Number Sense (Part 2 - Properties of real numbers)

In this section we give names to properties of real numbers with which we are already familiar. Throughout this section, the variables a, b, and c represent real numbers.

Number properties of real numbers:

A number property states a relationship between numbers and expressions.

Commutative Property

The commutative properties of addition and multiplication state that the order in which numbers are added or multiplied does not matter:

$$a + b = b + a \ (addition) \qquad \text{and} \quad a \bullet b = b \bullet a \ (multiplication)$$

Associative Property

The Associative properties of addition and multiplication state that the way in which numbers are grouped when more than two numbers are added or multiplied does not matter:

$$(a + b) + c = a + (b + c) \ (addition) \quad \text{and} \quad (a \bullet b) \bullet c = a \bullet (b \bullet c) \ (mulitplicaiton)$$

Distributive Property

The distributive property relates multiplication to addition or subtraction. The property states that everything inside the parentheses is multiplied by whatever is outside the parentheses.

$$a(b + c) = ab + ac \ (addition) \qquad \text{or} \qquad a(b - c) = ab - ac \ (subtraction)$$

Identity Property

Identity properties show what happens when you add zero to a number or multiply a number by one. The identity property of additions states that zero added to a number is equal to that same number. The identity property of multiplication states that a number multiplied by one is equal to that same number.

$$a + 0 = a \ (addition) \quad \text{and} \quad a \bullet 1 = a \ (mulitplicaiton)$$

Inverse Property

Inverse properties show what happens when you add a number's opposite to that number or multiply a number by its reciprocal. The inverse property of addition

states that a number added to its opposite is equal to zero. The inverse property of multiplication states that a number multiplied by its reciprocal is equal to one.

$$a + (-a) = 0 \,(addition) \qquad \text{and} \quad \frac{a}{b} \bullet \frac{b}{a} = 1 \,(mulitplication)$$

Closure property

Closure properties state that when two elements of a set are combined, the result is also in the set. The closure property of addition states that for any two real numbers, the sum of those numbers is a unique real number. The closure property of multiplication states that for any two real numbers, the product of those numbers is a unique real number.

If a and b are real numbers then, $a + b$ *is a unique real #* (*addition*)

and

If a and b are real numbers than, $a \bullet b$ *is a unique real #* (*mulitplication*)

Fill in the missing parts to the following chart:

Properties	Addition	Multiplication
		$a \bullet b = b \bullet a$
Associative		
	$a(b + c) = ab + ac$	
		$a \bullet 1 = a$
	$a + (-a) = 0$	
Closure		