

Volume Formulas

Essential question: How can you solve problems using the formulas for volume?

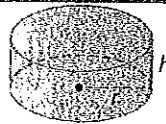
A cylinder has two parallel congruent circular bases. The area of a base is πr^2 .

COMMON CORE

CC.8.G.9

Volume of a Cylinder

The volume of a cylinder with base area B , radius r , and height h is $V = Bh$, or $V = \pi r^2 h$.



1 EXAMPLE Volume of a Cylinder

Find the volume of each cylinder. Round your answers to the nearest tenth if necessary. Use 3.14 for π .

- A** A cylindrical oatmeal canister has a radius of 3 inches and a height of 10 inches.

$$V = \pi r^2 h$$

$$\approx 3.14 \cdot \square^2 \cdot \square$$

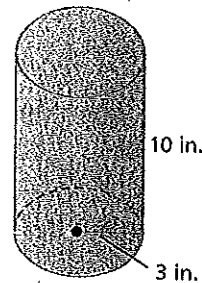
Substitute into the formula.

$$\approx 3.14 \cdot \square \cdot \square$$

Simplify the exponent.

$$\approx \square \text{ in}^3$$

Multiply.



The volume of the canister is about _____ in^3 .

- B** A drink can has a diameter of 6.4 centimeters and a height of 13 centimeters.

First, find the radius: _____ cm.

$$V = \pi r^2 h$$

$$\approx 3.14 \cdot \square^2 \cdot \square$$

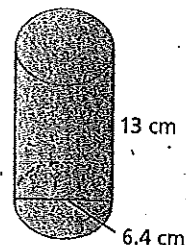
Substitute into the formula.

$$\approx 3.14 \cdot \square \cdot \square$$

Simplify the exponent.

$$\approx \square \text{ cm}^3$$

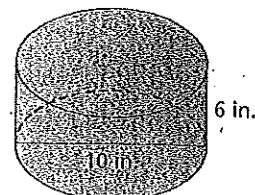
Multiply.



The volume of the can is about _____ cm^3 .

TRY THIS!

- 1a.** The top layer of a wedding cake has a diameter of 10 inches and a height of 6 inches. Find the volume of the top layer of the cake. Round your answer to the nearest tenth if necessary. Use 3.14 for π .



A cone has one circular base. The area of the base is πr^2 .

Volume of a Cone

The volume of a cone with base area B , radius r , and height h is $V = \frac{1}{3}Bh$, or $V = \frac{1}{3}\pi r^2h$.

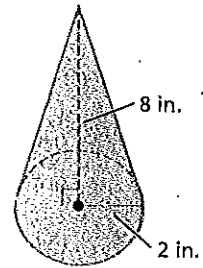


2 EXAMPLE Volume of a Cone

Find the volume of each cone. Round your answers to the nearest tenth if necessary. Use 3.14 for π .

- A** A candle in the shape of a cone has a height of 8 inches and a radius of 2 inches.

$$\begin{aligned}
 V &= \frac{1}{3}\pi r^2h \\
 &\approx \frac{1}{3} \cdot 3.14 \cdot \boxed{}^2 \cdot \boxed{} && \text{Substitute into the formula.} \\
 &\approx \frac{1}{3} \cdot 3.14 \cdot \boxed{} \cdot \boxed{} && \text{Simplify the exponent.} \\
 &\approx \boxed{} \text{ in}^3 && \text{Multiply.}
 \end{aligned}$$

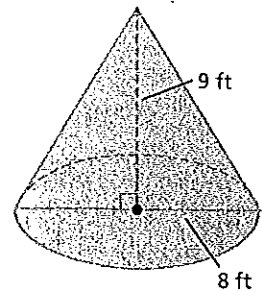


The volume of the candle is about _____ in^3 .

- B** Jacob has a tent that is cone-shaped. It has a height of 9 feet and a diameter of 8 feet.

First, find the radius: _____ ft.

$$\begin{aligned}
 V &= \frac{1}{3}\pi r^2h \\
 &\approx \frac{1}{3} \cdot 3.14 \cdot \boxed{}^2 \cdot \boxed{} && \text{Substitute into the formula.} \\
 &\approx \frac{1}{3} \cdot 3.14 \cdot \boxed{} \cdot \boxed{} && \text{Simplify the exponent.} \\
 &\approx \phantom{\frac{1}{3}} \text{ ft}^3 && \text{Multiply.}
 \end{aligned}$$



The volume of the tent is about _____ ft^3 .

TRY THIS!

- 2a.** A cone has a diameter of 6 centimeters and a height of 11.5 centimeters. Find the volume of the cone. Round your answer to the nearest tenth if necessary. Use 3.14 for π .

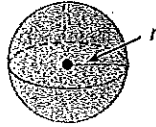
REFLECT

- 2b.** What is the relationship between the volume of a cylinder and a cone with the same height and same radius?

All the points in a sphere are the same distance from the center of the sphere.

Volume of a Sphere

The volume of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.



3 EXAMPLE Volume of a Sphere

Find the volume of each sphere. Round your answers to the nearest tenth if necessary. Use 3.14 for π .

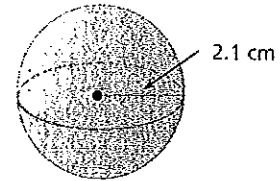
- A The radius of a golf ball is 2.1 centimeters.

$$\begin{aligned} V &= \frac{4}{3}\pi r^3 \\ &\approx \frac{4}{3} \cdot 3.14 \cdot \square^3 \\ &\approx \frac{4}{3} \cdot 3.14 \cdot \square \\ &\approx \square \text{ cm}^3 \end{aligned}$$

Substitute into the formula.

Simplify the exponent.

Multiply.



The volume of a golf ball is about _____ cm^3 .

- B The diameter of a tennis ball is 7 centimeters.

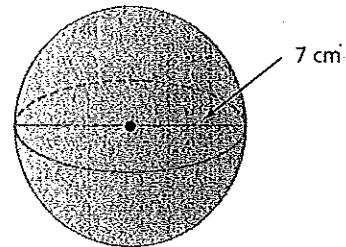
First, find the radius: _____ cm.

$$\begin{aligned} V &= \frac{4}{3}\pi r^3 \\ &\approx \frac{4}{3} \cdot 3.14 \cdot \square^3 \\ &\approx \frac{4}{3} \cdot 3.14 \cdot \square \\ &\approx \square \text{ cm}^3 \end{aligned}$$

Substitute into the formula.

Simplify the exponent.

Multiply.



The volume of the tennis ball is about _____ cm^3 .

TRY THIS!

- 3a. A baseball has a diameter of 2.9 inches. Find the volume of the baseball. Round your answer to the nearest tenth if necessary. Use 3.14 for π .

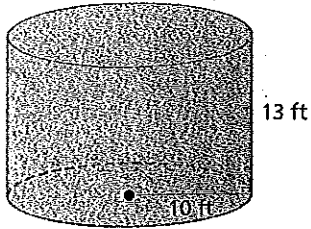
REFLECT

- 3b. A hemisphere is half of a sphere. Explain how you would find the volume of a hemisphere.

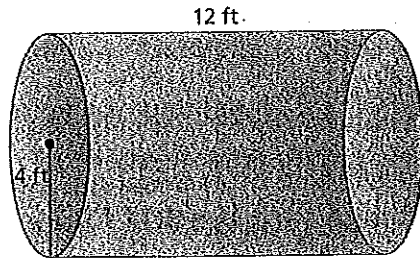
PRACTICE

Find the volume of each figure. Round your answers to the nearest tenth if necessary. Use 3.14 for π .

1.



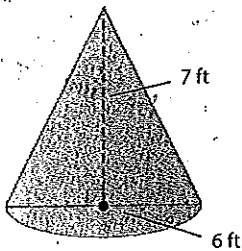
2.



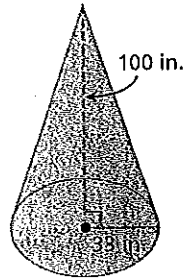
3. A cylinder has a radius of 4 centimeters and height of 40 centimeters.

4. A cylinder has a radius of 8 meters and height of 4 meters.

5.



6.

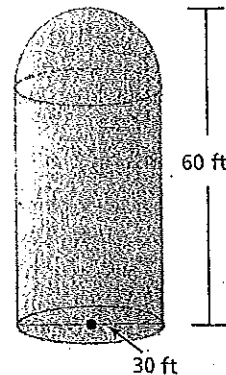


7. A sphere has a radius of 3.1 meters.

8. A sphere has a diameter of 18 inches.

9. A farmer stores corn in a silo that is in the shape of a cylinder with a hemisphere on top. The diameter of the silo is 30 feet, and the total height of the silo is 60 feet.

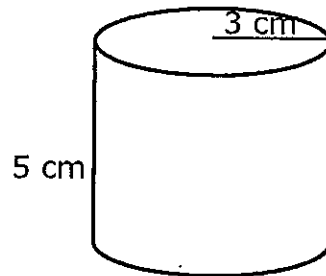
- Find the radius of the hemisphere. _____
- Find the height of the cylinder. _____
- Find the volume of the cylinder. _____
- Find the volume of the hemisphere. _____
- Find the volume of the silo. _____



Volume – Cylinders, Cones, Spheres

Name _____

1. What is the volume of the cylinder below? Show your work.



Formula for volume of a cylinder _____

r = _____ h = _____

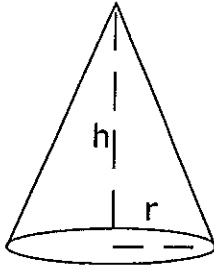
Volume = _____

2. Michael has a barrel in the pasture to keep water for his horse. The barrel is four feet tall with a diameter of 2 feet.

What is the volume of the barrel? Show your work.

How many gallons of water will the barrel hold? $1 \text{ ft}^3 \approx 7.5 \text{ gal}$

3.



$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

The radius of the cone is 6 meters and the height is 11 meters. What is the volume of the cone? Show your work.

If the radius of the cone is doubled, how would the volume change?

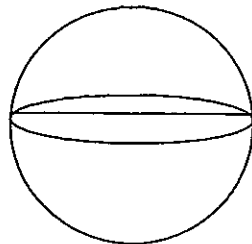
- A. The volume would double.
- B. The volume would be multiplied by 4.
- C. The volume would be multiplied by 6.
- D. The volume would be multiplied by 12.

Explain your reasoning.

4. Volume of a sphere = $\frac{4}{3}\pi r^3$ What is the volume of the sphere below?

Show your work.

diameter = 10 feet

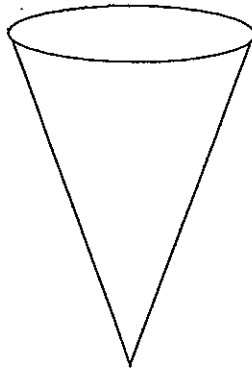


5. The radius of the sun is approximately 700,000 kilometers.

What is the volume of the sun?

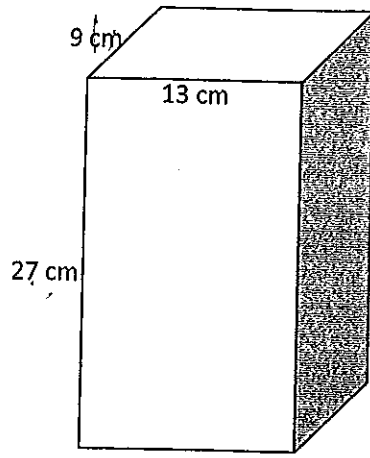
6. An ice cream cone has a diameter of 3 inches. The distance from the top of the cone to the point at the bottom (height) is 5 inches.

How many cubic inches of ice cream will the cone hold?



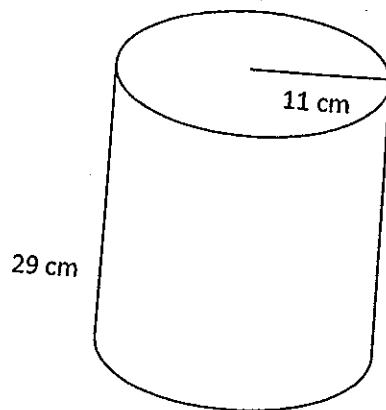
Find the Volume of each figure below.

1.



Formula

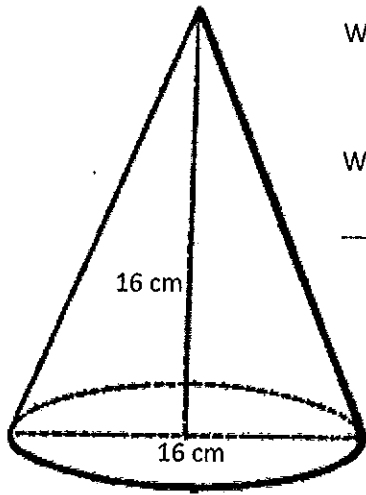
2.



Formula

3.

Find the volume of the figure.

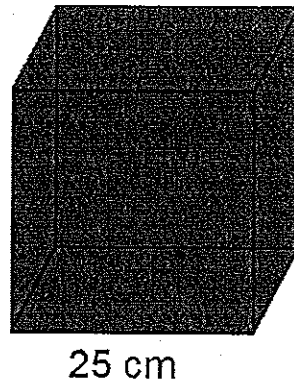
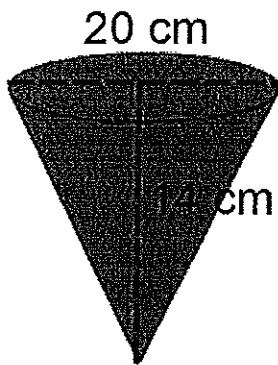


What shape is this figure? _____

What is the formula for the volume of this figure?



33 A cone 20 cm in diameter and 14 cm high was used to fill a cubical planter, 25 cm per edge, with soil. How many cones-ful of soil were needed to fill the planter?



ANSWER

