Chapter - 1 Sets

Q.1(ii). Yes. Because it is a collection of well-defined elements and will not vary from person to person.

(iii). No. Because it is not well-defined and may vary from person to person.

(iii). No. Because it is not well-defined and may vary from person to person.

(iv). Yes. Because it is a collection of well-defined elements and will not vary from person to person.

(v). Yes. Because it is a collection of well-defined elements i.e. 1, 2, 3, ..., 99 and will not vary from person to person.

(vi). Yes. Because it is a collection of well-defined elements and will not vary from person to person.

(vii). Yes. Because it is a collection of well-defined elements and will not vary from person to person.

(viii). Yes. Because it is well defined and will always remain the same.

(ix). No. Because it is not well-defined and the number of elements and the element itself may vary with person

Q.2. (i). $5 \in A$ (ii). $8 \notin A$ (iii). $0 \notin A$ (iv). $4 \in A$
(v). $2 \in A$ (vi). $10 \notin A$

Q.3. (i). Soln. set $= \{-2, -1, 0, 1, 2, 3, 4, 5, 6\}$

(ii). Soln. set $= \{5, 4, 3, 2, 1\}$

(iii). Solution set $= \{17, 26, 35, 44, 53, 62, 71\}$

(iv). Soln. set $= \{2, 3, 5\}$

(v). Soln. set $= \{T, R, I, G, O, N, M, E, Y\}$

(vi). Soln. set $= \{B, E, T, R\}$

Q.4. (i). $A = \{x : x = 3n$ where $n \in N$ and $n < 5\}$

(ii). $B = \{x : x = 2^n$ where $n \in N$ and $n < 6\}$

(iii). $C = \{x : x = 5^n$ where $n \in N$ and $n < 5\}$

(iv). $D = \{x : x = 2n$ where $n \in N\}$

(v). $E = \{x : x = n^2$ where $n \in N$ and $n \leq 10\}$

Q.5. (i). Soln. set $= \{1, 3, 5, 7, 9, 11, \ldots\}$

(ii). Soln. set $= \{0, 1, 2, 3, 4\}$

(iii). Solution set $= \{-2, -1, 0, 1, 2\}$

(iv). soln. set = { L, O, Y, A }

(v). soln. set = { February, April, June, September, November }

(vi). soln. set = { B, C, D, F, G, H, J }

Q.6.(i). {1, 2, 3, 6} → {x : x is a natural number & divisor of 6}

(ii). {2, 3} → {x : x is a prime number & divisor of 6}

(iii). {M, A, T, H, E, I, C, S} → {x : x is a letter of the word MATHEMATICS}

(iv). {1, 3, 5, 7, 9} → {x : x is an odd number less than 10}.

Exercise 1.2

Q.1. (i). Null set (ii) Not null (iii). Null set (iv). Null set.

Q.2. (i) Finite (ii). Infinite (iii.) finite (iv) Infinite (v). Finite.

Q.3 (i). Infinite (ii) Finite (iii) Infinite (iv) Finite (v). Infinite.

Q.4. (i). $A = B$ (ii). $A \neq B$ (iii) $A = B$ (iv). $A \neq B$

Q.5 (i). $A \neq B$. Because the solution set of B contains -2 & -3 which are absent in A.

(ii). Soln. set of $A = \{W, O, L, F\}$.
Soln. set of $B = \{W, O, L, F\}$
$\because B \subset A$ && $A \subset B$ $\therefore A = B$

Q. 6). $B = D$, $E = G$

Exercise 1.3

Q.1 (i). $\{2,3,4\} \subset \{1,2,3,4,5\}$ (ii). $\{a,b,c\} \not\subset \{b,c,d\}$

(iii). $\{x : x$ is a student of class xi of your school$\}$
$\subset \{x : x$ is a student of your school$\}$

(iv). $\{x : x$ is a circle in the plane$\} \not\subset$
$\{x : x$ is a circle in the same plane with radius 1 unit$\}$

(v). $\{x : x$ is a triangle in a plane$\} \not\subset$
$\{x : x$ is a rectangle in the plane$\}$

(vi). $\{x : x$ is an equilateral triangle in a plane$\}$
$\subset \{x : x$ is a triangle in the same plane.

(vii). $\{x : x$ is an even natural number$\} \subset \{x : x$ is an integer$\}$.

Q.2. (i). False (ii) True (iii). False (iv). True (v) True (vi) False

Q.3. (i). Incorrect.
Because $\{\{3,4\}\}$ as a whole is a single element of the set A whereas $\{3, 4\}$ separately does not belong to the set A.

(ii). correct (iii). correct (iv). correct

(v). Incorrect.
Because $\{1\}$ as an element is a subset of A but 1 is not a subset of A.

(vi) correct

(vii). Incorrect.
Because 1, 2, 5 separately belongs to set A but $\{1, 2, 5\}$ as a whole does not belong to set A.

(viii). Incorrect.
Because ϕ is not an element of A.

(x). correct.

(xi). Incorrect.
Because ϕ is not an element of A.

Q.4). (i). Subsets of $\{a\} \Rightarrow \{a\}, \phi$.

(ii). subsets of $\{a, b\} \Rightarrow \{a, b\}, \{a\}, \{b\}, \phi$.

(iii). subsets of $\{1, 2, 3\} \Rightarrow \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{3, 1\}, \{1, 2, 3\}, \phi$.

(iv). subsets of $\phi \Rightarrow \phi$.

Q.5). 1.

Q.6). (i). $(-4, 6]$ (ii). $(-12, -10)$ (iii). $[0, 7)$

(iv). $[3, 4]$.

Q.7). (i). $\{x : x \in R, \quad -3 < x < 0\}$

(ii). $\{x : x \in R, \quad 6 \leq x \leq 12\}$

(iii). $\{x : x \in R, \quad 6 < x \leq 12\}$

(iv). $\{x : x \in R, \quad -23 \leq x < 5\}$

Q.8). The set of triangles.

Q.9). (i) and (iii) would be considered as a universal set for all the 3 sets A, B, C.

EXERCISE – 1.4

Q.1). (i). $X \cup Y = \{1, 2, 3, 5\}$
(ii). $A \cup B = \{a, b, c, e, i, o, u\}$
(iii). $A \cup B = \{1, 2, 4, 5$ or a multiple of $3\}$
(iv). $A \cup B = \{\}$
(v). $A \cup B = \phi$

Q.2). Yes. $A \subset B$.
$\because A \subset B$.
$\therefore A \cup B = B = \{a, b, c\}$

Q.3). $\because A \subset B$.
$\therefore A \cup B = B$.

Q.4). (i). $A \cup B = \{1, 2, 3, 4, 5, 6\}$
(ii). $A \cup C = \{1, 2, 3, 4, 5, 6, 7, 8\}$
(iii). $B \cup C = \{3, 4, 5, 6, 7, 8\}$
(iv). $B \cup D = \{3, 4, 5, 6, 7, 8, 9, 10\}$
(v). $A \cup B \cup C = \{1, 2, 3, 4, 5, 6, 7, 8\}$
(vi). $A \cup B \cup D = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
(vii). $B \cup C \cup D = \{3, 4, 5, 6, 7, 8, 9, 10\}$

Q.5). $A \cap B = \{3, 4\}$ $B \cap C = \{5, 6\}$
$A \cap C = \{\}$ $B \cap D = \{\}$
$A \cap D = \{\}$ $C \cap D = \{7, 8\}$

Q.6). (i). $A \cap B = \{7, 9, 11\}$ (vi). $A \cap (B \cup C) = \{7, 9, 11\}$
(ii). $B \cap C = \{11, 13\}$ (vii). $A \cap D = \phi$
(iii). $A \cap C \cap D = \phi$ (viii). $A \cap (B \cup D) = \{7, 9, 11\}$
(iv). $A \cap C = \{11\}$ (ix). $(A \cap B) \cap (B \cup C) = \{11\}$
(v). $B \cap D = \phi$ (x). $(A \cup D) \cap (B \cup D) = \phi$.

Q.7. (i). $A \cap B = B$
(ii). $A \cap C = C$
(iii). $A \cap D = D$
(iv). $B \cap C = \phi$
(v). $C \cap D = \{x : x \text{ is a prime no., } x > 2\}$
(vi). $B \cap D = \{2\}$

Q.8). The (iii). the given sets are disjoint.

Q.9). (i). $A - B = \{3, 6, 9, 15, 18, 21\}$
(ii). $A - C = \{3, 9, 15, 18, 21\}$
(iii). $A - D = \{3, 6, 9, 12, 18, 21\}$
(iv). $B - A = \{4, 8, 16, 20\}$
(v). $C - A = \{2, 4, 8, 10, 14, 16\}$
(vi). $D - A = \{5, 10, 20\}$
(vii). $B - C = \{20\}$
(viii). $B - D = \{4, 8, 12, 16\}$
(ix). $C - B = \{2, 6, 10, 14\}$
(x). $D - B = \{5, 10, 15\}$
(xi). $C - D = \{2, 4, 6, 8, 12, 14, 16\}$
(xii). $D - C = \{5, 15, 20\}$

Q.10. (i) $X - Y = \{a, c\}$
(ii). $Y - X = \{f, g\}$
(iii). $X \cap Y = \{b, d\}$

Q.11. $R - Q = \{$ set of irrational numbers $\}$

Q.12. (i). NO.
(ii). NO.
(iii). Yes
(iv). Yes.

Date :

EXERCISE 1.5

Q.1. (i). $A' = U - A$
$= \{5, 6, 7, 8, 9\}$

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

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

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

(v). $(A')' = (U - A)'$
$= U - (U - A) = A$
$= \{1, 2, 3, 4\}$

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

Q.2. (i). $A' = U - A$
$= \{d, e, f, g, h\}$

(ii). $B' = U - B$
$= \{a, b, c, h\}$

(iii). $C' = U - C$
$= \{b, d, f, h\}$

(iv). $D' = U - D$
$= \{c, b, d, e\}$

Q.3. (i). $\{x : x$ is an odd natural number$\}$

(ii). $\{x : x$ is an even natural number$\}$

(iii). $\{x : x \in N, x$ is not a multiple of $3\}$

(iv). $\{x : x \in N, x$ is a composite number$\}$

(v). $\{x : x \in N, x$ is not divisible by $5\}$

(vi). $\{x : x \in N, x \text{ is not a perfect square}\}$

(vii). $\{x : x \in N, x \text{ is not a perfect cube}\}$

(viii). $\{x : x \in N, x \neq 3\}$

(ix). $\{x : x \in N, x \neq 2\}$

(x). $\{x : x < 7\}$

(xi). $\{x : x \in N, x < 3\}$

Q. 4). (i). $(A \cup B)'$

$= U - \{A \cup B\}$

$= U - \{3, 2, 4, 5, 6, 7, 8\}$

$= \{1, 9\}$

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

$A' \cap B'$

$= (U - A) \cap (U - B)$

$= \{1, 3, 5, 7, 9\} \cap \{1, 4, 6, 8, 9\}$

$= \{1, 9\}$

$= (A \cup B)'$ (from (i)...)

$\Rightarrow A' \cap B' = (A \cup B)' = \{1, 9\}$

$\because$ LHS = RHS.

Thus proved.

(ii). $(A \cap B)'$

$= \{1, 3, 4, 9, 5, 6, 7, 8\}$ ... (ii).

$A' \cup B'$

$= \{1, 3, 5, 7, 9\} \cup \{1, 4, 6, 8, 9\}$

$= \{1, 3, 4, 5, 6, 7, 8, 9\}$

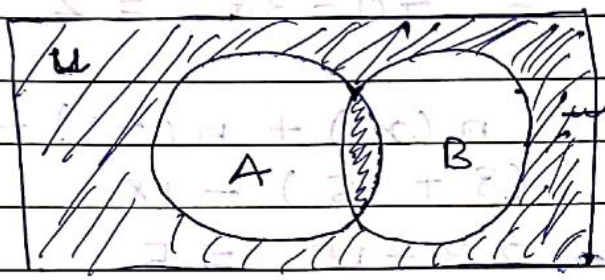
$= (A \cap B)'$ (from (i)...)

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

$\therefore$ LHS = RHS

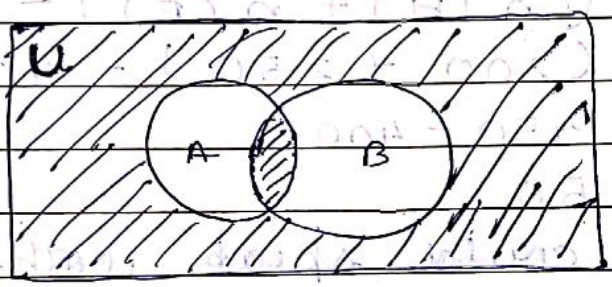
Thus proved.

Q.5). (i).



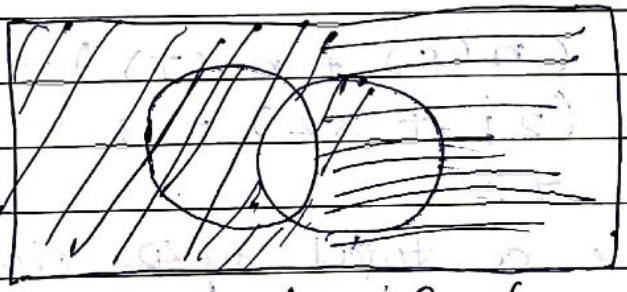
$(A \cup B)'$

(ii).



$A' \cap B'$

(iii)



$A' \cup B'$ & $(A \cap B)'$

Q.6). (i). $A \cup A' = U$

(ii). $\phi' \cap A = A$

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

(iv). $U \cap A = A$

EXERCISE - 1.6

Q.1). $n(X \cap Y) = (n(X) + n(Y)) - n(X \cup Y)$
$= (17 + 23) - 38$
$= 40 - 38 = 2$

Q.2). $n(X \cap Y) = (n(X) + n(Y)) - n(X \cup Y)$
$= (8 + 15) - 18$
$= 23 - 18 = 5$

Q.3). $n(H \cap E) = (n(H) + n(E)) - n(H \cup Y)$
$= (200 + 250) - 400$
$= 450 - 400$
$= 50$

∴ 50 people could speak both Hindi & English.

Q.4). $n(S \cup T) = (n(S) + n(T)) - n(S \cap T)$
$= (21 + 32) - 11$
$= 42$

SUT Have a total of 42 elements.

Q.5). $n(X \cap Y) = (n(X) + n(Y)) - n(X \cup Y)$
$10 = (40 + n(Y)) - 60)$
$10 + 20 = n(Y)$
$30 = n(Y)$

∴ Set Y have a total of 30 elements.

Q.6). $n(C \cap T) = (n(C) + n(T)) - n(C \cup T)$
$= (37 + 52) - 70$
$= 89 - 70 = 19$

19 people like both tea & coffee.

Q.7. $n(C \cap \bar{T}) = n(C) + n(T)' - n(C \cup T)$

$10 = (40 + n(\bar{T})) - 65$

$10 + 25 = n(\bar{T})$

$n(\bar{T}) = 35$

$\Rightarrow$ 35 persons like tennis.

$\Rightarrow (35 - 10) = 25$ persons like tennis only.

Q.8). $n(F \cap S) = (n(F) + n(S)) - n(F \cup S)$

$10 = (50 + 20) - n(F \cup S)$

$n(F \cup S) = 70 - 10$

$= 60$

∴ Total no. of peoples who can speak at least in ~~either~~ of the two languages = 60.