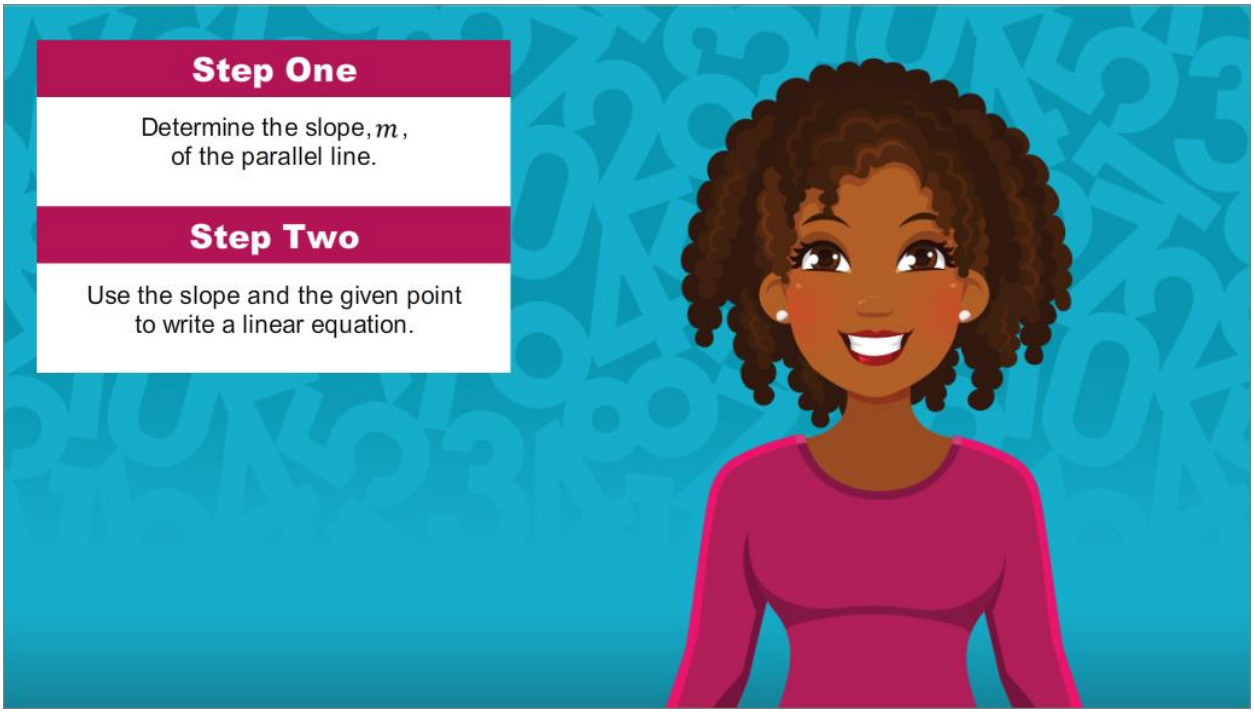
Module 9: Writing Linear Equations
Topic 3 Content: Writing the Equation of a Line Parallel to a Given Line

Introduction

Hi there! I'm so glad you could join me for this lesson in Algebra I. In this lesson, you will learn how to write the equation of a line that is parallel to a given line and passes through a given point.

Module 9: Writing Linear Equations
Topic 3 Content: Writing the Equation of a Line Parallel to a Given Line

Anticipatory Set



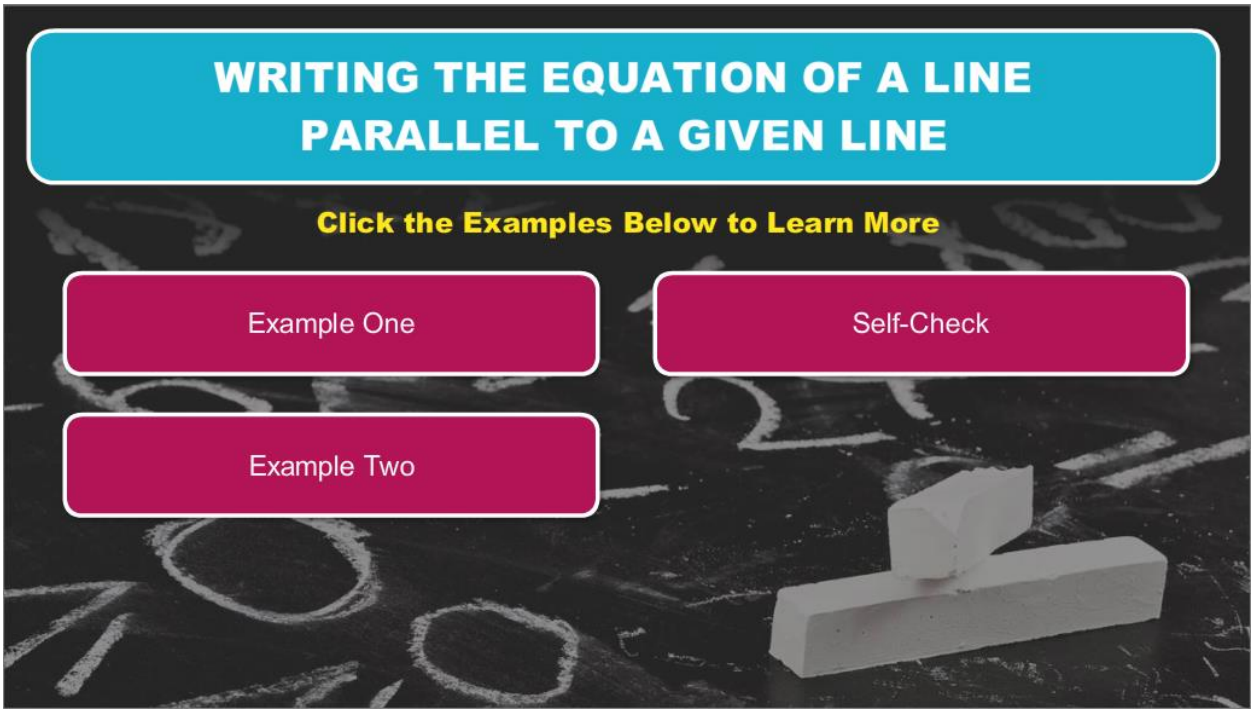
Use the following steps to guide you in the process of writing the equation of a line that is parallel to a given line and passes through a given point.

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

Step 2: Use the slope and the given point to write a linear equation.

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

Writing the Equation of a Line Parallel to a Given Line



Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

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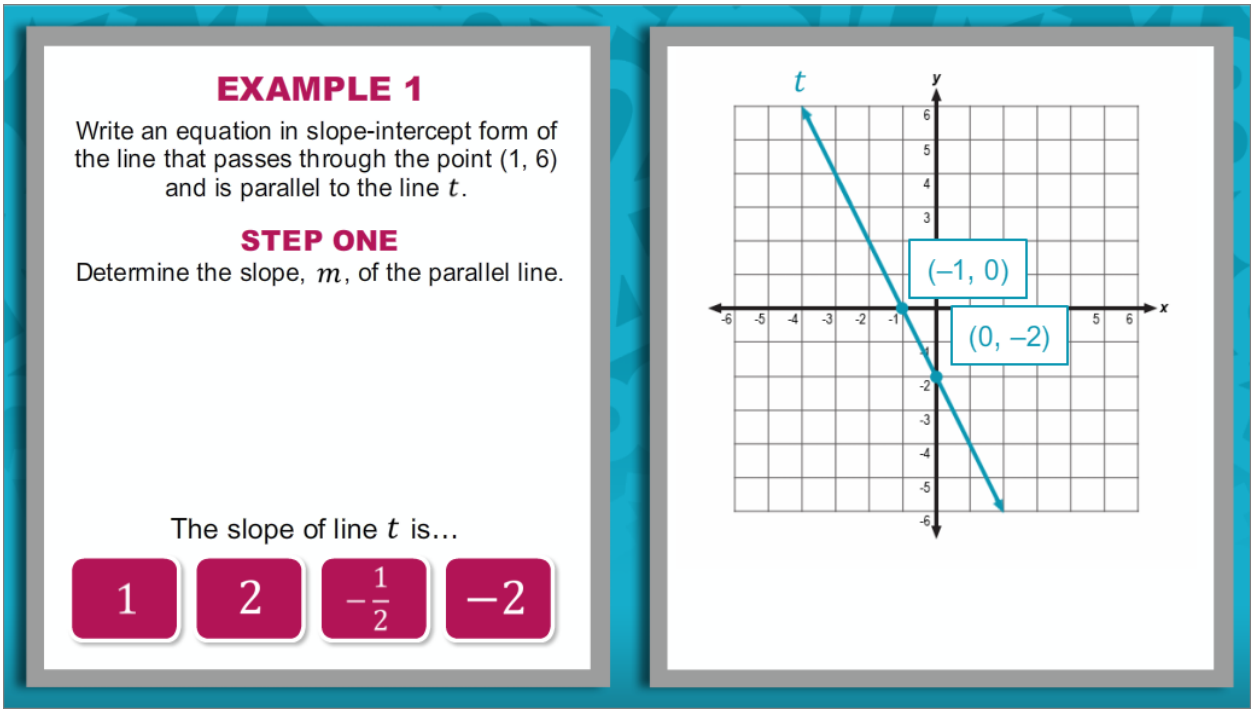
Example 1



Write an equation in slope-intercept form of the line that passes through the point $(1, 6)$ and is parallel to line t.

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

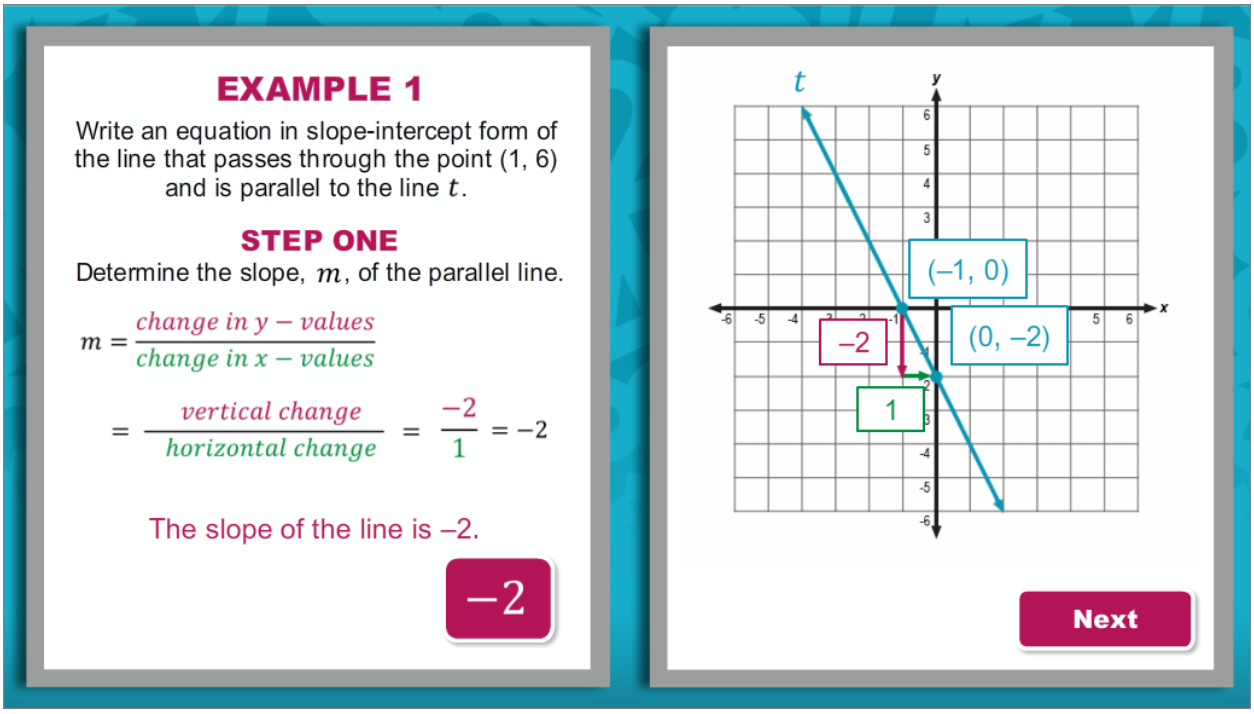
Recall that parallel lines have equal slopes. You will need to determine the slope of line t in order find the slope of a line parallel to line t.

Begin by locating two points on line t with integral coordinates. You can choose the points $(-1, 0)$ and $(0, -2)$.

The slope of line t is ...

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

Example 1 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(1, 6)$ and is parallel to line t.

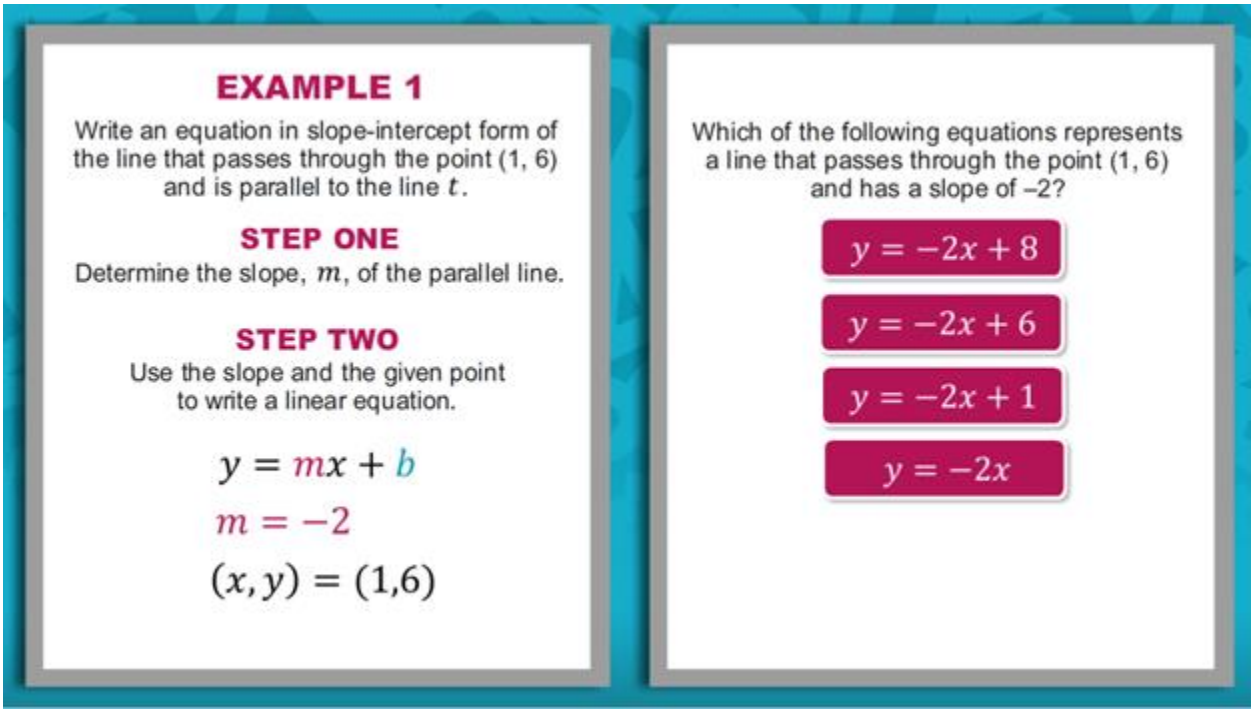
Step 1: Determine the slope, m, of the parallel line.

$$m = \frac{change\ in\ y - values}{change\ in\ x - values}$$

$$= \frac{vertical\ change}{horizontal\ change} = \frac{-2}{1} = -2$$

The slope of the line is -2.

Example 1 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(1, 6)$ and is parallel to line t.

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

Step 2: Use the slope and the given point to write a linear equation.

$$y = mx + b$$
$$m = -2$$
$$(x, y) = (1, 6)$$

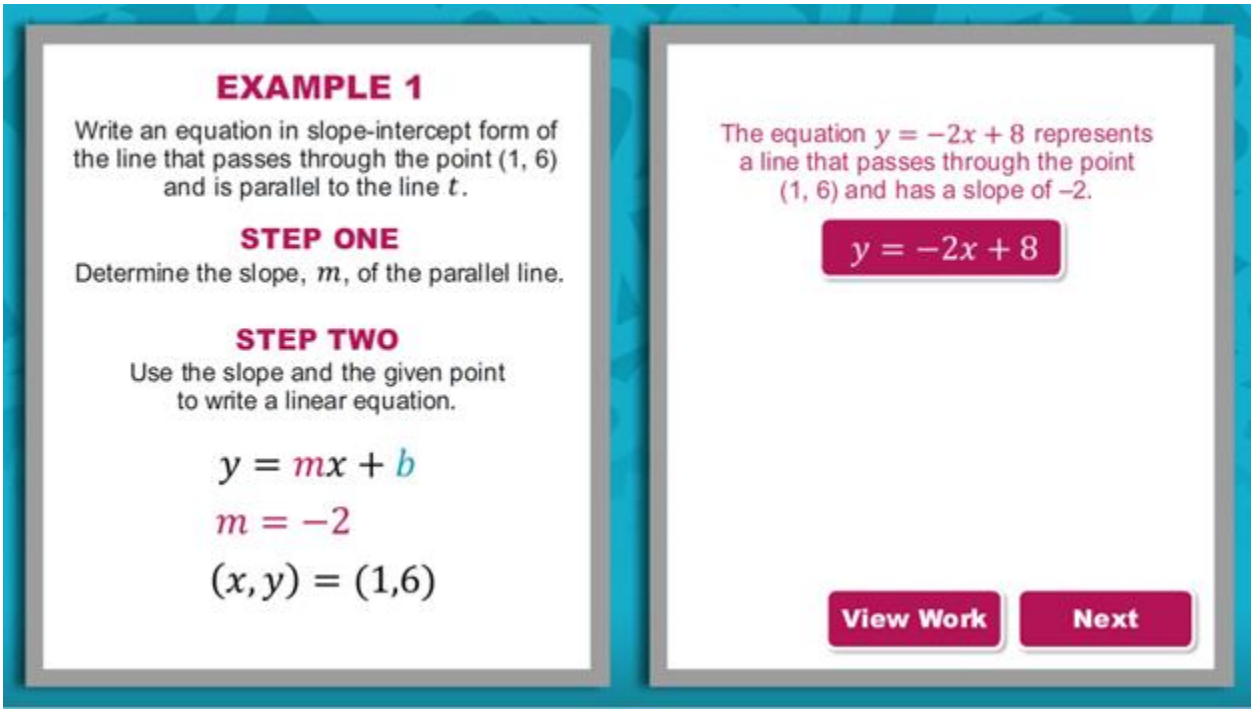
In this example, you are asked to write an equation in the form $y = mx + b$. Now that Step 1 is complete, you know that the slope, m, is -2.

To find b, substitute -2, for m and the coordinates of the given point $(1, 6)$ for x and y. Then, solve for b.

Which of the following equations represents a line that passes through the point $(1,6)$ and has a slope of -2?

A) $y = -2x + 8$
B) $y = -2x + 6$
C) $y = -2x + 1$
D) $y = -2x$

Example 1 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(1, 6)$ and is parallel to line t.

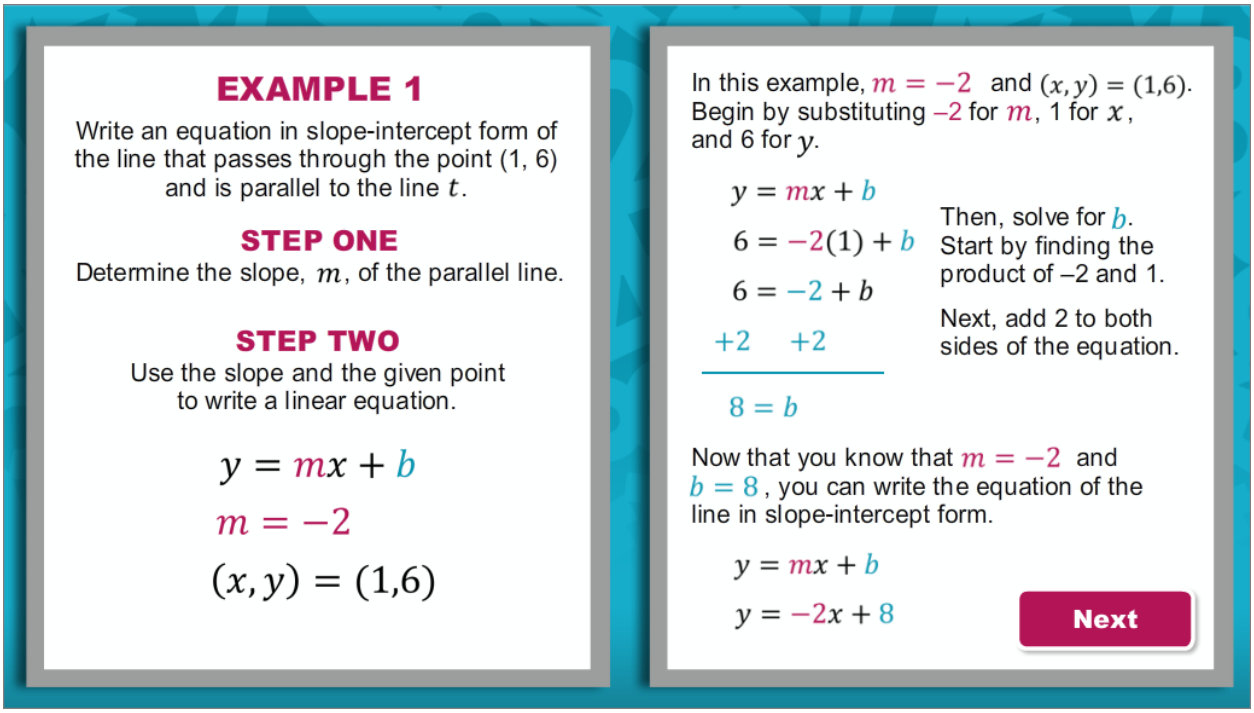
Step 1: Determine the slope, m, of the parallel line.

Step 2: Use the slope and the given point to write a linear equation.

$$y = mx + b$$
$$m = -2$$
$$(x, y) = (1, 6)$$

The equation $y = -2x + 8$ represents a line that passes through the point $(1, 6)$ and has a slope of -2.

Example 1 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(1, 6)$ and is parallel to line t.

In this example, $m = -2$ and $(x, y) = (1, 6)$. So, begin by substituting -2 for m, 1 for x, and 6 for y.

$y = mx + b$

$6 = -2(1) + b$ Then, solve for b. Start by finding the product of -2 and 1.

$6 = -2 + b$

$6 = -2 + b$

$+2 \quad +2$ Next, add 2 to both sides of the equation.

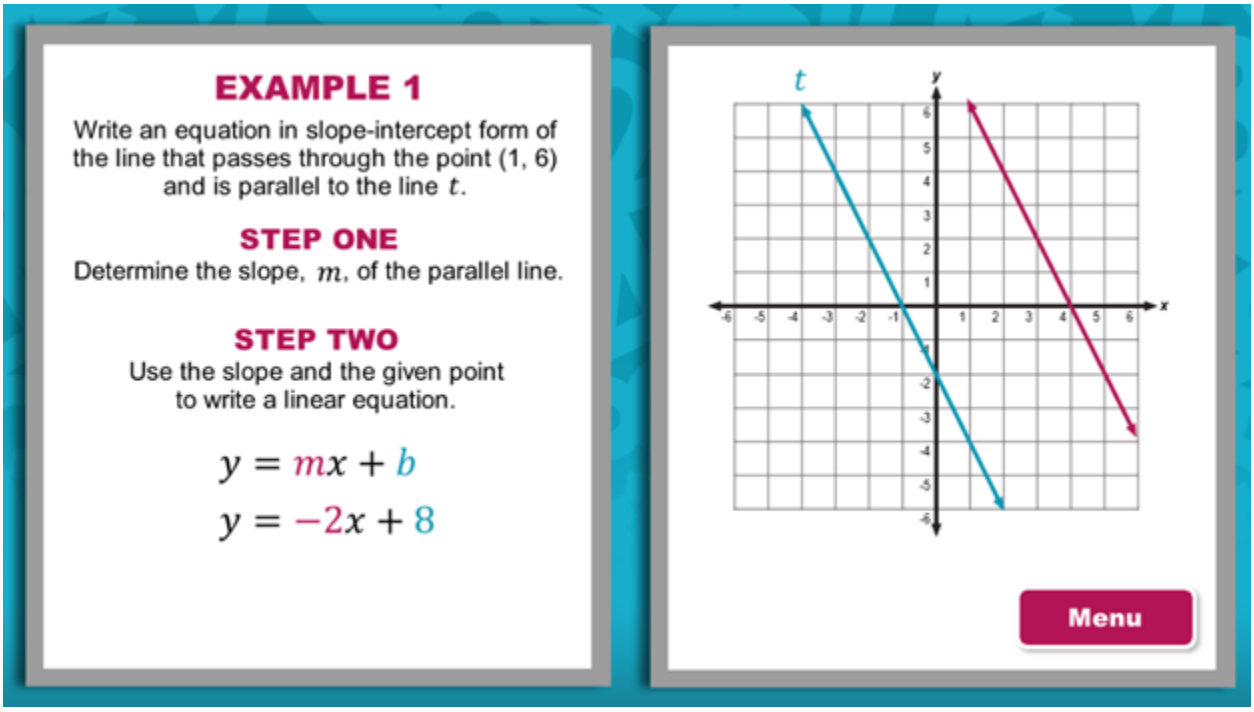
$8 = b$

Now that you know that $m = -2$ and $b = 8$, you can write the equation of the line in slope-intercept form.

$y = mx + b$

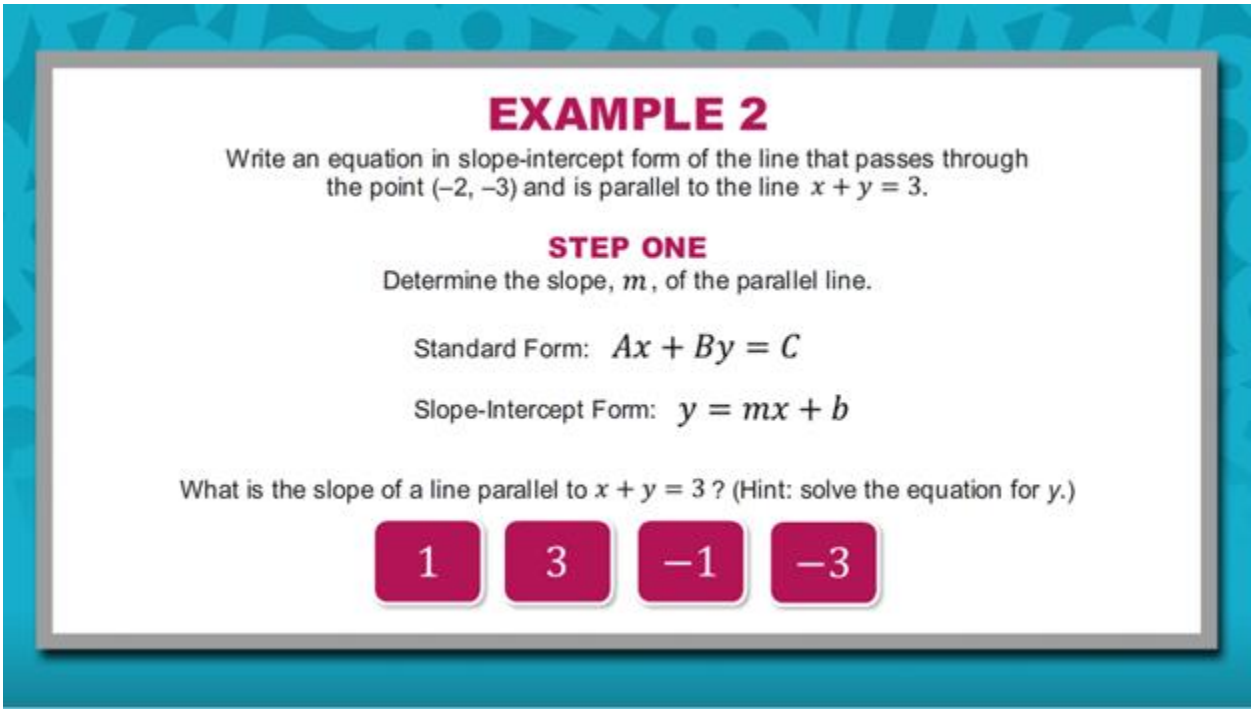
$y = -2x + 8$

Example 1 (continued)



Your work is complete. You have written the equation of a line parallel to line t that passes through the point $(1, 6)$.

Example 2



Write an equation in slope-intercept form of the line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

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

Recall that when given a linear equation in standard form, you can determine the slope of the line by representing the equation in slope-intercept form. Keep in mind that parallel lines have equal slopes.

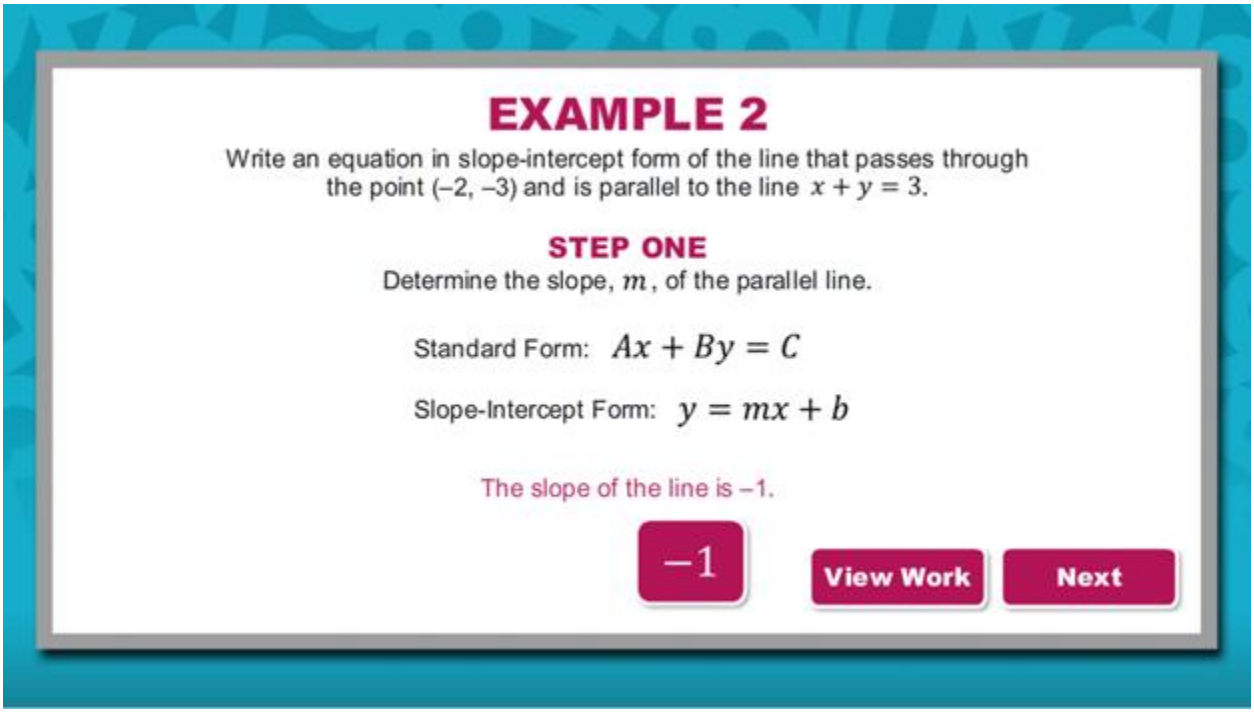
Standard Form: $Ax + By = C$

Slope-Intercept Form: $y = mx + b$

What is the slope of a line parallel to $x + y = 3$? (Hint: Solve the equation for y.)

A) 1
B) 3
C) -1
D) -3

Example 2 (continued)

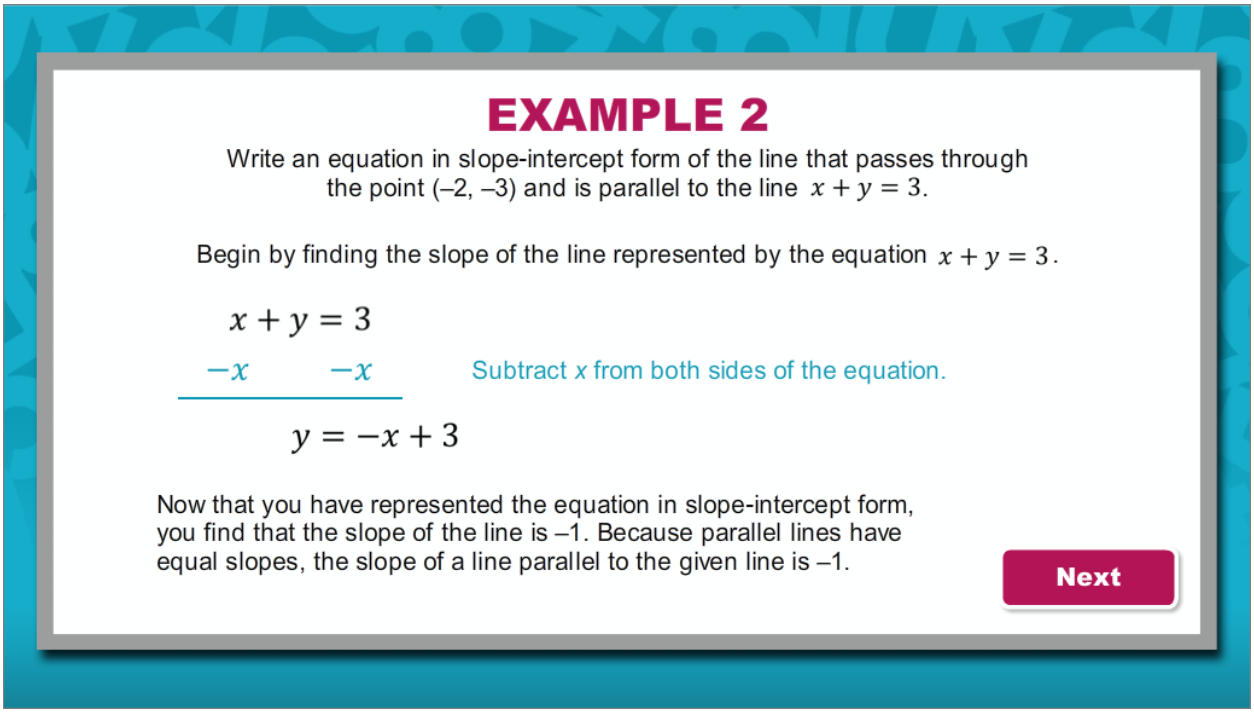


Write an equation in slope-intercept form of the line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

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

The slope of the line is -1.

Example 2 (continued)



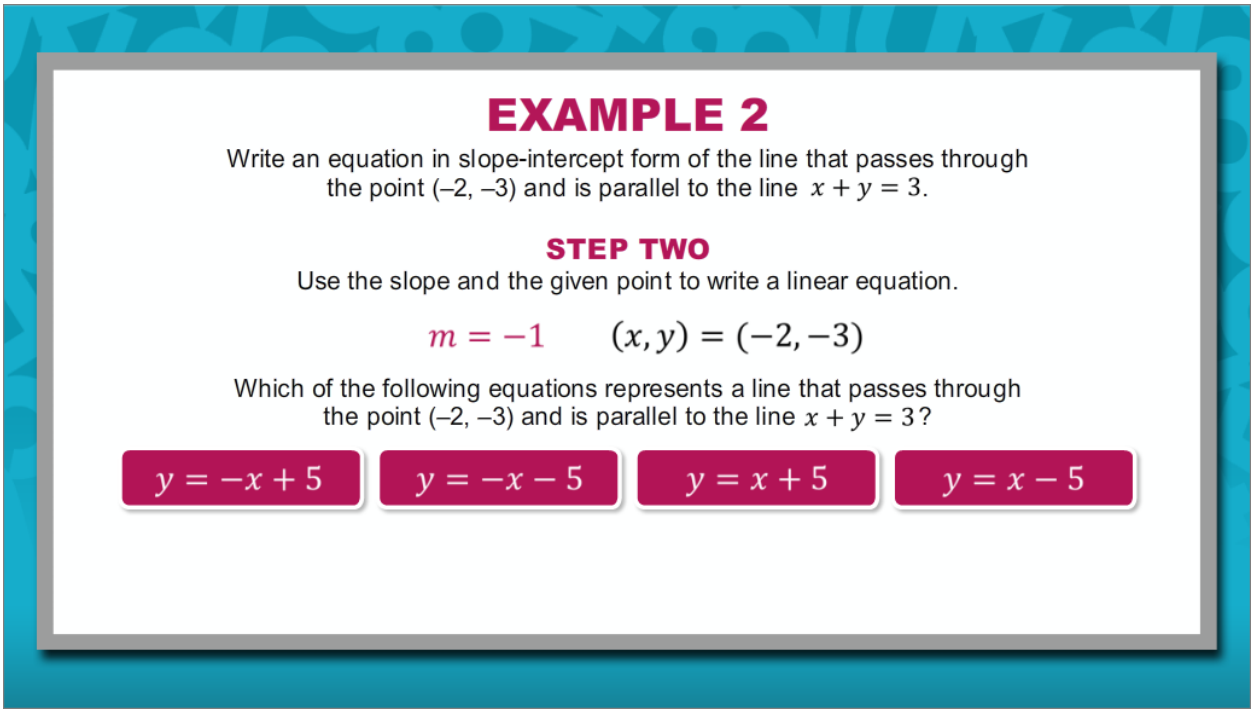
Write an equation in slope-intercept form of the line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

Begin by finding the slope of the line represented by the equation $x + y = 3$.

$$\begin{array}{rl} x + y = 3 & \\ -x \quad -x & \text{Subtract } x \text{ from both sides of the equation.} \\ \hline y = -x + 3 & \end{array}$$

Now that you have represented the equation in slope-intercept form, you find that the slope of the line is -1. Because parallel lines have equal slopes, the slope of a line parallel to the given line is -1.

Example 2 (continued)



Write an equation in slope-intercept form of the line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

Step 2: Use the slope and the given point to write a linear equation.

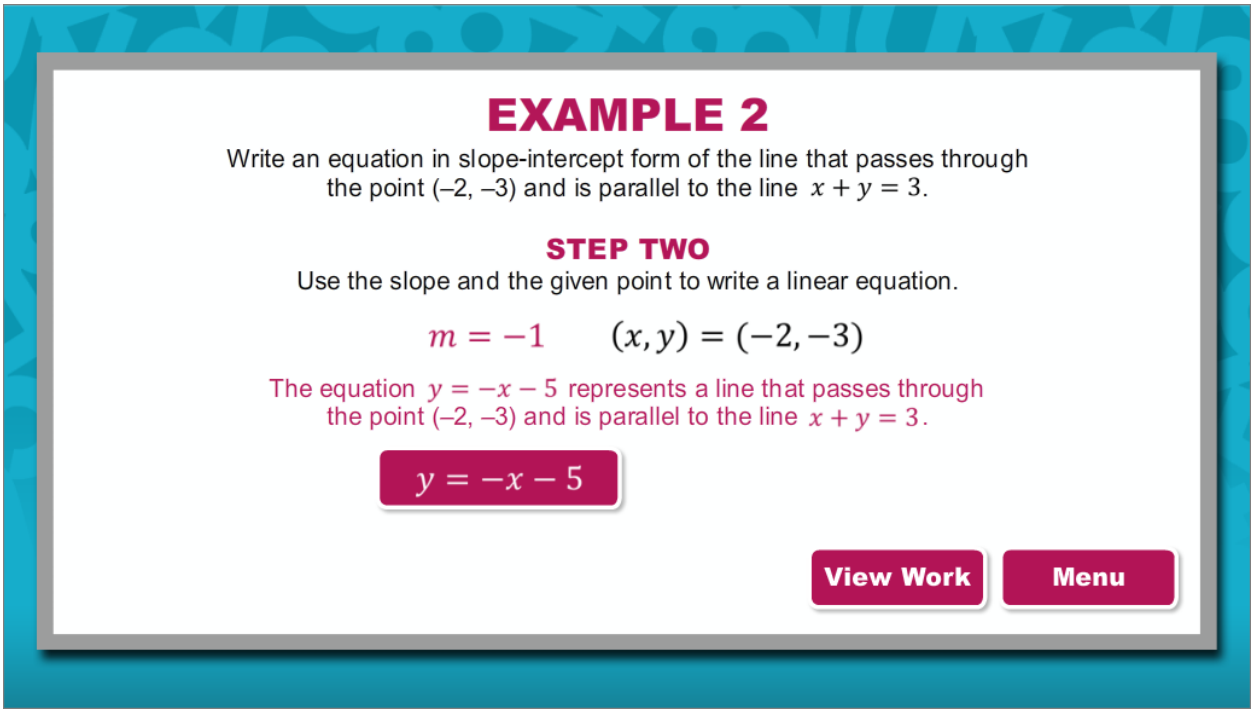
$$m = -1 \qquad (x, y) = (-2, -3)$$

You know that the parallel line has a slope of -1 and passes through the point $(-2, -3)$.

Which of the following equations represents a line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$?

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

Example 2 (continued)



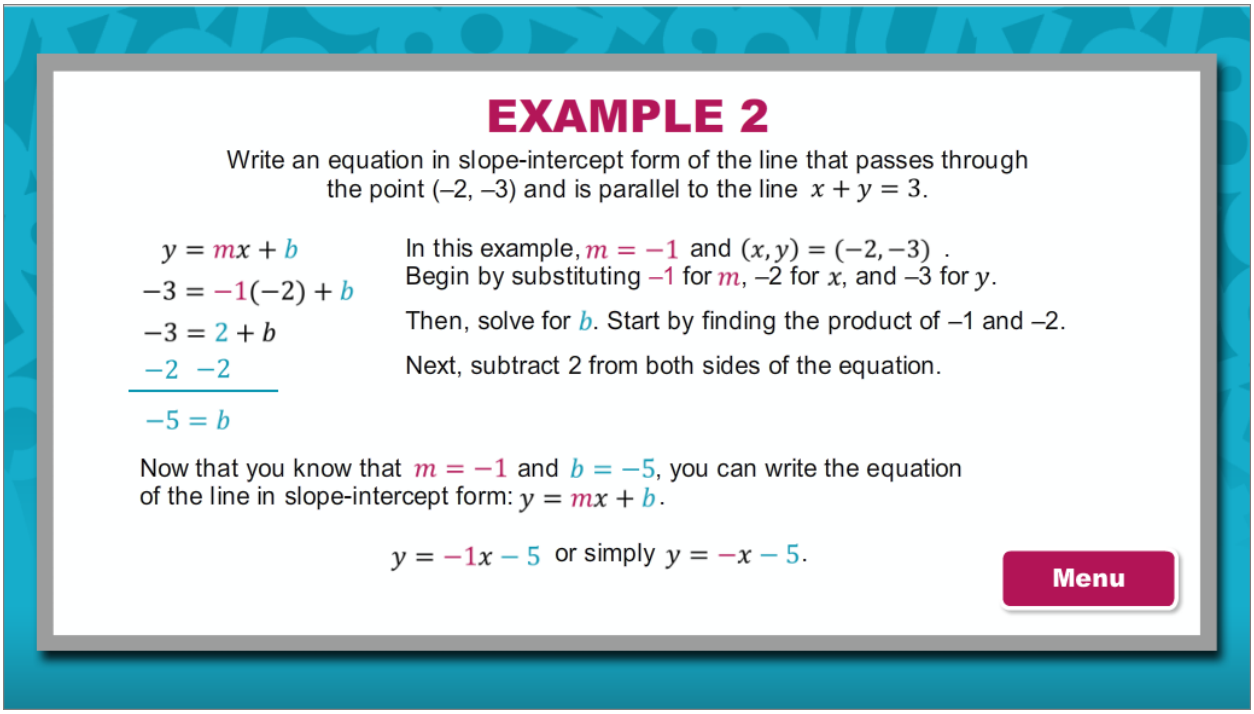
Write an equation in slope-intercept form of the line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

Step 2: Use the slope and the given point to write a linear equation.

$$m = -1 \qquad (x, y) = (-2, -3)$$

The equation $y = -x - 5$ represents a line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

Example 2 (continued)



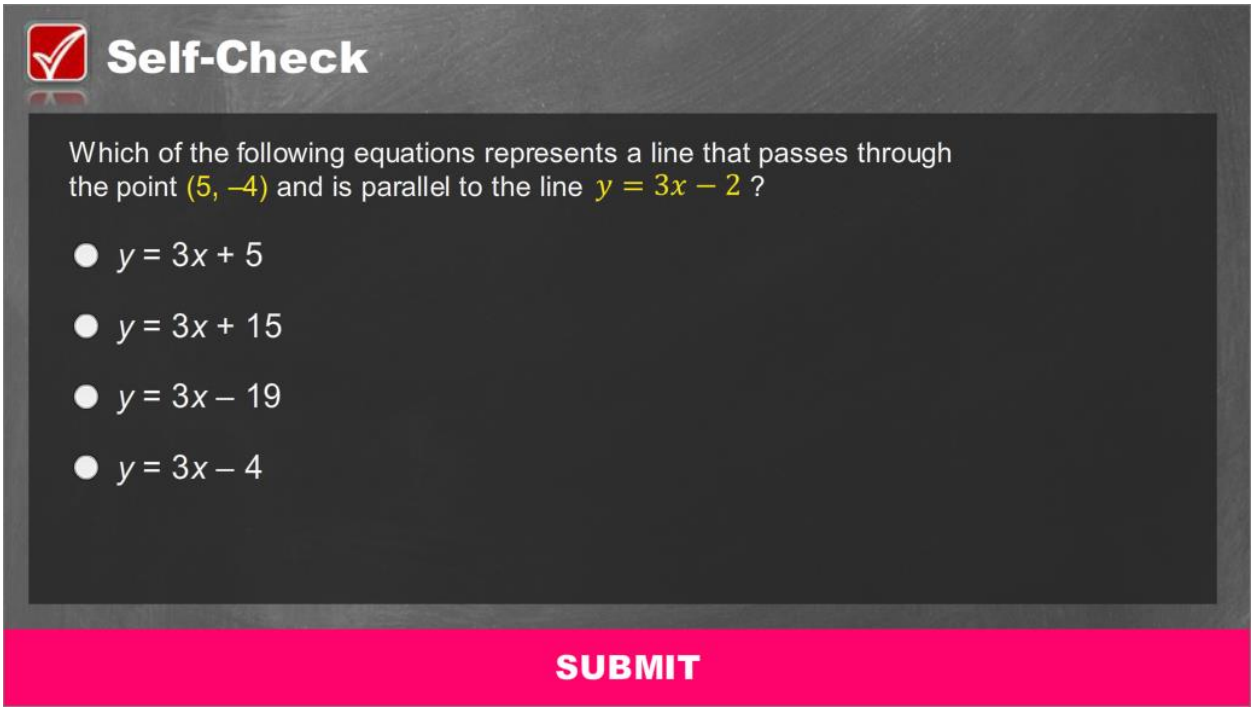
Write an equation in slope-intercept form of the line that passes through the point $(-2, -3)$ and is parallel to the line $x + y = 3$.

$y = mx + b$	In this example, $m = -1$ and $(x, y) = (-2, -3)$.
$-3 = -1(-2) + b$	Begin by substituting -1 for m, -2 for x, and -3 for y.
$-3 = 2 + b$	Then, solve for b. Start by finding the product of -1 and -2.
$-2 \quad -2$	Next, subtract 2 from both sides of the equation.
$-5 = b$	

Now that you know that $m = -1$ and $b = -5$, you can write the equation of the line in slope-intercept form: $y = mx + b$

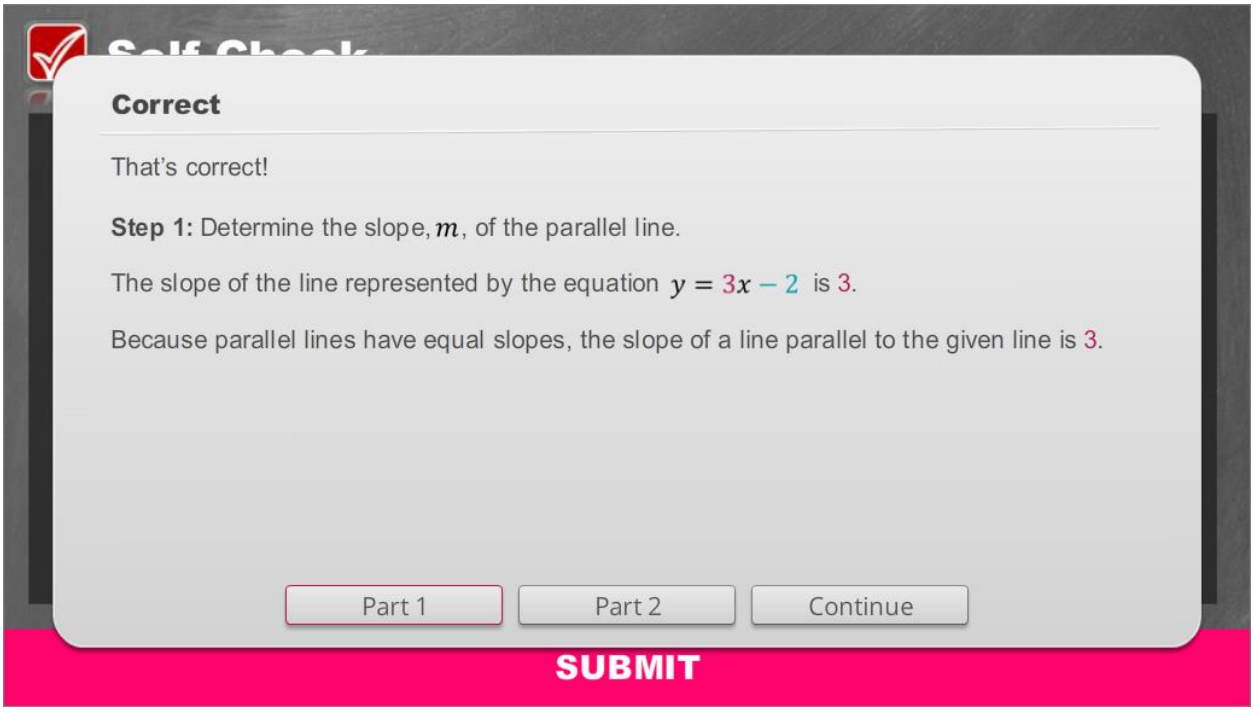
$$y = -1x - 5 \text{ or simply } y = -x - 5$$

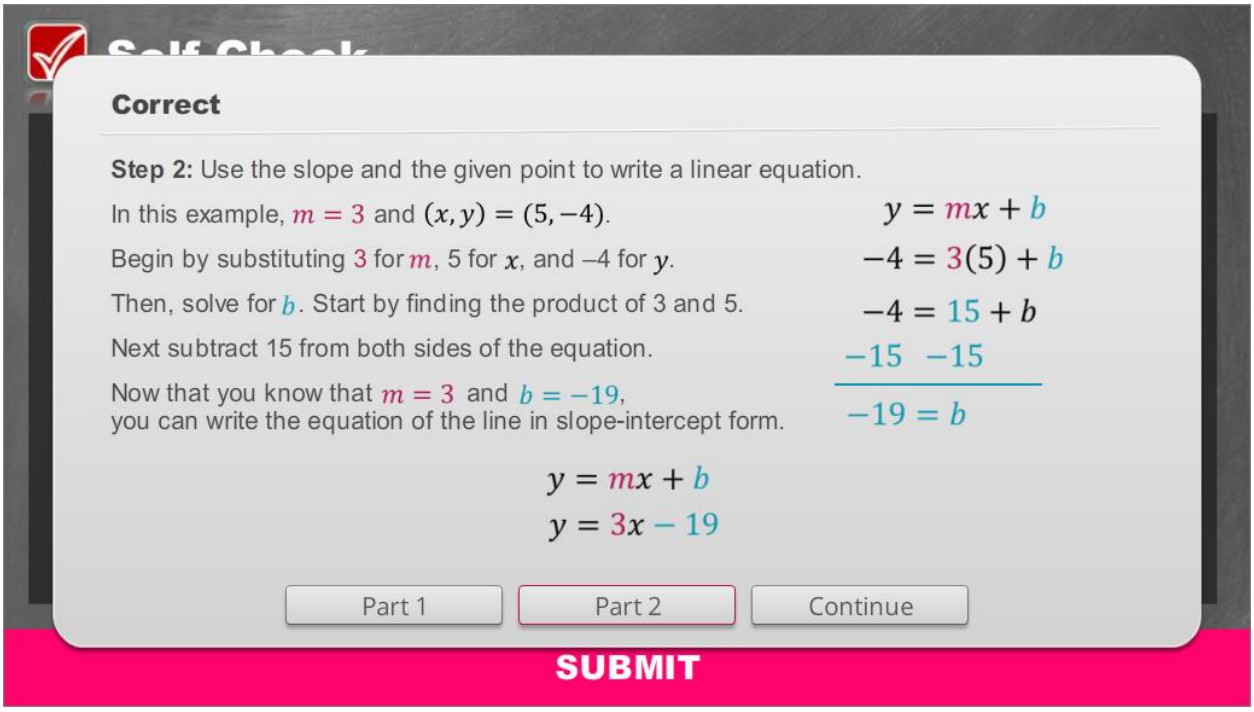
Self-Check



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

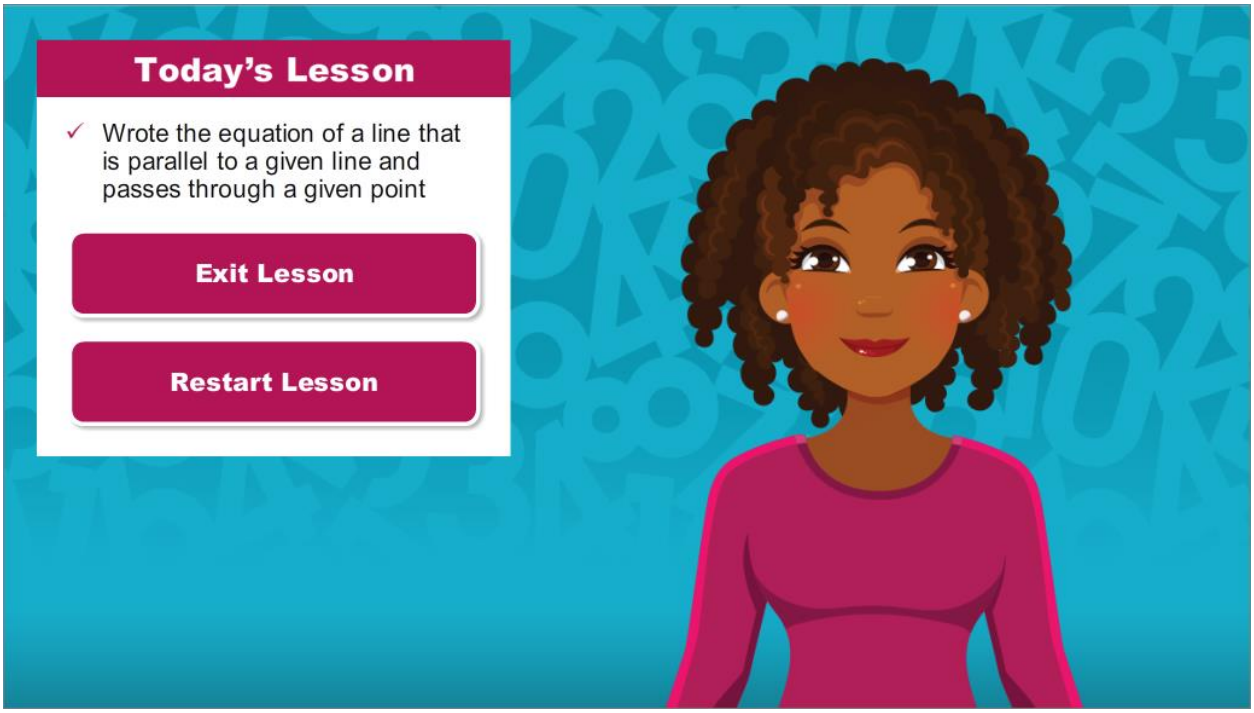
Self-Check: Answer





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 learned how to write the equation of a line that is parallel to a given line and passes through a given point.