Algebraic Proofs

Algebraic Properties of Equality

Addition Property - If $a = b$, then $a + c = b + c$.

Subtraction Property - If $a = b$, then $a - c = b - c$.

Multiplication Property - If $a = b$, then $a \bullet c = b \bullet c$

Division Property - If $a = b$ and $c \neq 0$, then $a \div c = b \div c$

Distributive Property - For all numbers a, b and c, $a(b + c) = a \bullet b + a \bullet c$.

Reflexive Property - For any real number a, $a = a$.

Symmetric Property - If $a = b$, then $b = a$.

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

Substitution Property - If $a = b$, then a can be substituted for b in any equation or expression.

Properties of Equality for Segment Length and Angle Measure

	Segment Length	Angle Measure
Reflexive -	$AB = AB$	$m\angle A = m\angle A$
Symmetric -	If $AB = CD$, then $CD = AB$.	If $m\angle A = m\angle B$, then $m\angle B = m\angle A$.
Transitive -	If $AB = CD$ and $CD = EF$, then $AB = EF$.	If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$.

Directions: Name the property of equality that justifies each statement.

1. If $LM = NO$ and $NO = PQ$, then $LM = PQ$.

2. If $m\angle A = 10^\circ$, then $12^\circ + m\angle A = 22^\circ$.

3. If $AB = 5$ and $AC = AB + 8$ then $AC = 13$.

4. If $m\angle C = m\angle D$, then $m\angle D = m\angle C$.

5. If $5(m\angle A) = 90^\circ$, then $m\angle A = 18^\circ$.

Directions: Write an algebraic proof for each.

6. Given: $5x - 18 = 3x + 2$
   Prove: $x = 10$

7. Given: $2(3x + 1) = 4x + 8$
   Prove: $x = 3$

8. Given: $5x-3(9x+12)=8$

   Prove: $x=-2$