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set theory

A set ~~theory~~ is a collection of well defined objects & these obj's are called an elements or members of the set.

Exp- $Jan = \{1, 2, \ldots 31\}$

$x = \{a_1, a_2, b_1, b_2\}$

$a_1 \in x$

$a_2 \in x$

$a_3 \notin x$

* Sets are alway represented by "capital letters" & elements are alway represented by "lowercase".

way to represent set.

$A \Rightarrow \{1, 3, 5, 7, 9\}$

$A = \{x \mid x$ is an odd ~~number~~ positive integer less than $10\}$

Subset

X, & 'Y' are two sets, & if every element of 'y' is in 'x' then 'y' is called subset of 'x'.

$x = \{1, 2, 3, 4, 5\}$

$y = \{2, 4\}$

$(y \subseteq x)$

If $y = \{2, 4, 6\}$

$y \not\subseteq x$

Multiset

it is a set in which elements are not necessarily distinct/unique.

$A = [a_1, a_2, a_3]$

$B = [1, 1, 2, 2, 3, 3]$ ← [illegible] multiset part 2

Multiplicity of a set

it denotes the no of times an elements appearing in the set.

exp $B = [1, 1, 2, 2, 2, 3, 3]$

$$\left.\begin{array}{l} M_1 = 2 \\ M_2 = 3 \\ M_3 = 2 \end{array}\right\}$$

ⓐ Sum of Multiplicity

$p = [1, 1, 2, 2, 3]$

$q = [1, 2, 3]$

$p + q = [1, 1, 1, 2, 2, 2, 3, 3]$

$$\left.\begin{array}{l} M_1 = 3 \\ M_2 = 3 \\ M_3 = 2 \end{array}\right\}$$

ⓑ Diff of multiplicity

$p - q =$

$[\ldots 1, 2 \ldots]$

* ~~$q - p$~~

~~$\Rightarrow E$~~

$p - q$

$p \Rightarrow [1, 1, 2, 2, 3]$

$q \Rightarrow [1, 1, 1]$

$p - q = [2, 2, 3]$

* -ve value we are not considering, if greater any -ve value it's means of ... is 0! & not required to mention them.

part-3

Basic theorem of Set theory

Theory

① 2 set A & B are equal if

$A \subseteq B$ & $B \subseteq A$.

$A = [1, 2, 3, 4]$

$B = [1, 2, 3]$

teorem

② Every set 'A' is a subset of the universal set set U

$U = \{ \_\_\_ \}$

$A = \{ a_1, a_2 \}$

$\Rightarrow \boxed{A \subseteq U}$

③ Every set is subset of itself.

$A \subseteq A$

④ Transitively property

if $A \subseteq B$ &

$B \subseteq C$

then $\boxed{A \subseteq C}$

$A = \{1, 2, 3\}$

$B = \{1, 2, 3, 4\}$

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

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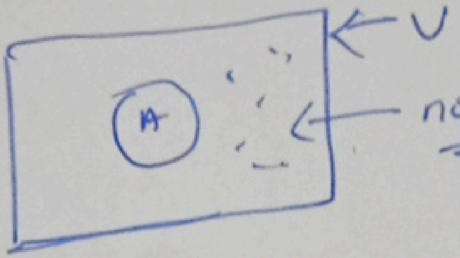
VENN Diagram

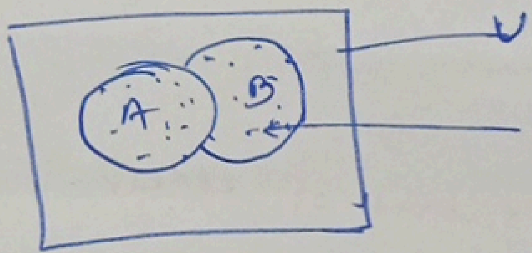
It is the pictorical representation of the sets in which sets are denoted by circles in a plane.



Set operations

(a) union → it contains element either in A, or, B, or, both.

$A \cup B = \{x : x \in A \text{ or } x \in B\}$



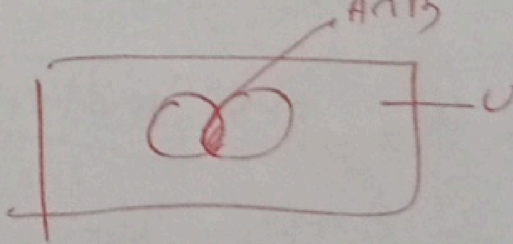
$A = \{1, 2, 3, 4\}$ $A \cup B = \{1, 2, 3, 4, 5\}$

$B = \{3, 4, 5\}$

(b) intersection

It contain element ~~of~~ that are in both A & 'B'.

$A \cap B = \{x : x \in A \text{ and } x \in B\}$.

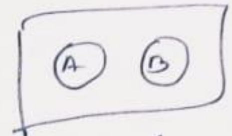


$A \cap B = \{3, 4\}$

③ disjoint set

↳ two sets 'A' & 'B' are called disjoint if there are no common elements.

$$\boxed{A \cap B = \phi}$$



$A = \{1, 2, 3\}$

$B = \{7, 8\}$.

④ Complementary of a set

It contains the element which belongs to universal set but not 'A'.

complementary (A^C)

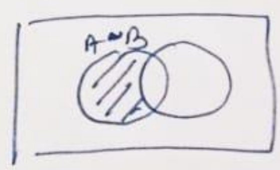
$$A^c = \{x \in U, x \notin A\}$$

⑤ Relativeey complement

→ It is the difference of A & B.

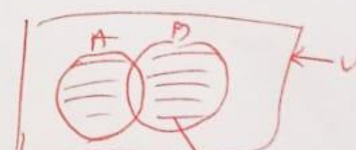
→ represented by ($A | B$ or $A \sim B$)

$$A \sim B = \{x : x \in A \text{ and } x \notin B\}$$



⑥ Symmetric Difference. ($A \oplus B$)

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



$A = \{1, 2, 3\}$

$B = \{1, 2\}$

$A \oplus B = \{3\}$