

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.

Answer

(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.

(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 \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)** $10 \dots A$

Answer

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

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

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

Answer

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

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

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

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

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)** $\{2, 4, 6 \dots\}$

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

Answer

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

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

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

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

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

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

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

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

It is a set of all even natural numbers.

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

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

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

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

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

Answer

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

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

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

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

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

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

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

$= \{\text{February, April, June, September, November}\}$

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

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

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) $\{1, 2, 3, 6\}$

(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) $\{x: x \text{ is natural number and divisor of } 6\}$

(iv) $\{1, 3, 5, 7, 9\}$

(d) $\{x: x \text{ is a letter of the word MATHEMATICS}\}$

Answer

(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)**.