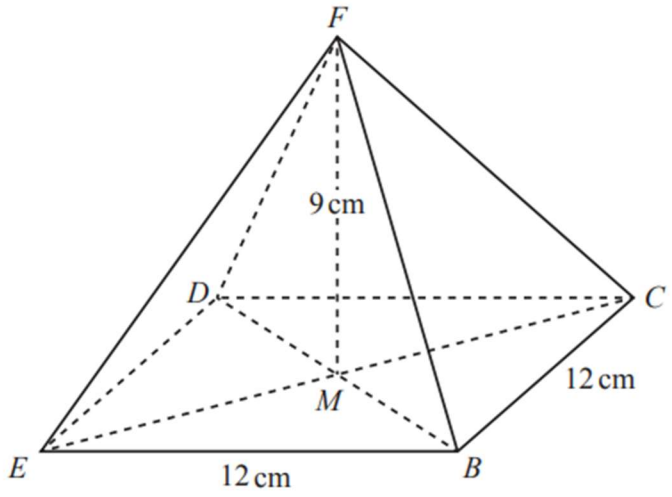
4 (a)



NOT TO SCALE

The diagram shows a pyramid with a square base $BCDE$.
The diagonals CE and BD intersect at M, and the vertex F is directly above M.
$BE = 12$ cm and $FM = 9$ cm.

(i) Calculate the volume of the pyramid.

[The volume, V, of a pyramid with base area A and height h is $V = \frac{1}{3}Ah$.]

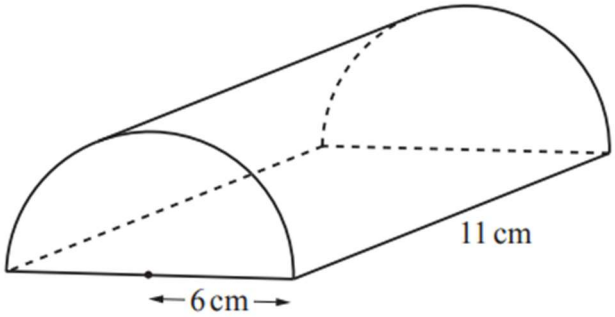
..... cm^3 [2]

6 Calculate the volume of a sphere with diameter 4.8 cm.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm^3 [2]

(b)



NOT TO SCALE

The diagram shows a half-cylinder of radius 6 cm and length 11 cm.

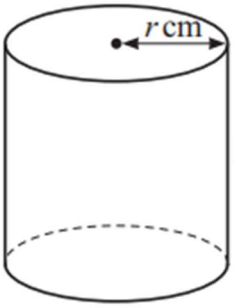
Calculate the volume of the half-cylinder.

..... cm^3 [2]

5 Find the volume of a cone with radius 3 cm and perpendicular height 8 cm.
Give your answer in terms of π.

..... cm^3 [2]

13



NOT TO SCALE

The diagram shows a cylinder with radius r cm and height 16 cm.
A sphere has radius 3 cm.
The volume of the cylinder is equal to the volume of the sphere.

Find the value of r.

$r =$ ..... [4]

7 The volume of a hemisphere with radius 3 cm is $k\pi$ cm^3.

Find the value of k.

$k =$ ..... [2]

6 A solid metal cuboid has a volume of $600\,\text{cm}^3$.

(a) The base of the cuboid is 10 cm by 12 cm.

Calculate the height of the cuboid.

..... cm [2]

(b) The solid metal cuboid is melted and made into 1120 spheres, each with radius 0.45 cm.

Find the volume of metal **not** used in making these spheres.

..... cm^3 [2]

6 A cone has base radius 5 cm and height $\frac{5}{4}$ cm.

A hemisphere has radius r cm.
The volume of the hemisphere is equal to the volume of the cone.

Find the value of r.

$r =$ ..... [3]

17 Find the radius of a hemisphere of volume $80\,\text{cm}^3$.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(b) A cylinder with radius 6 cm and height h cm has the same volume as a sphere with radius 4.5 cm.

Find the value of h.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$h =$ ..... [3]

(c) A solid metal cube of side 20 cm is melted down and made into 40 solid spheres, each of radius r cm.

Find the value of r.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... [3]

11 The volume of a cone is $18\pi\,\text{cm}^3$.
The height of the cone is the same as the diameter of its base.

Find the radius of the base.

..... cm [3]

(c) $2000\,\text{cm}^3$ of iron is melted down and some of it is used to make 50 spheres with radius 2 cm.

(i) Calculate the percentage of iron that is left over.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

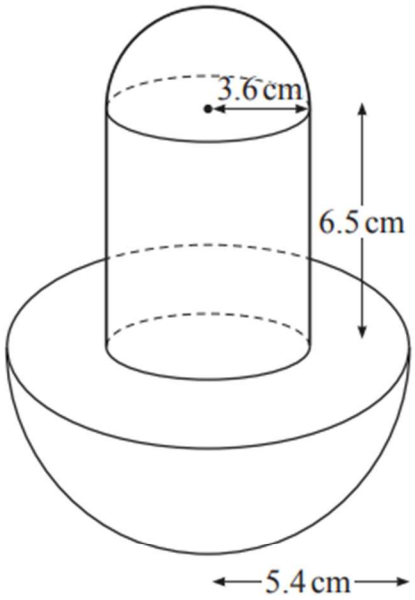
..... % [3]

(ii) The iron left over is then made into a cube.

Calculate the length of an edge of the cube.

..... cm [1]

8 (a)



NOT TO SCALE

The diagram shows a solid formed by joining two hemispheres and a cylinder.
The radius of the large hemisphere is 5.4 cm.
The radius of the small hemisphere and the radius of the cylinder are both 3.6 cm.
The height of the cylinder is 6.5 cm.

(i) Show that the volume of the solid is $692\,\text{cm}^3$, correct to the nearest cubic centimetre.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

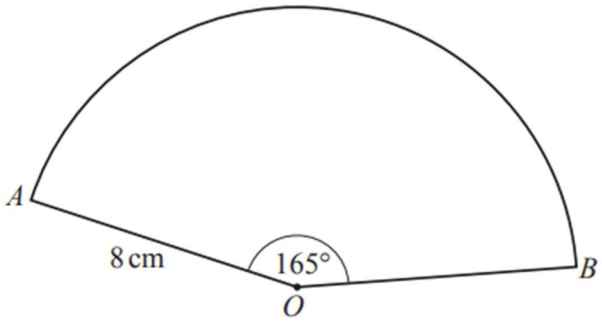
[4]

16 The volume of a hemisphere with radius r cm is $\frac{16}{3}\pi\,\text{cm}^3$.

Find the value of r.

$r =$ ..... cm [3]

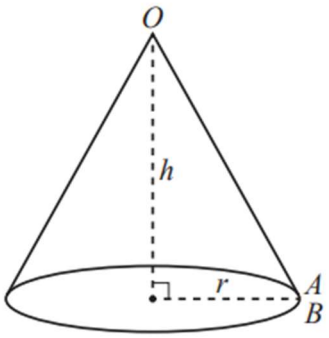
9



NOT TO SCALE

The diagram shows a sector of a circle with centre O, radius 8 cm and sector angle 165°.

(c)



NOT TO SCALE

A cone is made from the sector by joining OA to OB.

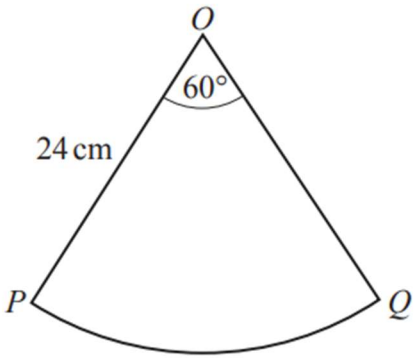
(i) Calculate the radius, r, of the cone.

$r =$ ..... cm [2]

(ii) Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

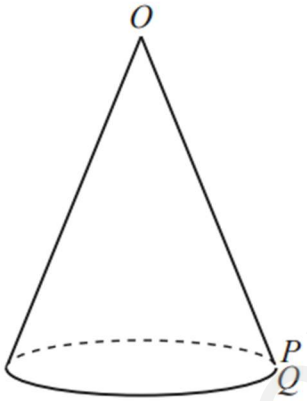
(b)



NOT TO SCALE

The diagram shows a sector OPQ of a circle with centre O and radius 24 cm.
The sector angle is 60°.

A cone is made from this sector by joining OP to OQ.



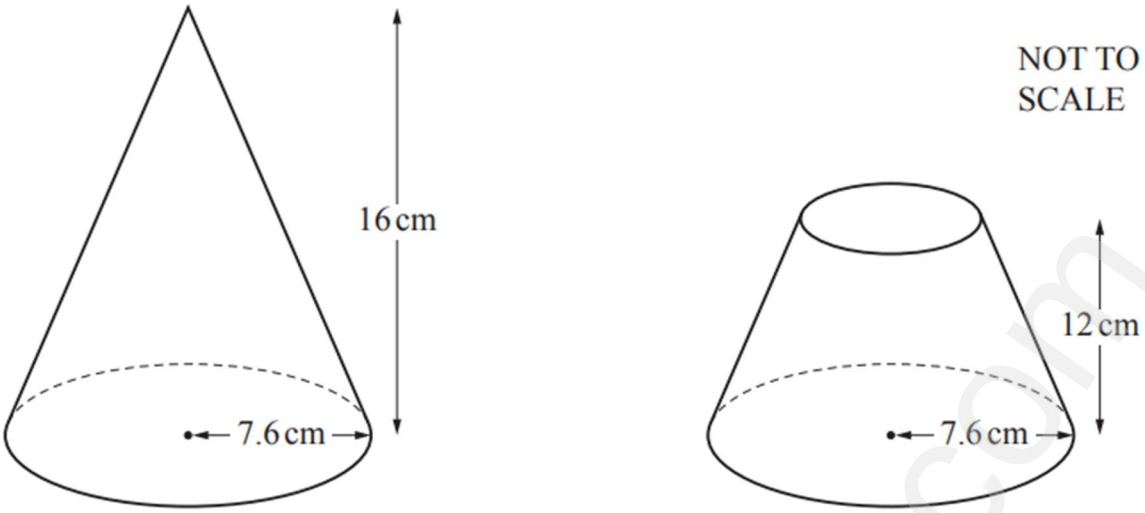
NOT TO SCALE

Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [6]

(b)



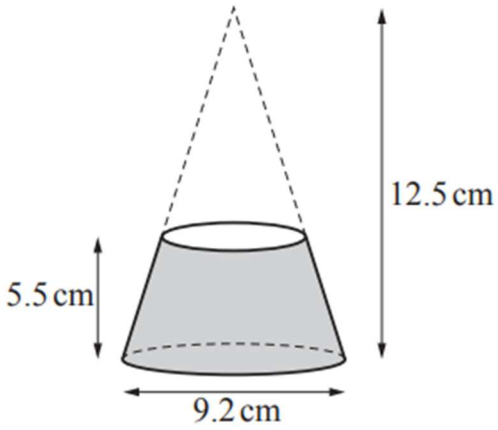
The diagram shows a solid cone with radius 7.6 cm and height 16 cm.
A cut is made parallel to the base of the cone and the top section is removed.
The remaining solid has height 12 cm, as shown in the diagram.

Calculate the volume of the remaining solid.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

21

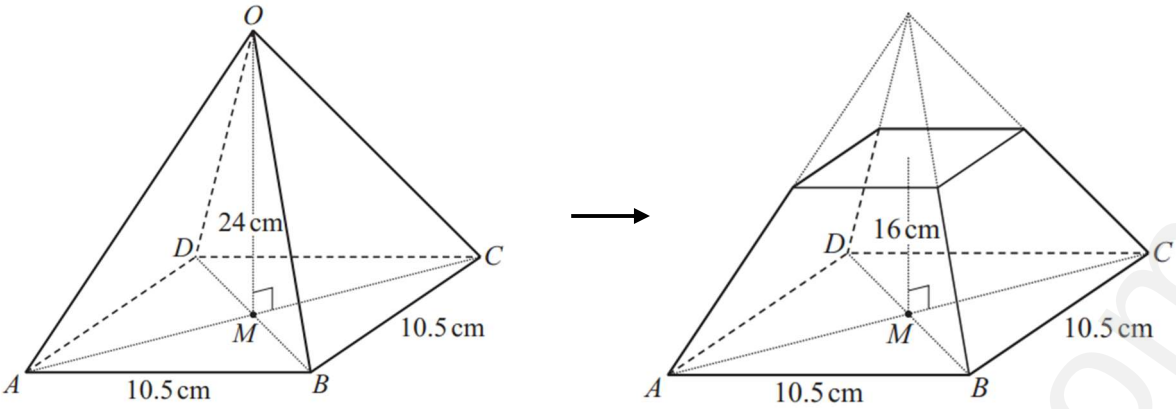


NOT TO SCALE

A solid is made by cutting a small cone from a larger cone, as shown in the diagram.
The height of the larger cone is 12.5 cm.
The height of the solid is 5.5 cm.
The diameter of the base of the larger cone is 9.2 cm.

Work out the volume of the solid.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

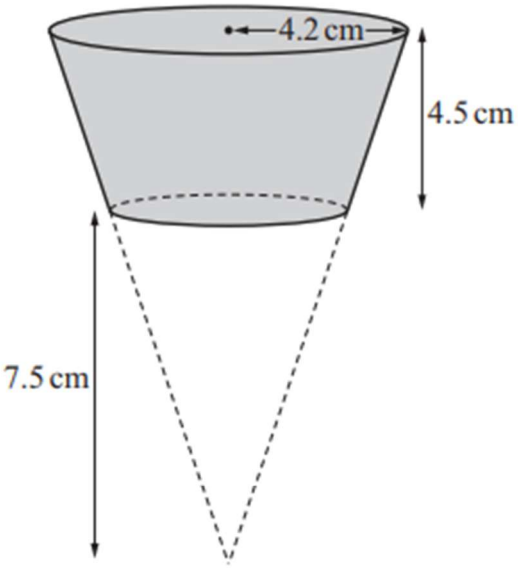


The diagram shows a frustum of the pyramid *OABCD*.
The height of the frustum is 16 cm.

Calculate the volume of the frustum.

..... cm^3 [5]

23



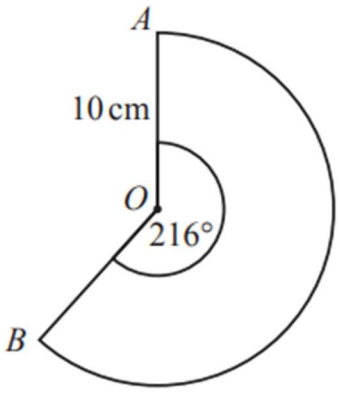
NOT TO SCALE

The diagram shows a frustum made by removing a small cone from a large cone.
The height of the small cone is 7.5 cm.
The height of the frustum is 4.5 cm.
The radius of the large cone is 4.2 cm.

Work out the volume of the frustum.

..... cm^3 [4]

(b)



NOT TO SCALE

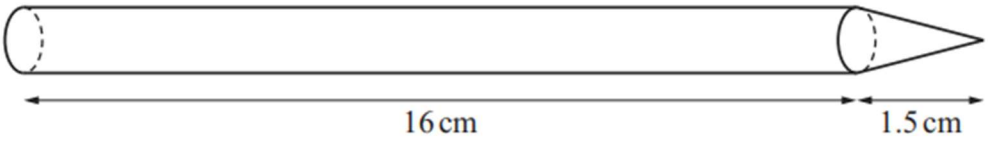
AOB is a sector of a circle, centre O.
$AO = 10$ cm and the sector angle is 216°.

(ii) A cone is made from this sector by joining OA to OB.

Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

8 **(a)**



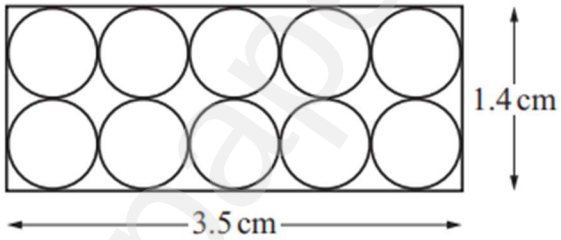
NOT TO SCALE

The diagram shows a solid made from a cylinder and a cone.
The height of the cylinder is 16 cm and the height of the cone is 1.5 cm.
The radius of the cylinder and the base radius of the cone are each 0.35 cm.

(ii) Calculate the volume of the solid.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [3]

(iii)



NOT TO SCALE

10 of the solids are placed in a box in the shape of a cuboid of length 17.5 cm.
The diagram shows one end of the box.

Calculate the volume of the empty space in the box.

..... cm^3 [3]

(b) A solid metal cylinder with radius x and height $\frac{9x}{2}$ is melted.
All the metal is used to make a sphere with radius r.

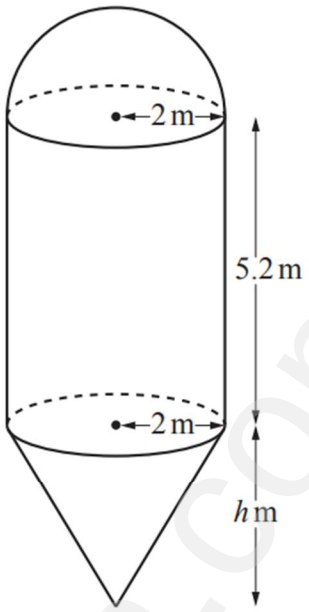
Find r in terms of x.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... [3]

7 **(a)** The diagram shows a container for storing grain.

The container is made from a hemisphere, a cylinder and a cone, each with radius 2 m. The height of the cylinder is 5.2 m and the height of the cone is h m.



NOT TO SCALE

(i) Calculate the volume of the hemisphere.
Give your answer as a multiple of π.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... m^3 [2]

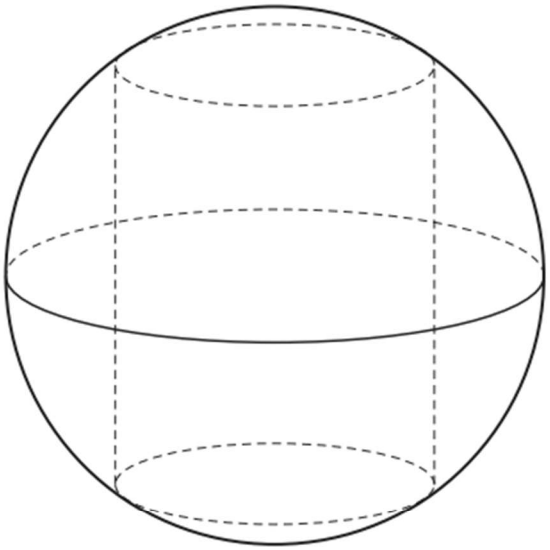
(ii) The total volume of the container is $\frac{88\pi}{3}$ m^3.

Calculate the value of h.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$h =$ ..... [4]

(b)



NOT TO SCALE

The diagram shows a cylinder with radius 8 cm inside a sphere with radius 17 cm. Both ends of the cylinder touch the curved surface of the sphere.

(i) Show that the height of the cylinder is 30 cm.

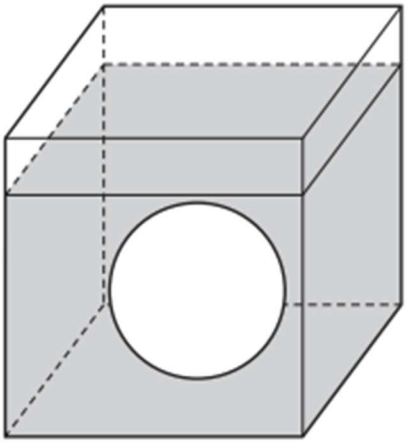
[2]

(ii) Calculate the volume of the cylinder as a percentage of the volume of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... % [4]

(c)



NOT TO SCALE

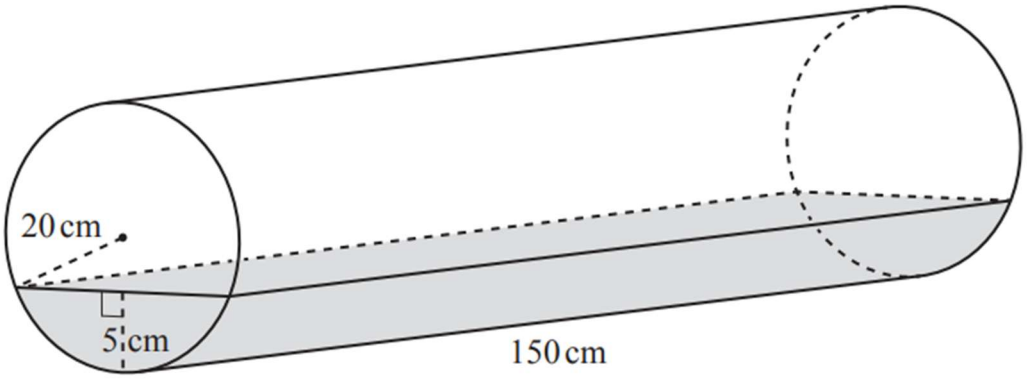
The diagram shows a solid sphere with radius 6 cm inside a cube with side length 20 cm.
The cube contains water to a depth of 15 cm.
The sphere is removed.

Calculate the new depth of water in the cube.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(c)



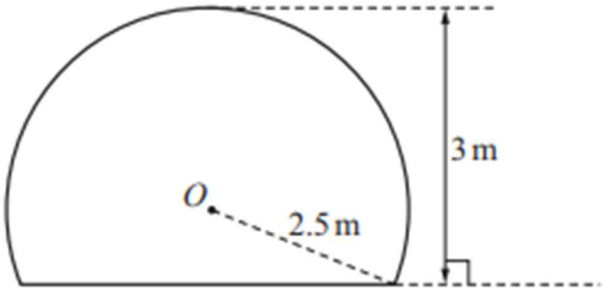
NOT TO SCALE

The diagram shows a cylinder of length 150 cm on horizontal ground.
The cylinder has radius 20 cm.
The cylinder contains water to a depth of 5 cm, as shown in the diagram.

Calculate the volume of water in the cylinder.
Give your answer in litres.

..... litres [7]

23



NOT TO SCALE

The diagram shows the major segment of a circle, centre O, radius 2.5 m.
The segment is the cross section of a tunnel with height 3 m.
The length of the tunnel is 800 m and it has the same cross section throughout its length.

Calculate the volume of the tunnel.

..... m^3 [7]