

Review:

a) Convert 315° to radians.

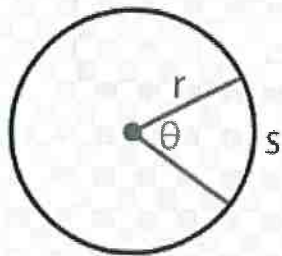
$$315^\circ \cdot \frac{\pi}{180} = \boxed{\frac{7\pi}{4} \text{ rad.}}$$

b) Convert $\frac{11\pi}{6}$ to degrees.

$$\frac{11\pi}{6} \cdot \frac{180}{\pi} = \boxed{330^\circ}$$

notation for angle θ

If θ is the measure in **radians** of a central angle in a circle with radius r , then the length s , of the arc intercepted by θ is given by $s = r\theta$. NOTE: θ must be in radians.



* This formula is meant for the θ to be in radians.

* IF θ (the angle) is in degrees, then be sure to convert to radians before using $s = r\theta$

Example 1: Find the arc length if the radius is 8 cm and the central angle measures $\frac{3\pi}{4}$ radians.

$r = 8$
 $\theta = \frac{3\pi}{4}$
 $s = \underline{\hspace{2cm}}$

$$s = 8 \cdot \left(\frac{3\pi}{4}\right) = 6\pi \rightarrow s \approx \boxed{18.850 \text{ cm}}$$

Example 2: Find the arc length if the radius is 12 cm and the central angle measures $\frac{5\pi}{6}$ radians.

$r = 12$
 $\theta = \frac{5\pi}{6}$
 $s = \underline{\hspace{2cm}}$

$$s = 12 \cdot \frac{5\pi}{6} \rightarrow s \approx 10\pi \approx \boxed{31.416 \text{ cm}}$$

Example 3: Find the arc length if the radius is 2.5 mi and the central angle measures 300° .

$r = 2.5$
 $\theta = 300^\circ \cdot \frac{\pi}{180} = \frac{5\pi}{3}$
 $s = \underline{\hspace{2cm}}$

$$s = r\theta$$

$$s = 2.5 \left(\frac{5\pi}{3}\right) = \frac{5}{2} \cdot \frac{5\pi}{3} = \frac{25\pi}{6} \approx \boxed{13.090 \text{ mi}}$$

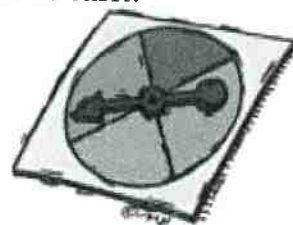
Example 4: While playing a game of chance, Jack flicks a spinner with a radius of 2 inches. If the spinner swings through 2665° , how far did the arrowhead travel during Jack's turn?

$r = 2$
 $\theta = 2665 \cdot \frac{\pi}{180} \approx 46.513$
 $s = \underline{\hspace{2cm}}$

$$s = r\theta$$

$$s = 2(46.513)$$

$$\boxed{s = 93.026 \text{ in.}}$$



1.07 Practice- Applications with Arc Length

Directions: Complete #1, 2, 51-60, 63, 33

$$s = r\theta$$

Date: _____

1. Find the length of an arc that subtends a central angle of 3 radians in a circle with radius 2 in.

$$\theta = 3 \quad s = 2(3) = \boxed{6 \text{ in.}}$$

$$r = 2$$

2. Find the length of a radius of a circle if an arc of length 7 cm is subtended by an angle of 2 rad.

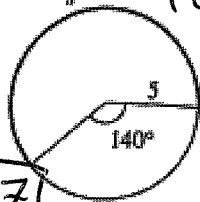
$$s = 7 \quad s = r\theta \quad \frac{7}{2} = r$$

$$\theta = 2 \text{ rad} \quad 7 = r(2) \quad \boxed{r = 3.5 \text{ cm}}$$

51. Find the length of the arc s in the figure.

$$r = 5 \quad \theta = 140 \cdot \frac{\pi}{180} = \frac{7\pi}{9}$$

$$s = (5) \left(\frac{7\pi}{9} \right) = \frac{35\pi}{9} = \boxed{12.217}$$

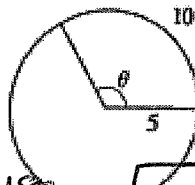


52. Find the angle θ in the figure.

$$r = 5 \quad s = r\theta$$

$$s = 10 \quad 10 = 5(\theta)$$

$$\theta = 2 \quad \theta = 2 \text{ rad} \cdot \frac{180}{\pi} = \boxed{114.592^\circ}$$

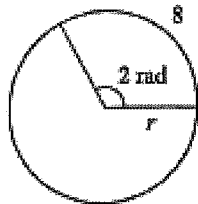


53. Find the radius r of the circle in the figure.

$$s = 8 \quad s = r\theta$$

$$r = \quad 8 = r(2)$$

$$\theta = 2 \text{ rad} \quad \boxed{4 = r}$$



54. Find the length of an arc that subtends a central angle of 45° in a circle of radius 10 m.

55. Find the length of an arc that subtends a central angle of 2 rad in a circle of radius 2 m.

56. A central angle θ in a circle of radius 5 m is subtended by an arc of length 6 m. Find the measure of θ in degrees and in radians.

57. An arc of length 100 m subtends a central angle θ in a circle of radius 50 m. Find the measure of θ in degrees and in radians.

58. A circular arc of length 3 ft subtends a central angle of 25° . Find the radius of the circle.

59. Find the radius of the circle if an arc of length 6 m on the circle subtends a central angle of $\pi/6$ rad.

60. Find the radius of the circle if an arc of length 4 ft on the circle subtends a central angle of 135° .

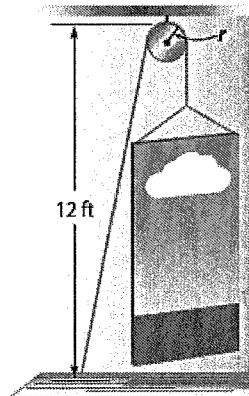
$$54) s = 10 \cdot \frac{\pi}{4} = \frac{5\pi}{2} \approx \boxed{7.854 \text{ m}}$$

$$55) s = 2 \cdot 2 = \boxed{4 \text{ m}}$$

63. DRAMA A pulley with radius r is being used to remove part of the set of a play during intermission. The height of the pulley is 12 feet.

- a. If the radius of the pulley is 6 inches and it rotates 180° , how high will the object be lifted?

- b. If the radius of the pulley is 4 inches and it rotates 900° , how high will the object be lifted?



$$a) s = 6 \cdot \pi$$

$$s \approx \boxed{18.850 \text{ in.}}$$

$$b) r = 4 \quad \theta = 900 \cdot \frac{\pi}{180}$$

$$s = 4 \cdot 5\pi$$

$$s = \boxed{62.832 \text{ in.}}$$

- 33 AMUSEMENT PARK A carousel at an amusement park rotates 3024° per ride. (Example 4)

- a. How far would a rider seated 13 feet from the center of the carousel travel during the ride?

- b. How much farther would a second rider seated 18 feet from the center of the carousel travel during the ride than the rider in part a?

$$a) s = \quad \theta = 3024 \cdot \frac{\pi}{180} = 52.778$$

$$r = 13 \quad s = (13)(52.778) = \boxed{686.124 \text{ ft}}$$

$$b) s = (18)(52.778) = 950.018$$

$$\text{Difference is } 950.018 - 686.124 =$$

$$\boxed{263.894 \text{ ft}}$$

$$56) 6 = 5\theta$$

$$\theta = 1.2 \text{ rad} \quad 1.2 \cdot \frac{180}{\pi} = \boxed{68.755^\circ}$$

$$57) 100 = 50\theta$$

$$2 = \theta \quad \theta = 2 \cdot \frac{180}{\pi} = \boxed{114.592^\circ}$$

$$58) s = 3 \quad \theta = 25 \cdot \frac{\pi}{180} = 0.43633$$

$$3 = r(0.43633) \quad r = \boxed{6.875 \text{ ft}}$$

$$59) s = 6 \quad 6 = r \cdot \frac{\pi}{6}$$

$$r = 6 \cdot \frac{6}{\pi} = \frac{36}{\pi} = \boxed{11.459 \text{ m}}$$

$$60) s = 4$$

$$\theta = 135 \cdot \frac{\pi}{180}$$

$$4 = \frac{3\pi}{4} \cdot r$$

$$r = \boxed{1.698 \text{ ft}}$$