

Commutative Property of addition

Add in any order

$$6+4 \text{ same } 4+6$$

$$a+b \text{ same } b+a$$

Commutative Property of Multiplication

multiply in any order

$8 \cdot 4$ same $4 \cdot 8$

ab same ba

Associative Properties

Change grouping = same sum or product

$$(3+7)+2 \quad \text{same as} \quad 3+(7+2)$$

$(a+b)+c$ $a+(b+c)$

$$(7 \cdot 3) \cdot 2 \quad \text{same as} \quad 7 \cdot (3 \cdot 2)$$

$(a \cdot b) \cdot c$ $a \cdot (b \cdot c)$

Additive Identity

anything
plus
zero

=

that #

$$a + 0 = a$$

Multiplicative Identity

anything
times

one

=
that #

$$a \cdot 1 = a$$

Distributive Property
of Multiplication
over addition

$$\begin{array}{r} 3(2+6) \\ 3(8) \\ 24 \end{array} \quad \begin{array}{r} (3 \cdot 2) + (3 \cdot 6) \\ 6 + 18 \\ 24 \end{array}$$

$$3(a+12)$$
$$3a + 36$$

$$4a(b+b)$$
$$24a + 4ab$$

Distributive Property of Multiplication over Subtraction

$$6(7-4)$$

$$6(3)$$

$$18$$

$$6(7-4)$$

$$42 - 24$$

$$18$$

$$6(a-12)$$

$$6a - 72$$

$$a - a = 0$$

$$4 - 4 = 0$$

$$7 - 7 = 0$$

$$-a + a = 0$$

$$-3 + 3 = 0$$

$$-5 + 5 = 0$$

Property of Equality

you add or subtract from both sides of an equation

$$4-2 = 4-2$$

$$4-2+3 = 4-2+3$$

$$a-2 = a-2$$

Inverse Operation

opposite operation

the opposite of addition
is subtraction

$$p + \cancel{6} = 9.$$

$$-6 \quad -6$$
$$p = 3$$

$$3 + 6 = 9 \quad \checkmark$$

$$a + \cancel{22} = 28$$
$$-22 \quad -22$$

$$a = 6$$

$$b - \cancel{12} = 59$$
$$+12 \quad +12$$

$$b = 71$$
$$4 - 3 = 1$$
$$x - 3 = -2$$
$$+3 \quad +3$$

$$x = 4 \quad \checkmark$$