

**Important Questions for Class 9 Maths Chapter 10:** Here are some important questions for Class 9 Maths Chapter 10 Circles created to help students grasp key concepts. This chapter covers essential topics such as the definition of a circle, radius, diameter, chord, arc and sector.

Students should focus on understanding the properties of circles, including the relationship between angles and chords, as well as theorems related to tangents and secants. Practicing these important questions will enhance problem-solving skills and boost confidence for exams. By mastering the concepts in this chapter students can build a strong foundation for more advanced studies in geometry.

## **Important Questions for Class 9 Maths Chapter 10 Overview**

The important questions for Class 9 Maths Chapter 10 Circles are created by subject experts of Physics Wallah to help students understand the topic better.

By practicing these questions, students can improve their understanding and problem-solving skills, which will help them do well in their exams.

## **Important Questions for Class 9 Maths Chapter 10 PDF**

You can access the Important Questions for Class 9 Maths Chapter 10 in PDF format by clicking the link below. This PDF contains a set of important questions designed to enhance your understanding of circles and their properties, making it a valuable resource for your exam preparation.

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## **Important Questions Class 9 Maths Chapter 10 Circles**

Below we have provided Important Questions Class 9 Maths Chapter 10 Circles-

### **Question 1:**

Bisectors of angles A, B and C of a triangle ABC intersect its circumcircle at D, E and F respectively. Prove that the angles of the triangle DEF are  $90^\circ - (\frac{1}{2})A$ ,  $90^\circ - (\frac{1}{2})B$  and  $90^\circ - (\frac{1}{2})C$ .

### **Solution:**

Here, ABC is inscribed in a circle with center O and the bisectors of  $\angle A$ ,  $\angle B$  and  $\angle C$  intersect the circumcircle at D, E and F respectively.

Now, join DE, EF and FD

As angles in the same segment are equal, so,

$$\angle FDA = \angle FCA \text{ —————(i)}$$

$$\angle FDA = \angle EBA \text{ —————(i)}$$

Adding equations (i) and (ii) we have,

$$\angle FDA + \angle EDA = \angle FCA + \angle EBA$$

$$\text{Or, } \angle FDE = \angle FCA + \angle EBA = (\frac{1}{2})\angle C + (\frac{1}{2})\angle B$$

$$\text{We know, } \angle A + \angle B + \angle C = 180^\circ$$

$$\text{So, } \angle FDE = (\frac{1}{2})[\angle C + \angle B] = (\frac{1}{2})[180^\circ - \angle A]$$

$$\Rightarrow \angle FDE = [90 - (\angle A/2)]$$

In a similar way,

$$\angle FED = [90 - (\angle B/2)]$$

And,

$$\angle EFD = [90 - (\angle C/2)]$$

### Question 2:

In any triangle ABC, if the angle bisector of  $\angle A$  and perpendicular bisector of BC intersect, prove that they intersect on the circumcircle of the triangle ABC.

### Solution:

Given: In  $\triangle ABC$ , AD is the angle bisector of  $\angle A$  and OD is the perpendicular bisector of BC, intersecting each other at point D.

To Prove: D lies on the circle

Construction: Join OB and OC

Proof:

BC is a chord of the circle.

The perpendicular bisector will pass through centre O of the circumcircle.

$\therefore OE \perp BC$  & E is the midpoint of BC

Chord BC subtends twice the angle at the centre, as compared to any other point.

BC subtends  $\angle BAC$  on the circle & BC subtends  $\angle BOC$  on the centre

$$\therefore \angle BAC = \frac{1}{2} \angle BOC$$

In  $\triangle BOE$  and  $\triangle COE$ ,

$BE = CE$  (OD bisects BC)  
 $\angle BEO = \angle CEO$  (Both  $90^\circ$ , as  $OD \perp BC$ )  
 $OE = OE$  (Common)  
 $\therefore \triangle BOE \cong \triangle COE$  (SAS Congruence rule)  
 $\therefore \angle BOE = \angle COE$  (CPCT)

Now,

$\angle BOC = \angle BOE + \angle COE$   
 $\angle BOC = \angle BOE + \angle BOE$   
 $\angle BOC = 2 \angle BOE \dots (2)$

AD is angle bisector of  $\angle A$

$\therefore \angle BAC = 2 \angle BAD$

From (1)

$\angle BAC = \frac{1}{2} \angle BOC$

$2 \angle BAD = \frac{1}{2} (2 \angle BOE)$

$2 \angle BAD = \angle BOE$

$\angle BAD = \frac{1}{2} \angle BOE$

BD subtends  $\angle BOE$  at centre and half of its angle at Point A.

Hence, BD must be a chord.

$\therefore D$  lies on the circle.

### Question 3:

Prove that the circle drawn with any side of a rhombus as diameter passes through the point of intersection of its diagonals.

### Solution:

To prove: A circle drawn with Q as centre, will pass through A, B and O (i.e.  $QA = QB = QO$ )

Since all sides of a rhombus are equal,

$AB = DC$

Now, multiply  $(\frac{1}{2})$  on both sides

$(\frac{1}{2})AB = (\frac{1}{2})DC$

So,  $AQ = DP$

$\Rightarrow BQ = DP$

Since Q is the midpoint of AB,

$AQ = BQ$

Similarly,

$$RA = SB$$

Again, as PQ is drawn parallel to AD,

$$RA = QO$$

Now, as  $AQ = BQ$  and  $RA = QO$  we have,

$$QA = QB = QO \text{ (hence proved).}$$

#### **Question 4:**

Two chords AB and CD of lengths 5 cm and 11 cm respectively of a circle are parallel to each other and are on opposite sides of its centre. If the distance between AB and CD is 6, find the radius of the circle.

#### **Solution:**

Here,  $OM \perp AB$  and  $ON \perp CD$ . is drawn and OB and OD are joined.

As we know, AB bisects BM as the perpendicular from the centre bisects the chord.

Since  $AB = 5$  so,

$$BM = AB/2$$

$$\text{Similarly, } ND = CD/2 = 11/2$$

Now, let ON be x.

$$\text{So, } OM = 6 - x.$$

Consider  $\triangle MOB$ ,

$$OB^2 = OM^2 + MB^2$$

Or,

$$OB^2 = 36 + x^2 - 12x + 25/4 \dots\dots(1)$$

Consider  $\triangle NOD$ ,

$$OD^2 = ON^2 + ND^2$$

Or,

$$OD^2 = x^2 + 121/4 \dots\dots\dots(2)$$

We know,  $OB = OD$  (radii)

From eq. (1) and eq. (2) we have;

$$36 + x^2 - 12x + 25/4 = x^2 + 121/4$$

$$12x = 36 + 25/4 - 121/4$$

$$12x = (144 + 25 - 121)/4$$

$$12x = 48/4 = 12$$

$$x = 1$$

Now, from eq. (2) we have,

$$OD^2 = 11 + (121/4)$$

$$\text{Or } OD = (5/2) \times \sqrt{5}$$

#### **Question 5:**

If circles are drawn taking two sides of a triangle as diameters, prove that the point of intersection of these circles lies on the third side.

#### **Solution:**

First, draw a triangle ABC and then two circles having a diameter as AB and AC respectively.

We will have to now prove that D lies on BC and BDC is a straight line.

Proof:

As we know, angle in the semi-circle are equal

$$\text{So, } \angle ADB = \angle ADC = 90^\circ$$

$$\text{Hence, } \angle ADB + \angle ADC = 180^\circ$$

$\therefore \angle BDC$  is a straight line.

So, it can be said that D lies on the line BC.

#### **Question 6:**

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

#### **Solution:**

Construction-Consider a trapezium ABCD with  $AB \parallel CD$  and  $BC = AD$ .

Draw  $AM \perp CD$  and  $BN \perp CD$

In  $\triangle AMD$  and  $\triangle BNC$ ;

$AD = BC$  (Given)

$\angle AMD = \angle BNC$  ( $90^\circ$ )

$AM = BN$  (perpendiculars between parallel lines)

$\triangle AMD \cong \triangle BNC$  (By RHS congruency)

$\angle ADC = \angle BCD$  (By CPCT rule) .....(i)

$\angle BAD$  and  $\angle ADC$  are on the same side of transversal AD.

$\angle BAD + \angle ADC = 180^\circ$  .....(ii)

$\angle BAD + \angle BCD = 180^\circ$  (by equation (i))

Since, the opposite angles are supplementary, therefore, ABCD is a cyclic quadrilateral.

#### **Question 7:**

ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. If  $\angle DBC = 70^\circ$ ,  $\angle BAC$  is  $30^\circ$ , find  $\angle BCD$ . Further, if  $AB = BC$ , find  $\angle ECD$ .

#### **Solution:**

Consider the chord CD,

As we know, angles in the same segment are equal.

So,  $\angle CBD = \angle CAD$

$\therefore \angle CAD = 70^\circ$

Now,  $\angle BAD$  will be equal to the sum of angles BAC and CAD.

So,  $\angle BAD = \angle BAC + \angle CAD$

$= 30^\circ + 70^\circ$

$\therefore \angle BAD = 100^\circ$

As we know, the opposite angles of a cyclic quadrilateral sum up to 180 degrees.

So,

$$\angle BCD + \angle BAD = 180^\circ$$

Since,  $\angle BAD = 100^\circ$

So,  $\angle BCD = 80^\circ$

Now consider the  $\triangle ABC$ .

Here, it is given that  $AB = BC$

Also,  $\angle BCA = \angle CAB$  (Angles opposite to equal sides of a triangle)

$$\angle BCA = 30^\circ$$

also,  $\angle BCD = 80^\circ$

$$\angle BCA + \angle ACD = 80^\circ$$

So,  $\angle ACD = 50^\circ$  and,

$$\angle ECD = 50^\circ$$

**Question 8:**

In Figure,  $\angle ABC = 69^\circ$ ,  $\angle ACB = 31^\circ$ , find  $\angle BDC$ .

**Solution:**

As we know, angles in the segment of the circle are equal so,

$$\angle BAC = \angle BDC$$

Now in the  $\triangle ABC$ , sum of all the interior angles will be  $180^\circ$

$$\text{So, } \angle ABC + \angle BAC + \angle ACB = 180^\circ$$

Now, by putting the values,

$$\angle BAC = 180^\circ - 69^\circ - 31^\circ$$

So,  $\angle BAC = 80^\circ$

**Question 9:**

In Figure,  $\angle PQR = 100^\circ$ , where P, Q and R are points on a circle with centre O. Find  $\angle OPR$ .

**Solution:**

Since angle which is subtended by an arc at the centre of the circle is double the angle subtended by that arc at any point on the remaining part of the circle.

So, the reflex  $\angle POR = 2 \times \angle PQR$

We know the values of angle PQR as  $100^\circ$

So,  $\angle POR = 2 \times 100^\circ = 200^\circ$

$\therefore \angle POR = 360^\circ - 200^\circ = 160^\circ$

Now, in  $\triangle OPR$ ,

OP and OR are the radii of the circle

So,  $OP = OR$

Also,  $\angle OPR = \angle ORP$

Now, we know sum of the angles in a triangle is equal to 180 degrees

So,

$$\angle POR + \angle OPR + \angle ORP = 180^\circ$$

$$\Rightarrow \angle OPR + \angle OPR = 180^\circ - 160^\circ$$

As  $\angle OPR = \angle ORP$

$$\Rightarrow 2\angle OPR = 20^\circ$$

Thus,  $\angle OPR = 10^\circ$

**Question 10:**

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

**Solution:**

Here the positions of Ankur, Syed and David are represented as A, B and C respectively. Since they are sitting at equal distances, the triangle ABC will form an equilateral triangle.

$AD \perp BC$  is drawn. Now, AD is median of  $\triangle ABC$  and it passes through the centre O.



Also, O is the centroid of the  $\triangle ABC$ . OA is the radius of the triangle.

$$OA = \frac{2}{3} AD$$

Let the side of a triangle a metres then  $BD = \frac{a}{2}$  m.

Applying Pythagoras theorem in  $\triangle ABD$ ,

$$AB^2 = BD^2 + AD^2$$

$$\Rightarrow AD^2 = AB^2 - BD^2$$

$$\Rightarrow AD^2 = a^2 - \left(\frac{a}{2}\right)^2$$

$$\Rightarrow AD^2 = \frac{3a^2}{4}$$

$$\Rightarrow AD = \frac{\sqrt{3}a}{2}$$

$$OA = \frac{2}{3} AD$$

$$\Rightarrow 20 \text{ m} = \frac{2}{3} \times \frac{\sqrt{3}a}{2}$$

$$\Rightarrow a = 20\sqrt{3} \text{ m}$$

So, the length of the string of the toy is  $20\sqrt{3}$  m.

### Question 11:

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:

From the question we have the following conditions:

- (i) AB and CD are 2 chords which are intersecting at point E.
- (ii) PQ is the diameter of the circle.
- (iii)  $AB = CD$ .

Now, we will have to prove that  $\angle BEQ = \angle CEQ$

For this, the following construction has to be done:

Construction:

Draw two perpendiculars are drawn as  $OM \perp AB$  and  $ON \perp CD$ . Now, join OE. The constructed diagram will look as follows:

Now, consider the triangles  $\triangle OEM$  and  $\triangle OEN$ .

Here,

(i)  $OM = ON$  [Since the equal chords are always equidistant from the centre]

(ii)  $OE = OE$  [It is the common side]

(iii)  $\angle OME = \angle ONE$  [These are the perpendiculars]

So, by RHS similarity criterion,  $\triangle OEM \cong \triangle OEN$ .

Hence, by CPCT rule,  $\angle MEO = \angle NEO$

$\therefore \angle BEQ = \angle CEQ$  (Hence proved).

#### **Question 12:**

If two circles intersect at two points, prove that their centres lie on the perpendicular bisector of the common chord.

#### **Solution:**

It is given that two circles intersect each other at P and Q.

To prove:

$OO'$  is a perpendicular bisector of PQ.

Proof:

Triangle  $\triangle POO'$  and  $\triangle QOO'$  are similar by SSS congruency since

$OP = OQ$  and  $O'P = O'Q$  (Since they are also the radii)

$OO' = OO'$  (It is the common side)

So, It can be said that  $\triangle POO' \cong \triangle QOO'$

$\therefore \angle POO' = \angle QOO'$  — (i)

Even triangles  $\triangle POR$  and  $\triangle QOR$  are similar by SAS congruency as

$OP = OQ$  (Radii)

$$\angle POR = \angle QOR \text{ (As } \angle POO' = \angle QOO')$$

$$OR = OR \text{ (Common arm)}$$

$$\text{So, } \triangle POR \cong \triangle QOR$$

$$\therefore \angle PRO = \angle QRO$$

Also, As we know,

$$\angle PRO + \angle QRO = 180^\circ$$

$$\text{Hence, } \angle PRO = \angle QRO = 180^\circ/2 = 90^\circ$$

So,  $OO'$  is the perpendicular bisector of  $PQ$ .

### **Question 13:**

Prove that if chords of congruent circles subtend equal angles at their centres, then the chords are equal.

### **Solution:**

Here, it is given that  $\angle AOB = \angle COD$  i.e. they are equal angles.

Now, we will have to prove that the line segments  $AB$  and  $CD$  are equal i.e.  $AB = CD$ .

Proof:

In triangles  $AOB$  and  $COD$ ,

$$\angle AOB = \angle COD \text{ (as given in the question)}$$

$$OA = OC \text{ and } OB = OD \text{ ((these are the radii of the circle)}$$

So, by SAS congruency,  $\triangle AOB \cong \triangle COD$ .

$\therefore$  By the rule of CPCT,  $AB = CD$ . (Hence proved).

## **Benefits of Practicing Important Questions for Class 9 Maths Chapter 10**

Practicing important questions for Class 9 Maths Chapter 10 on circles provide several benefits for students:

**Enhanced Understanding:** Regular practice helps solidify concepts related to circles, such as circumference, area, and properties of chords, arcs and sectors.

**Improved Problem-Solving Skills:** Working through a variety of questions helps students develop analytical and critical thinking skills making them more adept at tackling different types of problems.

**Increased Confidence:** Familiarity with important questions boosts students confidence as they approach their exams, reducing anxiety and improving performance.

**Time Management:** Practicing with sample questions allows students to develop better time management skills, ensuring they can complete their exams within the allotted time.

**Exam Readiness:** Focusing on important questions ensures that students are well-prepared for their exams, as these questions often reflect the types of problems they will face.