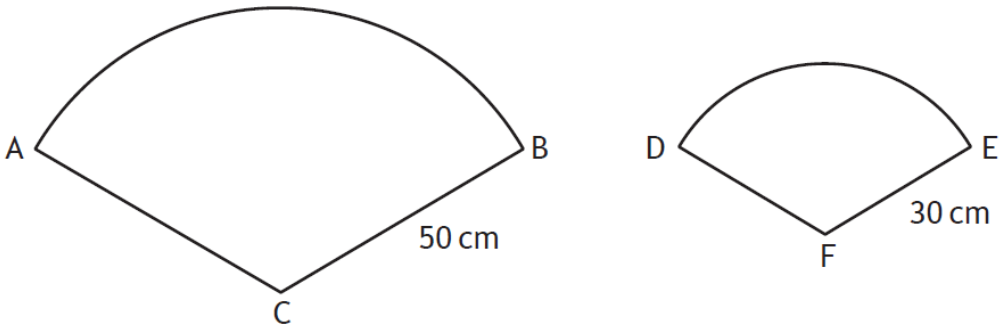
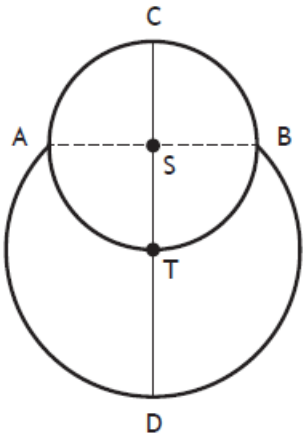
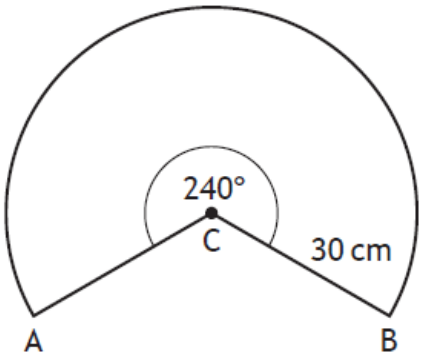
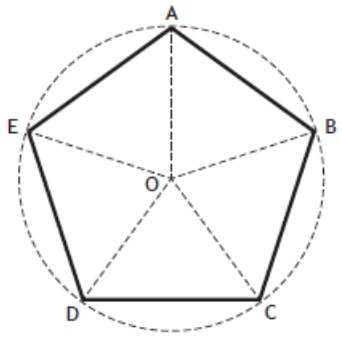
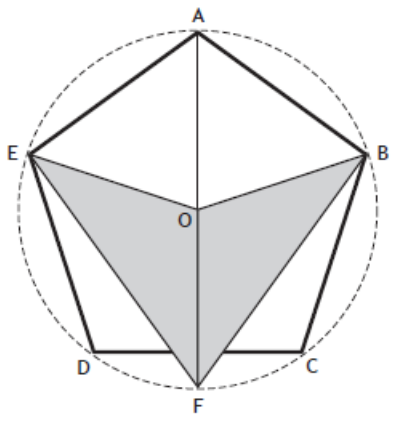
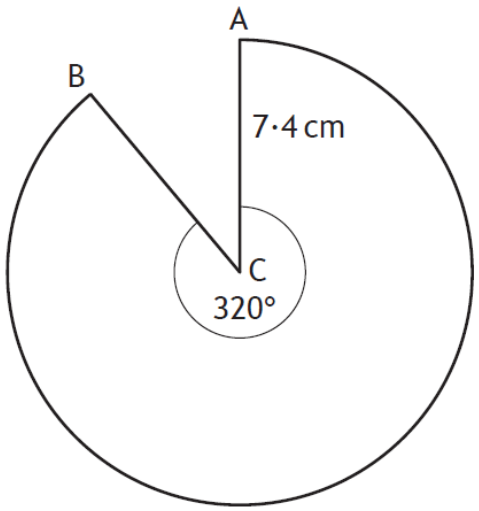
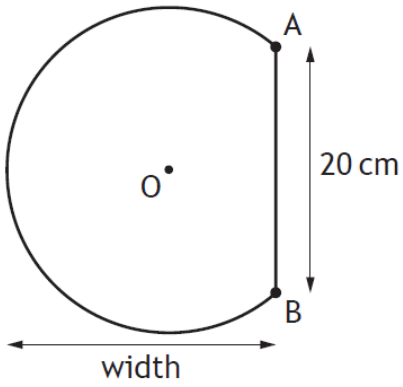
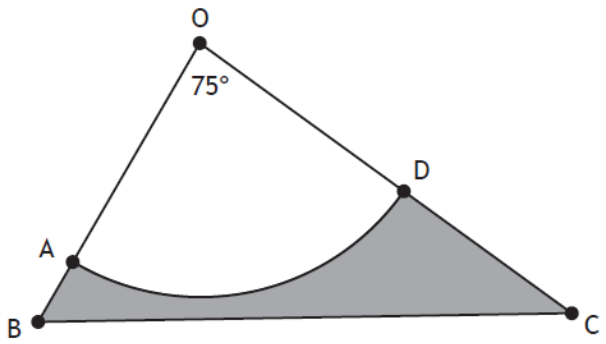
Nat 5/Credit/Int 2: Circle

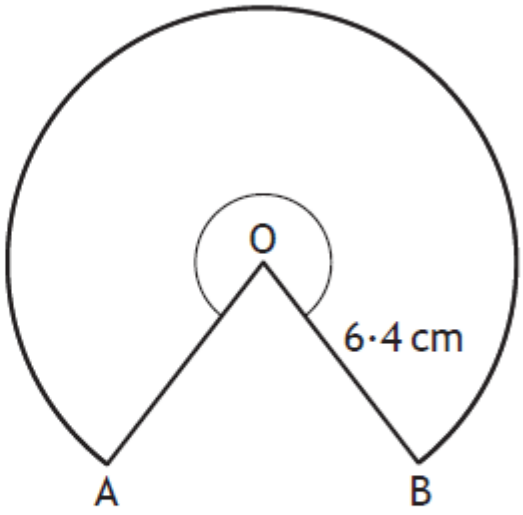
Nat 5 2019 P2 Q12	**12.** In the diagram • ABC is a sector of a circle, centre C • DEF is a sector of a circle, centre F.  The sectors are mathematically similar. The area of the larger sector, ABC, is 2750 square centimetres. (a) Calculate the area of the smaller sector, DEF. **3** (b) Calculate the size of angle ACB. **3**	3 3
Ans	(a) 990 cm^2 (b) 126.05	

Nat 5 2019 P2 Q 18	18. The picture shows a cartoon snowman.  The diagram below represents the snowman.  • The head is a small circle, centre S, with diameter 15 centimetres • The body is part of a larger circle, centre T • The point T lies on the circumference of the small circle • The points A and B lie on the circumferences of both circles Calculate CD, the height of the snowman. **4**	4
Ans	25.6 cm	

Nat 5 2019 P1 Q4	**4.** The diagram below shows a sector of a circle, centre C.  The radius of the circle is 30 centimetres. Calculate the length of the major arc AB. **Take $\pi = 3{\cdot}14$.** **3**	3
Ans	125.6 cm	
Nat 5 2019 P1 Q 11	**11.** Pam is designing a company logo. She starts by drawing a regular pentagon ABCDE. The vertices of the pentagon lie on the circumference of a circle with centre O.  She then adds to the design as shown in the diagram below.  AF is a diameter of the circle. Calculate the size of angle OFB. 3	3

Ans	36	
Nat 5 2018 P2 Q2	**2.** The diagram below shows a sector of a circle, centre C.  The radius of the circle is 7·4 centimetres. Calculate the length of the major arc AB. **3**	3
Ans	41.32 cm	
Nat 5 2018 P2 Q12	**12.** The shape below is part of a circle, centre O.  The circle has radius 13 centimetres. AB is a chord of length 20 centimetres. Calculate the width of the shape. **4**	4
Ans	21.3 cm	

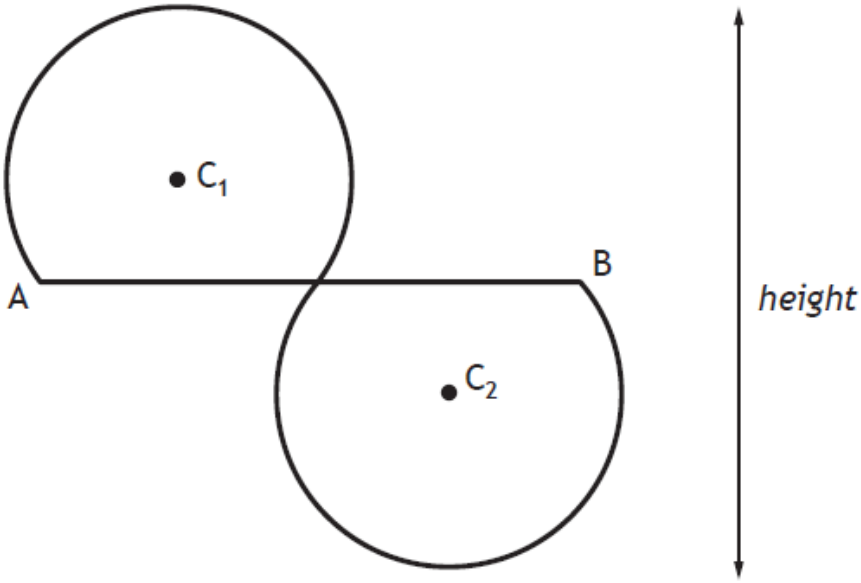
Nat 5 2018 P2 Q17	**17.** In the diagram below AOD is a sector of a circle, with centre O, and BOC is a triangle.  In sector AOD: • radius = 30 centimetres • angle AOD = 75°. In triangle OBC: • OB = 38 centimetres • OC = 55 centimetres. Calculate the area of the shaded region, ABCD. **5**	5
Ans	420.3 cm^2	

Nat 5 2017 P2 Q14	The diagram below shows part of a circle, centre O.  The radius of the circle is 6·4 centimetres. Major arc AB has length 31·5 centimetres. Calculate the size of the reflex angle AOB.	3
Ans	282°	

Nat 5 2017 P2 Q13

Two identical shapes are used to form a logo.

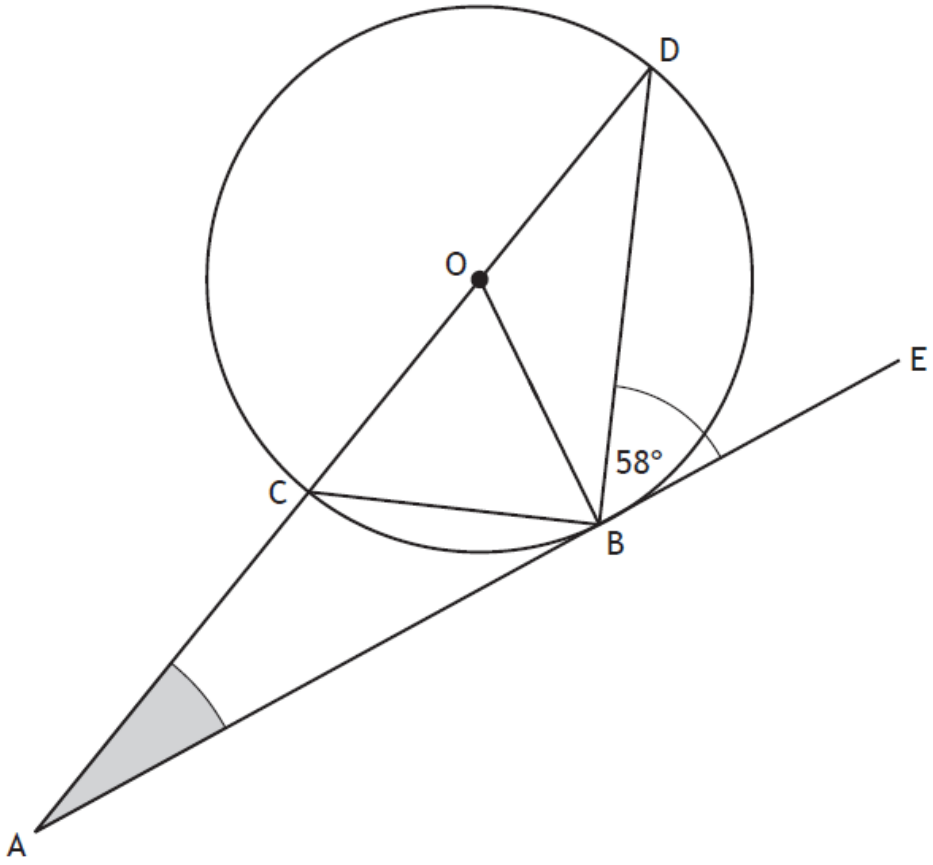
Each shape is part of a circle.

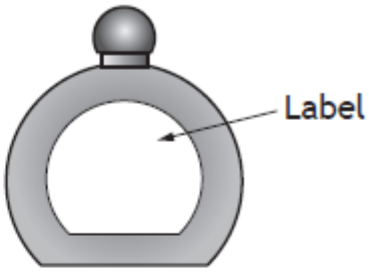
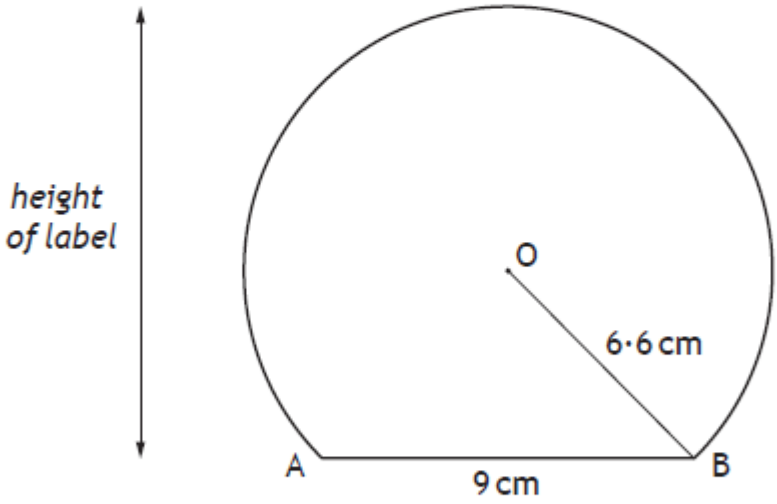


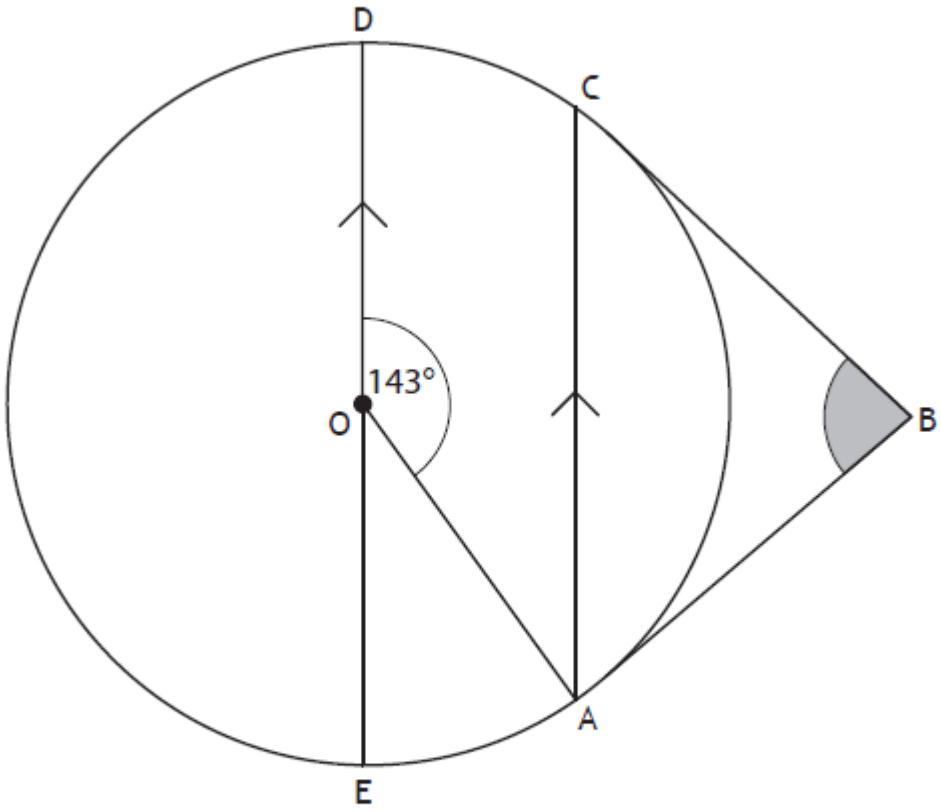
- The circles have centres C_1 and C_2.
- The radius of each circle is 14 centimetres.
- The logo has half-turn symmetry about the mid-point of AB.
- AB is 48 centimetres long.

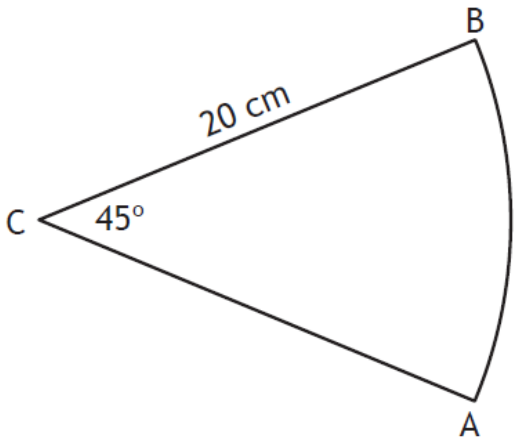
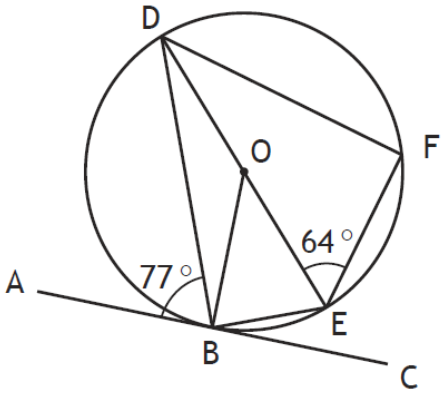
Calculate the height of the logo. 4

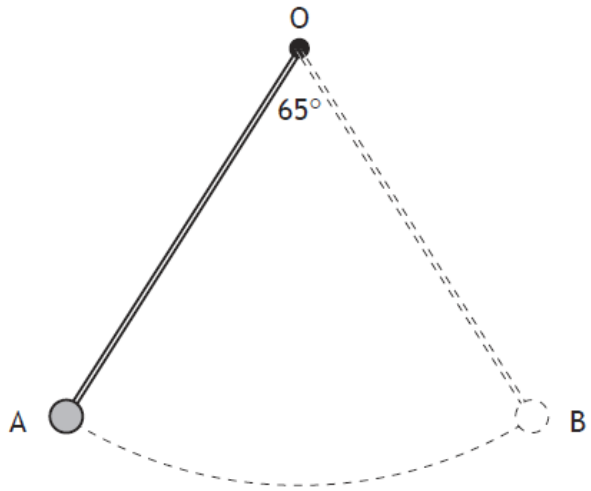
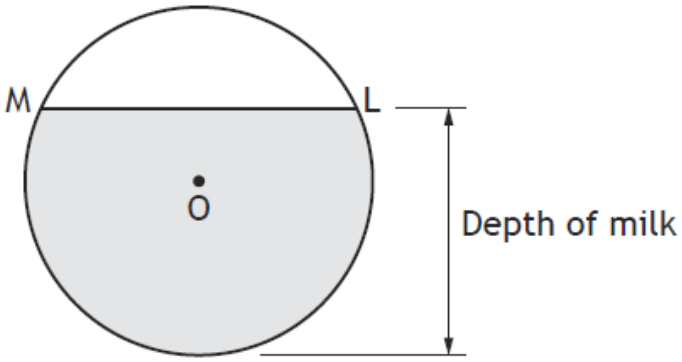
Ans 42·4 cm

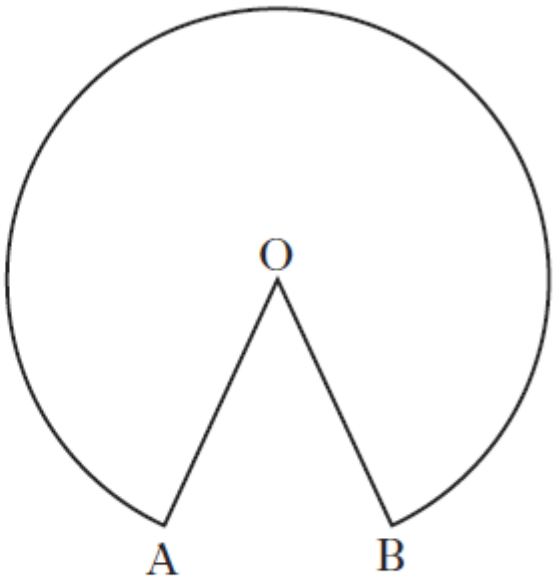
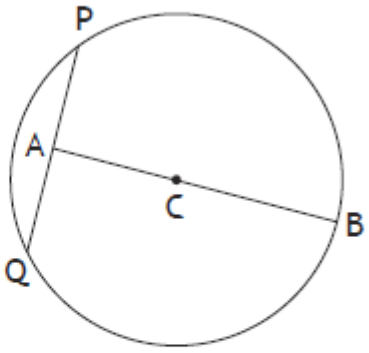
Nat 5 2017 P1 Q9	In the diagram shown below: • ABE is a tangent to the circle centre O • Angle DBE is 58°  Calculate the size of angle CAB.	3
Ans	26°	

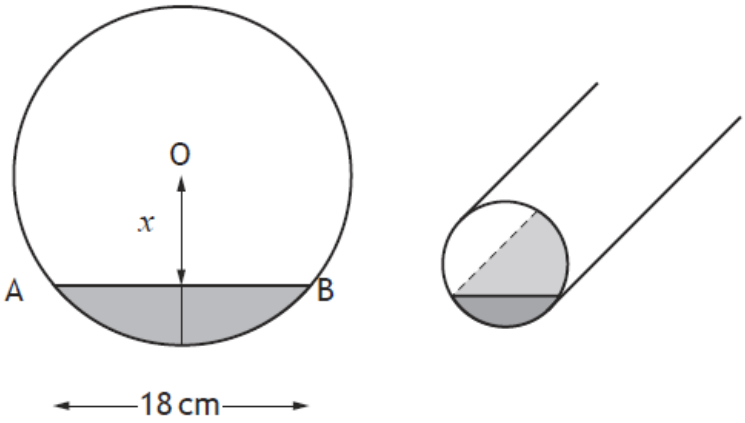
Nat 5 2016 P2 Q15	This perfume bottle has a label in the shape of part of a circle.  A diagram of the label is shown below.  • The centre of the circle is O. • The chord AB is 9 centimetres. • The radius OB is 6·6 centimetres. Find the height of the label.	4
Ans	11·4 cm	

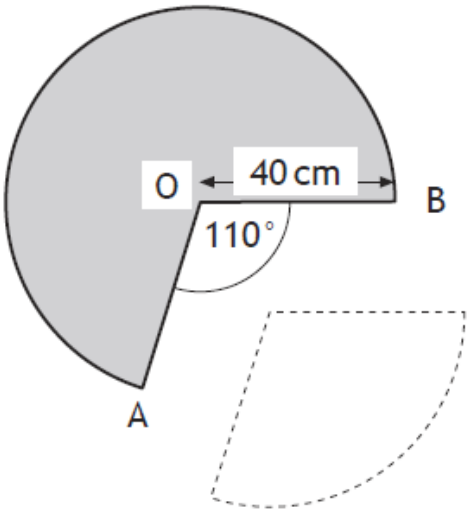
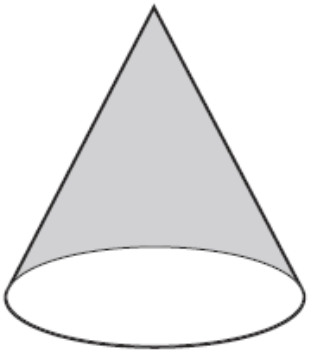
Nat 5 2016 P2 Q5	The diagram below shows a circle, centre O.  • AB and CB are tangents to the circle. • AC and ED are parallel. • Angle AOD is 143°. Calculate the size of angle ABC.	3
Ans	74°	

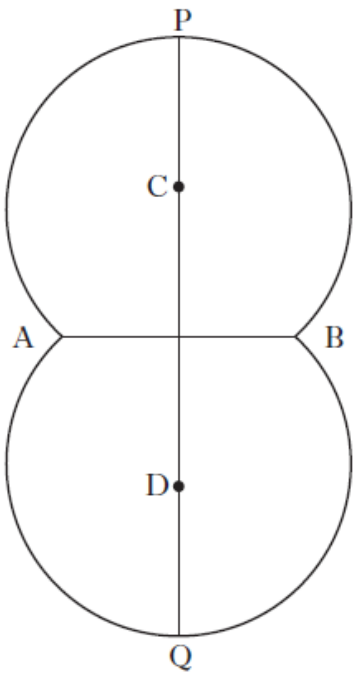
Nat 5 2016 P1 Q3	The diagram shows a sector of a circle, centre C.  The radius of the circle is 20 centimetres and angle ACB is 45°. Calculate the area of the sector. **Take $\pi = 3{\cdot}14$.**	3
Ans	157 cm^2	
Nat 5 2015 P1 Q3	 AC is a tangent to the circle, centre O, with point of contact B. DE is a diameter of the circle and F is a point on the circumference. Angle ABD is 77° and angle DEF is 64°. Calculate the size of angle BDF.	3
Ans	39°	

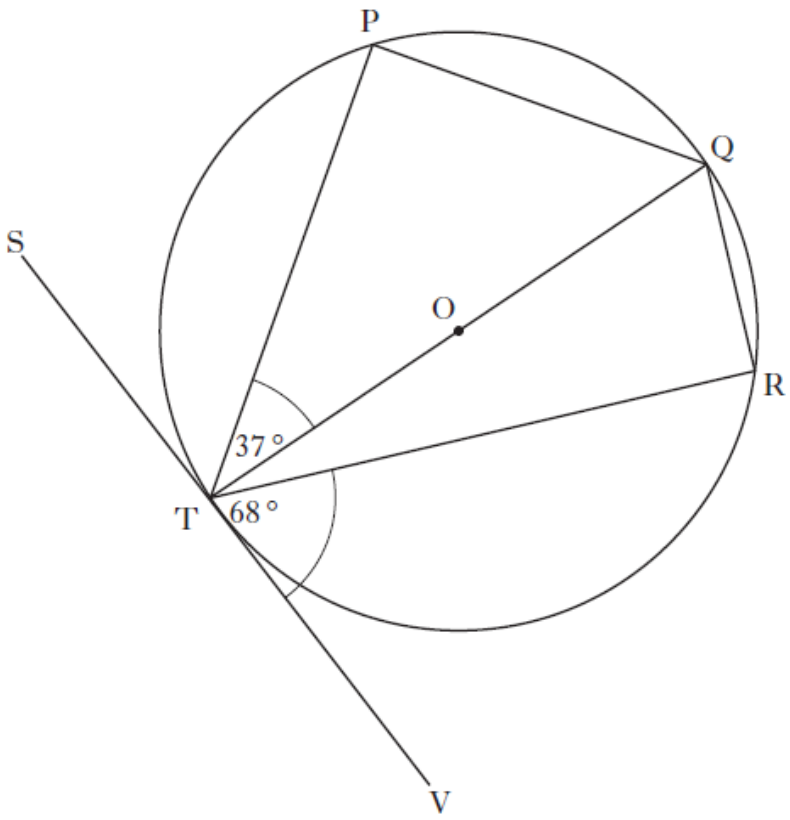
Nat 5 2015 P2 Q10	The pendulum of a clock swings along an arc of a circle, centre O.  The pendulum swings through an angle of 65°, travelling from A to B. The length of the arc AB is 28·4 centimetres. Calculate the length of the pendulum.	4
Ans	25 cm	
Nat 5 2015 P2 Q12	The diagram below shows the circular cross-section of a milk tank.  The radius of the circle, centre O, is 1·2 metres. The width of the surface of the milk in the tank, represented by ML in the diagram, is 1·8 metres. Calculate the depth of the milk in the tank.	4
Ans	1·99 metres	

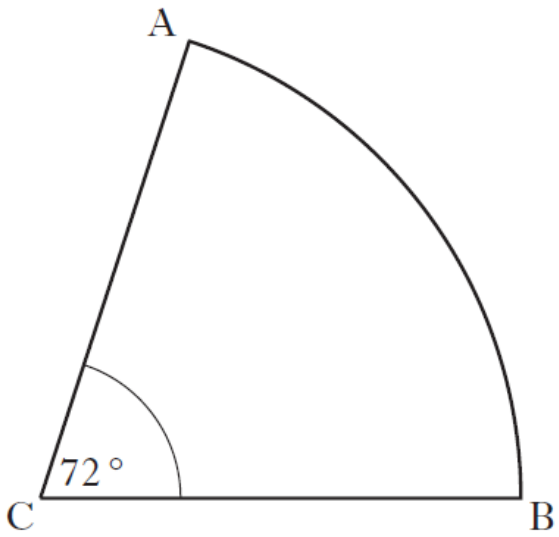
Int 2 2015 P2 Q15	The diagram below shows part of a circle, centre O.  The radius of the circle is 6·4 centimetres. Major arc AB has length 34·6 centimetres. Calculate the size of reflex angle AOB.	4
Ans	310°	
Nat 5 2014 P1 Q12	The diagram below shows a circle, centre C.  The radius of the circle is 15 centimetres. A is the mid-point of chord PQ. The length of AB is 27 centimetres. Calculate the length of PQ.	4

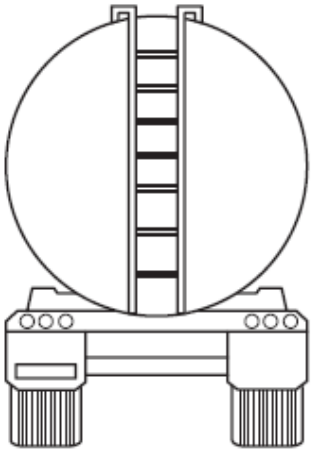
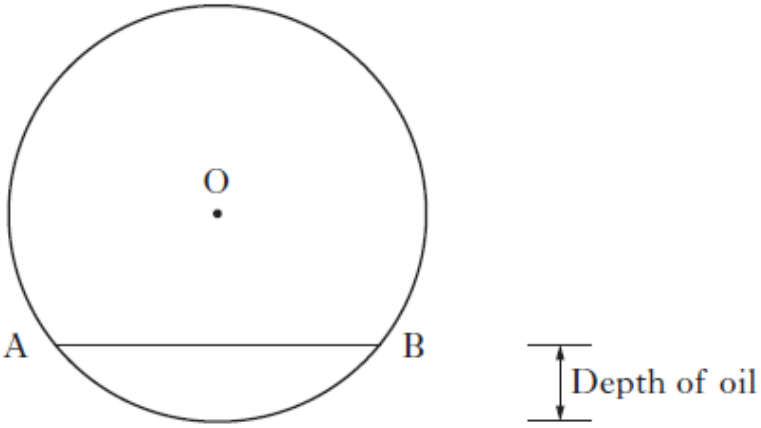
Ans	18 cm	
Nat 5 2014 P1 Q12	A cylindrical pipe has water in it as shown.  The depth of the water at the deepest point is 5 centimetres. The width of the water surface, AB, is 18 centimetres. The radius of the pipe is r centimetres. The distance from the centre, O, of the pipe to the water surface is x centimetres. (a) Write down an expression for x in terms of r. (b) Calculate r, the radius of the pipe.	4
Ans	(a) r – 5 (b) 10·6 cm	

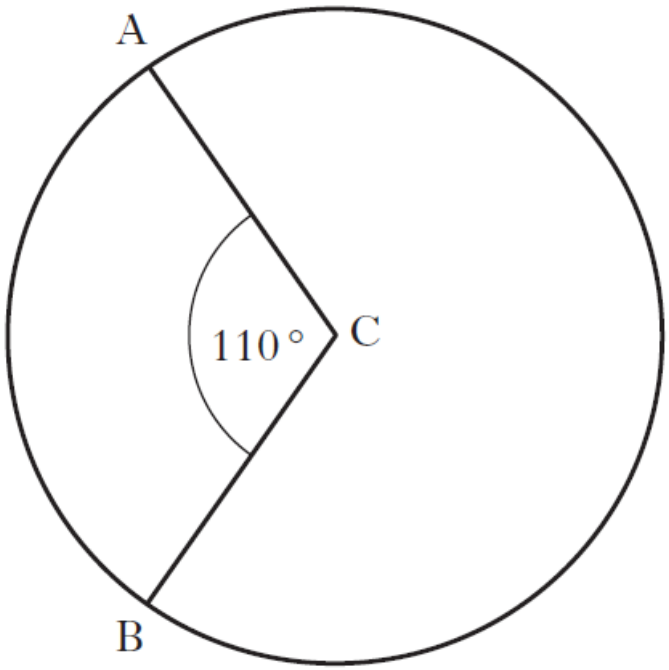
Nat 5 Specimen P2 Q11	A cone is formed from a paper circle with a sector removed as shown. The radius of the paper circle is 40 centimetres. Angle AOB is 110°.   (a) Calculate the area of the sector removed from the circle. (b) Calculate the circumference of the base of the cone.	4
Ans	(a) 1536 cm^2 (b) 175 cm	

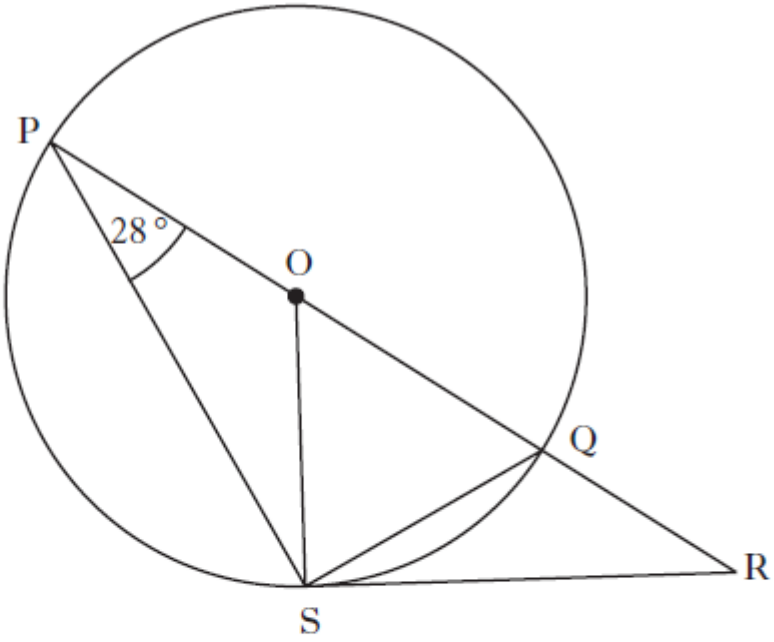
Int 2 2013 P2 Q12	The shape below is used as a logo in an advertising campaign. It is made up from segments of two identical circles.  The points C and D are the centres of the circles and each circle has a radius of 24 centimetres. AB is a common chord of length 30 centimetres. Calculate the height of the logo, represented by the line PQ.	5
Ans	85·4cm	

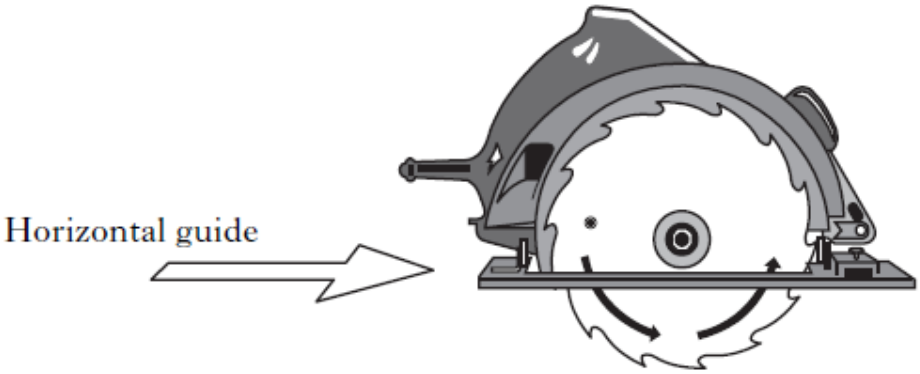
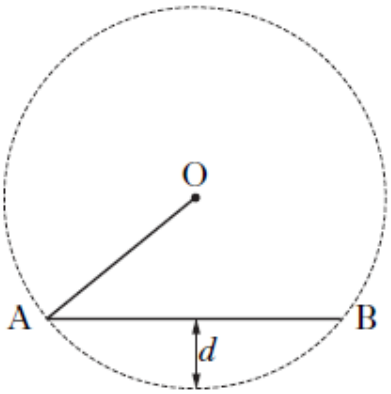
Int 2 2013 P1 Q5	 The tangent SV touches the circle, centre O, at T. Angle PTQ is 37 ° and angle VTR is 68 °. Calculate the size of angle PQR.	3
Ans	121°	

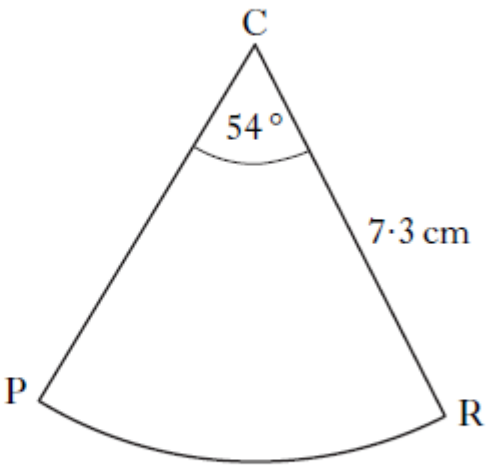
Int 2 2013 P1 Q3	The diagram below shows a sector of a circle, centre C.  The radius of the circle is 5 centimetres and angle ACB is 72°. Calculate the length of arc AB. **Take $\pi = 3{\cdot}14$.**	3
Ans	6·28 cm	

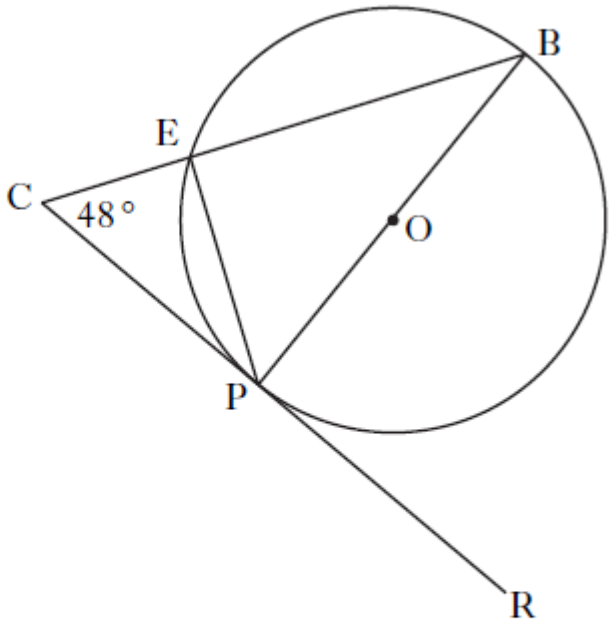
Int 2 2012 P2 Q10	A tanker delivers oil to garages. The tank has a circular cross-section as shown in the diagram below.   The radius of the circle, centre O, is 1·9 metres. The width of the surface of the oil, represented by AB in the diagram, is 2·2 metres. Calculate the depth of the oil in the tanker.	4
Ans	0·4m	

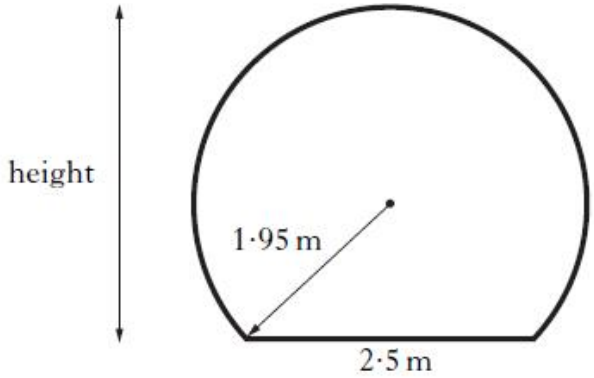
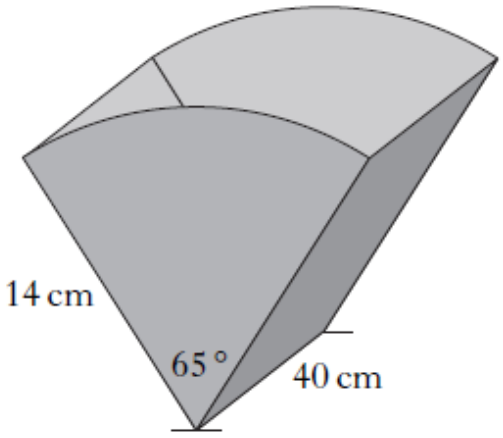
Int 2 2012 P2 Q1	The diagram below shows a circle, centre C.  The circumference of the circle is 40·8 centimetres. Calculate the length of the minor arc AB.	2
Ans	12·5 cm	

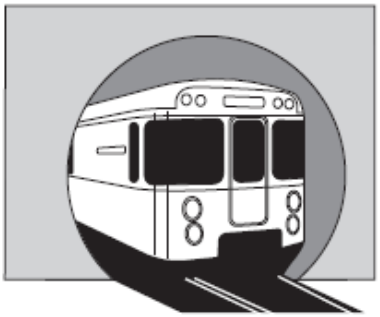
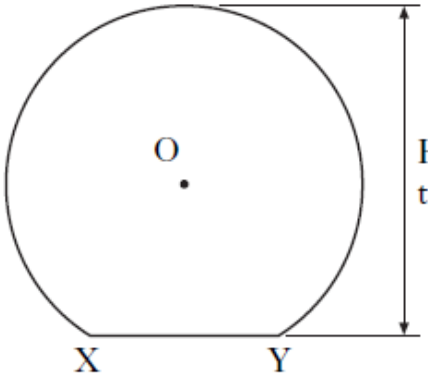
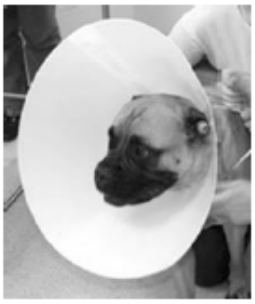
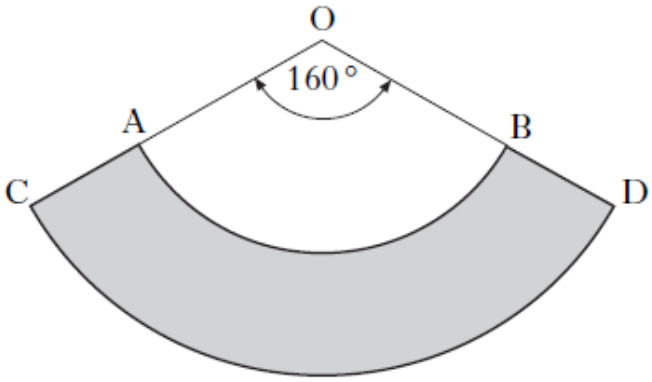
Int 2 2012 P1 Q4	 In the above diagram, • O is the centre of the circle • PQ is a diameter of the circle • PQR is a straight line • RS is a tangent to the circle at S • angle OPS is 28°. Calculate the size of angle QRS.	3
Ans	34°	

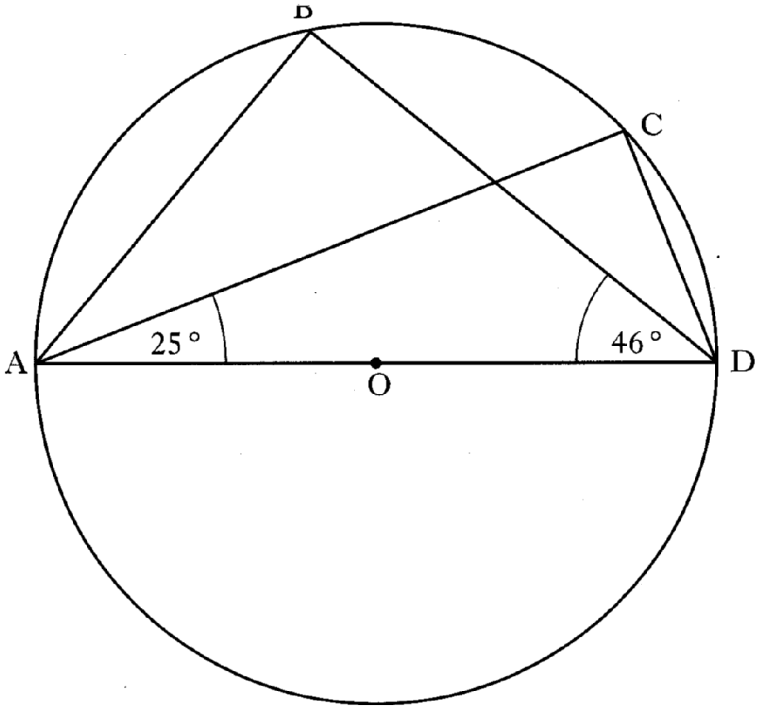
Int 2 2011 P2 Q13	A circular saw can be adjusted to change the depth of blade that is exposed below the horizontal guide.  The circle, centre O, below represents the blade and the line AB represents part of the horizontal guide. This blade has a radius of 110 millimetres. If AB has length 140 millimetres, calculate the depth, d millimetres, of saw exposed.  	4
Ans	25·1 mm	

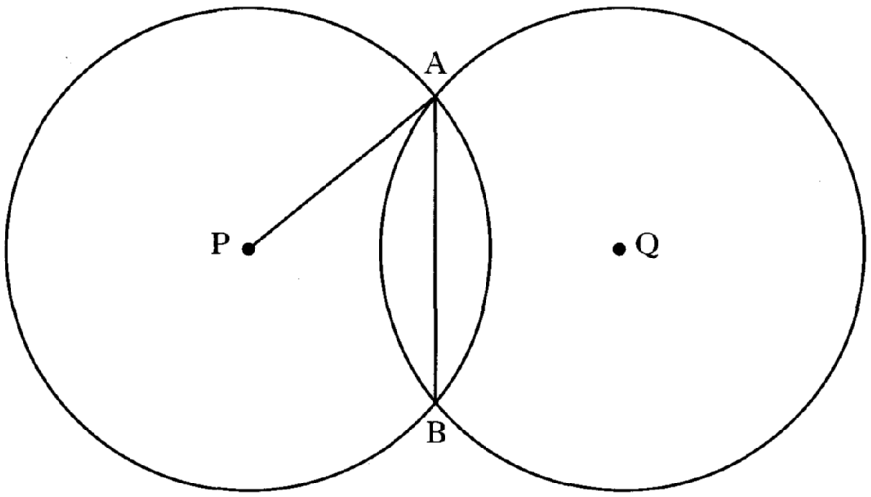
Int 2 2011 P2 Q5	The diagram below shows a sector of a circle, centre C.  The radius of the circle is 7·3 centimetres and angle PCR is 54°. Calculate the area of the sector PCR.	3
Ans	25·1 square centimetres	

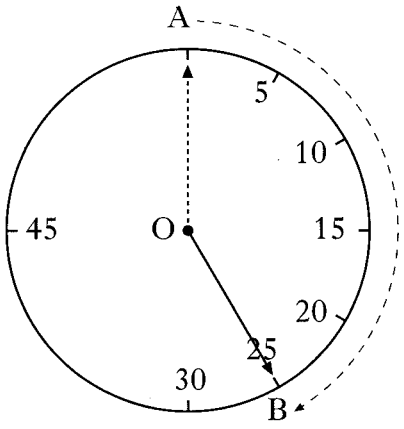
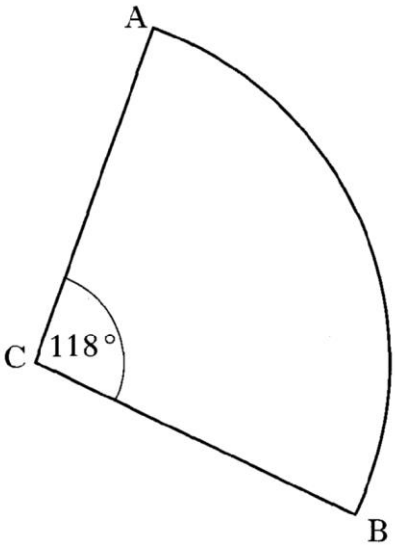
Int 2 2011 P1 Q3	A circle, centre O, is shown below.  In the circle • PB is a diameter • CR is a tangent to the circle at point P • Angle BCP is 48°. Calculate the size of angle EPR.	3
Ans	138°	

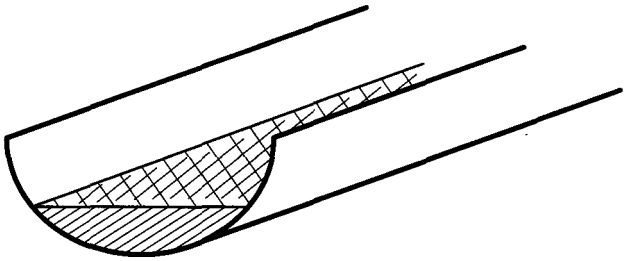
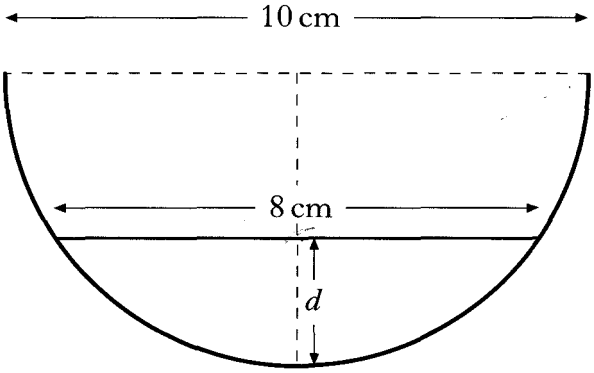
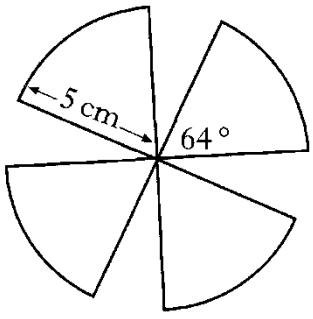
Int 2 2010 P2 Q13	Ocean World has an underwater viewing tunnel.  The diagram below shows the cross-section of the tunnel. It consists of part of a circle with a horizontal base.  The radius of the circle is 1·95 metres and the width of the base is 2·5 metres. Calculate the height of the tunnel.	4
Ans	3·45 metres	
Int 2 2010 P2 Q9	The ends of a magazine rack are identical. Each end is a sector of a circle with radius 14 centimetres. The angle in each sector is 65°. The sectors are joined by two rectangles, each with length 40 centimetres. The exterior is covered by material. What area of material is required? 	4
Ans	1342·35 square centimetres	

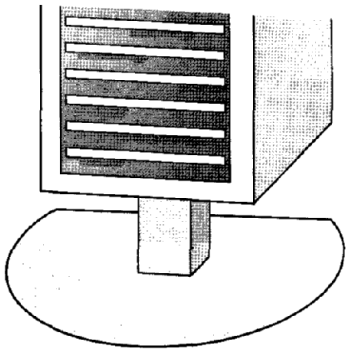
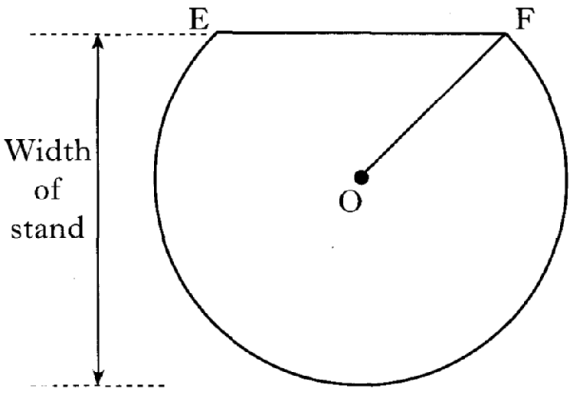
Int 2 2009 P2 Q14	A railway goes through an underground tunnel.  The diagram below shows the cross-section of the tunnel. It consists of part of a circle with a horizontal base.  • The centre of the circle is O. • XY is a chord of the circle. • XY is 1·8 metres. • The radius of the circle is 1·7 metres. Find the height of the tunnel.	4
Ans	3·14 metres	
Int 2 2009 P2 Q5	A pet shop manufactures protective dog collars. In the diagram below the shaded area represents one of these collars.   AB and CD are arcs of the circles with centres at O. The radius, OA, is 10 inches and the radius, OC, is 18 inches. Angle AOB is 160°. Calculate the area of a collar.	4

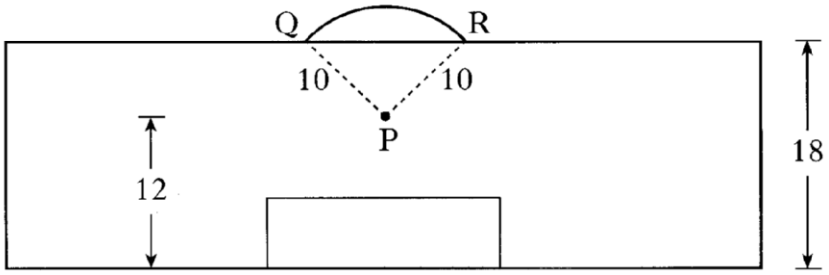
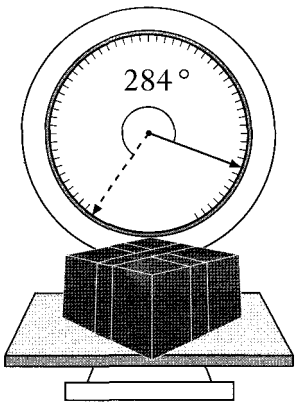
Ans	313 Square Inches	
Int 2 2008 P1 Q7	 AD is a diameter of a circle, centre O. B and C are points on the circumference of the circle. Angle CAD = 25 °. Angle BDA = 46 °. Calculate the size of angle BAC.	3
Ans	19º	

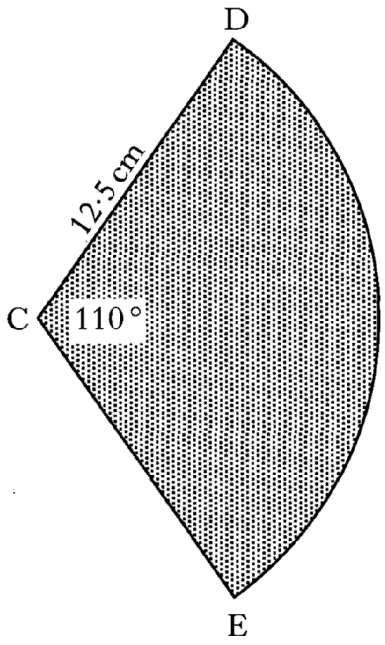
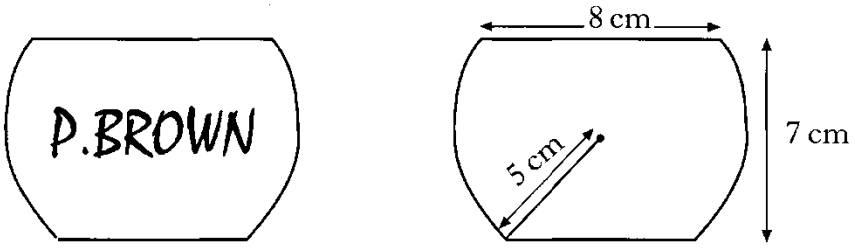
Int 2 2008 P2 Q9	Two identical circles, with centres P and Q, intersect at A and B as shown in the diagram.  The radius of each circle is 10 centimetres. The length of the common chord, AB, is 12 centimetres. Calculate PQ, the distance between the centres of the two circles.	5
Ans	16 metres	

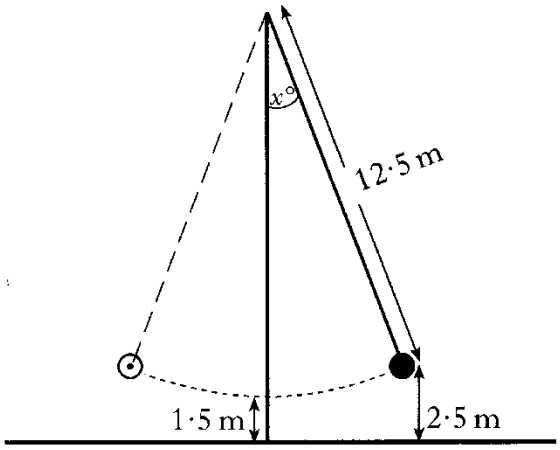
Credit 2008 P2 Q9	**9.** Contestants in a quiz have 25 seconds to answer a question. This time is indicated on the clock. The tip of the clock hand moves through the arc AB as shown.  (*a*) Calculate the size of angle AOB. (*b*) The length of arc AB is 120 centimetres. Calculate the length of the clock hand.	5
Ans	(a) 150° (b) 45·8cm	
Int 2 2007 P2 Q2	The diagram below shows a sector of a circle, centre C.  The radius of the circle is 10·5 centimetres and angle ACB is 118°. Calculate the length of arc AB.	3
Ans	21.6 cm	

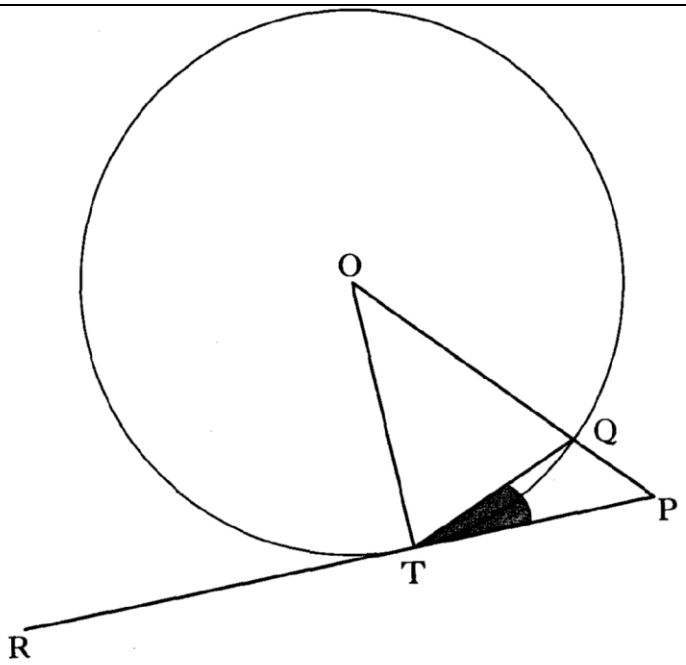
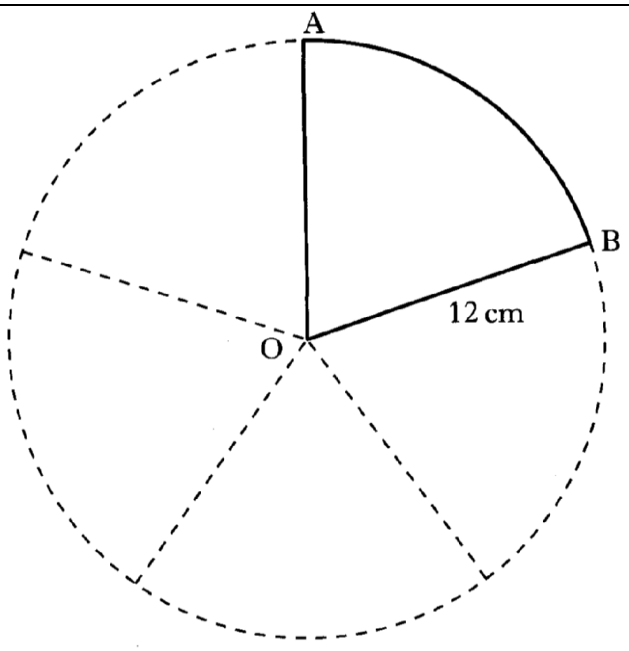
Credit 2007 P1 Q12	**12.** The diagram shows water lying in a length of roof guttering.  The cross-section of the guttering is a semi-circle with diameter 10 centimetres. The water surface is 8 centimetres wide.  Calculate the depth, d, of water in the guttering.	4
Ans	2 cm	
Credit 2007 P2 Q7	**7.** A fan has four identical plastic blades.  Each blade is a sector of a circle of radius 5 centimetres. The angle at the centre of each sector is 64°. Calculate the **total** area of plastic required to make the blades.	3

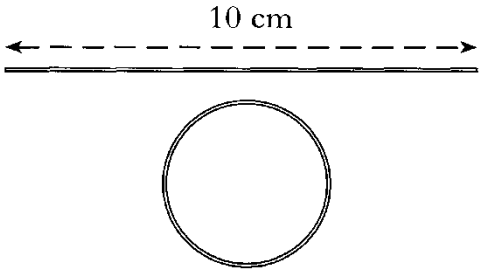
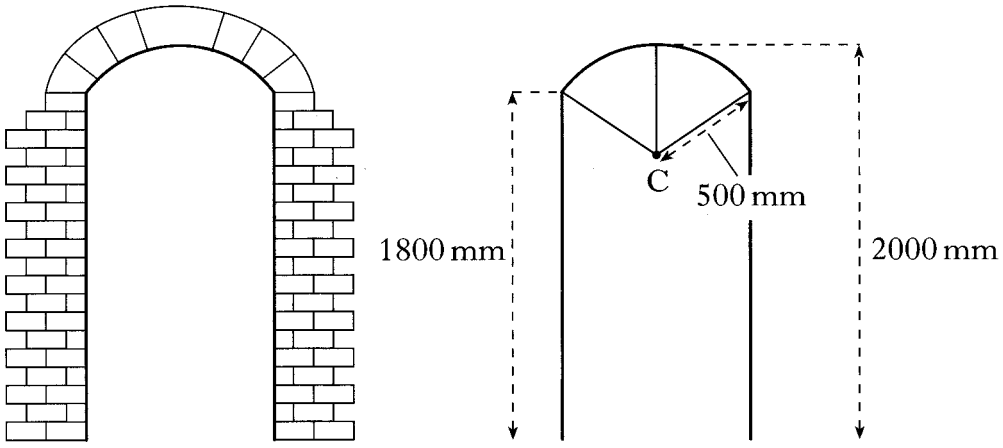
Ans	$55{\cdot}84\ cm^2$	
Int 2 2006 P2 Q4	. The diagram shows the base of a compact disc stand which has the shape of part of a circle.   • The centre of the circle is O. • EF is a chord of the circle. • EF is 18 centimetres. • The radius, OF, of the circle is 15 centimetres. Find the width of the stand.	4
Ans	27cm	

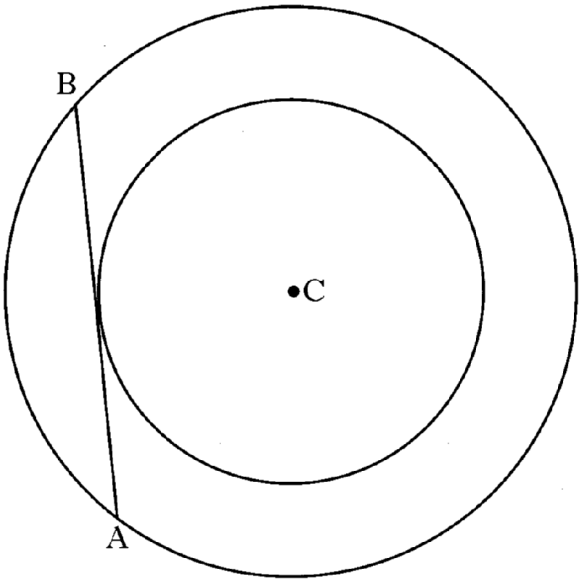
Int 2 2006 P2 Q8	The diagram shows the penalty area in a football pitch. All measurements are given in yards.  The penalty spot is marked at point P. QR is an arc of a circle, centre P, radius 10 yards. The width of the penalty area is 18 yards and the distance of the penalty spot from the goal line is 12 yards, as shown. (*a*) Calculate the size of angle QPR. (*b*) Calculate the length of arc QR.	3 2
Ans	(a) 106·3º (b) 18·6 yards	
Credit 2006 P2 Q8	**8.** A set of scales has a circular dial. The pointer is 9 centimetres long. The tip of the pointer moves through an arc of 2 centimetres for each 100 grams of weight on the scales.  A parcel, placed on the scales, moves the pointer through an angle of 284°. Calculate the weight of the parcel.	4
Ans	2 230 g	

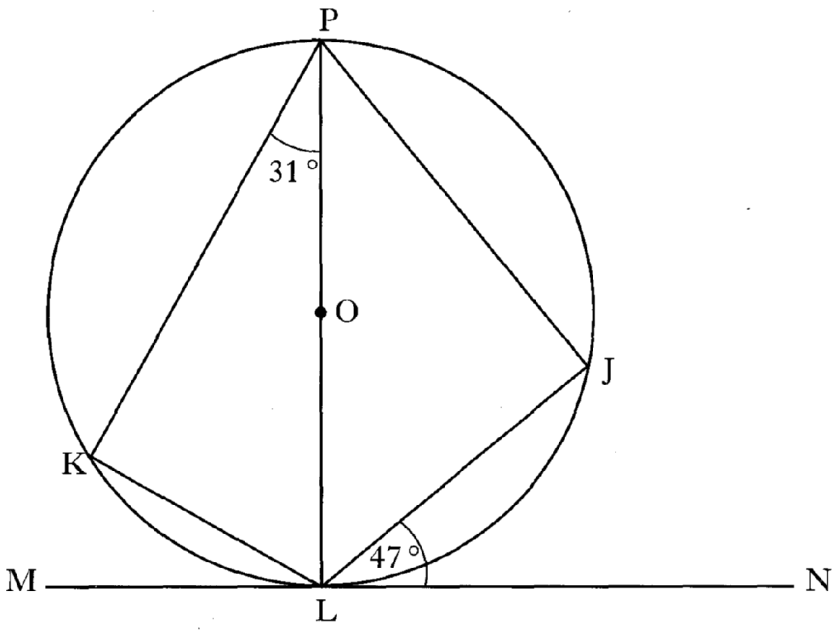
Int 2 2005 P2 Q5	The diagram below shows a sector of a circle, centre C.  The radius of the circle is 12·5 centimetres and angle DCE is 110°. Calculate the area of the sector CDE.	3
Ans	149·9cm^2	
Credit 2005 P1 Q10	**10.** A badge is made from a circle of radius 5 centimetres. Segments are taken off 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
Ans	6 cm	

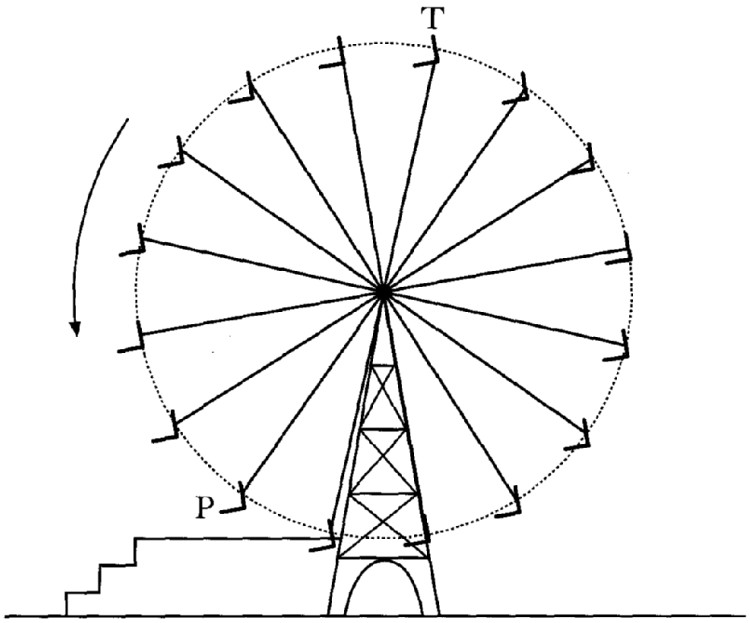
Credit 2005 P2 Q10	**10.** The chain of a demolition ball is 12·5 metres long. When vertical, the end of the chain is 1·5 metres from the ground.  It swings to a maximum height of 2·5 metres above the ground on both sides. (*a*) At this maximum height, show that the angle $x°$, which the chain makes with the vertical, is approximately 23°. (*b*) Calculate the maximum length of the arc through which the end of the chain swings. Give your answer **to 3 significant figures**.	8
Ans	(a) 23° (b) 10·0 m	

Int 2 2004 P1 Q3	 RP is a tangent to the circle, centre O, with a point of contact T. The shaded angle PTQ = 24°. Calculate the size of angle OPT.	3
Ans	42º	
Int 2 2004 P2 Q4	 A circle, with centre O and radius 12 centimetres, is cut into 5 equal sectors. Calculate the perimeter of sector OAB.	3
Ans	39·1cm	

Credit 2004 P1 Q12	**12.** A piece of gold wire 10 centimetres long is made into a circle.  The circumference of the circle is equal to the length of the wire. Show that the area of the circle is **exactly** $\frac{25}{\pi}$ square centimetres.	4
Ans	Proof.	
Credit 2004 P2 Q8	**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.	5
Ans	800 mm	

Int 2 2003 P1 Q7	 C is the centre of two concentric circles. AB is a tangent to the smaller circle and a chord of the larger circle. The radius of the smaller circle is 6 centimetres and the chord AB has length 16 centimetres. Calculate the radius of the larger circle.	3
Ans	10 cm	

Int 2 2003 P2 Q1	 The tangent, MN, touches the circle, centre O, at L. Angle JLN = 47 °. Angle KPL = 31 °. Find the size of angle KLJ.	3
Ans	102º	

Int 2 2003 P2 Q8	The diagram below shows a big wheel at a fairground.  The wheel has sixteen chairs equally spaced on its circumference. The radius of the wheel is 9 metres. As the wheel rotates in an anticlockwise direction, find the distance a chair travels in moving from position T to position P in the diagram.	4
Ans	24·7m	

Credit 2003 P2 Q10

4

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

It is 6 metres wide and 2 metres high.

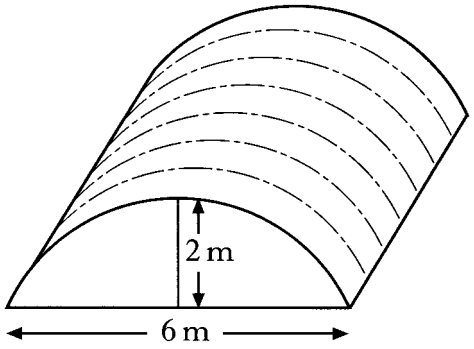


Figure 1

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.

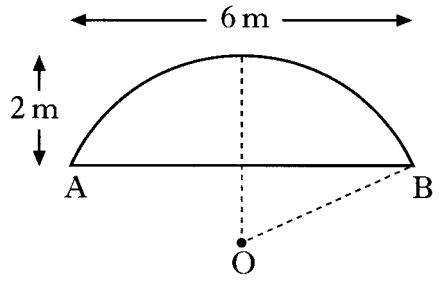
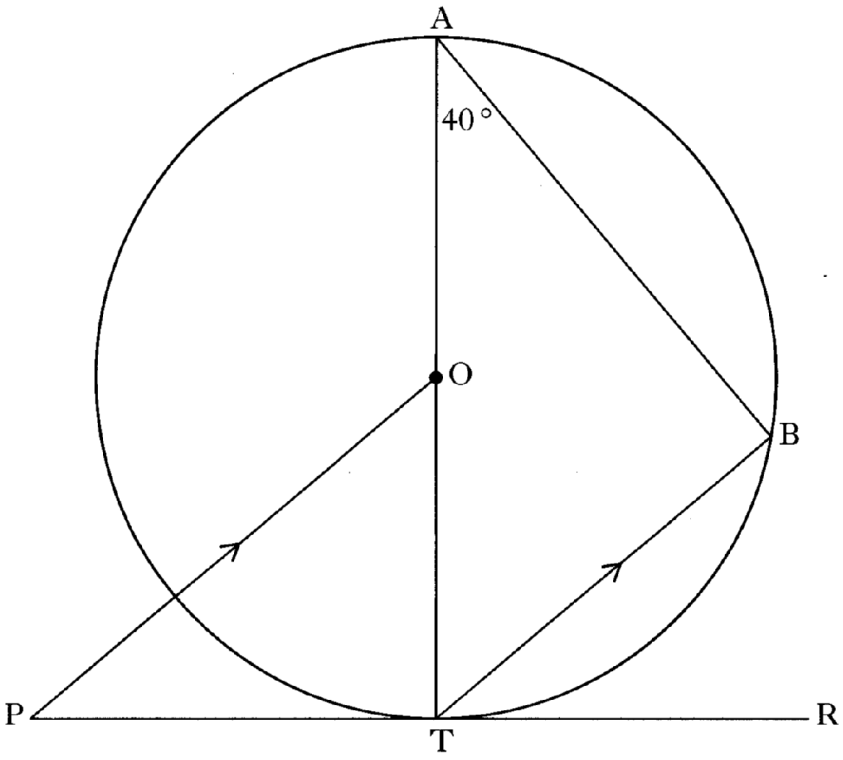
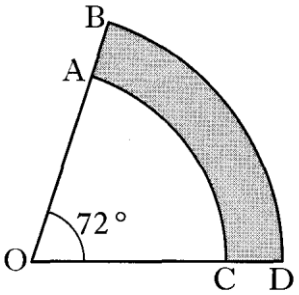
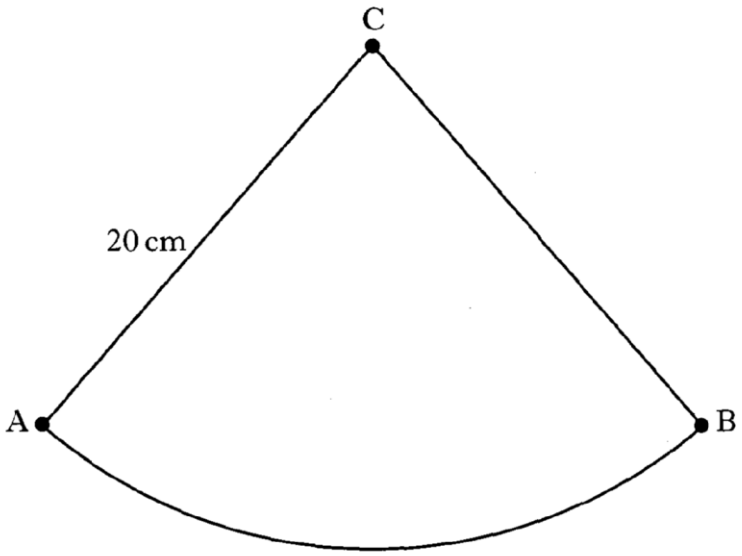


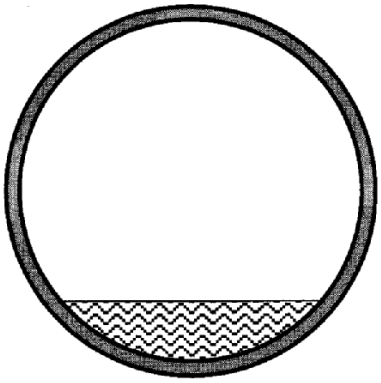
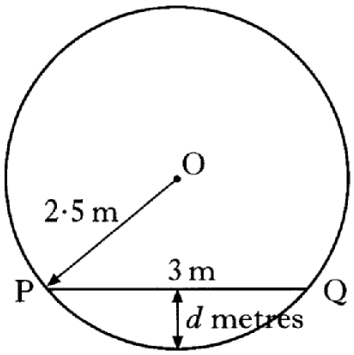
Figure 2

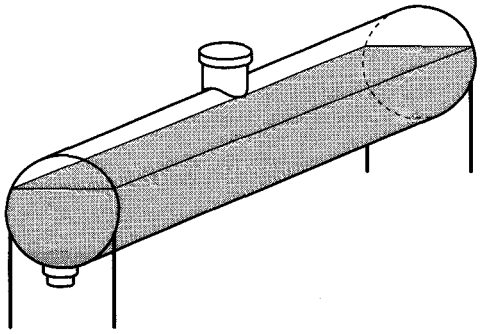
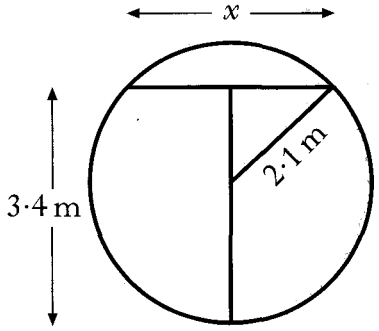
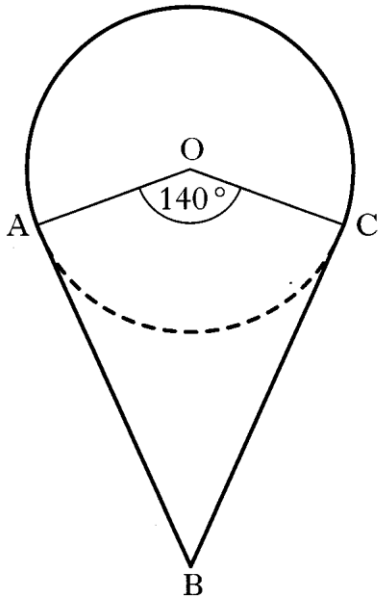
Calculate the length of OB.

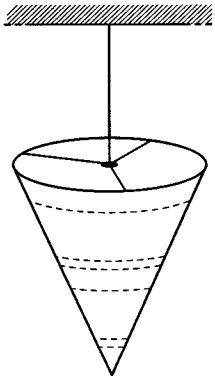
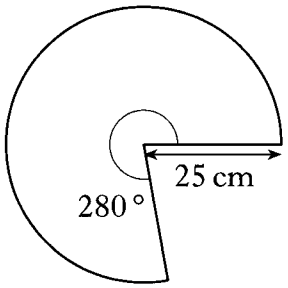
Ans	3·25 m	

Int 2 2002W P1 Q2	 PTR is a tangent to a circle, centre O. Angle BAT = 40 °. PO is parallel to TB. Calculate the size of angle OPT. **Show all working.**	3
Ans	40º	
Int 2 2002W P2 Q2	In the diagram opposite AC and BD are arcs of circles with centres at O. The radius, OA, is 8 metres and the radius, OB, is 10 metres. Angle AOC = 72 °. Find the shaded area. 	4
Ans	22·6m^2	

Int 2 2002 P2 Q4	A pendulum travels along an arc of a circle, centre C.  The length of the pendulum is 20 centimetres. The pendulum swings from A to B. The length of the arc AB is 28·6 centimetres. Find the angle through which the pendulum swings from A to B.	4
Ans	82º	

Int 2 2002 P2 Q9	The diagram below shows a circular cross-section of a cylindrical oil tank.  In the figure below, • O represents the centre of the circle • PQ represents the surface of the oil in the tank • PQ is 3 metres • the radius OP is 2·5 metres.  Find the depth, d metres, of oil in the tank.	4
Ans	d = 0·5m	

Credit 2002 P2 Q6	**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?	4
Ans	(a) 3·3m (b) 0·8 m	
Int 2 2001 P2 Q10	The diagram shows a mirror which has been designed for a new hotel. The shape consists of a sector of a circle and a kite AOCB. • The circle, centre O, has a radius of 50 centimetres. • Angle AOC = 140°. • AB and CB are tangents to the circle at A and C respectively. Find the perimeter of the mirror.  	5
Ans	467 cm	

Credit 2000 P2 Q11	**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°. (*a*) Find the area of the sector of the circle.	3
Ans	(a) 1527.2 cm^3	