Subject : Mathematics
Class : XI

Kannada

Sets

Set

A set is a well-defined collection of objects. A Collection is said to be well-defined when there is no ambiguity regarding inclusion and exclusion of the object and all objects have same common properties. Each object of a set is called an element of a set.

Methods of Representing a Set

(i) Roster or Tabular Form: In this form, a set is described by listing elements, separated by commas, within braces {}.

(ii) Set-builder Form: In this form, a set is described by a characterizing property $P(x)$ of its elements x. In such a case, the set is described by $\{x : P(x)$ holds $\}$, which is read as 'the set of all x such that $P(x)$ holds'.

Types of Sets

(i) **Empty Set:** A set having no element in it is called an empty set.

(ii) **Singleton Set :** A set Containing one element is called a singleton set.

(iii) **Finite Set :** A set having fixed no. of elements is called a finite set.

(iv) **Infinite Set :** A set that is not finite is infinite set.

(v) **Equal sets:** Two sets A and B are said to be equal if every element of A is a member of B and Vice-Versa.

Subsets

A set A is said to be a subset of a set B if every element of A is also an element of B. i.e., $A \subset B$ if $a \in A \Rightarrow a \in B$

Note that:

(i) Every set is a subset of itself.

(ii) Empty set ϕ is a subset of every set.

Intervals as Subsets of R

Let $a, b \in R$ and $a < b$, then

(i) Closed Interval $[a,b] = \{x \in R : a \le x \le b\}$

(ii) Open Interval $(a,b) = \{x \in R : a < x < b\}$

(iii) Semi-open or Semi-closed Interval $(a,b] = \{x \in R : a < x \le b\}$ and $[a,b) = \{x \in R : a \le x < b\}$

Power Set

The collection of all subsets of set A is called the power set of A. It is denoted by $P(A)$. Every element in $P(A)$ is a set. Note that if A is a finite set having n elements, then $P(A)$ has 2^n elements.

Universal Set

It is a set which includes all the elements of the sets under consideration. It is denoted by U. Eg., if $A=\{1,2,3\}, B=\{3,4,7\}$ and $C=\{2,8,9\}$, then $U=\{1,2,3,4,7,8,9\}$

Venn Diagrams

Most of the relationships between sets can be represented by means of diagrams which are known as Venn diagrams.

Operations on Sets

Union of Sets: The union of two sets A and B is the set of all those elements which are either in A or in B. It is denoted by $A\cup B$.

Properties of the Operation of Union

(i) $A\cup B=B\cup A$ (Commutative Law)

(ii) $(A\cup B)\cup C=A\cup(B\cup C)$ (Associative Law)

(iii) $A\cup\phi=A$ (Law of identity element, ϕ is the identity of U)

(iv) $A\cup A=A$ (Idempotent Law)

(v) $U\cup A=U$ (Law of U)

Intersection of Sets

The intersection of two sets A and B is the set of all the elements which are common. It is denoted by $A\cap B$.

Properties of the Operation of Intersection

(i) $A\cap B=B\cap A$ (Commutative Law)

(ii) $(A\cap B)\cap C=A\cap(B\cap C)$ (Associative Law)

(iii) $\phi\cap A=\phi, U\cap A=A$ (Law of ϕ and $\cup$)

(iv) $A\cap A=A$ (Idempotent Law)

(v) $A\cap(B\cup C)=(A\cap B)\cup(A\cap C)$ (Distributive Law)

Difference of Sets

The difference of two sets A and B i.e., $A-B$, is the set of all those elements of A which do not belong to B.

Thus, $A-B=\{x: x\in A \text{ and } x\notin B\}$

Similarly, $B-A=\{x: x\in B \text{ and } x\notin A\}$

Some Important Results on Number of Elements in Sets

(i) If A and B are finite sets such that $A\cap B=\phi$, then $n(A\cup B)=n(A)+n(B)$

(ii) If $A\cup B\neq\phi$, then $n(A\cup B)=n(A)+n(B)-n(A\cap B)$

(iii) If A, B and C are finite sets, then

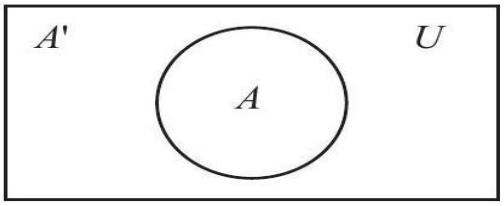
$(A\cup B\cup C)=n(A)+n(B)+n(C)-n(A\cap B)-n(B\cap C)-n(A\ \cap C)+n(A\cap B\cap C)$

Complement of a Set

Let U be the universal set and let A be a set such that $\mathrm{A} \subset \mathrm{U}$. Then, the complement of A with respect to U is denoted by A^{c} or A' or $\mathrm{U}-\mathrm{A}$ and is defined as the set of all those elements of U which are not in A.

Therefore, $\mathrm{A}'=\{x \in \mathrm{U}: x \notin \mathrm{A}\}$

Clearly, $x \in \mathrm{A}' \Leftrightarrow x \notin \mathrm{A}$



Properties of Complement Sets

(1) Complement Laws

(i) $A \cup A'=U$ (ii) $A \cap A'=\phi$

(2) De Morgan's Law

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

(3) Law of Double Complementation $\left(A'\right)'=A$

(4) Laws of ϕ and $U \phi'=U$ and $U'=\phi$



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