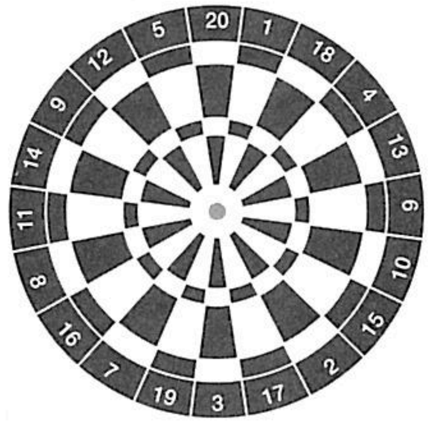
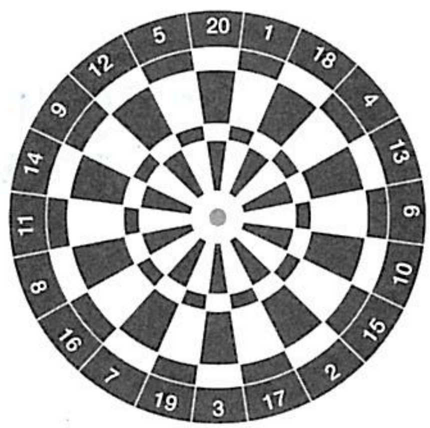
PROBLEM 1 Hitting the Bull's-Eye of a Circle

A standard dartboard is shown. Each section of the board is surrounded by wire, and the numbers indicate scoring for the game. For a single throw, the highest possible score can be achieved by landing a dart at the very center or the bull's-eye, of the dartboard.



Concentric circles are circles that share the same center point.

1. How many concentric circles do you see in the dartboard shown, not including the dartboard itself? Draw these circles.



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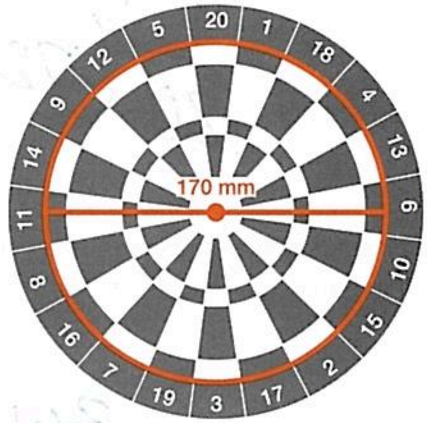
2. The diameter of the outermost circle is 170 millimeters. Calculate its area. Express your answer in terms of π.



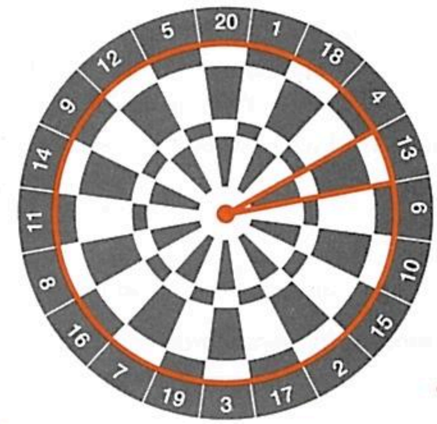
$r = 85$

$A = \pi(85)^2$

$A = 7225\pi$

A **sector of a circle** is a region of the circle bounded by two radii and the included arc. You will see that there is a relationship between the area of a sector and the area of a circle.

3. The dartboard can be divided into congruent sectors.



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a. Determine the number of sectors contained in the outermost circle.

20

b. Determine the measure of the central angle and the measure of the intercepted arc formed by each sector.

$360/20 = 18°$

c. Determine the ratio of the length of each intercepted arc to the circumference.

$\frac{1}{20}$

d. Determine the ratio of the area of each sector to the area of the circle.

$\frac{1}{20}(7225\pi)$

e. Determine the area contained by each of these sectors of the circle. Express your answer in terms of π. Explain how you determined the area.

361.25π

To determine the area of a sector, A, you multiplied the area of the circle by a fraction that represents the portion of the area determined by the central angle measure, m. There is a proportional relationship between the measure of the area of a circle sector, A, and the area of the circle.

$$A = \frac{m}{360^\circ} \cdot \text{area of circle}$$

$\frac{x}{360} \cdot \pi r^2$

$$\frac{A}{\text{area of circle}} = \frac{m}{360^\circ}$$

The formula for sector area can also be written as follows.

$$A = \frac{m}{360^\circ} \cdot \text{area of circle}$$

$$\boxed{A = \frac{m}{360^\circ} \cdot \pi r^2}$$

4. How does the formula for determining the area of a sector compare to the formula for determining the arc length.

fraction × Area or Circumference

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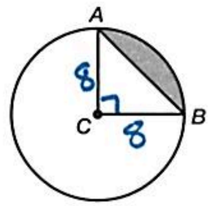
PROBLEM 2 Segment of a Circle

A **segment of a circle** is a region of the circle bounded by a chord and the included arc.



1. Name the chord and the arc that bound the shaded segment of the circle.

$\overline{AB}$ $\overset{\frown}{AB}$

2. Describe a method to calculate the area of the segment of the circle.

$A_{sector} - A_{Triangle}$

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3. If the length of the radius of circle C is 8 centimeters and $m\angle ACB = 90°$, use your method to determine the area of the shaded segment of the circle. Express your answer in terms of π. Then, rewrite your answer rounded to the nearest hundredth.

$r = 8$ $\frac{1}{4}$ circl

$A_{sector} = \frac{1}{4}\pi(8)^2$ $A_{\Delta} = \frac{1}{2}(8)(8)$

16π $= 32$

$\boxed{16\pi - 32}$ 18.27

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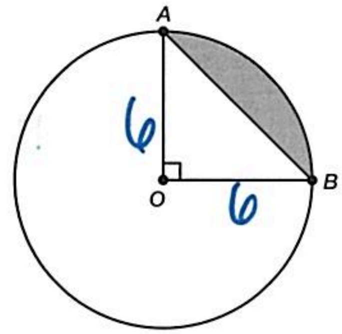
4. The area of the segment shown is $9\pi - 18$ square feet. Calculate the radius of circle O.



$\boxed{r=6}$

$A_{\Delta} = 18$

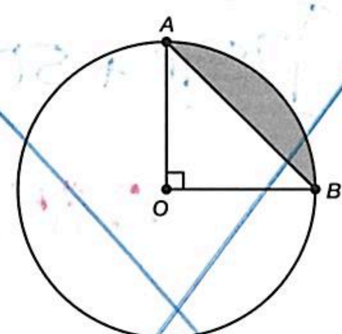
$\frac{1}{2}x^2 = 18$

$x^2 = 36$

$x = 6$

5. The area of the segment is 10.26 square feet. Calculate the radius of circle O.

Challenge!



$\frac{1}{4}\pi r^2 - \frac{1}{2}r^2 = 10.26$

$r^2\left(\frac{1}{4}\pi - \frac{1}{2}\right) = 10.26$

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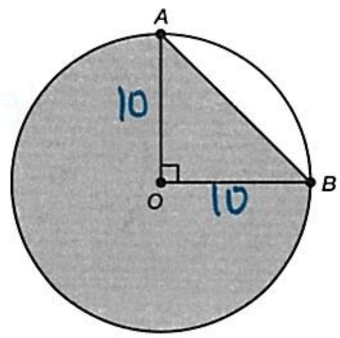
6. The length of the radius is 10 inches. Calculate the area of the shaded region of circle O. Express your answer in terms of π.



$$\frac{3}{4} \cdot \pi(10)^2 = 75\pi$$

$$\frac{1}{2}(10)(10) = 50$$

$$A = \boxed{75\pi + 50}$$

285.62

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