



EXERCISE 1.4

Question-1

Find the union of each of the following pairs of sets:

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

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

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

$B = \{x: x \text{ is a natural number less than } 6\}$

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

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

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

Ans.

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

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

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

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

(iii) $A = \{x: x \text{ is a natural number and multiple of } 3\} = \{3, 6, 9, \dots\}$

As $B = \{x: x \text{ is a natural number less than } 6\} = \{1, 2, 3, 4, 5\}$

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

$\therefore A \cup B = \{x: x = 1, 2, 4, 5 \text{ or a multiple of } 3\}$

(iv) $A = \{x: x \text{ is a natural number and } 1 < x \leq 6\} = \{2, 3, 4, 5, 6\}$

$B = \{x: x \text{ is a natural number and } 6 < x < 10\} = \{7, 8, 9\}$

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

$\therefore A \cup B = \{x: x \in \mathbb{N} \text{ and } 1 < x < 10\}$

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

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

Question-2

Let $A = \{a, b\}$, $B = \{a, b, c\}$. Is $A \subset B$? What is $A \cup B$?

Ans.

Here, $A = \{a, b\}$ and $B = \{a, b, c\}$

Yes, $A \subset B$.

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

Question-3

If A and B are two sets such that $A \subset B$, then what is $A \cup B$?

Ans.

If A and B are two sets such that $A \subset B$, then $A \cup B = B$.

Question-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) $A \cup B$

(ii) $A \cup C$

(iii) $B \cup C$

(iv) $B \cup D$

(v) $A \cup B \cup C$

(vi) $A \cup B \cup D$

(vii) $B \cup C \cup D$

Ans.

$A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$, $C = \{5, 6, 7, 8\}$ and $D = \{7, 8, 9, 10\}$

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

Question-5

Find the intersection of each pair of sets:

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

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

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

$B = \{x: x \text{ is a natural number less than } 6\}$

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

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

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

Ans.

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

$$X \cap Y = \{1, 3\}$$

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

$$A \cap B = \{a\}$$

$$\text{(iii) } A = \{x: x \text{ is a natural number and multiple of } 3\} = \{3, 6, 9, \dots\}$$

$$B = \{x: x \text{ is a natural number less than } 6\} = \{1, 2, 3, 4, 5\}$$

$$\therefore A \cap B = \{3\}$$

$$\text{(iv) } A = \{x: x \text{ is a natural number and } 1 < x \leq 6\} = \{2, 3, 4, 5, 6\}$$

$$B = \{x: x \text{ is a natural number and } 6 < x < 10\} = \{7, 8, 9\}$$

$$A \cap B = \Phi$$

$$\text{(v) } A = \{1, 2, 3\}, B = \Phi$$

$$A \cap B = \Phi$$

Question-6

If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$ and $D = \{15, 17\}$; find

$$\text{(i) } A \cap B$$

$$\text{(ii) } B \cap C$$

$$\text{(iii) } A \cap C \cap D$$

$$\text{(iv) } A \cap C$$

$$\text{(v) } B \cap D$$

$$\text{(vi) } A \cap (B \cup C)$$

$$\text{(vii) } A \cap D$$

$$\text{(viii) } A \cap (B \cup D)$$

$$\text{(ix) } (A \cap B) \cap (B \cup C)$$

$$\text{(x) } (A \cup D) \cap (B \cup C)$$

Ans.

$$(i) A \cap B = \{7, 9, 11\}$$

$$(ii) B \cap C = \{11, 13\}$$

$$(iii) A \cap C \cap D = \{A \cap C\} \cap D = \{11\} \cap \{15, 17\} = \Phi$$

$$(iv) A \cap C = \{11\}$$

$$(v) B \cap D = \Phi$$

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

$$= \{7, 9, 11\} \cup \{11\} = \{7, 9, 11\}$$

$$(vii) A \cap D = \Phi$$

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

$$= \{7, 9, 11\} \cup \Phi = \{7, 9, 11\}$$

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

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

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

Question-7

If $A = \{x: x \text{ is a natural number}\}$, $B = \{x: x \text{ is an even natural number}\}$

$C = \{x: x \text{ is an odd natural number}\}$ and $D = \{x: x \text{ is a prime number}\}$, find

$$(i) A \cap B$$

$$(ii) A \cap C$$

$$(iii) A \cap D$$

$$(iv) B \cap C$$

$$(v) B \cap D$$

$$(vi) C \cap D$$

Ans.

$$A = \{x: x \text{ is a natural number}\} = \{1, 2, 3, 4, 5 \dots\}$$

$$B = \{x: x \text{ is an even natural number}\} = \{2, 4, 6, 8 \dots\}$$

$$C = \{x: x \text{ is an odd natural number}\} = \{1, 3, 5, 7, 9 \dots\}$$

$$D = \{x: x \text{ is a prime number}\} = \{2, 3, 5, 7 \dots\}$$

$$(i) A \cap B = \{x: x \text{ is an even natural number}\} = B$$

$$(ii) A \cap C = \{x: x \text{ is an odd natural number}\} = C$$

$$(iii) A \cap D = \{x: x \text{ is a prime number}\} = D$$

$$(iv) B \cap C = \Phi$$

$$(v) B \cap D = \{2\}$$

$$(vi) C \cap D = \{x: x \text{ is odd prime number}\}$$

Question-8

Which of the following pairs of sets are disjoint

(i) $\{1, 2, 3, 4\}$ and $\{x: x \text{ is a natural number and } 4 \leq x \leq 6\}$

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

(iii) $\{x: x \text{ is an even integer}\}$ and $\{x: x \text{ is an odd integer}\}$

Ans.

(i) $\{1, 2, 3, 4\}$

$\{x: x \text{ is a natural number and } 4 \leq x \leq 6\} = \{4, 5, 6\}$

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

Therefore, this pair of sets is not disjoint.

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

Therefore, $\{a, e, i, o, u\}$ and $\{c, d, e, f\}$ are not disjoint.

(iii) $\{x: x \text{ is an even integer}\} \cap \{x: x \text{ is an odd integer}\} = \Phi$

Therefore, this pair of sets is disjoint.

Question-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) $A - B$

(ii) $A - C$

(iii) $A - D$

(iv) $B - A$

(v) $C - A$

(vi) $D - A$

(vii) $B - C$

(viii) $B - D$

(ix) $C - B$

(x) $D - B$

(xi) $C - D$

(xii) $D - C$

Ans.

- (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) $D - C = \{5, 15, 20\}$

Question-10

If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$, find

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

Ans.

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

Question-11

If \mathbf{R} is the set of real numbers and \mathbf{Q} is the set of rational numbers, then what is $\mathbf{R} - \mathbf{Q}$?

Ans.

\mathbf{R} : set of real numbers

\mathbf{Q} : set of rational numbers

Therefore, $\mathbf{R} - \mathbf{Q}$ is a set of irrational numbers

Question-12

State whether each of the following statement is true or false. Justify your answer.

- (i) $\{2, 3, 4, 5\}$ and $\{3, 6\}$ are disjoint sets.
- (ii) $\{a, e, i, o, u\}$ and $\{a, b, c, d\}$ are disjoint sets.
- (iii) $\{2, 6, 10, 14\}$ and $\{3, 7, 11, 15\}$ are disjoint sets.
- (iv) $\{2, 6, 10\}$ and $\{3, 7, 11\}$ are disjoint sets.

Ans.

(i) False

As $3 \in \{2, 3, 4, 5\}, 3 \in \{3, 6\}$

$$\Rightarrow \{2, 3, 4, 5\} \cap \{3, 6\} = \{3\}$$

(ii) False

As $a \in \{a, e, i, o, u\}, a \in \{a, b, c, d\}$

$$\Rightarrow \{a, e, i, o, u\} \cap \{a, b, c, d\} = \{a\}$$

(iii) True

$$\text{As } \{2, 6, 10, 14\} \cap \{3, 7, 11, 15\} = \Phi$$

(iv) True

$$\text{As } \{2, 6, 10\} \cap \{3, 7, 11\} = \Phi$$

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