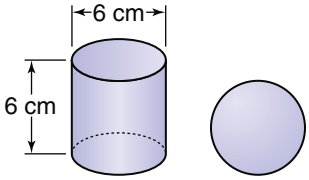
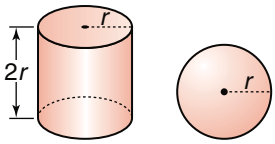


The height of this cylinder equals its diameter.
The volume of the cylinder is about 170 cm^3.
The volume of the sphere with the same diameter is about:
$\frac{2}{3} \times 170 \text{ cm}^3 \doteq 113 \text{ cm}^3$

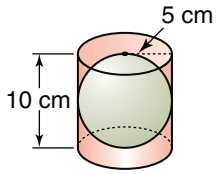


The volume of this cylinder is $\pi r^2 \times 2r = 2\pi r^3$
The volume of the sphere is:
$\frac{2}{3} \times 2\pi r^3 = \frac{4}{3}\pi r^3$

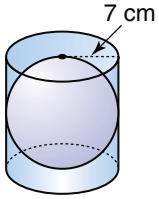
The volume V of a sphere with radius r is: $V = \frac{4}{3}\pi r^3$

Practice

1. The height of this cylinder is twice its radius.
Determine the volumes of the cylinder and the sphere.

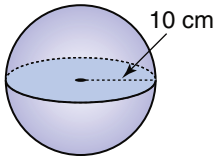


2. The height of this cylinder is twice its radius.
Determine the volume of the sphere.

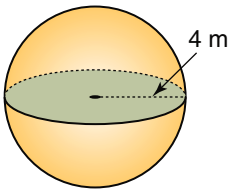


3. Determine the volume of each sphere.

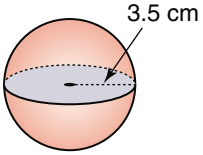
a)



b)



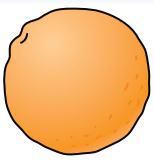
c)



Many objects are approximately spherical.
Their volumes can be estimated using the formula for the volume of a sphere.

Example

An orange is approximately spherical.
Its diameter is 10 cm.
What is the volume of the orange?



Solution

To determine the volume of the orange, use: $V = \frac{4}{3}\pi r^3$

$r = \frac{10 \text{ cm}}{2} = 5 \text{ cm}$. Substitute: $r = 5$

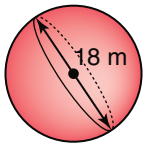
$V = \frac{4}{3} \times \pi \times 5^3$

$V \doteq 523.599$

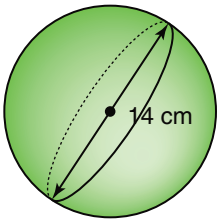
The volume of the orange is about 524 cm^3.

4. Determine the volume of each sphere.

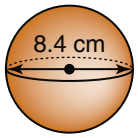
a)



b)



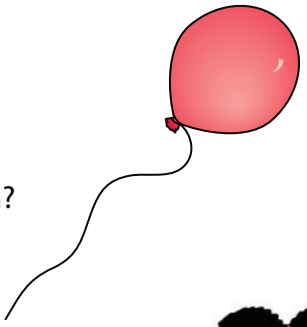
c)



5. An inflated balloon approximates a sphere with radius 11.5 cm.
A student's lung capacity is 3.6 L.

a) How many breaths does the student use to inflate the balloon? What assumptions did you make?

b) How do you know your answer is reasonable?



6. **Assessment Focus** Lyn has a block of wood that measures 14 cm by 14 cm by 14 cm.
She is making a wooden ball in tech class.

a) What is the volume of wood in the block?

b) What is the largest possible diameter for the ball?

c) What is the volume of the wooden ball?

d) What volume of wood is cut off the block to make the ball? What assumptions did you make?

7. **Take It Further** Meighan is selling ice-cream cones at the fall fair.
Each carton of ice cream is 20 cm by 11 cm by 24 cm.
The ice-cream scoop makes a sphere of ice cream, with diameter 8 cm.

a) How many scoops should Meighan get from each carton?

b) Each carton of ice cream costs $4.29. How much does each scoop cost?

c) Meighan pays $1.99 for a package of 12 sugar cones. Suggest a price Meighan should charge for each single-scoop and double-scoop cone. Justify your answer.

In Your Own Words

How is the volume of a sphere related to the volume of a cylinder?
Include diagrams in your explanation.