



A Premier Institute for Pre-Medical & Pre Engineering

**SRI VIDYA
ARADHANA
ACADEMY**

"Transforming Your DREAMS Into Reality...!"

**NEET/JEE****Topic: Sets**

Mathematics

Assignment 03 • Operations & Algebra of Sets

Chetan Sir

"If a problem does not make you uncomfortable, it is not teaching you anything new."

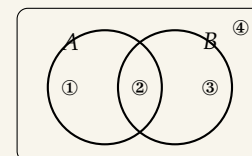
$$A - B = A \cap B'; \quad A \triangle B = (A - B) \cup (B - A) = (A \cup B) - (A \cap B).$$

$$\text{De Morgan: } (A \cup B)' = A' \cap B', \quad (A \cap B)' = A' \cup B'.$$

$$\text{Distributive: } A \cap (B \cup C) = (A \cap B) \cup (A \cap C);$$

$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C).$$

$$\text{Absorption: } A \cup (A \cap B) = A, \quad A \cap (A \cup B) = A; \quad A \cup A' = U, \quad A \cap A' = \emptyset.$$

① = $A - B$ ② = $A \cap B$ ③ = $B - A$ ④ = $(A \cup B)'$ **SECTION A : COMPUTE & VERIFY**

1. If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$, find $X - Y$, $Y - X$, $X \cap Y$ and $X \cup Y$. [NCERT]

2. Let $U = \{1, 2, \dots, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{2, 3, 5, 7\}$. Find A' , B' and hence verify $(A \cup B)' = A' \cap B'$. [NCERT]

SECTION B : PROVE (Region Method)

3. Prove that $A - (B \cup C) = (A - B) \cap (A - C)$. [NCERT]

*[Hint: both sides = the part of A lying outside B and outside C.]***SECTION C : ALGEBRA OF SETS (MCQ)**

4. For any two sets, $A - B$ equals
(A) $A \cap B$ (B) $A' \cap B$ (C) $A \cap B'$ (D) $A \cup B'$
5. The symmetric difference of $A = \{1, 2, 3\}$ and $B = \{2, 4, 5\}$ is
(A) $\{1, 2\}$ (B) (C) $\{3, 4\}$ (D) $\{1, 3, 4, 5\}$
6. $A \triangle B$ is not equal to
(A) $(A - B) \cup (B - A)$ (B) $(A \cup B) - (A \cap B)$
(C) $(A \cap B) - (A \cup B)$ (D) $(B - A) \cup (A - B)$
7. $(A' \cup B')'$ equals
(A) $A \cup B$ (B) $A \cap B$ (C) $A' \cap B'$ (D) $A - B$
8. $A - (A - B)$ equals
(A) $\emptyset$ (B) B (C) $A \cap B$ (D) $A \cup B$

9. $A \cap (A \cup B)'$ equals

(A) A (B) $A \cap B$ (C) $\emptyset$ (D) B

10. If A is the set of multiples of 3 and B the set of multiples of 5, then $A - B$ equals

(A) $A \cap B$ (B) $A \cup B$ (C) $A \cap B'$ (D) $B - A$

11. If $A \cup B = B$, then

(A) $A \subseteq B$ (B) $B \subseteq A$ (C) $A = \emptyset$ (D) $A = B$

12. If A and B are disjoint, then $n(A \cup B)$ equals

(A) $n(A) + n(B)$ (B) $n(A) + n(B) - n(A \cap B)$ (C) $n(A) \cdot n(B)$ (D) 0

13. Let F_1 = parallelograms, F_2 = rectangles, F_3 = rhombuses, F_4 = squares (in a plane). Then $F_2 \cap F_3$ equals

(A) F_1 (B) F_4 (C) $\emptyset$ (D) $F_2 \cup F_3$ **SECTION D : MATCH THE COLUMNS**

14. Match each expression in Column I with its simplest form in Column II.

Column I

- (i) $A \cap (A \cup B)$
(ii) $(A \cup B)'$
(iii) $A - (A - B)$
(iv) $(A - B) \cup (B - A)$

Column II

- (P) $A \cap B$
(Q) $A' \cap B'$
(R) $A \triangle B$
(S) A

SECTION E : SIMPLIFY (MCQ)

15. $A \cup (B \cap C)$ equals

(A) $(A \cup B) \cap (A \cup C)$ (B) $(A \cap B) \cup (A \cap C)$
(C) $A \cap B \cap C$ (D) $A \cup B \cup C$

16. $(A \cap B) \cup (A - B)$ equals

(A) A (B) B (C) $A \cap B$ (D) $A \cup B$

17. If $A \subseteq B$, then $(A \cap B, A \cup B)$ equals

- (A) (A, B) (B) (B, A) (C) (A, A) (D) (B, B)

SECTION F : ADDITIONAL PROBLEMS

18. If $A \triangle B = A \triangle C$, then

- (A) $A = B$ (B) $B = C$ (C) $A = C$ (D) $A = \emptyset$

19. For subsets A, B, C of U , the set $(A' \cap B' \cap C) \cup (B \cap C) \cup (A \cap C)$ equals

- (A) A (B) B (C) C (D) $A \cap B \cap C$

20. $A \cap (B \triangle C)$ equals

- (A) $(A \cap B) \cup (A \cap C)$ (B) $(A \cap B) \triangle (A \cap C)$
(C) $(A \cup B) \triangle (A \cup C)$ (D) $A \cap B \cap C$

21. If $X = \{4^n - 3n - 1 : n \in \mathbb{N}\}$ and $Y = \{9(n-1) : n \in \mathbb{N}\}$, then $X \cup Y$ equals

- (A) X (B) Y (C) $\emptyset$ (D) $\mathbb{N}$

22. The set $(A \cap (B \cup C)') \cup (B \cap (A \cup C)') \cup (C \cap (A \cup B)')$ consists of the elements lying in

- (A) all three of A, B, C (B) exactly one of A, B, C
(C) exactly two of A, B, C (D) at least one of A, B, C

ANSWER KEY

1. $X - Y = \{a, c\}; Y - X = \{f, g\};$
 $X \cap Y = \{b, d\}; X \cup Y = \{a, b, c, d, f, g\}$

4. C

7. B

10. C

13. B

16. A

19. C

22. B

2. $A' = \{1, 3, 5, 7, 9\}; B' = \{1, 4, 6, 8, 9\};$
both sides = $\{1, 9\}$

5. B

8. C

11. A

14. i $\rightarrow$ S, ii $\rightarrow$ Q, iii $\rightarrow$ P, iv $\rightarrow$ R

17. A

20. B

3. Proof (region A outside B, C)

6. C

9. C

12. A

15. A

18. B

21. B