

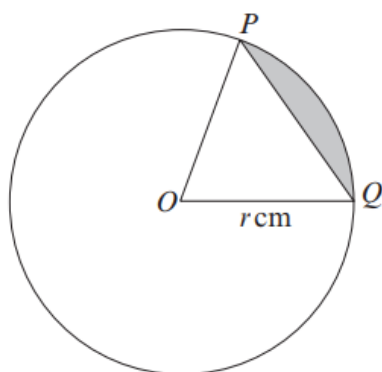
# ARC LENGTH & AREA OF A SECTOR: A2

## A2 Unit 3: Pure Mathematics B

### WJEC past paper questions: 2010 – 2018

$\pi$  radians =  $180^\circ$     Arc Length  $s = r\theta$     Area Sector  $A = \frac{1}{2}r^2\theta$     Area Triangle =  $\frac{1}{2}r^2\sin\theta$

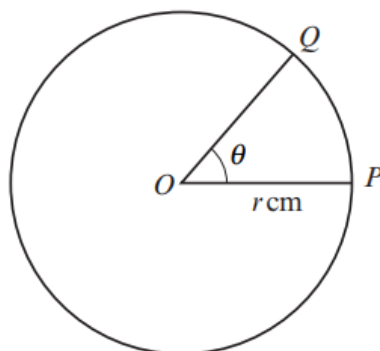
1.



The diagram shows a circle with centre  $O$  and radius  $r$  cm. The points  $P$  and  $Q$  are on the circle and  $\widehat{POQ} = 1.12$  radians. Given that the area of the shaded region is  $10.35 \text{ cm}^2$ , find the value of  $r$ . Give your answer correct to one decimal place. [5]

(Summer 12)

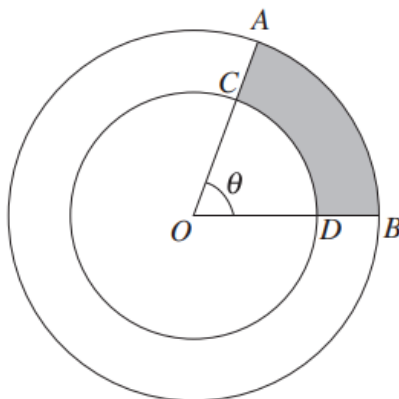
2.



The diagram shows two points  $P$  and  $Q$  on a circle with centre  $O$ . The radius of the circle is  $r$  cm and  $\widehat{POQ} = \theta$  radians. The length of the arc  $PQ$  is  $7.6$  cm and the area of the sector  $POQ$  is  $36.1 \text{ cm}^2$ . Find the values of  $r$  and  $\theta$ . [5]

(Summer 11)

3.

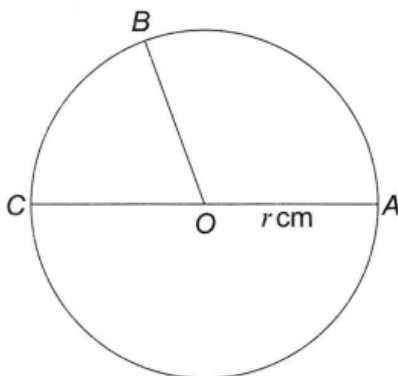


The diagram shows two concentric circles with common centre  $O$ . The radius of the larger circle is  $R$  cm and the radius of the smaller circle is  $r$  cm. The points  $A$  and  $B$  lie on the larger circle and are such that  $\widehat{AOB} = \theta$  radians. The smaller circle cuts  $OA$  and  $OB$  at the points  $C$  and  $D$  respectively. The length of the arc  $AB$  is  $L$  cm **greater** than the length of the arc  $CD$ . The area of the shaded region is  $K$  cm<sup>2</sup>.

- (a) (i) Write down an expression for  $L$  in terms of  $R$ ,  $r$  and  $\theta$ .
- (ii) Write down an expression for  $K$  in terms of  $R$ ,  $r$  and  $\theta$ . [2]
- (b) Use your results to part (a) to find an expression for  $r$  in terms of  $R$ ,  $K$  and  $L$ . [3]

(Summer 10)

4.

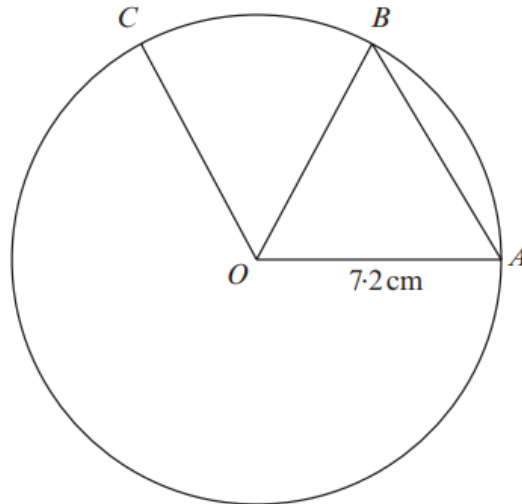


The diagram shows a sketch of a circle with centre  $O$  and radius  $r$  cm. Three points  $A$ ,  $B$  and  $C$  lie on the circle. The line  $AC$  is a diameter of the circle and  $\widehat{AOB} = 2.15$  radians.

Given that the area of sector  $BOC$  is  $26$  cm<sup>2</sup> less than the area of sector  $AOB$ , find the value of  $r$ . Give your answer correct to one decimal place. [5]

(Summer 16)

5.

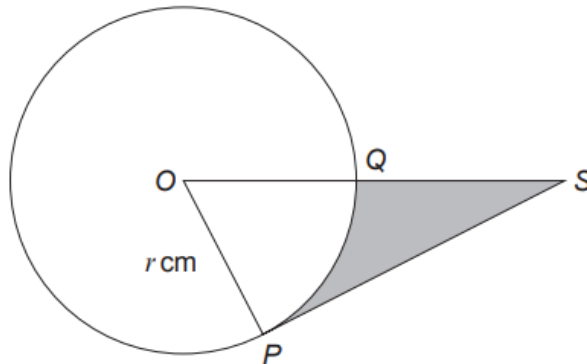


The diagram shows three points  $A$ ,  $B$  and  $C$  on a circle with centre  $O$  and radius  $7.2$  cm.

- (a) Given that  $\widehat{AOB} = 1.1$  radians, find the area of **triangle**  $AOB$ . Give your answer correct to one decimal place. [2]
- (b) The area of **sector**  $BOC$  is  $19.44\text{cm}^2$ . Find the length of the **arc**  $BC$ . [3]

(Summer 13 )

6.

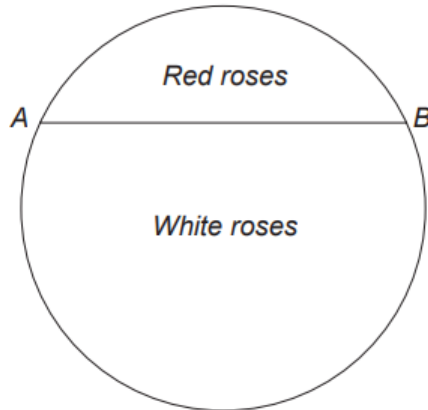


The diagram shows a circle with centre  $O$  and radius  $r$  cm. The points  $P$  and  $Q$  are on the circle and  $\widehat{POQ} = 0.9$  radians. The tangent to the circle at  $P$  intersects the line  $OQ$  produced at the point  $S$ .

- (a) Find an expression in terms of  $r$  for
  - (i) the area of sector  $POQ$ ,
  - (ii) the length of  $PS$ ,
  - (iii) the area of triangle  $POS$ . [3]
- (b) Given that the area of the shaded region is  $95.22\text{cm}^2$ , find the value of  $r$ . [3]

(Summer 14)

7. Gwyn wants to turn part of his garden into a circular flower bed. In order to do this, he digs out a shallow circular hole of radius  $r$  m and then divides it into two segments by means of a thin plank  $AB$ , as shown in the diagram. He plants red roses in the minor segment and white roses in the major segment.

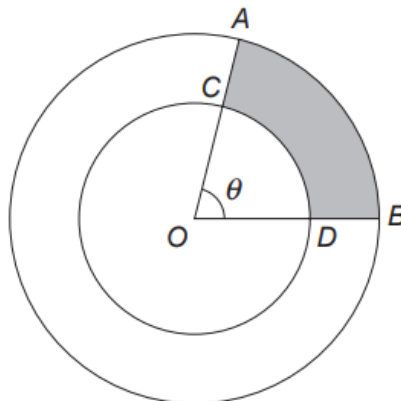


Let the centre of the flower bed be denoted by  $O$ . Show that when  $\widehat{AOB}$  equals 2.6 radians, the area of the flower bed containing white roses is approximately twice the area containing red roses.

[5]

(Summer 15)

- 8.

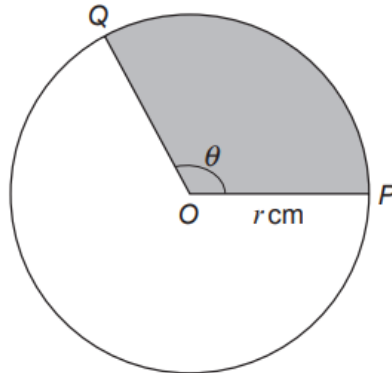


The diagram shows two concentric circles with common centre  $O$ . The radius of the larger circle is  $R$  cm and the radius of the smaller circle is  $r$  cm. The points  $A$  and  $B$  lie on the larger circle and are such that  $\widehat{AOB} = \theta$  radians. The smaller circle cuts  $OA$  and  $OB$  at the points  $C$  and  $D$  respectively. The sum of the lengths of the arcs  $AB$  and  $CD$  is  $L$  cm. The area of the shaded region  $ACDB$  is  $K$  cm<sup>2</sup>.

- (a) (i) Write down an expression for  $L$  in terms of  $R$ ,  $r$  and  $\theta$ .  
 (ii) Write down an expression for  $K$  in terms of  $R$ ,  $r$  and  $\theta$ . [2]
- (b) Given that  $AC = x$  cm, use your results to part (a) to find an expression for  $K$  in terms of  $x$  and  $L$ . [3]

(Summer 17)

9.



The diagram shows two points  $P$  and  $Q$  on a circle with centre  $O$ . The radius of the circle is  $r$  cm and  $\widehat{POQ} = \theta$  radians. The **perimeter** of the shaded sector  $POQ$  is 27 cm and its **area** is  $45\text{ cm}^2$ .

- (a) Write down two equations involving  $r$  and  $\theta$ . [2]
- (b) Show that  $2r^2 - 27r + 90 = 0$ . [2]
- (c) Find the two possible values of  $r$  and the corresponding values of  $\theta$ . [3]

(Summer 18)