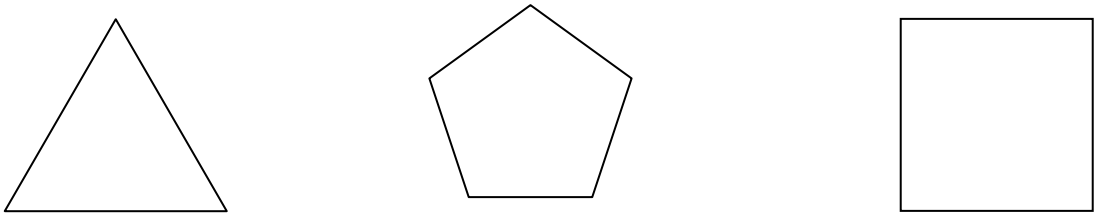
Math 1312
Section 8.2
Regular Polygons and Area

Definition:

A **regular polygon** is a polygon that is both equilateral (all sides are congruent) and equiangular (all angles are congruent).

Example1:



Theorem 1: The measure *I* of each interior angle of a regular polygon of *n* sides is

$$I = \frac{(n-2)\cdot 180^{\circ}}{n}.$$

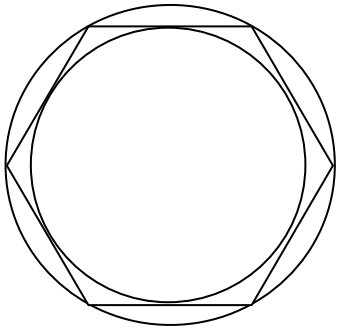
Definitions:

A polygon is **circumscribed about** a circle if all of its vertices lie on the circle.

A polygon is **inscribed in** a circle if each of its sides is tangent to the circle.

The **center of a regular polygon** is the common center for the inscribed and circumscribed circles of the polygon.

Example 2:



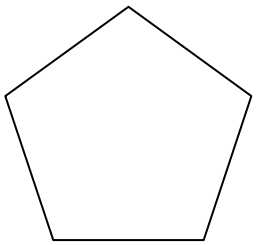
Definitions:

The segment from the center of a regular polygon perpendicular to a side of a regular polygon is called an **apothem**.

The segment from the center to a vertex a regular polygon is the **radius** of the regular polygon.

A **central angle** of a regular polygon is the angle formed by two consecutive radii.

Example 3:

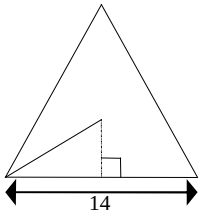


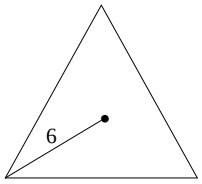
Theorem 2: The measure of each central angle is found by: $C = \frac{360}{n}$

Theorem 3: Any radius of a regular polygon bisects the angle at the vertex to which it is drawn and any apothem bisects the side to which it is drawn.

Theorem 4: The area of any regular polygon can be found by: $A = \frac{1}{2}aP$, where a = apothem and P = perimeter.

Example 4: Find the apothem (a), area (A), and perimeter (P) of each regular polygon.

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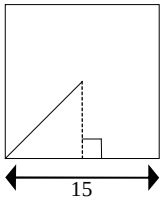
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Example 5: Find the apothem (a), area (A), and perimeter (P) of each regular polygon.

a) Hexagon with $a=8$

b) Octagon with apothem = 4.8, side = 4

c) Square with apothem = 24