

**Algebraic Proof**

A proof is a logical argument that shows a conclusion is true. An algebraic proof uses algebraic properties, including the Distributive Property and the properties of equality (see page 71 in workbook).

Distributive Property:  $a(b + c) = ab + ac$  Example:  $4(x + 7) = 4x + 28$

When solving an algebraic equation, you can justify each step by using a definition, property, or piece of given information.

- $2(a + 1) = -6$  Given equation
- $2a + 2 = -6$  Distributive Property
- $2a = -8$  Subtraction Property of Equality
- $a = -4$  Division Property of Equality

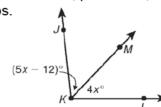
Solve each equation. Write a justification (reason) for each step.

1.  $6 + x = 3x - 8$  Given  
 $6 = 2x - 8$  Subtraction Prop. of Equality  
 $+8$   $14 = 2x$  Addition Prop. of Equality  
 $7 = x$  Division Prop. of Equality
2.  $\frac{n}{6} - 3 = 10$  Given  
 $\frac{n}{6} = 13$  Addition Prop. of Equality  
 $n = 78$  Multiplication Prop. of Equality

3.  $4(t - 3) = -20$  Given  
 $4t - 12 = -20$  Distributive Prop  
 $+12$   $4t = -8$  Addition Prop. of Equality  
 $t = -2$  Division Prop. of Equality
4.  $\frac{y+4}{7} = \frac{7}{6}$  Given  
 $y+4 = 21$  Multiplication Prop. of Equality  
 $y = 17$  Subtraction Prop. of Equality

When writing algebraic proofs in geometry, you can also use definitions, postulates, properties, and pieces of given information to justify the steps. 10/3

- $m\angle JKM = m\angle MKL$  Given
- $(5x - 12)^\circ = 4x^\circ$  Substitution Property of Equality
- $x - 12 = 0$  Subtraction Property of Equality
- $x = 12$  Addition Property of Equality



Properties of Congruence	Symbols	Examples
Reflexive	figure A $\cong$ figure A	$\angle CDE \cong \angle CDE$
Symmetric	If figure A $\cong$ figure B, then figure B $\cong$ figure A.	If $\overline{JK} \cong \overline{LM}$ , then $\overline{LM} \cong \overline{JK}$ .
Transitive	If figure A $\cong$ figure B and figure B $\cong$ figure C, then figure A $\cong$ figure C.	If $\angle N \cong \angle P$ and $\angle P \cong \angle Q$ , then $\angle N \cong \angle Q$ .

$\cong$  is congruent to (Same size)

Complete the proofs and write a justification for each step.

5.  $CE = CD + DE$

$6x = 8 + (3x + 7)$

$6x = 15 + 3x$

$3x = 15$

$x = 5$

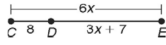
Segment addition postulate

Substitution prop. of equality

Substitution prop. of equality

Subtraction prop. of equality

Division Prop. of Equality



6.  $m\angle PQR = m\angle PQS + m\angle SQR$

$90^\circ = 2x^\circ + (4x - 12)^\circ$

$90 = 6x - 12$

$102 = 6x$

$17 = x$

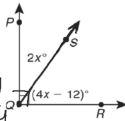
Angle addition postulate

Substitution prop. of equality

Substitution prop. of equality

addition prop. of equality

division prop. of equality



Identify the property that justifies each statement.

7. If  $\angle ABC \cong \angle DEF$ , then  $\angle DEF \cong \angle ABC$ .

Symmetric Prop.

8.  $\angle 1 \cong \angle 2$  and  $\angle 2 \cong \angle 3$ , so  $\angle 1 \cong \angle 3$ .

Transitive prop.

9. If  $FG = HJ$ , then  $HJ = FG$ .

Symmetric Prop.

10.  $\overline{WX} \cong \overline{WX}$

Reflexive