

Pre-Algebra

Essential Question: What are the properties of real numbers?

Do Now: Evaluate each numerical expression using the order of operations and answer the questions that follow.

A. $2 \times 3 + 9 \times 2$

B. $2(3 + 9)$

Are the numerical expressions equivalent? How do you know?

Properties of Real Numbers

Property	Definition	Addition	Multiplication
Commutative	Changing the order of numbers will not change the result.	$A + B = B + A$	$A \cdot B = B \cdot A$
Associative	Changing the grouping symbols will not change the result.	$(A + B) + C = A + (B + C)$	$(A \cdot B) \cdot C = A \cdot (B \cdot C)$
Identity	Any number plus 0 is equal to itself. Any number times 1 is equal to itself.	$A + 0 = A$	$A \cdot 1 = A$
Inverse	For each real number (except 0), there exists an <u>opposite number</u> (additive inverse) and a <u>reciprocal</u> (multiplicative inverse).	$A + (-A) = 0$	$A \cdot \frac{1}{A} = 1$
Distributive	Multiplication can be distributed over addition or subtraction. Combines 2 operations.	$A(B + C) = AB + AC$ $A(B - C) = AB - AC$	
Zero Product	Any number times 0 is always equal to zero.	$A \cdot 0 = 0$	

Name the property shown by each statement. *Remember to use the full name of the property.*

Ex: $5 + 4 = 4 + 5$ is an example of the Commutative Property of Addition

Statement	Property
$-5 + 0 = -5$	
$6(4 + 2) = 6(4) + 6(2)$	
$\sqrt{10} + (-\sqrt{10}) = 0$	
$-3(7) = 7(-3)$	
$(2 + 10) + 7 = 2 + (10 + 7)$	
$\frac{1}{4} \cdot 4 = 1$	
$\frac{1}{2} \cdot 1 = \frac{1}{2}$	

It's Your Turn Now

1. Which statement below represents the *zero product property*?

- A. $64 \times 1 = 64$ B. $12.8 + 0 = 12.8$ C. $-4 + 4 = 0$ D. $0 \times 32 = 0$

2. Which numerical expression is the same as $(5 \times 3) \times 7$?

- A. $5 \times (3 + 7)$ B. $5 \times (3 \times 7)$ C. $5 + (3 \times 7)$ D. $(5 + 3) \times 7$

3. John says that $\frac{2}{5} \times \frac{3}{3} = \frac{6}{15}$ is an example of the *identity property of multiplication*. Do you agree or disagree? Explain your reasoning.

TAKE AWAY: Properties of real numbers help us prove *equivalence* among numerical and algebraic expressions.
Important Vocabulary!

Additive Inverse = _____

Multiplicative Inverse = _____