

Question 1.

If the replacement set = $\{-7, -5, -3, -1, 3\}$, find the solution set of:

- (i) $x > -2$
- (ii) $x < -2$
- (iii) $x > 2$
- (iv) $-5 < x \leq 5$
- (v) $-8 < x < 1$
- (vi) $0 \leq x \leq 4$

Solution:

Given replacement set = $\{-7, -5, -3, -1, 3\}$

- (i) Solution set of $x > -2$ is $\{-1, 0, 1, 3\}$
- (ii) Solution set of $x < -2$ is $\{-7, -5, -3\}$
- (iii) Solution set of $x > 2$ is $\{3\}$
- (iv) Solution set of $-5 < x \leq 5$ is $\{-3, -1, 0, 1, 3\}$
- (v) Solution set of $-8 < x < 1$ is $\{-7, -5, -3, -1, 0\}$
- (vi) Solution set of $0 \leq x \leq 4$ is $\{0, 1, 3\}$

Question 2.

Represent the solution of the following inequalities graphically:

- (i) $x \leq 4, x \in \mathbb{N}$
- (ii) $x < 5, x \in \mathbb{W}$
- (iii) $-3 \leq x < 3, x \in \mathbb{I}$

Solution:

- (i) Given $x < 4, x \in \mathbb{N}$

The solution set = $\{1, 2, 3, 4\}$

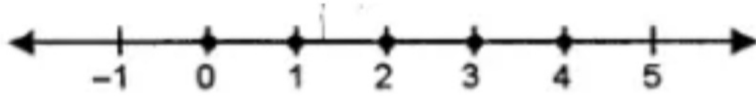
These four numbers are shown by thick dots on the number line.



(ii) Given $x < 5$, $x \in W$

The solution set = $\{0, 1, 2, 3, 4\}$

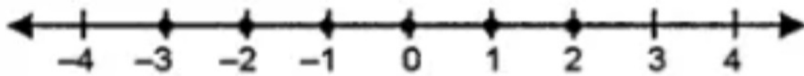
These five numbers are shown by thick dots on the number line.



(iii) Given $-3 \leq x < 3$, $x \in I$

The solution set = $\{-3, -2, -1, 0, 1, 2\}$

These six numbers are shown by thick dots on the number line.



Question 3.

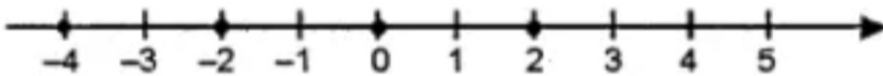
If the replacement set is $\{-6, -4, -2, 0, 2, 4, 6\}$, then represent the solution set of the inequality $-4 \leq x < 4$ graphically.

Solution:

The given replacement set is $\{-6, -4, -2, 0, 2, 4, 6\}$

and, given inequality $-4 \leq x < 4$ Solution set is $\{-4, -2, 0, 2\}$

Graphically representation of solution set is as under.



Question 4.

Find the solution set of the inequality $x < 4$ if the replacement set is

(i) $\{1, 2, 3, \dots, 10\}$

(ii) $\{-1, 0, 1, 2, 5, 8\}$

(iii) $\{-5, 10\}$

(iv) $\{5, 6, 7, 8, 9, 10\}$

Solution:

The given inequation $x < 4$

(i) replacement set is $\{1, 2, 3, -, 10\}$ for this set,
solution set is $\{1, 2, 3\}$

(ii) replacement set is $\{-1, 0, 1, 2, 5, 8\}$ for this set,
solution set is $\{-1, 0, 1, 2\}$

(iii) replacement set is $\{-5, 10\}$ for this set, solution
set is $\{-5\}$

(iv) replacement set is $\{5, 6, 7, 8, 9, 10\}$ for this set,
solution set is ϕ

Question 5.

If the replacement set = $\{-6, -3, 0, 3, 6, 9, 12\}$, find the
truth set of the following.:

(i) $2x - 3 > 7$

(ii) $3x + 8 \leq 2$

(iii) $-3 < 1 - 2x$

Solution:

The given replacement set = $\{-6, -3, 0, 3, 6, 9, 12\}$

(i) $2x - 3 > 7$

$$\Rightarrow 2x > 7 + 3$$

$$\Rightarrow 2x > 10$$

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

$$\Rightarrow x > 5$$

Its solution set is $\{6, 9, 12\}$

(ii) $3x + 8 \leq 2$

$$\Rightarrow 3x \leq 2 - 8$$

$$\Rightarrow 3x < -6$$

$$\Rightarrow x \leq -\frac{6}{3}$$

$$\Rightarrow x \leq -2$$

Its solution set is $\{-6, -3\}$

$$(iii) -3 < 1 - 2x$$

$$\Rightarrow 2x - 3 < 1$$

$$\Rightarrow 2x < 1 + 3$$

$$\Rightarrow 2x < 4$$

$$\Rightarrow x < \frac{4}{2}$$

$$\Rightarrow x < 2$$

Its solution set is $\{-6, -3, 0\}$

Question 6.

Solve the following inequations:

$$(i) 4x + 1 < 17, x \in \mathbb{N}$$

$$(ii) 4x + 1 \leq 17, x \in \mathbb{W}$$

$$(iii) 4 > 3x - 11, x \in \mathbb{N}$$

$$(iv) -17 \leq 9x - 8, x \in \mathbb{Z}$$

Solution:

$$(i) 4x + 1 < 17$$

$$\Rightarrow 4x < 17 - 1$$

$$\Rightarrow 4x < 16$$

$$\Rightarrow x < \frac{16}{4}$$

$$\Rightarrow x < 4$$

As $x \in \mathbb{N}$, the solution set is $\{1, 2, 3\}$

$$(ii) 4x + 1 \leq 17$$

$$\Rightarrow 4x \leq 17 - 1$$

$$\Rightarrow 4x \leq 16$$

$$\Rightarrow x \leq \frac{16}{4}$$

$\Rightarrow x < 4$. As $x \in \mathbb{W}$, the solution set is $\{0, 1, 2, 3, 4\}$

$$(iii) 4 > 3x - 11$$

$$\Rightarrow 4 + 11 > 3x$$

$$\Rightarrow 15 > 3x$$

$$\Rightarrow \frac{15}{3} > x$$

$$\Rightarrow 5 > x$$

$$\Rightarrow x > 5$$

As $x \in \mathbf{N}$, the solution set is $\{1, 2, 3, 4\}$

$$(iv) 17 \leq 9x - 8$$

$$\Rightarrow -17 + 8 \leq 9x$$

$$\Rightarrow -9 \leq 9x$$

$$\Rightarrow \frac{-9}{9} \leq x$$

$$\Rightarrow -1 \leq x$$

$$\Rightarrow x > -1$$

As $x \in \mathbf{Z}$, the solution set is $\{-1, 0, 1, 2, \dots\}$

Question 7.

Solve the following inequations :

$$(i) \frac{2y-1}{5} \leq 2, y \in \mathbf{N}$$

$$(ii) \frac{2y+1}{3} + 1 \leq 3, y \in \mathbf{W}$$

$$(iii) \frac{2}{3}p + 5 < 9, p \in \mathbf{W}$$

$$(iv) -2(p+3) > 5, p \in \mathbf{I}$$

Solution:

$$(i) \frac{2y-1}{5} \leq 2$$

$$\Rightarrow 2y - 1 \leq 10$$

$$\Rightarrow 2y \leq 10 + 1$$

$$\Rightarrow 2y \leq 11$$

$$\Rightarrow y \leq \frac{11}{2}$$

As $y \in \mathbb{N}$, the solution set is $\{1, 2, 3, 4, 5\}$

$$(ii) \frac{2y+1}{3} + 1 \leq 3$$

$$\Rightarrow \frac{2y+1+3}{3} \leq 3$$

$$\Rightarrow \frac{2y+4}{3} \leq 3$$

$$\Rightarrow 2y + 4 \leq 9$$

$$\Rightarrow 2y \leq 9 - 4$$

$$\Rightarrow 2y \leq 5$$

$$\Rightarrow y \leq \frac{5}{2}$$

As $y \in \mathbb{N}$, the solution set is $\{0, 1, 2\}$

$$(iii) \frac{2}{3}P + 5 < 9$$

$$\Rightarrow \frac{2}{3}p < 9 - 5$$

$$\Rightarrow \frac{2}{3}p < 4$$

$$\Rightarrow 2p < 4 \times 3$$

$$\Rightarrow 2p < 12$$

$$\Rightarrow P < \frac{12}{2} \Rightarrow p < 6$$

As $p \in \mathbb{W}$, the solution set is $\{0, 1, 2, 3, 4, 5\}$

$$(iv) -2(p + 3) > 5$$

$$\Rightarrow -2p - 6 > 5$$

$$\Rightarrow -2p > 5 + 6$$

$$\Rightarrow -2p > 11$$

$$\Rightarrow p < \frac{11}{(-2)}$$

$$\Rightarrow p < \frac{-11}{2}$$

As $p \in \mathbb{I}$, the solution set is $\{\dots -8, -7, -6\}$

Question 8.

Solve the following inequations:

(i) $2x - 3 < x + 2, x \in \mathbb{N}$

(ii) $3 - x \leq 5 - 3x, x \in \mathbb{W}$

(iii) $3(x - 2) < 2(x - 1), x \in \mathbb{W}$

(iv) $\frac{3}{2} - \frac{x}{2} > -1, x \in \mathbb{N}$

Solution:

(i) $2x - 3 < x + 2$

$$\Rightarrow 2x - x < 2 + 3$$

$$\Rightarrow x < 5$$

As $x \in \mathbb{N}$, the solution set is $\{1, 2, 3, 4\}$

(ii) $3 - x \leq 5 - 3x$

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

$$\Rightarrow 2x \leq 2$$

$$\Rightarrow x \leq \frac{2}{2}$$

$$\Rightarrow x \leq 1$$

As $x \in \mathbb{W}$, the solution set is $\{0, 1\}$

(iii) $3(x - 2) < 2(x - 1)$

$$\Rightarrow 3x - 6 < 2x - 2$$

$$\Rightarrow 3x - 2x < -2 + 6$$

$$\Rightarrow x < 4$$

As $x \in \mathbb{W}$, the solution set is $\{0, 1, 2, 3\}$

(iv) $\frac{3}{2} - \frac{x}{2} > -1$

$$\Rightarrow \frac{3}{2} + 1 > \frac{x}{2}$$

$$\Rightarrow \frac{3+2}{2} > \frac{x}{2}$$

$$\Rightarrow \frac{5}{2} > \frac{x}{2}$$

$$\Rightarrow 5 > x$$

$$\Rightarrow x > 5$$

As $x \in \mathbb{N}$, the solution set is $\{1, 2, 3, 4\}$

Question 9.

If the replacement set is $\{-3, -2, -1, 0, 1, 2, 3\}$, solve the inequation $\frac{3x-1}{2} < 2$. represent its solution on the number line.

Solution:

The given replacement set is $\{-3, -2, -1, 0, 1, 2, 3\}$

And inequation, $\frac{3x-1}{2} < 2$

$$\Rightarrow 3x - 1 < 4$$

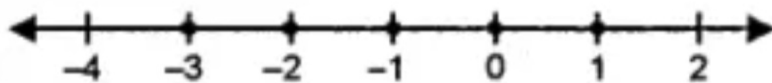
$$\Rightarrow 3x < 4 + 1$$

$$\Rightarrow 3x < 5$$

$$\Rightarrow x < \frac{5}{3}$$

Hence, solution set is $\{-3, -2, -1, 0, 1\}$

Graphical representation of this solution set is



Question 10.

Solve $\frac{x}{3} + \frac{1}{4} < \frac{x}{6} + \frac{1}{2}$, $x \in \mathbb{W}$. Also represent its solution on the number line.

Solution:

$$\text{Given } \frac{x}{3} + \frac{1}{4} < \frac{x}{6} + \frac{1}{2}$$

$$\Rightarrow \frac{x}{3} - \frac{x}{6} < \frac{1}{2} - \frac{1}{4}$$

$$\Rightarrow \frac{2x - x}{6} < \frac{2 - 1}{4}$$

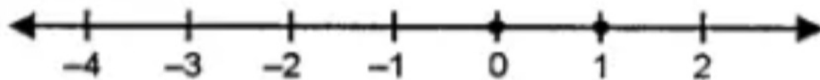
$$\Rightarrow \frac{x}{6} < \frac{1}{4}$$

$$\Rightarrow x < \frac{6}{4}$$

$$\Rightarrow x < \frac{3}{2}$$

As $x \in W$, the solution set is $\{0, 1\}$

Graphical representation of this solution set is



Question 11.

Solve the following inequations and graph their solutions on a number line

(i) $-4 \leq 4x < 14, x \in N$

(ii) $-1 < \frac{x}{2} + 1 \leq 3, x \in I$

Solution:

(i) Given $-4 \leq 4x < 14$

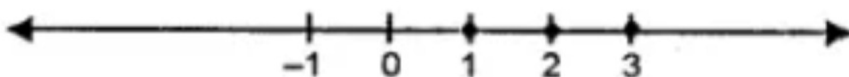
Dividing by 4

$$\Rightarrow \frac{-4}{4} \leq \frac{4x}{4} < \frac{14}{4}$$

$$\Rightarrow -1 \leq x < \frac{7}{2}$$

As $x \in N$, then its solution set is $\{1, 2, 3\}$

Its graphical representation is



(ii) Given $-1 < \frac{x}{2} + 1 \leq 3$

$$\Rightarrow -1 - 1 < \left(\frac{x}{2} + 1 \right) - 1 \leq 3 - 1$$

{ \because subtract 1}

$$\Rightarrow -2 < \frac{x}{2} < 2$$

$$\Rightarrow -2 \times 2 < \frac{x}{2} \times 2 < 2 \times 2 \quad [\because \text{multiplying by 2}]$$

$$\Rightarrow -4 < x < 4$$

As $x \in I$, then its solution set is $\{-3, -2, -1, 0, 1, 2, 3, 4\}$

Its Graphical representation is

