Properties of Numbers

Properties of Equality

Property	Words	Symbols	Examples
Reflexive Property	Any quantity is equal to itself	$x = x$	$5 = 5$ $4+7 = 4+7$
Symmetric Property	If one quantity equals a second then the second equals the first	If $a = b$ then $b = a$	If $2+6 = 8$ then $8 = 2+6$
Transitive Property		If $a = b$ and $b = c$ then $a = c$	If $2+3 = 4+1$ and $4+1 = 5$ then $2+3 = 5$
Substitution Property	Any quantity can be replaced for it's equal.	If $a = b$ then a can replace b anywhere	$(4+6)w$ $=$ $10w$

Addition Properties

Additive Identity	The sum of any number and zero stays the same	$a+0=a$ $0+a=a$	$5+0=5$
Additive Inverse	A number and it's opposite	$a+(-a)=0$	$3+(-3)=0$

Multiplication Properties

Multiplicative Identity	The product of a and 1 is a	$a \cdot 1 = a$ $1 \cdot a = a$	$9 \cdot 1 = 9$
Multiplicative Property of zero	The product of any number and zero is zero	$a \cdot 0 = 0$ $0 \cdot a = 0$	$5 \cdot 0 = 0$
Multiplicative Inverse	Number times reciprocal is 1	$a \cdot \frac{1}{a} = 1$ $\frac{a}{b} \cdot \frac{b}{a} = 1$	$5 \cdot \frac{1}{5} = 1$ $\frac{4}{5} \cdot \frac{5}{4} = 1$

BIG 3:

① Commutative Property

- order
- The order in which you add or multiply does not change the answer.
- $a+b+c = c+b+a$ $\quad ab = ba$

② Associative Property

- grouping
- The way we group numbers when adding or multiplying does not change the answer
- $(a+b)+c = a+(b+c)$

$(a+b)+c = (b+a)+c$ → Commutative

③ Distributive Property

* $a(b+c) = ab+ac$
* $(x+y)z = xz+yz$
* $2(x-5) = 2x-10$