NAME _____ DATE _____ PERIOD _____

2-6 Study Guide and Intervention

Algebraic Proof

Algebraic Proof A list of algebraic steps to solve problems where each step is justified is called an **algebraic proof**, The table shows properties you have studied in algebra.

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

Addition Property of Equality	
Subtraction Property of Equality	
Multiplication Property of Equality	
Division Property of Equality	
Reflexive Property of Equality	
Symmetric Property of Equality	
Transitive Property of Equality	
Substitution Property of Equality	
Distributive Property	

Example **Solve $6x + 2(x – 1) = 30$. Write a justification for each step.**

Algebraic Steps	Properties
1) $6x + 2(x – 1) = 30$	1) _____
2) $6x + 2x – 2 = 30$	2) _____
3) $8x – 2 = 30$	3) _____
4) $8x – 2 + 2 = 30 + 2$	4) _____
5) $8x = 32$	5) _____
6) $\frac{8x}{8} = \frac{32}{8}$	6) _____
7) $x = 4$	7) _____

Exercises

Complete each proof.

1. Given: $\frac{4x+6}{2} = 9$

Prove: $x = 3$

Proof:

Statements	Reasons
a. $\frac{4x+6}{2} = 9$	**a.** _____
b. $-\left(\frac{4x+6}{2}\right) = 2(9)$	**b.** Mult. Prop.
c. $4x + 6 = 18$	**c.** _____
d. $4x + 6 – 6 = 18 – 6$	**d.** _____
e. $4x =$ _____	**e.** Substitution
f. $\frac{4x}{4} =$ _____	**f.** Div. Prop.
g. _____	**g.** Substitution

2. Given: $4x + 8 = x + 2$

Prove: $x = –2$

Proof:

Statements	Reasons
a. $4x + 8 = x + 2$	**a.** _____
b. $4x + 8 = x + 2 – x$	**b.** _____
c. $3x + 8 = 2$	**c.** Substitution
d. _____	**d.** Subtr. Prop.
e. _____	**e.** Substitution
f. $\frac{3x}{3} = \frac{-6}{3}$	**f.** _____
g. _____	**g.** Substitution

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2-6 Study Guide and Intervention *(continued)*

Algebraic Proof

Geometric Proof Geometry deals with numbers as measures, so geometric proofs use properties of numbers. Here are some of the algebraic properties used in proofs.

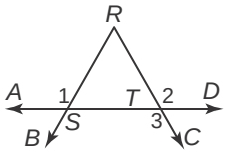
Property	Segments	Angles
Reflexive	$AB = AB$	$m\angle 1 = m\angle 1$
Symmetric	If $AB = CD$, then $CD = AB$.	If $m\angle 1 = m\angle 2$, then $m\angle 2 = m\angle 1$.
Transitive	If $AB = CD$ and $CD = EF$, then $AB = EF$.	If $m\angle 1 = m\angle 2$ and $m\angle 2 = m\angle 3$, then $m\angle 1 = m\angle 3$.

Example **Write a two-column proof to verify this conjecture.**

Given: $m\angle 1 = m\angle 2$,

Prove: $m\angle 1 = m\angle 3$

Proof:



Statements	Reasons
1. $m\angle 1 = m\angle 2$	**1.**
2. $m\angle 2 = m\angle 3$	**2.**
3. $m\angle 1 = m\angle 3$	**3.**

Exercises

State the property that justifies each statement.

1. If $m\angle 1 = m\angle 2$, then $m\angle 2 = m\angle 1$.

2. If $m\angle 1 = 90$ and $m\angle 2 = m\angle 1$, then $m\angle 2 = 90$.

3. If $AB = RS$ and $RS = WY$, then $AB = WY$.

4. If $AB = CD$, then $\frac{1}{2}AB = \frac{1}{2}CD$.

5. If $m\angle 1 + m\angle 2 = 110$ and $m\angle 2 = m\angle 3$, then $m\angle 1 + m\angle 3 = 110$.

6. $RS = RS$

7. If $AB = RS$ and $TU = WY$, then $AB + TU = RS + WY$.

8. If $m\angle 1 = m\angle 2$ and $m\angle 2 = m\angle 3$, then $m\angle 1 = m\angle 3$.

9. If the formula for the area of a triangle is $A = \frac{1}{2}bh$, then bh is equal to 2 times the area of the triangle. Write a two-column proof to verify this conjecture.

Given: $A = \frac{1}{2}bh$

Prove: $bh = 2A$

Proof:

Statements	Reasons