

Module 9: Writing Linear Equations

Topic 2 Content: Writing the Equation of a Line in Standard Form

Introduction



Today's Lesson

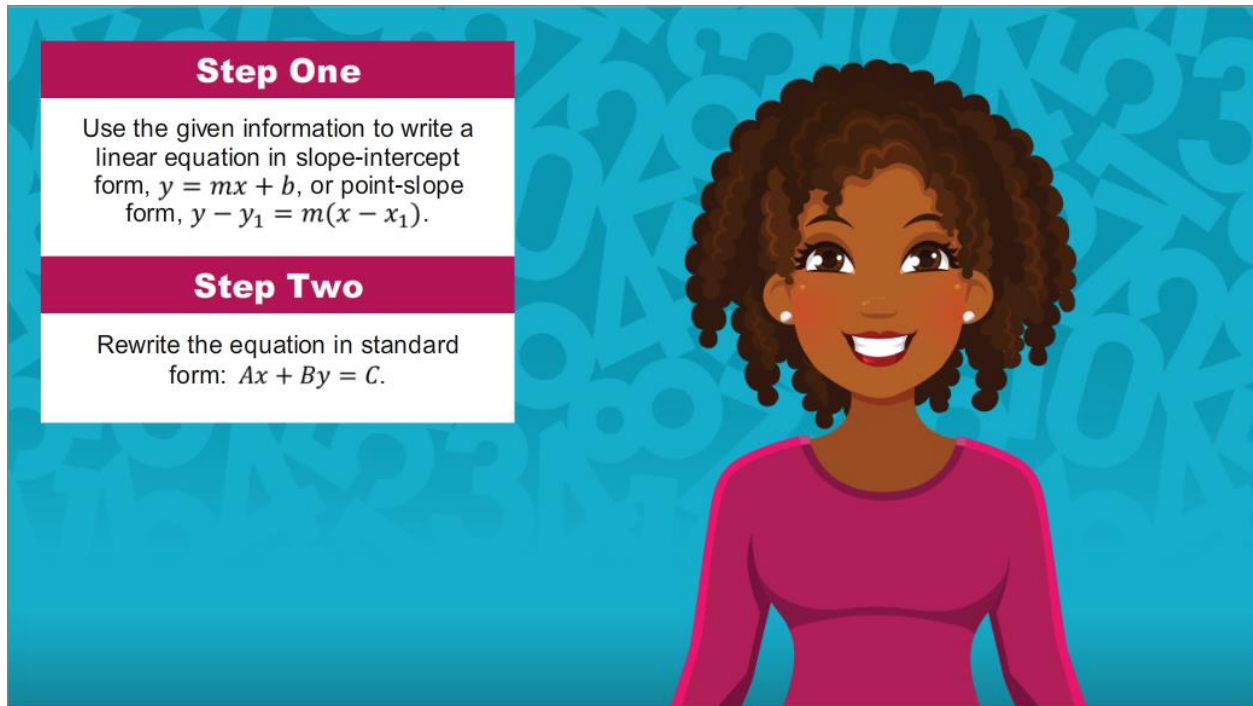
- You will learn how to write a linear equation in standard form.

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.

Module 9: Writing Linear Equations

Topic 2 Content: Writing the Equation of a Line in Standard Form

Anticipatory Set



Step One

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 Two

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

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.

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Writing the Equation of a Line in Standard Form

WRITING THE EQUATION OF A LINE IN STANDARD FORM

Click the Examples Below to Learn More

Example One

Self-Check

Example Two

Click the examples below to learn more.

- Example One
- Example Two
- Self-Check

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Example 1

EXAMPLE 1

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

STEP ONE

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

$$m = -\frac{5}{4} \quad (x_1, y_1) = (8, -9)$$
$$y - y_1 = m(x - x_1)$$
$$y - (-9) = -\frac{5}{4}(x - 8)$$
$$y + 9 = -\frac{5}{4}(x - 8)$$

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:

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

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Example 1 (continued)

EXAMPLE 1

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

STEP ONE

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 TWO

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

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

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

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

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

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

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

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

$$\begin{array}{r} -9 \qquad \qquad -9 \\ \hline \end{array}$$

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

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

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

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

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

Now, subtract 9 from both sides.

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

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Example 1 (continued)

EXAMPLE 1

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

STEP ONE
 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 TWO
 Rewrite the equation in standard form:
 $Ax + By = C$.

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

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

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

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

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

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

$$\frac{5}{4}x + y = 1$$

Next, add $\frac{5}{4}x$ to each side.

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

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Example 1 (continued)

EXAMPLE 1

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

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

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

STEP TWO
Rewrite the equation in standard form:
 $Ax + By = C$.

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

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 $-\frac{5}{4}$:

$$5x + 4y = 4$$

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Example 2

EXAMPLE 2

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

STEP ONE

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

$$y = mx + b$$

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

$y = 2x + 3$

$y = 2x - 3$

$y = 3x + 2$

$y = 3x - 2$

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) $y = 3x - 2$

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Example 2 (continued)

EXAMPLE 2

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

STEP ONE

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.

$y = 3x + 2$

Next

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.

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Example 2 (continued)

EXAMPLE 2

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

STEP TWO

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

$$y = 3x + 2$$

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

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

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Example 2 (continued)

EXAMPLE 2

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

STEP TWO

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

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

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

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

[True](#) [Menu](#)

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: $Ax + By = C$.

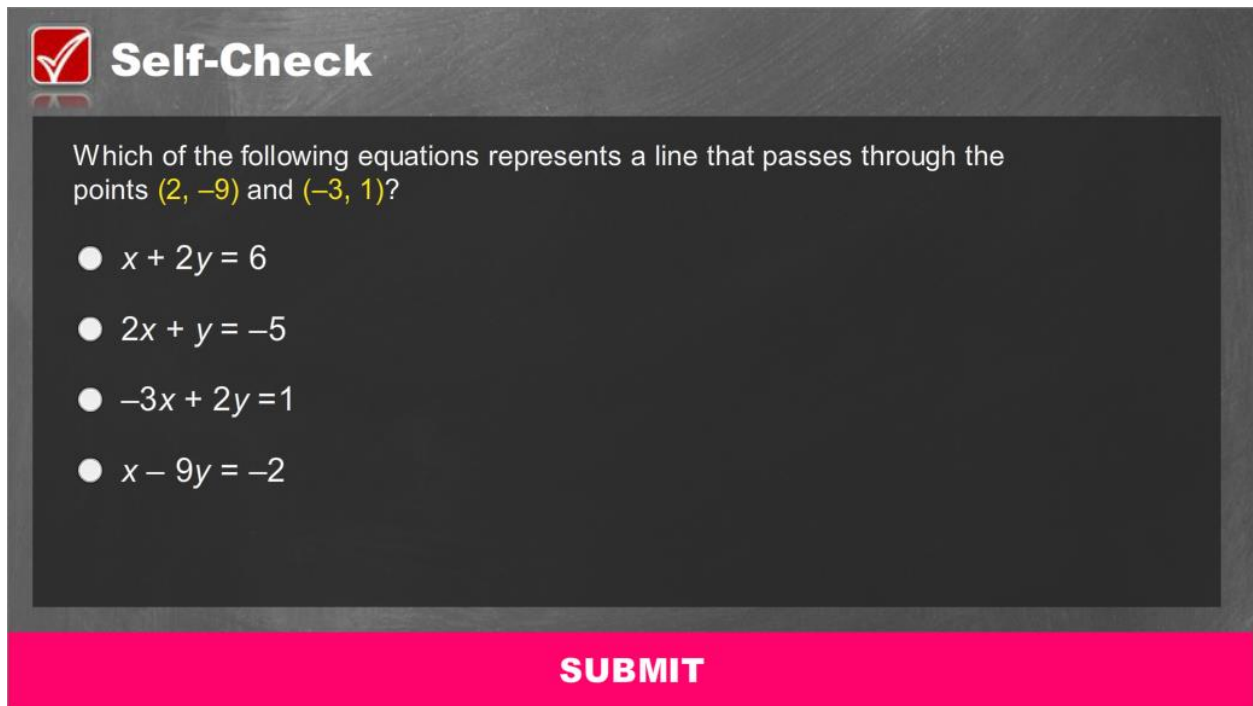
To represent the equation in standard form subtract $3x$ from both sides.

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

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

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Self-Check

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 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 $(2, -9)$ and $(-3, 1)$?

- $x + 2y = 6$
- $2x + y = -5$
- $-3x + 2y = 1$
- $x - 9y = -2$

SUBMIT

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

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Self-Check : Answer

Self Check

Correct

That's correct!

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

You may choose to begin by writing the equation in point-slope form. Start by using the slope-formula to determine m .

Let $(x_1, y_1) = (2, -9)$ and $(x_2, y_2) = (-3, 1)$.

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

$$= \frac{1 - (-9)}{-3 - 2}$$

Substitute the appropriate values.

$$= \frac{10}{-5}$$

Simplify the expression

$$= -2$$

The slope of the line is -2 .

Part 1

Part 2

Continue

SUBMIT

Self Check

Correct

Substitute -2 for m , and the coordinates of $(-3, 1)$ for x_1 and y_1 .

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

$$y - 1 = -2(x - (-3))$$

$$y - 1 = -2(x + 3)$$

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

$$y - 1 = -2(x + 3)$$

$$y - 1 = -2x - 6$$

Distributive Property.

$$\begin{array}{r} + 1 \qquad + 1 \\ \hline y - 1 = -2x - 6 \end{array}$$

Add 1 to both sides.

$$y = -2x - 5$$

$$\begin{array}{r} + 2x \quad + 2x \\ \hline y = -2x - 5 \end{array}$$

Add $2x$ to both sides.

$$2x + y = -5$$

Part 1

Part 2

Continue

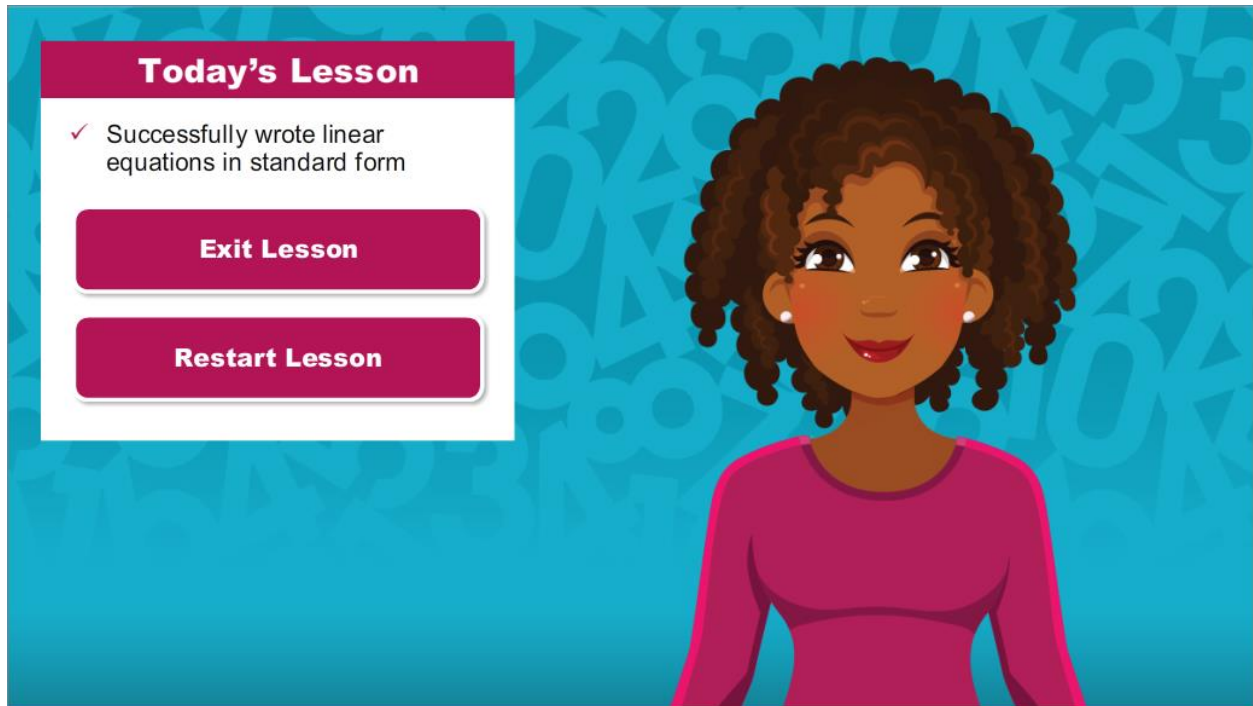
SUBMIT

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

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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 standard 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, set against a blue background with faint mathematical symbols.

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