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Adv Geo -

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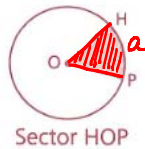
$$A_{\odot} = \pi r^2$$

where r is the radius.

$C = \pi d \quad or \ 2r\pi$

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.

Sector HOP

$\dfrac{a}{360} \pi r^2$

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.*

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

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.

$r = 5$

$\pi r^2 \rightarrow 25\pi$

Problem 2   Find the circumference of a circle whose area is 49π sq units.
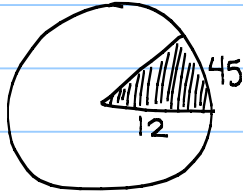
$$49\pi = \pi r^2$$
$$49 = r^2$$
$$7 = r$$
then $2r\pi = C$
$$14\pi$$

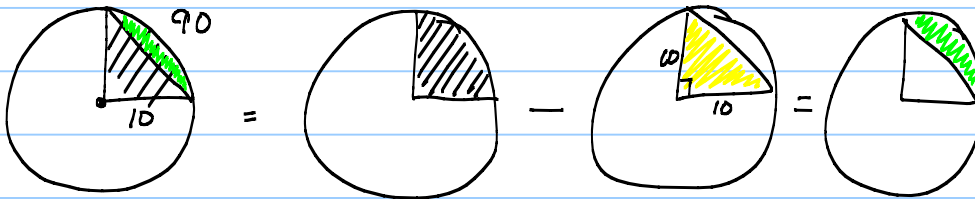**Problem 3**   Find the area of a sector with a radius of 12 and a 45° arc.

$$\left(\frac{45}{360}\right)\pi \, 12^2$$

$$\frac{1}{8} \cdot 12 \cdot 12\,\pi$$

$$\frac{\cancel{4} \cdot 3 \cdot \cancel{2} \cdot 6}{\cancel{4} \cdot \cancel{2}}\,\pi = \boxed{18\pi}$$

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

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

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

Tonight's homework: 1, 3, 5, 6, 7, 14