



**SpeedLabs**

**MATHS**

**CBSE 11<sup>th</sup>**

**TEEVRA EDUTECH PVT. LTD.**

# Sets

## Exercise-1.4

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)  $A = \{x: x \text{ is a natural number and multiple of } 3\} = \{3, 6, 9 \dots\}$   $B = \{x: x \text{ is a natural number less than } 6\} = \{1, 2, 3, 4, 5, 6\}$   $A \cup B = \{1, 2, 3, 4, 5, 6, 9, 12 \dots\}$

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

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

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,  $A \subset B$ .

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

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  $A \cup B = B$ .

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

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

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

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

(iii)  $A = \{x: x \text{ is a natural number and multiple of } 3\} = \{3, 6, 9 \dots\}$   $B = \{x: x \text{ is a natural number less than } 6\} = \{1, 2, 3, 4, 5\}$

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

(iv)  $A = \{x: x \text{ is a natural number and } 1 < x \leq 6\} = \{2, 3, 4, 5, 6\}$   $B = \{x: x \text{ is a natural number and } 6 < x < 10\} = \{7, 8, 9\}$   $A \cap B = \Phi$

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

$A \cap B = \Phi$

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

(i)  $A \cap B$

(ii)  $B \cap C$

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

(iv)  $A \cap C$

(v)  $B \cap D$

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

(vii)  $A \cap D$

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

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

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

**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)  $A \cap B = \{x: x \text{ is a even natural number}\} = B$
- (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)  $C \cap D = \{x: x \text{ is odd prime number}\}$

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

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

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

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.

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)  $A - B = \{3, 6, 9, 15, 18, 21\}$

$$(ii) A - C = \{3, 9, 15, 18, 21\}$$

$$(iii) A - D = \{3, 6, 9, 12, 18, 21\}$$

$$(iv) B - A = \{4, 8, 16, 20\}$$

$$(v) C - A = \{2, 4, 8, 10, 14, 16\}$$

$$(vi) D - A = \{5, 10, 20\}$$

$$(vii) B - C = \{20\}$$

$$(viii) B - D = \{4, 8, 12, 16\}$$

$$(ix) C - B = \{2, 6, 10, 14\}$$

$$(x) D - B = \{5, 10, 15\}$$

$$(xi) C - D = \{2, 4, 6, 8, 12, 14, 16\}$$

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

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)  $X - Y = \{a, c\}$

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

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

11. If  $R$  is the set of real numbers and  $Q$  is the set of rational numbers, then what is  $R - Q$ ?

Ans.  $R$ : set of real numbers  $Q$ : set of rational numbers Therefore,  $R - Q$  is a set of irrational numbers.

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

(iv) True As  $\{2, 6, 10\} \cap \{3, 7, 11\} = \Phi$