SPHERES – VOLUME

For a sphere with radius $r$, the volume is found using $V = \frac{4}{3} \pi r^3$.

For more information, see the Math Notes box in Lesson 10.1.5 of the Core Connections, Course 3 text.

Example 1

Find the volume of the sphere at right.

$$V = \frac{4}{3} \pi r^3 = \frac{4}{3} \pi \cdot 2^3 = \frac{32\pi}{3} \text{ ft}^3 \text{ exact answer}$$

or using $\pi \approx 3.14$

$$\frac{32(3.14)}{3} = 33.49 \text{ ft}^3 \text{ approximate answer}$$

Example 2

A sphere has a volume of $972\pi \text{ un.}^3$. Find the radius.

Use the formula for volume and solve the equation for the radius.

$$V = \frac{4}{3} \pi r^3 = 972\pi$$

Substitution.

$$4\pi r^3 = 2916\pi$$

Multiply by 3 to remove the fraction.

$$r^3 = \frac{2916\pi}{4\pi} = 729$$

Divide by $4\pi$ to isolate $r$.

$$r = \sqrt[3]{729} = 9$$

To undo cubing, take the cube root.
Problems

Use the given information to find the exact and approximate volume of the sphere.

1. radius = 10 cm  
2. radius = 4 ft  
3. diameter = 10 cm  
4. diameter = 3 miles  
5. circumference of great circle = 12\pi \text{ un.}  
6. circumference of great circle = 3\pi \text{ un.}

Use the given information to answer each question related to spheres.

7. If the radius is 7 cm, find the volume.  
8. If the diameter is 10 inches, find the volume.  
9. If the volume of the sphere is \(36\pi \text{ un.}^3\), find the radius.  
10. If the volume of the sphere is \(\frac{256\pi}{3} \text{ un.}^3\), find the radius.

Answers

1. \(\frac{4000\pi}{3} \approx 4186.67 \text{ cm}^3\)  
2. \(\frac{256\pi}{3} \approx 267.94 \text{ ft}^3\)  
3. \(\frac{500\pi}{3} \approx 523.33 \text{ cm}^3\)  
4. \(\frac{9\pi}{2} \approx 14.13 \text{ mi}^3\)  
5. \(288\pi \approx 904.32 \text{ un.}^3\)  
6. \(\frac{9\pi}{2} \approx 14.13 \text{ un.}^3\)  
7. \(\frac{1372\pi}{3} \approx 1436.75 \text{ cm}^3\)  
8. \(\frac{500\pi}{3} \approx 523.60 \text{ in.}^3\)  
9. \(r = 3 \text{ units}\)  
10. \(r = 4 \text{ units}\)