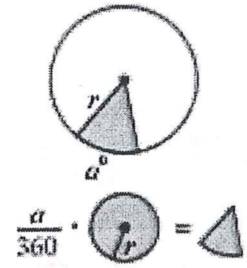
Unit 6 NOTES #9 Area of a Sector, Segment, and Annulus

A sector is the region between two radii of a circle and the included arc.

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



$$\left(\frac{a}{360}\right) \cdot \pi r^2 = A_{sector}$$

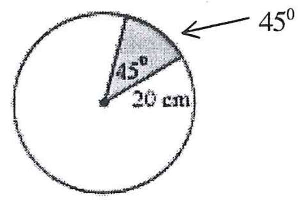
To find the **area of a sector** of a circle, follow these steps:

1. Find the fraction of the circle that is shaded in by dividing the angle measure of the included arc by 360.
2. Use the radius of the circle to find the area of the entire circle.
3. Multiply the fraction times the area of the circle to find the area of the sector.

$$A = \text{Fraction} \times \text{Area}_{circle} = \text{Area}_{sector}$$

$$A = \frac{\text{degrees}}{360} \times \pi r^2$$

r = 20 cm. The measure of the angle is 45^0.
Find the area of the sector.



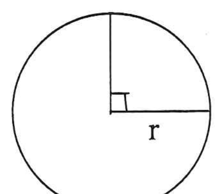
$$A = \frac{45}{360}\pi \cdot 20^2 = \frac{45}{360} \cdot 400\pi = 50\pi \text{ cm}^2$$

To **find the radius** of the circle if you know the area of the sector you must "work backwards" from the area to the radius using the formula.

1. Write an equation with the area of the sector on one side and the formula for the area of a sector on the other.
2. Solve the equation for r by dividing on both sides or taking the square root of both sides to find the radius

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

The area of the sector = **36π** cm
The angle = 90^0. Find r



$$A = \frac{\text{degrees}}{360} \cdot \pi r^2$$

$$\frac{36\cancel{\pi}}{\pi} = \frac{90}{360} \cdot \frac{\cancel{\pi} r^2}{\pi} \quad \text{divide by } \pi$$

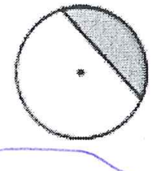
$$36 = \frac{90}{360} \cdot r^2$$

$$\div \frac{90}{360} \qquad \div \frac{90}{360} \quad \text{divide by } \frac{90}{360}$$

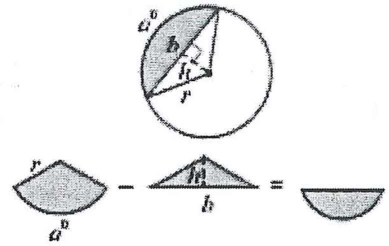
$$\sqrt{144} = \sqrt{r^2} \quad \text{take the square root}$$

$$12 \text{ cm} = r$$

A <u>Segment</u> is the region between a chord of a circle and the included arc.



$$A_{\text{segment}} = \frac{\text{degrees}}{360} \cdot \pi r^2 - \frac{1}{2}bh$$

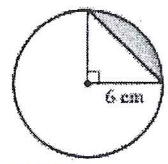


$$\left(\frac{a}{360}\right) \cdot \pi r^2 - \frac{1}{2}bh = A_{\text{segment}}$$

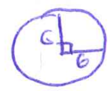
To find the **area of a segment** of a circle, follow these steps:

1. Find the fraction of the circle represented by the angle measure of the include arc. Take the angle measure and divide by 360
2. Find the area of the entire circle using the radius
3. Multiply the fraction times the area of the entire circle to find the area of the sector of the circle.
4. Find the area of the triangle created by the chord and the two radii in

r = 6 cm Find the area of the segment of the circle.



$$A = \frac{90}{360} \cdot \pi 6^2 = \frac{90}{360} \cdot 36\pi = 9\pi$$

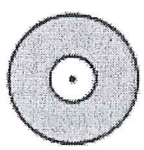


$b = 6$ ← both are radii
$h = 6$

$$A = \frac{1}{2}(6)(6) = 18$$

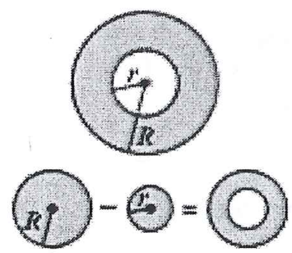
$$A_{\text{segment}} = 9\pi - 18 \approx 28.26 - 18 \approx 10.26\text{ cm}^2$$

An <u>Annulus</u> is the region between two concentric circles.



R = radius of large circle

r = radius of small circle



$$\pi R^2 - \pi r^2 = A_{\text{annulus}}$$

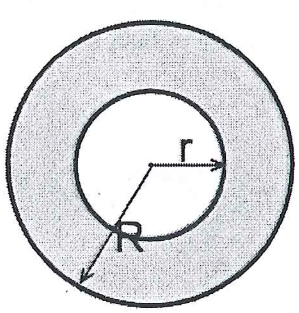
To find the **area of an annulus** follow these steps:

1. Find the area of the big circle using radius R.
2. Find the area of the smaller circle using radius r.
3. Subtract the area of the small circle from the area of the big circle to find the area of the annulus.

$$A_{\text{big circle}} - A_{\text{small circle}} = A_{\text{annulus}}$$

$$A_{\text{annulus}} = \pi R^2 - \pi r^2$$

R = 15 cm r = 7cm Find the area of the annulus.



$$A = \pi 15^2 - \pi 7^2$$

$$= 225\pi - 49\pi$$

$$= 176\pi\text{ cm}^2$$