

LESSON  
4.1**Study Guide**

For use with pages 216–224

**GOAL** Classify triangles and find measures of their angles.**Vocabulary**

A **triangle** is a polygon with three sides.

A **scalene triangle** has no congruent sides.

An **isosceles triangle** has at least two congruent sides.

An **equilateral triangle** has three congruent sides.

An **acute triangle** has three acute angles.

A **right triangle** has one right angle.

An **obtuse triangle** has one obtuse angle.

An **equiangular triangle** has three congruent angles.

When the sides of a polygon are extended, other angles are formed. The original angles are the **interior angles**. The angles that form linear pairs with the interior angles are the **exterior angles**.

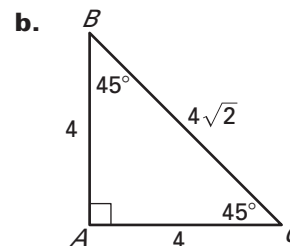
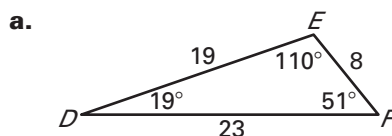
**Theorem 4.1 Triangle Sum Theorem:** The sum of the measures of the interior angles of a triangle is  $180^\circ$ .

**Theorem 4.2 Exterior Angle Theorem:** The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

**Corollary to the Triangle Sum Theorem:** The acute angles of a right triangle are complementary.

**EXAMPLE 1** Classify triangles by sides and by angles

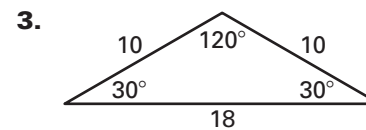
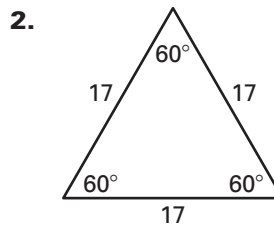
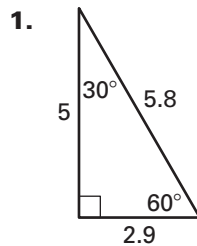
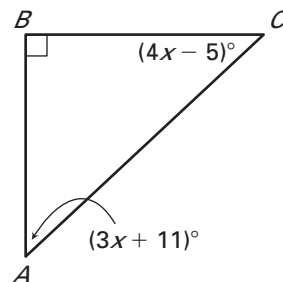
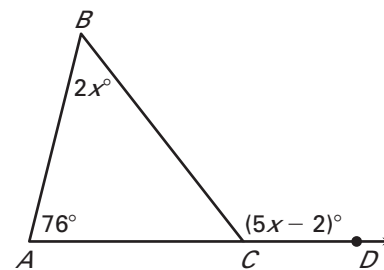
Classify the triangle by its sides and by its angles.

**Solution**

- Triangle  $DEF$  has one obtuse angle and no congruent sides. So,  $\triangle DEF$  is an obtuse scalene triangle.
- Triangle  $ABC$  has one right angle and two congruent sides. So,  $\triangle ABC$  is a right isosceles triangle.

**LESSON**  
**4.1****Study Guide** *continued*  
*For use with pages 216–224***Exercises for Example 1**

Classify the triangle by its sides and by its angles.

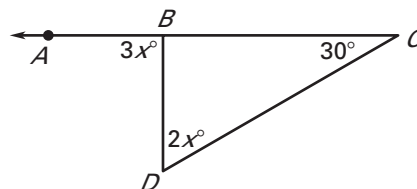
**EXAMPLE 2** Find angle measuresa. Find  $m\angle BAC$  and  $m\angle BCA$ .b. Find  $m\angle BCD$  and  $m\angle ABC$ .**Solution**

- a.  $(4x - 5)^\circ + (3x + 11)^\circ = 90^\circ$  Use Corollary to the Triangle Sum Theorem.  
 $x = 12$  Solve for  $x$ .

So,  $m\angle BCA = (4x - 5)^\circ = (4 \cdot 12 - 5)^\circ = 43^\circ$  and  
 $m\angle BAC = (3x + 11)^\circ = (3 \cdot 12 + 11)^\circ = 47^\circ$ .

- b.  $(5x - 2)^\circ = 2x^\circ + 76^\circ$  Use Exterior Angle Theorem.  
 $x = 26$  Solve for  $x$ .

So,  $m\angle BCD = (5x - 2)^\circ = (5 \cdot 26 - 2)^\circ = 128^\circ$  and  
 $m\angle ABC = 2x^\circ = 2(26)^\circ = 52^\circ$ .

**Exercises for Example 2**4. Find  $m\angle ABD$  and  $m\angle BDC$ .5. Find  $m\angle CAB$  and  $m\angle CBA$ .