

Understand Volume



Dear Family,

This week your child is exploring volume.

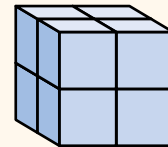
Volume is the amount of space inside a **solid figure**. A **unit cube** is a cube, 1 unit on each edge, used to measure volume.

Your child has already learned to find the area of a **plane figure**, such as a rectangle, by covering it with **unit squares**. Area is the number of square units needed to cover a plane figure.



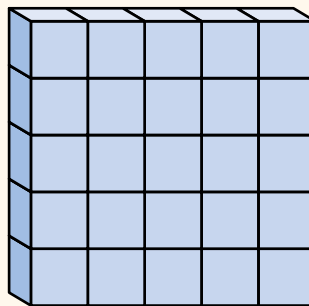
Area = 4 square units

Now your child is learning to find the volume of a solid figure, such as a cube, by filling it with unit cubes. Volume is the number of unit cubes needed to fill a solid figure. The cube at the right has a volume of 8 **cubic units**.

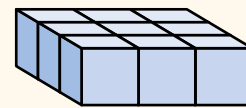


Volume = 8 cubic units

Each unit cube in the solid figures *A* and *B* at the right has a volume of 1 cubic unit.



A



B

To find which figure has a greater volume, you can count the unit cubes. Figure *A* has a volume of 25 cubic units. Figure *B* has a volume of 9 cubic units. Figure *A* has a greater volume than Figure *B* because $25 > 9$.

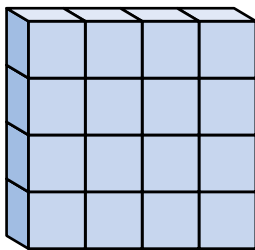
Invite your child to share what he or she knows about volume by doing the following activity together.

ACTIVITY VOLUME OF A RECTANGULAR PRISM

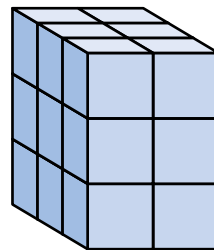
Do this activity with your child to explore volume.

A solid figure with six rectangular sides is called a rectangular prism. Work together with your child to find the volume of the rectangular prisms below.

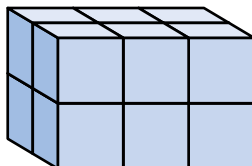
- Each solid figure below is a rectangular prism made of unit cubes. Each unit cube has a volume of 1 cubic unit.
- Ask your child to explain how to find the volume of each rectangular prism. Then write the volume.
- Challenge! Look at all the solid figures below. Which two figures have the same volume? What is the same about the figures? What is different?



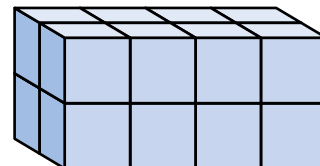
Volume = cubic units



Volume = cubic units



Volume = cubic units



Volume = cubic units

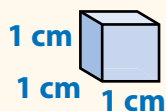
Find Volume Using Unit Cubes



Dear Family,

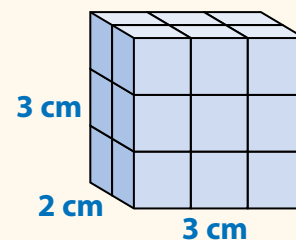
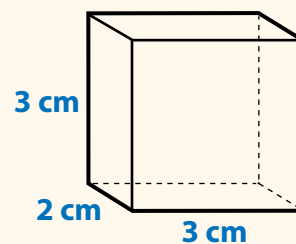
This week your child is learning to find volume using unit cubes.

Suppose you want to find the volume of the rectangular prism shown at the right. One way to find the volume is to fill it with unit cubes that each have a volume of 1 cubic centimeter.



1 cubic centimeter

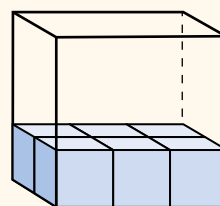
You can count all the cubes to find the volume. The prism has a volume of 18 cubic centimeters.



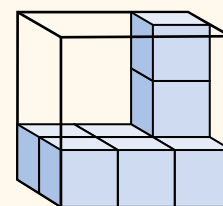
Another way to find the volume is to count the cubes in each layer and then add.

There are 6 cubes in each layer and 3 layers in all.

$$6 + 6 + 6 = 18 \text{ cubes}$$



One layer



3 total layers

The volume of the rectangular prism is 18 cubic centimeters. Using either method, the volume is the same.

Your child is also learning that unit cubes can be different sizes. So, it is important to know the size of the cube you are using when you find the volume of a figure.

- A unit cube with side lengths of 1 centimeter has a volume of 1 cubic centimeter.
- A unit cube with side lengths of 1 inch has a volume of 1 cubic inch.
- A unit cube with side lengths of 1 foot has a volume of 1 cubic foot.

Invite your child to share what he or she knows about different ways to find volume by doing the following activity together.

ACTIVITY FIND VOLUME USING UNIT CUBES

Do this activity with your child to find volume with unit cubes.

Materials scissors, tape, household containers shaped like rectangular prisms, such as cereal boxes and tissue boxes

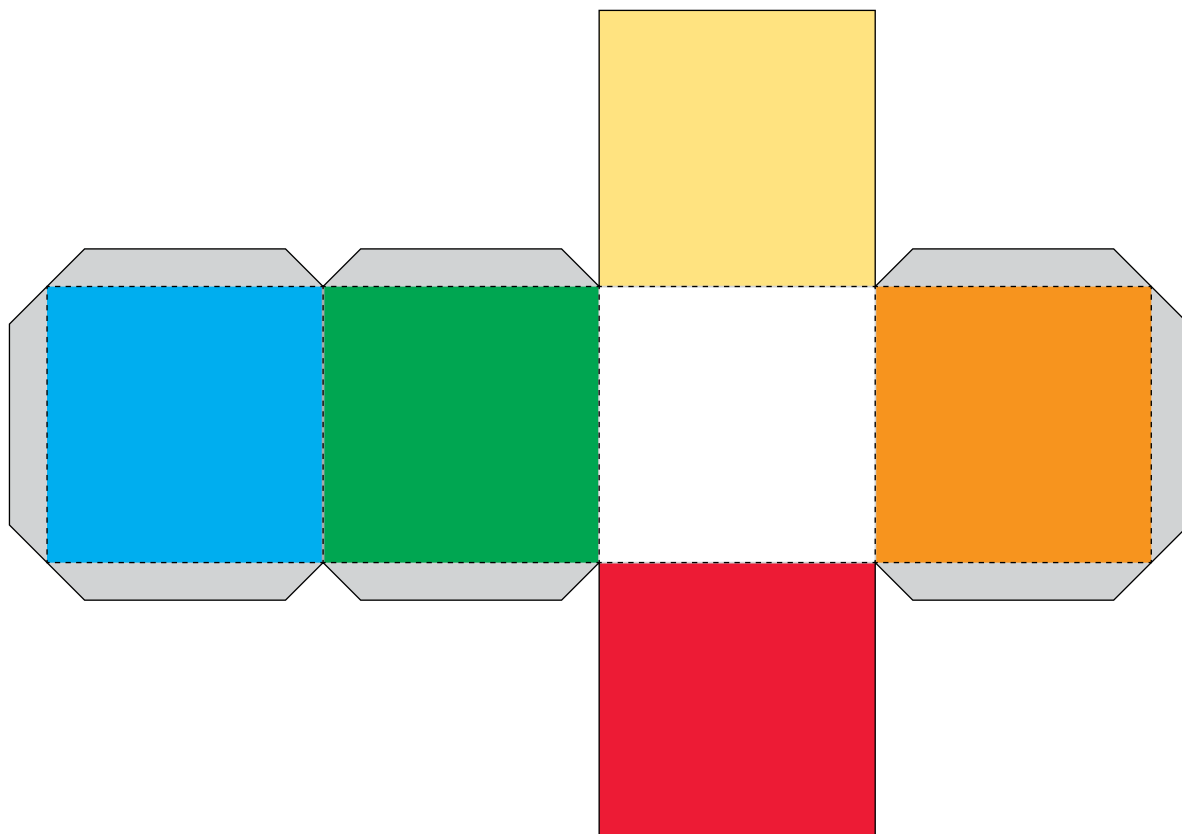
- Cut out the cube pattern below on the solid lines. Fold on the dotted lines and tape into a cube. This cube represents 1 cubic unit of volume.
- Have your child use the unit cube to estimate the volume of one household container (the number of cubes that fit in the container). Because your child is finding an approximate volume, discuss that the cubes do not need to fill the length, width, and height of the container completely (with no gaps).
- Ask your child the questions below:

How many cubes would fit in the bottom of the box?

How many layers of cubes would fit in the box?

What is the approximate volume of the box?

- Repeat for another container.



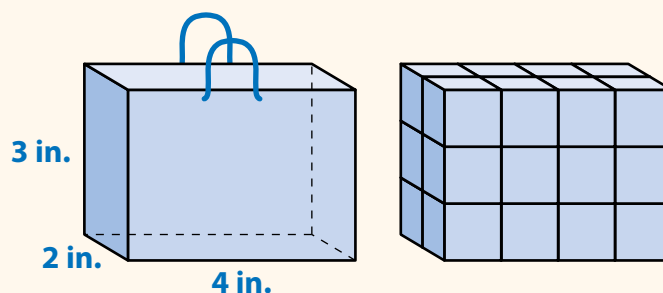
Find Volume Using Formulas



Dear Family,

This week your child is learning to find the volume of a solid figure using a formula.

You can use a formula to find the volume of a rectangular prism if you know its length, width, and height. The picture shows a gift bag that is 4 inches long, 2 inches wide, and 3 inches high. The model beside the bag shows the number of 1-inch cubes that would fill the bag.



Using the model, you can find the volume of the cube by multiplying the number of cubes in each layer by the number of layers.

The equation to the right shows that multiplying the number of cubes in each layer by the number of layers is the same as multiplying length, width, and height. This is one of the volume formulas your child is learning to use.

$$\begin{array}{rcccl} \text{volume} & = & \text{number of cubes} & \times & \text{number} \\ & & \text{in each layer} & & \text{of layers} \\ & & \downarrow & & \downarrow \\ & & 8 & \times & 3 \\ & & \downarrow & & \\ & & 4 \times 2 & \times & 3 \\ & \swarrow & & \searrow & \downarrow \\ \text{length} & & \text{width} & & \text{height} \end{array}$$

$$\begin{aligned} \text{Volume} &= \text{length} \times \text{width} \times \text{height} \\ \text{Volume} &= 4 \text{ inches} \times 2 \text{ inches} \times 3 \text{ inches} \\ &= (8 \times 3) \text{ cubic inches} \\ &= 24 \text{ cubic inches} \end{aligned}$$

The volume of the gift bag is 24 cubic inches.

Invite your child to share what he or she knows about finding volume using a formula by doing the following activity together.

ACTIVITY USE A VOLUME FORMULA

Do this activity with your child to find volume using a formula.

Work with your child to use a formula to find the volume of the L-shaped solid figure shown at the right.

- The figure is composed of two rectangular prisms. Ask your child to talk about different ways to break the figure apart into two smaller rectangular prisms.
- Choose two ways to break the figure into rectangular prisms. Have your child draw pictures of the two ways to break up the figure and label the lengths, widths, and heights.
- Start with one of the ways your child broke up the figure. Have him or her use the volume formula below to find the volume of each of the smaller rectangular prisms. Then add the volumes to find the volume of the original figure.

$$\text{Volume} = \text{length} \times \text{width} \times \text{height}$$

- Repeat for the other way your child broke up the figure.
- Have your child compare the two volumes he or she found for the figure. They should be the same. Ask your child: *Suppose there were a third way to break the figure into two other rectangular prisms. Would the volume of the figure be the same?*

