



Lesson: Identity Property, Commutative Property, Associative Property, Distributive Property

Sixth Grade Objective: 5.01 Simplify algebraic expressions and verify the results using the basic properties of rational numbers.

- a) Identity
- b) Commutative
- c) Associative
- d) Distributive
- e) Order of operations

Lesson

There are certain rules or properties of math that are always true. The **Commutative Properties** of addition and multiplication state that the order in which numbers are added or multiplied does not change the result.

$$\begin{array}{l} x + y = y + x \quad \text{and} \quad x \cdot y = y \cdot x \\ 4 + 3 = 7 \qquad \qquad 4 \cdot 3 = 12 \\ 3 + 4 = 7 \qquad \qquad 3 \cdot 4 = 12 \end{array}$$

The **Associative Properties** of addition and multiplication state that the way in which addends or factors are grouped does not change the result

$$\begin{array}{l} (x + y) + z = x + (y + z) \quad \text{and} \quad (x \cdot y) \cdot z = x \cdot (y \cdot z) \\ (4 + 3) + 8 = 4 + (3 + 8) \qquad \qquad (4 \cdot 3) \cdot 8 = 4 \cdot (3 \cdot 8) \\ 7 + 8 \qquad \qquad 4 + 11 \qquad \qquad 12 \cdot 8 \qquad \qquad 4 \cdot 24 \\ 15 \qquad \qquad 15 \qquad \qquad 96 \qquad \qquad 96 \end{array}$$

The **Identity Property of Addition** states that the sum of an addend and 0 is the addend.
 $11 + 0 = 11$

The **Identity Property of Multiplication** states that the products of a factor and 1 is that factor.

$$23 \cdot 1 = 23$$

The **Distributive Property** combines the operations of addition and multiplication.

$$\begin{array}{l} x \cdot (y + z) \qquad \qquad = \qquad \qquad (x \cdot y) + (x \cdot z) \\ 4 \cdot (3 + 8) \qquad \qquad (4 \cdot 3) + (4 \cdot 8) \\ 4 \cdot 11 \qquad \qquad \qquad 12 + 32 \\ 44 \qquad \qquad \qquad \qquad 44 \end{array}$$

Try these on your own! Name the property shown by each statement.

Example:

$$(5 + 7) + 3 = 5 + (3 + 7) \text{ Associative Property of Addition}$$

1. $7 \cdot 3 = 3 \cdot 7$ _____

2. $(4 \cdot 7) \cdot 2 = 4 \cdot (7 \cdot 2)$ _____

3. $8 + 0 = 8$ _____

Check your answers

1. Commutative Property of Multiplication
2. Associative Property of Multiplication
3. Identity Property of Addition

Quiz Yourself

Rewrite each expression using the property indicated.

Example:

$$\text{Distributive Property; } 2 \cdot (6 + 4) = \underline{(2 \cdot 6) + (2 \cdot 4)}$$

1. Commutative; $8 \cdot 12 =$ _____

2. Associative; $5 \cdot (6 \cdot 2) =$ _____

3. Identity; $123 + 0 =$ _____

Check Your Answers

1. $12 \cdot 8$

2. $(5 \cdot 6) \cdot 2 =$

3. 123