

3.1 - Radian Measure

1/7

Warmup

Express each degree measure in radians. Leave your answer in terms of π .

1. 45° $\frac{\pi}{4}$

2. 60° $\frac{\pi}{3}$

3. -120° $-\frac{2\pi}{3}$

4. 150° $\frac{5\pi}{6}$

5. -330° $-\frac{11\pi}{6}$

6. -315° $-\frac{7\pi}{4}$

Express each radian measure in degrees.

7. $\frac{\pi}{6}$ 30°

8. $\frac{\pi}{3}$ 60°

9. $\frac{4\pi}{3}$ 240°

10. $-\frac{7\pi}{6}$ -210°

11. 3π 540°

12. $-\frac{7\pi}{2}$ -630°

Chapter 3

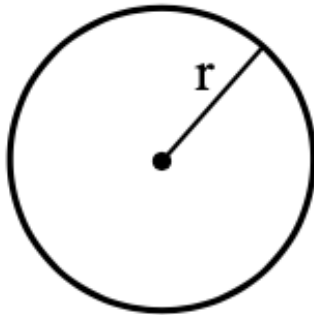
Radian Measure and the Unit Circle

1. Radian Measure
- 2. Arc Length and Area of a Circular Sector**
3. Linear and Angular Speeds
4. Unit Circle Approach

3.2 - Arc Length and Area of a Circular Sector

2/7

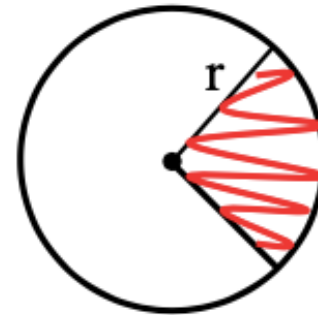
Remember circles formulas?



$$\text{Area} = \pi r^2$$

$$\text{Circumference} = 2\pi r = \pi d$$

What about sectors?



Area =

$$\frac{\theta^\circ}{360} \pi r^2 = \frac{\theta}{2\pi} \pi r^2 = \frac{1}{2} r^2 \theta$$

Radians

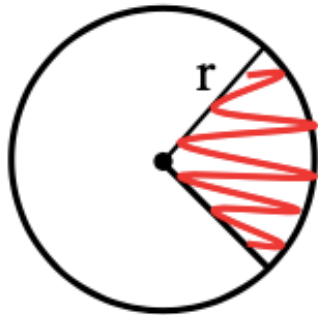
Arc length =

$$\frac{\theta^\circ}{360} 2\pi r = \frac{\theta}{2\pi} 2\pi r = r\theta$$

Radians

3.2 - Arc Length and Area of a Circular Sector

What about sectors?



$$\text{Area} = \frac{\theta^\circ}{360} \pi r^2 = \frac{\theta}{2\pi} \pi r^2 = \frac{1}{2} r^2 \theta$$

Radians ^{3/7}

$$\text{Arc length} = \frac{\theta^\circ}{360} 2\pi r = \frac{\theta}{2\pi} 2\pi r = r\theta$$

Radians

Practice - Find the area and arc length of the sector.

1) $r = 4 \text{ in}$
 $\theta = 25^\circ$

$\text{Area} = 3.49 \text{ in}^2$
 $\text{Arc } L = 1.75 \text{ in}$

2) $r = 3 \text{ m}$
 $\theta = 2.3 \text{ rads}$

$\text{Area} = 10.35 \text{ m}^2$
 $\text{Arc } L = 6.9 \text{ m}$

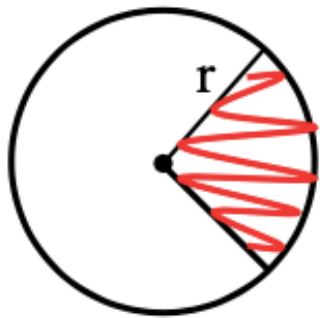
3) $r = 650 \text{ mm}$
 $\theta = 1.5 \text{ rads}$

$\text{Area} = 316,875 \text{ mm}^2$
 $\text{Arc } L = 975 \text{ mm}$

3.2 - Arc Length and Area of a Circular Sector

4/7

A sector has perimeter of 12 and area of 8. Find all possible radii.



$$\text{Area} = \frac{1}{2}r^2\theta$$

$$8 = \frac{1}{2}r^2\theta$$

$$8 = \frac{1}{2}r^2 \left(\frac{12 - 2r}{r} \right)$$

$$8 = 6r - r^2$$

$$r^2 - 6r + 8 = 0$$

$$(r - 4)(r - 2) = 0 \quad r = 4, 2$$

$$\text{Perimeter} = r + r + r\theta$$

$$12 = r + r + r\theta$$

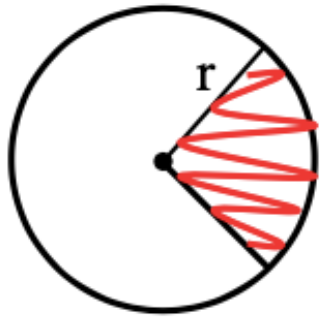
$$12 - 2r = r\theta$$

$$\frac{12 - 2r}{r} = \theta$$

3.2 - Arc Length and Area of a Circular Sector

5/7

A sector has perimeter of 12 and area of 8. Find all possible radii.



$$\text{Area} = \frac{1}{2}r^2\theta$$

$$8 = \frac{1}{2}r^2\theta$$

$$8 = \frac{1}{2}r^2 \left(\frac{12 - 2r}{r} \right)$$

$$\text{Perimeter} = r + r + r\theta$$

$$\frac{12 - 2r}{r} = \theta$$

$$8 = 6r - r^2$$

$$r^2 - 6r + 8 = 0$$

$$(r - 4)(r - 2) = 0 \quad r = 4, 2$$

Practice

1) A sector has area of 90 cm^2 and central angle of 0.2 rads. Find its radius and arc length.

$$r = 30 \text{ cm}$$

$$\text{Arc } L = 6 \text{ cm}$$

2) A sector has a perimeter of 24 and area of 20. Find all possible radii.

$$r = 2, 10$$

3.2 - Arc Length and Area of a Circular Sector

6/7

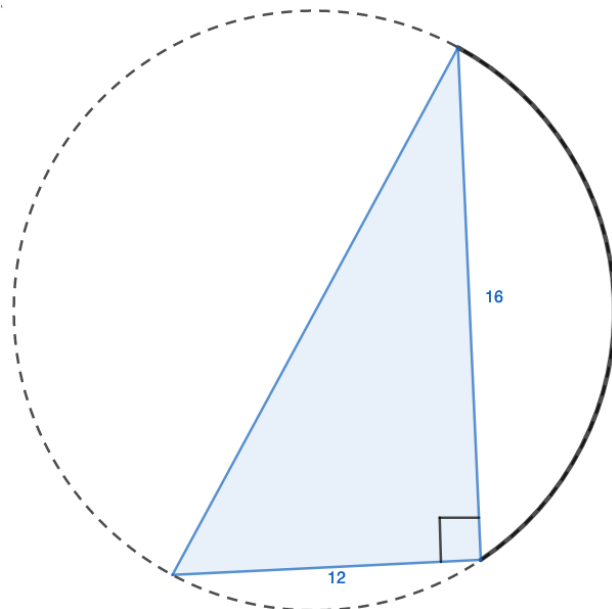
Find the circumference of

1) a circle circumscribed about a right triangle whose legs are 12 inches and 16 inches long

$$20\pi \approx 62.83 \text{ in}$$

2) a circle circumscribed about a square with a side length of 6 centimeters

$$\approx 26.66 \text{ cm}$$



3) the arc length intercepted by the 16 in side

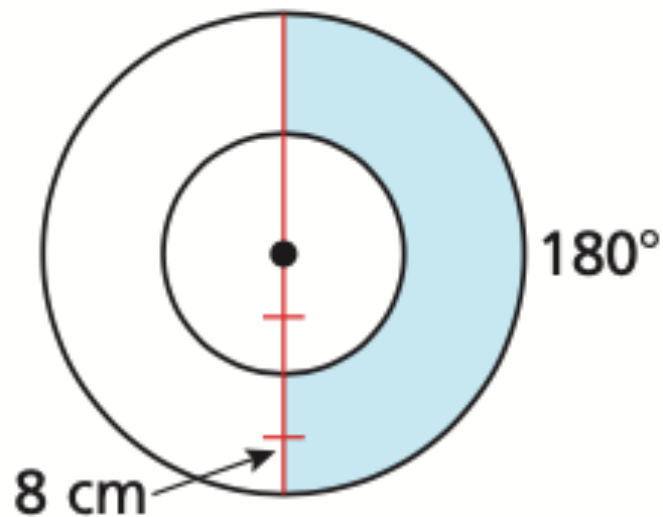
$$\approx 18.55 \text{ in}$$

3.2 - Arc Length and Area of a Circular Sector

7/7

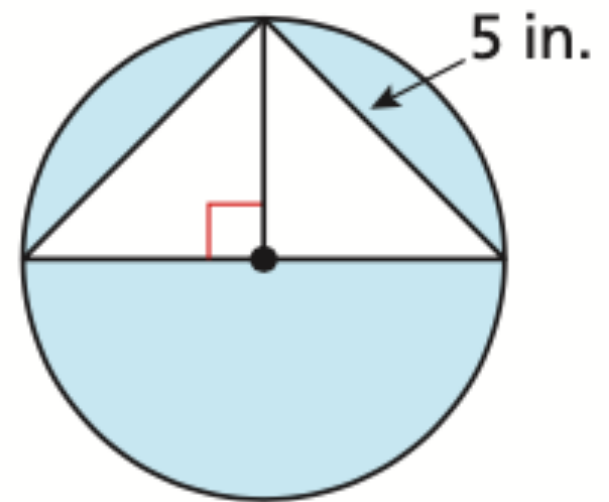
Find the area of the shaded region.

1)



$$96\pi \approx 301.59 \text{ cm}^2$$

2)



$$\approx 26.77 \text{ in}^2$$

