Exercise 6A

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

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

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

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

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

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

3(i) Is $\{1, 2, 4, 16, 64\} = \{x : x$ is a factor of 32$\}$? Give reason.

Ans: No, $\{1, 2, 4, 16, 64\} \neq \{x : x$ is a factor of 32$\}$ because 64 is not a factor of 32.

(ii) Is $\{x : x$ is a factor of 27$\} = \{3, 9, 27, 54\}$? Give reason

Ans⇒ Yes, $\{x : x$ is a factor of 27$\} \neq \{3, 9, 27, 54\}$ because 54 is not a factor of 24.

(iii) Write the set of even factores of 124

$1 \times 124 = 124$
$2 \times 62 = 124$
$4 \times 31 = 124$

∴ Factors of 124 = 1, 2, 4, 31, 62, 124

Set of even factors of 124 are 2, 4, 62, 124

(ii) Write the set of odd factors of 72

$1 \times 72 = 72$

~~$2 \times 24 = 72$~~

$2 \times 36 = 72$

$3 \times 24 = 72$

$4 \times 18 = 72$

$6 \times 12 = 72$

$8 \times 9 = 72$

∴ Factors of 72 are 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

Set of odd factors of 72 are 1, 3, 9

vi Write the set of prime factores of 3234

∴ Set of prime factores of 3234 are 2, 3, 7 and 11

2	3234
3	1617
7	539
7	77
11	11
	1

vii Is $\{x : x^2 - 7x + 12 = 0\} = \{3, 4\}$?

Ans) Yes $\{x : x^2 - 7x + 12 = 0\} = \{3, 4\}$ because

$x^2 - 7x + 12 = 0$

$\Rightarrow x^2 + (-4x) + (-3x) + 12 = 0$

$\Rightarrow x(x-4) + -3(x-4) = 0$

$\Rightarrow (x-4)(x-3) = 0$

$\Rightarrow x - 4 = 0$ or $x - 3 = 0$

$\therefore x = 4$ or $x = 3$ $\therefore$

vii) Is $\{x : x^2 - 5x - 6 = 0\} = \{2, 3\}$?

Ans No, $\{x : x^2 - 5x - 6 = 0\} \neq \{2, 3\}$ because

$x^2 - 5x - 6 = 0$

$x^2 - 6x + x - 6 = 0$

$x(x-6) + 1(x-6) = 0$

$(x-6)(x+1) = 0$

$x - 6 = 0, \quad x + 1 = 0$

$\therefore x = 6, \quad x = (-1)$

iv) i) 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}

ii) 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 $y = 4 \quad x = 4 + 3 = 7$

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

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

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

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

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

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

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

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

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

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

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

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

v) $C = \{x : x \text{ is a composite number and } 5 \leq x \leq 21\}$

$5 \leq x < 21$ means

$x = 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,$

But we are given that x is a composite number 21

$\therefore x = 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21$

$\therefore$ Roaster form of given set $C = \{6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21\}$

5) i) $x : x^2 - 2x - 3 = 0$

$x^2 - 3x + x - 3 = 0$

$x(x-3) + 1(x-3) = 0$

$(x-3)(x+1) = 0$

$x = 3, \quad x = -1$

ii) $\therefore$ element of the sets $\{x : x^2 - 2x - 3 = 0$ are $\{3, -1\}$

iii) $\{x : x = 2y + 5 ; y \in N$ and $2 \leq y < 6$

$x = 2y + 5$

When $y = 2$ $\quad x = 2 \times 2 + 5 = 9$

When $y = 3$ $\quad x = 2 \times 3 + 5 = 11$

When $y = 4$ $\quad x = 2 \times 4 + 5 = 13$

When $y = 5$ $\quad x = 2 \times 5 + 5 = 15$

$\therefore$ element of the given set $\{x : x = 2y + 5 ; y \in N$ and $2 \leq y \leq 6$ are $\{9, 11, 13, 15\}$

iii) $\{x : x$ is a factor of $24\}$

$1 \times 24 = 24$

$2 \times 12 = 24$

$3 \times 8 = 24$

$4 \times 6 = 24$

$\therefore$ element of the given set $\{x : x$ is a factor of 24 are $\{1, 2, 3, 4, 6, 8, 12, 24\}$

iv) $x : x \in Z$ and $x^2 \leq 4$

When $x^2 = 4 \quad x = \pm\sqrt{4} = \pm 2$

When $x^2 = 1 \quad x = \pm\sqrt{1} = \pm 1$

When $x^2 = 0 \quad x = \sqrt{0} = 0$

∴ element of the given set $= \{x : x \in Z \text{ and } x^2 \leq 4\}$ are $+2, -2, +1, -1, 0$ or $-2, -1, 0, 1, 2$

v) $\{x : 3x - 2 \leq 10 \text{ and } x \in N\}$

$3x - 2 \leq 10$

$3x \leq 10 + 2 = 12$

$3x \leq 12$

$x \leq \frac{12}{3} = 4$

$x \leq 4 \quad \therefore x = 1, 2, 3, 4$

∴ element of the given set $= \{x : 3x - 2 \leq 10 \text{ and } x \in N\}$ are $\{1, 2, 3, 4\}$

vi) $\{x : 4 - 2x > -6, x \in Z\}$

$4 - 2x > -6$

$-4 + 4 - 2x > -6 - 4$ (Subtracting 4 to both sides

$-2x > -10$

$-2x + 2x + 10 > -10 + 2x + 10$ (Adding $2x + 10$ to both sides)

$10 > 2x$

$\frac{10}{2} > x$

$5 > x$

∴ element of given set $\{x : 4 - 2x > -6, x \in Z\}$ are $\{4, 3, 2, 1, 0, -1\}$