

# Perimeters, Area and Volumes

## Difficulty: Hard

### Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Hard
Booklet	Question Paper 3

**Time allowed:** 117 minutes

**Score:** /102

**Percentage:** /100

#### Grade Boundaries:

##### CIE IGCSE Maths (0580)

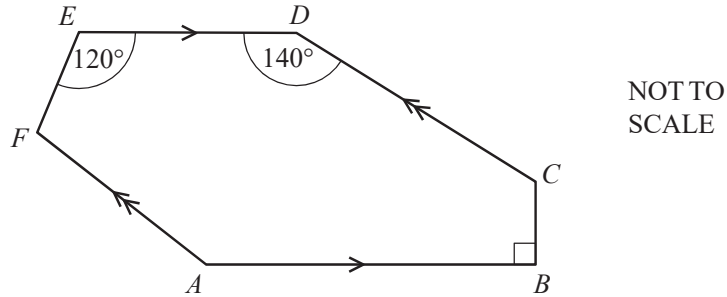
A*	A	B	C	D
>83%	67%	51%	41%	31%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%

# Question 1

(a)

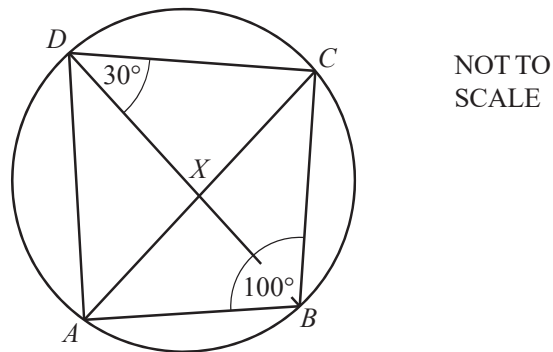


In the hexagon  $ABCDEF$ ,  $AB$  is parallel to  $ED$  and  $AF$  is parallel to  $CD$ .  
 Angle  $ABC = 90^\circ$ , angle  $CDE = 140^\circ$  and angle  $DEF = 120^\circ$ .

Calculate angle  $EFA$ .

[4]

(b)



In the cyclic quadrilateral  $ABCD$ , angle  $ABC = 100^\circ$  and angle  $BDC = 30^\circ$ .  
 The diagonals intersect at  $X$ .

(i) Calculate angle  $ACB$ .

[2]

(ii) Angle  $BXC = 89^\circ$ .

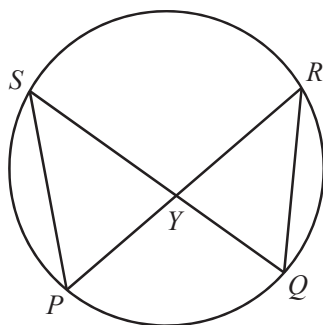
Calculate angle  $CAD$ .

[2]

(iii) Complete the statement.

[1]

(c)



NOT TO  
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$P$ ,  $Q$ ,  $R$  and  $S$  lie on a circle.

$PR$  and  $QS$  intersect at  $Y$ .

$PS = 11$  cm,  $QR = 10$  cm and the area of triangle  $QRY = 23$  cm<sup>2</sup>.

Calculate the area of triangle  $PYS$ .

[2]

(d) A regular polygon has  $n$  sides.

Each exterior angle is equal to  $\frac{n}{10}$  degrees.

(i) Find the value of  $n$ .

[3]

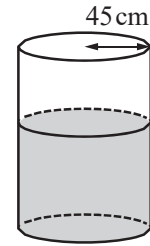
(ii) Find the size of an interior angle of this polygon.

[2]

## Question 2

- (a) A cylindrical tank contains  $180000 \text{ cm}^3$  of water.  
The radius of the tank is  $45 \text{ cm}$ .

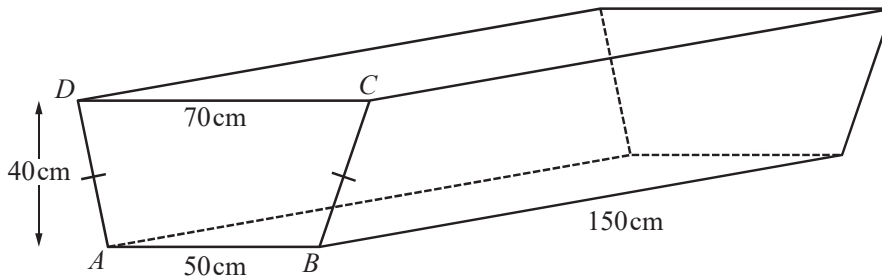
Calculate the height of water in the tank.



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[2]

- (b)



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The diagram shows an empty tank in the shape of a horizontal prism of length  $150 \text{ cm}$ .  
The cross section of the prism is an isosceles trapezium  $ABCD$ .  
 $AB = 50 \text{ cm}$ ,  $CD = 70 \text{ cm}$  and the vertical height of the trapezium is  $40 \text{ cm}$ .

- (i) Calculate the volume of the tank. [3]
- (ii) Write your answer to **part (b)(i)** in litres. [1]

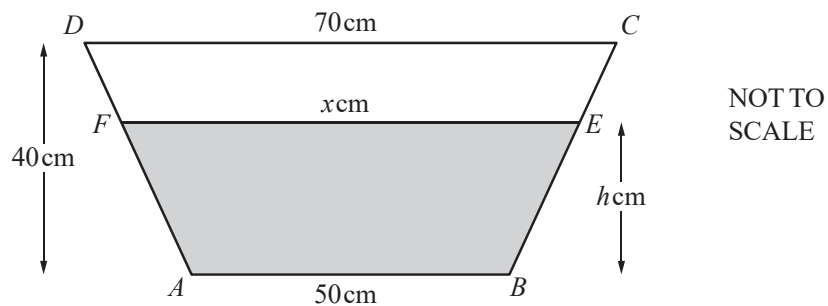
- (c) The  $180\,000 \text{ cm}^3$  of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of  $15 \text{ cm}^3/\text{s}$ .

Calculate the time this takes.

Give your answer in hours and minutes.

[3]

(d)



The  $180\,000\text{ cm}^3$  of water reaches the level  $EF$  as shown above.  
 $EF = x\text{ cm}$  and the height of the water is  $h\text{ cm}$ .

(i) Using the properties of similar triangles, show that  $h = 2(x - 50)$ . [2]

(ii) Using  $h = 2(x - 50)$ , show that the shaded area, in  $\text{cm}^2$ , is  $x^2 - 2500$ .

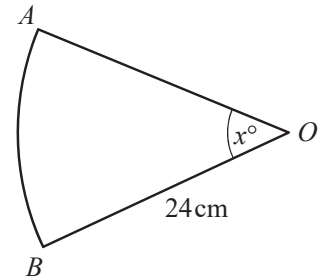
*Answer(d)(ii)* [1]

(iii) Find the value of  $x$ . [2]

(iv) Find the value of  $h$ . [1]

### Question 3

- (a) The diagram shows a sector of a circle with centre  $O$  and radius 24 cm.



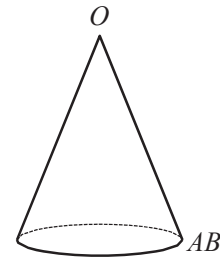
NOT TO SCALE

- (i) The total perimeter of the sector is 68 cm.

Calculate the value of  $x$ .

[3]

- (ii) The points  $A$  and  $B$  of the sector are joined together to make a hollow cone.  
The arc  $AB$  becomes the circumference of the base of the cone.



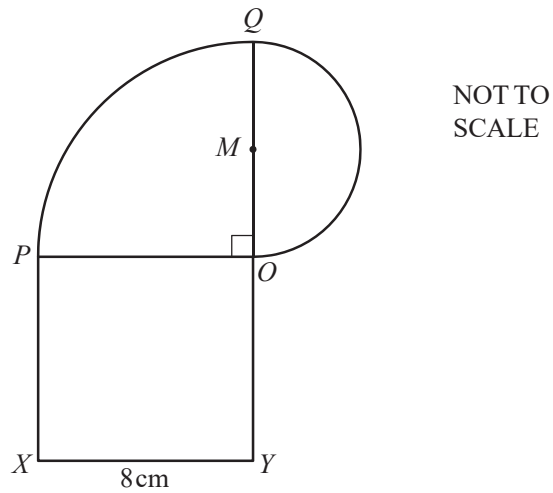
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Calculate the volume of the cone.

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

[6]

(b)



The diagram shows a shape made from a square, a quarter circle and a semi-circle.  
 $OPXY$  is a square of side 8 cm.  
 $OPQ$  is a quarter circle, centre  $O$ .  
 The line  $OMQ$  is the diameter of the semi-circle.

Calculate the area of the shape.

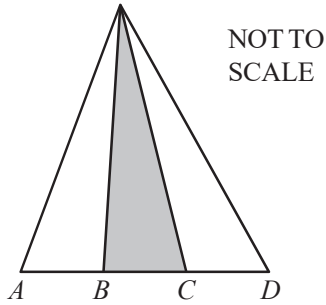
[5]

# Question 4

The total area of each of the following shapes is  $X$ .  
The area of the shaded part of each shape is  $kX$ .

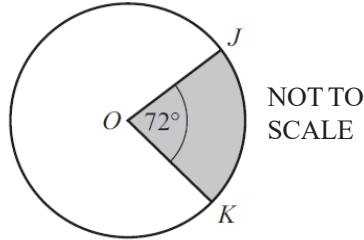
For each shape, find the value of  $k$  and write your answer below each diagram.

[10]



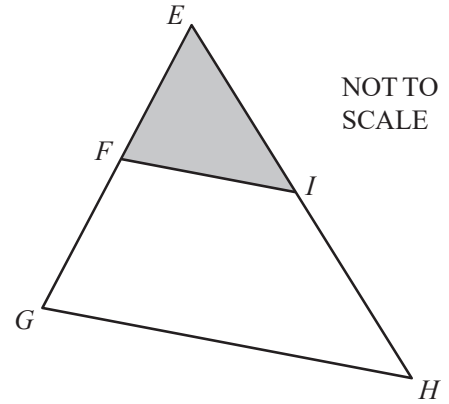
$AB = BC = CD$

$k = \dots\dots\dots$



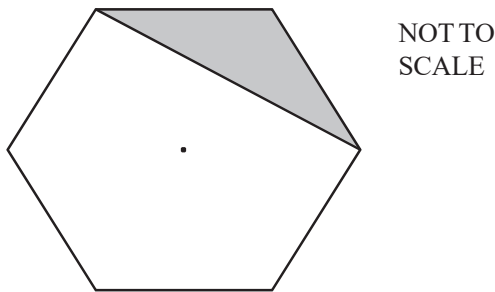
Angle  $JOK = 72^\circ$

$k = \dots\dots\dots$



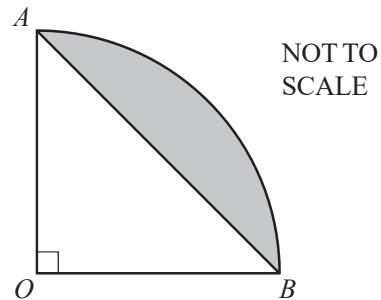
$EF = FG$  and  $EI = IH$

$k = \dots\dots\dots$



The shape is a regular hexagon.

$k = \dots\dots\dots$



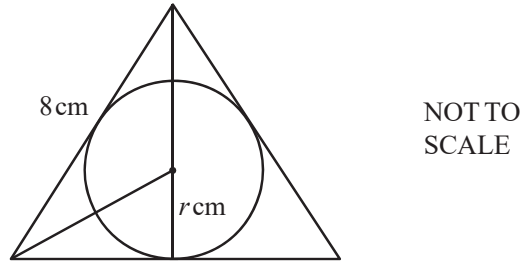
The diagram shows a sector of a circle centre  $O$ .  
Angle  $AOB = 90^\circ$

$k = \dots\dots\dots$



## Question 5

(a)



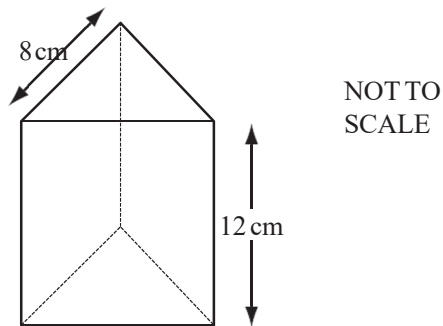
The three sides of an equilateral triangle are tangents to a circle of radius  $r\text{ cm}$ .  
The sides of the triangle are  $8\text{ cm}$  long.

Calculate the value of  $r$ .

Show that it rounds to 2.3, correct to 1 decimal place.

[3]

(b)



The diagram shows a box in the shape of a triangular prism of height  $12\text{ cm}$ .  
The cross section is an equilateral triangle of side  $8\text{ cm}$ .

Calculate the volume of the box.

[4]

(c) The box contains biscuits.

Each biscuit is a cylinder of radius 2.3 centimetres and height 4 millimetres.

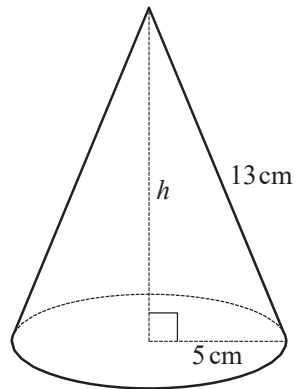
Calculate

(i) the largest number of biscuits that can be placed in the box, [3]

(ii) the volume of one biscuit in cubic centimetres, [2]

(iii) the percentage of the volume of the box **not** filled with biscuits. [3]

## Question 6



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(a) The diagram shows a cone of radius 5 cm and slant height 13 cm.

(i) Calculate the curved surface area of the cone.

[The curved surface area,  $A$ , of a cone with radius  $r$  and slant height  $l$  is  $A = \pi rl$ .] [2]

(ii) Calculate the perpendicular height,  $h$ , of the cone.

[3]

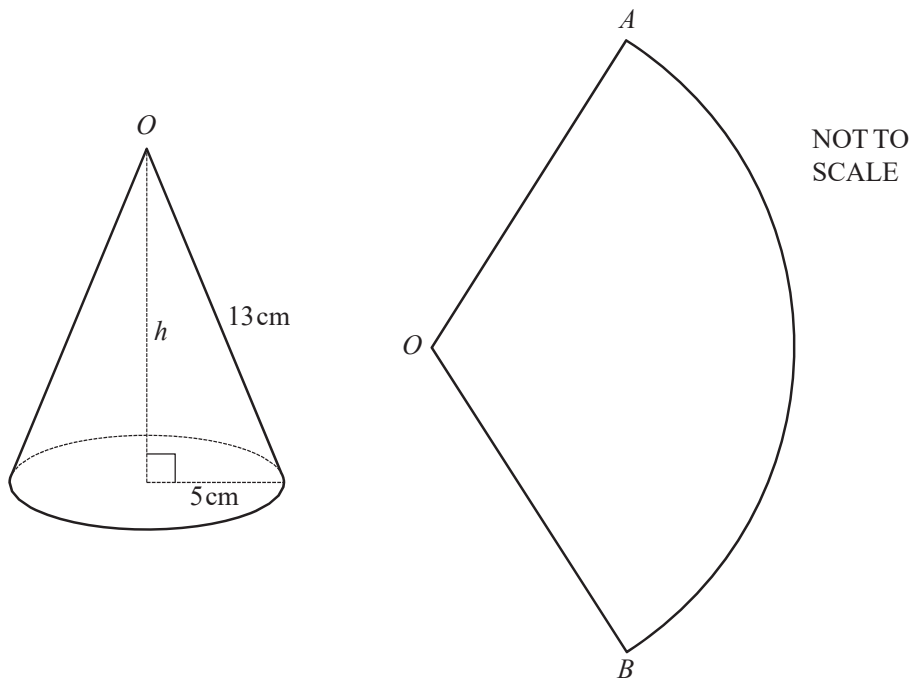
(iii) Calculate the volume of the cone.

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

(iv) Write your answer to **part (a)(iii)** in cubic metres.  
Give your answer in standard form.

[2]

(b)

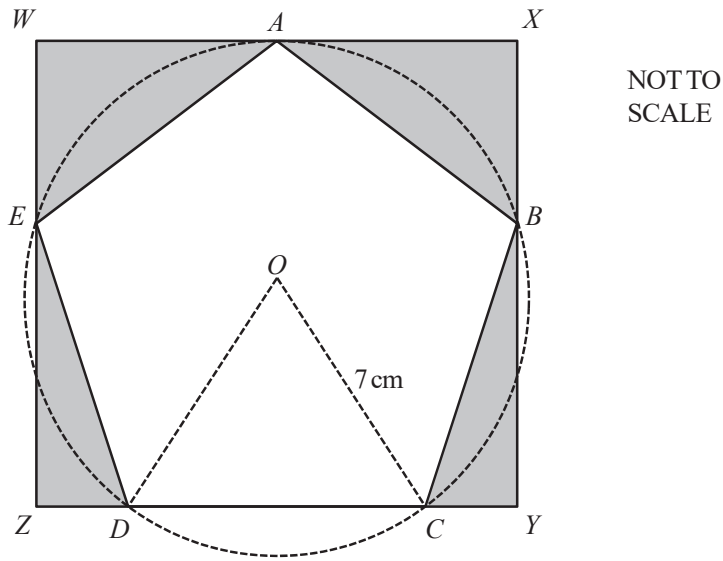


The cone is now cut along a slant height and it opens out to make the sector  $AOB$  of a circle.

Calculate angle  $AOB$ .

[4]

## Question 7



The vertices  $A$ ,  $B$ ,  $C$ ,  $D$  and  $E$  of a regular pentagon lie on the circumference of a circle, centre  $O$ , radius  $7$  cm.  
They also lie on the sides of a rectangle  $WXYZ$ .

(a) Show that

(i) angle  $DOC = 72^\circ$ , [1]

(ii) angle  $DCB = 108^\circ$ , [2]

(iii) angle  $CBY = 18^\circ$ . [1]

(b) Show that the length  $CD$  of one side of the pentagon is 8.23 cm correct to three significant figures. [3]

(c) Calculate

(i) the area of the triangle  $DOC$ , [2]

(ii) the area of the pentagon  $ABCDE$ , [1]

(iii) the area of the sector  $ODC$ , [2]

(iv) the length  $XY$ . [2]

(d) Calculate the ratio  
area of the pentagon  $ABCDE$  : area of the rectangle  $WXYZ$ .

Give your answer in the form  $1 : n$ . [5]