

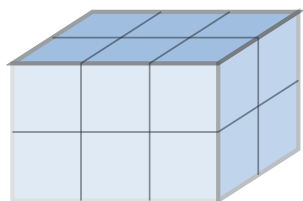
## Extension & Challenge — 3D Space & Structures

### Part A — Counting Cubes & Volume

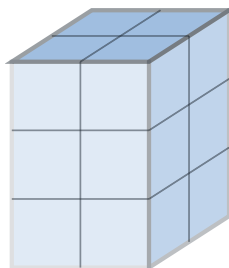
**Volume** is the amount of space a solid fills, measured in cubic units. For a rectangular prism, count the unit cubes — or multiply  $length \times width \times height$ . Do not forget the cubes hidden at the back and underneath.

**Worked example.** A prism is  $4 \times 2 \times 3$ . One layer has  $4 \times 2 = 8$  cubes; there are 3 layers, so  $8 \times 3 = 24$  cubes, i.e. a volume of 24 cubic units.

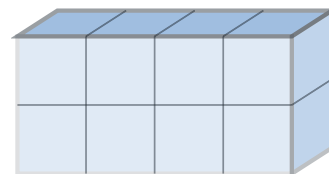
**How many unit cubes build each prism?**



**A**



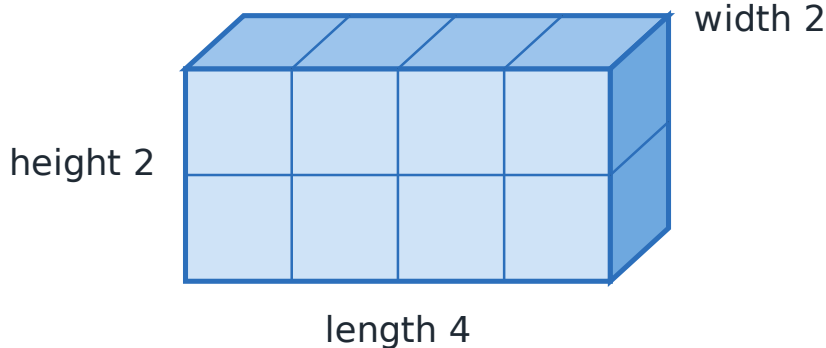
**B**



**C**

*Three prisms built from unit cubes.*

# Volume of a Rectangular Prism



$$\text{Volume} = 4 \times 2 \times 2 = 16 \text{ cubic units}$$

*Volume of a rectangular prism = length  $\times$  width  $\times$  height.*

1 Count the unit cubes that build each prism above (remember the hidden cubes at the back).

A: \_\_\_\_\_ B: \_\_\_\_\_ C: \_\_\_\_\_ cubes

2 Prism A measures 3 long, 2 wide and 2 high. Show that *length  $\times$  width  $\times$  height* gives the same count you found in question 1.

3 Find the volume of a box that is 5 cm long, 3 cm wide and 2 cm high.

Volume = \_\_\_\_\_  $cm^3$

4 A cube has a side length of 4 cm. What is its volume?

Answer: \_\_\_\_\_

5 A prism is built from exactly 24 unit cubes. Give **two** different sets of whole-number dimensions it could have.

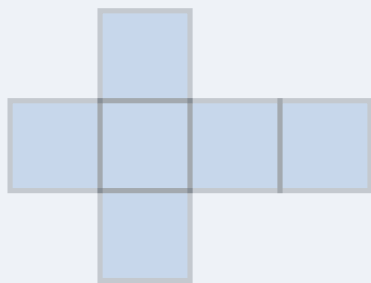
6 **Reasoning.** Prisms A and B above are different shapes but both use 12 cubes. Does the volume of a solid depend on its shape, or only on how many cubes fill it? Explain.

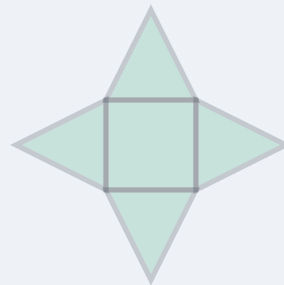
## Part B — Nets & Solids

A net is a flat pattern that folds up into a solid. Studying nets helps you count a solid's faces (flat surfaces), edges (where two faces meet) and vertices (corners).

### Which solid folds from each net?



**A**



**B**

*Net A and Net B. Picture each one folding up.*

The cross-shaped net of six squares is the most familiar cube net, but there are eleven different nets that fold into a cube!

1 Which solid does each net above fold into?

Net A: \_\_\_\_\_ Net B: \_\_\_\_\_

2 Complete the table for a cube.

Solid	Faces	Edges	Vertices
Cube			
Square pyramid			

3 How many squares are in the net of a cube? How many of each shape are in the net of a square pyramid?

4 A solid has 2 triangular faces and 3 rectangular faces. Name the solid.

Answer: \_\_\_\_\_

5 **Reasoning.** Sketch one net that folds into a cube and one arrangement of 6 squares that does *not*. How can you tell the difference?

6 **Prove it.** For any of these solids, add the faces and vertices then subtract the edges ( $F + V - E$ ). Do it for the cube and the square pyramid. What do you notice?