

TITLE OF LESSON

Geometry Unit 1 Lesson 38 – Geometric Concepts: Polygons, Quadrilaterals
Prove it! What's on the outside? What's on the inside? Of Geometry

TIME ESTIMATE FOR THIS LESSON

One class period

ALIGNMENT WITH STANDARDS

California – Geometry

10.0 Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.

12.0 Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.

MATERIALS

String

LESSON OBJECTIVES

- To introduce some additional properties of polygons
 - To work on some problems related to polygons
 - To introduce some properties of quadrilaterals
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FOCUS AND MOTIVATE STUDENTS

- 1) Homework Check – Stamp/initial complete homework assignments. Pass back graded work and have students place in the appropriate sections of their binders.
- 2) **Agenda** – Have students copy the agenda.
- 3) Homework Review – (10 minutes) Review homework from Lesson 37. Recall the homework assignment was: Find the sums of the measures of the interior angles of a polygon having:
 - a. Four sides
 - b. Five sides
 - c. Six sides
 - d. Seven sides
 - e. 102 sides

Find the measure of the remaining angle for a polygon whose other angles measure:

- a. Triangle: (12° , 90°)
- b. Quadrilateral: (12° , 100° , 100°)
- c. Pentagon: (112° , 142° , 91° , 92°)
- d. Hexagon: (90° , 150° , 85° , 142° , 81°)

Have students give the answers to these problems. Ask them to explain how they were able to answer them. Then collect the homework.

ACTIVITIES – INDIVIDUAL AND GROUP

1. **Jigsaw** – (20 minutes) Jigsaw using the following sets of problems. Please refer to Lesson 29, if you wish to review how to conduct a jigsaw. (If you wish to give each group one problem from each set (a-d and e-h) simply vary the number of sides in the first set and vary the measures of the angles in the second set. You can also give different groups of students the same problems.)
 - a. Find the sum of the interior angles in a pentagon.
Find the sum of the exterior angles in a pentagon.

- b. Find the sum of the interior angles in a hexagon.
Find the sum of the exterior angles in a hexagon.
- c. Find the sum of the interior angles in an octagon.
Find the sum of the exterior angles in an octagon.
- d. Find the sum of the interior angles in a decagon.
Find the sum of the exterior angles in a decagon.

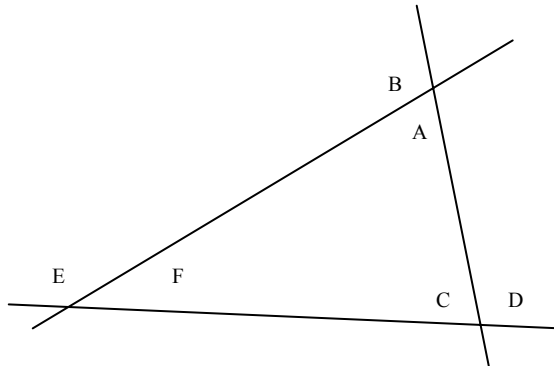


Figure 38.1 Exterior Angles of a Triangle

- e. Using this figure from the previous lesson (38.1) answer the following:
If the measure of angle A is 62° and the measure of angle C is 82° what are the measures of angles B, E, F and D? ($118^\circ, 144^\circ, 36^\circ, 98^\circ$)
 - f. Using this figure from the previous lesson (38.1) answer the following:
If the measure of angle A is 58° and the measure of angle C is 85° what are the measures of angles B, E, F and D? ($122^\circ, 143^\circ, 37^\circ, 95^\circ$)
 - g. Using this figure from the previous lesson (38.1) answer the following:
If the measure of angle A is 64° and the measure of angle C is 80° what are the measures of angles B, E, F and D? ($116^\circ, 144^\circ, 36^\circ, 100^\circ$)
 - h. Using this figure from the previous lesson (38.1) answer the following:
If the measure of angle A is 63° and the measure of angle C is 79° what are the measures of angles B, E, F and D? ($117^\circ, 142^\circ, 38^\circ, 101^\circ$)
2. Definitions: More Polygons– (10 minutes) Write the following definitions on the board and have the students copy the definitions into the *terms and definitions* section of their binders.

Definitions of Polygons in which each angle has the same measure:

An Equiangular polygon is a polygon in which each angle has the same measure.

An Equilateral polygon is a polygon in which each side has the same length.

A Regular polygon is a polygon that is both equiangular and equilateral.

If a triangle is a regular triangle what is the measure of the angles? (They are all equal to 60° since the sum of the angles of a triangle is 180° and there are 3 angles.)

If a quadrilateral is a regular quadrilateral what is the measure of the angles? (They are all equal to 90° since the sum of the angles of quadrilateral is 360° and there are 4 angles) What is another name for a regular triangle? (An equilateral triangle.) What is another name for a regular quadrilateral? (A square)

As the class answers the following, record their answers on the board:

What is the measure of each of the angles of a regular pentagon? ($180 \cdot (N-2)/N = 180 \cdot 3/5 = 108^\circ$)

What is the measure of each of the angles of a regular hexagon? ($180 \cdot 4/6 = 120^\circ$)

What is the measure of each of the angles of a regular decagon? ($180 \times 8 / 10 = 144^\circ$)

Look at these answers. Do you notice a pattern here? (The size of the angles is increasing?)

As the polygon has more and more sides, how large do you think this number can get, knowing that the answer is to the question *What is the measure of each of the interior angles in a polygon?* (180° , since the formula is $180^\circ((N-2)/N)$ which gets closer and closer to $180^\circ \times 1$ as N gets large. This involves understanding of limits and may not be a relevant question at this point but could be thought provoking.)

3. Definitions: Special Quadrilaterals – (10 minutes) It's now time to look at some special types of quadrilaterals. Write the following definitions on the board and have students copy them into their binders under *terms and definitions*. Accompany each definition with the appropriate drawing and make sure students draw the images too.

A Parallelogram is a quadrilateral having two pairs of parallel sides.

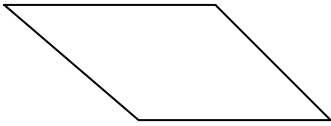


Figure 38.2 Rhombus

A parallelogram in which the angles are not equal to 90° is known as a Rhombus



Figure 38.3 Rectangle

A parallelogram in which the angles are equal to 90° is known as a Rectangle

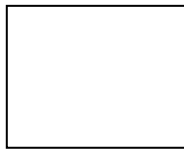


Figure 38.4 Square

A parallelogram in which the angles are equal to 90° and all the sides are equal is known as a Square



Figure 38.5 Trapezoid

If the quadrilateral has only one set of parallel sides it is known as a Trapezoid.

Using the string, have four students stand in place, holding string, while two others move them into the appropriate position for each of these shapes. Continue this until they have formed each one, and each student has had a chance to participate.

4. Homework Review – Explain the homework assignment. Answer questions.

HOMEWORK

Find 10 examples of shapes in the real world that conform to the shapes we looked at today. Extra points will be given for anyone who finds a rhombus or a trapezoid. Make a drawing, take a picture, cut it out of a magazine, or write a description.

GROUP ROLES

Prove It
How do we create truth?

2:1:38:Geometric Concepts: Polygons, Quadrilaterals

Recorder – All students need to record agreed upon answers, as they will be responsible for explaining them to group A.

Facilitator – Your job is to keep your group members focused on solving the problems.

Time Keeper – Your job is to make sure that your group finishes in the amount of time given.

Presenter – All students will present to their A group. So it is critical that all students understand how to solve the problems.

DOCUMENTATION FOR PORTFOLIO

None