

Steps for Solving Linear Equations

1. Remove any parentheses and combine like terms, if possible on each side of the equation.
2. Clear any fractions by multiplying all terms on both sides by the LCD (least common denominator).
3. Group like terms on each side of the equal sign.
4. Isolate the "x-term" (variable) on one side of the equation by adding or subtracting to combine like terms across the equal sign.
5. Divide or multiply both sides of the equation by the coefficient of the variable to solve for "x".
6. Check the solution by substituting your answer into the original equation wherever you have a variable. If the solution is correct, both sides of the equation will be equal.

Ex. 1:

$$\frac{3}{4}(x-3) = \frac{5}{8}x \quad \text{distribute}$$

Step 1: remove()

$$\frac{3}{4}x - \frac{9}{4} = \frac{5}{8}x$$

Step 2: LCD=8

$$2 \cdot 8 \left(\frac{3}{4}x \right) - 2 \cdot 8 \left(\frac{9}{4} \right) = 2 \cdot 8 \left(\frac{5}{8}x \right) \quad \begin{array}{l} \text{multiply by LCD} \\ \text{Reduce} \end{array}$$

$$6x - 18 = 5x$$

**Step 4: isolate
x-term**

$$\begin{array}{rcl} 6x - 18 & = & 5x \\ -6x & & -6x \\ \hline \end{array} \quad \begin{array}{l} \text{get the variables to one side} \\ \text{and the constants to the other} \end{array}$$

$$\begin{array}{rcl} -18 & = & -1x \\ \hline -1 & & -1 \end{array} \quad \begin{array}{l} \text{we need } x \text{ to be positive so divide} \\ \text{or multiply both sides by } (-1) \end{array}$$

**Step 5: divide to
Solve for x**

$18 = x$

Step 6: Check

$$\frac{3}{4}(18-3) = \frac{5}{8}(18)$$

replace x with 18 in the original equation.

$$\frac{3}{4}(15) = \frac{5}{4}(9)$$

$$\frac{45}{4} = \frac{45}{4}$$

The Solution is

$$\boxed{x = 18}$$

Ex. 2:

$$-2(w+3) - 3(-3w-2) = -14$$

distribute

Step 1: Remove ()

$$-2w - 6 + 9w + 6 = -14$$

Step 2: Group like terms

$$-2w + 9w = -14 + 6 - 6$$

variables on one side
constants on the other

$$7w = -14$$

combine like terms

Step 5: Divide to solve for w

$$\frac{7w}{7} = \frac{-14}{7}$$

$$\boxed{w = -2}$$

Step 6: Check

$$-2(-2+3) - 3[-3(-2)-2] = -14$$

replace w with (-2) in the original equation

$$-2(1) - 3(6-2) = -14$$

$$-2 - 3(4) = -14$$

$$-2 - 12 = -14$$

$$-14 = -14$$

The Solution is

$$\boxed{w = -2}$$