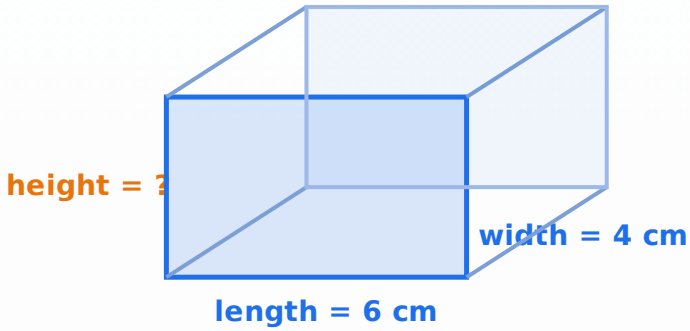
# Volume Problem-Solving & Missing Dimensions

## Problem-solving & missing dimensions

Once you know that $volume = length \times width \times height$, you can solve real problems — and you can also work *backwards*: if you know the volume and two of the dimensions, you can find the third.

> **Worked example.** A box has a volume of $30$ cubic units. Its base is $5$ long and $2$ wide, so one layer holds $5 \times 2 = 10$ cubes. To reach $30$ cubes we need $30 \div 10 = 3$ layers, so the height is $3$.

**Volume = 48 cubic centimetres. Find the height.**




*Known: length and width, and the total volume. Unknown: the height.*

## Apply the formula

Q1. A fish tank is $40\ cm$ long, $25\ cm$ wide and $30\ cm$ high. What is its volume in cubic centimetres? _____

**Q2.** A shipping carton measures $8$ by $5$ by $3$ units. A second carton is twice as tall but the same length and width. Find the volume of **each** carton.

## Find the missing dimension

**Q3.** Use the box in the picture. Its volume is $48$ cubic centimetres, its length is $6\ cm$ and its width is $4\ cm$. Work backwards to find the height. *Hint: how many cubes are in one layer?*

**Q4.** A prism has a volume of $60$ cubic units. Its base is $5$ long and $3$ wide. How tall is it?

**Q5.** A box holds $36$ centimetre cubes. It is $3\ cm$ high. List **two** possible length-and-width pairs for its base.

**Q6.** **Reasoning.** To find a missing height, Maya divided the volume by the area of the base. Explain why dividing works, using the idea of layers.

## Answer key (teacher use)

Suggested answers for the questions in this worksheet.

**Teacher answer key.** Encourage students to show the layer reasoning, not just the final number.

**Q1.** $40 \times 25 \times 30 = 30\,000$ cubic centimetres.

**Q2.** First carton: $8 \times 5 \times 3 = 120$ cubic units. Second carton (twice as tall): $8 \times 5 \times 6 = 240$ cubic units.

**Q3.** One layer $= 6 \times 4 = 24$ cubes. Number of layers $= 48 \div 24 = 2$. **Height $= 2$ cm.**

**Q4.** Base $= 5 \times 3 = 15$. Height $= 60 \div 15 = 4$. **Height $= 4$ units.**

**Q5.** One layer must hold $36 \div 3 = 12$ cubes. Any two length–width pairs that multiply to $12$: e.g. $6 \times 2$, $4 \times 3$, $12 \times 1$.

**Q6.** The base area is the number of cubes in one layer. The height is how many of those layers stack up, so dividing the total volume by the area of the base tells you how many layers there are — that is the height. (Volume = base × height, so height = volume ÷ base.)