

LESSON
12.6**Study Guide**

For use with pages 838–845

GOAL Find surface areas and volume of spheres.**Vocabulary**

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

A **radius** of a sphere is a segment from the center to a point on the sphere.

A **chord** of a sphere is a segment whose endpoints are on the sphere.

A **diameter** of a sphere is a chord that contains the center.

Theorem 12.11 Surface Area of a Sphere: The surface area S of a sphere is $S = 4\pi r^2$, where r is the radius of the sphere.

Theorem 12.12 Volume of a Sphere: The volume V of a sphere is $V = \frac{4}{3}\pi r^3$, where r is the radius of the sphere.

EXAMPLE 1 Find the surface area of a sphere

Find the surface area of the sphere.

Solution

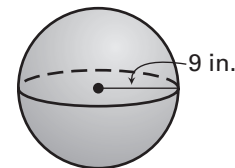
$$S = 4\pi r^2$$

Formula for surface area of a sphere

$$= 4\pi(9)^2 = 324\pi \approx 1017.88$$

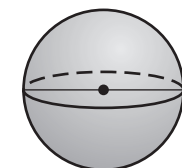
Substitute 9 for r and simplify.

The surface area of the sphere is about 1017.88 square inches.

**EXAMPLE 2** Standardized Test Practice

The surface area of the sphere is 12.25π square centimeters. What is the diameter of the sphere?

- (A) 12.25 cm (B) 1.75 cm
(C) 3.5 cm (D) 5.5 cm



$$S = 12.25\pi \text{ cm}^2$$

Solution

$$S = 4\pi r^2$$

Formula for surface area of a sphere

$$12.25\pi = 4\pi r^2$$

Substitute 12.25π for S .

$$3.0625 = r^2$$

Divide each side by 4π .

$$1.75 = r$$

Find the positive square root.

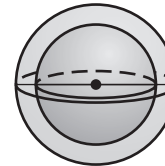
The diameter of the sphere is $2r = 2(1.75) = 3.5$ cm. The correct answer is C.

LESSON
12.6**Study Guide** *continued*
*For use with pages 838–845***Exercises for Examples 1 and 2**

- The diameter of a sphere is 50 feet. Find the surface area of the sphere.
- The surface area of a sphere is 36π square meters. Find the radius of the sphere.

EXAMPLE 3 **Use the circumference of a sphere**

In the diagram, the circumference of the outer ball is 8π feet. Find the surface area of the outer ball.

**Solution**

$$C = 2\pi r \quad \text{Formula for circumference}$$

$$8\pi = 2\pi r \quad \text{Substitute } 8\pi \text{ for } C.$$

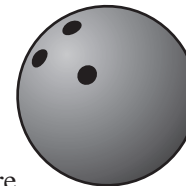
$$4 = r \quad \text{Divide each side by } 2\pi.$$

$$S = 4\pi r^2 = 4\pi(4)^2 = 64\pi \approx 201.06$$

The surface area of the outer ball is 64π , or about 201.06 square feet.

EXAMPLE 4 **Find the volume of a sphere**

The bowling ball has a diameter of 8 inches. Find its volume.

**Solution**

$$V = \frac{4}{3}\pi r^3 \quad \text{Formula for volume of a sphere}$$

$$V = \frac{4}{3}\pi(4)^3 = \frac{256}{3}\pi \approx 268.08 \quad \text{Substitute } \frac{8}{2}, \text{ or } 4, \text{ for } r \text{ and simplify.}$$

The volume of the bowling ball is $\frac{256}{3}\pi$, or about 268.08 cubic inches.

Exercises for Examples 3 and 4

- In Example 3, the circumference of the inner ball is 5π feet. Find the surface area of the inner ball. Round your answer to two decimal places.
- The radius of a sphere is 7 yards. Find the volume of the sphere. Round your answer to two decimal places.