

Firrhill High School  
Mathematics Department

Level 5

Assessment Questions

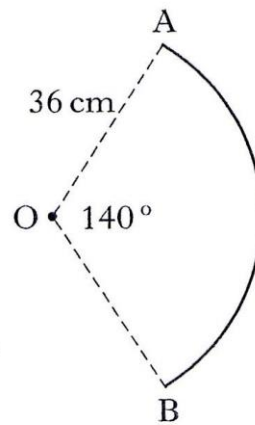
**Circles**

(1) 2010 Paper 2 Q.6

A circle, centre O, has radius 36 centimetres.

Part of this circle is shown.

Angle AOB =  $140^\circ$ .



Calculate the length of arc AB.

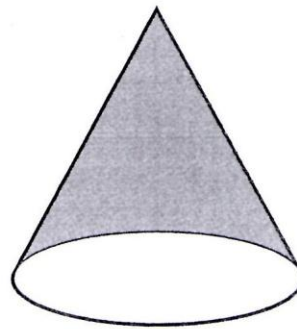
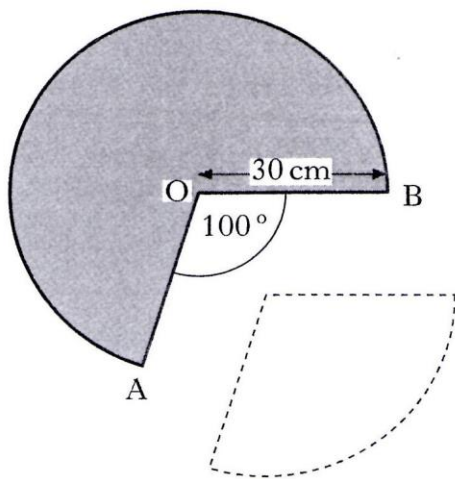
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(2) 2009 paper 2 Q.11

A cone is formed from a paper circle with a sector removed as shown.

The radius of the paper circle is 30 cm.

Angle AOB is  $100^\circ$ .



(a) Calculate the area of paper used to make the cone.

(b) Calculate the circumference of the base of the cone.

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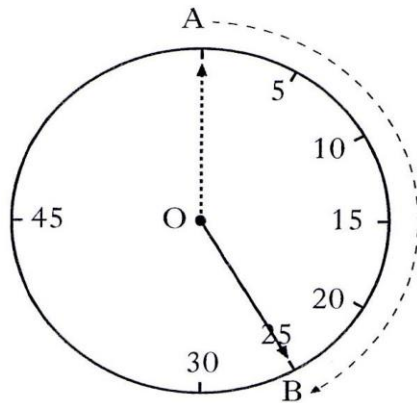
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(3) 2008 Paper 2 Q.9

Contestants in a quiz have 25 seconds to answer a question.

This time is indicated on the clock.

The tip of the clock hand moves through the arc AB as shown.



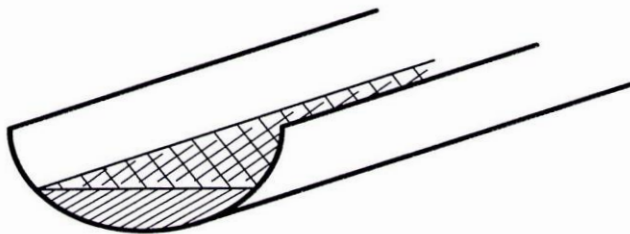
- (a) Calculate the size of angle AOB.
- (b) The length of arc AB is 120 centimetres.  
Calculate the length of the clock hand.

1

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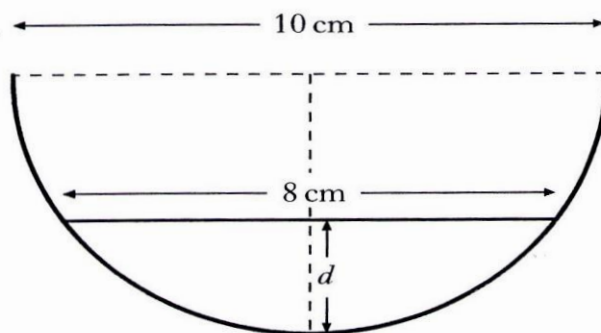
(4) 2007 Paper 1 Q.12

The diagram shows water lying in a length of roof guttering.



The cross-section of the guttering is a semi-circle with diameter 10 centimetres.

The water surface is 8 centimetres wide.



Calculate the depth,  $d$ , of water in the guttering.

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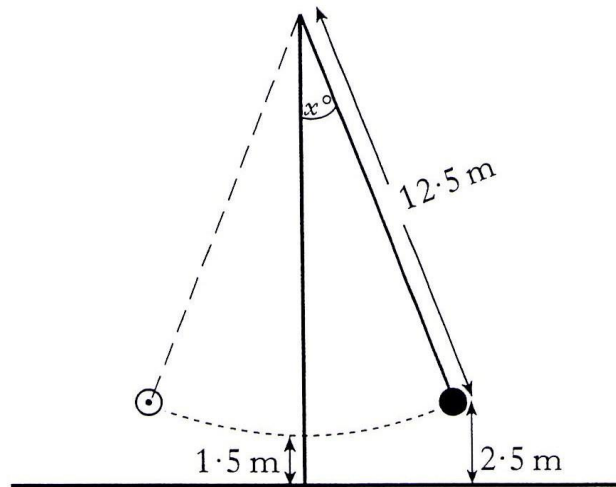
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(7) 2005 Paper 2 Q.10

The chain of a demolition ball is 12.5 metres long.

When vertical, the end of the chain is 1.5 metres from the ground.



It swings to a maximum height of 2.5 metres above the ground on both sides.

- (a) At this maximum height, show that the angle  $x^\circ$ , which the chain makes with the vertical, is approximately  $23^\circ$ .
- (b) Calculate the maximum length of the arc through which the end of the chain swings. Give your answer to **3 significant figures**.

4

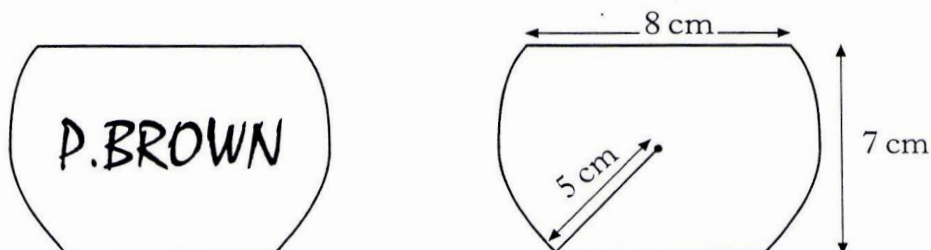
4

(8) 2005 Paper 1 Q.10

A badge is made from a circle of radius 5 centimetres.

Segments are taken off the top and the bottom of the circle as shown.

The straight edges are parallel.



The badge measures 7 centimetres from the top to the bottom.

The top is 8 centimetres wide.

Calculate the width of the base.

5

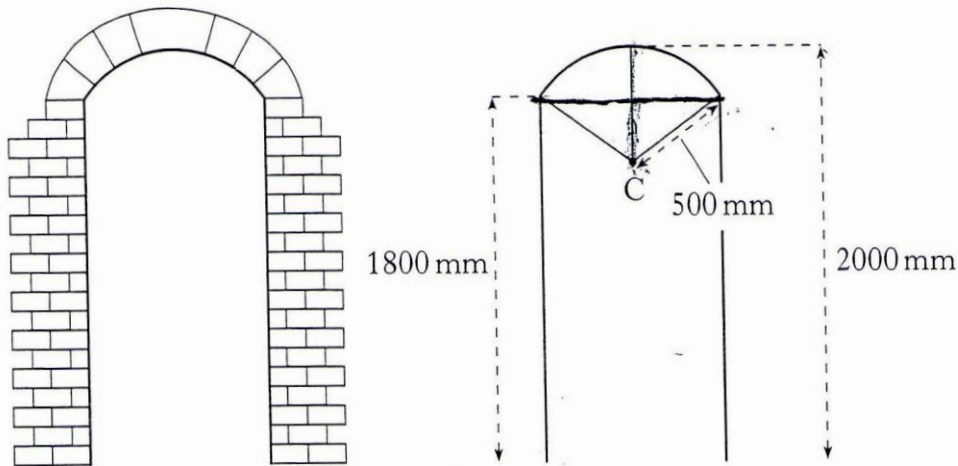


(9) 2004 Paper 2 Q.8

The curved part of a doorway is an arc of a circle with radius 500 millimetres and centre C.

The height of the doorway to the top of the arc is 2000 millimetres.

The vertical edge of the doorway is 1800 millimetres.



Calculate the width of the doorway.

KU RE

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(10) 2003 Paper 2 Q.10

A sheep shelter is part of a cylinder as shown in Figure 1.

It is 6 metres wide and 2 metres high.

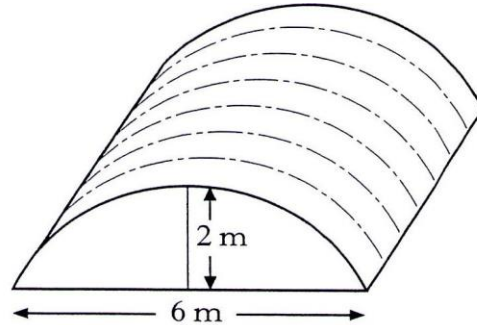


Figure 1

The cross-section of the shelter is a segment of a circle with centre O, as shown in Figure 2.

OB is the radius of the circle.

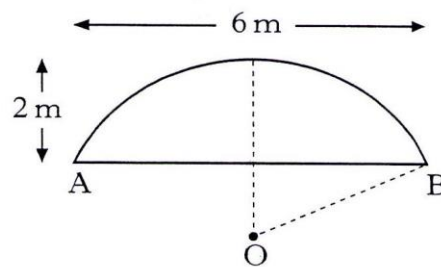


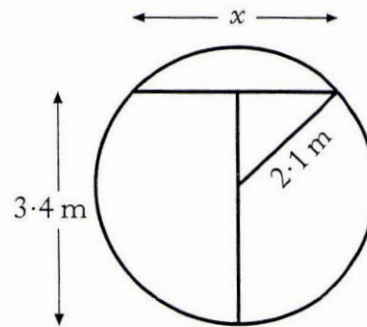
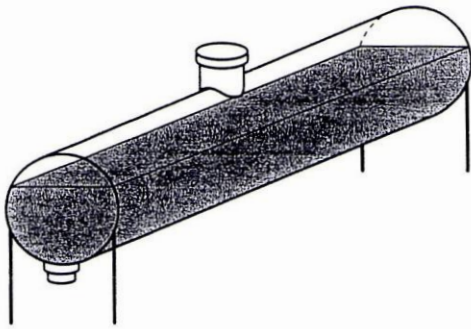
Figure 2

Calculate the length of OB.

4

(11) 2002 Paper 2 Q.6

An oil tank has a circular cross-section of radius 2.1 metres.  
It is filled to a depth of 3.4 metres.

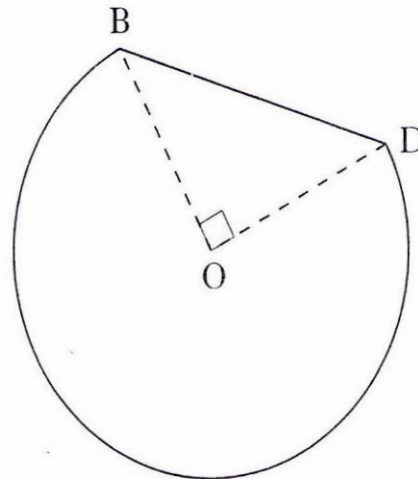
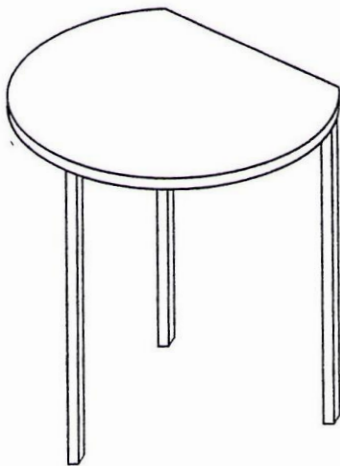


- (a) Calculate  $x$ , the width in metres of the oil surface.  
(b) What other depth of oil would give the same surface width?

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(12) 1999 Paper 2 Q.6

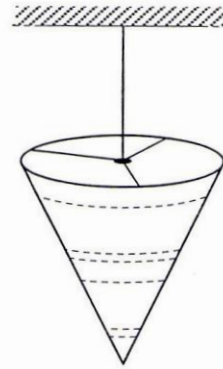
The diagram shows a table whose top is in the shape of part of a circle with centre,  $O$ , and radius 60 centimetres.



$BD$  is a straight line.  
Angle  $BOD$  is  $90^\circ$ .  
Calculate the perimeter of the table top.

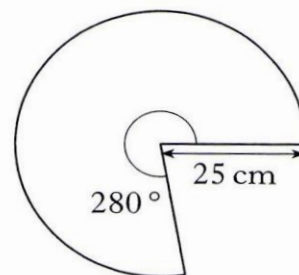
(13) 2000 paper 2 Q.11

A lampshade is made in the shape of a cone, as shown.



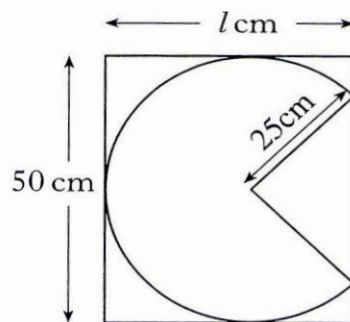
The shape of the material used for the lampshade is a sector of a circle.

The circle has radius 25 centimetres and the angle of the sector is  $280^\circ$ .



(a) Find the area of the sector of the circle.

Each sector is cut from a rectangular piece of material, 50 centimetres wide.

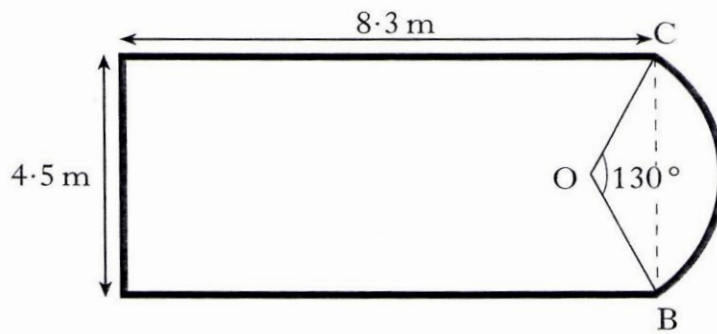


(b) Find, to the nearest centimetre, the **minimum** length,  $l$ , required for the piece of material.



(14) 1998 Paper 2 Q.3

The diagram below shows a ceiling in the shape of a rectangle and a segment of a circle.



The rectangle measures 8.3 metres by 4.5 metres.

OB and OC are radii of the circle and angle BOC is  $130^\circ$ .

(a) Find the length of OB.

A border has to be fitted round the perimeter of the ceiling.

(b) Find the length of border required.

KU RE

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(15) 1998 Paper 2 Q.4

Figure 1 shows the circular cross-section of a tunnel with a horizontal floor.

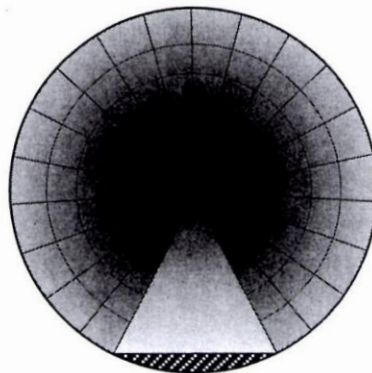
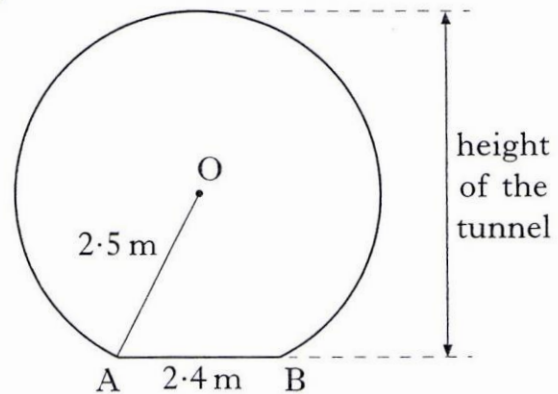


figure 1



In figure 2, AB represents the floor.  
AB is 2.4 metres.

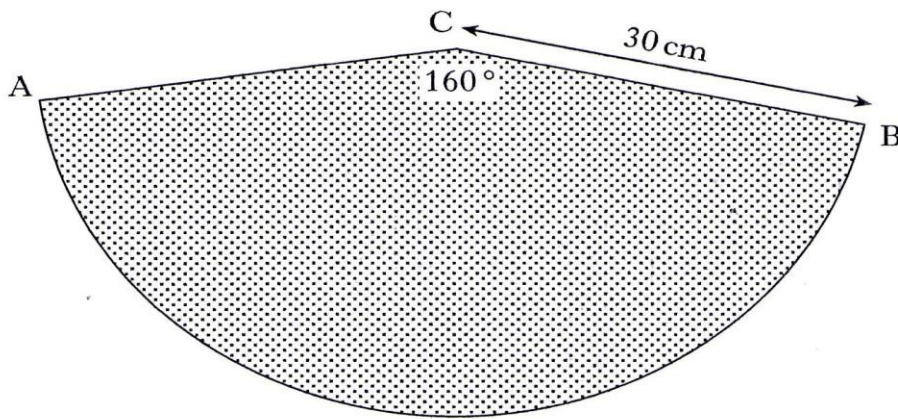
The radius, OA, of the cross-section is 2.5 metres.

Find the height of the tunnel.

figure 2

4

(16) 1997 Q.1

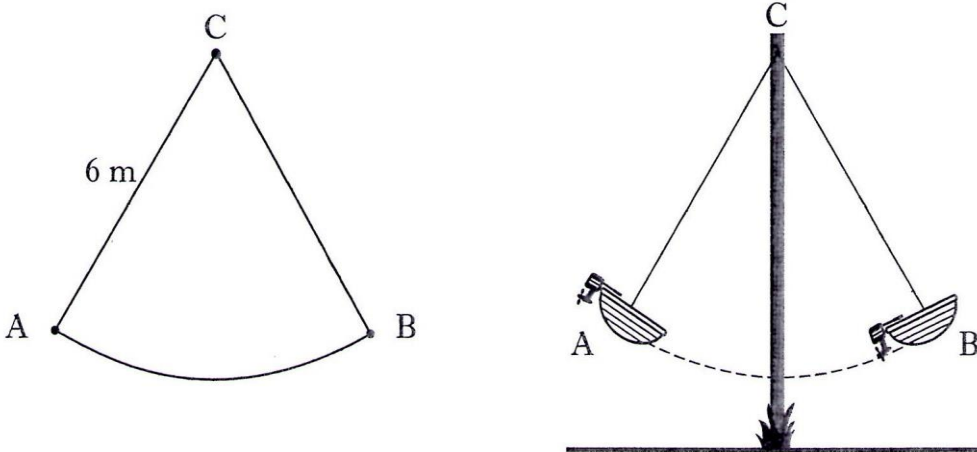


The diagram shows a sector of a circle, centre C.  
 Angle ACB is  $160^\circ$  and the radius of the circle is 30 cm.  
 Calculate the length of the arc AB.

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(17) 1996 Q.3

The boat on a carnival ride travels along an arc of a circle, centre C.



The boat is attached to C by a rod 6 metres long.  
 The rod swings from position CA to position CB.  
 The length of the arc AB is 7 metres.  
 Find the angle through which the rod swings from position A to position B.

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(18) 1995 Q.14

Figure 1 shows a road bridge.

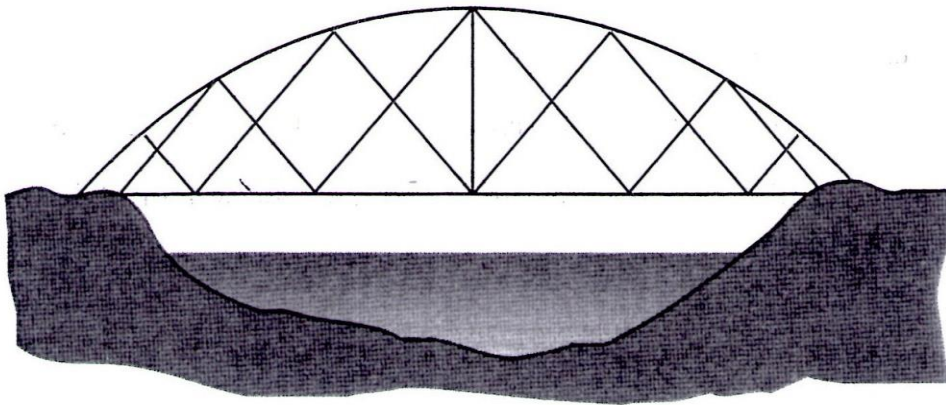


figure 1

The curved part of the bridge is formed from an arc of a circle, centre  $O$ , as shown in figure 2.

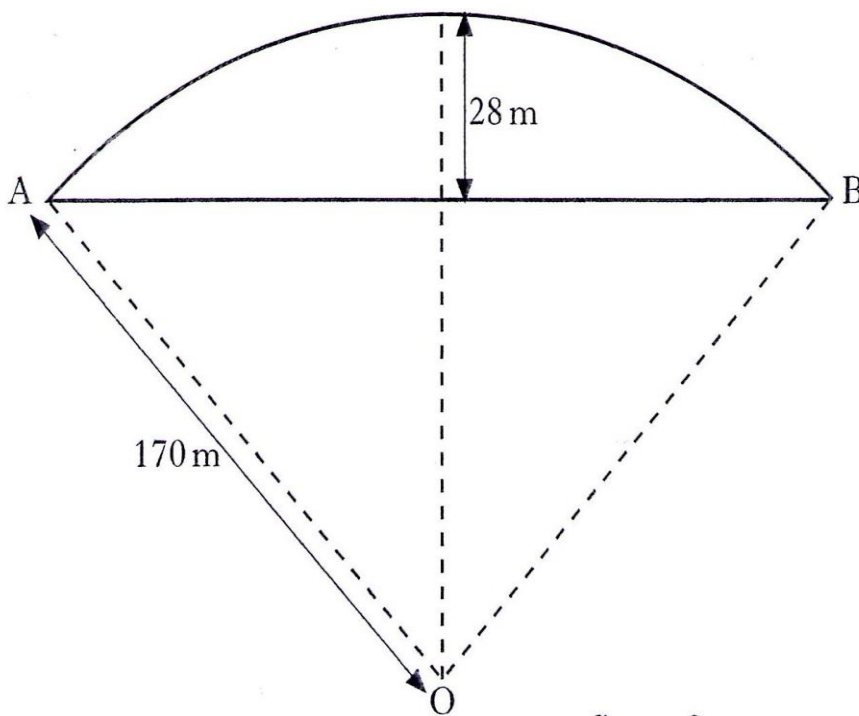


figure 2

$OA$  and  $OB$  are radii of length  $170$  metres.

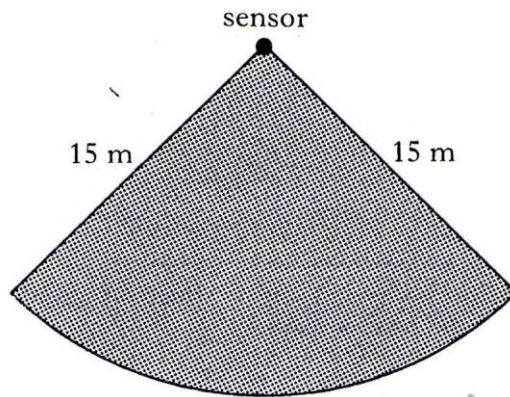
The height of the middle of the bridge above its ends is  $28$  metres as shown in figure 2.

Calculate the horizontal distance,  $AB$ .

**Do not use a scale drawing.**

(19) 1994 Q.10

A sensor in a security system covers a horizontal area in the shape of a sector of a circle of radius 15 m.

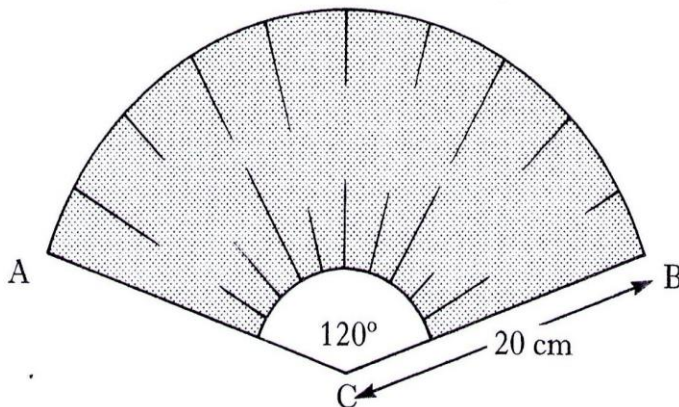


The area of the sector is 200 square metres.

Find the length of the arc of the sector.

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(20) 1992 Q.1



A fan is made from the sector of a circle, centre C, where the angle  $ACB = 120^\circ$  and the radius of the circle is 20 cm.

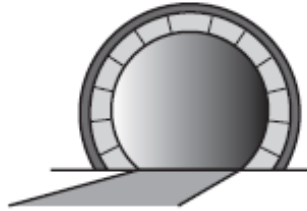
Calculate the length of the arc AB.

(3KU)



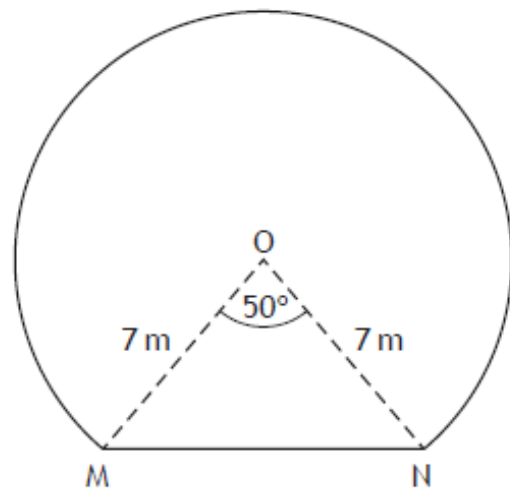
(21) 2014 Paper 2 Nat 5

13. The picture shows the entrance to a tunnel which is in the shape of part of a circle.



The diagram below represents the cross-section of the tunnel.

- The centre of the circle is  $O$ .
- $MN$  is a chord of the circle.
- Angle  $MON$  is  $50^\circ$ .
- The radius of the circle is 7 metres.

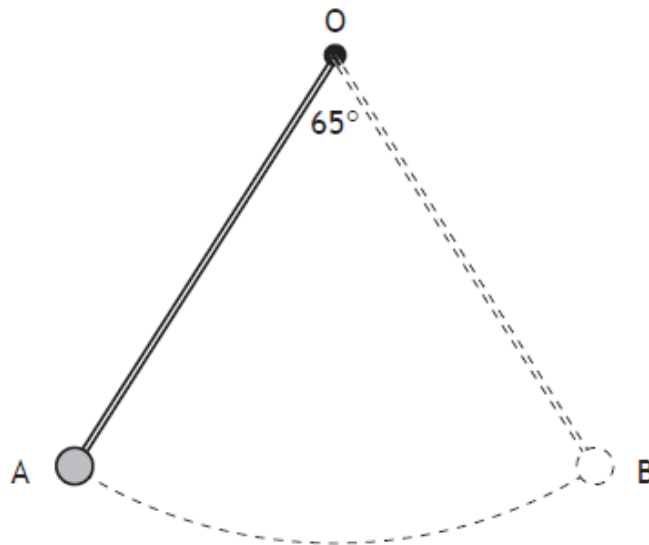


Calculate the area of the cross-section of the tunnel.



(22) 2015 Paper 2 Nat 5

10. The pendulum of a clock swings along an arc of a circle, centre O.



The pendulum swings through an angle of  $65^\circ$ , travelling from A to B.

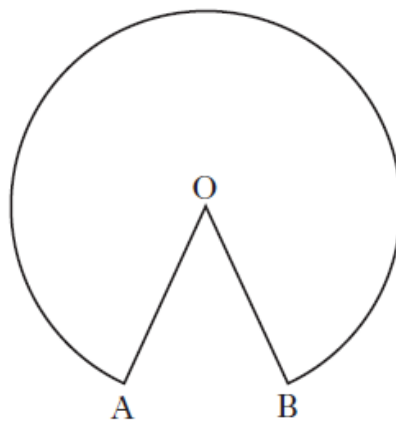
The length of the arc AB is 28.4 centimetres.

Calculate the length of the pendulum.

4

(23) 2015 Paper 2 Int 2

15. The diagram below shows part of a circle, centre O.



The radius of the circle is 6.4 centimetres.

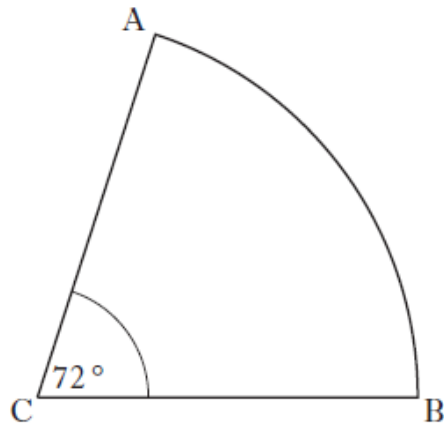
Major arc AB has length 34.6 centimetres.

Calculate the size of reflex angle AOB.

4

**(24) 2013 Paper 1 Int 2**

3. The diagram below shows a sector of a circle, centre C.



The radius of the circle is 5 centimetres and angle ACB is  $72^\circ$ .

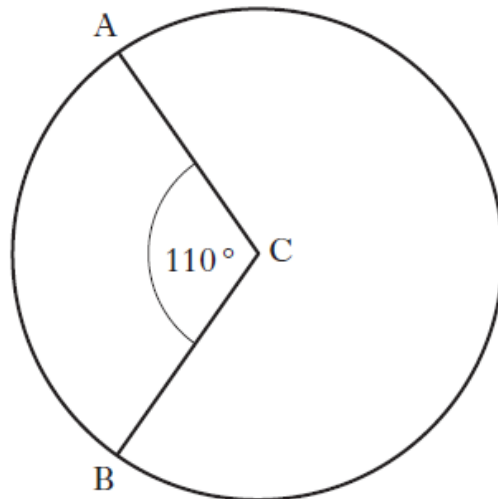
Calculate the length of arc AB.

Take  $\pi = 3.14$ .

3

**(25) 2012 Paper 2 Int 2**

1. The diagram below shows a circle, centre C.



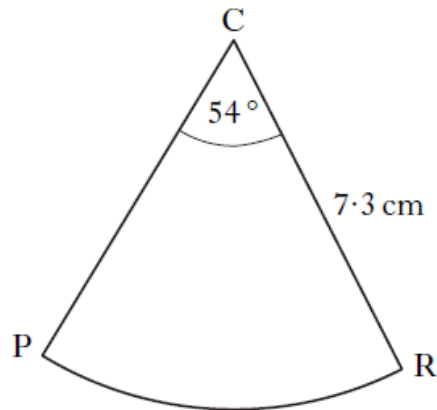
The circumference of the circle is 40.8 centimetres.

Calculate the length of the minor arc AB.

2

**(26) 2011 Paper 2 Int 2**

5. The diagram below shows a sector of a circle, centre C.

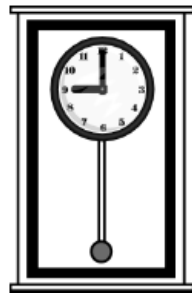
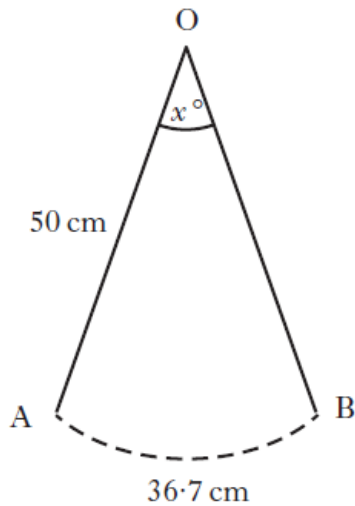


The radius of the circle is 7.3 centimetres and angle PCR is  $54^\circ$ .  
Calculate the area of the sector PCR.

3

**(27) 2013 Paper 2 Credit**

8. As the pendulum of a clock swings, its tip moves through an arc of a circle.

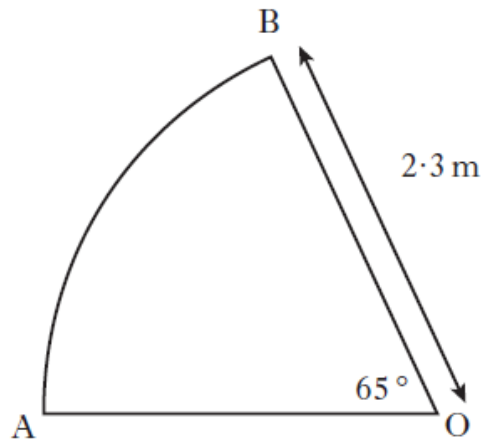


The length of the pendulum is 50 centimetres.  
The length of the arc is 36.7 centimetres.  
Calculate  $x^\circ$ , the angle through which the pendulum swings.

3

**(28) 2012 Paper 2 Credit**

4. A sector of a circle, centre O, is shown below.



The radius of the circle is 2.3 metres.

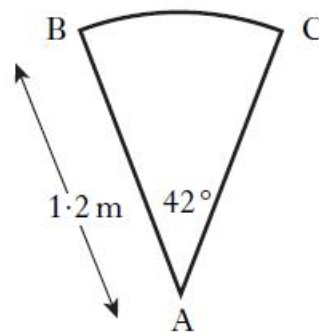
Angle AOB is 65°.

Find the length of the arc AB.

3

**(29) 2011 Paper 2 Credit**

5. A spiral staircase is being designed.



Each step is made from a sector of a circle as shown.

The radius is 1.2 metres.

Angle BAC is 42°.

For the staircase to pass safety regulations, the arc BC must be at least 0.9 metres.

Will the staircase pass safety regulations?

KU RE

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## **Answers**

- (1) 87.96cm
- (2) (a) 2042.04cm<sup>2</sup> (b) 136.14cm
- (3) (a) 150° (b) 45.8cm
- (4) 2cm
- (5) 55.9cm<sup>2</sup>
- (6) 2230.5g
- (7) (a) 23° (b) 10.0cm (3 sig figs)
- (8) 6cm
- (9) 800mm
- (10) 3.25m
- (11) (a) 3.3m (b) 0.8m
- (12) 367.6cm
- (13) (a) 1527.2cm<sup>2</sup> (b) 44cm
- (14) (a) 2.5m (b) 26.7m
- (15) 83.8cm
- (16) 83.8cm
- (17) 67°
- (18) 186.9m
- (19) 26.7m
- (20) 41.9cm
- (21) 151.3m<sup>2</sup>
- (22) 25cm
- (23) 310°
- (24) 6.28cm
- (25) 12.5cm
- (26) 25.1cm<sup>2</sup>
- (27) 42°
- (28) 2.6m
- (29) 0.88m