

Enrichment Topic A



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: $x + y = y + x$

Example 2:

$$8 + 2 = 2 + 8$$

Notice 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:

$$3(5 + 11) = 3 \cdot 5 + 3 \cdot 11$$

Example 4:

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

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:

$$5 + (7 + 3) = (5 + 7) + 3$$

$$(x + y) + z = x + (y + z)$$

Associative property of **multiplication**:

Example 6:

$$(4 \cdot 7) \cdot 3 = 4 \cdot (7 \cdot 3)$$

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

Example 7: Name the properties illustrated by these equations:

| | |
|---|---|
| $8x + 2y = 2y + 8x$ | <i>Commutative property of addition</i> |
| $7 + (5 + 9) = (7 + 5) + 9$ | <i>Associative property of addition</i> |
| $4 + 19 = 19 + 4$ | <i>Commutative property of addition</i> |
| $5(8 + 3) = 5 \cdot 8 + 5 \cdot 3$ | <i>Distributive property</i> |
| $(x + y) + z = x + (y + z)$ | <i>Associative property of addition</i> |
| $(a + b)x = ax + bx$ | <i>Distributive property</i> |
| $3x(2y) = (2y)3x$ | <i>Commutative property of multiplication</i> |
| $5 \cdot (9 \cdot 3) = (5 \cdot 9) \cdot 3$ | <i>Associative property of multiplication</i> |

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. $p \cdot q = q \cdot p$

Commutative property of multiplication

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

Associative property of multiplication

$$8. a \cdot b \cdot c = b \cdot a \cdot c$$

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