Commutative Property of Addition and Multiplication

Addition and Multiplication are commutative: switching the order of two numbers being added or multiplied does not change the result.

Examples:

$100 + 8 = 8 + 100$
$100 \times 8 = 8 \times 100$

Associative Property

Addition and multiplication are associative: the order that numbers are grouped in addition and multiplication does not affect the result.

Examples:

$(2 + 10) + 6 = 2 + (10 + 6) = 18$
$2 \times (10 \times 6) = (2 \times 10) \times 6 = 120$

Distributive Property

The distributive property of multiplication over addition: multiplication may be distributed over addition.

Examples:

$10 \times (50 + 3) = (10 \times 50) + (10 \times 3)$
$3 \times (12+99) = (3 \times 12) + (3 \times 99)$

The Zero Property of Addition

Adding 0 to a number leaves it unchanged. We call 0 the additive identity.

Example:

$88 + 0 = 88$

The Zero Property of Multiplication

Multiplying any number by 0 gives 0.

Example:

$88 \times 0 = 0$
$0 \times 1003 = 0$

The Multiplicative Identity

We call 1 the multiplicative identity. Multiplying any number by 1 leaves the number unchanged.

Example:

$88 \times 1 = 88$

Order of Operations

The order of operations for complicated calculations is as follows:

1) Perform operations within parentheses.
2) Multiply and divide, whichever comes first, from left to right.
3) Add and subtract, whichever comes first, from left to right.

Example:

$1 + 20 \times (6 + 2) \div 2 =$
$1 + 20 \times 8 \div 2 =$
$1 + 160 \div 2 =$
$1 + 80 =$
81.

Inverse

The inverse of something is that thing turned inside out or upside down. The inverse of an operation undoes the operation: division undoes multiplication.

A number's *additive inverse* is another number that you can add to the original number to get the additive identity. For example, the additive inverse of 67 is -67, because 67 + -67 = 0, the additive identity.

Similarly, if the product of two numbers is the *multiplicative identity*, the numbers are *multiplicative inverses*. Since 6 * 1/6 = 1 (the multiplicative identity), the multiplicative inverse of 6 is 1/6.

Zero does not have a multiplicative inverse, since no matter what you multiply it by, the answer is always 0, not 1.

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.

The *addition property of equality* says that if a = b, then a + c = b + c: if you add the same number to (or subtract the same number from) both sides of an equation, the equation continues to be true.

The *multiplication property of equality* says that if a = b, then a * c = b * c: if you multiply (or divide) by the same number on both sides of an equation, the equation continues to be true.

The *reflexive property of equality* just says that 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.

The *symmetric property of equality* says that if a = b, then b = a.

The *transitive property of equality* says that if a = b and b = c, then a = c