2. Write the following set in set-builder form:

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

Sol:- $B_1 = \{6, 9, 12, 15 \ldots\}$

$= \{x / x = 3n + 3;\ n \in N\}$

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

Sol:- $B_2 = \{11, 13, 17, 19\}$

$= \{x / x$ is a prime number between 10 and 20$\}$

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

Sol:- $B_3 = \{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11} \ldots\ldots\}$

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

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

Sol:- $B_3 = \{8, 27, 64, 125, 216\}$

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

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

Sol:- $B_5 = \{-5, -4, -3, -2, -1\}$

$= \{x / x \in Z, -5 \leq x \leq -1\}$

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

Sol:- $B_6 = \{\ldots, -6, -3, 0, 3, 6 \ldots\}$

$= \{x / x = 3n, n \in Z\}$

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

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

(ii) Is $\{x / x \text{ is a factor of } 27\} \neq \{3,9,27,54\}$? Give reason.

Ans. Yes $\{x/x \text{ is a factor of } 27\} + \{3,9,27,54\}$ because 54 is not a factor of 27.

(iii) Write the set of even factors of 124.

Ang. The set of even factors of 124 are

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

(iv) Write the set of odd factors of 72.

Ans. The set of odd factors of 72 are

$1 \times 72 = 72$
$2 \times 36 = 72$
$3 \times 24 = 72$
$4 \times 18 = 72$
$6 \times 12 = 72$
$8 \times 9 = 72$

(v) Write the set of prime factors of 3234.

Ans-

$$\begin{array}{r|l} 2 & 3234 \\ \hline 3 & 1617 \\ \hline 7 & 539 \\ \hline 7 & 77 \\ \hline & 11 \end{array}$$

$3234 = 2 \times 3 \times 7 \times 7 \times 11$

Set of prime factors of $3234 = \{2, 3, 7, 11\}$

(vi) Is $\{x / x^2 - 7x + 12 = 0\} = \{3, 4\}$?

Ans-

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

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

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

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

Either $x - 4 = 0$ or $x - 3 = 0$

$\Rightarrow x = 4 \quad \Rightarrow x = 3$

$\{x / x^2 - 7x + 12 = 0\} = \{3, 4\}$ is true

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

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

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

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

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

Either $x-6=0$ or $x+1=0$

i.e., $x=6$ i.e. $x=-1$

$\{x/x^2-5x-6=0\} \neq \{2,3\}$

In other words $\{x/x^2-5x-6=0\}=\{2,3\}$ is not true

4. Write the following sets in roaster form:

(i) The set of letters in the word 'MEERUT'.

Ans. Roaster form of the set of letters in the word "MEERUT" $=\{m,e,r,u,t\}$

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

Ans. Roaster form of the set of letters in the word "UNIVERSAL" $=\{u,n,i,v,e,r,s,a,l\}$

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

Ans- $A = \{x / x = y + 3, y \in N \text{ and } y \geq 3\}$

$x = y + 3$

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

Roaster form of the given set $A = \{7, 8, 9, 10, 11 \ldots\ldots\}$

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

Ans- $B = \{P / P \in W \text{ and } p^2 < 20\}$

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

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

Roaster form of the given set $B = \{0, 1, 2, 3, 4\}$

(v) $C = \{x / x$ is composite Number and $5 < x < 21\}$

Ans. $C = \{x / x$ is composite number and $5 \leq x \leq 21\}$

$5 \leq x \leq 21$ means $x = 5, 6, 7, 8, 9, 10, \ldots\ldots, 21$

But we are given that x is a composite number $x = 6, 8, 9, 10, 12, 14, 15, 16, 18, 20, 21$

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

5. List the element of the following sets:-

(i) $\{x : x^2 - 2x - 3 = 0\}$

$$x^2 - 2x - 3 = 0$$
$$\Rightarrow x^2 - 3x + x - 3 = 0$$
$$\Rightarrow x(x-3) + 1(x-3) = 0$$
$$\Rightarrow (x+1)(x-3) = 0$$

Either $x - 3 = 0$ or $x + 1 = 0$

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

Elements of set $\{x / x^2 - 2x - 3 = 0\}$ are 3 and -1.

(ii) $\{x / x = 2y + 5 ; y \in N \text{ and } 2 \leq y < 6\}$

Ans- $\{x / x = 2y + 5 ; y \in N \text{ and } 2 \leq y < 6\}$

$x = 2y + 5$

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

$\Rightarrow x = 9$

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

$\Rightarrow x = 11$

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

$\Rightarrow x = 13$

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

$\Rightarrow x = 15$

Elements of the given set $\{x / x = 2y + 5; y \in N \text{ and } 2 \leq y < 6\}$ are 9, 11, 13, 15.

(iii) $\{x / x \text{ is a factor of } 24\}$

Ans- $\{x / x \in Z \text{ and } x^2 \leq 4\}$

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

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

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

Elements of the given set $\{x | x \in z \text{ and } x^2 \leq 4\}$ are $+2, -2, +1, -1, 0$ or are $-2, -1, 0, 1, 2$.

(v) $\{x | 3x - 2 \leq 10, x \in N\}$

Ans

$$3x - 2 \leq 10$$

$$\Rightarrow 3x \leq 10 + 2$$

$$\Rightarrow 3x \leq 12$$

$$\Rightarrow x \leq \frac{12}{3}$$

$$\leq x \leq 4$$

Elements of the given set $\{x | 3x - 2 \leq 10, x \in N\}$ are 1, 2, 3 and 4

(vi) $\{x | 4 - 2x > -6, x \in z\}$

$\{x | 4 - 2x > -6, x \in z\}$

$$4 - 2x > -6$$

$$-4 + 4 - 2x > -6 - 4$$

(Subtracting 4 from both sides)

$$-2x > -10$$

$$-2x + 2x + 10 > -10 + 2x + 10$$

[Adding $2x+10$ to both sides]

$$+10 \geq 2x$$

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

$$5 \geq x$$

Elements of the given set $\{x \mid 4-2x > -6, x \in Z\}$ are $4, 3, 2, 1, 0, -1 \ldots\ldots$