Lesson 8.3:

Volumes of Spheres

Essential Question
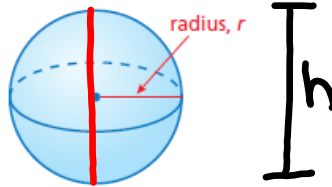
How can you find the volume of a sphere?

Key Idea

Volume of a Sphere

Words The volume V of a sphere is the product of $\frac{4}{3}\pi$ and the cube of the radius of the sphere.

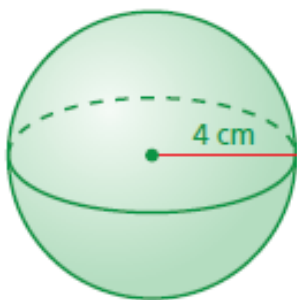**Algebra** $V = \frac{4}{3}\pi r^3$

Cube of radius of sphere

radius, r

$V_{sphere} = \frac{2}{3} V_{cylinder}$

$$V = \frac{2}{3} \cdot \pi r^2 h \rightarrow h = 2r$$

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

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

Find the volume of the sphere. Round your answer to the nearest tenth.
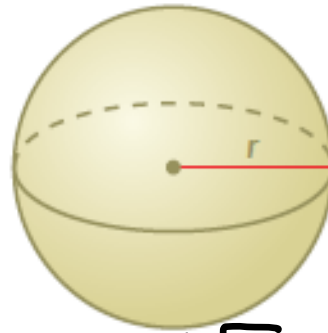
4 cm

$$\frac{4}{3}\pi r^3$$

$$\frac{4}{3} \cdot 3.14 \cdot (4cm)^3$$

$$\frac{4}{3} \cdot 3.14 \cdot 64 cm^3$$

$$267.94\overline{6} \approx \boxed{267.9 \, cm^3}$$

Find the radius of the sphere.

Volume = 288π in.^{3}

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

$$288\pi \text{ in}^3 = \frac{4}{3}\pi r^3$$

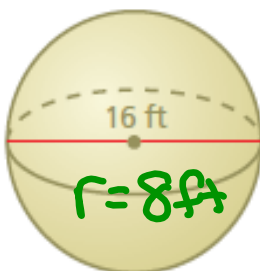$$\div \pi \quad | \quad \div \pi$$

$$288 \text{ in}^3 = \frac{4}{3} r^3$$

$$\cdot \frac{3}{4} \quad | \quad \cdot \frac{3}{4}$$

$$216 \text{ in}^3 = r^3$$

$$\boxed{6 \text{ in} = r} \longrightarrow \text{Guess \& check if unsure}$$

Calculator: $\boxed{2\text{nd}}$ $\boxed{\wedge}$ $\xleftarrow{}\xleftarrow{}$ $\boxed{3}$

$\times\sqrt{\ }$

Find the volume *V* or radius *r* of the sphere. Round your answer to the nearest tenth, if necessary.
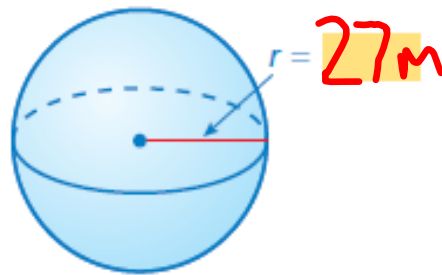
1.

16 ft

$r = 8 \text{ ft}$

$V \approx 2143.6 \text{ ft}^3$

$$\frac{4}{3}\pi r^3$$

$$\frac{4}{3} \cdot 3.14 \cdot 8^3$$

$$2143.573$$

2.

$r = 27m$

Volume = 36π m^3
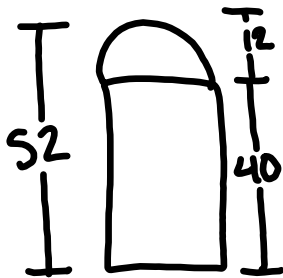
$$36\pi = \frac{4}{3}\pi r^3$$

$$\cdot \frac{3}{4} \quad | \quad \cdot \frac{3}{4}$$

$$27 = r$$

3

A hemisphere is one-half of a sphere. The top of the silo is a hemisphere with a radius of 12 feet. What is the volume of the silo? Round your answer to the nearest thousand.

52 ft

52

12

40

Cylinder + Hemisphere

$$\pi r^2 h + \frac{1}{2} \cdot \frac{4^2}{3} \pi r^3$$
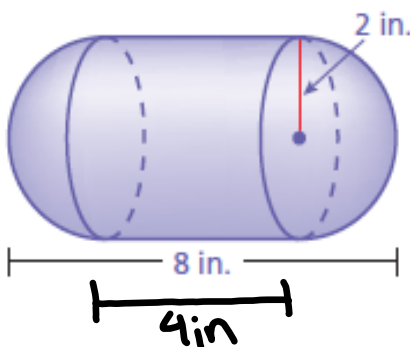
$$\pi \cdot 12^2 \cdot 40 + \frac{2}{3} \pi \cdot 12^3$$

$$5760\pi + 192\pi$$

$$5952\pi \approx 18,689 \rightarrow \boxed{19,000 \, ft^3}$$

Find the volume of the composite solid. Round your answer to the nearest tenth.

3.

2 in.

8 in.
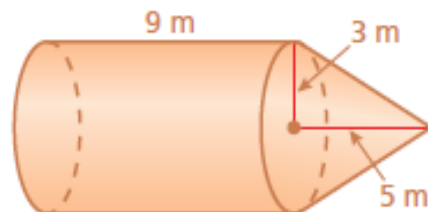
4in

Cylinder + Sphere

$$\pi r^2 h + \frac{4}{3}\pi r^3$$

$$\pi \cdot 2^2 \cdot 4 + \frac{4}{3}\pi \cdot 2^3$$

$$50.24 + 33.49\overline{3}$$

$$83.7\overline{3} \rightarrow \boxed{83.7 \, in^3}$$

4.

9 m   3 m

5 m

Cylinder + Cone

$$\pi r^2 h + \frac{1}{3}\pi r^2 h$$

$$\pi \cdot 3^2 \cdot 9 + \frac{1}{3}\pi \cdot 3^2 \cdot 5$$

$$254.34 + 47.1$$

$$301.44 \rightarrow \boxed{301.4 \, m^3}$$

4