Extension 5.2 Graphing Proportional Relationships

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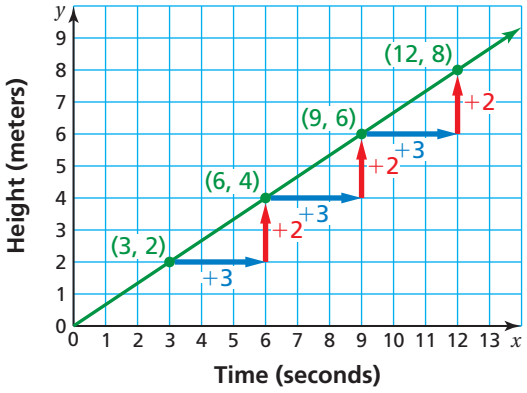
Recall that you can graph the values from a ratio table.

Time, x (seconds)	Height, y (meters)
3	2
6	4
9	6
12	8

+ 3, + 3, + 3 (down the Time column); + 2, + 2, + 2 (down the Height column)



The structure in the ratio table shows why the graph has a constant *rate of change*. You can use the constant rate of change to show that the graph passes through the origin. The graph of every proportional relationship is a line through the origin.

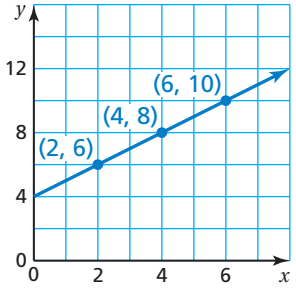
EXAMPLE 1 Determining Whether Two Quantities Are Proportional

Use a graph to tell whether x and y are in a proportional relationship.

a.

x	2	4	6
y	6	8	10

Plot (2, 6), (4, 8), and (6, 10). Draw a line through the points.



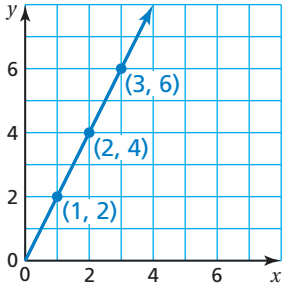
The graph is a line that does not pass through the origin.

∴ So, x and y are not in a proportional relationship.

b.

x	1	2	3
y	2	4	6

Plot (1, 2), (2, 4), and (3, 6). Draw a line through the points.



The graph is a line that passes through the origin.

∴ So, x and y are in a proportional relationship.

Proportions

In this extension, you will

- use graphs to determine whether two ratios form a proportion.
- interpret graphs of proportional relationships.

Practice

Use a graph to tell whether x and y are in a proportional relationship.

1.

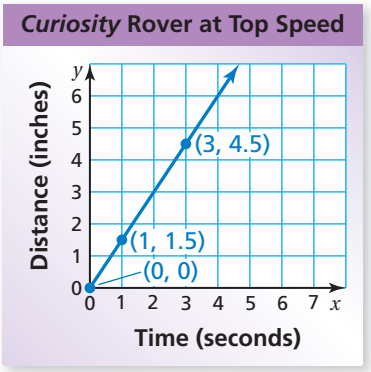
x	1	2	3	4
y	3	4	5	6

2.

x	1	3	5	7
y	0.5	1.5	2.5	3.5

EXAMPLE 2 Interpreting the Graph of a Proportional Relationship

The graph shows that the distance traveled by the Mars rover *Curiosity* is proportional to the time traveled. Interpret each plotted point in the graph.



(0, 0): The rover travels 0 inches in 0 seconds.

(1, 1.5): The rover travels 1.5 inches in 1 second. So, the unit rate is 1.5 inches per second.

Study Tip

In the graph of a proportional relationship, you can find the unit rate from the point (1, *y*).

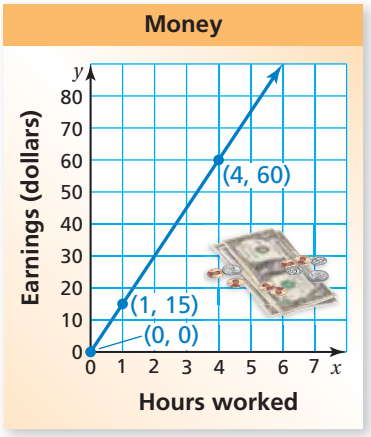
(3, 4.5): The rover travels 4.5 inches in 3 seconds. Because the relationship is proportional, you can also use this point to find the unit rate.

$$\frac{4.5 \text{ in.}}{3 \text{ sec}} = \frac{1.5 \text{ in.}}{1 \text{ sec}}, \text{ or } 1.5 \text{ inches per second}$$

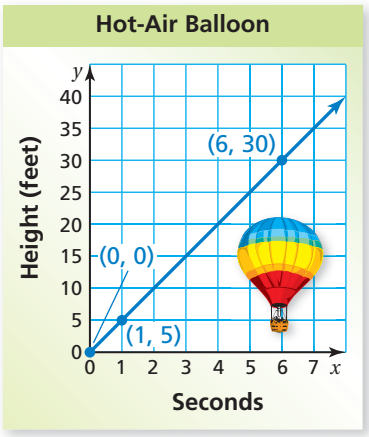
Practice

Interpret each plotted point in the graph of the proportional relationship.

3.



4.



Tell whether *x* and *y* are in a proportional relationship. If so, find the unit rate.

5.

x (hours)	1	4	7	10
y (feet)	5	20	35	50

6. Let *y* be the temperature *x* hours after midnight. The temperature is 60°F at midnight and decreases 2°F every $\frac{1}{2}$ hour.

7. REASONING The graph of a proportional relationship passes through (12, 16) and (1, *y*). Find *y*.

8. MOVIE RENTAL You pay $1 to rent a movie plus an additional $0.50 per day until you return the movie. Your friend pays $1.25 per day to rent a movie.

a. Make tables showing the costs to rent a movie up to 5 days.

b. Which person pays an amount proportional to the number of days rented?