



A Premier Institute for Pre-Medical & Pre Engineering

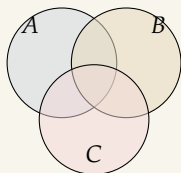
**SRI VIDYA
ARADHANA
ACADEMY**
"Transforming Your DREAMS Into Reality...!"**NEET/JEE**

Topic: Sets

Mathematics

Assignment 05 • Venn Diagrams & Cardinality (Three Sets)

Chetan Sir

"Be patient with yourself — you are changing habits you have been building for years."

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

$$n(\text{only } A) = n(A) - n(A \cap B) - n(A \cap C) + n(A \cap B \cap C); \quad n(\text{exactly two}) = \sum n(A \cap B) - 3n(A \cap B \cap C).$$

SECTION A : THREE-SET FORMULA

- In a class, 22 offered Mathematics, 18 Chemistry, 24 Physics; all offered at least one. If 11 offered Maths & Chemistry, 13 Chemistry & Physics, 14 Maths & Physics, and 7 all three, find (i) the total number of students, (ii) the number offering only Mathematics.
- In a survey of 60 people, 25 read newspaper H , 26 read T , 26 read I , 9 read H and I , 11 read H and T , 8 read T and I , and 3 read all three. Find (i) the number reading at least one, (ii) the number reading exactly one.

[NCERT]

SECTION B : SURVEYS & MEDALS

- A college awarded 38 medals in Football, 15 in Basketball and 20 in Cricket. These went to a total of 58 men, and only 3 got medals in all three sports. How many received medals in exactly two of the three sports?

[NCERT]

- Among three athletic teams, 21 are in basketball, 26 in hockey and 29 in football; 14 play hockey & basketball, 15 hockey & football, 12 football & basketball, and 8 play all three. Find the total number of members.
- In a survey of 100 students, the numbers studying various languages were: English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24. Find (i) how many studied Hindi, (ii) how many studied English and Hindi.

SECTION C : MINIMUM, MAXIMUM & COUNTING

- In a battle, 70% of soldiers lost an eye, 85% a leg and 80% an arm. What is the minimum percentage who lost all three?
- In a group of 40 students, 20 passed Mathematics, 25 Physics, 16 Chemistry; at most 11 passed Maths & Physics, at most 15 Physics & Chemistry, at most 15 Maths & Chemistry; each passed at least one. Find the maximum number who passed all three.
- There are 50 students; each reads 10 newspapers and each newspaper is read (shared) by exactly 20 students. Find the number of newspapers.
- A survey of 300 students found 125 like cricket, 145 football, 90 tennis; 32 like exactly two of the three games and each likes at least one. Find the number who like exactly one game.

SECTION D : MULTIPLE CHOICE

- In a class of 50, 22 like Maths, 18 Physics, 20 Chemistry; each likes at least one and no one likes all three. The number liking exactly two subjects is
(A) 8 (B) 10 (C) 12 (D) 15
- For three sets, $n(A \cup B \cup C)$ equals
(A) $n(A) + n(B) + n(C)$
(B) $\sum n(A) - \sum n(A \cap B) + n(A \cap B \cap C)$
(C) $\sum n(A) + n(A \cap B \cap C)$
(D) None of these

12. The number of elements belonging to exactly two of A, B, C is
 (A) $\sum n(A \cap B) - 3n(A \cap B \cap C)$
 (B) $\sum n(A \cap B) - 2n(A \cap B \cap C)$
 (C) $\sum n(A \cap B) - n(A \cap B \cap C)$
 (D) $\sum n(A \cap B)$
13. Let $A_1, \dots, A_{30}$ be 30 sets with 5 elements each and $B_1, \dots, B_n$ be n sets with 3 elements each, with $\bigcup A_i = \bigcup B_j = S$. If each element of S lies in exactly 10 of the A_i and exactly 9 of the B_j , then n is
 (A) 15 (B) 45 (C) 3 (D) 35
14. In a survey of 100 students: 40 like tea, 30 coffee, 20 milk; 15 tea & coffee, 10 coffee & milk, 12 tea & milk, 5 all three. The number who like none is
 (A) 42 (B) 58 (C) 37 (D) 45

SECTION E : MATCH THE COLUMNS

15. Given $n(A)=20$, $n(B)=15$, $n(C)=12$, $n(A \cap B)=5$, $n(B \cap C)=4$, $n(C \cap A)=3$, $n(A \cap B \cap C)=2$, match:

Column I

- (i) $n(A \cup B \cup C)$
 (ii) only A
 (iii) exactly two of them
 (iv) all three

Column II

- (P) 2
 (Q) 14
 (R) 6
 (S) 37

SECTION F : ADDITIONAL PROBLEMS

16. In a survey of 100 students, 60 like Mathematics, 70 Physics and 80 Chemistry. Find the minimum number of students who like all three subjects.
17. A survey of 500 TV viewers found: 285 watch Football, 195 Hockey, 115 Basketball, 45 Football & Basketball, 70 Football & Hockey, 50 Hockey & Basketball, and 50 watch none. Find (i) how many watch all three games, (ii) how many watch exactly one game.
18. In a class of 200 students, 120 passed Mathematics, 90 Physics, 70 Chemistry, 40 Maths & Physics, 30 Physics & Chemistry, 35 Maths & Chemistry and 15 passed all three. Find (i) the number who passed exactly one subject, (ii) the number who passed at least two subjects.
19. If $n(A \cup B \cup C) = 100$, $n(A) = n(B) = n(C) = 50$ and $n(A \cap B) = n(B \cap C) = n(C \cap A) = 20$, find $n(A \cap B \cap C)$.
20. For three sets, $n(A \cup B \cup C) = 58$; the numbers in "only A ", "only B " and "only C " are 10, 8 and 5, and $n(A \cap B \cap C) = 4$. Find the number of elements belonging to exactly two of the sets.

ANSWER KEY

1. (i) 33 (ii) 4	2. (i) 52 (ii) 30	3. 9	4. 43
5. (i) 18 (ii) 3	6. 35%	7. 10	8. 25
9. 254	10. B	11. B	12. A
13. B	14. A	15. i $\rightarrow$ S, ii $\rightarrow$ Q, iii $\rightarrow$ R, iv $\rightarrow$ P	16. 10
17. (i) 20 (ii) 325	18. (i) 115 (ii) 75	19. 10	20. 31