

Similar 3 Dimensional Figures

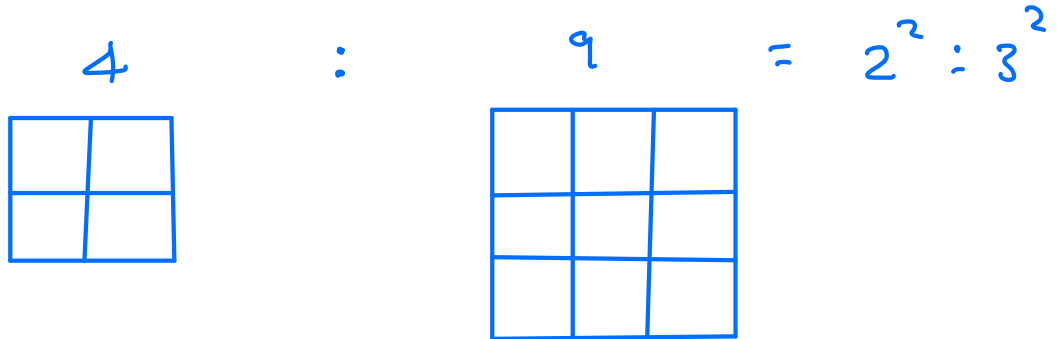
Scale factors are normally quoted for lengths

Example

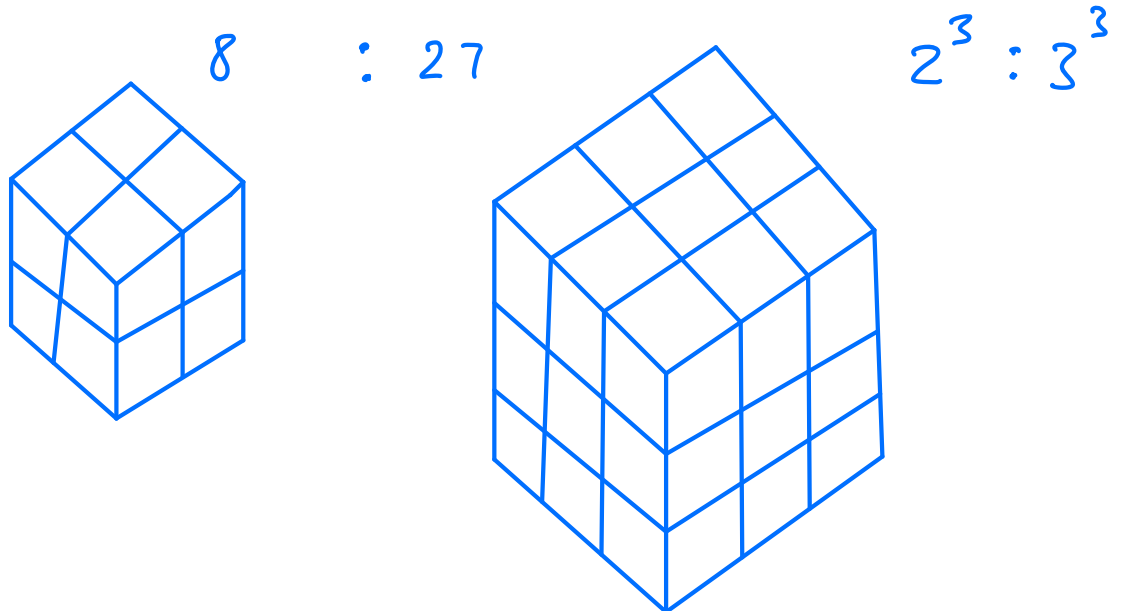
Length



Area



Vol



In general if lengths are in the ratio $m:n$ then we have

Length $m : n$

Area $m^2 : n^2$

Volume $m^3 : n^3$

Moving Between Ratios For Length, Area, Volume

Ex 1

L	2 : 5		
A	$2^2 : 5^2$	=	4 : 25
V	$2^3 : 5^3$	=	8 : 125

Ex 2

L	$\sqrt{16} : \sqrt{49}$	=	4 : 7
A	16 : 49		
V	$4^3 : 7^3$	=	64 : 343

Ex 3

L	$\sqrt[3]{27} = \sqrt[3]{216}$	=	3 : 6 = 1 : 2
A	$1^2 : 2^2$	=	1 : 4
V	27 : 216		

Exam Type Questions

1) Two statues A and B are mathematically similar
The length of A = 20 cm and the length
of B = 70 cm.

a) The surface Area of A = 240 cm^2
Find surface Area of B

b) The volume of B = 1200 cm^3

Find volume of A

$$\begin{array}{l} L \quad A : B \\ \quad 20 : 70 = 2 : 7 \\ A \quad 2^2 : 7^2 = 4 : 49 \\ V \quad 2^3 : 7^3 = 8 : 343 \end{array}$$

a) Surface Area of B

$$= 240 \times \frac{49}{4} = 2940 \text{ cm}^2$$

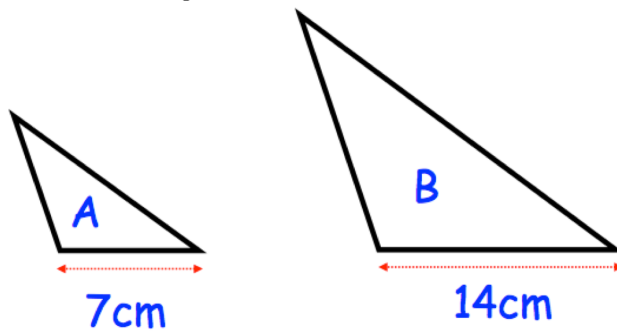
b) Volume of A

$$= 1200 \times \frac{8}{343} = 27.988$$

$$= 28.0 \text{ cm}^3$$

to 3 sig fig

1. Below are two similar triangles.



A : B

$$\text{Length } 7 : 14 = 1 : 2$$

$$\text{Area } 1^2 : 2^2 = 1 : 4$$

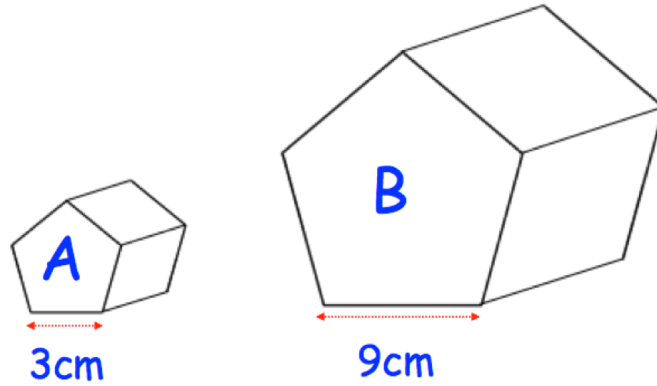
The area of triangle A is 20cm^2
Work out the area of triangle B.

$$\text{Area of B} = 20 \times \frac{4}{1}$$

80

..... cm^2
(2)

2. Below are two similar pentagonal prisms.



$$A : B$$

$$L \quad 3 : 9 = 1 : 3$$

$$A \quad 1^3 : 3^3 = 1 : 27$$

The volume of prism A is 15cm^3
Work out the volume of prism B.

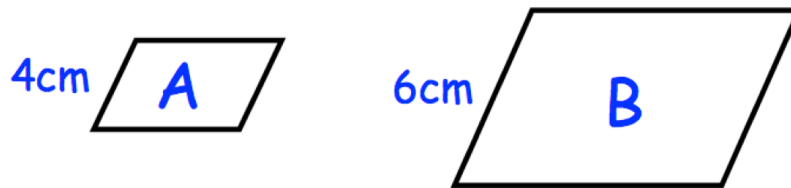
$$\text{Vol of B} = 15 \times \frac{27}{1}$$

$$\begin{array}{r} 10 \times 27 = 270 \\ 5 \times 27 = 135 \\ \hline 405 \end{array}$$

$$\dots\dots\dots 405 \text{cm}^3$$

(2)

3. Below are two similar parallelograms.



$$A : B$$

$$\text{Length} \quad 4 : 6 = 2 : 3$$

$$\text{Area} \quad 2^2 : 3^2 = 4 : 9$$

The area of parallelogram A is 28cm^2

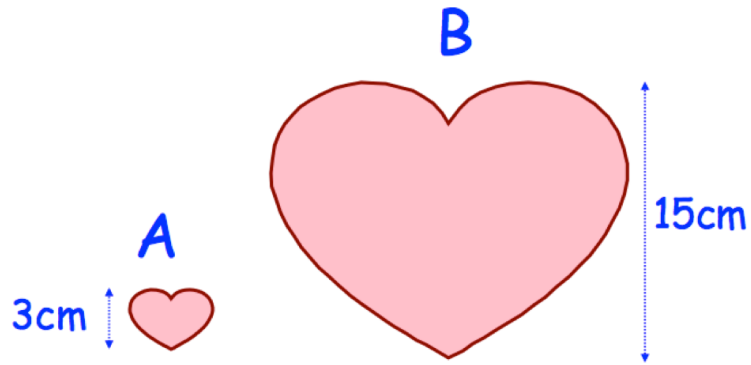
Work out the area of parallelogram B.

$$\text{Area of B} = 28 \times \frac{9}{4}$$

$$\dots\dots\dots 63 \text{cm}^2$$

(2)

4. Shown below are two mathematically similar shapes.



The area of shape B is 150cm^2

Work out the area of shape A.

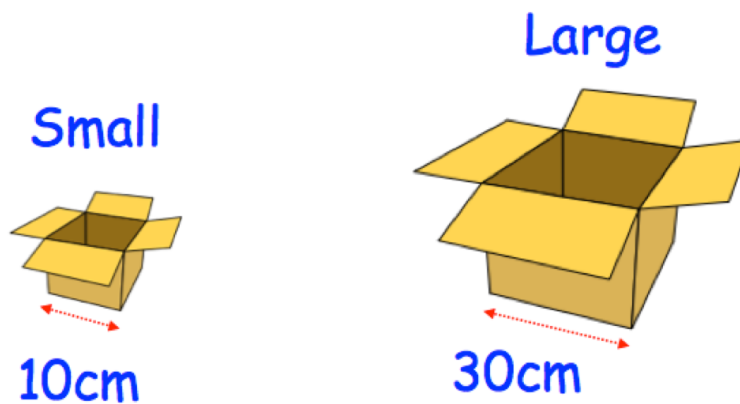
$A : B$

Length $3 : 15 = 1 : 5$

Area $1^2 : 5^2 = 1 : 25$

$$\text{Area of A} = 150 \times \frac{1}{25} = 6\text{cm}^2$$

7. Shown below are two boxes that are mathematically similar.



The volume of the small box is 500cm^3

Work out the volume of the larger box.

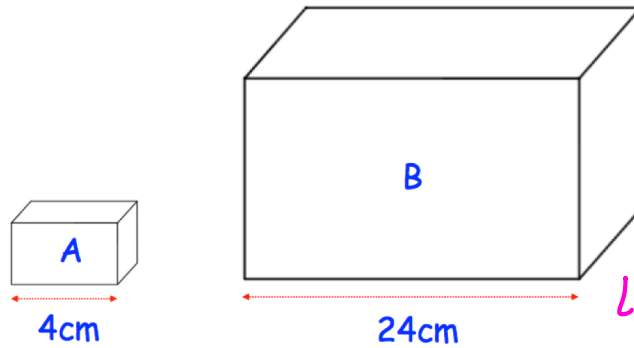
$\text{Small} : \text{Large}$

L $10 : 30 = 1 : 3$

V $1^3 : 3^3 = 1 : 27$

$$\begin{aligned} \text{Large vol} &= 500 \times 27 \\ &= 13500\text{cm}^3 \end{aligned}$$

8. Shown below are two mathematically similar cuboids.



$$A : B$$

$$\text{Length } 4 : 24 = 1 : 6$$

$$\text{Vol } 1^3 : 6^3 = 1 : 216$$

The volume of cuboid B is 1728cm^3

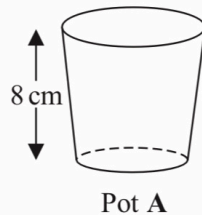
Find the volume of cuboid A.

$$\text{Vol of A} = 1728 \times \frac{1}{216} = 8$$

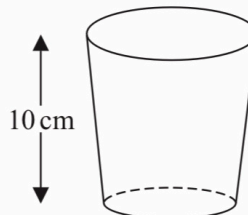
.....⁸..... cm^3
(2)

(Total for Question 14 is 3 marks)

15 Here are two pots.



Pot A



Pot B

Pot A and pot B are mathematically similar.

The area of the base of pot B is 160cm^2 .

Work out the area of the base of pot A.

$$\begin{array}{l} A : B \\ \text{Length } 8 : 10 = 4 : 5 \end{array}$$

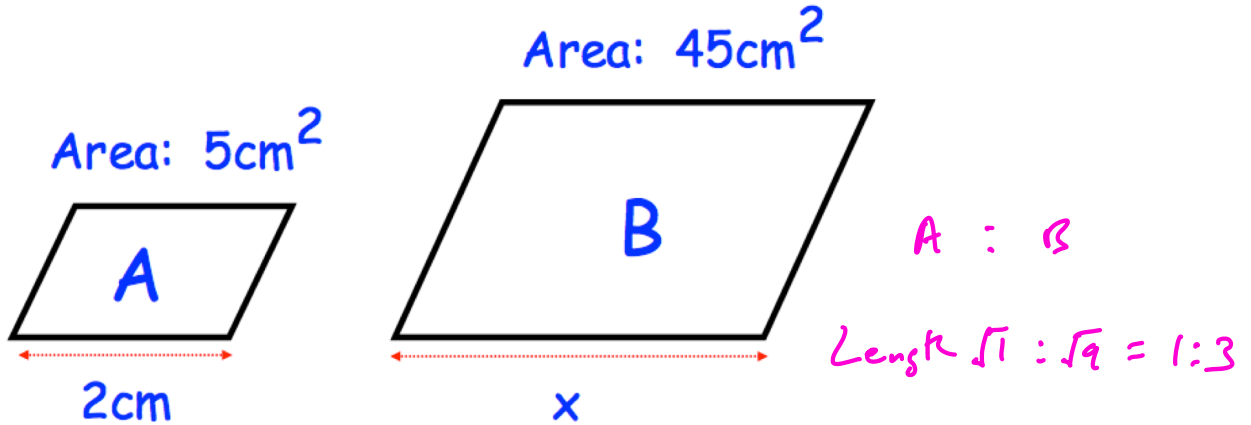
$$\text{Area } 4^2 : 5^2 = 16 : 25$$

$$\text{Area of pot A base} = 160 \times \frac{16}{25} = 102.4$$

.....^{102.4}..... cm^2

(Total for Question 15 is 2 marks)

9. Shown below are two mathematically similar parallelograms.

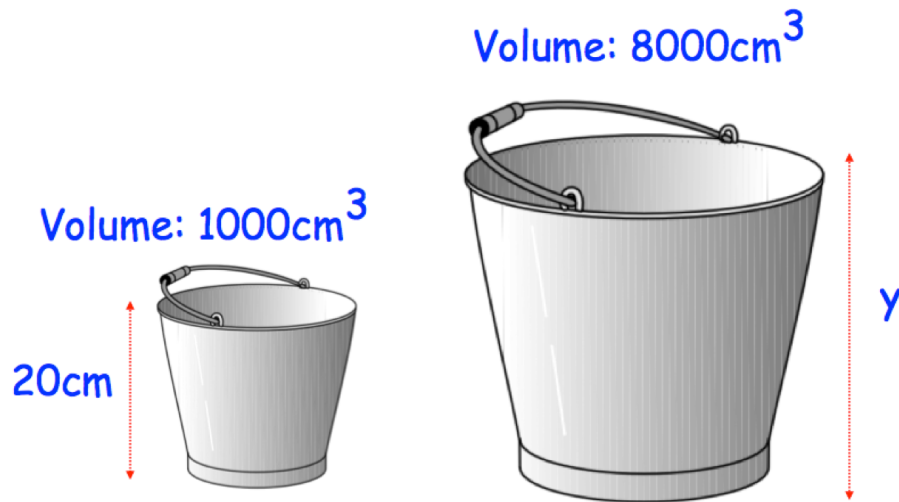


Find x

$$x = 2 \times \frac{3}{1}$$

.....cm
(2)

10. The two buckets below are similar.



Find y

Length $\sqrt[3]{1} : \sqrt[3]{8} = 1 : 2$

$$y = 20 \times \frac{2}{1} = 40\text{cm}$$

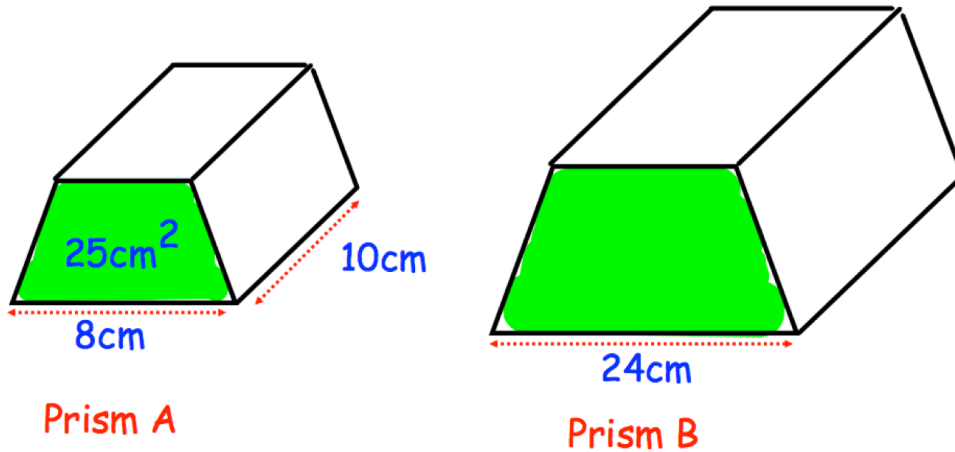
Vol $1000 : 8000 = 1 : 8$

.....cm
(2)

11. Prism A and prism B are mathematically similar



Not drawn to scale



Prism A has a cross-sectional area of 25cm^2

Work out the volume of prism B.

$$\text{Vol of A} = 25 \times 10 = 250\text{cm}^3$$

$$A : B$$

$$\text{Length } 8 : 24 = 1 : 3$$

$$\text{Vol } 1^3 : 3^3 = 1 : 27$$

$$\text{Vol of B} = 250 \times 27$$

$$= 6750\text{cm}^3$$