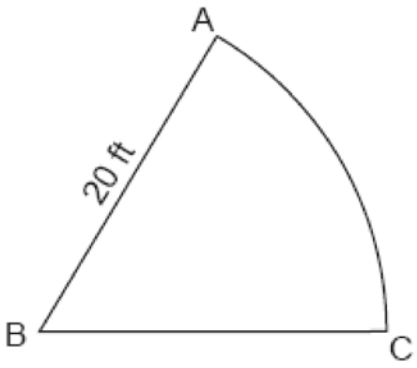
A2.A.61: Arc Length 1: Determine the length of an arc of a circle, given its radius and the measure of its central angle

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?
1) 63
2) 31
3) 20
4) 10

2 A circle has a radius of 4 inches. In inches, what is the length of the arc intercepted by a central angle of 2 radians?
1) 2π
2) 2
3) 8π
4) 8

3 In a circle with a diameter of 24 cm, a central angle of $\frac{4\pi}{3}$ radians intercepts an arc. The length of the arc, in centimeters, is
1) 8π
2) 9π
3) 16π
4) 32π

4 Jack wants to plant a border of flowers in the shape of an arc along the edge of a circular walkway. If the circle has a radius of 5 yards and the angle subtended by the arc measures $1\frac{1}{2}$ radians, what is the length, in yards, of the border?
1) 0.5
2) 2
3) 5
4) 7.5

5 A wheel has a radius of 18 inches. Which distance, to the *nearest inch*, does the wheel travel when it rotates through an angle of $\frac{2\pi}{5}$ radians?
1) 45
2) 23
3) 13
4) 11

6 A circle is drawn to represent a pizza with a 12 inch diameter. The circle is cut into eight congruent pieces. What is the length of the outer edge of any one piece of this circle?
1) $\frac{3\pi}{4}$
2) π
3) $\frac{3\pi}{2}$
4) 3π

7 In a circle with a radius of 3 centimeters, find, in centimeters, the length of an arc intercepted by a central angle of 2 radians.

Name: _____

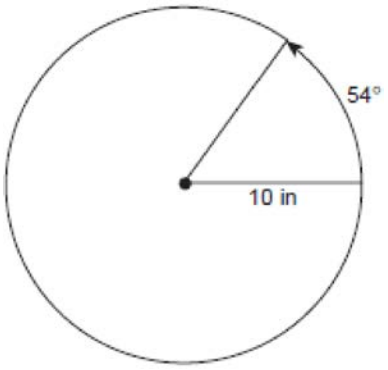
8 In a circle of radius 8, find the length of the arc intercepted by a central angle of 1.5 radians.

9 In a circle whose radius is 10, what is the length of the arc intercepted by a central angle of 4 radians?

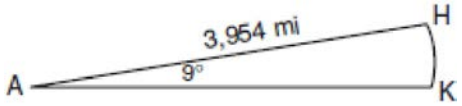
10 Circle *O* has a radius of 10. Find the length of an arc subtended by a central angle measuring 1.5 radians.

11 Express, in terms of π, the length of the arc intercepted by a central angle of $\frac{\pi}{6}$ radian in a circle with radius 30.

12 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.*

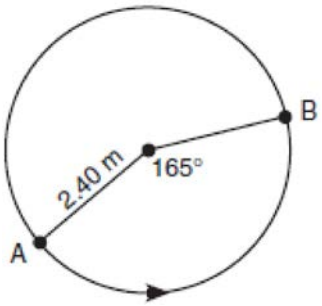


13 Cities *H* and *K* are located on the same line of longitude and the difference in the latitude of these cities is 9°, as shown in the accompanying diagram. If Earth's radius is 3,954 miles, how many miles north of city *K* is city *H* along arc *HK*? Round your answer to the *nearest tenth of a mile*.

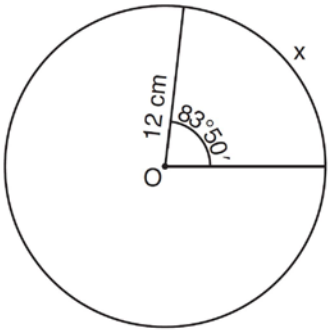


(Not drawn to scale)

14 The accompanying diagram shows the path of a cart traveling on a circular track of radius 2.40 meters. The cart starts at point A and stops at point B, moving in a counterclockwise direction. What is the length of minor arc AB, over which the cart traveled, to the *nearest tenth of a meter*?



15 Circle *O* shown below has a radius of 12 centimeters. To the *nearest tenth of a centimeter*, determine the length of the arc, *x*, subtended by an angle of 83°50'.



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Answer Section

1 ANS: 3
$s = \theta r = 1 \cdot 20 = 20$

REF: 060818b

2 ANS: 4
$s = \theta r = 2 \cdot 4 = 8$

REF: fall0922a2

3 ANS: 3
$s = \theta r = \frac{4\pi}{3} \cdot \frac{24}{2} = 16\pi$

REF: 011611a2

4 ANS: 4
$s = \theta r = 1\frac{1}{2} \cdot 5 = 7.5.$

REF: 010806b

5 ANS: 2
$s = \theta r = \frac{2\pi}{5} \cdot 18 \approx 23$

REF: 011526a2

6 ANS: 3
$s = \theta r = \frac{2\pi}{8} \cdot 6 = \frac{3\pi}{2}$

REF: 061212a2

7 ANS:
6

REF: 068514siii

8 ANS:
12

REF: 068713siii

9 ANS:
40

REF: 010415siii

10 ANS:
15

REF: 069714siii

11 ANS:
5π

REF: 089313siii

12 ANS:

9.42. $54 \cdot \frac{\pi}{180} = \frac{3\pi}{10}$ radians. $s = \theta r = \frac{3\pi}{10} \cdot 10 = 3\pi \approx 9.42.$

REF: 010223b

13 ANS:

621.1. $9 \cdot \frac{\pi}{180} = \frac{\pi}{20}$ radians. $s = \theta r = \frac{\pi}{20} \cdot 3954 \approx 621.1.$

REF: 080426b

14 ANS:

6.9. $165 \cdot \frac{\pi}{180} = \frac{11\pi}{12}$ radians. $s = \theta r = \frac{11\pi}{12} \cdot 2.4 \approx 6.9.$

REF: 080524b

15 ANS:

$83°50' \cdot \frac{\pi}{180} \approx 1.463$ radians $s = \theta r = 1.463 \cdot 12 \approx 17.6$

REF: 011435a2