

# Puzzling Polygons

**Purpose:**

Participants will use language and symbols of geometry and apply properties of polygons to arrange pattern block shapes in a row.

**Overview:**

Participants will use puzzle clues given on cards to arrange a set of pattern blocks in a row from left to right. They will use the language of geometry, area and perimeter concepts, and properties of the pattern block shapes to complete each arrangement.

**TexES Mathematics 4-8 Competencies.** The beginning teacher:

- III.009.A Understands concepts and properties of points, lines, planes, angles, length, and distances.
- III.009.B Analyzes and applies the properties of parallel and perpendicular lines.
- III.009C Uses the properties of congruent triangles to explore geometric relationships and prove theorems.
- III.010.A Uses and understands the development of formulas to find lengths, perimeters, areas, and volumes of basic geometric figures.
- III.010.C Uses the properties of congruent triangles to explore geometric relationships and prove theorems.

**TEKS Mathematics Objectives.** The student is expected to:

- 4.8A Identify right, acute, and obtuse angles.
- 4.8C Describe shapes and solids in terms of vertices, edges, and faces.  
Measure to solve problems involving length, including perimeter, time, temperature, and area.
- 5.7A Identify critical attributes including parallel, perpendicular, and congruent parts of geometric shapes and solids.
- 5.7B Use critical attributes to define geometric shapes or solids.
- 5.11A Measure to solve problems involving length (including perimeter), weight, capacity, time, temperature, and area.
- 6.6A Use angle measurements to classify angles as acute, obtuse, or right.
- 6.6B Identify relationships involving angles in triangles and quadrilaterals.
- 6.8B Select and use appropriate units, tools, or formulas to measure and to solve problems involving length (including perimeter and circumference), area, time, temperature, capacity, and weight.
- 7.6B Use properties to classify shapes including triangles, quadrilaterals, pentagons, and circles.

**Terms.**

Angle, side, vertex, congruent, area, perimeter, obtuse angle, acute angle, right angle, bisect perpendicular, parallel, polygon, ratio, isosceles, equiangular, equilateral, interior angle, diagonal

**Materials.**

- Pattern blocks or pattern block templates

**Transparencies.**

- *Puzzling Polygons*




























**Activity Sheet(s).**

- *Puzzling Polygons*

**Procedure:**

<b>Steps</b>	<b>Questions/Math Notes</b>
<p>1. Have participants:</p> <ol style="list-style-type: none"><li>Read the problem "Puzzling Polygons"</li><li>Explore relationships among the pattern block polygons.</li><li>Cut out the cards on the Activity Sheet <i>Puzzling Polygons</i> (optional).</li><li>Work with a partner to solve each puzzle.</li><li>Record the arrangement for each card.</li><li>Compare results with a partner group.</li></ol>	<p>Ask participants questions that require them to reflect on their understanding of geometric concepts and to extend their thinking.</p> <p><i>What relationships did you observe among the pattern block polygons? Explain.</i></p> <p><i>Which polygons have all sides congruent? All interior angles congruent?</i></p> <p><i>Which polygons have the same base and altitude?</i></p> <p><i>If the green triangle represents a unit of area, how can you find the area of the red trapezoid?</i></p> <p><i>What is the ratio of the area of the green triangle to the area of the red trapezoid?</i></p> <p><i>If the yellow hexagon represents a unit of area, what is the area of a green triangle? Explain.</i></p> <p><i>What is the sum of the perimeters of the tan rhombus and the red trapezoid?</i></p> <p><i>Which polygons have only two diagonals?</i></p> <p><i>Which polygons have congruent diagonals?</i></p> <p><i>Which polygons are parallelograms? How do you know?</i></p> <p><i>Which polygons are regular? Explain.</i></p>
<p>2. Ask groups to record their solutions to one or more of the "Puzzling Polygons" cards on transparency film and share with the whole group.</p>	<p><i>How did you use the clues to help you make "a row of 4"? "a row of 5"?</i></p> <p><i>Did anyone get a different arrangement for card number (1-6)? What is your justification for this arrangement?</i></p> <p><i>How could you modify the given set of clues on card number (1-6) to give the same arrangement as before?</i></p> <p><i>What clue(s) would you add/change so that there is only one possible arrangement for card #5?</i></p> <p><i>What new insights do you have about polygons and their properties?</i></p>

**Solution:** Possible answers are shown below.

1.    
2.    
3.    
4.     
5.     
6.     

Group discussions should validate the arrangement for each “Puzzling Polygon” card solution and are key to this activity. Multiple solutions are possible for some of the cards.

**Reference:**

Erickson, Tim (1989). *Get it Together: Math Problems for Groups, 4<sup>th</sup> –12<sup>th</sup>* (pp. 56-57). Berkeley, CA: EQUALS, Lawrence Hall of Science.