11-4 Volumes of Prisms and Cylinders
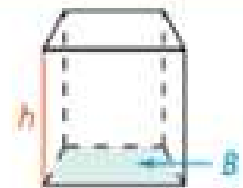
To find the volume of a prism and cylinder.

Theorem 11-6   Volume of a Prism

The volume of a prism is the product of the area of the base and the height of the prism.

$$V = Bh$$

11. A prism with a base area of 15 m² and a height 4 m has a volume of **60** m³.

15·4

12. A prism with a volume of 81 ft³ and a height of 3 ft has a base area of **27** ft².

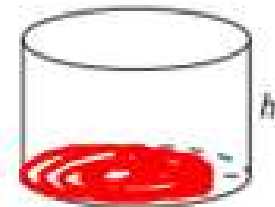$\frac{81}{3}$

Theorem 11-7   Volume of a Cylinder

The volume of a cylinder is the product of the area of the base and the height of the cylinder.

$$V = Bh, \text{ or } V = \pi r^2 h$$

25. Shade a base of the cylinder at the right.

26. Describe the shape of the base.

circle

"obliquo"

✓ **Problem 3** Finding the Volume of a Cylinder

Got It? What is the volume of the cylinder at the right in terms of π?

27. Compete the reasoning model below.

3 m

2 m

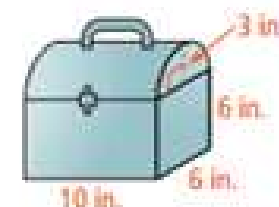| Think	Write
First I need to find the radius.	$r = \dfrac{2}{2} = 1m$
I can use the formula $V = \pi r^2 h$ and substitute for r and h.	$V = \pi \cdot 1^2 \cdot 3$
Now I simplify.	$V = 3\pi$

28. The volume of the cylinder is 3π m³.

Problem 4 Finding Volume of a Composite Figure

Got It? What is the approximate volume of the lunch box shown at the right? Round to the nearest cubic inch.
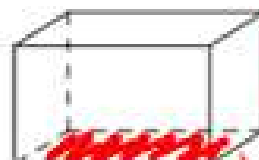
[handwritten: ½ cylinder]

29. The top and bottom of the lunch box are sketched below. Label the dimensions.

[handwritten dimensions: 10in, 3in on left figure; 6in, 10in, 6in on right figure]

30. Find the volume of the top.

$V = \frac{1}{2}\pi r^2 h$

$= \frac{1}{2}\pi (3^2)(10)$

$= 141.4 \text{ in}^3$

31. Find the volume of the bottom.

$V = Bh$

$= (10 \cdot 6)(6)$

$= 360 \text{ in}^3$

32. Find the sum of the volumes.

$V = $ *[handwritten]*

$= 141.4 + 360$

$= 501.4$

33. The approximate volume of the lunch box is **501** in.³

HOMEWORK

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#15, 19, 21, 30, 39

11-5 Volumes of Pyramids and Cones

To find the volume of a pyramid and a cone.

Theorem 11-8 Volume of a Pyramid

The volume of a pyramid is one third the product of the area of the base and the height of the pyramid.

8. Complete the formula for the volume of a pyramid.

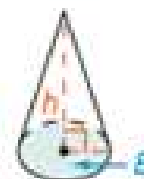$$V = \frac{1}{3} \cdot Bh$$

Theorem 11-9 Volume of a Cone

The volume of a cone is one third the product of the area of the base and the height of the cone.

$$V = \frac{1}{3} Bh$$

9. Circle an equivalent formula for the volume of a cone.

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

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

✓ Problem 2   Finding the Volume of a Pyramid

Got It? What is the volume of a square pyramid with base edges 24 m and slant height 13 m?

15. Label the pyramid at the right.

h ⟍ 13

h

12

13m

24m

16. Find the height of the pyramid.

$13^2 = h^2 + 12^2$

$169 = h^2 + 144$

$\sqrt{h^2} \; \sqrt{25}$

$h = 5\,m$

17. Find the area of the base.

$B = s^2$

$= 24^2$

$= 576\,m^2$

18. Find the volume of the pyramid.

$V = \frac{1}{3} \cdot Bh$

$= \frac{1}{3} \cdot 576 \cdot 5$

$= 960$

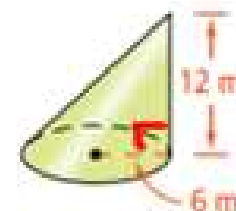**19.** The volume of the pyramid is **960** m^3.

Got It? What is the volume of the oblique cone at the right in terms of π and rounded to the nearest cubic meter?

24. The radius of the base is **6** m and the height is **12** m.

12 m

6 m

25. Cross out the formula that is NOT a formula for the volume of a cone.

$V = \frac{1}{3}Bh$ ~~$V = Bh$~~ $V = \frac{1}{3}\pi r^2 h$

26. Find the volume of the cone.

$$V = \frac{1}{3}\pi \cdot r^2 h = \frac{1}{3}\pi \cdot 6^2 \cdot 12 = 144\pi$$
$$= 452.3$$

27. The volume of the cone in terms of π is **144π** m³.

Rounded to the nearest cubic meter, the volume of the cone is **452** m³.

Lesson Check • Do you UNDERSTAND?

Error Analysis A square pyramid has base edges 13 ft and height 10 ft. A cone has diameter 13 ft and height 10 ft. Your friend claims the figures have the same volume because the volume formulas for a pyramid and a cone are the same: $V = \frac{1}{3}Bh$. What is her error?

28. Is $V = \frac{1}{3}Bh$ the volume formula for both a pyramid and a cone? <u>Yes</u> No

Underline the correct word to complete each sentence.

29. The base of a square pyramid is a circle / <u>polygon</u> .

30. The base of a cone is a <u>circle</u> / polygon .

31. Circle the base used in the formula for the volume of a cone. Underline the base used in the formula for the volume of a square pyramid.

$\boxed{B = \pi r^2}$ $\qquad\qquad B = \frac{1}{2}bh$ $\qquad\qquad \underline{B = s^2}$

32. Now explain your friend's error.

Since the bases are diff. shapes, their areas may not be =.

$\leftarrow$ 13 ft $\rightarrow$

$A_{\bigcirc} = \pi \cdot 6.5^2 = 133 \, ft^2$

$A_{\square} = 13^2 = 169 \, ft^2$

HOMEWORK

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