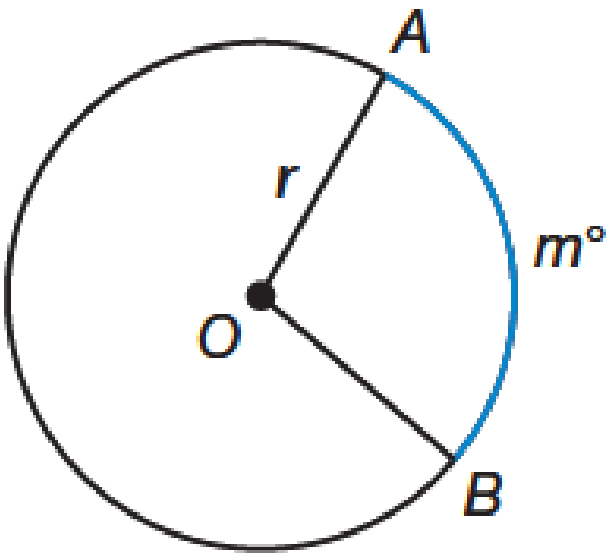
Lesson 35

Finding Arc Lengths and Areas of Sectors

Arc Length – To find the length of an arc, use this formula, where m is the degree measure of the arc.

$$L = 2\pi r\left(\frac{m°}{360°}\right)$$



Example 1 Finding Arc Length

Find each arc length. Give your answer in terms of π.

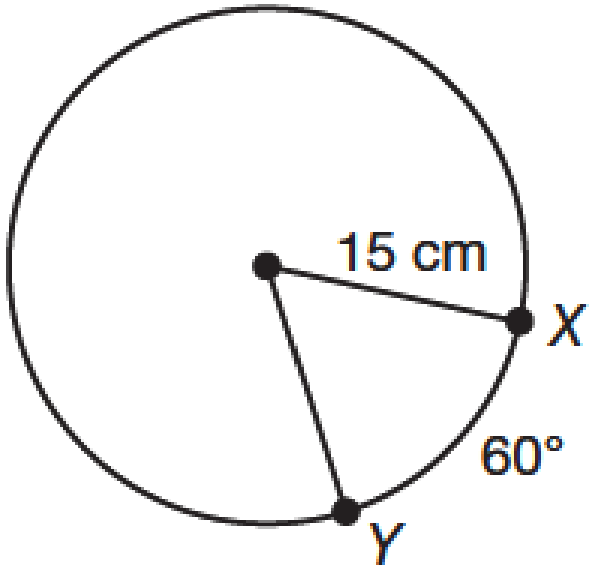
a. Find the length of $\widehat{XY}$.

SOLUTION

$$L = 2\pi r\left(\frac{m°}{360°}\right)$$

$$L = 2\pi(15)\left(\frac{60°}{360°}\right)$$

$$L = 5\pi \text{ cm}$$



Example 1 Finding Arc Length

Find each arc length. Give your answer in terms of π.

b. Find the length of an arc with a measure of 75° in a circle with a radius of 4 feet.

SOLUTION

$$L = 2\pi r\left(\frac{m°}{360°}\right)$$

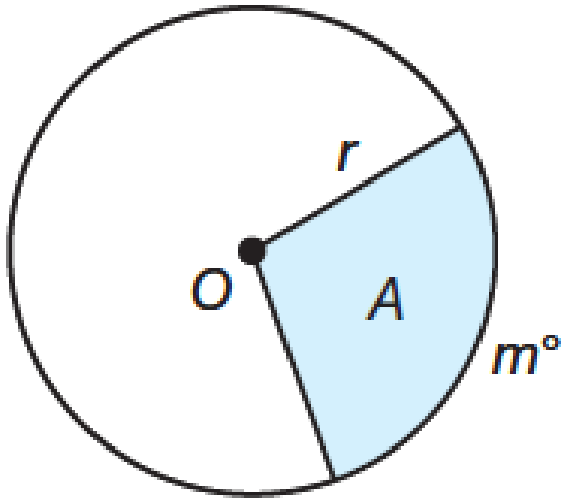
$$L = 2\pi 4\left(\frac{75°}{360°}\right)$$

$$L = \frac{5}{3}\pi ft$$

Sector of a Circle – The region inside a circle bounded by two radii of the circle and their intercepted arc.

Area of a Sector – To find the area of a sector (A), use the following formula, where r is the circle's radius and m is the central angle measure:

$$A = \pi r^2 \left(\frac{m°}{360°}\right)$$



Example 2 Finding the Area of a Sector

Find the area of each sector. Give your answer in terms of π.

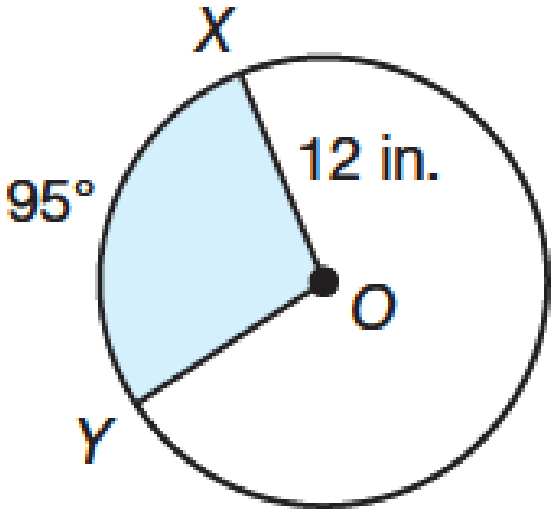
a. Find the area of sector *XOY*.

SOLUTION

$$A = \pi r^2 \left(\frac{m°}{360°}\right)$$

$$A = \pi 12^2 \left(\frac{95°}{360°}\right)$$

$$A = 38\pi\ in^2$$



Example 2 Finding the Area of a Sector

Find the area of each sector. Give your answer in terms of π.

b. Find the area of a sector with an arc that measures 174° in a circle with a radius of 13 meters.

$$A = \pi r^2 \left(\frac{m°}{360°}\right)$$

$$A = \pi(13)^2\left(\frac{174°}{360°}\right)$$

$$A = \frac{4901}{60}\pi\ m^2$$

Example 3 Solving for Unknown Radius

Find the radius of the circle to the nearest hundredth of a meter.

SOLUTION

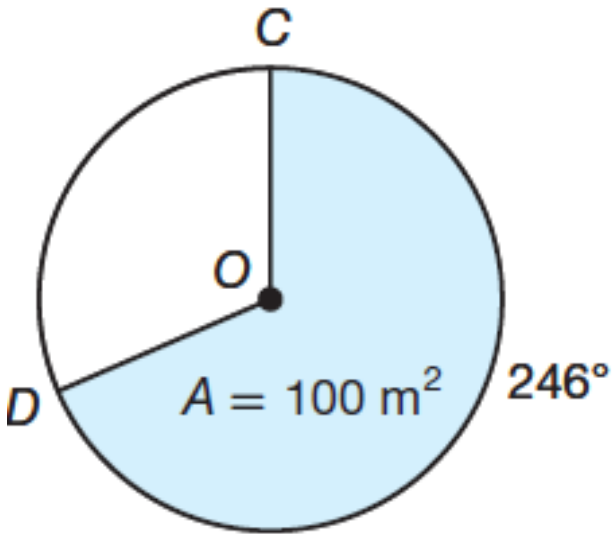
Substitute the known measures into the formula for the area of a sector, then solve for *r*.

$$A = \pi r^2 \left(\frac{m^\circ}{360^\circ}\right)$$

$$100 = \pi r^2 \left(\frac{246^\circ}{360^\circ}\right)$$

$$\frac{110 \cdot 360}{246\pi} = r^2$$

$r \approx 6.83$ m



Example 4 Solving for Unknown Central Angle

Find the central angle measure of $\widehat{RS}$ to the nearest hundredth of a degree, if the length of the arc is 12 centimeters.

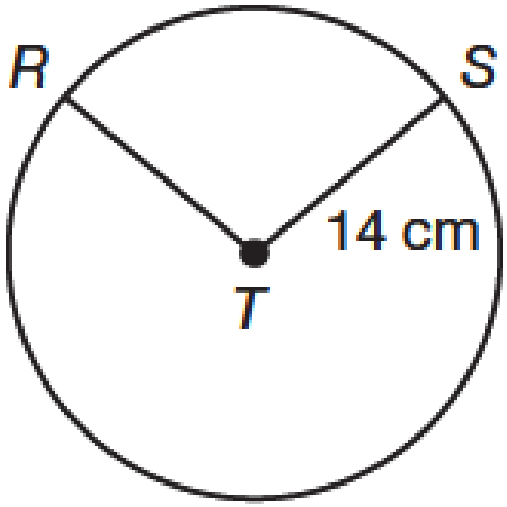
SOLUTION

$$L = 2\pi r\left(\frac{m^\circ}{360^\circ}\right)$$

$$12 = 2\pi(14)\left(\frac{m^\circ}{360^\circ}\right)$$

$$\frac{12 \cdot 360}{2 \cdot 14 \cdot \pi} = m^\circ$$

$m^\circ \approx 49.11^\circ$



Example 5 Application: Farming\

A spray irrigation system has a radius of 150 feet. If it rotates through a 175° central angle, what is the area that the system covers? Round your answer to the nearest square foot.

SOLUTION

$$A = \pi r^2 \left(\frac{m°}{360°}\right)$$

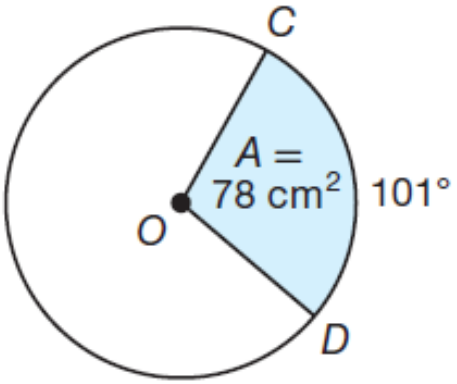
$$A = \pi 150^2 \left(\frac{175°}{360°}\right)$$

$$A \approx 34361\ ft^2$$

You Try!!!

a.Find the length of an arc with a measure of 125° in a circle and 12-mile radius. Round to the nearest hundredth of a mile.

c.Find the radius to the nearest hundredth of a centimeter.



Assignment

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Lesson Practice (Ask Mr. Heintz)

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Practice 1-30 (Do the starred ones first)