

Bellringer

Complete the table using the equation $y = 6x + 3$

X	-3	-2	-1	0	1	2	3
Y							

4.2 Determine Slope and y -intercept

8.EE.6

Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y=mx$ for a line through the origin and the equation $y=mx+b$ for a line intercepting the vertical axis at b

8.F.4

Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Vocabulary

y-intercept - the y-coordinate of a point where the graph intersects the y-axis

- ↳ in the ordered pair, the x will be zero
- ↳ ex: $(0, 3)$ y-intercept

Slope intercept form of an equation - a linear equation

- ↳ written as $y = mx + b$
- ↳ Its graph is a line with slope (m) and a y-intercept (b)

EXPLORE ACTIVITY 1

The graph represents the linear equation $y = -\frac{2}{3}x + 4$.

Find the slope of the line using the points $(0, 4)$ and $(-3, 6)$.

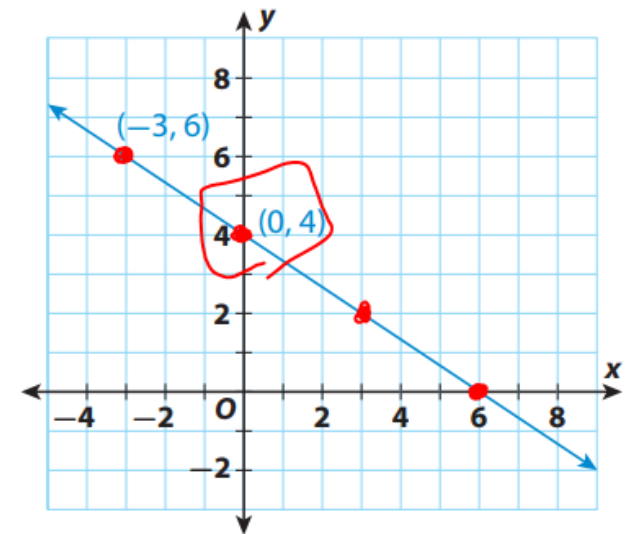
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 4}{-3 - 0} = \frac{2}{-3} = -\frac{2}{3}$$

The line also contains the point $(6, 0)$. What is the slope using $(0, 4)$ and $(6, 0)$? Using $(-3, 6)$ and $(6, 0)$. What do you notice?

SAME SLOPE

$$y = mx + b$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$



$$\begin{matrix} x_1 & y_1 & x_2 & y_2 \\ (0, 4) & & (6, 0) & \end{matrix}$$

$$\begin{matrix} (-3, 6) & (6, 0) \\ x_1 & y_1 & x_2 & y_2 \end{matrix}$$

$$m = \frac{0 - 4}{6 - 0} = \frac{-4}{6} = -\frac{2}{3}$$

$$m = \frac{0 - 6}{6 - (-3)} = \frac{-6}{9} = -\frac{2}{3}$$

EXPLORE ACTIVITY 1

Compare your answers in Steps 1 and 2 with the equation of the graphed line.

$$m = -\frac{2}{3} \quad \text{+ equation slope} = -\frac{2}{3}$$

Find the value of y when $x = 0$ using the equation $y = -\frac{2}{3}x + 4$.
Describe the point on the graph that corresponds to this solution.

$$y = -\frac{2}{3}(0) + 4$$

4 ; (0, 4) ; y-intercept ; where line crosses
y-axis

Compare your answer in Step 4 with the equation of the line.

Determining Rate of Change and Initial Value

Rate of Change \Rightarrow Slope (m)

Initial Value \Rightarrow y -intercept (b)

$$y = mx + b$$

↑ ↑
Slope y -intercept

← Slope intercept form

EXAMPLE 1



A phone salesperson is paid a minimum weekly salary and a commission for each phone sold, as shown in the table. Confirm that the relationship is linear and give the constant rate of change and the initial value.

X Number of Phones Sold	Weekly Income y (\$)
10	\$480
20	\$630
30	\$780
40	\$930

STEP 1

Confirming Rate of Change is constant. $\frac{\Delta y}{\Delta x}$

$$\frac{\Delta \text{Income}}{\Delta \text{Sales}} \rightarrow \frac{150}{10} = \frac{15}{1} \quad \frac{150}{10} = \frac{15}{1} \quad \frac{150}{10} = \frac{15}{1}$$

Rate of Change $\frac{15}{1}$

STEP 2

Find initial value. X is zero + y is b (y-int)

y	\$	330	480	630	780	930
x	Sales	0	10	20	30	40

Handwritten annotations: Blue arrow from 330 to 480 labeled -150. Red arrows from 480 to 630, 630 to 780, and 780 to 930 labeled +150. Blue arrow from 0 to 10 labeled -10. Red arrows from 10 to 20, 20 to 30, and 30 to 40 labeled +10.

Initial value is 330

$$y = 15x + 330$$

ADDITIONAL EXAMPLE 1

Gregg deposits the money he makes from mowing lawns into his savings account, adding it to the money his father gave him to open the account. Confirm the relationship is linear and give the constant rate of change and the initial value.

x	5	10	15	20
y	110	170	230	290

Handwritten annotations on the table:
 - A blue arrow above the x-axis points from 5 to 10, labeled "5".
 - Red arrows point up from the x-axis to 5, 10, 15, and 20, each labeled "x".
 - Red arrows point down from the y-axis to 110, 170, 230, and 290, each labeled "y".
 - A blue arrow below the y-axis points from 110 to 170, labeled "60".
 - Red arrows point down from the y-axis to 170, 230, and 290, each labeled "60".

① Rate of Change (m) $\frac{\Delta y}{\Delta x}$

$$\frac{60}{5} = \frac{12}{1} \quad \frac{60}{5} = \frac{12}{1} \quad \frac{60}{5} = \frac{12}{1}$$

$$m = \frac{12}{1}$$

② Initial Value (b) or use (x, y) values to plug into slope intercept form
(0, 50)

$$110 = 12(5) + b$$

$$110 = 60 + b$$

$$\frac{-60}{-60} \quad \frac{-60}{-60}$$

$$50 = b$$

③ Write in slope intercept form

$$y = 12x + 50$$

YOUR TURN

$$y = mx + b$$

Find the slope and y-intercept of the line represented by each table.

1.

x	2	4	6	8
y	22	32	42	52

$m = \frac{10}{2} = 5$ $b = 12$

$$y = 5x + 12$$

$$\frac{\Delta y}{\Delta x}$$

$$\frac{0}{1} = 0$$

$$\frac{0}{2} = 0$$

$$\frac{0}{3} = 0$$

$$(0, 12)$$

$$\begin{aligned} 22 &= 5(2) + b \\ 22 &= 10 + b \\ -10 & \quad -10 \\ \hline 12 &= b \end{aligned}$$

2.

x	1	2	3	4
y	8	15	22	29

$m = \frac{7}{1} = 7$ $b = 1$

$$y = 7x + 1$$

$$\frac{\Delta y}{\Delta x}$$

$$\frac{7}{1} = 7$$

$$\frac{7}{1} = 7$$

$$\frac{7}{1} = 7$$

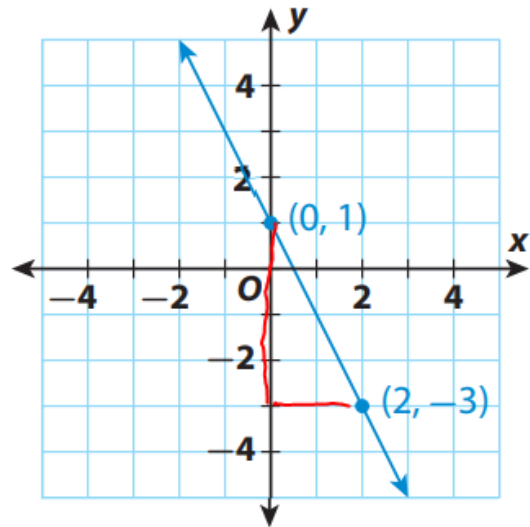
$$(0, 1)$$

$$\begin{aligned} 29 &= 7(4) + b \\ 29 &= 28 + b \\ -28 & \quad -28 \\ \hline 1 &= b \end{aligned}$$

Guided Practice

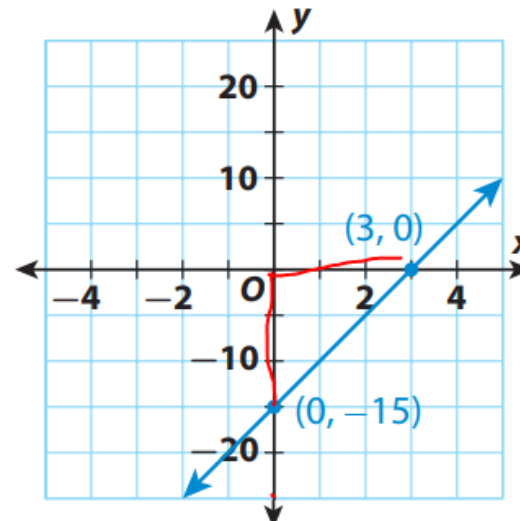
Find the slope and y-intercept of the line in each graph.

1.



slope $m = \frac{-4}{2} = -\frac{2}{1}$ y-intercept $b = \underline{1}$

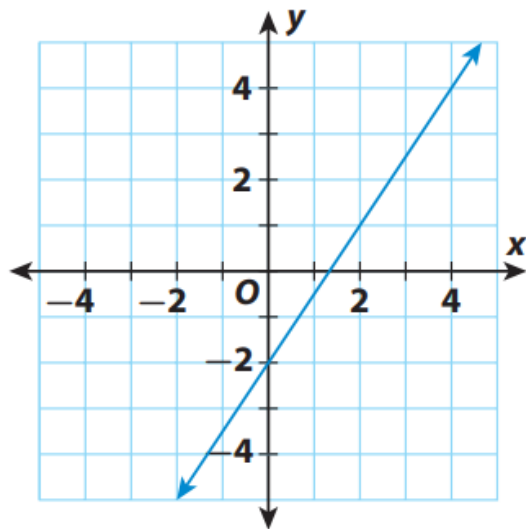
2.



slope $m = \frac{15}{3} = \frac{5}{1}$ y-intercept $b = \underline{-15}$

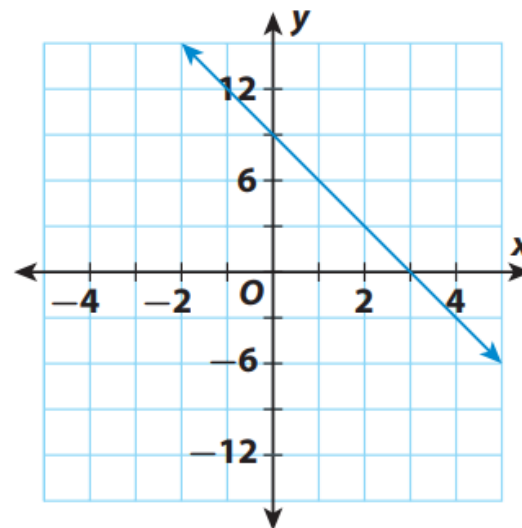
Find the slope and y-intercept of the line in each graph.

3.



slope $m =$ _____ y-intercept $b =$ _____

4.



slope $m =$ _____ y-intercept $b =$ _____

Find the slope and y -intercept of the line represented by each table.

5.

x	0	2	4	6	8
y	1	7	13	19	25

slope $m =$ _____ y -intercept $b =$ _____

6.

x	0	5	10	15	20
y	140	120	100	80	60

slope $m =$ _____ y -intercept $b =$ _____

HW

GP P 104

1-7
8-12

IP P 105