

# Math 6 - Act. 12: Patterns in the Sums of Polygon Angles

## Summary

At the conclusion of this two-part lesson students will understand the connection between the sum of the interior angles of a polygon to an algebraic formula for determining the sum of the angles of any polygon.

## Materials

Part 1: Analyzing Interior Angles of Polygons

Results of [Pattern Block Polygons](#) Activity

Results of [Measuring Pattern Block Angles with Hinged Mirrors](#) Activity

Recording handout

Colored markers

Tearing Polygon Angles

Recording handout

Tape

Assorted triangles, quadrilaterals, pentagons, and hexagons (each shape should be made from a different color paper)

Additional Resource

:

*Geometry Teacher's Activities Kit: Ready-to-Use Lesson & Worksheets for Grades 6-12* by Judith Muschla & Gary Muschla (The Center for Applied Research in Education)

## Background for Teachers

Depending on the ability of the class, either part of this lesson (or ideally both parts) may be used to develop the conclusion that each time a side is added, 180 degrees is added to the sum of the interior angles of the polygon.

## Intended Learning Outcomes

2. Become mathematical problem solvers.
5. Make mathematical connections.

## Instructional Procedures

### Invitation to Learn

Have students recall what they learned through participating in [Measuring Pattern Block Angles with Hinged Mirrors Activity](#). List the findings on the board because they will be useful in completing Part 1 of this activity.

Part 1: Analyzing Interior Angles of Polygons

### Instructional Procedures:

Have students recall what they learned from Measuring Pattern Block Angles with Hinged Mirrors Activity.

Introduce the new task. Students are to revisit Pattern Block Polygons Activity and use the findings from Measuring Pattern Block Angles with Hinged Mirrors Activity to determine the sum of the interior angles of the polygons they constructed in Pattern Block Polygons Activity.

Model using the information about the individual pattern block angles to mark the polygon angles in Pattern Block Polygons Activity and then to record each vertex angle on the new recording sheet (see handout as reference).

Have students work to complete the task, showing their work on Pattern Block Polygons Activity

and recording findings on the recording handout.

Students should share their findings and compare with the rest of the group.

Encourage students to generalize their findings to determine an algebraic formula to describe the geometric patterns they see.

Closing discussion.

## Part 2: Tearing Polygon Angles

### Instructional Procedures:

Introduce the task, pass out a triangle to each student, and instruct participants to label the angles of the triangle as "1," "2," and "3."

Demonstrate how to tear the interior angles of the triangle and place each angle around a point on the handout. It is important that students actually tear the angles off. Cutting the angles off will result in a small triangle and it will be difficult for the students to keep track of which angle of the small triangle was the vertex angle of their original triangle.

Instruct students to tape their angles around the indicated points on the handout.

Have students work on their own to discover relationships among the interior angles of the remaining shapes using the same "tearing" and angle placement strategy.

### Curriculum Integration

#### *Math: Geometry and Algebra*

-- Have students use a table to record information they gather from the task. Students can analyze the data to determine patterns and work towards finding an algebraic formula to represent what is happening geometrically with the sums of the interior angles of the polygons. Students might explore a variety of polygons to determine which ones can tessellate a plane.

### Extensions

Provide students with a protractor to actually measure the angles of a variety of triangles, quadrilaterals, pentagons, and hexagons. Have students test their conjectures on irregular polygons, as well as concave polygons.

### Homework & Family Connections

Have students create a collection of polygons (triangles, quadrilaterals, pentagons) and determine which ones tessellate. Have students identify angles that rotate around a point, and then sketch them and try to determine the angle measurements based on logical reasoning. For example, students might find an intersection of angles in a sidewalk and try to estimate the angles based on logical reasoning and the findings of the activities.

### Assessment Plan

Ask students to summarize in their journal what they found through the investigation. Given the measures of the all but one of the angles of a polygon, have students identify the last angle.

### Authors

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