

Algebraic Properties

A.REI.1 Using algebraic properties and the properties of real numbers, justify the steps of a simple, one-solution equation. Students should justify their own steps, or if given two or more steps of an equation, explain the progression from one step to the next using properties.

What am I learning today?

How to solve and explain a 2-step equation

How will I show that I learned it?

Solve a 2-step equation explaining the property for each step

Commutative Properties: changing the order does not change the value.

Addition: $4 + 5 = 5 + 4$

Multiplication: $xy = yx$

Associative Properties: changing the grouping does not change the value.

Addition: $4 + (2 + 1) = (4 + 2) + 1$

Multiplication: $x \cdot (y \cdot z) = (x \cdot y) \cdot z$

Identity Properties: adding 0 or multiplying by 1 does not change the value.

Addition: $4 + 0 = 4$

Multiplication: $x \cdot 1 = x$

Equality Properties: doing the same operation to each side of an equation keeps it balanced.

Addition:
$$\begin{array}{r} x - 5 = 7 \\ + 5 \quad + 5 \end{array}$$

Multiplication:
$$\begin{array}{l} 6 \left(\frac{x}{6} \right) = (10) \cdot 6 \quad \left| \quad \frac{5x}{5} = \frac{25}{5} \end{array}$$

Inverse Properties: Adding the opposite results in 0 or multiplying by the reciprocal results in 1.

Addition: additive inverse
 $3 + (-3) = 0$ ✓

Multiplication: multiplicative inverse
 $\frac{1}{4} \cdot \frac{4}{1} = 1$ ✓

Multiplicative Property of 0: Multiplying any number by 0 equals 0.

Example: $3 \cdot 0 = 0$ $x \cdot 0 = 0$

Distributive Property of Multiplication over

Addition: When an expression is multiplied by a single term, each term of the expression must be multiplied by that term.

Example:

$$5(x+3) = 5x+15$$

Exponential Property of Equality: If two exponential terms are equal and both bases are equal, the exponents must be equal.

Example:

Symmetric Property: If two expressions are being compared to one another, the order of the expression on each side of the equal sign or inequality can be switched.

Example:

$$0 = x$$

$$x = 0$$

"Justifying Equations"

Each step in solving an equation can be explained as using one of your Algebraic properties

Equality
Inverse
Identity

$$5x + 7 = -3$$

a) $\underline{-7} \quad -7$

b) $\underline{5x} + \underline{0} = -10$

c) $\underline{5x} = \underline{-10}$

d) $5 \quad 5$

e) $\underline{1}x = -2$

f) $x = -2$

a) Addition Property of Equality

b) Additive Inverse

c) Additive Identity

d) Division Property of Equality

e) Multiplicative Inverse

f) Multiplicative Identity

$$12 > 3(x - 2)$$

a) $3(x - 2) < 12$

a) _____

b) $3x - 6 < 12$

b) _____

c) + 6 + 6

c) _____

d) $3x + 0 < 18$

d) _____

e) 3x < 18

e) _____

f) 3 3

f) _____

g) $x < 6$

g) _____

