

# Direct Variation (Pages 264–269)

A **direct variation** is a linear function that can be written in the form  $y = kx$ , where  $k \neq 0$ . In this equation,  $k$  is called the **constant of variation**. We say that  $y$  *varies directly as*  $x$ . Since  $y$  depends on  $x$ ,  $y$  is the **dependent variable** and  $x$  is the **independent variable**. The graph of a direct variation passes through the origin. Direct variations can be used to solve **rate problems**.

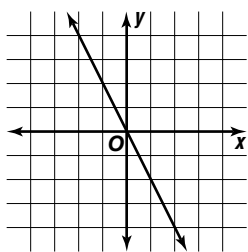
You can also use 3 of the general forms for proportions to solve direct

variation problems. These include  $\frac{y_1}{y_2} = \frac{x_1}{x_2}$ ,  $\frac{x_2}{y_2} = \frac{x_1}{y_1}$ , and  $\frac{y_1}{x_1} = \frac{y_2}{x_2}$ .

## EXAMPLES

**A** Determine whether  $y = -2x$  is a direct variation.

Graph the equation.



Since the graph passes through the origin, the equation is a direct variation.

**B** Suppose  $y$  varies directly as  $x$  and  $y = 4$  when  $x = 6$ . Find  $y$  when  $x = 9$ .

$$\frac{y_1}{y_2} = \frac{x_1}{x_2} \quad \text{Direct proportion}$$

$$\frac{4}{y_2} = \frac{6}{9} \quad y_1 = 4, x_1 = 6, \text{ and } x_2 = 9$$

$$36 = 6y_2 \quad \text{Find the cross products.}$$

$$6 = y_2 \quad \text{Divide each side by 6.}$$

So,  $y = 6$  when  $x = 9$ .

## PRACTICE

Determine whether each equation is a direct variation. Verify the answer with a graph.

1.  $y = x + 2$

2.  $y = 5x$

3.  $y = x$

4.  $y = -2x + 3$

Solve. Assume that  $y$  varies directly as  $x$ .

5. If  $y = 8$  when  $x = 5$ ,  
find  $x$  when  $y = 64$ .

6. If  $y = -14$  when  $x = 84$ ,  
find  $x$  when  $y = -2$ .

7. Find  $y$  when  $x = 9$ ,  
if  $y = -15$  when  $x = 27$ .

8. Find  $y$  when  $x = -52$ ,  
if  $y = 3$  when  $x = 4$ .

Solve by using direct variation.

9. If there are 4 quarts in a gallon, how many quarts are in 7.5 gallons?

10. How many inches are in 2.5 yards if there are 36 inches in a yard?

**11. Standardized Test Practice** The amount an employee earns varies directly as the number of hours she works. If she gets paid \$58.80 for 8 hours of work, how much will she get paid for 15 hours of work?

**A** \$110.25

**B** \$112.50

**C** \$117.60

**D** \$120.00

Answers: 1–4. See Answer Key for graphs. 1. no 2. yes 3. yes 4. no 5. 40 6. 12 7. -5 8. -39 9. 30 10. 90 11. A