

## **Multiplication and Division**

#### **Student Outcomes**

- Students develop expressions involving multiplication and division from real-world problems.
- Students evaluate these expressions for given values.

#### **Lesson Notes**

This lesson builds on Lesson 18 and 19, extending the concepts using multiplication and division expressions.

#### Classwork

#### **Opening (3 minutes)**

Take time to make sure the answers to the Problem Set from the previous lesson are clear. The labels on the tables should be complete.

#### **Discussion (3 minutes)**

- In the previous lessons, we created expressions that used addition and subtraction to describe the relationship between two quantities. How did using tables help your understanding?
  - Answers will vary. Patterns were easy to see. Looking down the columns revealed a number pattern. Looking across the rows revealed a constant difference between columns.
- In this lesson, we are going to develop expressions involving multiplication and division, much like the last lesson. We will also evaluate these expressions for given values.

### Example 1 (10 minutes)

- The farmers' market is selling bags of apples. In every bag, there are 3 apples.
  If I buy one bag, how many apples will I have?
  - Three.
- If I buy two bags, how many apples will I have?
  - Since  $2 \cdot 3 = 6$ , you will have 6 apples.
- If I buy three bags, how many apples will I have?
  - Since  $3 \cdot 3 = 9$ , you will have 9 apples.
- Fill in the table for a purchase of 4 bags of apples. Check your answer with a partner.

#### Scaffolding:

Having interlocking cubes ready in groups of three will make a concrete visual for students to see and hold for Example 1. Put these in clear plastic bags, if desired.



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#### Example 1

1. The farmers' market is selling bags of apples. In every bag, there are 3 apples.

a. Complete the table.

Number of Bags	Total Number of Apples
1	3
2	6
3	9
4	12
В	3 <i>B</i>

- What if I bought some other number of bags? If I told you how many bags, could you calculate the number of apples I would have altogether?
  - Yes, multiply the number of bags by 3 to find the total number of apples.
- What if I bought B bags of apples? Can you write an expression in the table that describes the total number of apples I have purchased?
  - $3B \text{ or } 3(B) \text{ or } 3 \cdot B$

Take a moment to review the different notations used for multiplication. Students should be comfortable reading and writing the expressions in all three forms.

- What if the market had 25 bags of apples to sell? How many apples is that in all?
  - If B = 25, then  $3B = 3 \cdot 25 = 75$  apples.

b. What if the market had 25 bags of apples to sell? How many apples is that in all?

If B = 25, then  $3B = 3 \cdot 25 = 75$  apples.

c. If a truck arrived that had some number, *a*, more apples on it, then how many bags would the clerks use to bag up the apples?

 $a \div 3$  bags are needed. If there are 1 or 2 apples left over, an extra bag will be needed (although not full).

d. If a truck arrived that had 600 apples on it, how many bags would the clerks use to bag up the apples?

 $600 \text{ apples} \div \frac{3 \text{ apples}}{1 \text{ bag}} = 200 \text{ bags.}$ 

e. How is part (d) different from part (b)?

Part (d) gives the number of apples and asks for the number of bags. Therefore, we needed to divide the number of apples by 3. Part (b) gives the number of bags and asks for the number of apples. Therefore, we needed to multiply the number of bags by 3.



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#### **Exercise 1 (5 minutes)**

Students work on Exercise 1 independently.

emp	ew York State, there is a five cent deposit on all oty can or bottle, you get the five cents back.	carbonated beverage cans and bottles.	viteri you return the		
a.	Complete the table.				
	Number of Containers Returne	d Refund in Dollars	]		
	1	0.05			
	2	0.10	-		
	3	0.15	-		
	4	0.20			
	10	0.50			
	50	2.50			
	100	5.00	1		
	С	0.05 <i>C</i>	1		
c. d.	If $C = 222$ , then $0.05C = 0.05 \cdot 222 = 11$ .	expression to find out how much money Brett would receive if he returned 222 cans. 22, then $0.05C = 0.05 \cdot 222 = 11.10$ . Brett would receive \$11.10 if he returned 222 cans. needs to earn \$4.50 for returning cans, how many cans does he need to collect and return? 0.05 = 90 cans.			
	How is part (d) different from part (c)?				
e.	How is part (d) different from part (c)? Part (d) gives the amount of money and asks				

Discuss the similarities and differences between Example 1 and Exercise 1. In both problems, the second quantity is a multiple of the first. Multiplication by the constant term is used to show the relationship between the quantities in the first column and the quantities in the second column. Division is used to show the relationship between the quantities in the second column and the quantities in the first column.



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#### Exercise 2 (10 minutes)

Students work on Exercise 2 independently.

2. The fare for a subway or a local bus ride is \$2.50. Complete the table. a. Number of Rides **Cost of Rides in Dollars** 1 2.50 2 5.00 3 **7**. **50** 10.00 4 5 12.50 10 25.00 30 75.00 R 2.50R or 2.5R If we let R represent the number of rides, what is the expression that shows the cost of the rides? b. 2.50R or 2.5R Use the expression to find out how much money 60 rides would cost. c. If R = 60, then  $2.50R = 2.50 \cdot 60 = $150.00$ . d. If a commuter spends \$175.00 on subway or bus rides, how many trips did the commuter take?  $175.00 \div 2.50 = 70.$  The commuter took 70 trips. How is part (d) different from part (c)? e. Part (d) gives the amount of money and asks for the number of rides. Therefore, we needed to divide the amount of money by the cost of each ride (\$2.50). Part (c) gives the number of rides and asks for the amount of money. Therefore, we needed to multiply the number of rides by \$2.50.





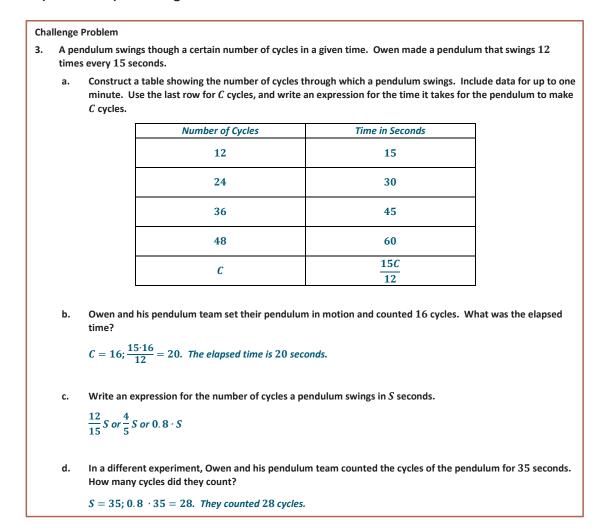
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#### Exercise 3 (10 minutes): Challenge Problem



#### **Closing (2 minutes)**

- In Example 1, we looked at the relationship between the number of bags purchased at the farmers' market and the total number of apples purchased. We created two different expressions: 3B and a ÷ 3. What does each variable represent, and why did we multiply by 3 in the first expression and divide by 3 in the second?
  - The variable B represented the number of bags. We had to multiply by 3 because we were given the number of bags and there were 3 apples packaged in each bag. The variable a represented the number of apples. We divided by 3 because we were given the number of apples and need to determine the number of bags needed.
- What would the expressions be if the farmers' market sold bags that contained 5 apples in a bag instead of 3?
  - 5*B* and  $a \div 5$ , respectively.

#### **Exit Ticket (3 minutes)**



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Date \_\_\_\_\_

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#### **Exit Ticket**

Anna charges \$8.50 per hour to babysit. Complete the table, and answer the questions below.

Number of Hours	Amount Anna Charges in Dollars
1	
2	
5	
8	
Н	

a. Write an expression describing her earnings for working *H* hours.

b. How much will she earn if she works for  $3\frac{1}{2}$  hours?

c. How long will it take Anna to earn \$51.00?



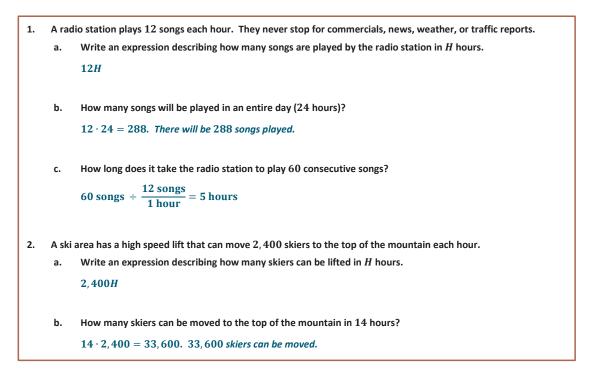




#### **Exit Ticket Sample Solutions**

	Number of Hours	Amount Anna Charges in Dollars
	1	8.50
	2 5	17.00 42.50
	8	68
	Н	8.50H or 8.5H
8.50 <i>H</i> o	8.5 <i>H</i>	
	1	
b. How muc	n will she earn if she works for $3\frac{1}{2}$	hours?
	n will she earn if she works for $3\frac{1}{2}$ 5, then 8.5 <i>H</i> = 8.5 · 3.5 = 29.7	
If $H=3$ .	2	

#### **Problem Set Sample Solutions**

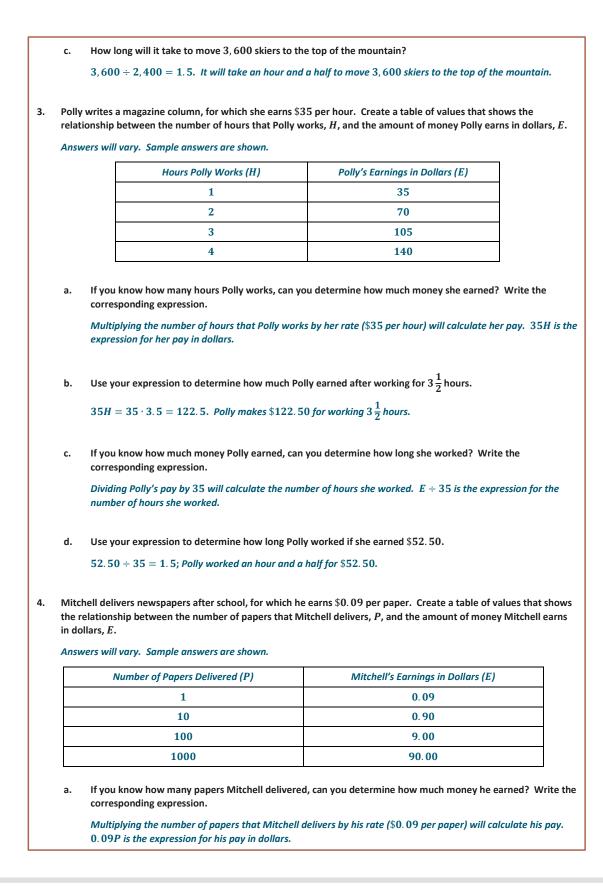




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corresponding expression.

b.

c.

Use your expression to determine how much Mitchell earned by delivering 300 newspapers.  $0.09P = 0.09 \cdot 300 = 27$ . Mitchell earned \$27.00 for delivering 300 newspapers. If you know how much money Mitchell earned, can you determine how many papers he delivered? Write the Dividing Mitchell's pay by \$0.09 will calculate the number of papers he delivered.  $E \div 0.09$  is the expression for the number of papers he delivered.

Use your expression to determine how many papers Mitchell delivered if he earned \$58.50 last week. d.

 $58.50 \div 0.09 = 650$ ; therefore, Mitchell delivered 650 newspapers last week.

- 5. Randy is an art dealer who sells reproductions of famous paintings. Copies of the Mona Lisa sell for \$475.
  - Last year Randy sold \$9,975 worth of Mona Lisa reproductions. How many did he sell? а.

 $9,975 \div 475 = 21.$  He sold 21 copies of the painting.

If Randy wants to increase his sales to at least \$15,000 this year, how many copies will he need to sell b. (without changing the price per painting)?

 $15,000 \div 475 \textit{ is about } 31.6. \textit{ He will have to sell } 32 \textit{ paintings in order to increase his sales to at least}$ \$15,000.



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