

# MATHEMATICS



Unit: 1

Topic: 3D shapes.

Sub-Topic: Surface area, volume and capacity of cubes and rectangular prisms.

- ❖ The surface area of an object is the sum of the area of all its faces.
- ❖ Volume is the space occupied by the object
- ❖ Capacity is the amount of space within an object and usually refers to the amount of liquid or gas the object can hold.
- ❖ Volume is measured in cubic units such as  $mm^3$ ,  $cm^3$  and  $m^3$
- ❖ Capacity is measured in units such as  $ml$ ,  $l$  and  $kl$ .
- ❖ *Volume of cube =  $l^3$*
- ❖ *Volume of rectangular prism =  $l \times b \times h$*

## Converting between units for volume and capacity

You need to be able to convert between  $mm^3$ ,  $cm^3$  and  $m^3$  and between millilitre, litre and kilolitre.  
Note:

1 cm = 10 mm so  $1\text{ cm}^3 = 10 \times 10 \times 10 = 1\ 000\text{ mm}^3$

1 m = 100 cm so  $1\text{ m}^3 = 100 \times 100 \times 100 = 1\ 000\ 000\text{ cm}^3$

1 litre = 1 000 ml and 1 kilolitre = 1 000 litre

1 millilitre is equivalent to  $1\text{ cm}^3$  and 1 kilolitre is equivalent to  $1\text{ m}^3$

We multiply when converting from a bigger unit to a smaller unit, e.g.  $\text{cm}^3 \times 1\ 000 = \text{mm}^3$

We divide when converting from a smaller unit to a bigger one, e.g.  $\text{cm}^3 \div 1\ 000\ 000 = \text{m}^3$

# Worked examples

## Example 1

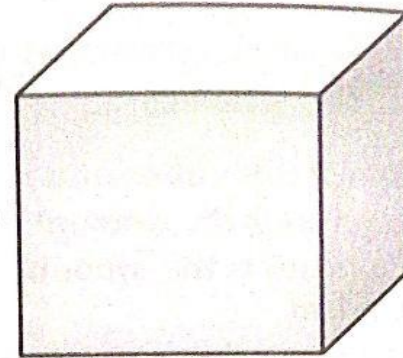
Find the volume and surface area of the cube, to two decimal places:

### Solution

$$\begin{aligned}\text{Volume} &= l^3 \\ &= (3,42)^3 \\ &= 40 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Surface area} &= 6l^2 \\ &= 6(3,42)^2 \\ &= 70,18 \text{ cm}^2\end{aligned}$$

3,42 cm



## Example 2

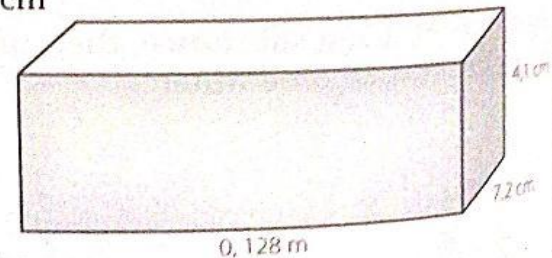
Mr Gregor collects vintage model cars, which come in boxes with dimensions as shown. Find the volume and surface area of the closed box:

### Solution

Convert all units to cm first: 0,128 m = 12,8 cm

$$\begin{aligned}\text{Volume} &= l \times b \times h \\ &= 12,8 \times 7,2 \times 4,1 \\ &= 377,86 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Surface area} &= 2lb + 2lh + 2bh \\ &= 2(12,8 \times 4,1) + 2(12,8 \times 7,2) + 2(4,1 \times 7,2) \\ &= 348,32 \text{ cm}^2\end{aligned}$$



## Unit: 2

Topic: Surface area , volume and capacity of a triangular prisms

- ❖ A triangular prism is made up of three rectangles or squares and two triangles.
- ❖ To find the Surface area of a triangular prism =  
*area of rectangle 1 + area of rectangle 2 + area of rectangle 3 + 2 × area of triangle 4.*
- ❖ To find the volume of triangular prism =  $\frac{1}{2}bh \times$   
*area of triangle 4*



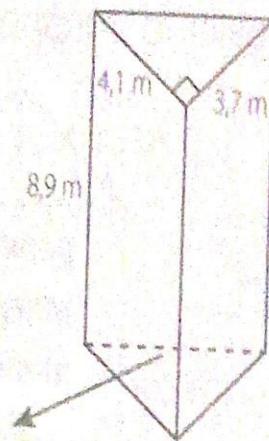
# Worked examples

Find the surface area and volume of this triangular prism:

**Solution**

$$\begin{aligned}\text{Surface area} &= 8,9 \times 3,7 + 8,9 \times 4,1 + 8,9 \times 5,5 + 2 \times \frac{1}{2} (4,1)(3,7) \\ &= 133,54 \text{ m}^2\end{aligned}$$

$$\begin{aligned}\text{Volume} &= \frac{1}{2} bh \times \text{height of prism} \\ &= \frac{1}{2} \times 4,1 \times 3,7 \times 8,9 \\ &= 67,51 \text{ m}^3\end{aligned}$$



To find the hypotenuse of the triangular base, we use the Theorem of Pythagoras:

$$\begin{aligned}h^2 &= (4,1)^2 + (3,7)^2 \\ &= 30,5 \\ h &= 5,5 \text{ m}\end{aligned}$$

# Exercises

## Exercise 17.1

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

## Exercise 17.2

- 2.
- 3.
- 4.
- 5.

## Exercise 17.3

- 5.
- 6.
- 6.1
- 6.2
- 7.
- 7.1
- 7.2