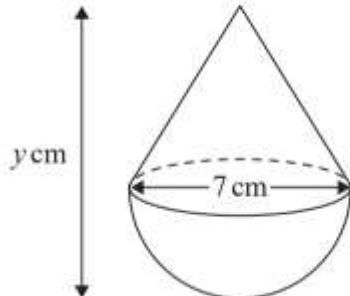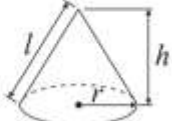**Volume and Area Questions - Calculator**

1.

A solid cone is joined to a solid hemisphere to make the solid **T** shown below.



Volume of sphere $= \dfrac{4}{3}\pi r^3$

Volume of cone $= \dfrac{1}{3}\pi r^2 h$

The diameter of the base of the cone is 7 cm.
The diameter of the hemisphere is 7 cm.

The total volume of **T** is $120\pi$ cm³
The total height of **T** is $y$ cm.

(a) Calculate the value of $y$.
   Give your answer correct to 3 significant figures.

The diameter of the base of the cone and the diameter of the hemisphere are both increased by the same amount.
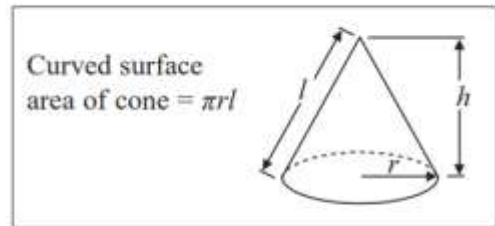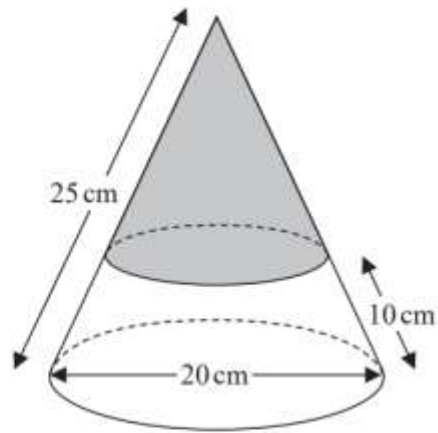Assuming the total volume of **T** does not change,

(b) explain the effect this would have on your answer to part (a).

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2,

The diagram represents a solid cone.



Curved surface
area of cone = $\pi r l$

The cone has a base diameter of 20 cm and a slant height of 25 cm.

A circle is drawn around the surface of the cone at a slant height of 10 cm above the base.
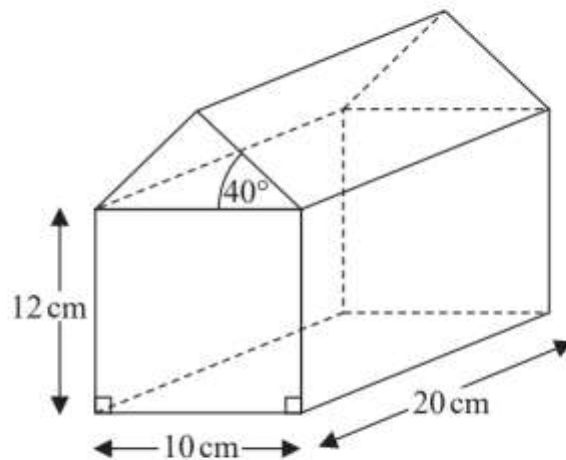The curved surface of the cone above the circle is painted grey.

Work out the area of the curved surface of the cone that is **not** painted grey.
Give your answer as a multiple of $\pi$
You must show all your working.

3.

The diagram shows a prism.
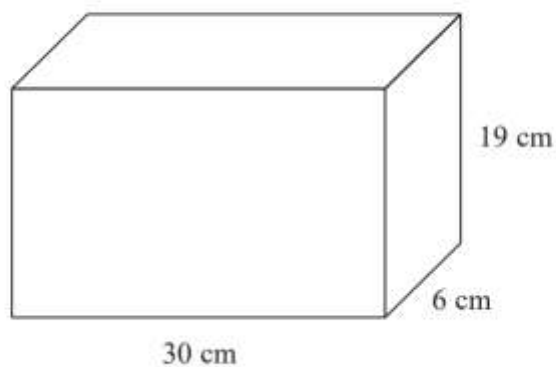
12 cm

40°

10 cm

20 cm

The cross section of the prism has exactly one line of symmetry.

Work out the volume of the prism.
Give your answer correct to 3 significant figures.

4.

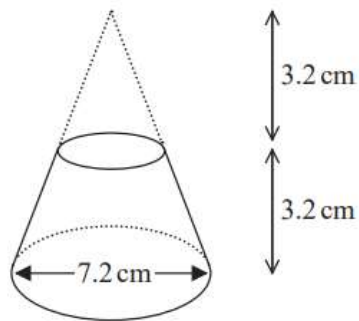A container is in the shape of a cuboid.

19 cm

6 cm

30 cm

The container is $\frac{2}{3}$ full of water.

A cup holds 275 ml of water.

What is the greatest number of cups that can be completely filled with water from the container?

5.

Here is a frustum of a cone.
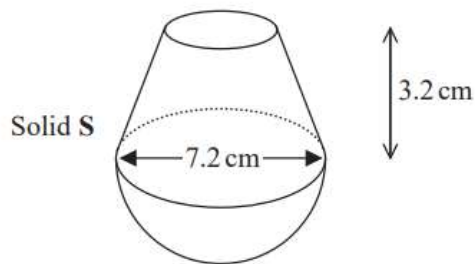


3.2 cm

3.2 cm

7.2 cm

Volume of sphere = $\frac{4}{3}\pi r^3$

Volume of cone = $\frac{1}{3}\pi r^2 h$

The diagram shows that the frustum is made by removing a cone with height 3.2 cm from a solid cone with height 6.4 cm and base diameter 7.2 cm.

The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid **S** shown below.

Solid **S**

7.2 cm

3.2 cm

The density of the frustum is 2.4 g/cm³
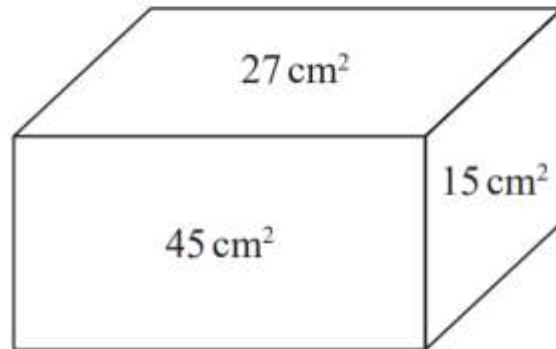The density of the hemisphere is 4.8 g/cm³

Calculate the average density of solid **S**.

6.

The diagram shows a solid metal cuboid.

The areas of three of the faces are marked on the diagram.
The lengths, in cm, of the edges of the cuboid are whole numbers.
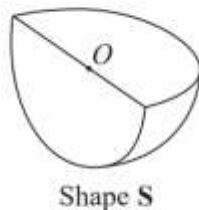


27 cm²

15 cm²

45 cm²

The metal cuboid is melted and made into cubes.
Each of the cubes has sides of length 2.5 cm.

Work out the greatest number of these cubes that can be made.

7.

Shape **S** is one quarter of a solid sphere, centre *O*.



Shape **S**

Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$
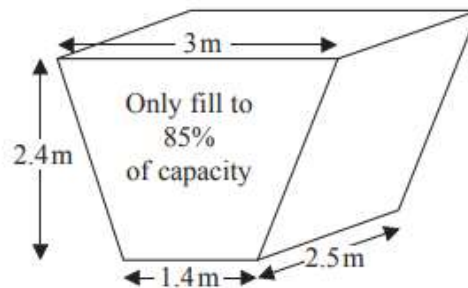
The volume of **S** is $576\pi$ cm³

Find the surface area of **S**.
Give your answer correct to 3 significant figures.
You must show your working.

8.

The diagram shows an oil tank in the shape of a prism.
The cross section of the prism is a trapezium.



The tank is empty.

Oil flows into the tank.
After one minute there are 300 litres of oil in the tank.

Assume that oil continues to flow into the tank at this rate.

(a) Work out how many **more** minutes it takes for the tank to be 85% full of oil.
$(1 m^3 = 1000$ litres)

........................................... minutes

(5)
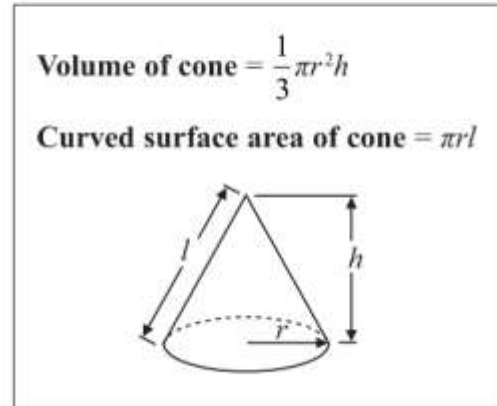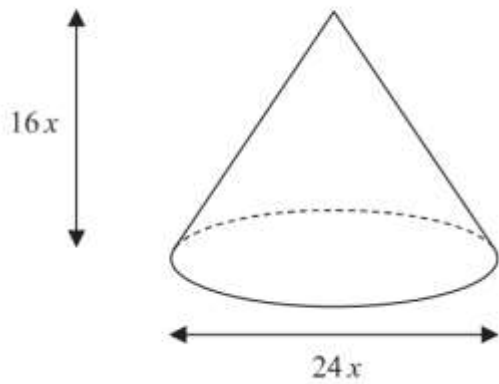
The assumption about the rate of flow of the oil could be wrong.

(b) Explain how this could affect your answer to part (a).

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9.

The diagram shows a solid cone.



The diameter of the base of the cone is 24x cm.
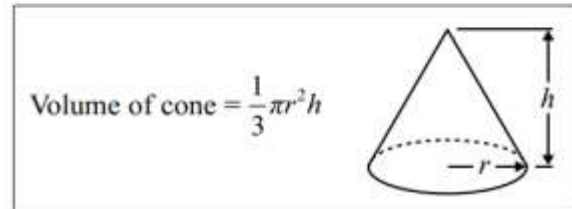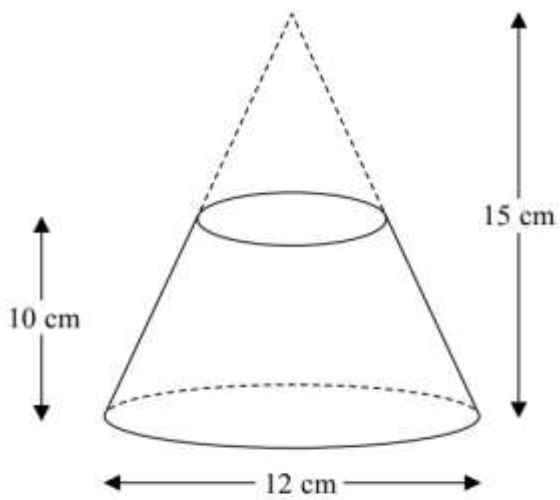The height of the cone is 16x cm.

The curved surface area of the cone is $2160\pi$ cm².
The volume of the cone is $V\pi$ cm³, where $V$ is an integer.

Find the value of $V$.

10.

A frustum is made by removing a small cone from a large cone as shown in the diagram.



Volume of cone $= \frac{1}{3}\pi r^2 h$

The frustum is made from glass.
The glass has a density of $2.5\,\text{g}/\text{cm}^3$

Work out the mass of the frustum.
Give your answer to an appropriate degree of accuracy.