Exercise 6-A

1. (i) $A_1 = \{x : 2x + 3 = 11\}$

$\therefore 2x + 3 = 11$

$\Rightarrow 2x = 11 - 3$

$\Rightarrow 2x = 8$

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

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

Any $\therefore x^2 - 4x - 5 = 0$

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

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

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

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

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

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

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

(v) $A_5 = \{x : x = 4n, n \in w \text{ and } n < 4\}$

Any $\therefore x = 4n$

$\therefore$ When $n = 0$, $x = 4 \times 0$

$\Rightarrow x = 0$

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

$\Rightarrow x = 4$

When $n = 2$, $x = 4 \times 2$
$\Rightarrow$ $x = 8$
When $n = 3$, $x = 4 \times 3$
$\Rightarrow$ $x = 12$
$\therefore$ Given set in roster (Tabular) form is
$A_5 = \{0, 4, 8, 12\}$

4. (ii) The set of letters in the word 'UNIVERSAL'
Ans) $\{u, n, i, v, e, r, s, a, l\}$

(iii) $A = \{x : x = y + 3, y \in N \text{ and } y > 3\}$.
Ans) $\{7, 8, 9, 10 \ldots\ldots\}$

(iv) $B = \{b : b \in w \text{ and } b^2 < 20\}$.
Ans) $\{0, 1, 2, 3, 4\}$

Exercise (6-B)

1. (i) $A_1 = \{-2, -1, 1, 3, 5\}$
Ans) Cardinal number of set $A_1 = 5$

(ii) $A_2 = \{x : x \in N \text{ and } 3 \leq x < 7\}$
Ans) $= \{3, 4, 5, 6\}$
Cardinal number of set $A_2 = 4$

(iii) $A_3 = \{b : b \in w \text{ and } 2b - 3 < 8\}$

2. (i) $B_1 = \{6, 9, 12, 15, \ldots\}$

Ans) $= \{x : x = 3n+3 ; n \in N\}$

(ii) $B_2 = \{11, 13, 17, 19 \ldots\}$

Ans) $= \{x : x$ is a prime number between 10 and 20$\}$

(iii) $B_3 = \left\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11} \ldots\right\}$

Ans) $\{x : x = \frac{n}{n+2}$, where n is an odd natural number$\}$

(iv) $B_4 = \{8, 27, 64, 125, 216\}$

Ans) $\{x : x = n^3 ; n \in N$ and $2 \leq n \leq 6\}$

(v) $B_5 = \{-5, -4, -3, -2, -1\}$

Ans) $= \{x : x \in Z, -5 \leq x \leq -1\}$

(vi) $B_6 = \{\ldots, -6, -3, 0, 3, 6, \ldots\}$

Ans) $\{x : x = 3n, n, \in Z\}$

When $n = 2$, $x = 4 \times 2$

$\Rightarrow$ $x = 8$

When $n = 3$, $x = 4 \times 3$

$\Rightarrow$ $x = 12$

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

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

4. (ii) The set of letters in the word 'UNIVERSAL'

Ans) $\{u, n, i, v, e, r, s, a, l\}$

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

Ans) $\{7, 8, 9, 10 \ldots\ldots\}$

(iv) $B = \{b : b \in w \text{ and } b^2 < 20\}$.

Ans) $\{0, 1, 2, 3, 4\}$

Exercise (6-B)

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

Ans) Cardinal number of set $A_1 = 5$

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

Ans) $= \{3, 4, 5, 6\}$

Cardinal number of set $A_2 = 4$

(iii) $A_3 = \{b : b \in w \text{ and } 2b - 3 < 8\}$

Ans) $2P - 3 < 8$

$\Rightarrow 2P - 3 + 3 < 8 + 3$

(Adding 3 to both sides)

$\Rightarrow 2P < 11$

$\Rightarrow P < \frac{11}{2}$

(Dividing both sides by 2)

$\Rightarrow P < 5.5$

$\therefore A_3 = \{0, 1, 2, 3, 4, 5\}$

$\therefore$ Cardinal number of set $A_3 = 6$

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

Ans) $-7 < 3b - 1$

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

(Adding 1 to both sides)

$\Rightarrow -6 < 3b$

$\Rightarrow \frac{-6}{3} < b$

(Dividing both sides by 3)

$\Rightarrow -2 < b$

$3b - 1 \leq 2$

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

(Adding 1 to both sides)

$\Rightarrow 3b \leq 3$

$\Rightarrow b \leq \frac{3}{3}$

(Dividing both sides by 3)

$\Rightarrow b \leq 1$

$\therefore -2 < b \leq 1$

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

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

3. (i) $A = \{x : x \in Z \text{ and } x < 10\}$

Ans) $= \{\ldots\ldots, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

$= \{9, 8, 7, 6, 5, 4, 3, 2, 1, 0, -1, -2, -3, -4, \ldots\}$

Infinite set.

(ii) $B = \{x : x \in w \text{ and } 5x - 3 \leq 20\}$

Ans) $5x - 3 \leq 20$

$\Rightarrow 5x - 3 + 3 \leq 20 + 3$

(Adding 3 to both sides)

$\Rightarrow 5x \leq 20 + 3$

$\Rightarrow 5x \leq 23$

$\Rightarrow x \leq \frac{23}{5}$

(Dividing both sides by 5)

$\Rightarrow x \leq 4.6$

$\therefore B = \{0, 1, 2, 3, 4\}$

Finite.

(iii) $P = \{y : y = 3x - 2, x \in N \text{ and } x > 5\}$

Ans) $y = 3x - 2$

when $x = 6$, $y = 3 \times 6 - 2$

$= 18 - 2 = 16$

When $x = 7$, $y = 3 \times 7 - 2$
$= 21 - 2 = 19$

When $x = 8$, $y = 3 \times 8 - 2$
$= 24 - 2 = 22$

When $x = 9$, $y = 3 \times 9 - 2$
$= 27 - 2 = 25$

$\therefore P = \{16, 19, 22, 25, \ldots\}$
$\therefore$ It is an infinite set.

(iv) $M = \{r : r = \frac{3}{n}, n \in W \text{ and } 6 < n \leq 15\}$

Any $r = \frac{3}{n}$

When $n = 7$, $r = \frac{3}{7}$

When $n = 8$, $r = \frac{3}{8}$

When $n = 9$, $r = \frac{3}{9}$

When $n = 10$, $r = \frac{3}{10}$

When $n = 11$, $r = \frac{3}{11}$

When $n = 12$, $r = \frac{3}{12}$

When $n = 13$, $r = \frac{3}{13}$

When $n = 14$, $r = \frac{3}{14}$

When $n = 15$, $r = \frac{3}{15}$

$\therefore M = \{\frac{3}{7}, \frac{3}{8}, \frac{3}{9}, \frac{3}{10}, \frac{3}{11}, \frac{3}{12}, \frac{3}{13}, \frac{3}{14}, \frac{3}{15}\}$

Finite set.