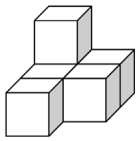
Volume

The **volume** of an object has to do with how much SPACE it takes up or occupies.

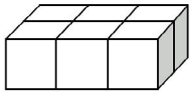
You have measured the volume of liquids with measuring cups that use ounces or milliliters. If we need to know the volume of a big object, such as a room, we cannot pour water into it to measure it with measuring cups. Instead, we use cube-shaped units or **cubic units**, and we simply check or calculate how many cubic units fit into the object.

This little cube is **1 cubic unit.**

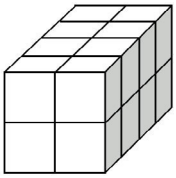
The volume of the figure on the right is six cubic units. We write V = 6 cubic units. Note that one cube is not visible.



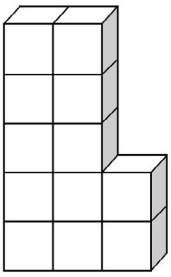
1. Find the volume of these figures in cubic units. "V" means volume.



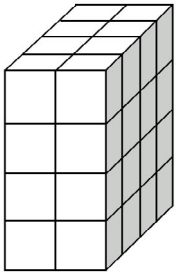
a. V = _____ cubic units



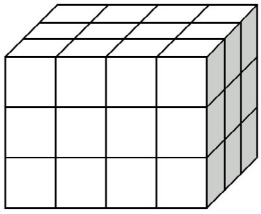
b. V = _____ cubic units



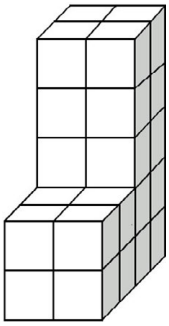
c. V = _____ cubic units



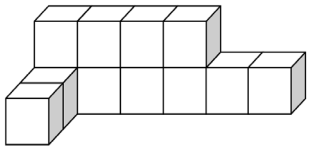
d. V = _____ cubic units



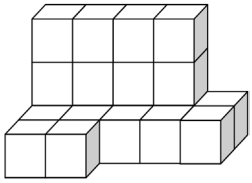
e. V = _____ cubic units



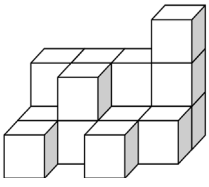
f. V = _____ cubic units



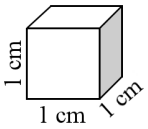
g. V = _____ cubic units



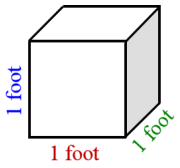
h. V = _____ cubic units



i. V = _____ cubic units

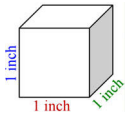


Each edge of this cube measures 1 cm. The volume of the cube is **1 cubic centimeter**. This is abbreviated as **1 cm^3**.



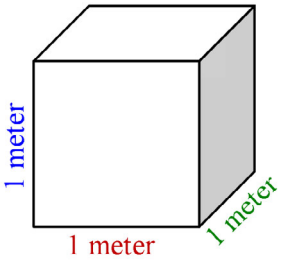
Each edge of this cube is 1 foot. Its volume is **1 cubic foot.**

V = 1 cu. ft. or 1 ft^3



Each edge of this cube is 1 inch. Its volume is **1 cubic inch**.

V = 1 cu. in. or 1 in^3

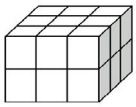


Each edge of this cube is 1 meter. Its volume is **1 cubic meter.**

V = 1 m^3

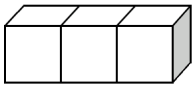
In general, if the edges of the cube are in certain units (such as inches, feet, centimeters, or meters), then the volume will be in corresponding *cubic* units.

If no unit is given for the edge lengths, we use the word "unit" for the lengths of the edges, and "cubic unit" for the volume. This "box" has a volume of 18 cubic units.



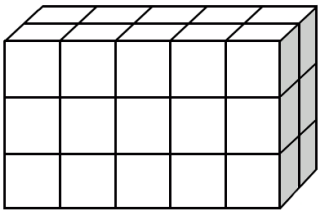
2. Find the total volume of each figure when the edge length of the little cube is given. Remember to include the unit!

The edge of each cube is 1 in.



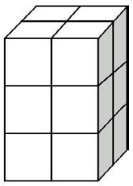
a. V = *3 in^3*

The edge of each cube is 1 ft.



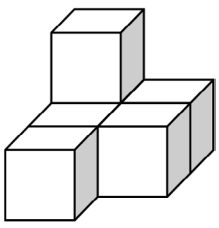
b. V = _____

The edge of each cube is 1 cm.



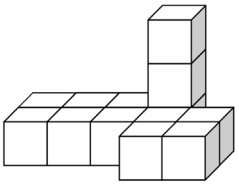
c. V = _____

The edge of each cube is 1 m.



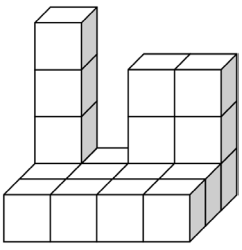
d. V = _____

The edge of each cube is 1 cm.



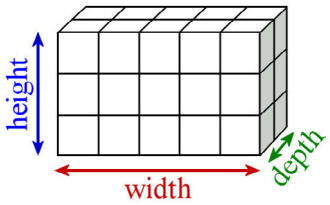
e. V = _____

The edge of each cube is 1 in.



f. V = _____

This figure is called a **rectangular prism.** It is also called *a cuboid*. It is simply a box with edges that meet at right angles.

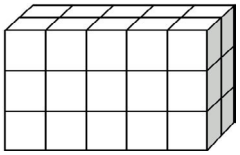


Many people call the **three dimensions** that we measure "length," "width," and "height." Here we will use "width," "depth," and "height."

The **width** will be the dimension that runs left to right.
The **depth** will be the dimension that points away from you—into the paper, so to speak.
The **height** will be the dimension pointing "up" in the figure.

A way to find the volume of a rectangular prism

1) Can you figure out a way to find the number of cubes in the *bottom* layer of this rectangular prism *without* counting?

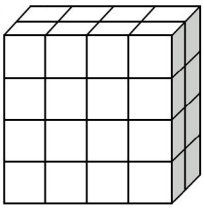
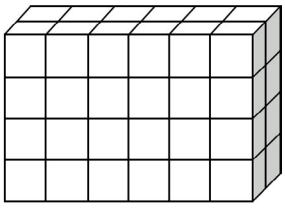
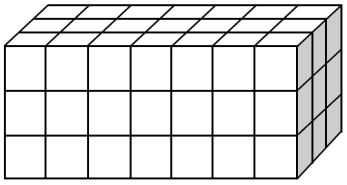
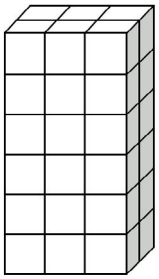


You can multiply 5 × 2 = 10, which means multiplying the *width* and the *depth*. The bottom layer has 10 cubic units.

2) After that, there is a way to easily find the *total* number of cubes in the rectangular prism (its volume). Can you figure that out?

Take the number of cubes in the bottom layer, and **multiply that by the number of layers** (the *height*). There are 10 cubes in the bottom layer, and 3 layers. We get 10 × 3 = 30 cubic units.

3. Find the volume of these rectangular prisms by finding the amount of cubic units in the bottom layer and multiplying that by the height (how many layers there are).

	a.	**b.**	**c.**	**d.**
				
Cubes in the bottom layer	*8*			
Height	*4*			
Volume	*32*			

4. If each little cube is 1 cubic inch, what is the total volume of the outer box?