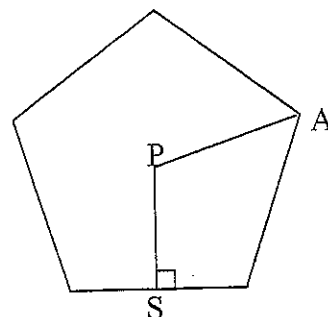
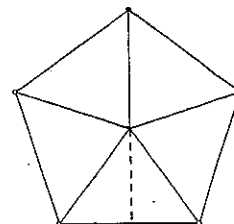


## Notes for sections 10.3 and 10.5 – Area of Regular Polygons

In a regular polygon, a segment drawn from the center of the polygon perpendicular to a side of the polygon is called an apothem. In the figure at the right  $\overline{PS}$  is an apothem. A segment drawn from the center of the polygon to a vertex is called a radius of the polygon. In the figure at the right,  $\overline{PA}$  is a radius.



The area of a regular polygon can be found by dividing the polygon into congruent isosceles triangles. For example, the pentagon above can be divided into 5 triangles by drawing all five radii. If a regular polygon has  $n$  sides then it can be divided into  $n$  triangles.



Now find the area of one of the triangles (note: area of triangle =  $\frac{1}{2}bh$ ). The height of the triangle will be the apothem. The base of the triangle is the length of one side,  $s$ , of the polygon. Therefore, area of the triangle =  $\frac{1}{2}sa$ .

Since there are  $n$  triangles, multiply the area of the triangle by  $n$  to get the area of the polygon.

$$\text{Area of polygon} = n[\frac{1}{2}s \cdot a] \text{ or } \frac{1}{2}n \cdot s \cdot a$$

However,  $n \cdot s$  is just the perimeter,  $P$ , of the polygon. Therefore, the area of a regular polygon with perimeter  $P$  and apothem  $a$  is

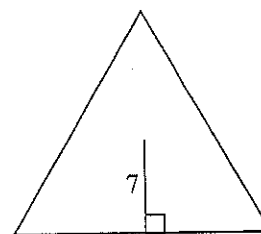
$$A = \frac{1}{2}Pa$$

Ex. 1 Find the area of a regular pentagon with perimeter 54.49 m and an apothem of 7.5 m.

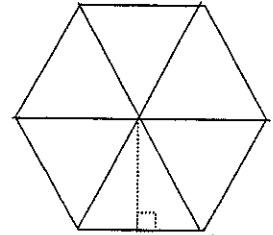
Ex. 2 Find the area of a regular hexagon with an apothem of  $5\sqrt{3}$  cm and each side 10 cm.

Equilateral triangles are sometimes easier to work with  $A = \frac{s^2\sqrt{3}}{4}$

Ex. 3 Find the apothem, area, and perimeter of the equilateral triangle below.

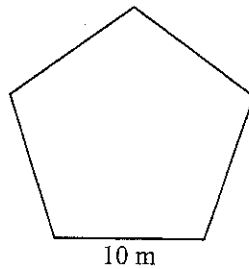


Ex. 4 Hexagons are made up of 6 congruent equilateral triangles so the area of a regular hexagon can be found using:  $A = 6 \times \left( \frac{s^2 \sqrt{3}}{4} \right)$ . Find the apothem, perimeter, and area of a regular hexagon that has a side of 8 in.



Find the apothem, perimeter, and area of each regular polygon. Round your answers to the nearest tenth.

Ex. 5



Ex. 6

