

LESSON
8.1**Study Guide***For use with pages 506–513***GOAL Find angle measures in polygons.****Vocabulary**

A **diagonal** of a polygon is a segment that joins two nonconsecutive vertices.

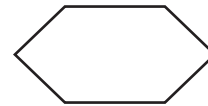
Theorem 8.1 Polygon Interior Angles Theorem: The sum of the measures of the interior angles of a convex n -gon is $(n - 2) \cdot 180^\circ$.

Corollary to Theorem 8.1 Interior Angles of a Quadrilateral: The sum of the measures of the interior angles of a quadrilateral is 360° .

Theorem 8.2 Polygon Exterior Angles Theorem: The sum of the measures of the exterior angles of a convex polygon, one angle at each vertex, is 360° .

EXAMPLE 1 Find the sum of angle measures in a polygon

Find the sum of the measures of the interior angles of a convex hexagon.

**Solution**

A hexagon has 6 sides. Use the Polygon Interior Angles Theorem.

$$\begin{aligned} (n - 2) \cdot 180^\circ &= (6 - 2) \cdot 180^\circ && \text{Substitute 6 for } n. \\ &= 4 \cdot 180^\circ && \text{Subtract.} \\ &= 720^\circ && \text{Multiply.} \end{aligned}$$

The sum of the measures of the interior angles of a hexagon is 720° .

EXAMPLE 2 Find the number of sides of a polygon

The sum of the measures of the interior angles of a convex polygon is 2700° . Classify the polygon by the number of sides.

Solution

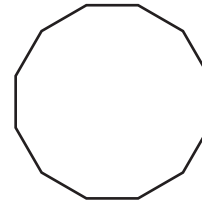
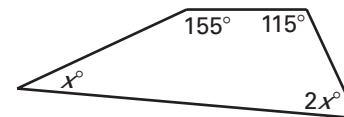
Use the Polygon Interior Angles Theorem to write an equation involving the number of sides n . Then solve the equation to find the number of sides.

$$\begin{aligned} (n - 2) \cdot 180^\circ &= 2700^\circ && \text{Polygon Interior Angles Theorem} \\ n - 2 &= 15 && \text{Divide each side by } 180^\circ. \\ n &= 17 && \text{Add 2 to each side.} \end{aligned}$$

The polygon has 17 sides. It is a 17-gon.

LESSON
8.1**Study Guide** *continued*
*For use with pages 506–513***Exercises for Examples 1 and 2**

- Find the sum of the measures of the interior angles of the polygon shown in the diagram.
- The sum of the measures of the interior angles of a convex polygon is 540° . Classify the polygon by the number of sides.

**EXAMPLE 3** Find an unknown interior angle measureFind the value of x in the diagram.**Solution**

The polygon is a quadrilateral. Use the Corollary to the Polygon Interior Angles Theorem to write an equation involving x . Then solve the equation.

$$x^\circ + 2x^\circ + 155^\circ + 115^\circ = 360^\circ$$

Corollary to Theorem 8.1

$$3x + 270 = 360$$

Combine like terms.

$$x = 30$$

Solve for x .**EXAMPLE 4** Find an unknown exterior angle measureFind the value of x in the diagram.**Solution**

Use the Polygon Exterior Angles Theorem to write an equation involving x . Then solve the equation.

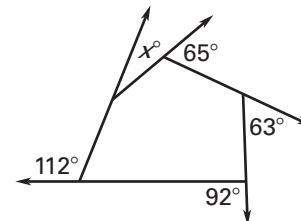
$$x^\circ + 65^\circ + 63^\circ + 92^\circ + 112^\circ = 360^\circ$$

Polygon Exterior Angles Theorem

$$x + 332 = 360$$

Combine like terms.

$$x = 28$$

Solve for x .**Exercises for Examples 3 and 4**

- What is the value of x in the diagram?
- A convex heptagon has exterior angles with measures 60° , 51° , 67° , 48° , 32° , and 59° . What is the measure of an exterior angle at the seventh vertex?

