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 Adv Geo -
 M 4/25/16

Note Title

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Objectives

After studying this section, you will be able to

- Find the areas of circles
- Find the areas of sectors
- Find the areas of segments

The Area of a Circle

You may already know the formula for the area of a circle.

Postulate *The area of a circle is equal to the product of π and the square of the radius.*

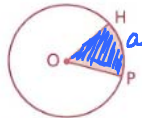
$$A_{\odot} = \pi r^2$$

where r is the radius.

The Area of a Sector

The region bounded by a circle may be divided into *sectors*.

Definition A *sector* of a circle is a region bounded by two radii and an arc of the circle.



$$\frac{a}{360} \pi r^2 = A_{\text{sector}}$$

Just as the length of an arc is a fractional part of the circumference of a circle, the area of a sector is a fractional part of the area of the circle.

Theorem 108 *The area of a sector of a circle is equal to the area of the circle times the fractional part of the circle determined by the sector's arc.*

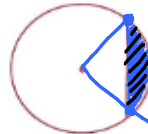
$$A_{\text{sector HOP}} = \left(\frac{m\widehat{HP}}{360} \right) \pi r^2$$

where r is the radius and \widehat{HP} is measured in degrees.

The Area of a Segment

Another way of dividing the interior of a circle produces a *segment*.

Definition A *segment* of a circle is a region bounded by a chord of the circle and its corresponding arc.



By studying the diagram above, you may be able to see what to do to find the area of a segment. Sample problem 4 will illustrate the procedure in detail.

Problem 1 Find the area of a circle whose diameter is 10.

$$r = 5$$

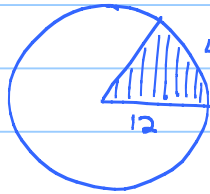
$$A = \pi r^2 = 25\pi$$

Problem 2 Find the circumference of a circle whose area is 49π sq units.

$$A = r^2 \pi$$
$$r = 7$$

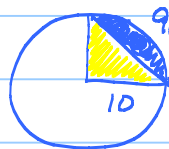
$$C = \pi d \Rightarrow C = 14\pi$$

Problem 3 Find the area of a sector with a radius of 12 and a 45° arc.



$$45^\circ \frac{\text{arc}}{360} (\pi r^2) \leftarrow$$
$$\frac{45}{360} (144\pi)$$
$$\frac{1}{8} \cdot \frac{12 \cdot 12}{2} \pi = 18\pi$$

Problem 4 The measure of the arc of the segment (\widehat{AB}) is 90° . The radius of the circle is 10. Find the area of the segment.



$$= \frac{90}{360} \pi 10^2 - \frac{1}{2} 10 \cdot 10$$

$$\frac{100}{4} \pi - \frac{100}{2}$$

$$\boxed{25\pi - 50}$$