## FEASIBLE SOLUTION:-

"Every point of the feasible region of inequalities is called feasible solution of system of linear inequalities."

## FEASIBLE SOLUTION SET:-

"The set consisting of all feasible solution of the system of linear inequalities is called Feasible Solution Set."



# EXERCISE 5·2

**Q.1** Graph the feasible region of system of linear inequalities and find corner points in each case:



(i) $2x-3y \le 6$ $\quad$ $2x+3y \le 12$ $\quad$ $x \geq 0,\ y \geq 0$

The associated equations are

$2x-3y=6$ $\quad$ $2x+3y=12$

To get the $x, y$ intercepts

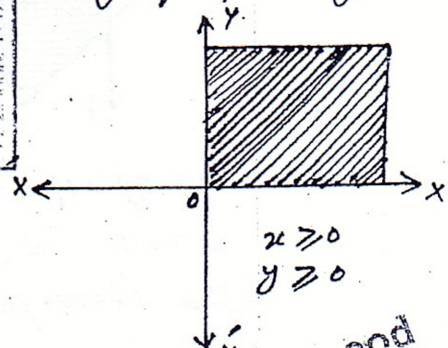
let $x=0$ $\quad$ $y=0$ $\quad$ and $\quad$ $x=0$ $\quad$ $y=0$

$\Rightarrow y=-2$ $\quad$ $\Rightarrow x=3$ $\quad$ and $\Rightarrow y=4$ $\quad$ $\Rightarrow x=6$

The ordered pairs are

$(0,-2), (3,0)$ and $(0,4), (6,0)$

The graph of this region is

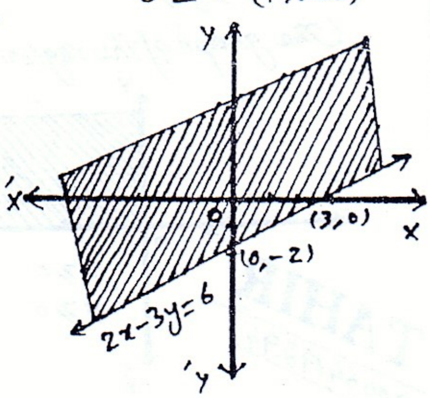


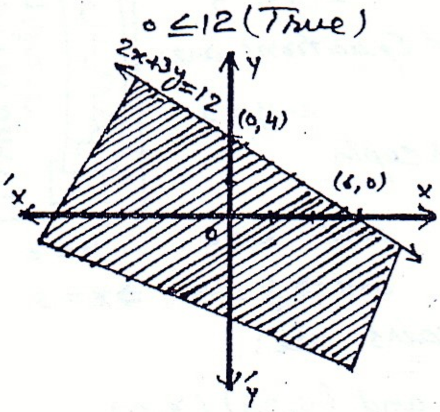

Let's check whether $(0,0)$ in the solution region or not:

$2(0)-3(0) \le 6$ $\quad$ and $\quad$ $2(0)+3(0) \le 12$

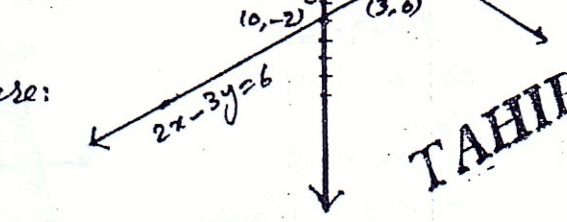
$0 \le 6$ (True) $\quad$ $0 \le 12$ (True)






The feasible simultaneous solution is graphed by:




Solving $2x-3y=6$ & $2x+3y=12$

$4x=18 \Rightarrow x=9/2$ also $y=1$

Thus corner points of feasible solution are:

$(0,0), (3,0), (0,4), (9/2, 1)$

(iii) $x+y \le 5$ $\quad -2x+y \le 2$ $\quad x \ge 0,\ y \ge 0$

The associated Equations are:

$x+y=5$ and $-2x+y=2$

To get $x, y$ intercepts:

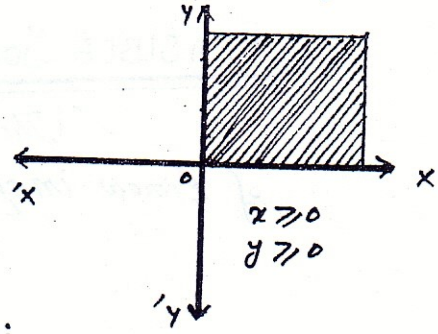
Let $x=0$ $\quad y=0$ $\quad$ and $\quad x=0$ $\quad y=0$

$\Rightarrow y=5$ $\quad \Rightarrow x=5$ $\quad$ and $\quad \Rightarrow y=2$ $\quad \Rightarrow x=-1$

The ordered Pairs are:

$(0,5), (5,0)$ and $(0,2), (-1,0)$

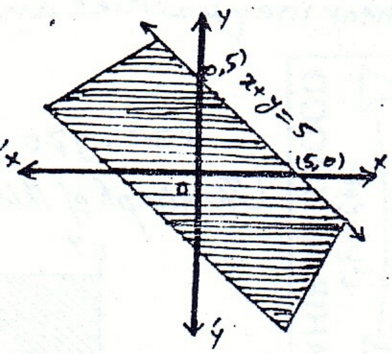
The graph of this region is

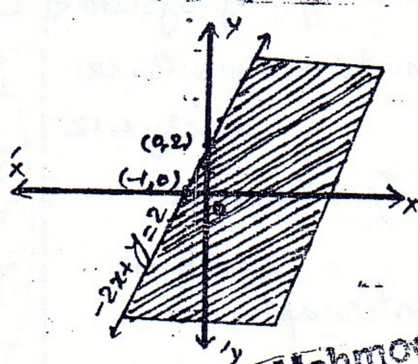



Let's Check whether $(0,0)$ is in Solution region or not:

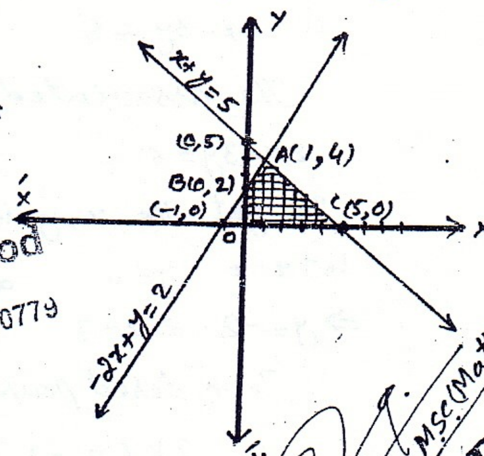
$0+0 \le 5$ $\quad$ and $\quad -2(0)+(0) \le 2$

$\Rightarrow 0 \le 5$ (True) $\quad \Rightarrow 0 \le 2$ (True)




Thus feasible Simultaneous Solution is graphed by:




Solving $x+y=5$ & $-2x+y=2$

$\Rightarrow x=1$ $\quad \Rightarrow y=4$

Thus Corner points of feasible solution are:

$(0,0), (5,0), (0,2), (1,4)$





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(iv) $3x+7y \le 21$ $\quad x-y \le 3$ $\quad x \ge 0,\ y \ge 0$

The associated Equations are:

$3x+7y=21$ $\quad x-y=3$

To get $x, y$ intercepts

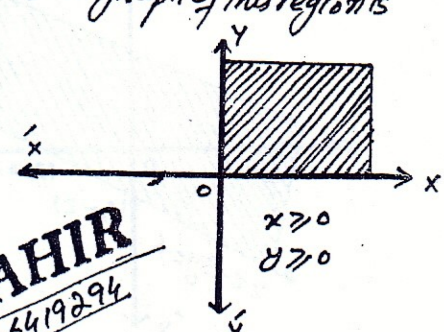
Let $x=0$ $\quad y=0$ $\quad$ and $\quad x=0$ $\quad y=0$

$\Rightarrow y=3$ $\quad \Rightarrow x=7$ $\quad$ and $\Rightarrow y=-3$ $\quad \Rightarrow x=3$

Thus ordered pairs are:

$(0,3), (7,0)$ and $(0,-3), (3,0)$

The graph of this region is








Now let's check whether $(0,0)$ in Solution region or not:

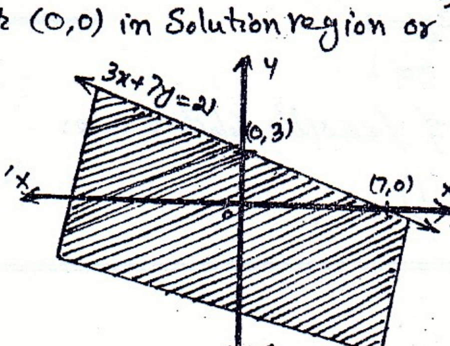
$3(0)+7(0) \le 21$

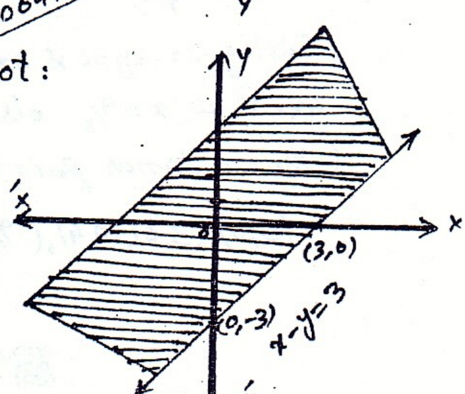
$\Rightarrow 0 \le 21$ (True)

Now

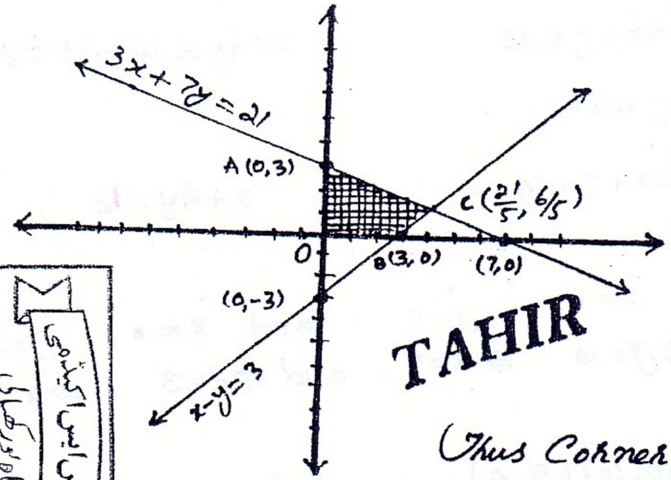
$0-0 \le 3$

$\Rightarrow 0 \le 3$ (True)



Thus feasible Simultaneous Solution is graphed by:




Now solving $3x+7y=21$ — ① and $x-y=3$ — ②

② $\Rightarrow x=3+y$

Putting in ① $3(3+y)+7y=21$

$\Rightarrow 9+3y+7y=21 \Rightarrow 10y=21-9$

$\Rightarrow 10y=12$

$\Rightarrow y=\frac{12}{10} \Rightarrow y=\frac{6}{5}$

So $x=3+\frac{6}{5} \Rightarrow x=\frac{21}{5}$

$\Rightarrow C\left(\frac{21}{5}, \frac{6}{5}\right)$

Thus Corner pts of feasible solution are

$(0,0), (0,3), (3,0)$ and $\left(\frac{21}{5}, \frac{6}{5}\right)$

(Similarly Remaining Parts do your self)



Q.2 Graph the Feasible region and also Find Corner Points:

(i) $2x+y\le 10$ $\quad x+4y\le 12$ $\quad x+2y\le 10$ $\quad$ For $x\ge 0, y\ge 0$

The associated Equations are:

$2x+y=10$ $\quad x+4y=12$ $\quad x+2y=10$

To get $x, y$ intercepts:

Let $x=0$ $\quad y=0$ and $x=0$ $\quad y=0$ and $x=0$ $\quad y=0$

$\Rightarrow y=10$ $\Rightarrow x=5$ and $\Rightarrow y=3$ $\Rightarrow x=12$ and $\Rightarrow y=5$ $\Rightarrow x=10$

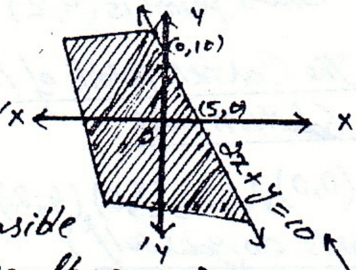
The ordered pairs are:

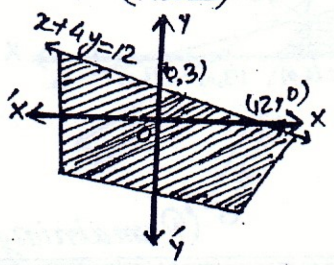
$(0,10), (5,0)$ and $(0,3), (12,0)$ and $(0,5), (10,0)$

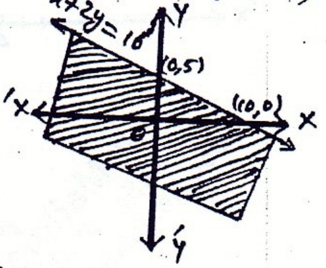
Let's check whether $(0,0)$ is in Solution region or not:

$2(0)+0\le 10$ $\quad 0+4(0)\le 12$ $\quad 0+2(0)\le 10$

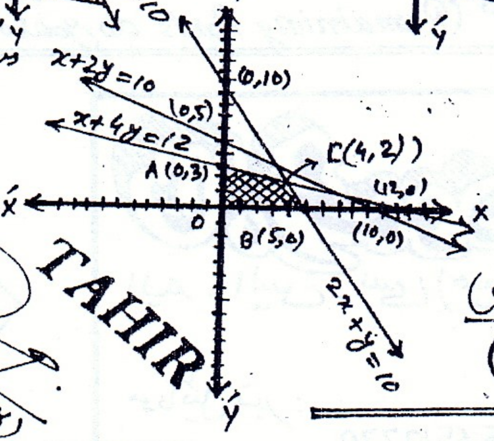
$0\le 10$ (True) $\quad 0\le 12$ (True) $\quad 0\le 10$ (True)




feasible Simultaneous Solution is




Solving $2x+y=10$ & $x+4y=12$

$\Rightarrow x=4 \quad \Rightarrow y=2$

pt $(4,2)$

The Corner Points of feasible Solution

$(0,0), (0,3), (5,0), (4,2)$

(iii) $2x+3y \le 18$ $\quad$ $2x+y \le 10$ $\quad$ $x+4y \le 12$ for $x \geq 0, y \geq 0$

The associated Equations are

$2x+3y=18$ $\quad$ $2x+y=10$ $\quad$ $x+4y=12$

To get $x, y$ intercepts

Let $x=0$ $\quad$ $y=0$ $\quad$ and $x=0$ $\quad$ $y=0$ $\quad$ and $x=0$ $\quad$ $y=0$

$\Rightarrow y=6$ $\quad$ $\Rightarrow x=9$ $\quad$ and $\Rightarrow y=10$ $\quad$ $\Rightarrow x=5$ $\quad$ and $\Rightarrow y=3$ $\quad$ $\Rightarrow x=12$

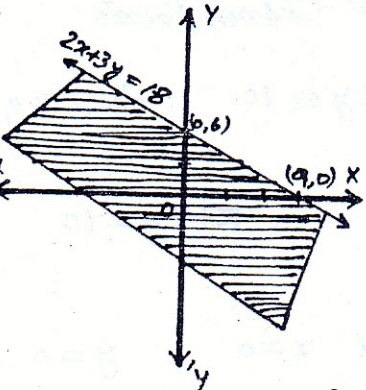
The ordered pairs are

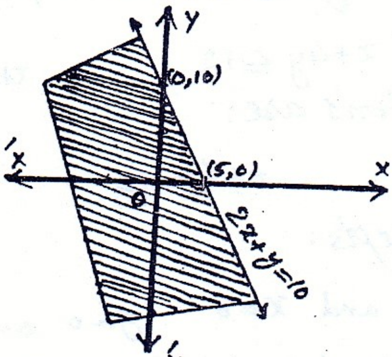
$(0,6),(9,0)$ and $(0,10),(5,0)$ and $(0,3),(12,0)$

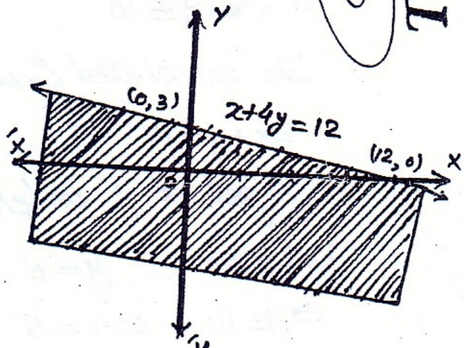
Let's check $(0,0)$ is in Solution region or not:

$2(0)+3(0) \le 18$ $\quad$ $2(0)+(0) \le 10$ $\quad$ $(0)+4(0) \le 12$

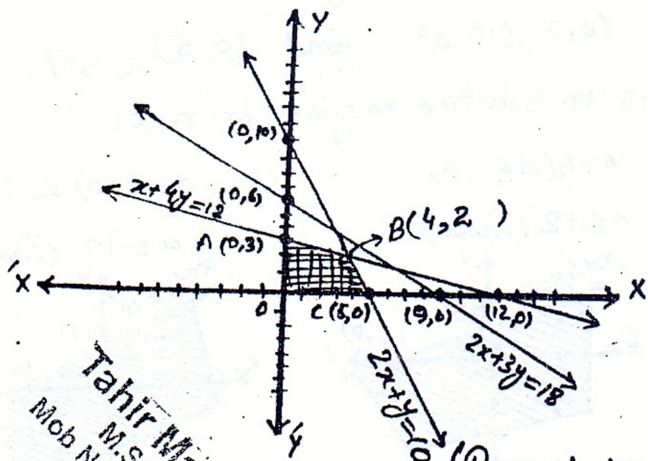
$0 \le 18$ (True) $\quad$ $0 \le 10$ (True) $\quad$ $0 \le 12$ (True)




The Simultaneous feasible Solution is shaded for $x \geq 0, y \geq 0$




Solving

$x+4y=12$ and $2x+y=10$

$x=4$ $\quad$ $y=2$

Thus point is $(4,2)$

The Corner points of the feasible Solution are

$(0,0),(0,3),(5,0),(4,2)$

(Remaining Parts do yourself)