

RD Sharma
Solutions
Class 11 Maths
Chapter 1
Ex 1.5

Sets Ex 1.5 Q1

(i)

$A \cap B$ denotes intersection of the two sets A and B , which consists of elements which are common to both A and B .

Since $A \subset B$, every element of A is already an element of B .

$$\therefore A \cap B = A$$

(ii)

$A \cup B$ denotes the union of the sets A and B which consists of elements which are either in A or B or in both A and B .

Since $A \subset B$, every element of A is already an element of B .

$$\therefore A \cup B = B$$

Sets Ex 1.5 Q2(i)

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

$$B = \{4, 5, 6, 7, 8\}$$

$$\text{So, } A \cup B = \{x : x \in A \text{ or } x \in B\}$$

Sets Ex 1.5 Q2(ii)

$$A \cup B = \{x \mid x \in A \text{ or } x \in B\}$$

$$= \{1, 2, 3, 4, 5, 7, 8, 9, 10, 11\}$$

Sets Ex 1.5 Q2(iii)

$$B \cup C = \{x \mid x \in B \text{ or } x \in C\}$$

$$= \{4, 5, 6, 7, 8, 9, 10, 11\}$$

Sets Ex 1.5 Q2(iv)

$$B \cup D = \{x \mid x \in B \text{ or } x \in D\}$$

$$= \{4, 5, 6, 7, 8, 10, 11, 12, 13, 14\}$$

Sets Ex 1.5 Q2(v)

$$A \cup B \cup C = \{x \mid x \in A \text{ or } x \in B \text{ or } x \in C\}$$

$$= \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$$

Sets Ex 1.5 Q2(vi)

$$A \cup B \cup D = \{x \mid x \in A \text{ or } x \in B \text{ or } x \in D\}$$

$$= \{1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14\}$$

Sets Ex 1.5 Q2(vii)

$$B \cup C \cup D = \{x \mid x \in B \text{ or } x \in C \text{ or } x \in D\}$$

$$= \{4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14\}$$

Sets Ex 1.5 Q2(viii)

$$A \cap (B \cup C) = \text{all those elements which are common}$$

$$\text{to } A \text{ and } B \cup C$$

$$= \{x \mid x \in A \text{ and } x \in B \cup C\}$$

$$\text{Now, } B \cup C = \{4, 5, 6, 7, 8, 9, 10, 11\}$$

$$\therefore A \cap (B \cup C) = \{1, 2, 3, 4, 5\} \cap \{4, 5, 6, 7, 8, 9, 10, 11\}$$

$$= \{4, 5\}$$

Sets Ex 1.5 Q2(ix)

$$(A \cap B) \cap (B \cap C) = \{x \mid x \in (A \cap B) \text{ and } x \in (B \cap C)\}$$

Now,

$$A \cap B = \{x \mid x \in A \text{ and } x \in B\}$$

i.e., elements which are common to A & B

$$\therefore A \cap B = \{1, 2, 3, 4, 5\} \cap \{4, 5, 6, 7, 8\}$$

$$= \{4, 5\}$$

Also,

$$B \cap C = \{4, 5, 6, 7, 8\} \cap \{7, 8, 9, 10, 11\}$$

$$= \{7, 8\}$$

$$\text{Hence, } (A \cap B) \cap (B \cap C) = \{4, 5\} \cap \{7, 8\}$$

$$= \emptyset$$

[\because there is no element common in $\{4, 5\}$ and $\{7, 8\}$]

Sets Ex 1.5 Q2(x)

$$(A \cup D) \cap (B \cup C) = \{x \mid x \in (A \cup D) \text{ or } x \in (B \cup C)\}$$

Now,

$$A \cup D = \{1, 2, 3, 4, 5, 10, 11, 12, 13, 14\}$$

$$\text{and } B \cup C = \{4, 5, 6, 7, 8, 9, 10, 11\}$$

$$\therefore (A \cup D) \cap (B \cup C) = \{4, 5, 10, 11\}$$

Sets Ex 1.5 Q3(i)

We have,

$$A = \{x \mid x \in N\}$$

$$= \{1, 2, 3, \dots\}, \text{ the set of natural numbers}$$

$$B = \{x \mid x = 2n, x \in N\}$$

$$= \{2, 4, 6, 8, \dots\}, \text{ the set of even natural numbers}$$

$$\therefore A \cap B = \{x \mid x \in A \text{ and } x \in B\}$$

$$= \{2, 4, 6, \dots\}$$

$$= B$$

[$\because B \subset A$]

Sets Ex 1.5 Q3(ii)

$$A = \{x : x \in \mathbb{N}\}$$

$$= \{1, 2, 3, \dots\}, \text{ the set of natural numbers}$$

$$C = \{x : x = 2n - 1, x \in \mathbb{N}\}$$

$$= \{1, 3, 5, \dots\}, \text{ the set of odd natural numbers}$$

$$A \cap C = \{x : x \in A \text{ and } x \in C\}$$

$$= C \quad [\because C \subset A]$$

Sets Ex 1.5 Q3(iii)

We have,

$$A = \{x : x \in \mathbb{N}\}$$

$$= \{1, 2, 3, \dots\}, \text{ the set of natural numbers}$$

and $D = \{x : x \text{ is a prime natural number}\}$

$$= \{2, 3, 5, 7, \dots\}$$

$$A \cap D = \{x : x \in A \text{ and } x \in D\}$$

$$= D \quad [\because D \subset A]$$

Sets Ex 1.5 Q3(iv)

We have,

$$B = \{x : x = 2n, x \in \mathbb{N}\}$$

$$= \{2, 4, 6, 8, \dots\}, \text{ the set of even natural numbers}$$

and

$$C = \{x : x = 2n - 1, x \in \mathbb{N}\}$$

$$= \{1, 3, 5, \dots\}, \text{ the set of odd natural numbers}$$

$$B \cap C = \{x : x \in B \text{ and } x \in C\}$$

$$= \emptyset \quad [\because B \text{ and } C \text{ are disjoint sets, i.e., } \\ \text{have no elements in common}]$$

Sets Ex 1.5 Q3(v)

Here,

$$B = \{x : x = 2n, x \in \mathbb{N}\}$$

$$= \{2, 4, 6, 8, \dots\}, \text{ the set of even natural numbers}$$

and $D = \{x : x \text{ is a prime natural number}\}$

$$= \{2, 3, 5, 7, \dots\}$$

$$B \cap D = \{x : x \in B \text{ and } x \in D\}$$

$$= \{2\}$$

Sets Ex 1.5 Q3(vi)

Here,

$$C = \{x : x = 2n - 1, x \in \mathbb{N}\}$$

$$= \{1, 3, 5, \dots\}, \text{ the set of odd natural numbers}$$

and $D = \{x : x \text{ is a prime natural number}\}$

$$= \{2, 3, 5, 7, \dots\}$$

$$C \cap D = \{x : x \in C \text{ and } x \in D\}$$

We observe that except, the element 2, every other element in D is an odd natural number.

Hence, $C \cap D = D - \{2\}$

$$= \{x \in D : x \neq 2\}$$

Sets Ex 1.5 Q4

We have,

$$A = \{2, 3, 6, 15, 18, 21\}$$

$$B = \{4, 8, 12, 16, 20\}$$

$$C = \{2, 4, 6, 8, 10, 12, 14, 16\}$$

$$D = \{5, 10, 15, 20\}$$

If A and B are two sets, then the set $A - B$ is defined as

$$A - B = \{x \in A : x \notin B\}.$$

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

Sets Ex 1.5 Q5

(i) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, $C = \{3, 4, 5, 6\}$

By the complement of a set A , which respect to the universal set U , denoted by A' or A^c or $U - A$, we mean $\{x \in U : x \notin A\}$.

Hence, $A' = \{x \in U : x \notin A\} = \{5, 6, 7, 8, 9\}$

(ii) $B' = \{x \in U : x \notin B\} = \{1, 3, 5, 7, 9\}$

(iii) $(A \cap C)' = \{x \in U : x \notin A \cap C\}$

Now,

$$A \cap C = \{x : x \in A \text{ and } x \in C\} = \{3, 4\}$$

$$\therefore (A \cap C)' = \{1, 2, 5, 6, 7, 8, 9\}$$

Sets Ex 1.5 Q6

(i) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 $A = \{2, 4, 6, 8\}$
 $B = \{2, 3, 5, 7\}$

We have,

$$A \cup B = \{x : x \in A \text{ or } x \in B\}$$

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

$$\therefore (A \cup B)' = \{x \in U : x \notin A \cup B\}$$

$$= \{1, 9\}$$

$$A' = \{x \in U : x \notin A\}$$

$$= \{1, 3, 5, 7, 9\}$$

$$B' = \{x \in U : x \notin B\}$$

$$= \{1, 4, 6, 8, 9\}$$

Hence, $A' \cap B' = \{1, 9\}$

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

(ii) $A \cap B = \{x : x \in A \text{ and } x \in B\}$
 $= \{2\}$

$$\therefore (A \cap B)' = \{x \in U : x \notin A \cap B\}$$

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

Also,

$$A' \cup B' = \{x : x \in A' \text{ or } x \in B'\}$$

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

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