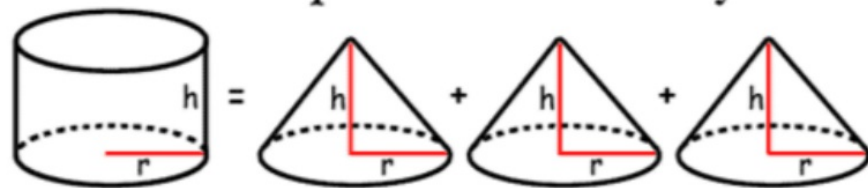


**Volume Comparison: Cone & Cylinder**



**Carnival** Grace and Elle are making snow cones for the school carnival. They want to know how much ice goes into a paper cone that has a radius of 1.5 inches and a height of 4 inches.

1. Recall the formula for finding the volume of a rectangular pyramid is  $V = \frac{1}{3}Bh$ . How does the volume of a pyramid compare to the volume of a prism with the same base and height?

**The volume of the pyramid is  $\frac{1}{3}$  the size of the prism.**

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2. What is the formula for finding the volume of a cylinder?

**$V = \pi r^2 h$**

---

3. What is the volume of a cylinder with a radius of 1.5 inches and a height of 4 inches? Use  $\pi = 3.14$ .

**$28.26 \text{ in}^3$**

---

4. The volume of the cones Grace and Elle are using is about 9.42 cubic inches. Write a ratio in simplest form comparing

the volume of the cone to the volume of the cylinder.

$$\frac{1}{3}$$

5.  **Make a Conjecture** What is the formula for the volume of a cone?

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

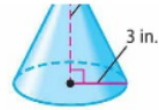
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$$V = \frac{1}{3} \cdot \pi \cdot 3^2 \cdot 6 \quad r = 3, h = 6$$

$$V \approx 56.5 \quad \text{Simplify.}$$

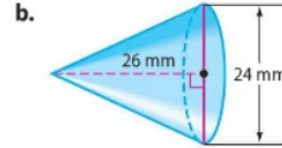
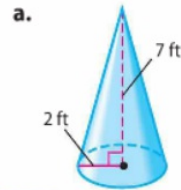
The volume is about 56.5 cubic inches.



Show your work.

**Got It?** Do these problems to find out.

Find the volume of each cone. Round to the nearest tenth.



a.  $29.3 \text{ ft}^3$

b.  $3,920.7 \text{ mm}^3$



### Example

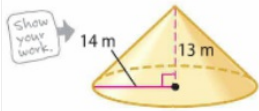


2. A cone-shaped paper cup is filled with water. The height of the cup is 10 centimeters and the diameter is 8 centimeters. What is the volume of the water in the cup?

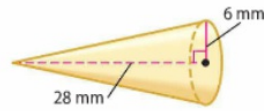
$$\frac{1}{3} (2)^2 (7) \pi$$
$$\frac{1}{3} (4) (7) (3.14)$$
$$\frac{1}{3} (28) (3.14)$$
$$\approx 29.3$$

Find the volume of each cone. Round to the nearest tenth. (Examples 1 and 2)

1. 2,668.3 m<sup>3</sup>



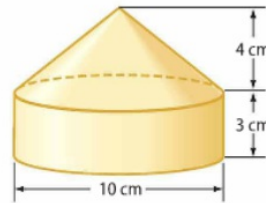
2. 1,055.6 mm<sup>3</sup>



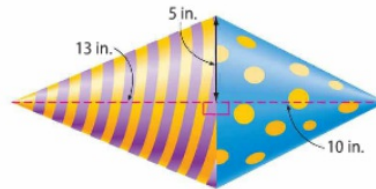
3. height: 9 m  
diameter: 10 m 235.6 m<sup>3</sup>

4. height: 120 millimeters  
radius: 45 millimeters 254,469.0 mm<sup>3</sup>

5. Find the volume of the solid at the right. Round to the nearest tenth. (Example 3) 340.3 cm<sup>3</sup>



6. Find the volume of the party favor shown. Round to the nearest tenth. (Example 3) 602.1 in<sup>3</sup>



7. **Building on the Essential Question** What would have a greater effect on the volume of a cone: doubling its radius or doubling its height? Explain.  
**Sample answer: Depending on the length of the radius and the height, generally doubling the radius has more effect since it is squared in the formula.**

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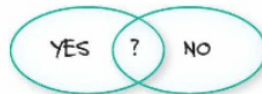
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**Rate Yourself!**

How confident are you about volume of cones? Shade the section that applies.



For more help, go online to access a Personal Tutor.



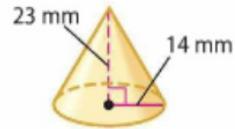
# Independent Practice

Go online for Step-by-Step Solutions



Find the volume of each cone. Round to the nearest tenth. (Example 1)

1. 4,720.8 mm<sup>3</sup>

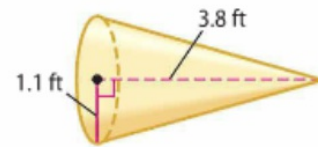


Show your work.

3 height: 8.4 feet

diameter: 3.5 feet 26.9 ft<sup>3</sup>

2. 4.8 ft<sup>3</sup>

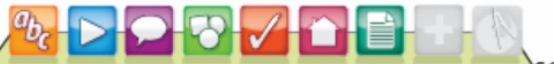


4. height: 3.9 yards

radius: 1.7 yards 11.8 yd<sup>3</sup>

5. A party hat like the one at the right is going to be filled with candy. What is the volume of the hat? Round to the nearest tenth. (Example 2)

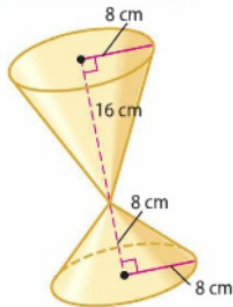
102.6 in<sup>3</sup>



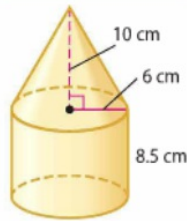
6. Mr. Walthour is building a storage shed in a conical shape. The base of the shed is 4 meters in diameter and the height of the shed is 3.8 meters. What is the volume of the shed? Round to the nearest tenth. (Example 2) 15.9 m<sup>3</sup>


Find the volume of each solid. Round to the nearest tenth. (Example 3)


7. 1,608.5 cm<sup>3</sup>



8. 1,338.3 cm<sup>3</sup>



9.  A cylinder has a radius of 5 centimeters and a height of 12 centimeters. What would the height of a cone need to be if it has the same volume and radius? Round to the nearest centimeter. 36 cm

10.  **Reason Abstractly** Isaiah is making cone-shaped ice cubes by using a mold. The radius of the mold is 1.5 inches and the height is 2 inches. If one cubic inch is about 0.55 ounce, how many ounces will ten ice cubes weigh? Round to the nearest tenth. 25.9 oz

11. The volume of a cone with a 30-millimeter radius is 9,420 cubic millimeters. What is the height of the cone to the nearest millimeter? 10 mm



## H.O.T. Problems Higher Order Thinking

12. **CCSS Find the Error** Carmen is finding the volume of rice that will fill a cone-shaped decorative vase. The vase is 6 inches tall with a 4-inch diameter. Find her mistake and correct it.

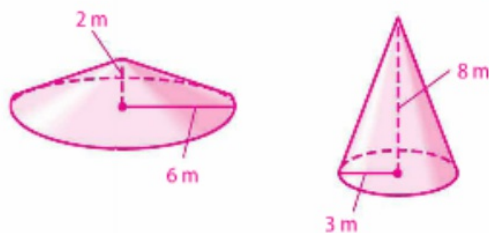
**Carmen used the incorrect radius;**

**25.1 in<sup>3</sup>.**

$$\begin{aligned}V &= \frac{1}{3}\pi r^2 h \\V &= \frac{1}{3}\pi \cdot 4 \cdot 4 \cdot 6 \\V &\approx 100.5 \text{ in}^3\end{aligned}$$



13. **CCSS Persevere with Problems** Draw and label two cones with different dimensions but the same volume. **Sample answer:**



14. **CCSS Reason Inductively** Determine whether the following statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

*The volume of a rectangular-based pyramid and a cone with the same height and equal areas of the base are equal.*

**always; Sample answer: The volumes are the same since both heights and the area of both bases are the same. Changing the shape of the base will not affect the volume.**

