RD SHARMA
Solutions
Class 10 Maths
Chapter 3
Ex 3.5

In each of the following systems of equation determine whether the system has a unique solution, no solution or infinite solutions. In case there is a unique solution, find it from 1 to 4:

(1) $x - 3y - 3 = 0$

$3x - 9y - 2 = 0$

Soln:

The given system may be written as

$x - 3y - 3 = 0 \quad 3x - 9y - 2 = 0$

The given system of equation is of the form

$a_1x + b_1y - c_1 = 0 \quad a_2x + b_2y - c_2 = 0$

Where, $a_1 = 1, b_1 = -3, c_1 = -3$

$a_2 = 3, b_2 = -9, c_2 = -2$

We have,

$\frac{a_1}{a_2} = \frac{1}{3} \quad \frac{b_1}{b_2} = \frac{-3}{-9} = \frac{1}{3}$

And , $\frac{c_1}{c_2} = \frac{-3}{-2} = \frac{3}{2}$

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

Therefore, the given equation has no solution.

(2) $2x + y - 5 = 0$

$4x + 2y - 10 = 0$

Soln:

The given system may be written as

$2x + y - 5 = 0 \quad 4x + 2y - 10 = 0$

The given system of equation is of the form

$a_1x + b_1y - c_1 = 0 \quad a_2x + b_2y - c_2 = 0$

Where, $a_1 = 2, b_1 = 1, c_1 = -5$

$a_2 = 4, b_2 = 2, c_2 = -10$

We have,

$a_1a_2 = 24 = 12$ $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$ $b_1b_2 = 12$ $\frac{b_1}{b_2} = \frac{1}{2}$

And , $c_1c_2 = -5-10 = 12$ $\frac{c_1}{c_2} = \frac{-5}{-10} = \frac{1}{2}$

So, $a_1a_2 = b_1b_2 = c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Therefore, the given equation has infinitely many solution.

(3) 3x−5y=20$3x - 5y = 20$

6x−10y=40$6x - 10y = 40$

Soln:

The given system may be written as

3x−5y=20$3x - 5y = 20$ 6x−10y=40$6x - 10y = 40$

The given system of equation is of the form

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

Where, $a_1=3,b_1=-5,c_1=-20$ $a_1 = 3, b_1 = -5, c_1 = -20$

$a_2=6,b_2=-10,c_2=-40$ $a_2 = 6, b_2 = -10, c_2 = -40$

We have,

$a_1a_2 = 36 = 12$ $\frac{a_1}{a_2} = \frac{3}{6} = \frac{1}{2}$ $b_1b_2 = -5-10 = 12$ $\frac{b_1}{b_2} = \frac{-5}{-10} = \frac{1}{2}$

And , $c_1c_2 = -20-40 = 12$ $\frac{c_1}{c_2} = \frac{-20}{-40} = \frac{1}{2}$

So, $a_1a_2 = b_1b_2 = c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Therefore, the given equation has infinitely many solution.

(4) x−2y−8=0$x - 2y - 8 = 0$

5x−10y−10=0$5x - 10y - 10 = 0$

Soln:

The given system may be written as

x−2y−8=0$x - 2y - 8 = 0$ 5x−10y−10=0$5x - 10y - 10 = 0$

The given system of equation is of the form

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

Where, $a_1=1,b_1=-2,c_1=-8$ $a_1 = 1, b_1 = -2, c_1 = -8$

$a_2=5,b_2=-10,c_2=-10$ $a_2 = 5, b_2 = -10, c_2 = -10$

We have,

$a_1a_2=15$ $\frac{a_1}{a_2} = \frac{1}{5}$ $b_1b_2=-2-10=15$ $\frac{b_1}{b_2} = \frac{-2}{-10} = \frac{1}{5}$

And , $c_1c_2=-8-10=45$ $\frac{c_1}{c_2} = \frac{-8}{-10} = \frac{4}{5}$

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Therefore, the given equation has no solution.

Find the value of k for each of the following system of equations which have a unique solution (5-8)

(5) **$kx+2y-5=0$** $kx + 2y - 5 = 0$

$3x+y-1=0$ $3x + y - 1 = 0$

Soln:

The given system may be written as

$kx+2y-5=0$ $kx + 2y - 5 = 0$ $3x+y-1=0$ $3x + y - 1 = 0$

The given system of equation is of the form

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

Where, $a_1=k,b_1=2,c_1=-5$ $a_1 = k, b_1 = 2, c_1 = -5$

$a_2=3,b_2=1,c_2=-1$ $a_2 = 3, b_2 = 1, c_2 = -1$

For unique solution,we have

$a_1a_2\neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $k3\neq 21$ $\frac{k}{3} \neq \frac{2}{1}$ $\Rightarrow k\neq 6 \Rightarrow k \neq 6$

Therefore, the given system will have unique solution for all real values of k other than 6.

(6) **$4x+ky+8=0$** $4x + ky + 8 = 0$

$2x+2y+2=0$ $2x + 2y + 2 = 0$

Soln:

The given system may be written as

$4x+ky+8=0$ $4x + ky + 8 = 0$ $2x+2y+2=0$ $2x + 2y + 2 = 0$

The given system of equation is of the form

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

Where, $a_1 = 4, b_1 = k, c_1 = 8$

$a_2 = 2, b_2 = 2, c_2 = 2$

For unique solution,we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\frac{4}{2} \neq \frac{k}{2}$ $\Rightarrow k \neq 4$

Therefore, the given system will have unique solution for all real values of k other than 4.

(7) $4x - 5y = k$

$2x - 3y = 12$

Soln:

The given system may be written as

$4x - 5y - k = 0$ $2x - 3y - 12 = 0$

The given system of equation is of the form

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

Where, $a_1 = 4, b_1 = -5, c_1 = -k$

$a_2 = 2, b_2 = -3, c_2 = -12$

For unique solution,we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\frac{4}{2} \neq \frac{-5}{-3}$

$\Rightarrow k$ can have any real values.

Therefore, the given system will have unique solution for all real values of k.

(8) $x + 2y = 3$

$5x + ky + 7 = 0$

Soln:

The given system may be written as

$x + 2y = 3$ $5x + ky + 7 = 0$

The given system of equation is of the form

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

Where, $a_1 = 1, b_1 = 2, c_1 = -3$

$a_2 = 5, b_2 = k, c_2 = 7$

For unique solution,we have

$a_1a_2 \neq b_1b_2 \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $15 \neq 2k \frac{1}{5} \neq \frac{2}{k}$ $\Rightarrow k \neq 10 \Rightarrow k \neq 10$

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

Find the value of k for which each of the following system of equations having infinitely many solution: (9-19)

(9) $\mathbf{2x+3y-5=0}$ $2x+3y-5=0$

$\mathbf{6x-ky-15=0}$ $6x-ky-15=0$

Soln:

The given system may be written as

$2x+3y-5=0$ $2x+3y-5=0$ $6x-ky-15=0$ $6x-ky-15=0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-5$ $a_1=2, b_1=3, c_1=-5$

$a_2=6, b_2=k, c_2=-15$ $a_2=6, b_2=k, c_2=-15$

For unique solution,we have

$a_1a_2 = b_1b_2 = c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $26 \neq 3k \frac{2}{6} \neq \frac{3}{k}$ $\Rightarrow k=9 \Rightarrow k=9$

Therefore, the given system of equation will have infinitely many solutions, if k=9.

(10) $\mathbf{4x+5y=3}$ $4x+5y=3$

$\mathbf{kx+15y=9}$ $kx+15y=9$

Soln:

The given system may be written as

$4x+5y=3$ $4x+5y=3$ $kx+15y=9$ $kx+15y=9$

The given system of equation is of the form

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

Where, $a_1=4, b_1=5, c_1=3$ $a_1=4, b_1=5, c_1=3$

$a_2=k, b_2=15, c_2=9$ $a_2=k, b_2=15, c_2=9$

For unique solution,we have

$a_1a_2 = b_1b_2 = c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $4k = 515 = -3-9 \frac{4}{k} = \frac{5}{15} = \frac{-3}{-9}$ $4k = 13 \frac{4}{k} = \frac{1}{3}$ $\Rightarrow k \neq 12 \Rightarrow k \neq 12$

Therefore, the given system will have infinitely many solutions if k=12.

(11) $kx - 2y + 6 = 0$

$4x + 3y + 9 = 0$

Soln:

The given system may be written as

$kx - 2y + 6 = 0$ $\quad 4x + 3y + 9 = 0$

The given system of equation is of the form

$a_1x + b_1y - c_1 = 0$ $\quad a_2x + b_2y - c_2 = 0$

Where, $a_1 = k, b_1 = -2, c_1 = 6$

$a_2 = 4, b_2 = -3, c_2 = 9$

For unique solution,we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\quad \frac{k}{4} = \frac{-2}{-3} = \frac{2}{3}$ $\Rightarrow k = \frac{8}{3}$

Therefore, the given system of equations will have infinitely many solutions, if $k = \frac{8}{3}$.

(12) $8x + 5y = 9$

$kx + 10y = 19$

Soln:

The given system may be written as

$8x + 5y = 9$ $\quad kx + 10y = 19$

The given system of equation is of the form

$a_1x + b_1y - c_1 = 0$ $\quad a_2x + b_2y - c_2 = 0$

Where, $a_1 = 8, b_1 = 5, c_1 = -9$

$a_2 = k, b_2 = 10, c_2 = -18$

For unique solution,we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\quad \frac{8}{k} = \frac{5}{10} = \frac{-9}{-18} = \frac{1}{2}$ $\Rightarrow k = 16$

Therefore, the given system of equations will have infinitely many solutions, if $k = 16$.

(13) $2x - 3y = 7$

(k+2)x−(2k+1)y=3(2k−1)$(k+2)x-(2k+1)y=3(2k-1)$

Soln:

The given system may be written as

2x−3y=7$2x-3y=7$ (k+2)x−(2k+1)y=3(2k−1)$(k+2)x-(2k+1)y=3(2k-1)$

The given system of equation is of the form

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

Where, $a_1=2, b_1=-3, c_1=-7$ $a_1=2, b_1=-3, c_1=-7$

$a_2=k, b_2=-(2k+1), c_2=-3(2k-1)$ $a_2=k, b_2=-(2k+1), c_2=-3(2k-1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2k+2=−3−(2k+1)=−7−3(2k−1 $\frac{2}{k+2}=\frac{-3}{-(2k+1)}=\frac{-7}{-3(2k-1}$ 2k+2=−3−(2k+1) and −3−(2k+1)=−7−3(2k−1 $\frac{2}{k+2}=\frac{-3}{-(2k+1)}$ and $\frac{-3}{-(2k+1)}=\frac{-7}{-3(2k-1}$ ⇒2(2k+1)=3(k+2)and3×3(2k−1)=7(2k+1)

$\Rightarrow 2(2k+1)=3(k+2)$ and $3\times 3(2k-1)=7(2k+1)$ ⇒4k+2=3k+6and18k−9=14k+7

$\Rightarrow 4k+2=3k+6$ and $18k-9=14k+7$ ⇒k=4and4k=16⇒k=4$\Rightarrow k=4$ and $4k=16\Rightarrow k=4$

Therefore, the given system of equations will have infinitely many solutions, if k=4$k=4$.

(14) **2x+3y=2**$2x+3y=2$

(k+2)x+(2k+1)y=2(k−1)$(k+2)x+(2k+1)y=2(k-1)$

Soln:

The given system may be written as

2x+3y=2$2x+3y=2$ (k+2)x+(2k+1)y=2(k−1)$(k+2)x+(2k+1)y=2(k-1)$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-2$ $a_1=2, b_1=3, c_1=-2$

$a_2=(k+2), b_2=(2k+1), c_2=-2(k-1)$ $a_2=(k+2), b_2=(2k+1), c_2=-2(k-1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2k+2=3(2k+1)=−2−2(k−1
$\frac{2}{k+2}=\frac{3}{(2k+1)}=\frac{-2}{-2(k-1}$ 2k+2=3(2k+1) and 3(2k+1)=22(k−1
$\frac{2}{k+2}=\frac{3}{(2k+1)}$ and $\frac{3}{(2k+1)}=\frac{2}{2(k-1}$ ⇒2(2k+1)=3(k+2)and3(k−1)=(2k+1)

$\Rightarrow 2(2k+1)=3(k+2)$ and $3(k-1)=(2k+1)$ ⇒4k+2=3k+6and3k−3=2k+1

$\Rightarrow 4k+2=3k+6$ and $3k-3=2k+1$ ⇒k=4andk=4$\Rightarrow k=4$ and $k=4$

Therefore, the given system of equations will have infinitely many solutions, if k=4$k = 4$.

(15) **x+(k+1)y=4**$x + (k + 1)y = 4$

(k+1)x+9y=(5k+2)$(k + 1)x + 9y = (5k + 2)$

Soln:

The given system may be written as

x+(k+1)y=4$x + (k + 1)y = 4$ (k+1)x+9y=(5k+2)$(k + 1)x + 9y = (5k + 2)$

The given system of equation is of the form

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

Where, $a_1=1,b_1=(k+1),c_1=-4$ $a_1 = 1, b_1 = (k + 1), c_1 = -4$

$a_2=(k+1),b_2=9,c_2=-(5k+2)$ $a_2 = (k + 1), b_2 = 9, c_2 = -(5k + 2)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ 1k+1=(k+1)9=−4−(5k+2 $\frac{1}{k+1} = \frac{(k+1)}{9} = \frac{-4}{-(5k+2}$ 1k+1=k+19 and k+19=45k+2

$\frac{1}{k+1} = \frac{k+1}{9}$ and $\frac{k+1}{9} = \frac{4}{5k+2}$ ⇒9=(k+1)^{2}and(k+1)(5k+2)=36

$\Rightarrow 9 = (k + 1)^2$ and $(k + 1)(5k + 2) = 36$ ⇒9=k^2+2k+1and5k^2+2k+5k+2=36

$\Rightarrow 9 = k^2 + 2k + 1$ and $5k^2 + 2k + 5k + 2 = 36$ ⇒k^2+2k−8=0and5k^2+7k−34=0

$\Rightarrow k^2 + 2k - 8 = 0$ and $5k^2 + 7k - 34 = 0$ ⇒k^2+4k−2k−8=0and5k^2+17k−10k−34=0

$\Rightarrow k^2 + 4k - 2k - 8 = 0$ and $5k^2 + 17k - 10k - 34 = 0$ ⇒k(k+4)−2(k+4)=0and(5k+17)−2(5k+17)=0

$\Rightarrow k(k + 4) - 2(k + 4) = 0$ and $(5k + 17) - 2(5k + 17) = 0$ ⇒(k+4)(k−2)=0and(5k+17)(k−2)=0

$\Rightarrow (k + 4)(k - 2) = 0$ and $(5k + 17)(k - 2) = 0$ ⇒k=−4ork=2andk=-175ork=2

$\Rightarrow k = -4$ or $k = 2$ and $k = \frac{-17}{5}$ or $k = 2$

thus, k=2 satisfies both the condition.

Therefore, the given system of equations will have infinitely many solutions, if k=2$k = 2$.

(16) **kx+3y=2k+1**$kx + 3y = 2k + 1$

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

Soln:

The given system may be written as

kx+3y=2k+1$kx + 3y = 2k + 1$ 2(k+1)x+9y=(7k+1)$2(k + 1)x + 9y = (7k + 1)$

The given system of equation is of the form

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

Where, $a_1=k,b_1=3,c_1=-(2k+1)$ $a_1 = k, b_1 = 3, c_1 = -(2k + 1)$

$a_2=2(k+1), b_2=9, c_2=-(7k+1)$ $a_2 = 2(k + 1), b_2 = 9, c_2 = -(7k + 1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $12(k+2)=39=-(2k+1)-(7k+1$ $\frac{1}{2(k+2)} = \frac{3}{9} = \frac{-(2k+1)}{-(7k+1}$ $12(k+2)=39$ and $39=(2k+1)$ $(7k+1$ $\frac{1}{2(k+2)} = \frac{3}{9}$ and $\frac{3}{9} = \frac{(2k+1)}{(7k+1}$ $\Rightarrow 9k=3\times2(k+1)$ and $3(7k+1)=9(2k+1)$

$\Rightarrow 9k = 3 \times 2(k + 1)$ and $3(7k + 1) = 9(2k + 1)$ $\Rightarrow 9k-6k=6$ and $21k-18k=9-3$

$\Rightarrow 9k - 6k = 6$ and $21k - 18k = 9 - 3$ $\Rightarrow 3k=6$ and $3k=6$ $\Rightarrow 3k = 6$ and $3k = 6$ $\Rightarrow k=2$ and $k=2$

$\Rightarrow k = 2$ and $k = 2$

Therefore, the given system of equations will have infinitely many solutions, if $k=2$ $k = 2$.

(17) $\mathbf{2x+(k-2)y=k}$ $2x + (k - 2)y = k$

$\mathbf{6x+(2k-1)y=(2k+5)}$ $6x + (2k - 1)y = (2k + 5)$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

Where, $a_1=2, b_1=(k-2), c_1=-k$ $a_1 = 2, b_1 = (k - 2), c_1 = -k$

$a_2=6, b_2=(2k-1), c_2=-(2k+5)$ $a_2 = 6, b_2 = (2k - 1), c_2 = -(2k + 5)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $26=k-22k-1=-k-2(2k+5)$ $\frac{2}{6} = \frac{k-2}{2k-1} = \frac{-k}{-2(2k+5)}$ $26=k-22k-1$ and $k-22k-1=k(2k+5$ $\frac{2}{6} = \frac{k-2}{2k-1}$ and $\frac{k-2}{2k-1} = \frac{k}{(2k+5}$ $13=k-22k-1$ and $2k^2+5k-4k-10=2k^2-k$

$\frac{1}{3} = \frac{k-2}{2k-1}$ and $2k^2 + 5k - 4k - 10 = 2k^2 - k$ $\Rightarrow 2k-3k=-6+1$ and $k+k=10$

$\Rightarrow 2k - 3k = -6 + 1$ and $k + k = 10$ $\Rightarrow -k=-5$ and $2k=10$ $\Rightarrow -k = -5$ and $2k = 10$ $\Rightarrow k=5$ and $k=5$

$\Rightarrow k = 5$ and $k = 5$

Therefore, the given system of equations will have infinitely many solutions, if $k=5$ $k = 5$.

(18) $\mathbf{2x+3y=7}$ $2x + 3y = 7$

$\mathbf{(k+1)x+(2k-1)y=(4k+1)}$ $(k + 1)x + (2k - 1)y = (4k + 1)$

Soln:

The given system may be written as

$2x+3y=7$ $2x + 3y = 7$ $(k+1)x+(2k-1)y=(4k+1)$ $(k + 1)x + (2k - 1)y = (4k + 1)$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-7$ $a_1=2, b_1=3, c_1=-7$

$a_2=k+1, b_2=2k-1, c_2=-(4k+1)$ $a_2=k+1, b_2=2k-1, c_2=-(4k+1)$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $2k+1=32k-1=-7-(4k+1)$ $\frac{2}{k+1}=\frac{3}{2k-1}=\frac{-7}{-(4k+1)}$ $2k+1=32k-1$ and $32k-1=7(4k+1)$
$\frac{2}{k+1}=\frac{3}{2k-1}$ and $\frac{3}{2k-1}=\frac{7}{(4k+1)}$ Extra close brace or missing open brace

$\Rightarrow 4k-2=3k+3 \text{and} 12k+3=14k-7$

$\Rightarrow 4k-2=3k+3$ and $12k+3=14k-7$ $\Rightarrow k=5 \text{and} 2k=10 \Rightarrow k=5$ and $2k=10$ $\Rightarrow k=5 \text{and} k=5$
$\Rightarrow k=5$ and $k=5$

Therefore, the given system of equations will have infinitely many solutions, if $k=5$ $k=5$.

(19) $\mathbf{2x+3y=k}$ $2x+3y=k$

$\mathbf{(k-1)x+(k+2)y=3k}$ $(k-1)x+(k+2)y=3k$

Soln:

The given system may be written as

$2x+3y=k$ $2x+3y=k$ $(k-1)x+(k+2)y=3k$ $(k-1)x+(k+2)y=3k$

The given system of equation is of the form

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

Where, $a_1=2, b_1=3, c_1=-k$ $a_1=2, b_1=3, c_1=-k$

$a_2=k-1, b_2=k+2, c_2=-3k$ $a_2=k-1, b_2=k+2, c_2=-3k$

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $2k-1=3k+2=-k-3k$ $\frac{2}{k-1}=\frac{3}{k+2}=\frac{-k}{-3k}$ $2k-1=3k+2$ and $3k+1=-k-3k$
$\frac{2}{k-1}=\frac{3}{k+2}$ and $\frac{3}{k+1}=\frac{-k}{-3k}$ Extra close brace or missing open brace

$2k+4=3k-3 \text{and} 9=k+2$

$\Rightarrow$ $\Rightarrow k=7 \text{and} k=7 \Rightarrow k=7$ and $k=7$

Therefore, the given system of equations will have infinitely many solutions, if $k=7$ $k=7$.

Find the value of k for which the following system of equation has no solution : (20-25)

(20) $\mathbf{kx-5y=2}$ $kx-5y=2$

$6x+2y=7$

Soln:

The given system may be written as

$kx-5y=2$ $6x+2y=7$

The given system of equation is of the form

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

Where, $a_1=k, b_1=-5, c_1=-2$

$a_2=6, b_2=2, c_2=-7$

For no solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ $\frac{k}{6}=\frac{-5}{2}\neq\frac{2}{7}$ $\Rightarrow 2k=-30$ $\Rightarrow k=-15$

Therefore, the given system of equations will have no solutions, if $k=-15$.

(21) $x+2y=0$

$2x+ky=5$

Soln:

The given system may be written as

$x2y=0$ $2x+ky=5$

The given system of equation is of the form

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

Where, $a_1=1, b_1=2, c_1=0$

$a_2=2, b_2=k, c_2=-5$

For no solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ $\frac{1}{2}=\frac{2}{k}\neq\frac{2}{7}$ $\Rightarrow k=4$

Therefore, the given system of equations will have no solutions, if $k=4$.

(22) $3x-4y+7=0$

$kx+3y-5=0$

Soln:

The given system may be written as

$3x-4y+7=0$ $kx+3y-5=0$

The given system of equation is of the form

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

Where, $a_1=3, b_1=-4, c_1=7$

$a_2=k, b_2=3, c_2=-5$

For no solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ $\frac{3}{k}=\frac{-4}{3} \Rightarrow k=\frac{-9}{4}$

Therefore, the given system of equations will have no solutions, if $k=\frac{-9}{4}$.

(23) $2x-ky+3=0$

$3x+2y-1=0$

Soln:

The given system may be written as

$2x-ky+3=0$ $3x+2y-1=0$

The given system of equation is of the form

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

Where, $a_1=2, b_1=-k, c_1=3$

$a_2=3, b_2=2, c_2=-1$

For no solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$ $\frac{2}{3}=\frac{-k}{2} \Rightarrow k=\frac{-4}{3}$

Therefore, the given system of equations will have no solutions, if $k=\frac{-4}{3}$.

(24) $2x+ky-11=0$

$5x-7y-5=0$

Soln:

The given system may be written as

$2x+ky-11=0$ $5x-7y-5=0$

The given system of equation is of the form

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

Where, $a_1 = 2, b_1 = k, c_1 = -11$

$a_2 = 5, b_2 = -7, c_2 = -5$

For no solution,we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\frac{2}{5} = \frac{-k}{-7}$ $\Rightarrow k = \frac{-14}{5}$

Therefore, the given system of equations will have no solutions, if $k = \frac{-14}{5}$.

(25) $kx + 3y = 3$

$12x + ky = 6$

Soln:

The given system may be written as

$kx + 3y = 3$ $12x + ky = 6$

The given system of equation is of the form

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

Where, $a_1 = k, b_1 = 3, c_1 = -3$

$a_2 = 12, b_2 = k, c_2 = -6$

For no solution,we have

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

$\frac{k}{12} = \frac{3}{k} \neq \frac{3}{6}$ ……(i)

$\Rightarrow k^2 = 36$ $\Rightarrow k = +6 \text{ or } -6$

From (i)

$\frac{k}{12} \neq \frac{3}{6}$ $\Rightarrow k \neq 6$

Therefore, the given system of equations will have no solutions, if $k = -6$.

(26) For what value of a, the following system of equation will be inconsistent?

$4x + 6y - 11 = 0$

$2x + ay - 7 = 0$

Soln:

The given system may be written as

$4x+6y-11=0 \quad 2x+ay-7=0$

The given system of equation is of the form

$a_1x+b_1y-c_1=0 \quad a_2x+b_2y-c_2=0$

Where, $a_1=4, b_1=6, c_1=-11$

$a_2=2, b_2=a, c_2=-7$

For unique solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2} \quad \frac{a_1}{a_2}=\frac{b_1}{b_2} \quad \frac{4}{2}=\frac{6}{a} \Rightarrow a=3$

Therefore, the given system of equations will be inconsistent, if $a=3$.

(27) For what value of a, the following system of equation have no solution?

$\mathbf{ax+3y=a-3}$

$\mathbf{12x+ay=a}$

Soln:

The given system may be written as

$ax+3y=a-3 \quad 12x+ay=a$

The given system of equation is of the form

$a_1x+b_1y-c_1=0 \quad a_2x+b_2y-c_2=0$

Where, $a_1=a, b_1=3, c_1=-(a-3)$

$a_2=12, b_2=a, c_2=-a$

For unique solution,we have

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2} \quad \frac{a}{12}=\frac{3}{a}\neq\frac{-(a-3)}{-a} \quad 3a\neq frac-(a-3)-a$
$\frac{3}{a}\neq frac-(a-3)-a \quad \Rightarrow a-3\neq 3 \quad \Rightarrow a\neq 6$

And,

$\frac{a}{12}=\frac{3}{a} \Rightarrow a^2=36 \Rightarrow a=+6 \text{ or } -6$

$\because a\neq 6$

$\Rightarrow a=-6$

Therefore, the given system of equations will have no solution, if $a=-6$.

(28) Find the value of a,for which the following system of equation have

(i) Unique solution

(ii) No solution

$kx + 2y = 5$

$3x + y = 1$

Soln:

The given system may be written as

$kx + 2y - 5 = 0$ $3x + y - 1 = 0$

The given system of equation is of the form

$a_1 x + b_1 y - c_1 = 0$ $a_2 x + b_2 y - c_2 = 0$

Where, $a_1 = k, b_1 = 2, c_1 = -5$

$a_2 = 3, b_2 = 1, c_2 = -1$

(i) For unique solution, we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\frac{k}{3} \neq \frac{2}{1}$ $k \neq 6$

Therefore, the given system of equations will have unique solution, if $k \neq 6$.

(ii) For no solution, we have

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\frac{k}{3} = \frac{2}{1} \neq \frac{-5}{-1}$ $\frac{k}{3} = \frac{2}{1}$ $\Rightarrow k = 6$

Therefore, the given system of equations will have no solution, if $a = 6$.

(29) For what value of c, the following system of equation have infinitely many solution (where $c \neq 0$)?

$6x + 3y = c - 3$

$12x + cy = c$

Soln:

The given system may be written as

$6x + 3y - (c - 3) = 0$ $12x + cy - c = 0$

The given system of equation is of the form

$a_1 x + b_1 y - c_1 = 0$ $a_2 x + b_2 y - c_2 = 0$

Where, $a_1 = 6, b_1 = 3, c_1 = -(c-3)$

$a_2 = 12, b_2 = c, c_2 = -c$

For infinitely many solution,we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \frac{6}{12} = \frac{3}{c} = \frac{-(c-3)}{-c} \quad \frac{1}{2} = \frac{3}{c} \text{ and } \frac{3}{c} = \frac{-(c-3)}{-c}$$

$$\Rightarrow c = 6 \text{ and } c - 3 = 3 \quad \Rightarrow c = 6 \text{ and } c = 6$$

Therefore, the given system of equations will have infinitely many solution, if $c = 6$.

(30) Find the value of k,for which the following system of equation have

(i) Unique solution

(ii) No solution

(iii) Infinitely many solution

$$2x + ky = 1$$

$$3x - 5y = 7$$

Soln:

The given system may be written as

$$2x + ky = 1 \quad 3x - 5y = 7$$

The given system of equation is of the form

$$a_1x + b_1y - c_1 = 0 \quad a_2x + b_2y - c_2 = 0$$

Where, $a_1 = 2, b_1 = k, c_1 = -1$

$a_2 = 3, b_2 = -5, c_2 = -7$

(i) For unique solution, we have

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \quad \frac{2}{3} \neq \frac{-k}{-5} \quad k \neq \frac{-10}{3}$$

Therefore, the given system of equations will have unique solution, if $k \neq \frac{-10}{3}$.

(ii) For no solution, we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad \frac{2}{3} = \frac{k}{-5} \neq \frac{-1}{-7} \quad \frac{2}{3} = \frac{k}{-5} \text{ and } \frac{k}{-5} \neq \frac{1}{7}$$

$$\Rightarrow k = \frac{-10}{3} \text{ and } k \neq \frac{-5}{7} \quad \Rightarrow k = \frac{-10}{3}$$

Therefore, the given system of equations will have no solution, if $k = \frac{-10}{3}$.

(iii) For the given system to have infinitely many solution,we have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \frac{2}{3} = \frac{k}{-5} = \frac{-1}{-7}$$

Clearly $\frac{a_1}{a_2} \neq \frac{c_1}{c_2}$,

So there is no value of k for which the given system of equation has infinitely many solution.

(31) For what value of k, the following system of equation will represent the coincident lines?

$$x + 2y + 7 = 0$$

$$2x + ky + 14 = 0$$

Soln:

The given system may be written as

$$x + 2y + 7 = 0 \quad 2x + ky + 14 = 0$$

The given system of equation is of the form

$$a_1x + b_1y - c_1 = 0 \quad a_2x + b_2y - c_2 = 0$$

Where, $a_1 = 1, b_1 = 2, c_1 = 7$

$a_2 = 2, b_2 = k, c_2 = 14$

The given system of equation will represent the coincident lines if they have infinitely many solution.

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \frac{1}{2} = \frac{2}{k} = \frac{7}{14} \quad \frac{1}{2} = \frac{2}{k} = \frac{1}{2} \Rightarrow k = 4$$

Therefore, the given system of equations will have infinitely many solution, if $k = 4$.

(32) (30) Find the value of k,for which the following system of equation have unique solution.

$$ax + by = c$$

$$lx + my = n$$

Soln:

The given system may be written as

$$ax + by - c = 0 \quad lx + my - n = 0$$

The given system of equation is of the form

$$a_1x + b_1y - c_1 = 0 \quad a_2x + b_2y - c_2 = 0$$

Where, $a_1 = a, b_1 = b, c_1 = -c$

$a_2 = l, b_2 = m, c_2 = -n$

For unique solution, we have

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow al \neq bm \Rightarrow \frac{a}{l} \neq \frac{b}{m} \Rightarrow am \neq bl$

Therefore, the given system of equations will have unique solution, if $am \neq bl$.

(33) Find the value of a and b such that the following system of linear equation have infinitely many solution:

$(2a-1)x + 3y - 5 = 0$

$3x + (b-1)y - 2 = 0$

Soln:

The given system of equation may be written as,

$(2a-1)x + 3y - 5 = 0 \quad 3x + (b-1)y - 2 = 0$

The given system of equation is of the form

$a_1x + b_1y - c_1 = 0 \quad a_2x + b_2y - c_2 = 0$

Where, $a_1 = (2a-1), b_1 = 3, c_1 = -5$

$a_2 = 3, b_2 = b-1, c_2 = -2$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \quad \frac{(2a-1)}{3} = \frac{3}{b-1} = \frac{-5}{-2}$

$\frac{(2a-1)}{3} = \frac{5}{2}$ 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 $5b = 11$

$\Rightarrow a = \frac{17}{4}$ and $b = \frac{11}{5}$

(34) Find the value of a and b such that the following system of linear equation have infinitely many solution:

$2x - 3y = 7$

$(a+b)x - (a+b-3)y = 4a + b$

Soln:

The given system of equation may be written as,

$2x - 3y - 7 = 0 \quad (a+b)x - (a+b-3)y - (4a+b) = 0$

The given system of equation is of the form

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

Where, $a_1 = 2, b_1 = -3, c_1 = -7$

$a_2 = (a+b), b_2 = -(a+b-3), c_2 = -(4a+b)$

The given system of equation will have infinitely many solution, if

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

$$\frac{2}{(a+b)} = \frac{-3}{-(a+b-3)} = \frac{-7}{-(4a+b)}$$

$$\frac{2}{(a+b)} = \frac{3}{(a+b-3)} \text{ and } \frac{3}{(a+b-3)} = \frac{7}{(4a+b)}$$

$$\Rightarrow 2(a+b-3) = 3(a+b) \text{ and } 3(4a+b) = 7(a+b-3)$$

$$\Rightarrow 2a+2b-6 = 3a+3b \text{ and } 12a+3b = 7a+7b-21$$

$$\Rightarrow a+b = -6 \text{ and } 5a-4b = -21$$

a+b= -6

$\Rightarrow a = -6 - b$

Substituting the value of a in $5a - 4b = -21$ we have

5(-b-6)-4b=-21

$\Rightarrow -5b - 30 - 4b = -21$ $\Rightarrow 9b = -9$ $\Rightarrow b = -1$

As a=-6-b

$\Rightarrow a = -6 + 1 = -5$

Hence the given system of equation will have infinitely many solution if

a=-5 and b=-1.

(35) Find the value of p and q such that the following system of linear equation have infinitely many solution:

$$2x - 3y = 9$$

$$(p+q)x + (2p-q)y = 3(p+q+1)$$

Soln:

The given system of equation may be written as,

$2x - 3y - 9 = 0$ $(p+q)x + (2p-q)y - 3(p+q+1) = 0$

The given system of equation is of the form

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

Where, $a_1 = 2, b_1 = 3, c_1 = -9$

$a_2 = (p+q), b_2 = (2p-q), c_2 = -3(p+q+1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2(p+q)=3(2p−q)=−9−3(p+q+1)

$\frac{2}{(p+q)}=\frac{3}{(2p-q)}=\frac{-9}{-3(p+q+1)}$ 2(p+q)=3(2p−q) and 3(2p−q)=3(p+q+1)

$\frac{2}{(p+q)}=\frac{3}{(2p-q)}$ and $\frac{3}{(2p-q)}=\frac{3}{(p+q+1)}$ 2(2p−q)=3(p+q)and(p+q+1)=2p−q

$2(2p-q)=3(p+q)$ and $(p+q+1)=2p-q$ ⇒4p−2q=3p+3qand−p+2q=−1

$\Rightarrow 4p-2q=3p+3q$ and $-p+2q=-1$ ⇒p=5qandp−2q=1⇒ $p=5q$ and $p-2q=1$

Substituting the value of p in p-2q=1, we have

3q=1

⇒q=13⇒ $q=\frac{1}{3}$

Substituting the value of p in p=5q $p=5q$ we have

p=53 $p=\frac{5}{3}$

Hence the given system of equation will have infinitely many solution if

p=53 $p=\frac{5}{3}$ and q=13 $q=\frac{1}{3}$.

(36) Find the values of a and b for which the following system of equation has infinitely many solution:

(i) (2a−1)x+3y=5 $(2a-1)x+3y=5$

3x+(b−2)y=3 $3x+(b-2)y=3$

Soln:

The given system of equation may be written as,

(2a−1)x+3y−5=0 $(2a-1)x+3y-5=0$ 3x+(b−2)y−3=0 $3x+(b-2)y-3=0$

The given system of equation is of the form

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

Where, $a_1=2a-1, b_1=3, c_1=-5$ $a_1=2a-1, b_1=3, c_1=-5$

$a_2=3, b_2=b-2, c_2=-3(p+q+1)$ $a_2=3, b_2=b-2, c_2=-3(p+q+1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2a−13=−3b−2=−5−3 $\frac{2a-1}{3}=\frac{-3}{b-2}=\frac{-5}{-3}$ 2a−13=53 and −3b−2=53

$\frac{2a-1}{3}=\frac{5}{3}$ and $\frac{-3}{b-2}=\frac{5}{3}$ 2a−1=5and−9=5(b−2) $2a-1=5$ and $-9=5(b-2)$ ⇒a=3and−9=5b−10

$\Rightarrow a=3$ and $-9=5b-10$ ⇒a=3andb=15⇒ $a=3$ and $b=\frac{1}{5}$

Hence the given system of equation will have infinitely many solution if

a=3 $a=3$ and b=15 $b=\frac{1}{5}$.

(ii) $2x-(2a+5)y=5$

$(2b+1)x-9y=15$

Soln:

The given system of equation may be written as,

$2x-(2a+5)y=5 \quad (2b+1)x-9y=15$

The given system of equation is of the form

$a_1x+b_1y-c_1=0 \quad a_2x+b_2y-c_2=0$

Where, $a_1=2, b_1=-(2a+5), c_1=-5$

$a_2=(2b+1), b_2=-9, c_2=-15$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2} \quad \frac{2}{2b+1}=\frac{-(2a+5)}{-9}=\frac{-5}{-15} \quad \frac{2}{2b+1}=\frac{1}{3} \text{ and } \frac{(2a+5)}{9}=\frac{1}{3}$

$\Rightarrow 6=2b+1 \text{ and } 2a+5=3 \quad \Rightarrow b=\frac{5}{2} \text{ and } a=-1$

Hence the given system of equation will have infinitely many solution if

$a=-1$ and $b=\frac{5}{2}$.

(iii) $(a-1)x+3y=2$

$6x+(1-2b)y=6$

Soln:

The given system of equation may be written as,

$(a-1)x+3y=2 \quad 6x+(1-2b)y=6$

The given system of equation is of the form

$a_1x+b_1y-c_1=0 \quad a_2x+b_2y-c_2=0$

Where, $a_1=a-1, b_1=3, c_1=-2$

$a_2=6, b_2=1-2b, c_2=-6$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2} \quad \frac{a-1}{6}=\frac{3}{1-2b}=\frac{2}{6} \quad \frac{a-1}{6}=\frac{1}{3} \text{ and } \frac{3}{1-2b}=\frac{1}{3}$

$\Rightarrow a-1=2 \text{ and } 1-2b=9 \quad \Rightarrow a=3 \text{ and } b=-4$

Hence the given system of equation will have infinitely many solution if

$a = 3$ and $b = -4$.

(iv) $3x + 4y = 12$

$(a + b)x + 2(a - b)y = 5a - 1$

Soln:

The given system of equation may be written as,

$3x + 4y - 12 = 0$ $(a + b)x + 2(a - b)y - (5a - 1) = 0$

The given system of equation is of the form

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

Where, $a_1 = 3, b_1 = 4, c_1 = -12$

$a_2 = (a + b), b_2 = 2(a - b), c_2 = -(5a - 1)$

The given system of equation will have infinitely many solution, if

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\frac{3}{a+b} = \frac{4}{2(a-b)} = \frac{12}{5a-1}$ $\frac{3}{a+b} = \frac{2}{a+b}$ and $\frac{2}{a+b} = \frac{12}{5a-1}$

$\Rightarrow 3(a-b) = 2a + 2b$ and $2(5a - 1) = 12(a - b)$

$\Rightarrow a = 5b$ and $-2a = -12b + 2$

Substituting a=5b in -2a=-12b+2 , we have

-2(5b)=-12b+2

$\Rightarrow -10b = -12b + 2$ $\Rightarrow b = 1$

Thus a=5

Hence the given system of equation will have infinitely many solution if

$a = 5$ and $b = 1$.

(v) $2x + 3y = 7$

$(a - 1)x + (a + 1)y = 3a - 1$

Soln:

The given system of equation may be written as,

$2x + 3y - 7 = 0$ $(a - 1)x + (a + 1)y - (3a - 1) = 0$

The given system of equation is of the form

a1x+b1y−c1=0 $a_1x + b_1y - c_1 = 0$ a2x+b2y−c2=0 $a_2x + b_2y - c_2 = 0$

Where, a1=2,b1=3,c1=−7 $a_1 = 2, b_1 = 3, c_1 = -7$

a2=(a−1),b2=(a+1),c2=−(3a−1) $a_2 = (a-1), b_2 = (a+1), c_2 = -(3a-1)$

The given system of equation will have infinitely many solution, if

a1a2=b1b2=c1c2 $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ 2a−b=3a+1)=−73a−1 $\frac{2}{a-b} = \frac{3}{a+1)} = \frac{-7}{3a-1}$ 2a−b=3a+1) and 3a+1)=−73a−1

$\frac{2}{a-b} = \frac{3}{a+1)}$ and $\frac{3}{a+1)} = \frac{-7}{3a-1}$ ⇒2(a+1)=3(a−1)and3(3a−1)=7(a+1)

$\Rightarrow 2(a+1) = 3(a-1)$ and $3(3a-1) = 7(a+1)$ ⇒2a−3a=−3−2and9a−3=7a+7

$\Rightarrow 2a - 3a = -3 - 2$ and $9a - 3 = 7a + 7$ ⇒a=5anda=5 $\Rightarrow a = 5$ and $a = 5$

Hence the given system of equation will have infinitely many solution if

a=5 $a = 5$ and b=1 $b = 1$.

(vi) **2x+3y=7** $2x + 3y = 7$

(a−1)x+(a+2)y=3a $(a-1)x + (a+2)y = 3a$

Soln:

The given system of equation may be written as,

2x+3y−7=0 $2x + 3y - 7 = 0$ (a−1)x+(a+2)y−3a=0 $(a-1)x + (a+2)y - 3a = 0$

The given system of equation is of the form

a1x+b1y−c1=0 $a_1x + b_1y - c_1 = 0$ a2x+b2y−c2=0 $a_2x + b_2y - c_2 = 0$

Where, a1=2,b1=3,c1=−7 $a_1 = 2, b_1 = 3, c_1 = -7$

a2=(a−1),b2=(a+2),c2=−3a $a_2 = (a-1), b_2 = (a+2), c_2 = -3a$

The given system of equation will have infinitely many solution, if

a1a2=b1b2=c1c2 $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ 2a−b=3a+2)=−7−3a $\frac{2}{a-b} = \frac{3}{a+2)} = \frac{-7}{-3a}$ 2a−b=3a+2) and 3a+2)=73a

$\frac{2}{a-b} = \frac{3}{a+2)}$ and $\frac{3}{a+2)} = \frac{7}{3a}$ ⇒2(a+2)=3(a−1)and3(3a)=7(a+2)

$\Rightarrow 2(a+2) = 3(a-1)$ and $3(3a) = 7(a+2)$ ⇒2a+4=3a−3and9a=7a+14

$\Rightarrow 2a + 4 = 3a - 3$ and $9a = 7a + 14$ ⇒a=7anda=7 $\Rightarrow a = 7$ and $a = 7$

Hence the given system of equation will have infinitely many solution if

a=7 $a = 7$ and b=1 $b = 1$.