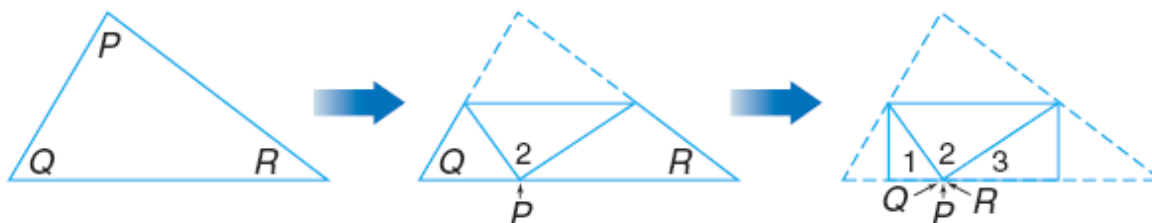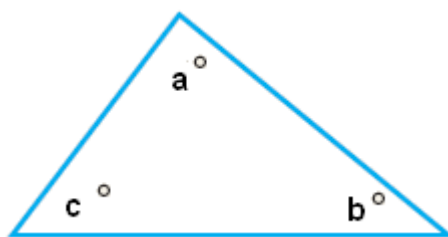# Triangles and Angles

Activity 1: If you measure and add the angles in any triangle, you will find that the sum of the angles have a special relationship. Cut and fold a triangle as shown below. Make a conjecture about the sum of the angle measures of a triangle.

The results of the activity above can be stated in the Angle Sum Theorem.

Theorem 1: **Angle Sum Theorem**

The sum of the measures of the angles of a triangle is 180^0.

$$a^0 + b^0 + c^0 = 180^0$$

You can use the Angle Sum Theorem to find missing measures in triangles.

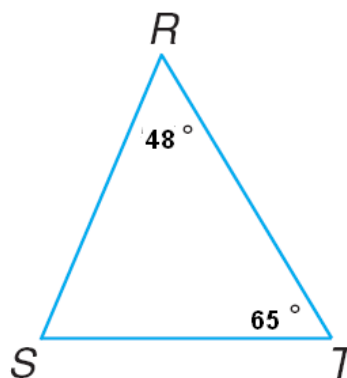**Example 1:** **Find** $m \angle TSR$ **in** $\triangle RST$**.**

$m\angle R + m\angle T + m\angle S = 180^0$ Angle Sum Theorem

$\Rightarrow 48^0 + 65^0 + m\angle S = 180^0$ Substitution

$\Rightarrow 113^0 + m\angle S = 180^0$ Add

$\Rightarrow m\angle S = 180^0 - 113^0$ Subtract

$\Rightarrow m\angle S = 67^0$

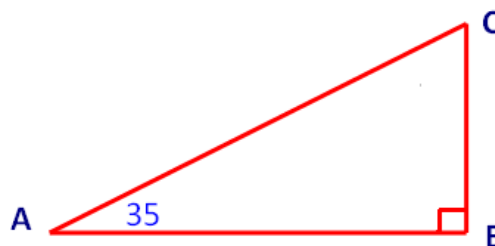You can use the Angle Sum Theorem to discover a relationship between the acute angles of a right triangle.

$m\angle A + m\angle B + m\angle C = 180^0$ Angle Sum Theorem

$\Rightarrow 35^0 + 90^0 + m\angle S = 180^0$ Substitution

$\Rightarrow 125^0 + m\angle S = 180^0$ Add

$\Rightarrow m\angle S = 180^0 - 125^0$ Subtract
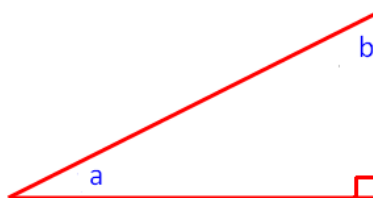
$\Rightarrow m\angle S = 55^0$

By the definition of complementary angles, $\angle A$ and $\angle C$ are complementary. This relationship is stated in the following theorem.

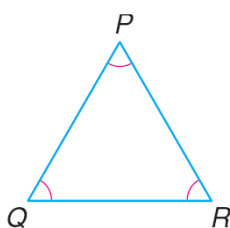**Theorem 2:** The acute angles of a right triangle are complementary.

$$a^0 + b^0 = 90^0$$

An **equiangular triangle** is a triangle in which all three angles are congruent. You can use the Angle Sum Theorem to find the measure of each angle in an equiangular triangle.

Triangle *PQR* is an equiangular triangle. Since $m\angle P + m\angle Q + m\angle R = 180^0$, the measure of each angle of ⊔*PQR* is $180^0 \div 3$ or 60^0.

Theorem 3: The measure of each angle of an equiangular triangle is 60.

$$x^0 = x^0 = x^0 = 60^0$$