

Solving Equations

One Solution	No Solution	Infinitely Many Solutions
Only one number makes the equation true. Example: $2x = x + 1$	No number makes the equation true. Example: $x + 1 = x + 2$	Any number makes the equation true. Example: $x + 0 = x$
$\begin{array}{r} -x \quad -x \\ x = 1 \end{array}$	$\begin{array}{r} -x \quad -x \\ 1 \neq 2 \text{ (this is never true)} \end{array}$	$x = x \text{ (always true)}$

Solve the following equations. Use the examples above to determine whether each equation has one solution, no solution, or infinitely many solutions. Be sure to show all work!

1. $13 - 1(2x + 2) = 2(x + 2) + 3x$

$13 - 2x - 2 = 2x + 4 + 3x$

$$\begin{array}{r} 11 - 2x = 5x + 4 \\ +2x \quad +2x \\ \hline 11 = 7x + 4 \\ -7x \quad -7x \\ \hline 4 = 7x \end{array}$$

$\frac{7}{7} \mid \frac{7x}{7}$
 $1 = x$
 one solution

3. $6x + 5 - 2x = 4 + 4x + 1$

$$\begin{array}{r} 4x + 5 = 5 + 4x \\ -4x \quad -4x \\ \hline 5 = 5 \end{array}$$

infinite solutions

5. $3x + 7 = 5x + 2(3 - x) + 1$

$$\begin{array}{r} 3x + 7 = 5x + 6 - 2x + 1 \\ 3x + 7 = 3x + 7 \\ -3x \quad -3x \\ \hline 7 = 7 \end{array}$$

infinite solutions

7. $3(x - 1) + x = 4(x + 2)$

$$\begin{array}{r} 3x - 3 + x = 4x + 8 \\ 4x - 3 = 4x + 8 \\ -4x \quad -4x \\ \hline -3 = 8 \end{array}$$

no solution

9. $\frac{f}{2} - 6 = 4$

$$\begin{array}{r} \frac{f}{2} - 6 = 4 \\ +6 \quad +6 \\ \hline \frac{f}{2} = 10 \end{array}$$

$f = 20$ one solution

11. $\frac{3}{4}x + 9 = 3$

$$\begin{array}{r} \frac{3}{4}x + 9 = 3 \\ -9 \quad -9 \\ \hline \frac{3}{4}x = -6 \end{array}$$

$x = -8$
 one solution

2. $11 + 3x - 7 = 6x + 5 - 3x$

$$\begin{array}{r} 4 + 3x = 3x + 5 \\ -3x \quad -3x \\ \hline 4 = 5 \end{array}$$

no solution

4. $6x - 8 = 2(2x + 1)$

$$\begin{array}{r} 6x - 8 = 4x + 2 \\ -4x \quad -4x \\ \hline 2x - 8 = 2 \\ +8 \quad +8 \\ \hline 2x = 10 \end{array}$$

$x = 5$ one solution

6. $2x - 7 + 3x = 4x + 2$

$$\begin{array}{r} 5x - 7 = 4x + 2 \\ -4x \quad -4x \\ \hline x - 7 = 2 \\ +7 \quad +7 \\ \hline x = 9 \end{array}$$

$x = 9$ one solution

8. $5(2x - 1) + x + 17 = 5x + 6(x + 2)$

$$\begin{array}{r} 10x - 5 + x + 17 = 5x + 6x + 12 \\ 11x + 12 = 11x + 12 \\ -11x \quad -11x \\ \hline 12 = 12 \end{array}$$

infinite solutions

10. $u - 9 = -7u + 7$

$$\begin{array}{r} u - 9 = -7u + 7 \\ +7u \quad +7u \\ \hline 8u - 9 = 7 \\ +9 \quad +9 \\ \hline 8u = 16 \\ \div 8 \quad \div 8 \\ \hline u = 2 \end{array}$$

$u = 2$ one solution

12. $0.5(2x + 8) = x - 4$

$$\begin{array}{r} x + 4 = x - 4 \\ -x \quad -x \\ \hline 4 = -4 \end{array}$$

no solution