Linear Inequations Ex 15.6 Q6(iii)

We have,

$x + 2y \le 40, \quad 3x + y \ge 30, \quad 4x + 3y \ge 60, \quad x \ge 0$ and $y \ge 0$

Converting the inequations into equations, we obtain,

$x + 2y = 40, \quad 3x + y = 30, \quad 4x + 3y = 60, \quad x = 0$ and $y = 0$

Region represented by $x + 2y \le 40$:

Putting $x = 0$ in $x + 2y = 40$, we get $y = \frac{40}{2} = 20$

Putting $y = 0$ in $x + 2y = 40$, we get $x = 40$

$\therefore$ The line $x + 2y = 40$, meets the coordinate axes at $(0,20)$ and $(40,0)$. Join these points by a thick line.

Now, putting $x = 0$ and $y = 0$ in $x + 2y \le 40$, we get $0 \le 40$

Therefore, $(0,0)$ satisfies the inequality $x + 2y \le 40$. so, the portion containing the origin represents the solution set of the inequation $x + 2y \le 40$.

Region represented by $3x + y \ge 30$:

Putting $x = 0$ in $3x + y \le 30$, we get $y = 30$

Putting $y = 0$ in $3x + y = 30$, we get, $x = \frac{30}{3} = 10$

$\therefore$ The line $3x + y = 30$ meets the coordinate axes at $(0,30)$ and $(10,0)$. Joining these points by a thick line.

Now, putting $x = 0$ and $y = 0$ in $3x + y \ge 30$, we get, $0 \ge 30$. This is not possible.

Therefore $(0,0)$ does not satisfies the inequality $3x + y \ge 30$. so, the portion not containing the origin is represented by the inequation $3x + y \ge 30$.

Region represented by $4x + 3y \ge 60$:

Putting $x = 0$ in $4x + 3y = 60$, we get, $y = \frac{60}{3} = 20$

Putting $y = 0$ in $4x + 3y = 60$, we get, $x = \frac{60}{4} = 15$.

$\therefore$ The line $4x + 3y = 60$ meets the coordinate axes at $(0,20)$ and $(15,0)$. Join these points by a thick line.

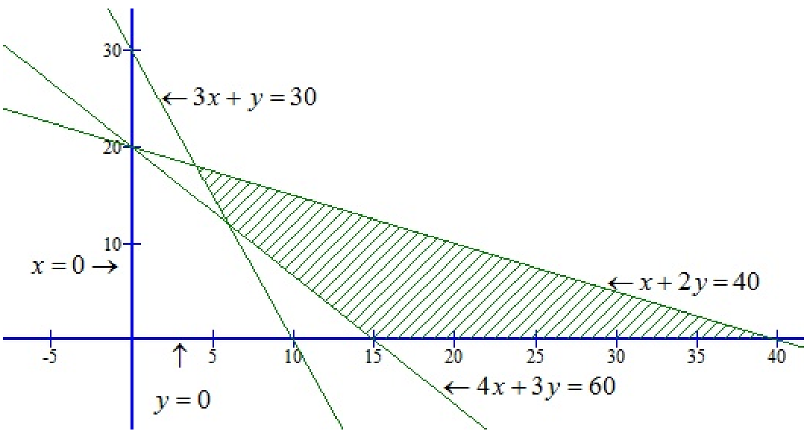
Now, putting $x = 0$, $y = 0$ in $4x + 3y \ge 60$, we get $0 \ge 60$.

This is not possible. Therefore, $(0,0)$ does not satisfies the inequality $4x + 3y \ge 60$. so, the portion not containing the origin is represented by the inequation $4x + 3y \ge 60$.

Region represented by $x \ge 0$ and $y \ge 0$:

Clearly, $x \ge 0$ and $y \ge 0$ represent the first quadrant.

The common region of the above five regions represents the solution set of the given inequations as shown below:



Linear Inequations Ex 15.6 Q6(iv)

We have,
$5x + y \geq 10, \ 2x + 2y \geq 12, \ x + 4y \geq 12, \ x \geq 0$ and $y \geq 0$

Converting the inequations into equations, we obtain,
$5x + y = 10, \ 2x + 2y = 1, \ x + 4y = 12, \ x = 0$ and $y = 0$

Region represented by $5x + y \geq 10$:
Putting $x = 0$ in $5x + y = 10$, we get $y = 10$
Putting $y = 0$ in $5x + y = 10$, we get $x = \frac{10}{5} = 2$

$\therefore$ The line $5x + y = 10$, meets the coordinate axes at $(0,10)$ and $(2,0)$. Join these points by a thick line.

Now, putting $x = 0$ and $y = 0$ in $5x + y \geq 10$, we get $0 \geq 10$, This is not possible.

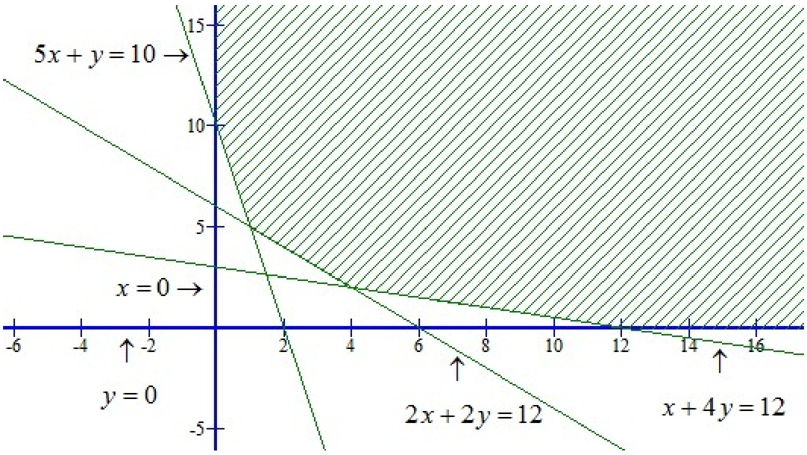
$\therefore (0, 0)$ does not satisfies the inequality $5x + y \geq 10$. so, the portion not containing the origin is represented by the inequation $5x + y \geq 10$.

Region represented by $2x + 2y \geq 12$:
Putting $x = 0$ in $2x + 2y = 12$, we get $y = \frac{12}{2} = 6$
Putting $y = 0$ in $2x + 2y = 12$, we get $x = \frac{12}{2} = 6$.
$\therefore$ The line $2x + 2y = 12$ meets the coordinate axes at $(0,6)$ and $(6,0)$. Join these point by a thick line.
Now, putting $x = 0$ and $y = 0$ in $2x + 2y = 12$, we get $0 \geq 12$, which is not possible.
Therefore, $(0,0)$ does not satisfies the inequality $2x + 2y = 12$. so, the portion not containing the origin is represented by the inequation $2x + 2y = 12$.

Region represented by $x + 4y \geq 12$
Putting $x = 0$ in $x + 4y = 12$, we get $y = \frac{12}{4} = 3$.
Putting $y = 0$ in $x + 4y = 12$, we get $x = 12$.

$\therefore$ The line $x + 4y = 12$ meets the coordinate axes at $(0,3)$ and $(12,0)$. Join these points by a thick line.
Now, putting $x = 0$ and $y = 0$ in $x + 4y = 12$, we get $0 \geq 12$, which is not possible.

Therefore, $(0,0)$ does not satisfies the inequality $x + 4y \geq 12$. so, the portion not containing the origin is represented by the inequation $x + 4y \geq 12$.



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