

Solving Equations

Solving Equations is a vast topic to cover and can take months to cover due to the number of different equations that we could be solving.

Today's focus will be on:

1. Linear Equations
2. Quadratic Equations

Linear Equations

Types of Equations that we will be solving:

1. One Step
2. Two Step
3. Multi Step
4. Variables on both sides

All of the above items are solved with the same end in mind:
GET THE VARIABLE ALONE!

How do we do this?

Inverse operations are used to untangle the mess of an equation that we are given.

- Opposite of Addition = Subtraction
- Opposite of Subtraction = Addition
- Opposite of Multiplication = Division
- Opposite of Division = Multiplication

One Step Linear Equations

Procedure:

1. Identify the operation being displayed in the problem.

Ex: $x + 3 = 12$ is addition

$x - 3 = 12$ is subtraction

$3x = 12$ is multiplication

$\frac{x}{3} = 12$ is division

2. Identify the opposite operation.
3. Perform the opposite operation on the constant to move it away from the variable that you are given.
4. Simplify!

Examples

Solve each of the following:

1. $x + 75 = 100$

2. $x - 5 = 92$

3. $2x = 184$

4. $\frac{x}{5} = 15$

Two Step Linear Equations

Procedure:

1. Identify the two operations being performed on the variable. This is typically a combination of one addition/subtraction and one multiplication/division. However, it could be any two operations.
2. Perform the opposite operation of the one that is NOT attached to the variable.
3. Simplify!
4. Perform the opposite operation of the one that is attached to the variable.
5. Simplify!
6. Check your answer by plugging in.
 - If both sides match, then you're correct!
 - If both sides don't match, then we have a problem!

Examples

Solve each of the following:

1. $3x + 7 = 19$

2. $10 = 7 - m$

3. $-6 = \frac{z}{4} - 3$

4. $\frac{a}{3} + 4 = 6$

Wait a minute! There's decimals?

Solve each of the following:

1. $16 - 2.4d = -8$

2. $3.2 + \frac{x}{2.5} = 4.6$

Multi Step Linear Equations

Procedure:

1. Simplify the side with multiple items:
 - Combine like terms
 - Distribute and eliminate parentheses if needed
2. Perform the opposite operation on any constant remaining.
3. Simplify
4. Perform the opposite operation on any coefficient that might still be attached to the variable.
5. Simplify
6. Check your answer to ensure both sides are equal.

Examples

Solve each of the following:

1. $p + 2p - 3 = 6$

2. $14 + 2(4g - 3) = 40$

More Examples

Solve each of the following:

$$3. \frac{1}{3}(d + 3) = 5$$

$$4. -32 = \frac{8}{7}(3w - 1)$$

Linear Equations with Variables on BOTH sides

Procedure:

1. Simplify the sides so that we have at most two terms:
 - A variable term
 - A constant
2. Perform the opposite operation on ONE of the variable expressions to get the variables on the same side.
3. Simplify
4. Perform the opposite operation on the constant to move it to the side AWAY from the variable.
5. Simplify.
6. Divide by any coefficient remaining on the variable.
7. Simplify
8. Check your answer.

NOTE: It is possible that the variable eliminates itself. If it does:
A True Statement = All real numbers
A False Statement = No Solution

Examples

Solve each of the following:

1. $24 - 3m = 5m$

2. $5z - 2 = 2(3z - 4)$

More Examples

Solve each of the following:

3. $8y - 6 = \frac{2}{3}(6y + 15)$

4. $2(3g + 2) = 0.5(12g + 8)$

Quadratic Equations

Standard form:

$$ax^2 + bx + c$$

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Procedure:

1. Move everything to one side if it is not already done.
2. Put the equation in Standard form.
You may put a zero for any term missing.
3. Identify the values of a, b, and c.
4. Plug into the formula above.
5. IF the number under the square root is a perfect square, continue!
If the number under the square root is not a perfect square, then stop!

Examples

Solve each of the following:

1. $-22x - 48 + x^2 = 0$

2. $x^2 + 15 = 16x$

More Examples

Solve each of the following:

3. $5x^2 + 16x - 6 = 3$

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