

LESSON 15.3 Solving Volume Equations

COMMON CORE 6.G.2

... Apply the formulas $V = \ell wh$ and $V = bh$... in the context of solving real-world and mathematical problems. Also 6.EE.7



ESSENTIAL QUESTION

How do you write equations to solve problems involving volume of rectangular prisms?

EXPLORE ACTIVITY



COMMON CORE 6.G.2, 6.EE.7

Writing Equations Using the Volume of a Rectangular Prism

You can use the formula for the volume of a rectangular prism to write an equation. Then solve the equation to find missing measurements for a prism.



EXAMPLE 1 Samuel has an ant farm with a volume of 375 cubic inches. The width of the ant farm is 2.5 inches and the length is 15 inches. What is the height of Samuel's ant farm?

Write a formula.

$$V = \ell \square \square$$

Substitute the given values into the equation.

$$\square = \square \cdot \square \cdot h$$

Multiply 15 and 2.5.

$$375 = \square h$$

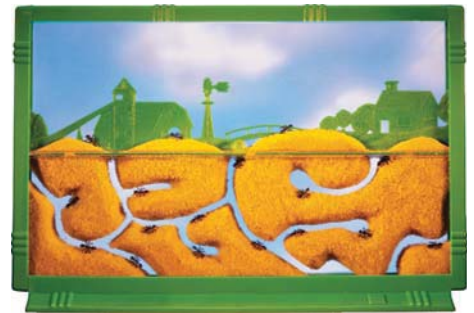
Divide both sides of the equation by _____.

$$\frac{375}{\square} = \frac{37.5h}{\square}$$

Simplify.

$$\square = h$$

The height of the ant farm is _____ inches.

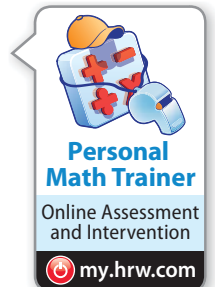
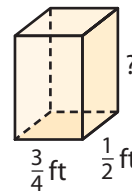


Reflect

- Communicate Mathematical Ideas** Explain how you would find the solution to Example 1 using the formula $V = Bh$.

YOUR TURN

- Find the height of this rectangular prism, which has a volume of $\frac{15}{16}$ cubic feet.





Math On the Spot

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Solving Multistep Problems

One cubic foot of water equals approximately 7.5 gallons and weighs approximately 62.43 pounds.

EXAMPLE 2



COMMON CORE

6.G.2, 6.EE.7

The classroom aquarium holds 30 gallons of water. It is 0.8 feet wide and has a height of 2 feet. Find the length of the aquarium.

STEP 1

Find the volume of the classroom aquarium in cubic feet.

$$\frac{30 \text{ gallons}}{7.5 \text{ gallons per cubic foot}} = 4 \text{ cubic feet}$$

Divide the total number of gallons by the unit rate to find the number of cubic feet.

STEP 2

Find the length of the aquarium.

$$4 = \ell \cdot 0.8 \cdot 2$$

Use the formula $V = \ell wh$ to write an equation.

$$4 = \ell(1.6)$$

Multiply.

$$\frac{4}{1.6} = \frac{\ell(1.6)}{1.6}$$

Divide both sides of the equation by 1.6.

$$2.5 = \ell$$

The length of the aquarium is 2.5 feet.

Math Talk

Mathematical Practices

How much does the water in the classroom aquarium weigh? Explain.

YOUR TURN

3. An aquarium holds 33.75 gallons of water. It has a length of 2 feet and a height of 1.5 feet. What is the width of the aquarium? _____



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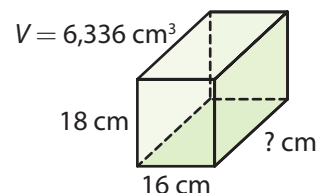
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Guided Practice

1. Use an equation to find the width of the rectangular prism.


(Explore Activity Example 1)

2. One clay brick weighs 5.76 pounds. The brick is 8 inches long and $2\frac{1}{4}$ inches wide. If the clay weighs 0.08 pounds per cubic inch, what is the volume of the brick? Find the height of the brick. (Example 2)



15.3 Independent Practice

COMMON CORE 6.EE.7, 6.G.2

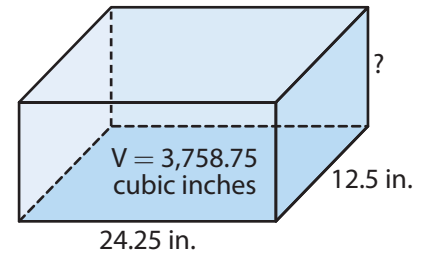


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3. Jala has an aquarium in the shape of a rectangular prism with the dimensions shown. What is the height of the aquarium?

Height = _____



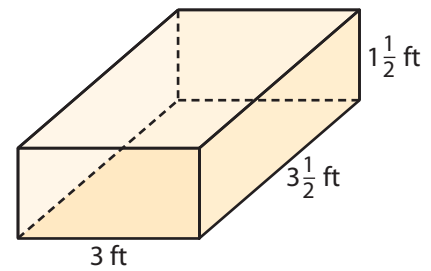
4. The area of the base of a rectangular juice box is $4\frac{1}{2}$ square inches. If the volume of the box is 18 cubic inches, how tall is the box?

Height = _____

5. A box of cereal is shaped like a rectangular prism. The box is 20 centimeters long and 30 centimeters high. Its volume is 3,600 cubic centimeters. Find the width of the box.

Width = _____

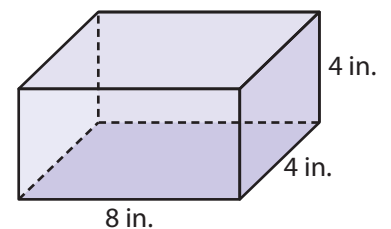
6. About 7.5 gallons of water fill up 1 cubic foot of space. How many gallons of water will fill a goldfish pool shaped like the prism shown?



7. **Physical Science** A small bar of gold measures 40 mm by 25 mm by 2 mm. One cubic millimeter of gold weighs about 0.0005 ounce. Find the volume in cubic millimeters and the weight in ounces of this small bar of gold.

8. **History** A typical stone on the lowest level of the Great Pyramid in Egypt was a rectangular prism 5 feet long by 5 feet high by 6 feet deep and weighed 15 tons. What was the volume of the average stone? How much did one cubic foot of this stone weigh?

9. Hank has cards that are 8 inches by 4 inches. A stack of these cards fits inside the box shown and uses up 32 cubic inches of volume. How tall is the stack of cards? What percent of the box's volume is taken up by the cards?



10. A freshwater fish is healthiest when there is at least 1 gallon of water for every inch of its body length. Roshel wants to put a goldfish that is about $2\frac{1}{2}$ inches long in her tank. Roshel's tank is 7 inches long, 5 inches wide, and 7 inches high. The volume of 1 gallon of water is about 231 cubic inches.

- a. How many gallons of water would Roshel need for the fish? _____
- b. What is the volume of Roshel's tank? _____
- c. Is her fish tank large enough for the fish? Explain. _____



FOCUS ON HIGHER ORDER THINKING

11. **Multistep** Larry has a clay brick that is 7 inches long, 3.5 inches wide, and 1.75 inches thick, the same size as the gold stored in Fort Knox in the form of gold bars. Find the volume of this brick. If the weight of the clay in the brick is 0.1 pound per cubic inch and the weight of the gold is 0.7 pound per cubic inch, find the weight of the brick and the gold bar. Round all answers the nearest tenth.

Volume of the brick or bar = _____ cubic inches

Weight of the brick = _____ pounds

Weight of the gold bar = _____ pounds

12. **Represent Real-World Problems** Luisa's toaster oven, which is in the shape of a rectangular prism, has a base that is 55 cm long by 40 cm wide. It is 30 cm high. Luisa wants to buy a different oven with the same volume but a smaller length, so it will fit better on her kitchen counter. What is a possible set of dimensions for this different oven?

13. **Multiple Representations** Use the formula $V = Bh$ to write a different version of this formula that you could use to find the area of the base B of a rectangular prism if you know the height h and the volume V . Explain what you did to find this equation.

14. **Communicate Mathematical Ideas** The volume of a cube is 27 cubic inches. What is the length of an edge? Explain.

Work Area