Properties of Real Numbers

The Commutative Property:

The **Commutative Property of Addition** states that if everything is being added, you can **add in ANY order.**

$$3 + 7 = 7 + 3$$

The **Commutative Property of Multiplication** states that if everything is being multiplied, you can **multiply in ANY order.**

$$3 \cdot 7 = 7 \cdot 3$$

The Associative Property:

The **Associative Property** states that if everything is being **either** added or multiplied, you can add or multiply by grouping in **ANY order.**

$$(4 + 3) + 2 = 4 + (3 + 2)$$
$$4 \cdot (3 \cdot 2) = (4 \cdot 3) \cdot 2$$

The use of these two properties can make simplifying expressions easier.

Evaluate:

$$4 - 7 + 6 - 9 - 3 + 8 - 1 + 2 + 5$$

We want to rewrite this expression so that everything is being added, then we can use the **Commutative Property of Addition.**

$$4 + (-7) + 6 + (-9) + (-3) + 8 + (-1) + 2 + 5$$

Now that everything is being added, we can **add in any order.**

What numbers seem to "go together"?

$$4 + (-7) + 6 + (-9) + (-3) + 8 + (-1) + 2 + 5$$

$$= 10 + (-10) + (-10) + 10 + 5$$

$$= 0 + 0 + 5$$

$$= \boxed{5}$$

The Identity Properties:

Name each property:

$5 + 0 =$ _____   _____

$0 + 5 =$ _____   _____

$5 \cdot 1 =$ _____   _____

$1 \cdot 5 =$ _____   _____

The Inverse Properties:

Name each property:

$7 + (-7) =$ _____   _____

$(-7) + 7 =$ _____   _____

$\dfrac{3}{4} \cdot \dfrac{4}{3} =$ _____   _____

$-\dfrac{2}{7} \cdot \left(-\dfrac{7}{2}\right) =$ ____   _____

The Distributive Property:

Example 2:

Evaluate:

$$4(7 + x) =$$

$$= 4(7) + 4(x)$$

$$= \boxed{28 + 4x}$$

Example 3:

Evaluate:

$$-6(5 - 2x) =$$

$$= -6(\quad) - (-6)(\quad)$$

$$= (\quad) - (\quad)$$

$$= \boxed{-30 + 12x}$$

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1. Evaluate:

$$-7 + 4 + 5 - 3 + 9 + 6 + 5$$

2. Evaluate:

$$\frac{6}{7} \cdot \frac{7}{6} =$$

3. Evaluate:

$$\left(-\frac{4}{31}\right) \cdot \left(-\frac{31}{4}\right) =$$

4. What number do you multiply by $-\dfrac{2}{3}$ to get 1 ?

5. Simplify:

$$-7(x - 3)$$