Unit 2
Algebra

Chapter 5
Linear Inequations

POINTS TO REMEMBER

1. **Linear inequation :** A statement of inequality between two expressions involving a single variable x with highest power one, is called a linear inequation. The general forms of linear inequations are :

   (*i*) $ax + b > c$ (*ii*) $ax + b < c$

   (*iii*) $ax + b \geq c$ (*iv*) $ax + b \leq 0$

   where a, b, c are real numbers and $a \neq 0$.

2. **Replacement set or Domain of the Variable :** The set from which the values of the variable x are replaced in an inequation, is called the replacement set or the domain of the variable. The replacement set is always given to us.

3. **Solution Set :** The set of all those values of x from the replacement set which satisfy the given inequation, is called the solution set of the inequation. Solution set is always a subset of the replacement set.

4. **Properties of Inequations :**

   (*i*) Adding or subtracting the same number or expression to each side of an inequation does not change the inequality.

   (*ii*) Multiplying or dividing each side of an inequation by the same positive number does not change the inequality.

   (*iii*) Multiplying or dividing each side of an inequation by the same negative number reverses the inequality.

   (*iv*) $a < b \Leftrightarrow b > a$

   (*v*) $a > b \Leftrightarrow b < a$

5. **Some Special Sets of Numbers shown on Number Line :**

   We should like to have a glimps on how we represent sets of numbers on a number line.

EXERCISE 5

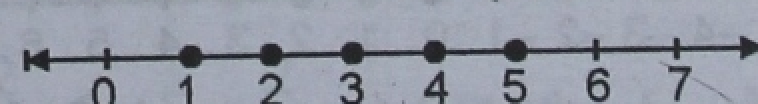
Solve each of the inequations given below and represent its solution set on a number line :

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

Sol. $2x - 7 < 4 \quad \Rightarrow 2x < 4 + 7$

$\Rightarrow 2x < 11 \quad \Rightarrow \quad x < \frac{11}{2}$

$\therefore$ Solution set is $\{1, 2, 3, 4, 5\}$ **Ans.**



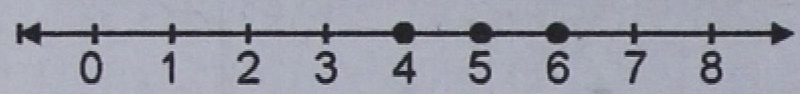
Q.2. $2x - 3 > 3, x \in \{1, 2, 3, 4, 5, 6\}$

Sol. $2x - 3 > 3 \quad \Rightarrow 2x > 3 + 3$

$\Rightarrow\ 2x > 6 \qquad \Rightarrow\ x > \frac{6}{2}$

$\Rightarrow\ x > 3$

$\therefore$ Solution set is {4, 5, 6} **Ans.**



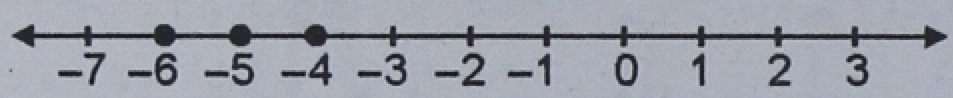
Q.3. $9 \le 1 - 2x,\ x \in \{-3, -4, -5, -6\}$.

Sol. $9 \le 1 - 2x \qquad \Rightarrow\ 2x \le 1 - 9$

$\Rightarrow 2x \le -8 \qquad \Rightarrow\ x \le -\frac{8}{2}$

$\Rightarrow\ x \le -4$

$\therefore$ Solution set is {–4, –5, –6} **Ans.**



Q.4. $\frac{3x-5}{6} > \frac{1}{2},\ x \in \{0, 1, 2, 3, 4, 5, 6\}$

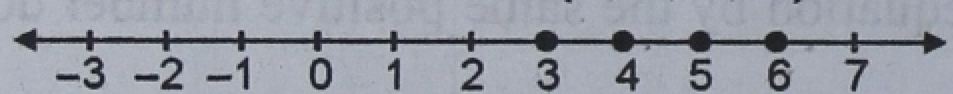
Sol. $\frac{3x-5}{6} > \frac{1}{2} \Rightarrow 3x - 5 > \frac{1}{2} \times 6$

$\Rightarrow 3x - 5 > 3 \quad \Rightarrow \quad 3x > 3 + 5$

$\Rightarrow \quad 3x > 8 \quad \Rightarrow \quad x > \frac{8}{3}$

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

$\therefore$ Solution set is {3, 4, 5, 6} **Ans.**



Q.5. $7x - 4(3 - x) \ge 3(2x - 5)$,
$x \in \{-3, -2, -1, 0, 1, 2, 3\}$

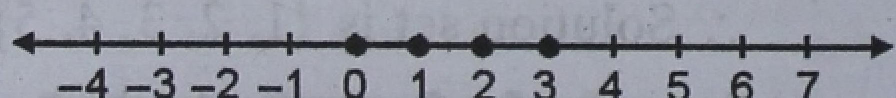
Sol. $7x - 4(3 - x) \ge 3(2x - 5)$

$\Rightarrow 7x - 12 + 4x \ge 6x - 15$

$\Rightarrow 7x + 4x - 6x \ge -15 + 12$

$\Rightarrow 5x \ge -3 \quad \Rightarrow \quad x \ge -\frac{3}{5}$

$\therefore$ Solution set is {0, 1, 2, 3} **Ans.**



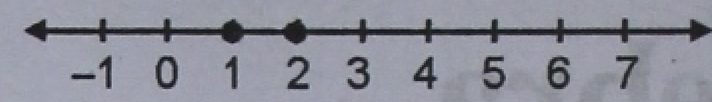
Q.6. $11 - 3x > 2 + x,\ x \in \{1, 2, 3, 4, 5, 6\}$

Sol. $11 - 3x > 2 + x$

$\Rightarrow -3x - x > 2 - 11 \quad \Rightarrow -4x > -9$

$\Rightarrow\ 4x < 9 \quad \Rightarrow\ x < \frac{9}{4} \Rightarrow x < 2\frac{1}{4}$

$\therefore$ Solution set is {1, 2} **Ans.**



Q.7. $4 - 3x \ge 3x - 14,\ x \in N$

Sol. $4 - 3x \ge 3x - 14$

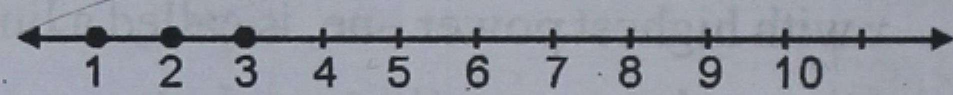
$\Rightarrow -3x - 3x \ge -14 - 4$

$\Rightarrow \quad -6x \ge -18 \quad \Rightarrow\ 6x \le 18$

$\Rightarrow \quad x \le \frac{18}{6} \quad \Rightarrow \quad x \le 3.$

$\therefore$ Solution set is {1, 2, 3} $\{\because x \in N\}$

Ans.



Q.8. $6 - 5x > 3 - 4x,\ x \in W$

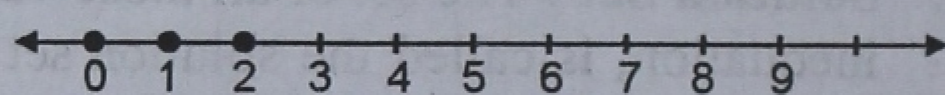
Sol. $6 - 5x > 3 - 4x$

$\Rightarrow -5x + 4x > 3 - 6$

$\Rightarrow \quad -x > -3 \quad \Rightarrow x < 3$

$\therefore$ Solution set is {0, 1, 2} $(\because x \in W)$

Ans.



Q.9. $30 - 2(3x - 4) < 24,\ x \in W$

Sol. $30 - 2(3x - 4) < 24$

$\Rightarrow 30 - 6x + 8 < 24$

$\Rightarrow \quad -6x < 24 - 30 - 8$

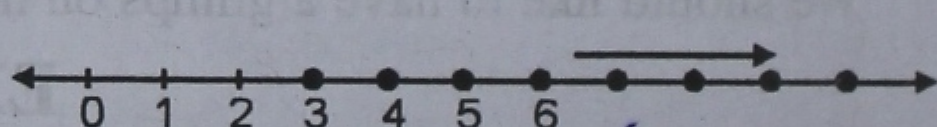
$\Rightarrow -6x < 24 - 38 \Rightarrow \quad -6x < -14$

$\Rightarrow \quad 6x > 14 \quad \Rightarrow \quad x > \frac{14}{6}$

$\Rightarrow \quad x > \frac{7}{3} \quad \Rightarrow \quad x > 2\frac{1}{3}$

$\therefore$ Solution set is {3, 4, 5, 6,......},

$(\because x \in W)$ **Ans.**



Q.10. $\frac{3}{5}x - \frac{2x-1}{3} > 1,\ x \in I$

Sol. $\frac{3}{5}x - \frac{2x-1}{3} > 1$

Multiplying by 15, the LCM of 5 and 3

$15 \times \frac{3}{5}x - 15 \times \frac{2x-1}{3} > 1 \times 15$

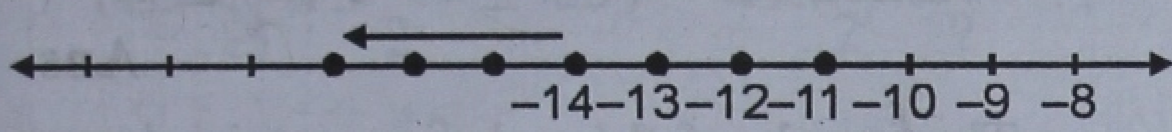
$\Rightarrow 9x - 5(2x - 1) > 15$

$\Rightarrow 9x - 10x + 5 > 15$

$\Rightarrow -x > 15 - 5 \quad \Rightarrow -x > 10$

$\Rightarrow x < -10$

$\therefore$ Solution set is $\{-11, -12, -13, ...\}$ $(\because x \in I)$ **Ans.**



Q.11. $-3 < 2x - 1 < x + 4, x \in I$

Sol. $-3 < 2x - 1 < x + 4$

(*i*) $-3 < 2x - 1 \Rightarrow -2x < -1 + 3$

$\Rightarrow -2x < 2 \quad \Rightarrow 2x > -2$

$\Rightarrow x > \frac{-2}{2} \quad \Rightarrow x > -1$

(*ii*) $2x - 1 < x + 4 \Rightarrow 2x - x < 4 + 1$

$\Rightarrow x < 5$

From (*i*) and (*ii*), solution set is $\{0, 1, 2, 3, 4\}$ **Ans.**

Q.12. $2 + 4x < 2x - 5 < 3x, x \in I$

Sol. $2 + 4x < 2x - 5 < 3x$

(*i*) $2 + 4x < 2x - 5$

$\Rightarrow 4x - 2x < -5 - 2 \quad \Rightarrow 2x < -7$

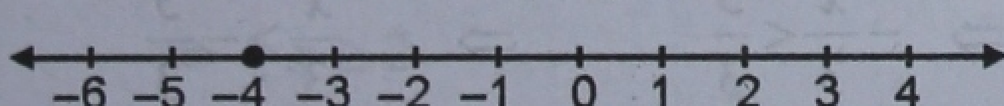
$\Rightarrow x < -\frac{7}{2} \quad \Rightarrow x < -3\frac{1}{2}$

(*ii*) $2x - 5 < 3x \quad \Rightarrow -3x + 2x < 5$

$\Rightarrow -x < 5 \quad \Rightarrow x > -5$

From (*i*) and (*ii*)

Solution set is $\{-4\}$ **Ans.**



Q.13. Find the smallest value of x, which satisfies the inequation $2x + \frac{7}{2} > \frac{5x}{3} + 3$, $x \in I$

Sol. $2x + \frac{7}{2} > \frac{5x}{3} + 3$

Multiplying by 6, the LCM of 2 and 3

$6 \times 2x + 6 \times \frac{7}{2} > 6 \times \frac{5x}{3} + 6 \times 3$

$\Rightarrow 12x + 21 > 10x + 18$

$\Rightarrow 12x - 10x > 18 - 21$

$\Rightarrow 2x > -3 \Rightarrow x > -\frac{3}{2} \quad \Rightarrow x > -1\frac{1}{2}$

$\therefore x \in I$ and it has smallest value

$x = 1$ **Ans.**

Q.14. If $10 - 5x < 5(x + 6)$, find the smallest value of x, when (*i*) $x \in I$ (*ii*) $x \in W$ (*iii*) $x \in N$

Sol. $10 - 5x < 5(x + 6)$

$\Rightarrow 10 - 5x < 5x + 30$

$\Rightarrow -5x - 5x < 30 - 10$

$\Rightarrow -10x < 20 \quad \Rightarrow 10x > -20$

$\Rightarrow x > \frac{-20}{10} \quad \Rightarrow x > -2$

(*i*) When $x \in I$ and it has the smallest value.

$\therefore x = -1$

(*ii*) When $x \in W$ and it has the smallest value.

$\therefore x = 0$

(*iii*) When $x \in N$ and it has the smallest value.

$\therefore x = 1$ **Ans.**

Q.15. Solve each of the inequations given below and graph the solution set on the number line :

(*i*) $2x + 3 \leq 3x + 1, x \in R$

(*ii*) $\frac{5x-8}{3} \geq \frac{4x-7}{2}, x \in R$

(*iii*) $\frac{5x}{4} - \frac{4x-1}{3} > 1, x \in R$

(*iv*) $2 \leq 2x - 3 \leq 5, , x \in R$

(*v*) $-1 \leq 3 + 4x < 23, x \in R$

(*vi*) $2x - 5 \leq 5x + 4 < 11, x \in R$

(*vii*) $-\frac{2}{3} < 1 + \frac{x}{3} \leq \frac{2}{3}, x \in R$

(*viii*) $-2 \leq \frac{1}{2} - \frac{2x}{3} < 1\frac{5}{6}, x \in I$

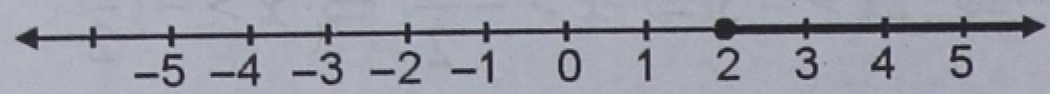
(*ix*) $1 \geq 15 - 7x > 2x - 27, x \in N$

Sol. (*i*) $2x + 3 \leq 3x + 1, x \in R$

$\Rightarrow 2x - 3x \leq 1 - 3 \quad \Rightarrow -x \leq -2$

$\Rightarrow \quad x \geq 2$

$\therefore$ Solution set is $\{x : x \geq 2, x \in R\}$



(*ii*) $\dfrac{5x-8}{3} \geq \dfrac{4x-7}{2}, x \in R$

$(5x - 8) \times 2 \geq (4x - 7) \times 3$

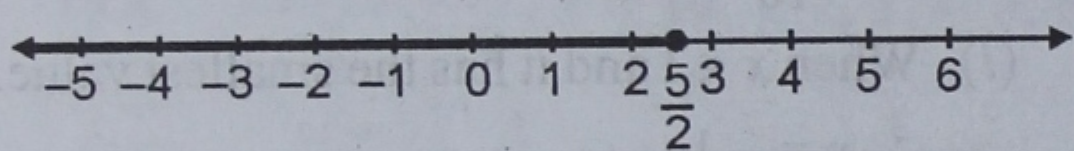
(By Cross multiplication)

$\Rightarrow \quad 10x - 16 \geq (12x - 21)$

$\Rightarrow \quad 10x - 12x \geq -21 + 16$

$\Rightarrow \quad -2x \geq -5 \Rightarrow 2x \leq 5 \Rightarrow x \leq \dfrac{5}{2}$

$\therefore$ Solution set is $\{x : x \leq \dfrac{5}{2}, x \in R\}$



(*iii*) $\dfrac{5x}{4} - \dfrac{4x-1}{3} > 1, x \in R$

Multiplying by 12, the LCM of 4 and 3

$12 \times \dfrac{5x}{4} - 12 \times \dfrac{4x-1}{3} > 12 \times 1$

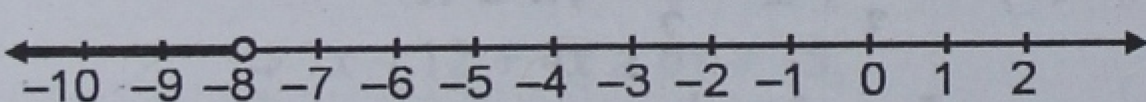
$\Rightarrow 15x - 4(4x - 1) > 12$

$\Rightarrow 15x - 16x + 4 > 12$

$\Rightarrow \quad -x > 12 - 4$

$\Rightarrow \quad -x > 8 \quad \Rightarrow x < -8$

Hence, solution set is $\{x : x < -8, x \in R\}$



(*iv*) $2 \leq 2x - 3 \leq 5, \in R, x \in R$

(*a*) $2 \leq 2x - 3 \Rightarrow 2 + 3 \leq 2x$

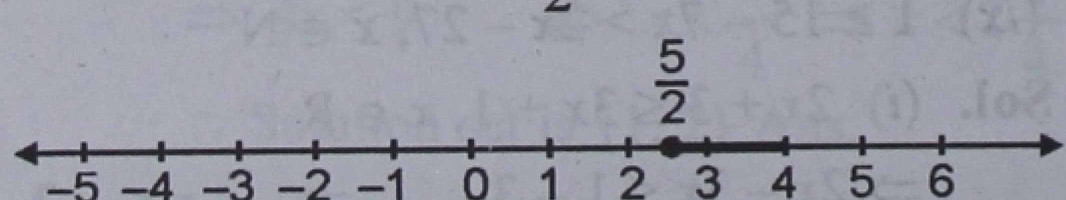
$\Rightarrow 2x \geq 5 \quad \Rightarrow \quad x \geq \dfrac{5}{2}$

(*b*) $2x - 3 \leq 5 \quad \Rightarrow \quad 2x \leq 5 + 3$

$\Rightarrow \quad 2x \leq 8 \quad \Rightarrow \quad x \leq 4$

From (*a*) and (*b*), solution set

$= \{x : \dfrac{5}{2} \leq x \leq 4, x \in R\}$



(*v*) We have

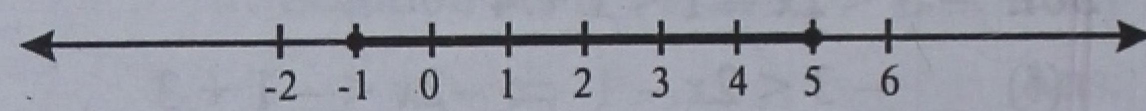
$-1 \leq 3 + 4x < 23, x \in R$

$\Rightarrow \quad -1 - 3 \leq 4x < 23 - 3 \quad \Rightarrow \quad -4 \leq 4x < 20$

$\Rightarrow \quad 1 \leq x < 5, x \in R$

$\therefore$ Solution set $= \{-1 \leq x < 5 \,;\, x \in R\}$ **Ans.**

The graph of the solution set is shown below :



(*vi*) $2x - 5 \leq 5x + 4 < 11, x \in R$

(*a*) $2x - 5 \leq 5x + 4 \Rightarrow 2x - 5x \leq 4 + 5$

$\Rightarrow -3x \leq 9 \quad \Rightarrow \quad 3x \geq -9$

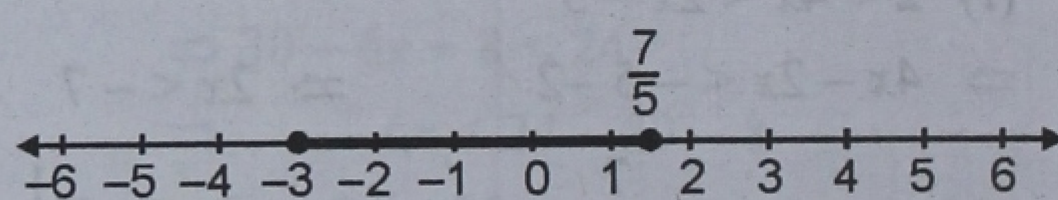
$\Rightarrow \quad x \geq -3$

(*b*) $5x + 4 < 11 \quad \Rightarrow \quad 5x < 11 - 4$

$\Rightarrow \quad 5x < 7 \quad \Rightarrow \quad x < \dfrac{7}{5}$

From (*a*) and (*b*), solution set

$= \{x : -3 \leq x < \dfrac{7}{5}, x \in R\}$



(*vii*) $-\dfrac{2}{3} < 1 + \dfrac{x}{3} \leq \dfrac{2}{3}, x \in R$

(*a*) $-\dfrac{2}{3} < 1 + \dfrac{x}{3} \Rightarrow -\dfrac{x}{3} < 1 + \dfrac{2}{3}$

$\Rightarrow -\dfrac{x}{3} < \dfrac{5}{3} \quad \Rightarrow \quad \dfrac{x}{3} > -\dfrac{5}{3}$

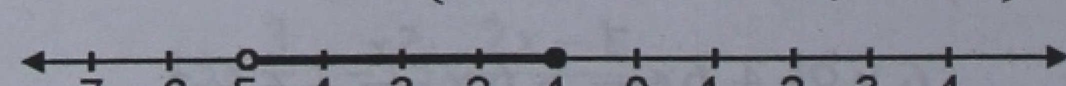
$\Rightarrow \quad x > -5$

(*b*) $1 + \dfrac{x}{3} \leq \dfrac{2}{3} \quad \Rightarrow \quad \dfrac{x}{3} \leq \dfrac{2}{3} - 1$

$\Rightarrow \dfrac{x}{3} \leq -\dfrac{1}{3} \quad \Rightarrow \quad x \leq -1$

From (*a*) and (*b*), solution set

$= \{x : -5 < x \leq -1, x \in R\}$



(*viii*) $-2 \le \frac{1}{2} - \frac{2x}{3} < 1\frac{5}{6},\ x \in \text{I}$

(*a*) $-2 \le \frac{1}{2} - \frac{2x}{3} \Rightarrow \frac{2x}{3} \le \frac{1}{2} + 2$

$\Rightarrow \frac{2}{3}x \le \frac{5}{2} \Rightarrow x \le \frac{5}{2} \times \frac{3}{2}$

$\Rightarrow x \le \frac{15}{4} \Rightarrow x \le 3\frac{3}{4}$

(*b*) $\frac{1}{2} - \frac{2}{3}x < 1\frac{5}{6}$

$\Rightarrow \frac{-2}{3}x < 1\frac{5}{6} - \frac{1}{2}$

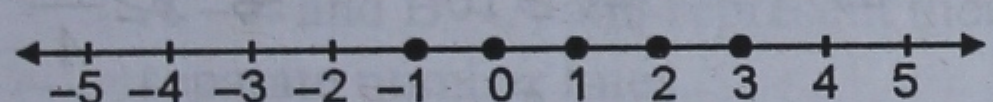
$\Rightarrow -\frac{2}{3}x < \frac{11}{6} - \frac{1}{2}$

$\Rightarrow -\frac{2}{3}x < \frac{11-3}{6}$

$\Rightarrow -\frac{2}{3}x < \frac{8}{6} \Rightarrow \frac{2}{3}x > -\frac{8}{6}$

$\Rightarrow x > -\frac{8}{6} \times \frac{3}{2} \Rightarrow x > -2$

From (*a*) and (*b*), solution set is $\{-1, 0, 1, 2, 3\}$, ($\therefore x \in \text{I}$)



(*ix*) $1 \ge 15 - 7x > 2x - 27,\ x \in \text{N}$

(*a*) $1 \ge 15 - 7x \Rightarrow 7x \ge 15$ -1

$\Rightarrow 7x \ge 14 \Rightarrow x \ge \frac{14}{7}$

$\Rightarrow x \ge 2$

(*b*) $15 - 7x > 2x - 27$

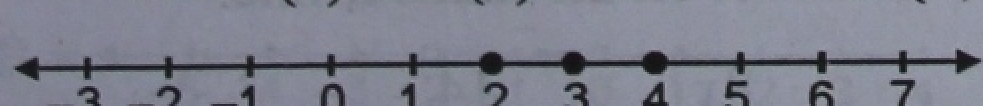
$\Rightarrow -7x - 2x > -27 - 15$

$\Rightarrow -9x > -42 \Rightarrow 9x < 42$

$\Rightarrow x < \frac{42}{9} \Rightarrow x < \frac{14}{3}$

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

From (*a*) and (*b*) solution set is $\{2, 3, 4\}$



Q.16. Find the range of values of x, which satisfy $-\frac{1}{3} \le \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}$. Graph the values of x on the real line.

Sol. $-\frac{1}{3} \le \frac{x}{2} - 1\frac{1}{3} < \frac{1}{6}$

(*a*) $-\frac{1}{3} \le \frac{x}{2} - \frac{4}{3}$

$\Rightarrow -\frac{x}{2} \le -\frac{4}{3} + \frac{1}{3} \Rightarrow -\frac{x}{2} \le \frac{-3}{3}$

$\Rightarrow -\frac{x}{2} \le -1 \Rightarrow \frac{x}{2} \ge 1$

$\Rightarrow x \ge 2$

(*b*) $\frac{x}{2} - 1\frac{1}{3} < \frac{1}{6} \Rightarrow \frac{x}{2} - \frac{4}{3} < \frac{1}{6}$

$\Rightarrow \frac{x}{2} < \frac{1}{6} + \frac{4}{3} \Rightarrow \frac{x}{2} < \frac{1+8}{6}$

$\Rightarrow \frac{x}{2} < \frac{9}{6} \Rightarrow x < \frac{9}{6} \times 2$

$\Rightarrow x < 3$

$\therefore$ From (*a*) and (*b*), solution set is $\{x : 2 \le x < 3, x \in \text{R}\}$

Q.17. Solve the following inequation and graph the solution on the number line.

$$-2\frac{2}{3} \le x + \frac{1}{3} < 3\frac{1}{3};\ x \in \text{R}$$

Graph the values of x on the number line.

Sol. Given $-2\frac{2}{3} \le x + \frac{1}{3} < 3\frac{1}{3};\ x \in \text{R}$

$$-\frac{8}{3} \le x + \frac{1}{3} < \frac{10}{3}$$

Multiplying by 3, L.C.M. of fractions, we get

$-8 \le 3x + 1 < 10$

$-8 - 1 \le 3x + 1 - 1 < 10 - 1$

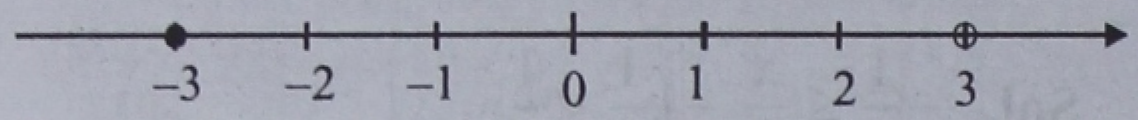
[Add – 1]

$-9 \le 3x < 9$

$-3 \le x < 3$

[Dividing by 3]

Hence, the solution set is $\{x : x \in R, -3 \le x < 3\}$



The graph of the solution set is shown by the thick portion of the number line. The solid circle -3 indicates that the number -3 is included ng the solutions whereas the open circle at 3 ates that 3 is not included among the solutions.

.18. Given : $P = \{x : 5 < 2x - 1 \le 11, x \in R\}$ and $Q = \{x : -1 \le 3 + 4x < 23, x \in I\}$, where R = {real numbers} and I = {integers}.

Represent P and Q on the number line. Write down the elements of $P \cap Q$.

Sol. $P = \{x : 5 < 2x - 1 \le 11, x \in R\}$

$Q = \{x : -1 \le 3 + 4x < 23, x \in I\}$

(*i*) $5 < 2x - 1 \Rightarrow -2x < -1 - 5$

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

$\Rightarrow x > 3$

(*ii*) $2x - 1 \le 11 \Rightarrow 2x \le 11 + 1$

$\Rightarrow 2x \le 12 \Rightarrow x \le \frac{12}{2} \Rightarrow x \le 6$

$\therefore$ From (*i*) and (*ii*), solution set is

$P = \{x : 3 < x \le 6, x \in R\}$

Again (*i*) $-1 \le 3 + 4x$

$\Rightarrow -4x \le 3 + 1 \Rightarrow -4x \le 4$

$\Rightarrow 4x \ge -4 \Rightarrow x \ge -1$

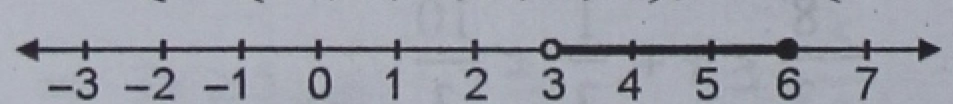
(*ii*) $3 + 4x < 23 \Rightarrow 4x < 23 - 3$

$\Rightarrow 4x < 20 \Rightarrow x < \frac{20}{4}$

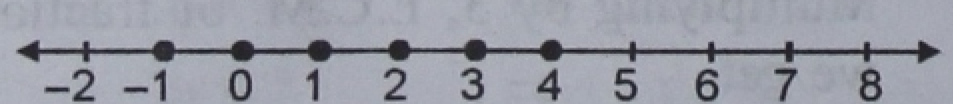
$\Rightarrow x < 5$

From (*i*) and (*ii*), solution set is

$Q = \{-1, 0, 1, 2, 3, 4\}$, $\{\because x \in I\}$



$P = \{x : 3 < x \le 6, x \in R\}$



$Q = \{-1, 0, 1, 2, 3, 4\}$

$\therefore P \cap Q = \{4\}$ **Ans.**

Q.19. Solve each of the following inequations and graph the solution set on the number line :

(*i*) $5x - 11 \le 7x - 5 < 9$

(*ii*) $2x - 1 \ge x + \frac{7-x}{3} > 2$

Sol. (*i*) $5x - 11 \le 7x - 5 < 9$

(*a*) $5x - 11 \le 7x - 5$

$\Rightarrow 5x - 7x \le -5 + 11$

$\Rightarrow -2x \le 6 \Rightarrow 2x \ge -6$

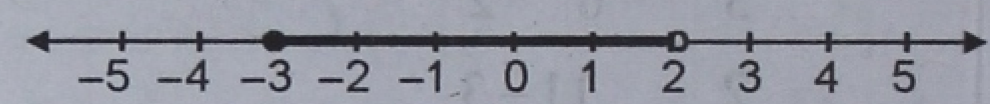
$\Rightarrow x \ge -\frac{6}{2} \Rightarrow x \ge -3$

(*b*) $7x - 5 < 9 \Rightarrow 7x < 9 + 5$

$\Rightarrow 7x < 14 \Rightarrow x < \frac{14}{7}$

$\Rightarrow x < 2.$

From (*a*) and (*b*), solution set is $\{x : -3 \le x < 2, x \in R\}$



(*ii*) $2x - 1, \ge x + \frac{7-x}{3,} > 2$

(*a*) $2x - 1 \ge x + \frac{7-x}{3}$

Multiplying by 3, we get

$6x - 3 \ge 3x + 7 - x$

$\Rightarrow 6x - 3x + x \ge 7 + 3$

$\Rightarrow 4x \ge 10 \Rightarrow x \ge \frac{10}{4}$

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

(*b*) $x + \frac{7-x}{3} > 2$

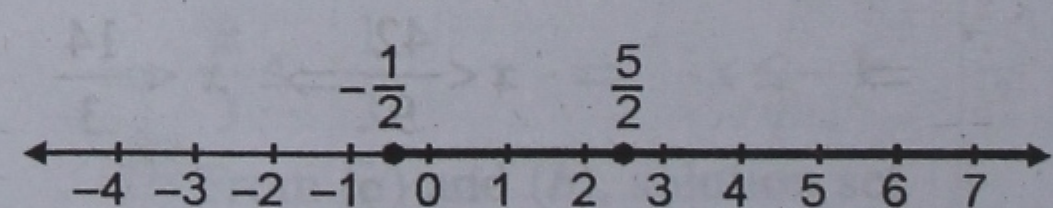
Multiplying by 3, we get

$3x + 7 - x > 6 \Rightarrow 2x > 6 - 7$

$\Rightarrow 2x > -1 \Rightarrow x > -\frac{1}{2}$

From (*a*) and (*b*), solution set is

$\{x : x \ge \frac{5}{2}, x \in R\}$



Q. 20. Solve the inequation and represent the solution set on the number line.

$-3 + x \le \frac{8x}{3} + 2 \le \frac{14}{3} + 2x$, where $x \in I$.

Sol.Given :

$$-3 + x \le \frac{8x}{3} + 2 \le \frac{14}{3} + 2x, \text{ where } x \in I$$

$$\Rightarrow -3 + x \le \frac{8x}{3} + 2 \qquad ....(i)$$

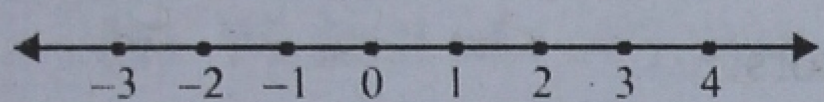
$$\text{and } \frac{8x}{3} + 2 \le \frac{14}{3} + 2x \qquad ....(ii)$$

$$\Rightarrow -5 \le \frac{5x}{3} \text{ and } \frac{2x}{3} \le \frac{8}{3} \Rightarrow x \ge -3 \text{ and } x \le 4$$

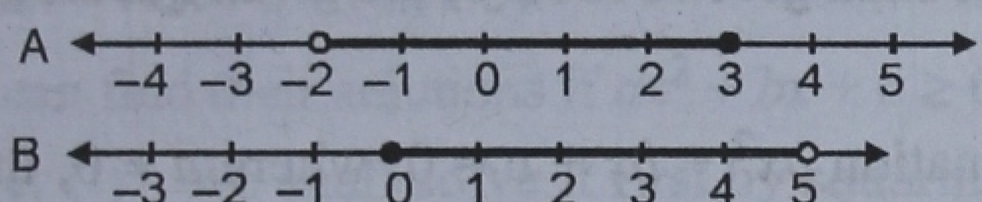
$\therefore -3 \le x \le 4$

Solution set = {–3, –2, –1, 0, 1, 2, 3, 4}

Number line



Q.21. The given diagram represents two sets A and B on the number line :



(*i*) Write down A and B in set builder form.

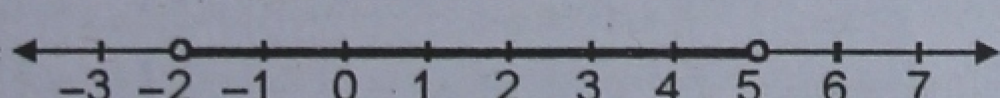
(*ii*) Write down $A \cup B$, $A \cap B$, $A' \cap B$, $A - B$ and $B - A$ and represent them on separate number lines.

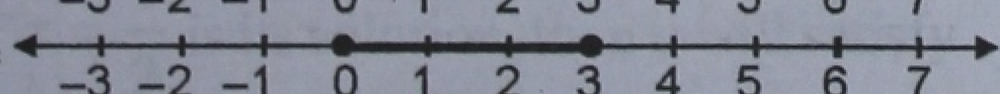
Sol. From the given number line, we find that

(*i*) $A = \{x : -2 < x \le 3, x \in R\}$and
$B = \{x : 0 \le x < 5, x \in R\}$.

(*ii*) $A \cup B = \{x : -2 < x < 5, x \in R\}$and
$A \cap B = \{x : 0 \le x \le 3, x \in R\}$

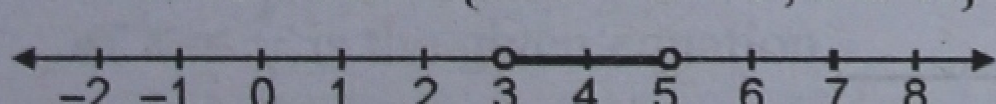
Now number lines of

$A \cup B =$ 

$A \cap B =$ 

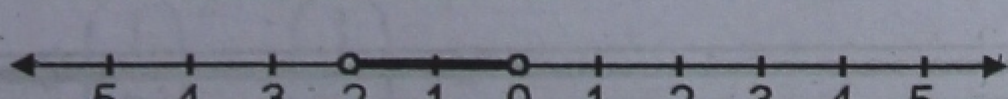
Now $A' = \{x : x > 3\}$

$\therefore A' \cap B = \{x : 3 < x < 5, x \in R\}$



$A - B = \{x : 2 < x < 0, x \in R\}$ and
$B - A = \{x : 3 < x < 5, x \in R\}$

Now number lines of

$A - B =$ 

Number of line of B – A is same as $A' \cap B$ as given above.

Q. 22. $A = \{x : 11x - 5 > 7x + 3, x \in R\}$ and
$B = \{x : 18x - 9 \ge 15 + 12x, x \in R\}$

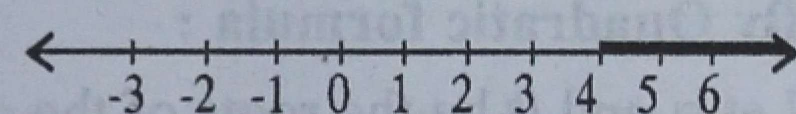
Find the range of set $A \cap B$ and represent it on a number line

Sol. $A = \{x : 11x - 5 > 7x + 3, x \in R\}$
$B = \{x : 18x - 9 \ge 15 + 12x, x \in R\}$

Now, $A = 11x - 5 > 7x + 3$
$= 11x - 7x > 3 + 5 \; = 4x > 8$
$= x > 2, \; x \in R$
$B = 18x - 9 \ge 15 + 12x$
$= 18x - 12x \ge 15 + 9$
$= 6x \ge 24$
$= x \ge 4 \; (x \in R)$

$\therefore A \cap B = x \ge 4, x \in R$

Hence Range of $A \cap B = \{x : x \ge 4, x \in R\}$ and its graph will be.



Q.23. Given : $A = \{x : 5x - 4 \ge 6, x \in R\}$ and $B = \{x : 5 - x > 1, x \in R\}$

Represent A and B on the real line.

Find (*i*) $A \cap B$ (*ii*) $A' \cap B$.

Sol. $A = \{x : 5x - 4 \ge 6, x \in R\}$
$B = \{x : 5 - x > 1, x \in R\}]$

In set A, $5x - 4 \ge 6$

$\Rightarrow 5x \ge 6 + 4 \;\Rightarrow\; 5x \ge 10$

$\Rightarrow x \ge \frac{10}{5} \;\Rightarrow\; x \ge 2$

$\therefore A = \{x : x \ge 2, x \in R\}$

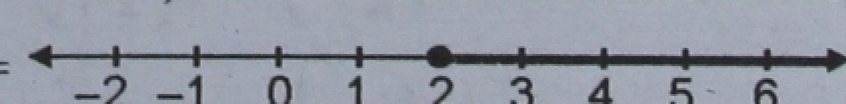
In set B, $5 - x > 1$

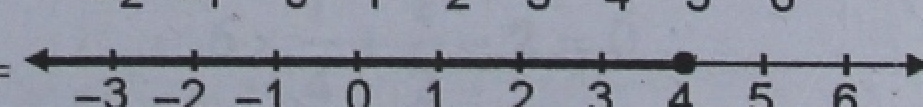
$\Rightarrow -x > 1 - 5 \;\Rightarrow\; -x > -4$

$\Rightarrow \; x < 4$

$\therefore B = \{x : x < 4, x \in R\}$.

Now, number line of A and B are given.

A = 

B = 

Now (*i*) $A \cap B = \{x : 2 \le x < 4, x \in R\}$

and (*ii*) $A' = \{x : x < 2, x \in R\}$

$\therefore A' \cap B = \{x : x < 2, x \in R\}$ **Ans.**