Chapter 4

Linear inequations

Exercise 4

1. Solve the inequation, $3x - 11 < 3$ where $x \in \{1,2,3, ...,10\}$. Also, represent its solution on a number line

Solution

Given inequation, $3x - 11 < 3$

$3x < 3 + 11$

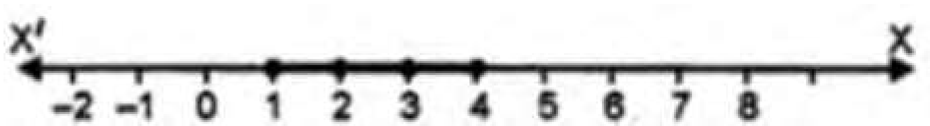
$3x < 14$

$= x < \frac{14}{3}$

But, $x \in \{1, 2, 3, ... ,10\}$

Hence the solution set is $\{1, 2, 3, 4\}$

Representing the solution on a number line:



2. solve 2(x – 3) < 1, x ∈{1,2,3,....10}

Solution

Given inequation 2(x – 3) < 1

2x – 6 < 1

2x < 7

= x < $\frac{7}{2}$

But, x ∈ {1, 2, 3.....10}

Hence the solution set is {1,2,3}

3. solve 5 – 4x > 2 – 3x, x ∈ w. Also represent its solution on the number line

Solution

Given inequation, 5 – 4x > 2 – 3x

-4x + 3x > 2 – 5

-x > - 3

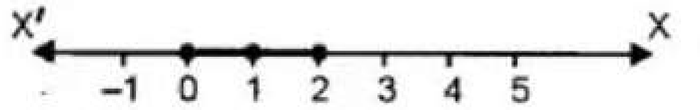
On multiplying both sides by – 1, the inequality reverses

= x < 3

Since, x ∈ w

The solution set is { 0, 1 , 2}

Representing the solution on a number line:



4. List the solution set of 30 – 4(2x – 1) < 30, given that x is a positive integer

Solution

Given inequation, $30 - 4(2x - 1) < 30$

$30 - 8x + 4 < 30$

$34 - 8x < 30$

$-8x < 30 - 34$

$-8x < -4$ [on multiplying both sides by – 1, the inequality reverse]

$8x > 4$

$X > \frac{4}{8}$

$= x > \frac{1}{2}$

As x is a positive integer

The solution set is { 1, 2, 3...}

5. solve: 2(x – 2) < 3x – 2, x ∈ { -3, -2, -1, 0, 1, 2, 3}

Solution

Given inequation 2(x -2) < 3x – 2

2x – 4 < 3x – 2

2x – 3x < - 2 + 4

-x < 2

= x > -2

But, x ∈ { -3, -2, -1, 0 , 1, 2, 3}

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

6. if x is a negative integer, find the solution set of

$\frac{2}{3} + \frac{1}{3}\ (x + 1) > 0$

solution

given inequation, $\frac{2}{3} + \frac{1}{3}(x + 1) > 0$

$\frac{2}{3} + \frac{x}{3} + \frac{1}{3}\ > 0$

$\frac{x}{3} +\ 1 > 0$

$\frac{x}{3}\ >\ -1$

$= x >\ -3$

As x is a negative integer

The solution set is {-1, -2}

7. Solve x – 3(2 + x) > 2(3x -1), x ∈ {-3, -2, -1, 0, 1, 2, 3} also represent its solution on the number line

Solution

Given inequation x – 3(2 + x) > 2(3x – 1)

X – 6 – 3x > 6x – 2

-2x – 6 > 6x – 2

-6x – 2x > -2 + 6

-8x > 4

X < $-\frac{4}{8}$

= x < $-\frac{1}{2}$

But x ∈ { -3, - 2, -1, 0, 1, 2, 3}

Hence the solution set is { -3, -2, -1}

8. given x ∈ { 1, 2, 3, 4, 5, 6, 7, 9} solve x – 3 < 2x – 1

Solution

Given inequation x – 3 < 2x – 1

X – 2x < - 1 + 3

$-x < 2$

$= x > -2$

But, x ∈ {1, 2, 3, 4, 5, 6, 7, 9 }

Hence the solution set is {1, 2, 3, 4, 5, 6, 7, 9}

9. List the solution set of the inequation $\frac{1}{2} + 8x > 5x - \frac{3}{2}$, x ∈ Z

Solution

Given inequation, $\frac{1}{2} + 8x > 5x - \frac{3}{2}$

$8x - 5x > -\frac{3}{2} - \frac{1}{2}$

$3x > -\frac{4}{2}$

$= x > -\frac{2}{3}$

As x ∈ Z

The solution set is {0, 1, 2, 3, 4, 5, ...}

10. List the solution set of $\frac{11-2x}{5} \geq \frac{9-3x}{8} + \frac{3}{4}$, $x \in N$

Solution

Given inequation $\frac{11-2x}{5} \geq \frac{9-3x}{8} + \frac{3}{4}$

$\frac{11-2x}{5} \geq \frac{9-3x+6}{8}$

8(11 -2x) ≥ 5(15 -3x)

88 – 16x ≥ 75 – 15x

15x – 16x ≥ 75 – 88

-x ≥ -13

= x ≤ 13

As x ∈ N

Hence the solution set is { 1, 2, 3, 4, ... 13}

11. Find the values of x, which satisfy the inequation:

-2 ≤ $\frac{1}{2} - \frac{2x}{3} \leq 1\frac{5}{6}$, $x \in N$. Graph the solution set on the number line.

Solution

Given inequation

-2 ≤ $\frac{1}{2} - \frac{2x}{3} \leq 1\frac{5}{6}$

$-2 \leq \frac{3-4x}{6} \leq \frac{11}{6}$

$-12 \leq 3 - 4x \leq 11$

$- 12 - 3 \leq -4x \leq 11 - 3$

$- 15 \leq -4x \leq 8$

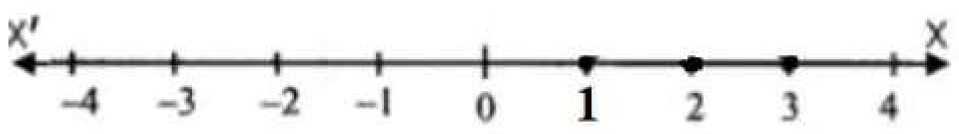
$-\frac{15}{4} \leq -x \leq \frac{8}{4}$

$= \frac{15}{4} \geq x \geq -2$

As x ∈ N,

The solution set is { 1, 2, 3}

Represent the solution on a number line:



12. if x ∈ W, find the solution set of $\frac{3}{5}x - \frac{2x-1}{3} > 1$. Also graph the solution set on the number line, if possible

Solution

Given inequation, $\frac{3}{5}x - \frac{2x-1}{3} > 1$

$\frac{9}{15}x - \frac{5(2x-1)}{15} > 1$ [taking L.C.M]

9x – 5(2x -1) > 15 [multiplying by 15 on both sides]

9x – 10x + 5 > 15

-x > 15 – 5

-x > 10

= x < - 10

But, x ∈ W

Hence the solution set is a null set.

Thus, it can't be represent on number line.

13. Solve:

(i) $\frac{x}{2} + 5 \leq \frac{x}{3} + 6$, where x is a positive odd integer.

(ii) $\frac{2x+3}{3} \geq \frac{3x-1}{4}$, where x is positive even integer.

Solution

(i) given inequation $\frac{x}{2} + 5 \leq \frac{x}{3} + 6$

$\frac{x+10}{2} \leq \frac{x+18}{3}$ [taking L.C.M on both sides]

$3(x + 10) \leq 2(x + 18)$ [on cross multiplying]

3x + 30 ≤ 2x + 36

3x – 2x ≤ 36 – 30

= x ≤ 6

As x is a positive odd integer.

Hence the solution set is { 1, 3, 5}

(ii) given inequation $\frac{2x+3}{3} \geq \frac{3x-1}{4}$

$4(2x+3) \geq 3(3x-1)$[on cross multiplying]

8x + 12 ≥ 9x – 3

-9x + 8x ≥ -12 -3

-x ≥ -15

= x ≤ 15

As x is positive even integer.

Hence the solution set is {2, 4, 6, 8, 10, 12, 14}

14. given that X ∈ 1, solve the inequation and graph the solution on the number line:

$\mathbf{3 \geq \frac{x-4}{2} + \frac{x}{3} \geq 2}$

Solution

Given inequation $3 \geq \frac{x-4}{2} + \frac{x}{3} \geq 2$

Now, let's take

$3 \geq \frac{x-4}{2} + \frac{x}{3}$ we have

$3 \geq \frac{3x-12+2x}{6}$ [taking L.C.M]

$18 \geq 5x - 12$

$30 \geq 5x$

$= x \leq 6$...(i)

Next

$\frac{x-4}{2} + \frac{x}{3} \geq 2$

$\frac{3x-12+2x}{6} \geq 2$

$5x - 12 \geq 12$

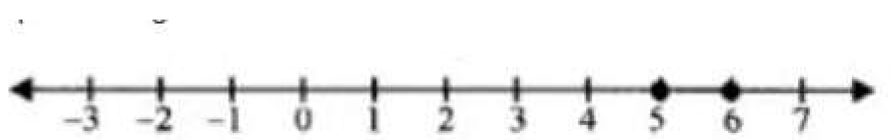
$5x \geq 24$

$X \geq \frac{24}{5} = x \geq 4.8$....(ii)

Hence from (i) and (ii) we have

Solution of x = { 5, 6}

Representing the solution on a number line:



15. solve: $1 \geq 15 - 7x > 2x - 27$, $x \in N$

Solution

Given inequation $1 \geq 15 - 7x > 2x - 27$

So we have

$1 \geq 15 - 7x$ and $15 - 7x > 2x - 27$

$7x \geq 15 - 1$ and $-2x - 7x > -27 - 15$

$7x \geq 14$ and $-9x > -42$

$X \geq 2$ and $-x > -\frac{42}{9}$

$X \geq 2$ and $x < \frac{14}{3}$

$= 2 \leq x < \frac{14}{3}$

But as $X \in N$

The solution set is {2,3,4}

16. If $x \in Z$, solve $2 + 4x < 2x - 5 \leq 3x$. Also represent its solution on the number line.

Solution

Given inequation $2 + 4x < 2x - 5 \leq 3x$

So we have

2 + 4x < 2x – 5 and 2x – 5 ≤ 3x

4x – 2x < -5 – 2 and 2x – 3x ≤ 5

2x < -7 and –x ≤ 5

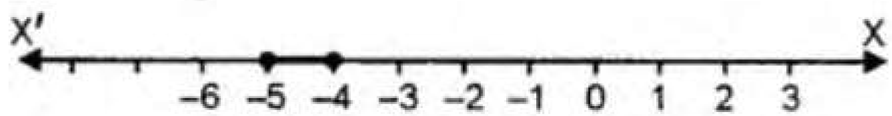
X < $-\frac{7}{2}$ and x ≥ -5

= $-5 \leq x < -\frac{7}{2}$

As x ∈ Z

The solution set is { -5, -4}

Representing the solution on a number line:



17. Solve: $\frac{4x-10}{3} \leq \frac{5x-7}{2}$ **, $x \in R$ and represent the solution set on the number line.**

Solution

Given inequation $\frac{4x-10}{3} \leq \frac{5x-7}{2}$

2(4x – 10) ≤ 3(5x – 7) [on cross multiplying]

8x – 20 ≤ 15x – 21

8x – 15x ≤ -21 + 20

$-7x \leq -1$

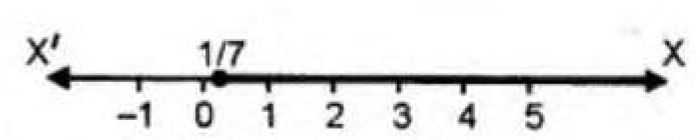
$-x \leq -\frac{1}{7}$

$X \geq \frac{1}{7}$

As $x \in R$

Hence the solution set is $\{x : x \in R, x \geq \frac{1}{7}\}$

Representing the solution on a number line:



18. Solve $\frac{3x}{5} - \frac{2x-1}{3} > 1,\ x \in R$ and represent the solution set on the number line.

Solution

Given inequation $\frac{3x}{5} - \frac{2x-1}{3} > 1$

$\frac{9x-10x+5}{15} > 1$ [taking L.C.M]

$-x + 5 > 15$

$-x > 15 - 5$

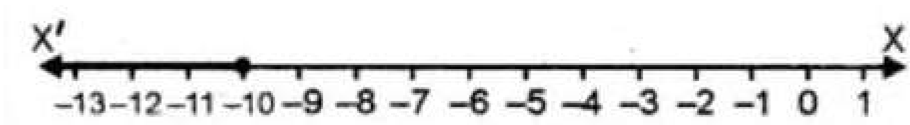
$-x > 10$

$x < -10$

As x ∈ R

Hence, the solution set is {x : x ∈ R, x < -10}

Representing the solution on a number line:



19. Given that X ∈ R, solve the following inequation and graph the solution on the number line: -1 ≤ 3 + 4x < 23

Solution

Given inequation -1 ≤ 3 + 4x < 23

-1 – 3 ≤ 4x < 23 -3

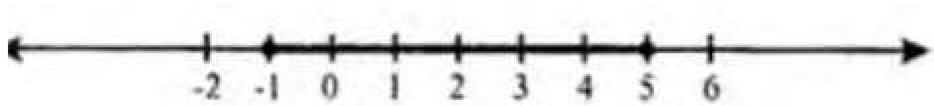
-4 ≤ 4x < 20

$-\frac{4}{4} \leq x < \frac{20}{4}$

-1 ≤ x < 5

Hence the solution set is {-1, ≤ x < 5; x ∈ R}

Representing the solution on a number line:



20. Solve the following inequation and graph the solution on the number line.

$$-2\frac{2}{3} \leq \boldsymbol{x} + \frac{1}{3} < 3 + \frac{1}{3} \quad \mathbf{x \in R}$$

Solution

Given inequation

$-2\frac{2}{3} \leq x + \frac{1}{3} < 3 + \frac{1}{3}$

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

$-8 \leq 3x + 1 < 10$ [multiplying by 3]

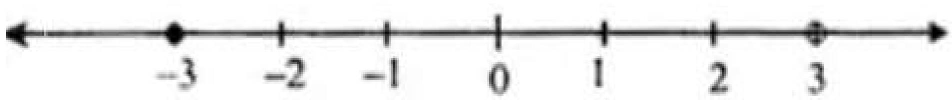
$-8 - 1 \leq 3x < 10 - 1$

$-9 \leq 3x < 9$

$-3 \leq x < 3$[dividing by 5]

Thus, the solution set is{x : x ∈ R, -3 ≤ x < 3}

Representing the solution on a number line:



21. solve the following inequation and represent the solution set on the number line:

$-3 < -\frac{1}{2} - \frac{2}{3}x \le \frac{5}{6}, x \in R$

Solution

Given in equation,

$-3 < -\frac{1}{2} - \frac{2x}{3} \le \frac{5}{6}, x \in R$

$-3 < -\frac{3+4x}{6} \le \frac{5}{6}$ [taking L.C.M]

$-18 < -3 - 4x \le 5$ [multiplying by 6]

$-18 + 3 < -4x \le 5 + 3$

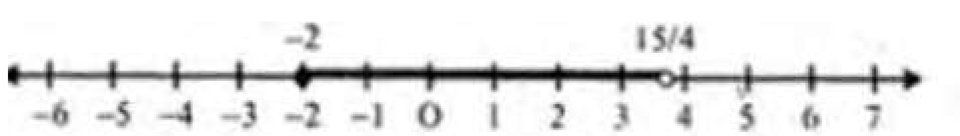
$-15 < -4x \le 8$

$-\frac{15}{4} < -x \le \frac{8}{4}$

$-2 \le x < \frac{15}{4}$

Hence, the solution set is $\{ x : x \in R, -2 \le x < \frac{15}{4}\}$

Represent the solution on a number line:



22. Solving the following inequation, write the solution set and represent it on the number line

-3(x – 7) ≥ $\mathbf{15 - 7x > x - \frac{1}{3}, x \in R}$

Solution

Given inequation , -3(x -7) ≥ 15 – 7x > $x + \frac{1}{3}$

-3x + 21≥ $15 - 7x > \frac{x+1}{3}$

So,

-3x + 21≥ $15 - 7x$

7x – 3x ≥ $15 - 21$

4x > -6

X ≥ $-\frac{6}{4}$

X ≥ $-\frac{3}{2}$

And

15 – 7x > $\frac{x+1}{3}$

3(15 – 7x) > $x + 1$

45 – 21x > $x + 1$

-21x – x > $1 - 45$

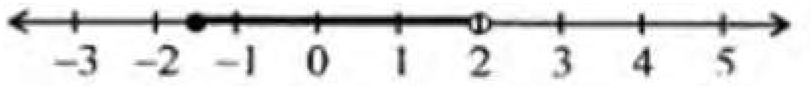
-22x > -44

-x > $-\frac{44}{22}$

$X < 2$

Hence, the solution set is {x : x ∈ $R, -\frac{3}{2} \leq x < 2$}

Represent the solution on a number line:



23. Solve the following inequation, write down the solution set and represent it in the real number line:

$-2 + 10x \leq 13x + 10 \leq 24 + 10x$, $x \in Z$

Solution

Given inequation, $-2 + 10x \leq 13x + 10 \leq 24 + 10x$

So, we have

$-2 + 10x \leq 13x + 10$ and $13x + 10 \leq 24 + 10x$

$10x - 13x \leq 10 + 2$ and $13x - 10x \leq 24 - 10$

$-3x \leq 12$ and $3x \leq 14$

$X \geq -\frac{12}{3}$ and $x \leq \frac{14}{3}$

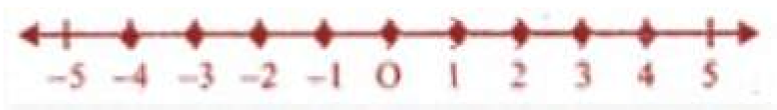
$X \geq -4$ and $x \leq \frac{14}{3}$

So, $-4 \leq x \leq \frac{14}{3}$

As x ∈ Z

Thus, the solution set is { -4,-3,-2,-1,0,1,2,3,4}

Representing the solution on a number line:



24. Solve the inequation $2x - 5 \leq 5x + 4 < 11$ where x ∈ 1. Also represent the solution set on the number line.

Solution

Given inequation, $2x - 5 \leq 5x + 4 < 11$

So, we have

$2x - 5 \leq 5x + 4$ and $5x + 4 < 11$

$2x - 5x \leq 4 + 5$ and $5x < 11 - 4$

$-3x \leq 9$ and $5x < 7$

$-x < \frac{9}{3}$ and $x < \frac{7}{5}$

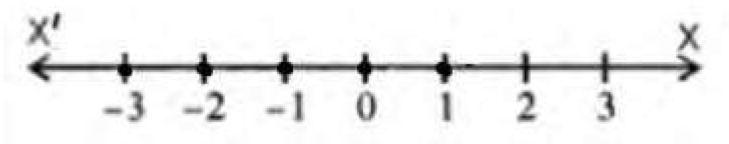
$-3 \geq -3$ and $x < \frac{7}{5}$

$-3 \leq x < \frac{7}{5}$

As x ∈ 1

Thus, the solution set is { -3, -2, -1, 0, 1}

Representing the solution on a number line:



25. If x ∈ 1, A is the solution set of 2 (x -1) $< 3x - 1$ and B is the solution set of 4x – 3 ≤ $8 + x$, find A ∩ B.

Solution

Given inequations,

2(x -1) < 3x – 1 and 4x – 3 ≤ 8 + x for x ∈ 1.

Solving for both, we have

2x – 3x $< 2 - 1$ and 4x – x ≤ $8 + 3$

-x < 1 and 3x ≤ 11

X > -1 and x ≤ $\frac{11}{3}$

Hence,

Solution set A = { 0, 1,2,3...}

Solution set B = { 3, 2, 1, 0, -1....}

Thus, A ∩ B = { 0, 1, 2, 3}

26. If P is the solution set of -3x + 4 $< 2x - 3$, x ∈ N and Q is the solution set of 4x – 5 < 12, x ∈ W, find

(i) P ∩ Q

(ii) Q – P.

Solution

Given inequations,

-3x + 4 $< 2x - 3$ where x ∈ N and 4x – 5x $<$ 12 where x ∈ W.

So, solving

-3x + 4 $< 2x - 3$ where x ∈ N

-3x – 2x < -3 – 4

-5x < -7

X > $\frac{7}{5}$

Hence, the solution set p is { 2,3,4,5}

And solving

4x – 5 < 12 where x ∈ W

4x $< 12 + 5$

4x < 17

X < $\frac{17}{4}$

Hence the solution set Q is {0,1,2,3,4}

Therefore,

(i) $P \cap Q = \{2,3,4\}$

(ii) $Q - P = \{0,1\}$

27. A = {x : 11x – 5 > 7x + 3, x ∈ R} and

B= {x : 18x – 9 ≥ 15 + 12x, x ∈ R}

Find the range of set A ∩ B and represent it on number line

Solution

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

Solving for A

$11x - 5 > 7x + 3$

$11x - 7x > 3 + 5$

$4x > 8$

$X > 2$

Hence $A = \{x : x > 2, x \in R\}$

Next, solving for B

$18x - 9 \geq 15 + 12x$

$18x - 12x \geq 15 + 9$

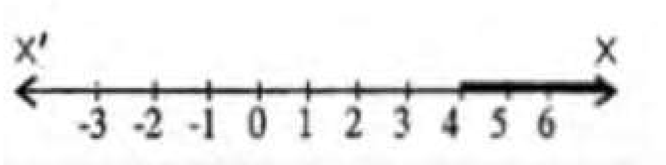
$6x \geq 24$

$X \geq 4$

Hence, B = {x:x ≥ 4, x ∈ R}

Thus, A ∩ B = $x \geq 4$

Represent the solution on a number line:



28. Given: P{x : 5 < 2x - 1≤ 11, X ∈ R}

Q{x : -1≤ 3+ 4x < 23, x ∈ 1} where

R = (real numbers), I = (integers)

Represent P and Q on number line. Write down the elements of P ∩ Q.

Solution

Given, P {x : 5 < 2x – 1 ≤ 11, x ∈ R} and Q{x: -1 $< 3 + 4x < 23, x \in 1$}

Solving for p

$5 < 2x - 1 \leq 11$

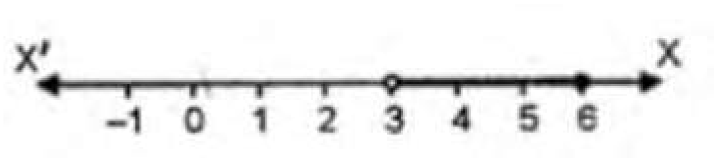
$5 + 1 < 2x \leq 11 + 1$

$6 < 2x \leq 12$

$3 < x \leq 6$

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

Representing the solution on a number line:



next, solving for Q

-1 $\leq 3 + 4x < 23$

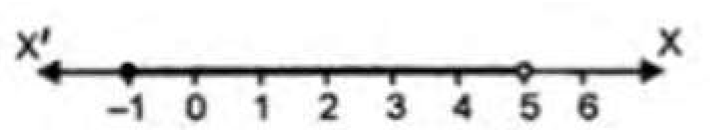
-1 -3 $\leq 4x < 23 - 3$

-4 $\leq 4x < 20$

-1 $\leq x < 5$

Hence, solution Q = {-1, 0, 1,2,3,4}

Representing the solution on a number line:



Therefore, P ∩ Q = {4}

29. If x ∈ 1, find the smallest value of x which satisfies the inequation

2x + $\frac{5}{2} > \frac{5x}{3} + 2$

Solution

Given inequation, 2x + $\frac{5}{2} > \frac{5x}{3} + 2$

$\frac{4x+5}{2} > \frac{5x+6}{3}$ [taking L.C.M]

3(4x + 5) > 2(5x + 6) [on cross- multiplication]

12x + 15 > 10x + 12

12x – 10x > 12 – 15

2x > -3

X > $-\frac{3}{2}$

Hence, for x ∈ 1 the smallest value of x is – 1

30. Given 20 – 5x < 5 (x + 8), find the smallest value of x, when

(i) x ∈ 1

(ii) x ∈ W

(iii) x ∈ N.

Solution

Given inequation 20 – 5x < $5(x + 8)$

20 – 5x < $5x + 40$

-5x – 5x < 40 – 20

-10x < 20

-x < $\frac{20}{10}$

$X > -2$

Thus,

(i) For x ∈ 1, the smallest value = -1

(ii) for x ∈ W, the smallest value = 0

(iii) For x ∈ N, the smallest value = 1

31. solve the following inequation and represent the solution set on the number line:

$\mathbf{4x - 19 < \frac{3x}{5} - 2 \leq -\frac{2}{5} + x, x \in R}$

Solution

Given inequation,

$4x - 19 < \frac{3x}{5} - 2 \leq -\frac{2}{5} + x, x \in R$

So, we have

$4x - 19 < \frac{3x}{5} - 2$ and $\frac{3x}{5} - 2 \leq -\frac{2}{5} + x$

$4x - \frac{3x}{5} < 19 - 2$ and $\frac{3x}{5} - x \leq 2 - \frac{2}{5}$

$\frac{20x - 3x}{5} < 17$ and $\frac{3x - 5x}{5} < \frac{10 - 2}{5}$

$17x < 35$ and $-2x \leq 8$ [multiplying by 5]

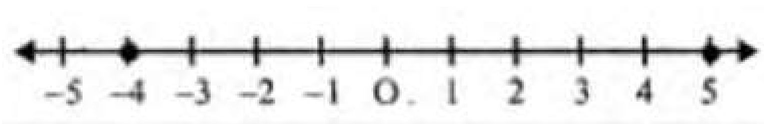
$X < 5$ and $-x \leq 4$

$X < 5$ and $x \geq 4$

$-4 \leq x < 5, x \in R$

Hence, the solution set is $\{x : -4 \leq x < 5, x \in R\}$

Representing the solution on a number line:



32. Solving the give inequation and graph the solution on the number line:

$2y – 3 < y + 1 \leq 4y + 7$;

$Y \in R$

Solution

Given inequation $2y – 3 < y + 1 \leq 4y + 7$

So, we have

$2y – 3 < y + 1$ and $y + 1 \leq 4y + 7$

$2y – y < 1 + 3$ and $y – 4y \leq 7 – 1$

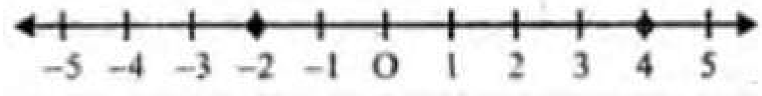
$Y < 4$ and $-3y \leq 6$

$Y < 4$ and $– y \leq 2 = y \geq -2$

Thus, $-2 \leq y < 4$

The solution set is $\{y : -2 \leq y < 4, y \in R\}$

Representing the solution on a number line:



33. Solve the inequation and represent the solution set on the number line.

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

Solution

Given inequation,

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

So, we have

$-3 + x \le \frac{8x}{3} + 2\ and \frac{8x}{3} + 2 \le \frac{14}{3} + 2x$

$X - \frac{8x}{3} \le 2 + 3\ and \frac{8x}{3} - 2x \le \frac{14}{3} - 2$

$\frac{3x - 8x}{3} \le 5$ and $\frac{8x-6x}{3} \le \frac{14-6}{3}$ [taking L.C.M]

$-\frac{5x}{3} \le 5\ and\ 2x \le 8$

$-5x \le 15\ and\ x \le \frac{8}{2}$

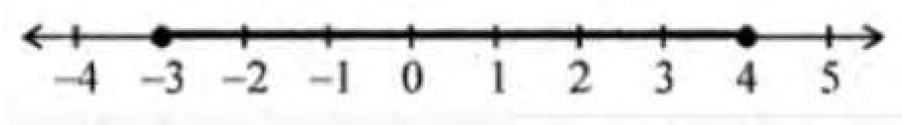
$-x \le 3\ and\ x \le 4$

$x \ge -3\ and\ x \le 4$

$= -3 \le x \le 4$

Thus, the solution set is {-3,-2,-1,0,1,2,3,4}

Representing the solution on a number line:



34. Find the greatest integer which is such that if 7 is added to its double, the resulting number becomes greater than three times the integer.

Solution

Lets consider the greatest integer to be x

Then according to the given condition, we have

$2x + 7 > 3x$

$2x - 3x > -7$

$-x > -7$

$X < 7, x \in R$

Hence, the greatest integer value is 6.

35. One – third of a bamboo pole is buried in mud, one – sixth of it is in water and the part above the water is greater than or equal to 3 meters. Find the length of the shortest pole.

Solution

Let's assume the length of the shortest pole = x meter

Now,

Length of the pole which is buried in mud = $\frac{x}{3}$

Length of the pole which is in the water = $\frac{x}{6}$

Then according to the given condition, we have

X – $\left[\frac{x}{3} + \frac{x}{6}\right] \geq 3$

X – $\left[\frac{2x+x}{6}\right] \geq 3$

X - $\frac{3x}{6} \geq 3$

X – $\frac{x}{2} \geq 3$

$\frac{x}{2} \geq 3$

X ≥ 6[multiplying by 6]

Therefore, the length of the shortest pole is 6 meters.

Chapter test

1. Solve the inequation: 5x – 2 ≤ $3(3 - x)$ where x ∈ {-2,-1,0,1,2,3,4}. Also represent its solution on the number line.

Solution

Given inequation 5x – 2 ≤ $3(3 - x)$

5x – 2 ≤ $9 - 3x$

5x + 3x ≤ $9 + 2$

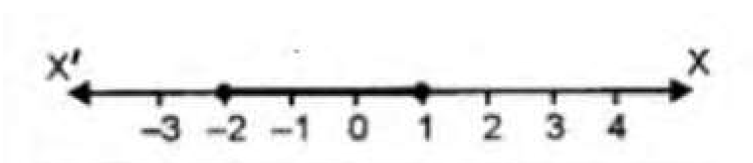
8x ≤ 11

X ≤ $\frac{11}{8}$

As x ∈ $\{-2, -1, 0, 1,2,3,4\}$

The solution set is {-2, -1, 0,1}

Representing the solution on a number line:



2. solve the inequation: $6x - 5 < 3x + 4$, $x \in 1$

Solution

Given inequation $6x - 5 < 3x + 4$

$6x - 3x < 4 + 5$

$3x < 9$

$X < \frac{9}{3}$

$X < 3$

As $x \in 1$

The solution set is {2, 1, 0, -1, -2,...}

3. find the solution set of the inequation $x + 5 \leq 2x + 3$; $x \in R$

Graph the solution set on the number line

Solution

Given inequation $x + 5 \leq 2x + 3$

$X - 2x \leq 3 - 5$

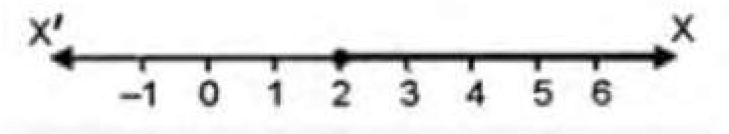
$-x \leq -2$

$X \geq 2$

As $x \in R$

Thus, the solution set is {2,3,4,5,...}

Representing the solution on a number line:



4. If x ∈ *R*(real numbers) and -1 < 3 -2x ≤ 7, find solution set and present it on a number line.

Solution:

Given inequation -1 $< 3 - 2x \ \leq 7$

-1 – 3 $< \ -2x \ \leq 7 - 3$

-4 $< \ -2x \ \leq 4$

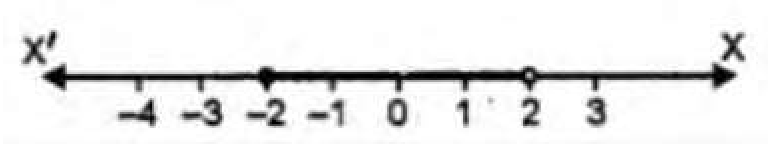
$-\frac{4}{2} < \ -x \ \leq \frac{4}{2}$

-2 $< \ -x \ \leq 2$

Thus - 2$\leq x \ < 2$

The solution set is {x : x ∈ R, -2 ≤ x < 2}

Representing the solution on a number line:



5. Solve the inequation:

$$\boldsymbol{5x + \frac{1}{7} - 4\left(\frac{x}{7} + \frac{2}{5}\right) \leq 1\frac{3}{5} + \frac{3x-1}{7}\ , x \in R}$$

Solution

Given inequation

$$\frac{5x+1}{7} - 4\left(\frac{x}{7} + \frac{2}{5}\right) \leq 1\frac{3}{5} + \frac{3x-1}{7}, x \in R$$

$$\frac{5x+1}{7} - \frac{4(5x+14)}{35} \leq \frac{8}{5} + \frac{3x-1}{7}$$

$$\frac{[5(5x+1)-4(5x+14)]}{35} \leq \frac{[56+5(3x-1)]}{35}$$ [Taking L.C.M]

$$(25x + 5 - 20x - 56) \leq 56 + 15x - 5$$

5x – 51 $\leq 51 + 51$

-10x $\leq$ 102

-x $\leq \frac{102}{10}$

X $\geq -\frac{51}{5}$

Hence the solution set is { x : x ∈ R, X $\geq -\frac{51}{5}$}

6. Find the range of values of a, which satisfy $7 \leq -4x + 2 < 12, x \in R$. graph these values of a on the real number line.

$7 < -4x + 2 < 12$

$7 < -4x + 2 \; and - 4x + 2 < 12$

7. if x ∈ R, solve 2x – 3 ≥ x + $\frac{1-x}{3} > \frac{2x}{5}$

Solution

Given inequation 2x – 3 ≥ $x + \frac{1-x}{3} > \frac{2x}{5}$

So, we have

2x – 3 ≥ x + $\frac{1-x}{3}$ and x + 1$\frac{1-x}{3} > \frac{2x}{5}$

2x -3 ≥ $\frac{3x+1-x}{3}$ and $\frac{3x+1-x}{3} > \frac{2x}{5}$ [on taking L.C.M]

3(2x -3) ≥ 2x + 1 and (2x +1) × 5 > $2x$ × 3[upon cross multiplication]

6x – 9 ≥ 2x + 1 and 10x + 5 > 6x

6x – 2x ≥ 1 + 9 and 10x – 6x > -5

4x ≥ 10 and 4x > -5

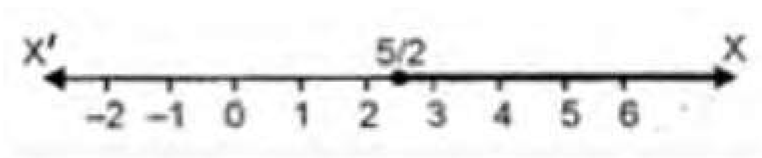
X ≥ $\frac{10}{4}$ and x > $-\frac{5}{4}$

X ≥ $\frac{5}{2}$

As x ∈ R

Thus, the solution set is { x : x ∈ R, x ≥ $\frac{5}{2}$}

Representing the solution on a number line:



7. If x ∈ R, solve 2x – 3 ≥ x + $\frac{1-x}{3}$ > $\frac{2x}{5}$. Also represent the solution on the number line.

Solution

Given inequation, 2x – 3 ≥ x + $\frac{1-x}{3}$ > $\frac{2x}{5}$

So, we have

2x - 3≥ $x + \frac{1-x}{3}$ and x + $\frac{1-x}{3}$ > $\frac{2x}{5}$

2x – 3 ≥ $\frac{3x+1-x}{3}$ and $\frac{3x+1-x}{3}$ > $\frac{2x}{5}$ [on taking L.C.M]

3(2x -3) ≥ 2x + 1 and 5 × $(2x + 1) > 3 \times 2x$

6x – 9 ≥ $2x + 1$ and 10x + 5 > 6x

6x – 2x ≥ 1 + 9 and 10x – 6x > -5

4x ≥ 10 and 4x > -5

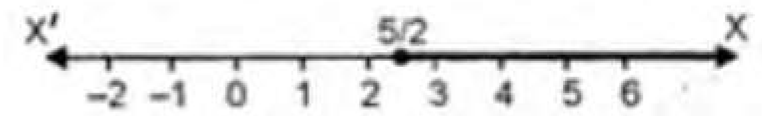
X ≥ $\frac{10}{4}$ and $x > -\frac{5}{4}$

X ≥ $\frac{5}{2}$

As x ∈ R

The solution set = { x :x ∈ R, x ≥ $\frac{5}{2}$}

Representing the solution on a number line:



8. Find positive integers which are such that if 6 is subtract from five times the integer than the resulting number cannot be greater than four times the integer.

Solution

Let's consider the positive integer be x

Then according to the problem, we have

5a – 6 < 4x

5a – 4x < 6

= x < 6

Hence the solution set = { x : x < 6}

= {1, 2, 3,4,5,6}

9. Find three smallest consecutive natural numbers such that the difference between one –third of the largest and one – fifth of the smallest is at least 3.

Solution

Let's consider the first least natural number as x

Then, second number = x +1

And third number = x + 2

So, according the conditions given in the problem, we have

$\frac{1}{3} \times (x + 2) - \frac{x}{5} \geq 3$

5x + 10 -3x $\geq 3 \times 15$

[multiplying by 15 the L.C.M of 3 and 5]

2x $\geq$ 45 – 10

2x $\geq$ 35

X $\geq \frac{35}{2}$

X ≥ 17.5

As x is a natural least number

Thus, first least natural number = 18

Second number = 18 + 1 = 19

And, third number = 18 + 2 = 20

Hence the least natural numbers are 18, 19 and 20