CBSE gives no formula booklet: learn every result on this sheet. Organised by NCERT chapter.

1 Sets

Intervals: (a,b), $[a,b]$, $[a,b)$, $(a,b]$; $A \subset B$: every element of A is in B

Difference; complement: $A - B = A \cap B'$; $A \cup A' = U$, $A \cap A' = \phi$

De Morgan: $(A \cup B)' = A' \cap B'$, $(A \cap B)' = A' \cup B'$

Distributive: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

2 Relations and Functions

Product: $n(A \times B) = n(A)\,n(B)$; relations $A \to B$: $2^{n(A)n(B)}$

Function: each element of the domain has exactly one image; domain: denominators $\neq 0$, $\sqrt{}$ of ≥ 0

$|x| \geq 0$; $\operatorname{sgn} x \in \{-1, 0, 1\}$; $[x]$ = greatest integer $\leq x$ ($[-2.5] = -3$)

3 Trigonometric Functions

Radians; arc: π rad $= 180°$; $l = r\theta$

Pythagorean: $\sin^2 x + \cos^2 x = 1$, $1 + \tan^2 x = \sec^2 x$

Compound, sin: $\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$

Compound, cos: $\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$

Compound, tan: $\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$

Double: $\sin 2x = 2 \sin x \cos x$, $\cos 2x = 1 - 2\sin^2 x = 2\cos^2 x - 1$

Double, tan: $\tan 2x = \frac{2\tan x}{1 - \tan^2 x}$

Triple: $\sin 3x = 3\sin x - 4\sin^3 x$, $\cos 3x = 4\cos^3 x - 3\cos x$

$\sin A + \sin B$: $\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$

$\cos A + \cos B$: $\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$

$\cos A - \cos B$: $\cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$

Signs: All, Sin, Tan, Cos in quadrants I to IV; $\sin, \cos$ period 2π, $\tan$ period π

4 Complex Numbers

$i^2 = -1$; $i^{4k} = 1$: $(a + ib)(c + id) = (ac - bd) + i(ad + bc)$

Modulus; conjugate: $|z| = \sqrt{a^2 + b^2}$, $z\bar{z} = |z|^2$, $z^{-1} = \frac{\bar{z}}{|z|^2}$

$|z_1 z_2| = |z_1||z_2|$; $\overline{z_1 z_2} = \bar{z}_1 \bar{z}_2$; Argand: $a + ib \mapsto (a, b)$

5 Linear Inequalities

× or ÷ by a negative number reverses the sign; system = intersection; ● included, ○ excluded

6 Permutations and Combinations

Arrangements; selections: ${}^nP_r = \frac{n!}{(n-r)!}$, ${}^nC_r = \frac{n!}{r!(n-r)!}$

Alike objects: $\frac{n!}{p!\,q!\cdots}$

Properties: ${}^nC_r = {}^nC_{n-r}$, ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

7 Binomial Theorem

Expansion: $(a+b)^n = \sum_{r=0}^{n} {}^nC_r a^{n-r} b^r$

$n+1$ terms; sum of coefficients: $\sum {}^nC_r = 2^n$, $\sum (-1)^r {}^nC_r = 0$

8 Sequences and Series

GP: $a_n = ar^{n-1}$, $S_n = \frac{a(r^n - 1)}{r - 1}$ $(r \neq 1)$

Infinite GP, $|r| < 1$: $S_\infty = \frac{a}{1-r}$

AM, GM; $A \geq G$: $A = \frac{a+b}{2}$, $G = \sqrt{ab}$

9 Straight Lines

Slope; angle between: $m = \tan\theta = \frac{y_2 - y_1}{x_2 - x_1}$; $\tan\phi = \left|\frac{m_2 - m_1}{1 + m_1 m_2}\right|$

Parallel $m_1 = m_2$; perpendicular $m_1 m_2 = -1$: $y - y_1 = m(x - x_1)$, $y = mx + c$, $\frac{x}{a} + \frac{y}{b} = 1$

Point to line: $\frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$

Parallel lines $Ax + By + C_1 = 0$, $Ax + By + C_2 = 0$ (same A, B): $\frac{|C_1 - C_2|}{\sqrt{A^2 + B^2}}$

10 Conic Sections

Circle, centre (h, k): $(x-h)^2 + (y-k)^2 = r^2$

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

Parabola $y^2 = 4ax$: focus $(a, 0)$, directrix $x = -a$, LR $4a$

Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, $a > b$: $c^2 = a^2 - b^2$, $e = \frac{c}{a} < 1$, LR $\frac{2b^2}{a}$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$: $c^2 = a^2 + b^2$, $e = \frac{c}{a} > 1$, LR $\frac{2b^2}{a}$

11 3D Geometry

Octants I–IV $z > 0$, V–VIII $z < 0$; on the x-axis $(x, 0, 0)$, in the xy-plane $(x, y, 0)$

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

12 Limits and Derivatives

Standard limits: $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{x \to 0} \frac{\sin x}{x} = 1$

Definition: $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

Rules: $(uv)' = u'v + uv'$, $\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}$

Derivatives: $(x^n)' = nx^{n-1}$, $(\sin x)' = \cos x$, $(\cos x)' = -\sin x$, $(\tan x)' = \sec^2 x$

13 Statistics

Mean deviation about a: $\frac{\sum f_i |x_i - a|}{\sum f_i}$

Variance; SD: $\sigma^2 = \frac{\sum f_i (x_i - \bar{x})^2}{N} = \frac{\sum f_i x_i^2}{N} - \bar{x}^2$, $\sigma = \sqrt{\sigma^2}$

Adding k leaves σ unchanged; multiplying by k multiplies σ by $|k|$

14 Probability

Axioms: $P(E) \geq 0$, $P(S) = 1$, additive for mutually exclusive events: $P(\text{not } A) = 1 - P(A)$

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

A but not B; neither: $P(A) - P(A \cap B)$; $1 - P(A \cup B)$