LESSON

9.3 Area of Circles

TEKS Equations, expressions, and relationships—7.8.C
Use models to determine the approximate formulas for the … area of a circle and connect the models to the actual formulas. *Also 7.9.B*

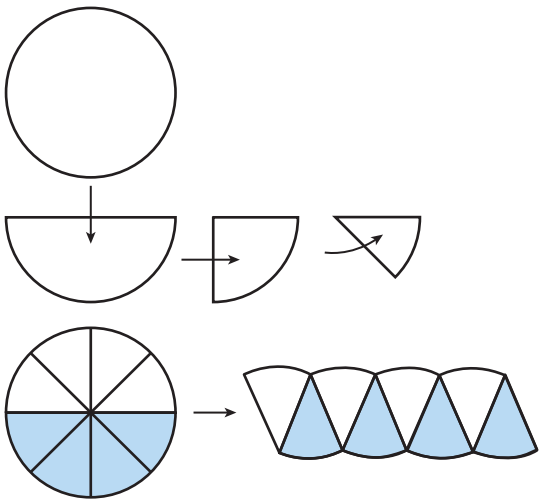
ESSENTIAL QUESTION

How do you find the area of a circle?

EXPLORE ACTIVITY 1 TEKS 7.8.C

Exploring Area of Circles

You can use what you know about circles and π to help find the formula for the area of a circle.



STEP 1 Use a compass to draw a circle and cut it out.

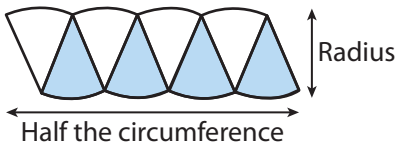
STEP 2 Fold the circle three times as shown to get equal wedges.

STEP 3 Unfold and shade one-half of the circle.

STEP 4 Cut out the wedges, and fit the pieces together to form a figure that looks like a parallelogram.

The base and height of the parallelogram relate to the parts of the circle.

base $b =$ $\frac{\square}{\square}$ the circumference of the circle, or _____



height $h =$ the _____ of the circle, or _____

To find the area of a parallelogram, the equation is $A =$ _____.

To find the area of the circle, substitute for b and h in the area formula.

$A = bh$

$A = \square\, h$ Substitute πr for b.

$A = \pi r\, \square$ Substitute r for h.

$A = \pi\, \square$ $r \cdot r = r^2$

Reflect

1. How can you make the wedges look more like a parallelogram?

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Finding the Area of a Circle

Area of a Circle

The area of a circle is equal to π times the radius squared.

$$A = \pi r^2$$

Remember that area is given in square units.

EXAMPLE 1

Real World

TEKS 7.9.B

A biscuit recipe calls for the dough to be rolled out and circles to be cut from the dough. The biscuit cutter has a radius of 4 cm. Find the area of the biscuit once it is cut. Use 3.14 for π.

$A = \pi r^2$	Use the formula.
$A = \pi(4)^2$	Substitute. Use 4 for r.
$A \approx 3.14 \times 4^2$	Substitute. Use 3.14 for π.
$A \approx 3.14 \times 16$	Evaluate the power.
$A \approx 50.24$	Multiply.

The area of the biscuit is about 50.24 cm^2.

Math Talk
Mathematical Processes

If the radius increases by 1 centimeter, how does the area of the top of the biscuit change?

Reflect

2. Compare finding the area of a circle when given the radius with finding the area when given the diameter.

_____

_____

_____

3. Why do you evaluate the power in the equation before multiplying?

_____

_____

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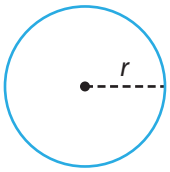
YOUR TURN

4. A circular pool has a radius of 10 feet. What is the area of the pool? Use 3.14 for π. _____

EXPLORE ACTIVITY 2 TEKS 7.9.B

Finding the Relationship between Circumference and Area



You can use what you know about circumference and area of circles to find a relationship between them.

Find the relationship between the circumference and area of a circle.

Start with a circle that has radius r.

Solve the equation $C = 2\pi r$ for r.

$$r = \frac{\square}{\square}$$

Substitute your expression for r in the formula for area of a circle.

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

Remember: Because the exponent is outside the parentheses, you must apply it to the numerator and to each factor of the denominator.

Square the term in the parentheses.

$$A = \pi\left(\frac{\square^{2}}{\square^{2} \cdot \square^{2}}\right)$$

Evaluate the power.

$$A = \frac{\square \cdot \square^{2}}{\square \cdot \square^{2}}$$

Simplify.

$$A = \frac{\square^{2}}{\square \cdot \square}$$

Solve for C^2.

$$C^2 = 4\square\square$$

The circumference of the circle squared is equal to

_____.

EXPLORE ACTIVITY 2 *(cont'd)*

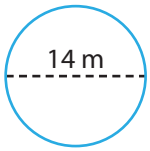
Reflect

5. Does this formula work for a circle with a radius of 3 inches? Show your work.

Guided Practice

Find the area of each circle. Round to the nearest tenth if necessary. Use 3.14 for π. (Explore Activity 1)

1.



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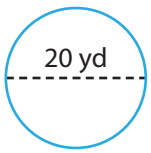

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Solve. Use 3.14 for π. (Example 1)

4. A clock face has a radius of 8 inches. What is the area of the clock face? Round your answer to the nearest hundredth. _____

5. A DVD has a diameter of 12 centimeters. What is the area of the DVD? Round your answer to the nearest hundredth. _____

6. A company makes steel lids that have a diameter of 13 inches. What is the area of each lid? Round your answer to the nearest hundredth. _____

Find the area of each circle. Give your answers in terms of π. (Explore Activity 2)

7. $C = 4\pi$

$A =$ _____

8. $C = 12\pi$

$A =$ _____

9. $C = \frac{\pi}{2}$

$A =$ _____

10. A circular pen has an area of 64π square yards. What is the circumference of the pen? Give your answer in terms of π. (Explore Activity 2) _____

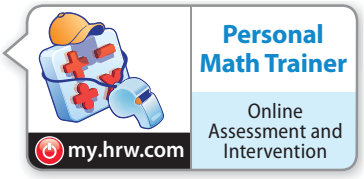
ESSENTIAL QUESTION CHECK-IN

11. What is the formula for the area A of a circle in terms of the radius r? _____

Name _____ Class _____ Date _____

9.3 Independent Practice

TEKS 7.8.C, 7.8.B



12. The most popular pizza at Pavone's Pizza is the 10-inch personal pizza with one topping. What is the area of a pizza with a diameter of 10 inches? Round your answer to the nearest hundredth.

_____

13. A hubcap has a radius of 16 centimeters. What is the area of the hubcap? Round your answer to the nearest hundredth.

_____

14. A stained glass window is shaped like a semicircle. The bottom edge of the window is 36 inches long. What is the area of the stained glass window? Round your answer to the nearest hundredth.

_____

15. **Analyze Relationships** The point (3, 0) lies on a circle with the center at the origin. What is the area of the circle to the nearest hundredth?

_____

16. **Multistep** A radio station broadcasts a signal over an area with a radius of 50 miles. The station can relay the signal and broadcast over an area with a radius of 75 miles. How much greater is the area of the broadcast region when the signal is relayed? Round your answer to the nearest square mile.

_____

17. **Multistep** The sides of a square field are 12 meters. A sprinkler in the center of the field sprays a circular area with a diameter that corresponds to a side of the field. How much of the field is **not** reached by the sprinkler? Round your answer to the nearest hundredth.

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18. **Justify Reasoning** A small silver dollar pancake served at a restaurant has a circumference of 2π inches. A regular pancake has a circumference of 4π inches. Is the area of the regular pancake twice the area of the silver dollar pancake? Explain.

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19. **Analyze Relationships** A bakery offers a small circular cake with a diameter of 8 inches. It also offers a large circular cake with a diameter of 24 inches. Does the top of the large cake have three times the area of that of the small cake? If not, how much greater is its area? Explain.

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20. **Communicate Mathematical Ideas** You can use the formula $A = \frac{C^2}{4\pi}$ to find the area of a circle given the circumference. Describe another way to find the area of a circle when given the circumference.

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21. **Draw Conclusions** Mark wants to order a pizza. Which is the better deal? Explain.

Donnie's Pizza Palace		
Diameter (in.)	12	18
Cost ($)	10	20

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_____

22. **Multistep** A bear was seen near a campground. Searchers were dispatched to the region to find the bear.

a. Assume the bear can walk in any direction at a rate of 2 miles per hour. Suppose the bear was last seen 4 hours ago. How large an area must the searchers cover? Use 3.14 for π. Round your answer to the nearest square mile. _____

b. **What If?** How much additional area would the searchers have to cover if the bear were last seen 5 hours ago? _____

H.O.T. FOCUS ON HIGHER ORDER THINKING

23. **Analyze Relationships** Two circles have the same radius. Is the combined area of the two circles the same as the area of a circle with twice the radius? Explain.

_____

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24. **Look for a Pattern** How does the area of a circle change if the radius is multiplied by a factor of n, where n is a whole number?

_____

25. **Represent Real World Problems** The bull's-eye on a target has a diameter of 3 inches. The whole target has a diameter of 15 inches. What part of the whole target is the bull's-eye? Explain.

_____

Work Area