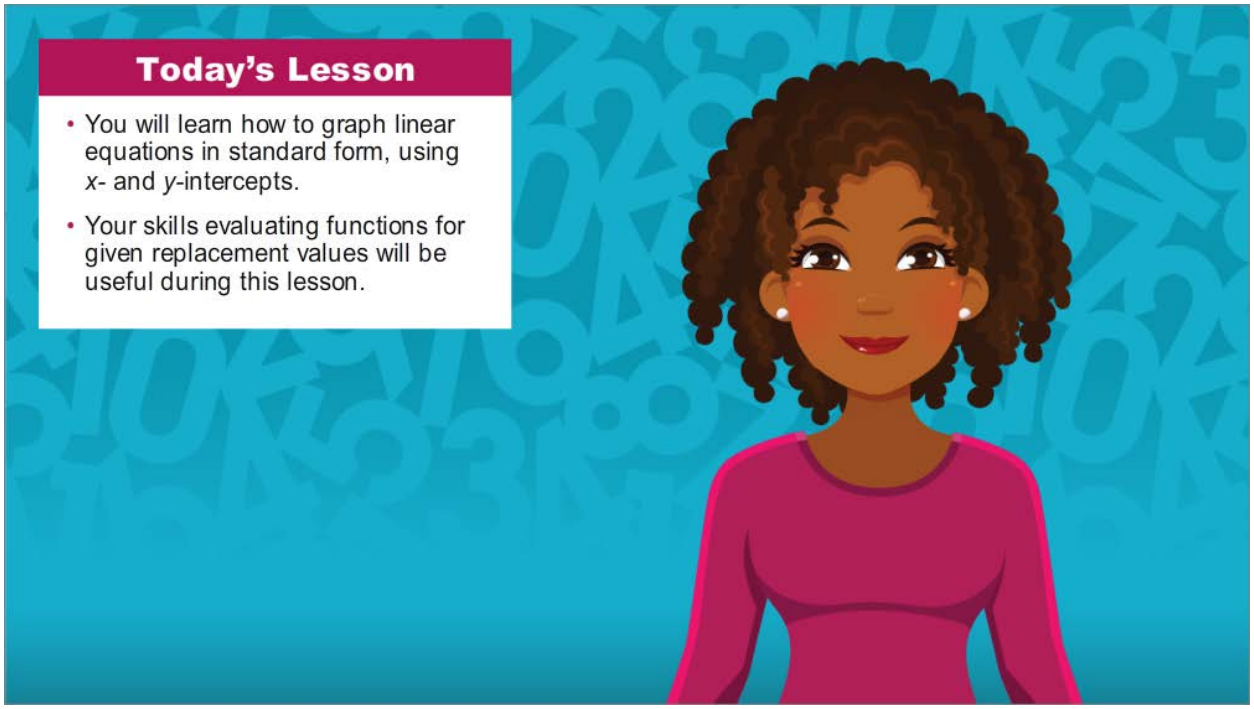
Module 8: Graphing Linear Equations

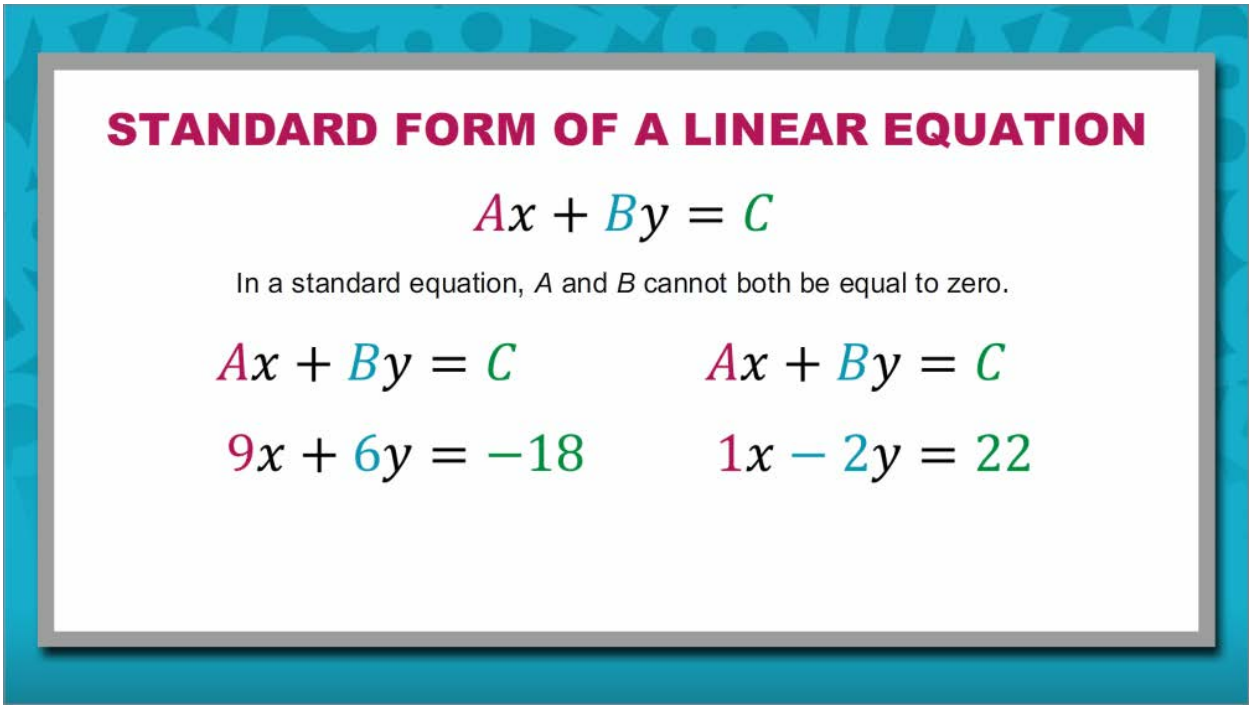
Topic 2 Content: Graphing a Linear Equation Using *x*- and *y*-Intercepts

Introduction



Hello and welcome! I'm so glad you could join me for this lesson in Algebra I, where you will learn how to graph linear equations in standard form, by using *x*- and *y*-intercepts. Your skills evaluating functions for given replacement values will be useful during this lesson.

Standard Form of a Linear Equation



$$Ax + By = C$$

The standard form of a linear equation is $Ax + By = C$, where A, B, and C are integers. In a standard equation A and B cannot both equal zero.

$$Ax + By = C$$

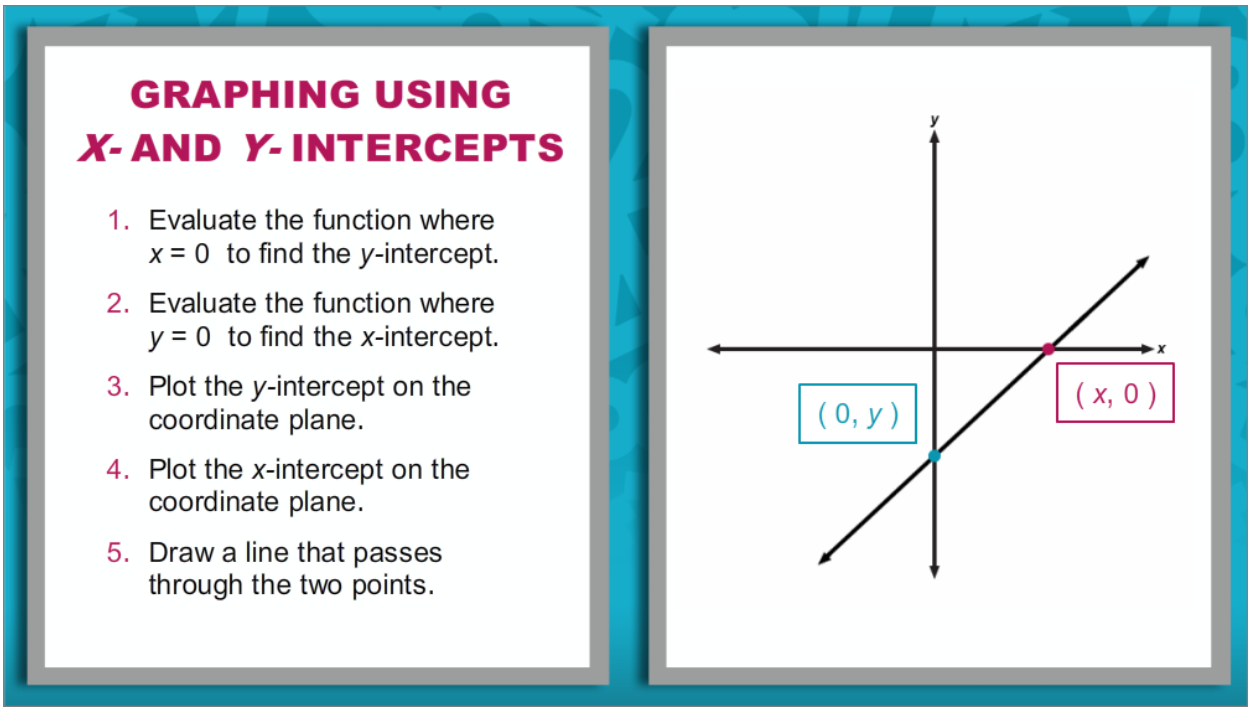
One example of a linear equation in standard form is $9x + 6y = -18$. In this case, $A = 9$, $B = 6$, and $C = -18$.

$$9x + 6y = -18$$

Another example is $x - 2y = 22$. Here, $A = 1, B = -2,$ and $C = 22$.

$$1x - 2y = 22$$

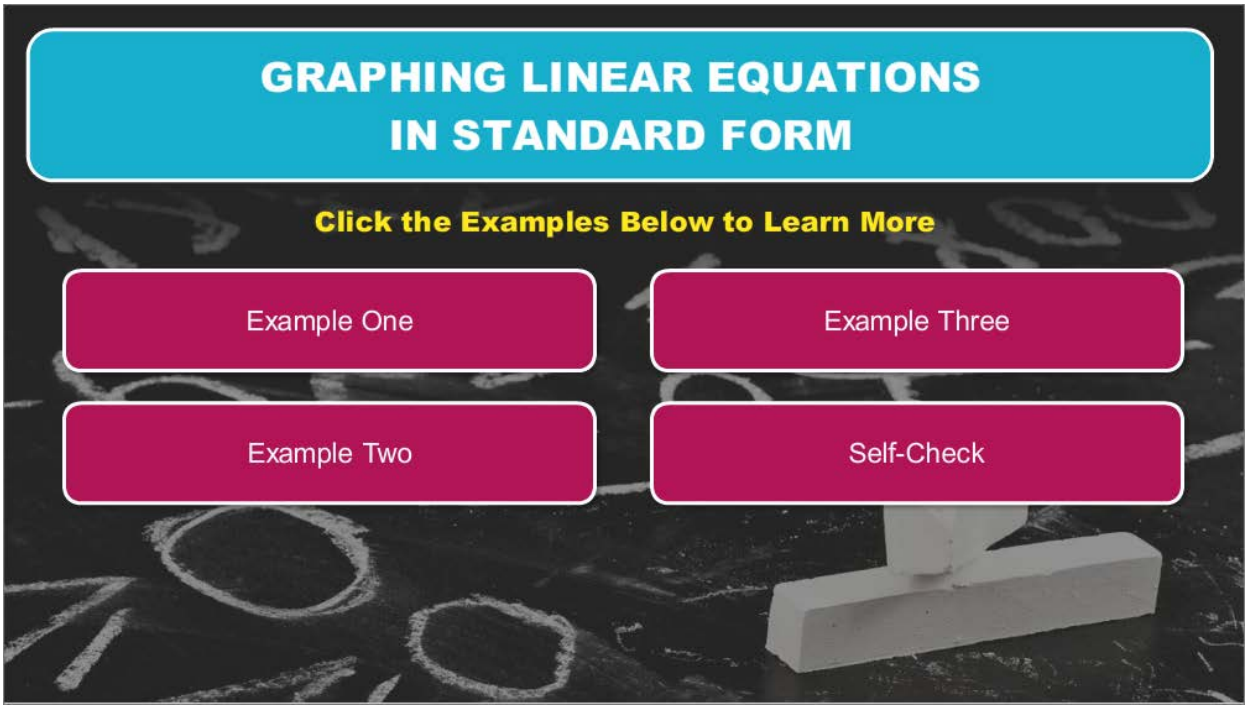
Graphing Using *X*- and *Y*- Intercepts



To graph a linear equation using *x*- and *y*-intercepts you will need to:

1. Evaluate the function where $x = 0$ to find the *y*-intercept.
2. Evaluate the function where $y = 0$ to find the *x*-intercept.
3. Plot the *y*-intercept on the coordinate plane.
4. Plot the *x*-intercept on the coordinate plane.
5. Draw a line that passes through the two points.

Graphing Linear Equations in Standard Form



Click the examples below to learn more.

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

Module 8: Graphing Linear Equations

Topic 2 Content: Graphing a Linear Equation Using *x*- and *y*-Intercepts

Example 1

Graph the linear equation below using x- and y-intercepts.

$$4x + 6y = 12$$

Evaluate the function where $x = 0$ to find the y-intercept.

$$4x + 6y = 12$$
$$4(0) + 6y = 12$$
$$0 + 6y = 12$$
$$6y = 12$$
$$\frac{6y}{6} = \frac{12}{6}$$
$$y = 2$$
$$(0, 2)$$

The first step to graphing the linear equation is to determine the y-intercept by evaluating the function where $x = 0$.

Substitute 0 for x. The left side of the equation will then simplify to, $0 + 6y$, which further simplifies to $6y$. You are then left with the equation, $6y = 12$.

Solve the equation for y by dividing each side by 6. The result is $y = 2$.

You have determined that when $x = 0$, $y = 2$. This means that the coordinates of the y-intercept of the linear equation are $(0, 2)$.

Evaluate the function where $y = 0$ to find the y-intercept.

$$4x + 6y = 12$$
$$4x + 6(0) = 12$$
$$4x + 0 = 12$$
$$4x = 12$$
$$\frac{4x}{4} = \frac{12}{4}$$
$$x = 3$$
$$(3, 0)$$

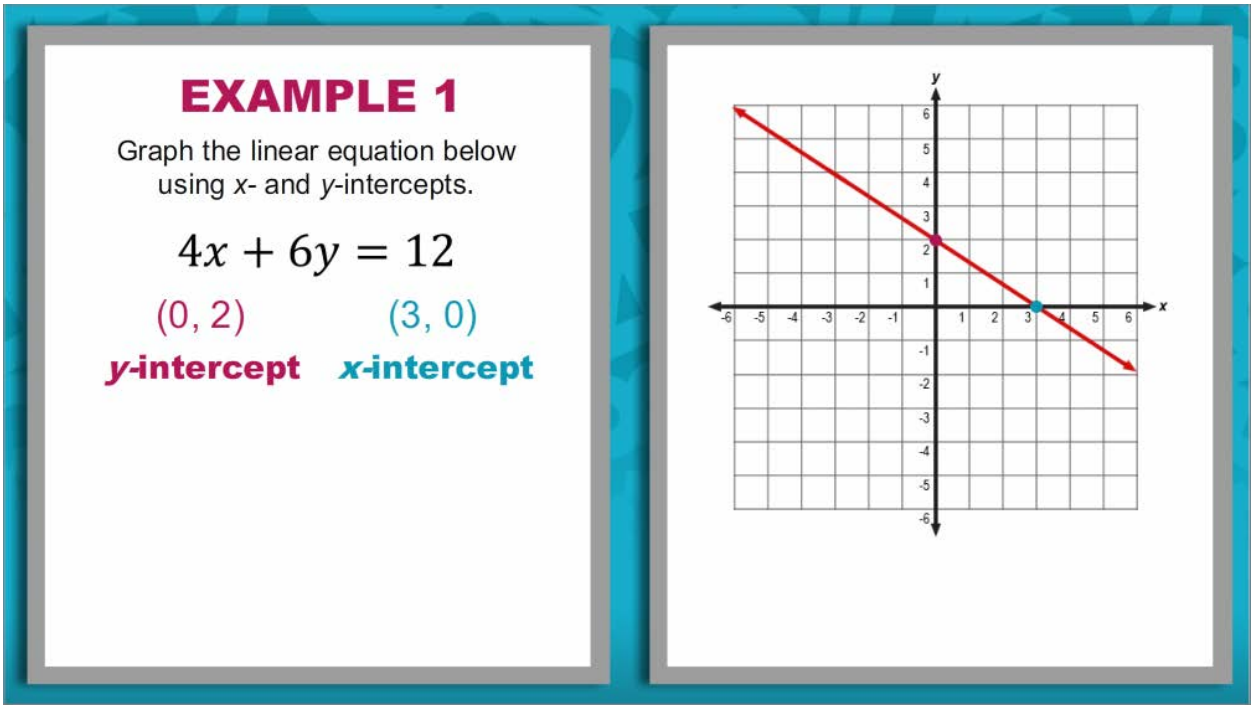
The next step is to determine the x-intercept by evaluating the function where $y = 0$.

Substitute 0 for y. The left side of the equation will then simplify to, $4x + 0$, which further simplifies to $4x$. You are then left with the equation, $4x = 12$.

Solve the equation for x by dividing each side by 4. The result is $x = 3$.

You have now found that $x = 3$ when $y = 0$. This means that the coordinates of the x-intercept of the linear equation are $(3, 0)$.

Example 1 (continued)



Now you are ready to graph.

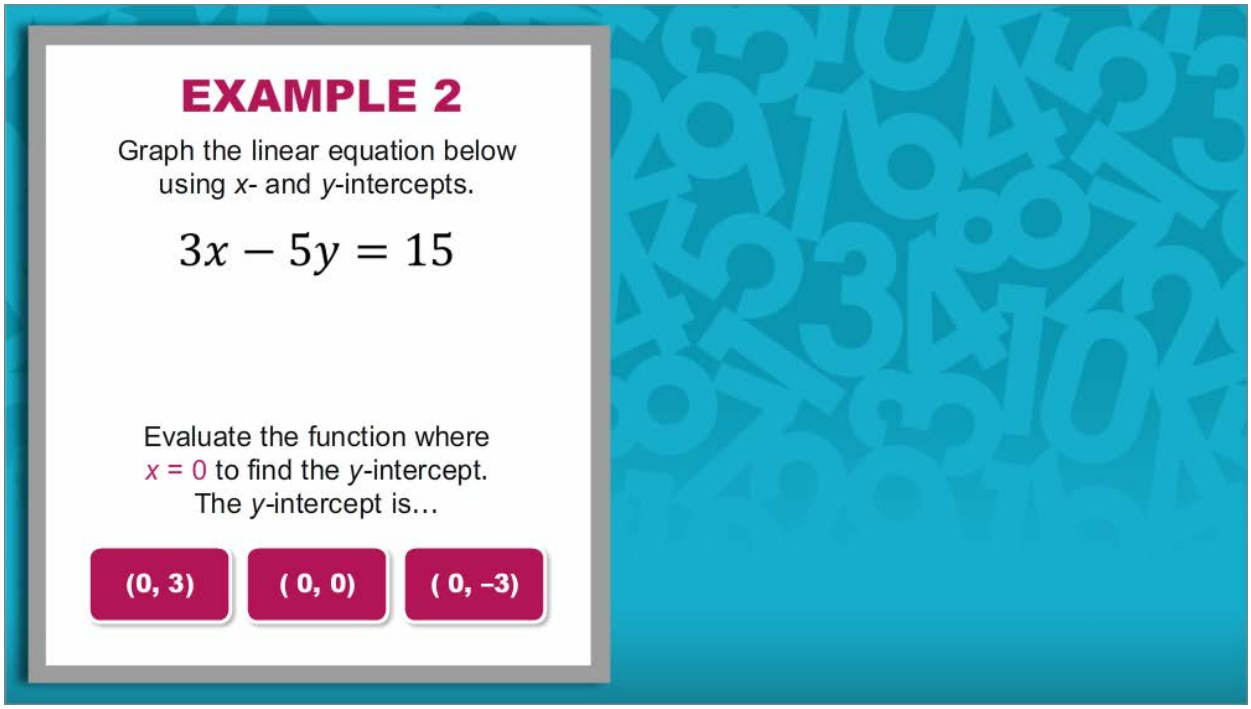
Plot the *y*-intercept $(0, 2)$.

Next, plot the *x*-intercept $(3, 0)$.

Now, graph the line that passes through the two points.

Your work is complete. You have graphed the linear equation $4x + 6y = 12$ using *x*- and *y*-intercepts.

Example 2



Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

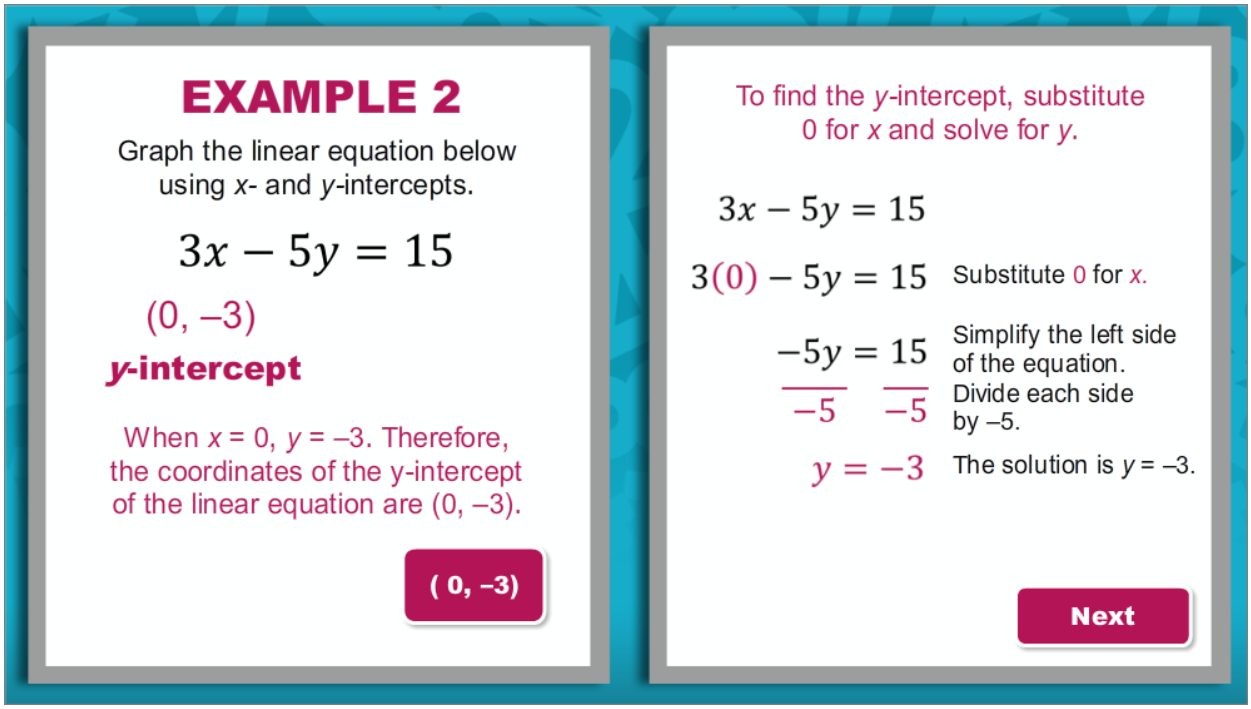
The first step to graphing the linear equation is to determine the y-intercept.

Evaluate the function where $x = 0$ to find the y-intercept.

The y-intercept is…

A) $(0, 3)$
B) $(0, 0)$
C) $(0, -3)$

Example 2 (continued)



Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

When $x = 0, y = -3$. Therefore, the coordinates of the y-intercept of the linear equation are $(0, -3)$.

To find the y-intercept, substitute 0 for x and solve for y.

$3x - 5y = 15$

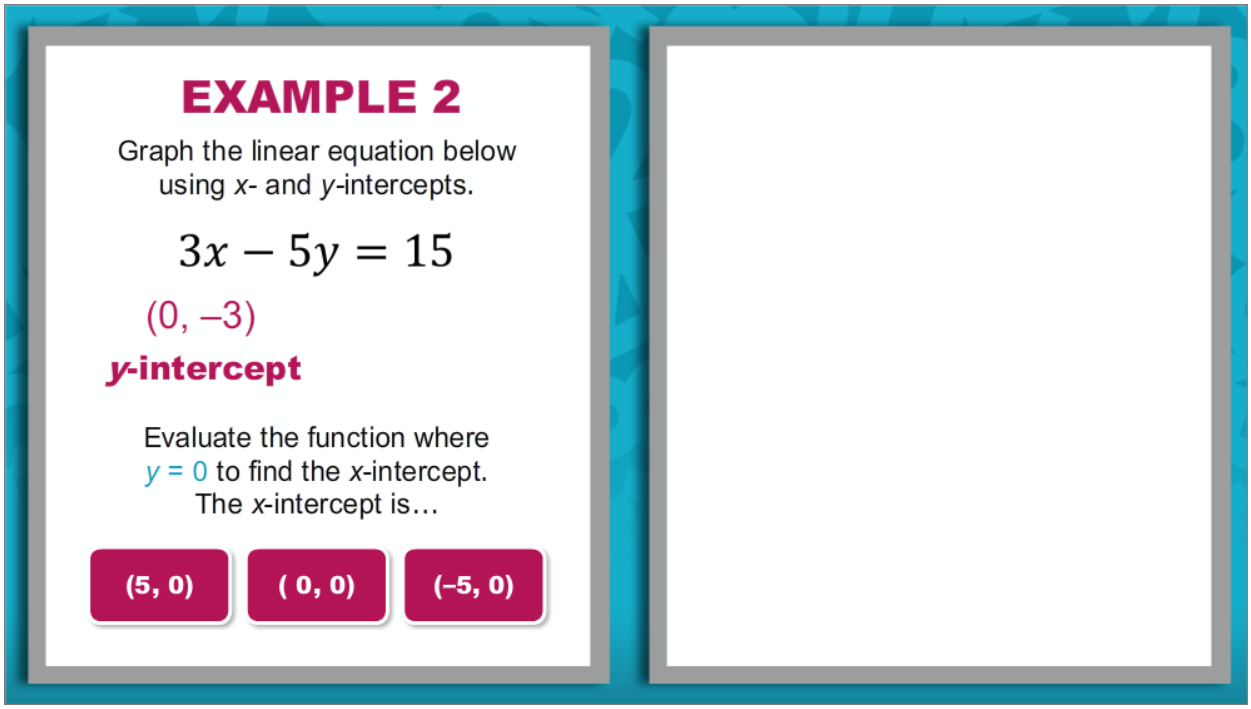
$3(0) - 5y = 15$ Substitute 0 for x.

$-5y = 15$ Simplify the left side of the equation.

$\frac{-5y}{-5} = \frac{15}{-5}$ Divide each side by -5.

$y = -3$ The solution is $y = -3$.

Example 2 (continued)



Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

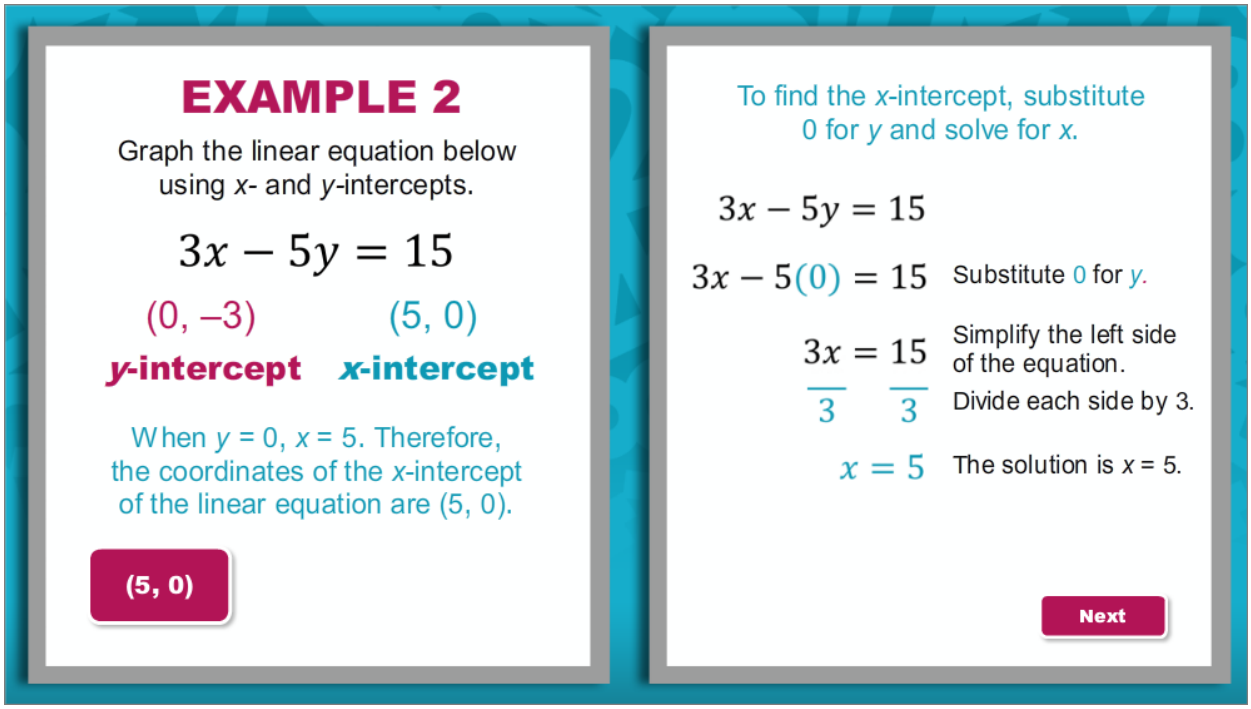
The second step is to determine the x-intercept.

Evaluate the function where $y = 0$ to find the y-intercept.

The x-intercept is…

A) $(5, 0)$
B) $(0, 0)$
C) $(-5, 0)$

Example 2 (continued)



Graph the linear equation below using x- and y-intercepts.

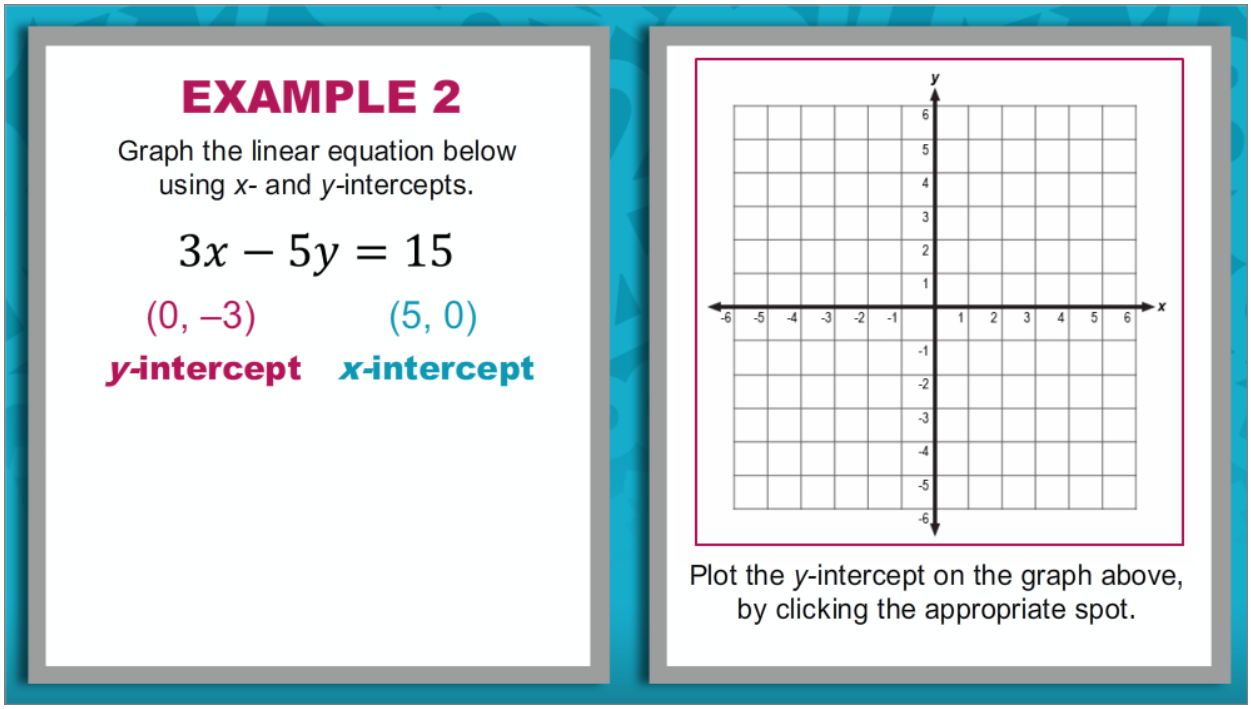
$$3x - 5y = 15$$

When $y = 0$, $x = 5$. Therefore, the coordinates of the x-intercept of the linear equation are $(5, 0)$.

To find the x-intercept, substitute 0 for y and solve for x.

$$\begin{aligned} 3x - 5y &= 15 \\ 3x - 5(0) &= 15 \quad \text{Substitute 0 for } y. \\ 3x &= 15 \quad \text{Simplify the left side of the equation.} \\ \frac{3x}{3} &= \frac{15}{3} \quad \text{Divide each side by 3.} \\ x &= 5 \quad \text{The solution is } x = 5. \end{aligned}$$

Example 2 (continued)

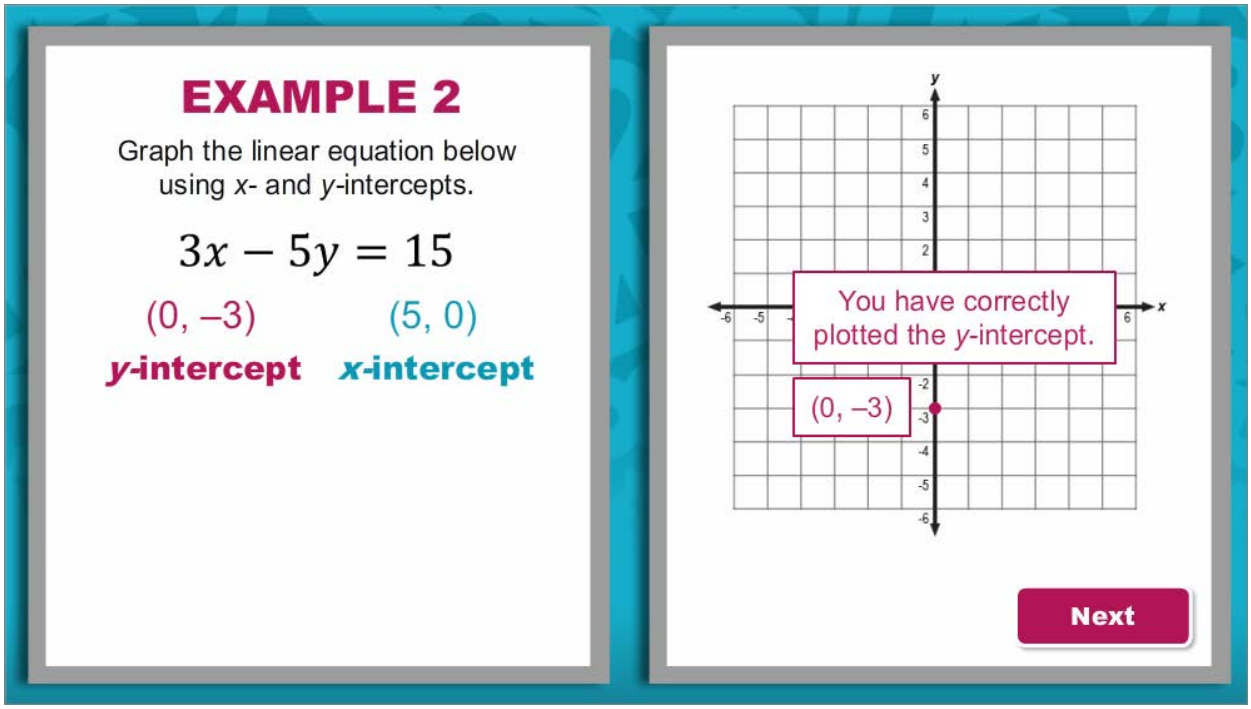


Graph the linear equation below using *x*- and *y*-intercepts.

$$3x - 5y = 15$$

Now you are ready to graph. Plot the *y*-intercept on the graph above, by click the appropriate spot.

Example 2 (continued)

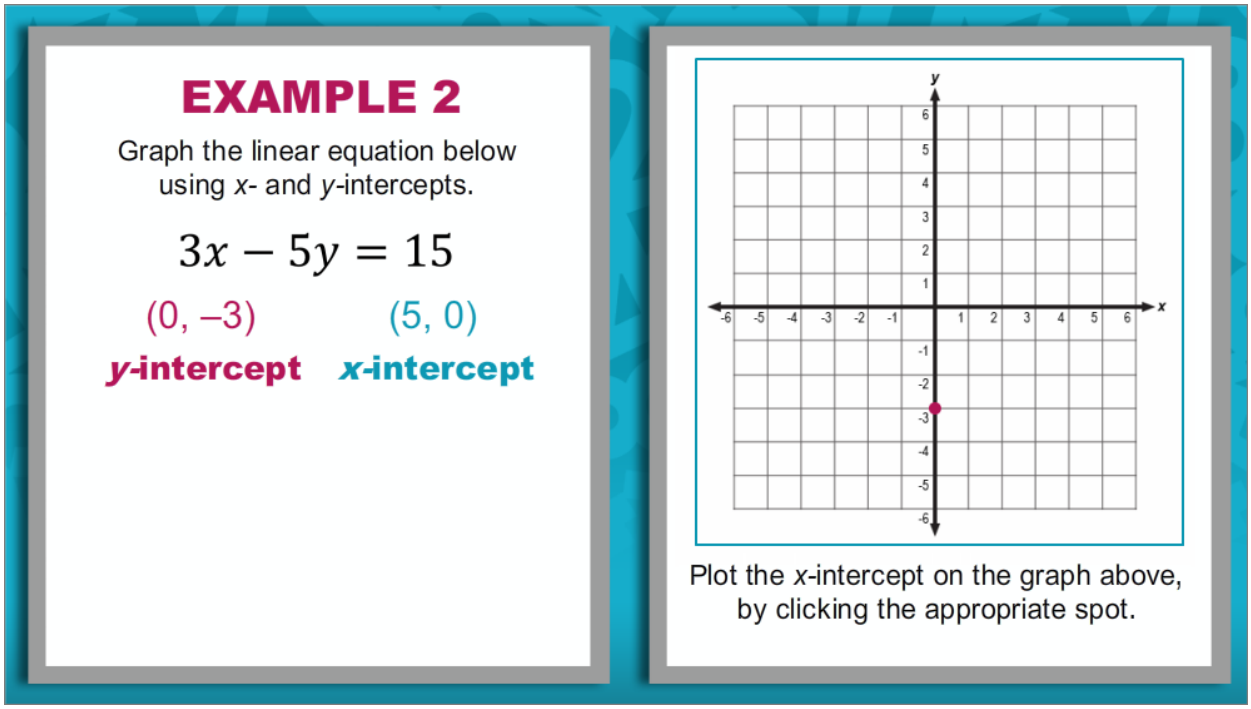


Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

You have correctly plotted the y-intercept $(0, -3)$.

Example 2 (continued)

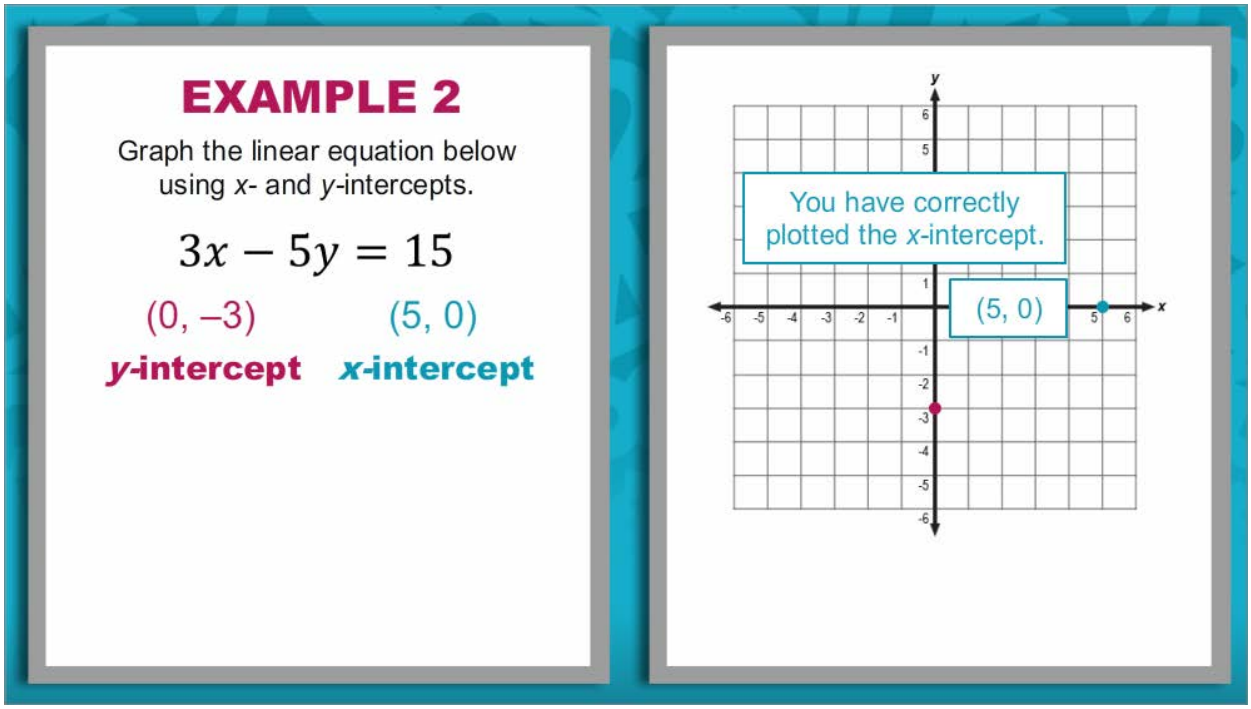


Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

Next, plot the x-intercept $(5, 0)$.

Example 2 (continued)

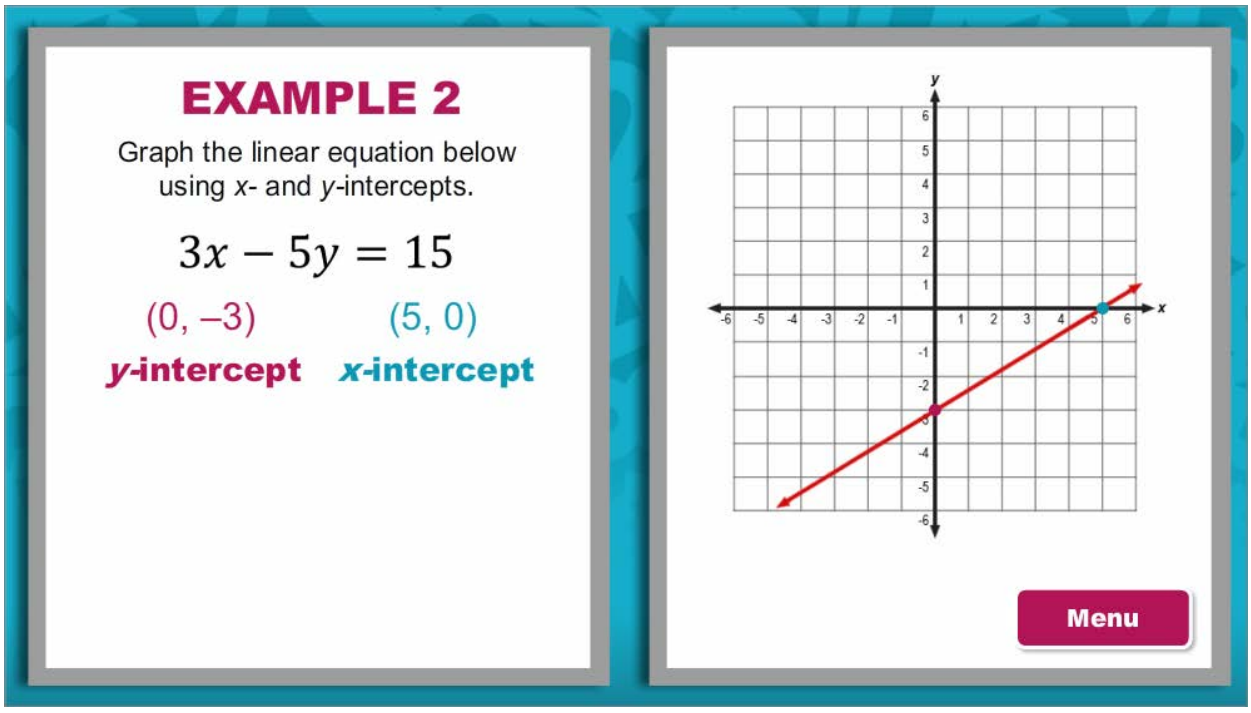


Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

You have correctly plotted the x-intercept $(5, 0)$.

Example 2 (continued)

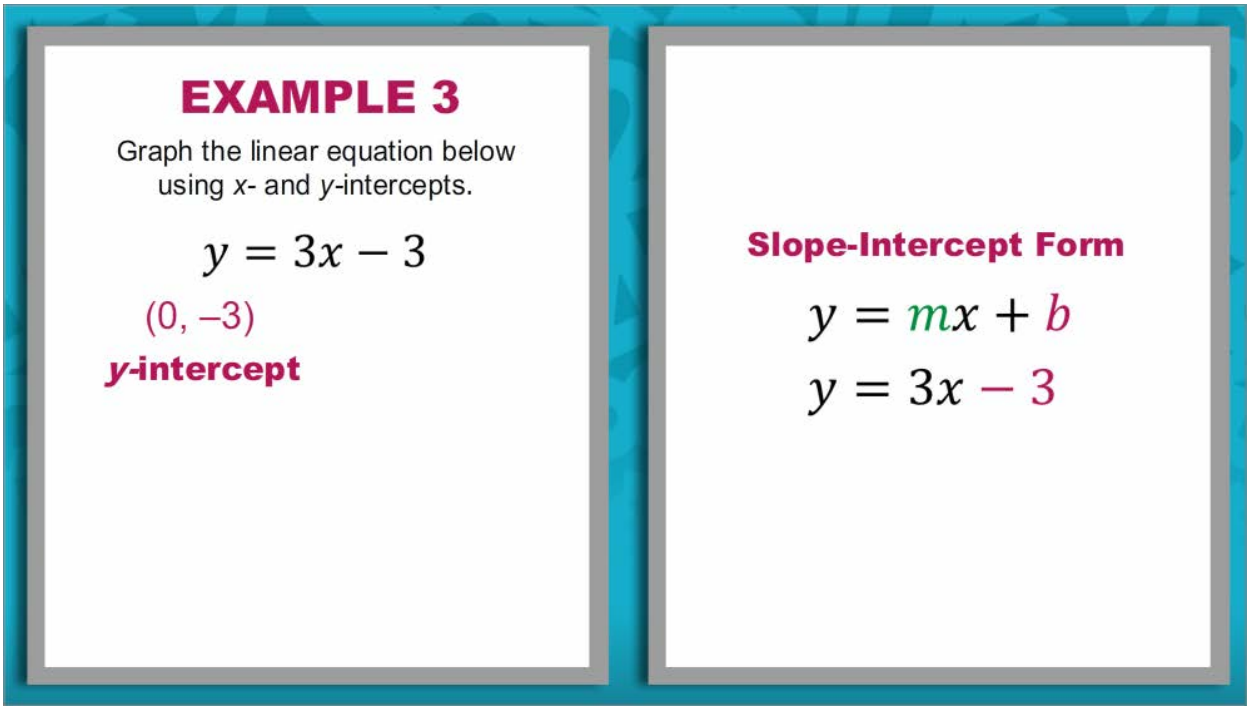


Graph the linear equation below using x- and y-intercepts.

$$3x - 5y = 15$$

Now, graph the line that passes through the two points. Your work is complete.

Example 3

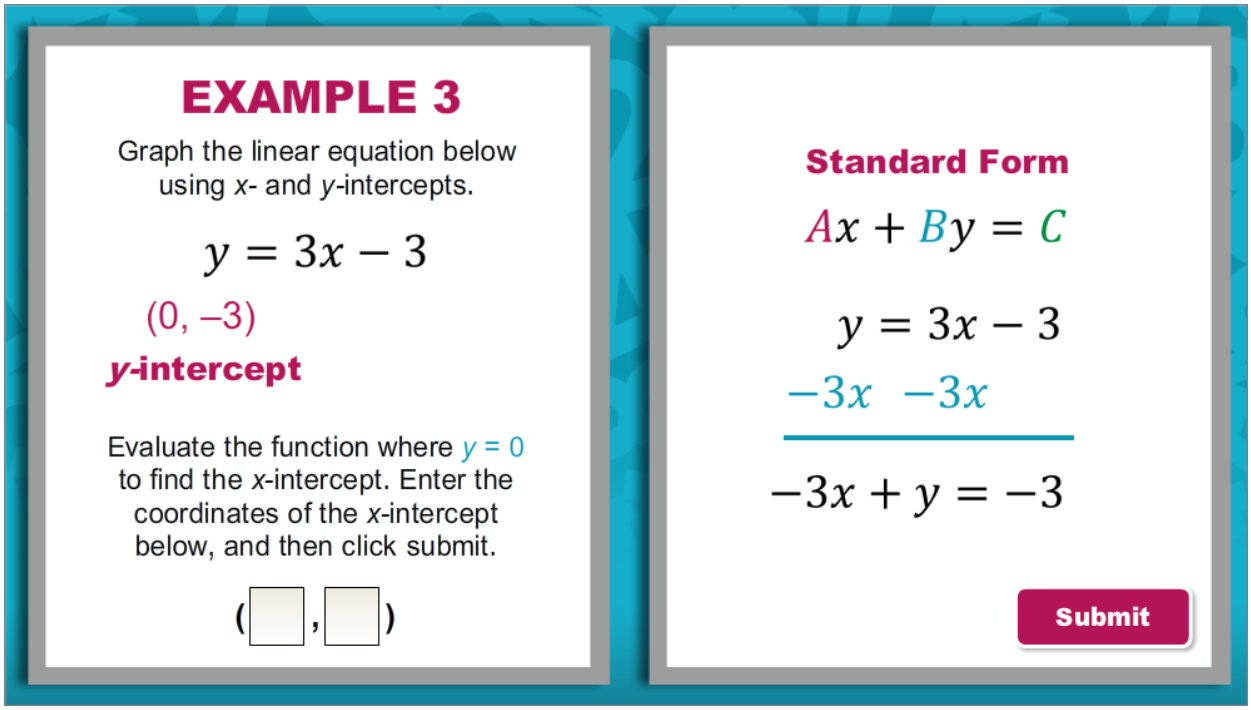


Graph the linear equation below using x- and y-intercepts.

$$y = 3x - 3$$

Notice that this linear equation is in slope-intercept form, where m represents the slope and b represents the y-intercept. Slope-intercept form allows you to easily determine the coordinates of the y-intercept. In this case $b = -3$. So the coordinates of the y-intercept are $(0, -3)$.

Example 3 (continued)



Graph the linear equation below using *x*- and *y*-intercepts.

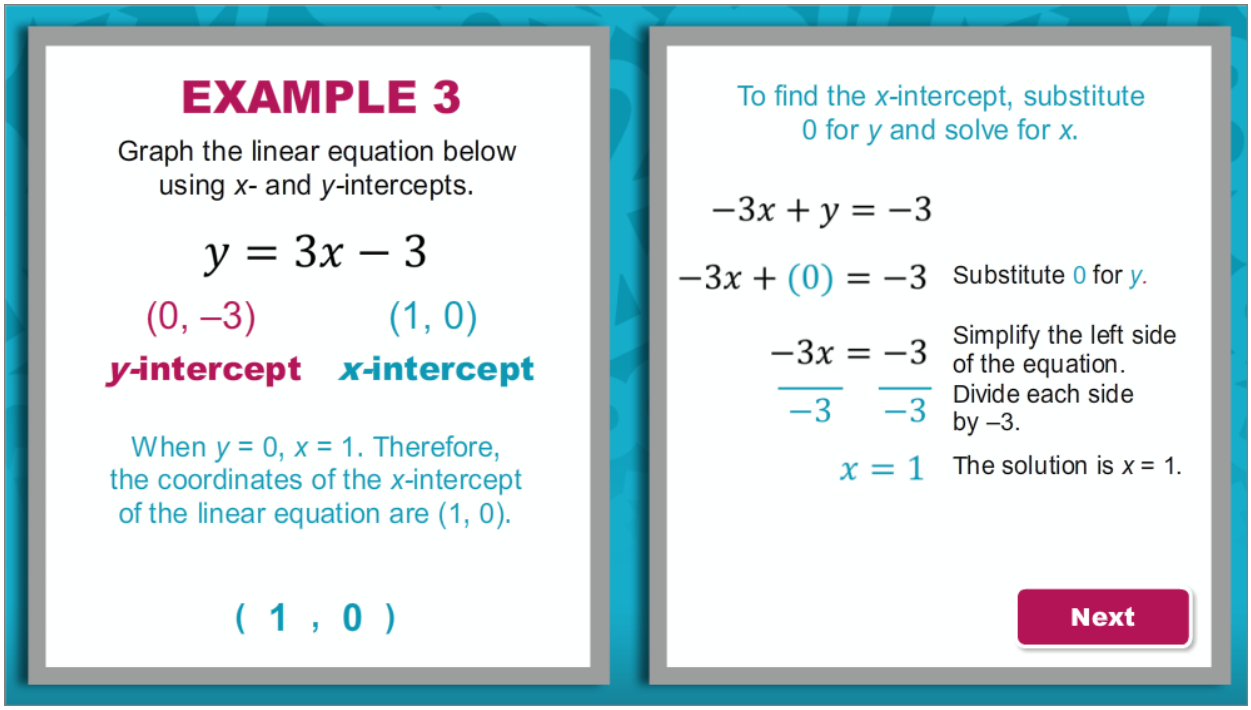
$$y = 3x - 3$$

To determine the coordinates of the *x*-intercept, represent the equation in standard form. Subtract $3x$ from each side of the equation. The result is $-3x + y = -3$. The equation is now in standard form.

Next, evaluate the function where $y = 0$ to find the *x*-intercept. Enter the coordinates of the *x*-intercept below, and then click submit.

(?, ?)

Example 3 (continued)



Graph the linear equation below using x- and y-intercepts.

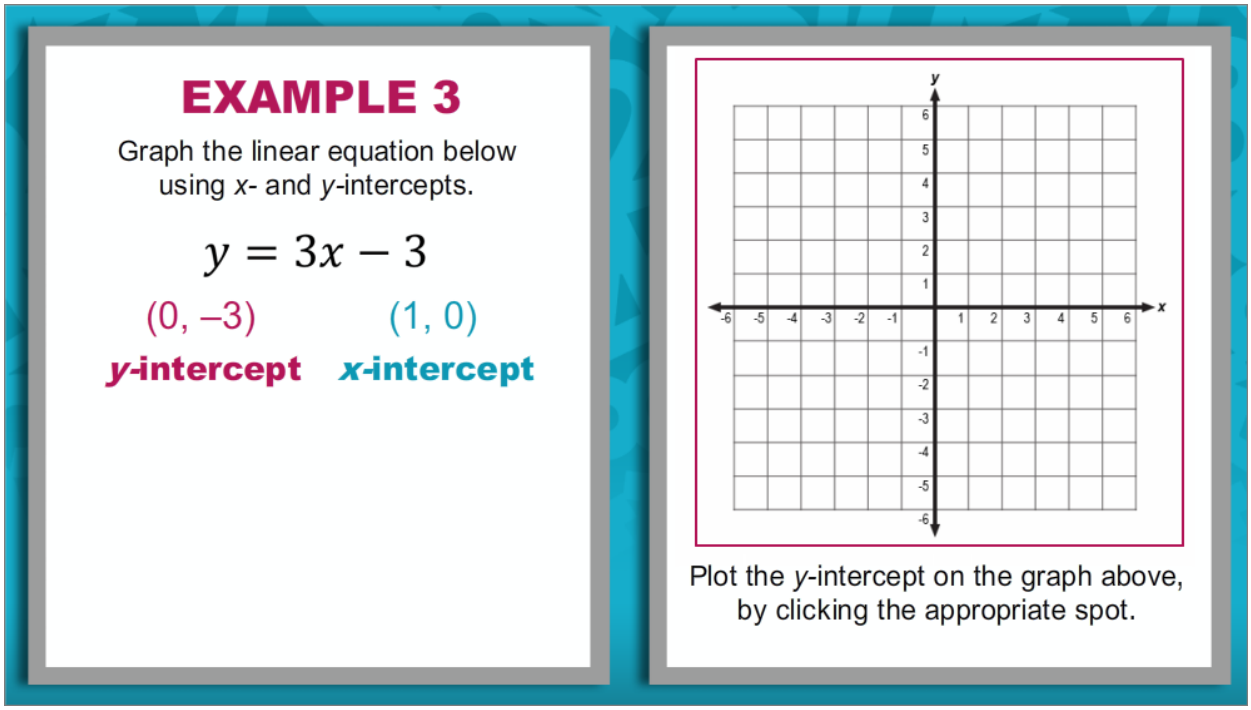
$$y = 3x - 3$$

When $y = 0$, $x = 1$. Therefore, the coordinates of the x-intercept of the linear equation are $(1, 0)$.

To find the x-intercept, substitute 0 for y and solve for x.

$$\begin{aligned} -3x + y &= -3 \\ -3x + (0) &= -3 && \text{Substitute 0 for } y. \\ -3x &= -3 && \text{Simplify the left side of the equation.} \\ \frac{-3}{-3} &= \frac{-3}{-3} && \text{Divide each side by } -3. \\ x &= 1 && \text{The solution is } x = 1. \end{aligned}$$

Example 3 (continued)



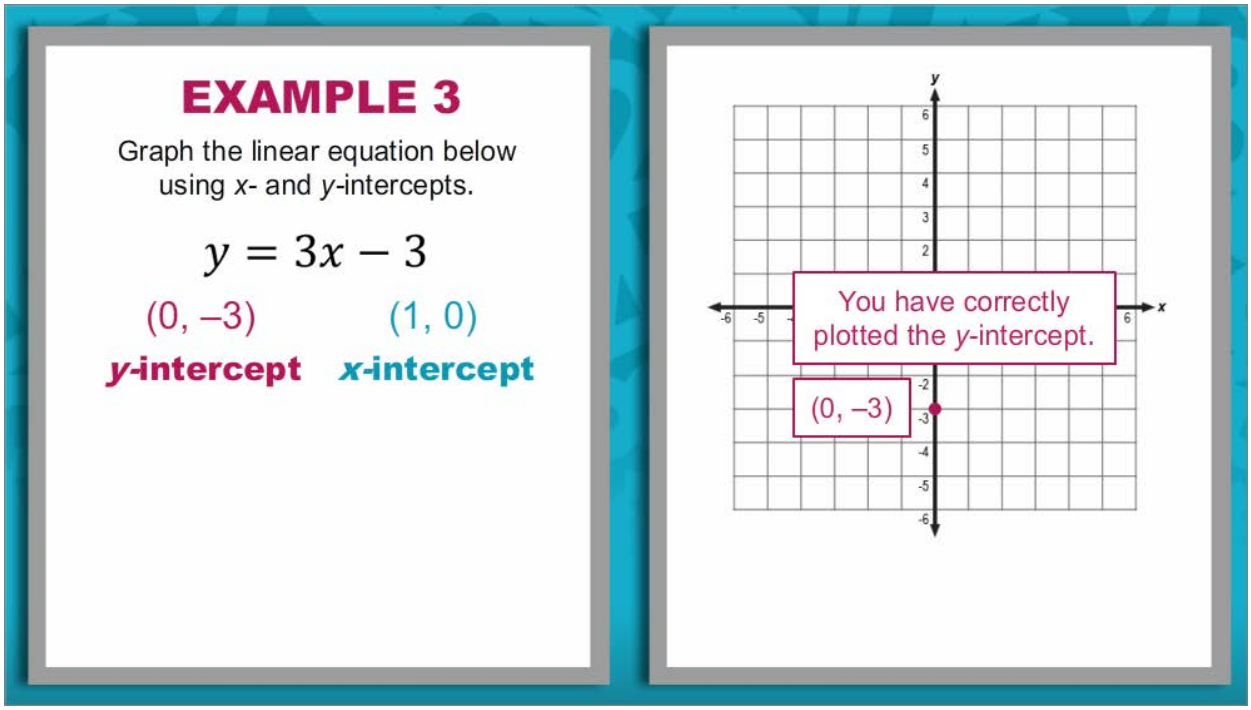
Graph the linear equation below using *x*- and *y*-intercepts.

$$y = 3x - 3$$

Now you are ready to graph. Plot the *y*-intercept $(0, -3)$.

Plot the *y*-intercept on the graph above, by click the appropriate spot.

Example 3 (continued)

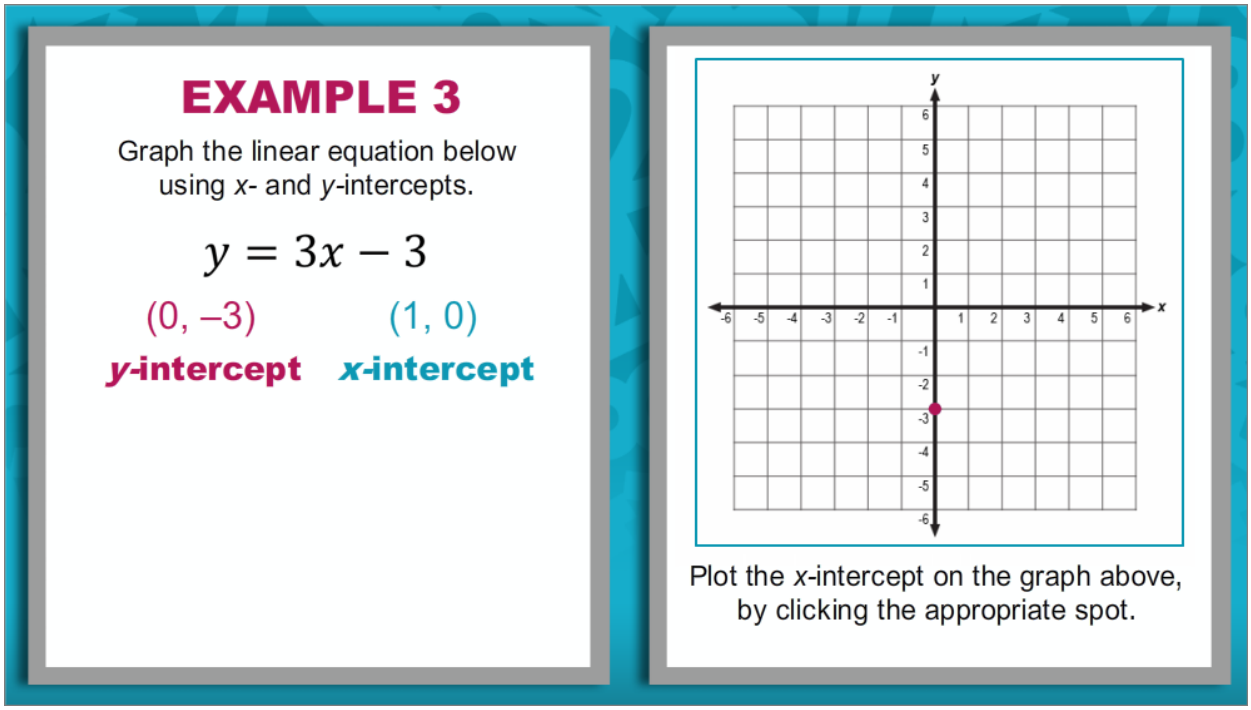


Graph the linear equation below using *x*- and *y*-intercepts.

$$y = 3x - 3$$

You have correctly plotted the *y*-intercept $(0, -3)$.

Example 3 (continued)



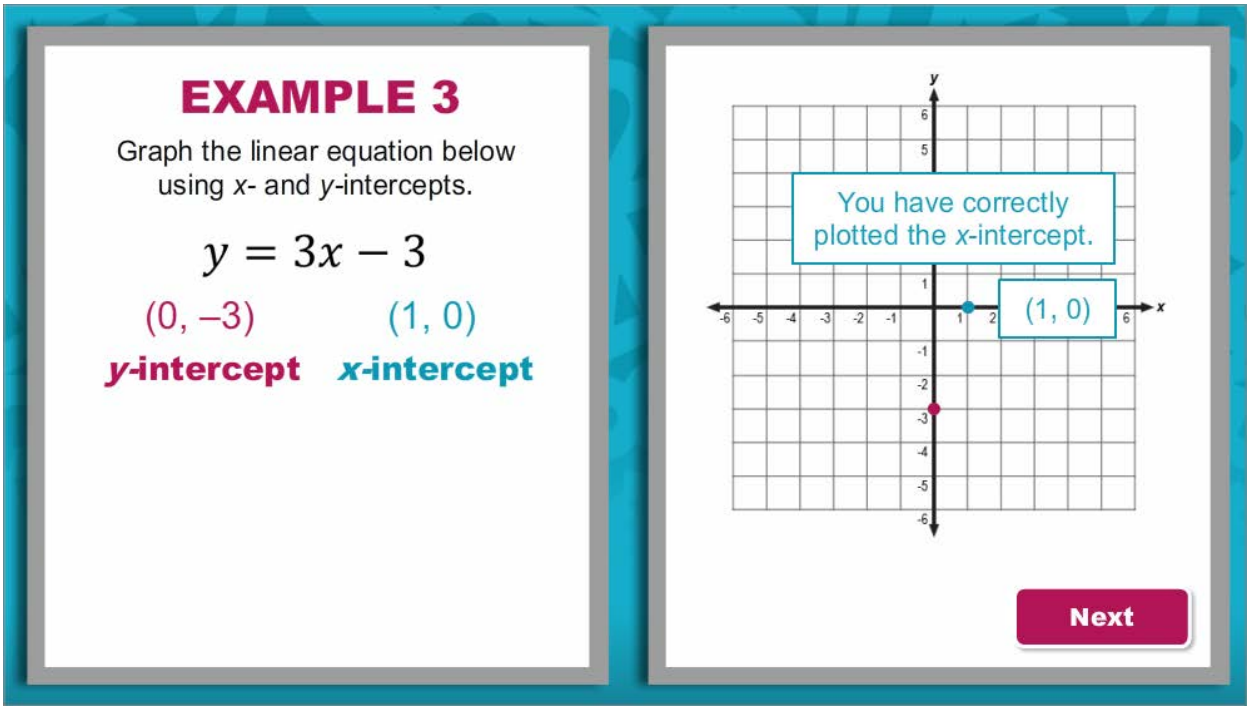
Graph the linear equation below using *x*- and *y*-intercepts.

$$y = 3x - 3$$

Next, plot the *x*-intercept $(1, 0)$.

Plot the *x*-intercept on the graph above, by click the appropriate spot.

Example 3 (continued)

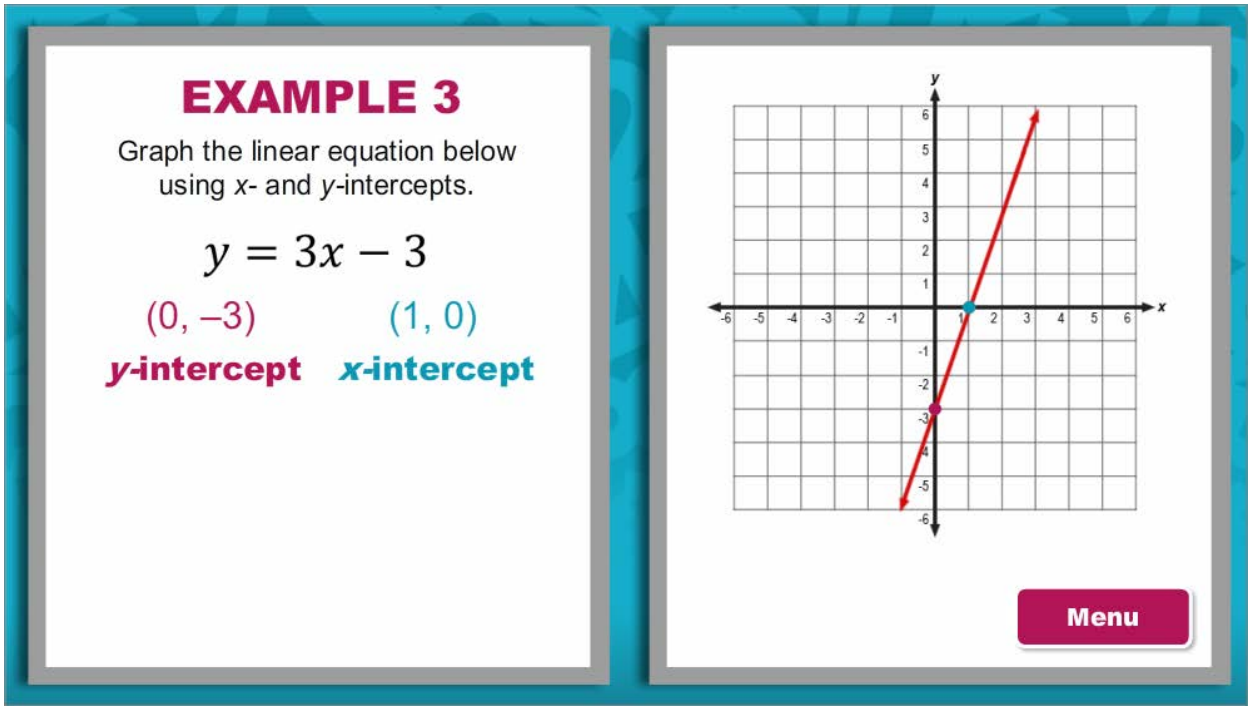


Graph the linear equation below using x- and y-intercepts.

$$y = 3x - 3$$

You have correctly plotted the y-intercept $(1, 0)$.

Example 3 (continued)



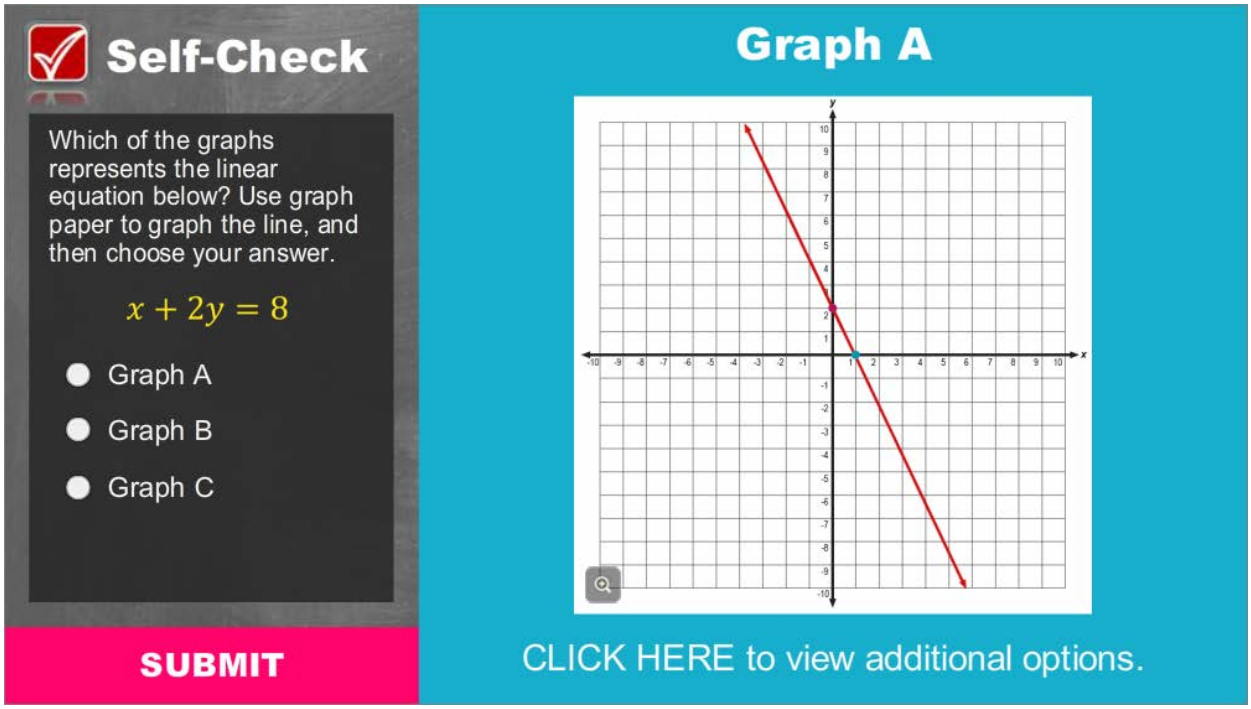
Graph the linear equation below using *x*- and *y*-intercepts.

$$y = 3x - 3$$

Now, graph the line that passes through the two points.

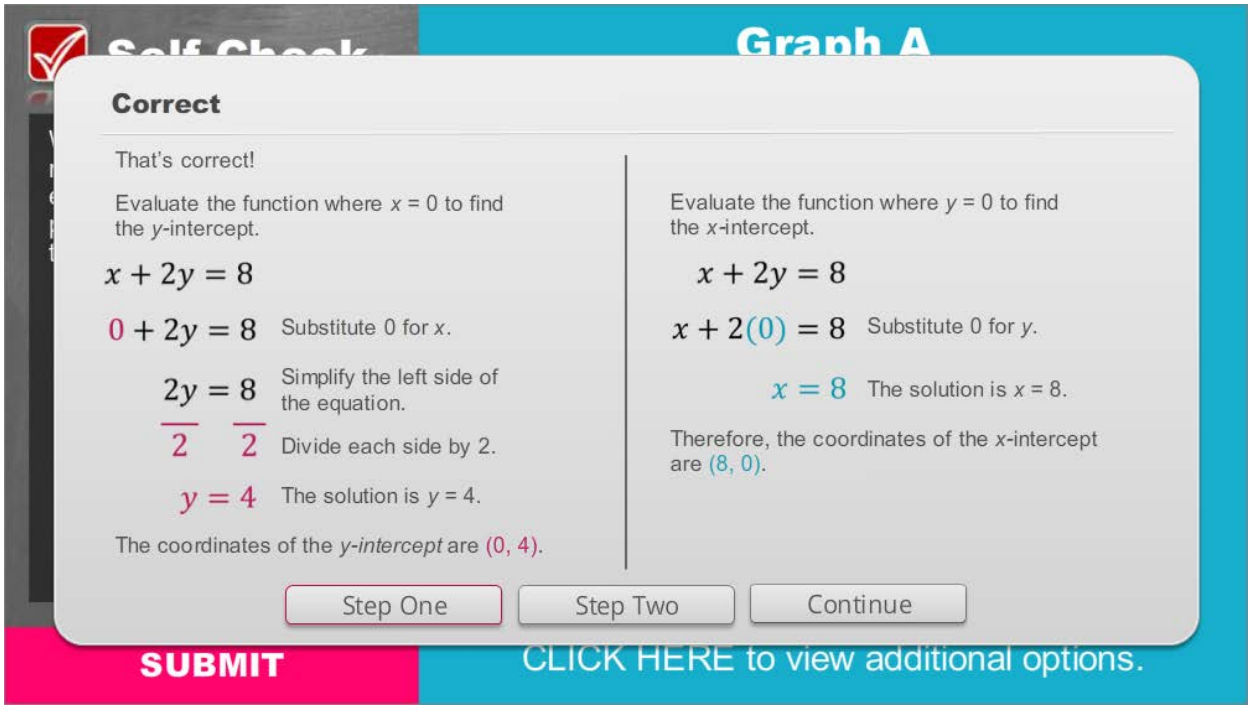
Your work is complete. You have graphed the linear equation $y = 3x - 3$ using *x*- and *y*-intercepts.

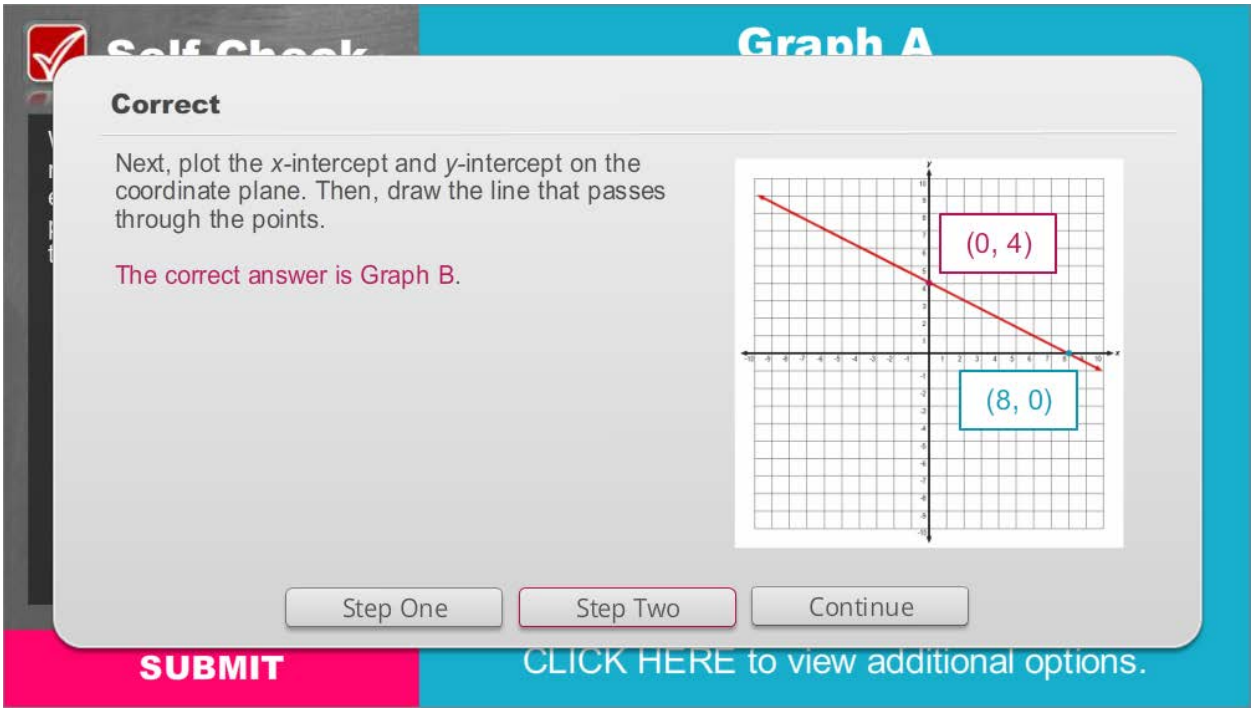
Self-Check 1



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

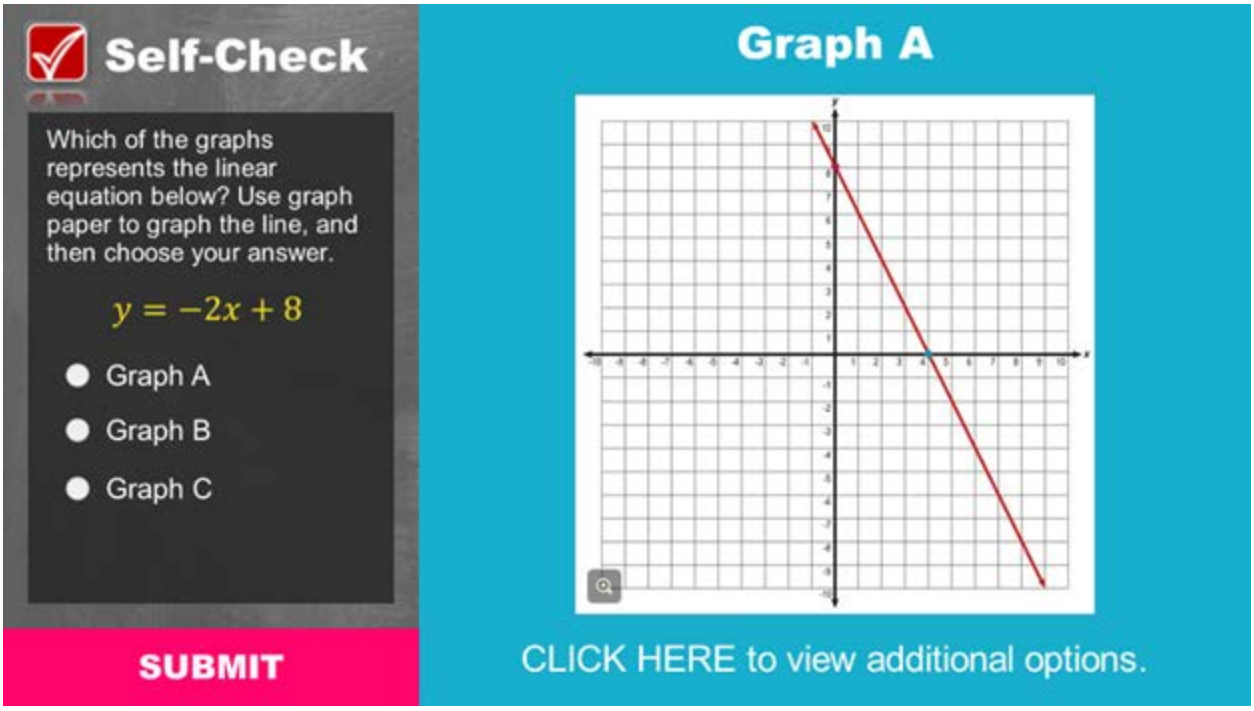
Self-Check 1: Answer





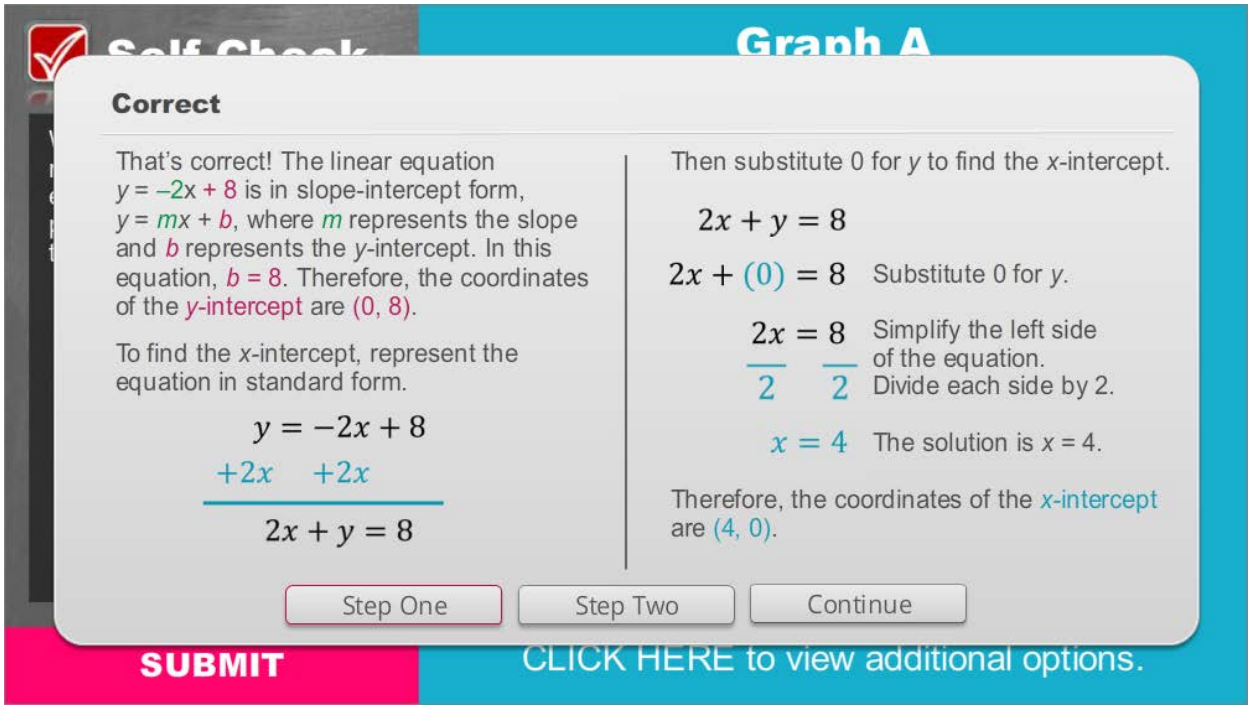
For your reference, the images above shows the correct solution to the self-check problem.

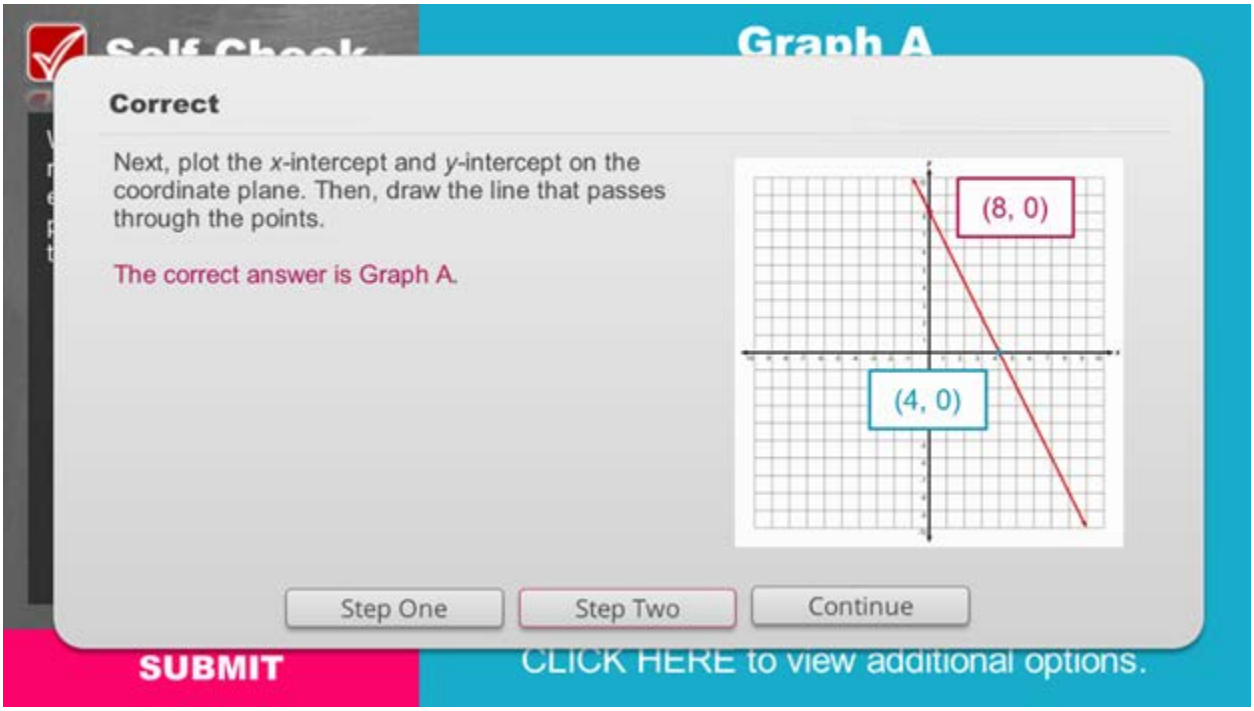
Self-Check 2



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

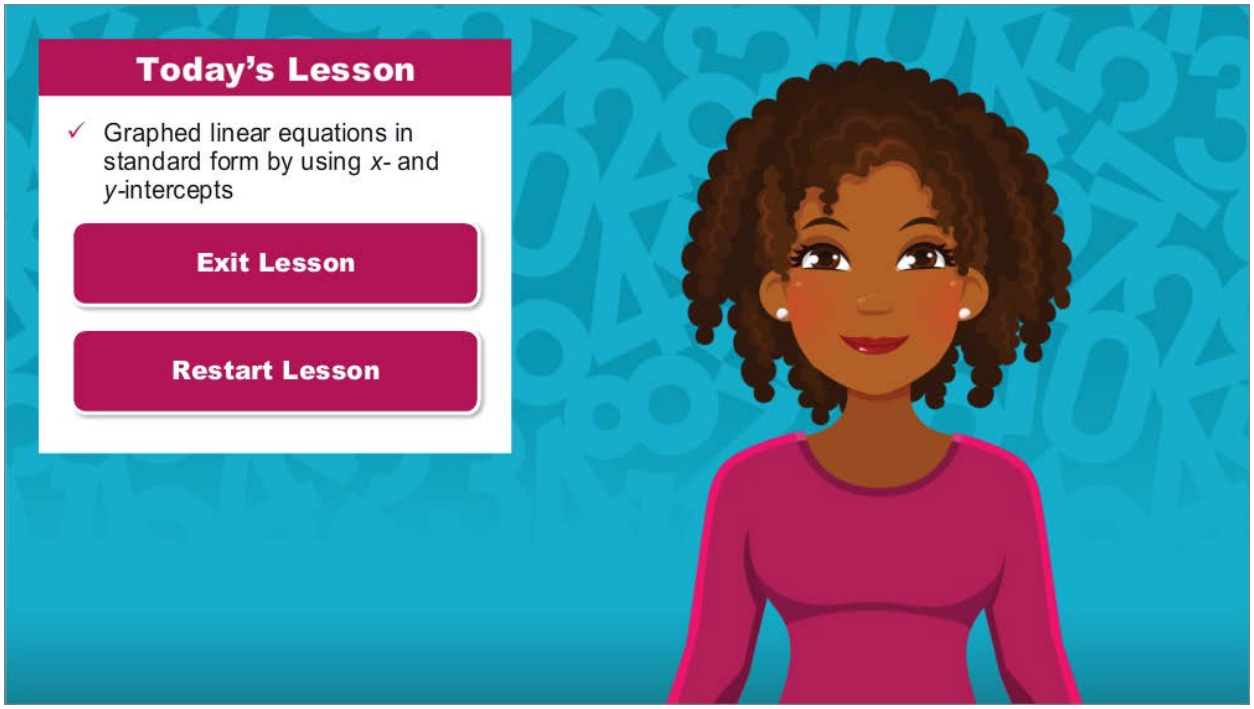
Self-Check 2: Answer





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

Conclusion



You have reached the conclusion of this lesson where you learned how to graph a linear equation in standard form by using *x*- and *y*-intercepts.