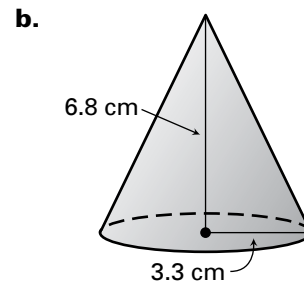
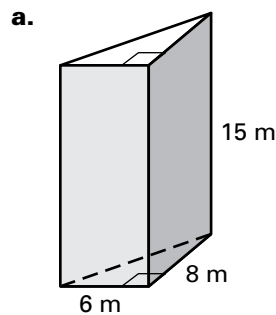


**LESSON**  
**11.7****Study Guide***For use with the lesson "Volume of Pyramids and Cones"***GOAL** **Volumes of pyramids and cones.****Vocabulary**

**Theorem 9 Volume of a Pyramid:** The volume  $V$  of a pyramid is  $V = \frac{1}{3}Bh$  where  $B$  is the area of the base and  $h$  is the height.

**Theorem 10 Volume of a Cone:** The volume  $V$  of a cone is  $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2h$ , where  $B$  is the area of the base,  $h$  is the height, and  $r$  is the radius of the base.

**EXAMPLE 1** **Find the volume of a solid****Find the volume of a solid.****Solution**

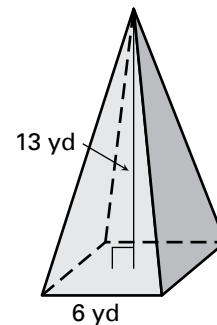
a.  $V = \frac{1}{3}Bh = \frac{1}{3}\left(\frac{1}{2} \cdot 6 \cdot 8\right)(15) = 120 \text{ m}^3$

b.  $V = \frac{1}{3}Bh = \frac{1}{3}(\pi r^2)(h) = \frac{1}{3}(\pi \cdot 3.3^2)(6.8)$

$$V = 24.684\pi \approx 77.55 \text{ cm}^3$$

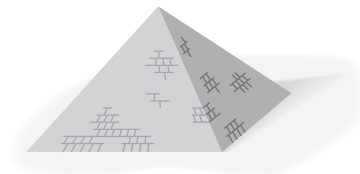
**Exercise for Example 1**

- Find the volume of the pyramid. Round your answer to two decimal places.



**LESSON**  
**11.7****Study Guide** *continued*  
*For use with the lesson "Volume of Pyramids and Cones"***EXAMPLE 2** Use volume of a pyramid

The pyramid has a height of 177 meters and volume of 3,465,825 cubic meters. Find the side length of the square base.



**Solution**

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

Write formula.

$$3,465,825 = \frac{1}{3}(x^2)(177)$$

Substitute.

$$10,397,475 = 177x^2$$

Multiply each side by 3.

$$58,743 \approx x^2$$

Divide each side by 177.

$$242 \approx x$$

Find the positive square root.

The side length of the base is about 242 meters.

**EXAMPLE 3** Use trigonometry to find the volume of a cone

**Find the volume of the right cone.**

**Solution**

To find the radius  $r$  of the base use trigonometry.

$$\tan 59^\circ = \frac{\text{opp.}}{\text{adj.}}$$

Write ratio.

$$\tan 59^\circ = \frac{20}{r}$$

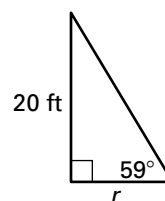
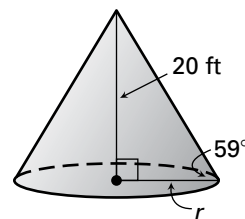
Substitute.

$$r = \frac{20}{\tan 59^\circ} \approx 12.02$$

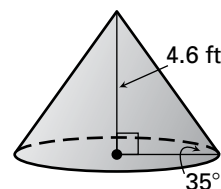
Solve for  $r$ .

Use the formula for the volume of a cone.

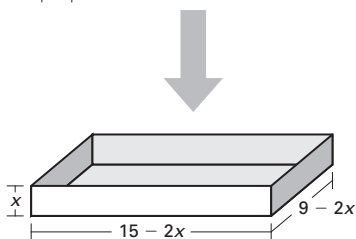
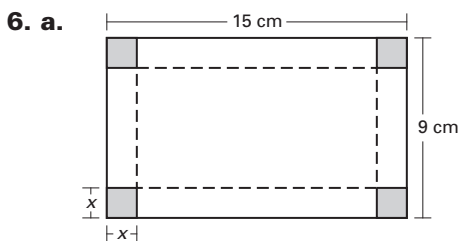
$$V = \frac{1}{3}Bh = \frac{1}{3}(\pi r^2)(h) = \frac{1}{3}\pi(12.02^2)(20) \approx 3025.99 \text{ ft}^3$$

**Exercises for Examples 2 and 3**

- The volume of a right cone is  $1275\pi$  cubic meters and the radius is 15 meters. Find the height of the cone. Round your answer to two decimal places.
- Find the volume of the cone at the right. Round your answer to two decimal places.



## Lesson 11.6 Volume of Prisms and Cylinders, continued



b.  $V = x(9 - 2x)(15 - 2x) = 4x^3 - 48x^2 + 135x$

c.

$x$	0.8	1.2	1.8	2.0	2.2	2.6
$V$	79.3	99.8	110.8	110	107.3	96.8

Length: 11.4 cm; width: 5.4 cm; height: 1.8 cm

## Lesson 11.7 Volume of Pyramids and Cones

### Teaching Guide

1. 9 2. about 848.2 ft<sup>3</sup> 3. about 31.4 yd<sup>3</sup>

4. The contractor only needs 25 cubic yards and has 31.4 cubic yards available. 5. No; There is about 22 cubic yards of gravel, so there is not enough.

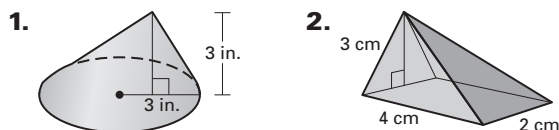
### Practice Level A

- $9\sqrt{3} \approx 15.6$  square units
- 64 square units
- $16\pi \approx 50.3$  square units
- 400 yd<sup>3</sup>
- 20 m<sup>3</sup>
- 65.33 in.<sup>3</sup>
- 336 cm<sup>3</sup>
- 86.6 ft<sup>3</sup>
- 249.42 cm<sup>3</sup>
- 100.53 in.<sup>3</sup>
- 287.98 cm<sup>3</sup>
- 75.40 mm<sup>3</sup>
- 117.29 yd<sup>3</sup>
- 314.16 ft<sup>3</sup>
- 25.13 m<sup>3</sup>
- $x = 10$  cm
- $x = 5$  ft
- $x = 11$  m
- 8 ft
- 1005.31 m<sup>3</sup>
- 17.34 ft<sup>3</sup>
- 638.98 cm<sup>3</sup>
- 323.04 yd<sup>3</sup>
- 79.52 cm<sup>3</sup>
- about 6.77 ft

### Practice Level B

- 100.53 cm<sup>3</sup>
- 20 in.<sup>3</sup>
- 10.67 cm<sup>3</sup>
- 414.69 m<sup>3</sup>
- 126 in.<sup>3</sup>
- 163.49 cm<sup>3</sup>
- 6 in.
- 7 cm
- 7 m
- C
- 2035.75 cm<sup>3</sup>
- 3681.88 m<sup>3</sup>
- 2652.53 ft<sup>3</sup>
- 448 m<sup>3</sup>
- 90.93 in.<sup>3</sup>
- 144 cm<sup>3</sup>
- 190.87 mm<sup>3</sup>
- 103.67 in.<sup>3</sup>
- 122.67 cm<sup>3</sup>
- 12 ft
- 1520.53 ft<sup>3</sup>
- 56.32 yd<sup>3</sup>
- no

### Practice Level C



28.27 in.<sup>3</sup>

8 cm<sup>3</sup>

- 169.76 m<sup>3</sup>
- 6.58 ft<sup>3</sup>
- 124.05 cm<sup>3</sup>
- 14.76 yd<sup>3</sup>
- 4,579,109.32 m<sup>3</sup>
- 50.20 in.<sup>3</sup>
- 2211.8 cm<sup>3</sup>
- 29,605.40 mm<sup>3</sup>
- 353.97 m<sup>3</sup>
- 10 yd
- 502.81 m<sup>3</sup>
- 181.83 in.<sup>3</sup>
- 178.63 cm<sup>3</sup>
- 963.4 cm<sup>3</sup>
- 24 in.<sup>3</sup>
- No, each cone would require about 5.06 grams of gold. For all twelve, the jeweler would need about 60.7 grams.
- 1840 in.<sup>3</sup>
- $533\frac{1}{3}$  m<sup>3</sup>

### Study Guide

- $V = 156$  yd<sup>3</sup>
- $h = 17$  m
- $V = 207.9$  in.<sup>3</sup>

### Problem Solving Workshop:

#### Worked Out Example

- 11.5 in.
- 1.61 in.
- 42.41 in.<sup>2</sup>

### Challenge Practice

- $\frac{7\sqrt{3}}{2} \approx 6.1$  in.
- Cone;  $100\pi \approx 314.2$  cm<sup>3</sup>
- Frustum of a cone;  $\frac{5056\pi}{3} \approx 5294.6$  ft<sup>3</sup>
- $V = \frac{1}{3}b^2H - \frac{1}{3}a^2(H - h)$
- $\frac{H}{b} = \frac{H - h}{a}$ ;  $H = \frac{bh}{b - a}$ ;  $H - h = \frac{ah}{b - a}$
- $V = \frac{1}{3}h(a^2 + ab + b^2)$
- 912 m<sup>3</sup>