CS & IT ENGINEERING

Discrete Maths
Set Theory
Set operations

Lecture No.2

By- SATISH YADAV SIR

01 Basics operations in sets

02 set theory laws

03 Different operations thm

04 Infinite union

05 Union on intervals

1) union ($\cup$)

2) Intersection ($\cap$)

3) Set difference ($-$)

**4) Symmetric difference ($\oplus$ / $\triangle$)

A =

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

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

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

$A \cap B = \{2, 3\}$

$B \cap A = \{2, 3\}$

$A - B = \{1\}$

A	B
1	~~2~~
~~2~~	~~3~~
~~3~~	

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

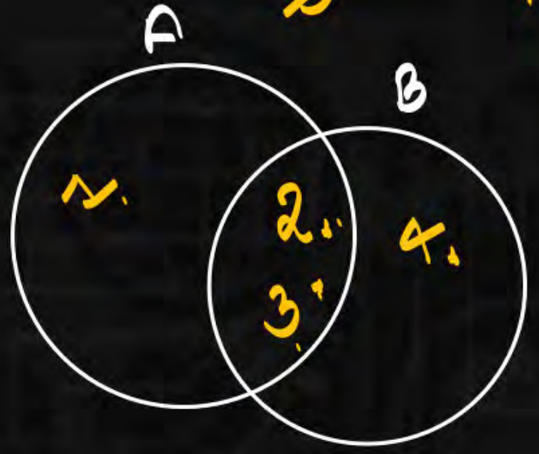
$A - B = \{1\}$

$B - A = \{4\}$

A	B
1	~~2~~
~~2~~	~~3~~
~~3~~	4

B	A
~~2~~	1
~~3~~	~~2~~
(4)	~~3~~

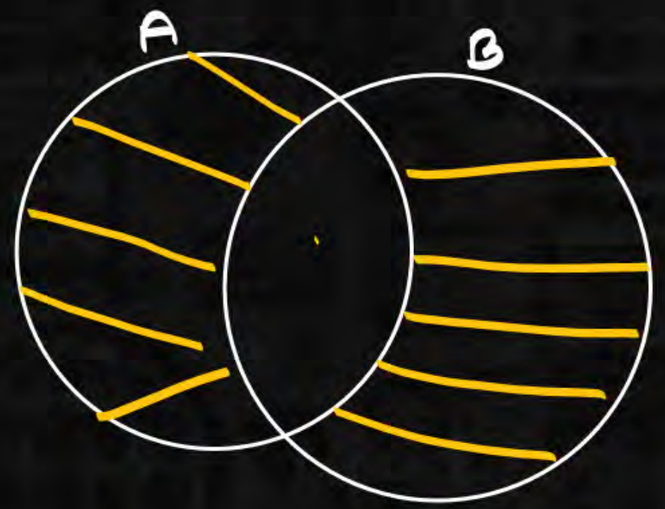
$A - B \neq B - A$



$A - B =$

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

elements which are present in A, B but not in both.



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

$A \triangle B = \{1, 4\}$

$B \triangle A = \{4, 1\}$

$A \triangle B = B \triangle A$

A B

1 2

2 3

3 4

U

$1,2,3,4,5 \cup 4,8 = \{1,2,3,4,5,8\}$

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

$B = \{1, 2, 4, 8\}$

$C = \{1, 2, 3, 5, 7\}$

$D = \{2, 4, 6, 8\}$

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

2) $(B - C) - D$

3) $B - (C - D)$

4) $(A \cup B) - (C \cap D)$

$(B - C) - D = \phi$

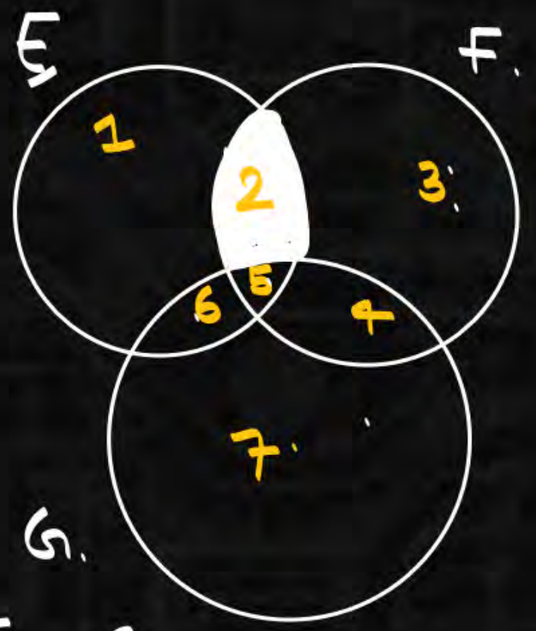
$\{1, 2, 4, 8\} - \{1, 2, 3, 5, 7\} = \{4, 8\}$

$\{4, 8\} - \{2, 4, 6, 8\} = \phi$

$x = (E \cap F) - (F \cap G)$ = part 2.

$y = (E - (E \cap G)) - (E - F)$

(GATE)



partwise distribution.

$\frac{2}{5} - \frac{4}{5} = \{2\}$

a) $x = y$

b) $x \subset y$

c) $y \subset x$.

d) nota.

$E \cap F$.

1 — 2

2 — 3

5 — 4 $= 2$

6 — 5. 5.

F — G.

2 — 4

3 — 5 $= 45$

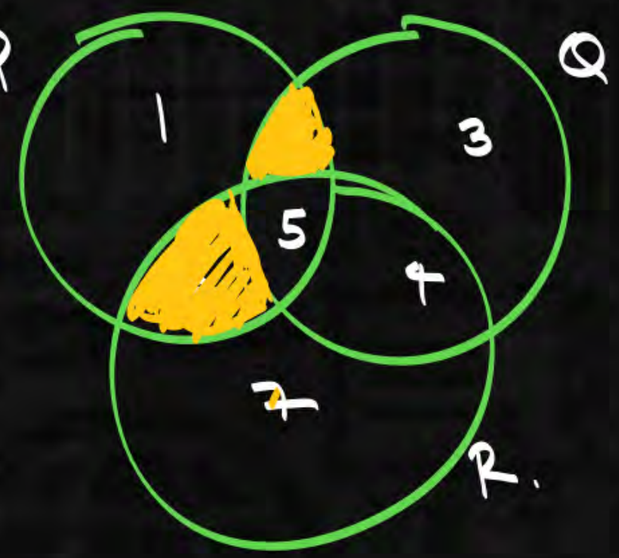
4 — 6

5 — 7

I

$(1,2,5) \cap (2,3,4,5) = (2,5)$ $\quad$ $(1,2,5,6) \cap (4,5,6,7) = (5,6)$

$(2,5) \Delta (5,6) = 26$



II. $P \cap (Q \Delta R) = (P \cap Q) \Delta (P \cap R)$

$Q \Delta R$: $2, 6, 3, \cancel{4}, \cancel{5}, \cancel{4}, \cancel{5}, 7$ $\Rightarrow (2, 3, 6, 7)$

$P \cap (Q \Delta R) = (1, 2, 5) \cap (2, 3, 6, 7) = 26$

$(P \cap Q) \Delta (P \cap R) = (2, 5) \Delta (5, 6) = 26$

I. $P \triangle (Q \cap R) = (P \triangle Q) \cap (P \triangle R)$

$Q \cap R$: 2, 3, 4 ∩ 4, 5, 6, 7 → 4, 5

$P \triangle (Q \cap R)$: $P \triangle$ 4, 5

$P \triangle Q$: 1, 2, 3, 4, 5, 6

$P \triangle R$: 1, 2, 4, 5, 6, 7

$(P \triangle Q) \cap (P \triangle R)$: 1, 2, 3, 4, 5, 6 ∩ 1, 2, 4, 5, 6, 7 → 1, 2, 4, 5, 6

14.

$P \triangle$ 4, 5 = 1, 2, 5, 6 △ 4, 5 = 1, 2, 4, 6

S_1. $A - (B \cup C) = (A - B) \cap (A - C)$ | (valid)

S_2. $A \triangle (B \triangle C) = (A \triangle B) \triangle C$.

A, B are sets. valid?

1. $P(A \cup B) = P(A) \cup P(B)$

2. $P(A \cap B) = P(A) \cap P(B)$

valid?

3. if $A \cap B = A \cap C \longrightarrow B = C$

4. if $A \cup B = A \cup C \longrightarrow B = C$.

5. if $A \triangle B = A \triangle C \longrightarrow B = C$.

$P(A \cup B) = P(A) \cup P(B)$ (Invalid)

$A = \{1\}$ $B = \{2\}$ $\longrightarrow$ $A \cup B = \{1, 2\}$

$P(A) = \{\phi, A\}$ $P(B) = \{\phi, B\}$ $\underline{P(A \cup B)} = \{\phi, \{1\}, \{2\}, \{1, 2\}\}$

$P(A) \cup P(B) = \{\phi, A, B\}$

$A = \{1\}$ $B = \{1, 2\}$ $\longrightarrow$ $A \cap B = \{1\}$

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

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

$P(A \cap B) = \{\phi, \{1\}\} = \{\phi, A\}$

$P(A) \cap P(B) = \{\phi, A\}$

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

if $A \cap B = A \cap C \longrightarrow B = C$.

$\{2\} = \{2\}$

$A \cap B = A \cap C \longrightarrow B = C$. (Invalid)

$\{2\} \cap \{2,10\} = \{2\} \cap \{2,11\}$

4. if $A \cup B = A \cup C \longrightarrow B = C$. (Invalid)

5. if $A \triangle B = A \triangle C \longrightarrow B = C$. (valid)

$\{23\}$ $\{23\}$

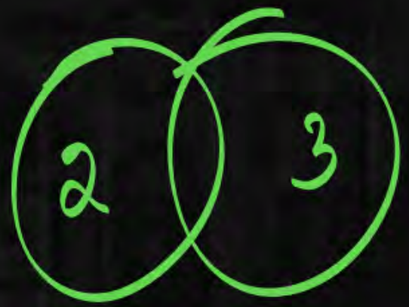
$A \cup B = A \cup C \longrightarrow B = C.$

$\{2\} \cup \{3\}$ $\{2\} \cup \{23\}$

$\{23\}$ $\{23\}$

5. $A \triangle B = A \triangle C \longrightarrow B = C.$

$\{2\} \triangle \{3\}$ $\{2\} \triangle \{3\}$



234

$A \cup B = B \cup A$

$A \cap B = B \cap A$

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

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

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

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

$A \cup A = A$

$A \cap A = A$

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

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

$A \cup U = U$

$A \cap U = A$

$A \cap \phi = \phi$

$A \cap U = A$

$\wedge$	$\cap$	$\cdot$
$\vee$	$\cup$	$+$
T	U	1
f	ϕ	0

$A_1 = \{\quad\}$ $A_2 = \{\ldots\}$ $A_3 = \{\ldots\}$

$$A_1 \cup A_2 \cup A_3 = \bigcup_{i=1}^{3} A_i$$

$A_n = [-2n, 3n]$

1. A_3 $[-6, 9]$

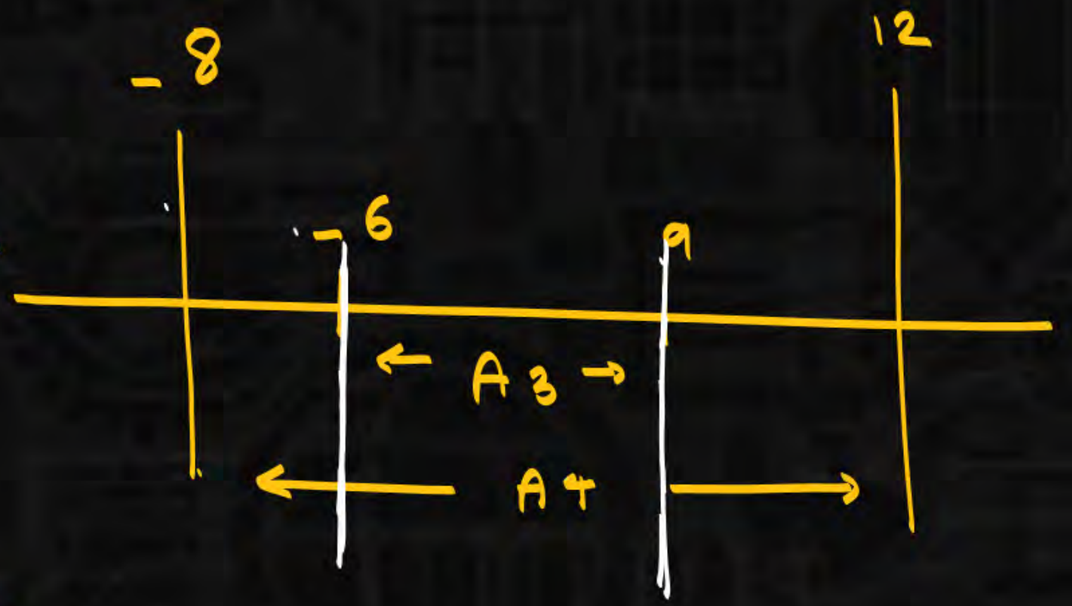
2. $A_3 - A_4 = \phi$

3. $A_3 \Delta A_4$

$= [-8, -6) \cup (9, 12]$

4. $\bigcup_{i=1}^{7} A_i = A_7$.

5. $\bigcap_{i=1}^{7} A_i = A_1$.




THANK YOU GW
SOLDIERS !