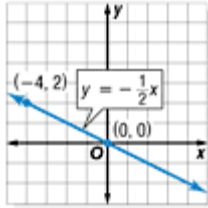


Lesson 5-2

Example 1 Slope and Constant of Variation

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

a.



The constant of variation is $-\frac{1}{2}$.

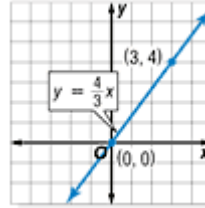
$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Slope formula}$$

$$m = \frac{2 - 0}{-4 - 0} \quad (x_1, y_1) = (0, 0)$$

$$(x_2, y_2) = (-4, 2)$$

$$m = -\frac{1}{2} \quad \text{The slope is } -\frac{1}{2}.$$

b.



The constant of variation is $\frac{4}{3}$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Slope formula}$$

$$m = \frac{4 - 0}{3 - 0} \quad (x_1, y_1) = (0, 0)$$

$$(x_2, y_2) = (3, 4)$$

$$m = \frac{4}{3} \quad \text{The slope is } \frac{4}{3}.$$

Example 2 Direct Variation with $k > 0$

Graph $y = \frac{3}{5}x$.

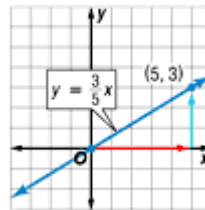
Step 1 Write the slope as a ratio.

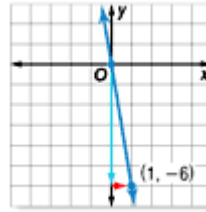
$$\frac{3}{5} \quad \begin{array}{l} \text{rise} \\ \text{run} \end{array}$$

Step 2 Graph $(0, 0)$.

Step 3 From the point $(0, 0)$, move up 3 units and right 5 units. Draw a dot.

Step 4 Draw a line connecting the points.



Example 3 Direct Variation with $k < 0$ **Graph $y = -6x$.****Step 1** Write the slope as a ratio.

$$-6 = \frac{-6}{1} \quad \begin{array}{l} \text{rise} \\ \text{run} \end{array}$$

Step 2 Graph $(0, 0)$.**Step 3** From the point $(0, 0)$, move down 6 units and right 1 unit.**Step 4** Draw a line connecting the points.**Example 4 Write and Solve a Direct Variation Equation****Suppose y varies directly as x , and $y = -10$ when $x = 8$.****a. Write a direct variation equation that relates x and y .**Find the value of k .

$$\begin{array}{ll} y = kx & \text{Direct variation formula} \\ -10 = k(8) & \text{Replace } y \text{ with } -10 \text{ and } x \text{ with } 8. \\ \frac{-10}{8} = \frac{k(8)}{8} & \text{Divide each side by } 8. \\ -1.25 = k & \text{Simplify.} \end{array}$$

Therefore, $y = -1.25x$.**b. Use the direct variation equation to find y when $x = 14$.**

$$\begin{array}{ll} y = -1.25x & \text{Direct variation equation} \\ y = -1.25(14) & \text{Replace } x \text{ with } 14. \\ y = -17.5 & \text{Multiply.} \end{array}$$

Therefore, $y = -17.5$ when $x = 14$.**Example 5 Direct Variation****A local fast food restaurant takes in \$9000 in a 4 hour period.****a. Write a direct variation equation for the income in any number of hours.****Words** The income is \$9000 and the time is 4 hours.**Variables** Let i = income per hour, I = total income, and h = hours.

$$\begin{array}{cccccc} \text{Equation} & \underbrace{\text{total income}} & \underbrace{\text{equals}} & \underbrace{\text{income per hour}} & \underbrace{\text{times}} & \underbrace{\text{number of hours}} \\ & 9000 & = & i & \times & 4 \end{array}$$

Solve for the income per hour.

$$9000 = i(4) \quad \text{Original equation}$$

$$\frac{9000}{4} = \frac{i(4)}{4} \quad \text{Divide each side by } 4.$$

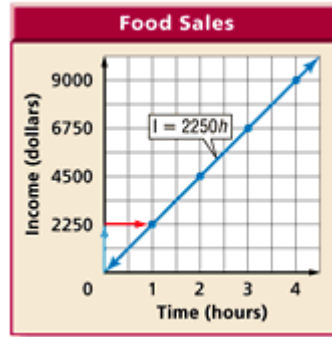
$$2250 = i \quad \text{Simplify.}$$

Therefore, the direct variation equation is $I = 2250h$.

b. Graph the equation.

The graph of $I = 2250h$ passes through the origin with slope 2250.

$$m = \frac{2250}{1} \quad \frac{\text{rise}}{\text{run}}$$



c. Estimate how many hours it would take the restaurant to earn \$20,250.

$$\begin{aligned} I &= 2250h && \text{Original equation} \\ 20,250 &= 2250h && \text{Replace } I \text{ with } 20,250. \\ \frac{20,250}{2250} &= \frac{2250h}{2250} && \text{Divide each side by } 2250. \\ 9 &= h && \text{Simplify.} \end{aligned}$$

At this rate, it will take 9 hours for the restaurant to earn \$20,250.