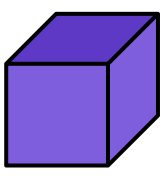
Volume

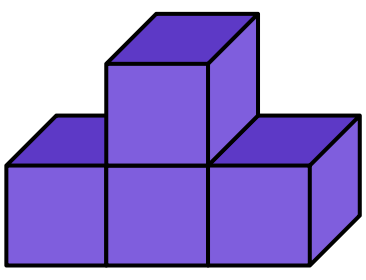
Volume is the amount of space taken up by a 3D shape, or by any object around us.

We measure volume using **cubic units**, and we write them using a small ^{3} next to the units, like cm^3 or m^3.

Sometimes we can calculate volume by counting **cubic units**. For example, since the cube on the left has a volume of 1 cm^3 and the 3D shape on the right contains four of them, it will have a volume of 4 cm^3.



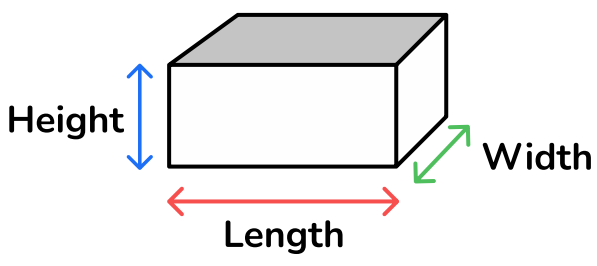
Volume = 1 cm^3



Volume = 4 cm^3

We can't always count the number of cubic units to work out the volume. When we don't know the volume of a **cube** or a **cuboid**, we can use this formula to calculate it:

Volume = Length x Width x Height



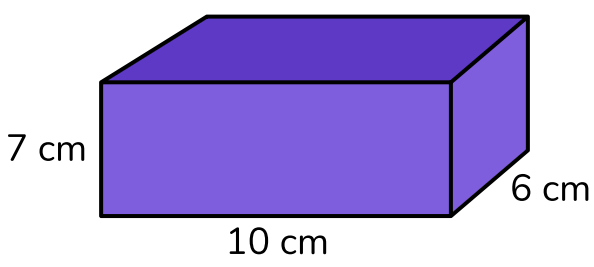
It does not matter which order we multiply the length x width x height, we will always get the same answer!

Sometimes a question will give you the **volume**, and ask you to **calculate the length of one of the sides**. To calculate either the length, width or height, our original formula needs to be rearranged:

Length = Volume ÷ (Height x Width)
Width = Volume ÷ (Height x Length)
Height = Volume ÷ (Width x Length)

Method

Let's find the volume of this cuboid!

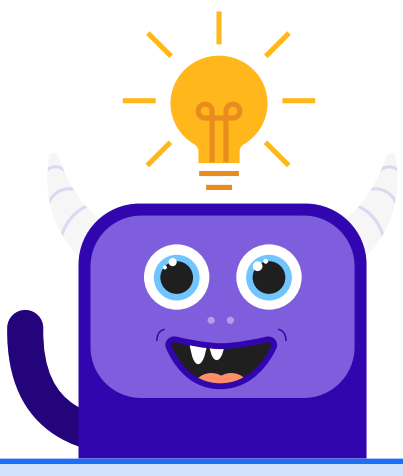


1. Identify the length, width and height of the cuboid.

Length = **10 cm**, width = **6 cm** and height = **7 cm**.

2. Multiply the length, width and height together to find the volume.

You can multiply these values **in any order** so choose the easiest calculation for you!

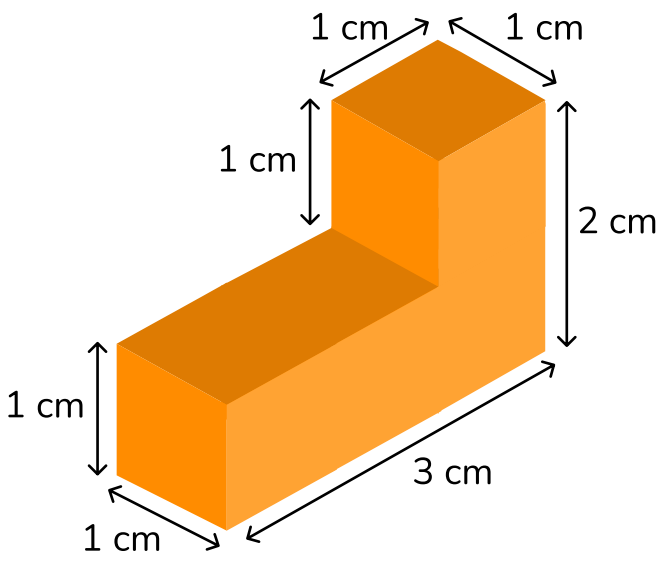


Volume = Length x Width x Height
Volume = 10 cm x **6 cm x 7 cm**
Volume = 10 cm x **42 cm^2** = 420 cm^3

The area of our cuboid is **420 cm^3**.

Example Question

This compound 3D shape is made from a cuboid and a cube.



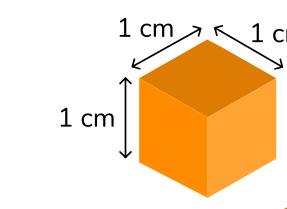
What is the volume of this compound shape?

A 3 cm^3 **B** 4 cm^3 **C** 5 cm^3 **D** 6 cm^3 **E** 7 cm^3

We need to split up our compound 3D shape into a cube and cuboid.

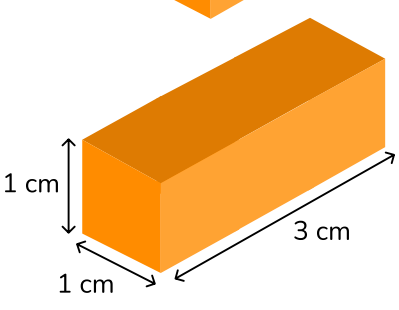
1. Start by working out the **volume of the cube**.

Volume of cube = Length x Width x Height
Volume = 1 cm x 1 cm x 1 cm = **1 cm^3**



2. Now work out the **volume of the cuboid**.

Volume of cuboid = Length x Width x Height
Volume = 3 cm x 1 cm x 1 cm = **3 cm^3**



3. **Add together** the volume of the cube and the cuboid.

Volume of compound shape = Volume of cube + Volume of cuboid
Volume of compound shape = 1 cm^3 + 3 cm^3 = **4 cm^3**

The answer is **B**, the volume of the 3D shape is **4 cm^3.**