

Name:

Exam Style Questions

Volume of a Frustum



Corbettmaths

Equipment needed: Calculator, pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Video Tutorial

www.corbettmaths.com/contents

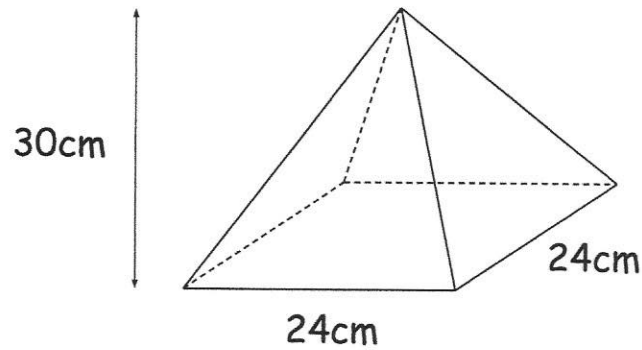
Video 360a



Answers and Video Solutions



1. Shown is a square based pyramid, A.



- (a) Find the volume of A

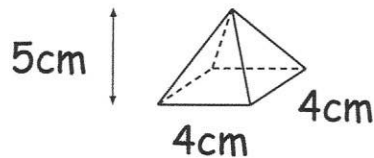
$$V = \frac{1}{3} Ah$$

$$V = \frac{1}{3} (24 \times 24) \times 30$$
$$= 5760$$

$$\dots\dots\dots 5760 \text{ cm}^3$$

(2)

- Shown is a smaller square based pyramid, B.



- (b) Find the volume of B

$$V = \frac{1}{3} Ah$$

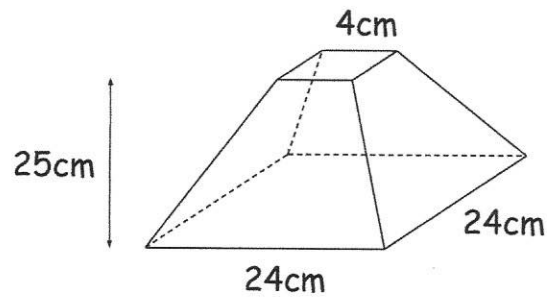
$$= \frac{1}{3} (4 \times 4) \times 5$$

$$= 26.6 \text{ cm}^3$$

$$\dots\dots\dots 26.66\dots \text{ cm}^3$$

(2)

A frustum is created by removing the pyramid B from the top of pyramid A.



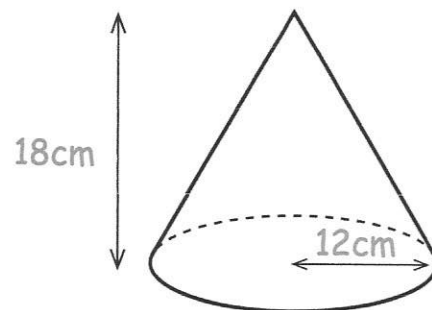
(c) Find the volume of the frustum.

$$5760 - 26.66... = 5733.33...$$

$$\begin{array}{r} 5733.33... \\ \hline \end{array} \text{cm}^3$$

(1)

2. Shown below is cone A.



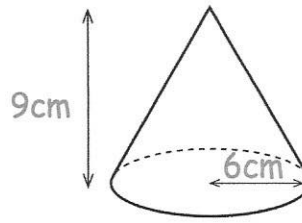
(a) Find the volume of A

$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \pi \times 12^2 \times 18 \\ &= 864\pi \\ &= 2714.336... \end{aligned}$$

$$\begin{array}{r} 2714.336... \\ \hline \end{array} \text{cm}^3$$

(2)

Shown is a smaller cone, B.

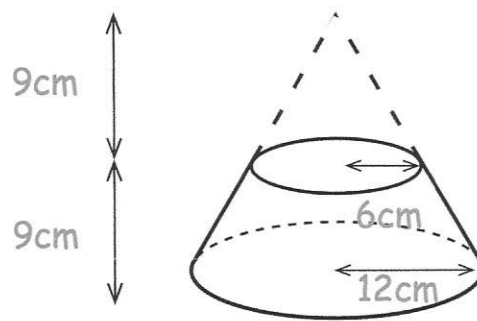


(b) Find the volume of B

$$\begin{aligned}
 V &= \frac{1}{3} \pi r^2 h \\
 &= \frac{1}{3} \times \pi \times 6^2 \times 9 \\
 &= 108\pi \\
 &= 339.292\dots
 \end{aligned}$$

$$\begin{array}{r}
 339.292\dots \\
 \hline
 \text{cm}^3 \\
 (2)
 \end{array}$$

A frustum is created by removing the cone B from the top of cone A.



(c) Find the volume of the frustum.

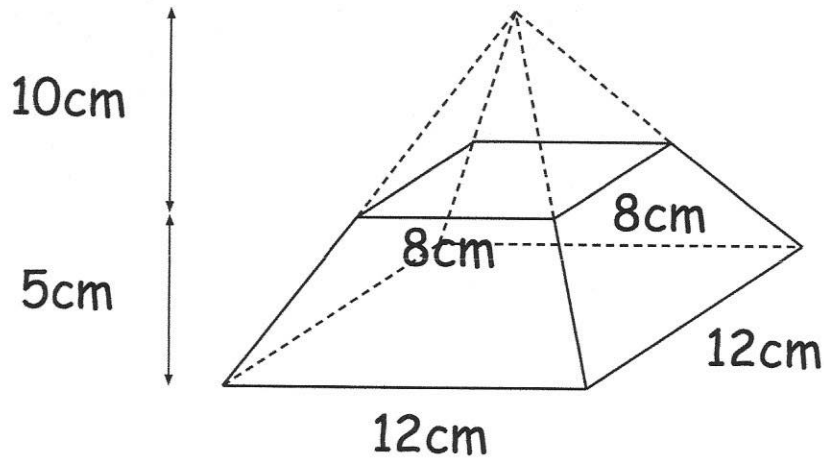
$$864\pi - 108\pi = 756\pi$$

or

$$\begin{aligned}
 2714.336\dots - 339.292\dots \\
 = 2375.044\dots
 \end{aligned}$$

$$\begin{array}{r}
 2375.044\dots \\
 \hline
 \text{cm}^3 \\
 (1)
 \end{array}$$

3. A frustum is made by removing a small pyramid from a larger pyramid.



Find the volume of the frustum.

$$V = \frac{1}{3} Ah$$

$$\frac{1}{3} (12 \times 12) \times 15 = 720 \text{ cm}^3$$

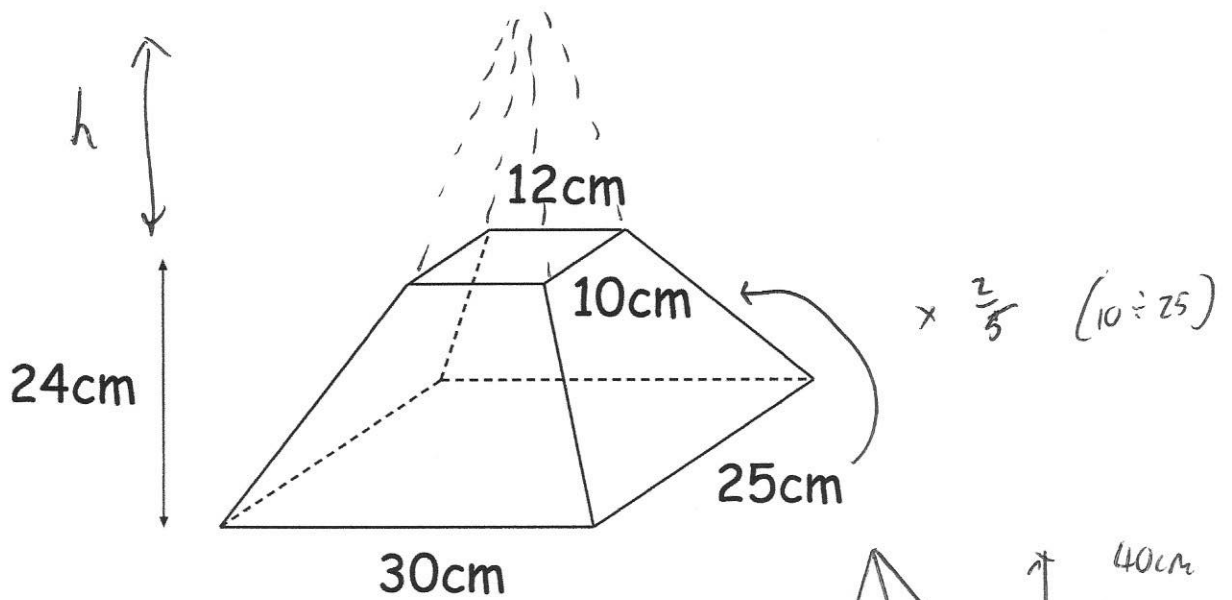
$$\frac{1}{3} (8 \times 8) \times 10 = 213.\bar{3} \text{ cm}^3$$

$$720 - 213.\bar{3} = 506.\bar{6} \text{ cm}^3$$

$$\underline{\hspace{1.5cm}} \text{ cm}^3$$

(4)

4. Shown is a frustum of a pyramid that had a perpendicular height of 40cm.



Find the volume of the frustum.

$$V = \frac{1}{3} A h$$

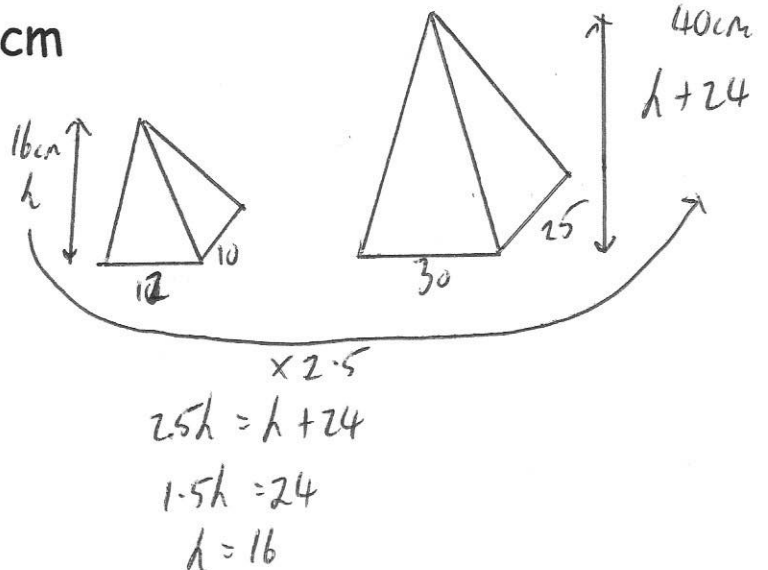
$$V = \frac{1}{3} (12 \times 10) \times 16$$

$$= 640 \text{ cm}^3$$

$$V = \frac{1}{3} (30 \times 25) \times 40$$

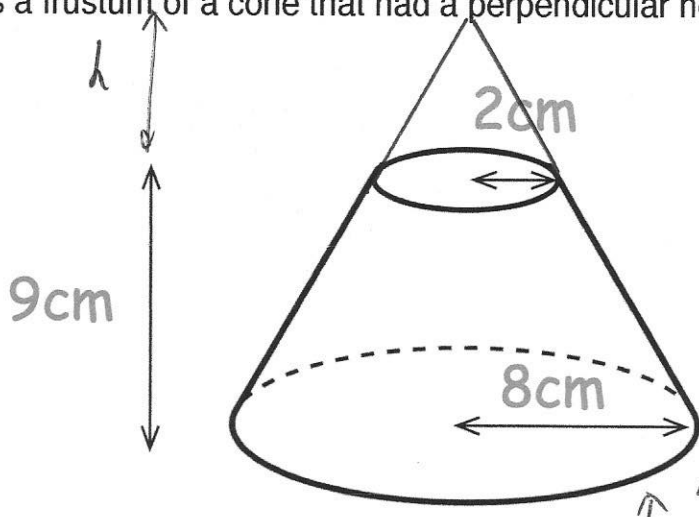
$$= 10000 \text{ cm}^3$$

$$10000 - 640 = 9360$$



9360
.....cm³
(4)

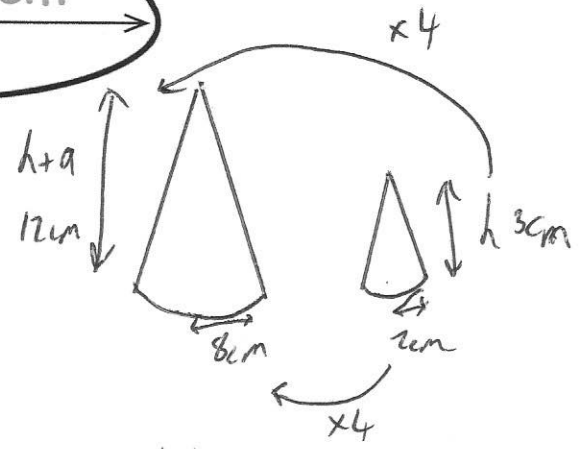
5. Shown is a frustum of a cone that had a perpendicular height of 12cm.



Find the volume of the frustum.

$$V = \frac{1}{3} \pi r^2 h$$

$$\begin{aligned} V &= \frac{1}{3} \times \pi \times 8^2 \times 12 \\ &= 256\pi \text{ cm}^3 \\ &= 804.2477\dots \text{ cm}^3 \end{aligned}$$



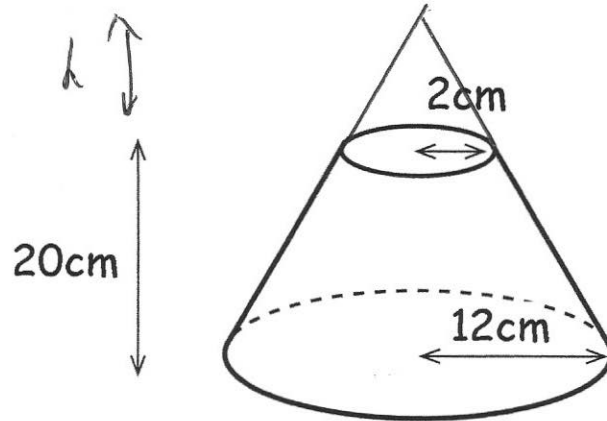
$$\begin{aligned} 4h &= h + 9 \\ 3h &= 9 \\ h &= 3 \end{aligned}$$

$$\begin{aligned} V &= \frac{1}{3} \times \pi \times 2^2 \times 3 \\ &= 4\pi \text{ cm}^3 \\ &= 12.566\dots \text{ cm}^3 \end{aligned}$$

$$\begin{array}{r} 791.681\dots \\ \hline \dots\dots\dots \text{ cm}^3 \\ (4) \end{array}$$

$$\begin{aligned} 256\pi - 4\pi &= 252\pi \text{ cm}^3 \\ \text{or} & \\ 804.247\dots - 12.566\dots &= 791.681\dots \text{ cm}^3 \end{aligned}$$

6. Shown below is a frustum of a cone.



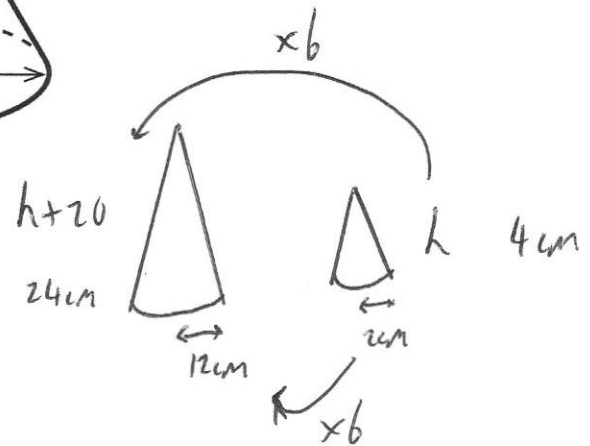
Work out the volume of the frustum.

$$V = \frac{1}{3} \pi r^2 h$$

$$\begin{aligned} V &= \frac{1}{3} \pi \times 12^2 \times 24 \\ &= 1152\pi \text{ cm}^3 \\ &= 3619.114\dots \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} V &= \frac{1}{3} \times \pi \times 2^2 \times 4 \\ &= \frac{16}{3} \pi \text{ cm}^3 \\ &= 16.755\dots \text{ cm}^3 \end{aligned}$$

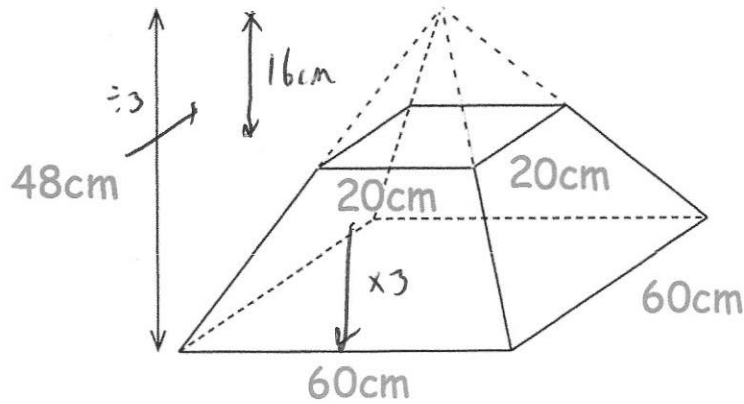
$$3619.114\dots - 16.755\dots = 3602.359\dots$$



$$\begin{aligned} 6h &= h + 20 \\ 5h &= 20 \\ h &= 4 \end{aligned}$$

$$\begin{array}{r} 3602.36 \text{ cm}^3 \\ \dots\dots\dots \\ \text{to 2 dp (4)} \end{array}$$

7. Shown below is a frustum of a square based pyramid.



Work out the volume of the frustum.

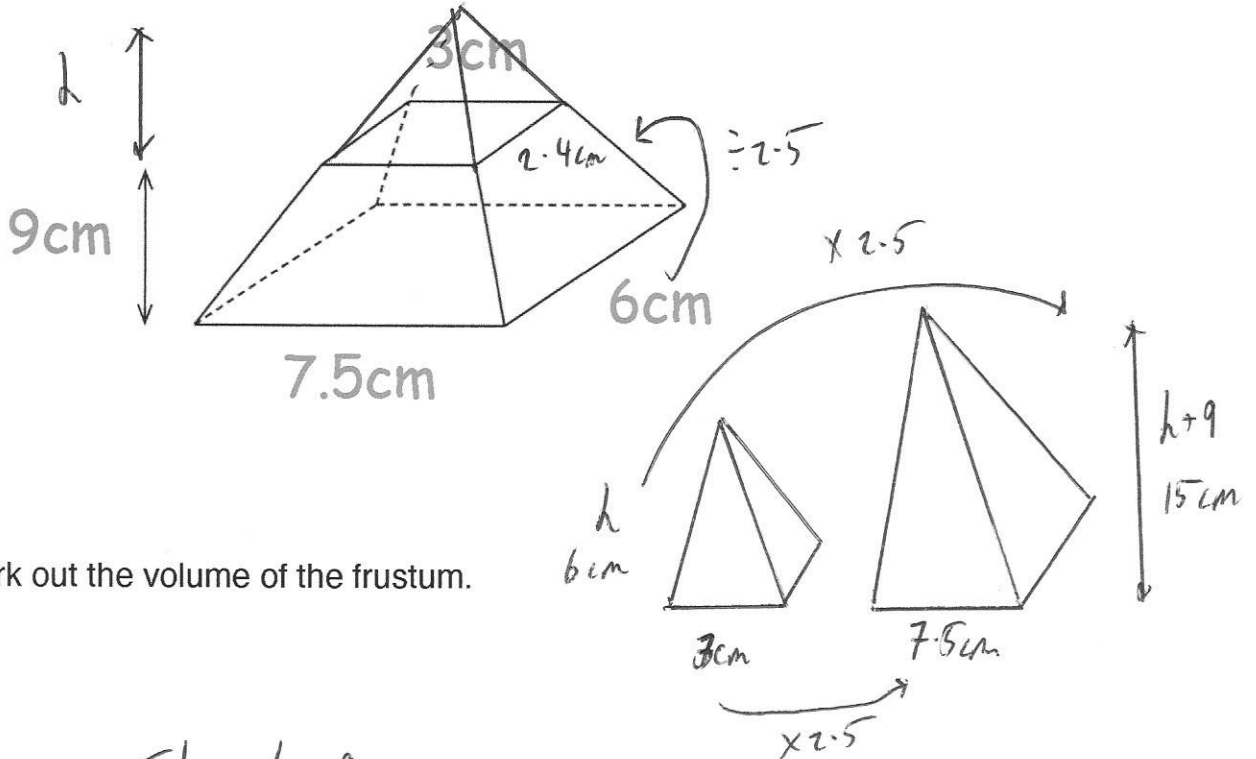
$$\begin{aligned}
 V &= \frac{1}{3} A h \\
 &= \frac{1}{3} (60 \times 60) \times 48 \\
 &= 57600 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 v &= \frac{1}{3} (20 \times 20) \times 16 \\
 &= 2133.33... \text{ cm}^3
 \end{aligned}$$

$$57600 - 2133.33... = 55466.6\dot{6}$$

$$\begin{array}{r}
 55466.6\dot{6} \\
 \hline
 \text{cm}^3 \\
 (4)
 \end{array}$$

8. Shown below is a frustum of a pyramid.



Work out the volume of the frustum.

$$2.5d = h + 9$$

$$1.5h = 9$$

$$h = 6$$

$$V = \frac{1}{3}Ah$$

$$= \frac{1}{3} \times (6 \times 7.5) \times 15$$

$$= 225 \text{ cm}^3$$

$$225 - 14.4 = 210.6 \text{ cm}^3$$

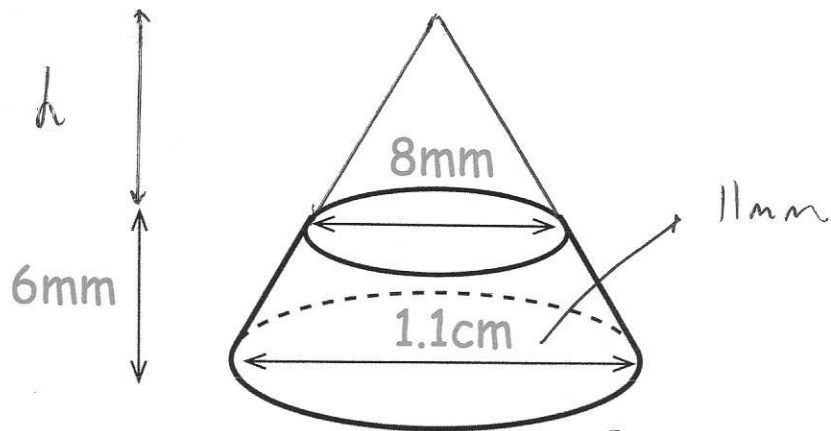
$$V = \frac{1}{3} \times (2.4 \times 3) \times 6$$

$$= 14.4 \text{ cm}^3$$

$$\underline{\hspace{2cm}} \dots \text{ cm}^3$$

(4)

9. Shown is a frustum of a cone.



Find the volume of the frustum.
Include suitable units.

$$1.375h = h + 6$$

$$0.375h = 6$$

$$h = 16\text{mm}$$

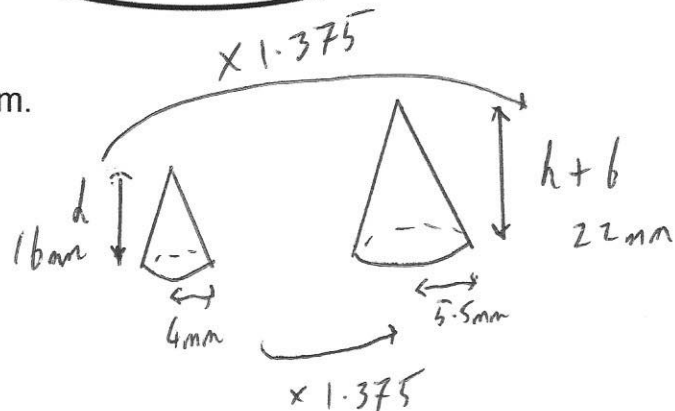
$$V = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3} \times \pi \times 5.5^2 \times 22$$

$$= 696.9099\dots \text{mm}^3$$

$$V = \frac{1}{3} \times \pi \times 4^2 \times 16$$

$$= 268.0825\dots$$



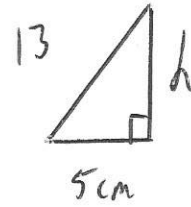
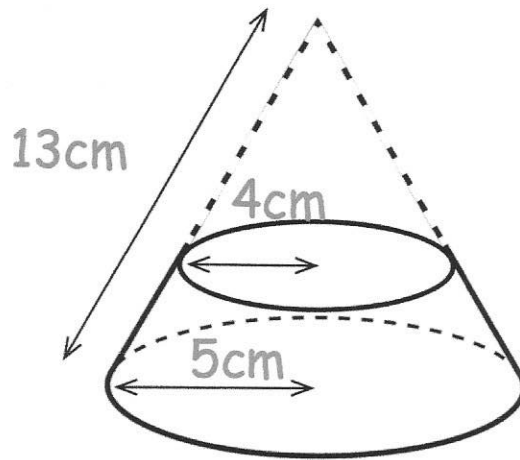
$$696.9099\dots - 268.0825\dots$$

$$= 428.827\dots$$

$$428.83\text{mm}^3$$

to 2 dp. (5)

10. Shown is a frustum of a cone.



$$5^2 + h^2 = 13^2$$

$$25 + h^2 = 169$$

$$h^2 = 144$$

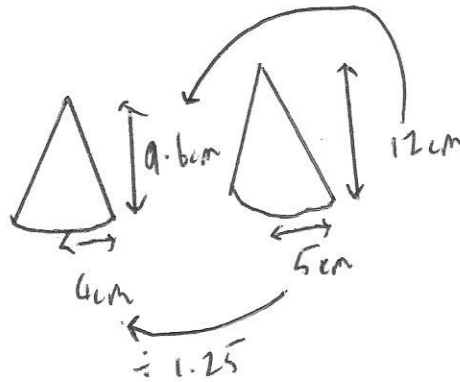
$$h = 12$$

Find the volume of the frustum.

$$V = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \times \pi \times 5^2 \times 12$$

$$= 100\pi \text{ cm}^3$$



$$V = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} \times \pi \times 4^2 \times 9.6$$

$$= 51.2\pi \text{ cm}^3$$

$$100\pi - 51.2\pi = 153.3097... \text{ cm}^3$$

$$\frac{153.31}{\dots} \text{ cm}^3$$

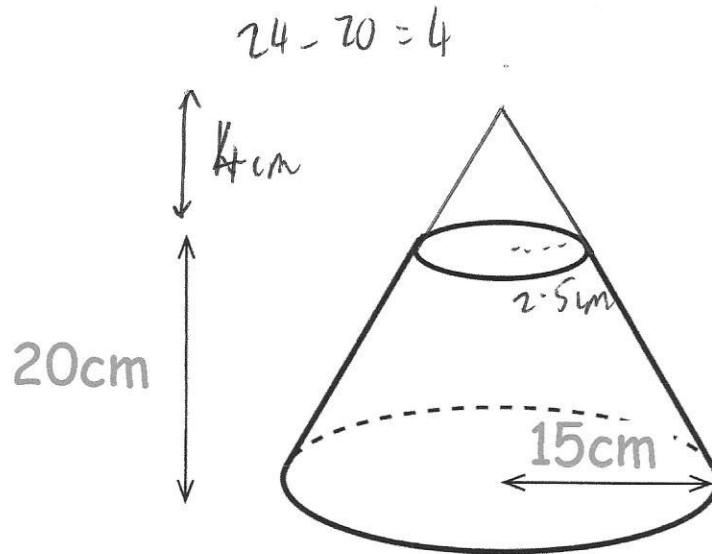
to 2dp (5)

11. Lily is making a solid metal sculpture.



Lily has a solid metal cone with base radius of 15cm and perpendicular height 24cm.

She removes a smaller cone from the top of the cone to leave a frustum.



The density of the metal is 5.8g/cm^3

Find the mass of the sculpture.

Give answer in kg

$$\begin{aligned}
 V &= \frac{1}{3} \pi r^2 h \\
 &= \frac{1}{3} \pi \times 15^2 \times 24 \\
 &= 1800\pi \text{ cm}^3 \quad (5654.866\dots)
 \end{aligned}$$

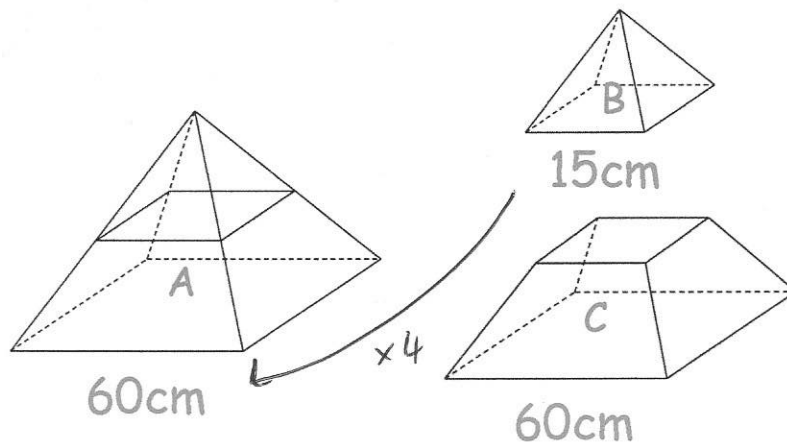
$$\begin{aligned}
 v &= \frac{1}{3} \times \pi \times 2.5^2 \times 4 \\
 &= 26.1799\dots \text{ cm}^3
 \end{aligned}$$

$$1800\pi - 26.179\dots = 5628.6868\dots \text{ cm}^3$$

$$\begin{aligned}
 5628.6868\dots \times 5.8 \\
 = 32646.383\dots \text{ g}
 \end{aligned}$$

$$\begin{aligned}
 &32.646\dots \text{ kg} \\
 &\text{.....} \\
 &(5)
 \end{aligned}$$

12. Squared based pyramid A is divided into pyramid B and frustum C.



Express the volume of Frustum C as a fraction of the volume of pyramid A.

Give your answer in its simplest form.

similar shapes	scale factor	
sides	$\times n$	$\times 4$
lengths	$\times n^2$	$\times 16$
volumes	$\times n^3$	$\times 64$

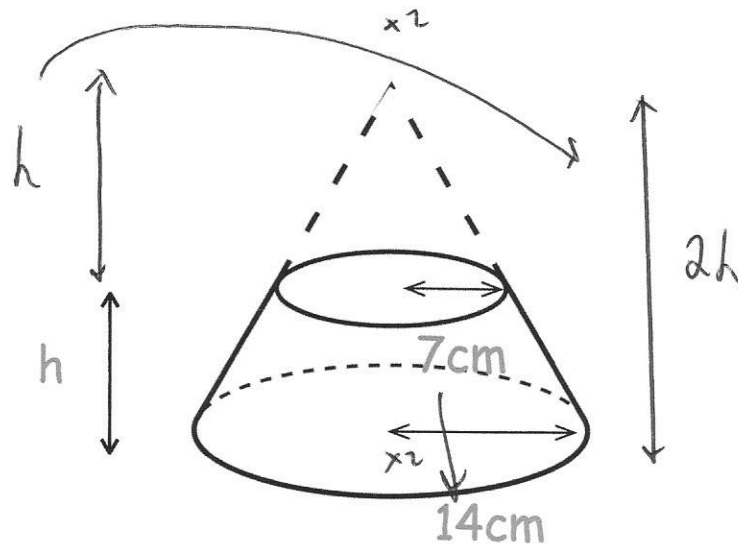
Volume of B is $\frac{1}{64}$ the volume of A

$$1 - \frac{1}{64} = \frac{63}{64}$$

$$\frac{63}{64}$$

(3)

13. A frustum is formed by removing a small cone from a larger cone.



The volume of the frustum is 9000cm^3

Work out the height of the frustum, h .

$$V = \frac{1}{3} \pi r^2 h$$

$$\left(\frac{1}{3} \pi \times 14^2 \times 2h \right) - \left(\frac{1}{3} \times \pi \times 7^2 \times h \right) = 9000$$

$$410.501\dots h - 51.31268001h = 9000$$

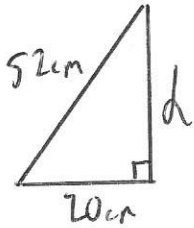
$$359.1887601 h = 9000$$

$$h = 25.056\dots$$

$$\underline{\hspace{1.5cm}} 25.056\dots \text{cm}$$

(4)

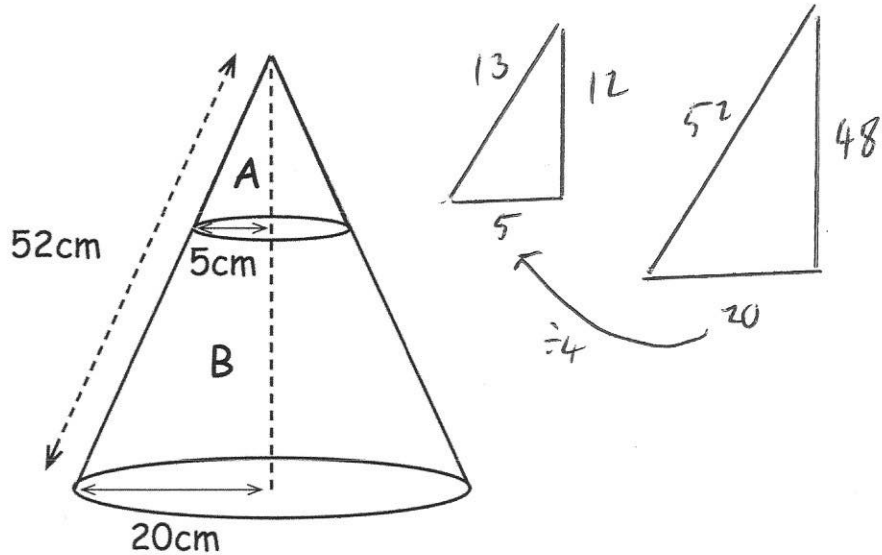
14. Anna made a solid conical ornament.



$$20^2 + h^2 = 52^2$$

$$h^2 = 2304$$

$$h = 48$$



The top of the ornament, A, is made from aluminium and the bottom of the ornament, B, is made from zinc.

The density of the aluminium is 2.7g/cm^3

The density of the zinc is 7.1g/cm^3

Find the mass of the sculpture.

Include suitable units.

$$\begin{aligned} \textcircled{A} \quad V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \pi \times 5^2 \times 12 \\ &= 314.159 \dots \text{cm}^3 \end{aligned}$$

$$314.159 \dots \times 2.7 = 848.23 \dots \text{g}$$

$$\begin{aligned} \textcircled{B} \quad V &= \frac{1}{3} \times \pi \times 20^2 \times 48 - 314.159 \dots \\ &= 19792.03372 \dots \text{cm}^3 \end{aligned}$$

$$19792.03 \dots \times 7.1 = 140523.4394 \text{g}$$

$$140523.4394 + 848.23 = 141371.6694 \text{g}$$

$$\frac{141371.6694}{1000} = 141.3716 \dots \text{kg}$$

(7)