

4.1

Triangles and Angles

- Goals**
- Classify triangles by their sides and angles.
 - Find angle measures in triangles.

VOCABULARY

Triangle A triangle is a figure formed by three segments joining three noncollinear points.

Vertex Each of the three points joining the sides of a triangle is a vertex.

Adjacent sides In a triangle, two sides sharing a common vertex are adjacent sides.

Legs In a right triangle, the sides that form the right angle are the legs of the right triangle. In an isosceles triangle, the two congruent sides are the legs of the isosceles triangle.

Hypotenuse The side opposite the right angle is the hypotenuse of the triangle.

Base In an isosceles triangle with two congruent sides, the third side is the base.

Interior angles When the sides of a triangle are extended, the interior angles are the three original angles.

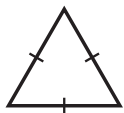
Exterior angles When the sides of a triangle are extended, the exterior angles are the three angles adjacent to the interior angles.

Corollary A corollary to a theorem is a statement that can be proved easily using the theorem.

NAMES OF TRIANGLES

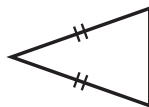
Classification by Sides

Equilateral Triangle



3 congruent sides

Isosceles Triangle



At least 2 congruent sides

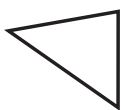
Scalene Triangle



No congruent sides

Classification by Angles

Acute Triangle



3 acute angles

Equiangular Triangle



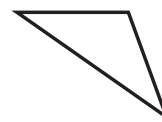
3 congruent angles

Right Triangle



1 right angle

Obtuse Triangle

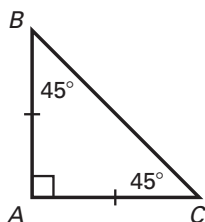


1 obtuse angle

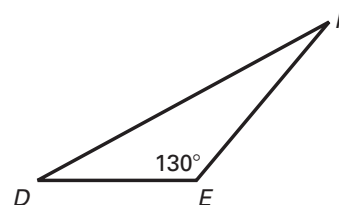
Example 1 Classifying Triangles

Classify each triangle. Be as specific as possible.

a. $\triangle ABC$ has two acute angles, one right angle and two congruent sides. It is a right isosceles triangle.



b. $\triangle DEF$ has one obtuse angle and no congruent sides. It is an obtuse scalene triangle.



THEOREM 4.1: TRIANGLE SUM THEOREM

The sum of the measures of the interior angles of a triangle is 180° .

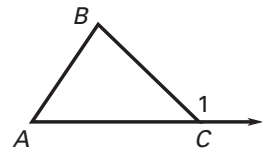
$$m\angle A + m\angle B + m\angle C = \underline{180^\circ}$$



THEOREM 4.2: EXTERIOR ANGLE THEOREM

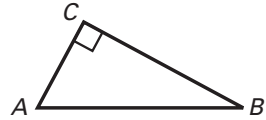
The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

$$m\angle 1 = \underline{m\angle A} + \underline{m\angle B}$$

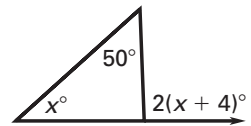
**COROLLARY TO THE TRIANGLE SUM THEOREM**

The acute angles of a right triangle are complementary.

$$m\angle A + m\angle B = \underline{90^\circ}$$

**Example 2** *Finding an Angle Measure*

You can apply the Exterior Angle Theorem to find the measure of the exterior angle shown. First write and solve an equation to find the value of x :



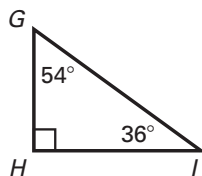
$$x^\circ + 50^\circ = 2(x + 4)^\circ \quad \text{Apply the Exterior Angle Theorem.}$$

$$\underline{42} = x \quad \text{Solve for } x.$$

Answer So, the measure of the exterior angle is $2 \cdot (\underline{42} + 4)^\circ$, or $\underline{92}^\circ$.

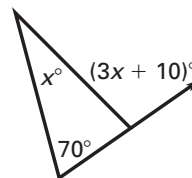
✓ Checkpoint Complete the following exercises.

1. Classify the triangle by its angles and by its sides.



right scalene

2. Find the measure of the exterior angle shown.



100°