

Solving Equations With Parentheses

When solving equations containing parentheses, we must remove the parentheses by using the

Distributive Property before we can solve. Removing parentheses will often give like terms which can be combined.

EXAMPLE:

$$9x - 3(2x - 1) = 15$$

Use the Distributive Property to remove the parentheses.

$$9x - 6x + 3 = 15$$

Combine like terms.

$$3x + 3 + (-3) = 15 + (-3)$$

Add the opposite of 3 to both sides.

$$3x = 12$$

Divide by 3 on both sides

$$x = 4$$

CHECK: $9(4) - 3[2(4) - 1] = 15$

$$36 - 3[8 - 1] = 15$$

$$36 - 3[7] = 15$$

$$36 - 21 = 15$$

$$15 = 15 \text{ TRUE}$$

EXAMPLE:

$$5 - 1(9 - 6x) = 2x - 2$$

$$5 - 9 + 6x = 2x - 2$$

Use the Distributive Property to remove the parentheses.

$$-4 + 6x = 2x - 2$$

Add the opposite of $2x$ to both sides and combine like terms.

$$-4 + 6x + (-2x) = -2x + 2x - 2$$

$$-4 + 4x = -2$$

Add the opposite of -4 to both sides.

$$-4 + 4 + 4x = -2 + 4$$

$$4x = 2$$

Divide by 4 on both sides

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

Some equations have parentheses inside brackets. With these problems we must start from the inside and work our way out.

EXAMPLE:

$$-3[x + 4(x + 1)] = x + 4$$

Use the Distributive Property to remove the parentheses.

$$-3[x + 4x + 4] = x + 4$$

Combine like terms inside the brackets.

$$-3[5x + 4] = x + 4$$

Use the Distributive Property to remove the brackets.

$$-15x - 12 = x + 4$$

Add the opposite of x to both sides.

$$-15x + (-x) - 12 = -x + x + 4$$

Combine like terms on both sides.

$$-16x - 12 = 4$$

Add the opposite of -12 to both sides.

$$-16x - 12 + 12 = 4 + 12$$

$$-16x = 16$$

Divide both sides by -16.

$$x = -1$$

CHECK: $-3[x + 4(x + 1)] = x + 4$

$$-3[-1 + 4(-1 + 1)] = -1 + 4$$

$$-3[-1 + 4(0)] = -1 + 4$$

$$-3[-1 + 0] = -1 + 4$$

$$-3[-1] = -1 + 4$$

$$3 = 3 \quad \text{TRUE}$$

EXERCISES: Solve and check.

1. $3[2(x + 1) - 4] = 5(x - 2) + 6$
2. $2(x - 3[2 - (x + 1)]) = 4(x - 1) + 10$
3. $4[3(x - 2) + 5] = 2(x + 7) + 3(2x - 1)$
4. $5[2x - (3 - x)] = 3(2x + 1) + 4$
5. $6[3x - (2 + x)] - 4 = 2(5x - 3) + 8$

Answer Key

1. $x = 3$
2. $x = 5$
3. $x = 3$
4. $x = 2$
5. $x = 1$