

# Chapter 2

## Reasoning and Proofs



2.1 - Conditional Statements

2.2 - Inductive and Deductive Reasoning

2.3 - Postulates and Diagrams

**2.4 - Algebraic Reasoning**

2.5 - Proving Statements about Segments and Angles

2.6 - Proving Geometric Relationships

## 2.4 - Algebraic Reasoning

**Solve:**  $3x + 2 = 23 - 4x$

### Statement

- (1)  $3x + 2 = 23 - 4x$
- (2)  $3x + 2 + 4x = 23 - 4x + 4x$
- (3)  $7x + 2 = 23$
- (4)  $7x + 2 - 2 = 23 - 2$
- (5)  $7x = 21$
- (6)  $7x / 7 = 21 / 7$
- (7)  $x = 3$

### Reason

- (1) Given (original equation)
- (2) Addition Prop of Equality
- (3) Combine like terms
- (4) Subtraction POE
- (5) Combine like terms
- (6) Division POE
- (7) Simplify

**Solution:  $x = 3$**

**This is an algebraic proof!!!**

## 2.4 - Algebraic Reasoning

### Algebraic Properties of Equality (POE)

**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  $a \times c = b \times c$ .

**Division Property of Equality**

If  $a = b$ , then  $a / c = b / c$  when  $c \neq 0$ .

**Substitution Property of Equality**

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

**Distributive Property of Equality**

$a(b + c) = ab + ac$

## 2.4 - Algebraic Reasoning

**Solve:**  $-2p - 9 = 10p - 17$

Statement

Reason

## 2.4 - Algebraic Reasoning

**Solve:**  $4 = -10b + 6(2 - b)$

Statement

Reason

## 2.4 - Algebraic Reasoning

### More Algebraic Properties of Equality

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 $a = c$ .

Name the property of equality:

- 1) If  $m\angle 6 = m\angle 7$ , then  $m\angle 7 = m\angle 6$ .
- 2)  $37^\circ = 37^\circ$
- 3) If  $AB = CD$  and  $CD = EF$ , then  $AB = EF$ .

## 2.4 - Algebraic Reasoning

**Solve:**  $4 = -10b + 6(2 - b)$

Statement

Reason