

MATHEMATICS FORMULA BOOK

CLASS 10

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 Real Numbers

Euclid's Division Lemma

$$a = bq + r, 0 \leq r < b$$

Fundamental Theorem of Arithmetic

Every composite number = product of primes (unique)

HCF $\times$ LCM

= Product of two numbers

HCF by Prime Factorization

Product of smallest powers of common factors

LCM by Prime Factorization

Product of greatest powers of all factors

2 Polynomials

Quadratic Polynomial: Sum of Zeroes

$$\alpha + \beta = -b/a$$

Quadratic Polynomial: Product of Zeroes

$$\alpha \times \beta = c/a$$

Cubic Polynomial Relations

$$\alpha + \beta + \gamma = -b/a; \alpha\beta + \beta\gamma + \gamma\alpha = c/a; \alpha\beta\gamma = -d/a$$

Forming Quadratic Polynomial

$$x^2 - (\text{sum})x + (\text{product})$$

3 Pair of Linear Equations in Two Variables

Condition	Nature of Solution
$a_1/a_2 \neq b_1/b_2$	Unique solution (intersecting lines)
$a_1/a_2 = b_1/b_2 = c_1/c_2$	Infinite solutions (coincident lines)
$a_1/a_2 = b_1/b_2 \neq c_1/c_2$	No solution (parallel lines)

- Methods: Graphical, Substitution, Elimination, Cross-multiplication

4 Quadratic Equations

Standard Form

$$ax^2 + bx + c = 0 \quad (a \neq 0)$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant

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

Nature of Roots

D > 0: real & distinct; D = 0: real & equal; D < 0: no real roots

5 Arithmetic Progressions

nth Term

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

Sum of n Terms

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

Sum (using last term)

$$S_n = n/2 (a + l)$$

Common Difference

$$d = a_n - a_{n-1}$$

6 Triangles

Basic Proportionality Theorem (Thales)

$$DE \parallel BC \Rightarrow AD/DB = AE/EC$$

Similarity Criteria

AA, SAS, SSS

Area Ratio of Similar Triangles

$$= (\text{ratio of corresponding sides})^2$$

Pythagoras Theorem

$$\text{Hyp}^2 = \text{Base}^2 + \text{Height}^2$$

7 Coordinate Geometry

Distance Formula

$$\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$$

Section Formula

$$[(mx_2 + nx_1)/(m+n), (my_2 + ny_1)/(m+n)]$$

Midpoint Formula

$$[(x_1 + x_2)/2, (y_1 + y_2)/2]$$

Area of Triangle

$$\frac{1}{2}|x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

8 Introduction to Trigonometry

Ratio	Definition
$\sin \theta$	Opposite/Hypotenuse
$\cos \theta$	Adjacent/Hypotenuse
$\tan \theta$	Opposite/Adjacent = $\sin \theta / \cos \theta$
$\operatorname{cosec} \theta$	$1/\sin \theta$
$\sec \theta$	$1/\cos \theta$
$\cot \theta$	$1/\tan \theta = \cos \theta / \sin \theta$

Trigonometric Identities

Identity 1

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

Identity 2

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

Identity 3

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

Standard Angle Values

θ	0°	30°	45°	60°	90°
$\sin \theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\cos \theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
$\tan \theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	∞

9 Applications of Trigonometry

Angle of Elevation

Angle from horizontal up to object

Angle of Depression

Angle from horizontal down to object

10 Circles

Tangent Property

Tangent $\perp$ radius at point of contact

Tangents from External Point

Equal in length

11 Areas Related to Circles

Quantity	Formula
Circumference	$2\pi r$
Area of Circle	πr^2
Area of Sector	$(\theta/360^\circ) \times \pi r^2$
Length of Arc	$(\theta/360^\circ) \times 2\pi r$
Area of Segment	Area of sector – Area of triangle

12 Surface Areas and Volumes

Solid	Surface Area	Volume
Cube	$6a^2$	a^3
Cuboid	$2(lb+bh+hl)$	lbh
Cylinder	$2\pi r(r+h)$	$\pi r^2 h$
Cone	$\pi r(l+r)$	$\frac{1}{3}\pi r^2 h$
Sphere	$4\pi r^2$	$(4/3)\pi r^3$
Hemisphere	$3\pi r^2$	$(2/3)\pi r^3$
Frustum of Cone	$\pi(r_1+r_2)l + \pi r_1^2 + \pi r_2^2$	$(\pi h/3)(r_1^2 + r_2^2 + r_1 r_2)$

13 Statistics

Mean (Direct Method)

$\bar{x} = \Sigma fxi / \Sigma fi$

Mean (Assumed Mean Method)

$\bar{x} = a + \Sigma fidi / \Sigma fi$

Median (Grouped Data)

$l + [(n/2 - cf)/f] \times h$

Mode (Grouped Data)

$l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$

14 Probability

Probability of Event

$P(E) = \text{favourable outcomes} / \text{total outcomes}$

Complementary Event

$P(E) + P(\text{not } E) = 1$

