Solving Multi Step Equations

Equations with 2 or more variables

Steps to Solve:
1. Choose a letter side & a number side.
2. Simplify by collecting like terms.
3. Divide or multiply to get the variable (letter) by itself.

Examples
a) \(5x - 8 = x + 8\)
\[
5x - x = 8 + 8 \\
4x = 16 \\
\frac{4}{4} x = \frac{16}{4} \\
x = 4
\]

b) \(2x + 7 = 5x + 10 + 3\)
\[
2x + 7 = 5x + 13 \\
7 - 13 = 5x - 2x \\
-6 = \frac{3}{3} x \\
-2 = x
\]

c) \(-3 + 4m = 30 - 3m - 4m\)
\[
-3 + 4m = 30 - 7m \\
4m + 7m = 30 + 3 \\
11m = 33 \\
\frac{11}{11} m = \frac{33}{11} \\
m = 3
\]

d) \(w + 13 - 3w = 1 - 6w\)
\[
w - 3w + 6w = 1 - 13 \\
4w = -12 \\
\frac{4}{4} w = \frac{-12}{4} \\
w = -3
\]

Equations with brackets

Steps to Solve:
1. Expand all brackets by distribution property.
2. Move all variables to one side and numbers on the other. (opposite operations!)
4. Solve for the variable.

Examples
a) \(4(k - 2) = 9k + 2\)
\[
4k - 8 = 9k + 2 \\
-8 - 2 = 9k - 4k \\
-10 = 5k \\
\frac{-10}{5} = \frac{5k}{5} \\
-2 = k
\]

b) \(3g - 1 = 5(g - 2) + 11\)
\[
2g - 1 = 5g - 10 + 11 \\
-10 + 11 = 5g - 3g \\
\frac{-2}{2} = \frac{2g}{2} \\
-1 = g
\]
Solve each equation.

1) \( 4n - 2n = 4 \)  
2) \( -12 = 2 + 5v + 2v \)

3) \( 3 = x + 3 - 5x \)  
4) \( x + 3 - 3 = -6 \)

5) \( -12 = 3 - 2k - 3k \)  
6) \( -1 = -3r + 2r \)

7) \( 6 = -3(x + 2) \)  
8) \( -3(4r - 8) = -36 \)

9) \( 24 = 6(-x - 3) \)  
10) \( 75 = 3(-6n - 5) \)

11) \( -3(1 + 6r) = 14 - r \)  
12) \( 6(6v + 6) - 5 = 1 + 6v \)

13) \( -4k + 2(5k - 6) = -3k - 39 \)  
14) \( -16 + 5n = -7(-6 + 8n) + 3 \)

15) \( 10p + 9 - 11 - p = -2(2p + 4) - 3(2p - 2) \)  
16) \( -10n + 3(8 + 8n) = -6(n - 4) \)
ANSWERS

1) $4n - 2n = 4$  
   $\{2\}$

2) $-12 = 2 + 5n + 2n$  
   $\{-2\}$

3) $3 = x + 3 - 5x$  
   $\{0\}$

4) $x + 3 - 3 = -6$  
   $\{-6\}$

5) $-12 = 3 - 2k - 3k$  
   $\{3\}$

6) $-1 = -3r + 2r$  
   $\{1\}$

7) $6 = -3(x + 2)$  
   $\{-4\}$

8) $-3(4r - 8) = -36$  
   $\{5\}$

9) $24 = 6(-r - 3)$  
   $\{-7\}$

10) $75 = 3(-6n - 5)$  
    $\{-5\}$

11) $-3(1 + 6r) = 14 - r$  
    $\{-1\}$

12) $6(6v + 6) - 5 = 1 + 6v$  
    $\{-1\}$

13) $-4k + 2(5k - 6) = -3k - 39$  
    $\{-3\}$

14) $-16 + 5n = -7(-6 + 8n) + 3$  
    $\{1\}$

15) $10p + 9 - 11 - p = -2(2p + 4) - 3(2p - 2)$  
    $\{0\}$

16) $-10n + 3(8 + 8n) = -6(a - 4)$  
    $\{0\}$