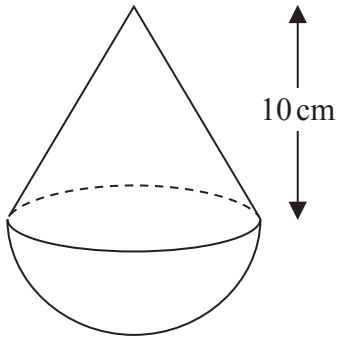
1 The diagram shows a solid shape.

Diagram **NOT** accurately drawn



The solid shape is made from a hemisphere and a cone.
The radius of the hemisphere is equal to the radius of the base of the cone.

The cone has a height of 10 cm.
The volume of the cone is 270π cm^3.

Work out the total volume of the solid shape.
Give your answer in terms of π.

..... cm^3

(Total for Question 1 is 5 marks)

2 Sumeet has a pond in the shape of a prism.

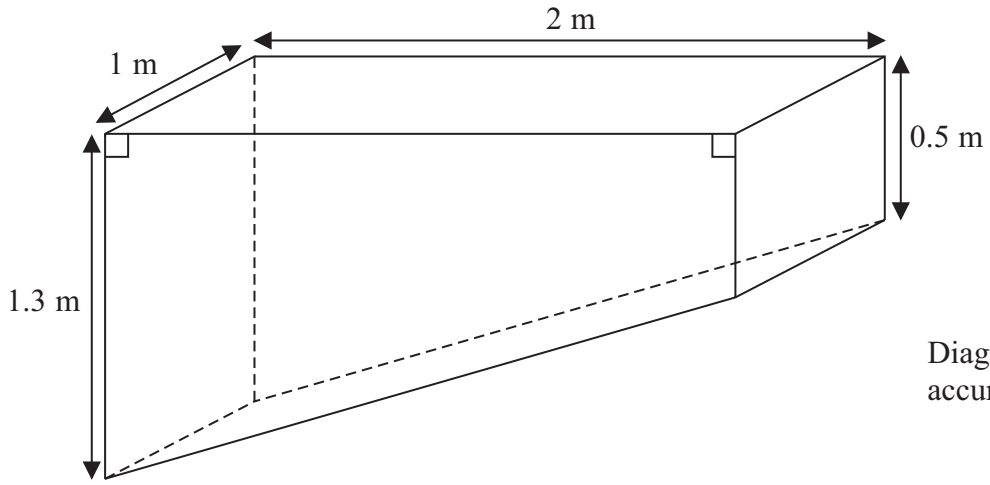


Diagram **NOT** accurately drawn

The pond is completely full of water.
Sumeet wants to empty the pond so he can clean it.
Sumeet uses a pump to empty the pond.

The volume of water in the pond decreases at a constant rate.
The level of the water in the pond goes down by 20 cm in the first 30 minutes.

Work out how much more time Sumeet has to wait for the pump to empty the pond completely.

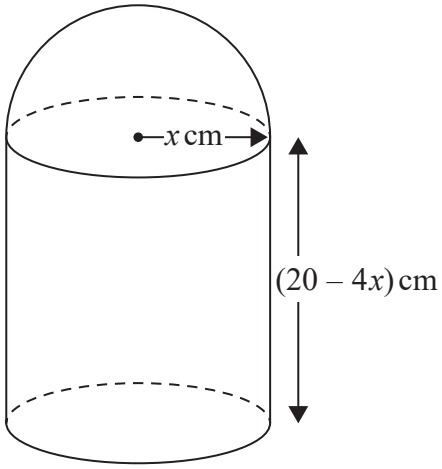
.....

(Total for Question 2 is 6 marks)

3 A solid, **S**, is made from a hemisphere and a cylinder.

The centre of the circular face of the hemisphere and the centre of the top face of the cylinder are at the same point.

Diagram **NOT** accurately drawn



The radius of the cylinder and the radius of the hemisphere are both x cm.
The height of the cylinder is $(20 - 4x)$ cm.

The volume of **S** is V cm^3 where $V = \frac{1}{3}\pi y$

Find in simplest terms an expression for y in terms of x.
Show clear algebraic working.

.....

(Total for Question 3 is 5 marks)

4 A solid is made from a cone and a hemisphere.

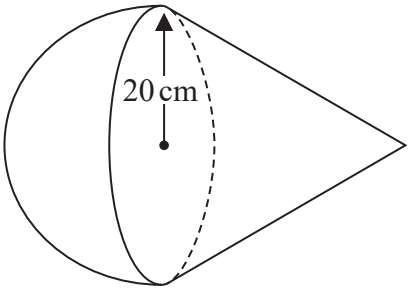


Diagram **NOT** accurately drawn

The circular plane face of the hemisphere coincides with the circular base of the cone.
The radius of the hemisphere and the radius of the circular base of the cone are both 20 cm.

The curved surface area of the cone is $580\pi \text{ cm}^2$

The volume of the solid is $k\pi \text{ cm}^3$

Work out the exact value of k

$k =$ .....

(Total for Question 4 is 5 marks)

5 A solid is made from a hemisphere and a cylinder.
The plane face of the hemisphere coincides with the upper plane face of the cylinder.

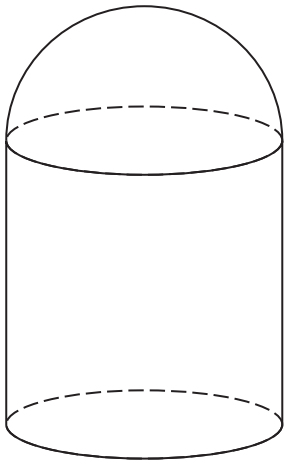


Diagram **NOT** accurately drawn

The hemisphere and the cylinder have the same radius.

The ratio of the radius of the cylinder to the height of the cylinder is 1 : 3

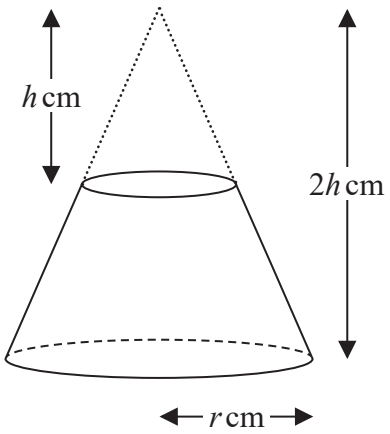
Given that the solid has volume $792\pi\,\text{cm}^3$
work out the height of the solid.

..... cm

(Total for Question 5 is 5 marks)

6 The diagram shows a frustum of a cone and a sphere.

The frustum is made by removing a small cone from a large cone.
The cones are similar.



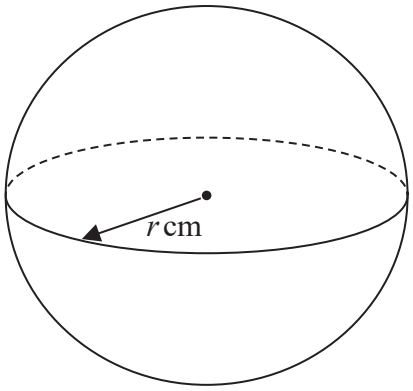


Diagram **NOT** accurately drawn

The height of the small cone is h cm.
The height of the large cone is $2h$ cm.
The radius of the base of the large cone is r cm.

The radius of the sphere is r cm.

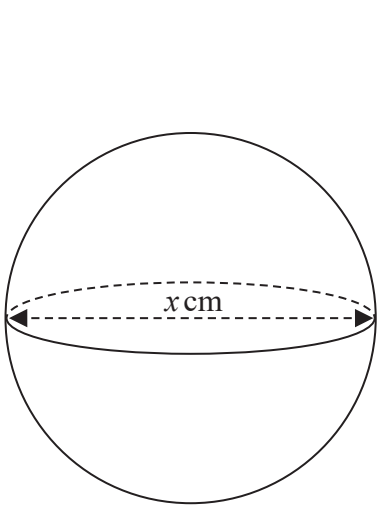
Given that the volume of the frustum is equal to the volume of the sphere,

find an expression for r in terms of h.
Give your expression in its simplest form.

$r =$ .....

(Total for Question 6 is 5 marks)

7 The diagram shows a sphere of diameter x cm and a pyramid $ABCDE$ with a horizontal rectangular base $BCDE$.



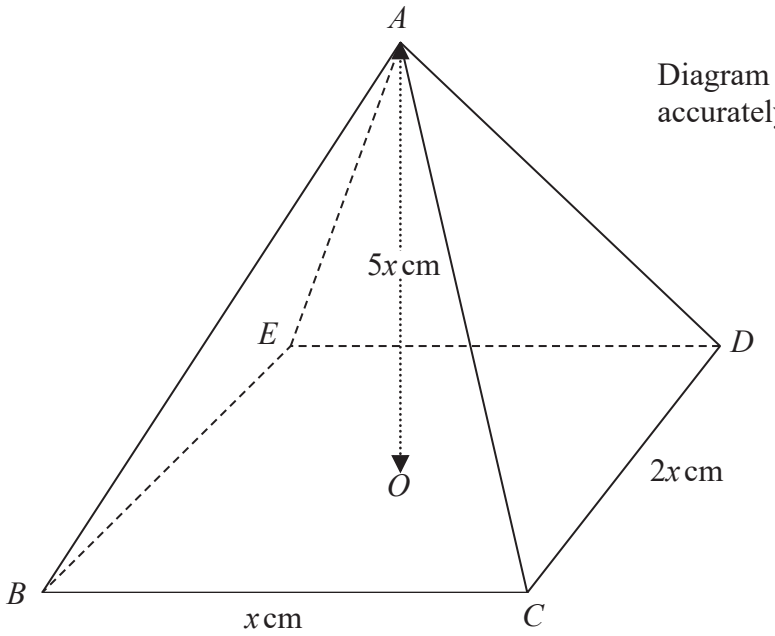


Diagram **NOT** accurately drawn

The vertex A of the pyramid is vertically above the centre O of the base so that $AB = AC = AD = AE$.

$BC = x$ cm, $CD = 2x$ cm and $AO = 5x$ cm.

The volume of the sphere is 288π cm^3

Calculate the total surface area of the pyramid.
Give your answer correct to the nearest cm^2

..... cm^2

(Total for Question 7 is 6 marks)