

EXERCISE 1.1

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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.

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 a 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 $5 = 5^1, 25 = 5^2, 125 = 5^3, \text{ and } 625 = 5^4$.

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

(ii) $\{2, 3\}$

(iii) $\{M, A, T, H, E, I, C, S\}$

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

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

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

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

(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, (iv) matches with (b).