

SETS

INTRODUCTION

A set is a well-defined collection of objects, whose elements are fixed and cannot vary. It means set doesn't change from person to person. Like for example, the set of natural numbers up to 7 will remain the same as $\{1, 2, 3, 4, 5, 6, 7\}$. Still, if we say the set of best players in a football team, then the name of footballers could vary every time we ask about the best players, as each person has its own choice to consider the best player. Similarly, if we speak about the set of rivers in India, the elements of the set will remain the same. So, this is a real-life example of a set. In mathematics, we represent the sets in curly brackets $\{ \}$.

NOTE

- **Empty Sets:** A set which does not contain any element is called an empty set or the void set or null set and it is denoted by $\{ \}$ or Φ .
- **Singleton Set:** A set consists of a single element, is called a singleton set.
- **Finite and infinite Set:** A set which consists of a finite number of elements, is called a finite set, otherwise the set is called an infinite set.
- **Equal Sets:** Two sets A and B are said to be equal, if every element of A is also an element of B or vice-versa, i.e. two equal sets will have exactly the same element.
- **Equivalent Sets:** Two finite sets A and B are said to be equal if the number of elements are equal, i.e. $n(A) = n(B)$

EXAMPLE SUMS

Q. 1: Write the following sets in the roaster form.

(i) $A = \{x \mid x \text{ is a positive integer less than } 10 \text{ and } 2x - 1 \text{ is an odd number}\}$

(ii) $C = \{x : x^2 + 7x - 8 = 0, x \in \mathbb{R}\}$

Solution:

(i) $2x - 1$ is always an odd number for all positive integral values of x since $2x$ is an even number.

In particular, $2x - 1$ is an odd number for $x = 1, 2, \dots, 9$.

Therefore, $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

(ii) $x^2 + 7x - 8 = 0$

$(x + 8)(x - 1) = 0$

$x = -8$ or $x = 1$

Therefore, $C = \{-8, 1\}$

Q. 2: Write the following sets in roster form:

(i) $A = \{x : x \text{ is an integer and } -3 \leq x < 7\}$

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

Solution:

(i) $A = \{x : x \text{ is an integer and } -3 \leq x < 7\}$

Integers are $\dots -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, \dots$

$A = \{-3, -2, -1, 0, 1, 2, 3, 4, 5, 6\}$

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

Natural numbers are $1, 2, 3, 4, 5, 6, 7, \dots$

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

PRACTICE SUMS

Q1. Given that $N = \{1, 2, 3, \dots, 100\}$, then

(i) Write the subset A of N , whose elements are odd numbers.

(ii) Write the subset B of N , whose elements are represented by $x + 2$, where $x \in N$

Q2. Let $U = \{1, 2, 3, 4, 5, 6\}$, $A = \{2, 3\}$ and $B = \{3, 4, 5\}$.

Find A' , B' , $A' \cap B'$, $A \cup B$ and hence show that $(A \cup B)' = A' \cap B'$