Skill check:
5 min

The number of students in a school club increased from 32 to 36. By what percent did the number of students in the club increase?

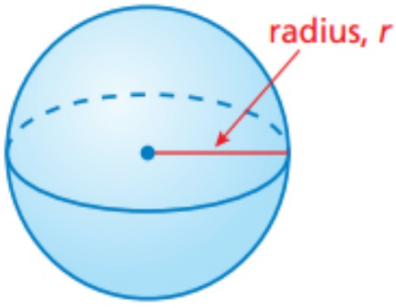
8-3 Volume of a sphere:

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.

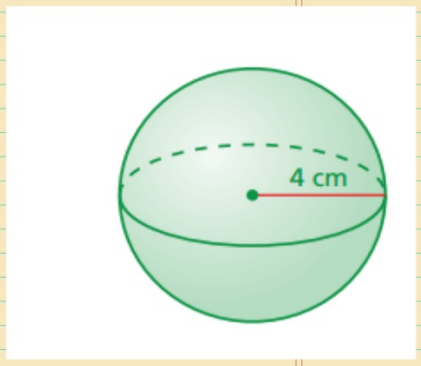
Algebra $V = \frac{4}{3}\pi r^3$

Cube of radius of sphere



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

Example 1: Finding the Volume of a Sphere

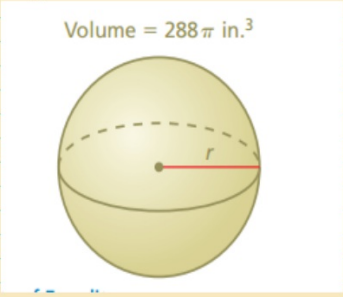


Check:

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

$V = \frac{4}{3}\pi r^3$	Write formula for volume.
$= \frac{4}{3}\pi(4)^3$	Substitute 4 for r.
$= \frac{256}{3}\pi$	Simplify.
≈ 268.1	Use a calculator.

Example 2: Finding the Radius of a Sphere



Check:

Find the radius of the sphere.

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

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

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

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

$$216 = r^3$$

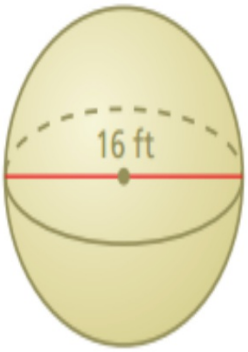
$$6 = r$$

∴ The radius is 6 inches.

Practice

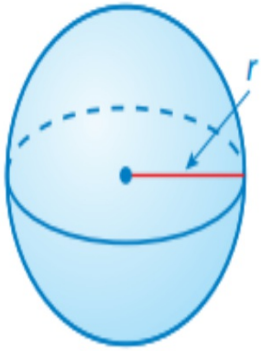
Find the volume V or radius r of the sphere. Round your answer to the nearest tenth, if necessary.

1.



$V \approx$ ____

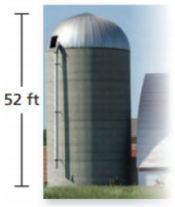
2.

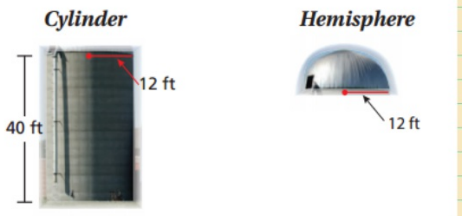


Volume = 36π m^3

Example 3:
Finding the volume of a composite solid:

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.





Work:

$V = Bh$

$= \pi(12)^2(40)$

$= 5760\pi$

$V = \frac{1}{2} \cdot \frac{4}{3}\pi r^3$

$= \frac{1}{2} \cdot \frac{4}{3}\pi(12)^3$

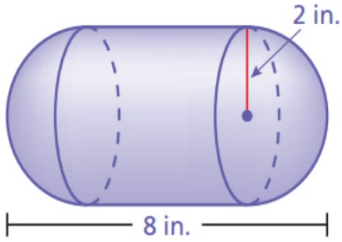
$= 1152\pi$

∴ So, the volume is $5760\pi + 1152\pi = 6912\pi \approx 22{,}000$ cubic feet.

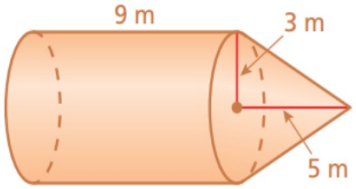
Practice

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

3.



4.



Lesson 11: Volume of a Sphere

Classwork

Exercises 1–3

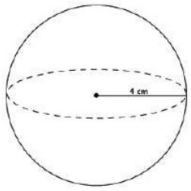
1. What is the volume of a cylinder?

2. What is the height of the cylinder?

3. If $\text{volume(sphere)} = \frac{2}{3}\text{volume(cylinder with same diameter and height)}$, what is the formula for the volume of a sphere?

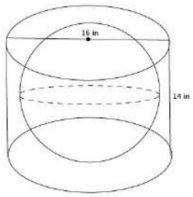
Example 1

Compute the exact volume for the sphere shown below.



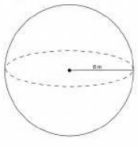
Example 2

A cylinder has a diameter of 16 inches and a height of 14 inches. What is the volume of the largest sphere that will fit into the cylinder?



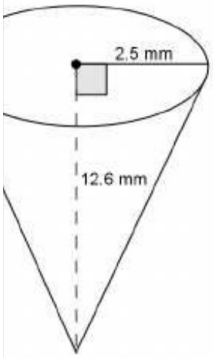
Exercises 4–8

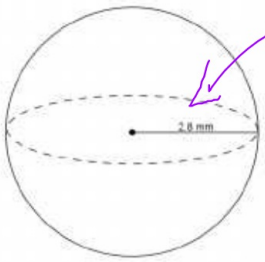
4. Use the diagram and the general formula to find the volume of the sphere.



5. The average basketball has a diameter of 9.5 inches. What is the volume of an average basketball? Round your answer to the tenths place.

am to answer the questions.





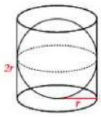
which of the figures shown above has the greater volume. Explain.

diagram to find the volume of each, and determine which has the greater volume.

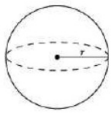
If spheres formed by a plane through the sphere's center is called a hemisphere. What is the e of a hemisphere?

Lesson Summary

The formula to find the volume of a sphere is directly related to that of the right circular cylinder. Given a right circular cylinder with radius r and height h, which is equal to $2r$, a sphere with the same radius r has a volume that is exactly two-thirds of the cylinder.

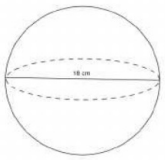


Therefore, the volume of a sphere with radius r has a volume given by the formula $V = \frac{4}{3}\pi r^3$.

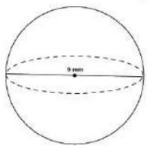


Problem Set

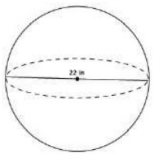
1. Use the diagram to find the volume of the sphere.



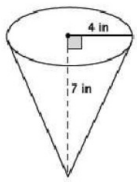
2. Determine the volume of a sphere with diameter 9 mm, shown below.



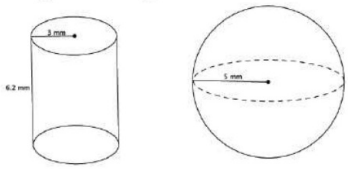
3. Determine the volume of a sphere with diameter 22 in., shown below.



4. Which of the two figures below has the lesser volume?



5. Which of the two figures below has the greater volume?



6. Bridget wants to determine which ice cream option is the best choice. The chart below gives the description and prices for her options. Use the space below each item to record your findings.

$2.00	$3.00	$4.00
One scoop in a cup	Two scoops in a cup	Three scoops in a cup
Half a scoop on a cone filled with ice cream		A cup filled with ice cream (level to the top of the cup)

A scoop of ice cream is considered a perfect sphere and has a 2-inch diameter. A cone has a 2-inch diameter and a height of 4.5 inches. A cup, considered a right circular cylinder, has a 3-inch diameter and a height of 2 inches.

a. Determine the volume of each choice. Use 3.14 to approximate π.

b. Determine which choice is the best value for her money. Explain your reasoning.