EXERCISE 1.1

Question-1

Which of the following are sets? Justify our 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.

Ans.

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

Hence, this collection is a set.

(ii) The collection of ten most talented writers of India is not a well-defined collection because the criteria for determining a writer's talent may vary from person to person.

Hence, this collection is not a set.

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

Hence, this collection is not a set.

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

Hence, this collection is a set.

(v) The collection of all natural numbers less than 100 is a well-defined collection because one can definitely identify a number that belongs to this collection.

Hence, this collection is a set.

(vi) A collection of novels written by the writer Munshi Prem Chand is a well-defined collection because one can definitely identify a book that belongs to this collection.

Hence, this collection is a set.

(vi) A collection of novels written by the writer Munshi Prem Chand is a well-defined collection because one can definitely identify a book that belongs to this collection.

Hence, this collection is a set.

(vii) The collection of all even integers is a well-defined collection because one can definitely identify an even integer that belongs to this collection.

Hence, this collection is a set.

(viii) The collection of questions in this chapter is a well-defined collection because one can definitely identify a question that belongs to this chapter.

Hence, this collection is a set.

(ix) The collection of most dangerous animals of the world is not a well-defined collection because the criteria for determining the dangerousness of an animal can vary from person to person.

Hence, this collection is not a set.

Question-2

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

(i) 5...A **(ii)** 8...A **(iii)** 0...A

(iv) 4...A **(v)** 2...A **(vi)** 10...A

Ans.

(i) $5 \in A$

(ii) $8 \notin A$

(iii) $0 \notin A$

(iv) $4 \in A$

(v) $2 \in A$

(vi) $10 \notin A$

Question-3

Write the following sets in roster form:

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

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

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

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

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

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

Ans.

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

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

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

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

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

The elements of this set are 1, 2, 3, 4, and 5 only.

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

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

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

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

Therefore, this set can be written in roster form as

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

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

2	60
2	30
3	15
	5

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

The elements of this set are 2, 3, and 5 only.

Therefore, this set can be written in roster form as D = $\{2, 3, 5\}$.

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

There are 12 letters in the word TRIGONOMETRY, out of which letters T, R, and O are repeated.

Therefore, this 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

There are 6 letters in the word BETTER, out of which letters E and T are repeated.

Therefore, this set can be written in roster form as

F = {B, E, T, R}

Question-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 ...}

(v) {1, 4, 9 ... 100}

Ans.

(i) $\{3, 6, 9, 12\} = \{x: x = 3n, n \in \text{N and } 1 \leq n \leq 4\}$

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

It can be seen that $2 = 2^1$, $4 = 2^2$, $8 = 2^3$, $16 = 2^4$, and $32 = 2^5$.

$\therefore \{2, 4, 8, 16, 32\} = \{x: x = 2^n, n \in \text{N and } 1 \leq n \leq 5\}$

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

It can be seen that $5 = 5^1$, $25 = 5^2$, $125 = 5^3$, and $625 = 5^4$.

$\therefore \{5, 25, 125, 625\} = \{x: x = 5^n, n \in \text{N and } 1 \leq n \leq 4\}$

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

It is a set of all even natural numbers.

$\therefore \{2, 4, 6 \ldots\} = \{x: x \text{ is an even natural number}\}$

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

It can be seen that $1 = 1^2$, $4 = 2^2$, $9 = 3^2 \ldots 100 = 10^2$.

$\therefore \{1, 4, 9 \ldots 100\} = \{x: x = n^2, n \in \text{N and } 1 \leq n \leq 10\}$

Question-5

List all the elements of the following sets:

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

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

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

Ans.

(i) A = {x: x is an odd natural number} = {1, 3, 5, 7, 9 …}

(ii) B = {x: x is an integer; $-\frac{1}{2} < n < \frac{9}{2}$}

It can be seen that $-\frac{1}{2} = -0.5$ and $\frac{9}{2} = 4.5$

$\therefore$ B $= \{0,1,2,3,4\}$

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

It can be seen that

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

$0^2 = 0 \leq 4$

$1^2 = 1 \leq 4$

$2^2 = 4 \leq 4$

$3^2 = 9 > 4$

$\therefore$ C = {−2, −1, 0, 1, 2}

(iv) D = (x: x is a letter in the word "LOYAL") = {L, O, Y, A}

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

= {February, April, June, September, November}

(vi) F = {x: x is a consonant in the English alphabet which precedes k}

= {b, c, d, f, g, h, j}

Question-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}
(ii) {2, 3}
(iii) {M, A,T, H, E, I,C, S}
(iv) {1, 3, 5, 7, 9}

(a) {x: x is a prime number and a divisor of 6}
(b) {x: x is an odd natural number less than 10}
(c) {x: x is natural number and divisor of 6}
(d) {x: x is a letter of the word MATHEMATICS}

Ans.

i) All the elements of this set are natural numbers as well as the divisors of 6. Therefore, **(i)** matches with **(c)**.

(ii) It can be seen that 2 and 3 are prime numbers. They are also the divisors of 6.

Therefore, **(ii)** matches with **(a)**.

(iii) All the elements of this set are letters of the word MATHEMATICS. Therefore, **(iii)** matches with **(d)**.

(iv) All the elements of this set are odd natural numbers less than 10. Therefore, **(iv)** matches with **(b)**.

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