

LESSON
11.1**Study Guide**

For use with the lesson "Circumference and Arc Length"

GOAL Find arc lengths and other measures of circles.**Vocabulary**The **circumference** of a circle is the distance around the circle.An **arc length** is a portion of the circumference of a circle.**Theorem 8 Circumference of a Circle:** The circumference C of a circle is $C = \pi d$ or $C = 2\pi r$, where d is the diameter of the circle and r is the radius of the circle.**Arc Length Corollary:** In a circle, the ratio of the length of a given arc to the circumference is equal to the ratio of the measure of the arc to 360° .**EXAMPLE 1** Use the formula for circumference**Find the indicated measure.**

- Circumference of a circle with radius 11 feet
- Diameter of a circle with circumference 75 meters

Solution

- $C = 2\pi r$ Write circumference formula.
 $= 2 \cdot \pi \cdot 11$ Substitute 11 for r .
 $= 22\pi$ Simplify.
 ≈ 69.12 Use a calculator.

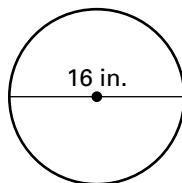
The circumference is about 69.12 feet.

- $C = \pi d$ Write circumference formula.
 $75 = \pi d$ Substitute 75 for C .
 $\frac{75}{\pi} = d$ Divide each side by π .
 $23.87 \approx d$ Use a calculator.

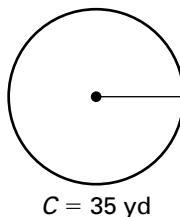
The diameter is about 23.87 meters.

Exercises for Example 1**Use the diagram to find the indicated measure.**

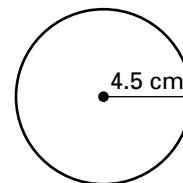
1. Circumference



2. Radius



3. Circumference

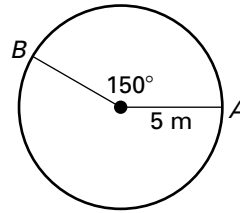


LESSON 11.1

Study Guide *continued*
For use with the lesson "Circumference and Arc Length"

EXAMPLE 2 Find arc lengths

Find the length of \widehat{AB} .

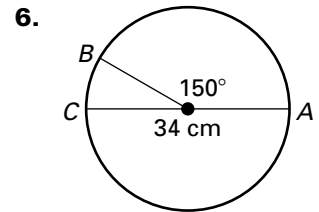
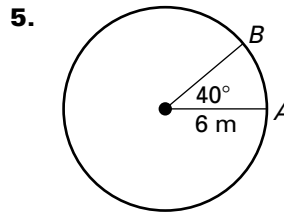
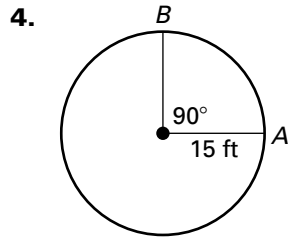


Solution

Arc length of $\widehat{AB} = \frac{150^\circ}{360^\circ} \cdot 2\pi(5) \approx 13.09$ meters.

Exercises for Example 2

Find the length of \widehat{AB} .



EXAMPLE 3 Use arc lengths to find measures

Find the circumference of $\odot Q$.

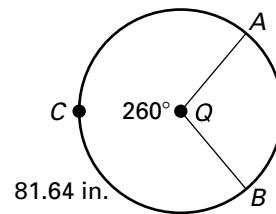
Solution

$$\frac{\text{Arc length of } \widehat{ACB}}{C} = \frac{m\widehat{ACB}}{360^\circ}$$

$$\frac{81.64}{C} = \frac{260^\circ}{360^\circ}$$

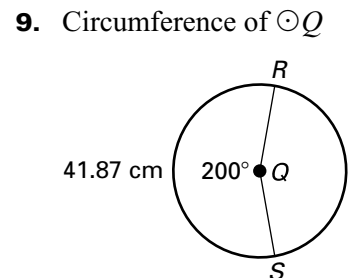
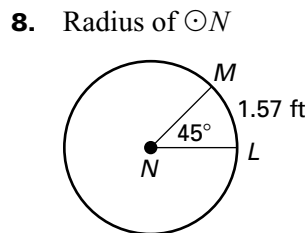
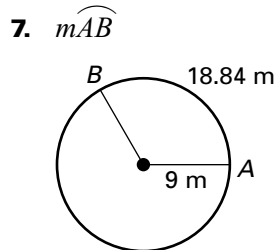
$$113.04 = C$$

The circumference of $\odot Q$ is 113.04 inches.



Exercises for Example 3

Find the indicated measure.



Answers for Chapter 11 Measuring Length and Area

Lesson 11.1 Circumference and Arc Length

Teaching Guide

1. 8 ft 2. 50 ft 3 in. 3. 37 ft 8 in.

Investigating Geometry Activity

1. *Sample answer:* It is about 3.14.
2. *Sample answer:* $C = 3.14 \cdot d$ where C is the circumference and d is the diameter.

Practice Level A

1. about 43.98 cm 2. about 62.83 ft
3. about 7.64 in. 4. $\frac{18}{\pi}$ m 5. $\frac{29}{\pi}$ ft 6. 26π in.
7. 30π cm 8. about 11 in. 9. about 12.57 ft
10. about 9.42 cm 11. 320° 12. 160°
13. about 22.34 in. 14. about 11.17 in. 15. 200°
16. about 13.96 in. 17. about 23.56 cm
18. 90 in. 19. 36 in. 20. 58.27 21. 24.57
22. 3.14; 110° ; 8.5; 5; 80° ; 53.15
23. a. about 14.14 in. b. 177 ft 24. 16 in.

Practice Level B

1. 50.27 ft 2. 40.84 in. 3. 10.50 cm 4. $\frac{21}{\pi}$ m
5. $\frac{39}{\pi}$ cm 6. 15π in. 7. 54π ft 8. 6.28 cm
9. 47.12 in. 10. 7.33 ft 11. 160° 12. 200°
13. 19.55 m 14. 24.43 m 15. 280°
16. 34.21 m 17. 114.02° 18. 58.03 ft
19. 20.53 cm 20. 45.71 mm 21. 138.56 in.
22. 2.09; 43.02° ; 9.79; 4.81; 88.24° ; 50.42
23. a. about 35.61 in. b. about 71 teeth
24. about 56.55 ft

Practice Level C

1. about 35.81 cm 2. about 67.86 ft
3. about 14.96 in. 4. $\frac{37}{\pi}$ 5. $\frac{58}{\pi}$ 6. 26.3π
7. 63.8π 8. about 35.94 in. 9. about 34.94 cm
10. about 36.02 m 11. 259° 12. 129.5°
13. about 112.56 m 14. about 56.28 m
15. 230.5° 16. about 100.17 m
17. about 50.82 cm 18. about 6.16 in.
19. about 36.25 ft 20. about 36.85 cm
21. about 87.96 in. 22. about 28.57 in.

23. 12.04; 79° ; 17.1; 13.6; 143° ; 111.83
24. 1414 cm 25. about 71.42 m; about 96.55 m
26. about 39.10 in. 27. about 26.85 in.

Study Guide

1. $C \approx 50.27$ in. 2. $r \approx 5.57$ yd
3. $C \approx 28.27$ cm 4. 23.56 ft
5. 4.19 m 6. 44.51 cm 7. 120°
8. $r \approx 2$ ft 9. $C \approx 75.37$ cm

Real-Life Application

1. $r_3 = 39.09$ m, $r_4 = 40.33$ m, $r_5 = 41.57$ m,
 $r_6 = 42.81$ m, $r_7 = 44.05$ m, $r_8 = 45.29$ m
2. Lane 1: 400.03 m, Lane 2: 407.82 m,
Lane 3: 415.61 m, Lane 4: 423.40 m,
Lane 5: 431.19 m, Lane 6: 438.98 m,
Lane 7: 446.77 m, Lane 8: 454.57 m
3. about 8 m 4. Lane 1: 115.01 m,
Lane 2: 118.91 m, Lane 3: 122.80 m,
Lane 4: 126.70 m, Lane 5: 130.60 m,
Lane 6: 134.49 m, Lane 7: 138.39 m,
Lane 8: 142.28 m 5. You and your two friends
will not run equal distances since there is an
8 meter difference in the lengths of each lane.

Challenge Practice

1. 63.3 in./sec 2. 9.4 rad/sec; 471.2 ft/min
3. 616.2 rev/min; 3872 rad/min 4. 212.1 in./sec
5. 1.2 cm/sec 6. 32,672.6 rad/min; 9869.8 ft/min
7. 25.1 rad/min; 565.5 ft/min
8. $400\pi \leq \omega \leq 1000\pi$; $2400\pi \leq v \leq 6000\pi$

Lesson 11.2 Areas of Circles and Sectors

Teaching Guide

1. the radius 2. $\frac{1}{3}$ 3. about 5027 ft²
4. about 1676 ft² 5. about 1885 ft²

Technology Activity

1. Area of circle $A = 2(\text{Area of circle } D + \text{Area of circle } E)$

$$\begin{aligned}\pi r^2 &= 2\left[\pi\left(\frac{1}{2}r\right)^2 + \pi\left(\frac{1}{2}r\right)^2\right] \\ &= 2\left(\pi \cdot \frac{1}{4}r^2 + \pi \cdot \frac{1}{4}r^2\right) \\ &= 2\left(\pi \cdot \frac{1}{2}r^2\right) \\ &= \pi r^2\end{aligned}$$