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:

$8x + 2y = 2y + 8x$	*Commutative property of addition*
$7 + (5 + 9) = (7 + 5) + 9$	*Associative property of addition*
$4 + 19 = 19 + 4$	*Commutative property of addition*
$5(8 + 3) = 5 \cdot 8 + 5 \cdot 3$	*Distributive property*
$(x + y) + z = x + (y + z)$	*Associative property of addition*
$(a + b)x = ax + bx$	*Distributive 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. $11 \cdot 4 = 4 \cdot 11$

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

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

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

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5. $\mathrm{f} + \mathrm{g} = \mathrm{g} + \mathrm{f}$

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

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

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

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

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

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

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