

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 $A = \{\text{vowels of English alphabet}\}$, then which of the following statements are true. In case a statement is incorrect, mention why.

- (i) $c \in A$
- (ii) $\{a\} \in A$
- (iii) $a, i, u, \in A$
- (iv) $\{a, u\} \notin A$
- (v) $\{a, i, u\} \in A$
- (vi) $a, b, \in A$

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 $b \notin A$. And, $a \in A$.

3. Describe the following sets:

- (i) $\{a, b, c, d, e, f\}$
- (ii) $\{2, 3, 5, 7, 11, 13, 17, 19\}$
- (iii) $\{\text{Friday, Saturday, Sunday}\}$
- (iv) $\{\text{April, August, October}\}$

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: $\{x : x = 2n, n \in \mathbb{N} \text{ and } 5 < n < 25\}$

- (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) $\{x \mid x = 4n, n \in \mathbb{W} \text{ and } n < 5\}$
- (ii) $\{x : x = n^2, n \in \mathbb{N} \text{ and } n < 8\}$
- (iii) $y : y = 2x - 1, x \in \mathbb{W} \text{ and } x < 5\}$
- (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

$$y = 2 \times 0 - 1, 2 \times 1 - 1, 2 \times 2 - 1, 2 \times 3 - 1, 2 \times 4 - 1$$

$$= 0 - 1, 2 - 1, 4 - 1, 6 - 1, 8 - 1$$

$$= -1, 1, 3, 5, 7$$

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) $\{x \mid x \in \mathbf{N}, 5 \leq x < 10\}$

(ii) $\{x \mid x = 6p, p \in \mathbf{I} \text{ and } -2 \leq p \leq 2\}$

(iii) $\{x \mid x = n^2 - 1, n \in \mathbf{N} \text{ and } n < 5\}$

(iv) $\{x \mid x - 1 = 0\}$

(v) $\{x \mid x \text{ is a consonant in word NOTATION}\}$

(vi) $\{x \mid x \text{ is a digit in the numeral } 11056771\}$

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

$$x = 6 \times (-2), 6 \times (-1), 6 \times 0, 6 \times 1, 6 \times 2$$

$$= -12, -6, 0, 6, 12$$

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 $x = n^2 - 1$, putting $n = 1, 2, 3, 4$, we get

$$x = 1^2 - 1, 2^2 - 1, 3^2 - 1, 4^2 - 1 = 0, 3, 8, 15$$

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.

$$\text{As, } x - 1 = 0$$

$$\Rightarrow x = 1$$

(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) $\{x \mid x \text{ is an odd natural number, } x < 30\}$

(ii) $\{x \mid x \text{ is a prime number, } x < 30\}$

(iii) The given numbers are perfect squares of natural numbers
 $\{x \mid x = n^2, n \in \mathbb{N}\}$

(iv) $\{x \mid x = 1/n, n \in \mathbb{N} \text{ and } 5 \leq n \leq 20\}$

(v) The given numbers are multiples of 8 lying between -16 and 40.
 $\{x \mid x = 8p, p \in \mathbb{I} \text{ and } -2 \leq p \leq 5\}$

(vi) $\{x \mid x \text{ is a month of a year whose name begins with letter 'J'}\}$