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

Introduction

Hi there! 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 standard form.

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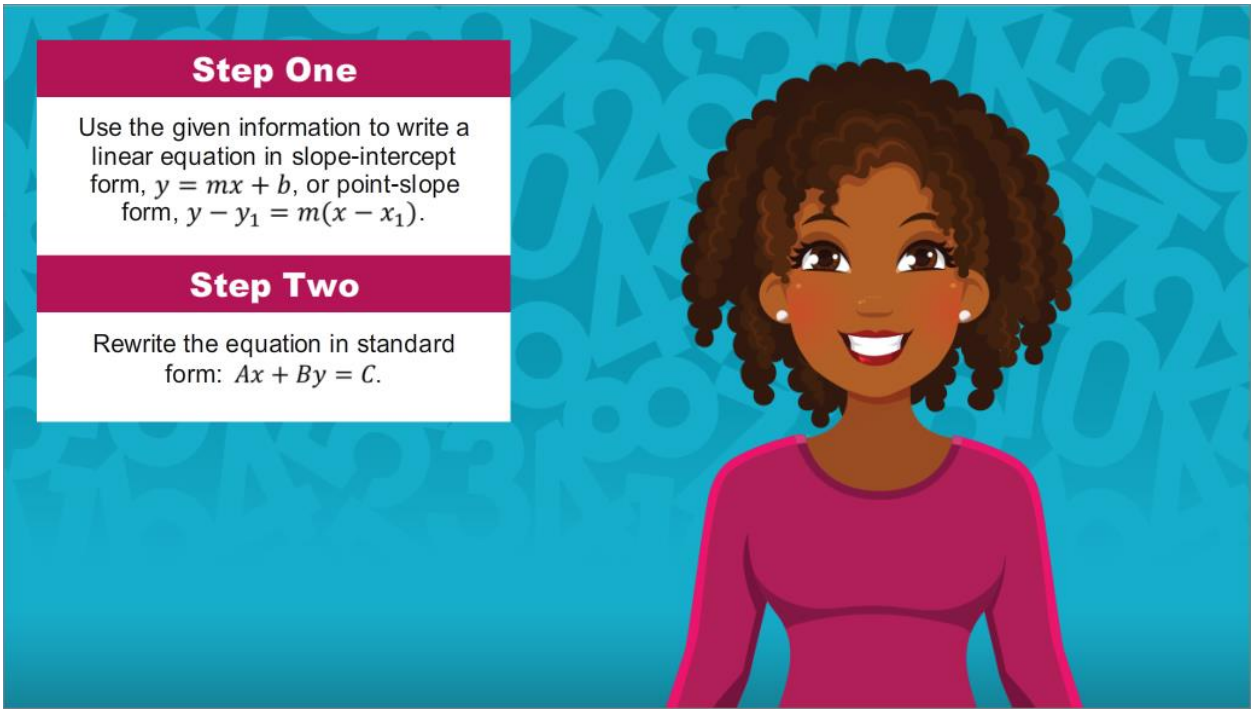
Anticipatory Set



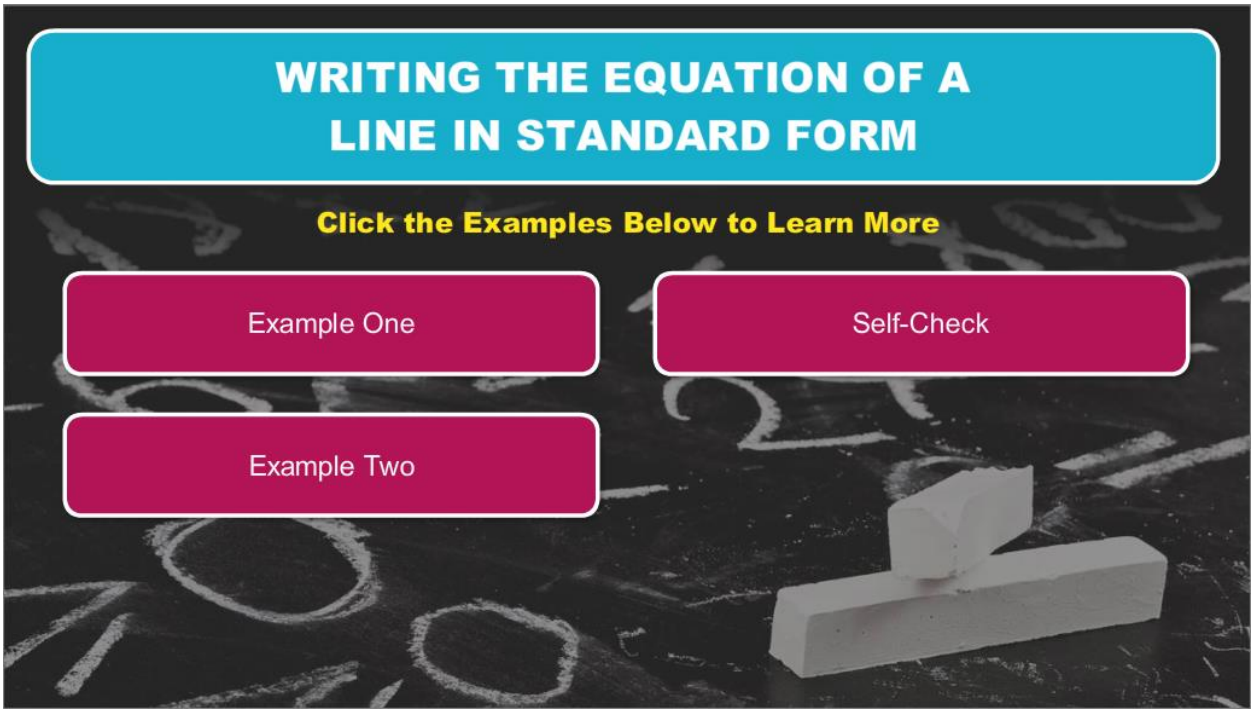
Use the following steps to guide you in the process of writing the equation of a line in standard form, when given two points on the line or when given the slope of the line and a point on the line.

Step 1: Use the given information to write a linear equation in slope-intercept form, $y = mx + b$, or point-slope form, $y - y_1 = m(x - x_1)$.

Step 2: Rewrite the equation in standard form: $Ax + By = C$.

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

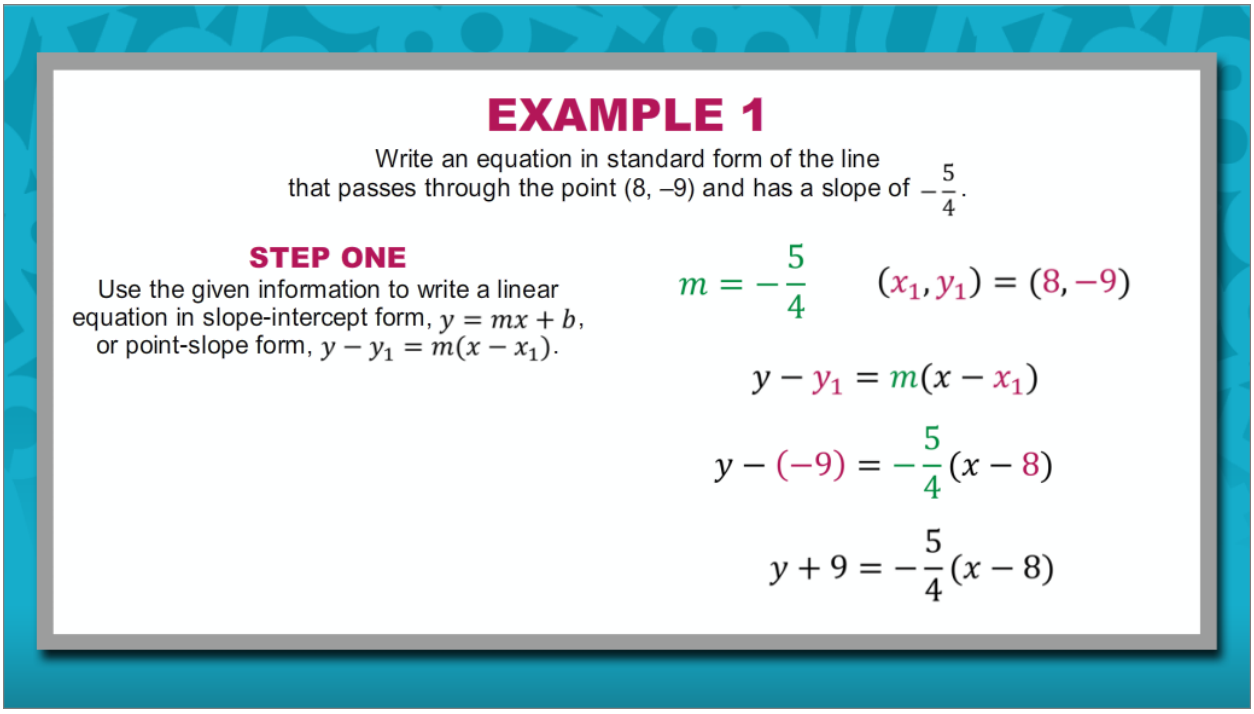
Writing the Equation of a Line in Standard Form



Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

Example 1



Write an equation in standard form of the line that passes through the point $(8, -9)$ and has a slope of $-\frac{5}{4}$.

$m = -\frac{5}{4}$

$(x_1, y_1) = (8, -9)$

$y - y_1 = m(x - x_1)$

$y - y_1 = m(x - x_1)$

$y - (-9) = -\frac{5}{4}(x - 8)$

$y + 9 = -\frac{5}{4}(x - 8)$

Step 1: Use the given information to write a linear equation in slope-intercept form, $y = mx + b$, or point-slope form, $y - y_1 = m(x - x_1)$.

In this example, you are given the slope of the line and the coordinates of a point on the line. Because of this, it would be more efficient to begin by writing the equation of the line in point-slope form than in slope-intercept form.

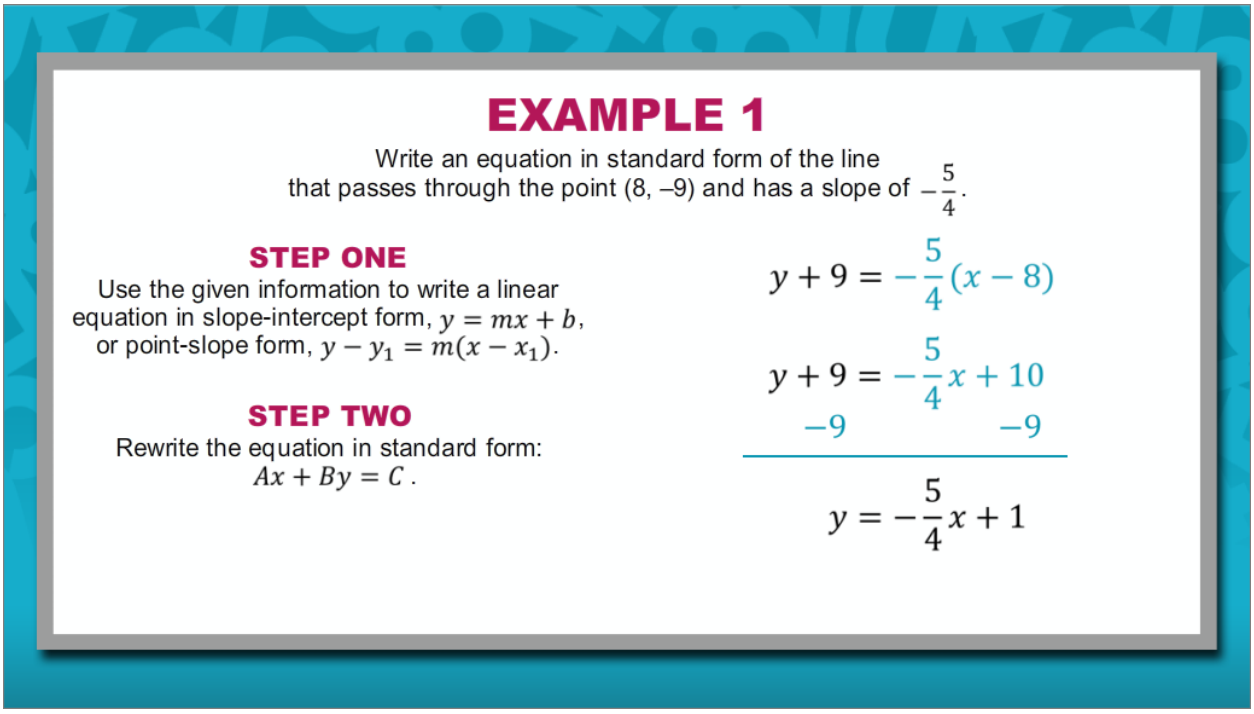
Substitute $-\frac{5}{4}$ for m, 8 for x_1, and -9 for y_1.

Next, simplify the left side of the equation.

The result is an equation in point-slope form:

$$y + 9 = -\frac{5}{4}(x - 8)$$

Example 1 (continued)



Write an equation in standard form of the line that passes through the point $(8, -9)$ and has a slope of $-\frac{5}{4}$.

$$y + 9 = -\frac{5}{4}(x - 8)$$

$$y + 9 = -\frac{5}{4}x + 10$$

Step 2: Rewrite the equation in standard form: $Ax + By = C$.

Begin by applying the distributive property to the right side of equation.

$$-\frac{5}{4} \cdot x = -\frac{5}{4}x$$

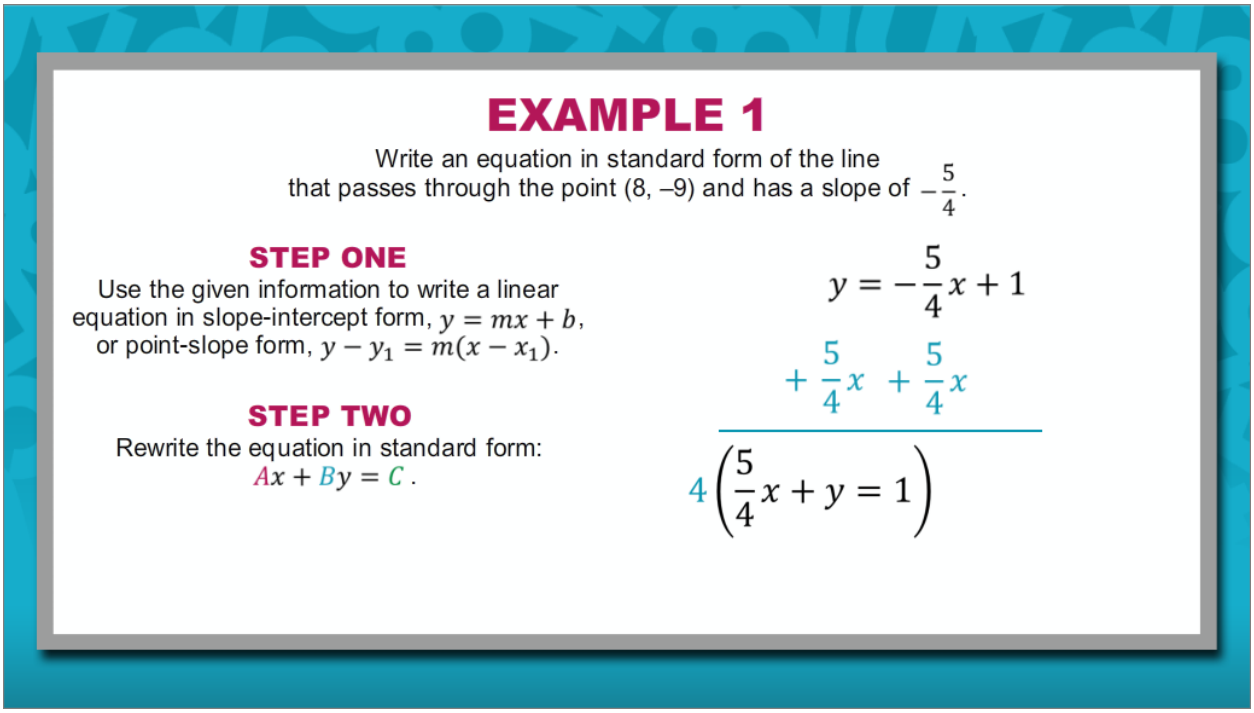
$$-\frac{5}{4} \cdot -8 = 10$$

$$y + 9 = -\frac{5}{4}x + 10$$
$$-9 \quad -9$$
$$y = -\frac{5}{4}x + 1$$

Now, subtract 9 from both sides.

The result is $y = -\frac{5}{4}x + 1$.

Example 1 (continued)



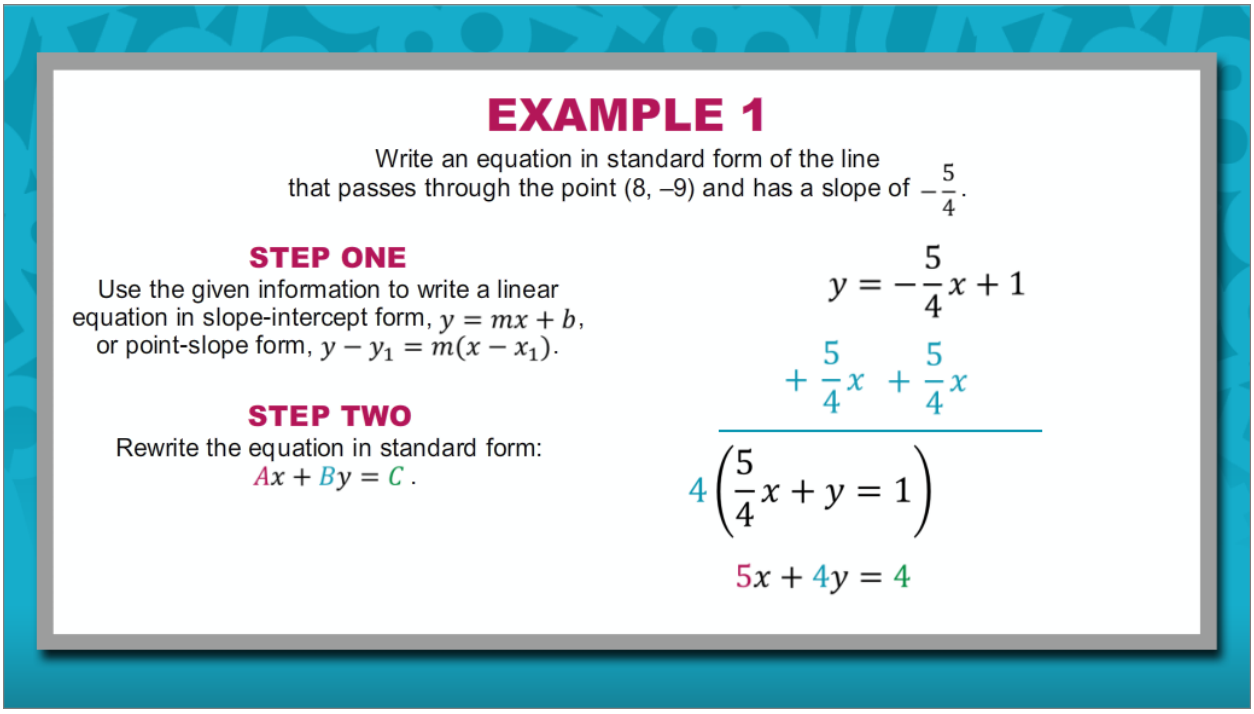
Write an equation in standard form of the line that passes through the point $(8, -9)$ and has a slope of $-\frac{5}{4}$.

$y = -\frac{5}{4}x + 1$ Next, add $\frac{5}{4}x$ to each side.

$+\frac{5}{4}x \quad +\frac{5}{4}x$

$\frac{5}{4}x + y = 1$ The result is $\frac{5}{4}x + y = 1$.

Example 1 (continued)



Write an equation in standard form of the line that passes through the point $(8, -9)$ and has a slope of $-\frac{5}{4}$.

$4\left(\frac{5}{4}x + y = 1\right)$

$5x + 4y = 4$

Recall that when a linear equation is written in standard form, A, B, and C are integers. This means that you must eliminate the fraction $\frac{5}{4}$. You can accomplish this by multiplying the equation by 4.

$4 \cdot \frac{5}{4}x = 5x$

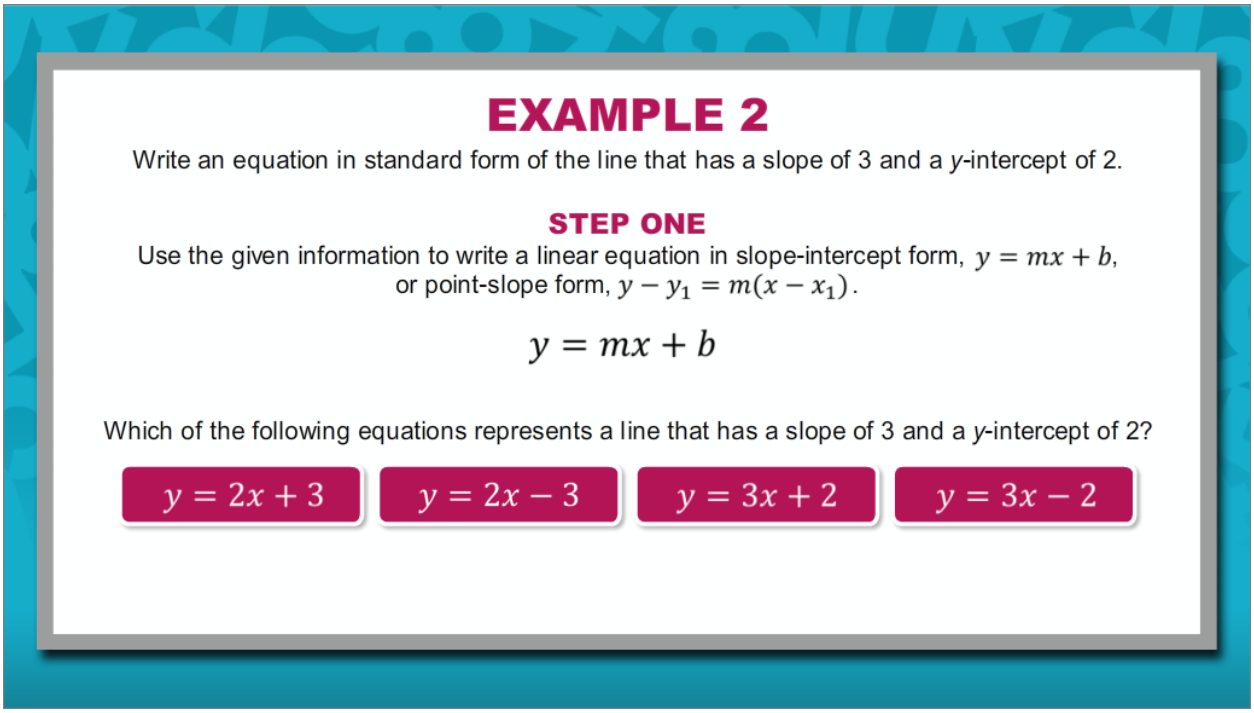
$4 \cdot y = 4y$

$4 \cdot 1 = 4$

The result is an equation in standard form of the line that passes through the point $(8, -9)$ and has a slope of $-\frac{5}{4}$:

$5x + 4y = 4$

Example 2



Write an equation in standard form of the line that has a slope of 3 and a y-intercept of 2.

Step 1: Use the given information to write a linear equation in slope-intercept form, $y = mx + b$, or point-slope form, $y - y_1 = m(x - x_1)$.

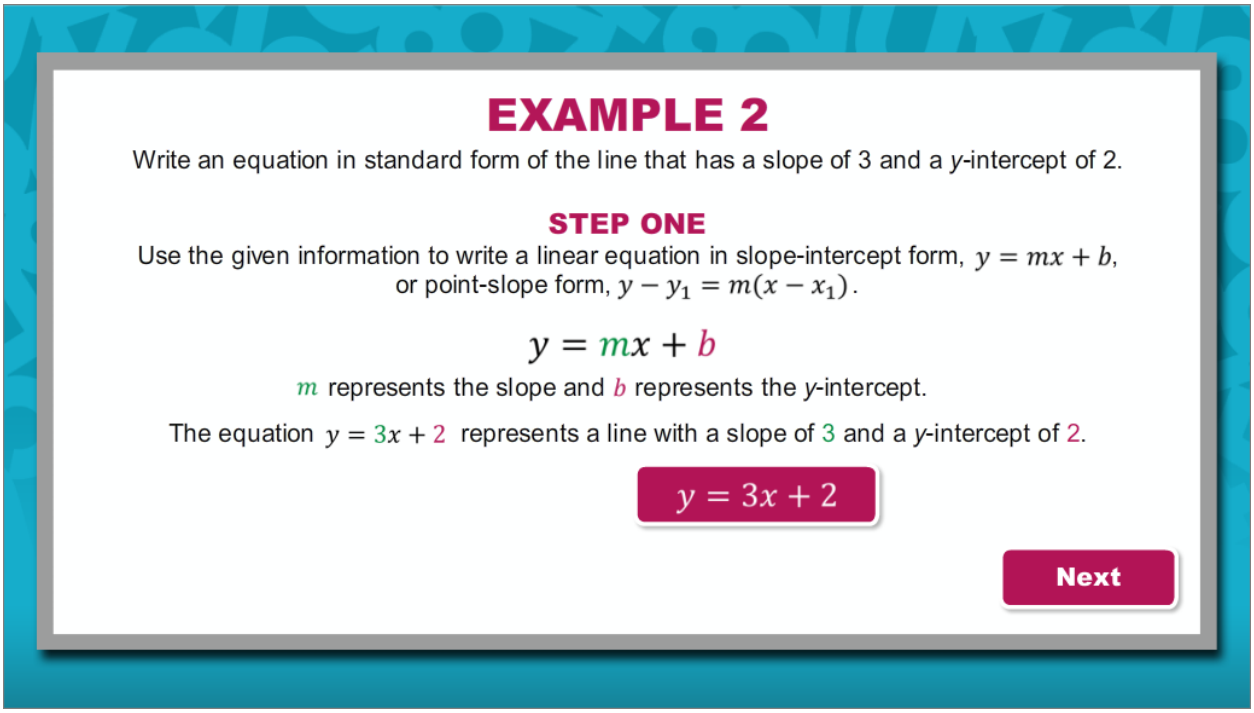
$$y = mx + b$$

In this example, you given the slope and the y-intercept of the line. Because of this, it would be more efficient to begin by writing the equation in slope-intercept form than in point-slope form.

Which of the following equations represents a line that has a slope of 3 and a y-intercept of 2 is?

A) $y = 2x + 3$
B) $y = 2x - 3$
C) $y = 3x + 2$
D) $y = 3x - 2$

Example 2 (continued)



Write an equation in standard form of the line that has a slope of 3 and a y-intercept of 2.

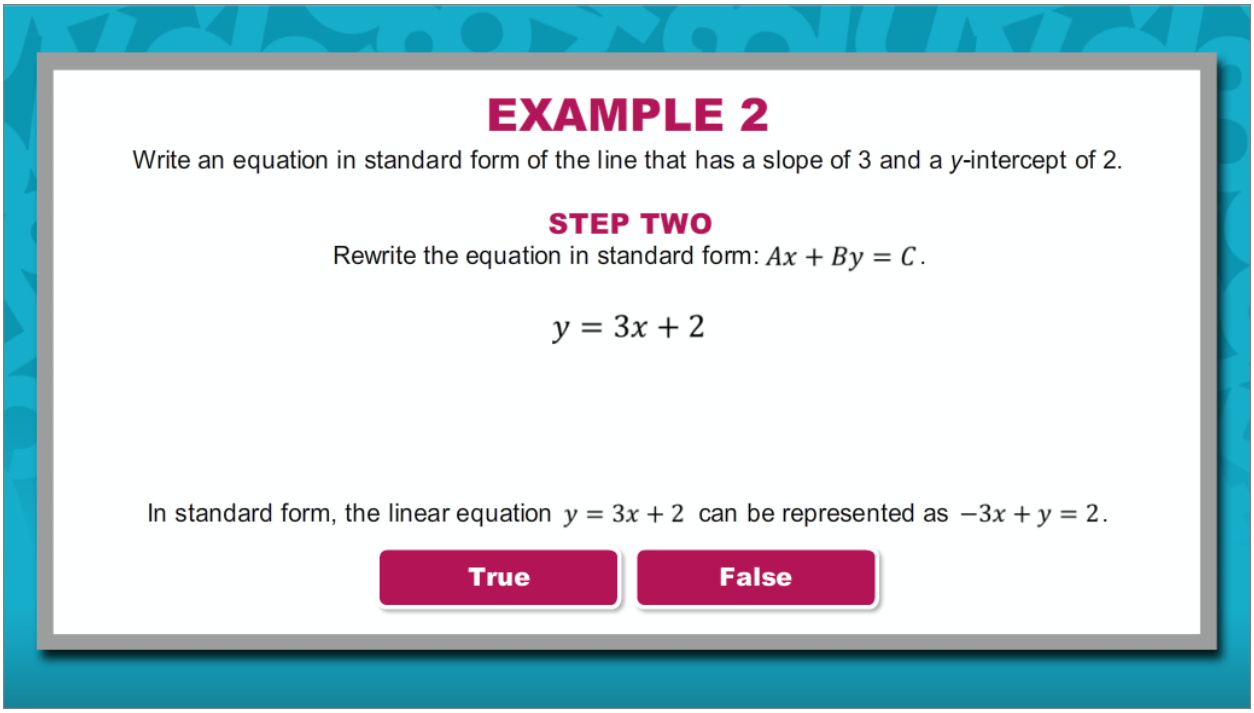
Step 1: Use the given information to write a linear equation in slope-intercept form, $y = mx + b$, or point-slope form, $y - y_1 = m(x - x_1)$.

$$y = mx + b$$

m represents the slope and b represents the y-intercept

The equation $y = 3x + 2$ represents a line with a slope of 3 and a y-intercept of 2.

Example 2 (continued)



Write an equation in standard form of the line that has a slope of 3 and a y-intercept of 2.

Step 2: Rewrite the equation in standard form: $Ax + By = C$.

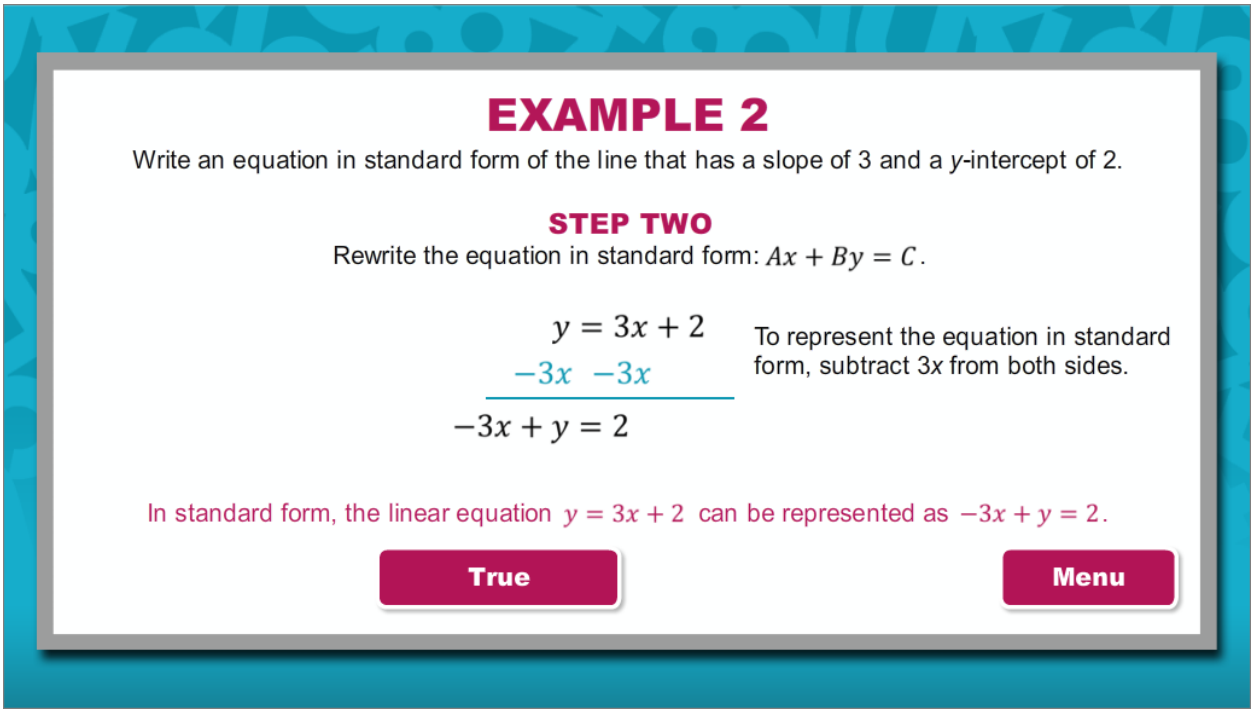
$$y = 3x + 2$$

Now that you have written an equation in slope-intercept form, use inverse operations to rewrite the equation in standard form.

In standard form, the linear equation $y = 3x + 2$ can be represented as $-3x + y = 2$.

A) True
B) False

Example 2 (continued)



Write an equation in standard form of the line that has a slope of 3 and a y-intercept of 2.

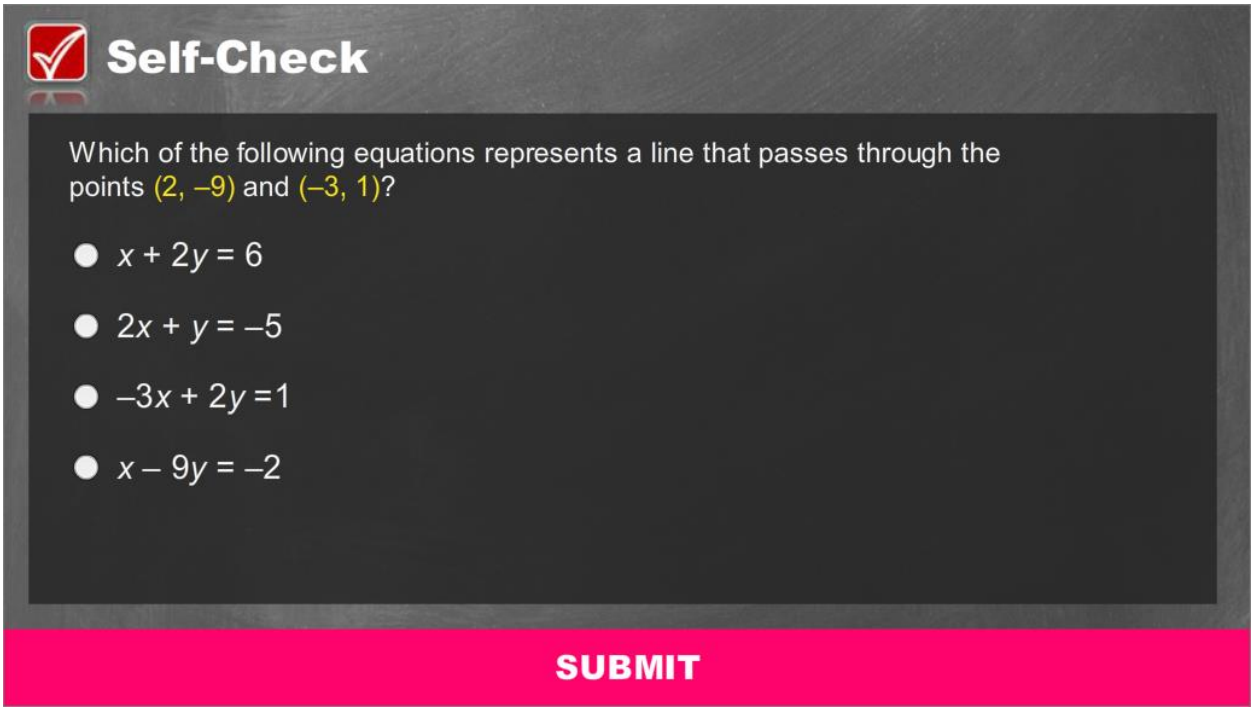
Step 2: Rewrite the equation in standard form: $Ax + By = C$.

To represent the equation in standard form subtract $3x$ from both sides.

$$\begin{array}{r} y = 3x + 2 \\ -3x \quad -3x \\ \hline -3x + y = 2 \end{array}$$

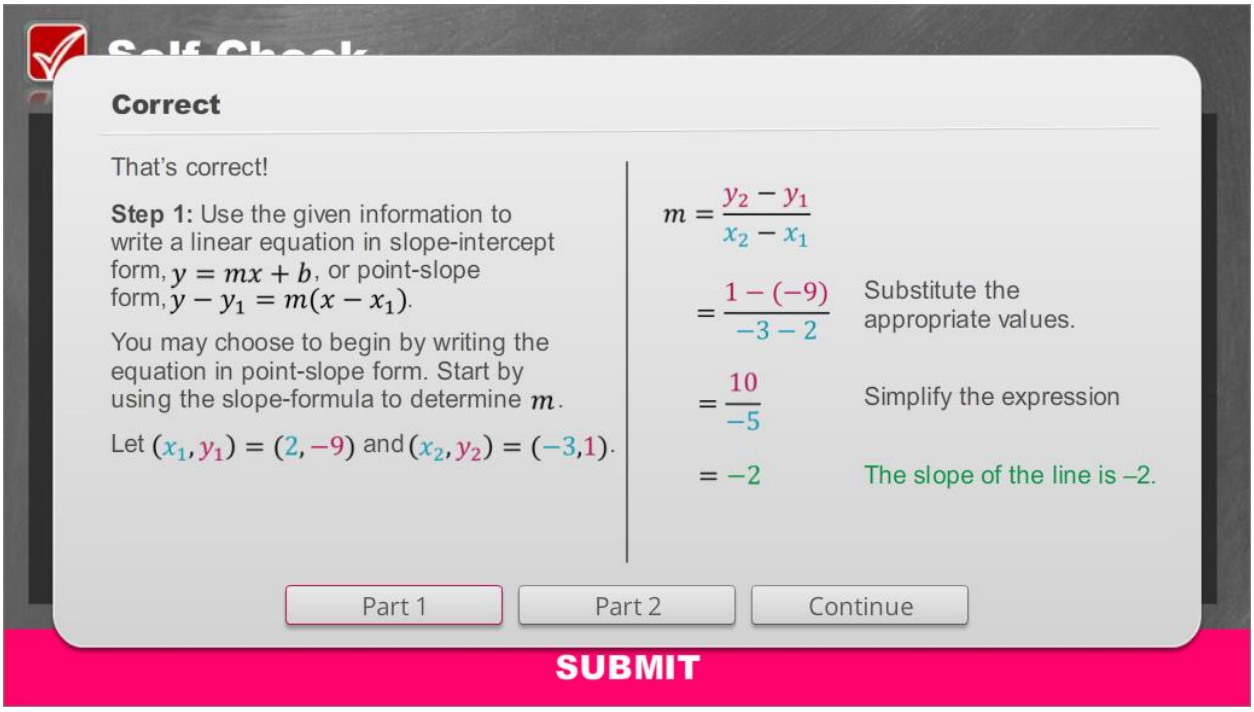
In standard form, the linear equation $y = 3x + 2$ can be represented as $-3x + y = 2$.

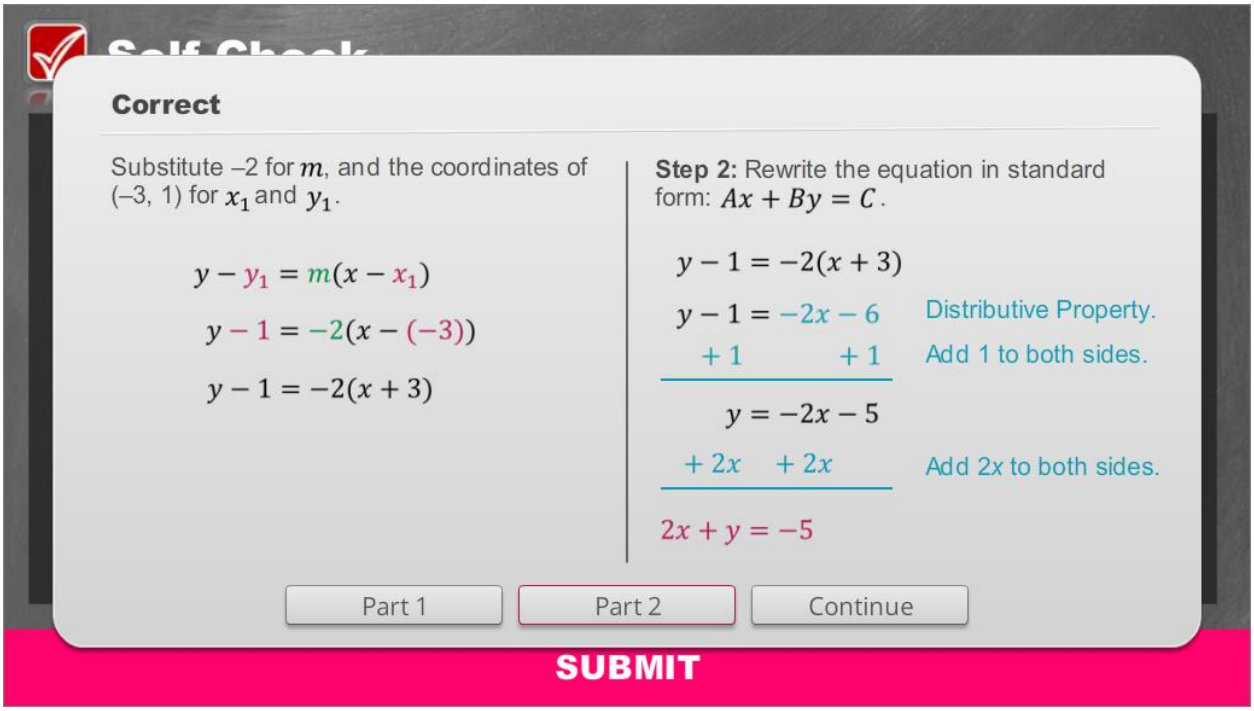
Self-Check



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

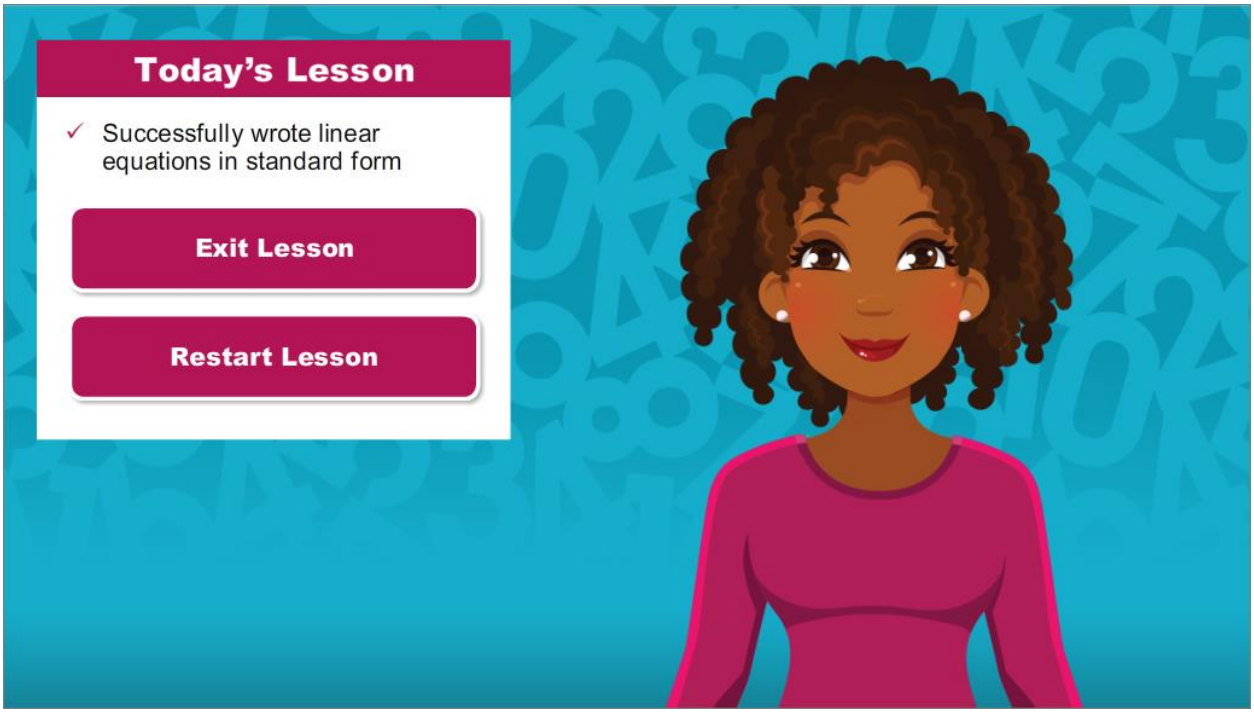
Self-Check : Answer





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 will learned how to write a linear equation in standard form.