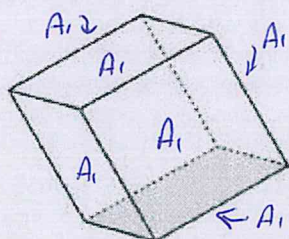


# Grade 8 Math – Measurement Surface Area of 3D Shapes 4

Name: \_\_\_\_\_ Class: \_\_\_\_\_

We have been working at surface area for a bit and now we are going to step it up and work backwards to find the lengths from the surface area.

1. The total surface area of this cube is  $216 \text{ m}^2$ . What is the length, width and height dimensions?



$$A_1 = L \times W \\ = L \times L$$

$$\text{If } SA = 6A_1 \\ \frac{216 \text{ m}^2}{6} = \frac{6A_1}{6} \\ 36 \text{ m}^2 = A_1$$

$$A_1 = L^2 \\ \sqrt{36 \text{ m}^2} = \sqrt{L^2} \\ 6 \text{ m} = L$$

$$V = A_{\text{face}} \times D$$

$\therefore$  The length, width and height dimensions are all  $6 \text{ m}$  of this cube.

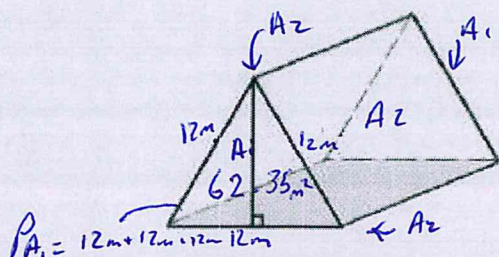
What is the volume in cubic feet?

There are  $0.02832 \text{ m}^3/\text{ft}^3$  (from sheet given in class)

$$\therefore 216 \text{ m}^3 \div 0.02832 \text{ m}^3/\text{ft}^3 = 7627.12 \text{ ft}^3 \text{ is the volume in cubic feet.}$$

- 2.

This equilateral, right triangular prism has total surface area of  $484.7 \text{ m}^2$ . We know that the triangular face has an area of  $62.35 \text{ m}^2$  and a side length of  $12 \text{ m}$ . What is the depth of the prism?



$$P_{A_1} = 12 \text{ m} + 12 \text{ m} + 12 \text{ m} = 36 \text{ m}$$

$$3A_2 = P_{A_1} \times D \\ = 36 \text{ m} \times D$$

$$SA = 2A_1 + 3A_2 \\ 484.7 \text{ m}^2 = 2(62.35 \text{ m}^2) + 3A_2 \\ 484.7 \text{ m}^2 = 124.7 \text{ m}^2 + 3A_2 \\ 360 \text{ m}^2 = 3A_2 \\ \frac{360 \text{ m}^2}{36 \text{ m}} = \frac{36 \times D}{36 \text{ m}} \\ 10 \text{ m} = D$$

$\therefore$  The depth of this right triangular prism is  $10 \text{ m}$ .

What is the volume in cubic yards?

$$V = A_{\text{face}} \times D$$

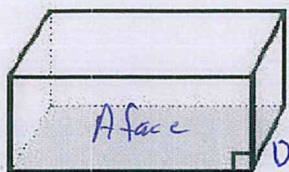
$$= 74.5724 \text{ yd}^2 \times 10.9361 \text{ yd} \\ = 815.53 \text{ yd}^3$$

$$A_{\text{face}} = 62.35 \text{ m}^2 \div 0.8361 \text{ m}^2/\text{yd}^2 \\ = 74.5724 \text{ yd}^2$$

$$D = 10 \text{ m} \div 0.9144 \text{ m/yd} \\ = 10.9361 \text{ yd}$$

$\therefore$  The volume in cubic yards of this right Triangular prism is  $815.53 \text{ yd}^3$

3.



The volume of this right rectangular prism is  $264 \text{ cm}^3$ . We know that the end face has an area of  $24 \text{ cm}^2$ . What is the other dimension?

$$V = A_{\text{face}} \times D$$

$$\frac{264 \text{ cm}^3}{24 \text{ cm}^2} = \frac{24 \text{ cm}^2 \times D}{24 \text{ cm}^2}$$

$$11 \text{ cm} = D$$

$\therefore$  The missing dimension of this right rectangular prism is  $11 \text{ cm}$ .

What is the volume in cubic millimetres?

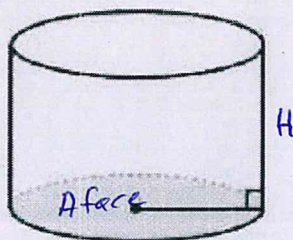
$$1 \text{ cm}^3 = 1000 \text{ mm}^3$$

$$\therefore 264 \text{ cm}^3 \times 1000 \text{ mm}^3/\text{cm}^3$$

$$= 264000 \text{ mm}^3$$

$\therefore$  The volume of this right rectangular prism is  $264000 \text{ mm}^3$

4.



This cylinder has a total surface area of  $703.36 \text{ mm}^2$ . The area of the circular end is  $153.86 \text{ mm}^2$ . What is the radius and the height of the cylinder?

$$A_{\text{face}} = 153.86 \text{ mm}^2$$

$$\frac{\pi r^2}{3.14} = \frac{153.86 \text{ mm}^2}{3.14}$$

$$\sqrt{r^2} = \sqrt{49 \text{ mm}^2}$$

$$= 7 \text{ mm}$$

$$D = 2r$$

$$= 2 \times 7 \text{ mm}$$

$$= 14 \text{ mm}$$

What is the volume in  $\text{cm}^3$ ?

$$A_{\text{face}} = 153.86 \text{ mm}^2 \div 100 \text{ mm}^2/\text{cm}^2$$

$$= 1.5386 \text{ cm}^2$$

$$H = 9 \text{ mm} \div 10 \text{ mm}/\text{cm}$$

$$= 0.9 \text{ cm}$$

$\therefore$  The radius is  $7 \text{ mm}$  and the height is  $9 \text{ mm}$  for this right cylinder.

$$V = A_{\text{face}} \times H$$

$$= 1.5386 \text{ cm}^2 \times 0.9 \text{ cm}$$

$$= 1.41 \text{ cm}^3$$

$\therefore$  The volume of this right prism is  $1.41 \text{ cm}^3$ .

$$SA = 2A_{\text{face}} + \pi D H$$

$$703.36 \text{ mm}^2 = 2(153.86 \text{ mm}^2) + \pi D H$$

$$703.36 \text{ mm}^2 = 307.72 \text{ mm}^2 + \pi D H$$

$$395.64 \text{ mm}^2 = \pi D H$$

$$\frac{395.64 \text{ mm}^2}{43.96 \text{ mm}} = \frac{3.14 \times 14 \text{ mm} \times H}{3.14 \times 14 \text{ mm}}$$

$$9 \text{ mm} = H$$