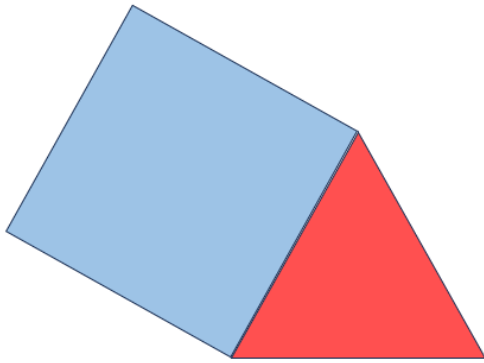


SHARP

Worksheet 17 Memorandum: Surface Area and Volume of 3D objects

Grade 8 Mathematics

- 1) Complete the missing words to make the sentence true:
- a) Volume is defined as the amount of **space** a 3D shape occupies.
 - b) Surface area is the total **area** of all the surfaces of a 3D shape.
 - c) **Capacity** is the amount a 3D shape can hold.
- 2) Your 3D triangular prism should look similar to the image below:



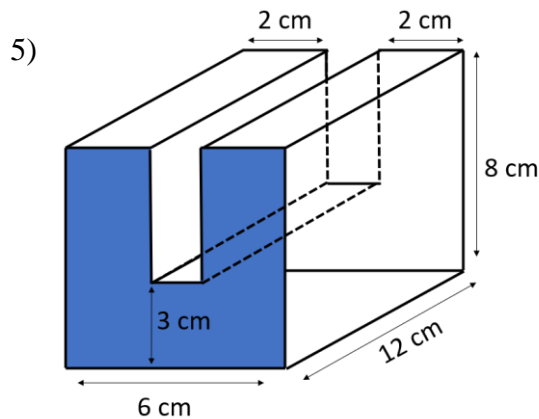
- 3) Match the description in column A with the correct formula in column B.

| Column A - description | | Column B - Formula | |
|------------------------|---------------------------------------|--------------------|---|
| 1 | The volume of a cube | D | l^3 or $l \times b \times h$ |
| 2 | The surface area for a rectangle | G | $2(l \times b) + 2(l \times b) + 2(l \times b)$ |
| 3 | The volume for a triangular prism | A | $\frac{1}{2}(b \times \perp h) \times l$ |
| 4 | The surface area for a cube | F | $6 \times l \times b$ |
| 5 | The volume for a rectangular prism | B | $l \times b \times h$ |
| 6 | The surface area for triangular prism | C | $(b \times \perp h) + 2(l \times b) + (l \times b)$ |

The extra formula given ($\pi r^2 \times h$) is the volume for a cylinder, you will learn about this in grade 9.

4) Calculate the volume and surface area of the following shapes:

| | Volume | Surface Area |
|----|--|--|
| a) | $V = l \times b \times h$ $= 8cm \times 12cm \times 2cm$ $= 192cm^3$ | $SA = 2(8 \times 2) + 2(12 \times 2) + 2(8 \times 12)$ $= 32cm^2 + 48cm^2 + 192cm^2$ $= 272cm^2$ |
| b) | $V = \frac{1}{2}(12mm \times 9mm) \times 18mm$ $= 972mm^3$ | $SA = (12 \times 9) + 2(18 \times 15) + (12 \times 15)$ $= 108mm^2 + 540mm^2 + 180mm^2$ $= 828mm^2$ |
| c) | $V = l^3$ $= (2m)^3$ $= 8m^3$ <p>Or $8\,000\,000\,cm^3$</p> <p>Or $8\,000\,000\,000\,mm^3$</p> | $SA = 6(l \times b)$ $= 6(2m \times 2m)$ $= 24m^2$ <p>Or $240\,000\,cm^2$</p> <p>Or $24\,000\,000\,mm^2$</p> |



- a) Divide shape into 3 rectangles and add their areas together:
- $$Total\ Area = (2 \times 8) + (3 \times 2) + (2 \times 8)$$
- $$= 16cm^2 + 6cm^2 + 16cm^2$$
- $$= 38cm^2$$
- b) Divide shape into 3 rectangles and add their volumes together. As you noticed above, there are two identical rectangles within the shape:
- $$V = 2cm \times 8cm \times 12cm$$
- $$= 192cm^3 \times 2$$
- $$= 384cm^3 \text{ (for the two larger rectangles)}$$
- $$V = 2cm \times 3cm \times 12cm$$
- $$= 72cm^3$$
- $$Total\ Volume = 384cm^3 + 72cm^3$$
- $$= 456cm^3$$
- c) $1cm^3 = 1ml$
 $456cm^3 = 456ml$
 $456 \div 1000 = 0,456\ litres$

6) Answer the following questions:

a) $\sqrt[3]{27} = 3m$

b) $100cm^2 = l \times b \times h$

$$100cm^2 = 10cm \times 5cm \times h$$

$$\frac{100}{50} = h$$

$$2cm = h$$

c) $180cm^3 = \frac{1}{2}(6 \times h) \times 15$

$$180cm^3 = 3 \times 0,5h \times 15$$

$$180cm^3 = 45 \times 0,5h$$

$$\frac{180}{45} = 0,5h$$

$$4 = 0,5h$$

$$8cm = h$$

d) $8000mm^3$