LESSON MAKER PRO

Solid Figure Math

Use dimensions and scale factors to find volume and surface area.

HIGH SCHOOL · G.3D.1

G.3D.1 "Solve real-world and mathematical problems involving three-dimensional figures. Represent, use, and apply mathematical models and other tools (e.g., nets, measuring devices…"

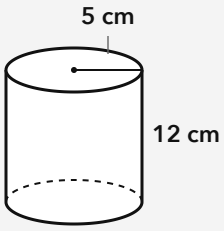
NAME _____ DATE _____

CHOOSE A MODEL

For a prism or cylinder, volume is base area times height. For a pyramid or cone, divide that product by 3. When similar solids have a length scale factor of k, their surface areas have a factor of k^2 and their volumes have a factor of k^3; leave answers involving circles in terms of pi.

WORKED EXAMPLE

Find the volume of the cylinder shown.

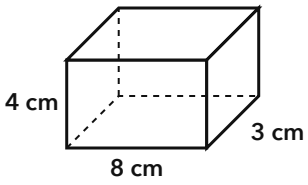


1. Use $V = \pi r^2 h$.
2. Substitute: $V = \pi(5)^2(12)$.
3. Multiply: $V = 300\pi$ cm^3.

Answer: 300π cm^3

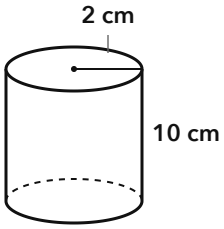
PRACTICE 6 problems

1 Find the volume of the rectangular prism shown.



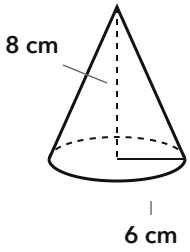
ANSWER _____

2 Find the total surface area of the cylinder shown, including both circular ends.



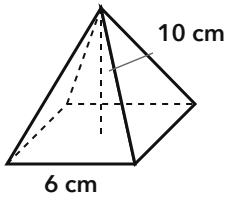
ANSWER _____

3 Find the volume of the cone shown.



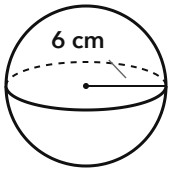
ANSWER _____

4 Find the volume of the square pyramid shown. Its base edges are all equal.



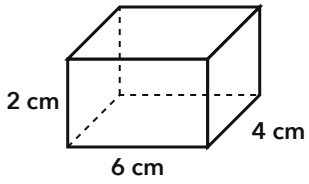
ANSWER _____

5 Find the volume of the sphere shown. Use $V = 4\pi r^3/3$.



ANSWER _____

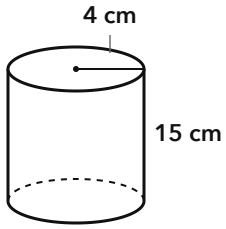
6 A rectangular prism similar to the one shown has a length of 18 cm. Find its total surface area.



ANSWER _____

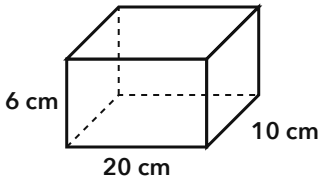
APPLY IT Show your work

1 A reusable tumbler has a cylindrical interior with the dimensions shown. How many cubic centimeters of drink can it hold when filled to the top?



ANSWER _____

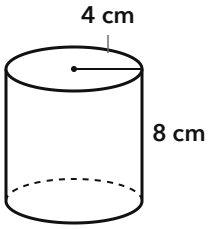
2 A student is making a closed cardboard box for a merch swap. Using the dimensions shown, how much cardboard is needed for one box? Ignore any overlap at the seams.



ANSWER _____

CHALLENGE One step up

A cylinder similar to the one shown has 8 times its volume. Find the larger cylinder's radius and total surface area. Explain how you found the length scale factor.



WORK SPACE AND ANSWER

Solid Figure Math

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the volume of the rectangular prism shown.	**96 cm^3**
2	Find the total surface area of the cylinder shown, including both circular ends.	**48pi cm^2**
3	Find the volume of the cone shown.	**96pi cm^3**
4	Find the volume of the square pyramid shown. Its base edges are all equal.	**120 cm^3**
5	Find the volume of the sphere shown. Use V = 4pi $r^3/3$.	**288pi cm^3**
6	A rectangular prism similar to the one shown has a length of 18 cm. Find its total surface area.	**792 cm^2**

PART 2 · APPLY IT

1. **240pi cm^3** Use the interior dimensions in V = pi r^2h. The capacity is pi$(4)^2(15)$ = 240pi cm^3.
2. **760 cm^2** Count all six faces of the closed box. Its surface area is 2(20 × 10 + 20 × 6 + 10 × 6) = 760 cm^2.

CHALLENGE

Radius: 8 cm. Total surface area: 384pi cm^2. Since $8 = 2^3$, the length scale factor is 2, so the larger cylinder has height 16 cm.

Accept equivalent exact expressions in terms of pi. For the challenge, accept a surface-area scale-factor argument: the original area is 96pi cm^2, and multiplying by 2^2 gives 384pi cm^2.