Exercise – 3A

1. **Sol**:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' representing the x-axis and y-axis, respectively.

Graph of 2x + 3y = 2

$2x + 3y = 2$

$\Rightarrow 3y = (2 - 2x)$

$\Rightarrow 3y = 2(1 - x)$

$\Rightarrow y = \frac{2(1-x)}{3}$ …(i)

Putting x = 1, we get y = 0

Putting x = -2, we get y = 2

Putting x = 4, we get y = -2

Thus, we have the following table for the equation 2x + 3y = 2

x	1	-2	4
y	0	2	-2

Now, plot the points A(1, 0), B(-2, 2) and C(4, -2) on the graph paper.

Join AB and AC to get the graph line BC. Extend it on both ways.

Thus, the line BC is the graph of 2x + 3y = 2.

Graph of x - 2y = 8

$x - 2y = 8$

$\Rightarrow 2y = (x - 8)$

$\Rightarrow y = \frac{x-8}{2}$ …(ii)

Putting x = 2, we get y = -3

Putting x = 4, we get y = -2

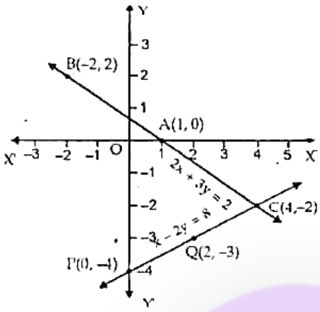
Putting x = 0, we get y = -4

Thus, we have the following table for the equation x – 2y = 8.

x	2	4	0
y	-3	-2	-4

Now, plot the points P(0, -4) and Q(2, -3). The point C(4, -2) has already been plotted. Join PQ and QC and extend it on both ways.

Thus, line PC is the graph of x – 2y = 8.



The two graph lines intersect at C(4, -2).

∴ x = 4 and y = -2 are the solutions of the given system of equations.

2. Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' representing the x-axis and y-axis, respectively.

Graph of 3x + 2y = 4

$3x + 2y = 4$

$\Rightarrow 2y = (4 - 3x)$

$\Rightarrow y = \frac{4 - 3x}{2}$ …(i)

Putting x = 0, we get y = 2

Putting x = 2, we get y = -1

Putting x = -2, we get y = 5

Thus, we have the following table for the equation 3x + 2y = 4

x	0	2	-2
y	2	-1	5

Now, plot the points A(0, 2), B(2, -1) and C(-2, 5) on the graph paper.

Join AB and AC to get the graph line BC. Extend it on both ways.

Thus, BC is the graph of 3x + 2y = 4.

Graph of 2x - 3y = 7

$2x - 3y = 7$

$\Rightarrow 3y = (2x - 7)$

$\Rightarrow y = \frac{2x - 7}{3}$ …(ii)

Putting x = 2, we get y = -1

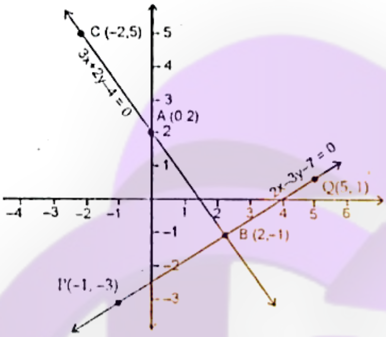
Putting x = -1, we get y = -3

Putting x = 5, we get y = 1

Thus, we have the following table for the equation 2x – 3y = 7.

x	2	-1	5
y	-1	-3	1

Now, plot the points P(-1, -3) and Q(5, 1). The point C(2, -1) has already been plotted. JoinPB and QB and extend it on both ways.
Thus, line PQ is the graph of 2x – 3y = 7.



The two graph lines intersect at B(2, -1).

∴x = 2 and y = -1 are the solutions of the given system of equations.

3. **Sol:**
On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of 2x + 3y = 8

2x + 3y = 8

⇒3y = (8 – 2x)

⇒ $y = \frac{8-2x}{3}$ …(i)

Putting x = 1, we get y = 2.
Putting x = -5, we get y = 6.
Putting x = 7, we get y = -2.
Thus, we have the following table for the equation 2x + 3y = 8.

x	1	-5	7
y	2	6	-2

Now, plot the points A(1, 2), B(5, -6) and C(7, -2) on the graph paper.
Join AB and AC to get the graph line BC. Extend it on both ways.
Thus, BC is the graph of 2x + 3y = 8.

Graph of x - 2y + 3 = 0

$x – 2y + 3 = 0$

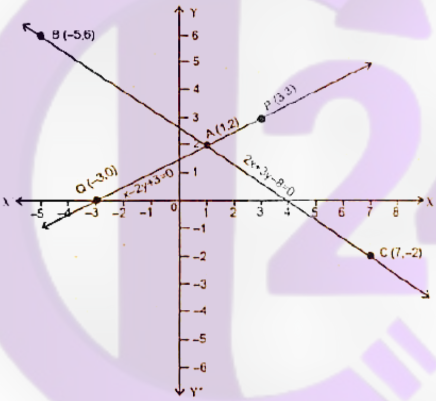
$\Rightarrow 2y = (x + 3)$

$\Rightarrow y = \frac{x+3}{2}$ …(ii)

Putting x = 1, we get y = 2.
Putting x = 3, we get y = 3.
Putting x = -3, we get y = 0.
Thus, we have the following table for the equation $x – 2y + 3 = 0$.

x	1	3	-3
y	2	3	0

Now, plot the points P (3, 3) and Q (-3, 0). The point A (1, 2) has already been plotted. Join AP and QA and extend it on both ways.
Thus, PQ is the graph of $x – 2y + 3 = 0$.



The two graph lines intersect at A (1, 2).

∴ x = 1 and y = 2.

4. Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of 2x - 5y + 4 = 0

$2x – 5y + 4 = 0$

$\Rightarrow 5y = (2x + 4)$

$\Rightarrow y = \frac{2x+4}{5}$ …(i)

Putting x = -2, we get y = 0.
Putting x = 3, we get y = 2.
Putting x = 8, we get y = 4.
Thus, we have the following table for the equation 2x - 5y + 4 = 0.

x	-2	3	8
y	0	2	4

Now, plot the points A (-2, 0), B (3, 2) and C(8, 4) on the graph paper.
Join AB and BC to get the graph line AC. Extend it on both ways.
Thus, AC is the graph of 2x - 5y + 4 = 0.

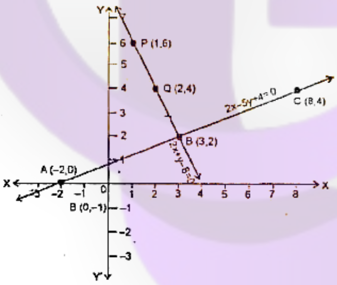
Graph of 2x + y - 8 = 0

2x + y - 8 = 0

⇒ y = (8 – 2x) …(ii)
Putting x = 1, we get y = 6.
Putting x = 3, we get y = 2.
Putting x = 2, we get y = 4.
Thus, we have the following table for the equation 2x + y - 8 = 0.

x	1	3	2
y	6	2	4

Now, plot the points P (1, 6) and Q (2, 4). The point B (3, 2) has already been plotted. Join PQ and QB and extend it on both ways.
Thus, PB is the graph of 2x + y - 8 = 0.



The two graph lines intersect at B (3, 2).

∴x = 3 and y = 2

5. **Sol:**

The given equations are:
3x + 2y = 12 …..(i)

5x – 2y = 4 …..(ii)

From (i), write y in terms of x

$y = \frac{12 - 3x}{2}$ …..(iii)

Now, substitute different values of x in (iii) to get different values of y

For x = 0, $y = \frac{12 - 3x}{2} = \frac{12 - 0}{2} = 6$

For x = 2, $y = \frac{12 - 3x}{2} = \frac{12 - 6}{2} = 3$

For x = 4, $y = \frac{12 - 3x}{2} = \frac{12 - 12}{2} = 0$

Thus, the table for the first equation (3x + 2y = 12) is

x	0	2	4
y	6	3	0

Now, plot the points A (0, 6), B(2, 3) and C(4, 0) on a graph paper and joinA, B and C to get the graph of 3x + 2y = 12.

From (ii), write y in terms of x

$y = \frac{5x - 4}{2}$ ….(iv)

Now, substitute different values of x in (iv) to get different values of y

For x = 0, $y = \frac{5x - 4}{2} = \frac{0 - 4}{2} = -2$

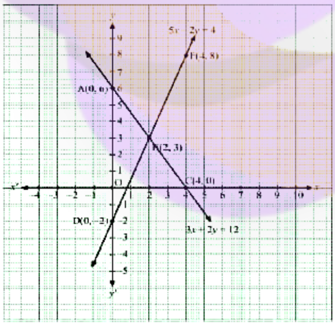
For x = 2, $y = \frac{5x - 4}{2} = \frac{10 - 4}{2} = 3$

For x = 4, $y = \frac{5x - 4}{2} = \frac{20 - 4}{2} = 8$

Thus, the table for the first equation (5x – 2y = 4) is

x	0	2	4
y	-2	3	8

Now, plot the points D (0, -2), E (2, 3) and F (4, 8) on the same graph paper and join D, E and F to get the graph of 5x – 2y = 4.



From the graph it is clear that, the given lines intersect at (2, 3).

Hence, the solution of the given system of equations is (2, 3).

6.

Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of $3x + y + 1 = 0$

$3x + y + 1 = 0$

$\Rightarrow y = (-3x - 1)$ ...(i)

Putting x = 0, we get y = -1.

Putting x = -1, we get y = 2.

Putting x = 1, we get y = -4.

Thus, we have the following table for the equation $3x + y + 1 = 0$.

x	0	-1	1
y	-1	2	-4

Now, plot the points A(0, -1), B(-1, 2) and C(1, -4) on the graph paper.Join AB and AC to get the graph line BC. Extend it on both ways.

Thus, BC is the graph of $3x + y + 1 = 0$.

Graph of $2x - 3y + 8 = 0$

$2x - 3y + 8 = 0$

$\Rightarrow 3y = (2x + 8)$

$\therefore y = \frac{2x+8}{3}$

Putting x = -1, we get y = 2.

Putting x = 2, we get y = 4.

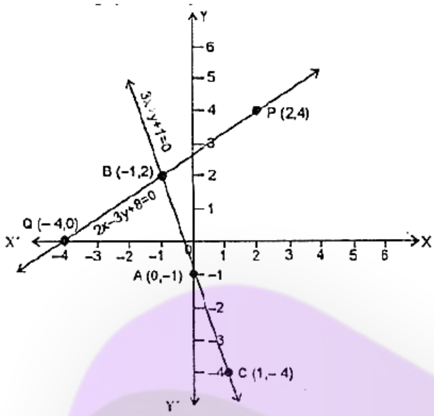
Putting x = -4, we get y = 0.

Thus, we have the following table for the equation $2x - 3y + 8 = 0$.

x	-1	2	-4
y	2	4	0

Now, plot the points P(2, 4) and Q(-4, 0). The point B(-1, 2) has already been plotted. JoinPB and BQ and extend it on both ways.

Thus, PQ is the graph of $2x + y - 8 = 0$.



The two graph lines intersect at B (-1. 2).

∴x = -1 and y = 2

7. **Sol:**

From the first equation, write y in terms of x

$y = -\left(\frac{5+2x}{3}\right)$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = -1, $y = -\frac{5-2}{3} = -1$

For x = 2, $y = -\frac{5+4}{3} = -3$

For x = 5, $y = -\frac{5+10}{3} = -5$

Thus, the table for the first equation (2x + 3y + 5 = 0) is

x	-1	2	5
y	-1	-3	-5

Now, plot the points A (-1, -1), B (2, -3) and C (5, -5) on a graph paper and join them to get the graph of 2x + 3y + 5 = 0.

From the second equation, write y in terms of x

$y = \frac{3x-12}{2}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = 0, $y = \frac{0-12}{2} = -6$

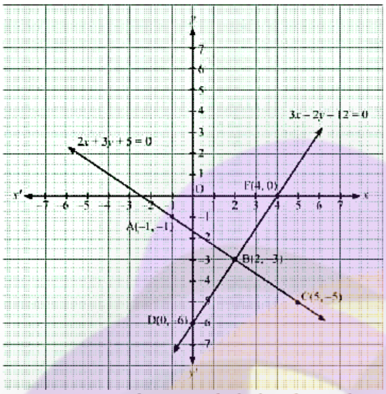
For x = 2, $y = \frac{6-12}{2} = -3$

For x = 4, $y = \frac{12-12}{2} = 0$

So, the table for the second equation (3x – 2y – 12 = 0) is

x	0	2	4
y	-6	-3	0

Now, plot the points D (0, -6), E (2, -3) and F (4, 0) on the same graph paper and join D, E and F to get the graph of 3x – 2y – 12 = 0.



From the graph it is clear that, the given lines intersect at (2, -3).

Hence, the solution of the given system of equation is (2, -3).

8. **Sol:**

From the first equation, write y in terms of x

$y = \frac{2x + 13}{3}$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = -5, $y = \frac{-10 + 13}{3} = 1$

For x = 1, $y = \frac{2 + 13}{3} = 5$

For x = 4, $y = \frac{8 + 13}{3} = 7$

Thus, the table for the first equation (2x - 3y + 13 = 0) is

x	-5	1	4
y	1	5	7

Now, plot the points A (-5, 1), B (1, 5) and C (4, 7) on a graph paper and join A, B and C toget the graph of 2x - 3y + 13 = 0.

From the second equation, write y in terms of x

$y = \frac{3x + 12}{2}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = -4, $y = \frac{-12+12}{2} = 0$

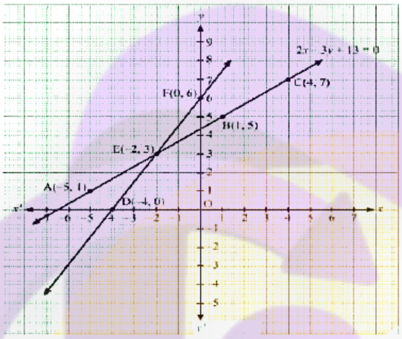
For x = -2, $y = \frac{-6+12}{2} = 3$

For x = 0, $y = \frac{0+12}{2} = 6$

So, the table for the second equation (3x – 2y + 12 = 0) is

x	-4	-2	0
y	0	3	6

Now, plot the points D (-4, 0), E (-2, 3) and F (0, 6) on the same graph paper and join D, E and F to get the graph of 3x – 2y + 12 = 0.



From the graph, it is clear that, the given lines intersect at (-2, 3).
Hence, the solution of the given system of equation is (-2, 3).

9. **Sol**:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of 2x + 3y = 4

2x + 3y = 4

⇒ 3y = (4 – 2x)

∴ $y = \frac{4-2x}{3}$ …(i)

Putting x = -1, we get y = 2.
Putting x = 2, we get y = 0.
Putting x = 5, we get y = -2.
Thus, we have the following table for the equation 2x + 3y = 4.

x	-1	2	5
y	2	0	-2

Now, plot the points A (-1, 2), B (2, 0) and C (5, -2) on the graph paper.
Join AB and BC to get the graph line AC. Extend it on both ways.
Thus, AC is the graph of 2x + 3y = 4.

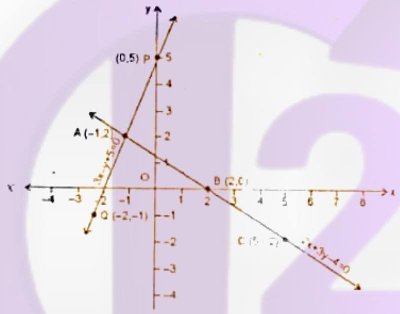
Graph of 3x – y = -5

3x – y = -5

⇒ y = (3x + 5)................(ii)
Putting x = -1, we get y = 2. Putting
x = 0, we get y = 5. Putting x = -2,
we get y = -1.
Thus, we have the following table for the equation 3x – y = -5.

x	-1	0	-2
y	2	5	-1

Now, plot the points P (0, 5) and Q (-2, -1). The point A (-1, 2) has already been plotted.
Join PA and QA and extend it on both ways.
Thus, PQ is the graph of 3x - y = - 5.



The two graph lines intersect at A (-1. 2).

∴x = -1 and y = 2 are the solutions of the given system of equations.

10. **Sol:**

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of 2x + 3y = 4

x + 2y + 2 = 0

⇒2y = (–2 – x)

∴ $y = \frac{-2-x}{2}$ …(i)

Putting x = -2, we get y = 0.
Putting x = 0, we get y = -1.
Putting x = 2, we get y = -2.
Thus, we have the following table for the equation x + 2y + 2 = 0.

x	-2	0	2
y	0	-1	-2

Now, plot the points A (-2, 0), B (0, -1) and C (2, -2) on the graph paper.
Join AB and BC to get the graph line AC. Extend it on both ways.
Thus, AC is the graph of x + 2y + 2 = 0.

Graph of 3x + 2y - 2 = 0

$3x + 2y - 2 = 0$

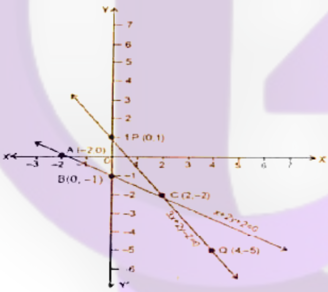
$\Rightarrow 2y = (2 - 3x)$

$\therefore \quad y = \frac{2 - 3x}{2}$ ……..(ii)

Putting x = 0, we get y = 1.
Putting x = 2, we get y = -2.
Putting x = 4, we get y = -5.
Thus, we have the following table for the equation 3x + 2y – 2 = 0.

x	0	2	4
y	1	-2	-5

Now, plot the points P (0, 1) and Q(4, -5). The point C(2, -2) has already been plotted. JoinPC and QC and extend it on both ways.
Thus, PQ is the graph of 3x + 2y – 2 = 0.



The two graph lines intersect at A(2, -2).

$\therefore$x = 2 and y = -2.

11.

Sol:
From the first equation, write y in terms of xy
= x + 3 …….(i)
Substitute different values of x in (i) to get different values of y
For x = -3, y = -3 + 3 = 0

For x = -1, y = -1 + 3 = 2
For x = 1, y = 1 + 3 = 4
Thus, the table for the first equation (x - y + 3 = 0) is

x	-3	-1	1
y	0	2	4

Now, plot the points A(-3, 0), B(-1, 2) and C(1, 4) on a graph paper and join A, B and C to get the graph of x - y + 3 = 0.

From the second equation, write y in terms of x

$y = \frac{4-2x}{3}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = -4, $y = \frac{4+8}{3} = 4$

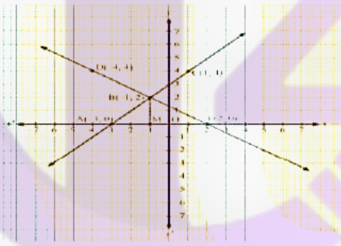
For x = -1, $y = \frac{4+12}{3} = 2$

For x = 2, $y = \frac{4-4}{3} = 0$

So, the table for the second equation (2x + 3y - 4 = 0) is

x	-4	-1	2
y	4	2	0

Now, plot the points D(-4, 4), E(-1, 2) and F(2, 0) on the same graph paper and join D, E and F to get the graph of 2x + 3y - 4 = 0.



From the graph, it is clear that, the given lines intersect at (-1, 2).
So, the solution of the given system of equation is (-1, 2).
The vertices of the triangle formed by the given lines and the x-axis are (-3, 0), (-1, 2) and(2, 0).
Now, draw a perpendicular from the intersection point E on the x-axis. So,

Area (ΔEAF) = $\frac{1}{2} \times AF \times EM$

$= \frac{1}{2} \times 5 \times 2$

= 5 sq. units

Hence, the vertices of the triangle formed by the given lines and the x-axis are (-3, 0), (-1,2) and (2, 0) and its area is 5 sq. units.

12.

Sol:

From the first equation, write y in terms of x

$y = \frac{2x + 4}{3}$ ....(i)

Substitute different values of x in (i) to get different values of y

For $x = -2$, $y = \frac{-4 + 4}{3} = 0$

For $x = 1$, $y = \frac{2 + 4}{3} = 2$

For $x = 4$, $y = \frac{8 + 4}{3} = 4$

Thus, the table for the first equation $(2x - 3y + 4 = 0)$ is

x	-2	1	4
y	0	2	4

Now, plot the points A(-2, 0), B(1, 2) and C(4, 4) on a graph paper and join A, B and C toget the graph of $2x - 3y + 4 = 0$.

From the second equation, write y in terms of x

$y = \frac{5 - x}{2}$ ....(ii)

Now, substitute different values of x in (ii) to get different values of y

For $x = -3$, $y = \frac{5+3}{2} = 4$

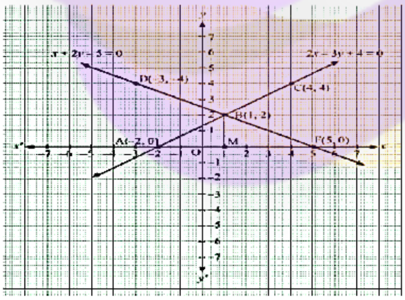
For $x = 1$, $y = \frac{5-1}{2} = 2$

For $x = 5$, $y = \frac{5 - 5}{2} = 0$

So, the table for the second equation $(x + 2y - 5 = 0)$ is

x	-3	1	5
y	4	2	0

Now, plot the points D(-3, 4), B(1, 2) and F(5, 0) on the same graph paper and join D, E and F to get the graph of $x + 2y - 5 = 0$.



From the graph, it is clear that, the given lines intersect at (1, 2).

So, the solution of the given system of equation is (1, 2).

From the graph, the vertices of the triangle formed by the given lines and the x-axis are (-2,0), (1, 2) and (5, 0).

Now, draw a perpendicular from the intersection point B on the x-a: CLASS24

Area (ΔBAF) = $\frac{1}{2}$ × AF × BM

= $\frac{1}{2}$ × 7 × 2

= 7 sq. units

Hence, the vertices of the triangle formed by the given lines and the x-axis are (-2, 0), (1, 2) and (5, 0) and the area of the triangle is 7 sq. units.

13. Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of 4x - 3y + 4 = 0

4x - 3y + 4 = 0

⇒ 3y = (4x + 4)

∴ $y = \frac{4x+4}{3}$ …(i)

Putting x = -1, we get y = 0.

Putting x = 2, we get y = 4.

Putting x = 5, we get y = 8.

Thus, we have the following table for the equation 4x - 3y + 4 = 0.

x	-1	2	5
y	0	4	8

Now, plot the points A(-1, 0), B(2, 4) and C(5, 8) on the graph paper.

Join AB and BC to get the graph line AC. Extend it on both ways.

Thus, AC is the graph of 4x - 3y + 4 = 0.

Graph of 4x + 3y - 20 = 0

4x + 3y - 20 = 0

⇒ 3y = (–4x + 20)

∴ $y = \frac{-4x+20}{3}$ ……..(ii)

Putting x = 2, we get y = 4.

Putting x = -1, we get y = 8.

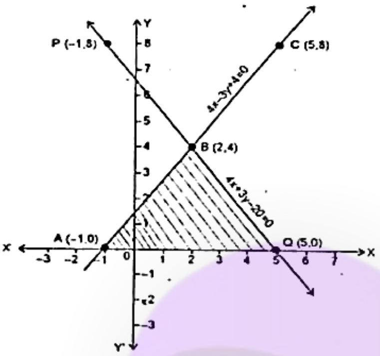
Putting x = 5, we get y = 0.

Thus, we have the following table for the equation 4x + 3y - 20 = 0.

x	2	-1	5
y	4	8	0

Now, plot the points P(1, -8) and Q(5, 0). The point B(2, 4) has already been plotted. JoinPB and QB to get the graph line. Extend it on both ways.

Then, line PQ is the graph of the equation 4x + 3y - 20 = 0.



The two graph lines intersect at B(2, 4).

∴ The solution of the given system of equations is x = 2 and y = 4.
Clearly, the vertices of ΔABQ formed by these two lines and the x-axis are Q(5, 0), B(2, 4) and A(-1, 0).
Now, consider ΔABQ.
Here, height = 4 units and base (AQ) = 6 units

∴ Area $\Delta ABQ = \frac{1}{2} \times \text{base} \times \text{height}$ sq. units

$= \frac{1}{2} \times 6 \times 4$

= 12 sq. units.

14. **Sol:**

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of x - y + 1 = 0

x - y + 1 = 0

⇒y = x + 1 …(i)
Putting x = -1, we get y = 0.
Putting x = 1, we get y = 2.
Putting x = 2, we get y = 3.
Thus, we have the following table for the equation x - y + 1 = 0.

x	-1	1	2
y	0	2	3

Now, plot the points A(-1, 0), B(1, 2) and C(2, 3) on the graph paper.
Join AB and BC to get the graph line AC. Extend it on both ways.

Thus, AC is the graph of x - y + 1 = 0.

Graph of 3x + 2y - 12 = 0

3x + 2y - 12 = 0

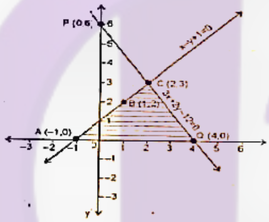
⇒ 2y = (–3x + 12)

∴ $y = \frac{-3x + 12}{2}$ ……..(ii)

Putting x = 0, we get y = 6.
Putting x = 2, we get y = 3.
Putting x = 4, we get y = 0.
Thus, we have the following table for the equation 3x + 2y - 12 = 0.

x	0	2	4
y	6	3	0

Now, plot the points P(0, 6) and Q(4, 0). The point B(2, 3) has already been plotted. JoinPC and CQ to get the graph line PQ. Extend it on both ways.
Then, PQ is the graph of the equation 3x + 2y - 12 = 0.



The two graph lines intersect at C(2, 3).

∴ The solution of the given system of equations is x = 2 and y = 3.
Clearly, the vertices of ΔACQ formed by these two lines and the x-axis are Q(4, 0), C(2, 3) and A(-1, 0).
Now, consider ΔACQ.
Here, height = 3 units and base (AQ) = 5 units

∴ Area ΔACQ = $\frac{1}{2}$ × base × height sq. units

= $\frac{1}{2}$ × 5 × 3

= 7.5 sq. units.

15. Sol:

From the first equation, write y in terms of x

$y = \frac{x + 2}{2}$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = -2, $y = \frac{-2+2}{2} = 0$

For x = 2, $y = \frac{2+2}{2} = 2$

For x = 4, $y = \frac{4+2}{2} = 3$

Thus, the table for the first equation (x - 2y + 2 = 0) is

x	-2	2	4
y	0	2	3

Now, plot the points A(-2, 0), B(2, 2) and C(4, 3) on a graph paper and join A, B and C toget the graph of x - 2y + 2 = 0.

From the second equation, write y in terms of xy

= 6 – 2x ....(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = 1, y = 6 – 2 = 4

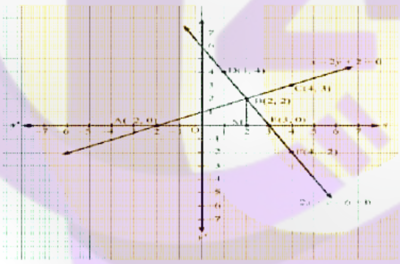
For x = 3, y = 0

For x = 4, y = 6 – 8 = -2

So, the table for the second equation (2x + y - 6 = 0) is

x	1	3	4
y	4	0	-2

Now, plot the points D(1, 4), E(3, 0) and F(4, -2) on the same graph paper and join D, E and F to get the graph of 2x + y - 6 = 0.



From the graph, it is clear that, the given lines intersect at (2, 2).

So, the solution of the given system of equation is (2, 2).

From the graph, the vertices of the triangle formed by the given lines and the x-axis are (-2,0), (2, 2) and (3, 0).

Now, draw a perpendicular from the intersection point B on the x-axis. So,

Area (ΔBAE) = $\frac{1}{2} \times AE \times BM$

$= \frac{1}{2} \times 5 \times 2$

= 5 sq. units

Hence, the vertices of the triangle formed by the given lines and the x-axis are (-2, 0), (2, 2) and (3, 0) and the area of the triangle is 5 sq. units.

16.

Sol:

From the first equation, write y in terms of x

$y = \frac{2x+6}{3}$ ....(i)

Substitute different values of x in (i) to get different values of y

For x = -3, $y = \frac{-6+6}{3} = 0$

For x = 0, $y = \frac{0+6}{3} = 2$

For x = 3, $y = \frac{6+6}{3} = 4$

Thus, the table for the first equation (2x - 3y + 6 = 0) is

x	-3	0	3
y	0	2	4

Now, plot the points A(-3, 0), B(0, 2) and C(3, 4) on a graph paper and join A, B and C toget the graph of 2x - 3y + 6 = 0.

From the second equation, write y in terms of x

$y = \frac{18-2x}{3}$ ....(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = 0, $y = \frac{18-0}{3} = 6$

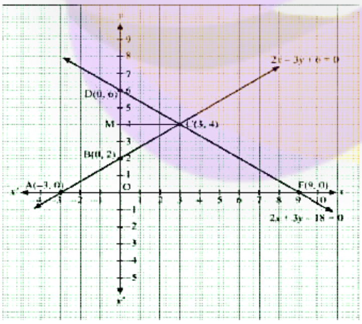
For x = 3, $y = \frac{18-6}{3} = 4$

For x = 9, $y = \frac{18-18}{3} = 0$

So, the table for the second equation (2x + 3y - 18 = 0) is

x	0	3	9
y	6	4	0

Now, plot the points D(0, 6), E(3, 4) and F(9, 0) on the same graph paper and join D, E andF to get the graph of 2x + 3y - 18 = 0.



From the graph, it is clear that, the given lines intersect at (3, 4).

So, the solution of the given system of equation is (3, 4).

From the graph, the vertices of the triangle formed by the given line 2), (0, 6) and (3, 4).

Now, draw a perpendicular from the intersection point E (or C) on the y-axis. So,

Area (ΔEDB) = $\frac{1}{2}$ × BD × EM

= $\frac{1}{2}$ × 4 × 3

=6 sq. units

Hence, the vertices of the triangle formed by the given lines and the y-axis are (0, 2), (0, 6) and (3, 4) and the area of the triangle is 6 sq. units.

17. Sol:

From the first equation, write y in terms of xy

= 4x – 4 …….(i)

Substitute different values of x in (i) to get different values of y

For x = 0, y = 0 – 4 = -4

For x = 1, y = 4 – 4 = 0

For x = 2, y = 8 – 4 = 4

Thus, the table for the first equation (4x - y – 4 = 0) is

x	0	1	2
y	-4	0	4

Now, plot the points A(0, -4), B(1, 0) and C(2, 4) on a graph paper and join A, B and C toget the graph of 4x – y – 4 = 0.

From the second equation, write y in terms of x

y = $\frac{14-3x}{2}$ …….(ii) 2y = 14 – 3x - 3x = 2y - 14

Now, substitute different values of x in (ii) to get different values of y

For x = 0, y = $\frac{14-0}{2}$ = 7

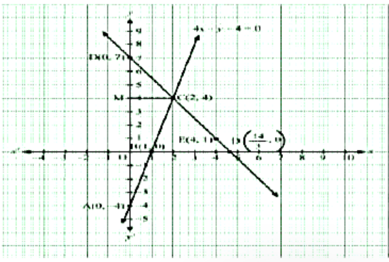
For x = 4, y = $\frac{14-12}{2}$ = 1

For x = $\frac{14}{3}$, y = $\frac{14-14}{2}$ = 0

So, the table for the second equation (3x + 2y - 14 = 0) is

x	0	4	$\frac{14}{3}$
y	7	1	0

Now, plot the points D(0, 7), E(4, 1) and F($\frac{14}{3}$, 0) on the same graph paper and join D, E and F to get the graph of 3x + 2y - 14 = 0.



From the graph, it is clear that, the given lines intersect at (2, 4).
So, the solution of the given system of equation is (2, 4).
From the graph, the vertices of the triangle formed by the given lines and the y-axis are 0,7), (0, -4) and (2, 4).
Now, draw a perpendicular from the intersection point C on the y-axis. So,

Area (ΔDAB) $= \frac{1}{2} \times DA \times CM$

$= \frac{1}{2} \times 11 \times 2$

= 11 sq. units

Hence, the vertices of the triangle formed by the given lines and the y-axis are (0, 7), (0, -4) and (2, 4) and the area of the triangle is 11 sq. units.

18. Sol:

From the first equation, write y in terms of xy
= x – 5 …….(i)
Substitute different values of x in (i) to get different values of y
For x = 0, y = 0 – 5 = -5
For x = 2, y = 2 – 5 = -3
For x = 5, y = 5 – 5 = 0
Thus, the table for the first equation (x – y – 5 = 0) is

x	0	2	5
y	-5	-3	0

Now, plot the points A(0, -5), B(2, -3) and C(5, 0) on a graph paper and join A, B and C toget the graph of x – y – 5 = 0.
From the second equation, write y in terms of x

$y = \frac{15-3x}{5}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = -5, $y = \frac{15+15}{5} = 6$

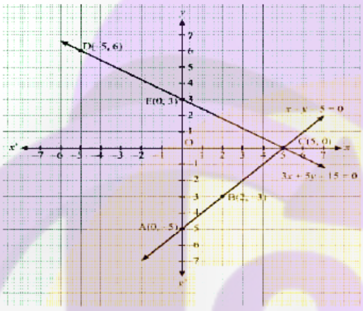
For x = 0, $y = \frac{15-0}{5} = 3$

For x = 5, $y = \frac{15-15}{5} = 0$

So, the table for the second equation (3x + 5y - 15 = 0) is

x	-5	0	5
y	6	3	0

Now, plot the points D(-5, 6), E(0, 3) and F(5, 0) on the same graph paper and join D, E and F to get the graph of 3x + 5y - 15 = 0.



From the graph, it is clear that, the given lines intersect at (5, 0).

So, the solution of the given system of equation is (5, 0).

From the graph, the vertices of the triangle formed by the given lines and the y-axis are 0,3), (0, -5) and (5, 0).

Now, draw a perpendicular from the intersection point C on the y-axis. So,

Area (ΔCEA) = $\frac{1}{2} \times EA \times OC$

$= \frac{1}{2} \times 8 \times 5$

= 20 sq. units

Hence, the vertices of the triangle formed by the given lines and the y-axis are (0, 3), (0, -5) and (5, 0) and the area of the triangle is 20 sq. units.

19. Sol:

From the first equation, write y in terms of x

$y = \frac{2x+4}{5}$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = -2, $y = \frac{-4+4}{5} = 0$

For x = 0, y = $\frac{0+4}{5} = \frac{4}{5}$

For x = 3, y = $\frac{6+4}{5} = 2$

Thus, the table for the first equation (2x – 5y + 4 = 0) is

x	-2	0	3
y	0	$\frac{4}{5}$	2

Now, plot the points A(-2, 0), B(0, $\frac{4}{5}$) and C(3, 2) on a graph paper and join A, B and C to get the graph of 2x – 5y + 4 = 0.

From the second equation, write y in terms of xy

= 8 – 2x ……..(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = 0, y = 8 – 0 = 8

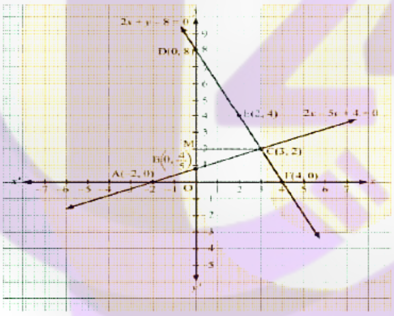
For x = 2, y = 8 – 4 = 3

For x = 4, y = 8 – 8 = 0

So, the table for the second equation (2x – 5y + 4 = 0) is

x	0	2	4
y	8	4	0

Now, plot the points D(0, 8), E(2, 4) and F(4, 0) on the same graph paper and join D, E andF to get the graph of 2x + y - 8 = 0.



From the graph, it is clear that, the given lines intersect at (3, 2).

So, the solution of the given system of equation is (3, 2).

The vertices of the triangle formed by the system of equations and y-axis are (0, 8), (0, $\frac{4}{5}$) and (3, 2).

Draw a perpendicular from point C on the y-axis. So,

Area (ΔDBC) = $\frac{1}{2} \times DB \times CM$

$= \frac{1}{2} \times (8 - \frac{4}{5}) \times 3$

$= \frac{54}{5}$ sq. units

Hence, the vertices of the triangle are (0, 8), (0, $\frac{4}{5}$) and (3, 2) and its area is $\frac{54}{5}$ sq. units.

20. Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line Y axis, respectively.

Graph of 5x - y = 7

5x - y = 7

$\Rightarrow$ y = (5x – 7) …(i)
Putting x = 0, we get y = -7.
Putting x = 1, we get y = -2.
Putting x = 2, we get y = 3.
Thus, we have the following table for the equation 5x - y = 7.

x	0	1	2
y	-7	-2	3

Now, plot the points A(0, -7), B(1, -2) and C(2, 3) on the graph paper.
Join AB and BC to get the graph line AC. Extend it on both ways.
Thus, AC is the graph of 5x - y = 7.

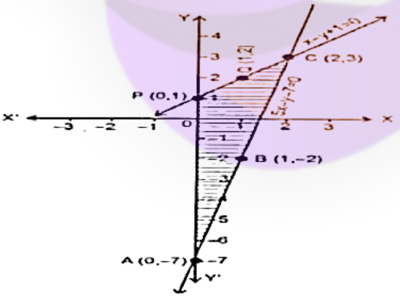
Graph of x - y + 1 = 0

x - y + 1 = 0

$\Rightarrow$ y = x + 1 .... (ii)
Putting x = 0, we get y = 1.
Putting x = 1, we get y = 2.
Putting x = 2, we get y = 3.
Thus, we have the following table for the equation x - y + 1 = 0.

x	0	1	2
y	1	2	3

Now, plot the points P(0, 1) and Q(1, 2). The point C(2, 3) has already been plotted. Join PQ and QC to get the graph line PC. Extend it on both ways.
Then, PC is the graph of the equation x - y + 1 = 0.



The two graph lines intersect at C(2, 3).

∴ The solution of the given system of equations is x = 2 and y = 3.
Clearly, the vertices of ΔAPC formed by these two lines and the y-axis are P(0, 1), C(2, 3) and A(0, -7).
Now, consider ΔAPC.
Here, height = 2 units and base (AP) = 8 units

∴ Area ΔAPC = $\frac{1}{2}$ × base × height sq. units

$= \frac{1}{2} \times 8 \times 2$

= 8 sq. units.

21. Sol:

From the first equation, write y in terms of x

$y = \frac{2x - 12}{3}$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = 0, $y = \frac{0-12}{3} = -4$

For x = 3, $y = \frac{6-12}{3} = -2$

For x = 6, $y = \frac{12-12}{3} = 0$

Thus, the table for the first equation (2x – 3y = 12) is

x	0	3	6
y	-4	-2	0

Now, plot the points A(0, -4), B(3,-2) and C(6, 0) on a graph paper and join A, B and C toget the graph of 2x – 3y = 12.
From the second equation, write y in terms of x

$y = \frac{6 - x}{3}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = 0, $y = \frac{6-0}{3} = 2$

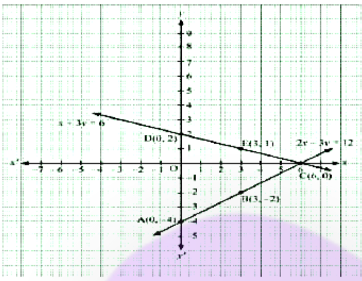
For x = 3, $y = \frac{6-3}{3} = 1$

For x = 6, $y = \frac{6-6}{3} = 0$

So, the table for the second equation (x + 3y = 6) is

x	0	3	6
y	2	1	0

Now, plot the points D(0, 2), E(3, 1) and F(6, 0) on the same graph paper and join D, E and F to get the graph of x + 3y = 6.



From the graph, it is clear that, the given lines intersect at (6, 0).

So, the solution of the given system of equation is (6, 0).

The vertices of the triangle formed by the system of equations and y-axis are (0, 2), (6, 0)and (0, -4).

Area (ΔDAC) = $\frac{1}{2} \times DA \times OC$

$= \frac{1}{2} \times 6 \times 6$

= 18 sq. units

Hence, the vertices of the triangle are (0, 2), (6, 0) and (0, -4) and its area is 18 sq. units.

22.

Sol:

From the first equation, write y in terms of x

$y = \frac{6 - 2x}{3}$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = -3, $y = \frac{6+6}{3} = 4$

For x = 3, $y = \frac{6-6}{3} = 0$

For x = 6, $y = \frac{6-12}{3} = -2$

Thus, the table for the first equation (2x + 3y = 6) is

x	-3	3	6
y	4	0	-2

Now, plot the points A(-3, 4), B(3, 0) and C(6, -2) on a graph paper and join A, B and C to get the graph of 2x + 3y = 6.

From the second equation, write y in terms of x

$y = \frac{12 - 4x}{6}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = -6, $y = \frac{12 + 24}{6} = 6$

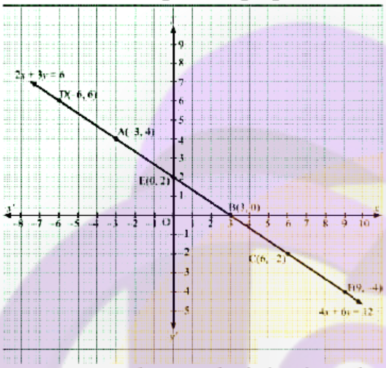
For x = 0, $y = \frac{12 - 0}{6} = 2$

For x = 9, $y = \frac{12 - 36}{6} = -4$

So, the table for the second equation (4x + 6y = 12) is

x	-6	0	9
y	6	2	-4

Now, plot the points D(-6, 6), E(0, 2) and F(9, -4) on the same graph paper and join D, E and F to get the graph of 4x + 6y = 12.



From the graph, it is clear that, the given lines coincidence with each other. Hence, the solution of the given system of equations has infinitely many solutions.

23.

Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' representing the x-axis and y-axis, respectively.

Graph of 3x - y = 5

3x - y = 5

⇒y = 3x - 5 …(i) Putting x = 1, we get y = -2

Putting x = 0, we get y = -5

Putting x = 2, we get y = 1

Thus, we have the following table for the equation 3x - y = 5

x	1	0	2
y	-2	-5	1

Now, plot the points A(1, -2), B(0, -5) and C(2, 1) on the graph paper.

Join AB and AC to get the graph line BC. Extend it on both ways.

Thus, the line BC is the graph of 3x - y = 5.

Graph of 6x - 2y = 10

6x - 2y = 10

⇒ 2y = (6x – 10)

⇒ $y = \frac{6x-10}{2}$ …(ii)

Putting x = 0, we get y = -5

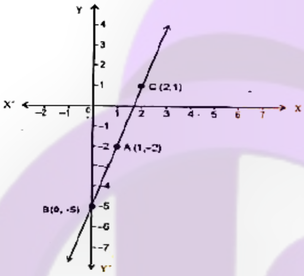
Putting x = 1, we get y = -2

Putting x = 2, we get y = 1

Thus, we have the following table for the equation 6x - 2y = 10.

x	0	1	2
y	-5	-2	1

These are the same points as obtained for the graph line of equation (i).



It is clear from the graph that these two lines coincide.

Hence, the given system of equations has infinitely many solutions.

24.

Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' representing the x-axis and y-axis, respectively.

Graph of 2x + y = 6

2x + y = 6

⇒ y = (6 – 2x) …(i)

Putting x = 3, we get y = 0

Putting x = 1, we get y = 4

Putting x = 2, we get y = 2

Thus, we have the following table for the equation 2x + y = 6

x	3	1	2
y	0	4	2

Now, plot the points A(3, 0), B(1, 4) and C(2, 2) on the graph paper.

Join AC and CB to get the graph line AB. Extend it on both ways.

Thus, the line AB is the graph of 2x + y = 6.

Graph of 6x + 3y = 18

6x + 3y = 18

⇒ 3y = (18 - 6x)

⇒ $y = \frac{18 - 6x}{3}$ …(ii)

Putting x = 3, we get y = 0

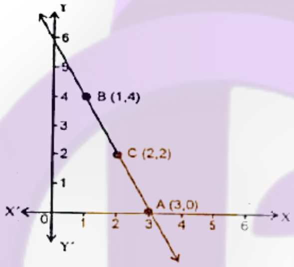
Putting x = 1, we get y = 4

Putting x = 2, we get y = 2

Thus, we have the following table for the equation 6x + 3y = 18.

x	3	1	2
y	0	4	2

These are the same points as obtained for the graph line of equation (i).



It is clear from the graph that these two lines coincide.

Hence, the given system of equations has an infinite number of solutions.

25.

Sol:

From the first equation, write y in terms of x

$y = \frac{x - 5}{2}$ …….(i)

Substitute different values of x in (i) to get different values of y

For x = -5, $y = \frac{-5-5}{2} = -5$

For x = 1, $y = \frac{1 - 5}{2} = -2$

For x = 3, $y = \frac{3 - 5}{2} = -1$

Thus, the table for the first equation (x - 2y = 5) is

x	-5	1	3
y	-5	-2	-1

Now, plot the points A(-2, -4), B(0, -2) and C(2, -2) on a graph paper and join A, B and C to get the graph of x - 2y = 6.

From the second equation, write y in terms of x

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$y = \frac{3x - 15}{6}$ ....(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = -3, $y = \frac{-9 - 15}{6} = -4$

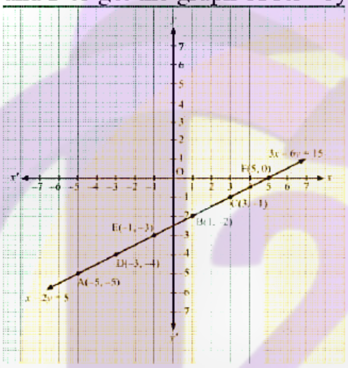
For x = -1, $y = \frac{-3 - 15}{6} = -3$

For x = 5, $y = \frac{15 - 15}{6} = 0$

So, the table for the second equation (3x - 6y = 15) is

x	-3	-1	5
y	-4	-3	0

Now, plot the points D(-3, -4), E(-1, -3) and F(5, 0) on the same graph paper and join D, E and F to get the graph of 3x - 6y = 15.



From the graph, it is clear that, the given lines coincide with each other.
Hence, the solution of the given system of equations has infinitely many solutions.

26.

Sol:

From the first equation, write y in terms of x

$y = \frac{x - 6}{2}$ ....(i)

Substitute different values of x in (i) to get different values of y

For x = -2, $y = \frac{-2-6}{2} = -4$

For x = 0, $y = \frac{0 - 6}{2} = -3$

For x = 2, $y = \frac{2 - 6}{2} = -2$

Thus, the table for the first equation (x - 2y = 5) is

x	-2	0	2
y	-4	-3	-2

Now, plot the points A(-2, -4), B(0, -3) and C(2, -2) on a graph paper and join A, B and C to get the graph of x - 2y = 6.

From the second equation, write y in terms of x

$-\ y = \frac{1}{2}x$ …….(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = -4, $y = \frac{-4}{2} = -2$

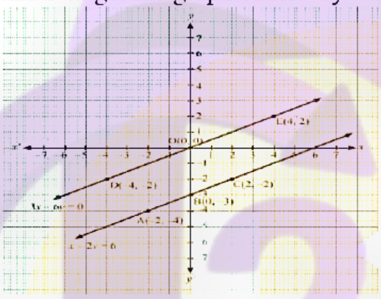
For x = 0, $y = \frac{0}{2} = 0$

For x = 4, $y = \frac{4}{2} = 2$

So, the table for the second equation (3x - 6y = 0) is

x	-4	0	4
y	-2	0	2

Now, plot the points D(-4, -2), O(0, 0) and E(4, 2) on the same graph paper and join D, E and F to get the graph of 3x - 6y = 0.



From the graph, it is clear that, the given lines do not intersect at all when produced.

Hence, the system of equations has no solution and therefore is inconsistent.

27.

Sol:

On a graph paper, draw a horizontal line X'OX and a vertical line YOY' as the x-axis andy-axis, respectively.

Graph of 2x +3y = 4

2x + 3y = 4

$\Rightarrow 3y = (-2x + 4)$ …(i)

Putting x = 2, we get y = 0

Putting x = -1, we get y = 2

Putting x = -4, we get y = 4

Thus, we have the following table for the equation 2x + 3y = 4.

x	2	-1	-4
y	0	2	4

Now, plot the points A(2, 0), B(-1, 2) and C(-4, 4) on the graph paper.

Join AB and BC to get the graph line AC. Extend it on both ways.

Thus, the line AC is the graph of 2x + 3y = 4.

Graph of 4x + 6y = 12

4x + 6y = 12

$\Rightarrow 6y = (-4x + 12)$

$\Rightarrow y = \frac{-4x+12}{6}$ …(ii)

Putting x = 3, we get y = 0

Putting x = 0, we get y = 2

Putting x = 6, we get y = -2

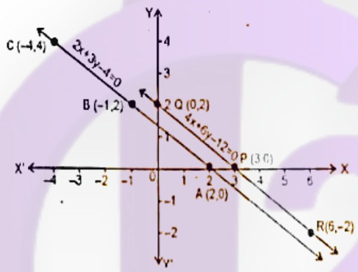
Thus, we have the following table for the equation 4x + 6y = 12.

x	3	0	6
y	0	2	-2

Now, on the same graph, plot the points A(3, 0), B(0, 2) and C(6, -2).

Join PQ and PR to get the graph line QR. Extend it on both ways.

Thus, QR is the graph of the equation 4x + 6y = 12.



It is clear from the graph that these two lines are parallel and do not intersect when produced.

Hence, the given system of equations is inconsistent.

28.

Sol:

From the first equation, write y in terms of xy

= 6 – 2x …….(i)

Substitute different values of x in (i) to get different values of y

For x = 0, y = 6 – 0 = 6

For x = 2, y = 6 – 4 = 2

For x = 4, y = 6 – 8 = -2

Thus, the table for the first equation (2x + y = 6) is

x	0	2	4
y	6	2	-2

Now, plot the points A(0, 6), B(2, 2) and C(4, -2) on a graph paper and join A, B and C toget the graph of 2x + y = 6.

From the second equation, write y in terms of x

$y = \frac{20-6x}{3}$ …….(ii)

Now, substitute different values of x in (ii) to get different values of

For x = 0, $y = \frac{20 - 0}{3} = \frac{20}{3}$

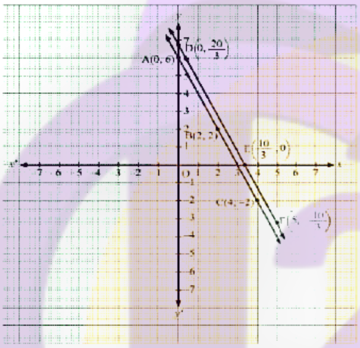
For $x = \frac{10}{3}$, $y = \frac{20 - 20}{3} = 0$

For x = 5, $y = \frac{20 - 30}{3} = -\frac{10}{3}$

So, the table for the second equation (6x + 3y = 20) is

x	0	$\frac{10}{3}$	5
y	$\frac{20}{3}$	0	$-\frac{10}{3}$

Now, plot the points D(0, $\frac{20}{3}$), O($\frac{10}{3}$, 0) and E(5, $-\frac{10}{3}$) on the same graph paper and join D, E and F to get the graph of 6x + 3y = 20.



From the graph, it is clear that, the given lines do not intersect at all when produced. Hence, the system of equations has no solution and therefore is inconsistent.

29. Sol:

From the first equation, write y in terms of xy

= 2 – 2x ……..(i)

Substitute different values of x in (i) to get different values of y

For x = 0, y = 2 – 0 = 2

For x = 1, y = 2 – 2 = 0

For x = 2, y = 2 – 4 = -2

Thus, the table for the first equation (2x + y = 2) is

x	0	1	2
y	2	0	-2

Now, plot the points A(0, 2), B(1, 0) and C(2, -2) on a graph paper and join A, B and C toget the graph of 2x + y = 2.

From the second equation, write y in terms of xy

= 6 – 2x ....(ii)

Now, substitute different values of x in (ii) to get different values of y

For x = 0, y = 6 – 0 = 6

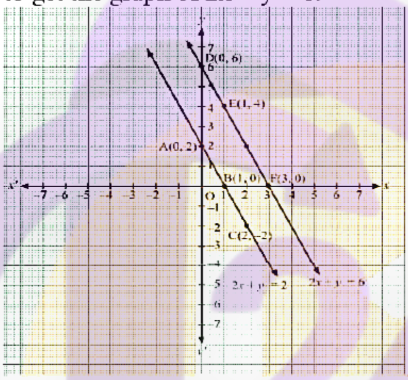
For x = 1, y = 6 – 2 = 4

For x = 3, y = 6 – 6 = 0

So, the table for the second equation (2x + y = 6) is

x	0	1	3
y	6	4	0

Now, plot the points D(0,6), E(1, 4) and F(3,0) on the same graph paper and join D, E andF to get the graph of 2x + y = 6.



From the graph, it is clear that, the given lines do not intersect at all when produced. So, these lines are parallel to each other and therefore, the quadrilateral DABF is a trapezium. The vertices of the required trapezium are D(0, 6), A (0, 2), B(1, 0) and F(3, 0).

Now,

Area(Trapezium DABF) = Area (ΔDOF) – Area(ΔAOB)

$= \frac{1}{2} \times 3 \times 6 - \frac{1}{2} \times 1 \times 2$

$= 9 - 1$

$= 8$ sq. units

Hence, the area of the required trapezium is 8 sq. units.

Exercise – 3B

1. **Sol:**

The given system of equation is:x

+ y = 3.......(i)

4x – 3y = 26 ......(ii)

On multiplying (i) by 3, we get:

$3x + 3y = 9$ ….(iii)
On adding (ii) and (iii), we get:
$7x = 35$

$\Rightarrow x = 5$
On substituting the value of $x = 5$ in (i), we get:$5 + y = 3$

$\Rightarrow y = (3 – 5) = -2$
Hence, the solution is $x = 5$ and $y = -2$

2.

Sol:
The given system of equations is
$x – y = 3$ …..(i)
$\frac{x}{3} + \frac{y}{2} = 6$ ……(ii)
From (i), write y in terms of x to get$y = x – 3$
Substituting $y = x – 3$ in (ii), we get
$\frac{x}{3} + \frac{x-3}{2} = 6$

$\Rightarrow 2x + 3(x – 3) = 36$

$\Rightarrow 2x + 3x – 9 = 36x$
$\Rightarrow = \frac{45}{5} = 9$
Now, substituting $x = 9$ in (i), we have$9 – y = 3$

$\Rightarrow y = 9 – 3 = 6$
Hence, $x = 9$ and $y = 6$.

3. **Sol:**
The given system of equation is:$2x + 3y = 0$ ……(i)
$3x + 4y = 5$ ……(ii)
On multiplying (i) by 4 and (ii) by 3, we get:$8x + 12y = 0$ ……(iii)
$9x + 12y = 15$ …….(iv)
On subtracting (iii) from (iv) we get:

$x = 15$
On substituting the value of $x = 15$ in (i), we get:$30 + 3y = 0$

$\Rightarrow 3y = -30$

$\Rightarrow y = -10$
Hence, the solution is $x = 15$ and $y = -10$.

4. **Sol**:
The given system of equation is:$2x - 3y = 13$ ……(i)
$7x - 2y = 20$ ……(ii)
On multiplying (i) by 2 and (ii) by 3, we get:$4x - 6y = 26$ ……(iii)
$21x - 6y = 60$ …….(iv)
On subtracting (iii) from (iv) we get:
$17x = (60 – 26) = 34$

$\Rightarrow x = 2$
On substituting the value of $x = 2$ in (i), we get:$4 – 3y = 13$

$\Rightarrow 3y = (4 – 13) = -9$

$\Rightarrow y = -3$
Hence, the solution is $x = 2$ and $y = -3$.

5. **Sol**:
The given system of equation is:
$3x - 5y - 19 = 0$ ……(i)
$-7x + 3y + 1 = 0$ ……(ii)
On multiplying (i) by 3 and (ii) by 5, we get:$9x - 15y = 57$ ……(iii)
$-35x + 15y = -5$ …….(iv)
On subtracting (iii) from (iv) we get:
$-26x = (57 – 5) = 52$

$\Rightarrow x = -2$
On substituting the value of $x = -2$ in (i), we get:

$-6 - 5y - 19 = 0$

$\Rightarrow 5y = (-6 - 19) = -25$

$\Rightarrow y = -5$

Hence, the solution is $x = -2$ and $y = -5$.

6.

Sol:

The given system of equation is:$2x - y + 3 = 0$…….(i)

$3x - 7y + 10 = 0$ ……(ii)

From (i), write y in terms of x to get

$y=2x + 3$

Substituting $y = 2x + 3$ in (ii), we get$3x - 7(2x + 3) + 10 = 0$

$\Rightarrow 3x - 14x - 21 + 10 = 0$

$\Rightarrow -7x = 21 - 10 = 11$

$x = -\frac{11}{7}$

Now substituting $x = -\frac{11}{7}$ in (i), we have

$-\frac{22}{7} - y + 3 = 0$

$y = 3 - \frac{22}{7} = -\frac{1}{7}$

Hence, $x = -\frac{11}{7}$ and $y = -\frac{1}{7}$.

7.

Sol:

The given system of equation can be written as:$9x - 2y = 108$ ……(i)

$3x + 7y = 105$ ……(ii)

On multiplying (i) by 7 and (ii) by 2, we get:$63x + 6x = 108 \times 7 + 105 \times 2$

$\Rightarrow 69x = 966$

$\Rightarrow x = \frac{966}{69} = 14$

Now, substituting $x = 14$ in (i), we get:$9 \times 14 - 2y = 108$

$\Rightarrow 2y = 126 - 108$

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$\Rightarrow$ $y = \frac{18}{2} = 9$

Hence, x = 14 and y = 9.

8.

Sol:

The given equations are:

$\frac{x}{3} + \frac{y}{4} = 11$

$\Rightarrow 4x + 3y = 132$ …….(i)

and $\frac{5x}{6} - \frac{y}{3} + 7 = 0$

$\Rightarrow 5x – 2y = -42$ ……… (ii)

On multiplying (i) by 2 and (ii) by 3, we get:$8x + 6y = 264$………..(iii)

$15x – 6y = -126$ ….(iv)

On adding (iii) and (iv), we get:

$23x = 138$

$\Rightarrow x = 6$

On substituting x = 6 in (i), we get:$24 + 3y = 132$

$\Rightarrow 3y = (132 – 24) = 108$

$\Rightarrow y = 36$

Hence, the solution is x = 6 and y = 36.

9.

Sol:

The given system of equation is:$4x - 3y = 8$ ……(i)

$6x - y = \frac{29}{3}$ ……(ii)

On multiplying (ii) by 3, we get:

$18x – 3y = 29$ ….(iii)

On subtracting (iii) from (i) we get:

$-14x = -21$

$x = \frac{21}{14} = \frac{3}{2}$

Now, substituting the value of $x = \frac{3}{2}$ in (i), we get:

$\times -4 \frac{3}{2} - 3y = 8$

$\Rightarrow 6 - 3y = 8$

$\Rightarrow 3y = 6 - 8 = -2$

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

Hence, the solution $x = \frac{3}{2}$ and $y = \frac{-2}{3}$.

10.

Sol:

The given equations are:

$2x - \frac{3y}{4} = 3$ .....(i)

$5x = 2y + 7$ ....(ii)

On multiplying (i) by 2 and (ii) by $\frac{3}{4}$, we get:

$4x - \frac{3}{2}y = 6$ ....(iii)

$\frac{15}{4}x = \frac{3}{2}y + \frac{21}{4}$....(iv)

On subtracting (iii) and (iv), we get:

$-\frac{1}{4}x = -\frac{3}{4}$

$\Rightarrow x = 3$

On substituting $x = 3$ in (i), we get:

$2 \times 3 - \frac{3y}{4} = 3$

$\Rightarrow \frac{3y}{4} = (6 - 3) = 3$

$\Rightarrow y = \frac{3 \times 4}{3} = 4$

Hence, the solution is $x = 3$ and $y = 4$.

11.

Sol:

The given equations are:

$2x - 5y = \frac{8}{3}$ .....(i)

$3x - 2y = \frac{5}{6}$ .... (ii)

On multiplying (i) by 2 and (ii) by 5, we get:

$4x - 10y = \frac{16}{3}$ .... (iii)

$15x - 10y = \frac{25}{6}$......(iv)

On adding (iii) and (iv), we get:

$19x = \frac{57}{6}$

$\Rightarrow x = \frac{57}{6 \times 19} = \frac{3}{6} = \frac{1}{2}$

On substituting $x = \frac{1}{2}$ in (i), we get:

$2 \times \frac{1}{2} + 5y = \frac{8}{3}$

$\Rightarrow 5y = \left(\frac{8}{3} - 1\right) = \frac{5}{3}$

$\Rightarrow y = \frac{5}{3 \times 5} = \frac{1}{3}$

Hence, the solution is $x = \frac{1}{2}$ and $y = \frac{1}{3}$.

12.

Sol:

The given equations are:

$\frac{7 - 4x}{3} = y$

$\Rightarrow 4x + 3y = 7$ .... (i)

and $2x + 3y + 1 = 0$

$\Rightarrow 2x + 3y = -1$ .... (ii)

On subtracting (ii) from (i), we get: $2x = 8$

$\Rightarrow x = 4$

On substituting $x = 4$ in (i), we get:

$16x + 3y = 7$

$\Rightarrow 3y = (7 - 16) = -9$

$\Rightarrow y = -3$

Hence, the solution is $x = 4$ and $y = -3$.

13.

Sol:

The given system of equations is $0.4x + 0.3y = 1.7$..............................(i)

$0.7x - 0.2y = 0.8$.......................(ii)

Multiplying (i) by 0.2 and (ii) by 0.3 and adding them, we get
$0.8x + 2.1x = 3.4 + 2.4$

$\Rightarrow 2.9x = 5.8$

$\Rightarrow x = \frac{5.8}{2.9} = 2$

Now, substituting x = 2 in (i), we have

$0.4 \times 2 + 0.3y = 1.7$

$\Rightarrow 0.3y = 1.7 - 0.8$

$\Rightarrow y = \frac{0.9}{0.3} = 3$

Hence, x = 2 and y = 3.

14.

Sol:

The given system of equations is $0.3x + 0.5y = 0.5$ ....(i)

$0.5x + 0.7y = 0.74$ ....(ii)

Multiplying (i) by 5 and (ii) by 3 and subtracting (ii) from (i), we get

$2.5y - 2.1y = 2.5 - 2.2$

$\Rightarrow 0.4y = 0.28$

$\Rightarrow y = \frac{0.28}{0.4} = 0.7$

Now, substituting y = 0.7 in (i), we have

$0.3x + 0.5 \times 0.7 = 0.5$

$\Rightarrow 0.3x = 0.50 - 0.35 = 0.15$

$\Rightarrow x = \frac{0.15}{0.3} = 0.5$

Hence, x = 0.5 and y = 0.7.

15.

Sol:

The given equations are:

$7(y + 3) - 2(x + 2) = 14$

$\Rightarrow 7y + 21 - 2x - 4 = 14$

$\Rightarrow -2x + 7y = -3$ ....(i)

and $4(y - 2) + 3(x - 3) = 2$

$\Rightarrow 4y - 8 + 3x - 9 = 2$

$\Rightarrow 3x + 4y = 19$ .... (ii)

On multiplying (i) by 4 and (ii) by 7, we get:

$-8x + 28y = -12$ ……(iii)

$21x + 28y = 133$ ……(iv)

On subtracting (iii) from (iv), we get:

$29x = 145$

$\Rightarrow x = 5$

On substituting x = 5 in (i), we get:

$-10 + 7y = -3$

$\Rightarrow 7y = (-3 + 10) = 7$

$\Rightarrow y = 1$

Hence, the solution is x = 5 and y = 1.

16.

Sol:

The given equations are:

$6x + 5y = 7x + 3y + 1 = 2(x + 6y – 1)$

$\Rightarrow 6x + 5y = 2(x + 6y – 1)$

$\Rightarrow 6x + 5y = 2x + 12y – 2$

$\Rightarrow 6x – 2x + 5y – 12y = -2$

$\Rightarrow 4x – 7y = -2$ .... (i)

and $7x + 3y + 1 = 2(x + 6y – 1)$

$\Rightarrow 7x + 3y + 1 = 2x + 12y – 2$

$\Rightarrow 7x – 2x + 3y – 12y = -2 – 1$

$\Rightarrow 5x – 9y = -3$ .... (ii)

On multiplying (i) by 9 and (ii) by 7, we get:

$36x - 63y = -18$ ……(iii)

$35x - 63y = -21$ ……(iv)

On subtracting (iv) from (iii), we get:x

$= (-18 + 21) = 3$

On substituting x = 3 in (i), we get:12

$- 7y = -2$

$\Rightarrow 7y = (2 + 12) = 14$

$\Rightarrow y = 2$

Hence, the solution is x = 3 and y = 2.

17.

Sol:

The given equations are:

$\frac{x+y-8}{2} = \frac{x+2y-14}{3} = \frac{3x+y-12}{11}$

i.e., $\frac{x+y-8}{2} = \frac{3x+y-12}{11}$

By cross multiplication, we get:

11x + 11y – 88 = 6x + 2y – 24

⇒11x – 6x + 11y – 2y = -24 + 88

⇒5x + 9y = 64 …….(i)

and $\frac{x+2y-14}{3} = \frac{3x+y-12}{11}$

⇒11x + 22y – 154 = 9x + 3y – 36

⇒11x – 9x + 22y – 3y = -36 + 154

⇒2x + 19y = 118 …….(ii)

On multiplying (i) by 19 and (ii) by 9, we get:

95x + 171y = 1216 ……(iii)

18x + 171y = 1062 ……(iv)

On subtracting (iv) from (iii), we get:

77x = 154

⇒x = 2

On substituting x = 2 in (i), we get: 10 + 9y = 64

⇒9y = (64 – 10) = 54

⇒y = 6

Hence, the solution is x = 2 and y = 6.

18.

Sol:

The given equations are:

$\frac{5}{x} + 6y = 13$ .... (i)

$\frac{3}{x} + 4y = 7$ .... (ii)

Putting $\frac{1}{x} = u$, we get:

5u + 6y = 13 …….(iii)3u
+ 4y = 7 ……(iv)
On multiplying (iii) by 4 and (iv) by 6, we get:
20u + 24y = 52 .... (v)
18u + 24y = 42 .... (vi)
On subtracting (vi) from (v), we get:

2u = 10 ⇒ u = 5
$\Rightarrow \frac{1}{x} = 5 \Rightarrow x = \frac{1}{5}$
On substituting $x = \frac{1}{5}$ in (i), we get:
$\frac{5}{1/5} + 6y = 13$
25 + 6y = 13
6y = (13 – 25) = -12
y = -2
Hence, the required solution is $x = \frac{1}{5}$ and y = -2.

19.

Sol:
The given equations are:
$x + \frac{6}{y} = 6$ ....(i)
$3x - \frac{8}{y} = 5$ ....(ii)
Putting $\frac{1}{y} = v$, we get:
x + 6v = 6 ....(iii)
3x – 8v = 5 ……(iv)
On multiplying (iii) by 4 and (iv) by 3, we get:4x
+ 24v = 24................(v)
9x – 24v = 15 .... (vi)
On adding (v) from (vi), we get:

13x = 39 ⇒ x = 3
On substituting x = 3 in (i), we get:
$3 + \frac{6}{y} = 6$
$\Rightarrow \frac{6}{y} = (6 – 3) = 3 \Rightarrow 3y = 6 \Rightarrow y = 2$
Hence, the required solution is x = 3 and y = 2.

20.

Sol:

The given equations are:

$2x - \frac{3}{y} = 9$ ....(i)

$3x + \frac{7}{y} = 2$ ....(ii)

Putting $\frac{1}{y} = v$, we get:

$2x - 3v = 6$..........(iii)

$3x + 7v = 2$ ……(iv)

On multiplying (iii) by 7 and (iv) by 3, we get:

$14x - 21v = 63$...........(v)

$9x + 21v = 6$...........(vi)

On adding (v) from (vi), we get:

$23x = 69 \Rightarrow x = 3$

On substituting x = 3 in (i), we get:

$2 \times 3 - \frac{3}{y} = 9$

$\Rightarrow 6 - \frac{3}{y} = 9 \Rightarrow \frac{3}{y} = -3 \Rightarrow y = -1$

Hence, the required solution is x = 3 and y = -1

21.

Sol:

The given equations are:

$\frac{3}{x} - \frac{1}{y} + 9 = 0,$

$\Rightarrow \frac{3}{x} - \frac{1}{y} = -9$ .... (i)

$\Rightarrow \frac{2}{x} - \frac{3}{y} = 5$........ (ii)

Putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, we get:

$3u – v = -9$ …….(iii)$2u$

$+ 3v = 5$ ……(iv)

On multiplying (iii) by 3, we get:$9u$

$– 3v = -27$................(v)

On adding (iv) and (v), we get:

$11u = -22 \Rightarrow u = -2$

$\Rightarrow \frac{1}{x} = -2 \Rightarrow x = \frac{-1}{2}$

On substituting $x = \frac{-1}{2}$ in (i), we get:

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$\frac{3}{-1/2} - \frac{1}{y} = -9$

$\Rightarrow -6 - \frac{1}{y} = -9 \Rightarrow \frac{1}{y} = (-6 + 9) = 3$

$\Rightarrow y = \frac{1}{3}$

Hence, the required solution is $x = \frac{-1}{2}$ and $y = \frac{1}{3}$.

22.

Sol:

The given equations are:

$\frac{9}{x} - \frac{4}{y} = 8$ ....(i)

$\frac{13}{x} + \frac{7}{y} = 101$ ....(ii)

Putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, we get:

$9u - 4v = 8$ …….(iii) $13u + 7v = 101$ ……(iv)

On multiplying (iii) by 7 and (iv) by 4, we get:

$63u - 28v = 56$ ....(v)

$52u + 28v = 404$ .... (vi)

On adding (v) from (vi), we get:

$115u = 460 \Rightarrow u = 4$

$\Rightarrow \frac{1}{x} = 4 \Rightarrow x = \frac{1}{4}$

On substituting $x = \frac{1}{4}$ in (i), we get:

$\frac{9}{1/4} - \frac{4}{y} = 8$

$\Rightarrow 36 - \frac{4}{y} = 8 \Rightarrow \frac{4}{y} = (36 - 8) = 28$

$y = \frac{4}{28} = \frac{1}{7}$

Hence, the required solution is $x = \frac{1}{4}$ and $y = \frac{1}{7}$.

23.

Sol:

The given equations are:

$\frac{5}{x} - \frac{3}{y} = 1$ ....(i)

$\frac{3}{2x} + \frac{2}{3y} = 5$ ....(ii)

Putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, we get:

$5u - 3v = 1$ …….(iii)

$\Rightarrow \frac{3}{2}u + \frac{2}{3}v = 5$

$\Rightarrow \frac{9u+4v}{6} = 5$

$\Rightarrow 9u + 4v = 30$ …….(iv)

On multiplying (iii) by 4 and (iv) by 3, we get:

$20u - 12v = 4$ ……….(v)

$27u + 12v = 90$ ………. (vi)

On adding (iv) and (v), we get:

$47u = 94 \Rightarrow u = 2$

$\Rightarrow \frac{1}{x} = 2 \Rightarrow x = \frac{1}{2}$

On substituting $x = \frac{1}{2}$ in (i), we get:

$\frac{5}{1/2} - \frac{3}{y} = 1$

$\Rightarrow 10 - \frac{3}{y} = 1 \Rightarrow \frac{3}{y} = (10 - 1) = 9$

$y = \frac{3}{9} = \frac{1}{3}$

Hence, the required solution is $x = \frac{1}{2}$ and $y = \frac{1}{3}$.

24.

Sol

The given equations are:

$\frac{3}{x} + \frac{2}{y} = 12$ ………. (i)

$\frac{2}{x} + \frac{3}{y} = 13$ ………. (ii)

Multiplying (i) by 3 and (ii) by 2 and subtracting (ii) from (i), we get:

$\frac{9}{x} - \frac{4}{x} = 36 - 26$

$\Rightarrow \frac{5}{x} = 10$

$\Rightarrow x = \frac{5}{10} = \frac{1}{2}$

Now, substituting $x = \frac{1}{2}$ in (i), we have

$6 + \frac{2}{y} = 12$

$\Rightarrow \frac{2}{y} = 6$

$\Rightarrow y = \frac{1}{3}$

Hence, $x = \frac{1}{2}$ and $y = \frac{1}{3}$.

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25.

Sol:

The given equations are: $4x + 6y = 3xy$ …..(i)

$8x + 9y = 5xy$ ……(ii)

From equation (i), we have:

$\frac{4x + 6y}{xy} = 3$

$\Rightarrow \frac{4}{y} + \frac{6}{x} = 3$ ……(iii)

For equation (ii), we have:

$\frac{8x + 9y}{xy} = 5$

$\Rightarrow \frac{8}{y} + \frac{9}{x} = 5$ ……(iv)

On substituting $\frac{1}{y} = v$ and $\frac{1}{x} = u$, we get:

$4v + 6u = 3$ ……(v)

$8v + 9u = 5$ …….(vi)

On multiplying (v) by 9 and (vi) by 6, we get:

$36v + 54u = 27$ ….(vii)

$48v + 54u = 30$ ….(viii)

On subtracting (vii) from (viii), we get:

$12v = 3 \Rightarrow v = \frac{3}{12} = \frac{1}{4}$

$\Rightarrow \frac{1}{y} = \frac{1}{4} \Rightarrow y = 4$

On substituting y = 4 in (iii), we get:

$\frac{4}{4} + \frac{6}{x} = 3$

$\Rightarrow 1 + \frac{6}{x} = 3 \Rightarrow \frac{6}{x} = (3 - 1) = 2$

$\Rightarrow 2x = 6 \Rightarrow x = \frac{6}{2} = 3$

Hence, the required solution is x = 3 and y = 4.

26.

Sol:

The given equations are: $x + y = 5xy$ …..(i)

$3x + 2y = 13xy$ ……(ii)

From equation (i), we have:

$\frac{x+y}{xy} = 5$

$\Rightarrow \frac{1}{y} + \frac{1}{x} = 5$ ……(iii)

For equation (ii), we have:

$\frac{3x+2y}{xy} = 13$

$\Rightarrow \frac{3}{y} + \frac{2}{x} = 13$ ……(iv)

On substituting $\frac{1}{y} = v$ and $\frac{1}{x} = u$, we get:

v + u = 5 ……(v)

3v + 2u = 13 …….(vi)

On multiplying (v) by 2, we get:2v + 2u = 10 ….(vii)

On subtracting (vii) from (vi), we get:v = 3

$\Rightarrow \frac{1}{y} = 3 \Rightarrow y = \frac{1}{3}$

On substituting $y = \frac{1}{3}$ in (iii), we get:

$\frac{1}{1/3} + \frac{1}{x} = 5$

$\Rightarrow 3 + \frac{1}{x} = 5 \Rightarrow \frac{1}{x} = 2 \Rightarrow x = \frac{1}{2}$

Hence, the required solution is $x = \frac{1}{2}$ and $y = \frac{1}{3}$ or x= 0 and y = 0.

27.

Sol:

The given equations are

$\frac{5}{x+y} - \frac{2}{x-y} = -1$ ……(i)

$\frac{15}{x+y} - \frac{7}{x-y} = 10$ ……(ii)

Substituting $\frac{1}{x+y} = u$ and $\frac{1}{x-y} = v$ in (i) and (ii), we get

5u – 2v = -1 .... (iii)

15u + 7v = 10 .... (iv)

Multiplying (iii) by 3 and subtracting it from (iv), we get7v + 6v = 10 + 3

$\Rightarrow$13v = 13

$\Rightarrow$v = 1

⇒ x – y = 1 $(\because \frac{1}{x-y} = v)$ .....(v)

Now, substituting v = 1 in (iii), we get5u – 2 = -1

⇒5u = 1

⇒ u = $\frac{1}{5}$

x + y = 5 ....(vi)

Adding (v) and (vi), we get

2x = 6 ⇒ x = 3

Substituting x = 3 in (vi), we have

3 + y = 5 ⇒ y = 5 – 3 = 2

Hence, x = 3 and y = 2.

28. ___ ___ ___ x ___

Sol:

The given equations are

$\frac{3}{x+y} + \frac{2}{x-y} = 2$ ......(i)

$\frac{9}{x+y} - \frac{4}{x-y} = 1$ ......(ii)

Substituting $\frac{1}{x+y}$ = u and $\frac{1}{x-y}$ = v, we get:

3u + 2v = 2................ (iii)

9u - 4v = 1..............(iv)

On multiplying (iii) by 2, we get:6u + 4v = 4................(v)

On adding (iv) and (v), we get:

15u = 5

⇒ u = $\frac{5}{15} = \frac{1}{3}$

⇒ $\frac{1}{x+y} = \frac{1}{3}$ ⇒ x + y = 3 ....(vi)

On substituting u = $\frac{1}{3}$ in (iii), we get

1 + 2v = 2

⇒2v = 1

⇒ v = $\frac{1}{2}$

⇒ $\frac{1}{x-y} = \frac{1}{2}$ ⇒ x – y = 2 ....(vii)

On adding (vi) and (vii), we get2x = 5

$\Rightarrow \quad x = \frac{5}{2}$

On substituting $x = \frac{5}{2}$ in (vi), we have

$\frac{5}{2} + y = 3$

$\Rightarrow \quad y = (3) - \frac{5}{2} = \frac{1}{2}$

Hence, the required solution is $x = \frac{5}{2}$ and $y = \frac{1}{2}$.

29. Sol:

The given equations are

$\frac{5}{x+1} + \frac{2}{y-1} = \frac{1}{2}$ ……(i)

$\frac{10}{x+1} - \frac{2}{y-1} = \frac{5}{2}$ ……(ii)

Substituting $\frac{1}{x+1} = u$ and $\frac{1}{y-1} = v$, we get:

$5u + 2v = \frac{1}{2}$ ……..(iii)

$10u - 2v = \frac{5}{2}$ …….(iv)

On adding (iii) and (iv), we get:

$15u = 3$

$\Rightarrow u = \frac{3}{15} = \frac{1}{5}$

$\Rightarrow \frac{1}{x+1} = \frac{1}{5} \Rightarrow x + 1 = 5 \Rightarrow x = 4$

On substituting $u = \frac{1}{5}$ in (iii), we get

$5 \times \frac{1}{5} + 2v = \frac{1}{2} \Rightarrow 1 + 2v = \frac{1}{2}$

$\Rightarrow 2v = \frac{1}{2} \Rightarrow v = \frac{1}{4}$

$\Rightarrow \frac{1}{y-1} = \frac{1}{4} \Rightarrow y - 1 = 4 \Rightarrow y = 5$

Hence, the required solution is $x = 4$ and $y = 5$.

Exercise – 3C

1.

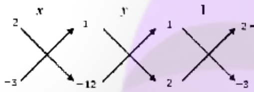
Sol:

The given equations are:

$x + 2y + 1 = 0$ ....(i)

$2x - 3y - 12 = 0$ ....(ii)

Here $a_1 = 1$, $b_1 = 2$, $c_1 = 1$, $a_2 = 2$, $b_2 = -3$ and $c_2 = -12$ By cross multiplication, we have:



$\therefore \frac{x}{[2\times(-12)-1\times(-3)]} = \frac{y}{[1\times2-1\times(-12)]} = \frac{1}{[1\times(-3)-2\times2]}$

$\Rightarrow \frac{x}{(-24+3)} = \frac{y}{(2+12)} = \frac{1}{(-3-4)}$

$\Rightarrow \frac{x}{(-21)} = \frac{y}{(14)} = \frac{1}{(-7)}$

$\Rightarrow x = \frac{-21}{-7} = 3$, $y = \frac{14}{-7} = -2$

Hence, $x = 3$ and $y = -2$ is the required solution.

2.

Sol:

The given equations are:

$6x - 5y - 16 = 0$ ....(i)

$7x - 13y + 10 = 0$ ....(ii)

Here $a_1 = 6$, $b_1 = -5$, $c_1 = -16$, $a_2 = 7$, $b_2 = -13$ and $c_2 = 10$

By cross multiplication, we have:

$\therefore \frac{x}{[(-5)\times10-(-16)\times(-13)]} = \frac{y}{[(-16)\times7-10\times6]} = \frac{1}{[6\times(-13)-(-5)\times7]}$

$\Rightarrow \frac{x}{(-50-208)} = \frac{y}{(-112-60)} = \frac{1}{(-78+35)}$

$\Rightarrow \frac{x}{(-258)} = \frac{y}{(-172)} = \frac{1}{(43)}$

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$\Rightarrow$

$x = \frac{-258}{-43} = 6,\ y = \frac{-172}{-43} = 4$

Hence, x = 6 and y = 4 is the required solution.

3.

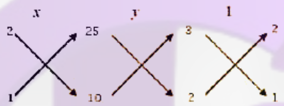
Sol:

The given equations are:

$3x + 2y + 25 = 0$ ....(i)

$2x + y + 10 = 0$ ....(ii)

Here $a_1 = 3$, $b_1 = 2$, $c_1 = 25$, $a_2 = 2$, $b_2 = 1$ and $c_2 = 10$By cross multiplication, we have:



$\therefore \frac{x}{[2\times10 - 25\times1]} = \frac{y}{[25\times2 - 10\times3]} = \frac{1}{[3\times1 - 2\times2]}$

$\Rightarrow \frac{x}{(20-25)} = \frac{y}{(50-30)} = \frac{1}{(3-4)}$

$\Rightarrow \frac{x}{(-5)} = \frac{y}{20} = \frac{1}{(-1)}$

$\Rightarrow x = \frac{-5}{-1} = 5,\ y = \frac{20}{(-1)} = -20$

Hence, x = 5 and y = -20 is the required solution.

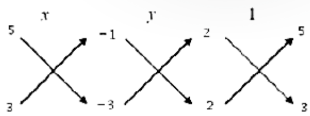
4.

Sol:

The given equations may be written as:$2x + 5y - 1 = 0$ ....(i)

$2x + 3y - 3 = 0$ ....(ii)

Here $a_1 = 2$, $b_1 = 5$, $c_1 = -1$, $a_2 = 2$, $b_2 = 3$ and $c_2 = -3$By cross multiplication, we have:



$\therefore \frac{x}{[5\times(-3) - 3\times(-1)]} = \frac{y}{[(-1)\times2 - (-3)\times2]} = \frac{1}{[2\times3 - 2\times5]}$

$\Rightarrow \frac{x}{(-15+3)} = \frac{y}{(-2+6)} = \frac{1}{(6-10)}$

$\Rightarrow \frac{x}{-12} = \frac{y}{4} = \frac{1}{-4}$

$x = \frac{-12}{-4} = 3$, $y = \frac{4}{-4}$

Hence, x = 3 and y = -1 is the required solution.

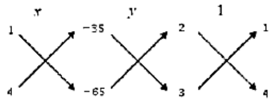
5.

Sol:

The given equations may be written as: $2x + y - 35 = 0$ …….(i)

3x + 4y – 65 = 0 …….(ii)

Here $a_1 = 2$, $b_1 = 1$, $c_1 = -35$, $a_2 = 3$, $b_2 = 4$ and $c_2 = -65$ By cross multiplication, we have:



$$\therefore \frac{x}{[1\times(-65)-4\times(-35)]} = \frac{y}{[(-35)\times 3-(-65)\times 2]} = \frac{1}{[2\times 4-3\times 1]}$$

$$\Rightarrow \frac{x}{(-65+140)} = \frac{y}{(-105+130)} = \frac{1}{(8-3)}$$

$$\Rightarrow \frac{x}{75} = \frac{y}{25} = \frac{1}{5}$$

$$\Rightarrow x = \frac{75}{5} = 15,\ y = \frac{25}{5} = 5$$

Hence, x = 15 and y = 5 is the required solution.

6. Sol:

Sol:

The given equations may be written as:

7x - 2y – 3 = 0 …….(i)

$11x - \frac{3}{2}y - 8 = 0$ …….(ii)

Here $a_1 = 7$, $b_1 = -2$, $c_1 = -3$, $a_2 = 11$, $b_2 = -\frac{3}{2}$ and $c_2 = -8$

By cross multiplication, we have:

$$\therefore \frac{x}{[(-2)\times(-8)-(-\frac{3}{2})\times(-3)]} = \frac{y}{[(-3)\times 11-(-8)\times 7]} = \frac{1}{[7\times(-\frac{3}{2})-11\times(-2)]}$$

$$\Rightarrow \frac{x}{(16-\frac{9}{2})} = \frac{y}{(-33+56)} = \frac{1}{(-\frac{21}{2}+22)}$$

$$\Rightarrow \frac{x}{(\frac{23}{2})} = \frac{y}{23} = \frac{1}{(\frac{23}{2})}$$

$$\Rightarrow x = \frac{\frac{23}{2}}{\frac{23}{2}} = 1,\ y = \frac{23}{\frac{23}{2}} = 2$$

Hence, x = 1 and y = 2 is the required solution.

Exercise – 3D

1.

Sol:

The given system of equations is:

$3x + 5y = 12$
$5x + 3y = 4$
These equations are of the forms:
$a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$
where, $a_1 = 3$, $b_1= 5$, $c_1 = -12$ and $a_2 = 5$, $b_2 = 3$, $c_2 = -4$For a unique solution, we must have:
$\frac{a_1}{a_2} \neq \frac{b1}{b2}$, i.e., $\frac{3}{5} \neq \frac{5}{3}$
Hence, the given system of equations has a unique solution.
Again, the given equations are:
$3x + 5y = 12$ .....(i)
$5x + 3y = 4$ .....(ii)
On multiplying (i) by 3 and (ii) by 5, we get:
$9x + 15y = 36$ ....(iii)
$25x + 15y = 20$ ......(iv)
On subtracting (iii) from (iv), we get:
$16x = -16$

$\Rightarrow x = -1$
On substituting $x = -1$ in (i), we get:
$3(-1) + 5y = 12$

$\Rightarrow 5y = (12 + 3) = 15$

$\Rightarrow y = 3$
Hence, $x = -1$ and $y = 3$ is the required solution.

2.

Sol:
The given system of equations is:
$2x - 3y - 17 = 0$ ....(i)
$4x + y - 13 = 0$ .....(ii) The given equations are of the form
$a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$
where, $a_1 = 2$, $b_1= -3$, $c_1 = -17$ and $a_2 = 4$, $b_2 = 1$, $c_2 = -13$
Now,
$\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$ and $\frac{b1}{b_2} = \frac{-3}{1} = -3$
Since, $\frac{a1}{a_2} \neq \frac{b1}{b_2}$, therefore the system of equations has unique solution.
Using cross multiplication method, we have

$\frac{x}{b_1c_2-b_2c_1}=\frac{y}{c_1a_2-c_2a_1}=\frac{1}{a_1b_2-a_2b_1}$

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$\Rightarrow \frac{x}{-3(-13)-1\times(-17)}=\frac{y}{-17\times4-(-13)\times2}=\frac{1}{2\times1-4\times(-3)}$

$\Rightarrow \frac{x}{39+17}=\frac{y}{-68+26}=\frac{1}{2+12}$

$\Rightarrow \frac{x}{56}=\frac{y}{-42}=\frac{1}{14}$

$\Rightarrow x=\frac{56}{14}, y=\frac{-42}{14}$

⇒ x = 4, y = -3

Hence, x = 4 and y = -3.

3.

Sol:

The given system of equations is:

$\frac{x}{3}+\frac{y}{2}=3$

$\Rightarrow \frac{2x+3y}{6}=3$

2x + 3y = 18

⇒2x + 3y – 18 = 0 ….(i)

and

x – 2y = 2

x – 2y – 2 = 0 …..(ii)

These equations are of the forms:

$a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$

where, $a_1 = 2$, $b_1= 3$, $c_1 = -18$ and $a_2 = 1$, $b_2 = -2$, $c_2 = -2$For a unique solution, we must have:

$\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$, i.e. $\frac{2}{1}\neq\frac{3}{-2}$

Hence, the given system of equations has a unique solution.

Again, the given equations are:

2x + 3y – 18 = 0 …..(iii)x

– 2y – 2 = 0 …..(iv)

On multiplying (i) by 2 and (ii) by 3, we get:4x

+ 6y – 36 = 0 …….(v)

3x - 6y – 6 = 0 ……(vi)

On adding (v) from (vi), we get:7x

= 42

⇒x = 6

On substituting x = 6 in (iii), we get:

$2(6) + 3y = 18$

$\Rightarrow 3y = (18 - 12) = 6$

$\Rightarrow y = 2$

Hence, x = 6 and y = 2 is the required solution.

4.

Sol:

The given system of equations are2x

$+ 3y – 5 = 0$

$kx - 6y - 8 = 0$

This system is of the form:

$a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$

where, $a_1 = 2$, $b_1= 3$, $c_1 = -5$ and $a_2 = k$, $b_2 = -6$, $c_2 = -8$

Now, for the given system of equations to have a unique solution, we must have:

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

– $\Rightarrow \frac{2}{k} \neq \frac{3}{-6}$

$\Rightarrow k \neq -4$ Hence,

$k \neq -4$

5.

Sol:

The given system of equations arex -

$ky – 2 = 0$

$3x + 2y + 5 = 0$

This system of equations is of the form:

$a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$

where, $a_1 = 1$, $b_1= -k$, $c_1 = -2$ and $a_2 = 3$, $b_2 = 2$, $c_2 = 5$

Now, for the given system of equations to have a unique solution, we must have:

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

– $\Rightarrow \frac{1}{3} \neq \frac{-k}{2}$

$\Rightarrow k \neq -\frac{2}{3}$

Hence, $k \neq -\frac{2}{3}$.

–

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6.

Sol:

The given system of equations are5x
- 7y – 5 = 0 ....(i)
2x + ky - 1 = 0 ...(ii)

This system is of the form:

$a_1x+b_1y+c_1 = 0$

$a_2x+b_2y+c_2 = 0$

where, $a_1 = 5$, $b_1= -7$, $c_1 = -5$ and $a_2 = 2$, $b_2 = k$, $c_2 = -1$

Now, for the given system of equations to have a unique solution, we must have:

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

– $\Rightarrow \frac{5}{2} \neq \frac{-7}{k}$

$\Rightarrow k \neq -\frac{14}{5}$

Hence, $k \neq -\frac{14}{5}$.

7.

Sol:

The given system of equations are4x
+ ky + 8 = 0
x + y + 1 = 0

This system is of the form:

$a_1x+b_1y+c_1 = 0$

$a_2x+b_2y+c_2 = 0$

where, $a_1 = 4$, $b_1= k$, $c_1 = 8$ and $a_2 = 1$, $b_2 = 1$, $c_2 = 1$

For the given system of equations to have a unique solution, we must have:

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\Rightarrow \frac{4}{1} \neq \frac{k}{1}$

$\Rightarrow k \neq 4$ Hence,
$k \neq 4$.

8.

Sol:

–

–

The given system of equations are4x
- 5y = k

⇒ 4x - 5y - k = 0 ….(i)
And, 2x - 3y = 12

⇒2x - 3y - 12 = 0 …(ii)
These equations are of the following form:
$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$
Here, $a_1 = 4$, $b_1= -5$, $c_1 = -k$ and $a_2 = 2$, $b_2= -3$, $c_2= -12$For a unique solution, we must have:
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
i.e., $\frac{4}{2} \neq \frac{-5}{-3}$
$\Rightarrow 2 \neq \frac{5}{3} \quad 6 \neq 5$
Thus, for all real values of k, the given system of equations will have a unique solution.

9.

Sol:
The given system of equations:
kx + 3y = (k – 3)

⇒ kx + 3y – (k - 3) = 0 ….(i)
And, 12x + ky = k

⇒12x + ky - k = 0 …(ii)
These equations are of the following form:
$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$
Here, $a_1 = k$, $b_1= 3$, $c_1 = -(k – 3)$ and $a_2 = 12$, $b_2 = k$, $c_2 = -k$
For a unique solution, we must have:
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
i.e., $\frac{k}{12} \neq \frac{3}{k}$
$\Rightarrow k^2 \neq 36 \Rightarrow k \neq \pm 6$

Thus, for all real values of k, other than ±6, the given system of equations will have a unique solution.

10.

6x - 9y = 15

Sol:

The given system of equations:

2x - 3y = 5

⇒ 2x - 3y – 5 = 0 ....(i)6x

- 9y = 15

⇒6x - 9y - 15 = 0 ...(ii)

These equations are of the following forms:

$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$

Here, $a_1 = 2$, $b_1 = -3$, $c_1 = -5$ and $a_2 = 6$, $b_2 = -9$, $c_2 = -15$

$\therefore \frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{-3}{-9} = \frac{1}{3}$ and $\frac{c_1}{c_2} = \frac{-5}{-15} = \frac{1}{3}$

Thus, $\frac{a1}{a2} = \frac{b1}{b2} = \frac{c1}{c2}$

Hence, the given system of equations has an infinite number of solutions.

11.

Sol:

The given system of equations can be written as6x

+ 5y – 11 = 0 ....(i)

⇒ $9x + \frac{15}{2}y - 21 = 0$ ...(ii)

This system is of the form

$a_1x+b_1y+c_1 = 0$

$a_2x+b_2y+c_2 = 0$

Here, $a_1 = 6$, $b_1 = 5$, $c_1 = -11$ and $a_2 = 9$, $b_2 = \frac{15}{2}$, $c_2 = -21$

Now,

$\frac{a_1}{a_2} = \frac{6}{9} = \frac{2}{3}$

$\frac{b_1}{b_2} = \frac{5}{\frac{15}{2}} = \frac{2}{3}$

$\frac{c_1}{c_2} = \frac{-11}{-21} = \frac{11}{21}$

Thus, $\frac{a1}{a2} = \frac{b1}{b2} \neq \frac{c1}{c2}$, therefore the given system has no solution.

12. Sol:

3x - 4y = 10

Sol:
The given system of equations:
kx + 2y = 5

⇒ kx + 2y - 5 = 0 ….(i)3x
- 4y = 10

⇒3x - 4y - 10 = 0 …(ii) These
equations are of the forms:
$a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$
where, $a_1 = k$, $b_1= 2$, $c_1 = -5$ and $a_2 = 3$, $b_2 = -4$, $c_2 = -10$
(i) For a unique solution, we must have:
$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ i.e. $\frac{k}{3} \neq \frac{2}{-4} \Rightarrow k \neq \frac{-3}{2}$
Thus for all real values of k other than $\frac{-3}{2}$, the given system of equations will have a unique solution.
(ii) For the given system of equations to have no solutions, we must have:
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
$\Rightarrow \frac{k}{3} = \frac{2}{-4} \neq \frac{-5}{-10}$
$\Rightarrow \frac{k}{3} = \frac{2}{-4}$ and $\frac{k}{3} \neq \frac{1}{2}$
$\Rightarrow k = \frac{-3}{2}, k \neq \frac{3}{2}$
Hence, the required value of k is $\frac{-3}{2}$.

13.

Sol:
The given system of equations:
x + 2y = 5

⇒ x + 2y - 5 = 0 ….(i)
3x + ky + 15 = 0 …(ii) These
equations are of the forms:
$a_1x+b_1y+c_1 = 0$ and $a_2x+b_2y+c_2 = 0$
where, $a_1 = 1$, $b_1= 2$, $c_1 = -5$ and $a_2 = 3$, $b_2 = k$, $c_2 = 15$
(i) For a unique solution, we must have:
$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ i.e., $\frac{1}{3} \neq \frac{2}{k} \Rightarrow k \neq 6$

Thus for all real values of k other than 6, the given system of equati solution.

(ii) For the given system of equations to have no solutions, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\Rightarrow \frac{1}{3} = \frac{2}{k} \neq \frac{-5}{15}$

$\Rightarrow \frac{1}{3} = \frac{2}{k}$ and $\frac{2}{k} \neq \frac{-5}{15}$

$\Rightarrow k = 6, k \neq -6$

Hence, the required value of k is 6.

14.

Sol:

The given system of equations:

$x + 2y = 3$

$\Rightarrow x + 2y - 3 = 0$ ....(i)

And, $5x + ky + 7 = 0$ ...(ii)

These equations are of the following form:

$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$

where, $a_1 = 1$, $b_1= 2$, $c_1 = -3$ and $a_2 = 5$, $b_2 = k$, $c_2 = 7$

(i) For a unique solution, we must have:

$\therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ i.e., $\frac{1}{5} \neq \frac{2}{k} \Rightarrow k \neq 10$

Thus for all real values of k other than 10, the given system of equations will have a unique solution.

(ii) In order that the given system of equations has no solution, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$\Rightarrow \frac{1}{5} \neq \frac{2}{k} \neq \frac{-3}{7}$

$\Rightarrow \frac{1}{5} \neq \frac{2}{k}$ and $\frac{2}{k} \neq \frac{-3}{7}$

$\Rightarrow k = 10, k \neq \frac{14}{-3}$

Hence, the required value of k is 10.

There is no value of k for which the given system of equations has an infinite number of solutions.

15.

Sol:

The given system of equations:

2x + 3y = 7,

⇒ 2x + 3y - 7 = 0 ….(i)

And, (k – 1)x + (k + 2)y = 3k

⇒(k – 1)x + (k + 2)y - 3k = 0 …(ii)

These equations are of the following form:

$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$

where, $a_1 = 2$, $b_1= 3$, $c_1 = -7$ and $a_2 = (k – 1)$, $b_2 = (k + 2)$, $c_2 = -3k$

For an infinite number of solutions, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\frac{2}{(k-1)} = \frac{3}{(k+2)} = \frac{-7}{-3k}$

$\Rightarrow \frac{2}{(k-1)} = \frac{3}{(k+2)} = \frac{7}{3k}$

Now, we have the following three cases:

Case I:

$\frac{2}{(k-1)} = \frac{3}{k+2}$

⇒ 2(k + 2) = 3(k – 1) ⇒ 2k + 4 = 3k – 3 ⇒ k = 7

Case II:

$\frac{3}{(k+2)} = \frac{7}{3k}$

⇒ 7(k + 2) = 9k ⇒ 7k + 14 = 9k ⇒ 2k = 14 ⇒ k = 7Case III:

$\frac{2}{(k-1)} = \frac{7}{3k}$

⇒ 7k – 7 = 6k ⇒ k = 7

Hence, the given system of equations has an infinite number of solutions when k is equal to7.

16.

Sol:

The given system of equations:

2x + (k – 2)y = k

⇒ 2x + (k – 2)y - k = 0 ….(i)

And, 6x + (2k - 1) y = (2k + 5)

⇒ 6x + (2k - 1) y - (2k + 5) = 0 …(ii)

These equations are of the following form:

$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$

where, $a_1 = 2$, $b_1= (k – 2)$, $c_1 = -k$ and $a_2 = 6$, $b_2 = (2k - 1)$, $c_2 = -(2k + 5)$For an infinite number of solutions, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\frac{2}{6} = \frac{(k-2)}{(2k-1)} = \frac{-k}{-(2k+5)}$

$\Rightarrow \frac{1}{3} = \frac{(k-2)}{(2k-1)} = \frac{k}{(2k+5)}$

Now, we have the following three cases:

Case I:

$\frac{1}{3} = \frac{(k-2)}{(2k-1)}$

⇒ (2k – 1) = 3(k – 2)

⇒ 2k - 1 = 3k – 6 ⇒ k = 5

Case II:

$\frac{(k-2)}{(2k-1)} = \frac{k}{(2k+5)}$

⇒ (k - 2) (2k + 5) = k(2k - 1)

⇒ $2k^2 + 5k – 4k – 10 = 2k^2 – k$

⇒ k + k = 10 ⇒ 2k = 10 ⇒ k = 5

Case III:

$\frac{1}{3} = \frac{k}{(2k+5)}$

⇒ 2k + 5 = 3k ⇒ k = 5

Hence, the given system of equations has an infinite number of solutions when k is equal to5.

17.

Sol:

The given system of equations:kx + 3y = (2k + 1)

⇒ kx + 3y - (2k + 1) = 0 ….(i)

And, $2(k + 1)x + 9y = (7k + 1)$

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$\Rightarrow 2(k + 1)x + 9y - (7k + 1) = 0$ …(ii)

These equations are of the following form:

$a_1x+b_1y+c_1 = 0,\ a_2x+b_2y+c_2 = 0$

where, $a_1 = k$, $b_1= 3$, $c_1 = -(2k + 1)$ and $a_2 = 2(k + 1)$, $b_2 = 9$, $c_2 = -(7k + 1)$For an infinite number of solutions, we must have:

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

i.e., $\frac{k}{2(k+1)} = \frac{3}{9} = \frac{-(2k+1)}{-(7k+1)}$

$\Rightarrow \frac{k}{2(k+1)} = \frac{1}{3} = \frac{(2k+1)}{(7k+1)}$

Now, we have the following three cases:

Case I:

$$\frac{k}{2(k+1)} = \frac{1}{3}$$

$\Rightarrow 2(k + 1) = 3k$

$\Rightarrow 2k + 2 = 3k$

$\Rightarrow k = 2$

Case II:

$$\frac{1}{3} = \frac{(2k+1)}{(7k+1)}$$

$\Rightarrow (7k + 1) = 6k + 3$

$\Rightarrow k = 2$

Case III:

$$\frac{k}{2(k+1)} = \frac{(2k+1)}{(7k+1)}$$

$\Rightarrow k(7k + 1) = (2k + 1) \times 2(k + 1)$

$\Rightarrow 7k^2 + k = (2k + 1)(2k + 2)$

$\Rightarrow 7k^2 + k = 4k^2 + 4k + 2k + 2$

$\Rightarrow 3k^2 – 5k – 2 = 0$

$\Rightarrow 3k^2 – 6k + k – 2 = 0$

$\Rightarrow 3k(k – 2) + 1(k – 2) = 0$

$\Rightarrow (3k + 1)(k – 2) = 0$

$\Rightarrow k = 2$ or $k = \frac{-1}{3}$

Hence, the given system of equations has an infinite number of solutions when k is equal to2.

18.

Sol:

The given system of equations:

5x + 2y = 2k

⇒ 5x + 2y - 2k = 0 ….(i)

And, 2(k + 1)x + ky = (3k + 4)

⇒ 2(k + 1)x + ky - (3k + 4) = 0 …(ii)

These equations are of the following form:

$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$

where, $a_1 = 5$, $b_1= 2$, $c_1 = -2k$ and $a_2 = 2(k + 1)$, $b_2 = k$, $c_2 = -(3k + 4)$For an infinite number of solutions, we must have:

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{5}{2(k+1)} = \frac{2}{k} = \frac{-2k}{-(3k+4)}$$

$$\Rightarrow \frac{5}{2(k+1)} = \frac{2}{k} = \frac{2k}{(3k+4)}$$

Now, we have the following three cases:

Case I:

$$\frac{5}{2(k+1)} = \frac{2}{k}$$

⇒ 2 × 2(k + 1) = 5k

⇒ 4(k + 1) = 5k

⇒ 4k + 4 = 5k

⇒ k = 4

Case II:

$$\frac{2}{k} = \frac{2k}{(3k+4)}$$

⇒ $2k^2 = 2 \times (3k + 4)$

⇒ $2k^2 = 6k + 8$ ⇒ $2k^2 – 6k – 8 = 0$

⇒ $2(k^2 – 3k – 4) = 0$

⇒ $k^2 – 4k + k – 4 = 0$

⇒ k(k – 4) + 1(k – 4) = 0

⇒ (k + 1) (k – 4) = 0

⇒ (k + 1) = 0 or (k – 4) = 0

$\Rightarrow$ k = -1 or k = 4

Case III:

$\frac{5}{2(k+1)} = \frac{2k}{(3k+4)}$

$\Rightarrow 15k + 20 = 4k^2 + 4k$

$\Rightarrow 4k^2 - 11k - 20 = 0$

$\Rightarrow 4k^2 - 16k + 5k - 20 = 0$

$\Rightarrow 4k(k - 4) + 5(k - 4) = 0$

$\Rightarrow (k - 4)(4k + 5) = 0$

$\Rightarrow k = 4$ or $k = \frac{-5}{4}$

Hence, the given system of equations has an infinite number of solutions when k is equal to 4.

19.

Sol:

The given system of equations:

$(k - 1)x - y = 5$

$\Rightarrow (k - 1)x - y - 5 = 0$ ….(i)

And, $(k + 1)x + (1 - k)y = (3k + 1)$

$\Rightarrow (k + 1)x + (1 - k)y - (3k + 1) = 0$ …(ii)

These equations are of the following form:

$a_1x+b_1y+c_1 = 0,\ a_2x+b_2y+c_2 = 0$

where, $a_1 = (k - 1)$, $b_1 = -1$, $c_1 = -5$ and $a_2 = (k + 1)$, $b_2 = (1 - k)$, $c_2 = -(3k + 1)$

For an infinite number of solutions, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

i.e., $\frac{(k-1)}{(k+1)} = \frac{-1}{-(k-1)} = \frac{-5}{-(3k+1)}$

$\Rightarrow \frac{(k-1)}{(k+1)} = \frac{1}{(k-1)} = \frac{5}{(3k+1)}$

Now, we have the following three cases: Case I:

$\frac{(k-1)}{(k+1)} = \frac{1}{(k-1)}$

$\Rightarrow (k - 1)^2 = (k + 1)$

$\Rightarrow k^2 + 1 - 2k = k + 1$

$\Rightarrow k^2 - 3k = 0 \Rightarrow k(k-3) = 0$

$\Rightarrow k = 0$ or $k = 3$

Case II:

$\frac{1}{(k-1)} = \frac{5}{(3k+1)}$

$\Rightarrow 3k + 1 = 5k - 5$

$\Rightarrow 2k = 6 \Rightarrow k = 3$

Case III:

$\frac{(k-1)}{(k+1)} = \frac{5}{(3k+1)}$

$\Rightarrow (3k+1)(k-1) = 5(k+1)$

$\Rightarrow 3k^2 + k - 3k - 1 = 5k + 5$

$\Rightarrow 3k^2 - 2k - 5k - 1 - 5 = 0$

$\Rightarrow 3k^2 - 7k - 6 = 0$

$\Rightarrow 3k^2 - 9k + 2k - 6 = 0$

$\Rightarrow 3k(k-3) + 2(k-3) = 0$

$\Rightarrow (k-3)(3k+2) = 0$

$\Rightarrow (k-3) = 0$ or $(3k+2) = 0$

$\Rightarrow k = 3$ or $k = \frac{-2}{3}$

Hence, the given system of equations has an infinite number of solutions when k is equal to3.

20.

Sol:

The given system of equations can be written as(k – 3) x + 3y - k = 0

kx + ky - 12 = 0

This system is of the form:

$a_1x+b_1y+c_1 = 0$

$a_2x+b_2y+c_2 = 0$

where, $a_1 = k$, $b_1= 3$, $c_1 = -k$ and $a_2 = k$, $b_2 = k$, $c_2 = -12$

For the given system of equations to have a unique solution, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{k-3}{k} = \frac{3}{k} = \frac{-k}{-12}$

$\Rightarrow k - 3 = 3$ and $k^2 = 36$

$\Rightarrow$ k = 6 and k = ±6
$\Rightarrow$ k = 6 Hence,
k = 6.

21.

Sol:
The given system of equations can be written as(a – 1) x + 3y = 2

$\Rightarrow$(a – 1) x + 3y – 2 = 0 ….(i)
and 6x + (1 – 2b)y = 6

$\Rightarrow$6x + (1 – 2b)y – 6 = 0 ….(ii)
These equations are of the following form:
$a_1x+b_1y+c_1 = 0$
$a_2x+b_2y+c_2 = 0$
where, $a_1 = (a – 1)$, $b_1= 3$, $c_1 = -2$ and $a_2 = 6$, $b_2 = (1 – 2b)$, $c_2 = -6$
For an infinite number of solutions, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{a-1}{6} = \frac{3}{(1-2b)} = \frac{-2}{-6}$

$\Rightarrow \frac{a-1}{6} = \frac{3}{(1-2b)} = \frac{1}{3}$

$\Rightarrow \frac{a-1}{6} = \frac{1}{3}$ and $\frac{3}{(1-2b)} = \frac{1}{3}$

$\Rightarrow$ 3a – 3 = 6 and 9 = 1 – 2b
$\Rightarrow$ 3a = 9 and 2b = -8
$\Rightarrow$ a = 3 and b = -4
∴ a = 3 and b = -4

22.

Sol:
The given system of equations can be written as
(2a – 1) x + 3y = 5

$\Rightarrow$(2a – 1) x + 3y – 5 = 0 ….(i)
and 3x + (b – 1)y = 2

$\Rightarrow$3x + (b – 1)y – 2 = 0 ….(ii)
These equations are of the following form:

$a_1x+b_1y+c_1 = 0$, $a_2x+b_2y+c_2 = 0$

where, $a_1 = (2a – 1)$, $b_1= 3$, $c_1 = -5$ and $a_2 = 3$, $b_2 = (b – 1)$, $c_2 = -2$

For an infinite number of solutions, we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{(2a-1)}{3} = \frac{3}{(b-1)} = \frac{-5}{-2}$

$\Rightarrow \frac{(2a-1)}{6} = \frac{3}{(b-1)} = \frac{5}{2}$

$\Rightarrow \frac{(2a-1)}{6} = \frac{5}{2}$ and $\frac{3}{(b-1)} = \frac{5}{2}$

$\Rightarrow 2(2a – 1) = 15$ and $6 = 5(b – 1)$

$\Rightarrow 4a – 2 = 15$ and $6 = 5b – 5$

$\Rightarrow 4a = 17$ and $5b = 11$

$\therefore a = \frac{17}{4}$ and $b = \frac{11}{5}$