

Properties of Equality

In mathematics we have certain rules or properties that allow us to use operations in certain ways.

These properties are what make solving equations possible

Associative Property of Addition

When three or more numbers are added, the sum is the same regardless of the grouping of the addends.

For example $(a + b) + c = a + (b + c)$

Associative Property of Multiplication

When three or more numbers are multiplied, the product is the same regardless of the order of the multiplicands.

For example $(a \times b) \times c = a \times (b \times c)$

Commutative Property of Addition

When two numbers are added, the sum is the same regardless of the order of the addends.

For example $a + b = b + a$

Commutative Property of Multiplication

When two numbers are multiplied together, the product is the same regardless of the order of the multiplicands.

For example $a \times b = b \times a$

Distributive Property

The sum of two numbers times a third number is equal to the sum of each addend times the third number.

For example $a \times (b + c) = a \times b + a \times c$

Identity Property of Addition

The sum of any number and zero is the original number.

For example $a + 0 = a$.

Identity Property of Multiplication

The product of any number and one is that number.

For example $a \times 1 = a$.

Additive Inverse of a Number

The additive inverse of a number, a is $-a$ so that $a + -a = 0$.

Multiplicative Inverse of a Number

The multiplicative inverse of a number, a is $1/a$

so that $a \times 1/a = 1$.

Addition Property of Zero

Adding 0 to any number leaves it unchanged.

For example $a + 0 = a$.

Multiplication Property of Zero

Multiplying any number by 0 yields 0.

For example $a \times 0 = 0$.

Property of Equality

The equals sign in an equation is like a scale: both sides, left and right, must be the same in order for the scale to stay in balance and the equation to be true.

Property of Equality for Addition

Property of Equality for Addition says that

if $a = b$, then $a + c = b + c$.

If you add the same number to both sides of an equation, the equation is still true.

Property of Equality for Subtraction

Property of Equality for Subtraction says that

if $a = b$, then $a - c = b - c$.

If you subtract the same number from both sides of an equation, the equation is still true.

Property of Equality for Multiplication

Property of Equality for Multiplication says that if $a = b$, then $a \times c = b \times c$.

If you multiply the same number to both sides of an equation, the equation is still true.

Property of Equality for Division

Property of Equality for Division says that if

$a = b$, then $a / c = b / c$.

If you divide the same number to both sides of an equation, the equation is still true.

Reflexive Property of Equality

Reflexive Property of Equality says that if $a = a$: anything is congruent to itself.

The equals sign is like a mirror, and the image it "reflects" is the same as the original.

Symmetric Property of Equality

Symmetric Property of Equality says that if $a = b$, then $b = a$.

Transitive Property of Equality

Transitive Property of Equality says that if $a = b$ and $b = c$, then $a = c$.

Substitution

You can

If $a = b$, then $b + 3 = a + 3$.

If you add the same number to both sides of an equation, the equation is still true.

For example if $a=b$, then $a+c=b+c$.



When three or more numbers are added, the sum is the same regardless of the grouping of the addends.

For example $(a+b)+c=a+(b+c)$

When two numbers are added, the sum is the same regardless of the order of the addends.

For example $a+b=b+a$



What Property is represented by the following statement: if $a = b$, then $b = a$.

What Property is illustrated by this statement: if $a = b$ and $b = c$, then $a = c$.



The product of any number and one is that number. For example $a \times 1 = a$.

