PRACTICE PAPER 01 (2024-25)
CHAPTER 01 SETS

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : XI **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. If $X = \{1, 2, 3\}$, if n represents any member of x, then all elements of a set, containing element $n + 6$ is given by:
(a) {6, 7, 8} (b) {5, 6, 7} (c) {7, 8, 9} (d) {8, 9, 10}

2. Two finite sets have m and n elements. The number of subsets of the first set is 112 more than that of second set. The values of m and n are respectively:
(a) 4, 7 (b) 7, 4 (c) 4, 4 (d) 7, 7

3. Let A and B be two sets such that $n(A) = 20$, $n(B) = 10$, $n(A \cup B) = 15$. Then, $n(A \cap B)$ is equal to:
(a) 30 (b) 40 (c) 15 (d) none of these

4. Let $A = \{x : x \in R, x > 6\}$ and $B = \{x \in R : x < 9\}$. Then, $A \cap B$ is equal to:
(a) (7, 8] (b) (7, 8) (c) [7, 8) (d) [7, 8]

5. If $S = \{ x \mid x$ is a positive multiple of 3 less than 100$\}$ and $P = \{ x \mid x$ is a prime number less than 20$\}$. Then, $n(S) + n(P)$ is equal to:
(a) 34 (b) 31 (c) 33 (d) 41

6. If $A = \{x : x$ is a multiple of 3$\}$ and, $B = \{x : x$ is a multiple of 5$\}$, then $A \cap B$ is:
(a) $\{ x : x$ is a multiple of 3$\}$ (b) $\{ x : x$ is a multiple of 5$\}$
(c) $\{ x : x$ is a multiple of 15$\}$ (d) none of the above

7. Given the set A = {1, 3, 5}, B = {2, 4, 6}, C = {0, 2, 4, 6, 8}. Which of the following can be considered as a universal set(s) for sets A, B, C?
(a) {0, 1, 2, 3, 4, 5, 6} (b) ϕ
(c) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10} (d) {1, 2, 3, 4, 5, 6, 7, 8}

8. If $X = \{8^n - 7n - 1 \mid n \in N\}$ and $Y = \{49n - 49 \mid n \in N\}$. Then
(a) $X \subset Y$ (b) $Y \subset X$ (c) $X = Y$ (d) $X \cap Y = \phi$

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** The set {1, 8, 27,. . ., 1000} in the set-builder form is { x: $x = n^3$, where $n \in N$ and $1 \le n \le 10$}.
Reason (R): In roster form, the order in which the elements are listed is immaterial.

10. **Assertion (A):** Let $A = \{2, 3, 4\}$ and $B = \{1, 2, 3, 4\}$ Then $A \subset B$
Reason (R): If every element of set A is also an element of set B, then A is a subset of B.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. 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?

12. If $X = \{5, 6, 7, 8\}$, $Y = \{7, 8, 9, 10\}$, $Z = \{3, 4, 5, 6\}$. Find: (a) $((X \cap Y) \cup Z)$ (b) $((X \cup Y) \cap Z)$

13. Given that $N = \{1, 2, 3,. . . 100\}$, then
(a) Write the subset A of N, whose elements are odd numbers.
(b) Write the subset B of N, whose elements are represented by $x + 2$, where $x \in N$.

14. If $P(A) = P(B)$, show that $A = B$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If $A = \{1, 3, 5, 7, 11, 13, 15, 17\}$, $B = \{2, 4, 6, 8, ... 18\}$ and U is universal set then find $A' \cup [(A \cup B) \cap B']$

16. Let $A = \{1, 2, 3, 4\}$ $B = \{1, 2, 3\}$ and $C = \{2, 4\}$. Find all sets of X satisfying each pair of conditions:
(a) $X \subset B$ and $X \not\subset C$
(b) $X \subset B, X \neq B$ and $X \not\subset C$
(c) $X \subset A, X \subset B$ *and* $X \subset C$

17. Let P and Q be sets, if $P \cap X = Q \cap X = \phi$ and $P \cup X = Q \cup X$ for some set X. Show that $P = Q$.

SECTION – D

Questions 18 carry 5 marks.

18. 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 products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. In a school, during the new academic session 2024-2025, in all sections of class XI, out of 200 students, 30 students offered English only, 24 students offered Sanskrit only, 16 students offered only Hindi, 80 students offered Hindi and English, 40 students offered Hindi and Sanskrit, 20 students offered English and Sanskrit, 130 students offered Hindi.

Based on the above information answer the following questions:
(a) Find the number of students who offered all the three subjects.
(b) Find the number of students who offered English.
(c) Find the number of students who offered Sanskrit
(d) Find the number of students who offered English and Sanskrit but not Hindi.

20. In a library, 25 students are reading books on physics, chemistry, and mathematics. It was found that 15 students were reading mathematics, 12 reading physics and 11 reading chemistry, 5 students reading both mathematics and chemistry, 9 students reading both physics and mathematics, 4 students reading both physics and chemistry, and 3 students reading all three subjects.

(a) Find the number of students reading only Chemistry.
(b) Find the number of students reading only Mathematics.
(c) Find the number of students reading at least one of the subject and also find the number of students reading none of the subjects.

PRACTICE PAPER 01 (2024-25)
CHAPTER 01 SETS (ANSWERS)

SUBJECT: MATHEMATICS | **MAX. MARKS : 40**
CLASS : XI | **DURATION : 1½ hrs**

General Instructions:

(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If $X = \{1, 2, 3\}$, if n represents any member of x, then all elements of a set, containing element $n + 6$ is given by:
(a) {6, 7, 8} (b) {5, 6, 7} (c) {7, 8, 9} (d) {8, 9, 10}
Ans: (c) {7, 8, 9}
The elements in a set containing $n + 6$ elements where $n \in x$ will
$1 + 6, 2 + 6, 3 + 6 = \{7, 8\ 9\}$.

2. Two finite sets have m and n elements. The number of subsets of the first set is 112 more than that of second set. The values of m and n are respectively:
(a) 4, 7 (b) 7, 4 (c) 4, 4 (d) 7, 7
Ans: (b) 7, 4
Given that the total number of subsets of the first set is 112 more than the total number of subsets of the second set.
$\Rightarrow 2^m - 2^n = 112 \Rightarrow 2^n (2^{m-n} - 1) = 2^4 \times 7$
$\therefore 2^n = 2^4$ and $(2^{m-n} - 1) = 7$
We can say that the value of $n = 4$
$\Rightarrow 2^{m-n} - 1 = 7 \Rightarrow 2^{m-n} = 8$
$\Rightarrow 2^{m-4} = 2^3$ [$\because n = 4$]
$\Rightarrow m - 4 = 3 \Rightarrow m = 7$
Therefore the value of $m = 7$ and $n = 4$.

3. Let A and B be two sets such that $n(A) = 20$, $n(B) =10$, $n(A \cup B) = 15$. Then, $n(A \cap B)$ is equal to:
(a) 30 (b) 40 (c) 15 (d) none of these
Ans: (c) 15
Given, A and B are two sets such that $n(A) = 20$, $n(B) = 10$, $n(A \cup B) = 15$
We know that, $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
$\Rightarrow 15 = 20 + 10 - n(A \cap B)$
$\Rightarrow 15 = 30 - n\ (A \cap B)$
$\Rightarrow n(A \cap B) = 15$

4. Let $A = \{x : x \in R, x > 6\}$ and $B = \{x \in R : x < 9\}$. Then, $A \cap B$ is equal to:
(a) (7, 8] (b) (7, 8) (c) [7, 8) (d) [7, 8]
Ans. *(b) (7, 8)*
$A = \{x : x \in R, x > 6\}$
$= A = \{7,8,9,. . . .\}$,
$B = \{x \in R : x < 9\}$

= {8, 7, 6, 5,. . . .}

$A \cap B = \{x : x \in R, x > 6\} \cap \{x \in R : x < 9\}$

$= \{x: x \in R, x > 6$ and $x < 9\}$

$= \{x : x \in R, 6 < x < 9\}$ (it shows an open interval.)

= (7, 8)

5. If $S = \{ x \mid x$ is a positive multiple of 3 less than 100} and $P =\{ x \mid x$ is a prime number less than 20}. Then, $n(S) + n(P)$ is equal to:

(a) 34 (b) 31 (c) 33 (d) 41

Ans. *(d) 41*

$S = \{x: x$ is a positive multiple of 3 less than 100}

$\Rightarrow S = \{ 3,6,9,12,. . . ,99\}$

$\Rightarrow n(S) = 33$

$P = \{x: x$ is a prime number less than 20}

$\Rightarrow P = \{2,3,5,7,11,13,17,19\}$

$n(P) = 8$

$n(S) + n(P) = 33 + 8 = 41$

6. If $A = \{x : x$ is a multiple of 3} and, $B = \{x : x$ is a multiple of 5}, then $A \cap B$ is:

(a) { $x : x$ is a multiple of 3} (b) { $x : x$ is a multiple of 5}

(c) { $x : x$ is a multiple of 15} (d) none of the above

Ans. (c) {x : x is a multiple of 15}

$A = \{3,6,9,12,15,18,21, . . . \}$

$B = \{5,10,15,20,25,30,. . . .\}$

Then, $A \cap B = \{3, 6, 9, 12, 15, 18, 21, . . .\} \cap \{5, 15, 20, 5, 30. . .\}$

$= \{15, 30, 45,. . . \} = \{x : x$ is a multiple of 15}

7. Given the set A = {1, 3, 5}, B = {2, 4, 6}, C = {0, 2, 4, 6, 8}. Which of the following can be considered as a universal set(s) for sets A, B, C?

(a) {0, 1, 2, 3, 4, 5, 6} (b) ϕ

(c) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10} (d) {1, 2, 3, 4, 5, 6, 7, 8}

Ans: (c) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

A, B, C are subsets of {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

8. If $X = \{8^n – 7n – 1 \mid n \in N\}$ and $Y = \{49n – 49 \mid n \in N\}$. Then

(a) $X \subset Y$ (b) $Y \subset X$ (c) $X = Y$ (d) $X \cap Y = \phi$

Ans: (a) $X \subset Y$

for n = 1, x = {81 – 7 × 1 – 1} = 0, y = 49 × 1 – 49 = 0

for n = 2, x = 82 – 7 × 2 – 1 = 49, y = 49 × 2 – 49 = 49

for n = 3, x = 83 – 7 × 3 – 1 = 490, y = 49 × 3 – 49 = 98

We see for n = 3, x = 490, y = 98

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. **Assertion (A):** The set {1, 8, 27,. . ., 1000} in the set-builder form is $\{ x: x = n^3$, where $n \in N$ and $1 \le n \le 10\}$.

Reason (R): In roster form, the order in which the elements are listed is immaterial.

Ans: (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

We can see that each member in the given set is the cube of a natural number. Hence, the given set in the set-builder form is { $x : x = n^3$, where $n \in N$ and $1 \leq n \leq 10$}.
Also, in roster form, the order in

10. Assertion (A): Let $A = \{2, 3, 4\}$ and $B = \{1, 2, 3, 4\}$ Then $A \subset B$
Reason (R): If every element of set A is also an element of set B, then A is a subset of B.
Ans: (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
Since, every element of A is in B so $A \subset B$.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. 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?
Ans: Given $n(X) = 40$, $n(X \cup Y) = 60$, $n(X \cap Y) = 10$
We know that, $n(X \cup Y) = n(X) + n(Y) - n(X \cap Y)$
$\Rightarrow 60 = 40 + n(Y) - 10$
$\Rightarrow 60 = 40 - 10 + n(Y)$
$\Rightarrow 60 = 30 + n(Y)$
$\therefore n(Y) = 60 - 30 = 30$
Thus, the set Y has 30 elements.

12. If $X = \{5, 6, 7, 8\}$, $Y = \{7, 8, 9, 10\}$, $Z = \{3, 4, 5, 6\}$. Find: (a) $((X \cap Y) \cup Z)$ (b) $((X \cup Y) \cap Z)$
Ans: Given, $X = \{5, 6, 7, 8\}$, $Y = \{7, 8, 9, 10\}$, $Z = \{3, 4, 5, 6\}$
(a) $X \cap Y = \{5, 6, 7, 8\} \cap \{7, 8, 9, 10\} = \{7, 8\}$
$\Rightarrow (X \cap Y) \cup Z = \{7, 8\} \cup \{3, 4, 5, 6\} = \{3, 4, 5, 6, 7, 8\}$
(b) $X \cup Y = \{5, 6, 7, 8\} \cup \{7, 8, 9, 10\} = \{5, 6, 7, 8, 9, 10\}$
$\Rightarrow (X \cup Y) \cap Z = \{5, 6, 7, 8, 9, 10\} \cap \{3, 4, 5, 6\} = \{5, 6\}$

13. Given that $N = \{1, 2, 3,. . . 100\}$, then (a) Write the subset A of N, whose elements are odd numbers.
(b) Write the subset B of N, whose elements are represented by $x + 2$, where $x \in N$.
Ans: Given, $N = \{1, 2, 3, . . . , 100\} = \{x : x = n \text{ and } n \in N\}$
(a) $A = \{x \mid x \in N \text{ and } x \text{ is odd}\} = \{1, 3, 5, 7, . . . 99\}$
(b) $B = \{y \mid y = x + 2, x \in N\}$
The set whose elements are represented by
$x + 2$ where $x \in N$ is obtained by putting x =1, 2, 3, 4 and so on in $y = x + 2$, we get
$y = x + 2 = 1 + 2 = 3$
$y = x + 2 = 2 + 2 = 4$
$y = x + 2 = 3 + 2 = 5$
$y = x + 2 = 4 + 2 = 6. . . .$
$y = x + 2 = 100 + 2 = 102$
So, the required set will be $A = \{3, 4, 5, 6,. . . . 102\}$.

14. If $P(A) = P(B)$, show that $A = B$.
Ans: Given, $P(A) = P(B)$ $\forall a \in A$
$\Rightarrow \{a\} \subset A \Rightarrow \{a\} \in P(A)$
$\Rightarrow \{a\} \in P(B)$ $[P(A) = P(B)]$
$\Rightarrow \{a\} \in B \Rightarrow \{a\} \subset B$
$\Rightarrow A \subset B$
For all $b \in B$
$\Rightarrow \{b\} \subset B \Rightarrow \{b\} \in P(B)$ $[P(A) = P(B)]$
$\Rightarrow \{b\} \in P(A) \Rightarrow \{b\} \in A$
$\Rightarrow \{b\} \subset A \Rightarrow B \subset A$

Since, $A \subset B$ and $B \subset A$, therefore $A = B$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If $A = \{1, 3, 5, 7, 11, 13, 15, 17\}$, $B = \{2, 4, 6, 8, ... 18\}$ and U is universal set then find $A' \cup [(A \cup B) \cap B']$

Ans: Given, $A = \{1, 3, 5, 7, 11, 13, 15, 17\}$, $B = \{2, 4, 6, 8, ... 18\}$ and U is the universal set.

$A' = \{2, 4, 6, 8, 9, 10, 12, 14, 16\}$

$\Rightarrow A \cup B = \{1, 3, 5, 7, 11, 13, 15, 17\} \cup \{2, 4, 6, 8....18\} = \{1, 2, 3, 4, 5.....17, 18\}$

And, $B' = \{1, 3, 5, 7, 9....17\}$

$\Rightarrow (A \cup B) \cap B' = \{1, 2, 3, 4, 5....17, 18\} \cap \{1, 3, 5, 7, 9....17\} = \{1, 3, 5, 7, 9....17\}$

Now, $A' \cup [(A \cup B) \cap B'] = \{2, 4, 6, 8, 9, 10, 12, 14, 16\} \cap \{1, 3, 5, 7, 9....17\}$

$= \{1, 2, 3, 4, 5, 6,....18\}$

$= U$ = Universal Set

16. Let $A = \{1, 2, 3, 4\}$ $B = \{1, 2, 3\}$ and $C = \{2, 4\}$. Find all sets of X satisfying each pair of conditions:

(a) $X \subset B$ and $X \not\subset C$

(b) $X \subset B$, $X \neq B$ and $X \not\subset C$

(c) $X \subset A$, $X \subset B$ *and* $X \subset C$

Ans: (a) We have, $X \subset B$ *and* $X \not\subset C$

$\Rightarrow$ X is a subset of B but X is not a subset of C.

$\Rightarrow X \in P(B)$ but $X \notin P(C)$

$\Rightarrow X = \{1\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}$,

(b) We have, $X \subset B$, $X \neq B$ and $X \not\subset C$

$\Rightarrow$ X is a subset of B other than B itself, and X is not a subset of C.

$X \in P(B)$

$\Rightarrow X \in P(B)$, $X \notin P(C)$ but $X \neq B$

$\Rightarrow X = \{1\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}$

(c) We have, $X \subset A$, $X \subset B$ and $X \subset C$

$\Rightarrow X \in P(A)$, $X \in P(B)$ and $X \in P(C)$

$\Rightarrow$ X is a subset of A, B, and C.

$\Rightarrow X = \phi, \{2\}$.

17. Let P and Q be sets, if $P \cap X = Q \cap X = \phi$ and $P \cup X = Q \cup X$ for some set X. Show that $P = Q$.

Ans: Given that, $P \cap X = Q \cap X = \phi$ and $P \cup X = Q \cup X$

Using, $P \cup X = Q \cup X$ (given)

$P \cap (P \cup X) = P \cap (Q \cup X)$

Using distributive property, $(P \cap P) \cup (P \cap X) = (P \cap Q) \cup (P \cap X)$

$\Rightarrow P \cup \phi = (P \cap Q) \cup \phi \Rightarrow P = (P \cap Q)$ …(i)

Again using, $P \cup X = Q \cup X$

$\Rightarrow Q \cap (P \cup X) = Q \cap (Q \cup X)$

Using distributive property, $(Q \cap P) \cup (Q \cap X) = (Q \cap Q) \cup (Q \cap X)$

$\Rightarrow (Q \cap P) \cup \phi = Q \cup \phi$

$\Rightarrow Q = (Q \cap P) \Rightarrow Q = (P \cap Q)$ …(ii)

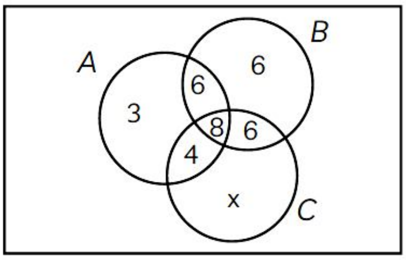
From (i) and (ii), we get $P = Q$

SECTION – D

Questions 18 carry 5 marks.

18. 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 products A and B, 12 people liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only.

Ans: Let A, B and C be the sets of people who like product A, product B and product C respectively.
Number of people who liked product $A = n(A) = 21$,
Number of people who liked product $B = n(B) = 26$,
Number of people who liked product $C = n(C) = 29$,
Number of people who liked product A and $B = n(A \cap B) = 14$
Number of people who liked product C and $A = n(C \cap A) = 12$
Number of people who liked product B and $C = n(B \cap C) = 14$
Number of people who liked all three products A, B and $C = n(A \cap B \cap C) = 8$
Let us draw a Venn diagram



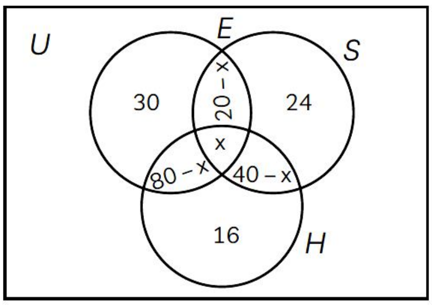
Number of people who liked product C only
$= n(C) - n(C \cap A) - n(B \cap C) + n(A \cap B \cap C) = 29 - 12 - 14 + 8 = 11$
Hence, the number of people who like product C only is 11.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. In a school, during the new academic session 2024-2025, in all sections of class XI, out of 200 students, 30 students offered English only, 24 students offered Sanskrit only, 16 students offered only Hindi, 80 students offered Hindi and English, 40 students offered Hindi and Sanskrit, 20 students offered English and Sanskrit, 130 students offered Hindi.

Based on the above information answer the following questions:
(a) Find the number of students who offered all the three subjects.
(b) Find the number of students who offered English.
(c) Find the number of students who offered Sanskrit
(d) Find the number of students who offered English and Sanskrit but not Hindi.
Ans: Let E, S and H be the sets of students who offered English, Sanskrit and Hindi, respectively. Let x be the number of students who offered all the three subjects, then the number of members in different regions are shown in the following diagram.



(a) From the above Venn diagram, We have, the number of students who offered Hindi.

$(80 - x) + x + (40 - x) + 16 = 130$ [Given]
$\Rightarrow 136 - x = 130 \Rightarrow x = 6$
The number of students who offered all the three subjects are 6.
(b) From the above Venn diagram,
The number of students who offered English
$= 30 + (20 - x) + x + (80 - x)$
$= 130 - x$
$= 130 - 6 = 124$ [$\because x = 6$, from (a)]
(c) From the above Venn diagram,
The number of students who offered Sanskrit
$= 24 + (20 - x) + x + (40 - x)$
$= 84 - x = 84 - 6 = 78$
(d) From the above Venn diagram,
The number of students who offered English and
Sanskrit but not Hindi $= 20 - x = 20 - 6 = 14$

20. In a library, 25 students are reading books on physics, chemistry, and mathematics. It was found that 15 students were reading mathematics, 12 reading physics and 11 reading chemistry, 5 students reading both mathematics and chemistry, 9 students reading both physics and mathematics, 4 students reading both physics and chemistry, and 3 students reading all three subjects.

(a) Find the number of students reading only Chemistry.
(b) Find the number of students reading only Mathematics.
(c) Find the number of students reading at least one of the subject and also find the number of students reading none of the subjects.
Ans: Let M denote a set of students who are reading mathematics, P denotes who is reading physics and C denotes who is reading chemistry.
We have, $n(U) = 25$, $n(M) = 15$, $n(P) = 12$, $n(C) = 11$, $n(M \cap C) = 5$, $n(M \cap P) = 9$, $n(P \cap C) = 4$ and $n(M \cap P \cap C) = 3$
(A) The number of students reading only chemistry $= n(M' \cap P' \cap C)$
But, $n(M' \cap P' \cap C) = n((M \cap P)' \cap C) = n(C) - n((M \cap P) \cap C)$
[since, $n(A \cap B') = n(A) - n(A \cap B)$] $= n(C) - n((M \cap C) \cup (P \cap C))$
$= n(C) - n(M \cap C) + n(P \cap C) - n(M \cap P \cap C))$
$= 11 - (5 + 4 - 3) = 5$
(B) The number of students reading only Mathematics $= n(M \cap P' \cap C')$
But, $n(M \cap P' \cap C') = n(M \cap (P \cap C)')$
$= n(M) - n(M \cap (P \cap C))$
$= n(M) - n((M \cap P) \cup (M \cap C))$
$= n(M) - (n(M \cap P) + n(M \cap C) - n(M \cap P \cap C))$
$= 15 - (9 + 5 - 3) = 4$
(C) The number of students reading at least one of the subject $= n(M \cup P \cup C)$
$n(M \cup P \cup C) = n(M) + n(P) + n(C) - n(M \cap P) - n(P \cap C) - n(M \cap C) + n(M \cap P \cap C)$

$= 15 + 12 + 11 – 9 – 4 – 5 + 3$
$= 41 – 18 = 23$
The number of students reading none of the subjects
$= n(M' \cap P ' \cap C') = n (M \cup P \cup C)$
$\therefore n(M \cup P \cup C)' = n(U) – ((M \cup P \cup C) = 25 – 23 = 2$