

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**.

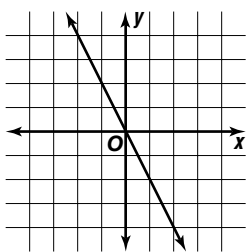
You can also use 3 of the general forms for proportions to solve direct

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