CLASS : XI CHAPTER - 1 SETS EXERCISE 1.4

Q No 1: find the union of each of the following pairs of sets;

(i) $X = \{1, 3, 5\}$ $Y = \{1, 2, 3\}$

$X \cup Y = \{1,3,5\} \cup \{1,2,3\} = \{1, 2, 3, 5\}$

(ii) $A = \{a, e, i, o, u\}$ $B = \{a, b, c\}$

$A \cup B = \{a, e, i, o, u\} \cup \{a, b, c\} = \{a, b, c, e, i, o, u\}$

(iii) $A = \{x; x$ is a natural number and multiple of $3\}$

$B = \{x; x$ is natural number less than $6\}$

$A \cup B = \{3, 6, 9, 12 \ldots\} \cup \{1, 2, 3, 4, 5\} = \{1, 2, 3, 4, 5, 6, 9, 12, \ldots\}$

(iv) $A = \{x; x$ is a natural number and $1 < x \leq 6\}$

$B = \{x; x$ is a natural number and $6 < x < 10\}$

$A \cup B = \{2, 3, 4, 5, 6\} \cup \{7, 8, 9\} = \{2, 3, 4, 5, 6, 7, 8, 9\}$

(v) $A = \{1, 2, 3\}$; $B = \phi$

$A \cup B = \{1, 2, 3\} \cup \phi = \{1, 2, 3\}$

Q No 2: Let $A = \{a, b\}$, $B = \{a, b, c\}$ Is $A \subset B$? What is $A \cup B$?

Sol. Since every element of A is B

$\Rightarrow A \subset B$

$\Rightarrow A \cup B = B = \{a, b, c\}$

Q No 3: If A and B are two sets such that $A \subset B$, then what is $A \cup B$?

Sol: If $A \subset B$ then Set A is fully contained in B

$\Rightarrow A \cup B = B$.

Q No 4: If $A = \{1, 2, 3, 4\}$; $B = \{3, 4, 5, 6\}$, $C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$; find

(i) $A \cup B$

$A \cup B = \{1, 2, 3, 4\} \cup \{3, 4, 5, 6\} = \{1, 2, 3, 4, 5, 6\}$

(iii) AUC

$AUC = \{1,2,3,4\} \cup \{5,6,7,8\} = \{1,2,3,4,5,6,7,8\}$

(iii) BUC

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

(iv) BUD

$BUD = \{3,4,5,6\} \cup \{7,8,9,10\} = \{3,4,5,6,7,8,9,10\}$

(v) AUBUC

$AUBUC = (\{1,2,3,4\} \cup \{3,4,5,6\}) \cup \{5,6,7,8\}$

$= \{1,2,3,4,5,6\} \cup \{5,6,7,8\} = \{1,2,3,4,5,6,7,8\}$

(vi) AUBUD

$AUBUD = (\{1,2,3,4\} \cup \{3,4,5,6\}) \cup \{7,8,9,10\}$

$= \{1,2,3,4,5,6\} \cup \{7,8,9,10\} = \{1,2,3,4,5,6,7,8,9,10\}$

(vii) BUCUD

$BUCUD = (\{3,4,5,6\} \cup \{5,6,7,8\}) \cup \{7,8,9,10\}$

$= \{3,4,5,6,7,8\} \cup \{7,8,9,10\} = \{3,4,5,6,7,8,9,10\}$

Q No 5: find the intersection of each pair of sets of Q No 1.

Sol:

(i) $X \cap Y = \{1,3,5\} \cap \{1,2,3\} = \{1,3\}$

(ii) $A \cap B = \{a,e,i,o,u\} \cap \{a,b,c\} = \{a\}$

(iii) $A \cap B = \{3,6,9,\ldots\} \cap \{1,2,3,4,5\} = \{3\}$

(iv) $A \cap B = \{2,3,4,5,6\} \cap \{7,8,9\} = \emptyset$

(v) $A \cap B = \{1,2,3\} \cap \emptyset = \emptyset$.

[NOTE: Intersection means set of common elements]

Q No 6. If $A = \{3,5,7,9,11\}$ and $B = \{7,9,11,13\}$ $C = \{11,13,15\}$ $D = \{15,17\}$ Find:

Sol: (i) $A \cap B$

$= \{3,5,7,9,11\} \cap \{7,9,11,13\} = \{7,9,11\}$

(ii) $B \cap C$

$B \cap C = \{7, 9, 11, 13\} \cap \{11, 13, 15\} = \{11, 13\}$

(iii) $A \cap C \cap D$

$A \cap C \cap D = (A \cap C) \cap D = (\{3, 5, 7, 9, 11\} \cap \{11, 13, 15\}) \cap \{15, 17\}$

$= \{11\} \cap \{15, 17\} = \phi$

(iv) $A \cap C$

$A \cap C = \{3, 5, 7, 9, 11\} \cap \{11, 13, 15\} = \{11\}$

(v) $B \cap D$

$B \cap D = \{7, 9, 11, 13\} \cap \{15, 17\} = \phi$

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

$A \cap (B \cup C) = \{3, 5, 7, 9, 11\} \cap (\{7, 9, 11, 13\} \cup \{11, 13, 15\})$

$= \{3, 5, 7, 9, 11\} \cap \{7, 9, 11, 13, 15\} = \{7, 9, 11\}$

(vii) $A \cap D$

$A \cap D = \{3, 5, 7, 9, 11\} \cap \{15, 17\} = \phi$

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

$A \cap (B \cup D) = \{3, 5, 7, 9, 11\} \cap (\{7, 9, 11, 13\} \cup \{15, 17\})$

$= \{3, 5, 7, 9, 11\} \cap \{7, 9, 11, 13, 15, 17\} = \{7, 9, 11\}$

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

$(A \cap B) \cap (B \cup C) = (\{3, 5, 7, 9, 11\} \cap \{7, 9, 11, 13\}) \cap (\{7, 9, 11, 13\} \cup \{11, 13, 15\})$

$= \{7, 9, 11\} \cap \{7, 9, 11, 13, 15\} = \{7, 9, 11\}$

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

$(\{3, 5, 7, 9, 11\} \cup \{15, 17\}) \cap (\{7, 9, 11, 13\} \cup \{11, 13, 15\})$

$= \{3, 5, 7, 9, 11, 15, 17\} \cap \{7, 9, 11, 13, 15\} = \{7, 9, 11, 15\}$

Q No 7: If $A = \{x; x \text{ is a natural number}\}$

$B = \{x; x \text{ is an even natural number}\}$

$C = \{x; x \text{ is an odd natural number}\}$

$D = \{x; x \text{ is a prime number}\}$, find

Sol Here $A = \{1, 2, 3, 4, \ldots\}$

$B = \{2, 4, 6, 8, \ldots\}$

$C = \{1, 3, 5, 7 \ldots\}$

$D = \{2, 3, 5, 7, 11 \ldots\}$

(i) $A \cap B = \{1,2,3,4\ldots\} \cap \{2,4,6,8\ldots\} = \{2,4,6,8\ldots\} = B.$

(ii) $A \cap C = \{1,2,3,4\ldots\} \cap \{1,3,5,7\ldots\} = \{1,3,5,7\ldots\} = C$

(iii) $A \cap D = \{1,2,3,4\ldots\} \cap \{2,3,5,7,11\ldots\} = \{2,3,5,7,11\ldots\} = D$

(iv) $B \cap C = \{2,4,6,8\ldots\} \cap \{1,3,5,7\ldots\} = \phi$

(v) $B \cap D = \{2,4,6,8\ldots\} \cap \{2,3,5,7\ldots\} = \{2\}$

(vi) $C \cap D = \{1,3,5,7\ldots\} \cap \{2,3,5,7\ldots\} = \{3,5,7\ldots\}$

QNo 8: Which of following pairs of sets are disjoint.

(i) $\{1,2,3,4\}$ and $\{x; x$ is a natural no. and $4 \leq x \leq 6\}$

Since Intersection of these sets is

$\{1,2,3,4\} \cap \{4,5,6\} = \{4\} \neq \phi$

∴ Not disjoint Sets.

(ii) $\{a,e,i,o,u\}$ and $\{c,d,e,f\}$

Since $\{a,e,i,o,u\} \cap \{c,d,e,f\} = \{e\} \neq \phi$

∴ Not disjoint Sets.

(iii) $\{x; x$ is an even integer$\}$ and $\{x; x$ is any odd integer$\}$

Here $\{2,4,6\ldots\} \cap \{1,3,5,\ldots\} = \phi$

∴ These are disjoint Sets.

QNo 9 If $A = \{3,6,9,12,15,18,21\}$; $B = \{4,8,12,16,20\}$

$C = \{2,4,6,8,10,12,14,16\}$; $D = \{5,10,15,20\}$ find:

(i) $A - B$

$A - B = \{x; x \in A$ and $x \notin B\}$

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

(ii) $A-C$

$A-C = \{x;\ x \in A \text{ and } x \notin C\} = \{3, 9, 15, 18, 21\}$

(iii) $A-D$

$A-D = \{x;\ x \in A \text{ and } x \notin D\} = \{3, 6, 9, 12, 18, 21\}$

(iv) $B-A$

$B-A = \{x;\ x \in B \text{ and } x \notin A\} = \{4, 8, 16, 20\}$

(v) $C-A$

$C-A = \{x;\ x \in C \text{ but } x \notin A\} = \{2, 4, 8, 10, 14, 16\}$

(vi) $D-A$

$D-A = \{x;\ x \in D \text{ but } x \notin A\} = \{5, 10, 20\}$

(vii) $B-C$

$B-C = \{x;\ x \in B \text{ but } x \notin C\} = \{20\}$

(viii) $B-D$

$B-D = \{x;\ x \in B \text{ but } x \notin D\} = \{4, 8, 12, 16\}$

(ix) $C-B$

$C-B = \{x;\ x \in C \text{ but } x \notin B\} = \{2, 6, 10, 14\}$

(x) $D-B$

$D-B = \{x;\ x \in D \text{ but } x \notin B\} = \{5, 10, 15\}$

(xi) $C-D$

$C-D = \{x;\ x \in C \text{ but } x \notin D\} = \{2, 4, 6, 8, 12, 14, 16\}$

(xii) $D-C$

$D-C = \{x;\ x \in D \text{ but } x \notin C\} = \{5, 15, 20\}$

Q No 10: If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$ Find.

(i) $X-Y$ (ii) $Y-X$ (iii) $X \cap Y$

Sol: $X-Y = \{x;\ x \in X \text{ but } x \notin Y\}$

$= \{a, c\}$

(ii) $Y - X = \{f, g\}$

(iii) $X \cap Y = \{b, d\}$

Q No 11: If R is set of real numbers and Q is set of rational numbers, then what is $R - Q$?

Sol: $R - Q$ = (Set of Real Numbers) − (set of Rational Numbers)

= Set of Irrational Numbers = Q^c.

Q No 12: State whether each of following statement is true or false. Justify your answer.

(i) $\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint sets.

False ∵ 3 is common element of both sets.

(ii) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets.

False ∵ a is common element

(iii) $\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are disjoint sets.

True ∵ There is no common element.

(iv) $\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint sets.

True because there is no common element.

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