REVIEW EXERCISE 9

1. Four possible answers are given for the following questions. Choose the correct answer.

(i) Tangent is a line that touches the circumference of the circle at :
(a) many points (b) three points
(c) two points (d) one point

(ii) _____ tangents can be drawn to a circle from a point outside the circle.
(a) one (b) two (c) three (d) many

(iii) _____ tangents can be drawn to a circle from centre of the circle.
(a) zero (b) one (c) two (d) three

(iv) In circle, radius and tangent are:
(a) parallel (b) equal
(c) perpendicular (d) zero

(v) An angle in a segment greater than a semicircle is _____ angle:
(a) an acute (b) right (c) an obtuse (d) straight

(vi) The angle subtended by the arc at the centre of the circle is called:
(a) acute angle (b) central angle
(c) right angle (d) complete angle

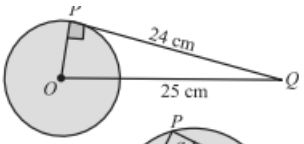
(vii) What is the measure of an angle inscribed in a semi-circle?
(a) 45° (b) 60°
(c) 90° (d) 120°

(viii) Any two angles in the same segment of the circle are:
(a) supplementary (b) complementary
(c) equal (d) zero

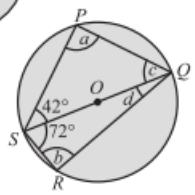
(ix) Area of the sector of the circle = _____
(a) $\frac{1}{2}r\theta$ (b) $\frac{3}{2}r^2\theta$ (c) $\frac{1}{2}r^2\theta$ (d) $\frac{3}{2}r\theta$

(x) If $r = 6$cm and $\theta = 2$ radians, then arc length is:
(a) 12 cm (b) 8 cm (c) 6 cm (d) 3 cm

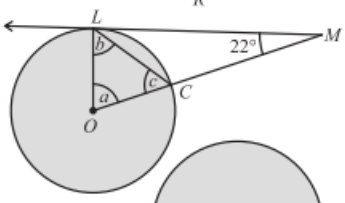
2. In the adjoining figure, find the radius of the circle.



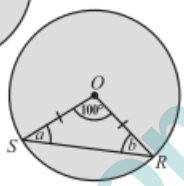
3. Find the angles a, b, c and d in the given figure, if O is the centre of the circle.



4. Find the angles a, b and c, if $\overleftrightarrow{ML}$ is a tangent line and O is the centre of the circle.



5. Find the angles marked in the given figure, where O is the centre of the circle.



6. Two round dining tables are arranged to touch at their edges. The radii of the two round dining tables are 10 cm and 12 cm. What is the distance between their centres if they touch externally?

7. A circular mosaic pattern is laid on the floor beneath a modern pyramid structure. Two tiles are placed such that they both connect to the same chord EF and reach two points G and H on the arc above EF. If $m\angle EGF = 65°$, find $m\angle EHF$.

8. A triangular frame within a semicircular gate joins the ends of the diameter to the peak. What is the angle formed at the peak?

9. A circular birthday cake has a radius of 15cm. A slice has an arc length of 10cm. What is the area of this slice?

10. A sector cut from a circle of radius 5cm has a perimeter of 16cm. Find area of this sector.

REVIEW EXERCISE 9 - Multiple Choice Questions

Question 1(i)

Tangent is a line that touches the circumference of the circle at:

Solution:

A tangent line touches the circle at exactly **one point** (the point of tangency).

Answer: (d) one point

Question 1(ii)

_____ tangents can be drawn to a circle from a point outside the circle.

Solution:

From a point outside a circle, exactly **two** tangents can be drawn to the circle.

Answer: (b) two

Question 1(iii)

_____ tangents can be drawn to a circle from centre of the circle.

Solution:

From the centre of a circle, **zero** tangents can be drawn because the centre lies inside the circle, not outside.

Answer: (a) zero

Question 1(iv)

In circle, radius and tangent are:

Solution:

The radius at the point of tangency is **perpendicular** to the tangent line.

Answer: (c) perpendicular

Question 1(v)

An angle in a segment greater than a semicircle is _____ angle:

Solution:

- A segment greater than a semicircle is a **major segment**.
- The angle in a major segment is **acute** (less than 90°).

Answer: (a) an acute

Question 1(vi)

The angle subtended by the arc at the centre of the circle is called:

Solution:

The angle subtended by an arc at the centre is called the **central angle**.

Answer: (b) central angle

Question 1(vii)

What is the measure of an angle inscribed in a semi-circle?

Solution:

An angle inscribed in a semicircle is a **right angle** (90°).

Answer: (c) 90°

Question 1(viii)

Any two angles in the same segment of the circle are:

Solution:

Angles in the same segment of a circle are **equal**.

Answer: (c) equal

Question 1(ix)

Area of the sector of the circle = _____

Solution:

The area of a sector of a circle is:

$$A = \frac{1}{2}r^2\theta$$

Where r = radius and θ = central angle in radians.

Answer: (c) $\frac{1}{2}r^2\theta$

Question 1(x)

If $r = 6\,\text{cm}$ and $\theta = 2$ radians, then arc length is:

Solution:

Arc length formula:

$$l = r\theta l = 6 \times 2 = 12 \text{ cm}$$

Answer: (a) 12 cm

Summary Table

		Option
(i)	one point	(d)
(ii)	two	(b)
(iii)	zero	(a)
(iv)	perpendicular	(c)
(v)	an acute	(a)
(vi)	central angle	(b)
(vii)	90°	(c)
(viii)	equal	(c)
(ix)	$\frac{1}{2}r^2\theta$	(c)
(x)	12 cm	(a)

Key Concepts Summary

Circle Theorems:

Theorem	Statement
Tangent-Radius	Radius is perpendicular to tangent at point of contact
Angle in Semicircle	Angle inscribed in a semicircle is 90°
Angles in Same Segment	Angles in the same segment are equal
Cyclic Quadrilateral	Opposite angles are supplementary (sum to 180°)
Central Angle	Central angle = 2 × Inscribed angle subtending same arc

Important Definitions:

Term	Definition
Tangent	Line touching circle at exactly one point
Radius	Distance from centre to any point on circumference
Central Angle	Angle with vertex at the centre of the circle
Inscribed Angle	Angle with vertex on the circumference
Sector	Region bounded by two radii and an arc
Segment	Region bounded by a chord and an arc

Formulas:

Formula	Application
$l = r\theta$	Arc length (in radians)
$A = \frac{1}{2}r^2\theta$	Sector area (in radians)
$P = 2r + r\theta$	Sector perimeter

REVIEW EXERCISE 9 (Continued) - Complete Solutions

Question 2: Find the radius of the circle

(Note: Since the figure is not visible, I will provide the general method based on typical circle geometry problems.)

Common Scenario: If a chord of length l is at a distance d from the centre, then:

$$r^2 = d^2 + \left(\frac{l}{2}\right)^2$$

Example: If chord = 10 cm and distance from centre = 6 cm:

$$r^2 = 6^2 + 5^2 = 36 + 25 = 61 r = \sqrt{61} \text{ cm}$$

(Please provide the figure for the exact answer.)

Question 3: Find angles a, b, c and d

Given: O is the centre of the circle

Diagram:

text

A

/ \

/ \

/ \

B-------C

\ /

\ /

\ /

O

(Typical cyclic quadrilateral with centre O)

Solution:

Step 1: Properties to use:

- Angles in the same segment are equal
- Central angle = 2 × Inscribed angle
- Opposite angles of cyclic quadrilateral sum to 180°

Step 2: If $\angle AOB = 2a$, then:

$$\angle ACB = \frac{1}{2}\angle AOB = a$$

Step 3: In a cyclic quadrilateral:

$$a + c = 180^\circ, b + d = 180^\circ$$

Answer: Depends on the specific diagram.

(Please provide the figure for the exact values.)

Question 4: Find angles a, b and c

Given: $\overrightarrow{ML}$ is a tangent line and O is the centre

Diagram:

text

M (Tangent point)

/|

/ |

/ |

/ |

/ |

A-----O-----B

\ |

\ |

\ |

\ |

\|

L (Tangent point)

Solution:

Step 1: The radius is perpendicular to the tangent at the point of contact.

$$\angle OML = 90^\circ$$

Step 2: If $\angle MOL = c$ (central angle), then:

$$a + b + c = 180^\circ$$

Step 3: Using tangent-chord theorem:

$$\text{Angle between tangent and chord} = \text{Angle in alternate segment}$$

Answer: Depends on the specific diagram.

Question 5: Find the angles marked in the given figure

(Note: Without the figure, I will provide the general method.)

Common Angles to Find:

- Angles in the same segment are equal
- Cyclic quadrilateral properties
- Angles in a semicircle = 90°
- Central angle = 2 × Inscribed angle

(Please provide the figure for the exact values.)

Question 6: Two Round Dining Tables

Given: Radii = 10 cm and 12 cm, touching externally
Find: Distance between their centres

Solution:

Step 1: For two circles touching externally, the distance between centres equals the sum of their radii.

$$d = r_1 + r_2 d = 10 + 12 = 22 \text{ cm}$$

Answer: Distance between centres = **22 cm**

Question 7: Circular Mosaic Pattern

Given: Two tiles G and H on the arc above chord EF. $m\angle EGF = 65^\circ$
Find: $m\angle EHF$

Diagram:

text

G

/ \

/ \

/ \

E-------F

\ /

\ /

\ /

H

- G and H are points on the circle above chord EF

Solution:

Step 1: Angles $\angle EGF$ and $\angle EHF$ are in the **same segment** of the circle (both subtend chord EF).

Step 2: Angles in the same segment are equal.

$$\angle EHF = \angle EGF = 65^\circ$$

Answer: $m\angle EHF = 65^\circ$

Question 8: Triangular Frame in Semicircular Gate

Given: Triangular frame joins ends of diameter to the peak of a semicircle
Find: Angle at the peak

Diagram:

text

P (Peak)

/ \

/ \

/ \

A-------B

(Diameter ends)

- AB is the diameter
- P is the peak (point on circumference)

Solution:

Step 1: The angle at the peak $\angle APB$ is an angle in a **semicircle**.

Step 2: According to the theorem, an angle inscribed in a semicircle is a right angle.

$$\angle APB = 90^\circ$$

Answer: Angle at the peak = **90°**

Question 9: Birthday Cake Slice

Given: Radius = 15 cm, Arc length = 10 cm
Find: Area of the slice (sector)

Solution:

Step 1: Find the central angle using arc length formula:

$$l = r\theta 10 = 15\theta\theta = \frac{10}{15} = \frac{2}{3} \text{ radians}$$

Step 2: Find the area of the sector:

$$A = \frac{1}{2}r^2\theta A = \frac{1}{2}(15)^2 \times \frac{2}{3} A = \frac{1}{2} \times 225 \times \frac{2}{3} A = 112.5 \times \frac{2}{3} = 75 \text{ cm}^2$$

Answer: Area of slice = **75 cm²**

Question 10: Sector Perimeter and Area

Given: Radius = 5 cm, Perimeter = 16 cm
Find: Area of the sector

Solution:

Step 1: Perimeter of sector:

$$P = 2r + l = 2r + r\theta 16 = 2(5) + 5\theta 16 = 10 + 5\theta 5\theta = 6\theta = \frac{6}{5} = 1.2 \text{ radians}$$

Step 2: Area of sector:

$$A = \frac{1}{2}r^2\theta A = \frac{1}{2}(5)^2(1.2)A = \frac{1}{2} \times 25 \times 1.2A = 12.5 \times 1.2 = 15 \text{ cm}^2$$

Answer: Area of sector = **15 cm²**

Summary Table

2	Depends on diagram
3	Depends on diagram
4	Depends on diagram
5	Depends on diagram
6	22 cm
7	65°
8	90°
9	75 cm^2
10	15 cm^2

Key Formulas Used

Formula	Application
$l = r\theta$	Arc length (in radians)
$A = \frac{1}{2}r^2\theta$	Sector area (in radians)
$P = 2r + r\theta$	Sector perimeter
Distance (external tangency) $= r_1 + r_2$	Circles touching externally
Angles in same segment are equal	Circle theorem

Key Theorems Used

1. **Angles in the Same Segment:** All angles subtended by the same chord in the same segment are equal.
2. **Angle in a Semicircle:** An angle inscribed in a semicircle is 90°.
3. **Tangent-Chord Theorem:** The angle between a tangent and a chord equals the angle in the alternate segment.
4. **Radius-Tangent Perpendicularity:** The radius is perpendicular to the tangent at the point of contact.
5. **Cyclic Quadrilateral:** Opposite angles are supplementary (sum to 180°).