Chapter : 33. LINEAR PROGRAMMING

Exercise : 33A

Question: 1

Solution:

Given $x + y \geq 4$

$\Rightarrow y \geq 4 - x$

Consider the equation $y = 4 - x$.

Finding points on the coordinate axes:

If $x = 0$, the y value is 4 i.e, $y = 4$

$\Rightarrow$ the point on the Y axis is A(0,4)

If $y = 0$, $0 = 4 - x$

$\Rightarrow x = 4$

The point on the X axis is B(4,0)

Plotting the points on the graph: fig. 1a

Now consider the inequality $y \geq 4 - x$

Here we need the y value greater than or equal to $4 - x$

$\Rightarrow$ the required region is above point A.

Therefore the graph of the inequation $x + y \geq 4$ is fig. 1b

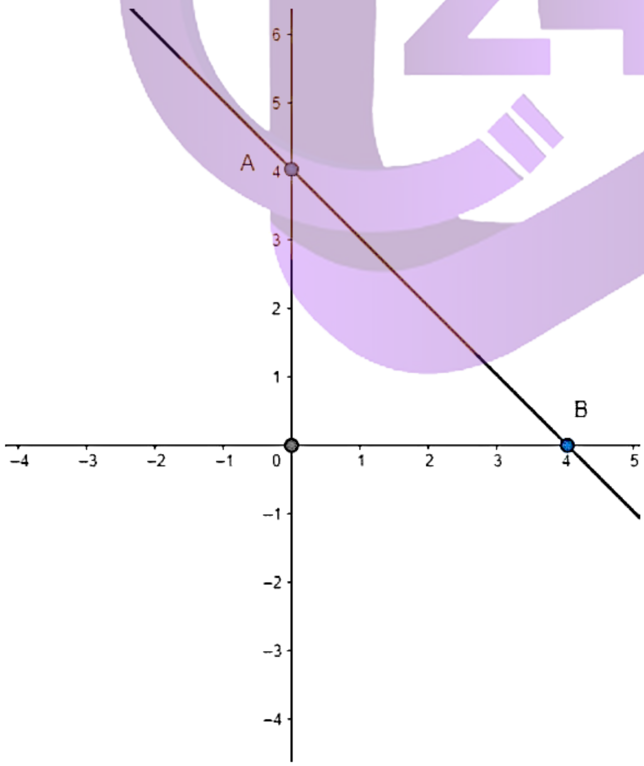

Fig 1a

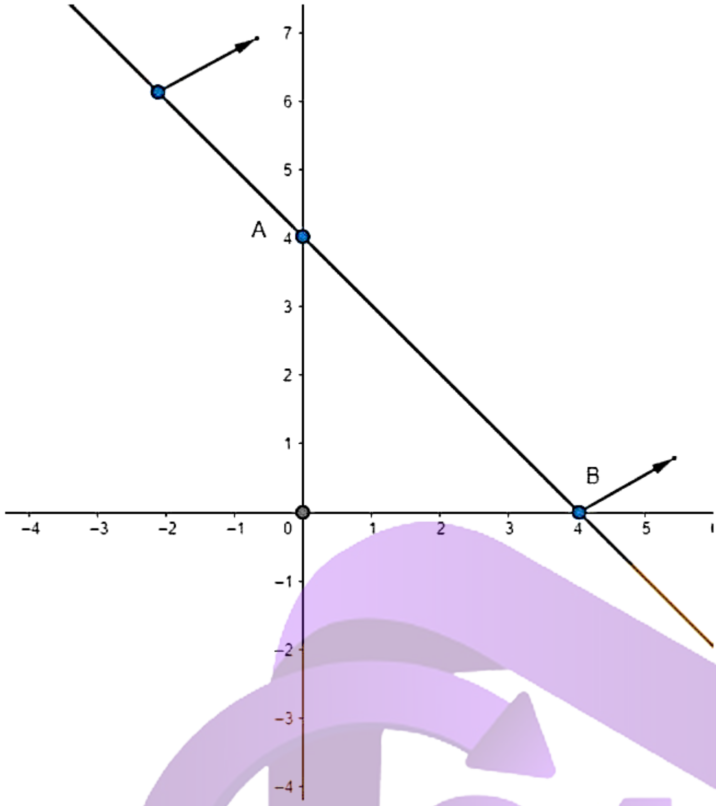

Fig 1b

Question: 2

Solution:

Given x - y≤3

⇒ - y≤ 3 - x

Multiplying by minus on both the sides, we'll get

y ≥ - 3 + x

y ≥ x - 3

Consider the equation y = x - 3.

Finding points on the coordinate axes:

If x = 0, the y value is - 3 i.e, y = - 3

⇒ the point on the Y axis is A(0, - 3)

If y = 0, 0 = x - 3

⇒x = 3

The point on the X axis is B(3,0)

Plotting the points on the graph: fig. 2a

Now consider the inequality y ≥ x - 3

Here we need the y value greater than or equal to x - 3

⇒ the required region is above point A.

Therefore the graph of the inequation x + y ≥ 4 is fig. 2b

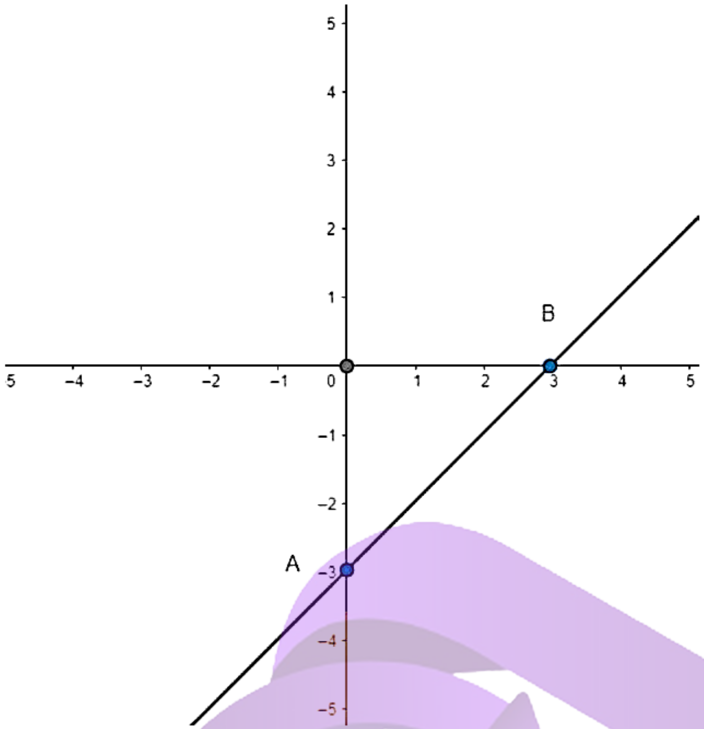

Fig 2a

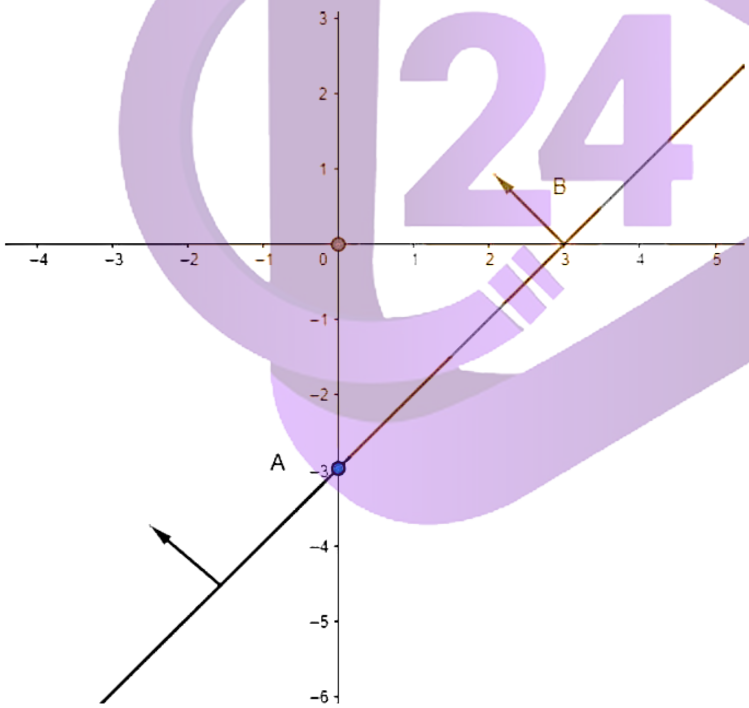

Fig 2b

Question: 3

Solution:

Given x + 2y>1

⇒ 2y>1 - x

$\Rightarrow y > \frac{1}{2} - \frac{x}{2}$

Consider the equation $y = \frac{1}{2} - \frac{x}{2}$

Finding points on the coordinate axes:

If x = 0, the y value is $\frac{1}{2}$ i.e., y = 4

⇒ the point on the Y axis is $A(0, \frac{1}{2})$

If y = 0, x = 1

The point on the X axis is B(1,0)

Plotting the points on the graph: fig. 3a

Now consider the inequality $y > \frac{1}{2} - \frac{x}{2}$

Here we need the y value greater than $\frac{1}{2} - \frac{x}{2}$

⇒ the required region is above point A.

Also , the line AB is represented in dotted line. This is s done because $y \neq \frac{1}{2} - \frac{x}{2}$

Therefore the graph of the inequation $y > \frac{1}{2} - \frac{x}{2}$is fig. 3b

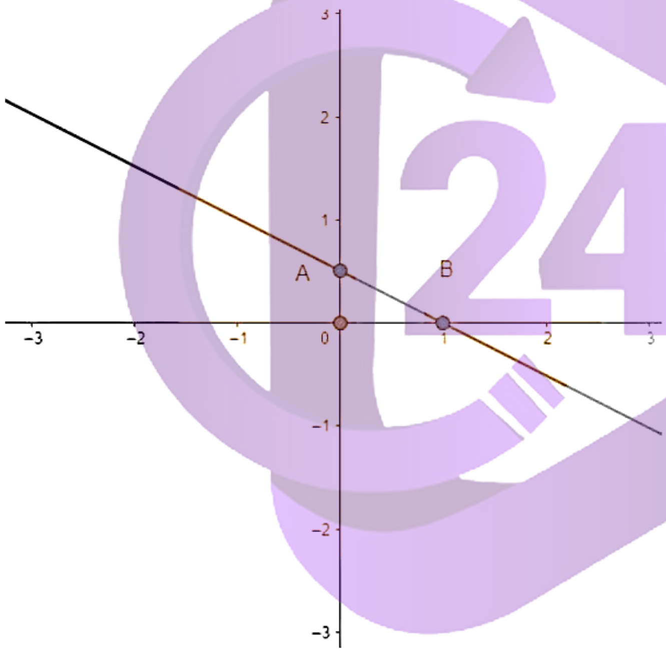

Fig 3a

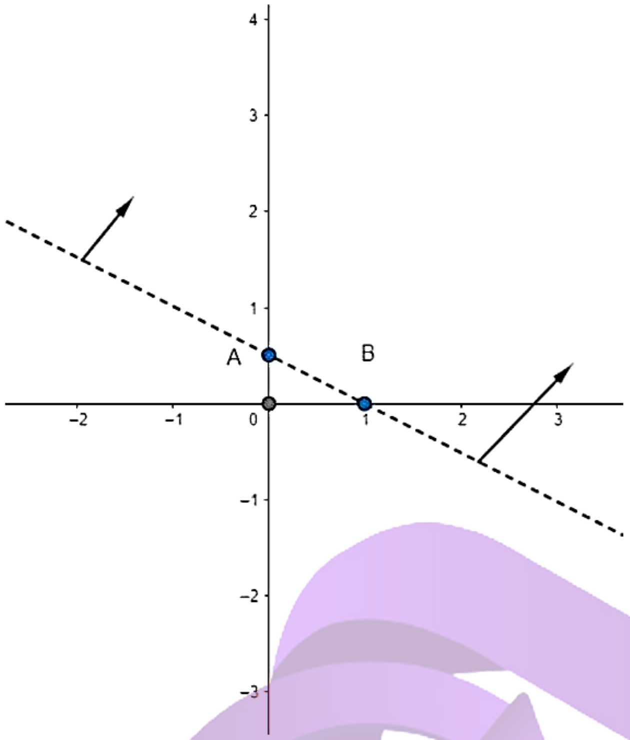

Fig 3b

Question: 4

Solution:

Given 2x - 3y<4

⇒ 2x - 4<3y

⇒3y>2x - 4

⇒$y > \frac{2}{3}x - \frac{4}{3}$

Consider the equation $y = \frac{2}{3}x - \frac{4}{3}$

Finding points on the coordinate axes:

If x = 0, the y value is $\frac{1}{2}$ i.e., $y = -\frac{4}{3}$

⇒ the point on the Y axis is A$(0, -\frac{4}{3})$

If y = 0, x = 2

The point on the X axis is B(2,0)

Plotting the points on the graph: fig. 4a

Now consider the inequality $y > \frac{2}{3}x - \frac{4}{3}$

Here we need the y value greater than $\frac{2}{3}x - \frac{4}{3}$

⇒ the required region is above point A.

Also , the line AB is represented in dotted line. This is s done because $y \neq \frac{2}{3}x - \frac{4}{3}$

Therefore the graph of the inequation $y > \frac{2}{3}x - \frac{4}{3}$ is fig. 4b

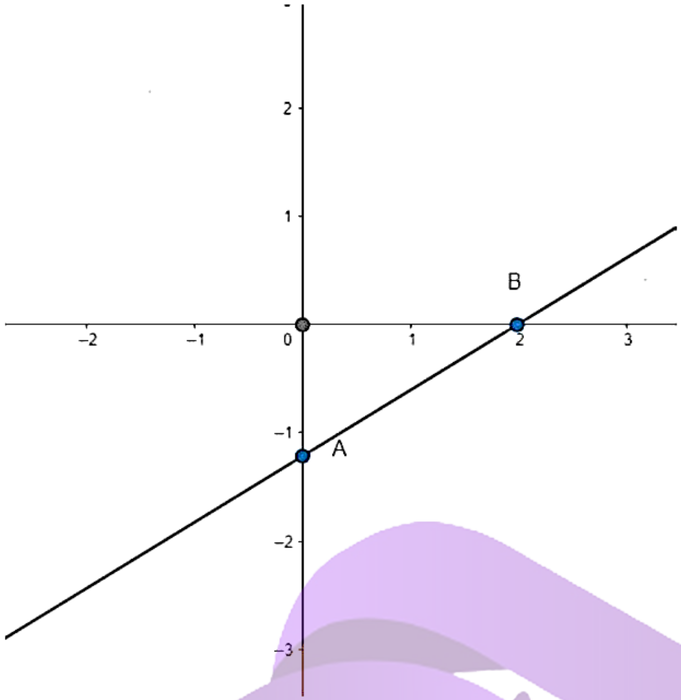

Fig 4a

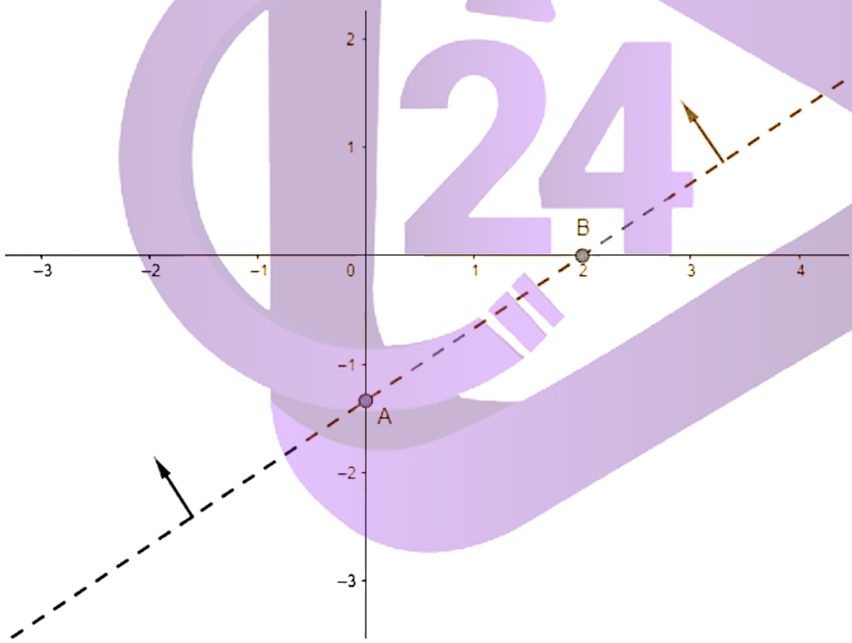

Fig 4b

Question: 5

Solution:

Given x ≥ y - 2

⇒ y≤x + 2

Consider the equation y = x + 2

Finding points on the coordinate axes:

If x = 0, the y value is 2 i.e, y = 2

⇒ the point on the Y axis is A(0,2)

If y = 0, 0 = x + 2

⇒x = - 2

The point on the X axis is B(- 2,0)

Plotting the points on the graph: fig. 5a

Now consider the inequality y≤x + 2

Here we need the y value less than or equal to x + 2

⇒ the required region is below point A.

Therefore the graph of the inequation x ≥ y - 2 is fig. 5b

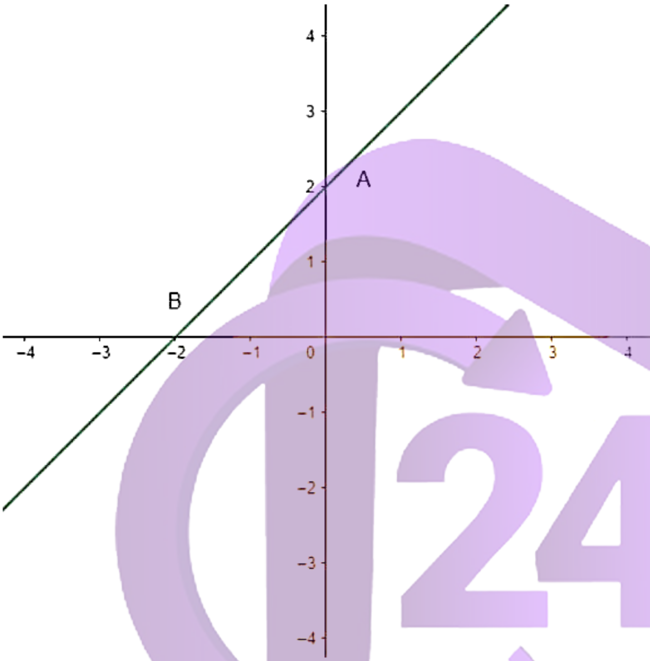

fig 5a

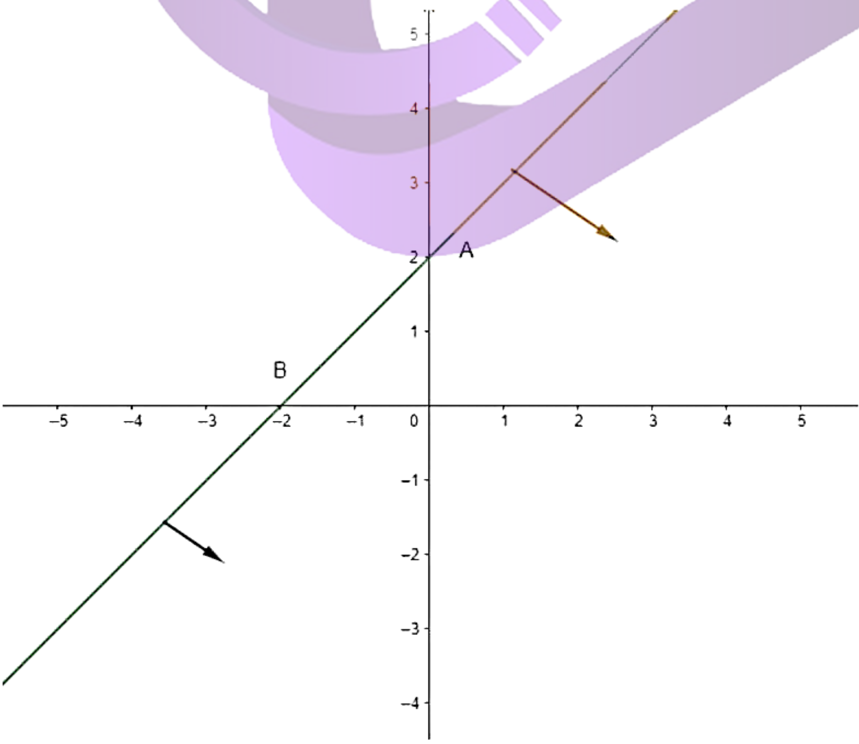

Fig 5b

Question: 6

Solution:

Given y - 2≤3x

⇒ y≤3x + 2

Consider the equation y = 3x + 2

Finding points on the coordinate axes:

If x = 0, the y value is 2 i.e, y = 2

⇒ the point on Y axis is A(0,2)

If y = 0, 0 = 3x + 2

$\Rightarrow x = -\frac{3}{2}$

The point on the X axis is B($- -\frac{3}{2}$,0)

Plotting the points on the graph: fig. 6a

Now consider the inequality y≤3x + 2

Here we need the y value less than or equal to 3x + 2

⇒ the required region is below point A.

Therefore the graph of the inequation y≤3x + 2 is fig. 5b

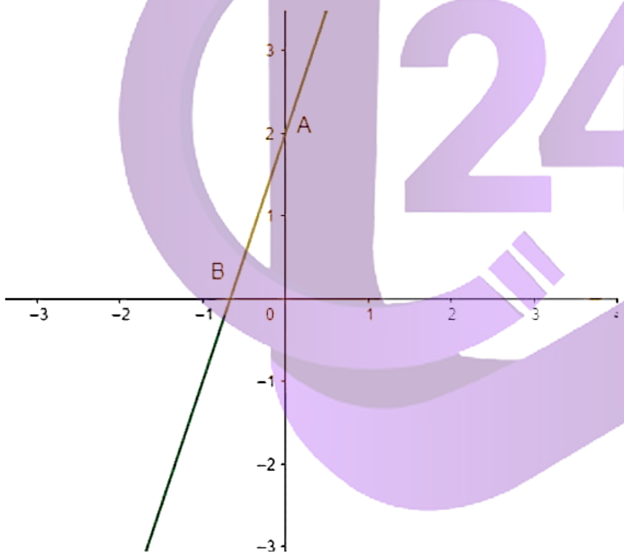

Fig 6a

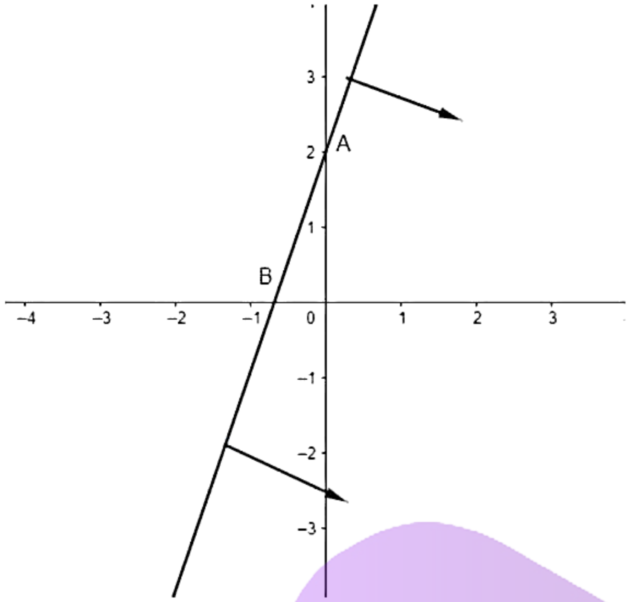

Fig 6b

Question: 7

Solution:

Consider the inequation 2x + y>1:

⇒ y>1 - 2x

Consider the equation y = 1 - 2x

Finding points on the coordinate axes:

If x = 0, the y value is 1 i.e, y = 1

⇒ the point on Y axis is A(0,1)

If y = 0, 0 = x + 2

⇒x = $\frac{1}{2}$

The point on the X axis is B($\frac{1}{2}$,0)

Plotting the points on the graph: fig. 7a

Now consider the inequality y>1 - 2x

Here we need the y value greater than x + 2

⇒ the required region is below point A.

Therefore the graph of the inequation y>1 - 2x is fig. 7b

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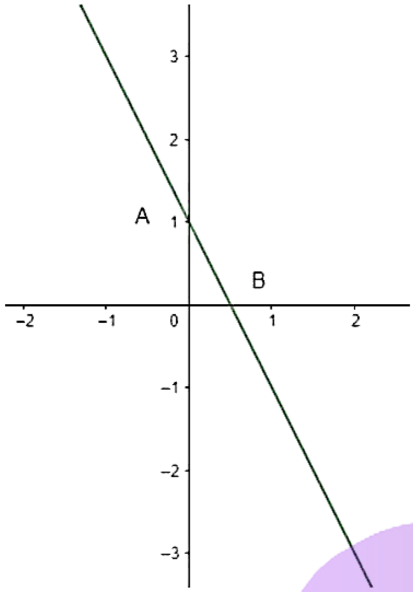


Fig 7a

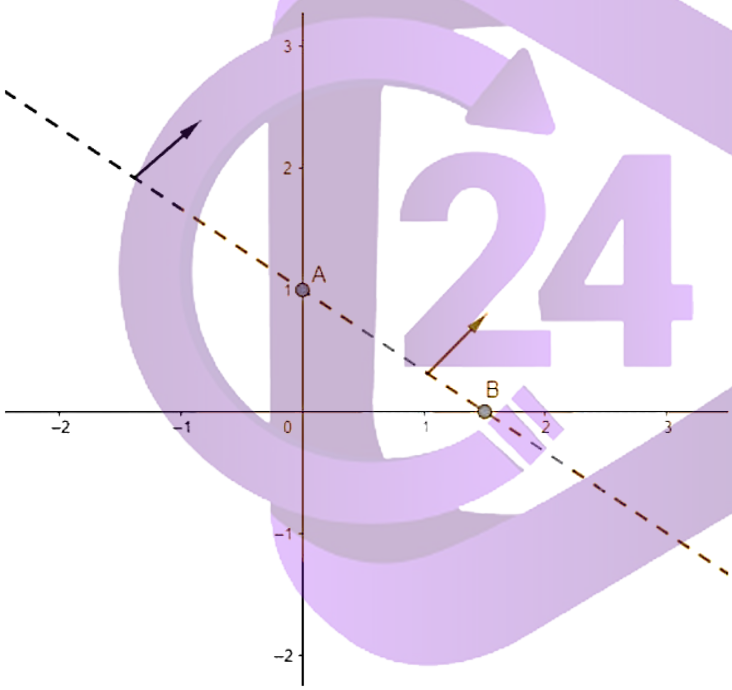


Fig 7b

Consider the inequation $2x - y \geq 3$

$\Rightarrow y \leq 2x - 3$

Consider the equation $y = 2x - 3$

Finding points on the coordinate axes:

If $x = 0$, the y value is - 3 i.e, $y = - 3$

$\Rightarrow$ the point on the Y axis is $C(0, - 3)$

If $y = 0$, $0 = 2x + 3$

$\Rightarrow x = \frac{3}{2}$

The point on the X axis is $D(\frac{3}{2},0)$

Plotting the points on the graph: fig. 7c

Now consider the inequality y≤2x - 3

Here we need the y value less than or equal to 2x - 3

⇒ the required region is below point C.

Therefore the graph of the inequation y≤2x - 3 is fig. 7d

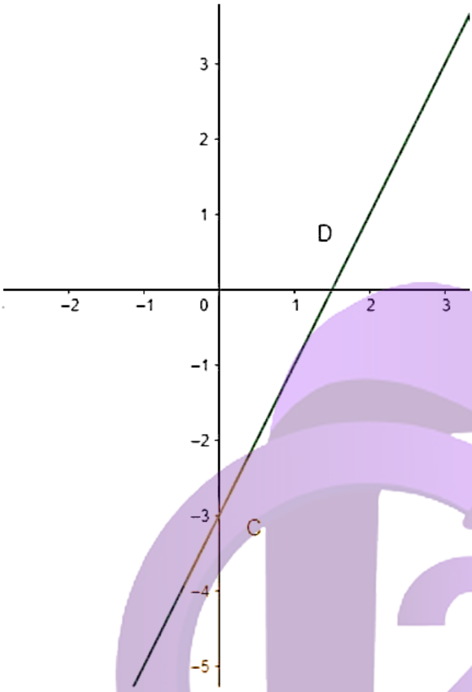


Fig 7c

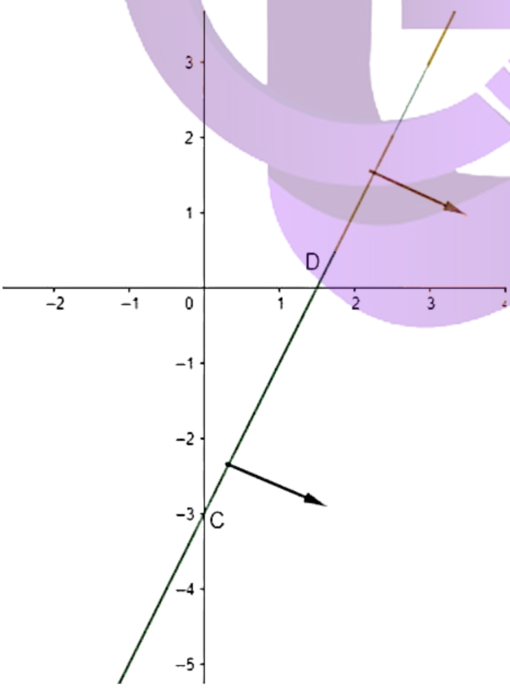
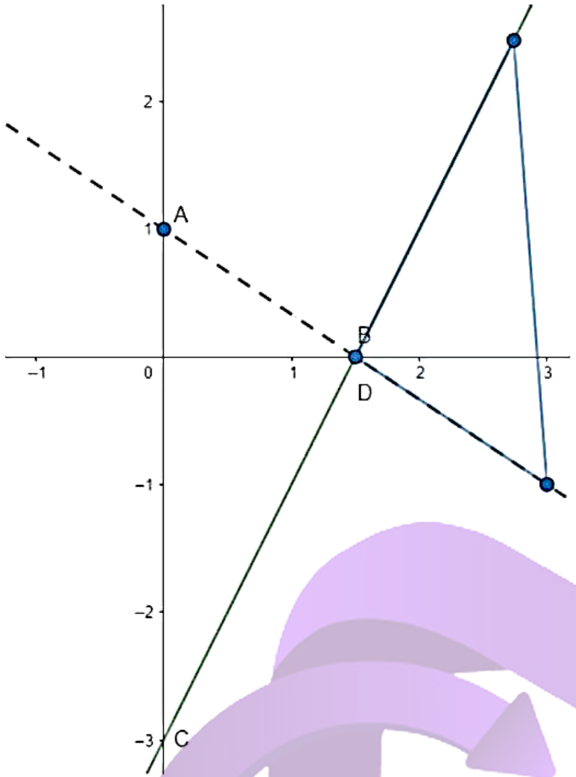


Fig 7d

Combining the graphs 7c and 7d, we'll get,



The solution of the system of simultaneous inequations is the intersection region of the solutions of the two given inequations.

Question: 8

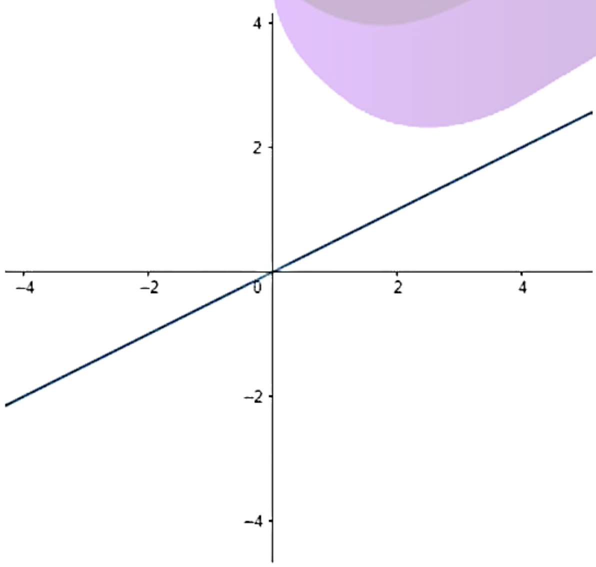
Solution:

Consider the inequation x - 2y ≥ 0:

$\Rightarrow x \geq 2y$

$\Rightarrow y \leq \frac{x}{2}$

consider the equation $y = \frac{x}{2}$. This equation's graph is a straight line passing through origin.



Now consider the inequality $y \leq \frac{x}{2}$

Here we need the y value less than or equal to $\frac{x}{2}$

⇒ the required region is below the origin.

Therefore the graph of the inequation $y \le \frac{x}{2}$ is fig.8a

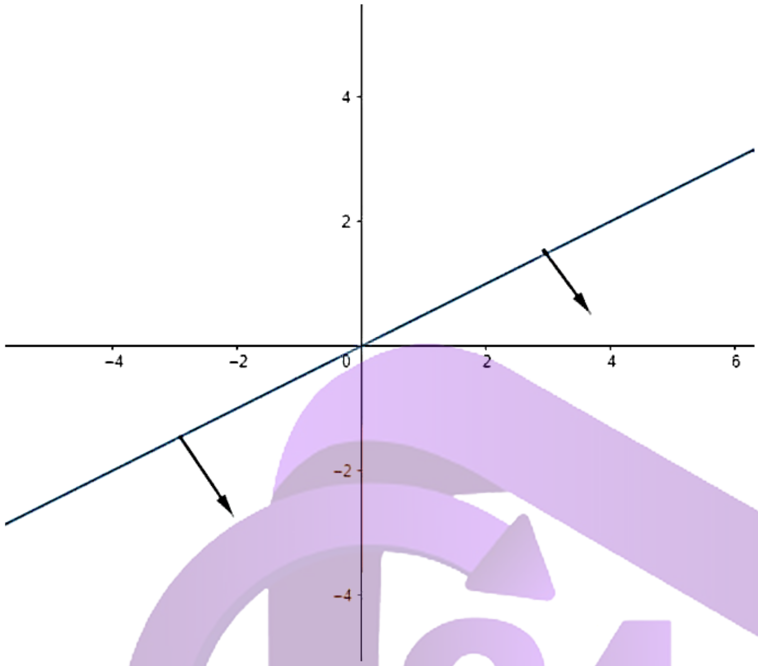


Fig 8a

Consider the inequation 2x - y≤ - 2 :

⇒y ≥ 2x + 2

Consider the equation y = 2x + 2

Finding points on the coordinate axes:

If x = 0, the y value is 2 i.e, y = 2

⇒ the point on the Y axis is A(0,2)

If y = 0, 0 = 2x + 2

⇒x = - 1

The point on the X axis is B(- 1,0)

Plotting the points on the graph: fig. 8b.

Now consider the inequality y ≥ 2x + 2

Here we need the y value greater than or equal to 2x + 2

⇒ the required region is above point A.

Therefore the graph of the inequation y ≥ 2x + 2 is fig. 8c

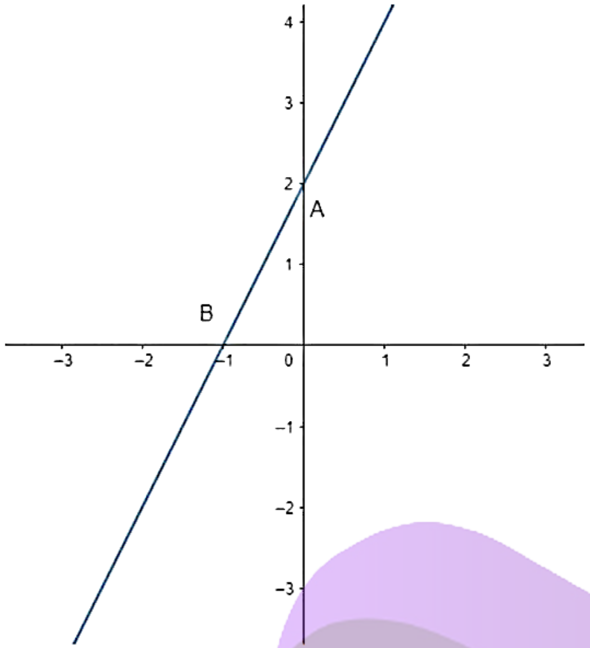


Fig 8b

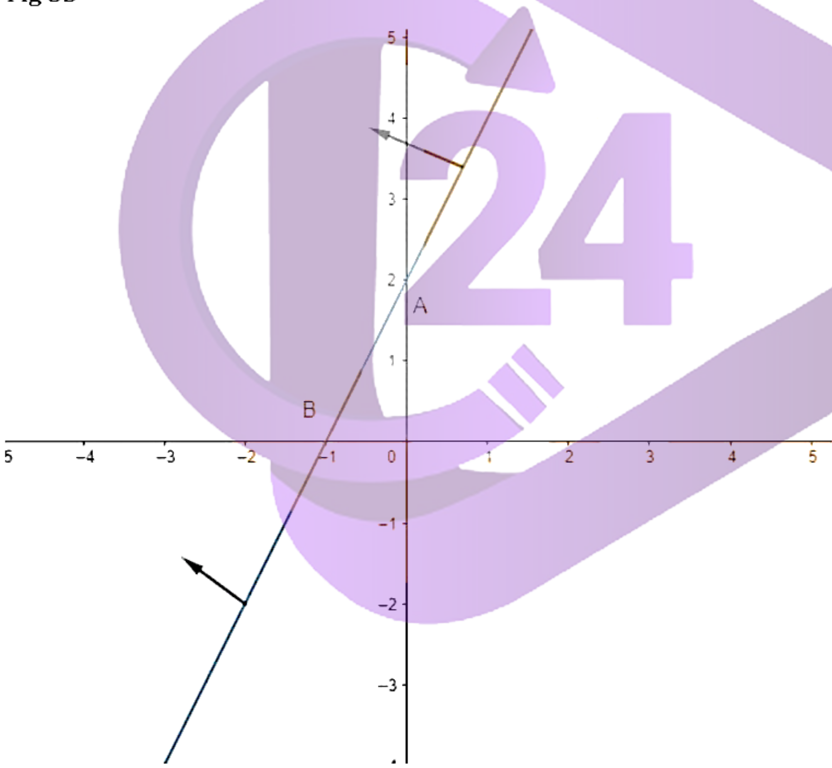
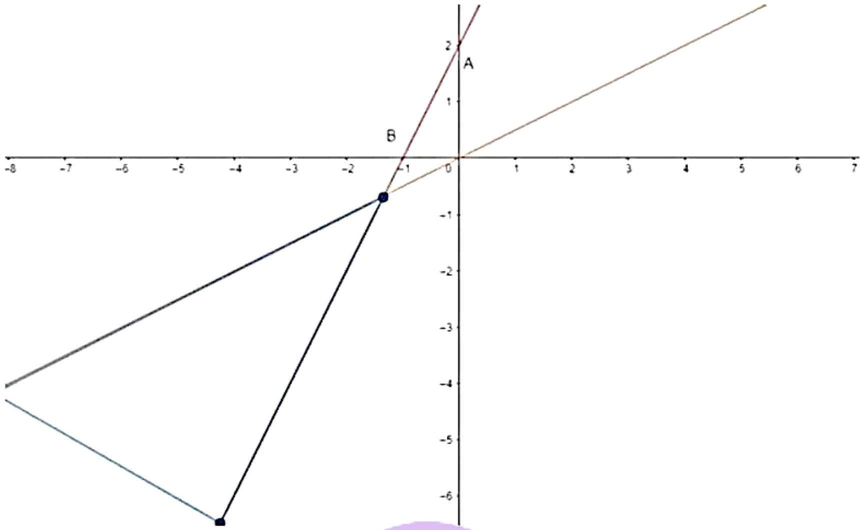


Fig 8c

Combining the graphs of 8a and 8c, we'll get



The solution of the system of simultaneous inequations is the intersection region of the solutions of the two given inequations.

Question: 9

Solution:

Consider the inequation $3x + 4y \geq 12$:

$\Rightarrow 4y \geq 12 - 3x$

$\Rightarrow y \geq 3 - \frac{3}{4}x$

Consider the equation $y = 3 - \frac{3}{4}x$

Finding points on the coordinate axes:

If x = 0, the y value is 3 i.e, y = 3

⇒ the point on the Y axis is A(0,3)

If y = 0, $0 = 3 - \frac{3}{4}x$

$\Rightarrow x = 4$

The point on the X axis is B(4,0)

Now consider the inequality $y \geq 3 - \frac{3}{4}x$

Here we need the y value greater than or equal to $y \geq 3 - \frac{3}{4}x$

⇒ the required region is above point A.

Therefore the graph of the inequation $y \geq 3 - \frac{3}{4}x$ is fig. 9a

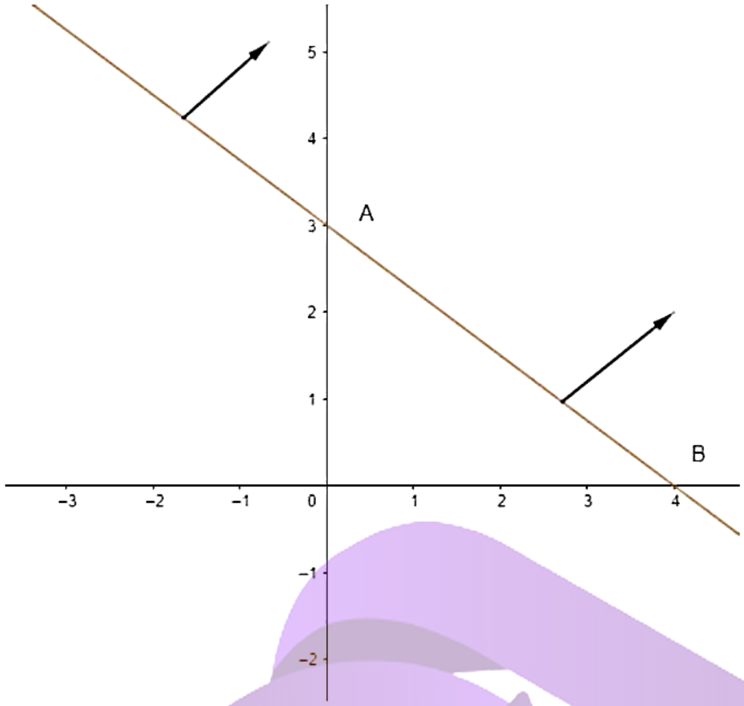


Fig 9a

Consider the inequation $4x + 7y \leq 28$

$\Rightarrow 7y \leq 28 - 4x$

$\Rightarrow y \leq 4 - \frac{4}{7}x$

Consider the equation $y = 4 - \frac{4}{7}x$

Finding points on the coordinate axes:

If x = 0, the y value is 4 i.e, y = 4

⇒ the point on the Y axis is C(0,4)

If y = 0, $0 = 4 - \frac{4}{7}x$

$\Rightarrow x = 7$

The point on the X axis is D(7,0)

Now consider the inequality $y \leq 4 - \frac{4}{7}x$

Here we need the y value less than or equal to $4 - \frac{4}{7}x$

⇒ the required region is below point C.

Therefore the graph of the inequation $y \leq 4 - \frac{4}{7}x$ is fig. 9b

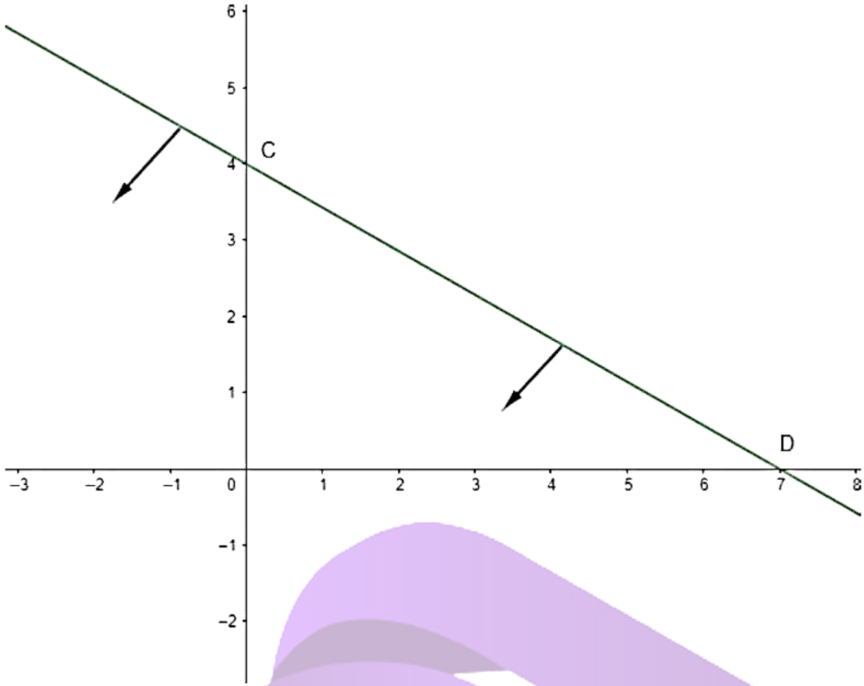
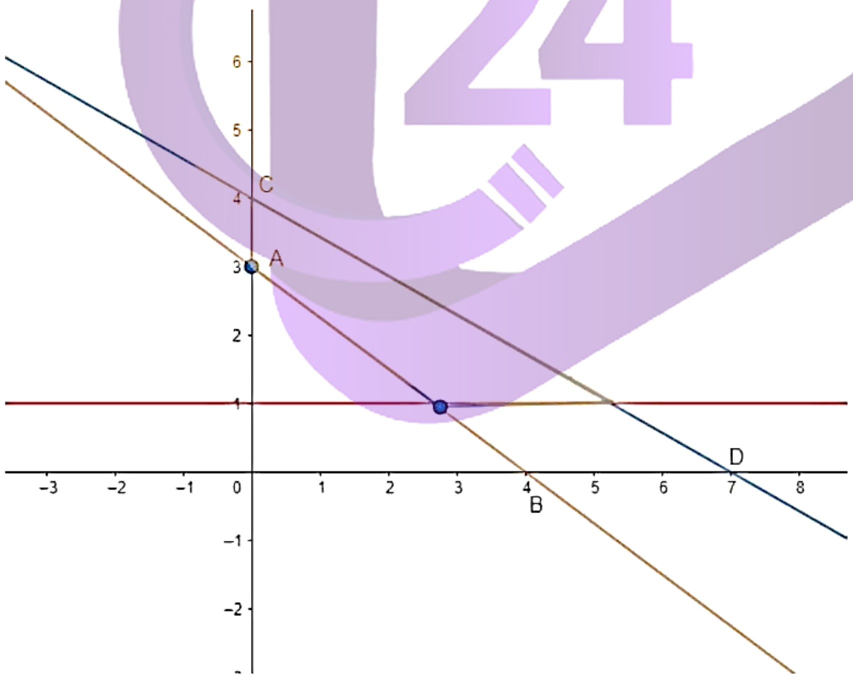


Fig 9b

x ≥ 0 is the region right side of Y - axis.

y ≥ 1 is the region above the line y = 1

Combining all the above results in a single graph , we'll get



The solution of the system of simultaneous inequations is the intersection region of the solutions of the two given inequations.

Question: 10

Show that the sol

Solution:

Consider the inequation x - 2y ≥ 0:

⇒x ≥ 2y

$\Rightarrow y \le \frac{x}{2}$

consider the equation $y = \frac{x}{2}$. This equation's graph is a straight line passing through origin.

Now consider the inequality $y \le \frac{}{2}$

Here we need the y value less than or equal to $\frac{x}{2}$

⇒ the required region is below origin.

Therefore the graph of the inequation $y \le \frac{x}{2}$ is fig.10a

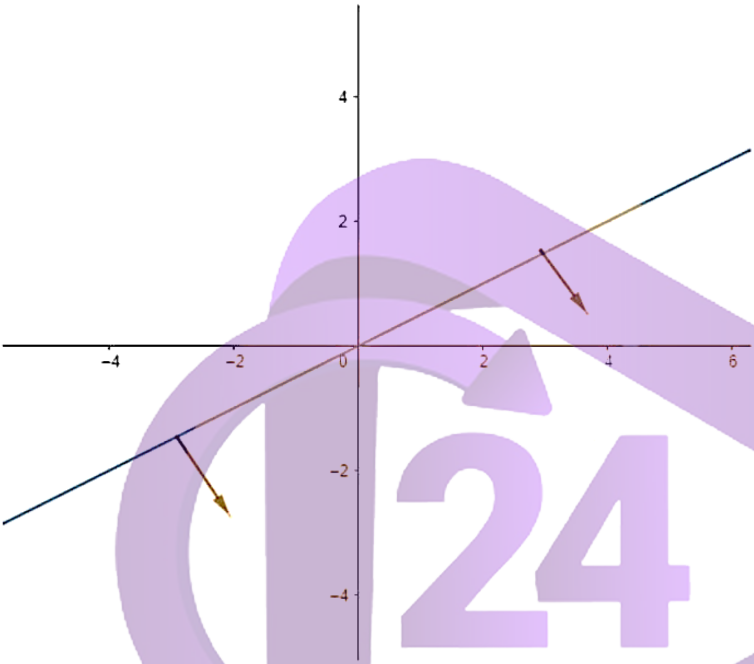


Fig 10a

Consider the inequation $2x - y \le -2$:

$\Rightarrow y \ge 2x + 2$

Consider the equation $y = 2x + 2$

Finding points on the coordinate axes:

If $x = 0$, the y value is 2 i.e, $y = 2$

⇒ the point on Y axis is A(0,2)

If $y = 0$, $0 = 2x + 2$

$\Rightarrow x = -1$

The point on X axis is B(- 1,0)

Now consider the inequality $y \ge 2x + 2$

Here we need the y value greater than or equal to $2x + 2$

⇒ the required region is above point A.

Therefore the graph of the inequation $y \ge 2x + 2$ is fig. 10b

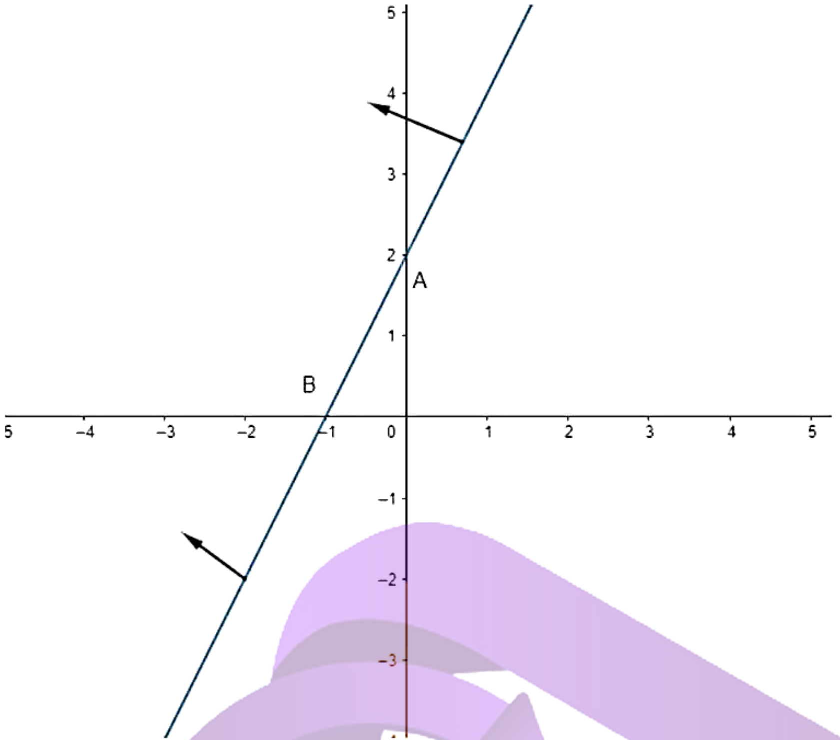
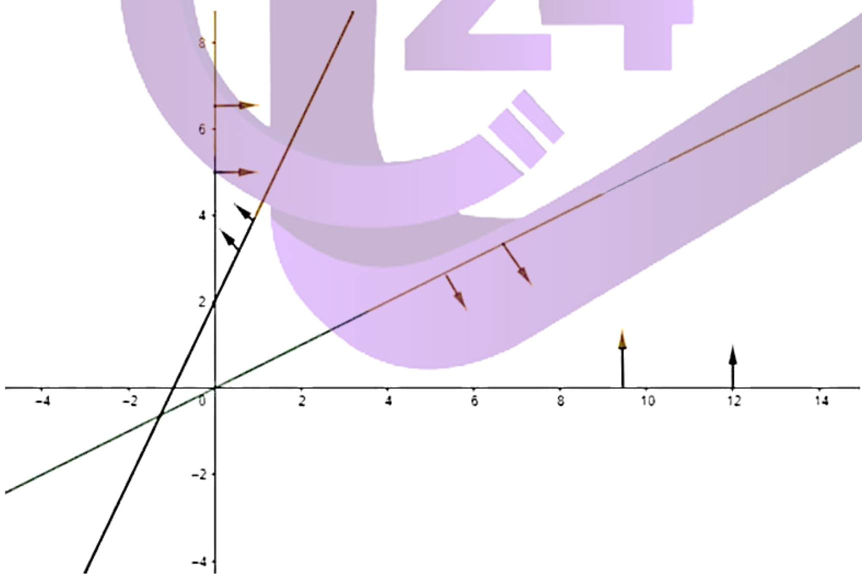


Fig 10b

y ≥ 0 is the region above X - axis

x ≥ 0 is the region right side of Y - axis

Combining the above results, we'll get

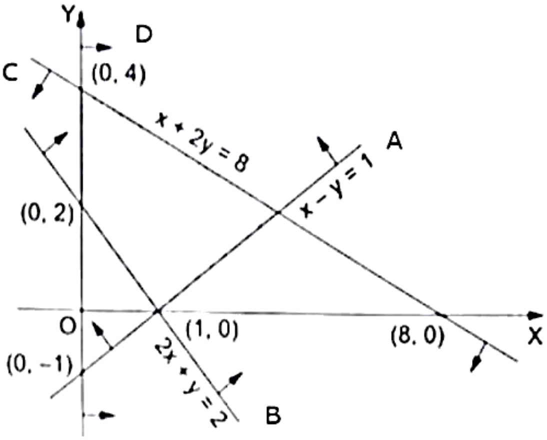


As they is no common area of intersection , there is no solution for the given set of simultaneous inequations.

Question: 11

Find the linear c

Solution:



Consider A:

Given line x - y = 1

$\Rightarrow y = x - 1$

As the region given in the figure is above the y - intercept's coordinates (0, - 1),

$\Rightarrow y \geq x - 1$

$\Rightarrow x - y \leq 1$

Consider B:

Given line 2x + y = 2

$\Rightarrow y = 2 - 2x$

As the region given in the figure is above the y - intercept's coordinates (0,2),

$\Rightarrow y \geq 2 - 2x$

$\Rightarrow 2x + y \geq 2$

Consider C:

Given line x + 2y = 8

$\Rightarrow 2y = 8 - x$

$\Rightarrow y = 4 - \frac{x}{2}$

As the region given in the figure is below the y - intercept's coordinates (0,4),

$\Rightarrow y \leq 4 - \frac{x}{2}$

$\Rightarrow 2y \leq 8 - x$

$\Rightarrow x + 2y \leq 8$

Consider D:

It is the region right side of the Y - axis.

It is $x \geq 0$.

All the results derived:

$x - y \leq 1$

$2x + y \geq 2$

$x + 2y \leq 8$

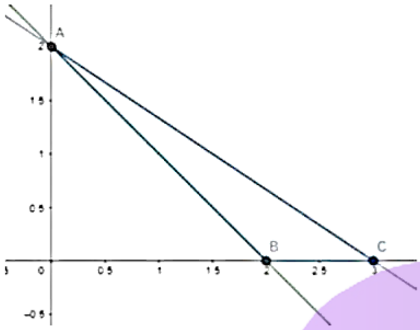
$x \geq 0$

Question: 1

Solution:

The feasible region determined by the constraints $x \geq 0$, $y \geq 0$,

$x + y \geq 2$, $2x + 3y \leq 6$ is given by



The corner points of the feasible region is A(0,2),B(2,0),C(3,0).

The values of Z at the following points is

Corner point	$Z = 7x + 7y$	
A(0,2)	14	
B(2,0)	14	
C(3,0)	21	Maximum

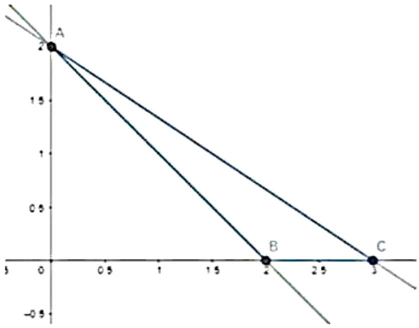
The maximum value of Z is 21 at point C(3,0) .

Question: 1

Solution:

The feasible region determined by the constraints x , ,

$x + y \geq 2$, $2x + 3y \leq 6$ is given by ≥ 0 $y \geq 0$



The corner points of the feasible region is A(0,2),B(2,0),C(3,0).

The values of Z at the following points is

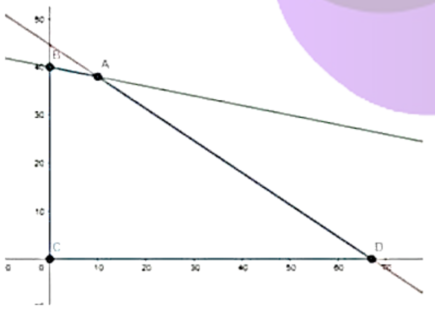
Corner point	Z = 7x + 7y	
A(0,2)	14	
B(2,0)	14	
C(3,0)	21	Maximum

The maximum value of Z is 21 at point C(3,0) .

Question: 2

Solution:

The feasible region determined by the constraints $x \geq 0$, $y \geq 0$, $x + 5y \leq 200$, $2x + 3y \leq 134$ is given by



The corner points of feasible region are A(10,38) ,B(0,40) ,C(0,0), D(67,0) . The values of Z at the following points is

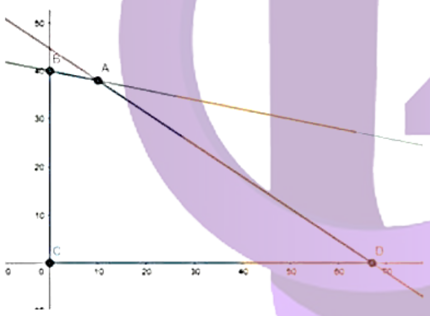
Corner Point	$Z = 4x + 9y$	
A(10,38)	382	Maximum
B(0,40)	360	
C(0,0)	0	
D(67,0)	268	

The maximum value of Z is 382 at point A(10,38) .

Question: 2

Solution:

The feasible region determined by the constraints $x \geq 0$, $y \geq 0$, $x + 5y \leq 200$, $2x + 3y \leq 134$ is given by



The corner points of feasible region are A(10,38) ,B(0,40) ,C(0,0), D(67,0) . The values of Z at the following points is

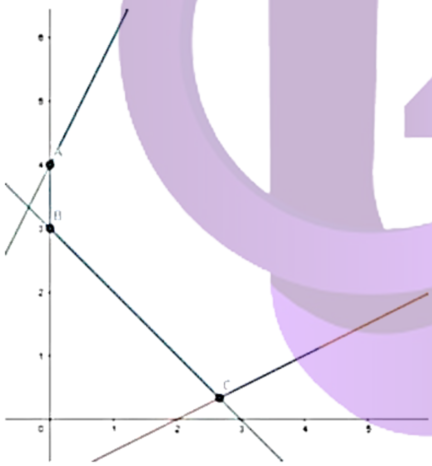
Corner Point	Z = 4x + 9y	
A(10,38)	382	Maximum
B(0,40)	360	
C(0,0)	0	
D(67,0)	268	

The maximum value of Z is 382 at point A(10,38) .

Question: 3

Solution:

The feasible region determined by the $-2x + y \leq 4$, $x + y \geq 3$, $x - 2y \leq 2$, $x \geq 0$ and $y \geq 0$ is given by



Here the feasible region is unbounded. The vertices of the region are A(0,4) ,B(0,3) ,C($\frac{8}{3}$,$\frac{1}{3}$). The values of Z at the following points is

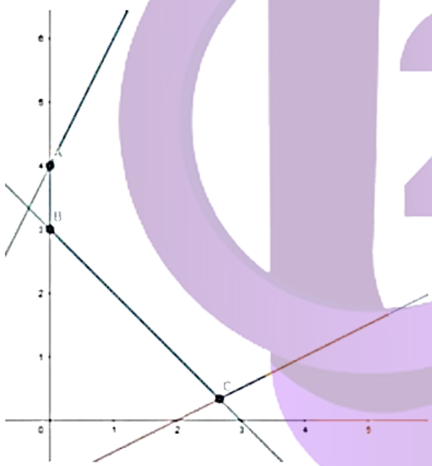
Corner Point	Z = 3x + 5y	
A(0,4)	20	
B(0,3)	15	
$C(\frac{8}{3},\frac{1}{3})$	$\frac{29}{3}$	Minimum

The minimum value of Z is $\frac{29}{3}$ at point $C(\frac{8}{3},\frac{1}{3})$.

Question: 3

Solution:

The feasible region determined by the $-2x + y \leq 4$, $x + y \geq 3$, $x - 2y \leq 2$, $x \geq 0$ and $y \geq 0$ is given by



Here the feasible region is unbounded. The vertices of the region are A(0,4) ,B(0,3) ,$C(\frac{8}{3},\frac{1}{3})$. The values of Z at the following points is

Corner Point	Z = 3x + 5y	
A(0,4)	20	
B(0,3)	15	
$C(\frac{8}{3},\frac{1}{3})$	$\frac{29}{3}$	Minimum

The minimum value of Z is $\frac{29}{3}$ at point $C(\frac{8}{3},\frac{1}{3})$.

Question: 4

Solution:

The feasible region determined by the $x \geq 0$, $y \geq 0$, $x + 2y \geq 1$ and $x + 2y \leq 10$ is given by

The corner points of the feasible region is $A(0,\frac{1}{2})$, B(0,5), C(10,0), D(1,0).The value of Z at corner points are

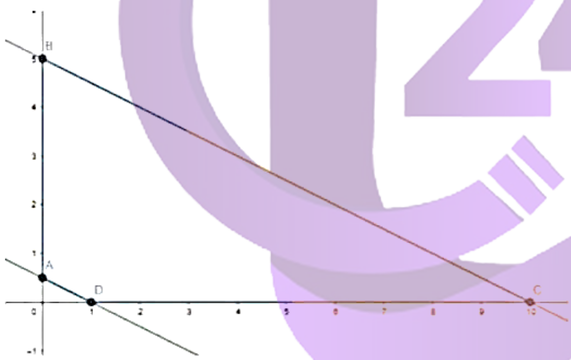
Corner Points	Z = 2x + 3y	
$A(0,\frac{1}{2})$	$\frac{3}{2}$	Minimum
B(0,5)	15	
C(10,0)	20	
D(1,0)	2	

The minimum value of Z is $\frac{3}{2}$ at point $A(0,\frac{1}{2})$.

Question: 4

Solution:

The feasible region determined by the $x \geq 0$, $y \geq 0$, $x + 2y \geq 1$ and $x + 2y \leq 10$ is given by



The corner points of the feasible region is $A(0,\frac{1}{2})$, B(0,5), C(10,0), D(1,0).The value of Z at corner points are

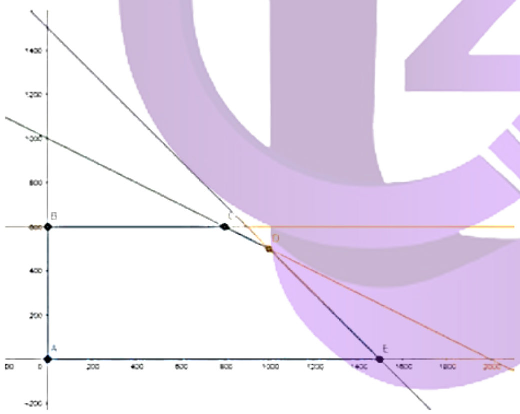
Corner Points	Z = 2x + 3y	
$A(0,\frac{1}{2})$	$\frac{3}{2}$	Minimum
B(0,5)	15	
C(10,0)	20	
D(1,0)	2	

The minimum value of Z is $\frac{3}{2}$ at point $A(0,\frac{1}{2})$.

Question: 5

Solution:

The feasible region determined by the $X + 2y \leq 2000$, $x + y \leq 1500$, $y \leq 600$, $x \geq 0$ and $y \geq 0$ is given by



The corner points of the feasible region are A(0,0), B(0,600), C(800,600), D(1000,500), E(1500,0).The value of Z at the corner points are

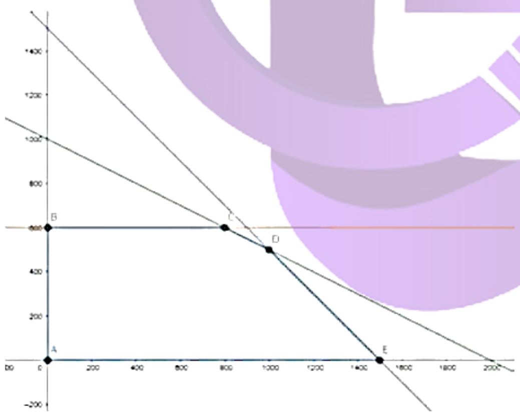
Corner Point	Z = 3x + 5y	
A(0,0)	0	
B(0,600)	3000	
C(800,600)	5400	
D(1000,500)	5500	Maximum
E(1500,0)	4500	

The maximum value of Z is 5500 at point D(1000,500).

Question: 5

Solution:

The feasible region determined by the $X + 2y \leq 2000$, $x + y \leq 1500$, $y \leq 600$, $x \geq 0$ and $y \geq 0$ is given by



The corner points of the feasible region are A(0,0), B(0,600), C(800,600), D(1000,500), E(1500,0).The value of Z at the corner points are

Corner Point	Z = 3x + 5y	
A(0,0)	0	
B(0,600)	3000	
C(800,600)	5400	
D(1000,500)	5500	Maximum
E(1500,0)	4500	

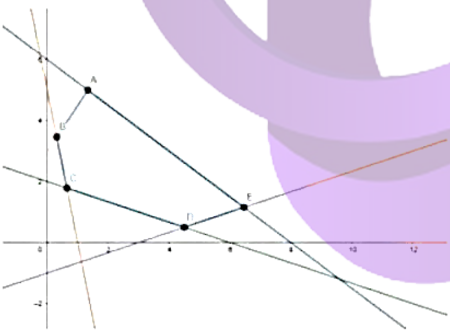
The maximum value of Z is 5500 at point D(1000,500).

Question: 6

Solution:

The feasible region determined by $X + 3y \geq 6$, $x - 3y \leq 3$, $3x + 4y \leq 24$,

$-3x + 2y \leq 6$, $5x + y \geq 5$, $x \geq 0$ and $y \geq 0$ is given by



The corner points of the feasible region are A(4/3,5) , B(4/13,45/13), C(9/14,25/14) , D(9/2,1/2) , E(84/13,15/13).The value of Z at corner points are

Corner Point	Z = 2x + y	
A(4/3,5)	23/3	
B(4/13,45/13)	53/13	
C(9/14,25/14)	43/14	Minimum
D(9/2,1/2)	19/2	
E(84/13,15/13)	183/13	Maximum

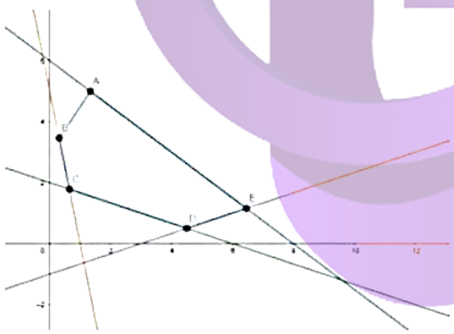
The maximum and minimum value of Z is 183/13 and 43/14 at points E(84/13,15/13) and C(9/14,25/14).

Question: 6

Solution:

The feasible region determined by X + 3y $\geq$ 6, x - 3y $\leq$ 3, 3x + 4y $\leq$ 24,

- 3x + 2y $\leq$ 6, 5x + y $\geq$ 5, x $\geq$ 0 and y $\geq$ 0 is given by



The corner points of the feasible region are A(4/3,5) , B(4/13,45/13), C(9/14,25/14) , D(9/2,1/2) , E(84/13,15/13).The value of Z at corner points are

Corner Point	Z = 2x + y	
A(4/3,5)	23/3	
B(4/13,45/13)	53/13	
C(9/14,25/14)	43/14	Minimum
D(9/2,1/2)	19/2	
E(84/13,15/13)	183/13	Maximum

The maximum and minimum value of Z is 183/13 and 43/14 at points E(84/13,15/13) and C(9/14,25/14).

Question: 7

Solution:

Let the invested money in PPF be x and in national bonds be y.

∴According to the question,

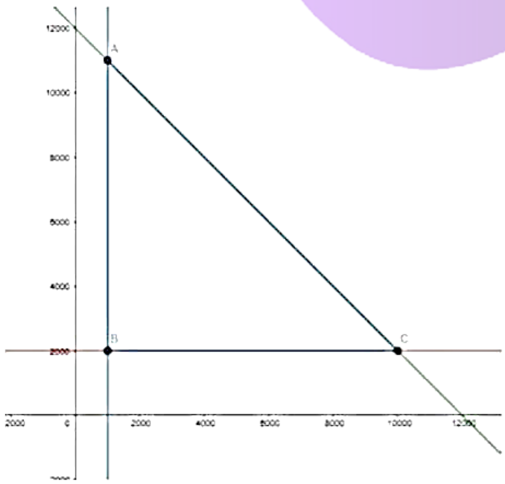
$X + y \leq 12000$

$x \geq 1000$, $y \geq 2000$

Maximize Z = 0.12x + 0.15y

The feasible region determined by $X + y \leq 12000$, $x \geq 1000$,

$y \geq 2000$ is given by



The corner points of the feasible region are A(1000,11000) , B(1000,2000) and C(10000,2000) .
The value of Z at the corner point are

Corner Point	Z = 0.12x + 0.15y	
A(1000,11000)	1770	Maximum
B(1000,2000)	420	
C(10000,2000)	1500	

The maximum value of Z is 1770 at point A(1000,11000).

So, he must invest Rs.1000 in PPF and Rs.11000 in national bonds.

The maximum annual income is Rs.1770 .

Question: 7

Solution:

Let the invested money in PPF be x and in national bonds be y.

∴According to the question,

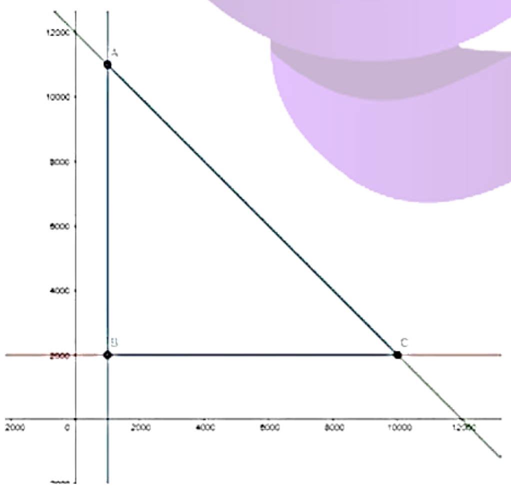
$X + y \leq 12000$

$x \geq 1000$, $y \geq 2000$

Maximize Z = 0.12x + 0.15y

The feasible region determined by $X + y \leq 12000$, $x \geq 1000$,

$y \geq 2000$ is given by



The corner points of the feasible region are A(1000,11000) , B(1000,2000) and C(10000,2000) .
The value of Z at the corner point are

Corner Point	Z = 0.12x + 0.15y	
A(1000,11000)	1770	Maximum
B(1000,2000)	420	
C(10000,2000)	1500	

The maximum value of Z is 1770 at point A(1000,11000).

So, he must invest Rs.1000 in PPF and Rs.11000 in national bonds.

The maximum annual income is Rs.1770 .

Question: 8

Solution:

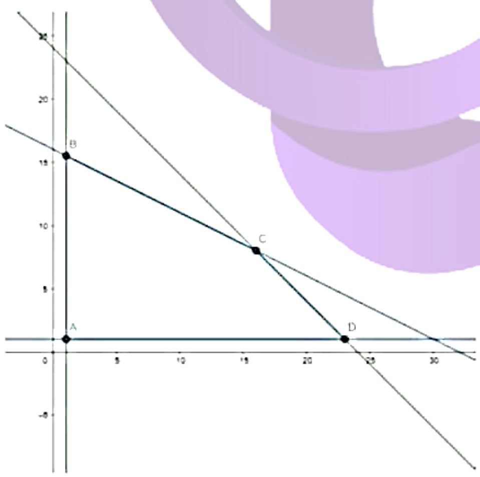
Let the firm manufacture x number of necklaces and y number of bracelets a day.

∴According to the question,

$X + y \leq 24$, $0.5x + y \leq 16$ $x \geq 1$, $y \geq 1$

Maximize $Z = 100x + 300y$

The feasible region determined by $X + y \leq 24$, $0.5x + y \leq 16$, $x \geq 1$, $y \geq 1$ is given by



The corner points of the feasible region are A(1,1) , B(1,15.5) , C(16,8) , D(23,1).The number of bracelets should be whole number. Therefore, considering point (2,15). The value of Z at corner point is

Corner Point	Z = 100x + 300y	
A(1,1)	400	
(2,15)	4700	Maximum
C(16,8)	4000	
D(23,1)	2600	

The maximum value of Z is 4700 at point B(2,15).

∴ The firm should make 2 necklaces and 15 bracelets.

Question: 8

Solution:

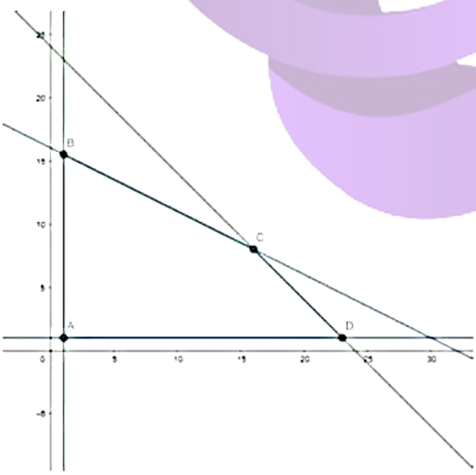
Let the firm manufacture x number of necklaces and y number of bracelets a day.

∴According to the question,

$X + y \leq 24$, $0.5x + y \leq 16$ $x \geq 1$, $y \geq 1$

Maximize Z = 100x + 300y

The feasible region determined by $X + y \leq 24$, $0.5x + y \leq 16$, $x \geq 1$, $y \geq 1$ is given by



The corner points of the feasible region are A(1,1) , B(1,15.5) , C(16,8) , D(23,1).The number of bracelets should be whole number. Therefore, considering point (2,15). The value of Z at corner point is

Corner Point	Z = 100x + 300y	
A(1,1)	400	
(2,15)	4700	Maximum
C(16,8)	4000	
D(23,1)	2600	

The maximum value of Z is 4700 at point B(2,15).

∴ The firm should make 2 necklaces and 15 bracelets.

Question: 9

Solution:

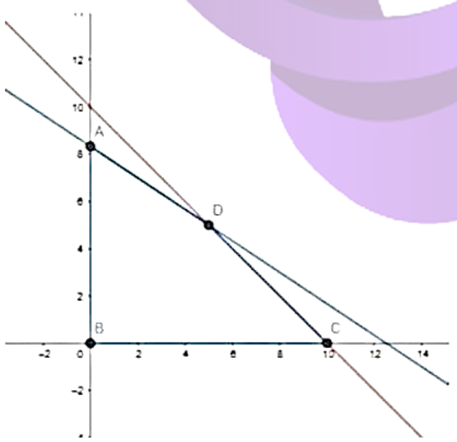
Let the number of wheat and rice bags be x and y.

∴According to the question,

$120x + 180y \leq 1500,\ x + y \leq 10, x \geq 0, y \geq 0$

Maximize Z = 8x + 11y

The feasible region determined by $120x + 180y \leq 1500,\ x + y \leq 10, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,8), B(0,0), C(10,0), D(5,5) .

The value of Z at corner point is

Corner Point	Z = 8x + 11y	
A(0,8)	88	
B(0,0)	0	
C(10,0)	80	
D(5,5)	95	Maximum

The maximum value of Z is 95 at point (5,5).

Hence, the man should 5 bags each of wheat and rice to earn maximum profit.

Question: 9

Solution:

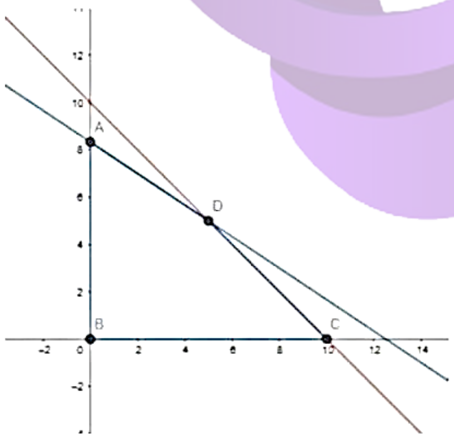
Let the number of wheat and rice bags be x and y.

∴According to the question,

$120x + 180y \leq 1500,\ x + y \leq 10, x \geq 0, y \geq 0$

Maximize Z = 8x + 11y

The feasible region determined by $120x + 180y \leq 1500,\ x + y \leq 10, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,8), B(0,0), C(10,0), D(5,5) .

The value of Z at corner point is

Corner Point	Z = 8x + 11y	
A(0,8)	88	
B(0,0)	0	
C(10,0)	80	
D(5,5)	95	Maximum

The maximum value of Z is 95 at point (5,5).

Hence, the man should 5 bags each of wheat and rice to earn maximum profit.

Question: 10

Solution:

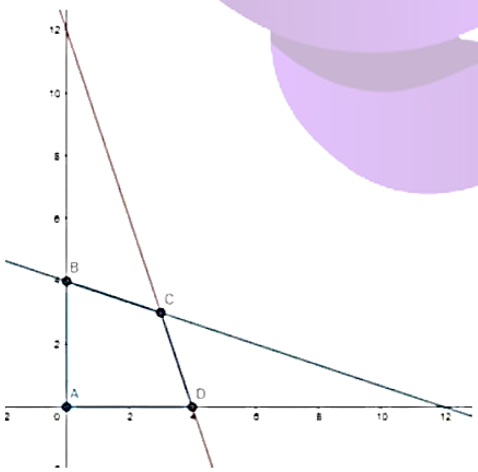
Let the number of packets of nuts and bolts be x and y respectively.

∴According to the question,

$X + 3y \leq 12, 3x + y \leq 12, x \geq 0, y \geq 0$

Maximize Z = 17.50x + 7y

The feasible region determined by $X + 3y \leq 12, 3x + y \leq 12, x \geq 0, y \geq 0$ is given by



The corner points of the feasible region are A(0,0), B(0,4), C(3,3)), D(4,0).The value of Z at the corner point is

Corner Point	Z = 17.50x + 7y	
A(0,0)	0	
B(0,4)	28	
C(3,3)	73.50	Maximum
D(4,0)	70	

The maximum value of Z is 73.50 at (3,3).

The manufacturer should make 3 packets each of nuts and bolts to make maximum profit of Rs.73.50.

Question: 10

Solution:

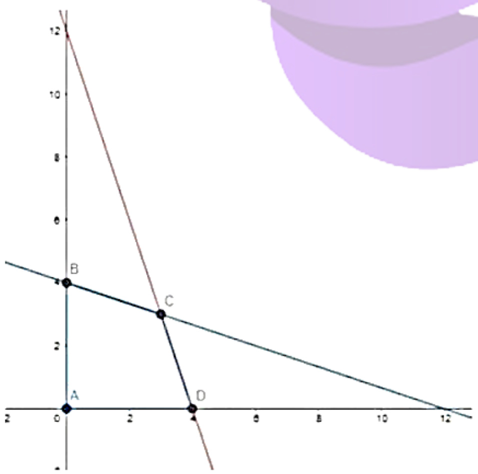
Let the number of packets of nuts and bolts be x and y respectively.

∴According to the question,

$X + 3y \leq 12$, $3x + y \leq 12, x \geq 0, y \geq 0$

Maximize Z = 17.50x + 7y

The feasible region determined by $X + 3y \leq 12$, $3x + y \leq 12, x \geq 0, y \geq 0$ is given by



The corner points of the feasible region are A(0,0), B(0,4), C(3,3)), D(4,0).The value of Z at the corner point is

Corner Point	Z = 17.50x + 7y	
A(0,0)	0	
B(0,4)	28	
C(3,3)	73.50	Maximum
D(4,0)	70	

The maximum value of Z is 73.50 at (3,3).

The manufacturer should make 3 packets each of nuts and bolts to make maximum profit of Rs.73.50.

Question: 11

Solution:

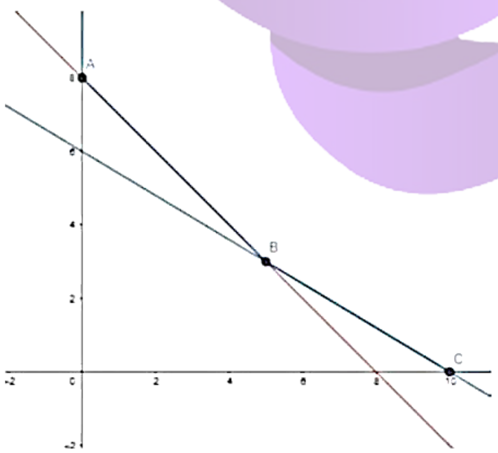
Let the total number of days tailor A work be x and tailor B be y.

∴According to the question,

$6x + 10y \geq 60,\ 4x + 4y \geq 32,\ x \geq 0,\ y \geq 0$

Minimize Z = 300x + 400y

The feasible region determined by $6x + 10y \geq 60,\ 4x + 4y \geq 32,\ x \geq 0,\ y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,8),B(5,3),C(10,0) .The value of Z at corner point is

Corner Point	Z = 300x + 400y	
A(0,8)	3200	
B(5,3)	2700	Minimum
C(10,0)	3000	

The minimum value of Z is 2700 at point (5,3).

∴Tailor A must work for 5 days and tailor B must work for 3 days for minimum expenses.

Question: 11

Solution:

Let the total number of days tailor A work be x and tailor B be y.

∴According to the question,

$6x + 10y \geq 60,\ 4x + 4y \geq 32,\ x \geq 0,\ y \geq 0$

Minimize $Z = 300x + 400y$

The feasible region determined by $6x + 10y \geq 60,\ 4x + 4y \geq 32,\ x \geq 0,\ y \geq 0$ is given by

The feasible region is unbounded. The corner points of feasible region are A(0,8),B(5,3),C(10,0) .The value of Z at corner point is

Corner Point	Z = 300x + 400y	
A(0,8)	3200	
B(5,3)	2700	Minimum
C(10,0)	3000	

The minimum value of Z is 2700 at point (5,3).

∴Tailor A must work for 5 days and tailor B must work for 3 days for minimum expenses.

Question: 12

Solution:

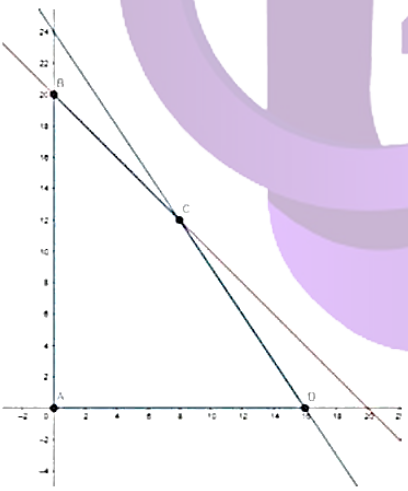
Let the number of fans bought be x and sewing machines bought be y.

∴According to the question,

$360x + 240y \le 5760, x + y \le 20, x \ge 0, y \ge 0$

Maximize $Z = 22x + 18y$

The feasible region determined by $360x + 240y \le 5760, x + y \le 20, x \ge 0, y \ge 0$ is given by



The corner points of the feasible region are A(0,0) , B(0,20),C(8,12) , D(16,0).The value of Z at corner points is

Corner Point	Z = 22x + 18y	
A(0,0)	0	
B(0,20)	360	
C(8,12)	392	Maximum
D(16,0)	352	

The maximum value of Z is 392 at point (8,12).

The dealer must buy 8 fans and 12 sewing machines to make the maximum profit.

Question: 12

Solution:

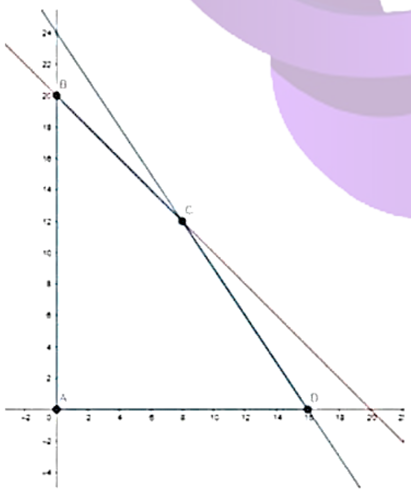
Let the number of fans bought be x and sewing machines bought be y.

∴According to the question,

$360x + 240y \le 5760, x + y \le 20, x \ge 0, y \ge 0$

Maximize $Z = 22x + 18y$

The feasible region determined by $360x + 240y \le 5760, x + y \le 20, x \ge 0, y \ge 0$ is given by



The corner points of the feasible region are A(0,0) , B(0,20),C(8,12) , D(16,0).The value of Z at corner points is

Corner Point	$Z = 22x + 18y$	
A(0,0)	0	
B(0,20)	360	
C(8,12)	392	Maximum
D(16,0)	352	

The maximum value of Z is 392 at point (8,12).

The dealer must buy 8 fans and 12 sewing machines to make the maximum profit.

Question: 13

Solution:

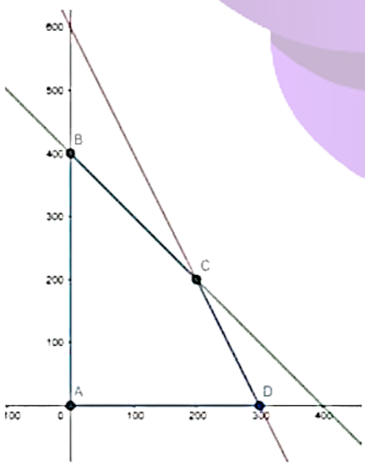
Let the firm manufacture x number of Aand y number of B products.

∴According to the question,

$X + y \leq 400, 2x + y \leq 600, x \geq 0, y \geq 0$

Maximize $Z = 2x + 2y$

The feasible region determined by $X + y \leq 400, 2x + y \leq 600, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,400) , C(200,200) , D(300,0).The value of Z at corner point is

Corner Point	Z = 2x + 2y	
A(0,0)	0	
B(0,400)	800	Maximum
C(200,200)	800	Maximum
D(300,0)	600	

The maximum value of Z is 800 and occurs at two points. Hence the line BC is a feasible solution.

The firm should produce 200 number of Aproducts and 200 number of B products.

Question: 13

Solution:

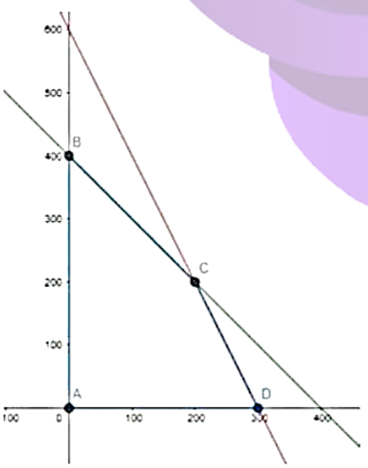
Let the firm manufacture x number of Aand y number of B products.

∴According to the question,

X + y$\leq$ $400 , 2x + y \leq 600 , x \geq 0 , y \geq 0$

Maximize Z = 2x + 2y

The feasible region determined by X + y$\leq$ $400 , 2x + y \leq 600 , x \geq 0 , y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,400) , C(200,200) , D(300,0).The value of Z at corner point is

Corner Point	Z = 2x + 2y	
A(0,0)	0	
B(0,400)	800	Maximum
C(200,200)	800	Maximum
D(300,0)	600	

The maximum value of Z is 800 and occurs at two points. Hence the line BC is a feasible solution.

The firm should produce 200 number of Aproducts and 200 number of B products.

Question: 14

Solution:

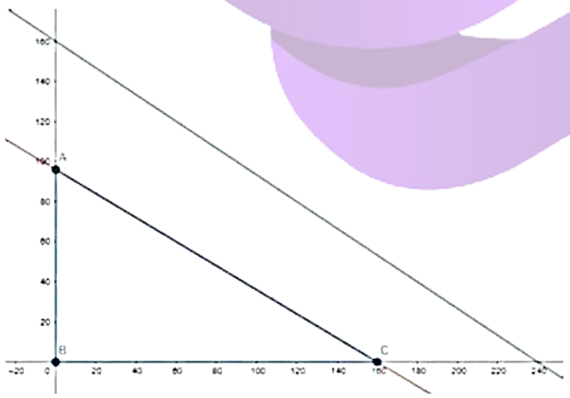
Let x and y be number of soaps be manufactured of 1^{st} and 2^{nd} type.

$\therefore$According to the question,

$2x + 3y \leq 480$, $3x + 5y \leq 480, x \geq 0$, $y \geq 0$

Maximize $Z = 0.25x + 0.50y$

The feasible region determined by $2x + 3y \leq 480$, $3x + 5y \leq 480, x \geq 0$, $y \geq 0$ is given by



The corner points of feasible region are A(0,96) , B(0,0) , C(160,0).

The value of Z at corner points are

Corner Point	Z = 0.25x + 0.50y	
A(0,96)	48	Maximum
B(0,0)	0	
C(160,0)	40	

The maximum value of Z is 48 at point (0,96).

Hence, the manufacturer should make 96 soaps of the 2^{nd} type to make maximum profit.

Question: 14

Solution:

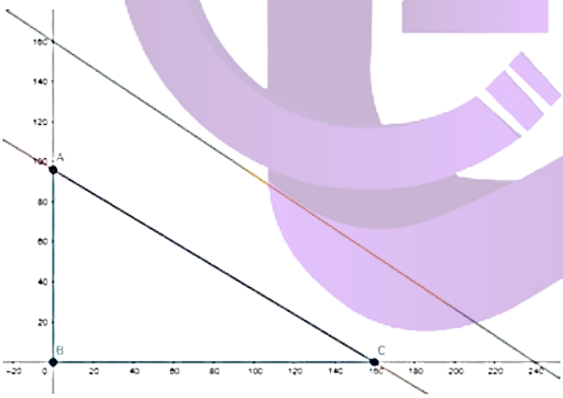
Let x and y be number of soaps be manufactured of 1^{st} and 2^{nd} type.

∴According to the question,

$2x + 3y \leq 480$, $3x + 5y \leq 480, x \geq 0$, $y \geq 0$

Maximize $Z = 0.25x + 0.50y$

The feasible region determined by $2x + 3y \leq 480$, $3x + 5y \leq 480, x \geq 0$, $y \geq 0$ is given by



The corner points of feasible region are A(0,96) , B(0,0) , C(160,0).

The value of Z at corner points are

Corner Point	$Z = 0.25x + 0.50y$	
A(0,96)	48	Maximum
B(0,0)	0	
C(160,0)	40	

The maximum value of Z is 48 at point (0,96).

Hence, the manufacturer should make 96 soaps of the 2^{nd} type to make maximum profit.

Question: 15

Solution:

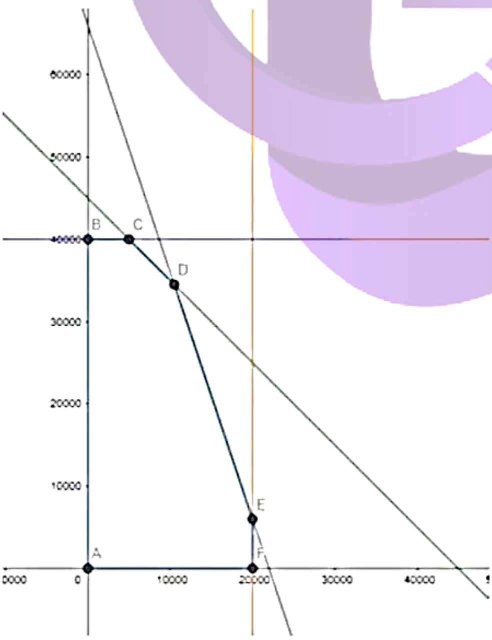
Let x and y be number of bottles of medicines A and B be prepared.

∴According to the question,

$x + y \le 45000$, $3x + y \le 66000, x \le 20000$, $y \le 40000$, $x \ge 0, y \ge 0$

Maximize $Z = 8x + 7y$

The feasible region determined by $x + y \le 45000$, $3x + y \le 66000, x \le 20000$, $y \le 40000$, $x \ge 0, y \ge 0$ is given by



The corner points of feasible region are A(0,0) , B(0,40000) , C(5000,40000),D(10500,34500),E(20000,6000),F(20000,0).

The value of Z at corner points are

Corner Point	Z = 8x + 7y	
A(0,0)	0	
B(0,40000)	280000	
C(5000,40000)	320000	
D(10500,34500)	325500	Maximum
E(20000,6000)	202000	
F(20000,0)	160000	

The maximum value of Z is 325500 at point (10500,34500).

Hence, the manufacturer should produce 10500 bottles of medicine A and 34500 bottles of medicine B.

Question: 15

Solution:

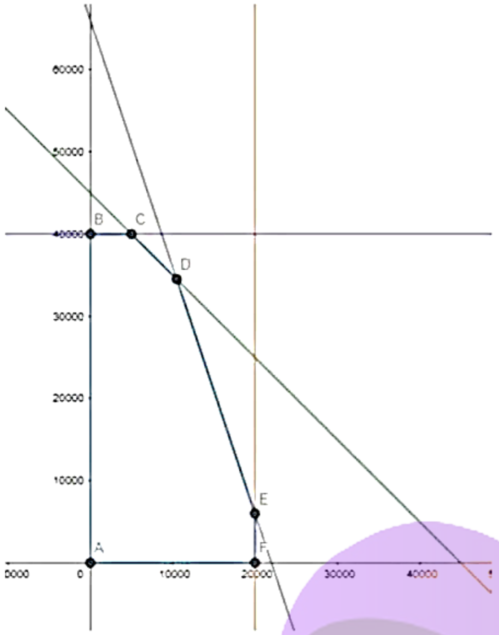
Let x and y be number of bottles of medicines A and B be prepared.

∴According to the question,

$x + y \leq 45000$, $3x + y \leq 66000, x \leq 20000$, $y \leq 40000$, $x \geq 0, y \geq 0$

Maximize $Z = 8x + 7y$

The feasible region determined by $x + y \leq 45000$, $3x + y \leq 66000, x \leq 20000$, $y \leq 40000$, $x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,40000) , C(5000,40000),D(10500,34500),E(20000,6000),F(20000,0).

The value of Z at corner points are

Corner Point	Z = 8x + 7y	
A(0,0)	0	
B(0,40000)	280000	
C(5000,40000)	320000	
D(10500,34500)	325500	Maximum
E(20000,6000)	202000	
F(20000,0)	160000	

The maximum value of Z is 325500 at point (10500,34500).

Hence, the manufacturer should produce 10500 bottles of medicine A and 34500 bottles of medicine B.

Question: 16

Solution:

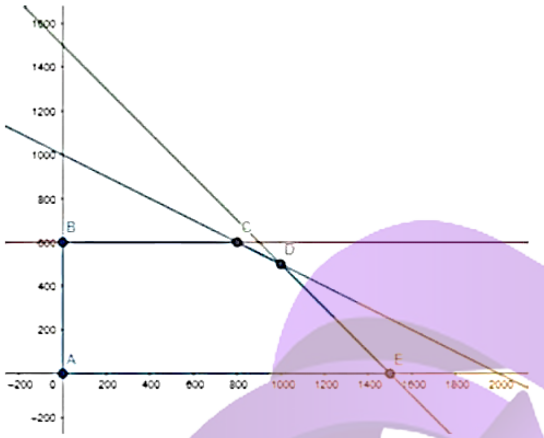
Let x and y be number of doll A manufactured and doll B manufactured.

∴According to the question,

$x + y \leq 1500, x + 2y \leq 2000, y \leq 600, x \geq 0, y \geq 0$

Maximize Z = 3x + 5y

The feasible region determined by $x + y \leq 1500, x + 2y \leq 2000, y \leq 600, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,600) , C(800,600),D(1000,500),E(1500,0).

The value of Z at corner points are

Corner Point	Z = 3x + 5y	
A(0,0)	0	
B(0,600)	3000	
C(800,600)	5400	
D(1000,500)	5500	Maximum
E(1500,0)	4500	

The maximum value of Z is 5500 at point (1000,500).

Hence, the manufacturer should produce 1000 types of doll A and 500 types of doll B to make maximum profit of Rs.5500.

Question: 16

Solution:

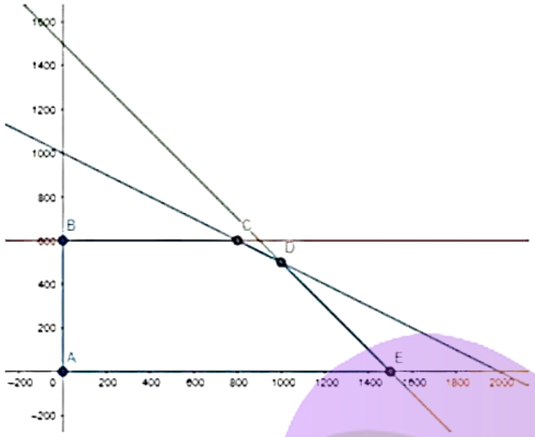
Let x and y be number of doll A manufactured and doll B manufactured.

∴According to the question,

$x + y \le 1500$, $x + 2y \le 2000$, $y \le 600$, $x \ge 0$, $y \ge 0$

Maximize $Z = 3x + 5y$

The feasible region determined by $x + y \le 1500$, $x + 2y \le 2000$, $y \le 600$, $x \ge 0$, $y \ge 0$ is given by



The corner points of feasible region are A(0,0) , B(0,600) , C(800,600),D(1000,500),E(1500,0).

The value of Z at corner points are

Corner Point	$Z = 3x + 5y$	
A(0,0)	0	
B(0,600)	3000	
C(800,600)	5400	
D(1000,500)	5500	Maximum
E(1500,0)	4500	

The maximum value of Z is 5500 at point (1000,500).

Hence, the manufacturer should produce 1000 types of doll A and 500 types of doll B to make maximum profit of Rs.5500.

Question: 17

Solution:

Let x and y be number of deluxe article manufactured and ordinary article manufact

∴According to the question,

$2x + y \le 40$, $2x + 3y \le 80$, $x \ge 0, y \ge 0$

Maximize Z = 15x + 10y

The feasible region determined by $2x + y \le 40$, $2x + 3y \le 80$, $x \ge 0, y \ge 0$ is given by

The corner points of feasible region are A(0,0) , B(0,80/3) , C(10,20),D(20,0).

The value of Z at corner points are

Corner Point	Z = 15x + 10y	
A(0,0)	0	
B(0,80/3)	266.67	
C(10,20)	350	Maximum
D(20,0)	300	

The maximum value of Z is 350 at point (10,20).

Hence, the manufacturer should produce 10 types of deluxe article and 20 types of ordinary article to make maximum profit of Rs.350.

Question: 17

Solution:

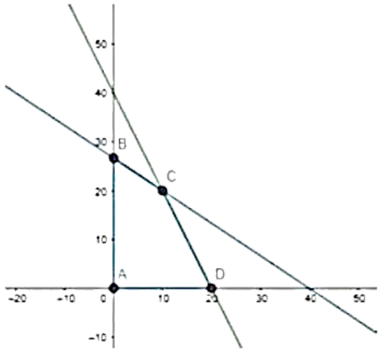
Let x and y be number of deluxe article manufactured and ordinary article manufactured.

∴According to the question,

$2x + y \le 40$, $2x + 3y \le 80$, $x \ge 0, y \ge 0$

Maximize Z = 15x + 10y

The feasible region determined by $2x + y \le 40$, $2x + 3y \le 80$, $x \ge 0, y \ge 0$ is given by



The corner points of feasible region are A(0,0) , B(0,80/3) , C(10,20),D(20,0).

The value of Z at corner points are

Corner Point	Z = 15x + 10y	
A(0,0)	0	
B(0,80/3)	266.67	
C(10,20)	350	Maximum
D(20,0)	300	

The maximum value of Z is 350 at point (10,20).

Hence, the manufacturer should produce 10 types of deluxe article and 20 types of ordinary article to make maximum profit of Rs.350.

Question: 18

Solution:

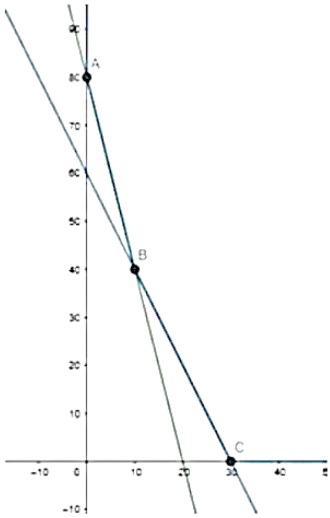
Let x and y be number of mixes from suppliers X and Y.

∴According to the question,

$4x + y \geq 80,\ 2x + y \geq 60, x \geq 0, y \geq 0$

Minimize Z = 10x + 4y

The feasible region determined by $4x + y \geq 80,\ 2x + y \geq 60, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded .The corner points of feasible region are A(0,80) , B(10,40) , C(30,0).

The value of Z at corner points are

Corner Point	Z = 10x + 4y	
A(0,80)	320	
B(10,40)	260	Minimum
C(30,0)	300	

The minimum value of Z is 260 at point (10,40).

Hence, the company should buy 10 mixes from supplier X and 40 mixes from supplier Y to minimize the cost.

Question: 18

Solution:

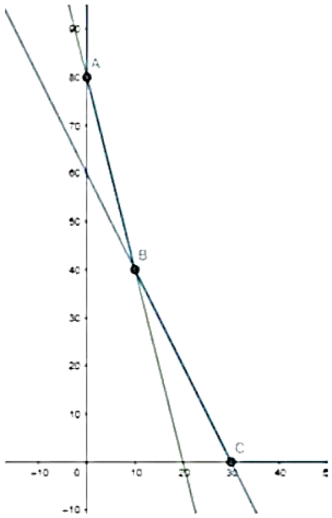
Let x and y be number of mixes from suppliers X and Y.

∴According to the question,

$4x + y \geq 80,\ 2x + y \geq 60,\ x \geq 0, y \geq 0$

Minimize Z = 10x + 4y

The feasible region determined by $4x + y \geq 80,\ 2x + y \geq 60,\ x \geq 0, y \geq 0$ is given by



The feasible region is unbounded .The corner points of feasible region are A(0,80) , B(10,40) , C(30,0).

The value of Z at corner points are

Corner Point	Z = 10x + 4y	
A(0,80)	320	
B(10,40)	260	Minimum
C(30,0)	300	

The minimum value of Z is 260 at point (10,40).

Hence, the company should buy 10 mixes from supplier X and 40 mixes from supplier Y to minimize the cost.

Question: 19

Solution:

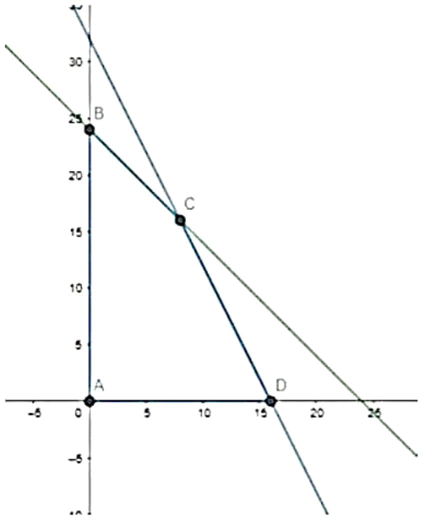
Let x and y be number of gold rings and chains.

∴According to the question,

$x + y \leq 24$, $x + 0.5y \leq 16$, $x \geq 0, y \geq 0$

Maximize Z = 300x + 190y

The feasible region determined by $x + y \leq 24$, $x + 0.5y \leq 16$, $x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,24) , C(8,16), D(16,0).The value of Z at corner points are

Corner Point	Z = 300x + 190y	
A(0,0)	0	
B(0,24)	4560	
C(8,16)	5440	Maximum
D(16,0)	4800	

The maximum value of Z is 5440 at point (8,16).

Hence, the firm should manufacture 8 gold rings and 16 gold chains to maximize their profit.

Question: 19

Solution:

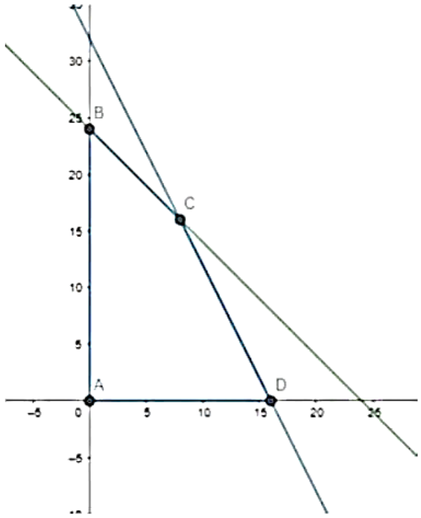
Let x and y be number of gold rings and chains.

∴According to the question,

$x + y \leq 24$, $x + 0.5y \leq 16$, $x \geq 0$, $y \geq 0$

Maximize Z = 300x + 190y

The feasible region determined by $x + y \leq 24$, $x + 0.5y \leq 16$, $x \geq 0$, $y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,24) , C(8,16), D(16,0).The value of Z at corner points are

Corner Point	Z = 300x + 190y	
A(0,0)	0	
B(0,24)	4560	
C(8,16)	5440	Maximum
D(16,0)	4800	

The maximum value of Z is 5440 at point (8,16).

Hence, the firm should manufacture 8 gold rings and 16 gold chains to maximize their profit.

Question: 20

Solution:

Let x teapots of type A and y teapots of type B manufactured.

Then,

$x \geq 0, y \geq 0$

Also,

$12x + 6y \leq 6 \times 60$

$12x + 6y \leq 360$

$2x + y \leq 60$ .....(1)

And,

$18x + 0y \le 6 \times 60$

$X \le 20$......(2)

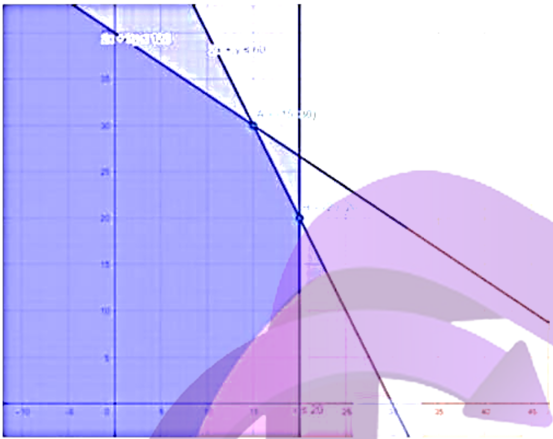
Also,

$6x + 9y \le 6 \times 60$

$2x + 3y \le 120$.....(3)

The profit will be given by: $Z = \frac{75}{100}x + \frac{50}{100}y \Rightarrow Z = \frac{3}{4}x + \frac{1}{2}y$

On plotting the constraints, we get,



Profit will be maximum when x = 30 and y = 15

Hence, Proved.

Question: 20

Solution:

Let x teapots of type A and y teapots of type B manufactured.

Then,

$x \ge 0, y \ge 0$

Also,

$12x + 6y \le 6 \times 60$

$12x + 6y \le 360$

$2x + y \le 60$.....(1)

And,

$18x + 0y \le 6 \times 60$

$X \le 20$......(2)

Also,

$6x + 9y \le 6 \times 60$

$2x + 3y \le 120$.....(3)

The profit will be given by: $Z = \frac{75}{100}x + \frac{50}{100}y \Rightarrow Z = \frac{3}{4}x + \frac{1}{2}y$

On plotting the constraints, we get,

Profit will be maximum when x = 30 and y = 15

Hence, Proved.

Question: 21

Solution:

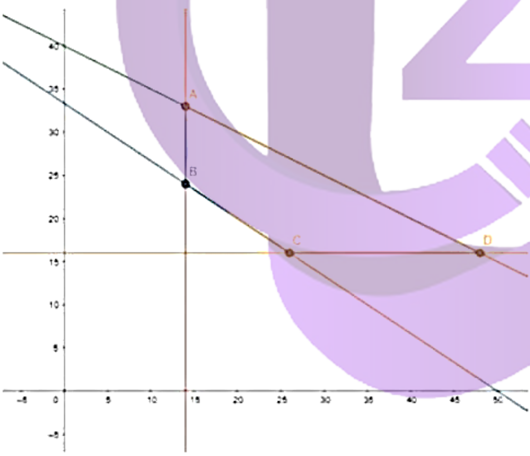
Let x and y be number of A and B products.

∴According to the question,

$0.5x + y \leq 40$, $200x + 300y \geq 10000, x \geq 14, y \geq 16$

Maximize Z = 20x + 30y

The feasible region determined by $0.5x + y \leq 40$, $200x + 300y \geq 10000, x \geq 14, y \geq 16$ is given by



The corner points of feasible region are A(14,33) , B(14,24) , C(26,16), D(48,16).The value of Z at corner points are

Corner Point	Z = 20x + 30y	
A(14,33)	1270	
B(14,24)	1000	
C(26,16)	1000	
D(48,16)	1440	Maximum

The maximum value of Z is 1440 at point (48,16).

Hence, the manufacturer should manufacture 48 A products and 16 B products to maximize their profit of Rs.1440.

Question: 21

Solution:

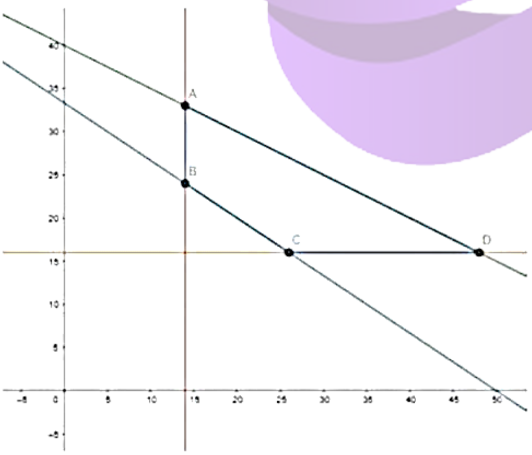
Let x and y be number of A and B products.

∴According to the question,

$0.5x + y \leq 40$, $200x + 300y \geq 10000, x \geq 14, y \geq 16$

Maximize $Z = 20x + 30y$

The feasible region determined by $0.5x + y \leq 40$, $200x + 300y \geq 10000, x \geq 14, y \geq 16$ is given by



The corner points of feasible region are A(14,33) , B(14,24) , C(26,16), D(48,16).The value of Z at corner points are

Corner Point	Z = 20x + 30y	
A(14,33)	1270	
B(14,24)	1000	
C(26,16)	1000	
D(48,16)	1440	Maximum

The maximum value of Z is 1440 at point (48,16).

Hence, the manufacturer should manufacture 48 A products and 16 B products to maximize their profit of Rs.1440.

Question: 22

Solution:

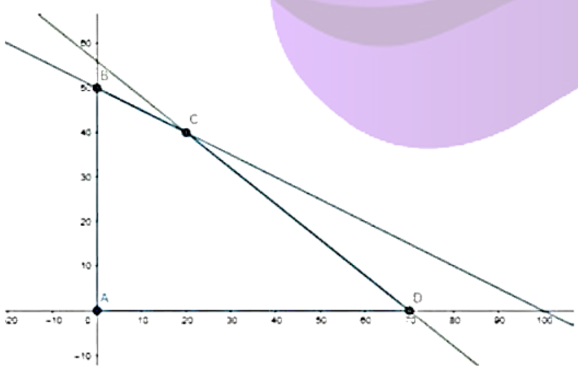
Let x and y be number of A and B trees.

∴According to the question,

$20x + 25y \leq 1400$, $10x + 20y \leq 1000, x \geq 0, y \geq 0$

Maximize $Z = 40x + 60y$

The feasible region determined by $20x + 25y \leq 1400$, $10x + 20y \leq 1000, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,50) , C(20,40), D(70,0).The value of Z at corner points are

Corner Point	Z = 40x + 60y	
A(0,0)	0	
B(0,50)	3000	
C(20,40)	3200	Maximum
D(70,0)	2800	

The maximum value of Z is 3200 at point (20,40).

Hence, the man should plant 20 A trees and 40 B trees to make maximum profit of Rs.3200.

Question: 22

Solution:

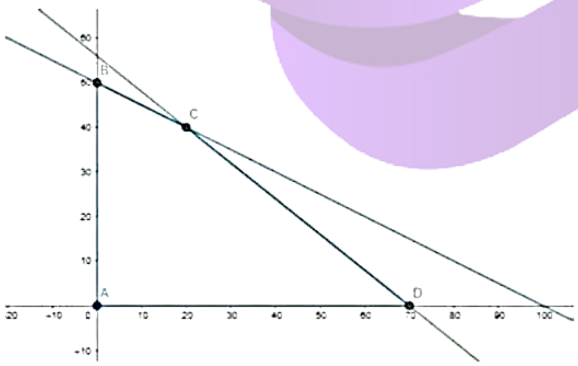
Let x and y be number of A and B trees.

∴According to the question,

$20x + 25y \leq 1400$, $10x + 20y \leq 1000, x \geq 0, y \geq 0$

Maximize $Z = 40x + 60y$

The feasible region determined by $20x + 25y \leq 1400$, $10x + 20y \leq 1000, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,50) , C(20,40), D(70,0).The value of Z at corner points are

Corner Point	Z = 40x + 60y	
A(0,0)	0	
B(0,50)	3000	
C(20,40)	3200	Maximum
D(70,0)	2800	

The maximum value of Z is 3200 at point (20,40).

Hence, the man should plant 20 A trees and 40 B trees to make maximum profit of Rs.3200.

Question: 23

Solution:

Let x and y be number of hardcover and paperback edition of the book.

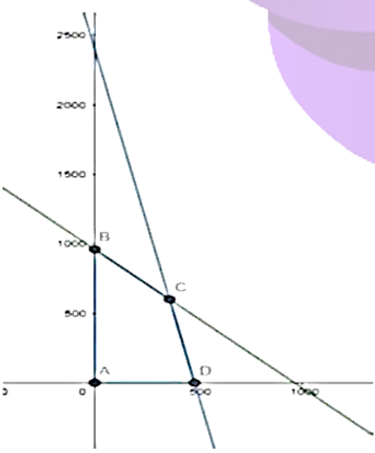
∴According to the question,

$5x + 5y \leq 4800$, $10x + 2y \leq 4800$, $x \geq 0, y \geq 0$

Maximize Z = (72x + 40y) – (56x + 28y + 9600)

= 16x + 12y - 9600

The feasible region determined by $5x + 5y \leq 4800$, $10x + 2y \leq 4800$, $x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,960) , C(360,600), D(480,0).The value of Z at corner points are

Corner Point	Z = 16x + 12y - 9600	
A(0,0)	0	
B(0,960)	1920	
C(360,600)	3360	Maximum
D(480,0)	- 1920	

The maximum value of Z is 3360 at point (360,600).

Hence, the publisher should publish 360 hardcover edition and 600 and paperback edition of the book to earn maximum profit of Rs.3360.

Question: 23

Solution:

Let x and y be number of hardcover and paperback edition of the book.

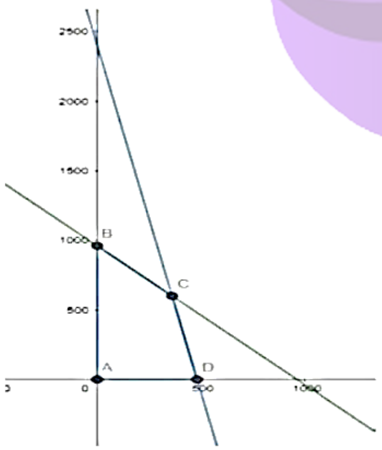
∴According to the question,

$5x + 5y \leq 4800$, $10x + 2y \leq 4800, x \geq 0, y \geq 0$

Maximize Z = (72x + 40y) – (56x + 28y + 9600)

= 16x + 12y - 9600

The feasible region determined by $5x + 5y \leq 4800$, $10x + 2y \leq 4800, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,960) , C(360,600), D(480,0).The value of Z at corner points are

Corner Point	Z = 16x + 12y - 9600	
A(0,0)	0	
B(0,960)	1920	
C(360,600)	3360	Maximum
D(480,0)	- 1920	

The maximum value of Z is 3360 at point (360,600).

Hence, the publisher should publish 360 hardcover edition and 600 and paperback edition of the book to earn maximum profit of Rs.3360.

Question: 24

Solution:

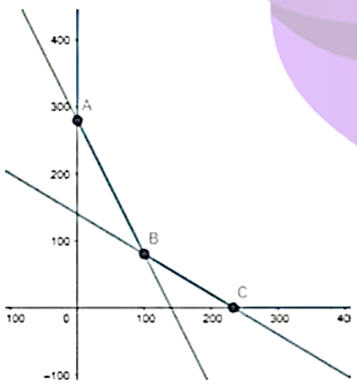
Let x and y be number of kilograms of fertilizer I and II

∴According to the question,

$0.10x + 0.05y \geq 14$, $0.06x + 0.10y \geq 14, x \geq 0, y \geq 0$

Minimize Z = 0.60x + 0.40y

The feasible region determined by $0.10x + 0.05y \geq 14$, $0.06x + 0.10y \geq 14, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,280) , B(100,80) , C(700/3,0).The value of Z at corner points are

Corner Point	Z = 0.60x + 0.40y	
A(0,280)	112	
B(100,80)	92	Minimum
C(700/3,0)	140	

The minimum value of Z is 92 at point (100,80).

Hence, the gardener should by 100 kilograms o fertilizer I and 80 kg of fertilizer II to minimize the cost which is Rs.92.

Question: 24

Solution:

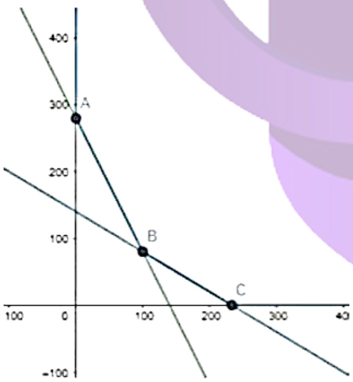
Let x and y be number of kilograms of fertilizer I and II

∴According to the question,

$0.10x + 0.05y \geq 14$, $0.06x + 0.10y \geq 14, x \geq 0, y \geq 0$

Minimize $Z = 0.60x + 0.40y$

The feasible region determined by $0.10x + 0.05y \geq 14$, $0.06x + 0.10y \geq 14, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,280) , B(100,80) , C(700/3,0).The value of Z at corner points are

Corner Point	Z = 0.60x + 0.40y	
A(0,280)	112	
B(100,80)	92	Minimum
C(700/3,0)	140	

The minimum value of Z is 92 at point (100,80).

Hence, the gardener should by 100 kilograms o fertilizer I and 80 kg of fertilizer II to minimize the cost which is Rs.92.

Question: 25

Solution:

Let x quintals of supplies be transported from A to D and y quintals be transported from A to E.

Therefore, 100 - (x + y) will be transported to F.

Also, (60 - x) quintals, (50 - y) quintals and (40 – (100 – (x + y))) quintals will be transported to D, E, F by godown B.

∴According to the question,

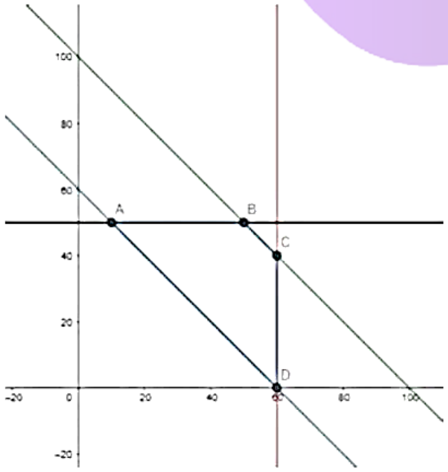
$x \geq 0, y \geq 0, x + y \leq 100, x \leq 60, y \leq 50, x + y \geq 60$

Minimize Z = 6x + 4(60 - x) + 3y + 2(50 – y) + 2.50(100 - (x + y)) + 3((x + y) – 60)

Z = 6x + 240 – 4x + 3y + 100 – 2y + 250 - 2.5x - 2.5y + 3x + 3y – 180

Z = 2.5x + 1.5y + 210

The feasible region represented by $x \geq 0, y \geq 0, x + y \leq 100, x \leq 60, y \leq 50, x + y \geq 60$ is given by



The corner points of feasible region are A(10,50) , B(50,50) , C(60,40) , D(60,0)

Corner Point	Z = 2.5x + 1.5y + 210	
A(10,50)	310	Minimum
B(50,50)	410	
C(60,40)	420	
D(60,0)	360	

The minimum value of Z is 310 at point (10,50).

Hence, 10, 50, 40 quintals of supplies should be transported from A to D, E, F and 50, 0, 0 quintals of supplies should be transported from B to D, E, F.

Question: 25

Solution:

Let x quintals of supplies be transported from A to D and y quintals be transported from A to E.

Therefore, 100 - (x + y) will be transported to F.

Also, (60 - x) quintals, (50 - y) quintals and (40 – (100 – (x + y))) quintals will be transported to D, E, F by godown B.

∴According to the question,

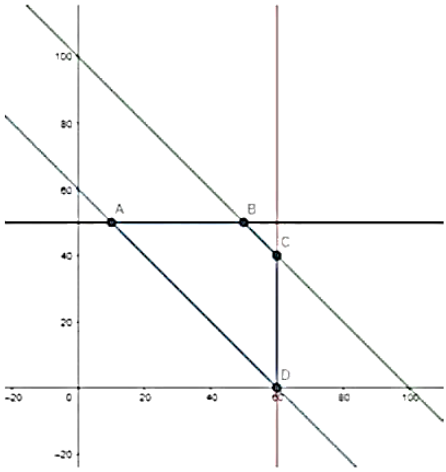
$x \geq 0, y \geq 0, x + y \leq 100, x \leq 60, y \leq 50, x + y \geq 60$

Minimize Z = 6x + 4(60 - x) + 3y + 2(50 – y) + 2.50(100 - (x + y)) + 3((x + y) – 60)

Z = 6x + 240 – 4x + 3y + 100 – 2y + 250 - 2.5x - 2.5y + 3x + 3y – 180

Z = 2.5x + 1.5y + 210

The feasible region represented by $x \geq 0, y \geq 0, x + y \leq 100, x \leq 60, y \leq 50, x + y \geq 60$ is given by



The corner points of feasible region are A(10,50) , B(50,50) , C(60,40) , D(60,0)

Corner Point	Z = 2.5x + 1.5y + 210	
A(10,50)	310	Minimum
B(50,50)	410	
C(60,40)	420	
D(60,0)	360	

The minimum value of Z is 310 at point (10,50).

Hence, 10, 50, 40 quintals of supplies should be transported from A to D, E, F and 50, 0, 0 quintals of supplies should be transported from B to D, E, F.

Question: 26

Solution:

Let x bricks be transported from P to A and y bricks be transported from P to B.

Therefore, 30000 - (x + y) will be transported to C.

Also, (15000 - x) bricks, (20000 - y) bricks and (15000 - (30000 - (x + y))) bricks will be transported to A, B, C from Q.

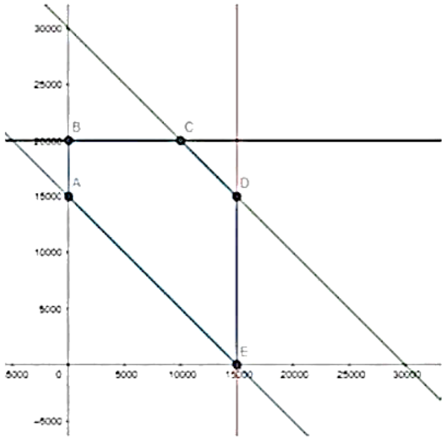
∴According to the question,

$x \geq 0, y \geq 0, x + y \leq 30000, x \leq 15000, y \leq 20000, x + y \geq 15000$

Minimize Z = 0.04x + 0.02(15000 - x) + 0.02y + 0.06(20000 - y) + 0.03(30000 - (x + y)) + 0.04((x + y) – 15000)

Z = 0.03x - 0.03y + 1800

The feasible region represented by x $\geq 0, y \geq 0, x + y \leq 30000, x \leq 15000, y \leq 20000, x + y \geq 15000$ is given by



The corner points of feasible region are A(0,15000) , B(0,20000) , C(10000,20000) , D(15000,15000), E(15000,0).

Corner Point	Z = 0.03x - 0.03y + 1800	
A(0,15000)	1350	
B(0,20000)	1200	Minimum
C(10000,20000)	1500	
D(15000,15000)	1800	
E(15000,0)	2250	

The minimum value of Z is 1200 at point (0,20000).

Hence, 0, 20000, 10000 bricks should be transported from P to A, B, C and 15000, 0, 5000 bricks should be transported from Q to A, B, C.

Question: 26

Solution:

Let x bricks be transported from P to A and y bricks be transported from P to B.

Therefore, 30000 - (x + y) will be transported to C.

Also, (15000 - x) bricks, (20000 - y) bricks and (15000 - (30000 - (x + y))) bricks will be transported to A, B, C from Q.

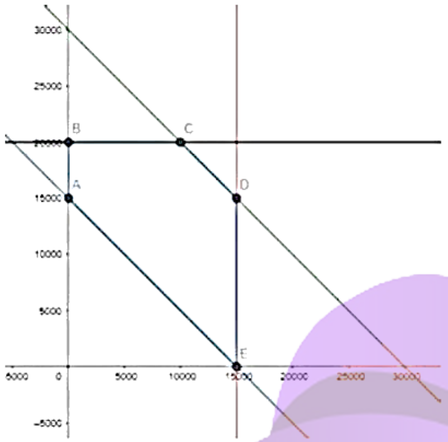
∴According to the question,

$x \geq 0, y \geq 0, x + y \leq 30000, x \leq 15000, y \leq 20000, x + y \geq 15000$

Minimize Z = 0.04x + 0.02(15000 - x) + 0.02y + 0.06(20000 - y) + 0.03(30000 - (x + y)) + 0.04((x + y) – 15000)

Z = 0.03x - 0.03y + 1800

The feasible region represented by x $\geq 0, y \geq 0, x + y \leq 30000, x \leq 15000, y \leq 20000, x + y \geq 15000$ is given by



The corner points of feasible region are A(0,15000) , B(0,20000) , C(10000,20000) , D(15000,15000), E(15000,0).

Corner Point	Z = 0.03x - 0.03y + 1800	
A(0,15000)	1350	
B(0,20000)	1200	Minimum
C(10000,20000)	1500	
D(15000,15000)	1800	
E(15000,0)	2250	

The minimum value of Z is 1200 at point (0,20000).

Hence, 0, 20000, 10000 bricks should be transported from P to A, B, C and 15000, 0, 5000 bricks should be transported from Q to A, B, C.

Question: 27

Solution:

Let x packets of medicines be transported from X to P and y packets of medicines be transported from X to Q.

Therefore, 60 - (x + y) will be transported to R.

Also, (40 - x) packets, (40 - y) packets and (50 - (60 - (x + y))) packets will be transported to P, Q, R from Y.

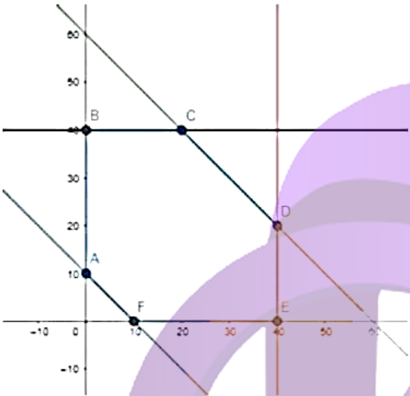
∴According to the question,

$x \geq 0, y \geq 0, x + y \leq 60, x \leq 40, y \leq 40, x + y \geq 10$

Minimize $Z = 5x + 4(40 - x) + 4y + 2(40 - y) + 3(60 - (x + y)) + 5((x + y) - 10)$

$Z = 3x + 4y + 370$

The feasible region represented by $x \geq 0, y \geq 0, x + y \leq 60, x \leq 40, y \leq 40, x + y \geq 10$ is given by



The corner points of feasible region are A(0,10) , B(0,40) , C(20,40) , D(40,20), E(10,0).

Corner Point	Z = 3x + 4y + 370	
A(0,10)	410	
B(0,40)	530	
C(20,40)	590	
D(40,20)	570	
E(10,0)	400	Minimum

The minimum value of Z is 40 at point (10,0).

Hence, 10, 0, 50 packets of medicines should be transported from X to P, Q, R and 30, 40, 0 packets of medicines should be transported from Y to P, Q, R.

Question: 27

Solution:

Let x packets of medicines be transported from X to P and y packets of medicines be transported from X to Q.

Therefore, 60 - (x + y) will be transported to R.

Also, (40 - x) packets, (40 - y) packets and (50 - (60 - (x + y))) packets will be transported to P, Q, R from Y.

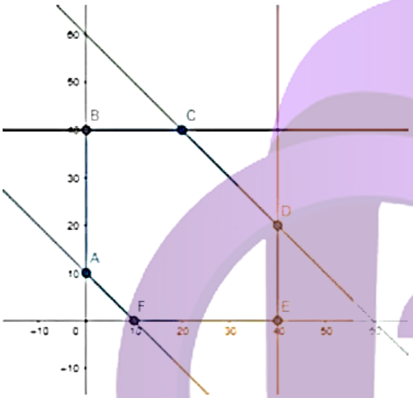
∴According to the question,

$x \geq 0, y \geq 0, x + y \leq 60, x \leq 40, y \leq 40, x + y \geq 10$

Minimize Z = 5x + 4(40 - x) + 4y + 2(40 - y) + 3(60 - (x + y)) + 5((x + y) – 10)

Z = 3x + 4y + 370

The feasible region represented by $x \geq 0, y \geq 0, x + y \leq 60, x \leq 40, y \leq 40, x + y \geq 10$ is given by



The corner points of feasible region are A(0,10) , B(0,40) , C(20,40) , D(40,20), E(10,0).

Corner Point	Z = 3x + 4y + 370	
A(0,10)	410	
B(0,40)	530	
C(20,40)	590	
D(40,20)	570	
E(10,0)	400	Minimum

The minimum value of Z is 40 at point (10,0).

Hence, 10, 0, 50 packets of medicines should be transported from X to P, Q, R and 3 packets of medicines should be transported from Y to P, Q, R.

Question: 28

Solution:

Let x liters of petrol be transported from A to D and y liters of petrol be transported from A to E.

Therefore, 7000 - (x + y) will be transported to F.

Also, (4500 - x) liters of petrol, (3000 - y) liters of petrol and (3500 – (7000 – (x + y))) liters of petrol will be transported to D, E, F by B.

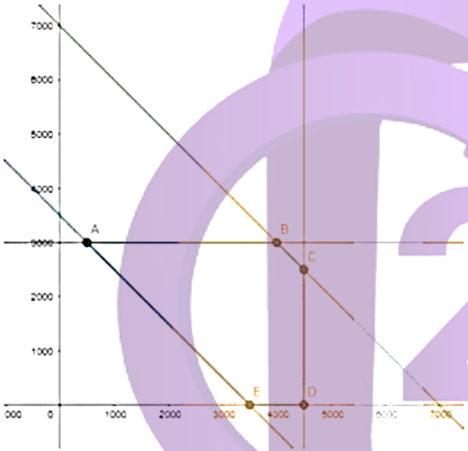
∴According to the question,

$x \geq 0, y \geq 0, x + y \leq 7000, x \leq 4500, y \leq 3000, x + y \geq 3500$

Minimize Z = 7x + 3(4500 – x) + 6y + 4(3000 – y) + 3(7000 –(x + y)) + 2 ((x + y) – 3500)

Z = 3x + y + 39500

The feasible region represented by $x \geq 0, y \geq 0, x + y \leq 7000, x \leq 4500, y \leq 3000, x + y \geq 3500$ is given by



The corner points of feasible region are A(500,3000) , B(4000,3000) , C(4500,2500) , D(4500,0) , E(3500,0)

Corner Point	$Z = 3x + y + 39500$	
A(500,3000)	44000	Minimum
B(4000,3000)	54500	
C(4500,2500)	55500	
D(4500,0)	53000	
E(3500,0)	50000	

The minimum value of Z is 44000 at point (500,3000).

Hence, 500,3000,3500 liters of petrol should be transported from A to D, E, F and 4000, 0, 0 liters of petrol should be transported from B to D, E, F.

Question: 28

Solution:

Let x liters of petrol be transported from A to D and y liters of petrol be transported from A to E.

Therefore, 7000 - (x + y) will be transported to F.

Also, (4500 - x) liters of petrol, (3000 - y) liters of petrol and (3500 – (7000 – (x + y))) liters of petrol will be transported to D, E, F by B.

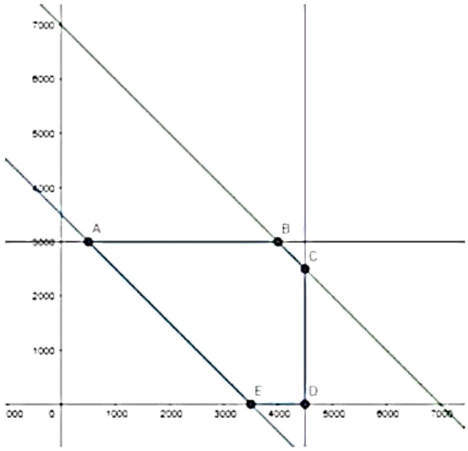
∴According to the question,

$x \geq 0, y \geq 0, x + y \leq 7000, x \leq 4500, y \leq 3000, x + y \geq 3500$

Minimize $Z = 7x + 3(4500 - x) + 6y + 4(3000 - y) + 3(7000 - (x + y)) + 2((x + y) - 3500)$

$Z = 3x + y + 39500$

The feasible region represented by $x \geq 0, y \geq 0, x + y \leq 7000, x \leq 4500, y \leq 3000, x + y \geq 3500$ is given by



The corner points of feasible region are A(500,3000) , B(4000,3000) , C(4500,2500) , D(4500,0) , E(3500,0)

Corner Point	Z = 3x + y + 39500	
A(500,3000)	44000	Minimum
B(4000,3000)	54500	
C(4500,2500)	55500	
D(4500,0)	53000	
E(3500,0)	50000	

The minimum value of Z is 44000 at point (500,3000).

Hence, 500,3000,3500 liters of petrol should be transported from A to D, E, F and 4000, 0, 0 liters of petrol should be transported from B to D, E, F.

Question: 29

Solution:

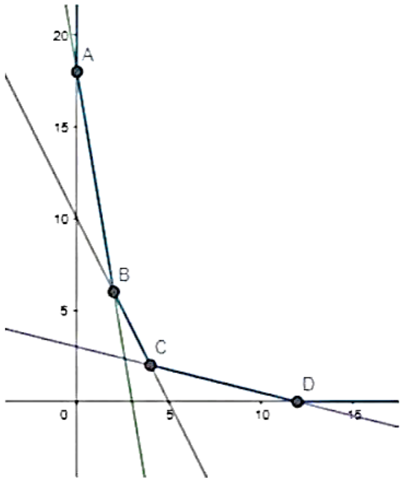
Let x and y be number of units of products of A and B.

∴According to the question,

$36x + 6y \geq 108$, $3x + 12y \geq 36$, $20x + 10y \geq 100$, $x \geq 0$, $y \geq 0$

Minimize $Z = 20x + 40y$

The feasible region determined $36x + 6y \geq 108$, $3x + 12y \geq 36$, $20x + 10y \geq 100$, $x \geq 0$, $y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,18) , B(2,6) , C(4,2) , D(12,0).The value of Z at corner points are

Corner Point	$Z = 20x + 40y$	
A(0,18)	720	
B(2,6)	280	
C(4,2)	160	Minimum
D(12,0)	240	

The minimum value of Z is 160 at point (4,2).

Hence, the firm should buy 4 units of fertilizer A and 2 units of fertilizer B to achieve minimum expense of Rs.160.

Question: 29

Solution:

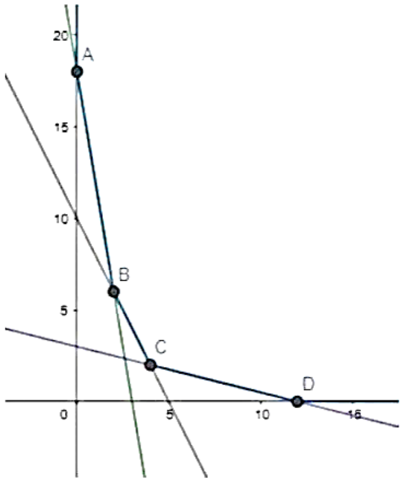
Let x and y be number of units of products of A and B.

∴According to the question,

$36x + 6y \geq 108$, $3x + 12y \geq 36, 20x + 10y \geq 100, x \geq 0, y \geq 0$

Minimize $Z = 20x + 40y$

The feasible region determined $36x + 6y \geq 108$, $3x + 12y \geq 36, 20x + 10y \geq 100, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,18) , B(2,6) , C(4,2) , D(12,0).The value of Z at corner points are

Corner Point	Z = 20x + 40y	
A(0,18)	720	
B(2,6)	280	
C(4,2)	160	Minimum
D(12,0)	240	

The minimum value of Z is 160 at point (4,2).

Hence, the firm should buy 4 units of fertilizer A and 2 units of fertilizer B to achieve minimum expense of Rs.160.

Question: 30

Solution:

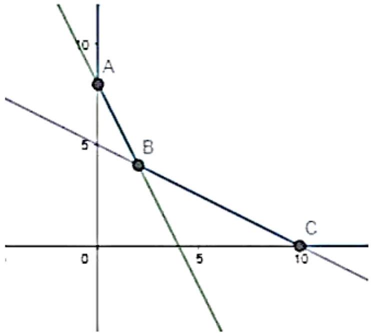
Let x and y be number of units of X and Y.

∴According to the question,

$2x + y \geq 8$, $x + 2y \geq 10, x \geq 0, y \geq 0$

Minimize $Z = 5x + 7y$

The feasible region determined $2x + y \geq 8$, $x + 2y \geq 10, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,8) , B(2,4) , C(10,0).The value of Z at corner points are

Corner Point	Z = 5x + 7y	
A(0,8)	56	
B(2,4)	38	Minimum
C(10,0)	50	

The minimum value of Z is 160 at point (4,2).

Hence, the dietician should mix 2 units of X and 4 units of Y to meet the requirements at minimum cost of Rs.38.

Question: 30

Solution:

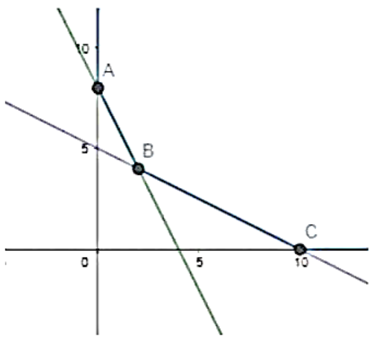
Let x and y be number of units of X and Y.

∴.According to the question,

$2x + y \geq 8$, $x + 2y \geq 10, x \geq 0, y \geq 0$

Minimize $Z = 5x + 7y$

The feasible region determined $2x + y \geq 8$, $x + 2y \geq 10, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,8) , B(2,4) , C(10,0).The value of Z at corner points are

Corner Point	Z = 5x + 7y	
A(0,8)	56	
B(2,4)	38	Minimum
C(10,0)	50	

The minimum value of Z is 160 at point (4,2).

Hence, the dietician should mix 2 units of X and 4 units of Y to meet the requirements at minimum cost of Rs.38.

Question: 31

Solution:

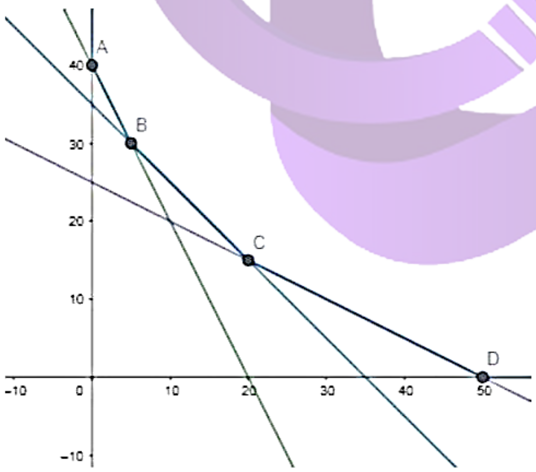
Let x and y be number of units of food A and B.

∴According to the question,

$200x + 100y \geq 4000$, $x + 2y \geq 50, 40x + 40y \geq 1400, x \geq 0, y \geq 0$

Minimize $Z = 4x + 3y$

The feasible region determined $200x + 100y \geq 4000$, $x + 2y \geq 50, 40x + 40y \geq 1400, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,40) , B(5,30) , C(20,15) , D(50,0).The value of Z at corner points are

Corner Point	Z = 4x + 3y	
A(0,40)	120	
B(5,30)	110	Minimum
C(20,15)	125	
D(50,0)	200	

The minimum value of Z is 110 at point (5,30).

Hence, the diet should contain 5 units of food A and 30 units of food B for the least cost.

Question: 31

Solution:

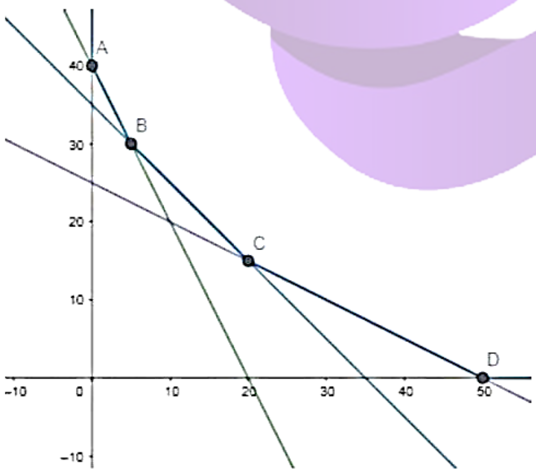
Let x and y be number of units of food A and B.

∴According to the question,

$200x + 100y \geq 4000$, $x + 2y \geq 50, 40x + 40y \geq 1400, x \geq 0, y \geq 0$

Minimize $Z = 4x + 3y$

The feasible region determined $200x + 100y \geq 4000$, $x + 2y \geq 50, 40x + 40y \geq 1400, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,40) , B(5,30) , C(20,15) , D(50,0).The value of Z at corner points are

Corner Point	Z = 4x + 3y	
A(0,40)	120	
B(5,30)	110	Minimum
C(20,15)	125	
D(50,0)	200	

The minimum value of Z is 110 at point (5,30).

Hence, the diet should contain 5 units of food A and 30 units of food B for the least cost.

Question: 32

Solution:

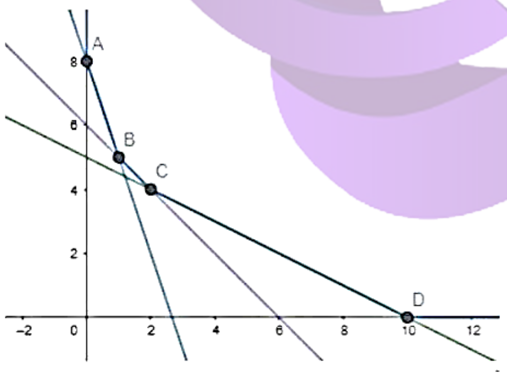
Let x and y be number of kilograms of food X and Y.

∴According to the question,

$x + 2y \geq 10$, $2x + 2y \geq 12, 3x + y \geq 8, x \geq 0, y \geq 0$

Minimize $Z = 6x + 10y$

The feasible region determined $x + 2y \geq 10$, $2x + 2y \geq 12, 3x + y \geq 8, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,8) , B(1,5) , C(2,4) , D(10,0).The value of Z at corner points are

Corner Point	Z = 6x + 10y	
A(0,8)	80	
B(1,5)	56	
C(2,4)	52	Minimum
D(10,0)	60	

The minimum value of Z is 52 at point (2,4).

Hence, the diet should contain 2 kgs of food X and 4 kgs of food Y for the least cost of Rs. 52.

Question: 32

Solution:

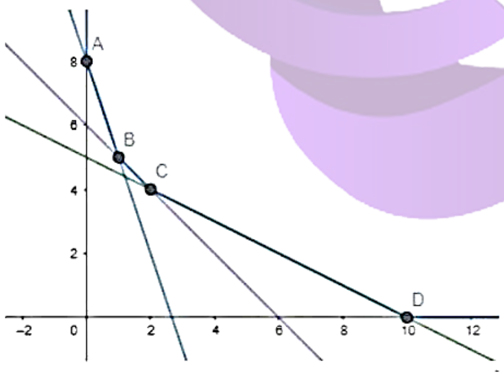
Let x and y be number of kilograms of food X and Y.

∴According to the question,

$x + 2y \geq 10$, $2x + 2y \geq 12, 3x + y \geq 8, x \geq 0, y \geq 0$

Minimize $Z = 6x + 10y$

The feasible region determined $x + 2y \geq 10$, $2x + 2y \geq 12, 3x + y \geq 8, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,8) , B(1,5) , C(2,4) , D(10,0).The value of Z at corner points are

Corner Point	Z = 6x + 10y	
A(0,8)	80	
B(1,5)	56	
C(2,4)	52	Minimum
D(10,0)	60	

The minimum value of Z is 52 at point (2,4).

Hence, the diet should contain 2 kgs of food X and 4 kgs of food Y for the least cost of Rs. 52.

Question: 33

Solution:

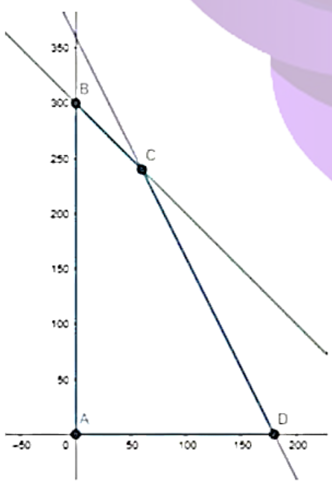
Let the firm manufacture x number of Aand y number of B products.

∴According to the question,

$X + y \leq 300, 2x + y \leq 360, x \geq 0, y \geq 0$

Maximize Z = 5x + 3y

The feasible region determined $X + y \leq 300, 2x + y \leq 360, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,300) , C(60,240) , D(180,0).The value of Z at corner point is

Corner Point	Z = 5x + 3y	
A(0,0)	0	
B(0,300)	900	
C(60,240)	1020	Maximum
D(180,0)	900	

The maximum value of Z is 1020 and occurs at point (60,240).

The firm should produce 60 Aproducts and 240 B products to earn maximum profit of Rs.1020.

Question: 33

Solution:

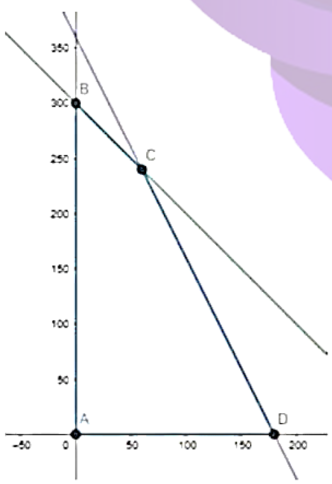
Let the firm manufacture x number of Aand y number of B products.

∴According to the question,

$X + y \leq 300, 2x + y \leq 360, x \geq 0, y \geq 0$

Maximize Z = 5x + 3y

The feasible region determined $X + y \leq 300, 2x + y \leq 360, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,300) , C(60,240) , D(180,0).The value of Z at corner point is

Corner Point	Z = 5x + 3y	
A(0,0)	0	
B(0,300)	900	
C(60,240)	1020	Maximum
D(180,0)	900	

The maximum value of Z is 1020 and occurs at point (60,240).

The firm should produce 60 Aproducts and 240 B products to earn maximum profit of Rs.1020.

Question: 34

Solution:

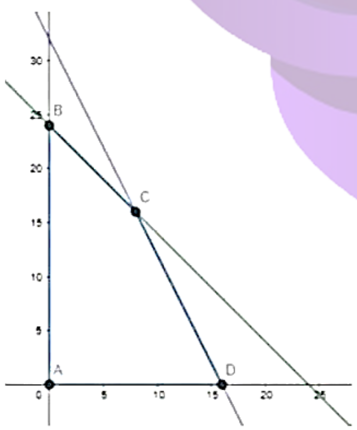
Let the firm manufacture x number of A and y number of B products.

∴According to the question,

$X + y \leq 24, x + 0.5y \leq 16, x \geq 0, y \geq 0$

Maximize Z = 300x + 160y

The feasible region determined $X + y \leq 24, x + 0.5y \leq 16, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,24) , C(8,16) , D(16,0).The value of Z at corner point is

Corner Point	Z = 300x + 160y	
A(0,0)	0	
B(0,24)	3840	
C(8,16)	4960	Maximum
D(16,0)	4800	

The maximum value of Z is 4960 and occurs at point (8,16).

The firm should produce 8 Aproducts and 16 B products to earn maximum profit of Rs.4960.

Question: 34

Solution:

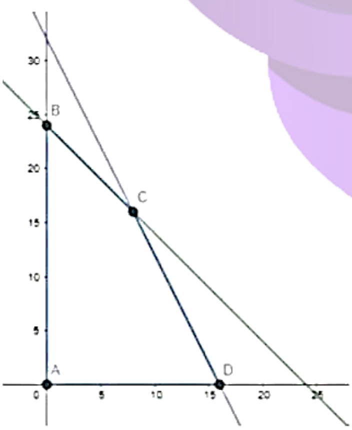
Let the firm manufacture x number of A and y number of B products.

∴According to the question,

$X + y \leq 24, x + 0.5y \leq 16, x \geq 0, y \geq 0$

Maximize Z = 300x + 160y

The feasible region determined $X + y \leq 24, x + 0.5y \leq 16, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,24) , C(8,16) , D(16,0).The value of Z at corner point is

Corner Point	Z = 300x + 160y	
A(0,0)	0	
B(0,24)	3840	
C(8,16)	4960	Maximum
D(16,0)	4800	

The maximum value of Z is 4960 and occurs at point (8,16).

The firm should produce 8 Aproducts and 16 B products to earn maximum profit of Rs.4960.

Question: 35

Solution:

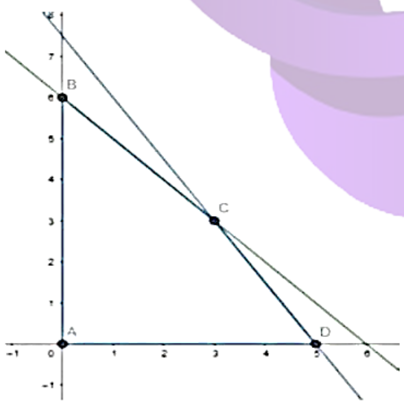
Let the manufacturer manufacture x and y numbers of type 1 and type 2trunks.

∴According to the question,

$3X + 3y \leq 18, 3x + 2y \leq 15, x \geq 0, y \geq 0$

Maximize $Z = 30x + 25y$

The feasible region determined $3X + 3y \leq 18, 3x + 2y \leq 15, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,6) , C(3,3) , D(5,0).The value of Z at corner point is

Corner Point	Z = 30x + 25y	
A(0,0)	0	
B(0,6)	150	
C(3,3)	165	Maximum
D(5,0)	150	

The maximum value of Z is165 and occurs at point (3,3).

The manufacturer should manufacture 3 trunks of each type to earn maximum profit of Rs.165.

Question: 35

Solution:

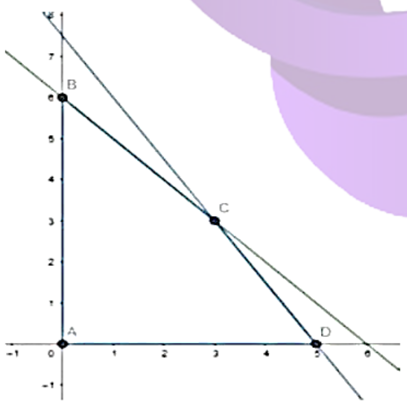
Let the manufacturer manufacture x and y numbers of type 1 and type 2trunks.

∴According to the question,

$3X + 3y \leq 18, 3x + 2y \leq 15, x \geq 0, y \geq 0$

Maximize Z = 30x + 25y

The feasible region determined $3X + 3y \leq 18, 3x + 2y \leq 15, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,6) , C(3,3) , D(5,0).The value of Z at corner point is

Corner Point	Z = 30x + 25y	
A(0,0)	0	
B(0,6)	150	
C(3,3)	165	Maximum
D(5,0)	150	

The maximum value of Z is165 and occurs at point (3,3).

The manufacturer should manufacture 3 trunks of each type to earn maximum profit of Rs.165.

Question: 36

Solution:

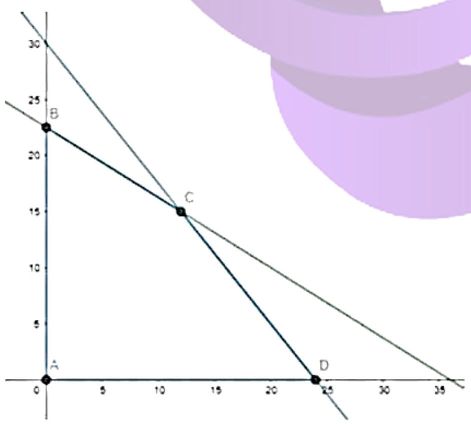
Let the company manufacture x and y numbers of toys A and B.

∴According to the question,

$5X + 8y \leq 180, 10x + 8y \leq 240, x \geq 0, y \geq 0$

Maximize Z = 50x + 60y

The feasible region determined $5X + 8y \leq 180, 10x + 8y \leq 240, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,22.5) , C(12,15) , D(24,0).The value of Z at corner point is

Corner Point	Z = 50x + 60y	
A(0,0)	0	
B(0,22.5)	1350	
C(12,15)	1500	Maximum
D(24,0)	1200	

The maximum value of Z is1500 and occurs at point (12,15).

The company should manufacture 12 A toys and 15 B toys to earn profit of rupees 1500.

Question: 36

Solution:

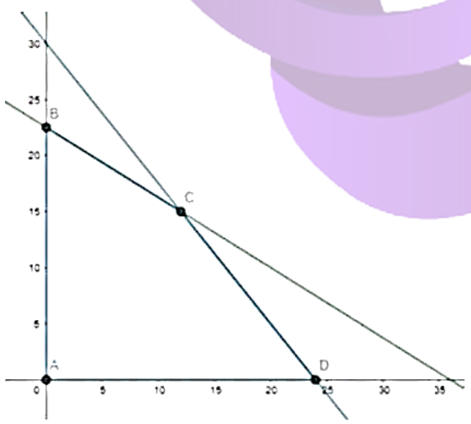
Let the company manufacture x and y numbers of toys A and B.

∴According to the question,

$5X + 8y \leq 180, 10x + 8y \leq 240, x \geq 0, y \geq 0$

Maximize Z = 50x + 60y

The feasible region determined $5X + 8y \leq 180, 10x + 8y \leq 240, x \geq 0, y \geq 0$ is given by



The corner points of feasible region are A(0,0) , B(0,22.5) , C(12,15) , D(24,0).The value of Z at corner point is

Corner Point	Z = 50x + 60y	
A(0,0)	0	
B(0,22.5)	1350	
C(12,15)	1500	Maximum
D(24,0)	1200	

The maximum value of Z is1500 and occurs at point (12,15).

The company should manufacture 12 A toys and 15 B toys to earn profit of rupees 1500.

Question: 37

Solution:

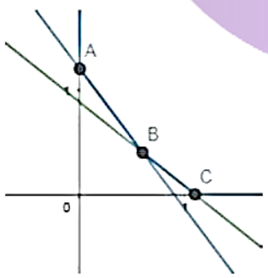
Let x and y be number of kilograms of bran and rice.

∴According to the question,

$80x + 100y \geq 88$, $40x + 30y \geq 36, x \geq 0, y \geq 0$

Minimize Z = 5x + 4y

The feasible region determined $80x + 100y \geq 88$, $40x + 30y \geq 36, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,1.2) , B(0.6,0.4) , C(1.1,0).The value of Z at corner points are

Corner Point	Z = 5x + 4y	
A(0,1.2)	4.8	
B(0.6,0.4)	4.6	Minimum
C(1.1,0)	5.5	

The minimum value of Z is 4.6 at point (0.6,0.4).

Hence, the diet should contain 0.6 kgs of bran and 0.4 kgs of rice for achieving minimum cost of Rs.4.6.

Question: 37

Solution:

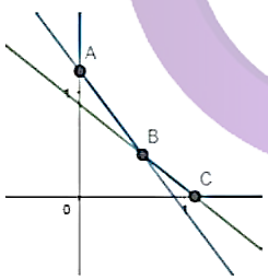
Let x and y be number of kilograms of bran and rice.

∴According to the question,

$80x + 100y \geq 88$, $40x + 30y \geq 36, x \geq 0, y \geq 0$

Minimize $Z = 5x + 4y$

The feasible region determined $80x + 100y \geq 88$, $40x + 30y \geq 36, x \geq 0, y \geq 0$ is given by



The feasible region is unbounded. The corner points of feasible region are A(0,1.2) , B(0.6,0.4) , C(1.1,0).The value of Z at corner points are

Corner Point	Z = 5x + 4y	
A(0,1.2)	4.8	
B(0.6,0.4)	4.6	Minimum
C(1.1,0)	5.5	

The minimum value of Z is 4.6 at point (0.6,0.4).

Hence, the diet should contain 0.6 kgs of bran and 0.4 kgs of rice for achieving minimum cost of Rs.4.6.

Question: 38

Solution:

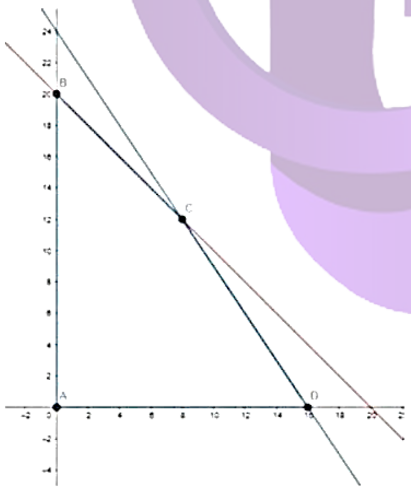
Let the number of fans bought be x and sewing machines bought be y.

∴According to the question,

$360x + 240y \leq 5760, x + y \leq 20, x \geq 0, y \geq 0$

Maximize $Z = 22x + 18y$

The feasible region determined by $360x + 240y \leq 5760, x + y \leq 20, x \geq 0, y \geq 0$ is given by



The corner points of the feasible region are A(0,0) , B(0,20),C(8,12) , D(16,0).The value of Z at corner points is

Corner Point	Z = 22x + 18y	
A(0,0)	0	
B(0,20)	360	
C(8,12)	392	Maximum
D(16,0)	352	

The maximum value of Z is 392 at point (8,12).

The dealer must buy 8 fans and 12 sewing machines to make the maximum profit.

Question: 38

Solution:

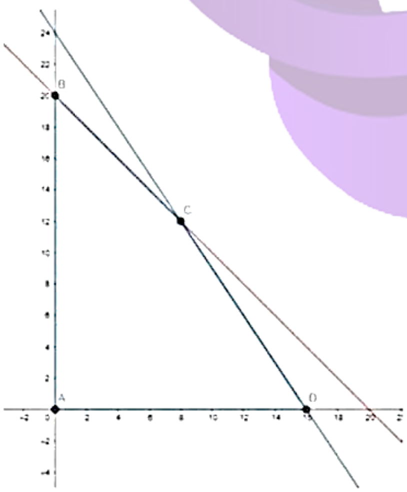
Let the number of fans bought be x and sewing machines bought be y.

∴According to the question,

$360x + 240y \leq 5760, x + y \leq 20, x \geq 0, y \geq 0$

Maximize Z = 22x + 18y

The feasible region determined by $360x + 240y \leq 5760, x + y \leq 20, x \geq 0, y \geq 0$ is given by



The corner points of the feasible region are A(0,0) , B(0,20),C(8,12) , D(16,0).The value of Z at corner points is

Corner Point	Z = 22x + 18y	
A(0,0)	0	
B(0,20)	360	
C(8,12)	392	Maximum
D(16,0)	352	

The maximum value of Z is 392 at point (8,12).

The dealer must buy 8 fans and 12 sewing machines to make the maximum profit.

Question: 39

Solution:

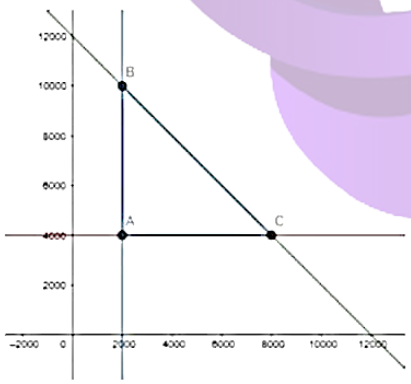
Let the invested money in bond A be x and in bond B be y.

∴According to the question,

$X + y \leq 12000$, $x \geq 2000$, $y \geq 4000$

Maximize Z = 0.08x + 0.10y

The feasible region determined by $X + y \leq 12000$, $x \geq 2000$, $y \geq 4000$ is given by



The corner points of the feasible region are A(2000,4000) , B(2000,10000) and C(8000,4000) .
The value of Z at the corner point are

Corner Point	Z = 0.08x + 0.10y	
A(2000,4000)	560	
B(2000,10000)	1160	Maximum
C(8000,4000)	1040	

The maximum value of Z is 116770 at point (2000,10000)

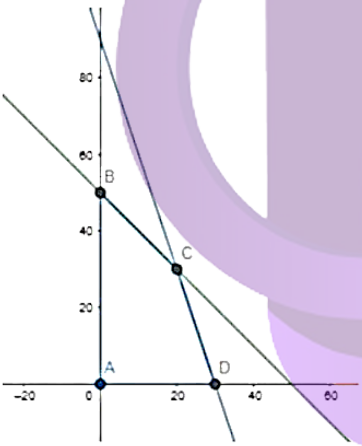
So, he must invest Rs.2000 in bond A and Rs.10000 in bond B.

The maximum annual income is Rs.1160 .

Question: 40

Solution:

The feasible region determined by the constraints $x + y \leq 50$, $3x + y \leq 90$, $x, y \geq 0$. is given by



The corner points of feasible region are A(0,0) ,B(0,50) ,C(20,30), D(30,0) . The values of Z at the following points is

Corner Point	Z = 60x + 15y	
A(0,0)	0	
B(0,50)	750	
C(20,30)	1650	
D(30,0)	1800	Maximum

The maximum value of Z is 1800 at point A(30,0) .