

Grade 5 - Volume of Rectangular Prisms - Lesson

Common Core 5.MD.C.3, 5.MD.C.4, 5.MD.C.5 · maths-pdf.fr/en/

Volume is the amount of space inside a solid figure, measured in cubic units. For a rectangular prism, multiply length times width times height: $V = l \times w \times h$. You can also multiply the area of the base by the height: $V = B \times h$. For a solid made of two prisms, add the two volumes.

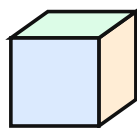
Grade 5 · Common Core State Standards: **5.MD.C.3, 5.MD.C.4, 5.MD.C.5**

Key facts

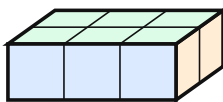
- A unit cube has volume 1 cubic unit.
- Volume is measured in cubic units such as cm^3 , in^3 and ft^3 .
- $V = l \times w \times h$, and $V = B \times h$ where B is the base area.
- A composite solid made of two prisms has volume equal to the sum of the two volumes.
- Volume = (cubes in one layer) $\times$ (number of layers).

What is volume?

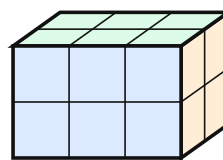
Volume is the amount of space inside a solid figure. We measure it by counting **unit cubes**. A unit cube has edges that are 1 unit long, so its volume is 1 **cubic unit**. If the edges are 1 centimeter long, the volume is 1 cubic centimeter, written 1 cm^3 .



1 cube
1 cubic unit



1 layer
 $3 \times 2 = 6$ cubes



2 layers
 $6 \times 2 = 12$ cubes

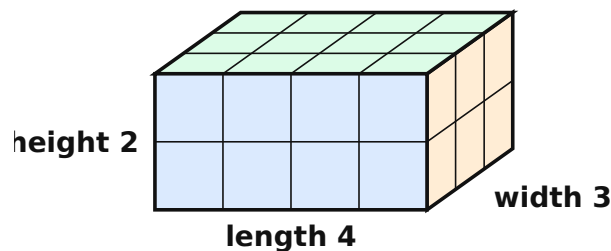
Layers of unit cubes build a prism. The volume counts every cube.

Vocabulary

Volume: space inside a solid. **Cubic unit:** the volume of a cube with edge length 1. **Base:** the face the prism sits on. **Layer:** one level of unit cubes.

How do you find volume by counting cubes?

Fill the bottom layer, then count how many layers are stacked. This prism has 4 cubes along the length and 3 along the width, so one layer has $4 \times 3 = 12$ cubes. There are 2 layers, so the volume is $12 \times 2 = 24$ cubic units. Counting layers is the same as multiplying: the cubes in one layer tell the area of the base, and the number of layers tells the height. This idea lets you find the volume of a big box without building it.

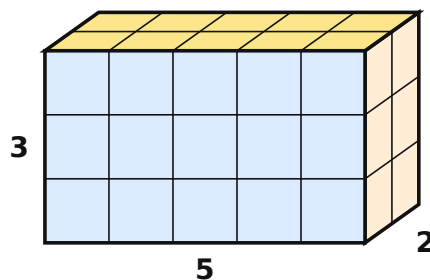


Volume = 24 cubic units

A prism built from 24 unit cubes.

What formulas give the volume of a rectangular prism?

Multiply the three edge lengths: $V = l \times w \times h$. The product $l \times w$ is the area of the base, so you can also write $V = B \times h$, where B is the area of the base. Always check the unit. Edges measured in feet give a volume in cubic feet, written ft^3 . Mixing units, such as inches and feet in one product, gives a wrong answer, so change them to the same unit first.

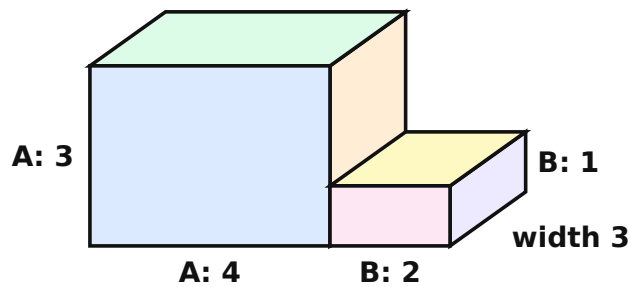


$$B = 5 \times 2 = 10, V = 10 \times 3 = 30$$

The base has area 10 square units. Multiply by the height 3.

How do you find the volume of a composite solid?

Split the solid into two rectangular prisms, find each volume, then add. Prism A is $4 \times 3 \times 3 = 36$ and prism B is $2 \times 3 \times 1 = 6$, so the whole solid is $36 + 6 = 42$ cubic units. You can cut the solid a different way and still get the same total.



$$36 + 6 = 42 \text{ cubic units}$$

Add the volumes of prism A and prism B.

Steps

1. Decide whether the solid is one prism or two.
2. Find the length, width and height of each prism.
3. Multiply to find each volume, with the right cubic unit.
4. Add the volumes if there are two prisms.

Questions about volume of rectangular prisms

What is the difference between area and volume?

Area measures a flat surface in square units. Volume measures the space inside a solid in cubic units. A rectangle has area, but a box has volume because it has height as well.

Why do we use cubic units for volume?

Volume counts how many unit cubes fill a solid. Each cube has length, width and height of 1 unit, so the answer is in cubic units such as cubic feet or cm^3 .

How do I find a missing height?

Use $V = l \times w \times h$ and divide the volume by the area of the base. For $V = 90$ and a 6 by 5 base, the base area is 30, and $90 \div 30 = 3$.

What does $V = B \times h$ mean?

B is the area of the base and h is the height. The base area tells how many unit cubes fit in the bottom layer, and the height tells how many layers there are.

How do I find the volume of an L-shaped solid?

Cut the solid into two rectangular prisms. Find the volume of each by multiplying length, width and height, then add the two volumes together.