We know that

$$n(H \cup E) = n(H) + n(E) - n(H \cap E)$$
$$= 100 + 50 - 25 = 125.$$

15. In a survey of 60 people, it was found that 25 people read Newspaper H, 26 read Newspaper T, 26 read Newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find

(i) the number of people who read at least one of the newspapers.

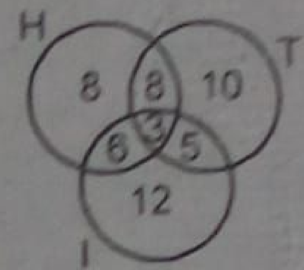
(ii) the number of people who read exactly one newspaper.

Sol. Clearly,

(i) No. of people who read at least one newspaper

$$= (8 + 8 + 10 + 6 + 3 + 5 + 12) = 52.$$

(ii) No. of people who read exactly one newspaper $= 52 - (8 + 3 + 6 + 5)$
$= 52 - 22$
$= 30.$

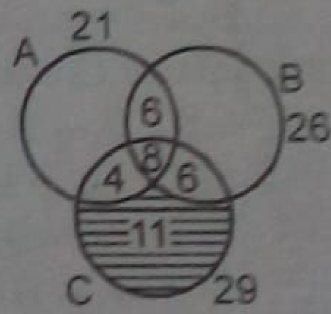


16. In a survey, it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked A and B, 12 people liked C and A, 14 people liked product B and C and 8 liked all the three products, find how many liked product C only.

Sol. $n(A \cap B) = 14$, $n(A \cap C) = 12$,
$n(B \cap C) = 14$,

$$n(A \cap B \cap C) = 8.$$

$$\therefore \quad n(C \text{ only}) = 29 - 4 - 8 - 6$$
$$= 29 - 18 = 11.$$



11. Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for some set X, prove that A = B.

Sol. We have : $A \cup X = B \cup X$ for some set X.

$\Rightarrow \quad A \cap (A \cup X) = A \cap (B \cup X).$

$\Rightarrow \quad A = (A \cap B) \cup (A \cap X) \quad [\because A \cap (A \cup X) = A]$

$\Rightarrow \quad A = (A \cap B) \cup \phi \quad [\because A \cap X = \phi \text{ (given)}]$

$\Rightarrow \quad A = A \cap B \Rightarrow A \subset B \quad \dots (1)$

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Again, $\quad A \cup X = B \cup X.$

$\Rightarrow \quad B \cap (A \cup X) = B \cap (B \cup X) \quad [\because B \cap (B \cup X) = B]$

$\Rightarrow \quad (B \cap A) \cup (B \cap X) = B \quad [\because B \cap X = \phi \text{ (given)}]$

$\Rightarrow \quad (B \cap A) \cup \phi = B \Rightarrow B \cap A = B$

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$\Rightarrow \quad A \cap B = B \Rightarrow B \subset A \quad \dots (2)$

From (1) and (2), we get

$$A = B.$$

EX

12. Find sets A, B and C such that $A \cap B$, $A \cap C$ and $B \cap C$ are non-empty sets and $A \cap B \cap C = \phi$.

Sol. Let A = {1, 2}, B = {2, 3} and C = {1, 3}.

Clearly, $\quad A \cap B = \{2\}, B \cap C = \{3\}$ and $A \cap C = \{1\}$.

i.e., $A \cap B$, $A \cap C$ and $B \cap C$ are non-empty sets.

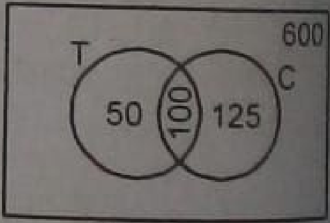
$\therefore \quad (A \cap B) \cap C = \{2\} \cap \{1, 3\} \Rightarrow A \cap B \cap C = \phi.$

13. In a survey of 600 students in a school, 150 students were found to be drinking Tea and 225 drinking Coffee, 100 were drinking both Tea and Coffee. Find how many students were drinking neither Tea nor Coffee.

Sol. Here, $n(T) = 150$, $n(C) = 225$, $n(T \cap C) = 100$.

Also, we know that

$$n(T \cup C) = n(T) + n(C) - n(T \cap C) = 150 + 225 - 100 = 275.$$



Total no. of students = 600.

$\therefore$ No. of students who neither take tea nor coffee

$$= 600 - n(T \cup C) = 600 - 275 = 325.$$

14. In a group of students, 100 students know Hindi, 50 know English and 25 know both. Each of the students knows either Hindi or English. How many students are there in the group ?

Sol. Here, $\quad n(H) = 100, n(E) = 50$

and $\quad n(H \cap E) = 25.$