LESSON **10.1**

Name _____ Date _____

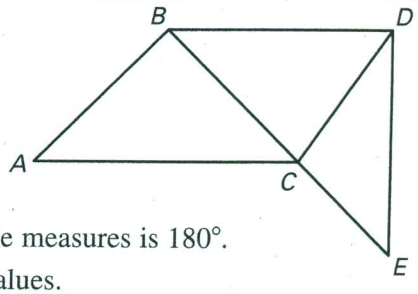
Study Guide

For use with pages 511–515

GOAL **Solve problems involving triangles.**

EXAMPLE 1 Classifying a Triangle by Angle Measures

In the diagram, $m\angle ABC = 90°$ and $m\angle A = m\angle BCA$. Find $m\angle A$ and $m\angle BCA$. Then classify $\triangle ABC$ by its angle measures.



Solution

Let $x°$ represent $m\angle A$ and $m\angle BCA$.

$m\angle A + m\angle BCA + m\angle ABC = 180°$	Sum of angle measures is 180°.
$x° + x° + 90° = 180°$	Substitute values.
$2x + 90 = 180$	Combine like terms.
$2x = 90$	Subtract 90 from each side.
$x = 45$	Divide each side by 2.

Answer: $m\angle A = m\angle BCA = 45°$. Because $\angle ABC$ is a right angle, $\triangle ABC$ is a right triangle.

Exercise for Example 1

Use the diagram in Example 1.

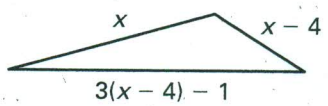
1. Given $m\angle E = 45°$ and $m\angle CDE$ is 10° less than $m\angle E$, find $m\angle CDE$ and $m\angle ECD$. Then classify $\triangle CDE$ by its angle measures.

EXAMPLE 2 Finding Unknown Side Lengths

The perimeter of a scalene triangle is 23 inches. The length of the first side is 4 inches longer than the length of the second side. The length of the third side is 1 inch shorter than three times the length of the second side. Find the lengths of the three sides.

Solution

Draw the triangle. Let x, $x - 4$, and $3(x - 4) - 1$ represent the unknown side lengths. Write an equation for the perimeter P. Then solve for x.



$P = x + (x - 4) + [3(x - 4) - 1]$	Formula for perimeter
$23 = x + (x - 4) + [3(x - 4) - 1]$	Substitute 23 for P.
$23 = x + (x - 4) + [(3x - 12) - 1]$	Distributive property
$23 = 5x - 17$	Combine like terms.
$40 = 5x$	Add 17 to each side.
$8 = x$	Divide each side by 5.

Answer: The lengths of the first, second, and third sides are 8 inches, 4 inches, and 11 inches, respectively.

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Exercises for Example 2

2. The perimeter of an isosceles triangle is 85 millimeters. The length of one side is 3 times longer than the length of each of the other two sides. Find the length of each side.

3. The perimeter of an equilateral triangle is 75 meters. Find the length of each side.

4. The perimeter of a scalene triangle is 42 feet. The length of the first side is 6 feet longer than the length of the second side and the length of the third side is twice the length of the second side. Find the length of each side.

EXAMPLE 3 Finding Angle Measures Using a Ratio

The ratio of the angle measures of a triangle is 5 : 6 : 7. Find the angle measures. Then classify the triangle by its angle measures.

Solution

(1) Let $5x°$, $6x°$, and $7x°$ represent the angle measures. Write an equation for the sum of the angle measures.

$5x° + 6x° + 7x° = 180°$ Sum of angle measures is 180°.

$18x = 180$ Combine like terms.

$x = 10$ Divide each side by 18.

(2) Substitute 10 for x in the expression for each angle measure.

$(5 \cdot 10)° = 50°$ $(6 \cdot 10)° = 60°$ $(7 \cdot 10)° = 70°$

Answer: The angle measures of the triangle are 50°, 60°, and 70°. So, the triangle is an acute triangle.

Exercises for Example 3

Use the given ratio of the angle measures of a triangle to find the angle measures. Then classify the triangle by its angle measures.

5. 1 : 2 : 3 **6.** 3 : 4 : 11 **7.** 5 : 15 : 16