LESSON 6

Objective

Identify and classify regular polygons.

Common Core State Standards

- **5.G.3** Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*
- **5.G.4** Classify two-dimensional figures in a hierarchy based on properties.

Geometry

Regular Polygons

Once students can identify and classify triangles and quadrilaterals by the measures of their sides and by their angles, they can explore the properties of regular polygons. In this lesson, students will characterize regular polygons in terms of their internal angles.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

- **Say:** *Consider all the shapes that you made.* **Ask:** *How are they the same? How are they different?* Elicit that the shapes are all polygons, and more specifically, that they are all regular polygons. Elicit also that the shapes have different side lengths, different numbers of sides, and different angle measures.
- **Ask:** *Is a right triangle a regular polygon? A trapezoid? Why is it not possible to classify these polygons as regular polygons?*
- **Ask:** *Can you see a pattern in the number of sides that a polygon has and the number of triangles that can be formed from one vertex? How can you state this as a rule?*

Solve It

Reread the problem with students. Have them sketch or trace the model of the hexagon and explain why the floor of the gazebo is a hexagon.

More Ideas

For other ways to teach about regular polygons—

- Extend the lesson by having students work in pairs using AngLegs® to build regular polygons with 7, 8, 9, and 10 sides. Have them draw each polygon and predict the measure of each internal angle and the sum of the angles using what they learned in the lesson. Tell students to test their predictions by dividing the polygons into triangles using a pencil and a straightedge.
- Give pairs of students Pattern Blocks. Have them sort the blocks into groups based on their properties. Have students verify their classification for each type of polygon by using rulers to measure the sides of the polygon and protractors to measure the angles.

Formative Assessment

Have students try the following problem.

Each angle in a regular polygon is 108°. Which polygon is it?

A. square **B.** pentagon **C.** hexagon **D.** octagon

Try It! 30 minutes | Groups of 4

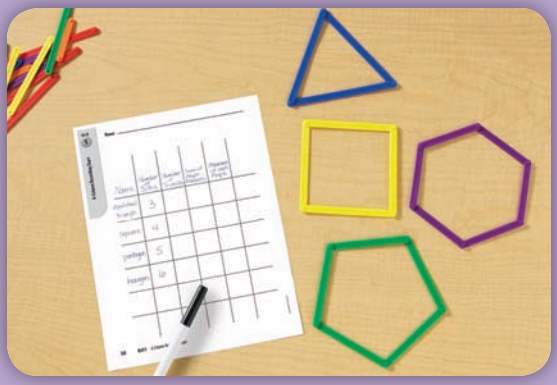
Here is a problem about classifying regular polygons.

The floor of a gazebo has the shape of a regular polygon. Each angle of the polygon measures 120°. What polygon describes the shape of the floor?

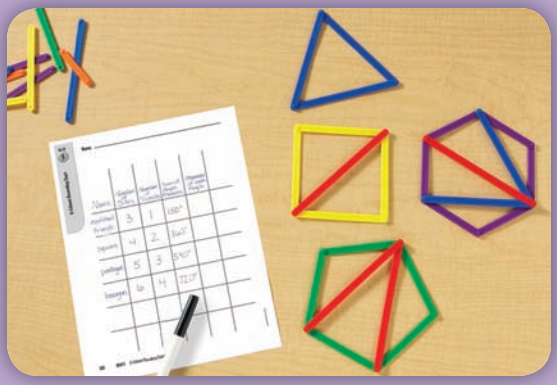
Introduce the problem. Then have students do the activity to solve the problem. Distribute AngLegs, recording charts, paper, and pencils to students. **Say:** *A* regular polygon *is a closed figure with all sides the same length and all angles the same measure.* Have students write the headings *Name, Number of Sides, Number of Triangles, Sum of the Angle Measures,* and *Measure of Each Angle* on their charts.

Materials

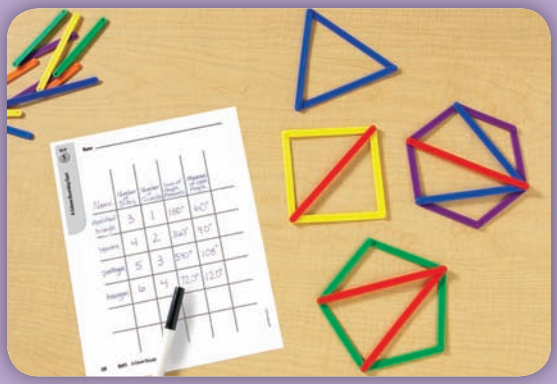
- AngLegs® (1 set per group)
- 6-Column Recording Chart (BLM 5; 1 per group)
- paper (1 sheet per group)
- pencils (1 per group)



1. Say: *Build a 3-sided polygon with blue AngLegs and a 4-sided polygon with yellow AngLegs.* **Ask:** *What are the names of these polygons? Are they regular?* Have students build 5-sided and 6-sided polygons using green and purple AngLegs, respectively, and name each polygon on the chart.



2. Say: *You can divide a polygon with more than three sides into triangles. Choose a vertex. Connect a red or blue AngLegs piece from that vertex to each of the other vertices.* Demonstrate to students how the sum of the internal angles is equal to 180° multiplied by the number of triangles formed. Have students find the sums of the internal angles of the polygons.



3. Say: *To find the measure of each angle in a regular polygon, divide the sum of its angle measures by the number of sides it has.* Have students complete the recording chart and determine the shape of the gazebo floor.

⚠ Look Out!

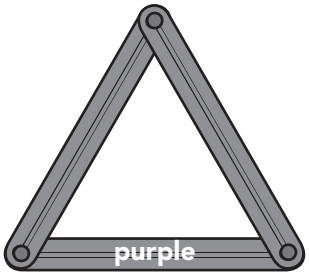
If students make models in Step 1 that look like irregular polygons, draw a regular pentagon and hexagon on the board and have students correct their models. The diagonals make the polygons rigid and enable students to count the triangles. Remind students that the angle measures in a regular polygon are equal.

Answer Key

Use AngLegs to model each regular polygon. What is the name of the polygon? Identify the sum of the measures of the interior angles of the polygon.

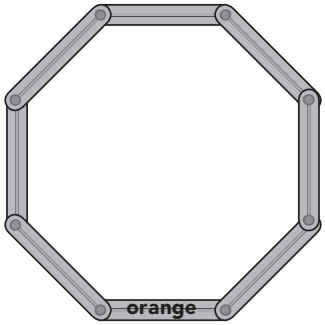
(Check students' work.)

1.



triangle; 180°

2.



octagon; 1,080°

Using AngLegs, model each regular polygon named. Sketch the model. What is the sum of the measures of the interior angles of the polygon?

(Check students' models.)

3. hexagon

720°

4. pentagon

540°

How many sides does each regular polygon have? What is the sum of the measures of the interior angles of each polygon?

5. decagon

10; 1,440°

6. heptagon

7; 900°

Answer Key

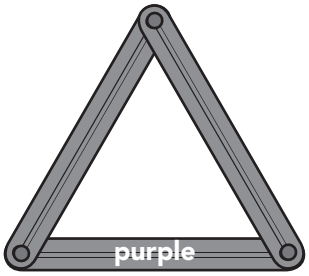
Challenge! Can the sum of the measures of the angles of a regular polygon be equal to 450°? Explain.

Challenge: No; 450° is not a multiple of 180°.

Name _____

Use AngLegs to model each regular polygon. What is the name of the polygon? Identify the sum of the measures of the interior angles of the polygon.

1.



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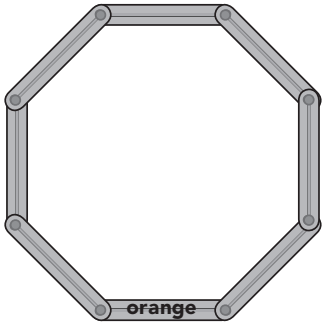

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Using AngLegs, model each regular polygon named. Sketch the model. What is the sum of the measures of the interior angles of the polygon?

3. hexagon

_____

4. pentagon

_____

How many sides does each regular polygon have? What is the sum of the measures of the interior angles of each polygon?

5. decagon

_____

_____

6. heptagon

_____

_____

Name _____

Challenge! Can the sum of the measures of the angles of a regular polygon be equal to 450°? Explain.

BLM 5

6-Column Recording Chart

Name _____
