Chart of Properties

Property	Description	Algebra	Example
Commutative Property of Addition	the order in which you add two numbers doesn't matter	a + b = b + a	$x + 5 = 5 + x$
Commutative Property of Multiplication	the order in which you multiply two numbers doesn't matter	a · b = b · a	$(x)(3) = 3x$
Associative Property of Addition	the grouping of three numbers in a sum doesn't matter	(a + b) + c = a + (b + c)	$(2x + 4) + 1 = 2x + (4 + 1)$
Associative Property of Multiplication	the grouping of three numbers in a product doesn't matter	(a · b) · c = a · (b · c)	$(2x)y = 2(xy)$
Identity Property of Addition	the sum of a number and 0 is the number	a + 0 = a	$-6 + 0 = -6$
Identity Property of Multiplication	the product of a number and 1 is the number	a · 1 = a	$1\left(\frac{3}{4}\right) = \frac{3}{4}$
Inverse Property of Addition	the sum of a number and its opposite is zero	a + (-a) = 0	$12 + (-12) = 0$
Inverse Property of Multiplication	the product of a non-zero number and its multiplicative inverse is 1	$a \cdot \frac{1}{a} = 1$	$3 \cdot \frac{1}{3} = 1$
Multiplicative Property of 0	the product of a number and 0 is 0	a · 0 = 0	$15 \cdot 0 = 0$
Addition Property of Equality	any number added to one side of an equation must also be added to the other side	$a = b$ $a + c = b + c$	$x - 4 = 16$ $x - 4 + 4 = 16 + 4$
Subtraction Property of Equality	any number subtracted from one side of an equation must also be subtracted from the other	$a = b$ $a - c = b - c$	$x + 17 = -2$ $x + 17 - 17 = -2 - 17$
Multiplication Property of Equality	any number multiplied on one side of the equation must also be multiplied on the other	$a = b$ $a \cdot c = b \cdot c$	$\frac{x}{5} = 12$ $\left(\frac{x}{5}\right)(5) = (12)(5)$
Division Property of Equality	any number divided from one side of the equation must also be divided from the other	$a = b$ $\frac{a}{c} = \frac{b}{c}$	$-3x = 57$ $\frac{-3x}{-3} = \frac{57}{-3}$
Transitive Property of Equality		If a = b and b = c, then a = c	If $x = y - 3$ and $y - 3 = 8$, then $x = 8$.
Reflexive Property	a number equals itself	a = a	12 = 12
Symmetric Property		If a = b, then b = a	

Substitution Property		If a = b, then a may be replaced by b	
Distributive Property	used to find the product of a sum or a difference	a(b + c) = ab + ac (b + c)a = ba + ca a(b – c) = ab – ac (b – c)a = ba - ca	$-2x(x-4) = -2x^2 + 8x$
Zero Product Property	If the product of two terms or expression is 0, then either of the terms or expressions must equal 0.	If $(a)(b) = 0$, then $a = 0$ or $b = 0$.	If $(x-3)(x+7) = 0$, then $x - 3 = 0$ or $x + 7 = 0$.