NCERT Solutions Class 9 Maths
Chapter 9: Circles
EXERCISE 9.2

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Quick Summary: In NCERT Solutions Class 9 Maths Chapter 9 Exercise 9.2, students learn about perpendicular from centre to chord and its fundamental properties in circles. This exercise covers the Equal Chords Theorem, congruent triangles proofs, and perpendicular bisector properties which are essential for CBSE Class 9 board exams and form the foundation for advanced circle geometry.

Key Takeaways:

- Equal Chords Theorem: Equal chords of a circle are equidistant from the centre, where distance = √(r^2 - \left(chord)/(2)\right)^2
- The perpendicular from the centre of a circle to a chord bisects the chord into two equal parts
- Congruent triangles (SAS, SSS criteria) are used to prove chord-related properties in circle geometry
- Understanding these properties helps solve complex problems involving intersecting circles, common chords, and distance calculations

Complete Solutions

Question 1

QUESTION

Two circles of radii 5 cm and 3 cm intersect at two points and the distance between their centres is 4 cm. Find the length of the common chord.

SOLUTION

This question involves understanding the properties of circles, intersecting circles, and the relationship between their radii, centers, and common chord. We need to find the length of the common chord given the radii of the two circles and the distance between their centers.

Step 1: Draw a diagram and label the points

Draw two circles with radii 5 cm and 3 cm, intersecting at points A and B. Let the centers of the circles be O and O', respectively, with OO' = 4 cm. AB is the common chord. Let M be the point where AB and OO' intersect.

Step 2: Recognize the right triangle

Notice that , and the radii are 5 cm and 3 cm. Consider triangle . We have , , and . Since , triangle is a right-angled triangle with the right angle at (by the converse of the Pythagorean theorem). Therefore, .

Step 3: Deduce that the common chord is a diameter of the smaller circle

Since , is perpendicular to . Also, we know that the line joining the centers of two intersecting circles is perpendicular to the common chord. Therefore, is perpendicular to . This means that lies along the common chord . Since cm is the radius of the smaller circle and lies on the common chord, it follows that the common chord is a diameter of the smaller circle.

Step 4: Calculate the length of the common chord

Since the common chord is the diameter of the smaller circle, its length is twice the radius of the smaller circle.

Length of cm.

Final Answer: The length of the common chord is 6 cm.

ANSWER

6 cm. First show that the line joining centres is perpendicular to the radius of the smaller circle and then that common chord is the diameter of the smaller circle.

Question 2

QUESTION

If two equal chords of a circle intersect within the circle, prove that the segments of one chord are equal to corresponding segments of the other chord.

SOLUTION

This question tests our understanding of circles, chords, and congruency of triangles. We need to prove that when two equal chords intersect inside a circle, the segments of one chord are equal to the corresponding segments of the other.

Step 1: Draw the diagram and state what is given

Draw a circle with center O. Let AB and CD be two equal chords intersecting at point E inside the circle. We are given that AB = CD.

Step 2: State what we need to prove

We need to prove that AE = CE and BE = DE.

Step 3: Construction

Draw OM perpendicular to AB and ON perpendicular to CD. Join OE.

Step 4: Proof

Consider triangles OME and ONE. We have:

Since equal chords are equidistant from the center, OM = ON.

OE = OE (Common)

Therefore, by RHS congruence, .

Hence, ME = NE (by CPCT - Corresponding Parts of Congruent Triangles).

Step 5: Use the property that the perpendicular from the center bisects the chord

Since OM is perpendicular to AB, M is the midpoint of AB. Therefore, AM = AB.

Similarly, since ON is perpendicular to CD, N is the midpoint of CD. Therefore, CN = CD.

Since AB = CD, AB = CD. Thus, AM = CN.

Step 6: Find AE and CE

Now, AE = AM - ME and CE = CN - NE.

Since AM = CN and ME = NE, we have AE = CE.

Step 7: Find BE and DE

Since AB = CD and AE = CE, subtracting AE from AB and CE from CD gives us:

AB - AE = CD - CE, which means BE = DE.

Step 8: Conclusion

Therefore, AE = CE and BE = DE. Hence, the segments of one chord are equal to the corresponding segments of the other chord.

ANSWER

If AB, CD are equal chords of a circle with centre O intersecting at E, draw perpendiculars OM on AB and ON on CD and join OE. Show that right triangles OME and ONE are congruent.

Question 3

QUESTION

If two equal chords of a circle intersect within the circle, prove that the line joining the point of intersection to the centre makes equal angles with the chords.

SOLUTION

This question tests our understanding of circles, chords, and the properties of congruent triangles. We need to prove that the line joining the point of intersection of two equal chords to the center of the circle makes equal angles with the chords.

Step 1: Draw the diagram and label the points

Draw a circle with center O. Draw two equal chords AB and CD intersecting at point E inside the circle. Join OE. We need to prove that .

Step 2: Draw perpendiculars from the center to the chords

Draw and . We know that the perpendicular from the center to a chord bisects the chord. Therefore, M is the midpoint of AB and N is the midpoint of CD.

Step 3: Use the property of equal chords

Since AB = CD (given), and we know that equal chords are equidistant from the center, therefore, .

Step 4: Prove the congruence of triangles OME and ONE

Consider triangles OME and ONE. We have:

(Proved above)

(By construction)

(Common side)

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

Step 5: Use CPCT to prove the required angles are equal

Since , by CPCT (Corresponding Parts of Congruent Triangles), we have .

This means , which is what we needed to prove.

Final Answer: Hence, the line joining the point of intersection to the centre makes equal angles with the chords.

Conclusion: By using the properties of equal chords and congruent triangles, we have successfully proved the required result. A common mistake is not drawing the perpendiculars correctly, which makes it difficult to apply the RHS congruence rule.

ANSWER

Proceed as in Example 2.

Question 4

QUESTION

If a line intersects two concentric circles with centre O at A, B, C and D, prove that AB = CD.

SOLUTION

This question tests our understanding of circles, particularly the properties of chords and perpendiculars from the center to a chord.

Step 1: Draw the diagram and add a construction

Draw two concentric circles with center O. Draw a line intersecting the circles at points A, B, C, and D in that order. Draw a perpendicular OM from O to the line AD.

Step 2: Recall the theorem about perpendiculars from the center

A perpendicular from the center of a circle to a chord bisects the chord. This means if OM is perpendicular to AD, then AM = MD, and if OM is perpendicular to BC, then BM = MC.

Step 3: Apply the theorem to the larger circle

Since OM is perpendicular to AD (the chord of the larger circle), we have:

Step 4: Apply the theorem to the smaller circle

Since OM is perpendicular to BC (the chord of the smaller circle), we have:

Step 5: Subtract the equations

Subtract the second equation from the first:

Step 6: Simplify the equation

From the diagram, we can see that and . Therefore:

Final Answer: AB = CD

Conclusion: By drawing a perpendicular from the center to the line and using the property that the perpendicular bisects the chord, we were able to show that AB = CD.

ANSWER

Draw perpendicular OM on AD.

Question 5

QUESTION

Three girls Reshma, Salma and Mandip are standing on a circle of radius 5 m. Reshma throws a ball to Salma, Salma to Mandip, Mandip to Reshma. If the distance between Reshma and Salma and between Salma and Mandip is 6 m each, what is the distance between Reshma and Mandip?

SOLUTION

This question involves understanding the properties of chords and perpendicular distances from the center of a circle. We need to find the length of a chord given the radius of the circle and the length of another chord.

Step 1: Draw a diagram and label the points

Draw a circle with center O and radius 5m. Let Reshma, Salma, and Mandip be represented by points R, S, and M respectively on the circle. We are given that RS = SM = 6m. We need to find RM.

Step 2: Draw perpendiculars from the center to the chords

Draw a perpendicular OL from O to RS. Since the perpendicular from the center bisects the chord, RL = LS = 3m. In right triangle ORL, we have . So, , which gives . Therefore, and m.

Step 3: Find the area of triangle ORS

The area of triangle ORS can be calculated in two ways. First, using the base RS and height OL: Area = . Second, let's drop a perpendicular from O to RM, call it K, and let RK = x. Then RM = 2x. Area of triangle ORS = . We need to find RM.

Step 4: Draw ON perpendicular to SM and note that OL = ON

Since RS = SM = 6m, the perpendicular distance from the center to these chords will be the same. Therefore, ON = OL = 4m. Now, consider quadrilateral OLSN. Since OL = ON and the angles at L and N are 90 degrees, this quadrilateral is a kite. Also, OS is a radius.

Step 5: Calculate the length of chord RM

Let KR = x. Then, the area of triangle ORS = . We know that the area of triangle ORS = 12. Therefore, . Since the area of triangle ORS is 12, . Solving for x, we get . Therefore, RM = 2x = m.

Final Answer: The distance between Reshma and Mandip is 9.6 m.

ANSWER

Let KR = x m. Area of ΔORS = 1/2 × x × 5. Also, area of ΔORS = 1/2 × RS × OL = 1/2 × 6 × 4. Find x and hence RM.

Question 6

QUESTION

A circular park of radius 20 m has three boys Ankur, Syed and David sitting at equal distances on its boundary, each having a toy telephone in his hands to talk to each other. Find the length of the string of each phone.

SOLUTION

This question involves finding the side length of an equilateral triangle inscribed in a circle. We'll use properties of equilateral triangles and the Pythagorean theorem to solve it.

Step 1: Draw a diagram and label points

Imagine a circle with center O and radius 20m. Ankur (A), Syed (S), and David (D) are sitting at equal distances on the circumference, forming an equilateral triangle ASD. Let's draw radii OA, OS, and OD. Also, let's draw a perpendicular from O to side AS, and call the intersection point M.

Step 2: Properties of equilateral triangles and circle

Since triangle ASD is equilateral, all its angles are 60 degrees. Also, the perpendicular from the center of the circle to a chord bisects the chord. Therefore, AM = MS.

Step 3: Find angle AOS

Since the boys are equally spaced, the angle subtended by each side at the center is the same. The total angle at the center is 360 degrees, so .

Step 4: Find angle AOM

Since OM bisects angle AOS, .

Step 5: Use trigonometry in triangle AOM

In right-angled triangle AOM, we have . We know m and . Therefore, m.

Step 6: Find the length of AS

Since M is the midpoint of AS, m.

Final Answer:

The length of the string of each phone is meters.

ANSWER

Use the properties of an equilateral triangle and also Pythagoras Theorem.

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Key Formulas

Important Formulas for Exercise 9.2

Formula / Concept	Description
Perpendicular from Centre to Chord Theorem	The perpendicular drawn from the centre of a circle to a chord bisects the chord. If O is the centre and $OM \perp AB$, then $AM = MB$.
Converse of Perpendicular from Centre Theorem	The line drawn through the centre of a circle to bisect a chord is perpendicular to the chord. If M is the midpoint of chord AB, then $OM \perp AB$.
Equal Chords and their Distance from the Centre Theorem	Equal chords of a circle (or of congruent circles) are equidistant from the centre (or centres). If $AB = CD$, then their distances from the centre are equal.
Converse of Equal Chords Theorem	Chords that are equidistant from the centre of a circle are equal in length. If the distances of two chords from the centre are equal, then $AB = CD$.
Pythagorean Theorem in Circles	In a right-angled triangle formed by the radius, the perpendicular from the centre to a chord, and half the chord's length: $r^2 = d^2 + \left(\frac{l}{2}\right)^2$ Where r is the radius, d is the perpendicular distance from the centre to the chord, and l is the length of the chord.
Chord	A chord of a circle is a line segment whose endpoints both lie on the circle.

❓ Top FAQs

Q1. How many questions are in NCERT Solutions Class 9 Maths Chapter 9 Circles Exercise 9.2 for CBSE 2025-26?

NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.2 contains exactly 6 questions. These questions focus on perpendicular from centre to chord and equal chords theorem, which are important concepts for CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.2 with step by step solutions?

You can download free PDF of NCERT Solutions for Class 9 Maths Chapter 9 Circles Exercise 9.2 from various educational websites offering step by step solutions. These PDFs are updated according to the latest CBSE syllabus 2025-26 and include detailed explanations for all 6 questions on perpendicular from centre to chord.

Q3. How many marks does Chapter 9 Circles carry in CBSE Class 9 board exam 2025-26 for Exercise 9.2 topics?

Chapter 9 Circles is part of Unit IV Geometry which carries a total weightage of 6 marks in CBSE Class 9 board exam 2025-26. Exercise 9.2 concepts like perpendicular from centre to chord and equal chords theorem are important for both board exams and competitive examinations.

Q4. Which is the most difficult question in Exercise 9.2 of NCERT Solutions Class 9 Maths Chapter 9 Circles for CBSE 2025-26?

Question 6 in Exercise 9.2 of NCERT Solutions Class 9 Maths Chapter 9 Circles is generally considered the most difficult as it requires application of equal chords theorem and perpendicular from centre properties together. Step by step solutions help students understand the proof-based approach required for CBSE board exam 2025-26.

Q5. What is Equal Chords Theorem in NCERT Solutions Class 9 Maths Chapter 9 Circles Exercise 9.2?

The Equal Chords Theorem in NCERT Class 9 Maths Chapter 9 Exercise 9.2 states that equal chords of a circle are equidistant from the centre. This theorem is crucial for solving problems in Exercise 9.2 and carries significant weightage in CBSE board exam 2025-26, often tested with perpendicular from centre concept.

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