Class XI: Maths
Chapter:1, Sets

Points to Remember

Key Concepts

1. A set is a well-defined collection of objects.
2. Sets can be represented by two ways: Roster or tabular Form and Set builder Form
3. Roster form: All the elements of a set are listed separated by commas and are enclosed within braces { }.Elements are not repeated generally.
4. Set Builder form: In set-builder form, set is denoted by stating the properties that its members satisfy.
5. A set does not change if one or more elements of the set are repeated.
6. Empty set is the set having no elements in it. It is denoted by φ or { }
7. On the basis of number of elements sets are of two types: Finite and Infinite Sets.
8. Finite set is a set in which there are definite number of elements. φ or { } or Null set is a finite set as it has 0 number of elements which is a definite number.
9. A set that is not finite is called **infinite set**.
10. All infinite sets cannot be described in the roster form.
11. Two sets are equal if they have exactly same elements.
12. Two sets are said to be equivalent if they have the same **number of** elements.

13. Set A is a subset of set B if every element of A is in B, i.e there is no element in A which is not in B. Denoted by $A \subset B$.

14. A is a proper subset of B if and only if every element in A is also in B, and there exists at least one element in B that is not in A.

15. If A is a proper subset of B then B is a superset of A. Denoted by $B \supset A$

16. **Common Set Notations**

N : the set of all natural numbers
Z : the set of all integers
Q : the set of all rational numbers
R : the set of real numbers
Z^+ : the set of positive integers
Q^+ : the set of positive rational numbers,
R^+ : the set of positive real numbers

$\mathbf{N \subset R\ ,\ Q \subset R\ ,\ Q \not\subset Z,\ \ R \not\subset Z\ ,\ N \subset R^+}$

17. Two sets are equal if $A \subseteq B$ and $B \subseteq A$ then $A = B$.

18. Null set ϕ is subset of every set including the null set itself.

19. The set of all the subsets of A is known as the Power Set of A

20. **Open Interval**: The interval which contains all the elements between a and b excluding a and b**.** In set notations:

$(a, b) = \{ x : a < x < b\}$

Closed Interval :The interval which contains all the elements between a and b and also the end points a and b is called **closed interval.**

$[a, b] = \{x : a \leq x \leq b\}$

21. **Semi open intervals:**

$[a, b) = \{x : a \leq x < b\}$ includes all the elements from a to b including a and excluding b

$(a, b] = \{x : a < x \leq b\}$ includes all the elements from a to b excluding a and including b.

22. Universal set refers to a particular context.

It is the basic set that is relevant to that context. The universal set is usually denoted by U

23. Union of sets A and B, denoted by $A \cup B$ is defined as the set of all the elements which are either in A or in B or in both.

24. Intersection of Sets A and B, denoted by $A \cap B$ is defined as the set of all the elements which are common to both A and B

25. The difference of the sets A and B is the set of elements which belong to A but not to B. Written as A-B and read as 'A minus B'.

In set notations $A-B = \{x: x \in A, x \notin B\}$ and $B - A = \{x: x \in B, x \notin A\}$

26. If the intersection of two non empty sets is empty i.e $A \cap B = \phi$ then A and B are disjoint sets.

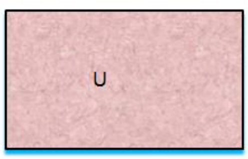
27. Let U be the universal set and A be a subset of U. Then the complement of A, written as A′ or A^c, is the set of all elements of U that are not in set A.

28. The number of elements present in a set is known as the cardinal number of the set or cardinality of the set. It is denoted by n(A).

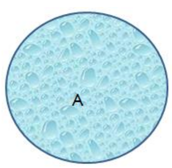
29. If A is a subset of U, then A′ is also a subset of U

30. Counting Theorems are together known as **Inclusion –Exclusion** Principle. It helps in determining the cardinality of union and intersection of sets.

31. Sets can be represented graphically using Venn diagrams. Venn diagrams, consist of rectangles and closed curves, usually circles. The universal set is generally represented by a rectangle and its subsets by circles.



Universal Set



Sets

<u>Key Formulae</u>

1. Union of sets $A \cup B = \{x : x \in A \text{ or } x \in B\}$

2. Intersection of sets $A \cap B = \{x : x \in A \text{ and } x \in B\}$

3. Complement of a set $A' = \{x : x \in U \text{ and } x \notin A\}$, $A' = U - A$

4. Difference of sets $A - B = \{x : x \in A, x \notin B\}$ and $B - A = \{x : x \in B, x \notin A\}$

5. Properties of the Operation of Union.

   a. Commutative Law:

$A \cup B = B \cup A$

b. Associative Law:

$(A \cup B) \cup C = A \cup (B \cup C)$

c. Law of Identity

$A \cup \phi = A$

d. Idempotent law

$A \cup A = A$

e. Law of U

$U \cup A = U$

6. Properties of Operation of Intersection

i) Commutative Law:

$A \cap B = B \cap A$

ii) Associative Law:

$(A \cap B) \cap C = A \cap (B \cap C)$

iii) Law of ϕ and U

$\phi \cap A = \phi$, $U \cap A = U$

iv) Idempotent law

$A \cap A = A$

v) Distributive law

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

7. Properties of complement of sets:

a. Complement laws:

i. $A \cup A' = U$

ii. $A \cap A' = \phi$

b. De-Morgan's law:

i. $(A \cup B)' = A' \cap B'$

ii. $(A \cap B)' = A' \cup B'$

c. Law of double complementation:

$(A')' = A$

d. Laws of empty set and universal set:

$\phi' = U$ and $U' = \phi$

8. **Counting Theorems**

a. If A and B are finite sets, and $A \cap B = \phi$ then number of elements in the union of two sets

$n(A \cup B) = n(A) + n(B)$

b. If A and B are finite sets, $A \cap B = \phi$ then

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

c. $n(A \cup B) = n(A - B) + n(B - A) + n(A \cap B)$

d. $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(B \cap C) - n(A \cap B) - n(A \cap C) + n(A \cap B \cap C)$

9. Number of elements in the power set of a set with n elements $= 2^n$.

Number of Proper subsets in the power set $= 2^n - 2$