

Lesson 8-7

Example 1 Write Equations From Slope and y-Intercept

Write an equation in slope-intercept form for each line.

a. slope = -9, y-intercept = 2

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = -9x + 2 \quad \text{Replace } m \text{ with } -9 \text{ and } b \text{ with } 2.$$

b. slope = 0, y-intercept = -4

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = 0x + (-4) \quad \text{Replace } m \text{ with } 0 \text{ and } b \text{ with } -4.$$

$$y = -4 \quad \text{Simplify.}$$

c. slope = $\frac{7}{5}$, y-intercept = 0

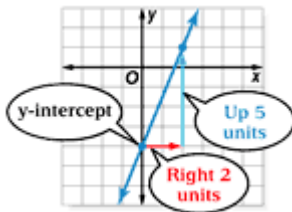
$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = \frac{7}{5}x + 0 \quad \text{Replace } m \text{ with } \frac{7}{5} \text{ and } b \text{ with } 0.$$

$$y = \frac{7}{5}x \quad \text{Simplify.}$$

Example 2 Write an Equation From a Graph

Write an equation in slope-intercept form for the line graphed.



The y-intercept is -4 . From $(0, -4)$, you can go up 5 units and right 2 units to another point on the line. So, the slope is $\frac{5}{2}$.

$$y = mx + b \quad \text{Slope-intercept form.}$$

$$y = \frac{5}{2}x - 4 \quad \text{Replace } m \text{ with } \frac{5}{2} \text{ and } b \text{ with } -4.$$

Example 3 Write an Equation to Solve a Problem

AUTOMOBILES The gas mileage for a car weighing 3500 pounds is 15 miles per gallon. The gas mileage increases 2 miles per gallon for every 300 pounds the car weight decreases.

- a. Write an equation to show the relationship between car weight, x and gas mileage, y .

Words Gas mileage increases 2 miles per gallon for every 300 pound decrease in car weight.

Variables Let x = the car weight and let y = the gas mileage.

Equations Use $m = \frac{\text{change in } y}{\text{change in } x}$ and $y = mx + b$.

Step 1

Find the slope m .

$$\begin{aligned} m &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{2}{-300} && \text{Increase of 2 mpg, decrease of 300 lbs.} \\ &\approx -0.007 && \text{Simplify.} \end{aligned}$$

Step 2

Find the y -intercept b .

$$\begin{aligned} y &= mb + b && \text{Slope-intercept form} \\ 15 &= -0.007(3500) + b && \text{Replace } (x, y) = (3500, 15) \text{ and } m \text{ with } -0.007. \\ 15 &= -24.5 + b && \text{Simplify.} \\ 39.5 &= b && \text{Add 24.5 to each side.} \end{aligned}$$

The y -intercept is about 39.5.

Step 3

Write the equation.

$$\begin{aligned} y &= mx + b && \text{Slope-intercept form} \\ y &= -0.007x + 39.5 && \text{Replace } m \text{ with } -0.007 \text{ and } b \text{ with } 39.5. \end{aligned}$$

So, the equation that represents this situation is $y = -0.007x + 39.5$.

- b. Predict the gas mileage for a car weighing 2700 pounds.

$$\begin{aligned} y &= -0.007x + 39.5 && \text{Write the equation.} \\ y &= -0.007(2700) + 39.5 && \text{Replace } x \text{ with } 2700. \\ y &= 20.6 && \text{Simplify.} \end{aligned}$$

So, for a car weighing 2700 pounds, the predicted gas mileage is 20.6 miles per gallon.

Example 4 Write an Equation Given Two Points

Write an equation for the line that passes through (3, -1) and (8, 6).

Step 1 Find the slope m .

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Definition of slope}$$

$$m = \frac{6 - (-1)}{8 - 3} \text{ or } \frac{7}{5} \quad (x_1, y_1) = (3, -1), (x_2, y_2) = (8, 6)$$

Step 2 Find the y -intercept b . Use the slope and the coordinates of either point.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$6 = \frac{7}{5}(8) + b \quad \text{Replace } (x, y) \text{ with } (8, 6) \text{ and } m \text{ with } \frac{7}{5}.$$

$$6 = \frac{56}{5} + b \quad \text{Simplify.}$$

$$6 - \frac{56}{5} = \frac{56}{5} - \frac{56}{5} + b \quad \text{Subtract } \frac{56}{5} \text{ from each side.}$$

$$\frac{30}{5} - \frac{56}{5} = b \quad \text{Rewrite 6 with a denominator of 5.}$$

$$\frac{-26}{5} = b \quad \text{Subtract.}$$

Step 3 Substitute the slope and y -intercept.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = \frac{7}{5}x - \frac{26}{5} \quad \text{Replace } m \text{ and } b.$$

Example 5 Write an Equation From a Table

Use the table of values to write an equation in slope-intercept form.

x	y
-3	1
1	-1
5	-3
9	-5

Step 1 Find the slope m . Use the coordinates of any two points.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Definition of slope}$$

$$= \frac{-1 - 1}{1 - (-3)} \text{ or } -\frac{1}{2} \quad (x_1, y_1) = (-3, 1), (x_2, y_2) = (1, -1)$$

Step 2 Find the y -intercept b . Use the slope and the coordinates of either point.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$1 = -\frac{1}{2}(-3) + b \quad \text{Replace } (x, y) \text{ with } (-3, 1) \text{ and } m \text{ with } -\frac{1}{2}.$$

$$1 = \frac{3}{2} + b \quad \text{Multiply.}$$

$$1 - \frac{3}{2} = \frac{3}{2} - \frac{3}{2} + b \quad \text{Subtract } \frac{3}{2} \text{ from each side.}$$

$$-\frac{1}{2} = b \quad \text{Simplify.}$$

Step 3 Substitute the slope and y -intercept.

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = -\frac{1}{2}x - \frac{1}{2} \quad \text{Replace } m \text{ and } b.$$

CHECK $y = -\frac{1}{2}x - \frac{1}{2}$ Write the equation.

$$-5 \stackrel{?}{=} -\frac{1}{2}(9) - \frac{1}{2} \quad \text{Replace } (x, y) \text{ with the coordinates of another point, } (9, -5).$$

$$-5 \stackrel{?}{=} -\frac{9}{2} - \frac{1}{2} \quad \text{Simplify.}$$

$$-5 = -5 \checkmark \quad \text{This is a true statement.}$$