

# Bellringer

**Write each fraction as a decimal.**

$$\frac{3}{8}$$

$$\frac{4}{5}$$

**Solve each proportion for x.**

$$\frac{20}{18} = \frac{10}{x}$$

$$\frac{24}{16} = \frac{x}{2}$$

## 3.1 Representing Proportional Relationships

8.EE.6

Use similar triangles to explain why the slope  $m$  is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation  $y=mx$  for a line through the origin and the equation  $y=mx+b$  for a line intercepting the vertical axis at  $b$

8.F.4

Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two  $(x,y)$  values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values

1. Video2. Wages Activity

Job	Hourly Wage
Warehouse Worker	\$10.25
Production Worker	\$13.65
Technical Support Rep.	\$15.55
Quality Specialist	\$18.05
Medical Assistant	\$12.15
Fast Food Worker	\$8.50
Zookeeper	\$14.50
Receptionist	\$9.65

How much will you make in:

1 Hour  $\rightarrow$  wage  $\times$  1  
 2 Hours  $\rightarrow$  wage  $\times$  2  
 3 Hours  $\rightarrow$  wage  $\times$  3  
 8 Hours  $\rightarrow$  wage  $\times$  8  
 40 Hours  $\rightarrow$  wage  $\times$  40 = \_\_\_\_\_  
 1 Week  $\rightarrow$  \_\_\_\_\_  
 1 Month  $\rightarrow$  \_\_\_\_\_  $\times$  4  
 1 Year  $\rightarrow$  \_\_\_\_\_  $\times$  52  
 4 wks  
 52 wks

$$y = 10.25x$$

\$      hours

## Vocabulary

- proportional relationship - relationship between two quantities where the **ratio** of one quantity to the other is **constant**
- Constant of proportionality - represented by the variable "k" in  $y = kx$

# What Are Ratios ?

- Comparison
- Boys to girls
- Students to desk
- Mph

## EXPLORE ACTIVITY

COMMON  
CORE

Prep for 8.EE.6

## Representing Proportional Relationships with Tables

$$3L = 9$$

$$4L = 12$$

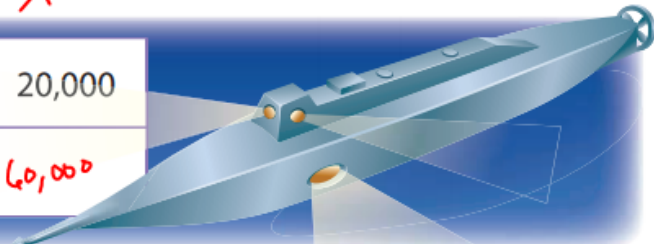
$$5L = 15$$

In 1870, the French writer Jules Verne published *20,000 Leagues Under the Sea*, one of the most popular science fiction novels ever written. One definition of a league is a unit of measure equaling 3 miles.

**A** Complete the table.

$$\times 3 \quad \times 3 \quad \div 3 \quad \times 3$$

Distance (leagues)	1	2	6	12	20,000
Distance (miles)	3	6	18	36	60,000



- B** What relationships do you see among the numbers in the table?

Every number in the bottom row is  
three times the top row

- C** For each column of the table, find the ratio of the distance in miles to the distance in leagues. Write each ratio in simplest form.

$$\frac{y}{x} \text{ miles} \quad \frac{3}{1} = 3 \quad \frac{4}{2} = 3 \quad \frac{18}{6} = 3 \quad \frac{36}{12} = 3 \quad \frac{60,000}{20,000} = 3$$

leagues

- D** What do you notice about the ratios? All equal  $\frac{3}{1}$  or 3

$$y = kx$$

$$y = 3x$$

## Formulas

$$y = kx$$

$k$  is the constant

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



**EXAMPLE 1**

COMMON CORE 8.EE.6

Meghan earns \$12 an hour at her part-time job. Show that the relationship between the amount she earned and the number of hours she worked is a proportional relationship. Then write an equation for the relationship.

**STEP 1**

Make a Table

\$	12	24	36	48	120
Hours	1	2	3	4	10

**STEP 2**

Create Ratios

$$\frac{12}{1} \quad \frac{24}{2} \quad \frac{36}{3} \quad \frac{48}{4} \quad \frac{120}{10}$$

$$12 \quad 12 \quad 12 \quad 12 \quad 12$$

**STEP 3**

Write Equation

$$y = kx$$

$$y = 12x$$

$$\text{Total \$} = 12(\text{Hours})$$

## ADDITIONAL EXAMPLE 1

Marco earns \$36.50 per hour as an accountant. Show that the relationship between the amount he earns and the number of hours he works is a proportional relationship. Then write an equation for the relationship.

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

$$K = \frac{\$}{\text{hours}}$$

Step 1: Table

\$	36.5	73	109.5	146	365
Hours	1	2	3	4	10

Step 2: Ratios

$$\begin{array}{ccccc} \frac{36.5}{1} & \frac{73}{2} & \frac{109.5}{3} & \frac{146}{4} & \frac{365}{10} \\ \text{Constant} \rightarrow & 36.5 & 36.5 & 36.5 & 36.5 \end{array}$$

Step 3: Equation

$$y = 36.5x$$

## YOUR TURN

3. Fifteen bicycles are produced each hour at the Speedy Bike Works. Show that the relationship between the number of bikes produced and the number of hours is a proportional relationship. Then write an equation for the relationship.

Step 3: Equation

$y = 15x$

Step 1: Table

y	Bikes	0	15	30	60	150
x	Hours	0	1	2	4	10

Step 2: Ratios

$$\frac{15}{1} = 15 \quad \frac{30}{2} = 15 \quad \frac{60}{4} = 15 \quad \frac{150}{10} = 15$$

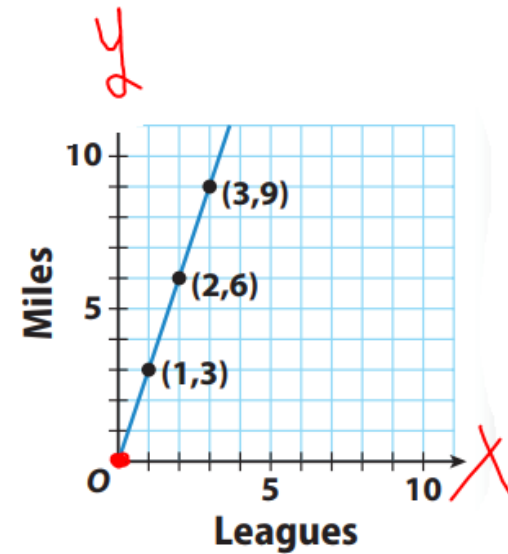
$(0,0)$   
 $(1,15)$   
 $(2,30)$

$\frac{y}{x}$

## Representing Proportional Relationships with Graphs

Proportional relationships have a graph with a line that passes through the origin  $(0,0)$

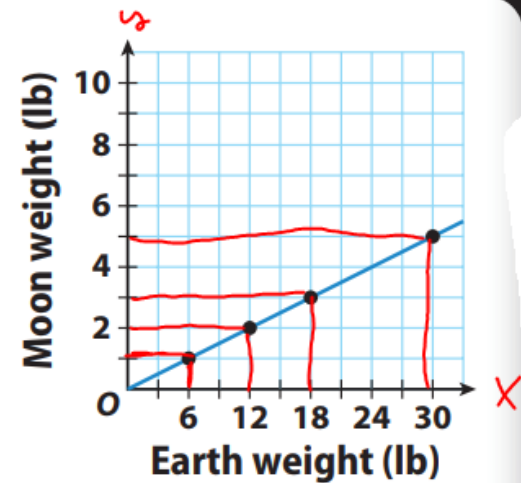
$(x, y)$



**EXAMPLE 2**COMMON  
CORE

8.EE.6

The graph shows the relationship between the weight of an object on the Moon and its weight on Earth. Write an equation for this relationship.

**STEP 1**

Make A Table

y	Moon	1	2	3	5	
x	Earth	6	12	18	30	

**STEP 2**

Find Constant

$$\boxed{\frac{1}{6}} \quad \frac{2}{12} \quad \frac{3}{18} \quad \frac{5}{30}$$

$$\boxed{\frac{1}{6}} \quad \boxed{\frac{1}{6}} \quad \boxed{\frac{1}{6}}$$

**STEP 3**

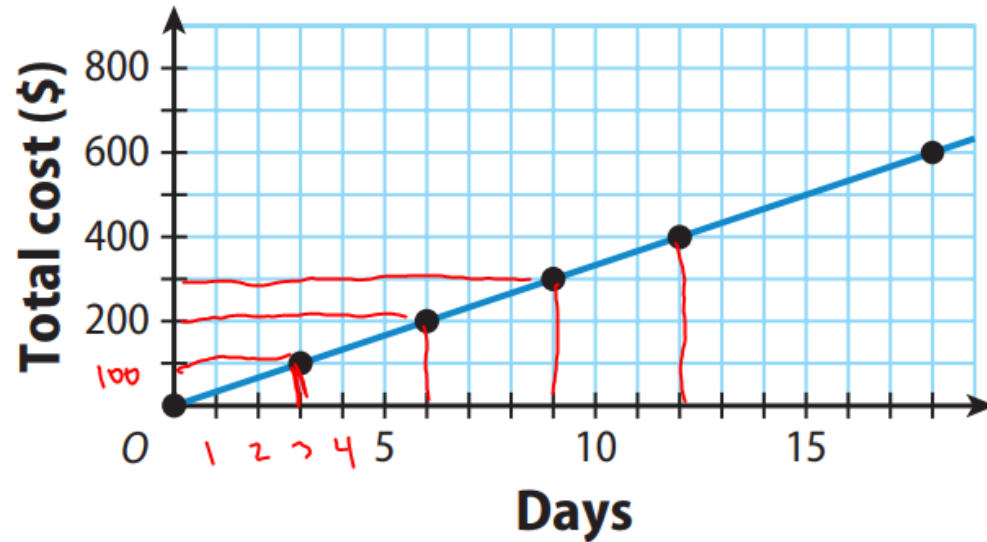
Write Equation

$$y = kx$$

$$y = \frac{1}{6}x$$

## ADDITIONAL EXAMPLE 2

The graph shows the relationship between the number of days a car is rented and the total cost for the rental. Write an equation for this relationship.



$x/y$					
\$	100	200	300	400	600
Days	3	6	9	12	18

$$\frac{100}{3} \quad \frac{200}{6} \quad \frac{300}{9} \quad \frac{400}{12} \quad \frac{600}{18}$$

$$\frac{100}{3} \quad \frac{100}{3} \quad \frac{100}{3} \quad \frac{100}{3}$$

$$y = \frac{100}{3}x$$

## YOUR TURN

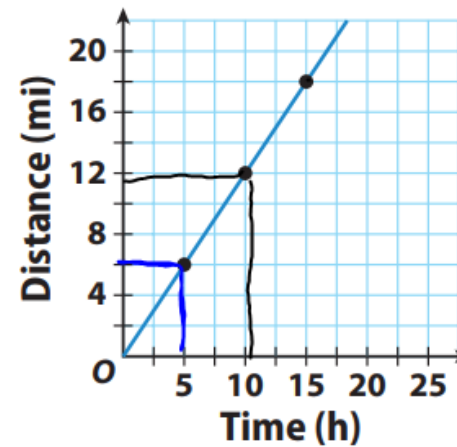
The graph shows the relationship between the amount of time that a backpacker hikes and the distance traveled.

4. What does the point (5, 6) represent?

Takes 5 hrs to go 6 miles

5. What is the equation of the relationship?

$y = \frac{6}{5}x$



$$\left(\frac{6}{5}\right) \quad \frac{12}{10} \quad \frac{18}{15}$$

$$\left(\frac{6}{5}\right) \quad \left(\frac{6}{5}\right)$$

miles	6	12	18	24	30
Hour	5	10	15	20	25

## Guided Practice

- 1. Vocabulary** A proportional relationship is a relationship between two quantities in which the ratio of one quantity to the other quantity **is / is not** constant.
- 2. Vocabulary** When writing an equation of a proportional relationship in the form  $y = kx$ ,  $k$  represents the \_\_\_\_\_.



- 3.** Write an equation that describes the proportional relationship between the number of days and the number of weeks in a given length of time.  
(Explore Activity and Example 1)

- a.** Complete the table.

<b>Time (weeks)</b>	1	2	4		10
<b>Time (days)</b>	7			56	

- b.** Let  $x$  represent \_\_\_\_\_.
- Let  $y$  represent \_\_\_\_\_.
- The equation that describes the relationship is \_\_\_\_\_.

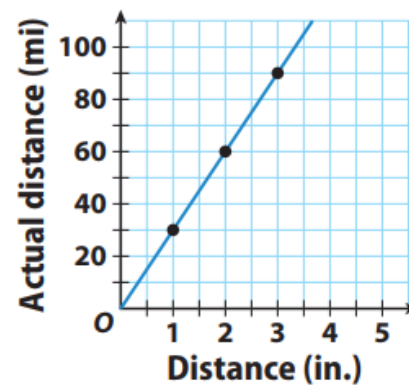
Each table or graph represents a proportional relationship. Write an equation that describes the relationship. (Example 1 and Example 2)

4. **Physical Science** The relationship between the numbers of oxygen atoms and hydrogen atoms in water

Oxygen atoms	2	5		120
Hydrogen atoms	4		34	

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5. **Map of Iowa**




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HW  
P 75-76  
1-13