

Name: _____

WORKSHEET: Algebraic Proof

Solve each equation. Write a reason for every step.

1. $4x = 12x + 32$

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2. $28 + 12x = 8x - 4$

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3. $60x + 153 = 9x + 51$

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4. $-4x + 10 = -5x + 18$

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5. $-3(x + 2) = 16 - x$

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6. $-x - 2(9 - 8x) = 12$

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7. $6(x - 6) = x(16 - 7)$

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8. $\frac{1}{4}x + 10 = 2$

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2-6 Skills Practice

Algebraic Proof

State the property that justifies each statement.

1. If $80 = m\angle A$, then $m\angle A = 80$.
2. If $RS = TU$ and $TU = YP$, then $RS = YP$.
3. If $7x = 28$, then $x = 4$.
4. If $VR + TY = EN + TY$, then $VR = EN$.
5. If $m\angle 1 = 30$ and $m\angle 1 = m\angle 2$, then $m\angle 2 = 30$.

Complete the following proof.

6. **Given:** $8x - 5 = 2x + 1$

Prove: $x = 1$

Proof:

Statements	Reasons
a. $8x - 5 = 2x + 1$	a. _____
b. $8x - 5 - 2x = 2x + 1 - 2x$	b. _____
c. _____	c. Substitution Property
d. _____	d. Addition Property
e. $6x = 6$	e. _____
f. $\frac{6x}{6} = \frac{6}{6}$	f. _____
g. _____	g. _____

Write a two-column proof to verify the conjecture.

7. If $\overline{PQ} \cong \overline{QS}$ and $\overline{QS} \cong \overline{ST}$ then $PQ = ST$.



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	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 $a \cdot c = b \cdot c$.
Division Property of Equality	If $a = b$ and $c \neq 0$, then, $\frac{a}{c} = \frac{b}{c}$.
Reflexive Property of Equality	$a = a$
Symmetric Property of Equality	If $a = b$ and $b = a$.
Transitive Property of Equality	If $a = b$ and $b = c$, then $a = c$.
Substitution Property of Equality	If $a = b$, then a may be replaced by b in any equation or expression.
Distributive Property	$a(b + c) = ab + ac$

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

Algebraic Steps

$$6x + 2(x - 1) = 30$$

$$6x + 2x - 2 = 30$$

$$8x - 2 = 30$$

$$8x - 2 + 2 = 30 + 2$$

$$8x = 32$$

$$\frac{8x}{8} = \frac{32}{8}$$

$$x = 4$$

Properties

Original equation or Given

Distributive Property

Substitution Property of Equality

Addition Property of Equality

Substitution Property of Equality

Division Property of Equality

Substitution Property of Equality

Exercises

Complete each proof.

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

Prove: $x = 3$

Proof:

Statements

a. $\frac{4x + 6}{2} = 9$

b. $-\left(\frac{4x + 6}{2}\right) = 2(9)$

c. $4x + 6 = 18$

d. $4x + 6 - 6 = 18 - 6$

e. $4x =$ _____

f. $\frac{4x}{4} =$ _____

g. _____

Reasons

a. _____

b. Mult. Prop.

c. _____

d. _____

e. Substitution

f. Div. Prop.

g. Substitution

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

Prove: $x = -2$

Proof:

Statements

a. $4x + 8 = x + 2$

b. $4x + 8 - x =$
 $x + 2 - x$

c. $3x + 8 = 2$

d. _____

e. _____

f. $\frac{3x}{3} = \frac{-6}{3}$

g. _____

Reasons

a. _____

b. _____

c. Substitution

d. Subtr. Prop.

e. Substitution

f. _____

g. Substitution