

Solids

Name _____

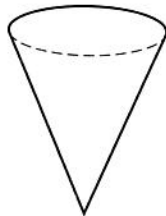
Reteaching
12-1

A **vertex** of a solid is the point at which three or more edges meet.

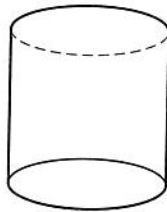
An **edge** of a solid is a line segment where two faces meet.

A **face** of a solid is a flat polygon-shaped surface.

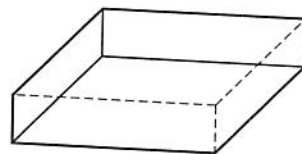
Here are some common three-dimensional shapes:



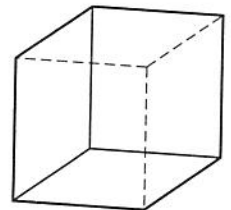
Cone



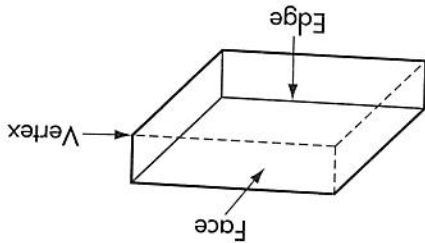
Cylinder



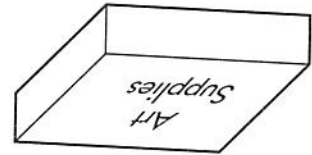
Rectangular Prism



Cube



For 1 through 3, tell which solid each object resembles.



1.



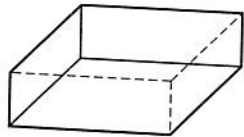
2.



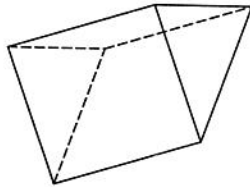
3.

In 4 through 6, complete each table by writing the number of vertices, edges, and faces in each solid shown at the right of each table.

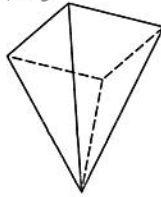
4.	Vertices	Edges	Faces



5.	Vertices	Edges	Faces



6.	Vertices	Edges	Faces



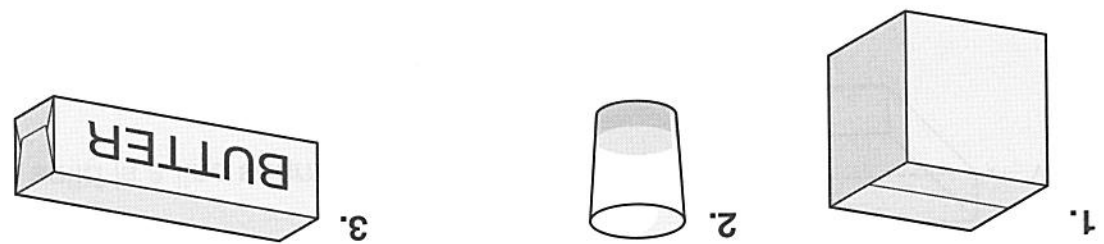
R 12-1

Solids

Name _____

Practice
12-1

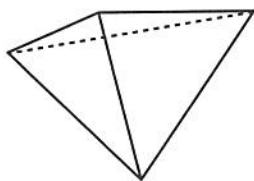
For 1 through 3, tell which solid each object resembles.



For 4 and 5, complete each table by writing the number of vertices, edges, and faces in each solid shown at the right of each table.

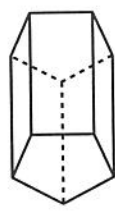
4.

Vertices	Edges	Faces

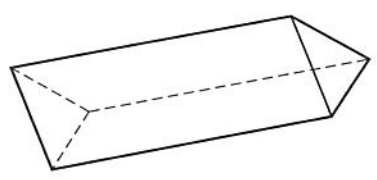


5.

Vertices	Edges	Faces



6. What is the name of the three-dimensional shape at the right?



- A Cone
- B Triangular prism
- C Pyramid
- D Rectangular prism

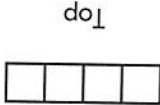
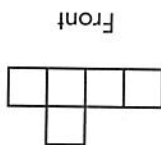
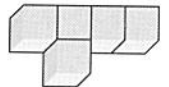
7. How many vertices does a cone have? Explain.

Views of Solids

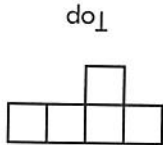
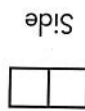
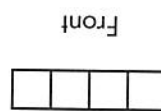
Name _____

Here is what each figure on the left would look like from the front, side, and top. The number of cubes that can't be seen for each figure is written.

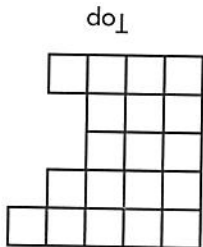
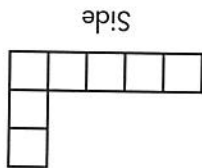
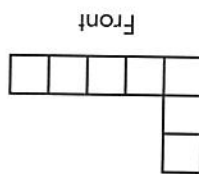
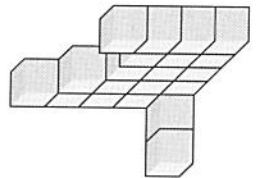
All the cubes are visible.



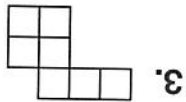
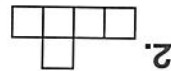
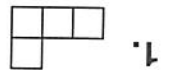
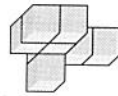
All the cubes are visible.



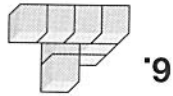
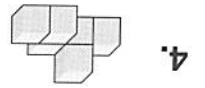
One of the cubes is not visible.



Look at the figure. Label its front, side, and top views.



How many cubes are hidden in each figure?



Views of Solids

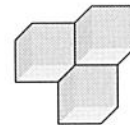
Name _____

Practice
12-2

For 1 and 2, draw front, side, and top views of each stack of unit blocks.



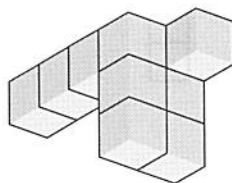
1.



2.

3. In the figure for Exercise 2, how many blocks are not visible?

4. In the figure at the right, how many unit blocks are being used?



- A 8
- B 9
- C 10
- D 11

5. A figure is made from 8 unit blocks. It is 3 units tall. What is the maximum length the figure could be? Explain.

Problem Solving: Use Objects and Solve a Simpler Problem

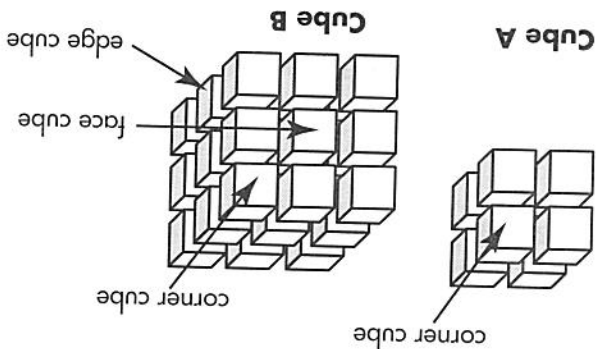
Name _____

At a math fair, Willie saw a puzzle about a giant cube made of smaller identical white cubes. The giant cube was $4 \times 4 \times 4$. It contained 64 smaller cubes. Each of the six faces of the giant cube was painted red. The puzzle asked, "If the giant cube were taken apart, how many smaller cubes would have only one face painted red?" Here is how Willie tried to solve the puzzle.

1. Construct Cube A using 8 smaller cubes and Cube B using 27 smaller cubes. Imagine painting Cubes A and B.

2. Classify the smaller cubes. Think:

Where are the cubes located in the Cubes A and B? How are they painted differently from each other? Make a table to organize the data.



Cube A		Cube B	
Location	Number	Painted Faces	Number
Corner	8	3	8
Edge	none	none	12
Face	none	none	6
Center	none	none	1

Willie organized the data about the 64 smaller cubes in the giant cube. Use the table above to complete the table below. One set of data has already been completed.

Giant Cube		Painted Faces	
Location	Number	Painted Faces	Number
Corner (Think: Same as a $3 \times 3 \times 3$.)	8	3	8
Edge (Think: One more than a $3 \times 3 \times 3$ on each edge.)		2	
Face (Think: Three more than a $3 \times 3 \times 3$ on each face.)		1	
Center (Think: The center is now $2 \times 2 \times 2$.)		0	

Name _____

Problem Solving: Use Objects and Solve a Simpler Problem

Use objects to help you solve a simpler problem. Use the solution to help you solve the original problem.

1. Six people can be seated at a table. If two tables are put together, 10 people can be seated. How many tables are needed to make a long table that will seat 22 people?

2. A large cube has 5 layers, each with 5 rows of 5 small cubes. How many small cubes will the larger cube contain?

3. There are 5 kinds of fish that Jerome feeds: guppies, zebra danios, bettas, platys, and neon tetras. Use the following clues to find the order in which Jerome feeds them.

- Jerome feeds the guppies third.
- Jerome does not feed the bettas right before or right after the guppies.
- Jerome feeds the zebra danios last.
- Jerome feeds the platys after the bettas.

- A** Guppies, zebra danios, bettas, platys, and neon tetras
B Bettas, platys, guppies, neon tetras, zebra danios
C Neon tetras, zebra danios, guppies, platys, bettas
D Bettas, guppies, platys, neon tetras, zebra danios

4. Suppose Ann is placing bowling pins in the following manner: 1 pin in the first row, 2 pins in the second row, 3 pins in the third row, and so on. How many pins will she use if she has 5 rows in her placement? Explain.

Practice
12-3

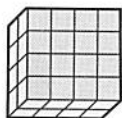
Models and Volume

Name _____

12-4
Reteaching

Volume is the measure of space inside a solid figure. If you had a box, the number of cubic units it would take to fill the box would be the volume.

Find the volume of this box in cubic units by counting the number of unit cubes.

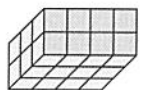


There are 16 cubes in the front layer and there are two layers. The total number of unit cubes is 32.

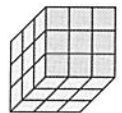
So, the volume is 32 cubic units.

In 1 through 6, find the volume in cubic units.

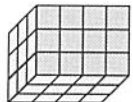
1.



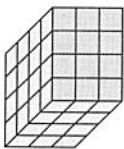
3.



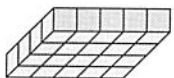
5.



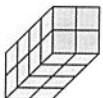
6.



4.



2.



7. Draw a solid figure that has a volume of 10 cubic units.

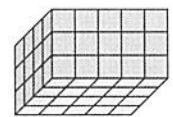
8. A jewelry store received a package of rings that is 16 inches long, 10 inches wide, and 12 inches high. The package contains 1-inch cubes that each hold one ring. How many rings did the jewelry store receive? Explain how you found your answer.

Name _____

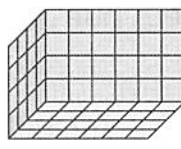
Models and Volume

Practice
12-4

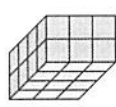
Find the number of cubes needed to make each rectangular prism. You can use unit cubes or you can count the cubes by looking at the drawing.



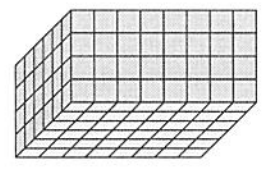
1.



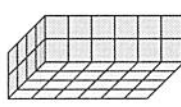
2.



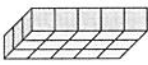
3.



4.



5.



6.

7. In the space below, draw a model of a rectangular prism 5 cubes long \times 4 cubes wide \times 2 cubes high.

8. How many cubes would it take to make a model of a rectangular prism that is 3 units long \times 2 units wide \times 4 units high?

- A 48
- B 24
- C 12
- D 6

9. How can you find the volume of a rectangular prism using a model?

Name _____

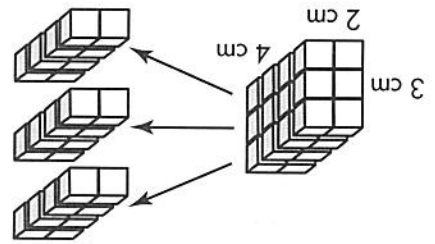
Volume

Reteaching
12-5

Volume is a measure of the space inside a solid figure. It is measured in cubic units. A **cubic unit** is the volume of a cube that has edges that are each 1 unit.

How to find the volume of a rectangular prism

Counting unit cubes:



Count the cubes in each layer: 8 cubes.

Multiply by the number of layers.

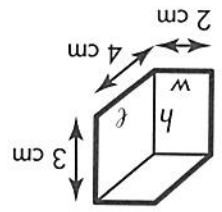
$$8 \text{ cubes} \times 3 = 24 \text{ cubes}$$

The volume of each cube is 1 cm³.

The volume of the prism is 24 cm³.

Using a formula:

You know the length ℓ , the width w , and the height h . Calculate the volume, V , using the formula $V = \ell \times w \times h$.

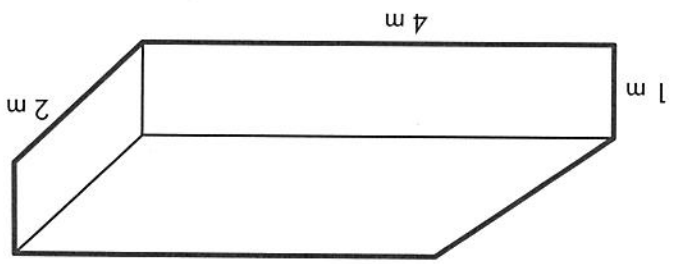


$$V = 4 \text{ cm} \times 2 \text{ cm} \times 3 \text{ cm}$$

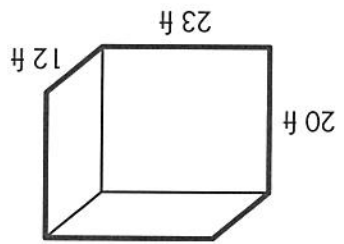
$$V = 24 \text{ cm}^3$$

Find the volume of each rectangular prism using a formula.

1.



2.



Name _____

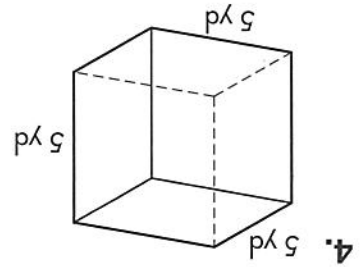
Volume

Find the volume of each rectangular prism.

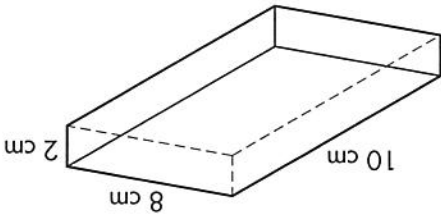
1. base area 56 in^2 , height 6 in .

2. base area 32 cm^2 , height 12 cm

3. base area 42 m^2 , height 8 m

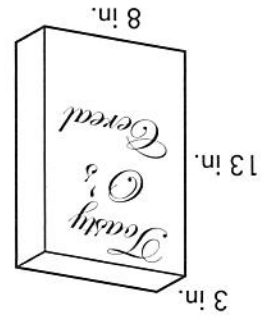


4.



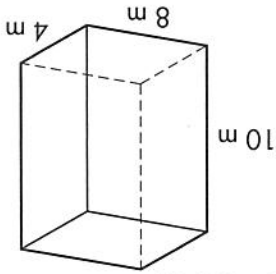
5.

6. What is the volume of the cereal box?



7. What is the volume of this solid?

- A 3.2 m^3
- B 32 m^3
- C 320 m^3
- D $3,200 \text{ m}^3$



8. What is the height of a solid with a volume of 120 m^3 and base area of 30 m^2 ?

9. Bradford has an aquarium with a base that is $22 \text{ inches} \times 12 \text{ inches}$ and a height that is 15 inches . What is the volume of the aquarium? Would the volume of the aquarium change if it did not have a lid? Explain.

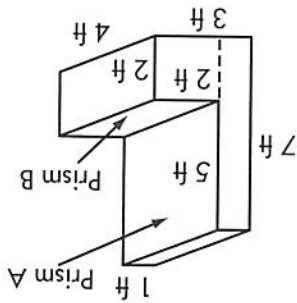
Name _____

Combining Volumes

12-6
Reteaching

To find the volume of a solid made up of familiar parts, find the volume of each part and add the volumes.

Step 1: To find the volume of the figure at the right, separate the solid into two rectangular prisms. (See the dotted line in the figure.)



Step 2: Use the formula

$$V = \ell \times w \times h \text{ to find}$$

the volume of each prism.

Step 3: Add the volumes

of each prism.

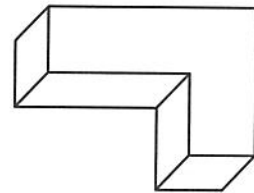
$$V = 1 \times 4 \times 7 = 28 \text{ ft}^3 \quad V = 2 \times 4 \times 2 = 16 \text{ ft}^3$$

The volume of the solid is $28 + 16 = 44 \text{ ft}^3$.

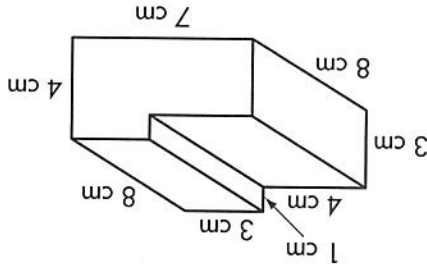
Volume of Prism B

Volume of Prism A

1. Show two ways of dividing the given solid into two rectangular solids.



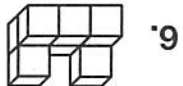
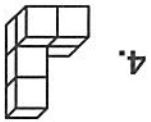
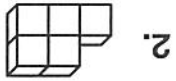
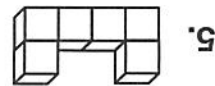
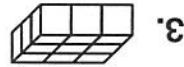
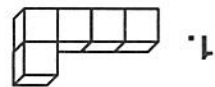
2. Find the volume of the rectangular solid shown below. Show your work.



Name _____

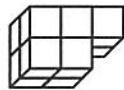
Problem Solving: Use Objects and Reasoning

Find the volume of each figure of centimeter cubes.



7. Make and draw a figure of cubes that has a volume of 6 cm^3 .

8. Without building a model, tell whether a long row of 8 cubes or a cube made from 8 cubes would have a greater volume. Explain.



9. Make and draw a figure that has the same volume as the diagram.

10. Find the volume of these figures. Then describe the pattern(s) you see. Can you determine the volume of the next figure in the pattern? Explain.

