

Grade 5 · Volume of Rectangular Prisms · Lesson

Common Core 5.MD.C.3, 5.MD.C.4, 5.MD.C.5 · mathovore.fr

Volume is the number of unit cubes that fill a solid, measured in cubic units. For a rectangular prism, multiply length, width, and height, $V = l \times w \times h$, or multiply the base area by the height, $V = B \times h$. For a composite solid, split it into prisms and add their volumes.

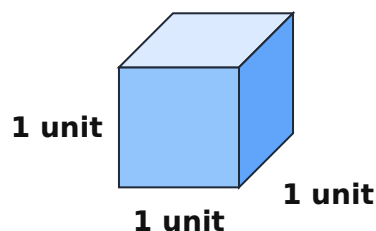
Grade 5 Common Core: 5.MD.C.3 · 5.MD.C.4 · 5.MD.C.5

Key facts:

- A unit cube has a volume of 1 cubic unit.
- Volume of a rectangular prism: $V = l \times w \times h$ or $V = B \times h$.
- B is the area of the base, which tells how many cubes fit in one layer.
- Volume is measured in cubic units such as cubic inches, cubic feet, and cubic centimeters.
- To find the volume of a composite solid, add the volumes of its non-overlapping prisms.

What is volume?

Volume is the amount of space inside a solid figure. To measure it, fill the figure with unit cubes that have no gaps and no overlaps. A **unit cube** has edges 1 unit long, and it has a volume of one **cubic unit**.

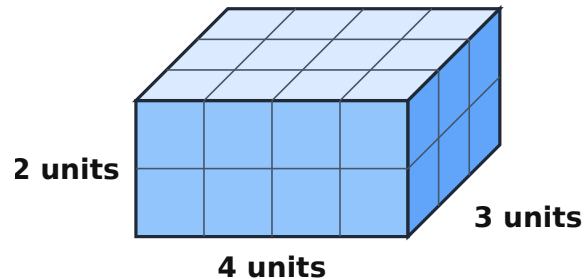


A unit cube has edges of 1 unit and a volume of 1 cubic unit.

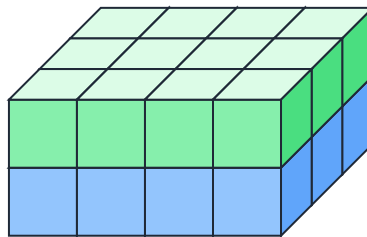
Volume is measured in cubic units such as cubic inches (in^3), cubic feet (ft^3), or cubic centimeters (cm^3). Area uses square units; volume uses cubic units.

How do you find the volume of a rectangular prism?

Count the cubes in one layer, then count the layers. The prism below has 4 cubes in each row and 3 rows, so each layer has $4 \times 3 = 12$ cubes. It has 2 layers, so the volume is $12 \times 2 = 24$ cubic units.



This prism is 4 units long, 3 units wide, and 2 units high.



Two layers of 12 cubes: $12 + 12 = 24$ cubes.

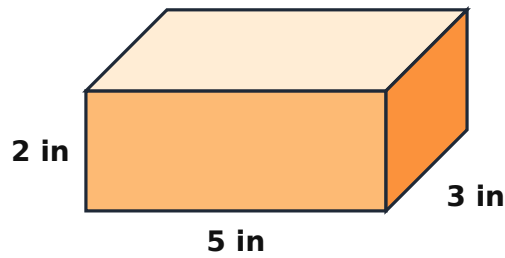
Volume formulas

For a rectangular prism with length l , width w , and height h :

$$V = l \times w \times h \quad \text{or} \quad V = B \times h$$

Here B is the area of the base. For a rectangular base, $B = l \times w$.

Both formulas give the same answer because the base area B tells how many cubes sit in one layer, and the height h tells how many layers there are.



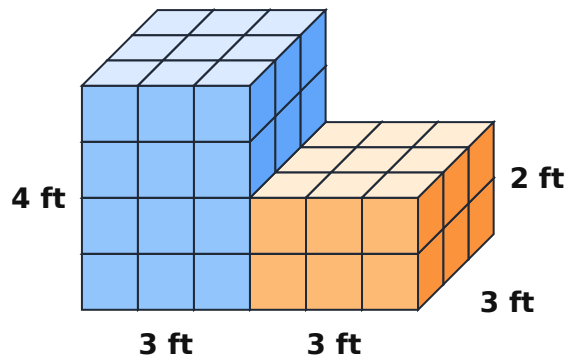
The base is 5 by 3, so $B = 15$ square inches.

Example. A prism is 5 in long, 3 in wide, and 2 in high. The base is $B = 5 \times 3 = 15$ square inches. Then $V = 15 \times 2 = 30$ cubic inches.

How do you find the volume of a solid made of two prisms?

1. Cut the solid into rectangular prisms that do not overlap.
2. Find the volume of each prism.
3. Add the volumes.

In the figure below, the blue prism is $3 \times 3 \times 4 = 36$ cubic feet and the orange prism is $3 \times 3 \times 2 = 18$ cubic feet. The whole solid has a volume of $36 + 18 = 54$ cubic feet.



Split the solid into a blue prism and an orange prism, then add their volumes.

Volume of Rectangular Prisms: frequently asked questions

What is the difference between area and volume?

Area measures a flat region in square units. Volume measures the space inside a solid in cubic units. A floor has an area, but the room above it has a volume.

Why does volume use cubic units?

Volume is counted with unit cubes that have three dimensions. One cube with edges of 1 foot has a volume of 1 cubic foot, written 1 ft^3 .

How do you find a missing edge when you know the volume?

Use a multiplication fact with a missing factor. If $V = 90$, $l = 6$, and $w = 5$, then $6 \times 5 \times h = 90$, so $30 \times h = 90$ and $h = 3$.

What is the formula $V = B \times h$?

B is the area of the base, and h is the height of the prism. The base area is the number of cubes in one layer, so multiplying by the number of layers gives the total volume.

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

Cut the solid into two rectangular prisms, find each volume, and add. The pieces must not overlap, and together they must make the whole solid.