Marks : 20	FYJC Subject : Mathematics 2 Linear Inequations	Time : 45 Min.

Q.1. Solve the following. **(8Marks)**

1) i) $\frac{3}{4}x - 6 \le x - 7$

Ans. $\frac{3}{4}x - 6 \le x - 7 \Rightarrow \frac{3}{4}x - x \le -7 + 6$

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

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

$$\Rightarrow -x \le -4$$

$$\Rightarrow x \ge -4$$

∴ **Solution interval**: [4,∞)

ii) $2|4-5x| \ge 9$

Ans. $2|4-5x| \ge 9 \Rightarrow 2(4-5x) \ge 9 \; or \; 2(4-5x) \le -9$

$$\Rightarrow 8 - 10x \ge 9 \quad or \;\; 8 - 10x \le -9$$

$$\Rightarrow -10x \ge 9 - 8 \; or - 10x \le -9 - 8$$

$$\Rightarrow -10x \ge 1 \qquad or - 10x \le -17$$

$$\Rightarrow -10x \le -1 \quad or \; 10x \ge 17$$

$$\Rightarrow x \le -\frac{1}{10} \qquad or \; x \ge \frac{17}{10}$$

∴ **Solution interval**: $(-\infty, -0.1] \cup [1.7, \infty)$

2) Rajiv obtained 70 and 75 marks in first two unit tests. Find the minimum marks he should get in the third test to have an average of at least 60 marks.

Ans. Let $x1$ = marks in first unit test = 70

$x2$ = marks in second unit test = 75

$x3$ = marks in third test

An average of marks in three test becomes at least 60 marks.

∴ $\frac{x_1+x_2+x_3}{3} \ge 60$

∴ $70 + 75\,x_3 \ge 180$

∴ $x_3 \ge 180 - 145$

∴ $x_3 \ge 35$

Hence, the minimum marks Rajiv should get in the third test in 35 marks.

3) i) $|x| \geq 3.5$

Ans. $|x| \geq 3.5 \Rightarrow x \geq 3.5 \; or \; x \leq -3.5$

Solution interval: [3.5,∞), unbounded (left-closed) or

(- ∞,- 3.5] unbounded (right closed).

Solution graph: It is shown as in figure 8.9

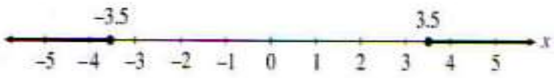


Fig. 8.9

ii) $-2 \leq x < 2.5$

Ans. **Solution interval:** [- 2, 2.5), unbounded semi-right open.

Solution graph: It is shown as in figure 8.6

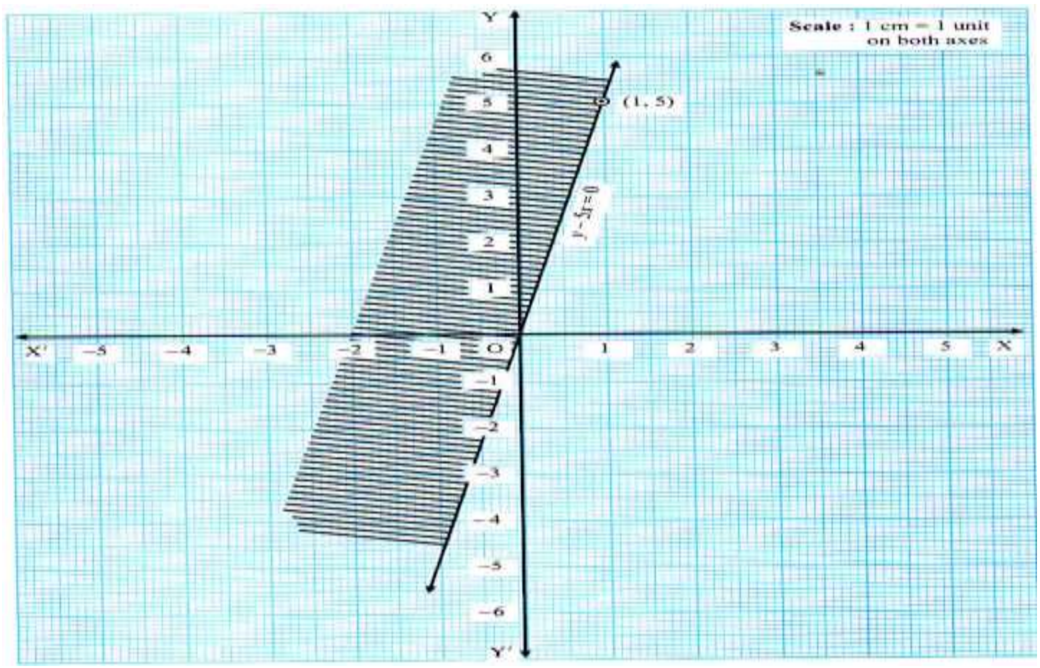
Fig. 8.6

4) $y - 5x \geq 0$

Consider the equation $y - 5x \geq 0$. To draw the graph of this equation two points are obtained as follows:

Point	X	Y
A	0	0
B	1	5

Two points are A (0, 0) and B (1, 5). Draw the line AB. It passes through origin and the point B (1, 5). Choose the point (2, 1) not lying on the line. The coordinates of this point does not satisfy the given inequation. Therefore, shade the portion above this line. The shaded portion as shown in figure 8.13, represents the solution set of the given inequation.



Q.2. Solve the following. (12Marks)

1. $2x + 3y \geq 12, -x + y \leq 3, x \leq 4, y \geq 3$

Ans. To draw the graphs of the system of linear inequations, we prepare the following table:

Inequation	Equation	Points (x, y)				Region
2x + 3y ≥ 12	2 X + 3Y = 12	X	0	6	A(0,4)	2(0) +3(0)= 0 ≱ 12 ∴Non-Origin side of the Line AB
		Y	4	0	B(6,0)	
- X + y ≤ 3	- X + Y = 3	X	0	-3	C(0,3)	0 + 0 = 0< 3 ∴Origin side of the Line CD
		Y	3	0	D(03,0)	
X ≤ 4	X = 4	(4, 0)				Parallel to Y-axis, origin side
Y ≥ 3	Y = 3	(0, 3)				Parallel to x-axis, non-origin side

X = 0, Y = 0 are coordinate axis.

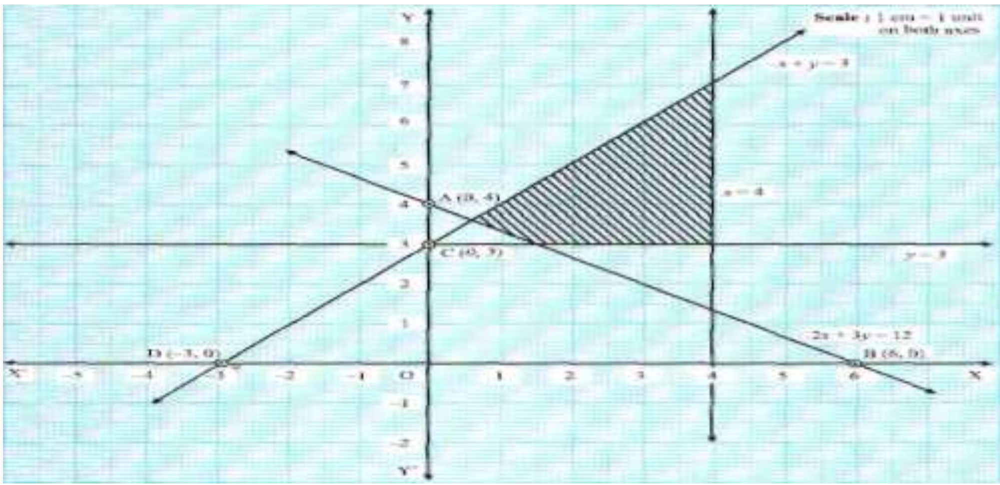


Fig. 8.21

Shaded portion in the graph represents the common region

2. $\frac{x}{60} + \frac{y}{90} \leq 1, \frac{x}{120} + \frac{y}{75} \leq 1, y \geq 0, x \geq 0$

Ans. $\frac{x}{60} + \frac{y}{90} \leq 1 \Rightarrow \frac{3x+2y}{180} \leq 1 \Rightarrow 3x + 2y \leq 180; \frac{x}{12} + \frac{y}{75} \leq 1 \Rightarrow 5x + 8y \leq 600$

To draw the graphs of the given system of linear inequation, we prepare the following table:

Inequation	Equation	Points (x, y)				Region
3x + 2y ≥ 180	3X + 2Y = 180	X	0	60	A(0,90)	3(0) +2(0) < 180 ∴Origin side of the Line AB
		Y	90	0	B(60,0)	
5X + 8y ≤ 600	5X + 8Y = 600	X	0	120	C(0,75)	5(0)+ 8(0) < 600 ∴Origin side of the Line CD
		Y	75	0	D(120,0)	
X ≤ 0	X = 0	-				RHS of Y-axis
Y ≥ 0	Y = 0	-				Above X-axis

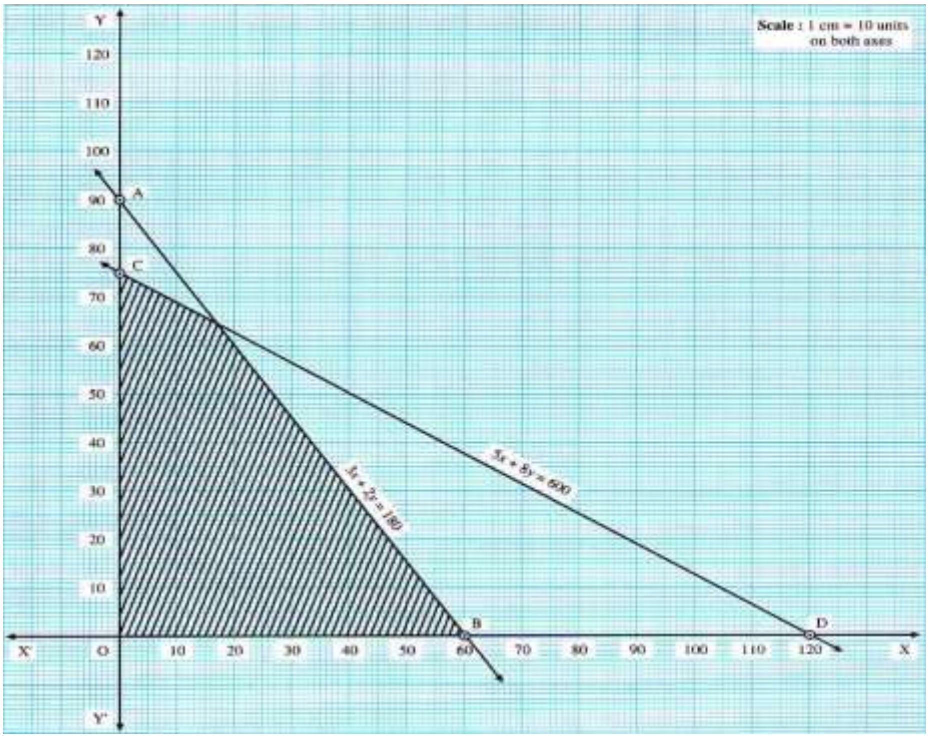


Fig.8.24

The shaded portion in the graph represents the common region

3. $3x + 2y \leq 24, 3x + y \geq 15, x \geq 4$

Ans.

Inequation	Equation	Points (x, y)	Region
3x + 2y ≤ 24	3x + 2y = 24	(0, 12)	3(0) + 2(0)<24
		(8, 0)	Origin side of the Line
3x + y ≥ 15	3x + y = 15	(0, 15)	3(0) + 0≱ 15
		(5, 0)	Non-Origin side of the Line
X ≥ 4	X = 4	(4, 0)	Parallel to Y-axis, non-origin side

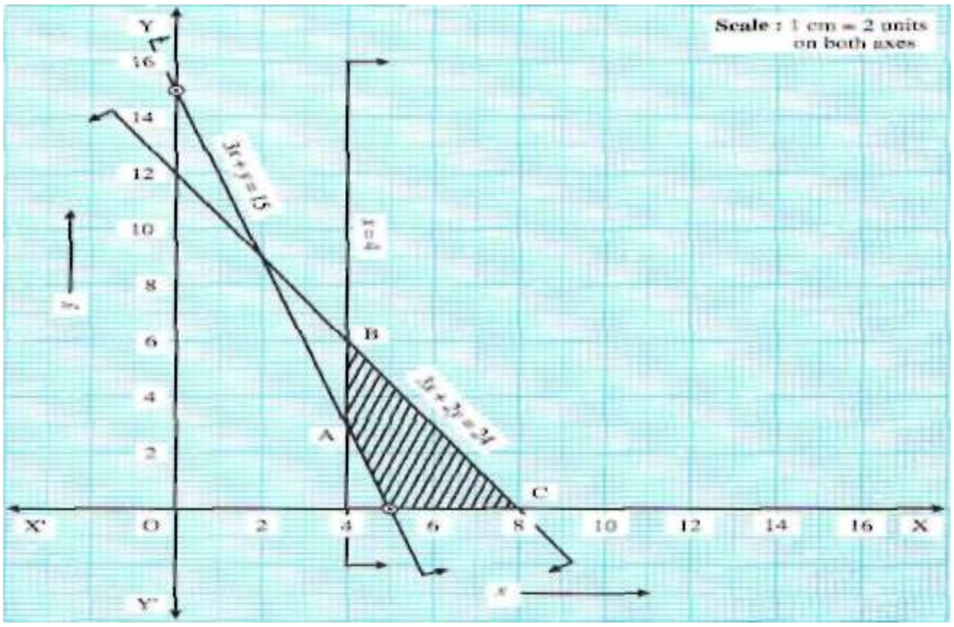


Fig. 8.25

The shaded portion in the graph represents the common region

4. a) the longest side of a triangle is twice the shortest side and the third side is 2cm longer than the shortest side. If the perimeter of the triangle is more than 166cm then find the minimum length of the shortest side.

Ans. Let the shortest side of a triangle be x cm.

$\therefore$ Longest side of a triangle be 2x cm and third side of a triangle will be (x+2) cm.

$\therefore$ Perimeter of the triangle is

$2x + x + (x + 2) > 168$

$\therefore 4x + 2 > 166$

$\therefore 4x > 166 - 2$

$\therefore 4x > 164$

$\therefore x > \frac{164}{4} = 41$

Hence, the minimum Length of the shortest side is 41 cm.

b) $[5, \infty]$

Ans. **Inequation :** $\boldsymbol{5 \leq x < \infty}$

Interval: Unbounded (Semi-Left closed)