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CC GEOMETRY

TROICI

LESSON #4: AREA OF SECTOR

Do Now:

1. An arc has a length of 7 kilometers with a radius of 12 kilometers. What is the measure of the arc's central angle, to the nearest degree?

$$s = \frac{\theta}{360} (2\pi r)$$

$$7 = \frac{\theta}{360} \cdot 2\pi \cdot 12$$

$$24\pi\theta = 2520$$

$$\theta = 33.4$$

33°

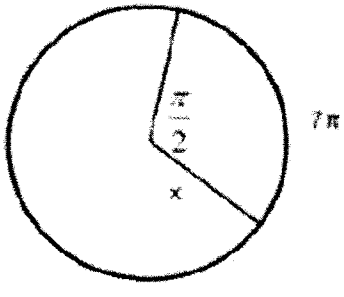
2. The circle below has a central angle of $\frac{\pi}{2}$ radians and an arc length of 7π inches. Find the radius:

$$s = \theta r$$

$$7\pi = \frac{\pi}{2} r$$

$$14 = r$$

r = 14

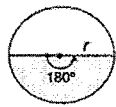


Circle

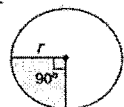


$A_c = \pi r^2$

Semi-circle



Quarter-circle



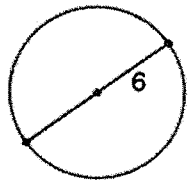
half circle = 180° central angle 1/4 of circle = 90° central angle

1. Find the area of a circle with a radius of 6.

$$A = \pi r^2$$

$$A = \pi 6^2$$

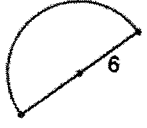
A = 36π



2. Determine the area of a semi-circle with a radius of 6.

$$A = \frac{\pi r^2}{2}$$


$$A = \frac{\pi 6^2}{2}$$

$$A = \frac{36\pi}{2} = \mathbf{18\pi}$$


3. Determine the area of a quarter-circle with a radius of 6

$$A = \frac{\pi r^2}{4}$$

$$A = \frac{\pi 6^2}{4}$$

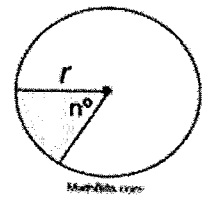
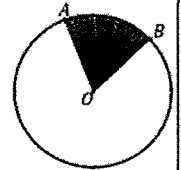
$$A = \frac{36\pi}{4} = \mathbf{9\pi}$$


Definition of Sector: Let \widehat{AB} be an arc of a circle with center O and radius r . The union of all segments \overline{OP} , where P is any point of \widehat{AB} , is called a *sector*.

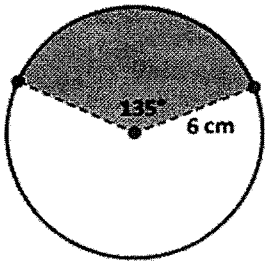
Area of a Sector formula:

$$\frac{\theta}{360} (\pi r^2)$$

area of circle!



4. Find the area of the shaded sector, to the nearest tenth.



$$\frac{\theta}{360} (\pi r^2)$$

$$\frac{135}{360} (\pi 6^2)$$

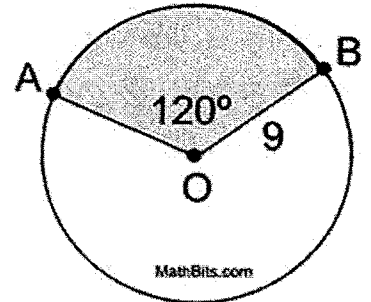
$$\boxed{42.4 \text{ cm}^2}$$

5. Find the area of the sector shown at the right. The radius of the circle is 9 cm. and the central angle of the sector is 120° . Express the answer to the *nearest tenth* of a square centimeter.

$$\frac{\theta}{360} (\pi r^2)$$

$$\frac{120}{360} (\pi 9^2)$$

$$\boxed{84.8 \text{ cm}^2}$$

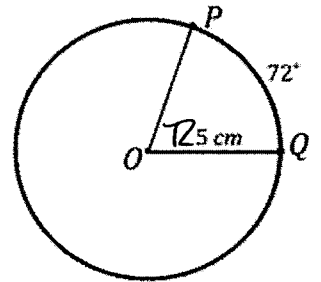


1. P and Q are points on the circle of radius 5 cm, and the measure of arc \widehat{PQ} is 72° . Find, *to the nearest tenth*, the area of the sector.

$$\frac{\theta}{360} (\pi r^2)$$

$$\frac{72}{360} (\pi 5^2)$$

$$\boxed{15.7 \text{ cm}^2}$$

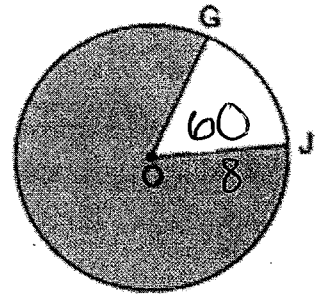


6. In the diagram below of circle O, the $m\angle GOJ = 60^\circ$ square centimeters and the length of \overline{OJ} is 8 centimeters. Determine the area, in terms of π , of the *shaded* region?

$$360 - 60 = 300^\circ$$

$$\frac{300}{360} (\pi 8^2)$$

$$\boxed{\frac{1600\pi}{3}}$$

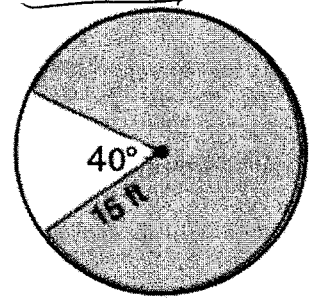


7. In the diagram below a circle has a radius of 15 feet and central angle of 40° . What is the area, in terms of π , of the shaded region?

$$360 - 40 = 320^\circ$$

$$\frac{320}{360} (\pi (15)^2)$$

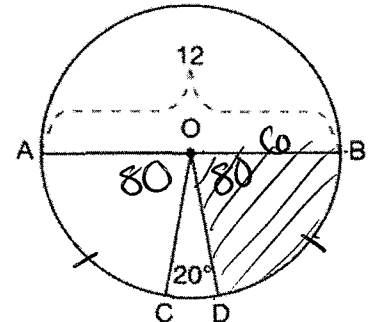
$$\boxed{200\pi}$$



8. In the diagram below of circle O, diameter \overline{AB} and radii \overline{OC} and \overline{OD} are drawn. The length of \overline{AB} is 12 and the measure of $\angle COD$ is 20 degrees. If $\overline{AC} \cong \overline{BD}$, find the area of sector BOD in terms of π .

$$\frac{80}{360} (\pi (6)^2)$$

$$\boxed{8\pi}$$



$$180 - 20 \div 2 = 80$$

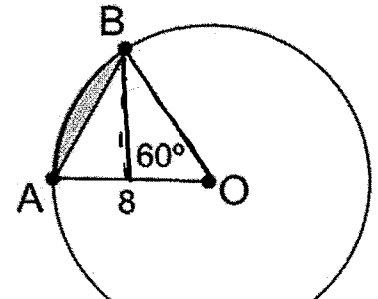
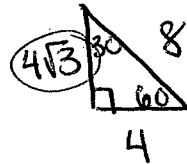
9. Find the area of the segment shown at the right. The radius of the circle is 8 ft., and the central angle of the sector is 60° . Express the answer to the nearest tenth of a square foot.

$$A_{\text{shaded}} = A_{\text{sector}} - A_{\text{triangle}}$$

$$= \frac{60}{360} (\pi 8^2) - \frac{1}{2} (8)(8) \rightarrow \text{need!}$$

$$= \frac{60}{360} (\pi 64) - \left(\frac{1}{2} (8)(4\sqrt{3}) \right)$$

$$= \boxed{5.8 \text{ ft}^2}$$



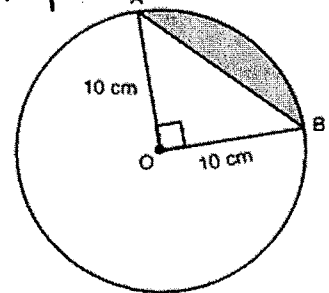
30	60	90
x	x\sqrt{3}	2x
4	4\sqrt{3}	8

10. Find the area of the shaded region to the nearest tenth.

$$A_{\text{shaded}} = A_{\text{sector}} - A_{\text{triangle}}$$

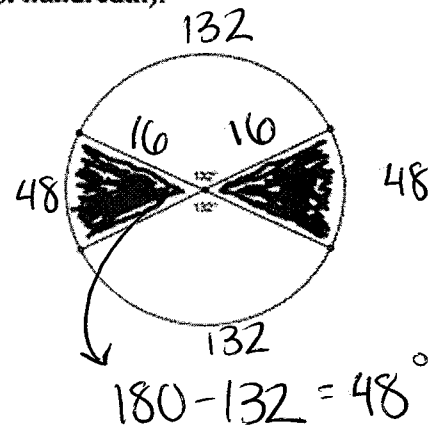
$$= \frac{90}{360} (\pi 10^2) - \frac{1}{2} (10)(10)$$

$$= \boxed{28.5 \text{ cm}^2}$$



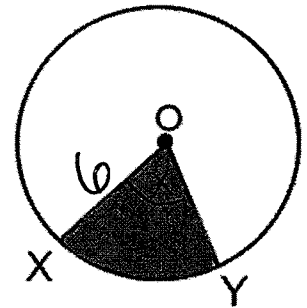
11. Find the area of the shaded region if the diameter is 32 inches (round to the nearest hundredth).

$$\begin{aligned}
 A_{\text{sector}} &= 2 \left(\frac{\theta}{360} (\pi r^2) \right) \\
 &= 2 \left(\frac{48}{360} (\pi 16^2) \right) \\
 &= \boxed{214.47 \text{ in}^2}
 \end{aligned}$$



12. In the diagram below of circle O , the area of the shaded region XOY is 7π square inches and the length of \overline{OX} is 6 inches. Determine and state the measure of $\angle XOY$ in degrees.

$$\begin{aligned}
 A_{\text{sector}} &= \frac{\theta}{360} \pi r^2 \\
 7\pi &= \frac{\theta}{360} \pi 6^2 \\
 \frac{360\pi \theta}{360\pi} &= \frac{2520\pi}{360\pi} \\
 \theta &= 70^\circ
 \end{aligned}$$



13. In the diagram below of circle O , the area of the *unshaded* sector GOJ is 5π square centimeters and the length of \overline{OJ} is 6 centimeters. Determine and state the $m\angle GOJ$ in degrees.

$$\begin{aligned}
 5\pi &= \frac{\theta}{360} \pi 6^2 \\
 \frac{360\pi \theta}{360\pi} &= \frac{1800\pi}{360\pi} \\
 \theta &= 50^\circ
 \end{aligned}$$

