

# 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

## 2.5 - Proving Statements about Segments and Angles

### Vocabulary

**Proof** - a logical argument that uses deductive reasoning to prove a statement is true

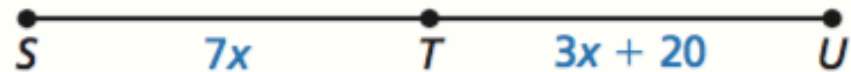
**Two-column proof** - a numbered set of statements in one column and reasons in the second column

<u>Statement</u>	<u>Reason</u>
(1) statement	(1) reason
(2) statement	(2) reason
(3) statement	(3) reason
...	...

## 2.5 - Proving Statements about Segments and Angles

### Complete the proof:

**Given**  $T$  is the midpoint of  $\overline{SU}$ .



**Prove**  $x = 5$

#### STATEMENTS

#### REASONS

1.  $T$  is the midpoint of  $\overline{SU}$ .

1. \_\_\_\_\_

2.  $\overline{ST} \cong \overline{TU}$

2. Definition of midpoint

3.  $ST = TU$

3. Definition of congruent segments

4.  $7x = 3x + 20$

4. \_\_\_\_\_

5. \_\_\_\_\_

5. Subtraction Property of Equality

6.  $x = 5$

6. \_\_\_\_\_

## 2.5 - Proving Statements about Segments and Angles

### Vocabulary

**Definitions** - used in a proof to go from algebra-to-geometry and vice versa

Geometric Term	Algebraic Term
congruent segments $\overline{AB} \cong \overline{CD}$	segments of equal length $AB = CD$
supplementary angles	angles whose sum is $180^\circ$
complementary angles	angles whose sum is $90^\circ$

## 2.5 - Proving Statements about Segments and Angles

### Vocabulary

#### Geometric Definitions

**midpoint** - a point that divides a segment into two congruent segments

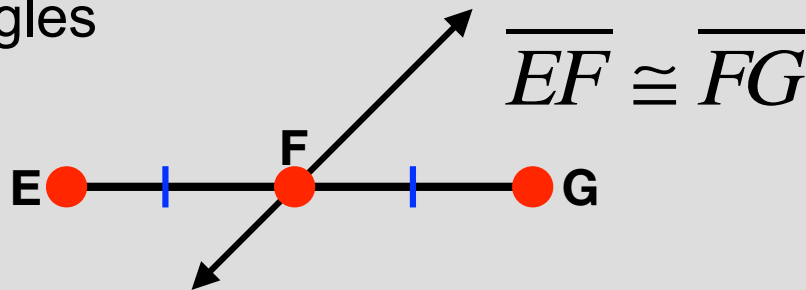


$$\overline{AB} \cong \overline{BC}$$

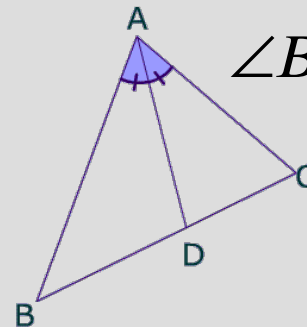
**bisector** -

a) a line, segment, or ray which divides a segment into two congruent segments, or

b) a line, segment, or ray which divides an angle into two congruent angles



$$\overline{EF} \cong \overline{FG}$$



$$\angle BAD \cong \angle DAC$$

## 2.5 - Proving Statements about Segments and Angles

### Definitions

#### Geometry

**congruent**

**supplementary angles**

**complementary angles**

**right angle**



#### Algebra

**equal**

**angles whose  
measures add to  $180^\circ$**

**angles whose  
measures add to  $90^\circ$**

**an angle whose  
measure is  $90^\circ$**

## 2.5 - Proving Statements about Segments and Angles

### Geometric Properties of Congruence (POC)

**Reflexive Property of  
Congruence**

For any segment  $\overline{AB}$ ,  $\overline{AB} \cong \overline{AB}$  .

**Symmetric Property of  
Congruence**

If  $\overline{AB} \cong \overline{CD}$  , then  $\overline{CD} \cong \overline{AB}$  .

**Transitive Property of  
Congruence**

If  $\overline{AB} \cong \overline{CD}$  and  $\overline{CD} \cong \overline{EF}$  , then  $\overline{AB} \cong \overline{EF}$  .

## 2.5 - Proving Statements about Segments and Angles

### Geometric Properties

Reflexive Property of  
Congruence

Symmetric Property of  
Congruence

Transitive Property of  
Congruence

### Algebraic Properties

Addition Property of Equality

Subtraction Property of Equality

Multiplication Property of  
Equality

Division Property of Equality

Substitution Property of Equality

Distribution Property of Equality

Reflexive Property of Equality

Symmetric Property of Equality

Transitive Property of Equality

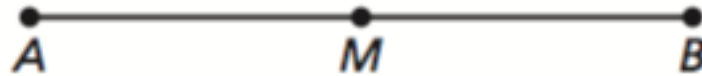


## 2.5 - Proving Statements about Segments and Angles

### Complete the proof:

**Given**  $M$  is the midpoint of  $\overline{AB}$ .

**Prove**  $AB = 2AM$ ,  $AM = \frac{1}{2}AB$



Statement

Reason