Properties of Multiplication and Addition

Objective 1 Understand the Associative Properties

The Associative Property

For addition, this property states that:
$$(a+b)+c = a+(b+c)$$
$$(3+4)+6 = 3+(4+6)$$

For multiplication, this property states that:
$$(a \cdot b) \cdot c = a \cdot (b \cdot c)$$
$$(7 \cdot 5) \cdot 2 = 7 \cdot (5 \cdot 2)$$

The associative property can be helpful when performing basic arithmetic calculations. Notice how the calculations below are somewhat simplified by applying the associative property.

$$(35+17)+3$$
$$35+(17+3)$$
$$35+20$$
$$55$$

$$(13 \cdot 5) \cdot 2$$
$$13 \cdot (5 \cdot 2)$$
$$13 \cdot 10$$
$$130$$

Objective 2 ## Understand the Commutative Properties

The Commutative Property

For addition, this property states that:

$$a + b = b + a$$

$$3 + 7 = 7 + 3$$

For multiplication, this property states that:

$$a \cdot b = b \cdot a$$

$$5 \cdot 8 = 8 \cdot 5$$

The associative and commutative properties for addition, provides us the ability to add numbers in any order. Therefore, if all our numbers are being added, we can rearrange them in order we see fit! We do not have to work left to right in these cases!

Suppose we want to calculate $7 + 8 + 3 + 2$. We can rearrange the problem to be

$$7 + 3 + 8 + 2$$

We can now simplify this problem to

$$10 + 10$$

$$20$$

Suppose we want to calculate $15+23+5+17$. We can rearrange the problem to be

$$15+5+23+17$$

We can now simplify this problem to

$$20+40$$

$$60$$

The associative and commutative properties for multiplication, provides us the ability to multiply numbers in any order. Therefore, if all our numbers are being multiplied, we can rearrange them in order we see fit! We do not have to work left to right in these cases either!

Suppose we want to calculate $12 \cdot 2 \cdot 5 \cdot 5$. We can rearrange the problem to be

$$12 \cdot 5 \cdot 2 \cdot 5$$

We can now simplify this problem to

$$60 \cdot 10$$

$$600$$

Answer the following homework questions.

In Exercises 1 – 9, perform each addition problem. Apply the associative and commutative properties when performing the calculations. Try to get the answer mentally!

1) $9 + 4 + 1$ 4) $23 + 19 + 7$ 7) $11 + 42 + 9 + 8$

2) $8 + 9 + 2$ 5) $96 + 58 + 4$ 8) $34 + 25 + 4 + 6$

3) $5 + 17 + 5$ 6) $14 + 39 + 6$ 9) $27 + 17 + 4 + 3$

In Exercises 10 – 18, perform each multiplication problem. Apply the associative and commutative properties when performing the calculations. Try to get the answer mentally!

10) $9 \cdot 2 \cdot 5$ 13) $9 \cdot 10 \cdot 2$ 16) $7 \cdot 5 \cdot 8 \cdot 2$

11) $2 \cdot 17 \cdot 5$ 14) $10 \cdot 12 \cdot 5$ 17) $2 \cdot 6 \cdot 3 \cdot 5$

12) $5 \cdot 38 \cdot 2$ 15) $10 \cdot 11 \cdot 9$ 18) $12 \cdot 2 \cdot 5 \cdot 11$