



Commutative, Distributive, and Associative properties

Commutative property: For multiplication: $x \cdot y = y \cdot x$ Example 1: $7 \cdot 9 = 9 \cdot 7$ For addition: x + y = y + xExample 2: 8 + 2 = 2 + 8Notice that numbers don't commute under the operation of subtraction:

 $4-3\neq 3-4$

Distributive property: The product of a number and a sum is equal to the sum of the individual products of addends and the number.

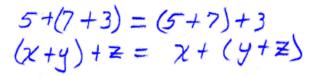
Example 3:

Example 4:

$$a(b \neq c) = ab + ac$$

Associative property: The addition or multiplication of a several numbers is the same regardless of how the numbers are grouped. The associative property will always involve 3 or more numbers. The parenthesis groups the terms that are considered one unit.

Associative property of **addition**: **Example 5**:



Associative property of **multiplication**: **Example 6**:

 $(4.7) \cdot 3 = 4 \cdot (7.3)$ $a \cdot (b \cdot c) = (a \cdot b) \cdot c$

Example 7: Name the properties illustrated by these equations:

8x + 2y = 2y + 8x	Commutative property of addition
7 + (5 + 9) = (7 + 5) + 9	Associative property of addition
4 + 19 = 19 + 4	Commutative property of addition
$5(8+3) = 5 \cdot 8 + 5 \cdot 3$	Dístríbutíve property
(x + y) + z = x + (y + z)	Associative property of addition
(a+b)x = ax + bx	Dístríbutíve property
3x(2y) = (2y)3x	Commutative property of multiplication
$5 \cdot (9 \cdot 3) = (5 \cdot 9) \cdot 3$	Associative property of multiplication

Assignment: Name the properties illustrated by these equations:

1. $11 \cdot 4 = 4 \cdot 11$

Commutative property of addition

2. 127(x + y + z) = 127x + 127y + 127z

Distributive property

3. 1 + (2 + 3 + 4) = (1 + 2 + 3) + 4

Associative property of addition

4. $3 \cdot 5 + 8 \cdot 5 + 4 \cdot 5 = (3 + 8 + 4)5$

Distributive property

5. f + g = g + f

Commutative property of addition

6. $\mathbf{p} \cdot \mathbf{q} = \mathbf{q} \cdot \mathbf{p}$

Commutative property of multiplication

7. $\mathbf{m} \cdot (\mathbf{n} \cdot \mathbf{p}) \cdot \mathbf{q} = \mathbf{m} \cdot \mathbf{n} \cdot (\mathbf{p} \cdot \mathbf{q})$

Associative property of multiplication

8. $\mathbf{a} \cdot \mathbf{b} \cdot \mathbf{c} = \mathbf{b} \cdot \mathbf{a} \cdot \mathbf{c}$

Commutative property of multiplication

9. $115 \cdot (59 \cdot 19) = (115 \cdot 59) \cdot 19$

Associative property of multiplication

10. (47 - 11)x = 47x - 11x

Distributive property

*11. $(76 - x) \cdot (a + b) = (a + b) \cdot (76 - x)$

Commutative property of multiplication

*12. (76 - x) + (a + b) = (a + b) + (76 - x)

Commutative property of addition