

Solve the following system of equations:

Question 1: $11x + 15y + 23 = 0$ and $7x - 2y - 20 = 0$

Soln:

The given system of equation is

$$11x + 15y + 23 = 0 \dots\dots\dots (i)$$

$$7x - 2y - 20 = 0 \dots\dots\dots (ii)$$

From (ii)

$$2y = 7x - 20$$

$$y = 7x - 20 \frac{7x - 20}{2} \dots\dots\dots (iii)$$

Substituting the value of y in equation (i) we get,

$$= 11x + 15(7x - 20) + 23 = 0 \quad 11x + 15\left(\frac{7x - 20}{2}\right) + 23 = 0$$

$$= 11x + (105x - 300) + 23 = 0 \quad 11x + \left(\frac{105x - 300}{2}\right) + 23 = 0$$

$$= (22 + 105x - 300 + 46) = 0 \quad \left(\frac{22 + 105x - 300 + 46}{2}\right) = 0$$

$$= 127x = 254 = x = 2$$

Putting the value of x in the equation (iii)

$$= y = 7(2) - 20 \frac{7(2) - 20}{2}$$

$$y = -3$$

The value of x and y are 2 and -3 respectively.

Question 2: $3x - 7y + 10 = 0$, $y - 2x - 3 = 0$

Soln:

The given system of equation is

$$3x - 7y + 10 = 0 \dots\dots\dots (i)$$

$$y - 2x - 3 = 0 \dots\dots\dots (ii)$$

From (ii)

$$y-2x-3=0$$

$$y= 2x+3 \dots\dots\dots (iii)$$

Substituting the value of y in equation (i) we get,

$$= 3x-7(2x+3)+10 =0$$

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

$$= -11x=11$$

$$= x=-1$$

Putting the value of x in the equation (iii)

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

$$y= 1$$

The value of x and y are -1 and 1 respectively.

Question 3: $0.4x + 0.3y = 1.7$, $0.7x - 0.2y = 0.8$

Soln:

The given system of equation is

$$0.4x+0.3y=1.7$$

$$0.7x-0.2y=0.8$$

Multiplying both sides by 10

$$4x+3y=17 \dots\dots\dots (i)$$

$$7x-2y=8 \dots\dots\dots (ii)$$

From (ii)

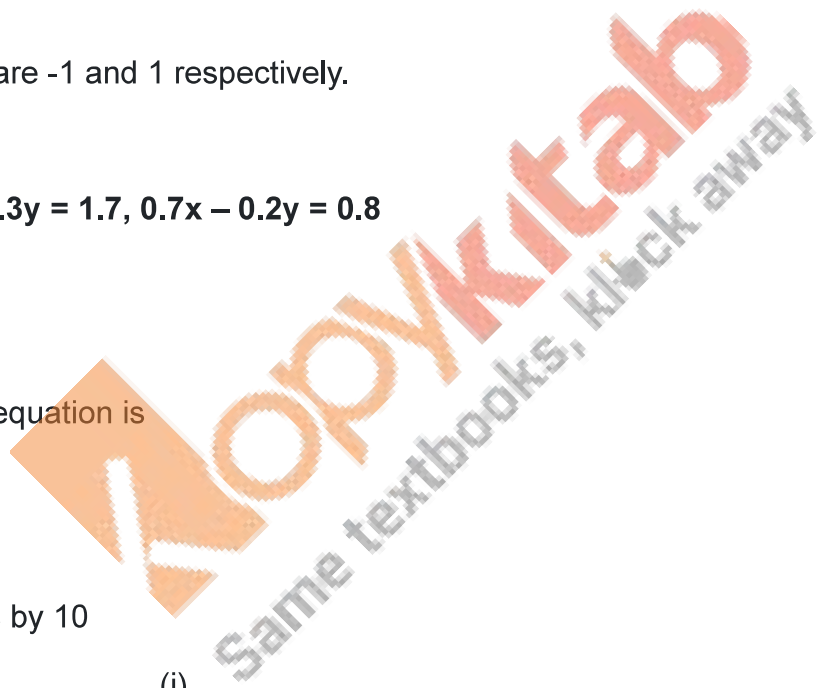
$$7x-2y=8$$

$$x= \frac{8+2y}{7} = 0 \dots\dots\dots (iii)$$

Substituting the value of y in equation (i) we get,

$$= 4\left(\frac{8+2y}{7} = 0\right)+3y=17$$

$$= 32+29y=119$$



$$= 29y=87$$

$$= y=3$$

Putting the value of y in the equation (iii)

$$= x= \frac{8+2(3)}{7} = \frac{14}{7} = 2$$

$$= x= 2$$

$$= x= 2$$

The value of x and y are 2 and 3 respectively.

Question 4

$$x + y = 0.8 \quad \frac{x}{2} + y = 0.8$$

$$7x + y = 10 \quad \frac{7}{x + \frac{y}{2}} = 10$$

Soln:

The given system of equation is

$$x + y = 0.8 \quad \frac{x}{2} + y = 0.8 \quad 7x + y = 10 \quad \frac{7}{x + \frac{y}{2}} = 10$$

Therefore $x + 2y = 1.6$

$$14x + y = 10 \quad \frac{14}{2x + y} = 10$$

$$x + 2y = 1.6$$

$$7 = 10x + 5y$$

Multiplying both sides by 10

$$10x + 20y = 16 \quad \dots\dots\dots (i)$$

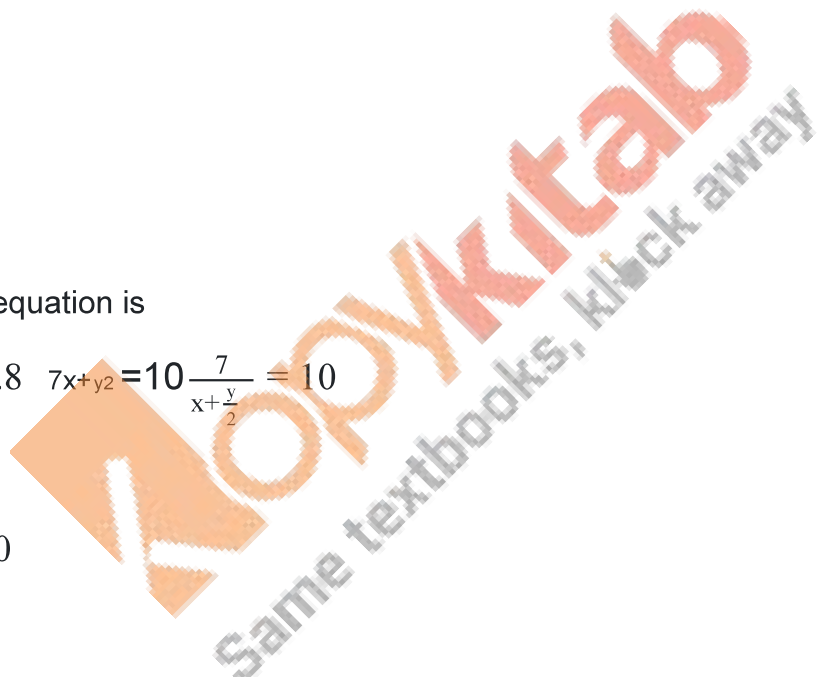
$$10x + 5y = 7 \quad \dots\dots\dots (ii)$$

Subtracting two equations we get,

$$15y = 9$$

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

$$x = 1.6 - 2\left(\frac{3}{5}\right) = 1.6 - 1.2 = 0.4$$



$$= 1.6 - (65)1.6 - \left(\frac{6}{5}\right)$$

$$= 25 \frac{2}{5}$$

The value of x and y are $25 \frac{2}{5}$ and $35 \frac{3}{5}$ respectively.

Question 5

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

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

Soln:

The given system of equation is

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

$$4(y-2)+3(x-3) = 2 \dots\dots\dots (ii)$$

From (i)

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

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

$$=y=2x-35 \frac{2x-3}{5}$$

From (ii)

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

$$= 4y+3x-17-2=0$$

$$= 4y+3x-19=0 \dots\dots\dots (iii)$$

Substituting the value of y in equation (iii)

$$=4\left(2x-35 \frac{2x-3}{5}\right)+3x-19=0$$

$$= 8x-12+21x-133=0$$

$$= 29x=145$$

$$= x=5$$

Putting the value of x in the above equation

$$= y = 1$$



The value of x and y are 5 and 1 respectively.

Question 6

$$x7 + y3 = 5 \frac{x}{7} + \frac{y}{3} = 5$$

$$x2 - y9 = 6 \frac{x}{2} - \frac{y}{9} = 6$$

Soln:

The given system of equation is

$$x7 + y3 = 5 \frac{x}{7} + \frac{y}{3} = 5 \dots\dots\dots (i)$$

$$x2 - y9 = 6 \frac{x}{2} - \frac{y}{9} = 6 \dots\dots\dots (ii)$$

From (i)

$$x7 + y3 = 5 \frac{x}{7} + \frac{y}{3} = 5$$

$$= x = 105 - 7y \frac{105 - 7y}{3}$$

From (ii)

$$x2 - y9 = 6 \frac{x}{2} - \frac{y}{9} = 6$$

$$= 9x - 2y = 108 \dots\dots\dots (iii)$$

Substituting the value of x in equation (iii) we get,

$$= 9(105 - 7y \frac{105 - 7y}{3}) - 2y = 108$$

$$= 945 - 63y - 6y = 324$$

$$= 945 - 324 = 69y$$

$$= 69y = 621$$

$$= y = 9$$

Putting the value of y in the above equation

$$= x = 105 - 7(9) \frac{105 - 7(9)}{3}$$

$$y = 14$$

The value of x and y are 5 and 14 respectively.

Question 7

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

$$5x - 6y = -7 \quad \frac{5x}{6} - \frac{y}{3} = -7$$

Soln:

The given system of equation is

$$3x + 4y = 11 \quad \frac{x}{3} + \frac{y}{4} = 11 \quad \dots\dots\dots (i)$$

$$5x - 6y = -7 \quad \frac{5x}{6} - \frac{y}{3} = -7 \quad \dots\dots\dots (ii)$$

From (i)

$$4x + 3y = 11 \quad \frac{4x + 3y}{12} = 11$$

$$4x + 3y = 132 \quad \dots\dots\dots (iii)$$

From (ii)

$$5x + 2y = -7 \quad \frac{5x + 2y}{6} = -7$$

$$5x - 2y = -42 \quad \dots\dots\dots (iv)$$

Let us eliminate y from the given equations. The coefficient of y in the equation (iii) and (iv) are 3 and 2 respectively. The L.C.M of 3 and 2 is 6. So, we make the coefficient of y equal to 6 in the two equations.

Multiplying equation (iii)*2 and (iv)*3 we get

$$8x + 6y = 264 \quad \dots\dots\dots (v)$$

$$15x - 6y = -126 \quad \dots\dots\dots (vi)$$

Adding equation (v) and (vi)

$$8x + 15x = 264 - 126$$

$$23x = 138$$

$$x = 6$$

Putting the value of x in the equation (iii)

$$24 + 3y = 132$$

$$3y = 108$$

$$y = 36$$

The value of x and y are 36 and 6 respectively.

Question 8

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

$$6x - 4y = -5 \frac{6}{x} - 4y = -5$$

Soln:

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

The new equation becomes

$$4u + 3y = 8 \dots\dots\dots (i)$$

$$6u - 4y = -5 \dots\dots\dots (ii)$$

From (i)

$$4u = 8 - 3y$$

$$u = \frac{8 - 3y}{4} = u$$

From (ii)

$$= 6 \left(\frac{8 - 3y}{4} \right) - 4y = -5$$

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

$$= \frac{24 - 9y - 8y}{2} = -5$$

$$= 24 - 17y = -10$$

$$= -17y = -34$$

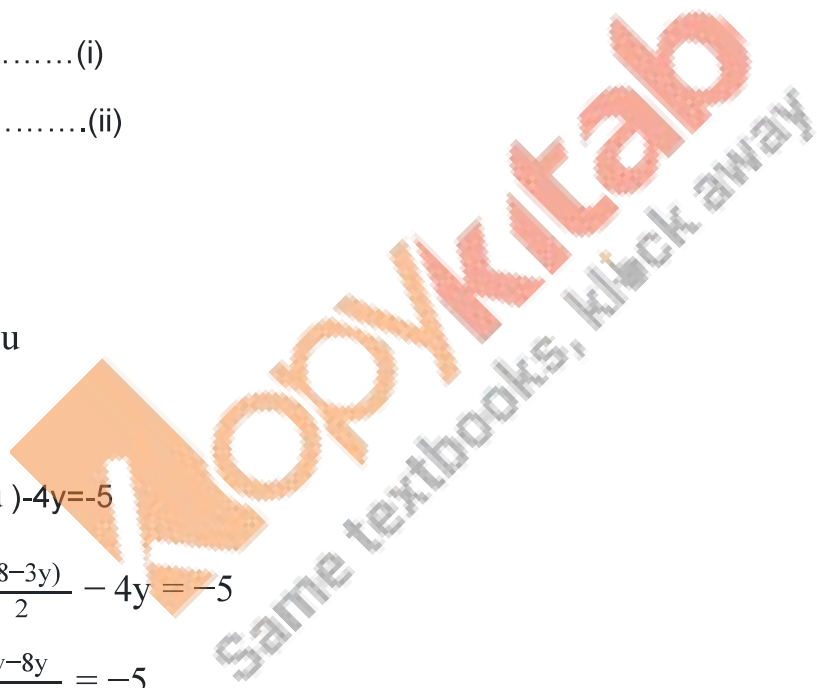
$$= y = 2$$

Putting $y = 2$ in $u = \frac{8 - 3y}{4} = u$ we get ,

$$= u = \frac{8 - 3(2)}{4}$$

$$= u = \frac{8 - 6}{4}$$

$$= u = \frac{2}{4}$$



$$=x=u=2$$

So the Solution of the given system of equation is $x=2$ and $y =2$

Question 9

$$x + y^2 = 4 \quad x + \frac{y}{2} = 4$$

$$2y + x^3 = 5 \quad 2y + \frac{x}{3} = 5$$

Soln:

The given system of equation is:

$$x + y^2 = 4 \quad x + \frac{y}{2} = 4 \quad \dots\dots\dots(i)$$

$$2y + x^3 = 5 \quad 2y + \frac{x}{3} = 5 \quad \dots\dots\dots(ii)$$

From (i) we get,

$$2x + y^2 = 4 \quad \frac{2x+y}{2} = 4$$

$$= 2x + y = 8$$

$$= y = 8 - 2x$$

From (ii) we get,

$$x + 6y = 15 \quad \dots\dots\dots(iii)$$

Substituting $y = 8 - 2x$ in (iii) , we get

$$= x + 6(8 - 2x) = 15$$

$$= x + 48 - 12x = 15$$

$$= -11x = 15 - 48$$

$$= -11x = -33$$

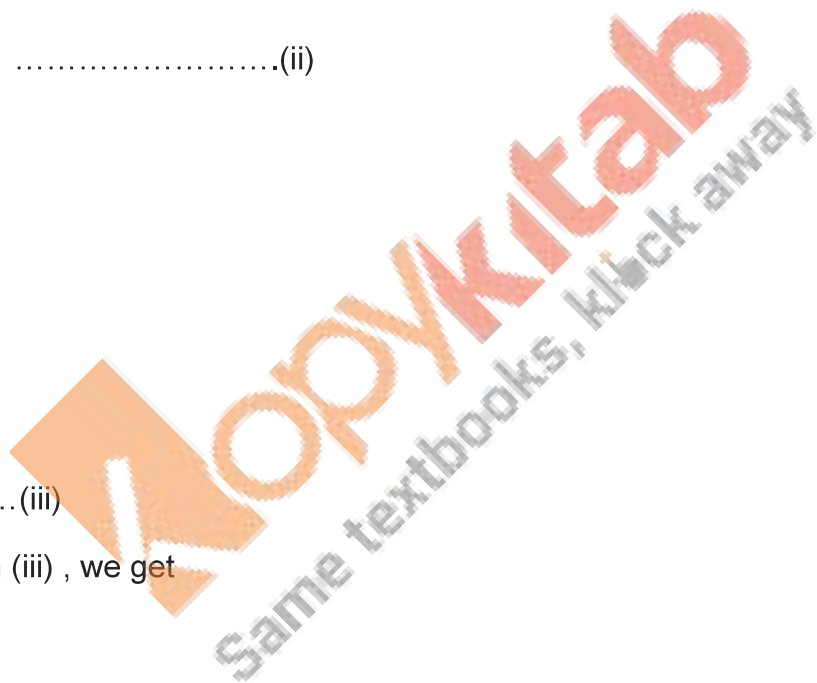
$$= x = 3$$

Putting $x = 3$ in $y = 8 - 2x$, we get

$$y = 8 - (2 \cdot 3)$$

$$= y = 8 - 6 = 2$$

The Solution of the given system of equation are $x = 3$ and $y = 2$ respectively.



Question 10

$$x+2y= 32 \frac{3}{2}$$

$$2x+y= 32 \frac{3}{2}$$

Soln:

The given system of equation is

$$x+2y= 32 \frac{3}{2} \dots\dots\dots(i)$$

$$2x+y= 32 \frac{3}{2} \dots\dots\dots(ii)$$

Let us eliminate y from the given equations. The coefficients of y in the given equations are 2 and 1 respectively. The L.C.M of 2 and 1 is 2. So, we make the coefficient of y equal to 2 in the two equations.

Multiplying equation (i)*1 and (ii)*2

$$x+2y= 32 \frac{3}{2} \dots\dots\dots(iii)$$

$$4x+2y=3 \dots\dots\dots(iv)$$

Subtracting equation (iii) from (iv)

$$4x-x+2y-2y=3- x+2y= 32 \frac{3}{2}$$

$$= 3x= x+2y= 6-32 \frac{6-3}{2}$$

$$= 3x= 32 \frac{3}{2}$$

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

Putting $x= 12 \frac{1}{2}$ in equation (iv)

$$4(12 \frac{1}{2})+2y=3$$

$$= 2+2y=3$$

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

The Solution of the system of equation is $x= 12 \frac{1}{2}$ and $y= 12 \frac{1}{2}$

Question 11

$$\sqrt{2}x+\sqrt{3}y=0 \quad \sqrt{2}x + \sqrt{3}y = 0$$

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$$\sqrt{3x} - \sqrt{8y} = 0 \quad \sqrt{3x} - \sqrt{8y} = 0$$

Soln:

$$\sqrt{2x} + \sqrt{3y} = 0 \quad \sqrt{2x} + \sqrt{3y} = 0 \dots\dots\dots(i)$$

$$\sqrt{3x} - \sqrt{8y} = 0 \quad \sqrt{3x} - \sqrt{8y} = 0 \dots\dots\dots(ii)$$

From equation (i)

$$= x = -\sqrt{3y}\sqrt{2} - \frac{-\sqrt{3y}}{\sqrt{2}} \dots\dots\dots(iii)$$

Substituting this value in equation (ii) we obtain

$$\sqrt{3}(-\sqrt{3y}\sqrt{2}) - \sqrt{8y} = 0 \quad \sqrt{3}\left(\frac{-\sqrt{3y}}{\sqrt{2}}\right) - \sqrt{8y} = 0 \quad -3y\sqrt{2} - 2\sqrt{2}y = 0 \quad \frac{-3y}{\sqrt{2}} - 2\sqrt{2}y = 0 \quad y(-3\sqrt{2} - 2\sqrt{2}) = 0$$

$$y\left(\frac{-3}{\sqrt{2}} - 2\sqrt{2}\right) = 0$$

$$= y = 0$$

Substituting the value of y in equation (iii) we obtain

$$= x = 0$$

The value of x and y are 0 and 0 respectively.

Question 12

$$3x - y + 7 = 11 \quad 3x - \frac{y+7}{11} + 2 = 10 \quad 2y - x + 11 = 10 \quad 2y - \frac{x+11}{7} = 10$$

Soln:

The given system of equation is:

$$3x - y + 7 = 11 \quad 3x - \frac{y+7}{11} + 2 = 10 \dots\dots\dots(i)$$

$$2y - x + 11 = 10 \quad 2y - \frac{x+11}{7} = 10 \dots\dots\dots(ii)$$

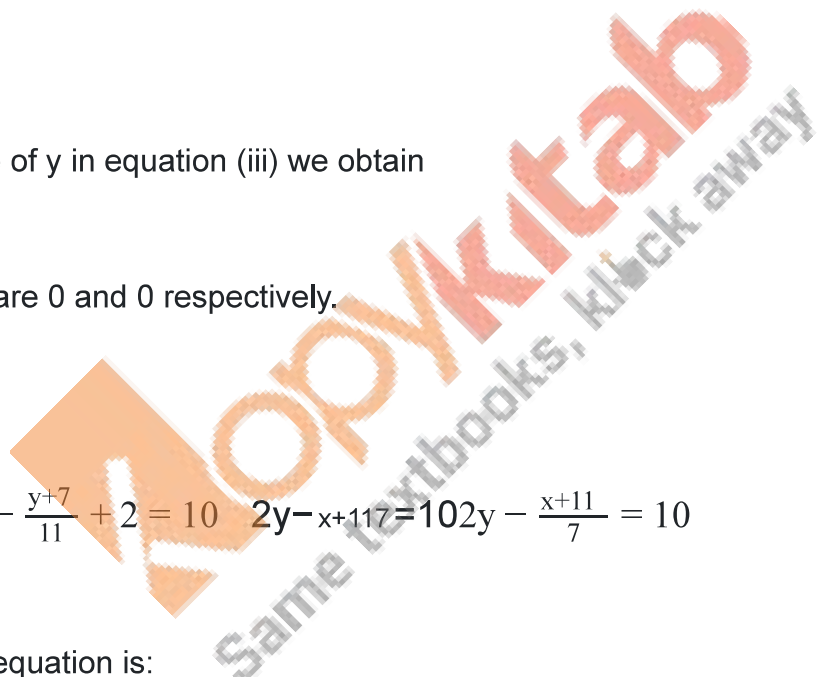
From equation (i)

$$33x - y - 7 + 22 = 110 \quad \frac{33x - y - 7 + 22}{11} = 10$$

$$= 33x - y + 15 = 110$$

$$= 33x + 15 - 110 = y$$

$$= y = 33x - 95$$



From equation (ii)

$$14+x+117=109 \frac{14+x+11}{7} = 109$$

$$= 14y+x+11=70$$

$$= 14y+x=70-11$$

$$= 14y+x=59 \dots\dots\dots(iii)$$

Substituting $y = 33x-95$ in (iii) we get,

$$14(33x-95)+x=59$$

$$= 462x-1330+x=59$$

$$= 463x=1389$$

$$= x=3$$

Putting $x=3$ in $y=33x-95$ we get,

$$=y=33(3)-95$$

$$= 99-95 = 4$$

The Solution of the given system of equation is 3 and 4 respectively.

Question 13

$$2x-3y=9 \quad 2x-\frac{3}{y}=9 \quad 3x+7y=2 \quad 3x+\frac{7}{y}=2$$

Soln:

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

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

Taking $\frac{1}{y}=u$ the given equation becomes,

$$2x-3u=9 \dots\dots\dots(iii)$$

$$3x+7u=2 \dots\dots\dots(iv)$$

From (iii)

$$2x=9+3u$$

$$=x= \frac{9+3u}{2}$$

Substituting the value $x= \frac{9+3u}{2}$ in equation (iv) we get,

$$3(9+3u^2 \frac{9+3u}{2})+7u=2$$

$$= 27+9u+14u^2 = 2 \frac{27+9u+14u^2}{2} = 2$$

$$=27+23u=4$$

$$= u = -1$$

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

Putting $u=-1$ in $x = 9+3u^2 \frac{9+3u}{2}$ we get,

$$= x = 9+3(-1)^2 \frac{9+3(-1)}{2}$$

$$= x = 3$$

The Solution of the given system of equation is 3 and -1 respectively.

Question 14

$$0.5x+0.7y=0.74$$

$$0.3x+0.5y=0.5$$

Soln:

The given system of equation is

$$0.5x+0.7y=0.74 \dots\dots\dots (i)$$

$$0.3x-0.5y=0.5 \dots\dots\dots (ii)$$

Multiplying both sides by 100

$$50x+70y=74 \dots\dots\dots (iii)$$

$$30x+50y=50 \dots\dots\dots (iv)$$

From (iii)

$$50x=74-70y$$

$$x = \frac{74-70y}{50} = 0 \dots\dots\dots (iii)$$

Substituting the value of y in equation (iv) we get,

$$= 30(\frac{74-70y}{50} = 0) + 50y = 50$$

$$= 222-210y+250y=250$$

$$= 40y=28$$

$$= y=0.7$$

Putting the value of y in the equation (iii)

$$= x= \frac{74-70(0.7)50}{50} = 0$$

$$=x= \frac{25}{50} = 0$$

$$= x= 0.5$$

The value of x and y are 0.5 and 0.7 respectively.

Question 15

$$17x + 16y = 3 \frac{1}{7x} + \frac{1}{6y} = 3 \quad 12x - 13y = 5 \frac{1}{2x} - \frac{1}{3y} = 5$$

Soln:

$$17x + 16y = 3 \frac{1}{7x} + \frac{1}{6y} = 3 \quad \dots\dots\dots (i)$$

$$12x - 13y = 5 \frac{1}{2x} - \frac{1}{3y} = 5 \quad \dots\dots\dots (ii)$$

Multiplying (ii) by $12 \frac{1}{2}$ we get,

$$14x - 16y = 52 \frac{1}{4x} - \frac{1}{6y} = \frac{5}{2} \quad \dots\dots\dots (iii)$$

Solving equation (i) and (iii)

$$17x + 16y = 3 \frac{1}{7x} + \frac{1}{6y} = 3 \quad \dots\dots\dots (i)$$

$$14x - 16y = 52 \frac{1}{4x} - \frac{1}{6y} = \frac{5}{2} \quad \dots\dots\dots (iii)$$

Adding we get,

$$17x + 16y = 3 + 52 \frac{1}{7x} + \frac{1}{6y} = 3 + \frac{5}{2}$$

$$=x= 114 \frac{1}{14}$$

When, $x= 114 \frac{1}{14}$ we get,

Using equation (i)

$$17(114) + 16y = 3 \frac{1}{7(\frac{1}{14})} + \frac{1}{6y} = 3$$

$$= 2 + 16y = 32 + \frac{1}{6y} = 3$$

$$= 16y \frac{1}{6y} = 1$$

$$= y = 16 \frac{1}{6}$$

The Solution of the given system of equation is $x = 114 \frac{1}{14}$ and $y = 16 \frac{1}{6}$ respectively.

Question 16

$$12x + 13y = 2 \frac{1}{2x} + \frac{1}{3y} = 2$$

$$13x + 12y = 136 \frac{1}{3x} + \frac{1}{2y} = \frac{13}{6}$$

Soln:

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

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

$$u + v = 2 \frac{u}{2} + \frac{v}{3} = 2 \quad 3u + 2v = 2 \frac{3u + 2v}{6} = 2$$

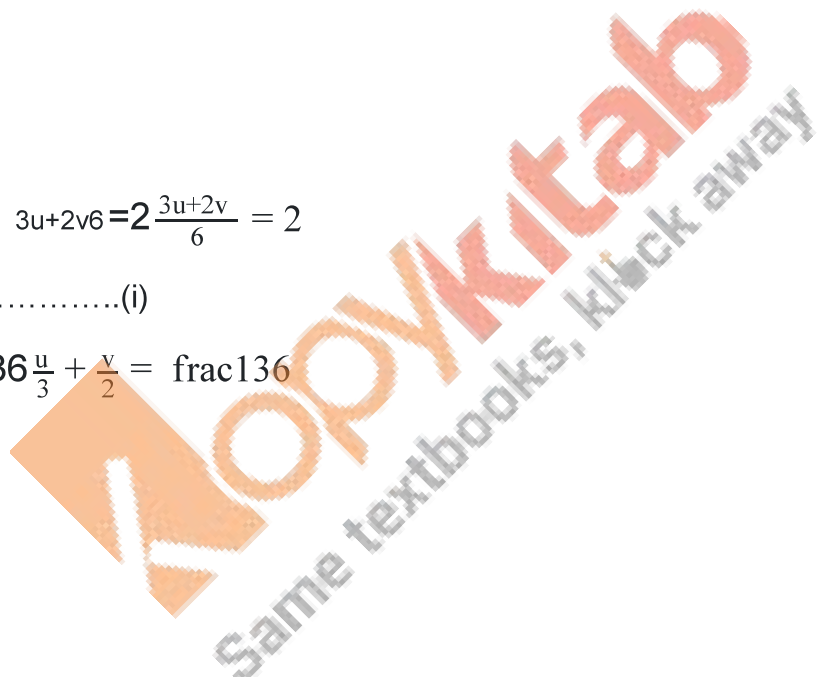
$$3u + 2v = 12 \dots\dots\dots(i)$$

$$\text{And, } u + v = \frac{136}{3} \frac{u}{3} + \frac{v}{2} = \frac{136}{6}$$

$$= v = 3$$

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

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



Question 17

$$15u + 2v = 17 \frac{15}{u} + \frac{2}{v} = 17 \quad 1u + 1v = 365 \frac{1}{u} + \frac{1}{v} = \frac{36}{5}$$

Soln:

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

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

$$15x + 2y = 17 \dots\dots\dots(i)$$

$$x + y = 365 \frac{36}{5} \dots\dots\dots(ii)$$

From equation (i) we get ,

$$2y=17-15x$$

$$=y= 17-15x \times \frac{17-15x}{2}$$

Substituting $y= 17-15x \times \frac{17-15x}{2}$ in equation (ii) we get,

$$= x+ 17-15x \times \frac{17-15x}{2} = 365 \frac{36}{5}$$

$$= -13x+17 \times \frac{-13x+17x}{2} = 365 \frac{36}{5}$$

$$= 5(-13x+17)=72$$

$$= -65x=-13$$

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

Putting $x= 15 \frac{1}{5}$ in equation (ii) , we get

$$15 \frac{1}{5} +y= 365 \frac{36}{5}$$

$$= y=7$$

$$=v= 1y \frac{1}{y}= 17 \frac{1}{7}$$

The Solution of the given system of equation is 5 and $17 \frac{1}{7}$ respectively.

Question 18

$$3x - 1y = -9 \frac{3}{x} - \frac{1}{y} = -9 \quad 2x + 1y = 5 \frac{2}{x} + \frac{1}{y} = 5$$

Soln:

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

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

$$3u - v = -9 \dots\dots\dots(i)$$

$$2u + 3v = 5 \dots\dots\dots(ii)$$

Multiplying equation (i) *3 and (ii) *1 we get,

$$9u - 3v = -27 \dots\dots\dots(iii)$$

$$2u + 3v = 5 \dots\dots\dots(iv)$$

Adding equation (i) and equation (iv) we get ,

$$9u+2u-3v+3v=-27+5$$

$$= u=-2$$

Putting $u=-2$ in equation (iv) we get,

$$2(-2)+3v=5$$

$$= 3v=9$$

$$= v=3$$

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

$$\text{Hence } y=1v \frac{1}{v} = 13 \frac{1}{3}$$

Question 19

$$2x-3y=9xy \quad \frac{2}{x} - \frac{3}{y} = \frac{9}{xy} \quad 2x+1y=9xy \quad \frac{2}{x} + \frac{1}{y} = \frac{9}{xy}$$

Soln:

$$2x-3y=9xy \quad \frac{2}{x} - \frac{3}{y} = \frac{9}{xy} \quad \dots\dots\dots (i)$$

$$2x+1y=9xy \quad \frac{2}{x} + \frac{1}{y} = \frac{9}{xy} \quad \dots\dots\dots (ii)$$

Multiplying equation (i) adding equation (ii) we get,

$$2y+3x=9 \dots\dots\dots (iii)$$

$$4y+9x=21 \dots\dots\dots (iv)$$

From (iii) we get ,

$$3x= 9-2y$$

$$= x= 9-2y3 \frac{9-2y}{3}$$

Substituting $x=9-2y3 \frac{9-2y}{3}$ in equation (iv) we get

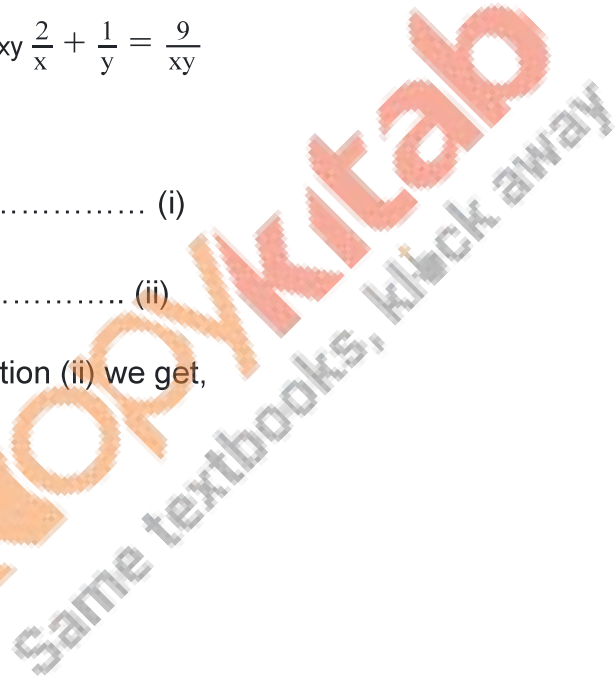
$$4x+9(9-2y3 \frac{9-2y}{3})=21$$

$$= 4y+3(9-2y) =21$$

$$= -2y=21-27$$

$$= y=3$$

Putting $y=3$ in $x= 9-2y3 \frac{9-2y}{3}$ we get,



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

$$=x=1$$

Hence the Solutions of the system of equation are 1 and 3 respectively.

Question 20

$$15x+16y=12 \frac{1}{5x} + \frac{1}{6y} = 12 \quad 15x+16y=8 \frac{1}{5x} + \frac{1}{6y} = 8$$

Soln:

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

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

$$u5+v6=12 \frac{u}{5} + \frac{v}{6} = 12$$

$$=6u+5v30=12 \frac{6u+5v}{30} = 12$$

$$=6u+5v=360 \dots\dots\dots(i)$$

$$u3+3v7 \frac{u}{3} + \frac{3v}{7} =8$$

$$=7u+9v21 \frac{7u+9v}{21} =8$$

$$=7u-9v=168 \dots\dots\dots(ii)$$

Let us eliminate v from the equation (i) and (ii) . multiplying equation (i) by 9 and (ii) by 5

$$54u+35v=3240+840$$

$$89u=4080$$

$$=u= 408089 \frac{4080}{89}$$

Putting u = 408089 $\frac{4080}{89}$ in equation (i) we get,

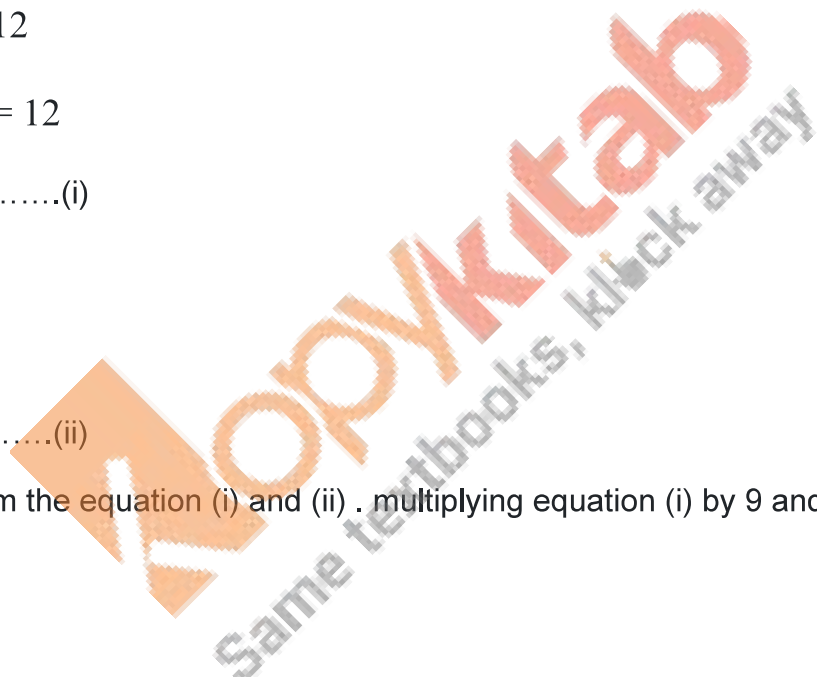
$$6(408089 \frac{4080}{89})+5v=360$$

$$= 2448089 \frac{24480}{89} +5v=360$$

$$=5v= 32040-2448089 \frac{32040-24480}{89}$$

$$= v= 756089 \frac{7560}{89}$$

$$= v= 75605*89 \frac{7560}{5*89}$$



$$=v= 151289 \frac{1512}{89}$$

$$1u \frac{1}{u} =x= 894080 \frac{89}{4080}$$

$$1v \frac{1}{v} =y= 891512 \frac{89}{1512}$$

.

Question 27

$$6x+y = 7x-y + 3 \frac{6}{x+y} = \frac{7}{x-y} + 3 \quad 12(x+y) = 13(x-y) \frac{1}{2(x+y)} = \frac{1}{3(x-y)}$$

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

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

Then, the given system of equation becomes,

$$6u=7v+3$$

$$6u-7v=3 \dots\dots\dots (i)$$

$$\text{And } u^2 = v^3 \frac{u}{2} = \frac{v}{3}$$

$$3u=2v$$

$$3u-2v=0 \dots\dots\dots (ii)$$

Multiplying equation (ii) by 2 and (i) 1

$$6u-7v=3$$

$$6u-4v=0$$

Subtracting $v=-1$ in equation (ii), we get

$$3u-2(-1)=0$$

$$3u+2=0$$

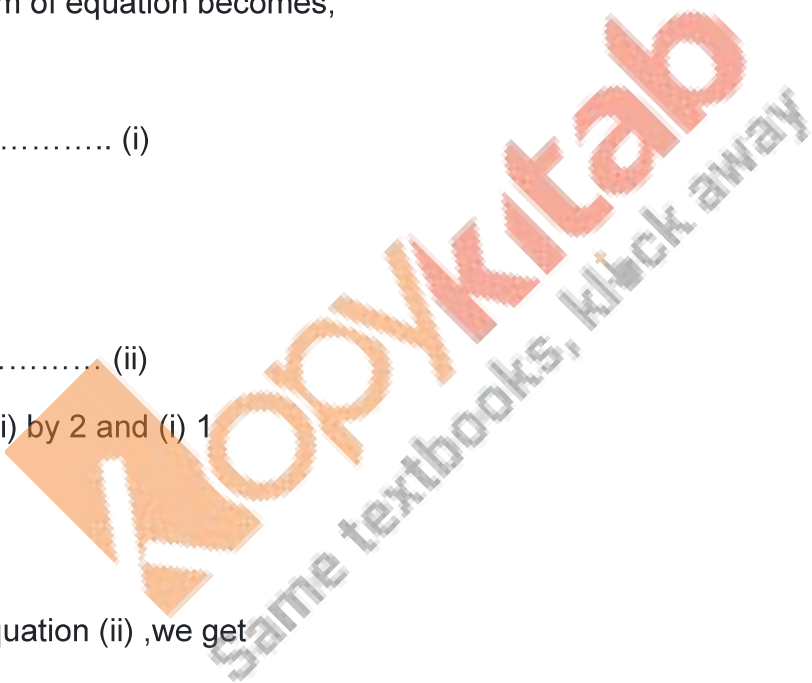
$$3u=-2$$

$$=u= -23 \frac{-2}{3}$$

$$1x+y \frac{1}{x+y} = -23 \frac{-2}{3}$$

$$x+y= -32 \frac{-3}{2} \dots\dots\dots(v)$$

and $v=-1$



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

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

Adding equation (v) and equation (vi) we get,

$$2x = -32 \frac{-3}{2} - 1$$

$$= x = -54 \frac{-5}{4}$$

Putting $x = -23 \frac{-2}{3}$ in equation (vi)

$$= -54 \frac{-5}{4} - y = -1$$

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

Question 28

$$xyx+y = 65 \frac{xy}{x+y} = \frac{6}{5} \quad xyy-x = 6 \frac{xy}{y-x} = 6$$

Soln:

$$xyx+y = 65 \frac{xy}{x+y} = \frac{6}{5}$$

$$5xy = 6(x+y)$$

$$= 5xy = 6x + 6y \dots\dots\dots (i)$$

And

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

$$xy = 6(y-x)$$

$$= xy = 6y - 6x \dots\dots\dots (ii)$$

Adding equation (i) and equation (ii) we get,

$$6xy = 6y + 6y$$

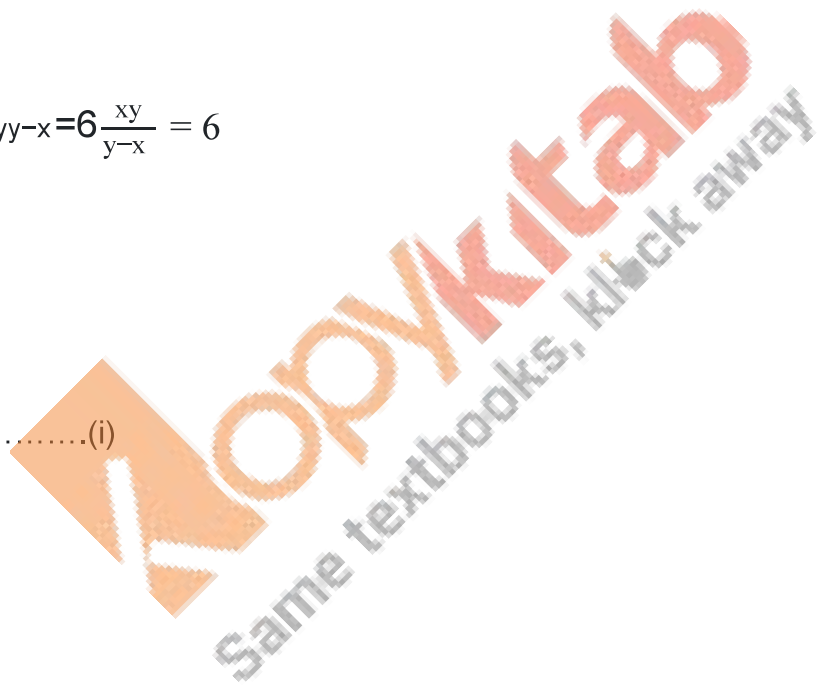
$$6xy = 12y$$

$$x = 2$$

Putting $x=2$ in equation (i) we get,

$$10y = 12 + 6y$$

$$10 - 6y = 12$$



$$4y=12$$

$$y=3$$

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

Question 29

$$22x+y+15x-y=5 \frac{22}{x+y} + \frac{15}{x-y} = 5 \quad 55x+y+45x-y=14 \frac{55}{x+y} + \frac{45}{x-y} = 14$$

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

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

Soln:

Then the given system of equation becomes:

$$22u+45v=5 \dots\dots\dots (i)$$

$$55u+45v=14 \dots\dots\dots (ii)$$

Multiplying equation (i) by 3 and (ii) by 1

$$66u+45v=15 \dots\dots\dots (iii)$$

$$55u+45v=14 \dots\dots\dots (iv)$$

Subtracting equation (iv) from equation (iii), we get

$$66u-55u=15-14$$

$$= 11u=1$$

$$=u= \frac{1}{11}$$

Putting $u= \frac{1}{11}$ in equation (i) we get,

$$=2+15v=5$$

$$=15v=3$$

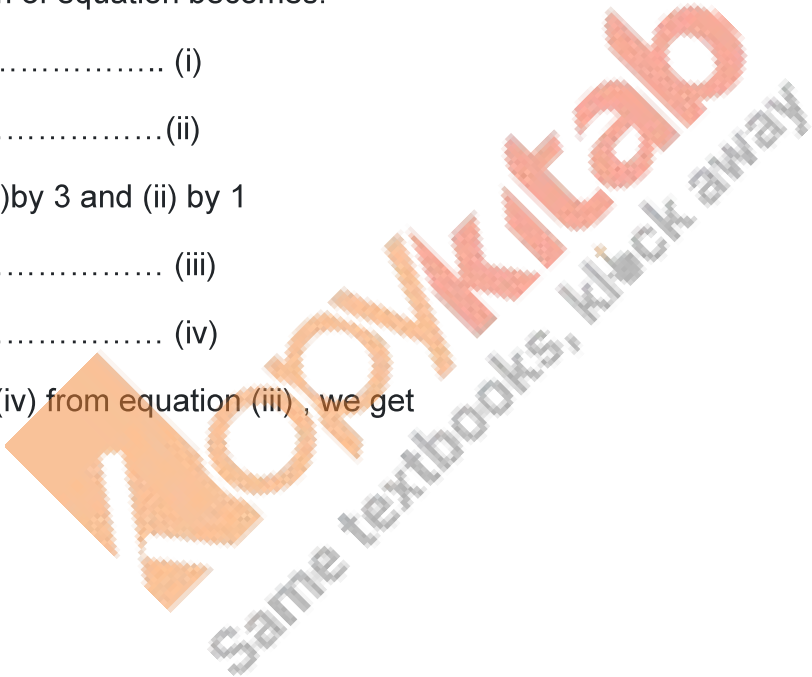
$$=v= \frac{1}{5}$$

Now,

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

$$=x+y=11 \dots\dots\dots (v)$$

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



$$= x-y=5 \dots\dots\dots(vi)$$

Adding equation (v) and (vi) we get,

$$2x=16$$

$$=x=8$$

Putting the value of x in equation (v)

$$8+y=11$$

$$= y=3$$

The Solutions of the given system of equation are 8 and 3 respectively.

Question 30

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

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

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

Soln:

Then the given system of equation becomes:

$$5u-2v=-1 \dots\dots\dots(i)$$

$$15u+7v=10 \dots\dots\dots(ii)$$

Multiplying equation (i) by 7 and (ii) by 2

$$35u-14v=-7 \dots\dots\dots(iii)$$

$$30u+14v=20 \dots\dots\dots(iv)$$

Subtracting equation (iv) from equation (iii) , we get

$$-2v=-1-1$$

$$= -2v=-2$$

$$=v=1$$

Now,

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

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

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

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

Adding equation (v) and (vi) we get,

$$2x=6$$

$$=x=3$$

Putting the value of x in equation (v)

$$3+y=5$$

$$= y=2$$

The Solutions of the given system of equation are 3 and 2 respectively.

Question 31

$$3x+y + 2x-y = 2 \frac{3}{x+y} + \frac{2}{x-y} = 2 \quad 9x+y - 4x-y = 1 \frac{9}{x+y} - \frac{4}{x-y} = 1$$

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

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

Soln:

Then the given system of equation becomes:

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

$$9u+4v=1 \dots\dots\dots (ii)$$

Multiplying equation (i) by 3 and (ii) by 1

$$6u+4v=4 \dots\dots\dots (iii)$$

$$9u-4v=1 \dots\dots\dots (iv)$$

Adding equation (iii) and (iv) we get,

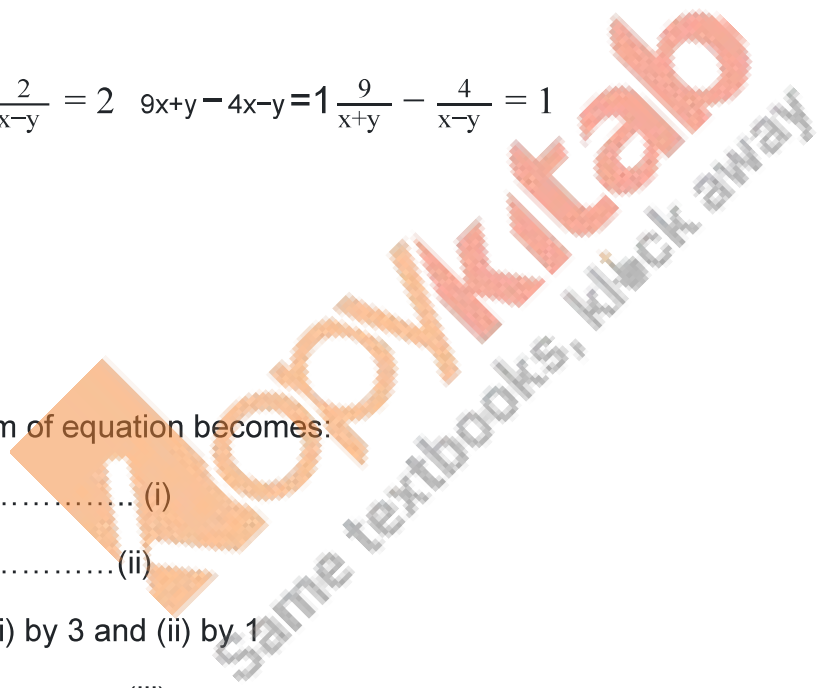
$$45u=5$$

$$=u=3$$

Subtracting equation (iv) from equation (iii) , we get

$$2v=2-1$$

$$= 2v=1$$



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

Now,

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

$$= x+y=3 \dots\dots\dots(v)$$

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

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

Adding equation (v) and (vi) we get,

$$2x=5$$

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

Putting the value of x in equation (v)

$$5 \frac{5}{2} + y = 11$$

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

The Solutions of the given system of equation are $5 \frac{5}{2}$ and $12 \frac{1}{2}$ respectively.

Question 32

$$12(x+2y) + 53(3x-2y) = -32 \frac{1}{2(x+2y)} + \frac{5}{3(3x-2y)} = \frac{-3}{2} \quad 54(x+2y) - 35(3x-2y) = 616 \frac{5}{4(x+2y)} - \frac{3}{5(3x-2y)} = \frac{61}{6}$$

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

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

Soln:

Then the given system of equation becomes:

$$u + 5v = -32 \frac{u}{2} + \frac{5v}{3} = \frac{-3}{2} \quad 3u + 10v = -32 \frac{3u+10v}{6} = \frac{-3}{2}$$

$$3u + 10v = -9 \dots\dots\dots(i)$$

$$5u - 3v = 6160 \frac{5u}{4} - \frac{3v}{5} = \frac{61}{60}$$

$$25u - 12v = 613 \frac{61}{3} \dots\dots\dots(ii)$$

Multiplying equation (i) by 12 and (ii) by 10

$$36u+120v=-108 \dots\dots\dots (iii)$$

$$250u+120v=6103 \frac{610}{3} \dots\dots\dots (iv)$$

Adding equation (iv) and equation (iii) , we get

$$36u+250u=6103 \frac{610}{3}-108$$

$$=286u=2863 \frac{286}{3}$$

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

Putting $u=13 \frac{1}{3}$ in equation (i)

$$3(13 \frac{1}{3})+10v=-9$$

$$=v=-1$$

Now,

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

$$=x+2y=3 \dots\dots\dots (v)$$

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

$$=3x-2y=-1 \dots\dots\dots (vi)$$

Putting $x=12 \frac{1}{2}$ in equation (v) we get,

$$12 \frac{1}{2}+2y=3$$

$$=y=54 \frac{5}{4}$$

The Solutions of the given system of equation are $12 \frac{1}{2}$

And $54 \frac{5}{4}$ respectively.

Question 34

$$x+y=5xy$$

$$3x+2y=13xy$$

Soln:



The given system of equations is:

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

$$3x+2y=13xy \dots\dots\dots (ii)$$

Multiplying equation (i) by 2 and equation (ii) 1 we get,

$$2x++2y=10xy \dots\dots\dots (iii)$$

$$3x+2y= 13xy \dots\dots\dots (iv)$$

Subtracting equation (iii) from equation (iv) we get,

$$3x-2x=13xy-10xy$$

$$= x=3xy$$

$$= x3x=y\frac{x}{3x} = y$$

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

Putting $y = 13=y\frac{1}{3} = y$ in equation (i) we get,

$$=x+y=5(x)(13\frac{1}{3})$$

$$= x+x3x\frac{x}{3x} = 5x3\frac{5x}{3}$$

$$= 2x=1$$

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

Hence Solution of the given system of equation is $12\frac{1}{2}$ and $13\frac{1}{3}$

Question 35

$$x+y=xy$$

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

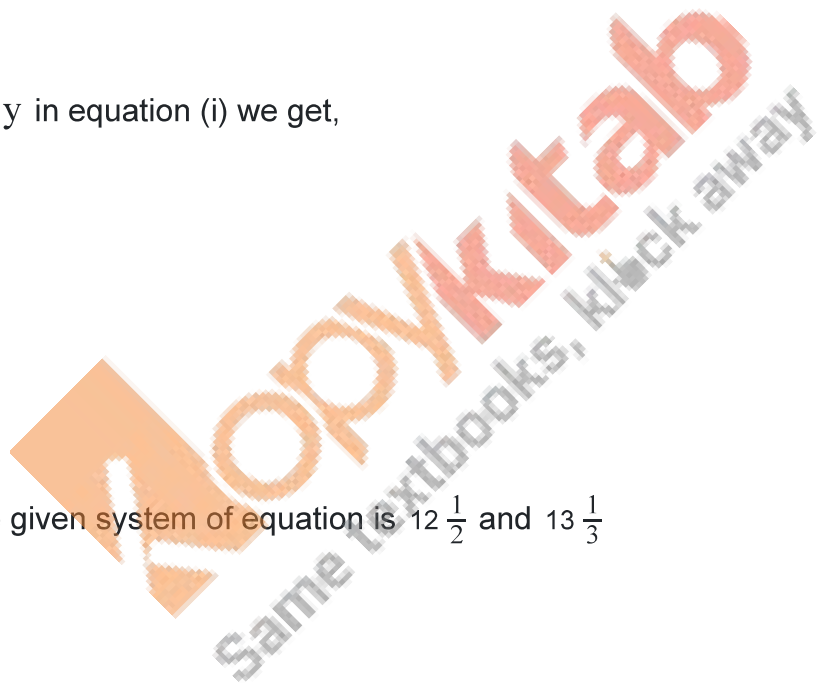
Soln:

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

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

Adding equation (i) and (ii) we get,

$$2x=2xy+6xy$$



$$=2x= 6xy$$

$$= y= x+y=xy$$

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

Putting $y= 14 \frac{1}{4}$ in equation (i) , we get,

$$=x+ 14 \frac{1}{4}=2x(14 \frac{1}{4})$$

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

Hence the Solution of the given system of equation is $x=-12 \frac{-1}{2}$

And $y= 14 \frac{1}{4}$ respectively.

Question 36

$$2(3u-v)=5uv$$

$$2(u+3v)=5uv$$

Solution

$$2(3u-v)=5uv$$

$$= 6u-2v=5uv \dots\dots\dots (i)$$

$$2(u+3v)=5uv$$

$$2u+6v=5uv \dots\dots\dots (ii)$$

Multiplying equation (i) by 3 and equation (ii) by 1 we get,

$$18u-6v=15uv \dots\dots\dots (iii)$$

$$2u+6v=5uv \dots\dots\dots (iv)$$

Adding equation (iii) and equation (iv) we get,

$$18u+2u=15uv+5uv$$

$$= v=1$$

Putting $v=1$ in equation (i) we get,

$$6u-2=5u$$

$$=u=2$$

Hence the Solution of the given system of Solution of equation is 2 and 1 respectively.

Question 37

$$23x+2y + 33x-2y = 175 \frac{2}{3x+2y} + \frac{3}{3x-2y} = \frac{17}{5} \quad 13x+2y - 13x-2y = 2 \frac{1}{3x+2y} - \frac{1}{3x-2y} = 2$$

$$\text{Let } 13x+2y \frac{1}{3x+2y} = u$$

$$\text{Let } 13x-2y \frac{1}{3x-2y} = v$$

Soln:

Then the given system of equation becomes:

$$2u+3v = -175 \frac{-17}{5} \dots\dots\dots(i)$$

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

Multiplying equation (ii) by 3

Adding equation (iv) and equation (iii) , we get

$$15u-2u = -175 \frac{-17}{5} + 5$$

$$= 13u = 135 \frac{13}{5}$$

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

Putting $u = 15 \frac{1}{5}$ in equation (i)

$$5(15 \frac{1}{5}) + v = -2$$

$$= v = 1$$

Now,

$$13x+2y \frac{1}{3x+2y} = u$$

$$= 3x+2y = 5 \dots\dots\dots(iv)$$

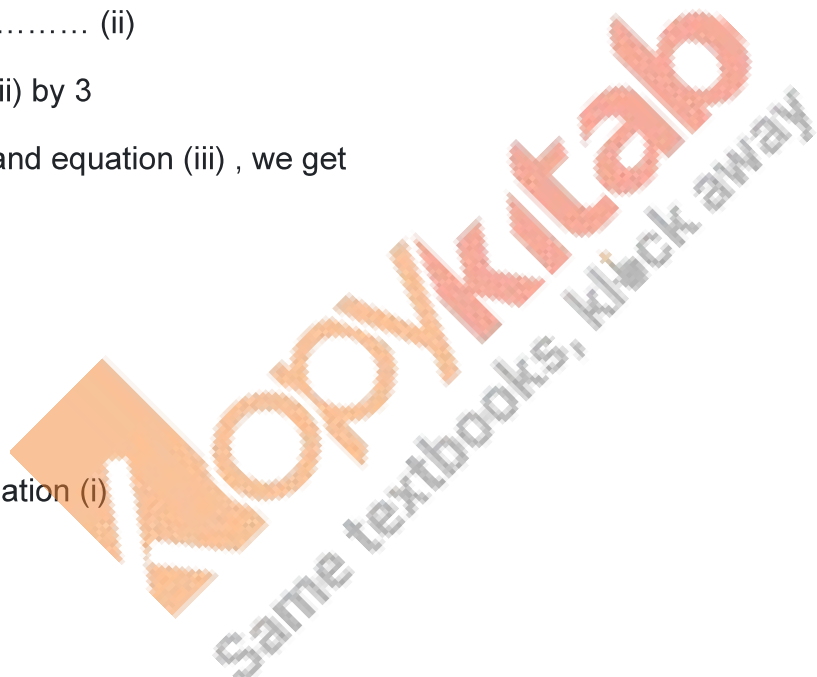
$$13x-2y \frac{1}{3x-2y} = v$$

$$= 3x-2y = 1 \dots\dots\dots(v)$$

Adding equation (iv) and (v) we get,

$$6x = 6$$

$$= x = 1$$



Putting the value of x in equation (v) we get,

$$3+2y=5$$

$$= y=1$$

The Solutions of the given system of equation are 1 and 1 respectively.

Question 38

$$44x+y + 36x-y = 4 \frac{44}{x+y} + \frac{36}{x-y} = 4 \quad 55x+y - 40x-y = 13 \frac{55}{x+y} - \frac{40}{x-y} = 13$$

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

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

Soln:

Then the given system of equation becomes:

$$44u+30v=10 \dots\dots\dots (i)$$

$$55u+40v=13 \dots\dots\dots (ii)$$

Multiplying equation (i) by 4 and (ii) by 3

$$176u+120v=40 \dots\dots\dots (iii)$$

$$165u+120v=39 \dots\dots\dots (iv)$$

Subtracting equation (iv) from (iii) we get,

$$176-165u=40-39$$

$$=u=111 \frac{1}{11}$$

Putting the value of u in equation (i)

$$44(111 \frac{1}{11})+30v=10$$

$$= 4+30v=10$$

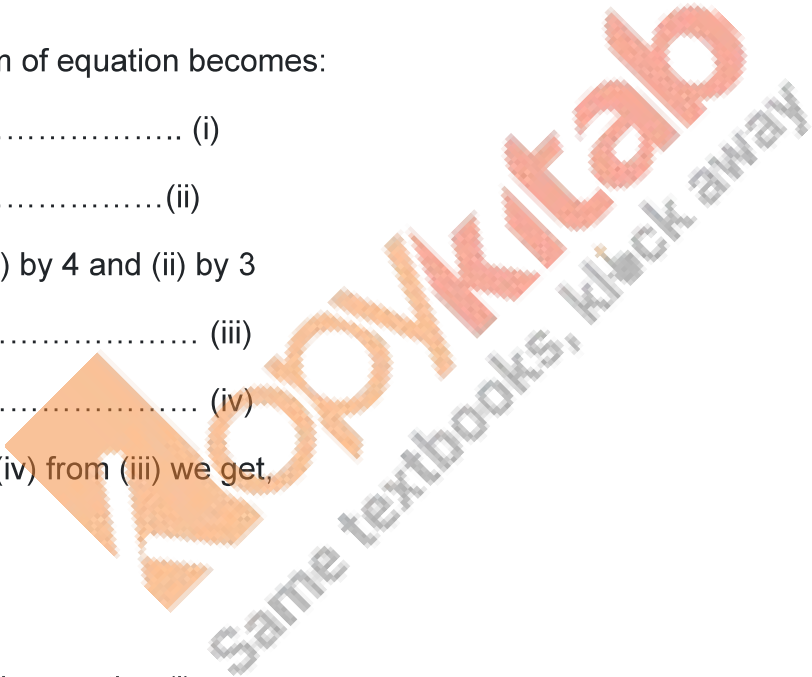
$$=30v=6$$

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

$$=x+y=11 \dots\dots\dots (v)$$

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

$$= x-y=5 \dots\dots\dots (vi)$$



Adding equation (v) and (vi) we get,

$$2x=16$$

$$=x=8$$

Putting the value of x in equation (v)

$$8+y=11$$

$$=y=3$$

The Solutions of the given system of equation are 8 and 3 respectively.

Question 40

$$10x+y+2x-y=4 \Rightarrow \frac{10}{x+y} + \frac{2}{x-y} = 4 \quad 15x+y-5x-y=-2 \Rightarrow \frac{15}{x+y} - \frac{5}{x-y} = -2$$

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

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

Soln:

Then the given system of equation becomes:

$$10p+2q=4 \dots\dots\dots (i)$$

$$15p-5q=-2 \dots\dots\dots (ii)$$

Multiplying equation (i) by 4 and (ii) by 3

$$176u+120v=40 \dots\dots\dots (iii)$$

$$165u+120v=39 \dots\dots\dots (iv)$$

Using cross multiplication method we get,

$$p4-20 = q-60-20 = 1-50-30 \Rightarrow \frac{p}{4-20} = \frac{q}{-60-20} = \frac{1}{-50-30} \quad p-16 = 1-80 \Rightarrow \frac{p}{-16} = \frac{1}{-80} \quad q-80 = 1-80 \Rightarrow \frac{q}{-80} = \frac{1}{-80}$$

$$p= 15 \frac{1}{5} \text{ and } q=1$$

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

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

$$x+y=5 \dots\dots\dots 3$$

$$x-y=1 \dots\dots\dots 4$$

Adding equation 3 and 4 we get,

$$x=3$$

Substituting the value of x in equation 3 we get,

$$y=2$$

The Solution of the given system of Solution is 3 and 2 respectively.

Question 41

$$13x+y + 13x-y = 34 = \frac{1}{3x+y} + \frac{1}{3x-y} = \frac{3}{4} = 12(3x+y) - 12(3x-y) = -18 \frac{1}{2(3x+y)} - \frac{1}{2(3x-y)} = \frac{-1}{8}$$

$$\text{Let } 1x-1 \frac{1}{x-1} = p$$

$$\text{Let } 1y-2 \frac{1}{y-2} = q$$

Soln:

Then the given system of equation becomes:

$$5x-1 + 1y-2 = 2 \frac{5}{x-1} + \frac{1}{y-2} = 2 \dots\dots\dots 1$$

$$6x-1 - 3y-2 = 1 \frac{6}{x-1} - \frac{3}{y-2} = 1 \dots\dots\dots 2$$

$$\text{Can be written as } 5p+q=2 \dots\dots\dots 3$$

$$6p-3q=1 \dots\dots\dots 4$$

Equation 3 and 4 from a pair of linear equation in the general form. Now, we can use any method to solve these equations.

$$\text{We get } p = 13 \frac{1}{3}$$

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

Substituting the $1x-1 \frac{1}{x-1}$ for p , we have

$$1x-1 \frac{1}{x-1} = 13 \frac{1}{3}$$

$$x-1 = 3$$

$$x = 4$$

$$1y-2 \frac{1}{y-2} = 13 \frac{1}{3}$$

$$y-2 = 3$$

$$y=5$$

The Solution of the required pair of equation is 4 and 5 respectively.

Question 42

$$7x-2y=5 \quad \frac{7x-2y}{xy} = 5 \quad 8x+7y=15 \quad \frac{8x+7y}{xy} = 15$$

Soln:

$$7y-2x=5 \quad \frac{7}{y} - \frac{2}{x} = 5 \quad \dots\dots\dots 1$$

$$8y+7x=15 \quad \frac{8}{y} + \frac{7}{x} = 15 \quad \dots\dots\dots 2$$

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

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

The given equations reduce to:

$$\begin{aligned} -2p+7q &= 5 \\ = -2p+7q-5 &= 0 \quad \dots\dots\dots 3 \end{aligned}$$

$$\begin{aligned} 7p+8q &= 15 \\ = 7p+8q-15 &= 0 \quad \dots\dots\dots 4 \end{aligned}$$

Using cross multiplication method we get,

$$\begin{aligned} p-105-(-40) &= q-30-35 = 1-16-49 \quad \frac{p}{-105-(-40)} = \frac{q}{-30-35} = \frac{1}{-16-49} \quad p-65 = 1-65 \quad \frac{p}{-65} = \frac{1}{-65} \quad q-65 = 1-65 \\ \frac{q}{-65} &= \frac{1}{-65} \end{aligned}$$

$$p=1 \text{ and } q=1$$

$$p=1x \frac{1}{x}$$

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

$$x=1 \text{ and } y=1$$

Question 43

$$152x-378y=-74$$

$$-378x+152y=-604$$

Soln:

$$152x - 378y = -74 \dots\dots\dots 1$$

$$-378x + 152y = -604 \dots\dots\dots 2$$

Adding the equations 1 and 2 , we obtain

$$-226x - 226y = -678$$

$$= x + y = 3 \dots\dots\dots 3$$

Subtracting the equation 2 from equation 1, we obtain

$$530x + 530y = 530$$

$$x - y = 1 \dots\dots\dots 4$$

Adding equations 3 and 4 we obtain,

$$2x = 4$$

$$= x = 2$$

Substituting the value of x in equation 3 we obtain y=1

Question 44

$$99x + 101y = 409$$

$$101x + 99y = 501$$

Soln:

The given system of equation are :

$$99x + 101y = 409 \dots\dots\dots 1$$

$$101x + 99y = 501 \dots\dots\dots 2$$

Adding equation 1 and 2 we get ,

$$99x + 101x + 101y + 99y = 49 + 501$$

$$= 200(x + y) = 1000$$

$$= x + y = 5 \dots\dots\dots 3$$

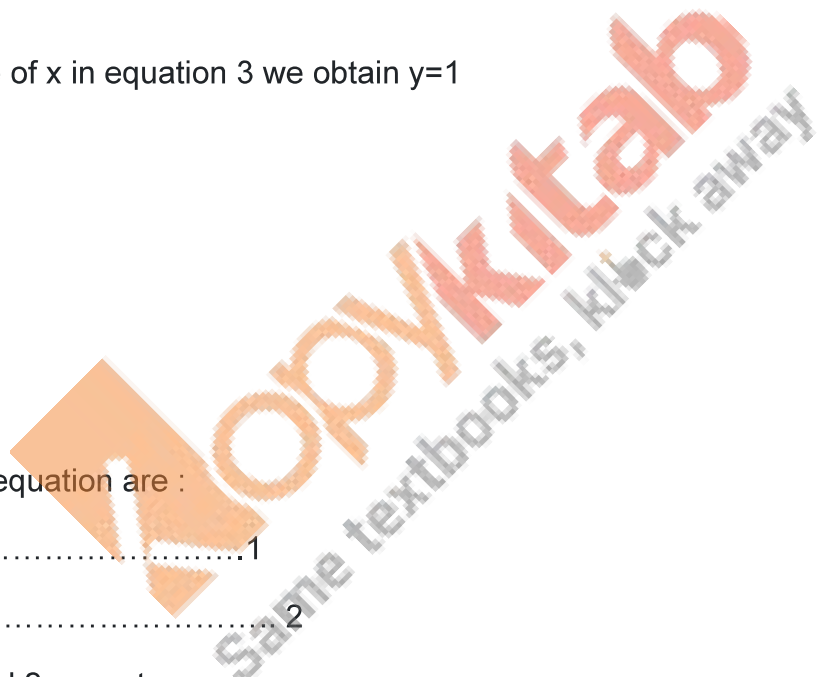
Subtracting equation 1 from 2

$$101x - 99x + 99y - 101y = 501 - 409$$

$$= 2(x - y) = 92$$

$$= x - y = 46 \dots\dots\dots 4$$

Adding equation 3 and 4 we get,



$$2x=6$$

$$= x= 3$$

Putting $x=3$ in equation 3 we get,

$$3+y =5$$

$$=y=2$$

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

Question 45

$$23x-29y=98$$

$$29x-23y=110$$

Soln:

$$23x-29y=98 \dots\dots\dots 1$$

$$29x-23y=110 \dots\dots\dots 2$$

Adding equation 1 and 2 we get,

$$= 6(x+y)=12$$

$$= x+y = 2 \dots\dots\dots 3$$

Subtracting equation 1 from 2 we get,

$$52(x-y) = 208$$

$$=x-y = 4 \dots\dots\dots 4$$

Adding equation 3 and 4 we get,

$$2x= 6$$

$$= x= 3$$

Putting the value of x in equation 4

$$3+y=2$$

$$=y= -1$$

The Solution of the given system of equation is 3 and -1 respectively.

Question 46

$$x-y+z=4$$

$$x-2y-2z=9$$

$$2x+y+3z=1$$

Soln:

$$x-y+z=4 \dots\dots\dots 1$$

$$x-2y-2z=9 \dots\dots\dots 2$$

$$2x+y+3z=1 \dots\dots\dots 3$$

From equation 1

$$z=4-x+y$$

$$z= -x+y+4$$

Subtracting the value of the z in equation 2 we get,

$$x-2y-2(-x+y+4) =9$$

$$= x-2y+2x-2y-8=8$$

$$= 3x-4y= 17 \dots\dots\dots 4$$

Subtracting the value of z in equation 3, we get,

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

$$= 2x+y +3x+3y+12 =1$$

$$= -x+4y=-11$$

Adding equation 4 and 5 we get,

$$3x-x-4y+4y=17-11$$

$$= 2x=6$$

$$= x= 3$$

Putting x=3 in equation 4, we get,

$$9-4y=17$$

$$= -4y= 17-9$$

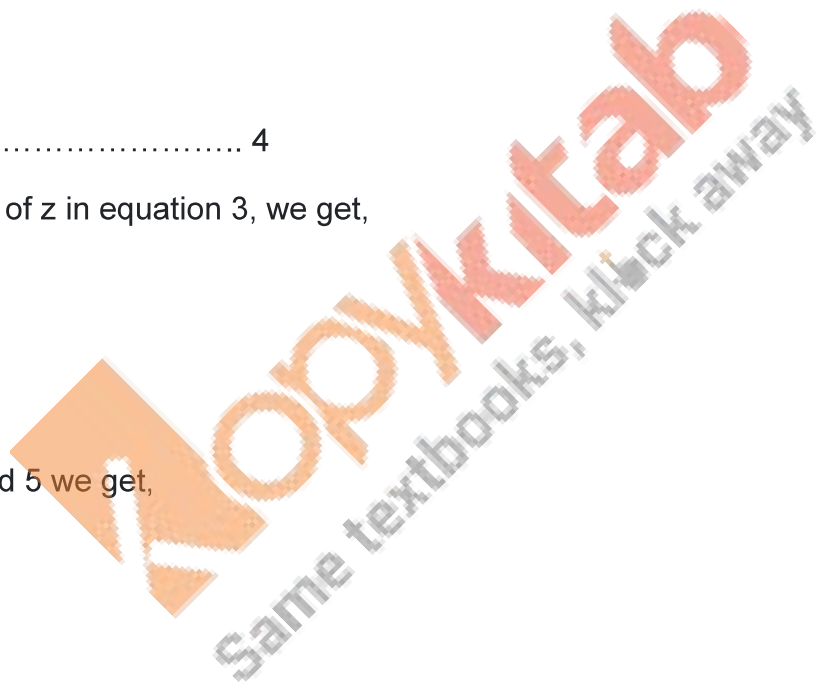
$$= y = -2$$

Putting x= 3 and y=-2 in z= -x+y+4 , we get,

$$Z= -3-2+4$$

$$= -1$$

The Solution of the given system of equation are 3 , -2 and -1 respectively.



Question 47

$$x-y+z=4$$

$$x+y+z=2$$

$$2x+y-3z=0$$

Soln:

$$x-y+z=4 \dots\dots\dots 1$$

$$x+y+z=2 \dots\dots\dots 2$$

$$2x+y-3z=0 \dots\dots\dots 3$$

From equation 1

$$z = -x+y+4$$

Substituting $z = -x+y+4$ in equation 2, we get,

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

$$= x+y-x+y+4 = 2$$

$$= 2y = 2$$

$$= y = 1$$

Substituting the value of z in equation 3

$$2x+y-3(-x+y+4) = 0$$

$$= 2x+y+3x-3y-12 = 0$$

$$= 5x-2y = 12 \dots\dots\dots 4$$

Putting the $y = -1$ in equation 4

$$5x-2(-1) = 12$$

$$5x = 10$$

$$= x = 2$$

Putting $x=2$ and $y = -1$ in $z = -x+y+4$

$$Z = -2-1+4$$

$$= 1$$

The Solution of the given system of equations are 2, -1 and 1 respectively.

