Question 6:

Let U be the set of all triangles in a plane. If A is the set of all triangles with at least one angle different from 60°, what is A'?

Answer

A' is the set of all equilateral triangles.

Question 7:

Fill in the blanks to make each of the following a true statement:

(i) $A \cup A' = \ldots$

(ii) $\Phi' \cap A = \ldots$

(iii) $A \cap A' = \ldots$

(iv) $U' \cap A = \ldots$

Answer

(i) $A \cup A' = U$

(ii) $\Phi' \cap A = U \cap A = A$

$\therefore \Phi' \cap A = A$

(iii) $A \cap A' = \Phi$

(iv) $U' \cap A = \Phi \cap A = \Phi$

$\therefore U' \cap A = \Phi$

Exercise 1.6

Question 1:

If X and Y are two sets such that $n(X) = 17$, $n(Y) = 23$ and $n(X \cup Y) = 38$, find $n(X \cap Y)$.

Answer

It is given that:

$n(X) = 17$, $n(Y) = 23$, $n(X \cup Y) = 38$

$n(X \cap Y) = ?$

We know that:

$$n(X \cup Y) = n(X) + n(Y) - n(X \cap Y)$$
$$\therefore 38 = 17 + 23 - n(X \cap Y)$$
$$\Rightarrow n(X \cap Y) = 40 - 38 = 2$$
$$\therefore n(X \cap Y) = 2$$

Question 2:

If X and Y are two sets such that X ∪Y has 18 elements, X has 8 elements and Y has 15 elements; how many elements does X ∩Y have?

Answer

It is given that:

$$n(X \cup Y) = 18,\ n(X) = 8,\ n(Y) = 15$$

n(X ï�f�? Y) = ?

We know that:

$$n(X \cup Y) = n(X) + n(Y) - n(X \cap Y)$$
$$\therefore 18 = 8 + 15 - n(X \cap Y)$$
$$\Rightarrow n(X \cap Y) = 23 - 18 = 5$$
$$\therefore n(X \cap Y) = 5$$

Question 3:

In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English?

Answer

Let H be the set of people who speak Hindi, and

E be the set of people who speak English

$\therefore n(H \cup E) = 400$, $n(H) = 250$, $n(E) = 200$

$n(H \cap E) = ?$

We know that:

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

$\therefore 400 = 250 + 200 - n(H \cap E)$

$\Rightarrow 400 = 450 - n(H \cap E)$

$\Rightarrow n(H \cap E) = 450 - 400$

$\therefore n(H \cap E) = 50$

Thus, 50 people can speak both Hindi and English.

Question 4:

If S and T are two sets such that S has 21 elements, T has 32 elements, and $S \cap T$ has 11 elements, how many elements does $S \cup T$ have?

Answer

It is given that:

$n(S) = 21$, $n(T) = 32$, $n(S \cap T) = 11$

We know that:

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

$\therefore n(S \cup T) = 21 + 32 - 11 = 42$

Thus, the set $(S \cup T)$ has 42 elements.

Question 5:

If X and Y are two sets such that X has 40 elements, $X \cup Y$ has 60 elements and $X \cap Y$ has 10 elements, how many elements does Y have?

Answer

It is given that:

$n(X) = 40$, $n(X \cup Y) = 60$, $n(X \cap Y) = 10$

We know that:

$n(X \cup Y) = n(X) + n(Y) - n(X \cap Y)$

$\therefore 60 = 40 + n(Y) - 10$

$\therefore n(Y) = 60 - (40 - 10) = 30$

Thus, the set Y has 30 elements.

Question 6:

In a group of 70 people, 37 like coffee, 52 like tea, and each person likes at least one of the two drinks. How many people like both coffee and tea?

Answer

Let C denote the set of people who like coffee, and

T denote the set of people who like tea

$n(C \cup T) = 70$, $n(C) = 37$, $n(T) = 52$

We know that:

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

$\therefore 70 = 37 + 52 - n(C \cap T)$

$\Rightarrow 70 = 89 - n(C \cap T)$

$\Rightarrow n(C \cap T) = 89 - 70 = 19$

Thus, 19 people like both coffee and tea.

Question 7:

In a group of 65 people, 40 like cricket, 10 like both cricket and tennis. How many like tennis only and not cricket? How many like tennis?

Answer

Let C denote the set of people who like cricket, and

T denote the set of people who like tennis

$\therefore n(C \cup T) = 65$, $n(C) = 40$, $n(C \cap T) = 10$

We know that:

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

$\therefore 65 = 40 + n(T) - 10$

$\Rightarrow 65 = 30 + n(T)$

$\Rightarrow n(T) = 65 - 30 = 35$

Therefore, 35 people like tennis.

Now,

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

Also,

$(T - C) \cap (T \cap C) = \Phi$

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

$\Rightarrow 35 = n(T - C) + 10$

$\Rightarrow n(T - C) = 35 - 10 = 25$

Thus, 25 people like only tennis.

Question 8:

In a committee, 50 people speak French, 20 speak Spanish and 10 speak both Spanish and French. How many speak at least one of these two languages?

Answer

Let F be the set of people in the committee who speak French, and

S be the set of people in the committee who speak Spanish

$\therefore n(F) = 50, n(S) = 20, n(S \cap F) = 10$

We know that:

$n(S \cup F) = n(S) + n(F) - n(S \cap F)$

$= 20 + 50 - 10$

$= 70 - 10 = 60$

Thus, 60 people in the committee speak at least one of the two languages.