Surface Area and Volume of Solids

MODULE 15

COMMON CORE

LESSON 15.1
Nets and Surface Area
COMMON CORE 6.G.4

LESSON 15.2
Volume of Rectangular Prisms
COMMON CORE 6.G.2

LESSON 15.3
Solving Volume Equations
COMMON CORE 6.EE.7, 6.G.2

ESSENTIAL QUESTION

How can a model help you to solve surface area and volume problems?

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Real-World Video

Surface area and volume can be important considerations when constructing or repairing buildings or other structures.

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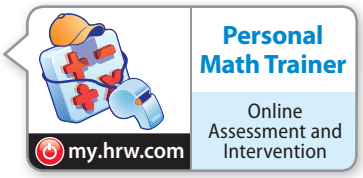
Are YOU Ready?

Complete these exercises to review skills you will need for this module.



Use of Parentheses

EXAMPLE

$\frac{1}{2}(14)(12 + 18) = \frac{1}{2}(14)(30)$ Perform operations inside parentheses first.

$= 7(30)$ Multiply left to right.

$= 210$ Multiply again.

Evaluate.

1. $\frac{1}{2}(3)(5 + 7)$ _____

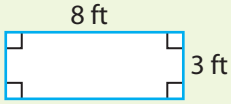
2. $\frac{1}{2}(15)(13 + 17)$ _____

3. $\frac{1}{2}(10)(9.4 + 3.6)$ _____

4. $\frac{1}{2}(2.1)(3.5 + 5.7)$ _____

Area of Squares, Rectangles, Triangles

EXAMPLE Find the area of the rectangle.



$A = bh$ Use the formula for area of a rectangle.

$= 8 \cdot 3$ Substitute for base and height.

$= 24$ Multiply.

Area equals 24 square feet.

Find the area of each figure.

5. a triangle with base 6 in. and height 3 in. _____

6. a square with sides of 7.6 m _____

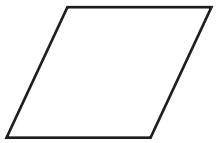
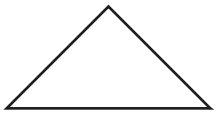
7. a rectangle with length $3\frac{1}{4}$ ft and width $2\frac{1}{2}$ ft _____

8. a triangle with base 8.2 cm and height 5.1 cm _____

Reading Start-Up

Visualize Vocabulary

Use review words to complete the graphic.

Shape	Area Formula
	$A = b \times$ _____
	$A = \frac{1}{2} \times$ _____ $\times h$

Understand Vocabulary

Complete the sentences using the preview words.

1. The total area of all the faces of a three-dimensional figure is called the _____.
2. A model that looks like an unfolded three-dimensional figure is a _____.
3. A three-dimensional shape with a polygon for a base and triangles for sides is a _____.

Vocabulary

Review Words

- area *(área)*
- base *(base)*
- height *(altura)*
- rectangular prism *(prisma rectangular)*
- volume *(volumen)*

Preview Words

- net *(plantilla)*
- pyramid *(pirámide)*
- surface area *(área total)*

Active Reading

Booklet Before beginning the module, create a booklet to help you learn the concepts in this module. Write the main idea of each lesson on each page of the booklet. As you study each lesson, write important details that support the main idea, such as vocabulary and important steps in solving problems. Refer to your finished booklet as you work on assignments and study for tests.

MODULE 15

Unpacking the Standards

Understanding the standards and the vocabulary terms in the standards will help you know exactly what you are expected to learn in this module.

COMMON CORE 6.G.2

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

What It Means to You

You will use the formula for the volume of a rectangular prism.

UNPACKING EXAMPLE 6.G.2

Jala has an aquarium in the shape of a rectangular prism. The dimensions of the base of the aquarium are $1\frac{1}{4}$ feet by $\frac{1}{2}$ foot, and the height is $\frac{3}{4}$ foot. Find the volume of the aquarium.

$$\begin{aligned} v &= l \cdot w \cdot h \\ &= 1\frac{1}{4} \cdot \frac{1}{2} \cdot \frac{3}{4} \\ &= \frac{5}{4} \cdot \frac{1}{2} \cdot \frac{3}{4} \\ &= \frac{15}{32} \end{aligned}$$

The volume of the aquarium is $\frac{15}{32}$ cubic foot.

COMMON CORE 6.G.4

Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. . . .

What It Means to You

You will use a net to find the surface area of a square pyramid.

UNPACKING EXAMPLE 6.G.4

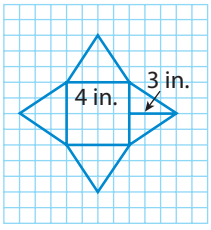
Meg drew a net to find the surface area of a square pyramid.

Square face: $A = b \times h = 16$ square inches

Triangular face: $A = \frac{1}{2} b \times h = 6$ square inches

Total of the areas:
$16 + (4 \times 6) = 40$ square inches

The surface area is 40 square inches.



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LESSON 15.1

Nets and Surface Area

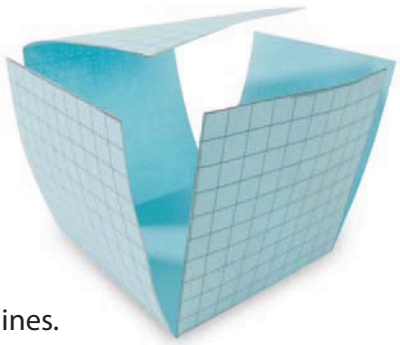
COMMON CORE 6.G.4

Represent three-dimensional figures using nets ... and use the nets to find...surface area.... *Also 6.EE.2c*

ESSENTIAL QUESTION

How can you use nets to find surface areas?

EXPLORE ACTIVITY COMMON CORE 6.G.4

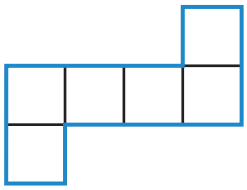


Using a Net

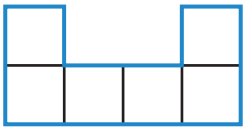
A **net** is a two-dimensional pattern of shapes that can be folded into a three-dimensional figure. The shapes in the net become the faces of the three-dimensional figure.

A Copy each net on graph paper. Cut out each net along the blue lines.

Net A



Net B



One of these nets can be folded along the black lines to make a cube.

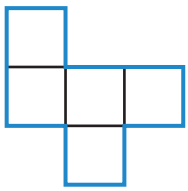
Which net will NOT make a cube? _____

B On your graph paper, draw a different net that you think will make a cube. Confirm by cutting out and folding your net. Compare results with several of your classmates. How many different nets for a cube did you and your classmates find? _____

Reflect

How do you know that each net cannot be folded into a cube without actually cutting and folding it?

1.



_____

_____

2.

_____

_____

_____

EXPLORE ACTIVITY *(cont'd)*

3. What shapes will appear in a net for a rectangular prism that is not a cube? How many of these shapes will there be?

_____

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Surface Area of a Pyramid

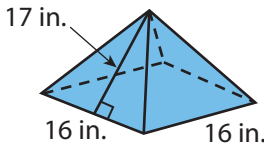
The **surface area** of a three-dimensional figure is the sum of the areas of its faces. A net can be helpful when finding surface area.

A **pyramid** is a three-dimensional figure whose base is a polygon and whose other faces are triangles that meet at a point. A pyramid is identified by the shape of its base.

EXAMPLE 1

COMMON CORE 6.G.4

Make a net of this square pyramid, and use the net to find the surface area.



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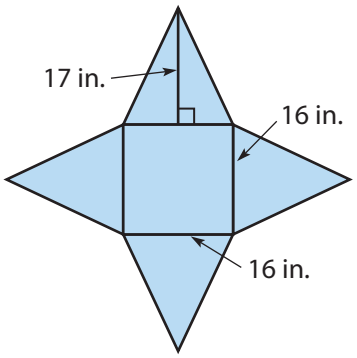
STEP 1 Make a net of the pyramid.

Draw the square base.

Draw a triangle on each side.

Label the dimensions.



STEP 2 Use the net to find the surface area.

There are four triangles with base 16 in. and height 17 in.

The area of the 4 triangles is $4 \times \frac{1}{2}(16)(17) = 544$ in^2.

The area of the base is $16 \times 16 = 256$ in^2.

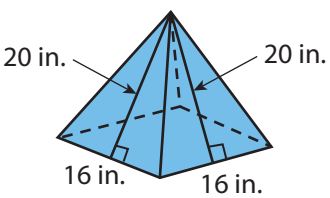
The surface area is $544 + 256 = 800$ in^2.

Math Talk
Mathematical Practices
How many surfaces does a triangular pyramid have? What shape are they?

YOUR TURN

4. Use a net to find the surface area of the pyramid.

_____



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Surface Area of a Prism

A **prism** is a three-dimensional figure with two identical and parallel bases that are polygons. The other faces are rectangles. A prism is identified by the shape of its base.

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My Notes

EXAMPLE 2

COMMON CORE 6.G.4

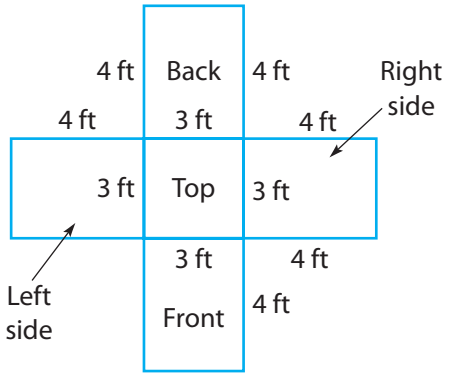
A sculpture sits on pedestal in the shape of a square prism. The side lengths of a base of the prism are 3 feet. The height of the prism is 4 feet. The museum director wants to cover all but the underside of the pedestal with foil that costs $0.22 per square foot. How much will the foil cost?

STEP 1 Use a net to show the faces that will be covered with foil.

Draw the top.

Draw the faces of the prism that are connected to the top.

You don't need to include the bottom of the pedestal.



STEP 2 Use the net to find the area that will be covered with foil.

Area of top $= 3 \cdot 3 = 9$ ft^2

The other four faces are identical.

Area of four faces $= 4 \cdot 3 \cdot 4 = 48$ ft^2

Area to be covered $= 9 + 48 = 57$ ft^2

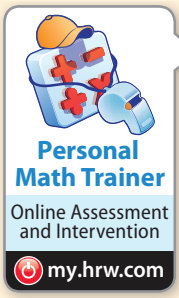
STEP 3 Find the cost of the foil.

$57 \cdot \$0.22 = \$12.54$

The foil will cost $12.54.

Reflect

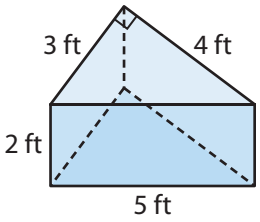
5. **Critical Thinking** What shapes would you see in the net of a triangular prism?



YOUR TURN

6. The figure shown is a triangular prism. How much would it cost to cover the bases and the other three faces with foil that costs $0.22 per square foot?

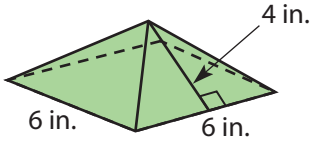
_____



Guided Practice

A square pyramid is shown.

1. The figure has _____ square base and _____ triangular faces. (Explore Activity)

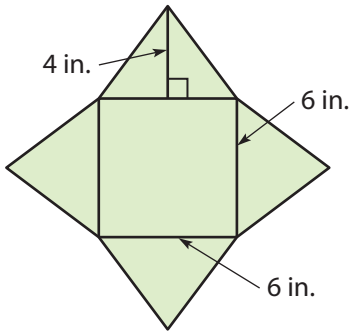


2. Find the surface area. (Example 1)

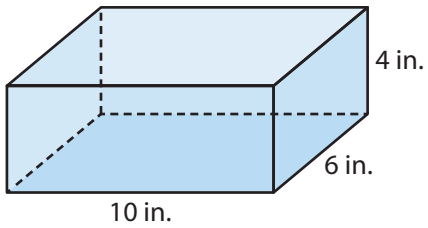
The area of the base is _____ square inches.

The area of the four faces is _____square inches.

The surface area is _____ square inches.



3. Yolanda makes wooden boxes for a crafts fair. She makes 100 boxes like the one shown, and she wants to paint all the outside faces. (Example 2)



a. Find the surface area of one box.

_____

b. Find the total surface area of 100 boxes.

_____

c. One can of paint will cover 14,000 square inches. How many cans of paint will Yolanda need to buy?

_____

ESSENTIAL QUESTION CHECK-IN

4. How is a net useful when finding the surface area of prisms and pyramids?

_____

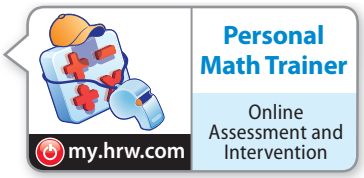
_____

_____

Name _____ Class _____ Date _____

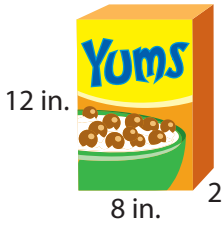
15.1 Independent Practice

COMMON CORE 6.G.4



5. Use a net to find the surface area of the cereal box.

Total surface area: _____

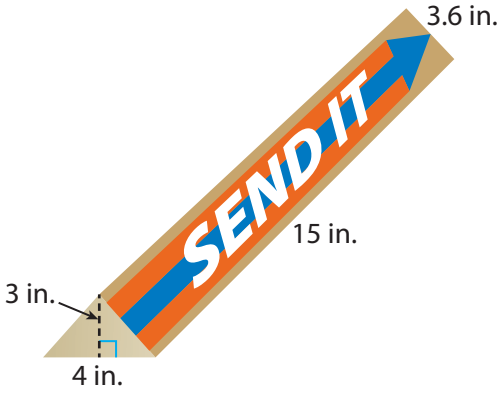


6. Inez bought a shipping container at a packaging store. She measured the dimensions shown to the nearest tenth.

a. Sketch a net of the container, and label the dimensions.

b. Find the surface area of the shipping container.

_____



7. Raj builds a side table in the shape of a cube. Each edge of the cube measures 20 inches. Raj wants to cover the top and four sides of the table with ceramic tiles. Each tile has an edge length of 5 inches. How many tiles will he need?

_____

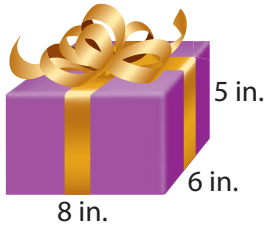
8. Santana wants to cover a gift box shaped like a rectangular prism with foil. The foil costs $0.03 per square inch. Santana has a choice between Box A which is 8 inches long, 3 inches wide, and 6 inches high, and Box B which is 10 inches long, 3 inches wide, and 4 inches high. Which box will be less expensive to cover with foil, and by how much?

_____

9. **Vocabulary** Name a three-dimensional shape that has four triangular faces and one rectangular face. Name a three-dimensional shape that has three rectangular faces and two triangular faces.

_____

10. Victor wrapped the gift box shown with adhesive paper (with no overlaps). How much paper did he use?



_____

11. **Communicate Mathematical Ideas** Describe how you approach a problem involving surface area. What do you do first? What are some strategies you can use?

H.O.T. FOCUS ON HIGHER ORDER THINKING

12. **Persevere in Problem Solving** A pedestal in a craft store is in the shape of a triangular prism. The bases are right triangles with side lengths of 12 centimeters, 16 centimeters, and 20 centimeters. The store owner wraps a piece of rectangular cloth around the pedestal, but does not cover the identical bases of the pedestal with cloth. The area of the cloth is 192 square centimeters.

a. What is the distance around the base of the pedestal? How do you know?

b. What is the height of the pedestal? How did you find your answer?

13. **Critique Reasoning** Robert sketches two rectangular prisms, A and B. Prism A's side lengths are 5 centimeters, 6 centimeters, and 7 centimeters. Prism B's side lengths were twice those of prism A's: 10 centimeters, 12 centimeters, and 14 centimeters. Robert says the surface area of prism B is twice the surface area of prism A. Is he correct? If he is not, how many times as great as prism A's surface area is prism B's surface area? Show your work.

Work Area

LESSON 15.2

Volume of Rectangular Prisms

COMMON CORE 6.G.2

Find the volume of a right rectangular prism with fractional edge lengths....

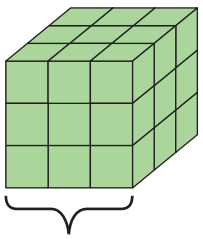
ESSENTIAL QUESTION

How do you find the volume of a rectangular prism?

EXPLORE ACTIVITY COMMON CORE 6.G.2

Using Fractional Edge Lengths

A cube with edge length 1 unit and volume 1 cubic unit is filled with smaller cubes as shown.



A How many small cubes are there? _____

How does the combined volume of the small cubes compare to the volume of the large cube?

_____

Number of small cubes	·	Volume of one small cube	=	Volume of large cube
☐	·	?	=	☐

What is the volume of one small cube? _____ cubic unit(s)

B Each edge of the large cube contains _____ small cubes.

Number of small cubes per edge	·	Edge length of one small cube	=	Edge length of large cube
☐	·	?	=	☐

What is the edge length of one small cube? _____ unit(s)

C Complete:

Each small cube has edge length _____ unit(s) and

volume _____ cubic unit(s).

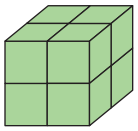
D The formula for volume of a cube with edge length ℓ is $V = \ell \cdot \ell \cdot \ell$, or $V = \ell^3$. Find the volume of one small cube using this formula.

$V =$ _____ $=$ _____

EXPLORE ACTIVITY *(cont'd)*

Reflect

1. Several of the small cubes in the Explore Activity are arranged into a medium-sized cube as shown.



Show two different ways to find the volume of this cube.

_____

_____

_____

_____

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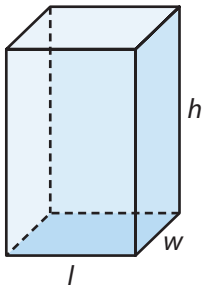
Finding Volume

A rectangular prism has six faces. Any pair of opposite faces can be called the **bases** of the prism.

Volume of a Rectangular Prism

$V = \ell wh$, or $V = Bh$

(where B represents the area of the prism's base; $B = \ell w$)

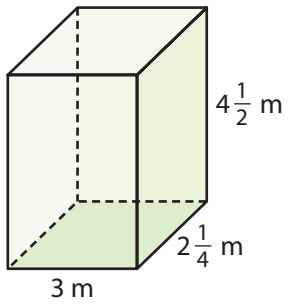


EXAMPLE 1

COMMON CORE 6.G.2

Find the volume of the rectangular prism.

$\ell = 3$ meters $\quad w = 2\frac{1}{4}$ meters $\quad h = 4\frac{1}{2}$ meters



$V = \ell wh$

$= 3 \cdot 2\frac{1}{4} \cdot 4\frac{1}{2}$

$= 3 \cdot \frac{9}{4} \cdot \frac{9}{2}$ Write each mixed number as an improper fraction.

$= \frac{243}{8}$ Multiply.

$= 30\frac{3}{8}$ cubic meters Write as a mixed number in simplest form.

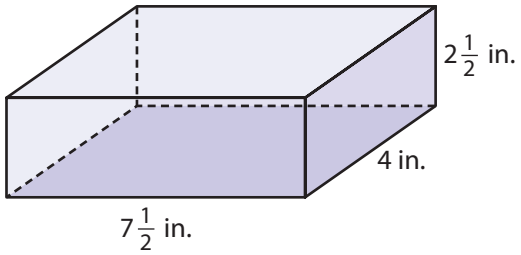
Math Talk
Mathematical Practices

Can you also use the formula $V = Bh$ to find the volume? Does it matter which face you choose as the base?

YOUR TURN

Find the volume of each rectangular prism.

2.



3. length $= 5\frac{1}{4}$ inches

width $= 3\frac{1}{2}$ inches

height $= 3$ inches

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Solving Volume Problems

When you solve a real-world problem involving the volume of a prism, you can choose to use either of the volume formulas you know.

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EXAMPLE 2

Real World

COMMON CORE 6.G.2

A terrarium is shaped like a rectangular prism. The prism is $25\frac{1}{2}$ inches long, $13\frac{1}{2}$ inches wide, and 16 inches deep. What is the volume of the terrarium?

STEP 1 Choose one side to be the base, and find its area.

$B = 25\frac{1}{2} \times 13\frac{1}{2}$ Use the $25\frac{1}{2}$-inch by $13\frac{1}{2}$-inch face as the base.

$= \frac{51}{2} \times \frac{27}{2}$

$= \frac{1{,}377}{4}$ The area of the base is $\frac{1{,}377}{4}$ square inches. You need to perform another operation, so you don't need to write this value as a mixed number.

STEP 2 Find the volume.

$V = Bh$

$= \frac{1{,}377}{4} \times 16$ Substitute $\frac{1{,}377}{4}$ for B and 16 for h.

$= \frac{1{,}377}{\cancel{4}_1} \times \frac{\cancel{16}^4}{1}$ Simplify before multiplying.

$= 5{,}508$

The volume of the terrarium is 5,508 cubic inches.

YOUR TURN

4. A rectangular swimming pool is 15 meters long, $10\frac{1}{2}$ meters wide, and $2\frac{1}{2}$ meters deep. What is its volume?

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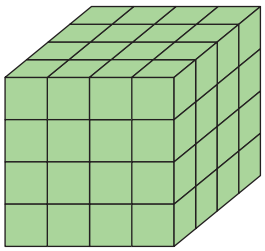
Guided Practice

A large cube is made up of smaller unit cubes as shown on the right. Each small cube has an edge length of $\frac{1}{2}$ unit. (Explore Activity)

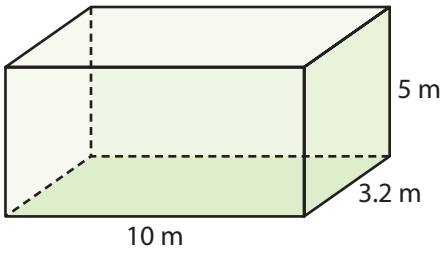


1. Each edge of the large cube is _____ units.

2. The volume of the large cube is _____ cubic units.

Find the volume of each prism. (Example 1)

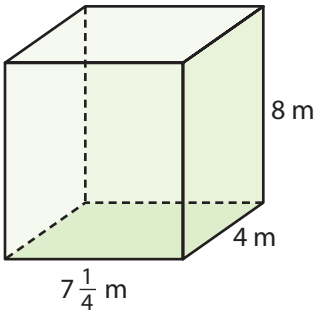
3.



$V =$ _____ $\times$ _____ $\times$ _____

$=$ _____ cubic meters

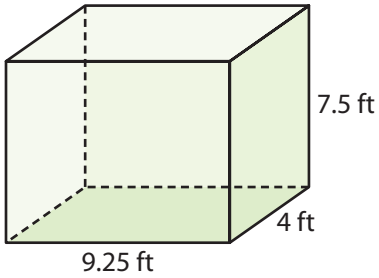
4.



$B =$ _____ $\times$ _____ $=$ _____ m^2

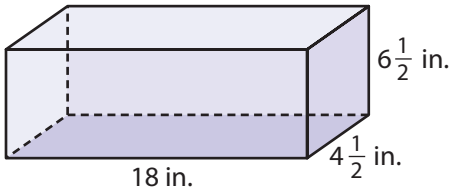
$V =$ _____ cubic meters

5.



$V =$ _____ cubic feet

6.



$V =$ _____ cubic inches

7. A cereal box is $8\frac{1}{2}$ inches long, $3\frac{1}{2}$ inches wide, and 12 inches high.

What is the volume of the box? (Example 2) _____

ESSENTIAL QUESTION CHECK-IN

8. Which two formulas can you use to find the volume of a rectangular prism? Why are these two formulas equivalent?

_____

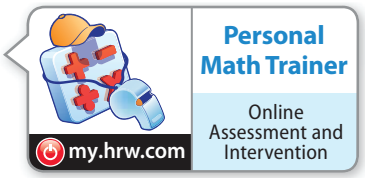
_____

_____

Name _____ Class _____ Date _____

15.2 Independent Practice

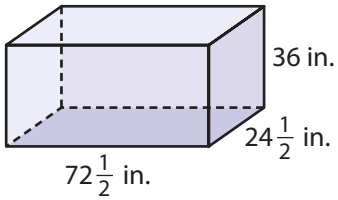
COMMON CORE 6.G.2



9. A block of wood measures 4.5 inches by 3.5 inches by 7 inches. What is the volume of the block of wood?

_____

10. A restaurant buys a freezer in the shape of a rectangular prism. The dimensions of the freezer are shown. What is the volume of the freezer?

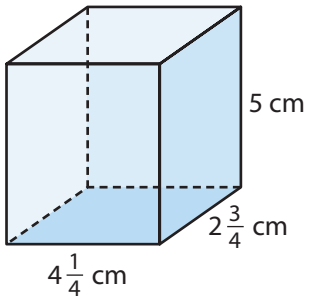


_____

11. Rectangular prism A measures 6 inches by 4 inches by 5 inches. Rectangular prism B's dimensions are twice those of prism A. Find the volume of each prism. How many times as great is prism B's volume as prism A's volume?

_____

12. Leticia has a small paper weight in the shape of a rectangular prism. The dimensions of the paper weight are shown. What is the volume of the paper weight?



_____

13. A company is designing a juice box. The box is in the shape of a rectangular prism. The base of the box is $6\frac{1}{2}$ inches by $2\frac{1}{2}$ inches, and the box is 4 inches high. If juice fills 90% of the box's volume, find the volume of juice in the box.

_____

14. **Science** Density is the amount of mass in a certain volume of an object. To find the density in grams per cubic centimeter of a substance you can use this relationship:

$$\text{Density} = \frac{\text{mass in grams}}{\text{volume in cubic centimeters}}$$

A gold bar that is 16 centimeters by 2.5 centimeters by 5 centimeters has a density of 19.3 grams per cubic centimeter. What is the mass of the gold bar?

_____

15. A suitcase is a rectangular prism whose dimensions are $1\frac{1}{4}$ feet by $1\frac{3}{4}$ feet by $1\frac{1}{4}$ feet. Find the volume of the suitcase.

_____

16. The Smith family is moving and needs to decide on the size of the moving truck they should rent.

Inside Dimensions of Trucks			
Type	**Length (ft)**	**Width (ft)**	**Height (ft)**
Van	$10\frac{1}{2}$	6	6
Small Truck	12	8	$6\frac{3}{4}$
Large Truck	20	$8\frac{3}{4}$	$8\frac{1}{2}$

a. A moving van rents for $94.50 per day, and a small truck rents for $162 per day. Based on the amount of space inside the van or truck, which is the better deal? Explain your answer.

_____

_____

_____

b. How much greater is the volume of the large truck than the volume of the small truck?

_____

c. The family estimates that they need about 1,100 cubic feet to move their belongings. What should they rent?

_____

H.O.T. FOCUS ON HIGHER ORDER THINKING

17. **Persevere in Problem Solving** A cube has a volume of $\frac{1}{512}$ cubic meter. What is the length of each side of the cube? Explain your thinking.

_____

_____

18. **Communicate Mathematical Ideas** Think about two rectangular prisms, one labeled prism *P* and one labeled prism *Q*.

a. Suppose the bases of the prisms have the same area, but the height of prism *Q* is twice the height of prism *P*. How do the volumes compare?

_____

b. Suppose the area of the base of prism *Q* is twice the area of the base of prism *P*. How do the volumes compare?

_____

19. **Critical Thinking** The dimensions of a rectangular prism are $3\frac{1}{4}$ feet by $2\frac{1}{2}$ feet by 5 feet. Lee found the volume by multiplying $12\frac{1}{2}$ by $3\frac{1}{4}$. Lola found the volume by multiplying $16\frac{1}{4}$ by $2\frac{1}{2}$. Who is correct? Explain.

_____

_____

_____

_____

Work Area

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?

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.

Math On the Spot
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EXAMPLE 1

Real World

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

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?

$V = \ell wh$	Write the formula.
$375 = 15 \cdot 2.5 \cdot h$	Use the formula to write an equation.
$375 = 37.5h$	Multiply.
$\frac{375}{37.5} = \frac{37.5h}{37.5}$	Divide both sides of the equation by 37.5.
$10 = h$	

The height of the ant farm is 10 inches.

Reflect

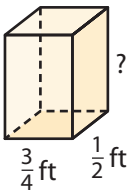
1. **Communicate Mathematical Ideas** Explain how you would find the solution to Example 1 using the formula $V = Bh$.

_____

_____

YOUR TURN

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



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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

Real World

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.

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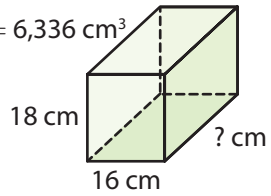
YOUR TURN

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? _____

Guided Practice

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

_____



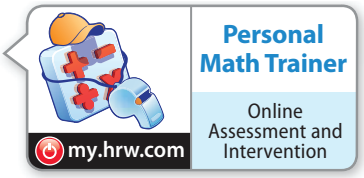
2. One clay brick weighs 5.76 pounds. The brick is 8 inches long and $2\frac{1}{4}$ inches wide. If the clay weighs 0.08 pounds per cubic inch, what is the volume of the brick? Find the height of the brick. (Example 2)

_____

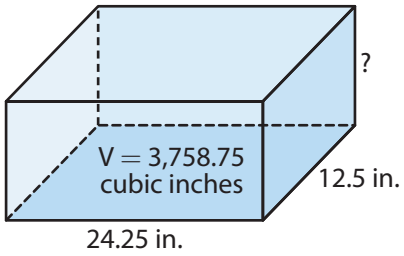
Name _____ Class _____ Date _____

15.3 Independent Practice

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



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



Height = _____

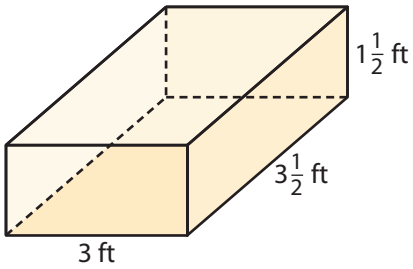
4. The area of the base of a rectangular juice box is $4\frac{1}{2}$ square inches. If the volume of the box is 18 cubic inches, how tall is the box?

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.

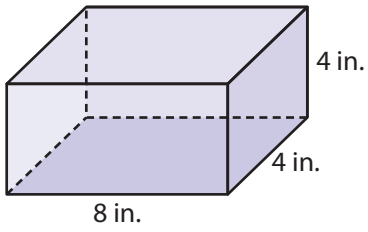
_____

_____

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. _____

_____

H.O.T. FOCUS ON HIGHER ORDER THINKING

Work Area

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.

_____

MODULE QUIZ

Ready to Go On?

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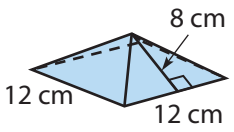
15.1 Nets and Surface Area

A square pyramid is shown sitting on its base.

1. Draw the net of the pyramid.

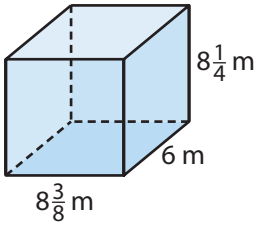


2. The surface area of the pyramid is _____ square centimeters.

15.2 Volume of Rectangular Prisms

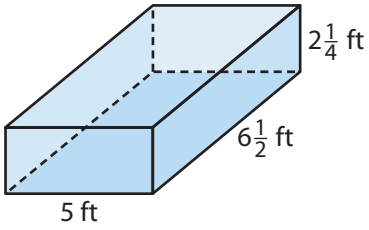
Find the volume of each rectangular prism.

3.



$V =$ _____ cubic meters

4.



$V =$ _____ cubic feet

15.3 Solving Volume Equations

Find the volume of each rectangular prism.

5. The volume inside a rectangular storage room is 2,025 cubic feet. The room is 9 feet high. Find the area of the floor. _____

6. An aquarium holds 11.25 cubic feet of water, and is 2.5 feet long and 1.5 feet wide. What is its depth? _____

ESSENTIAL QUESTION

7. How can a model help you to solve surface area and volume problems?

_____

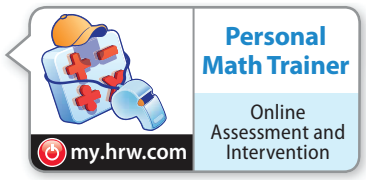
_____

_____

COMMON CORE

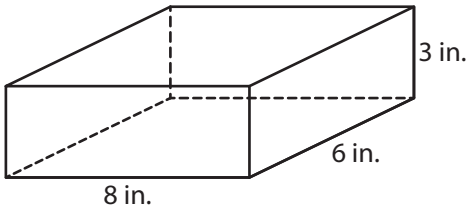
MODULE 15 MIXED REVIEW

Assessment Readiness



Selected Response

1. Indira is wrapping the box below. How much wrapping paper does she need?



Ⓐ 34 in.^{2} Ⓒ 144 in.^{2}

Ⓑ 90 in.^{2} Ⓓ 180 in.^{2}

2. Colin has an ice cube tray with 12 identical compartments. Each compartment is a prism that is 4 centimeters long, 3 centimeters wide, and 3 centimeters high. Given that 1 cubic centimeter holds 1 milliliter of water, how many milliliters of water can the tray hold?

Ⓐ 36 mL Ⓒ 432 mL

Ⓑ 66 mL Ⓓ 792 mL

3. A store manager set up a cardboard display to advertise a new brand of perfume. The display is a square pyramid whose base is 18 inches on each side. The height of each triangular face of the pyramid is 12 inches. How much cardboard was used to make the display?

Ⓐ 516 in^2 Ⓒ 756 in^2

Ⓑ 612 in^2 Ⓓ 1,080 in^2

4. Which expression is equivalent to $24 + 32$?

Ⓐ $8 \times (3 + 4)$

Ⓑ $8 \times (3 + 32)$

Ⓒ $6 \times (4 + 32)$

Ⓓ $6 \times (4 + 6)$

5. A bathtub in the shape of a rectangular prism is 5 feet long, $3\frac{1}{2}$ feet wide, and $4\frac{1}{4}$ feet high. How much water could the tub hold?

Ⓐ $14\frac{7}{8}$ ft^3 Ⓒ $74\frac{3}{8}$ ft^3

Ⓑ $25\frac{1}{2}$ ft^3 Ⓓ $87\frac{1}{2}$ ft^3

6. The point $(-1.5, 2)$ is reflected across the y-axis, What are the coordinates of the point after the reflection?

Ⓐ $(-1.5, -2)$ Ⓒ $(2, -1.5)$

Ⓑ $(1.5, 2)$ Ⓓ $(2, 1.5)$

Mini-Task

7. An cardboard box is open at one end and is shaped like a square prism missing one of its square bases. The volume of the prism is 810 cubic inches, and its height is 10 inches.

a. What is the length of each side of the base? _____

b. Draw a net of the box.

c. How much cardboard is used for the box?

_____