

Properties of Real Numbers Guide Notes

PROPERTIES OF REAL NUMBERS

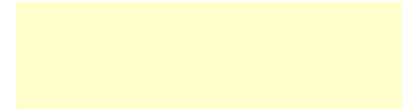
Let a , b , and c be any real numbers

1. IDENTITY PROPERTIES

A. Additive Identity

The sum of any number and 0 is equal to the number. Thus, 0 is called the **additive identity**.

For any number a , the sum of a and 0 is a .



B. Multiplicative Identity

The product of any number and 1 is equal to the number. Thus, 1 is called the **multiplicative identity**.

For any number a , the product of a and 1 is a .

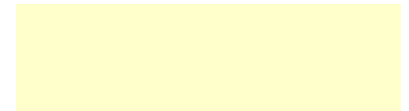


2. INVERSE PROPERTIES

A. Additive Inverse

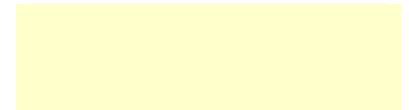
The sum of any number and its opposite number (its negation) is equal to 0 . Thus, 0 is called the **additive inverse**.

For any number a , the sum of a and $-a$ is 0 .



B. Multiplicative Property of Zero

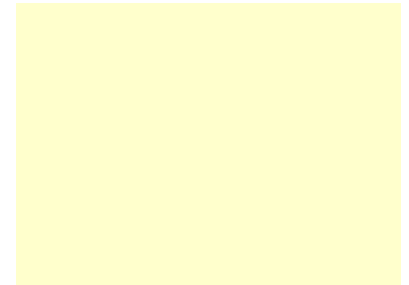
For any number a , the product of a and 0 is 0 .



C. Multiplicative Inverse

The product of any number and its reciprocal is equal to 1 . Thus, the number's reciprocal is called the **multiplicative inverse**.

For any number a , the product of a and its reciprocal $\frac{1}{a}$ is 1 .



For any numbers $\frac{a}{b}$ where $b \neq 0$, the product of $\frac{a}{b}$ and its reciprocal $\frac{b}{a}$ is 1 .

Properties of Real Numbers Guide Notes

Sample Problem 1: Name the property in each equation. Then find the value of x .

a. $24 \cdot x = 24$

b. $x + 0 = 51$

c. $x \cdot 6 = 1$

d. $x + 19 = 0$

e. $x \cdot 7 = 0$

f. $\frac{3}{5} \cdot x = 1$

3. EQUALITY PROPERTIES

A. Reflexive

Any quantity is equal to itself.

For any number a , $a = a$.

B. Symmetric

If one quantity equals a second quantity, then the second quantity equals the first quantity.

For any numbers a and b , if $a = b$ then $b = a$.

C. Transitive

If one quantity equals a second quantity and the second quantity equals a third quantity, then the first quantity equals the third quantity.

For any numbers a , b , and c , if $a = b$ and $b = c$, then $a = c$.

D. Substitution

A quantity may be substituted for its equal in any expression.

If $a = b$, then a may be replaced by b in any expression.

Properties of Real Numbers Guide Notes

Sample Problem 2: Evaluate $x(xy - 5) + y \cdot \frac{1}{y}$, if $x = 2$ and $y = 3$. Name the property of equality used in each step.

4. COMMUTATIVE PROPERTIES

A. Addition

The order in which two numbers are added does not change their sum.

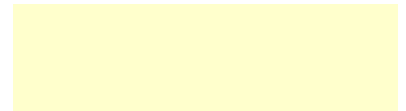
For any numbers a and b , $a + b$ is equal to $b + a$.



B. Multiplication

The order in which two numbers are multiplied does not change their product.

For any numbers a and b , $a \cdot b$ is equal to $b \cdot a$.



5. ASSOCIATIVE PROPERTIES

A. Addition

The way three or more numbers are grouped when adding does not change their sum.

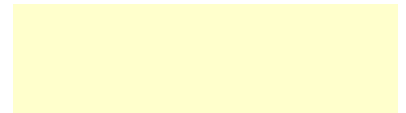
For any numbers a , b , and c , $(a + b) + c$ is equal to $a + (b + c)$.



B. Multiplication

The way three or more numbers are grouped when multiplying does not change their product.

For any numbers a , b , and c , $(a \cdot b) \cdot c$ is equal to $a \cdot (b \cdot c)$.



Sample Problem 3: Simplify variable expressions. Show all possible answers.

- $6 + (x + 3)$
- $(1 + x) + 2$
- $5 \cdot 7x$
- $(x + 4) + 8$
- $(6)(3x)$