

Grade 6 · Volume of Rectangular Prisms · Lesson

Common Core 6.G.A.2 · mathovore.fr

The volume of a rectangular prism is the number of unit cubes that fill it. Multiply length, width, and height, or multiply the base area by the height. Edges can be fractions: a prism packed with cubes of edge one half holds eight cubes in each cubic unit. Volume is written in cubic units.

Grade 6 Common Core: 6.G.A.2

Key facts:

- $V = \ell \times w \times h$ and $V = B \times h$ give the same volume.
- Volume is measured in cubic units such as in^3 or ft^3 .
- A cube with edge $\frac{1}{2}$ has volume $\frac{1}{8}$ cubic unit.
- To find a missing height, divide the volume by the base area.

What is the volume of a rectangular prism?

Volume is the amount of space inside a solid. It is measured in cubic units. A unit cube has edges of 1 unit and a volume of 1 cubic unit. If a rectangular prism is packed with unit cubes and nothing is left over, the number of cubes is the volume.

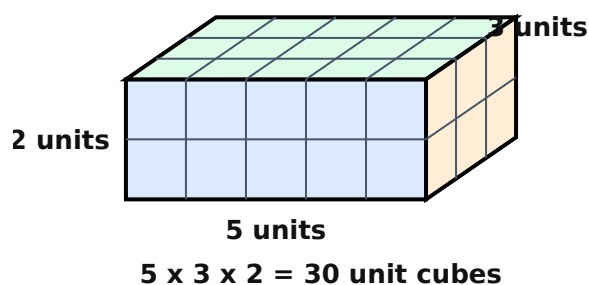


Figure 1. Counting unit cubes layer by layer: 15 cubes in each of 2 layers.

How do you find volume when the edges are fractions?

Use smaller cubes. A cube with edges of $\frac{1}{2}$ inch has a volume of $\frac{1}{8} \text{ in}^3$, because 8 of them fill a 1-inch cube. A prism that is 2 in by $1\frac{1}{2}$ in by 1 in holds $4 \times 3 \times 2 = 24$ of these cubes, so its

volume is $24 \times \frac{1}{8} = 3 \text{ in}^3$. Multiplying the edges gives the same answer: $2 \times \frac{3}{2} \times 1 = 3$.

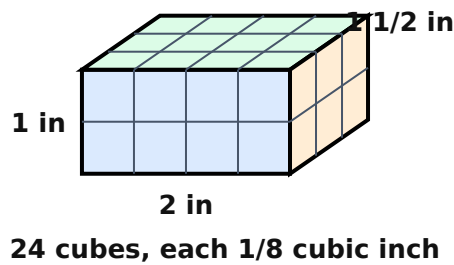


Figure 2. Packing with half-inch cubes: 24 cubes of $\frac{1}{8} \text{ in}^3$ each.

Volume formulas	
Formula	Meaning
$V = \ell \times w \times h$	length times width times height
$V = B \times h$	area of the base times height

The two formulas agree because the base area is $B = \ell \times w$. Think of the prism as layers: each layer holds B cubes, and there are h layers.

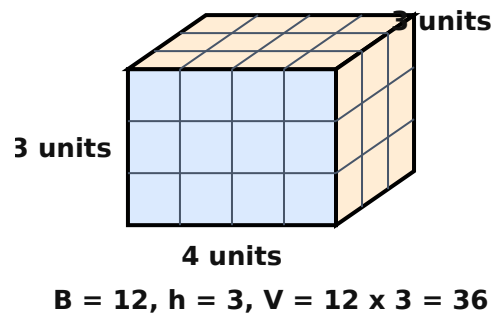


Figure 3. The shaded base holds 12 cubes, and there are 3 layers.

How do you find the volume step by step?

1. Write the three edge lengths in the same unit.
2. Write $V = \ell \times w \times h$.
3. Substitute the lengths. Change mixed numbers to fractions.
4. Multiply, then write the answer in cubic units.

Example. A box is $2\frac{1}{2}$ ft long, $1\frac{1}{2}$ ft wide, and 2 ft tall.

$$V = \frac{5}{2} \times \frac{3}{2} \times 2 = \frac{15}{4} \times 2 = \frac{15}{2} = 7\frac{1}{2} \text{ ft}^3$$

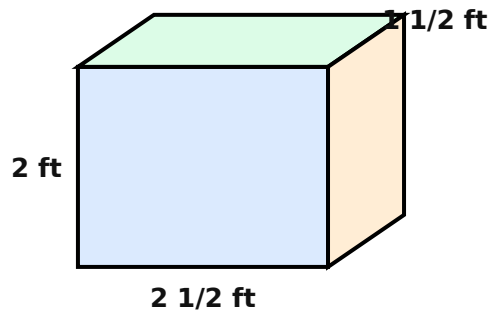


Figure 4. The box in the example: $V = 7\frac{1}{2} \text{ ft}^3$.

If a measurement is missing, divide: $h = V \div B$. A prism with $V = 60 \text{ ft}^3$ and $B = 15 \text{ ft}^2$ has $h = 60 \div 15 = 4 \text{ ft}$.

Volume of Rectangular Prisms: frequently asked questions

What is the formula for the volume of a rectangular prism?

Volume equals length times width times height, $V = \ell wh$. It can also be written $V = Bh$, where B is the area of the base.

Why is volume measured in cubic units?

Volume counts how many unit cubes fill a solid. A prism that holds 30 cubes with 1-inch edges has a volume of 30 cubic inches.

How do you find volume with fractional edge lengths?

Either multiply the fractions, or pack the prism with cubes whose edge is the unit fraction. A cube with edge $\frac{1}{3}$ has volume $\frac{1}{27}$ cubic unit.

How is volume different from surface area?

Volume measures the space inside a solid in cubic units. Surface area measures the total area of the outside faces in square units.

How do you find a missing edge of a prism?

Divide the volume by the area of the base. For a volume of 60 cubic feet and a base area of 15 square feet, the height is $60 \div 15 = 4$ feet.