



# The Four Basic Rules for Solving an Equation

# The Four Basic Rules for Solving an Equation

1. Addition Property of Equality
2. Subtraction Property of Equality
3. Multiplication Property of Equality
4. Division Property of Equality

## Addition Property of Equality

If the same quantity is added to both sides of an equation, the resulting equation is equivalent to the original equation.

**Example:**  $m - 9 = 12$   $\longrightarrow$  add (9) to both sides

$$m - 9 + 9 = 12 + 9 \longrightarrow -9 + 9 = 0$$

$$\mathbf{m = 21}$$

## Subtraction Property of Equality

If the same quantity is subtracted from both sides of an equation, the resulting equation is equivalent to the original equation.

**Example:**  $g + 10 = 11 \longrightarrow$  subtract both sides by 10

$$g + 10 - 10 = 11 - 10 \longrightarrow 10 - 10 = 0$$

$$g = 1$$

## Multiplication Property of Equality

If both sides of an equation are multiplied by the same (nonzero) quantity, the resulting equation is equivalent to the original equation.

**Example:**  $\frac{\times}{2} = 12 \longrightarrow$  multiply both sides by 2

## Division Property of Equality

If both sides of an equation are divided by the same (nonzero) quantity, the resulting equation is equivalent to the original equation.

Example:  $6n = 30$   $\longrightarrow$  divide both sides by 6

$$\frac{6n}{6} = \frac{30}{6}$$
$$n = 5$$

$$\cancel{2} \left( \frac{x}{\cancel{2}} \right) = 12 \times \cancel{2}$$
$$x = 24$$

Let's try to translate and solve the following equation:

I am 9 years older than twice the age of my younger brother.  
If I were 49 years old. How old is my younger brother?

Let  $y$  be her younger brother's age.

Algebraic Equation is:  $9 + 2y = 49$

Let us solve:  $9 + 2y = 49$

$-9 + 9 + 2y = 49 - 9 \longrightarrow$  **Subtraction Property of Equality**

$\frac{2y}{2} = \frac{40}{2} \longrightarrow$  **Division Property of Equality**

$$y = 20$$

Therefore, her youngest brother is **20 years old**.