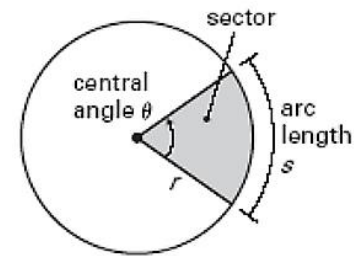


The arc length, s , of a sector of a circle with radius r and central angle θ measured in radians, is

Arc length: $s = r\theta$



Examples:

1. Find the length of an arc of a circle with radius 10 m that subtends a central angle of 30°.

Change to radians $s = r\theta$
 $30 \cdot \frac{\pi}{180} = \frac{\pi}{6} = \theta$
 $\frac{30}{180} = \frac{1}{6}$
 $s = (10)\left(\frac{\pi}{6}\right)$
 $s = 5.24 \text{ m}$
 or
 $s = \frac{5\pi}{3} \text{ m}$

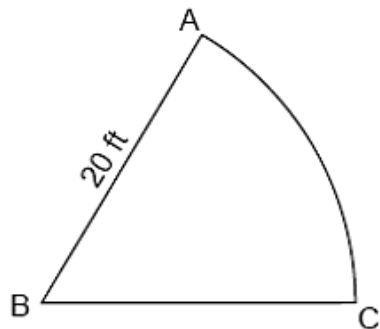
2. A central angle θ in a circle of radius 4 m is subtended by an arc of length 6 m. Find the measure of θ in radians and in degrees.

$r = 4$ $s = 6$ $\theta = ?$
 $s = r\theta$
 $6 = 4\theta$
 $\theta = \frac{3}{2} \text{ rad.}$
 $1 \text{ rad.} = 57.3^\circ$
 Degrees:
 $\frac{3}{2} \cdot 57.3^\circ = 86^\circ$

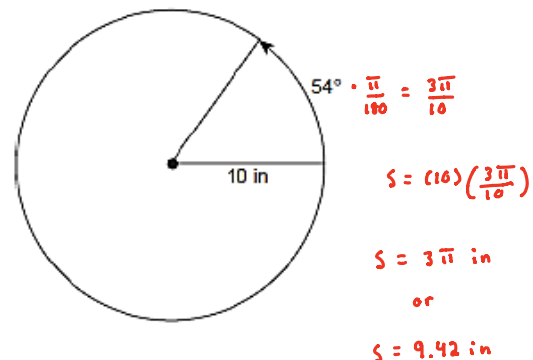
3. Memphis, TN and New Orleans, LA lie approximately on the same meridian. Memphis has latitude 35°N and New Orleans 30°N. Find the distance between the two cities. (Radius of earth is 3960 miles)

On Your Own:

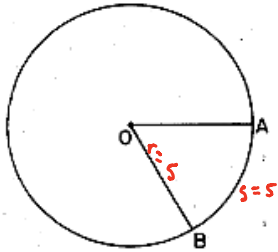
1. A sprinkler system is set up to water the sector shown in the accompanying diagram, with angle ABC measuring 1 radian and radius $AB = 20$ feet. What is the length of arc AC , in feet?



2. A ball is rolling in a circular path that has a radius of 10 inches, as shown in the accompanying diagram. What distance has the ball rolled when the subtended arc is 54°? Express your answer to the nearest hundredth of an inch.



3. In circle O, the length of radius \overline{OB} is 5 centimeters and the length of \widehat{AB} is 5 centimeters. What is the measure of $\angle AOB$?



$$s = r\theta$$

$$\frac{s}{s} = \frac{5\theta}{5}$$

$$\theta = 1 \text{ rad}$$

or

$$\theta = 57.3^\circ$$

4. An arc of a circle measures 30 centimeters and the radius measures 10 centimeters. In radians, what is the measure of the central angle that subtends the arc?

$$s = r\theta$$

$$\frac{30}{10} = \frac{10\theta}{10}$$

$$\theta = 3 \text{ rad.}$$

or

$$\theta = 172^\circ$$

Area of a Circular Sector

Do you recall the area of a circle? A sector of this circle with central angle θ (in radians) has an area that is a fraction of the area of the entire circle. Again, if angle is given in degrees, you must convert to radians.

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

Examples:

1. Find the area of a sector of a circle with a central angle of 45° if the radius is 2 m.

Convert to radians

$$\frac{45}{180} = \frac{1}{4} = \frac{\pi}{4}$$

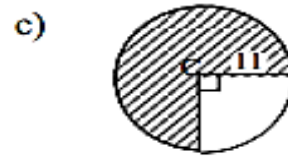
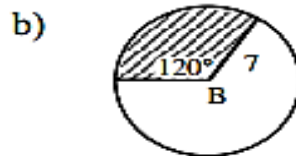
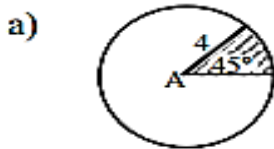
$$A = \left(\frac{1}{2}\right)(2)^2\left(\frac{\pi}{4}\right)$$

$$A = 1.57 \text{ m}^2 \text{ or } \frac{\pi}{2} \text{ m}^2$$

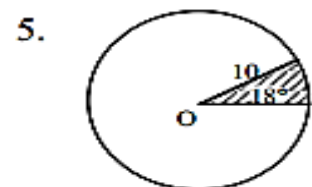
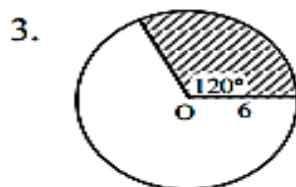
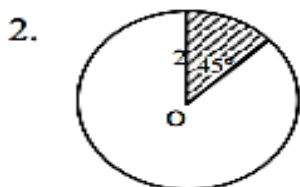
~~2.~~ Find the radius of the circle if the area of a sector of a circle with a central angle of 4 radians is 2 m

On Your Own:

1. Find the area of the shaded sector in each circle below. Points A, B and C are the centers.



Calculate the area of the following shaded sectors. Point O is the center of each circle.

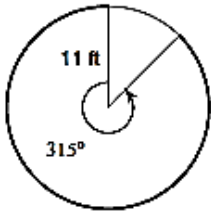


Arc Length and Sector Area

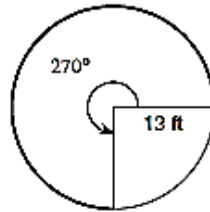
Date _____ Period _____

Find the length of each arc. Round your answers to the nearest tenth.

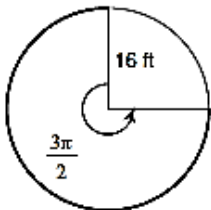
1)



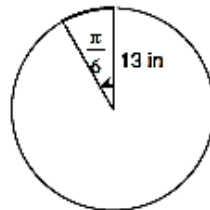
2)



3)



4)



5) $r = 18 \text{ cm}, \theta = 60^\circ$

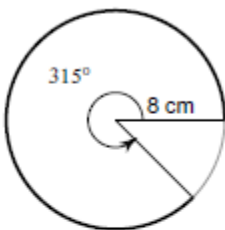
6) $r = 16 \text{ m}, \theta = 75^\circ$

7) $r = 9 \text{ ft}, \theta = \frac{7\pi}{4}$

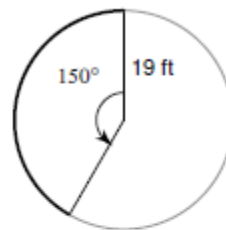
8) $r = 14 \text{ ft}, \theta = \frac{19\pi}{12}$

Find the length of each arc. Do not round.

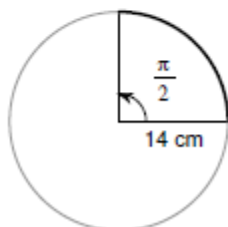
9)



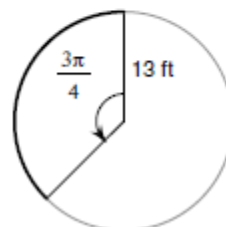
10)



11)

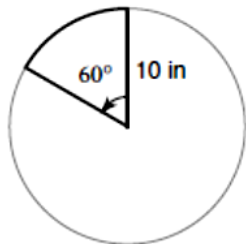


12)

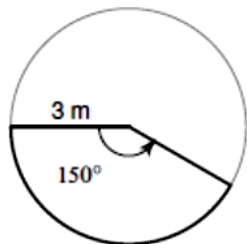


Find the area of each sector. Round your answers to the nearest tenth.

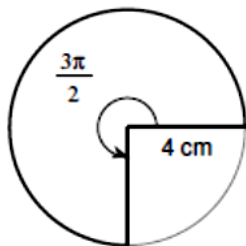
13)



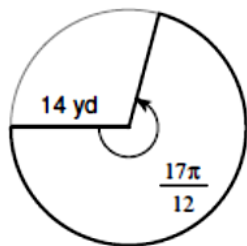
14)



15)

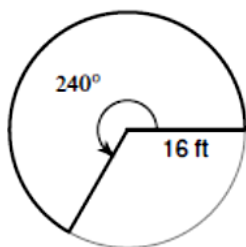


16)

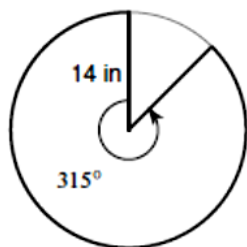


Find the area of each sector. Do not round.

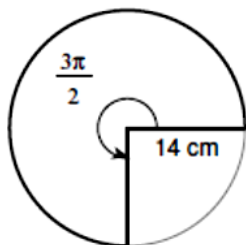
17)



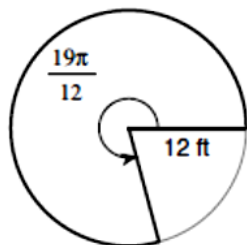
18)



19)



20)



21) $r = 10$ mi, $\theta = \frac{\pi}{2}$

22) $r = 12$ yd, $\theta = \frac{5\pi}{3}$

23) $r = 7$ km, $\theta = 60^\circ$

24) $r = 7$ mi, $\theta = 225^\circ$