

Perimeters, Area and Volumes

Difficulty: Medium

Question Paper 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Medium
Booklet	Question Paper 1

Time allowed: 107 minutes

Score: /93

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

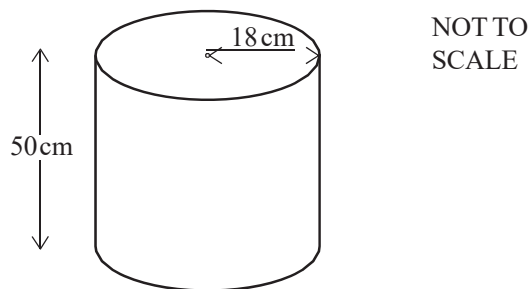
A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

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

Question 1

- (a) The diagram shows a cylindrical container used to serve coffee in a hotel.

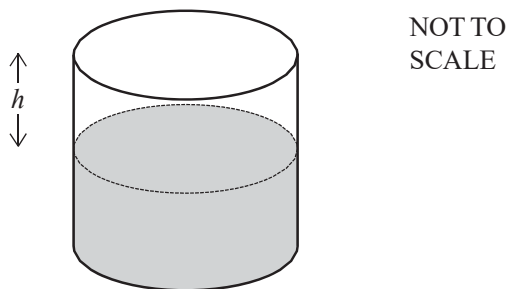


The container has a height of 50 cm and a radius of 18 cm.

- (i) Calculate the volume of the cylinder and show that it rounds to $50\,900\text{ cm}^3$, correct to 3 significant figures. [2]

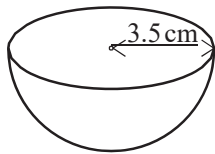
- (ii) 30 litres of coffee are poured into the container.

Work out the height, h , of the empty space in the container.



[3]

- (iii) Cups in the shape of a hemisphere are filled with coffee from the container.
The radius of a cup is 3.5 cm.

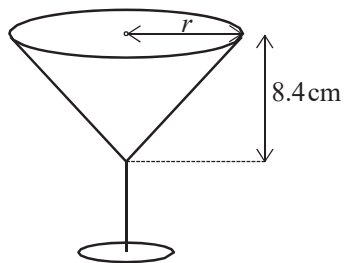


NOT TO
SCALE

Work out the maximum number of these cups that can be completely filled from the 30 litres of coffee in the container.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.] [4]

- (b) The hotel also uses glasses in the shape of a cone.



NOT TO
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The capacity of each glass is 95 cm^3 .

- (i) Calculate the radius, r , and show that it rounds to 3.3 cm, correct to 1 decimal place.

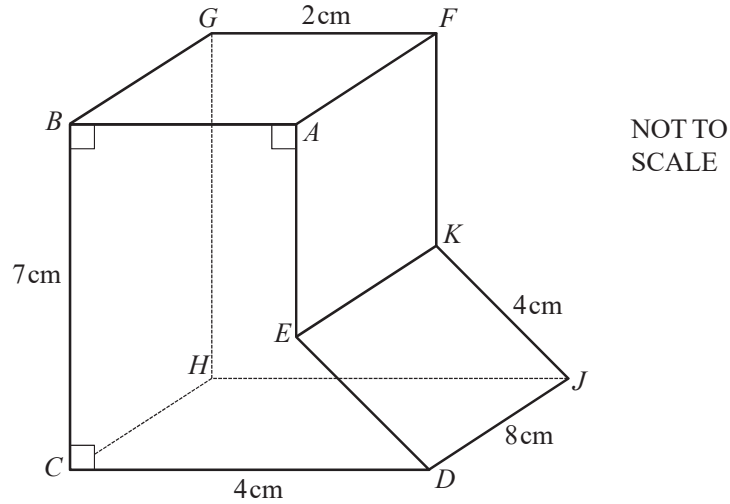
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.] [3]

- (ii) Calculate the curved surface area of the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.] [4]

Question 2

- (a) The diagram shows a solid metal prism with cross section $ABCDE$.



NOT TO
SCALE

- (i) Calculate the area of the cross section $ABCDE$.

[6]

- (ii) The prism is of length 8 cm .

Calculate the volume of the prism.

[1]

- (b) A cylinder of length 13 cm has volume 280 cm^3 .

- (i) Calculate the radius of the cylinder.

[3]

- (ii) The cylinder is placed in a box that is a cube of side 14 cm .

Calculate the percentage of the volume of the box that is occupied by the cylinder.

[3]

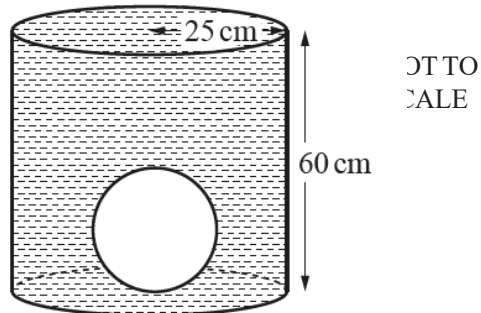
Question 3

- (a) Calculate the volume of a metal sphere of radius 15 cm and show that it rounds to $14\,140\text{ cm}^3$, correct to 4 significant figures.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[2]

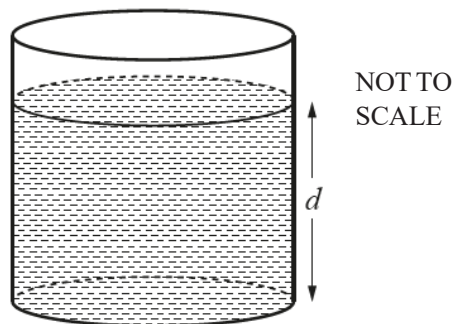
- (b) (i) The sphere is placed inside an empty cylindrical tank of radius 25 cm and height 60 cm. The tank is filled with water.



Calculate the volume of water required to fill the tank.

[3]

- (ii) The sphere is removed from the tank.



Calculate the depth, d , of water in the tank.

[2]

(c) The sphere is melted down and the metal is made into a solid cone of height 54cm.

(i) Calculate the radius of the cone.

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

[3]

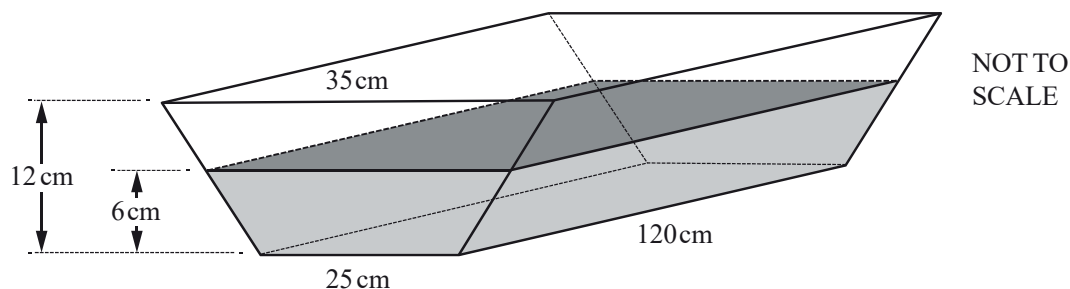
(ii) Calculate the **total** surface area of the cone.

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

[4]

Question 4

The diagram shows a horizontal water trough in the shape of a prism.



The cross section of this prism is a trapezium.

The trapezium has parallel sides of lengths 35 cm and 25 cm and a perpendicular height of 12 cm.

The length of the prism is 120 cm.

(a) Calculate the volume of the trough.

[3]

(b) The trough contains water to a depth of 6 cm.

(i) Show that the volume of water is $19\,800\text{ cm}^3$.

Answer (b)(i)

[2]

(ii) Calculate the percentage of the trough that contains water.

[1]

- (c) The water is drained from the trough at a rate of 12 litres per hour.

Calculate the time it takes to empty the trough.
Give your answer in hours and minutes.

[4]

- (d) The water from the trough just fills a cylinder of radius r cm and height $3r$ cm.

Calculate the value of r .

[3]

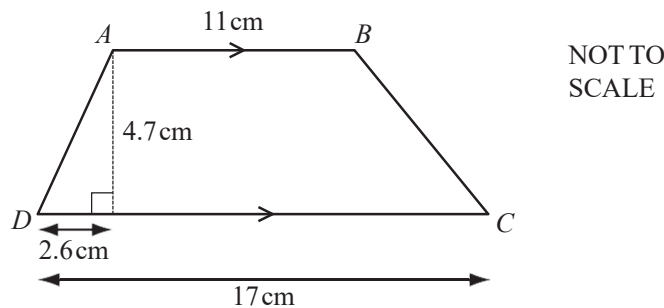
- (e) The cylinder has a mass of 1.2 kg.
1 cm³ of water has a mass of 1 g.

Calculate the total mass of the cylinder and the water.
Give your answer in kilograms.

[2]

Question 5

(a) $ABCD$ is a trapezium.



(i) Calculate the length of AD . [2]

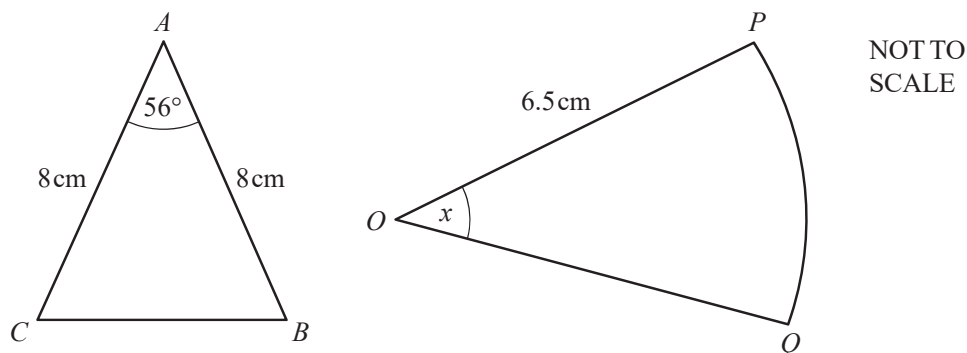
(ii) Calculate the size of angle BCD . [3]

(iii) Calculate the area of the trapezium $ABCD$. [2]

(b) A **similar** trapezium has perpendicular height 9.4 cm.

Calculate the area of this trapezium. [3]

Question 6



The diagram shows a triangle and a sector of a circle.
In triangle ABC , $AB = AC = 8 \text{ cm}$ and angle $BAC = 56^\circ$.
Sector OPQ has centre O , sector angle x and radius 6.5 cm .

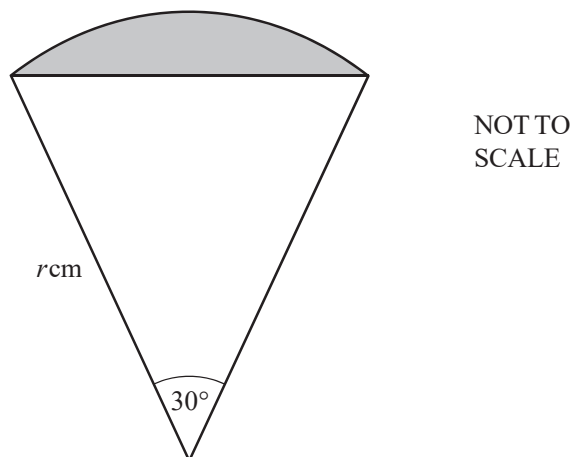
(a) Show that the area of triangle ABC is 26.5 cm^2 correct to 1 decimal place. [2]

(b) The area of sector OPQ is equal to the area of triangle ABC .

(i) Calculate the sector angle x . [3]

(ii) Calculate the perimeter of the sector OPQ . [3]

- (c) The diagram shows a sector of a circle, radius r cm.



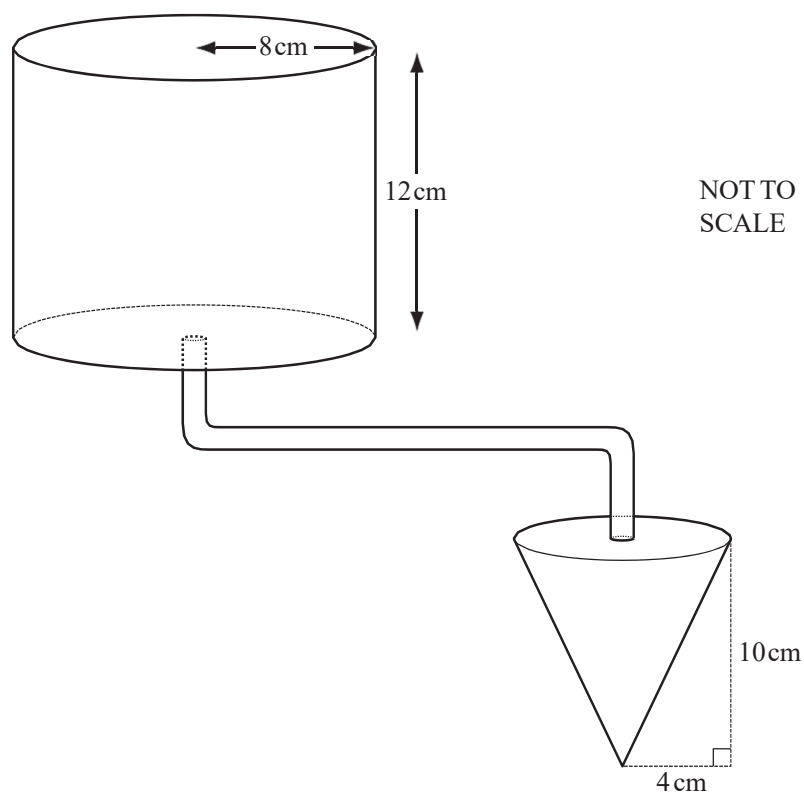
- (i) Show that the area of the shaded segment is $\frac{1}{4} r^2 \left(\frac{1}{3} \pi - 1 \right) \text{ cm}^2$. [4]

- (ii) The area of the segment is 5 cm^2 .

Find the value of r .

[3]

Question 7



The diagram shows a cylinder with radius 8 cm and height 12 cm which is full of water.
A pipe connects the cylinder to a cone.
The cone has radius 4 cm and height 10 cm.

(a) (i) Calculate the volume of water in the cylinder.

Show that it rounds to 2410 cm^3 correct to 3 significant figures.

[2]

(ii) Change 2410 cm^3 into litres.

[1]

(b) Water flows from the cylinder along the pipe into the cone at a rate of 2 cm^3 per second.

Calculate the time taken to fill the empty cone.

Give your answer in minutes and seconds correct to the nearest second.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.] [4]

(c) Find the number of empty cones which can be filled completely from the full cylinder. [3]

Perimeters, Area and Volumes

Difficulty: Medium

Question Paper 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Medium
Booklet	Question Paper 2

Time allowed: 94 minutes

Score: /82

Percentage: /100

Grade Boundaries:

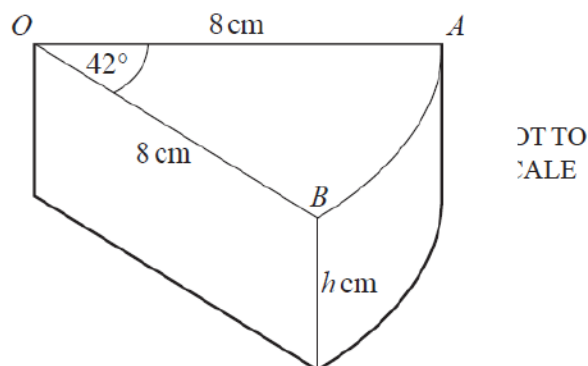
CIE IGCSE Maths (0580)

A*	A	B	C	D
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CIE IGCSE Maths (0980)

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Question 1



A wedge of cheese in the shape of a prism is cut from a cylinder of cheese of height h cm. The radius of the cylinder, OA , is 8 cm and the angle $AOB = 42^\circ$.

- (a) (i) The volume of the wedge of cheese is 90 cm^3 .

Show that the value of h is 3.84 cm correct to 2 decimal places.

[4]

- (ii) Calculate the **total** surface area of the wedge of cheese.

[5]

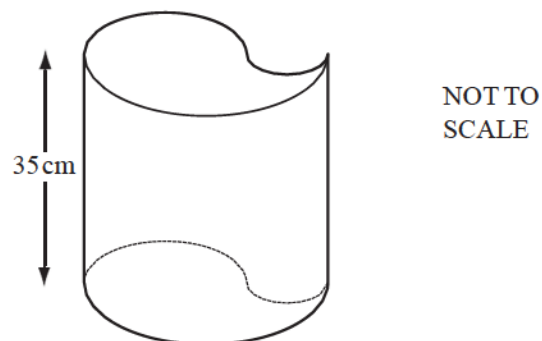
- (b) A mathematically similar wedge of cheese has a volume of 22.5 cm^3 .

Calculate the height of this wedge.

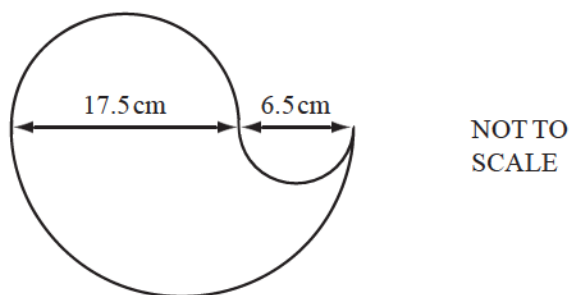
[3]

Question 2

Sandra has designed this open container.
The height of the container is 35 cm.



The cross section of the container is designed from three semi-circles with diameters 17.5 cm, 6.5 cm and 24 cm.



(a) Calculate the area of the cross section of the container. [3]

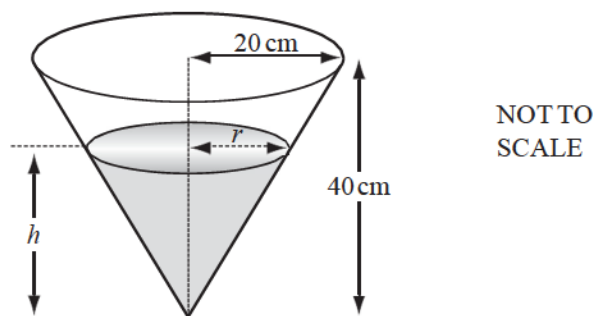
(b) Calculate the external surface area of the container, including the base. [4]

(c) The container has a height of 35 cm.

Calculate the capacity of the container.
Give your answer in litres.

[3]

- (d) Sandra's container is completely filled with water.
All the water is then poured into another container in the shape of a cone.
The cone has radius 20 cm and height 40 cm.



- (i) The diagram shows the water in the cone.

Show that $r = \frac{h}{2}$.

[1]

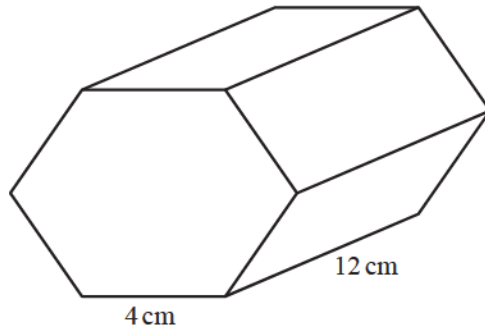
- (ii) Find the height, h , of the water in the cone.

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

[3]

Question 3

(a)



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The diagram shows a prism of length 12 cm.
The cross section is a regular hexagon of side 4 cm.

Calculate the total surface area of the prism.

[4]

- (b) Water flows through a cylindrical pipe of radius 0.74 cm.
It fills a 12 litre bucket in 4 minutes.

(i) Calculate the speed of the water through the pipe in centimetres per minute.

[4]

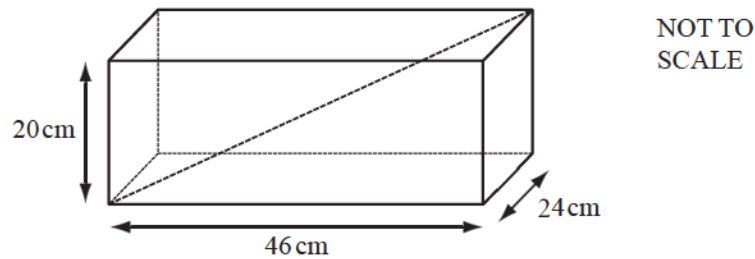
- (ii) When the 12 litre bucket is emptied into a circular pool, the water level rises by 5 millimetres.

Calculate the radius of the pool correct to the nearest centimetre.

[5]

Question 4

(a)



Jose has a fish tank in the shape of a cuboid measuring 46 cm by 24 cm by 20 cm.

Calculate the length of the diagonal shown in the diagram.

[3]

(b) Maria has a fish tank with a volume of $20\,000\text{ cm}^3$.

Write the volume of Maria's fish tank as a percentage of the volume of Jose's fish tank.

[3]

(c) Lorenzo's fish tank is mathematically similar to Jose's and double the volume.

Calculate the dimensions of Lorenzo's fish tank.

[3]

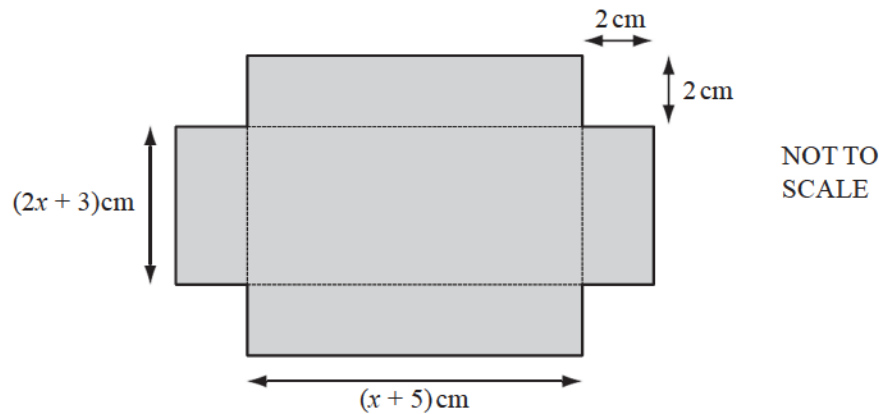
(d) A sphere has a volume of $20\,000\text{ cm}^3$. Calculate its radius.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[3]

Question 5

A rectangular piece of card has a square of side 2 cm removed from each corner.



- (a) Write expressions, in terms of x , for the dimensions of the rectangular card before the squares are removed from the corners. [2]
- (b) The diagram shows a net for an open box.
Show that the volume, $V \text{ cm}^3$, of the open box is given by the formula $V = 4x^2 + 26x + 30$. [3]
- (c) (i) Calculate the values of x when $V = 75$.
Show all your working and give your answers correct to two decimal places. [5]
- (ii) Write down the length of the longest edge of the box. [1]

Question 6

A metal cuboid has a volume of 1080 cm^3 and a mass of 8 kg .

(a) Calculate the mass of one cubic centimetre of the metal.

Give your answer in grams.

[1]

(b) The base of the cuboid measures 12 cm by 10 cm .

Calculate the height of the cuboid.

[2]

(c) The cuboid is melted down and made into a sphere with radius $r \text{ cm}$.

(i) Calculate the value of r .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3} \pi r^3$.]

[3]

(ii) Calculate the surface area of the sphere.

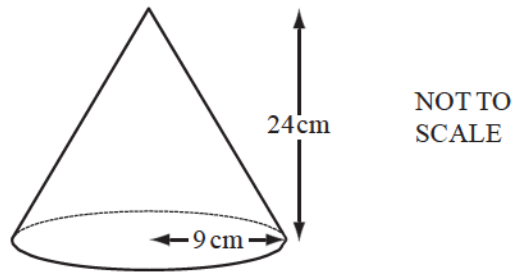
[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.] [2]

(d) A larger sphere has a radius R cm.

The surface area of this sphere is double the surface area of the sphere with radius r cm in part (c).

Find the value of $\frac{R}{r}$. [2]

Question 7

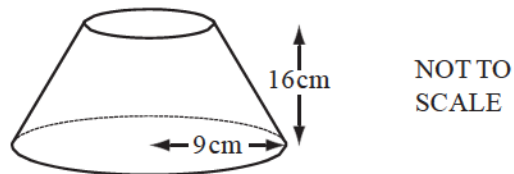


A solid metal cone has base radius 9 cm and vertical height 24 cm.

(a) 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]

(b)



A cone of height 8 cm is removed by cutting parallel to the base, leaving the solid shown above. Show that the volume of this solid rounds to 1960 cm^3 , correct to 3 significant figures. [4]

3

(c) The 1960 cm^3 of metal in the solid in part (b) is melted and made into 5 identical cylinders, each of length 15 cm. Show that the radius of each cylinder rounds to 2.9 cm, correct to 1 decimal place. [4]

Perimeters, Area and Volumes

Difficulty: Medium

Question Paper 3

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

Time allowed: 105 minutes

Score: /91

Percentage: /100

Grade Boundaries:

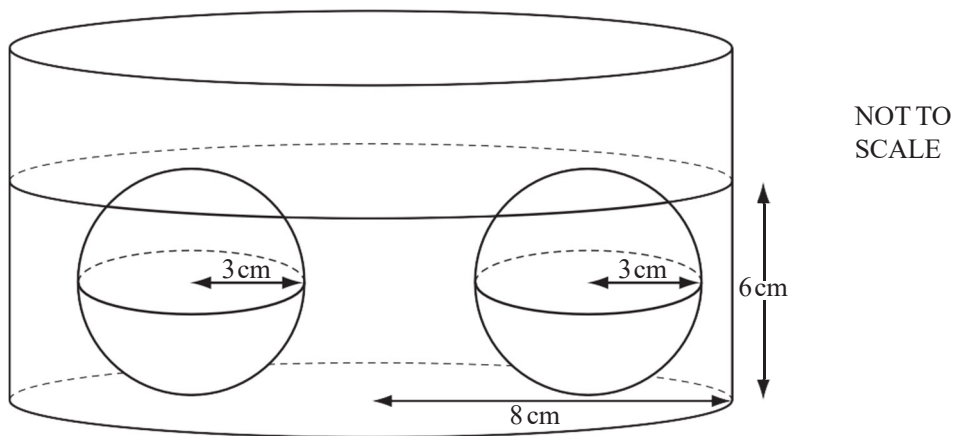
CIE IGCSE Maths (0580)

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



The diagram shows two solid spheres of radius 3 cm lying on the base of a cylinder of radius 8 cm.

Liquid is poured into the cylinder until the spheres are just covered.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(a) Calculate the volume of liquid in the cylinder in

(i) cm^3 ,

[4]

(ii) litres.

[1]

- (b) One cubic centimetre of the liquid has a mass of 1.22 grams.

Calculate the mass of the liquid in the cylinder.

Give your answer in kilograms.

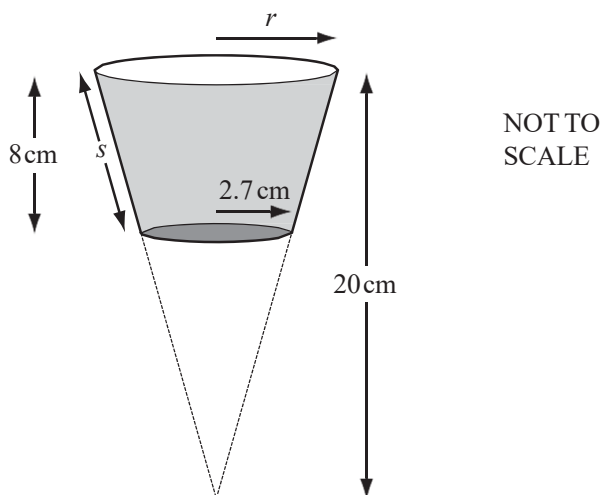
[2]

- (c) The spheres are removed from the cylinder.

Calculate the new height of the liquid in the cylinder.

[2]

Question 2



The diagram shows a plastic cup in the shape of a cone with the end removed.
The vertical height of the cone in the diagram is 20 cm.
The height of the cup is 8 cm.
The base of the cup has radius 2.7 cm.

(a) (i) Show that the radius, r , of the circular top of the cup is 4.5 cm. [2]

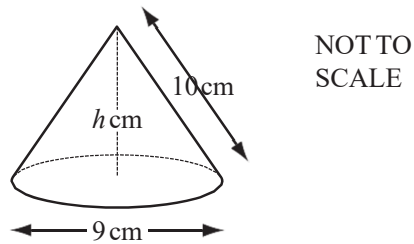
(ii) Calculate the volume of water in the cup when it is full.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3} \pi r^2 h$.] [4]

(b) (i) Show that the slant height, s , of the cup is 8.2 cm. [3]

(ii) Calculate the curved surface area of the outside of the cup. [5]
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

Question 3

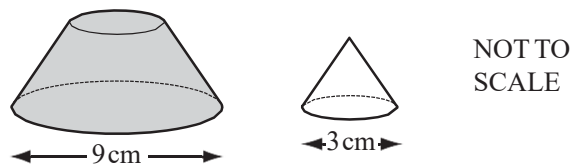


A solid cone has diameter 9 cm, slant height 10 cm and vertical height h cm.

- (a) (i) Calculate the curved surface area of the cone.
[The curved surface area, A , of a cone, radius r and slant height l is $A = \pi rl$.] [2]

- (ii) Calculate the value of h , the vertical height of the cone. [3]

(b)



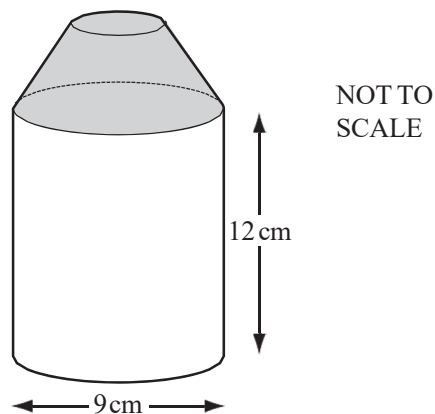
Sasha cuts off the top of the cone, making a smaller cone with diameter 3 cm.
This cone is **similar** to the original cone.

- (i) Calculate the **vertical** height of this small cone. [2]

(ii) Calculate the curved surface area of this small cone.

[2]

(c)

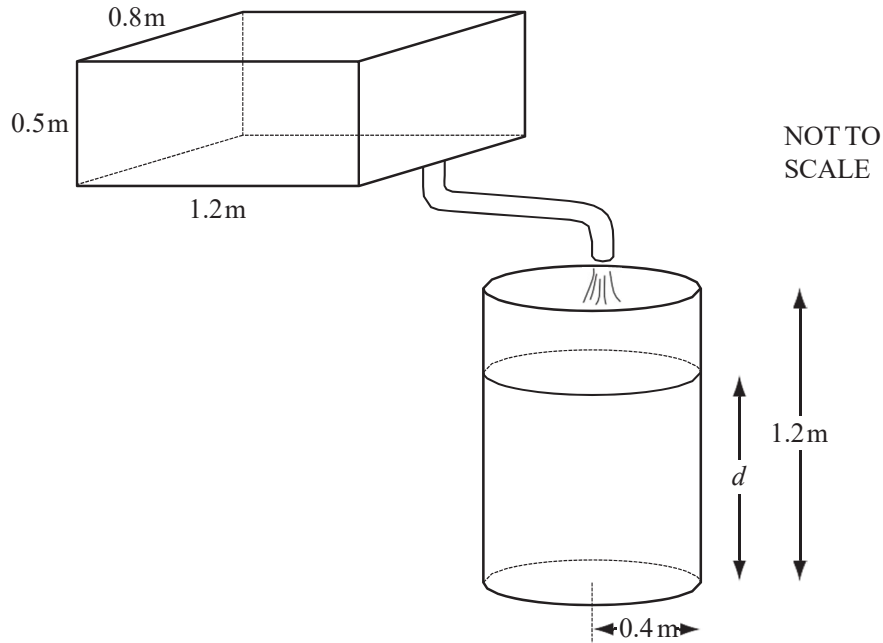


The shaded solid from **part (b)** is joined to a solid cylinder with diameter 9 cm and height 12 cm.

Calculate the **total** surface area of the whole solid.

[5]

Question 4



A rectangular tank measures 1.2 m by 0.8 m by 0.5 m.

(a) Water flows from the full tank into a cylinder at a rate of $0.3 \text{ m}^3/\text{min}$.

Calculate the time it takes for the full tank to empty.
Give your answer in minutes and seconds.

[3]

(b) The radius of the cylinder is 0.4 m.

Calculate the depth of water, d , when all the water from the rectangular tank is in the cylinder.

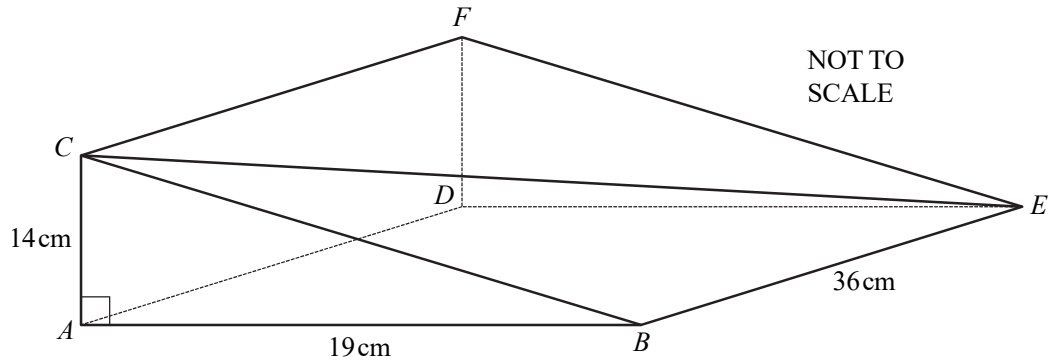
[3]

(c) The cylinder has a height of 1.2 m and is open at the top.
The inside surface is painted at a cost of \$2.30 per m^2 .

Calculate the cost of painting the inside surface.

[4]

Question 5



In the diagram, $ABCDEF$ is a prism of length 36 cm.
The cross-section ABC is a right-angled triangle.
 $AB = 19$ cm and $AC = 14$ cm.

Calculate

(a) the length BC , [2]

(b) the total surface area of the prism, [4]

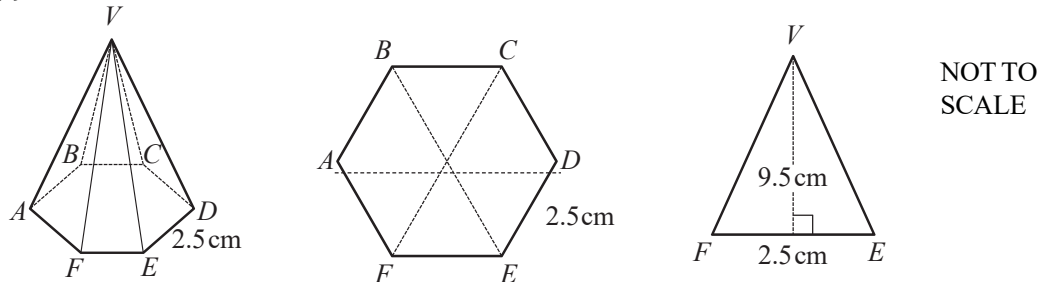
(c) the volume of the prism, [2]

(d) the length CE , [2]

(e) the angle between the line CE and the base $ABED$. [3]

Question 6

(a)

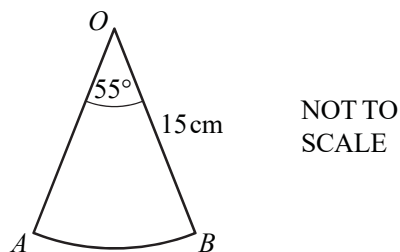


A solid pyramid has a **regular hexagon** of side 2.5 cm as its base.
Each sloping face is an isosceles triangle with base 2.5 cm and height 9.5 cm.

Calculate the **total** surface area of the pyramid.

[4]

(b)

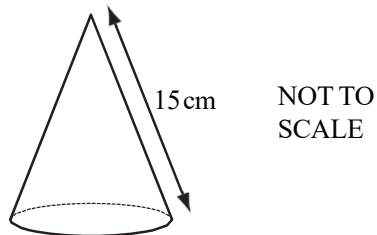


A sector OAB has an angle of 55° and a radius of 15 cm.

Calculate the area of the sector and show that it rounds to 108 cm^2 , correct to 3 significant figures.

[3]

(c)



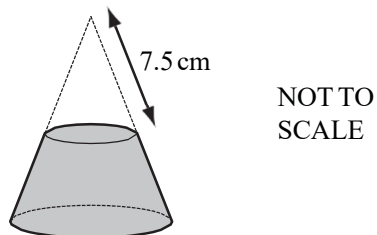
The sector radii OA and OB in **part (b)** are joined to form a cone.

(i) Calculate the base radius 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 of the cone. [3]

(d)



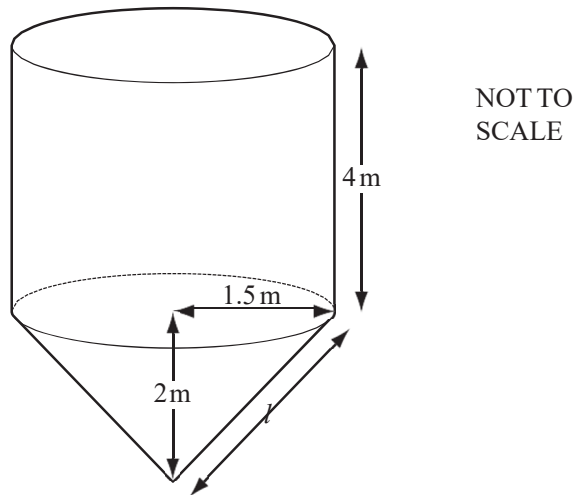
A solid cone has the same dimensions as the cone in **part (c)**.

A small cone with slant height 7.5 cm is removed by cutting parallel to the base.

Calculate the volume of the remaining solid.

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

Question 7



An open water storage tank is in the shape of a cylinder on top of a cone.
The radius of both the cylinder and the cone is 1.5 m.
The height of the cylinder is 4 m and the height of the cone is 2 m.

- (a) Calculate the total surface area of the outside of the tank.

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

[6]

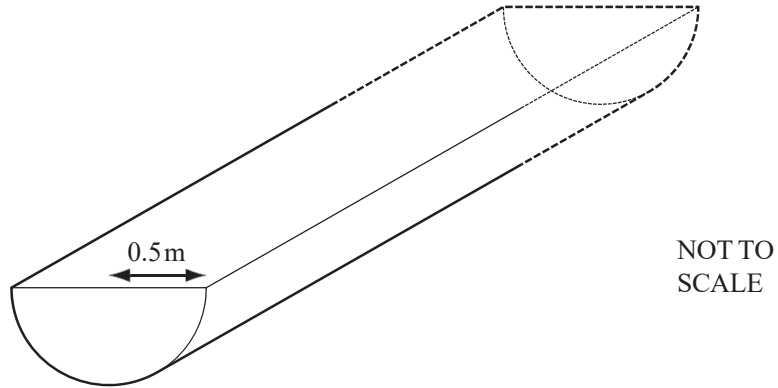
- (b) The tank is completely full of water.

- (i) Calculate the volume of water in the tank and show that it rounds to 33 m^3 , correct to the nearest whole number.

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

[4]

(ii)



The cross-section of an irrigation channel is a semi-circle of radius 0.5 m. The 33 m^3 of water from the tank completely fills the irrigation channel.

Calculate the length of the channel.

[3]

(c) (i) Calculate the number of litres in a full tank of 33 m^3 .

[1]

(ii) The water drains from the tank at a rate of 1800 litres per minute.

Calculate the time, in minutes and seconds, taken to empty the tank.

[2]

Perimeters, Area and Volumes

Difficulty: Medium

Question Paper 4

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

Time allowed: 108 minutes

Score: /94

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

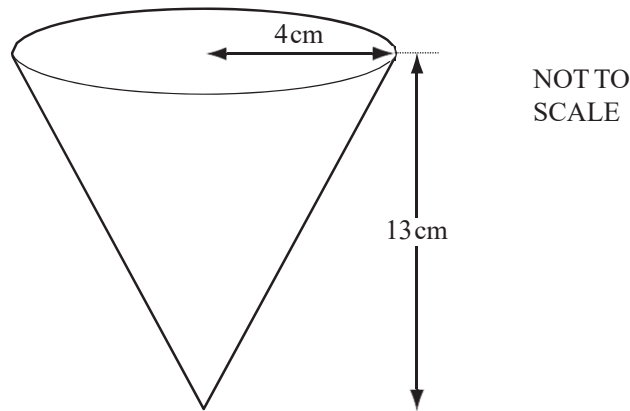
A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

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

Question 1

(a)



The diagram shows a cone of radius 4 cm and height 13 cm.
It is filled with soil to grow small plants.
Each cubic centimetre of soil has a mass of 2.3g.

- (i) Calculate the volume of the soil inside the cone.

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

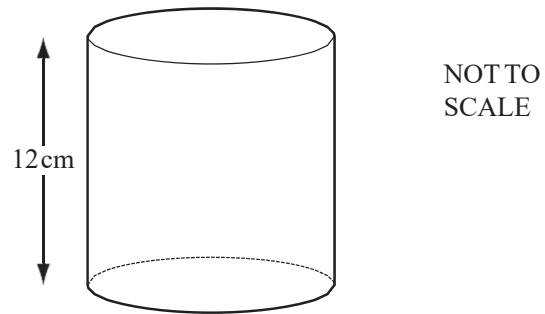
- (ii) Calculate the mass of the soil. [1]

- (iii) Calculate the greatest number of these cones which can be filled **completely** using 50 kg of soil. [2]

- (b) A **similar** cone of height 32.5 cm is used for growing larger plants.

Calculate the volume of soil used to fill this cone. [3]

(c)

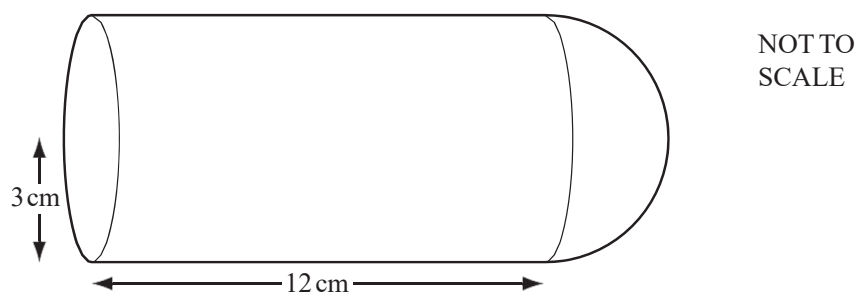


Some plants are put into a cylindrical container with height 12 cm and volume 550 cm^3 .

Calculate the radius of the cylinder.

[3]

Question 2



The diagram shows a solid made up of a hemisphere and a cylinder.
The radius of both the cylinder and the hemisphere is 3 cm.
The length of the cylinder is 12 cm.

- (a) (i) Calculate the volume of the solid.

[The volume, V , of a **sphere** with radius r is $V = \frac{4}{3} \pi r^3$.] [4]

- (ii) The solid is made of steel and 1 cm^3 of steel has a mass of 7.9 g.
Calculate the mass of the solid.
Give your answer in kilograms. [2]

- (iii) The solid fits into a box in the shape of a cuboid, 15 cm by 6 cm by 6 cm.
Calculate the volume of the box **not** occupied by the solid.

[2]

- (b) (i) Calculate the total surface area of the solid.
You must show your working.

[The surface area, A , of a **sphere** with radius r is $A = 4\pi r^2$.]

[5]

- (ii) The surface of the solid is painted.
The cost of the paint is \$0.09 per millilitre.
One millilitre of paint covers an area of 8 cm^2 .
Calculate the cost of painting the solid.

[2]

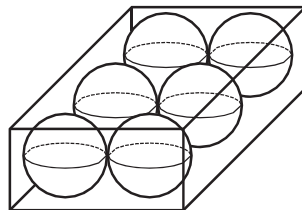
Question 3

A spherical ball has a radius of 2.4 cm.

- (a) Show that the volume of the ball is 57.9 cm^3 , correct to 3 significant figures.

[The volume V of a sphere of radius r is $V = \frac{4}{3}\pi r^3$.] [2]

(b)



NOT TO
SCALE

Six spherical balls of radius 2.4 cm fit exactly into a **closed** box.
The box is a cuboid.

Find

- (i) the length, width and height of the box, [3]
- (ii) the volume of the box, [1]
- (iii) the volume of the box **not** occupied by the balls, [1]
- (iv) the surface area of the box. [2]

(c)



NOT TO
SCALE

The six balls can also fit exactly into a **closed** cylindrical container, as shown in the diagram.

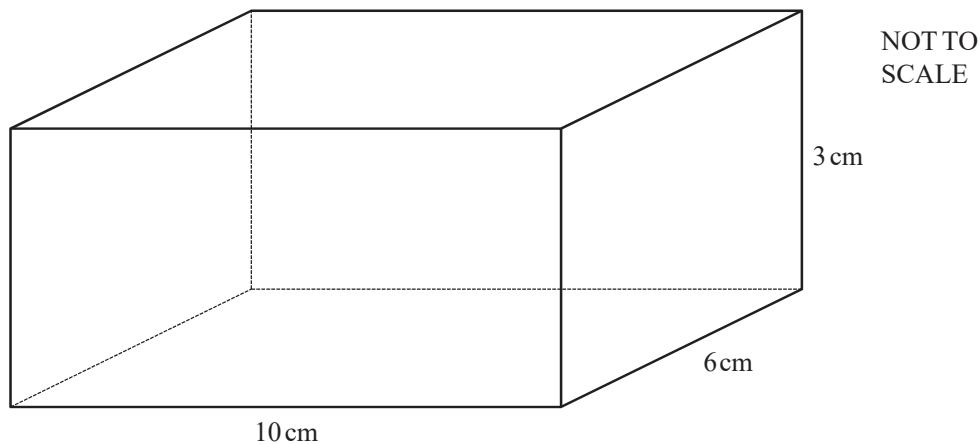
Find

(i) the volume of the cylindrical container, [3]

(ii) the volume of the cylindrical container **not** occupied by the balls, [1]

(iii) the surface area of the cylindrical container. [3]

Question 4



A solid metal cuboid measures 10 cm by 6 cm by 3 cm.

- (a) Show that 16 of these solid metal cuboids will fit exactly into a box which has internal measurements 40 cm by 12 cm by 6 cm. [2]

- (b) Calculate the volume of one metal cuboid. [1]

- (c) One cubic centimetre of the metal has a mass of 8 grams.
The box has a mass of 600 grams.

Calculate the **total** mass of the 16 cuboids **and** the box in

- (i) grams, [2]

- (ii) kilograms. [1]

(d) (i) Calculate the surface area of **one** of the solid metal cuboids. [2]

(ii) The surface of each cuboid is painted. The cost of the paint is \$25 per **square metre**.

Calculate the cost of painting all 16 cuboids. [3]

(e) One of the solid metal cuboids is melted down.

Some of the metal is used to make 200 identical solid spheres of radius 0.5 cm.

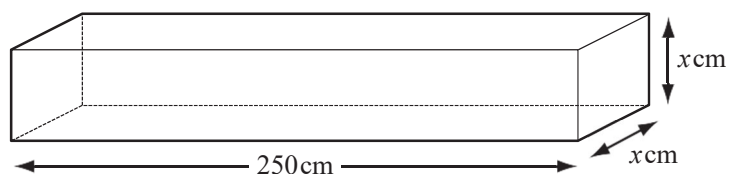
Calculate the volume of metal from this cuboid which is **not** used.

[The volume, V , of a sphere of radius r is $V = \frac{4}{3} \pi r^3$.] [3]

(f) 50 cm^3 of metal is used to make 20 identical solid spheres of radius r .

Calculate the radius r . [3]

Question 5



NOT TO
SCALE

A solid metal bar is in the shape of a cuboid of length of 250 cm.
The cross-section is a square of side x cm.
The volume of the cuboid is 4840 cm^3 .

(a) Show that $x = 4.4$.

[2]

(b) The mass of 1 cm^3 of the metal is 8.8 grams.
Calculate the mass of the whole metal bar in kilograms.

[2]

(c) A box, in the shape of a cuboid measures 250 cm by 88 cm by h cm.
120 of the metal bars fit exactly in the box.
Calculate the value of h .

[2]

- (d) One metal bar, of volume 4840 cm^3 , is melted down to make 4200 identical small spheres.

All the metal is used.

- (i) Calculate the radius of each sphere. Show that your answer rounds to 0.65 cm, correct to 2 decimal places.

[The volume, V , of a sphere, radius r , is given by $V = \frac{4}{3}\pi r^3$.]

Answer(d)(i) [4]

- (ii) Calculate the surface area of each sphere, using 0.65 cm for the radius.

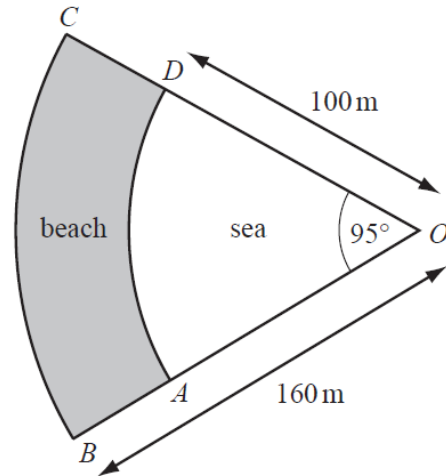
[The surface area, A , of a sphere, radius r , is given by $A = 4\pi r^2$.] [1]

- (iii) Calculate the total surface area of all 4200 spheres as a percentage of the surface area of the metal bar. [4]

Question 6

The shaded area shows a beach.
 AD and BC are circular arcs, centre O .
 $OB = 160\text{ m}$, $OD = 100\text{ m}$ and angle $AOD = 95^\circ$.

NOT TO
SCALE



- (a) Calculate the area of the beach $ABCD$ in square metres.

[3]

- (b) The beach area is covered in sand to a depth of 1.8 m .

Calculate the volume of the sand in cubic metres.

[1]

- (c) Write both the following answers in standard form.

[1]

- (i) Change your answer to part(b) into cubic millimetres.

- (ii) Each grain of sand has a volume of 2 mm^3 correct to the nearest mm^3 .

Calculate the maximum possible number of grains of sand on the beach.

[2]

Question 7

[The surface area of a sphere of radius r is $4\pi r^2$ and the volume is $\frac{4}{3}\pi r^3$.]

- (a) A solid metal sphere has a radius of 3.5 cm.

One cubic centimetre of the metal has a mass of 5.6 grams.

Calculate

- (i) the surface area of the sphere, [2]
- (ii) the volume of the sphere, [2]
- (iii) the mass of the sphere. [2]

- (b)

NOT TO
SCALE

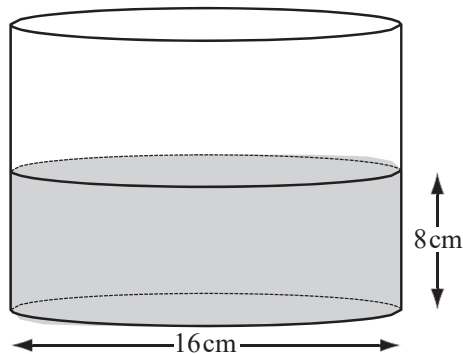


Diagram 1

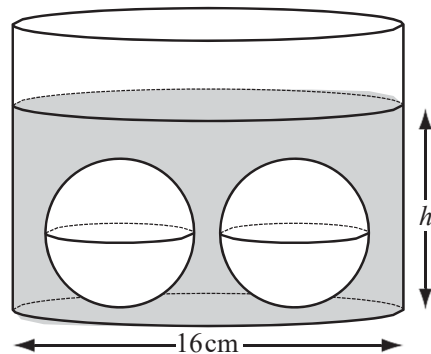


Diagram 2

Diagram 1 shows a cylinder with a **diameter** of 16 cm.

It contains water to a depth of 8 cm.

Two spheres identical to the sphere in **part (a)** are placed in the water. This is shown in Diagram 2.

Calculate h , the new depth of water in the cylinder. [4]

- (c) A different metal sphere has a mass of 1 kilogram.

One cubic centimetre of this metal has a mass of 4.8 grams.

Calculate the radius of this sphere. [3]

Perimeters, Area and Volumes

Difficulty: Medium

Question Paper 5

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Medium
Booklet	Question Paper 5

Time allowed: 89 minutes

Score: /77

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

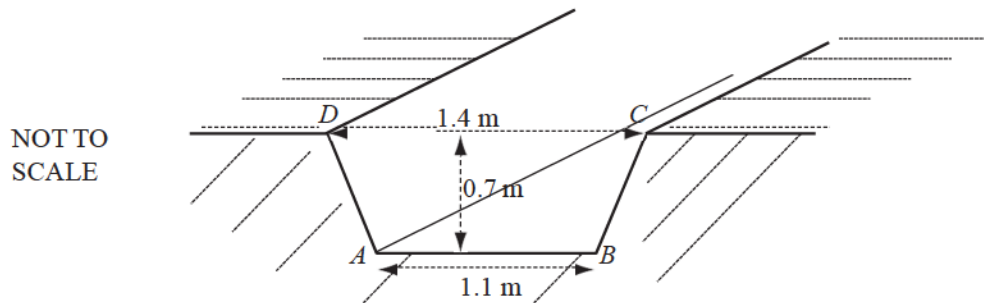
A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

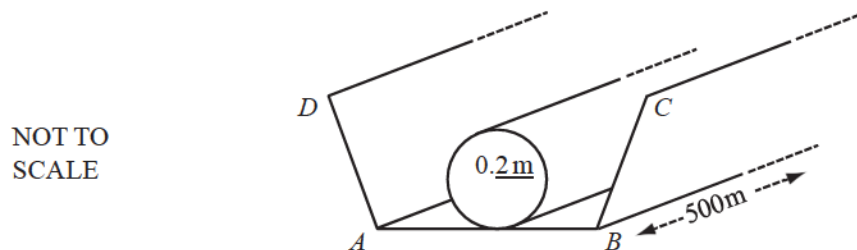
9	8	7	6	5	4
>95%	87%	80%	69%	58%	46%

Question 1

Workmen dig a trench in level ground.



- (a) The cross-section of the trench is a trapezium $ABCD$ with parallel sides of length 1.1 m and 1.4 m and a vertical height of 0.7 m.
Calculate the area of the trapezium. [2]
- (b) The trench is 500 m long.
Calculate the volume of soil removed. [2]
- (c) One cubic metre of soil has a mass of 4.8 tonnes.
Calculate the mass of soil removed, giving your answer in tonnes and in standard form. [2]
- (d) Change your answer to **part (c)** into grams. [1]



- (e) The workmen put a cylindrical pipe, radius 0.2 m and length 500 m, along the bottom of the trench, as shown in the diagram.
Calculate the volume of the cylindrical pipe. [2]
- (f) The trench is then refilled with soil.
Calculate the volume of soil put back into the trench as a percentage of the original amount of soil removed. [3]

Question 2

NOT TO
SCALE

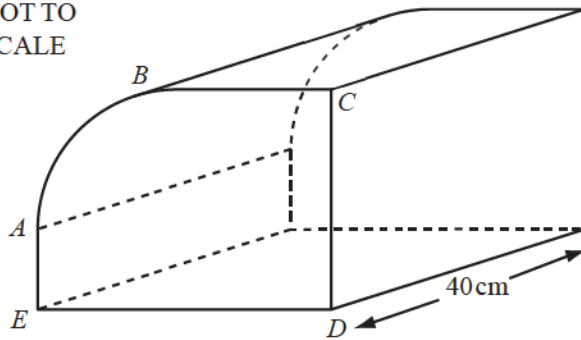


Diagram 1

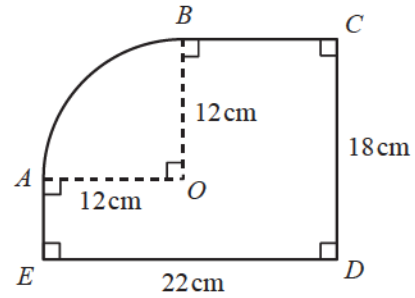


Diagram 2

Diagram 1 shows a closed box. The box is a prism of length 40 cm.
The cross-section of the box is shown in Diagram 2, with all the right-angles marked.
 AB is an arc of a circle, centre O , radius 12 cm.
 $ED = 22$ cm and $DC = 18$ cm.

Calculate

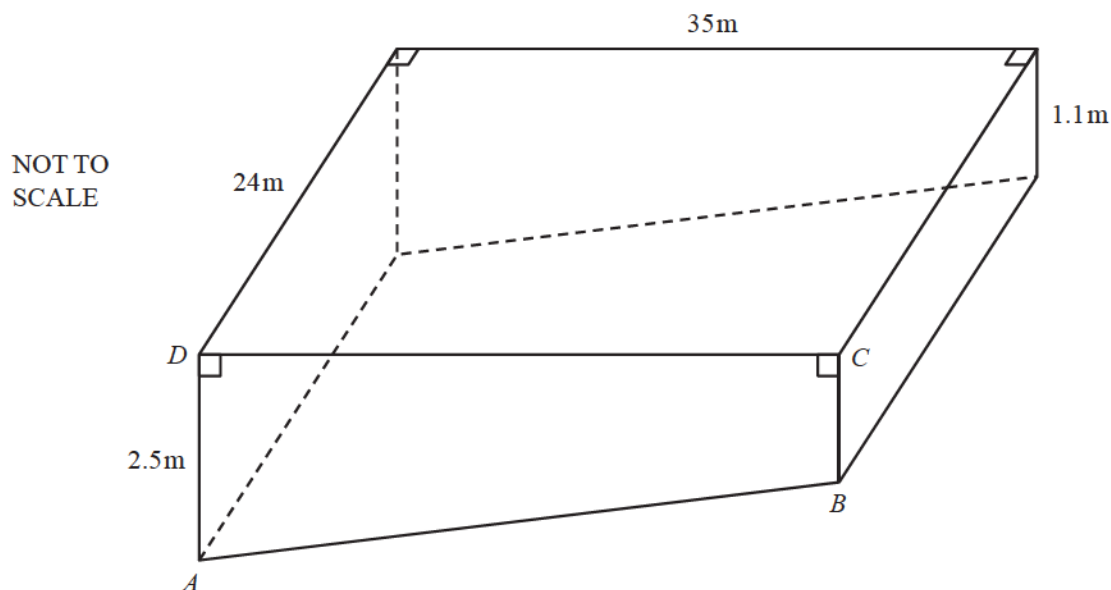
- (a) the perimeter of the cross-section, [3]

- (b) the area of the cross-section, [3]

- (c) the volume of the box, [1]

- (d) the **total** surface area of the box. [4]

Question 3



The diagram shows a swimming pool of length 35 m and width 24 m.
A cross-section of the pool, $ABCD$, is a trapezium with $AD = 2.5$ m and $BC = 1.1$ m.

(a) Calculate

- (i) the area of the trapezium $ABCD$, [2]
- (ii) the volume of the pool, [2]
- (iii) the number of litres of water in the pool, when it is full. [1]

(b) $AB = 35.03$ m correct to 2 decimal places.

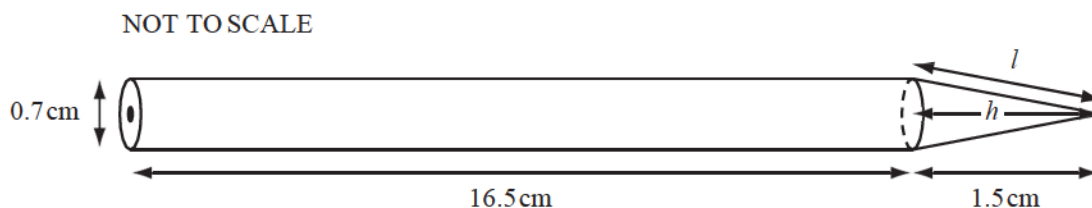
The sloping rectangular floor of the pool is painted.
It costs \$2.25 to paint one square metre.

- (i) Calculate the cost of painting the floor of the pool. [2]
- (ii) Write your answer to **part (b)(i)** correct to the nearest hundred dollars. [1]

(c) (i) Calculate the volume of a cylinder, radius 12.5 cm and height 14 cm. [2]

- (ii) When the pool is emptied, the water flows through a cylindrical pipe of radius 12.5 cm. The water flows along this pipe at a rate of 14 centimetres per second. Calculate the time taken to empty the pool. Give your answer in days and hours, correct to the nearest hour. [4]

Question 4



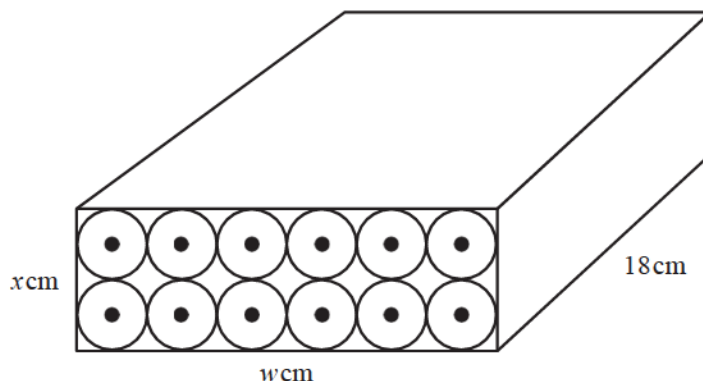
The diagram shows a pencil of length 18 cm.
 It is made from a cylinder and a cone.
 The cylinder has **diameter** 0.7 cm and length 16.5 cm.
 The cone has **diameter** 0.7 cm and length 1.5 cm.

(a) Calculate the volume of the pencil.

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

(b)

NOT TO SCALE



Twelve of these pencils just fit into a rectangular box of length 18 cm, width w cm and height x cm.
 The pencils are in 2 rows of 6 as shown in the diagram.

(i) Write down the values of w and x . [2]

(ii) Calculate the volume of the box. [2]

(iii) Calculate the percentage of the volume of the box occupied by the pencils. [2]

(c) Showing all your working, calculate

(i) the slant height, l , of the cone, [2]

(ii) the **total** surface area of **one** pencil, giving your answer correct to 3 significant figures.
 [The curved surface area, A , of a cone of radius r and **slant** height l is given by $A = \pi r l$.] [6]

Question 5

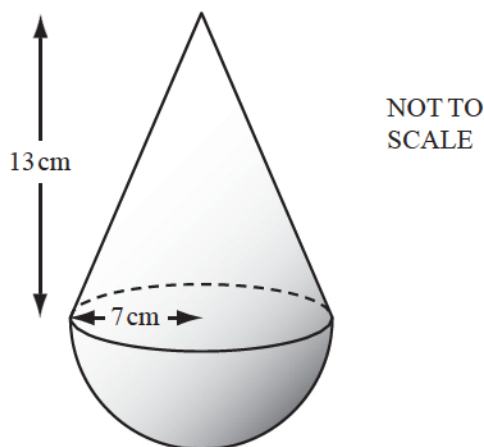
Water flows through a pipe into an empty cylindrical tank.
The tank has a radius of 40 cm and a height of 110 cm.

(a) Calculate the volume of the tank. [2]

(b) The pipe has a cross-sectional area of 1.6 cm^2 .
The water comes out of the pipe at a speed of 14 cm/s.
How long does it take to fill the tank?
Give your answer in hours and minutes, correct to the nearest minute. [4]

(c) All the water from the tank is added to a pond which has a surface area of 70 m^2 .
Work out the increase in the depth of water in the pond.
Give your answer in millimetres, correct to the nearest millimetre. [4]

Question 6



The diagram shows a solid made up of a hemisphere and a cone.
The base radius of the cone and the radius of the hemisphere are each 7 cm.
The height of the cone is 13 cm.

- (a) (i) Calculate the total volume of the solid.

[The volume of a hemisphere of radius r is given by $V = \frac{2}{3}\pi r^3$.]

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

- (ii) The solid is made of wood and 1 cm^3 of this wood has a mass of 0.94 g.
Calculate the mass of the solid, in kilograms, correct to 1 decimal place. [3]

- (b) Calculate the curved surface area of the cone.

[The curved surface area of a cone of radius r and sloping edge l is given by $A = \pi r l$.] [3]

- (c) The cost of covering all the solid with gold plate is \$411.58.

Calculate the cost of this gold plate per square centimetre.

[The curved surface area of a **hemisphere** is given by $A = 2\pi r^2$.] [5]

Perimeters, Area and Volumes

Difficulty: Hard

Question Paper 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Hard
Booklet	Question Paper 1

Time allowed: 93 minutes

Score: /81

Percentage: /100

Grade Boundaries:

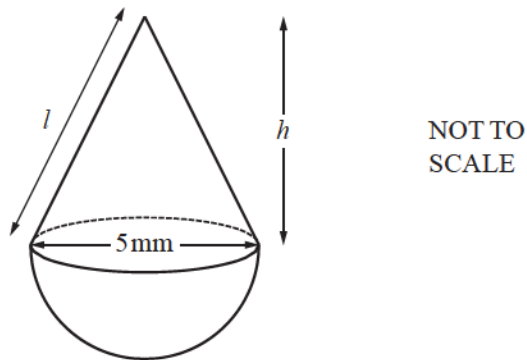
CIE IGCSE Maths (0580)

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



The diagram shows a solid made from a hemisphere and a cone.
The base diameter of the cone and the diameter of the hemisphere are each 5 mm.

- (a) The total surface area of the solid is $\frac{115r}{4} \text{ mm}^2$.

Show that the slant height, l , is 6.5 mm.

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

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

[4]

- (b) Calculate the height, h , of the cone.

[3]

- (c) Calculate the volume of the solid.

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

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[4]

- (d) The solid is made from gold.

1 **cubic centimetre** of gold has a mass of 19.3 grams.

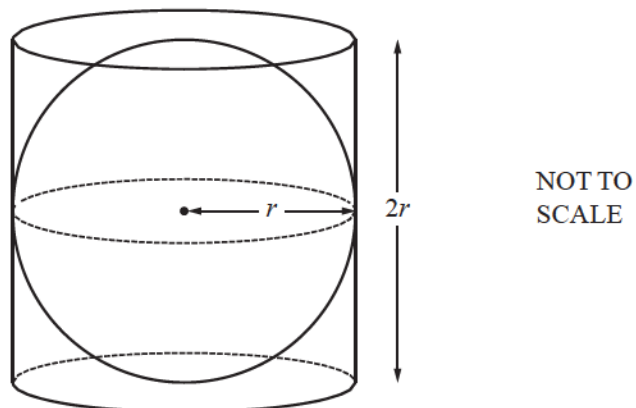
The value of 1 gram of gold is \$38.62.

Calculate the value of the gold used to make the solid.

[3]

Question 2

(a)



A sphere of radius r is inside a closed cylinder of radius r and height $2r$.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

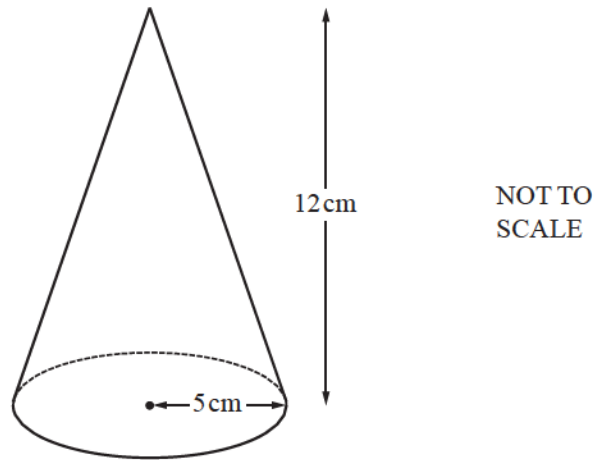
(i) When $r = 8$ cm, calculate the volume inside the cylinder which is **not** occupied by the sphere.

[3]

(ii) Find r when the volume inside the cylinder **not** occupied by the sphere is 36cm^3 .

[3]

(b)



The diagram shows a solid cone with radius 5 cm and perpendicular height 12 cm.

- (i) The **total** surface area is painted at a cost of \$0.015 per cm^2 .

Calculate the cost of painting the cone.

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

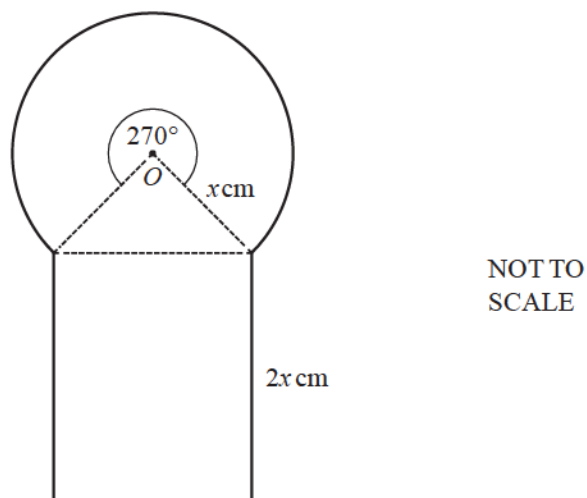
[4]

- (ii) The cone is made of metal and is melted down and made into smaller solid cones with radius 1.25 cm and perpendicular height 3 cm.

Calculate the number of smaller cones that can be made.

[3]

Question 3



The diagram shows a sector of a circle, a triangle and a rectangle.
The sector has centre O , radius x cm and angle 270° .
The rectangle has length $2x$ cm.

The total area of the shape is $kx^2 \text{ cm}^2$.

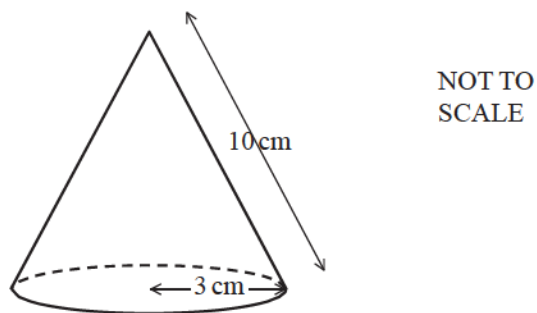
(a) Find the value of k .

[5]

(b) Find the value of x when the total area is 110 cm^2 .

[2]

Question 4



The diagram shows a hollow cone with radius 3 cm and slant height 10 cm.

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

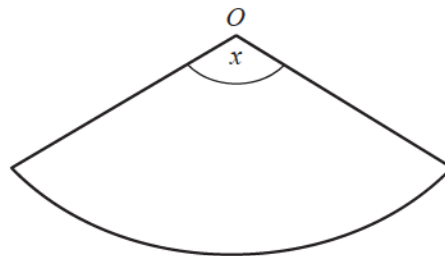
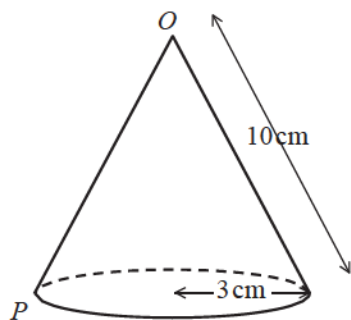
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.] [2]

- (ii) Calculate the perpendicular height 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]

(b)



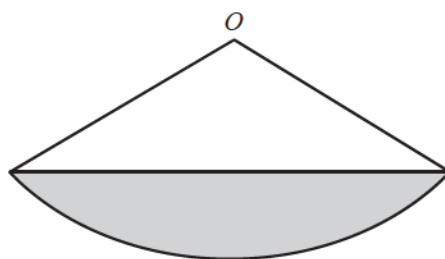
NOT TO
SCALE

The cone is cut along the line OP and is opened out into a sector as shown in the diagram.

Calculate the sector angle x .

[4]

(c)



NOT TO
SCALE

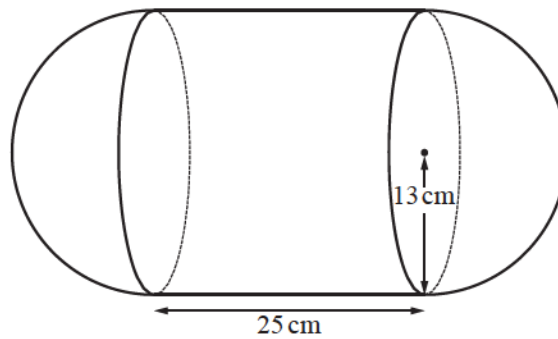
The diagram shows the same sector as in **part (b)**.

Calculate the area of the shaded segment.

[4]

Question 5

(a)



NOT TO
SCALE

The diagram shows a solid made up of a cylinder and two hemispheres.
The radius of the cylinder and the hemispheres is 13 cm.
The length of the cylinder is 25 cm.

- (i) One cubic centimetre of the solid has a mass of 2.3 g.

Calculate the mass of the solid.
Give your answer in kilograms.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[4]

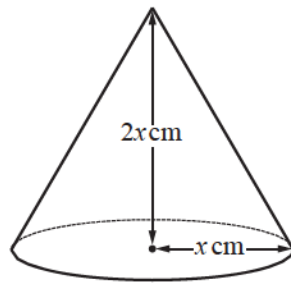
- (ii) The surface of the solid is painted at a cost of \$4.70 per square metre.

Calculate the cost of painting the solid.

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

[4]

(b)



NOT TO
SCALE

The cone in the diagram has radius $x \text{ cm}$ and height $2x \text{ cm}$.
The volume of the cone is 500 cm^3 .

Find the value of x .

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

[3]

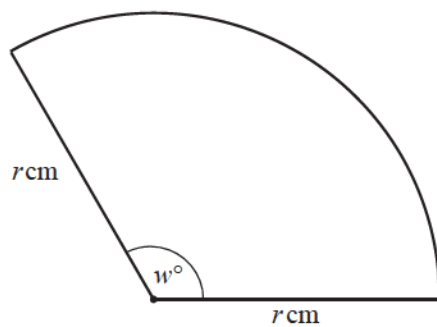
- (c) Two mathematically similar solids have volumes of 180 cm^3 and 360 cm^3 .
The surface area of the smaller solid is 180 cm^2 .

Calculate the surface area of the larger solid.

[3]

Question 6

(a)



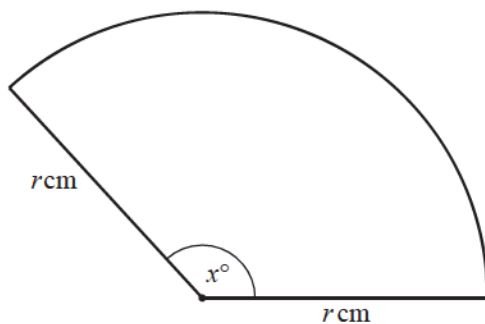
NOT TO
SCALE

The area of this sector is r^2 square centimetres.

Find the value of w .

[3]

(b)



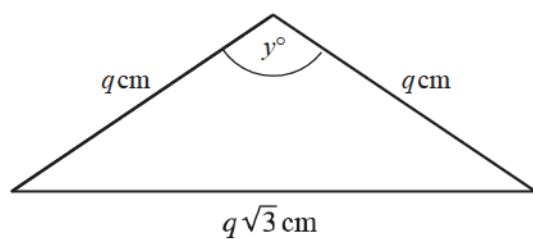
NOT TO
SCALE

The perimeter of this sector is $2r + \frac{7\pi r}{10}$ centimetres.

Find the value of x .

[3]

(c)



NOT TO
SCALE

The perimeter of the isosceles triangle is $2q + q\sqrt{3}$ centimetres.

Find the value of y .

[4]

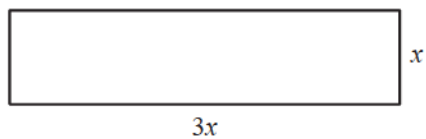
Question 7

The **perimeter** of each of the three shapes is 60cm.

Find x in each part.

(a)

Rectangle

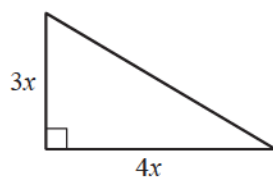


NOT TO
SCALE

[2]

(b)

Triangle

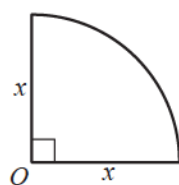


NOT TO
SCALE

[3]

(c)

Sector



NOT TO
SCALE

[3]

Perimeters, Area and Volumes

Difficulty: Hard

Question Paper 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Hard
Booklet	Question Paper 2

Time allowed: 92 minutes

Score: /80

Percentage: /100

Grade Boundaries:

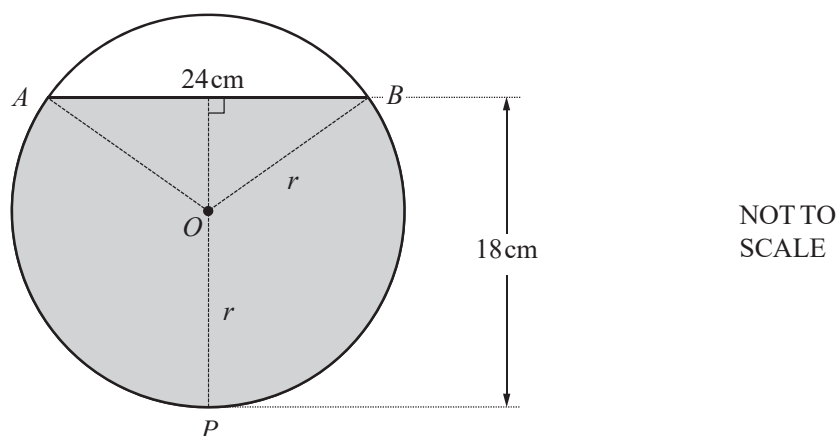
CIE IGCSE Maths (0580)

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



The diagram shows the cross section of a cylinder, centre O , radius r , lying on its side.
The cylinder contains water to a depth of 18 cm.
The width, AB , of the surface of the water is 24 cm.

(a) Use an algebraic method to show that $r = 13$ cm. [4]

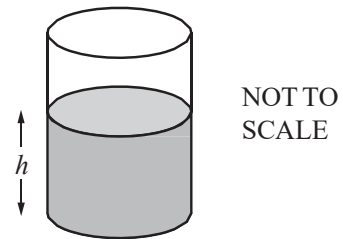
(b) Show that angle $AOB = 134.8^\circ$, correct to 1 decimal place. [2]

(c) (i) Calculate the area of the major sector $OAPB$. [3]

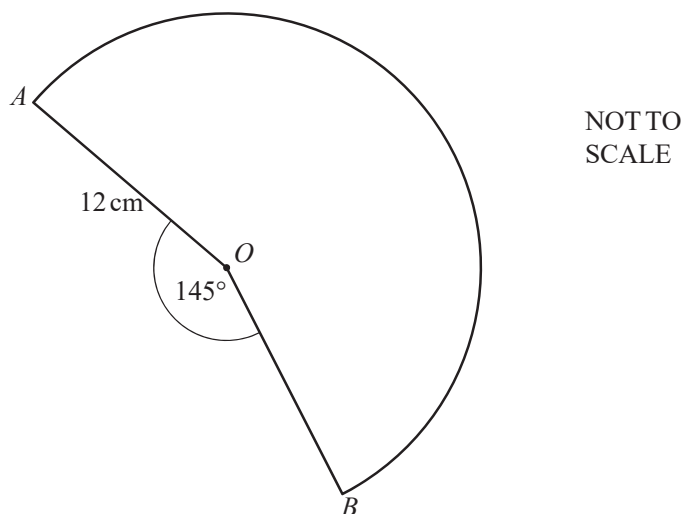
(ii) Calculate the area of the shaded segment APB . [3]

(iii) The length of the cylinder is 40 cm.
Calculate the volume of water in the cylinder. [1]

(d) The cylinder is turned so that it stands on one of its circular ends.
In this position, the depth of the water is h . [2]
Find h .



Question 2



The diagram shows a sector, centre O , and radius 12 cm .

(a) Calculate the area of the sector. [3]

(b) The sector is made into a cone by joining OA to OB .

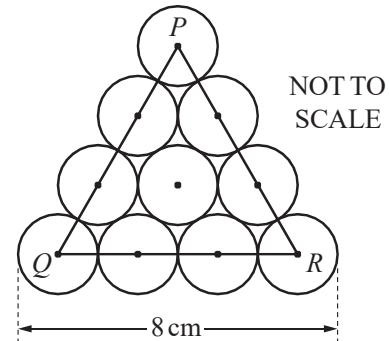
Calculate the volume of the cone.

[The volume, V , of a cone with base radius r and height h is $V = \frac{1}{3}\pi r^2 h$.] [6]

Question 3

- (a) The ten circles in the diagram each have radius 1 cm.
The centre of each circle is marked with a dot.

Calculate the height of triangle PQR .

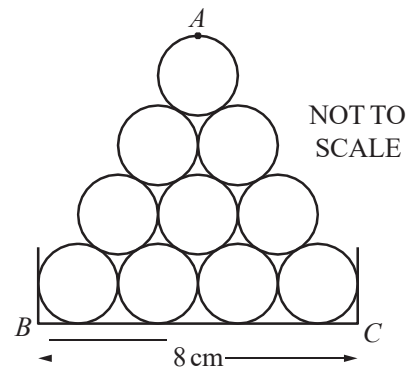


[3]

- (b) Mr Patel uses whiteboard pens that are cylinders of radius 1 cm.

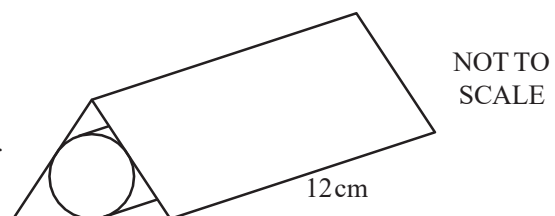
- (i) The diagram shows 10 pens stacked in a tray.
The tray is 8 cm wide.
The point A is the highest point in the stack.

Find the height of A above the base, BC , of the tray.



[1]

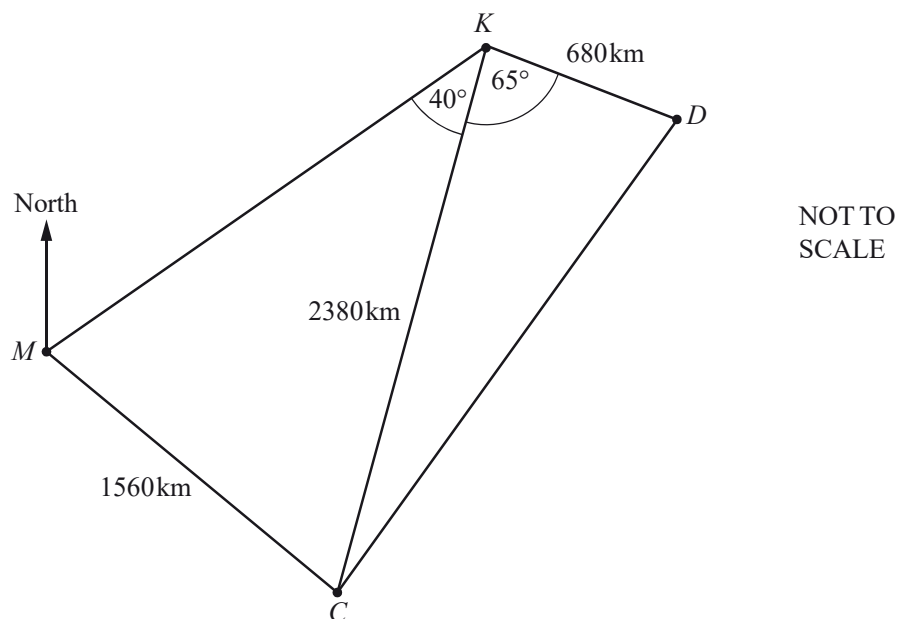
- (ii) The diagram shows a box that holds one pen.
The box is a prism of length 12 cm.
The cross section of the prism is an equilateral triangle.
The pen touches each of the three rectangular faces of the box.



Calculate the volume of this box.

[5]

Question 4



The diagram shows some distances between Mumbai (M), Kathmandu (K), Dhaka (D) and Colombo (C).

(a) Angle $CKD = 65^\circ$.

Use the cosine rule to calculate the distance CD .

[4]

(b) Angle $MKC = 40^\circ$.

Use the sine rule to calculate the acute angle KMC .

[3]

(c) The bearing of K from M is 050° .

Find the bearing of M from C .

[2]

(d) A plane from Colombo to Mumbai leaves at 2115 and the journey takes 2 hours 24 minutes.

(i) Find the time the plane arrives at Mumbai.

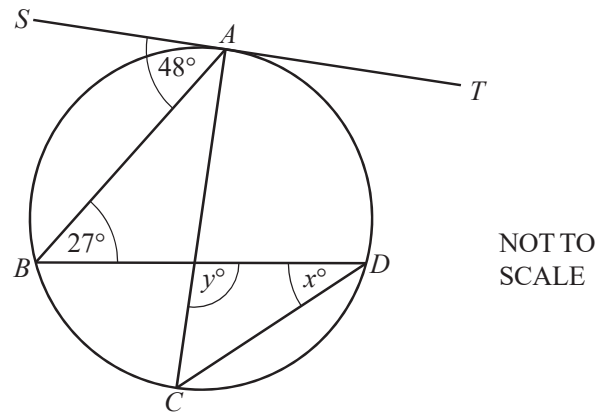
[1]

(ii) Calculate the average speed of the plane.

[2]

Question 5

- (a) The points A , B , C and D lie on a circle.
 AC is a diameter of the circle.
 ST is the tangent to the circle at A .

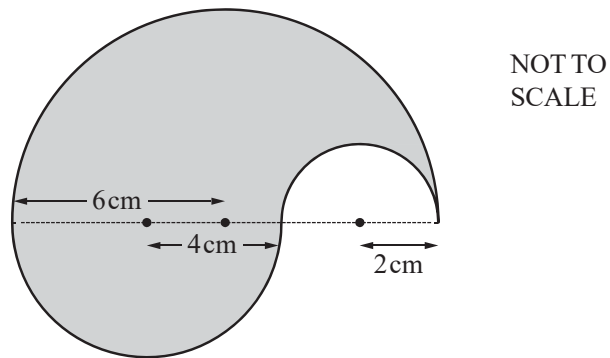


Find the value of

(i) x , [2]

(ii) y . [2]

- (b) The diagram shows a shaded shape formed by three semi-circular arcs. The radius of each semi-circle is shown in the diagram.



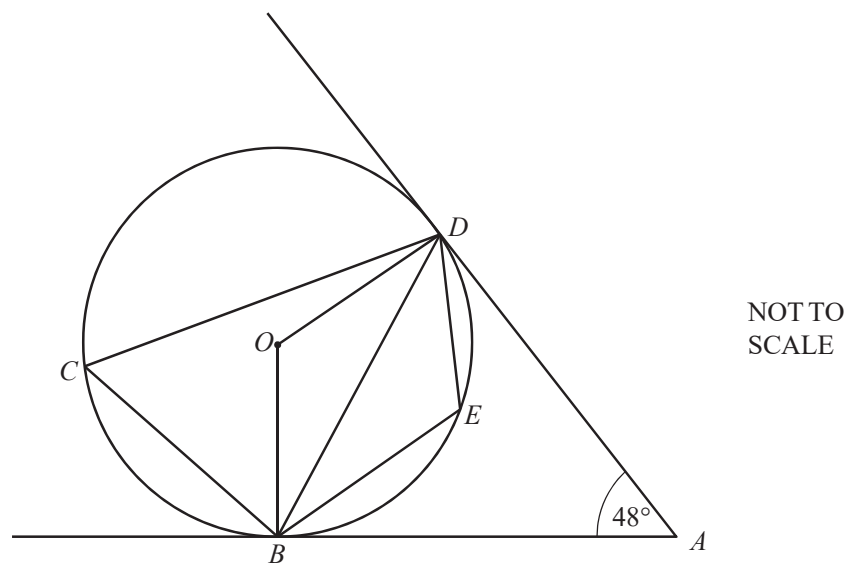
- (i) Calculate the perimeter of the shaded shape. [2]

- (ii) The shaded shape is made from metal 1.6mm thick.

Calculate the volume of metal used to make this shape.
Give your answer in cubic millimetres.

[5]

Question 6



In the diagram, B , C , D and E lie on the circle, centre O .
 AB and AD are tangents to the circle.
 Angle $BAD = 48^\circ$.

(a) Find

(i) angle ABD , [1]

(ii) angle OBD , [1]

(iii) angle BCD , [2]

(iv) angle BED . [1]

(b) The radius of the circle is 15 cm.

Calculate the area of triangle BOD .

[2]

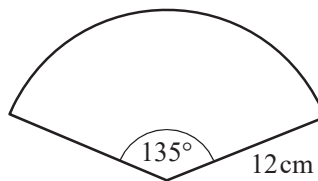
(c) Give a reason why $ABOD$ is a cyclic quadrilateral

[1]

Question 7

(a) A sector of a circle has radius 12 cm and an angle of 135° .

- (i) Calculate the length of the arc of this sector.
Give your answer as a multiple of π .

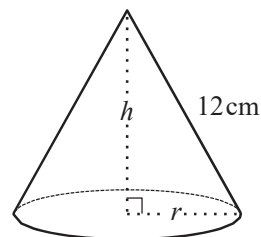


NOT TO
SCALE

[2]

(ii) The sector is used to make a cone.

- (a) Calculate the base radius, r .



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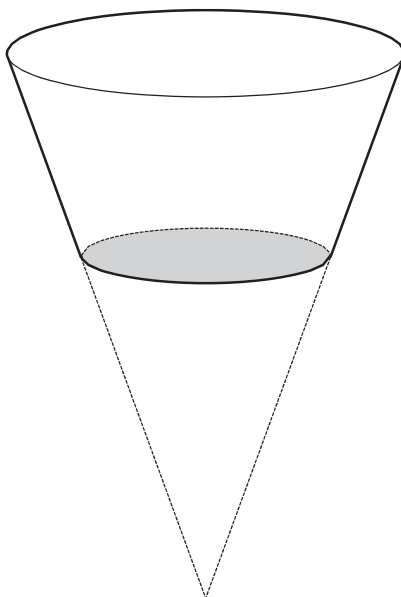
[2]

- (b) Calculate the height of the cone, h .

[3]

(b) The diagram shows a plant pot.

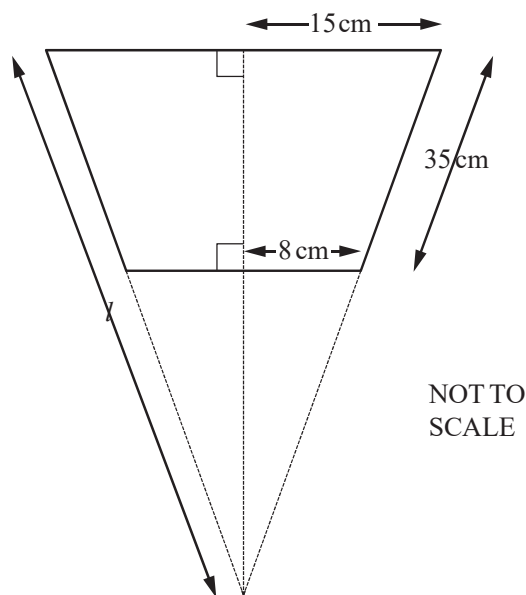
It is made by removing a small cone from a larger cone and adding a circular base.



NOT TO
SCALE

This is the cross section of the plant pot.

(i) Find l .



[3]

(ii) Calculate the total surface area of the outside of the plant pot.

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

[3]

(c) Some cones are mathematically similar.

For these cones, the mass, M grams, is proportional to the cube of the base radius, r cm.

One of the cones has mass 1458 grams and base radius 4.5 cm.

(i) Find an expression for M in terms of r .

[2]

(ii) Two of the cones have radii in the ratio 2 : 3.

Write down the ratio of their masses.

[1]

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)

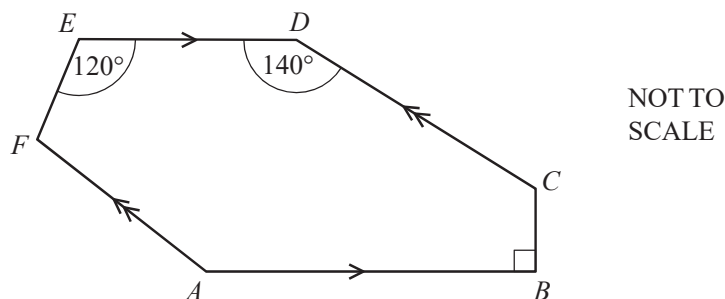
A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

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

Question 1

(a)

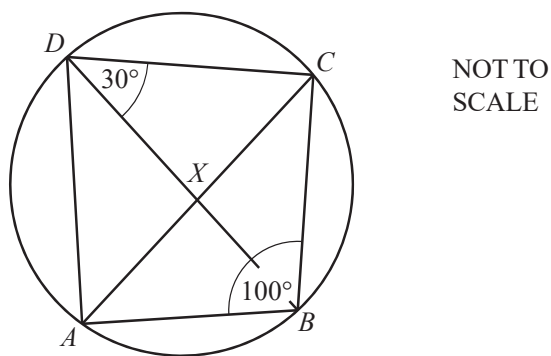


In the hexagon $ABCDEF$, AB is parallel to ED and AF is parallel to CD .
Angle $ABC = 90^\circ$, angle $CDE = 140^\circ$ and angle $DEF = 120^\circ$.

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 $BXC = 89^\circ$.

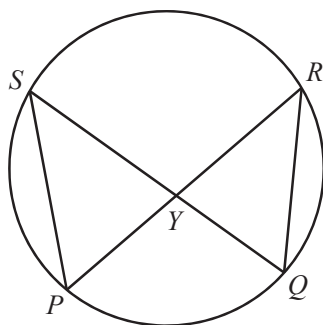
Calculate angle CAD .

[2]

(iii) Complete the statement.

[1]

(c)



NOT TO
SCALE

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 $QRY = 23$ cm².

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 cm^3 of water.
The radius of the tank is 45 cm .

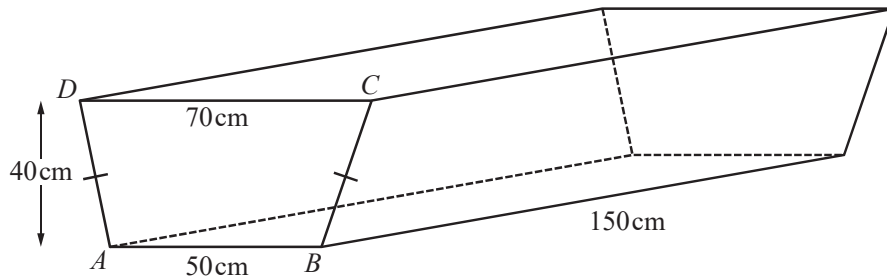
Calculate the height of water in the tank.



NOT TO
SCALE

[2]

(b)



NOT TO
SCALE

The diagram shows an empty tank in the shape of a horizontal prism of length 150 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 cm .

- (i) Calculate the volume of the tank.

[3]

- (ii) Write your answer to **part (b)(i)** in litres.

[1]

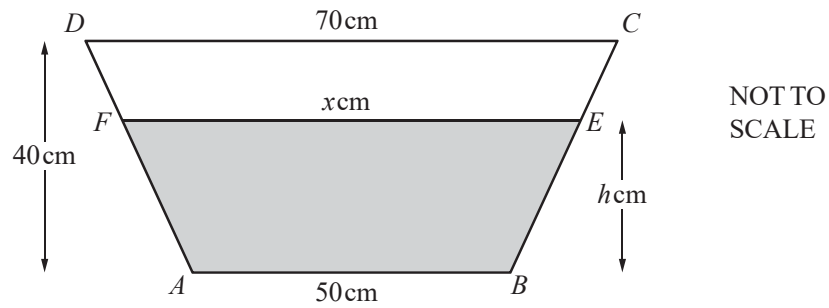
- (c) The $180\,000 \text{ cm}^3$ of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of $15 \text{ cm}^3/\text{s}$.

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 cm^2 , is $x^2 - 2500$.

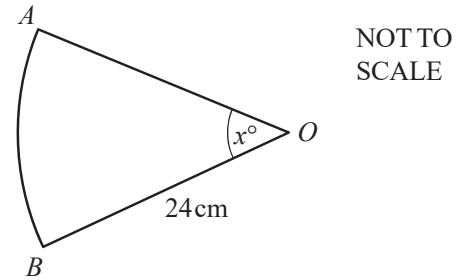
Answer(d)(ii) [1]

(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.

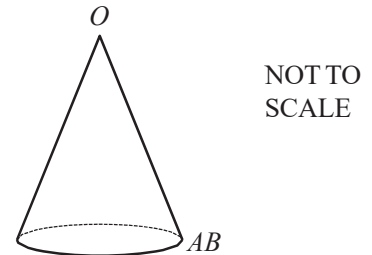


- (i) The total perimeter of the sector is 68 cm.

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.

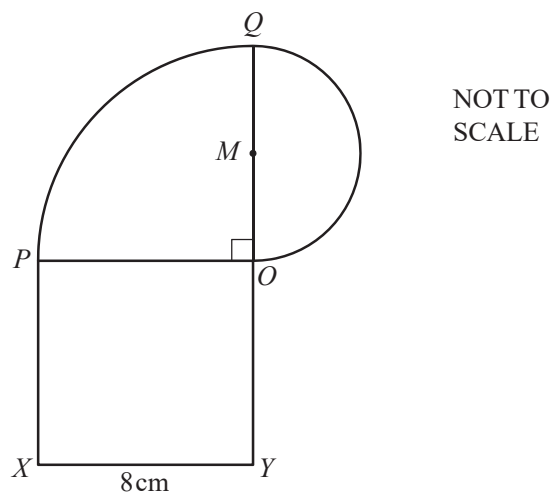


Calculate the volume of the cone.

[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.

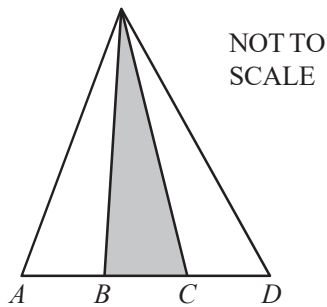
[5]

Question 4

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

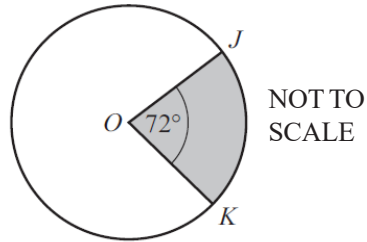
For each shape, find the value of k and write your answer below each diagram.

[10]



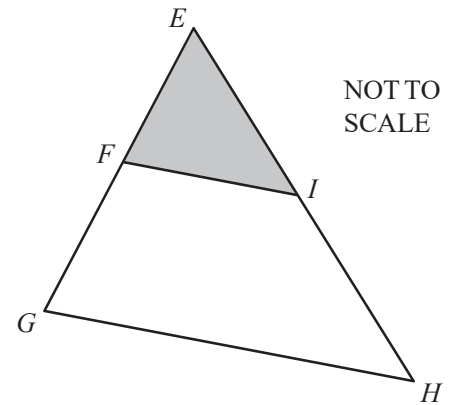
$$AB = BC = CD$$

$$k = \dots\dots\dots$$



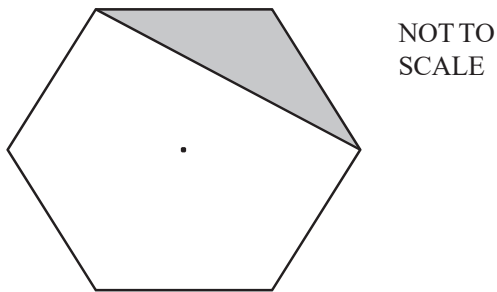
$$\text{Angle } JOK = 72^\circ$$

$$k = \dots\dots\dots$$



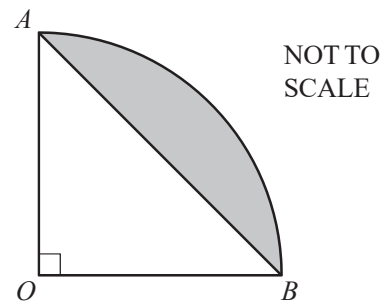
$$EF = FG \text{ and } EI = IH$$

$$k = \dots\dots\dots$$



The shape is a regular hexagon.

$$k = \dots\dots\dots$$

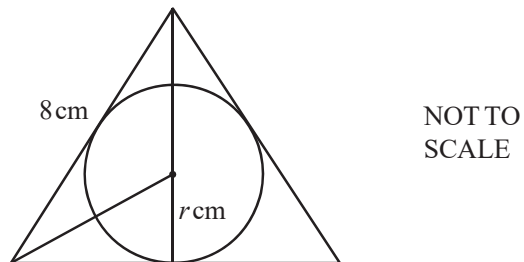


The diagram shows a sector of a circle centre O .
 Angle $AOB = 90^\circ$

$$k = \dots\dots\dots$$

Question 5

(a)



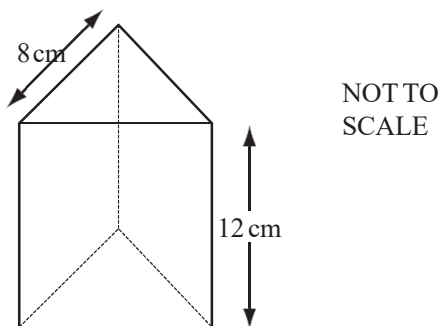
The three sides of an equilateral triangle are tangents to a circle of radius $r\text{ cm}$.
The sides of the triangle are 8 cm long.

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 cm .
The cross section is an equilateral triangle of side 8 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.

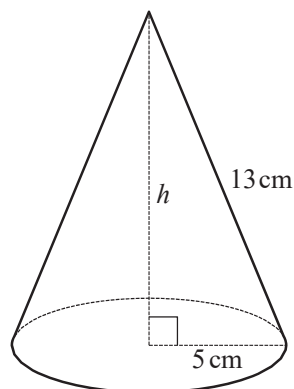
Calculate

(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



NOT TO
SCALE

(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.

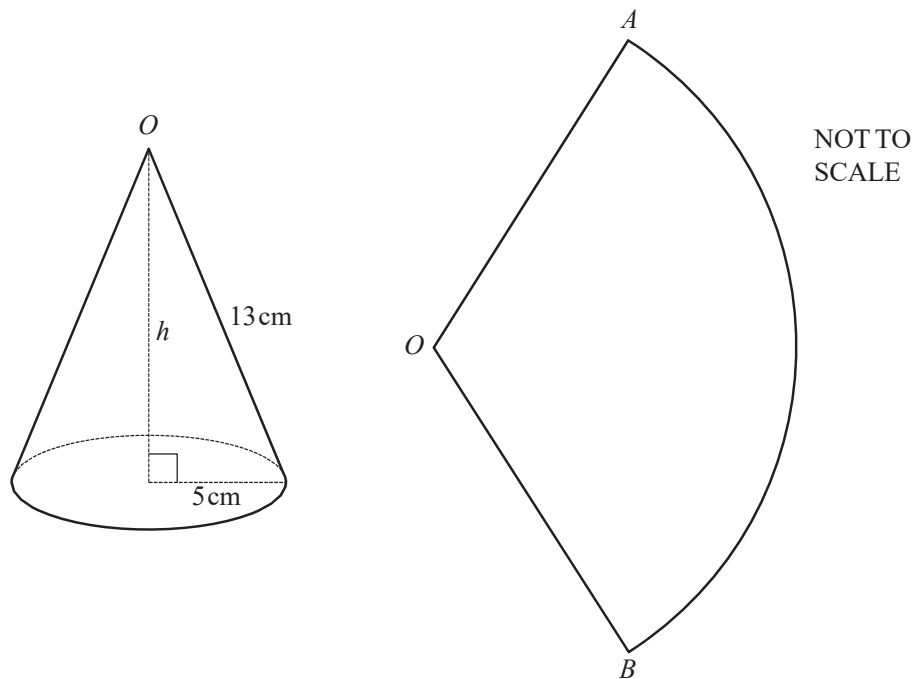
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[2]

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

[2]

(b)

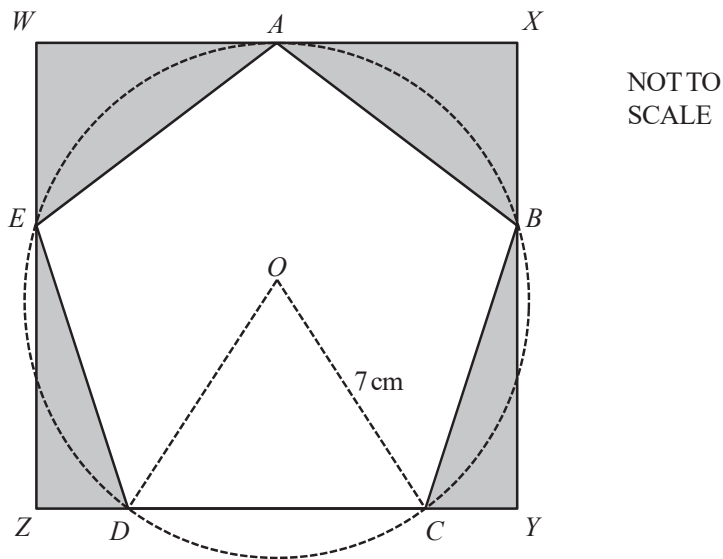


The cone is now cut along a slant height and it opens out to make the sector AOB of a circle.

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) $\text{angle } DOC = 72^\circ$, [1]

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

(iii) $\text{angle } CBY = 18^\circ$. [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]

Perimeters, Area and Volumes

Difficulty: Hard

Question Paper 4

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

Time allowed: 106 minutes

Score: /92

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

Boris has a recipe which makes 16 biscuits.

The ingredients are

160 g flour,

160 g sugar,

240 g butter,

200 g oatmeal.

(a) Boris has only 350 grams of oatmeal but plenty of the other ingredients.

[2]

(i) How many biscuits can he make?

(ii) How many grams of butter does he need to make this number of biscuits?

[2]

(b) The ingredients are mixed together to make dough.

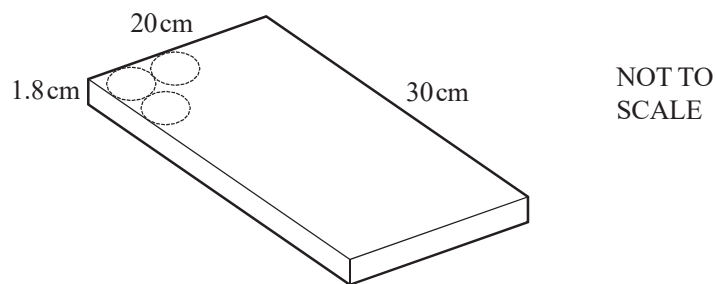
This dough is made into a sphere of volume 1080 cm^3 .

Calculate the radius of this sphere.

[The volume, V , of a sphere of radius r is $V = \frac{4}{3} \pi r^3$.]

[3]

(c)



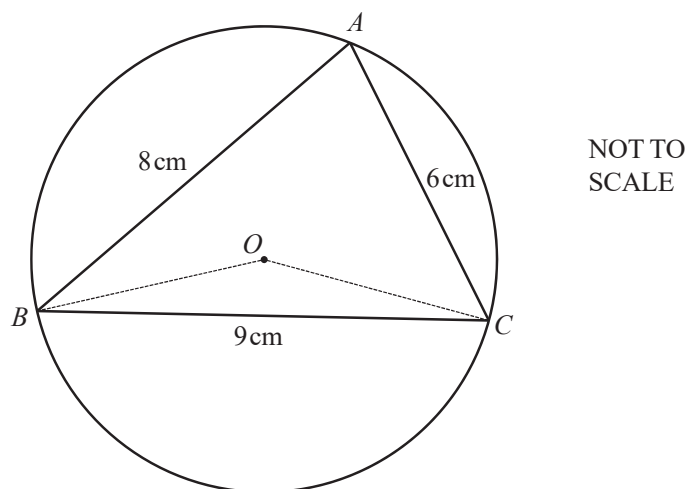
The 1080 cm^3 of dough is then rolled out to form a cuboid $20 \text{ cm} \times 30 \text{ cm} \times 1.8 \text{ cm}$.

Boris cuts out circular biscuits of diameter 5 cm.

(i) How many whole biscuits can he cut from this cuboid? [1]

(ii) Calculate the volume of dough left over. [3]

Question 2



The circle, centre O , passes through the points A , B and C .

In the triangle ABC , $AB = 8\text{ cm}$, $BC = 9\text{ cm}$ and $CA = 6\text{ cm}$.

(a) Calculate angle BAC and show that it rounds to 78.6° , correct to 1 decimal place. [4]

(b) M is the midpoint of BC .

(i) Find angle BOM . [1]

(ii) Calculate the radius of the circle and show that it rounds to 4.59 cm, correct to 3 significant figures. [3]

(c) Calculate the area of the triangle ABC as a percentage of the area of the circle. [4]

Question 3

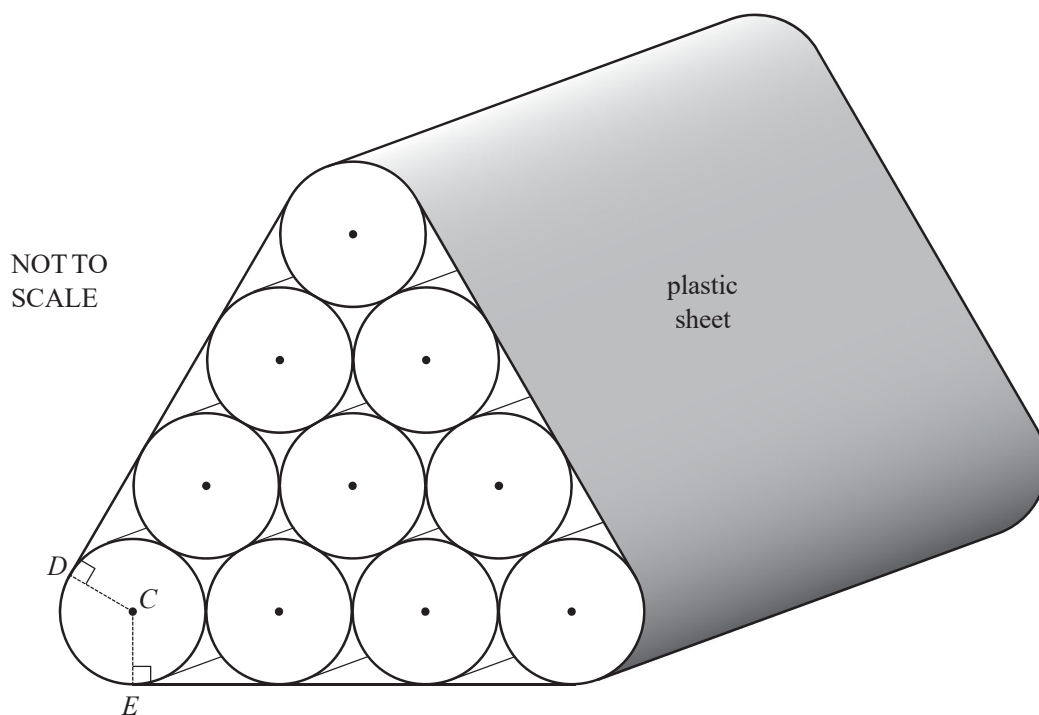
- (a) Calculate the volume of a cylinder of radius 31 **centimetres** and length 15 **metres**.
Give your answer in cubic metres.

[3]

- (b) A tree trunk has a circular cross-section of radius 31 cm and length 15 m.
One cubic metre of the wood has a mass of 800 kg.
Calculate the mass of the tree trunk, giving your answer in tonnes.

[2]

(c)



The diagram shows a pile of 10 tree trunks.
Each tree trunk has a circular cross-section of radius 31 cm and length 15 m.
A plastic sheet is wrapped around the pile.

C is the centre of one of the circles.
CE and *CD* are perpendicular to the straight edges, as shown.

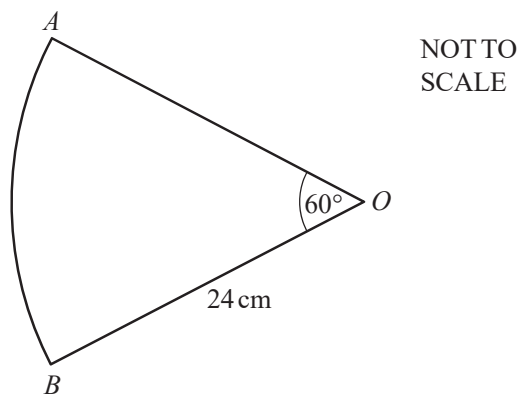
(i) Show that angle $ECD = 120^\circ$. [2]

(ii) Calculate the length of the arc DE , giving your answer in metres. [2]

(iii) The edge of the plastic sheet forms the perimeter of the cross-section of the pile.
The perimeter consists of three straight lines and three arcs.
Calculate this perimeter, giving your answer in metres. [3]

(iv) The plastic sheet does not cover the two ends of the pile.
Calculate the area of the plastic sheet. [1]

Question 4



- (a) The sector of a circle, centre O , radius 24 cm , has angle $AOB = 60^\circ$.

Calculate

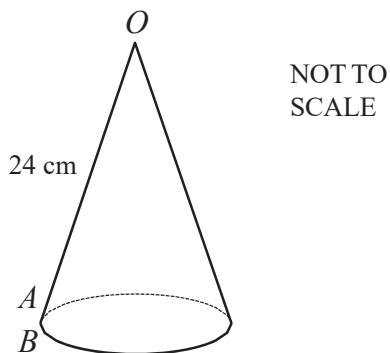
- (i) the length of the arc AB ,

[2]

- (ii) the area of the sector OAB .

[2]

- (b) The points A and B of the sector are joined together to make a hollow cone as shown in the diagram. The arc AB of the sector becomes the circumference of the base of the cone.



Calculate

(i) the radius of the base of the cone, [2]

(ii) the height of the cone, [2]

(iii) the volume of the cone.

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

(c) A different cone, with radius x and height y , has a volume W . [1]

Find, **in terms of W** , the volume of

(i) a similar cone, with both radius and height 3 times larger,

(ii) a cone of radius $2x$ and height y . [1]

Question 5

NOT TO
SCALE

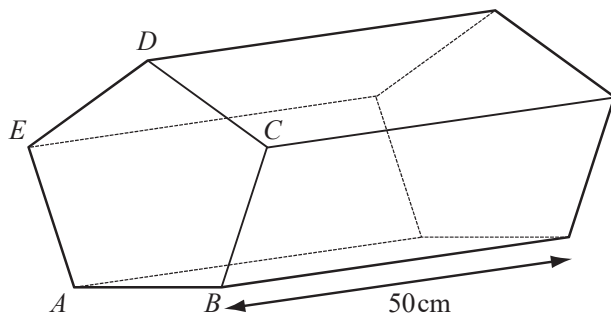


Diagram 1

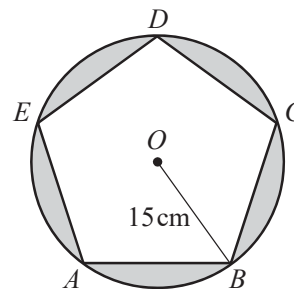


Diagram 2

Diagram 1 shows a solid wooden prism of length 50 cm.

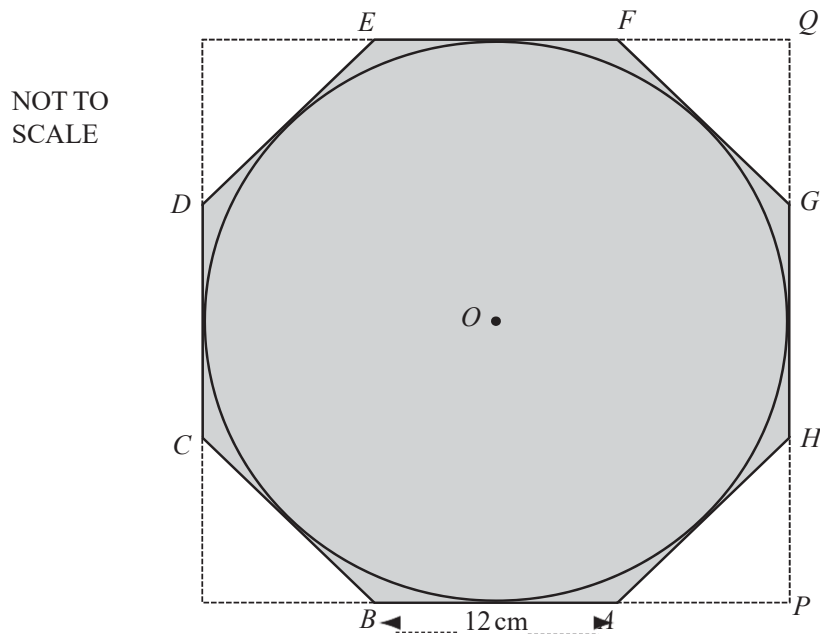
The cross-section of the prism is a regular pentagon $ABCDE$.

The prism is made by removing 5 identical pieces of wood from a solid wooden cylinder.

Diagram 2 shows the cross-section of the cylinder, centre O , radius 15 cm.

- (a) Find the angle AOB . [1]
- (b) Calculate
- (i) the area of triangle AOB , [2]
 - (ii) the area of the pentagon $ABCDE$, [1]
 - (iii) the volume of wood removed from the cylinder. [4]
- (c) Calculate the total surface area of the prism. [4]

Question 6



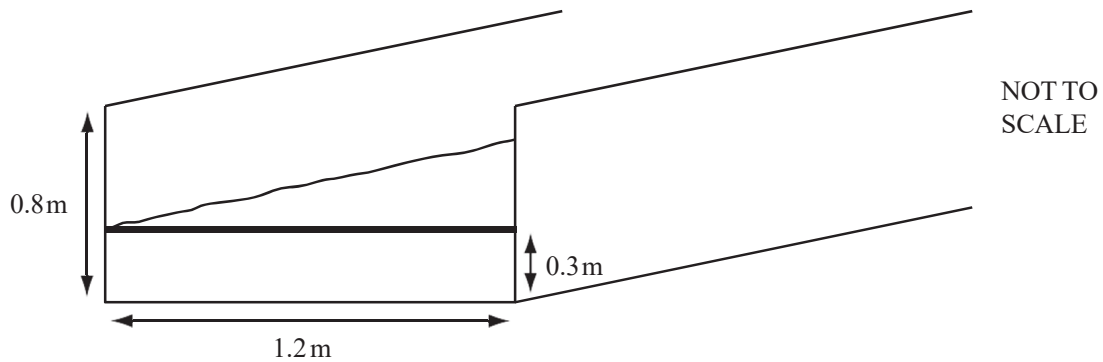
A circle, centre O , touches all the sides of the regular octagon $ABCDEFGH$ shaded in the diagram.

The sides of the octagon are of length 12 cm .

BA and GH are extended to meet at P . HG and EF are extended to meet at Q .

- (a) (i) Show that angle BAH is 135° . [2]
- (ii) Show that angle APH is 90° . [1]
- (b) Calculate
- (i) the length of PH , [2]
 - (ii) the length of PQ , [2]
 - (iii) the area of triangle APH , [2]
 - (iv) the area of the octagon. [3]
- (c) Calculate
- (i) the radius of the circle, [2]
 - (ii) the area of the circle as a percentage of the area of the octagon. [3]

Question 7



The diagram shows water in a channel.

This channel has a rectangular cross-section, 1.2 metres by 0.8 metres.

- (a) When the depth of water is 0.3 metres, the water flows along the channel at 3 metres/minute.

Calculate the number of cubic metres which flow along the channel in one hour.

[3]

- (b) When the depth of water in the channel increases to 0.8 metres, the water flows at 15 metres/minute.

Calculate the percentage increase in the number of cubic metres which flow along the channel in one hour.

[4]

- (c) The water comes from a cylindrical tank.

When 2 cubic metres of water leave the tank, the level of water in the tank goes down by 1.3 **millimetres**.

Calculate the radius of the tank, in **metres**, correct to one decimal place.

[4]

- (d) When the channel is empty, its **interior** surface is repaired.

This costs \$0.12 per square metre. The total cost is \$50.40.

Calculate the length, in metres, of the channel.

[4]

Perimeters, Area and Volumes

Difficulty: Hard

Question Paper 5

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Perimeters, Area and Volumes
Paper	Paper 4
Difficulty	Hard
Booklet	Question Paper 5

Time allowed: 85 minutes

Score: /74

Percentage: /100

Grade Boundaries:

CIE IGCSE Maths (0580)

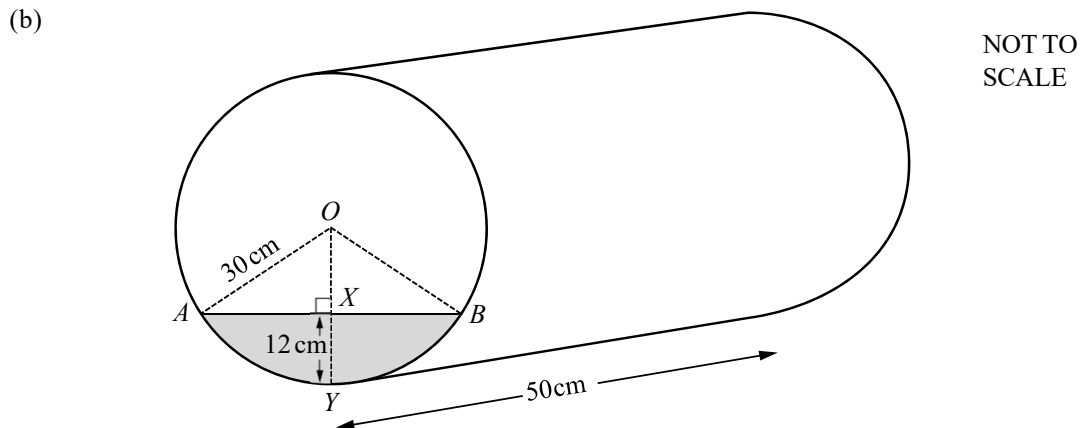
A*	A	B	C	D
>83%	67%	51%	41%	31%

CIE IGCSE Maths (0980)

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

Question 1

- (a) Calculate the volume of a cylinder with radius 30 cm and height 50 cm. [2]



A cylindrical tank, radius 30 cm and length 50 cm, lies on its side.
It is partially filled with water.
The shaded segment $AXBY$ in the diagram shows the cross-section of the water.
The greatest depth, XY , is 12 cm.
 $OA = OB = 30$ cm.

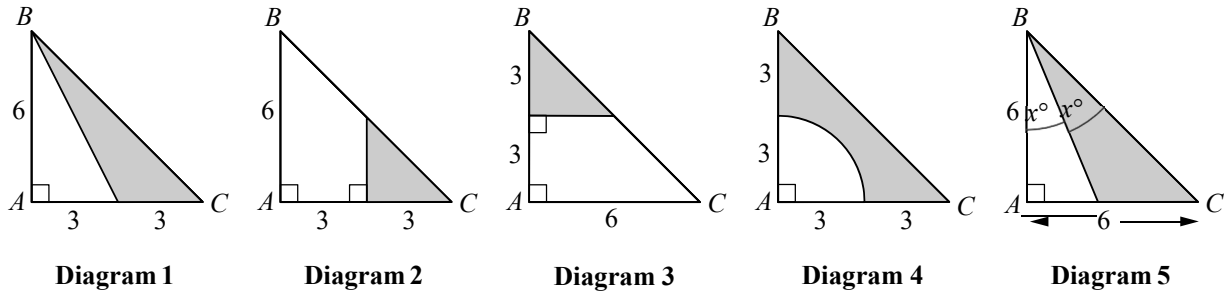
- (i) Write down the length of OX . [1]
(ii) Calculate the angle AOB correct to two decimal places, showing all your working. [3]
- (c) Using angle $AOB = 106.3^\circ$, find
- (i) the area of the sector $AOBY$, [3]
 - (ii) the area of triangle AOB , [2]
 - (iii) the area of the shaded segment $AXBY$. [1]
- (d) Calculate the volume of water in the cylinder, giving your answer
- (i) in cubic centimetres, [2]
 - (ii) in litres. [1]
- (e) How many more litres must be added to make the tank half full? [2]

Question 2

In each of the diagrams below, triangle ABC is an isosceles right-angled triangle.

$AB \neq AC \neq 6$ cm.

A straight line or a circular arc divides the triangle into two parts, one of which is shaded.



(a) Which diagram has a shaded region showing **all** the points in the triangle which are

- (i) closer to BC than to BA , [1]
- (ii) more than 3 cm from A , [1]
- (iii) closer to C than to A ? [1]

(b) For **each** of the five diagrams, calculate the shaded area. [11]

Question 3

(a) Calculate the area of an equilateral triangle with sides 10 cm. [2]

(b) Calculate the radius of a circle with circumference 10 cm. [2]

(c)

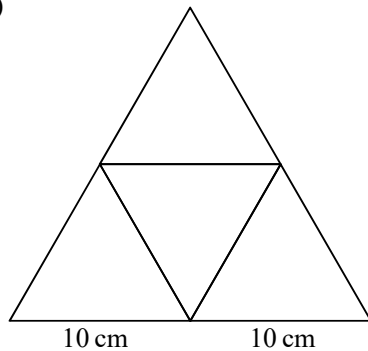


Diagram 1

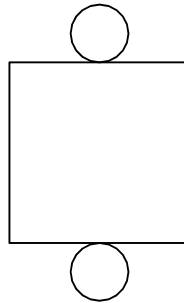


Diagram 2

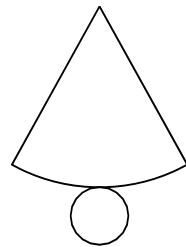


Diagram 3

The diagrams represent the nets of 3 solids. Each straight line is 10 cm long. Each circle has circumference 10 cm. The arc length in Diagram 3 is 10 cm.

(i) Name the solid whose net is Diagram 1. Calculate its surface area. [3]

(ii) Name the solid whose net is Diagram 2. Calculate its volume. [4]

(iii) Name the solid whose net is Diagram 3. Calculate its perpendicular height. [4]

Question 4

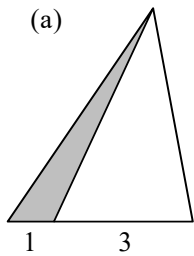


Diagram 1

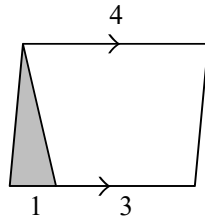


Diagram 2

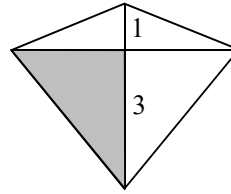


Diagram 3

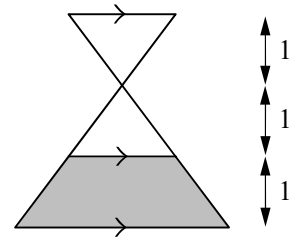


Diagram 4

Diagram 1 shows a triangle with its base divided in the ratio 1 : 3.

Diagram 2 shows a parallelogram with its base divided in the ratio 1 : 3.

Diagram 3 shows a kite with a diagonal divided in the ratio 1 : 3.

Diagram 4 shows two congruent triangles and a trapezium each of height 1 unit.

For each of the four diagrams, write down the **percentage** of the total area which is shaded. [7]

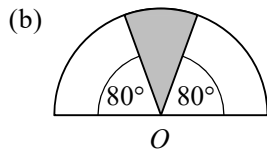


Diagram 5

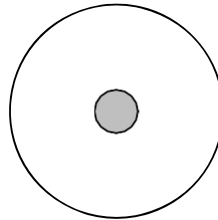


Diagram 6

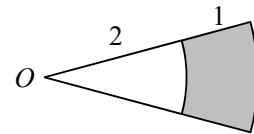


Diagram 7

Diagram 5 shows a semicircle, centre O .

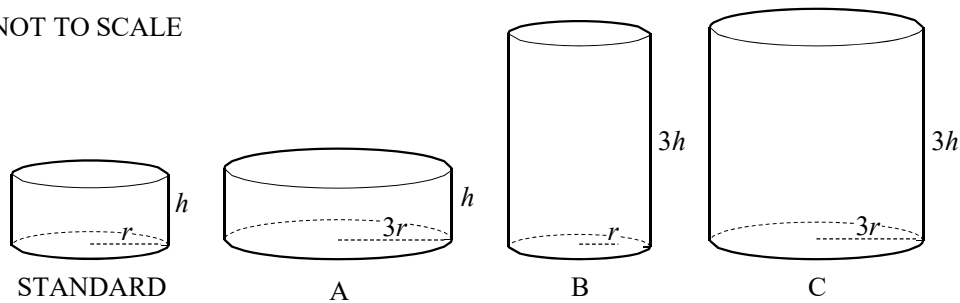
Diagram 6 shows two circles with radii 1 unit and 5 units.

Diagram 7 shows two sectors, centre O , with radii 2 units and 3 units.

For each of diagrams 5, 6 and 7, write down the **fraction** of the total area which is shaded. [6]

Question 5

NOT TO SCALE



Sarah investigates cylindrical plant pots.

The standard pot has base radius r cm and height h cm.

Pot A has radius $3r$ and height h . Pot B has radius r and height $3h$. Pot C has radius $3r$ and height $3h$.

- (a) (i) Write down the volumes of pots A , B and C in terms of π , r and h . [3]
- (ii) Find in its lowest terms the ratio of the volumes of $A : B : C$. [2]
- (iii) Which one of the pots A , B or C is mathematically similar to the standard pot? Explain your answer. [2]
- (iv) The surface area of the standard pot is S cm². Write down in terms of S the surface area of the similar pot. [2]
- (b) Sarah buys a cylindrical plant pot with radius 15 cm and height 20 cm. She wants to paint its outside surface (base and curved surface area).
- (i) Calculate the area she wants to paint. [2]
- (ii) Sarah buys a tin of paint which will cover 30 m². How many plant pots of this size could be painted on their outside surfaces **completely** using this tin of paint? [4]