

Warm-Up

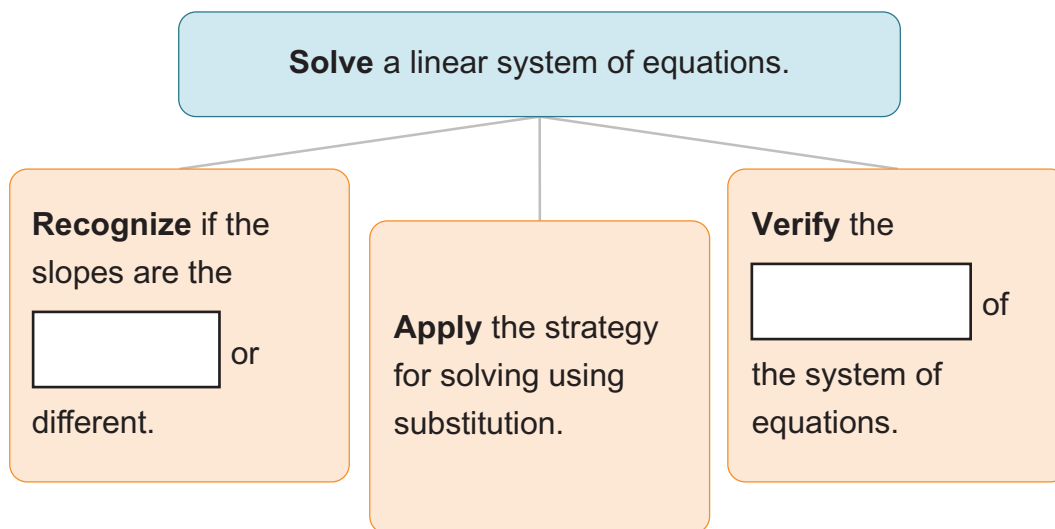
Using Substitution to Solve Systems



Lesson Question



Lesson Goals



Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

	the ratio of the change in the dependent values (outputs) to the change in the independent values (inputs) between two points on a line
	the point or points that make all equations in a system true
	to take the place of; to replace
	to examine; to study very carefully and in detail

**Finding the Number of Solutions**

The **solution to a system of equations** is the point or points that make all equations in the system true.

Complete the table.

System of Equations	Slopes	y-Intercepts	Number of Solutions
$y = 2x - 6, y = 3x + 4$	Different		
$y = \frac{1}{3}x - 2, y = \frac{1}{3}x - 4$	Same	Different	None
$y = -5x + 6, y = -5x + 6$		Same	

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Using the Substitution Method When One Variable Is Known

PROCEDURE

1. Use to create a one-variable linear equation.
2. Solve to determine the value of the unknown variable.
3. Write the solution to the system of equations as an ordered pair.
4. the solution.

Substitution Method

Solve the system of equations.

$$\begin{aligned} y &= 2x + 3 \\ y &= 7 \end{aligned}$$

To identify the slope, rewrite as $y = 0x + 7$. We expect to have one solution.

1. Use substitution to create a one-variable linear equation.
2. Solve to determine the value of the unknown variable.
3. Write the solution to the system of equations as an ordered pair.

$$\boxed{} = 2x + 3$$

$$7 - \boxed{} = 2x + 3 - 3$$

$$4 = 2x$$

$$\frac{4}{2} = \frac{\boxed{}}{2}$$

$$\boxed{} = x \quad y = 7$$

(2, 7)

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Graphing the System to Verify the Solution

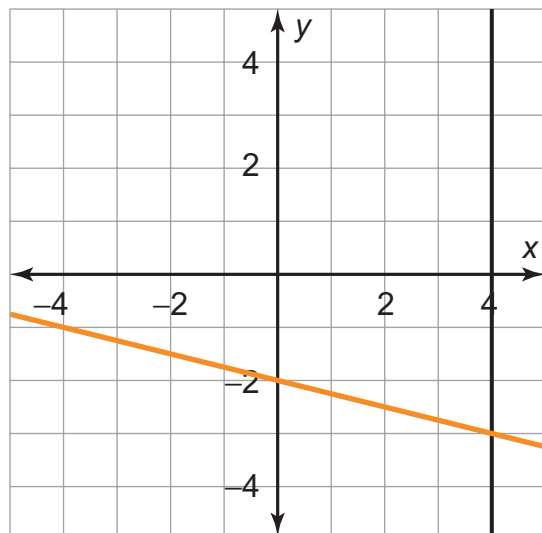
Examine the system of equations.

Locate the intersection point on the graph.

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

$$x = 4$$

4. Verify the solution.

Solution: (, -3)

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The Substitution Method with Two Variables

PROCEDURE

1. Use substitution to create a one-variable linear equation.
2. Solve to determine the variable in the equation.
3. **Substitute** the value of the variable into either original equation to solve for the other variable.
4. Write the solution to the system of equations as an pair.
5. Verify the solution.

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Substitution Method

Solve the system of equations using the substitution method.

1. Use substitution to create a one-variable linear equation.

$$y = 6x + 1$$

$$y = 2x + 9$$

$$6x + 1 = \boxed{} + 9$$

$$6x + 1 - 1 = 2x + 9 - 1$$

$$6x = 2x + \boxed{}$$

2. Solve to determine the unknown variable in the equation.

$$6x - \boxed{} = 2x + 8 - 2x$$

$$4x = 8$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = \boxed{}$$

Substitution Method

Solve the system of equations using the substitution method.

$x = 2$ was found in the first two steps.

3. Substitute the value of the variable into either original equation to solve for the other variable.

$$y = 6x + 1$$

$$y = 2x + 9$$

$$y = 6x + 1$$

$$y = 6(\boxed{}) + 1$$

$$y = 13$$

4. Write the solution to the system of equations as an ordered pair.

$$(\boxed{}, 13)$$

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Verifying the Solution Algebraically

Examine the system of equations.

$$y = 6x + 1$$

$$y = 2x + 9$$

5. Verify the solution.

Solution: (2, 13)

Substitute (2, 13) into both equations.

$$y = 6x + 1$$

$$13 = 6(2) + 1$$

$$13 = \boxed{} \quad \text{True}$$

$$y = 2x + 9$$

$$13 = 2(\boxed{}) + 9$$

$$13 = 13 \quad \text{True}$$

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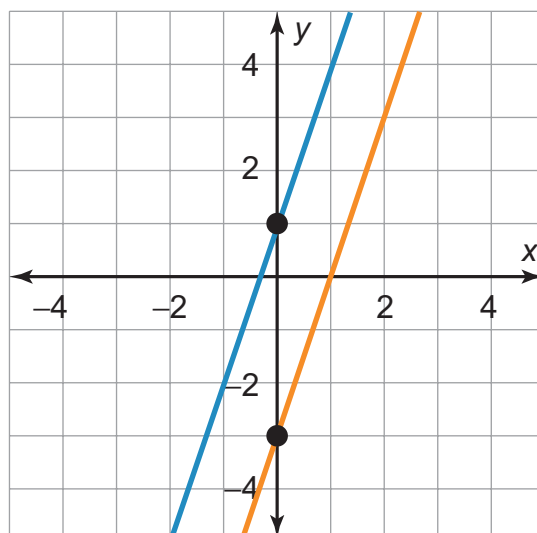
Substitution Method on Parallel Lines**Analyze** the system of equations in which the slopes are the same.

$$y = 3x - 3$$

$$y = 3x + 1$$

The slopes are the .

The y-intercepts are different.

These two lines are .So, we will have no .

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Solve the system of equations using substitution.

$$y = 3x - 3$$

$$y = 3x + 1$$

Substitute $3x - 3$ for y in the second equation.

$$3x - 3 = 3x + 1$$

$$3x - 3 + 3 = 3x + 1 + \boxed{}$$

$$3x = \boxed{} + 4$$

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

$$\boxed{} = 4 \quad \text{False}$$

The result $0 = 4$ does not give us a value of either variable, and the statement is false. This means that we have no solution.

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Substitution Method of Solving Equivalent Equations

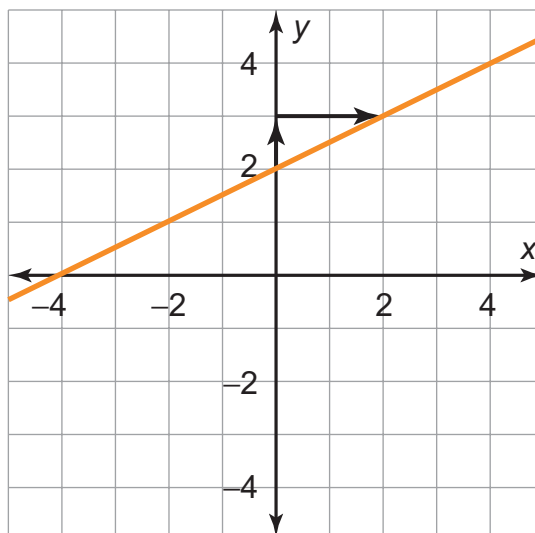
Analyze the system of equations in which the slopes and y -intercepts are the same.

$$y = \frac{1}{2}x + 2$$

$$y = \frac{1}{2}x + 2$$

This means both equations represent the same line, and we should expect

many solutions.



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Substitution Method of Solving Equivalent Equations

Examine the system of equations in which the slopes and the intercepts are the same.

$$y = \frac{1}{2}x + 2,$$

$$\frac{1}{2}x + 2 = \frac{1}{2}x + 2$$

$$y = \frac{1}{2}x + 2$$

$$\frac{1}{2}x + 2 - \boxed{} = \frac{1}{2}x + 2 - 2$$

$$\frac{1}{2}x = \boxed{}$$

$$\frac{1}{2}x - \frac{1}{2}x = \boxed{}$$

$$0 = 0 \quad \text{True}$$

This tells us there are infinitely $\boxed{}$ solutions to this system of equations.

Summary

Using Substitution to Solve Systems



Lesson Question

How do you solve a system of equations using the substitution method?



Answer

Use this space to write any questions or thoughts about this lesson.