Module 9: Writing Linear Equations
Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Introduction

Hello and welcome! I'm so glad you could join me for this lesson in Algebra I, where you will learn how to write a linear equation in slope-intercept form.

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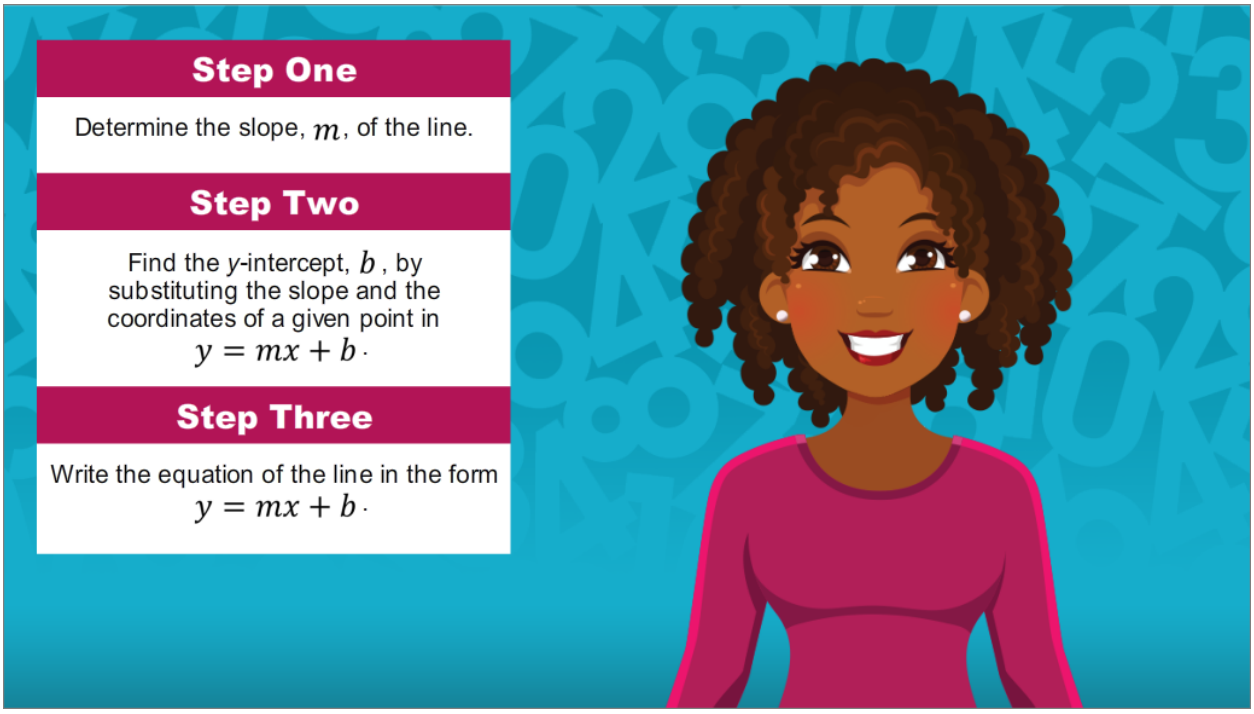
Antcipatory Set



Use the following steps to guide you in the process of writing the equation of the line in slope-intercept form, when given two points on the line or the slope of the line and a point on the line.

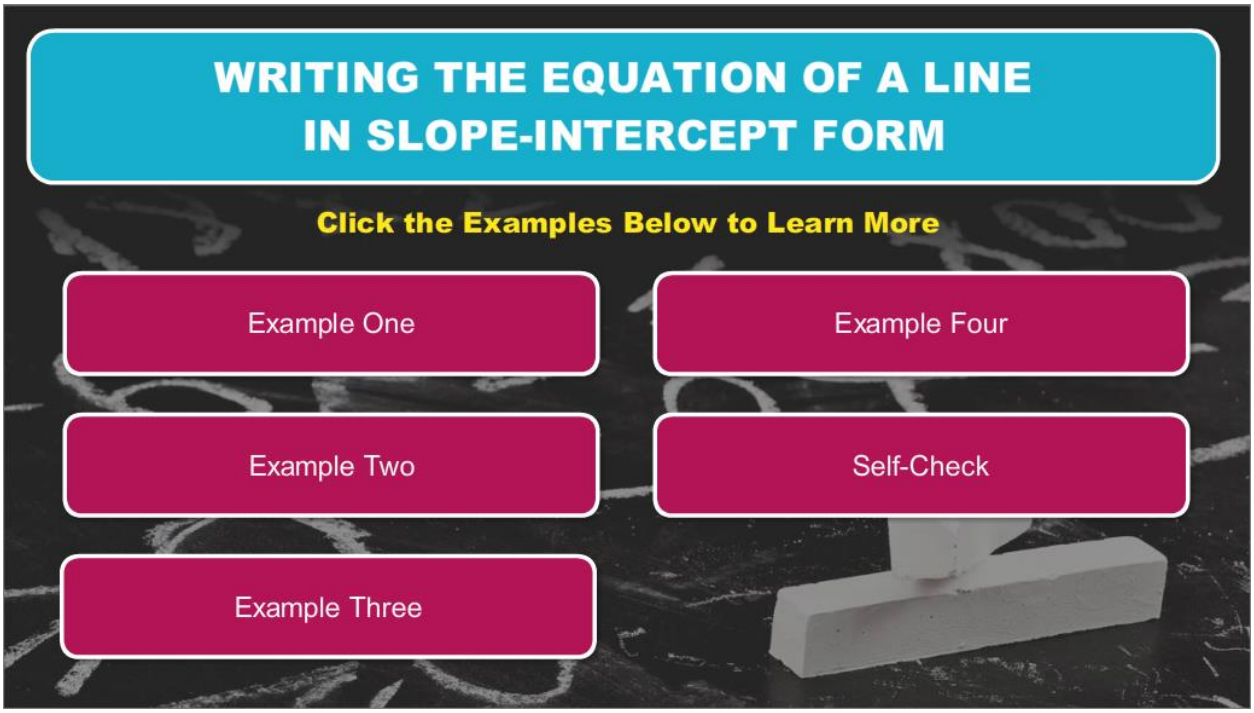
Step 1: Determine the slope, m, of the line.

Step 2: Find the y-intercept, b, by substituting the slope and the coordinates of a given point in $y = mx + b$.

Step 3: Write the equation of the line in the form $y = mx + b$.

Keep these steps in mind as you work through the following examples.

Writing the Equation of a Line in Slope-Intercept Form



Click the examples below to learn more.

- Example One
- Example Two
- Example Three
- Example Four
- Self-Check

Module 9: Writing Linear Equations
Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Example 1

Write an equation in slope-intercept form of the line that has a slope of $\frac{1}{4}$ and passes through the point $(4, -2)$.

$y = mx + b$

$slope = m = \frac{1}{4}$

Step 1: Determine the slope, m, of the line.

The first step to writing the equation of a line in slope-intercept form is to determine the slope of the line. For this example, you know that the slope of the line is $\frac{1}{4}$. Therefore, you can move to Step 2.

$y = mx + b$

$m = \frac{1}{4}$

$(x, y) = (4, -2)$

Step 2: Find the y-intercept, b, by substituting the slope and the coordinates of a given point in $y = mx + b$.

To find b, substitute the slope, $\frac{1}{4}$, for m and the coordinates of the point $(4, -2)$ for x and y. Then, solve for b.

$y = mx + b$

$-2 = \frac{1}{4}(4) + b$

$y = mx + b$

$-2 = \frac{1}{4}(4) + b$

$-2 = \ 1 \ + \ b$

Bring down 2 and the equals sign.

$\frac{1}{4} \cdot -4 = -1$

Bring down the addition sign and b.

$-2 = \ 1 \ + \ b$

$-1 \quad -1$

$-3 = \ b$

Now, subtract 1 from both sides of the equation. The result is $-3 = b$.

$y = mx + b$

$m = \frac{1}{4}$

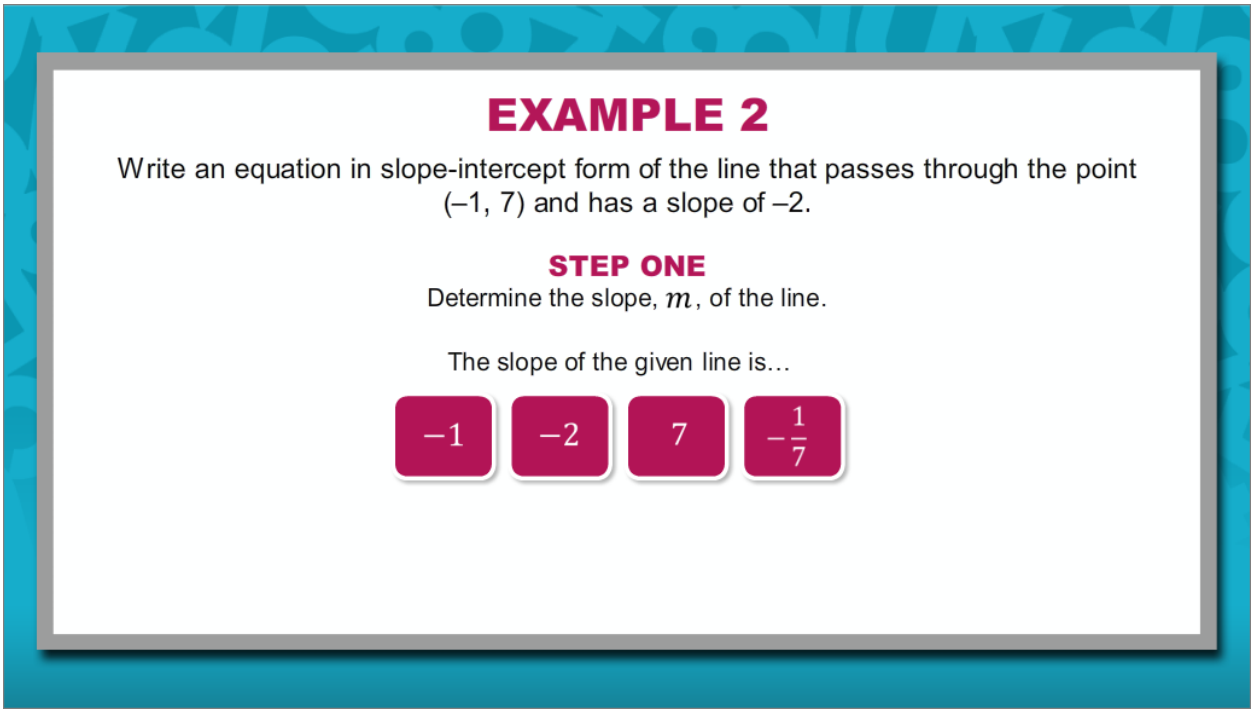
$b = -3$

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

Step 3: Write the equation of the line in the form $y = mx + b$.

Now that you know that $m = \frac{1}{4}$ and $b = -3$, you can write the equation of the line in slope-intercept form: $y = \frac{1}{4}x - 3$.

Example 2



Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

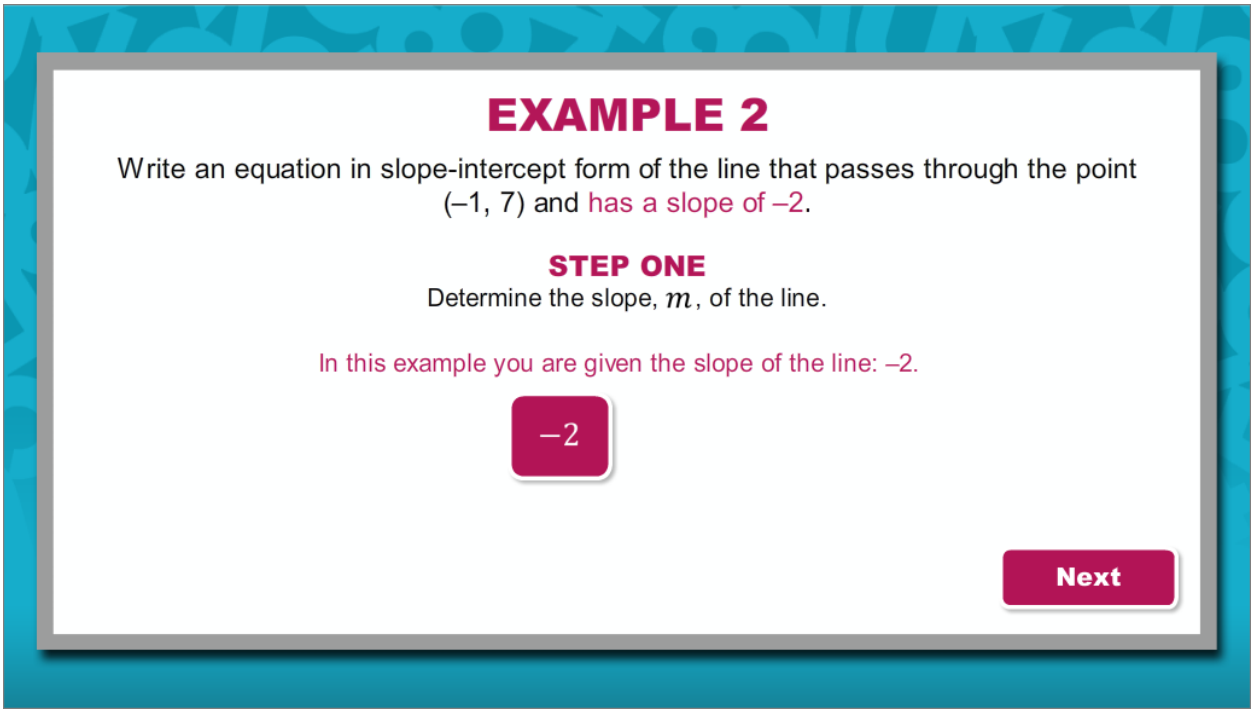
Step 1: Determine the slope, m, of the line.

Begin by determining the slope of the line.

The slope of the given line is…

A) -1
B) -2
C) 7
D) $-\frac{1}{7}$

Example 2 (continued)

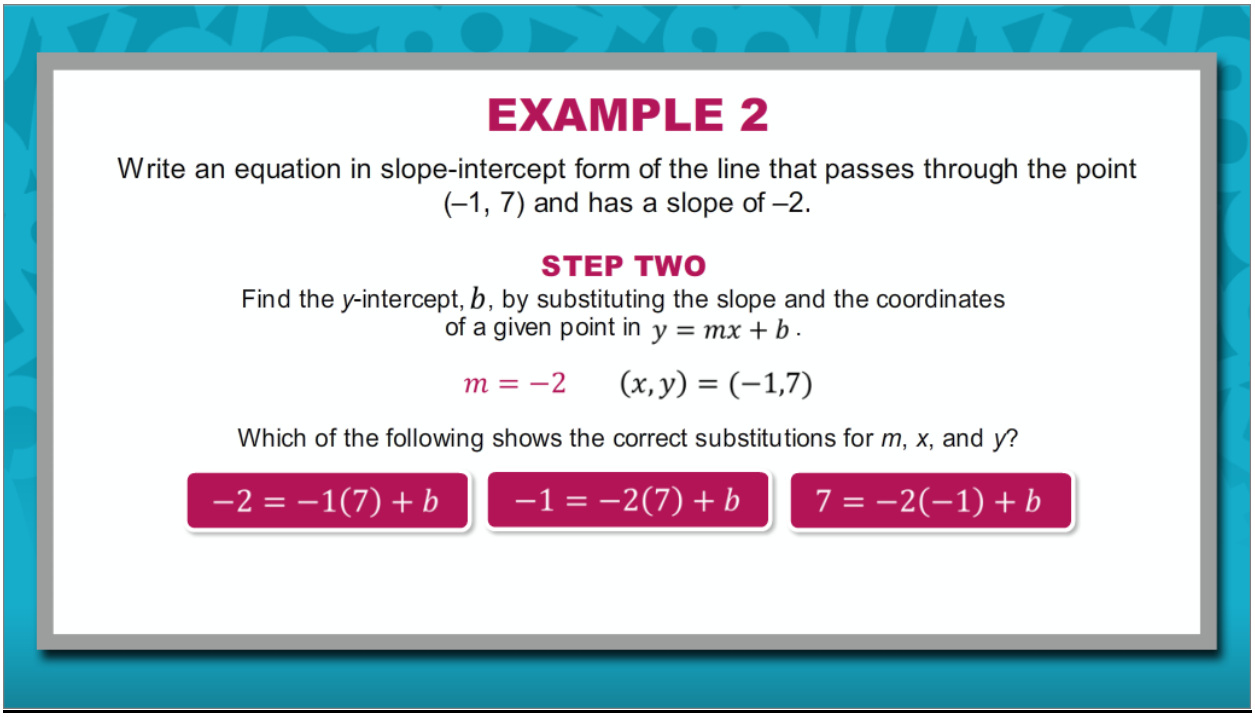


Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

Step 1: Determine the slope, m, of the line.

In this example you are given the slope of the line: -2.

Example 2 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

Step 2: Find the y-intercept, b, by substituting the slope and the coordinates of a given point in $y = mx + b$.

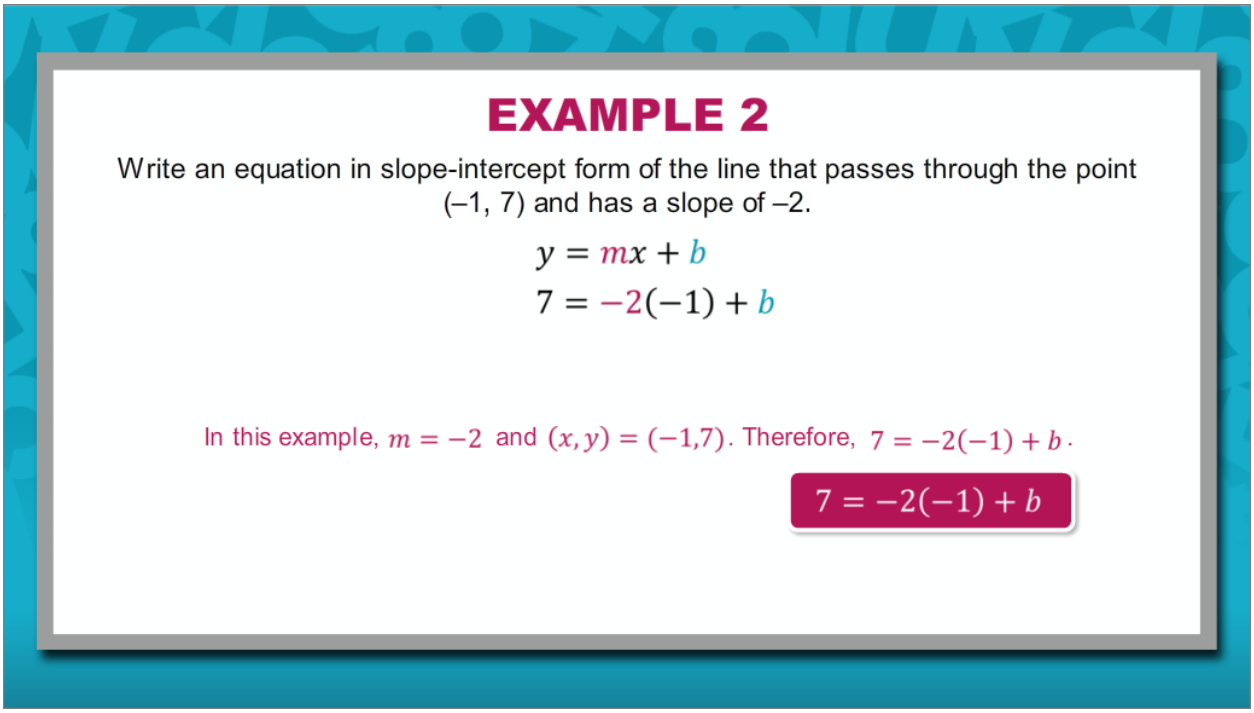
$$m = -2 \qquad (x, y) = (-1,7)$$

To find b, substitute the slope, -2, for m and the coordinates of the point $(-1, 7)$ for x and y. Then, solve for b.

Which of the following shows the correct substitution for m, x, and y?

A) $-2 = -1(7) + b$
B) $7 = -2(-1) + b$
C) $-1 = -2(7) + b$

Example 2 (continued)

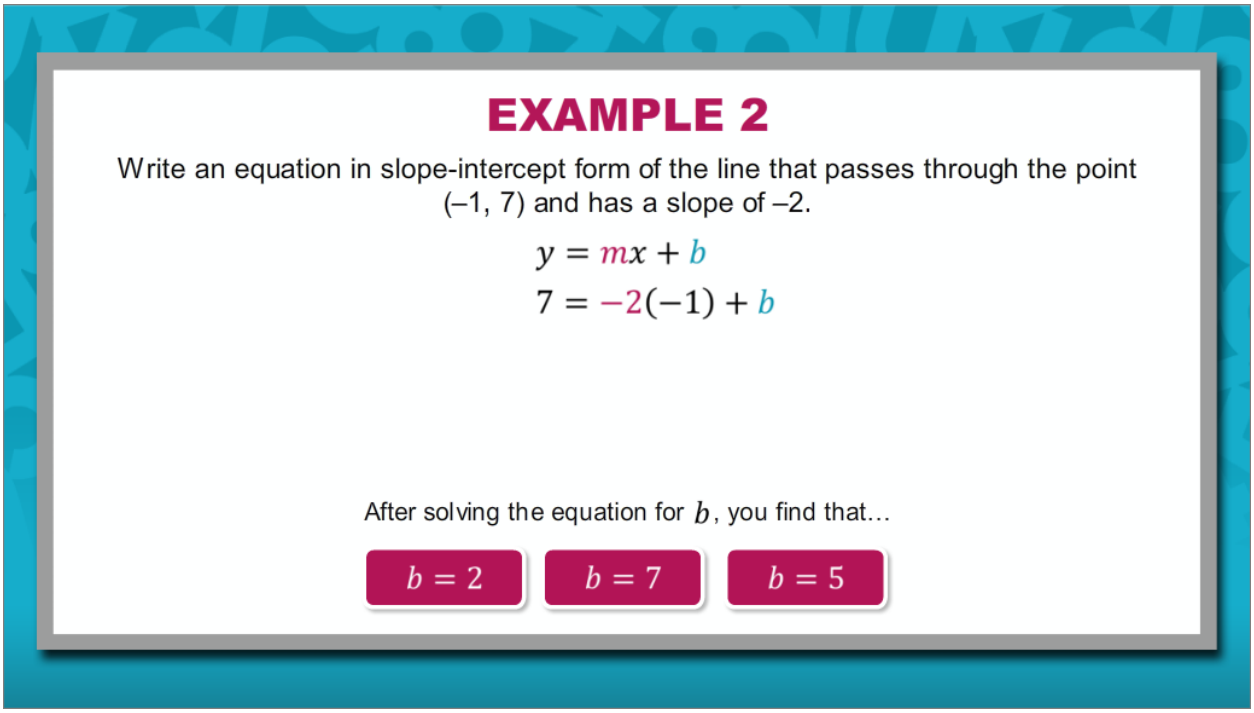


Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

$$y = mx + b$$
$$7 = -2(-1) + b$$

In this example, $m = -2$ and $(x, y) = (-1, 7)$. Therefore, $7 = -2(-1) + b$.

Example 2 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

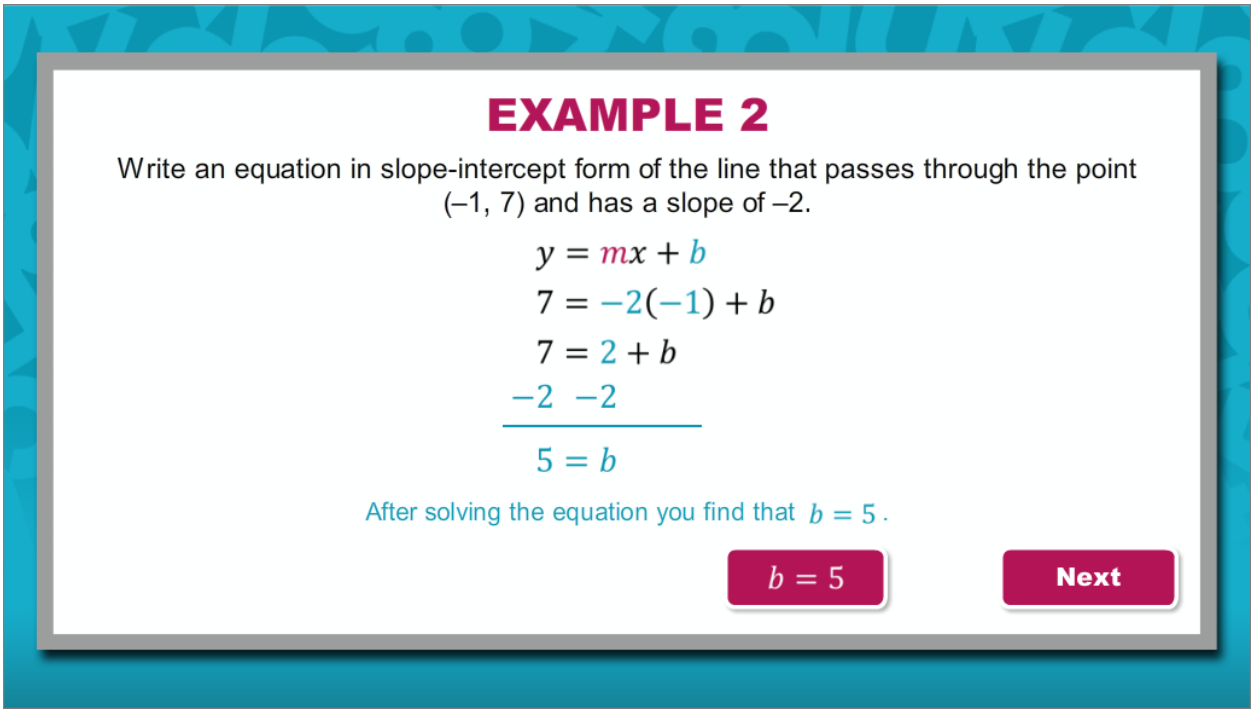
$$y = mx + b$$
$$7 = -2(-1) + b$$

Solve for b.

After solving the equation for b, you find that…

A) $b = 2$
B) $b = 7$
C) $b = 5$

Example 2 (continued)

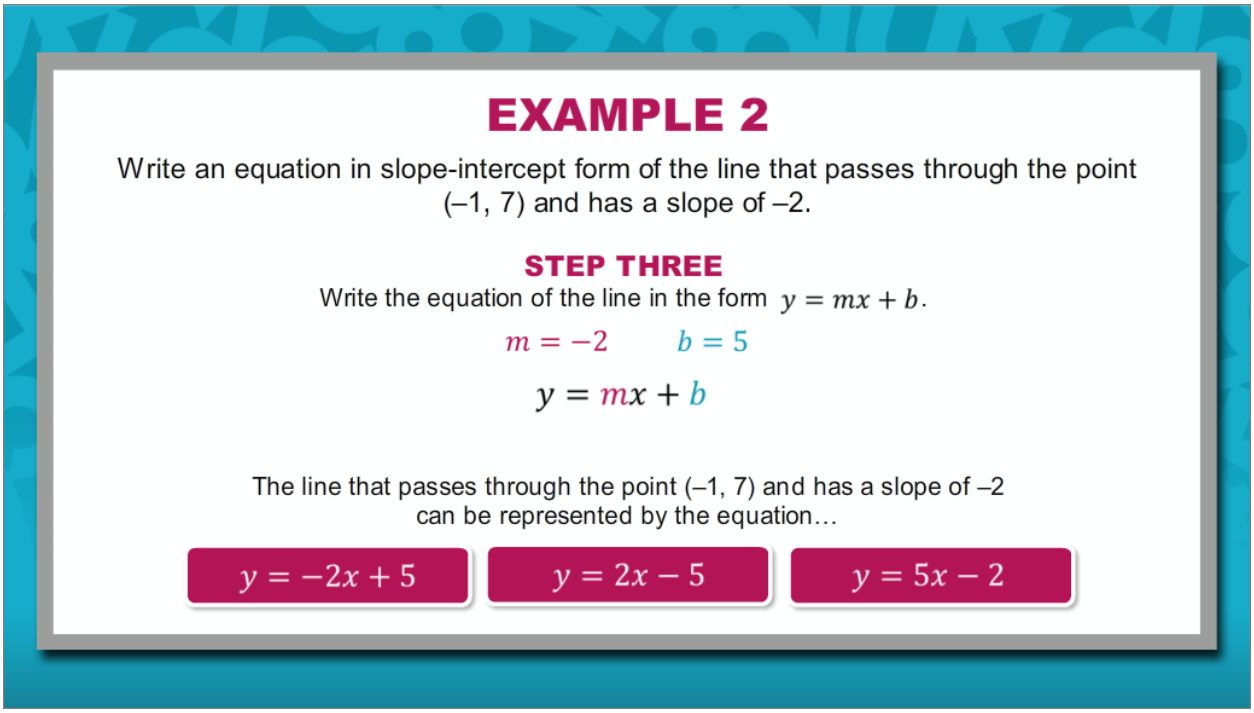


Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

$$y = mx + b$$
$$7 = -2(-1) + b$$
$$7 = 2 + b$$
$$-2 \quad -2$$
$$5 = b$$

After solving the equation you find that $b = 5$.

Example 2 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

Step 3: Write the equation of the line in the form $y = mx + b$.

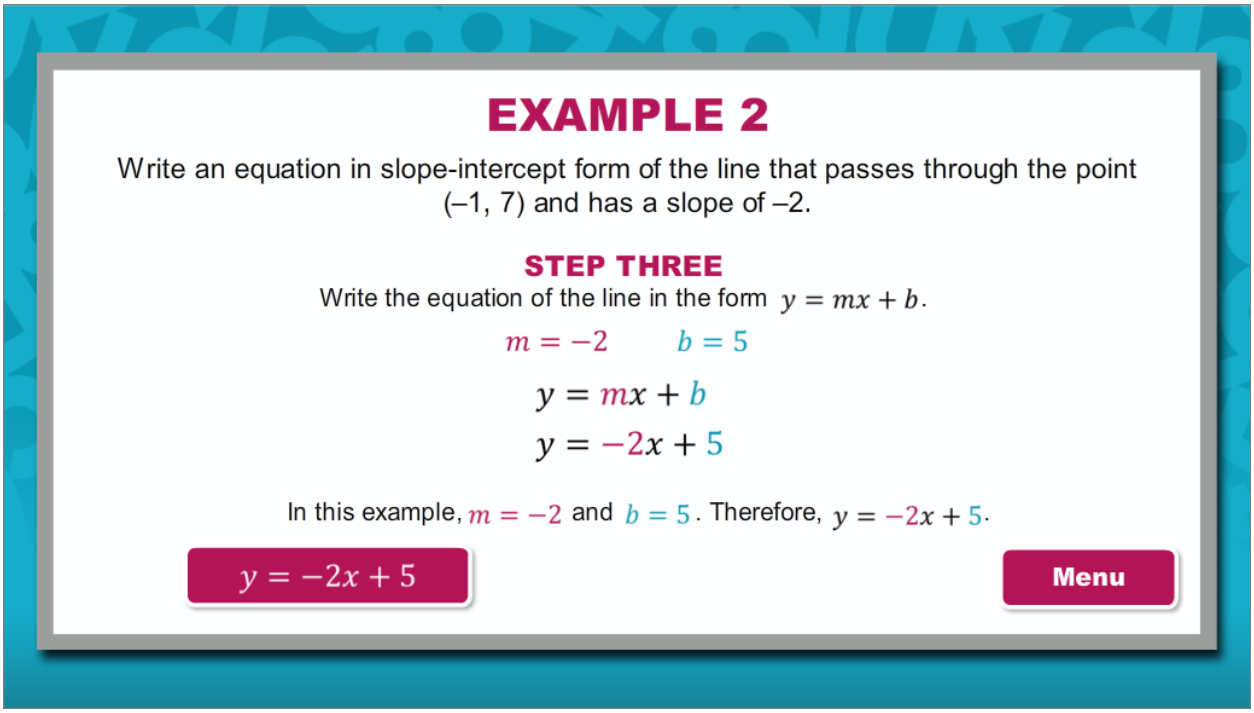
$$m = -2 \qquad b = 5$$
$$y = mx + b$$

Now that you know that $m = -2$ and $b = 5$, you can write the equation of the line in slope-intercept form.

The line that passes through the point $(-1, 7)$ and has a slope of -2 can be represented by the equation…

A) $y = -2x + 5$
B) $y = 2x - 5$
C) $y = 5x - 2$

Example 2 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(-1, 7)$ and has a slope of -2.

Step 3: Write the equation of the line in the form $y = mx + b$.

$$m = -2 \qquad b = 5$$

$$y = mx + b$$
$$y = -2x + 5$$

In this example, $m = -2$ and $b = 5$. Therefore, $y = -2x + 5$.

Example 3

Write an equation in slope-intercept form of the line that passes through the points $(10, -5)$ and $(5, -3)$.

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

$$(x_1, y_1) = (10, -5) \quad (x_2, y_2) = (5, -3)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - (-5)}{5 - 10} = \frac{2}{-5} = -\frac{2}{5}$$

Step 1: Determine the slope, m, of the line.

When given the coordinates of two points on a line, you can use the slope formula to determine the slope of the line.

Let $(x_1, y_1) = (10, -5)$ and $(x_2, y_2) = (5, -3)$. Then, substitute the appropriate values in the slope formula: y_2 is -3, y_1 is -5, x_2 is 5, and x_1 is 10.

Now begin to simplify the expression.

$$-3 - (-5) = 2$$
$$5 - 10 = -5$$
$$\frac{2}{-5} = -\frac{2}{5}$$

Therefore, the slope of the line is $-\frac{2}{5}$.

$$y = mx + b$$
$$m = -\frac{2}{5}$$
$$(x, y) = (10, -5)$$

Step 2: Find the y-intercept, b, by substituting the slope and the coordinates of a given point in $y = mx + b$.

To find b, substitute the slope, $-\frac{2}{5}$, for m and the coordinates of one of the given points for x and y. For example, you can substitute the coordinates of the point $(10, -5)$. Then, solve for b.

$$y = mx + b$$
$$-5 = -\frac{2}{5}(10) + b$$
$$-5 = -4 + b$$
$$-5 = -4 + b$$
$$+4 \quad +4$$
$$-1 = b$$

Bring down -5 and the equals sign.

$$-\frac{2}{5} \cdot 10 = -4$$

Bring down the addition sign and b.

Now, add 4 to both sides of the equation.

The result is $-1 = b$.

Example 3 (continued)

Write an equation in slope-intercept form of the line that passes through the points $(10, -5)$ and $(5, -3)$.

$y = mx + b$

$m = -\frac{2}{5}$

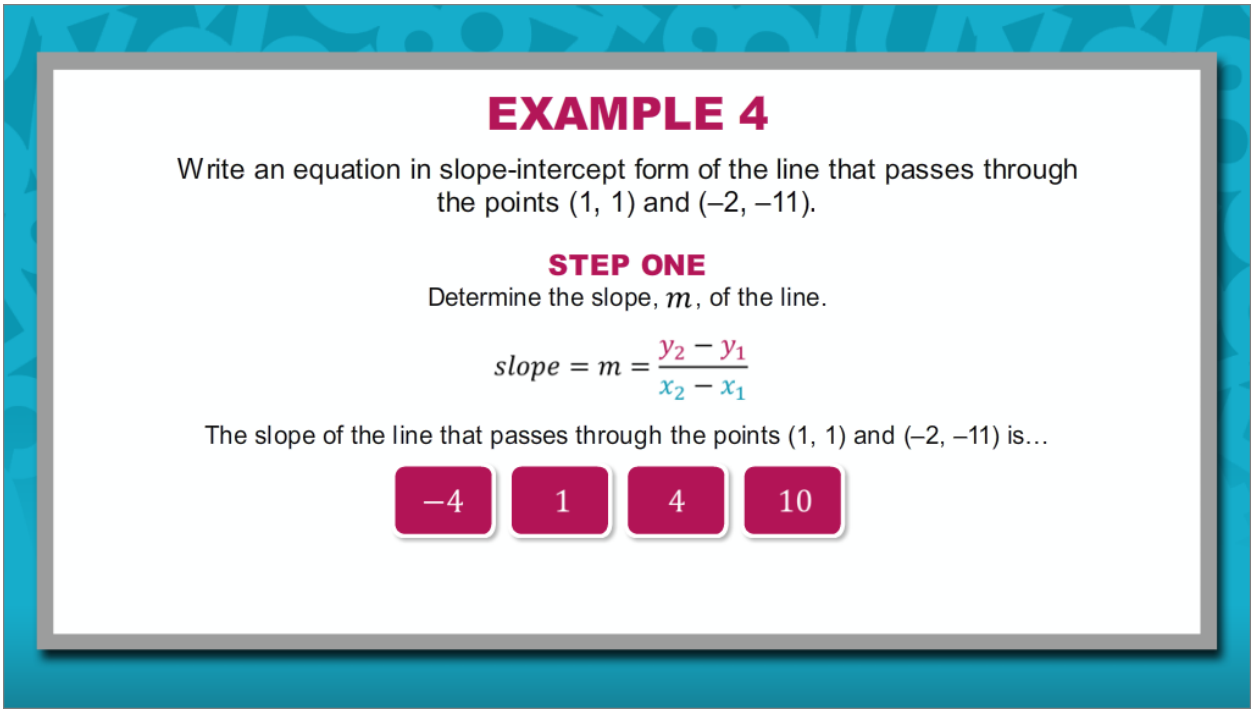
$b = -1$

$y = \frac{2}{5}x - 1$

Step 3: Write the equation of the line in the form $y = mx + b$.

Now that you know that $m = -\frac{2}{5}$ and $b = -1$, you can write the equation of the line in slope-intercept form: $y = -\frac{2}{5}x - 1$.

Example 4



Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Step 1: Determine the slope, m, of the line.

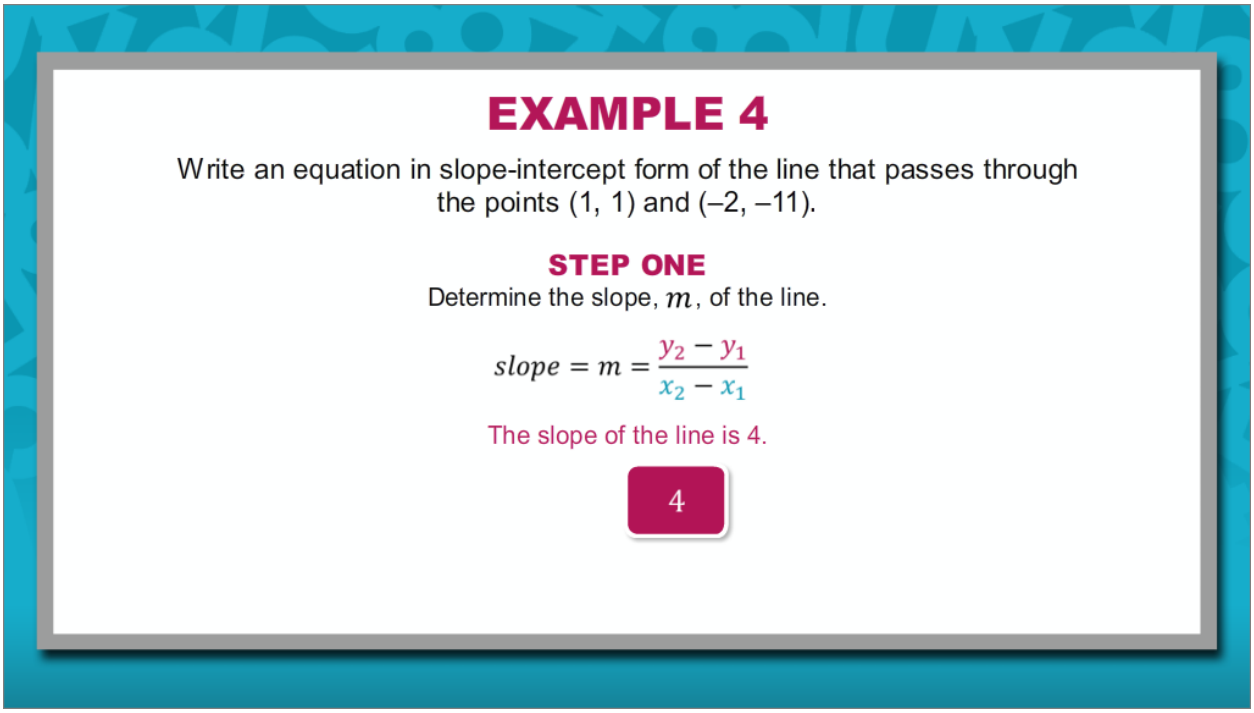
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Use the slope formula to determine the slope of the line.

The slope of the line that passes through the points $(1, 1)$ and $(-2, -11)$ is…

A) -4
B) 1
C) 4
D) 10

Example 4 (continued)



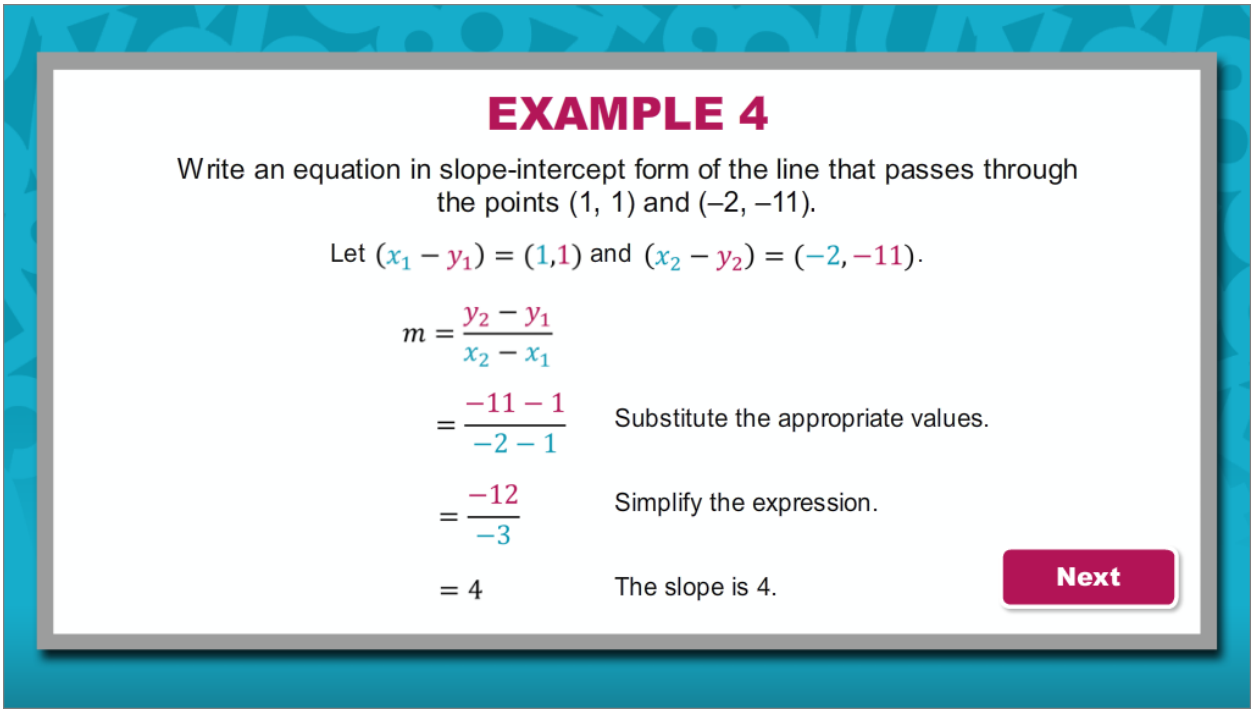
Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Step 1: Determine the slope, m, of the line.

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

The slope of the line is 4.

Example 4 (continued)



Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Let $(x_1, y_1) = (1, 1)$ and $(x_2, y_2) = (-2, -11)$.

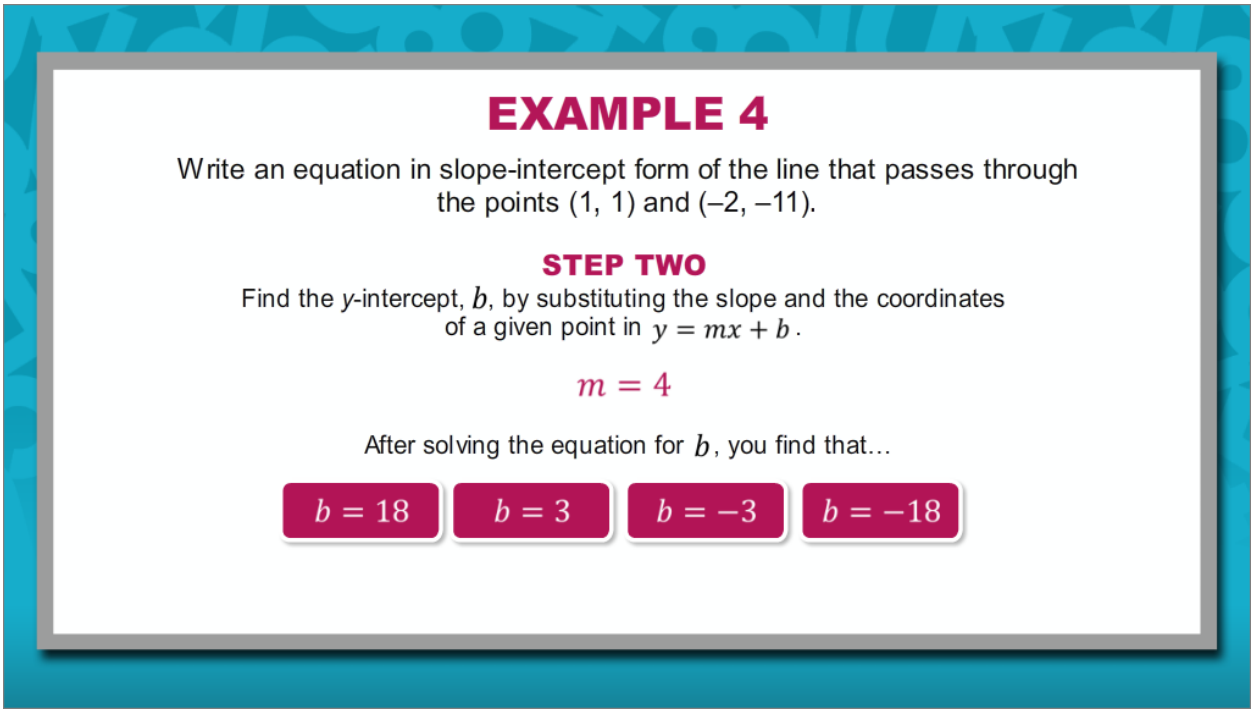
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$= \frac{-11-1}{-2-1}$ Substitute the appropriate values.

$= \frac{-12}{-3}$ Simplify the expression.

$= 4$ The slope of the line is 4.

Example 4 (continued)



Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Step 2: Find the y-intercept, b, by substituting the slope and the coordinates of a given point in $y = mx + b$.

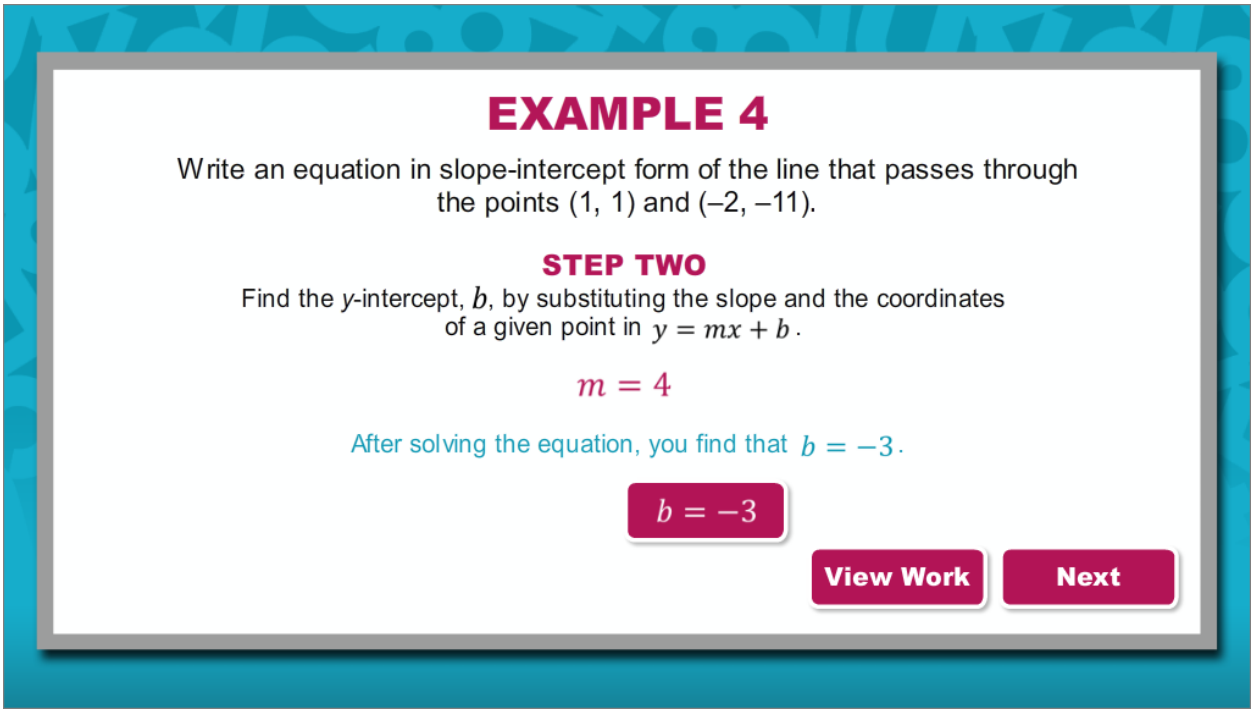
$$m = 4$$

To find b, substitute the slope,4, for m and the coordinates of one of the given points for x and y. Then, solve for b.

After solving the equation for b, you find that…

A) $b = 18$
B) $b = 3$
C) $b = -3$
D) $b = -18$

Example 4 (continued)



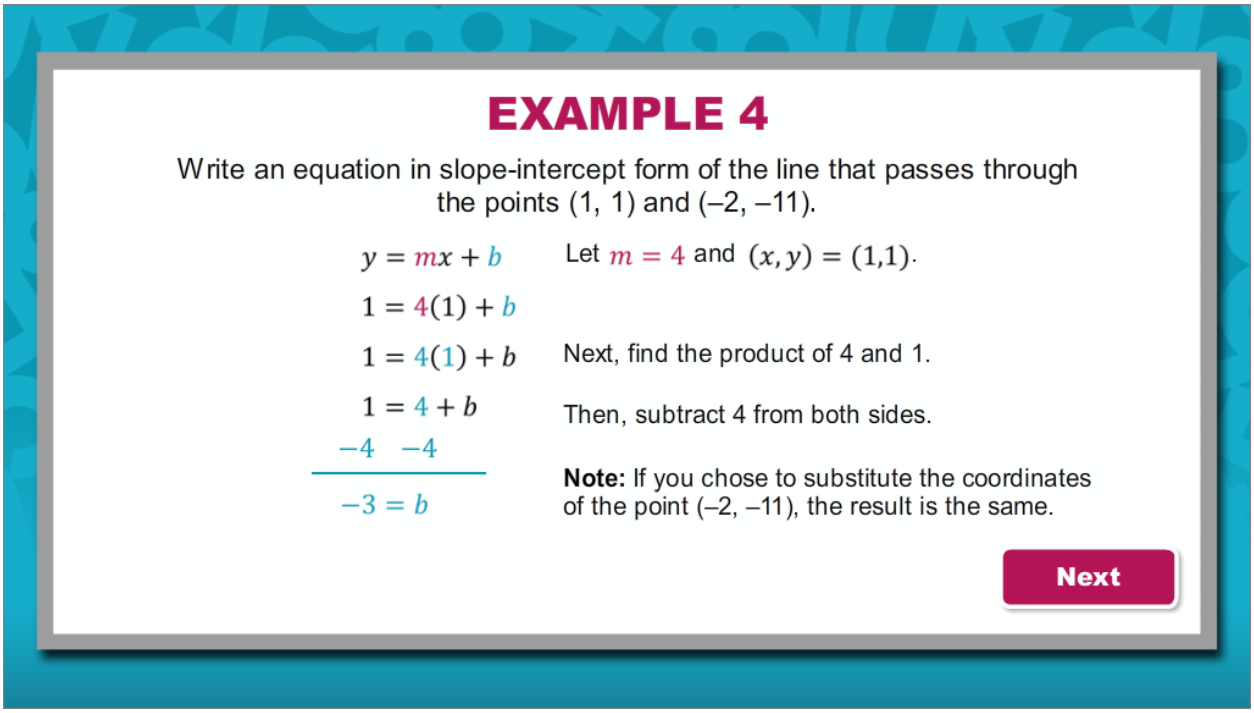
Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Step 2: Find the y-intercept, b, by substituting the slope and the coordinates of a given point in $y = mx + b$.

$$m = 4$$

After solving the equation, you find $b = 3$.

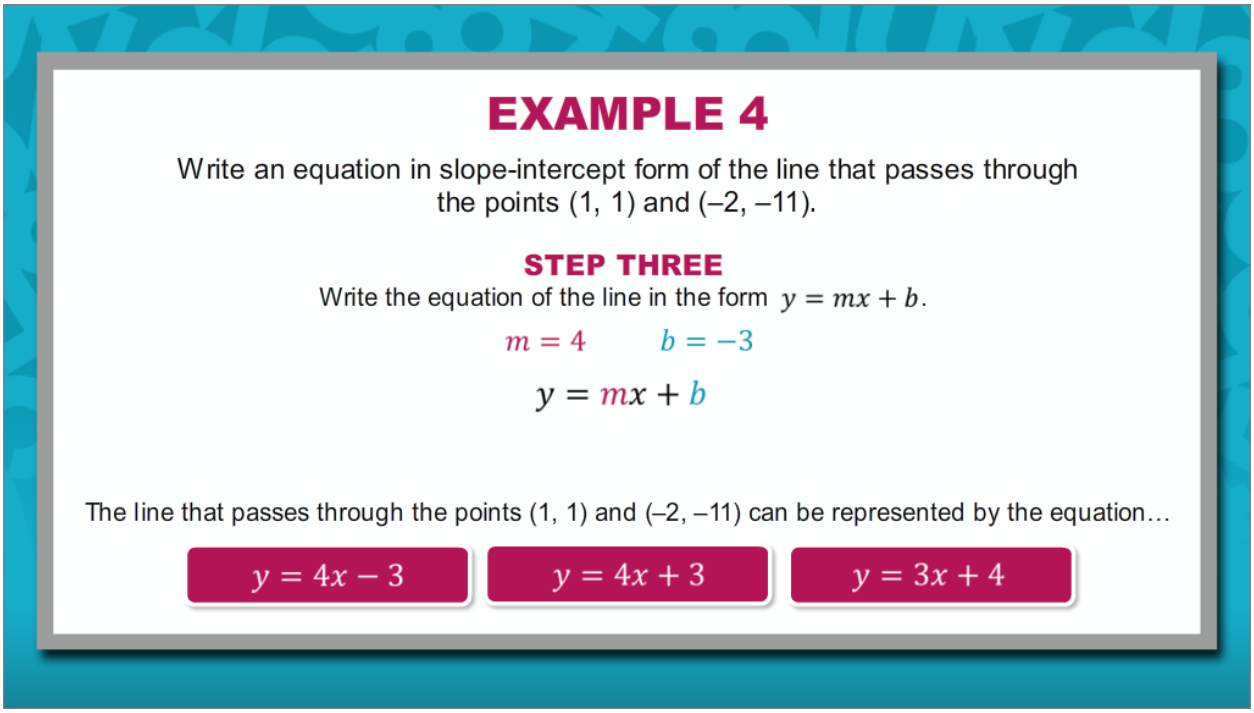
Example 4 (continued)



Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

$y = mx + b$	Let $m = 4$ and $(x, y) = (1, 1)$.
$1 = 4(1) + b$	
$1 = 4(1) + b$	Next, find the product of 4 and 1.
$1 = 4 + b$	Then subtract 4 from both sides.
$-4 \quad -4$	
$-3 = b$	**Note:** If you chose to substitute the coordinates of the point $(-2, -11)$, the result is the same.

Example 4 (continued)



Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Step 3: Write the equation of the line in the form $y = mx + b$.

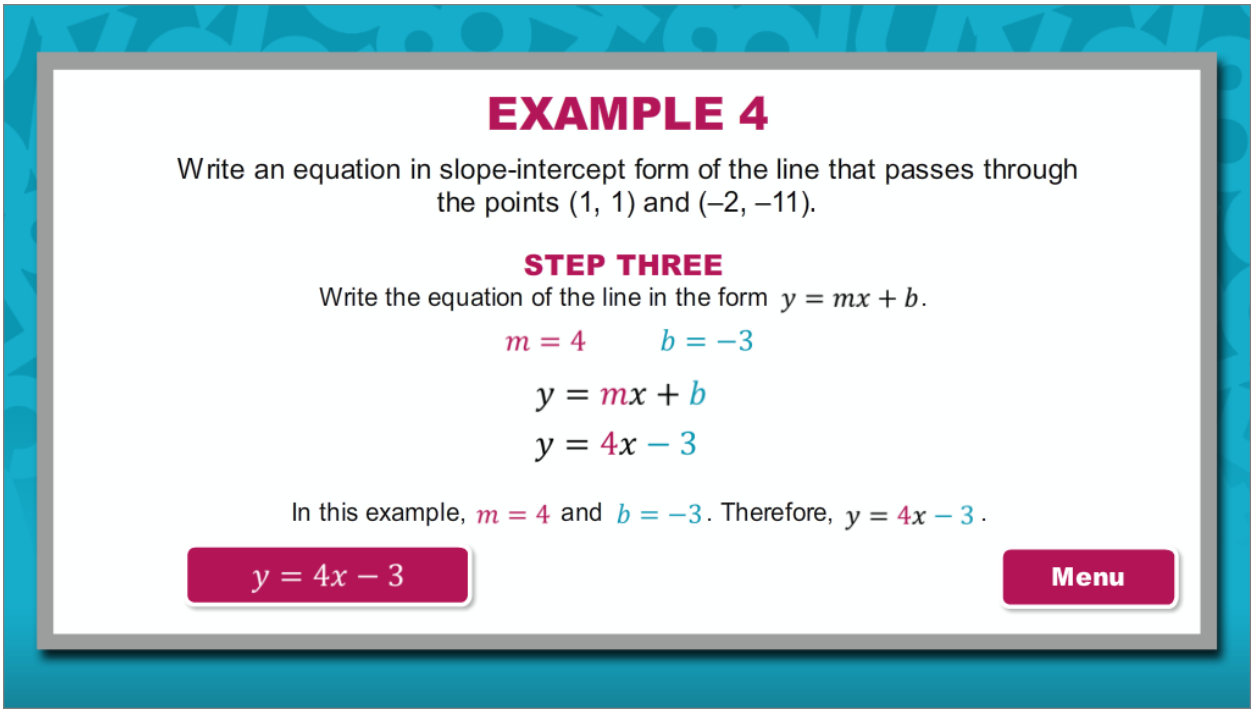
$$m = 4 \qquad b = -3$$
$$y = mx + b$$

Now that you know that $m = 4$ and $b = -3$, you can write the equation of the line in slope-intercept form.

The line that passes through the points $(1, 1)$ and $(-2, -11)$ can be represented by the equation…

A) $y = 4x - 3$
B) $y = 4x + 3$
C) $y = 3x + 4$

Example 4 (continued)



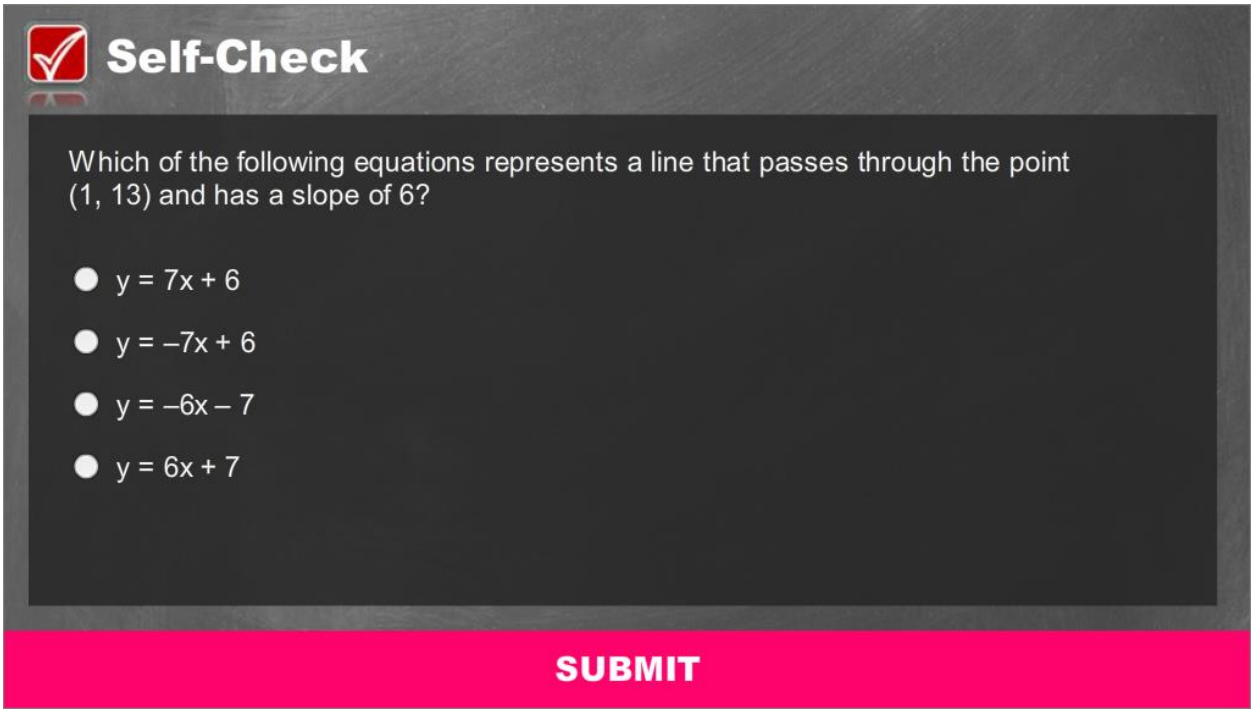
Write an equation in slope-intercept form of the line that passes through the points $(1, 1)$ and $(-2, -11)$.

Step 3: Write the equation of the line in the form $y = mx + b$.

$$m = 4 \qquad b = -3$$
$$y = mx + b$$
$$y = 4x - 3$$

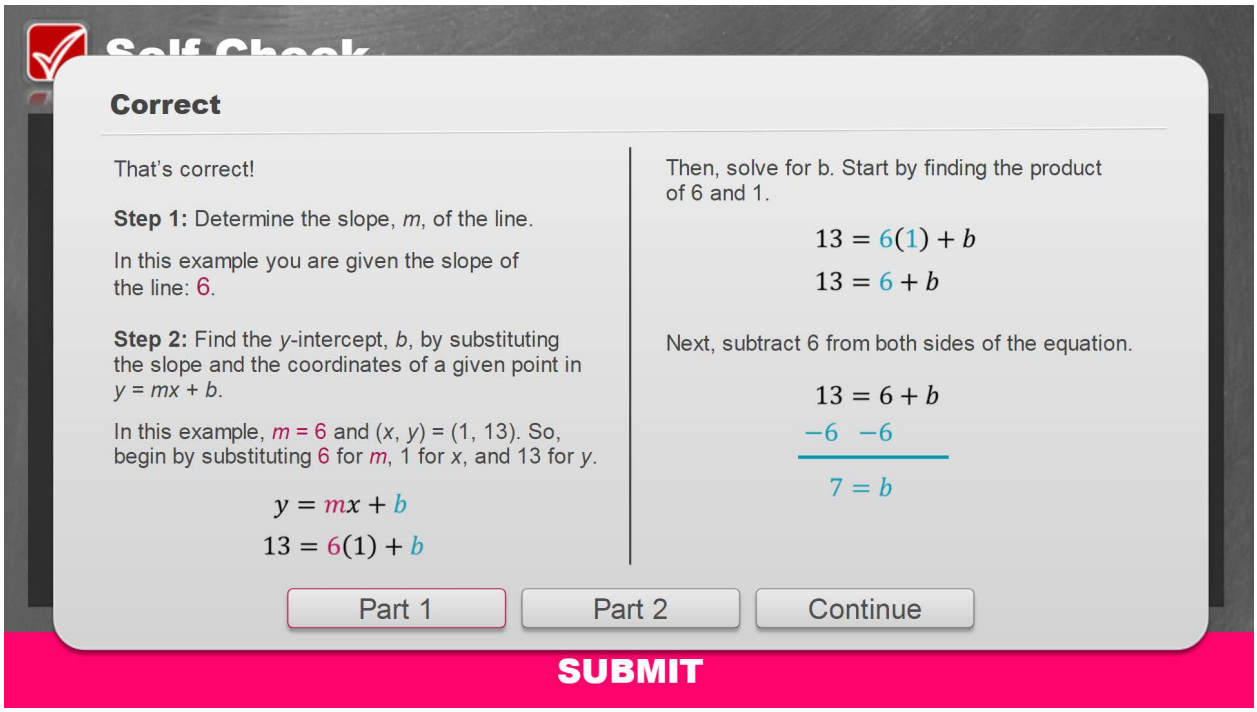
In this example, $m = 4$ and $b = -3$. Therefore, $y = 4x - 3$.

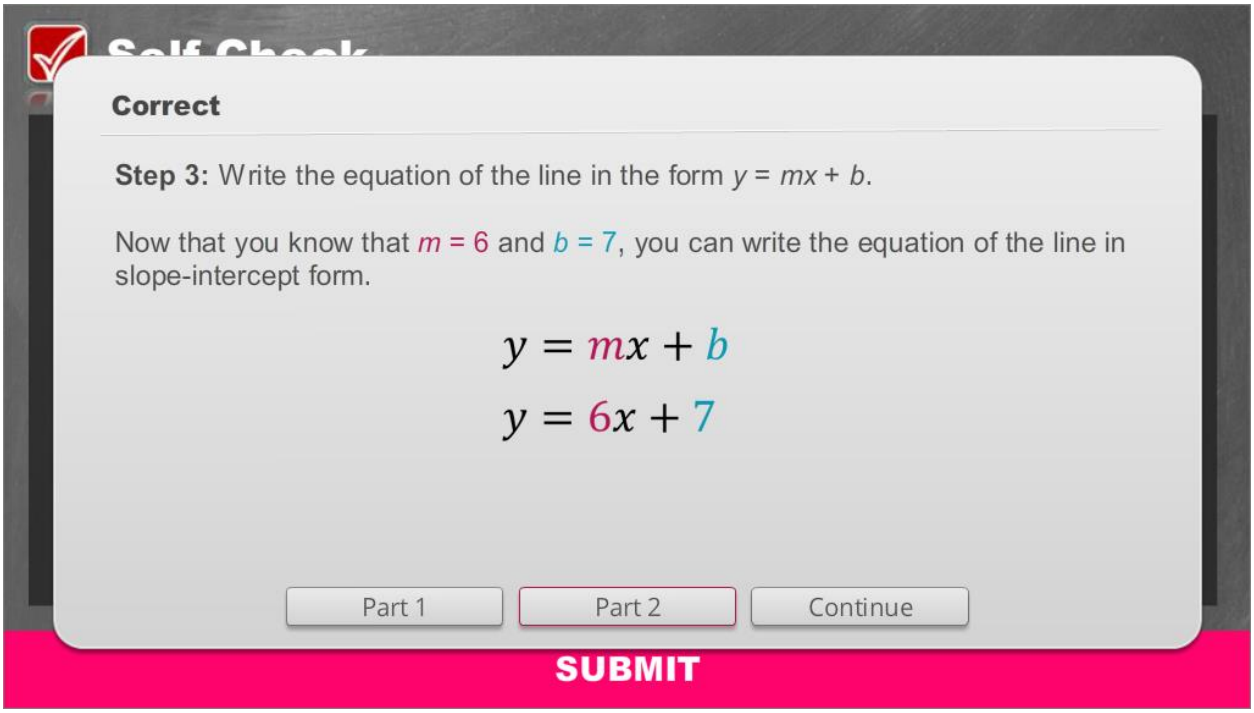
Self-Check 1



Solve the problem in the image above to check your understanding of the content.

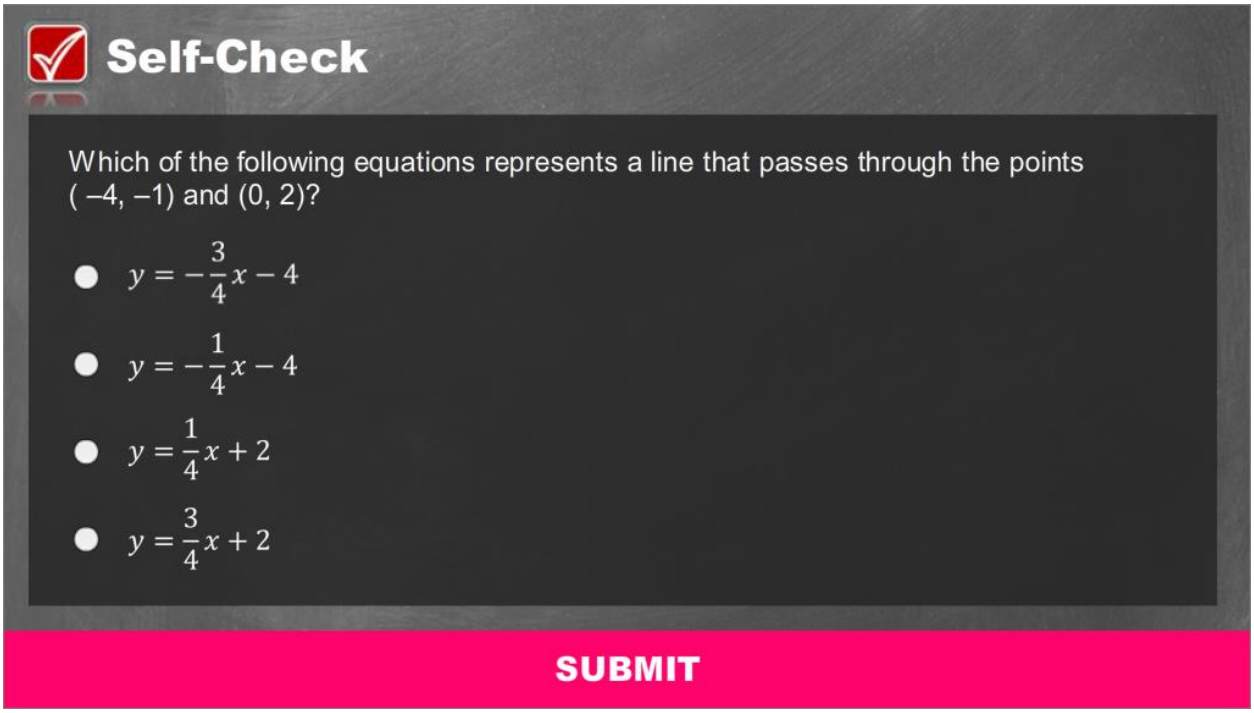
Self-Check1 : Answer





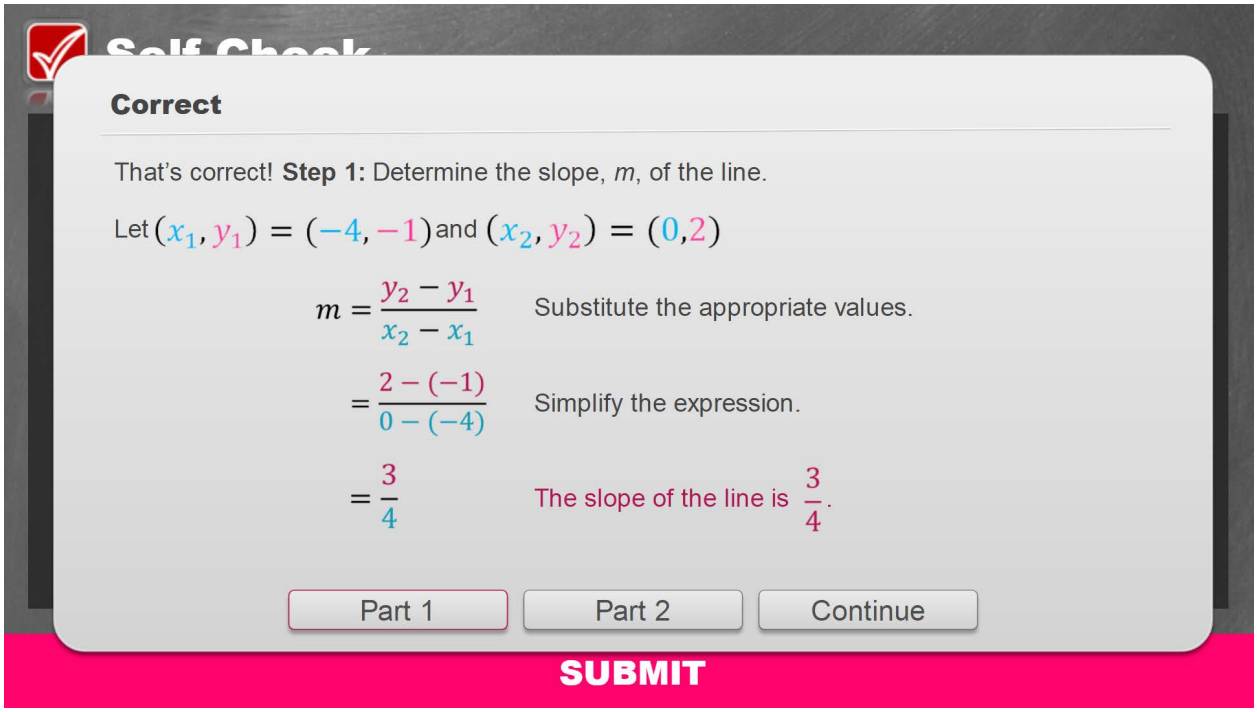
For your reference, the images above show the correct solution to the self-check problem.

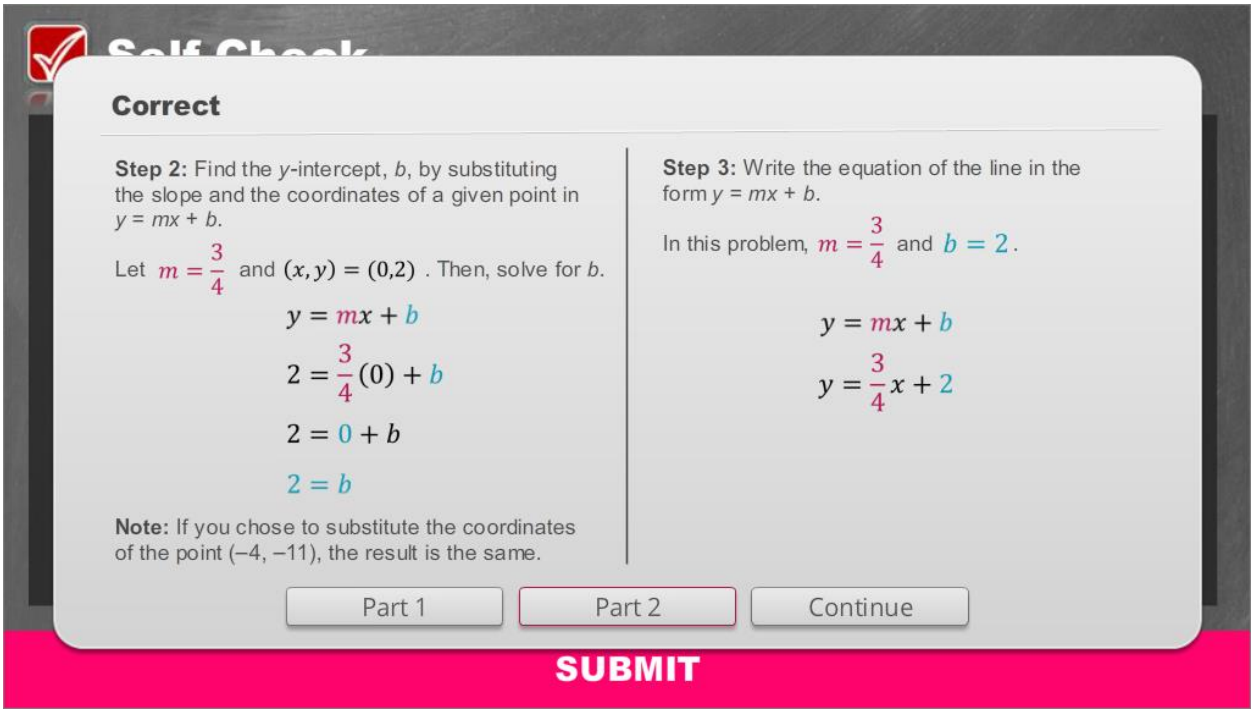
Self-Check 2



Solve the problem in the image above to check your understanding of the content.

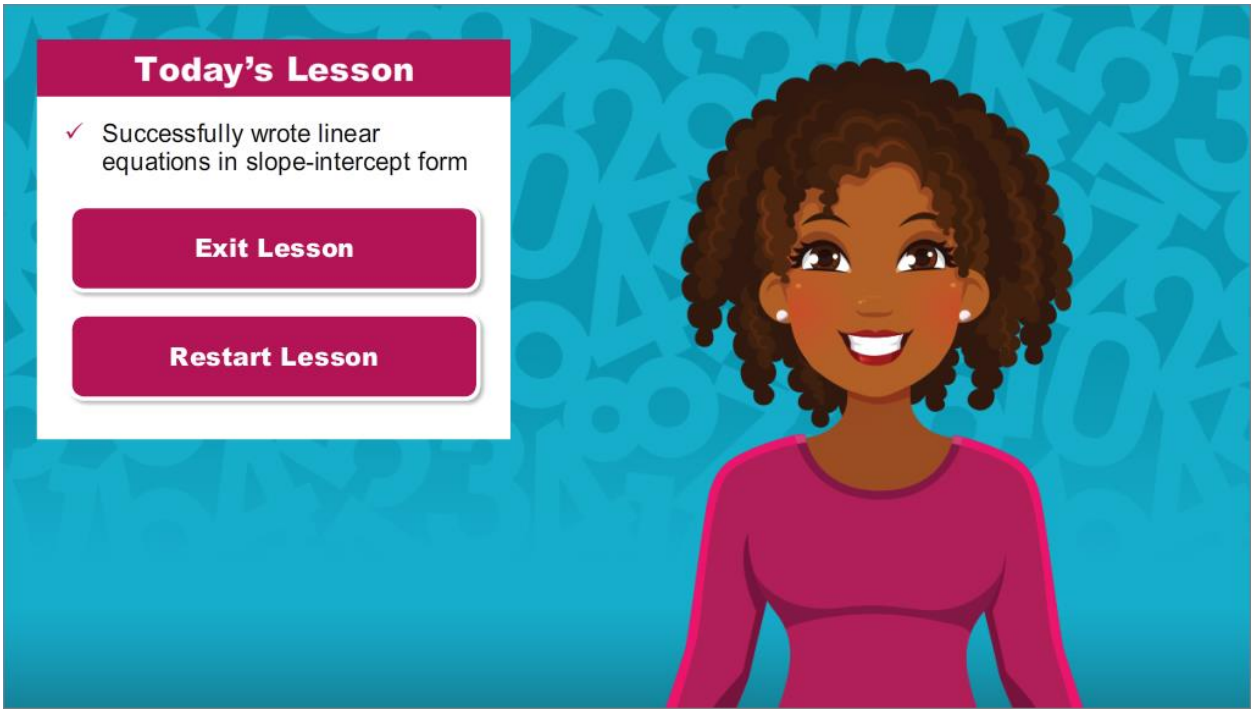
Self-Check 2 : Answer





For your reference, the images above show the correct solution to the self-check problem.

Conclusion



You have reached the conclusion of this lesson where you learned how to write a linear equation in slope-intercept form.