

Grade 6 - Volume of Prisms with Fractional Edges - Lesson

Common Core 6.G.A.2 · maths-pdf.fr/en/

The volume of a right rectangular prism is the product of its length, width, and height, $V = lwh$, or the base area times the height, $V = Bh$. Volume is measured in cubic units. It works with fractional edges too: a 2 by $1\frac{1}{2}$ by 1 prism holds 24 cubes of edge $\frac{1}{2}$, so its volume is 3.

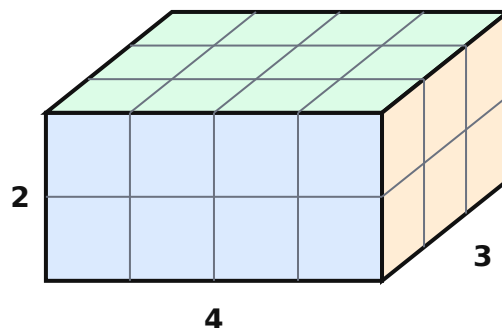
Grade 6 · Common Core State Standards: **6.G.A.2**

Key facts

- Volume is the number of cubic units that fill a solid.
- $V = lwh$ or $V = Bh$ for a right rectangular prism.
- Fractional edges work the same way: multiply the fractions.
- A cube with edge $\frac{1}{2}$ has volume $\frac{1}{8}$, and 8 of them fill a unit cube.
- To find a missing edge, divide the volume by the product of the other edges.

What is volume?

Volume measures the space inside a solid. It is counted in cubic units. A cube with edge 1 unit has a volume of 1 cubic unit. A prism that is 4 units long, 3 units wide, and 2 units tall holds 2 layers of $4 \cdot 3 = 12$ cubes, which is 24 cubes.



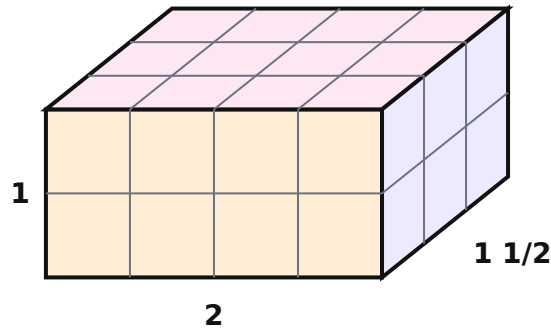
Layers of unit cubes: $4 \times 3 = 12$ cubes per layer, 2 layers, so 24 cubes.

Volume of a right rectangular prism

$V = \ell \cdot w \cdot h$, or $V = B \cdot h$, where B is the area of the base.

How do you find volume with fractional edges?

Fill the prism with cubes whose edges are a fraction of a unit. A cube with edge $\frac{1}{2}$ unit has volume $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$ cubic unit. A prism that is 2 units by $1\frac{1}{2}$ units by 1 unit is filled by $4 \cdot 3 \cdot 2 = 24$ such cubes, so its volume is $24 \cdot \frac{1}{8} = 3$ cubic units.

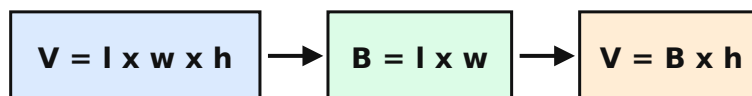


Cubes with edge $\frac{1}{2}$ unit: $4 \times 3 \times 2 = 24$ cubes, each $\frac{1}{8}$ cubic unit, so the volume is 3 cubic units.

The same answer comes from multiplying the edge lengths: $2 \cdot \frac{3}{2} \cdot 1 = 3$. This works for any fractional edges, so you can use $V = \ell w h$ directly.

How do you solve volume problems?

1. Draw or picture the prism and label the edges.
2. Write the formula and substitute the lengths (use fractions or mixed numbers).
3. Multiply and write the unit as cubic units.
4. For a missing edge, divide the volume by the product of the other edges.



The base area times the height is the volume.

Example: A tank is $1\frac{1}{2}$ ft by 2 ft by $1\frac{1}{2}$ ft. Its volume is $\frac{3}{2} \cdot 2 \cdot \frac{3}{2} = \frac{9}{2} = 4\frac{1}{2}$ cubic feet.

Prism	Volume
$5 \times 3 \times 4$	60
$1.5 \times 2 \times 4$	12
$2.5 \times 3 \times 1.5$	11.25

Fractional edges work the same way.

Questions about volume of prisms with fractional edges

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

The volume is $V = \text{length} \times \text{width} \times \text{height}$, or the area of the base times the height.

How do you find volume with fractional edge lengths?

Multiply the fractions or mixed numbers. For a prism $1\frac{1}{2}$ by 2 by 4, the volume is $\frac{3}{2}$ times 2 times 4, which is 12.

Why are volume units cubic?

Volume counts cubes that fill the space, so the unit is a cube, such as cubic inches or cubic feet.

How do you find a missing height?

Divide the volume by the base area. If $V = 60$ and the base area is 12, then $h = 60$ divided by $12 = 5$.

What is the volume of a cube with edge $\frac{1}{2}$ unit?

It is $(\frac{1}{2})$ times $(\frac{1}{2})$ times $(\frac{1}{2})$, which is $\frac{1}{8}$ cubic unit. Eight of these cubes fill one unit cube.