

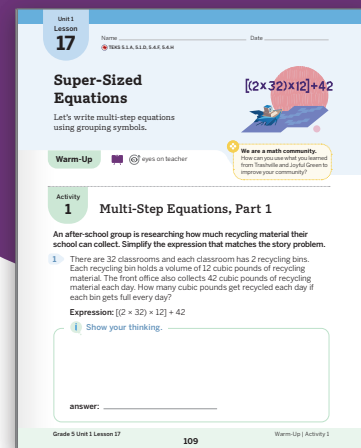


Student Edition pages and  
Presentation Screens support  
learning in this lesson.

# Super-Sized Equations

## Representing Multi-Step Story Problems with Equations that Include Grouping Symbols

Let's write multi-step equations using grouping symbols.



### Key Concepts

#### Today's Goals

1. **Goal:** Solve multi-step story problems involving multiplication and division.
2. **Goal:** Write equations using grouping symbols to represent multi-step story problems.
3. **Language Goal:** Explain how equations that include grouping symbols represent a story problem. **(Listening and Speaking)** 🇺🇸 ELPS 1.E, 2.E, 2.F

### Connections and Coherence

Students apply their work with multiplication, division, and volume to evaluate multi-step story problems and represent their thinking with equations involving grouping symbols. They reason that grouping symbols, like parentheses and brackets, are used to indicate which operation must be performed first based on the context of a real-world multi-step problem. **(TEKS 5.1.A, 5.1.D)**

#### ◀ Prior Learning

In Lesson 16, students simplified expressions involving up to 2 levels of grouping, recognizing that expressions within grouping symbols are always simplified first.

#### ➤ Future Learning

In Unit 2, students will continue to simplify expressions involving multiplication and division.

### Integrating Rigor in Student Thinking

- Students **apply** their understanding of multiplication and division to evaluate real-world, multi-step problems and represent them with expressions involving grouping symbols.

### Vocabulary

#### Review Vocabulary

*brackets*

*parentheses*

*simplify*

#### 🇺🇸 TEKS

#### Addressing

##### 5.4.H

**Represent and solve problems related to perimeter and/or area and related to volume.**

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

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

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

#### Building On

**4.4.D**

#### Building Toward

**5.4.B**

### Building Math Identity

#### 🌟 We are a math community.

How does working with a partner help your thinking in math class?

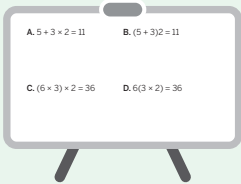
Invite students to reflect on this question as they complete this lesson.

# Lesson at a Glance 60 min

 **TEKS: 5.1.A, 5.1.D, 5.1.F, 5.1.G, 5.4.F, 5.4.H**

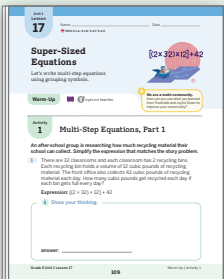
## Warm-Up Whole Class | 10 min

Students are introduced to the **True or False?** routine, in which they determine whether a series of expressions are true or false. They use the order of operations and parentheses to determine equivalence. (TEKS 5.1.F, 5.1.G)



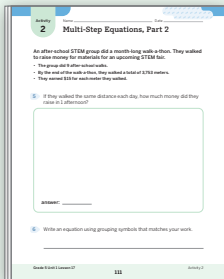
## Activity 1 Pairs | 15 min

Students solve a real-world, multi-step volume problem, and they write an equation to represent each step of their solution strategy. They recognize that in an equation, parentheses indicate what is evaluated first.



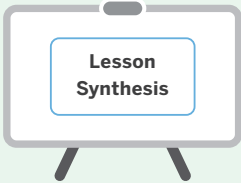
## Activity 2 Pairs | 20 min

Students evaluate a real-world, multi-step story problem, recognizing that sometimes a problem can have a different order of steps and therefore, a different grouping in the equation, but result in the same answer.



## Synthesis Whole Class | 10 min

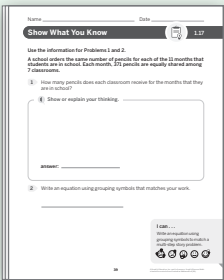
Students review and reflect on expressions that include grouping symbols that can be used to represent multi-step story problems.



## Show What You Know Independent | 5 min

Students demonstrate their understanding by simplifying multi-step story problems and writing equations to represent their steps.



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




## Math Language Development

### Emergent Bilinguals

Consider using the *Math Language Development Resources* with the **Activity 1, Monitor** to support math language acquisition.

-  Manipulatives
-  Sentence frames and word bank



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

### Pre-Production

Students **listen** to spoken English and **respond** using their primary languages and gestures.

### Beginning

Students **listen** to spoken English and **speak** using their primary languages, gestures, and single words or short phrases.

### Intermediate

Students **listen** to spoken English and **speak** using short phrases or simple sentences.

### High Intermediate

Students **listen** to spoken English and **speak** using a variety of sentence types.

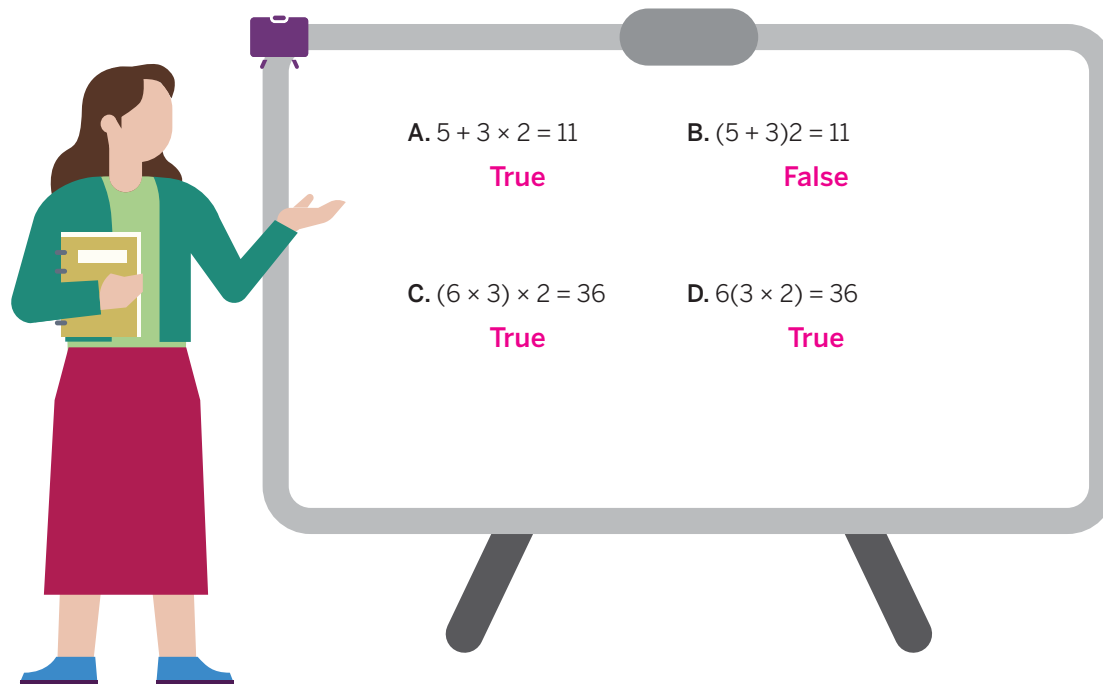
### Advanced

Students **listen** to spoken English and **speak** using longer sentences. Exemplar responses are provided.

# Warm-Up True or False?

Fluency

**Purpose:** Students analyze equations involving parentheses to develop fluency with the structure of order of operations.



**Why these problems?** These equations lend themselves to reviewing the order of operations and seeing how parentheses can or cannot affect equations when simplifying.

## 1 Launch

Use the **True or False?** routine.

Display 1 equation at a time.

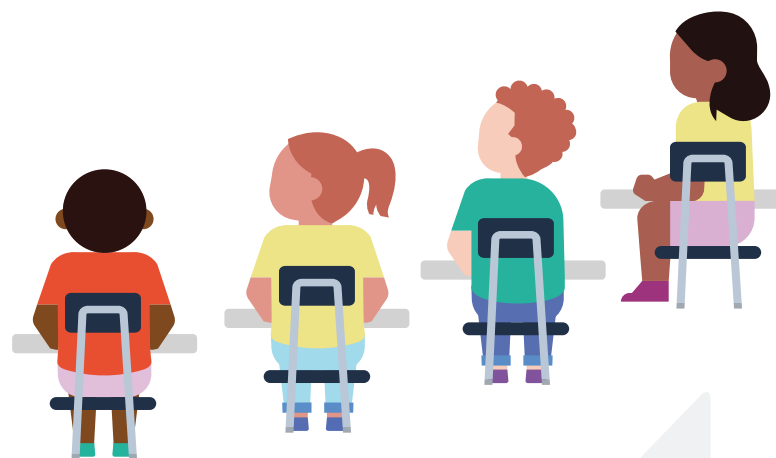
Say, "Give me a signal when you know whether the statement is true and can explain how you know."

## 2 Connect

Record 2 or 3 students' responses, asking for their reasoning and allowing others to agree or disagree. Keep each equation displayed as you progress to the next.

Repeat with each equation.

Ask, "How can Equation C and Equation D both be true?"



**Students might say . . .** 🇺🇸 ELPS 2.B, 2.C, 2.D, 2.E

**A: True.** If you follow the order of operations, you multiply  $3 \times 2$  first and get 6. Then you add 5 and get 11.

**B: False.** The value of this expression is 16 because you solve what is in the parentheses first. So, 5 plus 3 is 8. Then you multiply by 2, which equals 16.

**C: True.** You simplify the expression in parentheses first and get 18. Then multiply by 2.

**D: True.** You multiply  $3 \times 2$  first and get 6. Then multiply by 6.

# Activity 1 Multi-Step Equations, Part 1

**Purpose:** Students solve a multi-step story problem involving volume and write an equation that matches their work. They see that they can use grouping symbols to indicate what is simplified first.

**Short on time?** Consider omitting Problem 3.

## 1 Launch



**Read aloud** the introduction and Problem 1.

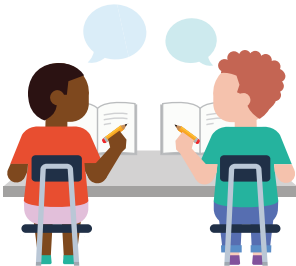
**Ask:**

- “How does this equation match the story problem?”
- “What is the purpose of the parentheses in this equation?”

**Say,** “Complete Problems 1–3 with your partner. You will join another pair to complete Problem 4.”

**A Accessibility: Visual-spatial processing** Create a chart with a visual representation of the rectangular prism. Label the given volume, width, and height. Label the missing length with a question mark. Annotate with any other thinking students share.

## 2 Monitor



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

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

- Ask, “Is the length greater than or less than 1,536? How do you know?”
- Ask, “What information could you determine first? How could you determine that information?”

## 3 Connect



**Invite students to share** their correct equations from Problem 3 and how their equations represent the story. Ensure they see the equations in Rows 2 and 3 in the *Differentiation table*.

**Record** the equations as students share.

**Ask,** “Why are parentheses needed in each equation?”

**EB Emergent Bilinguals** Use gestures or point to visual examples when saying the word *parentheses*. Cup hands in the shape of parentheses or point to parentheses in displayed work to provide visual cues for the word. **ELPS 3.D, 3.F**

**Key Takeaway:** Say, “A multi-step equation can be written to represent a multi-step story problem. The context of the problem can be used to indicate where to place parentheses within the expression.”

Unit 1  
Lesson  
17

Name \_\_\_\_\_ Date \_\_\_\_\_  
TEKS 5.1.A, 5.1.D, 5.4.F, 5.4.H

Super-Sized  
Equations

Let's write multi-step equations using grouping symbols.

$[(2 \times 32) \times 12] + 42$



Warm-Up

eyes on teacher

**We are a math community.**  
How can you use what you learned from Trashville and Joyful Green to improve your community?

Activity  
1

Multi-Step Equations, Part 1

An after-school group is researching how much recycling material their school can collect. Simplify the expression that matches the story problem.

- 1 There are 32 classrooms and each classroom has 2 recycling bins. Each recycling bin holds a volume of 12 cubic pounds of recycling material. The front office also collects 42 cubic pounds of recycling material each day. How many cubic pounds get recycled each day if each bin gets full every day?

Expression:  $[(2 \times 32) \times 12] + 42$  **Sample work shown.**

Show your thinking.

$$\begin{array}{r} [(2 \times 32) \times 12] + 42 \\ [64 \times 12] + 42 \\ 768 + 42 = 810 \end{array} \quad \begin{array}{r} 64 \\ \times 12 \\ \hline 128 \\ + 640 \\ \hline 768 \end{array}$$

answer: **810 cubic pounds**

Activity  
1

Name \_\_\_\_\_ Date \_\_\_\_\_

Multi-Step Equations, Part 1 (continued)

All the recycling gets collected into a larger bin that is shaped as a rectangular prism that has a volume of 1,536 cubic meters. It has a width of 4 meters and a height of 2 meters.

- 2 What is the length of the prism in meters? **Sample work shown.**

Show your thinking.

$$\begin{array}{r} 4 \times 2 = 8 \\ 0,192 \\ 8 \overline{)1,536} \\ \underline{-8} \phantom{00} \\ 73 \phantom{00} \\ \underline{-72} \phantom{00} \\ 16 \phantom{00} \\ \underline{-16} \phantom{00} \\ 0 \end{array} \quad \text{or} \quad \begin{array}{r} 0,768 \\ 2 \overline{)1,536} \\ \underline{-14} \phantom{00} \\ 13 \phantom{00} \\ \underline{-12} \phantom{00} \\ 16 \phantom{00} \\ \underline{-16} \phantom{00} \\ 0 \end{array} \quad \begin{array}{r} 192 \\ 4 \overline{)768} \\ \underline{-4} \phantom{00} \\ 36 \phantom{00} \\ \underline{-36} \phantom{00} \\ 08 \phantom{00} \\ \underline{-8} \phantom{00} \\ 0 \end{array}$$

answer: **192 meters**

- 3 Write an equation using grouping symbols that matches your work.

**Sample responses shown.**

$1,536 \div (4 \times 2) = 192$  or  
 $(1,536 \div 2) \div 4 = 192$

- 4 **Discuss** **Oral activity: No writing expected.**

Join another group.

- Compare your strategies. What is similar? What is different?
- Compare your equations. What is similar? What is different?
- How does the placement of the parentheses in your equation represent the problem and your work?

**D** Differentiation | Teacher Moves



Presentation Screens

Look for students who ...

For example ...

Provide support ...

**Almost there**

Do not represent any grouping in their equation.

$1,536 \div 4 \times 2 = 768$   
or  
 $1,536 \div 2 \div 4 = 192$

**Support** Ask, "How could you use a grouping symbol to show which part of your equation you evaluated first?"

Group and simplify  $4 \times 2$  first.

$1,536 \div (4 \times 2) = 192$

**Stretch** Ask, "What other information could have been helpful to know where to place the grouping symbols? How would that change your equation?"

Group and simplify  $1,536 \div 4$  or  $1,536 \div 2$  first.

$(1,536 \div 2) \div 4 = 192$

## Activity 2 Multi-Step Equations, Part 2

**Purpose:** Students solve a multi-step story problem involving multiplication and division and analyze how different first steps might result in a different grouping in their equation, but the answer is the same.

### 1 Launch



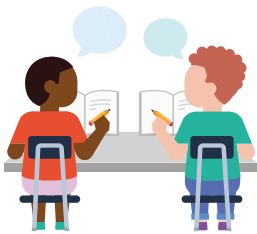
**Read aloud** the introduction and Problem 5.

**Say**, “Complete Problems 5 and 6 with your partner.”



**Accessibility: Executive functioning** Check for understanding by inviting students to rephrase the problem in their own words. Listen for and clarify any questions or misconceptions students have as they make sense of the problem.

### 2 Monitor



After students have completed **Problem 5**, refer to the **D Differentiation | Teacher Moves** table on the following page.

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

- Ask, “What information do you know? What information do you need to determine?”
- Ask, “What information could you determine first? How could you determine that information?”

### 3 Connect



**MLR**

This Connect is structured using the *MLR7: Compare and Connect* routine.



**ELPS 1.E, 2.B, 2.D, 2.E**

**Ask:**

- “What information was determined *first* in each equation?”
- “If you were to solve this problem again, which step would you do first? Why?”

**Record** responses as students share. For example, in  $(3,753 \div 9) \times 15 = 6,255$ , students determined the number of meters walked each afternoon, and in  $(15 \times 3,753) \div 9 = 6,255$ , students determined the amount of money earned for the entire walk-a-thon.

**EB**

**Emergent Bilinguals** Provide wait time to allow students to formulate and rehearse their responses with a partner before sharing with the class.



**ELPS 1.E, 2.D, 2.F**



**Key Takeaway:** Say, “Sometimes multi-step problems can be solved using a different order of steps. Because of this, the corresponding equations will show different operations grouped using parentheses.”

Activity

2

Name \_\_\_\_\_ Date \_\_\_\_\_

Multi-Step Equations, Part 2

An after-school STEM group did a month-long walk-a-thon. They walked to raise money for materials for an upcoming STEM fair.

- The group did 9 after-school walks.
- By the end of the walk-a-thon, they walked a total of 3,753 meters.
- They earned \$15 for each meter they walked.

5 If they walked the same distance each day, how much money did they raise in 1 afternoon? **Sample work shown.**

0, 4 1 7

9 3,753

- 36

15

- 9

63

- 63

0

4 1 7

×

15

3

2,085

+ 4,170

6,255

answer: **\$6,255**

6 Write an equation using grouping symbols that matches your work. **Sample responses shown.**

**$(3,753 \div 9) \times 15 = 6,255$  or  $(15 \times 3,753) \div 9 = 6,255$**



Presentation Screens

D Differentiation | Teacher Moves

Look for students who ...

For example ...

Provide support ...

Almost there

Divide the number of meters by the dollars earned for each meter.

first step:

**$3,753 \div 15 = 250 \text{ R}15$**

**S Support** Ask, “What does the quotient in your first step represent? How do you know?”

Determine the amount of money earned for the entire walk-a-thon first.

first step:

**$3,753 \times 15 = 56,295$**

**S Stretch** Ask, “What other information could have been determined first? How would that change your equation?”

Determine the number of meters walked each afternoon first.

first step:

**$3,753 \div 9 = 417$**

# Synthesis

**Lesson Takeaway:** Grouping symbols can be used in expressions and equations representing multi-step story problems. They indicate what is simplified first according to the context of the problem.



**Say,** “You know from Activity 2 that this equation is true.”

**Ask:**

- “How are parentheses helpful in making sense of longer equations?”
- “If you did not know that these expressions were equal, what would you think about first to determine whether this equation is true?”

**Say,** “Parentheses are grouping symbols that can be used in expressions and equations. They indicate what is evaluated first.”

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

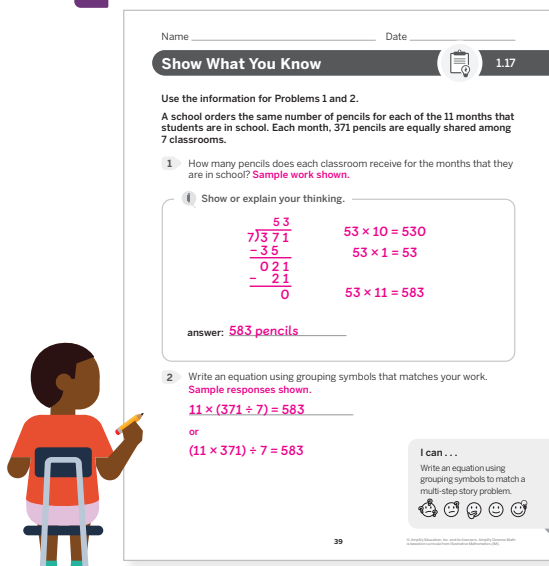
## Show What You Know

Independent | 5 min

Students  
using digital

Lesson 17  
Show What  
You Know

### Show What You Know PDF



### Today's Goals

1. **Goal:** Solve multi-step story problems involving multiplication and division.
  - In Problem 1 in the *Show What You Know*, students used multiplication and division to solve the multi-step story problem.
2. **Goal:** Write equations using grouping symbols to represent multi-step story problems.
  - In Problem 2 in the *Show What You Know*, students wrote an equation using parentheses to represent a multi-step story problem.
3. **Language Goal:** Explain how equations that include grouping symbols represent a story problem. **(Listening and Speaking)** 🇺🇸 ELPS 1.E, 2.E, 2.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.



Students using print

Summary 1.17

Parenteses are grouping symbols that can be used in expressions and equations. They indicate what is evaluated first.

Context	Equation
A rectangular prism has a volume of 1,536 cubic feet. It has a width of 4 feet and a height of 2 feet. What is the length of the prism in feet?	$1,536 \div (4 \times 2) = 192$

Practice 1.17

1

A rectangular prism has a volume of 138 cubic centimeters. It has a width of 2 centimeters and a height of 3 centimeters. What is the length of the prism in centimeters? Solve and write an equation to represent your work. **Sample work and equation shown.**

Show your thinking.

$$\begin{array}{r} 2 \times 3 = 6 \\ 23 \\ 6 \overline{)138} \\ \underline{-12} \phantom{0} \\ 18 \\ \underline{-18} \\ 0 \end{array}$$

answer: **23 centimeters**

equation:  **$138 \div (2 \times 3) = 23$**

Grade 5 Unit 1 Lesson 17

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Summary | Practice

Practice 1.17

Name \_\_\_\_\_ Date \_\_\_\_\_

2

A school orders library books. They receive 27 boxes, and each box has 24 packages. In each package there are 9 books. How many new books did the school order? Solve and write an equation to represent your work. **Sample work and equation shown.**


Show or explain your thinking.

$$\begin{array}{r} 27 \\ \times 24 \\ \hline 108 \\ + 540 \\ \hline 648 \end{array} \quad \begin{array}{r} 648 \\ \times 9 \\ \hline 5,832 \end{array}$$

answer: **5,832 books**

equation:  **$(27 \times 24) \times 9 = 5,832$**

3

 What is the value of the expression?  
 $12 + (6,003 \div 9)$

A 1,044

B 655

C 679

D 112

Grade 5 Unit 1 Lesson 17

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Practice

Practice 1.17

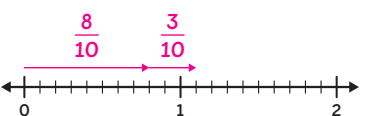
Name \_\_\_\_\_ Date \_\_\_\_\_

Spiral Review

4

Clare goes for a run around the park. She starts by the park and runs south for  $\frac{8}{10}$  miles and takes a break. Then she continues running south for another  $\frac{3}{10}$  miles. How far has Clare run? Use the number line to help you solve. **Sample work shown.**

Show or explain your thinking.



answer:  **$\frac{11}{10}$  miles or  $1 \frac{1}{10}$  miles**

For Problems 5–10, determine the value of the expression.

5

$80 \times 40$  **3,200**

6

$12 \times 12$  **144**

7

$55 \times 10$  **550**

8

$630 \div 9$  **70**

9

$480 \div 8$  **60**



10

$6,546 \div 6$  **1,091**

Grade 5 Unit 1 Lesson 17

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Practice

Practice Problem Item Analysis			
	Problem(s)	DOK	 TEKS
On-Lesson			
	1	2	5.4.H
	2	2	5.4.F*
 Test Practice	3	1	5.4.F
Spiral Review			
	4	1	4.3.E
Fluency	5–10	1	4.4.D, 4.4.F

\*This problem builds toward the standard shown.

## 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).

**Lesson Goal:** Write equations using grouping symbols to represent multi-step story problems.

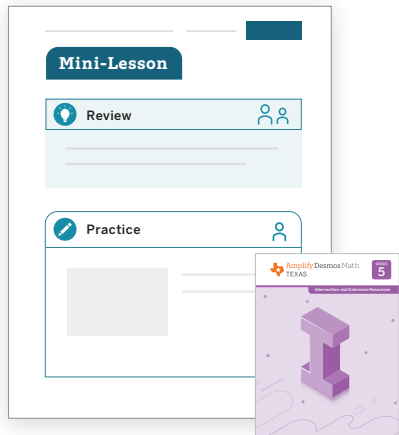
## S Support

Provide targeted intervention for students by using these resources.

**If students** write 2 separate equations to represent a multi-step story problem:

### Respond:

- Assign the *Writing Equations With Parentheses to Represent Multi-Step Story Problems* Mini-Lesson. | ⌚ 15 min
- Revisit Lesson 16.



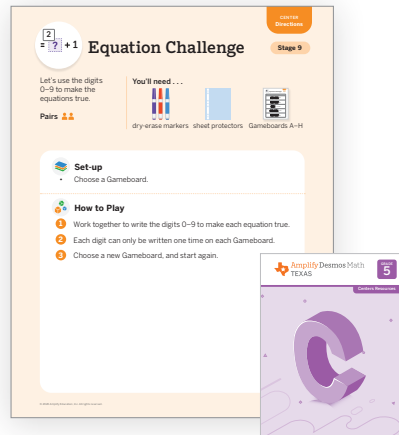
## S Strengthen

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

**If students** write 1 equation to represent a multi-step problem using parentheses to show what information is determined first:

### Respond:

- Invite students to play these **Centers**. | ⌚ 15 min  
*Equation Challenge: Two-Digit Factors*  
*Compare: Multi-Digit Operations*
- Have students complete **Lesson 17 Practice**. | ⌚ 15 min
- Item Bank



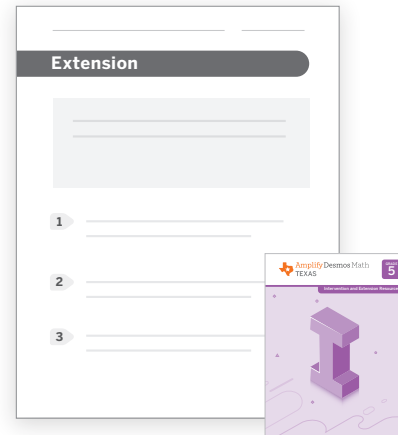
## S Stretch

Challenge students and extend their learning with these resources.

**If students** write more than 1 equation to represent the same multi-step story problem using parentheses to show what information is determined first:

### Respond:

- Invite students to explore the **Sub-Unit 3 Extension Activities**. | ⌚ 15 min
- Revisit Activity 2 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

What opportunities are you giving students to reflect on their understanding of the mathematical content?



Notes: