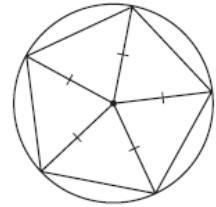


Lesson 8.4: Areas of Regular Polygons

In this lesson you will:

- discover the area formula for regular polygons

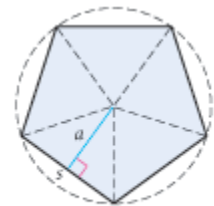
You can divide a regular polygon into congruent _____ triangles by drawing segments from the center of the polygon to each vertex. The center of the polygon is actually the center of the circumscribed circle, so each of these congruent segments is called a radius of the regular polygon.



In the investigation you will divide regular polygons into triangles. Then you will write a formula for the area of any regular polygon.

Investigation 8.4: “Area Formula for Regular Polygons”

Consider a regular pentagon with side length s , divided into congruent isosceles triangles. Each triangle has a base s and a height a .



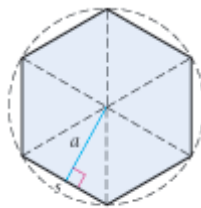
Regular pentagon

A.) What is the area of one isosceles triangle in terms of a and s ?

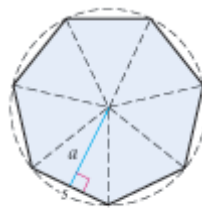
$A = \underline{\hspace{2cm}}$

B.) What is the area of this pentagon in terms of a and s ? $A = \underline{\hspace{2cm}}$

C.) Repeat parts A and B with other regular polygons and complete the table below.



Regular hexagon



Regular heptagon

Number of sides	5	6	7	8	9	10	...	12	...	n
Area of regular polygon							

The distance a appears in the area formula for a regular polygon, and it has a special name—**apothem**. An **apothem** for a regular polygon is a perpendicular segment from the center of the polygon’s circumscribed circle to a side of the polygon. You may also refer to the length of the segment as the apothem.

*Add “apothem” to your vocabulary list.

D.) What is the perimeter of a regular polygon in terms of n and s ? $P = \underline{\hspace{2cm}}$

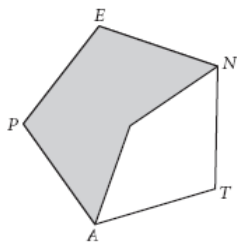
E.) Use your findings in this investigation to complete the following conjecture.

Regular Polygon Area Conjecture (C-79)

The area of a regular polygon is given by the formula $A = \underline{\hspace{2cm}}$ or $A = \underline{\hspace{2cm}}$, where A is the area, P is the perimeter, a is the apothem, s is the length of each side, and n is the number of sides.

•Example 1: The area of a regular nonagon is about 302.4 cm^2 and the apothem is about 9.6 cm . Find the approximate length of each side.

•Example 2: Find the area of the shaded region of the regular pentagon PENTA (shown below). The apothem measures about 2.0 cm . Segment PE measures about 2.9 cm .



⇒ASSIGNMENT: _____