CLASS 11 MATHEMATICS — FORMULA SHEET

Chapter 1 : Sets (NCERT)

1.1 Sets — Basic Definitions

Term	Definition / Notation
Set	A well-defined collection of distinct objects; denoted by capital letters A, B, C
Element	$a \in A$ means 'a belongs to A' ; $a \notin A$ means 'a does not belong to A'
Roster (tabular) form	List all elements in braces: A = {1, 2, 3, 4}
Set-builder form	State a common property: A = {x : x is a natural number, x < 5}
Standard number sets	N (naturals), Z (integers), Q (rationals), R (reals), W (whole), T (irrationals)
Cardinal number n(A)	Number of distinct elements in a finite set A

1.2 Types of Sets

Type	Definition / Example
Empty (null/void) set	Has no element ; denoted φ or { } ; e.g. $\{x : x^2 = -1, x \in R\}$
Singleton set	Exactly one element ; e.g. {0}
Finite set	Countable number of elements
Infinite set	Uncountable / endless elements ; e.g. N, Z, R
Equal sets	A = B if they have exactly the same elements
Equivalent sets	Same number of elements: n(A) = n(B)
Subset ($A \subseteq B$)	Every element of A is in B ; φ is a subset of every set
Proper subset ($A \subset B$)	$A \subseteq B$ but $A \neq B$
Superset ($B \supseteq A$)	B contains A
Universal set (U)	The set containing all objects under consideration

1.3 Power Set & Intervals

Concept	Detail / Formula
Power set P(A)	Set of all subsets of A
Number of subsets	If n(A) = n, then number of subsets = 2^n
Number of proper subsets	$= 2^n - 1$
Number of non-empty subsets	$= 2^n - 1$
Open interval (a, b)	$\{x : a < x < b\}$ — endpoints excluded
Closed interval [a, b]	$\{x : a \leq x \leq b\}$ — endpoints included
Half-open [a, b) / (a, b]	One endpoint included, the other excluded

1.4 Operations on Sets

Operation	Definition
Union (A ∪ B)	{x : x ∈ A OR x ∈ B} — all elements of both
Intersection (A ∩ B)	{x : x ∈ A AND x ∈ B} — common elements
Difference (A − B)	{x : x ∈ A and x ∉ B} — in A but not in B
Complement (A′ or A^c)	U − A = {x : x ∈ U and x ∉ A}
Disjoint sets	A ∩ B = φ (no common element)
Symmetric difference (A Δ B)	(A − B) ∪ (B − A)

1.5 Algebra of Sets (Laws)

Law	Statement
Commutative	A ∪ B = B ∪ A ; A ∩ B = B ∩ A
Associative	(A ∪ B) ∪ C = A ∪ (B ∪ C) ; similarly for ∩
Distributive	A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C) ; A ∪ (B ∩ C) = (A ∪ B) ∩ (A ∪ C)
Identity	A ∪ φ = A ; A ∩ U = A
Idempotent	A ∪ A = A ; A ∩ A = A
Complement laws	A ∪ A′ = U ; A ∩ A′ = φ ; (A′)′ = A
De Morgan's laws	(A ∪ B)′ = A′ ∩ B′ ; (A ∩ B)′ = A′ ∪ B′
U and φ	U′ = φ ; φ′ = U

1.6 Cardinality (Counting) Formulas

Formula	Expression
Two sets (union)	n(A ∪ B) = n(A) + n(B) − n(A ∩ B)
Disjoint sets	n(A ∪ B) = n(A) + n(B) (when A ∩ B = φ)
Three sets	n(A ∪ B ∪ C) = n(A) + n(B) + n(C) − n(A∩B) − n(B∩C) − n(C∩A) + n(A∩B∩C)
Only A (of two)	n(A only) = n(A) − n(A ∩ B)
Complement count	n(A′) = n(U) − n(A)
Neither A nor B	n((A ∪ B)′) = n(U) − n(A ∪ B)

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Subset count	n elements → 2^n subsets, 2^n − 1 proper subsets, 2^n − 1 non-empty subsets.
Empty set is special	φ is a subset of EVERY set ; n(φ) = 0 ; φ ≠ {0} ≠ {φ}.
Union vs Intersection	Union = OR (everything) ; Intersection = AND (common only).
De Morgan	Complement of union = intersection of complements (and vice versa).
Two-set formula	n(A∪B) = n(A) + n(B) − n(A∩B). Always subtract the overlap once.
Equal vs Equivalent	Equal = same elements ; Equivalent = same NUMBER of elements.

Interval brackets	Round ( ) excludes endpoint ; square [ ] includes it.
Venn diagrams	Best tool for 2-3 set word problems — fill the innermost region first.