7.1 Polygon Angles

Essential Question

What is the sum of the measures of the interior

angles of a polygon?

Exploration 1 **Draw the five polygons and use Inductive reasoning to complete th**
table and answer the question:

  How many diagonals can be drawn from one vertex of an n-gon?

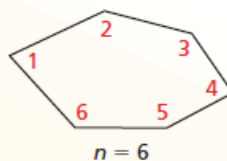| Sides	Diagonals	Triangles	Total Degrees
3			
4			
5			
6			
7			
...			
10			
20			
n			

⟳ Theorem

Theorem 7.1   Polygon Interior Angles Theorem

The sum of the measures of the interior angles
of a convex n-gon is $(n - 2) \cdot 180°$.

$$m\angle 1 + m\angle 2 + \cdots + m\angle n = (n - 2) \cdot 180°$$

Proof Ex. 42 (for pentagons), p. 365

$n = 6$

Example: Find the sum of the measures of the interior angles

of the figure.

1. The coin shown is in the shape of an 11-gon. Find

the sum of the measures of the interior angles.

Example:

> The sum of the measures of the interior angles of a convex polygon is 900°. Classify the polygon by the number of sides.
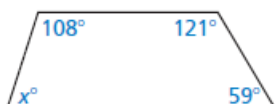
You Try it:

The sum of the measures of the interior angles of a convex polygon is 1440°. Classify the polygon by the number of sides.

⟳ Corollary

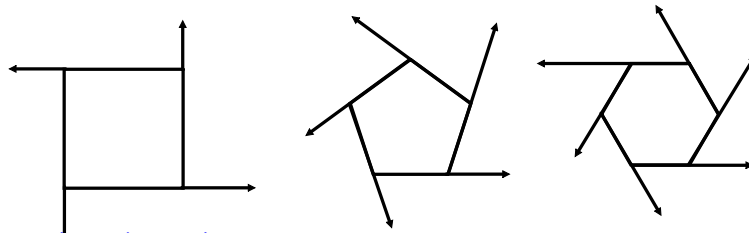**Corollary 7.1   Corollary to the Polygon Interior Angles Theorem**

The sum of the measures of the interior angles of a quadrilateral is 360°.

Proof Ex. 43, p. 366
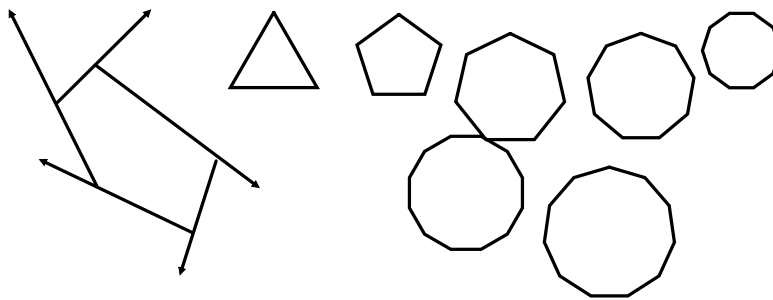
<u>Example</u>.Find the value of x in the diagram.

Exploration 2:

Complete the table:

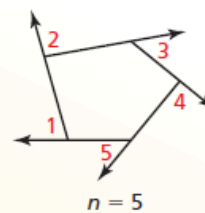| Sides	Total Interior Degrees	Measure of 1 Interior ∡	Measure of ∡ 1 Ext. Angle	Ext. Total
4				
5				
6				

Theorem

Theorem 7.2   Polygon Exterior Angles Theorem
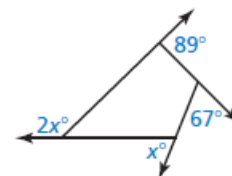
The sum of the measures of the exterior angles of a convex polygon, one angle at each vertex, is 360°.

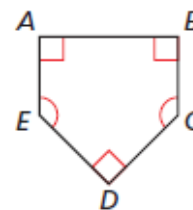$$m\angle 1 + m\angle 2 + \cdots + m\angle n = 360°$$

Proof Ex. 51, p. 366

$n = 5$

Example: Find the value of x in the diagram.

89°

2x°

67°

x°

Consider this:

A home plate for a baseball field is shown.

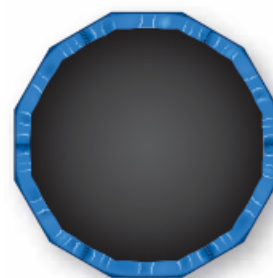a. Is the polygon regular? Explain your reasoning.

b. Find the measures of $\angle$ C and $\angle$ E

-ol

The trampoline shown is shaped like a

regular dodecagon.

a. Find the measure of each interior angle.

b. Find the measure of each exterior angle.

6. A convex hexagon has exterior angles with measures 34°, 49°, 58°, 67°, and 75°. What is the measure of an exterior angle at the sixth vertex?

7. An interior angle and an adjacent exterior angle of a polygon form a linear pair. How can you use this fact as another method to find the measure of each exterior angle in Example 6?

• Writing Prompt: To find the sum of the measures of the interior angles of an n-gon …