

SET THEORY

2 sets
3 sets

Set ③ elements

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

$$\text{no. of subsets} = 2^3 = {}^3C_0 + {}^3C_1 + {}^3C_2 + {}^3C_3$$

★ Set n elements \Rightarrow Subset = 2^n

$\{\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{3, 1\}, \{1, 2, 3\}\}$
 8 subsets

$$(x+y)^n = {}^nC_0 x^n y^0 + {}^nC_1 x^{n-1} y^1 + \dots + {}^nC_n x^0 y^n$$

2 sets

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

$$B = \{2, 4, 5\}$$

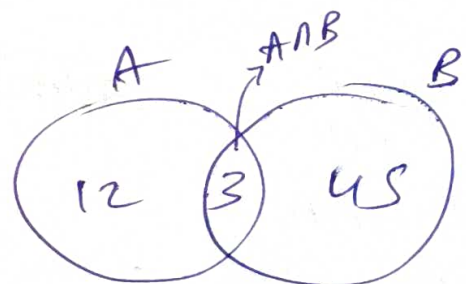
→ [Total = each like at least 1-]

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

$$(A \cap B) = \{2\}$$

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

$$1+2+3+4+5 = 1+2+3+3+4+5 - 3$$



100 students Each like at least 1 drink ^{total}

(50) — Tea

(60) — Coffee

$$n(T \cup C) = n(T) + n(C) - n(T \cap C)$$

$$100 = 50 + 60 - n(T \cap C)$$

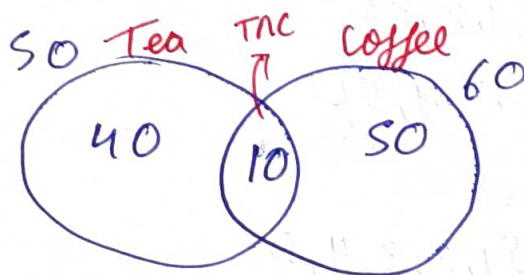
$$n(T \cap C) = 10$$

How many like

a) both (Tea + Coffee) (10)

b) Exactly 1 drink $40 + 50 = 90$

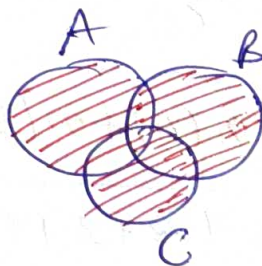
c) Tea but not coffee = (40)



3 sets

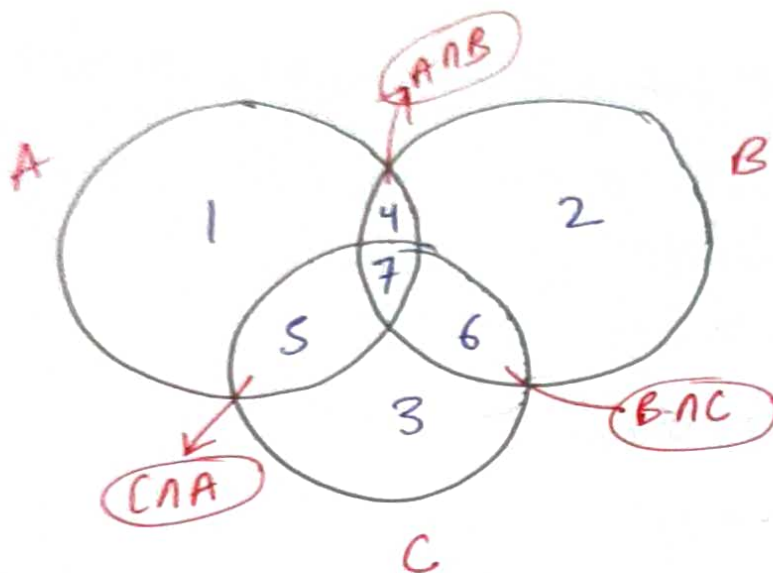
Each like at least 1

$A \cup B \cup C$



- ✓ A
- ✓ B
- ✓ C
- ✓ A ∩ B
- ✓ B ∩ C
- ✓ C ∩ A
- ✓ A ∩ B ∩ C

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



	Area
each like atleast ① ($A \cup B \cup C$)	1, 2, 3, 4, 5, 6
Exactly ①	1, 2, 3
Exactly ②	4, 5, 6
All ③	7
atleast ②	4, 5, 6, 7
A and B but not C	7 4
A but not B	1, 5

Set Theory
 P and C
 Probability

or \cup +

and \cap x

College

125

Students each like atleast 1 game.

100 — Cricket

50 — Hockey

60 — Football

30 ~~20~~ — C & H

35 ~~25~~ — H & F

45 ~~30~~ — C & F

How many students like

① Exactly 1 game $50 + 10 + 5 = 65$

② Exactly 2 game $5 + 20 + 10 = 35$

③ All 3 game 25

④ atleast 1 game $35 + 25 = 60$

⑤ Cricket and Hockey but not football. 5

⑥ Cricket but not football. $50 + 5 = 55$

$$\begin{aligned}
 n(A \cup B \cup C) &= n(A) - n(A \cap B) \\
 &\quad + n(B) - n(B \cap C) + n(A \cap B \cap C) \\
 &\quad + n(C) - n(C \cap A)
 \end{aligned}$$

$$\begin{aligned}
 125 &= 100 - 30 \\
 &\quad + 50 - 35 + n(A \cap B \cap C) \\
 &\quad + 60 - 45
 \end{aligned}$$

$$n(A \cap B \cap C) = 25$$

