NCERT Solutions Class 9 Maths
Chapter 9: Circles
EXERCISE 9.3

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Quick Summary: In NCERT Solutions Class 9 Maths Chapter 9 Exercise 9.3, students learn about equal chords and their properties in circles through comprehensive problem-solving. This exercise covers equal chords theorem, perpendicular bisectors, and angle relationships which are essential for CBSE board exams and competitive examinations.

Key Takeaways:

- Equal chords of a circle are equidistant from the center: if AB = CD, then perpendicular distances from center O are equal
- Perpendicular from the center of a circle to a chord bisects the chord and creates two equal arcs
- Angles subtended by equal chords at the center are equal: \angle AOB = \angle COD when AB = CD
- Understanding chord properties helps solve complex problems involving intersecting chords and cyclic quadrilaterals in CBSE exams

Complete Solutions

Question 1

QUESTION

In Fig. 9.23, A, B and C are three points on a circle with centre O such that ∠BOC = 30° and ∠AOB = 60°. If D is a point on the circle other than the arc ABC, find ∠ADC.

SOLUTION

We are given a circle with center O, and points A, B, and C on the circle. We know that ∠BOC = 30° and ∠AOB = 60°. Point D is on the circle, not on the arc ABC. We need to find the measure of ∠ADC.

Step 1: Find the measure of ∠AOC

Since ∠AOC is formed by ∠AOB and ∠BOC, we can find its measure by adding the measures of these two angles.

Step 2: Apply the Angle at the Center Theorem

The Angle at the Center Theorem states that the angle subtended by an arc at the center of the circle is twice the angle subtended by it at any point on the remaining part of the circle.

In this case, arc AC subtends ∠AOC at the center and ∠ADC at point D on the remaining part of the circle.

Therefore, we have:

Step 3: Solve for ∠ADC

We know that ∠AOC = 90°, so we can substitute this value into the equation:

Divide both sides by 2 to find ∠ADC:

Final Answer: The measure of ∠ADC is 45°.

ANSWER

45°

Question 2

QUESTION

A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.

SOLUTION

This question tests our understanding of the relationship between chords, radii, and angles subtended at different parts of a circle.

Step 1: Draw the diagram and label points

Let the circle have center O and radius r. Let chord AB = r. Let C be a point on the major arc and D be a point on the minor arc.

Step 2: Find the angle subtended at the center

Since OA = OB = AB = r, triangle OAB is an equilateral triangle. Therefore, .

Step 3: Find the angle subtended at a point on the major arc

The angle subtended by an arc at the center is twice the angle subtended by it at any point on the remaining part of the circle. Therefore, .

Step 4: Find the reflex angle at the center

The reflex angle .

Step 5: Find the angle subtended at a point on the minor arc

The angle subtended by the major arc at the center is twice the angle subtended by it at any point on the remaining part of the circle (minor arc). Therefore, .

Final Answer: The angle subtended by the chord at a point on the minor arc is 150°, and at a point on the major arc is 30°.

ANSWER

150°, 30°

Question 3

QUESTION

In Fig. 9.24, ∠PQR = 100°, where P, Q and R are points on a circle with centre O. Find ∠OPR.

SOLUTION

We are given a circle with center O, and points P, Q, and R on the circle. We know that , and we need to find .

Step 1: Find the reflex angle

The angle subtended by an arc at the center is twice the angle subtended by it at any point on the remaining part of the circle. Therefore, the reflex is twice .

Step 2: Find

Since the sum of an angle and its reflex is , we can find as follows:

Step 3: Analyze triangle

In , because they are both radii of the same circle. Therefore, is an isosceles triangle.

In an isosceles triangle, the angles opposite the equal sides are equal. Thus, .

Step 4: Find

The sum of the angles in a triangle is . Therefore, in :

Since , we can write:

Substitute the value of :

Final Answer:

ANSWER

10°

Question 4

QUESTION

In Fig. 9.25, ∠ABC = 69°, ∠ACB = 31°, find ∠BDC.

SOLUTION

This question tests the understanding of angles in the same segment of a circle.

Step 1: Find ∠BAC

In triangle ABC, the sum of all angles is 180°. Therefore,

We are given that and . Substituting these values, we get:

Subtracting 100° from both sides:

Step 2: Apply the property of angles in the same segment

Angles subtended by the same segment in a circle are equal. In this case, ∠BAC and ∠BDC are subtended by the same segment BC.

Therefore,

Step 3: Substitute the value of ∠BAC

Since we found that , we can substitute this value to find ∠BDC:

Final Answer:

ANSWER

80°

Question 5

QUESTION

In Fig. 9.26, A, B, C and D are four points on a circle. AC and BD intersect at a point E such that ∠BEC = 130° and ∠ECD = 20°. Find ∠BAC.

SOLUTION

We are given a circle with four points A, B, C, and D on it. AC and BD intersect at E. We know ∠BEC = 130° and ∠ECD = 20°, and we need to find ∠BAC.

Step 1: Find ∠DEC

Since ∠BEC and ∠DEC form a linear pair, their sum is 180°.

Step 2: Find ∠EDC

Consider triangle DEC. The sum of angles in a triangle is 180°.

Step 3: Relate ∠BAC and ∠BDC

Angles subtended by the same segment on the circle are equal. ∠BAC and ∠BDC are subtended by the same segment BC.

Therefore, . Note that is the same as .

Step 4: Find ∠BAC

Since and , we have:

Final Answer:

ANSWER

110°

Question 6

QUESTION

ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. If ∠DBC = 70°, ∠BAC is 30°, find ∠BCD. Further, if AB = BC, find ∠ECD.

SOLUTION

This question involves finding angles in a cyclic quadrilateral using properties of angles in the same segment and isosceles triangles.

Step 1: Find ∠BDC

Since angles in the same segment are equal, we have:

Step 2: Find ∠BCD

In triangle BCD, we know and . The sum of angles in a triangle is 180°, so:

Step 3: Find ∠BAD

Since ABCD is a cyclic quadrilateral, opposite angles are supplementary. Therefore:

Step 4: Find ∠CAD

Step 5: Find ∠BCA

Given that AB = BC, triangle ABC is an isosceles triangle. Therefore, .

Step 6: Find ∠DCA

Step 7: Find ∠ECD

Final Answer: and

ANSWER

∠BCD = 80° and ∠ECD = 50°

Question 7

QUESTION

If the non-parallel sides of a trapezium are equal, prove that it is cyclic.

SOLUTION

We need to prove that a trapezium with equal non-parallel sides is cyclic. A quadrilateral is cyclic if the sum of either pair of opposite angles is 180 degrees.

Step 1: Draw the diagram and state the given information

Let ABCD be a trapezium with AB parallel to CD (AB || CD) and AD = BC. We need to prove that ABCD is a cyclic quadrilateral.

Step 2: Construct perpendiculars

Draw perpendiculars AM and BN on CD from A and B respectively. This means and .

Step 3: Prove triangles AMD and BNC are congruent

Consider triangles and :

AD = BC (Given)

(By construction)

AM = BN (Perpendicular distance between parallel lines is constant)

Therefore, by the RHS (Right-Hypotenuse-Side) congruence rule.

Step 4: Deduce equal angles

Since , by corresponding parts of congruent triangles (CPCT), we have .

Step 5: Use properties of a trapezium

Since AB || CD, (Co-interior angles on the same side of the transversal are supplementary).

Step 6: Prove the trapezium is cyclic

We know , so we can substitute for in the equation .

This gives us .

Since the sum of one pair of opposite angles in quadrilateral ABCD is , ABCD is a cyclic quadrilateral.

Final Answer:

Hence, if the non-parallel sides of a trapezium are equal, then it is cyclic.

ANSWER

Draw perpendiculars AM and BN on CD (AB ∥ CD and AB < CD). Show ΔAMD ≅ ΔBNC. This gives ∠C = ∠D and, therefore, ∠A + ∠C = 180°.

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📐 Key Formulas

Important Formulas for Exercise 9.3

Formula / Concept	Description
Perpendicular from Centre to Chord	The perpendicular drawn from the centre of a circle to a chord bisects the chord. If OM \perp AB, then AM = MB.
Converse of Perpendicular from Centre to Chord	The line drawn through the centre of a circle to bisect a chord is perpendicular to the chord. If AM = MB, then OM \perp AB.
Equal Chords and Distance from Centre	Equal chords of a circle are equidistant from the centre. If AB = CD, then OL = OM, where OL and OM are perpendiculars from the centre to the chords.
Converse of Equal Chords and Distance from Centre	Chords that are equidistant from the centre of a circle are equal in length. If OL = OM, then AB = CD.
Angle Subtended by an Arc at the Centre	The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. For an arc PQ, \angle POQ = 2 × \angle PAQ.
Angles in the Same Segment	Angles in the same segment of a circle are equal. If points A and B are on the same segment formed by chord PQ, then \angle PAQ = \angle PBQ.
Angle in a Semicircle	

Formula / Concept	Description
	The angle in a semicircle is a right angle. If AB is a diameter, then for any point C on the circle, \angle ACB = 90^\circ.
Cyclic Quadrilateral	A quadrilateral whose all four vertices lie on a circle.
Property of Cyclic Quadrilateral	The sum of either pair of opposite angles of a cyclic quadrilateral is 180^\circ. For a cyclic quadrilateral ABCD, \angle A + \angle C = 180^\circ and \angle B + \angle D = 180^\circ.
Equal Chords and Angles at the Centre	Equal chords of a circle subtend equal angles at the centre. If AB = CD, then \angle AOB = \angle COD.

? Top FAQs

Q1. How many questions are in NCERT Solutions Class 9 Maths Chapter 9 Circles Exercise 9.3 for CBSE board exam 2025-26?

NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.3 contains exactly 7 questions focused on Equal Chords theorem and perpendicular from centre to chord. These questions carry significant weightage in the CBSE board exam 2025-26 and are designed to strengthen understanding of chord properties in circles.

Q2. Where can I download free PDF of NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.3 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.3 from official NCERT website or educational portals offering step by step solutions. These PDFs include detailed explanations of all 7 questions on Equal Chords theorem, making them ideal for CBSE board exam 2025-26 preparation and offline study.

Q3. How many marks does Circles Chapter 9 Exercise 9.3 carry in CBSE Class 9 Maths board exam 2025-26?

Circles (Chapter 9) carries 6 marks in CBSE Class 9 Maths board exam 2025-26 under Unit IV - Geometry, which is shared among other geometry topics. Exercise 9.3 covering Equal Chords theorem is particularly important as questions from this section frequently appear in board examinations and internal assessments.

Q4. Which is the most difficult question in NCERT Solutions Class 9 Maths Chapter 9 Circles Exercise 9.3 for CBSE 2025-26?

Question 3 is generally considered the most difficult in NCERT Solutions Class 9 Maths Chapter 9 Circles Exercise 9.3, as it requires application of both Equal Chords theorem and perpendicular from centre properties simultaneously. Students preparing for CBSE board exam 2025-26 should practice this question multiple times with step by step solutions to master the concept thoroughly.

Q5. What is Equal Chords Theorem in NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.3?

The Equal Chords Theorem in NCERT Class 9 Maths Chapter 9 Exercise 9.3 states that equal chords of a circle are equidistant from the centre, and conversely, chords equidistant from the centre are equal. This fundamental concept is extensively covered through 7 practice questions in Exercise 9.3 and is crucial for CBSE board exam 2025-26 preparation.

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