Constant of Proportionality

Procedural Lesson

Grade 7 · Unit 3 · Lesson 9

MC: 7.RP.2b

MPs ✓ Applied MP * Embedded MP

1	2	3	4	5	6	7	8
✓*		*	*	✓	*		*

Problem of the Day

Objective: _____

Vocabulary

Proportional Relationship: a relationship between two equal ratios

$$\frac{5 \text{ apples}}{2 \text{ dollars}} = \frac{20 \text{ apples}}{8 \text{ dollars}}$$

Written form is ***y = kx***; where ***k*** is constant, using the ordered data pairs (x, y).

Constant of Proportionality: the factor multiplied by the x-value to get the corresponding y-value. The unit rate and constant of proportionality both represent the value of the ratio of $y : x$.

$$y = kx$$

k is the constant of proportionality.

$$k = \frac{y}{x}$$

Notes

Steps:

To find the constant of proportionality, use the following:

- **Table:** convert one entry to a ratio; the equivalent fraction with a denominator of 1 is the constant of proportionality.
- **Coordinate Plane:** write one coordinate (x, y) as the fraction $\frac{y}{x}$; the equivalent fraction with 1 in the denominator is the constant of proportionality.
- **Linear Equation *y = kx*:** the coefficient k is the constant of proportionality.
- **Verbal Description:** the constant of proportionality is the unit rate.

Structured Guided Practice

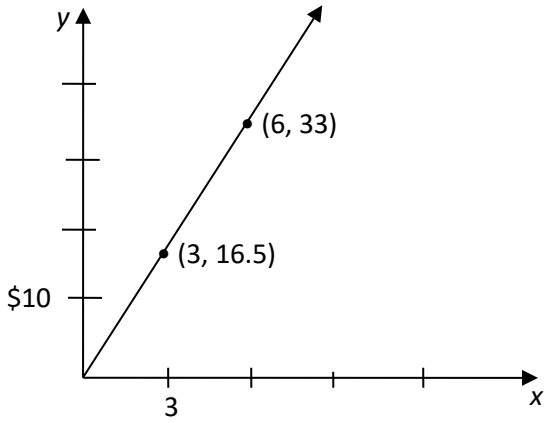
(A/B Partners Practice)

Directions: Read and solve. Create an equation that represents the relationship.

1. The amount of sugar needed for a cookie recipe is proportional to the number of cookies. Steven made a batch of 25 cookies that called for 5 tbsp sugar. Then, he made 65 cookies and used 13 tbsp of sugar and told his friend that if he was going to make 105 cookies, he would need 21 tbsp of sugar. What is the constant of proportionality?

	Sugar (tbsp)	Cookies	$\frac{y}{x}$
Batch 1	5	25	
Batch 2	13	65	
Batch 3	21	105	

2. The cost y of attending a show is proportional to the number of tickets purchased x, as shown in the graph. What is the constant of proportionality?



Final Check for Understanding

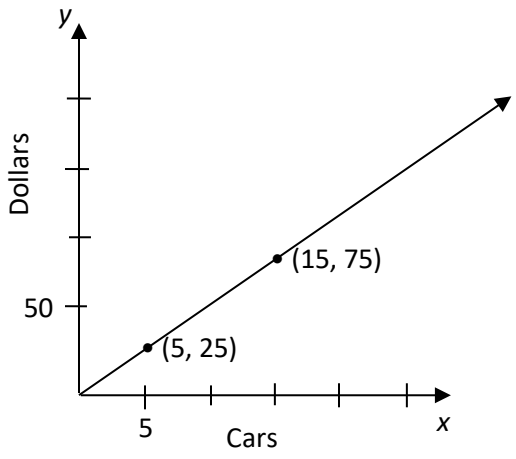
(Teacher Checks Work)

Directions: Read and solve. Create an equation that represents that relationship.

1. Two triangles are proportional. The first triangle has a base of 10 and a height of 5. The second triangle has a base of 15 and a height of 7.5. What is the constant of proportionality?

	Height	Base	$\frac{y}{x}$
Triangle 1	5	10	
Triangle 2	7.5	15	

2. The graph below shows Stan's earnings for washing cars. What is the constant of proportionality?



Student Practice

Unit 3 · Lesson 9: Constant of Proportionality

Name: _____

Date: _____

Directions: Determine the constant of proportionality and create an equation.

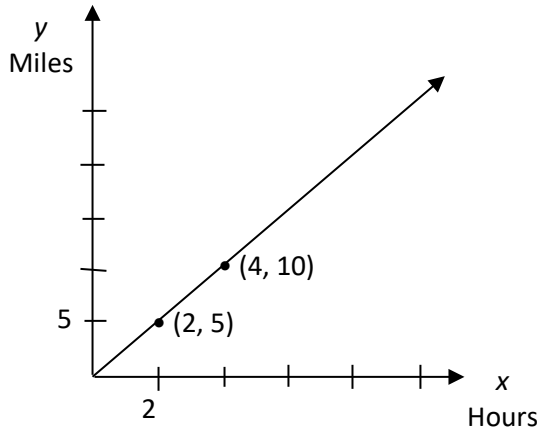
1. The table shows a proportional relationship between x and y.

x	y	$\frac{y}{x}$
0.25	0.50	
2	4	
5	10	

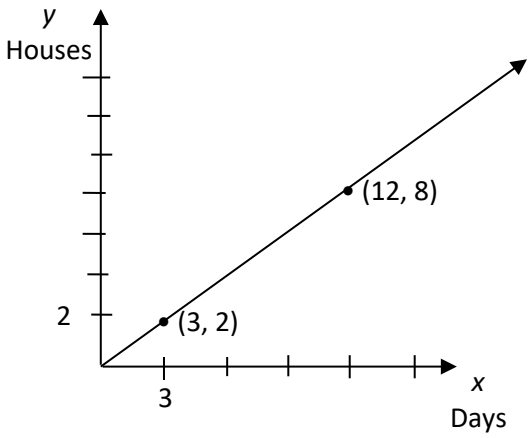
2. The grades Phil, Fred, and Steve received on their test are proportional to how long they studied.

	Time	Grade	$\frac{y}{x}$
Phil	30 min	24 pts	
Fred	45 min	36 pts	
Steve	90 min	72 pts	

3. The graph below shows Penelope's time on her bike and the distance she road.



4. The graph below shows the number of houses Harry paints over time.



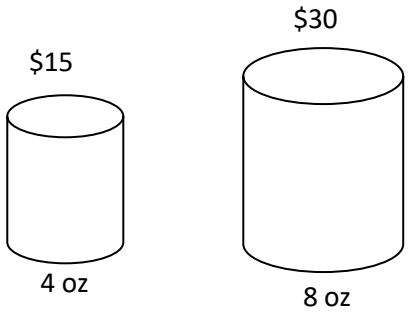
Student Practice

Unit 3 · Lesson 9: Constant of Proportionality

Directions: Determine the constant of proportionality and create an equation.

5. The amount of tomatoes in a sauce is proportional to the amount of olive oil used. Five tomatoes need 3 tbsp of olive oil. What is the constant of proportionality?

6. The cost of a can of soup is proportional to its volume. What is the constant of proportionality (to the nearest hundredth)?



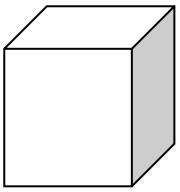
Challenge Problems

Directions: Read and solve. Create an equation that represents the relationship.

1. Determine whether the relationship between height and running speed is proportional.

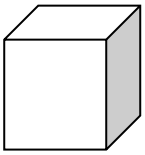
	Height	Running Speed
Tim	65 in.	$5\frac{5}{12}$ mph
Kate	60 in.	5 mph
John	70 in.	$5\frac{5}{6}$ mph

2. Determine whether the relationship is proportional, and if so, find the constant of proportionality. How else might you represent the situation?



Height: 6

Volume: 96



Height: 4

Volume: 64

Extension Activity

* **MP1:** Make sense of the problem and persevere in solving it.
* **MP4:** Apply mathematics in everyday life.

Fill in the missing values to create a constant of proportionality.

Apples	60	120		12
Pie	4		11	

Closure

Reaching Consensus

**MP3:* *Do you agree or disagree with your classmate? Why or why not?*

Student Presentations

**MP1:* *What steps in the process are you most confident about?*
**MP6:* *Explain how you might show that your solution answers the problem.*

Closure

Recap today's lesson with one or more of the following questions:

✓*MP1:* *What are some other strategies you might try?*
✓*MP5:* *In these situations, would it be helpful to use a number line or a graph?*

Notes