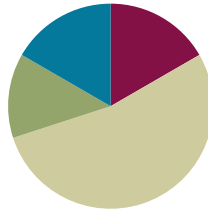


## Lesson 29

**Objective:** Solve division word problems involving multi-digit division with group size unknown and the number of groups unknown.

### Suggested Lesson Structure

■ Fluency Practice	(10 minutes)
■ Application Problem	(8 minutes)
■ Concept Development	(32 minutes)
■ Student Debrief	(10 minutes)
<b>Total Time</b>	<b>(60 minutes)</b>



### Fluency Practice (10 minutes)

- Unit Conversions **5.MD.1** (3 minutes)
- Divide Decimals by Two-Digit Numbers **5.NBT.7** (7 minutes)

#### Unit Conversions (3 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews unit conversions and prepares students for problem solving in the Concept Development.

Repeat the process from Lesson 27 for each unit conversion, using the following possible sequence:

1 kg = \_\_\_ g, 1 lb = \_\_\_ oz, 1 ft = \_\_\_ in, 1 L = \_\_\_ mL, 0.42 L = \_\_\_ mL, 0.678 kg = \_\_\_ g, and 0.953 m = \_\_\_ cm.

#### Divide Decimals by Two-Digit Numbers (7 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 27 content.

Repeat the process from Lesson 27, using the following possible sequence:  $8.61 \div 21$ ,  $4.9 \div 14$ , and  $24 \div 16$ .

**Application Problem (8 minutes)**

A one-year (52-week) subscription to a weekly magazine is \$39.95. Greg calculates that he would save \$219.53 if he subscribed to the magazine instead of purchasing it each week at the store. What is the price of the individual magazine at the store?

Note: This Application Problem uses concepts from Grade 5 Module 1 in the first step of the problem and division of decimals with group size unknown from Module 2 in the second step of the problem. A tape diagram or place value chart can be used to add the decimals. A tape diagram is the ideal strategy to represent the division.

$\$259.48 \div 52$  is best solved through estimation because the dividend can be estimated as an easily identifiable multiple of 50. However, if more time is needed for Concept Development, the Application Problem may be used for homework or journal entry.

$$\begin{array}{r} 219.53 \\ + 39.95 \\ \hline 259.48 \end{array}$$

Each magazine costs \$4.99.

$$\begin{array}{r} 499 \\ 52 \overline{) 259.48} \\ \underline{-208} \phantom{00} \\ 514 \\ \underline{-468} \phantom{00} \\ 468 \\ \underline{-468} \\ 0 \end{array}$$

**Concept Development (32 minutes)**

Materials: (S) Problem Set

Note: This lesson is a continuation of the problem solving from Lesson 28. It is recommended that delivery of today’s lesson follow that of Lesson 28. It is acceptable to allow students as much independence in solving as is appropriate for specific student populations.

**Problem 1**

Lamar has 1,354.5 kilograms of potatoes to deliver in equal amounts to 18 stores. Twelve of the stores are in the Bronx. How many kilograms of potatoes will be delivered to stores in the Bronx?

Before solving:

- T: Will the amount delivered to the stores in the Bronx be more or less than half of the total amount of potatoes delivered? How do you know?
- S: More than half because more than half of the stores are in the Bronx.

This two-step *equal groups with group size unknown problem* requires first dividing to find the value of one unit and then multiplying to find the value of 12 of those units.

1,354.5

Potatoes Store: 1 2 3 . . . 18

12 stores

?

18 units = 1,354.5  
1 unit = 75.25  
12 units = 903

903 kg of Potatoes will be delivered to the Bronx.

$$\begin{array}{r} 75.25 \\ 18 \overline{) 1,354.50} \\ \underline{-126} \phantom{00} \\ 94 \\ \underline{-90} \phantom{00} \\ 45 \\ \underline{-36} \phantom{00} \\ 90 \\ \underline{-90} \\ 0 \end{array}$$

$$\begin{array}{r} 75.25 \\ \times 12 \\ \hline 15050 \\ + 75250 \\ \hline 903.00 \end{array}$$

x100

÷100

- T: How can you know that your final answer is reasonable? Was the amount delivered to the Bronx stores more than half of the total?

T: How did you determine if your decimal was placed reasonably in your product?

S: I was multiplying by 12. I knew that my answer needed to be more than 750 but less than 7,500. The only place that made sense to put the decimal made the answer 903, not 90.3 or 9,030.  
 → I mentally multiplied 75.25 by 100 to make it 7,525 hundredths before I multiplied by 12. I knew I needed to adjust my product by dividing by 100 at the end.

**Problem 2**

**MP.2**

Valerie uses 12 fluid oz of detergent each week for her laundry. If there are 75 fluid oz of detergent in the bottle, in how many weeks will she need to buy a new bottle of detergent? Explain how you know.

The interpretation of the remainder in this single-step *equal groups with number of groups unknown* problem requires that students recognize the need to buy the detergent in 6 weeks. Although there will be a small amount of detergent left after the sixth week, there is not enough to do a seventh week of laundry.

Handwritten division:  $12 \overline{) 75.00}$   
 $\underline{-72}$   
 $30$   
 $\underline{-24}$   
 $60$   
 $\underline{-60}$   
 $0$

Valerie will need to buy a new bottle of detergent after 6 weeks. She will have a little left over after 6 weeks, but not enough to do all her laundry in the 7<sup>th</sup> week.

After solving and assessing reasonability:

- T: The quotient was more than 6. Why can't Valerie wait another week before buying detergent?
- S: The quotient is the number of weeks that the detergent will last. It will last a little more than 6 weeks, but that means she won't have enough for all the laundry in the seventh week. → To have enough for 7 weeks, the detergent bottle would need to hold  $7 \times 12$  fluid oz, which is 84 fluid oz. It's less than that, so she has to buy another bottle before the seventh week.

**Problems 3–4**

*Problem 3: The area of a rectangle is  $56.96 \text{ m}^2$ . If the length is 16 m, what is its perimeter?*

Handwritten division:  $16 \overline{) 56.96}$   
 $\underline{-48}$   
 $89$   
 $\underline{-80}$   
 $96$   
 $\underline{-96}$   
 $0$

$$A = l \times w$$

$$56.96 = 16 \times ?$$

$$P = 16 + 16 + ? + ?$$

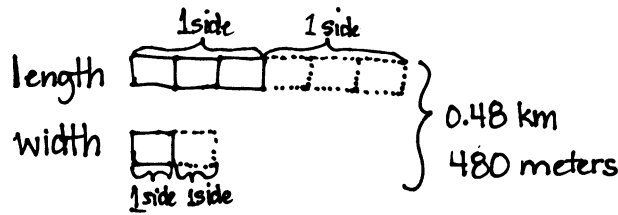
$$P = 32 + (3.56 \times 2)$$

$$= 32 + 7.12$$

$$= 39.12$$

The perimeter is 39.12 m.

Problem 4: A city block is 3 times as long as it is wide. If the total distance around the block is 0.48 kilometers, what is the area of the block in square meters?



$$8 \text{ units} = 480 \text{ meters}$$

$$1 \text{ unit} = 60 \text{ meters}$$

$$\text{length} = 3 \text{ units} = 180 \text{ m}$$

$$\text{width} = 1 \text{ unit} = 60 \text{ m}$$

$$A = 60 \times 180$$

$$= 6 \times 18 \times 100$$

$$= 108 \times 100$$

$$= 10800$$

The area of the block is  $10,800 \text{ m}^2$ .

Problems 3 and 4 require students to apply their knowledge of area and perimeter to find missing sides using division and then use that information to answer the question. In Problem 3, area information must be used to find the perimeter, and in Problem 4, the perimeter must be used to find the area. In both cases, students must consider the existence of 2 pairs of equal sides in their calculations. In Problem 3, students may find it more helpful to draw a rectangle rather than a tape diagram. However, the *3 times as long* relationship in Problem 4 might be better modeled using a tape diagram. An added complexity of Problem 4 is the need to convert between kilometers and meters.

After solving and assessing reasonability:

- T: Find someone whose drawing looks different than yours for Problem 3 or 4. Compare your approaches.
- T: How are these two problems alike, and how are they different?
- S: Both are about rectangles with missing information. → One asks for area, and the other asks for perimeter. → You have to remember how to find area and perimeter. You have to find the missing side before you can answer the question.



**NOTES ON  
MULTIPLE MEANS  
OF REPRESENTATION:**

When using a tape diagram that is divided into more than 10 equal parts, encourage students to use *dot, dot, dot* to indicate the uniformity of the equal parts in the tape diagram. This saves time and space. For students who are having difficulty with the tape diagram or calculations, it is better to work with smaller numbers that allow for a greater understanding of the concept when modeled.

**Problem Set (10 minutes)**

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

**Student Debrief (10 minutes)**

**Lesson Objective:** Solve division word problems involving multi-digit division with group size unknown and the number of groups unknown.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion. As there is so much time given to debriefing each individual problem in the set, the culminating questions for today’s lesson are brief.

- Compare Problems 3 and 4 and Problems 1 and 2. Students may note the following:
  - A tape diagram is not as helpful compared to a picture of the rectangle in Problem 3.
  - In Problems 3 and 4, it is harder to say if the divisor is the number of groups or the size of the group.
  - All four problems involve measurement.
- What did the divisor represent in each equation? What did the unknown represent for each? How did that change the model you drew? Which is easier to draw?

Lesson 29 Problem Set 5•2

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

Solve.

1. Lamar has 1,354.5 kilograms of potatoes to deliver equally to 18 stores. 12 of the stores are in the Bronx. How many kilograms of potatoes will be delivered to stores in the Bronx?

Potatoes

18 units = 1,354.5  
1 unit = 75.25  
12 units = 903

$$\begin{array}{r} 75.25 \\ 18 \overline{) 1,354.50} \\ \underline{-126} \phantom{00} \\ 94 \phantom{00} \\ \underline{-90} \phantom{00} \\ 45 \phantom{00} \\ \underline{-36} \phantom{00} \\ 90 \phantom{00} \\ \underline{-90} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 75.25 \\ \times 12 \\ \hline 15050 \\ + 75250 \\ \hline 903.00 \end{array}$$

(x100) (÷100)

903 kg of Potatoes will be delivered to the Bronx.

2. Valerie uses 12 fluid oz of detergent each week for her laundry. If there are 75 fluid oz of detergent in the bottle, in how many weeks will she need to buy a new bottle of detergent? Explain how you know.

week:

$$\begin{array}{r} 6.25 \\ 12 \overline{) 75.00} \\ \underline{-72} \phantom{00} \\ 30 \phantom{00} \\ \underline{-24} \phantom{00} \\ 60 \phantom{00} \\ \underline{-60} \phantom{00} \\ 0 \end{array}$$

Valerie will need to buy a new bottle of detergent after 6 weeks. She will have a little left over after 6 weeks, but not enough to do all her laundry in the 7<sup>th</sup> week.

engage<sup>ny</sup> 2.H.19

Lesson 29 Problem Set 5•2

3. The area of a rectangle is 56.96 m<sup>2</sup>. If the length is 16 m, what is its perimeter?

16 m

P = ?  
P = (3.56 × 2) + (16 × 2)  
= 7.12 + 32  
= 39.12

$$\begin{array}{r} 3.56 \\ 16 \overline{) 56.96} \\ \underline{-48} \phantom{00} \\ 89 \phantom{00} \\ \underline{-80} \phantom{00} \\ 96 \phantom{00} \\ \underline{-96} \phantom{00} \\ 0 \end{array}$$

$$\begin{array}{r} 3.56 \\ \times 2 \\ \hline 7.12 \end{array}$$

The perimeter of the rectangle is 39.12 meters.

4. A city block is 3 times as long as it is wide. If the distance around the block is 0.48 kilometers, what is the area of the block in square meters?

length

width

8 units = 480  
1 unit = 60

A = 180 × 60  
= 18 × 6 × 100  
= 108 × 100  
= 10,800

$$\begin{array}{r} 18 \\ \times 6 \\ \hline 108 \end{array}$$

The area of the block is 10,800 square meters.

engage<sup>ny</sup> 2.H.22

**Exit Ticket (3 minutes)**

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

Name \_\_\_\_\_

Date \_\_\_\_\_

Solve.

1. Lamar has 1,354.5 kilograms of potatoes to deliver equally to 18 stores. 12 of the stores are in the Bronx. How many kilograms of potatoes will be delivered to stores in the Bronx?

2. Valerie uses 12 fluid oz of detergent each week for her laundry. If there are 75 fluid oz of detergent in the bottle, in how many weeks will she need to buy a new bottle of detergent? Explain how you know.

3. The area of a rectangle is  $56.96 \text{ m}^2$ . If the length is 16 m, what is its perimeter?
4. A city block is 3 times as long as it is wide. If the distance around the block is 0.48 kilometers, what is the area of the block in square meters?



Name \_\_\_\_\_

Date \_\_\_\_\_

Solve.

Hayley borrowed \$1,854 from her parents. She agreed to repay them in equal installments throughout the next 18 months. How much will Hayley still owe her parents after a year?



3. The area of a rectangle is  $256.5 \text{ m}^2$ . If the length is 18 m, what is the perimeter of the rectangle?
4. Tyler baked 702 cookies. He sold them in boxes of 18. After selling all of the boxes of cookies for the same amount each, he earned \$136.50. What was the cost of one box of cookies?

5. A park is 4 times as long as it is wide. If the distance around the park is 12.5 kilometers, what is the area of the park?