

Volume Power

Use volume formulas for cylinders, cones, pyramids, and spheres.

HIGH SCHOOL • HSG-GMD.A

CCSS.Math.Content.HSG-GMD.A "Explain volume formulas and use them to solve problems"

NAME _____

DATE _____

VOLUME FORMULAS

Let B mean the area of a solid's base. A cylinder has volume $V = Bh$, while a cone or pyramid with the same base and height has volume $V = \frac{1}{3}Bh$. For a sphere, use $V = \frac{4}{3}\pi r^3$, where r is the radius.

WORKED EXAMPLE

Find the volume of a cone with radius 5 cm and height 12 cm.

1. Use $V = \frac{1}{3}\pi r^2h$.
2. Substitute: $V = \frac{1}{3}\pi(5^2)(12)$.
3. Simplify: $V = \frac{1}{3}\pi(25)(12) = 100\pi$.

Answer: $100\pi \text{ cm}^3$

PRACTICE 6 problems

- 1** Find the volume of a cylinder with radius 3 cm and height 8 cm.

ANSWER _____

- 2** Find the volume of a cone with radius 6 cm and height 10 cm.

ANSWER _____

- 3** Find the volume of a square pyramid with base side length 11 cm and height 15 cm.

ANSWER _____

- 4** Find the volume of a sphere with radius 7 cm.

ANSWER _____

- 5** A cylinder has a diameter of 18 cm and a height of 14 cm. Find its volume.

ANSWER _____

- 6** A cone has a diameter of 16 cm and a height of 21 cm. Find its volume.

ANSWER _____

APPLY IT Show your work

- 1** Your robotics team is designing a cylindrical container for small parts. The container has an inside radius of 4 cm and an inside height of 13 cm. What volume can it hold?

WORK SPACE

ANSWER _____

- 2** A 3D printer makes a solid spherical prop for a game club. The prop has a radius of 6 cm. How much material is in the prop, ignoring waste?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A snack container is made of a cylinder topped by a cone. Both parts have radius 10 cm. The cylinder is 11 cm tall, and the cone is 6 cm tall. Find the total volume of the container.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Find the volume of a cylinder with radius 3 cm and height 8 cm.	$72\pi \text{ cm}^3$
2	Find the volume of a cone with radius 6 cm and height 10 cm.	$120\pi \text{ cm}^3$
3	Find the volume of a square pyramid with base side length 11 cm and height 15 cm.	605 cm^3
4	Find the volume of a sphere with radius 7 cm.	$1372/3 \pi \text{ cm}^3$
5	A cylinder has a diameter of 18 cm and a height of 14 cm. Find its volume.	$1134\pi \text{ cm}^3$
6	A cone has a diameter of 16 cm and a height of 21 cm. Find its volume.	$448\pi \text{ cm}^3$

PART 2 • APPLY IT

- $208\pi \text{ cm}^3$** Use $V = \pi r^2 h$. Substitute $r = 4$ and $h = 13$: $V = \pi(4^2)(13) = 208\pi \text{ cm}^3$.
- $288\pi \text{ cm}^3$** Use $V = \frac{4}{3} \pi r^3$. Substitute $r = 6$: $V = \frac{4}{3} \pi(6^3) = 288\pi \text{ cm}^3$.

CHALLENGE

 $1300\pi \text{ cm}^3$

Accept equivalent exact forms, such as $\pi(72)$ for 72π . Students should leave answers involving π in terms of π unless a decimal approximation is specifically requested.