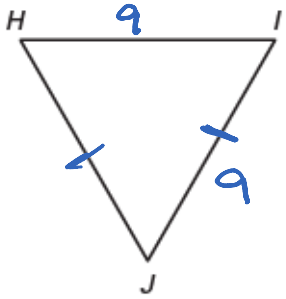
Name _____ Date _____

Prove Statements about Segments and Angles Practice Sheet

**In Exercises 1–4, complete the proof.**

**1.** **GIVEN:** $HI = 9, IJ = 9, \overline{IJ} \cong \overline{JH}$

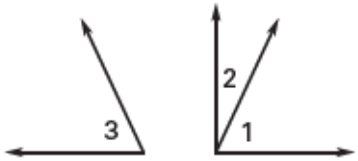
**PROVE:** $\overline{HI} \cong \overline{JH}$




| Statements | Reasons |
|---|---|
| 1. $HI = 9$ | 1. ? Given |
| 2. $IJ = 9$ | 2. ? Given |
| 3. $HI = IJ$ | 3. ? Substitution PoE |
| 4. ? $\overline{HI} \cong \overline{IJ}$ | 4. Definition of congruent segments |
| 5. $\overline{IJ} \cong \overline{JH}$ | 5. ? Given |
| 6. $\overline{HI} \cong \overline{JH}$ | 6. ? Transitive PoC |

**2.** **GIVEN:** $\angle 3$ and $\angle 2$ are complementary.
$m\angle 1 + m\angle 2 = 90°$

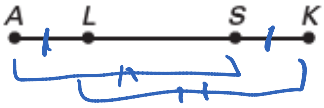
**PROVE:** $\angle 1 \cong \angle 3$




| Statements | Reasons |
|---|---|
| 1. $\angle 3$ and $\angle 2$ are complementary. | 1. ? given |
| 2. $m\angle 1 + m\angle 2 = 90°$ | 2. ? given |
| 3. $m\angle 3 + m\angle 2 = 90°$ | 3. ? def of complementary angles |
| 4. $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$ | 4. ? transitive PoE |
| 5. $m\angle 1 = m\angle 3$ | 5. ? subtraction PoE |
| 6. $\angle 1 \cong \angle 3$ | 6. ? Def of congruent angles |

**3.** **GIVEN:** $AL = SK$

**PROVE:** $AS = LK$

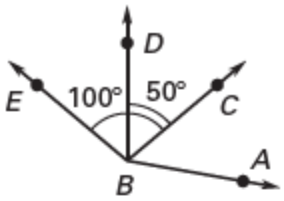



| Statements | Reasons |
|---|---|
| 1. $AL = SK$ | 1. ? Given |
| 2. $LS = LS$ | 2. ? Reflexive PoE |
| 3. $AL + LS = SK + LS$ | 3. ? Addition PoE |
| 4. $AL + LS = AS$ | 4. ? Segment Add |
| 5. $SK + LS = LK$ | 5. ? Segment Add |
| 6. $AS = LK$ | 6. ? Substitution PoE |

**In Exercises 1 and 2, complete the proof.**

**1.** **GIVEN:** $\angle ABC \cong \angle CBD$, $m\angle CBD = 50°$, $m\angle CBE = 100°$

**PROVE:** $\angle ABC \cong \angle DBE$

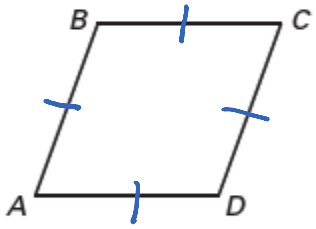



| Statements | Reasons |
|---|---|
| 1. $\angle ABC \cong \angle CBD$, $m\angle CBD = 50°$, $m\angle CBE = 100°$ | 1. ? Given |
| 2. ? $= m\angle CBE$ $m\angle CBD$ | 2. Angle Addition Postulate |
| 3. $50° + m\angle DBE = 100°$ | 3. ? Substitution PoE |
| 4. $m\angle DBE = 50°$ | 4. ? Subtraction PoE |
| 5. $m\angle CBD =$ ? $m\angle DBE$ | 5. Substitution Property of Equality |
| 6. ? $\angle CBD \cong \angle DBE$ | 6. Definition of congruent angles |
| 7. $\angle ABC \cong \angle DBE$ | 7. ? Transitive PoE |

**2.** The lengths of the sides of quadrilateral $ABCD$ are equal. Prove that the perimeter of $ABCD$ is equal to $4AB$.

**GIVEN:** $\overline{AB} \cong \overline{BC}$, $\overline{BC} \cong \overline{CD}$, $\overline{CD} \cong \overline{AD}$

**PROVE:** Perimeter of $ABCD = 4AB$




| Statements | Reasons |
|---|---|
| 1. $\overline{AB} \cong \overline{BC}$, $\overline{BC} \cong \overline{CD}$, $\overline{CD} \cong \overline{AD}$ | 1. ? Given |
| 2. $AB = BC$, $BC = CD$, $CD = AD$ | 2. ? Def of Congruent Segments |
| 3. $AB = CD$, $AB = AD$, $BC = AD$ | 3. ? Transitive PoE |
| 4. Perimeter of $ABCD = AB + BC + CD + AD$ | 4. ? Def of perimeter |
| 5. ? $P(ABCD) = AB + AB + AB + AB$ | 5. Substitution Property of Equality |
| 6. ? $P(ABCD) = 4AB$ | 6. Simplify. |

**Use the property to complete the statement.**

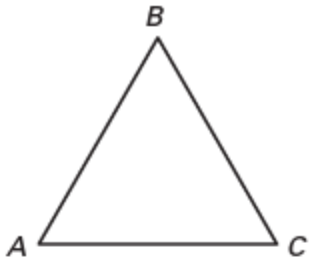
**3.** Transitive Property of Congruence: If $\angle 1 \cong \angle 5$ and ? $\angle 5 \cong \angle 7$, then $\angle 1 \cong \angle 7$.

**4.** Symmetric Property of Congruence: If $\angle 1 \cong \angle 2$ and $\angle 3 \cong \angle 4$, then ? $\angle 2 \cong \angle 1$, $\angle 4 \cong \angle 3$.

**In Exercises 1–3, complete the proof.**

**1.** **GIVEN:** $m\angle A = m\angle B, m\angle B = m\angle C$

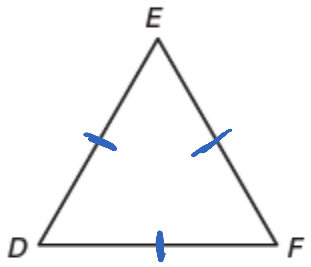
**PROVE:** $\angle A \cong \angle C$




| Statements | Reasons |
|---|---|
| 1. $m\angle A = m\angle B, m\angle B = m\angle C$ | 1. Given |
| 2. $m\angle A = m\angle C$ | 2. ? Transitive PoE |
| 3. ? $\angle A \cong \angle C$ | 3. Definition of congruent angles |

**2.** **GIVEN:** $DE = EF, EF = DF$

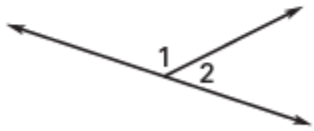
**PROVE:** $\overline{DF} \cong \overline{DE}$




| Statements | Reasons |
|---|---|
| 1. $DE = EF, EF = DF$ | 1. ? Given |
| 2. ? $DE = DF$ | 2. Transitive Property of Equality |
| 3. $DF = DE$ | 3. ? Symmetric PoE |
| 4. ? $\overline{DF} \cong \overline{DE}$ | 4. Definition of congruent segments |

**3.** **GIVEN:** $\angle 1$ and $\angle 2$ are a linear pair.

**PROVE:** $m\angle 1 = 180° - m\angle 2$




| Statements | Reasons |
|---|---|
| 1. ? $\angle 1$ and $\angle 2$ are a linear pair | 1. Given |
| 2. ? $\angle 1$ and $\angle 2$ are supplementary | 2. The angles in a linear pair are supplementary angles. |
| 3. $m\angle 1 + m\angle 2 = 180°$ | 3. ? Def. of Supp angles |
| 4. ? $m\angle 1 = 180 - m\angle 2$ | 4. Subtraction Property of Equality |

**Use the property to complete the statement.**

**4.** Reflexive Property of Congruence: ? $\cong \angle 4$ $\angle 4$

**5.** Symmetric Property of Congruence: If ? $\cong$ ?, then $\overline{CD} \cong \overline{DX}$. $\overline{DX} \cong \overline{CD}$

**In Exercises 6–9, name the property illustrated by the statement.**

**6.** If $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 4$, then $\angle 1 \cong \angle 4$. Transitive PoC

**7.** $\overline{XY} \cong \overline{XY}$ Reflexive PoC

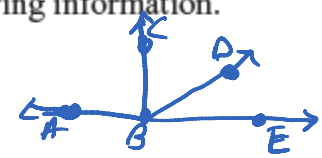
**8.** If $\angle CDE \cong \angle RST$, then $\angle RST \cong \angle CDE$. Symmetric PoC

**9.** If $\overline{AB} \cong \overline{BC}$, then $\overline{BC} \cong \overline{AB}$. Symmetric PoC

**10.** Sketch a diagram that represents the following information.

$\angle ABC$ and $\angle CBD$ are adjacent angles.

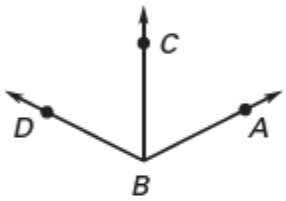
$\angle ABD$ and $\angle DBE$ are a linear pair.




**11.** Use the given information and the diagram to prove the statement.

**GIVEN:** $2m\angle ABC = m\angle ABD$

**PROVE:** $\angle ABC \cong \angle CBD$




| Statements | Reasons |
|---|---|
| 1) $2m\angle ABC = m\angle ABD$ | 1) Given |
| 2) $m\angle ABC + m\angle CBD = m\angle ABD$ | 2) Angle addition PoST |
| 3) $2m\angle ABC = m\angle ABC + m\angle CBD$ | 3) Transitive PoE |
| 4) $m\angle ABC = m\angle CBD$ | 4) Subtraction PoE |
| 5) $\angle ABC \cong \angle CBD$ | 5) Def of congruence |

**12.** **Bicycle Tour** You take part in a three day bicycle tour. On the first day, you ride 95 miles. On the third (final) day, you also ride 95 miles. Use the following steps to prove that the distance you ride in the first two days is equal to the distance that you ride in the last two days.

**a.** Draw a diagram for the situation by using a line segment to represent the total distance of the three days and dividing the line segment into three parts that represent the daily distances.

**b.** State what is given and what is to be proved.

**c.** Write a two-column proof.

A)


B) Given: $AB = 95, CD = 95$
Prove: $AC = BD$

C)

| Statements | Reasons |
|---|---|
| 1) $AB = 95, CD = 95$ | 1) Given |
| 2) $AB + BC = AC$<br>$BC + CD = BD$ | 2) Segment Addition |
| 3) $95 + BC = AC$<br>$BC + 95 = BD$ | 3) Substitution PoE |
| 4) $AC = 95 + BC$ | 4) Symmetric PoE |
| 5) $AC = BD$ | 5) Transitive PoE |