□ Class 11 Mathematics – Chapter 1: Sets

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1. Introduction

- A set is a well-defined collection of distinct objects.

- Sets are usually denoted by capital letters (A, B, C...), and elements are written inside curly brackets.
  Example: A = {1, 2, 3}

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2. Types of Sets

- Empty Set (Null Set): No elements. Denoted by {} or ϕ
  Example: A = {x | x > 3 and x < 1}

- Finite Set: Countable number of elements
  Example: A = {2, 4, 6, 8}

- Infinite Set: Uncountable number of elements
  Example: A = {x | x is a natural number}

- Equal Sets: Two sets A and B are equal if they have exactly the same elements.
  A = B if every element of A is in B and vice versa.

- Singleton Set: Contains exactly one element
  Example: A = {0}

- Subset: A is a subset of B if every element of A is also in B. Denoted by A □ B.

- Power Set: Set of all subsets of a set A. Denoted by P(A).

- Universal Set: Set that contains all objects under discussion. Usually denoted by U.

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3. Representation of Sets

- Roster (Tabular) Form: List all elements separated by commas
  Example: A = {1, 3, 5}

- Set-builder Form: Describes elements using a property
  Example: A = {x | x is an odd natural number less than 10}

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4. Venn Diagrams

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Visual representation of sets using closed curves (usually circles).

- Used to illustrate relationships like union, intersection, and complement.

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5. Set Operations

- Union (A ∪ B): Elements in A or B or both
  Example: {1,2} ∪ {2,3} = {1,2,3}

- Intersection (A ∩ B): Elements common to both A and B
  Example: {1,2} ∩ {2,3} = {2}

- Difference (A – B): Elements in A but not in B
  Example: {1,2,3} – {2,3} = {1}

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Complement (A′): Elements in universal set U but not in A

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6. Properties of Set Operations

- Commutative Laws
  $A \cup B = B \cup A, \quad A \cap B = B \cap A$

- Associative Laws
  $(A \cup B) \cup C = A \cup (B \cup C)$,
  $(A \cap B) \cap C = A \cap (B \cap C)$

- Distributive Laws
  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$,
  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

- De Morgan’s Laws

(A ∪ B)' = A' ∩ B',
(A ∩ B)' = A' ∪ B'

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7. Practical Applications

- Solving word problems with Venn diagrams.
- Survey and group data analysis.
- Useful in probability, logic, computer science.

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8. Exam Tips

- Master Venn diagrams for 2 and 3 sets.
- Understand terminology: universal set, complement, subset.
- Practice set identities using examples.
- Know standard forms and symbols