

4-5

Study Guide and Intervention

Graphing Linear Equations

Identify Linear Equations A linear equation is an equation that can be written in the form $Ax + By = C$. This is called the **standard form** of a linear equation.

Standard Form of a Linear Equation

$Ax + By = C$, where $A \geq 0$, A and B are not both zero, and A , B , and C are integers whose GCF is 1.

Example 1

Determine whether $y = 6 - 3x$ is a linear equation. If so, write the equation in standard form.

First rewrite the equation so both variables are on the same side of the equation.

$$y = 6 - 3x$$

Original equation

$$y + 3x = 6 - 3x + 3x$$

Add $3x$ to each side.

$$3x + y = 6$$

Simplify.

The equation is now in standard form, with $A = 3$, $B = 1$ and $C = 6$. This is a linear equation.

Example 2

Determine whether $3xy + y = 4 + 2x$ is a linear equation. If so, write the equation in standard form.

Since the term $3xy$ has two variables, the equation cannot be written in the form $Ax + By = C$. Therefore, this is not a linear equation.

Exercises

**THE "NOT LINEARS" CAN BE SHOWN ON THIS PAGE.
ALL OTHERS MUST BE ON LOOSE LEAF.*

* Determine whether each equation is a linear equation. If so, write the equation in standard form.

1. $2x = 4y$

2. $6 + y = 8$

3. $4x - 2y = -1$

4. $3xy + 8 = 4y$

5. $3x - 4 = 12$

6. $y = x^2 + 7$

7. $y - 4x = 9$

8. $x + 8 = 0$

9. $-2x + 3 = 4y$

10. $2 + \frac{1}{2}x = y$

11. $\frac{1}{4}y = 12 - 4x$

12. $3xy - y = 8$

13. $6x + 4y - 3 = 0$

14. $yx - 2 = 8$

15. $6a - 2b = 8 + b$

16. $\frac{1}{4}x - 12y = 1$

17. $3 + x + x^2 = 0$

18. $x^2 = 2xy$

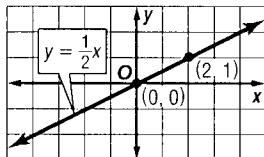
5-2 Study Guide and Intervention

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.



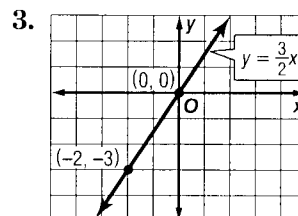
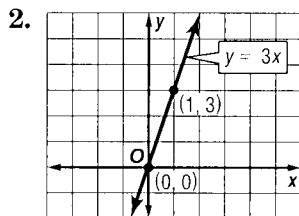
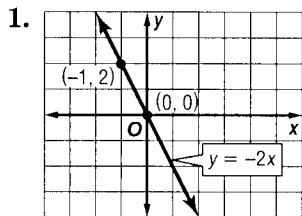
For $y = \frac{1}{2}x$, the constant of variation is $\frac{1}{2}$.

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

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

Exercises

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



ANSWER BOTH PARTS!

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

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

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 .

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

Therefore, the equation is $y = 6x$.

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

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

Therefore, $x = 3$ when $y = 18$.