## EXERCISE- 4 (A)

## Question 1:

State, true or false:

(i) $x < -y \Rightarrow -x > y$

(ii) $-5x \geq \Rightarrow x \geq -3$

(iii) $2x \leq -7 \Rightarrow \frac{2x}{-4} \geq \frac{-7}{-4}$

(iv) $7 > 5 \Rightarrow \frac{1}{7} < \frac{1}{5}$

## Solution 1:

(i) $x < -y \Rightarrow -x > y$

The given statement is true.

(ii) $-5x \geq 15 \Rightarrow \frac{-5x}{5} \geq \frac{15}{5} x \leq -3$

The given statement is false

(iii) $2x \leq -7 \Rightarrow \frac{2x}{-4} \geq \frac{-7}{-4}$

The given statement is true

(iv) $7 > 5 \Rightarrow \frac{1}{7} < \frac{1}{5}$

The given statement is true.

## Question 2:

(i) $a < b \Rightarrow a - c < b - c$

(ii) If $a > b \Rightarrow a + c > b + c$

(iii) If $a < b \Rightarrow ac < bc$

(iv) If $a > b \Rightarrow \frac{a}{c} > \frac{b}{c}$

(v) If $a - c > b - d \Rightarrow a + d > b + c$

(vi) If $a < b \Rightarrow a - c < b - c$ (Since, $c > 0$)

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

## Solution 2:

(i) $a < b \Rightarrow a - c < b - c$

The given statement is true.

(ii) If $a > b \Rightarrow a + c > b + c$

The given statement is true.

(iii) If $a < b \Rightarrow ac < bc$

The given statement is false.

(iv) If a > b ⇒ $\frac{a}{c} > \frac{b}{c}$
The given statement is false.

(v) If a – c > b – d ⇒ a + d > b + c
The given statement is true.

(vi) If a < b ⇒ a – c < b – c (Since, c > 0)
The given statement is false.

## Question 3:
If x ∈ N, find the solution set of in-equations.
(i) 5x + 3 ≤ 2x + 18
(ii) 3x – 2 < 19 – 4x

## Solution 3:
(i) 5x + 3 ≤ 2x + 18
5x – 2x ≤ 18 – 3
3x ≤ 15
X ≤ 5
Since, x ∈ N, therefore solution set is {1,2,3,4,5}

(ii) 3x – 2 < 19 – 4x
3x + 4x < 19 + 2
7x < 21
X < 3
Since, x ∈ N, therefore solution set is {1,2}.

## Question 4:
If the replacement set is the set of whole numbers, solve:
(i) x + 7 ≤ 11
(ii) 3x – 1 > 8
(iii) 8 – x > 5
(iv) $7 - 3x \geq -\frac{1}{2}$
(v) $x - \frac{3}{2} < \frac{3}{2} - x$
(vi) 18 ≤ 3x – 2

## Solution 4:
(i) x + 7 ≤ 11
X ≤ 11 – 7
X ≤ 4
Since, the replacement set = W (set of whole numbers)
⟹ Solution set = {0,1,2,3,4}

(ii) $3x - 1 > 8$
$3x > 8 + 1$
$X > 3$
Since, the replacement set = W (Set of whole numbers)
$\Longrightarrow$ Solution set = {4, 5, 6……}

(iii) $8 - x > 5$
$-X > 5 - 8$
$-X > -3$
$X < 3$
Since, the replacement set = W (Set of whole numbers)
$\Longrightarrow$ Solution set = {0, 1, 2 ……}

(iv) $7 - 3x \geq -\frac{1}{2}$
$-3x \geq -\frac{1}{2} - 7$
$-3x \geq -\frac{15}{2}$
$X \leq \frac{5}{2}$
Since, the replacement set = W (set of whole numbers)
$\therefore$ Solution set = {0, 1, 2}

(v) $x - \frac{3}{2} < \frac{3}{2} - x$
$x + x < \frac{3}{2} + \frac{3}{2}$
$2x < 3$
$X < \frac{3}{2}$
Since, the replacement set = W (set of whole numbers)
$\therefore$ Solution set = {0, 1}

(vi) $18 \leq 3x - 2$
$18 + 2 \leq 3x$
$20 \leq 3x$
$X \geq \frac{20}{3}$
Since, the replacement set = W (set of whole numbers)
$\therefore$ Solution set = {7, 8, 9….}

## Question 5:
Solve the in-equation:
$3 - 2x \geq x - 12$ given that $x \in N$

## Solution 5:
$3 - 2x \geq x - 12$

$-2x - x \geq -12 - 3$
$-3x \geq -15$
$X \leq 5$
Since, $x \in N$, therefore,
Solution set = {1, 2, 3, 4, 5}

## Question 6:
If $25 - 4x \leq 16$, find:
(i) the smallest value of x, when x is a real number,
(ii) the smallest value of x, when x is an integer.

## Solution 6:
$25 - 4x \leq 16$
$-4x \leq 16 - 25$
$-4x \leq -9$
$X \geq \frac{9}{4}$
$X \geq 2.25$
(i) The smallest value of x, when x is a real number, is 2.25.

(ii) The smallest value of x, when x is an integer, is 3.

## Question 7:
If the replacement set is the set of real number, solve:
(i) $4x \geq -16$
(ii) $8 - 3x \leq 20$
(iii) $5 + \frac{x}{4} > \frac{x}{5} + 9$
(iv) $\frac{x+3}{8} < \frac{x-3}{5}$

## Solution 7:
(i) $-4x \geq -16$
$X \leq 4$
Since, the replacement set of real numbers.
$\therefore$ solution set = $\{ x : x \in R \text{ and } x \leq 4\}$

(ii) $8 - 3x \leq 20$
$-3x \leq 20 - 8$
$-3x \leq 12$
$X \geq -4$
Since the replacement set of real numbers.
$\therefore$ solution set = $\{ x : x \in R \text{ and } x \leq -4\}$

(iii) $5 + \frac{x}{4} > \frac{x}{5} + 9$

$\frac{x}{4} - \frac{x}{5} > 9 - 5$

$\frac{x}{20} > 4$

X > 80

Since the replacement set of real numbers.

∴ solution set = { x:x ∈ R and x > 80}

(iv) $\frac{x+3}{8} < \frac{x-3}{5}$

5x + 15 < 8x – 24

5x – 8x < −24 – 15

− 3x < − 39

X > 13

Since the replacement set of real numbers.

∴ solution set = { x:x ∈ R and x > 13}

## Question 8:

Find the smallest value of x for which $5 - 2x < 5\frac{1}{2} - \frac{5}{3}x$, where x is an integer.

## Solution 8:

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

$-2x + \frac{5}{3}x < \frac{11}{2} - 5$

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

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

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

X > −1.5

Thus, the required smallest value of x is -1.

## Question 9:

Find the largest value of x for which

2(x −1) ≤ 9 – x and x ∈ W.

## Solution 9:

2(x −1) ≤ 9 – x

2x – 2 ≤ 9 – x

2x + x ≤ 9 + 2

3x ≤11

$x \le \frac{11}{3}$

X ≤ 3.67

Since, x ∈ W, thus the required largest value of x is 3.

## Question 10:

Solve the in-equation:

$12 + 1\frac{5}{6}x \leq 5 + 3x$ and $x \in R$.

## Solution 10:

$12 + 1\frac{5}{6}x \leq 5 + 3x$

$\frac{11}{6}X - 3X \leq 5 - 12$

$\frac{-7}{6}X \leq -7$

$X \geq 6$

∴ solution set = $\{x : x \in R \text{ and } x \geq 6\}$

## Question 11:

Given $x \in$ {Integers}, find the solution set of : $-5 \leq 2x - 3 < x + 2$

## Solution 11:

$-5 \leq 2x - 3 < x + 2$

$\Rightarrow -5 \leq 2x - 3$ and $2x - 3 < x + 2$

$\Rightarrow -5 + 3 \leq 2x$ and $2x - x < 2 + 3$

$\Rightarrow -2 \leq 2x$ and $x < 5$

$\Rightarrow X \geq -1$ and $x < 5$

Since, $x \in$ {integers}

∴ Solution set = { -1, 0, 1, 2, 3, 4}

## Question 12:

Given $x \in$ {whole numbers}, find the solution set of : $-1 \leq 3 + 4x < 23$

## Solution 12:

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

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

$\Rightarrow -4 \leq 4x$ and $4x < 20$

$\Rightarrow x \geq -1$ and $x < 5$

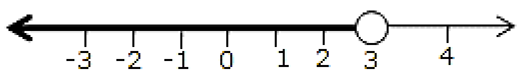
Since, $x \in$ { Whole numbers}

∴ solution set = { 0, 1, 2, 3, 4}

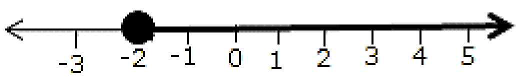
## EXERCISE 4(B)

### Question 1:
Represent the following in-equalities on real number lines:
(i) 2x – 1 < 5
(ii) 3x + 1 ≥ −5
(iii) 2(2x – 3) ≤ 6
(iv) – 4 < x < 4
(v) −2 ≤ x < 5
(vi) 8≥ x > −3
(vii) −5 < x ≤ −1

### Solution 1:
(i) 2x – 1 < 5
2x < 6
X < 3
Solution on number line is:



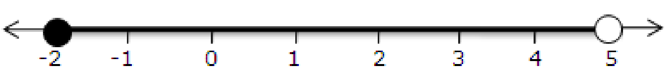

(ii) 3x + 1 ≥ −5
3x ≥ – 6
X ≥ – 2
Solution on number line is:




(iii) 2(2x – 3) ≤ 6
2x – 3 ≤ 3
2x ≤ 6
X ≤ 3
Solution on number line is:

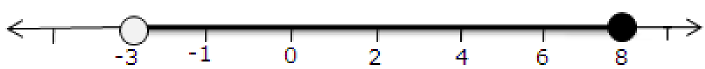

(iv) – 4 < x < 4
Solution on number line is:


(v) −2 ≤ x < 5
Solution on number line is:



(vi) $8 \geq x > -3$

Solution on number line is:

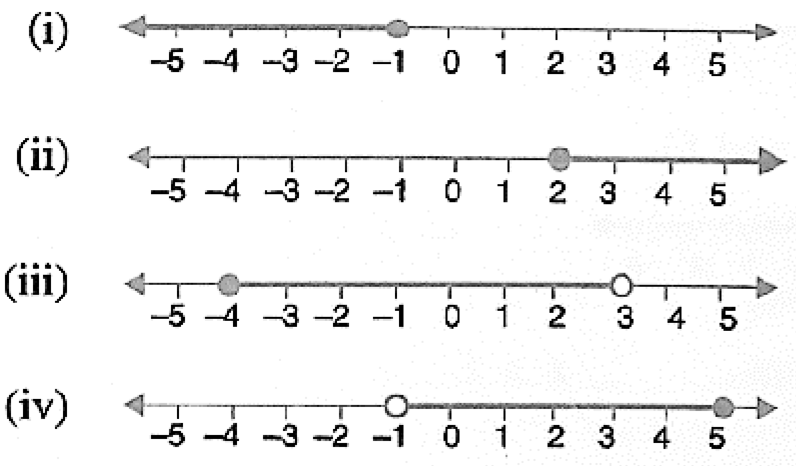



(vii) $-5 < x \leq -1$

Solution on number line is:


## Question 2:

For each graph given alongside, write an in-equation taking x as the variable




## Solution 2:

(i) $x \leq -1, x \in R$

(ii) $x \geq 2, x \in R$

(iii) $-4 \leq x < 3, x \in R$

(iv) $-1 < x \leq 5, x \in R$

## Question 3:

For the following in-equations, graph the solution set on the real number line:

(i) $-4 \leq 3x - 1 < 8$

(ii) $x - 1 < 3 - x \leq 5$

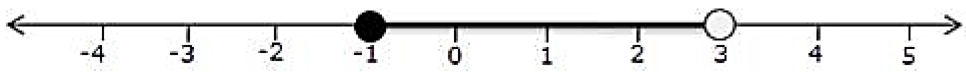
## Solution 3:

(i) $-4 \leq 3x - 1 < 8$

$-4 \leq 3x - 1$ and $3x - 1 < 8$

$-1 \leq x$ and $x < 3$

The solution set on the real number line is:



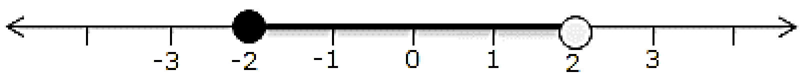

(ii) x – 1 < 3 – x ≤ 5

X – 1 < 3 – x and 3 – x ≤ 5

2x < 4 and –x ≤ 2

X < 2 and x ≥ – 2

The solution set on the real number line is:




## Question 4:

Represent the solution of each of the following in-equalities on the real number line:

(i) 4x – 1 > x + 11

(ii) 7 – x ≤ 2 – 6x

(iii) x + 3 ≤ 2x + 9

(iv) 2 – 3x > 7 – 5x

(v) 1 + x ≥ 5x – 11

(vi) $\frac{2x+5}{3}$ > 3x – 3

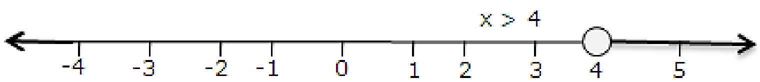
## Solution 4:

(i) 4x – 1 > x + 11

3x > 12

X > 4

The solution on number line is:

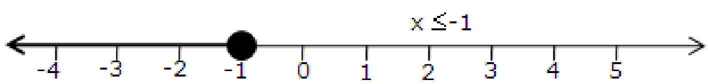



(ii) 7 – x ≤ 2 – 6x

5x ≤ – 5

X ≤ – 1

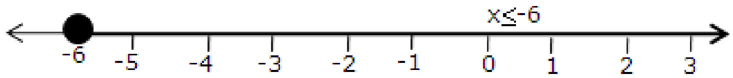
The solution on number line is:




(iii) x + 3 ≤ 2x + 9

– 6 ≤ x

The solution on number line is:




(iv) $2 - 3x > 7 - 5x$

$2x > 5$

$X > \frac{5}{2}$

$X > 2.5$

The solution on number line is:


(v) $1 + x \geq 5x - 11$

$12 \geq 4x$

$3 \geq x$

The solution on number line is:

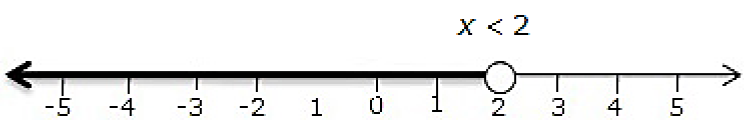

(vi) $\frac{2x+5}{3} > 3x - 3$

$2x + 5 > 9x - 9$

$-7x > -14$

$X < 2$

The solution on number line is:




## Question 5:

X ∈ {real numbers} and $-1 < 3 - 2x \leq 7$ evaluate x and represent it on a number line.

## Solution 5:

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

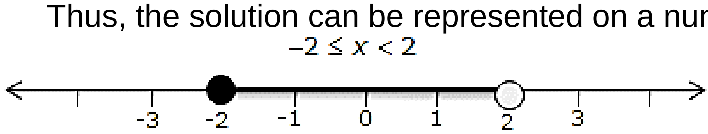
$-1 < 3 - 2x$ and $3 - 2x \leq 7$

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

$X < 2$ and $x \geq -2$

Solution set = $\{ -2 \leq x < 2, x \in R\}$

Thus, the solution can be represented on a number line as:



## Question 6:

List the elements of the solution set of the in-equation $-3 < x - 2 \leq 9 - 2x$; $x \in N$.

## Solution 6:

$-3 < x - 2 \leq 9 - 2x$

$-3 < x - 2$ and $x - 2 \leq 9 - 2x$

$-1 < x$ and $3x \leq 11$

$-1 < x \leq \frac{11}{3}$

Since, $x \in N$

$\therefore$ Solution set = {1, 2, 3}

## Question 7:

Find the range of values of x which satisfies

$-2\frac{2}{3} \leq x + \frac{1}{3} < 3\frac{1}{3}$, $x \in R$.

Graph these values of x on the number line.

## Solution 7:

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

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

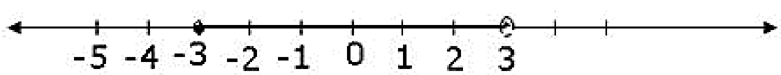
$\Rightarrow -\frac{8}{3} - \frac{1}{3} \leq x$ and $x < \frac{10}{3} - \frac{1}{3}$

$\Rightarrow -\frac{9}{3} \leq x$ and $x < \frac{9}{3}$

$\Rightarrow -3 \leq x$ and $x < 3$

$\therefore -3 \leq x$ and $x < 3$

The required graph of the solution set is:




## Question 8:

Find the values of x, which satisfy the in-equation: $-2 \leq \frac{1}{2} - \frac{2x}{3} < 1\frac{5}{6}$, $x \in N$.

Graph the solution on the number line.

## Solution 8:

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

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

$\frac{-5}{2} \leq -\frac{2x}{3}$ and $\frac{-2x}{3} < \frac{8}{6}$

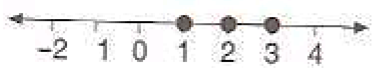
$\frac{15}{4} \geq x$ and $x > -2$

$3.75 \geq x$ and $x > -2$

Since, $x \in N$

$\therefore$ Solution set = {1, 2, 3}

The required graph of the solution set is:

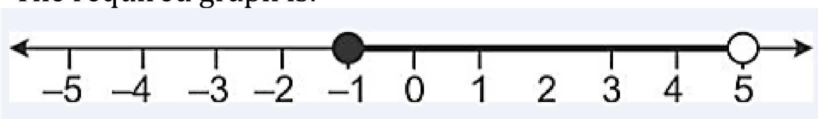



## Question 9:

Given x ∈ {real number}, find the range of values of x for which – 5 ≤ 2x – 3 < x + 2
And represent it on a real number line.

## Solution 9:

– 5 ≤ 2x – 3 < x + 2
– 5 ≤ 2x – 3 and 2x – 3 < x + 2
– 2 ≤ 2x and x < 5
– 1 ≤ x and x < 5
∴ Required range is – 1 ≤ x < 5
The required graph is:




## Question 10:

If 5x – 3 ≤ 5 + 3x ≤ 4x + 2, express it as a ≤ x ≤ b and then state the values of a and b.

## Solution 10:

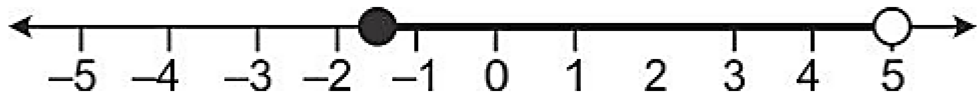
5x – 3 ≤ 5 + 3x ≤ 4x + 2
5x – 3 ≤ 5 + 3x and 5 + 3x ≤ 4x + 2
2x ≤ 8 and – x ≤ –3
X ≤ 4 and x ≥ 3
Thus, 3 ≤ x ≤ 4
Hence, a = 3 and b = 4

## Question 11:

Solve the following in-equation and graph the solution set on the number line:
2x – 3 < x + 2 ≤ 3x + 5; x ∈ R.

## Solution 11:

2x – 3 < x + 2 ≤ 3x + 5
2x – 3 < x + 2 and x + 2 ≤ 3x + 5
X < 5 and – 3 ≤ 2x
X < 5 and – 1.5 ≤ x
Solution set = { –1.5 ≤ x < 5}
The solution set can be graphed on the number line as:




## Question 12:

Solve and graph the solution set of:

(i) 2x – 9 < 7 and 3x + 9 ≤ 25; x ∈ R.

(ii) 2x – 9 ≤ 7 and 3x + 3x + 9 > 25; x ∈ I.

(iii) x + 5 ≥ 4(x – 1) and 3 – 2x < −7; x ∈ R.

## Solution 12:

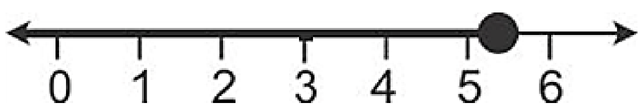
**(i) 2x – 9 < 7 and 3x + 9 ≤ 25**

2x < 16 and 3x ≤ 16

X < 8 and x ≤ $5\frac{1}{3}$

∴ Solution set = { x ≤ $5\frac{1}{3}, x \in R\}$

The required graph on number line is:




**(ii) 2x – 9 ≤ 7 and 3x + 3x + 9 > 25**

2x ≤ 16 and 3x > 16

X ≤ 8 and x > $5\frac{1}{3}$

∴ Solution set = { $5\frac{1}{3} < x \leq 8, x \in I\} = \{6, 7, 8\}$

The required graph on number line is:


**(iii) x + 5 ≥ 4(x – 1) and 3 – 2x < −7**

9 ≥ 3x and – 2x < – 10

3 ≥ x and x > 5

∴ solution set = Empty set

## Question 13:

Solve and graph the solution set of:

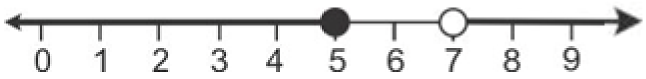
(i) 3x – 2 > 19 or 3 – 2x ≥ −7; x ∈ R.

(ii) 5 > p - 1 > 2 or 7 ≤ 2p - 1 ≤ 17; p ∈ R.

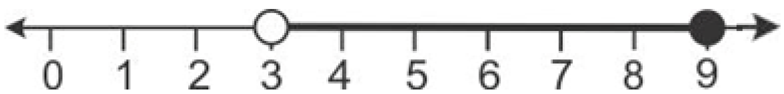
## Solution 13:

**(i) 3x – 2 > 19 or 3 – 2x ≥ −7**

3x > 21 or – 2x ≥ − 10
X > 7 or x ≤ 5
Graph of solution set of x > 7 or x ≤ 5 = Graph of points which belong to x > 7 or x ≤ 5 or both.
Thus, the graph of the solution set is:

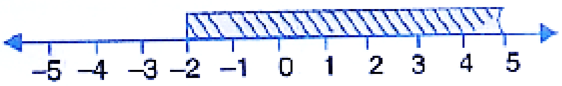



**(ii) 5 > p - 1 > 2 or 7 ≤ 2p - 1 ≤ 17**
6 > p > 3 or 8 ≤ 2p ≤ 18
6 > p > 3 or 4 ≤ p ≤ 9
Graph of solution set of 6 > p > 3 or 4 ≤ p ≤ 9
= Graph of points which belong to 6 > p > 3 or 4 ≤ p ≤ 9 or both
= Graph of points which belong to 3 < p ≤ 9
Thus, the graph of the solution set is:




## Question 14:

The diagram represents two in-equations A and B on real number lines:

A = 

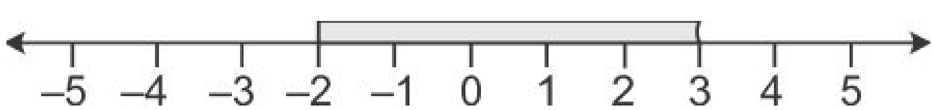

B = 


(i) Write down A and B in set builder notation.
(ii) Represent A ∩ B and A ∩ B' on two different number lines.

## Solution 14:

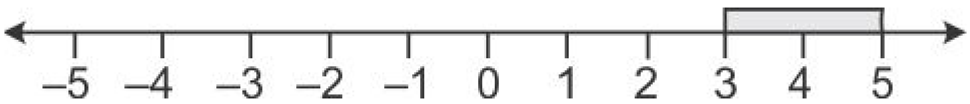
(i) A = { x ∈ R: – 2 ≤ x < 5}
B = {x ∈ R: – 4 ≤ x < 3}

(ii) A ∩ B = { x ∈ R:- 2 ≤ x < 5}
It can be represented on number line as:




$B'$ = { x ∈ R: 3 < x –4}

A ∩ B' = { x ∈ R: 3 ≤ x < 5}
It can be represented on number line as:



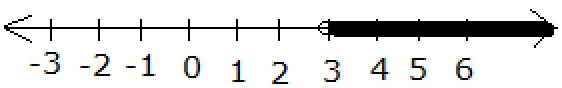

## Question 15:

Use real number line to find the range of values of x for which:
(i) x > 3 and 0 < x < 6.
(ii) x < 0 and – 3 ≤ x < 1
(iii) −1 < x ≤ 6 and −2 ≤ x ≤ 3

## Solution 15:

**(i) x > 3 and 0 < X < 6**

Both the given in equations are true in the range where their graphs on the real number lines overlap.
The graphs of the given in equations can be drawn as:
x > 3



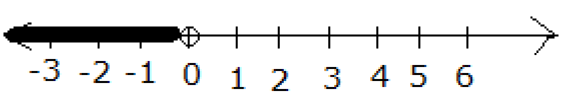

**0 < x < 6**


From both graphs, it is clear that their common range is
3 < x < 6

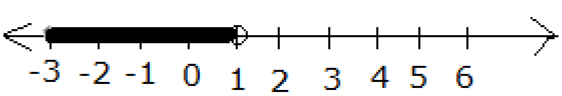
**(ii) x < 0 and -3 ≤ x < 1**

Both the given in equations are true in the range where their graphs on the real number lines overlap.
The graphs of the given in equations can be drawn as:

X < 0

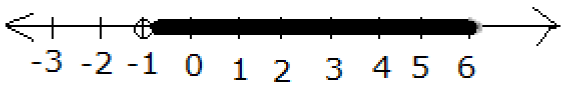



– 3≤ x < 1

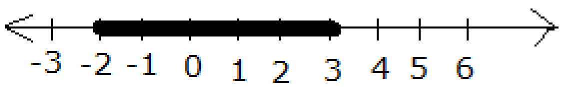


From both graphs, it is clear that their common range is
$-3 \leq x < 0$

**(iii)** $-1 < x \leq 6$ and $-2 \leq x \leq 3$
Both the given in equations are true in the range where their graphs on the real number lines overlap.
The graphs of the given in equations can be drawn as:
$-1 < x \leq 6$

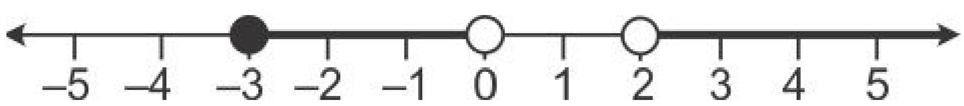



**$-2 \leq x \leq 3$**

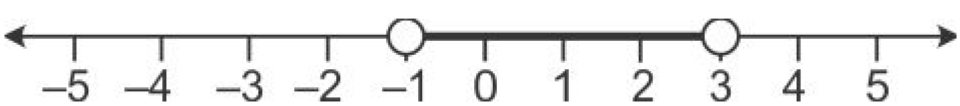



**From both graphs, it is clear that their common range is**
$1 < x \leq 3$

## Question 16:
Illustrate the set $\{x: -3 \leq x < 0 \text{ or } x > 2; x \in R\}$ on a real number line.
## Solution 16:
Graph of solution set of $-3 \leq x < 0$ or $x > 2$
= Graph of points which belong to $-3 \leq x < 0$ or $x > 2$ or both
Thus, the required graph is:



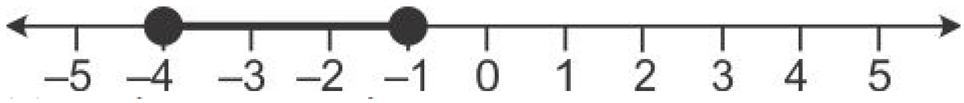

## Question 17:
Given $A = \{x: -1 < x \leq 5, x \in R\}$ and $B = \{x: -4 \leq x < 3, x \in R\}$
Represent on different number lines:
(i) $A \cap B$ (ii) $A' \cap B$ (iii) $A - B$
## Solution 17:
(i) $A \cap B = \{x: -1 < x < 3, x \in R\}$
It can be represented on a number line as:



(ii) Numbers which belong to B but do not belong to A = B - A

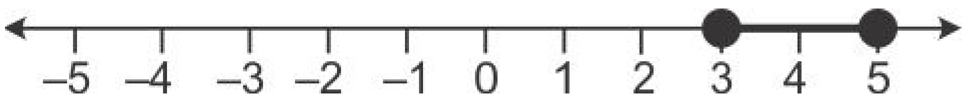
A' ∩ B = {x: - 4 ≤ x ≤ -1, x ∈ R}

It can be represented on a number line as:




(iii) A - B = {x: 3 ≤ x ≤ 5, x ∈ R}

It can be represented on a number line as:




## Question 18:

P is the solution set of 7X – 2 > 4X + 1 and Q is the solution set of 9x – 45 ≥ 5 (x – 5); where x ∈ R, Represent:

(i) P ∩ Q

(ii) P – Q

(iii) P ∩ Q' on different number lines.

## Solution 18:

P = { X : 7X – 2 > 4X + 1, X ∈ R }

$7x - 2 > 4x + 1$

$7x - 4x > 1 + 2$

$3x > 3$

$X > 1$

and

Q = {x: 9x – 45 ≥ 5 (x – 5), x ∈ R}

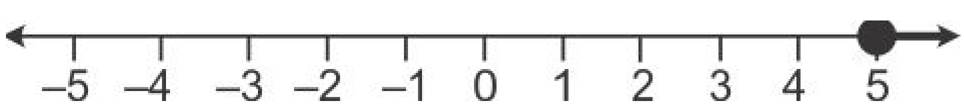
$9x - 45 \geq 5x - 25$

$9x - 5x \geq -25 + 45$

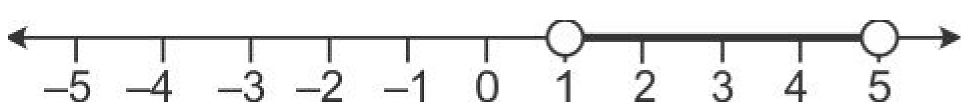
$4x \geq 20$

$X \geq 5$

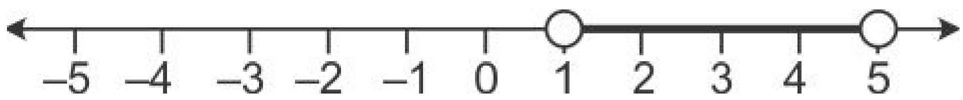
**(i) P ∩ Q = {x : x ≥ 5, x ∈ R}**




**(ii) P – Q = { X : 1 < X < 5, X ∈ R}**



**(iii) P ∩ Q' = {x : 1 < x < 5, x ∈ R}**




## Question 19:

If P = {X: 7X – 4 > 5X + 2, X ∈ R} and Q = {X : X – 19 ≥ 1 – 3X, X ∈ R}; find the range of set P ∩ Q and represent it on a number line.

## Solution 19:

**P = {X : 7X – 4 > 5X + 2, X ∈ R}**

$7X - 4 > 5X + 2$

$7X - 5X > 2 + 4$

$2X > 6$

$X > 3$

**Q = { X:X – 19 ≥ 1 – 3X, X ∈ R}**

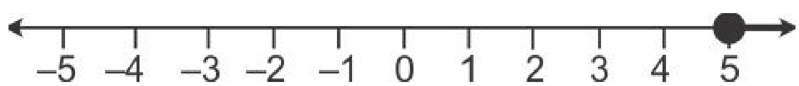
$X - 19 \geq 1 - 3X$

$X + 3X \geq 1 + 19$

$4X \geq 20$

$X \geq 5$

P ∩ Q = { X:X ≥ 5, X ∈ R}




## Question 20:

Find the range of values of x, which satisfy:

$-\frac{1}{3} \leq \frac{X}{2} + 1\frac{2}{3} < 5\frac{1}{6}$

Graph, in each of the following cases, the values of x on the different real number lines:

(i) x ∈ w (ii) x ∈ z (iii) x ∈ R.

## Solution 20:

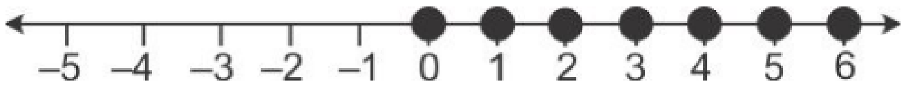
$-\frac{1}{3} \leq \frac{X}{2} + 1\frac{2}{3} < 5\frac{1}{6}$

$-\frac{1}{3} - \frac{5}{3} \leq \frac{X}{2} < \frac{31}{6} - \frac{5}{3}$

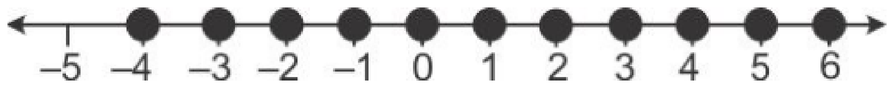
$-\frac{6}{3} \leq \frac{X}{2} < \frac{21}{6}$

$-4 \leq X < 7$

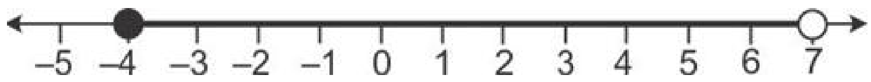
**(i) If x ∈ W, range of value of x is {0, 1, 2, 3, 4, 5, 6}**




**(ii) If x ∈ Z, range of values of x is {-4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6}.**




**(iii) If x ∈ R, range of values of x is $-4 \le x < 7$.**




## Question 21:

**Given:** $A = \{x : -8 < 5x + 2 \le 17, x \in I\}$

$B = \{x: -2 \le 7 + 3x < 17, x \in R\}$

Where R = {Real numbers} and I = {integers}. Represent A and B on two different number lines. Write down the elements of $A \cap B$.

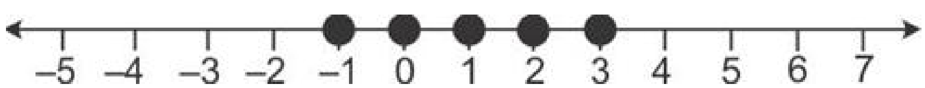
## Solution 21:

$A = \{x: -8 < 5x + 2 \le 17, x \in I\}$

$= \{x: -10 < 5x \le 15, x \in I\}$

$= \{x: -2 < x \le 3, x \in I\}$

It can be represented on number line as:

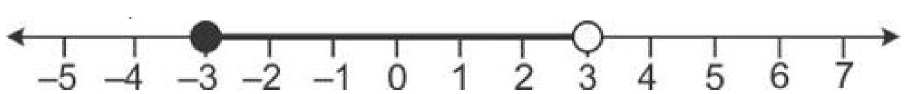



**$B = \{x: -2 \le 7 + 3x < 17, x \in R\}$**

$= \{x: -9 \le 3x < 10, x \in R\}$

$= \{x: -3 \le x < 3.33, x \in R\}$

It can be represented on number line as:




$A \cap B = \{-1, 0, 1, 2, 3\}$

## Question 22:

Solve the following in-equation and represent the solution set on the number line.

$2x - 5 \le 5x + 4 < 11$, where $x \in I$.

## Solution 22:

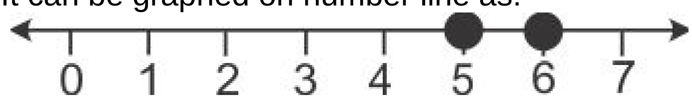
$2x - 5 \le 5x + 4$ and $5x + 4 < 11$
$2x - 5x \le 4 - 5$ and $5x < 11 - 4$
$3x \le -1$ and $5x < 7$
$x \ge -1$ and $x < \frac{7}{5}$
$x \ge -1$ and $x < 1.4$
Since x ∈ I, the solution set is $\{-3, -2\ -1, 0, 1\}$
And the number line representation is


## Question 23:

Given that x ∈ I, solve the in-equation and graph the solution on the number line:
$3 \ge \frac{x-4}{2} + \frac{x}{3} \ge 2$

## Solution 23:

$3 \ge \frac{x-4}{2} + \frac{x}{3} \ge 2$
$3 \ge \frac{3x-12+2x}{6} \ge 2$
$18 \ge 5x - 12 \ge 12$
$30 \ge 5x \ge 24$
$6 \ge x \ge 4.8$
Solution set = {5,6}
It can be graphed on number line as:



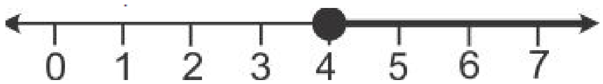

## Question 24:

Given:
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 a number line.

## Solution 24:

**A = {x: 11x - 5 > 7x + 3, x ∈ R}**
= {x : 4x > 8, x ∈ R}
= {x : x > 2, x ∈ R}

**B = {x : 18x - 9 ≥ 15 + 12x, x ∈ R}**
= {x : 6x ≥ 24, x ∈ R}
= {x : x ≥ 4, x ∈ R}
A ∩ B = {x : x ≥ 4, x ∈ R}
It can be represented on number line as:




## Question 25:

Find the set of value of x, Satisfying:

7X + 3 ≥ 3X – 5 and $\frac{x}{4} - 5 \le \frac{5}{4} - x$,

Where x ∈ N.

## Solution 25:

**7X + 3 ≥ 3X – 5**

4X ≥ – 8

X ≥ - 2

$\frac{X}{4} - 5 \le \frac{5}{4} - X$

$\frac{X}{4} - X \le \frac{5}{4} + 5$

$\frac{5X}{4} \le \frac{25}{4}$

X ≤ 5

Since, x ∈ N

∴ Solution set = {1, 2, 3, 4, 5}

## Question 26:

Solve:

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

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

## Solution 26:

**(i)** $\frac{x}{2} + 5 \le \frac{x}{3} + 6$

$\frac{x}{2} - \frac{x}{3} \le 6 - 5$

$\frac{x}{6} \le 1$

$x \le 6$

Since, x is a positive odd integer

∴ Solution set = {1, 3, 5}

(ii) $\frac{2x+3}{3} \ge \frac{3x-1}{4}$

8x + 12 ≥ 9x – 3

–X ≥ – 15

X ≤ 15
Since, x is a positive even integer
∴ Solution set = {2, 4, 6, 8, 10, 12, 14}

## Question 27:

Solve the in-equation:

$-\ 2\frac{1}{2} + 2x \leq \frac{4x}{5} \leq \frac{4}{3} + 2x$, x ∈ W.

Graph the solution set on the number line.

## Solution 27:

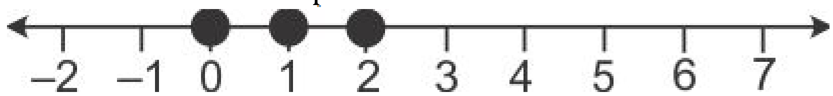
$-2\frac{1}{2} + 2x \leq \frac{4x}{5} \leq \frac{4}{3} + 2x$

$-2\frac{1}{2} \leq \frac{4x}{5} - 2x \leq \frac{4}{3}$

$-\frac{5}{2} \leq -\frac{6x}{5} \leq \frac{4}{3}$

$\frac{25}{12} \geq x \geq -\frac{10}{9}$

2.083 ≥ x ≥ − 1.111
Since, x ∈ W
∴ Solution set = {0, 1, 2}
The solution set can be represented on number line as:




## Question 28:

Find three consecutive largest positive integers such that the sum of one-third of first, one-fourth of second and one-fifth of third is atmost 20.

## Solution 28:

Let the required integers be x, x + 1 and x + 2.
According to the given statement,

$\frac{1}{3}x + \frac{1}{4}(x+1) + \frac{1}{5}(x+2) \leq 20$

$\frac{20x + 15x + 15 + 12x + 24}{60} \leq 20$

47x + 39 ≤ 1200
47x ≤ 1161
X ≤ 24. 702
Thus, the largest value of the positive integer x is 24.
Hence, the required integers are 24, 25 and 26.

## Question 29:

Solve the given in-equation and graph the solution on the number line.
2y – 3 < y + 1 ≤ 4y + 7, y ∈ R

## Solution 29:

2y – 3 < y + 1 ≤ 4y + 7, y ∈ R
⇒ 2y – 3 – y < y + 1 – y ≤ 4y + 7 – y
⇒ y – 3 < 1 ≤ 3y + 7
⇒ y – 3 < 1 and 1 ≤ 3y + 7
⇒ y < 4 and 3y ≥ −6 ⇒ y ≥ -2
⇒ -2 ≤ y < 4

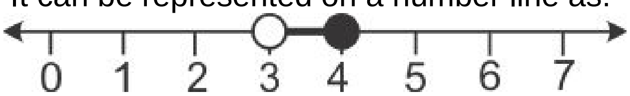
The graph of the given equation can be represented on a number line as:


## Question 30:

Solve the inequation:
3z – 5 ≤ z + 3 < 5z – 9; z ∈ R.
Graph the solution set on the number line.

## Solution 30:

3z – 5 ≤ z + 3 < 5z – 9
3z – 5 ≤ z + 3 and z + 3 < 5z – 9
2z ≤ 8 and 12 < 4z
Z ≤ 4 and 3 < z
Since, z ∈ R
∴ Solution set = {3 < z ≤ 4, x ∈ R}
It can be represented on a number line as:




## Question 31:

Solve the following in equation and represent the solution set on the number line.

$-\ 3 < -\frac{1}{2} - \frac{2X}{3} \leq \frac{5}{6}$, x ∈ R

## Solution 31:

$$-\ 3 < -\frac{1}{2} - \frac{2X}{3} \leq \frac{5}{6}$$

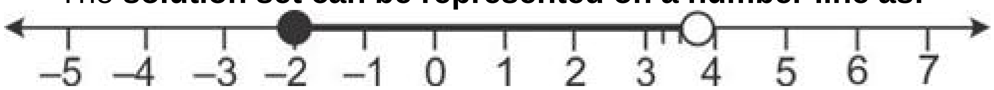
Multiply by 6, we get
⇒ − 18 < − 3 – 4x ≤ 5
⇒ − 15 < − 4x ≤ 8
Dividing by – 4, We get

$$\Rightarrow \frac{-15}{-4} > x \geq \frac{8}{-4}$$

$\Rightarrow -2 \leq x < \frac{15}{4}$

$\Rightarrow x \in \left(-2, \frac{15}{4}\right)$

The **solution set can be represented on a number line as:**




## Question 32:

Solve the following in equation and represent the solution set on the number line:

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

## Solution 32:

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

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

$\Rightarrow 4X - 17 < \frac{3X}{5} \leq X + \frac{8}{5}, X \in R$

$\Rightarrow 4X - \frac{3X}{5} < 17$ and $\frac{-8}{5} \leq x - \frac{3x}{5}, x \in R$

$\Rightarrow \frac{20X - 3X}{5} < 17$ and $\frac{-8}{5} \leq \frac{5X - 3X}{5}, X \in R$

$\Rightarrow \frac{17x}{5} < 17$ and $\frac{-8}{5} \leq \frac{2x}{5}, x \in R$

$\Rightarrow \frac{x}{5} < 1$ and $-4 \leq x, x \in R$

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

The solution set can be represented on a number line as: