

Module 9: Writing Linear Equations

Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Introduction



Today's Lesson

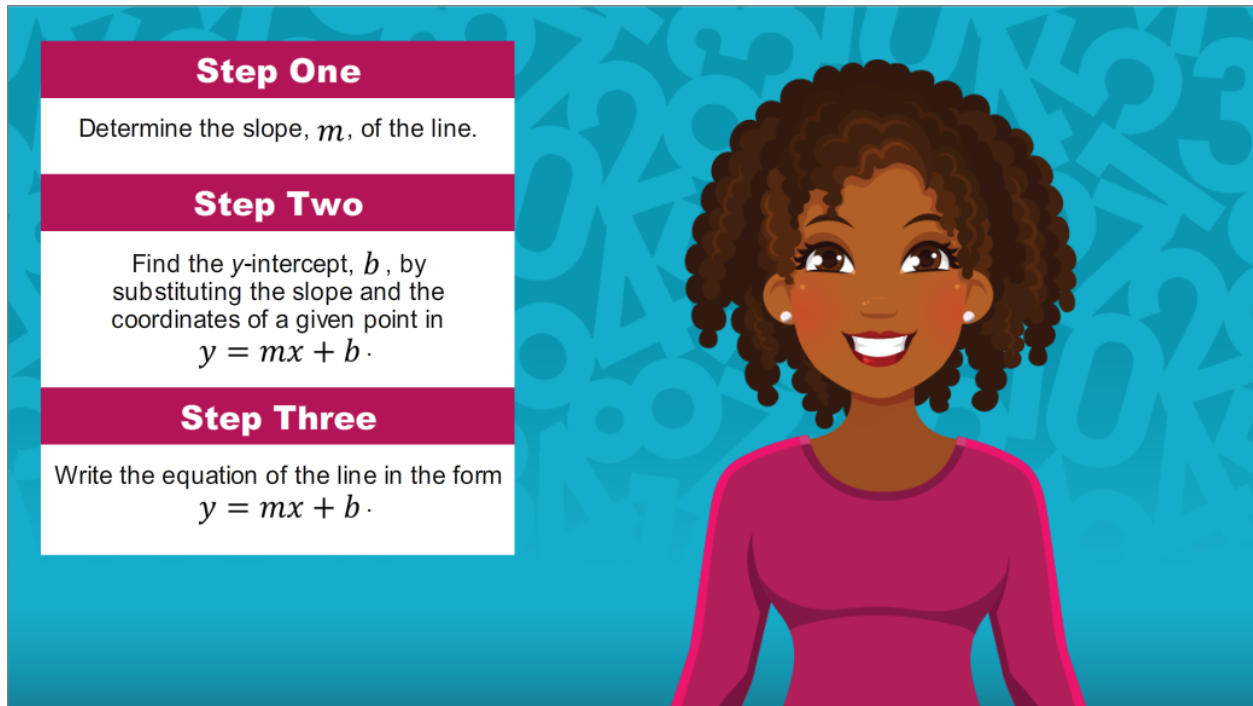
- You will learn how to write a linear equation in slope-intercept form.

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.

Module 9: Writing Linear Equations

Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Antcipatory Set



Step One
Determine the slope, m , of the line.

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

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

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.

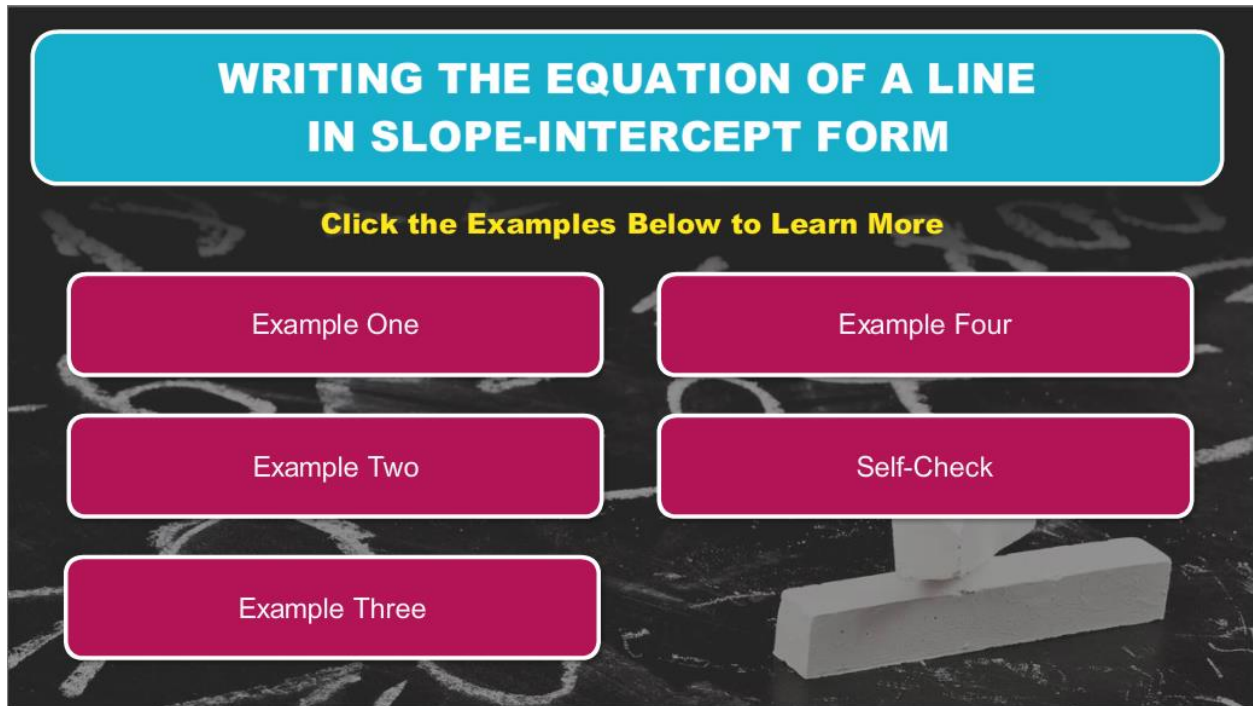
Step 2: Find the y -intercept, b , by substituting the slope and the coordinates of a given point in $y = mx + b$.

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.

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Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Writing the Equation of a Line in Slope-Intercept Form



The graphic features a dark background with faint chalkboard markings. At the top, a blue rounded rectangle contains the title "WRITING THE EQUATION OF A LINE IN SLOPE-INTERCEPT FORM" in white, bold, uppercase letters. Below this, a yellow text prompt reads "Click the Examples Below to Learn More". Five pink rounded rectangular buttons are arranged in two columns: "Example One", "Example Two", and "Example Three" on the left; "Example Four" and "Self-Check" on the right. A white 3D rectangular object is positioned in the bottom right corner of the graphic.

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 $(4, -2)$.

$$y = mx + b$$

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

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 .

$$-2 = 1 + b$$

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

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

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Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Example 2

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 ONE

Determine the slope, m , of the line.

The slope of the given line is...

-1 -2 7 $-\frac{1}{7}$

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) $-\frac{1}{7}$

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Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Example 2 (continued)

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 ONE

Determine the slope, m , of the line.

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

-2

Next

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 .

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Example 2 (continued)

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 TWO

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

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

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

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

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

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

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 $y = mx + b$.

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

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

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Example 2 (continued)

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 .

$$y = mx + b$$

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

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

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

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, $7 = -2(-1) + b$.

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Example 2 (continued)

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 .

$$y = mx + b$$

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

After solving the equation for b , you find that...

$$b = 2$$

$$b = 7$$

$$b = 5$$

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) $b = 5$

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Example 2 (continued)

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 .

$$y = mx + b$$

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

$$7 = 2 + b$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \end{array}$$

$$5 = b$$

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

$b = 5$

Next

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

$$y = mx + b$$

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

$$7 = 2 + b$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \end{array}$$

$$5 = b$$

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

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Example 2 (continued)

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 THREE

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

$m = -2$ $b = 5$

$y = mx + b$

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

$y = -2x + 5$

$y = 2x - 5$

$y = 5x - 2$

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

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

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

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) $y = 5x - 2$

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Example 2 (continued)

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 THREE

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

$m = -2$ $b = 5$

$y = mx + b$

$y = -2x + 5$

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

$y = -2x + 5$ **Menu**

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 $y = mx + b$.

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

$$y = mx + b$$

$$y = -2x + 5$$

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

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Example 3

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

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

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

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

$$y = mx + b$$

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

$$(x, y) = (10, -5)$$

$$y = mx + b$$

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

$$-5 = -4 + b$$

$$-5 = -4 + b$$

$$\begin{array}{r} +4 \quad +4 \\ \hline -5 = -4 + b \end{array}$$

$$-1 = b$$

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 $-\frac{2}{5}$.

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 .

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 $-1 = b$.

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

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Example 4

EXAMPLE 4

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

STEP ONE

Determine the slope, m , of the line.

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

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

-4 1 4 10

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

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Example 4 (continued)

EXAMPLE 4

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

STEP ONE

Determine the slope, m , of the line.

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

The slope of the line is 4.

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.

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

The slope of the line is 4.

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Example 4 (continued)

EXAMPLE 4

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 $(x_2, y_2) = (-2, -11)$.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-11 - 1}{-2 - 1} && \text{Substitute the appropriate values.} \\ &= \frac{-12}{-3} && \text{Simplify the expression.} \\ &= 4 && \text{The slope is 4.} \end{aligned}$$

Next

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 $(x_2, y_2) = (-2, -11)$.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-11 - 1}{-2 - 1} && \text{Substitute the appropriate values.} \\ &= \frac{-12}{-3} && \text{Simplify the expression.} \\ &= 4 && \text{The slope of the line is 4.} \end{aligned}$$

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Example 4 (continued)

EXAMPLE 4

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

STEP TWO

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 for b , you find that...

$b = 18$ **$b = 3$** **$b = -3$** **$b = -18$**

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) $b = -18$

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Example 4 (continued)

EXAMPLE 4

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

STEP TWO

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 that $b = -3$.

$b = -3$

[View Work](#) [Next](#)

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 $b = 3$.

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Example 4 (continued)

EXAMPLE 4

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

$$y = mx + b \quad \text{Let } m = 4 \text{ and } (x, y) = (1, 1).$$

$$1 = 4(1) + b$$

$$1 = 4(1) + b \quad \text{Next, find the product of 4 and 1.}$$

$$1 = 4 + b \quad \text{Then, subtract 4 from both sides.}$$

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

Note: If you chose to substitute the coordinates of the point (-2, -11), the result is the same.

Next

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

$$y = mx + b \quad \text{Let } m = 4 \text{ and } (x, y) = (1, 1).$$

$$1 = 4(1) + b$$

$$1 = 4(1) + b \quad \text{Next, find the product of 4 and 1.}$$

$$1 = 4 + b \quad \text{Then subtract 4 from both sides.}$$

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

Note: If you chose to substitute the coordinates of the point (-2, -11), the result is the same.

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Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Example 4 (continued)

EXAMPLE 4

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

STEP THREE

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

$m = 4$ $b = -3$

$y = mx + b$

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

$y = 4x - 3$ $y = 4x + 3$ $y = 3x + 4$

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 $y = mx + b$.

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

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) $y = 3x + 4$

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Example 4 (continued)

EXAMPLE 4

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

STEP THREE

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

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

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

$y = 4x - 3$ **Menu**

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

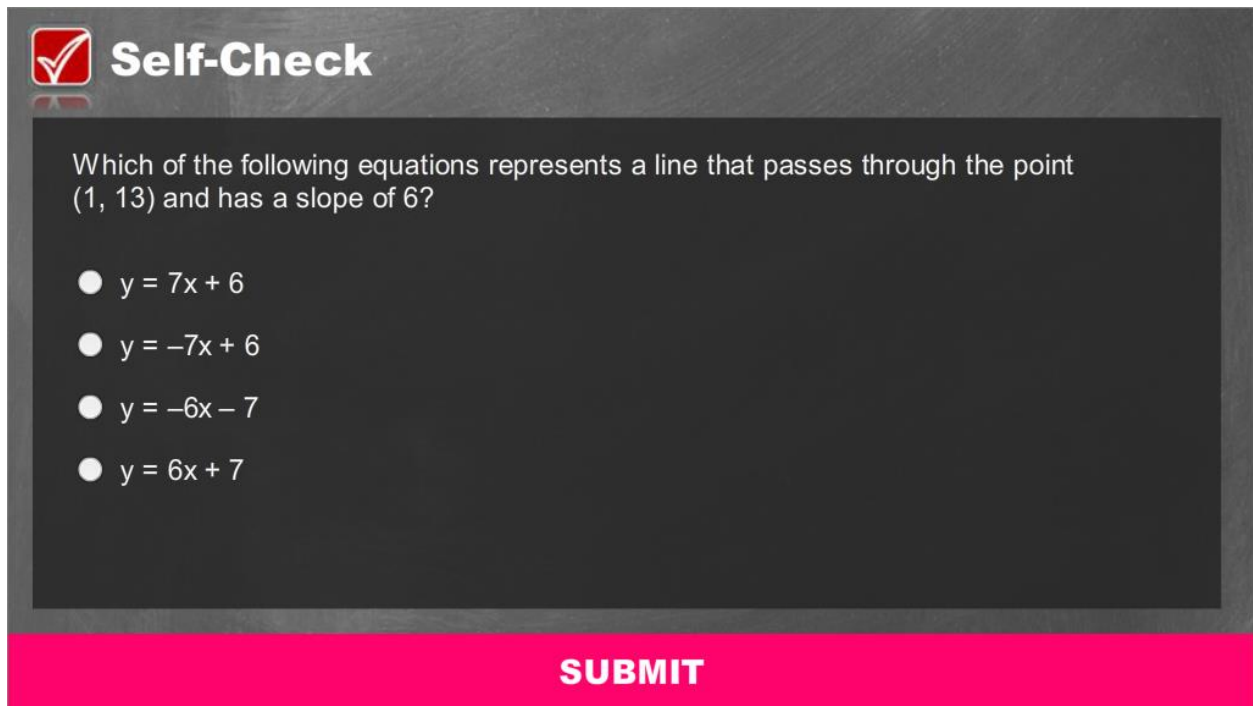
Step 3: Write the equation of the line in the form $y = mx + b$.

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

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

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Self-Check 1

A self-check interface with a dark grey background. At the top left is a red checkmark icon in a white square, followed by the text "Self-Check" in white. Below this is a dark grey rectangular area containing the question and four radio button options. At the bottom is a bright pink horizontal bar with the word "SUBMIT" in white capital letters.

Self-Check

Which of the following equations represents a line that passes through the point (1, 13) and has a slope of 6?

- $y = 7x + 6$
- $y = -7x + 6$
- $y = -6x - 7$
- $y = 6x + 7$

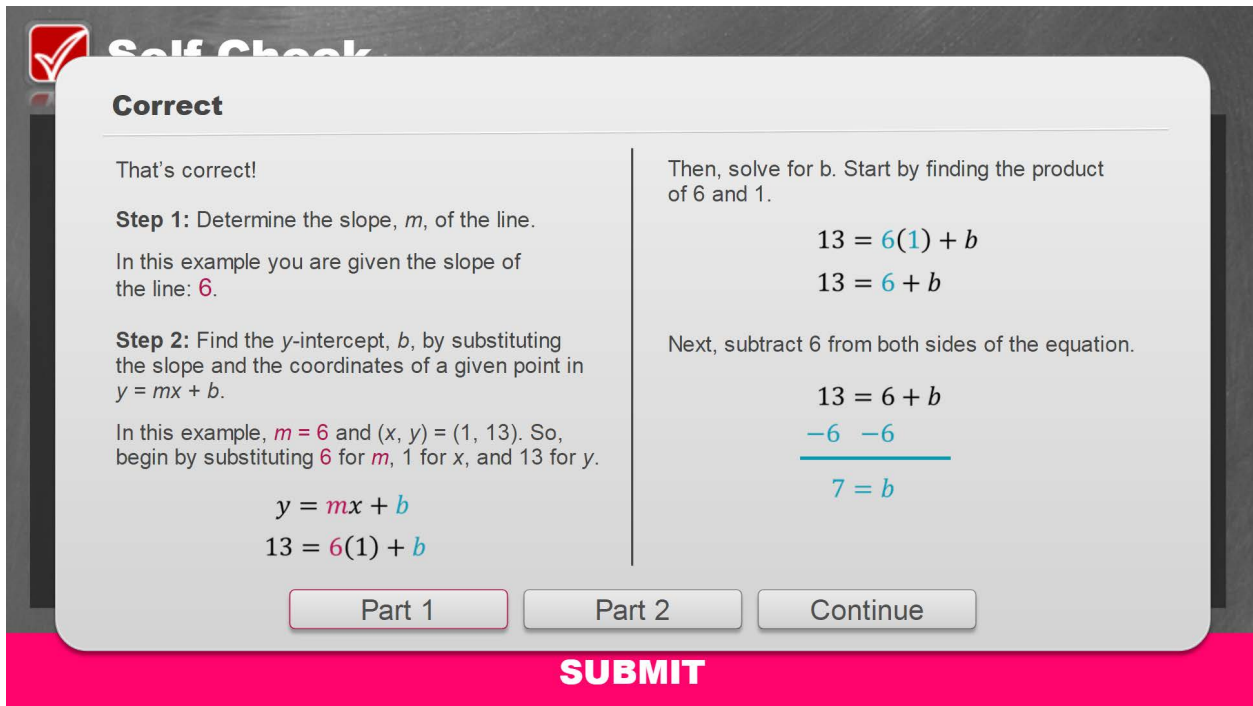
SUBMIT

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

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Self-Check1 : Answer



Correct

That's correct!

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

In this example you are given the slope of the line: 6 .

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

In this example, $m = 6$ and $(x, y) = (1, 13)$. So, begin by substituting 6 for m , 1 for x , and 13 for y .

$$y = mx + b$$
$$13 = 6(1) + b$$

Then, solve for b . Start by finding the product of 6 and 1 .

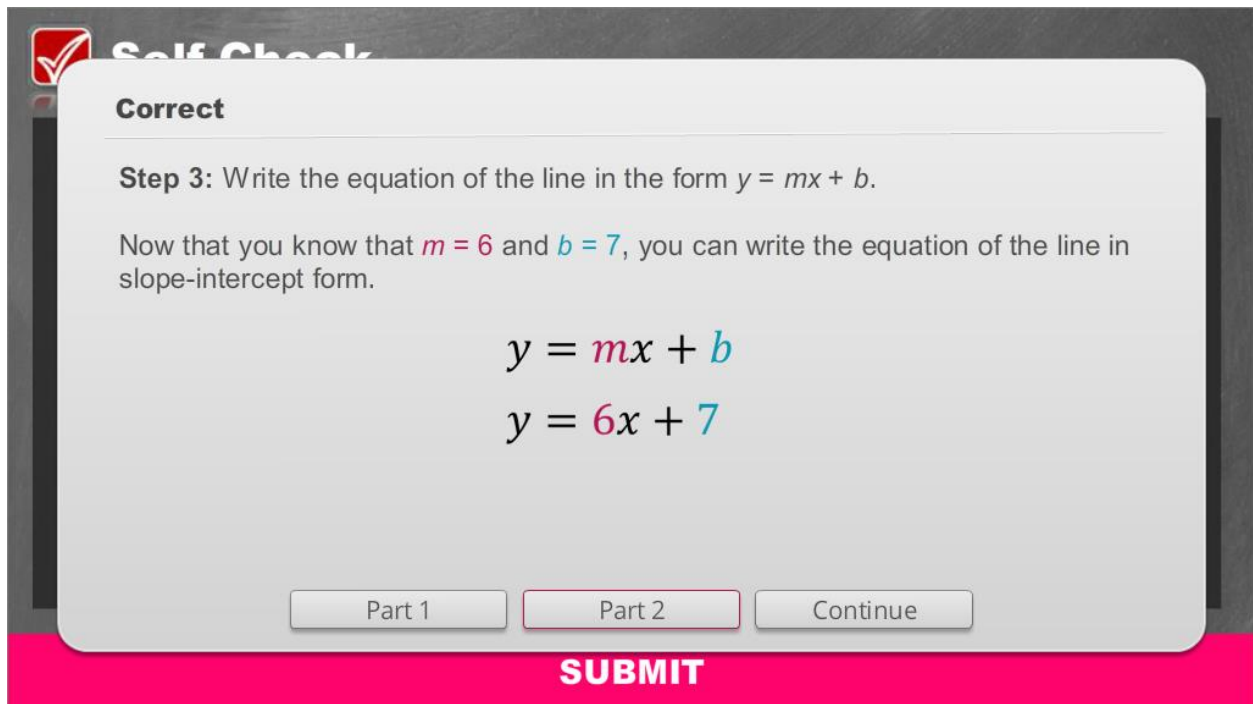
$$13 = 6(1) + b$$
$$13 = 6 + b$$

Next, subtract 6 from both sides of the equation.

$$13 = 6 + b$$
$$\begin{array}{r} -6 \quad -6 \\ \hline 7 = b \end{array}$$

Part 1 Part 2 Continue

SUBMIT



Correct

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

Now that you know that $m = 6$ and $b = 7$, you can write the equation of the line in slope-intercept form.

$$y = mx + b$$
$$y = 6x + 7$$

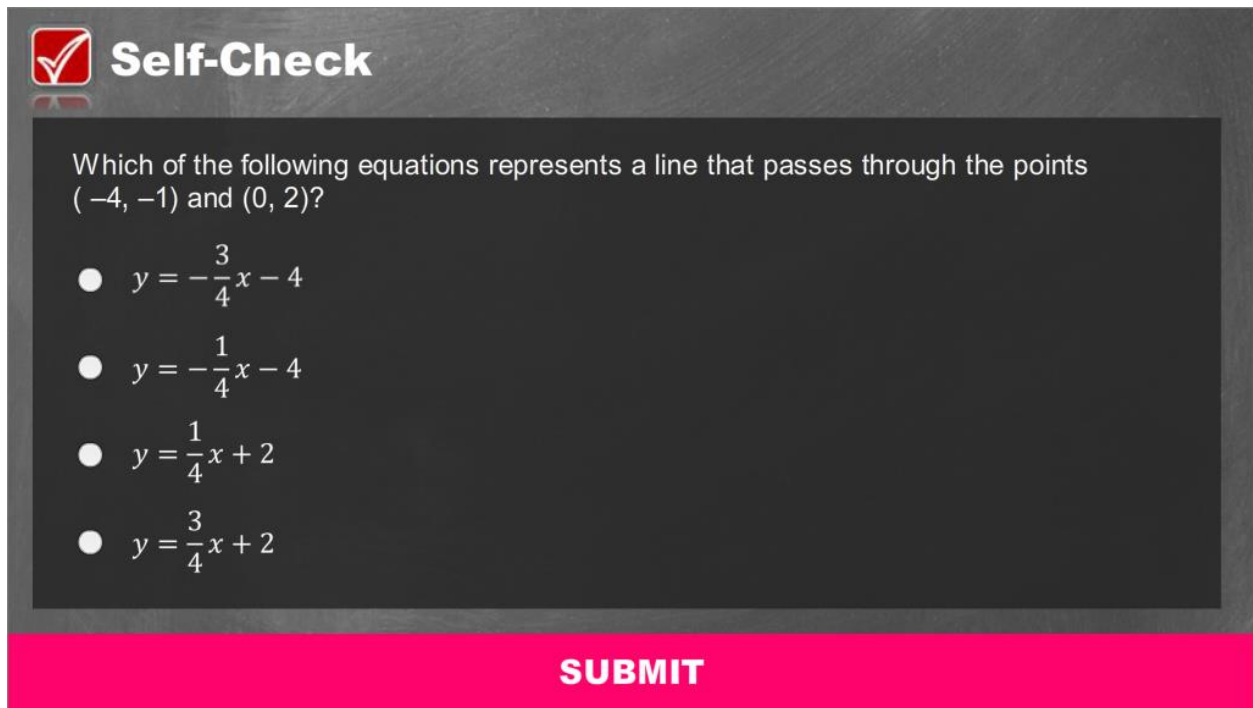
Part 1 Part 2 Continue

SUBMIT

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

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Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Self-Check 2

A digital interface for a self-check problem. It features a dark grey background with a red checkmark icon and the text "Self-Check" in white. Below this, a question is posed in white text. Four radio button options are listed, each with a linear equation. At the bottom, there is a bright pink rectangular button with the word "SUBMIT" in white capital letters.

Self-Check

Which of the following equations represents a line that passes through the points $(-4, -1)$ and $(0, 2)$?

- $y = -\frac{3}{4}x - 4$
- $y = -\frac{1}{4}x - 4$
- $y = \frac{1}{4}x + 2$
- $y = \frac{3}{4}x + 2$

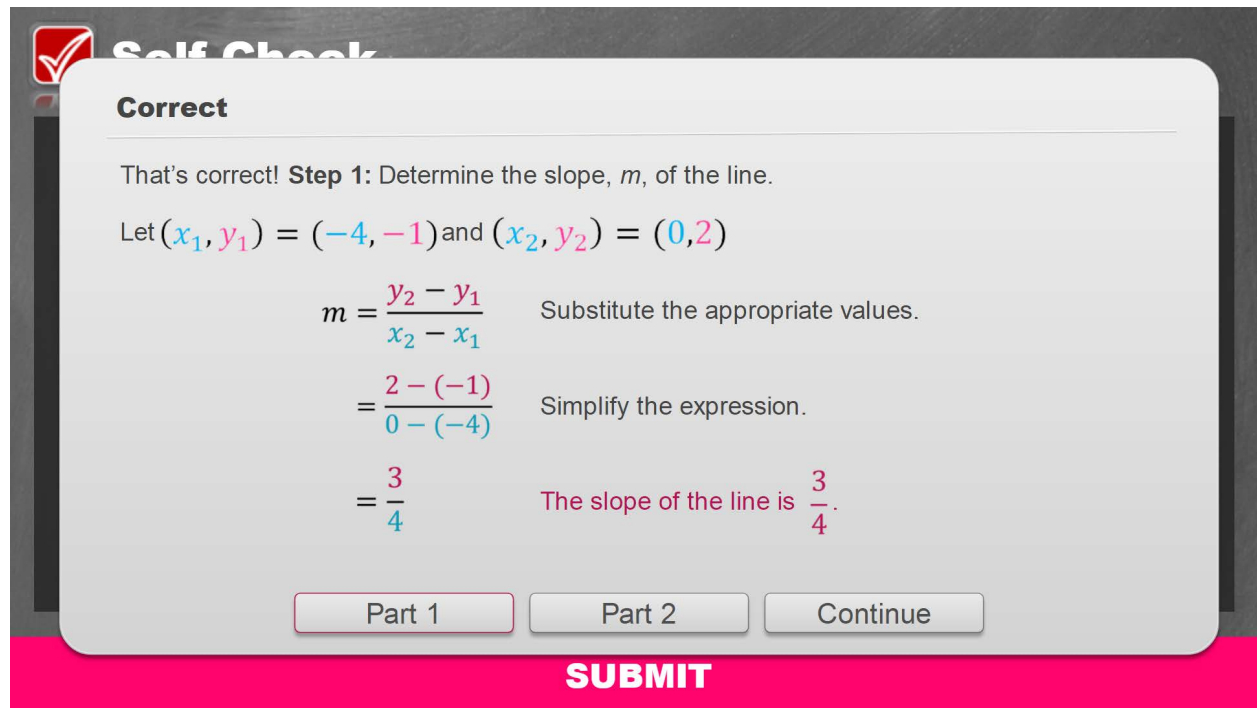
SUBMIT

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

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Self-Check 2 : Answer



Correct

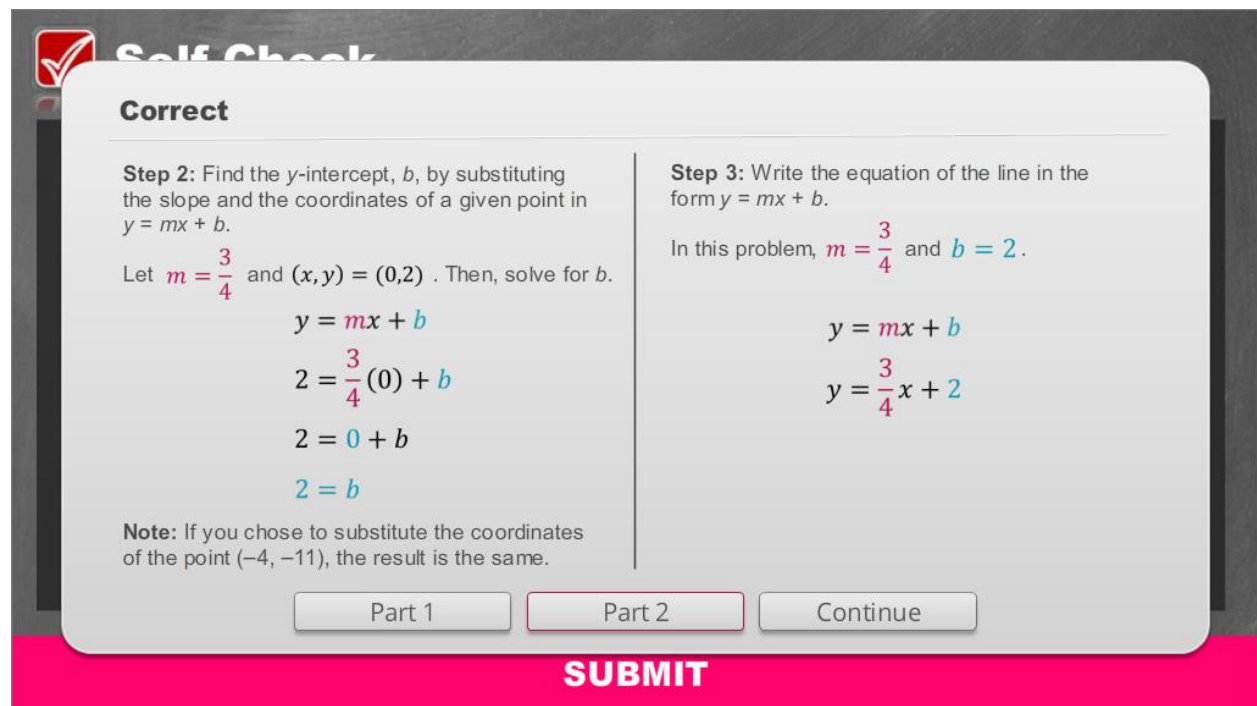
That's correct! **Step 1:** Determine the slope, m , of the line.

Let $(x_1, y_1) = (-4, -1)$ and $(x_2, y_2) = (0, 2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{Substitute the appropriate values.}$$
$$= \frac{2 - (-1)}{0 - (-4)} \quad \text{Simplify the expression.}$$
$$= \frac{3}{4} \quad \text{The slope of the line is } \frac{3}{4}.$$

Part 1 Part 2 Continue

SUBMIT



Correct

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

Let $m = \frac{3}{4}$ and $(x, y) = (0, 2)$. Then, solve for b .

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

Note: If you chose to substitute the coordinates of the point $(-4, -1)$, the result is the same.

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

In this problem, $m = \frac{3}{4}$ and $b = 2$.

$$y = mx + b$$
$$y = \frac{3}{4}x + 2$$

Part 1 Part 2 Continue

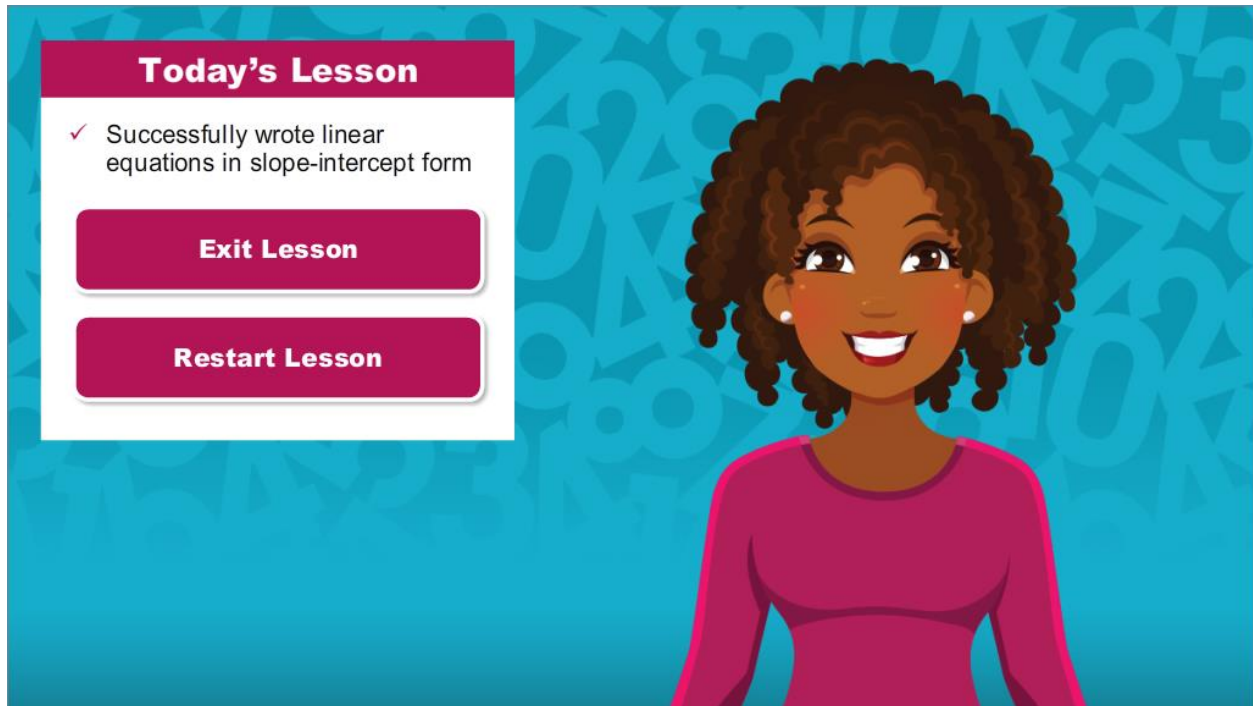
SUBMIT

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

Module 9: Writing Linear Equations

Topic 2 Content: Writing the Equation of a Line in Slope-Intercept Form

Conclusion



The image shows a digital interface for a lesson conclusion. On the left, a white box with a pink header titled "Today's Lesson" contains a checkmark and the text "Successfully wrote linear equations in slope-intercept form". Below this are two pink buttons: "Exit Lesson" and "Restart Lesson". To the right of the box is a cartoon illustration of a young woman with dark curly hair, wearing a pink long-sleeved shirt, smiling. The background is a blue pattern of faint mathematical symbols.

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