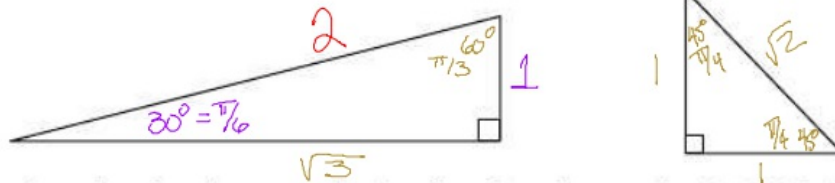


Warm-up: before Arc length, sector area, and Section 17.3

Name: _____
 Period: _____

SHOW YOUR WORK as demonstrated in class notes

Label all of the **angles** using **degree and radian** values and **sides** of each special triangle



Given an angle - determine the reference angle, then draw the reference triangle. Label the sides of the triangle.

1. $\theta = \frac{4\pi}{3}$ $\theta' = \frac{\pi}{3}$

$\sin \theta = \frac{y}{r}$
 $\cos \theta = \frac{x}{r}$
 $\tan \theta = \frac{y}{x}$

2. $\theta = 330^\circ$ $\theta' = 30^\circ$

3. $\theta = \frac{3\pi}{4}$ $\theta' = \frac{\pi}{4}$

1a. $\cos\left(\frac{4\pi}{3}\right) = \frac{-1}{2}$

2a. $\tan(330^\circ) = \frac{-1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

3a. $\sin\left(\frac{3\pi}{4}\right) = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

1b. $\csc\left(\frac{4\pi}{3}\right) = \frac{2}{-\sqrt{3}} = -\frac{2\sqrt{3}}{3}$

2b. $\csc(330^\circ) = \frac{2}{-1} = -2$

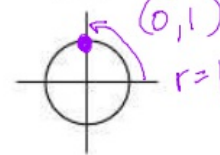
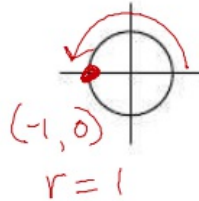
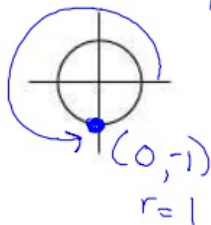
3b. $\sec\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{-1} = -\sqrt{2}$

Evaluate each trigonometric function by labeling the correct point on the unit circle.

4. $\cos(270^\circ) = \frac{0}{1} = 0$

5. $\sin(\pi) = \frac{0}{1} = 0$

6. $\tan\left(\frac{\pi}{2}\right) = \frac{1}{0} = \text{undef}$



7. How many radians is 120° ?

8. What degree measure is equivalent to $\frac{7\pi}{6}$ radians?

$\frac{120^\circ}{1} \cdot \left(\frac{\pi}{180^\circ}\right) = \frac{2\pi}{3}$

$\frac{7\pi}{6} \cdot \left(\frac{180^\circ}{\pi}\right) = 210^\circ$

Important conversion:

$$\pi \text{ radians} = 180^\circ$$

How many radians is 20° ?

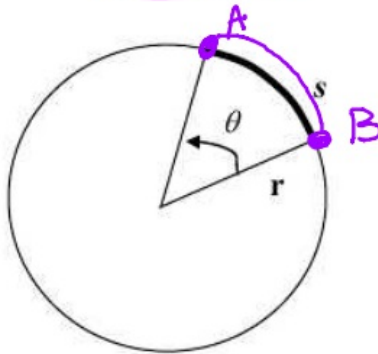
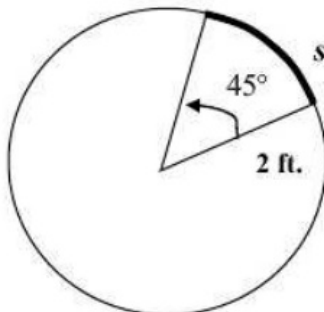
$$\frac{20^\circ}{1} \cdot \left(\frac{\pi}{180^\circ} \right) = \frac{\pi}{9}$$

How many radians is 315° ?

$$\frac{315^\circ}{1} \cdot \left(\frac{\pi}{180^\circ} \right) = \frac{7 \cdot 3 \pi}{4 \cdot 36} = \frac{7\pi}{4}$$

Arc Length along a Circle

$$s = r\theta$$

Arc Length: s Radius: r Angle of rotation creating the arc: θ (measured in radians)Formula (in your reference sheet): $s = r\theta$ **Example 1:**Radius: $r = 2 \text{ ft.}$ Angle of rotation creating the arc: θ

$$\theta = 45^\circ$$

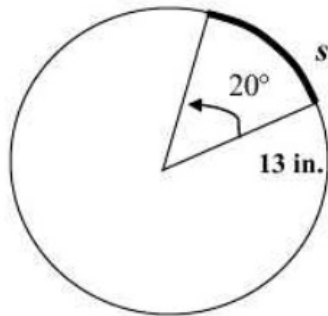
$$\theta = \frac{\pi}{4} \quad (\text{measured in radians})$$

Arc Length: $s = (2) \left(\frac{\pi}{4} \right)$

$$s = \frac{\pi}{2}$$

$$s = 1.57 \approx 1.6 \text{ ft}$$

Example 2:



Radius: $r = 13 \text{ in.}$

Angle of rotation creating the arc: θ

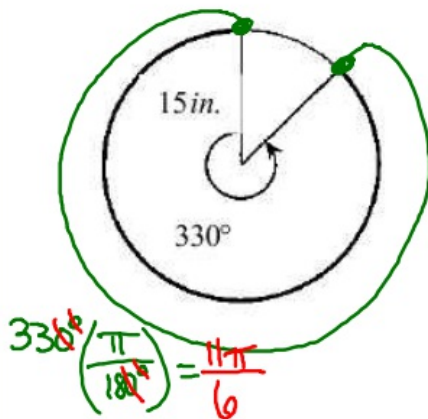
$$\theta = 20^\circ$$

$$\theta = \frac{\pi}{9} \quad (\text{measured in radians})$$

$$\text{Arc Length: } s = (13) \left(\frac{\pi}{9} \right) = \frac{13\pi}{9} \text{ inches} \quad (\text{exact answer})$$

$$s \approx 4.5 \text{ inches (approx.)}$$

Example 3:



Radius: $r = 15 \text{ in.}$

Angle of rotation creating the arc: θ

$$\theta = 330^\circ$$

$$\theta = \frac{11\pi}{6} \quad (\text{measured in radians})$$

$$\text{Arc Length: } s = (15) \left(\frac{11\pi}{6} \right) = 5 \left(\frac{11\pi}{2} \right) = \frac{55\pi}{2}$$

$$s \approx 86.4 \text{ inches}$$

Example 4:

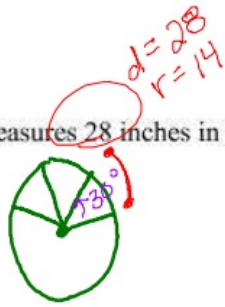
Find the arc length if the radius of a circle is 50 feet, and the angle creating the arc is $\theta = \frac{\pi}{3}$.

$$s = 50 \left(\frac{\pi}{3} \right)$$

$$s \approx 52.4 \text{ ft.}$$

Example 5:

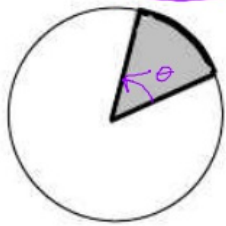
A wagon wheel measures 28 inches in diameter, and has an angle of 30° between spokes.



a) How many spokes are there? $\frac{360^\circ}{30^\circ} = 12$ spokes

b) What is the arc length between two adjacent spokes? $S = r\theta$
 $S = (14) \left(\frac{\pi}{6} \right)$
 $S \approx 7.3$ in.

Sector Area



or Area of a slice of pizza

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

Sector Area: A

Radius: r

Angle of rotation creating the sector: θ (measured in radians)

8. A circular shaped pizza has a radius of 20 inches. If there are 4 equally cut pieces, what is the area of each piece?

$\theta = \frac{\pi}{2}$
 $r = 20$ in.

$A = \frac{1}{2} (20)^2 \left(\frac{\pi}{2} \right)$
 $A = \frac{1}{2} \cdot \frac{400}{1} \cdot \frac{\pi}{2}$
 $A = 100\pi$ (exact answer)
 $A \approx 314.2$ in² (approx. answer)

A diagram of a circle divided into four equal quadrants by a vertical and a horizontal line. One quadrant is shaded in orange. The central angle is labeled $\theta = \frac{\pi}{2}$.

9. A circle has a radius of 200 feet, and a central angle measures $\frac{\pi}{8}$. Find the area of the sector (or the piece).

$\theta = \frac{\pi}{8}$
 $r = 200$
 $A = \frac{1}{2} (200)^2 \left(\frac{\pi}{8} \right)$ ft.
 $A \approx 7853.98$ ft.
 $A \approx 7854.0$ ft.

Homework	
Worksheet: Arc Length and Sector Area	
Page 746:	19, 20, 42** for a challenge