

# Volume Builders

Find the space inside cones and square-based pyramids.

GRADE 8 • 8.MG.2.b

**8.MG.2.b** "Determine the volume of cones and square-based pyramids, using concrete objects, diagrams, and formulas."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## VOLUME RULES

A cone's volume is  $V = (1/3)\pi r^2h$ , where  $r$  is the radius and  $h$  is the perpendicular height. A square-based pyramid's volume is  $V = (1/3)s^2h$ , where  $s$  is the base side length. Square the radius or side length before multiplying.

## WORKED EXAMPLE

Find the volume of a cone with radius 5 cm and perpendicular height 9 cm.

1. Use  $V = (1/3)\pi r^2h$ .
2. Substitute:  $V = (1/3)\pi(5^2)(9)$ .
3. Simplify:  $V = (1/3)\pi(25)(9) = 75\pi$ .

**Answer:  $75\pi \text{ cm}^3$**

## PRACTICE 6 problems

- 1** Find the volume of a cone with radius 3 cm and perpendicular height 12 cm.

ANSWER \_\_\_\_\_

- 2** Find the volume of a cone with diameter 8 cm and perpendicular height 6 cm.

ANSWER \_\_\_\_\_

- 3** Find the volume of a square-based pyramid with base side length 6 cm and perpendicular height 10 cm.

ANSWER \_\_\_\_\_

- 4** Find the volume of a square-based pyramid with base side length 4 cm and perpendicular height 15 cm.

ANSWER \_\_\_\_\_

- 5** Find the volume of a cone with radius 2 cm and perpendicular height 18 cm.

ANSWER \_\_\_\_\_

- 6** Find the volume of a square-based pyramid with base side length 12 cm and perpendicular height 8 cm.

ANSWER \_\_\_\_\_

## APPLY IT Show your work

- 1** For a gaming tournament, a cone-shaped prize has a radius of 4 cm and a perpendicular height of 21 cm. What is the volume of the prize?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** A student club makes a square-based pyramid display for a school event. Its base side length is 18 inches, and its perpendicular height is 7 inches. What is the volume of the display?

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A square-based pyramid has a volume of  $300 \text{ cm}^3$  and a perpendicular height of 4 cm. What is the length of one side of its square base?

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## PART 1 • PRACTICE

| # | PROBLEM                                                                                              | ANSWER                                 |
|---|------------------------------------------------------------------------------------------------------|----------------------------------------|
| 1 | Find the volume of a cone with radius 3 cm and perpendicular height 12 cm.                           | <b><math>36\pi \text{ cm}^3</math></b> |
| 2 | Find the volume of a cone with diameter 8 cm and perpendicular height 6 cm.                          | <b><math>32\pi \text{ cm}^3</math></b> |
| 3 | Find the volume of a square-based pyramid with base side length 6 cm and perpendicular height 10 cm. | <b><math>120 \text{ cm}^3</math></b>   |
| 4 | Find the volume of a square-based pyramid with base side length 4 cm and perpendicular height 15 cm. | <b><math>80 \text{ cm}^3</math></b>    |
| 5 | Find the volume of a cone with radius 2 cm and perpendicular height 18 cm.                           | <b><math>24\pi \text{ cm}^3</math></b> |
| 6 | Find the volume of a square-based pyramid with base side length 12 cm and perpendicular height 8 cm. | <b><math>384 \text{ cm}^3</math></b>   |

## PART 2 • APPLY IT

- $112\pi \text{ cm}^3$**  Use  $V = \frac{1}{3}\pi r^2 h$ . Substitute 4 for  $r$  and 21 for  $h$ :  $\frac{1}{3}\pi(4^2)(21) = 112\pi$ .
- $756 \text{ in}^3$**  Use  $V = \frac{1}{3}s^2 h$ . Substitute 18 for  $s$  and 7 for  $h$ :  $\frac{1}{3}(18^2)(7) = 756$ .

## CHALLENGE

**15 cm**

Accept exact cone volumes written with  $\pi$  or  $n$ , including equivalent factored forms. Heights must be perpendicular to the base.