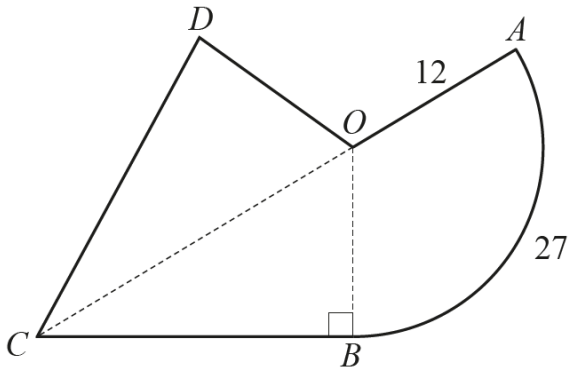
Circular measure – 2023 Additional Math 0606

1. Nov/2023/Paper_0606/12/No.10

In this question all lengths are in centimetres and all angles are in radians.



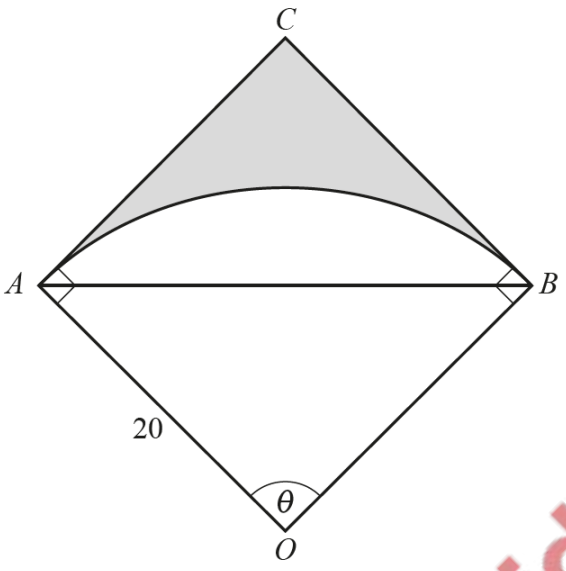
The diagram shows a badge which consists of a minor sector, OAB, of the circle with centre O and radius 12, and a kite $OBCD$, where $OB = OD$ and $CD = CB$. The arc AB has length 27. The line OB is perpendicular to the line CB, and COA is a straight line.

(a) Find the perimeter of the badge. [4]

(b) Find the area of the badge. [3]

2. Nov/2023/Paper_0606/13/No.10

In this question, all lengths are in centimetres and all angles are in radians.

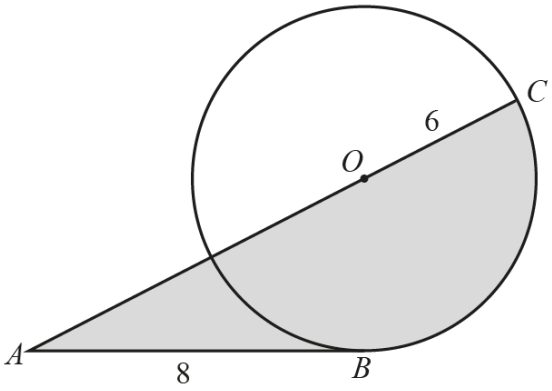


The diagram shows the sector, OAB, of a circle with centre O and radius 20. The perimeter of this sector is 65. The lines CA and CB are both tangents to the circle at the points A and B, so that the triangle ABC is isosceles, with $AC = CB$. The angle AOB is equal to θ.

Find the area of the shaded region. [9]

3. Nov/2023/Paper_0606/21/No.10

In this question all lengths are in centimetres.



The diagram shows a circle centre O with radius 6. The line AB is a tangent to the circle at the point B. The point C lies on the circle such that AOC is a straight line. $AB = 8$.

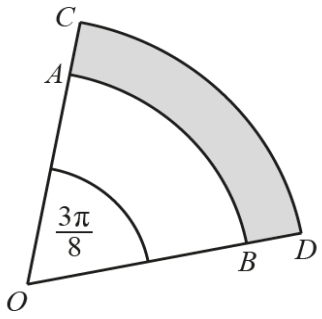
(a) Find the perimeter of the shaded region. [6]

(b) Find the area of the shaded region. [3]

4. March/2023/Paper_0606/22/No.9

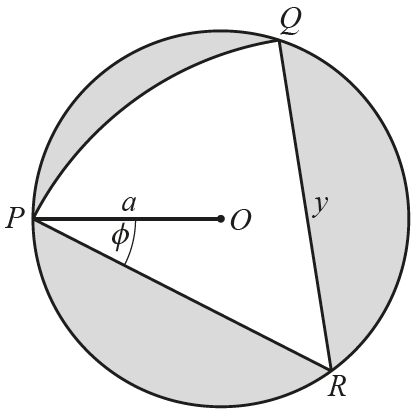
In this question, all lengths are in centimetres and all angles are in radians.

(a)



The diagram shows sectors AOB and COD of two circles with the same centre, O. Angle AOB is $\frac{3\pi}{8}$ and the length of OC is 6.5. It is given that OAC and OBD are straight lines and $OA : OC$ is 4 : 5. Find the perimeter of the shaded region. [3]

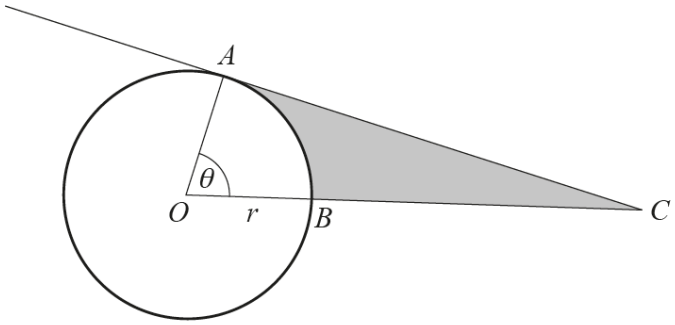
(b)



The diagram shows a circle with centre O and radius a. Sector PQR is a sector of a different circle with centre R and radius y. Angle OPR is ϕ. Find, in terms of a and ϕ only, the total area of the three shaded regions. Simplify your answer. [4]

5. June/2023/Paper_0606/12/No.4

In this question all lengths are in centimetres and all angles are in radians.



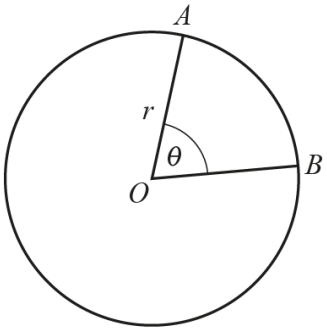
The diagram shows a circle with centre O and radius r. The points A and B lie on the circumference of the circle such that the angle AOB is θ and the length of the minor arc AB is 12. The area of the minor sector AOB is $57.6\,\text{cm}^2$. The point C lies on the tangent to the circle at A such that OBC is a straight line.

(a) Find the values of r and θ. [4]

(b) Find the area of the shaded region. Give your answer correct to 1 decimal place. [3]

6. June/2023/Paper_0606/13/No.6

In this question lengths are in centimetres and angles are in radians.



The diagram shows a circle with centre O and radius r. The points A and B lie on the circumference of the circle. The area of the minor sector OAB is $25\,\text{cm}^2$. The angle AOB is θ.

(a) Find an expression for the perimeter, P, of the minor sector AOB, in terms of r. [3]

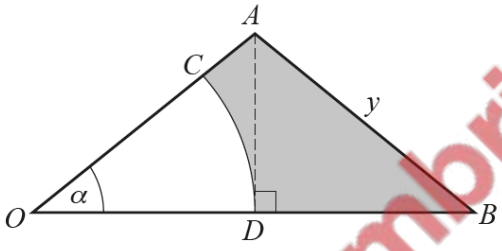
(b) Given that r can vary, show that P has a minimum value and find this minimum value. [4]

7. June/2023/Paper_0606/21/No.9

In this question all lengths are in centimetres and all angles are in radians.

(a) The area of a sector of a circle of radius 24 is $432\,\text{cm}^2$. Find the length of the arc of the sector. [4]

(b)



The diagram shows an isosceles triangle, OAB, with $AO = AB = y$ and height AD.
OCD is a sector of the circle with centre O. Angle AOB is α.

(i) Find an expression for OB in terms of y and α. [1]

(ii) Hence show that the area of the shaded region can be written as $\frac{y^2}{2}\cos\alpha(2\sin\alpha - \alpha\cos\alpha)$. [3]