Algebraic Properties of Addition and Multiplication

Name _____

Date _____ Period _____

Commutative Property

Addition	Multiplication
$a + b = b + a$	$a{\cdot}b = b{\cdot}a$

Order does not matter over addition or multiplication

$5 + 7$	$5 \cdot 7$
$x + 2$	$x \cdot 2$

Associative Property

Addition	Multiplication
$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$

Grouping does not matter over addition or multiplication

$(2 + 5) + 7$	$(3{\cdot}2)4$
$(x + 9) + y$	$(5{\cdot}x)y$

Identity Property

Addition

$$a + 0 = a$$

Adding 0 to any number preserves the identity of that number

Therefore, 0 is called the additive identity

$$5 + 0 = 5$$

Multiplication

$$a \cdot 1 = a$$

Multiplying any number by 1 preserves the identity of that number

Therefore, 1 is called the multiplicative identity

$$5 \cdot 1 = 5$$

Inverse Property

Addition

$$a + (-a) = 0$$

The sum of any number and its opposite is equal to 0, the additive identity

Since $5 + (-5) = 0$;

-5 is the additive inverse of 5

-a is the additive inverse of a

Multiplication

$$a \cdot \frac{1}{a} = 1$$

The product of any number and its reciprocal is equal to 1, the multiplicative identity

Since $5 \cdot \frac{1}{5} = 1$;

$\frac{1}{5}$ is the multiplicative inverse of 5

$\frac{1}{a}$ is the multiplicative inverse of a

Distributive Property

Addition	Multiplication

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

Distribute the term outside the parentheses to every term inside the parentheses

$5(x + 4)$	$2(x^2 + 7x - 4)$

State the algebraic property that is illustrated in the following statements

Addition	Multiplication

$$17 + 0 = 17$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$4 \cdot 6 = 6 \cdot 4$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$(x + 4) + 5 = x + (4 + 5)$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$7 \cdot \frac{1}{7} = 1$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$3(2x^2 - x - 8) = 6x^2 - 3x - 24$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$12 \cdot 1 = 12$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$9 + (-9) = 0$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$(x \cdot 2) \cdot 3 = x \cdot (2 \cdot 3)$$

State the algebraic property that is illustrated in the following statements

Addition   Multiplication

$$3 + 10 = 10 + 3$$

Commutative Property

Order does not matter

Associative Property

Grouping does not matter

Identity Property

Preserving the identity

Inverse Property

Creating the identity

Distributive Property

Distributing outside term to all terms inside parentheses