Name: Date: Period: 4

Algebraic Proofs

Learning Objective IWBAT write algebraic proofs and identify properties of = and ≅

Proof: A proof is an argument that uses logic, definitions, properties, and previous proven statements to show that a conclusion is true.

An important part of writing a proof is giving justifications to show that every step is valid.

Name of Algebraic Property of Equality	Description of Algebraic Property
Addition Property of Equality	If a = b, then… $a+c=b+c$
Subtraction Property of Equality	If a = b, then… $a-c=b-c$
Multiplication Property of Equality	If a = b, then… $ac=bc$
Division Property of Equality	If a = b, then… $\frac{a}{c}=\frac{b}{c}$ $c\neq 0$
Substitution Property of Equality	If a = b, then b can be substituted for a (or a for b) in any equation or expression.
Reflexive Property of Equality	$a=a$
Symmetric Property of Equality	If a = b, then… $b=a$
Transitive Property of Equality	If a = b, and b = c, then… $a=c$

Example:

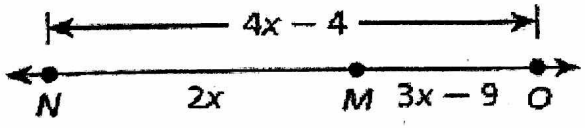
1. Solve the equation $4m - 8 = -12$. Write a justification for each step.

$4m-8=-12$ given

$4m=-4$ add. prop. =

$m=-1$ div. prop. =

2. Find the value of x. Write a justification for each step.



$2x+3x-9=4x-4$ seg. add. post.

$5x-9=4x-4$ simplify

$5x=4x+5$ add. prop. =

$x=5$ subtr. prop. =

Property of Segment Congruence	Description	[redacted]
Reflexive reflex. prop. $\cong$	$\overline{AB} \cong \overline{AB}$	
Symmetric symm. prop. $\cong$	If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$	
Transitive trans. prop. $\cong$	If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$	

**REMEMBER: Numbers are $=$ and figures are $\cong$

Example: lengths/measures seg./∠/shape...

3. Identify the property that justifies each statement.
   a. $\angle QRS \cong \angle QRS$ reflex. prop. $\cong$
   b. $m\angle 2 = m\angle 1$, so $m\angle 1 = m\angle 2$ symm. prop. $=$
   c. $\overline{AB} \cong \overline{CD}$ and $\overline{EF} \cong \overline{CD}$, so $\overline{AB} \cong \overline{EF}$ trans. prop. $\cong$
   d. $32° = 32°$ reflex. prop $=$
   e. DE = GH, so GH = DE symm. prop. $=$
   f. $94° = 94°$ reflex. prop $=$
   g. 0 = a and a = x, so 0 = x. trans. prop. $=$
   h. $\angle A \cong \angle Y$, so $\angle Y \cong \angle A$ symm. prop. $\cong$