

NCERT Solutions for Class 10 Maths Chapter 10 Circles | Exercise 10.1 Updated 2026-27

⚡ Quick Revision Box — Chapter 10 Circles

- **Tangent definition** (स्पर्श रेखा): A line that touches a circle at exactly one point — the point of contact.
- **Secant definition** (छेदक रेखा): A line that intersects a circle at two distinct points.
- **Key Theorem:** The tangent at any point on a circle is perpendicular to the radius at the point of contact.
- **Tangents from external point:** Exactly two tangents can be drawn from any point outside the circle, and they are equal in length.
- **Parallel tangents:** A circle can have at most **two** parallel tangents (at the ends of a diameter).
- **Total tangents to a circle:** Infinitely many (one at each point on the circumference).
- **Tangent-length formula:** If OP is radius and OQ is the distance from centre to external point, then tangent length $PQ = \sqrt{(OQ^2 - OP^2)}$.
- **Point inside circle:** No tangent can be drawn from a point inside the circle.

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The **NCERT Solutions for Class 10 Maths Chapter 10 Circles** on this page cover all questions from Exercise 10.1 with complete, step-by-step working — updated for the **2026-27** CBSE board exam. Whether you are revising tangents, secants, or circle theorems, these solutions from [NCERT Solutions for Class 10](#) will help you understand every concept clearly and score full marks. You can also explore all subjects in our [NCERT Solutions](#) hub.

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Chapter Overview — NCERT Solutions for Class 10 Maths Chapter 10 Circles

Chapter 10 of the NCERT Class 10 Maths textbook, *Mathematics — Textbook for Class X*, introduces you to the relationship between a circle and lines — specifically **tangents** and **secants**. You already studied basic properties of circles in Class 9; this chapter builds on that foundation by exploring how lines interact with circles and proving important theorems about tangent lengths and perpendicularity. You can download the official chapter from the [NCERT official textbook](#) portal.

For CBSE board exams, this chapter carries significant weight in the Geometry unit. Questions from Circles appear as **1-mark MCQs**, **2-mark short answers**, and **3-mark application problems**. The most frequently tested topics are: the tangent-radius perpendicularity theorem, the equal-tangent-lengths theorem, and Pythagoras-based tangent-length calculations.

Detail	Information
Chapter	Chapter 10 — Circles
Textbook	NCERT Mathematics Class X
Class	Class 10
Subject	Mathematics
Exercises	Exercise 10.1 (4 Questions), Exercise 10.2 (13 Questions)
Difficulty Level	Easy to Medium
Academic Year	2026-27



Property

The tangent at any point of a circle is perpendicular to the radius through the point of contact.

Fig 10.1: Tangent is perpendicular to the radius at the point of contact

Key Concepts and Theorems — Circles Class 10

Tangent, Secant, and Non-Intersecting Lines

A line and a circle can relate to each other in three ways:

- **Non-intersecting line:** The line does not touch or cross the circle at any point.
- **Secant** (छेदक रेखा): The line intersects the circle at two distinct points. The chord formed between these two points is part of the secant.
- **Tangent** (स्पर्श रेखा): The line touches the circle at exactly one point. This point is called the **point of contact** (स्पर्श बिंदु).

A tangent is actually a special limiting case of a secant — when the two intersection points of a secant come closer and closer until they coincide, the secant becomes a tangent.

Theorem 1 — Tangent is Perpendicular to Radius at Point of Contact

Statement: The tangent at any point of a circle is perpendicular to the radius through the point of contact.

If O is the centre of a circle and P is the point of contact of a tangent, then:

$$OP \perp \text{tangent at } P$$

Why does this matter? This theorem is the foundation for all tangent-length calculations. Whenever you see a tangent and a radius meeting, you immediately know the angle between them is 90° , which lets you apply the Pythagorean theorem.

Number of Tangents from a Point on a Circle

- **Point inside the circle:** No tangent can be drawn.
- **Point on the circle:** Exactly one tangent can be drawn.
- **Point outside the circle:** Exactly two tangents can be drawn, and their lengths are equal.

Theorem 2 — Equal Tangent Lengths from External Point

Statement: The lengths of the two tangents drawn from an external point to a circle are equal.

If PA and PB are two tangents from external point P to a circle with centre O , then:

$$PA = PB$$

This is proved using the RHS congruence rule on triangles OAP and OBP (both right-angled at A and B respectively, sharing hypotenuse OP, with $OA = OB = \text{radius}$).

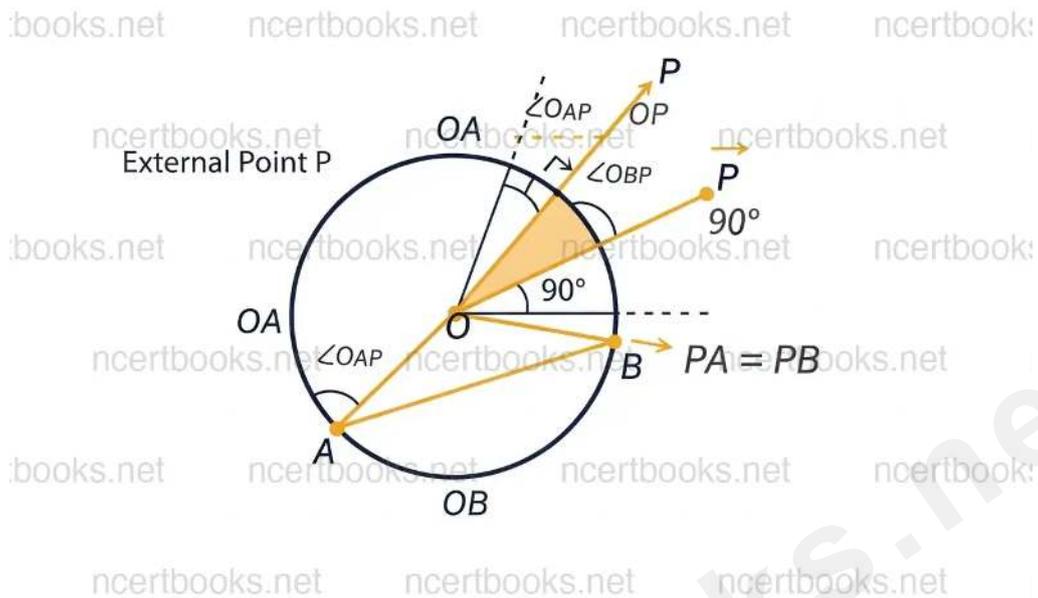


Fig 10.2: Tangents from an external point are equal in length ($PA = PB$)

NCERT Solutions for Class 10 Maths Chapter 10 Circles — Exercise 10.1

Below are complete, step-by-step solutions for all 4 questions in Exercise 10.1 of the **NCERT Solutions for Class 10 Maths Chapter 10 Circles**. Every answer is written to match the CBSE marking scheme for 2026-27.

Question 1

Easy

How many tangents can a circle have?

Key Concept: A tangent is a line that touches a circle at exactly one point. Since a circle is a continuous curve made up of infinitely many points, a tangent can be drawn at each of those points.

Step 1: Recall the definition — a tangent to a circle touches it at one and only one point (the point of contact).

Step 2: A circle has infinitely many points on its circumference.

Step 3: At each point on the circumference, exactly one tangent can be drawn (perpendicular to the radius at that point).

Answer: A circle can have **infinitely many tangents** — one at each point on its circumference.

Board Exam Note: This is a standard 1-mark recall question. Write the answer as a complete sentence: "A circle can have infinitely many tangents." Do not leave it as just a number.

Question 2

Easy

Fill in the blanks:

- (i) A tangent to a circle intersects it in point(s).
- (ii) A line intersecting a circle in two points is called a
- (iii) A circle can have parallel tangents at the most.
- (iv) The common point of a tangent to a circle and the circle is called

(i) A tangent to a circle intersects it in _____ point(s).

Reasoning: By definition, a tangent touches the circle at exactly one point — it does not cross through the circle.

Answer: ONE

(ii) A line intersecting a circle in two points is called a _____.

Reasoning: When a line cuts through a circle and meets it at two distinct points, that line is called a secant (छेदक रेखा). The chord formed between the two points lies inside the circle.

Answer: SECANT

(iii) A circle can have _____ parallel tangents at the most.

Reasoning: Two parallel tangents can be drawn to a circle — one on each side, touching the circle at the two endpoints of a diameter. A third parallel tangent is impossible because it would either miss the circle entirely or intersect it at two points (making it a secant, not a tangent).

Answer: TWO

(iv) The common point of a tangent to a circle and the circle is called _____.

Reasoning: The single point where a tangent line meets the circle is specifically named the point of contact (स्पर्श बिंदु). At this point, the tangent is perpendicular to the radius of the circle.

Answer: POINT OF CONTACT (स्पर्श बिंदु)

Board Exam Note: Fill-in-the-blank questions from this exercise appear regularly in 2-3 mark sections of CBSE board papers. Write the complete term clearly — "point of contact" not just "contact".

Question 3

Medium

A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that OQ = 12 cm. Length PQ is:

(a) 12 cm (b) 13 cm (c) 8.5 cm (d) $\sqrt{119}$ cm

Key Concept: The tangent at any point on a circle is perpendicular to the radius at the point of contact. So $OP \perp PQ$, meaning triangle OPQ is right-angled at P.

Step 1: Identify the given values.

- Radius $OP = 5$ cm (given)
- Distance from centre to Q: $OQ = 12$ cm (given)
- Angle $OPQ = 90^\circ$ (tangent \perp radius at point of contact)

Step 2: Apply Pythagoras' theorem to right-angled triangle OPQ (right angle at P):

$$OQ^2 = OP^2 + PQ^2$$

Step 3: Substitute the known values:

$$12^2 = 5^2 + PQ^2$$

$$144 = 25 + PQ^2$$

$$PQ^2 = 144 - 25 = 119$$

$$PQ = \sqrt{119} \text{ cm}$$

Step 4: Verify — $\sqrt{119} \approx 10.9$ cm. Check: $5^2 + (\sqrt{119})^2 = 25 + 119 = 144 = 12^2$. ✓

∴ Answer: (d) $\sqrt{119}$ cm

Board Exam Note: This MCQ-style problem is also asked as a short-answer calculation in 2-3 mark sections. Always state "tangent \perp radius" as your first step — it earns a method mark.

Question 4

Easy

Draw a circle and two lines parallel to a given line such that one is a tangent and the other, a secant to the circle.

Key Concept: This is a construction-based question. You need to draw a circle, choose a reference line, and then draw two parallel lines — one touching the circle (tangent) and one cutting through it (secant).

Step 1: Draw a circle with centre O and any convenient radius (say 3 cm).

Step 2: Draw a given line l (the reference line) — this line does not need to interact with the circle. Place it below or to the side of the circle.

Step 3: Draw line m parallel to l such that it touches the circle at exactly one point. This is the **tangent** to the circle. (To do this precisely: draw a radius OP perpendicular to l , and draw m through P perpendicular to OP . Since l and m are both perpendicular to OP , they are parallel.)

Step 4: Draw line n parallel to l such that it cuts through the circle at two points A and B . This is the **secant** to the circle. Line n must pass through the interior of the circle.

Step 5: Verify: Lines l , m , and n are all parallel. Line m is the tangent (meets circle at one point P). Line n is the secant (meets circle at two points A and B).

Result: The construction shows three parallel lines — the given line l , the tangent m (touching the circle at one point), and the secant n (intersecting the circle at two points). This confirms that through a circle, parallel lines can be both tangents and secants depending on their position relative to the circle.

[Diagram Description: A circle with centre O . Three horizontal parallel lines are shown — line l (below the circle, not touching it), line m (tangent, touching the bottom of the circle at point P), and line n (secant, passing through the interior of the circle and intersecting it at points A and B). The radius OP is drawn perpendicular to all three lines.]

Board Exam Note: In CBSE board exams, construction questions require a neat, labelled diagram. Label the centre O , the point of contact P for the tangent, and the two intersection points A and B for the secant. Mention that all three lines are parallel.

Formula Reference Table — Circles Class 10

Formula Name	Formula (LaTeX)	Variables Defined
Tangent length from external point	$PT = \sqrt{OP^2 - r^2}$	PT = tangent length, OP = distance from external point to centre, r = radius
Tangent perpendicular to radius	$\angle OPT = 90^\circ$	O = centre, P = point of contact, T = external point
Pythagoras in tangent triangle	$OT^2 = OP^2 + PT^2$	OT = hypotenuse (centre to external point), OP = radius, PT = tangent length
Equal tangents from external point	$PA = PB$	PA, PB = two tangents from external point P to circle
Angle between two tangents from external point	$\angle APB + \angle AOB = 180^\circ$	A, B = points of contact; O = centre; P = external point

Solved Examples Beyond NCERT — Circles Chapter 10

Example 1 — Finding Tangent Length

Medium

From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm. Find the radius of the circle.

Step 1: Let the radius = r cm, tangent length QT = 24 cm, OQ = 25 cm. Since tangent \perp radius at T:

$$OQ^2 = OT^2 + QT^2$$

Step 2: Substitute values:

$$25^2 = r^2 + 24^2$$

$$625 = r^2 + 576$$

$$r^2 = 625 - 576 = 49$$

$$r = 7 \text{ cm}$$

\therefore Radius = 7 cm

Example 2 — Angle Between Tangents

Medium

Two tangents PA and PB are drawn from an external point P to a circle with centre O. If $\angle APB = 60^\circ$, find $\angle AOB$.

Step 1: Use the property that $\angle APB + \angle AOB = 180^\circ$ (since OAPB is a cyclic quadrilateral with two right angles at A and B).

Step 2: Substitute $\angle APB = 60^\circ$:

$$\angle AOB = 180^\circ - 60^\circ = 120^\circ$$

$\therefore \angle AOB = 120^\circ$

Example 3 — Tangent from a Point on Concentric Circles

Hard

Two concentric circles have radii 5 cm and 13 cm. Find the length of the chord of the larger circle which is tangent to the smaller circle.

Step 1: Let O be the common centre. The chord AB of the larger circle is tangent to the smaller circle at point M. So $OM \perp AB$ and $OM = 5$ cm (radius of smaller circle).

Step 2: $OA = 13$ cm (radius of larger circle). In right triangle OMA:

$$AM^2 = OA^2 - OM^2 = 13^2 - 5^2 = 169 - 25 = 144$$

$$AM = 12 \text{ cm}$$

Step 3: Since $OM \perp AB$, M is the midpoint of AB. Therefore:

$$AB = 2 \times AM = 2 \times 12 = 24 \text{ cm}$$

\therefore Length of chord AB = 24 cm

Topic-Wise Important Questions for Board Exam — NCERT Class 10 Maths Circles

1-Mark Questions (Definition / Fill-in)

1. **Q:** What is a tangent to a circle?

A: A tangent to a circle is a line that touches the circle at exactly one point, called the point of contact (स्पर्श बिंदु).

2. **Q:** How many tangents can be drawn from a point inside a circle?

A: No tangent (zero tangents) can be drawn from a point inside the circle.

3. **Q:** What is the angle between the tangent and the radius at the point of contact?

A: The angle is always 90° (the tangent is perpendicular to the radius at the point of contact).

3-Mark Questions

1. **Q:** Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

A: Let O be the centre and P the point of contact of tangent XY. For any other point Q on XY, Q lies outside the circle, so $OQ > OP$ (radius is the shortest distance from centre to the tangent line). Since OP is the minimum distance from O to line XY, $OP \perp XY$. Hence the tangent is perpendicular to the radius at the point of contact. ■

2. **Q:** A point P is 13 cm from the centre of a circle of radius 5 cm. Find the length of the tangent from P to the circle.

A: Using Pythagoras: $PT^2 = OP^2 - r^2 = 13^2 - 5^2 = 169 - 25 = 144$, so $PT = 12$ cm.

5-Mark (Long Answer) Question

Q: Prove that the lengths of tangents drawn from an external point to a circle are equal.

A: Let O be the centre of the circle and P be an external point. Let PA and PB be the two tangents to the circle, touching at A and B respectively.

In triangles OAP and OBP:

- $OA = OB$ (radii of the same circle)
- $\angle OAP = \angle OBP = 90^\circ$ (tangent \perp radius at point of contact)
- $OP = OP$ (common hypotenuse)

By RHS congruence rule: $\triangle OAP \cong \triangle OBP$

Therefore, $PA = PB$ (by CPCT — Corresponding Parts of Congruent Triangles).

Hence, the lengths of the two tangents drawn from an external point to a circle are equal. ■

Additional results from this congruence: $\angle AOP = \angle BOP$ (OP bisects angle AOB) and $\angle APO = \angle BPO$ (OP bisects angle APB).

Common Mistakes Students Make in Circles Chapter 10

Mistake 1: Students write that a circle has only 2 tangents.

Why it's wrong: Two tangents can be drawn from a single *external point*. A circle itself has infinitely many tangents — one at every point on its circumference.

Correct approach: Always specify the context — "from an external point, 2 tangents; from the circle itself, infinitely many."

Mistake 2: Students apply Pythagoras as $OQ^2 = OP^2 - PQ^2$ instead of $OQ^2 = OP^2 + PQ^2$.

Why it's wrong: OQ is the hypotenuse (longest side) because it connects the centre to the external point, which is always farther than the radius.

Correct approach: Always identify OQ as the hypotenuse. Write $PQ = \sqrt{OQ^2 - OP^2}$.

Mistake 3: In Q4 (construction), students draw the tangent and secant as non-parallel lines.

Why it's wrong: The question specifically asks for both lines to be parallel to a given line.

Correct approach: Draw the radius perpendicular to the given line, then construct both the tangent and secant parallel to each other and to the given line.

Mistake 4: Students confuse "point of contact" with "centre" when describing where the tangent meets the circle.

Why it's wrong: The centre is inside the circle; the point of contact is on the circumference.

Correct approach: The point of contact (स्पर्श बिंदु) is always on the circle's boundary, not at the centre.

Mistake 5: Students forget to state "tangent \perp radius" as a reason when solving tangent-length problems, losing method marks.

Why it's wrong: CBSE marking schemes award 1 mark specifically for stating this property.

Correct approach: Always write "Since PQ is a tangent and OP is the radius at the point of contact, $\angle OPQ = 90^\circ$ " before applying Pythagoras.

Exam Tips for 2026-27 — CBSE Class 10 Maths Circles

CBSE 2026-27 Exam Tips — Chapter 10 Circles

- **Tip 1 — State the theorem first:** In any tangent problem, write "tangent \perp radius at point of contact" as your first line. The CBSE 2026-27 marking scheme awards a step mark for this.
- **Tip 2 — Identify the right-angle:** In tangent-length problems, always mark the right angle in your diagram. Examiners check for correct labelling.

- **Tip 3 — Proof questions:** The proof of "tangents from external point are equal" (using RHS congruence) is a high-frequency 5-mark question. Memorise the three matching pairs: equal radii, 90° angles, common hypotenuse.
- **Tip 4 — MCQ strategy:** For Q3-type MCQs, eliminate options by checking whether the answer satisfies $OQ^2 = OP^2 + PQ^2$. Never guess without calculating.
- **Tip 5 — Construction marks:** For Q4-type construction questions, use a sharp pencil and ruler. Label every point (O, P, A, B). Write a brief description of what each line represents.
- **Tip 6 — Revise Chapter 6 (Triangles):** RHS and SAS congruence rules from Chapter 6 are used in Circle proofs. A quick revision of congruence criteria before your board exam will help.

For the 2026-27 CBSE board exam, Chapter 10 Circles is part of the **Geometry unit**, which typically contributes around 15 marks to the paper. Questions range from 1-mark definitions to 5-mark proofs. Practise both Exercise 10.1 and Exercise 10.2 thoroughly — Exercise 10.2 has more complex proof and application questions.

Key Points to Remember — Circles Class 10

🔑 Key Points — Chapter 10 Circles

- A tangent to a circle touches it at exactly **one point** — the point of contact (स्पर्श बिंदु).
- The tangent at any point is **perpendicular to the radius** at that point ($\angle = 90^\circ$).
- From a point **outside** the circle: exactly **two tangents**, both equal in length.
- From a point **on** the circle: exactly **one tangent**.
- From a point **inside** the circle: **no tangent** possible.
- A circle has at most **two parallel tangents**, located at opposite ends of a diameter.
- A circle has **infinitely many tangents** in total (one per point on circumference).

For more practice on related topics, explore our solutions for [NCERT Solutions for Class 10 Maths](#) including Chapter 6 Triangles (congruence rules used in circle proofs) and Chapter 9 Some Applications of Trigonometry.

Frequently Asked Questions — Circles Class 10 Maths

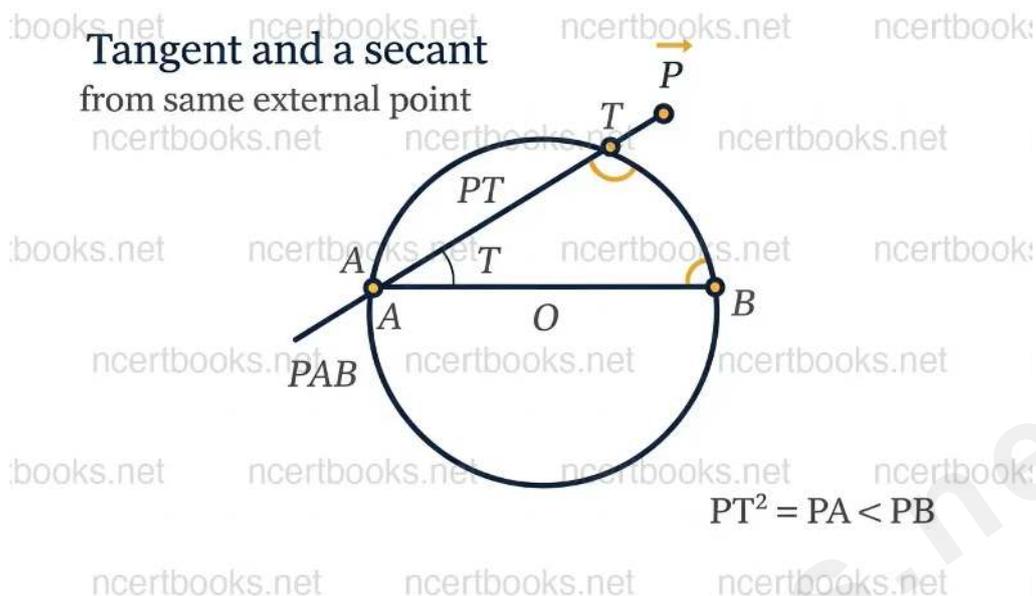


Fig 10.3: Tangent-secant relationship — $PT^2 = PA \times PB$

How many tangents can a circle have — Class 10 answer?

A circle can have infinitely many tangents. Since a tangent can be drawn at every point on the circumference, and a circle has infinitely many points on it, the total number of tangents is infinite. This is a standard 1-mark question in CBSE Class 10 Maths Exercise 10.1.

What is the length PQ if tangent PQ at point P meets OQ = 12 cm and radius = 5 cm?

The length $PQ = \sqrt{119}$ cm. Since the tangent PQ is perpendicular to radius OP at the point of contact P, triangle OPQ is right-angled at P. Applying Pythagoras: $PQ^2 = OQ^2 - OP^2 = 144 - 25 = 119$, so $PQ = \sqrt{119}$ cm. Option (d) is correct.

What is the difference between a tangent and a secant to a circle?

A tangent (स्पर्श रेखा) touches the circle at exactly one point called the point of contact, while a secant (छेदक रेखा) intersects the circle at two distinct points. A tangent is a limiting case of a secant — as the two intersection points of a secant move closer together, the secant becomes a tangent when they coincide. Both concepts are fundamental in NCERT Class 10 Maths Chapter 10.

What is the common point of a tangent to a circle called?

The common point of a tangent to a circle and the circle is called the **point of contact** (Hindi: स्पर्श बिंदु). At this point, the tangent line is perpendicular to the radius drawn from the centre to that point. This is a fill-in-the-blank question directly from NCERT Exercise 10.1, Question 2(iv).

How many parallel tangents can a circle have at most?

A circle can have at most **two** parallel tangents. These two tangents touch the circle at the two endpoints of a diameter. The distance between the two parallel tangents equals the diameter of the circle. It is impossible to draw a third tangent parallel to these two because any such line would either miss the circle (non-intersecting) or cut through it at two points (secant).

Is NCERT Solutions for Class 10 Maths Chapter 10 Circles important for the 2026-27 board exam?

Yes, Chapter 10 Circles is an important chapter for the 2026-27 CBSE Class 10 board exam. It is part of the Geometry unit, which carries significant marks. Expect 1-mark MCQs on definitions, 2-3 mark tangent-length calculations, and a 5-mark proof (usually the equal-tangent-lengths theorem). Both Exercise 10.1 and Exercise 10.2 are in the current rationalised syllabus.

Source: ncertbooks.net — Updated for CBSE Academic Year 2026-27