



Lesmahagow High School
Mathematics Department

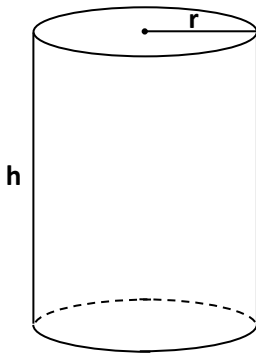
S3 Volume

WORKING with VOLUME of a CYLINDER

Cylinder is National 4

1. Circular – based prism (cylinder)

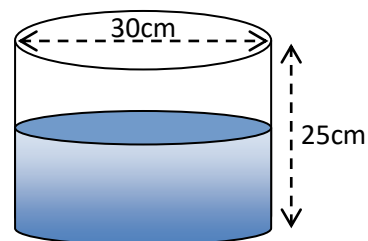
Find the volume of a circular-based prism for the values of r and h given.



- | | | |
|-----|----------------------|----------------------|
| (a) | $r = 6 \text{ cm}$ | $h = 15 \text{ cm}$ |
| (b) | $r = 8 \text{ cm}$ | $h = 24 \text{ cm}$ |
| (c) | $r = 4 \text{ cm}$ | $h = 12 \text{ cm}$ |
| (d) | $r = 10 \text{ cm}$ | $h = 8 \text{ cm}$ |
| (e) | $r = 20 \text{ cm}$ | $h = 60 \text{ cm}$ |
| (f) | $r = 7 \text{ cm}$ | $h = 20 \text{ cm}$ |
| (g) | $r = 15 \text{ cm}$ | $h = 40 \text{ cm}$ |
| (h) | $r = 11 \text{ cm}$ | $h = 35 \text{ cm}$ |
| (i) | $r = 44 \text{ cm}$ | $h = 125 \text{ cm}$ |
| (j) | $r = 8.8 \text{ cm}$ | $h = 30 \text{ cm}$ |

2. A milk dispenser is cylindrical in shape with diameter 30cm.

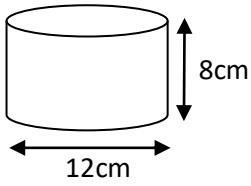
- (a) If 14 litres of milk are poured into it, calculate the depth of the milk in the cylinder.



- (b) The height of the cylinder is 25cm.

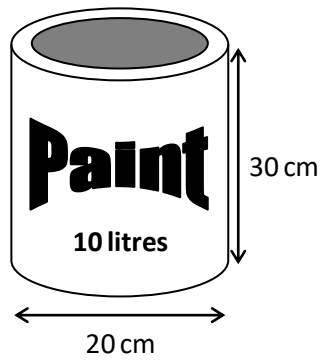
How many **more** litres of milk are needed to completely fill it?

3.



Calculate the volume of a cylinder with diameter 12cm and height 8cm.

4. This paint tin has diameter 20 cm and height 30 cm as shown in the diagram.

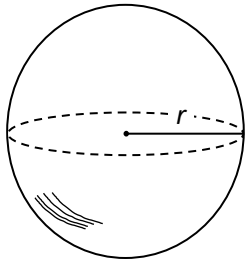


It is claimed that it can hold 10 litres of paint. Is this claim correct?

You must show all working and give a reason for your answer.

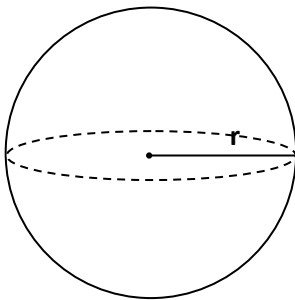
WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID

1. Calculate the volume of each sphere described below, rounding your answer to 1 decimal place.



- (a) $r = 6\text{cm}$
(b) $r = 2\text{m}$
(c) $r = 9\text{mm}$
(d) $r = 3\text{cm}$

2. Find the volume of a sphere for the following values of r and d .
(give your answers correct to 3 significant figures)

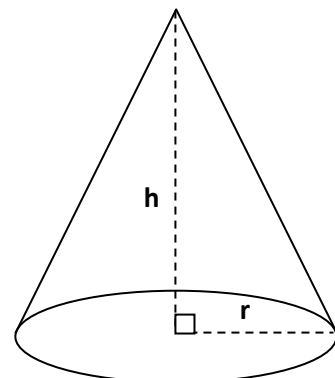


- (a) $r = 10\text{cm}$ (f) $d = 18\text{cm}$
(b) $r = 25\text{cm}$ (g) $r = 80\text{mm}$
(c) $d = 2\text{m}$ (h) $d = 55\text{cm}$
(d) $r = 200\text{mm}$ (i) $r = 3.5\text{m}$
(e) $d = 11\text{cm}$ (j) $d = 48\text{cm}$

3. A sphere has a diameter of 8cm.
Calculate its volume giving your answer correct to 3 significant figures.

4. Find the volume of a cone for the following values of r and h .
(give your answers correct to 3 significant figures)

- (a) $r = 5\text{cm}$ $h = 14\text{cm}$
(b) $r = 7\text{cm}$ $h = 25\text{cm}$
(c) $r = 3\text{cm}$ $h = 22\text{cm}$
(d) $r = 12\text{cm}$ $h = 7\text{cm}$

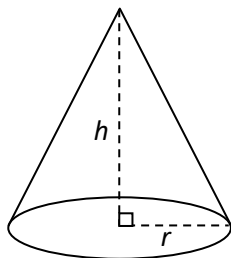


5. Find the volume of a cone for the following values of d and h .

(give your answers correct to 3 significant figures)

- (a) $d = 15\text{cm}$ $h = 40\text{cm}$
(b) $d = 11\text{cm}$ $h = 37\text{cm}$
(c) $d = 22\text{cm}$ $h = 125\text{cm}$
(d) $d = 8.8\text{cm}$ $h = 30\text{cm}$

6. Calculate the volume of each cone described below, rounding your answers to 1 decimal place.

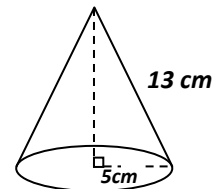


- (a) $r = 3\text{cm}$ and $h = 6\text{cm}$
(b) $r = 8\text{mm}$ and $h = 12\text{mm}$
(c) $r = 3\text{cm}$ and $h = 5\text{cm}$
(d) $r = 2\text{m}$ and $h = 6\text{m}$

7. A cone has a base diameter of 8cm and a height of 5cm. Calculate the volume of this cone.

8. A cone has a base diameter of 10cm and a **slant height** of 13cm.

Calculate the volume of the cone.



9. A cone has a base radius of 9cm and a **slant height** of 15cm.

Calculate the volume of the cone.

10. A pyramid has a square base of side 4cm and a vertical height of 7cm.

Calculate the volume of the pyramid correct to 2 significant figures.

11. A pyramid has a rectangular base measuring 16mm by 12mm and a vertical height of 10mm.

Calculate the volume of the pyramid.

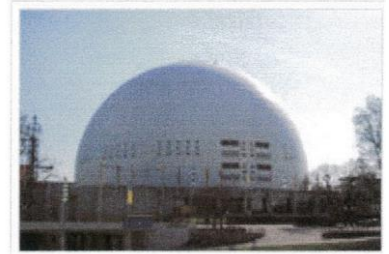
WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID & CYLINDER

EXAM QUESTIONS

1. The Stockholm Globe Arena is the largest hemispherical building in the world.

The radius of the building is 110 m.

Calculate the volume of the building in cubic metres, giving your answer in scientific notation correct to 3 significant figures.



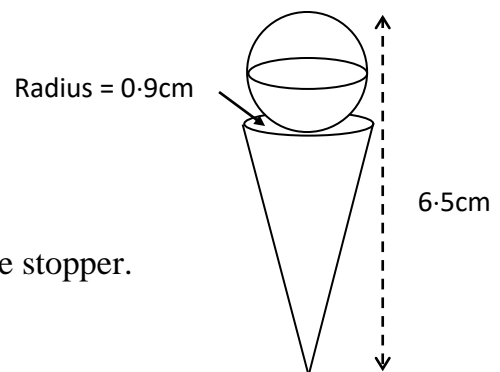
2. A metal bottle stopper is made up from a cone topped with a sphere.

The sphere has diameter 1.5cm.

The cone has radius 0.9cm.

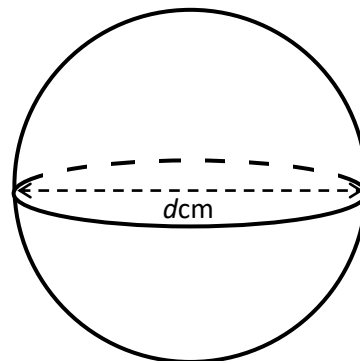
The overall length of the stopper is 6.5cm.

Calculate the volume of metal required to make the stopper. Give your answer correct to 3 significant figures.



3. The volume of this sphere is 524cm^3 .

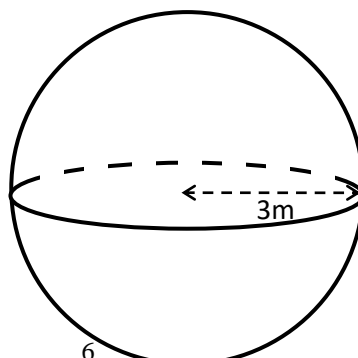
Calculate the diameter, d cm.



4. **Non Calculator!**

Calculate the volume of this sphere which has radius 3m.

[Take $\pi = 3.14$]



5. Sherbet in a sweet shop is stored in a cylindrical container like the one shown in *diagram 1*.

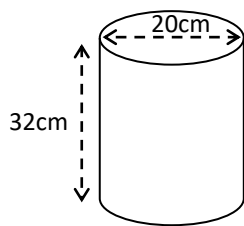


Diagram 1

The volume of the cylinder, correct to the nearest 1000cm^3 , is $10\,000\text{cm}^3$.

The sherbet is sold in conical containers with diameter 5 cm as shown in *diagram 2*.

250 of these cones can be filled from the contents of the cylinder.

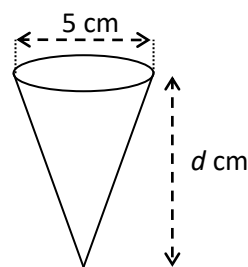


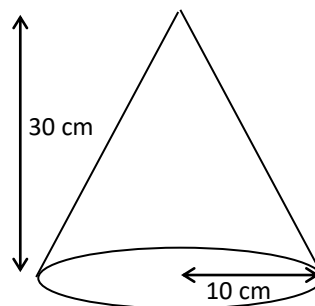
Diagram 2

Calculate the depth, d cm, of a sherbet cone.

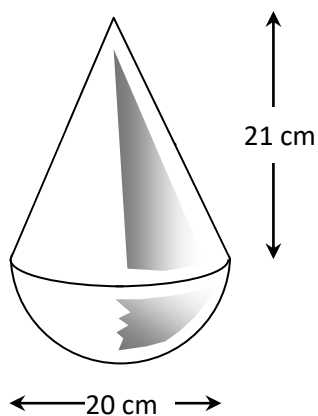
6. **Non Calculator!**

The diagram shows a cone with radius 10 centimetres and height 30 centimetres.

Taking $\pi = 3.14$, calculate the volume of the cone.

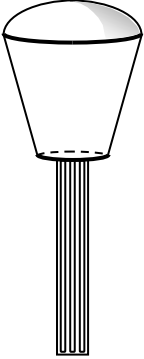


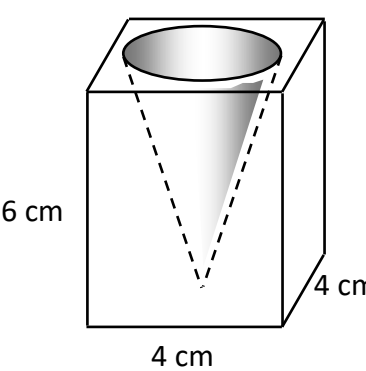
7. A children's wobbly toy is made from a cone, 21 cm high, on top of a hemispherical base of diameter 20 cm.



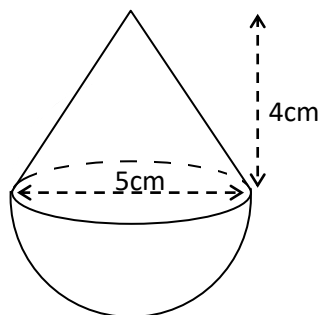
The toy has to be filled with liquid foam.

Calculate the volume of foam which will be required.

8.  The lamp cover in a street lamp is in the shape of a cone with the bottom cut off.
- The height of the cone is 50cm and its radius is 25cm. The height of the lamp is 30cm and the base of the lamp has a radius of 18cm
- Calculate the volume of the lamp cover. [Answer to 3 significant figures.]

9.  A glass candle holder is in the shape of a cuboid with a cone removed. The cuboid measures 4cm by 4cm by 6cm.
- The cone has a diameter of 3cm and a height of 5cm.
- Calculate the volume of glass in the candle holder.

10. For the Christmas market a confectioner has created a chocolate Santa. It consists of a solid hemisphere topped by a solid cone. Both have diameter 5cm and the height of the cone is 4cm as shown in the diagram.



Calculate the volume of chocolate required to make one chocolate Santa, giving your answer correct to 3 significant figures.

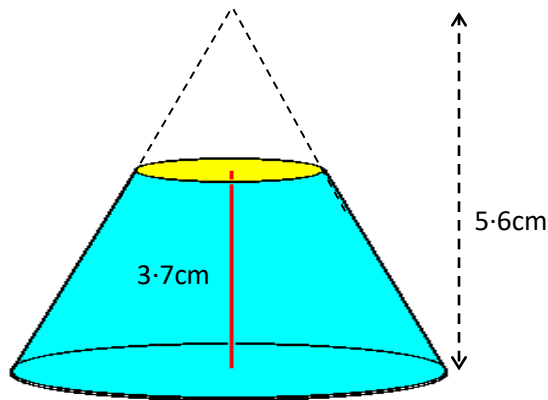
11. The diameter of an ordinary snooker ball is 5.25cm.

Calculate the volume of a snooker ball giving your answer correct to 3 significant figures.

12. A dessert is in the shape of a truncated cone [a cone with a 'slice' taken from the top].

The radius of the base is 4.1cm and is 1.6 cm at the top.

The other dimensions are shown in the diagram.



Calculate the volume of the dessert.

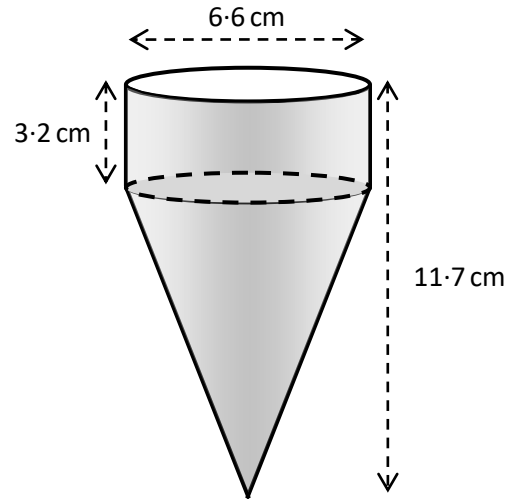
13. A young child was given a slab of moulding clay. It was a cuboid and measured 15.2cm by 4.8cm by 3.4cm.

(a) Calculate the volume of the cuboid rounding your answer to 2 significant figures.

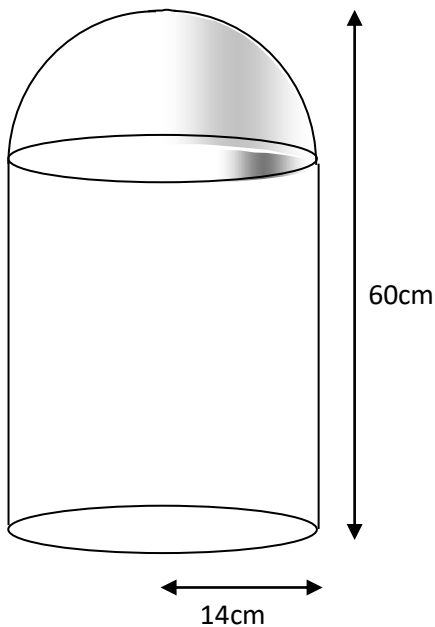
The clay was made into 25 identical spheres.

(b) Using your answer from part (a), calculate the radius of one of the spheres.

14. An ice cream is shaped like the one in the diagram.
 The overall height of is 11.7 cm.
 The height of the cylinder is 3.2 cm.
 The diameter of the cone and cylinder is 6.6 cm.
 Calculate the volume of ice cream.



15. A company that produces bins uses the design of a cylindrical base with a hemispherical lid.



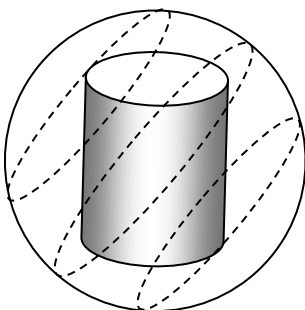
If the total height of the bin is 60cm and the radius of the bin is 14cm, calculate the total volume of the bin in litres correct to 3 significant figures.

(Volume of cylinder = $\pi r^2 h$;

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



- 16.



A Christmas bauble is made from a sphere of perspex with a coloured cylinder in the middle. The volume round the cylinder is filled with a thick liquid.

The sphere has a diameter of 8 cm. The cylinder has a radius of 2.6 cm with a height of 6 cm.

Calculate the volume of liquid needed to fill the sphere, giving your answer correct to 2 significant figures.

WORKING with VOLUME of a CYLINDER

1. (a) 1696.5 cm^3 (b) 4825.5 cm^3 (c) 603.2 cm^3 (d) 2513.3 cm^3 (e) 75398.2 cm^3
(f) 3078.8 cm^3 (g) 28274.3 cm^3 (h) 13304.6 cm^3 (i) 760265 cm^3 (j) 7298.5 cm^3
2. (a) 19.8 cm (b) 3.7 litres 3. 904 cm^3
4. No; volume is 9.72 litres

WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID

1. (a) 904.3 cm^3 (b) 33.5 m^3 (c) 3052.1 mm^3 (d) 113.0 cm^3
2. (a) 4190 cm^3 (b) 65400 cm^3 (c) 4.19 m^3 (d) 33500000 mm^3
(e) 697 cm^3 (f) 3050 cm^3 (g) 2140000 mm^3 (h) 87100 cm^3
(i) 180 m^3 (j) 57900 cm^3
3. 268 cm^3
4. (a) 366 cm^3 (b) 1280 cm^3 (c) 207 cm^3 (d) 1060 cm^3
5. (a) 2369 cm^3 (b) 1170 cm^3 (c) 15800 cm^3 (d) 608 cm^3
6. (a) 56.5 cm^3 (b) 803.8 mm^3 (c) 47.1 cm^3 (d) 25.1 cm^3
7. 83.7 cm^3 8. 314 cm^3 9. 1020 cm^3 10. 37 cm^3
11. 640 mm^3

WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID and CYLINDER

EXAM QUESTIONS

1. $2.79 \times 10^6 \text{ m}^3$ 2. 6.01 cm^3 3. 10 cm 4. 113.04 m^3
5. 6.11 cm 6. 3140 cm^3 7. 4291 cm^3 8. 25900 cm^3
9. 84.225 cm^3 10. 58.9 cm^3 11. 75.7 cm^3 12. 93.4 cm^3
13. (a) 250 cm^3 (b) 1.3 cm 14. 206 cm^3
15. 34.1 litres 16. 140 cm^3