

Algebraic Properties

Everything that we do in algebra will be based on certain rules. We call these rules properties of the real numbers. In this section we consider those properties that we will use be using.

Properties of Equality

The following properties are true for any numbers a , b , and c .

Reflexive Property: $a = a$

Symmetric Property: If $a = b$ then $b = a$.

Transitive Property: If $a = b$, and $b = c$, then $a = c$.

The following properties are true for any number a , b , and c .		
	Addition properties	Multiplication properties
Commutative:	$a + b = b + a$	$ab = ba$
Associative:	$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$
Identity:	Additive identity property $a + 0 = 0 + a = a$	Multiplicative identity property $a \cdot 1 = 1 \cdot a = a$
Zero:		Multiplicative property of Zero $a \cdot 0 = 0 \cdot a = 0$
Distributive:	$a(b + c) = ab + ac$ and $(b + c)a = ba + ca$	
	$a(b - c) = ab - ac$ and $(b - c)a = ba - ca$	
Substitution:	If $a = b$, then a may be substituted for b .	

Example 1: State the property shown in each of the following

1) $5+6=6+5$

Commutative property of addition

2) $5+6=5+6$

Reflexive property

3) $10+0=10$

Additive identity property

4) $2 \cdot 3 = 3 \cdot 2$

Commutative property of multiplication

5) $2 \cdot 3 = 2 \cdot 3$

Reflexive property

6) $ab = 1 \cdot ab$

Multiplicative identity property

7) $13 \cdot 0 = 0$

Multiplicative property of zero

8) $3 \cdot (4+5) = 3 \cdot 4 + 3 \cdot 5$

Distributive property

9) $3 + (4+5) = (3+4) + 5$

Associative property of addition

10) $5 \cdot (2 \cdot 3) = (5 \cdot 2) \cdot 3$

Associative property of multiplication

11) If $x = 10$, then $10 = x$

Symmetric property

12) $(6+2)a + 8b = 8a + 8b$

Substitution property

13) If $7+3=10$ and $10=6+4$, then $7+3=6+4$

Transitive property

14) $1+ab=1+ba$

Commutative property of multiplication