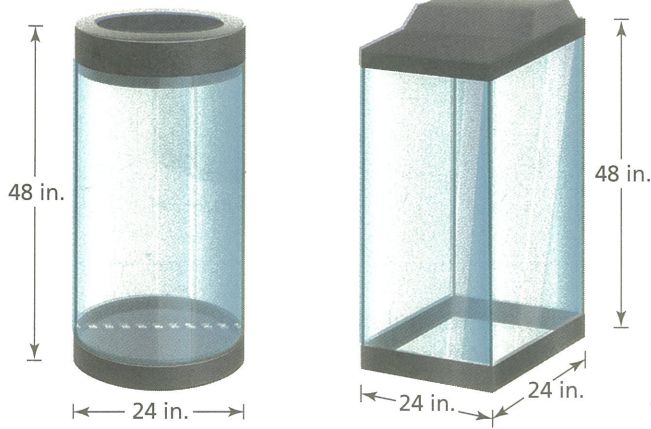




Explain It!



Jenna and Ricardo are buying a new fish tank for the growing population of zebra fish in their science lab. Jenna says the tanks hold the same amount of water because they have the same dimensions. Ricardo says that he can fill the bottom of the rectangular tank with more cubes, so it can hold more water.



A. Look for Relationships How are the shapes of the two fish tanks alike? How are they different? © MP.7

B. Critique Arguments Who do you think is correct, Ricardo or Jenna? Explain. © MP.3



Lesson 8-2 Find Volume of Cylinders



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I can...

use what I know about finding volumes of rectangular prisms to find the volume of a cylinder.

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8.G.C.9

Mathematical Practices
MP.2, MP.3, MP.7

Focus on math practices

Use Structure How can you use what you know about areas of two-dimensional figures and volumes of prisms to compare the volumes of the fish tanks? © MP.7

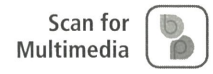
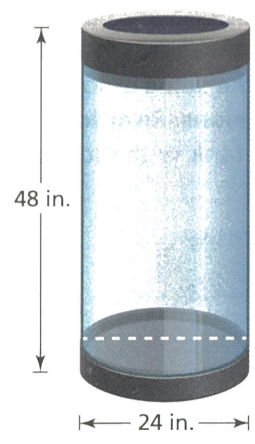
Essential Question How is the volume of a cylinder related to the volume of a rectangular prism?



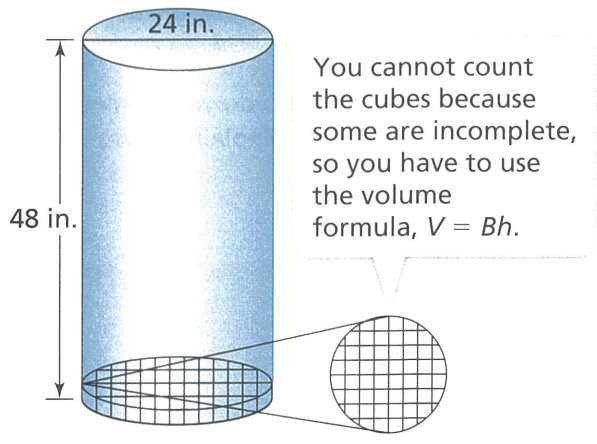
EXAMPLE 1 **Relate Volumes of Rectangular Prisms and Cylinders**

Jenna and Ricardo need to buy a tank that is large enough for 25 zebra fish. The tank needs to have a volume of 2,310 cubic inches. How can Jenna and Ricardo determine whether the cylindrical tank can hold the zebra fish?

Look for Relationships Remember, volume is the measure of the amount of space inside a solid figure. You can find the volume by filling the solid with unit cubes. © MP.7



Like you did to find the volume of a prism, fill the base of the cylinder with one layer of unit cubes and stack the layers to fill the cylinder.



Use the formula to find the volume of the cylinder. Use 3.14 for π .

$$\begin{aligned} V &= Bh \\ &= \pi r^2 \cdot h \\ &\approx 3.14 \cdot (12)^2 \cdot 48 \\ &= 21,703.68 \text{ in.}^3 \end{aligned}$$

The base of a cylinder is a circle, so the area of the base $B = \pi r^2$.

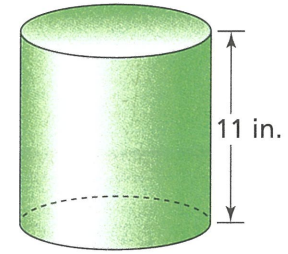
The cylindrical tank is large enough for the 25 zebra fish.

Try It!

The area of the base of the cylinder is 78.5 in.^2 . What is the volume of the cylinder?

$$\begin{aligned} V &= Bh \\ &= \square \cdot \square \\ &= \square \end{aligned}$$

The volume of the cylinder is cubic inches.



Convince Me! Why can you use the formula $V = Bh$ to find the volume of a cylinder?



EXAMPLE 2



Find an Unknown Measure



ACTIVITY



ASSESS

The volume of the apple juice can is 300 milliliters, which is equal to 300 cubic centimeters. What is the radius of the can? Use 3.14 for π , and round your answer to the nearest tenth.

Use the formula $V = Bh$ to find the radius of the base of the can.

$$\begin{aligned}V &= Bh \\300 &= \pi r^2 \cdot 14 \\300 &= 43.96r^2 \\6.82 &\approx r^2 \\2.6 &\approx r\end{aligned}$$



The radius of the can is about 2.6 centimeters.

EXAMPLE 3



Solve Problems Involving Volume of a Cylinder

Safety barrels are used on some highways to cushion cars on impact. If a city manager approves the purchase of 15 cubic meters of sand, how many barrels can be filled with sand? Use 3.14 for π .

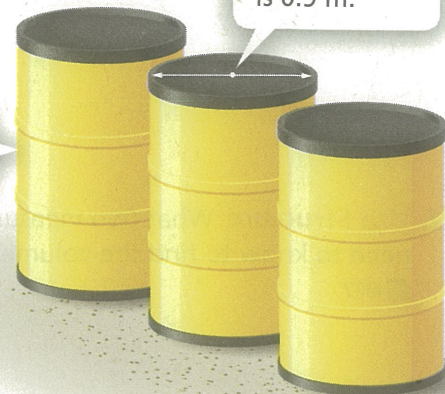
STEP 1 Find the volume of each safety barrel.

$$\begin{aligned}V &= Bh \\&= \pi r^2 h \\&= \pi(0.45)^2 1.2 \\V &\approx 0.76302 \text{ m}^3\end{aligned}$$

The diameter is 0.9 meter, so the radius is 0.45 meter.

The height is 1.2 m.

The diameter is 0.9 m.



STEP 2 Find the number of barrels that can be filled.

$$\frac{15}{0.76302} \approx 19.7$$

The city manager purchased enough sand to fill 19 safety barrels.



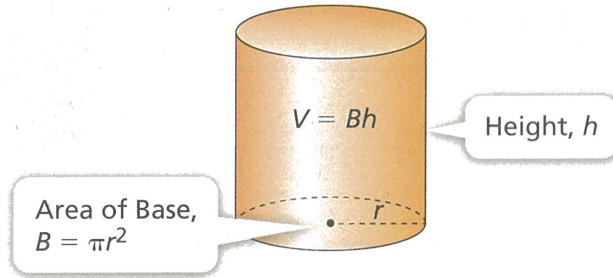
Try It!

Lin is building a cylindrical planter with a base diameter of 15 inches. She has 5,000 cubic inches of soil to fill her planter. What is the height of the largest planter Lin can build? Use 3.14 for π , and round to the nearest inch.





The formula for the volume of a cylinder is the same as the formula for the volume of a prism. The formula for volume of a cylinder is $V = Bh$, where B is the area of the circular base and h is the height of the cylinder.



Do You Understand?

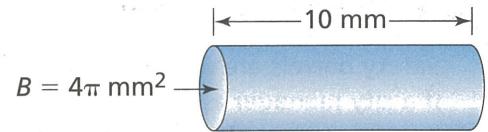
1. **Essential Question** How is the volume of a cylinder related to the volume of a rectangular prism?

2. **Use Structure** What two measurements do you need to know to find the volume of a cylinder?
© MP.7

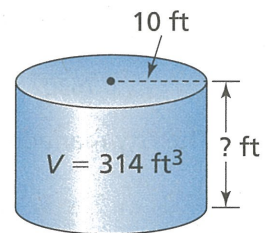
3. **Reasoning** Cylinder A has a greater radius than Cylinder B. Does Cylinder A necessarily have a greater volume than Cylinder B? Explain. © MP.2

Do You Know How?

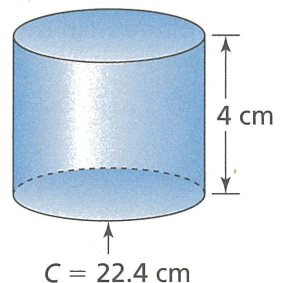
4. What is the volume of the cylinder? Express your answer in terms of π .



5. What is the approximate height of the cylinder? Use 3.14 for π , and if necessary, round to the nearest tenth.



6. What is the volume of the cylinder? Use 3.14 for π , and if necessary, round to the nearest tenth.



Name: _____



PRACTICE



TUTORIAL

Practice & Problem Solving



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- 7. Leveled Practice** What is the volume of a cylinder with a radius of 5 centimeters and height of 2.5 centimeters? Use 3.14 for π .

$$\begin{aligned} V &= \pi \cdot \boxed{}^2 \cdot \boxed{} \\ &= \pi \cdot \boxed{} \cdot \boxed{} \\ &= \boxed{} \pi \end{aligned}$$

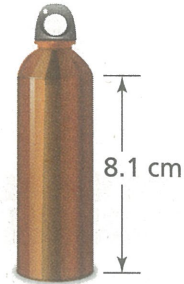
The volume of the cylinder is about cubic centimeters.

- 8.** Find the volume of each cylinder in terms of π . Which cylinder has the greater volume?

Cylinder A: Area of Base = $6\pi \text{ ft}^2$, height = 10 ft
Cylinder B: Circumference = $6\pi \text{ ft}$, height = 6 ft

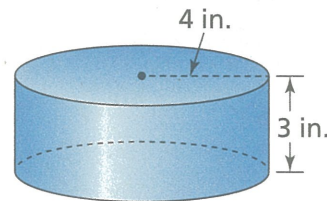
- 9.** The volume of a cylinder is 225π cubic inches, and the height of the cylinder is 1 inch. What is the radius of the cylinder?

- 10.** A company is designing a new cylindrical water bottle. The volume of the bottle is 103 cubic centimeters. What is the radius of the water bottle? Estimate using 3.14 for π , and round to the nearest hundredth.



- 11.** Use the figure at the right.

- a.** Find the volume of the cylinder in terms of π .
- b.** Is the volume of a cylinder, which has the same radius but twice the height, greater or less than the original cylinder? Explain.



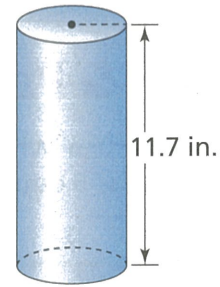
- 12. Reasoning** A rectangular piece of cardboard with dimensions 6 inches by 8 inches is used to make the curved side of a cylinder-shaped container. Using this cardboard, what is the greatest volume the cylinder can hold? Explain. © MP.2



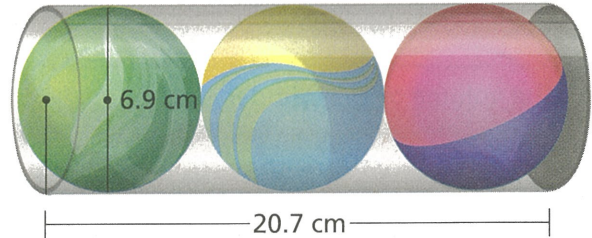
13. The cylinder shown has a volume of 885 cubic inches.

a. What is the radius of the cylinder? Use 3.14 for π .

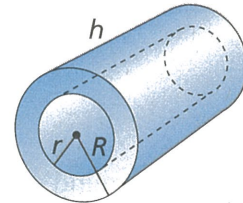
b. **Reasoning** If the height of the cylinder is changed, but the volume stays the same, then how will the radius change? Explain. © MP.2



14. Toy rubber balls are packaged in a cylinder that holds 3 balls. Find the volume of the cylinder. Use 3.14 for π , and round to the nearest tenth.



15. **Higher Order Thinking** An insulated collar is made to cover a pipe. Find the volume of the material used to make the collar. Let $r = 3$ inches, $R = 5$ inches, and $h = 21$ inches. Use 3.14 for π , and round to the nearest hundredth.



© Assessment Practice

16. The volume of a cylinder is $1,029\pi$ cubic centimeters. The height of the cylinder is 21 centimeters. What is the radius of the cylinder?

17. The diameter of a cylinder is 7 yards. The height is 12 yards. What is the volume of the cylinder?

