

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) $\{x: x \text{ is a natural numbers, } x < 5 \text{ and } x > 7 \}$
- (iv) $\{y: y \text{ is a point common to any two parallel lines}\}$

Answer 1:

- (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) $\{x: x \text{ is a natural number, } x < 5 \text{ and } x > 7\}$ is a null set because a number cannot be simultaneously less than 5 and greater than 7.
- (iv) $\{y: y \text{ is a point common to any two parallel lines}\}$ 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) $\{1, 2, 3 \dots\}$
- (iii) $\{1, 2, 3 \dots 99, 100\}$
- (iv) The set of positive integers greater than 100
- (v) The set of prime numbers less than 99

Answer 2:

- (i) The set of months of a year is a finite set because it has 12 elements.
- (ii) $\{1, 2, 3 \dots\}$ is an infinite set as it has infinite number of natural numbers.

- (iii) $\{1, 2, 3 \dots 99, 100\}$ 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 3:

- (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) $A = \{2, 4, 6, 8, 10\}$; $B = \{x: x \text{ is positive even integer and } x \leq 10\}$
- (iv) $A = \{x: x \text{ is a multiple of } 10\}$; $B = \{10, 15, 20, 25, 30 \dots\}$

Answer 4:

- (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.

$$\therefore A = B$$

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

It can be seen that $12 \in A$ but $12 \notin B$.

$$\therefore A \neq B$$

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

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

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

$$\therefore A = B$$

- (iv) $A = \{x: x \text{ is a multiple of } 10\}$

$$B = \{10, 15, 20, 25, 30 \dots\}$$

It can be seen that $15 \in B$ but $15 \notin A$.

$$\therefore A \neq B$$

Question 5:

Are the following pair of sets equal? Give reasons.

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

(ii) $A = \{x: x \text{ is a letter in the word FOLLOW}\}$; $B = \{y: y \text{ is a letter in the word WOLF}\}$

Answer 5:

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

The equation $x^2 + 5x + 6 = 0$ can be solved as: $x(x + 3) + 2(x + 3) = 0$

$$(x + 2)(x + 3) = 0 ; x = -2 \text{ or } x = -3$$

$$\therefore A = \{2, 3\}; \quad B = \{-2, -3\}$$

$$\therefore A \neq B$$

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

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

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 6:

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

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

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

It can be seen that

$$\begin{array}{ccccccc} 8 \in A, & 8 \notin B, & 8 \notin D, & 8 \notin E, & 8 \notin F, & 8 \notin G, & 8 \notin H \\ \Rightarrow A \neq B, & A \neq D, & A \neq E, & A \neq F, & A \neq G, & A \neq H \end{array}$$

$$\text{Also, } 2 \in A, \quad 2 \notin C$$

$$\therefore A \neq C$$

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

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

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

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

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

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

$$\text{Similarly, } E \neq F, \quad E \neq G, \quad E \neq H, \quad F \neq G, \quad F \neq H, \quad G \neq H$$

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

$$\therefore B = D \quad \text{and} \quad E = G$$

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