

Solutions of One-Variable Equations

Introduction

Ask students what it means to have a solution to an equation. Have students substitute 5 for x in the equation $2x + 1 = 11$. Ask the students if 5 is a solution to the equation. Have students justify their answers. Then, have students write their own equations and exchange them with partners. Partners should determine the solutions to the equations.

Creating the Notebook Page

Guide students through the following steps to complete the right-hand page in their notebooks.

1. Add a Table of Contents entry for the Solutions of One-Variable Equations pages.
2. Cut out the title and glue it to the top of the page.
3. Cut out the *Types of Solutions* and *6x + 12* flap books. Cut on the solid lines to create three flaps on each flap book. Apply glue to the gray glue section and place the *Types of Solutions* piece on top to create a stacked six-flap book. Apply glue to the back of the top section and attach it to the page below the title.
4. Under each flap, explain the type of solutions. Use the sample problem to support the explanation.
5. Cut out the *Solve each equation* flap book. Cut on the solid lines to create three flaps. Apply glue to the back of the top section and attach it to the page below the stacked flap book, leaving room to solve the equations below.
6. Use the space on the page below the flap book to solve each equation. Write the type of solution under each flap.

Solutions of One-Variable Equations

Types of Solutions

<p style="text-align: center; font-size: x-small;">One Solution</p> <p style="text-align: center;">$x = a$</p> <p style="text-align: center; font-size: x-small;">$x = 1$</p>	<p style="text-align: center; font-size: x-small;">Infinitely Many Solutions</p> <p style="text-align: center;">$a = a$</p>	<p style="text-align: center; font-size: x-small;">When solved, it will always equal a false statement.</p> <p style="text-align: center; font-size: x-small;">even make this equation true.</p>
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Solve each equation.

<p style="text-align: center; font-size: x-small;">infinitely many solutions</p> $2x + 8 = 2x + 8$ $\begin{array}{r} 2x + 8 = 2x + 8 \\ -2x \quad -2x \\ \hline 8 = 8 \end{array}$	$2x + 8 = \frac{2}{3}(6x + 6)$ $2x + 8 = 4x + 4$ $\begin{array}{r} 2x + 8 = 4x + 4 \\ -2x \quad -2x \\ \hline 8 = 2x + 4 \\ -4 \quad -4 \\ \hline 4 = 2x \\ \frac{4}{2} = \frac{2x}{2} \\ 2 = x \end{array}$	$2x + 8 = x + 6 + x$ $2x + 8 = 2x + 6$ $\begin{array}{r} 2x + 8 = 2x + 6 \\ -2x \quad -2x \\ \hline 8 = 6 \end{array}$
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Reflect on Learning

To complete the left-hand page, have the students look at the following equations. Have students decide whether each equation has one solution, no solutions, or infinitely many solutions without solving: Students should explain how they knew the type of solution without solving.

1. $8x + 4 = 4(x - 4)$; 2. $8x + 4 = 4(2x + 1)$; 3. $8x + 4 = 4(2x + 4)$

Answer Key

$8 = 8$, infinitely many solutions; $x = 2$, one solution; $8 = 6$, no solutions; Reflect: 1. one solution; 2. infinitely many solutions; 3. no solutions

Solutions of One-Variable Equations

Types of Solutions

One Solution

$$x = a$$

Infinitely Many Solutions

$$a = a$$

No Solutions

$$a = b$$

glue

$$6x + 12 = 6(2x + 1)$$

$$\begin{array}{r} 6x + 12 = 12x + 6 \\ -12x \quad \downarrow \quad -12x \quad \downarrow \\ \hline \end{array}$$

$$\begin{array}{r} -6x + 12 = \quad 6 \\ \downarrow -12 \quad \quad -12 \\ \hline \end{array}$$

$$-6x = -6$$

$$\frac{-6x}{-6} = \frac{-6}{-6}$$

$$x = 1$$

$$6x + 12 = 6(x + 2)$$

$$\begin{array}{r} 6x + 12 = 6x + 12 \\ -6x \quad \downarrow \quad -6x \quad \downarrow \\ \hline \end{array}$$

$$12 = 12$$

True—therefore any number will make the equation true.

$$6x + 12 = 6(x + 3)$$

$$\begin{array}{r} 6x + 12 = 6x + 18 \\ -6x \quad \downarrow \quad -6x \quad \downarrow \\ \hline \end{array}$$

$$12 = 18$$

False—therefore no number can make the equation true.

Solve each equation.

$$2x + 8 = \frac{2}{3}(3x + 12)$$

$$2x + 8 = \frac{2}{3}(6x + 6)$$

$$2x + 8 = x + 6 + x$$