

Q.1: $x + 2y + 1 = 0$ and $2x - 3y - 12 = 0$

Soln:

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

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

Here $a_1= 1$, $b_1= 2$, $c_1= 1$

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

By cross multiplication method,

$x-24+3 = -y-12-2 = 1-3-4 \frac{x}{-24+3} = \frac{-y}{-12-2} = \frac{1}{-3-4}$ $x-21 = -y-14 = 1-7 \frac{x}{-21} = \frac{-y}{-14} = \frac{1}{-7}$

Now,

$x-21 = 1-7 \frac{x}{-21} = \frac{1}{-7}$

$=x= 3$

And,

$-y-14 = 1-7 \frac{-y}{-14} = \frac{1}{-7}$

$=y=-2$

The solution of the given system of equation is 3 and -2 respectively.

Q.2: $3x + 2y + 25 = 0$, $2x + y + 10 = 0$

Soln:

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

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

Here $a_1= 3$, $b_1= 2$, $c_1= 25$

$a_2= 2$, $b_2= 1$, $c_2= 10$

By cross multiplication method,

$x20-25 = -y30-50 = 13-4 \frac{x}{20-25} = \frac{-y}{30-50} = \frac{1}{3-4}$ $x-5 = -y-20 = 1-1 \frac{x}{-5} = \frac{-y}{-20} = \frac{1}{-1}$

Now,

$$x-5 = 1-1 \frac{x}{-5} = \frac{1}{-1}$$

$$=x= 5$$

And,

$$-y-20 = 1-1 \frac{-y}{-20} = \frac{1}{-1}$$

$$=y=-20$$

The solution of the given system of equation is 5 and -20 respectively.

Q.3: $2x + y = 35, 3x + 4y = 65$

Soln:

$$2x+y= 35 \dots\dots\dots(i)$$

$$3x+4y=65\dots\dots\dots(ii)$$

Here $a_1= 2, b_1= 1, c_1= 35$

$a_2= 3, b_2= 4, c_2= 65$

By cross multiplication method,

$$x-65+140 = -y-130+105 = 18-3 \frac{x}{-65+140} = \frac{-y}{-130+105} = \frac{1}{8-3} \times 75 = -y-25 = 15 \frac{x}{75} = \frac{-y}{-25} = \frac{1}{5}$$

Now,

$$x75 = 15 \frac{x}{75} = \frac{1}{5}$$

$$=x= 15$$

And,

$$-y-25 = 15 \frac{-y}{-25} = \frac{1}{5}$$

$$=y=5$$

The solution of the given system of equation is 15 and 5 respectively.

Q.4: $2x - y - 6 = 0, x - y - 2 = 0$

Soln:

$$2x - y = 6 \dots\dots\dots(i)$$

$$x - y = 2 \dots\dots\dots(ii)$$

Here $a_1 = 2$, $b_1 = -1$, $c_1 = 6$

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

By cross multiplication method,

$$x \cdot 2 - 6 = -y \cdot 4 + 6 = 1 - 2 + 1 \frac{x}{2-6} = \frac{-y}{-4+6} = \frac{1}{-2+1} \quad x - 4 = -y \cdot 2 = 1 - 1 \frac{x}{-4} = \frac{-y}{2} = \frac{1}{-1}$$

Now,

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

$$= x = 4$$

And,

$$-y \cdot 2 = 1 - 1 \frac{-y}{2} = \frac{1}{-1}$$

$$= y = 2$$

The solution of the given system of equation is 4 and 2 respectively.

Q5: $x + yxy = 2 \frac{x+y}{xy} = 2$, $x - yxy = 6 \frac{x-y}{xy} = 6$

Soln:

$$x + yxy = 2 \frac{x+y}{xy} = 2$$

$$= 1x + 1y = 2 \frac{1}{x} + \frac{1}{y} = 2 \dots\dots\dots(i)$$

$$x - yxy = 6 \frac{x-y}{xy} = 6$$

$$= 1x - 1y = 6 \frac{1}{x} - \frac{1}{y} = 6 \dots\dots\dots(ii)$$

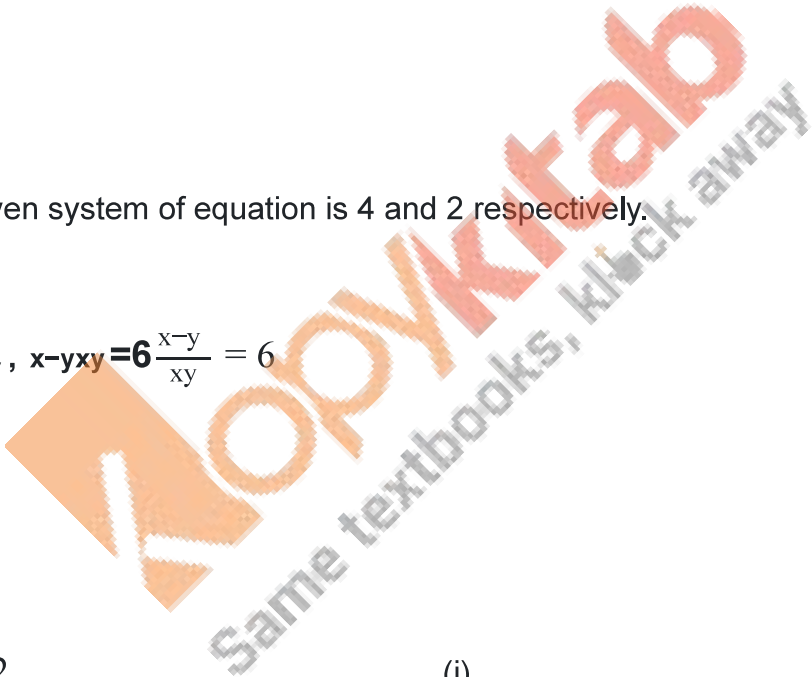
Taking $1x \frac{1}{x} = u$

Taking $1y \frac{1}{y} = v$

$$= u + v = 2 \dots\dots\dots(iii)$$

$$= u - v = 6 \dots\dots\dots(iv)$$

By cross multiplication method,



$$u6-2 = -v6+2 = 1-1-1 \frac{u}{6-2} = \frac{-v}{6+2} = \frac{1}{-1-1} \quad u4 = -v8 = 1-2 \frac{u}{4} = \frac{-v}{8} = \frac{1}{-2}$$

Now,

$$u4 = 1-2 \frac{u}{4} = \frac{1}{-2}$$

$$=u = -2$$

And,

$$-v-8 = 1-2 \frac{-v}{-8} = \frac{1}{-2}$$

$$=v = 4$$

$$1u \frac{1}{u} = x = -12 \frac{-1}{2}$$

$$1v \frac{1}{v} = y = 14 \frac{1}{4}$$

The solution of the given system of equation is $-12 \frac{-1}{2}$ and $14 \frac{1}{4}$ respectively.

Q.6: $ax+by=a-b$, $bx-ay=a+b$

Soln:

$$ax+by=a-b \dots\dots\dots (i)$$

$$bx-ay=a+b \dots\dots\dots (ii)$$

$$\text{Here } a_1 = a, b_1 = b, c_1 = a-b$$

$$a_2 = b, b_2 = -a, c_2 = a+b$$

By cross multiplication method,

$$\frac{x-ab-b^2+ab-a^2}{-ab-b^2+ab-a^2} = \frac{-y}{-a^2-ab-b^2+ab} = \frac{1}{-a^2-b^2} \quad x-b^2-a^2 = -y-a^2-b^2 = 1-a^2-b^2 \quad \frac{x}{-b^2-a^2} = \frac{-y}{-a^2-b^2} = \frac{1}{-a^2-b^2}$$

Now,

$$x-ab-b^2+ab-a^2 = 1-a^2-b^2 \frac{x}{-ab-b^2+ab-a^2} = \frac{1}{-a^2-b^2}$$

$$=x = 1$$

And,

$$-y - a^2 - ab - b^2 + ab = 1 - a^2 - b^2 \frac{-y}{-a^2 - ab - b^2 + ab} = \frac{1}{-a^2 - b^2}$$

$$= y = -1$$

The solution of the given system of equation is 1 and -1 respectively.

Q.7: $x + ay - b = 0$, $ax - by - c = 0$

Soln:

$$x + ay - b = 0 \dots\dots\dots (i)$$

$$ax - by - c = 0 \dots\dots\dots (ii)$$

Here $a_1 = 1$, $b_1 = a$, $c_1 = -b$

$a_2 = a$, $b_2 = -b$, $c_2 = -c$

By cross multiplication method,

$$x - ac - b^2 = -y - c + ab = 1 - a^2 - b \frac{x}{-ac - b^2} = \frac{-y}{-c + ab} = \frac{1}{-a^2 - b}$$

Now,

$$x - ac - b^2 = 1 - a^2 - b \frac{x}{-ac - b^2} = \frac{1}{-a^2 - b}$$

$$= x = b^2 + aca^2 + b \frac{b^2 + ac}{a^2 + b}$$

And,

$$-y - c + ab = 1 - a^2 - b \frac{-y}{-c + ab} = \frac{1}{-a^2 - b}$$

$$= y = -c + aba^2 + b \frac{-c + ab}{a^2 + b}$$

The solution of the given system of equation is $b^2 + aca^2 + b \frac{b^2 + ac}{a^2 + b}$ and $-c + aba^2 + b \frac{-c + ab}{a^2 + b}$ respectively.

Q8

$$ax + by = a^2$$

$$bx + ay = b^2$$

Soln:

$$ax+by=a^2 \dots\dots\dots(i)$$

$$bx+ay=b^2 \dots\dots\dots (ii)$$

$$\text{Here } a_1 = a, b_1 = b, c_1 = a^2$$

$$a_2 = b, b_2 = a, c_2 = b^2$$

By cross multiplication method,

$$x-b^2+a^2 = -y-ab^2-a^2b = 1a^2-b^2 \frac{x}{-b^2+a^2} = \frac{-y}{-ab^2-a^2b} = \frac{1}{a^2-b^2}$$

Now,

$$x-b^2+a^2 = 1a^2-b^2 \frac{x}{-b^2+a^2} = \frac{1}{a^2-b^2}$$

$$=x = a^2+ab+b^2a+b \frac{a^2+ab+b^2}{a+b}$$

And,

$$-y-ab^2-a^2b = 1a^2-b^2 \frac{-y}{-ab^2-a^2b} = \frac{1}{a^2-b^2}$$

$$=y = -ab(a-b)(a-b)(a+b) \frac{-ab(a-b)}{(a-b)(a+b)}$$

The solution of the given system of equation is $a^2+ab+b^2a+b \frac{a^2+ab+b^2}{a+b}$ and $-ab(a-b)(a-b)(a+b) \frac{-ab(a-b)}{(a-b)(a+b)}$ respectively.

Q9

$$5x+y - 2x-y = -1 \frac{5}{x+y} - \frac{2}{x-y} = -1 \quad 15x+y + 7x-y = -10 \frac{15}{x+y} + \frac{7}{x-y} = -10$$

Soln:

$$\text{Let } 1x+y = \frac{1}{x+y} = u$$

$$\text{Let } 1x-y = \frac{1}{x-y} = v$$

The given system of equations are :

$$5u-2v=-1$$

$$15u+7v = 10$$

$$\text{Here } a_1 = 5, b_1 = -2, c_1 = 1$$

$$a_2 = 15, b_2 = 7, c_2 = -10$$

By cross multiplication method,

$$u_{20-7} = -v_{-50-15} = 135+30 \frac{u}{20-7} = \frac{-v}{-50-15} = \frac{1}{35+30} \quad u_{13} = -v_{-65} = 165 \frac{u}{13} = \frac{-v}{-65} = \frac{1}{65}$$

Now,

$$u_{13} = 1-65 \frac{u}{13} = \frac{1}{-65}$$

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

$$1u = \frac{1}{u} = x+y$$

$$=x+y=5 \dots\dots\dots(i)$$

And,

$$-v_{-65} = 1-65 \frac{-v}{-65} = \frac{1}{-65}$$

$$=v=1$$

$$1v = \frac{1}{v} = x-y$$

$$=x-y=1 \dots\dots\dots(ii)$$

Adding equation (i) and (ii)

$$2x=6$$

$$=x=3$$

Putting the value of x in equation (i)

$$3+y=5$$

$$=y=2$$

The solution of the given system of equation is 3 and 2 respectively.

Q10

$$2x+3y=13 \quad \frac{2}{x} + \frac{3}{y} = 13 \quad 5x-4y=-2 \quad \frac{5}{x} - \frac{4}{y} = -2$$

Soln:

$$\text{Let } 1x \frac{1}{x} = u$$

$$\text{Let } 1y \frac{1}{y} = v$$

The given system of equations becomes:

$$2u+3v=13 \dots\dots\dots (i)$$

$$5u-4v=-2 \dots\dots\dots (ii)$$

By cross multiplication method,

$$u-52 = -v+65 = 1-8-15 \frac{u}{6-52} = \frac{-v}{4+65} = \frac{1}{-8-15} \quad u-46 = -v69 = 1-23 \frac{u}{-46} = \frac{-v}{69} = \frac{1}{-23}$$

Now,

$$u-46 = 1-23 \frac{u}{-46} = \frac{1}{-23}$$

$$=u= 2$$

$$1u = \frac{1}{u} = 1 \times \frac{1}{x}$$

$$=x= 12 \frac{1}{2}$$

And,

$$-v69 = 1-23 \frac{-v}{69} = \frac{1}{-23}$$

$$=v=3$$

$$1v \frac{1}{v} = 1y \frac{1}{y}$$

$$=y = 13 \frac{1}{3}$$

The solutions of the given system of equations are $12 \frac{1}{2}$ and $13 \frac{1}{3}$ respectively.

Q11

$$57x+y+6x-y=5 \frac{57}{x+y} + \frac{6}{x-y} = 5 \quad 38x+y+21x-y=9 \frac{38}{x+y} + \frac{21}{x-y} = 9$$

Soln:

$$\text{Let } 1x+y = \frac{1}{x+y} = u$$

$$\text{Let } 1x-y = \frac{1}{x-y} = v$$

The given system of equations are :

$$57u+6v=5$$

$$38u+21v =9$$

$$\text{Here } a_1= 57, b_1= 6, c_1= -5$$

$$a_2= 38, b_2=21, c_2= -9$$

By cross multiplication method,

$$u \cdot 54 + 105 = -v \cdot 513 + 190 = 11193 - 228 \frac{u}{-54+105} = \frac{-v}{-513+190} = \frac{1}{1193-228} \quad u \cdot 51 = -v \cdot 323 = 1969$$
$$\frac{u}{51} = \frac{-v}{-323} = \frac{1}{969}$$

Now,

$$u \cdot 51 = 1969 \frac{u}{51} = \frac{1}{969}$$

$$= u = 119 \frac{1}{19}$$

$$1u \frac{1}{u} = x + y$$

$$= x + y = 19 \dots\dots\dots (i)$$

And,

$$-v \cdot 323 = 1969 \frac{-v}{-323} = \frac{1}{969}$$

$$= v = 13 \frac{1}{3}$$

$$1v = \frac{1}{v} = x - y$$

$$= x - y = 3 \dots\dots\dots (ii)$$

Adding equation (i) and (ii)

$$2x = 22$$

$$= x = 11$$

Putting the value of x in equation (i)

$$11 + y = 19$$

$$= y = 8$$

The solution of the given system of equation is 11 and 8 respectively.

Q12

$$x \cdot a - y \cdot b = 2 \frac{x}{a} - \frac{y}{b} = 2$$

$$ax - by = a^2 - b^2$$

Soln:

$$a_1 = 1a \frac{1}{a}, \text{ Let } b_1 = 1b \frac{1}{b}, \text{ Let } c_1 = -2$$



$$a_2 = a, \quad b_2 = -b, \quad c_2 = b^2 - a^2$$

By cross multiplication method

$$= x_{b^2 - a^2} - 2b = -y_{b^2 - a^2} + 2b = 1 - ba - ab \quad \frac{x}{\frac{b^2 - a^2}{b} - 2b} = \frac{-y}{\frac{b^2 - a^2}{b} + 2b} = \frac{1}{\frac{-b}{a} - \frac{a}{b}}$$

$$= x_{b^2 - a^2 - 2b^2} = -y_{b^2 - a^2 + 2b^2} = 1 - b^2 - a^2 ab \quad \frac{x}{\frac{b^2 - a^2 - 2b^2}{b}} = \frac{-y}{\frac{b^2 - a^2 + 2b^2}{b}} = \frac{1}{\frac{-b^2 - a^2}{ab}}$$

$$\text{Now, } x_{b^2 - a^2 - 2b^2} = 1 - b^2 - a^2 ab \quad \frac{x}{\frac{b^2 - a^2 - 2b^2}{b}} = \frac{1}{\frac{-b^2 - a^2}{ab}}$$

$$x = a$$

$$\text{and, } -y_{b^2 - a^2 + 2b^2} = 1 - b^2 - a^2 ab \quad \frac{-y}{\frac{b^2 - a^2 + 2b^2}{b}} = \frac{1}{\frac{-b^2 - a^2}{ab}}$$

$$= y = b$$

Hence the solution of the given system of equation are a and b respectively.

Q13

$$xa + yb = a + b \quad \frac{x}{a} + \frac{y}{b} = a + b \quad xa^2 + yb^2 = 2 \quad \frac{x}{a^2} + \frac{y}{b^2} = 2$$

Soln:

$$\text{Here, } a_1 = 1a \frac{1}{a}, \quad \text{Let } b_1 = 1b \frac{1}{b}, \quad \text{Let } c_1 = -(a+b)$$

$$a_2 = 1a^2 \frac{1}{a^2}, \quad b_2 = 1b^2 \frac{1}{b^2}, \quad c_2 = -2$$

By cross multiplication method

$$= x_{-2b + ab^2 + 1b} = -y_{-2a + 1a + ba^2} = 1 - 1ab^2 - 1a^2b \quad \frac{x}{\frac{-2}{b} + \frac{a}{b^2} + \frac{1}{b}} = \frac{-y}{\frac{-2}{a} + \frac{1}{a} + \frac{b}{a^2}} = \frac{1}{\frac{-1}{ab^2} - \frac{-1}{a^2b}}$$

$$= x_{a - bb^2} = -y_{-a - ba^2 + 1a + ba^2} = 1 - 1ab^2 - 1a^2b \quad \frac{x}{\frac{a-b}{b^2}} = \frac{-y}{\frac{-a-b}{a^2} + \frac{1}{a} + \frac{b}{a^2}} = \frac{1}{\frac{-1}{ab^2} - \frac{-1}{a^2b}}$$

$$\text{Now, } x_{a - bb^2} = 1 - 1ab^2 - 1a^2b \quad \frac{x}{\frac{a-b}{b^2}} = \frac{1}{\frac{-1}{ab^2} - \frac{-1}{a^2b}}$$

$$= x = a^2$$

$$-y_{-a - ba^2 + 1a + ba^2} = 1 - 1ab^2 - 1a^2b \quad \frac{-y}{\frac{-a-b}{a^2} + \frac{1}{a} + \frac{b}{a^2}} = \frac{1}{\frac{-1}{ab^2} - \frac{-1}{a^2b}}$$

$$= y = b^2$$

The solution of the given system of equation are a^2 and b^2 respectively.

Q14

$$xa = yb \frac{x}{a} = \frac{y}{b}$$

$$ax + by = a^2 + b^2$$

Soln:

Here, $a_1 = 1a \frac{1}{a}$, Let $b_1 = 1b \frac{1}{b}$, $c_1 = 0$

Here, $a_1 = a$, $b_2 = b$, Let $c_1 = -(a^2 + b^2)$

By cross multiplication method

$$xa^2 + b^2b = ya^2 + b^2a = 1ab + ba \frac{x}{\frac{a^2 + b^2}{b}} = \frac{y}{\frac{a^2 + b^2}{a}} = \frac{1}{\frac{a}{b} + \frac{b}{a}}$$

Now, $xa^2 + b^2b = 1ab + ba \frac{x}{\frac{a^2 + b^2}{b}} = \frac{1}{\frac{a}{b} + \frac{b}{a}}$

$= x = a$

And $ya^2 + b^2a = 1ab + ba \frac{y}{\frac{a^2 + b^2}{a}} = \frac{1}{\frac{a}{b} + \frac{b}{a}}$

$= y = b$

The solution of the given system of equations are a and b respectively.

Q15

$$2ax + 3by = a + 2b$$

$$3ax + 2by = 2a + b$$

Soln:

The given system of equation is

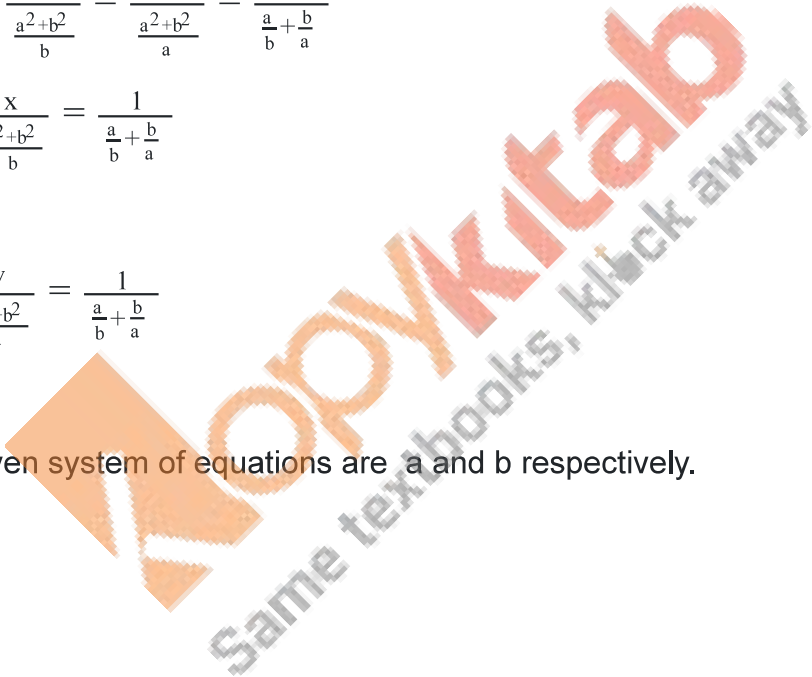
$$2ax + 3by = a + 2b \dots\dots\dots (i)$$

$$3ax + 2by = 2a + b \dots\dots\dots (ii)$$

Here $a_1 = 2a$, $b_1 = 3b$, $c_1 = -(a + 2b)$

$a_2 = 3a$, $b_2 = 2b$, $c_2 = -(2a + b)$

By cross multiplication method



$$x-4ab+b^2 = -y-a^2+4ab = 1-5ab \frac{x}{-4ab+b^2} = \frac{-y}{-a^2+4ab} = \frac{1}{-5ab}$$

Now,

$$x-4ab+b^2 = 1-5ab \frac{x}{-4ab+b^2} = \frac{1}{-5ab}$$

$$=x= 4a-b5a \frac{4a-b}{5a}$$

$$\text{And, } -y-a^2+4ab = 1-5ab \frac{-y}{-a^2+4ab} = \frac{1}{-5ab}$$

$$=y= 4b-a5b \frac{4b-a}{5b}$$

The solutions of the system of equations are $4a-b5a \frac{4a-b}{5a}$ and $4b-a5b \frac{4b-a}{5b}$.

Q16

$$5ax+6by=28$$

$$3ax+4by=18$$

Soln:

The systems of equations are:

$$5ax+6by=28 \dots\dots\dots (i)$$

$$3ax+4by=18 \dots\dots\dots (ii)$$

$$\text{Here } a_1= 5a, b_1= 6b, c_1= -(28)$$

$$a_2= 3a, b_2=4b, c_2= -(18)$$

By cross multiplication method

$$x4b = -y-6a = 12ab \frac{x}{4b} = \frac{-y}{-6a} = \frac{1}{2ab}$$

Now,

$$x4b = 12ab \frac{x}{4b} = \frac{1}{2ab}$$

$$=x= 2a \frac{2}{a}$$

$$\text{And, } -y-6a = 12ab \frac{-y}{-6a} = \frac{1}{2ab}$$

$$=y= 3b \frac{3}{b}$$

The solution of the given system of equation is $2a \frac{2}{a}$ and $3b \frac{3}{b}$.

Q17

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

$$(a-2b)x+(2a+b)y=3$$

Soln.

The given system of equations are :

$$(a+2b)x+(2a-b)y=2 \dots\dots\dots (i)$$

$$(a-2b)x+(2a+b)y=3 \dots\dots\dots (ii)$$

$$\text{Here } a_1= a+2b, b_1= 2a-b, c_1= -(2)$$

$$a_2= a-2b, b_2=2a+b, c_2= -(3)$$

By cross multiplication method:

$$x-2a+5b = ya+10b = 110ab \frac{x}{-2a+5b} = \frac{y}{a+10b} = \frac{1}{10ab}$$

$$\text{Now, } x-2a+5b = 110ab \frac{x}{-2a+5b} = \frac{1}{10ab}$$

$$=x= 5b-2a10ab \frac{5b-2a}{10ab}$$

$$\text{And } ya+10b = 110ab \frac{y}{a+10b} = \frac{1}{10ab}$$

$$=y= a+10b10ab \frac{a+10b}{10ab}$$

The solution of the system of equations are $x= 5b-2a10ab \frac{5b-2a}{10ab}$

And $y= a+10b10ab \frac{a+10b}{10ab}$ respectively.

Q18

$$x(a-b + \frac{ab}{a-b}) = y(a+b - \frac{ab}{a+b})$$

$$x+y=2a^2$$

Soln:

The given systems of equations are:

$$x(a-b + \frac{ab}{a-b}) = y(a+b - \frac{ab}{a+b})$$

$$x+y=2a^2$$

From equation (i)

$$X(a^2+b^2-2ab+aba-b) - Y(a^2+b^2+2ab-aba+b) = X\left(\frac{a^2+b^2-2ab+ab}{a-b}\right) - Y\left(\frac{a^2+b^2+2ab-ab}{a+b}\right)$$

$$= X(a^2+b^2-aba-b) - Y(a^2+b^2+aba+b) = X\left(\frac{a^2+b^2-ab}{a-b}\right) - Y\left(\frac{a^2+b^2+ab}{a+b}\right) \dots\dots\dots (iii)$$

From equation (ii)

$$X+y-2a^2=0$$

Here $a_1 = (a^2+b^2-aba-b)\left(\frac{a^2+b^2-ab}{a-b}\right)$, $b_1 = -(a^2+b^2+aba+b)\left(\frac{a^2+b^2+ab}{a+b}\right)$, $c_1=0$

$a_2=1$, $b_2=1$, $c_2=-2a^2$

By cross multiplication method:

$$x2a^2(a^2+b^2+aba+b) = -y(-2a^2)(a^2+b^2-aba-b) = 12a^3(a-b)(a+b) \frac{x}{2a^2\left(\frac{a^2+b^2+ab}{a+b}\right)} = \frac{-y}{(-2a^2)\left(\frac{a^2+b^2-ab}{a+b}\right)} = \frac{1}{\frac{2a^3}{(a-b)(a+b)}}$$

Now, $x2a^2(a^2+b^2+aba+b) = 12a^3(a-b)(a+b) \frac{x}{2a^2\left(\frac{a^2+b^2+ab}{a+b}\right)} = \frac{1}{\frac{2a^3}{(a-b)(a+b)}}$

$$= x = a^3 - b^3 a \frac{a^3 - b^3}{a}$$

And $-y(-2a^2)(a^2+b^2-aba-b) = 12a^3(a-b)(a+b) \frac{-y}{(-2a^2)\left(\frac{a^2+b^2-ab}{a+b}\right)} = \frac{1}{\frac{2a^3}{(a-b)(a+b)}}$

$$= y = a^3 + b^3 a \frac{a^3 + b^3}{a}$$

The solutions of the given system of equations are $a^3 - b^3 a \frac{a^3 - b^3}{a}$ and $a^3 + b^3 a \frac{a^3 + b^3}{a}$ respectively.

Q19

$$bx+cy=a+b$$

$$-ax(1a-b-1a+b)+cy(1b-a+1b+a)=2aa+b-ax\left(\frac{1}{a-b}-\frac{1}{a+b}\right)+cy\left(\frac{1}{b-a}+\frac{1}{b+a}\right)=\frac{2a}{a+b}$$

Soln:

The system of equation is given by :

$$bx+cy=a+b \dots\dots\dots (i)$$

$$-ax(1a-b-1a+b)+cy(1b-a+1b+a)=2aa+b-ax\left(\frac{1}{a-b}-\frac{1}{a+b}\right)+cy\left(\frac{1}{b-a}+\frac{1}{b+a}\right)=\frac{2a}{a+b} \dots\dots(ii)$$

From equation (i)

$$bx+cy-(a+b) = 0$$

From equation (ii)

$$-ax(1a-b - 1a+b) + cy(1b-a + 1b+a) - 2aa+b = 0 - ax\left(\frac{1}{a-b} - \frac{1}{a+b}\right) + cy\left(\frac{1}{b-a} + \frac{1}{b+a}\right) - \frac{2a}{a+b} = 0$$

$$= x(2ab(a-b)(a+b)) + y(2ac(b-a)(b+a)) - 2aa+b = 0 x\left(\frac{2ab}{(a-b)(a+b)}\right) + y\left(\frac{2ac}{(b-a)(b+a)}\right) - \frac{2a}{a+b} = 0$$

$$= 1a+b(2abxa-b - 2acya-b - 2a) = 0 \frac{1}{a+b} \left(\frac{2abx}{a-b} - \frac{2acy}{a-b} - 2a\right) = 0$$

$$= 2abxa-b - 2acya-b - 2a = 0 \frac{2abx}{a-b} - \frac{2acy}{a-b} - 2a = 0$$

$$= 2abx - 2acy - 2a(a-b) = 0 \dots\dots\dots (iv)$$

By cross multiplication

$$= x-4a^2c = -y4ab^2 = -14abc \frac{x}{-4a^2c} = \frac{-y}{4ab^2} = \frac{-1}{4abc}$$

$$\text{Now, } x-4a^2c = -14abc \frac{x}{-4a^2c} = \frac{-1}{4abc}$$

$$= x = ab \frac{a}{b}$$

And,

$$= -y4ab^2 = -14abc \frac{-y}{4ab^2} = \frac{-1}{4abc}$$

$$= y = bc \frac{b}{c}$$

The solution of the system of equations are $ab \frac{a}{b}$ and $bc \frac{b}{c}$

Q20

$$(a-b)x+(a+b)y=2a^2-2b^2$$

$$(a+b)(x+y) = 4ab$$

Soln.

The given system of equations are :

$$(a-b)x+(a+b)y=2a^2-2b^2 \dots\dots\dots (i)$$

$$(a+b)(x+y) = 4ab \dots\dots\dots (ii)$$

From equation (i)

$$(a-b)x+(a+b)y-2a^2-2b^2 = 0$$



$$= (a-b)x+(a+b)y-2(a^2-b^2) =0$$

From equation (ii)

$$(a-b)x+(a-b)y-4ab=0$$

Here, $a_1= a-b$, $b_1 = a+b$, $c_1=-2(a^2+b^2)$

Here, $a_2= a+b$, $b_2 = a+b$, $c_2=-4ab$

By cross multiplication method

$$x2(a+b)(a^2-b^2+2ab) = -y2(a-b)(a^2+b^2) = 1-2b(a+b) \frac{x}{2(a+b)(a^2-b^2+2ab)} = \frac{-y}{2(a-b)(a^2+b^2)} = \frac{1}{-2b(a+b)}$$

Now,

$$x2(a+b)(a^2-b^2+2ab) = 1-2b(a+b) \frac{x}{2(a+b)(a^2-b^2+2ab)} = \frac{1}{-2b(a+b)}$$

$$=x= 2ab-a^2+b^2b \frac{2ab-a^2+b^2}{b}$$

And, $-y2(a-b)(a^2+b^2) = 1-2b(a+b) \frac{-y}{2(a-b)(a^2+b^2)} = \frac{1}{-2b(a+b)}$

$$=y= (a-b)(a^2+b^2)b(a+b) \frac{(a-b)(a^2+b^2)}{b(a+b)}$$

The solution of the system of equations are $2ab-a^2+b^2b \frac{2ab-a^2+b^2}{b}$ and $(a-b)(a^2+b^2)b(a+b) \frac{(a-b)(a^2+b^2)}{b(a+b)}$ respectively.

Q21

$$a^2x+b^2y=c^2$$

$$b^2x+a^2y=d^2$$

Soln:

The given system of equations are :

$$a^2x+b^2y=c^2 \dots\dots\dots (i)$$

$$b^2x+a^2y=d^2 \dots\dots\dots (ii)$$

Here, $a_1= a^2$, $b_1 = b^2$, $c_1=-c^2$

Here, $a_2= b^2$, $b_2 = a^2$, $c_2=-d^2$

By cross multiplication method

$$= x - b^2d^2 + a^2c^2 = -y - a^2d^2 + b^2c^2 = 1a^4 - b^4 \frac{x}{-b^2d^2 + a^2c^2} = \frac{-y}{-a^2d^2 + b^2c^2} = \frac{1}{a^4 - b^4}$$

Now,

$$x - b^2d^2 + a^2c^2 = 1a^4 - b^4 \frac{x}{-b^2d^2 + a^2c^2} = \frac{1}{a^4 - b^4}$$

$$= x = a^2c^2 - b^2d^2 a^4 - b^4 \frac{a^2c^2 - b^2d^2}{a^4 - b^4}$$

$$\text{And, } = x - b^2d^2 + a^2c^2 = -y - a^2d^2 + b^2c^2 = 1a^4 - b^4 \frac{x}{-b^2d^2 + a^2c^2} = \frac{-y}{-a^2d^2 + b^2c^2} = \frac{1}{a^4 - b^4}$$

$$= y = a^2d^2 - b^2c^2 a^4 - b^4 \frac{a^2d^2 - b^2c^2}{a^4 - b^4}$$

The solution of the given system of equations are $a^2c^2 - b^2d^2 a^4 - b^4 \frac{a^2c^2 - b^2d^2}{a^4 - b^4}$ and $a^2d^2 - b^2c^2 a^4 - b^4 \frac{a^2d^2 - b^2c^2}{a^4 - b^4}$ respectively.

Q23

$$2(ax - by + a + 4b) = 0$$

$$2(bx + ay) + b - 4a = 0$$

Soln:

The given system of equation may be written as :

$$2(ax - by + a + 4b) = 0 \dots\dots\dots (i)$$

$$2(bx + ay) + b - 4a = 0 \dots\dots\dots (ii)$$

$$\text{Here, } a_1 = 2a, b_1 = -2b, c_1 = a + 4b$$

$$\text{Here, } a_2 = 2b, b_2 = 2a, c_2 = b - 4a$$

By cross multiplication method

$$= x - 2b^2 + 8ab - 2a^2 - 8ab = -y - 2ab - 8a^2 - 2ab - 8b^2 = 14a^2 + 4b^2 \frac{x}{-2b^2 + 8ab - 2a^2 - 8ab} = \frac{-y}{2ab - 8a^2 - 2ab - 8b^2} = \frac{1}{4a^2 + 4b^2}$$

$$= x - 2b^2 - 2a^2 = -y - 8a^2 - 8b^2 = 14a^2 + 4b^2 \frac{x}{-2b^2 - 2a^2} = \frac{-y}{-8a^2 - 8b^2} = \frac{1}{4a^2 + 4b^2}$$

$$\text{Now, } x - 2b^2 - 2a^2 = 14a^2 + 4b^2 \frac{x}{-2b^2 - 2a^2} = \frac{1}{4a^2 + 4b^2}$$

$$= x = -12 \frac{-1}{2}$$

$$\text{And, } -y-8a^2-8b^2 = 14a^2+4b^2 \frac{-y}{-8a^2-8b^2} = \frac{1}{4a^2+4b^2}$$

$$=y=2$$

The solution of the given pair of equations are $-12 \frac{-1}{2}$ and 2 respectively.

Q24

$$6(ax+by)=3a+2b$$

$$6(bx-ay) = 3b-2a$$

Soln:

The systems of equations are

$$6(ax+by)=3a+2b \dots\dots\dots (i)$$

$$6(bx-ay) = 3b-2a \dots\dots\dots (ii)$$

From equation (i)

$$6ax+6by-(3a+2b)=0 \dots\dots\dots (iii)$$

From equation (ii)

$$6bx-6ay-(3b-2a) = 0 \dots\dots\dots (iv)$$

$$\text{Here, } a_1 = 6a, b_1 = 6b, c_1 = -(3a+2b)$$

$$\text{Here, } a_2 = 6b, b_2 = -6a, c_2 = -(3b-2a)$$

By cross multiplication method

$$x-18(a^2+b^2) = -y12(a^2+b^2) = -136(a^2+b^2) \frac{x}{-18(a^2+b^2)} = \frac{-y}{12(a^2+b^2)} = \frac{-1}{36(a^2+b^2)}$$

$$\text{Now, } x-18(a^2+b^2) = -136(a^2+b^2) \frac{x}{-18(a^2+b^2)} = \frac{-1}{36(a^2+b^2)}$$

$$=x= 12 \frac{1}{2}$$

$$\text{And, } -y12(a^2+b^2) = -136(a^2+b^2) \frac{-y}{12(a^2+b^2)} = \frac{-1}{36(a^2+b^2)}$$

$$=y= 13 \frac{1}{3}$$

The solution of the given pair of equations are $12 \frac{1}{2}$ and $13 \frac{1}{3}$ respectively.

Q25

$$a^2x - b^2y = 0 \frac{a^2}{x} - \frac{b^2}{y} = 0 \quad a^2bx + b^2ay = a + b \frac{a^2b}{x} + \frac{b^2a}{y} = a + b$$

Soln:

The given systems of equations are

$$a^2x - b^2y = 0 \frac{a^2}{x} - \frac{b^2}{y} = 0 \quad a^2bx + b^2ay = a + b \frac{a^2b}{x} + \frac{b^2a}{y} = a + b$$

Taking $1x \frac{1}{x} = u$

Taking $1y \frac{1}{y} = v$

The pair of equations becomes:

$$a^2u - b^2v = 0$$

$$a^2bu + b^2av - (a + b) = 0$$

Here, $a_1 = a^2$, $b_1 = -b^2$, $c_1 = 0$

Here, $a_2 = a^2b$, $b_2 = b^2a$, $c_2 = -(a + b)$

By cross multiplication method

$$= ub^2(a+b) = va^2(a+b) = 1a^2b^2(a+b) \frac{u}{b^2(a+b)} = \frac{v}{a^2(a+b)} = \frac{1}{a^2b^2(a+b)}$$

Now, $ub^2(a+b) = 1a^2b^2(a+b) \frac{u}{b^2(a+b)} = \frac{1}{a^2b^2(a+b)}$

$$= x = 1a^2 \frac{1}{a^2}$$

And, $va^2(a+b) = 1a^2b^2(a+b) \frac{v}{a^2(a+b)} = \frac{1}{a^2b^2(a+b)}$

$$= y = 1b^2 \frac{1}{b^2}$$

The solution of the given pair of equations are $1a^2 \frac{1}{a^2}$ and $1b^2 \frac{1}{b^2}$ respectively.

Q26

$$mx - my = m^2 + n^2$$

$$x + y = 2m$$

Soln:

$$mx - my = m^2 + n^2 \dots\dots\dots (i)$$

$$x+y=2m \dots\dots\dots (ii)$$

$$\text{Here, } a_1 = m, b_1 = -n, c_1 = -(m^2+n^2)$$

$$\text{Here, } a_2 = 1, b_2 = 1, c_2 = -(2m)$$

By cross multiplication method

$$x(m+n)^2 = -y-m^2+n^2 = 1m+n \frac{x}{(m+n)^2} = \frac{-y}{-m^2+n^2} = \frac{1}{m+n}$$

$$\text{Now, } x(m+n)^2 = 1m+n \frac{x}{(m+n)^2} = \frac{1}{m+n}$$

$$=x= m+n$$

$$\text{And, } -y-m^2+n^2 = 1m+n \frac{-y}{-m^2+n^2} = \frac{1}{m+n}$$

$$=y=m-n$$

The solutions of the given pair of equations are $m+n$ and $m-n$ respectively.

Q27

$$axb - bya = a+b \frac{ax}{b} - \frac{by}{a} = a + b$$

$$ax-by=2ab$$

Soln:

The given pair of equations are:

$$axb - bya = a+b \frac{ax}{b} - \frac{by}{a} = a + b \dots\dots\dots (i)$$

$$ax-by=2ab \dots\dots\dots (ii)$$

$$\text{Here, } a_1 = ab \frac{a}{b}, b_1 = -ba \frac{b}{a}, c_1 = -(a+b)$$

$$\text{Here, } a_2 = a, b_2 = -b, c_2 = -(2ab)$$

By cross multiplication method

$$= xb(b-a) = -ya(-a+b) = 1b-a \frac{x}{b(b-a)} = \frac{-y}{a(-a+b)} = \frac{1}{b-a}$$

$$\text{Now, } xb(b-a) = 1b-a \frac{x}{b(b-a)} = \frac{1}{b-a}$$

$$=x=b$$

$$\text{And, } -ya(-a+b) = 1b-a \frac{-y}{a(-a+b)} = \frac{1}{b-a}$$

$$=y=-a$$

The solution of the given pair of equations are b and -a respectively.

Q28

$$ba x + ab y - (a^2 + b^2) = 0 \quad \frac{b}{a}x + \frac{a}{b}y - (a^2 + b^2) = 0$$

$$X + y - 2ab = 0$$

Soln:

$$ba x + ab y - (a^2 + b^2) = 0 \quad \frac{b}{a}x + \frac{a}{b}y - (a^2 + b^2) = 0 \quad \dots\dots\dots (i)$$

$$X + y - 2ab = 0 \quad \dots\dots\dots (ii)$$

$$\text{Here, } a_1 = \frac{b}{a}, b_1 = \frac{a}{b}, c_1 = -(a^2 + b^2)$$

$$\text{Here, } a_2 = 1, b_2 = -1, c_2 = -(2ab)$$

By cross multiplication method

$$= \frac{xb^2 - a^2}{b^2 - a^2} = \frac{-y - b^2 + a^2}{-b^2 + a^2} = \frac{1}{\frac{b^2 - a^2}{ab}}$$

$$\text{Now, } \frac{xb^2 - a^2}{b^2 - a^2} = \frac{1}{\frac{b^2 - a^2}{ab}}$$

$$= x = ab$$

$$\text{And, } \frac{-y - b^2 + a^2}{-b^2 + a^2} = \frac{1}{\frac{b^2 - a^2}{ab}}$$

$$= y = ab$$

The solutions of the given pair of equations are ab and ab respectively.

