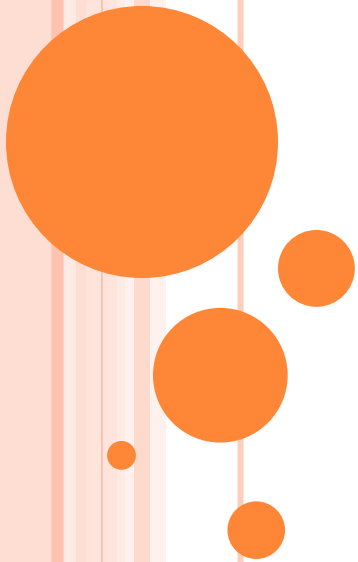


GEOMETRY UNIT 10

11-6: Arc Lengths and Areas of Sectors



WARM-UP

- Continue working where you left off on the group questions in the 11-5 notes.
- 10 minutes of work time, then we move on.



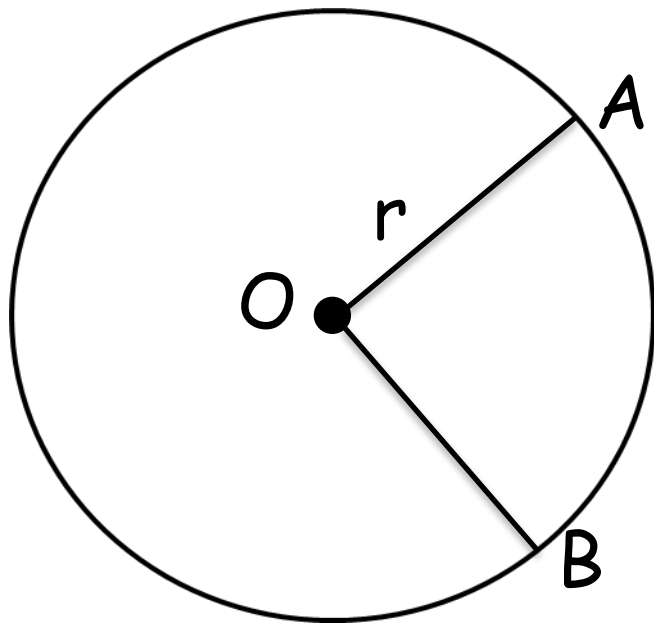
ARC LENGTHS AND AREAS OF SECTORS

- **Content Objective**: Students will be able to use equations to solve for the lengths of arcs and area of sectors.
- **Language Objective**: Students will be able to identify arcs and sectors of circle, being able to find the length of arcs and area of sectors.



REVIEW

- An arc is A portion of the circle connecting two points from the circle.
- Circumference of a circle: $C = 2\pi r$
- Area of a circle: $A = \pi r^2$

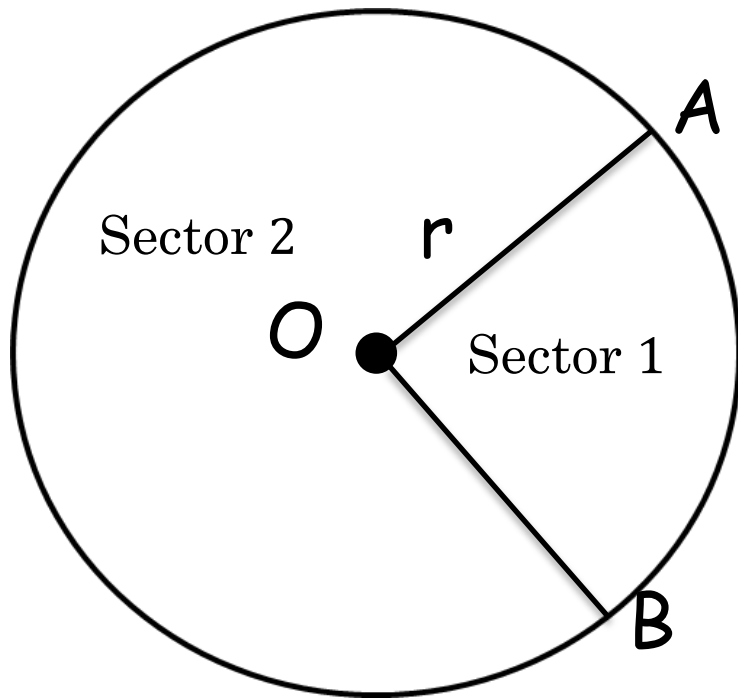


Minor Arc: \widehat{AB}



SECTORS

- The inside portion of the circle that is bounded by the arc and the radii is called the **Sector**.
- There are two sectors, each covered by a specific arc.

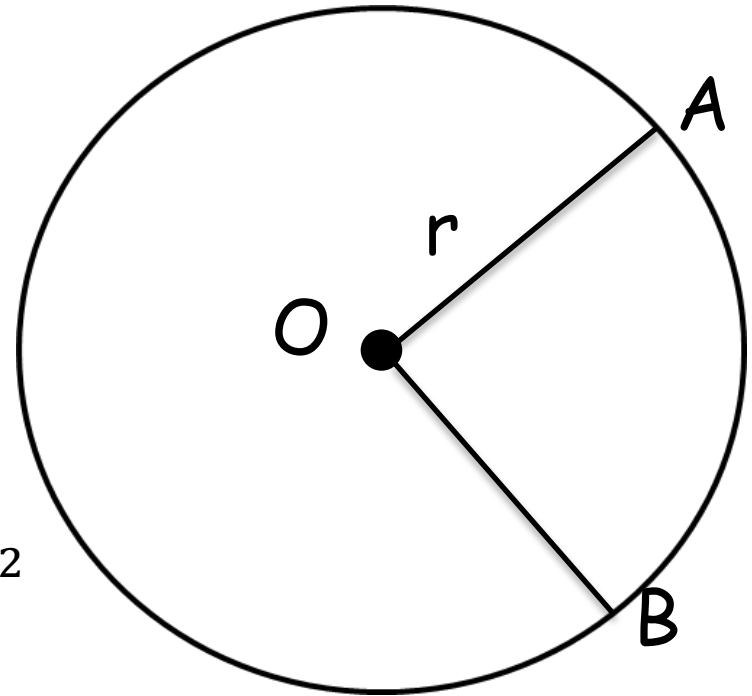


ARC LENGTH AND AREA OF A SECTOR

- Given the circle with minor arc \widehat{AB} ,

$$\text{Arc Length: } L = \frac{m \widehat{AB}}{360} \times 2\pi r$$

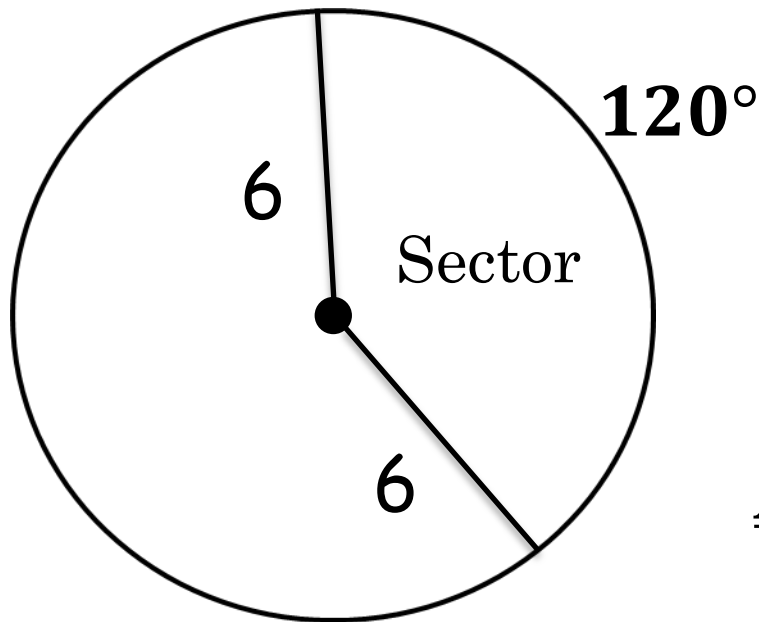
$$\text{Area of a Sector: } A = \frac{m \widehat{AB}}{360} \times \pi r^2$$



PRACTICE

- Find the arc length and area of each chosen sector.

1.)



Arc Length:

$$L = \frac{120}{360} \times 2\pi \times 6$$

$$L = \frac{1}{3} \times 12\pi$$

$$L = 4\pi$$

Area of Sector

$$A = \frac{120}{360} \times \pi \times 6^2$$

$$A = \frac{1}{3} \times 36\pi$$

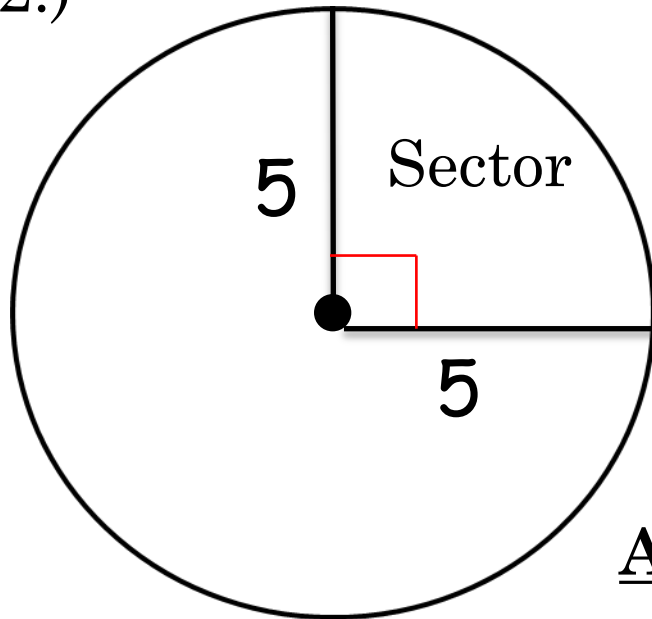
$$A = 12\pi$$



PRACTICE

- Find the arc length and area of each chosen sector.

2.)



Arc Length:

$$L = \frac{90}{360} \times 2\pi \times 5$$

$$L = \frac{1}{4} \times 10\pi$$

$$L = \frac{5}{2}\pi$$

Area of Sector

$$A = \frac{90}{360} \times \pi \times 5^2$$

$$A = \frac{1}{4} \times 25\pi$$

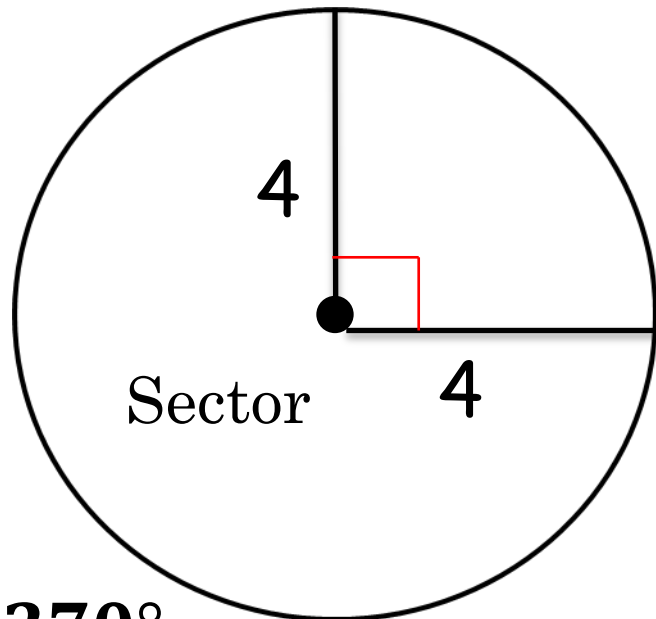
$$A = \frac{25}{4}\pi$$



PRACTICE

- Find the arc length and area of each chosen sector.

3.)



270°

Arc Length:

$$L = \frac{270}{360} \times 2\pi \times 4$$

$$L = \frac{3}{4} \times 8\pi$$

$$L = 6\pi$$

Area of Sector

$$A = \frac{270}{360} \times \pi \times 4^2$$

$$A = \frac{3}{4} \times 16\pi$$

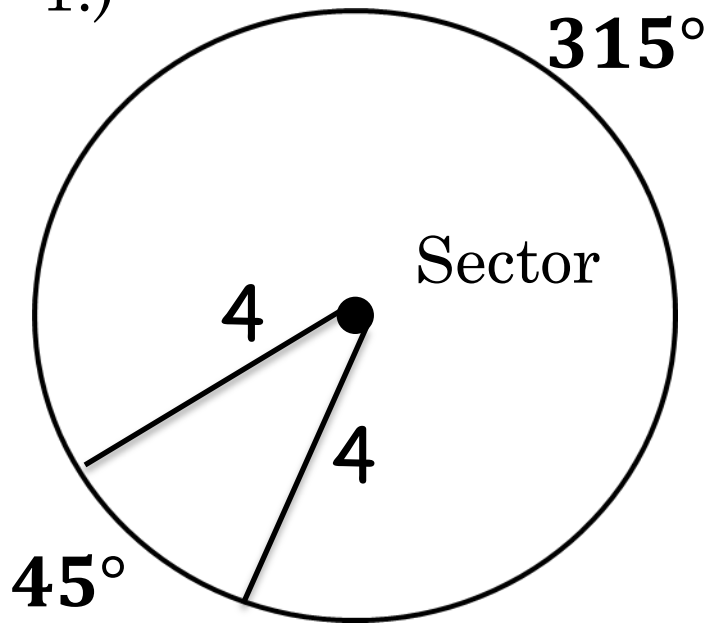
$$A = 12\pi$$



GROUP PRACTICE:

- Find the arc length and area of each sector of the circle.

1.)



Arc Length :

$$L = \frac{315}{360} \times 2\pi \times 4$$

$$L = \frac{7}{8} \times 8\pi$$

$$L = 7\pi$$

Area of Sector

$$A = \frac{315}{360} \times \pi \times 4^2$$

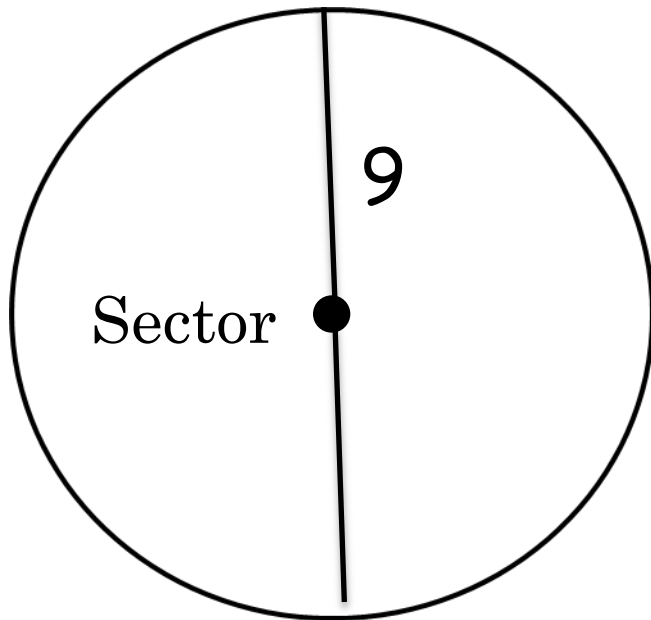
$$A = \frac{7}{8} \times 16\pi$$

$$A = 14\pi$$



GROUP PRACTICE:

- Find the arc length and area of each sector of the circle.
- 2.)



Arc Length :

$$L = \frac{180}{360} \times 2\pi \times 9$$

$$L = \frac{1}{2} \times 18\pi$$

$$L = 9\pi$$

Area of Sector

$$A = \frac{180}{360} \times \pi \times 9^2$$

$$A = \frac{1}{2} \times 81\pi$$

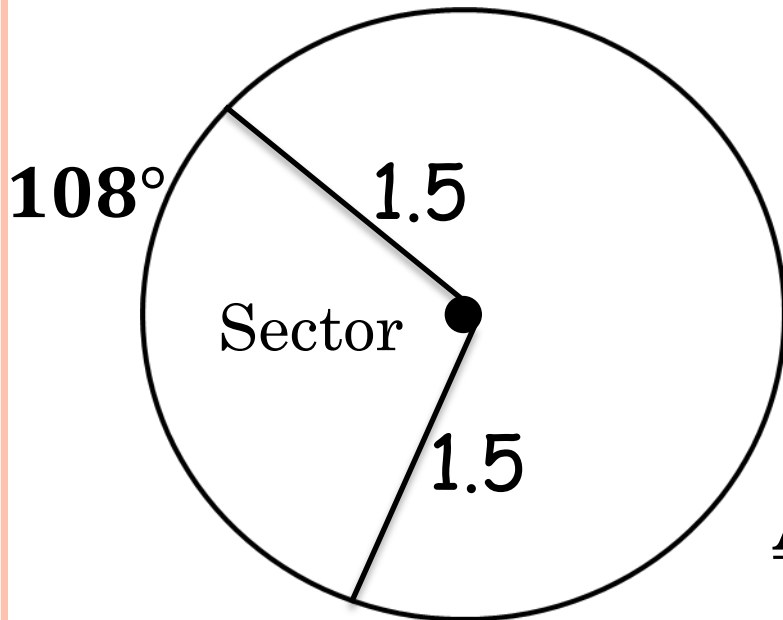
$$A = \frac{81}{2} \pi$$



GROUP PRACTICE:

- Find the arc length and area of each sector of the circle.

3.)



Arc Length :

$$L = \frac{108}{360} \times 2\pi \times 1.5$$

$$L = \frac{3}{10} \times 3\pi$$

$$L = \frac{9}{10}\pi$$

Area of Sector

$$A = \frac{108}{360} \times \pi \times 1.5^2$$

$$A = \frac{3}{10} \times 2.25\pi$$

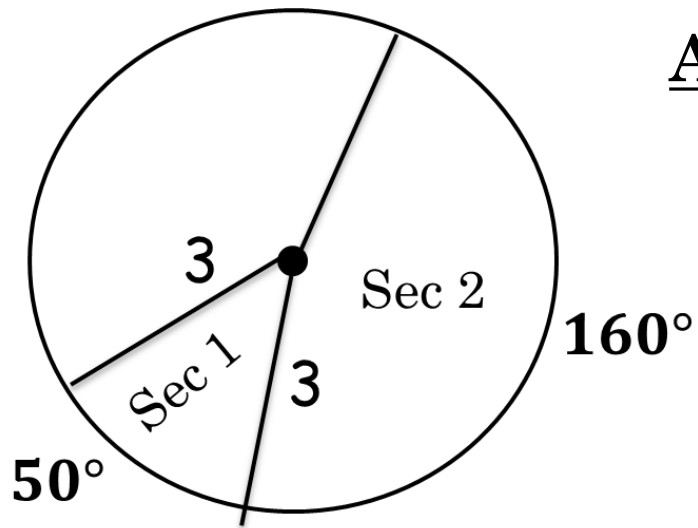
$$A = \frac{6.75}{10}\pi = 0.675\pi$$



GROUP PRACTICE:

- Find the arc length and area of each chosen sector.

4.)



Arc Length (1):

$$L = \frac{50}{360} \times 2\pi \times 3$$

$$L = \frac{5}{6}\pi$$

Area of Sector (1):

$$A = \frac{50}{360} \times \pi \times 3^2$$

$$A = \frac{5}{4}\pi$$

Arc Length (2):

$$L = \frac{160}{360} \times 2\pi \times 3$$

$$L = \frac{8}{3}\pi$$

Area of Sector (2):

$$A = \frac{160}{360} \times \pi \times 3^2$$

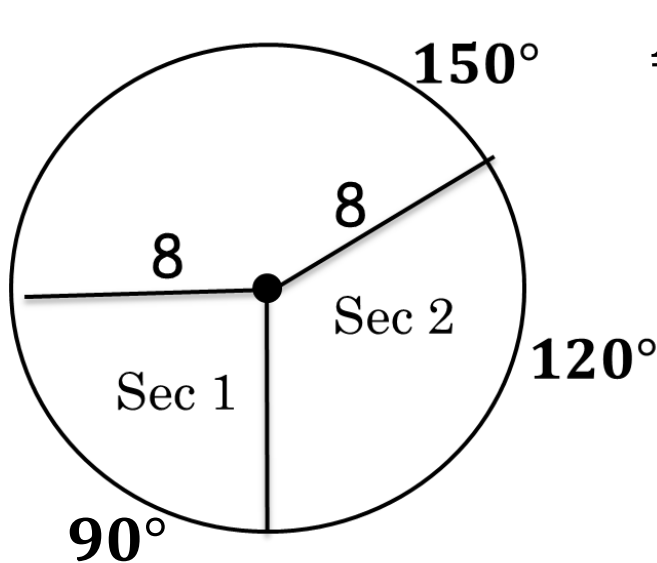
$$A = 4\pi$$



GROUP PRACTICE:

- Find the arc length and area of each chosen sector.

5.)



Arc Length (1): Area of Sector (1):

$$L = \frac{90}{360} \times 2\pi \times 8$$

$$L = 4\pi$$

$$A = \frac{90}{360} \times \pi \times 8^2$$

$$A = 16\pi$$

Arc Length (2):

$$L = \frac{120}{360} \times 2\pi \times 8$$

$$L = \frac{16}{3}\pi$$

Area of Sector (2):

$$A = \frac{120}{360} \times \pi \times 8^2$$

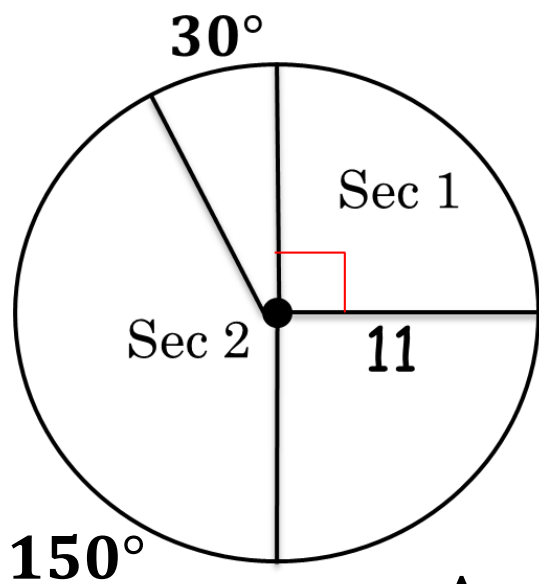
$$A = \frac{64}{3}\pi$$



GROUP PRACTICE:

- Find the arc length and area of each chosen sector.

6.)



Arc Length (1): Area of Sector (2):

$$L = \frac{90}{360} \times 2\pi \times 11 \quad A = \frac{90}{360} \times \pi \times 11^2$$

$$L = \frac{11}{2} \pi \quad A = \frac{121}{4} \pi$$

Arc Length (1):

$$L = \frac{150}{360} \times 2\pi \times 11$$

$$L = \frac{55}{6} \pi$$

Area of Sector (2):

$$A = \frac{150}{360} \times \pi \times 11^2$$

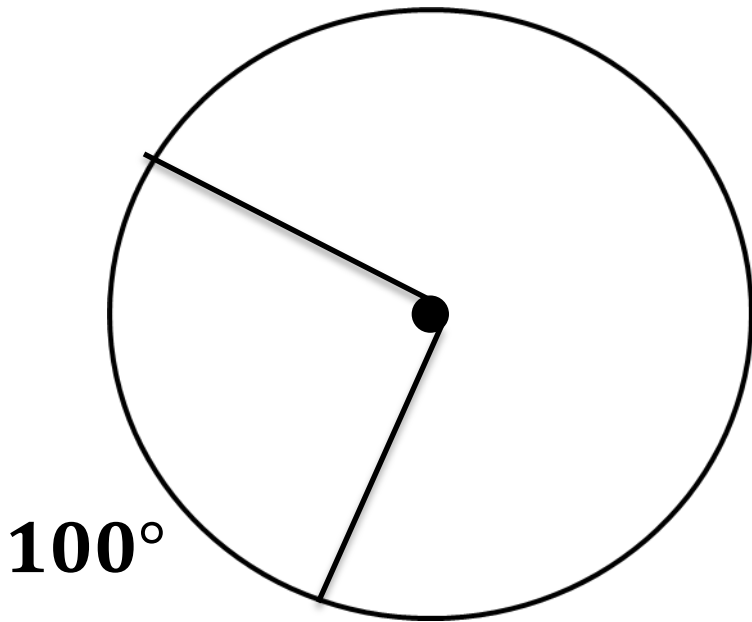
$$A = \frac{605}{12} \pi$$



GROUP PRACTICE:

If given the area of the sector, find the radius and the arc length. If given the arc length, find the radius and the area of the sector

7.)



Given Area of Sector: 10π

$$\text{Radius: } 10\pi = \frac{100}{360} \times \pi r^2$$

$$10 = \frac{5}{18} \times r^2$$

$$36 = r^2$$

$$r = 6$$

$$\text{Arc Length: } L = \frac{100}{360} \times 2\pi \times 6$$

$$L = \frac{5}{18} \times 12\pi$$

$$r = \frac{10}{3}\pi$$



GROUP PRACTICE:

If given the area of the sector, find the radius and the arc length. If given the arc length, find the radius and the area of the sector

8.)

Given Arc Length: 10π

$$\text{Radius: } 10\pi = \frac{72}{360} \times 2\pi \times r$$

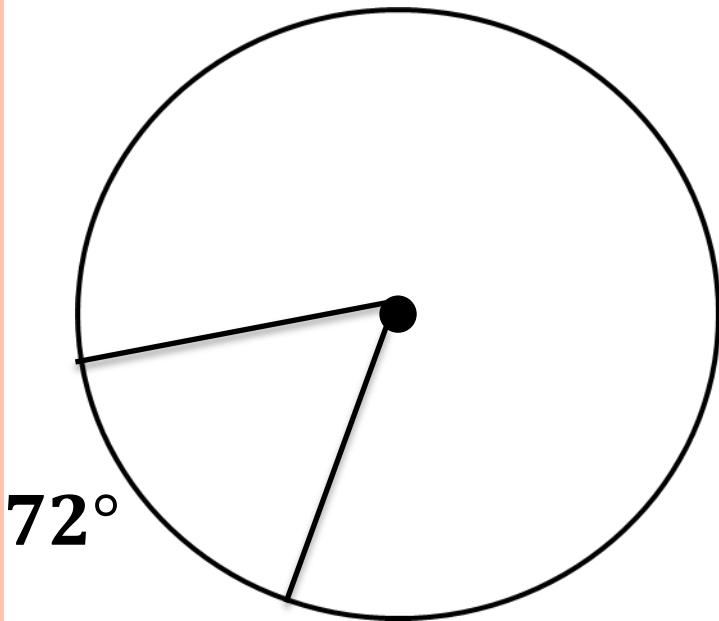
$$10 = \frac{1}{5} \times 2r$$

$$r = 25$$

$$\text{Area of Sector: } A = \frac{72}{360} \times \pi \times 25^2$$

$$A = \frac{1}{5} \times 625\pi$$

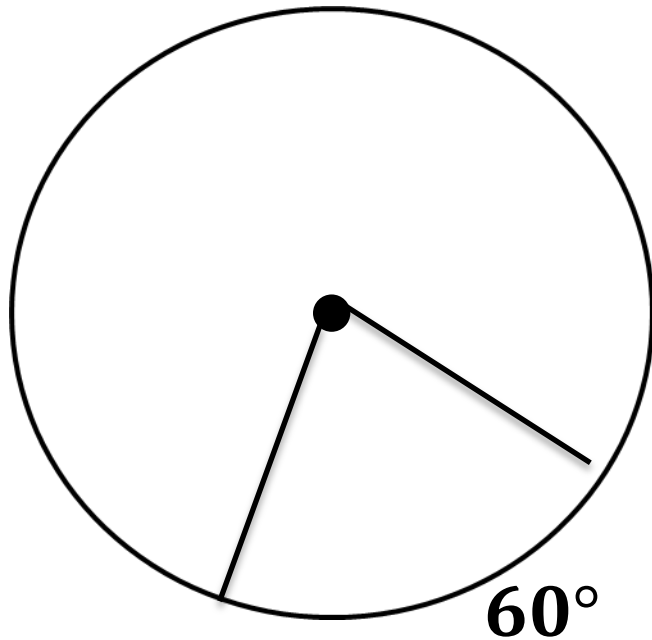
$$A = 125\pi$$



GROUP PRACTICE:

If given the area of the sector, find the radius and the arc length. If given the arc length, find the radius and the area of the sector

9.)



Given Arc Length: 3π

$$\text{Radius: } 3\pi = \frac{60}{360} \times 2\pi \times r$$

$$3 = \frac{1}{6} \times 2r$$

$$r = 9$$

$$\text{Area of Sector: } A = \frac{60}{360} \times \pi \times 9^2$$

$$A = \frac{1}{6} \times 81\pi$$

$$A = \frac{27}{2}\pi$$

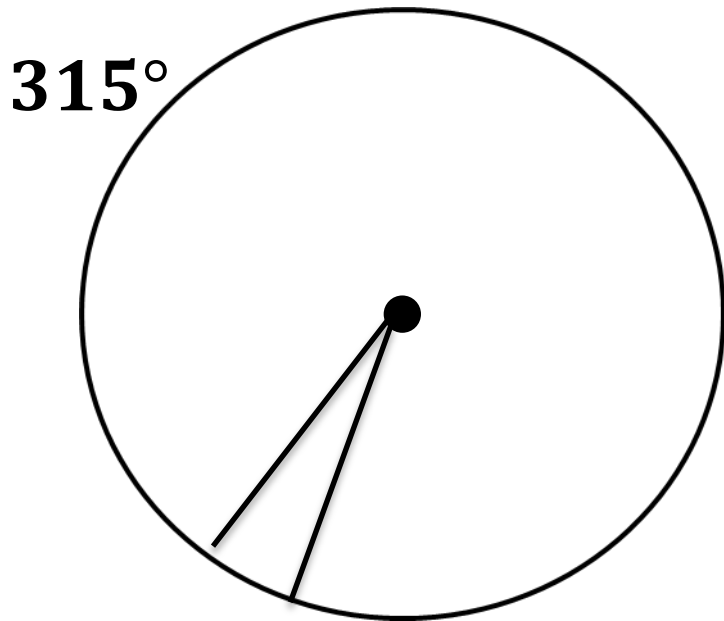


GROUP PRACTICE:

If given the area of the sector, find the radius and the arc length. If given the arc length, find the radius and the area of the sector

Given Area of Sector: $\frac{7}{2}\pi$

10.)



$$\begin{aligned}\text{Radius: } \frac{7}{2}\pi &= \frac{315}{360} \times \pi r^2 \\ \frac{7}{2} &= \frac{7}{8} \times r^2 \\ 4 &= r^2 \\ r &= 2\end{aligned}$$

$$\begin{aligned}\text{Arc Length: } L &= \frac{315}{360} \times 2\pi \times 2 \\ L &= \frac{7}{8} \times 4\pi \\ r &= \frac{7}{2}\pi\end{aligned}$$

