Exercise 1.2

Question 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 numbers, $x < 5$ and $x > 7\}$

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

Answer

(i) A set of odd natural numbers divisible by 2 is a null set because no odd number is divisible by 2.

(ii) A set of even prime numbers is not a null set because 2 is an even prime number.

(iii) $\{x : x$ is a natural number, $x < 5$ and $x > 7\}$ is a null set because a number cannot be simultaneously less than 5 and greater than 7.

(iv) $\{y : y$ is a point common to any two parallel lines$\}$ is a null set because parallel lines do not intersect. Hence, they have no common point.

Question 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) The set of months of a year is a finite set because it has 12 elements.

(ii) {1, 2, 3 …} is an infinite set as it has infinite number of natural numbers.

(iii) {1, 2, 3 …99, 100} is a finite set because the numbers from 1 to 100 are finite in number.

(iv) The set of positive integers greater than 100 is an infinite set because positive integers greater than 100 are infinite in number.

(v) The set of prime numbers less than 99 is a finite set because prime numbers less than 99 are finite in number.

Question 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) The set of lines which are parallel to the x-axis is an infinite set because lines parallel to the x-axis are infinite in number.

(ii) The set of letters in the English alphabet is a finite set because it has 26 elements.

(iii) The set of numbers which are multiple of 5 is an infinite set because multiples of 5 are infinite in number.

(iv) The set of animals living on the earth is a finite set because the number of animals living on the earth is finite (although it is quite a big number).

(v) The set of circles passing through the origin (0, 0) is an infinite set because infinite number of circles can pass through the origin.

Question 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) A = {a, b, c, d}; B = {d, c, b, a}

The order in which the elements of a set are listed is not significant.

∴A = B

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

It can be seen that 12 ∈ A but 12 ∉ B.

∴A ≠ B

(iii) A = {2, 4, 6, 8, 10}

B = {x: x is a positive even integer and $x \leq 10$}

= {2, 4, 6, 8, 10}

∴A = B

(iv) A = {x: x is a multiple of 10}

B = {10, 15, 20, 25, 30 …}

It can be seen that 15 ∈ B but 15 ∉ A.

∴A ≠ B

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

The equation $x^2 + 5x + 6 = 0$ can be solved as:

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

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

$x = -2$ or $x = -3$

∴A = {2, 3}; B = {−2, −3}

∴A ≠ B

(ii) A = {x: x is a letter in the word FOLLOW} = {F, O, L, W}

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

The order in which the elements of a set are listed is not significant.

$\therefore A = B$

Question 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

$A = \{2, 4, 8, 12\}$; $B = \{1, 2, 3, 4\}$; $C = \{4, 8, 12, 14\}$

$D = \{3, 1, 4, 2\}$; $E = \{-1, 1\}$; $F = \{0, a\}$

$G = \{1, -1\}$; $A = \{0, 1\}$

It can be seen that

$8 \in A$, $8 \notin B$, $8 \notin D$, $8 \notin E$, $8 \notin F$, $8 \notin G$, $8 \notin H$

$\Rightarrow A \neq B$, $A \neq D$, $A \neq E$, $A \neq F$, $A \neq G$, $A \neq H$

Also, $2 \in A$, $2 \notin C$

$\therefore A \neq C$

$3 \in B$, $3 \notin C$, $3 \notin E$, $3 \notin F$, $3 \notin G$, $3 \notin H$

$\therefore B \neq C$, $B \neq E$, $B \neq F$, $B \neq G$, $B \neq H$

$12 \in C$, $12 \notin D$, $12 \notin E$, $12 \notin F$, $12 \notin G$, $12 \notin H$

$\therefore C \neq D$, $C \neq E$, $C \neq F$, $C \neq G$, $C \neq H$

$4 \in D$, $4 \notin E$, $4 \notin F$, $4 \notin G$, $4 \notin H$

$\therefore D \neq E$, $D \neq F$, $D \neq G$, $D \neq H$

Similarly, $E \neq F$, $E \neq G$, $E \neq H$

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

The order in which the elements of a set are listed is not significant.

$\therefore B = D$ and $E = G$

Hence, among the given sets, $B = D$ and $E = G$.