Chapter-1

SETS

Exercise 1.2

Q. 1 Which of the following are examples of the null set?

(i) Set of odd natural numbers divisible by 2

(ii) Set of even prime numbers

(iii) {x: x is a natural number, x < 5 and x > 7}

(iv) {y: y is a point common to any two parallel lines}

Answer:

(i) Given: Set of odd natural numbers divisible by 2.

As we know set is a collection of well - defined objects.

Let we represent the given set in roaster form:

⇒ Set of odd natural numbers divisible by 2 is {ϕ}.

Because no odd natural number can be divided by 2. Hence, it is a null set.

(ii) Given: Set of even prime numbers.

As we know set is a collection of well-defined objects

Let we represent the given set in roaster form:

⇒ Set of even prime numbers is {2}.

Because 2 is an even prime number. Hence, it is not a null set.

(iii) Given: {x: x is a natural number, x < 5 and x > 7}

As we know set is a collection of well-defined objects.

Let we represent the given set in roaster form

⇒ {x: x is a natural number, x < 5 and x > 7} is {ϕ}.

Because no number can be simultaneously less than 5 and greater than 7. Hence, it is a null set.

(iv) Given: {y: y is a point common to any two parallel lines}

As we know set is a collection of well-defined objects.

Let we represent the given set in roaster form:

⇒ {y: y is a point common to any two parallel lines} is {ϕ}.

Because two parallel lines never meet at any of the point so they don't have any common point. Hence, it is a null set.

Q. 2 Which of the following sets are finite or infinite?

(i) The set of months of a year

(ii) {1, 2, 3, . . .}

(iii) {1, 2, 3, . . .99, 100}

(iv) The set of positive integers greater than 100.

(v) The set of prime numbers less than 99

Answer:

(i) Given: The set of months of a year.

As we know set is a collection of well-defined objects.

Let we represent the given set in roaster form:

⇒ Set of months of a year is {January, February, march, April, May, June, July, August, September, October, November, December}

Because the set contain 12 elements. Hence, it is a finite set.

(ii) Given: {1, 2, 3, . . .}.

As we know set is a collection of well -defined objects.

As it is already represented in roaster form:

⇒ Set = {1, 2, 3, . . .}.

Because the set contain infinite number of natural numbers. Hence, it is an infinite set.

(iii) Given: {1, 2, 3, . . .99, 100}.

As we know set is a collection of well -defined objects.

As it is already represented in roaster form

⇒ Set = {1, 2, 3, . . .99, 100}.

Because the set contain finite number from 1 to 100.Hence, it is a finite set.

(iv) Given: The set of positive integers greater than 100.

As we know set is a collection of well - defined objects.

Let we represent the set in roaster form:

⇒ Set of positive integers greater than 100 = {100, 101, 102,}.

Because the set contain an infinite number from 100 to infinity. Hence, it is an infinite set.

(v) Given: The set of prime numbers less than 99.

As we know set is a collection of well -defined objects.

Let we represent the set in roaster form:

⇒ The set of prime numbers less than 99 = {2, 3, . . .99}.

Because the set contain finite prime number from 2 to 99. Hence, it is a finite set.

Q. 3 State whether each of the following set is finite or infinite:

(i) The set of lines which are parallel to the x-axis.

(ii) The set of letters in the English alphabet.

(iii) The set of numbers which are multiple of 5.

(iv) The set of animals living on the earth.

(v) The set of circles passing through the origin (0,0).

Answer:

(i) Given: The set of lines which are parallel to the x-axis.

As we know set is a collection of well-defined objects.

Let we represent the set in set builder form:

⇒ S = {x: x is number of parallel lines to x-axis}.

Because the set of lines parallel to x-axis are infinite in number. Hence, I t is an infinite set.

(ii) Given: The set of letters in the English alphabet.

As we know set is a collection of well-defined objects.

Let we represent the set in roaster form:

⇒ The set of letters in the English alphabet = {A, B, C, …, Z}.

Because the set contain finite alphabet series and having 26 elements Hence, it is a finite set.

(iii) Given: The set of numbers which are multiple of 5

As we know set is a collection of well-defined objects.

Let we represent the set in roaster form:

⇒ The set of numbers which are multiple of 5 = {5, 10, 15, …}.

Because the set contain infinite numbers which are multiple of 5. Hence, it is an infinite set.

(iv) Given: The set of animals living on the earth.

As we know set is a collection of well-defined objects

Let we represent the set in set builder form:

⇒ S = {x: x is the set of animals living on the earth}.

Because the number of animal living on earth are though too large but they are finite in number. Hence, it is finite set.

(v) Given: The set of circles passing through the origin (0,0).

As we know set is a collection of well-defined objects.

Let we represent the set in set builder form:

⇒ S = {x: x is the set of circles passing through the origin (0,0)}.

Because the number of circles passing through the origin are infinite in number. Hence, it is an infinite set.

Q. 4 In the following, state whether A = B or not:

(i) A = {a, b, c, d} B = {d, c, b, a}

(ii) A = {4, 8, 12, 16} B = {8, 4, 16, 18}

(iii) A = {2, 4, 6, 8, 10} B = {x: x is positive even integer and $x \leq 10$}.

(iv) A = {x: x is a multiple of 10}, B = {10, 15, 20, 25, 30, . . .}

Answer:

(i) Given: A = {a, b, c, d} B = {d, c, b, a}.

Two set A and B are said to be equal if they have exactly same elements then we say A = B.

Because elements of set A and B do not have significant order but A and B have same element.

∴ A=B.

(ii) Given: A = {4, 8, 12, 16} B = {8, 4, 16, 18}.

Two set A and B are said to be equal if they have exactly same elements then we say A = B.

As 12 Є A but 12 does not belongs to B.

Because elements of set A and B do not have same element

∴ A ≠ B.

(iii) Given: A = {2, 4, 6, 8, 10} B = {x: x is positive even integer and x ≤ 10}.

Let we represent the set B in roaster form:

⇒ x is positive even integer and x ≤ 10= {2,4,6,8,10}.

Two set A and B are said to be equal if they have exactly same elements then we say A = B.

Because elements of set A and B have same element.

∴ A = B.

(iv) Given: A = {x: x is a multiple of 10}, B = {10, 15, 20, 25, 30, . . .}

Let we represent the set A in roaster form:

⇒ Set A = x is a multiple of 10= {10, 20, 30, …}.

And set B = {10, 15, 20, 25, 30, . . .}

Two set A and B are said to be equal if they have exactly same elements then we say A = B.

As 15 Є B but 15 does not belongs to

Because elements of set A and B do not have same element.

∴ A ≠ B.

Q. 5 Are the following pair of sets equal? Give reasons.

(i) A = {2, 3}, B = {x: x is solution of $x^2 + 5x + 6 = 0$}

(ii) A = {x: x is a letter in the word FOLLOW}

B = {y: y is a letter in the word WOLF}

Answer:

(i) Given: A = {2, 3}, B = {x: x is solution of $x^2 + 5x + 6 = 0$}

Solution of equation $x^2 + 5x + 6 = 0$

$\Rightarrow x^2 + 3x + 2x + 6 = 0$

$\Rightarrow x (x + 3) + 2(x + 3) = 0$

$\Rightarrow (x + 3) (x + 2) = 0$

$\Rightarrow x = \{-3, -2\}$

Let we represent the set B in roaster form:

⇒ Set B = {x is solution of $x^2 + 5x + 6 = 0$} = {-3, -2}.

And set A = {2, 3}

Two set A and B are said to be equal if they have exactly same elements then we say A = B.

Because the elements of set A and B do not have same numbers.

$\therefore A \neq B$.

(ii) Given: A = {x: x is a letter in the word FOLLOW}, B = {y: y is a letter in the word WOLF}.

Let we represent the set A in roaster form:

⇒ Set A = {x: x is a letter in the word FOLLOW} = {F, O, L, W}.

Let we represent the set B in roaster form:

⇒ Set B = {y: y is a letter in the word WOLF} = {W, O, L, F}.

Two set A and B are said to be equal if they have exactly same elements then we say A = B.

Because elements of set A and B do not have significant order, but A and B have same element.

∴ A =B.

Q. 6 From the sets given below, select equal sets:

A = {2, 4, 8, 12}, B = {1, 2, 3, 4}, C = {4, 8, 12, 14}, D = {3, 1, 4, 2}

E = {–1, 1}, F = {0, a}, G = {1, –1}, H = {0, 1}

Answer:

Given: A = {2, 4, 8, 12}, B = {1, 2, 3, 4}, C = {4, 8, 12, 14}, D = {3, 1, 4, 2}

E = {–1, 1}, F = {0, a}, G = {1, –1}, H = {0, 1}

As we see,

8 Є A, but 8 does not belong to B, D, E, F, G and H

⇒ A ≠ B, A ≠ D, A ≠ E, A ≠ F, A ≠ G, A ≠ H

And 2 Є A but 2 does not belong to C

⇒ A ≠ C.

Now, 3 Є B, but 3 does not belong to C, E, F, G and H

⇒ B ≠ C, B ≠ E, B ≠ F, B ≠ G, B ≠ H

Also, 12 Є C, but 12 does not belong to D, E, F, G and H

⇒ C ≠ D, C ≠ E, C ≠ F, C ≠ G, C ≠ H

Also, 4 Є D, but 4 does not belong to E, F, G and H

⇒ D ≠ E, D ≠ F, D ≠ G, D ≠ H

Also, -1 Є E, but -1 does not belong to F, G and H

⇒ E ≠ F, E ≠ G, E ≠ H

Also, a Є F, but a does not belong to G and H

$\Rightarrow F \neq G, F \neq H$

Also, -1 Є G, but -1 does not belong to H

$\Rightarrow G \neq H$

But B = D and E = G.

As, two set A and B are said to be equal if they have exactly same elements then we say A = B.

Because elements of set (B and D) and (E and G) do not have significant order but (B and D) and (E and G) have same element.

∴ B = D and E = G.