Sets

Exercise 6(A)

(iii) $A_1 = \{x : 2x + 3 = 11\}$

$= A_1 = \{2x + 3 = 11\}$

$= A_1 = \{2x = 11 - 3 = 8\}$

$\therefore A_1 = \{2x = 8\}$

$= A_1 = \{x = \frac{8}{2} = 4\}$

$= \therefore A_1 = \{4\}$

ii) $A_2 = \{x : x^2 - 4x - 5 = 0\}$

$x^2 - 4x - 5 = 0$

$x^2 - 5x + x - 5 = 0$

$x(x-5) + 1(x-5) = 0$

$(x-5)(x+1) = 0$

$\therefore x - 5 = 0$ or $x + 1 = 0$

$\Rightarrow x = 5, \quad x = -1$

$\therefore$ Given set in roster (Tabular) form is

$A_2 = \{5, -1\}$

iv) $A_5 = \{x : x = 4n, n \in W \text{ and } n < 4\}$

$x = 4n$

$\therefore n = 0 \qquad x = 4 \times 0 = 0$

When $n = 1 \qquad x = 4 \times 1 = 4$

When $n = 2 \qquad x = 4 \times 2 = 8$

When $n = 3 \qquad x = 4 \times 3 = 12$

$\therefore$ given set of number in tabular form is

$A_5 = \{0, 4, 8, 12\}$

Exercise 6A

2. (ii) $B_1 = \{6, 9, 12, 15, \ldots\}$
$= \{x : x = 3n + 3, n \in N\}$

(ii) $B_2 = \{11, 13, 17, 19\}$
$\Rightarrow x$ is $\{x : x$ is a prime number between 10 & 20$\}$

(iii) $B_3 = \left\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11}, \ldots\right\}$
$\left\{x : x = \frac{n}{n+2}, \text{ where } n \text{ is an odd natural number}\right\}$

(iv) $B_4 = \{8, 27, 64, 125, 216\}$
$\{x : x = n^3 ; n \in N \text{ and } 2 \leq n \leq 6\}$

(v) $B_5 = \{-5, -4, -3, -2, -1\}$
$\{x : x \in Z ; -5 \leq x \leq -1\}$

(vi) $B_6 = \{\ldots\ldots, -6, -3, 0, 3, 6, \ldots\}$
$\{x : x = 3n ; n \in Z\}$

(ii) The set of letters in the word "MEERUT"

Ans) The set of letters in the word MEERUT in Roster form = {m, e, r, u, t}

(iii) The set of letters in the word "UNIVERSAL"

Ans) The set of letters in the word UNIVERSAL in Roster form = {u, n, i, v, e, r, s, a, l}

(iii) $A = \{x : x = y+3, y \in N \text{ and } y > 3\}$

$A = x = y + 3$

= When $y = 4$ $x = 4+3 = 7$

When $y = 5$ $x = 5+3 = 8$

When $y = 6$ $x = 6+3 = 9$

When $y = 7$ $x = 7+3 = 10$

When $y = 8$ $x = 8+3 = 11$

∴ Roster of given set $A = \{7, 8, 9, 10, 11\}$

(iv) $B = \{p : p \in W \text{ and } p^2 < 20\}$

when $p^2 = 0$ $p = \sqrt{0} = 0$

when $p^2 = 1$ $p = \sqrt{1} = 1$

when $p^2 = 4$ $p = \sqrt{4} = 2$

when $p^2 = 9$ $p = \sqrt{3} = 3$

when $p^2 = 16$ $p = \sqrt{16} = 4$

∴ Roster of given set $B = \{0, 1, 2, 3, 4\}$

Exercise 6B

i) $A_1 = \{-2, -1, 1, 3, 5\}$

$n(A_1) = 5$

ii) $A_2 = \{x : x \in N \text{ and } 3 \leq x \leq 7\}$

$x = 3, 4, 5, 6$

$n(A_2) = 4$

iii) $A_3 = \{p : p \in W \text{ and } 2p - 3 < 8\}$

$2p - 3 < 8$

$2p - 3 + 3 < 8 + 3$

$\Rightarrow 2p < 11$

$p = \frac{11}{2} = 5.5$

Cardinal number $= 0, 1, 2, 3, 4, 5$

$\therefore p = 6$

$\therefore n(A_3) = 6$

iv) $A_4 = \{b : b \in Z \text{ and } -7 < 3b - 1 \leq 2\}$

$-7 < 3b - 1$

Adding 1 to both sides we get

$-7 + 1 < 3b - 1 + 1$

$-6 < 3b$

$\Rightarrow b = \frac{-6}{3} = -2$

$\therefore b = -2$

$3b - 1 \leq 2$

Adding 1 to both sides

$3b - 1 + 1 \leq 2 + 1$

$3b \leq 3$

$b \leq \frac{3}{3} = 1$

$\therefore b \leq 1$

$\therefore -2 \leq b \leq 1$

$\therefore$ Given set $A_4 = \{-1, 0, 1\}$

$\therefore$ Cardinal number of set $A_4 = 3$

2) If P = {p : p is a letter in the word 'PERMANENT'}, find n(P)

Ans) P = {p : p ∈ P, e, r, m, a, n, t}

n(P) = 7

3) State which of the following sets are finite and infinite

Exercise 6B

3) State which of the following sets are finite and which are infinite.

i) A = {x : x ∈ Z and x < 10}

x < 10 = 9, 8, 7, 6, 5, ...

∴ A = {x : x ∈ Z and x < 10} is infinite

ii) B = {x : x ∈ W and 5x - 3 ≤ 20}

5x - 3 ≤ 20

Add 3 to both sides

5x - 3 + 3 ≤ 20 + 3

5x ≤ 23

$x \leq \frac{23}{5} = 4.6$

= 0, 1, 2, 3, 4

∴ B = {x : x ∈ W and 5x - 3 ≤ 20} is finite.

iii) P = {y : y = 3x - 2, x ∈ N and x > 5}

= x > 5 = 6, 7, 8, 9, ...

y = 3x - 2

= 3 × 6 - 2 = 18 - 2 = 16

2) If P = {p : p is a letter in the word 'PERMANENT'}, find n(P)

Ans) P = {p : p, e, r, m, a, n, t}

n(P) = 7

3) State which of the following sets are finite and which are infinite.

Exercise 6B

3) State which of the following sets are finite and which are infinite.

i) A = {x : x ∈ Z and x < 10}

x < 10 = 9, 8, 7, 6, 5, ...

∴ A = {x : x ∈ Z and x < 10} is infinite

ii) B = {x : x ∈ W and 5x - 3 ≤ 20}

5x - 3 ≤ 20

Add 3 to both sides

5x - 3 + 3 ≤ 20 + 3

5x ≤ 23

x ≤ $\frac{23}{5}$ = 4.6

= 0, 1, 2, 3, 4

∴ B = {x : x ∈ W and 5x - 3 ≤ 20} is finite.

iii) P = {y : y = 3x - 2, x ∈ N and x > 5}

= x > 5 = 6, 7, 8, 9, ...

y = 3x - 2

= 3 × 6 - 2 = 18 - 2 = 16

y = 3x - 2

= 3 × 7 - 2 = 21 - 2 = 19

y = 3x - 2

= 3 × 8 - 2 = 24 - 2 = 22

y = 3x - 2

= 3 × 9 - 2 = 27 - 2 = 25

$xy = \{16, 19, 22, 25 \ldots\ldots\ldots\}$

So the given set is infinite.

iii $M = \{r : r = \frac{3}{n} ; n \in W \text{ and } 6 < n \leq 15\}$

$n = \{7, 8, 9, 10, 11, 12, 13, 14, 15\}$

$r = \left\{\frac{3}{7}, \frac{3}{8}, \frac{3}{9}, \frac{3}{10}, \frac{3}{11}, \frac{3}{12}, \frac{3}{13}, \frac{3}{14}, \frac{3}{15}\right\}$

So the given set is finite.