Properties

1. **Commutative Property of**
   Addition:
   The order of adding doesn't change the sum.
   1 + 2 = 2 + 1 **6 + 4 = 4 + 6**
   Multiplication:
   The order of multiplying doesn't change the product.
   3 x 5 = 5 x 3 **7 x 1 = 1 x 7**

2. **Associative Property of**
   Addition:
   Grouping numbers differently doesn't change the sum.
   (3 + 2) + 1 = 3 + (2 + 1) **(4 + 2) + 5 = 4 + (2 + 5)**
   Multiplication:
   Grouping numbers does not change the product.
   (2 x 3) x 4 = 2 x (3 x 4) **x(yz) = (xy)z**

3. **Distributive Property:**
   Distribute the number outside to both numbers inside the parenthesis by multiplying.
   2(3 + 4) = 2(3) + 2(4) **5(6 – 2) = 5(6) – 5(2)**

4. **Identity Property of**
   Addition:
   Adding zero to a number does not change the value. (It keeps its identity.)
   3 + 0 = 3 **0 + (-7) = -7**
   Multiplication:
   Multiplying a number by 1 does not change the value. (It keeps its identity.)
   7 x 1 = 7 **1 x 5 = 5**

5. **Zero Product Property:**
   Zero multiplied by any number equals zero.
   4 x 0 = 0 **0 x 9 = 0**

6. **Inverse Property of**
   Addition:
   A number added to its opposite equals zero.
   3 + (-3) = 0 **-5 + 5 = 0**
   Multiplication:
   Multiplying a number by its reciprocal equals to one.
   (A reciprocal is a fraction flipped upside down. Put whole numbers over 1.)
   $\frac{7}{8} \times \frac{8}{7} = 1$ $\frac{5}{1} \times \frac{1}{5} = 1$

Examples:

Finding the sum mentally:

Re-arrange numbers so that addition is easier to do in your head.

16 + 9 + 4

16 + 4 + 9
20 + 9
29

Rewrite using a commutative property:

Switch the order.

16 + 9

9 + 16

Rewrite using an associative property. Then simplify:

Regroup like terms that can be added or multiplied together.

(x + 20) + 5

x + (20 + 5)
x + 25

2(5x)

(2 • 5) x
10x

Restate using the Distributive Property. Do not simplify:

3 (2 + x)

3 • 2 + 3 • x
6 + 3x

3x + 6y

3(x + 2y)

Simplify each expression:

10x + 3 + 2x

10x + 2x +3
12x + 3

2(x + 4y) + 3(2x + y)

2x + 8y + 6x + 3y
2x + 6x + 8y + 3y
8x + 11y