5-5 Study Guide and Intervention

Inequalities Involving Two Triangles

**SAS Inequality** The following theorem involves the relationship between the sides of two triangles and an angle in each triangle.

<table>
<thead>
<tr>
<th>SAS Inequality/Hinge Theorem</th>
<th>If two sides of a triangle are congruent to two sides of another triangle and the included angle in one triangle has a greater measure than the included angle in the other, then the third side of the first triangle is longer than the third side of the second triangle.</th>
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</thead>
</table>

**Example** Write an inequality relating the lengths of \(CD\) and \(AD\).

Two sides of \(\triangle BCD\) are congruent to two sides of \(\triangle BAD\) and \(m\angle CBD > m\angle ABD\). By the SAS Inequality/Hinge Theorem, \(CD > AD\).

**Exercises**

Write an inequality relating the given pair of segment measures.

1. \(MR, RP\)

2. \(AD, CD\)

3. \(EG, HK\)

4. \(MR, PR\)

Write an inequality to describe the possible values of \(x\).

5. \((4x - 10)\) cm

6. \(1.8 \text{ cm}, 2.7 \text{ cm}\)
5-5   Study Guide and Intervention (continued)

Inequalities Involving Two Triangles

**SSS Inequality** The converse of the Hinge Theorem is also useful when two triangles have two pairs of congruent sides.

<table>
<thead>
<tr>
<th>SSS Inequality</th>
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<tbody>
<tr>
<td>If two sides of a triangle are congruent to two sides of another triangle and the third side in one triangle is longer than the third side in the other, then the angle between the pair of congruent sides in the first triangle is greater than the corresponding angle in the second triangle.</td>
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<th>Diagram</th>
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</table>
| \( \triangle NPS \) and \( \triangle TQR \) have two sides of congruent sides.
| \( NM = SR \), \( MP = RT \), and \( NP > ST \), then \( m \angle M > m \angle R \). |

**Example** Write an inequality relating the measures of \( \angle ABD \) and \( \angle CBD \).

Two sides of \( \triangle ABD \) are congruent to two sides of \( \triangle CBD \), and \( AD > CD \).

By the SSS Inequality, \( m \angle ABD > m \angle CBD \).

**Exercises**

Write an inequality relating the given pair of angle measures.

1. \( m \angle MPR, m \angle NPR \)

2. \( m \angle ABD, m \angle CBD \)

3. \( m \angle C, m \angle Z \)

4. \( m \angle XYW, m \angle WYZ \)

Write an inequality to describe the possible values of \( x \).

5. \( \left( \frac{3}{x} - 6 \right)^* \)

6. \( 36 \text{ cm}, 33^\circ, 30 \text{ cm}, 60 \text{ cm}, (3x - 3)^* \)
Skills Practice

Inequalities Involving Two Triangles

Write an inequality relating the given pair of angles or segment measures.

1. \( m\angle BXA, m\angle DXA \)

2. \( BC, DC \)

Write an inequality relating the given pair of angles or segment measures.

3. \( m\angle STR, m\angle TRU \)

4. \( PQ, RQ \)

5. In the figure, \( BA, BD, BC, \) and \( BE \) are congruent and \( AC < DE \). How does \( m\angle 1 \) compare with \( m\angle 3 \)? Explain your thinking.

6. Write a two-column proof.
   Given: \( BA \cong DA \)
   \( BC > DC \)
   Prove: \( m\angle 1 > m\angle 2 \)
5-5 Practice

Inequalities Involving Two Triangles

Write an inequality relating the given pair of angles or segment measures.

1. \(AB, BK\)

2. \(ST, SR\)

3. \(\angle CDF, \angle EDF\)

4. \(\angle R, \angle T\)

5. Write a two-column proof.
   \textbf{Given:} \(G\) is the midpoint of \(DF\).  
   \(\angle 1 > \angle 2\)
   \textbf{Prove:} \(ED > EF\)

6. \textbf{TOOLS} Rebecca used a spring clamp to hold together a chair leg she repaired with wood glue. When she opened the clamp, she noticed that the angle between the handles of the clamp decreased as the distance between the handles of the clamp decreased. At the same time, the distance between the gripping ends of the clamp increased. When she released the handles, the distance between the gripping end of the clamp decreased and the distance between the handles increased. Is the clamp an example of the SAS or SSS Inequality?