

Class X

Mathematics

One-page chapter summaries
Large print • CBSE 2026-27 syllabus

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Written for Mathematics Standard (041). Mathematics Basic (241) has exactly the same 2026-27 syllabus and chapters; only the question paper is easier. Content from the rationalised NCERT textbook (Reprint 2026-27); questions from official CBSE Sample Question Papers.

Chapter 1: Real Numbers

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Big idea: Every composite number breaks into primes in exactly one way, and that unlocks HCF, LCM and irrationality proofs.

Key points

- **Fundamental Theorem of Arithmetic**: every composite number is a product of primes, unique apart from the order of the factors.
- **HCF** = product of the smallest power of each common prime factor.
- **LCM** = product of the greatest power of each prime factor involved.
- If a prime p divides a^2 , then p divides a (a a positive integer).
- $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ are proved irrational by **contradiction**: assume a/b in lowest terms (co-prime), reach a common factor.
- Rational + irrational, and non-zero rational $\times$ irrational, are irrational (e.g. $2 + 3\sqrt{3}$, $5\sqrt{2}$).
- A number ends in 0 only if its prime factorisation has both 2 and 5 (so 6^n or 5^n never ends in 0).

Formulas, definitions & facts

- $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$ (two numbers only, not three)
- Largest number dividing x and y leaving remainders r_1 , $r_2 = \text{HCF}(x - r_1, y - r_2)$
- Things happening together again (bells, lights) $\rightarrow$ LCM; largest equal pieces / rooms / ruler $\rightarrow$ HCF

Exam focus: how to score

- **Irrationality proof (3 marks)**: write 'assume rational = a/b , $b \neq 0$ ', isolate the surd, state the contradiction, conclude. Each step earns marks.
- Word problems: decide HCF or LCM first and write why.
- Show the prime factorisation (factor tree or division) — answers alone lose marks.

★ Important questions from CBSE sample papers

- The greatest number which divides 134 and 188 leaving remainders 4 and 6 respectively is? (SQP 2026-27, 1 mark)
- Find the longest ruler that can exactly measure a hall $9.75 \text{ m} \times 6.75 \text{ m} \times 5.25 \text{ m}$. (SQP 2026-27, 2 marks)
- Given that $\sqrt{3}$ is irrational, prove that $2 + 3\sqrt{3}$ is irrational. (SQP 2026-27, 3 marks)

Remember: Together again $\rightarrow$ LCM. Cut into biggest equal parts $\rightarrow$ HCF.

Chapter 2: Polynomials

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Big idea: Zeroes are where the graph meets the x-axis, and they are tied to the coefficients.

Key points

- Degree 1, 2, 3 → **linear, quadratic, cubic** polynomial.
- **Zero** of $p(x)$: a value k with $p(k) = 0$.
- Geometrically, zeroes are the **x-coordinates where $y = p(x)$ cuts the x-axis**.
- Graph of a quadratic is a **parabola**: opens up if $a > 0$, down if $a < 0$.
- A quadratic has at most 2 zeroes; a cubic at most 3. Count zeroes from a graph by counting x-axis crossings.
- Zeroes reciprocal of each other → product = 1 → $a = c$.
- Equal zeroes → $b^2 = 4ac$, so a and c have the same sign.
- Form a quadratic from sum S and product P : $k(x^2 - Sx + P)$.

Formulas, definitions & facts

- **Quadratic $ax^2 + bx + c$: $\alpha + \beta = -b/a$, $\alpha\beta = c/a$**
- Cubic $ax^3 + bx^2 + cx + d$: $\alpha + \beta + \gamma = -b/a$, $\alpha\beta + \beta\gamma + \gamma\alpha = c/a$, $\alpha\beta\gamma = -d/a$
- $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$
- $1/\alpha + 1/\beta = (\alpha + \beta)/\alpha\beta$

Exam focus: how to score

- 'Find zeroes and verify the relationship' (3 marks): factorise by splitting the middle term, then check BOTH sum and product.
- For expressions in α , β , rewrite using $\alpha + \beta$ and $\alpha\beta$ first; never solve for α and β separately.
- Graph MCQs: count points where the curve touches/cuts the x-axis only.

★ Important questions from CBSE sample papers

- If α , β are zeroes of $2x^2 - 8x + 5$, find $(\alpha + 1/\beta)(\beta + 1/\alpha)$. (SQP 2026-27, 3 marks)
- Find the zeroes of $2x^2 - (1 + 2\sqrt{2})x + \sqrt{2}$ and verify the relationship between zeroes and coefficients. (SQP 2025-26, 3 marks)
- A-R: zeroes of $(2k - 1)x^2 + 4x - 3$ are reciprocals, so $k = -1$. Reason: if $a = c$, zeroes are reciprocal. (SQP 2026-27, 1 mark)

Remember: Sum is minus b by a, product is c by a.

Chapter 3: Pair of Linear Equations in Two Variables

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Big idea: Two lines can meet once, never, or everywhere: that decides the number of solutions.

Key points

- General form: $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$.
- **Graphical method:** plot both lines; the intersection point is the solution.
- Intersecting lines → unique solution → **consistent**.
- Coincident lines → infinitely many solutions → **dependent (consistent)**.
- Parallel lines → no solution → **inconsistent**.
- Algebraic methods in syllabus: **substitution** and **elimination**.
- Some equations (e.g. in $1/x$, $1/y$) can be changed into linear form by substitution.
- Word problems: ages, fractions, money, speed-of-boat, ticket sales.

Formulas, definitions & facts

- **$a_1/a_2 \neq b_1/b_2 \rightarrow$ unique solution (intersecting)**
- $a_1/a_2 = b_1/b_2 = c_1/c_2 \rightarrow$ infinitely many (coincident)
- $a_1/a_2 = b_1/b_2 \neq c_1/c_2 \rightarrow$ no solution (parallel)

Exam focus: how to score

- Word problems: define variables ('Let the cost of small bottle be ₹x'), form both equations, solve, answer in words.
- For 'find k' questions, write the ratio condition first, then solve.
- Check your answer in both original equations; a sign slip costs the final mark.

★ Important questions from CBSE sample papers

- Sanitizer case study: ₹10 small, ₹15 large; 1000 bottles sold for ₹12,750 in June. Prices +₹2; 2500 bottles for ₹34,250 in July. Form the equations and find bottles sold. (SQP 2026-27, 4 marks)
- Incomes of Aryan and Babban are in ratio 3:4, expenditures 5:7; each saves ₹15,000. Find their incomes. (SQP 2025-26, 3 marks)
- If $3x + 2ky = 2$ and $2x + 5y + 1 = 0$ are not parallel, then k has to be? (SQP 2025-26, 1 mark)

Remember: Ratios differ → meet once. All equal → same line. Last one differs → parallel.

Chapter 4: Quadratic Equations

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Big idea: $ax^2 + bx + c = 0$ is solved by factorising or by the formula; the discriminant tells you what roots to expect.

Key points

- Standard form $ax^2 + bx + c = 0$, with $a \neq 0$.
- A **root** α satisfies $a\alpha^2 + b\alpha + c = 0$. Roots of the equation = zeroes of the polynomial.
- **Factorisation**: split the middle term so the two parts multiply to ac and add to b .
- **Quadratic formula** works for every quadratic with real roots.
- **Discriminant** $D = b^2 - 4ac$ decides the nature of roots.
- Check 'is it quadratic?' by expanding both sides; x^2 terms may cancel.
- Word problems: area of strips/plots, speed-time, ages, consecutive numbers.
- Reject impossible roots (negative length, speed or age) and say why.

Formulas, definitions & facts

- $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- **$D > 0$: two distinct real roots; $D = 0$: two equal roots ($-b/2a$); $D < 0$: no real roots**
- Speed problems: time = distance / speed

Exam focus: how to score

- 5-mark word problem: set the variable, form the equation, simplify to standard form, solve, reject the invalid root, state the answer with units.
- 'Find k for equal roots' $\rightarrow$ set $b^2 - 4ac = 0$.
- Show the splitting step clearly; marking schemes give a mark for it.

★ Important questions from CBSE sample papers

- A park $50 \text{ m} \times 40 \text{ m}$ has a rectangular pool in the middle with a uniform grass strip around it of area 1184 m^2 . Find the pool's dimensions. (SQP 2026-27, 5 marks)
- A train travels 63 km at some speed, then 72 km at 6 km/h faster, taking 3 hours in all. Find the original speed. (SQP 2025-26, 5 marks)
- If $(1 - p)$ is a root of $x^2 + px + 1 - p = 0$, then its roots are? (SQP 2026-27, 1 mark)

Remember: D decides: positive two, zero one (repeated), negative none.

Chapter 5: Arithmetic Progressions

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Big idea: Add the same number d every time; two formulas give any term and any sum.

Key points

- **AP:** each term = previous term + fixed **common difference d** .
- General form: $a, a + d, a + 2d, a + 3d, \dots$
- Test for AP: $a_2 - a_1 = a_3 - a_2 = \dots$ (d can be positive, negative or zero).
- Use a_n for 'which term', 'nth term', 'is x a term?' (n must be a positive integer).
- Use S_n for totals: savings, rows of seats, logs in a pile.
- Middle term of an AP with odd n terms is the $((n + 1)/2)$ th term.
- n th term from the end = $l - (n - 1)d$.
- $a_n = S_n - S_{n-1}$.

Formulas, definitions & facts

- **$a_n = a + (n - 1)d$**
- **$S_n = n/2 [2a + (n - 1)d]$**
- $S_n = n/2 (a + l)$, l = last term
- If a, b, c are in AP: $b = (a + c)/2$ (arithmetic mean)

Exam focus: how to score

- Write a, d and n before substituting — each is worth a step mark.
- For 'sum of multiples of 4 and 5 between 1 and 400', first list the AP (20, 40, ..., 380).
- For 'sum of last 10 terms', use terms 51st to 60th or subtract S_{50} from S_{60} .

★ Important questions from CBSE sample papers

- The middle term of the AP 10, 7, 4, ..., -62 is? (SQP 2026-27, 1 mark)
- Find the sum of integers between 1 and 400 that are multiples of 4 as well as 5. (SQP 2026-27, 3 marks)
- A polygon's smallest exterior angle is 8° , each next one 4° more. Find the number of sides. (SQP 2026-27, 3 marks)
- The AP 8, 10, 12, ... has 60 terms. Find the sum of its last 10 terms. (SQP 2025-26, 2 marks)

Remember: Term: $a + (n-1)d$. Sum: $n/2 \times (\text{first} + \text{last})$.

Chapter 6: Triangles

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Big idea: Similar triangles have the same shape: equal angles and proportional sides.

Key points

- **Similar figures:** same shape, not necessarily same size. All congruent figures are similar, not vice versa.
- Two polygons with the same number of sides are similar if angles are equal AND sides are in the same ratio.
- **Basic Proportionality Theorem (Thales):** a line parallel to one side divides the other two sides in the same ratio (PROOF in syllabus).
- **Converse of BPT:** a line dividing two sides in the same ratio is parallel to the third side (statement only).
- Similarity criteria: **AAA / AA, SSS, SAS** (statements only).
- Ratio of perimeters (and of medians, altitudes) of similar triangles = ratio of corresponding sides.
- Write similarity in matching order: $\triangle ABC \sim \triangle PQR$ means $A \leftrightarrow P, B \leftrightarrow Q, C \leftrightarrow R$.

Formulas, definitions & facts

- BPT: $DE \parallel BC \Rightarrow AD/DB = AE/EC$
- $\triangle ABC \sim \triangle DEF \Rightarrow AB/DE = BC/EF = CA/FD$
- Perimeter ratio = side ratio

Diagrams, maps & graphs to practise

- BPT proof figure: $\triangle ABC$ with $DE \parallel BC$, join BE and CD, draw $EN \perp AB$ and $DM \perp AC$

Exam focus: how to score

- **BPT proof is a near-certain 5-marker:** Given, To prove, Construction, Proof (area ratios), then apply it to the second part.
- Name the criterion (AA, SAS, SSS) with every similarity claim.
- Draw a neat labelled figure; it carries marks.

★ Important questions from CBSE sample papers

- Prove BPT. Hence, in trapezium PQRS with $PQ \parallel SR$ and $XY \parallel PQ$, show $PX/XS = QY/YR$. (SQP 2026-27, 5 marks)
- ABCD is a trapezium with $AB \parallel DC$; diagonals meet at O. Show $AO/BO = CO/DO$. (SQP 2026-27, 2 marks)
- Perimeters of two similar triangles are 56 cm and 70 cm. A side of the first is 14 cm; find the corresponding side of the second. (SQP 2026-27, 1 mark)

Remember: Parallel line $\rightarrow$ equal ratios. Two equal angles $\rightarrow$ similar.

Chapter 7: Coordinate Geometry

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Big idea: Points on a grid let you measure lengths and split segments using two formulas.

Key points

- **Distance formula** gives the length between two points; use it to test isosceles, equilateral, right triangles, squares, rhombi, collinearity.
- Distance from the origin: $\sqrt{x^2 + y^2}$.
- Distance of (x, y) from the y-axis = $|x|$; from the x-axis = $|y|$.
- **Section formula** (internal division only in syllabus) finds the point dividing AB in $m_1 : m_2$.
- A point on the **x-axis** is $(x, 0)$; on the **y-axis** is $(0, y)$.
- Ratio in which the x-axis divides AB: take $k : 1$ and set $y = 0$.
- Diagonals of a parallelogram bisect each other: midpoints are equal (find the 4th vertex).
- Equidistant point / perpendicular bisector: equate the two distances (square both sides).

Formulas, definitions & facts

- **$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$**
- **$P = ((m_1x_2 + m_2x_1)/(m_1 + m_2), (m_1y_2 + m_2y_1)/(m_1 + m_2))$**
- Midpoint = $((x_1 + x_2)/2, (y_1 + y_2)/2)$

Exam focus: how to score

- Write the formula first, then substitute; mark schemes award the formula step.
- For ratio questions, use $k : 1$ and give the final point of division too.
- Square both sides early to avoid square-root errors.

★ Important questions from CBSE sample papers

- In what ratio does the x-axis divide the segment joining $(-4, -6)$ and $(-1, 7)$? Find the point of division. (SQP 2026-27, 3 marks)
- PM is a median of ΔPQR with $P(5, -6)$, $Q(6, 4)$, $R(0, 0)$. Find PM. (SQP 2026-27, 1 mark)
- Which point lies on the perpendicular bisector of $A(-3, -4)$ and $B(3, 4)$? (SQP 2026-27, 1 mark)
- $P(2, 5)$, $Q(4, 4)$, $R(8, 3)$: find PR; is Q the midpoint of PR? Find a point on the x-axis equidistant from P and Q. (SQP 2025-26, 4 marks)

Remember: Distance: root of $(\Delta x^2 + \Delta y^2)$. Section: cross-multiply ratio with the far point.

Chapter 8: Introduction to Trigonometry

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Big idea: In a right triangle, ratios of sides depend only on the angle.

Key points

- For acute angle A in right $\triangle ABC$ (right angle at B): $\sin A = \text{opp/hyp}$, $\cos A = \text{adj/hyp}$, $\tan A = \text{opp/adj}$.
- **cosec, sec, cot** are reciprocals of $\sin$, $\cos$, $\tan$.
- Know one ratio $\rightarrow$ draw the triangle, find the third side by Pythagoras, get all ratios.
- $\sin A$ and $\cos A$ never exceed 1; $\sec A$ and $\text{cosec } A$ are always ≥ 1 .
- $\tan 90^\circ$ and $\sec 90^\circ$ are not defined; $\cot 0^\circ$ and $\text{cosec } 0^\circ$ are not defined.
- **Learn the standard table** for 0° , 30° , 45° , 60° , 90° .
- Prove identities by working on ONE side (usually the harder one) until it equals the other.

Formulas, definitions & facts

- $\sin$: 0, $1/2$, $1/\sqrt{2}$, $\sqrt{3}/2$, 1 (0° , 30° , 45° , 60° , 90°)
- $\cos$: 1, $\sqrt{3}/2$, $1/\sqrt{2}$, $1/2$, 0
- $\tan$: 0, $1/\sqrt{3}$, 1, $\sqrt{3}$, not defined
- $\tan A = \sin A / \cos A$; $\cot A = \cos A / \sin A$
- **$\sin^2 A + \cos^2 A = 1$**
- $\sec^2 A - \tan^2 A = 1$; $\text{cosec}^2 A - \cot^2 A = 1$

Exam focus: how to score

- Identity proofs (3 marks): convert to $\sin$ and $\cos$, take LCM, use $\sin^2 + \cos^2 = 1$. Show every line.
- 'Find A and B' questions: turn each value into an angle (e.g. $\tan(A+B) = \sqrt{3} \rightarrow A + B = 60^\circ$), then solve.
- Error-spotting questions: find the faulty step, fix it, and finish the answer.

★ Important questions from CBSE sample papers

- If $\tan \theta = 1/\sqrt{5}$, find $(\text{cosec}^2 \theta - \sec^2 \theta)/(\text{cosec}^2 \theta + \sec^2 \theta)$. (SQP 2026-27, 2 marks)
- Find the error in Jyoti's simplification of $\cos \theta/(1 - \sin \theta) + (1 - \sin \theta)/\cos \theta$, rectify it and get the correct answer. (SQP 2026-27, 3 marks)
- If $\sin(A + B) = 1$ and $\cos(A - B) = \sqrt{3}/2$, $0^\circ < A, B < 90^\circ$, find A and B. (SQP 2025-26, 2 marks)
- Prove $(\cos A - \sin A + 1)/(\cos A + \sin A - 1) = \text{cosec } A + \cot A$. (SQP 2025-26, 3 marks)

Remember: Some People Have Curly Brown Hair Through Proper Brushing: $\sin = P/H$, $\cos = B/H$, $\tan = P/B$.

Chapter 9: Some Applications of Trigonometry

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Big idea: Heights and distances you can't measure are found with tan, sin or cos in right triangles.

Key points

- **Line of sight:** line from the observer's eye to the object.
- **Angle of elevation:** angle between line of sight and horizontal when looking UP.
- **Angle of depression:** angle between line of sight and horizontal when looking DOWN.
- Angle of depression from A to B = angle of elevation from B to A (alternate angles).
- Syllabus limit: at most **two right triangles**; angles only 30° , 45° , 60° .
- tan is used most (height and base); use sin/cos when the slant length (string, ladder) is involved.
- Include the observer's height when the angle is measured from the eye.

Formulas, definitions & facts

- $\tan \theta = \text{height} / \text{horizontal distance}$
- $\sin \theta = \text{height} / \text{slant length (string, ladder, wire)}$
- $\tan 30^\circ = 1/\sqrt{3}$, $\tan 45^\circ = 1$, $\tan 60^\circ = \sqrt{3}$

Diagrams, maps & graphs to practise

- Tower/lighthouse with two ships on the same side (angles of depression 45° and 30°)
- Observer of height h looking at a monument: horizontal line from the eye, not the ground

Exam focus: how to score

- Always draw a labelled diagram first — it carries marks in the 5-mark question.
- Write one equation per triangle, then eliminate the common unknown.
- State the final answer with units (m).

★ Important questions from CBSE sample papers

- Ships 200 m apart on the same side of a lighthouse are seen at angles of depression 45° and 30° . Find the lighthouse's height. (SQP 2026-27, 5 marks)
- Manish sees a kite 200 m away at 30° ; Mahesh, on a 50 m building opposite, sees it at 45° . Find the distance between kite and Mahesh. (SQP 2026-27, 5 marks)
- A kite string is 52 m and $\tan \theta = 12/5$. Find the kite's height. (SQP 2026-27, 1 mark)
- Shreya (eye height 1 m) views the 42 m India Gate: find the angle of elevation from 41 m away, and her distance when the angle is 60° . (SQP 2025-26, case study)

Remember: Draw first. Elevation up, depression down — and they are equal across parallel lines.

Chapter 10: Circles

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Big idea: A tangent touches a circle at exactly one point and is perpendicular to the radius there.

Key points

- **Secant:** line meeting a circle at two points. **Tangent:** line meeting it at exactly one point (point of contact).
- No tangent passes through a point inside the circle; exactly one through a point on it; exactly two from a point outside.
- **Theorem 10.1 (PROOF):** the tangent at any point is perpendicular to the radius through the point of contact.
- **Theorem 10.2 (PROOF):** lengths of tangents from an external point are equal.
- Tangents from an external point are equally inclined to the line joining the point to the centre.
- Angle between two tangents + angle subtended by the contact points at the centre = 180° .
- Quadrilateral circumscribing a circle: $AB + CD = AD + BC$.

Formulas, definitions & facts

- Tangent length from P: $PA = \sqrt{(OP^2 - r^2)}$
- $\angle APB + \angle AOB = 180^\circ$
- $\angle OAP = 90^\circ$

Diagrams, maps & graphs to practise

- Circle with two tangents PA, PB from external point P, radii OA, OB and line OP

Exam focus: how to score

- Both theorem proofs are in the syllabus: give Given, To prove, Construction, Proof with reasons.
- In 'prove it's a rhombus' type questions, label equal tangent pairs and add them up.
- Write the reason for each step (e.g. 'tangents from an external point are equal').

★ Important questions from CBSE sample papers

- Prove that the parallelogram circumscribing a circle is a rhombus. (SQP 2026-27, 3 marks)
- Garden case study: radius 9 m, $OP = 18$ m. Find $\angle OAP$, tangent PA and $\angle AOB$. (SQP 2026-27, 4 marks)
- XY and X'Y' are parallel tangents; tangent AB touches at C and meets them at A and B. Prove $\angle AOB = 90^\circ$. (SQP 2025-26, 3 marks)

Remember: Radius meets tangent at 90° . Two tangents from one point are twins.

Chapter 11: Areas Related to Circles

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Big idea: A sector is a slice of the circle; a segment is the sector minus its triangle.

Key points

- **Sector:** region between two radii and an arc. Minor sector uses angle θ ; major sector uses $360^\circ - \theta$.
- **Segment:** region between a chord and its arc.
- Area of segment = area of sector – area of triangle.
- Syllabus limit: segment questions only for central angle **60° , 90° or 120°** .
- $60^\circ \rightarrow$ equilateral triangle (area $\sqrt{3}/4 r^2$); $90^\circ \rightarrow$ right triangle (area $r^2/2$); $120^\circ \rightarrow$ area $(\sqrt{3}/4) r^2$.
- Distance covered in one revolution of a wheel = circumference = $2\pi r$.
- Take $\pi = 22/7$ unless told otherwise (SQP instruction).
- Grazing, clock-hand and wiper problems are sector problems.

Formulas, definitions & facts

- **Arc length = $(\theta/360^\circ) \times 2\pi r$**
- **Area of sector = $(\theta/360^\circ) \times \pi r^2$**
- Area of sector = $\frac{1}{2} \times \text{arc length} \times r$
- Area of segment = $(\theta/360^\circ)\pi r^2 - \text{area of triangle}$
- Circumference = $2\pi r$; area = πr^2

Exam focus: how to score

- Write the formula with θ before substituting; keep π as $22/7$ or 3.14 as told.
- For segments, show the triangle area separately — it is its own step mark.
- Units: cm for length, cm^2 for area.

★ Important questions from CBSE sample papers

- Find the area of a sector of a circle of diameter 28 cm if the arc length is 22 cm. (SQP 2026-27, 2 marks)
- An arc of length 6π cm bounds a sector of area $24\pi \text{ cm}^2$. Find the radius. (SQP 2026-27, 1 mark)
- A car wheel has diameter 21 cm. Find the complete revolutions it makes in 66 km. (SQP 2026-27, 1 mark)

Remember: Slice of pizza = sector; crust edge cut off by a straight line = segment.

Chapter 12: Surface Areas and Volumes

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Big idea: Combine two basic solids: add their volumes, but count only the surfaces you can see.

Key points

- Syllabus: combinations of ANY TWO of cube, cuboid, sphere, hemisphere, right circular cylinder, cone.
- **Total surface area of a combination** = sum of visible curved/flat surfaces only; hidden joined faces are left out.
- **Volume of a combination** = sum (or difference, if hollowed) of the individual volumes.
- Tent = cylinder + cone: canvas = CSA of cylinder + CSA of cone (no base).
- Toy = hemisphere + cone; capsule = cylinder + two hemispheres.
- Hollowing out a cavity: remove its volume, but ADD the inner surface it creates.
- Two cubes of side a joined end to end form a cuboid $2a \times a \times a$.
- Slant height $l = \sqrt{r^2 + h^2}$.

Formulas, definitions & facts

- Cylinder: CSA $2\pi rh$, volume $\pi r^2 h$
- **Cone: CSA πrl , volume $\frac{1}{3}\pi r^2 h$**
- Sphere: SA $4\pi r^2$, volume $(4/3)\pi r^3$
- **Hemisphere: CSA $2\pi r^2$, TSA $3\pi r^2$, volume $(2/3)\pi r^3$**
- Cuboid: TSA $2(lb + bh + hl)$, volume lbh ; Cube: $6a^2$, a^3

Exam focus: how to score

- Draw and split the solid; list each part's surface or volume before adding.
- Read carefully: 'canvas', 'painting', 'cost' mean surface area; 'wood used', 'capacity' mean volume.
- Convert units first ($\text{cm}^3 \leftrightarrow \text{litres}$: $1000 \text{ cm}^3 = 1 \text{ L}$).

★ Important questions from CBSE sample papers

- Tent: cylinder (h 3 m, r 14 m) with conical top, total height 13.5 m. Find canvas needed with 26 m^2 extra for wastage, and its cost at ₹250 per m^2 . (SQP 2026-27, 5 marks)
- Wooden toy: hemisphere (r 3.5 cm) surmounted by a cone; volume $166\frac{5}{6} \text{ cm}^3$. Find the cone's height and cost of painting the hemisphere at ₹15 per cm^2 . (SQP 2026-27, 5 marks)
- Two cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the cuboid. (SQP 2026-27, 1 mark)

Remember: Volumes add up; surfaces add only what you can touch.

Chapter 13: Statistics

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Big idea: Mean, median and mode of grouped data come from class marks, cumulative frequencies and the modal class.

Key points

- **Class mark** $x_i = (\text{lower limit} + \text{upper limit})/2$; frequency is assumed centred at it.
- **Mean**: direct, assumed-mean or step-deviation method — all give the same answer.
- **Modal class**: class with the highest frequency.
- **Median class**: class whose cumulative frequency first reaches or passes $n/2$.
- **Cumulative frequency (cf)**: running total of frequencies up to that class.
- Make classes continuous before using formulas; convert 'less than' tables to class-frequency form.
- Bimodal data is not asked in the syllabus.
- Combined mean $= (n_1\bar{x}_1 + n_2\bar{x}_2)/(n_1 + n_2)$.

Formulas, definitions & facts

- Direct: $\bar{x} = \sum f_i x_i / \sum f_i$
- Assumed mean: $\bar{x} = a + \sum f_i d_i / \sum f_i$, $d_i = x_i - a$
- Step deviation: $\bar{x} = a + (\sum f_i u_i / \sum f_i) \times h$, $u_i = (x_i - a)/h$
- **Mode** $= l + [(f_1 - f_0)/(2f_1 - f_0 - f_2)] \times h$
- **Median** $= l + [(n/2 - cf)/f] \times h$
- $3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$ (empirical)

Exam focus: how to score

- Draw a neat table with x_i , f_i , $f_i x_i$ (or d_i , u_i) and cf columns — table work earns marks.
- Write l , f , f_0 , f_1 , f_2 , cf, h separately before substituting.
- Case studies often ask modal class and median class: answer with the class interval, not a number.

★ Important questions from CBSE sample papers

- Marks out of 50: 0–10: 3, 10–20: 6, 20–30: 12, 30–40: 15, 40–50: 14. Find modal class, median class, and the mean or mode. (SQP 2026-27, 4 marks)
- Mean and median of a data set are 35.5 and 32. Find the mode. (SQP 2026-27, 1 mark)
- Combined mean age is 35; men 38, women 30. Find the percentage of women. (SQP 2026-27, 1 mark)
- If the mode of the given distribution is 55, find x and hence the mean. (SQP 2025-26, 5 marks)

Remember: Mode: highest f. Median: first cf past $n/2$. Mean: $\sum fx$ over $\sum f$.

Chapter 14: Probability

Class X • Mathematics • CBSE 2026-27

Big idea: Probability = favourable outcomes ÷ all equally likely outcomes, always between 0 and 1.

Key points

- **$P(E)$ = number of favourable outcomes / total number of outcomes** (equally likely outcomes).
- Sure event: $P = 1$. Impossible event: $P = 0$. Always $0 \leq P(E) \leq 1$.
- **Elementary event**: only one outcome. Sum of probabilities of all elementary events = 1.
- **Complementary events**: $P(E) + P(\text{not } E) = 1$.
- Two dice: 36 outcomes; write the pairs as a grid. Three coins: 8 outcomes.
- Deck: 52 cards, 4 suits of 13; 12 face cards (J, Q, K); 26 red, 26 black.
- If cards are removed, reduce the total first.
- Count carefully: 'between', 'from 4 to 99', 'perfect square or cube' (don't double count).

Formulas, definitions & facts

- $P(E)$ = favourable / total
- $P(\text{not } E) = 1 - P(E)$
- Two dice sums: 7 occurs 6 times; 2 and 12 once each

Exam focus: how to score

- List the sample space and the favourable outcomes explicitly; marking schemes reward the listing.
- Give the answer as a simplified fraction.
- In 'who is more likely' questions, compute both probabilities and compare with a clear statement.

★ Important questions from CBSE sample papers

- Two dice are thrown. Find the probability that the product of the numbers is a prime. (SQP 2026-27, 2 marks)
- T-shirts numbered 4 to 99: find the probability of a perfect square or a perfect cube. (SQP 2026-27, 1 mark)
- 2 diamonds and 4 spades are missing from a 52-card pack. Find $P(\text{heart})$. (SQP 2026-27, 1 mark)
- Vidhi and Unnati each flip a coin three times; two heads in a row vs head followed by tail. Who is more likely to drive? (SQP 2025-26, 3 marks)

Remember: What you want ÷ everything possible. Not-E = 1 minus E.