

EXERCISE 1.1**PAGE: 4**

1. Which of the following are sets? Justify your answer.

- (i) The collection of all months of a year beginning with the letter J.**
- (ii) The collection of ten most talented writers of India.**
- (iii) A team of eleven best-cricket batsmen of the world.**
- (iv) The collection of all boys in your class.**
- (v) The collection of all natural numbers less than 100.**
- (vi) A collection of novels written by the writer Munshi Prem Chand.**
- (vii) The collection of all even integers.**
- (viii) The collection of questions in this Chapter.**
- (ix) A collection of most dangerous animals of the world.**

Solution:

(i) The collection of all months of a year beginning with the letter J is a well-defined collection of objects as one can identify a month which belongs to this collection.

Therefore, this collection is a set.

(ii) The collection of ten most talented writers of India is not a well-defined collection as the criteria to determine a writer's talent may differ from one person to another.

Therefore, this collection is not a set.

(iii) A team of eleven best-cricket batsmen of the world is not a well-defined collection as the criteria to determine a batsman's talent may vary from one person to another.

Therefore, this collection is not a set.

(iv) The collection of all boys in your class is a well-defined collection as you can identify a boy who belongs to this collection.

Therefore, this collection is a set.

(v) The collection of all natural numbers less than 100 is a well-defined collection as one can find a number which belongs to this collection.

Therefore, this collection is a set.

(vi) A collection of novels written by the writer Munshi Prem Chand is a well-defined collection as one can find any book which belongs to this collection.

Therefore, this collection is a set.

(vii) The collection of all even integers is a well-defined collection as one can find an integer which belongs to this collection.

Therefore, this collection is a set.

(viii) The collection of questions in this chapter is a well-defined collection as one can find a question which belongs to this chapter.

Therefore, this collection is a set.

(ix) A collection of most dangerous animals of the world is not a well-defined collection as the criteria to find the dangerousness of an animal can differ from one animal to another.

Therefore, this collection is not a set.

2. Let $A = \{1, 2, 3, 4, 5, 6\}$. Insert the appropriate symbol \in or \notin in the blank spaces:

(i) $5 \dots A$ (ii) $8 \dots A$ (iii) $0 \dots A$

(iv) $4 \dots A$ (v) $2 \dots A$ (vi) $10 \dots A$

Solution:

(i) $5 \in A$

(ii) $8 \notin A$

(iii) $0 \notin A$

(iv) $4 \in A$

(v) $2 \in A$

(vi) $10 \notin A$

3. Write the following sets in roster form:

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

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

(iii) $C = \{x: x \text{ is a two-digit natural number such that the sum of its digits is 8}\}$

(iv) $D = \{x: x \text{ is a prime number which is divisor of 60}\}$.

(v) $E = \text{The set of all letters in the word TRIGONOMETRY.}$

(vi) $F = \text{The set of all letters in the word BETTER.}$

Solution:

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

$-2, -1, 0, 1, 2, 3, 4, 5$, and 6 only are the elements of this set.

Hence, the given set can be written in roster form as

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

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

$1, 2, 3, 4$, and 5 only are the elements of this set

Hence, the given set can be written in roster form as

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

(iii) $C = \{x: x \text{ is a two-digit natural number such that the sum of its digits is } 8\}$

$17, 26, 35, 44, 53, 62, 71$, and 80 only are the elements of this set

Hence, the given set can be written in roster form as

$$C = \{17, 26, 35, 44, 53, 62, 71, 80\}$$

(iv) $D = \{x: x \text{ is a prime number which is divisor of } 60\}$

2	60
2	30
3	15
	5

Here $60 = 2 \times 2 \times 3 \times 5$

$2, 3$ and 5 only are the elements of this set

Hence, the given set can be written in roster form as

$$D = \{2, 3, 5\}$$

(v) $E =$ The set of all letters in the word TRIGONOMETRY

TRIGONOMETRY is a 12 letters word out of which T, R and O are repeated.

Hence, the given set can be written in roster form as

$$E = \{T, R, I, G, O, N, M, E, Y\}$$

(vi) $F =$ The set of all letters in the word BETTER

BETTER is a 6 letters word out of which E and T are repeated.

Hence, the given set can be written in roster form as

$$F = \{B, E, T, R\}$$

4. Write the following sets in the set-builder form:

(i) $\{3, 6, 9, 12\}$

(ii) $\{2, 4, 8, 16, 32\}$

(iii) $\{5, 25, 125, 625\}$

(iv) $\{2, 4, 6 \dots\}$

(v) $\{1, 4, 9 \dots 100\}$

Solution:

(i) $\{3, 6, 9, 12\}$

The given set can be written in the set-builder form as $\{x: x = 3n, n \in \mathbb{N} \text{ and } 1 \leq n \leq 4\}$

(ii) $\{2, 4, 8, 16, 32\}$

We know that $2 = 2^1$, $4 = 2^2$, $8 = 2^3$, $16 = 2^4$, and $32 = 2^5$.

Therefore, the given set $\{2, 4, 8, 16, 32\}$ can be written in the set-builder form as $\{x: x = 2^n, n \in \mathbb{N} \text{ and } 1 \leq n \leq 5\}$.

(iii) $\{5, 25, 125, 625\}$

We know that $5 = 5^1$, $25 = 5^2$, $125 = 5^3$, and $625 = 5^4$.

Therefore, the given set $\{5, 25, 125, 625\}$ can be written in the set-builder form as $\{x: x = 5^n, n \in \mathbb{N} \text{ and } 1 \leq n \leq 4\}$.

(iv) $\{2, 4, 6 \dots\}$

$\{2, 4, 6 \dots\}$ is a set of all even natural numbers

Therefore, the given set $\{2, 4, 6 \dots\}$ can be written in the set-builder form as $\{x: x \text{ is an even natural number}\}$.

(v) $\{1, 4, 9 \dots 100\}$

We know that $1 = 1^2$, $4 = 2^2$, $9 = 3^2 \dots 100 = 10^2$.

Therefore, the given set $\{1, 4, 9 \dots 100\}$ can be written in the set-builder form as $\{x: x = n^2, n \in \mathbb{N} \text{ and } 1 \leq n \leq 10\}$.

5. List all the elements of the following sets:

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

(ii) $B = \{x: x \text{ is an integer, } -1/2 < x < 9/2\}$

(iii) $C = \{x: x \text{ is an integer, } x^2 \leq 4\}$

(iv) $D = \{x: x \text{ is a letter in the word "LOYAL"}\}$

(v) $E = \{x: x \text{ is a month of a year not having 31 days}\}$

(vi) $F = \{x: x \text{ is a consonant in the English alphabet which proceeds } k\}$.

Solution:

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

So the elements are $A = \{1, 3, 5, 7, 9, \dots\}$

(ii) $B = \{x: x \text{ is an integer, } -1/2 < x < 9/2\}$

We know that $-1/2 = -0.5$ and $9/2 = 4.5$

So the elements are $B = \{0, 1, 2, 3, 4\}$.

(iii) $C = \{x: x \text{ is an integer, } x^2 \leq 4\}$

We know that

$$(-1)^2 = 1 \leq 4; (-2)^2 = 4 \leq 4; (-3)^2 = 9 > 4$$

Here

$$0^2 = 0 \leq 4, 1^2 = 1 \leq 4, 2^2 = 4 \leq 4, 3^2 = 9 > 4$$

So we get

$$C = \{-2, -1, 0, 1, 2\}$$

(iv) $D = \{x: x \text{ is a letter in the word "LOYAL"}\}$

So the elements are $D = \{L, O, Y, A\}$

(v) $E = \{x: x \text{ is a month of a year not having 31 days}\}$

So the elements are $E = \{\text{February, April, June, September, November}\}$

(vi) $F = \{x: x \text{ is a consonant in the English alphabet which proceeds } k\}$

So the elements are $F = \{b, c, d, f, g, h, j\}$

6. Match each of the set on the left in the roster form with the same set on the right described in set-builder form:

(i) $\{1, 2, 3, 6\}$ (a) $\{x: x \text{ is a prime number and a divisor of } 6\}$

(ii) $\{2, 3\}$ (b) $\{x: x \text{ is an odd natural number less than } 10\}$

(iii) $\{M, A, T, H, E, I, C, S\}$ (c) $\{x: x \text{ is a natural number and divisor of } 6\}$

(iv) $\{1, 3, 5, 7, 9\}$ (d) $\{x: x \text{ is a letter of the word MATHEMATICS}\}$

Solution:

- (i) Here the elements of this set are natural number as well as divisors of 6. Hence, (i) matches with (c).
- (ii) 2 and 3 are prime numbers which are divisors of 6. Hence, (ii) matches with (a).
- (iii) The elements are the letters of the word MATHEMATICS. Hence, (iii) matches with (d).
- (iv) The elements are odd natural numbers which are less than 10. Hence, (v) matches with (b).