



2.5 Proving Statements about Segments



Standards/Objectives:

Standard 3: Students will learn and apply geometric concepts.

Objectives:

- Justify statements about congruent segments.
- Write reasons for steps in a proof.



Definitions

Theorem:

A true statement that follows as a result of other true statements.

Two-column proof:

Most commonly used. Has numbered statements and reasons that show the logical order of an argument.



def of Congruent = same measure

- Theorem 2.1
 - Segment congruence is reflexive, symmetric, and transitive.
- Examples:
 - Reflexive: For any segment AB , $\overline{AB} \cong \overline{AB}$
 - Symmetric: If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$
 - Transitive: If $\overline{AB} \cong \overline{CD}$, and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$

Example 1: Symmetric Property of Segment Congruence

Given: $\overline{PQ} \cong \overline{XY}$
 Prove $\overline{XY} \cong \overline{PQ}$

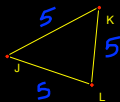
Statements:	Reasons:
1. $\overline{PQ} \cong \overline{XY}$	1. Given
2. $PQ = XY$	2. Definition of congruent segments
3. $XY = PQ$	3. Symmetric Property of Equality
4. $\overline{XY} \cong \overline{PQ}$	4. Definition of congruent segments

Paragraph Proof

- A proof can be written in paragraph form. It is as follows:
- You are given that $\overline{PQ} \cong \overline{XY}$. By the definition of congruent segments, $PQ = XY$. By the symmetric property of equality, $XY = PQ$. Therefore, by the definition of congruent segments, it follows that $\overline{XY} \cong \overline{PQ}$.

Example 2: Using Congruence

- Use the diagram and the given information to complete the missing steps and reasons in the proof.
- GIVEN: $LK = 5$, $JK = 5$, $\overline{JK} \cong \overline{JL}$
- PROVE: $\overline{LK} \cong \overline{JL}$

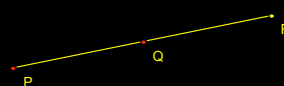


Statements:	Reasons:
1. $LK = 5$	1. Given
2. $JK = 5$	2. Given
3. $LK = JK$	3. Transitive Property
4. $\overline{LK} \cong \overline{JK}$	4. def of congruence
5. $\overline{JK} \cong \overline{JL}$	5. Given
6. $\overline{LK} \cong \overline{JL}$	6. Transitive Property

Statements:	Reasons:
1. $LK = 5$	1. Given
2. $JK = 5$	2. Given
3. $LK = JK$	3. Transitive Property
4. $\overline{LK} \cong \overline{JK}$	4. Def. Congruent seg.
5. $\overline{JK} \cong \overline{JL}$	5. Given
6. $\overline{LK} \cong \overline{JL}$	6. Transitive Property

Example 3: Using Segment Relationships

- In the diagram, Q is the midpoint of \overline{PR} . Show that PQ and QR are equal to $\frac{1}{2}$ PR.
- GIVEN: Q is the midpoint of \overline{PR} .
- PROVE: $PQ = \frac{1}{2} PR$ and $QR = \frac{1}{2} PR$.



Statements:	Reasons:
1. Q is the midpoint of \overline{PR} .	1. Given
2. $PQ = QR$	2. Definition of a midpoint
3. $PQ + QR = PR$	3. Segment Addition Postulate
4. $PQ + PQ = PR$	4. Substitution Property
5. $2 \cdot PQ = PR$	5. Distributive property
6. $PQ = \frac{1}{2} PR$	6. Division property
7. $QR = \frac{1}{2} PR$	7. Substitution

Pg. 104 – Activity—Copy a segment

- Use the following steps to construct a segment that is congruent to \overline{AB} .
- Use a straightedge to draw a segment longer than \overline{AB} . Label the point C on the new segment.
 - Set your compass at the length of \overline{AB} .
 - Place the compass point at C and mark a second point D on the new segment. \overline{CD} is congruent to \overline{AB} .