



CBSE Class 11 Mathematics Formula Sheet

109 formulas across 14 chapters — 2025-26 CBSE board exams

Ch 1. Sets

Union: inclusion-exclusion (2 sets)

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

Union: inclusion-exclusion (3 sets)

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$$

Complement

$$n(A') = n(U) - n(A)$$

Tip: A' = all elements in universal set U but not in A

Difference of sets

$$n(A - B) = n(A) - n(A \cap B)$$

Tip: $A - B$ = elements in A but not in B

Number of subsets

$$2^n \text{ (including empty set and the set itself)}$$

n = number of elements in set

Tip: Number of proper subsets = $2^n - 1$

Cartesian product

$$n(A \times B) = n(A) \times n(B)$$

Tip: $A \times B$ consists of all ordered pairs (a, b) with $a \in A$, $b \in B$

De Morgan's laws

$$(A \cup B)' = A' \cap B' \quad | \quad (A \cap B)' = A' \cup B'$$

Ch 2. Relations and Functions

Number of relations from A to B

$$2^{(m \times n)}$$

$m = n(A)$, $n = n(B)$

Tip: A relation is any subset of $A \times B$; total subsets = $2^{(mn)}$

Number of functions from A to B

$$n^m$$

$m = n(A)$, $n = n(B)$

Tip: Each of the m elements of A can map to any of the n elements of B

Domain of composite $f \circ g$

$$\text{Domain}(f \circ g) = \{x \in \text{Domain}(g) : g(x) \in \text{Domain}(f)\}$$

Tip: $(f \circ g)(x) = f(g(x))$ — apply g first, then f

Modulus function

$$|x| = x \text{ if } x \geq 0; -x \text{ if } x < 0$$

Tip: Graph: V-shape with vertex at origin

CBSE Class 11 Mathematics Formula Sheet

Greatest integer function

$$[x] = \text{largest integer } \leq x$$

Tip: $[2.7] = 2$; $[-2.7] = -3$ (not -2)

Signum function

$$\text{sgn}(x) = 1 \text{ if } x > 0; 0 \text{ if } x = 0; -1 \text{ if } x < 0$$

Ch 3. Trigonometric Functions

Pythagorean identity 1

$$\sin^2\theta + \cos^2\theta = 1$$

Pythagorean identity 2

$$1 + \tan^2\theta = \sec^2\theta$$

Pythagorean identity 3

$$1 + \cot^2\theta = \text{cosec}^2\theta$$

Sine of sum

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

Tip: Remember as: $\sin \text{ sum} = \sin \cdot \cos + \cos \cdot \sin$

Cosine of sum

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

Tangent of sum

$$\tan(A+B) = (\tan A + \tan B) / (1 - \tan A \tan B)$$

Double angle: sine

$$\sin 2A = 2 \sin A \cos A$$

Double angle: cosine

$$\cos 2A = \cos^2 A - \sin^2 A = 1 - 2\sin^2 A = 2\cos^2 A - 1$$

Double angle: tangent

$$\tan 2A = 2\tan A / (1 - \tan^2 A)$$

Product to sum

$$2 \sin A \cos B = \sin(A+B) + \sin(A-B)$$

Sum to product

$$\sin C + \sin D = 2 \sin[(C+D)/2] \cos[(C-D)/2]$$

Tip: Useful for simplifying sums of trig functions

Ch 4. Complex Numbers and Quadratic Equations

Complex number definition

$$z = a + ib$$

a = real part, b = imaginary part, $i = \sqrt{-1}$

Modulus of z

$$|z| = \sqrt{a^2 + b^2}$$

Argument of z

$$\arg(z) = \theta = \tan^{-1}(b/a) \text{ (adjusted for correct quadrant)}$$

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Polar form

$$z = r(\cos\theta + i \sin\theta)$$

$$r = |z|, \theta = \arg(z)$$

Conjugate

$$\bar{z} = a - ib \quad | \quad z \times \bar{z} = |z|^2$$

Tip: Multiply by conjugate to rationalise complex fractions

Quadratic discriminant

$$D = b^2 - 4ac$$

Tip: $D > 0$: two real roots; $D = 0$: equal real roots; $D < 0$: complex conjugate roots

Complex roots occur in pairs

If $p + iq$ is a root of real-coefficient polynomial, then $p - iq$ is also a root

Ch 5. Linear Inequalities

Sign reversal rule

Multiplying or dividing both sides by a negative number reverses the inequality sign

Tip: Most common error in inequality problems — always check if you multiplied/divided by a negative

Absolute value inequality (less than)

$$|x| < a \implies -a < x < a \quad (\text{i.e. } x \in (-a, a))$$

Tip: Valid for $a > 0$; represents points within distance a of origin

Absolute value inequality (greater than)

$$|x| > a \implies x < -a \text{ or } x > a \quad (\text{i.e. } x \in (-\infty, -a) \cup (a, \infty))$$

Tip: Two separate intervals — do not write as a single connected interval

Interval notation

Open: (a, b) means $a < x < b$ | Closed: $[a, b]$ means $a \leq x \leq b$ | Half-open: $[a, b)$ or $(a, b]$

Graphical solution: two variables

Shade feasible region satisfying all inequalities; test a point (usually origin) to determine which side

Tip: Each linear inequality corresponds to a half-plane; solution is the intersection of all half-planes

Ch 6. Permutations and Combinations

Permutation (arrangement)

$$P(n, r) = nPr = n! / (n-r)!$$

n = total items, r = items selected

Tip: Order matters in permutation

Combination (selection)

$$C(n, r) = nCr = n! / [r!(n-r)!]$$

Tip: Order does NOT matter in combination

Circular permutations

$$(n-1)! \quad (\text{for } n \text{ distinct items in a circle})$$

Tip: If clockwise and anticlockwise are same: $(n-1)!/2$

Permutations with repetition

$$n! / p!q!r! \dots$$

p, q, r = counts of repeated items

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Symmetry of nCr

$$nCr = nC(n-r)$$

Pascal's identity

$$nCr + nC(r+1) = (n+1)C(r+1)$$

Sum of all nCr

$$nC0 + nC1 + \dots + nCn = 2^n$$

Ch 7. Binomial Theorem

Binomial expansion

$$(a + b)^n = \sum_{r=0}^n nCr \times a^{(n-r)} \times b^r$$

General term

$$T_{(r+1)} = nCr \times a^{(n-r)} \times b^r$$

Tip: To find term containing b^k , set $r = k$

Middle term (n even)

$T_{(n/2 + 1)}$ is the single middle term

Middle terms (n odd)

$T_{((n+1)/2)}$ and $T_{((n+3)/2)}$ are both middle terms

Sum of coefficients

Put $a = b = 1$: sum = 2^n

Sum of odd-position coefficients

$$nC0 + nC2 + nC4 + \dots = 2^{(n-1)}$$

Tip: Same for even-position coefficients

Ch 8. Sequences and Series

AP: nth term

$$a_n = a + (n-1)d$$

a = first term, d = common difference

AP: sum of n terms

$$S_n = n/2 \times [2a + (n-1)d] = n/2 \times (a + l)$$

l = last term

Tip: Use second form when first and last terms are known

GP: nth term

$$a_n = ar^{(n-1)}$$

r = common ratio

GP: sum of n terms ($r \neq 1$)

$$S_n = a(r^n - 1) / (r - 1) \text{ for } r > 1 \quad | \quad a(1 - r^n)/(1 - r) \text{ for } r < 1$$

GP: sum of infinite series ($|r| < 1$)

$$S_\infty = a / (1 - r)$$

Arithmetic mean

$$\text{AM of } a \text{ and } b = (a + b) / 2$$

Geometric mean

$$\text{GM of } a \text{ and } b = \sqrt[2]{ab}$$

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AM-GM inequality

$AM \geq GM$ (equality when all terms are equal)

Sum of first n natural numbers

$$\Sigma n = n(n+1)/2$$

Sum of squares

$$\Sigma n^2 = n(n+1)(2n+1)/6$$

Sum of cubes

$$\Sigma n^3 = [n(n+1)/2]^2$$

Tip: $\Sigma n^3 = (\Sigma n)^2$ — a beautiful result worth memorising

Ch 9. Straight Lines

Slope formula

$$m = (y_2 - y_1) / (x_2 - x_1) = \tan \theta$$

θ = inclination of line with positive x-axis

Slope-intercept form

$$y = mx + c$$

c = y-intercept

Point-slope form

$$y - y_1 = m(x - x_1)$$

Two-point form

$$(y - y_1) / (y_2 - y_1) = (x - x_1) / (x_2 - x_1)$$

Intercept form

$$x/a + y/b = 1$$

a = x-intercept, b = y-intercept

Normal form

$$x \cos \omega + y \sin \omega = p$$

p = perpendicular distance from origin, ω = angle normal makes with x-axis

General form

$$ax + by + c = 0$$

Distance from point (x_1, y_1) to line $ax+by+c=0$

$$d = |ax_1 + by_1 + c| / \sqrt{a^2 + b^2}$$

Angle between two lines

$$\tan \theta = |(m_1 - m_2) / (1 + m_1 m_2)|$$

Tip: Lines parallel: $m_1 = m_2$; perpendicular: $m_1 m_2 = -1$

Ch 10. Conic Sections

Circle: standard form

$$(x - h)^2 + (y - k)^2 = r^2$$

Centre (h,k), radius r

Circle: general form

$$x^2 + y^2 + 2gx + 2fy + c = 0 \quad | \quad \text{Centre: } (-g, -f), r = \sqrt{g^2 + f^2 - c}$$

CBSE Class 11 Mathematics Formula Sheet

Parabola: standard

$$y^2 = 4ax \quad | \quad \text{Focus: } (a,0), \text{ Directrix: } x = -a, \text{ Axis: } x\text{-axis}$$

Tip: $a > 0 \rightarrow$ opens right; for $y^2 = -4ax \rightarrow$ opens left

Ellipse: standard

$$x^2/a^2 + y^2/b^2 = 1 \quad (a > b) \quad | \quad c^2 = a^2 - b^2, \text{ Eccentricity } e = c/a < 1$$

Ellipse: foci

$$\text{Foci at } (\pm c, 0) \quad | \quad \text{Length of major axis} = 2a \quad | \quad \text{Minor axis} = 2b$$

Hyperbola: standard

$$x^2/a^2 - y^2/b^2 = 1 \quad | \quad c^2 = a^2 + b^2, e = c/a > 1$$

Hyperbola: asymptotes

$$y = \pm(b/a)x$$

Tip: Asymptotes pass through centre and are NOT part of the curve

Parabola: parametric form

$$x = at^2, y = 2at \quad \text{for } y^2 = 4ax$$

Ellipse: parametric form

$$x = a \cos\theta, y = b \sin\theta$$

Ch 11. Introduction to Three Dimensional Geometry

Distance between two points

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

Tip: Extension of 2D distance formula to 3D; works the same way

Distance from origin

$$d = \sqrt{x^2 + y^2 + z^2}$$

Midpoint formula

$$M = ((x_1 + x_2)/2, (y_1 + y_2)/2, (z_1 + z_2)/2)$$

Tip: Same structure as 2D midpoint — just add the z-coordinate

Section formula (internal)

$$P = ((mx_2 + nx_1)/(m+n), (my_2 + ny_1)/(m+n), (mz_2 + nz_1)/(m+n))$$

$m:n$ = ratio in which P divides $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$

Section formula (external)

$$P = ((mx_2 - nx_1)/(m-n), (my_2 - ny_1)/(m-n), (mz_2 - nz_1)/(m-n))$$

Tip: External division: point lies outside the segment AB

Centroid of triangle

$$G = ((x_1 + x_2 + x_3)/3, (y_1 + y_2 + y_3)/3, (z_1 + z_2 + z_3)/3)$$

Tip: Centroid divides each median in ratio 2:1 from vertex

Ch 12. Limits and Derivatives

Standard limit 1

$$\lim_{x \rightarrow 0} \sin x / x = 1$$

Tip: x must be in radians

CBSE Class 11 Mathematics Formula Sheet

Standard limit 2

$$\lim_{x \rightarrow 0} (1 - \cos x)/x = 0$$

Standard limit 3

$$\lim_{x \rightarrow 0} \tan x/x = 1$$

Standard limit 4

$$\lim_{x \rightarrow a} (x^n - a^n)/(x - a) = na^{n-1}$$

Derivative from first principles

$$f'(x) = \lim_{h \rightarrow 0} [f(x+h) - f(x)] / h$$

Power rule

$$d/dx(x^n) = nx^{n-1}$$

Product rule

$$d/dx(uv) = u \cdot v' + v \cdot u'$$

Quotient rule

$$d/dx(u/v) = (v \cdot u' - u \cdot v') / v^2$$

d/dx(sin x)

$$\cos x$$

d/dx(cos x)

$$-\sin x$$

d/dx(tan x)

$$\sec^2 x$$

d/dx(constant)

$$0$$

Tip: A very common mistake is forgetting that the derivative of a constant is zero

Ch 13. Statistics

Mean (ungrouped)

$$\bar{x} = \sum x_i / n$$

Mean (grouped)

$$\bar{x} = \sum f_i x_i / \sum f_i$$

f_i = frequency, x_i = class midpoint

Variance (ungrouped)

$$\sigma^2 = \sum (x_i - \bar{x})^2 / n = \sum x_i^2 / n - \bar{x}^2$$

Variance (grouped)

$$\sigma^2 = \sum f_i (x_i - \bar{x})^2 / \sum f_i$$

Standard deviation (same as data units)

$$\sigma = \sqrt{\sigma^2}$$

Coefficient of variation (%)

$$CV = (\sigma / \bar{x}) \times 100$$

Tip: CV is dimensionless — used to compare variability of two datasets with different units or means

Range

$$\text{Range} = \text{Maximum value} - \text{Minimum value}$$

Mean deviation from mean

$$MD(\bar{x}) = \sum |x_i - \bar{x}| / n$$

Ch 14. Probability

Classical probability

$$P(A) = n(A) / n(S)$$

$n(A)$ = favourable outcomes, $n(S)$ = total outcomes

Tip: Valid only when all outcomes are equally likely

Addition theorem

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Mutually exclusive events

$$P(A \cup B) = P(A) + P(B) \text{ when } A \cap B = \emptyset$$

Complement rule

$$P(A') = 1 - P(A)$$

Exhaustive events

$$P(A_1) + P(A_2) + \dots + P(A_n) = 1 \text{ when } A_1, A_2, \dots, A_n \text{ are mutually exclusive and exhaustive}$$