Date: 9/10/2021

**Q1.** Find the solution of inequation $2(3 - x) \geq x + 1$.

**Q2.** Solve the following inequation $(3x - 5) \geq (1 + x) \times 2$.

**Q3.** Solve the following equations $2(1 + x) \geq 3(1 - x)$.

**Q4.** Solve the following inequations $\frac{(x-3)}{(x-5)} \geq 0$.

**Q5.** Solve the following inequation $\frac{x-3}{x} \geq 0$.

**Q6.** Solve the following inequation $\frac{x-3}{x} \leq 0$.

**Q7.** Solve the following inequation $\frac{x}{x-3} \geq 0$.

**Q8.** Solve the following inequation $\frac{x}{x-3} > 0$.

**Q9.** Solve the following inequations $\frac{x-3}{x-5} > 0$.

**Q10.** Solve the following inequations $4x + 3 < 6x + 7$.

**Q11.** Solve the inequations $2(x - 3) \geq (3 - x)$.

**Q12.** Solve the following inequations $7x + 3 < 4x + 9$.

**Q13.** Solve the following inequations $2(1 - x) \geq 34$.

**Q14.** Solve the following inequations $3(2 - x) \geq 2(1 - x)$.

**Q15.** Solve the following inequation $\frac{(x-5)}{(x-3)} \geq 0$.

**Q16.** Solve the following inequations $\frac{(x-3)}{(x-5)} \leq 0$, where $x$ is an integer.

**O17.** Solve $24x < 100$ when $x$ is an natural number.

**Q18.** Solve $-(x - 3) + 4 > -2x + 5$ and show the solution set on number line.

**Q19.** Solve $(4x - 7) \leq (3 - x)$ where $x$ is a natural number.

**Q20.** Solve $(4x - 7) < (3 - x)$ where $x$ is a natural number.

**Q21.** Solve $(5x - 8) < 7$ when $x$ is an integer.

**Q22.** Solve $(5x - 7) < 8$ when $x$ is natural number.

**Q23.** Solve $(5x - 7) \leq 8$ when $x$ is an odd natural number.

**Q24.** Solve $(5x - 7) \leq 8$ when $x$ is an even natural number.

**Q25.** Find all positive integral value of $x$ for which $5x - 7 \leq 8$.

Q26. Solve $\frac{x}{2}+1>\frac{x}{4}$ and show the solution set on the number line.

Q27. Solve $30x < 200$ when (i) $x$ is a natural number, (ii) $x$ is an integer.

Q28. Solve the following inequalities for real $x$:

$$3(x-1) \le 2(x-3).$$

Q29. Solve the following inequalities for real $x$:

$$3x-7 > 5x-1.$$

Q30. Solve the following inequalities for real $x$:

$$4x+3 < 6x+7.$$

Q31. Solve $-5 \le \frac{5-3x}{2} \le 8$.

Q32. Solve $-8 \le 5x-3 < 7$.

Q33. Solve $7x+3 < 5x+9$. Show the graph of the solutions on number line.

Q34. Solve $\frac{5-2x}{3} \le \frac{x}{6}-5$.

Q35. Solve $5x-3 < 3x+1$ when (i) $x$ is an integer, (ii) $x$ is a real number.

Q36. Solve the following inequalities for real $x$:

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

Q37. Solve the following inequalities for real $x$:

$$x+\frac{x}{2}+\frac{x}{3} < 11.$$

Q38. Solve the inequalities: $7 \le \frac{(3x+11)}{2} \le 11$.

Q39. Solve the inequalities: $-15 < \frac{3(x-2)}{5} \le 0$.

Q40. Solve the inequalities: $2 \le 3x-4 \le 5$.

Q41. Solve the inequality $2(2-x) \ge 3(x-2)$.

Q42. Find the solution of inequation $\frac{2(1-x)}{3} \ge \frac{(1+x)}{4}$.

Q43. Solve the following inequations $\frac{x+3}{x-2} \le 2$.

Q44. Solve $5x-3 > 2x+9$, when $x$ is an integer.

Q45. Solve $24x < 100$ when $x$ is an integer.

Q46. Solve the following inequations $\frac{(3x-5)}{4} > \frac{x-3}{2}$.

Q47. Solve the following inequations $3(x-4) > \frac{x}{3}$.

Q48. Solve the following inequations $\frac{3x-5}{3} > \frac{x}{4}$.

Q49. Solve the inequation $3x - 7 > \frac{x}{4}$.

Q50. Solve the following inequations $\frac{2-x}{x} > 0$.

Q51. Solve the following inequations $\left(x - \frac{x}{4}\right) \geq 3x + 2$.

Q52. Solve the inequation $5(x - 3) \geq 2(1 - x)$.

Q53. Solve the inequality $3(1 - x) < 2(x + 4)$ and show the solution set on number line.

Q54. Solve the following inequalities $\frac{x-1}{x-2} \geq 0$ and show the solution set on the number line.

Q55. Solve the following inequation $\frac{x+3}{x-2} \geq 2$.

Q56. Solve $3(x - 1) > \frac{x}{4}$ and show the solution set on number line.

Q57. Solve $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$ and show the solution set on the number line.

Q58. Solve $(3x + 5) < (x - 7)$ where $x$ is a real number and show the graph of the solution set on the number line.

Q59. Solve the following inequation $\frac{x+3}{x-2} \geq 2$, where $x$ is an integer.

Q60. Solve the following inequations $\frac{3(x-2)}{5} \geq \frac{5(2-x)}{3}$ and show the graph of the solution set on the number line.

Q61. Solve the following inequation $\frac{x}{3} + 1 \geq 2x - 4$ and show the solution set on number line.

Q62. Solve $\frac{x+1}{3} \geq (2x - 4)$ and show the solution set on the number line.

Q63. Solve the following inequalities for real $x$:

$$\frac{1}{2}\left(\frac{3x}{5} + 4\right) \geq \frac{1}{3}(x - 6).$$

Q64. Slove $3x + 8 > 2$, when (i) $x$ is an integer, (ii) $x$ is an real number.

Q65. Slove $5x - 3 < 7$, when (i) $x$ is an integer, (ii) $x$ is an real number.

Q66. Solve $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$. Show the graph of the solutions on number line.

Q67. Solve $\frac{x-3}{9} > \frac{x}{4}$ and show the solution set on number line.

Q68. Solve the following inequations $\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$ and show the graph of the solution set on the number line.

Q69. Solve the following inequation $x + \frac{3}{4} \geq \frac{(2-x)}{3}$ and show the solution set on the number line.

Q70. Solve the inequalities: $-3 \leq 4 - \frac{7x}{2} \leq 18$.

Q71. Solve the inequalities: $6 \leq -3(2x - 4) < 12$.

**Q72.** **Solve the following inequalities for real *x*:**

$$\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}.$$

**Q73.** **Solve the following inequalities for real *x*:**

$$37 - (3x + 5) \geq 9x - 8(x - 3)$$

**Q74.** **Solve the following inequalities for real *x*:**

$$2(2x + 3) - 10 < 6(x - 2)$$

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**S1.** Since, $2(3 - x) \geq x + 1$

$\Rightarrow \quad 6 - 2x \geq x + 1 \quad \Rightarrow \quad 3x \leq 5$

$\Rightarrow \quad x \leq \dfrac{5}{3}$

Hence, solution set for $x$ is $\left(-\infty, \dfrac{5}{3}\right]$.

**S2.** Since, $(3x - 5) \geq 2 + 2x$

$\Rightarrow \quad 3x - 2x \geq 2 + 5 \quad \Rightarrow \quad x \geq 7$

Hence solution set for $x$ is $[7, \infty)$

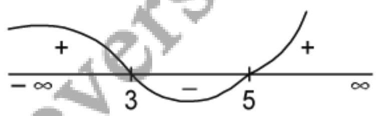
**S3.** Since, $2(1 + x) \geq 3(1 - x) \quad \Rightarrow \quad 2 + 2x \geq 3 - 3x$

$\Rightarrow \quad 5x \geq 1 \quad \Rightarrow \quad x \geq \dfrac{1}{5}$

Hence solution set for $x$ is $\left[\dfrac{1}{5}, \infty\right)$.

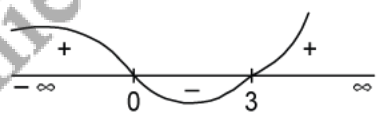
**S4.** Since critical points for this function are {3, 5}.

Hence solution set is $(-\infty, 3] \cup (5, \infty)$.



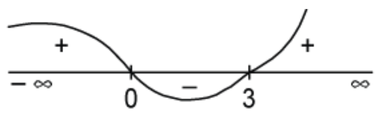

**S5.** Since critical points for this function are {3, 0}.

Hence solution set is $(-\infty, 0) \cup [3, \infty)$



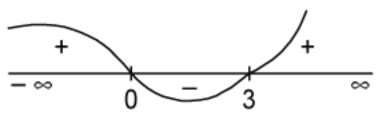

**S6.** Since the set of critical points for this function is {3, 0}.

Hence solution set is $(0, 3]$




**S7.** Since the set of critical points for this function are {0, 3}.

Hence solution set is $(-\infty, 0] \cup (3, \infty)$.




**S8.** Since critical points for this function are {0, 3}.

Hence solution set is $(-\infty, 0) \cup (3, \infty)$


**S9.** Since critical points for this inequation are {3, 5}

Hence solution set is $(-\infty, 3) \cup (5, \infty)$

**S10.** The given inequation is $4x + 3 < 6x + 7$

$\Rightarrow \quad 4x - 6x < 7 - 3 \quad \Rightarrow \quad -2x < 4$

$\Rightarrow \quad -2x - 4 < 0 \quad \Rightarrow \quad -2(x + 2) < 0$

$\Rightarrow \quad x + 2 > 0 \quad \Rightarrow \quad x > -2$

Hence solution set is $(-2, \infty)$.

**S11.** Since, $\quad 2(x - 3) \geq (3 - x)$

$\Rightarrow \quad 2x - 6 \geq 3 - x$

$\Rightarrow \quad 2x + x \geq 6 + 3 \quad \Rightarrow \quad 3x \geq 9$

$\Rightarrow \quad 3x - 9 \geq 0 \quad \Rightarrow \quad 3(x - 3) \geq 0$

$\Rightarrow \quad x - 3 \geq 0 \quad \Rightarrow \quad x \geq 3$

Hence solution set is $[3, \infty)$.

**S12.** Since, $\quad 7x + 3 < 4x + 9$

$\Rightarrow \quad 7x - 4x < 9 - 3$

$\Rightarrow \quad 3x < 6 \quad \Rightarrow \quad 3x - 6 < 0$

$\Rightarrow \quad 3(x - 2) < 0 \quad \Rightarrow \quad (x - 2) < 0$

$\Rightarrow \quad x < 2$

Hence solution set is $(-\infty, 2)$

**S13.** Since, $\quad 2(1 - x) \geq 34$

$\Rightarrow \quad 2 - 2x \geq 34 \quad \Rightarrow \quad 2 - 34 \geq 2x$

$\Rightarrow \quad 2x \leq -32 \quad \Rightarrow \quad 4x + 32 \leq 0$

$\Rightarrow \quad 6(x + 16) \leq 0 \quad \Rightarrow \quad x + 16 \leq 0$

$\Rightarrow \quad x \leq -16$

Hence solution set is $(-\infty, -16]$.

**S14.** Since, $\quad 3(2 - x) \geq 2(1 - x)$

$\Rightarrow \quad 6 - 3x \geq 2 - 2x$

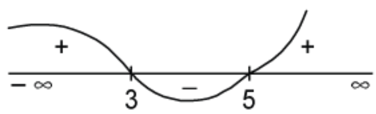
$\Rightarrow \quad 6 - 2 \geq 3x - 2x \quad \Rightarrow \quad 4 \geq x$

$\Rightarrow \quad x \leq 4$

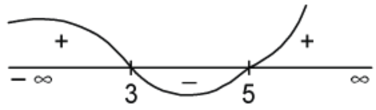
Hence solution set is $(-\infty, 4]$.

**S15.** Since critical points for this function are {5, 3}.

Hence solution set for this inequation is $(-\infty, -3) \cup [5, \infty)$.



**S16.** Since critical points for this function is {3, 5}.




Hence $x \in [3, 5)$.

Hence required solution set for $x$ is [3, 5].

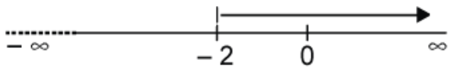
**S17.** $\because \quad 24x < 100$

$\Rightarrow \quad 24x - 100 < 0$

$\Rightarrow \quad 4(6x - 25) < 0 \quad \Rightarrow \quad x < \frac{25}{6}$

When $x$ is a natural number then $x = 1, 2, 3, 4$.

**S18.** Since, $\quad -(x - 3) + 4 > -2x + 5$




$\Rightarrow \quad -x + 3 + 4 > -2x + 5$

$\Rightarrow \quad -x + 7 > -2x + 5$

$\Rightarrow \quad -x + 2x > 5 - 7 \quad \Rightarrow \quad x > -2$

Hence solution set is $(2, \infty)$ which can be shown on number line as.

**S19.** Since, $\quad (4x - 7) \le (3 - x)$

$\Rightarrow \quad (4x - 7) \le (3 - x) \quad \Rightarrow \quad 4x + x \le 3 + 7$

$\Rightarrow \quad 5x \le 10 \quad \Rightarrow \quad x \le 2$

Since $x$ is natural number.

Hence solution set for $x$ is {1, 2}.

**S20.** Since, $\quad (4x - 7) < (3 - x)$

$\Rightarrow \quad 4x + x < 3 + 7$

$\Rightarrow \quad x < 2$

Since $x$ is a natural number.

Hence solution set for $x$ is {1}.

**S21.** Since, $\quad (5x - 8) < 7$

$\Rightarrow \quad 5x < 15$

$\Rightarrow \quad x < 3$

$\therefore \quad x \in (-\infty, 3)$

Since $x$ is an integer.

$\therefore$ solution set for $x$ is (... – 1, 0, 1, 2 ).

**S22.** Since, $\quad (5x - 7) < 8$

$\Rightarrow \quad 5x < 8 + 7$

$\Rightarrow \quad x < 3$

$\therefore \qquad x \in (-\infty, 3)$

Since $x$ is a natural number.

$\therefore$ Solution set for $x$ is {1, 2}.

**S23.** Since, $(5x - 7) \le 8$

$\Rightarrow \qquad 5x \le 15$

$\Rightarrow \qquad x \le 3$

$\therefore \qquad x \in (-\infty, 3]$

Since $x$ is an odd natural number.

Hence solution set for $x$ is {1, 3}.

**S24.** Since, $(5x - 7) \le 8$

$\Rightarrow \qquad 5x \le 15$

$\Rightarrow \qquad x \le 3$

$\therefore \qquad x \in (-\infty, 3]$

Since $x$ is an even natural number.

Hence solution set for $x$ is {2}.

**S25.** Since, $(5x - 7) \le 8$

$\Rightarrow \qquad 5x \le 7 + 8$

$\Rightarrow \qquad 5x \le 15$

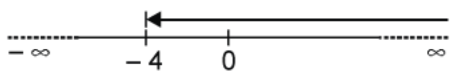
$\Rightarrow \qquad x \le 3$

$\therefore \qquad x \in (-\infty, 3]$

Since $x$ assumes only positive integral value.

Hence solution set for $x$ is {1, 2, 3}.

**S26.** Since, $\frac{x}{2} + 1 > \frac{x}{4}$




$\Rightarrow \qquad \frac{x}{2} - \frac{x}{4} > -1$

$\Rightarrow \qquad \frac{2x - x}{4} > -1 \Rightarrow \frac{x}{4} + 1 > 0$

$\Rightarrow \qquad \frac{x + 4}{4} > 0 \Rightarrow x + 4 > 0 \Rightarrow x > -4$

Hence solution set is $(-4, \infty)$, which can be shown on number line as.

**S27.** We are given, $30x < 200$

or $\frac{30x}{30} < \frac{200}{30}$

*i.e.*, $x < 20/3$

(i) When $x$ is a natural number, in this case the following values of $x$ make the statement true.

1, 2, 3, 4, 5, 6

The solution set of the inequality is {1, 2, 3, 4, 5, 6}.

(i) When $x$ is an integer, the solutions of the given inequality are

..., – 3, – 2, – 1, 0, 1, 2, 3, 4, 5, 6

The solution set of the inequality is {..., – 3, – 2, – 1, 0, 1, 2, 3, 4, 5, 6}.

**S28.** Given, $3(x-1) \leq 2(x-3)$

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

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

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

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

$\Rightarrow$ $x \leq -3$

Solution set = $(-\infty, -3]$.

**S29.** Given, $3x - 7 > 5x - 1$

$\Rightarrow$ $3x - 7 + 7 > 5x - 1 + 7$

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

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

$\Rightarrow$ $-2x < 6$

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

$\Rightarrow$ $x < -3$

Solution set = $(-\infty, -3)$.

**S30.** Given, $4x + 3 < 6x + 7$

$\Rightarrow$ $4x + 3 - 3 < 6x + 7 - 3$

$\Rightarrow$ $4x < 6x + 4$

$\Rightarrow$ $4x - 6x < 6x - 6x + 4$

$\Rightarrow$ $-2x < 4$

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

$\Rightarrow$ $x > -2$

Solution set = $(-2, \infty)$.

**S31.** We have, $-5 \le \dfrac{5-3x}{2} \le 8$

or $-10 \le 5-3x \le 16$ or $-15 \le -3x \le 11$

or $5 \ge x \ge -\dfrac{11}{3}$

which can be written as $\dfrac{-11}{3} \le x \le 5$.

**S32.** In this case, we have two inequalities,

$$-8 \le 5x-3 \quad \text{and} \quad 5x-3 < 7$$

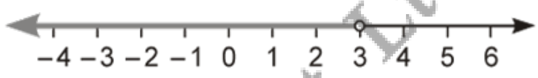
which will solve simultaneously.

We have $-8 \le 5x-3 < 7$

or $-5 \le 5x < 10$ or $-1 \le x < 2$.

**S33.** We have, $7x + 3 < 5x + 9$

or $2x < 6$ or $x < 3$




The graphical representation of the solutions are given in the figure.

**S34.** We have $\dfrac{5-2x}{3} \le \dfrac{x}{6} - 5$

or $2(5-2x) \le x - 30$

or $10 - 4x \le x - 30$

or $-5x \le -40$, *i.e.*, $x \ge 8$

Thus, all real numbers $x$ which are greater than or equal to 8 are the solutions of the given inequality, *i.e.*, $x \in [8, \infty)$.

**S35.** We have, $5x - 3 < 3x + 1$

$$5x - 3 + 3 < 3x + 1 + 3$$

$$5x < 3x + 4$$

$$5x - 3x < 3x + 4 - 3x$$

$$2x < 4$$

$$x < 2$$

(i) When x is an integer, the solutions of the given inequality are

...., –4, –3, –2, –1, 0, 1

(ii) When $x$ is a real number, the solutions of the inequality are given by $x < 2$, *i.e.*, all real numbers $x$ which are less than 2. Therefore, the solution set of the inequality is $x \in (-\infty, 2)$.

**S36.** Given, $\dfrac{x}{3} > \dfrac{x}{2} + 1$

$\Rightarrow$ $6\left(\dfrac{x}{3}\right) > 6\left(\dfrac{x}{2}+1\right)$ [Multiplying both sides by 6]

$\Rightarrow \quad 2x > 3x + 6$

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

$\Rightarrow \quad -x > 6$

$\Rightarrow \quad x < -6$

Solution set = $(-\infty, -6)$.

**S37.** Given, $x + \frac{x}{2} + \frac{x}{3} < 11$

$\Rightarrow \quad 6\left[x + \frac{x}{2} + \frac{x}{3}\right] < 11(6)$ [Multiplying both sides by 6, *i.e.*, L.C.M. of 2 and 3]

$\Rightarrow \quad 6x + 3x + 2x < 66$

$\Rightarrow \quad 11x < 66$

$\Rightarrow \quad \frac{11x}{11} < \frac{66}{11}$

$\Rightarrow \quad x < 6$

Solution set = $(-\infty, 6)$.

**S38.** Given, $7 \le \frac{(3x + 11)}{2} \le 11$

or $\quad 14 \le 3x + 11 \le 22$

or $\quad 14 - 11 \le 3x + 11 - 11 \le 22 - 11$

or $\quad 3 \le 3x \le 11$

or $\quad 1 \le x \le \frac{11}{3}$

Solution set = $\left[1, \frac{11}{3}\right]$.

**S39.** Given, $-15 < \frac{3(x - 2)}{5} \le 0$

or $\quad -75 < 3(x - 2) \le 0$

or $\quad -25 < (x - 2) \le 0$

or $\quad -25 + 2 < x - 2 + 2 \le 0 + 2$

or $\quad -23 < x \le 2$

Solution set = $(-23, 2]$.

**S40.** In this case, we have two inequalities $2 \le 3x - 4$ and $3x - 4 \le 5$ and which we will solve simultaneously.

We have $\quad 2 \le 3x - 4 \le 5$

or $\quad 2 + 4 \le 3x - 4 + 4 \le 5 + 4$

or $6 \le 3x \le 9$

or $\frac{6}{3} \le \frac{3x}{3} \le \frac{9}{3}$

or $2 \le x \le 3.$

**S41.** Since, $2(2 - x) \ge 3(x - 2)$

$\Rightarrow$ $4 - 2x \ge 3x - 6$

$\Rightarrow$ $4 + 6 \ge 3x - 2x \Rightarrow 10 \ge 5x$

$\Rightarrow$ $5x \le 10 \Rightarrow 5x - 10 \le 0$

$\Rightarrow$ $5(x - 2) \le 0 \Rightarrow (x - 2) \le 0$

$\Rightarrow$ $x \le 2$

Hence solution set is $(-\infty, 2]$

**S42.** Since, $\frac{2(1-x)}{3} \ge \frac{(1+x)}{4}$

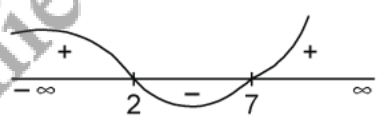
or $\frac{2-2x}{3} \ge \frac{1}{4} + \frac{x}{4} \Rightarrow \frac{x}{4} + \frac{2x}{3} \le 2 - \frac{1}{4}$

$\Rightarrow$ $\frac{3x+8x}{12} \le \frac{7}{4} \Rightarrow 11x \le \frac{7}{4} \times 12$

$\Rightarrow$ $11x \le 21 \Rightarrow x \le \frac{21}{11}$

Hence solution set for $x$ is $\left(-\infty, \frac{21}{11}\right]$.

**S43.** Since, $\frac{x+3}{x-2} - 2 \le 0$




$\Rightarrow$ $\frac{x+3-2x+4}{(x-2)} \le 0 \Rightarrow \frac{-x+7}{(x-2)} \le 0$

$\Rightarrow$ $\frac{x-7}{x-2} \ge 0$

Hence critical points for this function are {2, 7}

Hence solution set is $(-\infty, 2) \cup [7, \infty)$.

**S44.** Since, $5x - 3 > 2x + 9$

$\Rightarrow$ $5x - 2x > 9 + 3$

$\Rightarrow$ $3x > 12 \Rightarrow 3(x - 4) > 0$

$\Rightarrow$ $x > 4$

When $x$ is an integer, then

$x = 4, 5, 6 \cdot \cdot \cdot \cdot \cdot \cdot \cdot \cdot$

Hence solution set for $x$ is

$$x = \{4, 5, 6, \dots\}.$$

**S45.** $\because \quad 24x < 100$

$\Rightarrow \quad 4(6x - 25) < 0$

$\Rightarrow \quad x < \frac{25}{6}$

When $x$ is an integer.

$$x = \dots -3, -2, -1, 0, 1, 2, 3, 4.$$

Hence the solution set is $\{\dots -3, -2, -1, 0, 1, 2, 3, 4\}$.

**S46.** $$\frac{(3x-5)}{4} > \frac{x-3}{2} \quad \Rightarrow \quad \frac{(3x-5)}{4} - \frac{(x-3)}{2} > 0$$

$$\frac{(3x-5) - 2(x-3)}{4} > 0$$

$$\frac{3x - 5 - 2x + 6}{5} > 0$$

$\Rightarrow \quad \frac{x+1}{4} > 0 \quad \Rightarrow \quad (x+1) > 0$

$\Rightarrow \quad x > -1$

Hence solution set is $(-1, \infty)$.

**S47.** Since, $\quad 3(x-4) > \frac{x}{3} \quad \Rightarrow \quad 3(x-4) - \frac{x}{3} > 0$

$\Rightarrow \quad \frac{9(x-4) - x}{3} > 0 \quad \Rightarrow \quad \frac{9x - 36 - x}{3} > 0$

$\Rightarrow \quad 4(2x-9) > 0 \quad \Rightarrow \quad 2x - 9 > 0$

$\Rightarrow \quad x > \frac{9}{2}$

Hence solution set is $\left(\frac{9}{2}, \infty\right)$.

**S48.** $\frac{3x-5}{3} > \frac{x}{4} \quad \Rightarrow \quad \frac{3x-5}{3} - \frac{x}{4} > 0$

$\Rightarrow \quad \frac{12x - 20 - 3x}{12} > 0 \quad \Rightarrow \quad \frac{9x-20}{12} > 0$

$\Rightarrow \quad 9x - 20 > 0 \quad \Rightarrow \quad 9\left(x - \frac{20}{9}\right) > 0$

$\Rightarrow \quad x > \frac{20}{9}$

Hence solution set is $\left(\frac{20}{9}, \infty\right)$.

**S49.** Since, $(3x - 7) > \frac{x}{4} \quad \Rightarrow \quad (3x - 7) - \frac{x}{4} > 0$

$\Rightarrow \quad \frac{12x - 28 - x}{4} > 0 \quad \Rightarrow \quad \frac{11x - 28}{4} > 0$

$\Rightarrow \quad 11x - 28 > 0 \quad \Rightarrow \quad 11\left(x - \frac{28}{11}\right) > 0$

$\Rightarrow \quad \left(x - \frac{28}{11}\right) > 0 \quad \Rightarrow \quad x > \frac{28}{11}$

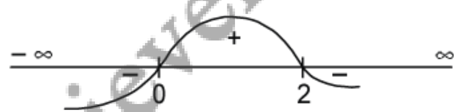
Hence solution set is $\left(\frac{28}{11}, \infty\right)$.

**S50.** The given inequation is $\frac{2 - x}{x} > 0$

First of all we find critical point (critical points are all such points at which function is zero or not defined).

Hence critical point for this function is {2, 0}.

Hence solution set is (0, 2)




**S51.** Since, $x - \frac{x}{4} \geq 3x + 2 \quad \Rightarrow \quad \frac{3x}{4} \geq 3x + 2$

$\Rightarrow \quad \frac{3x}{4} - \frac{3x}{1} \geq 2 \quad \Rightarrow \quad \frac{3x - 12x}{4} \geq 2$

$\Rightarrow \quad \frac{-9x}{4} \geq 2 \quad \Rightarrow \quad \frac{9x}{4} \leq -2 \quad \Rightarrow \quad x \leq \frac{-8}{9}$

Hence solution set for $x$ is $\left(-\infty, \frac{-8}{9}\right]$.

**S52.** Since, $5(x - 3) \geq 2(1 - x)$

$\Rightarrow \quad 5x - 15 \geq 2 - 2x$

$\Rightarrow \quad 5x + 2x \geq 2 + 15$

$\Rightarrow \quad 7x \geq 17 \quad \Rightarrow \quad 7\left(x - \frac{17}{7}\right) \geq 0$

$$\Rightarrow \quad \left(x - \frac{17}{7}\right) \geq 0 \quad \Rightarrow \quad x \geq \frac{17}{7}$$

Hence solution set is $\left[\frac{17}{7}, \infty\right)$.

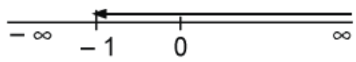
**S53.** Since, $3(1 - x) < 2(x + 4)$

$$\Rightarrow \quad 3 - 3x < 2x + 8$$

$$\Rightarrow \quad -3x - 2x < 8 - 3$$

$$\Rightarrow \quad -5x < 5 \quad \Rightarrow \quad -5x - 5 < 0$$

$$\Rightarrow \quad -5(x + 1) < 0$$

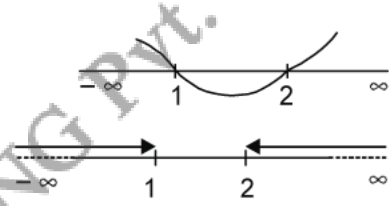



$$\Rightarrow \quad x + 1 > 0 \quad \Rightarrow \quad x > -1$$

Hence solution set is $(-1, \infty)$ which can be shown on number line as shown in the figure.

**S54.** Since,

$$\frac{x-1}{x-2} \geq 0$$




Critical points for this function are {1, 2}.

Hence solution set is $(-\infty, 1] \cup (2, \infty)$ which can be shown on number line as shown in figure.

**S55.** Since,

$$\frac{x+3}{x-2} \geq 2 \quad \Rightarrow \quad \frac{x+3}{x-2} - \frac{2}{1} \geq 0$$


$$\Rightarrow \quad \frac{x-7}{x-2} \leq 0$$

Hence critical points for this function are {7, 2}.

Hence solution set is (2, 7 ].

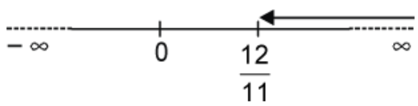
**S56.** Since,

$$3(x - 1) > \frac{x}{4} \quad \Rightarrow \quad 3x - 3 > \frac{x}{4}$$

$$\Rightarrow \quad 3x - \frac{x}{4} > 3 \quad \Rightarrow \quad \frac{12x - x}{4} > 3$$

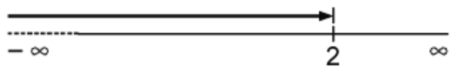
$$\Rightarrow \quad \frac{11x}{4} - 3 > 0 \quad \Rightarrow \quad \frac{11x - 12}{4} > 0$$

$$\Rightarrow \quad x > \frac{12}{11}$$




Hence solution set is $\left(\frac{12}{11}, \infty\right)$ which can be shown on number line as shown in the figure.

**S57.** Since, $\frac{3(x-2)}{5} \le \frac{5(2-x)}{3}$




$\Rightarrow \quad \frac{3x-6}{5} \le \frac{10-5x}{3}$

$\Rightarrow \quad \frac{(3x-6)}{5} - \frac{(10-5x)}{3} \le 0$

$\Rightarrow \quad \frac{9x-18-50+25x}{15} \le 0$

$\Rightarrow \quad \frac{34x-68}{15} \le 0$

$\Rightarrow \quad (x-2) \le 0 \quad \Rightarrow \quad x \le 2$

Hence solution set is $(-\infty, 2]$ which can be shown on number line as.

**S58.** (3x + 5) < (x – 7)


$\Rightarrow \quad (3x + 5) - x + 7 < 0$

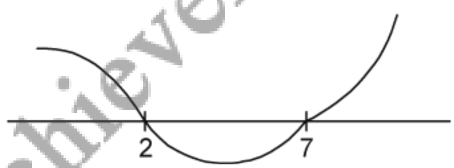
$\Rightarrow \quad 2x + 12 < 0 \quad \Rightarrow \quad x < -6$

When $x$ is a real number $x \in (-\infty, -6)$ which can be shown on number line as shown in figure.

**S59.** Since, $\frac{x+3}{x-2} \ge 2$

$\Rightarrow \quad \frac{x-7}{x-2} \le 0$

Hence critical points for this function are {2, 7}.




Hence $\quad x \in (2, 7]$

When $x$ is an integer then

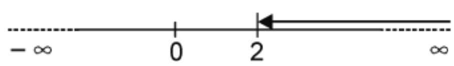
$x = 3, 4, 5, 7$

Hence solution set for $x$ is {3, 4, 5, 7}

**S60.** Since, $\frac{3(x-2)}{5} \ge \frac{5(2-x)}{3}$

$\Rightarrow \quad \frac{3x-6}{5} \ge \frac{10-5x}{3}$

$\Rightarrow \quad \frac{(3x-6)}{5} - \frac{(10-5x)}{3} \ge 0$




$\Rightarrow \quad \frac{9x-18-50+25x}{15} \ge 0$

$\Rightarrow \qquad \dfrac{34x - 68}{15} \geq 0 \quad \Rightarrow \quad 34\,(x - 2) \geq 0$

$\Rightarrow \qquad x \geq 2$

Hence solution set for $x$ is $[2, \infty)$, which is shown on the number line as shown in the figure.

**S61.** Since, $\qquad \dfrac{x}{3} + 1 \geq 2x - 4$

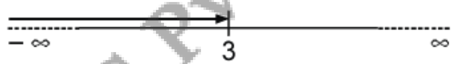
$\Rightarrow \qquad \dfrac{x+3}{3} \geq (2x - 4)$

$\Rightarrow \qquad \dfrac{x+3}{3} - \dfrac{(2x-4)}{1} \geq 0$

$\Rightarrow \qquad \dfrac{x + 3 - 6x + 12}{3} \geq 0$

$\Rightarrow \qquad \dfrac{-5x + 15}{3} \geq 0 \quad \Rightarrow \quad -5x + 15 \geq 0$

$\Rightarrow \qquad -5(x - 3) \geq 0 \quad \Rightarrow \quad x - 3 \leq 0$




$\Rightarrow \qquad x \leq 3$

Hence the solution set is $(-\infty, 3]$ which is shown on the number line as shown in the figure.

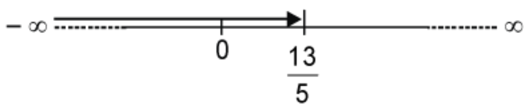
**S62.** Since, $\qquad \dfrac{x+1}{3} \geq (2x - 4)$

$\Rightarrow \qquad \dfrac{x+1}{3} - \dfrac{(2x-4)}{1} \geq 0$

$\Rightarrow \qquad \dfrac{x + 1 - 6x + 12}{3} \geq 0$

$\Rightarrow \qquad \dfrac{-5x + 13}{3} \geq 0 \quad \Rightarrow \quad -5x + 13 \geq 0$

$\Rightarrow \qquad -5\left(\dfrac{x - 13}{5}\right) \geq 0$




$\Rightarrow \qquad x \leq \dfrac{13}{5}$

Hence solution set is $\left(-\infty, \dfrac{13}{5}\right]$ which can be shown on number line as shown in the figure.

**S63.** We are given $\qquad \dfrac{1}{2}\left(\dfrac{3x}{5} + 4\right) \geq \dfrac{1}{3}(x - 6)$

$\Rightarrow \qquad \dfrac{1}{2}\left(\dfrac{3x + 20}{5}\right) \geq \dfrac{1}{3}(x - 6)$

$\Rightarrow \quad \frac{1}{10}(3x+20) \geq \frac{1}{3}(x-6)$ [Multiply both sides by 30]

$\Rightarrow \quad \frac{30}{10}(3x+20) \geq \frac{30}{3}(x-6)$

$\Rightarrow \quad 3(3x + 20) \geq 10(x - 6)$

$\Rightarrow \quad 9x + 60 \geq 10x - 60$

$\Rightarrow \quad 9x + 60 - 60 \geq 10x - 60 - 60$

$\Rightarrow \quad 9x \geq 10x - 120$

$\Rightarrow \quad 9x - 10x \geq 10x - 120 - 10x$

$\Rightarrow \quad -x \geq -120$

$\Rightarrow \quad x \leq 120$

Solution set = $(-\infty, 120]$.

**S64.** We are given $3x + 8 > 2$

$\Rightarrow \quad 3x - 8 - 8 > 2 - 8$

$\Rightarrow \quad 3x > -6$

$\Rightarrow \quad \frac{3x}{3} > \frac{-6}{3}$

$\Rightarrow \quad x > -2$

(i) When $x$ is an integer, the following values of $x$ make the statement true.

$x = -1, 0, 1, 2, 3, \ldots$.

$\therefore$ The solution set of the inequality is $\{-1, 0, 1, 2, 3, \ldots\}$.

(ii) When $x$ is a real number, the solutions of the inequality are given by $x > -2$, *i.e.*, all real numbers $x$ which are greater than $-2$. Therefore, the solution set of the inequalities is $(-2, \infty)$.

**S65.** We are given $5x - 3 < 7$

$\Rightarrow \quad 5x - 3 + 3 < 7 + 3$

$\Rightarrow \quad 5x < 10$

$\Rightarrow \quad \frac{5x}{5} < \frac{10}{5}$

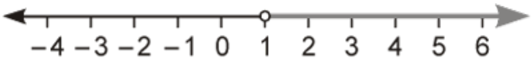
$\Rightarrow \quad x < 2$

(i) When $x$ is an integer the solutions of the given inequality are $\ldots, -3, -2, -1, 0, 1$.

$\therefore$ The solution set of the inequality is $\{\ldots, -3, -2, -1, 0, 1\}$.

(ii) When $x$ is a real number, the solutions of the inequality are given by $x < 2$, *i.e.*, all real numbers $x$ which are less than 2. Therefore, the solution set of the inequalities is $x \in (-\infty, 2)$.

**S66.** We have $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$




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

or $2(3x-4) \geq (x-3)$

or $6x - 8 \geq x - 3$

or $5x \geq 5$ or $x \geq 1$

The graphical representation of solutions is given in figure.

**S67.** Since, $\frac{x-3}{9} > \frac{x}{4}$

$\Rightarrow \frac{x}{9} - \frac{3}{9} > \frac{x}{4}$

$\Rightarrow \frac{x}{9} - \frac{x}{4} > \frac{3}{9}$

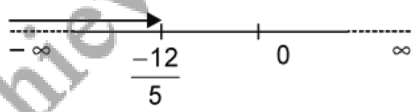
$\Rightarrow \frac{4x-9x}{36} > \frac{1}{3}$

$\Rightarrow \frac{-5x}{36} > \frac{1}{3}$

$\Rightarrow \frac{-5x}{36} - \frac{1}{3} > 0 \Rightarrow \frac{5x}{36} + \frac{1}{3} < 0$

$\Rightarrow \frac{5x+12}{36} < 0$

$\Rightarrow 5x + 12 < 0 \Rightarrow x < \frac{-12}{5}$



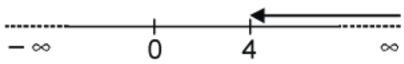

Hence solution set is $\left(-\infty, \frac{-12}{5}\right)$ which can be shown on number line as shown in figure.

**S68.** Since, $\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$

$\Rightarrow \frac{x}{4} < \frac{25x-10-21x+9}{15}$

$\Rightarrow \frac{x}{4} < \frac{4x-1}{15} \Rightarrow \frac{4x-1}{15} - \frac{x}{4} > 0$

$\Rightarrow \frac{16x-4-15x}{60} > 0$



$$\Rightarrow \qquad \frac{x-4}{60} > 0 \quad \Rightarrow \quad x > 4$$

Hence solution set for x is $(4, \infty)$ which can be shown on number line as shown in the figure.

**S69.** Since,

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

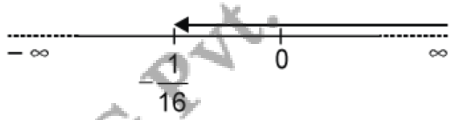
$$x + \frac{3}{4} \geq \frac{2}{3} - \frac{x}{3}$$

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

$$\Rightarrow \qquad \frac{4x}{3} \geq \frac{8-9}{12} \quad \Rightarrow \quad \frac{4x}{3} \geq \frac{-1}{12}$$

$$\Rightarrow \qquad \frac{4x}{3} + \frac{1}{12} \geq 0 \quad \Rightarrow \quad \frac{16x+1}{12} \geq 0$$

$$\Rightarrow \qquad 16x + 1 \geq 0 \quad \Rightarrow \quad x \geq -\frac{1}{16}$$




Hence solution set is $\left[-\frac{1}{16}, \infty\right)$ which can be shown on number line as shown in the figure.

**S70.** Given,

$$-3 \leq 4 - \frac{7x}{2} \leq 18$$

or $$-3 \leq \frac{8-7x}{2} \leq 18$$

or $$-6 \leq 8 - 7x \leq 36$$

or $$-6 - 8 \leq 8 - 7x - 8 \leq 36 - 8$$

or $$-14 \leq -7x \leq 28$$

or $$\frac{-14}{7} \leq \frac{-7x}{7} \leq \frac{28}{7}$$

or $$-2 \leq -x \leq 4$$

or $$-4 \leq x \leq 2$$

Solution set = $[-4, 2]$.

**S71.** We have,

$$6 \leq -3(2x-4) < 12$$

or $$\frac{6}{3} \leq \frac{-3(2x-4)}{3} \leq \frac{12}{3}$$

or $$2 \le -(2x - 4) < 4$$

or $$2 \le -2(x - 2) < 4$$

or $$\frac{2}{2} \le \frac{-2(x-2)}{2} \le \frac{4}{2}$$

or $$1 \le -(x - 2) < 2$$

or $$-1 \ge (x - 2) > -2$$

or $$-1 + 2 \ge x - 2 + 2 > -2 + 2$$

or $$1 \ge x > 0$$

Solution set = (0, 1].

**S72.** Given, $$\frac{(2x-1)}{3} \ge \frac{(3x-2)}{4} - \frac{(2-x)}{5}$$

Multiplying both sides by 60 *i.e.*, L.C.M. of 3, 4, and 5, we have

$$\Rightarrow \quad 60\left[\frac{(2x-1)}{3}\right] \ge 60\left[\frac{(3x-2)}{4} - \frac{(2-x)}{5}\right]$$

$$\Rightarrow \quad 20(2x - 1) \ge 15(3x - 2) - 12(2 - x)$$

$$\Rightarrow \quad 40x - 20 \ge 45x - 30 - 24 + 12x$$

$$\Rightarrow \quad 40x - 20 \ge 57x - 54$$

$$\Rightarrow \quad 40x - 20 + 20 \ge 57x - 54 + 20$$

$$\Rightarrow \quad 40x \ge 57x - 34$$

$$\Rightarrow \quad 40x - 57x \ge 57x - 57x - 34$$

$$\Rightarrow \quad -17x \ge -34$$

$$\Rightarrow \quad \frac{-17x}{-17} \le \frac{-34}{-17}$$

$$\Rightarrow \quad x \le 2$$

Solution set = $(-\infty, 2]$.

**S73.** Given, $$37 - (3x + 5) \ge 9x - 8(x - 3)$$

$$\Rightarrow \quad 37 - 3x - 5 \ge 9x - 8x + 24$$

$$\Rightarrow \quad 32 - 3x \ge x + 24$$

$$\Rightarrow \quad 32 - 3x + 3x \ge x + 3x + 24$$

$$\Rightarrow \quad 32 \ge 4x + 24$$

$$\Rightarrow \quad 32 - 24 \ge 4x + 24 - 24$$

$$\Rightarrow \quad 8 \ge 4x$$

$$\Rightarrow \quad 4x \le 8$$

$$\Rightarrow \quad \frac{4x}{4} \le \frac{8}{4}$$

$\Rightarrow \qquad x \le 2$

Solution set = $(-\infty, 2]$.

**S74.** Given, $\qquad 2(2x + 3) - 10 < 6(x - 2)$

$\Rightarrow \qquad 4x + 6 - 10 < 6x - 12$

$\Rightarrow \qquad 4x - 4 < 6x - 12$

$\Rightarrow \qquad 4x - 4 + 12 < 6x - 12 + 12$

$\Rightarrow \qquad 4x + 8 < 6x$

$\Rightarrow \qquad 4x - 4x + 8 < 6x - 4x$

$\Rightarrow \qquad 8 < 2x$

$\Rightarrow \qquad 2x > 8$

$\Rightarrow \qquad x > 4$

Solution set = $(4, \infty)$.

Date: 9/10/2021

**Q1.** Solve the system of inequations $x - 1 > 0$, $3x < 18$.

**Q2.** Solve the system of inequalities $3x - 7 < 5 + x$ and $11 - 5x \leq 1$.

**Q3.** Solve the system of inequations, $x - 3 \geq 0$ and $4 - x \geq 0$.

**Q4.** Solve the system of inequalities $x - 3 \geq 5x + 41$ and $3x - 8 \geq 10$.

**Q5.** Solve the system of inequations $7x - 8 < 4x + 7$ and $\frac{-x}{3} > 9$.

**Q6.** Solve the system of inequalities $x + 2 \leq 5$ and $3x - 4 > -2 + x$.

**Q7.** Solve the system of inequality $5(2x - 7) - 3(2x + 3) \leq 0$, and $2x + 19 \leq 6x + 47$.

**Q8.** Solve $x + 2 > 13$ and $3x \leq 18$.

**Q9.** Solve $-4x + 1 \geq 0$ and $3 - 4x \leq 0$.

**Q10.** Solve the system of inequality $2x + 5 \leq 0$ and $x - 2 \leq 0$.

**Q11.** Solve $-x > 0$ and $1 - x < 0$.

**Q12.** Solve $5x + 1 > -24$ and $5x - 1 < 24$.

**Q13.** Solve $3x + 5 > 8$ and $3x - 5 \geq 10$.

**Q14.** Solve $\frac{1}{x} < 0$ and $\frac{x}{3} - 1 < 0$.

**Q15.** Solve the system of inequalities $3x - 7 < 5 + x$ and $11 - 5x \leq 1$.

**Q16.** Find all integral values of x such that $5 - x \geq 0$ and $x - 9 \geq 0$.

**Q17.** Solve $2x - 7 < 9$ and $3x + 4 < -5$.

**Q18.** Solve the system of inequalities $2(x - 1) < x + 5$ and $3(x + 2) > (2 - x)$.

**Q19.** Solve the system of inequalities $2(1 - x) \geq 8$ and $3(5 + x) > 1 - 2x$.

**Q20.** Solve $x + 3 \leq 4$ and $3x - 4 \geq -2 + x$.

**Q21.** Solve $2(1 - x) > 3(x - 2)$ and $(x - 3) > -2x$.

**Q22.** Solve the following system of inequations $2(1 - x) \geq 8$ and $3(5 + x) \leq 9$.

**Q23.** Solve the system of inequalities $-2 - \frac{x}{4} \leq \frac{1+x}{3}$ and $(3 - x) < 4(x - 3)$.

**Q24.** Solve the system of inequalities $\frac{4x}{3} - \frac{9}{4} < x + \frac{3}{4}$ and $\frac{7x-1}{3} - \frac{7x+2}{6} > x$.

**Q25.** Solve $\frac{x}{3} - 1 > \frac{x}{2} + 3$ and $\frac{x}{2} - 1 > \frac{x}{3} + 9$.

**Q26.** Solve $5x - 7 < 3(x + 3)$ and $1 - \frac{3x}{2} \geq x - 4$.

Q27. Find all integral values of $x$ for which $\frac{x}{3} + 5 \geq 8$ and $\frac{x}{5} + 3 \leq 9$.

Q28. Solve the following system of inequations $2(2x + 3) - 10 < 6(x - 2)$ and $\frac{2x - 3}{4} + 6 \geq 2 + \frac{4x}{3}$.

Q29. Solve the system of inequalities $\left(\frac{x - 3}{5}\right) \geq 2x + 3$ and $\frac{(3 - x)}{8} \leq 12$.

Q30. Solve the system of inequality $3x + 7 \geq 10$ and $\frac{(x - 3)}{5} \geq 4$.

Q31. Solve system of inequation $3(5x + 1) \geq 18$ and $(3x + 8) \geq 23$.

Q32. Solve the following inequalities and show the graph of the solution on number line.

$$3(1 - x) < 2(x + 4).$$

Q33. Solve the following inequalities and show the graph of the solution on number line.

$$5x - 3 \geq 3x - 5.$$

Q34. Solve the following inequalities and show the graph of the solution on number line.

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

Q35. Solve the system of inequalities:

$$3x - 7 < 5 + x$$

$$11 - 5x \leq 1$$

and represent the solutions on the number line.

Q36. Solve the inequalities and represent the solution graphically on number line.

$$5(2x - 7) - 3(2x + 3) \leq 0, \qquad 2x + 19 \leq 6x + 47.$$

Q37. Solve the inequalities and represent the solution graphically on number line.

$$3x - 7 > 2(x - 6), \qquad 6 - x > 11 - 2x.$$

Q38. Solve the inequalities and represent the solution graphically on number line.

$$2(x - 1) < x + 5, \qquad 3(x + 2) > 2 - x.$$

Q39. Solve the inequalities and represent the solution graphically on number line.

$$5x + 1 > -24, \qquad 5x - 1 < 24.$$

Q40. Solve the following inequalities and show the graph of the solution on number line.

$$\frac{x}{2} < \frac{(5x - 2)}{3} - \frac{(7x - 3)}{5}.$$

Date: 9/10/2021

**S1.** Let, $x - 1 > 0$ ... (i)

$3x < 18$ ... (ii)

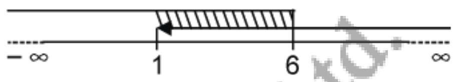
The solution set of (i) in given by $x > 1$

$\therefore$ The solution set of Eq. (i) is $(1, \infty)$.

Similarly the solution set of (ii) is $(-\infty, 6)$.

$$3x < 18 \quad \Rightarrow \quad x < 6$$

Let's represent these solution sets on number line




Hence required solution set for system of inequation is (1, 6).

**S2.** The given inequalities are

$$3x - 7 < 5 + x$$

$\Rightarrow$ $3x - x < 7 + 5 \quad \Rightarrow \quad 2x < 12$

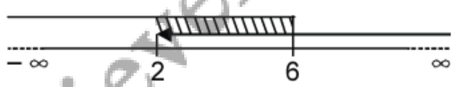
Hence solution set for this inequality is $(-\infty, 6)$.

Similarly,

$$11 - 5x \le 1 \quad \Rightarrow \quad 5x \ge 10$$

$\Rightarrow$ $x \ge 2$

Hence solution set for this inequality is $[2, \infty)$.



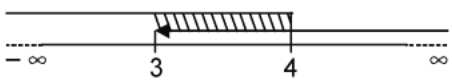

Hence solution set for system inequation is [2, 6)

**S3.** $x - 3 \ge 0 \quad \Rightarrow \quad x \ge 3$

Hence solution set for this is $[3, \infty)$.

Similarly, $4 - x \ge 0 \quad \Rightarrow \quad x \le 4$

Hence solution set for this is $(-\infty, 4]$.




Hence required solution set for this system of inequation is [ 3, 4 ]

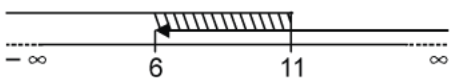
**S4.** Since, $x - 3 \ge 5x + 41 \quad \Rightarrow \quad 4x \le 44 \quad \Rightarrow \quad x \le 11$

Hence solution set for this inequality is $(-\infty, 11]$.

Similarly,

$3x - 8 \ge 10 \quad \Rightarrow \quad 3x \ge 18 \quad \Rightarrow \quad x \ge 6$

Hence solution set for this inequation is $[6, \infty)$.




Hence required solution set for system of inequation is [6, 11].

**S5.** Since, $7x - 8 < 4x + 7$

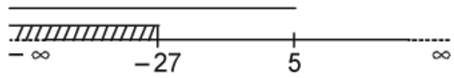
$\Rightarrow$ $7x - 4x < 7 + 8 \Rightarrow 3x < 15$

$\Rightarrow$ $x < 5$

Hence solution set for inequation is $(-\infty, 5)$.

Similarly, $\frac{-x}{3} > 9 \Rightarrow x < -27$

Hence solution set for Eq. (ii) is $(-\infty, -27)$.




Hence required solution set for this system of inequation is $(-\infty, -27)$.

**S6.** *Since,* $x + 2 \le 5 \Rightarrow x \le 3$

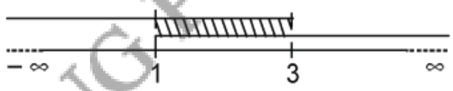
Hence solution set for this inequality is $(-\infty, 3]$

Similarly, $3x - 4 > -2 + x$

$\Rightarrow$ $3x - x > -2 + 4 \Rightarrow 2x > 2$

$\Rightarrow$ $x > 1$

Hence solution set for this inequality is $(1, \infty)$




Hence required solution set for this system of inequalities is $(1, 3]$.

**S7.** Since, $5(2x - 7) - 3(2x + 3) \le 0$

$\Rightarrow$ $10x - 35 - 6x - 9 \le 0$

$\Rightarrow$ $4x - 44 \le 0 \Rightarrow x \le 11$

Hence solution set for this inequality is $(-\infty, 11]$.

Similarly, $2x + 19 \le 6x + 47$

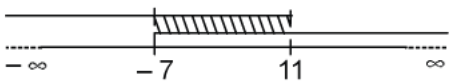
$\Rightarrow$ $2x - 6x \le 47 - 19$

$\Rightarrow$ $-4x \le 28 \Rightarrow -4x - 28 \le 0$

$\Rightarrow$ $-4(x + 7) \le 0 \Rightarrow x + 7 \ge 0$

$\Rightarrow$ $x \ge -7$

Hence solution set for this inequality is $[-7, \infty)$.




Hence solution set for system of inequality is $[-7, 11]$

**S8.** Since, $x + 2 > 13 \Rightarrow x > 13 - 2$

$\Rightarrow$ $x > 11$

Hence solution set for this inequality is $(11, \infty)$.

Similarly, $3x \le 18 \Rightarrow x \le 6$


Hence solution set for this inequality is $(-\infty, 6]$.

Clearly the intersection of these solution set is the set $\phi$. Hence given system of inequation has no solution.

**S9.** Since, $-4x + 1 \ge 0$

$\Rightarrow$ $-4\left(x - \frac{1}{4}\right) \ge 0 \Rightarrow x - \frac{1}{4} \le 0$

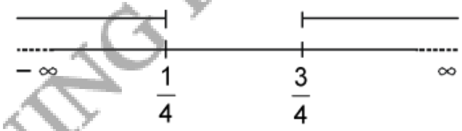
$\Rightarrow$ $x \le \frac{1}{4}$.

Hence solution set for this inequality is $\left(-\infty, \frac{1}{4}\right]$.

Similarly, $3 - 4x \le 0 \Rightarrow 4x \ge 3$

$\Rightarrow$ $x \ge \frac{3}{4}$

Hence solution set for this inequality is $\left[\frac{3}{4}, \infty\right)$.




Clearly, the intersection of these solution set is the set $\phi$.

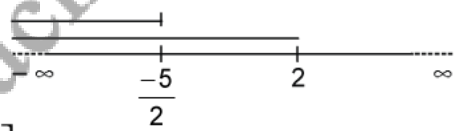
Hence given system of inequation has no solution.

**S10.** Since, $2x + 5 \le 0 \Rightarrow x \le \frac{-5}{2}$

Hence solution set for this inequality is $\left(-\infty, \frac{-5}{2}\right]$.

Similarly, $x - 2 \le 0 \Rightarrow x \le 2$

Solution set for this inequality is $(-\infty, 2]$.




Hence solution for this given system of inequalities is $\left(-\infty, \frac{-5}{2}\right]$

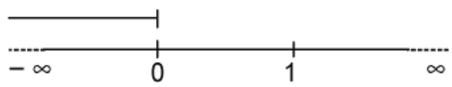
**S11.** Since, $-x > 0 \Rightarrow x < 0$

Hence solution set for this inequality is $(-\infty, 0)$.

Similarly, $1 - x < 0 \Rightarrow x > 1$

Hence solution set for this inequality is $(1, \infty)$.

Clearly the intersection of these solution sets is the set $\phi$.




Hence given system of inequation has no solution.

**S12.** Since, $5x + 1 > -24$ ... (i)

$5x - 1 < 24$ ... (ii)

After solving Eq. (i), we get

$$5x + 1 > -24 \Rightarrow 5x > -24 - 1$$

$$\Rightarrow 5x > -25 \Rightarrow 5x + 25 > 0$$

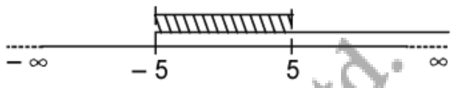
$$\Rightarrow 5(x + 5) > 0 \Rightarrow x > -5$$

Hence solution set for Eq. (i) is $(-5, \infty)$.

Similarly,

$$5x - 1 < 24 \Rightarrow 5x < 24 + 1$$

$$\Rightarrow 5x < 25 \Rightarrow x < 5$$




Hence solution set for Eq. (ii) is $(-\infty, 5)$.

Hence required solution for these system of inequality is $(-5, 5)$

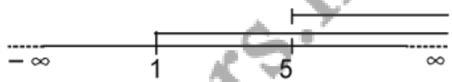
**S13.** $3x + 5 > 8$

$$\Rightarrow 3x > 8 - 5 \Rightarrow 3x > 3 \Rightarrow x > 1$$

Hence solution set for this inequality is $(1, \infty)$.

Similarly, $3x - 5 \geq 10 \Rightarrow 3x \geq 10 + 5$

$$\Rightarrow 3x \geq 15 \Rightarrow x \geq 5$$




Hence solution set for this inequality is $[5, \infty)$.

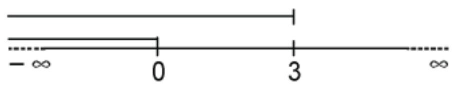
Hence required solution set for the given system of inequality is $[5, \infty)$.

**S14.** Since, $\frac{1}{x} < 0 \Rightarrow x < 0$

Hence solution set for this inequality is $(-\infty, 0)$.

Similarly, $\frac{x}{3} - 1 < 0 \Rightarrow \frac{x}{3} < 1$

$$\Rightarrow x < 3$$




Hence solution set for this inequality is $(-\infty, 3)$.

Hence solution set for the given system of inequation is $(-\infty, 0)$.

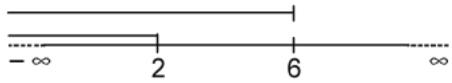
**S15.** Since, $3x - 7 < 5 + x$

$$\Rightarrow 3x - x < 7 + 5 \Rightarrow 2x < 12$$

$$\Rightarrow x < 6 \Rightarrow \text{Solution set is } (-\infty, 6).$$

Similarly, $11 - 5x \le 1 \Rightarrow 5x \ge 10 \Rightarrow x \ge 2$

Hence solution set is $[2, \infty)$.




Hence solution set for required system of inequation is $[2, 6)$.

**S16.** Since, $5 - x \ge 0 \Rightarrow x \le 5$

Hence solution set for this inequality is $(-\infty, 5]$.

Similarly, $x - 9 \ge 0 \Rightarrow x \ge 9$


Hence solution set for this inequality is $[9, \infty)$.

Hence there is no real $x$ satisfying this system of inequation hence required solution set is null set.

**S17.** $2x - 7 < 9 \Rightarrow 2x < 9 + 7$

$\Rightarrow 2x < 16 \Rightarrow x < 8$

Hence solution set for this inequality is $(-\infty, 8)$.

Similarly, $3x + 4 < -5 \Rightarrow 3x < -5 - 4$

$\Rightarrow 3x < -9 \Rightarrow x < -3$


Hence solution set for this inequality is $(-\infty, -3)$.

Hence solution set for required system of inequation is $(-\infty, -3)$.

**S18.** Let, $2(x - 1) < x + 5$ ... (i)

and $3(x + 2) > (2 - x)$ ... (ii)

After solving Eq. (i). we get

$2(x - 1) < x + 5$

$\Rightarrow 2x - 2 < x + 5 \Rightarrow x < 7$

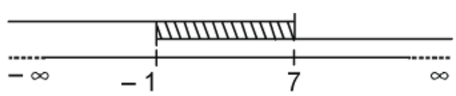
Hence solution set for Eq. (i) is $(-\infty, 7)$.

Similarly, after solving Eq. (ii). we get

$3(x + 2) > (2 - x)$

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

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




Hence solution set for Eq. (ii) is $(-1, \infty)$.

Hence solution set for system of inequalities is $(-1, 7)$.

**S19.** Let, $2(1 - x) \ge 8$ ... (i)

and $3(5 + x) > 1 - 2x$ ... (ii)

After solving Eq. (i), we get

$$2(1 - x) \geq 8 \quad \Rightarrow \quad 1 - x \geq 4$$

$$\Rightarrow \qquad x \leq -3$$

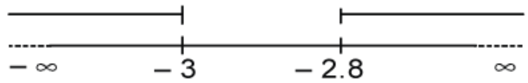
Hence solution set for Eq. (i) $(-\infty, -3]$.

Similarly, after solving Eq. (ii), we get

$$3(5 + x) \geq 1 - 2x \quad \Rightarrow \quad 15 + 3x \geq 1 - 2x$$

$$\Rightarrow \qquad 3x + 2x \geq 1 - 15 \quad \Rightarrow \quad 5x \geq -14$$

$$x \geq \frac{-14}{5} \quad \Rightarrow \quad x \geq -2.8$$




Hence solution set for Eq. (ii) is $[-2.8, \infty)$

Clearly the intersection of these solution set is the set $\phi$. Hence given system of inequations have no solution.

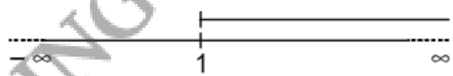
**S20.** Since, $x + 3 \leq 4 \quad \Rightarrow \quad x \leq 1$

Hence solution set for this inequality is $(-\infty, 1]$.

Similarly, $3x - 4 \geq -2 + x$

$$\Rightarrow \qquad 3x - x \geq 4 - 2 \quad \Rightarrow \quad 2x \geq 2$$

$$\Rightarrow \qquad x \geq 1 \quad \Rightarrow \quad x \in [1, \infty)$$




Hence system of linear inequation contains only one point in solution set that is $x = 1$.

**S21.** Since, $2(1 - x) > 3(x - 2)$

$$\Rightarrow \qquad 2 - 2x > 3x - 6$$

$$\Rightarrow \qquad -2x - 3x > -6 - 2$$

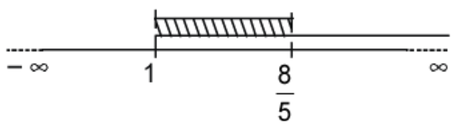
$$\Rightarrow \qquad -5x > -8 \quad \Rightarrow \quad 5x < 8$$

$$\Rightarrow \qquad x < \frac{8}{5}$$

Hence solution set for this inequality is $\left(-\infty, \frac{8}{5}\right)$.

Similarly, $x - 3 > -2x \quad \Rightarrow \quad x + 2x > 3$

$$\Rightarrow \qquad 3x > 3 \quad \Rightarrow \quad x > 1$$




Hence solution set for this inequality is $(1, \infty)$.

Hence solution set for system of inequalities is $\left(1, \frac{8}{5}\right)$.

**S22.** Since, $2(1 - x) \geq 8$ ... (i)

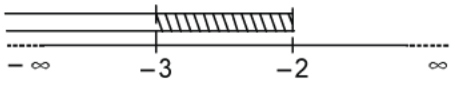
$3(5 + x) \leq 9$ ... (ii)

After solving Eq. (i), we get

$$2(1 - x) \geq 8 \quad \Rightarrow \quad (1 - x) \geq 4$$

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

Hence solution set for Eq. (i) is $(-\infty, -3]$.




Similarly, after solving Eq. (ii), we get

$$3(5 + x) \leq 9$$

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

Hence solution set for inequation (ii), is $(-\infty, -2]$

Hence required solution set for system of inequation is $[-3, -2]$.

**S23.** Since,

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

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

$$\Rightarrow \quad -\frac{x}{4} - \frac{x}{3} \leq 2 + \frac{1}{3} \quad \Rightarrow \quad \frac{-3x - 4x}{12} \leq \frac{7}{3}$$

$$\Rightarrow \quad \frac{-7x}{12} - \frac{7}{3} \leq 0$$

$$\Rightarrow \quad -7\left(\frac{x}{12} + \frac{1}{3}\right) \leq 0 \quad \Rightarrow \quad \frac{x}{12} + \frac{1}{3} \geq 0$$

$$\Rightarrow \quad \frac{x}{12} \geq -\frac{1}{3} \quad \Rightarrow \quad x \geq -4$$

Hence solution set for this inequality is $[-4, \infty)$.

Similarly, $(3 - x) < 4(x - 3)$

$$\Rightarrow \quad (3 - x) < 4x - 12 \quad \Rightarrow \quad 3 + 12 < 4x + x$$

$$\Rightarrow \quad 5x > 15 \quad \Rightarrow \quad x > 3$$

Hence solution set for this inequality is $(3, \infty)$.


Hence solution set for system of inequation is $(3, \infty)$.

**S24.** Since,

$$\frac{4x}{3} - \frac{9}{4} < x + \frac{3}{4}$$

$$\Rightarrow \quad \frac{4x}{3} - x < \frac{9}{4} + \frac{3}{4}$$

$$\Rightarrow \quad \frac{x}{3} < 3 \quad \Rightarrow \quad x < 9$$

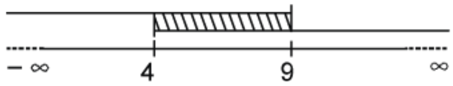
Hence solution set for this inequality is $(-\infty, 9)$.

Similarly, $\frac{7x-1}{3} - \frac{7x+2}{6} > x$

$\Rightarrow \quad \frac{7x-1}{3} - \frac{7x+2}{6} - \frac{x}{1} > 0$

$\Rightarrow \quad \frac{14x-2-7x-2-6x}{6} > 0$

$\Rightarrow \quad \frac{x-4}{6} > 0 \quad \Rightarrow \quad x > 4$




Hence solution set for this inequality is $(4, \infty)$.

Hence solution for the system of inequation is $(4, 9)$.

**S25.** Let, $\frac{x}{3} - 1 > \frac{x}{2} + 3$ ... (i)

and $\frac{x}{2} - 1 > \frac{x}{3} + 9$ ... (ii)

After solving Eq. (i), we get

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

$\Rightarrow \quad \frac{2x-3x}{6} > 4 \quad \Rightarrow \quad \frac{-x}{6} > 4$

$\Rightarrow \quad x < -24$

Hence solution set for Eq. (i) is $(-\infty, -24)$.

Similarly, $\frac{x}{2} - 1 > \frac{x}{3} + 9 \quad \Rightarrow \quad \frac{x}{2} - \frac{x}{3} > 9 + 1$

$\Rightarrow \quad \frac{x}{6} > 10 \quad \Rightarrow \quad x > 60$


Hence solution set for Eq. (ii) is $(60, \infty)$.

Clearly the intersection of these solution sets is the set $\phi$. Hence the given system of inequalities has no solution.

**S26.** Let, $5x - 7 < 3(x + 3)$

$\Rightarrow \quad 5x - 7 < 3x + 9 \quad \Rightarrow \quad 5x - 3x < 9 + 7$

$\Rightarrow \quad 2x < 16 \quad \Rightarrow \quad x < 8$

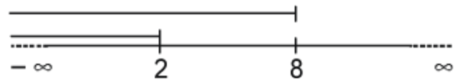
Hence solution set for this inequality is $(-\infty, 8)$

Similarly,

$$1 - \frac{3x}{2} \geq (x - 4)$$

$$\Rightarrow \qquad 1 + 4 \geq x + \frac{3x}{2} \quad \Rightarrow \quad \frac{5x}{2} \leq 5$$

$$\Rightarrow \qquad 5x \leq 10 \quad \Rightarrow \quad x \leq 2$$




Hence solution set for this Eq. is $(-\infty, 2]$

Hence required solution set for system of inequation is $(-\infty, 2]$

**S27.** Let,
$$\frac{x}{3} + 5 \geq 8 \qquad \text{... (i)}$$

and
$$\frac{x}{5} + 3 \leq 9 \qquad \text{... (ii)}$$

After solving Eq. (i), we get

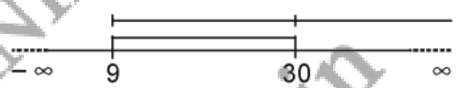
$$\Rightarrow \qquad \frac{x}{3} \geq 8 - 5 \quad \Rightarrow \quad \frac{x}{3} \geq 3$$

$$\Rightarrow \qquad x \geq 9$$

Hence solution set for Eq. (i) is $[9, \infty)$.

Similarly,
$$\frac{x}{5} + 3 \leq 9 \quad \Rightarrow \quad \frac{x}{5} \leq 6$$

$$\Rightarrow \qquad x \leq 30$$




Hence solution set for Eq. (ii)is $(-\infty, 30]$

$\therefore$ Hence required integral values of $x$ are all such integer lying between 9 to 30 for system of inequalities.

$\therefore$ Solution set for $x$ is.

{9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30}.

**S28.** Let,
$$2(2x + 3) - 10 < 6(x - 2) \qquad \text{... (i)}$$

and
$$\frac{2x - 3}{4} + 6 \geq 2 + \frac{4x}{3} \qquad \text{... (ii)}$$

After solving Eq. (i), we get

$$2(2x + 3) - 10 < 6(x - 2)$$

$$\Rightarrow \qquad 4x + 6 - 10 < 6x - 12$$

$$\Rightarrow \qquad 4x - 6x < -12 + 10 - 6$$

$$\Rightarrow \qquad -2x < -8 \quad \Rightarrow \quad 2x > 8$$

$$\Rightarrow \qquad x > 4$$

Hence solution set for Eq. (i) is $(4, \infty)$.

Similarly,
$$\frac{2x - 3}{4} + 6 \geq 2 + \frac{4x}{3}$$

$$\Rightarrow \quad \frac{2x}{4} - \frac{4x}{3} \geq 2 - 6 + \frac{3}{4}$$

$$\Rightarrow \quad \frac{6x - 16x}{12} \geq \frac{-4}{1} + \frac{3}{4}$$

$$\Rightarrow \quad \frac{-10x}{12} \geq \frac{-13}{4}$$

$$\Rightarrow \quad \frac{10x}{12} \leq \frac{13}{4} \quad \Rightarrow \quad 10x \leq \frac{13}{4} \times 12$$

$$\Rightarrow \quad 10x \leq 39 \quad \Rightarrow \quad x \leq 3.9$$


Hence solution set for Eq. (ii) is $(-\infty, 3.9]$.

Clearly the intersection of these solution set is the set $\phi$. Hence given system of inequation has no solution.

**S29.** Let $\left(\frac{x-3}{5}\right) \geq 2x + 3$ ... (i)

and $\frac{(3-x)}{8} \leq 12$ ... (ii)

After solving Eq. (i), we get

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

$$\Rightarrow \quad (x - 3) \geq 10x + 15 \quad \Rightarrow \quad 10x + 15 \leq (x - 3)$$

$$\Rightarrow \quad 10x - x \leq -3 - 15 \quad \Rightarrow \quad 9x \leq -18$$

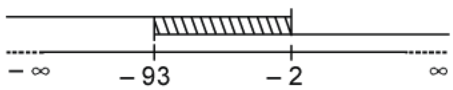
$$\Rightarrow \quad x \leq -2$$

Hence solution set for Eq. (i) is $(-\infty, -2]$.

Similarly, $\frac{3-x}{8} \leq 12 \quad \Rightarrow \quad 3 - x \leq 96$

$$\Rightarrow \quad 3 - 96 \leq x \quad \Rightarrow \quad x \geq -93$$

$$\Rightarrow \quad x \geq -93$$




Hence solution set for Eq. (ii) is $[-93, \infty)$.

Hence required solution set for system of inequation is $[-93, -2]$.

**S30.** Let, $3x + 7 \geq 10$ ... (i)

and $\frac{x-3}{5} \geq 4$ ... (ii)

After solving Eq. (i), we get

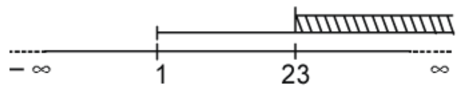
$$3x + 7 \geq 10 \quad \Rightarrow \quad 3x \geq 10 - 7$$

$$\Rightarrow \quad 3x \geq 3 \quad \Rightarrow \quad x \geq 1$$

Hence solution set for Eq. (i) is $[1, \infty)$

Similarly, $\left(\frac{x-3}{5}\right) \geq 4 \Rightarrow (x-3) \geq 20$

$\Rightarrow \quad x \geq 23$




Hence solution set for Eq. (ii) is $[23, \infty)$.

Hence required solution set for this system of inequation is $[23, \infty)$.

**S31.** Since, $3(5x + 1) \geq 18$ ... (i)

$(3x + 8) \geq 23$ ... (ii)

After solving Eq. (i), we get

$$3(5x + 1) \geq 18$$

$\Rightarrow \quad (5x + 1) \geq 6 \Rightarrow x \geq 1$

Hence solution set for Eq. (i) is $[1, \infty)$.

Similarly, after solving Eq. (ii), we get

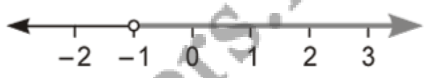

$$3x + 8 \geq 23 \Rightarrow 3x \geq 23 - 8$$

$\Rightarrow \quad 3x \geq 15 \Rightarrow x \geq 5$

Hence solution set for Eq. (ii) is $[5, \infty)$

Hence required solution set for system of inequation is $[5, \infty)$.

**S32.** Given, $3(1 - x) < 2(x + 4)$




$\Rightarrow \quad 3 - 3x < 2x + 8$

$\Rightarrow \quad 3 - 3x - 3 < 2x + 8 - 3$

$\Rightarrow \quad -3x < 2x + 5$

$\Rightarrow \quad -3x - 2x < 2x + 5 - 2x$

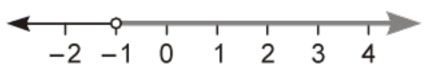
$\Rightarrow \quad -5x < 5$

$\Rightarrow \quad \frac{-5x}{-5} > \frac{5}{-5}$

$\Rightarrow \quad x > -1$

*i.e.*, all real numbers $x$ greater than $-1$ as shown on the nunmber line.

**S33.** Given, $5x - 3 \geq 3x - 5$




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

$\Rightarrow \quad 5x \geq 3x - 2$

$\Rightarrow \quad 5x - 3x \geq 3x - 2 - 3x$

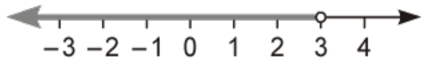
$\Rightarrow \quad 2x \geq -2$

$\Rightarrow \quad \dfrac{2x}{2} > \dfrac{-2}{2}$

$\Rightarrow \quad x \geq -1.$

*i.e.*, all real numbers $x$ greater than or equal to – 1 as shown on the number line.

**S34.** Given, $3x - 2 < 2x + 1$




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

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

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

$\Rightarrow \quad x < 3.$

*i.e.*, all real numbers $x$ less than 3 as shown on the number line.

**S35.** From inequality Eq. (i), we have

$3x - 7 < 5 + x$

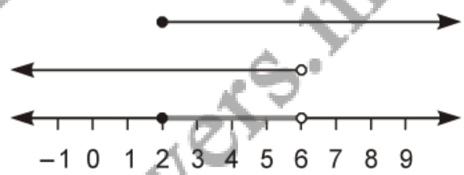
or $\quad x < 6 \qquad \ldots \text{(i)}$

Also, from inequality Eq. (ii), we have

$11 - 5x \leq 1$

or $\quad -5x \leq -10 \qquad$ *i.e.*, $\quad x \geq 2 \qquad \ldots \text{(ii)}$

If we draw the graph of inequalities Eq. (i) and (ii) on the number line, we see that the values of $x$, which are common to both, are shown by bold line in the figure.




Thus, solution of the system are real numbers $x$ lying between 2 and 6 including 2, *i.e.*, $2 \leq x < 6$.

**S36.** Given, $\quad 5(2x - 7) - 3(2x + 3) \leq 0 \qquad \ldots \text{(i)}$

$2x + 19 \leq 6x + 47 \qquad \ldots \text{(ii)}$

From inequality (i), we have

$5(2x - 7) - 3(2x + 3) \leq 0$

or $\quad 10x - 35 - 6x - 9 \leq 0$

or $\quad 4x - 44 \leq 0$

or $\quad 4x - 44 + 44 \leq 0 + 44$

or $\quad 4x \leq 44$

or $\quad x \leq 11 \qquad \ldots \text{(iii)}$

From inequality (ii), we have

$2x + 19 \leq 6x + 47$

or $\quad 2x + 19 - 6x \leq 6x + 47 - 6x$

or $\quad -4x + 19 \leq 47$

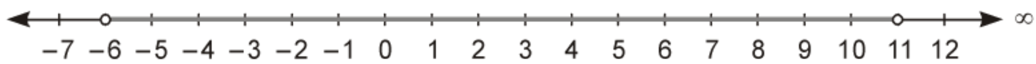
or $-4x + 19 - 19 \leq 47 - 19$

or $-4x \leq 28$

or $\dfrac{-4x}{-4} \geq \dfrac{28}{-4}$

or $x \geq -7$ ... (iv)

If we graph (iii) and (iv) above on the number line, we see that the values of $x$, which are common to both are shown by bold line in the figure.




Solution set is $-7 < x \leq 11$.

**S37.** Given, $3x - 7 > 2(x - 6)$ ... (i)

$6 - x > 11 - 2x$ ... (ii)

From inequality (i), we have

$3x - 7 > 2(x - 6)$

or $3x - 7 > 2x - 12$

or $3x - 2x - 7 > 2x - 12 - 2x$

or $x - 7 > -12$

or $x - 7 + 7 > -12 + 7$

or $x > -5$ ... (iii)

From inequality (ii), we have

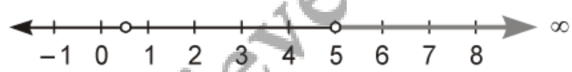
$6 - x > 11 - 2x$

or $6 - x + 2x > 11 - 2x + 2x$

or $6 + x > 11$

or $6 + x - 6 > 11 - 6$

or $x > 5$ ... (iv)




If we graph (iii) and (iv) above on the number line, we see that the values of $x$, which are common to both are shown by bold line in the figure. Hence solution set is $x > 5$.

**S38.** Given, $2(x - 1) < x + 5$ ... (i)

$3(x + 2) > 2 - x$ ... (ii)

From inequality (i), we have

$2(x - 1) < x + 5$

or $2x - 2 < x + 5$

or $2x - 2 - x < x + 5 - x$

or $x - 2 < 5$

or $x - 2 + 2 < 5 + 2$

or $x < 7$ ... (iii)

From inequality (ii), we have

$$3(x + 2) > 2 - x$$

or $3x + 6 > 2 - x$

or $3x + 6 + x > 2 - x + x$

or $4x + 6 > 2$

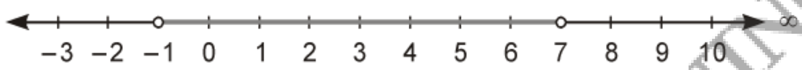
or $4x + 6 - 6 > 2 - 6$

or $4x > -4$

or $\frac{4x}{4} > \frac{-4}{4}$

or $x > -1$ ... (iv)

If we graph (iii) and (iv) above on the number line, we see that the values of $x$, which are common to both are shown by bold line in the figure.




$\boldsymbol{x \in (-1, 7)}$

**S39.** Given, $5x + 1 > -24$ ... (i)

$5x - 1 < 24$ ... (ii)

From inequality (i), we have

$$5x + 1 > -24$$

or $5x + 1 - 1 > -24 - 1$

or $5x > -25$

or $\frac{5x}{5} > \frac{-25}{5}$

or $x > -5$ ... (iii)

Also from inequality (ii), we have

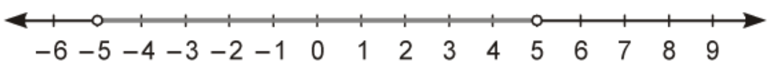
or $5x - 1 < 24$

or $5x - 1 + 1 < 24 + 1$

or $\frac{5x}{5} < \frac{25}{5}$

or $x < 5$ ... (iv)

If we graph (iii) and (iv) above on the number line, we see that the values of $x$, which are common to both are shown by bold line in the figure.

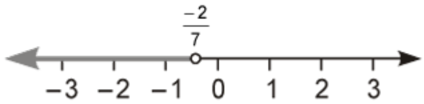



$\boldsymbol{x \in (-5, 5)}$

**S40.** Given, $\frac{x}{2} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

Multiplying both sides by 30, *i.e.*, L.C.M. of 2, 3 and 5, we have

$\Rightarrow \quad 30\left(\frac{x}{2}\right) < 30\left[\frac{5x-2}{3} - \frac{7x-3}{5}\right]$




$\Rightarrow \quad 15x < 10(5x-2) - 6(7x-3)$

$\Rightarrow \quad 15x < 50x - 20 - 42x + 18$

$\Rightarrow \quad 15x < 8x - 2$

$\Rightarrow \quad 15x - 8x < 8x - 2 - 8x$

$\Rightarrow \quad 7x < -2$

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

*i.e.*, all real numbers $x$ less than $\frac{-2}{7}$ as shown on the nunmber line.

Date: 9/10/2021

**Q1.** Solve $3x - 6 \geq 0$ graphically in two-dimensional plane.

**Q2.** Solve $y < 2$ graphycally.

**Q3.** Represent the following inequation graphically in two dimensional plane and hence solve them. $x > -2$.

**Q4.** Solve it graphically $y < 1$.

**Q5.** Solve it graphically $3x - 5 \geq 0$.

**Q6.** Solve it graphically $y \leq -5$.

**Q7.** Solve it graphically $x + y - 4 < 0$.

**Q8.** Solve it graphically $\frac{x}{2} + \frac{y}{3} \geq 1$.

**Q9.** Solve it graphically $3x + y < 5$.

**Q10.** Solve it graphically $|x| < 1$.

**Q11.** Solve it graphically $|y| \geq 3$.

**Q12.** Solve it graphically $|x| - 1 \geq 3$.

**Q13.** Solve $3x + 2y > 6$ graphically.

**Q14.** Represent the following inequalities graphically in a two-dimensional plane.

$$x + y < 5$$

**Q15.** Represent the following inequalities graphically in a two-dimensional plane.

$$3x + 4y \leq 12$$

**Q16.** Find the solution of following inequalities graphically in a two-dimensional plane.

$$y + 8 \geq 2x.$$

**Q17.** Find the solution of following inequalities graphically in a two-dimensional plane.

$$x + y \leq -2.$$

**Q18.** Find the solution of following inequalities graphically in a two-dimensional plane.

$$2x - 3y > 6.$$

**Q19.** Find the solutions of following inequalities graphically in a two-dimensional plane.

$$-3x + 2y \geq -6.$$

**Q20.** Find the solutions of following inequalities graphically in a two-dimensional plane.

$$3y - 5x < 30.$$

**Q21.** **Solve the following systems of inequalities graphically:**

$$x \geq 3, \quad y \geq 2.$$

**Q22.** **Solve the following inequalities graphically in a two-dimensional plane.**

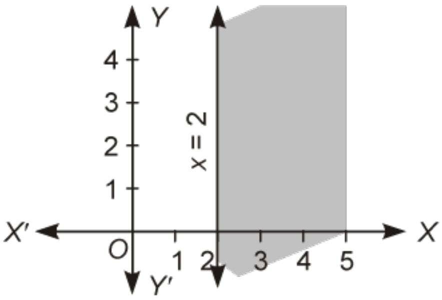
$$x > -3.$$

**Q23.** **Find the solutions of following inequalities graphically in a two-dimensional plane.**

$$y < -2.$$

Date: 9/10/2021

**S1.** Graph of $3x - 6 = 0$ is given in the figure

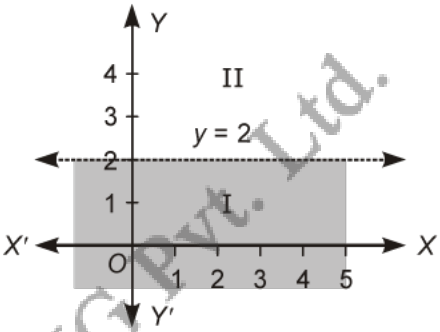



We select a point, say (0, 0) and substituting it in given inequality, we see that:

$$3(0) - 6 \geq 0 \quad \text{or} \quad -6 \geq 0 \quad \text{which is false.}$$

Thus, the solution region is the shaded region on the right hand side of the line $x = 2$.

**S2.** Graph of $y = 2$ is given in the figure.




Let us select a point (0, 0) in lower half plane I and putting $y = 0$ in the given inequality, we see that

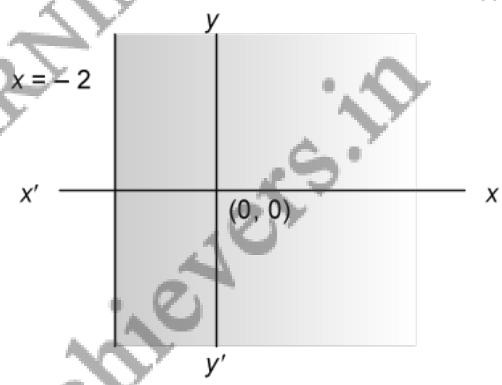
$$1 \times 0 < 2 \quad \text{or} \quad 0 < 2, \quad \text{which is true.}$$

Thus, the solution region is the shaded region below the line $y = 2$. Hence, every point below the line (excluding all the points on the line) determines the solution of the given inequality.

**S3.** We have, $x > -2$ ... (i)

Converting it into Eq., we get

$$x = -2$$




Clearly it is a straight line parallel to $y$-axis at a distance of two units on the left of the origin.

This divides the $xy$-plane into two parts.

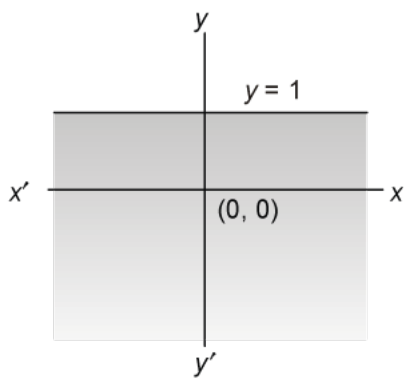
Select the arbitrary point say (0, 0).

This satisfies Eq. (i), $0 > -2$

Thus shaded region is the required solution set. Hence each point on the R.H.S. of the line (excluding all points on the line) determines the solution of the given inequation.

**S4.** Converting it into equation, we get,

$$y = 1$$




Clearly it is the straight line parallel to $x$-axis and at a distance of 1 unit above the origin, this divides the $xy$-plane into two parts.

Select the arbitrary point say (0, 0).

$\because$ $0 < 1$

This satisfies $y < 1$

Hence each point below the line (excluding all points on the line) determines the solution of the given inequation.

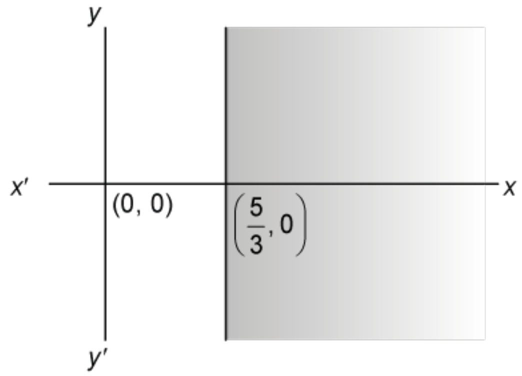
**S5.** Converting it into Eq. we get

$$3x - 5 = 0 \quad \Rightarrow \quad x = \frac{5}{3}$$

Clearly it is a straight line parallel to $y$-axis at a distance of 5/3 unit on the right of the origin. This divides the $xy$-plane into two parts.

Select the arbitrary point say (0, 0).

$$3 \times 0 - 5 \geq 0 \quad \Rightarrow \quad -5 \geq 0 \qquad \text{(not true)}$$




Thus the shaded region is required solution set. Hence each point on the R.H.S. of the line (including all points on the line) determines the solution of the given inequation.

**S6.** Converting it into Eq. we get

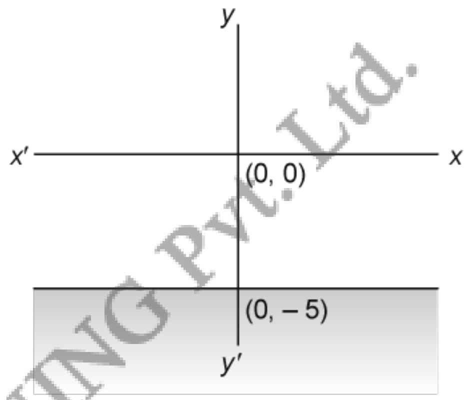
$$y = -5$$

Clearly it is a straight line parallel to $x$-axis at a distance of 5 units below the origin. This divides the $xy$-plane into two parts.

Select an arbitrary point say (0, 0).

$$0 \geq -5 \quad \text{(False)}$$

Hence each point below the line (including all points on the line) determines the solution of the given inequation.




**S7.** The given inequation is

$$x + y - 4 < 0$$

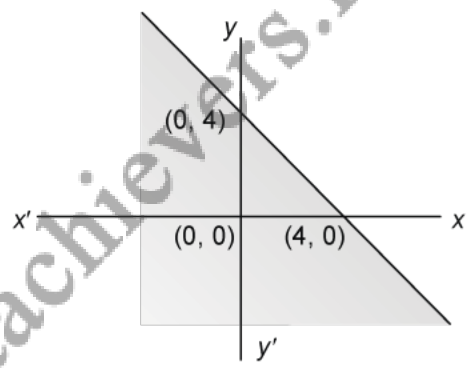
The corresponding Eq. is $x + y - 4 = 0$.

Take (0, 0) as an arbitrary point.

$\Rightarrow$ $$0 + 0 - 4 < 0 \quad \Rightarrow \quad -4 < 0 \text{ (True)}.$$

$\therefore$ (0, 0) lies on the graph.

Hence each point on the shaded region (excluding all points on the straight line) determines the solution of the given inequation.



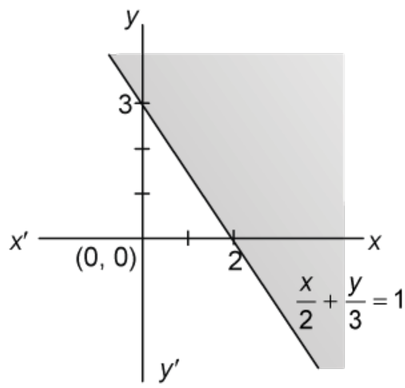

**S8.** The given inequation is

$$\frac{x}{2} + \frac{y}{3} \geq 1$$

The corresponding Eq. is $\frac{x}{2} + \frac{y}{3} = 1$

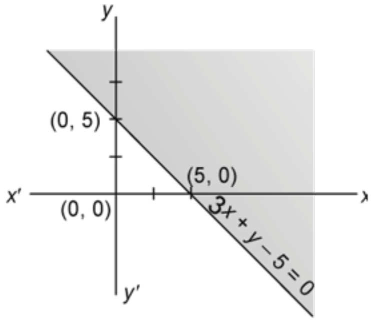
Take arbitrary point (0, 0).

$$0 \geq 1 \qquad \text{(False)}$$




Hence each point on the shaded region (including all points on the straight lines) determines the solution.

**S9.** $3x + y - 5 < 0$




It is corresponding Eq. is

$$3x + y - 5 = 0$$

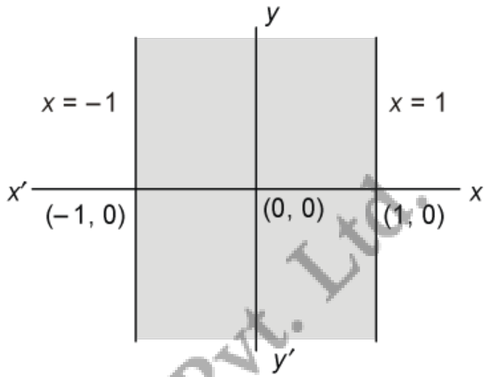
Take an arbitrary point (0, 0).

$\Rightarrow$ $-5 < 0$ (True)

Hence (0, 0) lies on the graph.

Hence each point in the shaded region (excluding all points on the straight line) determines the solution of the given inequation.

**S10.** We have, $|x| < 1$




Converting it into an equation, we get

$$|x| = 1 \quad \Rightarrow \quad x = \pm 1$$

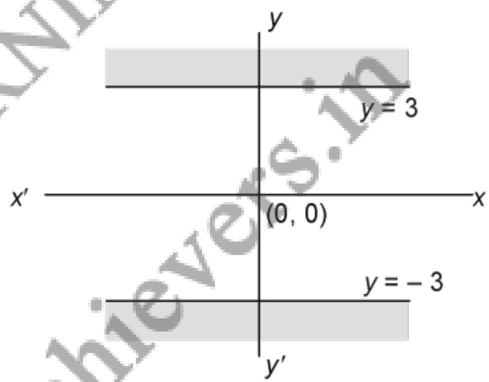
Which are the straight line parallel to $y$-axis at a distance of 1 unit on both sides of the origin.

Clearly (0, 0) satisfies $|x| < 1$.

As $(0 < 1)$

Hence each point between $x = 1$ and $x = -1$ (excluding all points on the line) determines the solution of the given inequation.

**S11.** We have, $|y| \geq 3$




Converting it into an equation, we get

$$|y| = 3 \quad \Rightarrow \quad y = \pm 3$$

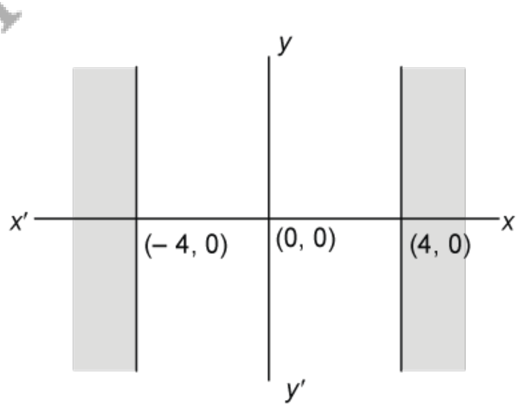
Which are the straight lines parallel to $x$-axis at a distance of 3 units on both sides of the origin.

Clearly (0, 0) does not satisfy $|y| \geq 3$.

As $(0 \geq 3)$ (False)

Hence each point in the shaded region (including all points on the straight line) determines the solution of the given inequation.

**S12.** $|x| - 1 \geq 3 \quad \Rightarrow \quad |x| \geq 4$




Converting it into an equation, we get

$$x = \pm 4$$

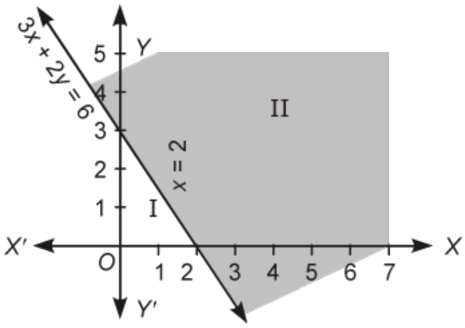
Which are the straight line parallel to $y$-axis at a distance of 4 units on both sides of the origin.

Take arbitrary point (0, 0).

As $(-1 \geq 3)$ (False)

Hence each point on the shaded region (including all points on the straight line) determines the solution.

**S13.** Graph of $3x + 2y = 6$ is given as dotted line in the figure.




This line divides the $xy$-plane in two half planes I and II. We select a point (not on the line), say (0, 0), which lies in one of the half planes (see figure) and determine if this point satisfies the given inequality, we note that

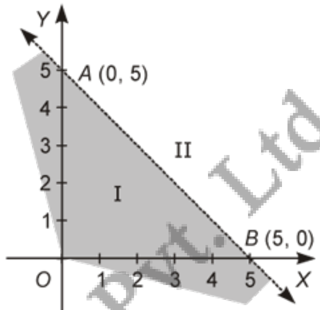
$$3(0) + 2(0) > 6$$

or $\quad 0 > 6$, which is false.

Hence, half plane I is not the solution region of the given inequality. Clearly, any point on the line does not satisfy the given strict inequality. In other words, the shaded half plane II excluding the points on the line is the solution region of the inequality.

**S14.** We draw the graph of the equation

$$x + y = 5 \qquad \text{... (i)}$$




Putting $y = 0$, $x = 5$, therefore the point on the $x$-axis is (5, 0). The point on the $y$-axis is (0, 5). $AB$ is the graph of (i).

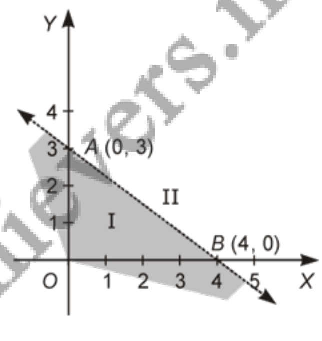
Putting $x = 0$, $y = 0$ in the given inequality, we have $0 + 0 < 5$ or $5 > 0$ which is true. Hence, origin lies in the half plane region I.

Clearly, any point on the line does not satisfy the given inequality.

Hence, the shaded region I excluding the points on the line is the solution region of the inequality.

**S15.** We draw the graph of the equation

$$3x + 4y = 12 \qquad \text{... (i)}$$




Putting $x = 0$, $y = 3$, therefore the point on the $y$-axis is (0, 3) and the point on $x$-axis is (4, 0). $AB$ is the graph of (i).

Putting $x = 0$, $y = 0$ in the given inequality, we have $3(0) + 4(0) \leq 12$ or $0 \leq 12$, which is true. Hence, origin lies in the half plane region I.

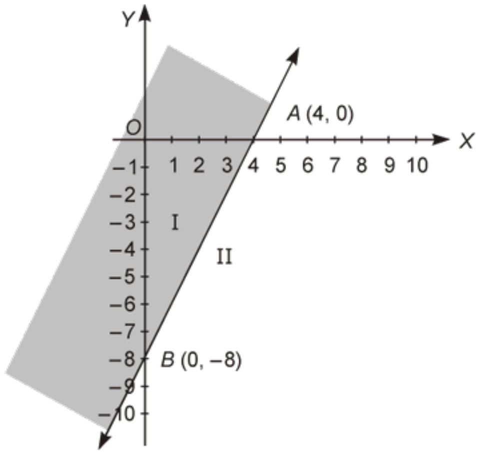
Hence, the shaded region I including the points on the line is the solution region of the inequality.

**S16.** We draw the graph of the equation

$$y + 8 = 2x$$

or $\quad y - 2x = -8$

or $\quad 2x - y = 8 \qquad \text{... (i)}$



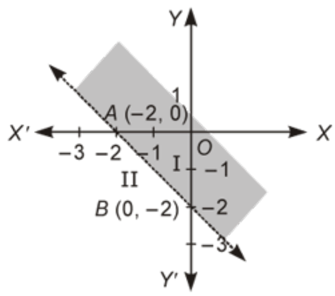

Putting $x = 0$, $y = -8$, therefore the point on the $y$-axis is (0, –8). The point on $x$-axis is (4, 0). $AB$ is the graph of (i).

Putting $x = 0$, $y = 0$ in the given inequality, we have $0 + 8 \geq 2(0)$ or $8 \geq 0$, which is true. Hence, origin lies in the half plane region I.

Hence, the shaded region I including the points on the line is the solution region of the inequality.

**S17.** We draw the graph of the equation

$$x + y = -2 \qquad \dots \text{(i)}$$



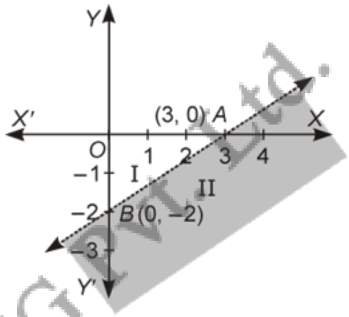

Putting $x = 0$, $y = -2$, therefore the point on the $y$-axis is $(0, -2)$. The point on $x$-axis is $(-2, 0)$. $AB$ is the graph of (i).

Putting $x = 0$, $y = 0$ in the given inequality, we have $0 + 0 \le 2$ or $0 \le 2$, which is true. Hence, origin lies in the half plane region I.

Hence, the shaded region I including the points on the line is the solution region of the inequality.

**S18.** We draw the graph of the equation

$$2x - 3y = 6 \qquad \dots \text{(i)}$$




Putting $x = 0$, $y = -2$, therefore the point on the $y$-axis is $(0, -2)$. The point on $x$-axis is $(3, 0)$. $AB$ is the graph of (i).

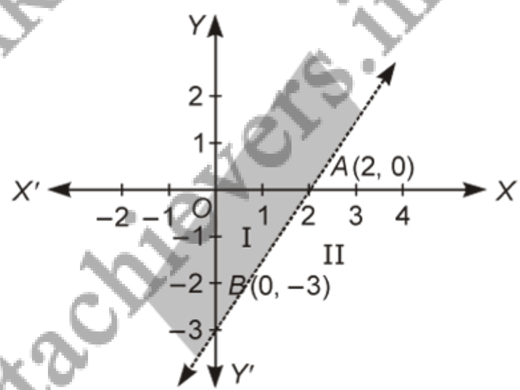
Putting $x = 0$, $y = 0$ in the given inequality, we have $2(0) + 3(0) > 6$ or $0 > 6$, which is false. Hence, origin lies in the half plane region I.

Clearly, any point on the line does not satisfy the given inequality.

Hence, the shaded region II excluding the points on the line is the solution region of the inequality.

**S19.** We draw the graph of the equation

$$-3x + 2y = -6 \qquad \dots \text{(i)}$$



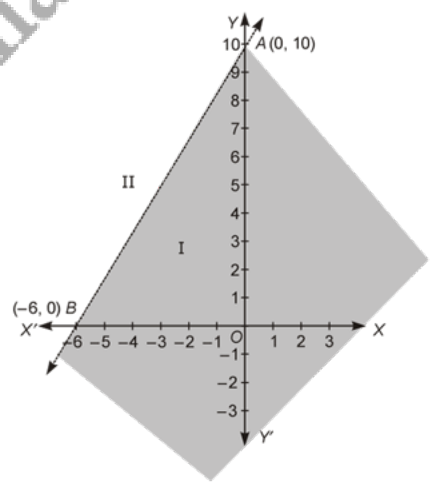

Putting $x = 0$, $y = -3$, therefore the point on the $y$-axis is $(0, -3)$. The point on $x$-axis is $(2, 0)$. $AB$ is the graph of (i).

Putting $x = 0$, $y = 0$ in the given inequality, we have $-3(0) + 2(0) \ge -6$ or $0 \ge -6$ or $0 \le 6$, which is true. Hence, origin lies in the half plane region I.

Hence, the shaded region I including the points on the line is the solution region of the inequality.

**S20.** We draw the graph of the equation

$$3y - 5x = 30 \qquad \dots \text{(i)}$$




Putting $x = 0$, $y = 10$, therefore the point on the $y$-axis is $(0, 10)$. The point on $x$-axis is $(-6, 0)$. $AB$ is the graph of (i).

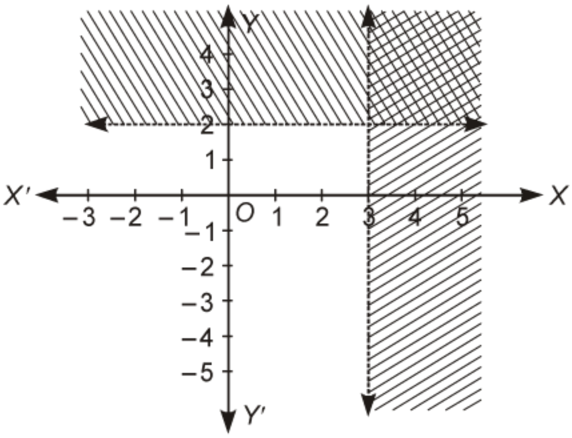
Putting $x = 0$, $y = 0$ in the given inequality, we have $3(0) - 5(0) < 30$ or $0 - 0 < 30$, which is true. Hence, origin lies in the half plane region I.

Clearly, any point on the line does not satisfy the given inequality.

Hence, the shaded region I excluding the points on the line is the solution region of the inequality.

**S21.** Given $x \geq 3$ ... (i)

and $y \geq 2$ ... (ii)




Graph of inequality (i). Let us draw the graph of the line $x = 3$. Clearly, $x = 3$ is a line parallel to $y$-axis at a distance of 3 units from the origin.

Since (0, 0) does not satisfy the inequality $x \geq 3$, because $0 \geq 3$, which is false. So the portion lying on the right side of $x = 3$ is the region represented by $x \geq 3$.

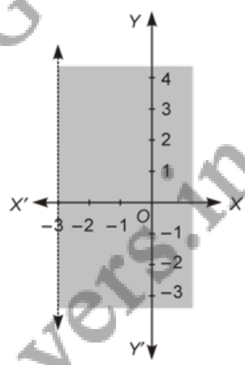
Graph of inequality (ii). Let us draw the graph of the line $y = 2$.

Clearly, $y = 2$ is a line parallel to $x$-axis at a distance of 3 units from it. Since (0, 0) does not satisfy $y \geq 2$ as $0 \geq 2$, which is false. So, the portion not containing the origin is represented by the given inequality.

The common region of the above two regions represents the solution set of the given linear constraints.

**S22.** We draw the graph of the equation

$$x > -3$$




Clearly it is a line parallel to $y$-axis at a distance of 3 units on the left of it.

The line $x = -3$ divides the $xy$-plane into two regions one on the right side and the other on the left side.

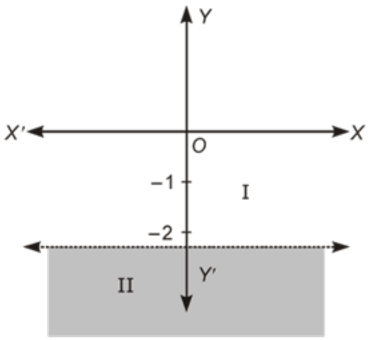
Consider the point 0 (0, 0).

We find that (0, 0) satisfy the inequality $x > -3$ because $0 > -3$, which is true.

So, the region represented by the given inequality is the region containing the origin as shown in figure, by the shaded origin excluding all points on the line.

**S23.** We draw the graph of the equation

$$y < -2$$



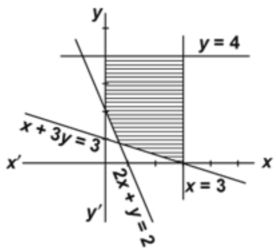

Clearly it is a line parallel to $x$-axis at a distance of 2 units below it. The line $y = -2$ divides the $xy$-plane into two regions one below it and the other above it.

Consider the point $O$(0, 0). We find that (0, 0) does not satisfy the inequality $y < -2$ because $0 < -2$, which is not true.

So, the region represented by the given inequality is the region not containing the origin as shown in figure, by the shaded region excluding all points on the line.

Date: 9/10/2021

**Q1.** Find the linear inequations for which the shaded area in the given figure is the solution set.

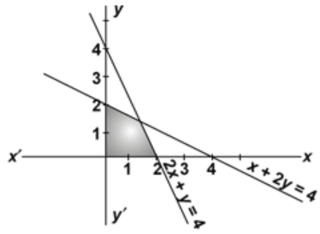



**Q2.** Draw the diagram of the solution set of the linear constraints $3x + 4y \geq 12$, $y \geq 1$, $x \geq 0$.

**Q3.** Draw the diagram of the solution of the linear constraints $2x + 3y \leq 6$, $x + 4y \leq 4$, $x \geq 0$, $y \geq 0$.

**Q4.** Draw the diagram of the solution set of the linear constraints $x + y \geq 1$, $y \geq 0$, $x \geq 0$.

**Q5.** Find the linear inequations for which the shaded area in the given figure is solution set.




**Q6.** Show that the following linear inequations have no solution.

$$3x - y \geq 0, \quad x - 3y \leq -6, \quad x \geq 0, y \leq 0.$$

**Q7.** Solve the following systems of inequalities graphically:

$$2x + y \geq 8, \quad x + 2y \geq 10.$$

**Q8.** Solve the following systems of inequalities graphically:

$$x + y \leq 6, \quad x + y \geq 4.$$

**Q9.** Solve the following systems of inequalities graphically:

$$2x - y > 1, \quad x - 2y < -1.$$

**Q10.** Solve the following systems of inequalities graphically:

$$x + y > 4, \quad 2x - y > 0.$$

**Q11.** Solve the following systems of inequalities graphically:

$$2x + y \geq 6, \quad 3x + 4y \leq 12.$$

**Q12.** Solve the following systems of inequalities graphically:

$$3x + 2y \leq 12, \quad x \geq 1, \quad y \geq 2.$$

**Q13.** Solve the following system of linear inequalities graphically.

$x + 2y \leq 8$ ... (i) $2x + y \leq 8$ ... (ii) $x \geq 0$ ... (iii) $y \geq 0$ ... (iv)

**Q14.** Solve the following system of linear inequalities graphically.

$8x + 3y \le 100$ ... (i) $x \ge 0$ ... (ii) $y \ge 0$ ... (iii)

**Q15.** Solve the following system of linear inequalities graphically.

$5x + 4y \le 40$ ... (i) $x \ge 2$ ... (ii) $y \ge 3$ ... (iii)

**Q16.** Solve the following system of linear inequalities graphically.

$x + y \ge 5$ ... (i) $x - y \le 3$ ... (ii)

**Q17.** Solve the following systems of inequalities graphically:

$$x + 2y \le 10, \quad x + y \ge 1, \quad x - y \le 0, \quad x \ge 0, \quad y \ge 0.$$

**Q18.** Solve the following systems of inequalities graphically:

$$3x + 2y \le 150, \quad x + 4y \le 80, \quad x \le 15, \quad x \ge 0.$$

**Q19.** Solve the following systems of inequalities graphically:

$$4x + 3y \le 60, \quad y \ge 2x, \quad x \ge 3, \quad x, y \ge 0.$$

**Q20.** Solve the following systems of inequalities graphically:

$$x - 2y \le 3, \quad 3x + 4y \ge 12, \quad x \ge 0, \quad y \ge 1.$$

**Q21.** Solve the following systems of inequalities graphically:

$$2x + y \ge 4, \quad x + y \le 3, \quad 2x - 3y \le 6.$$

**Q22.** Solve the following systems of inequalities graphically:

$$3x + 4y \le 60, \quad x + 3y \le 30, \quad x \ge 0, \quad y \ge 0.$$

**Q23.** Solve the following systems of inequalities graphically:

$$5x + 4y \le 20, \quad x \ge 1, \quad y \ge 2.$$

**Q24.** Solve the following systems of inequalities graphically:

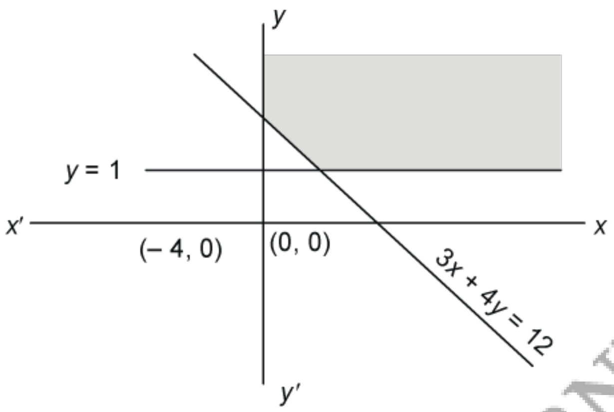
$$x + y \le 9, \quad y > x, \quad x \ge 0.$$

Date: 9/10/2021

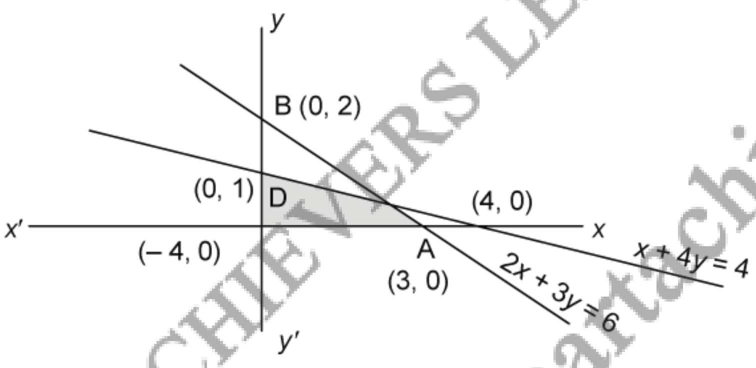
**S1.** We observe that the shaded region is satisfied for (origin and shaded region in opposite sides of the line).

$$2x + y \geq 2, \quad x + 3y \geq 3$$
$$0 \leq x \leq 3, \quad y \leq 4$$

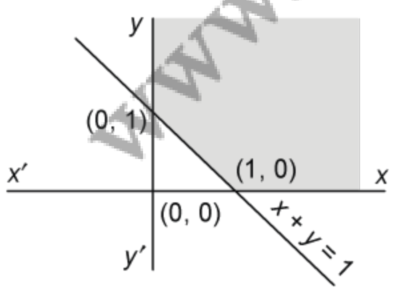
**S2.** The shaded portion is bounded by three lines $x = 0$, $y = 1$ and $3x + 4y = 12$, but itis unbounded because constraints can be satisfies by large positive values of $x$ and $y$.




**S3.** Hence solution is the shaded portion as shown in the given figure.




**S4.** The shaded portion is bounded by thee lines $x + y = 1$, $x = 0$ and y = 0 but it is unbounded because constraints can be satisfies by large positive values of $x$ and $y$.




**S5.** We see that the origin and the shaded region are on the same side of the line $x + 2y = 4$. Also $x + 2y \leq 4$ is satisfied by (0, 0).

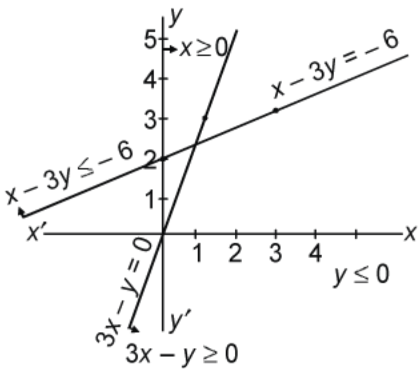
- The one inequation is $x + 2y \leq 4$. We also observe that the origin and the shaded region are on the same side of the line $2x + y = 4$. Also $2x + y \leq 4$ is satisfied by (0, 0).

- The other in equation is $2x + y \leq 4$. Also the shaded region is in the first quadrant and bounded by $x = 0$ and $y = 0$.

- The linear inequations for the entire shaded region are,

  $x + 2y \leq 4,\ 2x + y \leq 4,\ x \geq 0,\ y \geq 0.$

**S6.** We draw the graphs $3x - y = 0$ and $x - 3y = -6$




We observe that the given inequation do not have any common region. Therefore we get no solution.

**S7.** Given,

$$2x + y \geq 8 \quad \text{... (i)}$$

$$x + 2y \geq 10 \quad \text{... (ii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

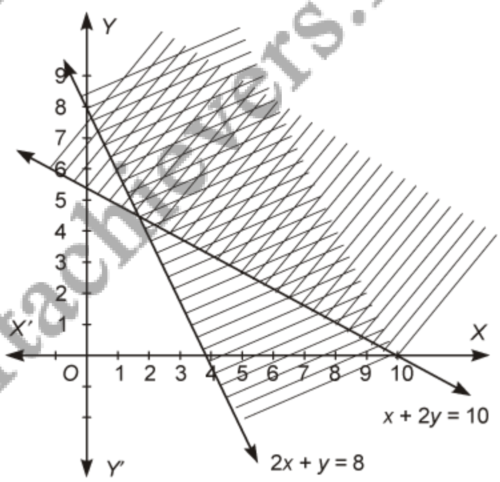
$$2x + y = 8$$

at $y = 0,\ x = 4$ we get the point (4, 0) on $x$-axis

at $x = 0,\ y = 8$ we get the point (0, 8) on $y$-axis

Putting $x = y = 0$ in (i) we get $0 \geq 8$ which is false.

Hence, half-plane region not containing the origin is the solution region of the given inequality.




**Graph of inequality (ii):** Let us draw the graph of the line

$$x + 2y = 10$$

at $y = 0,\ x = 10$ we get the point (10, 0) on $x$-axis

at $x = 0,\ y = 5$ we get the point (0, 5) on $y$-axis

Putting $x = y = 0$ in (ii) we get $0 \geq 10$ which is false.

Hence, half-plane region not containing the origin is the solution region of the given inequality.

The common region of the above two regions represents the solution set of the given linear system.

**S8.** Given,

$$x + y \leq 6 \quad \text{... (i)}$$

$$x + y \geq 4 \quad \text{... (ii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

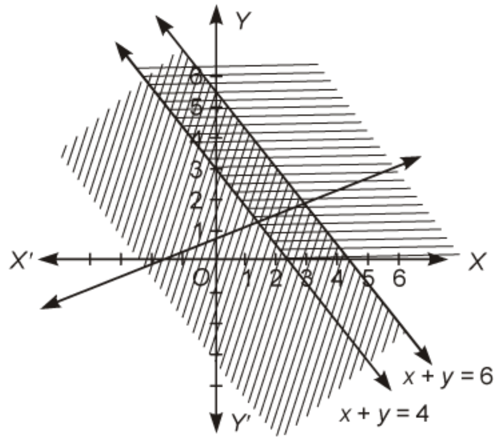
$$x + y = 6$$

at $y = 0,\ x = 6$ we get the point (6, 0) on $x$-axis

at $x = 0,\ y = 6$ we get the point (0, 6) on $y$-axis

Putting $x = y = 0$ in (i) we have $0 \le 6$ which is true.

Hence, half-plane containing the origin is the solution region of the given inequality.




**Graph of inequality (ii):** Let us draw the graph of the line

$$x + y = 4$$

at $y = 0,\ x = 4$ we get the point (4, 0) on $x$-axis

at $x = 0,\ y = 4$ we get the point (0, 4) on $y$-axis

Putting $x = y = 0$ in (ii) we get $0 \ge 4$ which is false.

Hence, half-plane not containing the origin is the solution region of the given inequality.

The common region of the above two regions represents the solution set of the given linear system.

**S9.** Given,

$$2x - y > 1 \quad \text{... (i)}$$

$$x - 2y < -1 \quad \text{... (ii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

$$2x - y = 1$$

at $y = 0,\ x = \frac{1}{2}$ we get the point $\left(\frac{1}{2}, 0\right)$ on $x$-axis

at $x = 0,\ y = -1$ we get the point $(0, -1)$ on $y$-axis

Putting $x = y = 0$ in (i) we have $0 > 1$ which is false.

Hence, half-plane region not containing the origin is the solution region of the given inequality.

**Graph of inequality (ii):** Let us draw the graph of the line

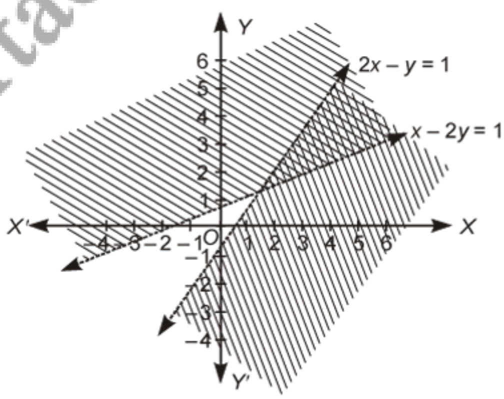
$$x - 2y < -1$$

at $y = 0,\ x = -1$ we get the point $(-1, 0)$ on $x$-axis

at $x = 0,\ y = \frac{1}{2}$ we get the point $\left(0, \frac{1}{2}\right)$ on $y$-axis

Putting $x = y = 0$ in (i) we get $0 < -1$ which is false.

Hence, half-plane region not containing the origin is the solution region of the given inequality.




The common region of the above two regions represents the solution set of the given linear system.

**S10.** Given,

$$x + y > 4 \quad \text{... (i)}$$

$$2x - y > 0 \quad \text{... (ii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

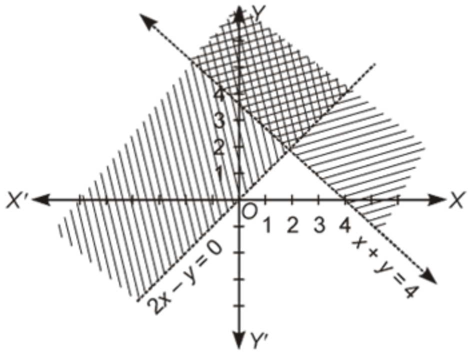
$$x + y = 4 \qquad \text{... (iii)}$$

at $y = 0,\ x = 4$ we get the point (4, 0) on $x$-axis

at $x = 0,\ y = 4$ we get the point (0, 4) on $y$-axis

Putting $x = y = 0$ in (i) we have $0 > 4$ which is false.

Hence, half-plane region not containing the origin is the solution region of the given inequality.




**Graph of inequality (ii):** Let us draw the graph of the line

$$2x - y = 0. \qquad \text{... (iv)}$$

On the line (iv)

at $x = 0 \Rightarrow 2(0) - y = 0 \Rightarrow y = 0$

The common region of the above two regions represents the solution set of the given linear system.

**S11.** Given,

$$2x + y \geq 6 \qquad \text{... (i)}$$

$$3x + 4y \leq 12 \qquad \text{... (ii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

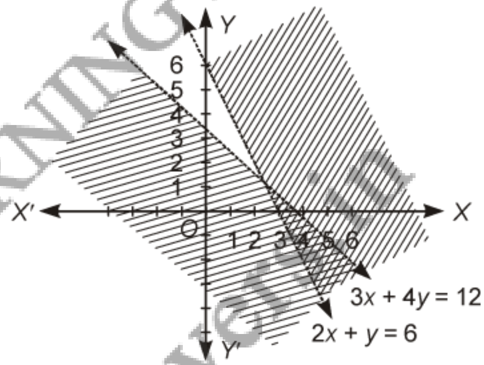
$$2x + y = 6$$

at $y = 0,\ x = 3$ we get the point (3, 0) on $x$-axis

at $x = 0,\ y = 6$ we get the point (0, 6) on $y$-axis

Putting $x = y = 0$ in (i) we have $0 \geq 6$ which is false.

Hence, half plane region not containing the origin is the solution region of the given inequality.




**Graph of inequality (ii):** Let us draw the graph of the line $3x + 4y = 12$. At $y = 0$, $x = 4$ we get the point (4, 0) on $x$-axis.

At $x = 0$, $y = 3$ we get the point (0, 3) on $y$-axis.

Putting $x = y = 0$ in (ii) we have $0 \leq 12$ which is true.

Hence, half-plane containing the origin is the solution region of the given inequality.

The common region of the above two regions represents the solution set of the given linear system.

**S12.** Given,

$$3x + 2y \leq 12 \qquad \text{... (i)}$$

$$x \geq 1 \qquad \text{... (ii)}$$

$$y \geq 2 \qquad \text{... (iii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

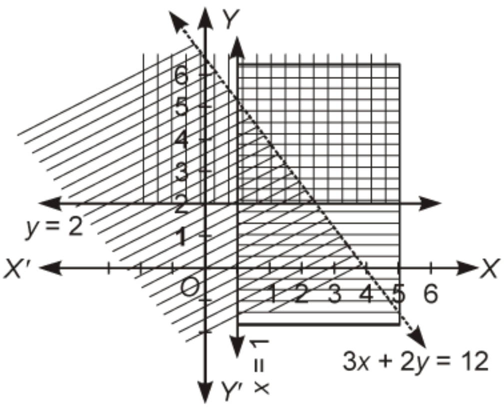
$$3x + 2y = 12$$

at $y = 0,\ x = 4$ we get point (4, 0) on $x$-axis

at $x = 0,\ y = 6$ we get point (0, 6) on $y$-axis

Putting $x = y = 0$ in (i) we have $0 \le 12$ which is true.

Hence, half plane region containing the origin including all the points on the line is the solution region of the given inequality.




**Graph of inequality (ii):** Let us draw the graph of the line $x = 1$. Clearly, $x = 1$ is a line parallel to $y$-axis at a distance of 1 unit from it. Since (0, 0) does not satisfy $x \ge 1$, as $0 \ge 1$, which is false. So the portion not containing the origin is represented by the given inequality.

**Graph of inequality (iii):** Let us draw the graph of the line $y = 2$. Clearly, $y = 2$ is a line parallel to $x$-axis at a distance of 2 units from it.

Since (0, 0) does not satisfy $y \ge 2$, as $0 \ge 2$, which is false. So the portion not containing the origin is represented by the given inequality.

The common region of the above three regions represents the solution set of the given linear system.

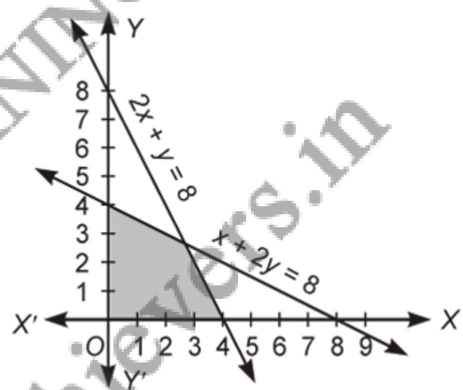
**S13.** We draw the graphs of the lines

$$x + 2y = 8$$

and $$2x + y = 8.$$

The inequality (i) and (ii) represent the region below the two lines, including the point on the respective lines.

Since, $x \ge 0$, $y \ge 0$, every point in the shaded region in the first quadrant including the points on the line and the axes, represent a solution of the given system of inequalities (see figure).

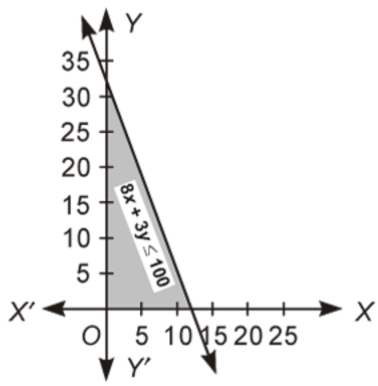



**S14.** We draw the graph of the line

$$8x + 3y = 100$$

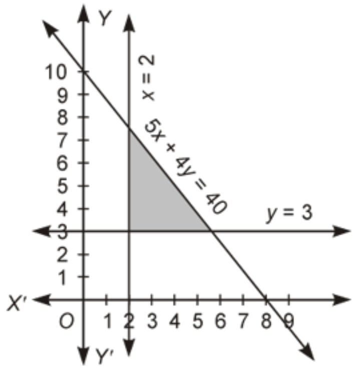
The inequality $8x + 3y \le 100$ represents the shaded region below the line including the points on the line $8x + 3y = 100$ (see figure).

Since, $x \ge 0$, $y \ge 0$, every point in the shaded region in the first quadrant, including the points on the line and the axes, represents the solution of the given system of inequalities.



**S15.** We first draw the graph of the line

$$5x + 4y = 40, \quad x = 2 \quad \text{and} \quad y = 3.$$

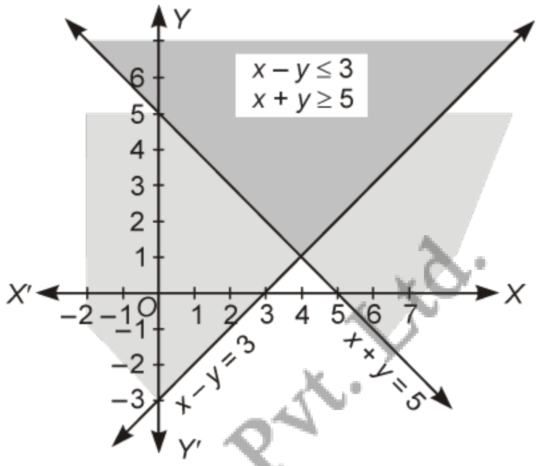



Then we note that the inequality (i) represents shaded region below the line $5x + 4y = 40$ and inequality (ii) represents the shaded region right of line $x = 2$ but inequality (iii) represents the shaded region above the line $y = 3$ Hence, shaded region (see figure) including all the point on the lines are also the solution of the given system of the linear inequalities.

**S16.** The graph of linear equation

$$x + y = 5$$

is drawn in figure




We note that solution of inequality in Eq., (i) is represented by the shaded region above the line $x + y = 5$, including the points on the line.

On the same set of axes, we draw the graph of the equation $x - y = 3$ as shown in figure. Then we note that inequality in Eq. (ii) represents the shaded region above the line x – y = 3, including the points on the line.

Clearly, the double shaded region, common to the above two shaded region is the required solution region of the given system of inequalities.

**S17.** Given,

$$x + 2y \le 10 \quad \dots \text{(i)}$$

$$x + y \ge 1 \quad \dots \text{(ii)}$$

$$x - y \le 0 \quad \dots \text{(iii)}$$

$$x \ge 0 \quad \dots \text{(iv)}$$

$$y \ge 0 \quad \dots \text{(v)}$$

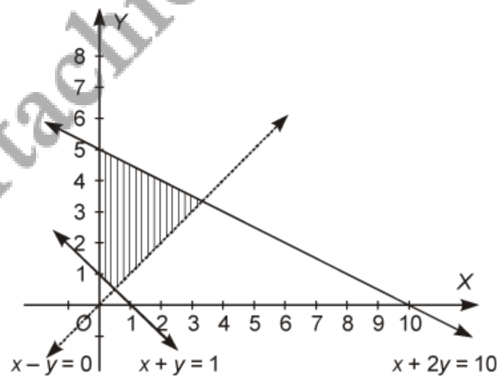
**Graph of inequality (i):** Let us draw the graph of the line

$$x + 2y = 10$$

at $y = 0 \Rightarrow x + 2(0) = 10 \Rightarrow x = 10$

at $x = 0 \Rightarrow 0 + 2y = 10 \Rightarrow y = 5$

(10, 0) and (0, 5) are the points on the line $x + 2y = 10$.




Putting $x = y = 0$ in (i) we have $0 \le 10$ which is true.

Hence, half-plane region containing the origin is the solution region.

**Graph of inequality (ii):** Let us draw the graph of the line

$$x + y = 1$$

at $y = 0 \Rightarrow x + 0 = 1 \Rightarrow x = 1$

at $x = 0 \Rightarrow 0 + y = 1 \Rightarrow y = 1$

∴ (1, 0) and (0, 1) are the points on the line $x + y = 1$.

Putting $x + y = 0$ in (ii) we have $0 \geq 1$ which is false.

Hence, half-plane region not containing the origin is the solution region.

**Graph of inequality (iii):** Let us draw the graph of the line

$$x - y = 0$$

On the line

at $x = 0 \Rightarrow 0 - y = 0 \Rightarrow y = 0$

at $x = 1 \Rightarrow 1 - y = 0 \Rightarrow y = 1$

∴ (0, 0) and (1, 1) are on line $x - y = 0$.

To determine the region represented by the given inequality (iii) consider the point not lying on the line $x - y = 0$ say (2, 0) and it is in the half-plane of (iii) $2 \leq 0$ which is not true.

Therefore the portion not containing (2, 0) represents the solution set of the given inequality.

**Graph of inequality (iv) and (v):** Clearly, $x \geq 0$ represents the region lying on the right side of $y$-axis and $y \geq 0$ represents the region lying above the $x$-axis

The common region of the above five regions is the solution set.

**S18.** Given,

$3x + 2y \leq 150$ ... (i)

$x + 4y \leq 80$ ... (ii)

$x \leq 15$ ... (iii)

$x \geq 0$ ... (iv)

**Graph of inequality (i):** Let us draw the graph of the line

$$3x + 2y = 150$$

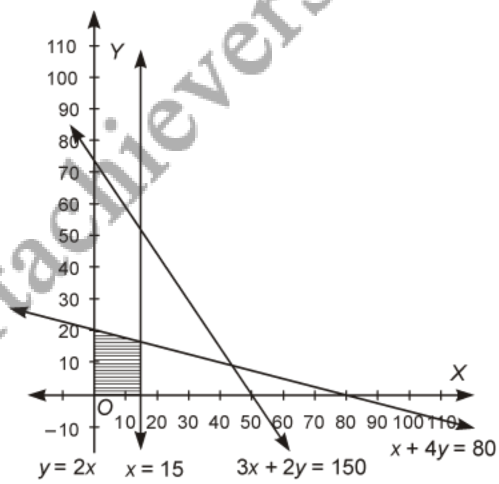
at $y = 0 \Rightarrow 3x + 2(0) = 150 \Rightarrow x = 50$

at $x = 0 \Rightarrow 3(0) + 2y = 150 \Rightarrow y = 75$

(50, 0) and (0, 75) are the points on the line $3x + 2y = 150$.

Putting $x = y = 0$ in (i) we have $0 \leq 150$ which is true.

Hence, half-plane region containing the origin is the solution region of this inequality.




**Graph of inequality (ii):** Let us draw the graph of the line

$$x + 4y = 80$$

at $y = 0 \Rightarrow x + 4(0) = 80 \Rightarrow x = 80$

at $x = 0 \Rightarrow 0 + 4y = 80 \Rightarrow y = 20$

∴ (80, 0) and (0, 20) are the points on the line $x + 4y = 80$.

Putting $x = y = 0$ in (ii) we have $0 \le 80$ which is true.

Hence, half-plane region containing the origin is the solution region of this inequality.

**Graph of inequality (iii):** Let us draw the graph of the line $x = 15$ which is parallel to the $y$-axis and at a distance of 15 units from it.

Putting $x = 0$ in (iii) we have $0 \le 15$ which is true. Hence, half-plane region containing the origin is the solution region of this inequality.

The common region of the above four regions represent the solution set of the given linear system.

**S19.** Given,

$$4x + 3y \le 60 \quad \text{... (i)}$$

$$y \ge 2x \quad \text{... (ii)}$$

$$x \ge 3 \quad \text{... (iii)}$$

$$x \ge 0 \quad \text{... (iv)}$$

$$y \ge 0 \quad \text{... (v)}$$

**Graph of inequality (i):** Let us draw the graph of the line

$$4x + 3y = 60$$

at $y = 0 \Rightarrow 4x + 3(0) = 60 \Rightarrow x = 15$

at $x = 0 \Rightarrow 4(0) + 3y = 60 \Rightarrow y = 20$

$\therefore$ (15, 0) and (0, 20) are the points on the line $4x + 3y = 60$.

Putting $x = y = 0$ in (i) we have $0 \le 60$, which is true.

Hence, half-plane region containing the origin is the solution region.

**Graph of inequality (ii):** Let us draw the graph of the line $x = 1$ which is parallel to the $y$-axis and is at a unit distance from it.

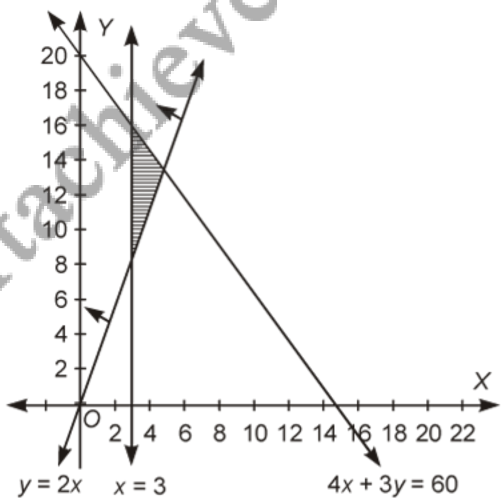
$$y = 2x$$

at $y = 0 \Rightarrow 0 = 2x \Rightarrow x = 0$

at $x = 1 \Rightarrow y = 2(1) \Rightarrow y = 2$

$\therefore$ (0, 0) and (1, 2) are the points on the line $y = 2x$.

To determine the region represented by the giben inequality (ii) consider the point not lying on the line $y = 2x$, say (2, 0) and it lies in the half-plane of (ii) if $0 \ge 4$, which is not true. Therefore the portion not containing (2, 0) represents the solution set of the given inequality.




**Graph of inequality (iii):** Let us draw the graph of the line $x = 3$ which is parallel to the $y$-axis and is at a distance of 3 units from it.

Putting $x = 0$ in (iii), we have $0 \ge 3$ which is not true. Hence half-plane region not containing the origin is the solution region of the given inequality.

**Graph of inequality (iv):** Clearly, $x \geq 0$ represents the region lying on the right side of $y$-axis.

**Graph of inequality (v):** Clearly, $y \geq 0$ represents the region lying above the $x$-axis.

The common region of the above five regions represent the solution set of the given linear system.

Triple shaded triangular area is the solution area in the solution region.

**S20.** Given,

$$x - 2y \leq 3 \quad \text{... (i)}$$
$$3x + 4y \geq 12 \quad \text{... (ii)}$$
$$x \geq 0 \quad \text{... (iii)}$$
$$y \geq 1 \quad \text{... (iv)}$$

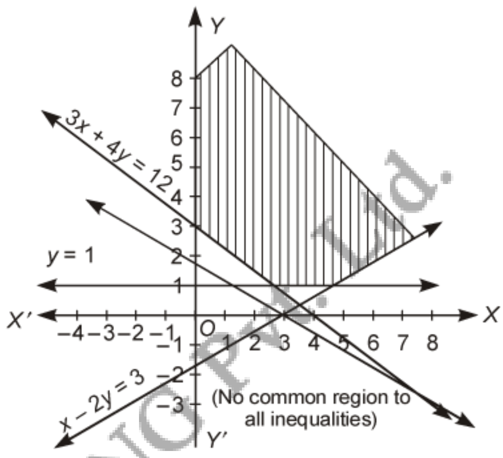
**Graph of inequality (i):** Let us draw the graph of the line

$$x - 2y = 3$$

at $y = 0 \Rightarrow x - 2(0) = 3 \Rightarrow x = 3$

at $x = 0 \Rightarrow 0 - 2y = 3 \Rightarrow y = \frac{-3}{2}$

$\therefore$ (3, 0) and $\left(0, \frac{-3}{2}\right)$ are the points on the line $x - 2y = 3$.




Putting $x = y = 0$ in (i), we have $0 \leq 3$ which is true.

Hence, half-plane region containing the origin is the solution region.

**Graph of inequality (ii):** Let us draw the graph of the line

$$3x + 4y = 12$$

at $y = 0 \Rightarrow 3x + 4(0) = 12 \Rightarrow x = 4$

at $x = 0 \Rightarrow 3(0) + 4y = 12 \Rightarrow y = 3$

$\therefore$ (4, 0) and (0, 3) are the points on the line $3x + 4y = 12$.

Putting $x = y = 0$ in (ii), we have $0 \geq 12$ which is false.

Hence, half-plane region not containing the origin is the solution region.

**Graph of inequality (iii):** Clearly, $x \geq 0$ represents the region lying on the right side of $y$-axis.

**Graph of inequality (iv):** Let us draw the graph of the line $y = 1$ which is parallel to $x$-axis and is at a distance of 1 unit from it.

Putting $y = 0$ in (iv), we have $0 \geq 1$ which is false.

Hence, half-plane region not containing the origin is the solution region of the given inequality.

The common region of the above four regions is the solution set of the given linear constraints.

**S21.** Given,

$$2x + y \geq 4 \quad \text{... (i)}$$
$$x + y \leq 3 \quad \text{... (ii)}$$
$$2x - 3y \leq 6 \quad \text{... (iii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

$$2x + y = 4$$

at $y = 0 \Rightarrow 2x + 0 = 4 \Rightarrow x = 2$

at $x = 0 \Rightarrow 2(0) + y = 4 \Rightarrow y = 4$

$\therefore$ (2, 0) and (0, 4) are on the line $2x + y = 4$.

Putting $x = y = 0$ in (i), we get $0 \geq 4$ which is false.

Hence, half-plane region not containing the origin is the solution region.

**Graph of inequality (ii):** Let us draw the graph of the line

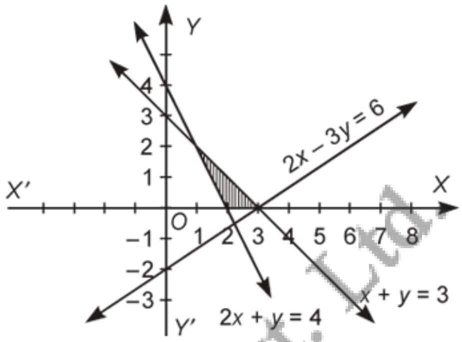
$$x + y = 3$$

at $y = 0 \Rightarrow x + 0 = 3 \Rightarrow x = 3$

at $x = 0 \Rightarrow 0 + y = 3 \Rightarrow y = 3$

Putting $x = y = 0$ in (ii), we have $0 \leq 3$ which is true.

Hence, half-plane region containing the origin is the solution region.




**Graph of inequality (iii):** Let us draw the graph of the line

$$2x - 3y = 6$$

at $y = 0 \Rightarrow 2x - 3(0) = 6 \Rightarrow x = 3$

at $x = 0 \Rightarrow 2(0) - 3y = 6 \Rightarrow y = -2$

$\therefore$ (3, 0) and (0, –2) are the points on the line $2x - 3y = 6$.

Putting $x = y = 0$ in (iii), we have $0 \leq 6$ which is true.

Hence, half-plane region containing the origin is the solution region.

The common region of the above three regions is the solution set.

**S22.** Given,

$$3x + 4y \leq 60 \quad \dots \text{(i)}$$
$$x + 3y \leq 30 \quad \dots \text{(ii)}$$
$$x \geq 0 \quad \dots \text{(iii)}$$
$$y \geq 0 \quad \dots \text{(iv)}$$

**Graph of inequality (i):** Let us draw the graph of the line

$$3x + 4y = 60 \quad \dots \text{(v)}$$

at $y = 0$

$\Rightarrow$ $3x + 4(0) = 60$

$\Rightarrow$ $x = 20$

at $x = 0$

$\Rightarrow$ $3(0) + 4y = 60$

$\Rightarrow$ $y = 15$

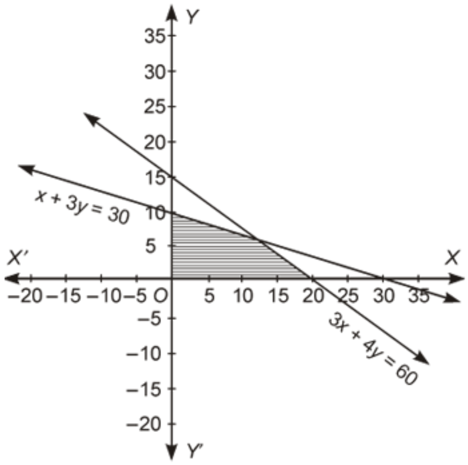
(20, 0) and (0, 15) are on the line (v).

Putting $x = y = 0$ in (i) we get $0 \le 60$ which is true.

Hence, half-plane region containing the origin is the solution region of the given inequality.

**Graph of inequality (ii):** Let us draw the graph of the line

$$x + 3y = 30 \quad \text{... (vi)}$$




at $y = 0$

$\Rightarrow$ $x + 3(0) = 30$

$\Rightarrow$ $x = 30$

at $x = 0$

$\Rightarrow$ $0 + 3y = 30$

$\Rightarrow$ $y = 10$

(30, 0) and (0, 10) are on the line (vi).

Putting $x = y = 0$ in (ii) we get $0 \le 30$ which is true.

Hence, half-plane region containing the origin is the solution region of the given inequality.

**Graph of inequality (iii):** Clearly, $x \ge 0$ represents the region lying on the right side of $y$-axis.

**Graph of inequality (iv):** Clearly, $y \ge 0$ represents the region lying above the $x$-axis.

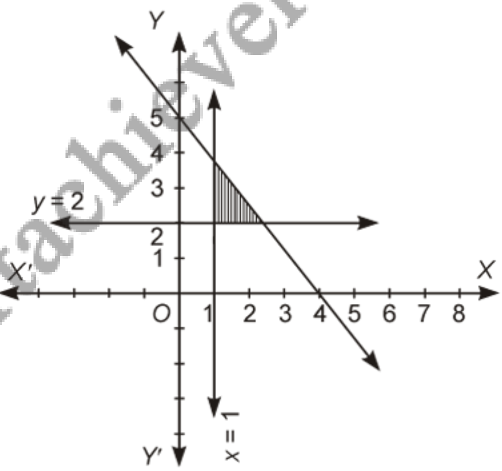
The common region of the above four regions is the solution set.

**S23.** Given,

$$5x + 4y \le 20 \quad \text{... (i)}$$
$$x \ge 1 \quad \text{... (ii)}$$
$$y \ge 2 \quad \text{... (iii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

$$5x + 4y = 20 \quad \text{... (iv)}$$




at $y = 0 \Rightarrow 5x + 4(0) = 20 \Rightarrow x = 4$

at $x = 0 \Rightarrow 5(0) + 4y = 20 \Rightarrow y = 5$

Putting $x = y = 0$ in (i) we get $5(0) + 4(0) \le 20$, *i.e.*, $0 \le 20$ which is true.

Hence, half-plane region containing the origin is the solution region of the given inequality.

**Graph of inequality (ii):** Let us draw the graph of the line $x = 1$ which is parallel to the $y$-axis and is at a unit distance from it.

Putting $x = 0$ in (ii), we have $0 \ge 1$ which is not true.

Hence, half-plane region not containing the origin is the solution region of the given inequality.

**Graph of inequality (iii):** Let us draw the graph of the line $y = 2$ which is parallel to the $x$-axis and is at a distance of 2 units from it.

Putting $y = 0$ in (iii), we have $0 \ge 2$ which is not true.

Hence, half-plane region not containing the origin is the solution region of the given inequality.

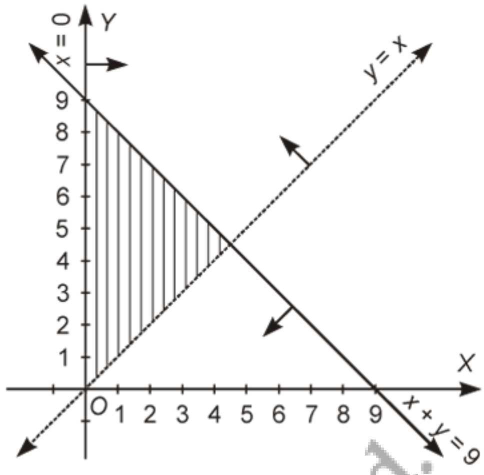
The common region of the above three regions represents the solution set of the given linear system.

**S24.** Given,

$$x + y \le 9 \quad \text{... (i)}$$
$$y > x \quad \text{... (ii)}$$
$$x \ge 0 \quad \text{... (iii)}$$

**Graph of inequality (i):** Let us draw the graph of the line

$$x + y = 9 \quad \text{... (iv)}$$




at $y = 0$, $x = 9$ we get the point (9, 0) on $x$-axis

at $x = 0$, $y = 9$ we get the point (0, 9) on $y$-axis

Putting $x = y = 0$ in (i) we get $0 \le 9$ which is true.

Hence, half-plane region containing the origin is the solution region of the given inequality.

**Graph of inequality (ii):** Let us draw the graph of the line

$$y = x$$

or

$$y - x = 0 \quad \text{... (v)}$$

On the line (v)

at $x = 0 \Rightarrow y - 0 = 0 \Rightarrow y = 0$

Clearly, $(x) \ge 0$ represents the region lying on the right side of $y$-axis.

Triple shaded region is the solution region.

Date: 9/10/2021

**Q1.** Ravi obtained 70 and 75 marks in first two unit tests. Find the number if minimum marks he should get in the third test to have an average of atleast 60 marks.

**Q2.** The marks obtained by a student of Class XI in first and second terminal examination are 62 and 48, respectively. Find the minimum marks he should get in the annual examination to have an average of at least 60 marks.

**Q3.** To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Sunita's marks in first four examinations are 87, 92, 94 and 95, find minimum marks that Sunita must obtain in fifth examination to get grade 'A' in the course.

**Q4.** A man wants to cut three lengths from the single piece of board of length 91 cm. The second length is to be 3 cm longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5 cm longer than the second?

**Q5.** A student $X$ obtained 70 and 75 marks in first two unit tests, find the number of minimum marks he should get in third test to have an average of atleast 65 marks.

**Q6.** The longest side of a triangle is 3 times the shortest side and third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm. Find the minimum length of the shortest side.

**Q7.** Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.

**Q8.** In the first four papers each of 100 marks, Rahul got 65, 67, 70, 68 marks. If he wants an average of marks between 65 and 70, find the range of marks he should get in the fifth paper.

**Q9.** Find all pairs of consecutive even natural numbers both of which are larger than 5 and their sum is less than 25.

**Q10.** How many litres of water will have to be added to 1125 litres of 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?

**Q11.** A solution is to be kept between 68°F and 77°F. What is the range in temperature in degree celsius (C) if the conversion formula is

$$C = \frac{5}{9}(F - 32)$$

**Q12.** IQ of a person is given by the formula

$$IQ = \frac{MA}{CA} \times 100.$$

Where $MA$ is mental age and $CA$ is chronological age. If $80 \leq IQ \leq 140$ for a group of 12 year children find the range of their mental age.

**Q13.** In an experiment a solution of hydrochloric acid is to kept between 30° and 40° celsius what is the range of temperature in degree fahrenhiet if conversion formula is given by

$$C = \frac{5}{9}(F - 32).$$

**Q14.** Find all pairs of consecutive positive odd integers both of which are larger than 6 and their sum is less than 24.

**Q15.** Find all pairs of consecutive even positive integers both of which are larger than 5 such that their sum is less than 23.

**Q16.** A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added?

**Q17.** Find all pairs of consecutive odd positive integers both of which arte smaller than 10 such that their sum is more than 11.

**Q18.** A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

**Q19.** In an experiment, a solution of hydrochloric acid is to be kept between 30° and 35° Celsius. What is the range of temperature in degree Fahrenheit if conversion formula is given by $C = \frac{5}{9}(F - 32)$, where C and F represent temperature in degree Celsius and degree Fahrenheit, respectively.

Date: 9/10/2021

**S1.** Let he should get $x$ marks in the third test such that

$$\Rightarrow \quad \frac{70+75+x}{3} \geq 60$$

$$\Rightarrow \quad \frac{145+x}{3} \geq 60$$

$$\Rightarrow \quad 145 + x \geq 180$$

$$\Rightarrow \quad x \geq 180 - 145$$

$$\Rightarrow \quad x \geq 35$$

Hence, he should get 35 or more marks in the third test.

**S2.** Let x be the marks obtained by student in the annual examination. Then

$$\frac{62+48+x}{3} \geq 60$$

or $\quad 110 + x \geq 180$

or $\quad x \geq 70$

Thus, the student must obtain a minimum of 70 marks to get an average of at least 60 marks.

**S3.** Let Sunita obtain $x$ marks in her fifth examination.

$$\Rightarrow \quad \frac{87+92+94+95+x}{5} \geq 90$$

$$\Rightarrow \quad 368 + x \geq 450$$

$$\Rightarrow \quad x \geq 82$$

Thus, Sunita must obtain a minimum of 82 marks to get Grade 'A' in the course.

**S4.** Let the shortest piece of length $x$ cm.

$\Rightarrow$ The length of second and third pieces will be $x + 3$ and $2x$ respectively.

As per the given conditions, we must have $x + (x + 3) + 2x \leq 91$ and $2x \geq (x + 3) + 5$.

$$\Rightarrow \quad 4x + 3 \leq 91 \quad \text{and} \quad x \geq 8$$

$$\Rightarrow \quad x \leq 22 \quad \text{and} \quad x \geq 8$$

$$\Rightarrow \quad 8 \leq x \leq 22$$

**S5.** Let $m$ be the marks obtained by student $X$ in third test.

Then, $\quad \dfrac{m+70+75}{3} \geq 65$

$\Rightarrow \quad 145 + m \geq 195$

$\Rightarrow \quad m \geq 195 - 145$

$m \geq 50$

Hence $X$ must obtain a minimum of 50 marks to get an average of atleast 65 marks.

**S6.** Let the shortest side be $x$ cm.

$\Rightarrow$ The longest side = $3x$ and the third side = $3x - 2$

Now, Perimeter $\geq 61$

$\Rightarrow \quad x + 3x + (3x - 2) \geq 61$

$\Rightarrow \quad 7x \geq 63$

$\Rightarrow \quad x \geq 9$

$\Rightarrow$ Minimum length of the shortest side = 9 cm

**S7.** Let $x$ be the smaller of the two consecutive odd natural number, so that the other one is $x + 2$. Then, we should have

$$x > 10 \quad \text{... (i)}$$

and
$$x + (x + 2) < 40 \quad \text{... (ii)}$$

Solving Eq. (ii), we get $2x + 2 < 40$

*i.e.*, $x < 19$ ... (iii)

From Eq. (i) and (iii), we get $10 < x < 19$

Since, $x$ is an odd number, $x$ can take the values 11, 13, 15 and 17. So, the required possible pairs will be

(11, 13), (13, 15), (15, 17), (17, 19).

**S8.** Let the marks in the fifth subject be $x$

$$\Rightarrow \quad 65 < \frac{65 + 67 + 70 + 68 + x}{5} < 70$$

$$\Rightarrow \quad 65 < \frac{270 + x}{5} < 70$$

$$\Rightarrow \quad 65 < 54 + \frac{x}{5} < 70$$

$$\Rightarrow \quad 11 < \frac{x}{5} < 16$$

$$\Rightarrow \quad 55 > x < 80$$

Hence, Rahul must score between 55 and 80.

**S9.** Let the numbers be $x$ and $x + 2$

$\Rightarrow \quad x > 5 \quad \text{and} \quad x + (x + 2) < 25$

$\Rightarrow \quad x > 5 \quad \text{and} \quad 2x < 23$

$\Rightarrow \quad x > 5 \quad \text{and} \quad x < \frac{23}{2}$

$\Rightarrow \quad 5 > x < \frac{23}{2}$

$\Rightarrow \quad x > 6, 7, 8, 9, 10, 11$

$\Rightarrow \quad x > 6, 8, 10 \qquad (\because \; x \text{ is even})$

$\Rightarrow$ The possible pairs will be (6, 8), (8, 10) and (10, 12)

**S10.** Let $x$ litres of water to be added

$\Rightarrow$ The total volume = $x + 1125$

We must have

$$\frac{25}{100}(x + 1125) < 1125 \times \frac{45}{100} < \frac{30}{100}(x + 1125)$$

$\Rightarrow \quad 25(x + 1125) < 1125 \times 45 < 30(x + 1125)$

$\Rightarrow \quad 25x + 1125 \times 25 < 1125 \times 45 \quad \text{and} \quad 1125 \times 45 < 30(x + 1125)$

$\Rightarrow \quad x < \frac{1125 \times 20}{25} \quad \text{and} \quad \frac{1125 \times 15}{30} < x$

$\Rightarrow \quad x < 900 \quad \text{and} \quad 562.5 < x$

$\Rightarrow$ The water should be added between 562.5 $l$ and 900 $l$.

**S11.** $68 < F < 77$

$\Rightarrow \quad 68 < \frac{9}{5}C + 32 < 77$

$\Rightarrow \quad 36 < \frac{9}{5}C < 45$

$\Rightarrow \quad 36\left(\frac{5}{9}\right) < C < 45\left(\frac{5}{9}\right)$

$\Rightarrow \quad 20 < C < 25$

$\Rightarrow$ The temperature should be between 20°C and 25°C.

**S12.** $\because \quad CA = 12$ years

$\therefore \quad IQ = \frac{MA}{CA} \times 100$

$$\Rightarrow \quad IQ = \frac{MA}{12} \times 100 = \frac{25}{3} MA \quad \dots \text{(i)}$$

Since, $80 \le IQ \le 140$

$$80 \le \frac{25}{3} MA \le 140$$

$$\Rightarrow \quad \frac{240}{25} \le MA \le \frac{420}{25}$$

$$\Rightarrow \quad 9.6 \le MA \le 16.8$$

Hence range of mental age is at least 9.6 but not more than 16.8.

**S13.** $30° < C < 40°$

$$\Rightarrow \quad 30° < \frac{5}{9} (F - 32) < 40°$$

$$\frac{5}{9} \times 30 < (F - 32) < 40 \times \frac{5}{9}$$

$$54 < F - 32 < 72$$

$$54 + 32 < F < 72 + 32$$

$$86 < F < 104$$

Hence required range of temperature in between 86 °F to 104 °F.

**S14.** Let x be the smaller of the two consecutive odd positive integer then the other integer is $x + 2$.

Hence,

$$x > 6 \quad \text{and} \quad x + (x + 2) < 24$$

$$\Rightarrow \quad x > 6 \quad \text{and} \quad x < 11$$

$$\Rightarrow \quad 6 < x < 11$$

$$\Rightarrow \quad x = 7, 9$$

Hence the required pairs of odd positive integers are (7, 9).

**S15.** Let $x$ be a smaller of the two consecutive even positive integers. Then the other even integer is $x + 2$.

Hence, $x > 5 \quad \text{and} \quad x + (x + 2) < 23$

$$\Rightarrow \quad x > 5 \quad \text{and} \quad 2x < 21$$

$$\Rightarrow \quad x > 5 \quad \text{and} \quad x < \frac{21}{2}$$

$\Rightarrow \qquad 5 < x < \dfrac{21}{2}$

$\Rightarrow \qquad x = 6, 8, 10$

Hence the required pairs of even positive integers are (6, 8), (8, 10), (10, 12).

**S16.** Let $x$ be the number of litres of 2% boric acid solution. The total mixture = (640 + x) litres.

$\therefore \qquad$ 2% of $x$ + 8% of (640) > 4% of (640 + $x$)

or $\qquad \dfrac{2x}{100} + \dfrac{8 \times 640}{100} > \dfrac{4}{100}(640 + x)$

or $\qquad 2x + 5120 > 2560 + 4x$

or $\qquad 5120 - 2560 > 4x - 2x$

or $\qquad 2x < 2560$

or $\qquad x < 1280 \qquad$ ... (i)

and $\qquad$ 2% of $x$ + 8% of 640 < 6% of (640 + $x$)

$\dfrac{2x}{100} + \dfrac{8 \times 640}{100} < \dfrac{6}{100}(640 + x)$

or $\qquad 2x + 5120 < 3840 + 6x$

or $\qquad 5120 - 3840 < 6x - 2x$

or $\qquad 4x > 1280 \quad$ or $\quad x > 320 \qquad$ ... (ii)

Thus, the number of litres to be added should be greater than 320 litres and less than 1280 litres.

**S17.** Let $x$ be the smaller of the two odd natural numbers so that the other one is $x + 2$. Then, we should have

$x < 10 \qquad$ ... (i)

and $\qquad x + (x + 2) > 11 \qquad$ ... (ii)

Solving Eq. (ii), we get $\qquad 2x + 2 > 11$

*i.e.*, $\qquad x > \dfrac{9}{2} \qquad$ ... (iii)

From Eq. (i) and (iii), we get

$$\frac{9}{2} < x < 10 \quad \text{or} \quad 4.5 < x < 10$$

*i.e.*, the odd number $x$ must lie between 4.5 and 10. So, the required possible pairs will be (5,7), (7, 9).

**S18.** Let $x$ litres of 30% acid solution is required to be added. Then

Total mixture = ($x$ + 600) litres

Therefore, $\quad$ 30% $x$ + 12% of 600 > 15% of ($x$ + 600) and $30\%\ x + 12\%$ of $600 < 18\%$ of $(x + 600)$

or $$\frac{30x}{100} + \frac{12}{100}(600) > \frac{15}{100}(x + 600)$$

and $$\frac{30x}{100} + \frac{12}{100}(600) < \frac{18}{100}(x + 600)$$

or $30x + 7200 > 15x + 9000$

and $30x + 7200 < 18x + 10800$

or $15x > 1800$ and $12x < 3600$

or $x > 120$ and $x < 300$

*i.e.*, $120 < x < 300$

Thus, the number of litres of the 30% solution of acid will have to be more than 120 litres but less than 300 litres.

**S19.** It is given that $30 < C < 35$.

Putting $$C = \frac{5}{9}(F - 32),$$

we get $$30° < \frac{5}{9}(F - 32) < 35°$$

or $$\frac{9}{5} \cdot (30° < (F - 32) < \frac{9}{5} \cdot (35°)$$

or $54° < (F - 32) < 63°$

or $86° < F < 95°$

Thus, the required range of temperature is between 86° F and 95° F.