Pei Hwa Secondary School
Mathematics Department

Secondary 4 NA Review Worksheet

Name: _____ **Class:** _____ **TG:** _____ **Date:** _____

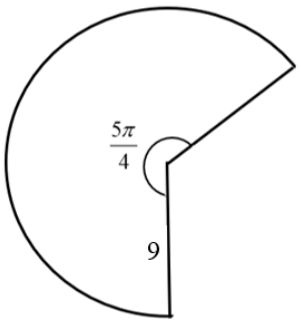
Chapter 2: Arc Length, Sector Area and Radian Measure

Success Criteria

	Success Criteria	Indicate confidence level for each success criteria. 
	2.1 Length of Arc	
1.	I can identify what is arc length.	
2.	I can find arc length with given angle in degrees.	
3.	I can find angle with given arc length.	
4.	I can solve word problem involving arc length.	
	2.2 Area of sector	
5.	I can identify what is a sector of a circle.	
6.	I can find sector area with given angle in degrees.	
7.	I can find radius with given area sector.	
8.	I can identify what is a segment of a circle.	
9.	I can find area of segment.	
10.	I can solve word problem involving sector area and segment.	
	2.3 Radian measure	
11.	I can convert radians to degree.	
12.	I can convert degree to radian.	
13.	I can use calculator to evaluate trigonometric ratio of angles.	
14.	I can use calculator to evaluate inverse trigonometric ratio.	
15.	I can solve problems involving radian measure.	
	2.4 Arc length and sector area using radian measure	
16.	I can find arc length with given angle in radian measure.	
17.	I can find area sector with given angle in radian measure.	

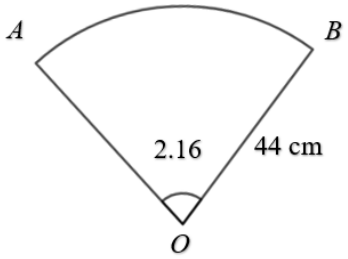
18.	I can find segment with given angle in radian measure.	
19.	I can solve word problems involving radian measure.	

1. Find the area of a sector of a circle with angle $\frac{5\pi}{4}$ radians and radius 9 cm.



[2023, Dunearn Sec, Prelims, P1, Q6]

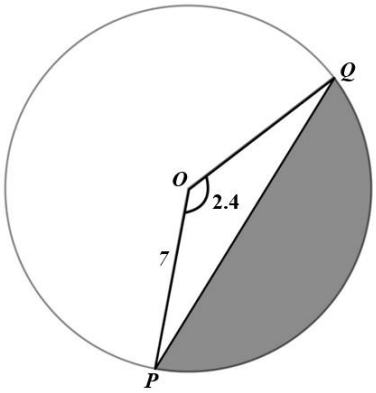
2. In the diagram, A and B lie on the circumference of a circle and O is the centre of the circle



Given that angle AOB = 2.16 radians and the radius of the circle is 44 cm, calculate the perimeter of the minor sector, AOB.

[2022, Kranji Sec, MYE, P2, Q4]

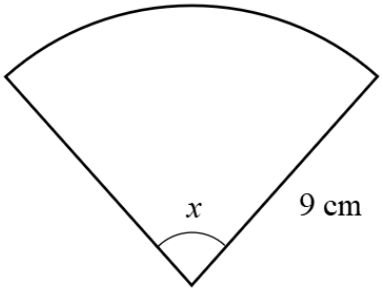
3.



P and Q are points on the circle centre O.
Angle POQ = 2.4 radians.
The radius of the circle is 7 cm.
Calculate
(i) the length of minor arc PQ,
(ii) the area of the segment shaded in the diagram.

[2023, Bukit View Sec, Prelims, P2, Q11b]

4.

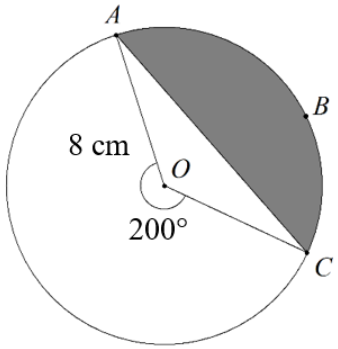


The diagram shows a sector of a circle with radius 9 cm and angle x radians.

The sector has a perimeter of 31.2 cm.
Calculate x.

[2023, Hillgrove Sec, Prelims, P1, Q16]

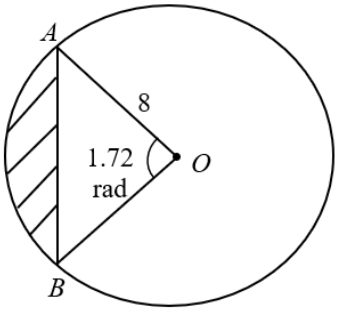
5. A circle has centre O and radius 8 cm. The reflex angle $\angle AOC = 200°$.



(a) Calculate the minor arc length ABC.
(b) Calculate the area of the minor shaded segment.

[2023, Bendemeer Sec, Prelims, P1, Q22]

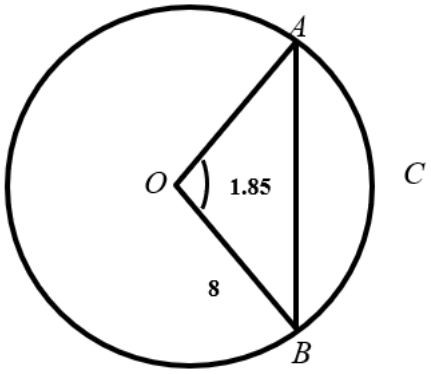
6. The points A and B lie on a circle centre O. The radius of the circle is 8 cm and $\angle AOB$ is 1.72 radian.



Find the
(i) length of minor arc AB,
(ii) length of line AB,
(iii) perimeter of the shaded region.

[2018, Boon Lay Sec, Prelims, P2, Q12a]

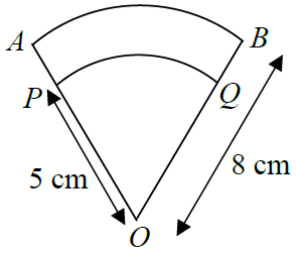
7. In the diagram, O is the centre of the circle. $\angle AOB = 1.85$ radians and OB = 8cm.



Calculate
(i) the length of the chord AB,
(ii) the area of minor segment ABC.

[2018, Fuhua Sec, Prelims, P2, Q12b]

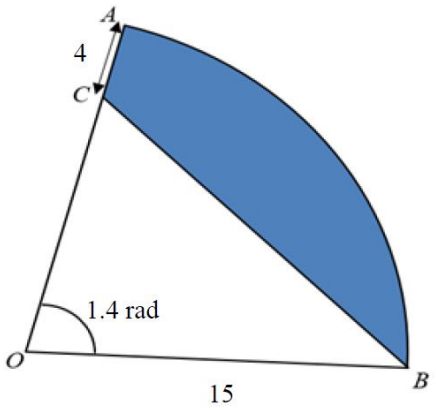
8. In the diagram, AB and PQ are arcs of a circle, centre O, with radii 8 cm and 5 cm respectively. Arc PQ has a length of 6.5 cm.



(a) Find angle AOB.
(b) Find the perimeter of $ABPQ$.

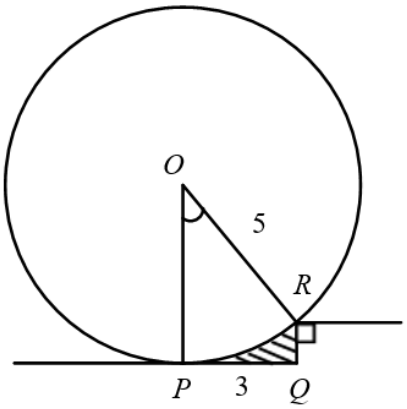
[2023, Queensway Sec, Prelims, P1, Q19]

9. In the diagram, OAB is a sector of a circle, centre O and radius 15 cm.
C lies on OA such that $AC = 4$ cm.
$\angle AOB = 1.4$ rad.
Find the area of the shaded region.



[2023, Hua Yi Sec, Prelims, P1, Q18]

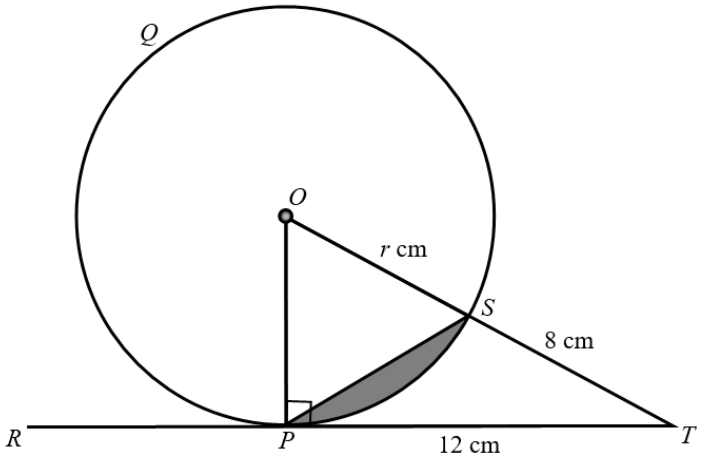
10. In the diagram, a toy-car wheel of radius 5 cm is in contact with the horizontal ground at P and touches the stair at R. The length of $PQ = 3$ cm.



(i) Show that angle POR is approximately 0.644 rad.
(ii) Calculate the area of sector POR.
(iii) Calculate the area of the shaded region.

[2018, Naval Base Sec, MYE, P2, Q12b]

11. In the diagram, P, Q, S are points on the circle with centre O and radius, r cm.
OPT is a right-angled triangle, RPT is a straight line, $ST = 8$ cm and $PT = 12$ cm.



(a) By using Pythagoras' Theorem or otherwise, show that $r = 5$ cm.
(b) Calculate angle POT.
(c) Find the length of major arc PQS.
(d) Find the area of the shaded segment.

[2019, Geylang Methodist Sec, Prelims, P2, Q9]

Answer Key:

1.	$159\ cm^2$	
2.	183.04 cm	
3.	(i)	16.8 cm
	(ii)	$42.3\ cm^2$
4.	$1\frac{7}{15}$	
5.	(a)	22.3 cm
	(b)	$78.4\ cm^2$
6.	(i)	13.76 cm
	(ii)	12.1 cm
	(iii)	25.9 cm (3 s.f)
7.	(a)	12.8 cm
	(b)	$28.4\ cm^2$
8.	(a)	74.5°
	(b)	22.9 cm
9.	$76.2\ cm^2$	
10.	(b)	$8.05\ cm^2$
	(c)	$0.95\ cm^2$
11.	(b)	67.4°
	(c)	25.5 cm
	(d)	$3.16\ cm^2$

Worked Solutions:

1.	area of sector $= \frac{1}{2} \times (9)^2 \times \left(\frac{5\pi}{4}\right)$	
	$= 159 \text{ cm}^2$	
2.	perimeter $= 2.16 \times 44 + 2(44)$	
	$= 183.04 \text{ cm}$	
3.	(i)	minor arc $= 7 \times 2.4$
		$= 16.8 \text{ cm}$
	(ii)	shaded segment $= \left(\frac{1}{2} \times 7^2 \times 2.4\right) - \left(\frac{1}{2} \times 7^2 \times \sin 2.4\right)$
		$= 42.3 \text{ cm}^2$
4.	arc length $= 31.2 - 2(9)$	
	$= 13.2 \text{ cm}$	
	$r \times x = 13.2$	
	$9x = 13.2$	
	$x = 1\frac{7}{15}$	
5.	(a)	minor arc $= \frac{360° - 200°}{360°} \times 2\pi(8)$
		$= 22.3 \text{ cm}$
	(b)	shaded segment $= \frac{360° - 200°}{360°} \times \pi(8)^2 - \frac{1}{2}(8)^2 \sin(360° - 200°)$
		$= 78.4 \text{ cm}^2$
6.	(i)	arc $AB = 8 \times 1.72$
		$= 13.76 \text{ cm}$
	(ii)	$AB^2 = 8^2 + 8^2 - 2(8)(8)\cos 1.72$
		$AB = \sqrt{8^2 + 8^2 - 2(8)(8)\cos 1.72}$
		$= 12.125$
		$= 12.1 \text{ cm}$
	(iii)	perimeter of shaded region $= 13.76 + 12.125$
		$= 25.9 \text{ cm (3 s.f)}$
7.	(a)	$AB^2 = 8^2 + 8^2 - 2(8)(8)\cos 1.85$
		$AB = \sqrt{8^2 + 8^2 - 2(8)(8)\cos 1.85}$
		$= 12.777$
		$= 12.8 \text{ cm}$
	(b)	shaded segment $= \frac{1}{2} \times (8)^2 \times 1.85 - \frac{1}{2}(8)^2 \sin(1.85)$
		$= 28.4 \text{ cm}^2$

8.	(a)	Arc $PQ = 6.5$ $\frac{x}{360°} \times 2\pi \times 5 = 6.5$ $x = \frac{6.5 \times 360°}{2\pi(5)}$ $\angle AOB = 74.484$ $= 74.5°$
	(b)	perimeter $= \frac{74.484°}{360°} \times 2\pi(8) + 2(3)$ $= 22.9$ cm
9.		area sector $OAB = \frac{1}{2}(15)^2(1.4)$ $= 157.5$ cm^2 $OC = 15 - 4$ $= 11$ cm area of shaded region $= 157.5 - \frac{1}{2}(15)(11)\sin 1.4$ $= 76.2$ cm^2
10.	(a)	$\sin \angle POR = \frac{3}{5}$ $\angle POR = \sin^{-1}\left(\frac{3}{5}\right)$ $= 0.644$ rad [shown]
	(b)	area of sector $= \frac{1}{2} \times 5^2 \times 0.644$ $= 8.05$ cm^2
	(c)	$RQ = 5 - \sqrt{5^2 - 3^2}$ $= 1$ cm area of trapezium $= \frac{1}{2} \times (5+1) \times 3$ $= 9$ cm^2 area of shaded region $= 9 - 8.05$ $= 0.95$ cm^2
11.	(a)	$OT^2 = OP^2 + PT^2$ $(r+8)^2 = r^2 + 12^2$ $r^2 + 16r + 64 = r^2 + 144$ $16r = 144 - 64$ $r = 5$ cm [shown]

	(b)	$\tan \angle POT = \frac{12}{5}$ $\angle POT = \tan^{-1}\left(\frac{12}{5}\right)$ $= 67.3801$ $= 67.4°$
	(c)	reflex $\angle POS = 360° - 67.3801°$ length of major arc $PQS = \frac{360° - 67.3801°}{360°} \times 2\pi(5)$ $= 25.5$ cm
	(d)	area of segment $= \frac{67.3801°}{360°} \times \pi(5)^2 - \frac{1}{2} \times (5)^2 \times \sin 67.3801°$ $= 3.16$ cm^2