RD Sharma Solutions Class 11 Maths Chapter 15 Ex 15.6

Linear Inequations Ex 15.6 Q1(i)

We have,

$$2x+3y\le 6,\quad 3x+2y\le 6,\quad x\ge 0, y\ge 0$$

Converting the given inequation into equations, the inequations reduce to $2x+3y=6$,

$$3x+2y=6,\quad x=0 \text{ and } y=0.$$

Region represented by $2x+3y\le 6$:

Putting $x=0$ inequation $2x+3y=6$

we get $y=\frac{6}{3}=2$.

Putting $y=0$ in the equation $2x+3y=6$,

we get $x=\frac{6}{3}=3$.

$\therefore$ This line $2x+3y=6$ meets the coordinate axes at $(0,2)$ and $(3,0)$. Draw a thick line joining these points. we find that $(0,0)$ satisfies inequation $2x+3y\le 6$.

Region represented by $3x+2y\le 6$:

Putting $x=0$ in the equation

$3x+2y=6$, we get $y=\frac{6}{2}=3$.

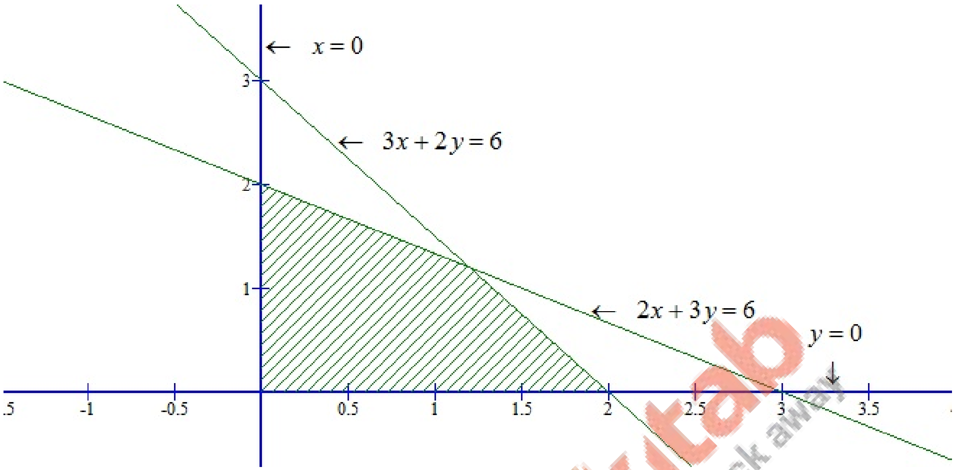
Putting $y=0$ in the equation

$3x+2y=6$, we get $x=\frac{6}{2}=2$.

$\therefore$ This line $3x+2y=6$ meets the coordinate axes at $(0,3)$ and $(2,0)$. Draw a thick line joining these points. we find that $(0,0)$ satisfies inequation $3x+2y\le 6$.

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

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



Linear Inequations Ex 15.6 Q1(ii)

We have,

$2x + 3y \le 6, \quad x + 4y \le 4, \quad x \ge 0, y \ge 0$

Converting the inequations into equations, the inequations reduce to $2x + 3y = 6$,

$x + 4y = 4, \quad x = 0$ and $y = 0$.

Region represented by $2x + 3y \le 6$:

Putting $x = 0$ in $2x + 3y = 6$,

we get $y = \frac{6}{3} = 2$

Putting $y = 0$ in $2x + 3y = 6$,

we get $x = \frac{6}{2} = 3$.

$\therefore$ The line $2x + 3y = 6$ meets the coordinate axes at $(0,2)$ and $(3,0)$. Draw a thick line joining these points.

Now, putting $x = 0$ and $y = 0$ in $2x + 3y \le 6 \quad \Rightarrow 0 \le 6$

Clearly, we find that $(0,0)$ satisfies inequation $2x + 3y \le 6$

Region represented by $x + 4y \le 4$

Putting $x = 0$ in $x + 4y = 4$

we get, $y = \frac{4}{4} = 1$

Putting $y = 0$ in $x + 4y = 4$,

we get $x = 4$

$\therefore$ The line $x + 4y = 4$ meets the coordinate axes at $(0,1)$ and $(4,0)$. Draw a thick line joining these points.

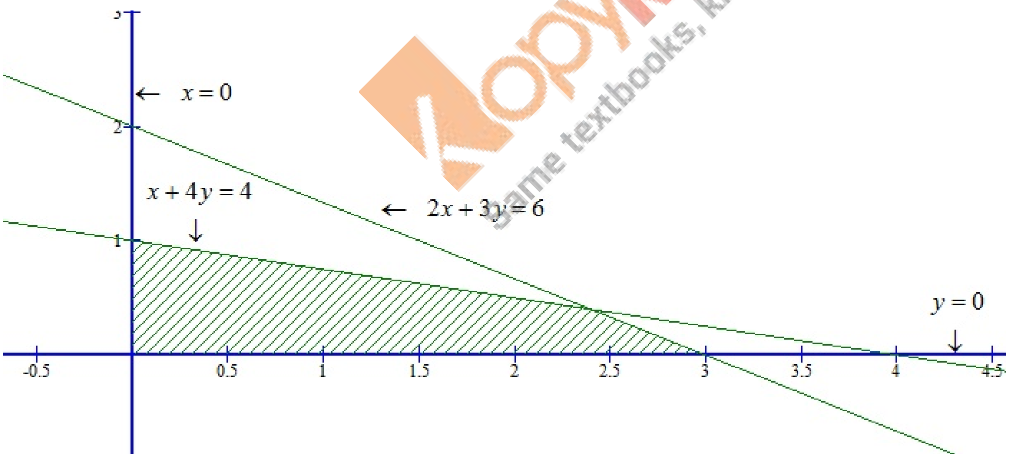
Now, putting $x = 0,\ y = 0$

in $x + 4y \le 4$, we get $0 \le 4$

Clearly, we find that $(0,0)$ satisfies inequation $x + 4y \le 4$.

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

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



Linear Inequations Ex 15.6 Q1(iii)

We have,

$$x - y \le 1, \quad x + 2y \le 8, \quad 2x + y \ge 2,$$
$$x \ge 0 \text{ and } y \ge 0$$

Converting the inequations into equations, we obtain

$$x - y = 1, \quad x + 2y = 8 \quad 2x + y = 2,$$
$$x = 0 \text{ and } y = 0.$$

Region represented by $x - y \le 1$:
Putting $x = 0$ in $x - y = 1$,
we get $y = -1$
Putting $y = 0$ in $x - y = 1$,
we get $x = 1$

$\therefore$ The line $x - y = 1$ meets the coordinate axes at $(0, -1)$ and $(1,0)$. Draw a thick line joining these points.
Now, putting $x = 0$ and $y = 0$ in $x - y \le 1$
in $x - y \le 1$, we get, $0 \le 1$

Clearly, we find that $(0,0)$ satisfies inequation $x - y \le 1$
Region represented by $x + 2y \le 8$:
Putting $x = 0$ in $x + 2y = 8$,
we get, $y = \frac{8}{2} = 4$
Putting $y = 0$ in $x + 2y = 8$,
we get $x = 8$,

$\therefore$ The line $x + 2y = 8$ meets the coordinate axes at $(8,0)$ and $(0,4)$. Draw a thick line joining these points.
Now, putting $x = 0$, $y = 0$
in $x + 2y \le 8$, we get $0 \le 8$

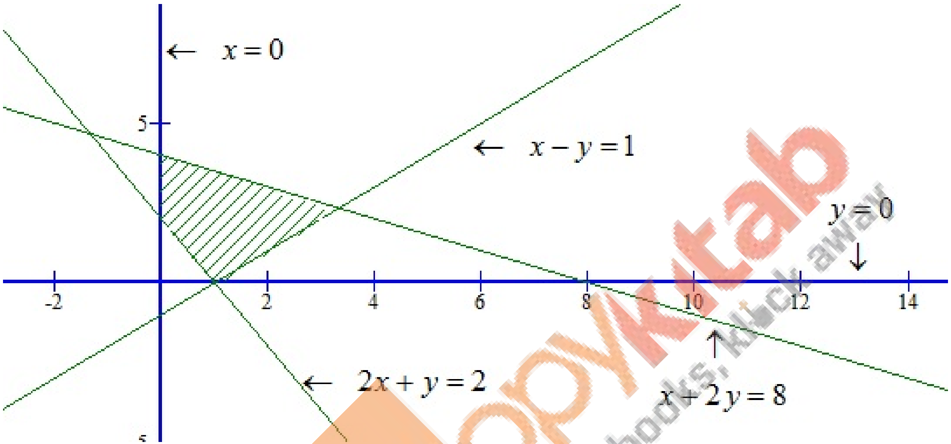
Clearly, we find that $(0,0)$ satisfies inequation $x + 2y \le 8$.

Region represented by $2x + y \ge 2$

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

Putting $y = 0$ in $2x + y = 2$, we get $x = \frac{2}{2} = 1.$

The line $2x + y = 2$ meets the coordinate axes at $(0,2)$ and $(1,0)$. Draw a thick line joining these points.



Linear Inequations Ex 15.6 Q1(iv)

We have,

$x + y \ge 1, \quad 7x + 9y \le 63, \quad x \le 6,$

$y \le 5 \quad x \ge 0$ and $y \ge 0$

Converting the inequations into equations, we obtain

$x + y = 1, \quad 7x + 9y = 63 \quad x = 6,$

$y = 5, \quad x = 0$ and $y = 0.$

Region represented by $x + y \ge 1$:

Putting $x = 0$ in $x + y = 1$, we get $y = 1$

Putting $y = 0$ in $x + y = 1$, we get $x = 1$

$\therefore$ The line $x + y = 1$ meets the coordinate axes at $(0,1)$ and $(1,0)$. join these point by a thick line.

Now, putting $x = 0$ and $y = 0$ in $x + y \geq 1$, we get $0 \geq 1$
This is not possible

$\therefore$ $(0,0)$ is not satisfies the inequality $x + y \geq 1$. So, the portion not containing the origin is represented by the inequation $x + y \geq 1$.

Region represented by $7x + 9y \leq 63$:

Putting $x = 0$ in $7x + 9y = 63$, we get, $y = \frac{63}{9} = 7$.

Putting $y = 0$ in $7x + 9y = 63$, we get $x = \frac{63}{7} = 9$.

$\therefore$ The line $7x + 9y = 63$ meets the coordinete axes of $(0,7)$ and $(9,0)$. Join these points by a thick line.

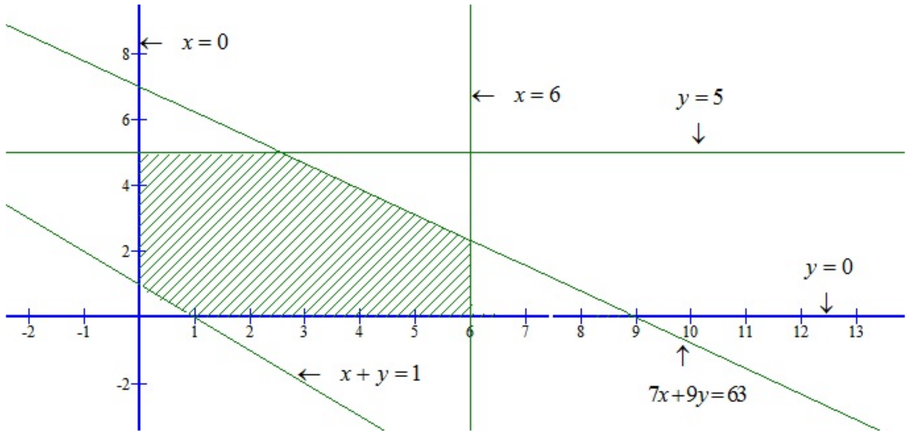
Now, putting $x = 0$ and $y = 0$
in $7x + 9y \leq 63$, we get, $0 \leq 63$

$\therefore$ we find $(0,0)$ satisfies the inequality $7x + 9y \leq 63$. So, the portion containing the origin represents the solution set of the inequation $7x + 9y \leq 63$.

Region represented by $x \leq 6$: Clearly, $x = 6$ is a line parallel to y-axis at a distance of 6 units from the origin. Since $(0,0)$ satisfies the inequation $x \leq 6$. so, the portion lying on the left side of $x = 6$ is the region represented by $x \leq 6$.

Region represented by $y \leq 5$: Clearly, $y = 5$ is a line parallel to x-axis at a distance 5 from it. since $(0,0)$ satisfies by the given inequation.
Region represented by $x \geq 0$ and $y \geq 0$: clearly, $x \geq 0$ and $y \geq 0$ represent the first quadrant.

The common region of the above six regions represents the solution set of the given inequation as shown below.



Linear Inequations Ex 15.6 Q1(v)

We have,

$2x + 3y \le 35,\quad y \ge 3,\quad x \ge 2,\quad x \ge 0$ and $y \ge 0$

Converting the inequations into equations, we get

$2x + 3y = 35,\quad y = 3,\quad x = 2,\quad x = 0$ and $y = 0$.

Region represented by $2x + 3y \le 35$:

Putting $x = 0$ in $2x + 3y = 35$, we get $y = \frac{35}{3}$

Putting $y = 0$ in $2x + 3y = 35$, we get $x = \frac{35}{2}$

$\therefore$ The line $2x + 3y = 35$ meets the coordinate axes at $\left(0, \frac{35}{3}\right)$ and $\left(\frac{35}{2}, 0\right)$. joining these point by a thick line.

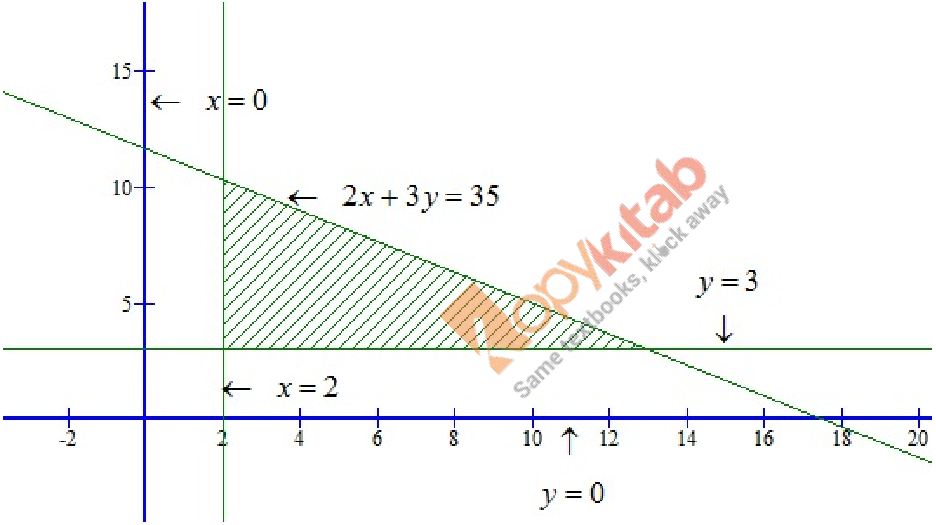
Now, putting $x = 0$ and $y = 0$ in $2x + 3y \le 35$, we get $0 \le 35$.
Clearly, $(0,0)$ satisfies the inequality $2x + 3y \le 35$. So, the portion containing the origin represents the solution $2x + 3y \le 35$.

Region represented by $y \ge 3$:
Clearly, $y = 3$ is a line parallel to x-axis at a distance 3 units from the origin. Since $(0,0)$ does not satisfies the inequation $y \ge 3$.
So, the portion not containing the origin is represented by the $y \ge 3$.

Region represented by $x \ge 2$
Clearly, $x = 2$ is a line parallel to y-axis at a distance of 2 units from the origin. Since $(0,0)$ does not satisfies the inequation $x \ge 2$. so, the portion not containing the origin is represented by the given inequation.

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.



15
10
5
$x = 0$
$2x + 3y = 35$
$y = 3$
$x = 2$
$y = 0$
-2
2
4
6
8
10
12
14
16
18
20