

MATHEMATICS FORMULA BOOK

CLASS 9

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 Number Systems

Rational Number

p/q form, $q \neq 0$

Irrational Number

Non-terminating, non-repeating decimal

$\sqrt{a} \times \sqrt{b}$

$= \sqrt{ab}$

$\sqrt{a} / \sqrt{b}$

$= \sqrt{a/b}$

Rationalizing $1/\sqrt{a}$

$= \sqrt{a} / a$

Rationalizing $1/(\sqrt{a}+\sqrt{b})$

$= (\sqrt{a}-\sqrt{b})/(a-b)$

Laws of Exponents

$a^m \cdot a^n = a^{m+n}$; $(a^m)^n = a^{mn}$; $a^m/a^n = a^{m-n}$

2 Polynomials

Identity	Expansion
$(x+y)^2$	$x^2+2xy+y^2$
$(x-y)^2$	$x^2-2xy+y^2$
x^2-y^2	$(x+y)(x-y)$
$(x+a)(x+b)$	$x^2+(a+b)x+ab$
$(x+y+z)^2$	$x^2+y^2+z^2+2xy+2yz+2zx$
$(x+y)^3$	$x^3+y^3+3xy(x+y)$
$(x-y)^3$	$x^3-y^3-3xy(x-y)$
x^3+y^3	$(x+y)(x^2-xy+y^2)$
x^3-y^3	$(x-y)(x^2+xy+y^2)$
$x^3+y^3+z^3-3xyz$	$(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$

Remainder Theorem

Remainder of $p(x) \div (x-a) = p(a)$

Factor Theorem

$(x-a)$ is factor of $p(x)$ if $p(a) = 0$

3 Coordinate Geometry

Cartesian Plane

Point $P(x, y)$: x = abscissa, y = ordinate

Quadrants

I(+,+) II(-,+) III(-,-) IV(+,-)

4 Linear Equations in Two Variables

General Form

$ax + by + c = 0$

Solution

Infinite solutions; each (x,y) satisfying equation lies on the line

5 Introduction to Euclid's Geometry

- Axioms, postulates, and Euclid's five postulates
- Things equal to the same thing are equal to one another

6 Lines and Angles

Linear Pair Axiom

Sum = 180°

Vertically Opposite Angles

Equal

Angle Sum of Triangle

180°

Exterior Angle Theorem

Exterior angle = sum of interior opposite angles

7 Triangles

Congruence Criteria

SAS, ASA, AAS, SSS, RHS

Angle-Side Relations

Longer side opposite to larger angle

Triangle Inequality

Sum of any two sides > third side

8 Quadrilaterals

Angle Sum

360°

Mid-point Theorem

Line joining midpoints of 2 sides is parallel to 3rd & half its length

Parallelogram Diagonals

Bisect each other

9 Circles

Equal Chords

Equal chords subtend equal angles at centre

Perpendicular from Centre

Bisects the chord

Angle in Semicircle

= 90°

Angle Subtended by Arc

Angle at centre = $2 \times$ angle at circumference

Cyclic Quadrilateral

Opposite angles sum to 180°

10 Heron's Formula

Semi-perimeter

$s = (a+b+c)/2$

Area of Triangle

$$\sqrt{[s(s-a)(s-b)(s-c)]}$$

11 Surface Areas and Volumes

Solid	Surface Area	Volume
Cube	$6a^2$ (TSA)	a^3
Cuboid	$2(lb+bh+hl)$	lbh
Cylinder	$2\pi rh$ (CSA); $2\pi r(r+h)$ (TSA)	$\pi r^2 h$
Cone	πrl (CSA); $\pi r(r+l)$ (TSA)	$\frac{1}{3}\pi r^2 h$
Sphere	$4\pi r^2$	$(\frac{4}{3})\pi r^3$
Hemisphere	$2\pi r^2$ (CSA); $3\pi r^2$ (TSA)	$(\frac{2}{3})\pi r^3$

Slant Height of Cone

$$l = \sqrt{r^2 + h^2}$$

12 Statistics

Mean

$$\bar{x} = \Sigma xi / n$$

Median (odd n)

$$[(n+1)/2]\text{th term}$$

Median (even n)

$$\text{Average of } (n/2)\text{th \& } (n/2+1)\text{th terms}$$

Mode

$$\text{Most frequently occurring value}$$

13 Probability

Empirical Probability

$$P(E) = \text{No. of trials with event E} / \text{Total trials}$$