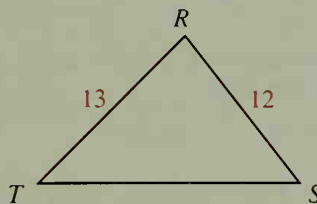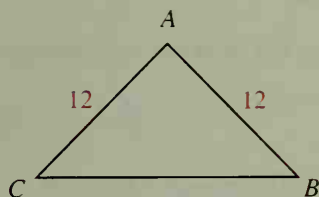# Inequalities in Triangles

Objectives

1. State and apply the inequality theorems and corollaries for one triangle.
2. State and apply the inequality theorems for two triangles.

6-4 *Inequalities for One Triangle*

From the information given in the diagram at the left below you can deduce that $\angle C \cong \angle B$.


Using the information in the diagram at the right you could write an indirect proof showing that $m \angle S \neq m \angle T$. The following theorem enables you to reach an even stronger conclusion, the conclusion that $m \angle S > m \angle T$.

Theorem 6-2

If one side of a triangle is longer than a second side, then the angle opposite the first side is larger than the angle opposite the second side.

Given: $\triangle RST$; $RT > RS$
Prove: $m \angle RST > m \angle T$
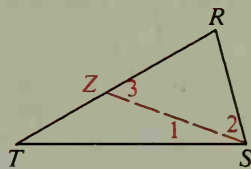
Proof:

By the Ruler Postulate there is a point Z on $\overline{RT}$ such that $RZ = RS$. Draw $\overline{SZ}$.
In isosceles $\triangle RZS$, $m \angle 3 = m \angle 2$.
Because $m \angle RST = m \angle 1 + m \angle 2$, you have $m \angle RST > m \angle 2$.
Substitution of $m \angle 3$ for $m \angle 2$ yields $m \angle RST > m \angle 3$.
Because $\angle 3$ is an ext. $\angle$ of $\triangle ZST$, you have $m \angle 3 > m \angle T$.
From $m \angle RST > m \angle 3$ and $m \angle 3 > m \angle T$, you get $m \angle RST > m \angle T$.