

# 11-6

## Surface Areas and Volumes of Spheres

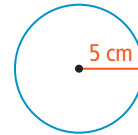


### Vocabulary

#### Review

Underline the correct word to complete each sentence.

- The diameter / radius of the circle at the right is 5 cm.
- The circumference of a circle is the product of its diameter / radius and  $\pi$ .
- The diameter / radius of a circle is a segment containing the center with endpoints on the circle.



#### Vocabulary Builder

**sphere** (noun) sfeer

**Related Words:** spherical (adjective), hemisphere (noun)

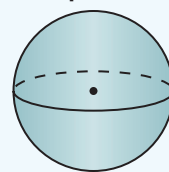
**Main Idea:** A **sphere** is formed by the revolution of a circle about its diameter.

**Definition:** A **sphere** is the set of all points in space equidistant from a given point called the *center*.

**Example:** A basketball is a **sphere**.

**Non-Example:** A football is not a **sphere**.

sphere



#### Use Your Vocabulary

- Complete each statement with *sphere* or *spherical*.

ADJECTIVE Each ? candy looks like a rock.

NOUN A baseball is in the shape of a ?.

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Write T for *true* or F for *false*.

- Celestial bodies such as the sun or Earth are often represented as *spheres*.
- A *sphere* is a two-dimensional figure.

### Theorem 11-10 Surface Area of a Sphere

The surface area of a sphere is four times the product of  $\pi$  and the square of the radius of the sphere.



7. Complete: S.A. =  ·  · <sup>2</sup>



#### Problem 1 Finding the Surface Area of a Sphere

**Got It?** What is the surface area of a sphere with a diameter of 14 in.? Give your answer in terms of  $\pi$  and rounded to the nearest square inch.

8. The radius of the sphere is  in.

9. Find the surface area.

$$\begin{aligned} \text{S.A.} &= 4\pi(\text{input})^2 && \text{Use the formula for surface area of a sphere.} \\ &= 4\pi(\text{input})^2 && \text{Substitute for } r. \\ &= \pi(\text{input}) && \text{Simplify.} \\ &\approx \text{input} && \text{Use a calculator.} \end{aligned}$$

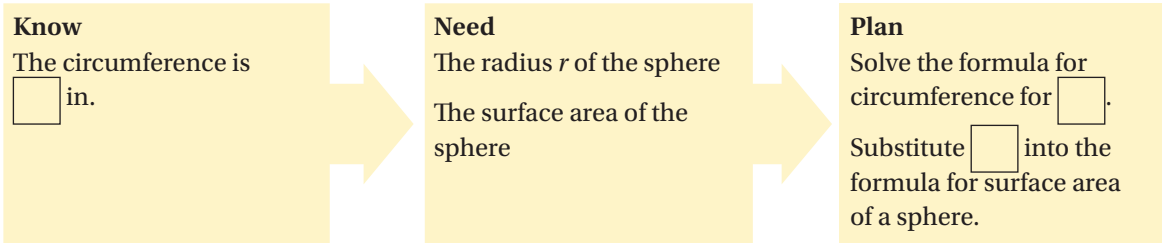
10. The surface area in terms of  $\pi$  is   $\pi$  in.<sup>2</sup>, or about  in.<sup>2</sup>.



#### Problem 2 Finding Surface Area

**Got It?** What is the surface area of a melon with circumference 18 in.? Round your answer to the nearest ten square inches.

11. Complete the problem-solving model below.



12. Find  $r$  in terms of  $\pi$ .

$$C = 2\pi r$$

13. Use your value for  $r$  to find the surface area.

$$\text{S.A.} = 4\pi r^2$$

14. To the nearest ten square inches, the surface area of the melon is  in.<sup>2</sup>.

### Theorem 11-11 Volume of a Sphere

15. Complete the model below.

Relate      The volume of a sphere is four thirds the product of  $\pi$  and the cube of the radius of the sphere.

Write       $V =$

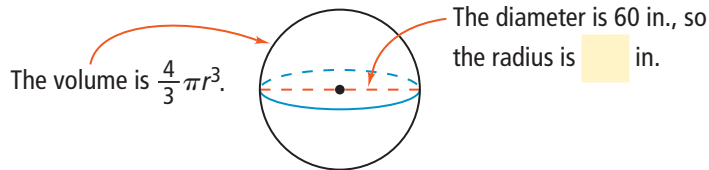
Draw a line from each measure in Column A to its corresponding formula in Column B.

Column A	Column B
16. surface area of a sphere	$\frac{4}{3}\pi r^3$
17. volume of a sphere	$4\pi r^2$

### Problem 3 Finding the Volume of a Sphere

**Got It?** A sphere has a diameter of 60 in. What is its volume to the nearest cubic inch?

18. Complete the missing information in the diagram.



19. Complete to find the volume.

$$\begin{aligned}
 V &= \frac{4}{3}\pi(\text{[ ]})^3 \\
 &= \frac{4}{3}\pi(\text{[ ]}) \\
 &= \pi(\text{[ ]}) \\
 &\approx \text{[ ]}
 \end{aligned}$$

20. The volume is about  in.<sup>3</sup>.

### Problem 4 Using Volume to Find Surface Area

**Got It?** The volume of a sphere is 4200 ft<sup>3</sup>. What is its surface area to the nearest tenth?

21. Circle the correct formula for the volume of a sphere.

$$V = \frac{4}{3}\pi r^2 \qquad V = \frac{4}{3}\pi r^3$$

22. Complete the reasoning model below.

Think	Write
I need to solve the volume formula for the radius.	$V = \frac{4}{3}\pi r^3$
I can substitute the given volume into the formula.	<input type="text"/> = $\frac{4}{3}\pi r^3$
Now, I can solve for $r^3$ .	<input type="text"/>
If I take the cube root of both sides, I can solve for $r$ . I need to use a calculator to simplify.	$\sqrt[3]{\text{input}} = r$ <input type="text"/> $\approx r$
Then, I can substitute $r$ into the formula for surface area of a sphere.	S.A. = $4\pi$ <input type="text"/> <sup>2</sup>
Finally, I can simplify.	S.A. $\approx$ <input type="text"/>

23. To the nearest tenth of a foot, the surface area is  ft<sup>2</sup>.



### Lesson Check • Do you UNDERSTAND?

**Vocabulary** What is the ratio of the area of a great circle to the surface area of the sphere?

24. A great circle is a circle whose center is the center of the    .

25.  $A =$

26. S.A. =

27. The ratio is , or .



### Math Success

Check off the vocabulary words that you understand.

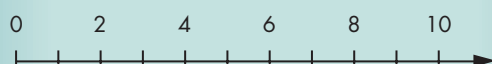
sphere (radius, diameter, circumference)

great circle

hemisphere

Rate how well you can *find surface area and volume of a sphere*.

Need to review



Now I get it!