

Essential Question

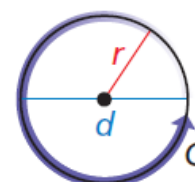
How can you find the length of a circular arc?

How can you find the area of a sector of a circle?

Core Concept

Circumference of a Circle

The circumference C of a circle is $C = \pi d$ or $C = 2\pi r$, where d is the diameter of the circle and r is the radius of the circle.



$$C = \pi d = 2\pi r$$

Find each indicated measure.

- a. circumference of a circle with a radius of 9 centimeters

$$C = 2\pi(9\text{cm}) = 18\pi\text{cm}$$
$$= 56.52\text{cm}$$

- b. radius of a circle with a circumference of 26 meters

$$C = \frac{26\text{m}}{2\pi} = \frac{2\pi r}{2\pi}$$
$$r = \frac{26}{2 \cdot 3.14} = 4.14\text{m}$$

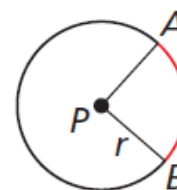
Core Concept

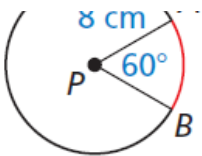
Arc Length

In a circle, the ratio of the length of a given arc to the circumference is equal to the ratio of the measure of the arc to 360° .

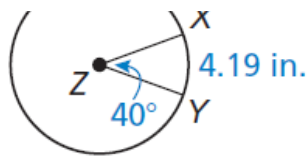
$$\frac{\text{Arc length of } \widehat{AB}}{2\pi r} = \frac{m\widehat{AB}}{360^\circ}, \text{ or}$$

$$\text{Arc length of } \widehat{AB} = \frac{m\widehat{AB}}{360^\circ} \cdot 2\pi r$$

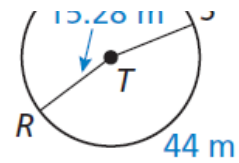




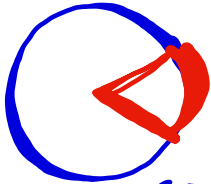
a. arc length of \widehat{AB}



b. circumference of $\odot Z$



c. \widehat{R}



$$4.19'' = \frac{40}{360} \cdot C$$

$$4.19 = \frac{40}{360} \cdot 2\pi r$$

$$C = 2\pi(8\text{ cm})$$

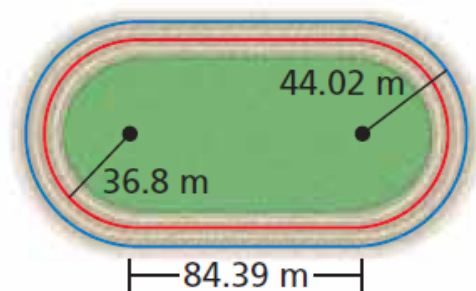
$$C = 16\pi\text{ cm}$$

$$C = 50.24$$

$$4.19 \cdot \frac{360}{40} = 2\pi r$$

$$\frac{60}{360} \cdot 50.24 = 8.51\text{ cm}$$

The curves at the ends of the track shown are 180° arcs of circles. The radius of the arc for a runner on the red path shown is 36.8 meters. About how far does this runner travel to go once around the track? Round to the nearest tenth of a meter.



 **Core Concept****Converting between Degrees and Radians****Degrees to radians**

Multiply degree measure by

$$\frac{2\pi \text{ radians}}{360^\circ}, \text{ or } \frac{\pi \text{ radians}}{180^\circ}.$$

Radians to degrees

Multiply radian measure by

$$\frac{360^\circ}{2\pi \text{ radians}}, \text{ or } \frac{180^\circ}{\pi \text{ radians}}.$$

a. Convert 45° to radians.

$$\frac{45^\circ \cdot \pi}{180^\circ} -$$

$$\frac{\pi}{4} \text{ radians}$$

b. Convert $\frac{3\pi}{2}$ radians to degrees.

$$\frac{3\pi}{2} \cdot \frac{360^\circ}{2\pi} = \frac{3 \cdot 360}{4}$$

$$= 270^\circ$$

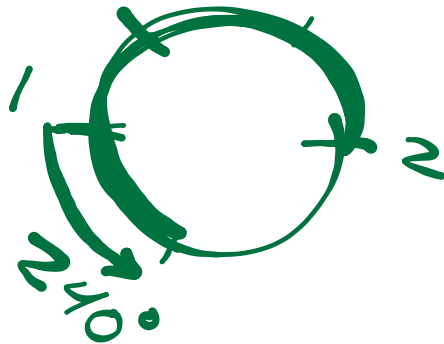


8. Convert 15° to radians.

$$15^\circ \frac{\pi}{180^\circ}$$

$$0.08\bar{3} = \frac{1}{12}$$

$$\frac{1}{12}\pi$$

9. Convert $\frac{4\pi}{3}$ radians to degrees.

$$\frac{2\cancel{\pi}}{3} \cdot \frac{360^\circ}{\cancel{\pi}}$$

$$\frac{2}{3} \cdot 360^\circ = \boxed{240^\circ}$$

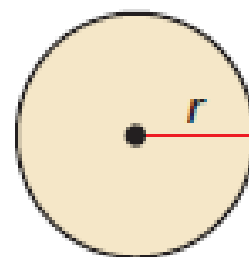
Core Concept

Area of a Circle

The area of a circle is

$$A = \pi r^2$$

where r is the radius of the circle.



Find each indicated measure.

- a. area of a circle with a radius of 2.5 centimeters

$$A = \pi (2.5 \text{ cm})^2 = 6.25 \pi \text{ cm}^2 = 19.625 \text{ cm}^2$$

- b. diameter of a circle with an area of 113.1 square centimeters

$$d = ?$$

$$A = \pi r^2 = 113.1 \text{ cm}^2$$

$$\frac{3.14 \cdot r^2}{3.14} = \frac{113.1}{3.14} \quad \sqrt{r^2} = \sqrt{\frac{113.1}{3.14}}$$

$$r = 6$$

a. About 430,000 people live in a 5-mile radius of a city's town hall. Find the population density in people per square mile.

b. A region with a 3-mile radius has a population density of about 6195 people per square mile. Find the number of people who live in the region.

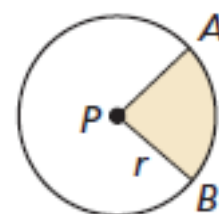
Core Concept

Area of a Sector

The ratio of the area of a sector of a circle to the area of the whole circle (πr^2) is equal to the ratio of the measure of the intercepted arc to 360° .

$$\frac{\text{Area of sector } APB}{\pi r^2} = \frac{m\widehat{AB}}{360^\circ}, \text{ or}$$

$$\text{Area of sector } APB = \frac{m\widehat{AB}}{360^\circ} \cdot \pi r^2$$



Find the areas of the sectors formed by $\angle UTV$.

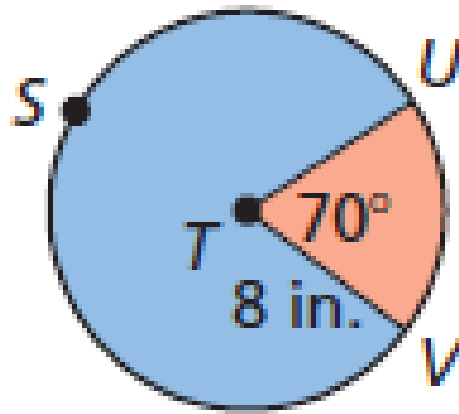
UV

$$A = \pi (64 \text{ in}^2)$$

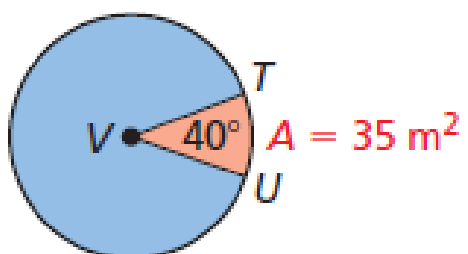
$$A = 200.96 \text{ in}^2$$

$$A_{\widehat{UV}} = \frac{70^\circ}{360^\circ} \cdot 200.96 \text{ in}^2$$

$$\boxed{39.07 \text{ in}^2}$$



Find the area of $\odot V$.



A rectangular wall has an entrance cut into it. You want to paint the wall. To the nearest square foot, what is the area of the region you need to paint?

