Launch Into Math 3

Launch Into Volume

On the Move

Florida is a popular place to live. More people move to Florida than to any other state. The two most popular cities to move to in Florida are Sarasota and Jacksonville.

According to the U.S. Census, over 600,000 people moved to Florida in 2019. This is a rate of more than 1,600 new residents daily. This is like adding a new city to Florida in a single year!

People move to Florida to enjoy the beautiful weather. They also come to buy homes, start new jobs, and establish their families.

Have you lived in Florida your whole life, or did you move here, like most Floridians?

More on Moving to Florida

- About 1 out of every 8 people who move in the United States move to Florida.
- The two top lifestyle reasons for moving to Florida are the sun and beaches.
- You are never more than 60 miles from the coast anywhere in Florida.
- People who live in Florida get discounts on great local attractions!

Three Reads

First, read to understand the situation.

Next, read to understand the amounts.

Then, read to ask what mathematical questions could be asked about the problem.

Danilo and his family are moving to Florida. He packs his belongings into moving boxes that are cubes with side lengths of 1 foot each. His boxes fit exactly into a moving container that is 4 feet long, 6 feet wide, and 6 feet high.

Go Online

For the interactive lesson

Read the final question. Make a plan to solve the problem.

Danilo and his family are moving to Florida. He packs his belongings into moving boxes that are cubes with side lengths of 1 foot each. His boxes fit exactly into a moving container that is 4 feet long, 6 feet wide, and 6 feet high.

How many moving boxes does Danilo have?

Write, model, or draw to solve the problem.

Discuss with a partner or in a group.

Math Talk

How many boxes that have a side length of 2 feet would fit in the moving container?

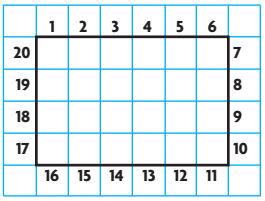
Chapter 15

Volume

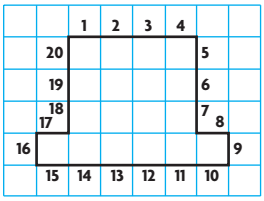
Name _____

Show What You Know

Perimeter Count the units to find the perimeter.

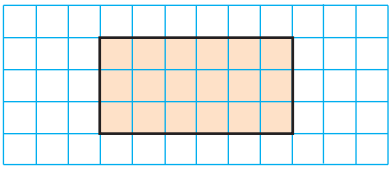
1. 

Perimeter = _____ units

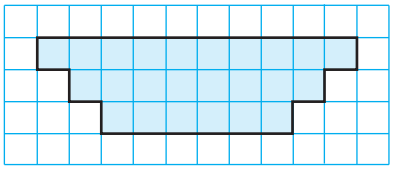
2. 

Perimeter = _____ units

Area Write the area of each shape.

3. 

_____ square units

4. 

_____ square units

Multiply Three Factors Write the product.

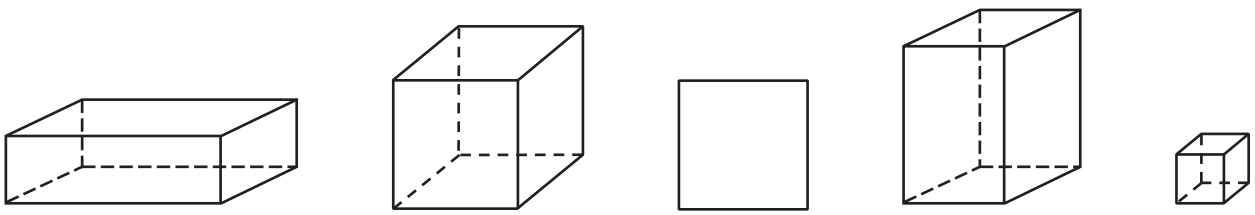
5. $3 \times 5 \times 4 \times$ _____

6. $5 \times 5 \times 10 \times$ _____

7. $7 \times 3 \times 20 \times$ _____

MATH in the Real World

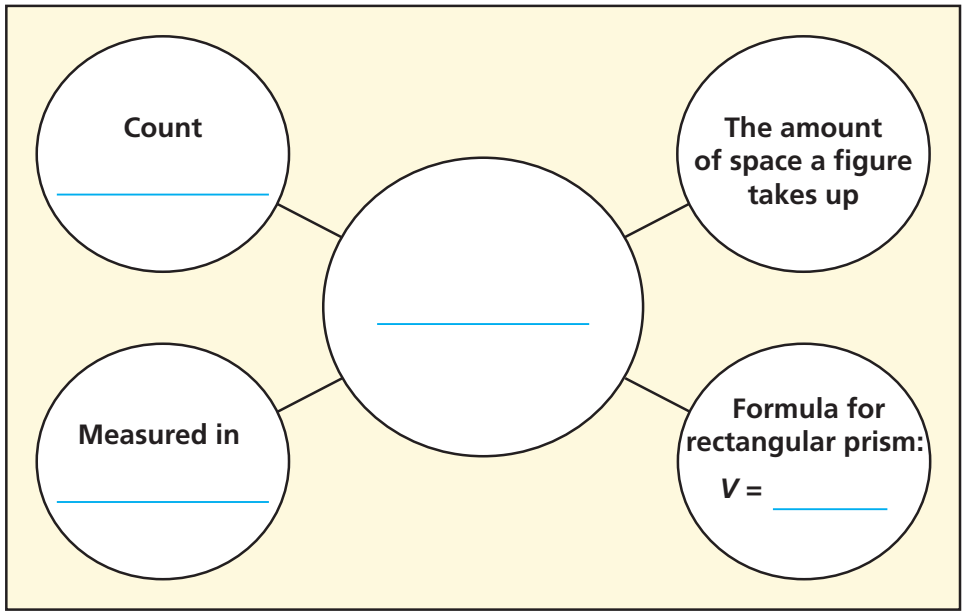
Circle the cubes.



Vocabulary Builder

Go Online For more help

Visualize It



Connect to Vocabulary

Preview Words

cubic units
unit cube
volume

Understand Vocabulary

Write the preview word that answers the riddle. You will use the words more than once.

1. I have a volume of 1 cubic unit. _____
2. Multiply the length, width, and height of a rectangular prism to find me. _____
3. I am a cube that has a length, width, and height of 1 unit. _____
4. I can be found by counting the unit cubes that make a figure. _____
5. I am the measure of the amount of space a solid figure occupies. _____

Name _____

Unit Cubes and Three-Dimensional Figures

Florida's B.E.S.T.

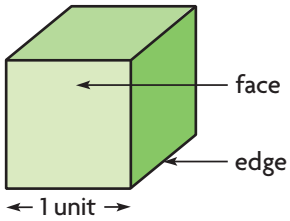
- **Geometric Reasoning** 5.GR.3.1, 5.GR.3.2, 5.GR.3.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1, MTR.71

I Can recognize a unit cube and how to use it to build a three-dimensional figure.

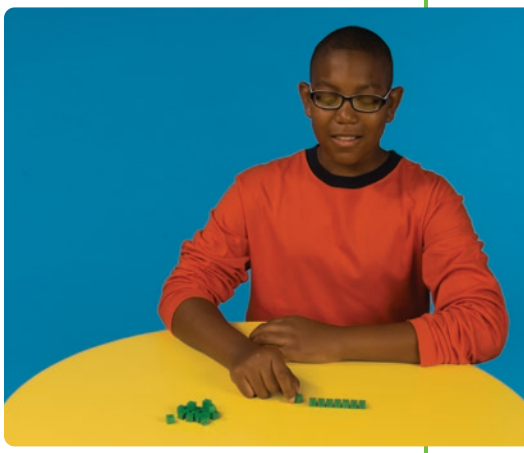
Investigate

You can build rectangular prisms using unit cubes. How many different rectangular prisms can you build with a given number of unit cubes?

Materials ■ centimeter cubes



A **unit cube** is a cube that has a length, width, and height of 1 unit. A cube has _____ square faces. All of its faces are congruent. It has _____ edges. The lengths of all its edges are equal.



A. Build a rectangular prism with 2 unit cubes.

Think: When the 2 cubes are pushed together, the faces and edges that are pushed together make 1 face and 1 edge.

- How many faces does the rectangular prism have? _____
- How many edges does the rectangular prism have? _____

B. Build as many different rectangular prisms as you can with 8 unit cubes.

C. Record in units the dimensions of each rectangular prism you built with 8 cubes.

Dimensions		

So, with 8 unit cubes, I can build _____ different rectangular prisms.

Math Talk MTR 4.1 Engage in discussions on mathematical thinking.

Describe the different rectangular prisms that you can make with 4 unit cubes.

Draw Conclusions

1. Explain why a rectangular prism composed of 2 unit cubes has 6 faces. How do its dimensions compare to a unit cube?

2. MTR Explain how the number of edges for the rectangular prism composed of 2 unit cubes compares to the number of edges for the unit cube.

3. MTR Describe what all of the rectangular prisms you made in Step B have in common.

Make Connections

You can build other three-dimensional figures and compare the three-dimensional figures by counting the number of unit cubes.

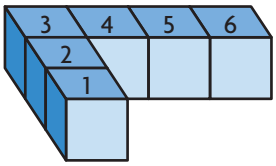


Figure 1

Figure 1 is made up of _____ unit cubes.

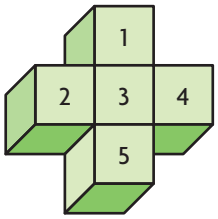


Figure 2

Figure 2 is made up of _____ unit cubes.

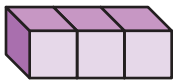
So, Figure _____ has more unit cubes than Figure _____.

- Use 12 unit cubes to build a three-dimensional figure that is not a rectangular prism. Share your model with a partner. Describe how your model is the same and how it is different from your partner's model.

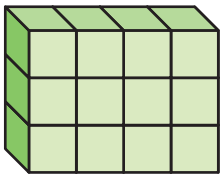
Name _____

Share and Show Math Board

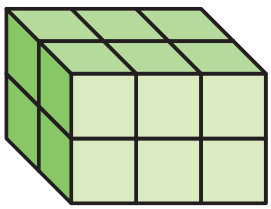
Count the number of cubes used to build each three-dimensional figure.



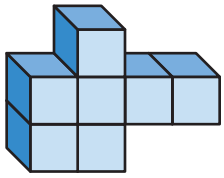
1. The rectangular prism is made up of _____ unit cubes.

2. 

_____ unit cubes

3. 

_____ unit cubes

4. 

_____ unit cubes

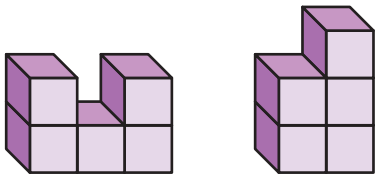
5. WRITE Math How are the rectangular prisms in Problems 2–3 related? Can you show a different rectangular prism with the same relationship? Explain.

_____

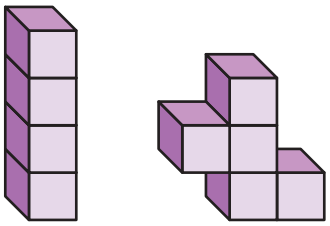
_____

On Your Own

Compare the number of unit cubes in each three-dimensional figure. Use <, > or =.

6. 

_____ unit cubes ◯ _____ unit cubes

7. 

_____ unit cubes ◯ _____ unit cubes

8. MTR Camila makes a three-dimensional figure by stacking 1 cube on top of a row of 2 cubes on top of a row of 3 cubes. Then she rearranges the cubes to form a rectangular prism. Describe the arrangement of cubes in the rectangular prism.

_____

Connect to Art

Architecture is the art and science of designing buildings and structures.

The Cube Houses of Rotterdam in the Netherlands, shown at the top right, were built in the 1970s. Each cube is a house, tilted and resting on a hexagon-shaped pylon, and is meant to represent an abstract tree. The village of Cube Houses makes a "forest."

The Nakagin Capsule Tower, shown at the bottom right, is an office and apartment building in Tokyo, Japan, made up of modules attached to two central cores. Each module is a rectangular prism connected to a concrete core by four huge bolts. The modules are office and living spaces that can be removed or replaced.

Use the information to answer the questions.

9. There are 38 Cube Houses. Each house could hold 1,000 unit cubes that are 1 meter by 1 meter by 1 meter. Describe the dimensions of a cube house using unit cubes. Remember that the edges of a cube are all the same length.

_____

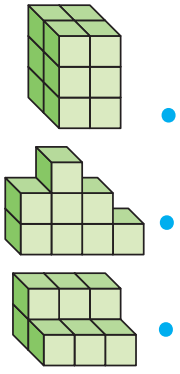
_____

10. The Nakagin Capsule Tower has 140 modules, and is 14 stories high. If all of the modules were divided evenly among the number of stories, how many modules would be on each floor? How many different rectangular prisms could be made from that number?

MATH on the Spot

_____

11. Match the figure with the number of unit cubes that would be needed to build each figure. Not every number of unit cubes will be used.



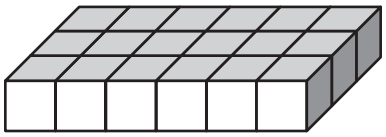
- 6 unit cubes
- 7 unit cubes
- 8 unit cubes
- 9 unit cubes
- 10 unit cubes
- 12 unit cubes

Name _____

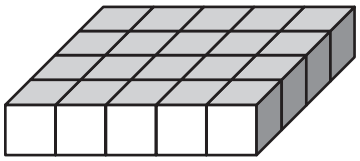
Unit Cubes and Three-Dimensional Figures

Go Online
Interactive Examples

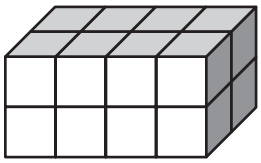
Count the number of cubes used to build each three-dimensional figure.

1. 

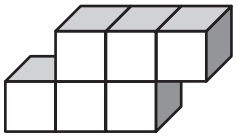
18 unit cubes

2. 

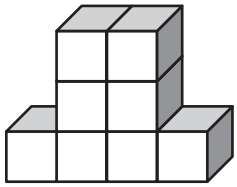
_____ unit cubes

3. 

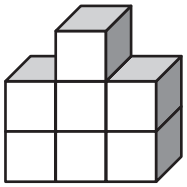
_____ unit cubes

4. 

_____ unit cubes

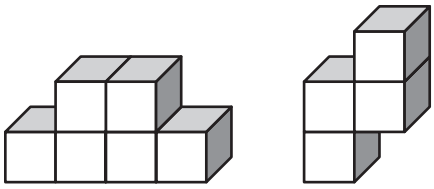
5. 

_____ unit cubes

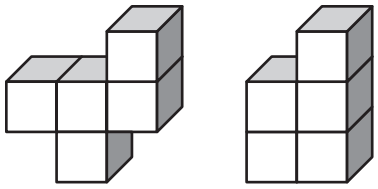
6. 

_____ unit cubes

Compare the number of unit cubes in each three-dimensional figure. Use <, >, or =.

7. 

_____ unit cubes ◯ _____ unit cubes

8. 

_____ unit cubes ◯ _____ unit cubes

Problem Solving Real World

9. A carton can hold 1,000 unit cubes that measure 1 inch by 1 inch by 1 inch. Describe the dimensions of the carton using unit cubes.

_____

_____

_____

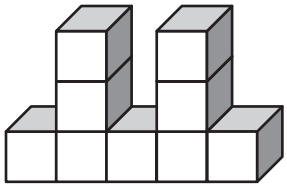
_____

10. WRITE *Math* Draw and label examples of all rectangular prisms built with 16 unit cubes.

_____

Lesson Check

11. Cecilia stacked some blocks to make the figure below. How many blocks are in Cecilia's figure?



12. Quentin has 18 unit cubes. How many different rectangular prisms can he build if he uses all of the cubes?

Spiral Review

13. In what shape are the lateral faces of a pyramid?

14. What is the area of a rectangle with length $12\frac{3}{8}$ inches and width $9\frac{1}{4}$ inches?

15. Complete the following statement. Write *sometimes, always,* or *never*.

The opposite sides of a parallelogram

are _____ congruent.

16. The tire on Levi's bike moves 6.25 feet in one rotation. How far will the tire move in 10.5 rotations?

Name _____

Understand Volume

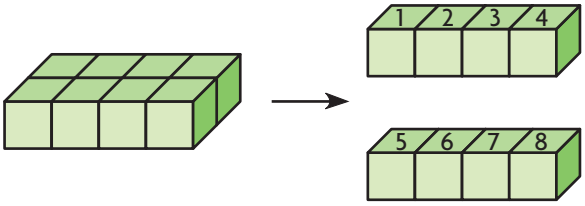
Florida's B.E.S.T.

- **Geometric Reasoning** 5.GR.3.1, 5.GR.3.2, 5.GR.3.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1

I Can use unit cubes to find the volume of a rectangular prism.

Investigate

MTR You can find the volume of a rectangular prism by counting unit cubes. **Volume** is the measure of the amount of space a three-dimensional figure occupies and is measured in **cubic units**. Each unit cube has a volume of 1 cubic unit.



The rectangular prism above is made up of _____ unit cubes and has a volume of _____ cubic units.

Materials

■ rectangular prism net A ■ centimeter cubes

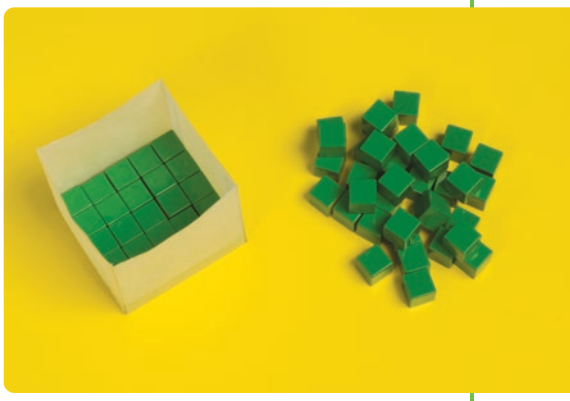
A. Cut out, fold, and tape the net to form a rectangular prism.

B. Use centimeter cubes to fill the base of the rectangular prism without gaps or overlaps. Each centimeter cube has a length, width, and height of 1 centimeter and a volume of 1 cubic centimeter.

- How many centimeter cubes make up the length of the first layer? the width? the height?

  length: _____ width: _____ height: _____

- How many centimeter cubes are used to fill the base? _____



C. Continue filling the rectangular prism, layer by layer. Count the number of centimeter cubes used for each layer.

- How many centimeter cubes are in each layer? _____
- How many layers of cubes fill the rectangular prism? _____
- How many centimeter cubes fill the prism? _____

So, the volume of the rectangular prism is _____ cubic centimeters.

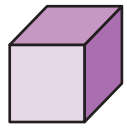
Draw Conclusions

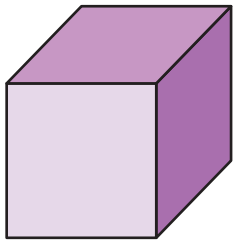
1. Describe the relationship among the number of centimeter cubes you used to fill each layer, the number of layers, and the volume of the prism.

2. MTR If you had a rectangular prism that had a width of 3 units, a length of 4 units, and a height of 2 units, how many unit cubes would you need for each layer? How many unit cubes would you need to fill the rectangular prism?

Make Connections

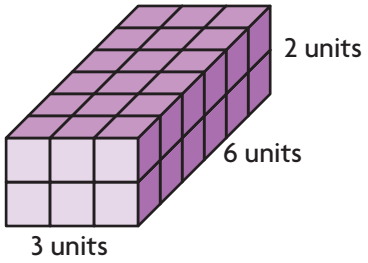
To find the volume of three-dimensional figures, you measure in three directions. For a rectangular prism, you measure its length, width, and height. Volume is measured using cubic units, such as cu cm, cu in., or cu ft.


1 cu cm


1 cu in.

- Which has a greater volume, 1 cu cm or 1 cu in.? Explain.

Find the volume of the prism if each cube represents 1 cu cm, 1 cu in., and 1 cu ft.



_____ cu cm

_____ cu in.

_____ cu ft

- MTR Would the prism above be the same size if it were built with centimeter cubes, inch cubes, or foot cubes? Explain.

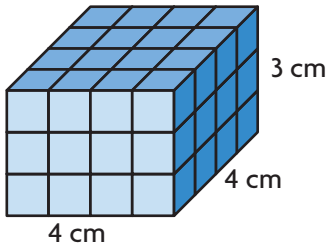
Name _____

Share and Show

Math Board

Use the unit given. Find the volume.

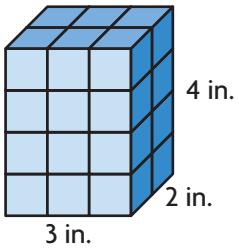
1.



Each cube = 1 cu cm

Volume = _____ cu _____

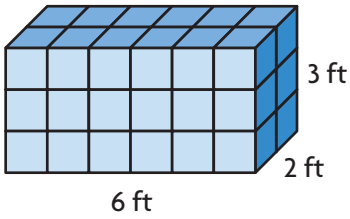
2.



Each cube = 1 cu in.

Volume = _____ cu _____

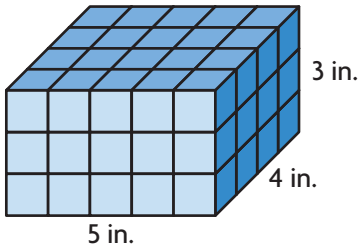
3.



Each cube = 1 cu ft

Volume = _____ cu _____

4.

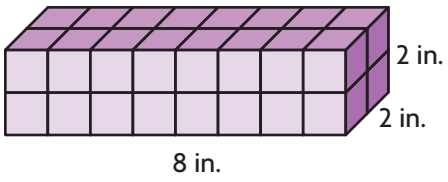


Each cube = 1 cu in.

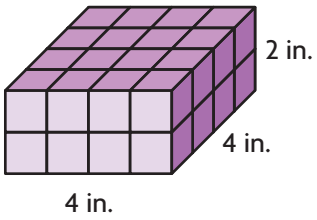
Volume = _____ cu _____

Compare the volumes. Write <, >, or =.

5.



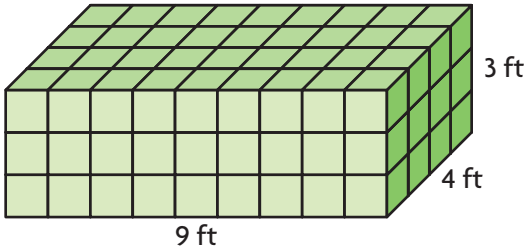
Each cube = 1 cu in.



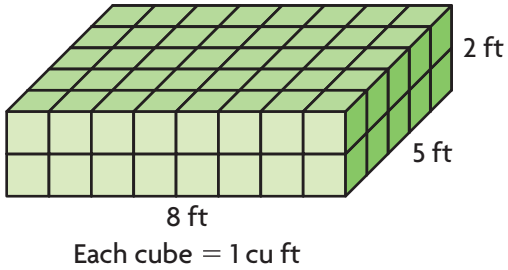
Each cube = 1 cu in.

_____ cu in. ◯ _____ cu in.

6.



Each cube = 1 cu ft



Each cube = 1 cu ft

_____ cu ft ◯ _____ cu ft

On Your Own

7. MTR Gerardo says that a cube with edges that measure 10 centimeters has a volume that is twice as much as a cube with sides that measure 5 centimeters. Explain and correct Gerardo's error.

Show the Math

Demonstrate Your Thinking

8. Pia built a rectangular prism with cubes. The base of her prism has 12 centimeter cubes. If the prism was built with 108 centimeter cubes, what is the height of her prism?

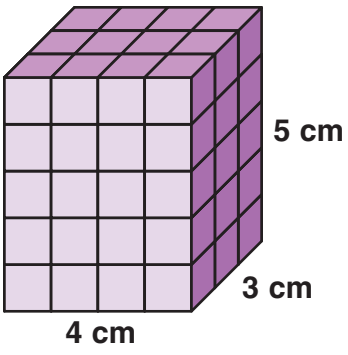
MATH on the Spot

9. A packing company makes boxes with edges each measuring 3 feet. What is the volume of the boxes? If 10 boxes are put in a larger, rectangular shipping container and completely fill it with no gaps or overlaps, what is the volume of the shipping container?

10. Carlton used 1-centimeter cubes to build the rectangular prism shown.

Find the volume of the rectangular prism Carlton built.

_____ cubic centimeters



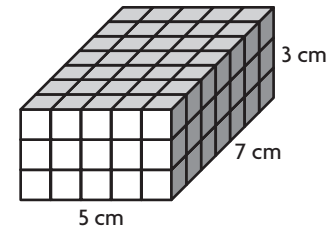
Name _____

Understand Volume

Go Online
Interactive Examples

Use the unit given. Find the volume.

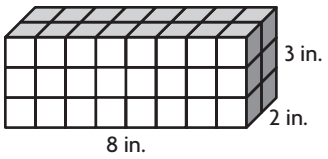
1.



Each cube = 1 cu cm

Volume = 105 cu cm

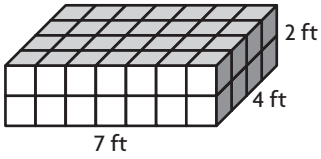
2.



Each cube = 1 cu in.

Volume = _____ cu _____

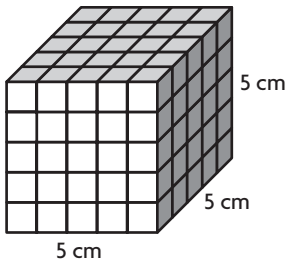
3.



Each cube = 1 cu ft

Volume = _____ cu _____

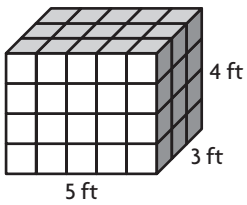
4.



Each cube = 1 cu cm

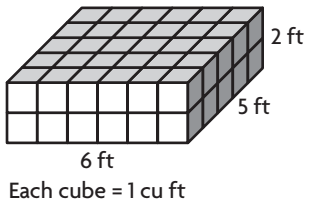
Volume = _____ cu _____

5. Compare the volumes. Write <, >, or =.



Each cube = 1 cu ft

_____ cu ft ◯ _____ cu ft



Each cube = 1 cu ft

Problem Solving Real World

6. A manufacturer ships its product in boxes with edges of 4 inches. If 12 boxes are put in a carton and completely fill the carton, what is the volume of the carton?

_____

_____

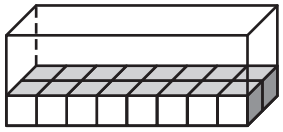
7. Hugo and Ava each built a rectangular prism that has a length of 5 units, a width of 2 units, and a height of 4 units. Hugo used cubes that are 1 cm on each side. Ava used cubes that are 1 in. on each side. What is the volume of each prism?

_____

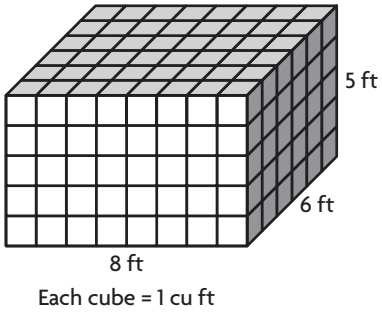
_____

Lesson Check

8. Elena packed 48 cubes into this box. Each cube has edges that are 1 centimeter. How many layers of cubes did Elena make?

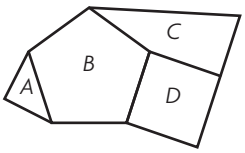


9. What is the volume of the rectangular prism?

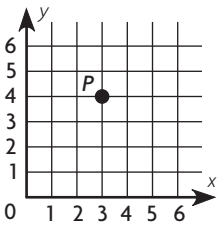


Spiral Review

10. Juan made a design with polygons. Which polygon in Juan's design is a pentagon?



11. What ordered pair describes the location of point *P*?



12. What is the least number of acute angles that a triangle can have?

13. Emma bought 3 pounds of cheese to serve at a picnic. How many ounces of cheese did Emma buy?

Name _____

Estimate Volume

Florida's B.E.S.T.

- **Geometric Reasoning** 5.GR.3.1, 5.GR.3.2, 5.GR.3.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1, MTR.7.1

I Can use an everyday object to estimate the volume of a rectangular prism.

Investigate

Izzy is mailing 20 boxes of crayons to a children's-education organization overseas. She can pack them in one of two different-sized shipping boxes. Using crayon boxes as a cubic unit, about what volume is each shipping box, in crayon boxes? Which shipping box should Izzy use to mail the crayons?

Materials ■ rectangular prism net B ■ 2 boxes, different sizes

A. Cut out, fold, and tape the net to form a rectangular prism. Label the prism "Crayons." You can use this prism to estimate and compare the volume of the two boxes.

B. Using the crayon box that you made, count to find the number of boxes that make up the base of the shipping box. Estimate the length to the nearest whole unit.

Number of crayon boxes that fill the base:

Box 1: _____ Box 2: _____

C. Starting with the crayon box in the same position, count to find the number of crayon boxes that make up the height of the shipping box. Estimate the height to the nearest whole unit.

Number of layers:

Box 1: _____ Box 2: _____

Box 1 has a volume of _____ crayon boxes

and Box 2 has a volume of _____ crayon boxes.

So, Izzy should use Box _____ to ship the crayons.

Draw Conclusions

1. MTR Explain how you estimated the volume of the shipping boxes.

2. MTR If you had to estimate to the nearest whole unit to find the volume of a shipping box, how might you be able to ship a greater number of crayon boxes in the shipping box than you actually estimated? Explain.

Make Connections

The crayon box has a length of 4 inches, a width of 3 inches, and a height of 1 inch. The volume of the crayon box is _____ cubic inches.

Using the crayon box, estimate the volume of the shipping box at the right in cubic inches.

- The box at the right holds _____ crayon boxes in each of _____ layers, or _____ crayon boxes.
- Multiply the volume of 1 crayon box by the estimated number of crayon boxes that fit in the box at the right.

_____ × _____ = _____

So, the volume of the shipping box at the right is about _____ cubic inches.

Name _____

Share and Show Math Board

Estimate the volume.

1. Each tissue box has a volume of 125 cubic inches.

There are _____ tissue boxes in the larger box.

The estimated volume of the box holding the tissue boxes is _____ × 125 = _____ cu in.

2. Volume of chalk box: 16 cu in.

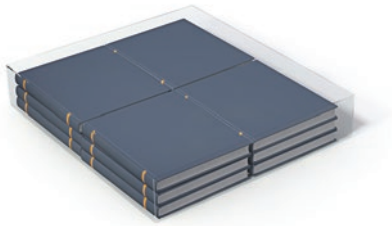
Volume of large box: _____

3. Volume of small jewelry box: 30 cu cm

Volume of large box: _____

On Your Own

4. MTR Mai Jou is mailing a large box of donated books to a community center. The volume of each book is 80 cubic inches. The picture shows the number of books she put in the box. Mai Jou can fit one more layer of books in the box. About what is the volume of the box?



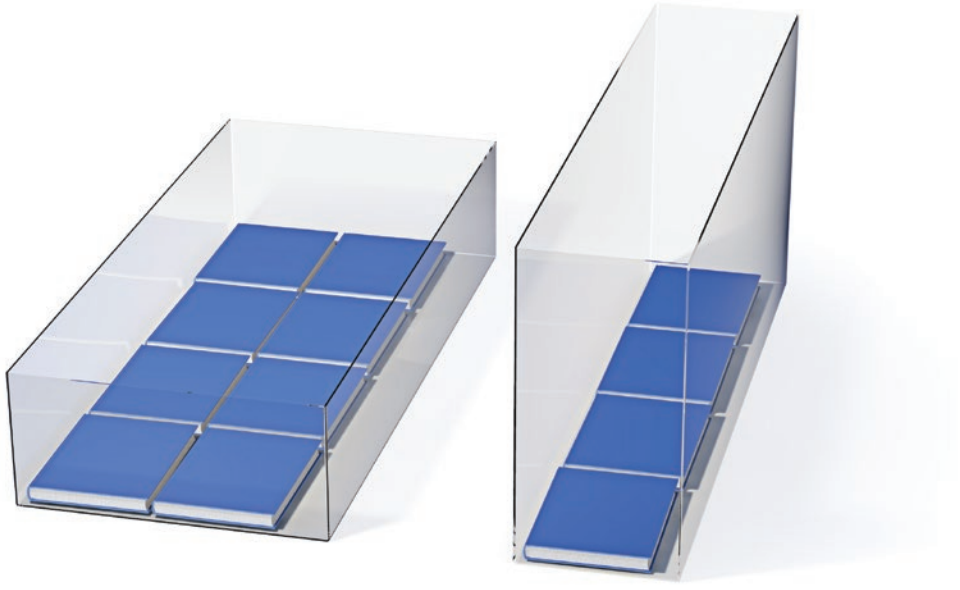
_____

5. Anita is collecting boxes of cereal to deliver to a food bank. The volume of each cereal box is 324 cubic inches. The picture shows the cereal boxes she has collected so far. A large delivery box holds three times as many boxes as Anita collected. About what is the volume of the delivery box?

_____

6. Marcelle estimated the volume of the two boxes below, using one of his books. His book has a volume of 48 cubic inches. Box 1 holds about 7 layers of books, and Box 2 holds about 14 layers of books. Marcelle says that the volume of either box is about the same.

MATH on the Spot



Box 1 Box 2

- Does Marcelle's statement make sense or is it nonsense? Explain your answer.

7. A pack of folders has a length of 12 inches, a width of 5 inches, and a height of 1 inch. The pack of folders will be shipped in a box that holds 12 packs of folders. For 7a–7c, select True or False for each statement.

7a.	Each pack of folders has a volume of 60 cubic inches.	○ True	○ False
7b.	The box has a volume of about 720 cubic inches.	○ True	○ False
7c.	If the box held 15 packs of folders, it would have a volume of about 1,200 cubic inches.	○ True	○ False

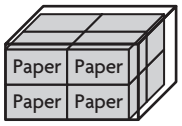
Name _____

Estimate Volume

Go Online
Interactive Examples

Estimate the volume.

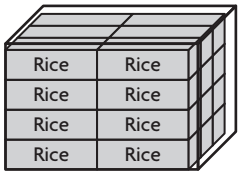
1. Volume of package of paper: 200 cu in.



Think: Each package of paper has a volume of 200 cu in. There are 8 packages of paper in the larger box. So, the volume of the large box is about 8 × 200, or 1,600 cubic inches.

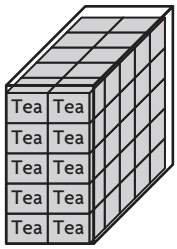
Volume of large box: 1,600 cu in.

2. Volume of rice box: 500 cu cm



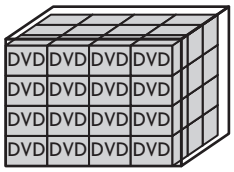
Volume of large box: _____

3. Volume of tea box: 40 cu in.



Volume of large box: _____

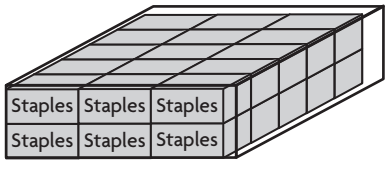
4. Volume of DVD case: 20 cu in.



Volume of large box: _____

Problem Solving Real World

5. Theo fills a large box with boxes of staples. The volume of each box of staples is 120 cu cm. Estimate the volume of the large box.



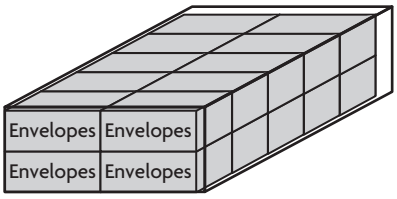
_____

6. WRITE Math Explain how you can estimate the volume of a large container that holds 5 rows of 4 snack-size boxes of cereal in its bottom layer and is 3 layers high. Each cereal box has a volume of 16 cubic inches.

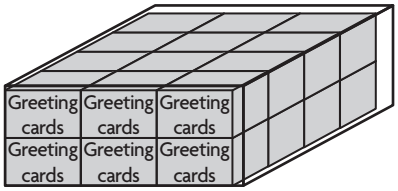
_____

Lesson Check

7. Mesoon packs boxes of envelopes into a larger box. The volume of each box of envelopes is 1,200 cubic centimeters. About what is the volume of the large box?



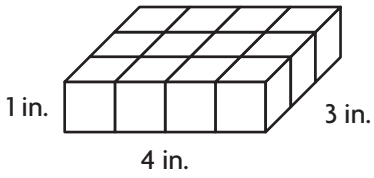
8. Calvin packs boxes of greeting cards into a larger box. The volume of each box of greeting cards is 90 cubic inches. About what is the volume of the large box?



Spiral Review

9. Rosa has 16 unit cubes. How many different rectangular prisms can she build with the cubes?

10. Each cube represents 1 cubic inch. What is the volume of the prism?



11. A certain aquarium holds 20 gallons of water. How many quarts of water does the aquarium hold?

12. Monique ran in a 5-kilometer race. How many meters did Monique run?

Name _____

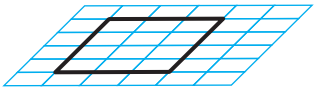
Volume of Rectangular Prisms

Florida's B.E.S.T.

- **Geometric Reasoning** 5.GR.3.1, 5.GR.3.2, 5.GR.3.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1, MTR.7.1

I Can find the volume of a rectangular prism.

MTR The base of a rectangular prism is a rectangle. You know that area is measured in square units, and that the area of a rectangle can be found by multiplying the length and the width.

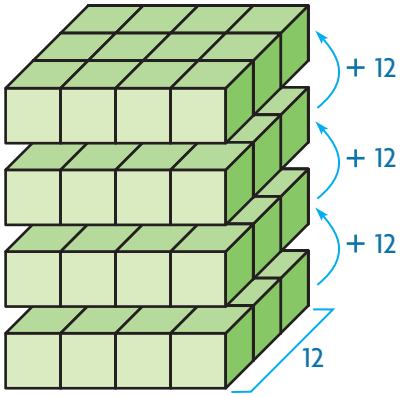


The area of the base is _____ sq units.

Volume is measured in cubic units. When you build a prism and add each layer of cubes, you are adding a third dimension, height.

UNLOCK the Problem Real World

Yuan built the rectangular prism shown at the right, using 1-inch cubes. The prism has a base that is a rectangle and has a height of 4 cubes. What is the volume of the rectangular prism that Yuan built?



You can find the volume of a prism in cubic units by multiplying the number of square units in the base shape by the number of layers, or its height.

Each layer of Yuan's rectangular prism is composed of _____ inch cubes.

Height (in layers)	1	2	3	4
Volume (in cubic inches)	12	24		

Multiply the height by _____.

1. How does the volume change as each layer is added?

_____

_____

2. What does the number you multiply the height by represent?

_____

_____

So, the volume of Yuan's rectangular prism is _____ cu in.

Relate Height to Volume

Toni stacks cube-shaped beads that measure 1 centimeter on each edge in a storage box. The box can hold 6 layers of 24 beads with no gaps or overlaps. What is the volume of Toni's storage box?

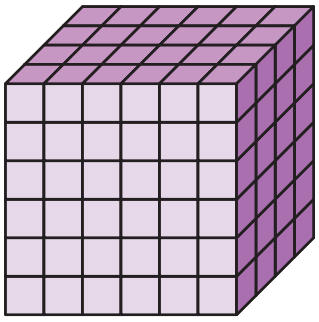
- What are the dimensions of the base of the box?

  _____

- What operation can you use to find the area of the base shape?

  _____

One Way **Use base and height.**



The volume of each bead is _____ cu cm.

The storage box has a base with an area of _____ sq cm.

The height of the storage box is _____ centimeters.

The volume of the storage box is

(_____ × _____), or _____ cu cm.
Base area

Another Way **Use length, width, and height.**

You know that the area of the base of the storage box is 24 sq cm.

The base has a length of _____ centimeters

and a width of _____ centimeters. The height

is _____ centimeters. The volume of the storage box is

(_____ × _____) × _____ , or _____ × _____ , or _____ cu cm.
Base area

So, the volume of the storage box is _____ cu cm.

3. What if each cube-shaped bead measured 2 centimeters on each edge? How would the dimensions of the storage box change? How would the volume change?

_____

_____

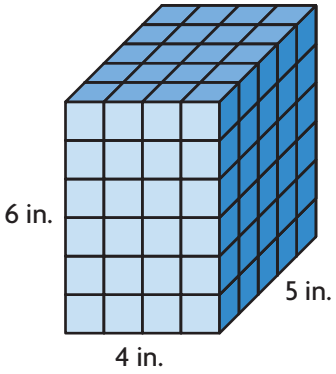
_____

Name _____

Share and Show

Math Board

Find the volume.

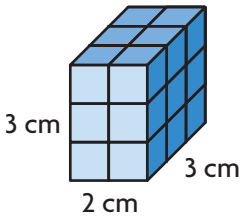


1. The length of the rectangular prism is _____.

The width is _____. So, the area of the base is _____.

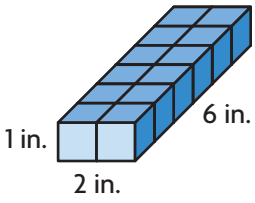
The height is _____. So, the volume of the prism is _____.

2.



Volume: _____

3.



Volume: _____

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

Explain why area is expressed in square units and volume is expressed in cubic units.

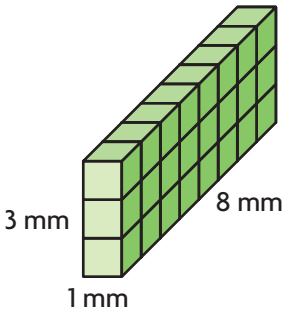
On Your Own

4. MTR Nou, Simon, and Aaliyah each make the rectangular prism shown. If they stand all of their prisms together, side by side, to make one large rectangular prism, what is the volume of the new prism? How did the dimensions change?

_____

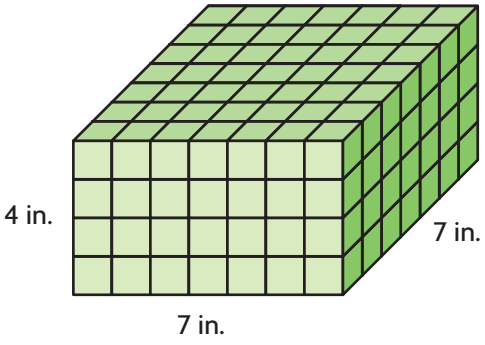
_____

_____



5. The rectangular prism is made of 1-inch cubes. If two more layers of cubes are placed on top of the rectangular prism, how many more cubes are added to the prism? What would be the volume of the new rectangular prism?

_____



Problem Solving · Applications

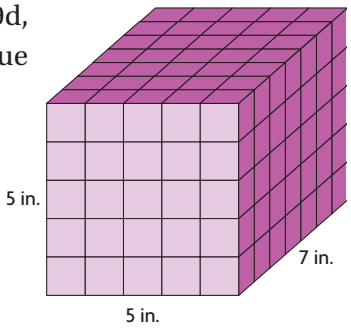
MATH on the Spot

6. Rich is building a travel crate for his dog, Thomas, a beagle-mix who is about 30 inches long, 12 inches wide, and 24 inches tall. For Thomas to travel safely, his crate needs to be a rectangular prism that is about 12 inches greater than his length and width, and 6 inches greater than his height. What is the volume of the travel crate that Rich should build?

7. What happens to the volume of a rectangular prism if you double the height? Give an example.

8. MTR Describe the difference between area and volume.

9. Yee-Tai used 1-inch cubes to make the rectangular prism shown. For 9a–9d, write the value from the tiles that makes each statement correct. Each value can be used more than once or not at all.



1	3	5	7	12	35	125	175

9a. Each cube has a volume of ☐ cubic inch(es).

9b. Each layer of the prism is made up of ☐ cubes.

9c. There are ☐ layers of cubes.

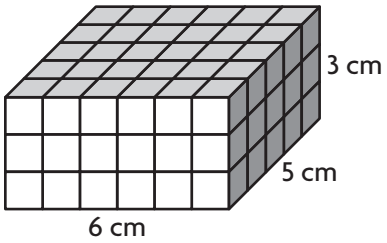
9d. The volume of the prism is ☐ cubic inches.

Name _____

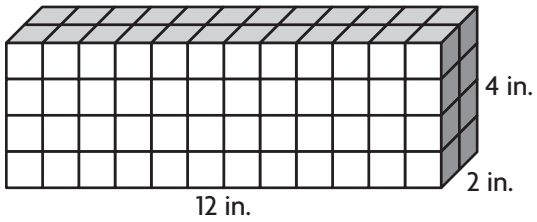
Volume of Rectangular Prisms

Go Online
Interactive Examples

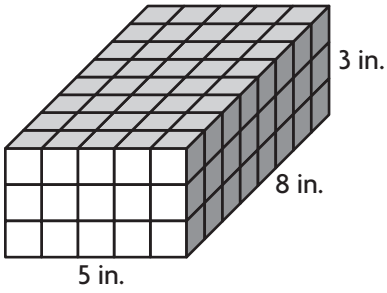
Find the volume.

1. 

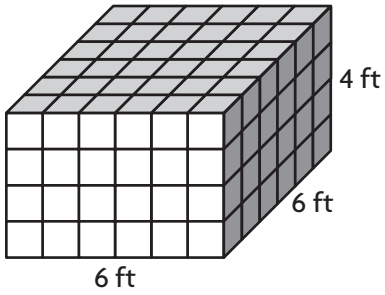
Volume: 90 cu cm

2. 

Volume: _____

3. 

Volume: _____

4. 

Volume: _____

Problem Solving Real World

5. Aaron keeps his baseball cards in a cardboard box that is 12 inches long, 8 inches wide, and 3 inches high. What is the volume of this box?

_____

6. Riley's jewelry box is in the shape of a cube that has 6-inch edges. What is the volume of Riley's jewelry box?

_____

7. WRITE Math Write a word problem that involves finding the volume of a box. Draw the box, solve the problem, and explain how you found your answer.

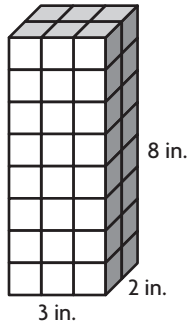
_____

_____

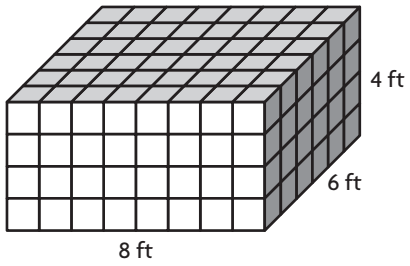
_____

Lesson Check

8. Laini uses 1-inch cubes to build the box shown below. What is the volume of the box?

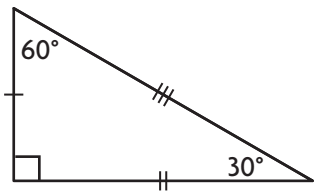


9. Mason stacked 1-foot cube-shaped boxes in a warehouse. What is the volume of the stack of boxes?



Spiral Review

10. What type of triangle is shown below?



11. What quadrilateral always has 4 congruent angles and opposite sides that are congruent and parallel?

12. Kayla is 64 inches tall. What is Kayla's height in feet and inches?

13. Trevor bought 8 gallons of paint to paint a house. He used all but 1 quart. How many quarts of paint did Trevor use?

Name _____

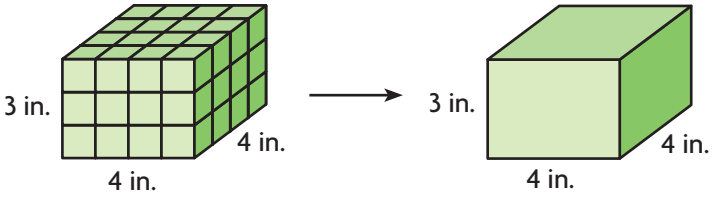
Apply Volume Formulas

Florida's B.E.S.T.

- **Geometric Reasoning** 5.GR.3.1, 5.GR.3.2, 5.GR.3.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1, MTR.7.1

I Can use a formula to find the volume of a rectangular prism.

MTR Both prisms show the same dimensions and have the same volume.



UNLOCK the Problem Real World

Mike is making a box to hold his favorite DVDs. The length of the box is 7 inches, the width is 5 inches and the height is 3 inches. What is the volume of the box Mike is making?

- Underline what you are asked to find.
- Circle the numbers you need to use to solve the problem.

One Way Use length, width, and height.

You can use a formula to find the volume of a rectangular prism.

$$Volume = length \times width \times height$$

$$V = l \times w \times h$$

Math Talk **MTR 5.1** Use patterns and structures.

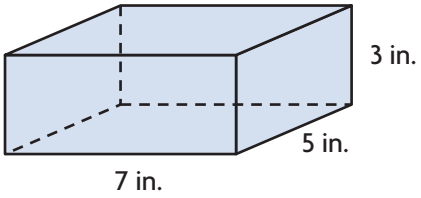
How can you use the Associative Property of Multiplication to group the part of the formula that represents area?

STEP 1 Identify the length, width, and height of the rectangular prism.

length = _____ in.

width = _____ in.

height = _____ in.



STEP 2 Multiply the length and the width.

_____ × _____ = _____

STEP 3 Multiply the product of the length and width by the height.

35 × _____ = _____

So, the volume of Mike's DVD box is _____ cubic inches.

You have learned one formula for finding the volume of a rectangular prism. You can also use another formula.

Volume = *Base area* × *height*

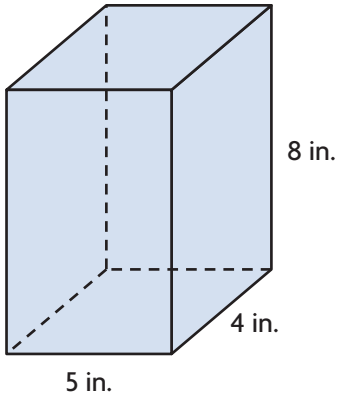
$V = B \times h$

B = area of the base shape,

h = height of the solid figure.

Another Way Use the area of the base shape and height.

Emilio's family has a sandcastle kit. The kit includes molds for several two-dimensional figures that can be used to make sandcastles. One of the molds is a rectangular prism like the one shown at the right. How much sand will it take to fill the mold?



$V =$ B $\times$ h — Replace B with an expression for the area of the base shape. Replace h with the height of the prism.

$V = (\_\_\_\_ \times \_\_\_\_) \times \_\_\_\_$ — Multiply.

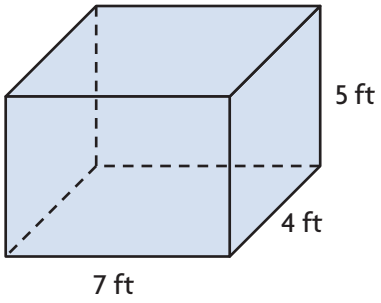
$V = \_\_\_\_ \times \_\_\_\_$

$V = \_\_\_\_$ cu in.

So, it will take _____ cubic inches of sand to fill the rectangular prism mold.

Try This!

A Find the volume.



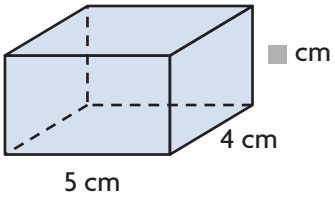
$V =$ l $\times$ w $\times$ h

$V = \_\_\_\_ \times \_\_\_\_ \times \_\_\_\_$

$V = \_\_\_\_ \times \_\_\_\_$

$V = \_\_\_\_$ cu ft

B Find the unknown measurement.



$V = 60$ cu cm

$V = l \times w \times h$

$60 = \_\_\_\_ \times \_\_\_\_ \times$ ■

$60 = \_\_\_\_ \times$ ■

Think: If I filled this prism with centimeter cubes, each layer would have 20 cubes. How many layers of 20 cubes are equal to 60?

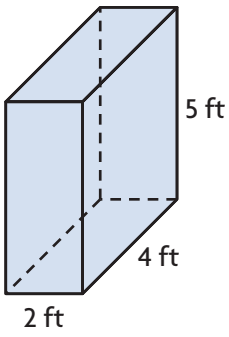
So, the unknown measurement is _____ cm.

Name _____

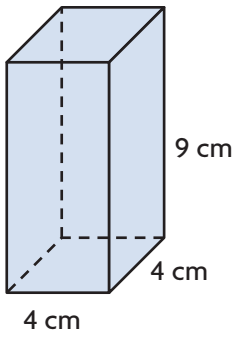
Share and Show

Math Board

Find the volume.

1. 

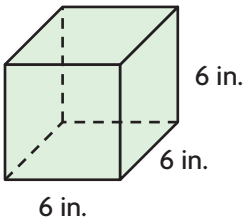
$V =$ _____

2. 

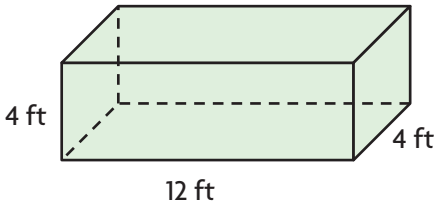
$V =$ _____

On Your Own

Find the volume.

3. 

$V =$ _____

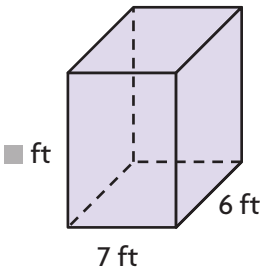
4. 

$V =$ _____

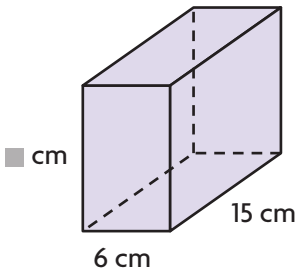
5. Hannah has a box that is in the shape of a rectangular prism. Its height is twice the length, its length is 3 times its width, and the width measures 6 inches. What is the volume of the box?

_____

MTR Find the unknown measurement.

6. 

$V = 420$ cu ft ■ = _____ ft

7. 

$V = 900$ cu cm ■ = _____ cm

Problem Solving · Applications Real World

8. The Jade Restaurant has a large aquarium on display in its lobby. The base of the aquarium is 5 feet by 2 feet. The height of the aquarium is 4 feet. How many cubic feet of water are needed to completely fill the aquarium?

_____

9. The Pearl Restaurant put a larger aquarium in its lobby. The base of the aquarium is 6 feet by 3 feet, and the height is 4 feet. How many more cubic feet of water does the Pearl Restaurant's aquarium hold than the Jade Restaurant's aquarium?

_____

10. Eddie measured his aquarium using a small fish food box. The box has a base area of 6 square inches and a height of 4 inches. Eddie found that the volume of his aquarium is 3,456 cubic inches. How many boxes of fish food could fit in the aquarium? Explain your answer.

MATH on the Spot

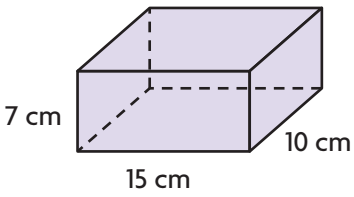
_____

_____

_____

_____

11. Manuel stores his favorite CDs in a box like the one shown.



Use the numbers and symbols on the tiles to write a formula that represents the volume of the box. Symbols may be used more than once or not at all.

V	7	10	15	=	+	×	−	÷

_____

What is the volume of the box? _____ cubic centimeters

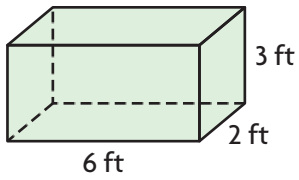
Name _____

Apply Volume Formulas

Go Online
Interactive Examples

Find the volume.

1.

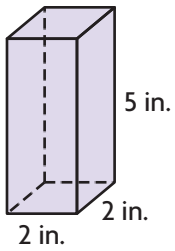


$V =$ *l* $\times$ *w* $\times$ *h*

$V =$ 6 $\times$ 2 $\times$ 3

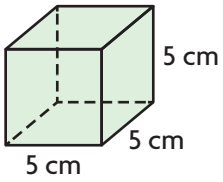
$V =$ 36 cu ft

2.



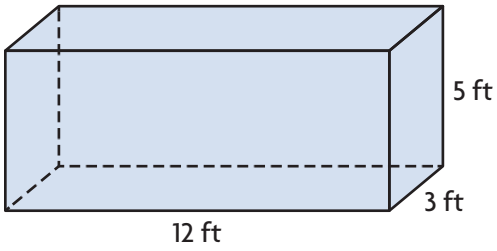
$V =$ _____

3.



$V =$ _____

4.



$V =$ _____

Problem Solving Real World

5. A construction company is digging a hole for a swimming pool. The hole will be 12 yards long, 7 yards wide, and 3 yards deep. How many cubic yards of dirt will the company need to remove?

_____

6. Andrea rents a storage room that is 15 feet long, 5 feet wide, and 8 feet high. What is the volume of the storage room?

_____

7. WRITE Math Explain how you would find the height of a rectangular prism if you know that the volume is 60 cubic centimeters and that the area of the base is 10 square centimeters.

_____

_____

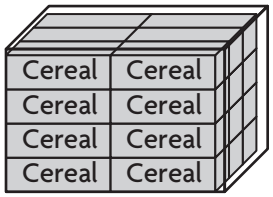
Lesson Check

8. Sayeed is buying a crate for his puppy. The crate is 20 inches long, 13 inches wide, and 16 inches high. What is the volume of the crate?

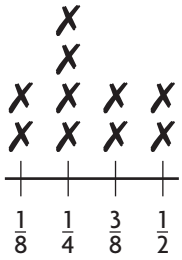
9. Carmen has a gift box in the shape of a cube. Each side of the box measures 15 centimeters. What is the volume of the gift box?

Spiral Review

10. Max packs cereal boxes into a larger box. The volume of each cereal box is 175 cubic inches. About what is the volume of the large box?



11. In health class, students record the weights of the sandwiches they have for lunch. The weights are shown in the line plot below. What is the average weight of one sandwich?



Weights of Sandwiches (in pounds)

12. Cleo has 20 unit cubes. How many different rectangular prisms can she build with the cubes?

13. Darnell went to the movies with his friends. The movie started at 2:35 P.M. and lasted 1 hour 45 minutes. What time did the movie end?

Name _____

Find Volume of Composed Figures

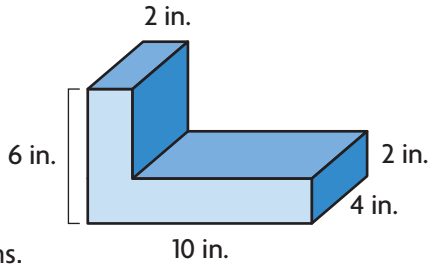
I Can find the volume of rectangular prisms that are combined.

Florida's B.E.S.T.

- **Geometric Reasoning** 5.GR.3.1, 5.GR.3.2, 5.GR.3.3
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.3.1, MTR.4.1, MTR.5.1, MTR.6.1, MTR.7.1

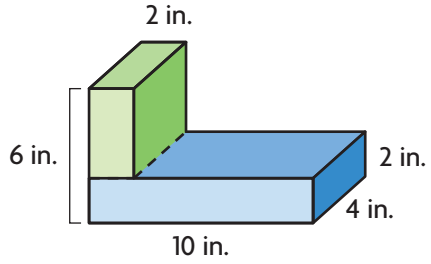
UNLOCK the Problem Real World

The shape at the right is a composite figure. It is made up of two rectangular prisms that are combined. How can you find the volume of the figure?

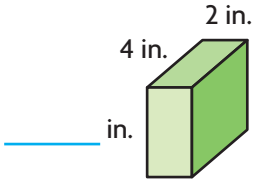


One Way Use addition.

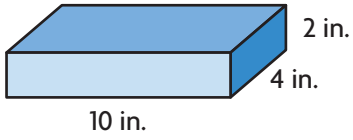
STEP 1 Break apart the composite figure into two rectangular prisms.



STEP 2 Find the length, width, and height of each prism.



Think: The total height of both prisms is 6 inches. Subtract the given heights to find the unknown height. $6 - 2 = 4$



STEP 3 Find the volume of each prism.

$V = l \times w \times h$

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

$V =$ _____ cu in.

$V = l \times w \times h$

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

$V =$ _____ cu in.

STEP 4 Add the volumes of the rectangular prisms.

_____ + _____ = _____

So, the volume of the composite figure is _____ cubic inches.

- **MTR** What is another way you could divide the composite figure into two rectangular prisms?

_____

_____

Another Way Use subtraction.

You can subtract the volumes of prisms formed in empty spaces from the greatest possible volume to find the volume of a composite figure.

STEP 1

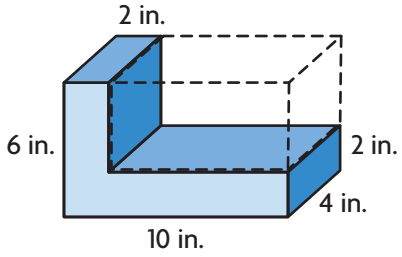
Find the greatest possible volume.

length = _____ in.

width = _____ in.

height = _____ in.

V = _____ cubic inches



STEP 2

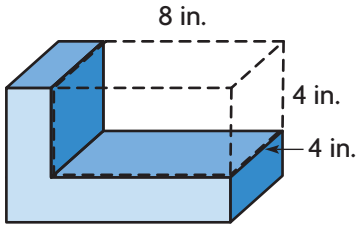
Find the volume of the prism in the empty space.

length = _____ in. **Think:** 10 − 2 = 8

width = _____ in.

height = _____ in. **Think:** 6 − 2 = 4

$V = 8 \times 4 \times 4$ = _____ cubic inches



STEP 3

Subtract the volume of the empty space from the greatest possible volume.

_____ − _____ = _____ cubic inches

So, the volume of the composite figure is _____ cubic inches.

Try This!

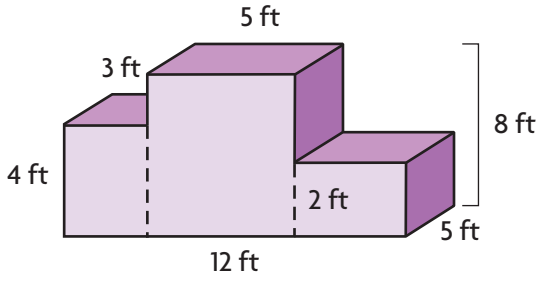
Find the volume of a composite figure made by putting together three rectangular prisms.

V = _____ × _____ × _____ = _____ cu ft

V = _____ × _____ × _____ = _____ cu ft

V = _____ × _____ × _____ = _____ cu ft

Total volume = _____ + _____ + _____ = _____ cubic feet



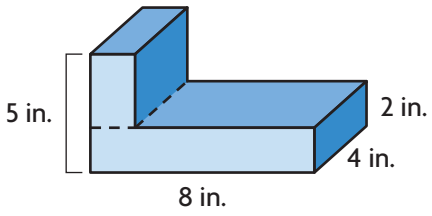
Name _____

Share and Show

Math Board

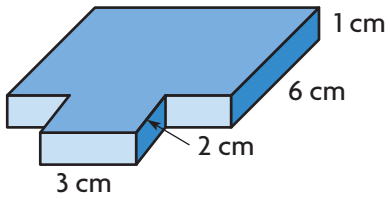
Find the volume of the composite figure.

1.



$V =$ _____

2.

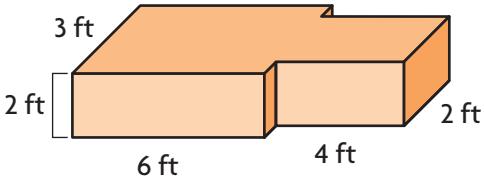


$V =$ _____

On Your Own

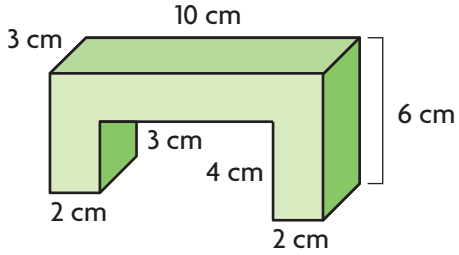
Find the volume of the composite figure.

3.



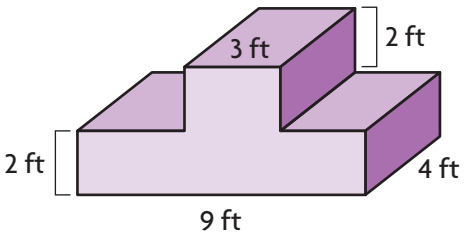
$V =$ _____

4.



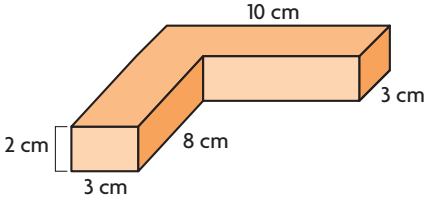
$V =$ _____

5. Mr. Alcorta's class built this platform for a school event. They also built a model of the platform in which 1 foot was represented by 2 inches. What is the volume of the platform? What is the volume of the model?



_____

6. Patty added the values of the expressions $2 \times 3 \times 11$ and $2 \times 3 \times 10$ to find the volume of the composite figure. Describe her error. What is the correct volume of the composite figure?



MATH on the Spot

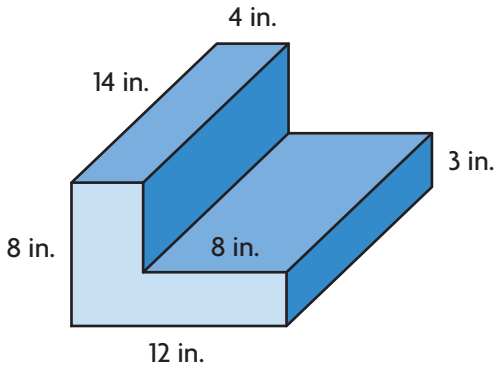
_____

_____

_____

Problem Solving · Applications

Use the composite figure at the right for 7–9.



7. As part of a wood-working project, Jordan made the figure at the right out of wooden building blocks. How much space does the figure he made take up?

_____

8. What are the dimensions of the two rectangular prisms you used to find the volume of the figure? What other rectangular prisms could you have used?

_____

_____

_____

_____

9. MTR If the volume is found using subtraction, what is the volume of the empty space that is subtracted? Explain.

_____

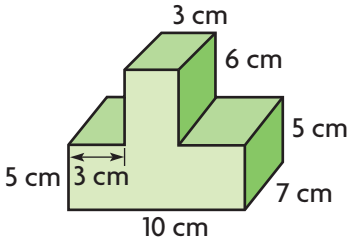
_____

10. WRITE *Math* Explain how you can find the volume of composite figures that are made by combining rectangular prisms.

_____

_____

11. A composite figure is shown. What is the volume of the composite figure?



Volume = _____ cubic centimeters

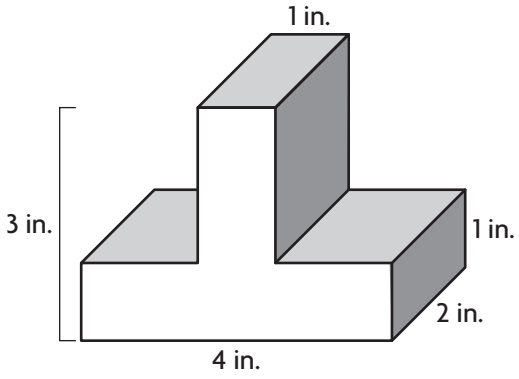
Name _____

Find Volume of Composed Figures

Go Online
Interactive Examples

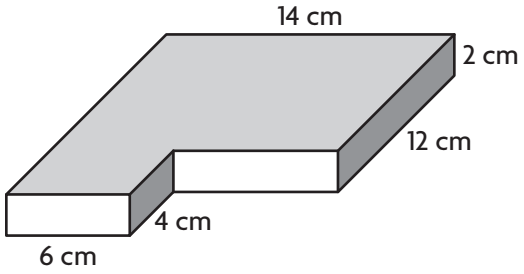
Find the volume of the composite figure.

1.



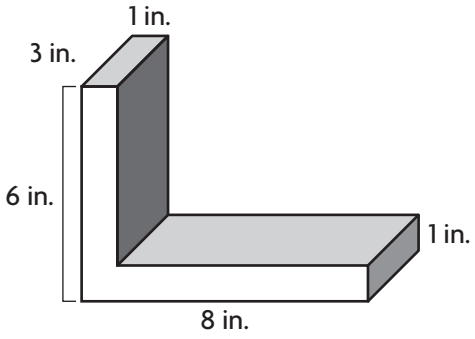
$V =$ _____

2.



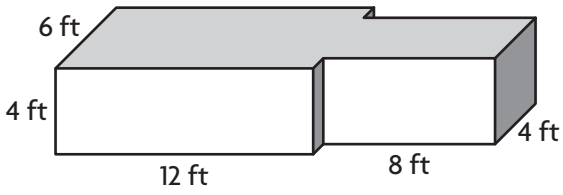
$V =$ _____

3.



$V =$ _____

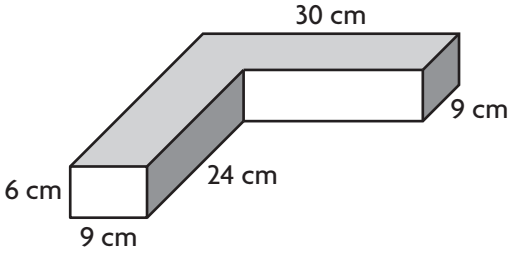
4.



$V =$ _____

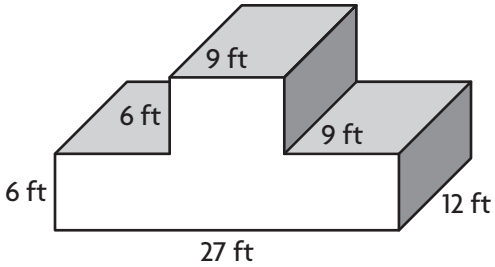
Problem Solving

5. As part of her shop class, Jules made the figure below out of pieces of wood. How much space does the figure she made take up?



_____

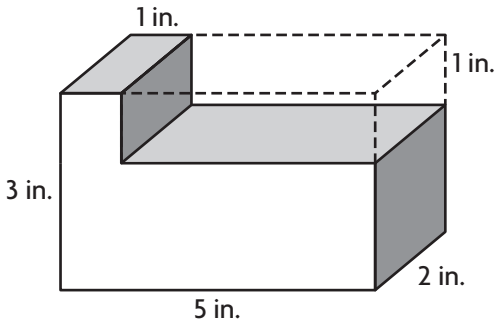
6. What is the volume of the composite figure below?



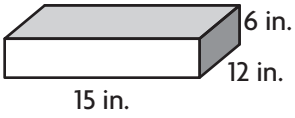
_____

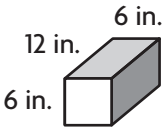
Lesson Check

7. Write an expression to represent the volume of the composite figure.



8. Suppose you take the small prism and stack it on top of the larger prism. What will be the volume of the composite figure?

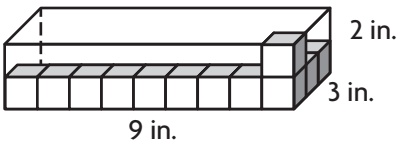




Spiral Review

9. Jesse wants to build a wooden chest with a volume of 8,100 cubic inches. The length will be 30 inches and the width will be 15 inches. How tall will Jesse's chest be?

10. What is the volume of the rectangular prism?



11. Adrian's recipe for cranberry relish calls for $1\frac{3}{4}$ cups of sugar. He wants to use $\frac{1}{2}$ that amount. How much sugar should he use?

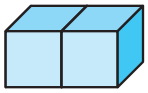
12. Joanna has a board that is 6 feet long. She cuts it into pieces that are each $\frac{1}{4}$ foot long. Write an equation to represent the number of pieces she cut.

Name _____

Chapter 15

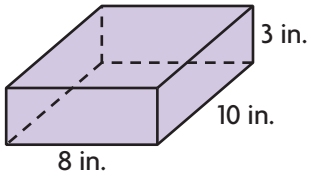
Chapter Review

1. How many faces does this prism have?



_____

2. Jose stores his baseball cards in a box like the one shown.



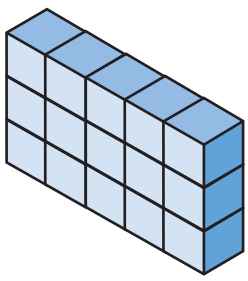
Use the numbers and symbols on the tiles to write a formula that represents the volume of the box. Symbols may be used more than once or not at all.

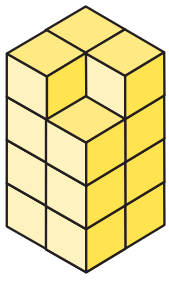
V	3	8	10	=	+	×	−	÷

_____

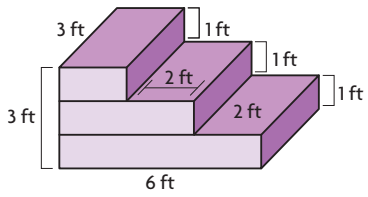
What is the volume of the box? _____ cubic inches

3. Compare the number of unit cubes in each three-dimensional figure. Use <, >, or =.



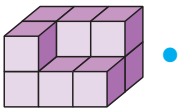


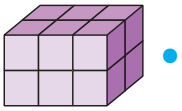
4. What is the volume of the composite figure?

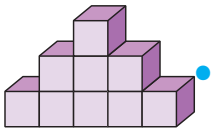


_____ cubic feet

5. Match the figure with the number of unit cubes that would be needed to build each figure. Not every number of unit cubes will be used.

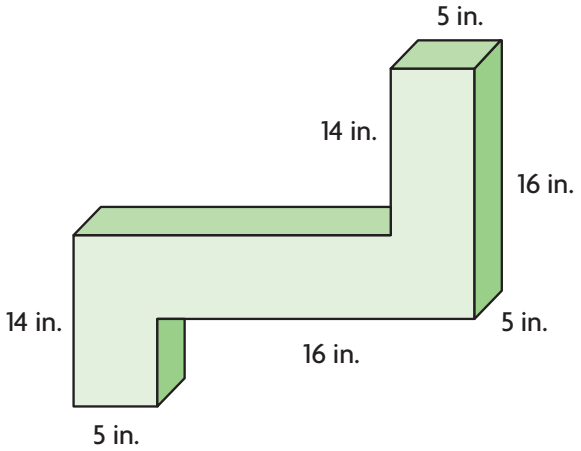






- 8 unit cubes
- 9 unit cubes
- 10 unit cubes
- 11 unit cubes
- 12 unit cubes
- 16 unit cubes

6. As part of a science project, Juaquim built the figure shown.



6a. How much space does the figure take up?

_____

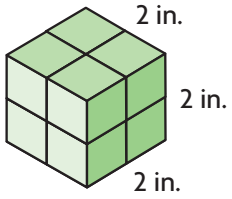
6b. What are the dimensions of the three rectangular prisms you used to find the volume of the figure?

_____

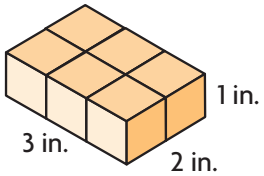
6c. Draw lines on the figure to show how you could have divided it into prisms differently.

Name _____

7. Compare the volume of each three-dimensional figure. Use <, >, or =.

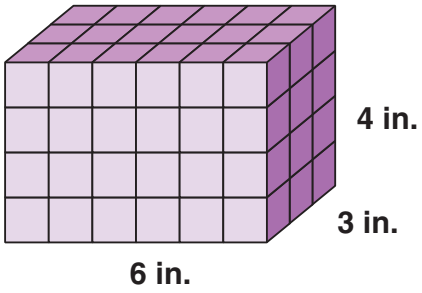


Each cube = 1 cu in.



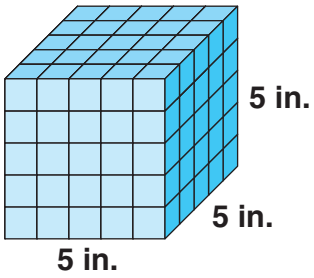
Each cube = 1 cu in.

8. Victoria used 1-inch cubes to build the rectangular prism shown. Find the volume of the rectangular prism Victoria built.



_____ cubic inches

9. A company ships its product in cubical boxes like the one shown.



They ship 20 boxes in a carton. The carton is completely full with no gaps or overlap.

What is the volume of the carton?

_____

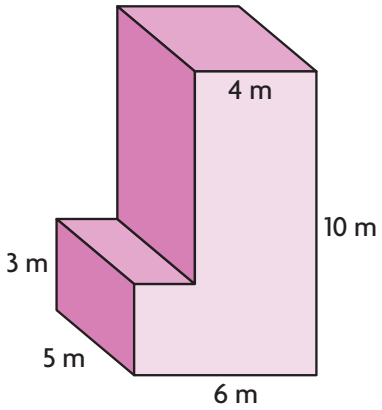
10. A shipping crate holds 20 shoeboxes. The dimensions of a shoebox are 6 inches by 4 inches by 12 inches. For numbers 10a–10c, select True or False for each statement.

10a. Each shoebox has a volume of 22 cubic inches. ○ True ○ False

10b. Each crate has a volume of about 440 cubic inches. ○ True ○ False

10c. If the crate could hold 27 shoeboxes the volume of the crate would be about 7,776 cubic inches. ○ True ○ False

11. A storage locker has the shape shown.



11a. Show how to find the volume using addition.

The volume of the first rectangular prism is _____ m^3.

The volume of the second rectangular prism is _____ m^3.

The volume of the figure is _____ m^3.

11b. Show how to find the volume using subtraction.

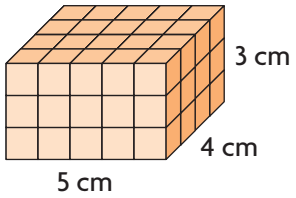
The volume of the greater rectangular prism is _____ m^3.

The volume of the empty space that is subtracted is _____ m^3.

The volume of the figure is _____ m^3.

Name _____

12. The rectangular prism is made of 1-centimeter cubes.



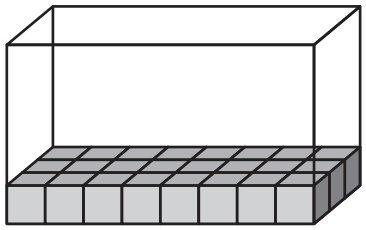
12a. If the height of the prism is doubled, what would be the volume of the prism?

_____ cm^3.

12b. How much greater is the volume of the new prism than the one shown?

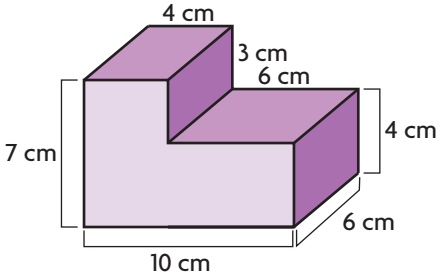
_____ cm^3.

13. Mark packed 1-inch cubes into a box with a volume of 120 cubic inches. How many layers of 1-inch cubes did Mark pack?



_____ layers

14. A composite figure is shown. What is the volume of the composite figure?



Volume = _____ cubic centimeters

15. A pack of crayons has a length of 5 inches, a width of 3 inches, and a height of 1 inch. The packs of crayons will be stored in boxes that hold 15 packs of crayons. For numbers 15a–15c, select True or False for each statement.

15a. Each pack of crayons has a volume of 15 cubic inches. ○ True ○ False

15b. Each box has a volume of about 500 cubic inches. ○ True ○ False

15c. If the box only held 12 packs of crayons, it would have a volume of about 180 cubic inches. ○ True ○ False

16. Megan's aquarium has a volume of 4,320 cubic inches. Which could be the dimensions of the aquarium? Mark all that apply.

Ⓐ 16 in. by 16 in. by 18 in.

Ⓑ 14 in. by 18 in. by 20 in.

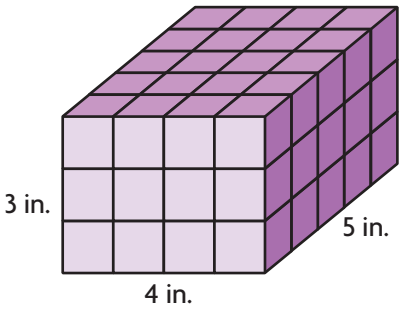
Ⓒ 12 in. by 15 in. by 24 in.

Ⓓ 8 in. by 20 in. by 27 in.

17. Ken keeps paper clips in a box that is the shape of a cube. Each side of the cube is 3 inches. What is the volume of the box?

_____ cubic inches

18. Monica used 1-inch cubes to make the rectangular prism shown. For 18a–18d, write the value that makes each statement true. Each value can be used more than once or not at all.



1	3	4	5	12	15	20	60

18a. Each cube has a volume of _____ cubic inch(es).

18b. Each layer of the prism is made up of _____ cubes.

18c. There are _____ layers of cubes.

18d. The volume of the prism is _____ cubic inches.