

Name:

Exam Style Questions

Volume of a Cone



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

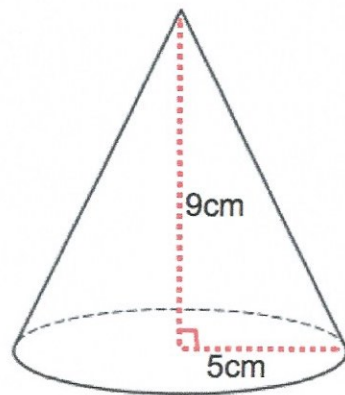
Video 359



Answers and Video Solutions



1. A cone has base radius 5cm and perpendicular height 9cm.



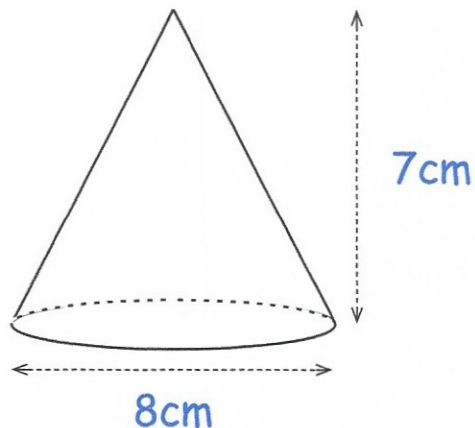
Work out the volume of the cone.
Give your answer to 1 decimal place.

$$\frac{1}{3} \times \pi \times 5^2 \times 9 = 75\pi$$
$$= 235.6194\dots$$

$$\underline{\hspace{1cm} 235.6 \hspace{1cm}} \text{cm}^3$$

(3)

2. A cone has base diameter 8cm and a vertical height of 7cm.



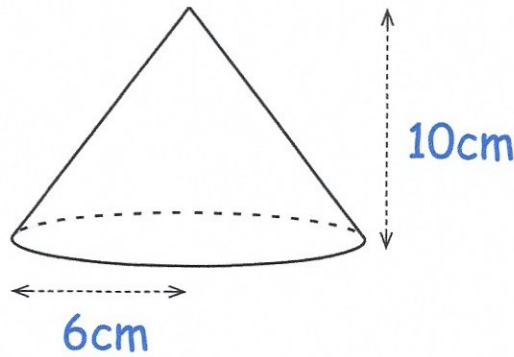
Work out the volume of the cone.
Give your answer to 1 decimal place.

$$\frac{1}{3} \times \pi \times 4^2 \times 7 = \frac{112}{3}\pi$$
$$= 117.2861\dots$$

$$\underline{\hspace{1cm} 117.3 \hspace{1cm}} \text{cm}^3$$

(3)

3. Shown below is a cone.



Calculate the volume of the cone.
Leave your answer in terms of π

$$\begin{aligned}\frac{1}{3} \times \pi \times 6^2 \times 10 &= \frac{1}{3} \times \pi \times 36 \times 10 \\ &= \frac{1}{3} \times 360\pi \\ &= 120\pi\end{aligned}$$

..... 120π cm^3
(3)

4. A cone has base diameter 18cm.
The height of the cone is 20cm.



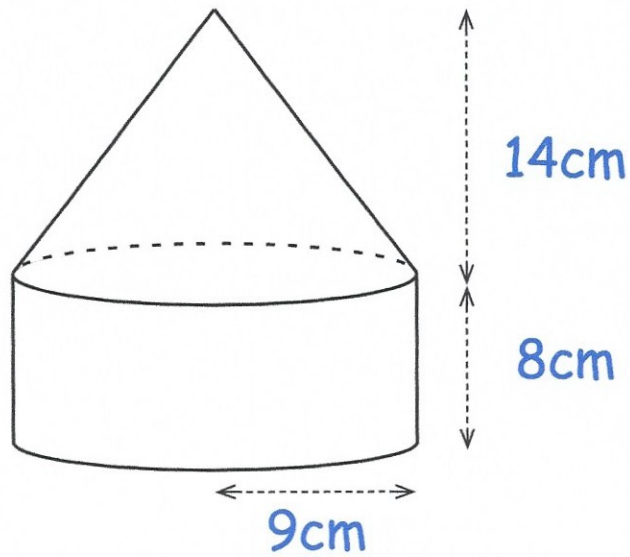
Calculate the volume of the cone.
Leave your answer in terms of π

$$\begin{aligned}9^2 &= 81 \\ 81 \times 20 &= 1620 \\ \frac{0540}{3} & \\ 3 \overline{)1620}\end{aligned}$$

$$\frac{1}{3} \times \pi \times 9^2 \times 20 = 540\pi$$

..... 540π cm^3
(3)

5. A shape is made by joining a cone and a cylinder.



Work out the volume of the shape.

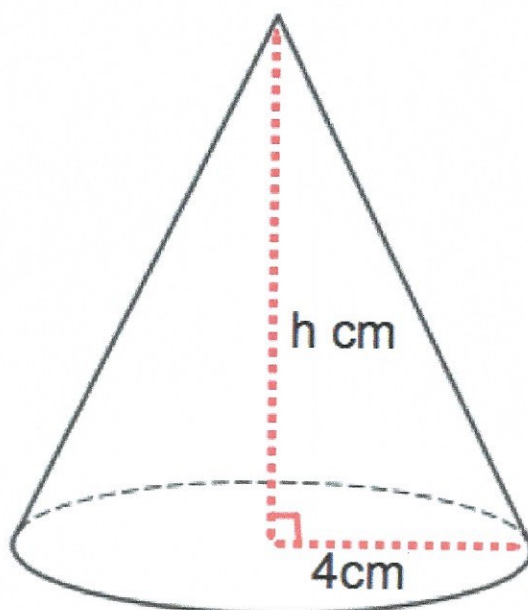
$$\begin{aligned} \text{Cylinder} : \pi \times 9^2 \times 8 &= 648\pi \\ &= 2035.75204 \end{aligned}$$

$$\begin{aligned} \text{Cone} : \frac{1}{3} \times \pi \times 9^2 \times 14 &= 378\pi \\ &= 1187.522\dots \end{aligned}$$

$$\begin{aligned} 648\pi + 378\pi &= 1026\pi \\ &= 3223.274063 \end{aligned}$$

$$\begin{array}{r} 3223.3 \\ \hline \dots\dots\dots \text{cm}^3 \\ (5) \end{array}$$

6.

The volume of the cone shown below is 150 cm^3 

Calculate the height of the cone.

Give your answer to ~~one~~^{two} decimal places

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

$$150 = \frac{1}{3} \times \pi \times 4^2 \times h$$

$$450 = \pi \times 4^2 \times h$$

$$143.23944\dots = 4^2 \times h$$

$$143.239\dots = 16h$$

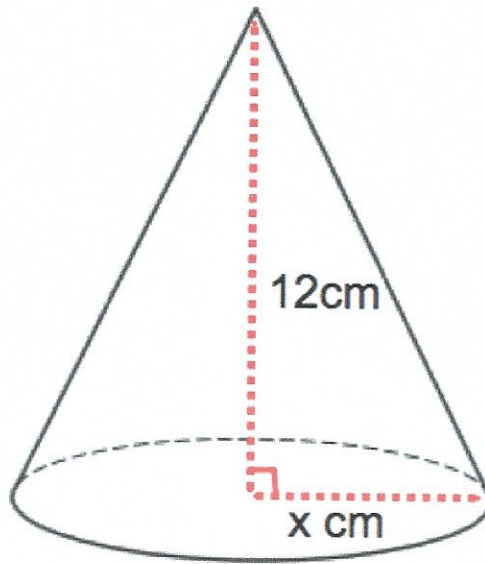
~~$$h = \frac{143.23944\dots}{16}$$~~

$$h = 8.952465\dots$$

$$\begin{array}{r} 8.95 \\ \dots\dots\dots \text{cm} \\ (3) \end{array}$$

7.

The volume of the cone shown below is 170 cm^3



Calculate the radius of the base of the cone.
Give your answer to one decimal place.

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

$$170 = \frac{1}{3} \times \pi \times r^2 \times 12$$

$$510 = \pi \times r^2 \times 12$$

$$42.5 = \pi \times r^2$$

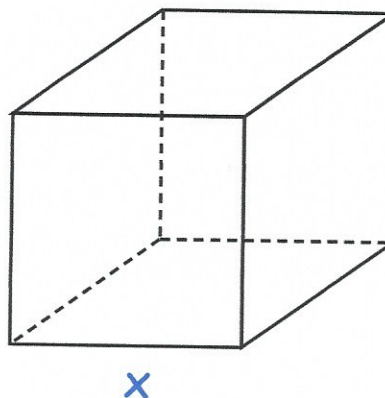
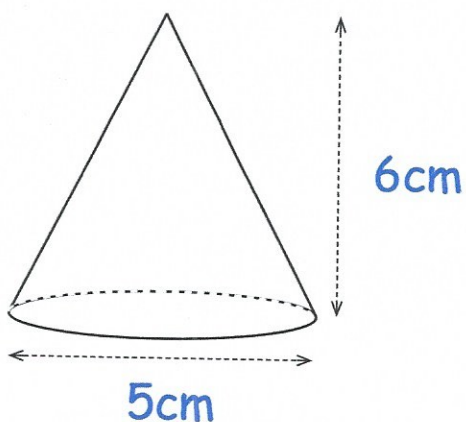
$$13.52817016 = r^2$$

$$r = 3.678\dots$$

3.7

.....cm
(3)

8. Shown below is a cone and a cube.



The volume of the cube is twice the volume of the cone.

Find the side length of the cube, x .

Give your answer to 1 decimal place.

Cone:

$$\begin{aligned} & \frac{1}{3} \times \pi \times 2.5^2 \times 6 \\ &= \frac{25}{2} \pi \\ &= 39.2699 \dots \end{aligned}$$

Cube

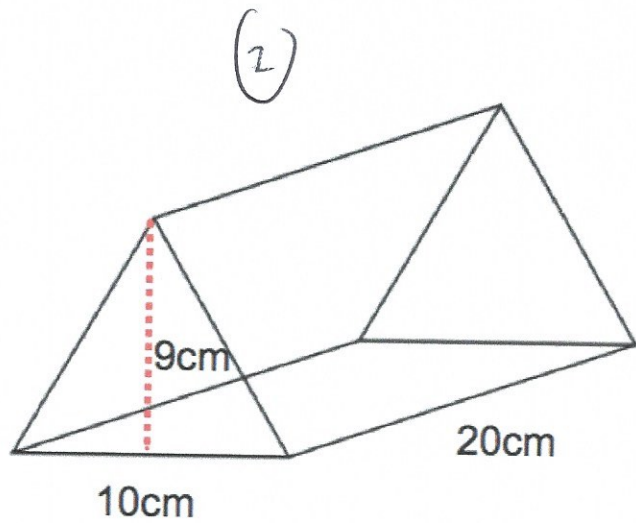
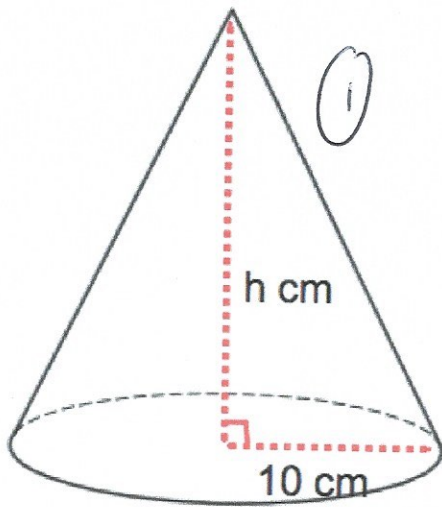
$$\begin{aligned} 2 \times 39.2699 \dots &= 25\pi \\ &= 78.5398 \dots \end{aligned}$$

$$\sqrt[3]{25\pi} = 4.28249 \dots$$

4.3

.....cm
(5)

9. Shown is a cone and a triangular prism.



Both solids have the same volume.

Calculate the height of the cone.

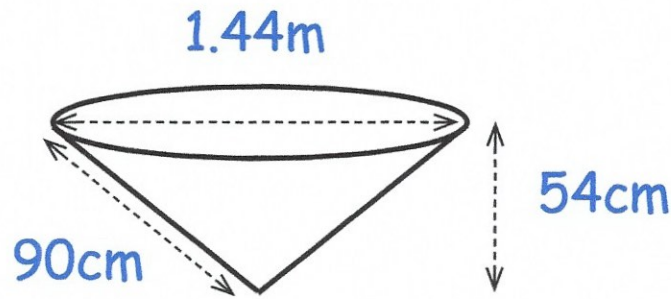
$$\begin{aligned} (2) \quad & \frac{1}{2} \times 10 \times 9 \times 20 \\ & = 900 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} (1) \quad & \frac{1}{3} \times \pi \times 10^2 \times h = 900 \\ & \pi \times 100 \times h = 2700 \\ & \pi h = 27 \\ & h = 8.594\dots \end{aligned}$$

8.6

.....cm
(3)

10. Jasmine has a pond in her garden.
The pond is a cone and is shown below.



Jasmine fills the pond from empty, at a rate of 15 litres per minute.

Work out how long it should take Jasmine to fill the pond.
Give your answer to the nearest minute.

$$\frac{1}{3} \times \pi \times 72^2 \times 54 = 93312\pi \text{ cm}^3$$
$$= 293148.2937 \text{ cm}^3$$

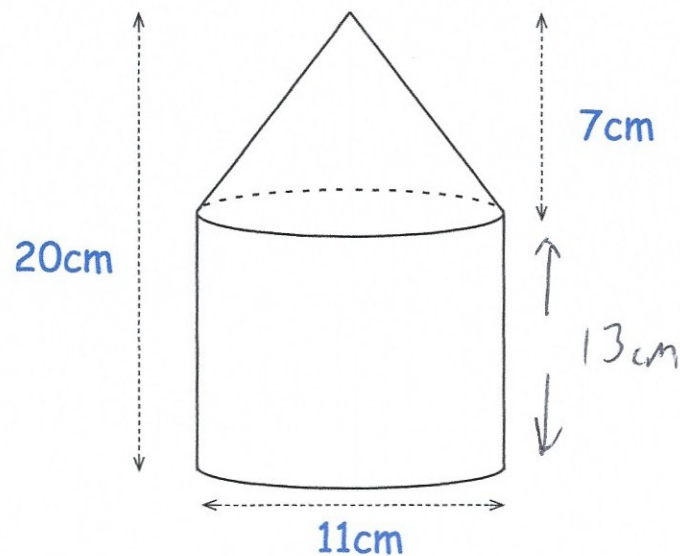
$$1 \text{ litre} = 1000 \text{ cm}^3$$

$$293148.2937 \div 1000 = 293.148... \text{ litres}$$

$$293.148... \div 15 = 19.5432... \text{ minutes}$$

20
..... minutes
(5)

11. A solid glass paperweight is shown below.



The density of glass is 2.5g/cm^3

Work out the mass of the paperweight.

$$\begin{aligned} \text{Cylinder: } & \pi \times 5.5^2 \times 13 \\ & = 1235.43131\dots \quad (393.25\pi) \end{aligned}$$

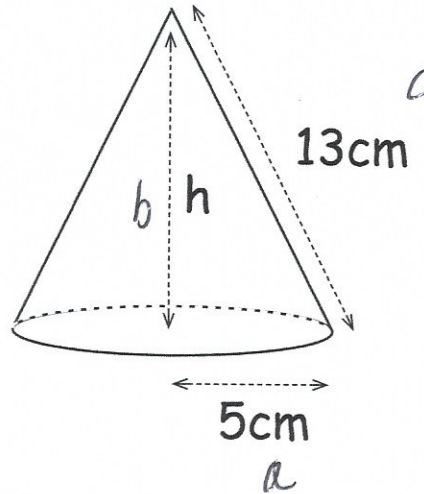
$$\begin{aligned} \text{Cone: } & \frac{1}{3} \times \pi \times 5.5^2 \times 7 \\ & = 221.74408\dots \quad \left(\frac{847}{12}\pi\right) \end{aligned}$$

$$\text{total volume: } 1457.175392\text{cm}^3 \left(\frac{2783}{6}\pi\right)$$

$$\begin{aligned} \text{mass} & = 1457.175\dots \times 2.5 \\ & = 3642.938\text{g} \end{aligned}$$

$$\begin{array}{r} 3.643\text{kg} \\ \hline \end{array} \text{ to 3dp} \\ (5)$$

12. A cone has a base with radius 5cm.
The slant height of the cone is 13cm



- (a) Find the perpendicular height of the cone, h .

$$a^2 + b^2 = c^2$$

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

$$25 + h^2 = 169$$

$$h^2 = 144$$

$$h = 12$$

$$\dots\dots\dots 12 \text{ cm} \\ (2)$$

- (b) Work out the volume of the cone.

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

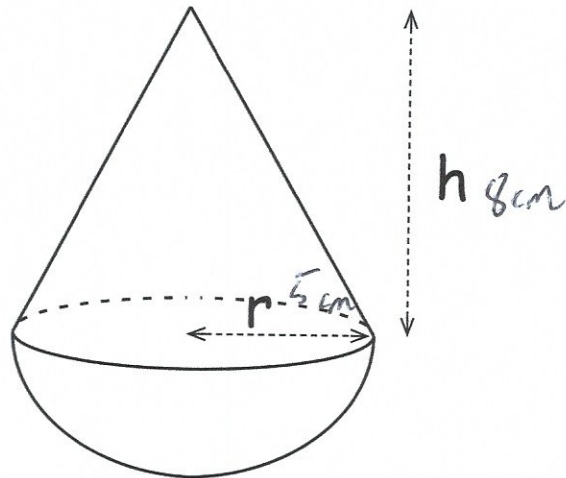
$$= \frac{1}{3} \times \pi \times 5^2 \times 12$$

$$= 100\pi$$

$$= 314.159\dots \text{ cm}^3$$

$$\dots\dots\dots 314.16 \text{ cm}^3 \\ (3)$$

13. The diagram shows a solid made up of a cone and a hemisphere.



The radius of the cone is 5cm.

The height of the cone is 8cm.

The volume of a hemisphere is $\frac{2}{3}\pi r^3$

Calculate the volume of the solid.

Cone:

$$\frac{1}{3} \times \pi \times 5^2 \times 8$$
$$= 209.4395 \dots \text{ cm}^3$$

hemisphere

$$\frac{2}{3} \times \pi \times 5^3$$
$$= 261.7993878 \text{ cm}^3$$

total

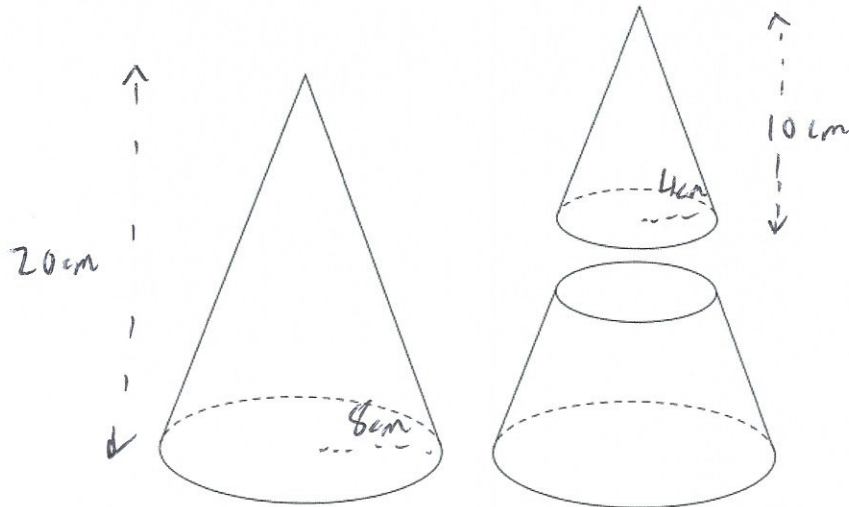
$$209.4395 \dots + 261.79938 \dots = 471.2388 \dots \text{ cm}^3$$

471.2 cm³
(4)

14. A large cone is cut into two parts, a smaller cone and a frustum of a cone.



The height of the large cone is 20cm.
The height of the smaller cone is 10cm.
The radius of the base of the large cone is 8cm.
The radius of the base of the smaller cone is 4cm.



Work out the volume of the frustum.

Large cone

$$\frac{1}{3} \times \pi \times 8^2 \times 20 = 1340.412866\dots$$

Small cone

$$\frac{1}{3} \times \pi \times 4^2 \times 10 = 167.5516\dots$$

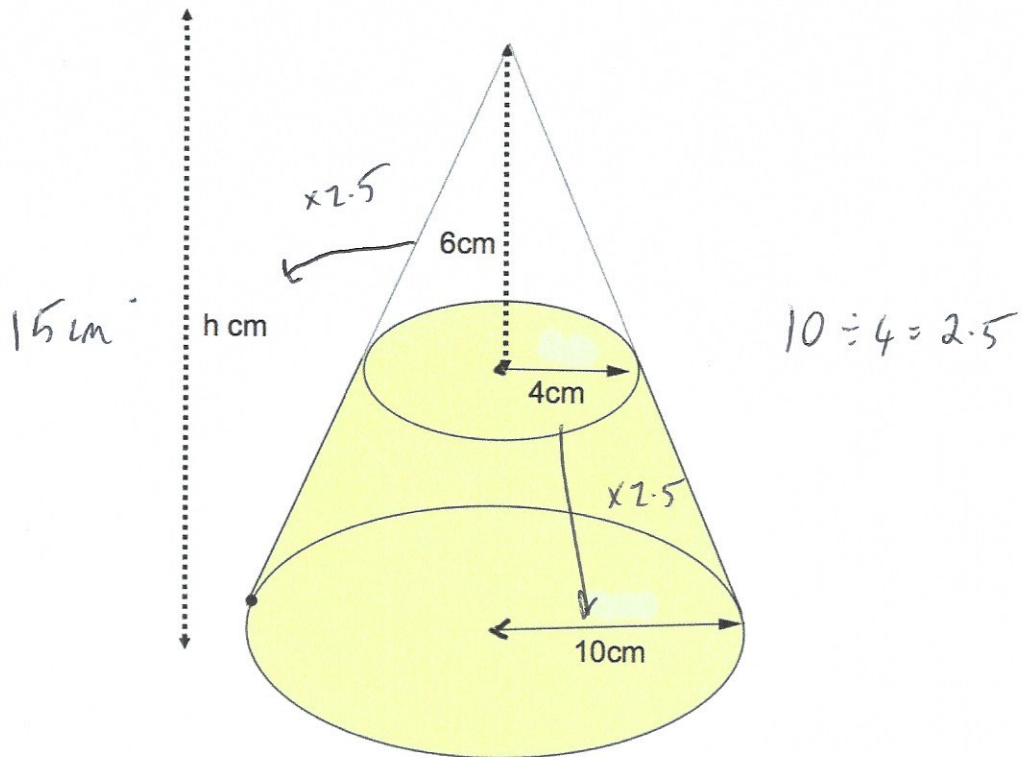
Frustum:

$$1340.412866\dots - 167.5516\dots = 1172.861257\dots$$

$$\underline{\underline{1172.9}} \text{ cm}^3$$

(3)

15. A cone below has base radius 10cm and height h cm.
 A smaller cone radius 4cm and height 6cm is cut from the top.
 The frustum is shown below.



Calculate the volume of the frustum.

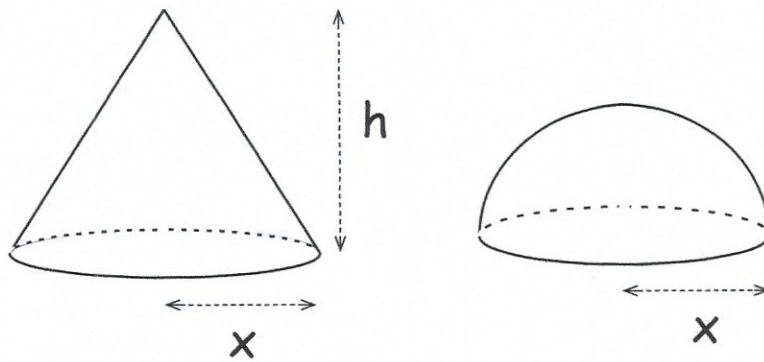
Large cone $\frac{1}{3} \times \pi \times 10^2 \times 15 = 1570.796327$

Small cone $\frac{1}{3} \times \pi \times 4^2 \times 6 = 100.5309649..$

Frustum $1570.796327 - 100.5309649.. = 1470.265..$

$\dots\dots\dots 1470.27 \text{ cm}^3$
 (5)

16. The diagram shows a cone and a hemisphere.



The hemisphere has base radius x cm.

The cone has base radius x cm and perpendicular height h cm.

The volume of the cone is equal to the volume of the hemisphere.

The volume of a hemisphere is $\frac{2}{3}\pi r^3$

Find an expression for h in terms of x .

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

$\times 3$

$\times 3$

$$\pi x^2 h = 2\pi x^3$$

$\div \pi$

$\div \pi$

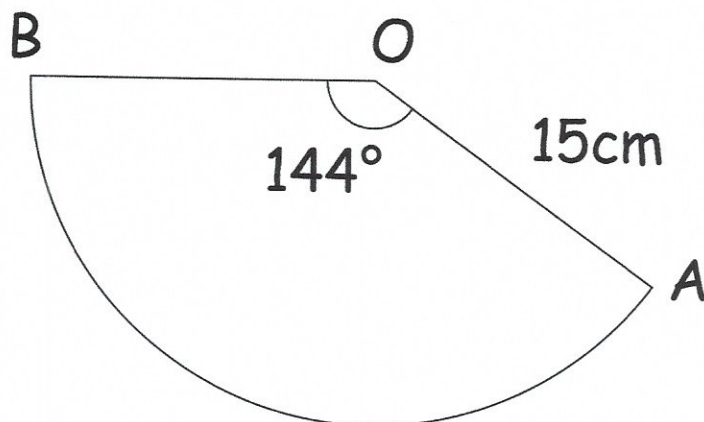
$$x^2 h = 2x^3$$

$$h = \frac{2x^3}{x^2}$$

$$h = 2x$$

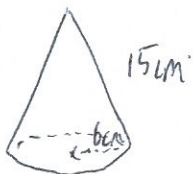
$$h = \frac{2x}{\dots\dots\dots} \quad (4)$$

17. Shown is sector OAB.
 OA and OB are joined to make a cone.



Calculate the volume of the cone.

Arc AB will be the circumference of the circle at the base of the cone.



$$\frac{144}{360} \times \pi \times 30 = 37.699\dots \text{ cm}$$

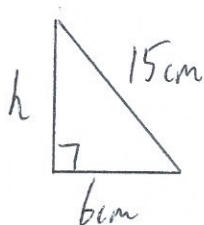
$$\pi \times d = 37.699\dots$$

$$d = 12$$

$$r = 6$$

$$V = \frac{1}{3} \times \pi \times 6^2 \times 13.7477\dots$$

$$V = 518.277101 \text{ cm}^3$$



$$h^2 + 6^2 = 15^2$$

$$h^2 = 225 - 36$$

$$h^2 = 189$$

$$h = 13.7477\dots$$

$$\underline{\hspace{1cm}} 518.28 \text{ cm}^3$$

(6)