**January 21, 2016 TPA Lesson 14.6**

Learning Objective: Students will be able to use the formal definition of direct variation to tell whether two variables show direct variation, write an equation that represents the relationship, and use the equation to find a missing value.

# Warm Up

1. $\frac{1}{7}+\frac{1}{11}$

2. $\frac{2}{3}+\frac{5}{18}$

3. $\frac{1}{4}+\frac{1}{9}$

5. $\frac{1}{16}+\frac{3}{8}$

6. $\frac{4}{17}+\frac{1}{2}$

7. $\frac{6}{17}+\frac{1}{2}$

9. $\frac{1}{2}+\frac{1}{5}$

10. $\frac{1}{3}+\frac{9}{16}$

11. $\frac{4}{9}+\frac{1}{7}$

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# Warm Up Answers

1. $\frac{1}{7}+\frac{1}{11}$
$=\frac{18}{77}$

2. $\frac{2}{3}+\frac{5}{18}$
$=\frac{17}{18}$

3. $\frac{1}{4}+\frac{1}{9}$
$=\frac{13}{36}$

5. $\frac{1}{16}+\frac{3}{8}$
$=\frac{7}{16}$

6. $\frac{4}{17}+\frac{1}{2}$
$=\frac{25}{34}$

7. $\frac{6}{17}+\frac{1}{2}$
$=\frac{29}{34}$

9. $\frac{1}{2}+\frac{1}{5}$
$=\frac{7}{10}$

10. $\frac{1}{3}+\frac{9}{16}$
$=\frac{43}{48}$

11. $\frac{4}{9}+\frac{1}{7}$
$=\frac{37}{63}$

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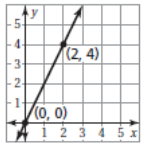
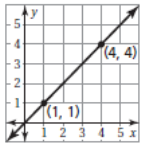
# Homework Answers

## 14.5 Record and Practice Journal

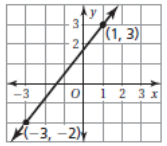
**Find the slope of the line.**

1. 


2

2. 


1

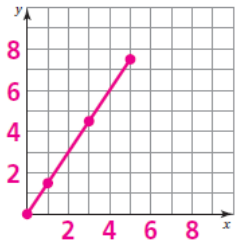
3. 


$\frac{5}{4}$

**Graph the data. Then find and interpret the slope of the line through the points.**

4.

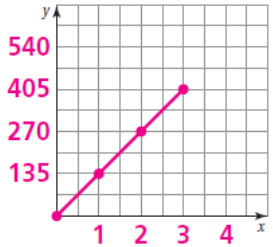
| Minutes, $x$ | 0 | 1 | 3 | 5 |
|---|---|---|---|---|
| Pages, $y$ | 0 | 1.5 | 4.5 | 7.5 |




1.5

5.

| Miles, $x$ | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Calories, $y$ | 0 | 135 | 270 | 405 |




135

6. By law, the maximum slope of a wheelchair ramp is $\frac{1}{12}$.

a. A ramp is designed that is 4 feet high and has a horizontal length of 50 feet. Does this ramp meet the law? Explain.

yes

b. What could be adjusted on an unacceptable ramp so that it meets the law?

*Sample answer:* greater horizontal distance

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Lesson 14.6 January 21, 2016

# Essential Question:

How can you use a graph to show the relationship between two quantities that vary directly? How can you use an equation?

Lesson 14.6

January 21, 2016

# Lesson Objective:

Students will be able to:

use the formal definition of direct variation to tell whether two variables show direct variation, write an equation that represents the relationship, and use the equation to find a missing value.

# Self-Evaluation Scale

| Score | Description |
|---|---|
| 4 | I can teach other students how to use the formal definition of direct variation to tell whether two variables show direct variation, write an equation that represents the relationship, and use the equation to find a missing value. |
| 3 | I can use the formal definition of direct variation to tell whether two variables show direct variation, write an equation that represents the relationship, and use the equation to find a missing value. |
| 2 | I recognize, but still need help to use the formal definition of direct variation to tell whether two variables show direct variation, write an equation that represents the relationship, and use the equation to find a missing value. |
| 1 | I do not know how to use the formal definition of direct variation to tell whether two variables show direct variation, write an equation that represents the relationship, and use the equation to find a missing value. |

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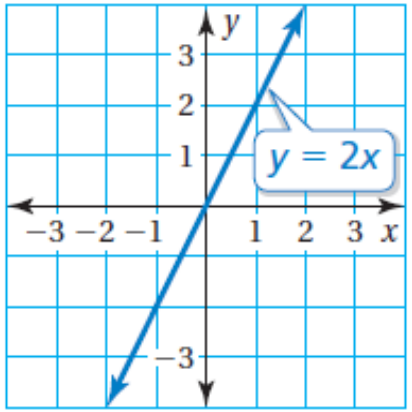
## Key Idea

### Direct Variation

**Words** Two quantities $x$ and $y$ show **direct variation** when $y = kx$, where $k$ is a number and $k \neq 0$. The number $k$ is called the **constant of proportionality**.

**Graph** The graph of $y = kx$ is a line with a slope of $k$ that passes through the origin. So, two quantities that show direct variation are in a proportional relationship.



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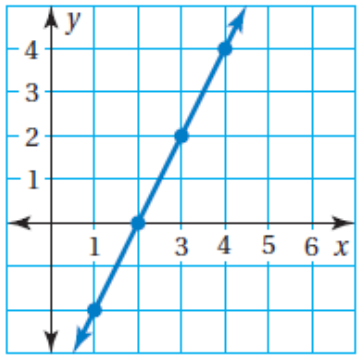
## 1 Identifying Direct Variation

**Tell whether $x$ and $y$ show direct variation. Explain your reasoning.**

**a.**

| $x$ | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $y$ | −2 | 0 | 2 | 4 |

Plot the points. Draw a line through the points.

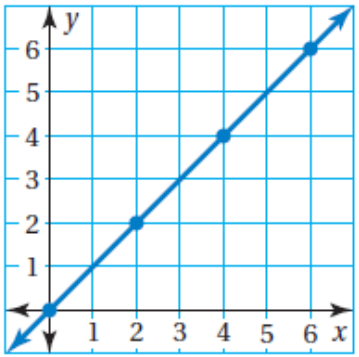



The line does *not* pass through the origin. So, $x$ and $y$ do *not* show direct variation.

**b.**

| $x$ | 0 | 2 | 4 | 6 |
|---|---|---|---|---|
| $y$ | 0 | 2 | 4 | 6 |

Plot the points. Draw a line through the points.




The line passes through the origin. So, $x$ and $y$ show direct variation.

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## 2 Identifying Direct Variation

**Tell whether $x$ and $y$ show direct variation. Explain your reasoning.**

**a.** $y + 1 = 2x$

$y = 2x - 1$ Solve for $y$.

∴ The equation *cannot* be written as $y = kx$. So, $x$ and $y$ do *not* show direct variation.

**b.** $\frac{1}{2}y = x$

$y = 2x$ Solve for $y$.

∴ The equation can be written as $y = kx$. So, $x$ and $y$ show direct variation.

**January 21, 2016 TPA Lesson 14.6**

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# OYO!

## On Your Own

**Tell whether $x$ and $y$ show direct variation. Explain your reasoning.**

**1.**

| $x$ | $y$ |
|---|---|
| 0 | $-2$ |
| 1 | 1 |
| 2 | 4 |
| 3 | 7 |

**2.**

| $x$ | $y$ |
|---|---|
| 1 | 4 |
| 2 | 8 |
| 3 | 12 |
| 4 | 16 |

**3.**

| $x$ | $y$ |
|---|---|
| $-2$ | 4 |
| $-1$ | 2 |
| 0 | 0 |
| 1 | 2 |

**4.** $xy = 3$

**5.** $x = \frac{1}{3}y$

**6.** $y + 1 = x$

**January 21, 2016 TPA Lesson 14.6**

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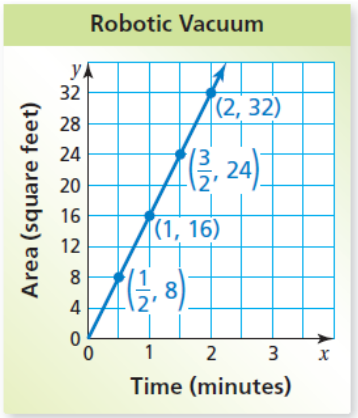
## 3 Real-Life Application

| $x$ | $y$ |
|---|---|
| $\frac{1}{2}$ | 8 |
| 1 | 16 |
| $\frac{3}{2}$ | 24 |
| 2 | 32 |

**The table shows the area $y$ (in square feet) that a robotic vacuum cleans in $x$ minutes.**




**a. Graph the data. Tell whether $x$ and $y$ are directly proportional.**

Graph the data. Draw a line through the points.

∴ The graph is a line through the origin. So, $x$ and $y$ are directly proportional.

**b. Write an equation that represents the line.**

Choose any two points to find the slope of the line.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{16}{1} = 16$$

∴ The slope of the line is the constant of proportionality, $k$. So, an equation of the line is $y = 16x$.

**c. Use the equation to find the area cleaned in 10 minutes.**

$y = 16x$ Write the equation.

$= 16\,(10)$ Substitute 10 for $x$.

$= 160$ Multiply.

∴ So, the vacuum cleans 160 square feet in 10 minutes.

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# OYO!

## On Your Own

7. **WHAT IF?** The battery weakens and the robot begins cleaning less and less area each minute. Do $x$ and $y$ show direct variation? Explain.

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# Assignment

Complete problems:

4, 6, 8, 10, 12, 20, 22, 26, & 28

on pages 638 - 639 in your Big Ideas Text Book.

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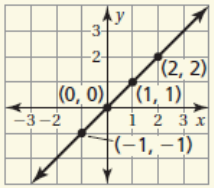
# Assignment Answers

**4.** 


yes; All the points lie on a line and the line passes through the origin.

**6.** yes; The line passes through the origin; $k = 2$

**8.** no; The line does not pass through the origin.

**10.** no; The equation cannot be written as $y = kx$.

**12.** no; The equation cannot be written as $y = kx$.

**20.** $k = 24$; $y = 24x$

**22.** $k = \frac{9}{8}$; $y = \frac{9}{8}x$

**26.** yes; $k = 13$; The cost of 1 ticket is \$13; $y = 13x$; \$182

**28.** 76,000 mg

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# Homework

In your Big Ideas Record and Practice Journal page 330.