

3-6 Study Guide and Intervention *(continued)*

Ratios and Proportions

Solve Proportions If a proportion involves a variable, you can use cross products to solve the proportion. In the proportion $\frac{x}{5} = \frac{10}{13}$, x and 13 are called **extremes** and 5 and 10 are called **means**. In a proportion, the product of the extremes is equal to the product of the means.

Means-Extremes Property of Proportions

For any numbers a , b , c , and d , if $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

Example

Solve $\frac{x}{5} = \frac{10}{13}$.

$$\frac{x}{5} = \frac{10}{13}$$

Original proportion

$$13(x) = 5(10)$$

Cross products

$$13x = 50$$

Simplify.

$$\frac{13x}{13} = \frac{50}{13}$$

Divide each side by 13.

$$x = 3\frac{11}{13}$$

Simplify.

The solution is $3\frac{11}{13}$.

Exercises

Solve each proportion.

1. $\frac{-3}{x} = \frac{2}{8}$

2. $\frac{1}{t} = \frac{5}{3}$

3. $\frac{0.1}{2} = \frac{0.5}{x}$

4. $\frac{x+1}{4} = \frac{3}{4}$

5. $\frac{4}{6} = \frac{8}{x}$

6. $\frac{x}{21} = \frac{3}{63}$

7. $\frac{9}{y+1} = \frac{18}{54}$

8. $\frac{3}{d} = \frac{18}{3}$

9. $\frac{5}{8} = \frac{p}{24}$

10. $\frac{4}{b-2} = \frac{4}{12}$

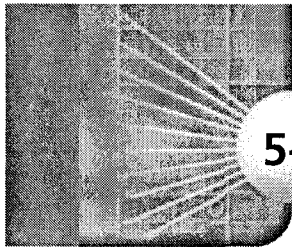
11. $\frac{1.5}{x} = \frac{12}{x}$

12. $\frac{3+y}{4} = \frac{-y}{8}$

13. $\frac{a-8}{12} = \frac{15}{3}$

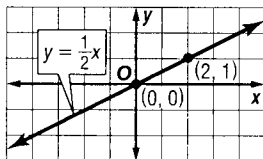
14. $\frac{12}{k} = \frac{24}{k}$

15. $\frac{2+w}{6} = \frac{12}{9}$

**5-2 Study Guide and Intervention****Slope and Direct Variation**

Direct Variation A direct variation is described by an equation of the form $y = kx$, where $k \neq 0$. We say that y *varies directly as* x . In the equation $y = kx$, k is the **constant of variation**.

Example 1 Name the constant of variation for the equation. Then find the slope of the line that passes through the pair of points.



For $y = \frac{1}{2}x$, the constant of variation is $\frac{1}{2}$.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Slope formula} \\ &= \frac{1 - 0}{2 - 0} && (x_1, y_1) = (0, 0), (x_2, y_2) = (2, 1) \\ &= \frac{1}{2} && \text{Simplify.} \end{aligned}$$

The slope is $\frac{1}{2}$.

Example 2 Suppose y varies directly as x , and $y = 30$ when $x = 5$.

a. Write a direct variation equation that relates x and y .

Find the value of k .

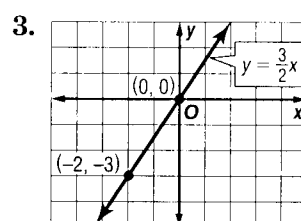
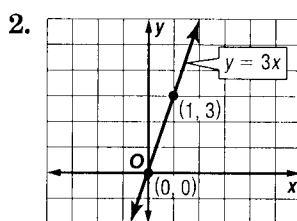
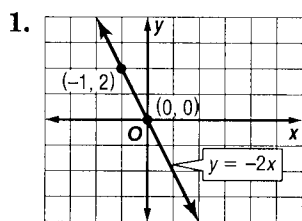
$$\begin{aligned} y &= kx && \text{Direct variation equation} \\ 30 &= k(5) && \text{Replace } y \text{ with } 30 \text{ and } x \text{ with } 5. \\ 6 &= k && \text{Divide each side by } 5. \\ \text{Therefore, the equation is } y &= 6x. \end{aligned}$$

b. Use the direct variation equation to find x when $y = 18$.

$$\begin{aligned} y &= 6x && \text{Direct variation equation} \\ 18 &= 6x && \text{Replace } y \text{ with } 18. \\ 3 &= x && \text{Divide each side by } 6. \\ \text{Therefore, } x &= 3 \text{ when } y = 18. \end{aligned}$$

Exercises

Name the constant of variation for each equation. Then determine the slope of the line that passes through each pair of points.



Write a direct variation equation that relates x to y . Assume that y varies directly as x . Then solve.

- If $y = 4$ when $x = 2$, find y when $x = 16$.
- If $y = 9$ when $x = -3$, find x when $y = 6$.
- If $y = -4.8$ when $x = -1.6$, find x when $y = -24$.
- If $y = \frac{1}{4}$ when $x = \frac{1}{8}$, find x when $y = \frac{3}{16}$.