

## 3-5

## Parallel Lines and Triangles



## Content Standard

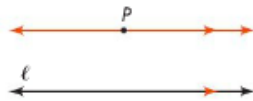
G.CO.10 Prove theorems about triangles ...  
measures of interior angles of a triangle sum to  $180^\circ$ .

**Objectives** To use parallel lines to prove a theorem about triangles  
To find measures of angles of triangles

Take note

**Postulate 3-2 Parallel Postulate**

Through a point not on a line, there is one and only one line parallel to the given line.

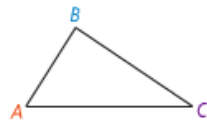


There is exactly one line through  $P$  parallel to  $l$ .

Take note

**Theorem 3-11 Triangle Angle-Sum Theorem**

The sum of the measures of the angles of a triangle is  $180$ .

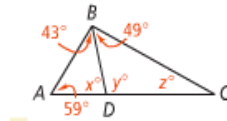


$$m\angle A + m\angle B + m\angle C = 180$$

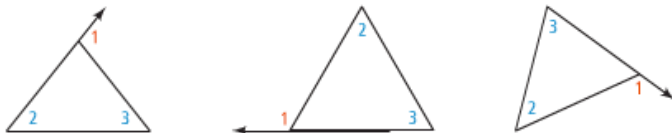
The proof of the Triangle Angle-Sum Theorem requires an *auxiliary line*. An **auxiliary line** is a line that you add to a diagram to help explain relationships in proofs. The red line in the diagram below is an auxiliary line.

When you know the measures of two angles of a triangle, you can use the Triangle Angle-Sum Theorem to find the measure of the third angle.

Example 1: Find the values of the variables.



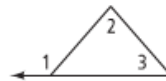
An **exterior angle of a polygon** is an angle formed by a side and an extension of an adjacent side. For each exterior angle of a triangle, the two nonadjacent interior angles are its **remote interior angles**. In each triangle below,  $\angle 1$  is an exterior angle and  $\angle 2$  and  $\angle 3$  are its remote interior angles.



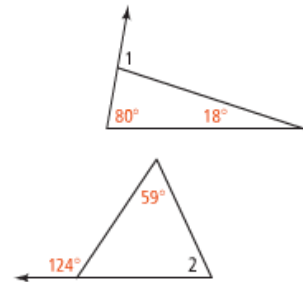
**Theorem 3-12 Triangle Exterior Angle Theorem**

The measure of each exterior angle of a triangle equals the sum of the measures of its two remote interior angles.

$$m\angle 1 = m\angle 2 + m\angle 3$$



Example 2: Find the measures of the labeled angles.





## Lesson Check

### Do you know HOW?

Find the measure of the third angle of a triangle given the measures of two angles.

1. 34 and 88
2. 45 and 90
3. 10 and 102
4.  $x$  and 50

In a triangle,  $\angle 1$  is an exterior angle and  $\angle 2$  and  $\angle 3$  are its remote interior angles. Find the missing angle measure.

5.  $m\angle 2 = 24$  and  $m\angle 3 = 106$
6.  $m\angle 1 = 70$  and  $m\angle 2 = 32$