Polygons / Prisms / Volume Sample Lesson

**• Lesson on Volume of a Solid Object**

A. The <u>volume</u> of an object is a measure of how much <u>space</u> the object occupies.

For example, if we are wondering whether a watermelon will fit in our refrigerator, it's the <u>volume</u> of the melon that we are interested in. Or if we are concerned that adding five cherries to a glass of lemonade will make some lemonade spill out, it's the <u>volume</u> of the cherries that is important. And if we need to know which of two rocks is "bigger", it is their <u>volumes</u> that we compare.

Since volume is a <u>measurement</u>, there must be <u>units</u> for expressing it—just as we have pounds and ounces for describing weight; square inches and square meters for describing area; etc.

Our units for measuring volume are standard <u>cubes</u> (cubic inches, cubic centimeters, cubic feet, etc.).

B. <u>Finding</u> the volume of objects such as watermelons, cherries, and pieces of rock is a difficult task. But for certain kinds of objects, we can easily calculate their volumes by <u>thinking</u> of them as a stack of congruent <u>layers</u> of cubes. These figures are called <u>prisms</u>. Here are some examples. (Cubes represent cubic centimeters.)
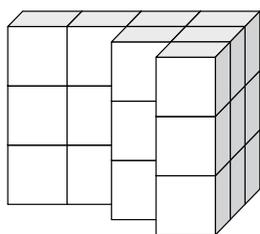
7 cubes per layer times 3 layers
21 total cubes
Volume: 21 cubic centimeters
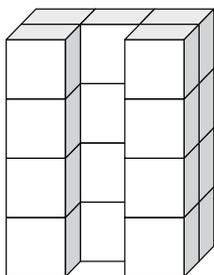
5 cubes per layer times 4 layers
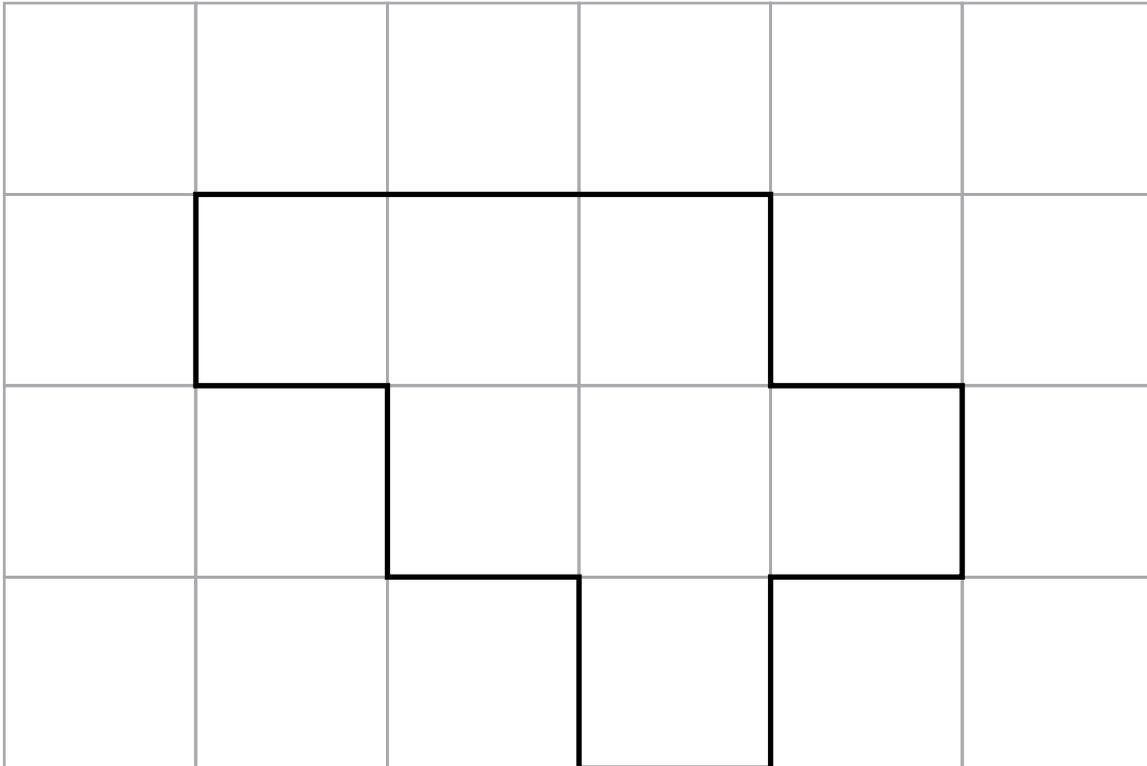20 total cubes
Volume: 20 cubic centimeters
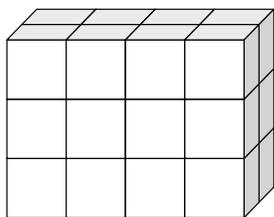
8 cubes per layer times 3 layers
24 total cubes
Volume: 24 cubic centimeters

(Notice that the layers of this prism are rectangles—so its no surprise that it is called a <u>rectangular prism</u>.

C. | Students need a supply of 1-inch cubes.

The individual squares in the grid below are square inches.

a. Put a cube <u>on top of each square inch</u> in the polygon shown in bold. How many cubes did you use to make this layer?

b. Put another layer of cubes on the top of the first layer. How many cubes are in this second layer? Altogether, how many cubes are in the two layers?
     What is the volume of the prism?

c. If you put <u>four more</u> layers of cubes on top of the two layers you already have, how many cubes would there be in the whole structure? How <u>high</u> would the structure be? What would be its volume?

F. The foundation for a statue of Thomas Jefferson is a rectangular prism. The block was made by cementing together 1-foot stone cubes, as shown in the picture.
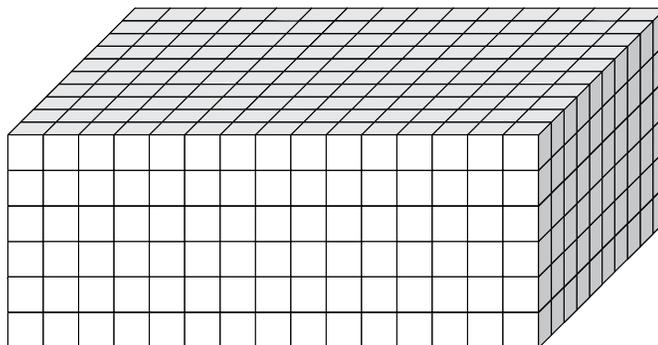
   a. How <u>high</u> is the block?

   b. How many <u>layers</u> of cubes were used to build the block?

   c. What is the length and width of each layer?

   d. How many cubes are in each layer?
   How did you find this answer?

   e. What is the volume of the block?
   What did you <u>do</u> to find the answer?

Now let's notice <u>what</u> <u>we</u> <u>did</u> to find the volume of the rectangular prism in part F:

number of cubes per layer   ×   number of layers   =   Volume

<u>length</u> × <u>width</u> of layers   <u>height</u> of prism

So we find the volume by multiplying length times width times height.
This can be written as a "formula":

Volume   =   L × W × H
for   length width height
rectangular prism

And remember that the three numbers can be multiplied in any order!