



FORMULA SHEET · CLASS 12

CBSE Class 12 Maths Formula Sheet

The Class 12 NCERT formulas on a few pages, from inverse trigonometric ranges to Bayes' theorem, laid out for the last month before the boards.

CBSE 12

01 Relations and inverse trigonometry

Equivalence relation – reflexive, symmetric and transitive

Functions – one-one (injective), onto (surjective), bijective = both

Principal value ranges – $\sin^{-1}x$ in $[-\pi/2, \pi/2]$; $\cos^{-1}x$ in $[0, \pi]$; $\tan^{-1}x$ in $(-\pi/2, \pi/2)$

Identities – $\sin^{-1}x + \cos^{-1}x = \pi/2$; $\tan^{-1}x + \cot^{-1}x = \pi/2$

02 Matrices and determinants

Transpose – $(AB)^T = B^T A^T$; A is symmetric if $A^T = A$, skew-symmetric if $A^T = -A$

Every square matrix – $A = \frac{1}{2}(A + A^T) + \frac{1}{2}(A - A^T)$

Inverse – $A^{-1} = \text{adj}(A)/|A|$, defined when $|A| \neq 0$

Determinants – $|AB| = |A||B|$; $|kA| = k^n|A|$ for an $n \times n$ matrix

Area of a triangle – $\frac{1}{2} |x_1 y_2 - x_2 y_1|$ (determinant)

Linear system $AX = B$ – unique solution $X = A^{-1}B$ when $|A| \neq 0$

03 Continuity and derivatives

Continuity at a – $\lim_{x \rightarrow a} f(x) = f(a)$

Derivatives – $\sin^{-1}x \rightarrow 1/\sqrt{1-x^2}$; $\cos^{-1}x \rightarrow -1/\sqrt{1-x^2}$; $\tan^{-1}x \rightarrow 1/(1+x^2)$

Exponential and log – $a^x \rightarrow a^x \ln a$; $\log_a x \rightarrow 1/(x \ln a)$

Logarithmic differentiation – for $y = u^v$, take logs before differentiating

Parametric – $dy/dx = (dy/dt)/(dx/dt)$

Applications – rate of change dy/dt ; increasing where $f' > 0$; maximum where $f' = 0$ and $f'' < 0$

04 Integrals

Standard forms – $\int x^n dx = x^{n+1}/(n+1) + C$; $\int dx/x = \ln|x| + C$; $\int e^x dx = e^x + C$; $\int \sin x dx = -\cos x + C$; $\int \sec^2 x dx = \tan x + C$

Special forms – $\int dx/(a^2 + x^2) = (1/a)\tan^{-1}(x/a) + C$; $\int dx/\sqrt{a^2 - x^2} = \sin^{-1}(x/a) + C$

By parts – $\int u v dx = u \int v dx - \int [u' \int v dx] dx$

Fundamental theorem – $\int_a^b f(x) dx = F(b) - F(a)$

Properties – $\int_0^a f(x) dx = \int_0^a f(a-x) dx$; $\int_{-a}^a f = 0$ for odd f

Area under a curve – $\int_a^b y dx$ (simple curves, lines, circles, parabolas, ellipses)

05 Differential equations

Order and degree – order = highest derivative; degree = its power when the equation is a polynomial in derivatives

Variables separable – separate and integrate both sides

Homogeneous – put $y = vx$

Linear – $dy/dx + Py = Q$; IF = $e^{\int P dx}$; $y \cdot IF = \int Q \cdot IF dx + C$

06 Vectors and 3D lines

Magnitude – $|a| = \sqrt{a_1^2 + a_2^2 + a_3^2}$

Dot product – $a \cdot b = |a||b|\cos\theta$

Cross product – $|a \times b| = |a||b|\sin\theta$; area of parallelogram = $|a \times b|$

Projection of a on b – $(a \cdot b)/|b|$

Direction cosines – $l^2 + m^2 + n^2 = 1$

Line – $r = a + \lambda b$; Cartesian $(x-x_1)/a = (y-y_1)/b = (z-z_1)/c$

Angle between lines – $\cos\theta = |b_1 \cdot b_2|/(|b_1||b_2|)$

Shortest distance (skew lines) – $|(b_1 \times b_2) \cdot (a_2 - a_1)|/|b_1 \times b_2|$

07 Linear programming and probability

LPP – the optimum of a bounded feasible region lies at a corner point; check every corner

Conditional probability – $P(E|F) = P(E \cap F)/P(F)$

Multiplication rule – $P(E \cap F) = P(E)P(F|E)$

Independent events – $P(E \cap F) = P(E)P(F)$

Total probability – $P(A) = \sum P(E_i)P(A|E_i)$

Bayes' theorem – $P(E_i|A) = P(E_i)P(A|E_i) / \sum P(E_j)P(A|E_j)$

Random variable – mean $E(X) = \sum x_i p_i$

How to use this sheet

- 1 Calculus is about half the paper: practise integration every day in the final month.
- 2 In LPP, draw neatly and label every corner point with its coordinates.
- 3 Read probability questions twice and write the events in words before using formulas.

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