## Exercise 3.1

Q1
Akhila went to a fair in her village. She wanted to enjoy rides on the Giant Wheel and play Hoopla (a game in which you throw a rig on the items kept in the stall, and if the ring covers any object completely you get it). The number of times she played Hoopla is half the number of rides she had on the Giant Wheel. Each ride costs Rs 3, and a game of Hoopla costs Rs 4. If she spent Rs 20 in the fair, represent this situation algebraically and graphically.

## Solution

$$
\begin{align*}
& \text { The par of equations formed is: } \\
& \qquad \begin{array}{r}
y-\frac{1}{2} x \\
\text { i.e. } \quad x-2 y=0 \\
3 x+4 y=20
\end{array}
\end{align*}
$$

Le: us cepresent these ecuations graphicaly. For this, we need at least twe solution for each eqjation. We give these solutions in Table


Recall from class IX that there are infinitely mary solutions of each linear egiation: So each of youchocse any too values, which may not be the oress we have chosan. can ycu quess why we have choten it $=0 \mathrm{~m}$ the first equation and in the second ecuation: When zoe of the varlabies is zero, the equation redaces to 3 linear equation is une wanable, which can be sulvei easily. For instarce, puttings $=0 \mathrm{if}$

 exactiy on the qraph papir. Gc, wor choase $\psi=2$ which $\varphi$ ves $x=4$, an entegral yale.


Flot the points $A(0,2), B(2,1)$ anie $P(D, \sigma), ~ C(4,2)$, scmispondinin to the stave the lines $\angle E$ and $P Q$, epresenting the equatibns it $-2 y=0$ and $3 x+4 y=26$, as shown in fig
In fig, Dhserve that the bwo lines soprosentigg the two equations ara instersecting at the piont ( 4,2 ).

## Q2

Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be." (Isn' this interesting?) Represent this situation algebraically and graphically.

Les the prasant we of Afthy and hill daughtar bex and y respectively
Seven yearf $=000$
Age of Aftab $=x-$ ?
Ageof his dauphtar $=y-7$
Avcorring to the given bondition,
$(x-7)-7(y-7)$
$=x-7-7 y-49$
$\Rightarrow x-7 y=-42$
Tiree years hence.
Age of Affah $=x+3$
Ageot this daughtit $=y+3$
Apcording to the given condition
$(x+3)=3(y+3)$
$3 x+3-3 y+9$
$\Rightarrow x-3 y=6$
Trus, the fiven convitians can be Bigebracally fayresented as
$x-7 y=-42$
$x-3 y=9$
$x-7 y-42 \Rightarrow x--42+7 y$


$x-3 y-6=x-6+3 y$


The graphisal representation as as follows.

 from Mow Here the with seven years ago meath we forye to buthract 7 from their presentages, and thee yeats from niow se threz years herce meate we hive to add 3 to their presant agee Fiememher in order ta repreanat the algearaic equations geaphicaly the solution set of equiatiana must he taken as whole ntrmber

## Q3

The path of a $\operatorname{train} A$ is given by the equation $3 x+4 y-12=0$ and the path of another $\operatorname{train} B$ is given by the equation $6 x+8 y-48=0$. Represent this situation graphically.

## Solution

The paths of two trains are given by the following pair of linear equations.

$$
\begin{align*}
& 3 x+4 y-12=0  \tag{i}\\
& 6 x+8 y-48=0 \tag{ii}
\end{align*}
$$

In order to represent the above pair of linear equations graphically, we need two points on the line representing each equation. That is, we find two solutions of each equations as given below:

We have,

$$
3 x+4 y-12=0
$$

Putting $y=0$, we get

$$
\begin{aligned}
& 3 x+4 \times 0-12=0 \\
\Rightarrow \quad & 3 x=12 \\
\Rightarrow \quad & x=\frac{12}{3}=4
\end{aligned}
$$

Putting $x=0$, we get

$$
3 \times 0+4 y-12=0
$$

$\Rightarrow \quad 4 y=12$
$\Rightarrow \quad y=\frac{12}{4}=3$

Thus, two solutions of equation $3 x+4 y-12=0$ are:
$(0,3)$ and $(4,0)$
We have,

$$
6 x+8 y-48=0
$$

Putting $x=0$, we get

$$
\begin{array}{ll} 
& 6 \times 0+8 y-48=0 \\
\Rightarrow \quad & 8 y=48 \\
\Rightarrow \quad & y=\frac{48}{8} \\
\Rightarrow \quad & y=6
\end{array}
$$

## Putting $y=0$, we get

$$
6 x+8 \times 0-48=0
$$

$\Rightarrow \quad 6 x=48$
$\Rightarrow x=\frac{48}{6}=8$
Thus, two solutions of equation $6 x+8 y-48=0$ are:
$(0,6)$ and $(8,0)$


We observe that the lines are parallel and they do not intersect any where

## Q4

Gloria is walking along the path joining $(-2,3)$ and $(2,-2)$, which soresh is walking along the path joining $(0,5)$ and $(4,0)$. Represent this situationgraphically.

## Solution

It is given that Gloria is walking along the path joining $(-2,3)$ and $(2,-2)$, while Suresh is walking along the path joining $(0,5)$ and $(4,0)$.


We observe that the lines are parallel and they do not intersect any where.

On comparing the ratios $\frac{a_{1}}{a_{2}}, \frac{b_{1}}{b_{2}}$ and $\frac{c_{1}}{C_{2}}$, and without drawing them, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincide:

$$
\begin{aligned}
& 5 x-4 y+8=0 \\
& 7 x+6 y-9=0
\end{aligned}
$$

## Solution

We have,

$$
\begin{aligned}
& 5 x-4 y+8=0 \\
& 7 x+6 y-9=0
\end{aligned}
$$

Here, $a_{1}=5, b_{1}=-4, c_{1}=8$,

$$
a_{2}=7, b_{2}=6, c_{2}=-9
$$

We have,

$$
\begin{array}{ll} 
& \frac{a_{1}}{a_{2}}=\frac{5}{7}, \frac{b_{1}}{b_{2}}=\frac{-4}{6}=\frac{-2}{3} \text { and } \frac{c_{1}}{c_{2}}=\frac{8}{-9}=\frac{-8}{9} \\
\therefore \quad & \frac{a_{1}}{a_{2}} \neq \frac{b_{1}}{b_{2}}
\end{array}
$$

$\therefore$ Two lines are intersecting with each other at a point.
Q6

On comparing the ratios $\frac{a_{1}}{a_{2}}, \frac{b_{1}}{b_{2}}$ and $\frac{c_{1}}{c_{2}}$, and without drawing them, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincide:

$$
\begin{aligned}
& 9 x+3 y+12=0 \\
& 18 x+6 y+24=0
\end{aligned}
$$

## Solution

We have,

$$
\begin{aligned}
& 9 x+3 y+12=0 \\
& 18 x+6 y+24=0
\end{aligned}
$$

Here, $a_{1}=9, b_{1}=3, c_{1}=12$,

$$
a_{2}=18, b_{2}=6, c_{2}=24
$$

Now,

$$
\begin{aligned}
\frac{a_{1}}{a_{2}} & =\frac{9}{18}=\frac{1}{2}, \\
& \frac{b_{1}}{b_{2}}
\end{aligned}=\frac{3}{6}=\frac{1}{2}, ~ \begin{array}{ll}
\text { and } \quad & \frac{c_{1}}{c_{2}}
\end{array}=\frac{12}{24}=\frac{1}{2},
$$

$\therefore$ Both the lines coincide.

## Q7

On comparing the ratios $\frac{a_{1}}{a_{2}}, \frac{b_{1}}{b_{2}}$ and $\frac{c_{1}}{c_{2}}$, and without drawing them, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincide:

$$
\begin{aligned}
& 6 x-3 y+10=0 \\
& 2 x-y+9=0
\end{aligned}
$$

## Solution

We have,

$$
\begin{aligned}
& 6 x-3 y+10=0 \\
& 2 x-y+9=0
\end{aligned}
$$

Here, $a_{1}=6, b_{1}=-3, c_{1}=10$,

$$
a_{2}=2, b_{2}=-1, c_{2}=9
$$

Now,

$$
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{6}{2}=\frac{3}{1} \\
& \frac{b_{1}}{b_{2}}=\frac{-3}{-1}=\frac{3}{1}
\end{aligned}
$$

and $\frac{c_{1}}{c_{2}}=\frac{10}{9}$

$$
\therefore \quad \frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}} \neq \frac{c_{1}}{c_{2}}
$$

$\therefore$ The lines are parallel.

## Q8

Given the linear equation $2 x+3 y-8=0$, write another linear equation in two variables such that the geometrical representation of the pair so formed is intersecting lines.

## Solution

We have,

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

Let another equation of line is:

$$
4 x+9 y-4=0
$$

Here,

$$
\begin{aligned}
& a_{1}=2, b_{1}=3, c_{1}=-8, \\
& a_{2}=4, b_{2}=9, c_{2}=-4
\end{aligned}
$$

Now,

$$
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{2}{4}=\frac{1}{2}, \\
& \frac{b_{1}}{b_{2}}=\frac{3}{9}=\frac{1}{3},
\end{aligned}
$$

and $\quad \frac{c_{1}}{c_{2}}=\frac{-8}{-4}=\frac{2}{1}$
$\therefore \quad \frac{a_{1}}{a_{2}} \neq \frac{b_{1}}{b_{2}}$
$\therefore \quad 2 x+3 y-8=0$ and $4 x+9 y-4=0$ intersect each other at one point.

Hence, required equation of line is $4 x+9 y-4=0$.

## Q9

Given the linear equation $2 x+3 y-8=0$, white another linear equation in two
variables such that the geometrical representation of the pair so formed is parallel lines.

## Solution

We have,

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

Let another equation of line is:

$$
4 x+6 y-4=0
$$

Here,

$$
\begin{aligned}
& a_{1}=2, b_{1}=3, c_{1}=-8, \\
& a_{2}=4, b_{2}=6, c_{2}=-4
\end{aligned}
$$

Now,

$$
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{2}{4}=\frac{1}{2} \\
& \frac{b_{1}}{b_{2}}=\frac{3}{6}=\frac{1}{2}
\end{aligned}
$$

and $\quad \frac{c_{1}}{c_{2}}=\frac{-8}{-4}=\frac{2}{1}$
$\therefore \quad \frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}} \neq \frac{c_{1}}{c_{2}}$
$\therefore$ Lines are parallel to each other.

Hence, required equation of line is $4 x+6 y-4=0$.

## Q10

Given the linear equation $2 x+3 y-8=0$, write another linear equation in two variables such that the geometrical representation of the pair so formed is coincident lines.

## Solution

We have,

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

Let another equation of line is:

$$
4 x+6 y-16=0
$$

Here,

$$
\begin{aligned}
& a_{1}=2, b_{1}=3, c_{1}=-8 \\
& a_{2}=4, b_{2}=6, c_{2}=-16
\end{aligned}
$$

Now,

$$
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{2}{4}=\frac{1}{2}, \\
& \frac{b_{1}}{b_{2}}=\frac{3}{6}=\frac{1}{2},
\end{aligned}
$$

and

$$
\frac{c_{1}}{c_{2}}=\frac{-8}{-16}=\frac{1}{2}
$$

$\therefore \quad \frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}}=\frac{c_{1}}{c_{2}}$
$\therefore$ Lines are coincident.

Hence, required equation of line is $4 x+6 y-16=0$.

## Solution

Lel fne cost of 1 kg of appies and 1 kg grapes he Rsx and Rsy The given conditions can be algebraically represented as
$2 x+y=160$
$4 x+2 y=300$
$2 x+y=160 \Rightarrow y=160-2 x$
Tiree solutions of this equation can be witten in a lable as follows:

| $x$ | 50 | 50 | 70 |
| :---: | :---: | :---: | :---: |
| $y$ | 60 | 40 | 20 |

$4 x+2 y-300-y=\frac{300-4 x}{2}$
Thitee solutions of this equation can be wilten in a fable as follows:

| $x$ | 70 | 80 | 75 |
| :---: | :---: | :---: | :---: |
| $y$ | 10 | -10 | 6 |

The graphical representafion is as follows:


Concept insight: cost of apples and grapes necds to be found so the cost of 1 kg apples and 1 kg grapes will be taken as the variables. From the given conditions of collective cost of apples and grapes, a pair of linear equations in two vatiables will be oblained Then, itierte fo represent the obtained equations graphicaly, take the values of variables as whole numbers only Since itrese values are large so take the suitable scale.

## Exercise 3.2

Q1

$$
\begin{aligned}
& \text { Solve the following systems of equations gr aphically: } \\
& \qquad \begin{array}{l}
x+y=3 \\
2 x+5 y=12
\end{array}
\end{aligned}
$$

Solution

We have,
$x+y=3$
$2 x+5 y=12$
Now,
$x+y=3$
When $y=0$, we have
$x=3$
When $x=0$, we have
$y=3$.
Thus, we have the following table giving points on the line $x+y<3$

| $x$ | 0 | 3 |
| :--- | :--- | :--- |
| $y$ | 3 | 0 |

Now,
$2 x+5 y=12$
$\Rightarrow \quad y=\frac{12-2 x}{5}$
Whan $x-1$, We have
$y=\frac{12-2(2)}{5}=2$
When $x=-4$, we hase
$y=\frac{12-2(-4)}{5}=4$
Thus, we have the following table giving points on the ling $2 x+5 y-12$

| $x$ | 1 | -4 |
| :---: | :---: | :---: |
| $y$ | 2 | 4 |

Graph of the squations $x+y-3$ and $2 x+5 y-12$ :


Clearly. two lines intersect at $P(1,2)$.

Hence, $x-1, y-2$ is the solution of the givan systam of equations,

## Q2

Solve the following systems of equations graphically:

$$
\begin{aligned}
& x-2 y=5 \\
& 2 x+3 y=10
\end{aligned}
$$

## Solution

We have:

$$
\begin{aligned}
& x-2 y=5 \\
& 2 x+3 y=10 \\
& x-2 y=5 \\
& \text { When } y=0 \text {, we have } \\
& x=5+2 \times 0=5 \\
& \text { When } y=-2 \text {, we have } \\
& x=5+2 \times(-2)=1
\end{aligned}
$$

Naw,

Thus, we have the following table giving points of the line $x-2 y=5$

| $x$ | 5 | 1 |
| :---: | :---: | :---: |
| $y$ | 0 | -2 |

Now,

$$
\begin{aligned}
& \Rightarrow \quad \frac{2 x+3 y-10}{\Rightarrow} \quad 2 x-10-3 y \\
& =\quad x-\frac{10-3 y}{2} \\
& \text { When } y=0, \text { we have } \\
& \quad x-\frac{10}{2}-5 \\
& \text { When } y-2, \text { we have } \\
& x-\frac{10-3 \times 2}{2}-2
\end{aligned}
$$

Thus, we have the following table giving points on the line $2 x+3 y-10$

| $X$ | 5 | 2 |
| :--- | :--- | :--- |
| $y$ | 0 | 2 |

Qraph of the equathons $x-2 y=5$ and $2 x+3 y=10$ (


Clearly, two lines intersect at $(5,0)$.
Hence, $x=5, y=0$ is the solution of the given system of equations.
Q3

Solve the following systems of equations graphically:

$$
\begin{aligned}
& 3 x+y+1=0 \\
& 2 x-3 y+8=0
\end{aligned}
$$

```
We have,
    \(3 x+y+1=0\)
    \(2 x-3 y+B-0\)
Nowt
    \(3 x+y+1=0\)
\(\Rightarrow \quad y=-1-3 x\)
Whan \(x-0\), we have
    \(y=-1\)
Whon \(x-1\), we have
    \(y=-2-2 x(-1)-2\)
```

Thus, we have the following rabla giving pointr on the line $3 x+\gamma+1-0$

| $x$ | -1 | 0 |
| :---: | :---: | :---: |
| $y$ | 2 | -1 |

Now,

$$
\begin{aligned}
& =\quad \begin{array}{l}
2 x-3 y+8-0 \\
=\quad 2 x-3 y-8 \\
\Rightarrow \quad x=\frac{3 y-9}{2} \\
\text { When } y=0 \quad \text { we have } \\
x
\end{array} \quad x=\frac{3 y-8-8}{2}=-4 \\
& \text { Whan } y=2 \text { we have } \\
& x=\frac{3 \times 2-8}{2}=-1
\end{aligned}
$$

Thus, we have the felloving table giving points on the line $2 v-3 y+8=0$

| $x$ | 4 | 1 |
| :---: | :---: | :---: |
| $y$ | 0 | -2 |

Eraph of the equations are:


Cleany, two unes intersect at $(-1,2)$


## Q4

Solve the following systems of equations graphically:

$$
\begin{aligned}
& 2 x+y-3=0 \\
& 2 x-3 y-7=0
\end{aligned}
$$

## Solution

We have,

$$
\begin{array}{ll} 
& 2 x+y-3=0 \\
& 2 x-3 y-7=0 \\
\text { Now, } \\
& 2 x+y-9=0 \\
\Rightarrow & y=3-2 x \\
\text { When } x=0, \text { we have } \\
& y=3 \\
\text { When } x=1, \text { we have } \\
& y=1
\end{array}
$$

Now,

Thius, we have the following table giving points on the line $2 x+y-3=0$

| $x$ | $a$ | 1 |
| :--- | :--- | :--- |
| $Y$ | 3 | 1 |

Now,

$$
2 x-\frac{1}{3} y-7-0
$$

$$
\Rightarrow \quad 3 y-2 x-7
$$

$$
\Rightarrow \quad y-\frac{2 x-7}{3}
$$

$$
\text { When } x-5 \text {, we have }
$$

$$
y=\frac{2 \times 5-7}{3}=1
$$

When $x=2$, we have

$$
y=\frac{2 \times 2-7}{3}=-1
$$

Thus; we have the followirg table giving points on the line $2 x-3 y-7=0$

| $x$ | 2 | 5 |
| :---: | :---: | :---: |
| $y$ | -1 | 1 |

Graph of the given equations are:


Clearly, two lines intersect at $(2,-1)$.

Hence, $x-2, y=-1$ is the solution of tho.given systam of equations,
Q5
Solve the following systems of equations graphically:

$$
\begin{aligned}
& x+y=6 \\
& x-y=2
\end{aligned}
$$

## Solution

We have,

$$
\begin{aligned}
& \quad \begin{array}{l}
x+y=6 \\
x-y-2
\end{array} \\
& \text { Now, } \begin{array}{l}
x+y-6 \\
=\quad y-6=x \\
\text { When } x-2 \text {, we have } \\
y-4
\end{array} \\
& \text { When } x-3 \text {, we have } \\
& y=3
\end{aligned}
$$

Thus, we have the following table giving points an the line $x+y=6$

| $x$ | 2 | 3 |
| :--- | :--- | :--- |
| $y$ | 4 | 3 |

Now,

$$
\begin{aligned}
& \text { = } \begin{array}{l}
x-y-2 \\
=\quad y-x-2 \\
\text { When } x-0, \text { we have } \\
y=-2
\end{array} \\
& \text { When } x-2 \text {, we have } \\
& y=0
\end{aligned}
$$

Thus, we howe the following table giving points on the linex-y-2

| $x$ | 0 | 2 |
| :---: | :---: | :---: |
| $y$ | -2 | 0 |

Graph of the given equations are:


Cleariv, two linesintersect at $(4,2)$.
Hence, $x-4 ; y-2$ is the soludan of the given systom of equations,

## Q6

Solve the following systems of equations gr aphically;

$$
\begin{aligned}
& x-2 y=6 \\
& 3 y-6 y-8
\end{aligned}
$$

## Solution

```
We have,
    \(x-2 y=6\)
    \(7 x-6 y=0\)
Now,
    \(x-2 y=6\)
\(\Rightarrow \quad x=6+2 y\)
Whern \(y=-2\), we thave
    \(x=6+2 x-2=2\)
When \(y=-3\), we have
    \(x=6+2 x-3=0\)
```

Thus, we have the fallowing table niving points on the line $x-2 y=6$

| $x$ | 2 | 0 |
| :---: | :---: | :---: |
| $y$ | -2 | -3 |

Now,

$$
\begin{aligned}
& \begin{array}{l}
3 k-5 y-0 \\
\Rightarrow \quad 3 x-6 y \\
=\quad x-2 y \\
\text { when } y-0 \text {, we have } \\
\quad x-0 \\
\text { when } y-1 \text { wis have } \\
\\
x-2
\end{array}
\end{aligned}
$$

Thus, we have the following table givirig points on the line ax-6y $=0$

| $x$ | 0 | $\mathbb{z}$ |
| :--- | :--- | :--- |
| $y$ | 0 | 1 |

Graph of the giyan equations are:


Clearty, two lines are parallel to sach other. So, the two lipes have no comm on point.
Hence, the given system of equations Mas nio solution.

## Q7

Solve the following systemas of equations graphically:

$$
\begin{aligned}
& x+y=4 \\
& 2 x-3 y-3
\end{aligned}
$$

```
We have,
    x+y=4
    2x-3y=3
Now,
= }\begin{array}{l}{x+y=4}\\{x=4-y.}
When }x=0\mathrm{ , we have
    x=4
When }y=2\mathrm{ , we have
    x=2
```

Thus, we have the following table giving points on the line $x+y=4$

| $x$ | 4 | 2 |
| :---: | :---: | :---: |
| $y$ | 0 | 2 |

Now,
$2 x-3 y=3$
$=\quad 2 x-3 y+3$
$\Rightarrow \quad x-\frac{3 y+3}{2}$
Whan $y=1$, we have
$x-3$
Whan $y=-1$, We have
$x=0$

Thus, we have the following table giving points on the line $2 x-3 y-3$

| $x$ | 3 | 0 |
| :---: | :---: | :---: |
| $y$ | 1 | -1 |

Sraph of the given equations are


Cleariy, two lines intersect at $(3,1)$.
Hence, $x-3, y=1$ is the solution of the given system of equations.
Q8

Solve the following syatams of equations graphically:

$$
\begin{aligned}
& 2 x+3 y=4 \\
& x-y+3-0
\end{aligned}
$$

Solution

We nave,

$$
2 x+3 y-4
$$

$$
x-y+3-0
$$

ND'W,

$$
2 x+3 y=4
$$

$=\quad 2 x-4-3 y$
$\Rightarrow \quad x-\frac{4-3 y}{2}$
When $y=0$, we have
$x=\frac{4-3(0)}{2}-2$
When $y=2$, we have
$x=\frac{4-3 \times 2}{2}=-1$
Thus; we have the following table giving points on the line $2 x+3 y=4$

| $x$ | -1 | 2 |
| :---: | :---: | :---: |
| $y$ | 2 | 0 |

Now,
$x-y+3=0$
$\Rightarrow \quad x=y=3$
When $y=3$, we have
$x=0$
When
$y=4$, whe have
$x=1$
Thus, we have the follownig table giving points on the line $x-y+3=0$

| $\%$ | 0 | 1 |
| :---: | :---: | :---: |
| $y$ | 3 | 4 |

Graph of the given nquations are:


Clearly, two linesintersect at $(-1,2)$.

Hence, $x=-1, y-2$ 15 the solution of the glven system of equations.

## Q9

Solve the following systems of equations grephically:

$$
\begin{aligned}
& 2 x-3 y+13-0 \\
& 3 x-2 y+12=0
\end{aligned}
$$

## Solution

We haver

$$
\begin{aligned}
& 2 x-3 y+33-0 \\
& 3 y-2 y+12=0 \\
& 2 x-3 y+13-1 \\
& =\quad 2 r=2 y-12 \\
& \Rightarrow \quad N=\frac{3 y-13}{2} \\
& \text { Wheit } y=1 \text {; we hàve } \\
& x=\frac{2 \times 1-13}{2}=-5 \\
& \text { When } y=3 \text {, we have } \\
& \hat{N}=\frac{3 \times 3-13}{2}=-2
\end{aligned}
$$



| $x$ | -5 | -2 |
| :---: | :---: | :---: |
| $y$ | 1 | 2 |

Now,

$$
\begin{aligned}
& 3 x-2 y+12-17 \\
& =\quad 3 x-2 y-19 \\
& \Rightarrow \quad N=\frac{2 y-12}{3} \\
& \text { When } x=0 \text {, tya bave } \\
& N=\frac{2 \times 0-12}{3}=-4 \\
& \text { when } y=\bar{j} \text {, we kave } \\
& x=\frac{2 \times 7-12}{3}-12
\end{aligned}
$$

Thus, we have the following lab e giving pomts on the me $3 x-2 y+12-0$

| $x$ | $-a$ | -2 |
| :---: | :---: | :---: |
| $y$ | $\square$ | 3 |

Qraph of the gron nquations aro:


Clearify twif lipets intersect at $(-233)$.
Hence, $y=-2, y=3$ is the solution of the given system of equations:

## Q10

Solve the following systams of equations graphically:

$$
\begin{aligned}
& 2 x+3 y+5-0 \\
& 3 x-2 y-12-0
\end{aligned}
$$

Solution

```
We have,
    \(2 k+3 y+5-10\)
    \(3 x-2 y-12=6\)
Now
    \(2 x+3 y+5-10\)
\(=\quad 2 x=-3 y-5\)
\(\Rightarrow \quad x=\frac{-7 y-3}{2}\)
Wher \(y-1\), we have
\(x=\frac{-3 \times 1-5}{2}=-4\)
When
    \(y=-1\). wh have
    \(3=\frac{-2 \cdot(-1)-5}{2}=-1\)
```

Thus, we have the follewing tabis geing points on the line $2 x+$ Bri $+\overline{3}=0$

| $\#$ | -4 | -1 |
| :---: | :---: | :---: |
| $y$ | 2 | -7 |

Now.
$2 x-2 y-12-0$
$=\quad 3 x-2 y+12$
$\Rightarrow \quad x-\frac{2 y+22}{3}$
When $y-0, w \in$ have:

$$
x-\frac{2-0+12}{3}=4
$$

When $y+3$, we have

$$
x-\frac{2 \times 1+12}{3}-6
$$

This, we have the following, table givirig pointt on the line $3 x-2 y-12-9$

| $y$ | 4 | 6 |
| :---: | :---: | :---: |
| $v$ | 0 | 2 |

Graph of the quven aquavons arel


Clearly; top lnes minniect at $(2,-3)$.
Hence, $x-2, y=-2$ is the-solution of the giver system of equations.

## Q11

Show graphically that asch pne of the following. system a of equatiogs has infinitely nany solutians

$$
\begin{aligned}
& 2 x+3 y-6 \\
& 4 y+5 y=12
\end{aligned}
$$

## Solution

$$
\begin{aligned}
& \text { We hase| } \\
& 2 x+3 y=6 \\
& 4 x-6 y=12 \\
& \text { Now } \\
& 2 x+3 y=6 \\
& =3 x-6-3 y \\
& \Rightarrow \quad x=\frac{6-3 y}{2} \\
& \text { Wham } y=0 \text { we have } \\
& x=3 \\
& \text { Whan y-2, we hava } \\
& x-\frac{6-3 \times 2}{2}-0
\end{aligned}
$$

Thes, we lave the followitig table pring points an the line $2 \mathrm{x}+3 y-5$

| $x$ | 0 | 3 |
| :---: | :---: | :---: |
| $y$ | 2 | $n$ |

Now

$$
\begin{aligned}
& 4 x+6 y-12 \\
& =\quad 4 x-12-6 y \\
& \geqslant \quad \omega+\frac{12-5 y}{4} \\
& \text { Whes } y^{\prime}=0 \text {, we bave } \\
& v=3 \\
& \text { Whati } y-2 \text {, we heva } \\
& W=\frac{12-0 \times 2}{2}=0
\end{aligned}
$$

Thus, we have the follewing table giving points of the line $4 x-6 y=12$

| $x$ | $\square$ | 3 |
| :---: | :---: | :---: |
| $y$ | 2 | 0 |

Craph of the qiven equations:


Thus, the graphs of the wo equations are concident
Hekce, the system of equationz has infinitely many sotutions.

## Q12

Show qraphically that gach one of the following systems of aquatidnes has infinitely matiy solitions.

$$
\begin{aligned}
& x-2 y-5 \\
& 3 x-6 y-15
\end{aligned}
$$

## Solution

We-have,

$$
\begin{aligned}
& x-2 y-5 \\
& 3 x-6 y=13
\end{aligned}
$$

How,
$x-2 y-5$
$\approx \quad x=2 y+5$
When $y=-1, w e$ have
$x-2(-1)+5-3$
When $y=0$, we have
$x-2 x \overline{4}+5=5$
Thise me herve the fallowing tatble geving points on the $\operatorname{line} x-2 y-5$

| 7 | 3 | I |
| :---: | :---: | :---: |
| $y$ | 1 | $i n$ |

How,
$3 x-6 y=15$
$3 \quad 3-15+6 y$
$\Rightarrow \quad x=\frac{15+6 y}{3}$
Wtun $y=-2$ wn have
$x=\frac{15+\mathrm{e}(-2)}{3}-1$
When $y=-3$, we have
$x=\frac{15+B(-3)}{3}=-1$
Thus, we have the following table glvirg polits on the line $5 x-6 y-15$

| $y$ | 1 | -1 |
| :---: | :---: | :---: |
| $y$ | -2 | -3 |

Graph of the given equations


Since the graph of the two lines coindde the qVentistem of equatons have infindely many soliutions

Q13

Show.graphically that ead ore of the following system s of equation = 1 -as infinitely
many solumons.

$$
\begin{aligned}
& 3 x+y-8 \\
& 3 x+2 y=15
\end{aligned}
$$

## Solution

```
We have,
\(3 x+y=16\)
    \(6 x+2 y-16\)
Now,
    \(3 r+y=15\)
\(\Rightarrow \quad y=3-3 x\)
When \(x=2\), hotave
    \(y=8-3 \times 2-2\)
When \(x-3\), wo have
    \(y=B-j x J=-1\)
Thind we bave the following tahlegiving pointa on the liret 3or \(+9-8\)
\begin{tabular}{|c|c|c|}
\hline\(x\) & 2 & 2 \\
\hline\(y\) & 2 & -1 \\
\hline
\end{tabular}
Non:
```

```
\[
\begin{aligned}
& 6 N+2 y=16 \\
& =\quad 2 y-1 E-3 x \\
& =y-\frac{16-6 x}{2} \\
& \text { Whan } x-1 \text {, veir have } \\
& y=\frac{16-6 x 1}{2}=5 \\
& \text { Whan } x-3 \text { we haver } \\
& y=\frac{16-6 \times 3}{2}=-1
\end{aligned}
\]
Thas, we have the following table givinu guints on the line \(6 x+2 y=16\)
\begin{tabular}{|c|c|c|}
\hline\(x\) & 1 & 3 \\
\hline\(y\) & 3 & -1 \\
\hline
\end{tabular}
```

[^0]

Thus the graph of the tro =quations are cor ordent
Hence, the sywten of equations has infinitely many eolutions.

## Q14

$$
\begin{aligned}
& \text { Show graphically that each one of the following aystems of equatons has infinitely } \\
& \text { many solutipns: } \\
& \qquad \begin{array}{l}
x-2 y+11-0 \\
\\
\hline x-6 y+37-7
\end{array}
\end{aligned}
$$

## Solution

We heus,

$$
x-2 y+11=0
$$

$$
3 r-6 y+33-0
$$

Nowe:
$x-2 y+11=0$
$\Rightarrow \quad x-2 y-11$
Whery $y-5$, we have
$x=2=8-11=-1$
whesi $y=4$, we hate
$x-2 \times 4-11-3$
Thus, wo nava the followng lable guving paigts in the lines $x-2 y+11-0$

| $y$ | -1 | -3 |
| :---: | ---: | ---: |
| $y$ | 5 | 4 |

Nove
$3 v-b y+33=0$
$=\quad 3 r=6 y-30$
$\geq \quad x-\frac{\overline{f y} y-33}{2}$
Whan y-6 we fiave
$x-\frac{6 \times 6-33}{3}-1$
When $y=5$, we Mate
$x=\frac{6 \times 5-33}{3}=-1$
Thut, wo have the follosing tablo geving points on tha ling $3 x-6 y+33-9$

| $i$ | 1 | -1 |
| :---: | :---: | :---: |
| $y$ | $f$ | 5 |

Sraph of the given equations


Thus, the graphs of the twor equations are seetrident
Hence, the systam of equationit has unfinitaly many sblutions.

## Q15

[^1]Solution

```
We nave
    3r-5y= 20
    6r-10y =-40
Now,
    3x-5y-20
= 3x = 3y+20
# x}=\frac{5y+20}{3
When, y=-1, ve hまue
    x-\frac{5{-1)+20}{3}}
```

When $y=-4$, we nave
$x-\frac{5(-4)+20}{3}=0$

Thusive have the following table giving points on the ine $3 x-59=30$

| $H$ | 5 | 0 |
| :---: | ---: | ---: |
| $y$ | -1 | 4 |

Now,

$$
5 k-10 y=-40
$$

$$
\Leftrightarrow \quad O M=-40+12 Y
$$

$$
=\quad x=\frac{-40+10 y}{6}
$$

$$
\text { Whan } y=4 \text {, wa nave }
$$

$$
x=\frac{-40+10 \times 4}{5}-0
$$

$$
\text { When } y=1 \text { we have }
$$

$$
x-\frac{40+10 \times 1}{5}--3
$$

Thus; We have the foflowing table giving points of trieline Eir $-10 y=-40$

| $X$ | $D$ | -5 |
| :---: | :---: | :---: |
| $y$ | 4 | $I$ |

Graph of the givea equations


Elearly, there is no common point between there two linesi
Hence, givan syztom of equations is in-cansistant:

## Q16

Shove graphically that aoct one of the Fallowing sytanco of equabionsis n-comsishart:
(1,0 nas no sulution)

$$
\begin{aligned}
& x-2 y-6 \\
& 3 x-6 y=0
\end{aligned}
$$

Solution

```
We foxa,
    \(x-2 y=6\)
    \(2 r-6 y=5\)
Now,
\(x-3 y=6\)
\(x-3+78\)
\(=x-3+2 y\)
Whan \(y=0\), +电
    \(v=5+2 \times 0=6\)
When \(y=-2\), we nave
    \(x=65+2 x(-2)-2\)
```

Thu\#, we have the following teble giving poicts on the linex - $2 y$ afi

| $\bar{y}$ | 6 | 2 |
| ---: | ---: | ---: |
| $y$ | 0 | -2 |

Now,

$$
\begin{aligned}
& \quad \begin{array}{l}
3 x-6 y=9 \\
\Rightarrow \quad \\
2 r-6 y \\
=\quad
\end{array} \quad N-\frac{6 y}{2} \\
& \Rightarrow \quad x-2 y \\
& \text { When } y=0, \text { wa have } \\
& \\
& x=2 \times 0=0 \\
& \text { When } y=1, \text { we have } \\
& \\
& \\
& n=2 \times 1-2 \text { ? }
\end{aligned}
$$

Thus, we nave the following table giving fointe on the line $2 r=6$ or $=0$

| $x$ | 0 | 2 |
| :---: | :---: | :---: |
| $y$ | 0 | 1 |

Grajh of 却e grven equations:


We find the lines reprerented by equationsx-7, -6 and $3 x-6 y=0$ are
parallel So , the twa limes have no wimmon powt

Honce, them qexon syotem of equations is in-ozonsistiant.

Q17

Shue graphically that ast orie of the followirn lyytares of equators if ri-comaitant
(i, e. has no soluticir):

$$
\begin{aligned}
& 2 y-x=9 \\
& 6 y-2 x-21
\end{aligned}
$$

## Solution

We tisue,

$$
2 \gamma-x-9
$$

$$
0 y-3 r>21
$$

Now.
$2 y-x-9$
$\Rightarrow \quad 2 y-q=x$
$\Rightarrow \quad x-2 y-9$
Whatr $y-3$, wh fravie
$x-2,3-9=-3$
When $y=4$, we hate
$x=2 x 4-5=-1$
Thus, we nave the following table giving pointe on thellie $2 x-x=9$

| $x$ | -3 | -1 |
| :---: | :---: | :---: |
| $y$ | 3 | 4 |

NOW.

Thus, we have the following table giving points an toe line $6 x-3 x=22$

| 7 | -3 | -1 |
| :---: | :---: | :---: |
| $V$ | 2 | 3 |

Graph af the given equations:


We find the lines represented Ey equations $2 y-N=9$ and $6 y-3 x-21$ are
perallel So, the two hofesfate no nommon pront:
Hence, the boven oystam of eqquations is in-coneistant.

## Q18

Shom grapitically that acch one of ina following syitiam pof equabons is n-cninsitant (1.8. Has no solutuon):

$$
\begin{aligned}
& 3 x-4 y-1-0 \\
& 2 t-\frac{8}{3} y+5-0
\end{aligned}
$$

$$
\begin{aligned}
& 6 y-3 x-21 \\
& =\quad 6 y-21-3 k \\
& =3 r-6 y-2.1 \\
& =x-\frac{3(2 y-7)}{3} \\
& =\quad x-2 y-7 \\
& \text { When } \gamma-2 \text {, we hava } \\
& x=2 * 2-7=-3 \\
& \text { When } \\
& \gamma+3 \text {, we have } \\
& x-2 \times 3-7-1
\end{aligned}
$$

We have,

$$
\begin{array}{ll} 
& 3 v-4 y-1=0 \\
& 2 v-\frac{1}{3} y+5-0 \\
\text { HON } & \\
& 3 x-4 y-1-0 \\
= & 3 x-1+4 y \\
\Rightarrow & x=\frac{1+4 y}{3}
\end{array}
$$

NOW

Wran $y=2$, we hava

$$
x=\frac{1+4 \times 2}{3}=3
$$

$$
\text { When } y=-1 \text {, va have }
$$

$$
x=\frac{1+4 \times(-1)}{3}=-1
$$

Thus, we have the following table giving points on tion ir:e $3 x-4 r-1=0$.

| $x$ | -1 | $\frac{3}{2}$ |
| :---: | :---: | :---: |
| $y$ | -1 | 2 |

Now,

When $y-3$, we haye
$x-\frac{8 x^{3}-15}{5}-1.5$
Trus, we have the following tasho Biving pointsion thy lime $2 x=\frac{3}{3} k=3-0$

| $x$ | -2.5 | 1.5 |
| :---: | :---: | :---: |
| $\gamma$ | 0 | 3 |

Graph of the given equations


We find tha lines rapireserited by equations $3 x-4 x-1=0$ and $2 x-\frac{8}{3} y+5=0$ are
parallel 50 , the two lines have n'o cammon point
Hincre, the given syition of equation is in-canmetort.

$$
\begin{aligned}
& 2 x=\frac{0}{3} y+5=0 \\
& \Rightarrow \quad \frac{6 x-8 y+15}{3}-7 \\
& \Rightarrow \quad 6 x-8 y+15=0 \\
& \Rightarrow \quad E x=8 y-15 \\
& \Rightarrow \quad N-\frac{8 y-15}{5} \\
& \text { When } y=0 \text {, wehave } \\
& N-\frac{6 \times 0-15}{5}-2.3
\end{aligned}
$$

Betemine graphically the vertices of the thangian the equations of whase sides as given below:

```
2y-x-8, cy-x-14 andy-2x-1
```


## Solution

$$
\begin{aligned}
& \text { W白 have, } \\
& 2 y-x=\square \\
& 5 y-x-14 \\
& y^{\prime}-7 x=1 \\
& \text { NOW, } \\
& 2 y-x-8 \\
& \Rightarrow \quad 2 y-8=x \\
& \Rightarrow \quad x-3 y-\pi \\
& \text { Whim } \gamma=2 \text {, wir hove } \\
& X-2 \times 2-8=-4 \\
& \text { Whan } y=4 \text {, wEnave } \\
& x-2 x 4-8-0
\end{aligned}
$$

This; we have the following sable grying points ion tie line : $2 y-x=3$,

| $x$ | 2 | 0 |
| :---: | :---: | :---: |
| $y$ | 2 | 4 |

We have,
$3 y-y=14$
$\Rightarrow \quad 3 y-14=0$

$$
=\quad x-5 p-14
$$

When $y=2$, wehaye

$$
x-5 \times 2-14=-4
$$

when $y=3$, we heve.

$$
x-5 x 3-14=7
$$

Thas. wat have the fallowitic table giving peints on thaline $5 y-8-14$,

| $x$ | -4 | 1 |
| :---: | :---: | :---: |
| $x$ | 2 | 3 |

Wio have:

$$
\begin{array}{ll} 
& y-2 x-1 \\
\Rightarrow & y-1-2 v \\
\Rightarrow \quad & x-\frac{y-1}{2}
\end{array}
$$

When $y<3$, we have.

$$
x=\frac{3-1}{z}<1
$$

Whan $y=-1$, we hawe

$$
X=\frac{-1-1}{2}=-1
$$

ation the llaey - $2 x-5$

| 5 | -1 | 1 |
| :---: | :---: | :---: |
| $Y$ | 1 | 2 |

Graph of the gwen equasons:


Fram the graph af the litex represented by the govan equations, we okserve that the Jines taken in paisinterseet eaid other at points $A(-4,2), S(1,3)$ ard $C\{2,5)$.

Hence, the vartices af the triarigle as : $A(-4,2), B\{(1,3)$ and $c\{2,5\}$,

## Q20

Qeremine graphically the wertices of the trangle the equatoch of whose sides ate $9 y$ wh below:
$y=x, y=0$ and $2 x+3 y=10$

## Solution

The given zystem of equationsit

$$
\begin{aligned}
& y=3 \\
& y=0
\end{aligned}
$$

$$
3 x+3 x=10
$$

venave
$y=x$
Whan $x=$ I. WB hase
$y=1$
When $x=-2$, wa hove
$y=-2$
Hur, we have tie following table guvg points on the lriey $y-x$

| $x$ | 1 | -2 |
| :---: | :---: | :---: |
| $y$ | 1 | -2 |

We have.
$3 x+3 y=10$
$\Rightarrow \quad 3 y+30-3 r$
$\Rightarrow \quad y=\frac{10-3 x}{3}$
When $x-1$, we nave:
$y=\frac{10-3 x}{3}-\frac{7}{3}$
When $x-2$, wehate

$$
\pi=\frac{10-3 \times 2}{3}=\frac{4}{3}
$$



| $x$ | 1 | 2 |
| :---: | :---: | :---: |
| $y$ | $7 / 3$ | $4 \sqrt{2}$ |

[^2]

From the graph of the lines pepresented by the given equations, we observe that
the linas takn in pairs intersect exch pthe at pointi $A(0,0), B\left(\frac{10}{2}, 0\right)$ and $C\left(\frac{8}{3}, \frac{5}{3}\right)$

Hence, the required verncec of the mangle are $z(0,0), v\left(\frac{10}{3}, 0\right)$ and $c\left(\frac{5}{3}, \frac{5}{3}\right)$

Q21

Deteminis, praphicaly whether tise systan of aquatunisx-2y-2, $4 x-2 y=5$ is
cansestent or in consistent.

## Solution

Wethave,

$$
\begin{array}{ll} 
& x-2 y+2 \\
& 4 x-2 y-5 \\
\text { Now, } \\
& x-2 y-2 \\
= & x=2+2 y \\
\text { Whien } y=0, \text { we have } \\
& x=2+2 \times 0=2 \\
\text { When } y=-1, \text { we nave } \\
& x-2+2 x(-1)=0
\end{array}
$$



| $x$ | $z$ | 0 |
| :---: | :---: | :---: |
| $y$ | 0 | -1 |

Now:

$$
4 x-2 y-5
$$

$\Rightarrow \quad 5 x=5+2 y$
$=x-\frac{3+2 y}{4}$
When $y \rightarrow A$ we have
$x=\frac{5+2=0}{4}-\frac{5}{4}$
When $y-1$, we have

$$
x=\frac{3+2-1}{4}=\frac{7}{4}
$$

Tluy, wa have the shipurng Lable qiving paitits an the fre $4 x-2 y=5$

| 3 | $3 / 4$ | $7 / 4$ |
| :---: | :---: | :---: |
| 7 | 0 | 3 |

Graph of the grver inquationsi


Cleary, the two ines intersect at $\left(1, \frac{-1}{2}\right)$.
Hence, the system of equationa is consistent

## Q22

Qesemा ize, by drawing:graph5, whether the following system of linear equations has: a unicue solution or not

$$
\begin{aligned}
& 2 x-3 y=6 \\
& x+y=1
\end{aligned}
$$

## Solution

We nave
$2 x-3 y-6$

$$
x+y=1
$$

Now.
$2 x-3 y=6$
$=2 x-6+3 y$
$=\quad x-\frac{6+3 y}{2}$
When $y=0$. we have
$x-\frac{\pi+J \times 0}{2}-3$
When $y=-2$, we have
$x=\frac{6+3 \times(-2)}{2}=0$
Thus, we have tha following table qiving points in the linu $2 r-3 y-b$

| $z$ | 2 | 0 |
| :---: | :---: | :---: |
| $y$ | $d$ | -2 |

Now,

$$
\begin{array}{ll}
\Rightarrow & x+y=1 \\
\Rightarrow & x+1-y \\
\text { When } & y-1, \text { we have } \\
& x=1-1=0 \\
\text { When } & y=0, \text { we have } \\
& x-1-0=1
\end{array}
$$

Thus, we bavs the following table giving-fointaidn the line $k+j=01$

| $x i$ | 0 | 1 |
| :---: | :---: | :---: |
| $y$ | 1 | 0 |

Graph of the given equationse


Clearly, the two lines interseot at one point.
A The systoni of linear equatjots has a unique solution.

## Q23

Qetermine, by drawing graphs, phethes tas following system of linear equations has a unique solution or not

$$
\begin{aligned}
& 2 y=4 x-5 \\
& 2 x-y+3
\end{aligned}
$$

Solution

We have,

$$
\begin{aligned}
& 2 y=4 x-b \\
& 2 r=y+3
\end{aligned}
$$

Now
$2 v=4 x-5$
$\Rightarrow \quad 2 y+6-4 x$
$=4 r-2 r+5$
$\Rightarrow \quad x=\frac{2 y+0}{4}$
When $y<-L$, wa have
$x=\frac{2 \times(-1)+6}{4}=1$
When $y-5$ 保, Whave
$x=\frac{2 \times 5+6}{4}=4$
Thus, we have the following table giving points on thefine $2 y=-4 x-6$.

| $K$ | $z$ | 4 |
| :---: | :---: | :---: |
| $y$ | -1 | 5 |

Now:

$$
2 x-y+3
$$

$\Rightarrow \quad x=\frac{y^{\prime}+3}{2}$
When
$y>1$, wehave
$x=\frac{1+3}{2}-2$
When $y=7$, kenave
$x=\frac{1+3}{2}=3$
Thus, wh have the followng tathle grving points on the 4 昭 $2 \kappa-x=7$

| 3 | 2 | 3 |
| :---: | :---: | :---: |
| $y$ | 1 | 3 |

Gitaph of the given Equations:


We find the graphs of the two equations are coincident
6. Hence; te systern of equarons has infintaly many: solutione

## Q24

$$
\begin{aligned}
& \text { Solve graphically each of the following systems of linear equations. Also find } \\
& \text { the coordinates of the points where the lines mivet shis of } y \text {. } \\
& \qquad \begin{array}{l}
2 r-5 y+4-0 \\
2 v+y-0=0
\end{array}
\end{aligned}
$$

## Solution

```
Ne have.
    2v-4y+A= b
    2v+r-H-6
nom
    2n-5n+4-0
= - 2v-5y-4
= }<<-\frac{5%-2}{z
wheli p-2; 05 have
    *- < < < %-a - - 
NTian y =4. wo nava
    s=\frac{In+4-a}{2}}+
```



```
|y
FITWM
    8v+と-3-3
    9: Dr*##y
= r- - - - r
whmm 
    * - v-- +
matw raz wtheve
    E=\frac{y-z}{z}+3
```





## 




Q25

Solve graphically each of the following systams of linear equation 3, Also find
the coordinates af the points where the linee meet axis of $y$.

$$
\begin{aligned}
& 3 x+2 y=12 \\
& 5 x-2 y=4
\end{aligned}
$$

## Solution

```
中v haver:
    \(3+2 H-1\)
    \(5 x-2 y+4\)
purw
- \(3<-2 k=12\)
a: \(\quad 2+15+2 H\)
\(=\quad e=\frac{12-2 r}{1}\)
Whan \(y=3\), wn have
    \(\therefore+\frac{11-1 \times 3}{3}=2\)
when \(y<-2\), we haw
    \(x-\frac{11-1 \cdot(-3)}{3}=8\)
```


$\square$
tchen
— $\mathrm{Fa}-2 y<1$
$=$ 幸 $*: 4.2 \%$
$=\quad=\frac{+1+1}{E}$
Whon ir $-x$ aconaw
$\Rightarrow-\frac{4+2 s)}{1}-2$
Whert + - ot wehnem
$=-\frac{4+2 y \mid-1\}}{5}=-2$



Brant of the gher equations





## Q26

Solve graphically each of the following systems of linear equations．Also find the coordinates of the points where the lines meet axis of $y$ ．

$$
\begin{aligned}
& 2 x+y-11=0 \\
& x-y-1=0
\end{aligned}
$$

## Solution

We have,

$$
2 r-y-11=0
$$

$$
x-y-1-0
$$

Now,
$2 x-y-11=0$
$=\quad y-11-2 x$
When $x=4$, Wn laver
$y=11-2 x+z \cdot 3$
When $x-5$; we have

$$
y=11-2 * 5-1
$$

Thus. we have the following sahle givinp points on the line $2 r+y-11=0$

| 1 | 4 | 5 |
| :--- | :--- | :--- |
| $y$ | 3 | 3 |

Nows.

$$
x-y-1=\frac{1}{0}
$$

$\Rightarrow \quad x-1-y$
$=\quad y-x-1$
When $x=3$, we have

$$
y=2-1-1
$$

When $N=3$, wil tave
$y=3-1=2$
Trus, we have boe following table grving paints on thelindx-y-1-0'

| 1 | 2 | 3 |
| :--- | :--- | :--- |
| $\boldsymbol{Y}$ | 1 | 2 |

Graph of the given equationis:


Searly, two intersect at $P(4,3)$.

Hence, $k=4: y=3$ is the solution of the giverisystem of eciabions.
We also gogarve that the linas piprussitad by $2 x+y-11-a$ and $x-y-1-0$ memt $y$-akis:ar $A\{0,21\}$ and $B\{0,-1\}$ =巴spectively.

## Q27

[^3]
## Solution

```
We n\existsve, x+24y-7=0
        2x-y-4=0
Nowi. 
        [17>-2y
When }\quad\textrm{y}=1,\quadk=
            q=2; |}|=
```

| $x$ | 5 | 2 |
| :---: | :---: | :---: |
| $y$ | 1 | 2 |

AH0，$\quad 2 x-y-4=0$

$$
y=2 x-4
$$

| $x$ | 2 | 0 |
| :---: | :---: | :---: |
| $y$ | 6 | -1 |



Eromthe graph，the solution is $\beta(3,2)$ ．
Wisc，the coordinates of the points where the flines meet the y anis are C （2 3（5） and $C(0,-4)$

## Q28

Solve graphically aach of the following sevetams of lineabequations：㧳三人 find the coorginates of the points wherg the lines meet atile of $y$ ．

$$
\begin{aligned}
& 3 x+y-5=0 \\
& 2 x-y-5=0
\end{aligned}
$$

## Solution

We hava；

$$
\begin{aligned}
& 3 r+y-5=0 \\
& 2 x-y-5-0 \\
& \text { Now. } \\
& 3 x+y-5=5 \\
& \text { 三 } \quad y=5-3 x \\
& \text { When } x * 1 \text { w Hase } \\
& r+5-3 \times 2-2 \\
& \text { Whian } x-2 \text { we have } \\
& y=5-3 \times 2=-I
\end{aligned}
$$

Thius，we have the fallovang cable gring points an the line Jr $-y-5=0$

| $\pi$ | 1 | 2 |
| :---: | :---: | :---: |
| 4 | 2 | -2 |

NEW

$$
\begin{array}{ll} 
& 2 x-y-5-0 \\
\Rightarrow & 2 r-5-y \\
\Rightarrow \quad & y=2 t-3 \\
\text { Whan } x=0, \text { wh have } \\
& y=-5 \\
\text { When } x=2 \text { we have } \\
& y=2 x 2-5--1
\end{array}
$$



| 1 | 0 | 2 |
| :---: | :---: | :---: |
| $y$ | -5 | -1 |

Gkaph of the given equationst：


Chatly，two infermet at $A(2,-2)$

$$
\text { Herce, } x-2, y=-1 \text { is me solution of the given まystem of equations }
$$

We asco observe that tize lir6s represented Dy $3 x+y-5=0$ ）and $2 x-x-5=0$ mest $y$－axis at $A\left(0_{1}, 5\right)$ and o $\left(0_{1}-5\right)$ respectivel $y$ ．

## Q29

Solvecraphically \＃ach of the followng systams of linear equations Ahpo find the


$$
\begin{aligned}
& 2 x-y-5=0 \\
& x-y-3=0
\end{aligned}
$$

## Solution

```
We hisere.
    2x-7-5-00
    x-y-3=0
Now:
    2x-y-5>11
# 2x-5=3y
=> y-2x-5
Whied }\pi-1\mathrm{ , we have
    y=2\timesI-5=-3
When, }x-2, y% Haque
    y-2*2-5- =-1
```

Thus, we have the following table giving points on the line $2 N-y-5=0$

| $K$ | 1 | 2 |
| :---: | :---: | :---: |
| $y$ | -3 | -1 |

```
Now:
\[
x-y-3=0
\]
\[
=\quad x-3-p
\]
\[
\Rightarrow \quad y-x-3
\]
\[
\text { Whan } x=3 \text {, ve have }
\]
\[
y=3-3=0
\]
\[
\text { Whan } x=4 \text {, we navel }
\]
\[
y=4-3=1
\]
```

This, we have the follawing table giving points on the line $x-y-9=0$

| $x$ | 3 | 4 |
| :--- | :--- | :--- |
| $y$ | 0 | 1 |

Sragh of the given equations:

Claariv, livo intersect ate (2-1)
Hence, $x+2, x<-1$ II the solutian of the g-ven system of equations.
We aiso observe that the lines pplasented by $2 x-y-\frac{1}{4}-0$ and $x-y-3=0$ mest $y$-ands at $A(0,-5)$ and $\xi\{(0,-3)$ respectively.

Q30

Solve the folioming systan of linear equat ons graphicaly and shade the region between the two lines and $x$-avis:

$$
\begin{aligned}
& 2 x+3 y=12 \\
& x-y-1
\end{aligned}
$$

Solution

The system of the given equations ith,

$$
2 x+3 y=12
$$

$$
x-y=1
$$

Nowe,

$$
2 x+3 y-12
$$

$$
\Rightarrow \quad 2 x-12-3 y
$$

$$
\Rightarrow \quad x-\frac{12-3 y}{2}
$$

When y -2 We have

$$
x=\frac{18-3 * 2}{2}-3
$$

Whan $y=4$, we have

$$
x=\frac{12-3=4}{2}-1
$$

Thus, will have the foltowng table:

| $x$ | 0 | 3 |
| :---: | :---: | :---: |
| $y$ | 4 | 2 |

Whe have.

$$
x-y=1
$$

$$
\therefore \quad N=1+\gamma
$$

When $y=0$, we have
$x=1$
When $y=1$ we have

$$
x=1+1=2
$$

Thus, eip have the follawing taste:

| $E$ | 1 | 2 |
| :---: | :---: | :---: |
| $y$ | 0 | 1 |

Graph if thequen sxstem of equations


Clamatly, the two liness in fier seck at $P(3,2)$.
Hence, $x-3, y=2$ is the solution of thegiven system of equistion

## Q31

Solution
between the two lines and $x$-axis:
$3 x+2 y-4=0$
$2 x-7 y-7=0$

Tae zysten of the given equatronsis,

$$
\begin{aligned}
& 2 x+2 y-4=0 \\
& 2 x-3 y-7=0
\end{aligned}
$$

Now,
$3 r+2 y-4=0$
$\Rightarrow \quad 3 x-4-2 y$
$\Rightarrow \quad x-\frac{4-2 y}{3}$
When $y-3$, we have

$$
x=\frac{4-2 \times 5}{3}=-2
$$

When $y-8$, wehave

$$
x=\frac{4-2 \times 0}{3}=-4
$$

Thas, the have the followng table

| $x$ | -2 | -4 |
| :---: | :---: | :---: |
| $y$ | 5 | 0 |



$$
\begin{aligned}
& 2 x-3 y-7=0 \\
& =\quad 2 x-3 y+7 \\
& \Rightarrow \quad i c=\frac{3 y+7}{2} \\
& \text { Whan } x-1, \text { wh have. } \\
& x=\frac{3 x 1+7}{2}=5 \\
& \text { Whan y- } x \text { - we have } \\
& x-\frac{3 x(-1)+7}{2}=2
\end{aligned}
$$

Thus, $w \in$ have the following tablo:

| 11 | 5 | 2 |
| :---: | :---: | :---: |
| $y$ | 1 | -1 |

Oraph of the grven swotum of nquations:

Cinarix, the lwo linesanpersect at $0(2,-1\}$
Hence, $x-2, y=-1$ ie the solution of te given system of equations
Q32

Solve the folowng syatem cflineas equaticos graphicaly and shade the region
between the twa lines and $x$-atis

$$
\begin{aligned}
& 3 x+2 y-11=0 \\
& 2 x-3 y+10=0
\end{aligned}
$$

## Solution

The systan of tre given equations is,

Thus, we have the following table:

| y | 3 | 1 |
| :---: | :---: | :---: |
| y | 1 | 4 |

We have,

$$
2 x-3 y+20=3
$$

$$
=\quad 2 x=-7 y-10
$$

$$
\Rightarrow \quad \pi=\frac{3 \gamma-10}{2}
$$

When $x-\overline{0}$, wenave

$$
w-\frac{3 \times 0-10}{32}-n 5
$$

When $y-2$, we have

$$
x=\frac{3 * 2-10}{2}=-2
$$

Thus, we tove the following table.

| 5 | -5 | -2 |
| :---: | :---: | :---: |
| $y$ | 0 | 2 |

Graph of the given system of equat ons:


Clibariv, the twa linits inturnect at $f(1,4)$
Hence, $x-1, y-4$ is the solution of the qiven systern of equato

$$
\begin{aligned}
& 2 x+7 y=12 \\
& x-y-1
\end{aligned}
$$

Find the cocrdinate of the vertces of the triangle formed by the two straight
finis and trimy $y$-axas.

$$
\begin{aligned}
& 2 z+2 y-11-0 \\
& 2 r-3 y+10-0 \\
& \text { How, } \\
& \text { Ir }+2 y-21-0 \\
& =3 x-11-7 x \\
& \Leftrightarrow \quad x=\frac{11-2 y}{3} \\
& \text { When } y=1 \text {, ผอ bave } \\
& x=\frac{11-2 x^{2}}{3}-3 \\
& \text { When } y=4, \text { we isave } \\
& x=\frac{11-2 \times 4}{3}-1
\end{aligned}
$$

## Solution

The Eystern of the gizen equabonsin,

$$
\begin{aligned}
& 2 x+3 y-12 \\
& x-y=1 \\
& 180 \mathrm{w} \\
& 2 x+3 r-12 \\
& \Leftrightarrow \quad 2 x=12-2 y \\
& \Rightarrow \quad x-\frac{19-3 y}{2} \\
& \text { When } x=\text { E. we have } \\
& x=\frac{12+3 \times 0}{2}=6 \\
& \text { When } y-2 \text {, we hiñe } \\
& x=\frac{12-3 \times 2}{2}-3
\end{aligned}
$$

Thu's, we have the following table:

| 4 | 6 | 2 |
| :---: | :---: | :---: |
| 7 | 0 | 2 |

We have,

$$
\begin{aligned}
& \Rightarrow \quad \begin{array}{l}
x-y-1 \\
\Rightarrow \\
\text { when } y \\
x
\end{array}=0, \text { we have } \\
& x
\end{aligned}=1 .
$$

Thus, we nave the followng taple:

| $a$ | 1 | 0 |
| :---: | :---: | :---: |
| $y$ | $\overline{0}$ | -1 |

Graph of thegivan syztem of equaboas:


Cluarly, the bwa linies intorivit: at $A\binom{3}{$ ? }
The als obstive that the limp reprecanted by the mquatrins $2 x+3 y-12$ and $x-y=-1$ mont $y$-asis at $E(0,-1)$ and $c(0,4)$.

Herce, the uertices of the nequired tiangie ase $\lambda(3,2), B(0,-1)$ and $Q(c, 4)$.

## Q34

[^4]The given syitem of equations is

$$
\begin{aligned}
& x-y+1-0 \\
& 3 x+2 y-12=0 \\
& \text { Now, } \\
& x-x+1=0 \\
& \Rightarrow \quad x=x-1 \\
& \text { Whan } y-3 \text {, we fiave } \\
& x-3-1-\text { ? } \\
& \text { when } y=-1 \text {, we have } \\
& x=-1-1--2
\end{aligned}
$$

Traje, we have the fullowng table

| $x$ | $z$ | $-x$ |
| :---: | :---: | :---: |
| $y$ | 3 | -1 |

$$
\begin{aligned}
& \text { Whi have. } \\
& \qquad \begin{array}{l}
3 x+2 y-12=0 \\
2 x-12-2 y \\
\Rightarrow \\
\Rightarrow-\frac{12-2 y}{3}
\end{array} \\
& \text { When } y=6, \text { we have } \\
& \qquad x-\frac{12-2-6}{3}=0 \\
& \text { When } y-3, \text { we have } \\
& x=\frac{12-2.3}{2}=2
\end{aligned}
$$

fius, we have the foliowng table:

| 1 | 0 | 2 |
| :--- | :--- | :--- |
| V | 6 | 3 |

Graph of the given zystam of equations:


Clearly the two linas intersect at $A$ I2. \$)

[^5]```
Clearly, we have
    AD = y-cocrimate of poin:A(z;j)
= AD-3
and, }BC=5-(-1)-4+7-
*. Aras af the shaded replon-area of \triangleABC
= Area of the shated region = 位(Basextleight)
    = \frac{I}{2}}\times(2C\times+B
    -\frac{1}{2}}\times5\times
    -7.5 sq. units.
```

- Area of the shaded region - 7.5 sq upits.


## Q35

Solve graphically the system of linear equations

$$
\begin{aligned}
& 4 x-3 y-4-0 \\
& 4 x+3 y-20=0
\end{aligned}
$$

Find the areabounded by these $n$ nes and $x$-करis

## Solution

Thu gunn system of bquatoons is

$$
\begin{aligned}
& 4 x-3 y+4=0 \\
& 4 x+3 y-20=0
\end{aligned}
$$

Now.

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

$$
=\quad 4 y-3 y-4
$$

$$
\Rightarrow \quad k=\frac{3 y-4}{4}
$$

When $y=0$, wa have

$$
\tilde{x}=\frac{3 \times 0-4}{4}=-1
$$

Whe?

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

Thus; we have the following table:

| $x$ | 2 | -1 |
| :---: | :---: | ---: |
| $y$ | 4 | $D$ |

W0 fasw

$$
4 v+3 p-20=0
$$

$$
\equiv \quad 4 N-20-2 \mu
$$

$$
\Rightarrow \quad x=\frac{20+3 y}{4}
$$

When $y=0$, we have

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

When $y-4$. We日 have:

$$
x-\frac{2 \bar{q}-3 x+4}{4}-2
$$

Thas, we have the following table

| $x$ | $\Sigma$ | 2 |
| :---: | :---: | :---: |
| $y$ | 0 | 4 |

Erath of the given syztam of equatipns


Clearly, the two linesintersect at $A(2,4) \cdot$ Hencex $-2, y+4$ if the solution of the given systim of Equations.

Whe 3 aso charer ve that the lines represented by the enuatians $4 x-I y+4-0$ and $A<+3 y-20-1$


Thus, $x=2, y=4$ Is the solut on of tif given syatem of equations.
brax Aa perpendualar flon $A$ on x-exis.
Clearly, we have
$A B-y$ - coordiriate of point $A[2,4]$
$=A O-4$
and. $B C=3-(-1)=5+1-6$

- 2rea of the shated riminn- Arina of $\triangle A B C$
$\Rightarrow$ area df the shaded region $=\frac{1}{2}$ (bases lelght)

$$
\begin{aligned}
& -\frac{3}{2} \times(B C \times 40) \\
& -\frac{3}{2} \times 6 \times 4 \\
& -\frac{5}{2} \times 2 \\
& -12 \times 14 \text { urits }
\end{aligned}
$$

- Area of the shaded fegion - 12 sq units:


## Q36

Solve the foloping. systam of inear aquations.glaphically:
$3 x+y-11=0, x-y-1=0$.
Shade the ragion bounded by these lines and $y$-avory, Alsn, find trie beea of the ragun bounded by the these lifies and $y$ 活itit.

## Solution

> The giveri systern of equations is

$$
\begin{aligned}
& 3 x+y-11=0 \\
& x-y-1-0
\end{aligned}
$$

Now:

$$
\begin{array}{ll} 
& 3 r+\mu-11=0 \\
\Rightarrow \quad & y-11-2 r
\end{array}
$$

```
Whani x-0, we have
    y=11-3\times0-11
wheq x-2, wenave:
    y-11-3k3-2
```

Thus, we have the following rable:

| $x$ | 0 | 3 |
| :---: | :---: | :---: |
| $y$ | 11 | 2 |

We have,

$$
\begin{array}{ll} 
& x-y-1-0 \\
\Rightarrow \quad & x-1=y \\
\Rightarrow \quad y-x-2 \\
\text { Whan } x-0, ~ w h e n e ~ \\
& y=0-1=-1 \\
\text { When } x=3, \text { whave } \\
& y=3-1-2
\end{array}
$$

Thus, we have the following tatiet

| $z$ | -2 | 3 |
| :---: | :---: | :---: |
| $V$ | -1 | $P$ |

Geaph of tie given syitem of equations:


Cleaty, tes two lines imersect at $-(3,2)$ Hendecy $=3 . y-2$ i 1 the soluthon of the given systant? of equatums.

We also jbserve that tre lines replasantso by the ecuations $30+y-11=0$ and $x-y-1=0$ meery-anis at: $(0,11)$ and $\alpha(0,1)$ respectively.

Draw $A D$ perpendinular from $A$ on $y$-zhisi
Cleatly, we theve:

$$
\begin{aligned}
& A 0-N \text { - coorcinate of peint } A(3 ; 1) \\
& \Rightarrow \quad A B-3 \\
& \text { and } 5(-11-(-1)-11+1-12 \\
& \text { Aried of the shaded repinn-4rica of AABC } \\
& \Rightarrow \text { Area pf the shadzd regupn= }=\frac{1}{2} \text { (Dasextienght) } \\
& -\frac{1}{2} \times(B C \times 4 O) \\
& -\frac{1}{2} \times 18 \times 3 \\
& \text { - Ex } 1 \\
& -185 \mathrm{y} \text { units }
\end{aligned}
$$

[^6] coordinares of the points where the lines meet the akis of $x$ in each system
\[

$$
\begin{aligned}
& 2 x+y=3 \\
& x-2 y=-2
\end{aligned}
$$
\]

## Solution

The plagn tystom of equations is

$$
\begin{aligned}
& 2 x+y=6 \\
& x-z y<-2
\end{aligned}
$$

Now,

$$
2 x+y=6
$$

$$
\Rightarrow \quad x-\frac{5-i y}{2}
$$

Whith iy $=0$, we have.

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

When $y=2$, wh haye:

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

This, wor have ty follipwing taties.

| $x$ | 3 | 2 |
| :---: | :---: | :---: |
| $y$ | 0 | 2 |

W/a) haves

$$
\begin{aligned}
& =\begin{array}{l}
x-2 y+-2 \\
= \\
\text { When } \\
\text { W-2y-2 we have } \\
\\
x-2 x 0-2=-2 \\
\text { When } \\
y-2 \text { wo have } \\
\\
x+2 x 1-2=0
\end{array}
\end{aligned}
$$

Thus we have the telowing table:

| $z$ | -2 | 9 |
| :---: | :---: | :---: |
| $Y$ | 0 | 1 |

Graph of the given syatern of equations:

 of equationes.
 meetxcaus at $b[3,0]$ and $c(-2,0)$ respect y ely

Solve graphicaby: eact of the following systams of ingear equations, Also, find thn cootorates of the points whera the lines meet the ave 5 of $x$ in each system?

$$
\begin{aligned}
& 26-y=2 \\
& 4 x-y+0
\end{aligned}
$$

## Solution

$$
\begin{aligned}
& 2 x-y=-2 \\
& 4 x-v-8 \\
& \text { How, } \\
& 2 x-y=2 \\
& =\quad \text { or }-y+2 \\
& \Rightarrow \quad x=\frac{y+2}{2} \\
& \text { Wher } y-0 \text {, wa have } \\
& x=\frac{0+2}{2}=2 \\
& \text { When } y=2 \text {, ne have } \\
& x=\frac{2+2}{2}-2
\end{aligned}
$$

Thus, we have the following taple:

| $z$ | 1 | 2 |
| :--- | :--- | :--- |
| $y$ | 0 | 2 |

$$
\begin{aligned}
& \text { We have. } \\
& 4 x-y=7 \\
& =\quad 4 x-y+8 \\
& =\quad x+\frac{v^{2}+B}{4} \\
& \text { When } y=0 \text {, we have } \\
& N=\frac{\square+\theta}{4}-2 \\
& \text { When } y:=-4 \text {. we Mave } \\
& x=\frac{-4+9}{4}=1
\end{aligned}
$$

Thus; we have the following tabie:

| $x$ | 2 | 4 |
| :---: | :---: | :---: |
| $y$ | 3 | -4 |

Qtaph of tien given systori of quatioms


Chearly, the two linez infarsectat $4(3,-4)$. Hencex $x-3, y-4$ is the solution of the given systom मfequatonn:

We asto obiserve that trie lines repreventedty thie uquations $2 x-y-2$ and $4 x-y=8$
meet xasis at $B(2,0)$ and $c:(2,0)$ respect vely.

## Q39

Solve graphicaby each of the following systans of lingar equationa, klso, find the coordrates af the points whefe the linet meet the axis of $x$ in each symeten:

$$
\begin{aligned}
& x+2 y=5 \\
& 2 x-7 y=-4
\end{aligned}
$$

## Solution

The systant of the given equations is

$$
\begin{aligned}
& x+3 y=1 \\
& 3 x-7 y=-4
\end{aligned}
$$

Now
$x+2 y=5$
$\Rightarrow \quad x-5-2 y$
Whuri $y-2$, we have
$(x=5-2 \times 2=1$
When
$r-3, w \in h$ 层
$x-5 \times 2 \times 3--1$
Thus) we have. the folloxing table:

| $x$ | 1 | -1 |
| :---: | :---: | :---: |
| $y$ | 2 | 3 |

$$
\begin{aligned}
& \text { We tave, } \\
& \begin{array}{ll} 
& 2 x-3 y--4 \\
\Rightarrow & 2 x-3 y-7 \\
= & x-\frac{3 y-4}{2}
\end{array} \\
& \text { Whan } \gamma=\text { bi, we have } \\
& x=\frac{3 \times 0-4}{2}-12 \\
& \text { Smen } y=5 \text {, wathine } \\
& x=\frac{3 \times 2-4}{2}=1
\end{aligned}
$$

Thus, we have the Folliowing tation

| $x$ | $-\frac{1}{2}$ | 1 |
| :---: | :---: | :---: |
| $y$ | 0 | 2 |

Graph of the given systen of equations:


Clealy, the twallries intersect at $A(22)$ Hencex $-1, y$-2 is the schution of the givan syatern of equations.

Solve graphically each of thefollowirs systems of ineest equationg. Alpo, find the eoroccinates of the points where the lines meat the axis of $x$ in eaithsystem:

$$
\begin{aligned}
& 2 x+3 y=8 \\
& y-2 y=-7
\end{aligned}
$$

## Solution

The givec system of egulapons is

$$
2 x+3 y=11
$$

$$
x-2 y--3
$$

Now,
$2 x+3 y=11$
$=3 x-3 y+3 y$
$\equiv \quad x+\frac{8-3 y}{2}$
Whan $y-2$, wn frave
$x=\frac{2-3 \times 2}{2}-1$
whign $y=4$ wo have

$$
x=\frac{9+7 \times 4}{2}=-2
$$

Thus, we have the following table:

| $H$ | 1 | -2 |
| :---: | :---: | :---: |
| $V$ | 2 | 4 |

We hever

$$
x-2 y=-3
$$

$$
=\quad n-2 y-3
$$

When $y-0$, wझ have
$x+2 \times 0-2-3$
When $y-1$, we have

$$
x+2 \times 1-3=-1
$$

Thus, we have the following table

| $y$ | -3 | -1 |
| :---: | :---: | :---: |
| $y$ | 0 | 1 |

Sraph of the given ststem of ecuanorst


Clearly, the two fines interrect at.A $(1,2)$. Hence $N-2, y-2$ is the zofution of the given zystem of equabons

Draw the graphs of the following equations:

$$
\begin{aligned}
& 2 k-2 y+5-0 \\
& 2 x+3 y-18-10 \\
& y-2=0
\end{aligned}
$$

Find the ver boes of the triangle so obtanied. Aha, find the irea of the triangle.

## Solution

The given syetem of equations is

$$
2 x-3 y+6=0
$$

$$
2 x+3 x-18=0
$$

$$
y-2=0
$$

Now,

$$
2 x-3 y+6-0
$$

$$
\Rightarrow \quad 2 x-3 y-6
$$

$$
\Rightarrow \quad x-\frac{3 y-6}{2}
$$

When $y=0$, we have
$x=\frac{3 \times 0-6}{2}=-3$
When $y=-2$, wh haver
$A=\frac{3 \times 2-6}{2}=0$
Thus, जא⿰ have the following table:

| $y$ | -3 | 0 |
| :---: | :---: | :---: |
| $y$ | 0 | 2 |

We have,

$$
\begin{aligned}
& \Rightarrow \quad 2 x-3 y-18=10 \\
& \Rightarrow \quad x-10-3 y \\
& \Rightarrow \quad x=\frac{12-3 y}{2} \\
& \text { When } x=\frac{2}{2}, w e n a v e \\
& x=\frac{13-3 \times 2}{2}=0 \\
& \text { When } y-6, \text { wan hove } \\
& x-\frac{18-3 \times 6}{2}=0
\end{aligned}
$$

Thus, we have the following tables

| $\frac{3}{2}$ | 3 | 0 |
| :--- | :--- | :--- |
| $y$ | 2 | 6 |

We have.

$$
\begin{array}{ll}
y-2=4 \\
=\quad & y=-2
\end{array}
$$

Grapis of the givan systion if equations:


From the oraph or the thrae aquations, we find that the three liogs taken in pars incerget sach other at point $4\{3,4\}, B\{0,2\}$ and $c(0,2)$.
Hence, the vititces of the regured triangle are $(3,4),(0,2)$ and $(6,2)$,
Fram graph, we have

$$
\begin{aligned}
& A D=A-2=2 \\
& B C=B=D-A
\end{aligned}
$$

Acea of $\mathrm{AAEC}=\frac{1}{2}$ (8asex Haight)

$$
\begin{aligned}
& -\frac{1}{2}=A C \times A b \\
& -\frac{1}{2} \times b \times 2 \\
& -\frac{0}{5} \text { sa, units }
\end{aligned}
$$

Atha or $A A B C=5$ - 59 , units

## Q42

Solve the folowing sutiom of equatone gr eoticaliy

$$
\begin{aligned}
& 2 x-3 y-5=0 \\
& 2 x+3 y-18=0
\end{aligned}
$$

$A(5 c$, find the:area of the region bounded by these two lines sud $r$-aks

## Solution

The given systen of eguations is

$$
2 x-3 y+3-7
$$

$$
3 x+3 y-18=0
$$

Nown,

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

$=\quad 2 x+6-7 y$
$=\quad 3 y-2 k+6$
$\Rightarrow \quad y=\frac{2 N+\varepsilon}{3}$
Whin $x=0$, whe have
$y=\frac{2=9+6}{3}-2$
When $x=-3$ we have

$$
y=\frac{2 *(-3)+0}{3}=0
$$

Thus, we have the following table:

| $x$ | 0 | -3 |
| :---: | :---: | :---: |
| $y$ | 2 | 0 |

W) huse,
$3 x+3 y-18-0$
$\Rightarrow \quad 3 y=10-2 x$
$\Rightarrow \quad x-\frac{18-2 x}{\equiv}$
When $x=0$, we have
$y=\frac{10-2 \times 0}{3}-6$
When $x=6$; we have
$y=\frac{1 E-2 \times 3}{3}-2$
Thusi ce have the folowing table:

| a | 0 | 6 |
| :---: | :---: | :---: |
| y | $\bar{\sigma}$ | 2 |

Traph of the given iystem of equations:


Clearly, the two linas intaraect $25 A(3,4)$, Hence, $, C-3, y+4$ - 1 the spluoun of the中気 systm uf equations

Win ano otharye that tim lines riprasentod oy the equations $2 x-3 y+6=0$ and $2 x+$ ay $-18-0$ Heet $y$-axis at $(0,2)$ and $C(0,5)$ respactively.
Thu $5, x=3 \quad y=4$ is the solutin of the given systen of equations,
Jraw AD perpendicular from $A$ on $y$ yaxas
Elesrly, wo havis
AD -5 -cwordimatiz of point $A\{2,4\}$
$\Rightarrow \quad 7 D= \pm$
anich BC-5:-2-4
Arsay of the shaded ragion - Area of oficc
$\Rightarrow$ Area of the shaded feqion $=\frac{-1}{2}$ fiase a Heicht)

$$
\begin{aligned}
& =\frac{1}{2}(D C x+d D) \\
& -\frac{1}{2} \times 4 \times 3 \\
& =\frac{2}{3} \times 3 \\
& =3 \mathrm{cq} . \text { urita }
\end{aligned}
$$



## Q43

Solve the following system of finear equations graphroally

$$
\begin{aligned}
& 4 x-5 y-20=0 \\
& x+5 y-15=0
\end{aligned}
$$

Datecmine the vertices of the triangle formed of the lines representing the above equavor ant thm yolabs

## Solution

The gisen system of equations is

$$
\begin{aligned}
& 4 x-5 y-20=0 \\
& 3 x+5 y-15=0
\end{aligned}
$$

How,

$$
\begin{aligned}
& \quad 4 x-5 y-20=0 \\
& \Rightarrow \quad 4 x=5 y+20 \\
& \Rightarrow \quad x-\frac{5 y+20}{4} \\
& \text { When } \quad y=0, \text { wehaye: } \\
& \\
& \quad x-\frac{5 x 5+20}{4}=5
\end{aligned}
$$

When $y+-4$, we have

$$
x=\frac{5 \times(-4)+20}{4}=0
$$

Thus, we have the follisuring table:

| 8 | 3 | 0 |
| :---: | :---: | :---: |
| $y$ | 0 | -4 |

Whe havel.

$$
\begin{array}{ll} 
& 3 x+5 y-15-0 \\
= & 3 x-15-5 y \\
= & x-\frac{15-5 y}{3} \\
\text { When } y-0, \text { we have } \\
& x-\frac{15-5 \times 0}{3}-5
\end{array}
$$

$$
\text { When } y-3+\text { wn have }
$$

$$
x=\frac{15-5 \times 3}{3}-0
$$

Thus, we here the folloming tables

| $x$ | 5 | 6 |
| :---: | :---: | :---: |
| $V$ | 0 | 3 |

Graph of the qiven systeen of efiations:


Elearly; the swo ines arersect at $A(5,0)+$ Hence, $x^{\prime}=5, y=3$ is the soution of the giver system cof equations.

Whe also find that the two Lhes represented by the equations $4 x-7 y-20-0$ and $3 x+3 y-15-0$ Thety-akis it $B(0,-4)$ aid $C(0,3)$ rexpgctively

Q44

[^7]
## Solution

$5 x-x-5=x-5 x-5$
Thne solutioniz of els equatine zan be whtun in a table as folowa

| $x$ | 0 | 1 | 2 |
| :--- | :--- | :--- | :--- |
| $y$ | -5 | 1 | 3 |


| $x$ | 0 | 1 | 2 |
| :---: | :---: | :---: | :---: |
| 7 | -3 | 0 | 3 |

The araphical ferresantation of the tho lires will be as follows:


It can ce obsenved trat the requited trangie is $\triangle \mathrm{AEC}$.

 1 equalle 1 spacesy, space unit




## Q45

Form the pair of linear equations in the following problems, and find their solutions graphically.
(i) 10 students of Class X took part in a Mathematics quiz. If the numbet offirls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz
(ii) 5 pencils and 7 pens together cost $R s 50$, whereas 7 pencils and, 5 pens together cost Rs 46 . Find the cost of one pencil and that of one pen.
(iii) Champa went to a 'Sale" to purchase some pants and skirts When her friends asked her how many of each she had bought, she answered, "The number of skirts is two less than twice the number of pants purchased. Also, the number of skirts is four less than four times the number of pants purchased". Help her friends to find how many pants and "kits Champa a bought.

## Solution



```
Aocotding to the given conditions. ve bave
2+y=10
z-y=4
x+y=10*x=10-y
```



| 3 | 4 | 5 | 8 |
| :--- | :--- | :--- | :--- |
| $y$ | 8 | 5 | 4 |

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


| $x$ | 5 | 4 | 2 |
| :---: | :---: | :---: | :---: |
| $y$ | 1 | $d$ | -1 |

[^8]

From the yraph, it can be obacrved that the wo limes mersect asch other athet point it a)
Sa: $x=7$, ma $y=3$ :


IIII Lat the oost of one pencil and one pen of Rax and Reyffrpectively
Actording to the riven conditions, we itate
$7 x+7 y=50$
$7 x+5 y=48$
$5 x+7 x-50-1=\frac{30-7 y}{5}$
Three solutions of thif equation oan be writtern in a tatle as followe.

| $x$ | 3 | 10 | -4 |
| :---: | :---: | :---: | :---: |
| $y$ | 5 | 0 | 10 |

$7 x=5 y-4 t-7=-\frac{46-3 y}{y}$
Three sclutions of this equation can tev written in a tap =as foriow

| $x$ | 5 | 3 | -2 |
| :---: | :---: | :---: | :---: |
| $y$ | 3 | 5 | 12 |

[^9]

[^10]

## (iii)

Let uf thencte the number of pantebyxano the number of skirs byy Then the equationa formed tre
$y=2 x-2 \ldots(1))$
and $y=4 x-4 \quad$ (2)
Let ut draw the graphe or Equationa (1) and (2) Ly finding two solutions for leach of the equations.
They are guyen in Tahle

| 2 | 2 | 0 |
| :---: | :---: | :---: |
| $y=2 x-2$ | 2 | -2 |


| $x$ | 0 | 1 |
| :---: | :---: | :---: |
| $y=4 x-4$ | -4 | 0 |



 E1 and she did not bifycany start




 State the solution paint.

## Q46

Solve die followng system of equation grephivaily:
Chade the region between the liner and the y-abis

$$
\begin{aligned}
& 3 x-4 y=7 \\
& 5 x+2 y=3
\end{aligned}
$$

## Solution

The giver evster of equations is

$$
\begin{aligned}
& 3 x-4 y=7 \\
& 5 x+2 y=3 \\
& \text { How, } \\
& 3 x-4 y-7 \\
& =\quad 3 x-7-4 y \\
& \Rightarrow \quad 4 r=3 r-7 \\
& =\quad y-\frac{3 v-7}{4} \\
& \text { When } x=1 \text {, we bave } \\
& y=\frac{\pi \times 1-7}{4}--1 \\
& \text { Whan } x=-3 \text {, we have } \\
& y=\frac{3 \times(-3)-7}{4}=-4
\end{aligned}
$$

Thus, we nower the fulteving rabion

| $x$ | 1 | -3 |
| :---: | :---: | :---: |
| $y$ | -1 | -4 |

We fiare,

$$
\begin{aligned}
& 5 x+2 y-3 \\
\Rightarrow \quad & 2 y-2+5 x \\
= & y-\frac{3-5 x}{2} \\
\text { When } & x-1, \text { wehave } \\
& y-\frac{3-5 x}{2}=-1 \\
\text { When } & x-3, \text { whatiave } \\
& y=\frac{3-5 x 3}{2}=-5
\end{aligned}
$$

Thusis whe have the following tablet

| $x$ | 2 | 3 |
| :---: | :---: | :---: |
| $y$ | -1 | $\epsilon$ |

Grapt of the given syivien of ocquthum:


Clearly, the two linets imernect at $A(1,-1)$, Hencon, $x-3, y-1$ is the ralation of them givensystam of equations:


$$
\begin{aligned}
& 4 x-y=4 \\
& I x+2 y=14
\end{aligned}
$$

## Solution

The giver sustem of equatiors is
if $-y=4$
$3 x+2 y=14$
Now,
4n $-y=4$
$\Rightarrow \quad 4 x-4>y$
$\Rightarrow \quad y=4 x-4$

$y=4 x 0-4=-4$
Whan $x=-1$, wathane
$y=->\left(-\frac{1}{3}\right)-4=-8$
Thus, xe heve the foiteving table:

| 1 | 0 | -3 |
| :---: | :---: | :---: |
| $y$ | -4 | -11 |

We have,

$$
\begin{aligned}
& \quad 3 x+2 y-14 \\
& \Rightarrow \quad \\
& \Rightarrow \quad y=24-3 x \\
& \Rightarrow \quad y=\frac{14-3 x}{2} \\
& \text { When } x-3, \text { wetave } \\
& \\
& \quad y=\frac{14-3 x 0}{2}=7 \\
& \text { When } x=4, \text { wetave } \\
& y=\frac{14-3 x-4}{2}=1
\end{aligned}
$$

Thus, er have the following table:

| $x$ | 9 | 4 |
| :---: | :---: | :---: |
| $y$ | 7 | 1 |

Graph of the grien system of equations:

 given system of equatoins:


[^11]
## Solution

The given systam of equations is

$$
\begin{aligned}
& r+3 y=6 \\
& 2 x-3 y-12
\end{aligned}
$$

How,
$x+3 j-5$
$\Rightarrow \quad 3 y+5-x$
$\Rightarrow y=\frac{6-x}{3}$
When $\mathrm{x}-0$, we hivive
$y=\frac{6-0}{3}=$ ?
When $X=3$, we have

$$
y=\frac{\frac{\bar{b}}{}-\frac{3}{2}}{2}-1
$$

Thus, re have the following tabie:

| $x$ | $\pi$ | 3 |
| :---: | :---: | :---: |
| $y$ | 2 | 3 |

We hader,

$$
2 x-3 y-12
$$

$$
\Rightarrow \quad 3 x-12=3 y
$$

$$
\Rightarrow \quad 3 y-2 x-12
$$

$$
\Rightarrow \quad x-\frac{2 \pi-12}{3}
$$

Wean $x=0$, we haw

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

Wren $x-6$; we have

$$
y=\frac{2 \times 5-12}{2}=0
$$

Ther, we have the fotlowing tatile

| 8 | 0 | 6 |
| :---: | :---: | :---: |
| $y$ | -4 | 0 |

Graph of the grven sypfom of nquations:

$W=$ opserue thas the lines represented by the equapons $x+3 y=6$ and $2 x-3 y=12$
met. m auis at s $(0,2)$ and $c(0,-4)$ respectively.
Hance, the raçuired co-urdinates ra $(0,2)$ and $(0,-4)$.

Given the linear equation $2 x+3 y-8=0$, write another linear equation in two variables such that the geometrical representation of the pair so formed is:
(i) Intersecting lines
(ii) parallel lines
(iii) Coincident lines

## Solution

(1) Fot the wo lines $a_{1} z+b_{1} x+c_{1}=0$ and $y_{2}\left(x+b_{2} x+c_{2}=0\right.$, to $b=$ intersectelg, wa mint hava
$\frac{\partial_{2}}{a_{1}} \neq \frac{\lambda_{2}}{B_{2}}$
So, the other liferarequatian can te $5 x+$ oy $-16=0$
ar $\frac{a_{1}}{a_{2}}=\frac{2}{5} \cdot \frac{b_{2}}{b_{2}}=\frac{3}{6}=\frac{1}{2}, \frac{a_{1}}{c_{2}}=\frac{-1}{-16}=\frac{1}{2}$

$\frac{a_{1}}{a_{2}}=\frac{q_{1}}{b_{2}} \times \frac{s_{1}}{c_{1}}$

$2 \pm \frac{a_{1}}{b_{2}}=\frac{2}{6}=\frac{1}{3}, \frac{b_{1}}{b_{2}}=\frac{3}{9}=\frac{1}{3}, \frac{c_{1}}{S_{2}}=\frac{-3}{24}=\frac{-1}{3}$
(iii) For the two lines $a_{1} x+b_{1} x+c_{1}=0$ ant $a_{2} x+b_{2} x+o_{2}=0$ to be coincidart. wie mint have
$\frac{d_{i}}{a_{i}}=\frac{b_{1}}{b_{2}}=\frac{b_{2}}{s_{3}}$
So, the other linear equatian can to $2 x+12 \gamma-32=0$,
ar $\frac{a_{1}}{a_{2}}=\frac{2}{3}=\frac{1}{4}, \frac{b_{1}}{b_{2}}=\frac{3}{12}=\frac{1}{4}, \frac{c_{2}}{c_{2}}=\frac{-8}{-32}=\frac{1}{4}$



## Q50

Datemine graphcally the coprdinateg of the verices of Mangla, the gquationg of whose sites ace
$y-x, y-2 x+\operatorname{ard} y+x-6$

## Solution

The system of the guen equasionsis.

$$
\begin{aligned}
& y=x \\
& y=2 r \\
& y+x=6 \\
& \text { Now, } \begin{aligned}
& y=x \\
& y=0, \text { we have } \\
& y=0 \\
& \text { When }
\end{aligned} \\
& \text { Whea }=-1, \text { we haqe } \\
& y=-1
\end{aligned}
$$

Now,

Trius, wh have the followng tatile:

| 1 | 0 | -1 |
| :--- | :--- | :--- |
| $y$ | 0 | -1 |

We have,

$$
y=2 v
$$

Whan $x-0$, we have

$$
y-2 \times a-1
$$

When $x=-2$, we have

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

Thas, wh have the followng tabier

| $y$ | 0 | -1 |
| :---: | :---: | :---: |
| $y$ | 0 | -2 |

We have,

$$
\begin{aligned}
& \begin{array}{l}
y+x-f \mid \\
y=-i-x
\end{array} \\
& \Rightarrow \quad y-6-x \\
& \text { When } x+2 \text {, we hare } \\
& y-n-2-4 \\
& \text { When } x * \text { 4; we have } \\
& y-6-4=2
\end{aligned}
$$

Thus, we fave the fallowning table.

| $x$ | 2 | 4 |
| :---: | :---: | :---: |
| $y$ | 4 | 2 |

Gfafh of the given aystam of equations:


From the graph of the three equations, we find that the three lines taken in pairs interzect each other at ppints $A(c, 0), \Delta\{2,4\}$ and $C(3,3)$

Hence, the:vertices of the requred thatigle are $(0,0),(2,4)$ and $(3,3)$.

## Q51

Detennine ofraphically the oourdinatus of the vatices of triancle, the aquations of whose sides are!
$y=x ; 2 y-x$ and $x=y=8$

## Solution

The system of ten gaver equationsis

$$
y=x
$$

$$
2 y-x
$$

$$
x+y=8
$$

Nov,

$$
\begin{aligned}
& y=x \\
\Rightarrow \quad & y * y
\end{aligned}
$$

When $y=0$, we ham

$$
f=0
$$

When $\mathrm{y}<-2$, we have

$$
x=-3
$$

Thus, we have the following table

| $x$ | 0 | -3 |
| :---: | :---: | :---: |
| $y$ | 5 | -3 |

We haye,

$$
\begin{aligned}
3 y & =\pi \\
3 & =3 y \\
\text { Whan } & y=0, \text {, } \\
& x=3>0=0 \\
\text { When } & y=-1, \text { We have } \\
& y=3>(-1)=-1
\end{aligned}
$$

Thus, we hove tres follogeng table:

| $i$ | 0 | -3 |
| :---: | :---: | :---: |
| $y$ | 0 | -1 |

We have.

$$
\begin{array}{rl}
x+y-8 \\
=3 & x=3-y \\
\text { When } y & =4 ; \text { wa have } \\
& x-8-4-4 \\
\text { When } y=5 ; \text { we havz } \\
& x=0-5=1
\end{array}
$$

This, wei have the following wisle

| $x$ | 4 | 5 |
| :---: | :---: | :---: |
| $y$ | 4 | 3 |

craph of the givery suxtem of bequations


From the qraph of the three equations, we find that the three lines tat en in pairs intersect eacn otiser at points $A(0, D), \quad B\{4,4)$ ard $C(6,2)$.

Hance, the vartces of the:rgured trangle ane $(0,2),\{4,4\}$ and $\{0,2\}$

Graphically, solve the following pair of equations:
$2 x+y=6$
$2 x-y+2=0$
Find the ratio of the areas of the two triangles formed by the lines representing these equations with the $x$-axis and the lines with the $y$-axis.

## Solution

$2 x+y=6$
$\Rightarrow y-6-2 x$

| $x$ | 0 | 3 |
| :---: | :---: | :---: |
| $v$ | 6 | 0 |

$2 x-y+2-0$
$\Rightarrow y-2 x+2$

| $x$ | 0 | -1 |
| :---: | :---: | :---: |
| $y$ | 2 | 0 |

Sraph of the given system of equation is as follows:


Then from graph, we haviv
$R M=4$ Linite $A N=1$ unit, $A F=4$ umis, $B D=4$ unity
Areas of trianigle formed by the lines and Aratis

- A (aREE $)$
$-\frac{1}{2} \times B Q \times F M$
$-\frac{1}{2} \times 4 \times 4$
$-83 \mathrm{~L}, \mathrm{nits}$
Area of triangle formed by thie lines and Y-aus
- $(\triangle A P F)$
$=\frac{1}{2} \times A P \times R N$
$=\frac{1}{2} \times 4 \times 1$
-234 units
$\frac{A(\Delta R C B)}{A(A A B P)}=\frac{8}{2}=\frac{4}{1}=4: 1$

Solution
$y-x$

| $x$ | 0 | 4 |
| :--- | :--- | :--- |
| $y$ | 0 | 4 |
| $-y-x$ |  |  |
| $y$ | $-x$ | 0 |
| $y$ | 0 | 3 |
| $y$ | 0 | 1 |
| $x+y=8 \Rightarrow x=8-y$ |  |  |
| $x$ | 0 | 8 |
| $y$ | 8 | 0 |

Graph of the given syatem of equation is as followe



Q54

Draw the graph of the equations $x=3, x=5$ and $2 x-y-4=0$.Also, find the area of the quadrilateral formed by the lines and the $x$-axis.

Solution

The graph of $x=5$ ia a arraight line garabel to Y-3xis at a distance of 5 unis to the nith of Y-axis
Ficr the graph of $2 x-y-4=0$ ie $y=2 x-4$, we have

| $x$ | 0 | 2 |
| :---: | :---: | :---: |
| $y$ | -4 | $a$ |

Graph of the given syistem of equation is as follows:


From the graph,
Aree of rrapezum APCD
$-\frac{1}{2} \times(A O+B C) \times A B$
$-\frac{1}{2} \times(2+6) \times 2$
-8 su, unts

Q55

Draw the graphs of the lines $x=-2$, and $y=3$. Write the vertices of the figure formed by these lines, the $x$-axis and the $y$-axis. Also, find the area of the figure.

## Solution

The graph of $x=-2$ a a suaght line paral|el to $Y$-axis at acistance of 2 unas to the elt of $Y$-axis
The graph of $y=3$ it a atraight ine parallel to $X$ taxis at a dlatanice of 3 units above $X$-axis


From the graph, the yertioes of the figure formed by given lines, X -oxis and Y -axis are $Q(0,0), A(0,3), D(-2,3)$ and $D(-2,0)$.
Now, CO - $\mathrm{AB}-2$ units and $\mathrm{BD}-\mathrm{CA}-3$ units
$\Rightarrow$ CABD is a rectengle:
Herce, area of the figure formed

- Area of rectangle CABBD
$-C A \times A B$
$-3 \times 2$
-5 sq units


## Q56

Draw the graphs of the pair of linear equations $x-y+2=0$ and $4 x-y-4=0$. Calculate the area of the triangle formed by the lines so drawn and the $x$ axis.

## Solution



Graph of the grvensystem of equatin 1 : as follows:


From the graih,
Aree of $\triangle A B C$
$-\frac{1}{2} \times B G x A M$
$-\frac{1}{2} \times 3=4$
$-6.5 q$ unite

## Exercise 3.3

Q1

```
Solve the folownna rystams of equavong
11u+1sy+2y-0
7x-2y-20=0:
```


## Solution

$$
\begin{aligned}
& \text { The given system of ectation: is } \\
& \begin{array}{ll}
11 y-15 y+23-9 \\
7 x-2 y-20-9 & -(0)
\end{array} \\
& \text { From } 13 \text {. We get } \\
& 2 y-7 x-20 \\
& \Rightarrow \quad r=\frac{7 x-20}{2} \\
& \text { Substituting } y=\frac{7,-20}{2} \text { in } \frac{10}{2} \text {, wat gat } \\
& 11 x+15\left(\frac{7 x-29}{2}\right)+23-9 \\
& \Rightarrow \quad 11 x+\frac{105 x-300}{2}+23-9 \\
& =\frac{2 x x+105 \pi-30 c+45}{2}-01 \\
& =127 x-254-0 \\
& \Rightarrow \quad 127 x-254 \\
& \Rightarrow \quad x=\frac{254}{127}=z \\
& \text { Futting } x-2 \ln y=\frac{2 x-20}{2} \text { weget } \\
& \Rightarrow \quad \gamma-\frac{7 \times 2-29}{2} \\
& =\frac{14-20}{2} \\
& -\frac{-5}{7} \\
& \text { - }-3
\end{aligned}
$$

Hence, the solut on of the gquen system of equaton=150x-2,y $=-3$.

## Q2

$$
\begin{aligned}
& \text { Solve tha following zysteme of aralatars } \\
& 3 x-7 y+10-0 \\
& y-2 x-3=0
\end{aligned}
$$

Solution

The given system of equationsifl

$$
\begin{array}{ll}
3 x-7 y=10-0 & -(0) \\
y-2 x-7-0 & =(11)
\end{array}
$$

Fram (i) , wh get

$$
r=2 r+3
$$

Substutng $y=2 x+3 \sin ()$, wegst

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

$=\quad 3 x-14 x-21+10-01$
$=-11 x-11-10$
$\Rightarrow \quad-11 x=11$
$\Rightarrow \quad \psi-\frac{11}{-11}=-1$
Futting $x=-1$ in $y=2 x-3$. We qet

$$
y=2 \times\{-7)+3
$$

$$
=-2+3
$$

$-1$
$=\quad \gamma=1$
Hence, the solution of tien pyom syitam of qquatons is $x--1, y=1$.

## Q3

Solve te following systerns of equatorn:
$0.4 x+0.3 y=3.7$
$0.7 s-412 y-0.4$

## Solution

The givien syibtuth af equasons is

$$
\begin{array}{ll}
0.4 x+0.3 y-1.7  \tag{i}\\
0.7 x-0.2 y-0.8 & \cdots(1)
\end{array}
$$

Mult piyeng both sudes offif and (ii) try 30 , xe get

$$
\begin{align*}
& 4 x-3 y-17  \tag{i}\\
& 7 x-2 y=8
\end{align*}
$$

-(iv)
From (iv), we:ger
$\Rightarrow \quad n=\frac{9+2 y}{7}$
Substituting $x=\frac{3+2 y}{7}$ infiii); we get:

$$
\begin{aligned}
& 4\left(\frac{8+2 y}{7}\right)+3 y-17 \\
\Rightarrow & \frac{32+8 y}{7}+2 y=17 \\
\Rightarrow & \frac{32-8 y+21 y}{7}=17 \\
\Rightarrow & -39+29 y-17=7 \\
\Rightarrow & 29 y=119-32 \\
\Rightarrow & 29 y-37 \\
\Rightarrow & y=\frac{87}{29}=3
\end{aligned}
$$

Puttingy $-3 \operatorname{in} x=\frac{8+1 y}{7}$, No get

$$
\begin{aligned}
x & =\frac{B+2 \times 3}{7} \\
& -\frac{8+6}{7} \\
& -\frac{14}{7} \\
& =2
\end{aligned}
$$

Solve the following systemis of eciasionat
$\frac{x}{2}+\mu=0.0$
$\frac{7}{x+\frac{y}{2}}=10$

## Solution

$$
\begin{aligned}
& \frac{x}{2}+y=0 \pi \text { and } \frac{\pi}{x+\frac{y}{2}}=10 \\
& \frac{\pi}{2}+y=0.8 \text { and } \frac{7}{\frac{3 x+y}{2}}=10 \\
& x-2 y=16 \text { and } \frac{7 \times 2}{2 x+y}=10 \\
& x+2 y=1.5 \text { \#\#म } \frac{7}{2 x+v}=5 \\
& x+2 \dot{y}=1.6 \quad \text { ard } 6: 7=10 H+5 y \\
& \text { Multiply first equation by } 10 \\
& 10 x+20 y=16 \text { and } 20 w+5 y=7 \\
& \text { Subtracting tibe twe equations } \\
& 25 y=9 \\
& y=\frac{9}{15}=\frac{3}{5} \\
& x=1.6-2\left(\frac{2}{5}\right)=1.6-\frac{E}{5}-\frac{2}{5} \\
& \text { Solution is }\left\{\frac{2}{5}, \frac{3}{5}\right\}
\end{aligned}
$$

Q5

$$
\begin{aligned}
& \text { Solve the falburig syotmene of befalionst } \\
& 7\left(y^{2}+3\right)-2(x-2)-14 \\
& 4(y-2)-2(x-3)-2
\end{aligned}
$$

## Solution

Than givan system of aquatians is

$$
\begin{array}{ll}
7(y+3)-2\{(x+2)-14 & -6\} \\
4(y-2)+3(x-3)-2 & -51
\end{array}
$$

From (3). we got

$$
\begin{array}{ll} 
& 7 y+21-2 x-4=14 \\
= & 7 y-14+4-21+2 x \\
\Rightarrow & y=\frac{2 x-3}{7}
\end{array}
$$

From (ii) , moget

$$
\begin{array}{ll} 
& 4 y-3+3 x-9=2 \\
= & 4 y-3 x-17-2-0 \\
= & 4 y-3 x-19-0
\end{array}
$$

Subitituting $y=\frac{2 x-3}{7}$ in $(i 1)$, wa get

$$
4\left(\frac{2 x-3}{7}\right)+3 x-19=0
$$

$\Rightarrow \frac{8 x-12}{7} \cdot 3 x-19-6$
$=\quad$ ox-12 $-21 \mathrm{x}-179-0$
$\Rightarrow \quad 20 x-1.45-0$
$\Rightarrow \quad 25 k=145$
$\Rightarrow \quad x=\frac{145}{29}-5$
Pufting $x-5$ in $y=\frac{2 x-3}{7}$, ww 94 t

$$
y=\frac{2 \times 5-3}{7}
$$

$$
-\frac{10-3}{7}
$$

$$
-\frac{7}{7}
$$

$$
=\quad y^{-1}
$$

Hance, the salution of the given system of echoations $s x-5, y$ on

## Q6

Solve the foliomngisystems rf aquationsi

$$
\begin{aligned}
& \frac{x}{7}+\frac{y}{3}=5 \\
& \frac{x}{2}-\frac{y}{9}=5
\end{aligned}
$$

## Solution

The given systen of eouations is

$$
\begin{array}{ll}
\frac{x}{7}+\frac{y}{3}-5 & -(i)  \tag{-1}\\
\frac{x}{2}-\frac{y}{9}-6 & -(a)
\end{array}
$$

From (3), we get

$$
\begin{aligned}
& \frac{2 x+7 y}{21}-5 \\
\Rightarrow & 3 x+7 y-105 \\
\Rightarrow & 3 x-105-7 y \\
\Rightarrow & x=\frac{105-7 y}{3}
\end{aligned}
$$

Erom $(1)$. We get

$$
\begin{align*}
& \frac{9 x-2 y}{10}=6 \\
& \Rightarrow \quad 9 x-2 y-168
\end{align*}
$$

Substituting $x-\frac{105-7 y}{3} \operatorname{in}(10)$. we get

$$
\begin{aligned}
& 9\left(\frac{105-7 y}{3}\right)-2 y-100 \\
\Rightarrow & \frac{945-63 y}{3}-2 y=100 \\
= & 046-63 y-6 y-108 \times 3 \\
\Rightarrow & 943-63 y=324 \\
\Rightarrow & 945-324-39 y \\
= & 69 y-623 \\
\Rightarrow & \quad 4-\frac{621}{29}-9
\end{aligned}
$$

Putting $y=\sin x-\frac{195-7 y}{3}$, wh igel

$$
\begin{aligned}
& x-\frac{105-7 \times 9}{3}-\frac{105-63}{3} \\
& \Rightarrow \quad x=\frac{42}{3}=14
\end{aligned}
$$

Hence, the solutict of tie giver syatem of equations is $x=14: y, y$

## Q7

Solve the foloumng systems of सqusticts:

$$
\begin{aligned}
& \frac{x}{3}+\frac{y}{4}=11 \\
& \frac{5 x}{6}-\frac{y}{3}=-7
\end{aligned}
$$

## Solution

The given system of equations 1 I

$$
\begin{array}{ll}
\frac{y}{3}+\frac{Y}{4}=11 & -(i) \\
\frac{5 x}{6}-\frac{y}{2}=-7 & -(i)
\end{array}
$$

Fram (1). we get

$$
\begin{align*}
& \frac{4 x+3 y}{12}-11 \\
=\quad & 4 x+3 r=132 \tag{iii}
\end{align*}
$$

From (ii), wo got

$$
\begin{equation*}
\frac{5 x-2 y}{5}<-7 \tag{iv}
\end{equation*}
$$

$\Rightarrow \quad 5 \hat{k}-2 y-42$


to 6 or the two suиatum
Multiplying (iii) bv 2 and $[v)$ by 3 , we get

$$
\begin{equation*}
\text { 䂗 }+6 y=264 \tag{v}
\end{equation*}
$$

$15 x-6 \mu=-126$
Adding $(v)$ and $(v i)$, we get
$0 x+15 x-224-120$
$\Rightarrow \quad 23 x-130$
$=\quad x-\frac{129}{23}-6$
Ecibatituting $x=5$ inflia, we get
$4 \times 6+5 k-532$
$\Rightarrow \quad 3 y+132-24$
$\Rightarrow \quad 3+100$
$\Rightarrow \quad y=\frac{108}{3}-35$
Hence, the sotution of the given system of equatansisan=6, y $=36$.

## Q8

Scirt Tle fofipmng systems of equationsly
$\frac{4}{x}+3 y=\frac{3}{6}$
$\frac{6}{x}-4 y-5$

## Solution

Tang $\frac{1}{x}=u$, then given कquatios tacume

$$
\begin{array}{ll}
4 u+3 y-6 & -10 \\
6 u-4 y--3 & -(i)
\end{array}
$$

Frum (i). What

$$
\begin{aligned}
& 4 \Delta-\varepsilon-3 y \\
\Rightarrow \quad & \quad 4=\frac{8-3 y}{4}
\end{aligned}
$$

Substituting $=\frac{8-2 y}{4}$ inf(9; wa वot
Frote (1) : wem get

$$
\begin{array}{ll} 
& 6\left(\frac{8-3 y}{4}\right)-4 y=-3 \\
\Rightarrow & \frac{3\{0-3 y)}{2}-4 y=-5 \\
\Rightarrow & \frac{24-9 y}{2}-4 y=-5 \\
\Rightarrow & \frac{24-9 y-8 y}{2}=-5 \\
\Rightarrow & 24-17 y=-10 \\
\Rightarrow & -17 y--10-24 \\
\Rightarrow & -1.7 y--34 \\
\Rightarrow & y-\frac{-37}{-17}-2
\end{array}
$$

Fitting $y-2$, if $u=\frac{\theta-2 y}{4}$, we get

$$
u=\frac{e-3 \times 2}{4}-\frac{a-E}{4}=\frac{2}{4}=\frac{1}{2}
$$

Hence, $x=\frac{1}{14}=2$

S0, the solution of the given azstem of equation is $x-2, y=2$.

## Q9

Solve tre follown g sverems of Equations:
$x+\frac{y}{2}=4$
$\frac{k}{3}+2 y-5$

Solution

```
The given spstems of equation玉iv
\[
\begin{array}{ll}
x+\frac{y}{2}-4 & -(i)  \tag{1}\\
\frac{x}{3}+2 y-5 & -(i)
\end{array}
\]
Fromin）\(x \equiv q\) 等
\[
\begin{aligned}
& \frac{2 x+y}{2}=4 \\
& 2 x+y=3 \\
& y-0-2 x
\end{aligned}
\]
From（ii），we get
\[
x+6 y=15
\]
\[
-(i)
\]
Sutphtutng \(x-8-2 x\) in \((i))_{2}\) we get
\[
\begin{array}{ll} 
& x+6(E-2 x)-15 \\
\Rightarrow & x+48-12 x-15 \\
\Rightarrow & -11 x=15-46 \\
\Rightarrow & -11 x--39 \\
\Rightarrow & x-\frac{-33}{-11}=3
\end{array}
\]
Puttiog \(x-3\) ，iny \(y-8-2 x\) ，wo get
\(y+8-2 \times 3\)
\(-8-\) 五
\(-2\)
\(\Rightarrow \quad y+z\)
```

Hence，Solution of the given system of Equabion iB $N=2, y=2$ ，
Q10

Solve the folloming systems of equattons：
$x+2 y-\frac{3}{2}$
$2 x+y=\frac{3}{2}$
Solution

The guen spsteme of equations is

$$
\begin{array}{ll}
x+2 y=\frac{3}{2} & - \text { हो } \\
2 x-y=\frac{3}{2} & -(i)
\end{array}
$$

Let Ls eliminatey from the given equations. The coeffoents of y in the given equatiors \#re 2 and 2 respectively, TheLic.M of 2 and 115 \& . So, Wemake the opetficient of: $Y$ equal to 2 in the tion equations.

Multipiyng (i) by 1 and (ii) by 2 , we get

$$
\begin{array}{ll}
x+2 y=\frac{3}{2} & -\{i i i\} \\
4 x+2 y-3 & -(v y)
\end{array}
$$

Bubvacting (ii); from (iv), vee get

$$
\begin{aligned}
& 4 x-x+2 y-2 y-3-\frac{3}{2} \\
= & 3 x-\frac{6-3}{2} \\
\Rightarrow \quad & 3 x-\frac{3}{2} \\
= & x=\frac{3}{2 \times 3} \\
= & x=\frac{3}{2}
\end{aligned}
$$

Suthraz $-\frac{1}{2}$, in uquation $(\mathrm{y})$, we get $4 \times \frac{1}{2}+2 y-3$
$=\quad 2+2 y-3$
$\Rightarrow \quad 2 i-7-2$
$\Rightarrow \quad y=\frac{1}{2}$

Herice, Solution of the givian sysitan of equation Esu- $-\frac{1}{2}, y=\frac{1}{2}$

Q11

Solve the following sy them of equaticos:

$$
\begin{aligned}
& \sqrt{2} x-\sqrt{3 y}=0 \\
& \sqrt{3} x-\sqrt{8} y=0
\end{aligned}
$$

## Solution


From equation ( 0 ), we ctain:
$x=\frac{\sqrt{3 y}}{\sqrt{\sqrt{2}}}$
Sutstruting this vatur in mquation (i1), we ctitam
$\sqrt{6}\left(\frac{\sqrt{2} y}{\sqrt{2}}\right)-\sqrt{6 y}=0$
$\frac{3 y}{\sqrt{2}}-2 \sqrt{2} y=10$
$y\left(\frac{3}{\sqrt{2}}-2 \sqrt{2}\right)-0$
$y=0$
Substcubng the value of $y$ in equastion (iii), we optains
$x=0$
$z x=0, y=0$

Q12

Solve the foliomnigsystems of equations:
$3 x-\frac{\gamma+7}{11}+2-10$
$2 y+\frac{x+11}{7}-10$

Solution

In given systemis of ecifationi is

$$
\begin{align*}
& 3 v-\frac{y+7}{11}+z-10 \\
& 2 y+\frac{x+11}{7}=10
\end{align*}
$$

Fion 住, we get

$$
\begin{array}{ll} 
& \frac{32 r-y-7+22}{11}=10 \\
=\quad & 33 x-y+25-10 \times 11 \\
\Rightarrow \quad & 33 x+15-110=y \\
\Rightarrow \quad & y-32 r-95
\end{array}
$$

From (ii), we qet

$$
\begin{array}{ll} 
& \frac{14 y+x+11}{7}-10 \\
= & 14 y+x+11-10 y ? \\
\Rightarrow \quad & 14 y+x+11-70 \\
\Rightarrow \quad & 14 y+x-70-11 \\
=\quad & 14 y+x-39 \tag{ii}
\end{array}
$$

Suthititutirg $y=83 x-95$ in fing, wo chit

$$
14(78 x-95)+x-50
$$

$\Rightarrow \quad 482 k-1330+x=59$
$=463 x-5 y+1300$
$\Rightarrow 463 v-1389$
$=x-\frac{1389}{463}-3$
putting $x-2$, in $y=32 r-95$, wegot
$y=33 \times 3-05$
$\Rightarrow \quad y-99-95$
$=\quad y=-4$
Mence, Soluton of the given systan of aquztion is $x-2, y=4$

## Q13

Solve the following syatertio of ectuations:

$$
\begin{aligned}
& 2 k-\frac{3}{y}=0 \\
& d x+\frac{7}{y}=2, r^{\prime} \geq \theta
\end{aligned}
$$

Solution

The glven sydtens of equatons is

$$
\begin{aligned}
& 2 x=\frac{3}{y}+3 \\
& 2 x+\frac{x}{y}+2 y y<0
\end{aligned}
$$

Tabing $\frac{1}{Y} \sim u$, the given equatipns becorn es,

$$
\begin{aligned}
2 r-3 u-9 & \\
3 r+2 u-2 &
\end{aligned}
$$

From (0) , wh get
$2 r=5+3 r$
$=x-\frac{9+2}{2}$
Gutintuting $x=\frac{\theta+30}{2}$ in $\{(v)$, on an

$$
3\left(\frac{9+3 u}{2}\right)+2 t=2
$$

$$
\Leftrightarrow \quad \frac{2 \pi+2 i+14+1}{7}=2
$$

$$
\Rightarrow \quad 2 ?+23 x<2 \times 2
$$

$$
\Rightarrow \quad 221-7-77
$$

$$
\Rightarrow \quad 4-\frac{-23}{23}=-1
$$

$$
\text { Hancil } Y=\frac{1}{4}-\frac{1}{-1}=-1
$$

Fitang $u=-1 \operatorname{in} x-\frac{9+3 i}{2}$, we qet

$$
\begin{aligned}
& x+\frac{y+3(-2)}{2}=\frac{9-3}{2}-\frac{6}{2}-3 \\
& \Rightarrow \quad x+3
\end{aligned}
$$



## Q14

Solve the folioving systems of equationst
$0.5 N+0.7 y=0.74$
$0.3 x+10.5 y-10.5$

## Solution

The griven systems of acuations in

$$
\begin{align*}
& 0.5 x+0.7 y-0.74 \\
& 0: 3 x+0.5 y-0.5
\end{align*}
$$

Maitplying (i) and (ii) by 200, we get

$$
30 x+70 y=74
$$

$$
30 x+50 y-50
$$

$$
\begin{aligned}
& -9 i 9 \\
& -(\mid v)
\end{aligned}
$$

Erom (ii) , Wla get
$500 r \times 74-70 y$
$\Rightarrow \quad x-\frac{24-70 y}{50}$
Substituting $x=\frac{(T 4-70 y}{50}$ in =quation (iv), we get

$$
\begin{aligned}
& 30\left(\frac{74-70 y}{50}\right)+50 y=30 \\
\Rightarrow & \frac{3(7+-70 y)}{5}+50 y=50 \\
\Rightarrow & \frac{222-210 y}{5}+50 y=50 \\
\Rightarrow & \frac{222-210 y+250 y=250}{20 y-250-2 z 2} \\
\Rightarrow & 40 y-28 \\
\Rightarrow & \quad 4-\frac{20}{40}-\frac{14}{20}-\frac{7}{10}-0.7
\end{aligned}
$$

Futing $y=9.7$ in $x=\frac{74-70 y}{50}$, we get

$$
\begin{aligned}
x & =\frac{74-70 \times 0.7}{50} \\
& =\frac{74-49}{50} \\
& =\frac{25}{50} \\
& =\frac{1}{2} \\
& =1.5
\end{aligned}
$$



## Q15

Solve the folloiarig svateme of equations:
$\frac{1}{7 x}+\frac{1}{6 y}-3$
$\frac{1}{2 x}-\frac{3}{3 y}=\frac{1}{5}$

## Solution

$\frac{1}{7 x}+\frac{1}{6 y}=3$
$\frac{1}{2 x}-\frac{1}{3 y}=5$
Multialyng|2| by $\frac{1}{3}$, we get
$\frac{1}{4 z}-\frac{1}{6 y}=\frac{5}{2}$
Satvine (1) and (3),wegel
$\frac{1}{7 \pi}, \frac{1}{5 y}=3$
$\frac{1}{4 \pi}-\frac{1}{6 y}=\frac{5}{2}$
$\frac{1}{7 \pi}+\frac{1}{4 \pi}=3+\frac{2}{2}$
(Adsing the equatione)
$\Rightarrow \frac{4+7}{23 x}=\frac{6+5}{2}$
$\Rightarrow \frac{11}{28 \pi}=\frac{31}{2}$
$\Rightarrow x=\frac{11 \times 2}{28 \times 11}=\frac{1}{14}$
When $\pi=\frac{1}{14}$, waget
$\frac{1}{7\left(\frac{1}{84}\right)}+\frac{1}{6 x}=3$
$\Rightarrow 2+\frac{1}{6 y}=3$
$\Rightarrow \frac{1}{6 y}=3-2 \pi 1$.
$\Rightarrow y=\frac{1}{6}$
Thus, ma solutionof givanequationsis $x=\frac{1}{14}$ atd $y=\frac{1}{6}$

## Q16

$$
\begin{aligned}
& \text { Salve the falowng system of equatuons: } \\
& \frac{1}{2 x}+\frac{1}{3 y}=2 \\
& \frac{1}{3 y}+\frac{1}{2 y}=\frac{12}{0}
\end{aligned}
$$

## Solution

Lut up pirmanate 'y' form mquations bi) and (i)
Multplying equation(i)by 3 and (il) by 2 , we get

$$
\begin{align*}
& 9 u+4 v=95 \\
& 4 w+b v=26
\end{align*}
$$



$$
\begin{aligned}
& 9 u-4 u+3 v-5 v=16-36 \\
= & 5 v-10 \\
= & 4-\frac{20}{5}-2
\end{aligned}
$$

Putting $=2$ in eqciaton 1 i, we qet

$$
3 \times 2+2 v-12
$$

$$
=\quad 6+2 y-12
$$

$$
=\quad 2 \omega-12-5
$$

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

Hence, $x-\frac{1}{4}-\frac{1}{2}$ and $y=\frac{1}{v}-\frac{1}{3}$
So, ther sblation of the given system of equation s $x-\frac{1}{2}$, y $-\frac{2}{3}$

## Q17

Solve the folloumg systems of riqutrans:
$\frac{15}{u}+\frac{2}{v}=17$
$\frac{1}{u}+\frac{1}{N}=\frac{36}{5}$

## Solution

$$
\begin{align*}
& \text { Le: } \frac{1}{x}-u \text { and } \frac{1}{y}-v \text {, then geven equasorn becme } \\
& \frac{4}{2}+\frac{v}{3}=2 \\
& \Rightarrow \quad \frac{3 u+2 v}{6}=2 \\
& =3 u+2 v-12 \quad-13 \\
& \text { Anit, } \frac{v a}{3}+\frac{v}{2}-\frac{13}{8} \\
& \Rightarrow \quad \frac{3 u+3 v}{6}=\frac{13}{6} \\
& =\quad 2 u+3 v-13 \tag{ii}
\end{align*}
$$

```
Let \(\frac{1}{M}=x\) and \(\frac{1}{v}=y\), Than the given gysbem of ecluaton becpmes
    \(15 x+2 y-17 \quad\) -
    \(x+y=\frac{3 \pi}{5}\)
From (0), we 这
\[
2 y-1 z-15 x
\]
\[
\Rightarrow \quad y=\frac{17-35 x}{2}
\]
Sulstiusing \(y=\frac{77-35 x}{2}\) in equestonfii), wa get
\[
\begin{aligned}
& x+\frac{17-12 x}{2}-\frac{30}{5} \\
= & \frac{2 v+17-15 x}{2}-\frac{36}{5} \\
\Rightarrow & \frac{-13 x+17}{2}-\frac{30}{5} \\
= & 5(-13 x+17)-36 \times 2 \\
\Rightarrow & -65 x+05-72 \\
= & -65 x-72-85 \\
\Rightarrow & -65 x<-12 \\
= & 65 x-\frac{-13}{-65}-\frac{1}{5}
\end{aligned}
\]
Futting \(x=\frac{1}{5}\) in equationfiy, we get
\[
\frac{1}{5}+y=\frac{36}{5}
\]
\[
\Rightarrow \quad y=\frac{36}{6}-\frac{1}{5}
\]
\[
=\frac{36-1}{5}
\]
\[
-\frac{35}{5}+7
\]
Henceri \(=\frac{1}{x}=5\) and \(v=\frac{1}{y}-\frac{1}{7}\)
```

So, the solution of the igivensystem of equation isu $-5: v=\frac{1}{7}$

## Q18


$\frac{3}{\pi}-\frac{1}{r}=-\frac{1}{2}$
$\frac{2}{x}+\frac{3}{y}-5$

## Solution

Let $\frac{1}{x}=b$ and $\frac{1}{y}=v$, then, the giver systam of equations becomes:
$3 x-12-0$
-(i)
$3 x+3 y=3$
-(ii)
Multipiving equation (i) by I ans equation 位) by i, we qet

$$
\begin{array}{ll}
5 t-2 v--27 & -(i n) \\
3 t+3 v-5 & -(i v)
\end{array}
$$

Adding equation (i) End ecciation (i), we get
$9 y+2 y-3 v+3 v-27+1$
$=11 u=-22$
$=u-\frac{-22}{11}-2$
futting u- 2 in equatinnfiv), weqet
$2 \times(-2)+2 n-5$
$=\quad-4+3 y=3$
$=\quad 2 v-5+4$
$\Rightarrow \quad \psi-\frac{9}{2}-3$
Hence, $x-\frac{1}{4}-\frac{1}{-2}=\frac{-1}{2}$ and $y-\frac{1}{v}=\frac{1}{3}$.
So, the soluton of the given myitsin of aquaton if $N=\frac{-1}{2}, y^{\prime}=\frac{1}{3}$,

## Q19

Solve the following syatams of equations:
$\frac{2}{7}+\frac{5}{r}-1$
$\frac{60}{x}+\frac{40}{y}+19$
Solution

Taing $\frac{t}{N}-u$ and $\frac{3}{V}=v$, the givan pecomes

$$
\begin{array}{ll}
3 i+6 v-1 & -(1) \\
600+40 v-19 & -(13)
\end{array}
$$

Let us aimieate 'u' from equations(i) and fii) Muitiolying equationfloy 50 and equation(i) by z. cove get

$$
\begin{array}{ll}
120 u+300 r=60 \\
120 u+80 v=30
\end{array} \quad-\text {-iii) }
$$

Subtracting(iv) 置m (iii), we gat

$$
3006-30 v-60-39
$$

$=820 v-22$
$=\quad 4-\frac{22}{220} \cdot \frac{1}{10}$
Puting $v=\frac{1}{2 \pi}$ in aquaronfi, wa get

$$
2 x+5 \times \frac{2}{10}=1
$$

$\geq \quad m+\frac{3}{2}+1$
$=\quad 2 x-3-\frac{1}{2}$
$\Rightarrow \quad 2 \pi+\frac{2-1}{2}+\frac{1}{2}$
$=\quad 3 i-\frac{1}{2}$
$\Rightarrow \quad d=\frac{1}{4}$
Herice, $x=\frac{1}{u}=4$ and $y=\frac{1}{v}-10$.
SBi, the siocifion of the given systain of equation is $x-3 y+y=10$

## Q20

Solve the folipming systerne of equavors:
$\frac{1}{5 x} * \frac{1}{6 y}-12$
$\frac{1}{3 x}-\frac{3}{7 y}=9$

## Solution

```
Fabing \(\frac{1}{x}=u\) and \(\frac{1}{y}=N\), the given equations become
    \(\frac{4}{5}+\frac{v}{6}-12\)
\(=\frac{6 u+5 v}{30}-12\)
\(\Rightarrow 50 v+5 v-360 \quad-\) (1)
and. \(\frac{u}{3}-\frac{2 u}{7}=8\)
\(\Rightarrow \quad \frac{74-9 x}{21}=8\)
\(=\quad \pi-9-138\)
 pquation (i), by \(5_{j}\) wee get
\[
\begin{array}{ll}
54 u-45 v=3240 & -(i i i)  \tag{iii}\\
35 u-49 \%=840 &
\end{array}
\]
adding equarion() adn equation(i), we get
\(54 u+75 u-32.40+840\)
\(\Rightarrow \quad 99 \omega=4000\)
\(=\quad \alpha=\frac{\Delta n 6 p}{109}\)

Potting \(u=\frac{20 e 0}{2}\) in equationf \((1)\) wegat
\[
\begin{aligned}
& 5 \times \frac{4000}{09}+5 v-360 \\
= & \frac{24+80}{\square 9}+5 v-760 \\
\Rightarrow \quad & 5 v-360-\frac{24430}{99} \\
\Rightarrow \quad & 5 v-\frac{78040-24480}{69} \\
\Rightarrow \quad & 5 v-\frac{7560}{89} \\
\Rightarrow \quad & v-\frac{7560}{5 \times 89} \\
\Rightarrow \quad & v=\frac{1512}{39}
\end{aligned}
\]

Hance, \(x-\frac{1}{4}-\frac{89}{4080}\) and \(y-\frac{1}{6}-\frac{89}{2512}\)
Co, the solution of the given system of aquapen isy \(=\frac{89}{4080}, y=\frac{89}{1512}\).

Q21

Solve ithe following zystem of equstions:
\(\frac{4}{x}+3 y=14\)
\(\frac{3}{11}-4 y=13\)

\section*{Solution}
\[
\begin{aligned}
& \frac{4}{y}+3 y-1= \\
& \frac{3}{3}-4 y-23 \\
& \operatorname{Let} \frac{1}{11}=\mathrm{F} \\
& \text { The given equations radace to } \\
& 14 \mathrm{y}+3 \mathrm{y}=14 \\
& \Rightarrow 40+3 y-14-0 \quad \text { |na|I } \\
& 3 p-4 y=2 z
\end{aligned}
\]

> Ueng croas multiplcation methor, we abtain:
> \(\frac{p}{-69-56}=\frac{y}{-42-(-921}=\frac{1}{-1 \hbar 1-9}\)
> \(\frac{\mathrm{p}}{-125}=\frac{y}{59}=\frac{-1}{25}\)
> \(\frac{\mathrm{p}}{-125}-\frac{-1}{25}, \frac{\mathrm{y}}{50}-\frac{-1}{25}\)
> \(D-3, y-)^{2}\)
> \(y-\frac{1}{x}=-5\)
> \(x=\frac{1}{5} \cdot y=2\)

\section*{Q22}

Solve the folioinng systems of equalong:
\(\frac{4}{x}+5 y=7\)
\(\frac{3}{x}+4 y=5\)

\section*{Solution}

The given sustain of equation is
\[
\begin{align*}
& \frac{4}{x}+5 y=?  \tag{0}\\
& \frac{3}{x}+4 y=5 \tag{iv}
\end{align*}
\]

Miltolying equation fi，by and 三quation（i）by 4，we get
\[
\begin{align*}
& \frac{12}{x}+15 y-21  \tag{iii}\\
& \frac{12}{x}+16 y-20 \tag{b}
\end{align*}
\]

Subtacting aovaition（iii）from equation \(\{V)\) ，we qet
\[
\begin{array}{ll} 
& \frac{22}{x}-\frac{12}{x}+16 y-15 y-20-21 \\
\Rightarrow \quad & y=-1
\end{array}
\]

Futting \(y=-1\) in equation（i），we zet
\[
\begin{aligned}
& \quad \frac{4}{x}+5 \times(-1)+7 \\
& =\frac{4}{3}-5+7 \\
& =\frac{4}{3}-7+5 \\
& =\frac{4}{x}-12 \\
& =4=12 x \\
& =\quad \frac{4}{12}=x \\
& =x-\frac{4}{12} \\
& =x-\frac{1}{3}
\end{aligned}
\]

Hence，solution of the given Ey三tem：of aquations is \(x-\frac{1}{3}, y<-1\)

\section*{Q23}

Solve tre par of euchatun
\(\frac{2}{3}+\frac{3}{y}=19\)
\(\frac{5}{3}-\frac{4}{y}=-2\)

\section*{Solution}

Let unswnte the given pair pf equations as
\(2\left(\frac{1}{x}\right)+3\left(\frac{1}{y}\right)-13\)
\(s\left(\frac{1}{x}\right)-4\left(\frac{1}{y}\right)=-2\)
（2）

Thene bquation arn not in the form an \(+b y+c=n\) ．Hewover，if we subatitute
\(\frac{1}{x}-p\) and \(\frac{1}{y}=q\) in Equations \(/ I\) ）and（2）we get
\(2 p+3 q=13\)
\(5 p-4 q=-2\)
So．We have enprassect the equations as a pair of lineax equations，Minw，you san vas． any metrod to sclve themse nquations，and got \(\mathrm{p}=2,4=\) ？
You kome，that \(\mathrm{p}=\frac{1}{11}\) and \(\mathrm{q}-\frac{1}{V}\)
Sutistitute the values uf pand q to get
\(\frac{1}{x}-2, \ln , x-\frac{1}{2}\) and \(\frac{1}{y}-31 \ln x-\frac{1}{2}\)

Solve the following sistem of equations
\(\frac{2}{\sqrt{4}}+\frac{5}{\sqrt{y}}-2\)
\(\frac{4}{\sqrt{6}}-\frac{9}{\sqrt{7}}=-1\)

\section*{Solution}
\(\frac{2}{\sqrt{x}}+\frac{3}{\sqrt{7}}=2\)
\(\frac{4}{\sqrt{x}}-\frac{9}{\sqrt{6}}=-1\)
L- \(\frac{1}{\sqrt{5}}-p\) and \(\frac{1}{\sqrt{y}}=-q\)

The gremt equaticne reduce to:
\(0+3 \pi-2\)
\(4 p-9 q--1\)

Multiblying equation (1) by J, we obtaint
\(6 p-9 q=a\)
Adding équation ( \(Z\) ) and (3), We obtain:
\(10 p-5\)
\(p=\frac{1}{2}\)
Putting the valje of \(\rho\) in equation (1), We obtain
\(2 \times \frac{1}{2}+3 q-2\)
\(3 \mathrm{at}-1\)
\(\mathrm{q}=\frac{1}{3}\)
\(\mathrm{A}=\frac{1}{\sqrt{5}}=\frac{1}{2}\)
\(\sqrt{x}-8\)
\(x=-4\)
\(Q=\frac{1}{\sqrt{y}}=\frac{1}{3}\)
\(\sqrt{y}-3\)
\(y=9\)
zis: \(=4 . y=9\)

Q25

> Solve the foilowing syptrm of Equation
> \(\frac{x+y}{x y}=2\)
> \(\frac{x-y}{x y}=6\)

The gren overem of equabcns 1s
\(\frac{x+y}{x y}=2\)
\(=x+y-2 x y\)
And, \(\frac{x-y}{x y}=6\)
\(\Rightarrow x-v-6 x y\)
Adding equat ons \(\{1\) ) and (i) , we get
\(3 x-8 x y\)
\(-1-4 y\)
\(\Rightarrow y-\frac{1}{4}\)
Substitutngy \(-\frac{1}{4} \ln (1)\) we ger
\(x+\frac{1}{4}-2 x \times \frac{1}{4}\)
- \(\frac{4 k+1}{4}-\frac{x}{2}\)
\(\Rightarrow 8 x+2-4 x\)
\(\Rightarrow 4 x=-2\)
\(=x-\frac{1}{2}\)
Hence, sclution of the given-sxstern of equatuonsis \(x=-\frac{1}{2}\) and \(v=\frac{1}{4}\)
Q26

Gotvis'tom following eycteme of igquatons
\(\frac{2}{x}+\frac{3}{y}-\frac{y}{x y}\)
\(\frac{4}{x}+\frac{9}{y}-\frac{21}{x y}\)

\section*{Solution}

The systim of giver equatitins is
\[
\begin{array}{ll}
\frac{2}{x}+\frac{3}{y}-\frac{9}{x y} & -(1) \\
\frac{4}{x}+\frac{3}{y}-\frac{21}{x y} & -11
\end{array}
\]

\[
2 y-3 x=9
\]
\(4 y+9 x=21\)
\[
-j i v)
\]

From (iii), we get
\[
3 x-9-2 y
\]
\[
=x-\frac{9-2 y}{3}
\]

Substitutin \(x-\frac{2-3 y}{3}\) if =quatom \((v)\). wai get
\[
\begin{array}{ll} 
& 4 y+9\left(\frac{a-2 y}{3}\right)-21 \\
\Rightarrow & 4 y+3(9-2 y)=21 \\
\Rightarrow & 4 y+2 y-5 y-23 \\
\Rightarrow & -2 y=21-27 \\
\Rightarrow & -2 y--6 \\
\Rightarrow & y=\frac{-5}{-2}=2
\end{array}
\]

Putung \(y=3\) in \(x=\frac{9-2 y}{3}\), पe गet
\[
\begin{aligned}
x & =\frac{9-2 \times 3}{3} \\
& =\frac{9-8}{3} \\
& =\frac{3}{3} \\
& =1
\end{aligned}
\]

Hances solution of the syotern systerm of aquagon if \(N-1 . y=3\)

Salve ite followng sy stams of equalions1
\(\frac{6}{x+y}-\frac{7}{x-y}+3\)
\(\frac{1}{2(x+y)}=\frac{1}{3(x-y)}\),
where \(x+k>B\) and \(x-y>0\)

\section*{Solution}

Let \(\frac{1}{x+y}=4\) and \(\frac{1}{F+Y}=v\), Then, the geven system of equations tecom as
\[
\begin{align*}
& 6 u=7 v+3 \\
& \Rightarrow: \quad 6 u-7 v=3 \tag{i}
\end{align*}
\]
and, \(\frac{u}{2}-\frac{v}{3}\)
\(\Rightarrow \quad 31=2 y\)
\(\Rightarrow \quad 3-24=0\)
Muttipiving equation (ii) br: 2 , arid equaluon ( \()\) by 1 , we qut
Cxt-7y-3
\(\mathrm{Cu}-4 t=0\)
一 (iii)
— (iv)

Subtracting equation (iv) frool equationfii), we get
\[
\begin{array}{ll} 
& -v+4 v-3 \\
\Rightarrow & -k-3 \\
\Rightarrow \quad & z=-1
\end{array}
\]

Dutting \(v=-1\) in agustion (ii), we get
\[
2-2 \times[-1]-0
\]
\(\Rightarrow \quad 3+2=0\)
\(=\quad 21<-1\)
\(\Rightarrow \quad \mathrm{s}=\frac{-2}{3}\)
Now,
\[
u=\frac{-2}{3}
\]
\(\Rightarrow \quad \frac{1}{x+y}-\frac{-2}{3}\)
\(\Rightarrow \quad N+y=\frac{-3}{2}\)
and \(V=-1\)
\(\Rightarrow \quad \frac{1}{x-y}=-1\)
\(\Rightarrow \quad x-y=-1\)

\[
\begin{aligned}
& 2 x-\frac{-3}{2}-1 \\
= & 2 x-\frac{-3-2}{2} \\
=\quad & 2 x-\frac{-5}{2} \\
=\quad & x-\frac{-5}{4}
\end{aligned}
\]

Purting \(x=\frac{-5}{4}\) in equation fu). we get
\[
\begin{aligned}
& \quad \frac{-5}{4}-y=-1 \\
& \Rightarrow \quad \frac{-5}{4}+1=y \\
& \Rightarrow \quad \frac{-5+4}{4}-y \\
& \Rightarrow \quad \frac{-1}{4}-y \\
& \Rightarrow \quad y=\frac{-1}{4}
\end{aligned}
\]

Hancie, solution of the sybtem: system bf oquation is \(x=\frac{-5}{4}, y=\frac{-1}{4}\)
Q28

Solve the fatoming systerns of equatanns:
\(\frac{x y}{x+y}-\frac{6}{3}\)
\(\frac{x^{\prime} y}{y-x}=-6\)
where \(x+y * 0\) and \(y-x=0\);

\section*{Solution}

The geven system of equation is
\[
\begin{array}{ll} 
& \frac{x y}{x+y}=\frac{6}{5} \\
\Rightarrow \quad & 5 x y-6(x+y) \\
\Rightarrow \quad & \quad x y-2 x+0 y \\
\text { And, } \frac{x y}{y-x}-6 \\
\Rightarrow \quad x y=6(y-x) \\
\Rightarrow \quad & x y=6 y-6 x
\end{array}
\]
\[
\Rightarrow \quad 5 x-8 x+0 y \quad-0
\]

Adding bequation 0 : :and equation (i) we gelt
\(6 x y=6 y+6 y\)
\(\Rightarrow \quad\) fiky \(-12 y\)
\(=x-\frac{12 y}{5 y}-2\)

Pejting \(x=2\) in vquation \((i)\), wo got
\[
3 \times 2 \times y^{\prime}=5 \times 2+6 y
\]
\(\Rightarrow \quad 15 y-12+6 y\)
\(\Rightarrow \quad 10 y-6 y-12\)
\(\Rightarrow \quad 4 y=12\)
\(\Rightarrow \quad y-\frac{12}{4}-1\)
Herice, solution of the given systurn of equatian is \(x-3, y=3\).

\section*{Q29}

Solve the followng systeras of ecciations:
\(\frac{22}{x+y}+\frac{1 E}{x-y}-5\)
\(\frac{58}{x+y}+\frac{45}{x-y}=14\)

\section*{Solution}

Let \(\frac{1}{x+y}=y\) and \(\frac{1}{x-y}-v\), Tann, the given \#ystem of equations becsinfes
\(224+13-5\)
-9
\(-(10)\)

Multuplying equation \(\{i\) i) by 3 ; and equation (i) by 1 , we get
\[
\begin{array}{ll}
66 u+4 S v=15 & -(i i i) \\
5 S u+4 S v=14 & -(i v)
\end{array}
\]

Siptractrig equabon (iv) from equabon(int, wi \(30 t\)
\[
66 u-55 u-15-14
\]
\(\Rightarrow \quad 1-4-1\)
\(\Rightarrow \quad u=\frac{1}{11}\)
Futting \(u=\frac{1}{11}\) in equation h), we get
\[
\begin{array}{ll} 
& 22 \times \frac{1}{11}+15 v=5 \\
= & 2+15 v-5 \\
\Rightarrow & 15 y=5-2 \\
= & 15 x-3 \\
\Rightarrow & v=\frac{3}{15}=\frac{1}{5}
\end{array}
\]

Now, \(U=\frac{1}{x+y}\)
\(\Rightarrow \quad \frac{-1}{x+y}=\frac{1}{11}\)
\(\Rightarrow \quad x+y-11\)
Ard, \(x=\frac{1}{x-y}\)
\(\Rightarrow \quad \frac{2}{x-y}-\frac{1}{5}\)
\(\Rightarrow \quad x-y=5\)
adding equation \((v)\) and aguation \(\{v)^{2}\), weget
\[
\begin{array}{ll} 
& 2 x-11+3 \\
= & 2 x-15 \\
= & x-\frac{15}{2}-8
\end{array}
\]

Putungx -8 in equation \(\left(v_{i}\right)\), wep get
\[
\begin{aligned}
& 8+y-12 \\
=\quad & y-11-12=3
\end{aligned}
\]

Hence: solution of the given, system of pquatons is \(x-8, y-3\)

Q30

Solve the falioning systumis of eculations:
\(\frac{5}{x+y}-\frac{2}{x-y}=-1\)
\(\frac{15}{x+y}+\frac{7}{x-y}=10\)

\section*{Solution}

Let \(\frac{1}{x^{2}+y}=u\) and \(\frac{1}{x-y}=v\). Then, fhe mwon sysum of wquations bncomer
\(5 u-2 v+-1\)
\(-6\)
\(15 i+7 v=10\)
一iii

Multiplying equasion (i) by 7 ; and equaticn (i) by ㄱ, we qet
\[
\begin{array}{ll}
35-14-2 & -(i i) \\
30 a+14 v-20 & -(v)
\end{array}
\]
\[
\begin{align*}
& \text { adding equation (iil) and eosation (v) we qet } \\
& \text { P } \quad 752+75 i r=7+20 \\
& =\quad 6.5-13 \\
& =\quad u=\frac{73}{65}-\frac{1}{5} \\
& \text { Puttagid }-\frac{1}{5} \text { in equation (), we gas } \\
& 5=\frac{1}{5}-2,--1 \\
& \Rightarrow \quad 2-2 y=-1 \\
& =\quad-2=-1-1 \\
& =\quad-2 v=-2 \\
& =v-\frac{-2}{-2}+2 \\
& \text { Now, } u=\frac{1}{N+y} \\
& =\quad \frac{1}{x+y}-\frac{1}{5} \\
& \Rightarrow \quad N+y=S \\
& \text {-(v) } \\
& \text { Ar }-1, y=\frac{2}{x-y}=1 \\
& \Rightarrow \quad x-y-1 \tag{iv}
\end{align*}
\]

Addingequation \((v)\) gnd souston \((v i)\), we get
\[
\begin{array}{ll}
\Rightarrow & 2 x-5+1 \\
= & 2 x-6 \\
\Rightarrow & x=\frac{6}{2}=3
\end{array}
\]

Putting \(x-3\) in R Ruajon (v) we:get
\[
\begin{aligned}
& 3+y-5 \\
& =\quad y-5-3-2
\end{aligned}
\]

Hencery solution of the given spostrm of equatons is \(x-3, y=2\)

Q31
\[
\begin{aligned}
& \text { Solve tha follamng systams of sugabons: } \\
& \frac{2}{x+y}+\frac{2}{x-y}=2 \\
& \frac{-9}{x+y}-\frac{4}{x-y}=1
\end{aligned}
\]

Solution

Let \(\frac{1}{x+y}=11\) and \(\frac{1}{x-y}=v\). Trun, the gyun syatern of equations becomms
\[
\begin{align*}
& 3 u+2 v-z  \tag{一}\\
& 5 u-4 v-1
\end{align*}
\]
- 0

Multiplyirig tactation \((i)\) by 2, and tiquation \((9)\) by 1 , we gel
\[
\begin{array}{ll}
6 U .+4 V=4 & \text {-(ii) } \\
S(U-4 V=1 & -(i v)
\end{array}
\]

Aoding equationfiilyand enuation (v), we ger
\[
\begin{array}{ll} 
& 5 u+9 u-4+1 \\
\Rightarrow & 16 u=3 \\
\Rightarrow & 4-\frac{5}{15}-\frac{1}{3}
\end{array}
\]

Putingiv \(=\frac{5}{3}\) in equaton(), was gat
\(3 \times \frac{1}{3}+2 v-2\)
\(\Rightarrow \quad 2+2 y-2\)
\(=2 v=2-1\)
\(\Rightarrow \quad v=\frac{1}{2}\)
Nowi \(2=\frac{1}{x+y}\)
\(\Rightarrow \quad \frac{1}{x+r}-\frac{2}{3}\)
\(\rightarrow x+y=3 \quad-(y)\)

And \(v=\frac{a}{x-r}\)
\(\Rightarrow \quad \frac{1}{x-y}-\frac{1}{2}\)
\(\Rightarrow \quad x-y-2\)

Adding equation ( \(x\) ) and equation \(\{v i\) ) we get
\[
2 i x=1+2
\]
\(\Rightarrow \quad x=\frac{5}{2}\)
Putting \(x=\frac{5}{2}\) In equat on \((x)\), weget
\[
\begin{aligned}
& \frac{3}{2}+y-3 \\
\Rightarrow & y-3-\frac{3}{2} \\
\Rightarrow \quad & y-\frac{6=5}{2}-\frac{1}{2}
\end{aligned}
\]

Hence, zolution of the given zystam of equations is \(x-\frac{5}{2}, y=\frac{1}{2}\),

\section*{Q32}

Sulve it falloming systams of nctanors:
\(\frac{1}{2(x+2 y)}+\frac{1}{3(3 x-2 y)}-\frac{-3}{2}\)
\(\frac{5}{4(x+2 y)}-\frac{7}{5(3 y-2 y)}-\frac{61}{60}\)

\section*{Solution}

Let \(\frac{1}{x+2 y}=0\) and \(\frac{1}{3 x-2 y}=v\). Ther, the giveti systarn af equatians becamies
\[
\begin{align*}
& \frac{4}{2}+\frac{3 v}{3}-\frac{-3}{2} \\
= & \frac{3 u+10 y}{6}=\frac{-3}{2} \\
= & 2+10 v=\frac{-3 \times 6}{2} \\
= & 3 u+10 v=-9
\end{align*}
\]

And, \(\frac{2 \pi}{4}-\frac{2 r}{5}=\frac{61}{60}\)
\(=\frac{252-12 r}{20}-\frac{61}{60}\)
\(\Rightarrow \quad 2 \pi-12 v-\frac{61}{3}\)
Multpyng equation() by 12 and mouationfii) by 10 , ve qat
\[
\begin{array}{ll}
30, ~+120 y-130 & -\{i i i\} \\
2504-120 v-\frac{510}{3} & -\{i v)
\end{array}
\]

Addingequation (iii) and acustion \((i v)\), No \(g e t\)
\[
\begin{aligned}
& 36 t+250 u-\frac{530}{3}-108 \\
= & 286 u-\frac{310-224}{3} \\
\Rightarrow & 206 u-\frac{206}{3} \\
\Rightarrow & 4=\frac{1}{9}
\end{aligned}
\]

Futting \(u=\frac{1}{3}\) in equation fit we get
\[
\begin{aligned}
& 3 \times \frac{1}{3}+10 v=-9 \\
\Rightarrow \quad & 1-10 v=-9 \\
=\quad & 10 v=-9-1 \\
=\quad & v-\frac{-10}{10}-n 1
\end{aligned}
\]
\[
\text { Nowi } x=\frac{1}{x+2 y}
\]
\[
\Rightarrow \quad \frac{1}{x+2 y}=\frac{1}{2}
\]
\[
\begin{equation*}
\Rightarrow \quad x+z y=\pi \tag{x}
\end{equation*}
\]
\[
\Delta n d_{1, v} v=\frac{1}{3 k-2 r}
\]
\[
\Rightarrow \quad \frac{1}{3 x-2 \gamma}=-1
\]
\[
=\quad 3 x-2 y-1
\]

Adding equation ( \(v\) ) and equation (vi), we get
\(x+3 r-3-1\)
\(\Rightarrow \quad 4 r+2\)
\(\Rightarrow \quad X+\frac{2}{4}-\frac{1}{2}\)
\[
\begin{aligned}
& \text { Puttimax }-\frac{1}{2} \text { in equation }(0) \text {. wn get } \\
& \frac{1}{2}+2 y-3 \\
& \Rightarrow \quad 2 y+3-\frac{1}{2} \\
& \Rightarrow \quad 2 y=\frac{6-1}{2} \\
& \Rightarrow \quad y-\frac{5}{4}
\end{aligned}
\]

Hance; solution of the qiven-systen of equationsif \(v-\frac{1}{2}, y=\frac{5}{4}\). Q33

Solue the followng sustems of equanons:
\(\frac{5}{x+1}-\frac{2}{y-1}=\frac{1}{2}\)
\(\frac{10}{x+1}+\frac{z}{y-1}-\frac{5}{2}\), जTuIE \(s \geqslant-1\) and \(y>-1\)
Solution

Lit \(\frac{1}{x+1}=\) w. and \(\frac{1}{y-1}-y\). Then, the guver system of apuabons becames
\(=\quad 3 \pi-2 v-\frac{1}{2}\)
\(=103+2=-\frac{5}{2}\)
\(-0\)

Adding equation fig and ectiationfiiy, we get
\[
\begin{aligned}
& 5 c+20 c-\frac{3}{2}+\frac{5}{2} \\
& =150-\frac{1+5}{2} \\
& =150-\frac{6}{2}-3 \\
& =\quad y=\frac{3}{15}-\frac{1}{5} \\
& \text { Futsing } a=\frac{1}{5} \text { in equation } 3 \text { i., at get } \\
& 5 \times \frac{1}{5}-\text { ir }-\frac{1}{2} \\
& \Rightarrow \quad 1-2 \cdot \frac{1}{2} \\
& \Rightarrow \quad-20+\frac{\pi}{2}-1 \\
& \Rightarrow \quad-2 y-\frac{1-2}{2} \\
& \Rightarrow \quad-2 v-\frac{-1}{2} \\
& \Rightarrow \quad \psi-\frac{-1}{-4}-\frac{1}{4}
\end{aligned}
\]

Now, \(u=\frac{1}{x+1}\)
\(\Rightarrow \quad \frac{1}{x+1}=\frac{1}{5}\)
\(=\quad N+1-5\)
\(\Rightarrow \quad x-5-1=4\)
And, \(v=\frac{1}{y-1}\)
\(\Rightarrow \quad \frac{1}{y-1}-\frac{1}{4}\)
\(=\quad y-1=4\)
\(\Rightarrow \quad y=4+y=3\)

```

Solve tes foloming systeris of equations:
x+y=5xy
3x+2y-23xy,x-0,y>0

```

\section*{Solution}

The given 5ystem of ecouation is
\[
\begin{aligned}
& x+y=5 x y: \\
& 3 y+2 y=13 x y
\end{aligned}
\]

Multipoyng eqgation (i) by \(z\) and equatondi) by +i, we get
\[
\begin{array}{ll}
2 x+2 y=10 v y & - \\
3 x+7 i i) \\
\hline 8 y & -13 x y
\end{array}
\]

Subtracting squation (iii) from equation(iv), We get
\(3 x-2 x+13 x y-10 x y\)
\(=x-3 x y\)
\(\Rightarrow \quad \frac{x}{3 x}+y\)
\(\Rightarrow \quad y=\frac{1}{3}\)

Futting \(r=\frac{1}{3}\) in Equation if, we get
\(x-\frac{1}{3}=5 x x \times \frac{1}{3}\)
\(x+\frac{1}{3}=\frac{5 x}{3}\)
\(=\quad \frac{1}{3}-\frac{5 x}{3}-8\)
\(\Rightarrow \frac{1}{3}-\frac{5 x-1 x}{3}\)
\(\Rightarrow \quad 1-2 x\)
\(\Rightarrow \quad 2 x+1\)
\(\Rightarrow \quad x-\frac{1}{2}\)

Hencer solutun of the given zystam of equationsis \(x-\frac{1}{2}, y-\frac{3}{3}\)

\section*{Q35}

\(x+y=2 y\)
\(\frac{x-y}{x y}-5, x=0, y+0\)
Solution

Dies syathe of the givan encuation is
\[
x+y=2 x y
\]
and, \(\frac{x-y}{x y}=6\)
\(x-y=6 x y\)
Abding equat onf \((\mathrm{f}\) and equation \((\mathrm{ii})\), ver get
\[
\begin{array}{ll} 
& 2 x-2 x y+6 x y \\
\Rightarrow & 3 x-0 x y \\
\Rightarrow & \frac{2 x}{6 x}-y \\
\Rightarrow \quad y-\frac{1}{4}
\end{array}
\]
\[
\text { Puttingy }=\frac{1}{4} \text { in nazatini }() \text {. We get }
\]
\[
x+\frac{1}{4}-2 x \times \frac{1}{4}
\]
\[
\Rightarrow \quad x+\frac{1}{4}-\frac{x}{2}
\]
\[
\Rightarrow \quad k-\frac{x}{2}-\frac{-1}{4}
\]
\[
\Rightarrow \quad \frac{2 x-x}{3}-\frac{-1}{4}
\]
\[
\Rightarrow \quad x * \frac{-2}{4}=\frac{-1}{8}
\]

Hence, solution of the given system of equatichs is \(=\frac{-1}{2}: y=\frac{1}{4}\),

\section*{Q36}

Solve the followity systervs of equationst
\(\square(3 u-k)=5 u\)
\(2(a+3 u)-5 u\)

\section*{Solution}
\[
\begin{aligned}
& \text { The system of the given equation is: } \\
& \qquad 2(30-v)-\text { Suv } \\
& \Rightarrow \quad 3 x-2 y-\text { suvs }
\end{aligned}
\]
sind, \(2(v+3 v)=2 i v\)
\(\Rightarrow \quad 3 u+6 r+3 i v\)
Multiplyingequation () by 3 and equation (f) by1, wa get
\[
\begin{array}{ll}
18 u-6 v-15 e v & = \\
202+6 v=3 i v & \text { (iii) } \\
\text { - iv) }
\end{array}
\]

Adding equation (ii) and equarion fiv), wegar
\(18 z+2 u-15 u v+5 u y\)
\(\Rightarrow \quad 20 u-20 u v\).
\(=\quad \frac{20 u}{-20 u}-v\)
\(\Rightarrow \quad y=1\)
Futting \(v=1\) in equation (1) wat \(q\) at
\(6 \mathrm{~L}-2 \times 1-5 \mathrm{~J} \times 1\)
\(\Rightarrow \quad 5 y-2-5 y\)
\(\Rightarrow \quad 60-50-2\)
\(\Rightarrow \quad 4-2\)
Hence, solution of the givan system of equationsis u-2iv-1.

Solve the fol owing syatems of equat ons:
\(\frac{2}{3 x+2 y}+\frac{3}{3 x-2 y}=\frac{17}{5}\)
\(\frac{5}{3 x+2 y}+\frac{1}{2 x-2 y}=2\)

\section*{Solution}

Let \(\frac{1}{2 x-2 y}=4\) and \(\frac{1}{3 x-2 y}=v\), Then, the quven sustem of equavons becomes
\[
\begin{array}{ll}
2 u+2 v=\frac{17}{5} & -11 \\
5 u+v=2 & -(11)
\end{array}
\]

Moultiflying equationfi) by 3i we get
\(150+3 v=6\)
Subtractang aquation (1) by nguation (iii) we unt
\[
\begin{aligned}
& 15 u-2 u-6-\frac{17}{5} \\
= & 1 x-\frac{3 u-17}{5} \\
\Rightarrow \quad & 130-\frac{13}{5} \\
\Rightarrow \quad & u-\frac{13}{5 \times 13}-\frac{2}{5}
\end{aligned}
\]

Futting \(u=\frac{3}{5}\) in zquation fi) we get
\[
\begin{array}{ll} 
& 5 \times \frac{2}{5}+v-2 \\
\Rightarrow & 1=v-7 \\
\Rightarrow & v=2-1 \\
\Rightarrow & v+1
\end{array}
\]
\[
N o w, u=\frac{1}{3 x+2 y}
\]
\[
\Rightarrow \quad \frac{1}{3 x+2 y}=\frac{1}{5}
\]
\[
\begin{equation*}
\Rightarrow \quad 3 v+2 y-5 \tag{iv}
\end{equation*}
\]
and. \(x=\frac{1}{3 x-2 y}\)
\[
\Rightarrow \quad \frac{1}{3 x+2 y}-1
\]
\[
\begin{equation*}
\Rightarrow \quad 3 x-2 y-1 \tag{x}
\end{equation*}
\]

Adding equation (iv) and (v), we get
\[
\begin{aligned}
& 6 x-2+5 \\
\Rightarrow & 6 x-6 \\
\Rightarrow \quad & N=1
\end{aligned}
\]
putsing \(x-\frac{1}{\text { in }}\) bquation \((v)\), wé get
\[
\begin{array}{ll} 
& 3 \times 1-2 y-5 \\
\Rightarrow & 3 y-5-7 \\
\Rightarrow & 2 y-2 \\
\Rightarrow & y-\frac{2}{2}=1
\end{array}
\]

\section*{Q38}

Solve ite falloming syitums of equations:
\(\frac{44}{x+y}+\frac{30}{x-y}=10\)
\(\frac{50}{x+y}+\frac{40}{x-y}=17\)

\section*{Solution}

Let \(\frac{1}{x+r} \sim u\) and \(\frac{1}{x-y}=v\), Then, the systam of the given aquations becomes
\(44 u+306=10\)
- 0
\(550+40 v=13\)

\(17 \mathrm{Ex}+180 \mathrm{c}=40\)
-(iii)
\(1550 /+1800-39\)
\(-(n)\)

Sidtitraping oquation (iv) by equation(iii), we get \(176 \mathrm{u}-165 \mathrm{u}=40-39\)
\(=\quad 11 \%=1\)
\(=\quad v-\frac{1}{11}\)
Putting \(u=\frac{1}{19}\) in Equation \((i) i_{i}\) Nes gest
\[
44 \times \frac{1}{11}+30 v-10
\]
\[
4+90 v=17
\]
\(\Rightarrow \quad 30 \mathrm{y}-10-6\)
\(\Rightarrow \quad 30 r=6\)
\(\Rightarrow \quad v-\frac{6}{30}-\frac{1}{5}\)
Nowi it \(=\frac{1}{x+y}\)
\(=\frac{1}{x+y}-\frac{1}{11}\)
\(=\quad x+y=11\)
and \(v=\frac{1}{x-y}\)
\(\Rightarrow \quad \frac{1}{x-x}-\frac{1}{5}\)
\(=x-y-5\)
Adding equation (v) and \((v i)\), we get
\(2 x-21+5\)
\(=\quad 8 x-16\)
\(\Rightarrow \quad x+\frac{16}{2}-9\)
Futting \(x-8\) in equation \((v)\), im ght
\[
3+y-11
\]
\(\Rightarrow \quad y-11-\pi-3\)
Hence, solution of the cinvan system of aquations is \(x+8, y-3\),

Solve the pair of equations:
\(\frac{5}{x-1}+\frac{1}{y-2}=2\)
\(\frac{5}{x-1}-\frac{3}{y-2}=1\)

\section*{Solution}

Let us put \(\frac{1}{x-1}-1\) and \(\frac{1}{y^{-2}}-9\) Then the given equations
\[
\begin{align*}
& s\left(\frac{1}{x-1}\right)+\frac{1}{y-2}=2 \\
& 6\left(\frac{1}{x-1}\right)-3\left(\frac{1}{y-2}\right)-1 \tag{2}
\end{align*}
\]

Cart be writtan as : \(\quad 5 p+a=2\)
\[
\begin{equation*}
5 p-3 q=1 \tag{3}
\end{equation*}
\]

Equaboris (a) and (4) Forti-a pair oflinest aquataris in the gerisual formi Nov, you
can use any method to sclve these equations. We get \(p=\frac{1}{3}\) and \(q=\frac{1}{3}\). . WSW,
subistituting \(\frac{1}{x-2}\) far \(p_{i}\) we have
\(\frac{1}{x-2}=\frac{1}{3}\),
H.e., \(\quad x-1=3, f, 9, x^{2}=4\)

Simiarly, suostituting \(\frac{1}{v-2}\) for 9 , we qet
\(\frac{1}{y-2}=\frac{1}{3}\)
4, E. \(_{n} \quad 3=y-z\), \(E_{n}, y=5\)
H⿰nce, Il: \(=4, y=5\) IE the requirec splution of the given pair -Df ocquticns

Solve the following system ot equabons
\(\frac{10}{1+4}+\frac{2}{w-y}-4\)
\(\frac{15}{x+y}-\frac{5}{x-y}=-2\)

\section*{Solution}

\section*{Q41}

Solve the fulfowing syptem of nquations:
\[
\begin{aligned}
& \frac{1}{77_{R}+v}+\frac{1}{3 x-v}=\frac{2}{4} \\
& \frac{1}{2|7 x+y|}-\frac{1}{2|3 x-y|}=\frac{-1}{8}
\end{aligned}
\]

\section*{Solution}
\(\frac{1}{3 x+y}+\frac{1}{3 x-y}-\frac{3}{4}\)
\(\frac{1}{2\{3 x+y \mid}-\frac{1}{2(3 x-y)}-\frac{-1}{8}\)
Lat \(\frac{1}{3 x+y}-p\) and \(\frac{1}{3 x-y}-q\)
The yiren equations. resuc= to:
\(\mathrm{F}+\mathrm{O}=\frac{3}{4}\)
\(\frac{9}{2}-\frac{3}{2}-\frac{-1}{1}\)
\(\Rightarrow p-a-\frac{-1}{4}\)
Adding (1) and (2), we chtain:
2p \(-\frac{3}{4}-\frac{1}{4}\)
ap \(=\frac{1}{2}\)
\(p=\frac{1}{4}\)
Substititing the value of \(p\) or \(\langle 2\rangle\), te obtain.
\(\frac{1}{4}-a=\frac{-1}{4}\)
\(8=\frac{3}{4}+\frac{1}{4}=\frac{1}{2}\)
\(a=\frac{1}{3 x+y}=\frac{1}{4}\)
\(8 x+y-4 \quad-\quad-18\)
\(p-\frac{1}{3 x-y}-\frac{1}{2}\)
\(3 x-y=2\)
Adding equations (3) and (4). we obtaint
\(6 x-6\)
\(x-1\)
Substruting the value of : in (3), we obtaint
\(3 / 1+y=4\)
\(\dot{y}=1\)
\(x=2, y=1\)

\section*{Q42}

Ssive the fodnwong systertinf kquations
\(\frac{7 x-2 y}{x y}=3\)
\(\frac{3 x+7 y}{x y}=15\)

\section*{Solution}
\(\frac{7 x-8 y}{3 y}=5\)
\(=\frac{7}{y}-\frac{2}{x}=5 \quad(.1(1)\)
\(\frac{8 x+7 y}{x y}=15\)
\(=\frac{a}{y}+\frac{7}{x}-15-(2)\)
tet \(\frac{1}{x}-p\) and \(\frac{1}{y}-q\)

The given \#quationi reduca tol
\(-2 t i+74-5\)
\(=-2 p+7 q-5-0\)
\(75+B q-25\)
\(\geq 175+8 q-15-0 \quad\)...i(4)
Using-tross-multiplication meethod, we obtain:
\(\frac{p}{-105-1-40)}=\frac{q}{-35-30}=\frac{1}{-16-49}\)
\(\frac{p}{-65}-\frac{7}{-65}-\frac{1}{-65}\)
\(\frac{p_{i}}{-65}=\frac{1}{-55}, \frac{9}{-65}+\frac{1}{-65}\)
\(p-1, q-1\)
\(p=\frac{1}{\pi}=1 \quad q=\frac{1}{y}-1\)
\(\pi=1, y=1\)

Q43

Solution

Q44

Solve toe foloming systems of equations
\(99 y+101 y-499\)
\(102 x+94 y-501\)

\section*{Solution}

The given sytam of equation is
\[
\begin{align*}
& 90 y+101 y=490 \\
& 101 x+99 y-501
\end{align*}
\]

Adding eq-ation ( ) and equaturifi), wis cet \(99 x+101 v+101 y+79 y-499+521\)
\(=200 x+200 y=1000\)
\(=200(x+y)-1000\)
\(=x+y-\frac{1000}{200}-5\)
\(=x+x-5\)
Subtracting eculation (i) by equation (i) ), we get
\[
102 x-99 \%+99 y-291 y-501-499
\]
\(=2 x-2 y-2\)
\(\Rightarrow \quad 2(x-y)-2\)
\(=x-y-\frac{y}{2}\)
\(=\quad x-r-1\)
Adding equation (iii) and equation (iv), We get \(2 x=5+1\)
\(=x=\frac{6}{2}=3\)
Buttitigx -3 in aquation (ii), we pot
\[
=\quad y-5-3-2
\]

Hence, soluton of thegiven system of equations is \(x-3, y+2\).

\section*{Q45}

Solve the following zysteme of equatorns:
\(29 x-29 y-90\)
\(20 x-23 y-110\)

\section*{Solution}

The glven system of enquation in
\[
\begin{array}{ll}
29 i-39 y-98 & -21 \\
29 y-29 y-110 & -(0)
\end{array}
\]

Subtacting zquasion (i) by equation (i). wegec
\[
29 x-27 x-23 y+79 y-110-90
\]
\(=\quad 5 x+6 y-12\)
\(=5(x+y)-12\)
\(=x+y-\frac{12}{5}-2\)
\(=\quad x+y=2\)
Adding equstion (iii) and equaron (iv), Wק get
\[
2 x-2+4=5
\]
\[
\Rightarrow \quad x=\frac{6}{2}>3
\]

Putting \(x=3\) in equation \(\left\langle\eta^{2}\right.\), , ine get.
\(3+y=2\)
\(=\quad r-2-3=-1\)
Hence, salution of the given-yytem of equations is \(v=3, y=-1\)

\section*{Q46}

Solve the folloining systime of empathins:
\(x-y+z=4\)
\(x-2 y-2 z=9\)
\(2 x+y+3 z=1\)

\section*{Solution}
\[
\begin{aligned}
& 23 x+27 x-29 y-75 y-90+115 \\
& \Rightarrow \quad 52 x-52 y-208 \\
& =52(x-y)-208 \\
& =x-n-\frac{208}{52}-4 \\
& =x-p-4 \quad-(i n)
\end{aligned}
\]

We have:
\[
\begin{align*}
& x-y+z+4  \tag{1}\\
& x-2 y-2 z=9 \\
& 2 y+y+3 z+1
\end{align*}
\]

From equation fi, we ger
\[
\begin{aligned}
& z=4-x+y \\
& \Rightarrow \quad z=-x+y+4
\end{aligned}
\]

Substioting the vifue of 2 itrequationfij). Su get
\[
\begin{array}{ll} 
& x-2 y \sim 2(-x+y+4)-9 \\
\Rightarrow & x-2 y+2 x-2 y-8-9 \\
\Rightarrow & 3 x-4 y=9+8 \\
\Rightarrow & 3 x-4 y=17 \tag{v}
\end{array}
\]

Substituting the value of 2 in equationfiif, We get
\[
\begin{align*}
& 2 x+y+3(-x+y+4)-1 \\
\Rightarrow & 2 x+y-3 x+3 y+12=1 \\
\Rightarrow & -x+4 y-1-12 \\
\Rightarrow & -x+4 y-11 \tag{v}
\end{align*}
\]

Adding suquations \((v)\) ind \((v)\). We get
\[
\begin{array}{ll} 
& 3 k-x-4 y+4 x-17-11 \\
\equiv & 2 x-0 \\
\Rightarrow & x=\frac{b}{2}=3
\end{array}
\]

Futting \(x-3\) in equation \([(1 x)\), se git
\[
3 \times 7-4 y-17
\]
\[
=\quad 9-4 y-17
\]
\[
\Rightarrow \quad-4 y=-17-3
\]
\[
\Rightarrow \quad-4 y-0
\]
\[
=\quad y-\frac{8}{-4}=-2
\]
\[
\begin{aligned}
& \text { Futting } x-3 \text { and } y-2 \text { in } z--x+y+4 \text { wn gnt } \\
& \Rightarrow \quad z=-3-2+4 \\
& \Rightarrow \quad z=-5+4 \\
& \Rightarrow \quad z--1
\end{aligned}
\]

Hence, solution of the givirg system of eqgation \(1 \overline{2} x-3,0<-2, z+-1\)

\section*{Q47}

Solve the following systeric of ecuaturs:
\(x-y+z=4\)
\(x+y+z-z\)
\(2 x+y-3 z=3\)

\section*{Solution}

Wid hivin,
\[
\begin{array}{ll}
x-y+z-4 & -10 \\
x+y+z-2 & -(11) \\
2 x+y-3 z-0 & -(11)
\end{array}
\]
\[
\begin{aligned}
& \text { Froon equation }(i) \text {, weqet } \\
& \qquad \begin{aligned}
& x-4-x+y \\
& \Rightarrow \quad x--x+y+4
\end{aligned}
\end{aligned}
\]

Subsututing \(z+-x+y+4\) in ecuation (ii), we get
\[
\begin{aligned}
& x+y+(-x+y+4)-2 \\
\Rightarrow & x-y-x+y+4-2 \\
\Rightarrow & 2 y+4=z \\
\Rightarrow & y y-2-4--2 \\
\Rightarrow & 2 y=-2 \\
\Rightarrow & y=\frac{-2}{2}=-1
\end{aligned}
\]

Subsgruting the value of I in Bquarg on (iii), We get
\[
\begin{align*}
& 2 x+y-3(-y+y+4)-10 \\
= & 3 y+y+2 x-3 y-12-0 \\
= & 5 x-2 y-12=0 \\
= & 5 x-2 y=12 \tag{m}
\end{align*}
\]

Futang \(y=-2\) in equationfiv), we get
\(5 x-2 x(-1)=12\)
\(=\quad 5 k+2+12\)
\(\Rightarrow \quad 5 x-12-2+10\) :
\(=\quad x-\frac{10}{5}-2\)
Froting \(x-2\) and \(y-1\) in \(z-\cdots+y+4\), wo got
\(x=-2+(-1)+1\)
\(=-2-1+4\)
\(--3+4\)
\(-1\)
Hence, sofution of the geving syburen of equationasx \(-2, y=-1,-1\).

\section*{Q48}

Solve the following systems of equation:
\(21 x+47 y=110\)
\(47 x+21 y=162\)

\section*{Solution}

The given system of equations is
\(21 x+47 y=110\)
\(47 x+21 y-162\)
Adding equations (i) and (ii), we get.
\(69 x+56 y-272\).
\(\Rightarrow 69(x+y)-272\)
\(\Rightarrow x+y=4\)
sobtracting equation (i) from (ii), we ger
\(25 x-26 y-52\)
\(\Rightarrow 26(x-y)=52\)
\(\Rightarrow x-v-2\) (iv)
Adding equations (iii) and (iv), ve get
\(2 x=6\)
\(4-3\)
Substituting \(x-3\)-in equationi (iii), we got
\(3+y=4\)
ey-1
Hence, sidution of the given syatern of equitions is \(x-3\) and \(y-2\),

\section*{Q49}

If \(x+1\) is a factor of \(2 x^{3}+a x^{2}+2 b x+1\), the find the values of \(a\) and \(b\) given that \(2 a-3 b=\)

\section*{Solution}
```

Since $(x+1)$ is a factor of $2 x^{3}+a x^{2}+2 b x+1$
$\Rightarrow x-1$ is a zero of $2 x^{3}+a x^{2}+2 b x-1$
$\Rightarrow 2(-1)^{3}+(-1)^{2}+2(-1)+1-0$
$\Rightarrow-2+a-2 b+1=0$
$\Rightarrow a-$ あ $-1-0$
$\Rightarrow s-2 b=1$

```
Given that \(2 a-3 b-4\)
    (ii)

Multuplying enpiation (a) by 2 we gat.
\(2 a-4=2\)
(iii)

Subtracting equation (iii) from (ii), we get
b-2
Subsuorting \(b=2\) in equation (1), we have
\(a-2(2)-1\)
\(\Rightarrow a-4-1\)
\(\Rightarrow a=5\)
Hense, \(a-5\) and \(b-2\)

\section*{Q50}


\section*{Solution}

The given system of oquations is:
\[
\begin{aligned}
& \frac{x}{10}+\frac{y}{5}-1-0 \\
& \Rightarrow \frac{x+2 y-10}{10}-0 \\
& \Rightarrow x+2 y=10 \quad \text { ㅈ․ } 0 \text { ( } 0 \text { ) } \\
& \text { And } \frac{x}{8}, \frac{y}{6}=15 \\
& \Rightarrow \frac{3 x+4 y}{24}=15 \\
& \Rightarrow 3 ₹+49=360 \quad \text {....(in) } \\
& \text { Multiplying equation (1) by } 3 \text {, we get } \\
& 3 x+6 y=30 \\
& \text { oun(iii) } \\
& \text { Suovacting equation (ii) from (ii), we get } \\
& -2 x-3 \pi \\
& \Rightarrow \mathrm{y}=-165 \\
& \text { Subspitutig y }-165 \text { in (i), we have } \\
& x+2 x-665)=10 \\
& =x-330-10 \\
& \Rightarrow x-340 \\
& \text { Now, } y=\lambda x+5 \\
& =-165-\lambda \times 3-40+5 \\
& \Rightarrow 240 x=-170 \\
& \Rightarrow x=\frac{-170}{340}<-\frac{1}{2} \\
& \text { Hence, } x-349, y=-165 \text { and } x-\frac{1}{2}
\end{aligned}
\]

Solution


Since \(A B C D\) is a rectangle,
CD - AB
\(\Rightarrow x+3 y=13\)
\(A 50+4 D-B C\)
\(\Rightarrow 3 \mathrm{x}+\mathrm{y}-7\)
Multppying equation (ii) by 3, we get
\(9 x+3 y-21\)
Subtracting equation (i) fram (iii), we gat
\(8 x=8\)
\(\Rightarrow x-1\)
Substimuting \(x-1\) in equation (i), We halse
\(1+3 y=13\)
\(=3 y-12\)
\(\Rightarrow y-4\)
Hence, \(=-1\) and \(y-4\)

\section*{Q52}

Write an equation of a line passing through the point representing solution of the pair of linear equations \(x+y=2\) and \(2 x-y=1\). How many such lines can we find?

\section*{Solution}

The given system of equations is
\(x+y-2\) (....(1)
\(2 x-y=-1 \quad\) (.. (0i)
Adding equat ons ( 1 ) and (i) \()\) we get
\(3 x-3\)
\(\Rightarrow \mathrm{x}=1\)
Substibuting \(x=1\) in (i), we have
\(1+y=2\)
\(\Rightarrow y-1\)
Hence, \(x=1\) and \(y=1\) is e solution of theguen sestem cr equationis.
There are infirite number ch lines which cafr pass through \((1,1)\)
The general form of linear equation in two variables is a \(x^{2}+b y+c-0\)
Hence, the equation of linis is:
\(3 x+2 y=5\) which sabsifes \(x=1 y=1\).

\section*{Q53}

Write a pair of linear equations which has the unique solution \(x=-1, y=3\). How many such pairs can you write?

\section*{Solution}

Gven, \(x--1\) and \(y-3\)
The general form of linear equation in two vanables \(15 a x^{2}-b y+6-0\)
We can form apair of linear equaberis os follomati
\(12 x+3 y=-3\)
\(2 x+2 y-4\)
Thus, there can beimifinite number of liries whith can pass through ( \(-1,3\) ).

\section*{Exercise 3.4}

Q1

Galye nact of trie followng vastems of equations by the metrod of cross-mul tiplization:
\(x+2 y+1=0\)
\(2 k-3 y-12+0\)

\section*{Solution}

The givensyetem of nquation is
\(x+2 y+1=0\)
\(2 r-3 r-12=0\)
17ere,
\[
\begin{aligned}
& \exists_{1}-1, b_{1}-2, c_{1}-1 \\
& \exists_{2}-y_{1}, b_{2}=-3, \text { and } c_{2}=-12
\end{aligned}
\]

Ev. Deoss m ultiplication, we get
\(=\frac{1}{2 \times(-12)-1 \times(-3)}-\frac{-y}{1 \times(-12)-1 \times 2}-\frac{1}{1 \times(-2)-2 \times 2}\)
\(=\frac{x}{-24+3}-\frac{-y}{-12-2}-\frac{1}{-3-4}\)
\(=\frac{x}{-21}-\frac{-y}{-14}-\frac{1}{-7}\)
Now,
\[
\frac{\pi}{-21}-\frac{1}{-7}
\]
\[
=\quad r-\frac{-24}{-7}-3
\]
anc,
\(\frac{-y}{-14}=\frac{1}{-7}\)
\(=\frac{y}{14}-\frac{-1}{7}\)
\(=y=\frac{-14}{7}--2\)
Hance, the siglution of the geven sy tam of cquatum rix-3

\section*{Q2}
 af urass-muluplication:
\(3 x+2 y+25=0\)
\(2 x+y+10=0\)

\section*{Solution}

The givers syotem of equstion is
\(3 y+2 y+25=5\)
\(2 x+y+10=0\)
Hare,
\[
\begin{aligned}
& a_{1}=3, b_{1}=2, g_{1}=25 \\
& a_{2}=2, b_{2}=1, \text { and } c_{2}=10
\end{aligned}
\]

By cress-multoplication, we have
\(=\frac{x}{2 \times 10-25 \times 1}-\frac{-y}{3 \times 10-25 \times 2}-\frac{1}{3 \times 1-2 \times 2}\)
\(=\frac{x}{20-25}-\frac{-y}{30-50}-\frac{1}{3-4}\)
\(\Rightarrow \quad \frac{x}{-5}-\frac{-y}{-20}=\frac{1}{-1}\)
Nome,
\(\frac{x}{-5}-\frac{1}{-1}\)
\(\Rightarrow \quad x^{\prime \prime}=\frac{-5}{-1}=5\)
and.
\[
\begin{aligned}
& \frac{-y}{-20}-\frac{1}{-1} \\
=\quad & \frac{y}{20}=-1 \\
\Rightarrow \quad & y=-20
\end{aligned}
\]

Hatice, \(x-5, y=-20\) is the salutuon of the given sivstam of equations.

\section*{Q3}

Solve each of the foliowing kystern sof equations by the mathod of पusstribliplitaton:
\(2 k+x=35\)
\(3 x+4 y=65\)

\section*{Solution}

The given system of squations miay be writter as
\(2 e+y-3 E=0\)
\(3 x+4 y-55-0\)
Hare.
\[
\begin{aligned}
& a_{1}=2, b_{1}=1, c_{1}=-35 \\
& s_{2}=3, b_{2}=4, \text { and } c_{2}=-65
\end{aligned}
\]

Ay cross-multiplichtion swi have.
\(=\frac{x}{1 \times(-65)-(-35) \times 4}=\frac{-y}{2 \times(-65)-(-35) \times 3)}=\frac{1}{2 \times 4-1 \times 3}\)
\(\Leftrightarrow \frac{x}{-65+140}=\frac{-\gamma}{-130+105}=\frac{1}{8-3}\)
\(\Rightarrow \quad \frac{x}{75}=\frac{-y}{-25}=\frac{1}{5}\)
\(\Rightarrow \quad \frac{x}{75}-\frac{y}{25}-\frac{1}{6}\)
Now.
\[
\begin{aligned}
& \frac{x}{75}=\frac{1}{5} \\
& \Rightarrow \quad x=\frac{75}{3}=15
\end{aligned}
\]
anid,
\[
\frac{y}{25}=\frac{I}{E}
\]
\[
\Rightarrow \quad y=\frac{25}{3}-5
\]

\section*{Q4}

Solye encti of the folowing systion s of equateris by the methat of cross-miuttoplication:
\(2 k-y=5\)
\(x-y-2\)

\section*{Solution}

The grean system of equations may be varition as
\(2 x-y-6=0\)
\(x=y-2=0\)
Here,
\[
\begin{aligned}
& a_{1}=2, b_{3}=-1, b_{3}=-6 \\
& a_{2}-1, b_{2}=-1 ; \text { and } b_{2}--2
\end{aligned}
\]

My cross mivitiplicaton, we get
```

$\Rightarrow \quad(-1) \times(-2)-(-5) \times(-1)-\frac{x}{2 \times(-2)-(-6) \times 1}-\frac{1}{2 \times(-1)-(-1)=1}$
$\Rightarrow \quad \frac{x}{2-6}=\frac{-y}{-4+6}=\frac{1}{-2+1}$
$\Rightarrow \quad \frac{x}{-4}-\frac{-y}{2}-\frac{1}{-4}$
$\Rightarrow \quad \frac{x}{-4}-\frac{-y}{2}-1$
Now,
$\frac{x}{-4}=-1$
$\Rightarrow \quad x-(-4) \times\{-1\}+4$
anid.

```
    \(\frac{-y}{2}=-1\)
\(\Rightarrow \quad-y-(13) \times 0\)
\(\Rightarrow \quad-y+-2\)
\(=\quad y-2\)
Heace, \(x-4, y-3\), 3 , the solution ip the grven system; of the equab onz

\section*{Q5}

Folve ench of the followimg sy stam s of squatem by the muthod af uross-mul iplisatrobi
\(\frac{x+y}{x y}-2, \frac{x-y}{x y}=6\)

\section*{Solution}

The giveniskstem of equatphsis
\[
\begin{align*}
& \frac{x+y}{x y}-2 \\
\Rightarrow \quad & \frac{x}{x y}+\frac{y}{x y}-2 \\
=\quad & \frac{1}{y}+\frac{1}{x}-2 \\
=\quad & \frac{1}{x}+\frac{1}{y}-2
\end{align*}
\]
and,
\[
\begin{align*}
& \frac{x-y}{x y}=6 \\
&= \frac{x}{x y}-\frac{y}{\Delta y}=0 \\
& \Rightarrow \frac{1}{y}-\frac{1}{y}-0 \\
& \Rightarrow \frac{1}{x}-\frac{1}{y}=-3 \\
& \text { Taking } u=\frac{1}{x} \text { and } v-\frac{1}{y}, \text { we get } \\
& \quad \square+v-2 \Rightarrow u+y-2=0 \quad \text { - (ii) } \tag{aH}
\end{align*}
\]
and, \(\bar{z}-v=-6 \rightarrow u-v>6=0 \quad-(v)\)
Here,
\[
\begin{aligned}
& z_{1}+1, B_{1}-1, c_{1} \cdot-2 \\
& a_{2}=1, E_{2}=-1, \text { anc } c_{2}-5
\end{aligned}
\]

Ey orossm uliplication
\(\equiv \quad \frac{4}{1 \times 6=(-2) \times(-1)}+\frac{3}{1 \times-6-(-2) \times 3}-\frac{1}{1 \times(-1)-1 \times 5}\)
\(=\frac{16}{6-2}=\frac{-6}{6+\frac{2}{2}}+\frac{1}{-1-1}\)
\(=\quad \frac{u}{4}+\frac{-v}{\theta}=\frac{1}{-Q}\)
Nowi \(\frac{u}{4}=\frac{1}{-2}\)
\(=\quad 4=\frac{4}{-2}=-2\)
ind. \(\frac{-v}{3}=\frac{1}{-2}\)
\(\Rightarrow \quad-i-\frac{B}{-2}=-4\)
\(\Rightarrow \quad-4,-2\)
\(\Rightarrow \quad V-4\)
Now \(\quad x=\frac{1}{4}-\frac{-1}{2}\) and \(y=\frac{1}{V}-\frac{1}{4}\)

Hance, \(x=\frac{-1}{2}, y=\frac{1}{4}\) is the soluten of the giver syitan. of equatons.
Q6

Ealve nach of the falianity syitams of equations toy the fre ethod of crass-multuplitationt
\(a x+b y=a-b\)
\(b x-a y-2+b\)

\section*{Solution}

The given syEtem of equaticas is
\(a x+b y=a-b\)
\(b x-a y=a+6\)
-
Here;
\[
\begin{aligned}
& b_{1}=a, b_{1}-b, E_{1}-b-a \\
& z_{2}=b, b_{2}-2, \text { arud } c_{2}=-a t-b
\end{aligned}
\]
by cross-multiplicat on, we get
\(=\frac{x}{(-a-b) \times(b)-(b-a) \times(-a)}-\frac{2 y}{(-a-b) \times(a)-(b-a) \times(b)}-\frac{1}{-a \times a-b \times b}\)
\(=\frac{x}{-a b-b^{2}+a t b-a^{2}}-\frac{-y}{-a^{2}-a b-b^{2}+a b}-\frac{1}{y^{2}-b^{2}}\)
\(\Rightarrow \quad \frac{x}{-b^{2}-a^{2}} \frac{\psi}{-a^{2}-b^{2}} \frac{1}{-a^{2}-b^{2}}\)
Now,
\[
\begin{aligned}
& \frac{x}{-b^{2}-a^{2}}-\frac{1}{-a^{2}-b^{2}} \\
& \Rightarrow \quad N=\frac{-b^{2}-a^{2}}{-a^{2}-b^{2}} \\
&=\frac{-\left(b^{2}+a^{2}\right)}{-\left(a^{2}+b^{2}\right)} \\
&=\frac{\left(a^{2}+b^{2}\right)}{\left(a^{2}+b^{2}\right)} \\
& \Rightarrow \quad \pi=1 \\
& \text { arid. }
\end{aligned}
\]
\[
\begin{aligned}
& \frac{-y}{-a^{2}-b^{2}}=\frac{1}{-a^{2}-b^{2}} \\
= & x-\frac{-\left(a^{2}+b^{2}\right)}{-\left(a^{2}+b^{2}\right)} \\
= & y-1 \\
\Rightarrow \quad & y-m-1
\end{aligned}
\]

Hente, \(N-1, y=-1\) is the sylution of the given sevtith of the nquasonth

\section*{Q7}

Solve 日act of the following syotam of equatcons tiy the nimtant
of cross multipligationt
\(x+a y=b\)
\(a x-b y=c\)

Solution

The giverisystem of equatimens thay be writhon as
\(x+a y-t=0\)
A \(\mathrm{A}-\mathrm{Br}-\mathrm{C}-\mathrm{a}\)
Hare,
\[
\begin{aligned}
& a_{1}=1_{1} b_{1}=a, c_{1}=-b \\
& a_{2}=a_{1}, b_{2}=-b \text {, and } c_{2}=-c
\end{aligned}
\]

By urosi-mulsplication, we get
\(=\frac{x}{a \times(-c)-(-b) \times(-b)}-\frac{x}{1 \times(-a)-(-b) \times 3}-\frac{1}{1 \times(-b)+-a \times a}\)
\(\Leftrightarrow \quad \frac{x}{-3 c-b^{2}}=\frac{-y}{-c+a b}=\frac{1}{-b-a^{2}}\)
How,
\[
\begin{aligned}
& \frac{x}{-a c-b^{2}}-\frac{a}{-b-a^{2}} \\
&=\quad x=\frac{-a c-b^{2}}{-b-a^{2}} \\
& \Rightarrow \quad i=\frac{-\left\{b^{2}+a c\right\}}{-\left\{a^{2}+b\right\}} \\
&=\frac{a^{2}+a c}{a^{2}+b}
\end{aligned}
\]
and;
\[
\frac{-y}{c+a b}-\frac{1}{-D-z^{2}}
\]
\[
=\quad-y-\frac{a n-c}{-\left\{a^{2}+b\right\}}
\]
\[
=\quad y=\frac{2 a-c}{\frac{2}{2}+b}
\]

Henca, \(x-\frac{a c+b^{2}}{a^{2}+b}, \gamma-\frac{a b-c}{a^{2}+b}\) is the solutian of the quarn systann in
the oquabons:

\section*{Q8}

Shlve each of the foliceving systamm of equato ons by the metnod af croes-multipisationt
\(a \pi+b y-z^{2}\)
\(a x+a y=b^{2}\)

\section*{Solution}

The syitem of the giveri equations may be writton as
\(a x+b y-z^{2}=0\)
\(\Delta x+a y-b^{2}=0\)
Here,
\[
\begin{aligned}
& \bar{a}_{1}+3_{1} b_{1}-b_{1}, c_{1}-a^{2} \\
& \bar{a}_{2}=b_{1} b_{2} \sim a_{1} \text { and } c_{2}=-b^{2}
\end{aligned}
\]

EV crossmuliplication, we g\#t
\(\leq \quad \frac{x}{E \times\left(-b^{2}\right)-\left(-a^{2}\right) \times a}-\frac{1 y}{a \times\left(-b^{2}\right)-\left(-a^{2}\right) \times D}+\frac{1}{a \times x-b \times b}\)
\(\leq \quad \frac{x}{-b^{3}+a^{2}}=\frac{-4}{-a b^{2}+b^{2} b} \cdot \frac{1}{a^{2}-b^{2}}\)
Now,
\[
\begin{gathered}
\quad \frac{x}{-b^{2}+a^{2}}-\frac{1}{a^{2}-b^{2}} \\
=\quad \times-\frac{a^{2}-b^{3}}{\frac{a^{2}}{2}-b^{2}} \\
=\frac{(a-b)\left(a^{2}+a b+b^{2}\right)}{(a-b)(a+b)} \\
=\frac{a^{2}+a b+b^{2}}{(a+b}
\end{gathered}
\]
\[
\begin{aligned}
& \frac{-y}{-a b^{2}+a^{2} b}-\frac{1}{z^{2}-b^{2}} \\
\Rightarrow \quad-y & =\frac{a^{2} b-a b^{2}}{a^{2}-b^{2}} \\
\Rightarrow \quad Y & =\frac{a b^{2}-a^{2} t}{a^{2}-b^{2}} \\
& =\frac{a b(b-a)}{(a-b)(a+b)} \\
& =\frac{-a b(a-b)}{(a-b)(a+b)} \\
& =\frac{-a b)}{a+b}
\end{aligned}
\]

the equavana:

\section*{Q9}

Ealve nact of the falizvinit syitams of equatencomy the insthod of cross-muloplicationt
\(\frac{5}{x+y}-\frac{2}{x-y}=-1\)
\(\frac{25}{x+y}+\frac{7}{x-y}=10\),
wheres \(=0\) and \(r=0\)

\section*{Solution}

Let \(\frac{1}{x+y}=4\) and \(\frac{1}{x-y}-v\). Then, the pyen system af subations beramm
\[
5 i-2 v=-1
\]
\[
35 i+7 k-10
\]

Hares,
\[
a_{1}-5, b_{1}<-2, c_{1}-1
\]
\[
a_{2}=15, b_{2}-7 \text { and } c_{2}=-10
\]

By cross-rultiplucation toe get
\(\Rightarrow \quad \frac{a}{(-2) \times(-10)-1 \times 7}=\frac{-v}{5 \times(-10)-1 \times 15}=\frac{1}{5 \times 7-(-2) \times 15}\)
\(\Rightarrow \quad \frac{\Delta}{20-7}-\frac{-3}{-50-15}-\frac{1}{35-30}\)
\(\Rightarrow \quad \frac{4}{13} \cdot \frac{-}{-55}-\frac{1}{65}\)
\(\Rightarrow \quad \frac{4}{13}=\frac{v}{65}-\frac{1}{55}\)
Now,
\[
\begin{aligned}
& \frac{4}{13}=\frac{1}{65} \\
\Rightarrow \quad & 4=\frac{13}{65}=\frac{1}{6}
\end{aligned}
\]
and,
\(\frac{y}{65}-\frac{3}{65}\)
\(\Rightarrow \quad n=\frac{65}{65}-1\)
Now,
\(4=\frac{1}{x+Y}\)
\(\Rightarrow \quad \frac{1}{x+\gamma}-\frac{1}{5}\)
\(\Rightarrow \quad x+y-5\)
and,
\(y=\frac{1}{\mid x-y}\)
\(\Rightarrow \quad \frac{1}{x-y}-1\)
\(\Rightarrow \quad x-y+1\)
(i)

\[
\begin{array}{ll} 
& 2 x-5+1 \\
\Rightarrow & 2 x=6 \\
\Rightarrow & x=\frac{6}{2}=1
\end{array}
\]

Futting \(x=3\) in equation(i), we get
\[
=\quad \begin{aligned}
& 3+y-5 \\
& y-1-1-2
\end{aligned}
\]

Hence, \(x-3, y=\frac{13}{}\) s the solution of tha given syaten of squations.

\section*{Q10}

Solve each of the fotioving systani s of equations by the in uthod
of cross-muloplication:
\(\frac{3}{x}+\frac{3}{y}-29\)
\(\frac{5}{\pi}-\frac{4}{y}=-2\), where \(x=0\) and \(y \neq 0\)
Solution

The given firystem of equations is
\(\frac{2}{x}+\frac{3}{y}-13\)
\(\frac{5}{x}-\frac{1}{y}=-2\), where \(x-0\) and \(y=0\)

\(2 u+9 v-13\)
\(5 u-4 y=-2\)
Here.
\(a_{1}-2, b_{1}-3, y_{1}-131\)
\(s_{2}-\sigma_{1}, t_{2}=-4\) and \(c_{2}-2\)

By cross-multpicaten, we tava
\(=\frac{4}{3 \times 2-(-13) \times(-4)}=\frac{y}{2 \times 2-(-13) \times 5}=\frac{1}{2 \times(-4)-3 \times 3}\)
\(=\frac{u}{5-52}-\frac{-v}{4+65}-\frac{1}{-4-15}\)
\(=\frac{\Delta}{-46}-\frac{-k}{69}=\frac{-1}{-23}\)
Nov,
\(\frac{d}{-46}=\frac{1}{-23}\)
\(=\quad\left\langle=\frac{-46}{-23}-2\right.\)
ad
\(\frac{-4}{69}-\frac{1}{-23}\)
\(=\quad v=\frac{-89}{-23}-3\)
Now,
\(x=\frac{1}{4}-\frac{1}{2}\)
and.
\(y-\frac{1}{y}-\frac{1}{3}\)

Hence, \(x-\frac{1}{2}, y=\frac{1}{3}\) is the sol ution cf the glyen Eystem of equations

\section*{Q11}

Solve tach of the following swstems of vquabons bu Ahemethod of cross-multuplisation:
\(\frac{57}{x+y}+\frac{6}{x-y}-5\)
\(\frac{3 B}{N+y}+\frac{21}{x-y}=5\)

\section*{Solution}

Let \(\frac{1}{x+y}=u\) and \(\frac{1}{x-y}=v \cdot\) Then, the geven fystem of equations becone
\(157 u+6 y-5 \rightarrow 57 u+6 y-5=0\)
\(3 P u+2 t-9=39 u+21-9-0\)
HEF,
\(a_{1}=77, b_{1}=6 ; c_{1}=-5\)
\(\hat{a}_{2}=30,5_{2}+21\) and \(c_{2}=-9\)
Sy crose-iniltipilation, Wa hase
\(\Rightarrow \quad \frac{4}{-56+105}+\frac{-v}{-513+100}+\frac{1}{1197-228}\)
\(\Rightarrow \quad \frac{4}{51}+\frac{-\psi}{-323}=\frac{1}{069}\)
\(\Rightarrow \quad \frac{4}{51} \cdot \frac{v}{322}-\frac{1}{569}\)
Nows
\(\frac{4}{51}=\frac{1}{065}\)
\(\Rightarrow \quad 0=\frac{51}{1960}\)
\(\Rightarrow \quad 2=\frac{1}{19}\)
and
\[
\frac{y}{329}=\frac{1}{959}
\]
\(\Rightarrow \quad v=\frac{223}{963}\)
\(=\quad v=\frac{1}{3}\)
Now,
\[
\begin{aligned}
& 4-\frac{1}{x+y} \\
& \Rightarrow \frac{1}{x+y}+\frac{1}{17} \\
&= x+y+19 \\
& \text { thd } \\
& y=\frac{1}{x-y} \\
& \Rightarrow \frac{1}{x-y}-\frac{1}{2} \\
& \Rightarrow x-y-3
\end{aligned}
\]

Adiding sequavon(i) and equation (i), we quit
\[
2 x-19+3
\]
\(=\quad 3 r-22\)
\(\Rightarrow \quad x=\frac{22}{2}=11\)

\[
=\quad \begin{aligned}
& 11-y-19 \\
& =\quad y-17-11-8
\end{aligned}
\]

Hence, \(N=11, r=8\) is the solution of the given system of the equations.

\section*{Q12}

Salve uach of the following systamis of equationy by the mistriod
De cross multiplicationt
\(\frac{\Sigma}{a}+\frac{y}{b}=\) ?
\(a x-b y=a^{2}-b^{2}\)

\section*{Solution}

The syitem of the given equations mar be befttan ien
\(\frac{2}{a} x x+\frac{2}{b} x y-2=0\)
\(a x-b y+b^{2}-a^{2}-0\)
Hece,
\[
\begin{aligned}
& a_{1}=\frac{1}{a}, b_{2}=\frac{1}{b}, F_{1}=-2 \\
& a_{2}=a, b_{2}=-b_{4} \text {, and } c_{2}=a^{2}-a^{2}
\end{aligned}
\]

EV arossmuluplitaton, we get
\(=\frac{x^{2}}{\frac{1}{b} \times\left(b^{2}-a^{2}\right\}-(-2) \times(-b)}-\frac{1}{\frac{1}{3} \times\left(b^{2}-a^{2}\right)-(-2) \times a t}=\frac{1}{\frac{-b \times 1}{a}-\frac{a \times 1}{b}}\)
\(=\frac{x}{\frac{b^{2}-a^{2}}{b}-3 b}-\frac{-p^{2}}{\frac{b^{2}-a^{2}}{a}+2 a}-\frac{1}{\frac{-b}{\equiv}-\frac{a}{b}}\)
\(=\frac{\frac{y}{b^{2}-a^{2}-2 b^{2}}}{b}-\frac{-y}{\frac{b^{2}-a^{2}+2 a^{2}}{A}} \cdot \frac{1}{\frac{-b^{2}-a^{2}}{a b}}\)
\(\Rightarrow \quad \frac{x}{\frac{-a^{2}-b^{2}}{b}} \frac{-y}{\frac{b^{2}+a^{2}}{a}}=\frac{1}{\frac{-b^{2}-a^{2}}{a b}}\)
Now,
\[
\begin{aligned}
& \frac{\frac{x}{a^{2}-b^{2}}}{b}-\frac{1}{\frac{-b^{2}+a^{2}}{a b}} \\
& \Rightarrow \quad \pi=\frac{-\Delta v^{2}-t^{2}}{t}=\frac{a b}{t t^{2}-a^{2}} \\
& \text { anct } \\
& \frac{-y}{\frac{b^{2}+a^{2}}{a}}-\frac{1}{\frac{-b^{2}+b^{2}}{a b}} \\
& \Rightarrow \quad-y=\frac{b^{2}+a^{2}}{a}=\frac{3 b}{-b^{2}-a^{2}} \\
& =y-\frac{\left(b^{2}+a^{2}\right) \times a}{-\left(b^{2}+z^{2}\right)} \\
& =\quad y-b
\end{aligned}
\]

Hence, \(x=3, y=D\) is the solution of the given Eystem of
the neuatisen.

\section*{Q13}

Solve each of the foliowing sy stem s of equarons by the metnod of orass-mulizilicationt:
\[
\begin{aligned}
& \frac{x}{a}+\frac{y}{b}=a+b \\
& \frac{x}{a^{n}}+\frac{y}{b^{2}}=?
\end{aligned}
\]

\section*{Solution}

The gwen system of ョquatuons may bex witten as
\(\frac{1}{3} x=+\frac{1}{b} x-y-(a-b)-0\)
\(\frac{1}{a^{2}} \times x+\frac{1}{a^{2}} \times y-2=0\)
Here
\[
\begin{aligned}
& \exists_{1}=\frac{1}{3}, f_{1}-\frac{1}{b_{1}}, c_{t}=-(a+b) \\
& y_{2}=\frac{1}{a^{2}}, b_{2}-\frac{1}{b^{2}} \text {, and } s_{2}=-\frac{c}{2}
\end{aligned}
\]

By oross multoplication, we get
\[
\begin{aligned}
& =\frac{\frac{x}{\frac{1}{b}} \times(-2)-\frac{1}{a^{2}} \times-(a+b)}{\frac{1}{a} x-2-\frac{1}{a^{2}} *-(a+b)}=\frac{1}{\frac{1}{3} \times \frac{1}{b^{2}}-\frac{1}{a^{2}} \times \frac{1}{b}} \\
& =\frac{x}{\frac{2}{b}+\frac{a}{b^{2}}+\frac{1}{b}}=\frac{-y}{\frac{2}{a}+\frac{1}{a}, \frac{h}{b^{2}}}-\frac{1}{\frac{1}{a b^{2}} \cdot \frac{1}{a^{7} b}} \\
& \Rightarrow \quad \frac{x}{\frac{a}{b^{2}}-\frac{1}{b}}-\frac{-y}{-\frac{1}{d}+\frac{b}{b^{2}}}-\frac{1}{\frac{1}{-1 b^{2}}-\frac{1}{a^{2} b}} \\
& \Rightarrow \quad \frac{x}{\frac{a-b}{b^{2}}}-\frac{y}{\frac{a-b}{a^{2}}}-\frac{1}{\frac{a-b}{a^{2} b^{2}}} \\
& \Rightarrow \quad x+\frac{a-b}{b^{2}} \times \frac{1}{\frac{a-b}{a^{2} b^{2}}}-a^{2} \text { and } y-\frac{a-b}{a^{2}} \times \frac{1}{\frac{a-b}{a^{2} b^{2}}}-b^{2}
\end{aligned}
\]

Herice, \(x \rightarrow a^{2}, y=b^{2}\) is tha sciution of the given 3ystam of the equations

\section*{Solution}
\[
\begin{aligned}
& \frac{A}{a}=\frac{y}{b} \\
& a x+b y=a^{2}+b^{2} \\
& H o \sigma_{0}=\frac{1}{a}, b_{1}=\frac{-1}{b}, c_{2}=0 \\
& a_{2}=b_{2} \quad b_{2}=b, c_{2}=-\left\{a^{2}+b^{2}\right\}
\end{aligned}
\]

By cross multipilization, we get
\(\frac{u}{\frac{-1}{b}\left(-\left(d^{2}+b^{2}\right)\right)-b(0)}=\frac{-v}{\frac{1}{a}\left(-\left(a^{2}+b^{2}\right)\right)-a(0)}=\frac{1}{\frac{1}{3}(b)-a *\left(\frac{-1}{b}\right)}\)
\(\frac{\frac{x}{a^{2}+b^{2}}}{b}=\frac{v}{\frac{a^{2}+b^{2}}{a}}=\frac{\frac{1}{b}+\frac{a}{b}}{\frac{a}{b}}\)
\(n=\frac{\frac{a^{2}+b^{2}}{b}}{\frac{b}{a}+\frac{3}{b}}=\frac{\frac{a^{2}+b^{2}}{b}}{\frac{b^{2}+z^{2}}{a b}}=a\)
\(y=\frac{\frac{a^{2}+b^{2}}{a}}{\frac{b}{a}+\frac{3}{b}}=\frac{\frac{a^{2}+b^{2}}{a}}{\frac{b^{2}+a}{a b}}=b\)
Solution 75 (ac)

\section*{Q15}
\[
\begin{aligned}
& \text { Solve nad of the rolioxing systams of equations thy thi matiod } \\
& \text { of crass-muitiplipetion: } \\
& 2 a x+30 y=-+2 s \\
& 3 a x+20 y=a a+b
\end{aligned}
\]

\section*{Solution}

The ヨiven system of aquations is
\[
\begin{array}{ll}
2 a x+3 b y-a+2 b & -() \\
3 a x+2 b y-2 a+b & -(i)
\end{array}
\]

Here，
\[
\begin{aligned}
& a_{1}-2 a, b_{1}-3 b, c_{1}=-(2+2 b) \\
& a_{2}-3 a, b_{2}-2 b, a_{2}=-(2 a+b)
\end{aligned}
\]

By crassmulúplication，we have
and．
\[
\frac{-y}{-y^{2}+4 a b}-\frac{1}{-5 a b}
\]
\[
=\quad-r-\frac{-a^{2}+4 a b}{-53 b}
\]
\[
\Rightarrow \quad-y=\frac{-2(a-4 b)}{-5 a b}
\]
\[
=\quad-y=\frac{a-4 b}{5 b}
\]
\[
幺 \quad y=\frac{4 b-z}{56}
\]

Hence，\(N=\frac{4 \vec{a}-b}{5 a}, y=\frac{4 b-a}{5 b}\) is को solumon of the given syatern of＝quations．

\section*{Solution}
\[
\begin{aligned}
& =\frac{x}{-3 b \times(2 a+b) \times[-(a+2 b)] \times 2 b}-\frac{-y}{-2 a \times(2 a+b)-[-(a+2 b)] \times 2 a}-\frac{3}{2 a \times 2 b-2 b \times 3 a} \\
& =\frac{x}{-3 b+(a a+b)+2 b(a+2 b)}=\frac{4 y}{-2 a(2 a+b)+3 a(a+2 b)}=\frac{1}{4 a n-5 a t x} \\
& \Rightarrow \quad \frac{x}{-63 b-3 b^{2}+2 a b+4 b^{2}}-\frac{4 a^{2}-2 a b+3 a^{2}+6 a b}{-2 a b} \\
& =\frac{x}{-4 a b+b^{2}}-\frac{-y}{-a^{2}+4 a b}-\frac{1}{-5 a b} \\
& \text { Now, } \\
& \frac{x}{-4 a b+a^{2}}+\frac{1}{-5 w b} \\
& =\quad \hat{N}=\frac{-4 a b+b^{2}}{-53 b} \\
& \therefore \frac{-b(a a-b)}{-5 a b} \\
& -\frac{4 a-b}{5 a}
\end{aligned}
\]
```

The given s%atenv of equaton隹
3ar +50y = 20

# 5ax+55y-2H-0

and. }3ax+4by=1
= 3av+4by-48-0
Нен品，
$a_{1}-5 a_{1} b_{2}=\frac{b}{b_{1}} a_{1} c_{t}=-2 n$
$a_{2}-3 a_{1}, b_{2}=16$ and $c_{2}=-18$

```

By croes rrmultplicatoon，wo haye
\(=\frac{x}{6 b \times(-18)-(-28) \times 4 b}-\frac{-y}{5 e \times(-18)-(-28) \times 33}-\frac{1}{5 e \times 4 b-6 b \times 3 a}\)
\(=\frac{x}{-108 b+112 b}-\frac{y}{-90 x+94 a=} \frac{1}{20 \partial b-18 a b}\)
\(\Rightarrow \quad \frac{x}{4 b}=\frac{-y}{-6 z}=\frac{1}{2+10}\)
Nuw，
\(\frac{x}{4 b}=\frac{1}{2 \pi b}\)
\(\Rightarrow \quad त-\frac{t b}{2 a t}=\frac{2}{3}\)
andi；
\[
\begin{array}{ll} 
& \frac{-y}{-6 a}-\frac{1}{2 d b} \\
\Rightarrow \quad & y=\frac{6 a}{2 a b}=\frac{3}{b}
\end{array}
\]

Hence，\(x=\frac{2}{a}, y=\frac{3}{b}\) IE the solution of the given system：of ecuasions．

Q17

Solve each of the folowing zystams of equationt by tiemetiod
of cross－muitipitication：
\((3+2 b) x+\{2 a-t) y=2\)
\((a-2 b) x+(2 a+b) y=1\)

\section*{Solution}

The given system of Bquation may be vitten ate
\[
\begin{aligned}
& (a+2 b) x+(2 a-b) y-2=0 \\
& (a-2 b) x+(2 a+b) y-3=0
\end{aligned}
\]

Here;
\[
\begin{aligned}
& b_{2}-a+2 b, b_{y}-2 a-b, c_{1}-2 \\
& b_{2}-a-2 b, b_{2}-2 a+b \text { and } c_{2}--3
\end{aligned}
\]

BV crossmultplication, wehave
\(=\frac{x}{-3(2 a-b)-(-2)(2 a+b)}=\frac{-y}{-3(a-2 b)-(-2)(a-2 b)}-\frac{1}{(a+2 b)(2 a+b)-(2 a-b)(a-2 b)}\)
\(=\frac{3}{-5 a+3 b+4 a+2 b^{2}} \frac{y}{-3 a-6 b+2 a-4 b} \pi \frac{1}{2 a^{2}+a b+4 a b+2 b^{2}-\left(2 a^{2}-4 a b-a b+2 b^{2}\right\}}\)
\(=\frac{x}{-2 a+5 b} \cdot \frac{-y}{-a-16 b} \times \frac{1}{2 a^{2}+a b+4 a b+2 b^{2}-2 a^{2}+43 b+3 b-2 b^{2}}\)
\(\Rightarrow \quad \frac{x}{-2 a+5 b}=\frac{-y}{-(3+10 D)}=\frac{1}{1020}\)
\(\Rightarrow \quad \frac{x}{-2 a+5 b}-\frac{y}{a+10 b}=\frac{1}{10 a b}\)
Noin.
\[
\frac{x}{-2 a+5 b}-\frac{1}{10 a b}
\]
\[
\Rightarrow \quad x=\frac{56-2 a}{10 a b}
\]
and,
\[
\begin{aligned}
& \frac{y}{3+10 b}-\frac{1}{20 a b} \\
=\quad & r=\frac{a+10 b}{10 a b}
\end{aligned}
\]

Hence, \(x+\frac{5 b-2 a}{10 i v b}, y+\frac{a+108}{10 a b}\) is the solution of the given sjotem af equations

\section*{Q18}

Solve each of the follcuwing aysterns of equations by them evigd
of crosemultuplicstion:
\[
\begin{aligned}
& x\left(3-b+\frac{a b}{a-b}\right)=y\left(3+b-\frac{a b x}{a+b}\right) \\
& x+y-8 y^{2}
\end{aligned}
\]

\section*{Solution}

The givani zy三tern of equation is
\[
\begin{align*}
& x\left(a-b+\frac{a b}{a-b}\right)-y\left(z+b-\frac{a b}{a+b}\right) \\
& x+y-2 y^{2} \tag{ii}
\end{align*}
\]

From equation (i), we get
\[
\begin{aligned}
& x\left(a-b+\frac{a b}{a-b}\right)-y\left(a+b-\frac{a b}{a+b}\right)=0 \\
= & =\left(\frac{(a-b)^{2}+a b}{a-b}\right)-y\left(\frac{(a+b)^{2}-a b}{a+b}\right)=a \\
= & x\left[\left(\frac{a^{2}+b^{2}-2 a b+a b}{a-b}\right)-y\left(\frac{a^{2}+b^{2}+2 a b-a b}{2+b}\right)-0\right.
\end{aligned}
\]
\(\Rightarrow \quad x\left(\frac{a^{2}+b^{2}-a b}{a-b}\right)-y\left(\frac{a^{2}+b^{2}+a b}{a+b}\right)-0\)
From equation fit, we get
\[
\begin{equation*}
x+y-2 a^{2}-8 \tag{iv}
\end{equation*}
\]

Hese,
\[
\begin{aligned}
& a_{1}=\frac{a^{2}+b^{2}-a b}{a-b}, b_{1}=-\left(\frac{\partial^{2}+a^{2}+a b}{\partial+b}\right), c_{1}-b \\
& a_{2}=1, b_{2}=1 \text { and } c_{2}=-2 a^{2}
\end{aligned}
\]

Ay crosf-tisltpocaocn, weget
\[
\Rightarrow \quad \frac{A}{2 a^{2}\left(\frac{a^{2}+b^{2}+a b}{a+b}\right)}=\frac{a}{2 a^{2}\left(\frac{a^{2}+b^{2}-a b}{a-b}\right)}=\frac{a^{2}+b^{2}+a^{2}-b^{2}}{(a-b)(a+b)}
\]
\[
=\frac{x}{2 a^{2}\left(\frac{a^{2}+b^{2}+a b}{a+b}\right)}=\frac{x}{2 a^{2}\left(\frac{a^{2}+b^{2}-a b}{a-b}\right)}=\frac{1}{\frac{2 a^{2}}{(a-b)(a+b)}}
\]

Now"
\[
\begin{aligned}
& \frac{x}{2 a^{2}\left(\frac{a^{2}+b^{2}+a b}{a+b}\right)}=\frac{\frac{1}{2 a^{2}}}{(\sqrt{a}-b)(a+b)} \\
=\quad x^{\prime} & =\frac{2 a^{2}\left(a^{2}+b^{2}+a b\right)}{a+b}=\frac{(a-b)(a+b)}{2 a^{3}} \\
& =\frac{(a-b)\left(a^{2}+b^{2}+a b\right)}{a} \\
= & {\left[a^{3}-b^{3}\right.} \\
a & \left.a^{3}-(a-t)\left(a^{2}+b^{2}+a b\right)\right]
\end{aligned}
\]
orid
\[
\begin{aligned}
& \frac{y}{2 a^{2}\left(\frac{a^{2}+b^{2}-a b}{a-b}\right)}=\frac{\frac{1}{2 a^{a}}}{(a-b)(a+b)} \\
=\quad y & =\frac{2 a^{2}\left(a^{2}+b^{2}-a b\right)}{a-b}=\frac{(a-b)(a+b)}{2 a^{2}} \\
& =\frac{(a+b)\left(a^{2}+b^{2}-a b\right)}{a} \\
& =\frac{a^{3}+t^{3}}{a} \quad\left[a a^{2}+b^{3}=\{a+b)\left(a^{2}+b^{2}-a b\right)\right]
\end{aligned}
\]

Fence, \(N=\frac{i^{3}-b^{2}}{a}, y=\frac{i^{2}+b^{3}}{b}\) is the jolution of the given system of equations:
\[
\begin{aligned}
& \leq \quad \frac{a}{\left(-2 a^{2}\right)\left[-\left(\frac{a^{2}+b^{2}+a b}{\ni+b}\right)\right]-a \times 1}=\frac{-b}{\left(-2 a^{2}\right)\left(\frac{a^{2}+b^{2}-a b}{\#-b}\right)-0 \times 1 \cdot \frac{a^{2}+b^{2}-a b}{a-b}-\left[\frac{1}{a+b}\right]} \\
& \text { S } \frac{x}{27^{2}\left(\frac{a^{2}+b^{2}+a b}{a+b}\right)}-\frac{y}{\left(2 a^{2}\right)\left(\frac{a^{2}+b^{2}-a b}{a-b}\right)}+\frac{1}{\frac{a^{2}+b^{2}-\Delta a}{a-b}+\frac{a^{2}+b^{2}+a b}{a+b}} \\
& \Rightarrow \quad \frac{v}{2 a^{2}\left(\frac{a^{2}+b^{2}+a b}{a+b}\right]}-\frac{y}{\left(z^{2} a^{2}\right)\left(\frac{a^{2}+b^{2}-a b}{a-b}\right)} \frac{(a+b)\left(a^{2}+b^{2}-a b\right)+(a-b)\left(a^{2}+b^{2}+a b\right)}{(a-b)(a+b)}
\end{aligned}
\]

Solve each of the foliowing zy三tern \(\equiv\) of eqquations by the method of Goss mulaplication:
\(b x+c y=a+b\)
\(\operatorname{av}\left(\frac{1}{a-b}-\frac{1}{a+b}\right)+a r\left(\frac{I}{b-a}-\frac{I}{a+a}\right)-\frac{2 a}{a+b}\)

Solution

The guersyytan of equation a
\[
\begin{aligned}
& b x+c y=a+b \\
& z x\left(\frac{1}{a-b}-\frac{1}{3+b}\right)+c y\left(\frac{1}{b-a}-\frac{1}{b-a}\right)=\frac{3 y}{a+b}
\end{aligned}
\]

From equation(i), we aet:
\[
\begin{equation*}
b x+c y=(2+b)=0 \tag{iii}
\end{equation*}
\]

From uquakion (i), ise jot

Ftom squation () and aquation (i), we get
\(a_{1}-b_{1} b_{t}-c_{t} c_{4}-(a+b)\)
\(b_{2}-3 a b_{1} b_{2}=-200\) and \(E_{2}-2 a(a-b)\)
By crassmultiplication, wo qut
\(\Rightarrow \frac{v}{-2 a c(2)-b)-[-(2-b)][-2 a c)}+\frac{4 y}{-2 a b\left(2^{2}-b\right)-[-(2-3)][2 a b]}+\frac{1}{-2 a b c-2 a b c}\)
\(=\frac{x}{-2 a^{2} z+2 a t c-\left[2 a^{2} c+2 a b c\right]}-\frac{\alpha x}{-2 a^{2} b+2 a b^{2}+\left[2 a^{2} b+2 a b^{2}\right]}-\frac{1}{-4 a b c}\)
\(=\frac{v}{-2 a^{2} c+2 a b c-2 a^{2} c-2 a b c}=\frac{-y}{-2 a^{2} b+2 a b^{2}+2 a^{2} b+2 a b^{2}}+\frac{-1}{4 a b c}\)
\(=\frac{x}{-4 \sigma^{2}}=\frac{-y}{43 b^{2}}=\frac{-1}{43 b c}\)
Now
\[
\frac{x}{-4 a^{2} c}-\frac{-1}{4 a b c}
\]
\[
\Rightarrow \quad x-\frac{4 a^{2} c}{4 \dot{a} c}=\frac{a}{b}
\]
anc.
\[
\frac{-y}{4 a b^{2}}=\frac{-1}{4 a b c}
\]
\[
\Rightarrow \quad y=\frac{4 a b^{2}}{4 a b c}=\frac{b}{c}
\]

Hance, \(x=\frac{3}{5}, y=\frac{b}{5}\) is the spution of the qiven syscem of the equasions,
\[
\begin{align*}
& 4 \times\left[\frac{a+b-(a-b)}{(a-b)(a-b)}\right]-c y\left(\frac{b+a-(b-a)}{(b-a)(b+a)}\right)=\frac{a z}{a+b}=0 \\
& \Rightarrow \quad \equiv x\left[\frac{a+b-a+b}{(a-b)(\xi+b)}\right]+c y\left(\frac{b+a-b+a}{(b-a)(b+a)}\right)-\frac{\partial a}{a+b}=0 \\
& \Rightarrow \quad \equiv x\left[\frac{20}{(a-b)(a+b)}\right]+c y\left(\frac{2 a}{(D-a)(b+a)}\right]-\frac{2 a}{3+b}-0 \\
& =\quad v\left[\frac{2 a b}{(a+b)(a+b)}\right]+v\left(\frac{2 a c}{-(a-b)(a+b)}\right)-\frac{2 a}{a+b}=0 \\
& \Rightarrow \quad \cdots\left[\frac{2 a b}{(y-b)(a+b)}\right]+\gamma\left(\frac{\Delta a c}{(j-b)(a+b)}\right)-\frac{2 a}{\partial+b}-b \\
& \Rightarrow \quad \frac{1}{a+b}\left[\frac{2 a d x}{a-5}-\frac{2 a c y}{a-b}-2 a\right]-0 \\
& \Rightarrow \quad \frac{2 a b x}{a-b}-\frac{2 a c y}{z-b}+2 a=0 \\
& \Rightarrow \quad \frac{2 a b x-2 a c y-7 a(a-b)}{3-b}=0 \\
& \Rightarrow \quad 2 a b x-2 a c y-2 y(\equiv-b)=0
\end{align*}
\]

Solve nach of the following systomn of equations by them method of cross muls spization:
\((a-b) x+(a+b) y-2 a^{2}-2 n^{2}\)
\((a+b)(x+y)-4 a b\)

\section*{Solution}

The given system of sodetion is
\[
\begin{align*}
& (a-b) x+(a+b) y-2 a^{2}-3 b^{2} \\
& (7+b)(x+v)=7 a b \tag{ii}
\end{align*}
\]

From equaku() , we ges
\[
\begin{align*}
& (a-b) x+(a+D) y-\left(2 a^{2}-2 b^{2}\right)=0 \\
= & (a-b) x+(a+b) v-2\left(7^{2}-D^{2}\right)=0
\end{align*}
\]

From eqsoun(i), ve oet
\[
\begin{equation*}
(j+b) k+(e+b) F-4 a b-0 \tag{i}
\end{equation*}
\]

Hera,
\[
\begin{aligned}
& a_{1}-2-b, b_{2}-a+b_{,} c_{3}-2\left\{a^{2}-c^{2}\right) \\
& a_{2}-a+b, a_{2}=a+b \text { and } c_{2}=-4 a b
\end{aligned}
\]

Ey zross-nuidalicabon, we get
\[
\equiv \frac{x}{2(p+b)\left(7^{2}-b^{2}-2 a b\right)}{ }^{2} \frac{-y}{2(a-b)\left(a^{2}+b^{2}\right)}=\frac{1}{-2 b(a+b)}
\]

Now,
\[
\frac{y}{\left.2(a+t) \mid z^{2}-b^{2}-2 a b\right) \mid}-\frac{1}{-22(a+b)}
\]
\[
=x-\frac{2(a+b)\left(a^{2}-b^{2}-2 a b\right)}{-2 b(a+b)}
\]
\[
\Rightarrow \quad x=\frac{x^{2}-b^{2}-2 a b}{-t}
\]
\[
\Rightarrow \quad x=\frac{-a^{2}+b^{2}+2 a b}{b}
\]
\[
-\frac{33 t-a^{2}+b^{2}}{a}
\]

Now,
\[
\begin{aligned}
& \frac{-y}{2(a-b)\left(a^{2}+b^{2}\right)}+\frac{1}{-\frac{a b}{\{ }(a+b)} \\
& \Rightarrow \quad-y=\frac{2(a-b)\left\{a^{2}+b^{2}\right)}{-2 b(a+b)} \\
& \Rightarrow \quad x=\frac{(a-b)\left(a^{2}+b^{2}\right)}{b(a+b)}
\end{aligned}
\]
\[
\text { Hence, } x-\frac{2 a b-\vec{d}^{2}+b^{2}}{b}+x=\frac{(i-b)\left(a^{2}+b^{2}\right)}{b(a+b)} \text { is the sointion of the given fysten of gquations }
\]
\[
\begin{aligned}
& \Rightarrow \quad \frac{x}{-4 a b(a+b)+2\left(a^{2}-D^{2}\right)(z+b)}-\frac{-y}{-4 a t(z-b)+2\left(a^{2}-b^{2}\right)(z+b)}-\frac{1}{(a-b)(z+b)-(a+b)(3+b)} \\
& =\frac{x}{2(a+b)\left[-2 a b+a^{2}-b^{2}\right]}=\frac{-4}{-4 a b(a-b)+2[(a-b)(a+b)](2-b)}-\frac{1}{(z+b)[(a-b)-(a+b)]} \\
& =\frac{-\lambda}{2(a-b)\left(z^{2}-b^{2}-2 a b\right)}{ }^{=} \frac{a}{2(a-b)[-2 a b+(a+b)(a+b)]^{*}} \frac{1}{(a+b)[a-b-a-b]} \\
& 3 \quad \frac{x}{2(a+b)\left(a^{2}-b^{2}-2 a b\right)}<\frac{-r}{2(a-b)\left[-3 b+\left(a^{2}+b^{2}+2 a b\right)\right]}-\frac{1}{(a+b)(-a b)}
\end{aligned}
\]
```

Solve each of the foliowing systems of equators by teemethod
af crass-mulzplicationt
a
b}\mp@subsup{b}{}{2}x+\mp@subsup{z}{}{2}y=\mp@subsup{q}{}{2

```

\section*{Solution}

The given sustem 万f equations mav be witten as
\[
\begin{aligned}
& a^{2} x+b^{2} y-z^{2}=0 \\
& b^{2} x+a^{2} y-d^{2}=0
\end{aligned}
\]

Hurn，
\[
\begin{aligned}
& \xi_{1}-a^{2}, b_{1}-b^{2}, c_{1}-+c^{2} \\
& \xi_{2}-b^{2}, b_{2}-a^{2} \text {, and } c_{2}--\phi^{2}
\end{aligned}
\]

餉 crossmultiplication，we have
\(\Rightarrow \quad \frac{x^{1}}{-b^{2} d^{2}+a^{2} c^{2}}=\frac{-y}{-z^{2} c^{2}+B^{2} c^{2}}=\frac{1}{z^{4}-b^{4}}\)
Nowi
\[
\begin{aligned}
& \frac{x}{-b^{2} a^{2}+a^{2} c^{2}}=\frac{1}{a^{2}-b^{4}} \\
& \Rightarrow \quad \pi-\frac{a^{2} c^{2}-b^{2} y^{2}}{\vec{a}^{4}-b^{4}} \\
& \text { ar-dy } \frac{-y}{-a^{2} d^{2}+b^{2} c^{2}}=\frac{1}{a^{4}-b^{4}} \\
& \Rightarrow \quad-y=\frac{-a^{2} d^{2}+b^{2} c^{2}}{a^{4}-b^{4}} \\
& =\quad y=\frac{a^{2} d^{2}-b^{2} c^{2}}{d^{4}-b^{4}}
\end{aligned}
\]

Hence，तt \(-\frac{a^{2} c^{2}-b^{2} d^{2}}{a^{4}-b^{4}},-\frac{a^{2} d^{2}-b^{2} z^{2}}{a^{4}-b^{2}}\) is the soluticn of tre yver sestem of the equation玉：

\section*{Q22}
 of crassimultiplication：
\(a N+b y=\frac{a+b}{2}\)
\(3 y+5 y=4\)

\section*{Solution}

The ghen syatem of equatons is
\[
\begin{align*}
& a x+b y=\frac{a+b}{2} \\
& 3 x+5 y=4
\end{align*}
\]

Eram (i). we get
\[
\begin{gathered}
2(a x+b y)=a y 0 \\
e 2 a v+2 b y-(z+b)=0
\end{gathered}
\]
-fiij

From (i), we get
\[
\begin{equation*}
3 x+5 y-+=0 \tag{iv}
\end{equation*}
\]
there.
\[
\begin{aligned}
& a_{1}-2 y_{1} b_{1}-2 b_{1}, c_{1}-(a+b) \\
& a_{2}=p_{1} b_{2}-3_{1} g_{2}--4
\end{aligned}
\]

By cross-multplication, we have

\section*{Q23}
\[
\begin{aligned}
& \text { Solve each of the follosing syetems } 5 \text { of eguations by themetrod } \\
& \text { of वross-mul splization: } \\
& 2(a x-b y)+3+4 k=0 \\
& 2\{(2 x+z y)+b-4 z=0
\end{aligned}
\]

\section*{Solution}
\[
\begin{aligned}
& \frac{-y}{-5 a+3 b}-\frac{1}{10 a-6 b} \\
& =\quad-y=\frac{-5 a+3 b}{2(5 a-3 b)^{2}} \\
& \Rightarrow \quad y=\frac{-(-5 v+3 b)}{2\{5 z-3 b)} \\
& =\frac{3 a-3 b}{2(5 a-3 b)} \\
& \Rightarrow \quad y-\frac{1}{2} \\
& \text { Hance, } x-\frac{1}{2}, y-\frac{1}{2} \text { is the sqlisiun of the given fox com of equatiatis }
\end{aligned}
\]
\[
\begin{aligned}
& =\frac{x}{2 b \times(-4)-[-(x+b)] \times=}=\frac{4 y}{2 a \times(-4)-[-(-1+b)] \times 3}=\frac{1}{2-5-2 b \times 3} \\
& =\frac{x}{-80+5(a+\theta)}=\frac{-y}{-8 a+3(a-b)}=\frac{1}{10 a-66} \\
& \Rightarrow \quad \frac{x}{-B t+5 a-5 b b}-\frac{-y}{-C a+3 a+3 b} \cdot \frac{1}{10 a-6 b} \\
& \Rightarrow \quad \frac{1}{5-70}-\frac{4 y}{-5 y+3 b}-\frac{1}{2012+50} \\
& \text { Now, } \\
& \frac{x}{5 z-3 b}=\frac{1}{10 a-5 t} \\
& \Rightarrow \quad x-\frac{5 a-30}{107-E 8}-\frac{5 a-36}{2(5 a-30)}-\frac{1}{2} \\
& \text { ent }
\end{aligned}
\]

The 号ven systern of Equatons \(133 y\).be written as
\[
\begin{aligned}
& 2 a x-2 b y-a+4 b=0 \\
& 3 b+5 a y+b 1-4 a-0 \\
& a_{1}-2 a, b_{1}--2 b, c_{1}=a+4 b \\
& a_{2}-2 b, b_{2}-2 a, c_{2}-b-4 a
\end{aligned}
\]

Herais

3 y crostemiatpleation, wot hiave
\[
-\frac{-1}{2}
\]
abad

Hence, \(x=\frac{-1}{2}, y=2\) in the sofution of the oiker system or the eqiations.

Q24
```

Solve esd= of the following system इof:equations ty tremetnod
of crosi-mulfiplicstion:
s(ax+by)=3a+2b
5(bx-3)

```

\section*{Solution}
\[
\begin{aligned}
& \frac{y}{8 \cdot y^{2}-8 v^{2}}-\frac{1}{4 y^{2}+4 b^{2}} \\
& \Rightarrow \quad-y=\frac{-a z^{2}-c b^{2}}{4 a^{2}+4 b^{2}} \\
& =\quad-y-\frac{-B\left(a^{2}-b^{2}\right)}{4\left(a^{2}+b^{2}\right)} \\
& =\quad-y=\frac{-8}{4} \\
& \Rightarrow \quad y=z
\end{aligned}
\]
\[
\begin{aligned}
& =(\overline{-5})(b-4 y)-(2 a)(2+4 b) \quad \frac{x}{(2 a)(b-4)-(2 h)\left(x^{2}+4 b\right)}-\frac{1}{4 z^{2}+4 b^{2}} \\
& \Rightarrow \quad \frac{x}{-2 t^{2}+8 a b-2 A^{2}-8 a t}-\frac{-y}{2 a b-6 t^{2}-2 a t-8 t^{2}}-\frac{2}{4 a^{2}+4 b^{2}} \\
& \Rightarrow \quad \frac{x}{-2 a^{2}-2 b^{2}}=\frac{-4}{-a a^{2}-a b^{2}} * \frac{1}{4 a^{2}+4 b^{2}} \\
& \text { Now. } \\
& \frac{x}{-2 a^{2}-2 b^{2}} \cdot \frac{1}{4 a^{2}+4 b^{2}} \\
& =\quad>-\frac{-2 a^{2}-2 b^{2}}{4 z^{2}+2 t^{2}} \\
& =\frac{-2\left[a^{2}-\theta^{2}\right]}{a\left(a^{2}+b^{2}\right\}}
\end{aligned}
\]

The given system of equations it
\[
\begin{array}{ll}
0(a x+b y)-3 a+2 b & =-1 \\
b(a x-a y)-3 b-2 a &
\end{array}
\]

From equation (i), we get
\[
6 a v+6 b y-\{2 a+2 b\}=0 \quad \text { - } i i\rangle
\]

From equation fii), we.get
\[
6 b x-5 a y-\{3 p-2 a\}=0 \quad-\{i v\}
\]

Herg.
\[
a_{1}-b a_{1}, b_{7}-\left(b, c_{1}--(3 a+2 b)\right.
\]
\[
\partial_{2}-6 b, b_{2}--6 d_{1} \text { and } c_{2}=-(30-2 \Rightarrow)
\]

By cross-muthpication, wernave

Now,
\[
\frac{x}{-10^{2}\left(z^{2}+b^{2}\right\}}=\frac{-1}{a 6\left\{a^{2}+b^{2}\right\}}
\]
\[
=x=\frac{18\left(a^{2}+b^{2}\right)}{36\left(b^{2}+b^{2}\right)}
\]
\[
-\frac{1}{2}
\]
and,
\[
\left.\frac{y}{12\left(y^{2}+b^{2}\right)}\right)^{2} \frac{1}{36\left(z^{2}+t^{2}\right)}
\]
\[
\Rightarrow \quad y=\frac{12\left|\partial^{2}+b^{2}\right|}{36\left\{\partial^{2}+a^{2}\right\}}
\]
\[
\Rightarrow \quad y-\frac{1}{3}
\]

Hence, : \(=\frac{1}{2}, y=\frac{1}{3}\) is tie selution of the given system of equatiurs

\section*{Q25}

Golver bach of then folipwing systam s of equation by the thetriad of eross-mbloplitation:
\[
\begin{aligned}
& \frac{a^{2}}{x}-\frac{b^{2}}{y}=0 \\
& \frac{a^{2} b}{x}+\frac{b^{2} a}{y}=a+A^{2}, W_{i} y=0
\end{aligned}
\]
\[
\begin{aligned}
& \frac{x}{-6 b(3 b-2 a)-6 a(3 a+2 b)}=\frac{-y}{-6 a(3 b-2 \theta)+6 b(3 a+2 b)}=\frac{1}{-26 a^{2}-3 b b^{2}} \\
& 3 \quad \frac{x}{-1 A b^{2}+12 a b-18 a^{2}-12 a b b}-\frac{-y}{-18 a b+12 a^{2}+10 a b 1+12 b^{2}}-\frac{1}{\left.-36 b^{2}+b^{2}\right)} \\
& =\frac{x}{-18 a^{2}-18 b^{2}}+\frac{-y}{12 a^{2}+52 b^{2}}=\frac{1}{-36\left(a^{2}+b^{2}\right)} \\
& \geqslant \frac{x}{-18\left(a^{2}+b^{2}\right)}-\frac{-y}{12\left(a^{2}+b^{2}\right)}-\frac{-1}{36\left(a^{2}+s^{2}\right)}
\end{aligned}
\]

Taking \(\frac{1}{x}+u\) and \(\frac{1}{y}=x\). Taen, the given syitem of equations become
\[
\begin{aligned}
& a^{2} 1-b^{2}-b \\
& a^{2} b_{1}+b^{2} a v-(a+b)-0 \\
& a_{1}-a^{2}, b_{1}--b^{2}, c_{1}-b \\
& a_{2}-a^{2} b_{1}, b_{2}-b^{2} a_{1} \text { and } c_{2}-(a+b)
\end{aligned}
\]

Нल्धा
sy-crose-multiplication, we nave
\[
\begin{aligned}
& =\frac{u}{b^{2}(a+b)-0 \times b^{2} a}=\frac{4}{-a^{2}(a+b)-0 * a^{2} b}=\frac{1}{a^{2} b^{2}+a^{2} b^{2}} \\
& =\quad \frac{4}{b^{2}(a+b)}-\frac{4}{a^{2}(a+b)}-\frac{1}{a^{2} b^{2}(a+b)} \\
& \text { Now }
\end{aligned}
\]
\[
\frac{a}{b^{2}(a+b)}-\frac{1}{a^{2} b^{2}(a+b)}
\]
\[
=\quad u=\frac{b^{2}(a+b)}{a^{2} b^{2}(a+b)}
\]
\[
\Rightarrow \quad u-\frac{1}{a^{2}}
\]

वर्ना
\[
\frac{v}{a^{2}(a+b)}-\frac{1}{a^{2} b^{-2}(a+b)}
\]
\[
\Rightarrow \quad v=\frac{a^{2}(a+b)}{a^{2} a^{2}(a+b)}
\]
\[
=\quad y=\frac{1}{\theta^{2}}
\]

Now,
\[
x-\frac{1}{6}=3^{2}
\]
\(\mathrm{arg}_{\mathrm{H}}\)
\[
y=\frac{1}{y}-b^{2}
\]

Hence, \(x=a^{2}, y-b^{2}\) is the volution of the given syetem of equatons.

\section*{Q26}

Solve each of the following zystems of equaterge by the metrod of cross-multplipation:
\(m x-n y=m m^{2}+n^{2}\)
\(x+y-2 m\)

\section*{Solution}

The given system of eqGationsmay be whitten as
\[
\begin{aligned}
& 1 z e x-12 y-\left(m r^{2}+1 i^{2}\right)=0 \\
& x+y-2 m-0
\end{aligned}
\]

Hown
\[
\begin{aligned}
& a_{1}=m_{1} b_{1}=-r_{1} \cdot r_{1} \cdots\left\{m^{2}+n^{2}\right) \\
& \xi_{7}=I_{1} b_{2}=I_{1} \text { and } c_{y}=-2 m
\end{aligned}
\]

Q y cross-mulsiplication, we have
\[
\frac{x}{3 m n+\left(m^{2}+n^{2}\right)}-\frac{y}{-2 m^{2}+\left(m^{2}+n^{2}\right)}-\frac{1}{m+n}
\]
\(=\frac{x}{2 m m+m^{2}+m^{2}}-\frac{-m}{-m^{2}+r^{2}}-\frac{1}{m+\pi}\)
\(\Rightarrow \quad \frac{x}{(m+n)^{2}}=\frac{-r}{-m^{2}-n^{2}}=\frac{1}{m+m}\)
Now,
\[
\begin{aligned}
& \frac{x}{(m+n)^{2}}-\frac{1}{m+n} \\
\Rightarrow & x=\frac{(m+n)^{2}}{m \pi+n} \\
\Rightarrow \quad & x=m+n
\end{aligned}
\]
and:
\[
\frac{-\mu}{-m^{2}+n^{2}}=\frac{1}{m+n}
\]
\[
=\quad-y=\frac{-m m^{2}+n^{2}}{m+n}
\]
\[
\Rightarrow \quad r-\frac{m^{2}-n^{2}}{m+n}
\]
\[
\Rightarrow \quad y=\frac{(m-n)(m+n)}{m+n}
\]
\[
\Rightarrow \quad y+m-n
\]

Hancencx \(-m=n, y=m-\pi\), 5 the solutinn of the gryen wastum of equations

\section*{Q27}

Eblve each of the following systeni i of equatons by them ethod of crons-r. uitupicationt
\[
\begin{aligned}
& \frac{a y}{b}-\frac{b y}{7}=a+b \\
& w-b y-2 a b
\end{aligned}
\]

\section*{Solution}

Tise giveri zy zterm of equationis may be written as
\[
\begin{aligned}
& \frac{a}{b}=x-\frac{b}{a} \times y-(a+b)=b \\
& a x-b y-2 a b=2 \\
& a_{1}=\frac{b}{b}, b_{1}=-\frac{b}{a}, c_{1}=-(a+b) \\
& a_{2}-a_{1}, b_{2}=-b_{1} \text { and } c_{2}=-2 a b
\end{aligned}
\]

He:E:

By cross-multiplifition, wo hare
\[
\begin{aligned}
& \frac{x}{\frac{b}{a} \times 2 a b-b(a+b)}=\frac{-y}{\frac{a}{b} \times(-2 a b)-a(a+b)}=\frac{1}{-b \times \frac{a}{b}+\frac{b}{a} \times \frac{a}{a}} \\
= & \frac{x}{b^{2}-a b-b^{2}}-\frac{-y}{-2 b^{2}+a^{2}+a b}-\frac{1}{-a+b} \\
= & \frac{x}{b^{2}-a b}=\frac{-y}{-a^{2}+a b}-\frac{1}{-a+b} \\
= & \frac{x}{b(b-a)}-\frac{-y}{2(-2+b)}-\frac{1}{b-a}
\end{aligned}
\]

Now
\[
\begin{aligned}
& \quad \frac{A}{b(b-a)}-\frac{1}{b-a} \\
& =\quad x=\frac{b(b-a)}{b-a}=b \\
& \text { and }
\end{aligned}
\]
\[
\frac{-y}{a(b-z)}-\frac{1}{b-a}
\]
\[
=\quad \Rightarrow=\frac{a(b-a)}{b-a}
\]
\[
\begin{array}{ll}
= & y<a \\
= & v=a
\end{array}
\]

Herioe, \(x-b, y--3\) ie the solution of the givenizyelem of equations:

\section*{Q28}

Solve esch of the folfering syztern of equatione by the method of crosermul tpilicatiant
\(\frac{b}{a} x+\frac{a}{b} y=a^{2}+b^{2}\)
\(x+y-2 a b\)

\section*{Solution}

The given system of cquatienh may bu written as
\[
\begin{aligned}
& \frac{b}{a} x+\frac{a}{b} y-\left(e^{2}+b^{2}\right)=0 \\
& x+y-2 a b=0
\end{aligned}
\]

Heres
\[
\begin{aligned}
& a_{2}=\frac{b}{a}, t_{1}=\frac{d}{b}, t_{1}-\left(a^{2}+b^{2}\right) \\
& a_{2}=1, b_{2}=1, \text { and } c_{2}=-2 a b
\end{aligned}
\]

By cross-mulsiplitstran, verehave
\[
\begin{aligned}
& \frac{r}{-2 a b \times \frac{a}{b}+a^{2}+b^{2}}=\frac{\frac{a y}{-2 a b \times \frac{b}{a}+a^{2}+b^{2}}}{-\frac{1}{\frac{b}{a}-\frac{z^{2}}{b}}} \\
= & \frac{x}{-2 a^{2}+a^{2}+b^{2}}=\frac{-y}{-2 b^{2}+a^{2}+b^{2}}=\frac{1}{\frac{b^{2}-a^{2}}{a b}} \\
= & \frac{x}{b^{2}-a^{2}}-\frac{-y}{-b^{2}+a^{2}}-\frac{1}{\frac{b^{2}-a^{2}}{a b}}
\end{aligned}
\]

Nown
\[
\begin{aligned}
& \frac{x}{b^{2}-a^{2}}-\frac{1}{\frac{a^{2}-a^{2}}{a b}} \\
&=\quad x-a^{2}-a^{2} \times \frac{a b}{a^{2}-a^{2}} \\
&= x-a b \\
& \text { anay } \\
& \frac{-x}{-b^{2}+a^{2}}-\frac{1}{b^{2}-\frac{y^{2}}{a}} \\
&=-y=-b^{2}+a^{2} x \frac{a b}{a^{2}-a^{2}} \\
&=-y=-\left(b^{2}-a^{2}\right) / \frac{a b}{b^{2}-a^{2}} \\
&=-y=-a b \\
&= y=a b
\end{aligned}
\]


\section*{Exercise 3.5}

Q1

Determine whether the following system has a unique solution, no solution or infinitely many solutions. In case there is a unique solution, find it:
\(x-3 y=3\)
\(3 x-9 y=2\)

\section*{Solution}

The qiver systen of \(\exists\) quations in ay te wnitan as
\[
\begin{aligned}
& x-3 y<3-0 \\
& 3 x-9 y-2-0
\end{aligned}
\]

The gived systen of equations is of the form
\[
a_{1} v+b_{1} y+c_{2}=0
\]
\[
a_{2} x+c_{2} y r+c_{2}=0
\]
```

Whats, क, -1, b

```
and. \(i_{2}-3, b_{2}=-0, c_{2}=-2\)

Wミheves
\[
\frac{w_{1}}{d_{2}}-\frac{1}{3}
\]
\[
\frac{\partial_{1}}{b_{2}}=\frac{-3}{0}=\frac{1}{3}
\]
\[
\text { anc. } \quad \frac{b_{1}}{c_{3}}=\frac{-3}{-2}=\frac{3}{2}
\]

Clearly, \(\frac{a_{2}}{a_{2}}=\frac{b_{1}}{b_{2}}+\frac{c_{1}}{c_{2}}\)
So, the givan systen of equarons nas ho solutions.

Q2


Solution

The given system of equaticesmay de writtan ins
\[
\begin{aligned}
& 2 x+y-5-9 \\
& 4 x+2 y-10=0
\end{aligned}
\]

The given sisstem of equaticos is iof the form
\[
\begin{aligned}
& a_{2} x+b_{2} y+c_{1}=0 \\
& a_{2} x+b_{2} y+c_{2}=0
\end{aligned}
\]

Wanditi \(_{2} a_{3}-2 b_{1}-1_{1} \quad c_{1}-45\)
and \(\quad a_{2}-4, b_{2}-2, F_{2}=-10\)
We have,
\[
\begin{aligned}
& \frac{B_{1}}{y_{2}}=\frac{2}{4}-\frac{1}{2} \\
& \frac{b_{7}}{b_{2}}=\frac{1}{2}
\end{aligned}
\]
anc, \(\quad \frac{m_{2}}{c_{2}}=\frac{-\xi}{-10}=\frac{1}{2}\)
clearly, \(\frac{a_{1}}{s_{2}}=\frac{b_{1}}{b_{2}}=\frac{b_{1}}{c_{2}}\)
So, the gryen zy \(\begin{gathered}\text { term of equations has nninitely many solumons. }\end{gathered}\)

\section*{Q3}

Determine whether the following system has a unique solution, no solution or infinitely many solutions. In caseythere is a unique solution, find it: \(3 x-5 y=20\)
\(6 x-10 y=40\)

\section*{Solution}
\(3 x-5 y=20\)
\(6 x-10 y=45\)
Cumpareit with
\(\mathrm{a}_{1} 11+\mathrm{b}_{2} y+\mathrm{c}_{3}=0\)
\(\mathrm{s}_{2} 11+\mathrm{b}_{2} \mathrm{~V}+\mathrm{c}_{2}=9\)
Wシ get
\(B_{2}=2, \quad b_{2}=-5_{1}\), and \(c_{1}=-20\)
\(\mathrm{a}_{2}=6, \quad \mathrm{~b}_{2}=-10\) and \(c_{2}=-40\)
\(\frac{\bar{y}_{1}}{a_{2}}=\frac{3}{5}, \frac{b_{1}}{b_{2}}=\frac{-5}{-10}\), and \(\frac{a_{1}}{c_{2}}=\frac{-20}{-40}\)
Simpiffangit we get
\(\frac{\bar{T}_{1}}{a_{2}}=\frac{1}{2}, \frac{b_{1}}{b_{2}}=\frac{1}{2}\), inल \(\frac{c_{1}}{c_{2}}=\frac{1}{2}\)
Hence
\(\frac{a_{1}}{D_{7}}=\frac{D_{1}}{b_{2}}=\frac{C_{1}}{c_{2}}\)
Soboth linems are cuincident and avetlap with Eachother
Sc it vill have infinite or manysolutions

\section*{Q4}

Determine whether the following system has a unique solution, no solution or infinitely many solutions. In case there is a unique solution, find it:
\(x-2 y=8\)
\(5 x-10 y=10\)

\section*{Solution}

The given system of equanons may be written as
\[
\begin{aligned}
& x-2 y-8-c \\
& 5 x-10 y-10=0
\end{aligned}
\]

The qu:n systom of equarons is of the firm
\(a_{1} y+b, y+c_{1}=0\)
\(c_{2} x+b_{2} y+c_{2}-\theta\)
(4) мिए, \(a_{2}-1_{1} \quad b_{1}--2, r_{1}--3\)
arch, \(\dot{\sigma}_{2}=5, b_{2}=-10, \hat{c}_{2}=-10\)
Wミhave,
\[
\begin{aligned}
& \frac{a_{1}}{3_{2}}-\frac{1}{5} \\
& \frac{t_{1}}{b_{2}}=\frac{-2}{-10}-\frac{1}{5}
\end{aligned}
\]

आrci. \(\frac{c_{1}}{C_{2}}=\frac{-0}{-10}=\frac{4}{5}\)

Cleary. \(\frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}}+\frac{c_{1}}{c_{2}}\)
So, the givan systar of equatons has no sulution.

\section*{Q5}

Find the value of \(k\) for which the following system of equations has a unique solution:
\(k x+2 y=5\)
\(3 x+y=1\)

\section*{Solution}

The givino syoteiti of oquations is
\[
\begin{aligned}
& k x+2 y-5=0 \\
& 3 v+y-1=0
\end{aligned}
\]

This systern af iequationsis if the form
\[
\begin{aligned}
& 3_{y} z+b_{1} y+c_{1}=0 \\
& 3_{2} x+b_{z} y+c_{z}=0
\end{aligned}
\]

Where, \(B_{1}-k_{i}, b_{1}-2, c_{1}<-5\)
and, \(a_{2}=3, b_{2}=1, c_{2}=-1\)
For a uniguo solution, we must have
\[
\begin{array}{r}
\frac{a_{1}}{d_{2}}=\frac{b_{1}}{b_{2}} \\
=\frac{k}{3}=\frac{2}{1} \\
x<6=
\end{array}
\]

So, the givan इए5tam of equation will hava ق uligue solution for all real valuきs of \(x\) other than 5.

Q6

\footnotetext{
Find the value of \(k\) for which the following system of equations has a unique solution:
}
\[
\begin{aligned}
& 4 x+k y+8=0 \\
& 2 x+2 y+2=0
\end{aligned}
\]

\section*{Solution}

Here \(a_{2}-4_{1} a_{2}-k_{1}, b_{1}-2, b_{2}-2\).
Now for the given pair to have a unique solution: \(\frac{a_{1}}{a_{2}}<\frac{b_{2}}{b_{2}}\)
1.e), \(\frac{4}{2}+\frac{1}{2}\)
in.. 1.4
Therefore, for al values of ki enicopl 4, the quyen pair of oquations will have a utique folution

\section*{Q7}

Find the value of \(k\) for which the following system of equations has a unique solution:
\(4 x-5 y=k\)
\(2 x-3 y=12\)

\section*{Solution}

The given system at apdations is
\[
\begin{aligned}
& 4 x-5 y-k=0 \\
& 2 x-2 y-12=0
\end{aligned}
\]

This sysiem of aquations is of the form
\(a_{2} x+D_{y} y+c_{3}=0\)
\(3_{2} x+b_{1} y+c_{2}=0\)
Where, \(a_{1}-4, b_{1} *-\frac{5}{2}, c_{1}+-1\)
anc: \(a_{2}+2, b_{2}=-3, c_{2}=-12\)
Fiar a unigue solution, ver murt have
\(\frac{\partial_{1}}{\partial_{2}} \rightarrow \frac{b_{1}}{b_{2}}\)
\(\frac{0}{2} \times \frac{-5}{-2}\)
- if any real number.

So, the gyen system cf equavone will have a urigus golltion for all real vaues of K.

Q8

Find the value of \(k\) for which the following system of equations has a unique solution:
\(x+2 y=3\)
\(5 x+k y+7=0\)

\section*{Solution}

The qiven spotem of equations is
\[
\begin{aligned}
& x+2 y-3=0 \\
& 5 x+k y+7=0
\end{aligned}
\]

This systum af aquations is of the form
\[
\begin{aligned}
& a_{1} x+b_{1} y+c_{1}=0 \\
& a_{2} x+b_{2} y+c_{2}=0
\end{aligned}
\]

Where, \(a_{2}-1, b_{1}-2, b_{1}--3\)
aलd, \(a_{2}-5, \mathrm{~b}_{2}-k \cdot c_{2}=7\)

For a unique sblution, we enust hive
\[
\begin{aligned}
& \frac{a_{1}}{d_{2}} \geqslant \frac{b_{i}}{b_{2}} \\
=\quad & \frac{1}{5}+\frac{2}{x} \\
=\quad & k+10
\end{aligned}
\]

So, the given system of equations will have a ungue solution for all real valueg of 4 other than 10.

\section*{Q9}

Find the value of k for which the following systems of equations have infinitely many solutions: \(2 x+3 y-5=0\)
\(6 x+k y-15=0\)

\section*{Solution}

The given systen' of equations is
\[
\begin{aligned}
& 2 x+3 y=5-0 \\
& 5 x+4 y-15-0
\end{aligned}
\]

This system of equationsite of the form
\[
\begin{aligned}
& a_{1} x+b_{2} y+c_{1}=0 \\
& a_{2} x+b_{y} y+c_{2}-0
\end{aligned}
\]
\[
\begin{aligned}
& \text { Where, } a_{1}-2, b_{1}=2, c_{2}-5 \\
& \text { anchy } \text { on }_{2}-6, b_{2}-k, c_{2}=-15
\end{aligned}
\]

For intinitoly many solutions, wa must have
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{b_{i}}{b_{2}}=\frac{c_{1}}{\sqrt{2}} \\
\Rightarrow \quad & \frac{2}{6}-\frac{3}{N}=\frac{-5}{-15}
\end{aligned}
\]

Now,
\[
\begin{aligned}
& \frac{2}{6}=\frac{3}{k} \\
\Rightarrow \quad & 2 k-88 \\
\Rightarrow \quad & k+\frac{10}{2}=9
\end{aligned}
\]

Hence, the ofven system of equations wil haveinfintely many solutions; if \(\mathrm{Cl}-9 \mathrm{a}\)

Q10

Find the value of k for which the following systems of equations have infinitely many solutions:
\(4 x+5 y=3\)
\(k x+15 y=9\)

\section*{Solution}

The given syssem of equations may be wintten as
\[
\begin{aligned}
& 4 x+3 y-3-0 \\
& k x+15 y-9-0
\end{aligned}
\]

Thiseystem of equations ia of the form
\[
\begin{aligned}
& a_{y} x+c_{1} y+c_{y}=0 \\
& a_{2} x+c_{y} y+c_{2}=0
\end{aligned}
\]

Where, 斿 \(=4, b_{1}-5 c_{1} c_{1}--2\)
and, \(m_{2}-f_{1}, b_{2}-15, c_{2}--9\)
For infinitaiy max solutens, 00 o must have
\[
\begin{aligned}
& \frac{a_{1}}{d_{2}}=\frac{D_{1}}{D_{2}}=\frac{c_{1}}{c_{2}} \\
= & \frac{4}{A}-\frac{5}{15}=\frac{-3}{-3}
\end{aligned}
\]

How,
\begin{tabular}{ll} 
& \(\frac{4}{k}=\frac{s}{15}\) \\
\(=\) & \(\frac{4}{k}-\frac{1}{3}\) \\
\(=\quad\) & \(k=12\)
\end{tabular}

Hence, the given systan of eovations wil nave infinitaly many solutions, \(11 / k-12\)

\section*{Q11}

Find the value of \(k\) for which the following systems of equations have infinitely many solutions:
\(k x-2 y+6=0\)
\(4 x-3 y+9=0\)

\section*{Solution}

The given system of equations is
\[
\begin{aligned}
& 2 x-2 y+5-0 \\
& 4 x-3 y+9-0
\end{aligned}
\]
this systerr of equations is of the form
\[
\begin{aligned}
& a_{1} r+b_{1} y+c_{2}=0 \\
& b_{2} x+b_{2} y=c_{2}=1
\end{aligned}
\]

Where, \(a_{1}=k, b_{1}=-2, c_{1}=6\)
ars. \(\xi_{2}=4, D_{2}=+3, c_{2}=\xi\)
Far infinitely many solution, we must havé
\[
\begin{aligned}
& \frac{\partial_{1}}{a_{2}}-\frac{b_{1}}{D_{2}}-\frac{c_{2}}{\sigma_{2}} \\
\Rightarrow \quad & \frac{1}{4}=\frac{-2}{-3}=\frac{6}{9}
\end{aligned}
\]

Now
\[
\begin{aligned}
& \quad \frac{k}{4}=\frac{8}{9} \\
& =\quad \frac{k}{4}=\frac{3}{3} \\
& \Rightarrow \quad k=\frac{2 \times 4}{3} \\
& =\quad k=\frac{8}{3}
\end{aligned}
\]

Hence, the given sygtern of equationa'vell havalinfinitaly many solutions;
1 \(14=\frac{\mathrm{H}}{3}\)

Find the value of k for which the following systems of equations have infinitely many solutions:
\(8 x+5 y=9\)
\(k x+10 y=18\)

\section*{Solution}
\[
\text { Whare, } a_{2}-a_{1} h_{i}-\xi_{j} c_{7}=-3
\]
\[
\text { anc, } \quad i_{2}-2, b_{2}-10, c_{2}=-10
\]

For infirutaly mariy solution, we must have
\[
\begin{aligned}
& \frac{3_{1}}{\#_{2}}=\frac{b_{1}}{b_{2}}-\frac{c_{1}}{C_{2}} \\
=\quad & \frac{B_{1}}{R}-\frac{5}{10}=\frac{-9}{-10}
\end{aligned}
\]
Now,
\[
\frac{8}{k}-\frac{5}{10}
\]
\[
=8 \times 10-5 \pi k
\]
\[
\equiv \quad \frac{8 \times 10}{5}-k
\]
\[
=\quad k-8 * 2-16
\]

if \(k\) - 16 .
\((k+2) x-(2 k+1) y=3(2 k-1)\)

\section*{Solution}
\[
\begin{aligned}
& \text { The given system of equations is } \\
& \text { + } 2 x+5 y-9=0 \\
& d x+10 y-1 E-6 \\
& \text { This systam of equations is of the farm } \\
& a_{1} x+b_{1} y+c_{1}=0 \\
& a_{2} x+A_{y} y+c_{z}=0
\end{aligned}
\]
```

The given scestem of equations reay be ar tten an
$2 x-3 y-7=0$
$(k+2) x-(2 k-1) y-3)(2 k-1)=0$
This syEtam of equationis is of the form
$3_{1} x+b_{4} x+c_{1}=0$
$\Delta_{2} x+b_{2} z+c_{2}=0$
Wharrata $a_{1}-2, b_{1}=-3, c_{1}-77$
and, $\quad \dot{j}_{2}-t+2 b_{2}-(2 v-1), s_{2}-2 \frac{2}{2}(-1)$

```

For infinitely many solution, we must have
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{3}}-\frac{c_{1}}{c_{2}} \\
& \Rightarrow \frac{2}{x+2}=\frac{-3}{-\{x+1\}}=\frac{-1}{-3\{2 x-1\}}
\end{aligned}
\]
\[
\begin{aligned}
& \Rightarrow \quad 2(2 k+1)=3(k+2) \text { anc } 3 \times 3(2 k-1)=7(2 k+2) \\
& \Rightarrow \quad 4 k+2=3 k+6 \text { and } 16 k-9=54 k+7 \\
& =4 k-3 k-6-2 \text { and } 18 k-14 k-7+9 \\
& =\quad A-4 \text { and } 4 k-10 \text { つh }-4 \\
& \Rightarrow \quad K=4 \text { and } K=4
\end{aligned}
\]

Hence, the given pysture of asuation's will have infintuly many dolutors if \(k=4\).

\section*{Q14}

Find the value of \(k\) for which the following systems of equations have inflifely many solutions:
\(2 x+3 y=2\)
\((k+2) x+(2 k+1) y=2(k-1)\)

\section*{Solution}

The given system of eqtations may be writhen ale
\[
\begin{aligned}
& 2 x+3 y-2-0 \\
& (k+2) x-2 k+1) r-2(y-1)-0
\end{aligned}
\]

This syetem of equations is of the form
\[
\begin{aligned}
& b_{1} x+b_{3} y+c_{1}=0 \\
& \Delta_{2} x+b_{2} y+r_{2}=0
\end{aligned}
\]

Whye, \(\boldsymbol{b}_{1}-2, b_{1}=3_{1}, c_{5}=-2\)
anu: \(\quad c_{2}-k+2, b_{2}-(2 k+1), c_{2}--2(k-2)\)

Far infintely many solution, we must have

Hence, the goven oystatn of exuations wil have infinitaly many solubons, if: \(=4\)
\[
(k+1) x+9 y=(5 k+2)
\]

\section*{Solution}
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}} \\
& =\frac{2}{x+2}+\frac{2}{(2 k+1)}=\frac{-2}{\left.-2()^{2}-1\right)} \\
& =\frac{2}{x+2} \div \frac{3}{(2 k+1)} \text { and } \frac{3}{\left(22^{2}+1\right)} \div \frac{2}{2(x-1)} \\
& =2(2 k+1)-3(k+2) \text { and } 3(k-1)-(2 k+1) \\
& =\quad 4 k+2-3 k+\overline{5} \text { and } 3 k-3-2 \hat{2}+1 \\
& \Rightarrow \quad 4 \hat{k}-3 k=6-2 \text { anc } 3 k=3 k=1+3 \\
& =3=4 \text { and } k=-6
\end{aligned}
\]

The giveosysten pr \(\exists q u a t i o n s\) in ay tie whttan at
\[
\begin{aligned}
& x-(k+1) y-4=0 \\
& (k+1) x+9 y-(5 x-2)=0
\end{aligned}
\]

This zystem of equationsie of the form
\[
a_{1} r+b_{1} N+c_{1}=0
\]
\[
a_{2} x+b_{2} y_{i}+B_{2}-\theta
\]

Where, 首 \(-1, \quad \sigma_{1}=k+I, \quad E_{1}=-4\)
and, \(\quad a_{2}-k+1, b_{2}-9, G_{2}=\left(c_{1}+2\right)\)
Far infintely many solition, we must have

Hence, the given zystam of eccations will havalinfritely rin any folutionas if 1 - ?

\section*{Q16}

\footnotetext{
Find the value of k for which the following systems of equations have infinitely many solutions:
\(\mathrm{kx}+3 \mathrm{y}=2 \mathrm{k}+1\)
\(2(k+1) x+9 y=7 k+1\)
}

\section*{Solution}
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{1}}-\frac{c_{1}}{c_{2}} \\
& \Rightarrow \quad \frac{1}{k+1}-\frac{k+1}{9}=\frac{-4}{-(5 k+2)} \\
& =\frac{1}{k+1}=\frac{k+1}{9} \text { and } \frac{k+1}{9}-\frac{4}{5 x+2} \\
& =\quad \equiv=(k+1)^{2} \text { and }(k+1)(5 k+2)-36 \\
& =\quad 3-k^{2}+1+2 k \text { and } x^{2}+2 k+5 k+2+36 \\
& =\quad k^{2}+2 k:-1-9-0 \text { and } 5 k^{2}+7 k+2-36=0 \\
& =\quad x^{2}+2 h-8-0 \text { and } 5 x^{2}+7 h-34-0 \\
& \Rightarrow \quad k^{2}+4 k-2 x-0-0 \text { and } 5 k^{2}+17 k-10 k-34-0 \\
& =\quad k(k+4)-2(k-4)-0 \text { and } k(5 k+17)-2(5 k+17)-0 \\
& =(x+4)(x-2)-U \text { anc }(5 x+17)(k-2)=0 \\
& =(k--4 \operatorname{or} k-2) \text { and }\left(h-\frac{-17}{5} \text { or } k-2\right) \\
& =\quad \lambda-2 \text { sahsfies opth the candmans }
\end{aligned}
\]

The givedisystem of eqeations may be whtten as:
\[
\begin{aligned}
& k x+3 y-\{2 k+1\}-0 \\
& 2(k+1) x+9 y-(7 k+1)=0
\end{aligned}
\]

This system of equations is of the farm
\[
\begin{aligned}
& \dot{B}_{1} x+b_{2} y+c_{2}=0 \\
& \dot{B}_{2} x+D_{2} y+c_{2}=0
\end{aligned}
\]

and, \(\quad \dot{z}_{2}=2(k+1), \quad \sigma_{2}=9, \quad c_{z}=-(7 k+1)\)
For infritely miany solution, we must have
\[
\begin{aligned}
& \frac{a_{1}}{b_{2}}=\frac{b_{1}}{b_{2}}=\frac{c_{1}}{c_{2}} \\
& =\frac{h}{2\{(k+1)}-\frac{3}{9}-\frac{-(2)+1)}{-(7 k+2)} \\
& \Rightarrow \quad \frac{k}{2 k+1)}=\frac{3}{9} \text { and } \frac{3}{9}=\frac{2 k+1}{7 k+1} \\
& \Rightarrow \quad 3 k=3 \times 2(k+1) \text { and } 3(2 k+1)=9(2 k+1\}
\end{aligned}
\]
\[
\begin{aligned}
& =\quad 3 \mathrm{~F}-6 \mathrm{t}-6 \text { and } 23 \mathrm{x}:-28 \mathrm{P}=8-3 \\
& \text { 4. } 3 x=6 \text { and } 3<=0 \\
& =A-\frac{5}{3} \text { and } k-\frac{6}{3} \\
& =\quad A-2 \sin k=2 \\
& \equiv \quad \hat{\alpha} \text { - 2 satsfies bath the manditions }
\end{aligned}
\]

Hence, the given systea of equaticos will havainfintely manys solubens? if \(k=2\)

\section*{Q17}

Find the value of k for which the following systems of equations have infinitely many solutions:
\(2 x+(k-2) y=k\)
\(6 \mathrm{x}+(2 \mathrm{k}-1) \mathrm{y}=2 \mathrm{k}+5\)

\section*{Solution}

The given system of emuaiong may be writhan as
\[
\begin{aligned}
& 2 x+(k-2) y-k-0 \\
& 5 x+(2 x-1) y-\{2 k+5\rangle=0
\end{aligned}
\]

Thist dystom uf ecpuatinns in of the form
\[
\begin{aligned}
& a_{1} x+b_{1} y+c_{1}=0 \\
& a_{x} x+b_{y} y+c_{2}=0
\end{aligned}
\]

Whers, \(\vec{z}_{2}=2, t_{t}=k-2, c_{t}=-k\)
and, \(a_{2}-6, b_{2}-2 k-1, r_{2}--(2 k+5)\)
\[
\begin{aligned}
& \text { For infinitely many solution, we must have } \\
& \frac{b_{1}}{a_{2}}-\frac{b_{1}}{s_{2}}-\frac{c_{1}}{c_{2}} \\
& \Rightarrow \quad \frac{2}{6}=\frac{x-2}{2 k-1}-\frac{-x}{-(2 k+5)^{2}} \\
& \Rightarrow \quad \frac{2}{6}-\frac{k-2}{2 k-1} \text { and } \frac{\frac{1}{2}-2}{2 k-1}-\frac{k}{2 k+1} \\
& \Rightarrow \quad \frac{1}{3}-\frac{k-2}{2 k-1} \text { alad }(k-2)(2 k+5)=k(2 k-1) \\
& \Rightarrow \quad 2 x-1-3(k-2) \text { कार } 2 k^{2}+5 k-4 k-10=2 x^{2}-k \\
& 2 \quad 2 t-1-3 k-6 \text { and } k-20=+t \\
& =2 k-3 k-6+1 \text { and } N+N-10 \\
& =-k=-\frac{1}{-2} \cdot \operatorname{and} 2 t=10 \\
& \Rightarrow \quad k-\frac{-5}{-1} \text { and } k-\frac{10}{2} \\
& \text { \# } k-5 \text { and }<-3 \\
& \Rightarrow \quad k-5 \text { sethrfies botnthaconditions: }
\end{aligned}
\]

Hence, the given system of equations will hate Infinitely many efogrons,
Tr-5.

\section*{Q18}

Find the value of k for which the following systers of equations have infinitely many solutions:
\(2 x+3 y=7\)
\((k+1) x+(2 k-1) y=4 k+1\)

\section*{Solution}
```

The given syztem of equatorise mave written as
$2 x+3 x-7=0$
$(k+2) x+(\alpha x-3) y-(a k+3)-0$
This system of equations is of the form
$a_{1} x+b_{1} y+c_{1}=a$
$a_{x} x+2 y+c_{2}=0$
Wherib, in - $2, b_{i}-3,54=-7$
and, $a_{2}-k+1, D_{2}-2 k-1, c_{2}-(4 \hbar+1)$
For infintely many solution, wa 而usthave
$\frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}}$
$\Rightarrow \quad \frac{2}{k+1}=\frac{1}{2 k-1}=\frac{-7}{-(4 k+1)}$
$=\frac{2}{k+1}=\frac{3}{2 k-1}$ and $\frac{3}{2 k-1}=\frac{7}{4 k+1}$
$=\quad 2(2(-1)-3(k+1)$ and $3(4 k+1)-7(2 x-1)$
$=\quad 4 k-2-3 k+3$ and $12 k+3-24 k-7$
$=\quad 4 k-3 k=2+2 \operatorname{an}+12 k-14 k=-7-3$
$=\quad k-5$ and $-k(2 k$
$\Rightarrow \quad k-5$ and $k-\frac{10}{2}-5$
$=x-5$ satafien poththecondions

```

Hentu, the given systum of equatrons wall have iefinitaig inany solution s
if \(\kappa=5\).

Q19

Find the value of k for which the following systems of equations haveinfinitely many solutions:
\(2 x+3 y=k\)
\((k-1) x+(k+2) y=3 k\)

\section*{Solution}

The giverisystem of equatians in ay bee whtten las
\[
\begin{aligned}
& 2 x+3 y-x=0 \\
& (x-2) x+(x+2) x-3 x-0
\end{aligned}
\]

This system af equations ith of the form
\[
\begin{aligned}
& a_{1} x+b_{1} y+c_{1}=0 \\
& a_{2} y+b_{2} y+c_{2}-0
\end{aligned}
\]

Whझeध，泣 \(-2, b_{1}-3, c_{2}--k\)
and，\(\quad \vec{z}_{2}-k-1, \mathrm{~b}_{2}-k+2, \mathrm{c}_{2}=-3 k\)
For infinitely many solution，we must have
\[
\begin{aligned}
& \frac{D_{1}}{d_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}} \\
& =\frac{2}{x-1}-\frac{2}{k+2}-\frac{-k}{-2 k} \\
& =\frac{2}{k-1} \cdot \frac{3}{k+2} \text { and } \frac{3}{R+2}=\frac{-k}{-3 k} \\
& =2(k+2)-3(k-1) \text { and } 3 \times 2<k+2 \\
& =2 k+4-3 k-3 \text { and } 9 \pi k+2 \\
& =\quad 4+3-3 k-2 N \text { ind } 9-2-k \\
& =7-6 \text { anc } 7-k \\
& =\quad k-7 \text { and } k=7 \\
& =A-7 \text { satufees both the opadilions }
\end{aligned}
\]

Hence，the given syistem of equations will have infinitaly many smbitoring if \(k=\) ？

\section*{Q20}

Find the value of k for which the following system of equations has no soketion
\(k x-5 y=2\)
\(6 x+2 y=7\)

\section*{Solution}

Gンロ
\(x x-5 y=2\)
\(6 x+2 y=7\)
Conditon for tyutem of equaton baving te solution
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{b_{3}}{b_{2}} \neq \frac{e_{1}}{c_{2}} \\
& \rightarrow \frac{2}{k}=\frac{-3}{2} \neq \frac{2}{7} \\
& \Rightarrow \frac{2 k}{}=-30 \\
& \rightarrow k=-15
\end{aligned}
\]
```

Find the valos ofk: for what the following system of equbtichs han no toluthon:
$x+2 y=0$
$2 x+k y=5$

```

\section*{Solution}
```

The given system of equations may be wniten as
$x+3 y=0$
$2 r+k y-3=0$
This system of equations is of the form
$A_{x^{2}}+B_{1} y+F_{5}-0$
$a_{2} x+b_{2} y=c_{2}-0$
Whera, $a_{1} \rightarrow 1, D_{1}=2, \bar{n}_{1}>0$
and, $\quad \bar{s}_{2}=2 \quad b_{2}=A, \quad c_{2}=-5$
For no solunon, we must have

$$
\frac{a_{1}}{z_{2}}-\frac{b_{1}}{b_{2}}<\frac{c_{1}}{c_{2}}
$$

```

```

$$
\begin{aligned}
& \frac{A_{1}}{B_{2}}=\frac{1}{2} \\
& \frac{b_{1}}{D_{2}}=\frac{2}{2}
\end{aligned}
$$

and $\frac{c_{2}}{c_{2}}=\frac{\square}{-5}$
Now, $\frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}}$
$=\quad \frac{1}{2}-\frac{2}{\pi}$
$\Rightarrow \quad k=4$

```

Hence, the peven system of ac, dations has ne solutaro, when \(<-2\)

\section*{Q22}

Find the value ofic for whish the foll ssing spistem of equations liss to sollition:
\(3 x-4 x+7=0\)
\(\mathrm{kx}+3 \mathrm{~F}-5=0\)

\section*{Solution}

The qiver zystem of equatons is
\[
3 y-4 y+7=0
\]
\[
k x+3 y-5=0
\]

This system of aquationsis of the form
\[
a_{1} y+b_{y} y+c_{2}=0
\]
\[
a_{2} k+c_{2} y^{\prime}+c_{2}=0
\]

Wherk, \(a_{i}-a_{1}, b_{1}-4_{1} c_{1}-7\)
and \(O_{2}-1, t_{2}-3, O_{2}-5\)
For ros solution, wemust have
\[
\frac{a_{1}}{a_{z}}=\frac{b_{1}}{b_{x}}=\frac{c_{1}}{c_{x}}
\]

Wetave.
\[
\frac{b_{1}}{b_{2}}=\frac{-4}{3}
\]
and \(\frac{c_{1}}{c_{7}}=\frac{-7}{b}\)
Clearly, \(\frac{b_{1}}{b_{2}}=\frac{c_{1}}{c_{2}}\)
So, the given systen will have no salution.
if \(\frac{a_{1}}{g_{2}}-\frac{b_{1}}{k_{2}}=\frac{3}{k}-\frac{-4}{7}=k-\frac{+9}{4}\)
Cleariy, for this tuatue of \(k\), on haver \(\frac{a_{1}}{\partial_{1}}-\frac{b_{2}}{b_{2}}=\frac{c_{1}}{c_{2}}\)
Hence, the given zystem of equationis has no zolutions, when \(k=\frac{-9}{4}\).

\section*{Q23}

Find the value ofk for which the following syatem of equanichs has po solurigh:
\(2 x-6 y+3=0\)
\(3 r+2 r-1-0\)

\section*{Solution}
```

The given sysem Df equetiens is

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

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

Thie system bf equations is of the form

$$
\begin{aligned}
& a_{2} x+b_{y} y+c_{1}=0 \\
& a_{2} x+b_{2} y+c_{2}=0
\end{aligned}
$$

```

फinere, \(\sigma_{1}=2, b_{1}=-\lambda, c_{1}=3\)
\(\operatorname{arc} d_{1} \quad a_{2}=3, b_{2}=z_{1}, c_{2}=-1\)

For ro solution, we must have
\[
\frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}}+\frac{b_{1}}{G_{2}}
\]

Wenare,
\[
\frac{a_{1}}{a_{2}}=\frac{2}{3}
\]
anes, \(\quad \frac{G_{1}}{c_{2}}=\frac{3}{-1}\)
Clearly: \(\frac{a_{1}}{a_{2}}=\frac{c_{1}}{c_{2}}\)
So, theriven system of equatinns will have cha solutoch, if
\[
\frac{a_{1}}{i_{2}}=\frac{D_{1}}{D_{2}} i \in, \frac{2}{3}=\frac{-k}{2}=k-\frac{-1}{3}
\]

Hance, the qivan Fyztern of equations well haye:no selution, if \(s=\frac{-4}{\pi}\)

Q24

Find the yalie ofk for which the follcwingsystem of eauanions has no sol tion:
\(2 x+k y-12\)
\(5 x-7 y-5\)

Solution

The given sustem of squatorlais
\[
2 x+k y-11=0
\]
\[
5 x-\pi y-3-0
\]

This syetem of equations is of that form
\[
a_{2} x+b_{1} y+c_{2}=0
\]
\[
a_{2} x^{\prime}+b_{y} y^{\prime}+c_{z}=-0
\]

Whane, \(a_{1}-2, b_{3}-k_{1} c_{1}=-11\)
and \(\left.d_{1}\right|_{2}-5, \mathrm{~h}_{2}-7, \mathrm{c}_{2}=5\)

For mo solution, wa must have
\[
\begin{aligned}
& \quad \frac{a_{1}}{a_{2}}=\frac{b_{1}}{p_{2}}+\frac{g_{1}}{c_{2}} \\
& \Rightarrow \quad \frac{2}{5}-\frac{k}{-7}+\frac{-11}{-5} \\
& =\quad \frac{3}{5}-\frac{k}{-7} \text { and } \frac{k}{-7}=\frac{-11}{-5} \\
& \text { HON, }
\end{aligned}
\]
\[
\frac{2}{5}-\frac{k}{-7}
\]
\[
\Rightarrow \quad 2 \times(-7)-5
\]
\[
=5 x-14
\]
\[
\Rightarrow \quad k=\frac{-14}{5}
\]

Cleafly, fork \(=\frac{-14}{5}\) we have \(\frac{k}{-7}+\frac{-11}{-5}\)
Hence, the grven उyster of equavens wiil have no saluton, if \(N-\frac{-14}{5}\)

\section*{Q25}

Find he value of \(k\) for which of the following system of equation has no solution:
\(k x+3 y=k-3\)
\(12 x+k y=6\)

\section*{Solution}

The given system of equations may be written as
\(k x+3 y-(k-3)=0\)
\(12 x+k y-6-0\)
This system of equaticris is of the form
\(a_{1} x+b_{1} y+c_{2}-0\)
\(a_{2} x+b_{2} y+c_{2}=0\)
where: \(\mathrm{s}_{\mathrm{y}}-12, b_{1}-3, c_{1}=-(k-3)\)
And, \(a_{2}-12, b_{2}-k, g_{2}--6\)
For the system of equations to have no sciution.
\(\frac{a_{1}}{a_{1}}=\frac{b_{1}}{b_{2}}=\frac{c_{1}}{C_{2}}\)
\(\Rightarrow \frac{k}{12}-\frac{3}{k}-\frac{-(k-3)}{-6}\)
\(=\frac{k}{12}=\frac{1}{k} \geqslant \frac{k-\frac{2}{2}}{6}\)
Now, \(\frac{k}{12}-\frac{3}{k}\)
\(=k^{2}=35\)
\(\pm k- \pm 5\)
And, \(\frac{k}{1=} \times \frac{k-3}{6}\)
\(=3 k=12 k-36\)
动 \(6 \mathrm{k}-36\)
\(\Rightarrow k<6\)
Hence, \(k=-6\)
Thus, the qiven system of equatichs will have nos solutica if \(k=-6\).

\section*{Q26}

For what value of the fangming sistarn of equatints will te rocnsctant
\(4 x+5 y=11\)
\(2 x+k y=7\)

\section*{Solution}
```

The given systern of equationg inay be wittun as
$4 x+3 y-1120$
$2 x+N y-7=0$
This systam of equations is of the fom
$B_{1} k+b_{y} y+c_{2}=0$
$B_{2} x+D_{2} y z+C_{2}=0$
Whene, $a_{2}-4, b_{2}-5, c_{1}=-11$
arch. $\mathrm{a}_{2}-2, \mathrm{H}_{2}-\mathrm{A}_{1} \mathrm{C}_{2}=-$ ?

```

Fir incunaistant, vin \(\bar{\pi}\) us hava
```

    \(\frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}}=\frac{d_{1}}{s_{2}}\)
    Now
$\frac{a_{1}}{a_{2}}-\frac{b_{1}}{D_{2}}$
$\Rightarrow \quad \frac{4}{2}-\frac{6}{x}$
$\Rightarrow \quad 4 k=12$
$=\quad k=\frac{12}{4}-3$

```
Clearly, for this value of le, we have
    \(\frac{b_{1}}{d_{2}}-\frac{h_{1}}{D_{2}}-\frac{c_{1}}{c_{2}}\)


\section*{Solution}

The given sywtiots of ociuations may bee writuen as
\[
\begin{aligned}
& 2 x+3 y-(x-8)-0 \\
& 12 x+2 y-2-0
\end{aligned}
\]

Thie system of equations is of the form
\[
a_{1} x+b_{y} y+c_{2}=1
\]
\[
\omega_{2} k+b_{z} k+c_{y}=0
\]

Whare, \(a_{i}-a_{1}, b_{i}-3, c_{1}--\{\alpha-3\rangle\)
and, \(a_{2}-12, b_{z}-a_{1}, D_{z}=-\) il
Fiar na sulubion, we must have
\[
\begin{aligned}
& \quad \frac{\frac{a_{1}}{a_{2}}-\frac{b_{1}}{s_{2}}=\frac{c_{1}}{c_{2}}}{\Rightarrow \quad} \begin{array}{l}
\text { Now } \\
\Rightarrow \\
\text { Now }_{1}
\end{array}=\frac{-1(\alpha-3)}{-i z}
\end{aligned}
\]
\[
\frac{3}{a}=\frac{-(x-3)}{-a}
\]
\[
\Rightarrow \quad \frac{3}{a}+\frac{a-3}{a}
\]
\[
=\quad 3-i x-3
\]
\[
\Rightarrow \quad 3+3=w
\]
\[
=6+\alpha
\]
\[
=\quad i=6
\]
and.
\begin{tabular}{ll} 
& \(\frac{a}{12} \cdot \frac{3}{4}\) \\
\(=\) & \(x^{2}-36\) \\
\(=\) & \(x-t 6\) \\
\(\Rightarrow\) & \(x--6\)
\end{tabular}\(\quad\left[\begin{array}{ll} & \\
& \end{array}\right.\)

Hence, the given system of equations will hasen na sclution, if a - -6.

Q28
```

Far the valuen of \&, tre whith theslyulem
xx+3y-5
3x+y=1
har{音 a uniqum solution, ama(i) novsmution

```

\section*{Solution}

The ghven system of equations may be writam as
\[
i x+2 y-5=0
\]
\[
3 x+y-1=0
\]

Jtis of the form
\[
a_{i^{\prime}}+b_{1} y+c_{t}=p
\]
\[
a_{2} r+b_{2} y+c_{2}+E
\]

Where \(a_{1}=k, b_{1}=2, c_{1}=-5\)
and, \(\quad B_{2}=3_{3}, b_{2}-1 \quad c_{2}=-1\)
(1) The giversisterin will Have a uniques solution, if
\[
\begin{aligned}
& \frac{a_{1}}{p_{1}} \times \frac{b_{1}}{b_{2}} \\
& =\quad \frac{k}{3} \cdot \frac{2}{1} \\
& =\quad k-6
\end{aligned}
\]

So, fres giveri systan of squations will lave a anique solution, if \(k=6\)
(1) The.given sy stern will have ne solution. If
\[
\frac{b_{1}}{a_{2}}-\frac{b_{1}}{b_{2}}+\frac{c_{1}}{s_{2}}
\]

We have;
\(=\quad \frac{E_{1}}{B_{2}}=\frac{2}{1}\) anid \(\frac{c_{1}}{E_{2}}-\frac{-5}{-1}-\frac{5}{1}\)
cluariv, \(\frac{b_{1}}{b_{2}}=\frac{c_{1}}{c_{2}}\)
Sic, the system of equatipras will haqe no solution. if
\[
\begin{aligned}
& \frac{b_{1}}{क_{2}}-\frac{b_{1}}{b} \\
= & \frac{k}{3} \cdot \frac{2}{1} \\
= & \lambda-6
\end{aligned}
\]

Hence, the given system of equastient will have no solution, IfA - fि

\section*{Q29}

Froke trat thereis a valua of \(5[-0)\) for which toe \(3 y\) gtem
\(6 x+3 y=c-3\)
\(12 x+c y=c\)
Fas infinitely many molutions. Find thes.value

\section*{Solution}

The given system of equstions may be writtan as
\[
6 x+3 y-(c-3)=0
\]
\[
22 x+c y-5-0
\]

This is of the form
\[
a_{1} x+b_{1} y+c_{1}=0
\]
\[
a x+b y+c_{z}=0
\]

Whara, \(a_{1}-6,,_{1}-\beta, F_{1}=\{c-3\}\)
and, \(a_{2}=12, b_{2}=2, c_{2}=-c\)
For infinitely many solutions, we rust have
\[
\frac{b_{1}}{b_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{7}}
\]
\[
\Rightarrow \quad \frac{6}{12}-\frac{3}{5}-\frac{-(c-n)}{-c}
\]
\[
\Rightarrow \quad \frac{6}{12}-\frac{3}{3} \text { and } \frac{3}{c}-\frac{c-3}{E}
\]
\[
\Rightarrow \quad 5 c-12 \times 3 \text { and }]-(c-7)
\]
\[
=\quad=-\frac{36}{6} \text { and } c-3-3
\]
\[
\Rightarrow \quad=-6 \text { anic } \subset-6
\]

Nown
\(\frac{a_{1}}{i_{2}}=\frac{0}{12}=\frac{1}{2}\)
\(\frac{b_{1}}{b_{2}}=\frac{2}{2}-\frac{1}{2}\)
\(\frac{c_{1}}{c_{2}}=\frac{-(5-3)}{-6}=\frac{1}{2}\)
\(\frac{a_{1}}{a_{2}}-\frac{b_{2}}{b_{2}}-\frac{c_{1}}{b_{2}}\)
Cieady, for this value of ci, we have \(\frac{a_{1}}{a_{2}}-\frac{\varepsilon_{1}}{\partial_{2}}=\frac{c_{2}}{c_{2}}\)

Henve, the given systen of equatiuns has infinitely manysulution 5, if \(\mathrm{c}-\mathrm{c}\)

\section*{Q30}

Find dise value of \(k\) for which the system
\(2 k+5 y-1\)
\(3 x-5 y=7\)
 system has infintely ei any saluons?

\section*{Solution}

The given gystem：of equatiofs in ay te writtan as
\[
\begin{aligned}
& 2 i+k y-1=0 \\
& 3 x-5 y-7=0
\end{aligned}
\]

比枟 of tise 万orm
\[
a_{1} y+b_{1} y+c_{1}=0
\]
\[
a_{2} z+B_{2} y+C_{2}=-0
\]

Whare，\(a_{1}-2, b_{1}-k, c_{1}-1\)
afnc，\(a_{2}-3, H_{2}--5, c_{2}=-7\)
（i）The given systen will havea unlque solutions，if
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}+\frac{b_{1}}{b_{2}} \\
\Rightarrow & \frac{2}{3}=\frac{k}{25} \\
= & -10-3 h \\
\Rightarrow & 3=-10 \\
= & k-\frac{-11}{3}
\end{aligned}
\]

Sä，the givan sivitam of equations will lave a unque solution，if \(K=\frac{-10}{8}\) ．
（ii）The gryan systom will heve no polution，if
\[
\frac{B_{1}}{i_{1}}=\frac{b_{1}}{b_{2}}=\frac{\sigma_{1}}{c_{2}}
\]

We方㭩E，
\[
\begin{array}{ll} 
& \frac{B_{1}}{3}=\frac{t_{1}}{b_{2}} \\
= & \frac{2}{3}=\frac{\pi}{5} \\
\Rightarrow & -10=3 k \\
= & 3 k=-10 \\
\Rightarrow & k=\frac{-10}{3!}
\end{array}
\]

Wehaver，
\[
\frac{b_{1}}{n_{2}}=\frac{N}{-5}=\frac{-10}{3 i-5}=\frac{2}{3}
\]
and，\(\frac{a_{1}}{c_{2}}-\frac{-3}{-7}-\frac{1}{2}\)
Cleary，\(\frac{b_{1}}{b_{2}}+\frac{c_{1}}{c_{2}}\)
So，te given system whilhaye no：三cution if \(-\frac{115}{3}\)

Fic the oiven syatem to have infinite num ber of solutions．wef must bave
\[
\frac{b_{1}}{b_{2}}=\frac{b_{2}}{b_{2}}=\frac{c_{1}}{b_{2}}
\]

We have，
\[
\frac{a_{1}}{b_{2}}-\frac{2}{3} \quad \frac{b_{1}}{b_{2}}-\frac{k}{-5}
\]
and，\(\frac{c_{1}}{\epsilon_{2}}-\frac{-1}{-7}-\frac{1}{2}\)
Clearlen，\(\frac{i_{1}}{a_{2}}-\frac{c_{7}}{c_{2}}\)
Ep，whatever pe the value of \(k\) ，we cannot nave
\[
\frac{\theta_{1}}{b_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}}
\]

HEnce，there is na walue of \(k\) ，for which the given system of equations has infritely in any solutions．

Q31

For what value of k ，the following system of equations will represent the coincident lines？
\[
\begin{aligned}
& x+2 y+7=0 \\
& 2 x+k y+14=0
\end{aligned}
\]

\section*{Solution}

The giver system of equistionsiniay bu:mntton as
\[
\begin{aligned}
& x+2 y+z-0 \\
& 2 x+k y+14+0
\end{aligned}
\]

Thie given erquations are of the form
\[
\begin{aligned}
& a_{1} x+b_{1} y+c_{1}=0 \\
& a_{1} x+b_{2} y+c_{2}=0
\end{aligned}
\]

Where, \(a_{1}-1, k_{1} * 2, c_{2}=7\)
and, \(A_{2}-2, D_{2}=\lambda, C_{2}=14\)

The giveriequations wif repierent moindidentliner if they have infinitely many solutions
The arndition for whichis
\[
\frac{i_{1}}{D_{2}}=\frac{p_{1}}{b_{2}}=\frac{c_{1}}{c_{2}}=\frac{1}{2}=\frac{\frac{1}{1}}{1}=\frac{7}{14}=x=c
\]

Henve, the given systan of equatung will reprosant opincident lines, if \(A=4\).

\section*{Q32}

Obtain the condition for the following system of tinear equations to have a unique
solarin
\(a x+6 y-1-\)
\(n c+m y=n\)

\section*{Solution}

The glven system of exuatons may be witten as
\[
\begin{aligned}
& 3 x+b y-c=0 \\
& b x-3 \pi y-r=0
\end{aligned}
\]
it is of the form
\(\pi_{1} x+b_{2} y+c_{1}=\pi\)
\(a_{2} x+b_{2} y+c_{2}=\) II
\(W_{\text {Wram }}^{1}+w_{1}-\infty, b_{1}-A, c_{2}=-k\)
and, \(\omega_{2}-1, v_{2}-+\omega_{1} B_{2}-m\)
For unque solution, we must have
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{p}} \\
=\quad & \frac{a}{1} \rightarrow \frac{b}{m} \\
=\quad & a m \rightarrow b
\end{aligned}
\]


\section*{Q33}

\footnotetext{

infiritely m any solutions:
\((8 a-7) x+7 x-5-0\)
\(3 y+(b-1) y-2-0\)
}

\section*{Solution}

The qhiven systern of equatura is
\[
\begin{aligned}
& (2 x-1) x+3 y-5=0 \\
& 3 x+(b-1) x-2=0
\end{aligned}
\]

Titly of then form
\[
a_{1} x-b_{1} y+c_{1}-3
\]
\[
A_{2} r+\theta_{2} y+c_{2}-0
\]

Whiera, \(\boldsymbol{H}_{7}-2 a-1, b_{7}-3, c_{t}-5\)
क्ती \(H_{2}-3 i_{2} \mathrm{~B}_{2}-b-1, k_{2}=-2\)
The qiven systern of equations will have infinite number of sclutions, if
\[
\begin{aligned}
& \frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{i}}-\frac{5}{c} \\
= & \frac{2 a-1}{3}=\frac{3}{b-1}=\frac{-5}{-2} \\
= & \frac{2 a-1}{3}=\frac{-5}{-1} \text { and } \frac{3}{A-1}=\frac{-5}{-2} \\
= & 2(2 a-1)=5 \times 3 \text { and } 3 \times 2=5(b-1) \\
= & 4 a-2=15 \text { and } b-5 b-5 \\
= & 4 a-15+2 \text { and } 5+5=-5 b \\
= & \quad \theta-\frac{17}{4} \text { and } \frac{11}{5}-b \\
= & a-\frac{17}{4} \text { ana } b-\frac{11}{5}
\end{aligned}
\]

Fenoc, the given systern of aquatons will have infintely many solusions
If \(a=\frac{17}{4}\) and \(b=\frac{11}{5}\).

\section*{Q34}


\section*{number of soluters!}
\(2 x-3 y-7\)
\((a+b) x-(v+b-3) y=4 a+b\)

\section*{Solution}

The givan zyatem of equatrons is
\[
\begin{aligned}
& 2 x-7 y-7=0 \\
& (a+b) x-(a+b-3) y-(4 a+b)=0
\end{aligned}
\]

It is of tho form
\(a_{1} x+b_{1} y+c_{1}=a\)
\(2 z_{2}+2 y+c_{2}=0\)
Where, \(a_{1}-z, b_{1}=-3, c_{1}=-1\)
ind \(A_{2}=a+b, b_{z}=-(a+b-3), c_{z}=-(4+b)\)
The givan systern of equations whll have infinite number of sobitions if
\[
\begin{aligned}
& \frac{a_{7}}{a_{2}}=\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}} \\
& \Rightarrow \quad \frac{2}{\pi+b}-\frac{-3}{-\left(-\frac{1+5-3)}{-(4 a+B)}\right.} \\
& \Rightarrow \quad \frac{2}{a+b}-\frac{3}{a+b-3} \text { and } \frac{a}{a+b-a}-\frac{7}{4 a+b} \\
& =2(a+b-3)-3(a+b) \text { and } 3(4 a+b)-7(i+6-3) \\
& =2 a+2 b-6-3 y+36 \text { and } 12 a+3 b-7 a+7 b-21 \\
& =\quad-6-3 a-27+3 t-2 t 5 \text { sid } 72 a-7 a+3 b-7 b-21 \\
& =\quad-6=+2 \text { and } 5 a-4 b=-91 \\
& \text { Now, } \\
& \text { 言 }+6-6 \\
& \Rightarrow \quad a=-6-b \\
& \text { Sukstituting the value of al in } 5 a-46=-2 \text {, we get } \\
& 3(-b-5)-4 b=-21 \\
& =\quad-5 b-30-4 b--21 \\
& \Rightarrow \quad-9 b=-21+30 \\
& \Rightarrow \quad-5 b-9 \\
& \Rightarrow \quad n=\frac{9}{-9}=-1 \\
& \text { Pattingits }-1 \text { in a }=-b-6 \text {, wh got } \\
& a=-(-1)-6-1-5=-5
\end{aligned}
\]

Herioe, the given system of equations will have infifitety many solutiars:
if \(u=-5\) and \(b=-1\).

\section*{Q35}

Frat the yalue af \(p\) and \(\bar{y}\) her whith itherownemg system on hoar equatiuns has infirite numbe of solutges:
\(R x+3 y=9\)
\((n+7) x+(2 p-q) y-3(n+q+2)\)

Solution

The giver system of equations is
\[
\begin{aligned}
& 2 x+9 y-9-0 \\
& (p+q) x-\{2 p-q) x-3(p+9+1\}-0
\end{aligned}
\]
at is af the form
\[
\begin{aligned}
& a_{2} x+b_{2} y+c_{1}=0 \\
& a_{2} x+b_{2} y+c_{2}=0
\end{aligned}
\]

Where, \(a_{1}-2, b_{1}-3, c_{1}<-9\)
an \(d_{1} \quad a_{2}=p+q_{1}, \eta_{2}=2 p-q_{2}, c_{2}=-3(p+q+2)\)
The given zystem of equations will have lofinite number of sofutions, if
\[
\begin{aligned}
& \frac{a_{1}}{a_{1}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}} \\
& \Leftrightarrow \quad \frac{2}{b+q}=\frac{3}{2 D-q}=\frac{-9}{-3(p+9+1)} \\
& \Rightarrow \quad \frac{2}{n+q}=\frac{3}{2 n-q}=\frac{3}{n+q+1} \\
& \text { \& } \quad \frac{z}{p+q}=\frac{3}{2 p+q} \text { and } \frac{3}{2 p-q}=\frac{3}{p+q+1} \\
& =2(2 p-q)-3(p+q) \text { ar }(p n+q+1-2 n-\bar{p} \\
& \Rightarrow \quad 4 p-2 q=3 p+3 q \text { and }-2 p+p+q+q=-1 \\
& \Rightarrow \quad p-5 q-0 \text { and }-p+2 q--1 \\
& \geq F F-3 q-p+3 q-1 \quad \text { [On adding] } \\
& \Rightarrow \quad-3 q-1 \\
& \Rightarrow \quad q=\frac{1}{3} \\
& \text { Futting } q=\frac{1}{3} \text { in } p-5 q \text {, we get }
\end{aligned}
\]
\[
\begin{aligned}
& \quad P-5\left(\frac{1}{3}\right)-E \\
& =\quad P-\frac{5}{3}
\end{aligned}
\]

Henca, the gixen sxstem of aquations wil havie infintely manw zolutome
\[
\text { if } p=\frac{5}{\pi} \text { and } a=\frac{1}{3}
\]

\section*{Q36}

Find the value of a nad b for whith the followind systern of efuat cris has anfinitely many solutions:
\[
\begin{aligned}
& (2 a-2) x-3 y=5 \\
& 7 v+(b-2) y=3
\end{aligned}
\]

\section*{Solution}

The giveri system of equationsiz
\[
\begin{aligned}
& (2 x-1) \times-3 y-3=0 \\
& 3 x+(2-2) y-3=0
\end{aligned}
\]
it is:of the form
\[
s_{3} \pi+b_{2} y+c_{3}=0
\]
\[
s_{2} x+b_{2 y}+c_{2}=0
\]

and, \(z_{2}=3, b_{2}=b-2, c_{2} \times-3\)
The qiven system of equations will have infinite number of solutions if

Hence, the quen systom of, equations: will have infiritely many solutans. if \(\alpha-3\) and \(\theta-\frac{1}{5}\).

\section*{Q37}

Find tha value of a frad in for which the follewing: systim of equatons has infintaly n! any solutions
\(2 x-(2-+5) y=5\)
\((2 b+1) x-5 y-15\)

\section*{Solution}
\[
\begin{aligned}
& \frac{a_{1}}{d_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}} \\
& =\quad \frac{2 a-1}{3}-\frac{-3}{t-2}-\frac{-5}{-3} \\
& =\quad \frac{2 a-1}{3}-\frac{-2}{6-2}-\frac{5}{3} \\
& \Rightarrow \quad \frac{2 a-1}{3}=\frac{5}{8} \text { and } \frac{-3}{6-2}=\frac{5}{3} \\
& =\frac{3(24-1)}{3}-5 \text { ता }-9-5(5-2) \\
& =32-1-5 \operatorname{and}-5-50-17 \\
& =22-5+1 \text { and }-9+10-55 \\
& =\quad-\frac{6}{2} \text { and } t=50 \\
& \Rightarrow \quad \#=2 \text { and } \frac{1}{5}=b \\
& \Rightarrow \quad \#=3 \text { and } b=\frac{1}{5}
\end{aligned}
\]

The given syotem of oquationsis
\[
2 x-(2 a+5) y-5-0
\]
\[
(2 x+1) x-9 y-15-0
\]

It is ef the form
\[
\begin{aligned}
& a_{1} x+c_{2} y+c_{1}=0 \\
& a_{2} v+c_{2} y+c_{2}=0
\end{aligned}
\]

Whare; \(a_{1}-2, b_{1}=-(2 a+5), c_{1}+-5\) :
and \(d_{1} \alpha_{2}-(2 n+2), b_{2}=-9, c_{2}=-15\)
The givensystem of equations will have infinite num ber of solations, if \(\frac{b_{1}}{b_{2}}=\frac{b_{1}}{b_{2}}+\frac{c_{1}}{c_{2}}\)
\(=\frac{2}{2 b+1}-\frac{-(2 a+5)}{-9}-\frac{-c}{-15}\)
\(\Rightarrow \quad \frac{2}{2 b-1}-\frac{2 a+5}{9}-\frac{1}{3}\)
\(\Rightarrow \quad \frac{2}{2 b-1}-\frac{1}{3}\) and \(\frac{2 a+5}{4}-\frac{1}{3}\)
\(=\quad 5=2 b+1\) and \(\frac{3(2 a+5)}{9}=1\)
\(\Rightarrow \quad 6-1-2 b\) and \(2 a+8=3\)
\(=5 \times 20\) and \(2 a=-2\)
\(=\quad \frac{5}{2}-b \cdot \operatorname{ancs} a=\frac{-2}{2}--1\)
Hence, the given systani of equations will have infiritely \(m\) any solutions.
If \(a=-1\) anc \(b-\frac{5}{2}\)

\section*{Q38}

Find the value of a niad bifor whith the following systam of equaticis has infinitaly
many: spluvons:
\((2-1) x+3 y-2\)
\(\overline{\mathrm{b}} x+(1-2 b) y=\overline{\text { б }}\)

\section*{Solution}

The given systami of equations in
\[
\begin{aligned}
& (-1) x+3 y-z-6 \\
& 5 x+(1-20) y-6-0
\end{aligned}
\]

It is of the form
\[
a_{2} k+b_{2} y+c_{2}=0
\]
\[
a_{2} x+b_{2 y} t+c_{2}=0
\]

Where, at \(-a-1, b_{1}-3, c_{1}-2\) :
im \(\sigma_{1}\) 次- \(\bar{n}, b_{2}-1-96, c_{2}--6\)


Hinche, the gexen syotam of aruations wil havo infin tioly many solutionso If \(3-3\) and \(b=-4\).

\section*{Q39}

Find the value of a nad bo for which tie foliewinis syitan at equat ore has inthitely
many: solutions.
\(2 \pi+4 y-12\)
\((a+b) x+2(a-b) y-5-1\)

\section*{Solution}
\[
\begin{aligned}
& \frac{a_{1}}{d_{2}}=\frac{b_{1}}{b_{2}}=\frac{a_{1}}{c_{2}} \\
& =\quad \frac{a-1}{6}-\frac{8}{1-\frac{3}{3}}-\frac{-2}{-6} \\
& =\quad \frac{a-1}{2}-\frac{3}{1-20}-\frac{1}{3} \\
& =\quad \frac{x-1}{5}-\frac{1}{3} \text { and } \frac{3}{1-26}-\frac{1}{3} \\
& =3(a-1)-6 \text { and } 3 \times 3-1-26 \\
& \Rightarrow \quad-1=2 \text { and } 9=1-2 b \\
& =a-2+1 \text { and } 2 b-1=9 \\
& =\quad \text { a }-3 \text { and } 20=-3 \\
& =\quad 4-3 \operatorname{cand} 6=\frac{-0}{2}=-4
\end{aligned}
\]
```

The givan systam of equatuma is
$3 x+4 y-12-0$
$(a+b) x+2(a-b) y-(5 a-1)=0$
It in of the form

$$
a_{1} z-b_{1} y+c_{1}=0
$$

$$
क_{y} r+0 y+c_{2}=0
$$

$$
\text { Wheren } a_{1}=3, \quad b_{1}=4, c_{1}=-12
$$

$$
\text { and, } \left.a_{2}-a+b\right) b_{2}-2\{a-b\}, c_{2}-\{(5 a-1\}
$$

```

The given 3yster of eqdations will have infinite number of socutions, if
```

        \(\frac{b_{2}}{\partial_{7}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}}\)
    $=\frac{2}{a+b}-\frac{4}{2(3-i b\}}-\frac{-12}{-[5 a-1]}$
$\Rightarrow \quad \frac{1}{a+b}-\frac{2}{3-b}-\frac{12}{3 a-1}$
$=\frac{a}{j+b}=\frac{2}{a-b}$ and $\frac{2}{j-b}-\frac{12}{5 a-1}$
$\Rightarrow \quad a(a-b)-2(b+b)$ and $2(5 a-1)-12(a-b)$
$=3 a-7 b-2 a+2 b$ and $10 a-2 a-12 a-12 b$
$\Rightarrow \quad 3 b-2 a-2 b+3 t$ and $10 a-12 a-12 b+2$
$\Rightarrow \quad \exists=36$ and $-2 d=-12 b+2$
Subuttuting e $-5 b$ in $-2 a=-12 \hat{c}+2$ i wes get
$-2(5 b)--12 b+2$
$\Rightarrow \quad-1 c b-12 b-2$
$=\quad 12 b-10 b=2$
$=2 k-2$
$\Rightarrow 6-1$
Butting $b=1$ in $2=56$, WG get
$a-5 \times 1=5$

```

Harce, the given syutern of equations will have infirite'v. many kolegions if \(a=5\) and \(b=1\)

\section*{Q40}

Find the values of \(a\) and \(b\) for which the following system of equations has indintely many solutions:
\(2 x+3 y=7\)
\((a-b) x+(a+b) y=3 a+b-2\)

\section*{Solution}

\section*{Q41}

Find the value of a nad is for whict the following syatam of equations has infinitely:
miany solusinns
\(2 x+3 y-z-0\)
\((a-1) x+(a+1) x-(a a-1)\)

\section*{Solution}

The givan systam of equation \(i_{5}\)
\[
\begin{aligned}
& 2 x+3 y-7=0 \\
& (2-1) x+(2-1) y-(3 a-1)=0
\end{aligned}
\]
it is of the form
\(a_{1} x+b_{1} y+c_{1}=0\)
\(a_{2} x+b_{2} y+c_{2}=a\)
whares \(_{4} \bar{q}_{1}-2, B_{1}-3_{i}, c_{1}-7\)
and, \(a_{2}-3-1, B_{2}-a+1 \quad C_{2}=-(3 a-1)\)
The givenigysten of equations will tiave infiniterumber of solutions, if
\[
\begin{aligned}
& \frac{b_{1}}{b_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}} \\
& =\frac{2}{a-1}=\frac{3}{a+1}=\frac{-1}{-(3 a-1)} \\
& =\frac{2}{a-1}-\frac{3}{a+1}=\frac{?}{3 i-1} \\
& \Rightarrow \quad \frac{2}{a-1}-\frac{3}{a+1} \text { and } \frac{3}{a+1}=\frac{7}{2, y-1} \\
& =\quad 2\{z+1\}=3\{e-1\} \text {, and } j(3 a-1)=T(z+1) \\
& 3 \quad 29+2-3 \mathrm{a}-3 \text { and } 9 \mathrm{a}-3-7 \mathrm{ia}+7
\end{aligned}
\]
\[
\begin{aligned}
& =\quad-\pi-\text {-9 and } 2 a=10 \\
& =\quad=-5 \text { sida }-\frac{10}{2}-5 \\
& \text { 18 2-5 }
\end{aligned}
\]
 fe=5.

\section*{Q42}

Find the volue of a naid by for whith the folicwitig syition of wquations hinatifitaly
many solutions:
\(2 x+3 y-7\)
\((a-1) x+(a+2) y=3 a\)

\section*{Solution}

Thy given हystem of equations in
\[
2 x+2 y-7=0
\]
\[
(a-1) x+(a+2) y-3 a+9
\]

It 15 of the form
\[
a_{1} x+b_{3} y+c_{1}=0
\]
\[
a_{2} v+b_{2} y+c_{2}-0
\]

Wher\#, \(a_{1}-2, b_{1}-2, c_{1}=-7\)
and \(a_{2}-3-1 \quad b_{2}<a+2, c_{2}-3\) - 2
The givanisyitain of equatiord ivill have infinite fiumbor of sotationsi if
\(\frac{\bar{क}_{1}}{\bar{\sigma}_{2}}=\frac{b_{2}}{c_{2}}=\frac{c_{1}}{c_{2}}\)
\(=\frac{2}{a-1}-\frac{3}{a+2} \cdot \frac{-7}{-33}\)
\(\Rightarrow \quad \frac{2}{a-1}-\frac{a}{a+2}-\frac{7}{3 a}\)
\(=\frac{2}{a-1}-\frac{3}{a+2}\) and \(\frac{5}{a+2}-\frac{3}{3 a}\)
\(=\quad 2(\pi+2)-3(\sigma-1)\) and \(3 \times 3 a-7(2+2)\)
\(=\quad 2 a+4=3 a-3\) and \(9 a=7 a+14\)
\(=\quad 2 a-3 a-3-4\) and \(80-7 a-14\)
\(=\quad \rightarrow--3\) and \(2 a-1.4\)
\(=\quad d-7\) and \(a-\frac{14}{2}=7\)
\(=a=7\)
Hence, the given system of equarions will have infinitely mariy solutions fa \(\mathrm{f}=7\);

Q43

Find the values of \(a\) and \(b\) for which the following system of equations has infinitely many solutions:
\(x+2 y=1\)
\((a-b) x+(a+b) y=a+b-2\)
Solution

The given sxicom of equations may be woitter as
\(x+2 y-1=0\)
\((a-b) x+(a+b) y-(a+b-2)-a\)
Thes systim of equations I of the form
\(a_{1} x+b_{1} y+c_{1}=0\)
\(a_{2} x+b_{2} y+c_{2}=0\)
where, \(\mathrm{s}_{2}-1, b_{1}-2, c_{2}--1\)
And, \(s_{2}-a-b, b_{2}-a+b, c_{2}-(a+b-3)\)
For the system of equationsto heve infinite sodutions.
\(\frac{a_{1}}{s_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{1}}{c_{2}}\)
\(=\frac{1}{a-b}-\frac{2}{a+b}-\frac{-1}{-(a+b-2)}\)
\(=\frac{1}{a-b}-\frac{2}{b+b}-\frac{1}{a+b-2}\)
Nowi \(\frac{1}{a-b}-\frac{2}{a+b}\)
\(=a+b-2 a-2\)
\(=2-30=0 \quad-\quad(0)\)
And, \(\frac{1}{a-b}-\frac{1}{a-b-2}\)
\(=a+b-2-a-b\)
\(=26=2\)
\(\Rightarrow b-1\)
Sibstututing \(b-1\) in (i), we heye
\(a-3 \times 1=0\)
\(\Rightarrow \mathrm{s}-3\)
Hence, the given system of equations will have infinite number of solutions for \(a-3\) and -1 .

\section*{Q44}

Find the values of \(a\) and \(b\) for which the following system of equations has invnitely many solutions:
\(2 x+3 y=7\)
\(2 a x+a y=28-b y\)

\section*{Solution}

The given systetm of equationis may be wnitter as \(2 x+3 y-7=0\)
\(2 a x+a y+b y-28-0 \Rightarrow 2 a x+(a+b) y-29-0\)
Thes system of equations in of the form
\(a_{1} x+b_{1} y+c_{1}=0\)
\(\theta_{2} x+b_{2} y+c_{2}-0\)
where \(3_{3}-2 b_{2}-3 c_{2}=-7\)
And, \(a_{2}-2 a, b_{2}-a+b, c_{2}--28\)
For the system of equatoons to hivelininite solutions,
\(\frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{2}}-\frac{c_{2}}{c_{2}}\)
\(=\frac{2}{20}-\frac{3}{a+b}-\frac{-7}{-28}\)
\(=\frac{1}{a}-\frac{3}{a+b}-\frac{1}{4}\)
Now, \(\frac{1}{a}=\frac{1}{4}\)
\(\Rightarrow\) - -4
And, \(\frac{1}{a}-\frac{3}{a+b}\)
\(\Rightarrow a+b=3 a\)
\(\Rightarrow 2 a-b\)
\(\Rightarrow 2 x+-b\)
\(\Rightarrow b=8\)
Hence, the given system of equations will have infinite number of soluto of 1 for \(\mathrm{a}-4\) and \(\mathrm{b}-8\).

For which value(s) of \(\lambda\), do the pair of linear equations \(\lambda x+y=\lambda^{2}\) and \(x+\lambda y=1\) haveno solution?

\section*{Solution}

The given system of eqquabion may be written as
\(x x^{2}+y-x^{2}=0\)
\(x+\lambda y=1=0\)
Tris syetem of equso ons is of the form
\(a_{1} x+b_{1} y+c_{2}-G\)
\(a_{2} x+b_{2 k}+c_{2}-0\)
where, \(z_{2}-\lambda, b_{2}-1, c_{2}-2^{2}\)
And, \(\bar{a}_{2}-1, b_{2}-h_{1}, c_{2}--1\)
For tie system of equatons to have no solutron.
\(\frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{2}}<\frac{c_{2}}{c_{2}}\)
\(\Rightarrow \frac{x}{1}=\frac{1}{\lambda} * \frac{-x^{2}}{-1}\)
\(\Rightarrow \frac{x}{1}=\frac{1}{x}=\frac{x^{2}}{1}\)
NOW, \(\frac{\lambda}{1}-\frac{1}{\lambda}\)
\(\Rightarrow x^{3}-1\)
\(=\lambda- \pm 1\)
And, \(\frac{1}{x}=\frac{x^{2}}{3}\)
\(\Rightarrow \lambda^{3}+1 \Rightarrow \lambda\) annct be \((+1)\)
Henctan \(\mathrm{A}-1\)
Thum the gi ven system of equaticris will have
rics solution if \(\mathrm{\lambda}=-1\).

For which value(s) of \(\lambda\), do the pair of linear equations \(\lambda x+y=\lambda^{2}\) and \(x+\lambda y=1\) have infinitely many solutions?

\section*{Solution}

The given system of equations may be writton as
\(x x+y=x^{2}=0\)
\(x+k y-1=0\)
This sustem of equations is of the form
\(a_{1}=+b_{1} y-c_{1}=0\)
\(a_{2} x+b_{2} y+c_{2}-0\)
where, \(a_{2}-x_{1} b_{2}-1, c_{1}--x^{2}\)
And, \(\sigma_{2}-1, b_{2}-\lambda_{1} c_{2}=-1\)
For the system of squatoris toinfinite solutions,
\(\frac{a_{1}}{a_{1}}-\frac{b_{1}}{b_{2}}=\frac{c_{1}}{c_{2}}\)
\(\Rightarrow \frac{\lambda}{1}=\frac{1}{\lambda}-\frac{-x^{2}}{-1}\)
\(\Rightarrow \frac{3}{1}-\frac{1}{x}-\frac{x^{2}}{1}\)
Naw \(\frac{x}{1}-\frac{1}{1}\)
\(\Rightarrow \mathrm{x}^{2}-1\)
\(\Rightarrow \lambda- \pm 1\)
And, \(\frac{1}{\lambda}-\frac{x^{2}}{1}\)
\(\Rightarrow x^{3}-1 \Rightarrow x\) cannict be (-1).
Hence. \(\mathrm{X}=1\)
Thut, the given sybtem of equations will have infinuse namber of solution if \(x=1\).

For which value(s) of \(\lambda\), do the pair of linear equations \(\lambda x+\lambda=\lambda^{2}\) and \(x+\lambda y=1\) have a unique solution?

\section*{Solution}

The giverctystom of equations may be whtten as
\(x x+y-x^{2}-0\)
\(x+\lambda y-1-0\)
This systam of equaticois iz of the form
\(a_{1} x+b_{1} y+c_{1}-0\)
\(a_{2} x+b_{2} y+c_{2}=0\)
where \(s_{2}-x_{1} b_{1}-1, c_{1}--x^{2}\)
And, \(c_{2}=1, b_{2}=\lambda_{1} c_{3}=-1\)
For \(t=s y s t e m\) of equations to have un que,
\(\frac{a_{1}}{a_{2}}-\frac{b_{i}}{b_{i}}\)
\(\Rightarrow \frac{2}{1}=\frac{1}{1}\)
\(=\mathrm{x}^{2}-1\)
\(\Rightarrow \lambda< \pm 1\)
Thus, the given system of equetions wil hase unique solution for all raelvelues of 2 excepr +1

\section*{Exercise 3.6}

\section*{Q1}
 of 1 pen and 1 pencil

\section*{Solution}

```

    \(5 x+0 y=0 \quad-10\)
    ancy $3 x+8 y=5$
- i)

```

Multiplyug nquanon(i) by 2 and equation(i) by 6 , wa get
\(108+12 y-18\)
\(-(i)\)
\(18 x+12 y=30\)
- (iv)

Subtracting equation (iii) by =quation \(\{\mathrm{iv})\). We get
\(18 k-10 x+12 y-17 y-30-10\)
\(=\operatorname{Br}-12\)
\(=x-\frac{12}{8}-\frac{3}{2}-1.5\)
Substituting \(x-\) Iis in mquation ih, we get
\[
\begin{array}{ll} 
& 5 \times 1,5+6,=9 \\
= & 75+5 y-9 \\
\Rightarrow & 6 y-9-75 \\
\Rightarrow & 6 y=15 \\
\Rightarrow & y-\frac{15}{5}-\frac{1}{4}-0,25
\end{array}
\]

Hence, cost of onepen \(-k_{3} 140\) and cost of one pemal \(-R_{s} q_{2}\). 5

\section*{Q2}



\section*{Solution}

Lut the eoet of a audio cassette be Rsx and thag oc orvideo colvetce be Rs y. Then,
\[
7 x+3 y-1110
\]
and \(2,5 y+5 y-1350\)
\[
-11
\]

Multiplying equation ( ) by 4 and nguation () by 3 , wo get
\[
28 x+12 y=4440
\]
\[
\text { -( } \text { (iii) }
\]
\[
15 x+12 y=41150
\]
\[
-(v)
\]

Subvacting qquation (iv) foom equasionfii), we get
\[
28 x-15 x+12 y-12 y-4440-4050
\]
\(\Rightarrow \quad 13 \pi=390\)
\(=x-\frac{7 \pi 0}{10}-30\)
Substitutng \(x-30\). me equation \((1)\). We gat
\(7 \times 30+3 x=1110\)
\(=\quad 210+3 y-1110\)
\(=3 y-1110-210\)
\(\Rightarrow \quad 3 y=900\)
\(=y-\frac{900}{3}=300\)

Reena has pans and paricils which together are 40 in number if she has 5 more pencil and 5 les pers，thet rumbier of pericile wcild became 4 timete thet rumtier Gif peng．Find the onginal number of pens ard oancils．

\section*{Solution}
\begin{tabular}{|c|c|c|}
\hline \multicolumn{3}{|l|}{Let the number of pens bes，and that of pencil bey．Then，} \\
\hline & \(N+y=40\) & \(\cdots(1)\) \\
\hline andi & \((y+5)-4(y-5)\) & \\
\hline \(\Rightarrow\) & \(y+5=4 x-20\) & \\
\hline 2 & \(5+24-4 k-y\) & \\
\hline 三 & \(4 x-y=25\) & 一倍 \\
\hline \multicolumn{3}{|l|}{－oding equationi）and equation（i），ve get} \\
\hline & \(x+4 x=4.0+25\) & \\
\hline － & \(5 \mathrm{c}+5 \mathrm{~b}\) & \\
\hline \(\Rightarrow\) & \[
x-\frac{55}{5}-13
\] & \\
\hline \multicolumn{3}{|l|}{Puting \(x=12\) in equation 0 ，we get} \\
\hline & \(23+y=40\) & \\
\hline \＃ & \(y=40-13-27\) & \\
\hline
\end{tabular}

Hancu，fibura nias 12 perns anus 27 porncis．

\section*{Q4}

4 tables and 3 chairs，together，cest \(E \leq 2,250\) and 3 tables and 4 cnairs cost \(5 F \mathrm{~F}=145 \mathrm{C}\) ．Find the cost of 2 ethars and 1 table

\section*{Solution}

Lat the cast of a tabla bo RI \(x\) and that of a crain ber For \(y\)－Thop．
\[
4 x+3 y-2,250
\]
anct，\(\quad 3 x+4 y-1950\)


Moltplyitig equation（i）by 4 and equation（ii）
\[
\begin{aligned}
& 16 x+12 y=0000 \\
& 3 x+12 y=5650
\end{aligned}
\]

Subtacting equation（iv）by squationfii），we get
\[
\begin{array}{ll}
= & 16 x-9 N-9000-5020 \\
= & 7 x-2150 \\
\Rightarrow & N+\frac{3150}{2}-450
\end{array}
\]
\[
\text { Puttirig }=450 \text { in equaben ( }) \text {, wooget }
\]
\[
4 \times 450+3 y-2,250
\]
\[
\Rightarrow \quad 1000+2 y-2250
\]
\[
=3 y-2250-1900
\]
\[
\Rightarrow \quad 3 y=450
\]
\[
=\quad y-\frac{450}{3}-150
\]
\[
=\quad 2 y-2 \times 350-300
\]
\[
\text { Cose sf } 2 \text { chairs }=25300
\]
\[
\text { and cost of } 1 \text { table } 45450
\]

Find the total cost of 1 bag and 10 pans．

\section*{Solution}

Let the coat of a biag be R3s 天 and that af a pon be Rs 9．Theri，
\(3 x+4 y-257\)
一官
and，\(\quad 4 x+3 y=324\)
\(-(i)\)
Multipiying equation \(\{y\) by 3and equation（f）by 4，wor gel．
```

3v+12y-771
－（ii）
$16 z+12 y-1226$
—（16）

```

\[
\begin{aligned}
& 16 x-9 x-1295-771 \\
& =7 x-525 \\
& \Rightarrow \quad x=\frac{525}{7}-75 \\
& \text {.. Cost of a bag-15. } 75 \\
& \text { Futting } x=15 \text { in souation fi, we get } \\
& 3 \times 75+4 / n=257 \\
& =\quad 225+4 /-257 \\
& \leq \quad 4 \mathrm{r}-25 \mathrm{y}-228 \\
& \Rightarrow \quad 4 i=22 \\
& =\quad \hat{y}-\frac{32}{4}-8
\end{aligned}
\]
\[
\begin{aligned}
& \text { Cost of } 10 \text { pens }-8 \times 10=\text { RS } 80
\end{aligned}
\]

Hence，the total cest of 1 bokl and 10 pert \(-75+80-\) Rs 155

\section*{Q6}

Fird the total cest of 1 book shid 2 －hens

\section*{Solution}

Lent tha cost of a book buRis and that at a pern be Fis \(y\). Trien,
\(5 x+7 y=79\)
\(-0\)
mat \(7 x+5 y=\) ?
-(i)
Mustiplyng vquation (i) by. 5 and *quation(i) by F. we get
\[
\begin{array}{ll}
25 x+35 y=395 & - \text { (iii) } \\
40 x+35 y=539 & - \text { (iv) }
\end{array}
\]

Subtracting equajon (iii) cy equation (iv), we get
\[
40 r-25 r-539-395
\]
\(\Rightarrow \quad 34 \mathrm{r} \pm 1+4\)
\(=x-\frac{144}{24}-0\)
Cost af a toral: - RE: 6
Futting \(x-6\) in equationtif, we get
\[
5 \times 6+7 y=79
\]
\(\Rightarrow \quad 30+7 y=77\)
\(=\quad 7 y-79-30\)
\(\Rightarrow \quad 7 y-49\)
\(\Rightarrow \quad y=\frac{70}{7}-7\)
\(\therefore \quad\) Cost of \(\equiv\) pen \(=\) RS: 7
Zint of 2 pem - \(2 \times 7\)-Rs 14
Hance, thm lotai cant of 1 buok and 2 perm \(-6+14-\) Res 20

\section*{Q7}

Jamila sold a table and a chair for Rs. 1050 , thereby making a profit of \(10 \%\) on a table and \(25 \%\) on the chair. If she hadtaken profit of \(25 \%\) on the table and \(10 \%\) on the chair she would have got Rs.1085. Find the cost price of each.

\section*{Solution}

Let the cast price of table ev \(k=x\) and that of chair be \(A\) s. \(V\).
Then, selling price of thble when soid at \(10 \%\) proft \(-R E\left(x+\frac{10 x}{100}\right)-R=\left(\frac{110 x}{100}\right)\)
And, selling price of coer when sold at \(254 \mathrm{proft}-R=\left(y+\frac{25 y}{100}\right)-\operatorname{Rs}\left(\frac{125 y}{100}\right)\)
Acocrding to question,
\(\frac{110 x}{100}+\frac{125 y}{100}=1050\)
\(=110 \mathrm{c}-125 \mathrm{y}-105000\)
Now selling prise of table when sold at 2evp piofit - Rs \(\left(x+\frac{25 x}{100}\right)-R=\left(\frac{125 x}{100}\right)\)
And, selling price of chair when sold at \(10 \%\) profit \(-\mathrm{Rz}\left(y+\frac{10 \mathrm{z}}{100}\right)-\mathrm{Re}\left(\frac{110 y}{100}\right)\)
Acoording to quession,
\(\frac{125 x}{100}+\frac{110 y}{100}=1065\)
\(\Rightarrow 125 i+110 y-106500\)
Adding equations (i) and (i) ), we get
\(235 x+235 y-211500\)
\(z x+y=900\)
Sobtrating equation (i) from 011 , we get
\(15 x-15 y-1500\)
\(\Rightarrow x-y-100\)
Adding equations(iii \()\) and (iv), we ger:
\(2 x-1000\)
\(\Rightarrow x-500\)
\(=500+y-900 \Rightarrow y-400\)
Hance, the ust price of table is Ris 500 and that of chair is Ris. 400.

\section*{Q8}

Susan invested certain amount of money in two schemes A and B , which offer interest at the rate of \(8 \%\) per annum and \(9 \%\) per annum, respectively. She received Rs. 1860 as annual interest. However, had she interchanged the amount of investment in the two schemes, she would have received Rs. 20 more as annual interest. How much money did she invest in each scheme?

\section*{Solution}

Let Susan inuested Bax \(x\) in scheme \(A\) and Rs. y in stheme R:
Then, S.I, on Rs. \(x\) at \(8 \%\) p. a for 1 year \(=R s \frac{x \times \theta \times 1}{100}=R s \frac{E x}{100}\)
Andi STi on Res y at \(9 \% \%\), ia for 1 year - Rs \(\frac{y \cdot 9 \times 1}{100}-R s=\frac{9 y}{100}\)
Arcarding to question,
\(\frac{8 x}{100}+\frac{9 y}{100}-1800\)
\(\Rightarrow 8 x+9 y-188000\)
New: S.1 on Rs. 2 at \(99 \%\) p.a for 1 year \(=R<\frac{z \times 9 \times 1}{100}=R 3 \frac{S x}{100}\)
And, S1, on Rs \(y\) at \(8 \%\), e, e for 1 vear - Ra \(\frac{y \times \delta x 1}{100}-R s \frac{8 y}{106}\)
Aocording to question,
\(\frac{9 x}{100}+\frac{8 y}{100}=1860+20\)
\(\Rightarrow 9 x+8 y=188000 \quad\)....(i)
Adding equat (nss (i) and (ii), we get
\(17 x+17 y-374000\)
\(\Rightarrow x+y=22000\)
Subtracting-equations: (i) from (ii), wo get
\(x-y-374000\)
\(\Rightarrow x-y=2000\) (iv)

Adding equat ons (iii) and (jv), the get
\(2 x-24000\)
\(\Rightarrow \mathrm{x}=12000\)
\(\Rightarrow 12000+y-22000 \Rightarrow y=10000\)
Hence, the money invested in toneme A is R= \(12000^{\circ}\)
and in sheme \({ }^{3}\) is Ra 10000 .

\section*{Q9}

The coach of a cricket team buys 7 bats and 6 balls for Rs 9800 . Later, he buys 3 bats and 5 balls for Rs 1750 . Find the cost of each bat and each ball.

\section*{Solution}

Let the coss of a bat bex and y respectively.
According to the given information,
\(7 x+6 y=3800 . \ldots \ldots(1)\)
\(3 x+5 y=1750 . \ldots \ldots(2)\)
From(1), we obrain,
\(y=\frac{3800-7 x}{5}\) (9)

Substitut ing this value in equation (2), we obtain
\(3 x+5\left(\frac{3800-7 x}{6}\right)=1750\)
\(3 x+\frac{19000-35 x}{6}=1750\)
\(3 x-\frac{35 x}{6}=1750-\frac{19000}{6}\)
\(\frac{18 x-35 x}{6}=\frac{10500-19000}{6}\)
\(\frac{17 x}{6}=\frac{5500}{5}\)
\(x=500 \ldots \ldots .\). (4)
Substituting this equation 3 ), we obtain.
\(y=\frac{3800-7 \times 500}{6}\)
\(=\frac{300}{6}=50\)
Hence, the cost of a bat is Rs 500 and that of a bait is Rs50.
Concept Insight Cost of bots and balls need to be founc so the cgst of a buil and bat will be taken as the variables. Apply the cond tions of totaleastrof bats and balls algebraicequations will be obtained. The par of equations can then be solved by suitable substitution.

\section*{Q10}

A lending library has a fixed charge for the first three days and ary addifional charge for each day thereafter. Saritha paid Rs. 27 for a book kept for seven days, while Susy paid Rs 21 for the bookshekept for five days. Find the fixed charge and the charge for each extra day.

\section*{Solution}
\[
\begin{align*}
& \text { Let then fixed charge for fest thren days and nach oay charge thereafter be Res and Rav } \\
& \text { rempectively. } \\
& \text { According to the question. } \\
& x+4 y=27 \quad \text { (1) } \\
& x+2 y=23  \tag{2}\\
& \text { eibtracting aquatian }\{2 \text { ) fromequation (1), we obtain: } \\
& 2 y=6 \\
& y=\frac{1}{2} \\
& \text { Substituting tive value of } y \text { in equation (i). We obtam } \\
& x-12=27 \\
& x=15
\end{align*}
\]

\footnotetext{
Hence, the fixed charge in Rbs 15 and the chatge'por day it Rs 3.
}

The cost of 4 pens and 4 pencils boxes is Rs. 100 . Three times the cost of a pen is Rs. 15 more than the cost of a pencil box. Form the pair of linear equations for the above situation. Find the cost of a pen and a pencil box.

\section*{Solution}

Let the ocst of a pen be Rs. \(x\) anid that of penitl beRs. \(y\).
According to question, we have
\(4 x+4 y-100\)
\(\Rightarrow x+y\) - 2 \(\quad \rightarrow i)\)
And, \(\mathrm{Sc}-\gamma=15 \quad \ldots(i)\)
Adding equations (1) and (it \(\lambda\) we ger
\(4 x=40\)
\(\Rightarrow x=10\)
Sibstituting \(x-10\) in (i) we have
\(10+y-25\)
\(\rightarrow y=15\)
Hence, the crest of a pan is R is. 10 and that of a pencil is \(\mathrm{R}=15\).

\section*{Q12}

One says, "Give me a hundred, friend! I shall then become twice as rich as you". The other replies, Tl you give me ten, I stall be six times as rich as you". Tell me what is the amount of their (respective) capital?

\section*{Solution}

According ko the question.
\(x+100=2(y-100)\)
\(x-100=2 y-200\)
\(x-2 y=-300\)
\(6(r-10)=(y+10)\)
\(6 x-60=y-10\)
\(6 x-y=70\)
Mailiplying :enpation (2) tiv: 2, we abtain
\(12=-2 y=140\)
Subtracting equation \{a) frort equation (3), we obtain)
\(11 x^{\prime}=140-300\)
\(1 E F=440\).
\(x=40\)
Puften the value of \(x\) in equation ( 2 ), we phran:
\(40-2 y=-300\)
\(40+200=3 y\)
\(2 y=340\)
\(y=270\)
Thus the \(\$\) wo friectis hac ks 40 and ks 170 with shemi.

\section*{Solution}

Supposer anasx mangoes and al tias y mangces.
Acmordig to tin pean corutitionsy wey have
\[
\begin{array}{ll} 
& x+39-2(y-30) \\
\Rightarrow & x+30-2 y-60 \\
\Rightarrow & x-2 y-60-30 \\
\Rightarrow & x-2 y--90 \\
\text { and } \quad & y+10-3 y(x-10) \\
\Rightarrow \quad & y-10=3 x-30 \\
\Rightarrow & 10+30-3 x-y \\
\Rightarrow \quad & 3 x-y-40
\end{array}
\]

Multpeying equaton (i) by a and equation (i) by 1 , we get
\(3 x-6 y=-270\)
-fiii)
\(3 x-y=40\)
-(iv)

Subtracting equation (iv) b ecuasionf(ii), we get.
\(-6 y-(-t)=-270-40\) :
\(=\quad-6 y+y=-210\)
\(\Rightarrow \quad-5 y=-310\)
\(\Rightarrow \quad y=\frac{310}{5}+62\)

\(x-2 \times 62-90\)
\(\Rightarrow \quad x-124=-90\)
\(\Rightarrow \quad x=-90+114\)
\(=x-34\)

Hence, \(f\) has 24 mangofe and a bas 62 mangoes.

\section*{Q14}

Vijay had some bananas, and he divided them into two lots A and B . He sold first lot atthe rate of Rs. 2 for 3 bananas and the second lot at the rate of Rs. 1 per banana and got a total of Rs. 400 . If he had sold the first lot at the rate giRs 1 per banana and the second lot at the rate of Rs. 4 per five bananas, his total collection would have been Re 480 . Find the fotal number of bananas he had.

\section*{Solution}

Let the number of banamasin fat. A be \(x\) and thiat in for B be y .
Then, rotal number of bananas \(-x+y\)
Acrording to question,
\(2 x \frac{z}{3}+1 \times \frac{y}{1}=400\)
\(=2 x+3 x-1200\)
And, \(1=\frac{x}{1}+4 x \frac{y}{5}-450\)
\(\Rightarrow 5 x+4 y-2200\)
Adding mpuation \(\equiv\) (1) and ( 11 ), me get
\(7 x+7 y=3500\)
\(\Rightarrow x+y=500\)
Hence, Way had 500 basanan:

\section*{Q15}

\section*{Solution}
ket the price of a TM be Res it and that of a frigge be Ry \(y\) Theit, we have
\(\frac{10 r}{100}-\frac{10 y}{100}-2000\)
\(=\quad 5 z+13 y-200000\)
\(\Rightarrow \quad 5(x+2 y)-200000\)
\(\Rightarrow \quad x+2 y=401000\)
\(-11\)
atid. \(\frac{200}{102}-\frac{5 y}{100}-1500\)
\(=10 x-5 y-150000\)
\(\Rightarrow \quad 5(2 x-y)-150 D 0 d\)
\(\Rightarrow \quad 2 k=y=30000\)
Multpilying equation(i) by 2; we got
\(4 x-2 y=50000\)
- - in

Addinu vquation [9 and bouation (ii). we get
\(x+4 x<40000+60000\)
\(=5 x-105000\)
\(=x=20000\)
Puttinu \(x-20000\) in aguationfi), wo git.
\[
20000+2 y=40000
\]
\(=\quad 2 y-40000-20000\)
\(=\quad y=\frac{20000}{2}=10000\)

Hence; the actual prute of \(T, V=F 3,20,000\)
and, the rctual price of fhidge - R \(s 10,000\).

\section*{Exercise 3.7}

\section*{Q1}

The sum of tion rumbers is 8 . If their sum is for tmes their dfference, find tie nunters.

\section*{Solution}

Let the numbers bey and. \(\mu\). Than we have
\[
x+y=8
\]
and. \(\quad x+y-4(x-y)\)
\(\Rightarrow \quad x+y-4 x-4 y\)
\(\Rightarrow \quad 0=4 x-4 y-x-y\)
\(\Rightarrow \quad 3 x-5 y-0\)
Multplying equation (i) by S and, weqet
\(5 r+5 y-40\)
一(i)
Adding equation \((1)\) and equation (i) , we get
\(3 r+5 x=40\)
\(\Rightarrow \quad 8 x=40\)
\(\Rightarrow \quad x=\frac{40}{8}=5\)
PLiting \(x-5\) in 日quatior ( ), win get
\(5+y=0\)
\(\Rightarrow \quad y-8-5-3\)

Hence; the required numbers ake 5 and 2

\section*{Q2}

The sum of digits of a swo digit numbers is 13 . obtainec by interchanging the nigits, the result is 45 What is the numgert

\section*{Solution}

Let tne-digit in the units placebex and digit in the ter splace bey then,
\(x+y=13\)
[given]
and, Number \(-10 y+x\)
Number pothainoc by tevorsing the digits - 196
It is given that the number is suotracted from the one obtained by
interdsanging the idigits, the tesuit iE 45 .
1.4.4 (Nunber oblanad to intirctangime the dight) - Number - 45
\[
\begin{array}{ll} 
& 20 x+y-(20 y+x)-45 \\
\Rightarrow & 5 x-9 y-45 \\
\Rightarrow & 9(x-y)=45 \\
\Rightarrow & x-y-5 \tag{1}
\end{array}
\]

Adiding equation fi and equatonfii), witiget
\[
\begin{array}{ll} 
& 2 r-13+5 \\
\Rightarrow \quad & 2 r=18 \\
\Rightarrow & x-\frac{18}{2}-5
\end{array}
\]

Putting \(=-9\) in equation (1). wछgat
\[
9+y=13
\]
\[
\Leftrightarrow \quad y:-13-9-4
\]

A rumber conisi三t of twe digita, whose sum is five, Whein the digits ane reverand, the number jecoines greater by nine. Find the number.

\section*{Solution}
```

Let the digitin the units plaig be $x$ and digit in the tern plake bo $y$. Then,
$x+y=5 \quad$ [gien] $\quad$ ( $)$
anc, Number $-10 y+x$

```

Eumiker abtairet by wersing the digits - 1 2 \(k+y\)

It is given that if the idigis are reversec, the number becomes greater by nine.
1. W. Numbur potarnod by intarcharging then diphan \(=\) fiuniber 49

W \(\quad 10 x+y=10 y+x+9\)
\(\Rightarrow \quad 10 x-x+y-10 y=9\)
\(\Rightarrow \quad 9 x=9 y<9\)
\(\Rightarrow 9(x-y)=9\)
\(\Rightarrow \quad x-\mu=1\)
Adding equation \(\left\{\begin{array}{c}\text { a } \\ \text { and equatipntin). we get }\end{array}\right.\)
```

        \(2 r-5+1\)
    $\Rightarrow \quad 2 k=6$
$=x-\frac{6}{2}-3$
Futting $x=3$ in equation(i), we get
$\pi+y=\pi$
$=\quad y-5-3-7$

```

Hence, the number is \(10 y+\Rightarrow-10 x^{2}+3-23\) :

\section*{Q4}

The sum of digits of a twa dig number is 15 The number stitaned by faverining the order of digits of the given number Eingeds the given rule ber by of Finid the given numbee

\section*{Solution}
```

Let the digit in the units placetrex and digit in the teris placs be. . Then,
Number - $10 y+x$
Number formnd by reversumg the diges - tak *y
According to the given conditions, we have
$x+y=15 \quad-$ ( $)$
and, $20 x+y-10 y+x=0$
$=10 x-x+y-10 y-9$
$\Rightarrow \quad 9 x-9 y \equiv 9$
$\Rightarrow \quad 9(x-y)=5$
$\Rightarrow x-y=1$ - -
Adding equation in and equationf9, we get

$$
\begin{aligned}
& 8 x-15+7 \\
=\quad & 2 x=10 \\
= & \quad x-\frac{15}{2}-8
\end{aligned}
$$

$$
\text { putting } N=8 \text { in equation }(1) \text {, we get }
$$

$$
8+y=15
$$

$$
=\quad y-15-6-7
$$

```

Hence the requised numberis \(10 y+x=20 \times 7+0=70\).

\section*{Q5}

The sum of two-digit number and the number formed by reversing the order of digits is 66 . If the two digits differ by 2 , find the number. How many such numbers are there?

\section*{Solution}

Let the fent and the unit's drgits in the first number be anc yo respectroely, 50 , the
 \(20(5)+5)\)
 digit This numker, in the empanded notatinn is 10 y + F- For example, oban 56 is reversed; \(w=g a t 65>10(6)+3)\)
accordng to the givan condition

Lin. \(4 \quad i!(x+y)=66\)
4eig \(\quad x+y=6\)
We ire alsc qiven that the digits offsed by 2 , thagefore, ether
\[
\begin{equation*}
x-x=2 \tag{2}
\end{equation*}
\]
\[
\text { or } \quad y-x=z
\]

In this ciste, we get the mumber 42
IF \(y-\pi=2\), then solving (1) and \((3)\) Ey eimination, we get \(x=2\) and \(y=4\), In this case, we gut the number-24

Thus, there an two suek numbers 42 and 24 .

\section*{Q6}

Let the large numbar BEN and the smale number bay then;
\[
\begin{array}{ll} 
& x+y=1000 \\
\text { and, } & x^{2}-y^{2}-256000 \\
\text { sow } x^{2}-y^{2}=250000 \\
= & (x+y)(x-y)=256000 \\
= & 1000 x(x-y)=256000 \quad[-1 i \\
= & x-y=256 \quad[(i)
\end{array}
\]

Adding eqation (f) and equation fil), we get
\[
5 x-1060+256
\]
\(=\quad x=\frac{1256}{2}=620\)

\[
628+y-1000
\]
\(=y=1000-620=372\)
Hance, the requirud rumbers are 028 and 372

\section*{Q7}

The sum of: a two digit num oer and toe number oltaned by rovarsing the ordar of its digits is 99 . If the digits differ by 3 , find the number.

\section*{Solution}

Leit thin digit in the units placat bex and then digit at thein tim'cplaan be \(y\). Than Number \(=10 y+x\)

The number abtames by meversing the ofder if the digits is \(10 \% \times\)
Acocrding to the geven conditions, we have
\[
\begin{aligned}
& (10 y+x)+(20 x+y)-99 \\
= & 11 x-11 y-99 \\
\Rightarrow & 11(x+y)-99 \\
= & x+y=9
\end{aligned}
\]

Thus, we haye the fotowing seta of simultarsous हquetions
\begin{tabular}{rr}
\(x-y=9\) & \(-(1)\) \\
ard. & \begin{tabular}{rl}
\(x-y\) & \(=3\) \\
\(x+y\) & \(=9\) \\
\(x-y\) & \(=-3\)
\end{tabular} \\
& \(-(i i)\) \\
& \(-(i)\)
\end{tabular}

Adding equationi \(\{\) ) and \((1)\), wee get
\[
\begin{aligned}
& \quad 2 r=9+3 \\
& =\quad \pi-\frac{12}{2}-6 \\
& \text { Furting } x=6 \text { in बquझtion(), weget } \\
& =\quad \begin{array}{l}
\delta+y-8 \\
= \\
y-6-5-3
\end{array}
\end{aligned}
\]
\[
\text { The required number is } 50 y+x-10 \times 3+6-36
\]

Adding equation(ii) ent equation (rv), we qet
\[
\begin{array}{r}
2 r=9-3 \\
=\quad \pi-\frac{5}{2}-3
\end{array}
\]

Putting \(x=3\) in equation \((-1)\), wo get
\[
\begin{array}{ll} 
& 3+y=9 \\
=\quad & y-9-3-5 \\
\text { The required number is } 10 y+x=10 \times 6+3=63
\end{array}
\]

Hance, the required rember if \(\begin{aligned} & \\ & 3 \text { or, } 96 .\end{aligned}\)

\section*{Q8}
4. wo-digit num ber is - 4 Tmes the 3 Im of its digits if 19 - 3 added to che number, the digts are reversed. find te num ber.

\section*{Solution}

Let the digit in the unitsplace \(b=x\) and the digit at the ten's plece be \(y\). Then. Number - \(10 y+N\)

The num ber abtained by reyersing the order of the digits is \(10 y+y\).
Acpirding to the zuven conditions, we have
```

    \(10 y+x=4(x+9)\)
    $\Rightarrow \quad 10 y+x=4 z+4 y$
$\Rightarrow \quad 0-4 x-x+4 y-10 y$
$=0-3 x-6 y$
$\Rightarrow \quad 3 x-6 y=0$
$\Rightarrow \quad 3(x-2 y)=0$
$\Rightarrow \quad x-2 y=3$
ind,$\quad 10 y+x+10-10 y+y$
$=18-10 x-x+y-10 y$
$\Rightarrow \quad 18=9 x-9 y$
$=\quad 3 r-9 y-19$
$=9(N-y)-10$
$=\quad x-y-2$
一何

```

Subtracting equation (i) fram equation (i), we get
\[
-2 y-(-y)-0-2
\]
\(\Rightarrow \quad-2 y+y=-2\)
\(=\quad-y=-2\)
\(=\quad r=2\)
Putting \(f=2\) in equatonf(1), we get
\[
\begin{aligned}
& x-2-2 \\
& =\quad x-4
\end{aligned}
\]

Hence, the required number io 10 Cl - \(\mathrm{x}-10 \mathrm{k} 2+14-24\)

\section*{Q9}

A two-digit number is 3 more than 4 times treate of its digitsi if 1515 added to the number, the digts are reversed, Find the num ber

\section*{Solution}

Let the digit in the unies place be \(x\) and the sigit at trie terd place be \(y\). Thianj Nuriber \(-20 Y+B\)

The number obtained by reversing the order of the afigits is \(10 \mathrm{v}+y\).
Accordiog to the given sonditions, we have
\[
\begin{align*}
& 10 y+x-4(x+y)-3 \\
& =10 y+x+4 x+4 y+2 \\
& =10 y-4 y+x-4 x-3 \\
& \Rightarrow \quad 0 y-3 x-3 \\
& =\quad 3(2 y-x)-3 \\
& =2 y-x-1 \quad \text { - } 11 \\
& \text { and, } \quad 10 y+x+211-10 x+y \\
& =18-10 x-x+y-10 y \\
& \Rightarrow \quad 18-9 x-9 y \\
& \Rightarrow \quad 9 x-9 y-12 \\
& \Rightarrow \quad \equiv(N-y)-10 \\
& \Rightarrow \quad N-n-\frac{18}{5}-2 \tag{0}
\end{align*}
\]
adding equation\{i, and equation\{i). we qet \(2 y-y=1+2\)
\(\Rightarrow \quad r-3\)
Putting \(y-3\) 位 equation(o) segas
\(=x-3-2\)
\(\Rightarrow \quad x=2+3-5\)
Hencr, the requited number in \(10 y+x=20 \times 3+5-35\)

Q10

A two-digt number is 4 more than 6 times the sum of its digits. If 19 is subracted iora the number, the oigts are revarsed, Find the number.

\section*{Solution}

Let the idigit in the urut＇s place bex afod the digit si Ene ten＇s place be \(y\) ，Than， Number \(=10 p+K\)

The num ber abtainad tiy revarsing the onfer of the digits is \(10 x+y\) ．
Aconding to the given conditiois，we have
\(10 y+x-6(x+y)+4\)
\(\Rightarrow \quad 10 y+x-6 x+5 y+4\)
\(=10 y-5 y+x-6 x-4\)
\(=\quad 4 y-5 x-4 \quad=(0)\)
and \(10 y+x+28=10 x+y\)
\(\Rightarrow \quad-10-10 x-x+x-10 y\)
\(=\quad-18-9 x-6 y\)
\(\Rightarrow \quad \operatorname{six}-9 \hat{y}=-10\)
\(\Rightarrow \quad P(x-y)=-18\)
\(\Rightarrow \quad x-y=-2\)
Multflyirg equat onf（i）by＋＋we get． \(4 x-4 x=-1\)一（iii）
Adding equation名 and equation \(\left.(1)^{2}\right)\) we get
```

        \(-5 x+4 x-4-8\)
    $\Rightarrow \quad-x=-4$
$=\quad N=4$
froting $x-4$ in 日quatunfif, we get
$4-y=-2$
$\Rightarrow \quad-y=-2<4$
$=\quad-y=0$
$\Rightarrow \quad y=0$

```

Hence，the required number is \(10 y+x-10 \times 5+4-34\)

\section*{Q11}

A．tiva digit number，is 4 times the sem ofde digits：anis ton ce the product or the digits
Find the number

\section*{Solution}
```

Lat the digit in the unit's place beN' and the:dizit at tres ter's place be y. Thea,
Number = 20y+x

```

The number obtained by reversing the order of the:dizits. is \(10 \dot{v}+y\).
According to the given conditions, we have
\[
\begin{array}{ll} 
& 10 y+x=4(x+y) \\
= & 10 y+x-4 x+4 y \\
\Rightarrow & 10 y-4 y+x-4 x-0 \\
\Rightarrow & 6 y-3 x=0 \\
= & -3 x+5 y-0 \\
\Rightarrow & 3 x-0 y-0 \\
\Rightarrow & 3(x-2 y)-0 \\
\Rightarrow & x-2 y=0 \\
\Rightarrow & x=2 y \\
\text { anc. } & 10 y+x=2\{x \times y) \\
\Rightarrow & 10 y+x=2 x x \tag{一析}
\end{array}
\]

Substintong \(x-2 y\) in equation \((i)\), we get \(10 y+2 y-2=(2 y) \times y\)
\(\Rightarrow \quad 12 y=4 y^{2}\)
\(=3 y-y^{2}\)
\(=y^{2}-3 y-0\)
\(=y(y-3)=0\)
\(=y-0\) if \(y=3 \quad\) [y-Ton's ifigit can not ber 0]
\(\Rightarrow \quad \gamma=3\)
Putting \(y=3\) in equaton(i). \(w=\) get \(y-203-5\)

Herce, the required numbeci \(i=10 y^{\prime}+x-10 x 3+6+36\),
Q12

A toro-digit number is guch finat the produt of its digite is 20. if 9 is adided to fhemumber,
the digis inter chanoe their placesi Find the number.

\section*{Solution}

Let the digit in the unit splare bex and the digit at the ter's place bey. Then, Number \(-10 y+x\)

The number obtained by reversing the order of the digits is \(18 x-y\).
According to tre glyen conditions; upe have
\[
\begin{align*}
& n \times y-33 \\
& =\quad y=\frac{20}{x}
\end{align*}
\]
and. \(10 y+x+\overline{7}-1 \bar{\pi} x+\gamma\)
\(=\quad 9-10 x-x+y-10 y\)
\(\Leftrightarrow \quad 9=9 x-9 y\)
\(=\quad 3 x-9 y-0\)
\(=3(x-y)-9\)
\(=x-y-1\)
Substiouting \(y=\frac{20}{x}\) in equation fil. 'waget
\[
\begin{aligned}
& x-\frac{20}{x}=1 \\
&= x^{2}-20-x \\
&= x^{2}-x-20-0 \\
&= x^{2}-5 x-4 x-20-0 \\
&= x(x-5)+4(x-5)-0 \\
&=(x-4)(x-5)-0 \\
&= x-5-0 \quad \text { or } \\
&= x-7 \\
& \text { Puttitig } x-5 \ln y-\frac{20}{N}, x \cos \\
& y=\frac{20}{5}=4
\end{aligned}
\]
\[
=x-5-0 \text { or } x+4-0 \quad \text { [idigit can hot beinglative] }
\]

Hances, the raquinend numbur is \(10 y+x-10 \times 4+5-4.5\).

\section*{Q13}

Find them

\section*{Solution}

Lat the larger number bex and the smaler numberne, Then.
\[
\begin{array}{ll}
x-y+2 a & \text {-(i) } \\
\text { and } & x-3 y
\end{array}
\]

Substitutingie \(=3 y\) in equation (1). We get
\[
\begin{array}{ll} 
& 3 y-y<26 \\
\Rightarrow \quad & 2 y-26 \\
\Rightarrow \quad & y+\frac{2 E}{2}=17
\end{array}
\]

F-ltinc \(y=13\) - in equation(4), We get \(x-2 x 13-39\)

Hence, the required numbers are 39 and 12.

\section*{Q14}

The sum of digits of a two-digit number is 9 . Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

\section*{Solution}

Letze Grita digit and tons digit or the numbiar be harof y rezoestivels.
tuartaer - \(10 \%+x\)
fiventer atter teverving tie tidits \(-10 x+r\)
Acoarting to the question,
\(x \rightarrow \rightarrow=9\) (i. (1)
\(9(10 y+N)-z(11 x+y)\)

\(-x-8 y=0 \quad\) (2)
Adding equition: (1) and (2), we obrain!
\(9 y=4\)
Evbitining the veluan af 4 in anastion (1), ine cotain:
\(x-1 i\)
Thut, the nutater is \(14 y+z-10=1+8-15\).
Concrpt ansights this protiem solks about a svo dign number. Herz: remember that a two digit number xr oan be oxpandod as
 Ifth sariables.

\section*{Q15}

Syven times a two-digit number is equal to four times tom fumber obtain:ed by rmansing the digiss. If the difference hetween the digits if 2. Find the fumber

\section*{Solution}

Lat the digit in the unit's place bun . 3 ced tine digit at trif ter'3. piace bey then, vumber \(=30 y+N\)

The number obtained by faversing the order of the digits is \(10 x+y\).
\&cturiting to the giver concitions, wo have


Hence, it + required number if \(10 y+x=10 \times 2+b-36\),

\section*{Q16}

Two numbers are in the ratio \(5: 6\). If 8 is subtracted from each of the numbers, the ratio becomes \(4: 5\). Find the numbers.

\section*{Solution}

Let the two numbers be \(x\) and \(y\).
Acrurding to question,
\(\frac{x}{4}-\frac{5}{6}\)
\(\Rightarrow 6 \mathrm{x}-5 \mathrm{y}\)
\(\Rightarrow 5 x-5 y-D\)
And, \(\frac{x-8}{y-8}=\frac{4}{5}\)
\(\Rightarrow 5 x-40-4 y-32\)
\(\Rightarrow 5 x-4 y-8\)
Mult plying equation (i) by 4 and (11) by 5 , we get
\(24 x-20 y-0 \quad-\ldots .0\) in
\(25 x-20 y-40\)-..(iv)
Subvecang equation (iil) frem (iv), we tiave
\(x-40\)
Substiouting \(x-40\) in (i), wee have
\(6 x-40-5 y=0\)
\(\Rightarrow 5 \psi-240\)
\(\Rightarrow y-48\)
Hence, the two numbers are 40 and 48

\section*{Q17}

A two-digit number is obtained by either multiplying the sum of the digits by 8 and then subtracting 5 or by mutiplying the difference of the digits by 16 and then adding 3 . Find the number.

\section*{Solution}

Let the digh at unite place be x and the digit at tureplowe bey
Then, number \(=10 y+x\)
According to given conditions, whe have
\(10 y+z=8(x+y)-5\)
\(=10 y+x-8 x+8 y-5\)
\(\Rightarrow 7 x-2 y-5-0\)
And, \(10 y+x=16(y-x)+3\)
\(\Rightarrow 10 y+x-16 y-16 x+3\)
\(\Rightarrow 17 x-5 y-3-0\)
By cross-rrultiplicabon, we have
\(\frac{x}{-2 \times(-3)-(-6) \times(-5)}-\frac{-4}{7 \times(-3)-17 \times(-5)}-\frac{1}{7 \times(-6)-17 \times(-2)}\)
\(=\frac{x}{6-30}-\frac{-x}{-21+85}-\frac{1}{-42+34}\)
\(\Rightarrow \frac{x}{-24}=\frac{-v}{64}=\frac{1}{-8}\)
How, \(\frac{x}{-24}-\frac{1}{-8}<-8 x--24<x-3\)
And, \(\frac{x}{64}-\frac{1}{-8} \Rightarrow 8 y-54 \Rightarrow y=8\)
Hence, the number \(=10 \times 8+3=80+3=63\);

\section*{Exercise 3.8}

Q1

The numerator of a fraction in 4 less than the dehiominator If the numeraton is decreased by 2 and denominabor if increazed on 1, then the denominator is aigh: om ee the numeratpr Firs the fracton-

\section*{Solution}

Lit the rumerator and decominator of the fraction \(\mathrm{te} x\) arid \(y\) respectivaly. Then
\[
\text { Fracsan - } \frac{x}{y}
\]

14 is given that
Rumeraser = Denominator-4
\(=x-y-4\)
\(\geq \quad N-y=-4 \quad=-10\)
according to the givon condition, we have
\[
\frac{1}{4}(x-2)-(y+1)
\]
\(=182-10-y+1\)
\(\Rightarrow B x-y-1+16\)
\(\Rightarrow \quad d x-y=27\)
Subtracting equation i) by equation (ii), we qet
\[
\begin{aligned}
& \left.8 k-x-y-(-y)^{\prime}-1^{\prime}\right)-(-4) \\
& =\quad 2 x-y+y-17+4 \\
& \Leftrightarrow \quad 7 x=21 \\
& =x-\frac{21}{7}-3 \\
& \text { Putringex-3 inequation(i), we get } \\
& \text { - } 3-y=-4 \\
& =\quad-y=-4-3 \\
& \Rightarrow \quad-y=-7 \\
& =\quad y=z
\end{aligned}
\]

Hence, the fraction if \(\frac{3}{8}\)

\section*{Q2}

A fraction becomes \(9 / 11\) if 2 is added to both numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes \(5 / 6\).
Find the fraction.

\section*{Solution}

Let the fraction \(b \in \frac{x}{y}\)
escorting to the given information,
\[
\frac{+2}{+2}=\frac{9}{11}
\]
\(1 i x+22=9 y+18\)
\(11 x-9 y=-4\)
\(\frac{x+3}{y+3}=\frac{5}{6}\)
\(6 x+18=5 y+15\)
\(6 x-5 y=-3\)
From equation (1), we obtain \(x=\frac{-4+9 y}{11}\)
Substituting this in equation (2), we obtain
\[
\begin{align*}
& 6\left(\frac{-4+9 y}{11}\right)-5 y=-3 \\
& -24+54 y-55 y=-33 \\
& -y=-9 \\
& y=9 \tag{4}
\end{align*}
\]

Substituting this in equation (3), we obtain \(x=\frac{-4+81}{11}=7\)
Hence, the fraction is \(\frac{7}{9}\).

\section*{Q3}
A. flaction becomes \(1 / 3\) if 1 is subtracted from both it humbatce and denomingting If i

Is added to both denumeator and denominator, inpecomes \(1 / 2\). Find the imotwin.

\section*{Solution}

Let the:fraction be \(\frac{x}{y}\)
Then, zocording to the given ooncitions, we have
\begin{tabular}{ll} 
& \(\frac{x-1}{y-1}=\frac{1}{3}\) \\
\(=\) & \(3(x-1)-(y-1)\) \\
\(\Rightarrow\) & \(3 x-3-y-1\) \\
\(\Rightarrow\) & \(3 x-y=-1+3\) \\
\(\Rightarrow\) & \(3 x-y-2\) \\
and & \(\frac{x+1}{y+1}=\frac{1}{2}\) \\
& \(2(x-1)-y-1\) \\
\(\Rightarrow\) & \(2 x+2-y+1\) \\
\(\Rightarrow\) & \(2 x-y=1+2\) \\
\(\Rightarrow\) & \(2 x-y-1\)
\end{tabular}

Subteacting ectiatica(i) by equation(i), we get
\[
\begin{array}{ll} 
& 3 x-2 x-2-(-1) \\
\Rightarrow \quad & x=2+1-7
\end{array}
\]

Putting \(x-3\) inequasonf(), we zet
\[
\begin{array}{ll} 
& 3 \times 3-y-2 \\
\Rightarrow & 9-y-2 \\
\Rightarrow & -y-2-1 \\
\Rightarrow & -y<-7 \\
\Rightarrow & y=7
\end{array}
\]

Hence, the fracton is \(\frac{3}{7}\).

\section*{Q4}

If we add 1 to the numerator and subtract 1 from the denominator, a fraction becomes 1 . Yyiso becomes \(1 / 2\) if we only add 1 to the denominator. What is the fraction?

\section*{Solution}
bet thestration be \(\frac{\pi}{y}\)
Ac-ardituc to the elestian.
\(\frac{x+1}{y-1}=1\)
\(\Rightarrow z-y=-2\)
\(\frac{x}{y+1}=\frac{1}{2}\)
\(\Rightarrow 2 x-y=1\)
Subteranc eoustan (I) fimi equation (A), we ubtein!
\(x=3\)
Sabsthuting this walue if \(=\) in pquation (1), we oftains
\[
\begin{aligned}
& 3-y=-2 \\
& -y=-5 \\
& y=5 \\
& \text { Hence, the fratuin is } \frac{3}{5}
\end{aligned}
\]

\footnotetext{
 thage ar varinbles \(x\) and y cespectivaly where variahie \(y\) must hn non zem, Than, a pair of linear enuetione san an formed from tha given candzons. The pair ct equatons can then be sniked by eliminazing a suitable variabie.
}

The sum of the numerator and denominator of a fraction is 12 . If the denominator is increased by 3 , the fraction becomes \(1 / 2\). Find the fraction.

\section*{Solution}

Let the fraction be \(\frac{x}{y}\)
Then, according so thagen condions, we have
\[
\begin{align*}
& x+y=12 \\
& \text { - (i) } \\
& \text { and, } \frac{x}{y+3}-\frac{1}{2} \\
& \Rightarrow \quad 2 x-y+3 \\
& \Rightarrow \quad 2 x-y-3  \tag{--in}\\
& \text { edding equabon() and equaton(i) we get } \\
& x+2 x-12+3 \\
& \Rightarrow 3 x-15 \\
& \Rightarrow \quad x-\frac{15}{3}-5 \\
& \text { Putting } x-5 \text { in equation(i) , weget } \\
& 5+y-12 \\
& \geq \quad y=12-3-7
\end{align*}
\]

Hance, tie fraction is \(\frac{5}{7}\).

\section*{Q6}
 becom \(\because 1 / 4\). And, when at is added to nam arator and the denominator is miltip ind by
3 , it becones \(2 / 3\). Find the fraction

Solution

Let the fratton be \(\frac{k}{y}\),

\[
\begin{align*}
& \frac{x-2}{y+3}-\frac{1}{4} \\
= & 4(x-y)-y+3 \\
= & 4 x-8=y+3 \\
\Rightarrow \quad & 4 x-y=3+7 \\
= & 4 x-y=11 \tag{i}
\end{align*}
\]

And. \(\frac{x+5}{3 y}-\frac{2}{3}\)
\(\Rightarrow \quad \frac{3(x+5)}{3 y}-2\)
\(=x+6-2 y\)
\(=x-2 y-25\)

Muitplying equation (1) ty 2 , w we get \(8 y-2 y-28\)

Subtractiong aquat on (i), fram squator (iii), wh get
\(8 x-5-22-(-5)\)
\(=8 x-x-28 \times 6\)
\(\Rightarrow \quad 7 K+2 E\)
\(=x-\frac{28}{7}-4\)

Futung \(x=4\) (n equation (if). We gat
\[
\begin{array}{ll} 
& 4-3 y--6 \\
= & -2 r--5-4 \\
= & -2 y--10 \\
\Rightarrow \quad y-\frac{-19}{-2}-\frac{e}{4}
\end{array}
\]

Herce, the fraction is \(\frac{4}{5}\);

\section*{Q7}

The sum of a numarator and denominator of a fiaction ass if the derom nator is increased oy 2, the facrion reduces to \(1 / 3\). Finc til fraction.

Solution
```

Let the fraction be $\frac{x}{y}$.
Ther, according so the qiven concitons, we frave
$x-y=28$
-(i)
and $\frac{x}{y+2}-\frac{1}{2}$
$\Rightarrow \quad 3 x-y+2$
$\Rightarrow \quad 3 x-y-2 \quad$-iii)
Afding eovasion() ath equaton (ii) ) We get
$x+3 x-10+2$
$\Rightarrow \quad 4 x=20$
$\Rightarrow \quad x-\frac{20}{4}-5$
Hutting $x-5$ in equation 3 位, we get
$\Rightarrow \quad \begin{aligned} & 5+4-18 \\ & y=28-5\end{aligned}$
$\Rightarrow \quad y=28-5$
$\Rightarrow \quad y-1 \pi$

```

Hence, tas frackion is \(\frac{5}{13}\)

\section*{Q8}
 denorninator, it requce to 1/2. Find the fraczon.

\section*{Solution}

Let the fiaction be \(\frac{x}{y}\).
Thun, acconding to the givan amicitumb, whe have
\[
\begin{aligned}
& \frac{x+2}{y}=\frac{2}{2} \\
\Rightarrow \quad & 2(x+2)-y \\
\Rightarrow \quad & 2 v+5=y \\
\Rightarrow \quad & 2 v-y=-4
\end{aligned}
\]
\[
\text { And: } \frac{x}{y-1}-\frac{1}{3}
\]
\[
=\quad 3 x-r-1
\]
\[
\begin{equation*}
\Rightarrow \quad 3 x-y=-1 \tag{ii}
\end{equation*}
\]

Subtacting wgation (i) by aquatro (ii), we gut
\[
3 x-2 x--1+4
\]
\[
\Rightarrow \quad N=3
\]
putting \(x-3\) in equatrom(i), we get
\[
\begin{array}{ll} 
& 2 \times 3-y--4 \\
\Rightarrow & 5-y=-4 \\
\Rightarrow & -y=-4-5 \\
\Rightarrow & -y=-10 \\
\Rightarrow \quad & y=-10
\end{array}
\]

Heace, the fract on is \(\frac{3}{10}\).

The sum of the rivmeramt and demominaty of afraction is 4 more than twica the numetatot. If the numerator and denominator are increased by 3 , they are in the ratio \(z ; 3\). Qeptarmine the fracoon.

\section*{Solution}

Let the raction be \(\frac{x}{y}\).
Then, according to the gleen oonditions, we have
\[
\begin{array}{ll} 
& x+y-2 x+4 \\
\Rightarrow & x+y-2 x=4 \\
\Rightarrow & -x+y<4 \tag{1}
\end{array}
\]
\[
\text { srid } \frac{x+3}{y+3}-\frac{3}{3}
\]
\[
\Rightarrow \quad 3(y-3)=2\{y+2\}
\]
\[
\Rightarrow \quad 3 x+7-2 y+0
\]
\[
\Rightarrow \quad 3 x-2 y-5-9
\]
\[
\Rightarrow \quad 3 x-2 y=-3
\]

Multip ying equation () bya, we gat
\[
-3 x+3 y=17 \quad-\{i i i)
\]
 \(-2 y+3 y--3+12\) \(y=9\).

Pefting \(\gamma=9\) in aquation (i), we zut
\[
\begin{array}{ll} 
& -x+9-4 \\
\Rightarrow & x-4-9 \\
\Rightarrow & -x--5 \\
\Rightarrow & x-5
\end{array}
\]

Hence, the fracticn is \(\frac{5}{6}\)

\section*{Q10}

If the namsorator of a faction is multipled by 2 and the jenominator is raduced by 5 the fraction becomes \(\mathrm{b} / \mathrm{a}\). And, if the denominater is doubled and the numerator is
increased by 8, the fracpon becomes 2/5. Find the fraction.

\section*{Solution}

Let the fraction be \(\frac{\pi}{y}\)
Then, acoording to the given toncitoris, we have
\[
\begin{array}{ll} 
& \frac{2 x}{y-5}-\frac{6}{1} \\
\Rightarrow \quad & 5 \times 2 v-0 . y(y-5) \\
\Rightarrow \quad & 10 x-6 y-30 \\
\Rightarrow & 10 y-6 y-30 \\
\Rightarrow & 2(5 x-3 y)--30 \\
\Rightarrow & 5 x-3 y=-15 \tag{-ii}
\end{array}
\]
sid \(\frac{x+\pi}{2 y}+\frac{2}{5}\)
\(\Rightarrow \quad 5\{x+8\}-2 \times 2 y\)
\(\Rightarrow \quad 5 x+40-4 y\)
\(=\quad 5 x-4 y=-40\)
Subtracting ntuation(i) by uquotion (0) wo get
\[
\begin{array}{ll} 
& -3 y+4 y=-1 \pm+40 \\
\Rightarrow \quad & y+25
\end{array}
\]

\[
5 x-3 \times 25=-15
\]
\(=\quad 5 x-75=-15\)
\(=\quad 5 K<-15+75\)
\(\Rightarrow \quad 5 x=60\)
\(\Rightarrow \quad x-\frac{50}{5}-12\)
Hence, the fracton is \(\frac{12}{25}\)
Q11

The sum of the numerato and denoni rate of a fracuon is 3 less than tutceithe
denominater, If the numerator and cenominator arececreazed by- \& the nomeraton
Eecomeshaif the deanminator bangminatar the fractigh.

\section*{Solution}

Let the fraction be \(\frac{x}{y}=\)
\[
\begin{align*}
& \text { Then: according to the gren conditions, we hava } \\
& \begin{array}{l}
=\quad x y-2 y-3 \\
=\quad x-2 y-y=-3: \\
=\quad x-y=-3 \\
\text { And; } \quad(x-2)-\frac{1}{2}(y-1) \\
\Rightarrow \quad 2(x-1)=y-1 \\
=\quad 2 x-2-y-1 \\
=\quad 2 x-y-1+2 \\
=\quad 2 x-y-1
\end{array}
\end{align*}
\]

Subtracting equation i) and equaron i 10 , we get \(2 x-x=1+3\)
\(=x=4\)
Putsingx - 4 in muationth, we get
\[
\begin{aligned}
& \quad 4-y=-3 \\
& =\quad-y=-3-4 \\
& =\quad-y=-7 \\
& =\quad y-7
\end{aligned}
\]

Herice, the fraction is \(\frac{4}{2}\).

\section*{Exercise 3.9}

\section*{Q1}

A fethet is three fimes as old as hiz soi. Afor tivelva vestr, hix age will-be twice as that of his son then. Find their presert ages.

\section*{Solution}

Suppese fathar's age be \(x\) and zhat of scr's bey, Then.
\[
x=3 y
\]
- (i)

Thelve years lats, fatterta age wh be \((x+12)\) years and son's age will te \((y+12)\) years
\[
\begin{array}{ll} 
& x+12-2(x+x 2) \\
= & n+12-2 y+24 \\
\Rightarrow \quad & x-2 y=24-12 \\
= & x-2 y-12 \tag{-i}
\end{array}
\]

Subssitutinger - 3rin equation (i), ne get
\[
3 y-2 y-12
\]
\[
=\quad y=12
\]

Putting \(y=-32\) in mpaation(i), we.get
\(x=3 \times 12-3 \dot{1}\)
Hencer, fiother's aye is 36 years and scors age is 12 yerars.

\section*{Q2}
 B. What are the present anes of \(A\) ante?

\section*{Solution}

Let the age of \(\pi\) ande it be \(x\) and \(y\) years respectualy, Then,
Ten years later, the age of \& will be \((k+10)\) vears anc, the age of \(\delta\) will be \(f(x+20)\) veart.
\[
\begin{array}{ll}
\Rightarrow & x+10-2(y+10) \\
\Rightarrow & x+10=2 y+20 \\
\Rightarrow & x-2 y-20-10 \\
\Rightarrow & x-2 y-10
\end{array}
\]

Five years aiq. A's age -i ( \(x-5\) ) years
\[
8 \text { 'sage }-(y-5) \text { whars }
\]

Using the given informationf wo get
\[
\begin{align*}
& x-5-3(y-5) \\
= & x-5-3 y-15 \\
= & x-3 y--15+5 \\
= & x-3 y--10 \tag{i1}
\end{align*}
\]

Subtractima equation)(i) from equation (i), we pet
\[
-2 y+3 y=10+10
\]
\(\Rightarrow \quad r-20\)
Putting \(y=20\) in \(\begin{gathered}\text { Eqution }\end{gathered}\) i), We get
\(x-\frac{2}{2} \times 20=10\)
\(=x-40-10\)
\(=\quad x=10+40=50\)
Hence, A's age -50 yeas
\[
8^{4} \text { s age - } 20 \text { vears. }
\]

\section*{Q3}

Five years ago, Nuri was thrice as old as Sonu. Ten years later, Nuri will be twice, as old as Sonu. How old are Nuri and Sonu?

\section*{Solution}

Liet present age of Num and Snni bit \(x\) and y crespecivaly.
Acrording th the quastion,
\[
\begin{align*}
& (x-5)=3(y-5) \\
& x-3 y=-10  \tag{1}\\
& (x+10)=2(y+10) \\
& x-2 y=10 \tag{2}
\end{align*}
\]

Subtracting equation (1) frots equation (2), we obtain!
\(y=2 \pi\)
Substituting the value of \(y\) in aquation (1), wo nttarा
\(x-50=-10\)
\(x=50\)
Thus, the age of Nun and Sonu are 50 years and 20 years respeztiyndy;

\section*{Q4}
```

Let the jorebiant age of Man's be x years and trie proatrit age of his soist be y yours.
Sx yaas hence, Man i age $-(x+0)$ vears
Son's age $-(j 1-\sigma\rangle)$ years
U列g the gum informaturn ve get
$x-6=3(y-6)$
$=\quad x+5-3 y+28$
$\Rightarrow \quad x-3 y=10-5$
$\Rightarrow \quad x-3 y-12$
-il
Tareie' youes ago, Man's age $=(x-3)$ yoars

$$
\text { ben's age }=(y-3) \text { years }
$$

Using tre giken infort 350 un , we get

$$
\begin{array}{ll} 
& x-3-9(y+3) \\
\Rightarrow & y-3-9 y-27 \\
\Rightarrow & x-9 y--27+1 \\
\Rightarrow & x-9 y=-24 \tag{i}
\end{array}
$$

Ebtracting oquation(i) from aquation(i), wo got

$$
\begin{aligned}
& \Rightarrow \quad-3 y+9 y-12+24 \\
& \Rightarrow \quad 6 y-30 \\
& \Rightarrow \quad y-\frac{96}{3}-5 \\
& \text { Putting } y=-6 \text { in equation }(1), \text { we get } \\
& \Rightarrow \quad x-3 \times 6-12 \\
& \Rightarrow \quad x-18-12 \\
& \Rightarrow \quad x-12+10-30
\end{aligned}
$$

```

Hence, Man's fresent aje -30 years Son'spravant agn- - y yerats.

\section*{Q5}

Ten years age a father was twelve tries as eld as his soh and ten yeirs hehce fre will be swice as pldi \(\geq\) his sen will be then. Find ther present one

Solution

Ler the pratent age of fathur bex vars and the present age of son bey vears
Ten feart ago, Trather's age - \((x-19)\) y yars
Gonz age \(-(y-10)\) years
Ungat the given ififarmatioti, mo pot
\[
\begin{array}{ll} 
& x-10-12(y-10) \\
= & x-10-12 y-120 \\
= & x-12 y--120+10 \\
= & x-12 y=-110
\end{array}
\]

Ten vars hence, Father's: \(=g e-(x+18)\) Yearn
\[
\text { Son's age }=(y+1 \sigma) \text { years }
\]

Using the given information we get
\[
\begin{align*}
& x+10-2(y+10) \\
\Rightarrow \quad & x+10=2 y+20 \\
\Rightarrow \quad & x-3 y-20-10 \\
\Rightarrow \quad & x-2 y-10 \tag{i}
\end{align*}
\]

Subtracsige enuaton(i) from equadon(1i) weget
\[
\begin{array}{ll} 
& -2 y+12 y=10+110 \\
= & 10 y-120 \\
= & y-\frac{120}{10}-12
\end{array}
\]
\[
\text { putting y - in it equaton ( } \mathrm{b} \text { ) ve get }
\]
\[
\begin{array}{ll} 
& x-2 \times 12=10 \\
= & x-24-20 \\
\Rightarrow \quad & x-30+24-34
\end{array}
\]

Hencer present aqe of tatherts is 34 years and present age of sco is in vearbin

\section*{Q6}

The present age of a father is three more than three times the age of the son.Theeyears hence father's age will be 10 years more than twice the age of the son. Determine their present ages.

\section*{Solution}

Let the presentage of father ben yeses and the preseat age of son bey vesers. Then;
\begin{tabular}{ll}
\(x=2 r+3\) & [given] \\
\(\left.=\begin{array}{ll}x-3 y=3 & \end{array}\right]\)
\end{tabular}

\[
\text { Sonis sate- }(y+9) \text { yeari }
\]

Using the quegn information, we get
\[
\begin{array}{ll} 
& x<3-2(y+3)+10 \\
\Rightarrow & x+3-2 y+5+10 \\
\Rightarrow & x-2 y+10-3 \\
\Rightarrow & x-2 y=13 \tag{ii}
\end{array}
\]

Subtracting aquation(y) by oquation(ii). wo get
\[
-2 y+3 y-13-3
\]
\(\Leftrightarrow \quad y=10\)
Pistifig \(y=10\) in mquaturn(i), we get
\[
x-3 \times 10-3
\]
a) \(\quad x-30=9\)
\(\geq \quad x-3+3 \pi-33\)
Honce, prement age of fatmotsis 33 vears and pressent age of sen il 10 wars.
Q7
 Find the present ages of fatter and the son.

\section*{Solution}

Let the:present age of fatier bex vears anat the present aoe of sch bey, eare Men, \(x=3 y\)
Timeive years henos, Fithar's aget \((x+13)\) verars Son's age - \((v-12)\) yoare.
Using the gite intarm ation, we get
\[
y+18-2[y+32]
\]
\(\Rightarrow \quad n-18-7 y+24\)
\(\Rightarrow \quad x-2 y-24-12\)
\(\Rightarrow \quad x-2 y=12\)
Substititingacting \(s\) - 3y in Equation \(|i|\).
\[
\begin{aligned}
& 3 y-2 y=12 \\
& \Rightarrow \quad y-12 \\
& \text { Putting } y-12 \text { in undiatinn }(1) \text {, we get } \\
& N-3 y-3 \times 12-3 E
\end{aligned}
\]

Hatice, prasent ape of Lathur's is 36 years and present age of ann is 12 years-
Q8
 be twae: the sum of:ages of two chicken Find the age of father.

\section*{Solution}

Let the present age of father be a years and the fum of the present age of two thilisran tee \(y\) ybary, Thun,
\[
\begin{equation*}
x=3 y \tag{0}
\end{equation*}
\]

Sum of chifannt's ags - \((x+5+5)-(x+10)\) yeats

Using tas given infornatich, we get
\[
\begin{align*}
& x+5=2\{y+20\} \\
= & x+5-2 y-20 \\
\Rightarrow & x-2 y=20-5 \\
= & N-2 y-15 \tag{ii}
\end{align*}
\]

Eubsjtuting \(x=3 y\) in equason (i), we get
\(3 y-2 y-15\)
\(=p-15\)
Putting: -15 in equation(i), wE qes
\(x=3 \times 25=15\)
Hancre prement ago of tather is 45 yeats.

\section*{Q9}

Tinc vears ago, a fathe was fye times as old aE his son. Two Veare later, his agd will be Qmure than thr \(\Leftrightarrow\) thes the age of the san. Find the firexent agef of father ardid suनh

\section*{Solution}

Let the present ian of fatier bex years anid the preongt dae of thon bey years.
Two years ago, Fathar's age \(-(M-2)\) years
\[
\text { Sorlil ace - }(v-2) \text { yours }
\]

Usirig the qivert informution, wit get
\[
\begin{array}{ll} 
& x-2-5(y-2) \\
\Rightarrow & x-2-5 y-10 \\
\Rightarrow & x-5 y=-10+2 \\
\Rightarrow & x-5 y=-28
\end{array}
\]

Tro vears later, father's age - \((x+2)\) yajrs
\[
\text { Son's age - }(y+2) \text { years }
\]

Using the grven information, we get
\[
\begin{array}{ll} 
& x+2-3(y+2)+8 \\
\Rightarrow & x+2-3 y+E+8 \\
\Rightarrow & x-3 y-14-2 \\
\Rightarrow & x-3 y=12 \tag{10}
\end{array}
\]

Subtractng equationg) by equationstif), we get
\[
\begin{array}{ll} 
& -3 y+5 y-12+0 \\
\Rightarrow & 2 Y+20 \\
= & y-\frac{21}{2}-10
\end{array}
\]

Ruting \(y=20\) in squation (ii), we gevt
\[
\begin{aligned}
& x-3 \times 10-12 \\
=\quad & x-30-12 \\
=\quad & x-12.30-42
\end{aligned}
\]

\footnotetext{
Hence, present age of Efther is 42 vears and prevent age of son th 10 years.
}

A it elder to b by-2 yeare d's fathar Fis tivice as old as A and a ls tivice as eid as his asster 8. If the sqei of the father and sister differ by 40 years, find the age of \(A\).

\section*{Solution}
-uppose father's aqe be x vears and tat of aster's aje be v years Then,
\[
x-y=40
\]
\(\square\)
\(N\) NW, B'sis twice as chicr as his sistor,
\[
z^{\prime} \leq 3 g e-2 y
\]
and, father's it twice is oid as A.
\(\therefore N=2(A\) s-age \()\)
\(\geqslant \quad A \leq \operatorname{sige} u \frac{x}{2}\)

```

$\Rightarrow \quad x=4 r+4$
$=\quad x-4 y-4$

$$
-(i v\rangle
$$

```

\[
\begin{array}{ll}
\Rightarrow & y+4 y-40-4 \\
\Rightarrow & 3 v=36 \\
\Rightarrow & y-\frac{36}{3}-12
\end{array}
\]

Peithing \(p-12\) ini nquathanifi), we gart
\[
x-1 z=40
\]
\(=\quad x-46+17-5 ?\)
Put \(x-52\) in Equatran (in), weqat
स's agy - \(\frac{52}{2}=20\) ysars.

Q11

The ages of two friends Ani and Biju differ by 3 years. Ani's father Dharam is twiee as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differs by 30 years. Find the ages of Ani and Biju.

\section*{Solution}

```

Let the ape of Ani and Ea, bex, years and y years reapentery
Ags of Dhamm=2 x= =2xypals
Age of Cathy - = }\frac{y}{2}\mathrm{ yearm
Qasel: Anilim oldartman Byy ty \ymars
x-%=3 -(")

```

```

4x-y=60 (2)
Subtracing(1) flom (2), we chrain)
3x}=30-3=5
N=\frac{57}{3}=10
Age of hat = 19, Em=3
Age of {li| = 10-3=10
Oasell Bugu is older than Ani by 3jeaia
x-\pi=3 - (\$)

```

```

4x-y=80
(4)
Adding (3) and (4), weit obtain:
$3 x=83$
$x=21$
Age of Art $=21 y=a r$
Age of Ein $1=21+3=24$ years

```


 be zolved using a sultable aigehraic method

\section*{Q12}

Two years ago, Salim was thrice as old as his daughter and six years later he we four years older than twice her age. How old are they now?

\section*{Solution}

Let Salm's present age be \(x\) years and vis dawhter's age be y vearn.
Two ycars ages
Salim's sge \(=(x-2)\) years
Eaughter's age - \((y-2)\) years
Using the given informiation, we have
\(x-2=3(y-2)\)
\(\Rightarrow x-3 y--4\)
Sx yearr hence
Solim's age \(=(x+6)\) years
Baughter's age \(-(y+6)\) years
Using the given information, we have
\(x+6-2(y+6)+4\)
\(\Rightarrow x-2 y=10\)
Sibrtacting (i) tran (i) we get
\(y=14\)
\(\Rightarrow x-3(24)=-4\)
\(4=x-38\)
Thus, present age of Salim is 38 years
and that of his dapghicer is 14 years.

\section*{Solution}
teet father's age bex years and
the surn of the ages of his two children be y years.
Then,
\(x=2 \mathrm{ay}\)
\(\Rightarrow x-2 y=0\)
20 years hence,
Eather's age \(-(x+20)\) vears
Surn of the ages of two ctildren \(=y-20+20=(y+40)\) years
Tren, we have
\(x+20-y+40=\)
\(\Rightarrow x-y-20\)
Muitiplying (ii) by \& we get
\(2 x-2 y-40\) (iii)
Subtracang (i) from (iii), we lave
\(x=40\)
Thir, the age of father is 40 years.

\section*{Exercise 3.10}

\section*{Q1}

\section*{Solution}

L- \(\mathcal{Y}\) and \(V\) be two cans starting from points \(A\) and \(A\) rempect \(v a l y\).
Let the speed of car \(x\) bex \(\mathrm{lm} / \mathrm{hr}\) and that of car \(x\) be \(y \mathrm{~lm} / \mathrm{l}\).

Casei, whin two car s move if the same directions:
Suppose two carzmeet atpoint \(Q\). Thers
Distance travelled by car \(X^{\circ}=A Q\)
Discenbe trawnilnd by car \(\mathrm{H}-8 \mathrm{Q}\)
it is given tiat too cars meet in y hours Eistance trawellect by car \(x\) in 7 hours \(=7 x \mathrm{~km}\)
\(\Rightarrow \quad A Q-7 x\)
Distarce travelied ty car Minij hours \(=7\) y km
\(=\quad B Q=7 Y\)
Cleatl, \(A Q-B Q\) - AE
\(\Rightarrow \quad 7 y-7 y=70 \quad[y B-70 \mathrm{~km}]\)
\(\Rightarrow \quad T(x-y)-70\)
\(\Rightarrow \quad x-y-10 \quad-1\)
Caner, when two gars mowe in opposite direrzans!
Suppose two cars mest at peint e. Therv.
bissance raverted by car \(X=A P_{\text {. }}\)
Distanne trayelled ty car \(x-B R\),

Distance traveifed by car \(X\) in I hour \(=\) in 8 m
\(\Rightarrow \quad A \rho-k\)
Disterte trabulbid ty wi in 1 bour - y ko
\(\Leftrightarrow \quad E F=y\)
Clearly: \(A R+B P-A Q\)
\(\rightarrow x+y=75\)
Sdding equation in and mquation (ii) , Weges
\[
\begin{array}{ll} 
& 2 r=10+70 \\
\Rightarrow & 2 r-80 \\
\Rightarrow & x-\frac{80}{2}=40
\end{array}
\]

Phtting \(x=40\) in equatog \((i)\) ) \(w \equiv g\) get
\[
40+y-70
\]
\[
\Rightarrow \quad y=72-40+30
\]


\section*{Q2}

\footnotetext{
A sailor goes 8 kn downstrean in 40 minutes and \(\begin{aligned} \text { aturns in } 2 \text { hicurs Detwing the }\end{aligned}\)
} sueed af the salor in=still water arad the speed af the current.
Trom a simulatanecusly if they travei in the same diraction, the na neet in thours but if
they. travel towards each othec, they re eet in pee hour. Find the speed of the tropeat

Let the seedt of the witor in stifi water bet \(x\) kimht arid the spiad of the darmint bey kinfor
Then,
Speed downstream \(-(x+y)\) 2m/hr
Speed in return joumey \(-(x-y)\) kinht
Now. Timier bat en to cower 8 kmi downsthani \(-\frac{\square}{R+F}\) hirs
Qut, Tine taken to cover e im doornatream is 40 minutes
\(\Rightarrow \quad \frac{11}{x+y}-\frac{40}{50} \quad\left[\because 40\right.\) minutes \(-\frac{40}{60}\) firs \(]\)
\(=\frac{8}{x+y}-\frac{2}{3}\)
\(=\frac{8 \times 3}{2}+x+\gamma\)
\(\Rightarrow \quad 4 x 3=x+y\)
\(\Rightarrow \quad x+y=12\)
and, Time takin in retuim jpurney \(=\frac{\pi}{x-\gamma} k m / h \pi\)
But. Tme taken in fatum joumey is 1 hour
\(=\frac{8}{N-y}=1\)
\(\Rightarrow \quad x-y=0\)
adding equation \(\{i\}\) ans equatico\{ii). we get
\[
\begin{array}{ll} 
& 2 x-22+8 \\
=\quad & 2 r-20 \\
= & x-\frac{20}{2}-10
\end{array}
\]

Putting \(x=10\) in equationg \()\), we get
\[
\begin{array}{ll} 
& 10+y-12 \\
\Rightarrow \quad & y-12-10 \\
\Rightarrow \quad & y+2
\end{array}
\]

Hence, Speed of the sailor, in \(3 t\) ili water -10 km hlor speed of the current \(-2 \mathrm{~km} / \mathrm{hr}\)

\section*{Q3}

The boat goes 30 km upstream and 44 km downstream in 10 hours. Inw 3 hours, it can go 40 km upstream and 55 km downstream. Determine the speed of stream and that of the boat in still water.

\section*{Solution}

Let the speed of the boat in still water be \(x\) km／h and the speed of the ミtream－bey \(\mathrm{km} / \mathrm{m}\)
Than，
Spaed upstream－\((x-y)\) knihir
Spaed downstivant \(-(y+j) \mathrm{kni} / \mathrm{fif}\)
Now，Dime tal an to cover 30 im uestresin－\(\frac{70}{N-y}\) hrs
Timptaken to cover 44 hm downstram－\(\frac{4=}{x+y}\) tि
दut．Total time of journeylis 20 noure
\(\frac{30}{x-y}+\frac{44}{x+y}=10\)

Time taken to cover 40 km ．spstream \(=\frac{40}{x-y}\) hrs
Hime takan to cover 5 S km downstream \(=\frac{35}{x+y}\) his
But，Total bfre of jaurnidy is 13 hours
\(=\frac{40}{x-y}+\frac{55}{x+y}=13\)
suthen \(\frac{1}{x-y}-4\) and \(\frac{1}{x+y}-v\) irn wquation \((\hat{i}\) anda \((i)\) ，wet get
\[
\begin{array}{ll}
3 \mathrm{E} \dot{\sigma}+44 \mathrm{i}=10 & -(i i i)  \tag{iii}\\
46 \mathrm{j}+15 \mathrm{i}=13 & -(i v)
\end{array}
\]

By cross－muitiplication，wo．get
\[
\begin{aligned}
& \frac{4}{44 \times(-13)-(-10) \times 55}-\frac{1}{30 \times(-12)-(-10) \times 41}-\frac{1}{30 \times 55-44+41} \\
& \bar{三} \quad \frac{u}{-572+550}=\frac{4 y}{-390+400}=\frac{1}{1650-1760} \\
& \bar{\equiv} \quad \frac{u}{-22}=\frac{-y}{10}=\frac{1}{-110} \\
& \Rightarrow \quad u=\frac{-22}{-110} \text { anil }-v=\frac{70}{-110} \\
& =\quad u \cdot \frac{1}{5} \text { anct } v-\frac{1}{11}
\end{aligned}
\]

Now，\(\quad U=\frac{1}{5}\)
\(\rightarrow \quad \frac{2}{x-y}-\frac{1}{5}\)
\(=x-y+5\)
An0，\(\gamma=\frac{1}{11}\)
\(=\quad \frac{1}{x+p}=\frac{1}{13}\)
\(\Rightarrow \quad x+y=11\)
\[
-(\sqrt{9})
\]

Adcing equason \((v)\) and equat an \((v)\) ；wa ge：
\[
\begin{aligned}
& 24-5+11 \\
\Rightarrow \quad & x<\frac{16}{2}=0
\end{aligned}
\]

Dusting \(x-3\) iniequation（v），we get
\[
\begin{array}{ll} 
& 8+y-11 \\
\Rightarrow \quad & y-31-8 \\
\Rightarrow \quad & y-3
\end{array}
\]

\section*{Q4}
 anc 21 km ciownstream in \(5 \frac{7}{2} \mathrm{hrs}\). Find the spaed of the boat in still water and also apped of the streamt:

\section*{Solution}

\section*{Lat}

Speed of tho doas be xatil pend of the ntream bey
Froun the given dats
we grit
\(\frac{2 \Delta}{2-r}+\frac{25}{r+r}=6\)
\(\frac{35}{x \rightarrow 7}+\frac{21}{1+y}=6.5\)
さnt
\(\frac{1}{x-7}=X\)
\(\frac{1}{x+y}=y\)
Then the \#ipuation becen=:
\(24 K+25 Y=6 \cdots\) ( \(\%\)
\(30 x+2 y=63---(i i)\)
Bolinge (3) hind (i) we get
\(X=\frac{1}{6} \operatorname{an} A X=\frac{1}{14}\)
So \(x-y=5\) and \(x+y=14\)
\#\#eave
\(z=10 \mathrm{mmph}\) and \(x=4\) hmply
Fpetd of the boat is tofanph
Speed of the strean be 4 huph

\section*{Q5}

A man wallos:a certan distance with certan speed ithe walke \(1 / 2 \mathrm{~km}\) an hour faster, he
 distance covered by the mian and his crignal rate of valling.

\section*{Solution}

Let the origiral speed of man be \(x\) kin/hr and the actial sime takan by \(y\) hours. Thens Distence covared - \(\{x y\}\) km - 13 : \([y=-5 x T]\)

If the speed. is increased by \(\frac{1}{2}\) kmihu then time of journey is reducect bv I touir lien when rpoed is \(\left(x+\frac{1}{2}\right) \times\) xh/he time ar journew is \((y-1)\) haurs.

Distance covered \(-\left(x+\frac{1}{2}\right)(y-1)\)
\(\Rightarrow \quad n y-x y=x+\frac{1}{2} y-\frac{1}{2}\)
[using(i)]
\(\Rightarrow \quad x-\frac{1}{2} y+\frac{1}{2}-0\)
\(\Rightarrow \quad 2 x-y+1=0\)

Wren the speed is reduces by 1 . mion then the tine of joumey is increased by I hours i a. When 3peed is \((x-1)\) km/hr tine af foumey is \((x+3)\) hours.
```

    Distarices covirnd - (x-1)fv+3)
    
# xy- (v-1)(y-3) [using(i)]

= xy=xy+3x-y-3
F a-3x-y-3
= 3x-y-3-0

Thus, we obtain the follewing system of equaboris:

$$
\begin{aligned}
& 2 k-y+1=0 \\
& 3 k-y-3=0
\end{aligned}
$$

By using cmiss-muitiplication, we have
$\frac{x}{(-1) \times(-3)-(1) \times(-1)} \times \frac{-v}{(2) \times(-3)-(1) \times(2)}=\frac{1}{(2) \times(-1)^{2}-(-1) \times(3)}$
$\Rightarrow \quad \frac{x}{3+1}-\frac{-y}{-6 k 3}-\frac{1}{-2+3}$
$=\quad \frac{N}{4} \div \frac{-y}{-9} \div \frac{1}{1}$
$=\frac{v}{4}+\frac{v}{9}-1$
$=\frac{v}{4}+1$ end $\frac{y}{g}-1$
$=\quad n-5 \operatorname{and} y=9$
Putting the valus of $x$ and $y$ in equation () we obtain
Distance: $=(4 \times 3) \mathrm{km}=80 \mathrm{~km}$

Hence, distence covered by mar-35:1m.
orgiral rate of waking $+4 \mathrm{~km} / \mathrm{hr}$

## Q6

A person rowing at the rate of $5 \mathrm{~km} / \mathrm{h}$ in still water, takes thrice as much time in going 40 km upstream as in going 40 km downstream. Find the speed of stream.

Solution

Given, speed of boat in stil rater $-5 \mathrm{~km} / \mathrm{hr}$
Let the speed of the stream be $\times \mathrm{km} / \mathrm{hr}$;
Speed of the boarupstream $-(5-x) \mathrm{km} / \mathrm{hr}$
Speed of the boat dowenstream - $(5+x) \mathrm{km} / \mathrm{hir}$
It is given that
Time to cover 40 km upatream - $3 \times$ time to cover 40 km downstream
$\Rightarrow \frac{40}{5-x}-3 x \frac{41}{5+x}$
$\Rightarrow \frac{4}{5-x}=\frac{120}{5+x}$
$\Rightarrow \frac{1}{5-x}-\frac{3}{5+x}$
$\Rightarrow 5+x-15-\bar{x}$
$\Rightarrow 4 x=10$
$\Rightarrow x-\frac{10}{4}$
$\Rightarrow x-2.5$
Thus, the speed of the stream is $25 \mathrm{~km} / \mathrm{hr}$.

## Q7

Wamesh travels 760 km to his home party by train and oartly by car. He takes blours if he qavels 160 km , by tyain and the rest by car He taker 12 minutes moes if the traverg 240 km by train and tie rest by car Find the speed of the tron and car myectively.

## Solution

Let the sperd of the train be e $\mathrm{km} / \mathrm{hr}$ and that of the car bey Im/hi, We haver folfowing canes


In this rass we heve,
Time takan by Pamesh to trayel 160 km by $\mathrm{tram}-\frac{\text { IEC }}{\mathrm{k}}$ hrs
Time takan by Rameth to travel $(760-160)=600) \mathrm{km}$ by car $-\frac{600}{y}$ heI
Total lime Taker by Ramesh to caver: $760 \mathrm{kcon}-\frac{160}{x}, \frac{500}{x}$
tt is given that foe total time taken is 8 bourg.

$$
\begin{align*}
& =\frac{1 E 0}{x}+\frac{600}{y}-0 \\
& \Rightarrow \quad 8\left[\frac{20}{x}+\frac{75}{y}\right]-8 \\
& \Rightarrow \quad \frac{20}{x}+\frac{75}{y}-1 \tag{1}
\end{align*}
$$

 In thls case, we have

Fimb takian by Ramen fotraval $(760-250)-520 \mathrm{kim}$ by ज्वा - $\frac{520}{y}$
In this case; total time of the journe; is 8 hirs: 22 minutes

$$
\begin{align*}
& \frac{240}{x}+\frac{520}{y}-8 \text { he } 12 \text { minctes } \\
\Rightarrow & \frac{240}{x}+\frac{520}{y}-8 \frac{12}{60} \\
\Rightarrow & \frac{240}{x}+\frac{520}{y}=\frac{41}{5}
\end{align*}
$$

Thus, we obtain the following system of equapons:

$$
\begin{aligned}
& \frac{20}{x}+\frac{75}{y}-1 \\
& \frac{240}{x}+\frac{520}{y}=\frac{41}{5}
\end{aligned}
$$

Puttiog $\frac{1}{x}-\mu$ and $\frac{1}{y}-v$. the atove syntim, rettjoes to

$$
\begin{aligned}
& 20 u+75 v=1 \\
& 240 u+520 v=\frac{41}{5}
\end{aligned}
$$

Muliplyirg equationfin) by 12, we ge:
$2404+000 v-12$

一(iin) -(ii)

Subtracting equanon(iv) by equptian $(x)$ ) we gur

$$
\begin{aligned}
& 900 v-5200-12-\frac{41}{5} \\
= & 300 v-\frac{100-41}{5} \\
= & 3800-\frac{19}{5} \\
= & x-\frac{19}{5} \times \frac{1}{300}
\end{aligned}
$$

$$
\begin{aligned}
& \Rightarrow \quad v-\frac{1}{5} \times \frac{1}{20} \\
& \Rightarrow \quad v=\frac{2}{100} \\
& \text { Patting v = } \frac{1}{200} \text { in uquatian }\{v) \text {, wo get } \\
& 2400+500 \times \frac{1}{100}-12 \\
& \Rightarrow \quad 2+0 .+9-12 \\
& =\quad 2404-12-9-3 \\
& \Rightarrow \quad 4-\frac{3}{240}-\frac{1}{80} \\
& \text { Now, } \quad 4=\frac{1}{80} \\
& =\quad \frac{1}{N} \rightarrow \frac{1}{80} \\
& \Rightarrow \quad x-80 \\
& \text { Anc. } v=\frac{1}{100} \\
& \Rightarrow \quad \frac{1}{\gamma}=\frac{1}{200} \\
& \Rightarrow \quad y=100 \\
& \text { Hence, zpeed of the train }-80 \mathrm{~km} / \mathrm{Am} \\
& \text { Speed of the car * } 100 \mathrm{~km} / \mathrm{hr} \text { - }
\end{aligned}
$$

## Q8

 the rest by car, it teles him o hours and 30 minutes but if the travels 200 km by $t \mathrm{san}$ and the rest by car, he tak es half an hour longer. Find the speed of the train and that of the car.

Solution

Let the speed of the trair bex km/hi and that of the car bey kim/hr we have colowing cases:
Casel When Ramesh travels 400 km by tram and the rest by car:
In this case, we have
Titi $=$ esten by tha man to travel ton im by train- $\frac{400}{x}$
Time saim by tha man to treuel $(690-400)-290$ lon by car $-\frac{200}{y}$
In thus case, total time of the jeartiey is if hrs act foumures.

$$
\begin{align*}
& \frac{400}{x}+\frac{200}{y}=6 h r 320 \text { minutes } \\
= & \frac{400}{x}+\frac{200}{y}=6 \frac{1}{2} \\
= & \frac{400}{x}+\frac{200}{y}=\frac{13}{2}
\end{align*}
$$

Caselt when he trawels 205lam by train and the rest by con in this case, ve have

Time taken by the man to trevel 300 kn by train - $\frac{200}{x}$ hors
Time tahen by the man to trevel $(600-200)-400 \mathrm{~km}$ by car $-\frac{400}{F}$ hrs

In this case, total timenf jaurney in $\left(\frac{13}{2}+\frac{1}{2}\right)-7$ hist

$$
\frac{200}{x}+\frac{400}{7}-7
$$

Rutang $\frac{1}{x}-u$ and $\frac{1}{y}-v_{i}$ in -qquation fit and

$$
\begin{array}{ll}
4000+200 v=\frac{13}{2} & -(i \operatorname{in}) \\
200 u+400 v=7 & -(i v)
\end{array}
$$

Multiplying equation (in) by e wo gut
$3002-400 k=13$
Subtracting equation (iv) by equation (v). me get

$$
\begin{array}{ll} 
& 400 u-200 u=12-7 \\
\Rightarrow \quad & 50 \alpha-5 \\
\Rightarrow \quad & u=\frac{6}{600}=\frac{2}{100}
\end{array}
$$

Rutting $u=\frac{1}{109}$ in equationfiv), we get

$$
200 \times \frac{1}{100}+4000=?
$$

$=\quad 2+400 \mathrm{v}-7$
$\Rightarrow \quad 400 v-7-2$
$=400 v-5$
$\Rightarrow \quad i \quad=\frac{5}{400}=\frac{1}{80}$

$$
\begin{aligned}
& \text { NOW, } \alpha=\frac{1}{100} \\
& =\frac{1}{x}-\frac{1}{100} \\
& \Rightarrow \quad x-100 \\
& \text { sind } \quad y-\frac{1}{60} \\
& \Rightarrow \quad \frac{1}{y}-\frac{1}{60} \\
& \Rightarrow \quad y-80
\end{aligned}
$$

Hence, speed of the tain - $100 \mathrm{~km} / \mathrm{kr}$ Spued of the car - $80 \mathrm{~km} / \mathrm{hr}$.

## Q9


 and ir they muve in oppesite tirectors, thoy maut in 1 hete ard 28 minutes. Find the
speed of the cars;

## Solution

Leit $X$ and $V$ 'be ton seles startinig from points $A$ and 8 nespectiooly.

Cashl, When tria carsmove in the same diructiant
Suppose two cars mest at point Q. Then.
Ditterce trauklied by zar $x=A Q$
Destances travelind by car $V=8 Q$

Distanca travolled by car $x$ in 8 hiturs - $8 i x \mathrm{~km}$
$\Rightarrow \quad A Q=8 x$
Destance travilind by car $\mathcal{Y}$ in a hous - $8, \mathrm{~cm}_{\mathrm{c}} \mathrm{km}$
$\Rightarrow \quad B C=8 y$
Clisarly, $A Q-B Q-A E$

| $=8 x-8 y-30$ | $[A B-80 \mathrm{~km}]$ |
| :--- | :--- |
| $=8(r-y)-60$ |  |
| $=x-y-10$ |  |

Caselt. When twa cars meve in oppous to dienctions
Suppose two car's meet at point pl. Then.
Dirtance travelied by $\operatorname{car} X=A P$,
Destaries of invand by car $Y=B P$
In this carse, two cars mees in 1 hour 20 minutes- $1 \frac{1}{2}=\frac{4}{2}$ hre
Distance ravelled by car $x$ in $\frac{4}{3}$ hour $3-\frac{4}{3} x$ kn
$=A^{2}-\frac{4}{3} x$
Distance traveled by car $\psi$ in $\frac{4}{3}$ nours $-\frac{4}{3} y \mathrm{~km}$
$=\quad E 8-\frac{4}{3} y$
Gearly, $A 0+50-2 \mathrm{E}$

$$
\begin{align*}
& \Rightarrow \quad \frac{4}{3} x+\frac{4}{3} y-80 \\
& \Rightarrow \quad \frac{4}{3}(x+y)-80 \\
& \Rightarrow \quad x+y-\frac{80 \times 3}{4} \\
& =\quad y+y-50 \tag{i}
\end{align*}
$$

Adding equation (i) anct ectuation (ii) , We get

$$
\begin{array}{ll} 
& 2 x-10+60 \\
= & 2 x-70 \\
\Rightarrow \quad & x=\frac{10}{2}-35
\end{array}
$$

Futting $x-35$ in equation (ii), we get,

$$
\begin{aligned}
& 35+y=60 \\
& =\quad y-60-35-25
\end{aligned}
$$



## Q10

[^12]Let doe speed of the boat in still water ben km/hr and the speed of the ztram bey km/lr.
Then,
Spond uperrnam - $(x-y) \mathrm{km} / \mathrm{fr}$
Speed downstramm $-\langle(x+y) \mathrm{km} / \mathrm{hr}$

Now, Time taken to nojer 12 km Gpatreamil $=\frac{18}{x-y}$ hrs
Tima taken to oover 40 km downstean $=\frac{40}{x+y}$ Fry

But. Tot3 time of journmis a hours
$\frac{12}{x-x}+\frac{4 \alpha}{x+y}-\varepsilon$

Time ralcen to cover 15 km upgream $-\frac{16}{x-y}$ hrs:
Time talenn to owert 32 km downstream $-\frac{22}{x+y}$ hrs
Sut, Fota timin of journey is 8 hours.
$\frac{15}{x-y}+\frac{72}{x+y}-\varepsilon$
Dutthg $\frac{1}{x-y}=2$ and $\frac{1}{x+y}=v$, in equationify and $\langle a\rangle$, we दुat

$$
12 u+40 v-8
$$

$\Rightarrow \quad 4(3(t-10 v)-8$
$\Rightarrow \quad 3 u+100-2$
$=\quad 3 u+10 v-2=0$
Anc, $164+324=\pi$
$\Rightarrow \quad[(2 u+A V)=E$
$\Rightarrow \quad 2 i+4 y-1$
$\Rightarrow \quad 2 u+4 v-1-0$
By GTOX-min ultiphitation, nu gots
$\frac{d}{10 \times(-2)-(-9) \times 4}-\frac{-v}{3 \times(-1)(-2) \times 2}-\frac{1}{3 \times 4-2 \times 20}$
$=\frac{4}{-10+3}=\frac{-4}{-3+4}=\frac{1}{12-20}$
$\Rightarrow \quad \frac{4 i}{-2}=\frac{-v}{1}+\frac{1}{-4}$
$\Rightarrow \quad \frac{u}{-2}-\frac{1}{-8}$ and $\frac{v}{1}=\frac{1}{-8}$
$=4 . \frac{2}{8}$ and $v . \frac{1}{8}$
$\Rightarrow \quad u-\frac{1}{4}$ and $v=\frac{1}{8}$
Now: $\mathrm{a}-\frac{1}{4}$
$=\frac{1}{x-y}-\frac{1}{4}$
$\Rightarrow \quad x-y=4$

$$
\begin{aligned}
& \text { And, } v-\frac{1}{9} \\
& =\frac{1}{x+y}-\frac{1}{3}
\end{aligned}
$$

$$
\Rightarrow x+y=0 \quad-(i)
$$



$$
2 x-4+8
$$

$$
\Rightarrow \quad x-\frac{12}{2}-\theta
$$

futting $x=10$ in equationf(vi), we get
$5+y-6$
$=\quad y-8-6-2$
Hance, speed of the boat in stil watey - 6 k, m/hr Spend of the stream - 2 limitr

## Q11

Roohi travels 300 रos to her hame pactly' by train and party by Eus. She taces 4 hour拿 if
 the ram aining by buts, she tere: 10 minuths longer, find the spesd of the train and the ous separately.

Solution

Let the spe日c of tha train b日, kmpe and that of the bus bey lm dir We have the following: Dases:

Sagel When D.ochi travala 60 km by train add the rest ty bus In thie caso, we have

Time takan by Hocion to trave 60 km by train - $\frac{60}{x}$ hrs
Time talken by Hocih to travel $(500-60)-240 \mathrm{~km}$ by bus $=\frac{240}{y}$ hrs
Total umetalen by rooh to cover $300 \mathrm{~km}-\frac{60}{\mathrm{x}}+\frac{242}{y}$
Itis given that the potal tme taicen is 4 hours
$\frac{60}{x}+\frac{2 x a}{y}=4$
$\Rightarrow \quad 4\left[\frac{10}{x}, \frac{60}{x}\right]=4$
$\Rightarrow \quad \frac{15}{x}+\frac{60}{y}=1$
Casell when Rachil travals 400 km Ey tain and the rest by bus:
in thil cash, we have
Time taken by Rochal to travel 100 km by train - $\frac{100}{x}$ hrs
Tine taken by Rochil to travel $(200-100)-200 \mathrm{~km}$ by bus - $\frac{g 00}{y}$ hra
In this case, thal tome of the jourrey is 4 hes 10 timinties
$\frac{100}{x}+\frac{200}{y}-4$ her 10 minutes:
$\Rightarrow \quad \frac{100}{x}+\frac{200}{x}=4 \frac{1}{6}$
$\Rightarrow \quad \frac{100}{x}+\frac{200}{y}-\frac{25}{6}$
$\Rightarrow \quad 25\left(\frac{4}{x}, \frac{8}{7}\right)-\frac{25}{6}$
$\Rightarrow \quad \frac{4}{x}+\frac{1}{x}=\frac{2}{9}$
$\Rightarrow \quad\left(\frac{\Delta}{x}+\frac{8}{y}\right)-1$
$\Rightarrow \quad \frac{24}{x}+\frac{40}{x}=1$

Putting $\frac{1}{x}-4$ and $\frac{1}{y}-v$, 17 equation 0$)$ and (ii).
$15 u+60 v-1$
$24 u+4 \varepsilon 2-1$


6y erciss-multplication, be have

$$
\begin{aligned}
& \frac{4}{60 \times(-1)-48 \times(-1)}=\frac{-x}{15 \times(-1)-24 \times(-1)}=\frac{1}{15 \times+8-60 \times 24} \\
= & \frac{4}{-60+48}-\frac{-}{-15+24}=\frac{1}{720-1440}
\end{aligned}
$$

$$
\begin{aligned}
& \Rightarrow \quad \frac{4}{-12}-\frac{-v}{9}-\frac{1}{-720} \\
& \Rightarrow \quad \frac{4}{-12}=\frac{1}{-720} \text { and } \frac{-v}{9}-\frac{1}{-720} \\
& \Leftrightarrow \quad \psi=\frac{-12}{-720} \text { arict } v=\frac{-9}{-720} \\
& \text { \&: }\left\langle=\frac{1}{50} \text { ast } v=\frac{1}{80}\right. \\
& \text { Now } \quad a=\frac{1}{50} \\
& \Rightarrow \quad \frac{1}{x}=\frac{1}{60} \\
& \text { (2) } x-60 \mathrm{~km} / \mathrm{hr} \\
& \text { and. } v=\frac{1}{00} \\
& \Rightarrow \quad \frac{1}{y}-\frac{1}{80} \\
& \Rightarrow \quad y=\text { ec kri/hr }
\end{aligned}
$$

Hence, speed of the tram $=60 \mathrm{~km} / \mathrm{hr}$ Speet of the cer - 80 km/hr.

## Q12

Ritu can row downstream 20 km in 2 hours, and upstream 4 km in 2 hours. Find her speed of rowing in still water and the speed of the current.

## Solution

Enerd ef Eitu while rawing upitraam - ( $\mathrm{x}-3$ ) km m
Loeed ef Ritu while ravine donastream - $(x+y)$ lrih
Ascarding tie the cuestion,
$2(x+y)-29$
$\Rightarrow x+y=10$
$2(x-y)=4$
$\Rightarrow x-y=2$
Adding equatrons (1) تnd (2). Writ ottaim
$2 \pi=12$
$\Rightarrow x=6$
Putting the valco of 3 in eqcation (2), $=T$ ebtain
$t=9$
Than, Riti's speed in util weser is $1.2 \mathrm{~m} / \mathrm{h}$ anc the speec of the curreptis is $\mathrm{hm} / \mathrm{h}$.

## Q13

[^13]
## Solution

Let the speed of boet in still water be $\times \mathrm{km} / \mathrm{hr}$ and the speed of the strearn be y $\mathrm{km} / \mathrm{hr}$

Speed of the boat upstream - $(x-y)$ km /hr
Speed of the boat downistream - $(x-y) \mathrm{km} / \mathrm{hr}$
Now, Ime taken by boet to trevel 30 km upstream $-\frac{30}{x-y}$
Time taken by boat to travel $\approx 8 \mathrm{~km}$ diconntream- $\frac{28}{x+y}$
Therv we have $\frac{30}{x-x}+\frac{28}{x+y}-7$
Also time taken by boat to travel 21 km upstream $=\frac{21}{x-y}$
Tinse takerl by boat to travel 21 km downistream- $\frac{21}{x+y}$
Then we have $\frac{21}{x-y}, \frac{21}{x+y}-5$
Putting $\frac{1}{x-y}=u$ and $\frac{1}{x+y}=v$ in equations (i) and $\langle i)^{2}$, we get
$300+200-7$
$\Rightarrow 30 u+28 v-7-0$
$2 u+21 v=5$
$\Rightarrow 2 \mathrm{u} u+2 \mathrm{lv}-5-0$
By cross multiplicaticn, we have
$\frac{4}{28 \times(-5)-21 \times(-7)}-\frac{-1}{30 \times(-5)-21 \times(-7)}-\frac{1}{30 \times 21-71 \times 28}$
$\Rightarrow \frac{u}{-140+147}=\frac{-v}{-150+147}=\frac{1}{830-598}$
$=\frac{4}{7}-\frac{x}{3}-\frac{1}{42}$
Now $=\frac{u}{7}-\frac{1}{42}=42 u-7 \Rightarrow u-\frac{7}{42}-\frac{1}{6} \Rightarrow \frac{1}{x-y}-\frac{1}{6}$
$\Rightarrow x-\gamma=6 \quad ; \quad ; i v$
And $\frac{y}{3}-\frac{1}{42}=42 v-3=v-\frac{3}{42}-\frac{1}{14} \Rightarrow \frac{1}{x+y}-\frac{1}{14}$
$=x+y-14$
Adding (i) and (iil. wie get $2 x-20 \Rightarrow x=10$
$\Rightarrow 10+y-14 \Rightarrow y=4$
Thus, the pees of the bast in tall water is $10 \mathrm{kon} / \mathrm{hr}$ and the speed of the strearn ss $4 \mathrm{~km} / \mathrm{mr}$.

## Q14

 if te travels 300 km by tain and 240 km by tozi he takes of minutesionger, Hind the speed of the tain and trat of the tool.

## Solution

Lat the speed of itia train bextion/hr and that of the tave bey km/ht. We have tre follower
cases
Casel When abdul travela 900 km by train and 200 km by tarit in ther case, wh have
fime taken by abdul to travel 300 lm by train $=\frac{800}{x}$ hrs
time tiken by abdul to travel 200 km by taine a $\frac{200}{y}$ his
Total tim $\equiv$ taken by abcul $=\frac{300}{x}+\frac{2 m 0}{y}$

$\frac{390}{x}+\frac{200}{y}-5$ haume 30 mindutw
$\Leftrightarrow \quad \frac{390}{x}+\frac{200}{x}=5 \frac{1}{2}$
$=\frac{300}{x}+\frac{200}{\gamma}=\frac{11}{2}$
$=\quad \frac{600}{x}-\frac{900}{\gamma}=11$
Caself When abdul travel 260 km by tran and 240 km by tayll In this cathe, me have

Timetaken by abdul to vavel 200 km by tran $=\frac{260}{x}$ hrs
Timetaken bx abdul to vayel 240 km by tax $=\frac{240}{4} \mathrm{hrs}$

In this case, fotal time of the journey is ( $s$ hours 30 ininutes +6 minu tey)

Futting $\frac{1}{x}-4$ and $\frac{1}{y}-v$ in equation (2) and (i) wa gat

$$
600 i+400 v-11
$$

$$
=600 u+400 \mathrm{v}-11-0
$$

$$
\begin{align*}
& -5 \frac{1}{2}+\frac{1}{10} \\
& -\frac{11}{2}+\frac{1}{10} \\
& -\frac{55+1}{11} \\
& -\frac{59}{10} \\
& =\frac{20}{5} \mathrm{hrs} \\
& \frac{250}{x}-\frac{240}{y}=\frac{20}{5} \\
& =4\left(\frac{55}{x}+\frac{50}{y}\right)-\frac{29}{5} \\
& \Rightarrow \quad \frac{65}{\pi}+\frac{60}{y}=\frac{T}{5} \\
& \Leftrightarrow \quad \frac{65 \times 5}{x}+\frac{60 \times 5}{y}=7 \\
& =\frac{325}{x}+\frac{300}{\pi}=7 \tag{1}
\end{align*}
$$

```
Agnd 2236}+300v=
= 225u-300%-7-0
```

Ry crass-mulaplication, NE have

$$
\text { And, } v=\frac{1}{00}
$$

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

$$
\Rightarrow \quad y=00
$$

Herice, speed of the train $+100 \mathrm{~km} / \mathrm{hr}$
sound of the $\mathrm{mol}-90 \mathrm{~km} / \mathrm{hr}$

## Q15

[^14] time. And if the train were slower by $10 \mathrm{~km} / \mathrm{h}$; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

## Solution

$$
\begin{aligned}
& \frac{4}{-400 \times(-7)-(-11) \times 300}=\frac{4}{600 \times(-7)-(-11) \times 325}=\frac{1}{500 \times 300-400 \times 325} \\
& \Rightarrow \frac{a}{-2300+3300}-\frac{v}{-4200+3575}-\frac{1}{1000 m 0-170000} \\
& \Rightarrow \quad \frac{11}{500}-\frac{-v}{-625}-\frac{1}{50000} \\
& \Rightarrow \quad \frac{u}{500}-\frac{v}{625} \cdot \frac{1}{30000} \\
& =\quad \frac{4}{505}-\frac{1}{50000} \text { and } \frac{\nu}{625}-\frac{1}{50060} \\
& \Rightarrow \quad d=\frac{500}{60000} \text { and } y=\frac{e 25}{50.900} \\
& \Rightarrow \quad a=\frac{1}{100} \operatorname{abc} v=\frac{1}{80} \\
& \text { Now: } u=\frac{1}{100} \\
& \Rightarrow \quad \frac{1}{N}=\frac{1}{100} \\
& =x-100
\end{aligned}
$$



```
*ove, Spred - = Dastance travellad
x = - d
Oi}d=

Acoording to the queston,
```

$(x+10)=\frac{d}{(t-2)}$
$(x+10)(t-2)-d$
$2 t+10:-2 \pi-20=d$
By using equation ( 1 ), wo obtain:
$-2 i+100=20$
$(x-30)-\frac{d}{(t+3)}$
$(x-10)(c+3)-17$
$3 t-10 z+3 x-30-d$
By uniog aguation (1//vae obturn
$3 \mathrm{x}-10 \mathrm{t}=30 \quad-(3)$

```

```

$x=50$
Subsiltuting the vat ee of $x$ ia equation (2), we ottain:
$(-2) \times(100)+10 t=20$
$-100+10 t=20$
$10 \mathrm{r}=120$
$t=12$
Form equation (1), 症 obtain:
$d=x=50 \times 12=\log$

```


Concept insight: To solve this problem, it ie very limpoitant io tementer the So, wewill Tepreant mese
by three differ int


be solved essity by elimination method.

Q16

Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towaroseach other, they meet in 1 hours. What are the speeds of two cars?

\section*{Solution}

Let the speed of first tar and setond car be u Lmh and \(x \mathrm{kim}_{\mathrm{c}}^{\mathrm{L}} \mathrm{h}\) respecturely:
acoarcing to the quastion,
\(5(z-y)=100\)
\(\Rightarrow リ-v=20\)
\(1(n+v)=100\)
\(\Rightarrow u+v=100\)
Adding equations \(\langle 1\rangle\) and (2), we cotain:
\(2 u=120\)
\(u=60\)
Substitutind the value of \(u\) in equation \((2)\), we ohtain.
\(v=40\)
Hence, speed of the firut car is \(60 \mathrm{~km} / \mathrm{h}\) and speed of the sespnd zet is \(40 \mathrm{~km} / \mathrm{h}\)

While coysaing a distance of 30 kim.ajeat takes 2 hours more than amit If Ajeet doubles his spead, he would take 1 hour less than dint. Find thein speeds of walking.

\section*{Solution}

Time taken by somet to coyer \(30 \mathrm{~km}-\frac{20}{x}\) hrs
and. Time raken by Am is to cover \(30 \times \mathrm{m}-\frac{30}{\gamma}\) hes

By thie given oonditions, Wu Have
\[
\begin{align*}
& \frac{39}{x}-\frac{30}{y}-2 \\
=\quad & \frac{35}{x}+\frac{15}{y}=1 \tag{i}
\end{align*}
\]

If A; met doublas hispiace; then spend of ajeat is or km/Air
A. Fimes taken by Ajeet to cover \(30 \mathrm{~km}=\frac{30}{20} \mathrm{hrs}\)

Times taken by Afilt to cover \(30 \mathrm{~km}-\frac{30}{y}\) hre

Acrording to the given condtions, we have
\[
\begin{align*}
& \frac{30}{y}-\frac{30}{2 x}=1 \\
\Rightarrow & \frac{30}{x}-\frac{15}{x}=1
\end{align*}
\]

Puming \(\frac{1}{x}-u\) and \(\frac{1}{\mu} * k\) in equarions \((i)\) and \(f i\); wo get
\[
\begin{array}{ll}
15 z-15 y-1 \\
30 y-15 y-1 \tag{iv}
\end{array} \quad \text { - (iii) }
\]

Alding ecioasionfiii) , 3rd equation(iv), we get
\[
\begin{aligned}
& \quad 30 v-15 y=1+1 \\
& \Rightarrow \quad 15 r-2 \\
& \Rightarrow \quad v=\frac{2}{15}
\end{aligned}
\]

Putang \(-\frac{2}{15}\) in equalion \((i \operatorname{li})\), wo get
\[
15 \cdot i-15=\frac{\frac{2}{15}}{15}-1
\]
\(\Rightarrow \quad 15 u-2-1\)
\(=\quad 15 i-1+8\)
\(=150-3\)
\(\Rightarrow \quad \mu-\frac{3}{15}-\frac{3}{5}\)
Now, \(\quad a=\frac{1}{5}\)
\(=\frac{1}{x}-\frac{1}{5}\)
\(\Rightarrow \quad x-5\)
And, \(v=\frac{2}{15}\)
\(\Rightarrow \quad \frac{1}{y}=\frac{2}{15}\)
\(\Rightarrow \quad \rho=\frac{15}{2}=7.5\)

A taices 7 hours more tnan:B to walk \# oistance of 30 km . but, if \(A\) doubles his pace (spead)
The is ahead of \(s\) by \(1 \frac{1}{2}\), hours, Find the speeds of diand di

Solution

Le: the speed \(A\) and 8 ben \(3 \pi / h r\) and \(y\) tm thr respect vely. Then.
Time taken by A to cover \(30 \mathrm{~km}-\frac{3 \mathrm{c}}{x^{2}}\) hes
Kand; Tonv taken by: \(A\) to opver \(30 \mathrm{~km}=\frac{30}{\gamma}\) hes
By toe qives soriditions, 'We have
\[
\begin{align*}
& \frac{30}{x}-\frac{30}{y}=1 \\
\Rightarrow \quad & \frac{30}{3}-\frac{10}{y}-1
\end{align*}
\]

If \(A\) doubles hes pace, ther speed of \(A\) is \(2 \mathrm{ir} \mathrm{km} / \mathrm{hr}\)
... Himetaken by to ocver \(30 \mathrm{~km}=\frac{30}{2 \mathrm{~V}} \mathrm{Hrs}\) Timetalen byo to ocver \(30 \mathrm{~km}=\frac{39}{y}\) his

Accurding to the given conditons, we have
\[
\begin{array}{ll} 
& \frac{30}{y}-\frac{30}{2 x}-1 \frac{1}{x} \\
\Rightarrow & \frac{30}{y}-\frac{30}{2 x}=\frac{3}{2} \\
\Rightarrow & \frac{10}{y}-\frac{10}{2 x}=\frac{1}{2} \\
\Rightarrow \quad & \frac{10}{y}-\frac{5}{x}=\frac{1}{2} \\
\Rightarrow \quad & \frac{-5}{x}+\frac{10}{y}=\frac{1}{2} \\
\Rightarrow \quad & \frac{-10}{x}+\frac{20}{x}=1 \tag{iii}
\end{array}
\]

Futang \(\frac{1}{x}-w\) and \(\frac{i}{r}-v\), in equatim \((i)\) and \((i)\), we get:
\[
\Rightarrow \begin{array}{ll}
10 u-10 v=1  \tag{iii}\\
& -10 v+20 v=1
\end{array} \quad-\text { (iii) } \quad \text { (v) }
\]

\[
\begin{array}{ll}
\Rightarrow & -10 v+20 v-1-1 \\
\Rightarrow & 10 v-2 \\
\Rightarrow-\frac{2}{10}-\frac{1}{5}
\end{array}
\]

Eutting ic \(=\frac{1}{5}\) in saciationf(ii), whe get
\[
100-10 \times \frac{1}{5}-1
\]
\[
\Rightarrow \quad 100-2-1
\]
\[
=\quad 100-1+2
\]
\[
\Rightarrow \quad 100=3
\]
\[
=\quad \pi=\frac{3}{10}
\]
\[
\text { Now, } u=\frac{3}{10}
\]
\[
=\quad \frac{1}{1 \pi}-\frac{3}{10}
\]
\[
=\quad x-\frac{10}{3}
\]
\[
\text { And, } \psi=\frac{1}{3}
\]
\[
=\frac{1}{4}-\frac{1}{5}
\]
\[
=\quad y=5
\]

Hence, A's speed - \(\frac{10}{3} \mathrm{~km} / \mathrm{hr}\) and \(\mathrm{b}^{\prime} \mathrm{s}\) speed - \(5 \mathrm{~km} / \mathrm{hr}\).

\section*{Exercise 3.11}

\section*{Q1}

If in a retangie, the tength 15 incroased arsi breadtn reducec each by 2 units, the area is reduced by 28 square units tf: howewief the lengtti is teduced by 7 unit and the tireadth increased by 2 units; the area ingrases by 33 square shitm. Find the area of the ractangle

\section*{Solution}
```

Let tte length and breadth of the:rectangie 3ex and y units respectively. Then.
Ared}=Ny so, unitz

```

If length is moreased by 2 units and the breacth is reduced by. 2 unitsu then afrea is reduced by 26 -square units.
```

$=\quad x y-29=(x+2)(y-2)$
$\Rightarrow \quad x y-2 \theta-x y-2 x+2 y-4$
$=-28+4--2 x+3 r$
$=-24=-2 x+2 \psi$
$\Rightarrow \quad 3 x-2 y-34$
$\Rightarrow \quad 2(x-x)-29$
$\Rightarrow \quad x-y-12 \quad-i)$

```

When lizngth is fatiuced by 1 Lunts and the breadth is increased by 2 units, thun atear

```

        \(x y+23-(r-1)(r+2)\)
    $=x y+33=x y-2 x-y-2$
$\Rightarrow \quad 33+2-2 x-y$
$\Rightarrow \quad 35+2 x-y$
$=2 x+x-35$

```

Subtracting equation(i) by equaton \(\{i)\), we get
\[
\begin{aligned}
& 2 x-x-35-12 \\
& =\quad x=23
\end{aligned}
\]
\[
\text { buttirg } x=2 j \text { ins aquation } \sqrt{3} \text { wEget }
\]
\[
2 s-y-12
\]
\[
=\quad 4=12-23
\]
\[
=\quad-y=-11
\]
\[
=\quad y=31
\]
\[
=\text { Asean } N \times Y
\]
\[
-13 \times 11
\]
\[
[-23, y=11]
\]
\[
-353 \leq 4 \text { 4nes }
\]


\section*{Q2}
 breadth is decreased by 3 metres. The ariba remains uniefected if the length is decreasad oy 7 metres and tisacth is increassed by 5 metres. Find the dimersions of the rectangle.

\section*{Solution}

Let the length and breadth of the rectangle berm and ym respectively Then:
\[
\text { srea }-x / m^{2}
\]

If length isincreased by 7 m and the breadth is decreased dy 3et, the atea romams samet
\[
\begin{array}{ll} 
& x y-(x+7)(y-3) \\
\Rightarrow & x y-x y-3 y+7 y-21 \\
\Rightarrow & 3 x-7 y<-21
\end{array}
\]

When length is decressed ty. 7 m and breadtrit incrased by \(5 m\) then arba remarns Mnaffected
\[
\begin{array}{ll} 
& 3 y-(x-7)(y+5) \\
\Rightarrow & x y-x y+5 y-7 y-75 \\
\Rightarrow & 35-5 x-7 y \\
\Rightarrow & 5 x-7 y-25
\end{array}
\]

Subracting egeation(ी) from (ii), He get
\[
\begin{array}{ll} 
& 5 x-3 x-35-(-21) \\
\Rightarrow \quad & 2 x-35+21 \\
\Rightarrow \quad & x=\frac{55}{2}-28
\end{array}
\]

Puttong \(x-28\) in equation (i) 2 , wiengot
\[
\begin{array}{ll} 
& 5 \times 28-7 y=35 \\
\Rightarrow & 140-7 y-25 \\
\Rightarrow & -7 y-35-140 \\
\Rightarrow & -7 y=-105 \\
\Rightarrow \quad & y-\frac{105}{7}-15
\end{array}
\]

Hance; lengtti and breacth of the ecctangie are 26 m and 15 m reapectively.

\section*{Q3}

In a ractangle, if the length Is increased by 2 metres and bfeadth is decreasad oy 4 metres,

 dimertions of the fectangla

\section*{Solution}

Lot the length and breadts of the rectangle bexm and ym renpectualy. then,
Area-kym?

- \(\quad x y-63=(x+3)(y-4)\)
\(\Rightarrow \quad x y-07-x y-4 r+3 y-1 z\)
\(\Rightarrow \quad 4 x-3 y-12+67\)
\(\Rightarrow \quad 4 x-3 x-55\)

```

        \(k y^{\prime}+25-(x-1)(y+4)\)
    $\Rightarrow \quad x y-05=x y+2 x-y-4$
$=89+4=4 r-Y$
$=\quad 93-4 x-y$
$=\quad 4-4 .-93$

```

Subtrecting equation(i) by equation(i). we qet
        \(-y+3 r-93-55\)
\(=\quad 2 v-38\)
\(\Rightarrow \quad y=\frac{31}{2}-19\)
Pustng \(y=19\) in equation(ii), we get
\(4 x-19-03\)
\(\Rightarrow \quad 4 x-9 x+10\)
\(\Rightarrow \quad 4 y=112\)
\(\Rightarrow \quad x-\frac{112}{4}-28\)
Hifor, fingtharid breadth of the nectarigle ire 8sin and 19 in respectuelh

\section*{Q4}

The incomes of \(X\) and V:are in the ratic of \(8 / 7\) and their:expenditures afe in the faro 19.16.
If eact saves \(\mathrm{F}=1250\), find their incomes:

\section*{Solution}
```

Let the incone of $X$ berts an and the indme of 4 laesi br.
Furtiter, int the mopanditires of $x$ and $y$ be 19 y and 16 y raspectivaly, Then,
Saving of $x=8 x-19$
Saying of $y=7 x-16 y$
$8 x-59 y-1250$
and, $7 x-15 y-1250$
$-1)$
Multplying equationgi) by $T$, and equation (ii) by a , we yet

$$
\begin{aligned}
& 56 x-133 p-8750 \\
& 50 x-128 y-10,000
\end{aligned}
$$

Sutstracang erquaton (iv) from nquationfiii) wo get

$$
\begin{array}{ll} 
& -133 y+328 y-8750-10000 \\
\Rightarrow & -5 y--1250 \\
\Rightarrow & y=\frac{-1250}{-5}=254
\end{array}
$$

$$
\text { Hutang } y=250 \text { in equation (i), we get }
$$

$$
9 x-19 \times 2 m-1250
$$

$$
\Rightarrow \quad 8 N-4750=1250
$$

$$
=\quad 0 v-1250+4750
$$

$$
\Rightarrow \quad x=\frac{6000}{8}=750
$$

```

```

$Y^{\prime} 5$ uncome $-7 x=7 \times 750-R 55250$

```

\section*{Q5}
 with \(A\) Eut, if E gVES Rs 10 to \(A\), that, A will have torice as much as is left with fow much money does tach havin?

\section*{Solution}
\begin{tabular}{|c|c|c|}
\hline & \(2(w-39)-y+30\) & \\
\hline \(\Rightarrow\) & \(2 \mathrm{~F}-\mathrm{f0}=\mathrm{y}=3+30\) & \\
\hline \(\Rightarrow\) & \(2 x-y=30+60\) & \\
\hline \(\Rightarrow\) & \(2 y-y=90\) & 一焦 \\
\hline And. & \(x+20-3(y-10)\) & \\
\hline \(\Rightarrow\) & \(x+10=3 y-30\) & \\
\hline \(\Rightarrow\) & \(x-3 y-30-10\) & \\
\hline \(\Rightarrow\) & \(x-3 y=-4\) & -ii \\
\hline
\end{tabular}

Multplying aquation (0) by R. wo gel \(28-6 y=-80 \quad-(i i)\)

Subtracting equation fii) fom eqsation (i), ke get \(3 y+6 y=90+60\)
\(\leftrightharpoons \quad 5 y-170\)
\(=\quad y-\frac{170}{5}-34\)
Futting \(y\) - 3A in oquation (2), no get
\(2 s-34-99\)
\(=\quad 2 x-90+34\)
\(\Rightarrow \quad 2 r=124\).
\(=x-\frac{124}{2}-E 2\)
Herce, \(A^{\prime}\) smoney - As B 2 \(\mathrm{A}^{\prime}\) Imoney - Rs 34

Q6


\section*{Solution}


\(\angle A+\angle C=18 B\)
\(4 y+20-4 x=380\)
\(-6 x+4 y=100\)
\(x-y=-40\)
Alyo, \(\angle B+\angle D=1801\)
\(3 y-5-7 x+5=150\)
\(78+3 y=130\)
Multiplying zquation (1) by 3. we otrain:
\(3 x-3 y=+920\) (2)

Addint aquations: 2 ) and (8). Ue obtain
\(\mathrm{A} \mathrm{t}=0\)
\(x=-15\)
Subptiuning the value of \(x\) in\#\#quton: (1), we obtam:
\(-15-y=-40\)
\(y=-15+40=25\)
\(\angle A=4 y+20=4(23)+20 \Rightarrow 120^{\circ}\)
\(\angle \beta=3 y-\overline{5}=3(25)-5=70^{2}\)
\(\angle C=-4==3(1+10)=20^{2}\)
\(\angle \bar{D}=7 x+5=7(-1 \overline{5})+5=110^{17}\)



\section*{Q7}

I men and \(X\) bey \(\ddagger\) dan do a piece of woth 14 f days. The same woth ladoce in 3 days by 4 men ano 4 bays. How long would it tale one manard one bow to da it?

\section*{Solution}

Supposa that one man done pan fonsh the work in \(x\) days anct orm suy alane san finish it in \(y\) Jay市, Than,
\[
\begin{aligned}
& \text { One man'spne day's work - } \frac{1}{\pi} \\
& \text { One boy's one dsy'E worli }=\frac{4}{7} \\
& 2 \text { men's one day's work }=\frac{2}{x} \\
& \text { Tboy's arse day's wofk }=\frac{?}{y}
\end{aligned}
\]

Since 2 reen and \(\%\) boys can finiph the woll in: 4 days:
\[
\begin{align*}
& \frac{2}{x}+\frac{7}{y}-\frac{1}{4} \\
\Rightarrow & 4\left(\frac{2}{x}-\frac{7}{y}\right)=1 \\
\Rightarrow & \frac{B}{x}+\frac{2 \pi}{y}=1
\end{align*}
\]

Again, 4 man and 4 bays can firitsh fhe same woik in 3 days
\[
\begin{align*}
& =\quad \frac{4}{x}+\frac{4}{y}-\frac{1}{3} \\
& \Rightarrow \quad 3\left(\frac{4}{y}+\frac{4}{y}\right)-1 \\
& \Rightarrow \quad \frac{12}{x}+\frac{12}{y}=1
\end{align*}
\]

Futting \(\frac{1}{k}-u\) and \(\frac{1}{v}=v\) in equations(i) and (i), we get
\[
\begin{array}{ll}
3 u+2 k v=1 & - \\
12 u+12 v=1
\end{array}
\]

Multpiyng equation(iii) by 3and Equationdiv) by 2; we get
\(24 u+64 y=3\)
\(24 u+24 v=3\)

Subtrating: Equation \((v)\) fiom aquation (vi) na:get
\(24 y-54 y-2-2\)
\(=-60 \mathrm{~V}--3\)
\(\Rightarrow \quad v=\frac{1}{68}\)
Futtigg \(v=\frac{1}{60}\) insequation \((i v)^{\prime}\), we giet
\[
\begin{aligned}
& 12 u+12 \times \frac{1}{50}-1 \\
&= 12 u+\frac{1}{5}-1 \\
& \Rightarrow \quad 12 u-1-\frac{1}{5} \\
& \Rightarrow \quad 12 u=\frac{5-1}{5}=\frac{4}{5} \\
& \Rightarrow \quad u=\frac{4}{5 \sim 12} \\
&=\frac{1}{\sqrt{5} * 3} \\
&=\frac{1}{15}
\end{aligned}
\]
\[
\begin{array}{ll}
\text { Now. } \quad u=\frac{1}{15} \\
\Rightarrow & \frac{1}{x}=\frac{1}{15} \\
\Rightarrow \quad x-15 \\
\text { And, } \quad v=\frac{1}{60} \\
\Rightarrow \quad \frac{1}{y}-\frac{1}{60} \\
\Rightarrow \quad y=E 0
\end{array}
\]

Herce, oneman alore can finimn the work in 15 daye one poyalone can frish the wori in 60 daye:

\section*{Q8}


\section*{Solution}


Putting \(\angle C-y^{2}\) ind \(<-\left(3 z^{2}-2\right)^{\circ}\) in Bunation \((y)\), wh gut
\[
x-(2 x-2)-9
\]
\(\Rightarrow \quad y-3 r+2-9\)
\(\Rightarrow \quad y-3 x=9-2\)
\(\Rightarrow \quad-3 x+y=7\)
We vinw that the sum ni angles of a many \(=\) is \(180^{\circ}\)
\(=\quad \angle A+\angle 2+\angle C=100^{\circ}\)
\(\Rightarrow \quad x+2 v-2+x-190^{6}\)
\(\Rightarrow \quad 4 x+y-180+2\)
\(=\quad 4 v+y-282\)
\(-(\mathrm{vi}\)
Subtracting equation \((v)\) from equastin \((v i)\).
\(4 x+3 r-182-7\)
\(\Rightarrow \quad 3 x-175\)
\(=\quad x-\frac{175}{7}-25\)

Putting \(N=25\) in equation \(\left(v_{)}\right)\), weqet
\(-2 \times 25+y=7\)
\(=\quad-75+r=\) ?
\(\Rightarrow \quad y=y+y \mathrm{~S}\)
\(\Rightarrow \quad y=0\) :
\(\angle A=-x^{*}-25^{\circ}\)
\(\angle B=(3 N-2)^{\prime}=(3 \times 25-2)^{\prime \prime}=[15-2)^{\prime \prime}=73^{\circ}\)
And, \(\angle C-y^{+}+62^{+}\)

Q9

Firid the four angles.

\section*{Solution}
```

Weg know that the sum of t:e opposte angles of a cyctit quadriateralis 20|" .
In the cyclic buadritatnall ABCD, nigles A and Ciand mogles A and D Farm pairs
of opopsite angles:
\angleA+\angleC=1BO}\mathrm{ and }\angleE+\angleO=10\mp@subsup{C}{}{\circ
NOW, }\angleA+\angleS-180
=>2x+4+2y+10=180 [ [ <A= (2x+4}) and \angleC={2v+10)}
=> 2x+2y+14=130
= 2x+2y-100-14
=> 2x+2y-166
=2(x+y)-156
= x+y-\frac{156}{2}-33
= x+y-83 - -1)
How, }\angleB+\angleB-120
=>r}r<3+4K-5=18
[\angleE=(y+2)* arc }\angle0={(4x-5)*
7 4-र-\mu-2 = 100

# 4; - y=182

-6

```

Suhtranting equation of tram equathin (if) we get
```

    \(4 x-x=102-83\)
    $=\quad 3 r-99$
$=x-38$

```
Putting \(x=3\) in aquation 保, we get
    \(33+y-83\)
\(=y-83-33\)
\(\Rightarrow \quad y=50\)

Hance \(\angle \angle A-(2 x+4)\) :
\[
-(2 \times 33+4)
\]
\(\Rightarrow \quad \angle A=70^{\circ}\).
\(\angle A-\{y+2)^{\circ}\)
\(-(50+z)\).
\(=\quad \angle 8-53^{\circ}\),
\(\angle C=(2 y+10)\)
\(=(2 \times 50+10)^{\text {o }}\)
\(\Rightarrow \quad \angle C=120\),
and,
2i) \(-(4 x-5)^{-}\)
\(-(4=33-5))\)
\[
-(112-12)
\]
\(\Rightarrow \quad \angle 0.12 \%\)

Q10
Yash scored 40 mafks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each incorrect answer, then Yash would have scored 50 marks. How many question were there in the test?
leet the number of right answers and wrong answers bex and y respectivelv.
According ro the question,
\(3 x-\mathrm{y}=40, \ldots \ldots(1)\)
\(4 x-2 y=50\)
\(\Rightarrow 2 x-y=25\) a)

Subtracting equation (2) from equation (1), we obtlan:
\(x=15\)
Substitut ing the value of \(x\) in equation (2), we obtam:
\(30-\mathrm{y}=25\)
\(y=5\)
Thus, the number of right answers and the number of wrong answers is 15 and 5 respectivelv. Therefore the total number of questions is 20.

Concept insight: In this probiem the number of write answers and the number of wrong answers answered by Yastiare the unknown variable y has the same coefficient in both the equations, sa it will be easier to find the solution by eliminatingy from both the equations.

\section*{Q11}
 night angled.

\section*{Solution}

We have,
\(\angle A=\aleph^{*}\)
- -1
\(\therefore 2=7 x^{4}\)
(-7i)

Ahd, \(\angle C=p^{*}\)

We know that, the sum of angies of a triangie is 1 got.
\[
\begin{array}{ll} 
& \angle 4+\angle 6+\angle c-280 \\
x+3 x+y-100 & \\
& 4 x+y-280 \\
\text { NOW } & \text {-(iv) } \\
& \text { [usingfi) }  \tag{x}\\
7 y-5 x-30 & \text { (v) }
\end{array}
\]


Multp) ving equation (iv) by 3 , we get
\[
12 x+3 y=540
\]
\[
-(v i)
\]

Futtracting zquation \((v)\) focm equathon (vi); we get
\[
\begin{aligned}
& \quad 12 x+5 x=540-30 \\
& =\quad 17 x-510 \\
& =\quad x-\frac{510}{17}-39
\end{aligned}
\]

Futting \(x-30\) in equatuan (iv), we get
\[
\begin{array}{ll} 
& 4 \times 30+y=180 \\
= & 120+y-180 \\
=\quad & y-180-120-30
\end{array}
\]

How, \(\angle 0-3 v\)
\(=\quad 28-3 \times 30^{\circ}-90^{\circ}\)
- \(4 A B C\) is theright angle viangie

Hanco proveid

\footnotetext{
The car hire charges in a city comprise of fixed charges together with the charge for the distance covered. For a journey of 12 km , the charge paid is Rs 89 and for a journey of 20 km , the charge paid is Rs. 145 . What will a. person have to pay for travelling a distance of 30 km ?
}

Solution

Let the fiked charges of the ciar be ha \(k\) and the furning ckarges be hs y/km
According to the given conditioni we have
\[
\begin{align*}
& x+12 y=89 \\
& x+20 y=145
\end{align*}
\]
- 19

Siturating equation \((i)\) fion equaton () , we cet
\[
\begin{aligned}
& 20 y-12 y-145-69 \\
& \Rightarrow \quad B y-56 \\
& =y<\frac{56}{8}=7 \\
& \text { Puttingy }=7 \text { in equation(i), we get } \\
& x+12 \times 7-89 \\
& \Rightarrow \quad x+85-89 \\
& \Rightarrow \quad x-69-84-5
\end{aligned}
\]
: Total charges from tr avelling a distancu of 30 km .
\(=x+36 y\)
\(-5+30 \times 7\)
\(-5+210\)
-Rs 215

Henos, total charges Irom travelling a distanon of 30 km is Rs 21.5.

\section*{Q13}

A part of monthly hostel charges in a college are foxed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 20 days, he has to pay Rs 1000 as hostel charges whereas a student B, who takes food for 26 days, pays Rs 1180 as hostel charges. Find the fixed charge and the cost of food per day.

\section*{Solution}

Let the finad charge of the foud and the charea for tood per dáy be at and y rasbestively.
actording to the quastion
\(x+20 x=5000\)
\(x+26 y-1130 \quad\) (22)

\(6 y-100\)
\(y=20\)
Substuturg this walue of \(\mid \gamma\) in equation 421, we obtain:
\(x+20 k 20-1000\)
\(x=1000-600\)
\(x=400\)

Concept insight: Here, the fiveo charge of the focct and charge for fogd per day are the unknown cuartitiez: So
they aro takan as yarablas \(x\) ancy. The two ectuations can than be obtained by using the oiven conciotions. You wil obserre that the \(v\) ariable \(x\) has the same coefficient in bcth the equatioris, so it weif b e easier to find the solution by pliminating of frem toth the equations. Aise, oria san solve the systern by other methons

\section*{Q14}

Half the permetar of a garden, vhiose lengti is 4 more than its width \(/ 3.36 \mathrm{~m}\). Find the dim enझons of the garden

\section*{Solution}
```

Lat the leggtr and breadth of the garden bexm and ym respectively Then,
$x-y+4$
- 19
And $\frac{1}{2}$ [parimater of a gavden]-35
$=\frac{1}{2}[2[x+y)]=36 \quad$ [viperimetar of rectange $-2[(p \rightarrow b)]$
$=\quad y+y-3 t$
Subsrating $x-y+4$ in equation (ii), me get
$r * 4+y=35$
$\Rightarrow \quad 2 y-35-4$
$\Rightarrow \quad 2 y-32$
$\Rightarrow \quad y-\frac{32}{2}-15$
Pitting $x-26$ in equatian if , we get

$$
x=16+4=20
$$

```

Hence, the length and treadth of the \(q\) acden ale 20 m and 16 m respactivesy.

\section*{Q15}

The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.

\section*{Solution}

\section*{Let the lierge ancie to \(x\) arit smallez anciot tr \(\gamma\),}

Weknaw that the sum of the measures ut angles uf a scoblemeatery per as alvers \(1.30^{\circ}\) Arcerding to the giver intormation.
```

$z+y=180^{\circ}$
$x-y=18^{\circ}$

Fun (1). we ottain
$x=260^{\circ}-\gg 3$
atesctitutina this in exastion \{2), we obtain
$135-y-y=15^{\circ}$
$16 z^{*}=2 y$
$8 t^{2}=y$
Putanc this in equation ( $\overline{0}$ ), $x=$ e3ten
$x=181^{3}-32^{3}$
-9?
Hence, the sigles are +4i and s3",




## Q16

2 Women and 5 men can together finish a piece of embroidery in 4 days, while 3 women and 6 men can finish it in 3 days. Find the time taken by 1 woman alone to finish the embroideery, and that taken by 1 man alone.

Solution

Whrl: doge by a woman in 1 -day $=\frac{1}{2}$
Work-tore oy a man $\ln 1$ day $=\frac{1}{y}$
Acoording te thin eusstan.
$4\left(\frac{2}{\pi}, \frac{5}{y}\right)-1$
$\Rightarrow \frac{2}{\pi}+\frac{5}{7}-\frac{1}{4}$
$3\left(\frac{3}{x}+\frac{6}{y}\right)-1$
$\Rightarrow \frac{3}{x}+\frac{6}{y}-\frac{1}{3}$
ver $\frac{1}{x}-p$ and $\frac{1}{y}-a$
The given equations reducs to:
$2 p-5 q-\frac{1}{4}$
$\Rightarrow 3 p+20 g-1$
$3 p+c q-\frac{1}{3}$
$-9 p+1 \varepsilon-1$
Using oressmultplication, me obtaor
$\frac{F}{-28-(-18)}-\frac{7}{-7-(-8)}-\frac{1}{164-180}$
$\frac{F}{-2}-\frac{1}{-1}-\frac{1}{-3 \pi}$
$\frac{p}{-2}-\frac{1}{-30}, \frac{q}{-1}-\frac{1}{-30}$
$x=\frac{1}{12}-9-\frac{1}{16}$
$p-\frac{1}{x}-\frac{1}{18}, q-\frac{1}{y}-\frac{1}{35}$
$x=18, y=16$


## Q17

Meena went to a bank to withdraw Rs 2000. She asked the cashier to give her Rs 50 and Rs 100 notes only. Meena got 25 notes in all. Find how many notes Rs 50 and Rs 100 she received.

## Solution

Let the number of F : 50 notes and ks 100 notes be:ll and V fesbectives:
Aacirding to tha question.
$x+y=25$
$50 x+100 y=2000$
Multikiria equation (1) Ey 50, we cotan
$50 x+50 y-1250$
Sutarating equation (3) fromequation (2) , we phtart
$56 y-756$
$t=15$
Suasthating the yalue of $y$ in equasion (2), we obtain
$y=10$

Combept insingte: Thes ptoblem talls about koo types of notes, Rs 50 notes and Fs 100 nobans. And the

## Q18

Thets are tw $Q$ examitiation roomi $A$ and $E$, If 10 candidates are sent from $A$ to $B$, the number of studerits in each roion is sam. If 26 candidates aie ubit from $B$ to $A$, the numberof studettiniA is dqutle the numbec of stadents in $B$. Find tise number of studtemts in enach form

## Solution

Let the number of candichites on trams $A$ and $\bar{A}$ bex and $y$ tempect voly Then,

|  | $x-10-y+10$ |  | [givar] |
| :---: | :---: | :---: | :---: |
| $=$ | $x-\gamma^{\prime}=10+10$ |  |  |
| $\geq$ | $x-y-20$ | - 0 |  |
| And, | $2(y-20)-x+26$ |  | [given] |
| 4 | 2y-4]-x+20 |  |  |
| 3 | $2 y-x-29+40$ |  |  |
| $\geqslant$ | -x $+2 y=60$ | - 017 |  |

Aditing squations (i) and (u), wo got

$$
\begin{aligned}
& -y+2 x-20-60 \\
& y=80
\end{aligned}
$$

Putting $y$ - 80 in equationfy, to pat

$$
\begin{aligned}
& x-90-20 \\
= & x-20+80 \\
= & x=100
\end{aligned}
$$

Honce, number ibf students in room $A=100$ and nutitine ofitudeots in roan $8<89$
Q19

A ralway half tipket costs half the full fare and the reservaton chargel s the same on half ficket as on full tidect. One ceanvod ifrst dass ticcet from Mymbin to shmedabad arats
 first dass full fare and what is the facervation charge?

## Solution



$$
x+y=216 \quad \text { [gmeri] }
$$

Añ,

$$
(x+y)+\left(\frac{1}{2} x+y\right)-227 \quad[\text { given }]
$$

$$
x+y=\frac{1}{2} x+y=327
$$

$=x+\frac{1}{2} x+2 y=z 2 t$
$=\frac{3 \pi}{2}+2 y=327$
$\Rightarrow$ 3 $+4 y=634$ - (ii)
Multol yimg vquation() by 4 , wer get
$4 x+4 y=864$ $\square$
Subtracting:equation (ii) from equation (iii), weget
$4 x-3 x-854-554$
$\Rightarrow \quad x=210$
Puttings $x 210$ in equatanid, weget

$$
210+y-216
$$

$\Leftrightarrow \quad y=216-210=6$
Himan, the cost of the sul fare - Rs 210 and, tha cost of the rexervaten cha ge - Ris 0

## Q20

A mizarc having powers of $m$ ystipin candations and magipal m poicines seeing $\equiv$ cod ripht going on, spole privately to bott the owners of coove. To ore ne ster, fy you thed
 third of that. Soing to the other he promised in the same way to give thr both of them his gain would be anly 12 gole coins Find the stale of monev zad of the cpol-avners havi.

## Solution


$y-\frac{2}{3} x-12$
$=\quad 3 y-2 x-3 t$

And, $\quad x-\frac{3}{4} y=12$
$\Rightarrow \quad 4 x-3 y=4$ 日

Mu bpiying equatan (i) by 2 , ve get
$5 y-4 x-72$
Agding Equations( $)$ and(ii). we get
$-2 x+5 y-4 e+72$
$=\quad 3 y-120$
$\Rightarrow \quad n=\frac{120}{3}-40$
Putting $y=40$ in acyation $(i)$, we get
$4 x-3 \times 40=40$
$=\quad 4 x-120-48$
$\Rightarrow \quad 4 x=40+120$
$\Rightarrow \quad 4 x-168$
$\Rightarrow \quad X=\frac{160}{4}=+2$

Hence, the stake df moriey of lst csck-owner $=42$ gold coins and, the stale of im ohey of il no cock-owner $=40$ gold soins.

Number of sudents in Bach row $=\frac{x}{y}$
When 3 students are estra in each row, there is $:$ row less ie, when each row has $\left(\frac{x}{y}+y\right)$ stadents the num bem of rows is $(y-1)$

> Tatal numben of shudants-Number of roves isfumber of studnotisin nach rame
> $=x=\left(\frac{x}{y}+3\right)(y-1)$
> $=x-x-\frac{x}{y}+3 y-3$
> $=\frac{x}{y}-3 y+3=9$

If 3 stugente are less in each row, then thene are 2 rows more i: m , when each row:
$\left(\frac{x}{v}-3\right)$ students, this num be ofrowais $(y+2)$,
2-Total mumber of stidents-Number of rowa $\times$ Number of students in liach row.
$=x-\left(\frac{x}{y}-3\right)(y+3)$
$\Rightarrow \quad x-x+\frac{2 x}{y}-3 y-6$
$\Rightarrow \quad \frac{-2 x}{y}+3 y+5-10$
Multiplyim equation (i) by 2 xeget

$$
\frac{2 x}{y}-5 j+6-a
$$

Addirg Eguationfis and equationfich, weg get

$$
\begin{array}{ll} 
& 3 y-64+\overline{6}+6-6 \\
\Rightarrow & -3 y--12 \\
\Rightarrow \quad & y-\frac{-12}{-3}-4
\end{array}
$$

puttingy $=4$ hin equationf! we get

$$
\begin{aligned}
& \frac{x}{4}-3 \times 4+3=0 \\
= & \frac{x}{4}-12+3-0 \\
= & \frac{\pi}{4}=5 \\
= & x+9 \times 4 \\
= & x-35
\end{aligned}
$$

Herse, the number of Etudenta in the diss is 36 .

## Q22

One says, "Give me a hundred, friend! I shall then become twice as rich as you". The other replies, "If you give me ten, I shall be six times as rich as you". Tell me what is the amount of their (respective) capital?

## Solution

Let the money with the first person and second person be Rs x and Rs y respectively.
According to the question,
$x+100=2(y-100)$
$x+100=2 y-200$
$x-2 y=-300$
$6(x-10)=(y+10)$
$6 x-60=y+10$
$6 x-y=70$
Multiplying equation (2) by 2 , we obtain:
$12 x-2 y=140 \quad$... (3)
Subtracting equation (1) from equation (3), we obtain:
$11 \mathrm{x}=140+300$
$11 \mathrm{x}=440$
$\mathrm{x}=40$
Putting the value of $x$ in equation (1), we obtain:
$40-2 y=-300$
$40+300=2 y$
$2 y=340$
$y=170$
Thus, the two friends had Rs 40 and Rs 170 with them.
Concept insight: This problem talks about the amount of capital with two friends. So, we will represent them by variables $x$ and $y$ respectively. Now, using the given conditions, a pair of linear equations can be formed which can then be solved easily using elimination method.

## Q23

A shopkeeper sells a saree at $8 \%$ profit and a sweater at $10 \%$ discount, thereby getting a sum of Rs. 1008 . If she had sold the saree at $10 \%$ profit and sweater at $8 \%$ discount, she would have got Rs.1028. Find the cost price of the saree and the list price (price before discount) of the sweater.

## Solution

Let teh cost price of a saree $b=\mathrm{Rs}$. $x$
and the list price of the sweater be Rs. y
S.P. of sarsea: $8 \%$ profit $=R+\left(x+\frac{8 x}{100}\right)-R \Leftrightarrow\left(\frac{105 x}{100}\right)$
S.P- of sweater at $10 \%$ discrumt $-R=\left(y-\frac{10 \%}{100}\right)-R s\left(\frac{90 y}{100}\right)$

Aocordino so question
$\frac{102 \mathrm{ex}}{100}+\frac{90 y}{100}-1008$
$\Rightarrow 108 x+90 y-100800$

$$
01
$$

Now, S. F of seree at $10 \%$ profit $-R E\left(x+\frac{10 x}{100}\right)-F=\left(\frac{110 x}{100}\right)$
S.F. of swester at $8 \%$ discount $-\mathrm{Fs}\left(y=\frac{0 y}{100}\right)-R s\left(\frac{92 y}{100}\right)$

Accecrding to -question,
$\frac{1100}{100}+\frac{92 y}{100}=1029$
$\Rightarrow 110 x-90 y-100000$....(i)
Shtracting (i) from (i), vee get
$2 x+2 y=2000$
$\Rightarrow x+y-1000$
$\Rightarrow x-1000-y$
Sibstitutng (ii) in ( 1 ), we get
$108(1000-y \%+90 y-100800$
$\Rightarrow 108000-108 y+90 y-100800$
$\Rightarrow-18 \mathrm{y}=-7200 \Rightarrow \mathrm{y}=486$
$\Rightarrow x-1000-400-600$
Thas, the cost brite of saree is Ps 600 and
the list price of sensater is RES, 400 questions and got 90 marks. How many questions did she answer correctly?

## Solution

Let Jeypanti antwered $x$ questicns divecty $y$ and $y$ qiestions wöngly
Aoziding to information quen in questor,

```
\(x+y=120\)
        (1)
\(1 x=-\frac{1}{3} x v-90\)
\(\Rightarrow 2 x-y-180\)
Adding equat on ( 1 ) and (10) ) we get
\(3 x=300\)
\(\Rightarrow x-100\)
Thus, Jayarit answered 100 questions cometiy.
```


## Q25

A shopkeeper gives book on rent for reading. She takes a fxed charge for the first two days, and an additional charge for each day thereafter. Latika paid Rs. 22 for a book kept for 6 days, while Rs. 16 for the book kept for four days. Find the fixed charges and charge for each extraday.

## Solution

Let the fixed charge for first tirse days befl. : and the additional charge for each day thereattor bef's $y$, Tren, acording on question, we have
$x+4 y=22$

- (i)
$x+2 y=16$
Suotracons equation (ii) froms (i), we have
$2 \mathrm{y}-6$
$\Rightarrow y=3$
Scostiouting y -3 in ( H ), we have
$x+2(3)-16$
$\Rightarrow x+6=15$
$\Rightarrow x-10$
Thus, the 开xed charge for first triee deys is Rs io
and the addutinal tharge for eadi day thereaftor ienes 31

Exercise 3.114
Q1

Solution

Q2

Solution

${ }_{2} 2+1 y_{2} y+52<0-21$
For infinite soluton
$\frac{a_{1}}{a_{2}}-\frac{b_{3}}{b_{2}}-\frac{s_{1}}{\sigma_{1}} \quad-\quad[$
Guth munntion art
$2 x+3 y=5-\frac{4}{4}$
$2 x+h y=10$
Tram equationa [1] $5\left[\right.$ [4] $a_{1}=2 \hbar_{1}-3 \quad c_{3}=3$

Tram nquation ( I $_{1}$
$\frac{2}{4}-\frac{3}{k}-\frac{-5}{-10}$
$=\frac{\pi}{k}-\frac{2}{2}$
$-\sqrt{x+3}$
Ste tive correct antionis. (fi)
Q3

Solution

Q4

The value af if for which the system ef eeuok:sht

a
1 a/9 (b) 2 (0.6 (i)

Solution

for inininte salunans

$$
\frac{a_{1}}{a_{2}}-\frac{b_{1}}{b_{2}} \quad \cdots+[]_{1}
$$

Goven equebont are

oncombering 国图迢
$-a_{1}-3 \quad b_{3}-3$
$a_{2}-k \quad b_{2}-10$
$\operatorname{tram}\left[\frac{1}{k}=\frac{5}{10}\right.$
$-(1-6$
与bither correckeption｜a（i）

Q1

Solution
5. $A_{2} x+b_{j} y+c_{1}-A-$-II

$$
\pi_{2} x+b_{y} y+i_{2}-6-2
$$

for imeons/atere solution

$$
\frac{a_{1}}{a_{2}}-\frac{\eta_{1}}{\eta_{2}}-- \text { I }
$$

trume equanons are
$\# 2+x=3 \quad \cdots$ -
$(2 k-1)=+(a-1)=7 \pi+3-(3)$
fram (2) \& c (4)
$-a_{1}-3 \quad b_{1}-1 \quad c_{1}--1$
Tram (2) K ( ( 1 i
$B_{1}-2 k-1 \quad H_{2}-k-1 \quad i_{2}-2 k+1$
frome
$\frac{9}{2 k-1}=\frac{1}{k-1}$

- $3 k-z=3 k-1$
$=-2$
Sy. the comete opticnis id

Q2

If $a m=b$, then the system of equations
$a x+b y=c$
$\mid x+m y=n$
(a) has a unique solution
(b) has no solution
(c) has infinite many solution
(d) may or may not have a solution

## Solution

for unique salistion
$\frac{a}{1}=\frac{a}{m}$

- min = til
antch is the given condition
fiesce the given equation
$3 m=b$
is the conctition to \% unitur matutiun
So, Hecorletr Opton S (a)

Q3
fthe syatim of equations
$3 v+3 y-7$
$2 a s-(a+k) y-2 E$
hav infienter mary solutione than


Solution

## Solution

## Q5

If $2 x-3 y=7$ and $(a+b) x-(a+b-3) y=4 a+b$ represent coincident lines than $a$ and $b$ satisfy the equation
(a) $a+5 b=0$
(b) $51+\mathrm{b}=0$
(c) $a-5 b=0$
(d) $5 a-b=0$

## Solution

```
Forconiridentinez
    \frac{2}{a+b}}=\frac{-3}{-(a+b-2)}=\frac{7}{a++b
- \frac{2}{a+1}=\frac{7}{4a+b}
- Ea+2b-7a+7b
-2.-5早
B6-sb-g
```

Q6

If a pair of linear equations in two variables is consistent, then the lines represented by two equations are
(a) Intersecting
(b) parallel
(c) always coincident
(d) intersecting or coincident

## Solution

Consistent solution means either linear equations have anique solutions or infinite solutions.
$=$ In case of unique solution; lines are intersecting
= If solutions are infinite, lines are coincident.
So, lines are either intersecting or coincident
So, the correct option is (d).

Q7

## Solution


nterapton $x-$ Nul $-a$
interceat on $v$-asjo $-b$
area cftrangia $-\frac{1}{2} \times a \times b$ $-\frac{1}{2} A b$


Q8

The area of the triangle formed by the lines
$y=x, x=6$, and $y=0$ is
(a) 36 sq. units
(b) 18 sq , units
(c) 9 sq , units
(d) 72 sq, units

## Solution



Q9

If the system of equations $2 x+3 y=5,4 x+k y=10$ has infinitely many solutions, then $k=$
(a) 1
(b) $\frac{1}{2}$
(c) 3
(d) 6

## Solution

If the system of equations $k x-5 y=2,6 x+2 y=7$ has no solution，then $k=$
（a）-10
（b）-5
（c）-6
（d）-15

## Solution

$$
\begin{aligned}
& \text { Fenjatians } \left.\quad a_{1} u+b_{1} v+c_{2}-0 \quad-1\right] \\
& \text { and } a_{2} x^{2}+b_{2} x+r_{2}=0 \\
& \cdots-\text { - }
\end{aligned}
$$

have ao ublutiun，the：

$$
\frac{a_{1}}{a_{2}}=\frac{b_{1}}{b_{2}}=\frac{c_{1}}{c_{2}} \quad \ldots-I_{1}
$$

On somparimatwith miven equation to 回 6 目
we get

$$
\begin{array}{lll}
a_{1}=k & b_{1}=-3 & c_{1}=-1 \\
a_{2}-1 & b_{2}-2 & c_{3}=-1
\end{array}
$$

Frien nquabor 图

$$
\begin{aligned}
& \frac{1}{6}-\frac{-5}{2}-\frac{2}{7} \\
& -5--15
\end{aligned}
$$



## Q11

The area of the triangle formed by the lines
$\mathrm{x}=3, \mathrm{y}=4$ and $\mathrm{x}=\mathrm{y}$ is
（a）$\frac{1}{2}$ sq．unit
（b） 1 sq ．unit
（c） 2 sq ．unit
（d）None of these

## Solution


(3,4)

$$
\begin{aligned}
& \begin{aligned}
\text { area of thangle } & -\frac{1}{2} \times 1=1 \\
& =\frac{1}{2}=4 \text { wnit }
\end{aligned} \\
& \text { So, tre comect opoon is a) }
\end{aligned}
$$

## Exercise 3.116

Q1


The area of the triangle formed by the lines
$2 x-3 y=12, \quad x-y-1=0$ and $x=0$
a) 3 sq, units
(b) 7.5 sq . units
(c) $6,5 \mathrm{sa}$, unite
(d) 6 sq, units

## Solution



Q2

The sum of the digits of a two digit number is 9 . If 27 is added to it, the digits of the number get reversed. The number is
25
72
63
36

Solution
thet the digt at unit's place he $x$ and the dgit at ren's ploce he $x$ :
Thes, number $=10 \mathrm{y}+\mathrm{x}$
Aocording wa given conditions, we have
$x+y-9$
.. 0 )
And, $10 y+x+27=10 x-y$
$\Rightarrow 9 x-9 y-27$
$\Rightarrow x-y=3 \quad$ (ii)
Adding cquations (i) and (a) we fove
$2 x-12 \Rightarrow x-6$
$\Rightarrow y-9-6-3$
Hence, the number -36
Fence, correct option is (d).

## Q3

If $x=a, y=b$ is the solution of the system of equations $x-y=2$ and $x+y=4$, then the values of $a$ and $b$ are, respectively
3 and 1
3 and 5
5 and 3
-1 and -3

## Solution

Since $x=a$ and $y=b$ is the solution of given system of equations $x-y=2$ and $x+y=4$, we have
$a-b=2 \ldots$ (i)
$a+b=4 \ldots$ (i)
Adding (i) and (ii), we have
$2 a=6 \Rightarrow a=3$
$\Rightarrow b=4-3=1$
Hence, correct option is (a).

Q4

For what valuek do the equalions $3 x-y+3=0$ and $6 x-k y+18=8$ enesert coineident lites?
$\frac{1}{2}$
$-\frac{1}{2}$
$\frac{2}{2}$

## Solution

The giveri syatem of equations are
$3 x-y+8=0$
$5 x-k y+16=0$
Thes systom of aquabons is of the form
$a_{1} x+b_{2} y+c_{1}=0$
$a_{2} z+b_{2} y+c_{2}-0$
where, $a_{1}-3, b_{1}--1_{1} c_{1}-8$
And, $a_{2}-6, b_{2}-+, c_{2}-16$
For the lines th be ooind derit, we must have
$\frac{d_{1}}{\sigma_{2}}=\frac{b_{1}}{b_{i}}-\frac{c_{2}}{c_{2}}$
$=\frac{3}{6}-\frac{-1}{-k}-\frac{8}{16}$
Now, $\frac{3}{5}-\frac{-1}{-1} \Rightarrow 3-6 \Rightarrow k-2$
Hence, earrect oetion is (c)

## Q5

Aruna has only Rs. 1 and Rs. 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is Rs.75, then the number of Rs. 1 and Rs. 2 coins are, respectively

35 and 15
35 and 20
15 and 35
25 and 25

## Solution

Let there be x cans of Rs \& und $y$ courts of Rs: 2
Tren, we have
$x+y-50 \quad$ (i)
$x+2 y-75$.....il)
Subtractiog (i) from (i), we have
$p-25$
$\Rightarrow x-50-25-25$
Trus, number of Pee. 1 ocins is 25 and the number of ps. 2 .oons is 25 .
Henon. corract option is (d)


[^0]:    Graph of the given equatorg:

[^1]:    Show graphically that each one of the following systems of equations is in-coinsistent (i.e. has no solution):
    $3 x-5 y=20$
    $6 x-10 y=-40$

[^2]:    Graph:of the given equationa:

[^3]:    Solve graphically each of the following systems of linear equations. Also find the coordinates of the points where the lines meet axis of $y$
    $x+2 y-7=0$
    $2 x-y-4=0$

[^4]:    Dravi the graphs of $x-y^{\prime}+1=0$ and $3 x+2 y-12=0$. Determine the cocedinatas of the verbices of the triangle formed by theme lines and $x$-axis and sitede the triangular areas Calculate the area sounded ty thes. Ines and $x$-ilecs

[^5]:    We aंsu cusarve that to lines represantad by the equations $x-y+1=0$ and $3 x-2 y-12-0$ reest N-a及त at $B(-1,0)$ and $0(4,0)$, सिspectively:

    Thus. $x=2, y=3$ is the solution of the given srstem of equations:
    Draw $A D$ perperudicular from A on $K$ - anis

[^6]:    - Area of the shadedregion-is $=q$. units

[^7]:    Draw the graphs of the equations $5 x-y=5$ and $3 x-y=3$. Determine the co-ordinates of the vertices of the triangle formed by these lines and the $y$ axis. Calculate the area of the triangle so formed.

[^8]:    The graphisal'faptesentatite as followa

[^9]:    Thenraghical regresentuson ヨas followly

[^10]:    From the graph, it oan be obseived that the wo' lineat merfectazah other at the porth (3:3)
    $S 0, x=3=n=y=3$

[^11]:    Alphaserst the following pair of oquations graphigally and write tha coordinates of pcints where the limes interserts $y$-adis.

    $$
    \begin{aligned}
    & x+3 y=3 \\
    & 2 x-3 x-12
    \end{aligned}
    $$

[^12]:    S boat gaes 12 km usitream and 40 km downstream in 8 hours it tan 7010 km upstrasm and 32. km doymstream in the samestine. Find the speed of the boat in stil watar and the घ户eed of the strean.

[^13]:    A motor boat can travel 30 km upstream and 28 km downstream in 7 hours. It can travel 21 km upstream and return in 5 hours. Find the speed of the boat in still water and the speed of the stream.

[^14]:    A train covered a certain distance at a uniform speed. If the train would have been $10 \mathrm{~km} / \mathrm{h}$ faster, it would have taken 2 hours less than the scheduled

