Example 1.

If $n(A) = 10$, $n(B) = 7$ and $n(A \cup B) = 15$, then which of the following is the value of $n(A \cap B)$?

(i) 3 (ii) 2 (iii) 0 (iv) 17

Solution :

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

or $$15 = 10 + 7 - n(A \cap B)$$

$\therefore$ $$n(A - B) = 17 - 15 = 2$$

Example 2

The total membership of Mathematical Society and Science Club is 122. If 50 students are the members of Mathematical Society and 28 students are members of both the organisation, find how many students are the members of Science Club ?

Solution :

Let $A = \{x/x$ is the member of Mathematics Society$\}$

$B = \{x/x$ is the member of Science Club$\}$

By the question,

$n(A \cup B) = 122$, $n(A) = 50$, $n(A \cap B) = 28$, $n(B) = ?$

By the formula,

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

or $122 = 50 + n(B) - 28$

or $n(B) = 122 - 50 + 28 = 100$

$\therefore$ So number of members of Science Club = 100 . **Ans.**

Example 3

In a group of 26 persons, 8 persons take tea instead of coffee and 16 persons take tea. How many persons take only coffee, not taking tea ? *(J.A.C., 2015)*

Solution :

Let $A = \{x/x$ is the person takes tea$\}$

$B = \{x/x$ is the person takes coffee$\}$

By the question, $n(A \cup B) = 26, n(A) - n(A \cap B) = 8$

$n(A) = 16, n(B) - n(A \cap B) = ?$

By the formula,

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

or $26 = 16 + n(B) - n(A \cap B)$

$\therefore$ $n(B) - n(A \cap B) = 26 - 16 = 10$

So the number of persons take only coffee, not taking tea = 10 **Ans.**

Example 4

In a class there are 50 students. Of them each student study neither Hindi or Urdu or both. If 21 students study Hindi and 10 students Hindi and Urdu both, then state how many students study Urdu, how many study Urdu only and how many study Hindi only ?

Solution :

Let $H = \{x/x$ is the person study Hindi$\}$

$U = \{x/x$ is the person study Urdu$\}$

By the question,

$n(H \cup U) = 50, n(H) = 21, n(U) = ?$

$n(H \cap U) = 10$

By the formula,

$$n(H \cup U) = n(H) + n(U) - n(H \cap U)$$

or $50 = 21 + n(U) - 10$

$\therefore$ $n(U) = 39$

So number of students study Urdu only $= n(U) - n(H \cap U) = 39 - 10 = 29$

Number of students study Hindi only $= n(H) - n(H \cap U) = 21 - 10 = 11$

Exercise 8(E)

1. If $A \cap B = \phi$, then $n(A \cup B)$ is equal to which of the following : *(JAC, 2015)*
   (a) $n(A) - n(B)$ (b) $n(A) + n(B)$ (c) $n(A) \times n(B)$ (d) $n(A \times B)$
2. If $n(A) = 20$, $n(B) = 30$ and $n(A \cap B) = 10$, then find the value of $n(A \cup B)$.
3. If $n(A \cup B) = 50$, $n(A) = 28$ and $n(B) = 32$, then find the value of $n(A \cap B)$. *(JAC, 2017)*
4. If $n(A) = 40$, $n(A \cup B) = 60$ and $n(A \cap B) = 10$, then calculate the value of $n(B)$.
5. If $n(A) = 17$, $n(B) = 23$ and $n(A \cup B) = 38$, then find the value of $n(A \cap B)$.
6. If $n(A \cup B) = 80$, $n(B) = 15$ and $n(A \cap B) = 5$, then find the value of $n(A)$ and $n(A) - n(A \cap B)$.
7. In a school there are 20 teachers who teach Mathematics and Physics. Out of them 12 teaches Mathematics and 4 Physics and Mathematics. State how many teachers teach Physics ?
8. In a group each person knows atleast one language out of Hindi and Urdu. 100 persons know Hindi, 50 Urdu and of them 25 knows both Hindi and Urdu, find by set method how many person are there in the group ?
9. In a group of 70 persons, 37 persons like coffee, 52 likes tea and each persons likes atleast one of the two drinks. Find how many persons like both coffee and tea ? *(JAC, 2009, 14)*