

# Edexcel GCSE

## Mathematics (Linear) – 1MA0

# SPHERES AND CONES

**Materials required for examination**

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.  
Tracing paper may be used.

**Items included with question papers**

Nil

**Instructions**

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Use black ink or ball-point pen.

Fill in the boxes at the top of this page with your name, centre number and candidate number.

Answer all questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

**Information**

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The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.

Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

**Advice**

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Read each question carefully before you start to answer it.

Keep an eye on the time.

Try to answer every question.

Check your answers if you have time at the end.

1.

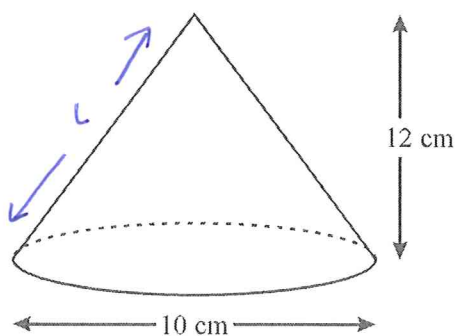


Diagram **NOT** accurately drawn

The diagram represents a cone.

The height of the cone is 12 cm.

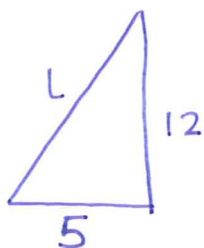
The diameter of the base of the cone is 10 cm.

Calculate the curved surface area of the cone.

Give your answer as a multiple of  $\pi$ .

$$\text{Curved surface area} = \pi r l$$

Slant height,  $l$



$$L^2 = 12^2 + 5^2$$

$$L^2 = 169$$

$$L = \sqrt{169} = 13$$

$$\begin{aligned}\text{Curved surface} &= \pi(5)(13) \\ &= 65\pi\end{aligned}$$

$65\pi$  cm<sup>2</sup>  
.....  
(Total 3 marks)

2.

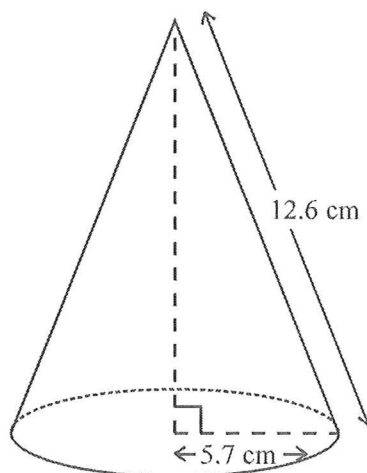


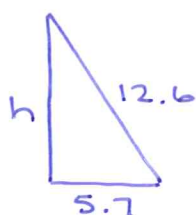
Diagram **NOT** accurately drawn

The radius of the base of a cone is 5.7 cm.  
Its slant height is 12.6 cm.

Calculate the volume of the cone.  
Give your answer correct to 3 significant figures.

$$\begin{aligned} \text{Volume} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (5.7)^2 h \end{aligned}$$

Calculate h



$$\begin{aligned} h^2 &= 12.6^2 - 5.7^2 \\ h^2 &= 126.27 \\ h &= 11.23693 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= \frac{1}{3} \pi (5.7)^2 (11.23693) \\ &= 382.32123 \text{ cm}^3 \\ &= 382 \text{ (3sf)} \end{aligned}$$

382 ..... cm<sup>3</sup>  
(Total 4 marks)

3.

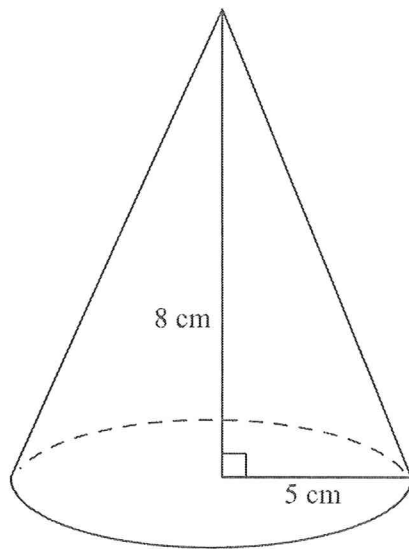


Diagram **NOT**  
accurately drawn

A cone has a base radius of 5 cm and a vertical height of 8 cm.

Calculate the volume of the cone.

Give your answer correct to 3 significant figures.

$$\begin{aligned} \text{Vol} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (5)^2 (8) \\ &= 209.43951 \text{ cm}^3 \\ &= 209 \text{ (3 sf)} \end{aligned}$$

.....209..... cm<sup>3</sup>

(2)

4. The diagram shows a child's toy.

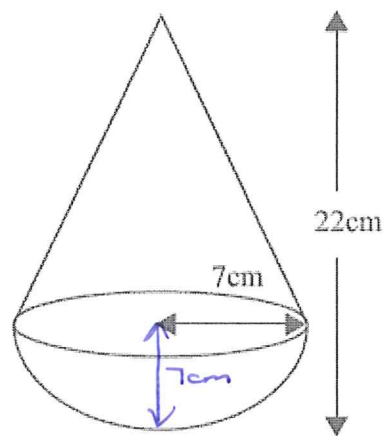


Diagram NOT  
accurately drawn

The toy is made from  
The cone and hemisphere  
The total height of the toy is 22cm  
Work out the volume of the toy  
Give your answer correct to 3 significant figures

$$\text{Height cone} = 22 - 7 = 15\text{cm}$$

$$\begin{aligned}\text{Volume Cone} &= \frac{1}{3} \pi (7)^2 15 \\ &= 245\pi\end{aligned}$$

$$\begin{aligned}\text{Volume hemisphere} &= \frac{\frac{4}{3} \pi (7)^3}{2} \\ &= \frac{686}{3} \pi\end{aligned}$$

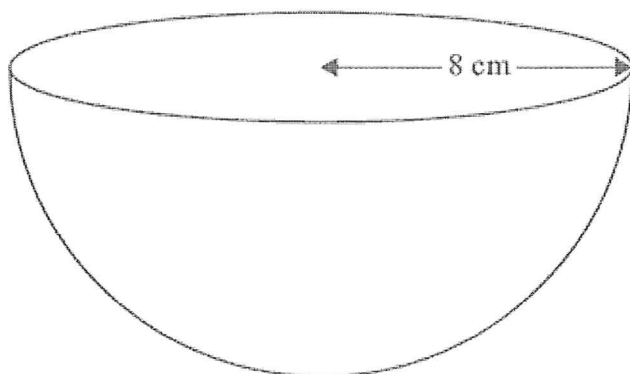
$$\begin{aligned}\text{Total Vol} &= 245\pi + \frac{686}{3} \pi \\ &= 1488.06772 \text{ cm}^3 \\ &= 1490 \text{ (3sf)}\end{aligned}$$

1490

..... cm<sup>3</sup>  
(Total 3 marks)

5. The diagram shows a solid hemisphere of radius 8 cm.

Diagram NOT  
accurately drawn



Work out the total surface area of the hemisphere.  
Give your answer correct to 3 significant figures.

$$\begin{aligned}\text{Curved surface} &= \frac{4\pi(8)^2}{2} \\ &= 128\pi\end{aligned}$$

$$\begin{aligned}\text{Circular top surface} &= \pi(8)^2 \\ &= 64\pi\end{aligned}$$

$$\begin{aligned}\text{Total surface area} &= 128\pi + 64\pi \\ &= 192\pi \\ &= 603.1857895 \text{ cm}^2 \\ &= 603 \text{ (3 sf)}\end{aligned}$$

..... 603 ..... cm<sup>2</sup>

(Total 3 marks)

6.

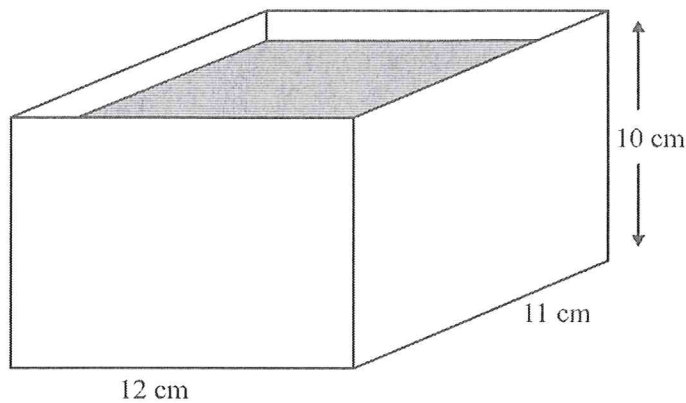
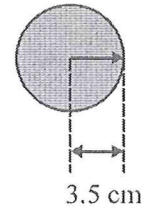


Diagram NOT  
accurately drawn



A rectangular container is 12 cm long, 11 cm wide and 10 cm high.  
The container is filled with water to a depth of 8 cm.

A metal sphere of radius 3.5 cm is placed in the water.  
It sinks to the bottom.

Calculate the rise in the water level.  
Give your answer correct to 3 significant figures.

$$\begin{aligned}\text{Volume of Sphere} &= \frac{4}{3}\pi(3.5)^3 \\ &= 179.59438 \text{ cm}^3\end{aligned}$$

$$\begin{aligned}\text{Volume water in tank} &= 12 \times 11 \times 8 \\ &= 1056\end{aligned}$$

$$\text{Total Volume of water and sphere} = 1235.53438 \text{ cm}^3$$

$$\begin{aligned}1235.53438 \div (12 \times 11) &= \text{new height of water} \\ \text{new height} &= 9.360563\end{aligned}$$

$$\begin{aligned}\text{Rise in water level} &= 9.360563 - 8 \\ &= 1.360563 \text{ cm} \\ &= 1.36 \text{ (3 sf)}\end{aligned}$$

$$\underline{\underline{1.36}} \text{ cm}$$

(Total 4 marks)

7.

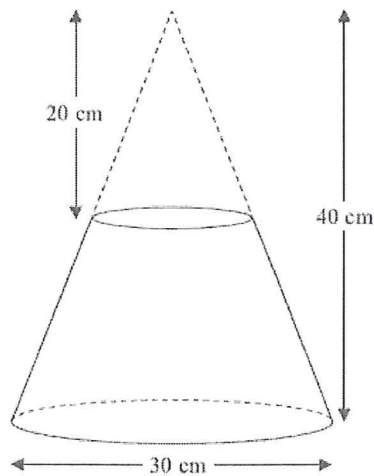


Diagram NOT  
accurately drawn

A frustum is made by removing a small cone from a similar large cone.

The height of the small cone is 20 cm.

The height of the large cone is 40 cm.

The diameter of the base of the large cone is 30 cm.

Work out the volume of the frustum.

Give your answer correct to 3 significant figures.

$$\text{Height small cone} = \frac{1}{2} \times \text{height large cone}$$

$$\text{So radius small cone} = \frac{1}{2} \times \text{radius of large cone}$$

$$= \frac{1}{2} \times 15$$

$$= 7.5$$

Volume Large cone

$$= \frac{1}{3} \pi (15)^2 (40)$$

$$= 3000\pi$$

Volume Small cone

$$= \frac{1}{3} \pi (7.5)^2 (20)$$

$$= 375\pi$$

$$\text{Volume Frustum} = \text{Vol large cone} - \text{Vol Small cone}$$

$$= 3000\pi - 375\pi$$

$$= 2625\pi$$

$$= 8246.6807 \text{ cm}^3$$

$$= 8250 \text{ (3sf)}$$

$$\dots\dots\dots 8250 \dots\dots\dots \text{cm}^3$$

(Total 4 marks)