An ________________ is created by setting two algebraic expressions equal to each other. It is a statement of equality. In order for something to be an equation, there must be an “=” sign!

For example, 5x + 2 is an ____________, whereas 5x + 2 = 0 is an ________________.

When an equation involves a variable(s), we can try finding the value(s) of the variable(s) that make the equation a true statement. Finding these values is called solving the equation and any values of the variables that make the equation statement true are called solutions.

To solve a linear equation, we want to get the variable all by itself on one side so that:

\[ x = \text{number} \quad \text{or} \quad \text{number} = x \]  (either way, they are the same)

**Properties of Equality**

For all \( a, b, c \) are real numbers, if \( a = b \), then…

\[
\begin{align*}
  a + c & = b + c \\
  a - c & = b - c \\
  ac & = bc \quad \text{if } c \neq 0 \\
  \frac{a}{c} & = \frac{b}{c} \quad \text{if } c \neq 0 
\end{align*}
\]

It comes down to this: What you do to one side of the equation, you MUST do to the other!!!

**Solving a Linear Equation in 1 Variable**

GOAL: Isolate the variable (get it by itself on one side)!

1. Start with the original equation.

2. Use **properties of equality** (above) to produce simpler ________________ (equations that have exactly the same set of solutions), working towards isolating the variable.
   
   - Use the distributive property to remove any parentheses and simplify.
   - Use addition/subtraction to get all terms containing a variable on one side and all constants on the other. Simplify.
   - Use multiplication/division to isolate the variable.

3. Check the solution in the original equation.
Example 5: Solve the following equations.

a) \( x + 4 = -6 \)

b) \( -2x = 36 \)

c) \( 4x = 5x \)

d) \( -\frac{x}{4} = -30 \)

e) \( \frac{2}{5}x = 10 \)

f) \( -x = 45 \)

https://www.youtube.com/watch?v=vX8oLMdYj_s&list=PL9dj44OpeMZfqN4Kqgg7mF0AJOEN2Fzb8&index=4

Additional Examples:

\[
\frac{1}{2}v - 4 = \frac{5}{3}
\]

\[
3(z + 4) = -5(z - 9) + 23
\]

\[
2(3y - 6) = -4y + 18
\]
Application:

Translating into Algebra

When working on applications, we often have to translate words into an algebraic expression.

<table>
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<th>Addition (+)</th>
<th>Subtraction (-)</th>
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<td>Represents</td>
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Try these yourself:

Example 6: Write each of the following as an algebraic expression and simplify if possible.

a) The difference of a number and two, divided by 5.

b) The sum of 3 times a number and 10, subtracted from 9 times the same number

c) The product of a number and 15 is 30.