

# Chapter 9 Linear Equations and Inequalities

## Ex 9.3

Question 1.

If the replacement set is  $(-5, -3, -1, 0, 1, 3, 4)$ , find the solution set of:

(i)  $x < -2$

(ii)  $x > 1$

(iii)  $x \geq -1$

(iv)  $-5 < x < 3$

(v)  $-3 \leq x < 4$

(vi)  $0 \leq x < 7$ .

Solution:

Replacement set =  $\{-5, -3, -1, 0, 1, 3, 4\}$

(i) Solution set of  $x < -2 = \{-5, -3\}$

(ii) Solution set of  $x > 1 = \{3, 4\}$

(iii) Solution set of  $x \geq -1 = \{-1, 0, 1, 3, 4\}$

(iv) Solution set of  $-5 < x < 3 = \{-3, -1, 0, 1\}$

(v) Solution set of  $-3 \leq x < 4 = \{-3, -1, 0, 1, 3\}$

(vi) Solution set of  $0 \leq x < 7 = \{0, 1, 3, 4\}$

Question 2.

Represent the following inequations graphically:

(i)  $x \leq 3, x \in \mathbb{N}$

(ii)  $x < 4, x \in \mathbb{W}$

(iii)  $-2 \leq x < 4, x \in \mathbb{I}$

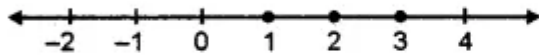
(iv)  $-3 \leq x \leq 2, x \in \mathbb{I}$

Solution:

(i) Given  $x \leq 3, x \in \mathbb{N}$

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

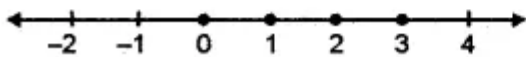
The solution set is shown by thick dots on the number line.



(ii)  $x < 4, x \in \mathbb{W}$

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

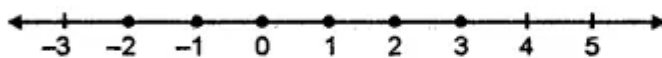
The Solution set is shown by thick dots on the number line.



(iii)  $-2 \leq x < 4, x \in \mathbb{I}$

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

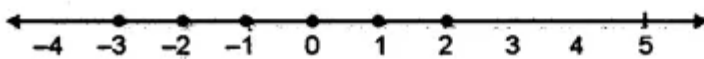
The graph of the solution set is shown by thick dots on the number line.



(iv)  $-3 \leq x \leq 2, x \in \mathbb{I}$

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

The graph of the solution set is shown by thick dots on the number line.



Question 3.

Solve the following inequations.

(i)  $4 - x > -2, x \in \mathbb{N}$

(ii)  $3x + 1 \leq 8, x \in \mathbb{W}$

Also represent their solutions on the number line.

Solution:

(i) Given,  $4 - x > -2$

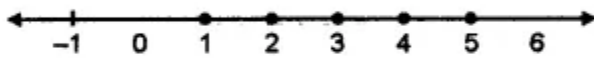
Subtract 4 from both sides

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

$$\Rightarrow x < 6 \text{ (Reverse the symbols)}$$

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

The graph of the solution set



(ii) Given  $3x + 1 \leq 8$ .

Subtracting -1 from both sides,

$$3x + 1 - 1 \leq 8 - 1$$

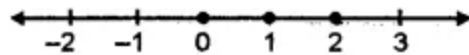
$$3x \leq 7$$

Dividing both sides by 3

$$\Rightarrow x \leq \frac{7}{3}$$

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

The graph of the solution set



Question 4.

Solve  $3 - 4x < x - 12$ ,  $x \in \{-1, 0, 1, 2, 3, 4, 5, 6, 7\}$ .

Solution:

Given  $3 - 4x < x - 12$

Subtracting 3 from both sides

$$\Rightarrow -3 + 3 - 4x < x - 12 - 3$$

$$\Rightarrow -4x < x - 15$$

Subtracting  $x$  from both sides

$$\Rightarrow -4x - x < x - x - 15$$

$$\Rightarrow -5x < -15 \Rightarrow x > 3$$

(Dividing by  $-5$  and reverse the symbols)

As  $x \in \{-1, 0, 1, 2, 3, 4, 5, 6, 7\}$

The solution set =  $\{4, 5, 6, 7\}$

Question 5.

Solve  $-7 < 4x + 1 \leq 23$ ,  $x \in I$ .

Solution:

Given,  $-7 < 4x + 1 \leq 23$ .

We take  $-7 < 4x + 1 \leq 23$ .

Subtracting -1 from all sides,

$$-7 - 1 < 4x + 1 - 1 \leq 23 - 1$$

$$-8 < 4x \leq 22$$

$$\frac{-8}{4} < \frac{4x}{4} \leq \frac{22}{4} \text{ (Dividing by 4)}$$

$$-2 < x \leq 5.5$$

As  $x \in I$ , the solution set =  $\{-1, 0, 1, 2, 3, 4, 5\}$ .