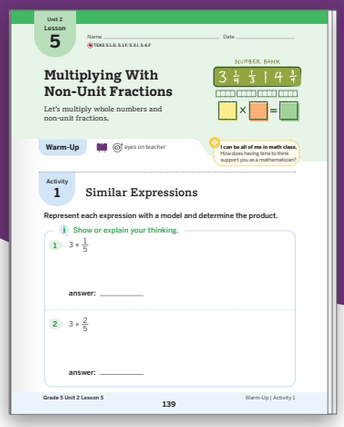
Unit 2
Lesson
5

Student Edition pages and Presentation Screens support learning in this lesson.




# Multiplying With Non-Unit Fractions

## Determining Products of Whole Numbers and Non-Unit Fractions

Let's multiply whole numbers and non-unit fractions.

## Key Concepts

### Today's Goals

1. **Goal:** Represent and solve multiplication of a whole number and a fraction with pictorial models.
2. **Language Goal:** Explain how different equivalent expressions represent the product of a whole number and a non-unit fraction. **(Listening, Speaking, and Writing)** ELPS 1.E, 2.E, 2.F, 4.D, 4.F

## Connections and Coherence

Students use their prior work with multiplying a whole number and a unit fraction to make sense of the product of a whole number and a non-unit fraction. They represent and solve multiplication expressions using pictorial models. Students use their understanding of the relationship between factors to interpret problems in ways that make sense to them. **(TEKS 5.1.D, 5.1.F)**

### Prior Learning

In Lesson 3, students represented multiplication of a unit fraction and a whole number using objects and pictorial models.

### Future Learning

In Lesson 6, students will represent multiplication of a whole number and a unit and non-unit fraction.

## Integrating Rigor in Student Thinking

- Students **apply** their understanding of multiplication to interpret problems involving the multiplication of whole numbers and non-unit fractions.

## Vocabulary

### Review Vocabulary

*non-unit fraction*

## TEKS

### Addressing

**5.3.I**

**Represent and solve multiplication of a whole number and a fraction that refers to the same whole using** objects **and pictorial models, including area models.**

*Also Addressing:* **5.4.F**

**Math Process Standards:** 5.1.D, 5.1.F

**ELPS:** 1.E, 1.F, 2.C, 2.D, 2.E, 2.F, 3.A, 3.E, 3.F, 4.C, 4.D, 4.E, 4.F

## Building Math Identity

**I can be all of me in math class.**
How does having time to think support you as a mathematician?

Invite students to reflect on this question as they complete this lesson.

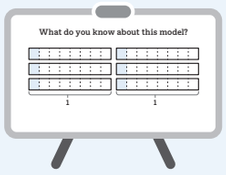
# Lesson at a Glance 60 min

**TEKS: 5.1.D, 5.1.F, 5.3.I, 5.4.F**

## Warm-Up

Whole Class | 10 min

Students use the **What Do You Know About ___?** routine, which provides an opportunity to hear the knowledge they already have about a model that represents equal shares and how it connects to multiplying whole numbers and unit fractions.

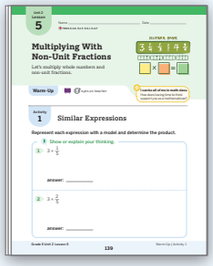



## Activity 1

Pairs | 15 min

Students apply their prior work with multiplying whole numbers and unit fractions to represent and solve multiplication expressions involving whole numbers and non-unit fractions using pictorial models.

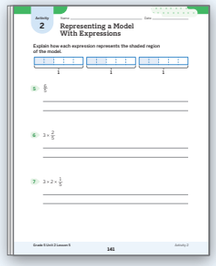
**Materials:** graph paper (as needed)




## Activity 2

Pairs | 20 min

Students use their understanding of multiplying a whole number and a non-unit fraction to interpret and explain how different expressions represent the same pictorial model.




## Synthesis

Whole Class | 10 min

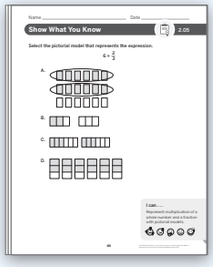
Students review and reflect on how different equivalent expressions can represent the same pictorial model.


## Show What You Know

Independent | 5 min

Students demonstrate their understanding of multiplication of whole numbers and non-unit fractions by selecting different pictorial models that represent an expression.

**Materials:** *Show What You Know* PDF




## Math Language Development

### Emergent Bilinguals

Consider using the *Math Language Development Resources* with the **Activity 2, Monitor** to support math language acquisition.

- ✓ Cognates
- ✓ Visuals
- ✓ Sentence frames and word bank

**ELPS 1.E, 2.B, 2.C, 2.D, 2.E, 2.F, 4.C, 4.D, 4.F**

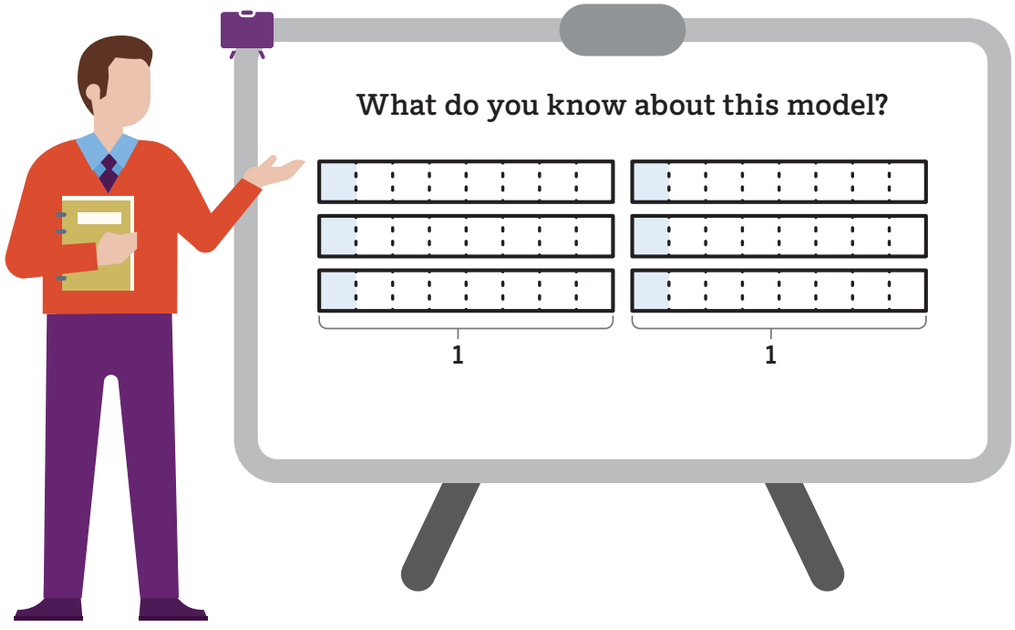
| Pre-Production | Beginning | Intermediate | High Intermediate | Advanced |
|---|---|---|---|---|
| Students **listen** to spoken English and **respond** using their primary languages and gestures. | Students **listen** to spoken English and **speak** and **write** using their primary languages, gestures, and single words or short phrases. | Students **listen** to spoken English and **speak** and **write** using short phrases or simple sentences. | Students **listen** to spoken English and **speak** and **write** using a variety of sentence types. | Students **listen** to spoken English and **speak** and **write** using longer sentences.<br>Exemplar responses are provided. |

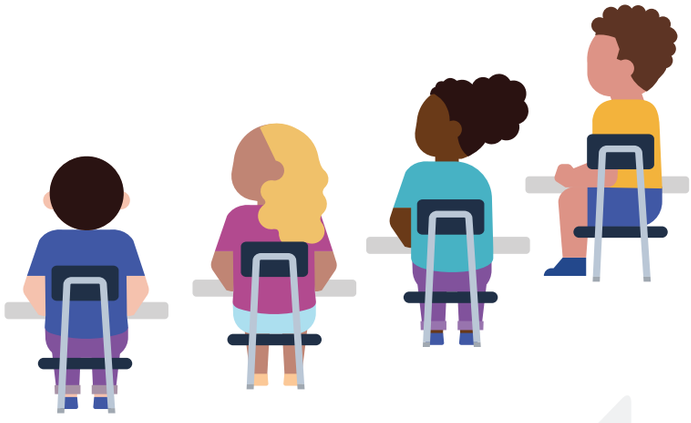
Whole Class | 10 min

Presentation Screens


# Warm-Up What Do You Know About __?

**Purpose:** Students share ideas about a pictorial model representing equal shares to honor what they already know about multiplying whole numbers by unit fractions.



## 1 Launch

**Display** the question.

**Use the What Do You Know About ___? routine.**

**Ask**, "What do you know about this pictorial model?"

**Invite students to share** their responses.

## 2 Connect

**Record** students' responses as they share.

**Ask**, "How could we represent this pictorial model with different expressions?"

**Record** students' responses as they share.

**Students might say . . .** ELPS 1.E, 2.C, 2.D, 2.F

*There are 6 wholes, and each whole is divided into 8 equal parts with 1 part shaded.*

*There is a total of $\frac{6}{8}$ shaded. I see 6 wholes each with $\frac{1}{8}$ shaded.*

*The wholes are arranged in 2 groups of 3 wholes, so I see 2 groups of $\frac{3}{8}$ shaded.*

*The wholes are arranged in 3 rows of 2 wholes, so I see 3 groups of $\frac{2}{8}$ shaded.*

Pairs | 15 min

# Activity 1 Similar Expressions

**Purpose:** Students apply their understanding of multiplying whole numbers by unit fractions to represent and solve multiplication expressions involving whole numbers and non-unit fractions.

Presentation Screens


## Materials

- Provide students with access to graph paper (as needed).

## 1 Launch

**Ask**, "How are the expressions $3 \times \frac{2}{5}$ and $3 \times \frac{3}{5}$ similar to what you have represented before? How are they different?"

**Read aloud** the directions and Problem 4.

A **Accessibility: Visual-spatial processing** Provide access to graph paper for students to use to draw strip diagrams.

## 2 Monitor

After students have completed **Problem 3**, refer to the D **Differentiation | Teacher Moves** table on the following page.

**If students need help getting started . . .**

- Ask, "What does the expression mean? How can you represent 3 groups of $\frac{1}{3}$?"
- Ask, "How many wholes are represented in the expression? How much of each whole is shaded?"

EB **Emergent Bilinguals** Demonstrate awareness of print concepts by showing how Activity 1 continues on the next page. **ELPS 3.A**

## 3 Connect

**Invite students to share** how they reasoned about the expression $\frac{3}{5} \times 3$. Select and sequence their responses using Rows 2 and 3 in the *Differentiation* table.

**Record** students' responses as they share. Ensure that students see a student-drawn pictorial model.

**Ask**, "How can the value of $3 \times \frac{1}{5}$ help you determine the value of $3 \times \frac{3}{5}$?"

**Key Takeaway:** Say, "Sometimes the product of a multiplication expression involving a fraction and a whole number will be a fraction."

Student Edition

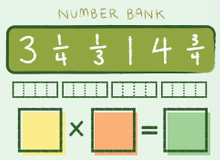
Unit 2 Lesson 5

Name _____ Date _____

TEKS 5.1.D, 5.1.F, 5.3.I, 5.4.F

# Multiplying With Non-Unit Fractions

Let's multiply whole numbers and non-unit fractions.




**Warm-Up** eyes on teacher

**I can be all of me in math class.** How does having time to think support you as a mathematician?

Activity 1

## Similar Expressions

Sample models shown.

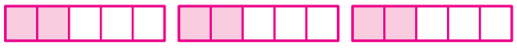
**Represent each expression with a model and determine the product.**

Show or explain your thinking.

1. $3 \times \frac{1}{5}$

answer: $\frac{3}{5}$

2. $3 \times \frac{2}{5}$



answer: $\frac{6}{5}$ or equivalent



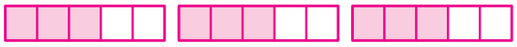
Activity 1

Name _____ Date _____

## Similar Expressions (continued)

Show or explain your thinking.

3. $3 \times \frac{3}{5}$



answer: $\frac{9}{5}$ or equivalent

4. **Discuss**

Join another pair.

- Share and compare your answers and reasoning for Problems 1–3.
- How are the expressions in each problem the same? How are they different?
- How are the products for each expression related? Why does that make sense?

Oral activity: No writing expected. Sample response shown.

*The expressions are the same because they all multiply a fraction and the same whole number. They are different because each problem uses a different fraction. Problem 1 uses a unit fraction, and Problems 2 and 3 use non-unit fractions. The products for each expression are related because they are all multiples of $\frac{3}{5}$ and represent parts of 3 wholes.*



Presentation Screens

## Differentiation | Teacher Moves

| Look for students who . . . | For example . . . | Provide support . . . |
|---|---|---|
| **Almost there**<br>Draw a model and interpret the product as the number of shaded parts out of the total number of parts. |  <br>$\frac{9}{15}$ | **Support** Ask, "How much of 1 whole is shaded? How do you know?" |
| Draw a model and interpret the product as the sum of the number of shaded parts in each whole. |  <br>$\frac{3}{5} + \frac{3}{5} + \frac{3}{5} = \frac{9}{5}$ | **Strengthen** Ask, "Where do you see $3 \times \frac{3}{5}$ in the model?" |
| Draw a model and interpret the product as the number of shaded parts out of the number of parts in 1 whole. |  <br>$\frac{9}{5}$ | **Stretch** Ask, "How could you use $3 \times \frac{1}{5}$ to reason without a model?" |

Pairs | 20 min

# Activity 2 Representing a Model With Expressions

**Purpose:** Students apply their work in Activity 1 to interpret a pictorial model representing the product of a whole number and a non-unit fraction. They explain how different expressions represent the shaded region of the model.

Presentation Screens


**Short on time?** Consider completing Problem 8 as a whole class.

## 1 Launch

MLR **MLR5: Co-Craft Questions** ELPS 4.C, 4.D, 4.E

- Display the pictorial model from Activity 2.
- Have students work with their partner to generate 2–3 mathematical questions they could ask about the model.
- Ask, "How is this model similar to those you have used in the last few lessons? How is it different?"

**Read aloud** the directions and Problems 5–8.

**Say**, "Complete Problems 5–8 with your partner."

## 2 Monitor

After students have completed **Problem 7**, refer to the D **Differentiation | Teacher Moves** table on the following page.

**If students need help getting started . . .**

- Ask, "What are some different ways you could interpret $\frac{6}{5}$?"
- Ask, "Where do you see 6 of something in the model? Where do you see 5 of something in the model?"

## 3 Connect

**Invite students to share** how the expressions $3 \times \frac{2}{5}$ and $3 \times 2 \times \frac{1}{5}$ represent the pictorial model. Select and sequence their responses using Rows 2 and 3 in the *Differentiation* table.

**Use the Think-Pair-Share Routine.** Ask, "How do you know these expressions are equivalent?"

EB **Emergent Bilinguals** Encourage students to record what they discussed with a partner about their explanations using drawings, words, or a graphic organizer. ELPS 3.E, 3.F

**Play** the animation. ELPS 1.F

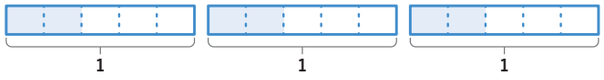
**Key Takeaway:** Say, "You can represent the multiplication of a non-unit fraction and a whole number using different equivalent expressions."

Activity 2

Name _____ Date _____

## Representing a Model With Expressions

Explain how each expression represents the shaded region of the model. Sample responses shown.




**5** $\frac{6}{5}$

There are 6 shaded parts, and each one is $\frac{1}{5}$, so that is $\frac{6}{5}$ total.

**6** $3 \times \frac{2}{5}$

There are 3 groups of 2 shaded parts, and the shaded parts represent $\frac{2}{5}$ of each whole.

**7** $3 \times 2 \times \frac{1}{5}$

There are 3 groups of 2 shaded parts, and each part is $\frac{1}{5}$ of each whole.



Activity 2

Name _____ Date _____

## Representing a Model With Expressions (continued)

**8** Discuss

Join another pair.

- Share and compare your explanations for Problems 5–7.
- How are your explanations for Problems 6 and 7 related? Why does that make sense?
- What is another equivalent expression that could represent the model? How do you know?

Oral activity: No writing expected. Sample response shown.

Both explanations refer to 3 groups of 2 shaded parts, but they refer to the size of the shaded parts differently.
$3 \times \frac{2}{5}$ represents the model because $\frac{2}{5}$ of each whole is shaded.

**9** Simplify the expression. Sample work shown.

$[2\ (10 \times \frac{1}{2})] + 8$

Show your thinking.

$[2(10 \times \frac{1}{2})] + 8$
$[2(5)] + 8$
$10 + 8$
$18$

answer: 18



Presentation Screens

## D Differentiation | Teacher Moves

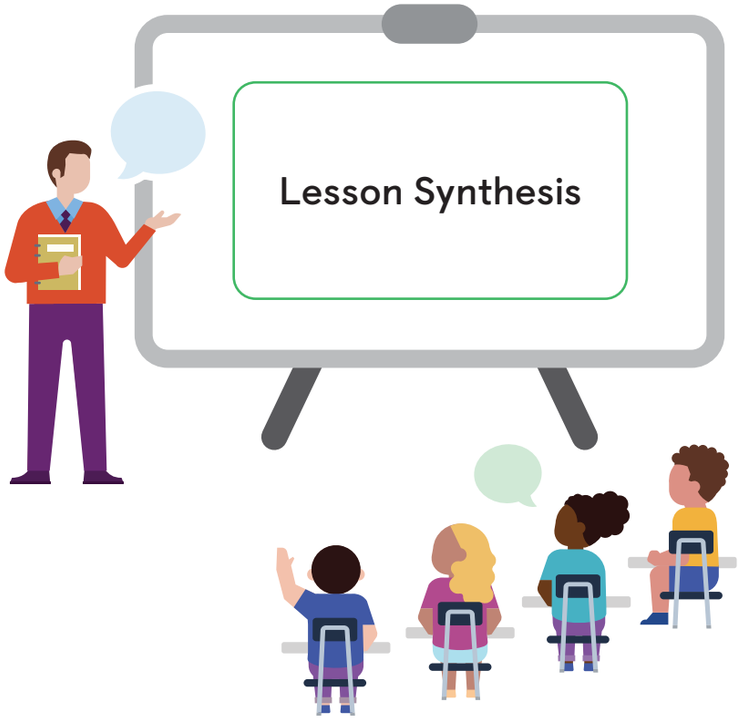
| Look for students who . . . | For example . . . | Provide support . . . |
|---|---|---|
| Use the product of 3 × 2 to reason about the individual shaded parts in the model. | There are 6 parts shaded, and each is $\frac{1}{5}$ of a whole. | **S Strengthen** Ask, "Where do you see 3 of something in the model? Where do you see 2 of something? Where do you see $\frac{1}{5}$? How does your explanation relate to the expression $3 \times 2 \times \frac{1}{5}$?" |
| Connect the expression to $3 \times \frac{2}{5}$. | $3 \times 2 \times \frac{1}{5}$ is the same as $3 \times \frac{2}{5}$ because $\frac{2}{5} = 2 \times \frac{1}{5}$. So, $3 \times 2 \times \frac{1}{5}$ represents 3 groups of $\frac{2}{5}$. | **S Strengthen** Ask, "How could you use *groups of* language to further explain your thinking?" |
| Recognize the number and size of each group and the size of each part in each group. | There are 3 groups of 2 shaded parts, and each part is $\frac{1}{5}$ of each whole. | **S Strengthen** Ask, "How are your explanations for Problems 6 and 7 related? Why does that make sense?" |

Whole Class | 10 min

# Synthesis

Presentation Screen


**Lesson Takeaway:** Pictorial models and equivalent expressions can be used to represent the product of a non-unit fraction and a whole number.




**Ask**, "What are some different ways you could represent the expression $4 \times \frac{6}{5}$?"

**Record** students' responses as they share.

**Say**, "In this sub-unit, you explored the relationship between multiplication and division. You saw that different equivalent expressions can represent the same model, whether the model involves whole numbers, unit fractions, or non-unit fractions. You also saw that dividing 2 whole numbers is equivalent to multiplying a whole number by a unit fraction."

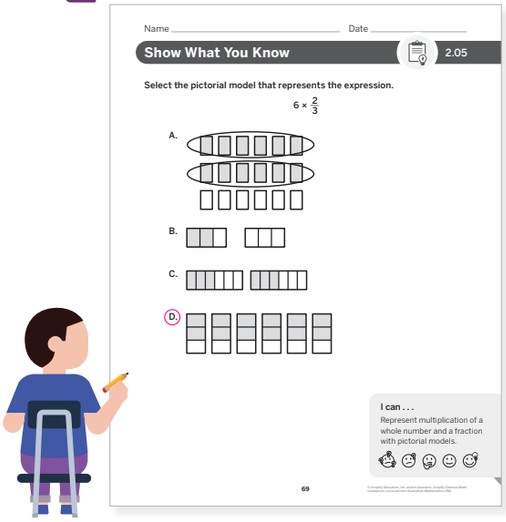
**Invite** students to refer to the **Summary** during Practice or anytime during the year.

# Show What You Know

Independent | 5 min

***Students using digital***


Show What You Know PDF


Name _____ Date _____

Show What You Know 2.05

Select the pictorial model that represents the expression.

$6 \times \frac{2}{3}$

A.

B.

C.

D.

I can . . .
Represent multiplication of a whole number and a fraction with pictorial models.

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## Today's Goals

1. **Goal:** Represent and solve multiplication of a whole number and a fraction with pictorial models.
   - In the *Show What You Know*, students selected the pictorial model that represented a whole number multiplied by a fraction.
2. **Language Goal:** Explain how different equivalent expressions represent the product of a whole number and a non-unit fraction. **(Listening, Speaking, and Writing)**
   ELPS 1.E, 2.E, 2.F, 4.D, 4.F

**Differentiation** See the last page of the lesson for differentiation and Math Language Development support.

# 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.

Lesson 5
**Practice**

***Students using digital***

***Students using print***

**Summary** 2.05

Models and equivalent expressions can be used to represent the product of a non-unit fraction and a whole number.


**Practice** 2.05

1 At a construction site, $\frac{2}{3}$ of the day is spent building custom designs. If the crew of workers work 4 days, how much of the days are spent building custom designs? Represent with a model and write an equation to solve. **Sample model and equation shown.**

Show your thinking.

equation: $4 \times \frac{2}{3} = \frac{8}{3}$ answer: $\frac{8}{3}$ days or equivalent



**Practice** 2.05

Name _____ Date _____

**For Problem 2, use the number bank.**

**Number Bank**

| | | | | | |
|---|---|---|---|---|---|
| 3 | $\frac{1}{4}$ | $\frac{1}{3}$ | 1 | 4 | $\frac{3}{4}$ |

2 Use the pictorial model to make the equation true.

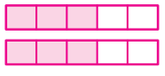
$4 \times \frac{3}{4} = 3$


3 Simplify the expression.

$2 \times \left(\frac{1}{5} + \frac{2}{5}\right) - \frac{2}{5}$

Show your thinking.

**Sample work shown.**



$2 \times \left(\frac{3}{5}\right)$

$2 \times \left(\frac{1}{5} + \frac{2}{5}\right) - \frac{2}{5}$
$2 \times \left(\frac{3}{5}\right) - \frac{2}{5}$
$\frac{6}{5} - \frac{2}{5}$
$\frac{4}{5}$

answer: $\frac{4}{5}$



**Practice** 2.05

Name _____ Date _____

4 Use the representation of $5 \times 2 \times \frac{1}{8}$ to solve.


$\frac{10}{5}$ or 2

**Spiral Review**

**For Problems 5–8, complete the comparison statement using <, >, or =.**

5 4,901,001 < 4,910,100

6 820,544 < 842,005

7 50,131,999 > 5,928,766

8 60,059 = 60,059

9 Simplify the expression.

$10 \times (23 - 14) + 234 \div 9$

Show your thinking.

**Sample work shown.**

$23 - 14 = 9$
$9 \times 10 = 90$
$90 + 26 = 116$

$9\overline{)234}$ = 26, $-18$, $54$, $-54$, $0$

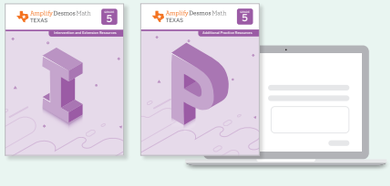
answer: 116



## Practice Problem Item Analysis

| | Problem(s) | DOK | TEKS |
|---|---|---|---|
| **On-Lesson** | | | |
| | 1 | 2 | 5.3.I |
| Test Practice | 2 | 1 | 5.3.I |
| | 3 | 2 | 5.4.F |
| | 4 | 1 | 5.3.I |
| **Spiral Review** | | | |
| | 5–8 | 1 | 4.2.C |
| Fluency | 9 | 1 | 5.4.F |

## Need more Practice?



Additional practice can be found in the **Practice Resources, Intervention and Extension Resources,** and online resources (item banks, Boost Personalized Learning, and Fluency Practice).

# Differentiation Use after Lesson 5

**Lesson Goal:** Represent and solve multiplication of a whole number and a fraction with pictorial models.

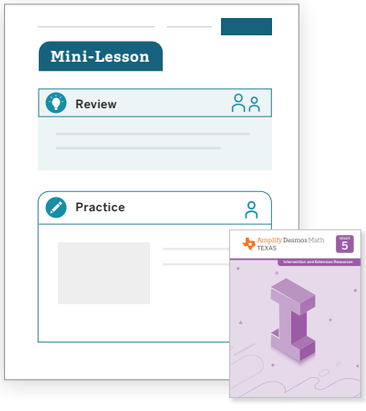
## Support

**Provide targeted intervention for students by using these resources.**

**If students** represent the product of a fraction and a whole number by selecting equal parts:

**Respond:**

- Assign the *Multiplying Whole Numbers and Non-Unit Fractions* Mini-Lesson. | 15 min
- Revisit **Lesson 2.**




## Strengthen

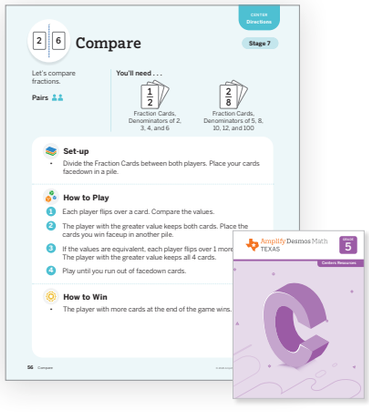
**Reinforce students' understanding of the concepts assessed by using these resources.**

**If students** represent the product of a fraction and a whole number by grouping and selecting equal parts:

**Respond:**

- Invite students to play these **Centers.** | 15 min
  *Compare: Fractions*
  ***How Close?:***
  - *Multiply to 3,000*
  - ***Multiply Fractions and Whole Numbers to 5***

  *Rectangle Rumble: Whole Numbers and Fraction Factors*
- Have students complete **Lesson 5 Practice.** | 15 min
- **Item Bank**



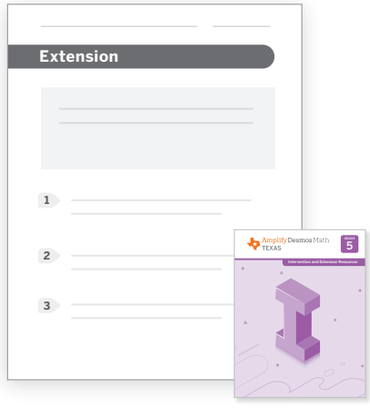

## Stretch

**Challenge students and extend their learning with these resources.**

**If students** represent the product of a fraction and a whole number by using the fraction to compose groups and selecting equal parts:

**Respond:**

- Invite students to explore the **Sub-Unit 1 Extension Activities.** | 15 min
- Revisit Activity 1 and invite students to respond to the **Stretch** question from the *Differentiation: Teacher Moves* table. | 5 min




*Support*, *Strengthen*, and *Stretch* learning by assigning these digital resources that adjust to each student's current level of skill and understanding.
• **Boost Personalized Learning** • **Fluency Practice** • **Math Adventures**

## Math Language Development

EB Use the ***Math Language Development Resources*** for further language support with all your students, including those building English proficiency.

- English/Spanish cognates
- Frayer Model templates
- Vocabulary routines

### Professional Learning

If you were to teach this lesson again, what would you do the same? What would you change?