MATHEMATICS FORMULA BOOK

CLASS 11

Complete Formula & Concept Book (CBSE/NCERT)

Covers: Complete syllabus formulas
Use: Quick revision & exam preparation
Format: Chapter-wise formula reference

All formulas, identities, theorems & results in one place

1 Sets

Union
A∪B = {x : x∈A or x∈B}

Intersection
A∩B = {x : x∈A and x∈B}

Difference
A−B = {x : x∈A, x∉B}

Complement
A' = U − A

De Morgan's Laws
(A∪B)' = A'∩B'; (A∩B)' = A'∪B'

n(A∪B)
n(A)+n(B)−n(A∩B)

n(A∪B∪C)
n(A)+n(B)+n(C)−n(A∩B)−n(B∩C)−n(A∩C)+n(A∩B∩C)

Power Set Cardinality
|P(A)| = 2^n

2 Relations and Functions

Number of Relations
2^(mn) from set of m to set of n

Domain, Codomain, Range
Range ⊆ Codomain

3 Trigonometric Functions

Radian Measure
π radians = 180°

Arc Length
l = rθ

Fundamental Identities

Identity 1
$\sin^2 x + \cos^2 x = 1$

Identity 2
$1 + \tan^2 x = \sec^2 x$

Identity 3
$1 + \cot^2 x = \operatorname{cosec}^2 x$

Sum & Difference Formulas

Formula	Expression
sin(x+y)	sin x cos y + cos x sin y
sin(x−y)	sin x cos y − cos x sin y
cos(x+y)	cos x cos y − sin x sin y
cos(x−y)	cos x cos y + sin x sin y
tan(x+y)	(tan x+tan y)/(1−tan x tan y)
tan(x−y)	(tan x−tan y)/(1+tan x tan y)

Double & Triple Angle

Formula	Expression
sin 2x	2 sin x cos x
cos 2x	$\cos^2x-\sin^2x = 2\cos^2x-1 = 1-2\sin^2x$
tan 2x	$2\tan x /(1-\tan^2x)$
sin 3x	$3\sin x - 4\sin^3x$
cos 3x	$4\cos^3x - 3\cos x$

Sum-to-Product

sin A + sin B	2 sin[(A+B)/2] cos[(A−B)/2]
sin A − sin B	2 cos[(A+B)/2] sin[(A−B)/2]
cos A + cos B	2 cos[(A+B)/2] cos[(A−B)/2]
cos A − cos B	−2 sin[(A+B)/2] sin[(A−B)/2]

Sine & Cosine Rule (Triangle)

Sine Rule
$a/\sin A = b/\sin B = c/\sin C$

Cosine Rule
$\cos A = (b^2+c^2-a^2)/2bc$

4 Principle of Mathematical Induction

- Base step: verify P(1) is true
- Inductive step: assume P(k), prove P(k+1)

5 Complex Numbers and Quadratic Equations

Imaginary Unit
$i^2 = -1$

Complex Number
$z = a + ib$

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

Conjugate
$\bar{z} = a - ib$

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

Powers of i
$i^1=i, i^2=-1, i^3=-i, i^4=1$

6 Linear Inequalities

- Multiplying/dividing inequality by negative number reverses inequality sign
- Graphical solution: shaded common region

7 Permutations and Combinations

Factorial
$n! = n\times(n-1)\times\ldots\times1$

Permutation
${}^nP_r = n!/(n-r)!$

Combination
${}^nC_r = n!/[r!(n-r)!]$

Relation

$^nP_r = r! \times {}^nC_r$

Circular Permutation

$(n-1)!$

8 Binomial Theorem

Binomial Expansion

$(x+y)^n = \Sigma\ {}^nC_r\ x^{n-r}y^r$

General Term

$T_{r+1} = {}^nC_r\ x^{n-r}y^r$

Middle Term (n even)

(n/2 + 1)th term

9 Sequences and Series

Arithmetic Progression (AP)

nth Term

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

Sum of n Terms

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

Arithmetic Mean

A = (a+b)/2

Geometric Progression (GP)

nth Term

$a_n = ar^{n-1}$

Sum of n Terms

$S_n = a(r^n-1)/(r-1),\ r\neq1$

Sum to Infinity

$S\infty = a/(1-r),\ |r|<1$

Geometric Mean

G = √(ab)

Sum of Squares ($1^2+2^2+...+n^2$)

n(n+1)(2n+1)/6

Sum of Cubes ($1^3+2^3+...+n^3$)

$[n(n+1)/2]^2$

10 Straight Lines

Slope (2 points)

m = (y2−y1)/(x2−x1)

Slope-Intercept Form

y = mx + c

Point-Slope Form

y − y1 = m(x − x1)

Two-Point Form

y−y1 = [(y2−y1)/(x2−x1)](x−x1)

Intercept Form

x/a + y/b = 1

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

Distance of Point from Line
$|Ax1+By1+C|/\sqrt{(A^2+B^2)}$

Distance Between Parallel Lines
$|C1-C2|/\sqrt{(A^2+B^2)}$

Angle Between Two Lines
$\tan\theta = |(m1-m2)/(1+m1m2)|$

11 Conic Sections

Conic	Standard Equation
Circle	$x^2 + y^2 = r^2$
Parabola	$y^2 = 4ax$
Ellipse	$x^2/a^2 + y^2/b^2 = 1$ (a>b)
Hyperbola	$x^2/a^2 - y^2/b^2 = 1$

Eccentricity (Ellipse)
$e = \sqrt{(1 - b^2/a^2)}$

Eccentricity (Hyperbola)
$e = \sqrt{(1 + b^2/a^2)}$

Latus Rectum (Parabola)
$4a$

12 Introduction to 3D Geometry

Distance Formula (3D)
$\sqrt{[(x2-x1)^2+(y2-y1)^2+(z2-z1)^2]}$

Section Formula (3D)
$[(mx2+nx1)/(m+n), (my2+ny1)/(m+n), (mz2+nz1)/(m+n)]$

13 Limits and Derivatives

Derivative Definition
$f'(x) = \lim(h\to0) [f(x+h)-f(x)]/h$

d/dx (x^n)
$n\cdot x^{n-1}$

d/dx (sin x)
$\cos x$

d/dx (cos x)
$-\sin x$

d/dx (e^x)
e^x

d/dx (ln x)
$1/x$

Product Rule
$(uv)' = u'v + uv'$

Quotient Rule
$(u/v)' = (u'v - uv')/v^2$

lim(x→0) sinx/x
$= 1$

14 Statistics

Mean Deviation about Mean

$\Sigma|x_i - \bar{x}| / n$

Variance

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

Standard Deviation

$\sigma = \sqrt{\text{Variance}}$

Coefficient of Variation

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

15 Probability

$P(A \cup B)$

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

Mutually Exclusive

$P(A \cap B) = 0$

Complementary

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