SETS

- Sets are well defined collection of Objects.

→ Elements of Sets are kept in Curly Brackets ({ }). These elements are separated by Commas.

→ No same element is reapeated.

→ Each Set's name is denoted by Capital Letter

For Example :- First five natural nos.

$A \rightarrow \{1, 2, 3, 4, 5\}$.

→ Elements of a set are ~~shon~~ shown by:

$1 \in A \Leftrightarrow$ 1 is an element of set A.

belongs to

→ Non-Elements of a set are shown by:-

$6 \notin A \Leftrightarrow$ 6 is not an element of set A

not belongs to

→ Roster form :- $A = \{4, 7, 3, 2\}$

→ Set-Builder form :- {x : x's property satisfying element

- Cardinal NO :- Number of elements in the set.

For Ex:- $A = \{1, 2, 3, 4, a\}$

$\therefore n(A) = 5$

→ $n(A) = 0$ → Empty / Void Set
→ $n(A) = 1$ → Singleton Set
→ $n(A) = 2$ → Pair Set

Finite Set → Cardinal No. finite
Infinite Set → No Possible Cardinal No.

- Equivalent Sets :- Sets with same Cardinal Numbers.

$$\left.\begin{array}{l} A \rightarrow \{1, 2, 3, 4\} \\ B \rightarrow \{a, b, c, d\} \end{array}\right] \therefore n(A) = n(B)$$

- Equal Sets :- Sets with same Cardinal Numbers as well as same elements.

For Ex.:-

$$\left.\begin{array}{l} A = \{1, 2, 3, 4\} \\ B = \{3, 2, 1, 4\} \end{array}\right] \therefore A = B$$

☆ → All equal sets are equivalent sets but not all equivalent sets are equal sets.

- Null Set :- Set with no elements.

→ Denoted by ϕ or $\{\ \}$.

☆ → $\{\phi\}$ is not a Null set.

- Sub-Set :-

For Example :-

(A) $A = \{1, 2, 3, 4, 5\}$

$B = \{2, 5\}$

$\therefore B \subset A$ → B is said to be subset of A if every element of B lies in A.

✯ → Empty set will always be a subset of every set.

(B) $A = \{1, 2, 3\}$

→ $S_1 \to \phi$ | $S_5 \to \{1, 3\}$ | $n(A) = 3$
$S_2 \to \{1\}$ | $S_6 \to \{1, 2\}$ |
$S_3 \to \{2\}$ | $S_7 \to \{2, 3\}$ | $\therefore$ Subsets $= 2^3 = 8$
$S_4 \to \{3\}$ | $S_8 \to \{1, 2, 3\}$ |

✯ Every set is also a subset of itself.
✯ Total number of subsets of a set containing 'n' elements is 2^n.

(C) $A = \{1, 2, \{3\}, 4, 5\}$

→ $1 \in A$ | → $\{1, 2\} = D \subset A$
→ $2 \in A$ |
→ $3 \notin A$ | → $\{1, 3\} = B \not\subset A$
→ $\{3\} \in A$ |
| → $\{1, \{3\}\} = C \subset A$

(D) $A = \{\{4\}, 2, 3\}$

$E = \{\{4\}\}$ $\therefore E \subset A$

But,

$B = \{\{4\}\} \rightarrow B \not\subset A$

Also,

$C = \{4\} \rightarrow C \not\subset A$

Imp.

(E) $A = \{3, \{3\}, 4, 5\}$

$\rightarrow B = \{3\} \rightarrow B \subset A$

& $B = \{\{3\}\} \rightarrow B \subset A$

$C = \{3, \{3\}\} \rightarrow C \subset A$

Imp.

(F) $A = \{\phi, 1, 2, 3\}$

$\rightarrow B = \{\phi\} \rightarrow \phi / B \subset A$

$\rightarrow \phi \in A$ and $\phi \subset A$

Imp.

(G) $A = \{1, 2, 3\}$ and $B = \{1, 2, 3\}$

$B \subset A$ and $B \subseteq A$

Subset Equal + Subset

- **Power Set :-** A set of all subsets of a given set is called Power Set.

→ Denoted by $P(A)$ for a set A

For Example :-

(A) $A = \{\phi\}$

$S_1 = \{\ \} = \phi \quad | \quad S_2 = \{\phi\}$

$\therefore P(A) = \{\{\ \}, \{\phi\}\}$

(B) If $A = \{\phi\}$, then find $n(P(P(P(A))))$

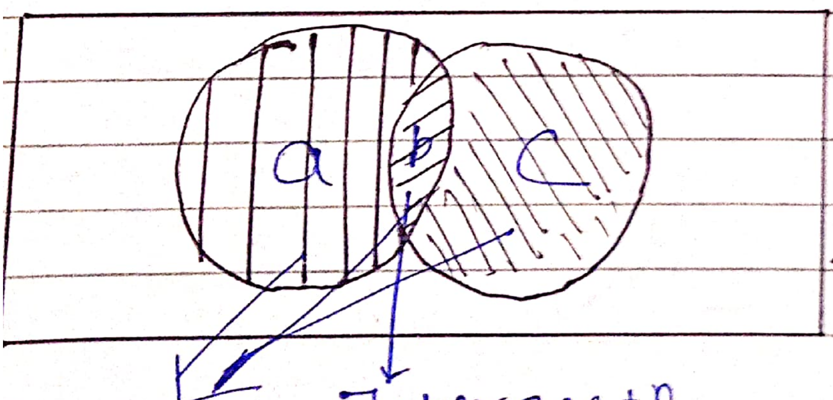
→ $n(A) = 1 \quad | \quad \therefore n(P(A)) = 2^1 = 2$

→ $n(P(P(A))) = 2^2 = 4$

→ $n(P(P(P(A)))) = 2^4 = \boxed{16}$ Ans.

☆ No. of elements in a Power Set = No. of Subsets $= 2^n$

- **Venn Diagram :-**



Common (or)

Intersectn (and)

$A \cap B = \{b\}$ (and)

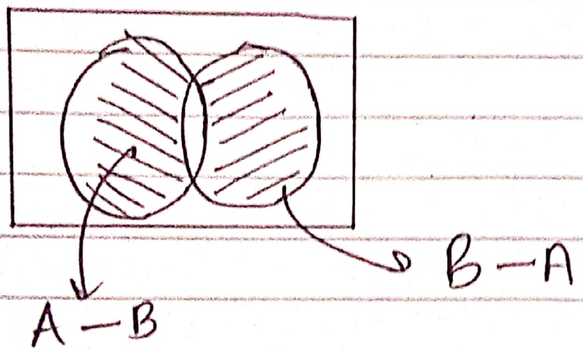
$A \cup B = \{a + b + c\}$ (or)

imp.

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

$A \cup A \rightarrow A$		$A \cup \phi \rightarrow A$
✩ →	$A \cap A \rightarrow A$		$A \cap \phi \rightarrow \phi$
	$A \cup U \rightarrow U$		$U \cup \phi \rightarrow U$
	$A \cap U \rightarrow A$		$U \cap \phi \rightarrow \phi$

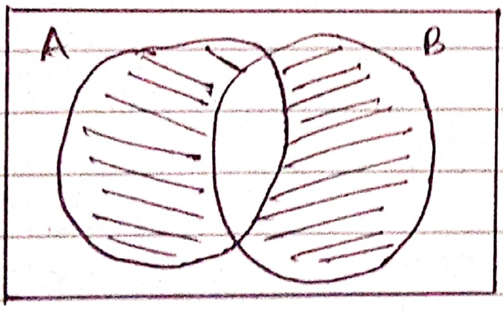
- Difference Of Sets :-



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

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

- Symmetric Difference Of Set :-



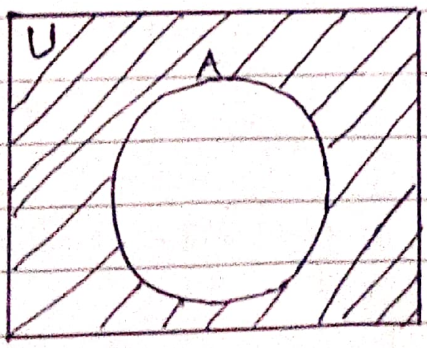
$A \triangle B =$

$(A - B) \cup (B - A)$

OR

$(A \cup B) - (A \cap B)$

- Compliment Of Set A :-



↓

A' → Compliment Of Set A

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Universal Set − Elements Of Set A