

RD Sharma
Solutions
Class 11 Maths
Chapter 15
Ex 15.6

Linear Inequations Ex 15.6 Q1(i)

We have,

$$2x + 3y \leq 6, \quad 3x + 2y \leq 6, \quad x \geq 0, y \geq 0$$

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 $2x + 3y \leq 6$:

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

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

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

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

\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 $2x + 3y \leq 6$.

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

Putting $x = 0$ in the equation

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

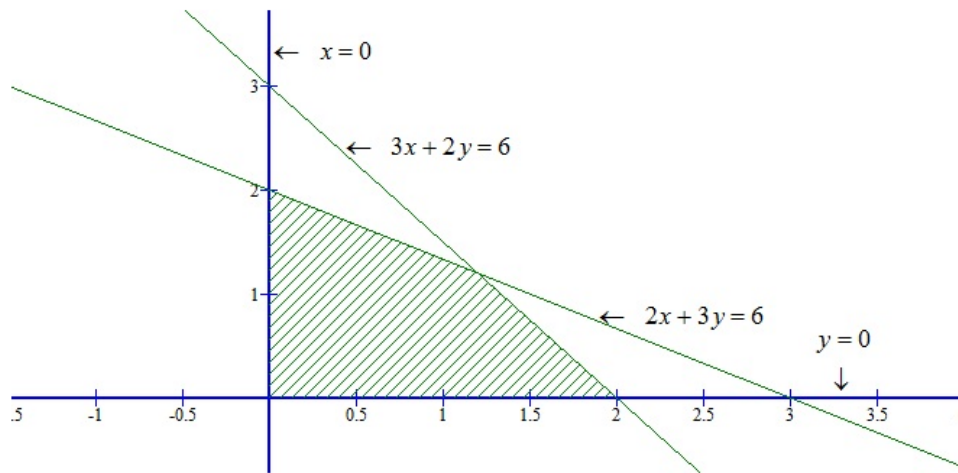
Putting $y = 0$ in the equation

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

\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 $3x + 2y \leq 6$.

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

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



Linear Inequations Ex 15.6 Q1(ii)

We have,

$$2x + 3y \leq 6, \quad x + 4y \leq 4, \quad x \geq 0, y \geq 0$$

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

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

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

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

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

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

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

\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 $2x + 3y \leq 6 \Rightarrow 0 \leq 6$

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

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

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.

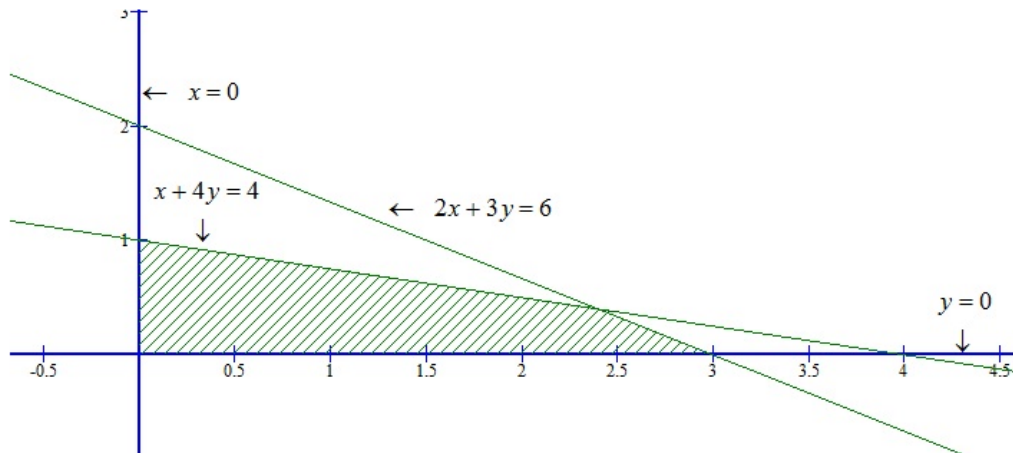
Now, putting $x = 0$, $y = 0$

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

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

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

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



Linear Inequalities Ex 15.6 Q1(iii)

We have,

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

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 $x - y \leq 1$:

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 $x - y \leq 1$

in $x - y \leq 1$, we get, $0 \leq 1$

Clearly, we find that $(0, 0)$ satisfies inequation $x - y \leq 1$

Region represented by $x + 2y \leq 8$:

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 $x + 2y \leq 8$, we get $0 \leq 8$

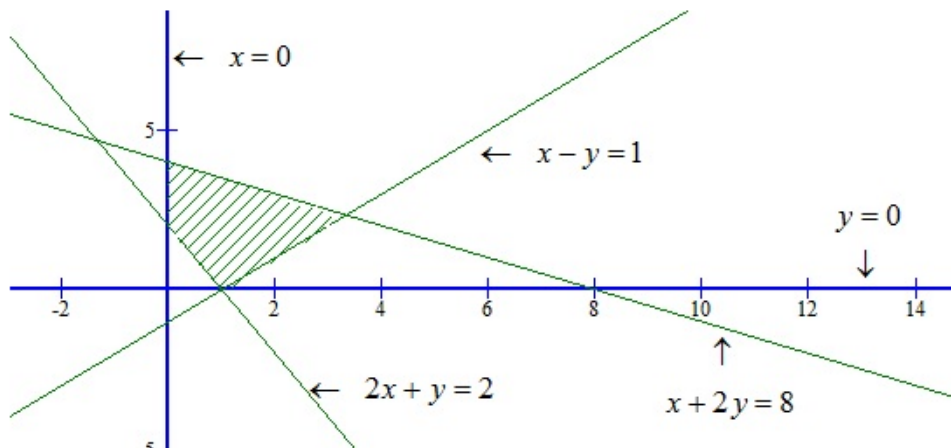
Clearly, we find that $(0, 0)$ satisfies inequation $x + 2y \leq 8$.

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

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,

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

$$y \leq 5, \quad x \geq 0 \text{ and } y \geq 0$$

Converting the inequations into equations, we obtain

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

$$y = 5, \quad x = 0 \text{ and } y = 0.$$

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

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

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

∴ The line $x + y = 1$ meets the coordinate axes at $(0,1)$ and $(1,0)$. Join these points 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

∴ $(0,0)$ does not satisfy the inequality $x + y \geq 1$. So, the portion not containing the origin is represented by the inequality $x + y \geq 1$.

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 $x = \frac{63}{7} = 9$.

∴ The line $7x + 9y = 63$ meets the coordinate axes at $(0,7)$ and $(9,0)$. Join these points by a thick line.

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

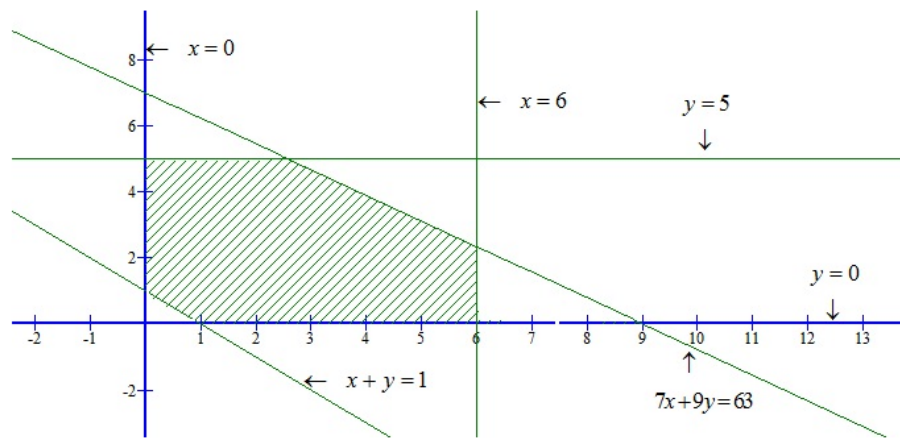
∴ we find $(0,0)$ satisfies the inequality $7x + 9y \leq 63$. So, the portion containing the origin represents the solution set of the inequality $7x + 9y \leq 63$.

Region represented by $x \leq 6$: Clearly, $x = 6$ is a line parallel to the y-axis at a distance of 6 units from the origin. Since $(0,0)$ satisfies the inequality $x \leq 6$, 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 the x-axis at a distance of 5 from it. Since $(0,0)$ satisfies the given inequality.

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 inequality as shown below.



Linear Inequations Ex 15.6 Q1(v)

We have,

$$2x + 3y \leq 35, \quad y \geq 3, \quad x \geq 2, \quad x \geq 0 \text{ and } y \geq 0$$

Converting the inequations into equations, we get

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

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

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 $2x + 3y \leq 35$, we get $0 \leq 35$.

Clearly, $(0,0)$ satisfies the inequality $2x + 3y \leq 35$. So, the portion containing the origin represents the solution $2x + 3y \leq 35$.

Region represented by $y \geq 3$

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 $y \geq 3$.

So, the portion not containing the origin is represented by the $y \geq 3$.

Region represented by $x \geq 2$

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 $x \geq 2$. so, the portion not containing the origin is represented 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 five regions represents the solution set of the given inequations as shown below.

