Name: Date: Period:

Properties of Real Numbers

1. **Commutative Property of Addition**: $a + b = b + a$
   You can add numbers of a sum in any order.

2. **Commutative Property of Multiplication**: $a\,(b) = b\,(a)$
   You can multiply numbers of a product in any order.

3. **Associative Property of Addition**: $(a + b) + c = a + (b + c)$
   Changing the grouping of numbers will not change the sum.

4. **Associative Property of Multiplication**: $a\,(bc) = (ab)\,c$
   Changing the grouping of numbers will not change the product.

5. Zero is the **Additive Identity**: $a + 0 = a$ $\quad 0 + a = a$
   When zero is added to any number, the result is the number itself.

6. Every number, a, has an **Additive Inverse**, -a. $a + -a = 0$
   When you add a number and its opposite, the result it zero.

7. One is the **Multiplicative Identity**: $a * 1 = a$ $\quad 1 * a = a$
   When any number is multiplied by one, the result is the number itself.

8. Every number, a, that is not zero has a **Multiplicative Inverse** (reciprocal), $\frac{1}{a}$. $\quad \frac{a}{1} \bullet \frac{1}{a} = 1$
   When you multiply a number and its reciprocal, the result is one.

9. **Distributive Property of Multiplication**: $a\,(b + c) = a(b) + a(c)$
   When the number outside the parenthesis is shared with EACH of the numbers inside the parenthesis.

10. **Closure**:
    You are given a set of numbers to start. If when you perform the indicated operation(s), your answer is a # in the set you started with, you have closure. If not, the set is not closed under that operation.
    Ex: Given {1, 2, 3, 4, 5, …}
    Determine if the set is closed under addition, subtraction, multiplication and division.
    Addition? Add any two #s in the set. Do you always get another # in the given set? If yes, the set is closed under addition. If no, the set is NOT closed under addition.

    Repeat the same question for other operations to determine closure.