

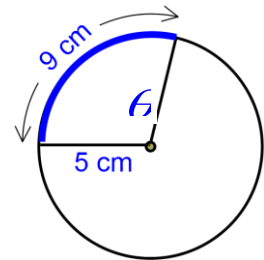
Trigonometry – radian measure, arc length, sector

► selected formulas that appear in both SL & HL formula booklets ◀

- $l = \theta r$, where θ is the angle measured in radians, r is the radius
- $A = \frac{1}{2}\theta r^2$, where θ is the angle measured in radians, r is the radius

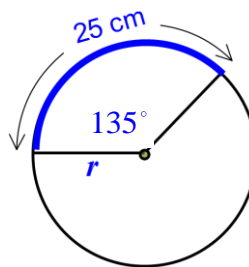
Exercises (answers included)

1. Find the angle θ in the figure in both radian measure and angle measure.

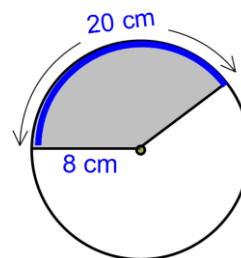


2. Find the radius r of the circle in the figure.

[In the figure, the arc with length of 25 cm subtends a central angle of 135°]

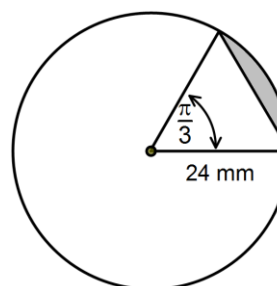


3. Find the area of the shaded region in the figure.

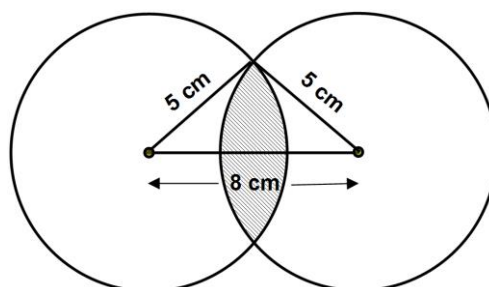


4. An arc of length x cm subtends a central angle of $\frac{3}{2}$ radians in a circle of radius 12 cm. Find x .

5. Find the area of the shaded region in the figure.



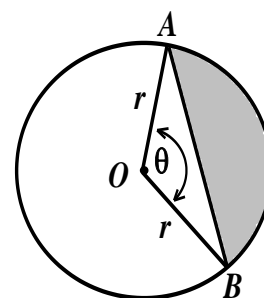
6. Find the area of the overlapping region (shaded below) enclosed by two circles both with radius of 5 cm, positioned such that their centers are 8 cm apart.



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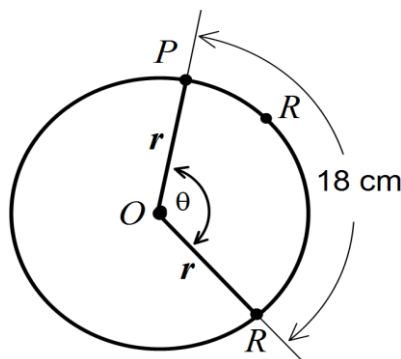
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7. The diagram shows a circle with centre O and radius r . The central angle AOB has a measure of θ radians. Show that the area of the shaded region is $\frac{1}{2}r^2(\theta - \sin \theta)$.

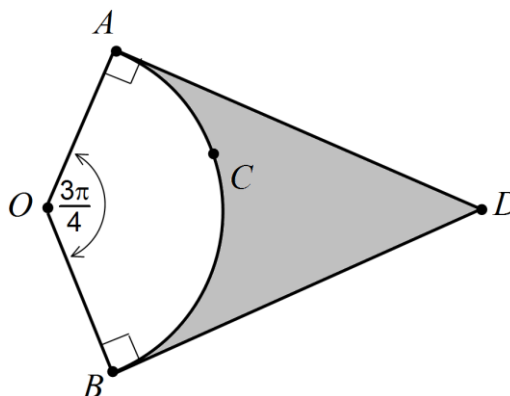


8. The diagram below shows a circle with radius r and centre O . The central angle $POR = \theta$.

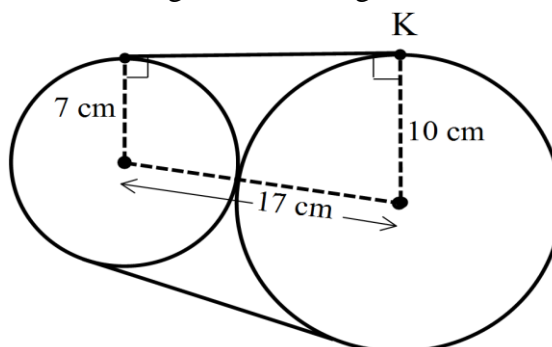
The length of the minor arc PR is 18 cm. The area of the sector $OPSR$ is 108 cm^2 . Find the value of r and the value of θ .



9. ACB is an arc of a circle with centre O and radius 8 cm. AD and BD are tangents to the circle at A and B and angle $AOB = \frac{3\pi}{4}$. Find the area enclosed by arc ACB and line segments AD and BD (region shaded in the diagram below).



10. Two circles, one of radius 10 cm and one of radius 7 cm, are positioned such that they intersect at a single point as shown in the diagram below. A length of string is wrapped around both circles starting at point K and finishing at point K. Find the length of the string.



[diagram not to scale]

Trigonometry – radian measure, arc length, sector**Answers**

1. $\theta = \frac{9}{5}$ radians; $\theta \approx 103^\circ$

2. $r = \frac{100}{3\pi} \approx 10.6$ cm

3. area = 80 cm^2

4. $x = 18$ cm

5. area = $96\pi - 144\sqrt{3} \approx 52.2 \text{ cm}^2$

6. area $\approx 8.18 \text{ cm}^2$

8. $r = 12$ cm, $\theta = 1.5$ radians ($\theta \approx 85.9^\circ$)

9. 79.1 cm^2

10. 87.9 cm