit 5 Lesson 6 440 Warm-Up

Pairs | 18 min

Activity 1 Ali's and Camila's Strategies

Purpose: Students compare strategies for dividing decimals such as rewriting using whole numbers, then dividing using **long division** or partial quotients.

Short on time? Consider skipping Problem 8 or completing it as a class.

1 Launch

Direct students' attention to the first expression. Consider sharing that this activity has three expressions. For each expression, they try a division problem, then analyze two students' strategies. **(MTR.2.1)**

Invite students to try the first problem independently, then share their thinking with a partner.

2 Monitor

Look for a variety of strategies students use to calculate the expression's value to highlight during the Pause.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to review their work from the Warm-Up. Consider asking, "What was your first step for those expressions?"
Write 53 because $25 \div 5$ is 5 and $15 \div 5$ is 3.	**Support** Consider asking, "What does the 15 represent? Ones? Tenths? Hundredths?"
Use partial quotients, long division, or another strategy.	**Stretch** Encourage students to try a different strategy.

Pause to discuss Ali's and Camila's **long division** strategies.

MLR MLR7: Compare and Connect Invite students to analyze and compare each strategy, and then connect to their own strategy. See the Routine Facilitation Guide for more information.

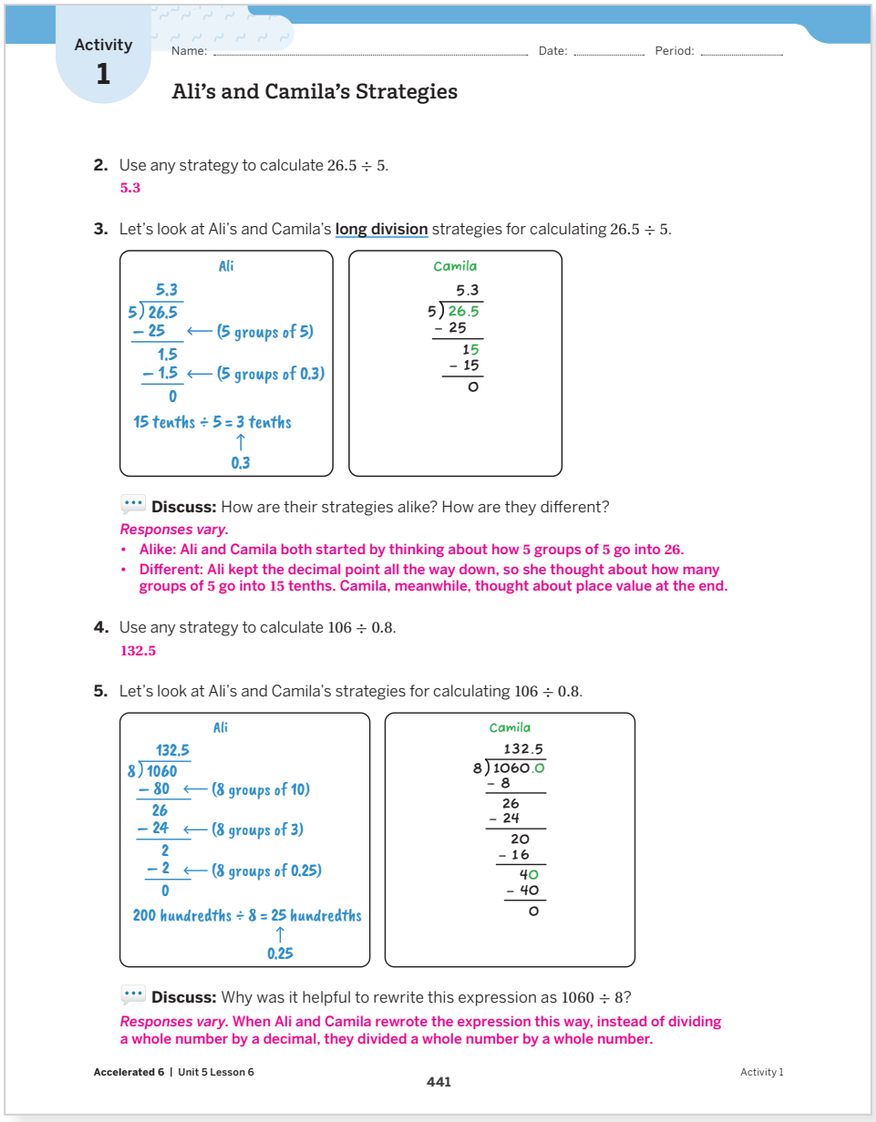
Consider asking:

- "Where do you see the same information in Ali's and Camila's strategies?"
- "What do you think was helpful about each strategy?"

Direct students' attention to the second expression and repeat the same structure for the expression and discussion prompt.

D Differentiation: (Support) Look for students who need support getting started or who divide 106 by 8. Consider asking them, "What does the 8 represent? Ones? Tenths? Hundredths? How can we rewrite the expression using only whole numbers?"

Activity 1 continued >



Activity 1

Name: Date: Period:

Ali's and Camila's Strategies

2. Use any strategy to calculate $26.5 \div 5$.

5.3

3. Let's look at Ali's and Camila's **long division** strategies for calculating $26.5 \div 5$.

Ali

5.3
5) 26.5
− 25 ← (5 groups of 5)
1.5
− 1.5 ← (5 groups of 0.3)
0

15 tenths ÷ 5 = 3 tenths
↑
0.3

Camila

5.3
5) 26.5
− 25
15
− 15
0

Discuss: How are their strategies alike? How are they different?

Responses vary.

- Alike: Ali and Camila both started by thinking about how 5 groups of 5 go into 26.
- Different: Ali kept the decimal point all the way down, so she thought about how many groups of 5 go into 15 tenths. Camila, meanwhile, thought about place value at the end.

4. Use any strategy to calculate $106 \div 0.8$.

132.5

5. Let's look at Ali's and Camila's strategies for calculating $106 \div 0.8$.

Ali

132.5
8) 1060
− 80 ← (8 groups of 10)
26
− 24 ← (8 groups of 3)
2
− 2 ← (8 groups of 0.25)
0

200 hundredths ÷ 8 = 25 hundredths
↑
0.25

Camila

132.5
8) 1060.0
− 8
26
− 24
20
− 16
40
− 40
0

Discuss: Why was it helpful to rewrite this expression as $1060 \div 8$?

Responses vary. When Ali and Camila rewrote the expression this way, instead of dividing a whole number by a decimal, they divided a whole number by a whole number.

Accelerated 6 | Unit 5 Lesson 6 441 Activity 1

Pairs | 18 min

Activity 1 Ali's and Camila's Strategies (continued)

Purpose: Students compare strategies for dividing decimals such as rewriting using whole numbers, then dividing using **long division** or partial quotients.

Short on time? Consider skipping Problem 8 or completing it as a class.

2 Monitor

Direct students' attention to the third expression and repeat the same structure for the expression and discussion prompt. Consider returning to the previous problem as a support.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "What might Ali do first here? Camila?"
Rewrite the expression as $198 \div 15$ by "removing the decimal points."	**Strengthen** Consider asking, "Would this strategy have worked on the previous problem? Why or why not?"
Rewrite the expression as $198 \div 15$ by: • Converting each decimal to a fraction. • Multiplying each value by 10. • Recognizing 19.8 and 1.5 are both tenths.	**Stretch** Encourage them to write a different expression that has the same value.

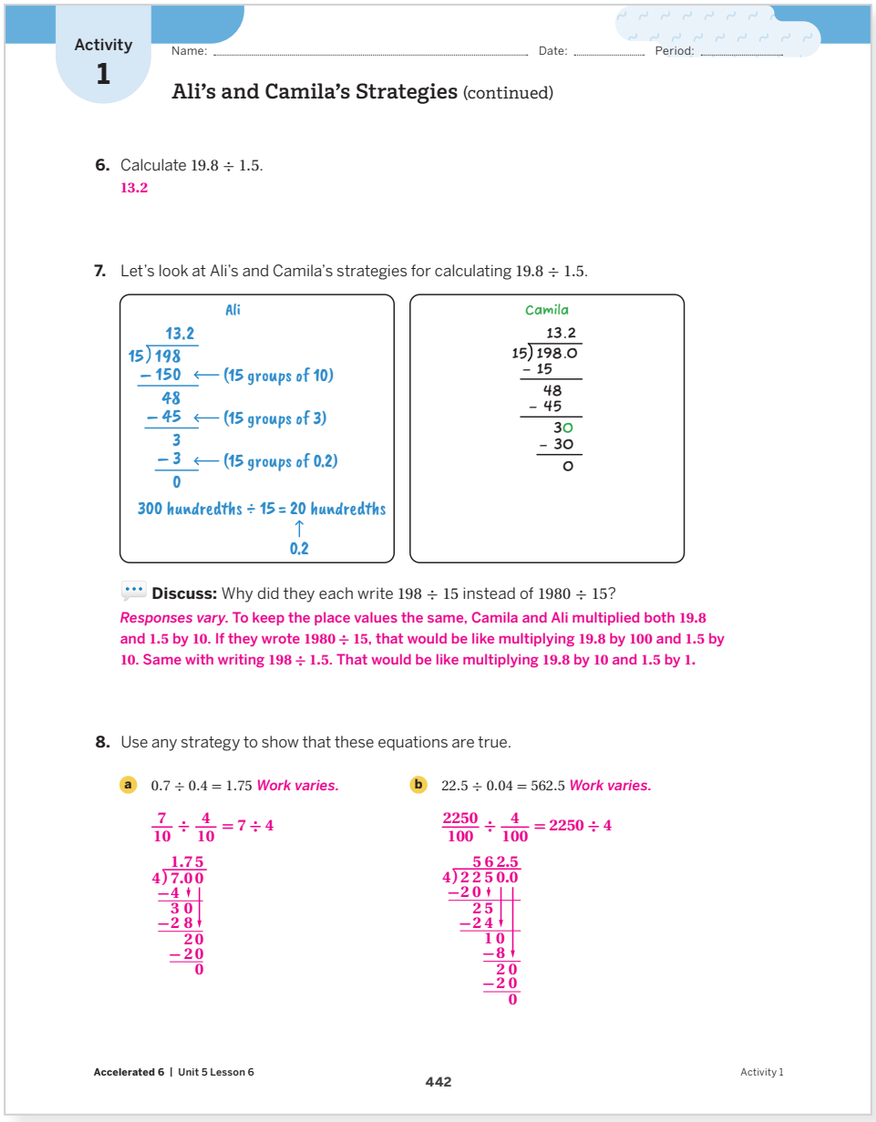
To support students getting started, consider inviting students to think about the previous lesson and asking, "What could we do to rewrite each expression using whole numbers?"

3 Connect

Invite students to share their steps for showing that each equation is true. It may be helpful to leave this displayed publicly for students to refer to.

Create a record of each strategy that students share, along with the name of the student who shared it.

To surface the Key Takeaway, consider asking:
- "How are the strategies we have discussed alike? How are they different?"
- "What steps did we take before using long division or partial quotients?"



Activity 1

Name: _____ Date: _____ Period: _____

Ali's and Camila's Strategies (continued)

6. Calculate $19.8 \div 1.5$.

13.2

7. Let's look at Ali's and Camila's strategies for calculating $19.8 \div 1.5$.

Ali

13.2
15)198
− 150 ← (15 groups of 10)
48
− 45 ← (15 groups of 3)
3
− 3 ← (15 groups of 0.2)
0

300 hundredths ÷ 15 = 20 hundredths
↑
0.2

Camila

13.2
15)198.0
− 15
48
− 45
30
− 30
0

Discuss: Why did they each write $198 \div 15$ instead of $1980 \div 15$?

Responses vary. To keep the place values the same, Camila and Ali multiplied both 19.8 and 1.5 by 10. If they wrote $1980 \div 15$, that would be like multiplying 19.8 by 100 and 1.5 by 10. Same with writing $198 \div 1.5$. That would be like multiplying 19.8 by 10 and 1.5 by 1.

8. Use any strategy to show that these equations are true.

a. $0.7 \div 0.4 = 1.75$ *Work varies.*

$\frac{7}{10} \div \frac{4}{10} = 7 \div 4$

1.75
4)7.00
−4
30
−28
20
−20
0

b. $22.5 \div 0.04 = 562.5$ *Work varies.*

$\frac{2250}{100} \div \frac{4}{100} = 2250 \div 4$

562.5
4)2250.0
−20
25
−24
10
−8
20
−20
0

Accelerated 6 | Unit 5 Lesson 6 442 Activity 1

Key Takeaway: It can be helpful to rewrite decimal division expressions with whole numbers. There are several ways to do this, including converting to fractions, multiplying by powers of 10, and reasoning about place value.

Pairs | 12 min

Activity 2 Finding Expressions

Purpose: Students develop fluency in dividing by decimals using a variety of strategies. **(MTR.2.1)**

Short on time? Consider giving students a fixed amount of time to sort the cards so they can focus on calculating.

1 Launch

Direct students' attention to the instructions and review them as a class. Consider discussing some of the categories (e.g., ". . .includes division by a number in the hundredths place") to support access to the task.

Distribute one set of Activity 2 Cards to each pair of students. It is okay if students do not find all of the cards that meet each criteria.

A **Accessibility: Executive Functioning** To support students with multi-step activities, invite them to choose one category at a time and find a card that belongs there.

2 Monitor

Encourage students to discuss their thinking with a partner as they categorize the cards and calculate their values.

To support students getting started, invite them to choose one expression that looks like one they've worked with before.

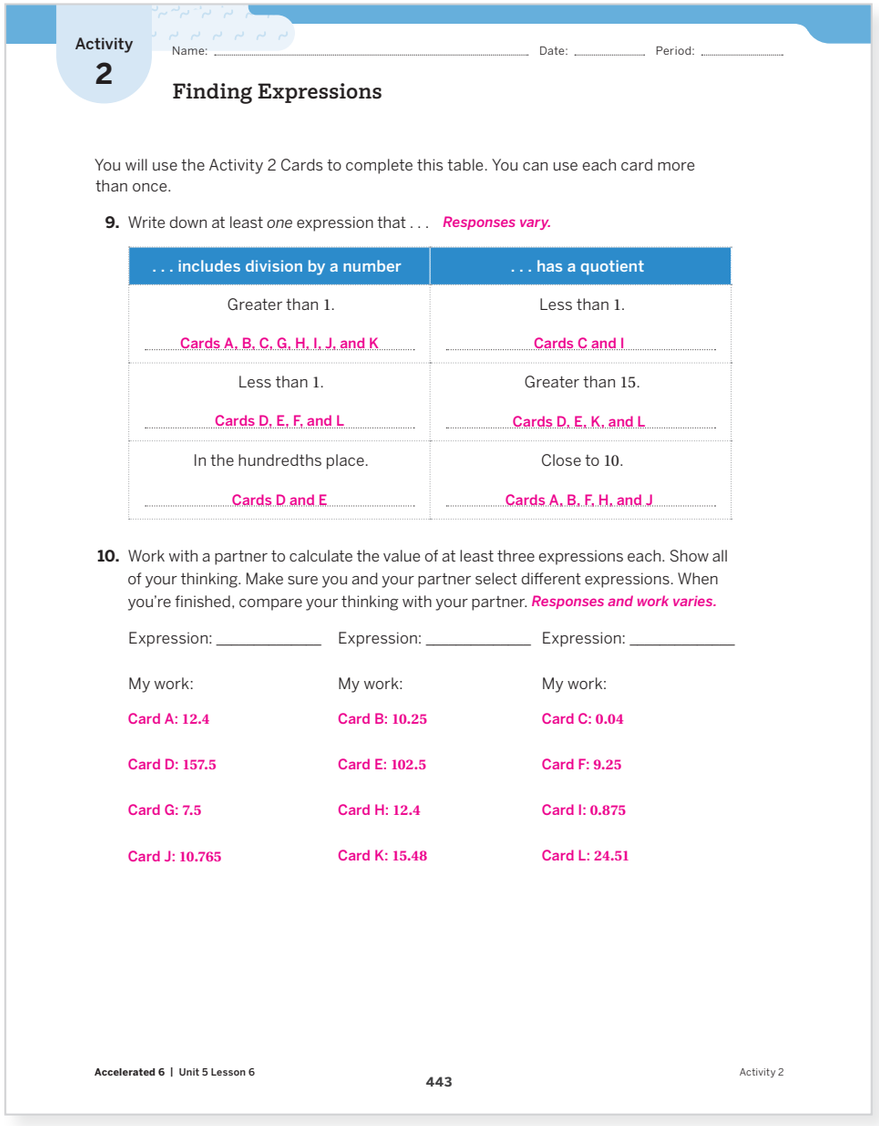
Select and sequence students' strategies for dividing to share during the Connect.

D **Differentiation**

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Invite students to write each number as a fraction. Consider asking, "How can we create common denominators?"
Rewrite the expression by incorrectly multiplying by a power of 10 (e.g., $9 \div 1.2 = 9 \div 12$).	
Need support dividing whole numbers.	**Support** Consider asking, "How many groups of [divisor] fit into [dividend]?"
Rewrite the expression and use long division or partial quotients.	**Stretch** Encourage students to write a new expression that has the same value.

3 Connect

Invite students to share strategies that they found helpful or what they learned from the mistakes they made while dividing the expressions. **(MTR.2.1)**



Activity 2

Name: _____ Date: _____ Period: _____

Finding Expressions

You will use the Activity 2 Cards to complete this table. You can use each card more than once.

9. Write down at least *one* expression that . . . ***Responses vary.***

. . . includes division by a number	. . . has a quotient
Greater than 1.	Less than 1.
Cards A, B, C, G, H, I, J, and K	Cards C and I
Less than 1.	Greater than 15.
Cards D, E, F, and L	Cards D, E, K, and L
In the hundredths place.	Close to 10.
Cards D and E	Cards A, B, F, H, and J

10. Work with a partner to calculate the value of at least three expressions each. Show all of your thinking. Make sure you and your partner select different expressions. When you're finished, compare your thinking with your partner. ***Responses and work varies.***

Expression: _____ Expression: _____ Expression: _____

My work: My work: My work:

Card A: 12.4 Card B: 10.25 Card C: 0.04

Card D: 157.5 Card E: 102.5 Card F: 9.25

Card G: 7.5 Card H: 12.4 Card I: 0.875

Card J: 10.765 Card K: 15.48 Card L: 24.51

Accelerated 6 | Unit 5 Lesson 6 443 Activity 2

Whole Class | 5 min

Synthesis

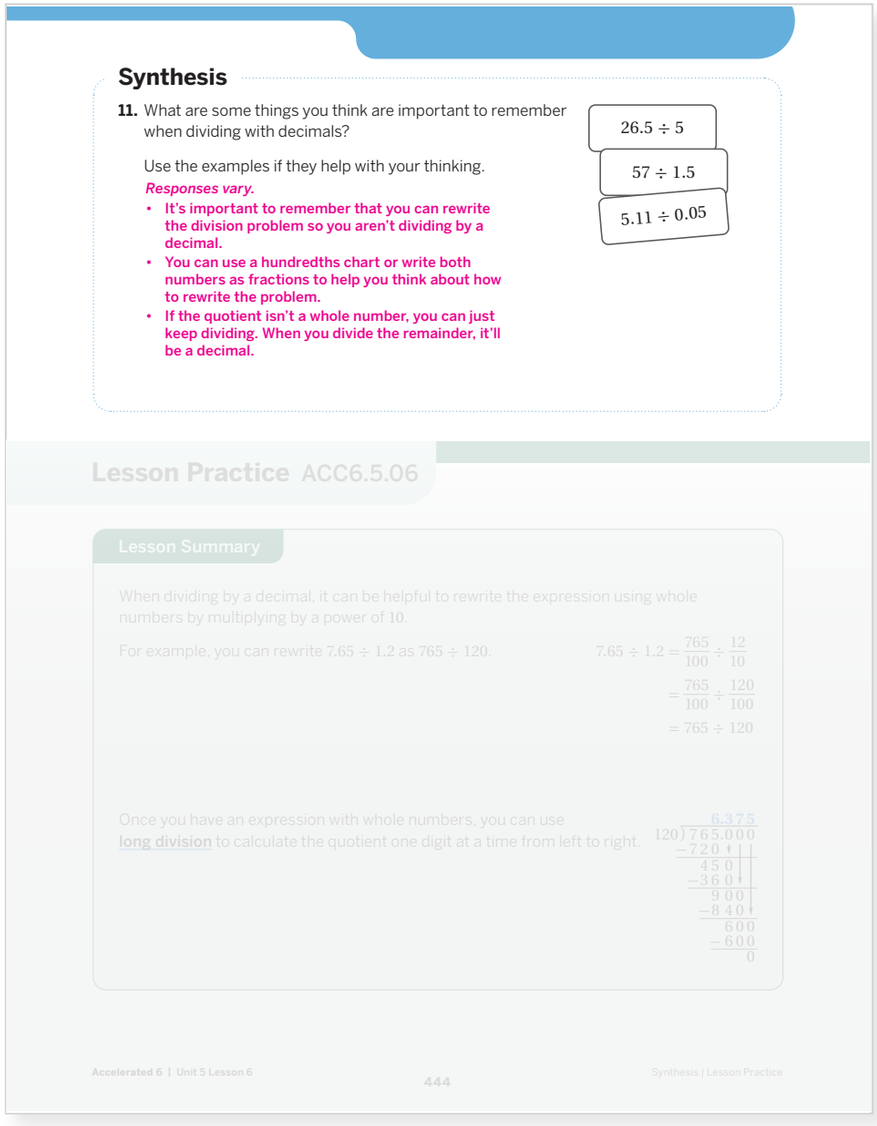
Purpose: Students synthesize their understanding of strategies for dividing by decimals.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Using fractions or multiplying by powers of 10 to rewrite the expression using whole numbers.
- Using strategies like long division or partial quotients to divide the whole numbers.
- Thinking about place value (tenths, hundredths, etc.) to help estimate the size of the quotient.

MLR **MLR2: Collect and Display** Use this routine to formalize the long division strategy using students' language. Display any new language, examples, or diagrams publicly for students to reference later.



Synthesis

11. What are some things you think are important to remember when dividing with decimals?

$26.5 \div 5$

$57 \div 1.5$

$5.11 \div 0.05$

Use the examples if they help with your thinking.

Responses vary.

- It's important to remember that you can rewrite the division problem so you aren't dividing by a decimal.
- You can use a hundredths chart or write both numbers as fractions to help you think about how to rewrite the problem.
- If the quotient isn't a whole number, you can just keep dividing. When you divide the remainder, it'll be a decimal.

Lesson Practice ACC6.5.06

Lesson Summary

When dividing by a decimal, it can be helpful to rewrite the expression using whole numbers by multiplying by a power of 10.

For example, you can rewrite $7.65 \div 1.2$ as $765 \div 120$.

$$7.65 \div 1.2 = \frac{765}{100} \div \frac{12}{10}$$
$$= \frac{765}{100} \div \frac{120}{100}$$
$$= 765 \div 120$$

Once you have an expression with whole numbers, you can use long division to calculate the quotient one digit at a time from left to right.

$$120\overline{)765.000}\quad 6.375$$
$$-720$$
$$450$$
$$-360$$
$$900$$
$$-840$$
$$600$$
$$-600$$
$$0$$

Accelerated 6 | Unit 5 Lesson 6 444 Synthesis | Lesson Practice

Lesson Takeaway: We can divide expressions with decimals by rewriting them as expressions with whole numbers. Then, we can use strategies like **long division** or partial quotients to divide the whole numbers.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by dividing decimals whose quotient is also a decimal.

Today's Goals

1. **Goal:** Use *long division* to divide multi-digit decimals.
2. **Language Goal:** Compare strategies for dividing whole numbers and decimals. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.06

Calculate $0.071 \div 0.02$. Show your thinking.

3.55. ***Responses vary.***

$\frac{71}{1000} \div \frac{20}{1000} = \frac{71}{20}$.

$$\begin{array}{r} 3.55 \\ 20\overline{)71.00} \\ -60 \\ \hline 110 \\ -100 \\ \hline 100 \\ -100 \\ \hline 0 \end{array}$$

Differentiation Use after Lesson 6

Support

Provide targeted intervention for students by using these resources.

If students need support dividing by decimals:

» **Respond to Student Thinking:**

- Use the *Dividing Decimals Using Long Division* **Mini-Lesson**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to **revisit Unit 3, Lesson 7 (*More Soft Serve*)** and answer the questions in Activity 1 using long division.

Professional Learning

Take a moment to reflect on the strategies students used in this lesson to divide decimals.

- How did the order in which you sequenced student ideas support the learning goals of the lesson? What might you change?
- What opportunities were there to celebrate specific students' strategies?
- What opportunities might there be in future lessons to connect back to the strategies students shared?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

11. What are some things you think are important to remember when dividing with decimals?

Use the examples if they help with your thinking.

$26.5 \div 5$

$57 \div 1.5$

$5.11 \div 0.05$

Responses vary.

- It's important to remember that you can rewrite the division problem so you aren't dividing by a decimal.
- You can use a hundredths chart or write both numbers as fractions to help you think about how to rewrite the problem.
- If the quotient isn't a whole number, you can just keep dividing. When you divide the remainder, it'll be a decimal.

Lesson Practice ACC6.5.06

Lesson Summary

When dividing by a decimal, it can be helpful to rewrite the expression using whole numbers by multiplying by a power of 10.

For example, you can rewrite $7.65 \div 1.2$ as $765 \div 120$.

$$7.65 \div 1.2 = \frac{765}{100} \div \frac{12}{10}$$
$$= \frac{765}{100} \div \frac{120}{100}$$
$$= 765 \div 120$$

Once you have an expression with whole numbers, you can use **long division** to calculate the quotient one digit at a time from left to right.

$$\begin{array}{r} 6.375 \\ 120\overline{)765.000} \\ -720\downarrow \\ \hline 450\downarrow \\ -360\downarrow \\ \hline 900\downarrow \\ -840\downarrow \\ \hline 600 \\ -600 \\ \hline 0 \end{array}$$

Lesson Practice ACC6.5.06

Name: _____ Date: _____ Period: _____

1. Select *all* the expressions that are equivalent to $4.5 \div 0.08$.

- ☐ A. $\frac{45}{100} \div \frac{8}{100}$
- ☐ B. $45 \div 8$
- ☑ C. $\frac{450}{100} \div \frac{8}{100}$
- ☑ D. $450 \div 8$
- ☑ E. $45 \div 0.8$

2. What is the value of $4.5 \div 0.08$?

56.25

Problems 3–5: Use long division to calculate each quotient. Show your thinking.

3. $7.89 \div 2 = 3.945$

Work varies.

$$\begin{array}{r} 3.945 \\ 2\overline{)7.890} \\ -6\downarrow \\ \hline 18\downarrow \\ -18\downarrow \\ \hline 09\downarrow \\ -8\downarrow \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

4. $176 \div 0.5 = 352$

Work varies.

$176 \div 0.5 = 1760 \div 5$

$$\begin{array}{r} 352 \\ 5\overline{)1760} \\ -15\downarrow \\ \hline 26\downarrow \\ -25\downarrow \\ \hline 10 \\ -10 \\ \hline 0 \end{array}$$

5. $199.8 \div 0.8 = 249.75$

Work varies.

$199.8 \div 0.8 = 1998 \div 8$

$$\begin{array}{r} 249.75 \\ 8\overline{)1998.00} \\ -16\downarrow \\ \hline 39\downarrow \\ -32\downarrow \\ \hline 78\downarrow \\ -72\downarrow \\ \hline 60 \\ -56 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

6. Four students set up a lemonade stand. By the end of the day, they earned $17.52. If they split the amount equally, how much money would each student get? Show or explain your thinking.

$4.38. *Explanations vary.* Each student will receive $17.52 \div 4 = $4.38.

Lesson Practice ACC6.5.06

Name: _____ Date: _____ Period: _____

7. A bag of pennies weighs 5.1 kilograms. Each penny weighs 2.5 grams. Which of these is the best estimate for the number of pennies in the bag? Show or explain your thinking. (1 kilogram = 1000 grams)

A. 20 B. 200 C. 2,000 D. 20,000

***Work varies.* 5.1 kilograms = 5100 grams. $5100 \div 2.5$ is about $5000 \div 2.5$, which is 2,000.**

FAST Practice

8. Determine the quotient of $33.8 \div 32.5$.

1.04

Spiral Review

Problems 9–10: Fill in the blanks to make each subtraction problem true.

9.

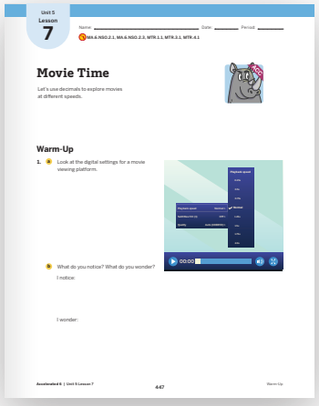
$$\begin{array}{r} 5 \\ -\ \boxed{0}.\boxed{6}\boxed{7}\boxed{1} \\ \hline 4.329 \end{array}$$

10.

$$\begin{array}{r} 1 \\ -\ \boxed{0}.\boxed{1}\boxed{3}\boxed{7} \\ \hline 0.863 \end{array}$$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.NSO.2.1
	2–7	2	MA.6.NSO.2.1
FAST Practice	**8**	2	MA.6.NSO.2.1
Spiral Review			
	9–10	2	MA.5.NSO.2.3



Movie Time

Dividing Decimals in Context

Let's use decimals to explore movies at different speeds.

Learning Outcomes

Today's Goals

1. **Goal:** Divide decimals to solve problems about speed and duration.
2. **Language Goal:** Analyze the relationship between the duration and playback speed of a movie by dividing decimals. **(Writing, Speaking, and Listening)**

Students practice dividing decimals to solve problems and answer the question "How long will this movie take if I play it at a different speed?" They determine the relationship between the speed of a movie and its duration, then determine the durations of movies played at various speeds.

Coherence

Prior Learning

In Lessons 5–6, students built their conceptual understanding of and fluency in dividing multi-digit decimals.

Future Learning

In Lessons 8 and 10, students will apply operations with multi-digit decimals to real-world scenarios.

Connections

- Students apply multiplication and division to the context of movie speeds. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.3.1, MTR.4.1

ELA Expectation: ELA.K12.EE.1.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.2.2
MA.5.NSO.2.2	MA.7.NSO.2.3
MA.5.NSO.2.4	
MA.5.NSO.2.5	
MA.5.AR.1.1	

Lesson at a Glance

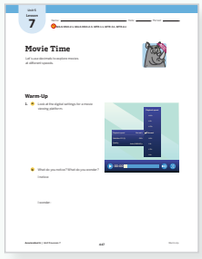
~ 45 min

MA.6.NSO.2.1, MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

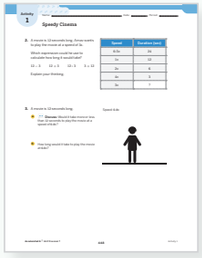
Students use the **Notice and Wonder** routine to explore digital sound settings.



Activity 1

Pairs | 10 min

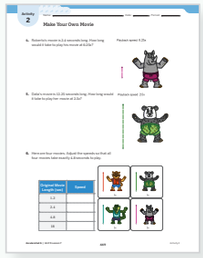
Students establish that they can divide the original movie length by the playback speed to determine its duration.



Activity 2

Pairs | 20 min

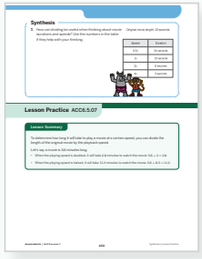
Students calculate movie durations at various speeds and determine playback speeds to meet a given duration.



Synthesis

Whole Class | 5 min

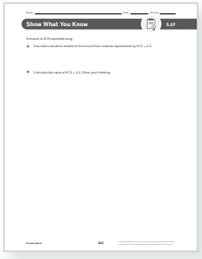
Students synthesize strategies for determining the duration of a movie played at different speeds.



Show What You Know

Independent | 5 min

Students demonstrate their understanding of dividing decimals by calculating the duration of a movie given its playback speed.



Prep Checklist

This lesson includes:

- Student Edition
- Show What You Know

Pairs | 5 min

Warm-Up

Purpose: Students use the Notice and Wonder routine to explore digital sound settings.

1 Launch

Direct students' attention to the image of the sound settings.

Use the Notice and Wonder routine to promote curiosity and help students make sense of the playback speeds. See the Routine Facilitation Guide for more information. **(MTR.1.1)**

To surface connections, consider asking:

- "When might you want to change the speed of a movie?"
- "Would you rather have a movie play slower, faster, or at the normal speed setting?"

ELL **English Language Learners** Invite students to share what they know about movie speed settings to increase access to the task. It may be helpful to act out a normal playback speed versus a slow or fast playback speed. **(Reading, Speaking, and Listening)**

2 Connect

Invite students to share their noticings and wonderings.

Consider asking, "Which playback speeds will make a movie play more slowly? Play faster?"

Unit 5
Lesson 7

Name: ..... Date: ..... Period: .....

MA.6.NSO.2.1, MA.6.NSO.2.3, MTR.1.1, MTR.3.1, MTR.4.1

Movie Time

Let's use decimals to explore movies at different speeds.

Warm-Up

1. a Look at the digital settings for a movie viewing platform.

b What do you notice? What do you wonder?

I notice:

Responses vary.

- I notice that the settings show speed, subtitles, and quality.
- I notice that the current playback speed is normal.
- I notice that there are different playback speeds to choose from.

I wonder:

Responses vary.

- I wonder what the x means after each number in the playback speeds.
- I wonder how choosing a different playback speed affects a movie.
- I wonder whether 1.25x means a faster playback speed than normal.

Accelerated 6 | Unit 5 Lesson 7 447 Warm-Up

Pairs | 10 min

Activity 1 Speedy Cinema

Purpose: Students establish that they can divide the original movie length by the playback speed to determine its duration.

1 Launch

Direct students' attention to the table.

Consider asking:

- "What happens when you choose a speed greater than 1? What about less than 1?"
- "What do you think would happen with a speed of 2.5x? What about 0.25x?" **(MTR.4.1)**

2 Monitor

To support students getting started, consider asking, "What patterns do you notice in the table? How can we use them to write an expression?" **(MTR.1.1)**

Look and listen for strategies students use to figure out the duration to highlight during the Connect.

D Differentiation *(Problem 3)*

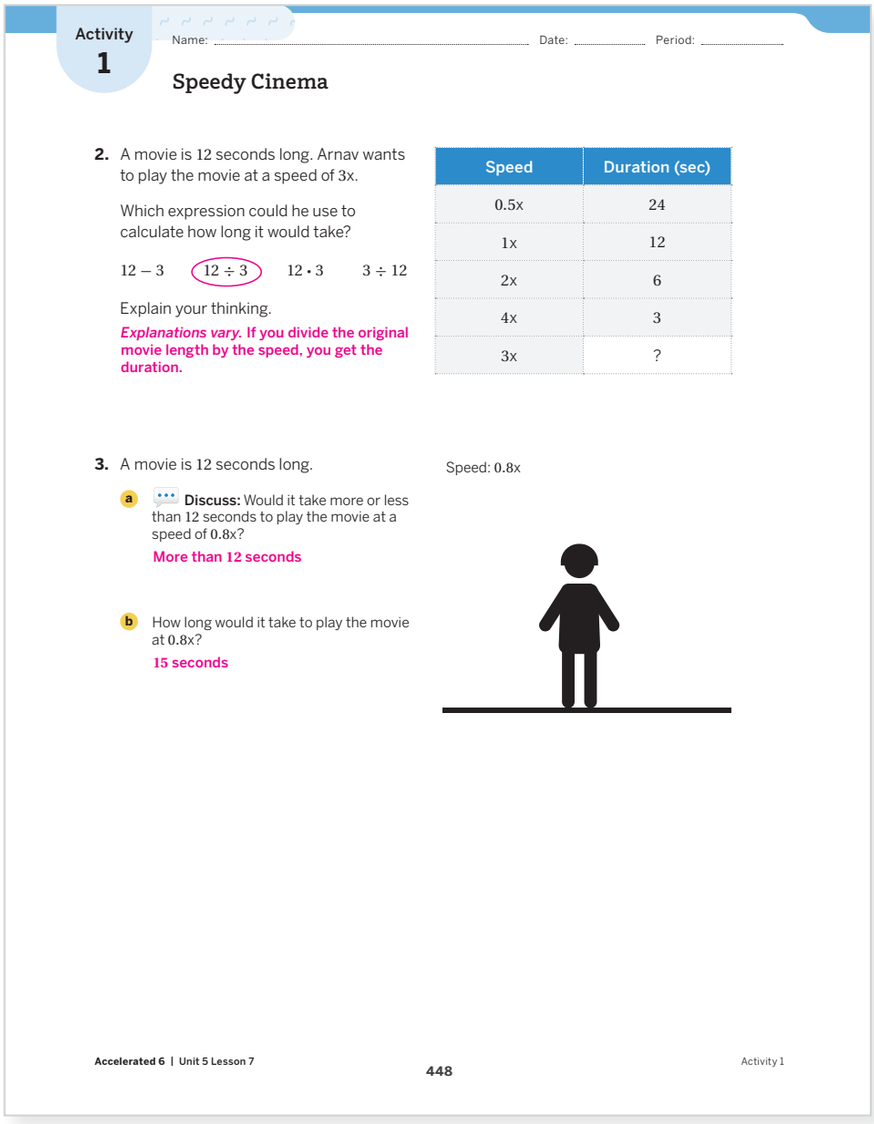
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking: • "How could we use the previous problem to write an expression?" • "What strategies have we learned for dividing decimals?"
Write 9.6 since they multiplied 12 • 0.8.	
Write 12 ÷ 0.8 but need support calculating its value.	**Strengthen** Invite students to reference any anchor or reference chart on strategies for dividing decimals.
Rewrite 12 ÷ 0.8 as 120 ÷ 8, or use other creative strategies.	**Stretch** Consider asking, "What speed did we play the movie in if the new duration was 20 seconds?"

3 Connect

Invite students that used division or other creative strategies to share. Consider asking, "Will your strategy always work?" **(MTR.3.1, MTR.4.1)**

To surface the Key Takeaway, consider asking:

- "How can we tell from the speed if the movie will be longer or shorter than the original?"
- "How can we determine the duration if we know the original length and playback speed?"



Activity 1

Name: _____ Date: _____ Period: _____

Speedy Cinema

2. A movie is 12 seconds long. Arnav wants to play the movie at a speed of 3x.

Which expression could he use to calculate how long it would take?

$12 - 3$ $\quad$ $12 \div 3$ $\quad$ $12 \cdot 3$ $\quad$ $3 \div 12$

Explain your thinking.

Explanations vary. If you divide the original movie length by the speed, you get the duration.

Speed	Duration (sec)
0.5x	24
1x	12
2x	6
4x	3
3x	?

3. A movie is 12 seconds long.

a. Discuss: Would it take more or less than 12 seconds to play the movie at a speed of 0.8x?

More than 12 seconds

b. How long would it take to play the movie at 0.8x?

15 seconds

Speed: 0.8x

Accelerated 6 | Unit 5 Lesson 7 448 Activity 1

Key Takeaway: We can calculate a movie's duration by dividing the original length by the playback speed. For example, a 20-second movie played at 1.25x speed would take $20 \div 1.25 = 16$ seconds.

Pairs | 20 min

Activity 2 Make Your Own Movie

Purpose: Students calculate movie durations at various speeds and determine playback speeds to meet a given duration.

Short on time? Consider completing Problem 6 as a class.

1 Launch

Direct students' attention to Problem 4. Invite students to share how this situation is similar to and different from the previous one. **(MTR.4.1)**

2 Monitor

Select and sequence a variety of strategies students used to divide decimals.

D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Consider asking, "How can we estimate the duration of the movie? Which strategy for dividing decimals would you like to use to calculate exactly?"
Guess and check.	
Use area models, partial quotients, or long division.	**Strengthen** Invite students to share during the Connect.
Convert to fractions and make common denominators.	
Use ratios and proportional reasoning (e.g., recognizing that the movie would take 1.225 seconds at 10x speed, so the answer must be 4 times that).	

A Accessibility: Conceptual Processing

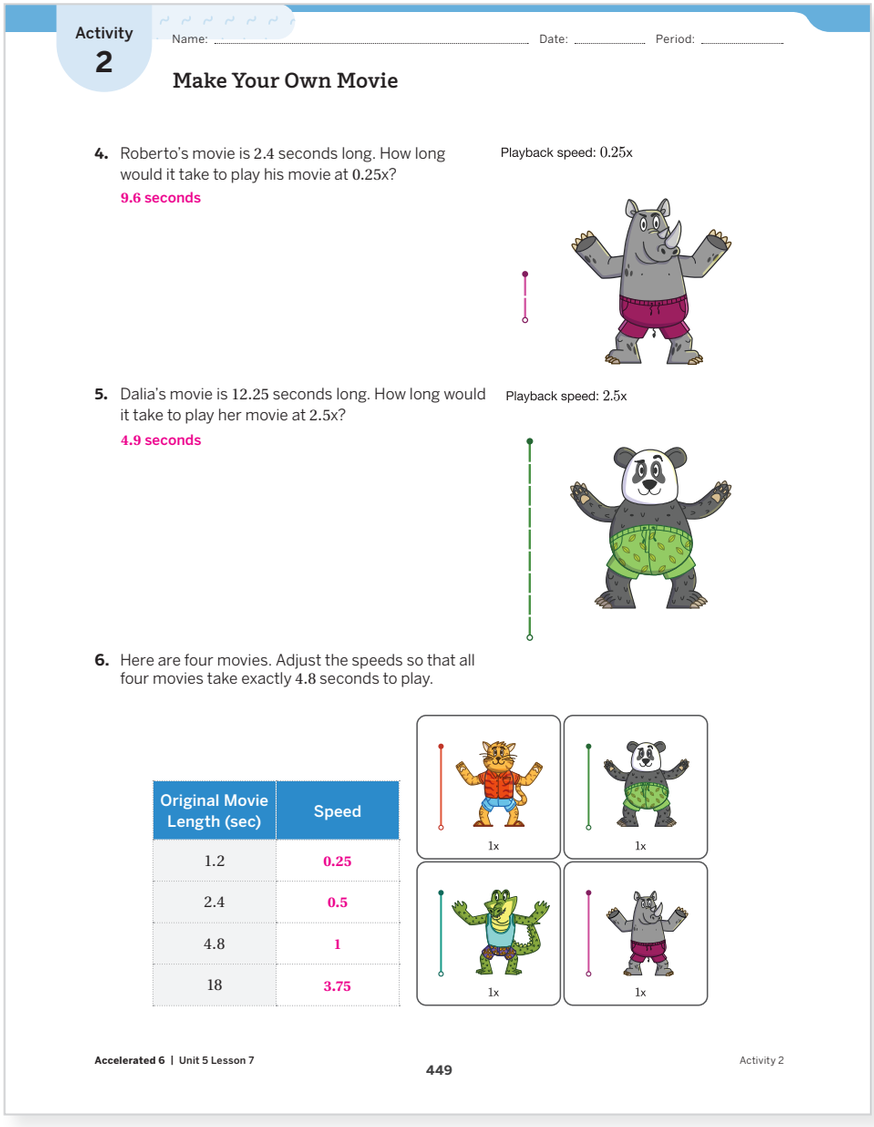
Invite students to solve similar problems with friendlier numbers to support thinking abstractly (e.g., "If Roberto's movie was 10 seconds long and it played at 0.25x speed, how could we figure out its duration?").

3 Connect

Invite students to share their strategies for dividing decimals. **(MTR.3.1)**

Consider asking:

- "What were some strategies you heard your classmates use to divide decimals?"
- "When we're dividing decimals, how can we decide which strategy to use?"



Activity 2

Name: _____ Date: _____ Period: _____

Make Your Own Movie

4. Roberto's movie is 2.4 seconds long. How long would it take to play his movie at 0.25x?

9.6 seconds

Playback speed: 0.25x

5. Dalia's movie is 12.25 seconds long. How long would it take to play her movie at 2.5x?

4.9 seconds

Playback speed: 2.5x

6. Here are four movies. Adjust the speeds so that all four movies take exactly 4.8 seconds to play.

Original Movie Length (sec)	Speed
1.2	0.25
2.4	0.5
4.8	1
18	3.75

1x 1x 1x 1x

Accelerated 6 | Unit 5 Lesson 7 449 Activity 2

Whole Class | 5 min

Synthesis

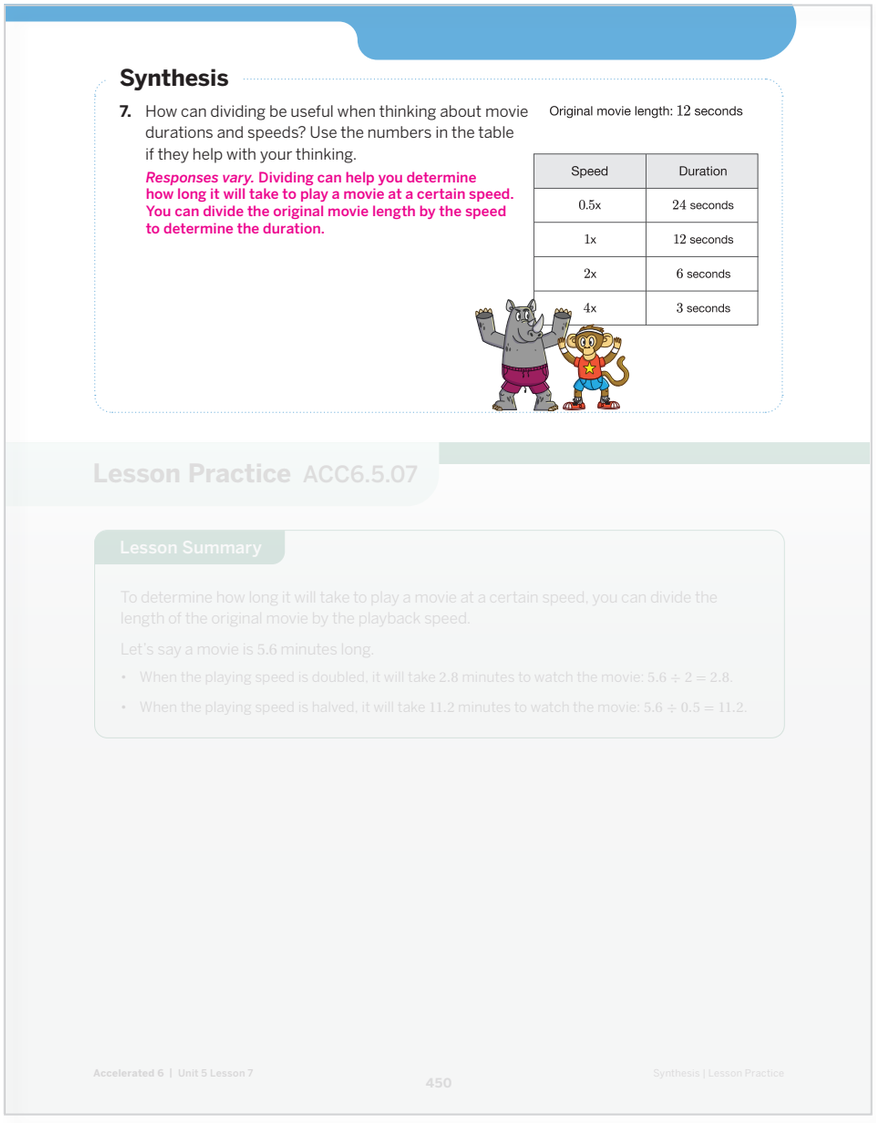
Purpose: Students synthesize strategies for determining the duration of a movie played at different speeds.

Invite students to respond independently, and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- We can divide the original length of the movie by the speed to determine its duration.
- There are multiple ways to divide decimals, including using an area model, partial quotients, converting to fractions, and long division.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

7. How can dividing be useful when thinking about movie durations and speeds? Use the numbers in the table if they help with your thinking.

Responses vary. Dividing can help you determine how long it will take to play a movie at a certain speed. You can divide the original movie length by the speed to determine the duration.

Original movie length: 12 seconds

Speed	Duration
0.5x	24 seconds
1x	12 seconds
2x	6 seconds
4x	3 seconds

Lesson Practice ACC6.5.07

Lesson Summary

To determine how long it will take to play a movie at a certain speed, you can divide the length of the original movie by the playback speed.

Let's say a movie is 5.6 minutes long.

- When the playing speed is doubled, it will take 2.8 minutes to watch the movie: $5.6 \div 2 = 2.8$.
- When the playing speed is halved, it will take 11.2 minutes to watch the movie: $5.6 \div 0.5 = 11.2$.

Accelerated 6 | Unit 5 Lesson 7 450 Synthesis | Lesson Practice

Lesson Takeaway: We can calculate how long a movie will play by dividing its original length by the playback speed.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding of dividing decimals by calculating the duration of a movie given its playback speed.

Today's Goals

1. **Goal:** Divide decimals to solve problems about speed and duration.
2. **Language Goal:** Analyze the relationship between the duration and playback speed of a movie by dividing decimals. **(Writing, Speaking, and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.07

A movie is 9.75 seconds long.

a. Describe a situation related to this movie that could be represented by $9.75 \div 2.5$.

Responses vary. It takes me $9.75 \div 2.5$ seconds to watch the movie when I play it at 2.5x speed.

b. Calculate the value of $9.75 \div 2.5$. Show your thinking.

3.9. *Methods vary.*

$9.75 \div 2.5 = \frac{975}{250} = 3.9$

D Differentiation Use after Lesson 7

Support

Provide targeted intervention for students by using these resources.

If students need support dividing decimals in context:

» **Respond to Student Thinking:**

- Review the **Lesson Summary**.
- Revisit **Lesson 6, Activity 1** and give students individualized feedback.
- Use the *Dividing Fractions Using Common Denominators* Mini-lesson.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.
- Invite them to research the lengths of their favorite videos, then determine their durations at 0.5x, 0.75x, 1.5x, and 2x speeds.

Professional Learning

Reflect on students' progress with dividing decimals in Sub-Unit 2. In what ways have students' understanding and skills grown? What concepts do students need additional support with? How can you use students' strengths to help everyone feel prepared for their upcoming assessment?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

7. How can dividing be useful when thinking about movie durations and speeds? Use the numbers in the table if they help with your thinking.

Responses vary. Dividing can help you determine how long it will take to play a movie at a certain speed. You can divide the original movie length by the speed to determine the duration.

Original movie length: 12 seconds

Speed	Duration
0.5x	24 seconds
1x	12 seconds
2x	6 seconds
4x	3 seconds

Lesson Practice ACC6.5.07

Lesson Summary

To determine how long it will take to play a movie at a certain speed, you can divide the length of the original movie by the playback speed.

Let's say a movie is 5.6 minutes long.

- When the playing speed is doubled, it will take 2.8 minutes to watch the movie: $5.6 \div 2 = 2.8$.
- When the playing speed is halved, it will take 11.2 minutes to watch the movie: $5.6 \div 0.5 = 11.2$.

Lesson Practice ACC6.5.07

Name: _____ Date: _____ Period: _____

1. Select *all* the expressions that have a value of 8.

☑ A. $3.2 \div 0.4$ ☐ B. $0.32 \div 4$ ☑ C. $\frac{32}{10} \div \frac{4}{10}$

☐ D. $32 \div \frac{4}{100}$ ☐ E. $0.032 \div 0.04$

Problems 2–3: Naoki recorded a video of his dog catching a frisbee. The video is 10 seconds long.

2. Naoki plays the video in slow motion at 0.5x speed. How long does it take?

20 seconds

3. How long does the video take if Naoki plays it at 2.5x speed?

4 seconds

Problems 4–5: Farah is listening to an audiobook. To get through the book faster, she listens at 1.2x speed.

4. Complete the table to determine how long it will take to listen to each of the first three chapters.

	Duration at Regular Speed (min)	Duration at 1.2x Speed (min)
Chapter 1	12	10
Chapter 2	10.5	8.75
Chapter 3	39.3	32.75

5. It takes Farah 8.5 minutes to listen to Chapter 4 at 1.2x speed. What is the length of Chapter 4 at regular speed?

(A.) 10.2 minutes B. 9.7 minutes

C. 7.3 minutes D. 7.08 minutes

Lesson Practice ACC6.5.07

Name: _____ Date: _____ Period: _____

6. Estimate whether $9 \cdot 0.8$ is greater than or less than 10. Explain your thinking.

Less than 10. *Explanations vary.* Multiplying 9 by a number that is less than 1 will give me a number that's less than 9.

7. Estimate whether $4.25 \cdot 2.5$ is greater than or less than 10. Explain your thinking.

Greater than 10. *Explanations vary.* $2.5 \cdot 4 = 10$, so multiplying $2.5 \cdot 4.5$ will give me a number that's greater than 10.

FAST Practice

8. Estimate whether $3.9 \cdot 3.9$ is greater than or less than 10. Explain your thinking.

A. Less than 10. 3.9 is close to 3, and $3 \cdot 3 = 9$.

B. Less than 10. 3.9 is close to 4, and $4 \cdot 2 = 8$.

(C.) Greater than 10. 3.9 is close to 4, and $4 \cdot 4 = 16$.

D. Greater than 10. 3.9 is close to $3 + 10$, and $3 + 10 = 13$.

Spiral Review

9. Plant B is $6\frac{2}{3}$ inches tall. Plant C is $4\frac{4}{15}$ inches tall. Complete this sentence:

Plant C is $\frac{16}{25}$ times as tall as Plant B.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1	1	MA.6.NSO.2.1
	2–5	2	MS.6.NSO.2.3
	6–7	2	MA.6.NSO.2.1
FAST Practice	8	2	MA.6.NSO.2.1
Spiral Review			
	9	2	MA.6.NSO.2.2, MA.6.NSO.2.3

Assess and Respond

Sub-Unit Quiz 2

Independent | 45 min

Facilitation: Assign the Sub-Unit Quiz to learn about your students' understanding of the concepts and skills so far in this unit. Text to speech is available in the digital version. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Identifying equivalent expressions for multi-digit decimal quotients using place value reasoning	Lesson 5	1	MA.6.NSO.2.1, MTR.5.1
2a, 2b	Dividing multi-digit decimals with remainders	Lesson 6	1	MA.6.NSO.2.1
3a	Dividing multi-digit decimals with remainders in context	Lessons 7	1	MA.6.NSO.2.1, MTR.4.1
3b	Solving problems with multi-digit decimals in context and explaining strategies	Lesson 7	2	MA.6.NSO.2.1, MTR.4.1

Assessment Resources

- Student Assessments
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: ..... Date: ..... Period: .....

Sub-Unit Quiz 2

Unit 5

1. Select *all* the expressions that are equivalent to $5.2 \div 0.04$.

   - [x] A. $\frac{52}{10} \div \frac{4}{100}$
   - [x] B. $\frac{520}{100} \div \frac{4}{100}$
   - [ ] C. $52 \div 4$
   - [x] D. $520 \div 4$
   - [ ] E. $\frac{52}{100} \div \frac{4}{100}$

2. Determine the value of each expression.

   a. $2.304 \div 0.06$
   $= 38.4$

   b. $15.48 \div 0.2$
   $= 77.4$

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Name: ..... Date: ..... Period: .....

Sub-Unit Quiz 2 (continued)

Unit 5

3. Madison likes to run races. Recently, it took her 26.66 minutes to run 3.1 miles.

   a. How many minutes per mile did Madison run?
   8.6 minutes per mile

   b. If she continues to run at the same pace, how long will it take her to run 13.1 miles?
   112.66 minutes

   Show or explain your thinking.
   Explanations vary. **Madison can run one mile in 8.6 minutes. $13.1 \cdot 8.6$ tells us how many minutes it will take her to run 13.1 miles. That's like $\frac{131}{10} \cdot \frac{86}{10}$, which equals $\frac{11266}{100}$ or 112.66 minutes.**

D Differentiation (Sub-Unit Quiz 2)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	
Divide multi-digit numbers with and without remainders using long division. **(Lessons 5–7)**	1	Support Strengthen	• **Teacher Move:** Consider revisiting Lesson 5 (*Division Diagrams*)
		Stretch	• **You're invited to explore more:** Lesson 5 (*Decimal Diagrams*)

	2a, 2b, 3a, 3b	Support
		Strengthen
			• **Mini-Lesson:** *Dividing Decimals Using Long Division*
			• **Teacher Move:** Consider revisiting:
			  • Lesson 6 (*Long Division and Other Strategies*)
			  • Lesson 7 (*Movie Time*)

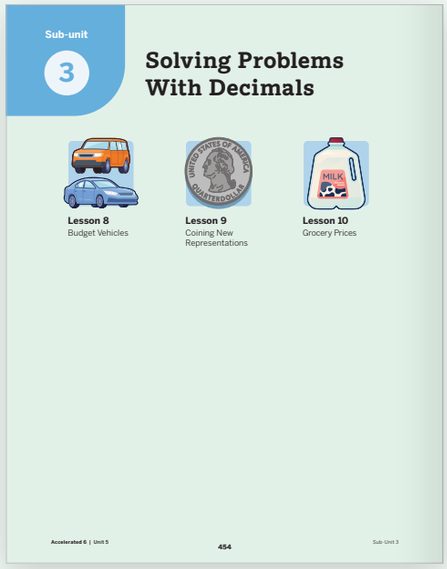
Sub-Unit 3

Solving Problems With Decimals

Sub-Unit 3 Goals

- **Goal:** Use decimal operations to solve problems in context.
- **Goal:** Make connections among percentages, decimals, and fractions.
- **Language Goal:** Explain how operations with decimals relate to real-world problems.

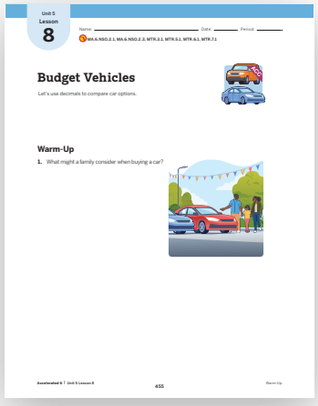
In this sub-unit, students apply their understanding of multi-digit decimal arithmetic to real-world problems, including buying a new car, relating values of different coins to the value of a dollar, and determining the amount of money spent on groceries.



Math that Matters Most

Concept or Skill	For example . . .
Solve problems using decimal operations.	The DesWagon can hold 12.4 gallons of gas. How much more did it cost to fill a tank of gas in April than in January? **$5.83** Month / Average Cost of Gas per Gallon January: $2.93 April: $3.40
Write equivalent fraction, percent, and decimal expressions.	Complete the table.

Percent (%)	Fraction	Decimal
35	$\frac{35}{100}$ (or equivalent)	0.35
7	$\frac{7}{100}$	0.07
2.3	$\frac{2.3}{100}$ (or equivalent)	0.023


Unit 5
Lesson
8

Budget Vehicles

Warm-Up

Budget Vehicles

Operations With Decimals in Context

Let's use decimals to compare car options.

Learning Outcomes

Today's Goals

1. **Goal:** Apply ratio reasoning and decimal operations to real-world problems involving decimal values.
2. **Language Goal:** Explain how operations with decimals relate to real-world problems. **(Speaking and Listening)**

Students practice using the skills they have learned about operations with decimals to make decisions about purchasing a car. Students consider monetary factors (e.g., initial cost and gas expenses) and personal preferences to analyze the benefits of gas-powered, hybrid, and electric cars. **(MTR.7.1)**

Coherence

Prior Learning

In Lessons 1–5, students gained fluency with multiplying and dividing multi-digit decimal values.

Future Learning

In Lessons 9–10, students will make connections between decimals and percentages and use multi-digit decimals to solve real-world problems involving percentages.

Connections

- Students apply decimal operations to compare different cars. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

MA.6.NSO.2.3
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.

Mathematical Thinking and Reasoning Standards: MTR.3.1, MTR.5.1, MTR.6.1, MTR.7.1

ELA Expectation: ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.5.NSO.2.1	MA.7.NSO.2.2
MA.5.NSO.2.2	MA.7.NSO.2.3
MA.5.NSO.2.4	
MA.5.NSO.2.5	
MA.5.AR.1.1	
MA.5.M.2.1	
MA.5.GR.2.1	

Lesson at a Glance

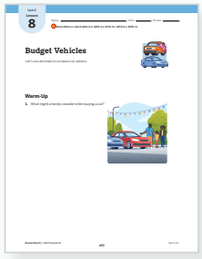
~ 45 min

MA.6.NSO.2.1, MA.6.NSO.2.3

Warm-Up

Pairs | 5 min

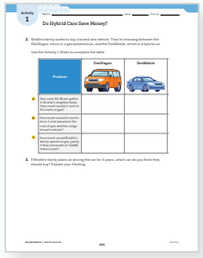
Students surface which variables would be important to consider in the context of buying a car.



Activity 1

Pairs | 10 min

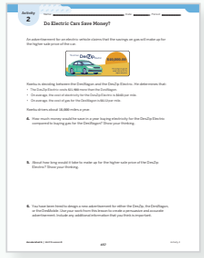
Students use operations with decimals to calculate the cost of gas for two cars and reason about which car to buy. **(MTR.7.1)**



Activity 2

Pairs | 20 min

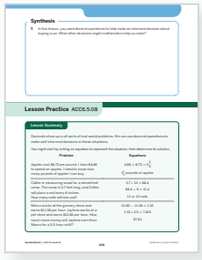
Students model with decimal operations to create posters comparing costs of electric and gas-powered cars. **Routine: Gallery Tour** **(MTR.7.1)**



Synthesis

Whole Class | 5 min

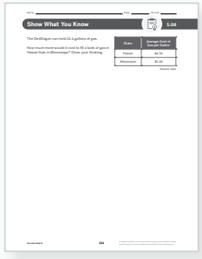
Students synthesize their understanding of using decimal operations to solve real-world problems. **MLR2: Collect and Display**



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating the cost difference of gas for two different vehicles.



Prep Checklist

Prepare the Activity 1 Sheet.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Sheet, one per pair
- Coloring tools, posters

Pairs | 5 min

Warm-Up

Purpose: Students surface which variables would be important to consider in the context of buying a car.

1 Launch

Direct students' attention to the image of the car and the discussion question.

To surface prior knowledge, consider asking, "What information do you think someone would want to know when deciding to buy a car?"

A **Accessibility: Affective Functioning** To support students in making connections to their everyday lives, ask them if they have experienced a similar situation — whether riding in a vehicle, buying a new or used car, seeing commercials for vehicles, etc. — to help them gain access to this context.

Invite students to brainstorm as many ideas as possible in pairs, encouraging creative and divergent thinking.

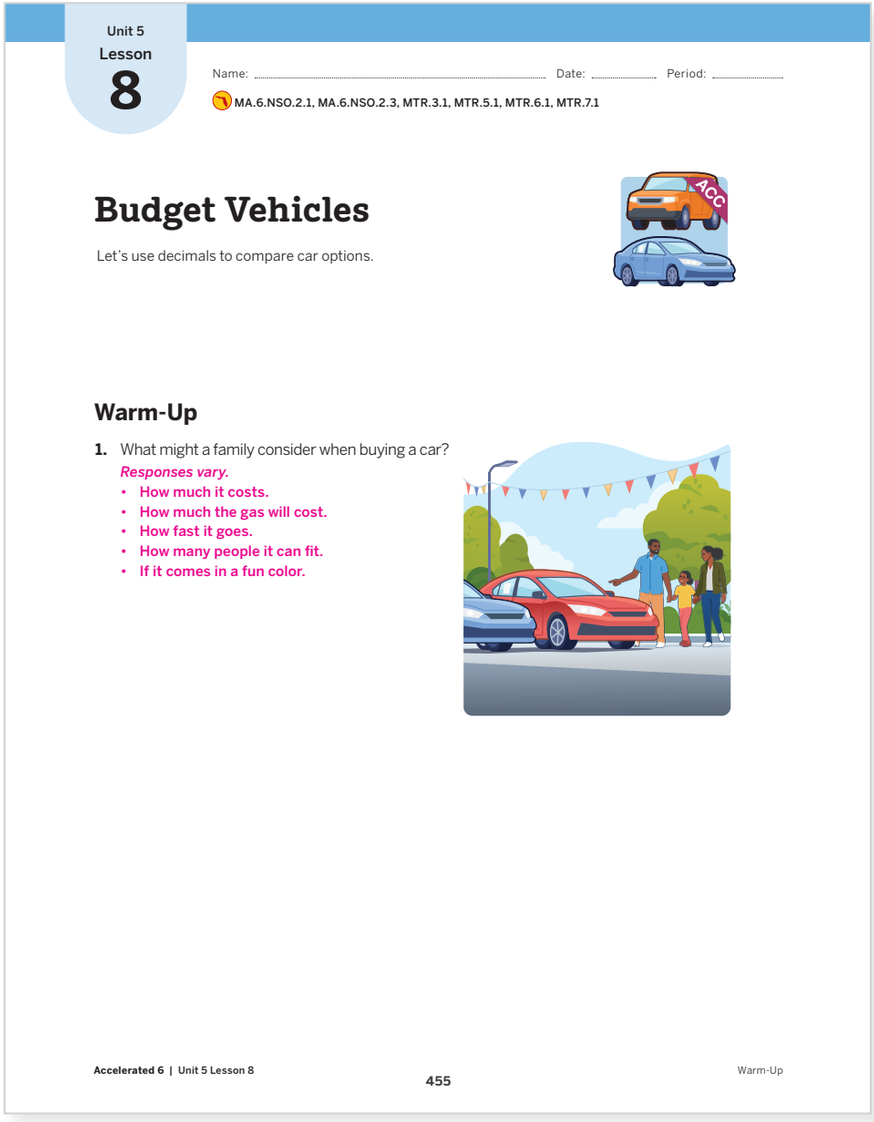
ELL **English Language Learners** Strategically pair students with partners who speak the same primary language. Allow students to share and receive feedback in their primary language. **(Speaking and Listening)**

2 Connect

Invite pairs of students to share their favorite responses and consider documenting them visually for students to reference throughout the lesson.

Consider sharing that all of the variables are important but that cost, type of vehicle, and the cost of gas are the ones we will explore in this lesson.

To surface the Key Takeaway, consider asking, "Why is it important that we select one of the brainstormed variables for the lesson today?"



Unit 5
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Name: _____ Date: _____ Period: _____

MA.6.NSO.2.1, MA.6.NSO.2.3, MTR.3.1, MTR.5.1, MTR.6.1, MTR.7.1

Budget Vehicles

Let's use decimals to compare car options.

Warm-Up

1. What might a family consider when buying a car?

Responses vary.

- How much it costs.
- How much the gas will cost.
- How fast it goes.
- How many people it can fit.
- If it comes in a fun color.

Accelerated 6 | Unit 5 Lesson 8 455 Warm-Up

Key Takeaway: When we are making predictions about real-life situations (modeling), there are a lot of different variables we could consider, but, to make the problem simpler, we might select one variable at a time and then add in more as time allows.

Pairs | 10 min

Activity 1 Do Hybrid Cars Save Money?

Purpose: Students use operations with decimals to calculate the cost of gas for two cars and reason about which car to buy. **(MTR.7.1)**

1 Launch

Direct students' attention to the images of the DesWagon and DesMobile and poll the class to see a distribution of preferences.

Distribute one copy of the Activity 1 Sheet to each pair of students.

ELL **English Language Learners** Use objects or images of a gas tank and a gas meter to demonstrate the context of the activity, specifically "Gas Tank Capacity."

2 Monitor

Capture explanations to share during the Connect.

D **Differentiation**

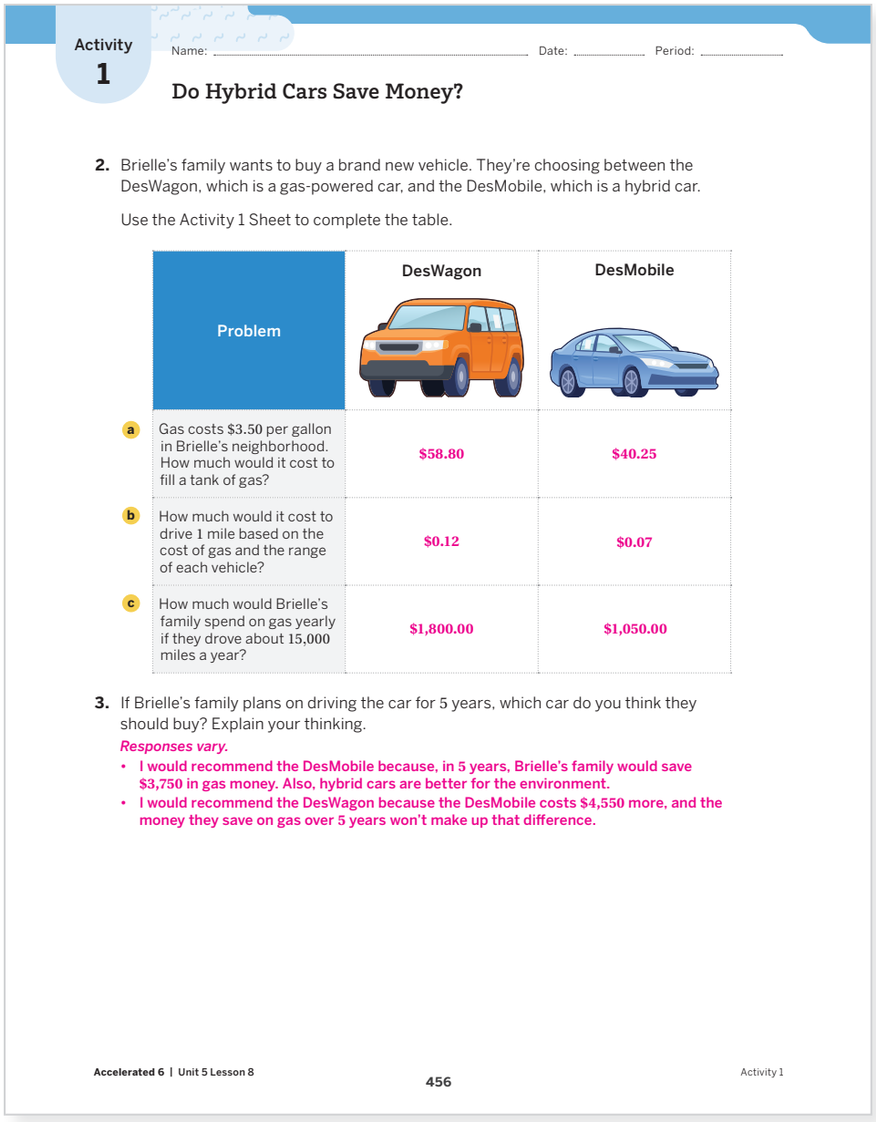
Look for students who:	Respond to Student Thinking
Use an incorrect operation or select the wrong values from the table when calculating each cost. (*Problem 2*)	**Support** Consider asking, "Which quantities would help us determine the cost of a full tank of gas?" Invite students to consider friendlier numbers (e.g., \$3 and 10 gallons) to generalize a solution.
Choose appropriate operations and correctly calculate using algorithms developed in the unit. (*Problem 2*) **(MTR.3.1)**	**Strengthen** Invite students to share their strategies during the Connect.
Make connections between their calculations and considerations around car ownership. (*Problem 3*) **(MTR.5.1, MTR.7.1)**	**Stretch** Consider asking, "How many miles would they have to drive for the cost to be the same after 5 years?"

3 Connect

Invite students to share how they calculated the cost to drive 1 mile for Problem 2b.

Consider asking:

- "How did you determine which operation to use for each question?" **(MTR.5.1)**
- "What car do you recommend now? Why?"



Activity 1

Name: _____ Date: _____ Period: _____

Do Hybrid Cars Save Money?

2. Brielle's family wants to buy a brand new vehicle. They're choosing between the DesWagon, which is a gas-powered car, and the DesMobile, which is a hybrid car.

Use the Activity 1 Sheet to complete the table.

Problem	DesWagon	DesMobile
a. Gas costs \$3.50 per gallon in Brielle's neighborhood. How much would it cost to fill a tank of gas?	\$58.80	\$40.25
b. How much would it cost to drive 1 mile based on the cost of gas and the range of each vehicle?	\$0.12	\$0.07
c. How much would Brielle's family spend on gas yearly if they drove about 15,000 miles a year?	\$1,800.00	\$1,050.00

3. If Brielle's family plans on driving the car for 5 years, which car do you think they should buy? Explain your thinking.

Responses vary.

- I would recommend the DesMobile because, in 5 years, Brielle's family would save \$3,750 in gas money. Also, hybrid cars are better for the environment.
- I would recommend the DesWagon because the DesMobile costs \$4,550 more, and the money they save on gas over 5 years won't make up that difference.

Accelerated 6 | Unit 5 Lesson 8 456 Activity 1

Pairs | 20 min

Activity 2 Do Electric Cars Save Money?

Purpose: Students model with decimal operations to create posters comparing costs of electric and gas-powered cars. **(MTR.7.1)**

Short on time? Consider omitting the poster activity and invite students to share their learning with a family member.

1 Launch

Invite students to read the prompt for Activity 2 aloud in pairs. Invite one student to restate the situation for the class to establish shared understanding.

To surface prior knowledge, consider asking, "How are gas-powered and electric cars alike and different?"

Consider sharing that they will use their knowledge about gas-powered and electric cars to create an advertising poster. Distribute coloring tools and poster paper.

2 Monitor

To support students getting started, consider asking, "How can we find Kweku's cost of the DesWagon for a year? What information do we need about the electric car?" **(MTR.7.1)**

Look for a variety of strategies.

D Differentiation

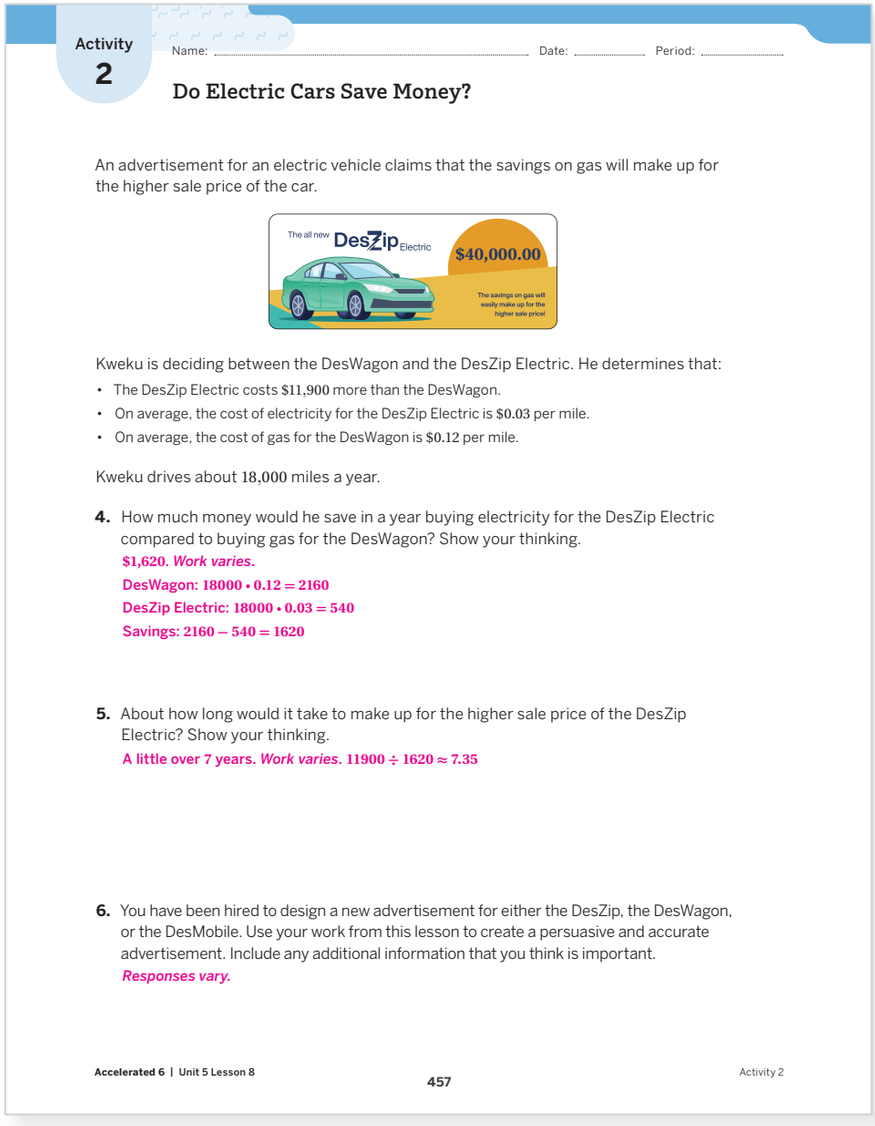
Look for students who:	Respond to Student Thinking
Use the cost difference instead of the number of miles driven.	**Support** Remind students that the question is related to the miles that Kweku drives each year.
Correctly find the price difference. (*Problem 4*)	**Strengthen** Invite them to share during the Connect.
Correctly divide the whole numbers, rounding the answer and interpreting it in context. (*Problem 5*) **(MTR.6.1)**	**Strengthen** Invite students to begin creating a poster advertisement as outlined in Problem 6.

3 Connect

Invite students to share their work through a Gallery Tour. Encourage them to silently view their classmates' work and leave feedback. Then give each pair time to review the feedback about their work.

Consider asking:

- "Based on your calculations, which car would you recommend someone buy if their priority was saving money?"
- "Based on this information, which car would you buy?"
- "What other factors should car-buyers consider? What additional information would they need?" **(MTR.7.1)**



Activity 2

Name: _____ Date: _____ Period: _____

Do Electric Cars Save Money?

An advertisement for an electric vehicle claims that the savings on gas will make up for the higher sale price of the car.

Kweku is deciding between the DesWagon and the DesZip Electric. He determines that:

- The DesZip Electric costs $11,900 more than the DesWagon.
- On average, the cost of electricity for the DesZip Electric is $0.03 per mile.
- On average, the cost of gas for the DesWagon is $0.12 per mile.

Kweku drives about 18,000 miles a year.

4. How much money would he save in a year buying electricity for the DesZip Electric compared to buying gas for the DesWagon? Show your thinking.

$1,620. *Work varies.*
DesWagon: $18000 \cdot 0.12 = 2160$
DesZip Electric: $18000 \cdot 0.03 = 540$
Savings: $2160 - 540 = 1620$

5. About how long would it take to make up for the higher sale price of the DesZip Electric? Show your thinking.

A little over 7 years. *Work varies.* $11900 \div 1620 \approx 7.35$

6. You have been hired to design a new advertisement for either the DesZip, the DesWagon, or the DesMobile. Use your work from this lesson to create a persuasive and accurate advertisement. Include any additional information that you think is important.

Responses vary.

Accelerated 6 | Unit 5 Lesson 8 457 Activity 2

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of using decimal operations to solve real-world problems.

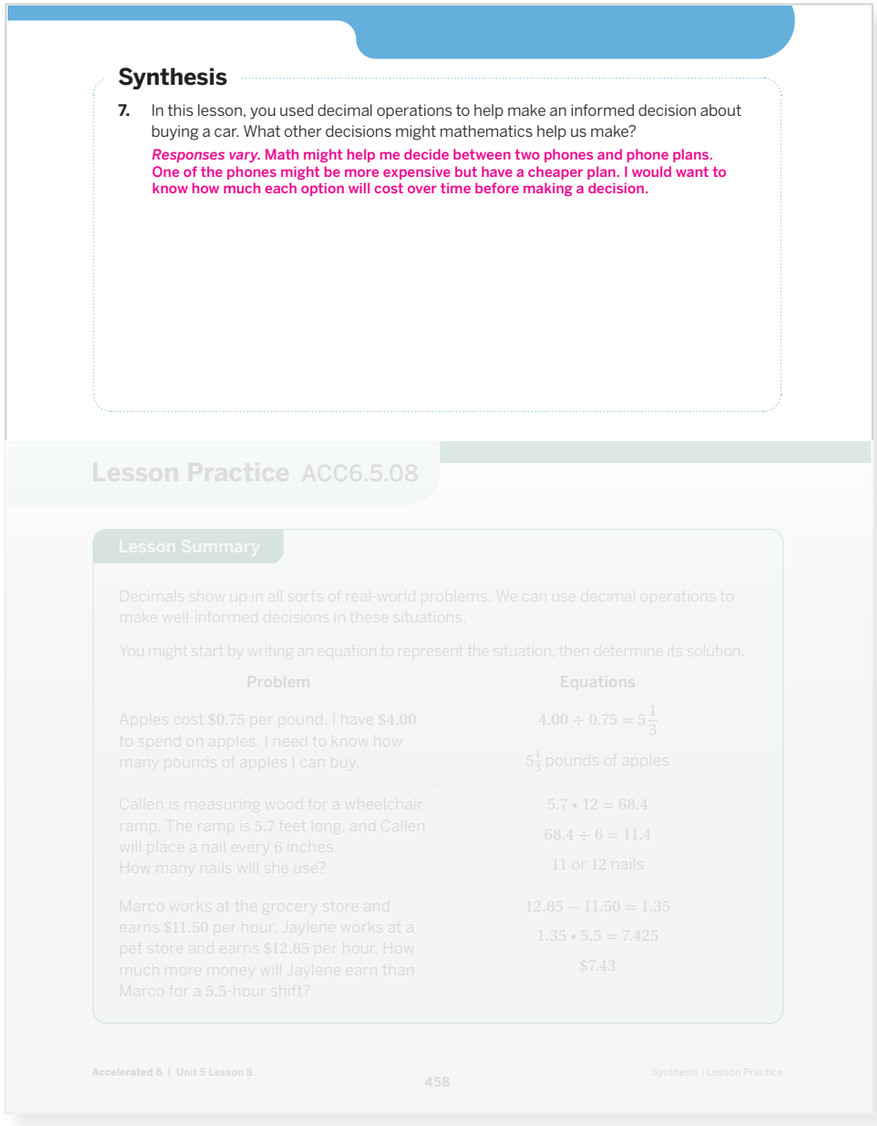
Invite students to spend two minutes responding to the prompt. Ask them to share their thinking with a partner.

Display several students' responses.

Invite students to share how they could determine what operation to use when writing expressions for different scenarios.

Consider asking, "How has working with decimals today and in our previous lessons helped you better understand our world?" We could determine how much money we would save with an electric car. We accurately predicted the duration of videos with different playback speeds. We estimated whether we could afford fruit.

MLR **MLR2: Collect and Display** Use this routine to collect students' persuasive advertisements from their posters about which car should be bought. Consider outlining the poster with headings like "Reasons a Person Should Buy a DesWagon," "Reasons a Person Should Buy a DesMobile," and "Reasons a Person Should Buy a DesZip." Display for students to reference and consider inviting them to share their learning with a family member.



Synthesis

7. In this lesson, you used decimal operations to help make an informed decision about buying a car. What other decisions might mathematics help us make?

Responses vary. Math might help me decide between two phones and phone plans. One of the phones might be more expensive but have a cheaper plan. I would want to know how much each option will cost over time before making a decision.

Lesson Practice ACC6.5.08

Lesson Summary

Decimals show up in all sorts of real-world problems. We can use decimal operations to make well-informed decisions in these situations.

You might start by writing an equation to represent the situation, then determine its solution.

Problem	Equations
Apples cost \$0.75 per pound. I have \$4.00 to spend on apples. I need to know how many pounds of apples I can buy.	$4.00 \div 0.75 = 5\frac{1}{3}$ $5\frac{1}{3}$ pounds of apples
Callen is measuring wood for a wheelchair ramp. The ramp is 5.7 feet long, and Callen will place a nail every 6 inches. How many nails will she use?	$5.7 \cdot 12 = 68.4$ $68.4 \div 6 = 11.4$ 11 or 12 nails
Marco works at the grocery store and earns \$11.50 per hour. Jaylene works at a pet store and earns \$12.85 per hour. How much more money will Jaylene earn than Marco for a 5.5-hour shift?	$12.85 - 11.50 = 1.35$ $1.35 \cdot 5.5 = 7.425$ \$7.43

Accelerated 6 | Unit 5 Lesson 8 458 Synthesis | Lesson Practice

Lesson Takeaway: Being fluent with decimals can help us make informed decisions about complicated situations, like car-buying. There are a lot of variables to consider and focusing on different variables can result in different decisions or outcomes.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by calculating the cost difference of gas for two different vehicles.

Today's Goals

1. **Goal:** Apply ratio reasoning and decimal operations to real-world problems involving decimal values.
2. **Language Goal:** Explain how operations with decimals relate to real-world problems. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.08

The DesWagon can hold 12.4 gallons of gas.

How much more would it cost to fill a tank of gas in Hawaii than in Mississippi? Show your thinking.

$18.85. *Work varies.*

$12.4 \cdot 4.70 = 58.28$

$12.4 \cdot 3.18 = 39.432$

$58.28 - 39.432 = 18.848$

State	Average Cost of Gas per Gallon
Hawaii	$4.70
Mississippi	$3.18

Source: *AAA*

Differentiation Use after Lesson 8

Support

Provide targeted intervention for students by using these resources.

If students need support multiplying or dividing decimals:

» **Respond to Student Thinking:**

- Review the **Lesson Summary**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 3 Extension Activities**.
- Invite them to investigate the local prices and gas mileage of gas-powered, hybrid, and electric cars. Invite them to calculate the long-term costs over a decade.

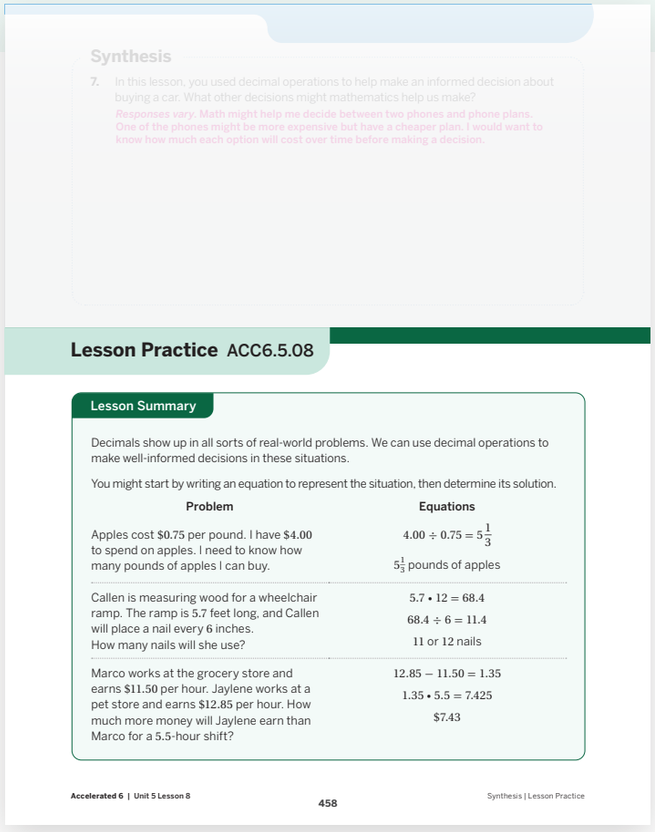
Professional Learning

Take a moment to reflect on how students engaged with the modeling process in today's lesson. What variables did they consider when thinking through their car buying decisions? What assumptions did they make to simplify this complicated situation? What revisions did they say they wanted to consider if they had more time?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



Synthesis

7. In this lesson, you used decimal operations to help make an informed decision about buying a car. What other decisions might mathematics help us make?

Responses vary. Math might help me decide between two phones and phone plans. One of the phones might be more expensive but have a cheaper plan. I would want to know how much each option will cost over time before making a decision.

Lesson Practice ACC6.5.08

Lesson Summary

Decimals show up in all sorts of real-world problems. We can use decimal operations to make well-informed decisions in these situations.

You might start by writing an equation to represent the situation, then determine its solution.

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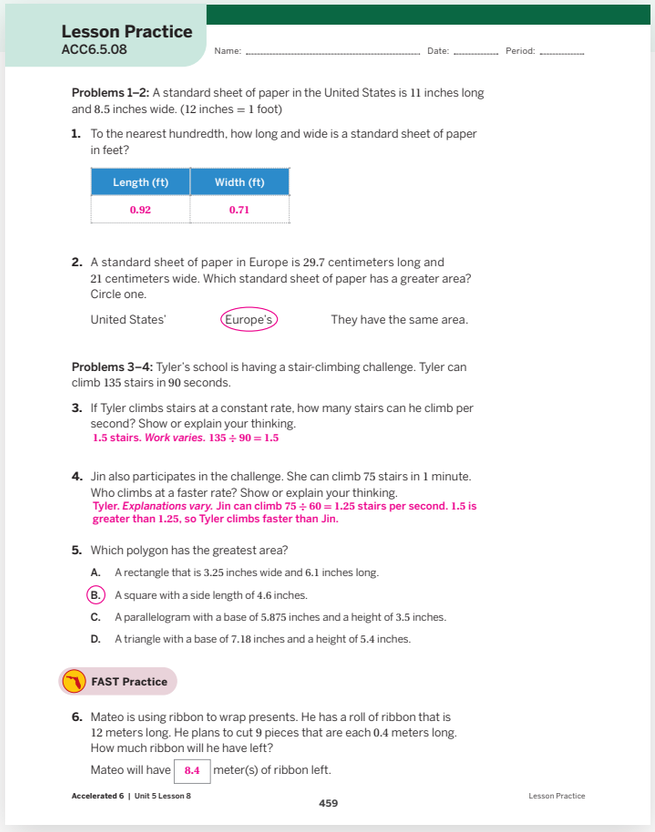
Apples cost $0.75 per pound. I have $4.00 to spend on apples. I need to know how many pounds of apples I can buy.	$4.00 \div 0.75 = 5\frac{1}{3}$ $5\frac{1}{3}$ pounds of apples
Callen is measuring wood for a wheelchair ramp. The ramp is 5.7 feet long, and Callen will place a nail every 6 inches. How many nails will she use?	$5.7 \cdot 12 = 68.4$ $68.4 \div 6 = 11.4$ 11 or 12 nails
Marco works at the grocery store and earns $11.50 per hour. Jaylene works at a pet store and earns $12.85 per hour. How much more money will Jaylene earn than Marco for a 5.5-hour shift?	$12.85 - 11.50 = 1.35$ $1.35 \cdot 5.5 = 7.425$ $7.43



Lesson Practice
ACC6.5.08

Name: _____ Date: _____ Period: _____

Problems 1–2: A standard sheet of paper in the United States is 11 inches long and 8.5 inches wide. (12 inches = 1 foot)

1. To the nearest hundredth, how long and wide is a standard sheet of paper in feet?

Length (ft)	Width (ft)
0.92	0.71

2. A standard sheet of paper in Europe is 29.7 centimeters long and 21 centimeters wide. Which standard sheet of paper has a greater area? Circle one.

United States' (Europe's) They have the same area.

Problems 3–4: Tyler's school is having a stair-climbing challenge. Tyler can climb 135 stairs in 90 seconds.

3. If Tyler climbs stairs at a constant rate, how many stairs can he climb per second? Show or explain your thinking.
1.5 stairs. *Work varies.* $135 \div 90 = 1.5$

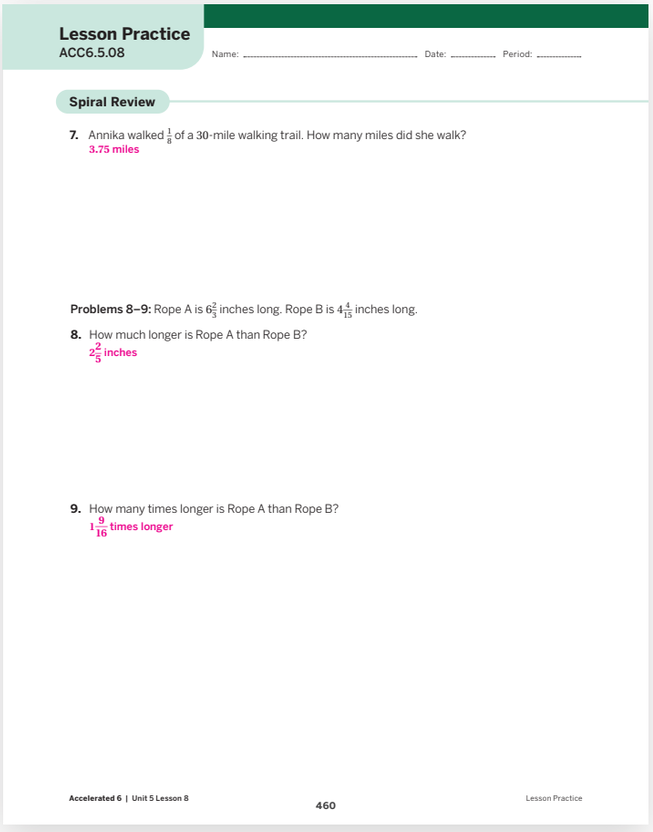
4. Jin also participates in the challenge. She can climb 75 stairs in 1 minute. Who climbs at a faster rate? Show or explain your thinking.
Tyler. *Explanations vary.* Jin can climb $75 \div 60 = 1.25$ stairs per second. 1.5 is greater than 1.25, so Tyler climbs faster than Jin.

5. Which polygon has the greatest area?
   - A. A rectangle that is 3.25 inches wide and 6.1 inches long.
   - (B.) A square with a side length of 4.6 inches.
   - C. A parallelogram with a base of 5.875 inches and a height of 3.5 inches.
   - D. A triangle with a base of 7.18 inches and a height of 5.4 inches.

FAST Practice

6. Mateo is using ribbon to wrap presents. He has a roll of ribbon that is 12 meters long. He plans to cut 9 pieces that are each 0.4 meters long. How much ribbon will he have left?

Mateo will have [8.4] meter(s) of ribbon left.



Lesson Practice
ACC6.5.08

Name: _____ Date: _____ Period: _____

Spiral Review

7. Annika walked $\frac{1}{8}$ of a 30-mile walking trail. How many miles did she walk?
3.75 miles

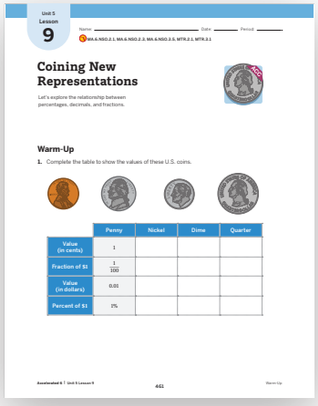
Problems 8–9: Rope A is $6\frac{2}{5}$ inches long. Rope B is $4\frac{4}{13}$ inches long.

8. How much longer is Rope A than Rope B?
$2\frac{2}{5}$ inches

9. How many times longer is Rope A than Rope B?
$1\frac{9}{16}$ times longer

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	2	MA.6.NSO.2.3
	5	2	MA.6.NSO.2.1
FAST Practice	6	2	MA.6.NSO.2.3
Spiral Review			
	7	1	MA.4.AR.1.3
	8	1	MA.5.AR.1.2
	9	1	MA.6.NSO.2.3


Unit 5
Lesson 9

Coining New Representations

Let's explore the relationship between percentages, decimals, and fractions.

Warm-Up

1. Complete the table to show the values of these U.S. coins.

	Penny	Nickel	Dime	Quarter
Value (in cents)	1			
Fraction of $1	$\frac{1}{100}$			
Value (in dollars)	0.01			
Percent of $1	1%			

461

Coining New Representations

Percentages, Decimals, and Fractions

Let's explore the relationship between percentages, decimals, and fractions.

Learning Outcomes

Today's Goals

1. **Goal:** Convert between values represented as percentages, decimals, and fractions.
2. **Language Goal:** Describe the relationship between percentages and their decimal equivalent. **(Speaking and Listening)**

Students build on their prior knowledge of *percentages*, beginning with the context of money and relating the values of different coins to the value of a dollar. Then they engage in a card sort and build fluency with solving problems using percents by rewriting them as decimals.

Coherence

Prior Learning

In Unit 3, students converted between percentages and fractions to solve problems. In Lessons 1–8, students gained fluency in decimal arithmetic.

Future Learning

In Lesson 10, students will apply the relationship between decimals and percents to solve real-world problems involving percentages.

Connections

- Students build on their understanding of percents, decimals, and fractions to solve problems. (mathematical)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.2.1
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

Also Addressing: **MA.6.NSO.2.3**

Mathematical Thinking and Reasoning Standards: MTR.2.1, MTR.3.1

ELA Expectations: ELA.K12.EE.4.1, ELA.K12.EE.5.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.FR.1.2	**MA.7.NSO.1.2**
MA.5.NSO.1.2	**MA.7.NSO.2.2**
MA.5.NSO.2.5	**MA.7.AR.3.1**
MA.5.AR.1.2	

Vocabulary

Review Vocabulary

percent (percentage)

Lesson at a Glance

~ 45 min

MA.6.NSO.2.1, MA.6.NSO.2.3, MA.6.NSO.3.5

Warm-Up

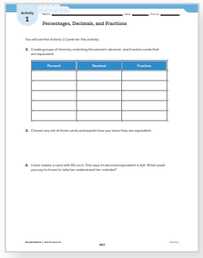
Pairs | 5 min

Students share prior knowledge of coins and reason about monetary amounts as decimals and fractions.

Activity 1

Pairs | 15 min

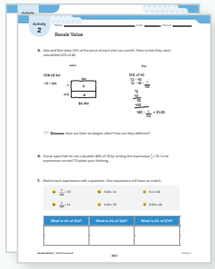
Students connect equivalent representations of a fraction, a decimal, and a *percentage* and describe how to convert between them. MLR3: Critique, Correct, Clarify **(MTR.2.1)**



Activity 2

Pairs | 15 min

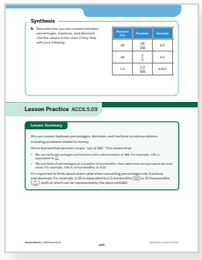
Students generalize methods for converting between *percentages* and decimals to solve problems involving finding the *percentage* of a given value. **(MTR.3.1)**



Synthesis

Whole Class | 5 min

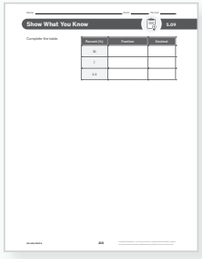
Students synthesize their understanding of strategies for rewriting equivalent fractions, decimals, and *percentages*. MLR2: Collect and Display



Show What You Know

Independent | 5 min

Students demonstrate their understanding by writing a *percentage* as its fraction and decimal equivalent.



Prep Checklist

Prepare the Activity 1 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 Cards, one per pair, pre-cut
- Calculator
- U.S. dollar bill (as needed)
- 100 pennies (as needed)
- Several examples of U.S. coins (as needed)

Pairs | 5 min

Warm-Up

Purpose: Students share prior knowledge of coins and reason about monetary amounts as decimals and fractions.

1 Launch

Direct students' attention to the image of the coins and consider asking, "What do you know, or think you know, about these coins? What other types of money do you know about?"

Invite students to document their thinking in the table in their Student Edition.

To support students getting started, consider asking, "How much is a penny worth? How is that represented in different ways in the first column?"

Encourage students to use the structure of the responses in the Penny column to support their reasoning about the other columns. **(MTR.2.1)**

A **Accessibility: Conceptual Processing** To support students in accessing the context of the Warm-Up, consider bringing in 1 U.S. dollar and 100 pennies or showing a visual that illustrates how many pennies equal 1 U.S. dollar. For students who may not be as familiar with U.S. currency, display the relationship that there are 100 pennies in 1 U.S. dollar or show examples of other coins as needed.

2 Connect

Invite students to share their responses and strategies for each part of the table, ensuring both fraction and decimal amounts are shown.

Consider asking:

- "How does thinking about a *percent* as a rate per 100 help us rewrite it in different ways?"
- "What is similar and what is different between each row?"
- "Why might it be helpful to write the same value in different ways?"

Unit 5
Lesson
9

Name: _____ Date: _____ Period: _____

MA.6.NSO.2.1, MA.6.NSO.2.3, MA.6.NSO.3.5, MTR.2.1, MTR.3.1

Coining New Representations

Let's explore the relationship between percentages, decimals, and fractions.

Warm-Up

1. Complete the table to show the values of these U.S. coins.

	Penny	Nickel	Dime	Quarter
Value (in cents)	1	5	10	25
Fraction of $1	$\frac{1}{100}$	$\frac{5}{100}$ or $\frac{1}{20}$	$\frac{10}{100}$ or $\frac{1}{10}$	$\frac{25}{100}$ or $\frac{1}{4}$
Value (in dollars)	0.01	0.05	0.10	0.25
Percent of $1	1%	5%	10%	25%

Accelerated 6 | Unit 5 Lesson 9 461 Warm-Up

Pairs | 15 min

Activity 1 Percentages, Decimals, and Fractions

Purpose: Students connect equivalent representations of a fraction, a decimal, and a *percentage* and describe how to convert between them. **(MTR.2.1)**

Short on time? Consider doing the card sort together as a class.

1 Launch

Direct students' attention to the cards and instructions for the card sort and invite a student to read them aloud.

Distribute one set of the Activity 1 Cards per pair of students.

A **Accessibility: Executive Functioning** To support students in carrying out multiple steps, chunk this task into more manageable parts by inviting them to choose one percent card, match it to its fraction card, and then match it to its decimal card.

2 Monitor

Encourage students to share their reasoning with a partner and work together to reach an agreement about how to match the fraction, decimal, and percentage for each card. **(MTR.2.1)**

D **Differentiation**

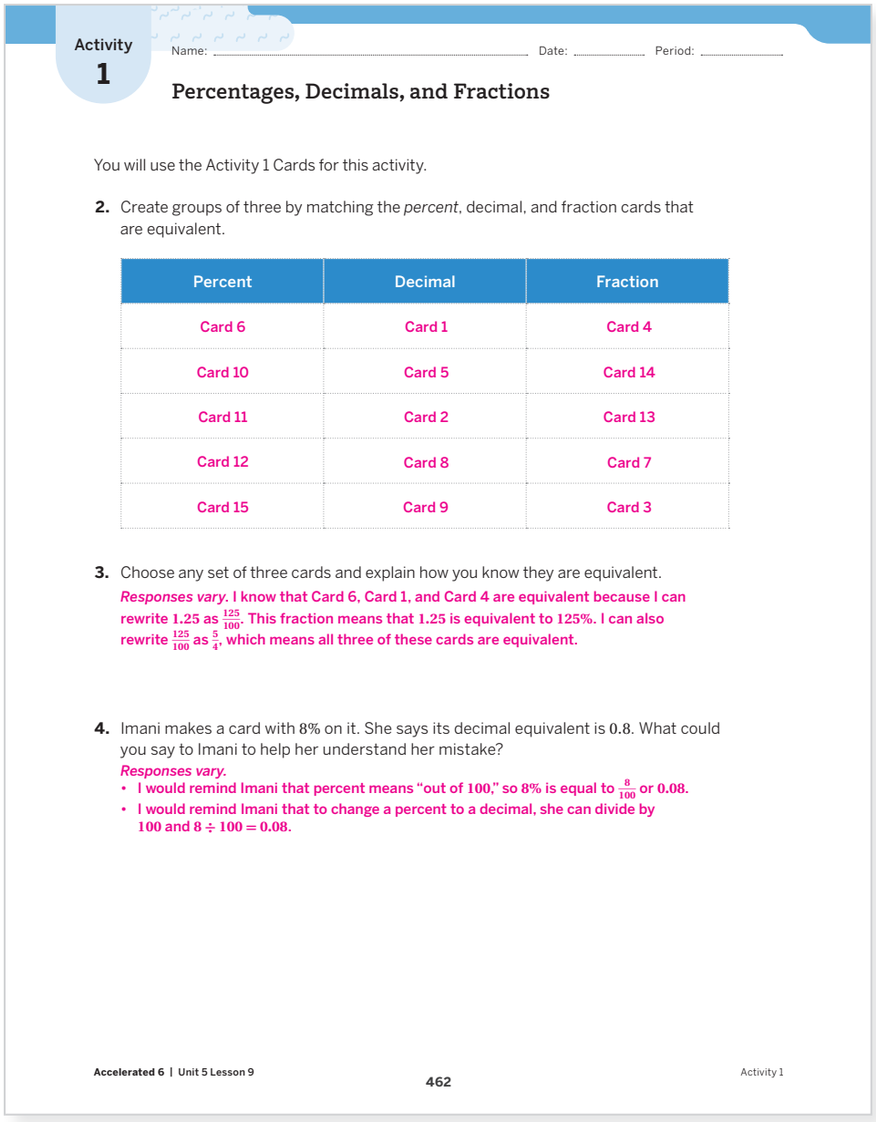
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to select a card that looks most familiar to them, then make a hypothesis for which cards might match.
Remove the decimal point to convert a decimal to a percentage. (*Problem 2*)	**Strengthen** Consider asking, "What does *percent* mean? How can you represent this value as a number out of 100?"
Use precise language to describe what they would say to Imani. (*Problem 4*) **(MTR.3.1)**	**Stretch** Invite these students to share during the Connect.

3 Connect

MLR **MLR3: Critique, Correct, Clarify** Use this routine to help students describe strengths, errors, and ambiguities in Imani's work. Then invite students to:

a. Discuss what is *correct* about the response.
b. Discuss what is *incorrect* or *unclear*.
c. Write a question to help Imani see how her work can be improved, or create a revised response.

To surface the Key Takeaway, consider asking, "If you are given a decimal, fraction, or percentage, how would you rewrite it in one of the other forms?"



Activity 1

Name: _____ Date: _____ Period: _____

Percentages, Decimals, and Fractions

You will use the Activity 1 Cards for this activity.

2. Create groups of three by matching the *percent*, decimal, and fraction cards that are equivalent.

Percent	Decimal	Fraction
Card 6	Card 1	Card 4
Card 10	Card 5	Card 14
Card 11	Card 2	Card 13
Card 12	Card 8	Card 7
Card 15	Card 9	Card 3

3. Choose any set of three cards and explain how you know they are equivalent.

Responses vary. I know that Card 6, Card 1, and Card 4 are equivalent because I can rewrite 1.25 as $\frac{125}{100}$. This fraction means that 1.25 is equivalent to 125%. I can also rewrite $\frac{125}{100}$ as $\frac{5}{4}$, which means all three of these cards are equivalent.

4. Imani makes a card with 8% on it. She says its decimal equivalent is 0.8. What could you say to Imani to help her understand her mistake?

Responses vary.
- I would remind Imani that percent means "out of 100," so 8% is equal to $\frac{8}{100}$ or 0.08.
- I would remind Imani that to change a percent to a decimal, she can divide by 100 and $8 \div 100 = 0.08$.

Accelerated 6 | Unit 5 Lesson 9 462 Activity 1

Key Takeaway: A number can be written in three equivalent forms: as a fraction, as a decimal, and as a *percentage*. There are a variety of strategies to use to move between forms.
- To rewrite a fraction as a decimal, divide the numerator by the denominator.
- To rewrite a decimal as a percentage, multiply by 100.
- To rewrite a percentage as a fraction, write the value over 100. Sometimes you can write an equivalent fraction with a smaller denominator.

Pairs | 15 min

Activity 2 Resale Value

Purpose: Students generalize methods for converting between *percentages* and decimals to solve problems involving finding the percentage of a given value. **(MTR.3.1)**

Short on time? Consider inviting students to select two of the four Repeated Challenges.

1 Launch

Direct students' attention to Ada's and Bao's work.

ELL **English Language Learners** Invite students to share what they know about the word *profit* to increase access to the task. **(Reading and Listening)**

2 Monitor

To support students getting started, invite them to draw arrows between the parts of Ada's and Bao's strategies that connect before discussing with a partner.

Look and listen for students who think one strategy is correct and one is incorrect and remind them that both are correct. Consider asking, "Which strategy makes more sense to you?"

A **Accessibility: Executive Functioning** Consider chunking the matching exercise by inviting students to choose one of the expressions at a time and cover the other ones.

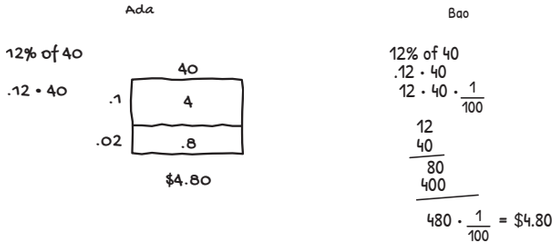
Activity 2 continued >

Activity 2

Name: Date: Period:

Resale Value

5. Ada and Bao keep 12% of the price of each shirt as a profit. Here is how they each calculated 12% of 40.



Discuss: How are their strategies alike? How are they different?

Responses vary. Both Ada and Bao rewrote 12% as the decimal 0.12. Ada used an area model to calculate the product, while Bao did his calculation vertically.

6. Oscar says that he can calculate 40% of 70 by writing the expression $\frac{2}{5} \cdot 70$. Is his expression correct? Explain your thinking.

Yes. *Explanations vary.* 40% is equivalent to $\frac{40}{100}$, which I can also write as $\frac{2}{5}$.

7. Match each expression with a question. One expression will have no match.

a. $\frac{4}{100} \cdot 70$ b. $0.04 \cdot 14$ c. $0.4 \cdot 48$

d. $\frac{4}{100} \cdot 14$ e. $0.04 \cdot 70$ f. $0.04 \cdot 48$

What is 4% of $14?	What is 4% of $48?	What is 4% of $70?
b	f	a
d		e

Accelerated 6 | Unit 5 Lesson 9 463 Activity 2

Pairs | 20 min

Activity 2 Resale Value (continued)

Purpose: Students generalize methods for converting between *percentages* and decimals to solve problems involving finding the percentage of a given value. **(MTR.3.1)**

Short on time? Consider inviting students to select two of the four Repeated Challenges.

2 Monitor

Capture strategies and explanations to share during the Connect.

D Differentiation

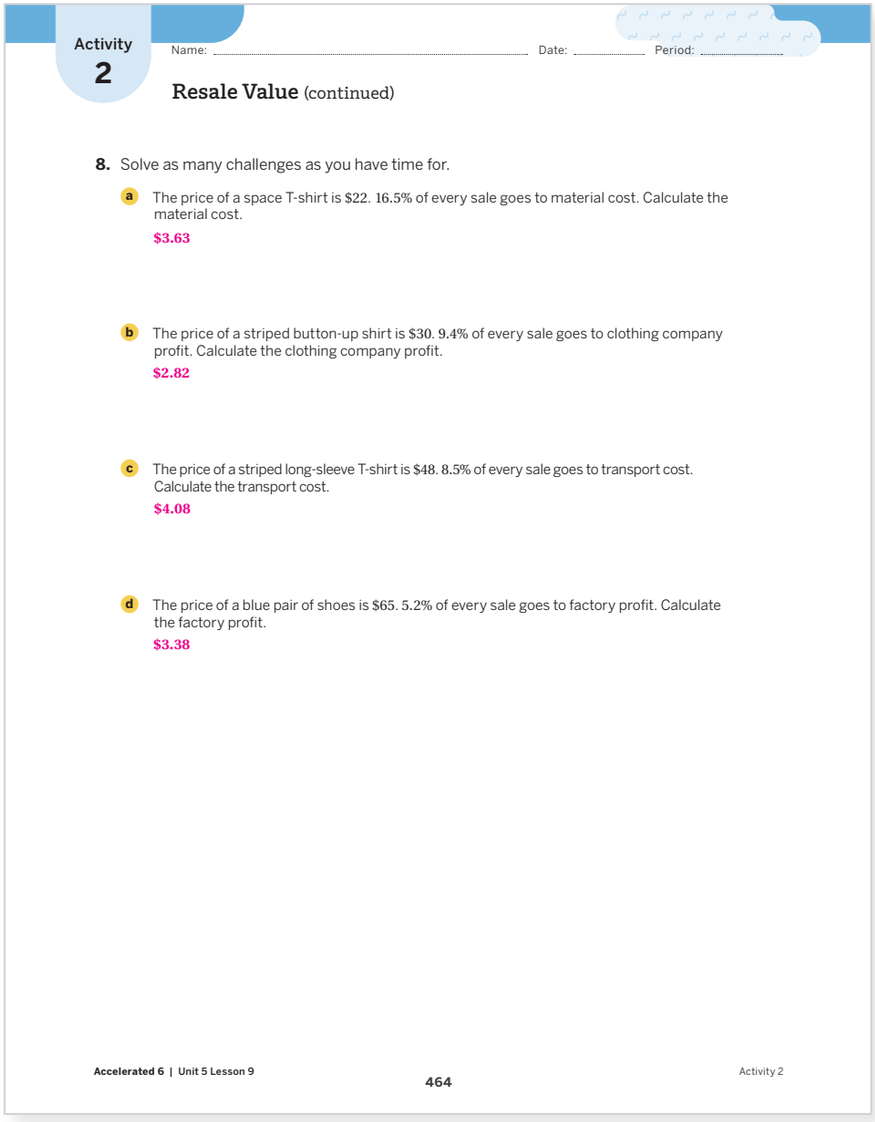
Look for students who:	Respond to Student Thinking
Need support getting started.	**Support** Encourage them to rewrite percentages as decimals using strategies recorded in Activity 1.
Multiply by the number in the percent.	**Support** Invite students to consider what a percent means using information from Activity 1. Then consider asking, "What is another way we could write a percentage that might help us solve this problem more precisely?"
Say "I just move the decimal point to the left and multiply."	**Strengthen** Consider asking, "What is happening when we 'move the decimal point to the left'? Why does that work?" Invite these students to share their explanations during the Connect.
Complete each problem with precision and explain their thinking to other students with clarity.	**Stretch** Invite students to look for other real-world examples of percentages and challenge them to write problems similar to the ones in Activity 2.

3 Connect

Invite students to share a variety of explanations for solving each problem. Consider using the Student Edition for students to first make sense of the context, then the strategy for solving.

To surface the Key Takeaway, consider asking:

- "What was similar about each of these problems?"
- "What is your preferred method for solving problems involving percentages?"
- "How would you describe this method to a friend who is just learning about percentages?" **(MTR.3.1)**
- "What other types of problems could be solved using strategies like this?"



Activity 2

Name: _____ Date: _____ Period: _____

Resale Value (continued)

8. Solve as many challenges as you have time for.

a. The price of a space T-shirt is $22. 16.5% of every sale goes to material cost. Calculate the material cost.
$3.63

b. The price of a striped button-up shirt is $30. 9.4% of every sale goes to clothing company profit. Calculate the clothing company profit.
$2.82

c. The price of a striped long-sleeve T-shirt is $48. 8.5% of every sale goes to transport cost. Calculate the transport cost.
$4.08

d. The price of a blue pair of shoes is $65. 5.2% of every sale goes to factory profit. Calculate the factory profit.
$3.38

Accelerated 6 | Unit 5 Lesson 9 464 Activity 2

Key Takeaway: To make sense of problems in the form A% of B, it is helpful to rewrite the *percentage* as a decimal by dividing by 100. Then, you can multiply by B.

Whole Class | 5 min

Synthesis

Purpose: Students synthesize their understanding of strategies for rewriting equivalent fractions, decimals, and *percentages*.

Invite students to respond independently, and then share their thinking with a partner.

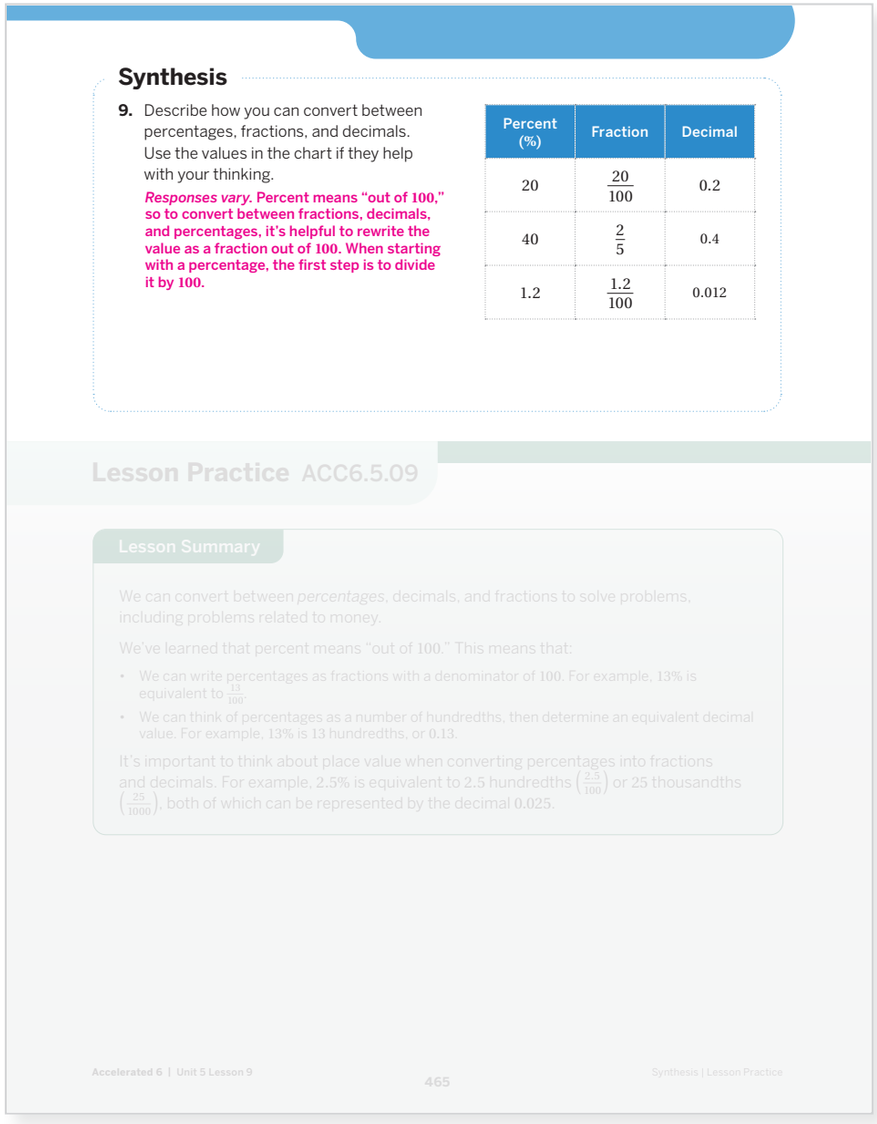
Capture and share a variety of ideas, such as:

- Percent means "out of 100," so write the percent value as a fraction with a denominator of 100 and simplify.
- When starting with a fraction, the first step is to divide the numerator by the denominator.
- To rewrite a percentage as a decimal, you can divide your percent by 100.

Create an anchor chart showing equivalent fractions, decimals, and percentages and strategies for rewriting each one in other forms.

MLR **MLR2: Collect and Display** Use this routine to formalize the strategies for rewriting percentages, fractions, and decimals using students' language. Display any new language, examples, or diagrams publicly for students to reference later.

Note: If time allows, invite students to share with a partner what makes sense about each strategy and what questions they still have.



Synthesis

9. Describe how you can convert between percentages, fractions, and decimals. Use the values in the chart if they help with your thinking.

Responses vary. Percent means "out of 100," so to convert between fractions, decimals, and percentages, it's helpful to rewrite the value as a fraction out of 100. When starting with a percentage, the first step is to divide it by 100.

Percent (%)	Fraction	Decimal
20	$\frac{20}{100}$	0.2
40	$\frac{2}{5}$	0.4
1.2	$\frac{1.2}{100}$	0.012

Lesson Practice ACC6.5.09

Lesson Summary

We can convert between *percentages*, decimals, and fractions to solve problems, including problems related to money.

We've learned that percent means "out of 100." This means that:

- We can write percentages as fractions with a denominator of 100. For example, 13% is equivalent to $\frac{13}{100}$.
- We can think of percentages as a number of hundredths, then determine an equivalent decimal value. For example, 13% is 13 hundredths, or 0.13.

It's important to think about place value when converting percentages into fractions and decimals. For example, 2.5% is equivalent to 2.5 hundredths $\left(\frac{2.5}{100}\right)$ or 25 thousandths $\left(\frac{25}{1000}\right)$, both of which can be represented by the decimal 0.025.

Accelerated 6 | Unit 5 Lesson 9 465 Synthesis | Lesson Practice

Lesson Takeaway: *Percentages*, decimals, and fractions are all equivalent ways of writing the same value. For solving problems with percentages, it is often helpful to rewrite a percentage as a decimal and multiply.

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by writing a *percentage* as its fraction and decimal equivalent.

Today's Goals

1. **Goal:** Convert between values represented as percentages, decimals, and fractions.
2. **Language Goal:** Describe the relationship between percentages and their decimal equivalent. **(Speaking and Listening)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.09

Complete the table.

Percent (%)	Fraction	Decimal
35	$\frac{35}{100}$ (or equivalent)	0.35
7	$\frac{7}{100}$	0.07
2.3	$\frac{2.3}{100}$ (or equivalent)	0.023

Differentiation Use after Lesson 9

Support

Provide targeted intervention for students by using these resources.

If students need support calculating equivalent fractions, percents, and decimals:

» **Respond to Student Thinking:**

- Use the *Converting Between Fractions, Percents, and Decimals* Mini-lesson.
- Review the **Lesson Summary**.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 3 Extension Activities.**
- Invite them to **convert several unit fractions to percentages** and share what they notice and wonder.

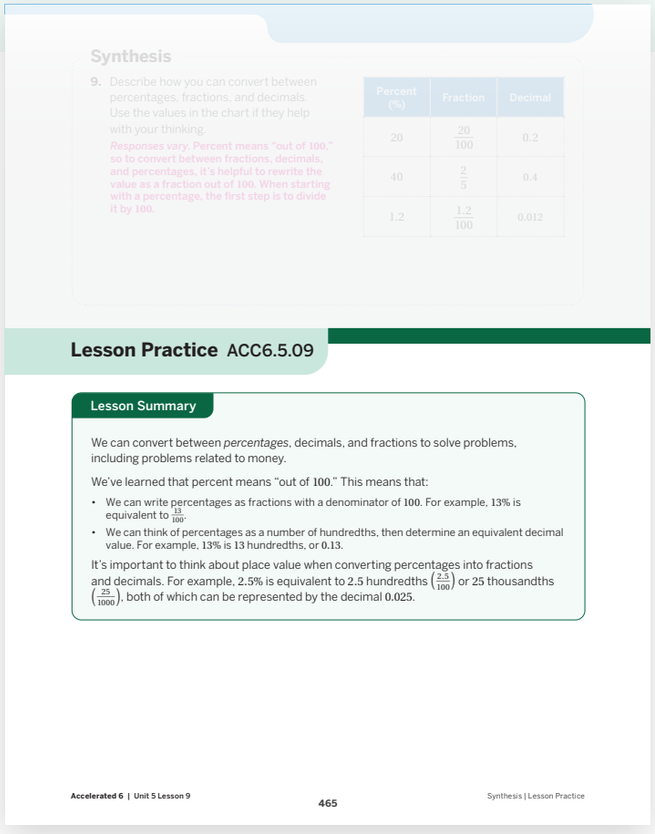
Professional Learning

Reflect on your facilitation of **MLR3: Critique, Correct, Clarify** in this lesson. How did students engage in the routine? What about how you facilitated the routine promoted student learning? How might you facilitate it differently in the future?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.



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20	$\frac{20}{100}$	0.2
40	$\frac{2}{5}$	0.4
1.2	$\frac{1.2}{100}$	0.012

Lesson Practice ACC6.5.09

Lesson Summary

We can convert between *percentages*, decimals, and fractions to solve problems, including problems related to money.

We've learned that percent means "out of 100." This means that:

- We can write percentages as fractions with a denominator of 100. For example, 13% is equivalent to $\frac{13}{100}$.
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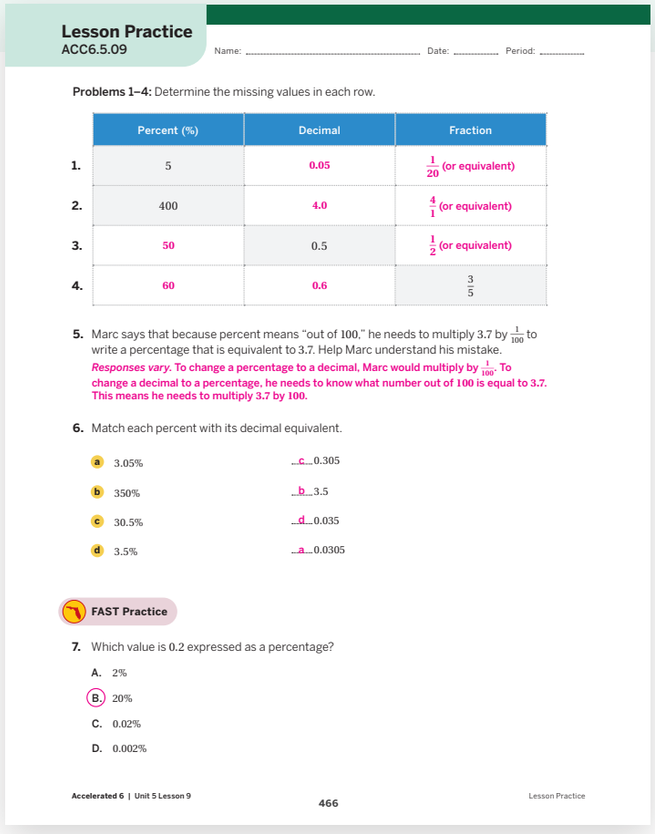
It's important to think about place value when converting percentages into fractions and decimals. For example, 2.5% is equivalent to 2.5 hundredths $\left(\frac{2.5}{100}\right)$ or 25 thousandths $\left(\frac{25}{1000}\right)$, both of which can be represented by the decimal 0.025.



Lesson Practice ACC6.5.09

Name: _____ Date: _____ Period: _____

Problems 1–4: Determine the missing values in each row.

	Percent (%)	Decimal	Fraction
1.	5	0.05	$\frac{1}{20}$ (or equivalent)
2.	400	4.0	$\frac{4}{1}$ (or equivalent)
3.	50	0.5	$\frac{1}{2}$ (or equivalent)
4.	60	0.6	$\frac{3}{5}$

5. Marc says that because percent means "out of 100," he needs to multiply 3.7 by $\frac{1}{100}$ to write a percentage that is equivalent to 3.7. Help Marc understand his mistake.

Responses vary. To change a percentage to a decimal, Marc would multiply by $\frac{1}{100}$. To change a decimal to a percentage, he needs to know what number out of 100 is equal to 3.7. This means he needs to multiply 3.7 by 100.

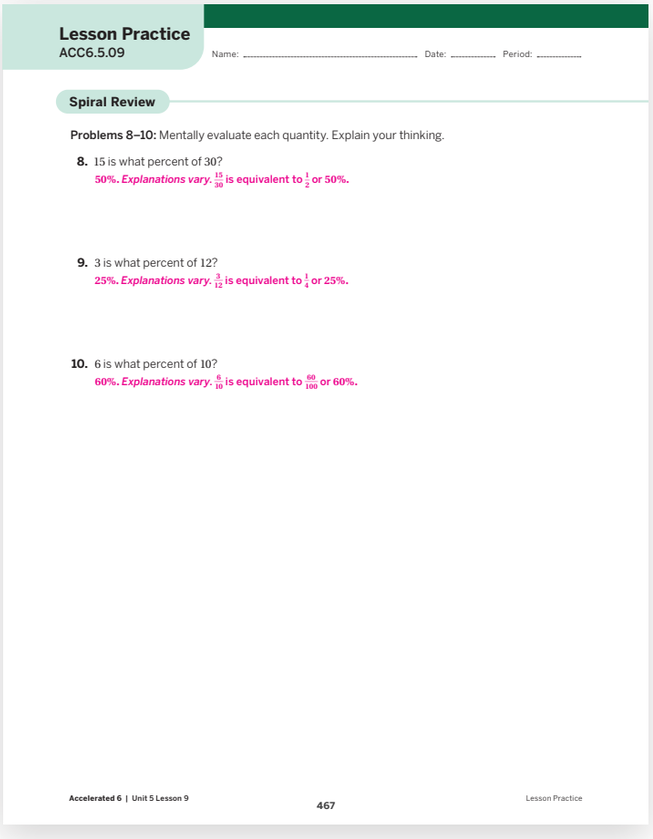
6. Match each percent with its decimal equivalent.

a. 3.05%	c. 0.305
b. 350%	b. 3.5
c. 30.5%	d. 0.035
d. 3.5%	a. 0.0305

FAST Practice

7. Which value is 0.2 expressed as a percentage?

A. 2%
B. 20%
C. 0.02%
D. 0.002%



Lesson Practice ACC6.5.09

Name: _____ Date: _____ Period: _____

Spiral Review

Problems 8–10: Mentally evaluate each quantity. Explain your thinking.

8. 15 is what percent of 30?

50%. *Explanations vary.* $\frac{15}{30}$ is equivalent to $\frac{1}{2}$ or 50%.

9. 3 is what percent of 12?

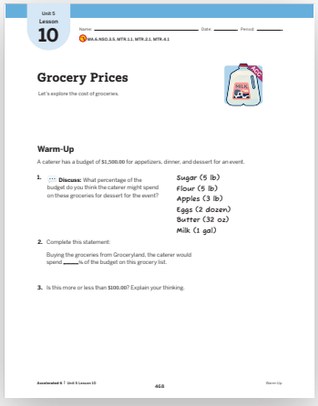
25%. *Explanations vary.* $\frac{3}{12}$ is equivalent to $\frac{1}{4}$ or 25%.

10. 6 is what percent of 10?

60%. *Explanations vary.* $\frac{6}{10}$ is equivalent to $\frac{60}{100}$ or 60%.

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–4	1	MA.6.NSO.3.5
	5–6	2	MA.6.NSO.2.1, MA.6.NSO.3.5
FAST Practice	7	1	MA.6.NSO.3.5
Spiral Review			
	8–10	2	MA.6.AR.3.4


Unit 5
Lesson
10

Grocery Prices

Let's explore the cost of groceries.

Warm-Up

A caterer has a budget of $1,500.00 for appetizers, dinner, and dessert for an event.

1. Discuss: What percentage of the budget do you think the caterer might spend on these groceries for dessert for the event?

Sugar (5 lb)
Flour (5 lb)
Apples (3 lb)
Eggs (2 dozen)
Butter (32 oz)
Milk (1 gal)

2. Complete this statement:

Buying the groceries from Groceryland, the caterer would spend ____% of the budget on this grocery list.

3. Is this more or less than $100.00? Explain your thinking.

468

Grocery Prices

Percentages as Decimals

Let's explore the cost of groceries in different locations.

Learning Outcomes

Today's Goals

1. **Goal:** Make connections between percentages and decimals.
2. **Goal:** Write and evaluate expressions to represent problems involving percentages.
3. **Language Goal:** Discuss the impact of costs on a budget using percentages. **(Speaking, Listening, and Writing)**

Students apply what they know about decimals and percentages to explore prices of groceries for different budgets and in different grocery stores. They reason about how to determine whether a grocery item is within a percent of a budget.

Coherence

Prior Learning

In Lesson 9, students converted between decimals and percentages. In Unit 3, students used fractions and ratio reasoning to solve percent problems in context.

Future Learning

In Unit 6, students will expand on their understanding of percentages and decimals to solve multi-step percent problems.

Connections

- Students build on their understanding of percents, decimals, and fractions to problems involving grocery prices. (real world)

FL B.E.S.T. Math Benchmarks

Addressing

MA.6.NSO.3.5
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages.

Mathematical Thinking and Reasoning Standards: MTR.1.1, MTR.2.1, MTR.4.1

ELA Expectation: ELA.K12.EE.1.1

English Language Development Standards: ELD.K12.ELL.MA.1, ELD.K12.ELL.SI.1

Building On	Building Toward
MA.4.FR.1.2	MA.7.NSO.1.2
MA.5.NSO.1.2	MA.7.AR.3.1
MA.5.NSO.2.2	

Lesson at a Glance

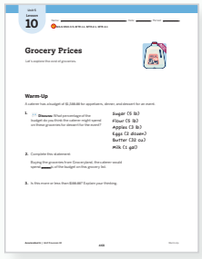
~ 45 min

MA.6.NSO.3.5

Warm-Up

Pairs | 5 min

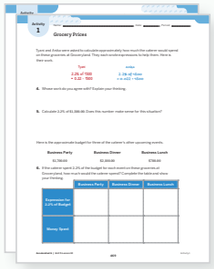
Students consider percentages when solving problems about a caterer's budget.



Activity 1

Pairs | 15 min

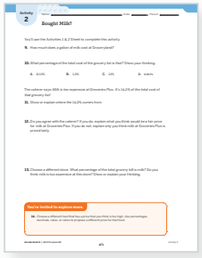
Students calculate percentages and construct arguments concerning the cost of groceries for different events. **Routine:** Decide and Defend **(MTR.4.1)**



Activity 2

Pairs | 15 min

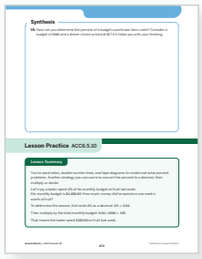
Students compare the cost of groceries in different stores using percentages and propose grocery prices. **(MTR.2.1)**



Synthesis

Whole Class | 5 min

Students synthesize their understanding of grocery prices.



Show What You Know

Independent | 5 min

Students demonstrate their understanding by calculating the amount of money a cafe manager spends on food each month.

Prep Checklist

Prepare the Activity 1 & 2 Cards.

This lesson includes:

- Student Edition
- Show What You Know
- Activity 1 & 2 cards, one per student

Pairs | 5 min

Warm-Up

Purpose: Students consider percentages when solving problems about a caterer's budget.

1 Launch

Direct students' attention to the grocery list and invite one student to read the prompt. Invite students to restate the situation to their partners before predicting the percent of the budget they think would be spent on this list. **(MTR.1.1)**

Share with students that the grocery list is 2.2% of the caterer's budget. Invite students to share if their prediction was too high, too low, or just right with a partner. Invite students to fill in the blank in Problem 2 with 2.2% before making a prediction for Problem 3.

ELL **English Language Learners** Strategically pair students with partners who speak the same primary language. Allow students to share and receive feedback on their predictions in their primary language. **(Speaking and Listening)**

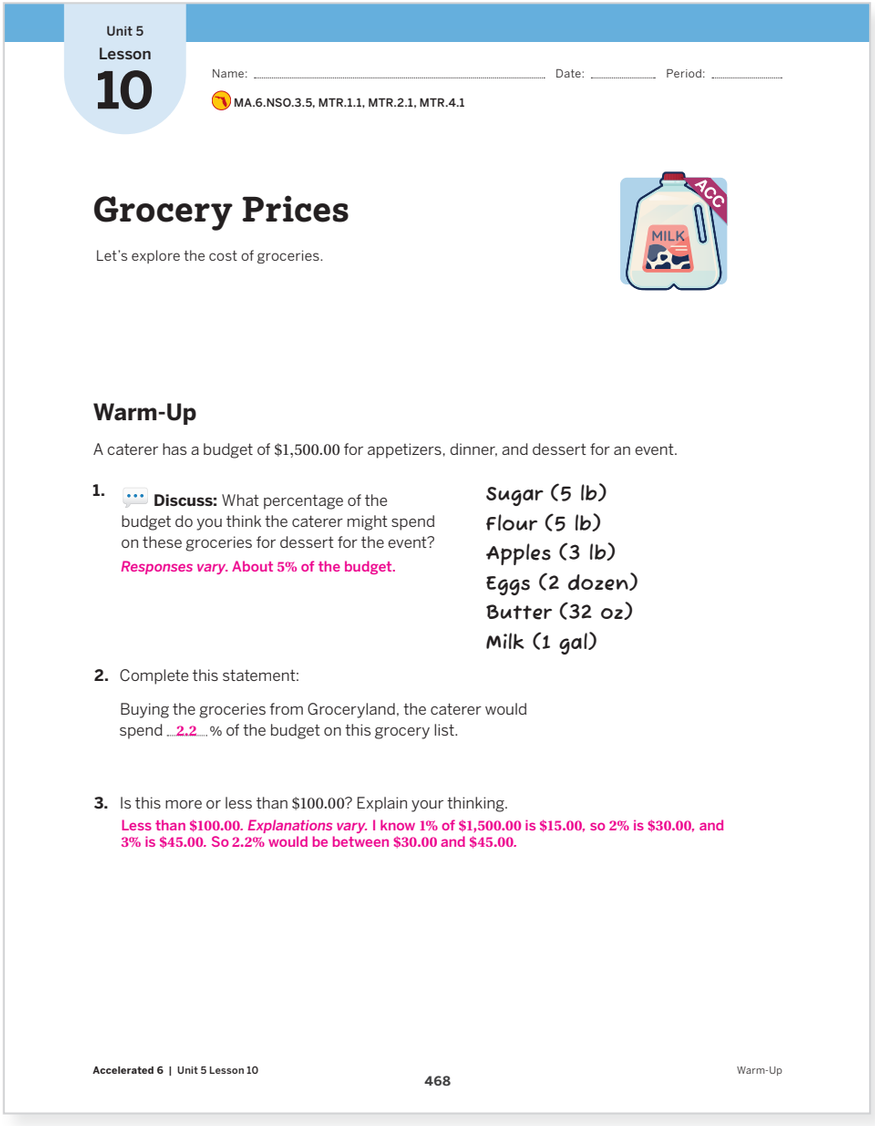
2 Connect

Capture and share a variety of responses to the question, including the reasoning students discussed with their partner.

A **Accessibility: Conceptual Processing** Create or review an anchor chart that publicly displays key information about percentages from Unit 3 to aid students in reasoning throughout this lesson.

Consider asking, "What are some strategies for finding or approximating the percent of a number?"

Share the sample response to highlight that using benchmark percentages is one way to solve percent problems. They can also use estimation to determine if the total grocery cost is more or less than $100, if it doesn't come up naturally.



Unit 5
Lesson
10

Name: _____ Date: _____ Period: _____

MA.6.NSO.3.5, MTR.1.1, MTR.2.1, MTR.4.1

Grocery Prices

Let's explore the cost of groceries.

Warm-Up

A caterer has a budget of $1,500.00 for appetizers, dinner, and dessert for an event.

1. **Discuss:** What percentage of the budget do you think the caterer might spend on these groceries for dessert for the event?

   Responses vary. About 5% of the budget.

   Sugar (5 lb)
   Flour (5 lb)
   Apples (3 lb)
   Eggs (2 dozen)
   Butter (32 oz)
   Milk (1 gal)

2. Complete this statement:

   Buying the groceries from Groceryland, the caterer would spend 2.2 % of the budget on this grocery list.

3. Is this more or less than $100.00? Explain your thinking.

   Less than $100.00. *Explanations vary.* I know 1% of $1,500.00 is $15.00, so 2% is $30.00, and 3% is $45.00. So 2.2% would be between $30.00 and $45.00.

Accelerated 6 | Unit 5 Lesson 10 468 Warm-Up

Pairs | 15 min

Activity 1 Grocery Prices

Purpose: Students calculate percentages and construct arguments concerning the cost of groceries for different events. **(MTR.4.1)**

1 Launch

Direct students' attention to Tyani's and Anika's work and invite students to share what they notice and wonder about in partners.

Use the Decide and Defend routine to support students in making arguments and critiquing the reasoning of others. **(MTR.4.1)**

Display the distribution of responses by polling the class.

Consider asking:
- "What is similar about their strategies?"
- "What is different about their strategies?"
- "What advice would you give Tyani about revising her work?"

Distribute one copy of the Activities 1 & 2 Sheet to each student.

2 Monitor

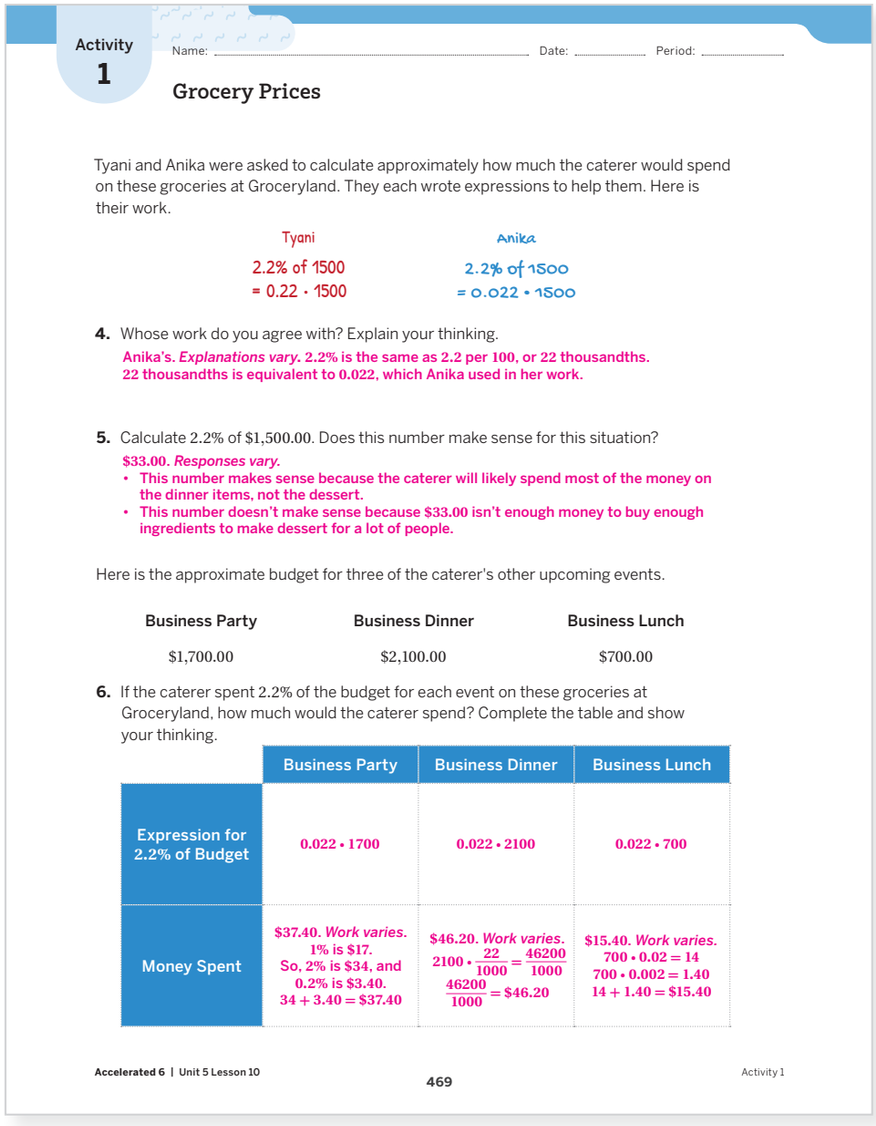
Listen for students who make personal connections to the context to justify their answers making sense.

D Differentiation

Look for students who:	Respond to Student Thinking
Write an expression using 2.2 or 0.22 to represent 2.2%. (*Problem 5*)	**Support** Consider asking, "How could we use what we know about percentages to write 2.2% as a fraction? Since we're dividing 2.2 by 100, how could we write this as a decimal?"
Divide by 0.022 to find the percent. (*Problem 5*)	
Calculate Problem 5 correctly, but need support writing an expression. (*Problem 6*)	**Strengthen** Invite them to compare what is similar between Problem 5 and Problem 6 and how one can help with the other.
Recognize that 2.2% is the same as 0.022 and multiply correctly for each city. (*Problem 6*)	**Stretch** Invite students to research the cost for a caterer for an event with 500 people. Then calculate the amount of the budget spent on dessert ingredients, assuming 2.2% of the budget is spent on these groceries.

A Accessibility: Executive Functioning To support students who would benefit from more processing time, invite them to complete the table for two of the three listed events.

Activity 1 continued >



Activity 1

Name: _____ Date: _____ Period: _____

Grocery Prices

Tyani and Anika were asked to calculate approximately how much the caterer would spend on these groceries at Groceryland. They each wrote expressions to help them. Here is their work.

Tyani	Anika
2.2% of 1500 = 0.22 · 1500	2.2% of 1500 = 0.022 · 1500

4. Whose work do you agree with? Explain your thinking.

Anika's. *Explanations vary.* 2.2% is the same as 2.2 per 100, or 22 thousandths. 22 thousandths is equivalent to 0.022, which Anika used in her work.

5. Calculate 2.2% of $1,500.00. Does this number make sense for this situation?

$33.00. *Responses vary.*
- This number makes sense because the caterer will likely spend most of the money on the dinner items, not the dessert.
- This number doesn't make sense because $33.00 isn't enough money to buy enough ingredients to make dessert for a lot of people.

Here is the approximate budget for three of the caterer's other upcoming events.

Business Party	Business Dinner	Business Lunch
$1,700.00	$2,100.00	$700.00

6. If the caterer spent 2.2% of the budget for each event on these groceries at Groceryland, how much would the caterer spend? Complete the table and show your thinking.

	Business Party	Business Dinner	Business Lunch
Expression for 2.2% of Budget	0.022 • 1700	0.022 • 2100	0.022 • 700
Money Spent	$37.40. *Work varies.* 1% is $17. So, 2% is $34, and 0.2% is $3.40. 34 + 3.40 = $37.40	$46.20. *Work varies.* $2100 \cdot \frac{22}{1000} = \frac{46200}{1000}$ $\frac{46200}{1000} = \$46.20$	$15.40. *Work varies.* 700 • 0.02 = 14 700 • 0.002 = 1.40 14 + 1.40 = $15.40

Accelerated 6 | Unit 5 Lesson 10 469 Activity 1

Pairs | 15 min

Activity 1 Grocery Prices (continued)

Purpose: Students calculate percentages and construct arguments concerning the cost of groceries for different events. **(MTR.4.1)**

2 Monitor

To support students getting started, consider inviting them to list the money spent for the groceries for each of the four events.

Note: Conversations about event catering can look and feel different based on students' experiences, cultures, and locations. Consider the variety of event experiences that students in your classroom may have. Listen for students who make assumptions about others' event experiences and invite them to consider other perspectives.

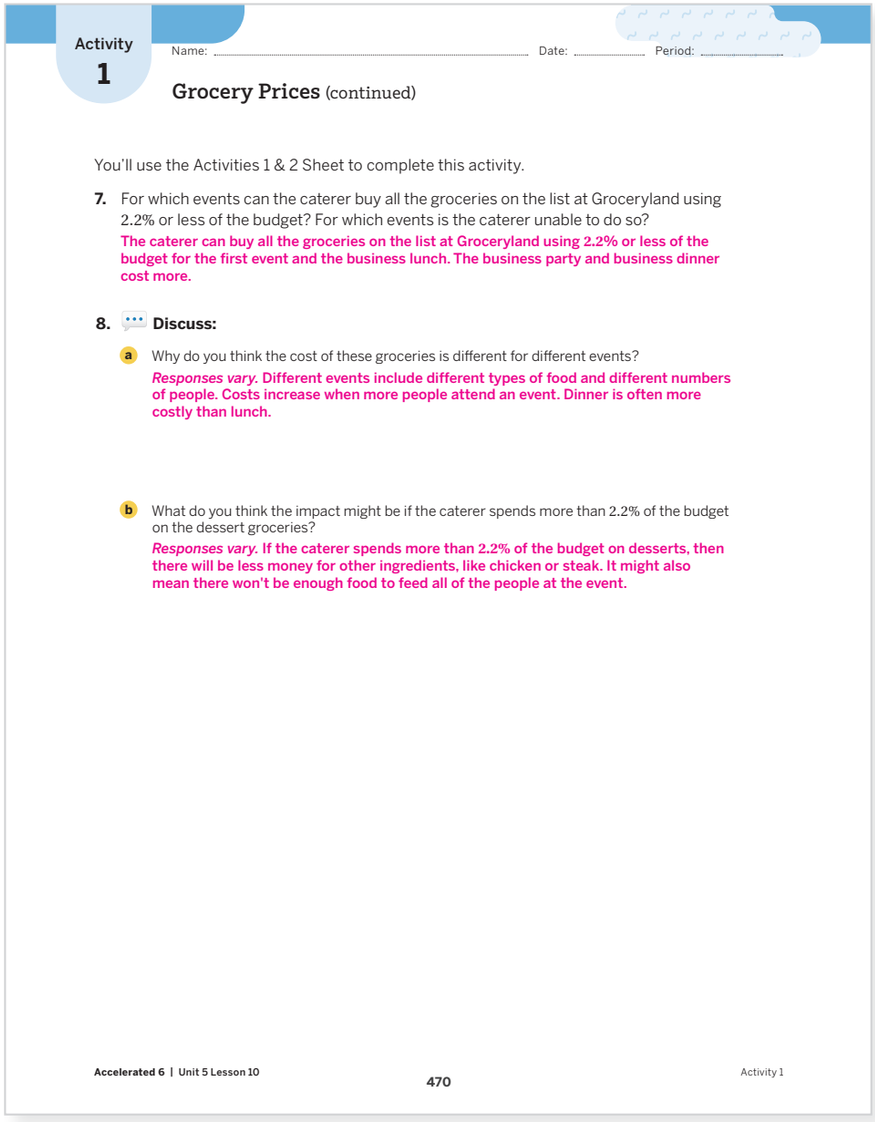
3 Connect

Invite students to share their responses to Problem 8 and explain their thinking. Allow multiple students to share different responses.

Consider asking:

- "Do you think 2.2% of a budget is the correct amount of money to spend on groceries for dessert for an event?"
- "What impact do you think grocery prices have on the costs of services like catering? Explain." **(MTR.4.1)**

To surface the Key Takeaway, consider asking, "How can decimals help us calculate the percentage of a number? Why does this work?"



Activity 1

Name: Date: Period:

Grocery Prices (continued)

You'll use the Activities 1 & 2 Sheet to complete this activity.

7. For which events can the caterer buy all the groceries on the list at Groceryland using 2.2% or less of the budget? For which events is the caterer unable to do so?

The caterer can buy all the groceries on the list at Groceryland using 2.2% or less of the budget for the first event and the business lunch. The business party and business dinner cost more.

8. **Discuss:**

a. Why do you think the cost of these groceries is different for different events?

Responses vary. Different events include different types of food and different numbers of people. Costs increase when more people attend an event. Dinner is often more costly than lunch.

b. What do you think the impact might be if the caterer spends more than 2.2% of the budget on the dessert groceries?

Responses vary. If the caterer spends more than 2.2% of the budget on desserts, then there will be less money for other ingredients, like chicken or steak. It might also mean there won't be enough food to feed all of the people at the event.

Accelerated 6 | Unit 5 Lesson 10 470 Activity 1

Key Takeaway: Decimals can be used to calculate a percentage of any number by rewriting the percent as a decimal and then multiplying the decimal by the number you are finding the percent of.

Pairs | 15 min

Activity 2 Bought Milk?

Purpose: Students compare the cost of groceries in different stores using percentages and propose grocery prices. **(MTR.2.1)**

Short on time? Consider omitting Problem 12.

1 Launch

Direct students' attention to the gallon of milk in each list on the Activities 1 & 2 Sheet and discussion questions and invite students to respond in partners.

2 Monitor

Capture explanations to share during the Connect.

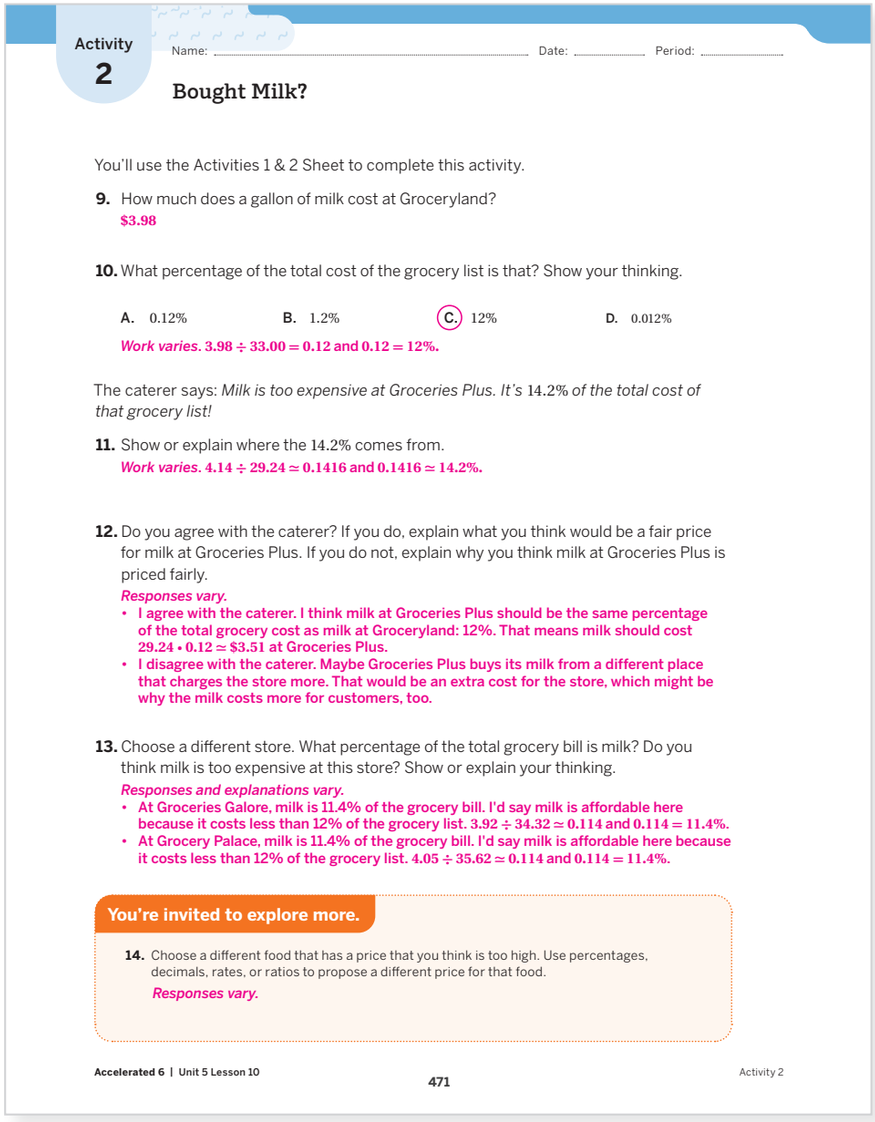
D Differentiation

Look for students who:	Respond to Student Thinking
Need support getting started. (*Problem 9*)	**Support** Consider asking, "How can you use the cost of a gallon of milk to find the percent of the total cost of the grocery list?"
Divide the cost of food per store by the cost of a gallon of milk. (*Problems 9–10*)	**Support** Consider asking, "If milk was \$2 and the grocery bill was \$40, how could we find the percentage then?"
Use the data from the Activities 1 & 2 Sheet to determine the percent of the grocery list cost for Groceries Plus. (*Problems 11–12*)	**Strengthen** Invite students to use information from the other stores to justify their thinking.
Correctly set up the expression to determine the percent of the grocery list cost in a variety of stores and connect their responses to the situation. (*Problem 13*) **(MTR.2.1)**	**Stretch** **You're invited to explore more.** Invite students who would like to explore the costs of grocery prices further to complete this optional task. Encourage them to discuss their thinking with a partner. **Stretch** Encourage students to research current grocery prices in a nearby city.

3 Connect

Direct students' attention to the Activities 1 & 2 Sheet. Invite students to share their responses to Problem 11 and how their thinking aligns with or differs from the caterer's.

Consider asking, "What are different ways we can decide which store to choose to buy groceries?"



Activity 2

Name: _____ Date: _____ Period: _____

Bought Milk?

You'll use the Activities 1 & 2 Sheet to complete this activity.

9. How much does a gallon of milk cost at Groceryland?

\$3.98

10. What percentage of the total cost of the grocery list is that? Show your thinking.

A. 0.12% B. 1.2% C. 12% D. 0.012%

Work varies. $3.98 \div 33.00 = 0.12$ and $0.12 = 12\%$.

The caterer says: *Milk is too expensive at Groceries Plus. It's 14.2% of the total cost of that grocery list!*

11. Show or explain where the 14.2% comes from.

Work varies. $4.14 \div 29.24 \approx 0.1416$ and $0.1416 \approx 14.2\%$.

12. Do you agree with the caterer? If you do, explain what you think would be a fair price for milk at Groceries Plus. If you do not, explain why you think milk at Groceries Plus is priced fairly.

Responses vary.

- I agree with the caterer. I think milk at Groceries Plus should be the same percentage of the total grocery cost as milk at Groceryland: 12%. That means milk should cost $29.24 \cdot 0.12 \approx \$3.51$ at Groceries Plus.
- I disagree with the caterer. Maybe Groceries Plus buys its milk from a different place that charges the store more. That would be an extra cost for the store, which might be why the milk costs more for customers, too.

13. Choose a different store. What percentage of the total grocery bill is milk? Do you think milk is too expensive at this store? Show or explain your thinking.

Responses and explanations vary.

- At Groceries Galore, milk is 11.4% of the grocery bill. I'd say milk is affordable here because it costs less than 12% of the grocery list. $3.92 \div 34.32 \approx 0.114$ and $0.114 = 11.4\%$.
- At Grocery Palace, milk is 11.4% of the grocery bill. I'd say milk is affordable here because it costs less than 12% of the grocery list. $4.05 \div 35.62 \approx 0.114$ and $0.114 = 11.4\%$.

You're invited to explore more.

14. Choose a different food that has a price that you think is too high. Use percentages, decimals, rates, or ratios to propose a different price for that food.

Responses vary.

Accelerated 6 | Unit 5 Lesson 10 471 Activity 2

Whole Class | 5 min

Synthesis

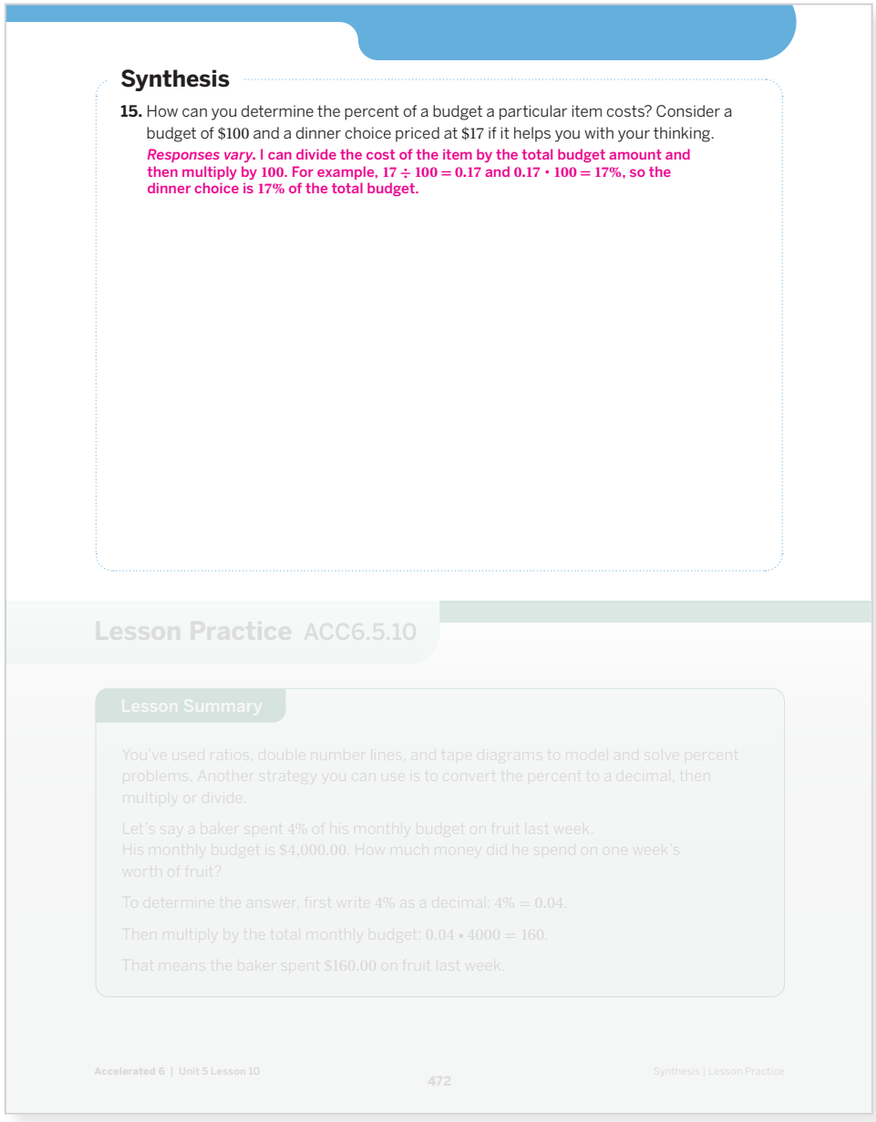
Purpose: Students synthesize their understanding of grocery prices.

Synthesis

Invite students to respond independently and then share their thinking with a partner.

Capture and share a variety of ideas, such as:

- Divide the cost of the item by the total budget.
- Percent means "for every 100," so to convert a decimal to a percent, multiply the decimal by 100.



Synthesis

15. How can you determine the percent of a budget a particular item costs? Consider a budget of $\$100$ and a dinner choice priced at $\$17$ if it helps you with your thinking.

Responses vary. **I can divide the cost of the item by the total budget amount and then multiply by 100. For example, $17 \div 100 = 0.17$ and $0.17 \cdot 100 = 17\%$, so the dinner choice is 17% of the total budget.**

Lesson Practice ACC6.5.10

Lesson Summary

You've used ratios, double number lines, and tape diagrams to model and solve percent problems. Another strategy you can use is to convert the percent to a decimal, then multiply or divide.

Let's say a baker spent 4% of his monthly budget on fruit last week. His monthly budget is $\$4{,}000.00$. How much money did he spend on one week's worth of fruit?

To determine the answer, first write 4% as a decimal: $4\% = 0.04$.

Then multiply by the total monthly budget: $0.04 \cdot 4000 = 160$.

That means the baker spent $\$160.00$ on fruit last week.

Accelerated 6 | Unit 5 Lesson 10 472 Synthesis | Lesson Practice

Lesson Takeaway: A strategy you can use to solve percent problems is to convert the percent to a decimal, then multiply.

- First, write the percent as a decimal (e.g., $4\% = 0.04$).
- Then multiply the decimal by the quantity (e.g., $0.04 \cdot 30$).
- Make sure to connect your solution back to the situation. **(MTR.2.1)**

Independent | 5 min

Show What You Know

Purpose: Students demonstrate their understanding by calculating the amount of money a cafe manager spends on food each month.

Today's Goals

1. **Goal:** Make connections between percentages and decimals.
2. **Goal:** Write and evaluate expressions to represent problems involving percentages.
3. **Language Goal:** Discuss the impact of disproportionate costs on a budget using percentages. **(Speaking, Listening, and Writing)**

Show What You Know (Assessment Resources)

Name: _____ Date: _____ Period: _____

Show What You Know 5.10

A small breakfast cafe has a monthly budget of $6,250. The cafe manager spends 30% of the budget on food.

a. Write an expression to represent how much money the cafe manager spends on food each month.

$0.3 \cdot 6250$

b. How much money does the cafe manager spend on food each month? Show your thinking.

$1,875. *Work varies.* 10% of $6,250 is $625. 30% of $6,250 is 3 times $625, which is $1,875.

D Differentiation Use after Lesson 10

Support

Provide targeted intervention for students by using these resources.

If students need support calculating a given percentage of a quantity:

» **Respond to Student Thinking:**

- Review the **Lesson Summary**.
- Selecting a few related **Practice Problems** and giving individualized feedback.

Stretch

Challenge students and extend their learning with these resources.

If students would enjoy an additional challenge:

» **Respond to Student Thinking:**

- Invite them to explore the **Sub-Unit 2 Extension Activities**.

Professional Learning

Take a moment to reflect on how students applied what they've learned about decimals to the grocery prices in different stores and for different events. In what ways were students able to make connections between math ideas and their or others' communities? How might you support students in making more connections between the math they learn and their world?

Lesson Practice

Independent

Provide students with sufficient practice to build and reinforce their conceptual understanding, fluency, and application of mathematical topics, assessment practice, and ongoing spiral review.

Synthesis

15. How can you determine the percent of a budget a particular item costs? Consider a budget of $100 and a dinner choice priced at $17 if it helps you with your thinking.

Responses vary. I can divide the cost of the item by the total budget amount and then multiply by 100. For example, $17 \div 100 = 0.17$ and $0.17 \cdot 100 = 17\%$, so the dinner choice is 17% of the total budget.

Lesson Practice ACC6.5.10

Lesson Summary

You've used ratios, double number lines, and tape diagrams to model and solve percent problems. Another strategy you can use is to convert the percent to a decimal, then multiply or divide.

Let's say a baker spent 4% of his monthly budget on fruit last week. His monthly budget is $4,000.00. How much money did he spend on one week's worth of fruit?

To determine the answer, first write 4% as a decimal: $4\% = 0.04$.

Then multiply by the total monthly budget: $0.04 \cdot 4000 = 160$.

That means the baker spent $160.00 on fruit last week.

Lesson Practice
ACC6.5.10

Name: _____ Date: _____ Period: _____

Problems 1–4: Jada's restaurant has a weekly profit of approximately $1,150.00. She tries to spend no more than 40% of the weekly profit on groceries.

1. Write an expression to represent how much money she spends on the restaurant's weekly groceries.

$0.4 \cdot 1150$

2. How much money, at most, does Jada spend on groceries each week for the restaurant?

$460.00

3. Jada puts 12% of the weekly profit into a savings account. How much money does Jada save from the restaurant each each week?

$138.00

4. Jada's restaurant recently had to spend $184.00 on an oven repair. What percent of the weekly profit did Jada spend on the oven repair?

A. 0.16% B. 6.25% (C.) 16% D. 62.5%

5. Circle the expression that has a greater value.

7% of 250 70% of 25 They have the same value.

FAST Practice

6. Oliver went to the store and purchased these items. Beef is the most expensive item. What percent of the total is it?

40 %

Items	Cost ($)
Milk (1 gal)	$3.61
Beef (1 lb)	$7.10
Apples (1 lb)	$2.39
Bananas (1 lb)	$0.91
Oranges (1 lb)	$1.99
Potatoes (1 lb)	$1.75
Total	$17.75

Lesson Practice
ACC6.5.10

Name: _____ Date: _____ Period: _____

Spiral Review

7. One serving of yogurt contains 5.2 grams of sugar. How many grams of sugar are in 14.25 servings of yogurt?

A. 7.41 grams B. 2.74 grams C. 19.45 grams (D.) 74.1 grams

Problems 8–11: Determine the value of each expression. Show your thinking.

8. $4.4 - 0.72 = 3.68$

Work varies.

$$\begin{array}{r} 4.40 \\ -\ 0.72 \\ \hline 3.68 \end{array}$$

9. $4 + 1.3 + 0.56 = 5.86$

Work varies.

$$\begin{array}{r} 4.00 \\ 1.30 \\ +\ 0.56 \\ \hline 5.86 \end{array}$$

10. $4.34 \div 0.7 = 6.2$

Work varies. $4.34 \div 0.7 = 43.4 \div 7$

$$\begin{array}{r} 06.2 \\ 7\overline{)43.4} \\ -\ 0\downarrow\downarrow \\ \hline 43\downarrow \\ -\ 42\downarrow \\ \hline 14 \\ -\ 14 \\ \hline 0 \end{array}$$

11. $0.32 \cdot 4.7 = 1.504$

Work varies.

$$\begin{array}{r} .32 \\ \times\ 4.7 \\ \hline 224 \\ +\ 128 \\ \hline 1.504 \end{array}$$

Lesson Practice Item Analysis

	Problem(s)	DOK	FL B.E.S.T. Math Benchmarks
On-Lesson			
	1–5	2	MA.6.NSO.3.5
FAST Practice	6	2	MA.6.NSO.3.5
Spiral Review			
	7	2	MA.6.AR.3.5
	8–9	1	MA.5.NSO.2.3
	10–11	1	MA.6.NSO.2.1

Assess and Respond

End-of-Unit Assessment

Independent | 45 min

Facilitation: Assign the End-of-Unit Assessment to learn about your students' understanding of the concepts and skills in this unit. There are two forms of the End-of-Unit Assessment: Forms A and B. Text to speech is available in the digital version. If time allows, consider inviting students to complete one or more of the tasks in the Unit Synthesis and Reflection.

Item Analysis, Forms A and B

Problem(s)	Concept or skill	Addressed in	DOK	FL B.E.S.T. Math Benchmarks
1	Converting between values represented as percentages, decimals, fractions, and place values	Lesson 9	1	MA.6.NSO.3.5, MTR.2.1
2a	Identifying equivalent expressions for multi-digit decimal quotients using place value reasoning	Lesson 5	1	MA.6.NSO.2.1, MTR.2.1
2b	Dividing multi-digit decimals	Lesson 6	1	MA.6.NSO.2.1
3	Multiplying multi-digit decimals	Lesson 4	1	MA.6.NSO.2.1
4	Multiplying multi-digit decimals and comparing their products	Lesson 4	2	MA.6.NSO.2.1, MTR.2.1
5a, 5b	Analyzing and evaluating expressions to represent problems involving percentages	Lesson 9	2	MA.6.NSO.3.5, NSO MTR.4.1
6	Using decimal operations to solve problems in context	Lesson 10	2	MA.6.NSO.3.5, MTR.7.1

Assessment Resources

- Student Assessments
- Assessment Rubrics with Answers
- Show What You Knows and Answer Keys

Intervention and Extension Resources

- Mini-Lessons
- Extensions

Name: Date: Period:

End-of-Unit Assessment

Unit 5

1. Select *all* the expressions that are equivalent to $\frac{35}{100}$.

- [x] **A.** 0.35
- [ ] **B.** 35 thousandths
- [ ] **C.** 3.5
- [x] **D.** 35%
- [x] **E.** 35 hundredths

2. **a** Which expression has the same value as $224.7 \div 0.7$?

A. $2247 \div 70$ **B.** $2247 \div 7$ **C.** $2247 \div 700$ **D.** $\frac{2247}{10} \div \frac{70}{10}$

b Calculate the quotient of $224.7 \div 0.7$.

321

3. Calculate the value of the expression.

$0.32 \cdot 12.125 = 3.88$

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Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 5

4. Circle the expression that has the greater value.

$2 \cdot 0.003$ $0.2 \cdot 0.03$ They have the same value

Explain your reasoning.

Explanations vary. $2 \cdot 0.003$ is like $2 \cdot \frac{3}{1000}$ or 6 thousandths. $0.2 \cdot 0.03$ is like $\frac{2}{10} \cdot \frac{3}{100}$, which is also 6 thousandths. That means both expressions have the same value.

5. Abdullah and Terrance both earned \$136 in January and decided to save 6.5% of this income. Here are the expressions they wrote to determine how much to save.

Abdullah	Terrance
6.5% of 136 = 0.65 · 136	6.5% of 136 = 0.065 · 136

a Whose work do you agree with? Circle one.

Abdullah's Terrance's Neither

Explain your thinking.

Explanations vary. 6.5% is the same as $\frac{6.5}{100}$ or $\frac{65}{1000}$ or 65 thousandths.

b Calculate 6.5% of \$136.

\$8.84

Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 5

6. Abena also earned \$136 in February and saved \$27.20 of that money. Her goal was to save a minimum of 20% of her earnings. How did Abena do? Circle one.

She saved less than 20% She saved more than 20% She saved exactly 20%

Explain your reasoning.

Explanations vary. $\frac{27.20}{136}$ is the same as $\frac{272}{1360}$ or 0.2, meaning that Abena saved 20%.

Name: Date: Period:

End-of-Unit Assessment

Unit 5

1. Select *all* the expressions that are equivalent to $\frac{42}{1000}$.

- ☐ A. 0.42
- ☑ B. 4.2%
- ☑ C. 0.042
- ☑ D. 42 thousandths
- ☐ E. 42 hundredths

2. a. Which expression has the same value as $127.8 \div 0.6$?

A. $12780 \div 6$ B. $1278 \div 60$ C. $1278 \div 600$ D. $\frac{1278}{10} \div \frac{6}{10}$

b. Calculate the quotient of $127.8 \div 0.6$.

213

3. Calculate the value of the expression.

$12.75 \cdot 0.2 = 2.55$

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Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 5

4. Circle the expression that has the greater value.

$3 \cdot 0.002$ $0.03 \cdot 0.02$ They have the same value

Explain your reasoning.

Explanations vary. $3 \cdot 0.002$ is like $3 \cdot \frac{2}{1000}$ or 6 thousandths. $0.03 \cdot 0.02$ is like $\frac{3}{100} \cdot \frac{2}{100}$, which is 6 ten-thousandths, so $3 \cdot 0.002$ is larger.

5. Liam and Luca both earned $152.50 in January and decided to save 8% of this income. Here are the expressions they wrote to determine how much to save.

Liam	Luca
8% of 152.5 = 0.8 · 152.5	8% of 152.5 = 0.08 · 152.5

a. Whose work do you agree with? Circle one.

Liam's Luca's Neither

Explain your thinking.

Explanations vary. 8% is the same as $\frac{8}{100}$ or 8 hundredths.

b. Calculate 8% of $152.50.

$12.20

Name: Date: Period:

End-of-Unit Assessment (continued)

Unit 5

6. Carlos also earned $152.50 in February and saved $6.10 of that money. His goal was to save a minimum of 3.6%. How did Carlos do? Circle one.

He saved less than 3.6% He saved more than 3.6% He saved exactly 3.6%

Explain your reasoning.

Explanations vary. $\frac{6.1}{152.5}$ is the same as $\frac{61}{1525}$ or 0.04, meaning that Carlos saved 4%, which is more than 3.6%.

D Differentiation (End-of-Unit Assessment)

Note: To **strengthen** and **stretch** students' learning, refer to the differentiation resources suggested throughout this unit and in the Unit Overview.

Sub-Unit Goals	Problem(s)	To respond to student thinking, consider:	

Sub-Unit 1:
Multiply multi-digit decimals using a variety of strategies.
(Lessons 1–4)
	3, 4	**Support**	• **Mini-Lesson:** *Multiplying Decimals Using Area Models*
			• **Teacher Move:** Consider revisiting:
			  • Lesson 3 (*Multiplying with Areas*)
			  • Lesson 4 (*Multiplication Methods*)

		Strengthen	• **Repeated Challenges:** Lesson 1 (*Decimal Multiplication*)
Sub-Unit 2: Divide multi-digit numbers with and without remainders using long division. **(Lessons 5–7)**	2a	**Support** **Strengthen**	• **Mini-Lesson:** *Dividing Decimals Using Long Division* • **Teacher Move:** Consider revisiting: • Lesson 5 (*Division Diagrams*)
		Stretch	• **You're invited to explore more:** Lesson 5 (*Division Diagrams*)

	2b	**Support**
		Strengthen
			• **Teacher Move:** Consider revisiting:
			  • Lesson 6 (*Long Division and Other Strategies*)
			  • Lesson 7 (*Movie Time*)

Sub-Unit 3: Use decimal operations to solve problems in context. **(Lessons 8–10)**	1, 5a, 5b	**Support** **Strengthen**	• **Mini-Lesson:** *Converting Between Fractions, Percents, and Decimals* • **Teacher Move:** Consider revisiting: • Lesson 9 (*Coining New Representations*)
	6	**Support** **Strengthen**	• **Teacher Move:** Consider revisiting: • Lesson 10 (*Grocery Prices*)
		Stretch	• **You're invited to explore more:** Lesson 10 (*Grocery Prices*)

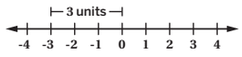
Glossary/Glosario

English

Español

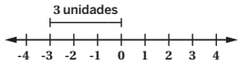
A

absolute value The distance from 0 to a number on a number line is its absolute value.



For example, the absolute value of -3 is 3 because -3 is 3 units away from 0. This is written as $|-3| = 3$.

valor absoluto La distancia del 0 a un número en una recta numérica es su valor absoluto.



Por ejemplo, el valor absoluto de -3 es 3 porque -3 está a 3 unidades del 0. Esto se escribe $|-3| = 3$.

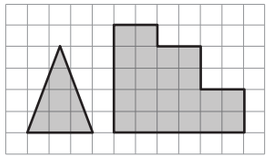
additive inverses The additive inverse of a is $-a$. The sum of two additive inverses is 0.

For example, 5 and -5 are additive inverses because $5 + (-5) = 0$.

inversos aditivos El inverso aditivo de a es $-a$. La suma de dos inversos aditivos es 0.

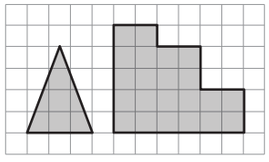
Por ejemplo, 5 y -5 son inversos aditivos porque $5 + (-5) = 0$.

area Area measures the space inside a two-dimensional figure. It is expressed in square units.



The area of the triangle is 6 square units. The area of the other shape is 22 square units.

área El área mide el espacio dentro de una figura bidimensional. Se expresa en unidades cuadradas.



El área del triángulo mide 6 unidades cuadradas. El área de la otra figura mide 22 unidades cuadradas.

associative property The property says $a + (b + c) = (a + b) + c$ and $a \cdot (b \cdot c) = (a \cdot b) \cdot c$. This means that expressions with addition or multiplication have the same sum or product no matter how the numbers in the expression are grouped.

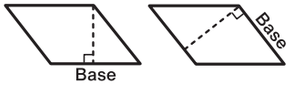
For example, $(2 + 1) + 3 = 2 + (1 + 3)$ and $(3 \cdot 4) \cdot 5 = 3 \cdot (4 \cdot 5)$.

propiedad asociativa La propiedad indica que $a + (b + c) = (a + b) + c$ y $a \cdot (b \cdot c) = (a \cdot b) \cdot c$. Esto significa que las expresiones en las que se suma o se multiplica tienen la misma suma o el mismo producto independientemente de cómo se agrupen los números en la expresión.

Por ejemplo, $(2 + 1) + 3 = 2 + (1 + 3)$ y $(3 \cdot 4) \cdot 5 = 3 \cdot (4 \cdot 5)$.

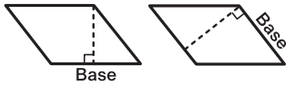
B

base (of a parallelogram) One side of a parallelogram. We can choose any side to be the base.



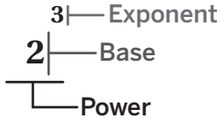
The base can also refer to the length of this side. The height of a shape is perpendicular to the base.

base (de un paralelogramo) Un lado de un paralelogramo. Podemos elegir cualquier lado como base.



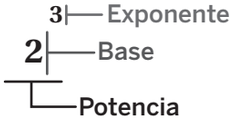
La base también puede referirse a la longitud de este lado. La altura de una figura es perpendicular a la base.

base (of a power) The number that is raised to an exponent. When determining the value of a power, the exponent tells you how many times the base should be multiplied.



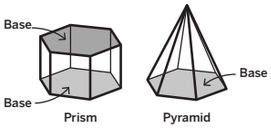
In the expression 2^3, 2 is the base.

base (de una potencia) El número elevado a un exponente. Al determinar el valor de una potencia, el exponente indica cuántas veces debe multiplicarse la base.

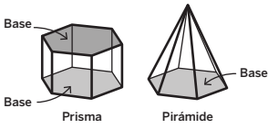


En la expresión 2^3, 2 es la base.

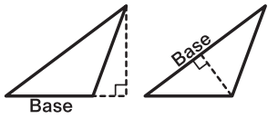
base (of a pyramid or prism) The face that gives the solid its name. A prism has two identical bases that are parallel. A pyramid has one base.



base (de una pirámide o un prisma) La cara que da el nombre al cuerpo geométrico. Un prisma tiene dos bases idénticas que son paralelas. Una pirámide tiene una base.

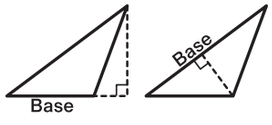


base (of a triangle) The base is one side of a triangle. We can choose any side to be the base.



The base can also refer to the length of this side. The height of a shape is perpendicular to the base.

base (de un triángulo) La base es un lado de un triángulo. Podemos elegir cualquier lado como base.

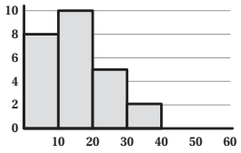


La base también puede referirse a la longitud de este lado. La altura de una figura es perpendicular a la base.

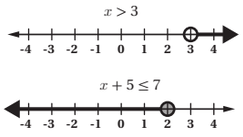
English

bin (of a histogram) The intervals used to group data values in a histogram.

For example, this histogram shows bins of 10 units each.

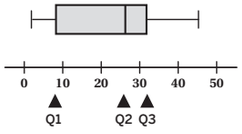


boundary point The point on a number line or graph that separates solutions of an inequality from non-solutions.
If the boundary point is a solution to the inequality (i.e., ≥ or ≤), it's represented with a closed circle on the graph. If it's not a solution (i.e., > or <), it's represented with an open circle on the graph.



The boundary point of $x > 3$ is 3. The boundary point of $x \leq 2$ is 2.

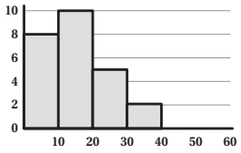
box plot A way to visualize numerical data sets. The data is divided into four sections using five values: the minimum, Q1, Q2 (or the median), Q3, and the maximum. A box is drawn between Q1 and Q3. The line inside the box represents the median.



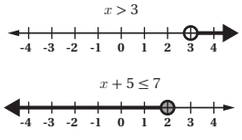
Español

intervalo (de un histograma) Los intervalos que se usan para agrupar los valores de datos en un histograma.

Por ejemplo, este histograma muestra intervalos de 10 unidades cada uno.

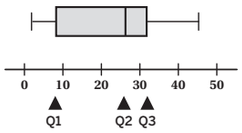


punto límite Punto en una recta numérica o una gráfica que separa las soluciones de una desigualdad de los valores que no son soluciones.
Si el punto límite es una solución de la desigualdad (es decir, ≥ o ≤), se representa con un círculo cerrado en la gráfica. Si no es una solución (es decir, > o <), se representa con un círculo abierto en la gráfica.



El punto límite de $x > 3$ es 3. El punto límite de $x \leq 2$ es 2.

diagrama de caja Una forma de visualizar conjuntos de datos numéricos. Los datos se dividen en cuatro secciones utilizando cinco valores: el mínimo, Q1, Q2 (o la mediana), Q3 y el máximo.
Se dibuja una caja entre Q1 y Q3. La línea dentro de la caja representa la mediana.



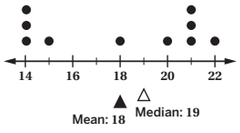
C

categorical data Data that can be sorted into categories instead of counted. Categorical data usually have values that are represented by words instead of numbers.

"What kind of pet do you have?" is a question that would result in categorical data.

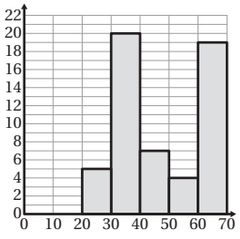
center A single value that can be used to summarize the typical value in a data set.

Mean and median are measures of center.



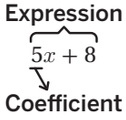
cluster A group of data values that are close together.

For example, this histogram shows a cluster between 30 and 40 and between 60 and 70.



coefficient A number that is multiplied by a variable. Usually, there is no symbol between the coefficient and the variable.

In the expression $5x + 8$, 5 is the coefficient of x.

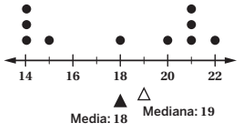


datos categóricos Datos que pueden clasificarse en categorías en lugar de contarse. Los datos categóricos suelen tener valores que se representan mediante palabras en lugar de números.

"¿Qué tipo de mascota tienes?" es una pregunta que produciría datos categóricos.

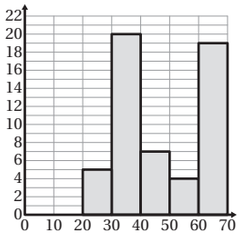
centro Un solo valor que puede utilizarse para resumir el valor típico de un conjunto de datos.

La media y la mediana son medidas de tendencia central, o sea, medidas de centro.



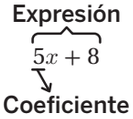
agrupación Un grupo de valores de datos que están próximos entre sí.

Por ejemplo, este histograma muestra una agrupación entre 30 y 40, y entre 60 y 70.



coeficiente Un número que se multiplica por una variable. Por lo general, no hay ningún símbolo entre el coeficiente y la variable.

En la expresión $5x + 8$, el coeficiente de x es 5.



Glossary/Glosario

English

common denominator The denominator is the bottom number in a fraction. Two fractions have a common denominator when their denominators are the same.

For example, $\frac{3}{4}$ and $\frac{5}{4}$ have a common denominator because they each split the whole into fourths.

common factor When two numbers have the same factor, we call that a common factor.

For example, the factors of 8 are 1, 2, 4, and 8 and the factors of 12 are 1, 2, 3, 4, 6, and 12.

Since 2 is a factor of 8 and also of 12, 2 is a common factor of 8 and 12.

common multiple When two numbers have the same multiple, we call that a common multiple.

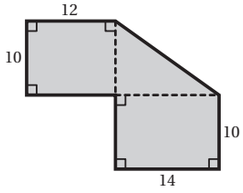
For example, 12 is a multiple of 2 and also of 3, so 12 is a common multiple of 2 and 3.

commutative property The property says $a + b = b + a$ and $a \cdot b = b \cdot a$. This means that expressions with addition or multiplication have the same sum or product no matter what order the numbers are in.

For example, $2 + 1 = 1 + 2$ or $3 \cdot 4 = 4 \cdot 3$.

composite figure A two- or three-dimensional figure that can be decomposed into smaller figures.

The composite figure can be decomposed into 2 rectangles and a triangle.



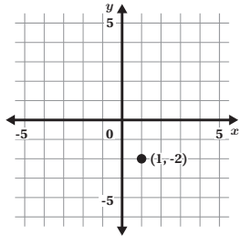
constant A value that does not change. In an algebraic expression, the constant term does not contain a variable.

In the expression $7x + 9$, 9 is the constant term.

In the expression $5x - 8$, -8 is the constant term.

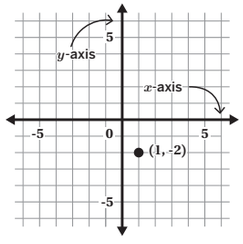
In the expression $12 - 4x$, 12 is the constant term.

coordinate plane The coordinate plane consists of two axes that intersect at 0: one horizontal (often called the x-axis) and one vertical (often called the y-axis).



coordinates A pair of numbers that shows an exact position on the coordinate plane. The first number represents a position on the x-axis and is called the x-coordinate. The second number represents a position on the y-axis and is called the y-coordinate.

The coordinates of the point on the graph are $(1, -2)$.



Español

denominador común El denominador es el número de abajo en una fracción. Dos fracciones tienen un denominador común cuando los denominadores son iguales.

Por ejemplo, $\frac{3}{4}$ y $\frac{5}{4}$ tienen un denominador común porque cada uno divide el todo en cuartos.

factor común Cuando dos números tienen el mismo factor, lo llamamos factor común.

Por ejemplo, los factores de 8 son 1, 2, 4 y 8 y los factores de 12 son 1, 2, 3, 4, 6 y 12.

Ya que 2 es un factor de 8 y también de 12, 2 es un factor común de 8 y 12.

múltiplo común Cuando dos números tienen el mismo múltiplo, lo llamamos múltiplo común.

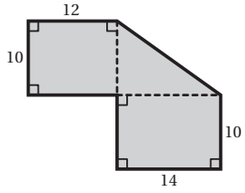
Por ejemplo, 12 es un múltiplo de 2 y también de 3, por lo tanto, 12 es un múltiplo común de 2 y 3.

propiedad conmutativa La propiedad indica que $a + b = b + a$ y $a \cdot b = b \cdot a$. Esto significa que las expresiones en las que se suma o se multiplica tienen la misma suma o el mismo producto, independientemente del orden en el que estén los números.

Por ejemplo, $2 + 1 = 1 + 2$ o $3 \cdot 4 = 4 \cdot 3$.

figura compuesta Figura bidimensional o tridimensional que puede descomponerse en figuras más pequeñas.

La figura compuesta se puede descomponer en 2 rectángulos y un triángulo.



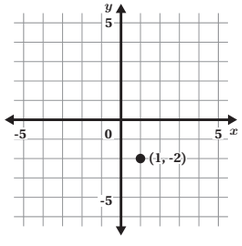
constante Un valor que no cambia. En una expresión algebraica, el término constante no contiene una variable.

En la expresión $7x + 9$, 9 es el término constante.

En la expresión $5x - 8$, -8 es el término constante.

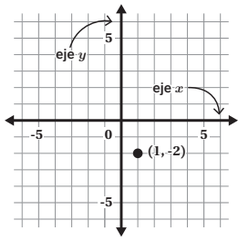
En la expresión $12 - 4x$, 12 es el término constante.

plano de coordenadas El plano de coordenadas consta de dos ejes que se intersecan en 0: uno horizontal (a menudo llamado el eje x) y uno vertical (a menudo llamado el eje y).



coordenadas Un par de números que muestran una posición exacta en el plano de coordenadas. El primer número representa una posición en el eje x y se denomina coordenada x. El segundo número representa una posición en el eje y y se denomina coordenada y.

Las coordenadas del punto en la gráfica son $(1, -2)$.

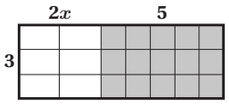


English

D

decompose Decompose means "take apart." We use the word *decompose* to describe taking a figure apart to make more than one new shape.

distributive property The property that says $a(b + c) = ab + ac$. This means that multiplying a number by the sum of two or more terms is equal to multiplying the number by each term separately before adding the products together.



Area as a Product
$3(2x + 5)$

For example, $3(2x + 5) = 3 \cdot 2x + 3 \cdot 5 = 6x + 15$.

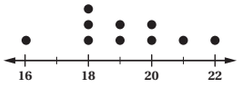
dividend The number in a division statement that is being divided.

For example, in the equation $12 \div 3 = 4$, the dividend is 12.

divisor In a division statement, the divisor describes the number of equal-sized groups or the size of each group being created.

For example, in the equation $12 \div 3 = 4$, the divisor is 3.

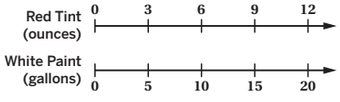
dot plot A way to visualize numerical data sets, where each data point is represented by a dot on a number line. Data points with the same value are stacked on top of each other. A dot plot is sometimes called a line plot.



Number of Jelly Beans

For example, this dot plot shows that 3 students guessed that there were 18 jelly beans in a jar.

double number line A pair of parallel number lines showing equivalent ratios. The tick marks are labeled so that the marks that line up vertically are equivalent ratios.



This double number line shows a ratio of 3 ounces of red tint : 5 gallons of white paint.

E

edge Each straight side of a polygon is called an edge. An edge is also a line segment where two faces of a 3-D figure meet.

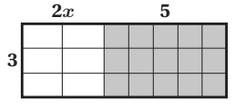
This rectangle has four edges.

Español

D

descomponer Descomponer significa "desmontar." Usamos la palabra *descomponer* para describir que una figura se desmonta para formar más de una figura nueva.

propiedad distributiva La propiedad que indica que $a(b + c) = ab + ac$. Significa que multiplicar un número por la suma de dos o más términos equivale a multiplicar el número por cada término individualmente y luego sumar los productos.



El área como un producto
$3(2x + 5)$

Por ejemplo, $3(2x + 5) = 3 \cdot 2x + 3 \cdot 5 = 6x + 15$.

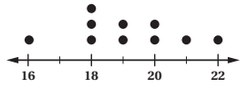
dividendo El número que se está dividiendo en un enunciado de división.

Por ejemplo, en la ecuación $12 \div 3 = 4$, el dividendo es 12.

divisor En un enunciado de división, el divisor describe la cantidad de grupos de igual tamaño o el tamaño de cada grupo que se produce.

Por ejemplo, esta ecuación $12 \div 3 = 4$, el divisor es 3.

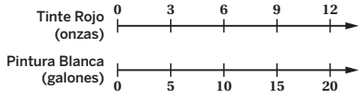
diagrama de puntos Una forma de visualizar conjuntos de datos numéricos, en la que cada punto de datos se representa mediante un punto en una recta numérica. Los puntos de datos con el mismo valor se apilan unos sobre otros. Un diagrama de puntos a veces se conoce como gráfica de puntos.



Cantidad de frijolitos

Por ejemplo, este diagrama de puntos muestra que 3 estudiantes estimaron que había 18 frijolitos de jalea en un tarro.

recta numérica doble Un par de rectas numéricas paralelas que muestran razones equivalentes. Las marcas indicadoras se denominan de forma tal que las marcas alineadas verticalmente sean razones equivalentes.



Esta recta numérica doble muestra una razón de 3 onzas de tinte rojo : 5 galones de pintura blanca.

E

lado, arista Cada borde recto de un polígono se llama arista o lado. Una arista también es un segmento de recta donde se unen dos caras de una figura tridimensional.

Este rectángulo tiene cuatro aristas.

Glossary/Glosario

English

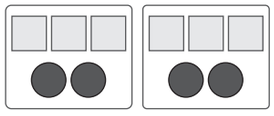
equation A mathematical statement made up of two expressions with an equal sign between them.

For example, $6m + 5 = 17$ and $12 - 15 = -3$ are equations, but $2n$ and $x > 5$ are not equations.

equivalent expressions Expressions that are equal for every value of a variable.

$x + x + x$ is equivalent to $3x$ because they both describe three copies of an unknown number, x.

equivalent ratio Two ratios are equivalent if you can multiply each of the values in the first ratio by the same number to get the values in the second ratio.



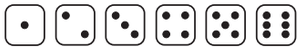
$3 : 2$ is equivalent to $6 : 4$ because $3 \cdot 2 = 6$ and $2 \cdot 2 = 4$.

One lemonade recipe uses 3 cups of water and 2 lemons. Another uses 6 cups of water and 4 lemons. The second recipe will make twice as much lemonade but both recipes will taste the same.

evaluate To evaluate is to determine a single number that represents an expression's value.

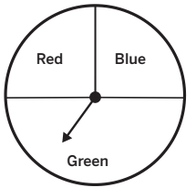
For example, to evaluate $5x + 2$ when $x = 3$, we substitute 3 for x and then calculate $5(3) + 2 = 17$.

event A set of one or more outcomes in a chance experiment.



For example, if we roll a number cube, there are six possible outcomes.

experiment An action or activity that you can do over and over again without knowing what the outcome will be each time.



For example, each time you spin the spinner, it could land on red, blue, or green.

exponent A number used to describe repeated multiplication. Exponents are sometimes called powers.

$2^4 = 16$

For example, $2 \cdot 2 \cdot 2 \cdot 2 = 16$ can be represented by the equation $2^4 = 16$, where 4 is the exponent. We can read this equation as "2 to the power of 4 equals 16" or "2 to the fourth equals 16."

expression A set of numbers, variables, operations, and grouping symbols that represent a quantity.

For example, $2n - 8$ and $21 + 37$ are expressions.

Español

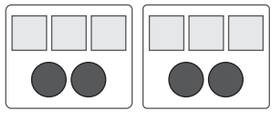
ecuación Un enunciado matemático formado por dos expresiones con un signo igual entre ellas.

Por ejemplo, $6m + 5 = 17$ y $12 - 15 = -3$ son ecuaciones, pero $2n$ y $x > 5$ no son ecuaciones.

expresiones equivalentes Expresiones que son iguales para cualquier valor de una variable.

$x + x + x$ equivale a $3x$ porque ambas describen tres copias de un número desconocido, x.

razón equivalente Dos razones son equivalentes si cada uno de los valores de la primera razón se puede multiplicar por el mismo número para obtener los valores de la segunda razón.



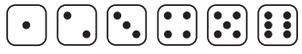
$3 : 2$ es equivalente a $6 : 4$ porque $3 \cdot 2 = 6$ y $2 \cdot 2 = 4$.

Una receta de limonada lleva 3 tazas de agua y 2 limones. Otra lleva 6 tazas de agua y 4 limones. La segunda receta rendirá el doble de limonada, pero ambas tendrán el mismo sabor.

evaluar Evaluar significa determinar el número individual que representa el valor de una expresión.

Por ejemplo, para evaluar $5x + 2$ cuando $x = 3$, sustituimos x por 3 y luego calculamos $5(3) + 2 = 17$.

evento Un conjunto de uno o más resultados en un experimento de azar.



Por ejemplo, si tiramos un dado, hay seis resultados posibles.

experimento Una acción o actividad que se puede llevar a cabo una y otra vez sin saber cuál será el resultado en cada ocasión.

Por ejemplo, cada vez que se gira la ruleta, podría caer en rojo, azul o verde.

exponente Un número que se usa para describir multiplicaciones repetidas. A los exponentes a veces se les conoce como potencias.

$2^4 = 16$

Por ejemplo, $2 \cdot 2 \cdot 2 \cdot 2 = 16$ puede representarse con la ecuación $2^4 = 16$, donde 4 es el exponente. Podemos leer esta ecuación como "2 a la potencia de 4 es igual a 16" o "2 a la cuarta potencia es igual a 16".

expresión Un conjunto de números, variables, operaciones y símbolos de agrupación que representan una cantidad.

Por ejemplo, $2n - 8$ y $21 + 37$ son expresiones.

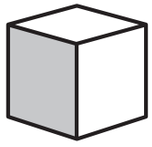
English

Español

F

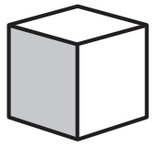
face Each flat side of a polyhedron is called a face.

A cube has six faces and they are all squares.



cara Cada lado plano de un poliedro se llama cara.

Un cubo tiene seis caras y todas son cuadradas.



factor (of a number) A whole number that divides evenly into the given number (with no remainder).

For example, 1, 2, 4, and 8 are all factors of the number 8.

factor (de un número) Un número natural por el que se puede dividir en partes iguales el número dado (sin resto).

Por ejemplo, 1, 2, 4 y 8 son factores del número 8.

frequency table A table that shows the number of times each value or category occurs in a data set.

For example, this frequency table shows that 5 students selected red as their favorite color.

Favorite Color	Frequency
Red	5
Blue	3
Pink	4

tabla de frecuencia Una tabla que muestra el número de veces que aparece cada valor o categoría en un conjunto de datos.

Por ejemplo, esta tabla de frecuencia muestra que 5 estudiantes seleccionaron el rojo como su color favorito.

Color favorito	Frecuencia
Rojo	5
Azul	3
Rosado	4

G

≥ (greater-than-or-equal-to) This symbol means "greater than or equal to."

For example, the inequality $x \geq 3$ says the value of x is either exactly 3 or any value greater than 3.

≥ (mayor que o igual a) Este símbolo significa "mayor que o igual a".

Por ejemplo, la desigualdad $x \geq 3$ indica que el valor de x es exactamente 3 o cualquier valor mayor que 3.

greatest common factor (GCF) The largest number that is a common factor of two numbers.

The common factors of 8 and 12 are 1, 2, and 4. The greatest common factor is 4.

máximo común divisor (MCD) El número mayor que es factor común de dos números.

Los factores comunes de 8 y 12 son 1, 2 y 4. El máximo común divisor es 4.

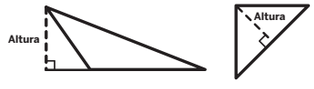
H

height (of a parallelogram) The shortest distance between a base and its opposite side. The height is always perpendicular to the base.

altura (de un paralelogramo) La distancia más corta entre una base y su lado opuesto. La altura siempre es perpendicular a la base.

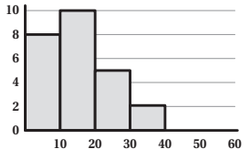
height (of a triangle) The shortest distance between a base and its opposite vertex. Sometimes the height falls outside the shape. The height is always perpendicular to the base.

altura (de un triángulo) La distancia más corta entre una base y su vértice opuesto. A veces, la altura cae fuera de la figura. La altura siempre es perpendicular a la base.



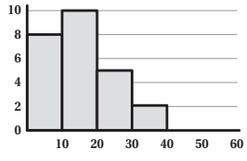
histogram A way to visualize numerical data where the data is grouped into bins represented by rectangles. The height of each rectangle shows how many values are in that bin.

For example, this histogram shows that there are 8 data values from 0 up to (but not including) 10.



histograma Una forma de visualizar datos numéricos en la que los datos se agrupan en intervalos que se representan con rectángulos. La altura de cada rectángulo muestra cuántos valores hay en ese intervalo.

Por ejemplo, este histograma muestra que hay 8 valores de datos del 0 al 10 (sin incluirlo).



Glossary/Glosario

English

Español

I

inequality A comparison statement that uses the symbols $<$ or $>$. Inequalities are used to represent the relationship between numbers, variables, or expressions that are not always equal.

For example, the inequality $y > 30$ means that the value of the expression y is any number greater than 30.

desigualdad Un enunciado de comparación que utiliza los símbolos $<$ o $>$. Las desigualdades se usan para representar la relación entre números, variables o expresiones que no siempre son iguales.

Por ejemplo, la desigualdad $y > 30$ significa que el valor de la expresión y es cualquier número mayor que 30.

integers All whole numbers and their opposites.

For example, 35, -15, and 1 are integers. 0.3 and $\frac{1}{3}$ are not.

enteros Todos los números enteros y sus opuestos.

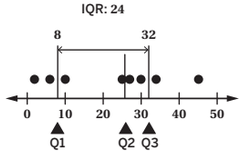
Por ejemplo, 35, -15 y 1 son números enteros. 0.3 y $\frac{1}{3}$ no lo son.

interest The extra money that you pay on a loan or the money that you earn when you save or invest.

interés El dinero extra que pagas por un préstamo o el dinero que ganas cuando ahorras o inviertes.

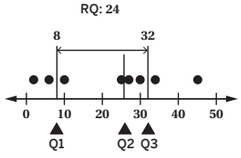
interquartile range (IQR) A measure of spread. The IQR is calculated as the distance from Q1 to Q3, or the width of the box in a box plot.

For example, the IQR of this data set is $32 - 8 = 24$.



rango intercuartílico (RQ) Una medida de dispersión. El RQ se calcula como la distancia de Q1 a Q3, o el ancho de la caja en un diagrama de caja.

Por ejemplo, el RQ de este conjunto de datos es $32 - 8 = 24$.



L

least common multiple (LCM) The smallest number that is a common multiple of two numbers.

The common multiples of 2 and 3 are $6, 12, 18, \ldots$
The least common multiple is 6.

mínimo común múltiplo (MCM) El número menor que es múltiplo común de dos números.

Los múltiplos comunes de 2 y 3 son $6, 12, 18\ldots$
El mínimo común múltiplo es 6.

≤ (less-than-or-equal-to) This symbol means "less than or equal to."

For example, the inequality $x \leq 9$ says the value of x is either exactly 9 or any value less than 9.

≤ (menor que o igual a) Este símbolo significa "menor que o igual a".

Por ejemplo, la desigualdad $x \leq 9$ indica que el valor de x es exactamente 9 o cualquier valor menor que 9.

like terms Terms with variables and exponents that are the same.

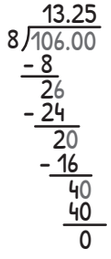
For example, $8x$ and $12x$ are like terms because both terms have a variable of x. $3x$ and $3x^2$ are not like terms because they have different exponents.

términos semejantes Términos con variables y exponentes iguales.

Por ejemplo, $8x$ y $12x$ son términos semejantes porque ambos tienen una variable que incluye x. $3x$ y $3x^2$ no son términos semejantes porque tienen exponentes diferentes.

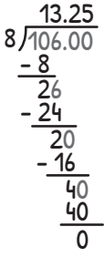
long division A way to divide numbers. When we use long division, we determine the quotient one digit at a time, from left to right.

For example, here is the long division for $106 \div 8$.



división larga Una forma de dividir números. Al usar la división larga, determinamos el cociente de izquierda a derecha, un dígito a la vez.

Por ejemplo, esta es la división larga de $106 \div 8$.



M

markdown The amount of decrease between the original price of an item and its sale price.

rebaja El monto de descuento entre el precio original de un artículo y su precio de venta.

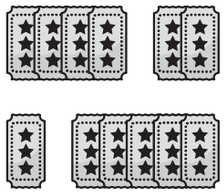
markup The amount of increase between the store's cost of an item and the item's selling price.

sobreprecio La cantidad de aumento entre el costo de un artículo en la tienda y el precio de venta del artículo.

English

maximum The greatest value in a data set.

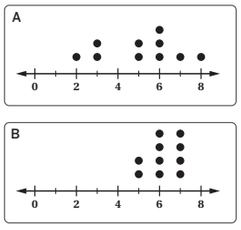
mean (average) A measure of center. If you equally distribute a set of items into different groups, the mean is the number of items in each group. It is also the balance point of a dot plot. To calculate the mean, you can add the values of all the data points, then divide by the number of data points.



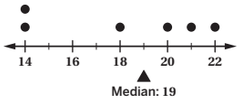
The mean in this example is 3 tickets because that is the number each person would get if the tickets were distributed equally among four people.

measure of center A single number that summarizes all of the values in a data set. It is usually a typical value for a data set. Mean and median are measures of center.

measure of spread A single number that describes the spread of a data set. Range and interquartile range are measures of spread.



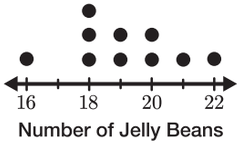
median A measure of center. It is the middle value of a data set when the values are in numerical order. When there is an even number of data points, the median is the average of the two middle values.



The median of this data set is 19 because it is the average of the two middle values: 18 and 20.

minimum The least value in a data set.

mode A measure of center. It is the value that occurs most often in a data set. There may be no mode, one mode, or more than one mode.



For example, the mode of this data set is 18 jelly beans because the value 18 occurs more times than any other data value.

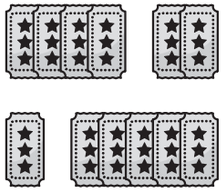
multiple The result of multiplying a number by a whole number.

For example, 10, 15, and 20 are all multiples of the number 5.

Español

máximo El mayor valor en un conjunto de datos.

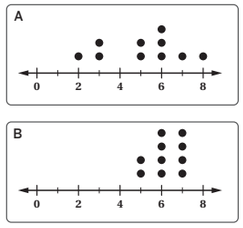
media (promedio) Una medida de tendencia central. Si se distribuye equitativamente un conjunto de elementos en diferentes grupos, la media es la cantidad de elementos en cada grupo. También es el punto de equilibrio de un diagrama de puntos. Para calcular la media, se pueden sumar los valores de todos los puntos de datos y luego dividir por la cantidad de puntos de datos.



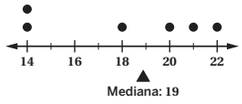
La media en este ejemplo es 3 boletos porque es la cantidad que obtendría cada persona si los boletos se distribuyeran equitativamente entre cuatro personas.

medida de tendencia central, medida de centro Un solo número que resume todos los valores de un conjunto de datos. Suele ser un valor típico de un conjunto de datos. La media y la mediana son medidas de tendencia central.

medida de dispersión Un solo número que describe la dispersión de un conjunto de datos. El rango y el rango intercuartílico son medidas de dispersión.



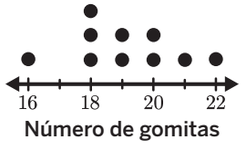
mediana Una medida de tendencia central. Es el valor del medio de un conjunto de datos cuando los valores se clasifican en orden numérico. Cuando hay un número par de puntos de datos, la mediana es el promedio de los dos números centrales.



La mediana de este conjunto de datos es 19 porque es el promedio de los dos valores centrales: 18 y 20.

mínimo El menor valor en un conjunto de datos.

moda Una medida de centro. Es el valor que aparece con mayor frecuencia en un conjunto de datos. Puede no haber ninguna moda, haber una moda o más de una moda.



Por ejemplo, la moda de este conjunto de datos es 18 gomitas, porque el valor 18 aparece más veces que cualquier otro valor de datos.

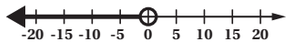
múltiplo El resultado de multiplicar un número por un número natural.

Por ejemplo, 10, 15 y 20 son múltiplos del número 5.

Glossary/Glosario

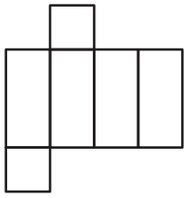
N

negative number A number that is less than 0. On a horizontal number line, negative numbers are to the left of 0.



net A two-dimensional representation of a three-dimensional shape. It can be folded to make a polyhedron.

Here is a net for a rectangular prism.

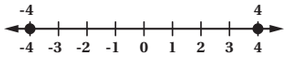


numerical data Data that includes values that are numbers and can be measured and meaningfully compared.

"How many pets do you have?" is a question that would result in numerical data.

O

opposite Two numbers that are the same distance from 0 and on different sides of 0 on the number line are opposites.



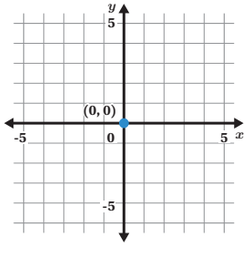
For example, 4 and -4 are opposites.

order of operations A consistent order applied to an expression with multiple operations so that the expression is evaluated the same way by everyone. The standard order of operations is parentheses/grouping symbols, exponents/roots, multiplication/division, and then addition/subtraction.

ordered pair Two values of x and y, written as (x, y), that represent a point on the coordinate plane.

For example, $(3, 5)$ represents the point where $x = 3$ and $y = 5$.

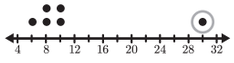
origin The point $(0, 0)$ on the coordinate plane. This is where the x-axis and the y-axis intersect.



outcome One of the possible results of an experiment.

For example, the possible outcomes of tossing a coin are heads and tails.

outlier A data value that is far from the other values in a data set.

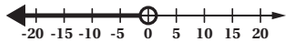


The circled point is an outlier.

Español

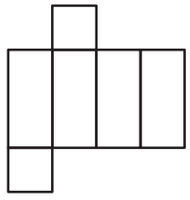
N

número negativo Un número que es menor que 0. En una recta numérica horizontal, los números negativos están a la izquierda del 0.



red Una representación bidimensional de una figura tridimensional. Puede plegarse para formar un poliedro.

Esta es una red de un prisma rectangular.

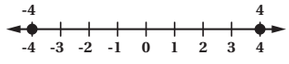


datos numéricos Datos que incluyen valores numéricos que pueden medirse y compararse de forma significativa.

"¿Cuántas mascotas tienes?" es una pregunta que produciría datos numéricos.

O

opuesto Dos números son opuestos si están a la misma distancia del 0 y en diferentes lados del 0 en la recta numérica.



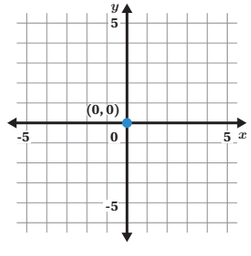
Por ejemplo, 4 y -4 son opuestos.

orden de las operaciones Un orden coherente aplicado a una expresión con múltiples operaciones para que cualquiera pueda evaluar la expresión de la misma manera. El orden estándar de las operaciones es paréntesis/símbolos de agrupación, exponentes/raíces, multiplicación/división y, luego, suma/resta.

par ordenado Dos valores de x y y, escritos como (x, y), que representan un punto en el plano de coordenadas.

Por ejemplo, $(3, 5)$ representa el punto donde $x = 3$ y $y = 5$.

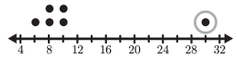
origen El punto $(0, 0)$ en el plano de coordenadas. El punto en el que se intersecan los ejes x y y.



resultado Uno de los posibles resultados de un experimento.

Por ejemplo, los posibles resultados de lanzar una moneda son cara y sello.

valor atípico Un valor de datos que está lejos de los demás valores del conjunto de datos.



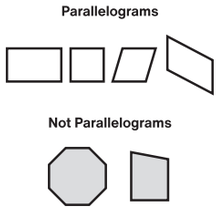
El punto encerrado en un círculo es un valor atípico.

English

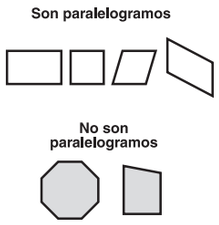
Español

P

parallelogram A quadrilateral that has two pairs of parallel sides. Opposite, or parallel, sides of a parallelogram are the same length.



paralelogramo Un cuadrilátero que tiene dos pares de lados paralelos. Los lados opuestos, o paralelos, de un paralelogramo tienen la misma longitud.



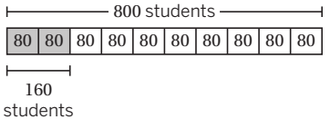
per The word *per* means "for each."

For example, if the price is $5 per ticket, that means that each ticket costs $5. Buying 4 tickets would cost $5 \cdot 4 = \$20$.

por, por cada La palabra *por* puede significar "por cada".

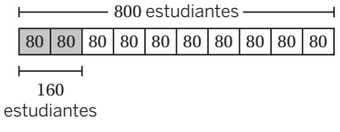
Por ejemplo, si el precio es $5 por boleto, esto significa que cada boleto cuesta $5. Comprar 4 boletos costaría $5 \cdot 4 = \$20$.

percent (percentage) Percent means "for every 100." It is represented by the percent symbol, %. We use percentages to represent ratios and fractions.



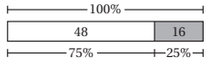
For example, 20% means 20 for every 100. 20% of a number means $\frac{20}{100}$ or $\frac{1}{5}$ of that number. Let's say there are 800 students in a school. If 20% of them are on a field trip, that means 160 students because 20 students are on the trip for every 100 students total.

por ciento (porcentaje) Por ciento significa "por cada 100". Se representa con el símbolo de porcentaje, %. Usamos porcentajes para representar razones y fracciones.



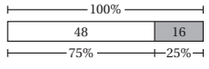
Por ejemplo, 20% significa 20 por cada 100. 20% de un número significa $\frac{20}{100}$ o $\frac{1}{5}$ de dicho número. Supongamos que hay 800 estudiantes en una escuela. Si el 20% de ellos está en una excursión, eso significa 160 estudiantes porque 20 están de viaje por cada 100 estudiantes.

percent decrease How much a quantity goes down, expressed as a percentage of the starting amount.



For example, a store had 64 hats in stock on Friday. They had 48 hats left on Saturday. The amount of hats went down by 16. This was a 25% decrease because 16 is 25% of 64.

disminución porcentual Describe cuánto disminuye una cantidad, expresada como un porcentaje de la cantidad inicial.



Por ejemplo, una tienda tenía 64 sombreros en inventario el viernes. El sábado le quedaban 48 sombreros. La cantidad de sombreros se redujo en 16. Fue una disminución del 25% porque 16 es el 25% de 64.

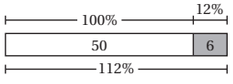
percent error A way to describe the difference between a desired value and the actual value, expressed as a percent of the desired value.

For example, a box is supposed to have 150 folders in it. Clare counts only 147 folders in the box. This is an error of 3 folders. The percent error is 2% because 3 is 2% of 150. $\frac{3}{150} = 0.02 = 2\%$

porcentaje de error, error porcentual Una forma de describir la diferencia entre un valor deseado y el valor real, expresada como un porcentaje del valor deseado.

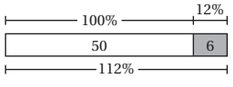
Por ejemplo, se supone que una caja contiene 150 carpetas. Clare cuenta solo 147 carpetas en la caja. Ese es un error de 3 carpetas. El porcentaje de error es del 2% porque 3 es el 2% de 150. $\frac{3}{150} = 0.02 = 2\%$

percent increase How much a quantity goes up, expressed as a percentage of the starting amount.



For example, Elena had $50 on Monday. She helped a neighbor, so she had $56 on Tuesday. The amount went up by $6. This was a 12% increase because 6 is 12% of 50. $\frac{6}{50} = 0.12 = 12\%$

aumento porcentual Cuánto aumenta una cantidad, expresada como un porcentaje de la cantidad inicial.

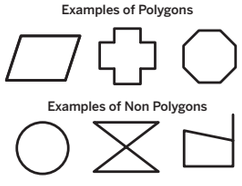


Por ejemplo, Elena tenía $50 el lunes. Ayudó a un vecino, así que el martes tenía $56. La cantidad aumentó en $6. Fue un aumento del 12% porque 6 es el 12% de 50. $\frac{6}{50} = 0.12 = 12\%$

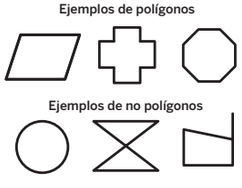
perpendicular Describes a line that crosses or meets another line at a 90° angle.

perpendicular Describe una línea que cruza o se une con otra línea formando un ángulo de 90°.

polygon A closed two-dimensional shape with straight sides that do not cross each other.



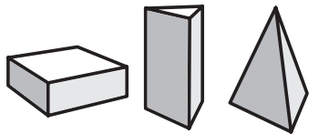
polígono Una figura bidimensional cerrada con lados rectos que no se cruzan.



Glossary/Glosario

English

polyhedron A polyhedron is a closed three-dimensional shape with flat sides. The plural of polyhedron is polyhedra. Prisms and pyramids are types of polyhedra.

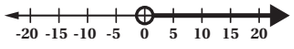


Here are some drawings of polyhedra.

population A set of people or things that are being studied.

For example, if we want to study the heights of people on different sports teams, the population would be all the people on the teams.

positive number A number that is greater than 0. On a horizontal number line, positive numbers are to the right of 0.



prime factorization The expression of a number as the product of prime factors.

The prime factorization of 28 is $2 \cdot 2 \cdot 7$.

principal The total amount (initial value) of money borrowed or invested, not including any interest.

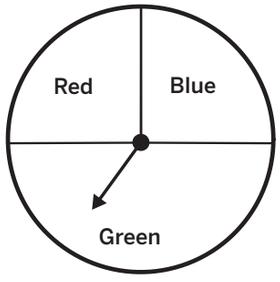
prism A three-dimensional shape, or polyhedron, with two bases that are identical copies.

Triangular Prism

Hexagonal Prism

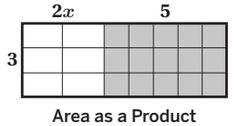
probability A number that tells us howlikely an event is to happen. A probability of 1 means the event is certain. A probability of 0 means the event is impossible.

For example, the probability of spinning red is $\frac{1}{4}$.



product The value of two or more quantities when multiplied.

For example, the area of this rectangle is the product of 3 and $2x + 5$ or $3(2x + 5)$.



Area as a Product
$3(2x + 5)$

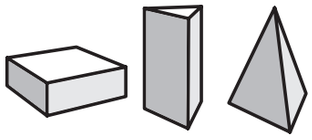
profit The money left after paying for business expenses.

proportional Quantities are proportional if they form equivalent ratios.

For example, the heights and bases of these triangles are proportional because the ratio $6 : 12$ is equivalent to $4 : 8$.

Español

poliedro Un poliedro es una figura tridimensional cerrada con caras planas. En inglés, usamos las palabras polyhedron (singular) y polyhedra (plural). Los prismas y las pirámides son tipos de poliedros.



Estos son algunos dibujos de poliedros.

población Conjunto de personas o cosas que se estudian.

Por ejemplo, si queremos estudiar las alturas de las personas de diferentes equipos deportivos, la población sería todas las personas de los equipos.

número positivo Un número que es mayor que 0. En una recta numérica horizontal, los números positivos están a la derecha del 0.

factorización prima La expresión de un número como producto de factores primos.

La factorización prima de 28 es $2 \cdot 2 \cdot 7$.

principal La cantidad total (valor inicial) de un préstamo o una inversión de dinero, excluyendo los intereses.

prisma Una figura tridimensional, o poliedro, con dos bases que son copias idénticas.

Prisma triangular

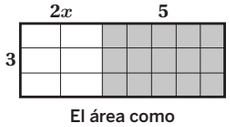
Prisma hexagonal

probabilidad Número que indica qué tan probable es que ocurra un evento.Una probabilidad de 1 significa que el evento es seguro. Una probabilidad de 0 significa que el evento es imposible.

Por ejemplo, la probabilidad de girar y que caiga rojo es $\frac{1}{4}$.

producto El valor de dos o más cantidades cuando se multiplican.

Por ejemplo, el área de este rectángulo es el producto de 3 y $2x + 5$ o $3(2x + 5)$.



El área como un producto
$3(2x + 5)$

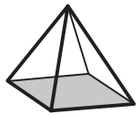
ganancia El dinero que sobra después de pagar los gastos del negocio.

proporcional Diferentes cantidades son proporcionales si forman razones equivalentes.

Por ejemplo, las alturas y las bases de estos triángulos son proporcionales porque la relación $6 : 12$ es equivalente a $4 : 8$.

English

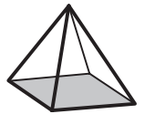
pyramid A three-dimensional shape, or polyhedron, that has one base. All of the other faces are triangles that meet at a single vertex.



Pyramid

Español

pirámide Una figura tridimensional, o poliedro, que tiene solo una base. Todas las demás caras son triángulos que se unen en un único vértice.

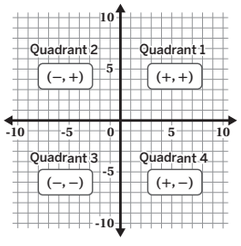


Pirámide

Q

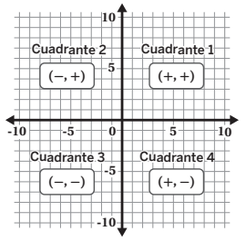
quadrant The coordinate plane is divided into 4 regions called quadrants.

The image shows each quadrant, along with the sign of the x- and y-values in that quadrant.



cuadrante El plano de coordenadas se divide en 4 regiones llamadas cuadrantes.

La imagen muestra cada cuadrante junto con el signo de los valores x y y del cuadrante correspondiente.



quadrilateral A polygon that has four sides.

Squares, rectangles, and parallelograms are examples of quadrilaterals.

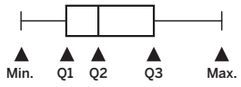
cuadrilátero Un polígono que tiene cuatro lados.

Los cuadrados, rectángulos y paralelogramos son ejemplos de cuadriláteros.

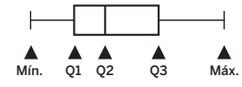
quantity The amount or the number of a thing.

cantidad Cierta cantidad o número de algo.

quartile Quartiles divide an ordered data set into four equal sections.
Quartile 1 (Q1) is the median of the lower half of the data.
Quartile 2 (Q2) is the median.
Quartile 3 (Q3) is the median of the upper half of the data.



cuartil Los cuartiles dividen un conjunto de datos ordenado en cuatro secciones iguales.
El cuartil 1 (Q1) es la mediana de la mitad inferior de los datos.
El cuartil 2 (Q2) es la mediana.
El cuartil 3 (Q3) es la mediana de la mitad superior de los datos.



quotient The result of dividing two numbers is called the quotient.

For example, in the equation $12 \div 3 = 4$, the quotient is 4.

cociente Se denomina cociente al resultado de dividir dos números.

Por ejemplo, en la ecuación $12 \div 3 = 4$, el cociente es 4.

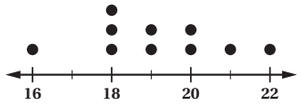
R

random Outcomes of a chance experiment are random if they are all equally likely to happen.

aleatorio Los resultados de un experimento de azar son aleatorios si todos tienen la misma probabilidad de suceder.

range A measure of spread. It is the difference between the maximum and minimum values in a data set.

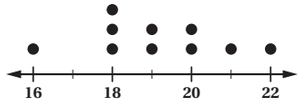
For example, the range of this data set is 6 jelly beans because $22 - 16 = 6$.



Number of Jelly Beans

rango Una medida de dispersión. Es la diferencia entre los valores máximo y mínimo de un conjunto de datos.

Por ejemplo, el rango de este conjunto de datos es 6 frijolitos de jalea porque $22 - 16 = 6$.



Cantidad de frijolitos

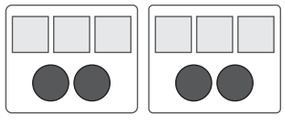
rate A comparison, or ratio, that describes how two quantities change together.

tasa Una comparación, o razón, que describe cómo cambian juntas dos cantidades.

Glossary/Glosario

English

ratio A ratio $a : b$ is a relationship between two quantities. For every a of the first, there are b of the second.



There are several ways to describe ratios.
- For every 3 squares, there are 2 circles.
- The ratio of squares to circles is 3 to 2.
- The ratio of squares to circles is $3 : 2$.

If the ratio of apples to oranges in a fruit bowl is $2 : 3$, then for every 2 apples, there are 3 oranges.

rational number Any number that can be written as a fraction, including whole numbers and negative numbers.

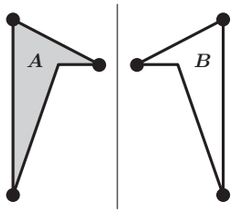
For example, -10, 2.5, $\frac{3}{7}$, and 82 are all rational numbers.

rearrange Change the position of something. We use the word *rearrange* to describe moving pieces of a figure to make a new shape.

reciprocal The reciprocal of a fraction $\frac{a}{b}$ is $\frac{b}{a}$. The product of two fractions that are reciprocals of one another is 1.

For example, $\frac{3}{2}$ and $\frac{2}{3}$ are reciprocals because $\frac{3}{2} \cdot \frac{2}{3} = 1$.

reflection A reflection moves each point on a figure across a line of reflection to a point on the opposite side of the line. The new point is the same distance from the line as it was in the original figure.



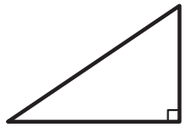
This diagram shows a reflection of A over a line that makes the mirror image B.

relative frequency The number of times an outcome happens divided by the number of repeated experiments. After several experiments, the relative frequency of an outcome gets close to its probability.

For example, if you spin a spinner 12 times and it lands on red 5 times, that means the relative frequency of landing on red is $\frac{5}{12}$.

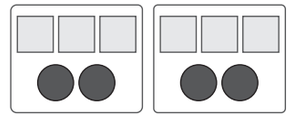
rhombus A quadrilateral containing four equal-length sides.

right triangle A triangle containing an interior right angle, or angle measuring exactly $90°$.



Español

razón Una razón $a : b$ es una relación entre dos cantidades. Por cada a del primero, hay b del segundo.



Hay varias formas de describir razones.
- Por cada 3 cuadrados hay 2 círculos.
- La razón de cuadrados a círculos es de 3 a 2.
- La razón de cuadrados a círculos es $3 : 2$.

Si la razón de manzanas a naranjas en un frutero es $2 : 3$, entonces por cada 2 manzanas hay 3 naranjas.

número racional Cualquier número que pueda escribirse como una fracción, incluidos los números enteros y los números negativos.

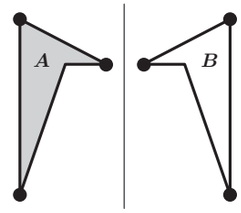
Por ejemplo, -10, 2.5, $\frac{3}{7}$ y 82 son números racionales.

reordenar Cambiar la posición de algo. Usamos la palabra *reordenar* para describir el movimiento de las partes de una figura para formar una nueva figura.

recíproco El recíproco de una fracción $\frac{a}{b}$ es $\frac{b}{a}$. El producto de dos fracciones que son recíprocas entre sí es 1.

Por ejemplo, $\frac{3}{2}$ y $\frac{2}{3}$ son recíprocos porque $\frac{3}{2} \cdot \frac{2}{3} = 1$.

reflexión Una reflexión mueve cada punto de una figura sobre una línea de reflexión a un punto en el lado opuesto de la línea. El nuevo punto está a la misma distancia de la línea que estaba en la figura original.

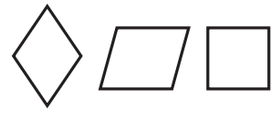


Este diagrama muestra una reflexión de A sobre una línea que produce la imagen espejo B.

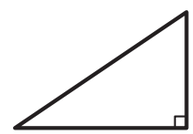
frecuencia relativa El número de veces que se produce un resultado dividido por el número de experimentos repetidos. Al cabo de varios experimentos, la frecuencia relativa de un resultado se aproxima a su probabilidad.

Por ejemplo, si se hace girar una ruleta 12 veces y cae en rojo 5 veces, la frecuencia relativa de que caiga en rojo es $\frac{5}{12}$.

rombo Un cuadrilátero que contiene cuatro lados de igual longitud.



triángulo recto Un triángulo que contiene un ángulo recto interior o un ángulo que mide exactamente $90°$.



S

sample A part of a population.

For example, a population could be all the seventh grade students at one school. One sample of that population is all the seventh grade students who are in band.

muestra Una parte de una población.

Por ejemplo, una población podría ser todos los estudiantes de séptimo grado de una escuela. Una muestra de esa población son todos los estudiantes de séptimo grado que están en la banda.

English

sample space The list of every possible outcome for a chance experiment.

For example, the sample space for tossing two coins is: heads-heads, tails-heads, heads-tails, tails-tails.

shape A description of the distribution (or pattern) of the data within a data set. Descriptions of the shape of a distribution can include: symmetry, skew, clusters, and outliers.

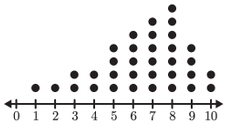
sign The sign of a number (other than 0) is either positive or negative.

For example, the sign of 4 or $+4$ is positive. The sign of -4 is negative.

simple interest Interest that is calculated solely based on the initial amount.

$I = prt$, where I = interest, p = principal, r = rate, and t = time

skewed A data distribution where there are more values concentrated on one end of the data and few values on the other end.



solution to an equation A value of a variable that makes the equation true. "Solving an equation" is any work you do to answer the question "Which values make the equation true?"

$$3x = 15$$
$$x = 15$$
$$3(5) = 15$$

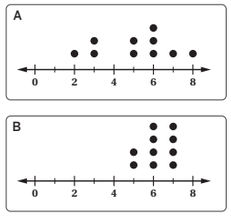
For example, 5 is a solution to the equation $3x = 15$ because $3(5) = 15$ is true. 6 is not a solution to the equation $3x = 15$ because $3(6) = 15$ is not true.

solution to an inequality Any value of a variable that makes the inequality true.

For example, 5 is a solution to the inequality $x < 10$ because $5 < 10$. Some other solutions to $x < 10$ are 9.99, 0, and -4.

spread A description of how alike or different the values in a distribution are, often in relation to the center. The spread also describes the variability of a distribution.

For example, Dot Plot A has a larger spread than Dot Plot B.



statistic A single number that measures something about a data set.

Examples of statistics include: mean, median and IQR.

Español

espacio muestral La lista de todos los posibles resultados de un experimento de azar.

Por ejemplo, el espacio muestral del lanzamiento de dos monedas es: cara-cara, sello-cara, cara-sello, sello-sello.

figura Una descripción de la distribución (o patrón) de los datos en un conjunto de datos. Las descripciones de la forma de una distribución pueden incluir: simetría, asimetría, agrupaciones y valores atípicos.

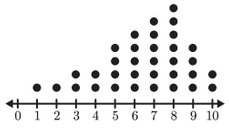
signo El signo de un número (que no sea 0) es positivo o negativo.

Por ejemplo, el signo de 4 o $+4$ es positivo. El signo de -4 es negativo.

interés simple Interés que se calcula solo según la cantidad inicial.

$I = prt$, donde I = interés, p = principal, r = tasa y t = tiempo

asimétrico Una distribución de datos en la que hay valores concentrados en un extremo de los datos y pocos valores en el otro extremo.



solución de una ecuación Un valor de una variable que hace que la ecuación sea verdadera. "Resolver una ecuación" es cualquier trabajo que se hace para responder la pregunta: "¿Qué valores hacen que la ecuación sea verdadera?".

$$3x = 15$$
$$x = 15$$
$$3(5) = 15$$

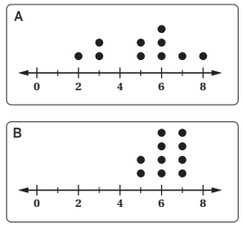
Por ejemplo, 5 es una solución de la ecuación $3x = 15$ porque $3(5) = 15$ es verdadero. 6 no es una solución de la ecuación $3x = 15$ porque $3(6) = 15$ no es verdadero.

solución de una desigualdad Cualquier valor de una variable que hace que la desigualdad sea verdadera.

Por ejemplo, 5 es una solución de la desigualdad $x < 10$ porque $5 < 10$. Algunas otras soluciones de $x < 10$ son 9.99, 0 y -4.

dispersión Una descripción de las semejanzas o diferencias de los valores en una distribución, a menudo en relación con el centro. La dispersión también describe la variabilidad de una distribución.

Por ejemplo, el diagrama de puntos A tiene una dispersión mayor que el diagrama de puntos B.



dato estadístico, estadística Un número único que mide algo de un conjunto de datos.

Ejemplos de datos estadísticos: media, mediana y RQ.

Glossary/Glosario

English

statistical question A question that requires more than one piece of data to answer.

Here are some examples of statistical questions:
- What is the most popular band at your school?
- When do students in your class typically eat dinner?

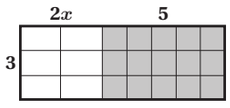
substitute To replace a variable with a value or other expression.

$$4x = 4(5)$$
$$= 20$$

In this example, 5 is substituted for x in the expression $4x$.

sum The value of two or more quantities when added together.

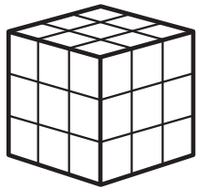
For example, the area of this rectangle is the sum of $6x$ and 15, or $6x + 15$.



Area as a Sum
$6x + 15$

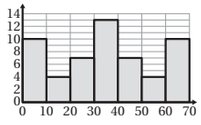
surface area The sum of the areas of a polyhedron's faces.

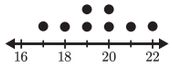
If the six faces of a cube each have an area of 9 square centimeters, then the surface area of the cube is $6 \cdot 9$, or 54 square centimeters.



symmetry (of a data distribution) A property of a data display where the left side of the distribution is a mirror image of the right side.

Here are some examples of data distributions that have symmetry.





Español

pregunta estadística Una pregunta que requiere más de un dato para responder.

Estos son algunos ejemplos de preguntas estadísticas:
- ¿Cuál es la banda más popular en tu escuela?
- ¿Cuándo suelen cenar los estudiantes de tu clase?

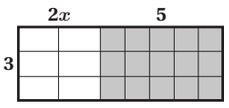
sustituir Reemplazar una variable por un valor u otra expresión.

$$4x = 4(5)$$
$$= 20$$

En este ejemplo, el 5 sustituye a la x en la expresión $4x$.

suma El valor de dos o más cantidades que se suman.

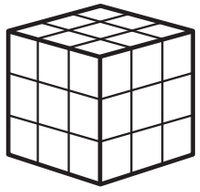
Por ejemplo, el área de este rectángulo es la suma de $6x$ y 15, o $6x + 15$.



El área como una suma
$6x + 15$

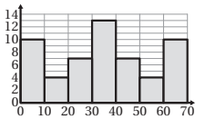
área de superficie La suma de las áreas de sus caras.

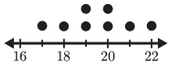
Si cada una de las seis caras de un cubo tiene un área de 9 centímetros cuadrados, el área de superficie del cubo mide $6 \cdot 9$, o 54 centímetros cuadrados.



simetría (de una distribución de datos) Una propiedad de una representación de datos donde el lado izquierdo de la distribución es una imagen reflejada del lado derecho.

Estos son algunos ejemplos de distribuciones de datos que tienen simetría.





T

table A table organizes information into horizontal rows and vertical columns. The first row or column usually tells what the numbers represent.

Here is a table showing the tail lengths of three different pets. This table has four rows and two columns.

Pet	Tail Length (in.)
Dog	22
Cat	12
Mouse	2

term A part of an expression. A term can be a single number, a variable, or a number and variable multiplied together.

For example, the expression $5x + 8$ has two terms. The first term is $5x$ and the second term is 8.

Expression
$5x + 8$
Terms

trapezoid A quadrilateral with *at least* one pair of parallel sides.

tabla Una tabla organiza la información en filas horizontales y columnas verticales. La primera fila o columna suele indicar lo que representan los números.

Esta es una tabla que muestra la longitud de la cola de tres mascotas diferentes. Esta tabla tiene cuatro filas y dos columnas.

Mascota	Longitud de cola (pulg.)
Perro	22
Gato	12
Ratón	2

término Una parte de una expresión. Un término puede ser un número individual, una variable, o una variable y un número multiplicados.

Por ejemplo, la expresión $5x + 8$ tiene dos términos. El primer término es $5x$ y el segundo término es 8.

Expresión
$5x + 8$
Términos

trapezoide Un cuadrilátero con al menos un par de lados paralelos.

U

unit price The price per unit of an item. You can count how many units by counting the items or the weight.

For example, if 4 avocados cost $12, then the unit price is $\frac{12}{4} = \$3$ per avocado.

unit rate A rate that describes how one quantity changes when the other quantity changes by exactly 1 unit.

For example, if 12 people share 3 pizzas equally, then one unit rate is 4 people per pizza. Another unit rate in this situation is $\frac{1}{4}$ pizza per person.

precio unitario El precio por unidad de un artículo. Puedes contar la cantidad de unidades contando los artículos o el peso.

Por ejemplo, si 4 aguacates cuestan $12, el precio unitario es $\frac{12}{4} = \$3$ por aguacate.

tasa unitaria Una tasa que describe cómo cambia una cantidad cuando la otra cantidad cambia en exactamente 1 unidad.

Por ejemplo, si 12 personas se reparten 3 pizzas en partes iguales, entonces una tasa unitaria es 4 personas por pizza. Otra tasa unitaria en esta situación es $\frac{1}{4}$ de pizza por persona.

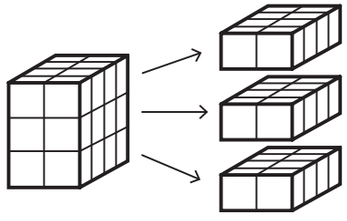
V

variable A letter or symbol that represents a value or set of values.

In the expression $10 - x$, the variable is x.

volume The number of unit cubes needed to fill a three-dimensional shape without gaps or overlaps.

The volume of this rectangular prism is 24 cubic units because it is composed of 3 layers that are each 8 cubic units.

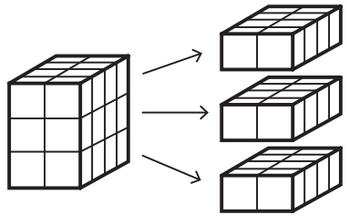


variable Una letra o un símbolo que representa un valor o un conjunto de valores.

En la expresión $10 - x$, la variable es x.

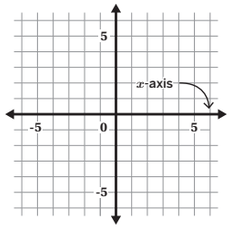
volumen La cantidad de cubos unitarios que se necesitan para llenar una figura tridimensional sin vacíos ni superposiciones.

El volumen de este prisma rectangular es de 24 unidades cúbicas porque se compone de 3 capas de 8 unidades cúbicas cada una.



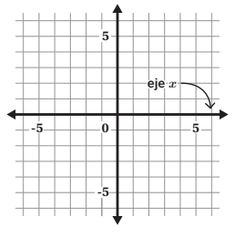
X

x-axis One of the perpendicular number lines that form the coordinate plane. The x-axis is the horizontal number line.



x-coordinate See *coordinates*.

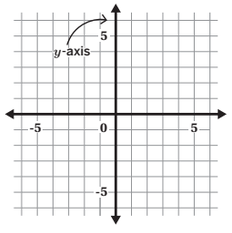
eje x Una de las rectas numéricas perpendiculares que forman el plano de coordenadas. El eje x es la recta numérica horizontal.



coordenada x Ver *coordenadas*.

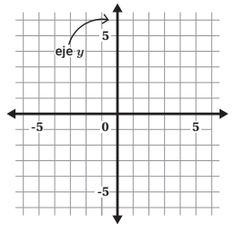
Y

y-axis One of the perpendicular number lines that form the coordinate plane. The y-axis is the vertical number line.



y-coordinate See *coordinates*.

eje y Una de las rectas numéricas perpendiculares que forman el plano de coordenadas. El eje y es la recta numérica vertical.



coordenada y Ver *coordenadas*.

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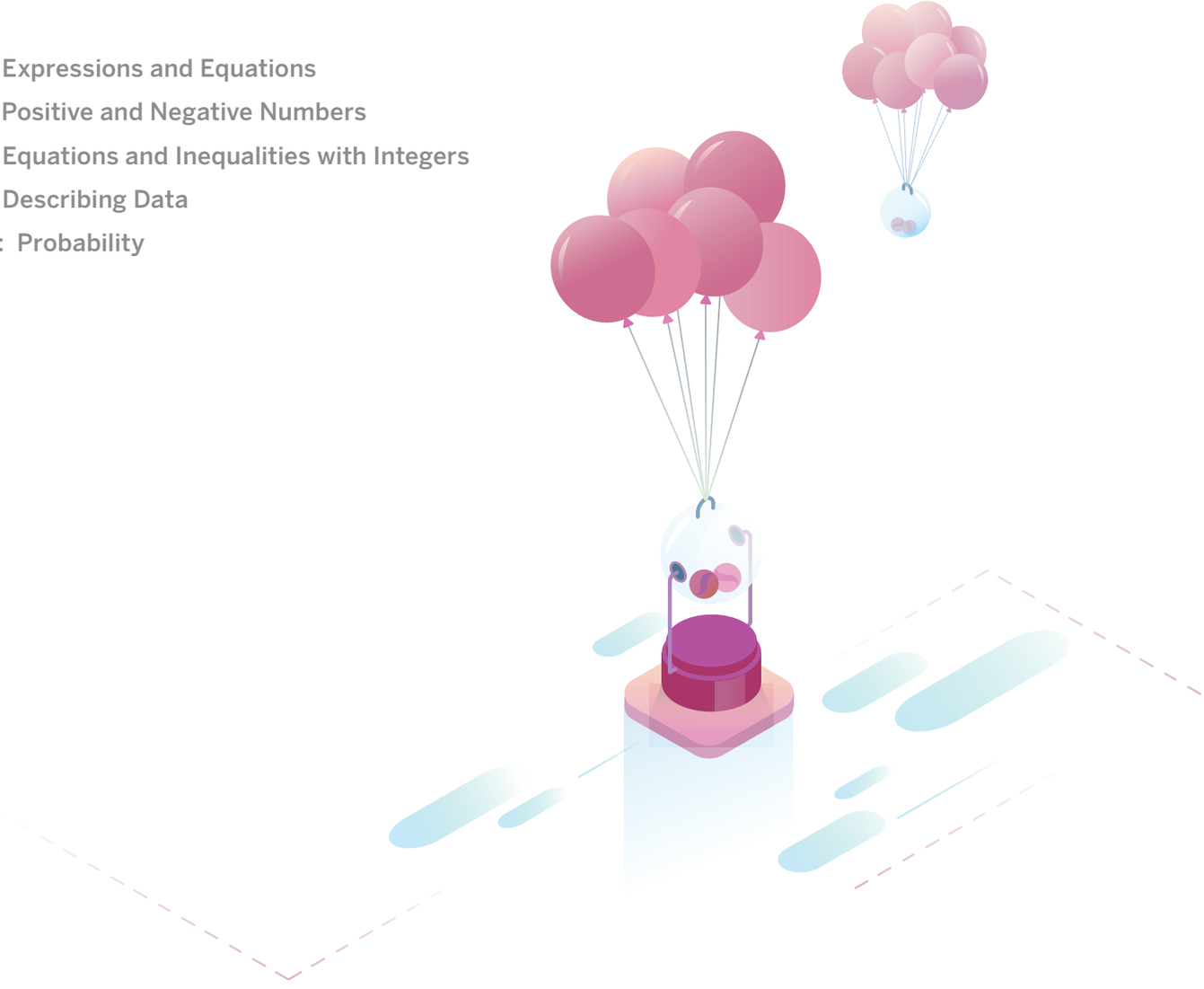

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