

LESSON

9.2 Finding Circumference



TEKS

Equations, expressions, and relationships—
7.9.B Determine the circumference ... of circles.



ESSENTIAL QUESTION

How do you find the circumference of a circle?

Finding Circumference Using Diameter

As you learned earlier, the ratio of the circumference to the diameter $\frac{C}{d}$ is the same for all circles. This ratio is called π or *pi*, and you can approximate it as 3.14 or as $\frac{22}{7}$. You can use π to find a formula for circumference.

For any circle, $\frac{C}{d} = \pi$. Solve the equation for C to give an equation for the circumference of a circle in terms of the diameter.

$$\frac{C}{d} = \pi$$

The ratio of the circumference to the diameter is π .

$$\frac{C}{d} \times d = \pi \times d$$

Multiply both sides by d .

$$C = \pi d$$

Simplify.



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EXAMPLE 1



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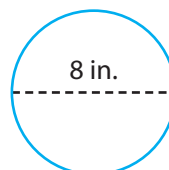
Find the circumference of the circle to the nearest hundredth.

Use 3.14 or $\frac{22}{7}$ for π .

STEP 1

Identify the diameter of the circle.

$$d = 8 \text{ in.}$$



STEP 2

Use the formula.

$$C = \pi d$$

$$C = \pi(8)$$

Substitute 8 for d .

$$C \approx 3.14(8)$$

Substitute 3.14 for π .

$$C \approx 25.12$$

Multiply.

The circumference is about 25.12 inches.



Math Talk

Mathematical Processes

Explain why you wouldn't want to use $\frac{22}{7}$ as an approximation for π in this problem.

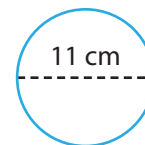
Reflect

1. What value of π could you use to estimate the circumference? _____

2. **Checking for Reasonableness** How do you know your answer is reasonable?

YOUR TURN

3. Find the circumference of the circle to the nearest hundredth.



Finding Circumference Using Radius

Since the diameter of a circle is the same as 2 times the radius, you can substitute $2r$ in the equation for d .

$$C = \pi d$$

$$C = \pi(2r) \quad \text{Substitute } 2r \text{ for } d.$$

$$C = 2\pi r \quad \text{Use the Commutative Property.}$$

The two equivalent formulas for circumference are $C = \pi d$ or $C = 2\pi r$.

EXAMPLE 2



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An irrigation sprinkler waters a circular region with a radius of 14 feet. Find the circumference of the region watered by the sprinkler. Use $\frac{22}{7}$ for π .

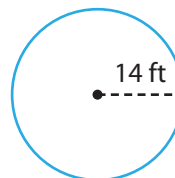
Use the formula.

$$C = 2\pi r \quad \text{The radius is 14 feet.}$$

$$C = 2\pi(14) \quad \text{Substitute 14 for } r.$$

$$C \approx 2\left(\frac{22}{7}\right)(14) \quad \text{Substitute } \frac{22}{7} \text{ for } \pi.$$

$$C \approx 88 \quad \text{Multiply.}$$



The circumference of the region watered by the sprinkler is about 88 feet.

Reflect

4. **Analyze Relationships** When is it logical to use $\frac{22}{7}$ instead of 3.14 for π ?

YOUR TURN

5. Find the circumference of the circle.



Using Circumference

Given the circumference of a circle, you can use the appropriate circumference formula to find the radius or the diameter of the circle. You can use that information to solve problems.



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EXAMPLE 3



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A circular pond has a circumference of 628 feet. A model boat is moving directly across the pond, along a radius, at a rate of 5 feet per second. How long does it take the boat to get from the edge of the pond to the center?

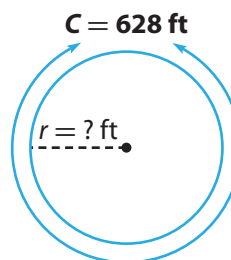
STEP 1 Find the radius of the pond.

$$C = 2\pi r \quad \text{Use the circumference formula.}$$

$$628 \approx 2(3.14)r \quad \text{Substitute for the circumference and for } \pi.$$

$$\frac{628}{6.28} \approx \frac{6.28r}{6.28} \quad \text{Divide both sides by 6.28.}$$

$$100 \approx r \quad \text{Simplify.}$$



The radius is about 100 feet.

STEP 2 Find the time it takes the boat to get from the edge of the pond to the center along the radius. Divide the radius of the pond by the speed of the model boat.

$$100 \div 5 = 20$$

It takes the boat about 20 seconds to get to the center of the pond.

Reflect

6. **Analyze Relationships** Dante checks the answer to Step 1 by multiplying it by 6 and comparing it with the given circumference. Explain why Dante's estimation method works. Use it to check Step 1.

7. **What If?** Suppose the model boat were traveling at a rate of 4 feet per second. How long would it take the model boat to get from the edge of the pond to the center? _____

YOUR TURN

8. A circular garden has a circumference of 44 yards. Lars is digging a straight line along a diameter of the garden at a rate of 7 yards per hour. How many hours will it take him to dig across the garden?



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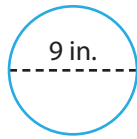
Guided Practice

Find the circumference of each circle. (Examples 1 and 2)

1. $C = \pi d$

$C \approx$ _____

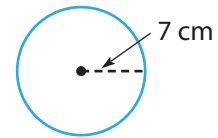
$C \approx$ _____ inches



2. $C = 2\pi r$

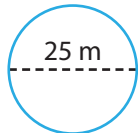
$C \approx 2\left(\frac{22}{7}\right)$ (_____)

$C \approx$ _____ cm

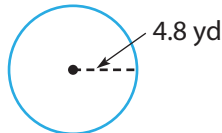


Find the circumference of each circle. Use 3.14 or $\frac{22}{7}$ for π . Round to the nearest hundredth, if necessary. (Examples 1 and 2)

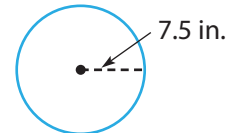
3.



4.



5.



6. A round swimming pool has a circumference of 66 feet. Carlos wants to buy a rope to put across the diameter of the pool. The rope costs \$0.45 per foot, and Carlos needs 4 feet more than the diameter of the pool. How much will Carlos pay for the rope? (Example 3)

Find the diameter.

$C = \pi d$

_____ $\approx 3.14d$

$\frac{\square}{3.14} \approx \frac{3.14d}{3.14}$

_____ $\approx d$

Find the cost.

Carlos needs _____ feet of rope.

_____ $\times \$0.45 =$ _____

Carlos will pay _____ for the rope.

Find each missing measurement to the nearest hundredth. Use 3.14 for π . (Examples 1 and 3)

7. $r =$ _____

$d =$ _____

$C = \pi r$

8. $r \approx$ _____

$d \approx$ _____

$C = 78.8$ ft

9. $r \approx$ _____

$d \approx 3.4$ in.

$C =$ _____



ESSENTIAL QUESTION CHECK-IN

10. Norah knows that the diameter of a circle is 13 meters. How would you tell her to find the circumference?

9.2 Independent Practice



7.9.B

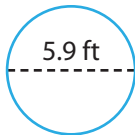


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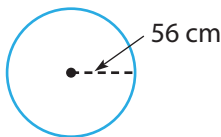
Online
Assessment and
Intervention

Find the circumference of each circle. Use 3.14 or $\frac{22}{7}$ for π . Round to the nearest hundredth, if necessary.

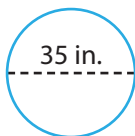
11.



12.



13.



14. In Exercises 11–13, for which problems did you use $\frac{22}{7}$ for π ? Explain your choice.

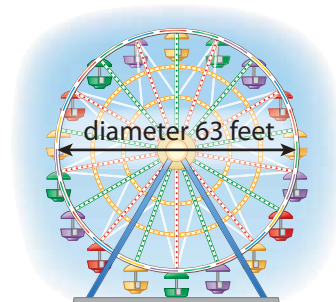
15. A circular fountain has a radius of 9.4 feet. Find its diameter and circumference to the nearest hundredth.

16. Find the radius and circumference of a CD with a diameter of 4.75 inches.

17. A dartboard has a diameter of 18 inches. What is its radius and circumference?

18. **Multistep** Randy's circular garden has a radius of 1.5 feet. He wants to enclose the garden with edging that costs \$0.75 per foot. About how much will the edging cost? Explain.

19. **Represent Real-World Problems** The Ferris wheel shown makes 12 revolutions per ride. How far would someone travel during one ride?



20. The diameter of a bicycle wheel is 2 feet. About how many revolutions does the wheel make to travel 2 kilometers? Explain. Hint: 1 km = 3,280 ft

21. **Multistep** A map of a public park shows a circular pond. There is a bridge along a diameter of the pond that is 0.25 mi long. You walk across the bridge, while your friend walks halfway around the pond to meet you at the other side of the bridge. How much farther does your friend walk?

- 22. Architecture** The Capitol Rotunda connects the House and the Senate sides of the U.S. Capitol. Complete the table. Round your answers to the nearest foot.

Capitol Rotunda Dimensions	
Height	180 ft
Circumference	301.5 ft
Radius	
Diameter	



FOCUS ON HIGHER ORDER THINKING

- 23. Multistep** A museum groundskeeper is creating a semicircular statuary garden with a diameter of 30 feet. There will be a fence around the garden. The fencing costs \$9.25 per linear foot. About how much will the fencing cost altogether?

- 24. Critical Thinking** Sam is placing rope lights around the edge of a circular patio with a diameter of 18 feet. The lights come in lengths of 54 inches. How many strands of lights does he need to surround the patio edge?

- 25. Represent Real-World Problems** A circular path 2 feet wide has an inner diameter of 150 feet. How much farther is it around the outer edge of the path than around the inner edge?

- 26. Critique Reasoning** A gear on a bicycle has the shape of a circle. One gear has a diameter of 4 inches, and a smaller one has a diameter of 2 inches. Justin says that the circumference of the larger gear is 2 inches more than the circumference of the smaller gear. Do you agree? Explain your answer.

- 27. Persevere in Problem Solving** Consider two circular swimming pools. Pool A has a radius of 12 feet, and Pool B has a diameter of 7.5 meters. Which pool has a greater circumference? How much greater? Justify your answers.

Work Area