



Math Virtual Learning

Grade 8

Equation of a Line From Two Points

May 15, 2020



Math 8

Lesson: May 15, 2020

Objective/Learning Target:

I can write an equation given two points.

Warm-Up:

Answers on next slide

Match each term with its correct definition or formula.

1) Slope

2) Y-intercept

3) Linear Equation

4) Slope Intercept form

A) The point where a line crosses the y-axis

B) $y = mx + b$

C) $\frac{\text{Rise}}{\text{Run}}$

D) An equation with two variables that graphs as a straight line

Warm-Up: *Answer Key*

1) Slope

2) Y-intercept

3) Linear Equation

4) Slope Intercept form

A) The point where a line crosses the y-axis

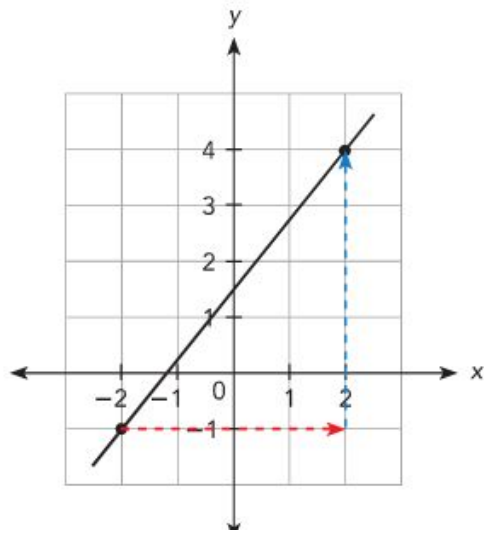
B) $y = mx + b$

C) Rise
Run

D) An equation with two variables that graphs as a straight line

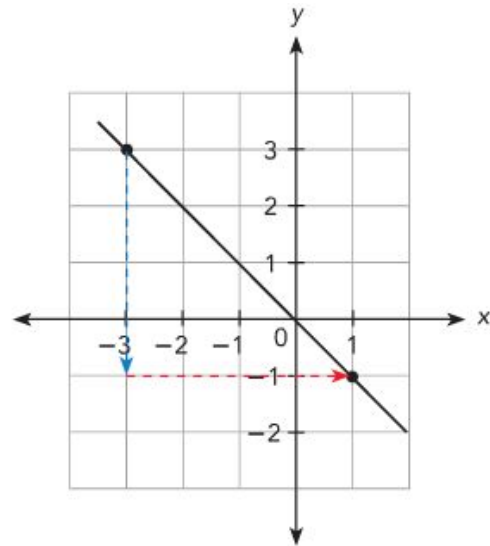
Review: How to Count Slope from a Graph

a)



The graph passes through the points $(-2, -1)$ and $(2, 4)$.

$$\begin{aligned}\text{Slope} &= \frac{\text{Rise}}{\text{Run}} \\ &= \frac{4 - (-1)}{2 - (-2)} \\ &= \frac{5}{4}\end{aligned}$$



The graph passes through the points $(-3, 3)$ and $(1, -1)$.

$$\begin{aligned}\text{Slope} &= \frac{\text{Rise}}{\text{Run}} \\ &= \frac{-1 - 3}{1 - (-3)} = \frac{-4}{4} = -1\end{aligned}$$

The slope is -1 .

Review: How to Use the Slope Formula

Find the slope of the line that goes through the points (2,5) and (4,8).

Step 1: Label the points. It doesn't matter which one you pick as "Point 1" and "Point 2."

Remember the x's are listed first in an ordered pair and the y's are listed second.

$$\begin{array}{ccc} (2,5) & \text{and} & (4,8) \\ \uparrow \uparrow & & \uparrow \uparrow \\ x_1 & y_1 & x_2 & y_2 \end{array}$$

Step 2: Plug in the values. Subtract the y's on the top, subtract the x's on the bottom. Make sure to subtract in the same order in the numerator and denominator.

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 5}{4 - 2} = \boxed{\frac{3}{2}}$$

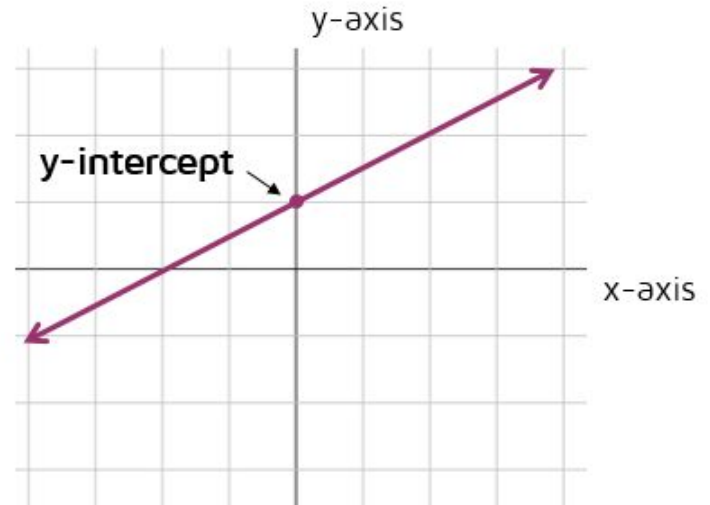
Step 3: Make sure your answer is simplified. $3/2$ cannot be reduced, so we leave the answer as $3/2$.

Review: What is an Intercept?

There are two axes on the coordinate plane: the **x-axis** and the **y-axis**.

When your line crosses one of those axes, it is called an **intercept**.

For slope-intercept form, we want to find the **y - intercept**: The point where the line crosses the y-axis.



Review: Equation in Slope-Intercept Form

$$y = mx + b$$

↑ ↑
slope y-intercept

Example:

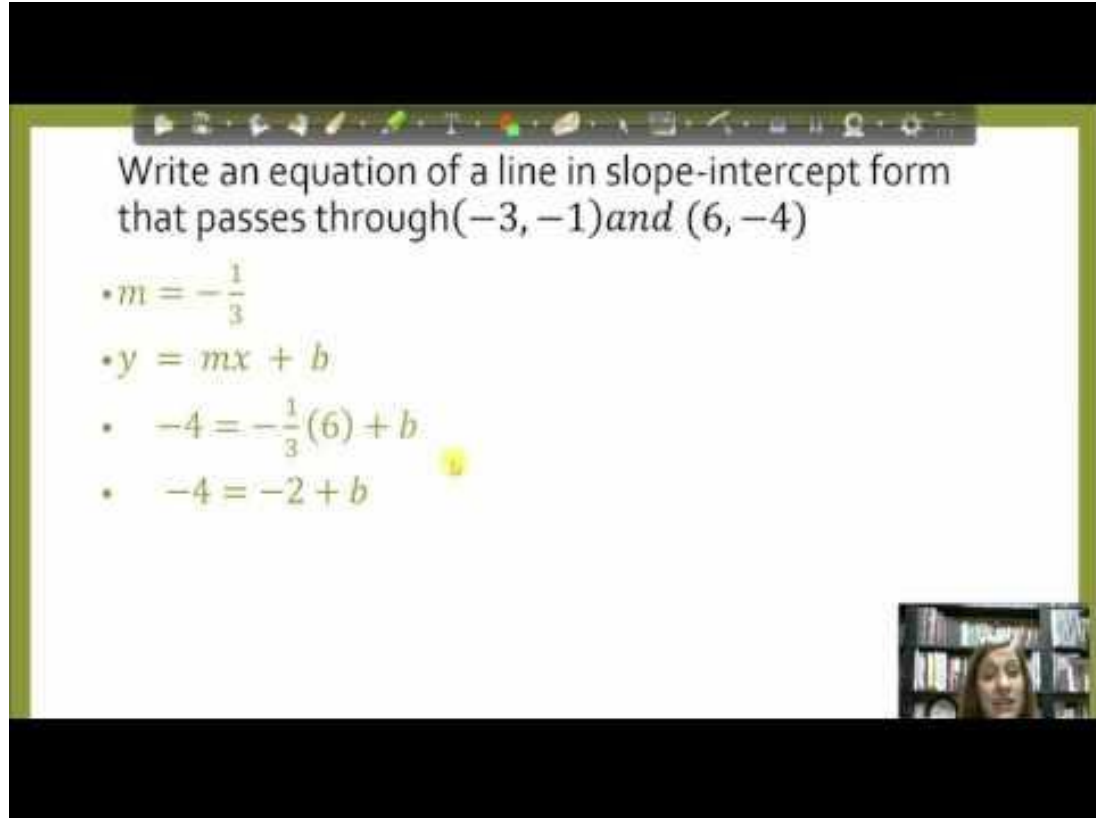
$$y = 2x + 3$$

↑ ↑
slope y-intercept

2/1 is the slope
(0,3) is the y-intercept


Video:

Take notes on a piece of paper as you watch this video.

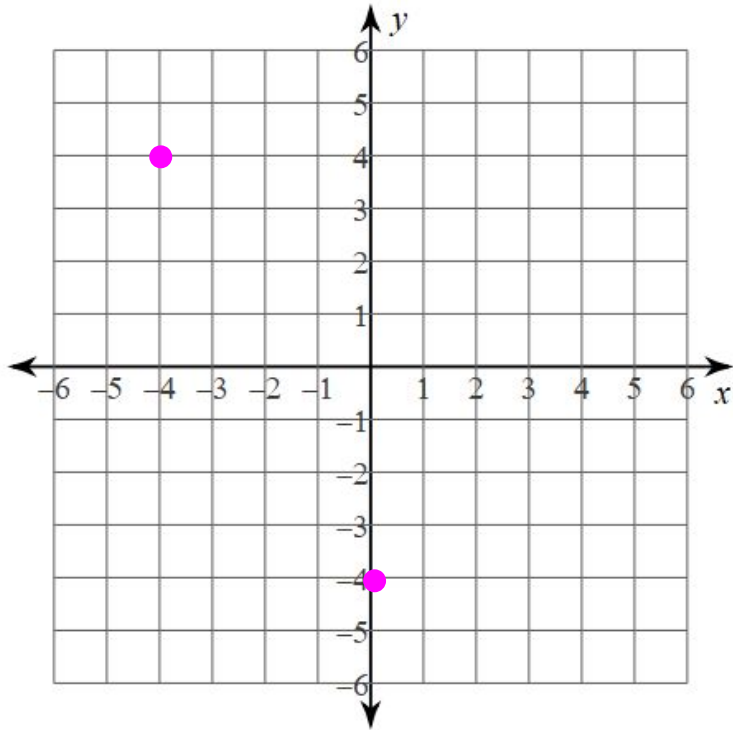


Write an equation of a line in slope-intercept form that passes through $(-3, -1)$ and $(6, -4)$

- $m = -\frac{1}{3}$
- $y = mx + b$
- $-4 = -\frac{1}{3}(6) + b$
- $-4 = -2 + b$



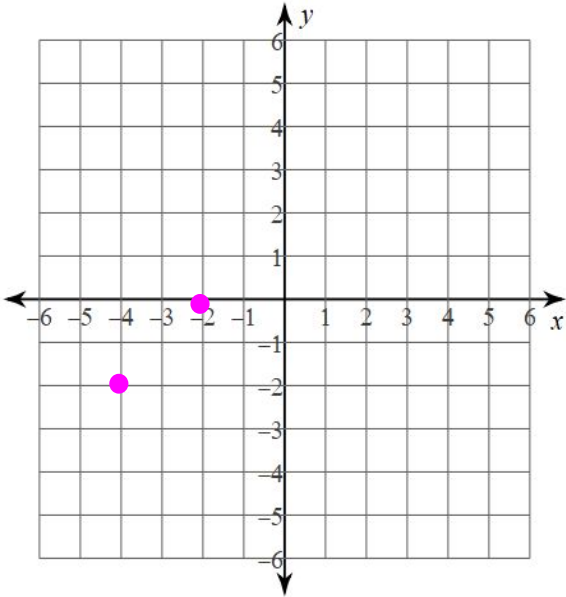
How To: Write an Equation *from Two Points on a Graph*



- ① Count the **slope** between the two points.
Between these two points, you would count down 8 units and right 4 units, so the slope is $-8/4$ or -2
- ② Find the **y-intercept** on the graph.
The y-intercept is given. It is $(0, -4)$.
- ③ Plug the slope and y-intercept into the equation in **slope-intercept form**.

$$y = -2x - 4$$

Example 1:



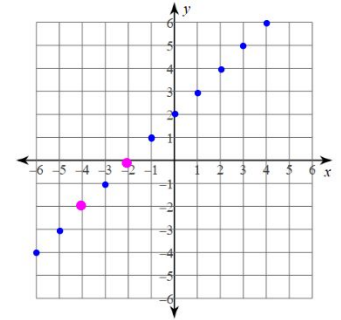
- ① Count the **slope** between the two points.

Between these two points, you would count up 2 units and right 2 units, so the slope is $2/2$ or 1

- ② Find the **y-intercept** on the graph.

The y-intercept is not given. Use the slope to create more points, or draw a line through both points using a straightedge to see where it crosses the y-axis.

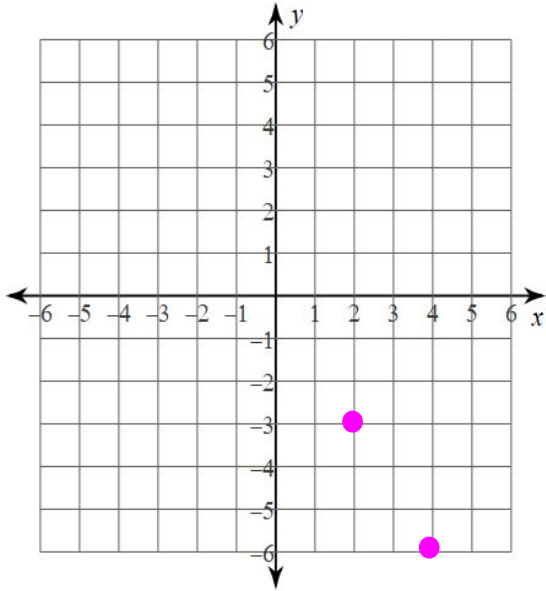
(See example to the right.) You would find the point $(0, 2)$. This is the y-intercept.



- ③ Plug the slope and y-intercept into the equation in **slope-intercept form**.

$$y = 1x + 2 \quad \text{or} \quad y = x + 2$$

Example 2:



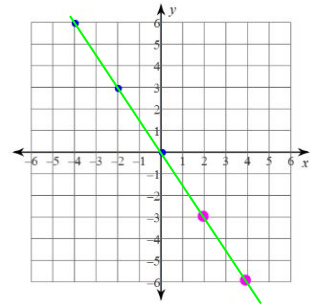
- ① Count the **slope** between the two points.

Between these two points, you would count down 3 units and right 2 units, so the slope is $-3/2$

- ② Find the **y-intercept** on the graph.

The y-intercept is not given. Use the slope to create more points, or draw a line through both points using a straightedge to see where it crosses the y-axis.

(See example to the right.) You would find the point $(0,0)$. This is the y-intercept.



- ③ Plug the slope and y-intercept into the equation in **slope-intercept form**.

$$y = -3/2x + 0 \quad \text{or} \quad y = -3/2x$$

How To: Write an Equation *from Two Points*

Write the equation *in slope-intercept form* of a line that passes through the points $(0, -5)$ and $(1, -4)$.

① Find the **slope**: Plug the points into the Slope Formula.

Notice: $x_1=0$ $y_1=-5$ $x_2=1$ $y_2=-4$

The formula is: $\frac{y_2 - y_1}{x_2 - x_1}$ To set it up: $\frac{-4 - -5}{1 - 0}$ Solve/Reduce: $\frac{1}{1}$ or 1

② Find the **y-intercept**: Plug in one point into the slope-intercept equation.

The y-intercept was given! It is $(0, -5)$.

③ Write the **equation** in slope-intercept form.

$$y = 1x - 5 \text{ or } y = x - 5$$

Example 3:

Write the equation *in slope-intercept form* of a line that passes through the points $(-4, -3)$ and $(0, 2)$.

① Find the **slope**: Plug the points into the Slope Formula.

Notice: $x_1 = -4$ $y_1 = -3$ $x_2 = 0$ $y_2 = 2$

The formula is: $\frac{y_2 - y_1}{x_2 - x_1}$ To set it up: $\frac{2 - -3}{0 - -4}$ Solve/Reduce: $\frac{5}{4}$

② Find the **y-intercept**: Plug in one point into the slope-intercept equation.

The y-intercept was given! It is $(0, 2)$.

③ Write the **equation** in slope-intercept form.

$$y = \frac{5}{4}x + 2$$

Example 4:

Write the equation *in slope-intercept form* of a line that passes through the points $(-4, -2)$ and $(4, 4)$.

① Find the **slope**: Plug the points into the **Slope Formula**.

Notice: $x_1 = -4$ $y_1 = -2$ $x_2 = 4$ $y_2 = 4$

The formula is: $\frac{y_2 - y_1}{x_2 - x_1}$ To set it up: $\frac{4 - -2}{4 - -4}$ Solve/Reduce: $\frac{6}{8}$ or $\frac{3}{4}$

② Find the **y-intercept**: Plug in one point into the slope-intercept equation.

The formula: $y = mx + b$. Use $\frac{3}{4}$ for slope (m) and use the point $(4, 4)$.

Set it up: $4 = \frac{3}{4}(4) + b$

$$\begin{array}{r} 4 = 3 + b \\ -3 \quad -3 \\ \hline 1 = b \end{array}$$

③ Write the **equation** in slope-intercept form.

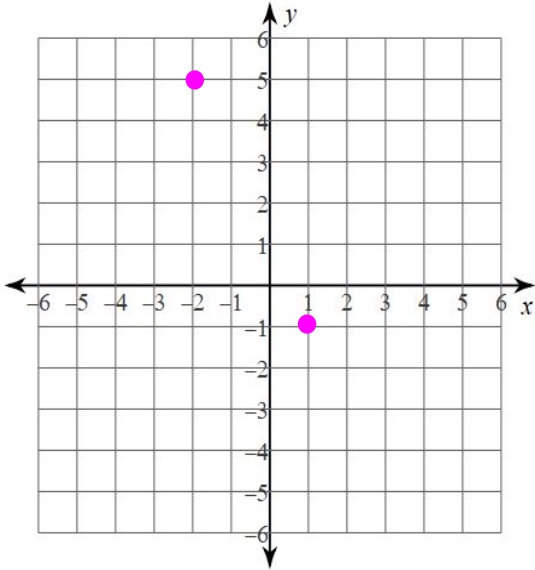
$$y = \frac{3}{4}x + 1$$

Practice 1:

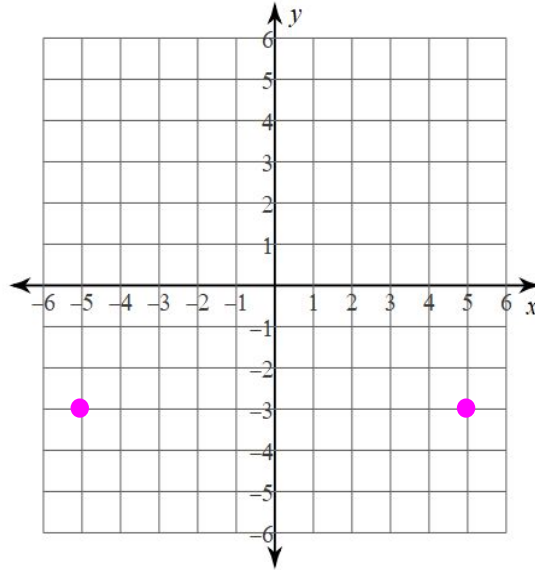
Answers on next slide

Find the equation of each line. (Two points are given.)

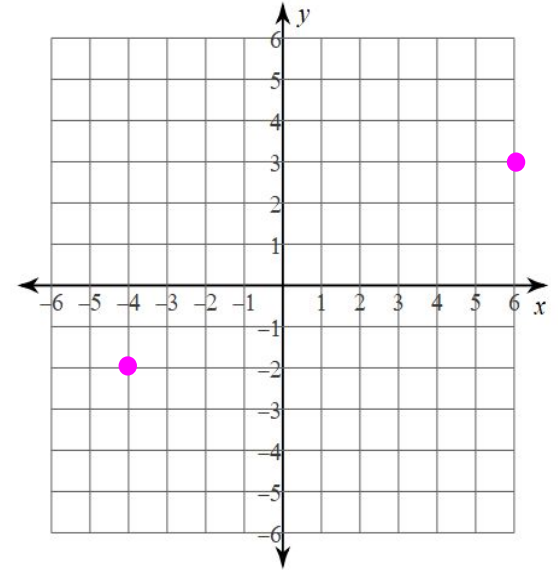
①



②



③



④

$(-4, 4)$

$(0, -2)$

⑤

$(0, -3)$

$(1, -2)$

⑥

$(4, -1)$

$(-2, -4)$

Practice 1:

Answer Key

①

$$y = -2x + 1$$

②

$$y = -3$$

③

$$y = \frac{1}{2}x$$

④

$$y = -\frac{3}{2}x - 2$$

⑤

$$y = x - 3$$

⑥

$$y = \frac{1}{2}x - 3$$

Additional Resources:

[Writing an Equation with Two Points - Lesson and Practice Problems](#)

[Writing an Equation with Two Points - Online practice](#)

[Lesson with Examples - Khan Academy](#)