Exercise

1. State which of the following collections are set:
(i) All states of India.
(ii) Four cities of India having more than one lac population.
(iii) All tall students of your school.
(iv) Four colours of a rainbow.
(v) All the beautiful flowers.
(vi) All clever people of Lucknow.
(vii) Last three days of a week.
(viii)All months of a year having at least 30 days.
Solution:

(i) It is a set.
(ii) It is not a set because the collection is not well defined.
(iii) It is not a set because the collection is not well defined.
(iv) It is not a set because the collection is not well defined.
(v) It is not a set because the collection is not well defined.
(vi) It is not a set because the collection is not well defined.
(vii) It is a set.
(viii) It is a set.

2. Let A = {vowels of English alphabet}, then which of the following statements are true. In case a statement is incorrect, mention why.
(i) c ∈ A
(ii) {a} ∈ A
(iii) a, i, u, ∈ A
(iv) {a, u} ∉ A
(v) {a, i, u } ∈ A
(vi) a, b, ∈ A
Solution:

(i) As c is not a vowel, this statement is false.
(ii) This statement is false because {a} is a set and not an element.
(iii) This statement is true.
(iv) This statement is true as it is a set and not elements.
(v) This statement is false because {a, i, u} is a set and not an element.
(vi) This statement is false because b is not a vowel, so b ∉ A. And, a ∈ A.

3. Describe the following sets:
(i) {a, b, c, d, e, f}
(ii) {2, 3, 5, 7, 11, 13, 17, 19}
(iii) {Friday, Saturday, Sunday}
(iv) {April, August, October}
Solution:

The given set can be written as:

(i) The set of first six letters of alphabet or {first six letters of alphabet}.
(ii) The set of prime numbers less than 20 or {prime numbers less than 20}.
(iii) The set of last three days of a week or {last three days of a week}.
(iv) The set of months of a year whose name begin with a vowel or {months of a year whose name begin with a vowel}.

4. Write the following sets in tabular form and also in set builder form:
(i) The set of even whole numbers which lie between 10 and 50.
(ii) {months of a year having more than 30 days}
(iii) The set of single-digit whole numbers which are a perfect square.
(iv) The set of factors of 36.

Solution:

The given set can be written as:
(i) Tabular form: {12, 14, 16, 18, 20, ……. , 48}
Set builder form: $\{x : x = 2n, n \in N \text{ and } 5 < n < 25\}$

(ii) Tabular form: {January, March, May, July, August, October, December)
Set builder form: $\{x \mid x \text{ is a month of a year having 31 days}\}$

(iii) Tabular form: {0, 1, 4, 9}
Set builder form: $\{x \mid x \text{ is a perfect square of one digit number})$

(iv) Tabular form: {1,2, 3, 4, 6, 9, 12, 18, 36}
Set builder form: $\{x \mid x \text{ is a factor of 36}\}$

5. Write the following sets in roster form and also in description form:
(i) $\{x \mid x = 4n, n \in W \text{ and } n < 5\}$
(ii) $\{x : x = n^2, n \in N \text{ and } n < 8\}$
(iii) $y : y = 2x - 1, x \in W \text{ and } x < 5\}$
(iv) $\{x : x \text{ is a letter in word ULTIMATUM}\}$
Solution:

(i) Whole numbers less than 5 are 0, 1, 2, 3, 4.
4n i.e., four times the above numbers are 0, 4, 8, 12, 16.
Thus, the given set can be written as:

{0, 4, 8, 12, 16} – Roster form
Or
{whole numbers which are divisible by 4 and less than 20} – Description form

(ii) Natural numbers less than 8 are 1, 2, 3, 4, 5, 6, 7
n^2 i.e., squares of these numbers are 1, 4, 9, 16, 25, 36, 49
Thus, the given set can be written as:

{1,4, 9, 16, 25, 36, 49} – Roster form
Or

{squares of first seven natural numbers} – Description form

(iii) Whole numbers less than 5 are 0, 1, 2, 3, 4.
i.e. x = 0, 1, 2, 3, 4.
Given y = 2x – 1, putting x = 0, 1, 2, 3, 4, we get

y = 2 × 0 – 1, 2 × 1 – 1, 2 × 2 – 1, 2 × 3 – 1, 2 × 4 – 1
= 0 – 1, 2 – 1, 4 – 1, 6 – 1, 8 – 1
= -1, 1, 3, 5, 7
Thus, the given set can be written as:

{- 1, 1, 3, 5, 7} – Roster form
Or
{odd integers which lie between -2 and 8} – Description form

(iv) The given set can be written as:

{U, L, T, I, M, A}- Roster form [Write each element of the set once and only once] or {letters in the word ULTIMATUM} – Description form)

6. Write the following sets in roster form:
(i) {x | x ∈ N, 5 ≤ x < 10 }
(ii) {x | x = 6 p, p ∈ I and – 2 ≤ p ≤ 2}
(iii) {x | x = n² – 1, n ∈ N and n < 5}
(iv) {x | x – 1 = 0}
(v) {x | x is a consonant in word NOTATION}
(vi) {x | x is a digit in the numeral 11056771}
Solution:

The given set can be written as:
(i) {5, 6, 7, 8, 9} – Roster form

(ii) Integers lie between -2 and 2 are -2, -1, 0, 1, 2, or p = -2, -1, 0, 1, 2
Given x = 6p i.e. putting p = -2, -1, 0, 1, 2, we get
x = 6 × (-2), 6 × (-1), 6 × 0, 6 × 1, 6 × 2
= -12, -6, 0, 6, 12
Thus, the given set can be written as {-12, -6, 0, 6, 12} in roster form

(iii) Natural numbers less than 5 are 1, 2, 3, 4
i.e., n = 1, 2, 3, 4
Given x = n² – 1, putting n = 1, 2, 3, 4, we get
x = 1² – 1, 2² – 1, 3² – 1, 4² – 1 = 0, 3, 8, 15
Thus, the given set can be written as {0, 3, 8, 15} – Roster form

(iv) The given set can be written as {1} in roster form.
As, x – 1 = 0

⇒ x = 1

(v) The given set can be written as:

{N, T} in roster form

(vi) The given set can be written as:
{1, 0, 5, 6, 7} in roster form

7. Write the following sets in set builder form:
(i) (1, 3, 5, 7, …….. 29}
(ii) {2, 3, 5, 7, 11, 13, 17, 19, 23, 29}
(iii) {1, 4, 9, 16, 25, ………}

(iv) {1/5, 1/6, 1/7, …… 1/20}
(v) {-16, -8, 0, 8, 16, 24, 32, 40}
(vi) {January, June, July}
Solution:

The given set can be written in set builder form as:
(i) {x | x is an odd natural number, x < 30}

(ii) {x | x is a prime number, x < 30}

(iii) The given numbers are perfect squares of natural numbers
{x | x = n², n ∈ N}

(iv) {x | x = 1/n, n ∈ N and 5 ≤ n ≤ 20}

(v) The given numbers are multiples of 8 lying between -16 and 40.

{x | x = 8p, p ∈ I and -2 ≤ p ≤ 5}

(vi) {x | x is a month of a year whose name begins with letter 'J'}