



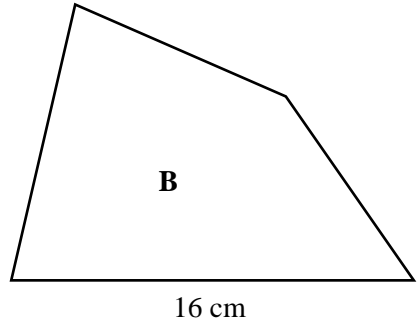
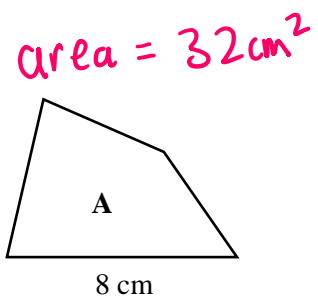
SCAN ME

# Similar Areas/Volumes

← REVISE THIS TOPIC



1 Quadrilaterals **A** and **B** are similar.



The area of quadrilateral **A** is  $32\text{cm}^2$

Work out the area of quadrilateral **B**.

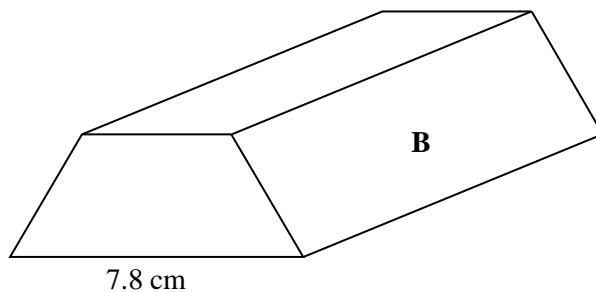
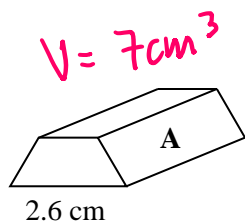
$$\begin{aligned}
 A \rightarrow B \text{ Length scale factor} &= 16 \div 8 \\
 &= 2 \\
 \text{Area scale factor} &= 2^2 \\
 &= 4 \\
 32 \times 4 &= 128
 \end{aligned}$$

.....  $128$  .....  $\text{cm}^2$

(Total for Question 1 is 3 marks)



2 Prisms **A** and **B** are similar.



The volume of prism **A** is  $7\text{ cm}^3$

Work out the volume of prism **B**.

$$\text{Length scale factor} = 7.8 \div 2.6 = 3$$

$$\text{Volume scale factor} = 3^3 = 27$$

$$7 \times 27 = 189$$

..... 189 .....  $\text{cm}^3$

(Total for Question 2 is 3 marks)

3 Solids **P** and **Q** are similar.

**P** has a height of 10 cm and **Q** has a height of 8 cm.

The volume of **P** is  $800\text{ cm}^3$

Work out the volume of **Q**.

$$P \rightarrow Q \quad \text{Length scale factor} = 8 \div 10 = 0.8$$

$$\text{Volume scale factor} = 0.8^3 = 0.512$$

$$800 \times 0.512 = 409.6$$

..... 409.6 .....  $\text{cm}^3$

(Total for Question 3 is 3 marks)





6 Here is some information about similar solids X, Y and Z.

	X	Y	Z
Height	6 cm	15 cm	18
Volume	240 cm <sup>3</sup>	3750	6480 cm <sup>3</sup>

(a) Complete the table

$$X \rightarrow Y \quad \text{Length scale factor} = 15 \div 6 \quad (5)$$

$$= 2.5$$

$$\text{Volume scale factor} = 2.5^3$$

$$= 15.625$$

$$240 \times 15.625 = 3750 \text{ cm}^3$$

$$Y \rightarrow Z \quad \text{Volume scale factor} = 6480 \div 3750$$

$$= 1.728$$

$$\text{Length scale factor} = \sqrt[3]{1.728}$$

$$= 1.2$$

(b) Work out

$$15 \times 1.2 = 18 \text{ cm}$$

surface area of X : surface area of Y : surface area of Z

Give your answer in its simplest form.

$$\text{Lengths} \quad 6 : 15 : 18 = 2 : 5 : 6$$

$$\text{Areas} \quad 2^2 : 5^2 : 6^2 = 4 : 25 : 36$$

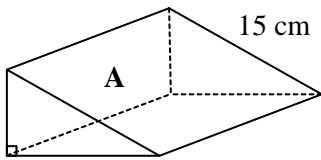
$$4 : 25 : 36$$

(2)

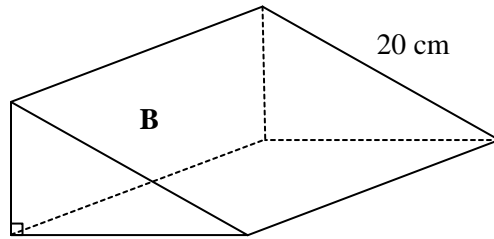
(Total for Question 6 is 7 marks)



7 Here are triangle prisms **A** and **B**.



Surface area =  $960 \text{ cm}^2$



Surface area =  $1500 \text{ cm}^2$

Show that prisms **A** and **B** are **not** similar.

$$A \rightarrow B \quad \text{Length scale factor} = 20 \div 15 = 1.\dot{3}$$

$$\text{Area scale factor} = 1500 \div 960 = 1.5625$$

$$\sqrt{1.5625} = 1.25 \quad 1.25 \neq 1.\dot{3}$$

(Total for Question 7 is 3 marks)

8 Solids **G** and **H** are similar.

**G** has a surface area of  $3430 \text{ cm}^2$  and **H** has a surface area of  $280 \text{ cm}^2$ .  
The height of **G** is 84 cm

Work out the height of **H**.

$$G \rightarrow H \quad \text{Area scale factor} = 280 \div 3430 = \frac{4}{49}$$

$$\text{Length scale factor} = \sqrt{\frac{4}{49}} = \frac{2}{7}$$

$$84 \times \frac{2}{7} = 24$$

24

(Total for Question 8 is 3 marks)



9 Solids C and D are similar.

C has a volume of  $40 \text{ cm}^3$  and D has a volume of  $1080 \text{ cm}^3$ .  
The surface area of C is  $100 \text{ cm}^2$

Work out the surface area of D.

$$\begin{aligned}
 C \rightarrow D \quad \text{Volume scale factor} &= 1080 \div 40 \\
 &= 27 \\
 \text{Length scale factor} &= \sqrt[3]{27} = 3 \\
 \text{Area scale factor} &= 3^2 = 9 \\
 100 \times 9 &= 900
 \end{aligned}$$

900

.....  $\text{cm}^2$

(Total for Question 9 is 3 marks)

10 Solids U and V are similar.

U has a surface area of  $375 \text{ cm}^2$  and V has a surface area of  $540 \text{ cm}^2$ .  
The volume of V is  $432 \text{ cm}^3$

Work out the volume of U.

$$\begin{aligned}
 V \rightarrow U \quad \text{Area scale factor} &= 375 \div 540 \\
 &= \frac{25}{36} \\
 \text{Length scale factor} &= \sqrt{\frac{25}{36}} = \frac{5}{6} \\
 \text{Volume scale factor} &= \left(\frac{5}{6}\right)^3 = \frac{125}{216} \\
 432 \times \frac{125}{216} &= 250
 \end{aligned}$$

250

.....  $\text{cm}^3$

(Total for Question 10 is 3 marks)





11 Solids **M** and **N** are similar.

volume of **M** : volume of **N** = 1000 : 1

The surface area of **M** is 80 cm<sup>2</sup>

Work out the surface area of **N**.

M : N

Volume      1000 : 1

Length        10 : 1

Area         100 : 1

$\swarrow \times 0.8$        $\searrow \times 0.8$   
 80 : 0.8

0.8

..... cm<sup>2</sup>

(Total for Question 11 is 3 marks)

12 Solids **A**, **B** and **C** are similar.

surface area of Solid **A** : surface area of Solid **B** = 4 : 25

volume of Solid **A** : volume of solid **C** = 64 : 729

height of Solid **A** : height of Solid **B** : height of Solid **C** =  $p : q : r$

where  $p$ ,  $q$  and  $r$  are integers in their simplest form.

Work out the values of  $p$ ,  $q$  and  $r$ .

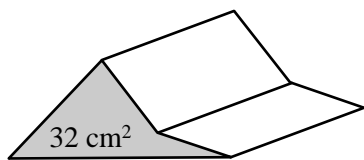
	A : B	A : C	
Area	4 : 25	Volume 64 : 729	
Length	2 : 5	Length 4 : 9	
	A : B = 2 : 5	A : C = 4 : 9	p = $\frac{4}{\dots}$
	= 4 : 10	A : B : C = 4 : 10 : 9	q = $\frac{10}{\dots}$
			r = $\frac{9}{\dots}$

(Total for Question 12 is 3 marks)

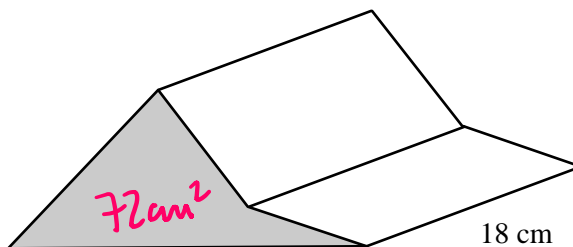


13 Prisms **A** and **B** are similar.  
The cross sections are shaded.

Prism **A**



Prism **B**



The area of the cross section of prism **A** is  $32 \text{ cm}^2$   
The length of prism **B** is  $18 \text{ cm}$ .

volume of prism **A** : volume of prism **B** =  $8 : 27$

Work out the volume of prism **B**.

$A : B$   
 Volume  $8 : 27$   
 Length  $2 : 3$   
 Area  $4 : 9$   
 $\begin{matrix} \times 8 \swarrow & & \searrow \times 8 \\ & 32 : 72 & \end{matrix}$

Cross section of **B** =  $72 \text{ cm}^2$

Volume of prism = area of cross section  $\times$  length  
 $= 72 \times 18$

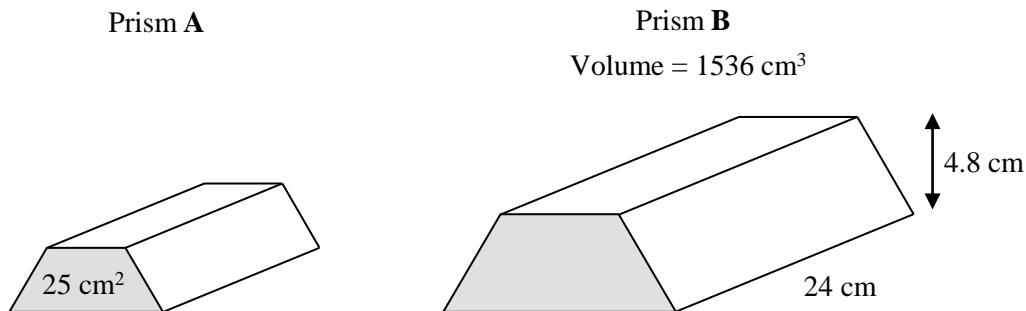
1296 .....  $\text{cm}^3$

(Total for Question 13 is 4 marks)





14 Prisms **A** and **B** are similar.  
The cross sections are shaded.



Here is some information about the prisms.

	Length	Height	Cross Section Area	Volume
Prism A			25 cm <sup>2</sup>	
Prism B	24 cm	4.8 cm		1536 cm <sup>3</sup>

Work out the height of prism A.

$$\begin{aligned}
 \text{Area of cross section of B} &= 1536 \div 24 \\
 &= 64 \text{ cm}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{B} \rightarrow \text{A} \quad \text{Area scale factor} &= \frac{25}{64} \\
 \text{Length scale factor} &= \frac{5}{8}
 \end{aligned}$$

$$4.8 \times \frac{5}{8} = 3$$

3

..... cm

(Total for Question 14 is 4 marks)



15 Solids X and Y are similar.

X has a height of 14 cm and Y has a height of 21 cm.  
The volume of Y is  $950 \text{ cm}^3$  greater than the volume of X.

Work out the volume of Solid X.

$$Y \rightarrow X \quad \text{Length scale factor} = 14 \div 21$$

$$= \frac{2}{3}$$

$$\text{Volume scale factor} = \left(\frac{2}{3}\right)^3$$

$$= \frac{8}{27}$$

$$\text{also volume scale factor} = \frac{x}{x+950}$$

$$\frac{x}{x+950} = \frac{8}{27}$$

$$27x = 8(x+950)$$

$$27x = 8x + 7600$$

$$19x = 7600$$

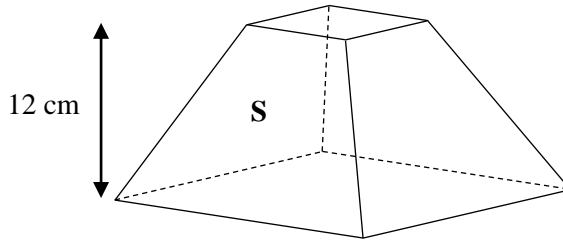
$$x = 7600 \div 19$$

..... **400** .....  $\text{cm}^3$

(Total for Question 15 is 4 marks)



16 Solid S is shown below.



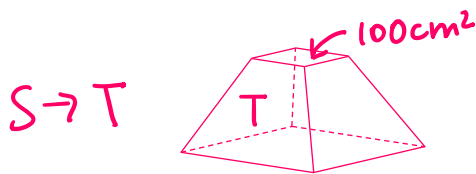
Two of the faces of Solid S are squares with areas of  $36 \text{ cm}^2$  and  $225 \text{ cm}^2$   
 Four of the faces of Solid S are trapeziums.

The vertical height of Solid S is 12 cm.

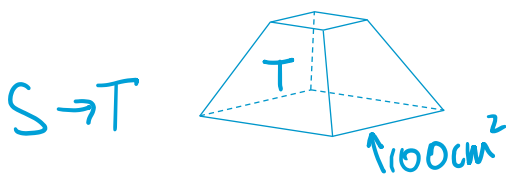
Solid T is similar to Solid S.

The area of one of the square faces of Solid T is  $100 \text{ cm}^2$

Work out two possible values for the vertical height of Solid T.



Area scale factor =  $\frac{100}{36}$   
 Length scale factor =  $\frac{10}{6}$   
 $12 \times \frac{10}{6} = \underline{\underline{20 \text{ cm}}}$



Area scale factor =  $\frac{100}{225}$   
 Length scale factor =  $\frac{10}{15}$   
 $12 \times \frac{10}{15} = \underline{\underline{8 \text{ cm}}}$

..... 20 ..... cm

..... 8 ..... cm

(Total for Question 16 is 4 marks)





17 Solids **X**, **Y** and **Z** are similar.

volume of **X** : volume of **Y** = 1 : 8

surface area of **Y** : surface area of **Z** = 9 : 20

height of **X** : height of **Y** : height of **Z** =  $a : b : c\sqrt{5}$

where  $a$ ,  $b$  and  $c$  are integers.

Work out the values of  $a$ ,  $b$  and  $c$ .

$$\begin{array}{ll}
 X : Y & Y : Z \\
 \text{Volume } 1 : 8 & \text{Area } 9 : 20 \\
 \text{Length } 1 : 2 & \text{Length } 3 : \sqrt{20} \\
 X : Y = 1 : 2 & Y : Z = 3 : \sqrt{20} \\
 = 3 : 6 & = 6 : 2\sqrt{20} \\
 X : Y : Z = 3 : 6 : 2\sqrt{20} \\
 = 3 : 6 : 2 \times \sqrt{4} \times \sqrt{5} \\
 = 3 : 6 : 4\sqrt{5}
 \end{array}$$

$$\begin{array}{l}
 a = \dots\dots\dots 3 \\
 b = \dots\dots\dots 6 \\
 c = \dots\dots\dots 4
 \end{array}$$

(Total for Question 17 is 4 marks)

