IGCSE · Cambridge (CIE) · Maths

3 hours 31 questions

Calculator Questions

Circles, Arcs & Sectors

Area & Circumference of Circles / Arc Lengths & Sector Areas

Medium (12 questions)	/44
Hard (13 questions)	/64
Very Hard (6 questions)	/50
Total Marks	**/158**

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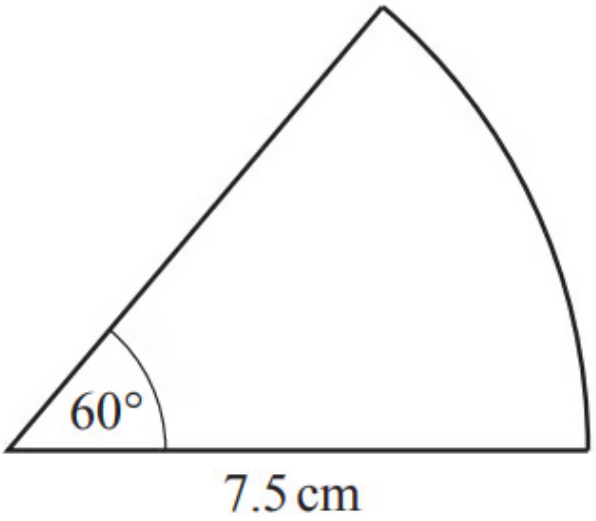
Medium Questions

1



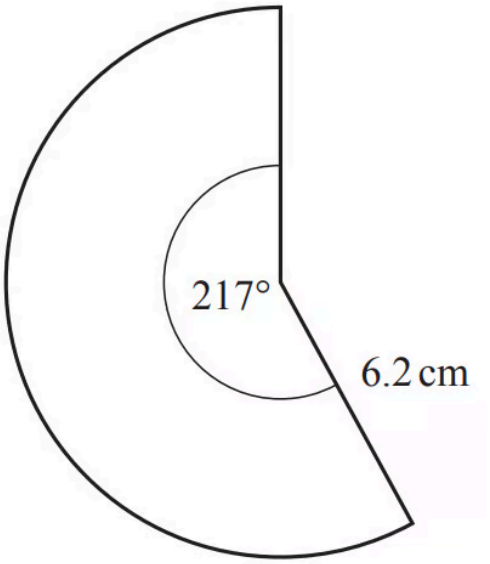
NOT TO SCALE

Calculate the area of this sector of a circle.

..... cm^2

(2 marks)

2



NOT TO SCALE

The diagram shows a sector of a circle with radius 6.2 cm and sector angle 217°.

Calculate the area of this sector.

..... cm^2

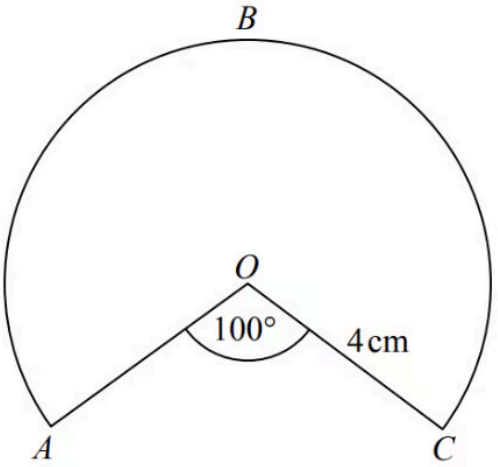
(2 marks)

3 Calculate the area of a circle with radius 5.1 cm.

.....cm^2

(2 marks)

4 The diagram shows a sector of a circle of radius 4 cm.



Work out the length of the arc ABC.
Give your answer correct to 3 significant figures.

(2 marks)

5 The diagram shows sector OPQ of a circle, centre O

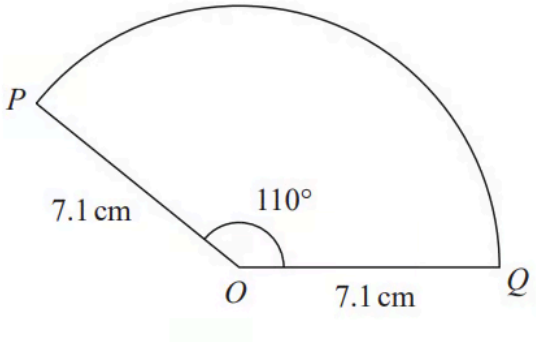


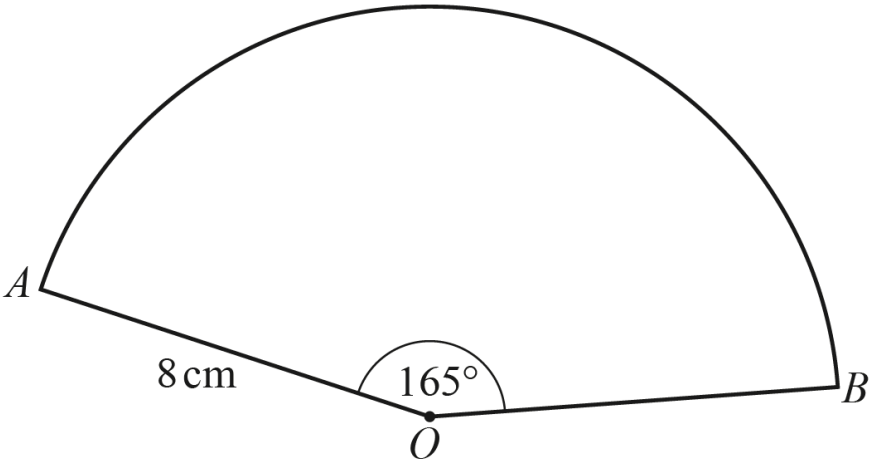
Diagram **NOT** accurately drawn

$OP = OQ = 7.1$ cm
Angle $POQ = 110°$

Calculate the area of sector OPQ
Give your answer correct to one decimal place.

(2 marks)

6



NOT TO SCALE

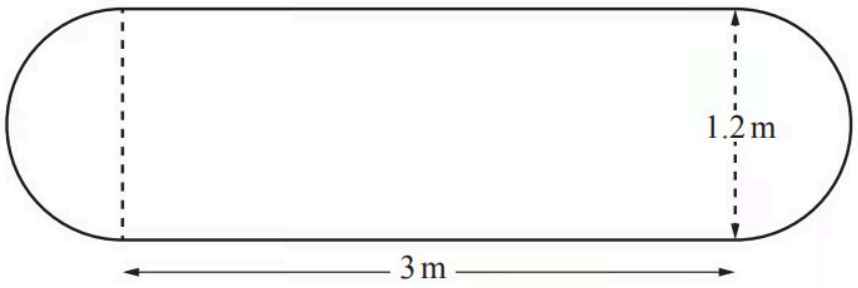
The diagram shows a sector of a circle with centre O, radius 8 cm and sector angle 165°.

Calculate the total perimeter of the sector.

..... cm

(3 marks)

7



NOT TO SCALE

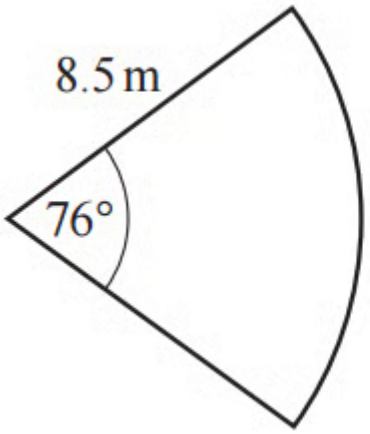
The diagram shows the surface of a garden pond, made from a rectangle and two semicircles.
The rectangle measures 3 m by 1.2 m.

Calculate the area of this surface.

.....m^2

(3 marks)

8 (a)



NOT TO SCALE

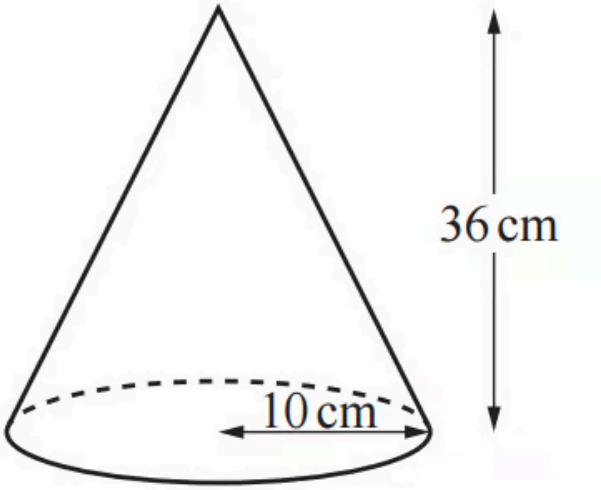
The cross-section of a gate is a sector of a circle with radius 8.5 m and angle 76°.

Calculate the perimeter of the sector.

..... m

(7 marks)

(b)



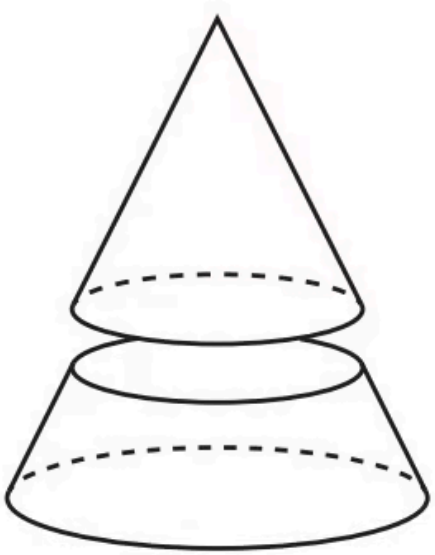
NOT TO SCALE

A solid metal cone has radius 10 cm and height 36 cm.

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

..... cm^3[2]

ii) The cone is cut, parallel to its base, to give a smaller cone.



NOT TO SCALE

The volume of the smaller cone is half the volume of the original cone.
The smaller cone is melted down to make two different spheres.
The ratio of the radii of these two spheres is 1 : 2.

Calculate the radius of the smaller sphere.

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

..... cm [4]

(6 marks)

9 The diagram shows the top of Levi's birthday cake.

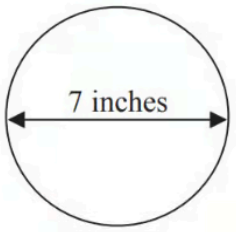


Diagram **NOT** accurately drawn

The top of the cake is in the shape of a circle.
The diameter of the circle is 7 inches.

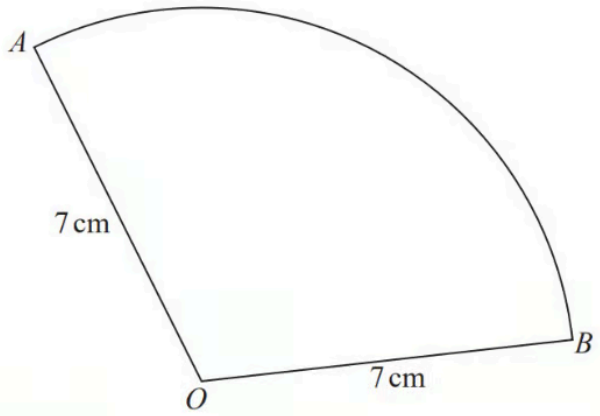
A ribbon is going to be put around the side of the cake. Ribbons are sold in 50 cm lengths.

1 inch is 2.54 cm.

Work out if one length of ribbon is long enough to go all the way around the cake.
You must show your working.

(4 marks)

10 OAB is a sector of a circle with centre O and radius 7 cm.



The area of the sector is 40 cm^2.

Calculate the perimeter of the sector.
Give your answer correct to 3 significant figures.

(4 marks)

11 The diagram shows a circle with centre O

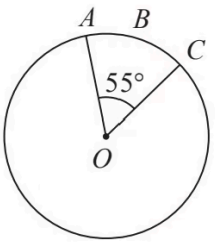


Diagram **NOT** accurately drawn

A, B and C are points on the circle so that the length of the arc ABC is 5 cm.

Given that angle AOC = 55°

work out the area of the circle.
Give your answer correct to one decimal place.

(4 marks)

12 The diagram shows Yuen's garden.

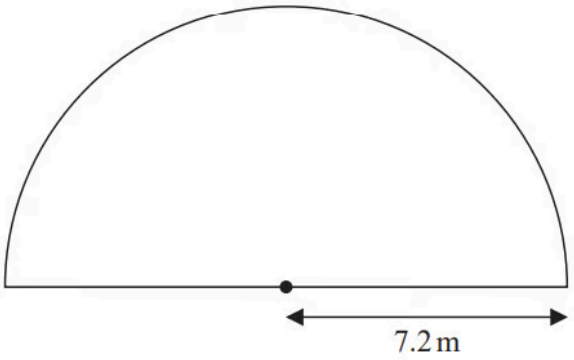


Diagram **NOT** accurately drawn

The garden is in the shape of a semicircle of radius 7.2m. Yuen is going to cover his garden with grass seed.

Yuen has 12 boxes of grass seed.
Each box of grass seed contains enough seed to cover 6m^2 of the garden.

Has Yuen enough grass seed for his garden?
Show your working clearly.

(3 marks)

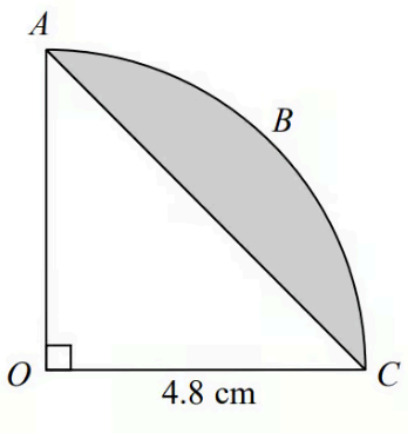
Hard Questions

1 Calculate the area of the sector of a circle with radius 65 mm and sector angle 42°.
Give your answer in square centimetres.

..... cm^2

(3 marks)

2



The arc ABC is a quarter of a circle with centre O and radius 4.8 cm.
AC is a chord of the circle.

Work out the area of the shaded segment.
Give your answer correct to 3 significant figures.

(3 marks)

3

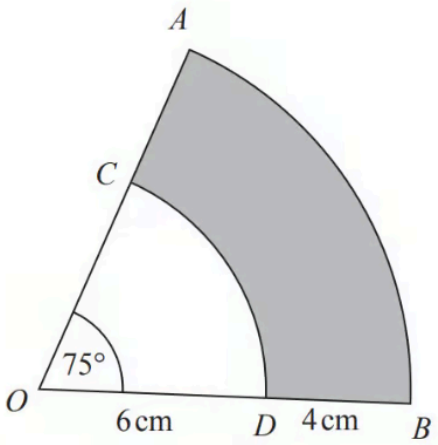


Diagram **NOT** accurately drawn

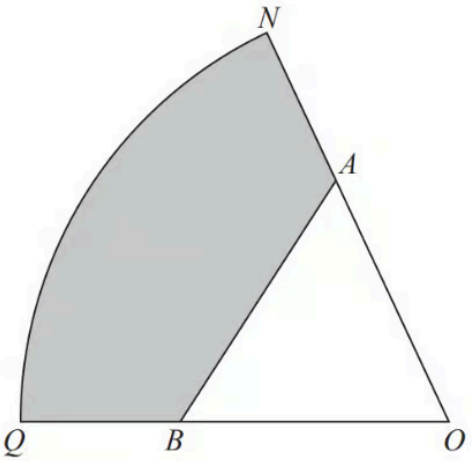
OAB is a sector of a circle, centre O.
OCD is a sector of a circle, centre O.
OCA and ODB are straight lines.

Angle $AOB = 75°$
$OD = 6$ cm
$DB = 4$ cm

Calculate the perimeter of the shaded region.
Give your answer correct to 3 significant figures.

(3 marks)

4



ONQ is a sector of a circle with centre O and radius 11 cm.

A is the point on ON and B is the point on OQ such that AOB is an equilateral triangle of side 7 cm.

Calculate the area of the shaded region as a percentage of the area of the sector ONQ. Give your answer correct to 1 decimal place.

(5 marks)

5 The diagram shows a shaded shape $ABCD$ made from a semicircle ABC and a right-

angled triangle ACD.

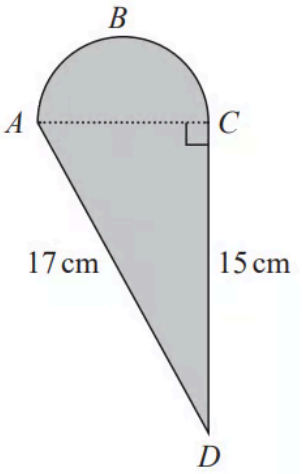


Diagram **NOT** accurately drawn

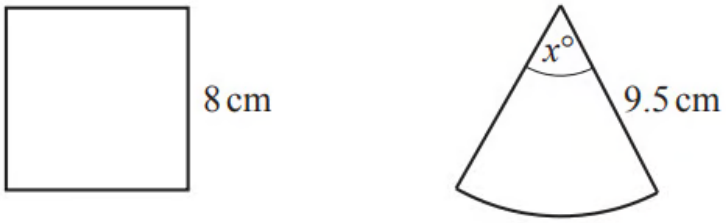
AC is the diameter of the semicircle ABC.

Work out the perimeter of the shaded shape.
Give your answer correct to 3 significant figures.

.....cm

(5 marks)

6



NOT TO SCALE

The diagram shows a square with side length 8 cm and a sector of a circle with radius 9.5 cm and sector angle $x°$. The perimeter of the square is equal to the perimeter of the

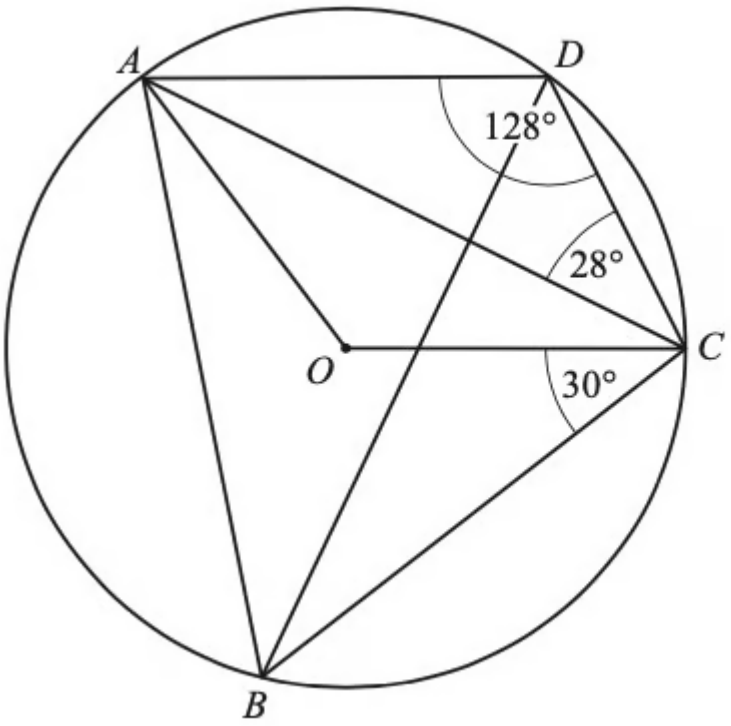
sector.

Calculate the value of x.

x = ...

(3 marks)

7



NOT TO SCALE

In the diagram, *A*, *B*, *C* and *D* lie on the circle, centre *O*.

Angle *ADC* = 128°, angle *ACD* = 28° and angle *BCO* = 30°. Angle *AOC* = 104°.

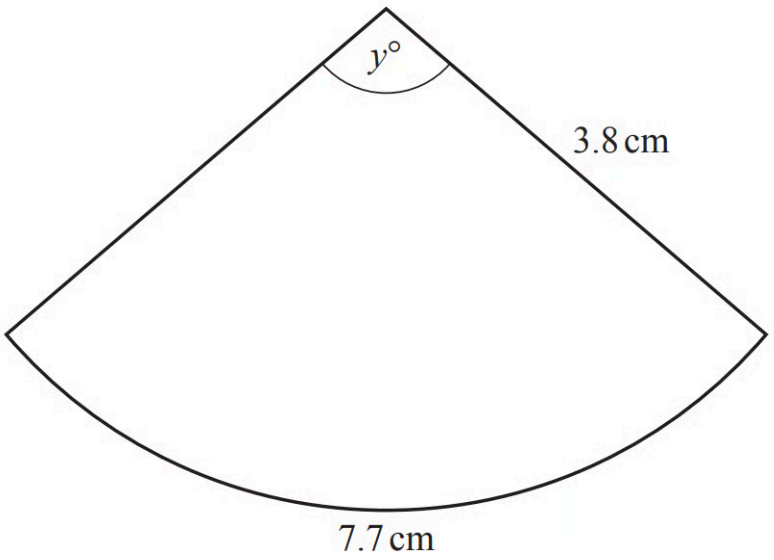
The radius, *OC*, of the circle is 9.6 cm.

Calculate the total perimeter of the sector *OADC*.

..... cm

(9 marks)

8



NOT TO SCALE

The diagram shows a sector of a circle of radius 3.8 cm. The arc length is 7.7 cm.

i) Calculate the value of y.

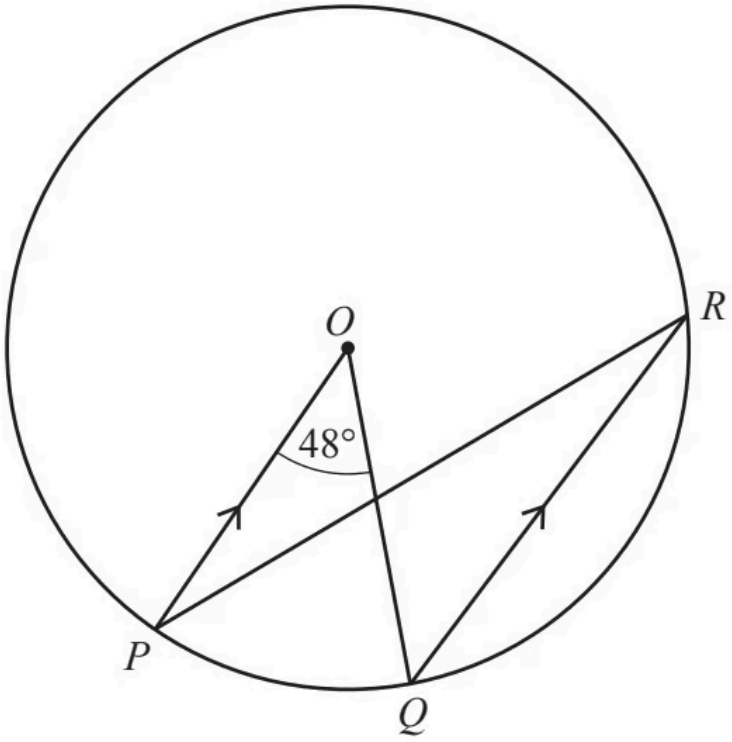
y = ... [2]

ii) Calculate the area of the sector.

..... cm^2 [2]

(4 marks)

9 (a)



NOT TO SCALE

P, *Q* and *R* are points on the circumference of the circle, centre *O*.
PO is parallel to *QR* and angle *POQ* = 48°.

Find angle *OPR*.

Angle *OPR* = ...

(5 marks)

(b) The radius of the circle is 5.4 cm.
Calculate the length of the **major** arc *PQ*.

..... cm

(5 marks)

10 The diagram shows a plan of Brian's lawn.

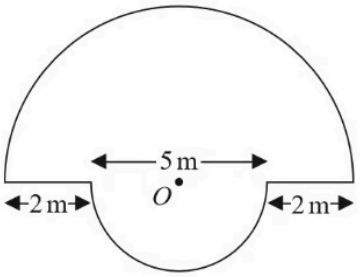


Diagram **NOT** accurately drawn

The edge of the lawn consists of two semicircles and two straight lines.
Each semicircle has centre O.
The diameters of the semicircles are 9 m and 5 m.

Brian is going to put lawn edging around the edge of the lawn.
Lawn edging is sold in 2.4 metre rolls.

Brian has £35

Lawn edging
£3.99 per roll
or
3 rolls for £10

Has Brian got enough money to buy all the rolls of lawn edging he needs?

You must show all your working.

(5 marks)

11 Saphia is organising a conference.

People at the conference will sit at circular tables.

Diagram **NOT** accurately drawn

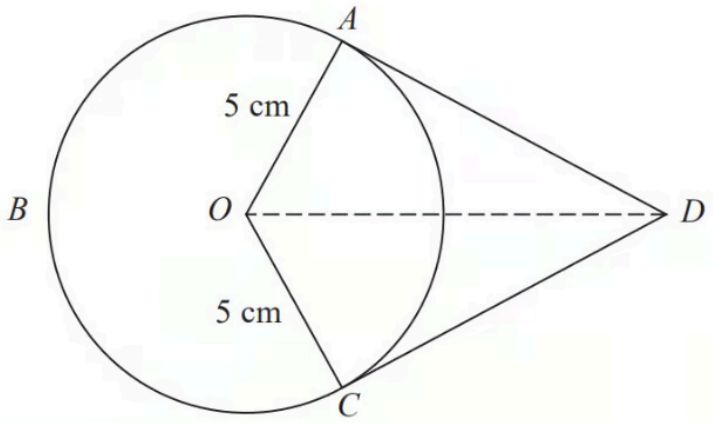
Each table has a diameter of 140 cm.
Each person needs 60 cm around the circumference of the table.

There are 12 of these tables in the conference room.
A total of 90 people will be at the conference.

Are there enough tables in the conference room?

(4 marks)

12



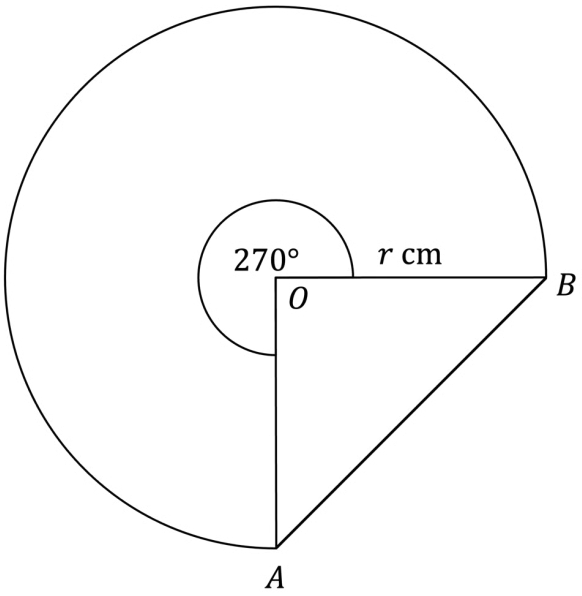
A, B and C are points on a circle of radius 5 cm, centre O.

DA and DC are tangents to the circle.
$DO = 9$ cm

Work out the length of arc ABC.
Give your answer correct to 3 significant figures.

(5 marks)

13



The image above shows the sector of a circle centre O, with radius r and central angle $270°$.

The sector is joined to the triangle ABO.

The perimeter of the compound shape is 21 cm.

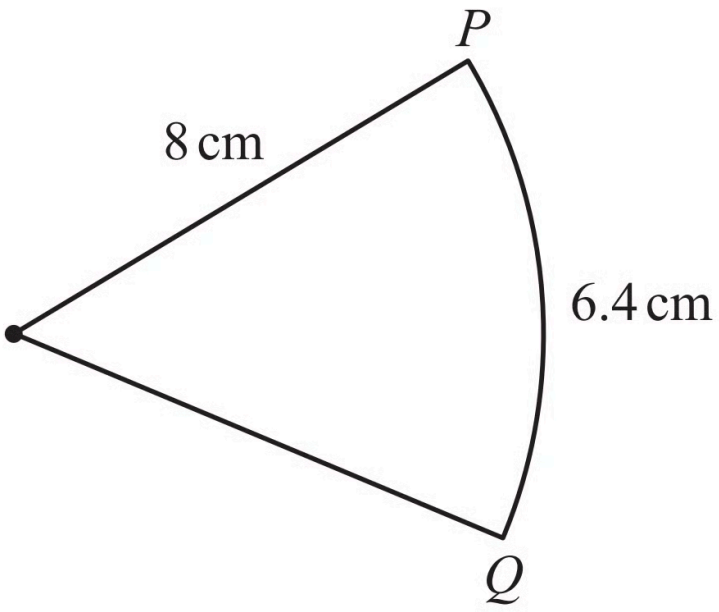
Work out the value of r.

Leave your answer to one decimal place.

(5 marks)

Very Hard Questions

1



NOT TO SCALE

The diagram shows a sector of a circle of radius 8 cm. The length of the arc PQ is 6.4 cm.

Find the area of the sector.

..... cm^2

(4 marks)

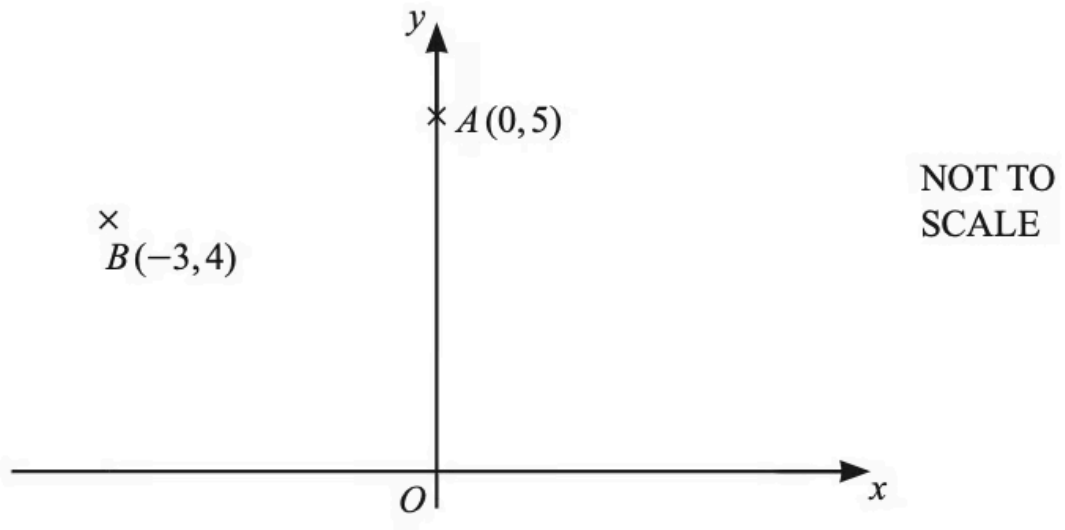
2 The total perimeter of a semicircle is 19.02 cm.

Calculate the radius of the semicircle.

..... cm

(3 marks)

3

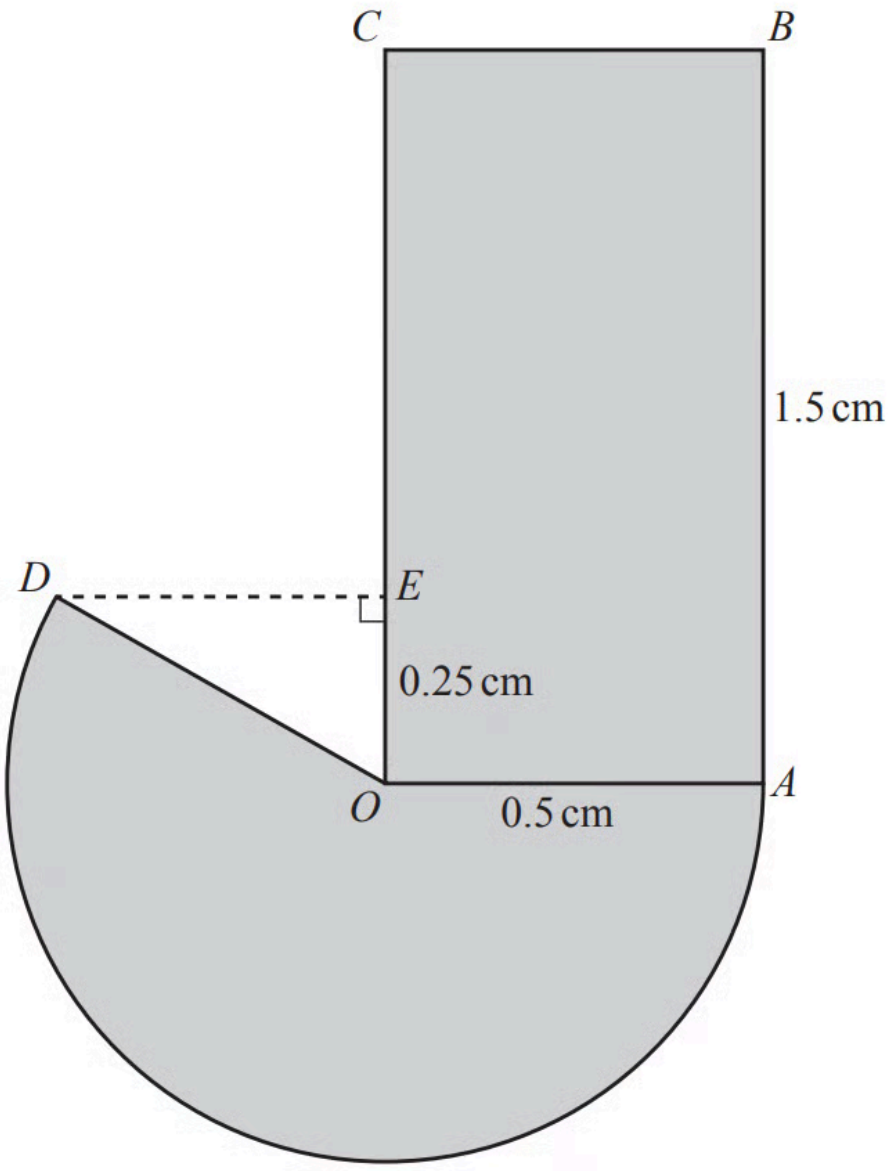


A and B lie on a circle, centre O.

Calculate the length of the arc AB.

(8 marks)

4 (a)



The diagram shows a company logo made from a rectangle and a major sector of a circle.

The circle has centre O and radius OA.

$OA = OD = 0.5$ cm and $AB = 1.5$ cm.

E is a point on OC such that $OE = 0.25$ cm and angle $OED = 90°$.

Calculate the perimeter of the logo.

..... cm

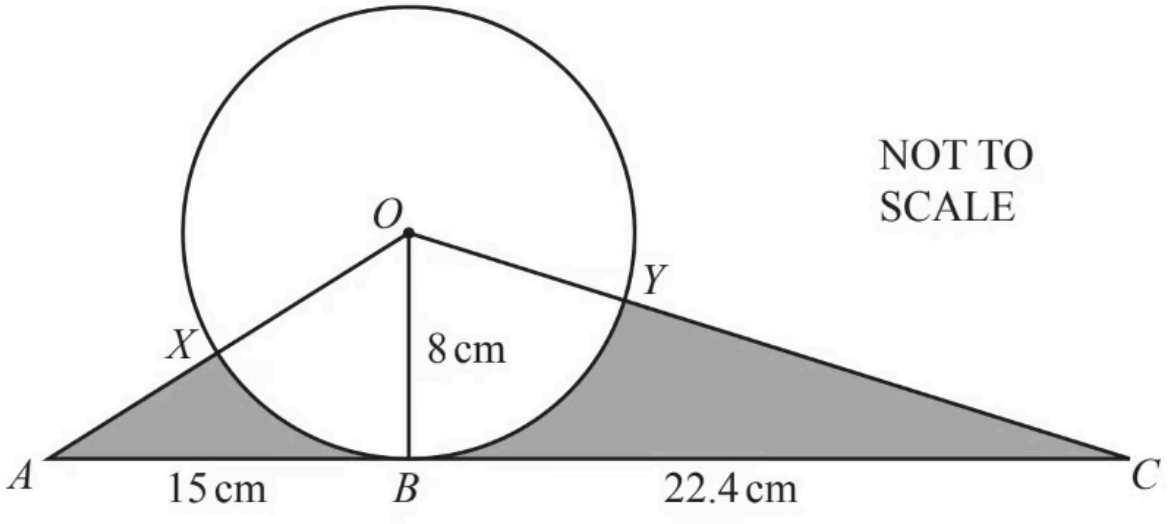
(5 marks)

(b) Calculate the area of the logo.

..... cm^2

(3 marks)

5 (a)



The diagram shows a circle, centre *O*.

The straight line *ABC* is a tangent to the circle at *B*.

OB = 8 cm, *AB* = 15 cm and *BC* = 22.4 cm.

AO crosses the circle at *X* and *OC* crosses the circle at *Y*. Calculate angle *XOY*.

Angle *XOY* = ...

(5 marks)

(b) Calculate the length of the arc *XBY*.

..... cm

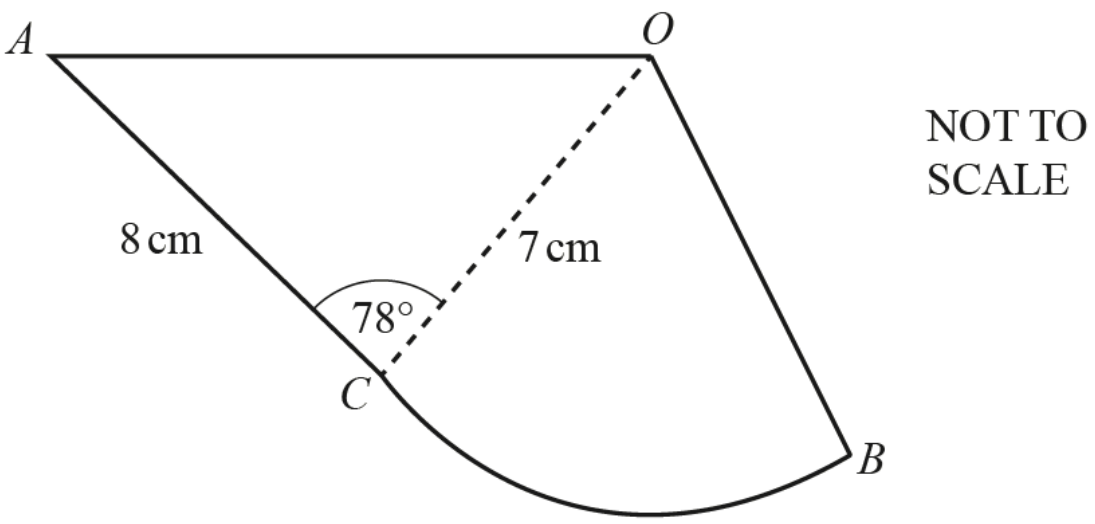
(2 marks)

(c) Calculate the total area of the two shaded regions.

..... cm^2

(4 marks)

6 (a)



The diagram shows a design made from a triangle *AOC* joined to a sector *OCB*.

AC = 8cm, *OB* = *OC* = 7 cm and angle *ACO* = 78°.

Use the cosine rule to show that *OA* = 9.47 cm, correct to 2 decimal places.

(4 marks)

(b) Calculate angle *OAC*.

Angle *OAC* = ...

(3 marks)

(c) The perimeter of the design is 29.5 cm.

Show that angle *COB* = 41.2°, correct to 1 decimal place.

(5 marks)

(d) Calculate the total area of the design.

..... cm^2

(4 marks)