CLASS : XI CHAPTER – 1 EXERCISE 1.5

Q No 1 Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$ $B = \{2, 4, 6, 8\}$
$C = \{3, 4, 5, 6\}$, find (i) A' (ii) B' (iii) $(A \cup C)'$ (iv) $(A \cup B)'$
(v) $(A')'$ (vi) $(B - C)'$

Sol: Here $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

(i) $A' = A^c$ = Set of those elements of U which are not in A
$= \{x ; x \in U \text{ but } x \notin A\} = U - A$
$= \{5, 6, 7, 8, 9\}$

(ii) $B' = U - B = \{1, 3, 5, 7, 9\}$

(iii) $A \cup C = \{1, 2, 3, 4, 5, 6\}$
$\therefore (A \cup C)' = U - (A \cup C) = \{7, 8, 9\}$

(iv) $A \cup B = \{1, 2, 3, 4, 6, 8\}$
$\therefore (A \cup B)' = \{5, 7, 9\}$

(v) $A^c = \{5, 6, 7, 8, 9\}$
$\therefore (A^c)^c = \{1, 2, 3, 4\} = A$ (Note that $(A^c)^c = A$)

(vi) $B - C = \{2, 8\}$
$\therefore (B - C)' = \{1, 3, 4, 5, 6, 7, 9\}$

Q No 2 If $U = \{a, b, c, d, e, f, g, h\}$, find the complements of the following sets:
(i) $A = \{a, b, c\}$ (ii) $B = \{d, e, f, g\}$ $C = \{a, c, e, g\}$ (iv) $D = \{f, g, h, a\}$

Sol. (i) A^c = Elements of U which are not in A $= \{d, e, f, g, h\}$.
(ii) B^c = Elements of U which are not in B $= \{a, b, c, h\}$
(iii) $C^c = U - $ $= \{b, d, f, h\}$
(iv) $D^c = U - D = \{b, c, d, e\}$

Q No. 3 Taking the set of Natural Numbers as the universal set, write down the complements of the following set:

(i) $\{x;\ x$ is an even natural numbers$\}$

Complement Set $= \{x;\ x$ is an odd Natural Number$\}$

(ii) $\{x;\ x$ is an odd Natural Number$\}$

Complement Set $= \{x;\ x$ is an even natural number$\}$

(iii) $\{x;\ x$ is a positive multiple of $3\}$

Complement Set $= \{x;\ x \in N$ and x is not a multiple of $3\}$

(iv) $\{x;\ x$ is a prime Number$\}$

Complement Set $= \{x;\ x$ is a composite number and $x = 1\}$

(v) $\{x;\ x$ is a natural number divisible by 3 and $5\}$

Complement Set $= \{x;\ x \in N$ and x is neither divisible by 3 nor by $5\}$

(vi) $\{x;\ x$ is a perfect square$\}$

Complement Set $= \{x;\ x \in N$ and x is not perfect square$\}$

(vii) $\{x;\ x$ is a perfect Cube$\}$

Complement Set $= \{x;\ x \in N$ and x is not a perfect cube$\}$

(viii) $\{x;\ x+5 = 8\}$

Complement Set $= \{x;\ x \in N$ and $x \neq 3\}$ or $N - \{3\}$

(ix) $\{x;\ 2x+5 = 9\}$

Complement Set $= \{x;\ x \in N$ and $x \neq 2\}$ or $N - \{2\}$

(x) $\{x;\ x \geq 7\}$

Complement Set $= \{x;\ x \in N$ and $x < 7\}$

(xi) $\{x;\ x \in N$ and $2x+1 > 10\}$

Complement Set $= \{x:\ x \in N$ and $x \leq \frac{9}{2}\}$

Q No 4: If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$. Verify that

(i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$

Sol: Here $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$.

$A \cup B = \{2, 4, 6, 8\} \cup \{2, 3, 5, 7\} = \{2, 3, 4, 5, 6, 7, 8\}$

$A \cap B = \{2, 4, 6, 8\} \cap \{2, 3, 5, 7\} = \{2\}$

(i) Now $(A \cup B)' = \{1, 9\}$

Also $A' = \{1, 3, 5, 7, 9\}$ and $B' = \{1, 4, 6, 8, 9\}$

$\therefore$ $A' \cap B' = \{1, 3, 5, 7, 9\} \cap \{1, 4, 6, 8, 9\} = \{1, 9\} = (A \cup B)'$

$\therefore$ $(A \cup B)' = A' \cap B'$ has been verified.

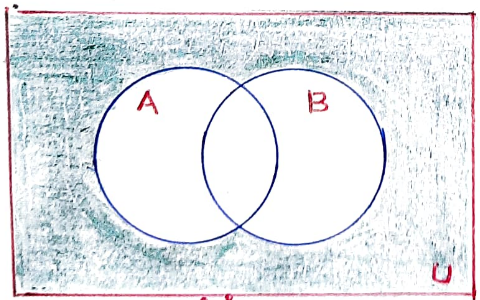
(ii) $(A \cap B)' = \{1, 3, 4, 5, 6, 7, 8, 9\}$

$A' \cup B' = \{1, 3, 5, 7, 9\} \cup \{1, 4, 6, 8, 9\} = \{1, 3, 4, 5, 6, 7, 8, 9\} = (A \cap B)'$

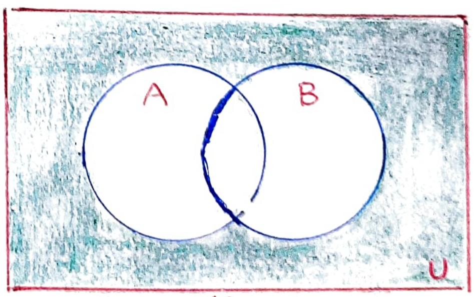
$\therefore$ $(A \cap B)' = A' \cup B'$ has been verified.

Q No. 5 Draw appropriate Venn diagram for each of following.

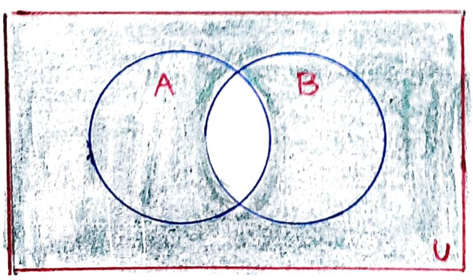
(i) $(A \cup B)'$ (ii) $A' \cap B'$ (iii) $(A \cap B)'$ (iv) $A' \cup B'$



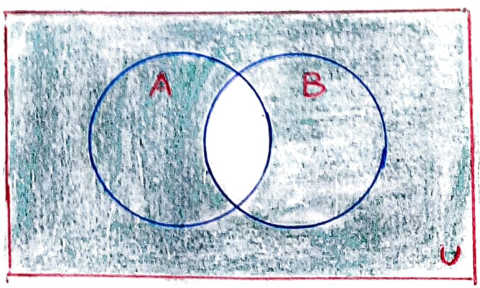
(i)



(ii)



(iii)



(iv)

Q.No. 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'?

Sol: A is the set of triangles having atleast one angle equal to $60°$

$\therefore A = \{x ; x \text{ is triangle which is not equilateral}\}$

$\therefore A' = \{x ; x \text{ is triangle which is equilateral}\}$

or. A' is set of all equilateral triangles.

Q.No. 7 Fill in the blanks to make each of the following a true statement:

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

(ii) $\phi' \cap A = A$ $\quad [\because \phi' = U \text{ and } U \cap A = A]$

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

(iv) $U' \cap A = \phi$ $\quad [\because U' = \phi \text{ and } \phi \cap A = \phi]$

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