# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.1

**Q 1. 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 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 played she had on a thegiant 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.**

**Soln:**

The pair of equation formed is: y−12xy − $\frac{1}{2}$x

x – 2y = 0 ……(i)

3x + 4y = 20 …… (ii)

Let us represent these equations graphically. For this, we need at least two Solutions for each Q. We give these Solutions in the table:

| **x** | 0 | 2 |
|---|---|---|
| **y−12x**y − $\frac{1}{2}$x | 0 | 1 |

| **x** | 0 | 2 | 4 |
|---|---|---|---|
| **y=20−3x4** y = $\frac{20-3x}{4}$ | 5 | 0 | 2 |

When:

The solution of the variable is zero; the equation can be solved easily. Putting x =0 in equation (ii) we get

4y = 20

i.e y = 5

Similarly putting y = 0 in equation (ii) we get

3x = 20

**x=**203x = $\frac{20}{3}$ but it is not an integer so it is not easy to plot on graph paper so we chose y=2 which gives x =4 as an integer value.

The points are A(0,0) ; B(0,5) and P(0,5) ; Q(4,12)

**Q 2. 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.” Is this not interesting? Represent this situation algebraically and graphically**

**Soln:**

Let the present age of Aftab and his daughter be x and y respectively. Seven years ago,

Age of Aftab = x – 7

Age of his daughter = y – 7

According to the given condition,

x – 7 =7 (y – 7) = x – 7y = -42

Three years from hence,

x + 3 = 3 (y + 3) = x – 3y = 6

Thus the given Soln: can be algebraically represented as

= x – 7y = -42 …….. (i)

= x – 3y = 6 …… (ii)

From equation (i)

x = -42 + 7y

| | | | |
|---|---|---|---|
| **X** | -7 | 0 | 7 |
| **Y** | 5 | 6 | 7 |

From equation (ii)

x = 6 + 3y

| | | | |
|---|---|---|---|
| **X** | 6 | 3 | 0 |
| **Y** | 0 | -1 | -2 |

The above can be plotted in the graph as follows:

**Q 3. The path of the train A is given by the equation 3x+4y-12 =0 and the path of another train B is given by the equation 6x+8y-48 =0. Represent this situation graphically.**

**Soln:**

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



3x + 4y – 12 = 0……(i)

$6x + 8y – 48 = 0$ …….(ii)

In order to represent the following sets of lines graphically we need two points for a single equation

We have,

$3x + 4y – 12 = 0$

Putting $y = 0$

$3x + 4(0) = 12 = 3x = 12 =x =4$

Hence the coordinate is (4,0)

Putting $x = 0$

$3(0) + 4y = 12 = 4y = 12 = y = 3$

Hence the coordinate is (0,3)

We have,

$6x + 8y – 48 = 0$

Putting $x = 0$

$= 6(0) + 8y = 48 = 8y = 48 = y = 6$

Hence the coordinate is (0,6)

$6x + 8y – 48 = 0$

Putting $y = 0$

$6x + 8(0) = 48 = 6x =48 = x = 8$

Hence the coordinate is (8,0)

Hence the two lines intersect at point (-1 ,2)

Hence x= -1 and y = 2

**Q 4. Gloria is walking along a path joining (-2,3)and (2,-2), while Suresh is walking along the path joining (0,5) and (4,0). Represent this situation graphically.**

**Soln:**

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 observed that the two lines did not intersect anywhere, hence they are parallel.

**Q 5. On comparing the ratios $a_1a_2$, $b_1b_2$ and $c_1c_2$ $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ 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 co-incide:**

**(i) 5x-4y+8=0 and 7x+6y-9=0**

**(ii) 9x+ 3y+12=0 and 18x +6y+24=0.**

**(iii) 6x-3y +10=0 and 2x-y+9 =0**

**(i) 5x-4y+8=0 and 7x+6y-9=0**

Here $a_1$= 5 , $b_1$=-4 ,$c_1$=8

=$a_2$= 7 , $b_2$=6 ,$c_2$=-9

We have,

$a_1a_2 = 57$ $\frac{a_1}{a_2} = \frac{5}{7}$ $b_1b_2 = -46$ $\frac{b_1}{b_2} = \frac{-4}{6}$ $c_1c_2 = -89$ $\frac{c_1}{c_2} = \frac{-8}{9}$ $a_1a_2 \neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Two lines are intersecting at a point

**(ii) 9x+ 3y+12=0 and 18x +6y+24=0.**

Here $a_1$= 9 , $b_1$=3 ,$c_1$=12

=$a_2$= 18 , $b_2$=6 ,$c_2$=24

We have,

$a_1a_2 = 918 = 12$ $\frac{a_1}{a_2} = \frac{9}{18} = \frac{1}{2}$ $b_1b_2 = 36 = 12$ $\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$ $c_1c_2 = 1224 = 12$ $\frac{c_1}{c_2} = \frac{12}{24} = \frac{1}{2}$ $a_1a_2 = b_1b_2 = c_1c_2$
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Both the lines co –inside with each other.

**(iii)6x-3y +10=0 and 2x-y+9 =0**

Here $a_1$= 6 , $b_1$=-3 ,$c_1$=10

=$a_2$= 2 , $b_2$=-1 ,$c_2$=9

We have,

$a_1a_2 = 62\ \frac{a_1}{a_2} = \frac{6}{2}$ $b_1b_2 = 31\ \frac{b_1}{b_2} = \frac{3}{1}$ $c_1c_2 = 109\ \frac{c_1}{c_2} = \frac{10}{9}$ $a_1a_2 = b_1b_2 \neq c_1c_2\ \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Therefore the lines are parallel.

**Q 6. Given the linear equation 2x+3y-8 =0 , write another linear equation in two variable such that the geometrical representation of the pair so formed are.**

**(i) Intersecting lines**

**(ii) Parallel lines**

**(iii) Coincident lines**

**Sol:**

We have, 2x+3y-8 =0

Let another equation of line is 4x+9y-4 =0

Here, Here $a_1$= 2 , $b_1$=3 ,$c_1$=-8

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

$a_1a_2 = 24 = 12\ \frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$ $b_1b_2 = 39 = 13\ \frac{b_1}{b_2} = \frac{3}{9} = \frac{1}{3}$ $c_1c_2 = -8-4 = 21\ \frac{c_1}{c_2} = \frac{-8}{-4} = \frac{2}{1}$ $a_1a_2 \neq b_1b_2$
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

2x+3y-8 =0 and 4x+9y-4 =0 intersect each other at a point.

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

We have, 2x+3y-8 =0

Let another equation of line is 4x+6y-4 =0

Here, Here $a_1$= 2 , $b_1$=3 ,$c_1$=-8

=$a_2$= 4, $b_2$=6 ,$c_2$=-4

$a_1a_2 = 24 = 12\ \frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$ $b_1b_2 = 36 = 12\ \frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$ $c_1c_2 = -8-4 = 21\ \frac{c_1}{c_2} = \frac{-8}{-4} = \frac{2}{1}$ $a_1a_2 = b_1b_2 \neq c_1c_2$

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

Therefore the lines are parallel to each other.

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

**Q 7. The cost of 2kg apples and 1kg of grapes was found to be Rs.160.After a month the cost of 4 kg of apples and 2 kg of grapes is Rs.300. represent this situation algebraically and geometrically.**

**Soln:**

Let the cost of a 1kg apple and 1 kg grape be Rs x and Rs. y respectively.

The given conditions can be algebraically represented as :

2x + y = 160 …… (i)

4x + 2y =300 …… (ii)

From equation (i)

Y = 160 – 2x

| | | | |
|---|---|---|---|
| **X** | **50** | **60** | **70** |
| **Y** | **60** | **40** | **20** |

From equation (ii):

Y= $300-4x2\ \frac{300-4x}{2}$

| | | | |
|---|---|---|---|
| **X** | **70** | **80** | **75** |
| **Y** | **10** | **-10** | **0** |

The graphical representation is as follows:

y
x
O
90
70
50
30
10
−10
−30
−50
−70
−90
−90 −70 −50 −30 −10 10 30 50 70 90
(50, 60)
(60, 40)
(70, 20)
(70, 10)
(75, 0)
(80, −10)
4x + 2y = 300

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.2

**Solve the following system of equations graphically:**

**Q1. x + y = 3; 2x + 5y = 12**

**Sol:**

2x + 5y = 12

We have,

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+5y= 12

= y = $12-2x5\ \frac{12-2x}{5}$

When x= 1, we have

= y = $12-2(1)5\ \frac{12-2(1)}{5}$ = 4

Thus we have the following table giving points on the line 2x+5y=12

| | | |
|---|---|---|
| **X** | **1** | **-4** |
| **Y** | **2** | **4** |

Graph of the equation x+y =3 and 2x+5y=12 is

Clearly two lines intersect at a point P (1,2)

Hence x= 1 and y = 2

**Q2: x- 2y=5, 2x+3y=10**

**Sol:**

We have, x- 2y=5 and 2x+3y=10

Now, x- 2y=5

= x = 5+2y

When y=0 then, x= 5

When y=-2 then, x=1

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

| | | |
|---|---|---|
| **X** | **5** | **-1** |
| **Y** | **0** | **-2** |

Now, 2x+3y=10 =x= 10−3y2 $\frac{10-3y}{2}$

When y=0, then x=5

When y=2 , then x= 2Thus, we have the following table giving points on the line 2x+3y =10

| | | |
|---|---|---|
| **X** | **5** | **2** |
| **Y** | **0** | **2** |

Graph of the equation x-2y =5 and 2x+3y =10

Clearly, two lines intersect at a point P (5,0)

Hence x= 5 and y = 0

**Q3: 3x+y+1=0, 2x-3y+8=0**

**Sol:**

We have, 3x+y+1=0 and 2x-3y+8=0

Now 3x+y+1=0

= y = -1-3x

When x=0 then, x= -1

When y=-1 then, x=2

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

| | | |
|---|---|---|
| **X** | **-1** | **0** |
| **Y** | **2** | **-1** |

Now, 2x-3y+8=0

=x= 3y−82 $\frac{3y-8}{2}$

When y=0, then x=-4

When y=2 , then x= 1Thus, we have the following table giving points on the line 2x+3y =10

| | | |
|---|---|---|
| **X** | **-4** | **-1** |
| **Y** | **0** | **-2** |

Graph of the equation 3x+y+1=0 and 2x-3y+8=0

Clearly two lines intersect at a point P (-1, 2)

Hence x= -1 and y = 2

**Q4: 2x+y-3 = 0, 2x-3y-7 =0**

**Sol:**

We have, 2x+y-3 = 0 and 2x-3y-7 =0

Now 2x+y-3 = 0

= y = 3-2x

When x=0 then, x= 3

When x=1 then, x=1

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

| | | |
|---|---|---|
| X | 0 | 1 |
| Y | 3 | 1 |

Now, 2x-3y-7 =0

=y= $2x-73\frac{2x-7}{3}$

When x=0, then y=1

When x=2, then y= -1Thus, we have the following table giving points on the line 2x+3y =10

| | | |
|---|---|---|
| X | 2 | 5 |
| Y | -1 | 1 |

Graph of the equation 2x+y-3 = 0 and 2x-3y-7 =0

Clearly two lines intersect at a point P (2,-1)

Hence x= 2 and y = -1

**Q5.**

**x+y=6**

**x-y=2**

**Soln:**

We have,  x+y=6 and x-y=2

Now x+y=6

= y = 6-x

When x=2 then, y= 4

When x=3 then, y=3

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

| | | |
|---|---|---|
| X | 2 | 3 |
| Y | 4 | 3 |

Now ,  x-y=2

=y= x-2

When x=0, then y=-2

When x=2 , then y= 0Thus, we have the following table giving points on the line 2x+3y =10

| | | |
|---|---|---|
| X | 0 | 2 |
| Y | 2 | 0 |

Graph of the equation x+y=6 and x-y=2

Clearly two lines intersect at a point P (4,2)

Hence x= 4 and y = 2

**Q6.**

**x-2y=6**

**3x-6y=0**

**Soln:**

We have,  x-2y=6 and 3x-6y=0

Now x-2y=6

= x= 6+2y

When y=-2 then, x=2

When y=-3 then, x=0

Thus, we have the following table giving points on the line x-2y=6

| | | |
|---|---|---|
| X | 2 | 0 |
| Y | -2 | -3 |

Now ,  3x-6y=0

=x=2y

When y=0, then y=0

When y=-1 , then x= 2

Thus, we have the following table giving points on the line 3x-6y=0

| | | |
|---|---|---|
| X | 0 | 2 |
| Y | 0 | 1 |

Graph of the equation x-2y=6 and 3x-6y=0

Clearly two lines are parallel to each other. So, the two lines have no common point.

Hence the given system has no solutions.

**Q7.**

**x+y=4**

**2x-3y=3**

**Soln:**

We have,  x+y=4 and 2x-3y=3

Now x+y=4

= x= 4-y

When y=0 then, x=4

When y=2 then, x=2

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

| | | |
|---|---|---|
| X | 4 | 2 |
| Y | 0 | 2 |

Now ,  2x-3y=3

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

When y=1, then x=3

When y=-1 , then x= 0

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

| | | |
|---|---|---|
| X | 3 | 0 |
| Y | 1 | -1 |

Graph of the equation x+y=4 and 2x-3y=3

Clearly two lines intersect at a point P(3,1)

Hence x= 3 and y = 1



**Q8.**

**2x+3y=4**

**x -y+3=0**

**Soln:**

So we have, 2x+3y=4 and x-y+3=0

Now 2x+3y=4

= x= 4−3y2 $\frac{4-3y}{2}$

When y=0 then, x=2

When y=2 then, x=-1

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

| | | |
|---|---|---|
| X | -1 | 2 |
| Y | 2 | 0 |

Now , x-y+3=0

=x=y-3

When y=3, then x=0

When y=4, then x= 1

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

| | | |
|---|---|---|
| X | 0 | 1 |
| Y | 3 | 4 |

Graph of the equation 2x+3y=4 and x-y+3=0

Clearly two lines intersect at (-1, 2)

Hence x=-1 and y=2 is the solution of the given system of equations.

**Q9.**

**2x-3y+13=0**

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

**Soln:**

So we have 2 x-3y + 13=0 and 3 x-2y + 12=0

Now, 2x-3y+13=0

= x= 3y−132 $\frac{3y-13}{2}$

When y=1 then, x=-5

When y=3 then, x=-2

Thus, we have the following table giving points on the line 2x-3y+13=0

| | | |
|---|---|---|
| X | -5 | -2 |
| Y | 1 | 3 |

Now, 3x-2y+12=0

=x= 2y−123 $\frac{2y-12}{3}$

When y=0, then x=-14

When y=3, then x= -2

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

| | | |
|---|---|---|
| X | -4 | -2 |
| Y | 0 | 3 |

Graph of the equation 2x-3y+14=0 and 3x-2y+12=0

Clearly two lines intersect at (-2, 3)

Hence x=-2 and y=3 is the solution of the given system of equations.

**Q10.**

**2x+3y+5=0**

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

**Soln:**

So we have 2x+3y+5=0 and 3x+2y- 12=0

Now, 2x+3y+5=0

= x= $-3y-52\ \frac{-3y-5}{2}$

When y=1 then, x=-4

When y=-1 then, x=-1

Thus, we have the following table giving points on the line 2x+3y+5=0



| | | |
|---|---|---|
| | | |

| | | |
|---|---|---|
| X | -4 | -1 |
| Y | 1 | -1 |

Now, 3x+2y-12=0

=x= 2y+123 $\frac{2y+12}{3}$

When y=0, then x=4

When y=3, then x= 6

Thus, we have the following table giving points on the line 3x-2y-12=0

| | | |
|---|---|---|
| X | 4 | 6 |
| Y | 0 | 3 |

Graph of the equation 2x+3y+5=0 and 3x+2y-12=0

Clearly two lines intersect at (2, 3)

Hence x=2 and y=3 is the solution of the given system of equations.

**Q11.**

**2x+3y=6**

**4x+6y=12**

**Soln:**

So we have 2x+3y=6 and 4x+6y=12

Now, 2x+3y=5

= x= 6−3y2 $\frac{6-3y}{2}$

When y=0 then, x=3

When y=2 then, x=0

Thus, we have the following table giving points on the line 2x+3y=6

| | | |
|---|---|---|
| X | 0 | 3 |
| Y | 2 | 0 |

Now, 4x+6y=12

=x= 12−6y4 $\frac{12-6y}{4}$

When y=0, then x=3

When y=2, then x= 0

Thus, we have the following table giving points on the line 4x+6y=12

| | | |
|---|---|---|
| X | 0 | 3 |
| Y | 2 | 0 |

Graph of the equation 2x+3y=6 and 4x+6y=12

Thus the graphs of the two equations are coincident.

Hence, the system of equations has infinitely many solutions.

**Q12.**

**x-2y=5**

**3x-6y=15**

**Soln:**

So we have x-2y=5 and 3x-6y=15

Now, x-2y=5

= x= 2y+5

When y=-1 then, x=3

When y=0 then, x=5

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

| | | |
|---|---|---|
| X | 3 | 5 |
| Y | 1 | 0 |

Now, 3x-6y=15

=x= 15+6y3 $\frac{15+6y}{3}$

When y=-2, then x=1

When y=-3, then x= -1

Thus, we have the following table giving points on the line 3x-6y=15

| | | |
|---|---|---|
| X | 1 | -1 |
| Y | -2 | -3 |

**Q13.**

**3x+y=8**

**6x+2y=16**

**Soln:**

So we have 3x+y=8 and 6x+2y=16

Now, x-2y=5

= y= 8-3x

When x=2 then, y=2

When x=3 then, y=-1

Thus, we have the following table giving points on the line 3x+y=8

| | | |
|---|---|---|
| X | 2 | 3 |
| Y | 2 | -1 |

Now, 6x+2y=16

=y= 16−6x2 $\frac{16-6x}{2}$

When x=1, then y=5

When x=3, then y= -1

Thus, we have the following table giving points on the line 6x+2y=16

| | | |
|---|---|---|
| X | 1 | 3 |

| | | |
|---|---|---|
| Y | 5 | -1 |

Graph of the given equation

Thus, the graphs of the two equations are coincident

Hence, the system of equations has infinitely many solutions.

**Q14.**

**X-2y+11=0**

**3x+6y+33=0**

**Soln:**

So we have x-2y+11=0 and 3x+6y+33=0

Now,  x-2y+11=0

= x= 2y-11

When y=5 then, x=-1

When y=4 then, x=-3

Thus, we have the following table giving points on the line x-2y+11=0

| | | |
|---|---|---|
| X | -1 | -3 |
| Y | 5 | 4 |

Now, 3x+6y+33=0

=x= 6y−333 $\frac{6y-33}{3}$

When y=6, then x=-1

When y=5, then x= -1

Thus, we have the following table giving points on the line 3x-6y+33=0

| | | |
|---|---|---|
| X | 1 | -1 |
| Y | 6 | 5 |

Thus, the graphs of the two equations are coincident

Hence, the system of equations has infinitely many solutions.

**Q15.**

**3x-5y=20**

**6x-10y=-40**

**Soln:**

So we have 3x-5y=20 and 6x-10y=-40

Now, 3x-5y=20

=x= 5y+203 $\frac{5y+20}{3}$

When y=-1 then, x=5

When y=-4 then, x=0

Thus, we have the following table giving points on the line 3x-5y=20

| | | |
|---|---|---|
| X | 5 | 0 |
| Y | -1 | -4 |

Now, 6x-10y=-40

=x= 6y−406 $\frac{6y-40}{6}$

When y=4, then x=0

When y=1, then x= -5

Thus, we have the following table giving points on the line 6x-10y=-40

| | | |
|---|---|---|
| X | 0 | -5 |
| Y | 4 | 1 |

Clearly, there is no common point between these two lines.

Hence, given systems of equations is in consistent.

**Q16.**

**x-2y = 6**

**3x-6y =0**

**Soln:**

So we have x-2y=6 and 3x-6y=0

Now,  x-2y=6

=x=6+2y

When y=0 then, x=6

When y=-2 then, x=2

Thus, we have the following table giving points on the line x-2y=6

| | | |
|---|---|---|
| X | 6 | 2 |
| Y | 0 | -2 |

Now,  3x-6y=0

=x=2y

When y=0, then x=0

When y=1, then x= 2

Thus, we have the following table giving points on the line 3x-6y=0

| | | |
|---|---|---|
| X | 0 | 2 |
| Y | 0 | 1 |

We find the lines represented by equations x-2y=6 and 3x-6y =0 are parallel. So, the two lines have no common point.

Hence, the given system of equations is in-consistent.



**Q17.**

**2y-x=9**

**6y-3x=21**

**Soln:**

So we have 2y-x=9 and 6y-3x=21

Now,  2y-x=9

=x=-9+2y

When y=3 then, x=-3

When y=4 then, x=-1

Thus, we have the following table giving points on the line 2y-x=9

| | | |
|---|---|---|
| X | -3 | -1 |
| Y | 3 | 4 |

Now,  6y-3x=21

=x=2y-7

When y=2, then x=-3

When y=3, then x= -1

Thus, we have the following table giving points on the line 6y-3x=21

| | | |
|---|---|---|
| X | -3 | -1 |
| Y | 2 | 3 |

Graph of the given equation

We find the lines represented by equations 2y-x=9 and 6y-3x =21 are parallel. So, the two lines have no common point.

Hence, the given system of equations is in-consistent.

**Q18. 3x-4y-1 =0**

**2x−83y+5=0**$2x - \frac{8}{3}y + 5 = 0$

**Soln:**

So we have 3x-4y-1=0 and 2x−83y+5=0$2x - \frac{8}{3}y + 5 = 0$

Now, 3x-4y-1=0

=x=4y+13 $\frac{4y+1}{3}$

When y=2 then, x=3

When y=-1 then, x=-1

Thus, we have the following table giving points on the line 3x-4y-1=0

| | | |
|---|---|---|
| X | -1 | 3 |
| Y | -1 | 2 |

Now, 2x−83y+5=0$2x - \frac{8}{3}y + 5 = 0$

=x=8y−156 $\frac{8y-15}{6}$

When y=0, then x=-2.5

When y=3, then x= 1.5

Thus, we have the following table giving points on the line 2x−83y+5=0$2x - \frac{8}{3}y + 5 = 0$

| | | |
|---|---|---|
| X | -2.5 | 1.5 |
| Y | 0 | 3 |

Graph of the given equation

We find the lines represented by equations 3x-4y-1=0 and 2x−83y+5=0$2x - \frac{8}{3}y + 5 = 0$

are parallel. So, the two lines have no common point.

Hence, the given system of equations is in-consistent.

**Q19. Determine graphically the vertices of the triangle, the equations of whose sides are given below,**

**(i) 2y-x=8, 5y-x=14 and y-2x = 1**

**(ii) y=x, y = 0 and 3x+3y = 10**

**Soln:**

2y-x=8

5y-x=14

y-2x=1

Now, 2y-x=8

x= 2y-8

When y=2 then x=-4

When y=4 then x= 0

Thus, we have the following table giving points on the line 2y-x=8

| | | |
|---|---|---|
| X | -4 | 0 |
| y | 2 | 4 |

Now, 5y-x=14

x=5y-14

When y=2, then x=1

When y=3 , then x= 1

Thus, we have the following table giving points on the line 5y-x=14

| | | |
|---|---|---|
| X | -4 | 1 |
| y | 2 | 3 |

We have,

y-2x=1

x= y−12 $\frac{y-1}{2}$

When y=-1, then x=1

When y=3 , then x= 1

Thus, we have the following table giving points on the line y-2x=1

| | | |
|---|---|---|
| X | -1 | 1 |
| y | 1 | 3 |

The graph of the given equation is:

From the graph of the lines represent by the given equation, we observe that the lines taken in pairs intersect at points A(-4,2) B(1,3) and C(2,5)

Hence the vertices of the triangle are A(-4,2) B(1,3) and C(2,5)

The given systems of equations are:

y= x

y=0

3x+3y=10

We have, y=x

When x=1, then y=1

When x=-2 , then y= -2

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

| | | |
|---|---|---|
| X | 1 | -2 |
| y | $73\frac{7}{3}$ | $43\frac{4}{3}$ |

The graph of the given equation is

From the graph of the lines represent by the given equation, we observe that the lines taken in pairs intersect at points A(0,0) B( 103 $\frac{10}{3}$,0) and C( 53 $\frac{5}{3}$ 53 $\frac{5}{3}$)

Hence the vertices of the triangle are A(0,0) B( 103 $\frac{10}{3}$,0) and C( 53 $\frac{5}{3}$ 53 $\frac{5}{3}$)

**Q20. Determine graphically whether the system of equations x-2y=2 , 4x-2y=5 is consistent or in-consistent**

**Soln:**

x-2y=2

4x-2y=5

Now, x-2y=2

=> x=2+2y

When y=0 then, x=2

When y=-1 then, x=0

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

| | | |
|---|---|---|
| X | 2 | 0 |
| Y | 0 | -1 |

Now, 4x-2y=5

=> x= 5+2y4 $\frac{5+2y}{4}$

When y=0, then x= $54\frac{5}{4}$

When y=1, then x= $74\frac{7}{4}$

Thus, we have the following table giving points on the line 4x-2y=5

| | | |
|---|---|---|
| X | $54\frac{5}{4}$ | $74\frac{7}{4}$ |
| Y | 0 | 1 |

Graph of the given equation

Clearly, the two lines intersect at (1,0)

Hence, the system of equation is consistent.

**Q21.Determine by drawing graphs, whether the following system of linear equation has a unique solution or not:**

**(i)2x-3y=6 and x+y=1**

**(ii)2y= 4x-6 and 2x= y+3**

**Soln:**

(i) 2x-3y=6 and x+y=1

Now, 2x-3y=6

x= 6+3y2 $\frac{6+3y}{2}$

When y=0 then, x=3

When y=-2 then, x=0

Thus, we have the following table giving points on the line 2x-3y=6

| | | |
|---|---|---|
| X | 3 | 0 |
| Y | 0 | -2 |

Now, x+y=1

=> x=1-y

When y=0, then x=1

When y=1, then x= 0

Thus, we have the following table giving points on the line x+y=1

| | | |
|---|---|---|
| X | 0 | 1 |
| Y | 1 | 0 |

Graph of the given equations:

(ii) 2y= 4x-6

2x= y+3

Now, 2y= 4x-6

x= 6+2y4 $\frac{6+2y}{4}$

When y=-1 then, x=1

When y=5 then, x=4

Thus, we have the following table giving points on the line 2y=4x-6

| | | |
|---|---|---|
| X | 1 | 4 |
| Y | -1 | 5 |

Now, 2x=y+3

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

When y=1, then x=2

When y=3, then x= 3

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

| | | |
|---|---|---|
| X | 2 | 3 |
| Y | 1 | 3 |

Graph of the given equations:

We find the graphs of the two equations are consistent.

Therefore, the system of equations has infinitely many solutions.

**Q22. Solve graphically each of the following system of linear equations. Also, find the coordinates of the points where the lines meet axis of y.**

**(i) 2x-5y+4=0 and 2x+y-8=0**

**(ii) 3x+2y=12 and 5x-2y=4**

**(ii) 2x+y-11=0 and x-y-1=0**

**(iv) X+2y-7=0 and 2x-y-4=0**

**(v) 3x+y-5=0 and 2x-y-5=0**

**(vi) 2x-y-5=0 and x-y-3=0**

**Soln:**

(i) 2x-5y+4=0 and 2x+y-8=0

Now, 2x-5y+4=0

x= 5y−42 $\frac{5y-4}{2}$

When y=2 then, x=3

When y=4 then, x=8

Thus, we have the following table giving points on the line2x-5y+4=0

| | | |
|---|---|---|
| X | 3 | 8 |
| Y | 2 | 4 |

Now, 2x+y-8=0

=x= −y+82 $\frac{-y+8}{2}$

When y=4, then x=2

When y=2, then x= 3

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

| | | |
|---|---|---|
| X | 3 | 8 |
| Y | 2 | 4 |

Clearly, two intersect at P(3,2)

Hence, x=3 and y=2 is the solution of the given system of equations.

We also observe that the lines represented by 2x-5y+4=0 and 2x+y-8=0 meet y-axis at A(0, $45\frac{4}{5}$) and B(0,8) respectively.

(ii) 3x+2y=12 and 5x-2y=4

Now, 3x+2y=12

x= $12-2y3\frac{12-2y}{3}$

When y=3 then, x=2

When y=-3 then, x=6

Thus, we have the following table giving points on the line 3x+2y=12

| | | |
|---|---|---|
| X | 2 | 6 |
| Y | 3 | -3 |

Now, 5x-2y=4

x= $4+2y5\frac{4+2y}{5}$

When y=3, then x=2

When y=-7, then x= -2

Thus, we have the following table giving points on the line 5x-2y=4

| | | |
|---|---|---|
| X | 2 | -2 |
| Y | 3 | -7 |

Clearly, two intersect at P(2,3)

Hence, x=2 and y=3 is the solution of the given system of equations.

We also observe that the lines represented by 3x+2y=12 and 5x-2y=4 meet y-axis at A(0, 6) and B(0,-2) respectively.

(iii) 2x+y-11=0 and x-y-1=0

Now, 2x+y=11

y= 11-2x

When y=4 then, x=3

When y=-5 then, x=1

Thus, we have the following table giving points on the line 2x+y=11

| | | |
|---|---|---|
| X | 4 | 5 |
| Y | 3 | 1 |

Now, x-y=1

=y=x-1

When x=2, then y=1

When y=3, then y= 2

Thus, we have the following table giving points on the line x-y=1

| | | |
|---|---|---|
| X | 2 | 3 |
| Y | 1 | 2 |

Clearly, two intersect at P (4, 3)

Hence, x=4 and y=3 is the solution of the given system of equations.

We also observe that the lines represented by 2x+y=11 and x-y=1 meet y-axis at A(0, 11) and B(0,-1) respectively.

(iv) x+2y-7=0

2x-y-4=0

Soln:

Now, 2x-y-4=0

X=7-2y

When y=1 then, x=5

When y=-2 then, x=3

Thus, we have the following table giving points on the line 2x+y=11

| | | |
|---|---|---|
| X | 5 | 3 |
| Y | 1 | 2 |

Now, 2x-y-4=0

=y=2x-4

When x=2, then y=0

When y=0, then y= -4

Thus, we have the following table giving points on the line 2x-y-4=0

| | | |
|---|---|---|
| X | 2 | 0 |
| Y | 0 | -4 |

Clearly, two intersect at P (3,2)

Hence, x=3 and y=2 is the solution of the given system of equations.

We also observe that the lines meet y-axis at A(0, 3.5) and B(0,-4) respectively.

(v)3x+y-5=0 and 2x-y-5=0

Solution

Now, 3x+y-5=0

y=5-3x

When x=1 then, y=2

When x=2 then, y=-1

Thus, we have the following table giving points on the line 3x+y-5=0

| | | |
|---|---|---|
| X | 1 | 2 |
| Y | 2 | -1 |

Now, 2x-y-5=0

=y=2x-5

When x=0, then y=-5

When x=2, then y= -1

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

| | | |
|---|---|---|
| X | 0 | 2 |
| | | |

| | | |
|---|---|---|
| Y | -5 | -1 |

Clearly, two intersect at P (2,-1)

Hence, x=2 and y=-1 is the solution of the given system of equations.

We also observe that the lines meet y-axis at A(0,5)  and B(0,-5) respectively.

(vi)2x-y-5=0 and x-y-3=0

Now, 2x-y-5=0

y=2x-5

When x=1 then, y=-3

When x=2 then, y=-1

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

| | | |
|---|---|---|
| X | 1 | 2 |
| Y | -3 | -1 |

Now,  x-y-3=0

=y=x-3

When x=3, then y=0

When x=4, then y= -1

Thus, we have the following table giving points on the line x-y-3=0

| | | |
|---|---|---|
| X | 3 | 0 |
| | | |

| | | |
|---|---|---|
| Y | 4 | -1 |

Clearly, two intersect at P(2,-1)

Hence, x=2 and y=-1 is the solution of the given system of equations.

We also observe that the lines meet y-axis at A(0,5) and B(0,-3) respectively.

**Q23. Solve the following system of linear equations graphically and shade the region between the two lines and x- axis.**

**(i) 2x+3y=12 and x-y=1**

**(ii) 3x+2y-4=0 and 2x-3y-7=0**

**(iii) 3x+2y-11=0 and 2x-3y+10=0**

**Soln:**

(i) 2x+3y=12 and x-y=1

The system of the given equation is y=x, 3y=x and y+x=8

Now, 2x+3y=12

x= 12−3y2 $\frac{12-3y}{2}$

When y=2, then x=3

When y=4, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 0 | 3 |

| | | |
|---|---|---|
| Y | 4 | 2 |

We have,

x-y=1

x=y+1

When y=0, then x=1

When y=1, then x=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 1 | 2 |
| Y | 0 | 1 |

Graph of the given system is:

Clearly the two lines intersect at P (3, 2)

Hence x=3 and y=2 is the solution of the given system of equations.

(ii) 3x+2y-4=0 and 2x-3y-7=0

The system of the given equation is 3x+2y-4=0 and 2x-3y-7=0

Now,3x+2y-4=0

x= $4-2y3\ \frac{4-2y}{3}$

When y=5, then x=-2

When y=8, then x=-4

Thus, we have the following table:

| | | |
|---|---|---|
| X | -2 | -4 |
| Y | 5 | 8 |

We have,

2x-3y-7=0

x= 3y+72 $\frac{3y+7}{2}$

When y=1, then x=5

When y=-1, then x=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 5 | 2 |
| Y | 1 | -1 |

Graph of the given system is:

Clearly the two lines intersect at P(2,-1)

Hence x=2 and y=-1 is the solution of the given system of equations.

(iii) 3x+2y-11=0 and 2x-3y+10=0

Now,3x+2y-11=0

x= 11−2y3 $\frac{11-2y}{3}$

When y=1, then x=-3

When y=4, then x=1

Thus, we have the following table:

| | | |
|---|---|---|
| X | 3 | 1 |
| Y | 1 | 4 |

We have,

2x-3y+10=0

x= 3y−102 $\frac{3y-10}{2}$

When y=0, then x=-5

When y=2, then x=-2

Thus, we have the following table:

| | | |
|---|---|---|
| X | -5 | -2 |
| Y | 0 | 2 |

Graph of the given system is:

Clearly the two lines intersect at P(1,4)

Hence x=1 and y=4 is the solution of the given system of equations.

**Q24. Draw the graphs of the following equations on the same graph paper:**

**2x+3y= 12 and x-y=1**

**Soln:**



Now,2x+3y=12

x= 12−3y2 $\frac{12-3y}{2}$

When y=0, then x=6

When y=2, then x=3

Thus, we have the following table:

| | | |
|---|---|---|
| X | 6 | 3 |
| Y | 0 | 2 |

We have,

x-y=1

x=1+y

When y=0, then x=1

When y=-1, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 1 | 0 |
| Y | 0 | -1 |

Graph of the given system is:

Clearly the two lines intersect at A(3,2)

We also observe that the lines meet y-axis B(0,-1) and C(0,4)

Hence the vertices of the required triangle are A(3,2) , B(0,-1) and C(0,4).

**Q25. Draw the graphs of x-y+1=0 and 3x+2y-12=0. Determine the coordinates of the vertices of the triangle formed by these lines and x-axis and shade the triangular area. Calculate the area bounded by these lines and x- axis.**

**Soln:**

The given system of equations is:

x-y+1=0 and 3x+2y-12 =0

Now, x-y+1=0

x= y-1

When y=3, then x=2

When y=-1, then x=-2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 2 | -2 |
| Y | 3 | -1 |

We have,

3x+2y-12=0

x= 12−2y3 $\frac{12-2y}{3}$

When y=6, then x=0

When y=3, then x=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 0 | 2 |
| Y | 6 | 3 |

Graph of the given system is:

Clearly, the two lines intersect at A(2,3)

We also observe that the lines meet x-axis B(-1,0) and C(4,0)

Thus x=2 and y=3 is the solution of the given system of equations.

AD is drawn perpendicular A on x-axis. Clearly we have,

AD=y-coordinate point A (2,3)

AD= 3 and BC=4-(-1) =4+1 = 5

**Q26. Solve graphically the system of linear equation:**

**4x-3y+4=0 and 4x+3y-20=0**

**Find the area bounded by these lines and x-axis.**

**Soln:**

The given system of equation is 4x-3y+4=0 and 4x+3y-20=0

Now, 4x-3y+4=0

x= $3y-44\ \frac{3y-4}{4}$

When y=0, then x=-1

When y=4, then x=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 2 | -1 |
| Y | 4 | 0 |



We have,

4x+3y-2=0

x= 20−3y4 $\frac{20-3y}{4}$

When y=0, then x=5

When y=4, then x=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 5 | 2 |
| Y | | 4 |

Graph of the given system is:

Clearly, the two lines intersect at A(2,4)

We also observe that the lines meet x-axis B(-1,0) and C(5,0)

Thus x=2 and y=4 is the solution of the given system of equations.

AD is drawn perpendicular A on x-axis. Clearly we have,

AD=y-coordinate point A(2,4)

AD= 3 and BC=5-(-1) =4+1 = 6

Area of the shaded region = 12×base×altitude$\frac{1}{2} \times \text{base} \times \text{altitude}$

= 12×6×4$\frac{1}{2} \times 6 \times 4$

= 12 sq. units

**Q27. Solve the following system of linear equations graphically:**

**3x+y-11=0 and x-y-1=0**

**Shade the region bounded by these lines and y- axis. Also find the area of the region bounded by these lines and y-axis.**

**Soln:**

The given system of equations is 3x+y-11=0 and x-y-1=0

Now, 3x+y-11=0

y=11-3x

When x=0, then y=11

When x=3, then y=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 0 | 3 |
| Y | 11 | 2 |

We have

x-y-1=0

y=x-1

When x=0, then y=-1

When x=3, then y=2

Thus, we have the following table:

| | | |
|---|---|---|
| X | 0 | 3 |
| Y | -1 | 2 |

Graph of the given system is:

Clearly, the two lines intersect at A (3,2)

We also observe that the lines meet y-axis B(0,11) and C(0,-1)

Thus x=3 and y=2 is the solution of the given system of equations.

AD is drawn perpendicular A on x-axis. Clearly we have,

AD=y-coordinate point A(2,4)

AD= 3 and BC=11-(-1) =11+1 = 12

Area of the shaded region = 12×base×altitude$\frac{1}{2} \times \text{base} \times \text{altitude}$

= 12×12×3$\frac{1}{2} \times 12 \times 3$

= 18 sq. units

**Q29. Draw the graph of the following equation:**

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

**2x+3y-18=0**

**y-2=0**

**Soln:**

Now,2x-3y+6=0

x= 3y−62 $\frac{3y-6}{2}$

When y=0, then x=-3

When y=2, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | -3 | 0 |
| Y | 0 | 2 |

We have

2x+3y-18=0

X= 18−3y2 $\frac{18-3y}{2}$

When y=2, then x=6

When y=6, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 6 | 0 |
| Y | 2 | 6 |

We have

y-2=0

y=-2

Graph of the given system of equations:

From the graph of three equations, we find that the three lines taken in pairs intersect each other at points A(3,4) , B(0,2) and C(6,2)

Hence, the vertices of the required triangle are (3,4) , (0,2) and (6,2)

From the graph, we have

AB=4-2=2

BC=6-0=+

Area of the shaded region = 12 ×base×altitude$\frac{1}{2} \times \text{base} \times \text{altitude}$

= 12 ×6×2$\frac{1}{2} \times 6 \times 2$

= 6 sq. units

**Q30. Solve the following system of equations graphically:**

**2x-3y+6=0 and 2x+3y-18=0**

**Also, find the area of the region bounded by these lines and y-axis.**

**Soln:**

The given system of equations:

2x-3y+6=0 and 2x+3y-18=0

Now,2x-3y+6=0

y= 2x+63 $\frac{2x+6}{3}$

When x=0, then y=2

When x=-3, then y=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 0 | -3 |
| Y | 2 | 6 |

We have

2x+3y-18=0

X= 18−3y2 $\frac{18-3y}{2}$

When y=2, then x=6

When y=6, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 6 | 0 |
| Y | 2 | 6 |

Graph of the given system of equations:

Clearly, the two lines intersect at A(3,4) .Hence x=3 and y=4 is the solution of the given system of equations.

From the graph, we have

AD=x-coordinate point A(3,4) =3

BC=6-2 = 4

Area of the shaded region = 12×base×altitude$\frac{1}{2} \times \text{base} \times \text{altitude}$

= 12×4×3$\frac{1}{2} \times 4 \times 3$

= 6 sq. units

**Q31. Solve the following system of linear equation graphically;**

**4x-5y-20=0 and 3x+5y-15=0**

**Soln:**

Now,4x-5y-20=0

x= 5y+204 $\frac{5y+20}{4}$

When y=0, then x=5

When y=-4, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 5 | 0 |
| Y | 0 | -4 |

We have

3x+5y-15=0

x= 5y+205 $\frac{5y+20}{5}$

When y=0, then x=5

When y=-4, then x=0

Thus, we have the following table:

| | | |
|---|---|---|
| X | 5 | 0 |
| Y | 0 | 3 |

Graph of the given system of equations:

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

The lines meet y-axis at B(0,-4) and C(0,3) respectively.

The vertices of the triangle are (5,0) , (0,-4) and (0,3)

**Q32: Draw the graphs of the equations 5x-y=5 and 3x-y=3. Determine the coordinates of the vertices of the triangle forms by these lines and y-axis. Calculate the area of the triangle forms.**

**Soln:**

5x-y=5

=> y= 5x-5

Three solutions of this equation can be written as follows:

| | | | |
|---|---|---|---|
| X | 0 | 1 | 2 |
| | | | |

| | | | |
|---|---|---|---|
| y | -5 | 0 | 5 |

3x-y=3

Y=3x-3

| | | | |
|---|---|---|---|
| X | 0 | 1 | 2 |
| y | -3 | 0 | 3 |

The graphical representation of the two lines will be as follows:

It can observed that the required triangle is ABC

The coordinates of its vertices A (1,0) B(0,-3) and C(0,-5)

**Q33. Form the pair of linear equation in the following problems, and find their solution graphically:**

**(i) 10 students of class X took part in mathematics quiz. If the number of girls 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 costs Rs.50, whereas 7 pencils and 5 pens together cost Rs.46.**

**Find the cost of one pencil and one pen.**

**(iii) Champa went to a sale to purchase some pants and skirts. When her friends asked her how many of each kind she had bought, she answered, “the number of skirts is two less than twice the number of pants purchase”. 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 skirts champa bought.**

**Soln:**



(i) Let the number of girls and boys in the class be x and y respectively.

According to the Q.,

x+y=10 and x-y=4 are the given equations

Now, x+y=10

x=10-y

Three solutions of this equation can be written as follows:

| | | | |
|---|---|---|---|
| X | 4 | 5 | 6 |
| Y | 6 | 5 | 4 |

x-y=4

x=4+y

Three solutions of this equation can be written as follows:

| | | | |
|---|---|---|---|
| X | 5 | 4 | 3 |
| Y | 1 | 0 | -1 |

The graphical representation is as follows:

From the graph , it can be observed that the two lines intersect each other at point (7,3).

So x=7 and y =3

The number of girls and boys in the class are 7 and 3 respectively.

(ii) Let the cost of one pencil and one pen Rs. x and Rs. y respectively.

According to the Q., we have,

5x+7y=50

7x+5y=50

Now, 5x+7y=50

x= 50−7y5 $\frac{50-7y}{5}$

Three solutions of this equation can be written as follows:

| | | | |
|---|---|---|---|
| X | 3 | 10 | -4 |
| y | 5 | 0 | 10 |

7x+5y=46

x=46−5y7 $\frac{46-5y}{7}$

Three solutions of this equation can be written as follows:

| | | | |
|---|---|---|---|
| X | 8 | 3 | -2 |
| y | -2 | 5 | 12 |

The graphical representation is as follows:

From the graph it can be observed that the two lines intersect each other at the point (3,5)

So x= 3 and y =5

Therefore the cost of the pencil and the pen are 3 and 5 respectively.

(iii) Let us denote the number of pants by x and the number of skirts be y . Then the equations formed are :

y=2x?2 …… (i)

y=4x?2 ……..(ii)

let us draw the graphs of the equations (i) and (ii) by finding the two solutions for each of the equations.

| | | |
|---|---|---|
| X | 2 | 0 |
| y-2x?2 | 2 | -2 |

| | | |
|---|---|---|
| X | 0 | 1 |
| y-4x?2 | -4 | 0 |

The lines intersect at point (1,0)

The value of x=1 and y =0

**Q34. Solve the following system of equations graphically:**

**Shade the region between the lines and y-axis**

**(i) 3x-4y=7 and 5x+2y=3**

**(ii) 4x-y=4 and 3x+2y=14**

**Soln:**

(i) 3x-4y=7 and 5x+2y=3

The given system of linear equation is 3x-4y=7 and 5x+2y=3

Now, 3x-4y=7

y= 3x−74 $\frac{3x-7}{4}$

When x=1 then, y=-1

When x=-3 then y=-4

Thus, we have the following table

| | | |
|---|---|---|
| X | 1 | -3 |
| Y | -1 | -4 |

Now, 5x+2y=3

y= 3−5x2 $\frac{3-5x}{2}$

When x=1 then, y=-1

When x=3 then y=-6

Thus, we have the following table

| | | |
|---|---|---|
| X | 1 | 3 |
| Y | -1 | -6 |

Graph of the given system of equations are :

Clearly the two lines intersect at A(1,-1)

Hence x=1 and y=-1 is the solution of the given system of equations.

(ii) 4x-y=4 and 3x+2y=14

The given system of linear equation is 4x-y=4 and 3x+2y=14

Now, 4x-y=4

y= 4x-4

When x=0 then, y=-4

When x=-1 then y=-8

Thus, we have the following table

| | | |
|---|---|---|
| X | 0 | -1 |
| y | -4 | -8 |

Now, 3x+2y=14

y= $14-3x2\frac{14-3x}{2}$

When x=0then, y=7

When x=4 then y=1

Thus, we have the following table

| | | |
|---|---|---|
| X | 0 | 4 |
| Y | 7 | 1 |

Graph of the given system of equations are:

Clearly the two lines intersect at A (2, 4)

Hence x=2 and y=4 is the solution of the given system of equations.

**Q35. Represent the following pair of equations graphically and write the coordinates of points where the lines intersects y-axis**

**x+3y=6 and 2x-3y=12**

**Soln:**

The given systems of equations are:

x+3y=6 and 2x-3y=12

Now, x+3y=6

y= $6-x3\frac{6-x}{3}$

When x=0 then, y=2

When x=3 then y=1

Thus, we have the following table

| | | |
|---|---|---|
| X | 0 | 3 |
| Y | 2 | 1 |

Now, 2x-3y=12

y= $2x-123\frac{2x-12}{3}$

When x=0 then, y=-4

When x=6 then y=0

Thus, we have the following table

| | | |
|---|---|---|
| X | 0 | 6 |
| Y | -4 | 0 |

Graph of the given system of equations are :

Clearly the two lines meet y-axis at B(0,2) and C(0,-4) respectively.

Hence the required coordinates are (0,2) and (0,-4)

**Q36. Given the linear equation 2x+3y-8=0 , write another in two variables in two variables such that the geometrical representation of the pair so formed is (i)intersecting lines (ii) parallel lines (iii) coincident lines**

**Soln:**

(i) For the two lines $a_1x+b_1x+c_1=0$ and $a_2x+b_2x+c_2=0$ to be intersecting. We must have

$a_1a_2 \neq b_1b_2 \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

So the other linear equation can be 5x+6y-16=0

$a_1a_2 \frac{a_1}{a_2} = 25 \frac{2}{5}$

$b_1b_2 \frac{b_1}{b_2} = 36 \frac{3}{6} = 12 \frac{1}{2}$

$c_1c_2 \frac{c_1}{c_2} = -8-16 \frac{-8}{-16} = 12 \frac{1}{2}$

(ii) For the two lines $a_1x+b_1x+c_1=0$ and $a_2x+b_2x+c_2=0$ to be parallel we must have

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

So, the other linear equation can be 6x+9y+24=0

$a_1a_2 \frac{a_1}{a_2} = 26 \frac{2}{6} = 13 \frac{1}{3}$

$b_1b_2 \frac{b_1}{b_2} = 39 \frac{3}{9} = 13 \frac{1}{3}$

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.3

**Solve the following system of equations:**

**Question 1: 11x + 15y + 23 = 0 and 7x – 2y – 20 = 0**

**Soln:**

The given system of equation is

11x+15y+23=0 ……. (i)

7x-2y-20=0 ……..(ii)

From (ii)

2y=7x-20

y= 7x−202 $\frac{7x-20}{2}$ …… (iii)

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

= 11x+15(7x−202)+23=0$11x + 15(\frac{7x-20}{2}) + 23 = 0$

= 11x+(105x−3002)+23=0$11x + (\frac{105x-300}{2}) + 23 = 0$

= (22+105x−300+462)=0$(\frac{22+105x-300+46}{2}) = 0$

= 127x = 254 = x=2

Putting the value of x in the equation (iii)

= y= 7(2)−202 $\frac{7(2)-20}{2}$

y= -3

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

**Question 2: 3x – 7y + 10 = 0, y – 2x – 3 = 0**

**Soln:**

The given system of equation is

3x-7y+10=0 ……. (i)

y-2x-3=0 ……..(ii)

From (ii)

y-2x-3=0

y= 2x+3 …… (iii)

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

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

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

= -11x=11

= x=-1

Putting the value of x in the equation (iii)

= y= 2(-1)+3

y= 1

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

**Question 3: 0.4x + 0.3y = 1.7, 0.7x – 0.2y = 0.8**

**Soln:**

The given system of equation is

0.4x+0.3y=1.7

0.7x-0.2y=0.8

Multiplying both sides by 10

4x+3y=17 …….. (i)

7x-2y=8 …… (ii)

From (ii)

7x-2y=8

x= 8+2y7 =0 $\frac{8+2y}{7} = 0$ …… (iii)

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

= 4( 8+2y7 =0 $\frac{8+2y}{7} = 0$ )+3y=17

= 32+29y=119

= 29y=87

= y=3

Putting the value of y in the equation (iii)

= x= 8+2(3)7 =0 $\frac{8+2(3)}{7} = 0$

=x= 147 =0 $\frac{14}{7} = 0$

= x= 2

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

**Question 4**

**x2 +y=0.8** $\frac{x}{2} + y = 0.8$

**7x+y2 =10** $\frac{7}{x+\frac{y}{2}} = 10$

**Soln:**

The given system of equation is

x2 +y=0.8 $\frac{x}{2} + y = 0.8$ 7x+y2 =10 $\frac{7}{x+\frac{y}{2}} = 10$

Therefore x+2y=1.6

142x+y =10 $\frac{14}{2x+y} = 10$

x+2y=1.6

7=10x+5y

Multiplying both sides by 10

10x+20y=16 ……. (i)

10x+5y=7 …… (ii)

Subtracting two equations we get,

15y=9

y= 35 $\frac{3}{5}$

x=1.6−2( 35 )$1.6 - 2(\frac{3}{5})$

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

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

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

**Question 5**

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

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

**Soln:**

The given system of equation is

7(y+3)-2(x+3) = 14……. (i)

4(y-2)+3(x-3) = 2……..(ii)

From (i)

7y+21-2x-4=14

7y=14+4-21+2x

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

From (ii)

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

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

= 4y+3x-19=0 …….(iii)

Substituting the value of y in equation (iii)

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

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

= 29x=145

= x=5

Putting the value of x in the above equation

= y = 1

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

**Question 6**

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

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

**Soln:**

The given system of equation is

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

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

From (i)

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

=x= 105−7y3 $\frac{105-7y}{3}$

From (ii)

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

=9x-2y=108 ……(iii)

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

= 9( 105−7y3 $\frac{105-7y}{3}$ )-2y=108

= 945-63y-6y=324

=945-324=69y

=69y=621

=y=9

Putting the value of y in the above equation

= x= 105−7(9)3 $\frac{105-7(9)}{3}$

y= 14

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

**Question 7**

x3 + y4 =11 $\frac{x}{3} + \frac{y}{4} = 11$

5x6 − y3 =−7 $\frac{5x}{6} - \frac{y}{3} = -7$

**Soln:**

The given system of equation is

x3 + y4 =11 $\frac{x}{3} + \frac{y}{4} = 11$ ……. (i)

5x6 − y3 =−7 $\frac{5x}{6} - \frac{y}{3} = -7$ …….(ii)

From (i)

4x+3y12 =11 $\frac{4x+3y}{12} = 11$

=4x+3y=132……(iii)

From (ii)

5x+2y6 =−7 $\frac{5x+2y}{6} = -7$

=5x-2y=-42 ……(iv)

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

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

= 8x+6y=264 …….(v)

= 15x-6y=-126 ……(vi)

Adding equation (v) and (vi)

8x+15x=264-126

=23x=138

x=6

Putting the value of x in the equation (iii)

= 24+3y=132

=3y=108

y= 36

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

**Question 8**

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

**6x −4y=−5** $\frac{6}{x} - 4y = -5$

**Soln:**

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

The new equation becomes

4u+3y=8……(i)

6u-4y=-5……(ii)

From (i)

4u=8-3y

=u= 8−3y4 =u $\frac{8-3y}{4} = u$

From (ii)

=6( 8−3y4 =u $\frac{8-3y}{4} = u$ )-4y=-5

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

= 24−9y−8y2 =−5 $\frac{24-9y-8y}{2} = -5$

= 24-17y=-10

= -17y=-34

= y=2

Putting y=2 in u = 8−3y4 =u $\frac{8-3y}{4} = u$ we get ,

=u= 8−3(2)4 $\frac{8-3(2)}{4}$

=u= 8−64 $\frac{8-6}{4}$



=u= 24 $\frac{2}{4}$

=x=u=2

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

**Question 9**

**x+ y2 =4**$x + \frac{y}{2} = 4$

**2y+ x3 =5**$2y + \frac{x}{3} = 5$

**Soln:**

The given system of equation is:

**x+** y2 **=4**$x + \frac{y}{2} = 4$ …….(i)

2y+ x3 **=5**$2y + \frac{x}{3} = 5$ …….(ii)

From (i) we get,

2x+y2 **=4**$\frac{2x+y}{2} = 4$

= 2x+y=8

=y=8-2x

From (ii) we get,

x+6y=15 ……(iii)

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

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

= x+48-12x=15

= -11x=15-48

= -11x=-33

=x=3

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

y=8-(2*3)

=y=8-6=2

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

Question 10

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

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

Soln:

The given system of equation is

x+2y= $32\frac{3}{2}$ …….(i)

2x+y= $32\frac{3}{2}$……(ii)

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

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

x+2y= $32\frac{3}{2}$ …….(iii)

4x+2y=3 …….(iv)

Subtracting equation (iii) from (iv)

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

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

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

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

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

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

= 2+2y=3

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

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

**Question 11**

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

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

**Soln:**

$\sqrt{2}x+\sqrt{3}y=0\sqrt{2}x+\sqrt{3}y=0$ ……..(i)

$\sqrt{3}x-\sqrt{8}y=0\sqrt{3}x-\sqrt{8}y=0$ ……..(ii)

From equation (i)

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

Substituting this value in equation (ii) we obtain

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

=y=0

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

=x=0

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

Question 12

$3x-y+711+2=103x-\frac{y+7}{11}+2=10$ $2y-x+117=102y-\frac{x+11}{7}=10$

Soln:

The given system of equation is:

$3x-y+711+2=103x-\frac{y+7}{11}+2=10$ ……..(i)

$2y-x+117=102y-\frac{x+11}{7}=10$ ……..(ii)

From equation (i)

$33x-y-7+2211=10\frac{33x-y-7+22}{11}=10$

=33x -y+15=110

=33x+15-110=y

= y= 33x-95

From equation (ii)

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

= 14y+x+11=70

= 14y+x=70-11

= 14y+x=59 ……..(iii)

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

14(33x-95)+x=59

= 462x-1330+x=59

= 463x=1389

= x=3

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

=y=33(3)-95

= 99-95 = 4

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

Question 13

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

Soln:

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

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

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

2x-3u=9 ……..(iii)

3x+7u=2……..(iv)

From (iii)

2x=9+3u

=x= 9+3u2 $\frac{9+3u}{2}$

Substituting the value x= 9+3u2 $\frac{9+3u}{2}$ in equation (iv) we get,

3( 9+3u2 $\frac{9+3u}{2}$ )+7u=2

= 27+9u+14u2 =2 $\frac{27+9u+14u}{2} = 2$

=27+23u=4

= u= -1

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

Putting u=-1 in =x= 9+3u2 $\frac{9+3u}{2}$ we get,

=x= 9+3(−1)2 $\frac{9+3(-1)}{2}$

= x=3

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

Question 14

0.5x+0.7y=0.74

0.3x+0.5y=0.5

Soln:

The given system of equation is

0.5x+0.7y=0.74……(i)

0.3x-0.5y=0.5 ……..(ii)

Multiplying both sides by 100

50x+70y=74 …….. (iii)

30x+50y=50 …… (iv)

From (iii)

50x=74-70y

x= 74−70y50 =0 $\frac{74-70y}{50} = 0$ …… (iii)

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

= 30( 74−70y50 =0 $\frac{74-70y}{50} = 0$ )+50y=50

= 222-210y+250y=250

= 40y=28

= y=0.7

Putting the value of y in the equation (iii)

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

=x= 2550 =0 $\frac{25}{50} = 0$

= x= 0.5

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

Question 15

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

Soln:

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

12x − 13y =5 $\frac{1}{2x} - \frac{1}{3y} = 5$ ……. (ii)

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

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

Solving equation (i) and (iii)

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

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

Adding we get,

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

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

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

Using equation (i)

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

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

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

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

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

Question 16

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

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

Soln:

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

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

u2 + v3 =2 $\frac{u}{2} + \frac{v}{3} = 2$ 3u+2v6 =2 $\frac{3u+2v}{6} = 2$

3u+2v=12 …….(i)

And, u3 + v2 = frac136 $\frac{u}{3} + \frac{v}{2} =$ frac136

=v=3

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

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

Question 17

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

Soln:

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

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

15x+2y=17 …….(i)

x+y= 365 $\frac{36}{5}$…….(ii)

From equation (i) we get ,

2y=17-15x

=y= 17−15x2 $\frac{17-15x}{2}$

Substituting y= 17−15x2 $\frac{17-15x}{2}$ in equation (ii) we get,

= x+ 17−15x2 $\frac{17-15x}{2}$ = 365 $\frac{36}{5}$

= −13x+17x2 $\frac{-13x+17x}{2}$ = 365 $\frac{36}{5}$

= 5(-13x+17)=72

= -65x=-13

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

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

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

= y=7

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

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

Question 18

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

Soln:

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

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

3u-v=-9…….(i)

2u+3v=5 …….(ii)

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

9u-3v=-27 ……. (iii)

2u+3v=5 …… (iv)



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

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

= u=-2

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

2(-2)+3v=5

= 3v=9

= v=3

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

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

Question 19

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

Soln:

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

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

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

2y+3x=9…….(iii)

4y+9x=21 …….(iv)

From (iii) we get ,

3x= 9-2y

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

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

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

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

= -2y=21-27

= y=3

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

=x= 9−2(3)3 $\frac{9-2(3)}{3}$

=x=1

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

Question 20

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

Soln:

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

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

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

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

= 6u+5v=360 …….(i)

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

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

= 7u-9v=168 …….(ii)

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

54u+35u=3240+840

89u=4080

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

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

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

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

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

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

= v= 75605∗89 $\frac{7560}{5*89}$

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

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

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

.

Question 27

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

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

Let 1(x−y) =v $\frac{1}{(x-y)} = v$

Then, the given system of equation becomes,

6u=7v+3

6u-7v=3…….. (i)

And u2 = v3 $\frac{u}{2} = \frac{v}{3}$

3u=2v

3u-2v=0 …… (ii)

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

6u-7v=3

6u-4v=0

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

3u-2(-1)=0

3u+2=0

3u=-2

=u= −23 $\frac{-2}{3}$

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

x+y= −32 $\frac{-3}{2}$ …….(v)

and v=-1

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

x-y=-1……(vi)

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

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

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

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

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

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

Question 28

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

Soln:

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

5xy= 6(x+y)

=5xy= 6x+6y …….(i)

And

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

xy=6(y-x)

=xy= 6y-6x ……(ii)

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

6xy= 6y+6y

6xy=12y

x= 2

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

10y=12+6y

10-6y=12

4y=12

y=3

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

Question 29

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

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

Let 1x−y $\frac{1}{x-y}$=v

Soln:

Then the given system of equation becomes:

22u+45v=5 …….. (i)

55u+45v=14 ……(ii)

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

66u+45v=15 …… (iii)

55u+45v=14 …… (iv)

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

66u-55u=15-14

= 11u=1

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

Putting =u= 111 $\frac{1}{11}$ in equation (i) we get,

=2+15v=5

=15v=3

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

Now,

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

=x+y=11 …….(v)

1x−y $\frac{1}{x-y}$=v

= x-y=5 …….(vi)

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

2x=16

=x=8

Putting the value of x in equation (v)

8+y=11

= y=3

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

Question 30

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

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

Let 1x−y $\frac{1}{x-y}$=v

Soln:

Then the given system of equation becomes:

5u-2v=-1 ……. (i)

15u+7v=10 ……(ii)

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

35u-14v=-7 …… (iii)

30u+14v=20 …… (iv)

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

-2v=-1-1

= -2v=-2

=v=1

Now,

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

=x+y=5 …….(v)

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

= x-y=1 ……..(vi)

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

2x=6

=x=3

Putting the value of x in equation (v)

3+y=5

= y=2

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

Question 31

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

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

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

Soln:

Then the given system of equation becomes:

3u+2v=2 …….. (i)

9u+4v=1 ……(ii)

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

6u+4v=4 …… (iii)

9u-4v=1 …… (iv)

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

45u=5

=u=3

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

2v=2-1

= 2v=1

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

Now,

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

=x+y=3 …….(v)

1x−y $\frac{1}{x-y}$ =v

= x-y=2 ……..(vi)

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

2x=5

=x= 52 $\frac{5}{2}$

Putting the value of x in equation (v)

52 $\frac{5}{2}$ +y=11

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

The Solutions of the given system of equation are 52 $\frac{5}{2}$ and 12 $\frac{1}{2}$ respectively.

Question 32

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

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

Let 1x−y $\frac{1}{x-y}$ =v

Soln:

Then the given system of equation becomes:

u2 + 5v3 = −32 $\frac{u}{2} + \frac{5v}{3} = \frac{-3}{2}$ 3u+10v6 = −32 $\frac{3u+10v}{6} = \frac{-3}{2}$

3u+10v=-9 ……..(i)

5u4 − 3v5 = 6160 $\frac{5u}{4} - \frac{3v}{5} = \frac{61}{60}$

25u-12v= 613 $\frac{61}{3}$ ……(ii)

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

36u+120v=-108 …… (iii)

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

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

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

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

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

Putting u=613 $\frac{61}{3}$ in equation (i)

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

=v=-1

Now,

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

=x+2y=3 ……..(v)

1x−y $\frac{1}{x-y}$=v

= 3x-2y=-1 ……..(vi)

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

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

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

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

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

Question 34

x+y=5xy

3x+2y=13xy

Soln:

The given system of equations is:

x+y=5xy …….. (i)

3x+2y=13xy…… (ii)

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

2x++2y=10xy …… (iii)

3x+2y= 13xy ……. (iv)

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

3x-2x=13xy-10xy

= x=3xy

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

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

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

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

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

= 2x=1

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

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

Question 35

x+y=xy

x−yxy=6$\frac{x-y}{xy}$ = 6

Soln:

x+y=xy …….. (i)

x−yxy=6$\frac{x-y}{xy}$ = 6 …….. (ii)

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

2x=2xy+6xy

=2x= 6xy

= y= x+y=xy

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

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

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

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

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

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

Question 36

2(3u-v)=5uv

2(u+3v)=5uv

Solution

2(3u-v)=5uv

= 6u-2v=5uv ……. (i)

2(u+3v)=5uv

2u+6v=5uv …….. (ii)

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

18u-6v=15uv …….. (iii)

2u+6v=5uv …….. (iv)

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

18u+2u=15uv+5uv

= v=1

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

6u-2=5u

=u=2

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

Question 37

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

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

Let 13x−2y $\frac{1}{3x-2y}$=v

Soln:

Then the given system of equation becomes:

2u+3v= −175 $\frac{-17}{5}$ ……..(i)

5u-v=2 …… (ii)

Multiplying equation (ii) by 3

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

15u-2u= −175 $\frac{-17}{5}$ +5

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

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

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

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

=v=1

Now,

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

=3x+2y=5 …….(iv)

13x−2y $\frac{1}{3x-2y}$=v

= 3x-2y=1 ……..(v)

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

6x=6



=x=1

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

3+2y=5

= y=1

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

Question 38

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

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

Let 1x−y $\frac{1}{x-y}$=v

Soln:

Then the given system of equation becomes:

44u+30v=10 …….. (i)

55u+40v=13 ……(ii)

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

176u+120v=40 …… (iii)

165u+120v=39 …… (iv)

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

176-165u=40-39

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

Putting the value of u in equation (i)

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

= 4+30v=10

=30v=6

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

=x+y=11……..(v)

1x−y $\frac{1}{x-y}$=v

= x-y=5 ……(vi)

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

2x=16

=x=8

Putting the value of x in equation (v)

8+y=11

= y=3

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

Question 40

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

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

Let 1x−y $\frac{1}{x-y}$=q

Soln:

Then the given system of equation becomes:

10p+2q=4 …….. (i)

15p-5q=-2 ……(ii)

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

176u+120v=40 …… (iii)

165u+120v=39 …… (iv)

Using cross multiplication method we get,

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

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

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

q= 1x−y $\frac{1}{x-y}$

x+y=5…….. 3

x-y=1 ……..4

Adding equation 3 and 4 we get,

x=3

Substituting the value of x in equation 3 we get,

y=2

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

Question 41

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

Let 1x−1 $\frac{1}{x-1}$ =p

Let 1y−2 $\frac{1}{y-2}$ =q

Soln:

Then the given system of equation becomes:

5x−1 + 1y−2 =2 $\frac{5}{x-1} + \frac{1}{y-2} = 2$ ……..1

6x−1 − 3y−2 =1 $\frac{6}{x-1} - \frac{3}{y-2} = 1$ …….. 2

Can be written as 5p+q=2 …… 3

6p-3q=1 …….. 4

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

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

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

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

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

x-1 = 3

x= 4

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

y-2 =3

y=5

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

Question 42

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

Soln:

7y−2x=5 $\frac{7}{y} - \frac{2}{x} = 5$ ……..1

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

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

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

The given equation s reduce to:

-2p+7q=5

= -2p+7q-5=0 …….. 3

7p+8q=15

= 7p+8q-15=0 …… 4

Using cross multiplication method we get,

p−105−(−40)=q−30−35=1−16−49 $\frac{p}{-105-(-40)} = \frac{q}{-30-35} = \frac{1}{-16-49}$ p−65=1−65 $\frac{p}{-65} = \frac{1}{-65}$ q−65=1−65 $\frac{q}{-65} = \frac{1}{-65}$

p=1 and q=1

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

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

x=1 and y=1

Question 43

152x-378y=-74

-378x+152y=-604



Soln:

152x-378y=-74 ……. 1

-378x+152y=-604 ……. 2

Adding the equations 1 and 2 , we obtain

-226x-226y=-678

=x+y=3 …….. 3

Subtracting the equation 2 from equation 1, we obtain

530x+530y=530

x-y=1 …….4

Adding equations 3 and 4 we obtain,

2x=4

= x=2

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

Question 44

99x+101y=409

101x+99y=501

Soln:

The given system of equation are :

99x+101y=409 …….1

101x+99y=501…….. 2

Adding equation 1 and 2 we get ,

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

= 200(x+y) = 1000

=x+y=5 …….. 3

Subtracting equation 1 from 2

101x-99x+99y-101y = 501-499

= 2(x-y)=2

= x-y = 1 ……. 4

Adding equation 3 and 4 we get,

2x=6

= x= 3

Putting x=3 in equation 3 we get,

3+y =5

=y=2

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

Question 45

23x-29y=98

29x-23y=110

Soln:

23x-29y=98 ……1

29x-23y=110 …… 2

Adding equation 1 and 2 we get,

= 6(x+y)=12

= x+y = 2 ……3

Subtracting equation 1 from 2 we get,

52(x-y) = 208

=x-y = 4 ……. 4

Adding equation 3 and 4 we get,

2x= 6

= x= 3

Putting the value of x in equation 4

3+y=2

=y= -1

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

Question 46

x-y+z=4

x-2y-2z=9

2x+y+3z=1

Soln:

x-y+z=4 ……..1

x-2y-2z=9……..2

2x+y+3z=1……3

From equation 1

z=4-x+y

z= -x+y+4

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

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

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

= 3x-4y= 17 …….. 4

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

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

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

= -x+4y=-11

Adding equation 4 and 5 we get,

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

= 2x=6

= x= 3

Putting x=3 in equation 4, we get,

9-4y=17

= -4y= 17-9

= y = -2

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

Z= -3-2+4

= -1

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

Question 47

x-y+z=4

x+y+z=2

2x+y-3z =0

Soln:

x-y+z=4 …….1

x+y+z=2……..2

2x+y-3z =0……3

From equation 1

=z= -x+y+4

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

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

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

= 2y =2

= y= 1

Substituting the value of z in equation 3

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

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

= 5x-2y = 12 ……. 4

Putting the y= -1 in equation 4

5x-2(-1) = 12

5x =10

=x=2

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

Z= -2-1+4

= 1

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

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.4

**Q.1: x + 2y + 1 = 0 and 2x – 3y – 12 = 0**

**Soln:**

x+2y+1 =0 …….(i)

2x-3y-12=0……. (ii)

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

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

By cross multiplication method,

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

Now,

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

=x= 3

And,

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

=y=-2

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

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

**Soln:**

3x+2y+25 =0 …….(i)

2x+y+10=0……. (ii)

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

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

By cross multiplication method,

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

Now,

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

=x= 5

And,

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

=y=-20

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

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

**Soln:**

2x+y= 35 ……(i)

3x+4y=65……. (ii)

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

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

By cross multiplication method,

$x-65+140 = -y-130+105 = 18-3 \frac{x}{-65+140} = \frac{-y}{-130+105} = \frac{1}{8-3}$ $x75 = -y-25 = 15 \frac{x}{75} = \frac{-y}{-25} = \frac{1}{5}$

Now,

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

=x= 15

And,

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

=y=5

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

**Q.4: 2x – y – 6 = 0, x – y – 2 = 0**

**Soln:**

2x-y= 6 …….(i)

x-y=2……. (ii)

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

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

By cross multiplication method,

x2−6 = −y−4+6 = 1−2+1 $\frac{x}{2-6} = \frac{-y}{-4+6} = \frac{1}{-2+1}$ x−4 = −y2 = 1−1 $\frac{x}{-4} = \frac{-y}{2} = \frac{1}{-1}$

Now,

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

=x= 4

And,

−y2 = 1−1 $\frac{-y}{2} = \frac{1}{-1}$

=y=2

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

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

**Soln:**

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

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

x−yxy =6 $\frac{x-y}{xy} = 6$

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

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

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

= u+v=2 …… (iii)

= u-v= 6 ……. (iv)



By cross multiplication method,

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

Now,

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

=u= -2

And,

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

=v=4

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

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

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

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

**Soln:**

ax+by=a-b…….(i)

bx-ay=a+b……. (ii)

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

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

By cross multiplication method,

$x-ab-b^2+ab-a^2 = -y-a^2-ab-b^2+ab = 1-a^2-b^2$

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

Now,

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

=x= 1

And,

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

=y=-1

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

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

**Soln:**

x+ay-b=0 …….. (i)

ax-by-c=0……. (ii)

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

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

By cross multiplication method,

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

Now,

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

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

And,

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

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

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

**Q8**

$ax+by=a^2$

$bx+ay=b^2$

**Soln:**

$ax+by=a^2$……(i)

$bx+ay=b^2$…… (ii)

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

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

By cross multiplication method,

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

Now,

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

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

And,

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

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

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

**Q9**

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

**Soln:**

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

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

The given system of equations are :

5u-2v=-1

15u+7v =10

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



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

By cross multiplication method,

u20−7 = −v−50−15 = 135+30 $\frac{u}{20-7} = \frac{-v}{-50-15} = \frac{1}{35+30}$ u13 = −v−65 = 165 $\frac{u}{13} = \frac{-v}{-65} = \frac{1}{65}$

Now,

u13 = 1−65 $\frac{u}{13} = \frac{1}{-65}$

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

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

=x+y=5 …….(i)

And,

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

=v=1

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

=x-y =1 …… (ii)

Adding equation (i) and (ii)

2x= 6

=x=3

Putting the value of x in equation (i)

3+y=5

=y=2

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

**Q10**

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

**Soln:**

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

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

The given system of equations becomes:

2u+3v=13 …… (i)

5u-4v=-2……. (ii)

By cross multiplication method,

u6−52 = −v4+65 = 1−8−15 $\frac{u}{6-52} = \frac{-v}{4+65} = \frac{1}{-8-15}$ u−46 = −v69 = 1−23 $\frac{u}{-46} = \frac{-v}{69} = \frac{1}{-23}$

Now,

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

=u= 2

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

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

And,

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

=v=3

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

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

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

**Q11**

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

**Soln:**

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

Let 1x−y = $\frac{1}{x-y} =$ =v

The given system of equations are :

57u+6v=5

38u+21v =9

Here $a_1$= 57, $b_1$= 6 , $c_1$= -5

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

By cross multiplication method,

u−54+105 = −v−513+190 = 11193−228 $\frac{u}{-54+105} = \frac{-v}{-513+190} = \frac{1}{1193-228}$ u51 = −v−323 = 1969

$\frac{u}{51} = \frac{-v}{-323} = \frac{1}{969}$

Now,

u51 = 1969 $\frac{u}{51} = \frac{1}{969}$

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

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

=x+y=19 ……..(i)

And,

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

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

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

=x-y =3 …… (ii)

Adding equation (i) and (ii)

2x= 22

=x=11

Putting the value of x in equation (i)

11+y=19

=y=8

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

**Q12**

xa − yb =2 $\frac{x}{a} - \frac{y}{b} = 2$

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

**Soln:**

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

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

By cross multiplication method

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

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

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

x= a

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

=y=b

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

**Q13**

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

**Soln:**

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

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

By cross multiplication method

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

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

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

$=x=a^2$

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

$=y=b^2$

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

**Q14**

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

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

**Soln:**

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

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

By cross multiplication method

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

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

=x=a

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

=y=b

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

**Q15**

2ax+3by=a+2b

3ax+2by=2a+b

**Soln:**

The given system of equation is

2ax+3by=a+2b …… (i)

3ax+2by=2a+b…….. (ii)

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

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

By cross multiplication method

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

Now,

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

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

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

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

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

**Q16**

5ax+6by=28

3ax+4by=18

**Soln:**

The systems of equations are:

5ax+6by=28 ……. (i)

3ax+4by=18……. (ii)

Here $a_1$= 5a, $b_1$= 6b , $c_1$= -(28)

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

By cross multiplication method

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

Now,

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

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

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

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

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

**Q17**

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

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

**Soln.**

The given system of equations are :

(a+2b)x+(2a-b)y=2 ……. (i)

(a-2b)x+(2a+b)y=3……. (ii)

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

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

By cross multiplication method:

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

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

=x= 5b−2a10ab $\frac{5b-2a}{10ab}$

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

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

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

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

**Q18**

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

x+y=$2a^2$

**Soln:**

The given systems of equations are:

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

x+y=$2a^2$

From equation (i)

$x(a^2+b^2-2ab+aba-b)-y(a^2+b^2+2ab-aba+b)x(\frac{a^2+b^2-2ab+ab}{a-b})-y(\frac{a^2+b^2+2ab-ab}{a+b})$

$= x(a^2+b^2-aba-b)-y(a^2+b^2+aba+b)x(\frac{a^2+b^2-ab}{a-b})-y(\frac{a^2+b^2+ab}{a+b})$ ……. (iii)

From equation (ii)

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

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

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

By cross multiplication method:

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

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

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

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

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

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

**Q19**

$bx+cy=a+b$

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

**Soln:**

The system of equation is given by :

$bx+cy=a+b$ ……. (i)

$-ax(1a-b-1a+b)+cy(1b-a+1b+a)=2aa+b-ax(\frac{1}{a-b}-\frac{1}{a+b})+cy(\frac{1}{b-a}+\frac{1}{b+a})=\frac{2a}{a+b}$ …..(ii)

From equation (i)

bx+cy-(a+b) =0

From equation (ii)

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

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

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

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

= 2abx-2acy-2a(a-b) =0 ……. (iv)

By cross multiplication

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

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

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

And,

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

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

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

**Q20**

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

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

**Soln.**

The given system of equations are :

$(a-b)x+(a+b)y=2a^2-2b^2$ …….. (i)

(a+b)(x+y) =4ab ……. (ii)

From equation (i)

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

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

From equation (ii)

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

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

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

By cross multiplication method

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

Now,

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

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

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

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

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

**Q21**

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

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

**Soln:**

The given system of equations are :

$a^2x+b^2y=c^2$ …….. (i)

$b^2x+a^2y=d^2$…… (ii)

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

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

By cross multiplication method

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

Now,

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

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

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

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

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

**Q23**

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

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

**Soln:**

The given system of equation may be written as :

2(ax-by+a+4b=0 …….. (i)

2(bx+ay)+b-4a=0……. (ii)

Here, $a_1$= 2a , $b_1$ = -2b , $c_1$=a+4b

Here, $a_2$= 2b , $b_2$ = 2a , $c_2$=b-4a

By cross multiplication method

$= x-2b^2+8ab-2a^2-8ab = -y2ab-8a^2-2ab-8b^2 = 14a^2+4b^2 \frac{x}{-2b^2+8ab-2a^2-8ab} = \frac{-y}{2ab-8a^2-2ab-8b^2} = \frac{1}{4a^2+4b^2}$

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

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

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

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

=y=2

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

**Q24**

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

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

**Soln:**

The systems of equations are

6(ax+by)=3a+2b …… (i)

6(bx-ay) = 3b-2a ……. (ii)

From equation (i)

6ax+6by-(3a+2b)=0 …… (iii)

From equation (ii)

6bx-6ay-(3b-2a) =0 …… (iv)

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

Here, $a_2$= 6b , $b_2$ = -6a , $c_2$=-(3b-2a)

By cross multiplication method

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

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

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

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

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

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



**Q25**

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

**Soln:**

The given systems of equations are

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

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

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

The pair of equations becomes:

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

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

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

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

By cross multiplication method

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

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

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

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

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

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

**Q26**

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

$x + y = 2m$

**Soln:**

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

x+y=2m……. (ii)

Here, $a_1$= m , $b_1$ = -n , $c_1$=-($m^2$+$n^2$)

Here, $a_2$= 1 , $b_2$ = 1 , $c_2$=-(2m)

By cross multiplication method

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

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

=x= m+n

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

=y=m-n

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

**Q27**

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

ax-by=2ab

**Soln:**

The given pair of equations are:

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

ax-by=2ab …….. (ii)

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

Here, $a_2$= a , $b_2$ = – b, $c_2$=-(2ab)

By cross multiplication method

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

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

=x=b

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

=y=-a

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

**Q28**

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

X+y-2ab=0

**Soln:**

$\frac{b}{a}x+\frac{a}{b}y-(a^2+b^2)=0$ $\frac{b}{a}x+\frac{a}{b}y-(a^2+b^2)=0$ …….. (i)

X+y-2ab=0……. (ii)

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

Here, $a_2=1$, $b_2=-1$, $c_2=-(2ab)$

By cross multiplication method

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

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

=x=ab

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

=y=ab

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

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.5

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

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

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

**Soln:**

The given system may be written as

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

The given system of equation is of the form

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

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

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

We have,

$a_1a_2=13$ $\frac{a_1}{a_2}=\frac{1}{3}$ $b_1b_2=-3-9=13$ $\frac{b_1}{b_2}=\frac{-3}{-9}=\frac{1}{3}$

And , $c_1c_2=-3-2=32$ $\frac{c_1}{c_2}=\frac{-3}{-2}=\frac{3}{2}$

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

Therefore, the given equation has no solution.

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

$4x+2y-10=0$ $4x+2y-10=0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

We have,

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

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

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

Therefore, the given equation has infinitely many solution.

**(3)** $3x-5y=20$ $3x - 5y = 20$

$6x-10y=40$ $6x - 10y = 40$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

We have,

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

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

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

Therefore, the given equation has infinitely many solution.

**(4)** $x-2y-8=0$ $x - 2y - 8 = 0$

$5x-10y-10=0$ $5x - 10y - 10 = 0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

We have,

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

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

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

Therefore, the given equation has no solution.

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

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

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

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form



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

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

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

For unique solution,we have

$a_1a_2 \neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $42 \neq k2$ $\frac{4}{2} \neq \frac{k}{2}$ $\Rightarrow k \neq 4 \Rightarrow$ $k \neq 4$

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

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2 \neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $42 \neq -5-3$ $\frac{4}{2} \neq \frac{-5}{-3}$

$\Rightarrow k \Rightarrow$ $k$ can have any real values.

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

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

$5x+ky+7=0$ $5x + ky + 7 = 0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

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

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

**(9)** $2x+3y-5=0$ $2x+3y-5=0$

$6x-ky-15=0$ $6x-ky-15=0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

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

**(10)** $4x+5y=3$ $4x+5y=3$

$kx+15y=9$ $kx+15y=9$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

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

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

$4x+3y+9=0$ $4x + 3y + 9 = 0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $k4=-2-3=23$ $\frac{k}{4} = \frac{-2}{-3} = \frac{2}{3}$ $\Rightarrow k=83$ $\Rightarrow k = \frac{8}{3}$

Therefore, the given system of equations will have infinitely many solutions, if $k=83$ $k = \frac{8}{3}$ .

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

$kx+10y=19$ $kx + 10y = 19$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $8k=510=-9-18=12$ $\frac{8}{k} = \frac{5}{10} = \frac{-9}{-18} = \frac{1}{2}$ $\Rightarrow k=16$ $\Rightarrow k = 16$

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



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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2k+2=−3−(2k+1)=−7−3(2k−1 $\frac{2}{k+2}=\frac{-3}{-(2k+1)}=\frac{-7}{-3(2k-1}$ 2k+2=−3−(2k+1) and −3−(2k+1)=−7−3(2k−1 $\frac{2}{k+2}=\frac{-3}{-(2k+1)}$ and $\frac{-3}{-(2k+1)}=\frac{-7}{-3(2k-1}$ ⇒2(2k+1)=3(k+2)and3×3(2k−1)=7(2k+1)
$\Rightarrow 2(2k+1)=3(k+2)$ and $3\times 3(2k-1)=7(2k+1)$ ⇒4k+2=3k+6and18k−9=14k+7
$\Rightarrow 4k+2=3k+6$ and $18k-9=14k+7$ ⇒k=4and4k=16⇒k=4⇒ $k=4$ and $4k=16 \Rightarrow k=4$

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

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ 2k+2=3(2k+1)=−2−2(k−1
$\frac{2}{k+2}=\frac{3}{(2k+1)}=\frac{-2}{-2(k-1}$ 2k+2=3(2k+1) and 3(2k+1)=22(k−1
$\frac{2}{k+2}=\frac{3}{(2k+1)}$ and $\frac{3}{(2k+1)}=\frac{2}{2(k-1}$ ⇒2(2k+1)=3(k+2)and3(k−1)=(2k+1)
$\Rightarrow 2(2k+1)=3(k+2)$ and $3(k-1)=(2k+1)$ ⇒4k+2=3k+6and3k−3=2k+1
$\Rightarrow 4k+2=3k+6$ and $3k-3=2k+1$ ⇒k=4andk=4⇒ $k=4$ and $k=4$

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

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

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

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

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

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

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

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

$\Rightarrow (k+4)(k-2)=0$ and $(5k+17)(k-2)=0$ $\Rightarrow k=-4$ or $k=2$ and $k=-175$ or $k=2$

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

thus, k=2 satisfies both the condition.

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

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $12(k+2)=39=-(2k+1)-(7k+1$ $\frac{1}{2(k+2)} = \frac{3}{9} = \frac{-(2k+1)}{-(7k+1}$ $12(k+2)=39$ and $39=(2k+1)$
$(7k+1$ $\frac{1}{2(k+2)} = \frac{3}{9}$ and $\frac{3}{9} = \frac{(2k+1)}{(7k+1}$ $\Rightarrow 9k=3\times 2(k+1)$ and $3(7k+1)=9(2k+1)$
$\Rightarrow 9k = 3 \times 2(k+1)$ and $3(7k+1) = 9(2k+1)$ $\Rightarrow 9k-6k=6$ and $21k-18k=9-3$
$\Rightarrow 9k - 6k = 6$ and $21k - 18k = 9 - 3$ $\Rightarrow 3k=6$ and $3k=6$ $\Rightarrow 3k = 6$ and $3k = 6$ $\Rightarrow k=2$ and $k=2$
$\Rightarrow k = 2$ and $k = 2$

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

**(17)** $2x+(k-2)y=k$ $2x + (k-2)y = k$

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $26=k-22k-1=-k-2(2k+5)$ $\frac{2}{6} = \frac{k-2}{2k-1} = \frac{-k}{-2(2k+5)}$ $26=k-22k-1$ and $k-22k-1=k(2k+5$
$\frac{2}{6} = \frac{k-2}{2k-1}$ and $\frac{k-2}{2k-1} = \frac{k}{(2k+5}$ $13=k-22k-1$ and $2k^2+5k-4k-10=2k^2-k$
$\frac{1}{3} = \frac{k-2}{2k-1}$ and $2k^2 + 5k - 4k - 10 = 2k^2 - k$ $\Rightarrow 2k-3k=-6+1$ and $k+k=10$
$\Rightarrow 2k - 3k = -6 + 1$ and $k + k = 10$ $\Rightarrow -k=-5$ and $2k=10$ $\Rightarrow -k = -5$ and $2k = 10$ $\Rightarrow k=5$ and $k=5$
$\Rightarrow k = 5$ and $k = 5$

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

**(18)** $2x+3y=7$ $2x + 3y = 7$

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

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

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

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

**(19)** $2x+3y=k$ $2x + 3y = k$

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

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

$2k+4=3k-3$ and $9=k+2$

$\Rightarrow$ $\Rightarrow k=7$ and $k=7$ $\Rightarrow k = 7$ and $k = 7$

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

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

**(20)** $kx-5y=2$ $kx - 5y = 2$

**6x+2y=7**$6x + 2y = 7$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ k6=−52≠27 $\frac{k}{6} = \frac{-5}{2} \neq \frac{2}{7}$ ⇒2k=−30⇒ $2k = -30$ ⇒k=−15⇒ $k = -15$

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

**(21) x+2y=0**$x + 2y = 0$

**2x+ky=5**$2x + ky = 5$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ 12=2k≠27 $\frac{1}{2} = \frac{2}{k} \neq \frac{2}{7}$ ⇒k=4⇒ $k = 4$

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

**(22) 3x−4y+7=0**$3x - 4y + 7 = 0$

**kx+3y−5=0**$kx + 3y - 5 = 0$

Soln:

The given system may be written as



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

The given system of equation is of the form

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

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

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

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $3k=-43$ $\frac{3}{k} = \frac{-4}{3}$ $\Rightarrow k=-94$ $\Rightarrow k = \frac{-9}{4}$

Therefore, the given system of equations will have no solutions, if $k=-94$ $k = \frac{-9}{4}$ .

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

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

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $23=-k2$ $\frac{2}{3} = \frac{-k}{2}$ $\Rightarrow k=-43$ $\Rightarrow k = \frac{-4}{3}$

Therefore, the given system of equations will have no solutions, if $k=-43$ $k = \frac{-4}{3}$ .

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

$5x-7y-5=0$ $5x - 7y - 5 = 0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For no solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $25=-k-7$ $\frac{2}{5} = \frac{-k}{-7}$ $\Rightarrow k=-145$ $\Rightarrow k = \frac{-14}{5}$

Therefore, the given system of equations will have no solutions, if $k=-145$ $k = \frac{-14}{5}$ .

**(25)** $kx+3y=3$ $kx + 3y = 3$

$12x+ky=6$ $12x + ky = 6$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For no solution,we have

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

$k12=3k\neq 36$ $\frac{k}{12} = \frac{3}{k} \neq \frac{3}{6}$ ……(i)

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

From (i)

$k12\neq 36$ $\frac{k}{12} \neq \frac{3}{6}$ $\Rightarrow k\neq 6$ $\Rightarrow k \neq 6$

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

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

$4x+6y-11=0$ $4x + 6y - 11 = 0$

$2x+ay-7=0$ $2x + ay - 7 = 0$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $a_1a_2=b_1b_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ $42=6a$ $\frac{4}{2} = \frac{6}{a}$ $\Rightarrow a=3$ $\Rightarrow a = 3$

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

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

**$ax+3y=a-3$** $ax + 3y = a - 3$

**$12x+ay=a$** $12x + ay = a$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For unique solution,we have

$a_1a_2=b_1b_2\neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $a12=3a\neq-(a-3)-a$ $\frac{a}{12} = \frac{3}{a} \neq \frac{-(a-3)}{-a}$ $3a\neq frac-(a-3)-a$
$\frac{3}{a} \neq frac-(a-3)-a$ $\Rightarrow a-3\neq3$ $\Rightarrow a - 3 \neq 3$ $\Rightarrow a\neq6$ $\Rightarrow a \neq 6$

And,

$a12=3a$ $\frac{a}{12} = \frac{3}{a}$ $\Rightarrow a^2=36$ $\Rightarrow a^2 = 36$ $\Rightarrow a=+6 or -6$ $\Rightarrow a = +6 \text{ or } -6$

$\because a\neq6$ $a \neq 6$

$\Rightarrow a=-6$ $\Rightarrow a = -6$

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



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

**(i) Unique solution**

**(ii) No solution**

**kx+2y=5**$kx + 2y = 5$

**3x+y=1**$3x + y = 1$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

(i) For unique solution, we have

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

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

(ii) For no solution, we have

$a_1a_2 = b_1b_2 \neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $k3 = 21 \neq -5-1$ $\frac{k}{3} = \frac{2}{1} \neq \frac{-5}{-1}$ $k3 = 21$ $\frac{k}{3} = \frac{2}{1}$ $\Rightarrow k=6 \Rightarrow$ $k = 6$

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

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

**6x+3y=c−3**$6x + 3y = c - 3$

**12x+cy=c**$12x + cy = c$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

For infinitely many solution,we have

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $612=3c=-(c-3)-c$ $\frac{6}{12} = \frac{3}{c} = \frac{-(c-3)}{-c}$ $12=3c$ and $3c=-(c-3)-c$
$\frac{1}{2} = \frac{3}{c}$ and $\frac{3}{c} = \frac{-(c-3)}{-c}$ $\Rightarrow c=6$ and $c-3=3$ $\Rightarrow c = 6$ and $c - 3 = 3$ $\Rightarrow c=6$ and $c=6$ $\Rightarrow c = 6$ and $c = 6$

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

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

**(i) Unique solution**

**(ii) No solution**

**(iii) Infinitely many solution**

**$2x+ky=1$** $2x + ky = 1$

**$3x-5y=7$** $3x - 5y = 7$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

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

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

(i) For unique solution, we have

$a_1a_2 \neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $23 \neq -k-5$ $\frac{2}{3} \neq \frac{-k}{-5}$ $k \neq -103$ $k \neq \frac{-10}{3}$

Therefore, the given system of equations will have unique solution, if $k \neq -103$ $k \neq \frac{-10}{3}$.

(ii) For no solution, we have

$a_1a_2=b_1b_2 \neq c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $23=k-5$ neq $-1-7$ $\frac{2}{3} = \frac{k}{-5}$ neq $\frac{-1}{-7}$ $23=k-5$ and $k-5$ neq $17$
$\frac{2}{3} = \frac{k}{-5}$ and $\frac{k}{-5}$ neq $\frac{1}{7}$ $\Rightarrow k=-103$ and $k$ neq $-57$ $\Rightarrow k = \frac{-10}{3}$ and $k$ neq $\frac{-5}{7}$ $\Rightarrow k=-103$ $\Rightarrow k = \frac{-10}{3}$

Therefore, the given system of equations will have no solution, if $k=-103$ $k = \frac{-10}{3}$.

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

$a_1a_2 = b_1b_2 = c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $23 = k-5 = -1-7 \frac{2}{3} = \frac{k}{-5} = \frac{-1}{-7}$

Clearly $a_1a_2 \neq c_1c_2 \frac{a_1}{a_2} \neq \frac{c_1}{c_2}$ ,

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

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

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

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

Soln:

The given system may be written as

$x+2y+7=0x + 2y + 7 = 0$ $2x+ky+14=02x + ky + 14 = 0$

The given system of equation is of the form

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

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

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

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

$a_1a_2 = b_1b_2 = c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $12 = 2k = 714 \frac{1}{2} = \frac{2}{k} = \frac{7}{14}$ $12 = 2k = 12 \frac{1}{2} = \frac{2}{k} = \frac{1}{2}$ $\Rightarrow k=4 \Rightarrow k = 4$

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

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

**ax+by=c**$ax + by = c$

**lx+my=n**$lx + my = n$

Soln:

The given system may be written as

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

The given system of equation is of the form

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

Where, $a_1=a,b_1=b,c_1=-ca_1 = a, b_1 = b, c_1 = -c$

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

For unique solution, we have

$a_1a_2 \neq b_1b_2$ $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\Rightarrow al \neq bm \Rightarrow$ $\frac{a}{l} \neq \frac{b}{m}$ $\Rightarrow am \neq bl \Rightarrow$ $am \neq bl$

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

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

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

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

Soln:

The given system of equation may be written as,

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

The given system of equation is of the form

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

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

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

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

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $(2a-1)3=3b-1=-5-2$ $\frac{(2a-1)}{3}=\frac{3}{b-1}=\frac{-5}{-2}$ $(2a-1)3=52$ and $3b-1=52$
$\frac{(2a-1)}{3}=\frac{5}{2}$ and $\frac{3}{b-1}=\frac{5}{2}$ $\Rightarrow 2(2a-1)=15$ and $6=5(b-1)$
$\Rightarrow 2(2a-1)=15$ and $6=5(b-1)$ $\Rightarrow 4a-2=15$ and $6=5b-5$
$\Rightarrow 4a-2=15$ and $6=5b-5$ $\Rightarrow 4a=17$ and $5b=11$ $\Rightarrow 4a=17$ and $5b=11$ $\Rightarrow a=174$ and $b=115$
$\Rightarrow a=\frac{17}{4}$ and $b=\frac{11}{5}$

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

**$2x-3y=7$** $2x-3y=7$

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

Soln:

The given system of equation may be written as,

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

The given system of equation is of the form

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

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

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

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

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $2(a+b)=-3-(a+b-3)=-7-(4a+b)$

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

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

$\Rightarrow 2(a+b-3)=3(a+b)$ and $3(4a+b)=7(a+b-3)$ $\Rightarrow 2a+2b-6=3a+3b$ and $12a+3b=7a+7b-21$

$\Rightarrow 2a+2b-6=3a+3b$ and $12a+3b=7a+7b-21$ $\Rightarrow a+b=-6$ and $5a-4b=-21$

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

a+b= -6

$\Rightarrow a=-6-b$ $\Rightarrow a=-6-b$

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

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

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

As a=-6-b

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

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

a=-5 and b=-1.

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

$2x-3y=9$ $2x-3y=9$

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

Soln:

The given system of equation may be written as,

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

The given system of equation is of the form

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

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

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

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

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

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

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

$2(2p-q) = 3(p+q)$ and $(p+q+1) = 2p-q$ $\Rightarrow 4p-2q=3p+3q$and$-p+2q=-1$

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

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

3q=1

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

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

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

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

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

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

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

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

Soln:

The given system of equation may be written as,

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

The given system of equation is of the form

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

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

$a_2=3, b_2=b-2, c_2=-3(p+q+1)$ $a_2=3, b_2=b-2, c_2=-3(p+q+1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2 \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $2a-13=-3b-2=-5-3 \frac{2a-1}{3} = \frac{-3}{b-2} = \frac{-5}{-3}$ $2a-13=53$ and $-3b-2=53$

$\frac{2a-1}{3} = \frac{5}{3}$ and $\frac{-3}{b-2} = \frac{5}{3}$ $2a-1=5$and$-9=5(b-2)$ $2a-1=5$ and $-9=5(b-2)$ $\Rightarrow a=3$and$-9=5b-10$

$\Rightarrow a=3$ and $-9=5b-10$ $\Rightarrow a=3$and$b=15 \Rightarrow a=3$ and $b=\frac{1}{5}$

Hence the given system of equation will have infinitely many solution if

$a=3a=3$ and $b=15 \; b=\frac{1}{5}$.

**(ii)** $2x-(2a+5)y=5$ $2x-(2a+5)y=5$

$(2b+1)x-9y=15$ $(2b+1)x-9y=15$

Soln:

The given system of equation may be written as,

$2x-(2a+5)y=5$ $2x-(2a+5)y=5$ $(2b+1)x-9y=15$ $(2b+1)x-9y=15$

The given system of equation is of the form

$a_1x+b_1y-c_1=0$ $a_1x+b_1y-c_1=0$ $a_2x+b_2y-c_2=0$ $a_2x+b_2y-c_2=0$

Where, $a_1=2, b_1=-(2a+5), c_1=-5$ $a_1=2, b_1=-(2a+5), c_1=-5$

$a_2=(2b+1), b_2=-9, c_2=-15$ $a_2=(2b+1), b_2=-9, c_2=-15$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $22b+1=-(2a+5)-9=-5-15$ $\frac{2}{2b+1}=\frac{-(2a+5)}{-9}=\frac{-5}{-15}$ $22b+1=13$ and $(2a+5)9=13$
$\frac{2}{2b+1}=\frac{1}{3}$ and $\frac{(2a+5)}{9}=\frac{1}{3}$ $\Rightarrow 6=2b+1$ and $2a+5=3$ $\Rightarrow 6=2b+1$ and $2a+5=3$ $\Rightarrow b=52$ and $a=-1$
$\Rightarrow b=\frac{5}{2}$ and $a=-1$

Hence the given system of equation will have infinitely many solution if

$a=-1$ $a=-1$ and $b=52$ $b=\frac{5}{2}$.

**(iii)** $(a-1)x+3y=2$ $(a-1)x+3y=2$

$6x+(1-2b)y=6$ $6x+(1-2b)y=6$

Soln:

The given system of equation may be written as,

$(a-1)x+3y=2$ $(a-1)x+3y=2$ $6x+(1-2b)y=6$ $6x+(1-2b)y=6$

The given system of equation is of the form

$a_1x+b_1y-c_1=0$ $a_1x+b_1y-c_1=0$ $a_2x+b_2y-c_2=0$ $a_2x+b_2y-c_2=0$

Where, $a_1=a-1, b_1=3, c_1=-2$ $a_1=a-1, b_1=3, c_1=-2$

$a_2=6, b_2=1-2b, c_2=-6$ $a_2=6, b_2=1-2b, c_2=-6$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$ $a-16=31-2b=26$ $\frac{a-1}{6}=\frac{3}{1-2b}=\frac{2}{6}$ $a-16=13$ and $31-2b=13$
$\frac{a-1}{6}=\frac{1}{3}$ and $\frac{3}{1-2b}=\frac{1}{3}$ $\Rightarrow a-1=2$ and $1-2b=9$ $\Rightarrow a-1=2$ and $1-2b=9$ $\Rightarrow a=3$ and $b=-4$
$\Rightarrow a=3$ and $b=-4$

Hence the given system of equation will have infinitely many solution if

$a=3$ and $b=-4$ .

**(iv)** $3x+4y=12$

$(a+b)x+2(a-b)y=5a-1$

Soln:

The given system of equation may be written as,

$3x+4y-12=0$ $(a+b)x+2(a-b)y-(5a-1)=0$

The given system of equation is of the form

$a_1x+b_1y-c_1=0$ $a_2x+b_2y-c_2=0$

Where, $a_1=3, b_1=4, c_1=-12$

$a_2=(a+b), b_2=2(a-b), c_2=-(5a-1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $3a+b=42(a-b)=125a-1$ $\frac{3}{a+b}=\frac{2}{a+b}$ and $\frac{2}{a+b}=\frac{12}{5a-1}$ $\Rightarrow 3(a-b)=2a+2b$ and $2(5a-1)=12(a-b)$

$\Rightarrow a=5b$ and $-2a=-12b+2$

Substituting a=5b in -2a=-12b+2 , we have

-2(5b)=-12b+2

$\Rightarrow -10b=-12b+2$ $\Rightarrow b=1$

Thus a=5

Hence the given system of equation will have infinitely many solution if

$a=5$ and $b=1$ .

**(v)** $2x+3y=7$

$(a-1)x+(a+1)y=3a-1$

Soln:

The given system of equation may be written as,

$2x+3y-7=0$ $(a-1)x+(a+1)y-(3a-1)=0$

The given system of equation is of the form

$a_1x+b_1y-c_1=0$ $a_1x + b_1y - c_1 = 0$ $a_2x+b_2y-c_2=0$ $a_2x + b_2y - c_2 = 0$

Where, $a_1=2, b_1=3, c_1=-7$ $a_1 = 2, b_1 = 3, c_1 = -7$

$a_2=(a-1), b_2=(a+1), c_2=-(3a-1)$ $a_2 = (a-1), b_2 = (a+1), c_2 = -(3a-1)$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $2a-b=3a+1)=-73a-1$ $\frac{2}{a-b} = \frac{3}{a+1)} = \frac{-7}{3a-1}$ $2a-b=3a+1)$ and $3a+1)=-73a-1$
$\frac{2}{a-b} = \frac{3}{a+1)}$ and $\frac{3}{a+1)} = \frac{-7}{3a-1}$ $\Rightarrow 2(a+1)=3(a-1)$ and $3(3a-1)=7(a+1)$
$\Rightarrow 2(a+1) = 3(a-1)$ and $3(3a-1) = 7(a+1)$ $\Rightarrow 2a-3a=-3-2$ and $9a-3=7a+7$
$\Rightarrow 2a-3a = -3-2$ and $9a-3 = 7a+7$ $\Rightarrow a=5$ and $a=5$ $\Rightarrow a = 5$ and $a = 5$

Hence the given system of equation will have infinitely many solution if

$a=5$ $a = 5$ and $b=1$ $b = 1$.

**(vi)** $2x+3y=7$ $2x + 3y = 7$

$(a-1)x+(a+2)y=3a$ $(a-1)x + (a+2)y = 3a$

Soln:

The given system of equation may be written as,

$2x+3y-7=0$ $2x + 3y - 7 = 0$ $(a-1)x+(a+2)y-3a=0$ $(a-1)x + (a+2)y - 3a = 0$

The given system of equation is of the form

$a_1x+b_1y-c_1=0$ $a_1x + b_1y - c_1 = 0$ $a_2x+b_2y-c_2=0$ $a_2x + b_2y - c_2 = 0$

Where, $a_1=2, b_1=3, c_1=-7$ $a_1 = 2, b_1 = 3, c_1 = -7$

$a_2=(a-1), b_2=(a+2), c_2=-3a$ $a_2 = (a-1), b_2 = (a+2), c_2 = -3a$

The given system of equation will have infinitely many solution, if

$a_1a_2=b_1b_2=c_1c_2$ $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $2a-b=3a+2)=-7-3a$ $\frac{2}{a-b} = \frac{3}{a+2)} = \frac{-7}{-3a}$ $2a-b=3a+2)$ and $3a+2)=73a$
$\frac{2}{a-b} = \frac{3}{a+2)}$ and $\frac{3}{a+2)} = \frac{7}{3a}$ $\Rightarrow 2(a+2)=3(a-1)$ and $3(3a)=7(a+2)$
$\Rightarrow 2(a+2) = 3(a-1)$ and $3(3a) = 7(a+2)$ $\Rightarrow 2a+4=3a-3$ and $9a=7a+14$
$\Rightarrow 2a+4 = 3a-3$ and $9a = 7a+14$ $\Rightarrow a=7$ and $a=7$ $\Rightarrow a = 7$ and $a = 7$

Hence the given system of equation will have infinitely many solution if

$a=7$ $a = 7$ and $b=1$ $b = 1$.

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.6

**Q1) 5 pens and 6 pencils together cost Rs 9 and 3 pens and 2 pencils cost Rs 5. Find the cost of 1 pen and 1 pencil.**

**Soln:**

Let the cost of a pen be Rs x and that of a pencil be Rs y. Then,

5x + 6y = 9 …(i)

3x + 2y = 5 …(ii)

Multiplying equation(i) by 2 and equation (ii) by 6, we get

10x + 12y = 18 (iii)

18x + 12y = 30 (iv)

Subtracting equation(iii) by equation(iv), we get

18x-10x+12y-12y=30 – 18

8x=12

x=128=32=1.5$x = \frac{12}{8} = \frac{3}{2} = 1.5$

Substituting x =1.5 in equation(i), we get

5 x 1.5 + 6y = 9

7.5+6y = 9

6y = 1.5

y=1.56=14=0.25$y = \frac{1.5}{6} = \frac{1}{4} = 0.25$

Hence, cost of one pen = Rs. 1.50 and cost of one pencil = Rs. 0.25

**Q2) 7 audio cassettes and 3 videocassettes cost Rs. 1110, while 5 audio cassettes and 4 videocassettes cost Rs. 1350. Find the cost of audio cassettes and a video cassette.**

**Soln:**

Let the cost of a audio cassette be Rs. X and that of a video cassette be Rs. y. Then,

7x + 3y = 1110 …(i)

5x + 4y = 1350 …(ii)

Multiplying equation(i) by 4 and equation(ii) by 3, we get

28x + 12y = 4440 …(iii)

15x + 4y = 4050 …(iv)

Subtracting equation (iv) from equation(iii) we get

28x-13x+12y-12y=4440-4050

13x=390

x= 39013 =30 $\frac{390}{13} = 30$

Substituting x=30 in equation (i), we get

7 x 30+3y=1110

210+3y=1110

3y=1110-210

3y=900

y= 9003 =300y $= \frac{900}{3} = 300$

Hence, cost of one audio cassette = Rs. 30 and cost of one video cassette = Rs. 300

**Q3) Reena has pens and pencils which together are 40 in number. If she has 5 more pencils and 5 fewer pens, then the number of pencils would become 4 times the number of pens. Find the original number of pens and pencils.**

**Soln:**

Let the number of pens be x and that of pencil be y, then,

x+y=40 …(i)

and (y+5)=4((x-5)

y+5=4x-20

5+20=4x-y

4x-y=25 …(ii)

Adding equation (i) and equation(ii), we get

x+4x=40+25

5x=65

x=655=13$x = \frac{65}{5} = 13$

Putting x=13 in equation (i), we get

13+y=40

y=40-13-27

Hence, Reena has 13 pens 27 pencils.

**Q4) 4 tables and 3 chairs, together, cost Rs. 2250 and 3 tables and 4 chairs cost Rs. 1950. Find the cost of 2 chairs and 1 table.**

**Soln:**

Let the cost of 1 table is Rs. x and cost of 1 chair is Rs. y.
Then, by the given question,
4x+3y=2250————(1)
3x+4y=1950————(2)
Multiplying (1) with 3 and (2) with 4 we get,
12x+9y=6750————(3)
12x+16y=7800————-(4)
Now subtracting (4) from (3) we get,
-7y=-1050
or, y=150
Then, x=(1950-4×150)/3=(1950-600)/3=1350/3=450
∴, The total cost of 2 chairs and 1 table is:
2y+x=2×150+450=300+450=750

**Q5) 3 bags and 4 pens together cost Rs 257 whereas 4 bags and 3 pens together cost Rs. 324. Find the total cost of 1 bag and 10 pens.**

**Soln:**

Let the cost of a bag be Rs. x and that of a pen be Rs. y. Then,

3x+4y=257 …(i)

and, 4x+3y=324 …(ii)

Multiplying equation (i) by 3 and equation (ii) by 4, we get

9x+12y=770 …(iii)

16x+12y=1296 …(iv)

Subtracting equation (iii) by equation (iv), we get

16x-9x=1296-771

7x=525

x= 5257 =75$x = \frac{525}{7} = 75$

Cost of a pen = Rs. 75

Putting x = 75 in equation (i), we get

3 x 75 + 4y =257

225 + 4y = 257

4y = 257-225

4y=32

y= 324 =8$y = \frac{32}{4} = 8$

Therefore, Cost of a pen = Rs. 8

Therefore, Cost of 10 pens = 8 x 10 = Rs. 80

Hence, the total cost of 1 bag and 10 pens = 75 + 80 = Rs. 155.

**Q6) 5 books and 7 pens together cost Rs. 79 whereas 7 books and 5 pens together cost Rs. 77. Find the total cost of 1 book and 2 pens.**

**Soln:**

Let the cost of a book be Rs. x and that of a pen be Rs. y .Then,

5x+7y=79 …(i)

and, 7x+5y=77 …(ii)

Multiplying equation (i) by 5 and equation (ii) by 7, we get

25+35y=395 …(iii)

49x+35y=539 …(iv)



Subtracting equation (iii) by equation (iv), we get

49x-25x=539-395

24x=144

x= 14424 =6$x = \frac{144}{24} = 6$

Therefore, cost of a book = Rs. 6

Putting x= 6 in equation (i) , we get

5 x 6+7y=79

30+7y=79

7y=79-30

7y=49

y= 497 =7$y = \frac{49}{7} = 7$

Therefore, cost of a pen = Rs. 7

Therefore, cost of 2 pens = 2 x 7 = Rs. 14

Hence, the total cost of 1 book and 2 pens = 6+14= Rs. 20

**Q7) Jamila sold a table and a chair for Rs 1050, thereby making a profit of 10% on the table and 25% on the chair. If she had taken a profit of 25% on the table and 10% on the chair she would have got Rs 1065. Find the cost price of each.**

**Soln:**

Let the cost price of the table be Rs x and the cost price of the chair be Rs y.

The selling price of the table, when it is sold at a profit of 10% = Rs x + 10x/100 = 110x / 100

The selling price of the chair when it is sold at a profit of 25% = Rs y + 25y/100 = 125y / 100

So, 110x / 100 + 125y / 100 = 1050 … (1)

When the table is sold at a profit of 25%, its selling price = Rs (x + 25x/100) = Rs 125x / 100

When the chair is sold at a profit of 10%, its selling price = Rs (y + 10y/100) = Rs 110y / 100

So, 125x / 100 + 110y / 100 = 1065 … (2)

Solve (1) and (2), to get x = 500 and y = 400

Hence, the cost price of the table is Rs 500 and the cost price of the chair is Rs 400.

**Q8) Susan invested a certain amount of money in two schemes A and B, which offer interest at the rate of 8% and 9% per annum respectively. She received Rs 1860 as annual interest. However, if she had interchanged the amounts 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?**

**Soln:**

Let Susan invest Rs x in scheme A at the rate 8% per annum

And Rs y in scheme B at the rate 9% per annum

According to the given conditions,

8x+9y=1860 …(i)

9x+8y=1860+20 …(ii)

Multiplying (i) by 9 and by 8, we get

72x+81y=16740 …(iii)

72x+64y=15040 …(iv)

Subtracting (iv) from (iii)

Therefore, 17y = 1700

y=170017=100$y = \frac{1700}{17} = 100$

y = 100

Substituting the value of y in (i), we get

8x+ 9 x 100= 1860

Therefore, 8x=1860-900

8x = 960

x=9608=120$x = \frac{960}{8} = 120$

x = 120

Therefore, Susan invested Rs. 120 in the scheme A and Rs. 100 in the scheme B.

**Q9) The coach of a cricket team buys 7 bats and 6 balls for Rs 3800. Later, she buys 3 bats and 5 balls for Rs 1750. Find the cost of each bat and each ball.**



**Soln:**

Let cost of each bat =Rs x

And, Cost of each ball = Rs y

Given that coach of a cricket team buys 7 bats and 6 balls for Rs 3800.

So that $7x + 6y = 3800$

$6y = 3800 - 7x$

Divide by 6 we get

$y = (3800 – 7x) /6$ … (1)

Given that she buys 3 bats and 5 balls for Rs 1750.so that

$3x + 5y = 1750$

Plug the value of y

$3x + 5 ((3800 – 7x) /6) = 1750$

Multiply by 6 we get

$18 x + 19000 – 35 x = 10500$

$-17x = 10500 – 19000$

$-17x = -8500$

$x = – 8500 / – 17$

$x = 500$

Put this value in equation first we get

$y = (3800 – 7 * 500) / 6$

$y = 300/6$

$y = 50$

Hence cost of each bat = Rs 500 and cost of each balls is Rs 50

**Q10) A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid Rs 27 for a book kept for seven days, while Susy paid Rs 21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.**

**Soln:**

Let the fixed charge for first three days and each day charge thereafter be Rs *x* and Rs *y* respectively. According to the question,

$x + 4y = 27$ … (i)

$x + 2y = 21$ … (ii)
Subtracting equation (ii) from equation (i), we get
$2y = 6$
$y = 3$ … (iii)
Putting in equation (i), we get
$x + 12 = 27$
$x = 15$
Hence, fixed charge = Rs 15 and Charge per day = Rs 3.

**Q11) The cost of 4 pens and 4 pencil 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.**

**Soln:**

Let price of pens be = Rs. x
let price of pencil boxes =Rs. y
4x + 4y = 100 —— 1
3x- y=15 ——- 2
so using (1) and (2)

4x+4y=100

4{3x-y=15}

So equation becomes

4x+4y=100

12x-4y=60

It becomes

16x=160

x= Rs. 10

Substituting this value in (1)

40+4y=100

So, y = Rs. 15

**LEVEL 2**

**Q12 One says, "Give me a hundred, friend! I shall be twice as rich as you." The other replies, "If you give me ten, I shall be six times as rich as you,". Tell me the amount of their respective capital.**

**Soln:**

Suppose two friends were having Rs $x$ and $y$ with them.
as per condition given in the question, we obtain
$x + 100 = 2(y - 100)$
$x + 100 = 2y - 200$
$x - 2y = -300$ (*i*)
and $6(x - 10) = (y + 10)$
$6x - 60 = y + 10$
$6x - y = 70$ (*ii*)
Multiplying equation (*ii*) by 2, we obtain
$12x - 2y = 140$ (*iii*)
Subtracting equation (*i*) from equation (*iii*), we obtain
$11x = 140 + 300$
$11x = 440$
$x = 40$
Using this in equation (*i*), we obtain
$40 - 2y = -300$
$40 + 300 = 2y$
$2y = 340$
$y = 170$
Therefore, those friends had Rs 40 and Rs 170 with them respectively.

**Q13) A and B have a certain number of mangoes. A says to B "If you give 30 of your mangoes I will have twice as many left with you." B replies, " If you give me 10, I will have thrice as many as left with you. How many mangoes does each have?**

**Soln:**

Assume A has x mangoes and B has y mangoes.
(x+30) = 2(y-30)…….. (Eq. 1)
à x=2y-90
3(x-10) = (y+10)…….. (Eq. 2)

à 3x = y+40
à 3(2y-90) = y+40 (using x from Eq. 1)
à 6y-y=310
à y=62
So, x=124-90=34
Answer: A has 34 mangoes and B has 62 mangoes.

**Q14) Vijay had some bananas and he divided them into 2 lots A and B. He sold the first lot Rs 2 for 3 bananas and the 2nd lot Rs 1 per banana and got a total of Rs 400. If he had sold the first lot Rs 1 per banana and the 2nd lot Rs 4 for 5 bananas, his total collection would have been Rs 460. Find the total no. of bananas he had?**

**Soln:**

Let the number of bananas in lot A be x and in lot B be y.

Condition I:

In lot A, cost of 3 bananas = Rs. 2

Therefore, In lot A, cost of x bananas =Rs. x× 23 =Rs 2x3 $x \times \frac{2}{3} = Rs \frac{2x}{3}$

In lot B, cost of 1 banana =Re. 1

Therefore, In lot B, cost of y bananas = Rs. y

Total cost of lot A and lot B = Rs. 400

Therefore, 2x3 +y=400 $\frac{2x}{3} + y = 400$

Therefore, 2x+3y = 1200 …(1)

Condition II:

In lot A, cost of 1 banana = Rs. 1

Therefore, In lot A, cost of x bananas = Rs. x

In lot B, cost of 5 bananas = Rs. 4

Therefore, In lot B, cost of y bananas = Rs. y× 45 =Rs. 4y5 $y \times \frac{4}{5} = Rs. \frac{4y}{5}$

Total cost of lot A and lot B = Rs. 460

Therefore, x+ 45 y=460 $x + \frac{4}{5}y = 460$

Therefore, 5x + 4y = 2300 …(2)

Multiplying equation (1) by 5, we get

10x +15 y = 6000 …(3)

Multiplying equation (2) by 2, we get

10x + 8y = 4600 …(4)

Subtracting eq. (3) from eq. (4)

We get, -7y = -1400

Therefore, y= 14007 =200 $y = \frac{1400}{7} = 200$

Substituting the value of y in (1), we get

2x + 3 x 200 = 1200

Therefore, 2x = 1200 – 600

à x= 6002 =300 $x = \frac{600}{2} = 300$

Number of bananas in lot A = 300

Number of bananas in lot B = 200

Therefore, total number of bananas = 300 + 200 = 500

**Q15) On selling a T.V. at 5% gain and a fridge at 10% gain shop keeper gain Rs. 2000 but if he sells the T.V. at 10% gain in the fridge at 5% loss. He gains Rs. 1500 on the transaction. Find the actual price of T.V. and fridge.**

**Soln:**

To solve these questions, you can form simultaneous equations:
First let price of T.V. be x and that of the fridge be y
5% gain on chair= 5/100x= 0.05x
10% gain on fridge= 10/100y =0.1y
Therefore 0.05x + 0.1 y = 2000(total profit)…..first equation(hence 5x+10y=200000)

10% gain on T.V. = 10/100x =0.1x
5%loss on fridge= -5/100y =-0.05y

Therefore 0.1x – 0.05y = 1500……our second equation (hence, 5y= 10x-150000…y = (10x-150000)/5….y=2x-30000
solve by substitution: y= 2x-30000
5x+10y=200000
5x + 10(2x-30000)=200000
5x + 20x -300000= 200000
25x = 500000
x = 20000
y = 2x-30000
=2(20000)-30000 =40000-30000
=10000

Therefore, the price of the T.V. = Rs. 20,000
price of the fridge= Rs. 10,000

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.7

**Q.1: The sum of two numbers is 8. If their sum is four times their difference, find the numbers.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The sum of the two numbers is 8. Thus, we have $x+y = 8$

The sum of the two numbers is four times their difference. Thus, we have

$x+y = 4(x— y)$

$=>x+y= 4x-4y$

$=>4x — 4y—x—y = 0$

$=> 3x-5y = 0$

So, we have two equations

$x+y=8$

$3x-5y = 0$

Here x and y are unknowns.

We have to solve the above equations for x and y.

Multiplying the first equation by 5 and then adding with the second equation, we have

$5(x + y)+(3x — 5y) = 5\times8+0$

$=>5x+5y+3x-5y =40$

$=>8x = 40$

$=> x = 5$

x = Substituting the value of x in the first equation, we have

$5+y=8$

$=>y=8-5$

$=>y=3$

Hence, the numbers are 5 and 3.

**Q. 2: The sum of digits of a two digit number is 13. If the number is subtracted from the one obtained by interchanging the digits, the result is 45. What is the number?**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The sum of the digits of the number is 13. Thus, we have x+y =13

After interchanging the digits, the number becomes10x+y.

The difference between the number obtained by interchanging the digits and the original number is 45. Thus, we have

(10x + y) — (10y + x)= 45

=> 110x+y-10y—x= 45

=> 9x-9y=45

=> 9(x – y) = 45

=>.x-y=5

So, we have two equations

x+y=13

x- y =5

Here x and y are unknowns. We have to solve the above equations for x and y.

Adding the two equations, we have

(x+y)+(x—y)=13+5

=>x+y+x-y=18

=> 2x=18

=> x= 9

Substituting the value of x in the first equation, we have

9+y = 13

=> y = 13 – 9

=> y = 4

Hence, the number is 10 x 4 + 9 = 49

**Q.3: A number consists of two digits whose sum is five. When the digits are reversed, the number becomes greater by nine. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The sum of the digits of the number is 5. Thus, we have $x+ y = 5$

After interchanging the digits, the number becomes $10x+ y$.

The number obtained by interchanging the digits is greater by 9 from the original number. Thus, we have

$10x+ y =10y + x +9$

$\Rightarrow 10x + y – 10y – x = 9$

$\Rightarrow 9x – 9y = 9$

$\Rightarrow 9(x – y) = 9$

$\Rightarrow x – y = 1$

So, we have two equations

$x +y=5$

$x-y=1$

Here x and y are unknowns. We have to solve the above equations for x and y.

Adding the two equations, we have

$(x + y)+(x – y) = 5+1$

$\Rightarrow x + y + x – y = 5+1$

$\Rightarrow 2x = 6$

$\Rightarrow x = 6/2$

$\Rightarrow x = 3$

Substituting the value of x in the first equation, we have

$3 + y = 5$

$\Rightarrow y = 5-3$

$\Rightarrow y = 2$

Hence, the number is $10 \times 2 + 3 = 23$

**Q.4: The sum of digits of a two digit number is 15. The number obtained by reversing the order of digits of the given number exceeds the given number by 9. Find the given number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The sum of the digits of the number is 15. Thus, we have x+ y = 15

After interchanging the digits, the number becomes 10x + y.

The number obtained by interchanging the digits is exceeding by 9 from the original number. Thus, we have

10x+y=10y+x+ 9

=> 10x + y – 10y –x = 9

=>9x- 9y = 9

=>9(x -y) = 9

=> x-y = 9/9

=>x-y = I

So, we have two equations

x+y =15

x-y = I

Here x and y are unknowns. We have to solve the above equations for x and y. Adding the two equations, we have

(x+ y)+(x – y)=15+1

=>x+y+x-y=16

=>2x = 16

=> x = 16/2

=> x = 8

Substituting the value of x in the first equation, we have

8+ y = 5

=> y = 15-8

=> y = 7

Hence, the number is 10 x 7 + 8 = 78

**Q.5: 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?**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The two digits of the number are differing by 2. Thus, we have x-y=±2

After interchanging the digits, the number becomes 10x + y.

The sum of the numbers obtained by interchanging the digits and the original number is 66. Thus, we have

(10x+ y)+(10y+x)=66

=> 10x+y+10y+x = 66

=> 11x +11y= 66

=> 11(x + y) = 66

=> x + y = 66/11

=> x + y = 6

So, we have two systems of simultaneous equations

x-y = 2,

x +y = 6

x – y = -2,

x + y = 6

Here x and y are unknowns. We have to solve the above systems of equations for x and y.

**(i)** First, we solve the system

x-y= 2,

x+y=6

Adding the two equations, we have

(x— y)+(x + y) = 2+6

=>x-y+x+y=8

=>2x =8

=> x = 8/2

=> x = 4

Substituting the value of x in the first equation, we have

4-y=2

=>y=4-2

=> y=2

Hence, the number is 10 x 2 +4 = 24

**(ii)** Now, we solve the system

x-y= -2,

x+y=6

Adding the two equations, we have

(x – y)+(x + y)= -2 + 6

=>x-y+x+y=4

=> 2x =4

=> x = 4/2

=> x=2

Substituting the value of x in the first equation, we have

2-y = -2

=> y=2+2

=> y=4

Hence, the number is 10×4+ 2 = 42

There are two such numbers.

**6. The sum of two numbers is 1000 and the difference between their square is 256000. Find the numbers.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The sum of the two numbers is 1000. Thus, we have x+y = 1000

The difference between the squares of the two numbers is 256000. Thus, we have

$x^2 – y^2$ = 256000

=>(x+y)(x-y)= 256000



=>1000(x-y)= 256000

=> x-y = 256000/1000

=>x-y =256

So, we have two equations

x+y =1000

x- y= 256

Here x and y are unknowns. We have to solve the above equations for x and y. Adding the two equations, we have

(x+ y)+(x- y)=1000 + 256

=>x+y+x-y =1256

=> 2x=1256

=> x= 1256/ 2

x=628

Substituting the value of x in the first equation.we have

628+y =1000

=> y= 1000-628

=>y = 372

Hence, the numbers are 628 and 372

**7. The sum of a two digit number and the number obtained by reversing the order of its digits is 99.If the digits differ by 3, find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y + x.

The two digits of the number are differing by 3. Thus, we have x —y = ±3

After interchanging the digits, the number becomes 10x + y.

The sum of the numbers obtained by interchanging the digits and the original number is 99. Thus, we have

(10x+y)+(I0y+x)= 99

=> 10x+y+10y+x = 99

=>11x+11y = 99

=> 11(x + y)= 99



=>x+y = 99/11

=>x = 9

So, we have two systems of simultaneous equations

x-y= 3,

x+y = 9

x-y = -3,

x+y=9

Adding the two equations, we have

(x – y)+(x + y)= 3 + 9

=>x–y+x+y=12

=> 2x =12

=> x= 12/2

=>x =6

Substituting the value of x in the first equation, we have

6–y=3

=>y= 6-3

=> y=3

Hence, the number is 10×3+ 6 =36

(ii) Now, we solve the system

x –y = –3,

x+y=9

Adding the two equations we have

(x – y)+(x + y)= –3 +9

=> x–y+x+y= 6

=> 2x = 6

=>x=3

Substituting the value of x in the first equation, we have

3-y = -3

=>y=3+3

=>y=6

Hence, the number is 10×6+3=63

Note that there are two such numbers.

**8. A two- digit number is 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The number is 4 times the sum of the two digits. Thus, we have

10y+x = 4(x + y)

=>10y+x = 4x+ 4y

=> 4x +4y -10y -x =0

=> 3x-6y = 0

=> 3(x — 2y) = 0

=>x-2y=0

After interchanging the digits, the number becomes10x+y.

If 18 is added to the number, the digits are reversed. Thus, we have

(10y+x)+18=10x+y

=>10x+y-10y-x=18

=> 9x-9y =18

=> 9(x -y)=18

=>x-y= 18/9

=>x-y =2

So, we have the systems of equations

x- 2y =0,

x-y=2

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Subtracting the first equation from the second, we have

(x- y)- (x – 2y) = 2-0

=> x-y-x+ 2y =2

=> y=2

Substituting the value of y in the first equation, we have

x-2×2=0

=> x-4=0

=> x = 4

Hence, the number is 10x 2 +4 = 24

**9. A two-digit number is 3 more than 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y + x.

The number is 3 more than 4 times the sum of the two digits. Thus, we have

10y+x=4(x+y)+3

=>10y+x=4x+4y+3

=> 4x+4y-10y-x=-3

=> 3x – 6y = -3

=> 3(x – 2y) = -3

=>x-2y= -3/3

=>x-2y= -1

Alter interchanging the digits, the number becomes10x+ y.

If 18 is added to the number, the digits are reversed. Thus, we have

(10y+x)+18 =10x+y

=>10x+y-10y-x =18

=>9x-9y =18

=> 9(x — y) =18

=> x-y=18/9

=> x-y= 2

So, we have the systems of equations x-2y=-1,

x-y= 2

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Subtracting the first equation from the second, we have

(x- y)-(x-2y) = 2 – (-1)

=> x- y-x+2y =3

=> y=3

Substituting the value of y in the first equation, we have

x-2×3=-1

=>x-6=-1

=> x=-1+6

=> x =5

Hence the number is 10 x3 + 5 = 35

**10. A two-digit number is 4 more than 6 times the sum of its digits. If 18 is subtracted from the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The number is 4 more than 6 times the sum of the two digits. Thus, we have

10y+ x = 6(x + y)+ 4

=> 10y+x=6x+6y+4

=> 6x +6y -10y – x = -4

=> 5x-4y = -4

After interchanging the digits, the number becomes 10x + y.

If 18 is subtracted from the number, the digits are reversed. Thus, we have

(10y+x)-18=10x+y

=> 10x+y-10y-x=-18

=> 9x-9y=-18

=> 9(x -y)= -18

=>x-y = -18/9

=>x-y = -2

So, we have the systems of equations

$5x – 4y = -4$,

$x – y = -2$

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Multiplying the second equation by 5 and then subtracting from the first, we have

$(5x – 4y)- (5x -5y) = -4 – (-2 x 5)$

$\Rightarrow 5x – 4y – 5x + 5y= -4 +10$

$\Rightarrow y = 6$

Substituting the value of y in the second equation, we have

$x-6 = -2$

$\Rightarrow x = 6 – 2$

$\Rightarrow x = 4$

Hence, the number is $10 x 6 + 4 = 64$

**11. A two-digit number is 4 times the sum of its digits and twice the product of the digits. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is $10y + x$.

The number is 4 times the sum of the two digits. Thus, we have

$10y+ x = 4(x + y)$

$\Rightarrow 10y + x = 4x + 4y$

$\Rightarrow 4x +4y -10y – x = 0$

$\Rightarrow 3x – 6y = 0$

$3(x – 2y) = 0$

$\Rightarrow x – 2y = 0$

$\Rightarrow x = 2y$

After interchanging the digits, the number becomes $10x + y$.

The number is twice the product of the digits. Thus, we have I0y+x = 2xy

So, we have the systems of equations

$x = 2y$

$10y + x = 2xy$

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Substituting x = 2y in the second equation, we get

10y+2y=2x2yxy

=>$12y = 4y^2$

=> $4y^2 -12y = 0$

=> $4y(y -3) = 0$

=>y(y — 3) = 0

=> y=0 or y=3

Substituting the value of y in the first equation, we have

| | | |
|---|---|---|
| y | 0 | 3 |
| x | 0 | 6 |

Hence, the number is 10 x 3 +6 = 36

Note that the first pair of solution does not give a two digit number

**12. A two-digit number is such that the product of its digits is 20. If 9 is added to the number, the digits interchange their places. Find the number.**

**Soln:**Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+ x.

The product of the two digits of the number is 20. Thus, we have xy = 20

After interchanging the digits, the number becomes 10x+ y

If 9 is added to the number, the digits interchange their places. Thus, we have

(10y + x)+ 9 =10x + y

=>10y+x+9=10x+y

=> 10x+y-10y-x = 9

=> 9x- 9y = 9

=> 9(x – y) = 9

=> x-y = 9/9

=> x-y=1

So, we have the systems of equations

xy = 20,

x-y=1

Here x and y are unknowns. We have to solve the above systems of equations for x and y.

Substituting x = I + y from the second equation to the first equation, we get

(1+ y) y = 20

=> y +$y^2$ = 20

=> $y^2$+y-20=0

=> $y^2$ +5y-4y -20 = 0

=>y(y + 5)- 4(y + 5) = 0

=>(y+5) (y-4)= 0

=> y=-5 or y=4

Substituting the value of y in the second equation, we have

| | | |
|---|---|---|
| y | -5 | 4 |
| x | -4 | 5 |

Hence, the number is 10 x 4 +5 = 45

Note that in the first pair of solution the values of x and y are both negative. But the digits of the number can't be negative. So, we must remove this pair.

**13. The difference between two numbers is 26 and one number is three times the other. Find them.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The difference between the two numbers is 26. Thus, we have x -y = 26

One of the two numbers is three times the other number. Here, we are assuming that x is greater than or equal to y. Thus, we have x = 3y

So, we have two equations



x-y = 26

$x = 3y$

Here x and y are unknowns. We have to solve the above equations for x and y.

Substituting $x = 3y$ from the second equation in the first equation, we get

$3y – y = 26$

$\Rightarrow 2y = 26$

$\Rightarrow y = 13$

Substituting the value of y in the first equation, we have

$x-13 =26$

$\Rightarrow x=13+ 26$

$\Rightarrow x = 39$

Hence.the numbers are 39 and 13.

**14. The sum of the 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.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively Thus, the number is $10y+x$.

The sum of the two digits of the number is 9.

Thus, we have $x + y = 9$

After interchanging the digits, the number becomes $10x + y$.

Also, 9 times the number is equal to twice the number obtained by reversing the order of the digits. Thus, we have

$9(10y+ x) = 2(10x + y)$

$\Rightarrow 90y+ 9x = 20x + 2y$

$\Rightarrow 20x + 2y – 90y – 9x = 0$

$\Rightarrow 11x -88y = 0$

$\Rightarrow 11(x -8y) = 0$

$\Rightarrow x-8y=0$

So, we have the systems of equations

$x+ y = 9$

$x - 8y = 0$

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Substituting x = 8y from the second equation to the first equation, we get

$8y + y = 9$

$\Rightarrow 9y = 9$

$\Rightarrow y = 9/9$

$\Rightarrow y = 1$

Substituting the value of y in the second equation, we have

$x-8\times1=0$

$\Rightarrow x-8 = 0$

$\Rightarrow x = 8$

Hence, the number is 10 x 1 +8 = 18

**15. Seven times a two-digit number is equal to four times the number obtained by reversing the digits. If the difference between the digits is 3. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The difference between the two digits of the number is 3. Thus, we have $x-y = \pm3$

After interchanging the digits, the number becomes 10x + y.

Seven times the number is equal to four times the number obtained by reversing the order of the digits. Thus, we have

$7(10y + x) = 4(10x+ y)$

$\Rightarrow 70y + 7x = 40x + 4y$

$\Rightarrow 40x + 4y - 70y-7x = 0$

$\Rightarrow 33x - 66y = 0$

$\Rightarrow 33(x - 2y) = 0$

$\Rightarrow x - 2y = 0$

So, we have two systems of simultaneous equations

$x - y = 3,$



$x-2y=0$

$x - y = -3$,

$x - 2y = 0$

Here x and y are unknowns. We have to solve the above systems of equations for x and y.

(i) First, we solve the system

$x - y = 3$,

$x - 2y = 0$

Multiplying the first equation by 2 and then subtracting from the second equation, we have

$(x - 2y) - 2(x - y) = 0 - 2 \times 3$

$\Rightarrow x - 2y - 2x + 2y = -6$

$\Rightarrow -x = -6$

$\Rightarrow x = 6$

Substituting the value of x in the first equation, we have

$6 - y = 3$

$\Rightarrow y = 6 - 3$

$\Rightarrow y = 3$

Hence, the number is $10 \times 3 + 6 = 36$

(ii) Now, we solve the system

$x - y = -3$,

$x - 2y = 0$

Multiplying the first equation by 2 and then subtracting from the second equation we have

$(x - 2y) - 2(x - y) = 0 - (-3 \times 2)$

$\Rightarrow x - 2y - 2x + 2y = 6$

$\Rightarrow -x = 6$

$\Rightarrow x = -6$

Substituting the value of x in the first equation, we have

$-6 - y = -3$

$\Rightarrow y = -6 + 3$

$\Rightarrow y = -3$

But, the digits of the number can't be negative. Hence, the second case must be removed.

**16. 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.**

**Soln:** Let the numbers be 5x and 6x

Now subtracting 8 we get the numbers as

5x – 8 and 6x– 8

Thus, (5x – 8)/ (6x – 8) = 4: 5

By cross multiplying we get,

5(5x – 8) = 4(6x – 8)

=> 25x – 40 = 24x – 32

=> x = 8

Hence, the numbers are

5x = 5 x 8 = 40

6x = 6 x 8 = 48

**17. A two-digit number is obtained by either multiplying the sum of the digits by 8 and then subtracting 5 or by multiplying the difference of the digits by 16 and then adding 3. Find the number.**

**Soln:** Let the unit digit and ten's digit of the number be x and y respectively.

Therefore the number = 10y + x

Sum of digits = x + y

10y +x = 8(x + y) – 5

10y + x = 8x + 8y – 5

7x – 2y = 5……(1)

Difference of the digits = y – x [if x < y]

10y + x = 16(y – x) + 3

10y + x = 16y – 16x +3

17x – 6y = 3……(2)

Multiply equation (1) and (2) and subtracting equation (2)

$21x – 6y = 15$

$17x – 6y = 3$

$4x = 12$

$x = 12/4 = 3$

Putting the value of $x = 3$ in equation (1)

$7 \times 3 – 2y = 5$

$2y = 21 – 5$

$2y = 16$

$y = 16/2 = 8$

Thus the unit digit of the number is 3 and ten's digit is 8.

Therefore the number is 83.

## Exercise 3.7

**Q.1: The sum of two numbers is 8. If their sum is four times their difference, find the numbers.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The sum of the two numbers is 8. Thus, we have $x+y = 8$

The sum of the two numbers is four times their difference. Thus, we have

$x+y = 4(x— y)$

$=>x+y= 4x-4y$

$=>4x — 4y—x—y = 0$

$=> 3x-5y = 0$

So, we have two equations

$x+y=8$

$3x-5y = 0$

Here x and y are unknowns.

We have to solve the above equations for x and y.

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Multiplying the first equation by 5 and then adding with the second equation, we have

$5(x + y)+(3x — 5y) = 5\times8+0$

$=>5x+5y+3x-5y =40$

$=>8x = 40$

$=> x = 5$

x = Substituting the value of x in the first equation, we have

$5+y=8$

$=>y=8-5$

$=>y=3$

Hence, the numbers are 5 and 3.

**Q. 2: The sum of digits of a two digit number is 13. If the number is subtracted from the one obtained by interchanging the digits, the result is 45. What is the number?**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is $10y+x$.

The sum of the digits of the number is 13. Thus, we have $x+y =13$

After interchanging the digits, the number becomes$10x+y$.

The difference between the number obtained by interchanging the digits and the original number is 45. Thus, we have

$(10x + y) — (10y + x)= 45$

$=> 110x+y-10y—x= 45$

$=> 9x-9y=45$

$=> 9(x – y) = 45$

$=>.x-y=5$

So, we have two equations

$x+y=13$

$x- y =5$

Here x and y are unknowns. We have to solve the above equations for x and y.

Adding the two equations, we have

$(x+y)+(x—y)=13+5$

$=>x+y+x-y=18$

$=> 2x=18$

$=> x= 9$

Substituting the value of x in the first equation, we have

$9+y = 13$

$=> y = 13 – 9$

$=> y = 4$

Hence, the number is $10 \times 4 + 9 = 49$

**Q.3: A number consists of two digits whose sum is five. When the digits are reversed, the number becomes greater by nine. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is $10y+x$.

The sum of the digits of the number is 5. Thus, we have $x+ y = 5$

After interchanging the digits, the number becomes $10x+ y$.

The number obtained by interchanging the digits is greater by 9 from the original number. Thus, we have

$10x+ y =10y + x +9$

$=> 10x + y – 10y – x = 9$

$=> 9x – 9y = 9$

$=> 9(x – y) = 9$

$=> x – y = 1$

So, we have two equations

$x +y=5$

$x-y=1$

Here x and y are unknowns. We have to solve the above equations for x and y.

Adding the two equations, we have

$(x + y)+(x – y) = 5+1$

=> x + y + x – y = 5+1

=> 2x = 6

=> x = 6/2

=> x = 3

Substituting the value of x in the first equation, we have

3 + y = 5

=> y = 5-3

=> y = 2

Hence, the number is 10 x 2 + 3 = 23

**Q.4: The sum of digits of a two digit number is 15. The number obtained by reversing the order of digits of the given number exceeds the given number by 9. Find the given number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The sum of the digits of the number is 15. Thus, we have x+ y = 15

After interchanging the digits, the number becomes 10x + y.

The number obtained by interchanging the digits is exceeding by 9 from the original number. Thus, we have

10x+y=10y+x+ 9

=> 10x + y – 10y –x = 9

=>9x- 9y = 9

=>9(x -y) = 9

=> x-y = 9/9

=>x-y = I

So, we have two equations

x+y =15

x-y = I

Here x and y are unknowns. We have to solve the above equations for x and y. Adding the two equations, we have

$(x+y)+(x-y)=15+1$

$\Rightarrow x+y+x-y=16$

$\Rightarrow 2x = 16$

$\Rightarrow x = 16/2$

$\Rightarrow x = 8$

Substituting the value of x in the first equation, we have

$8+y = 5$

$\Rightarrow y = 15-8$

$\Rightarrow y = 7$

Hence, the number is $10 \times 7 + 8 = 78$

**Q.5: 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?**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is $10y+x$.

The two digits of the number are differing by 2. Thus, we have $x-y=\pm 2$

After interchanging the digits, the number becomes $10x + y$.

The sum of the numbers obtained by interchanging the digits and the original number is 66. Thus, we have

$(10x+y)+(10y+x)=66$

$\Rightarrow 10x+y+10y+x = 66$

$\Rightarrow 11x+11y= 66$

$\Rightarrow 11(x + y) = 66$

$\Rightarrow x + y = 66/11$

$\Rightarrow x + y = 6$

So, we have two systems of simultaneous equations

$x-y = 2,$

$x+y = 6$

$x-y = -2,$

x + y = 6

Here x and y are unknowns. We have to solve the above systems of equations for x and y.

**(i)** First, we solve the system

x-y= 2,

x+y=6

Adding the two equations, we have

(x— y)+(x + y) = 2+6

=>x-y+x+y=8

=>2x =8

=> x = 8/2

=> x = 4

Substituting the value of x in the first equation, we have

4-y=2

=>y=4-2

=> y=2

Hence, the number is 10 x 2 +4 = 24

**(ii)** Now, we solve the system

x-y= -2,

x+y=6

Adding the two equations, we have

(x – y)+(x + y)= -2 + 6

=>x-y+x+y=4

=> 2x =4

=> x = 4/2

=> x=2

Substituting the value of x in the first equation, we have

2-y = -2

=> y=2+2

=> y=4

Hence, the number is 10×4+ 2 = 42

There are two such numbers.

**6. The sum of two numbers is 1000 and the difference between their square is 256000. Find the numbers.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The sum of the two numbers is 1000. Thus, we have x+y = 1000

The difference between the squares of the two numbers is 256000. Thus, we have

$x^2 - y^2 = 256000$

=>(x+y)(x-y)= 256000

=>1000(x-y)= 256000

=> x-y = 256000/1000

=>x-y =256

So, we have two equations

x+y =1000

x- y= 256

Here x and y are unknowns. We have to solve the above equations for x and y. Adding the two equations, we have

(x+ y)+(x- y)=1000 + 256

=>x+y+x-y =1256

=> 2x=1256

=> x= 1256/ 2

x=628

Substituting the value of x in the first equation.we have

628+y =1000

=> y= 1000-628

=>y = 372

Hence, the numbers are 628 and 372

**7. The sum of a two digit number and the number obtained by reversing the order of its digits is 99.If the digits differ by 3, find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y + x.

The two digits of the number are differing by 3. Thus, we have x —y = ±3

After interchanging the digits, the number becomes 10x + y.

The sum of the numbers obtained by interchanging the digits and the original number is 99. Thus, we have

(10x+y)+(I0y+x)= 99

=> 10x+y+10y+x = 99

=>11x+11y = 99

=> 11(x + y)= 99

=>x+y = 99/11

=>x = 9

So, we have two systems of simultaneous equations

x-y= 3,

x+y = 9

x-y = -3,

x+y=9

Adding the two equations, we have

(x – y)+(x + y)= 3 + 9

=>x–y+x+y=12

=> 2x =12

=> x= 12/2

=>x =6

Substituting the value of x in the first equation, we have

6–y=3

=>y= 6-3

=> y=3

Hence, the number is 10×3+ 6 =36

(ii) Now, we solve the system

x –y = –3,

x+y=9

Adding the two equations we have

(x – y)+(x + y)= –3 +9

=> x–y+x+y= 6

=> 2x = 6

=>x=3

Substituting the value of x in the first equation, we have

3-y = -3

=>y=3+3

=>y=6

Hence, the number is 10×6+3=63

Note that there are two such numbers.

**8. A two- digit number is 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The number is 4 times the sum of the two digits. Thus, we have

10y+x = 4(x + y)

=>10y+x = 4x+ 4y

=> 4x +4y -10y -x =0

=> 3x-6y = 0

=> 3(x — 2y) = 0

=>x-2y=0

After interchanging the digits, the number becomes10x+y.

If 18 is added to the number, the digits are reversed. Thus, we have

(10y+x)+18=10x+y

=>10x+y-10y-x=18

=> 9x-9y =18

=> 9(x -y)=18

=>x-y= 18/9

=>x-y =2

So, we have the systems of equations

x- 2y =0,

x-y=2

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Subtracting the first equation from the second, we have

(x- y)- (x – 2y) = 2-0

=> x-y-x+ 2y =2

=> y=2

Substituting the value of y in the first equation, we have

x-2×2=0

=> x-4=0

=> x = 4

Hence, the number is 10x 2 +4 = 24

**9. A two-digit number is 3 more than 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y + x.

The number is 3 more than 4 times the sum of the two digits. Thus, we have

10y+x=4(x+y)+3

=>10y+x=4x+4y+3

=> 4x+4y-10y-x=-3

=> 3x – 6y = -3

=> 3(x – 2y) = -3

=>x-2y= -3/3

=>x-2y= -1

Alter interchanging the digits, the number becomes10x+ y.

If 18 is added to the number, the digits are reversed. Thus, we have

(10y+x)+18 =10x+y

=>10x+y-10y-x =18

=>9x-9y =18

=> 9(x — y) =18

=> x-y=18/9

=> x-y= 2

So, we have the systems of equations x-2y=-1,

x-y= 2

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Subtracting the first equation from the second, we have

(x- y)-(x-2y) = 2 – (-1)

=> x- y-x+2y =3

=> y=3

Substituting the value of y in the first equation, we have

x-2×3=-1

=>x-6=-1

=> x=-1+6

=> x =5

Hence the number is 10 x3 + 5 = 35

**10. A two-digit number is 4 more than 6 times the sum of its digits. If 18 is subtracted from the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The number is 4 more than 6 times the sum of the two digits. Thus, we have

$10y+ x = 6(x + y)+ 4$

$\Rightarrow 10y+x=6x+6y+4$

$\Rightarrow 6x +6y -10y – x = -4$

$\Rightarrow 5x-4y = -4$

After interchanging the digits, the number becomes 10x + y.

If 18 is subtracted from the number, the digits are reversed. Thus, we have

$(10y+x)-18=10x+y$

$\Rightarrow 10x+y-10y-x=-18$

$\Rightarrow 9x-9y=-18$

$\Rightarrow 9(x -y)= -18$

$\Rightarrow x-y = -18/9$

$\Rightarrow x-y = -2$

So, we have the systems of equations

$5x – 4y = -4,$

$x – y = -2$

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Multiplying the second equation by 5 and then subtracting from the first, we have

$(5x – 4y)- (5x -5y) = -4 – (-2 \times 5)$

$\Rightarrow 5x – 4y – 5x + 5y= -4 +10$

$\Rightarrow y = 6$

Substituting the value of y in the second equation, we have

$x-6 = -2$

$\Rightarrow x = 6 – 2$

$\Rightarrow x = 4$

Hence, the number is $10 \times 6 + 4 = 64$

**11. A two-digit number is 4 times the sum of its digits and twice the product of the digits. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y + x.

The number is 4 times the sum of the two digits. Thus, we have

10y+ x = 4(x + y)

=> 10y + x = 4x + 4y

=> 4x +4y -10y – x = 0

=> 3x – 6y = 0

3(x – 2y) = 0

=> x – 2y = 0

=> x = 2y

After interchanging the digits, the number becomes 10x + y.

The number is twice the product of the digits. Thus, we have I0y+x = 2xy

So, we have the systems of equations

x = 2y,

10y + x = 2xy

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Substituting x = 2y in the second equation, we get

10y+2y=2x2yxy

=>12y = $4y^2$

=> $4y^2$ -12y = 0

=> 4y(y -3) = 0

=>y(y — 3) = 0

=> y=0 or y=3

Substituting the value of y in the first equation, we have

| | | |
|---|---|---|
| y | 0 | 3 |
| x | 0 | 6 |

Hence, the number is 10 x 3 +6 = 36

Note that the first pair of solution does not give a two digit number

**12. A two-digit number is such that the product of its digits is 20. If 9 is added to the number, the digits interchange their places. Find the number.**

**Soln:**Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+ x.

The product of the two digits of the number is 20. Thus, we have xy = 20

After interchanging the digits, the number becomes 10x+ y

If 9 is added to the number, the digits interchange their places. Thus, we have

(10y + x)+ 9 =10x + y

=>10y+x+9=10x+y

=> 10x+y-10y-x = 9

=> 9x- 9y = 9

=> 9(x – y) = 9

=> x-y = 9/9

=> x-y=1

So, we have the systems of equations

xy = 20,

x-y=1

Here x and y are unknowns. We have to solve the above systems of equations for x and y.

Substituting x = I + y from the second equation to the first equation, we get

(1+ y) y = 20

=> y +$y^2$ = 20

=> $y^2$+y-20=0

=> $y^2$ +5y-4y -20 = 0

=>y(y + 5)- 4(y + 5) = 0

=>(y+5) (y-4)= 0

=> y=-5 or y=4

Substituting the value of y in the second equation, we have

| | | |
|---|---|---|
| y | -5 | 4 |
| x | -4 | 5 |

Hence, the number is 10 x 4 +5 = 45

Note that in the first pair of solution the values of x and y are both negative. But the digits of the number can't be negative. So, we must remove this pair.

**13. The difference between two numbers is 26 and one number is three times the other. Find them.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The difference between the two numbers is 26. Thus, we have x -y = 26

One of the two numbers is three times the other number. Here, we are assuming that x is greater than or equal to y. Thus, we have x = 3y

So, we have two equations

x-y = 26

x = 3y

Here x and y are unknowns. We have to solve the above equations for x and y.

Substituting x = 3y from the second equation in the first equation, we get

3y – y = 26

=> 2y = 26

=> y = 13

Substituting the value of y in the first equation, we have

x-13 =26

=> x=13+ 26

=> x = 39

Hence.the numbers are 39 and 13.

**14. The sum of the 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.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively Thus, the number is 10y+x.

The sum of the two digits of the number is 9.

Thus, we have $x + y = 9$

After interchanging the digits, the number becomes $10x + y$.

Also, 9 times the number is equal to twice the number obtained by reversing the order of the digits. Thus, we have

$9(10y+ x) = 2(10x + y)$

$\Rightarrow 90y+ 9x = 20x + 2y$

$\Rightarrow 20x + 2y – 90y – 9x = 0$

$\Rightarrow 11x -88y = 0$

$\Rightarrow 11(x -8y) = 0$

$\Rightarrow x-8y=0$

So, we have the systems of equations

$x+ y = 9,$

$x – 8y = 0$

Here x and y are unknowns. We have to solve the above systems of equations for x and y. Substituting $x = 8y$ from the second equation to the first equation, we get

$8y + y = 9$

$\Rightarrow 9y = 9$

$\Rightarrow y =9/9$

$\Rightarrow y = 1$

Substituting the value of y in the second equation, we have

$x-8\times1=0$

$\Rightarrow x-8 = 0$

$\Rightarrow x = 8$

Hence, the number is $10 \times 1 +8 = 18$

**15. Seven times a two-digit number is equal to four times the number obtained by reversing the digits. If the difference between the digits is 3. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is 10y+x.

The difference between the two digits of the number is 3. Thus, we have x-y = ±3

After interchanging the digits, the number becomes 10x + y.

Seven times the number is equal to four times the number obtained by reversing the order of the digits. Thus, we have

7(10y + x) = 4(10x+ y)

=> 70y + 7x = 40x + 4y

=> 40x + 4y – 70y-7x = 0

=> 33x – 66y = 0

=>33(x — 2y) = 0

=> x – 2y = 0

So, we have two systems of simultaneous equations

x – y = 3,

x-2y=0

x – y = -3,

x – 2y = 0

Here x and y are unknowns. We have to solve the above systems of equations for x and y.

(i) First, we solve the system

x – y = 3,

x – 2y = 0

Multiplying the first equation by 2 and then subtracting from the second equation, we have

(x -2y)- 2(x – y) = 0 – 2 x 3

=> x – 2y – 2x + 2y = -6

=> -x = -6

=> x =6

Substituting the value of x in the first equation, we have

6-y=3

=>y=6 – 3

=> y=3

Hence, the number is 10 x3 + 6 = 36

(ii) Now, we solve the system

x – y = -3,

x-2y=0

Multiplying the first equation by 2 and then subtracting from the second equation we have

(x -2y)- 2(x – y) = 0 – (-3 x 2)

=> x- 2y – 2x + 2y =6

=> -x = 6

=> x = -6

Substituting the value of x in the first equation, we have

-6 – y = -3

=> y = -6 + 3

=> y = -3

But, the digits of the number can't be negative. Hence, the second case must be removed.

**16. 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.**

**Soln:** Let the numbers be 5x and 6x

Now subtracting 8 we get the numbers as

5x – 8 and 6x– 8

Thus, (5x – 8)/ (6x – 8) = 4: 5

By cross multiplying we get,

5(5x – 8) = 4(6x – 8)

=> 25x – 40 = 24x – 32

=> x = 8

Hence, the numbers are

$5x = 5 \times 8 = 40$

$6x = 6 \times 8 = 48$

**17. A two-digit number is obtained by either multiplying the sum of the digits by 8 and then subtracting 5 or by multiplying the difference of the digits by 16 and then adding 3. Find the number.**

**Soln:** Let the unit digit and ten's digit of the number be x and y respectively.

Therefore the number = $10y + x$

Sum of digits = $x + y$

$10y + x = 8(x + y) - 5$

$10y + x = 8x + 8y - 5$

$7x - 2y = 5$……(1)

Difference of the digits = $y - x$ [if $x < y$]

$10y + x = 16(y - x) + 3$

$10y + x = 16y - 16x + 3$

$17x - 6y = 3$……(2)

Multiply equation (1) and (2) and subtracting equation (2)

$21x - 6y = 15$

$17x - 6y = 3$

$4x = 12$

$x = 12/4 = 3$

Putting the value of $x = 3$ in equation (1)

$7 \times 3 - 2y = 5$

$2y = 21 - 5$

$2y = 16$

$y = 16/2 = 8$

Thus the unit digit of the number is 3 and ten's digit is 8.

Therefore the number is 83.

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.8

**Q.1) The numerator of a fraction is 4 less than the denominator. If the numerator is decreased by 2 and denominator is increased by 1, then the denominator is eight times the numerator. Find the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $xy\frac{x}{y}$

The numerator of the fraction is 4 less the denominator. Thus, we have

x = y – 4

$\Rightarrow x-y=-4 \Rightarrow x-y=-4$

If the numerator is decreased by 2 and denominator is increased by 1, then the denominator is 8 times the numerator. Thus, we have

y+1 = 8(x-2)

$\Rightarrow y+1=8x-16 \Rightarrow y+1=8x-16 \quad \Rightarrow 8x-y=1+16 \Rightarrow 8x-y=1+16 \quad \Rightarrow 8x-y=17 \Rightarrow 8x-y=17$

So, we have two equations

x – y = -4

8x – y = 17

Here x and y are unknowns. We have to solve the above equations for x and y. Subtracting the second equation from the first equation, we get

(x – y) – (8x – y)= – 4 – 17

$\Rightarrow x-y-8x+y=-21 \Rightarrow x-y-8x+y=-21 \quad \Rightarrow -7x=-21 \Rightarrow -7x=-21 \quad \Rightarrow x=217 \Rightarrow x=\frac{21}{7}$

$\Rightarrow 217 \Rightarrow \frac{21}{7}$ x = 3

Substituting the value of x in the first equation, we have

3 – y = – 4

$\Rightarrow y=3+4 \Rightarrow y=3+4 \quad \Rightarrow y=7 \Rightarrow y=7$

Hence the fraction is $37\frac{3}{7}$

**Q.2) A fraction becomes $911\frac{9}{11}$ if 2 is added to both numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes $56\frac{5}{6}$. Find the fraction**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $\frac{x}{y}$

If 2 is added to both numerator and the denominator, the fraction becomes $\frac{9}{11}$. Thus, we have

$\frac{x+2}{y+2} = \frac{9}{11} \Rightarrow 11(x+2)=9(y+2) \Rightarrow 11(x+2) = 9(y+2) \Rightarrow 11x+22=9y+18$
$\Rightarrow 11x + 22 = 9y + 18 \Rightarrow 11x-9y=18-22 \Rightarrow 11x-9y = 18-22 \Rightarrow 11x-9y+4=0$
$\Rightarrow 11x-9y+4=0$

If 3 is added to both numerator and the denominator, the fraction becomes $\frac{5}{6}$

$\frac{x+3}{y+3} = \frac{5}{6} \Rightarrow 6(x+3)=5(y+3) \Rightarrow 6(x+3) = 5(y+3) \Rightarrow 6x+18=5y+15$
$\Rightarrow 6x + 18 = 5y + 15 \Rightarrow 6x-5y=15-18 \Rightarrow 6x-5y = 15-18 \Rightarrow 6x-5y+3=0 \Rightarrow 6x-5y+3=0$

So, we have two equations

11x – 9y +4 = 0

6x – 5y + 3 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

$\frac{x}{-9*3-(-5)*4} = \frac{-y}{11*3-6*4} = \frac{1}{11*(-5)-6*(-9)}$

$\Rightarrow \frac{x}{-27+20} = \Rightarrow \frac{-y}{33-24} = \frac{1}{-55+54}$

$\Rightarrow \frac{x}{-7} = \frac{-y}{9} = \frac{1}{-1}$

$\Rightarrow \frac{x}{7} = \frac{y}{9} = 1$

x = 7, y =9

The fraction is $\frac{7}{9}$

**Q.3) A fraction becomes $\frac{1}{3}$ if 1 is subtracted from both its numerator and denominator. If 1 is added to both the numerator and denominator, it becomes $\frac{1}{2}$. Find the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $\frac{x}{y}$

If 1 is subtracted from both numerator and the denominator, the fraction becomes $13\frac{1}{3}$ . Thus, we have

$x-1y-1=13\frac{x-1}{y-1}=\frac{1}{3}$ $\Rightarrow 3(x-1)=(y-1)\Rightarrow 3(x-1)=(y-1)$ $\Rightarrow 3x-3=y-1\Rightarrow 3x-3=y-1$ $\Rightarrow 3x-y-2=0\Rightarrow 3x-y-2=0$

If 1 is added to both numerator and the denominator, the fraction becomes $12\frac{1}{2}$. Thus, we have

$x+1y+1=12\frac{x+1}{y+1}=\frac{1}{2}$ $\Rightarrow 2(x+1)=(y+1)\Rightarrow 2(x+1)=(y+1)$ $\Rightarrow 2x+2=y+1$
$\Rightarrow 2x+2=y+1$ $\Rightarrow 2x-y+1=0\Rightarrow 2x-y+1=0$

So, we have two equations

3x – y – 2 = 0

2x – y + 1 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

$x(-1)*1-(-1)*(-2)\frac{x}{(-1)*1-(-1)*(-2)}=-y3*1-2*(-2)\frac{-y}{3*1-2*(-2)}=13*(-1)-2*(-1)\frac{1}{3*(-1)-2*(-1)}$

$\Rightarrow x-1-2\Rightarrow\frac{x}{-1-2}=\Rightarrow -y3+4\Rightarrow\frac{-y}{3+4}=1-3+2\frac{1}{-3+2}$

$\Rightarrow x-3\Rightarrow\frac{x}{-3}=-y7\frac{-y}{7}=1-1\frac{1}{-1}$

$\Rightarrow x3=y7=1\Rightarrow\frac{x}{3}=\frac{y}{7}=1$ $\Rightarrow x=3,y=7\Rightarrow x=3,y=7$

The fraction is $37\frac{3}{7}$

**Q.4) If we add 1 to the numerator and subtract 1 from the denominator, a fraction becomes 1. It also becomes $12\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction?**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $xy\frac{x}{y}$

If 1 is added to the numerator and 1 is subtracted from the denominator, the fraction becomes 1. Thus, we have

$x+1y-1=1\frac{x+1}{y-1}=1$ $\Rightarrow (x+1)=(y-1)\Rightarrow (x+1)=(y-1)$ $\Rightarrow x+1-y+1=0\Rightarrow x+1-y+1=0$ $\Rightarrow x-y+2=0\Rightarrow x-y+2=0$

If 1 is added to the denominator, the fraction becomes $12\frac{1}{2}$. Thus, we have

$xy+1 = 12\frac{x}{y+1} = \frac{1}{2}$ $\Rightarrow 2x=(y+1) \Rightarrow 2x = (y+1)$ $\Rightarrow 2x-y-1=0 \Rightarrow 2x-y-1=0$

So, we have two equations

x – y + 2 = 0

2x – y – 1 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

$x(-1)*(-1)-(-1)*2\frac{x}{(-1)*(-1)-(-1)*2} = -y1*(-1)-2*2\frac{-y}{1*(-1)-2*2} = 11*(-1)-2*(-1)\frac{1}{1*(-1)-2*(-1)}$

$\Rightarrow x1+2 \Rightarrow \frac{x}{1+2} = \Rightarrow -y-1-4 \Rightarrow \frac{-y}{-1-4} = 1-1+2\frac{1}{-1+2}$

$\Rightarrow x3 \Rightarrow \frac{x}{3} = -y-5\frac{-y}{-5} = 11\frac{1}{1}$

$\Rightarrow x3 = y5 = 1 \Rightarrow \frac{x}{3} = \frac{y}{5} = 1$ $\Rightarrow x=3, y=5 \Rightarrow x = 3, y = 5$

The fraction is $35\frac{3}{5}$

**5) The sum of the numerator and denominator of a fraction is 12. If the denominator is increased by 3, the fraction becomes $12\frac{1}{2}$. Find the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $xy\frac{x}{y}$

The sum of the numerator and denominator of the fraction is 12. Thus, we have

x + y = 12

$\Rightarrow x+y-12=0 \Rightarrow x+y-12=0$

If the denominator is increased by 3, the fraction becomes $12\frac{1}{2}$. Thus, we have

$xy+3 = 12\frac{x}{y+3} = \frac{1}{2}$ $\Rightarrow 2x=(y+3) \Rightarrow 2x = (y+3)$ $\Rightarrow 2x-y-3=0 \Rightarrow 2x-y-3=0$

So, we have two equations

x + y – 12 = 0

2x – y – 3 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

$$x(1)*(-3)-(-1)*-12 \frac{x}{(1)*(-3)-(-1)*-12} = -y1*(-3)-2*-12 \frac{-y}{1*(-3)-2*-12} = 11*(-1)-2*(1) \frac{1}{1*(-1)-2*(1)}$$

$$\Rightarrow x-3-12 \Rightarrow \frac{x}{-3-12} = \Rightarrow -y-3+24 \Rightarrow \frac{-y}{-3+24} = 1-1-2 \frac{1}{-1-2}$$

$$\Rightarrow x-15 \Rightarrow \frac{x}{-15} = -y21 \frac{-y}{21} = 1-3 \frac{1}{-3}$$

$$\Rightarrow x15 = y21 = 13 \Rightarrow \frac{x}{15} = \frac{y}{21} = \frac{1}{3} \Rightarrow x = 153, y = 213 \Rightarrow x = \frac{15}{3}, y = \frac{21}{3} \Rightarrow x=5, y=7 \Rightarrow x = 5, y = 7$$

The fraction is $57\frac{5}{7}$

**7) The sum of a numerator and denominator of a fraction is 18. If the denominator is increased by 2, the fraction reduces to $13\frac{1}{3}$. Find the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $xy\frac{x}{y}$

The sum of the numerator and denominator of the fraction is 18. Thus, we have

x + y = 18

$$\Rightarrow x+y-18=0 \Rightarrow x + y - 18 = 0$$

If the denominator is increased by 2, the fraction becomes $13\frac{1}{3}$. Thus, we have

$$xy+2 = 13 \frac{x}{y+2} = \frac{1}{3} \Rightarrow 3x=(y+2) \Rightarrow 3x = (y + 2) \Rightarrow 3x-y-2=0 \Rightarrow 3x - y - 2 = 0$$

So, we have two equations

x + y – 18 = 0

3x – y – 2 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

$$x(1)*(-2)-(-1)*-18 \frac{x}{(1)*(-2)-(-1)*-18} = -y1*(-2)-3*-18 \frac{-y}{1*(-2)-3*-18} = 11*(-1)-3*(1) \frac{1}{1*(-1)-3*(1)}$$

$$\Rightarrow x-2-18 \Rightarrow \frac{x}{-2-18} = \Rightarrow -y-2+54 \Rightarrow \frac{-y}{-2+54} = 1-1-3 \frac{1}{-1-3}$$

$$\Rightarrow x-20 \Rightarrow \frac{x}{-20} = -y52 \frac{-y}{52} = 1-4 \frac{1}{-4}$$

$\Rightarrow$ x20 = y52 = 14 $\Rightarrow \frac{x}{20} = \frac{y}{52} = \frac{1}{4}$ $\Rightarrow$ x= 204 ,y= 524 $\Rightarrow x = \frac{20}{4}, y = \frac{52}{4}$ $\Rightarrow$ x=5,y=13 $\Rightarrow x = 5, y = 13$

The fraction is 513 $\frac{5}{13}$

**8) If 2 is added to the numerator of a fraction, it reduces to 12 $\frac{1}{2}$ and if 1 is subtracted from the denominator, it reduces to 13 $\frac{1}{3}$. Find the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is xy $\frac{x}{y}$

If 2 is added to the numerator of the fraction, it reduces to **12** $\frac{1}{2}$. Thus we have

x+2y $\frac{x+2}{y}$ = **12** $\frac{1}{2}$

$\Rightarrow$ 2(x+2)=y $\Rightarrow 2(x+2) = y$ $\Rightarrow$ 2x+4=y $\Rightarrow 2x + 4 = y$ $\Rightarrow$ 2x–y+4=0 $\Rightarrow 2x - y + 4 = 0$

If 1 is subtracted from the denominator, the fraction reduces to 13 $\frac{1}{3}$. Thus, we have

xy−1 = 13 $\frac{x}{y-1} = \frac{1}{3}$ $\Rightarrow$ 3x=(y–1) $\Rightarrow 3x = (y-1)$ $\Rightarrow$ 3x–y+1=0 $\Rightarrow 3x - y + 1 = 0$

So, we have two equations

2x – y + 4 = 0

3x – y + 1 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

x(−1)∗(1)−(−1)∗4 $\frac{x}{(-1)*(1)-(-1)*4}$ = −y2∗(1)−3∗4 $\frac{-y}{2*(1)-3*4}$ = 12∗(−1)−3∗(−1) $\frac{1}{2*(-1)-3*(-1)}$

$\Rightarrow$ x−1+4 $\Rightarrow \frac{x}{-1+4}$ = $\Rightarrow$ −y2−12 $\Rightarrow \frac{-y}{2-12}$ = 1−2+3 $\frac{1}{-2+3}$

$\Rightarrow$ x3 $\Rightarrow \frac{x}{3}$ = −y−10 $\frac{-y}{-10}$ = 11 $\frac{1}{1}$

$\Rightarrow$ x3 = y10 = 1 $\Rightarrow \frac{x}{3} = \frac{y}{10} = 1$

⇒x=3,y=10⇒ $x = 3, y = 10$

The fraction is 310 $\frac{3}{10}$

**9) The sum of the numerator and denominator of a fraction is 4 more than twice the numerator. If the numerator and denominator are increased by 3, they are in the ratio 2:3. Determine the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is xy $\frac{x}{y}$

The sum of the numerator and denominator of the fraction is 4 more than twice the numerator. Thus, we have

x + y = 2x + 4

⇒2x+4–x–y=0⇒ $2x + 4 – x – y = 0$

⇒x–y+4=0⇒ $x – y + 4 = 0$

If the numerator and denominator are increased by 3, they are in the ratio 2:3. Thus we have

x + 3:y + 3 = 2:3

⇒ x+3y+3 = 23 ⇒ $\frac{x+3}{y+3} = \frac{2}{3}$ ⇒3(x+3)=2(y+3)⇒ $3(x + 3) = 2(y + 3)$ ⇒3x+9=2y+6
⇒ $3x + 9 = 2y + 6$ ⇒3x–2y+3=0⇒ $3x – 2y + 3 = 0$

So, we have two equations

x – y + 4 = 0

3x – 2y + 3 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

x(−1)∗(3)−(−2)∗4 $\frac{x}{(-1)*(3)-(-2)*4}$ = −y1∗(3)−3∗4 $\frac{-y}{1*(3)-3*4}$ = 11∗(−2)−3∗(−1) $\frac{1}{1*(-2)-3*(-1)}$

⇒ x−3+8 ⇒ $\frac{x}{-3+8}$ = ⇒ −y3−12 ⇒ $\frac{-y}{3-12}$ = 1−2+3 $\frac{1}{-2+3}$

⇒ x5 ⇒ $\frac{x}{5}$ = −y−9 $\frac{-y}{-9}$ = 1−2+3 $\frac{1}{-2+3}$

⇒ x5 = y9 = 1 ⇒ $\frac{x}{5} = \frac{y}{9} = 1$ ⇒x=5,y=9⇒ $x = 5, y = 9$

The fraction is $59\frac{5}{9}$

**10) If the numerator of a fraction is multiplied by 2 and the denominator is reduced by 5 the fraction becomes $65\frac{6}{5}$. And, if the denominator is doubled and the numerator is increased by 8, the fraction becomes $25\frac{2}{5}$. Find the fraction.**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is $xy\frac{x}{y}$

If the numerator is multiplied by 2 and denominator is reduced by 5, the fraction becomes $65\frac{6}{5}$. Thus, we have

$\Rightarrow 2xy-5=65 \Rightarrow \frac{2x}{y-5}=\frac{6}{5}$ $\Rightarrow 10x=6(y-5) \Rightarrow 10x=6(y-5)$ $\Rightarrow 10x-6y+30=0$
$\Rightarrow 10x-6y+30=0$ $\Rightarrow 2(5x-3y+15)=0 \Rightarrow 2(5x-3y+15)=0$ $\Rightarrow 5x-3y+15=0$
$\Rightarrow 5x-3y+15=0$

If the denominator is doubled and the numerator are increased by 8, the fraction becomes $25\frac{2}{5}$.. Thus we have

$\Rightarrow x+82y=25 \Rightarrow \frac{x+8}{2y}=\frac{2}{5}$ $\Rightarrow 5(x+8)=4y \Rightarrow 5(x+8)=4y$ $\Rightarrow 5x+40=4y \Rightarrow 5x+40=4y$ $\Rightarrow 5x-4y+40=0 \Rightarrow 5x-4y+40=0$

So, we have two equations

5x – 3y + 15 = 0

5x – 4y + 40 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

$x(-3)*(40)-(-4)*15\ \frac{x}{(-3)*(40)-(-4)*15} = -y5*(40)-5*15\ \frac{-y}{5*(40)-5*15} = 15*(-4)-5*(-3)\ \frac{1}{5*(-4)-5*(-3)}$

$\Rightarrow x-120+60 \Rightarrow \frac{x}{-120+60} = \Rightarrow -y200-75 \Rightarrow \frac{-y}{200-75} = 1-20+15\ \frac{1}{-20+15}$

$\Rightarrow x-60 \Rightarrow \frac{x}{-60} = -y125\ \frac{-y}{125} = 1-5\ \frac{1}{-5}$

$\Rightarrow x60 \Rightarrow \frac{x}{60} = y125\ \frac{y}{125} = 15\ \frac{1}{5}$

$x=605, y=1255$ $x=\frac{60}{5}, y=\frac{125}{5}$ $\Rightarrow x=12, y=25$ $\Rightarrow x=12, y=25$

The fraction is $1225\frac{12}{25}$

**11) The sum of the numerator and denominator of a fraction is 3 less than twice the denominator. If the numerator and denominator are decreased by 1, the numerator becomes half the denominator. Determine the fraction**

**Soln:**

Let the numerator and denominator of the fraction be x and y respectively. Then the fraction is xy $\frac{x}{y}$

The sum of the numerator and denominator of a fraction is 3 less than twice the denominator. Thus, we have

x + y = 2y – 3

⇒x+y–2y+3=0⇒ $x + y - 2y + 3 = 0$ ⇒x–y+3=0⇒ $x - y + 3 = 0$

If the numerator and denominator are decreased by 1, the numerator becomes half the denominator. Thus, we have

x−1=12(y−1)$x - 1 = \frac{1}{2}(y - 1)$ ⇒x−1y−1=12⇒ $\frac{x-1}{y-1} = \frac{1}{2}$ ⇒2(x−1)=(y–1)
⇒ $2(x - 1) = (y - 1)$ ⇒2x–2=(y–1)⇒ $2x - 2 = (y - 1)$ ⇒2x–y–1=0⇒ $2x - y - 1 = 0$

So, we have two equations

x – y + 3 = 0

2x – y – 1 = 0

Here x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

x(−1)∗(−1)−(−1)∗3 $\frac{x}{(-1)*(-1)-(-1)*3}$ = −y1∗(−1)−2∗3 $\frac{-y}{1*(-1)-2*3}$ = 11∗(−1)−2∗(−1) $\frac{1}{1*(-1)-2*(-1)}$

⇒x1+3⇒ $\frac{x}{1+3}$ = ⇒−y−1−6⇒ $\frac{-y}{-1-6}$ = 1−1+2 $\frac{1}{-1+2}$

⇒x4⇒ $\frac{x}{4}$ = −y−7 $\frac{-y}{-7}$ = 11 $\frac{1}{1}$

⇒x4⇒ $\frac{x}{4}$ = y7 $\frac{y}{7}$ = 11

⇒x=4,y=7⇒ $x = 4, y = 7$

The fraction is 47 $\frac{4}{7}$

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.9

**Q 1: A father is 3 times as old as his son. After 12 years, his age will be twice as that of his son then. Find their present ages.**

**Soln:** Let the present age of the father be x years. Father is 3 times as old as his son. Thus we have

X = 3y

⇒⇒ x – 3y = 0

After 12 years, father's age will be (x+12) years and son's age will be (y+12) years. Thus using the given information, we have

x + 12 = 2(y + 12)

⇒⇒ x + 12 = 2y + 24

⇒⇒ x – 2y – 12 = 0

So, we have two equations

x – 3y = 0

x – 2y – 12 = 0

Here, x and y are unknowns. We have to solve the above equations for x and y.

By using cross-multiplication, we have

x(−3)×(−12)−(−2)×0=−y1×(−12)−1×0=11×(−2)−1×(−3)

$$\frac{x}{(-3)\times(-12)-(-2)\times 0} = \frac{-y}{1\times(-12)-1\times 0} = \frac{1}{1\times(-2)-1\times(-3)} \Rightarrow x36-0=-y-12-0\ 1-2+3$$

$$\Rightarrow \frac{x}{36-0} = \frac{-y}{-12-0}\ \frac{1}{-2+3}\quad x36=-y-12=11\ \frac{x}{36} = \frac{-y}{-12} = \frac{1}{1}\quad x36=y12=1\ \frac{x}{36} = \frac{y}{12} = 1$$

x = 36, y = 12

Hence, the present age of father is 36 years and the present age of son Is 12 years.

**Q 2. Ten years later. A will be twice as old as B and five years ago, A was three times as old as B. What are the present ages of A and B.**

**Soln:** Let the present age of x years and the present age of B be y years.

After 10 years, A's age will be (x +10) years and B's age will be (y + 10) years. Thus using the given information, we have

x – 5 = 3(y – 5)

⇒⇒ x + 10 = 2y + 20

⇒⇒ x – 2y -10 = 0

Before 5 years, the age of A was (x – 5) years and the age of B was (y – 5) years. Thus using the given information, we have

x – 5 = 3(y-5)

⇒⇒ x – 5 = 3y – 15

⇒⇒ x – 3y + 10 = 0

So, we have 2 equations

x – 2y – 10 = 0

x – 3y + 10 = 0

Here, x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-2)\times 10-(-3)\times(-10) = -y1\times 10-1\times(-10) = 11\times(-3)-1\times(-2)$$

$$\frac{x}{(-2)\times 10-(-3)\times(-10)} = \frac{-y}{1\times 10-1\times(-10)} = \frac{1}{1\times(-3)-1\times(-2)} \Rightarrow x-20-3- = -y10+10 = 1-3+2$$

$$\Rightarrow \frac{x}{-20-3-} = \frac{-y}{10+10} = \frac{1}{-3+2} \Rightarrow x-50 = -y20 = 1-1 \Rightarrow \frac{x}{-50} = \frac{-y}{20} = \frac{1}{-1} \Rightarrow x50 = y20 = 1$$

$$\Rightarrow \frac{x}{50} = \frac{y}{20} = 1 \Rightarrow x=50, y=20 \Rightarrow x = 50, y = 20$$

Hence, the present age of A is 50 years and the present age if b is 20 years.

**Q 3. A is elder to B by 2 years. A's father F is twice as old as A and B is twice as old as his sister S. If the age of the father and sister differ by 40 years, find the age of A.**

**Soln:** Let the present ages of A, B, F and S be x, y, z and t years respectively.

A is elder to b by 2 years. Thus, we have x = y + 2

F is twice as old as A. Thus, we have z = 2x

B is twice as old as S. Thus, we have y = 2t

The ages of F and S is differing by 40 years. Thus we have z – t = 40.

So, we have four equations

x = y + 2,…(1)

z = 2x,…(2)

y = 2t, …(3)

z – t = 40 …(4)

Here x, y, z and t are unknowns. We have to find the value of x. By using the third equation, the first equation becomes x = 2t + 2

From the third equation, the first equation becomes x = 2t + 2

From the fourth equation, we havet = z – 40

Hence, we have

x = 2(z – 40) + 2

= 2z – 80 + 2

= 2z – 78

Using the second equation, we have

$x=2\times 2x-78$ $x = 2 \times 2x - 78$ $\Rightarrow x=4x-78$ $\Rightarrow x = 4x - 78$ $\Rightarrow 4x-x=78$ $\Rightarrow 4x - x = 78$ $\Rightarrow 3x=78$ $\Rightarrow 3x = 78$ $\Rightarrow x=783$ $\Rightarrow x = \frac{78}{3}$ $\Rightarrow x=26$ $\Rightarrow x = 26$

Hence, the age of A is 26 years.

**Q 4. Six year hence a man's age will be three times age of his son and three years ago he was nine times as old as his son. Find their present ages.**

**Soln:** Let the present age of the man be x years and the present age of his son be y years.

After 6 years, the man's age will be (x + 6) years and son's age will be (y + 6) years. Thus using the given information, we have

x+6=3(y+6)

x+6=3y+18

x-3y-12=0

Before 3 years, the age of the man was (x – 3) years and the age of son's was (y — 3) years. Thus using the given information, we have

x-3 = 9(y-3)

x-3 = 9y-27

x-9y+24=0

So, we have two equations

x-3y-12=0

x-9y+ 24=0

Here x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-3)\times 24-(-9)\times(-12)=-y1\times 24-1\times(-12)=11\times(-9)-1\times(-3)$$

$$\frac{x}{(-3)\times 24-(-9)\times(-12)}=\frac{-y}{1\times 24-1\times(-12)}=\frac{1}{1\times(-9)-1\times(-3)}\Rightarrow x-72-108=-y24+12=19+3$$

$$\Rightarrow \frac{x}{-72-108}=\frac{-y}{24+12}=\frac{1}{9+3}\Rightarrow x-180=-y36=1-9+3\Rightarrow \frac{x}{-180}=\frac{-y}{36}=\frac{1}{-9+3}\Rightarrow x180=y36=16$$

$$\Rightarrow \frac{x}{180}=\frac{y}{36}=\frac{1}{6}\Rightarrow x=1806, y=366\Rightarrow x=\frac{180}{6}, y=\frac{36}{6}\ |\Rightarrow x=30, y=6|\Rightarrow x=30, y=6$$

Hence, the present age of the man is 30 years and the present age of son is 6 years.

**Q 5: Ten years ago, a father was 12 times as old as his son and 10 years hence, he will be twice as old as his son will be then. Find their present ages.**

**Soln:** Let the present age of father be x years and the present age of his son be y years.

After 10 years, father's age will be (x+10) years and son's age will be (y + 10) years. Thus using the given information, we have

x+10=2(y+10)

x-10= 2y+20

x-2y-10=0

Before 10 years, the age of father was (x-10)years and the age of son was (y — 10) years. Thus using the given information, we have

x-10 =12(y-10)

x-10 =12y—I20

x-12y+110=0

So, we have two equations

x-2y-10= 0

x-12y+110 = 0

Here x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-2)\times 110-(-12)\times(-10)=-y1\times 110-1\times(-10)=11\times(-12)-1\times(-12)$$

$$\frac{x}{(-2)\times 110-(-12)\times(-10)}=\frac{-y}{1\times 110-1\times(-10)}=\frac{1}{1\times(-12)-1\times(-12)}\Rightarrow x-220-120=-y110+10=1-12+2$$

$$\Rightarrow \frac{x}{-220-120}=\frac{-y}{110+10}=\frac{1}{-12+2}\Rightarrow x-340=-y120=1-10\Rightarrow \frac{x}{-340}=\frac{-y}{120}=\frac{1}{-10}\Rightarrow x340=y120=110$$

$$\Rightarrow \frac{x}{340}=\frac{y}{120}=\frac{1}{10}\Rightarrow x=34010, y=12010\Rightarrow x=\frac{340}{10}, y=\frac{120}{10}\Rightarrow x=34, y=12\Rightarrow x=34, y=12$$



Hence, the present age of father is 34 years and the present age of the son is 12 years.

**Q 6. The present age of father is 3 years more than three times of the age of the son. Three years hence, father's age will be 10 years more than twice the age of the son. Determine their present age.**

**Soln:** Let the present age of father be x years and the present age of his son be y years.

The present age of father is three years more than three times the age of the son. Thus, we have

x=3y+3 x-3y -3=0

After 3 years, father's age will be (x + 3)years and son's age will be (y + 3)years.

Thus using the given information, we have

x+3=2(y-F3)+10

x+3 = 4+6+10

x — 2y-13 = 0 So.

We have two equations

x-3y-3= 0

x-2y-13 = 0

Here x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-3)\times(-13)-(-2)\times(-3) = -y1\times(-13)-1\times(-3) = 11\times(-2)-1\times(-3)$$

$$\frac{x}{(-3)\times(-13)-(-2)\times(-3)} = \frac{-y}{1\times(-13)-1\times(-3)} = \frac{1}{1\times(-2)-1\times(-3)} \Rightarrow x39-6 = -y-13+3 = 1-2+3$$

$$\Rightarrow \frac{x}{39-6} = \frac{-y}{-13+3} = \frac{1}{-2+3} \Rightarrow x33 = -y-10 = 11 \Rightarrow \frac{x}{33} = \frac{-y}{-10} = \frac{1}{1} \Rightarrow x33 = y10 = 1$$

$$\Rightarrow \frac{x}{33} = \frac{y}{10} = 1 \Rightarrow x = x33, y = y10 \Rightarrow x = \frac{x}{33}, y = \frac{y}{10} \Rightarrow x=33, y=10 \Rightarrow x = 33, y = 10$$

**Q 7. A father is 3 times as old as his son. In 12 years' time, he will be twice as old as his son. Find the present ages of son and father.**

**Soln:** Let the present age of father be x years and the present age of his son be y years.

The present age of father is three times the age of the son. Thus, we have

x =3y

x-3y= 0

After 12 years, father's age will be (x +12) years and son's age will be (y +12)years. Thus using the given information, we have

x+12 = 2(y+12)

x+12=2y+24

x-2y-12=0

So, we have two equations

x-3y=0

x-2y-12=0

Here x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-3)\times(-12)-(-2)\times 0 = -y1\times(-12)-1\times 0 = 11\times(-2)-1\times(-3)$$

$$\frac{x}{(-3)\times(-12)-(-2)\times 0} = \frac{-y}{1\times(-12)-1\times 0} = \frac{1}{1\times(-2)-1\times(-3)} \Rightarrow x36-0 = -y-12-0 = 1-2+3$$

$$\Rightarrow \frac{x}{36-0} = \frac{-y}{-12-0} = \frac{1}{-2+3} \Rightarrow x36 = -y-12 = 11 \Rightarrow \frac{x}{36} = \frac{-y}{-12} = \frac{1}{1} \Rightarrow x36 = y12 = 1$$

$$\Rightarrow \frac{x}{36} = \frac{y}{12} = 1 \Rightarrow x33 = y10 \Rightarrow \frac{x}{33} = \frac{y}{10} \Rightarrow x=36, y=12 \Rightarrow x = 36, y = 12$$

Hence, the present age of the father is 36 years old and the present age of son is 12 years.

**Q 8. Father's age is three times the sum of age of his 2 children. After 5 years his age will be twice the sum of ages of two children. Find the age of father.**

**Soln:** Let the present age of father be x years and the present ages of his two children's be y and z years.

The present age of father is three times the sum of the ages of the two children's. Thus, we have

x =3(y+ z)

y+z= $x3\frac{x}{3}$

After 5 years, father's age will be (x+5) years and the children's age will be (y + 5) and (z +5) years. Thus using the given information, we have

x+5 =2{(y+5)+(z+5)}

x+5= 2(y+5+z+5)

x = 2(y+z)+ 20 -5

x = 2(y + z)+l5

So, we have two equations

y+z= x3 $\frac{x}{3}$

x=2(y+z)+15

Here x, y and z are unknowns. We have to find the value of x.

Substituting the value of (y+ z) from the first equation in the second equation, we have

By using cross-multiplication, we have

x = 2x3 +15 $\frac{2x}{3} + 15$

⇒x−2x3 =15⇒ $x - \frac{2x}{3} = 15$ ⇒x(1−23 )=15⇒ $x(1 - \frac{2}{3}) = 15$ ⇒x3 =15⇒ $\frac{x}{3} = 15$ ⇒x=15×3
⇒ $x = 15 \times 3$ ⇒x=45⇒ $x = 45$

Hence, the present age of father is 45 years.

**Q 9. Two years ago, a father was 5 times as old as his son. Two years later his age will be 8 more than 3 times the age of the son. Find the present ages of father and son.**

**Soln:** Let the present age of father be x years and the present age of his son be y years.

After 2 years, father's age will be (x+ 2) years and the age of son will be (y + 2) years. Thus using the given information, we have

x+2=3(y+2)+8

x+2=3y+6+8

x-3y-12=0

Before 2 years, the age of father was (x —2) years and the age of son was (y— 2) years. Thus using the given information, we have

x-2 =5(y-2)

x-2 =5y-10

x-5y+8=0

So, we have two equations

x – 3y -12 = 0

x – 5y +8 = 0

Here x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-3)\times 8-(-5)\times(-12) = -y1\times 8-1\times(-12) = 11\times(-5)-1\times(-3)$$

$$\frac{x}{(-3)\times 8-(-5)\times(-12)} = \frac{-y}{1\times 8-1\times(-12)} = \frac{1}{1\times(-5)-1\times(-3)} \Rightarrow x-24-60 = -y8+12 = 1-5+3$$

$$\Rightarrow \frac{x}{-24-60} = \frac{-y}{8+12} = \frac{1}{-5+3} \Rightarrow x-84 = -y20 = 1-2 \Rightarrow \frac{x}{-84} = \frac{-y}{20} = \frac{1}{-2} \Rightarrow x84 = y20 = 12$$

$$\Rightarrow \frac{x}{84} = \frac{y}{20} = \frac{1}{2} \Rightarrow x = 842, y = 202 \Rightarrow x = \frac{84}{2}, y = \frac{20}{2} \Rightarrow x=42, y=10 \Rightarrow x = 42, y = 10$$

Hence, the present age of father is 42 years and the present age of son is 10 years.

**Q 10. 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?**

**Soln:** Let the present age of Nuri be x years and the present age of Sonu be y years.

After 10 years, Nuri's age will be(x + 10) years and the age of Sonu will be(y + 10) years. Thus using the given information, we have

x +10 =2(y+10)

x + 10 = 2y + 20

x – 2y – 10 =0

Before 5 years, the age of Nuri was (x – 5)years and the age of Sonu was (y- 5)years. Thus using the given information, we have

x -5 =3(y-5)

x – 5 =3y-15

x-3y+10=0

So, we have two equations

x – 2y – 10 = 0

x-3y+10=0

Here x and y are unknowns. We have to solve the above equations for x and y. By using cross-multiplication, we have

$$x(-2)\times 10-(-3)\times(-10) = -y1\times 10-1\times(-10) = 11\times(-3)-1\times(-2)$$

$$\frac{x}{(-2)\times 10-(-3)\times(-10)} = \frac{-y}{1\times 10-1\times(-10)} = \frac{1}{1\times(-3)-1\times(-2)} \Rightarrow x-20-30 = -y10+10 = 1-3+2$$

$$\Rightarrow \frac{x}{-20-30} = \frac{-y}{10+10} = \frac{1}{-3+2} \Rightarrow x-50 = -y20 = 1-1 \Rightarrow \frac{x}{-50} = \frac{-y}{20} = \frac{1}{-1} \Rightarrow x50 = y20 = 1$$

$$\Rightarrow \frac{x}{50} = \frac{y}{20} = 1 \Rightarrow x=50, y=20 \Rightarrow x = 50, y = 20$$

**Q 11. The ages of two friends Ani and biju differ by 3 years. Ani's father Dharam is twice as old as Ani and Biju as twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30**

**years. Find the ages of Ani and Biju.**

**Soln:** Let the present ages of Ani, Biju, Dharam and Cathy be x, y, z and t years respectively.

The ages of Ani and Biju differ by 3 years. Thus, we have

$x - y = \pm 3$

$x = y \pm 3$

Dharam is twice as old as Ani. Thus, we have

$z = 2x$

Biju is twice as old as Cathy. Thus, we have

$y = 2t$

The ages of Cathy and Dharam differ by 30 years. Clearly, Dharam is older than Cathy. Thus, we have

$z - t = 30$

So, we have two systems of simultaneous equations

(i) $x = y + 3$,

$z = 2x$,

$y = 2t$,

$z - t = 30$

(ii) $x = y - 3$,

$z = 2x$,

$y = 2t$,

$z - t = 30$

Here x, y, z and t are unknowns. We have to find the value of x and y.

(i) By using the third equation, the first equation becomes $x = 2t + 3$

From the fourth equation, we have

$t = z - 30$

Hence, we have

$x = 2(z-30)+3$

$= 2z - 60 + 3$

$= 2z - 57$

Using the second equation, we have

x=2×2x−57$x = 2 \times 2x - 57$

x = 4x-57

4x – x = 57

3x =57

x=573$x = \frac{57}{3}$

x = 19

From the first equation, we have

x =y+3

y=x-3

y=19-3

y = 16

Hence, the age of Ani is 19 years and the age of Biju is 16 years.

(ii) By using the third equation, the first equation becomes x= 2t -3.

From the fourth equation, we have

t = z – 30

Hence, we have

x = 2(z —30)-3

=2z-60-3

= 2z-63

Using the second equation, we have

x=2×2x–63$x = 2 \times 2x - 63$

x = 4x-63

4x – x = 63

3x =63

x=633$x = \frac{63}{3}$

x = 21

From the first equation, we have

$x = y-3$

$y= x + 3$

$y= 21 + 3$

$y= 24$

Hence, the age of Ani is 21 years and the age of Biju is 24 years.

Note that there are two possibilities.

Exercise 3.10 Page No: 3.101

**1. Points A and B are 70km. apart on a highway. A car starts from A and another car starts from B simultaneously. If they travel in the same direction, they meet in 7hrs, but if they travel towards each other, they meet in one hour. Find the speed of two cars.**

**Solution:**

Let's consider the car starting from point A as X and its speed as x km/hr.

And, the car starting from point B as Y and its speed as y km/hr.

It's seen that there are two cases in the question:

# Case 1: Car X and Y are moving in the same direction

# Case 2: Car X and Y are moving in the opposite direction

Let's assume that the meeting point in case 1 as P and in case 2 as Q.

**Now, solving for case 1:**

The distance travelled by car X = AP

And, the distance travelled by car Y = BP

As the time taken for both the cars to meet is 7 hours,

The distance travelled by car X in 7 hours = 7x km [∵ distance = speed x time]

⇒ AP = 7x

Similarly,

The distance travelled by car Y in 7 hours = 7y km

⇒ BP = 7Y

As the cars are moving in the same direction (i.e. away from each other), we can write

AP – BP = AB

So, 7x – 7y = 70

x – y = 10 ..... (i) [after taking 7 common out]

**Now, solving for case 2:**

In this case as it's clearly seen that,

The distance travelled by car X = AQ

And,

The distance travelled by car Y = BQ

As the time taken for both the cars to meet is 1 hour,

The distance travelled by car x in 1 hour = 1x km

⇒ AQ = 1x

Similarly,

The distance travelled by car y in 1 hour = 1y km

⇒ BQ = 1y

Now, since the cars are moving in the opposite direction (i.e. towards each other), we can write

AQ + BQ = AB

⇒ x + y = 70 ..... (ii)

Hence, by solving (i) and (ii) we get the required solution

From (i), we have x = 10 + y..... (iii)

Substituting this value of x in (ii).

⇒ (10 + y) + y = 70

⇒ y = 30

Now, using y = 30 in (iii), we get

⇒ x = 40

Therefore,

– Speed of car X = 40km/hr.

– Speed of car Y = 30 km/hr.

**2. A sailor goes 8 km downstream in 40 minutes and returns in 1 hour. Determine the speed of the sailor in still water and the speed of the current.**

**Solution:**

Let's assume,

The speed of the sailor in still water as x km/hr

And,

The speed of the current as y km/hr

We know that,

Speed of the sailor in upstream = (x – y) km/hr

Speed of the sailor in downstream = (x + y) km/hr

So, time taken to cover 8 km upstream = 8/ (x – y) hr [∵ time = distance/ speed]

And, time taken to cover 8 km downstream = 8/ (x + y hr [∵ time = distance/ speed]

It's given that time taken to cover 8 km downstream in 40 minutes or, 40/ 60 hour or 2/3 hr.

8/ (x + y) = 2/3

8 × 3 = 2(x + y)

24 = 2x + 2y

x + y = 12 ..... (i) [After taking 2 common out and rearranging]

Similarly, time taken to cover 8 km upstream in 1hour can be written as,

8/ (x – y) = 1

8 = 1(x – y)

⇒ x – y = 8 ..... (ii)

Hence, by solving (i) and (ii) we get the required solution

On adding (i) and (ii) we get,

2x = 20

⇒ x = 10

Now, putting the value of x in (i), we find y

$10 + y = 12$

$\Rightarrow y = 2$

Therefore, the speed of sailor is 10km/hr and the speed of the current is 2km/hr.

**3. The boat goes 30km upstream and 44km downstream in 10 hours. In 13 hours, it can go 40km upstream and 55km downstream. Determine the speed of stream and that of the boat in still water.**

**Solution:**

Let's assume,

The speed of the boat in still water as x km/hr

And,

The speed of the stream as y km/hr

We know that,

Speed of the boat in upstream = $(x - y)$ km/hr

Speed of the boat in downstream = $(x + y)$ km/hr

So,

Time taken to cover 30 km upstream = $30/(x - y)$ hr [$\because$ time = distance/ speed]

Time taken to cover 44 km downstream =$44/(x + y)$ hr [$\because$ time = distance/ speed]

It's given that the total time of journey is 10 hours. So, this can expressed as

$30/(x - y) + 44/(x + y) = 10$ ..... (i)

Similarly,

Time taken to cover 40 km upstream = $40/(x - y)$ hr [$\because$ time = distance/ speed]

Time taken to cover 55 km downstream = $55/(x + y)$ hr [$\because$ time = distance/ speed]

And for this case the total time of the journey is given as 13 hours.

Hence, we can write

40/ (x − y) + 55/ (x + y) = 13 ……. (ii)

Hence, by solving (i) and (ii) we get the required solution

Taking, 1/ (x − y) = u and 1/ (x + y) = v in equations (i) and (ii) we have

30u + 44v = 10

40u + 55v = 10

Which may be re- written as,

30u + 44v − 10 = 0 ……. (iii)

40u + 55v − 13 = 0…… (iv)

Solving these equations by cross multiplication we get,

$$\frac{u}{44x-13-55x-10} = \frac{-v}{30x-13-40x-10} = \frac{1}{30\times55-40\times44}$$

$$u = \frac{-22}{-110}$$

$$v = \frac{10}{110}$$

$$u = \frac{2}{10}$$

$$v = \frac{1}{11}$$

Now,

1/ (x − y) = 2/10

⇒ 1 x 10 = 2(x − y)

⇒ 10 = 2x − 2y

⇒ x − y = 5 ……. (v)

And,

1/ (x + y) = 1/11

⇒ x + y = 11 ……. (vi)

Again, solving (v) and (vi)

Adding (v) and (vi), we get

2x = 16

⇒ x = 8

Using x in (v), we find y

$8 - y = 5$

$\Rightarrow y = 3$

Therefore, the speed of the boat in still water is 8 km/hr and the speed of the stream is 3 km/hr.

**4. A boat goes 24km upstream and 28km downstream in 6hrs. It goes 30km upstream and 21km downstream in 6.5 hours. Find the speed of the boat in still water and also speed of the stream.**

**Solution:**

Let's assume,

The speed of the boat in still water as x km/hr

And,

The speed of the stream as y km/hr

We know that,

Speed of the boat in upstream = $(x - y)$ km/hr

Speed of the boat in downstream = $(x + y)$ km/hr

So, time taken to cover 28 km downstream = $28/(x+y)$ hr [$\because$ time = distance/ speed]

Time taken to cover 24 km upstream $=24/(x - y)$ hr [$\because$ time = distance/ speed]

It's given that the total time of journey is 6 hours. So, this can expressed as

$24/(x - y) + 28/(x + y) = 6$..... (i)

Similarly,

Time taken to cover 30 km upstream = $30/(x - y)$ [$\because$ time = distance/ speed]

Time taken to cover 21km downstream $=21/(x + y)$ [$\because$ time = distance/ speed]

And for this case the total time of the journey is given as 6.5 i.e 13/2 hours.

Hence, we can write

30/ (x − y) + 21/ (x + y) = 13/2 ..... (ii)

Hence, by solving (i) and (ii) we get the required solution

Taking, 1/ (x − y) = u and 1/ (x + y) = v in equations (i) and (ii) we have (after rearranging)

24u + 28v − 6 = 0 ..... (iii)

30u + 21v − 13/2 = 0 ..... (iv)

Solving these equations by cross multiplication we get,

$$\frac{u}{28x-6.5-21x-6} = \frac{-v}{24x-6.5-30x-6} = \frac{1}{24\times21-30\times28}$$

u = 1/6 and v = 1/14

Now,

u = 1/ (x − y) = 1/ 6

x − y = 6 .... (v)

v = 1/ (x + y) = 1/ 14

x + y = 14..... (vi)

On Solving (v) and (vi)

Adding (v) and (vi), we get

2x = 20

⇒ x = 10

Using x = 10 in (v), we find y

10 + y = 14

⇒ y = 4

Therefore,

Speed of the stream = 4km/hr.

Speed of boat = 10km/hr.

**5. A man walks a certain distance with a certain speed. If he walks 1/2 km an hour faster, he takes 1 hour less. But, if he walks 1km an hour slower, he takes**

**3 more hours. Find the distance covered by the man and his original rate of walking.**

**Solution:**

Let the actual speed of the man be x km/hr and y be the actual time taken by him in hours.

So, we know that

Distance covered = speed × distance

⇒ Distance = $x \times y = xy$ ..... (i)

First condition from the question says that,

If the speed of the man increase by 1/2 km/hr, the journey time will reduce by 1 hour.

Showing this using variables, we have

⇒ When speed is $(x + 1/2)$ km/hr, time of journey = $y - 1$ hours

Now,

Distance covered = $(x + 1/2) \times (y - 1)$ km

Since the distance is the same i.e xy we can equate it, [from (i)]

$xy = (x + 1/2) \times (y - 1)$

And we finally get,

$-2x + y - 1 = 0$ ..... (ii)

From the second condition of the question, we have

If the speed reduces by 1 km/hr then the time of journey increases by 3 hours.

⇒ When speed is $(x-1)$ km/hr, time of journey is $(y+3)$ hours

Since, the distance covered = xy [from (i)]

$xy = (x-1)(y+3)$

⇒ $xy = xy - 1y + 3x - 3$

⇒ $xy = xy + 3x - 1y - 3$

⇒ $3x - y - 3 = 0$ ..... (iii)

From (ii) and (iii), the value of x can be calculated by

(ii) + (iii) ⇒

$x - 4 = 0$

$x = 4$

Now, y can be obtained by using x = 4 in (ii)

$-2(4) + y - 1 = 0$

$\Rightarrow y = 1 + 8 = 9$

Hence, putting the value of x and y in equation (i), we find the distance

Distance covered = xy

$= 4 \times 9$

= 36 km

Thus, the distance is 36 km and the speed of walking is 4 km/hr.

**6. A person rowing at the rate of 5km/h in still water, takes thrice as much as time in going 40 km upstream as in going 40km downstream. Find the speed of the stream.**

**Solution:**

Let's assume x to be the speed of the stream.

So, we know that

Speed of boat in downstream = (5 + x) and,

Speed of boat in upstream = (5 − x)

It is given that,

The distance in one way is 40km.

And,

Time taken during upstream = 3 × time taken during the downstream

Expressing it by equations, we have

$40/(5 - x) = 3 \times 40/(5 + x)$ [∵ time = distance/ speed]

By cross multiplication, we get

$(5+x) = 3(5-x)$

$\Rightarrow 5 + x = 3(5 - x)$

$\Rightarrow x + 3x = 15 - 5$

$\Rightarrow x = 10/4 = 2.5$

Therefore, the speed of the stream is 2.5 km/hr.

**7. Ramesh travels 760km to his home partly by train and partly by car. He takes 8 hours if he travels 160km by train and the rest by car. He takes 12 minutes more if he travels 240km by train and the rest by car. Find the speed of the train and car respectively.**

**Solution:**

Let's assume,

The speed of the train be x km/hr

The speed of the car = y km/hr

From the question, it's understood that there are two parts

# Part 1: When Ramesh travels 160 Km by train and the rest by car.

# Part 2: When Ramesh travels 240Km by train and the rest by car.

Part 1,

Time taken by Ramesh to travel 160 km by train = 160/x hrs [∵ time = distance/ speed]

Time taken by Ramesh to travel the remaining (760 – 160) km i.e., 600 km by car =600/y hrs

So, the total time taken by Ramesh to cover 760Km = 160/x hrs + 600/y hrs

It's given that,

Total time taken for this journey = 8 hours

So, by equations its

$160/x + 600/y = 8$

$20/x + 75/y = 1$ [on dividing previous equation by 8] ..... (i)

Part 2,

Time taken by Ramesh to travel 240 km by train = 240/x hrs

Time taken by Ramesh to travel (760 – 240) = 520km by car = 520/y hrs

For this journey, it's given that Ramesh will take a total of is 8 hours and 12 minutes to finish.

240/x + 520/y = 8hrs 12mins = 8 + (12/60) = 41/5 hr

240/x + 520/y = 41/5

6/x + 13/y = 41/200 ..... (ii)

Solving (i) and (ii), we get the required solution

Let's take 1/x = u and 1/y = v,

So, (i) and (ii) becomes,

20u + 75v = 1 ..... (iii)

6u + 13v = 41/200 ..... (iv)

On multiplying (iii) by 3 and (iv) by 10,

60u + 225v = 3

60u + 130v = 41/20

Subtracting the above two equations, we get

(225 – 130)v = 3 – 41/20

95v = 19/ 20

⇒ v = 19/ (20 x 95) = 1/100

⇒ y = 1/v = 100

Using v = 1/100 in (iii) to find v,

20u + 75(1/100) = 1

20u = 1 – 75/100

⇒ 20u = 25/100 = 1/4

⇒ u = 1/80

⇒ x = 1/u = 80

So, the speed of the train is 80km/hr and the speed of car is100km/hr.

**8) A man travels 600 km partly by train and partly by car. If he covers 400km by train and the rest by car, it takes him 6 hours and 30 minutes. But, if he travels 200km by train and the rest by car, he takes half an hour longer. Find the speed of the train and the speed of the car.**

**Solution:**

Let's assume,

The speed of the train be x km/hr

The speed of the car = y km/hr

From the question, it's understood that there are two parts

# Part 1: When the man travels 400 km by train and the rest by car.

# Part 2: When Ramesh travels 200 km by train and the rest by car.

Part 1,

Time taken by the man to travel 400km by train = 400/x hrs [∵ time = distance/ speed]

Time taken by the man to travel (600 – 400) = 200km by car = 200/y hrs

Time taken by a man to cover 600km = 400/x hrs + 200/y hrs

Total time taken for this journey = 6 hours + 30 mins = 6 + 1/2 = 13/2

So, by equations its

400/x + 200/y = 13/2

400/x + 200/y = 13/2

400/x + 200/y = 13/2

200 (2/x + 1/y) = 13/2

2/x + 1/y = 13/400 ....(i)

Part 2,

Time taken by the man to travel 200 km by train = 200/x hrs. [∵ time = distance/ speed]

Time taken by the man to travel (600 – 200) = 400km by car = 200/y hrs

For the part, the total time of the journey is given as 6hours 30 mins + 30 mins that is 7hrs,

$200/x + 400/y = 7$

$200 (1/x + 2/y) = 7$

$1/x + 2/y = 7/200$ .....(ii)

Taking $1/x = u$, and $1/y = v$,

So, the equations (i) and (ii) becomes,

$2u + v = 13/400$ ..... (iii)

$u + 2v = 7/200$ ..... (iv)

Solving (iii) and (iv), by

(iv) x 2 – (iii) ⇒

$3v = 14/200 - 13/400$

$3v = 1/400 \times (28 - 13)$

$3v = 15/400$

$v = 1/80$

$\Rightarrow y = 1/v = 80$

Now, using v in (iii) we find u,

$2u + (1/80) = 13/400$

$2u = 13/400 - 1/80$

$2u = 8/400$

$u = 1/100$

$\Rightarrow x = 1/u = 100$

Hence, the speed of the train is 100km/hr and the speed of the car is 80km/hr.

**9. Places A and B are 80km apart from each other on a highway. A car starts from A and other from B at the same time. If they move in the same direction, they meet in 8 hours and if they move in opposite direction, they meet in 1hour and 20 minutes. Find the speeds of the cars.**

**Solution:**

Let's consider the car starting from point A as X and its speed as x km/hr.

And, the car starting from point B as Y and its speed as y km/hr.

It's seen that there are two cases in the question:

# Case 1: Car X and Y are moving in the same direction

# Case 2: Car X and Y are moving in the opposite direction

Let's assume that the meeting point in case 1 as P and in case 2 as Q.

**Now, solving for case 1:**

The distance travelled by car X = AP

And, the distance travelled by car Y = BP

As the time taken for both the cars to meet is 8 hours,

The distance travelled by car X in 7 hours = 8x km [∵ distance = speed x time]

⇒ AP = 8x

Similarly,

The distance travelled by car Y in 8 hours = 8y km

⇒ BP = 8Y

As the cars are moving in the same direction (i.e. away from each other), we can write

AP – BP = AB

So, 8x – 8y = 80

⇒ x – y = 10 ..... (i) [After taking 8 common out]

**Now, solving for case 2:**

In this case as it's clearly seen that,

The distance travelled by car X = AQ

And,

The distance travelled by car Y = BQ

As the time taken for both the cars to meet is 1 hour and 20 min, ⇒1 + (20/60) = 4/3 hr

The distance travelled by car x in 4/3 hour = 4x/3 km

⇒ AQ = 4x/3

Similarly,

The distance travelled by car y in 4/3 hour = 4y/3 km

⇒ BQ = 4y/3

Now, since the cars are moving in the opposite direction (i.e. towards each other), we can write

AQ + BQ = AB

⇒ 4x/3 + 4y/3 = 80

⇒ 4x + 4y = 240

⇒ x + y = 60 ..... (ii) [After taking LCM]

Hence, by solving (i) and (ii) we get the required solution

From (i), we have x = 10 + y..... (iii)

Substituting this value of x in (ii).

⇒ (10 + y) + y = 60

⇒ 2y = 50

⇒ y = 25

Now, using y = 30 in (iii), we get

⇒ x = 35

Therefore,

– Speed of car X = 35 km/hr.

– Speed of car Y = 25 km/hr.

# RD SHARMA

# Solutions

# Class 10 Maths

# Chapter 3

# Ex 3.11

**Q 1: If in a rectangle, the length is increased and breadth reduced each by 2 units, the area is reduced by 28 square units. If, however, the length is reduced by 1 unit and the breadth is increased by 2 units, the area increases by 33 square units. Find the area of the rectangle.**

**Sol:**

Let the length and breadth of the rectangle be x and y units respectively.

Then, area of rectangle =xy units

If length is increased and breadth is reduced each by 2 units, then the area is reduced by 28 square units.

$(x+2)(y-2)=xy-28$ $(x+2)(y-2)=xy-28$ $\Rightarrow xy-2x+2y-4=xy-28$
$\Rightarrow xy-2x+2y-4=xy-28$ $\Rightarrow -2x+2y-4+28=0$ $\Rightarrow -2x+2y-4+28=0$ $\Rightarrow -2x+2y+24=0$
$\Rightarrow -2x+2y+24=0$ $\Rightarrow 2x-2y-24=0$ $\Rightarrow 2x-2y-24=0$

Therefore, 2x – 2y – 24 = 0 —— (i)

Then the length is reduced by 1 unit and the breadth is increased by 2 units then the area is increased by 33 square units.

$(x-1)(y+2)=xy+33$ $(x-1)(y+2)=xy+33$ $\Rightarrow xy+2x-y-2=x+33$
$\Rightarrow xy+2x-y-2=x+33$ $\Rightarrow 2x-y-2-33=0$ $\Rightarrow 2x-y-2-33=0$ $\Rightarrow 2x-y-35=0$
$\Rightarrow 2x-y-35=0$

Therefore, 2x – y – 35 = 0 —— (ii)

Thus we get the following system of linear equation

2x – 2y – 24 = 0

2x – y – 35 = 0

By using cross multiplication, we have

$x(-2*-35)-(-1*-24)=y(2*-35)-(2*-24)=1(2*-1)-(2*-2)$
$\frac{x}{(-2*-35)-(-1*-24)}=\frac{y}{(2*-35)-(2*-24)}=\frac{1}{(2*-1)-(2*-2)}$ $x70-24=-y-70+48=1-2+4$
$\frac{x}{70-24}=\frac{-y}{-70+48}=\frac{1}{-2+4}$ $x46=-y-22=12$ $\frac{x}{46}=\frac{-y}{-22}=\frac{1}{2}$ $x=462$ $x=\frac{46}{2}$ $x=23$ $x=23$

And

$y=222$ $y=\frac{22}{2}$ $y=11$ $y=11$

The lengthof rectangle is 23 units.

The breadth of rectangle is 11 units.

Area of rectangle = length x breadth,

$=x\times y$ $=x\times y$

=23 x 11

= 253 square units

Hence, the area of rectangle is **253** square units.

**Q.2: The area of a rectangle remains the same if the length is increased by 7 metres and the breadth is decreased by 3 metres. The area remains unaffected if the length is decreased by 7 metres and the breadth is increased by 5 metres. Find the dimensions of the rectangle.**

**Sol:**

Let the length and breadth of the rectangle be x and y units respectively

Then, area of rectangle = xy square units

If length is increased by 7 metres and breadth is decreased by 3 metres the area of a rectangle remains the same

Therefore,

$$xy=(x+7)(y-3)xy = (x + 7)(y - 3) \quad xy=xy+7y-3x-21xy = xy + 7y - 3x - 21$$

3x – 7y + 21 = 0 ——— (i)

If the length is decreased by 7 metres and the breadth is increased by 5 metres the area remains unaffected, then

$$xy=(x-7)(y+5)xy = (x - 7)(y + 5) \quad xy=xy-7y+5x-35xy = xy - 7y + 5x - 35$$

5x – 7y – 35 = 0 ——— (ii)

Thus we get the following system of linear equation

3x – 7y + 21 = 0

5x – 7y – 35 = 0

By using cross-multiplication, we have

$$x(-7\times-5)-(-7\times21)=y(3\times-35)-(5\times21)=1(3\times-7)-(5\times-7)$$

$$\frac{x}{(-7\times-5)-(-7\times21)} = \frac{y}{(3\times-35)-(5\times21)} = \frac{1}{(3\times-7)-(5\times-7)} \quad x245+147=-y-105-105=1-21+35$$

$$\frac{x}{245+147} = \frac{-y}{-105-105} = \frac{1}{-21+35} \quad x392=-y-210=114\ \frac{x}{392} = \frac{-y}{-210} = \frac{1}{14} \quad x=39214x = \frac{392}{14} \quad x=28x = 28$$

And

$$y=21014y = \frac{210}{14} \quad y=15y = 15$$

Hence, the length of rectangle is **28** meters

The breadth of rectangle is **15** metres

**Q.3:** In a rectangle, if the length is increased by 3 metres and breadth is decreased by 4 metres, the area of the triangle is reduced by 67 square metres. If length is reduced by 1 metre and breadth is increased by 4 metres, the area is increased by 89 sq. metres. Find the dimension of the rectangle.

**Sol:**

Let the length and breadth of the rectangle be x and y units respectively

Then, area of rectangle = xy square units

If the length is increased by 3 metres and breadth is reduced by 4 metres, then the area is reduced by 67 sq. metres

Therefore,

$xy - 67 = (x + 3)(y - 4)$

$xy - 67 = xy + 3y - 4x - 12$

$4xy - 3y - 67 + 12 = 0$

$4x - 3y - 55 = 0$ —— (i)

Then the length is reduced by 1 metre and the breadth is increased by 4 metre, then the area is increased by 89 sq. metres

Therefore,

$4x - y - 93 = 0$ —— (ii)

Thus, we get the following system of linear equation

$4x - 3y - 55 = 0$

$4x - y - 93 = 0$

By using cross multiplication, we have

$$x(-3\times-93)-(-1\times-55) = -y(4\times-93)-(4\times-55) = 1(4\times-1)-(4\times-3)$$

$$\frac{x}{(-3\times-93)-(-1\times-55)} = \frac{-y}{(4\times-93)-(4\times-55)} = \frac{1}{(4\times-1)-(4\times-3)}$$

$$x279-55 = -y-372+220 = 1-4+12$$

$$\frac{x}{279-55} = \frac{-y}{-372+220} = \frac{1}{-4+12}$$

$$x224 = -y-152 = 18$$

$$\frac{x}{224} = \frac{-y}{-152} = \frac{1}{8}$$

$$x = 2248 \quad x = \frac{224}{8} \quad x = 28 \quad x = 28$$

And

$$y = 1528 \quad y = \frac{152}{8} \quad y = 19 \quad y = 19$$

Hence, the length of rectangle is **28** metre

The breadth of rectangle is **19** metre.

**Q 4: The income of X and Y are in the ratio of 8 : 7 and their expenditures are in the ratio 19 : 16. If each saves Rs. 1250, find their incomes.**

**Sol:**

Let the income of X be Rs. 8x and the income of Y be Rs. 7x. Further let the expenditure of X be 19y and the expenditure of Y be 16y. Then,

Saving of X = 8x – 19y = 1250

Saving of Y = 7x – 16y = 1250

8x – 19y – 1250 = 0 —— (i)

7x – 16y – 1250 = 0 —— (ii)

Solving equation (i) and (ii) by cross-multiplication, we have

$$x(-19\times-1250)-(-16\times-1250)=-y(8\times-1250)-(7\times-1250)=1(8\times-16)-(7\times-19)$$

$$\frac{x}{(-19\times-1250)-(-16\times-1250)}=\frac{-y}{(8\times-1250)-(7\times-1250)}=\frac{1}{(8\times-16)-(7\times-19)}\quad x23750-20000=-y-10000+8750=1-128+133$$

$$\frac{x}{23750-20000}=\frac{-y}{-10000+8750}=\frac{1}{-128+133}\quad x3750=y1250=15\ \frac{x}{3750}=\frac{y}{1250}=\frac{1}{5}\quad x=37505\ x=\frac{3750}{5}\quad x=750$$

$$x = 750$$

The monthly income of X = 8x

= 8 x 750

= 6000

The monthly income of Y = 7x

= 7 x 750

= 5250

Hence the monthly income of X is **Rs. 6000**

The monthly income of Y is **Rs. 5250**

**Q.5: A and B each has some money. If A gives Rs. 30 to B, then B will have twice the money left with A. But, if B gives Rs. 10 to A, then A will have thrice as much as is left with B. How much money does each have?**

**Sol:**

Let the money with A be Rs.x and the money with B be Rs. y.

If A gives Rs. 30 to B, then B will have twice the money left with A. According to the condition we have,

y + 30 = 2(x – 30)

y + 30 = 2x – 60

2x – y – 60 – 30 = 0

2x – y – 90 = 0 —— (i)

If B gives Rs. 10 to A, then A will have thrice as much as is left with B,

x + 10 = 3(y – 10)

x + 10 = 3y – 10

x – 3y + 10 + 30 = 0

$x - 3y + 40 = 0$ —— (ii)

By multiplying equation (ii) with 2 we get, $2x - 6y + 80 = 0$

By subtracting (ii) from (i) we get, $y = 34$

By substituting $y = 34$ in equation (i) we get, $x = 62$

Hence the money with A be **Rs. 62** and the money with B be **Rs. 34**

**Q 6: 2 men and 7 boys can do a piece of work in 4 days. The same work is done in 3 days by 4 men and 4 boys. How long would it take one man and one boy to do it?**

**Soln:**

A man can alone finish the work in x days and one boy alone can finish it in y days then

One man one day work = $1x\frac{1}{x}$

One boy one day work = $1y\frac{1}{y}$

2 men one day work = $2x\frac{2}{x}$

7 boys one day work = $7y\frac{7}{y}$

Since 2 men and 7 boys can finish the work in 4 days

$4(2x+7y)=14(\frac{2}{x}+\frac{7}{y})=1$

$8x+28y=1\frac{8}{x}+\frac{28}{y}=1$ ——(i)

Again 4 men and 4 boys can finish the work in 3 days

$3(4x+4y)=13(\frac{4}{x}+\frac{4}{y})=1$

$12x+12y=1\frac{12}{x}+\frac{12}{y}=1$ ——(ii)

Putting $1x=u\frac{1}{x}=u$ and $1y=v\frac{1}{y}=v$ in equation (i) and (ii) we get

$8u + 28v = 1$

$12u + 12v = 1$

$8u + 28v - 1 = 0$ —— (iii)

$12u + 12v - 1 = 0$ —— (iv)

By using cross multiplication we have

Now,

u= 115 $u = \frac{1}{15}$  1x = 115 $\frac{1}{x} = \frac{1}{15}$

x = 15

and

v= 160 $v = \frac{1}{60}$  1y = 160 $\frac{1}{y} = \frac{1}{60}$

y = 60

Hence, one man alone can finish the work in **15 days** and one boy alone can finish the work in **60 days**.

**Q 7: In a ΔΔ ABC, ∠∠A = $x^o$, ∠∠B = $(3x – 2)^o$, ∠∠C = $y^o$, Also, ∠∠C – ∠∠B = $9^o$. Find the three angles.**

**Sol:**

Let ∠∠A = $x^o$, ∠∠B = $(3x – 2)^o$, ∠∠C = $y^o$ and

∠∠C – ∠∠B = $9^o$

⇒∠C=9°+∠B⇒ $\angle C = 9° + \angle B$  ⇒∠C=9°+3x°−2°⇒ $\angle C = 9° + 3x° - 2°$  ⇒∠C=7°+3x°
⇒ $\angle C = 7° + 3x°$

Substitute ∠∠C = $y^o$ in above equation we get,

$y^o = 7^o + 3x^o$

∠∠A + ∠∠B + ∠∠C = $180^o$

⇒x°+(3x°−2°)+(7°+3x°)=180°⇒ $x° + (3x° - 2°) + (7° + 3x°) = 180°$  ⇒7x°+5°=180°
⇒ $7x° + 5° = 180°$  ⇒7x°=175°⇒ $7x° = 175°$  ⇒x°=25°⇒ $x° = 25°$

∠∠A = $x^o = 25^o$

∠∠B = $(3x – 2)^o = 73^o$

∠∠C = $(7 + 3x)^o = 82^o$

Hence, **∠∠A = $25^o$, ∠∠B = $73^o$, ∠∠C = $82^o$**

**Q 8: In a cyclic quadrilateral ABCD, ∠∠A = $(2x + 4)^o$, ∠∠B = $(y + 3)^o$, ∠∠C = $(2y + 10)^o$, ∠∠D = $(4x – 5)^o$. Find the four angles.**

**Soln:**

We know that the sum of the opposite angles of cyclic quadrilateral is $180^o$. In the cyclic quadrilateral ABCD, angles A and C and angles B and D pairs of opposite angles

Therefore $\angle\angle A + \angle\angle C = 180^o$ and $\angle\angle B + \angle\angle D = 180^o$

Taking $\angle\angle A + \angle\angle C = 180^o$

By substituting $\angle\angle A = (2x + 4)^o$ and $\angle\angle C = (2y + 10)^o$ we get

$2x + 4 + 2y + 10 = 180^o$

$2x + 2y + 14 = 180^o$

$2x + 2y = 180^o – 14^o$

$2x + 2y = 166$ —— (i)

Taking $\angle\angle B + \angle\angle D = 180^o$

By substituting $\angle\angle B = (y+3)^o$ and $\angle\angle D = (4x – 5)^o$ we get

$y + 3 + 4x – 5 = 180^o$

$4x + y – 5 + 3 = 180^o$

$4x + y – 2 = 180^o$

$4x + y = 180^o + 2^o$

$4x + y = 182^o$ —— (ii)

By multiplying equation (ii) by 2 we get $8x + 2y = 364$ —— (iii)

By subtracting equation (iii) from (i) we get

$-6x = -198$

$x = -198-6 \; x = \frac{-198}{-6}$

$x = 33^o$

By substituting $x = 33^o$ in equation (ii) we get

$4x + y = 182$

$132 + y = 182$

$y = 182 – 132$

$y = 50$

The angles of a cyclic quadrilateral are

$\angle\angle A = 2x + 4$

$= 66 + 4$

$= 70^o$

$\angle\angle B = y + 3$

$= 50 + 3$

$= 53^o$

$\angle\angle C = 2y + 10$

$= 100 + 10$

$= 110^o$

$\angle\angle D = 4x – 5$

$= 132 – 5$

$= 127^o$

Hence, the angles of cyclic quadrilateral ABCD are **$\angle\angle A = 70^o$, $\angle\angle B = 53^o$, $\angle\angle C = 110^o$, $\angle\angle D = 127^o$**

**Q 9: In a $\Delta\Delta$ ABC, $\angle\angle A = x^o$, $\angle\angle B = 3x^o$, $\angle\angle C = y^o$. If $3y – 5x = 30$, prove that the triangle is right angled.**

**Soln:**

We have to prove that the triangle is right angled.

Given $\angle\angle A = x^o$, $\angle\angle B = 3x^o$ and $\angle\angle C = y^o$

Sum of three angles in triangle are $\angle\angle A + \angle\angle B + \angle\angle C = 180^o$

$\angle\angle A + \angle\angle B + \angle\angle C = 180^o$

$x + 3x + y = 180^o$

$4x + y = 180$ —— (i)

By solving $4x + y = 180$ with $3y – 5x = 30$ —— (ii) we get,

Multiplying equation (i) by 3 we get

$12x + 36y = 540$ —— (iii)

Subtracting equation (ii) from (iii)

$17x = 510$

**x=**51017 $x = \frac{510}{17}$

$x = 30^o$

Substituting $x = 30^o$ in equation (i) we get

$4x + y = 180$

$120 + y = 180$

$y = 180 – 120$

$y = 60^o$

Angles ∠∠A, ∠∠B and ∠∠C are

∠∠A = $x^o$

= $30^o$

∠∠B = $3x^o$

= $90^o$

∠∠C = $y^o$

= $60^o$

A right angled triangle is a triangle in which one side should has a right angle that is $90^o$ in it. Hence, ∠∠B = $90^o$. The triangle ABC is right angled.

**Q 10: The car hire charges in a city comprise of a 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?**

**Soln:**

Let the fixed charges of car be Rs. x per km and the running charges be Rs. y km/hr

According to the given condition we have

$x + 12y = 89$ —— (i)

$x + 20y = 145$ —— (ii)

By subtracting (i) from (ii) we get

$-8y = -56$

y= −56−8 $y = \frac{-56}{-8}$

$y = 7$

Putting y = 7 in equation (i) we get

$x + 12y = 89$

$x + 84 = 89$

$x = 89 – 84$

$x = 5$

Therefore, total charges for travelling distance of 30 km

= x + 30y

= 5 + 210

= Rs. 215

Hence, A person have to pay **Rs. 215** for travelling a distance of 30 km.

**Q 11: A part of monthly hostel charges in a college are fixed and the remaining depend 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.**

**Soln:**

Let the fixed charges of hostel be Rs. x and the cost of food charges be Rs. y per day

According to the given condition we have,

x + 20y = 1000 —— (i)

x + 26y = 1180 —— (ii)

Subtracting equation (ii) from equation (i) we get

-6y = -180

y= –180–6 $y = \frac{-180}{-6}$

y = 30

Putting y =30 in equation (i) we get

x + 20y = 1000

x + 600 = 1000

x = 1000 – 600

x = 400

Hence, the fixed charges of hostel is **Rs. 400**

The cost of food per day is **Rs. 30**

**Q 12: Half the perimeter of a garden, whose length is 4 more than its width is 36 m. Find the dimension of the garden.**

**Soln:**

Let perimeter of rectangular garden will be 2(l + b). Then half the perimeter of a garden will be 36 m

½ x 2(l + b) = 36



l + b = 36 ——- (i)

When the length is four more than its width then (b + 4)

Substituting l = b + 4 in equation (i) we get

l + b = 36

b + 4 + b = 36

2b = 36 – 4

2b = 32

b = 32/2

b = 16

Putting b = 16 in equation (i) we get

(l + b) = 36

l + 16 = 36

l = 36 -16

l = 20

Hence, the dimension of rectangular garden are **width = 16 m** and **length = 20 m**.

**Q 13: The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.**

**Soln:**

We know that the sum of supplementary angles will be $180^o$

Let the larger supplementary angle be x.

We know x + y = $180^o$ —— (i)

If larger of supplementary angles exceeds the smaller by 18 degrees, then

x = y + 18 —— (ii)

Substitute x = y + 18 in equation (i), we get

x + y = $180^o$

y + 18 + y = $180^o$

2y + 18 = $180^o$

2y = $180^o$ – $18^o$

2y = $162^o$

y = $(162/2)^o$

y = $81^o$

Put y = $81^o$ in equation (ii), we get

x = y+ 18

x = 81 + 18

x = $90^o$

Hence, the larger supplementary angle is **$99^o$**

The smaller supplementary angle is **$81^o$**

**Q 14: 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 embroidery, and that taken by 1 man alone.**

**Soln:**

Q woman alone can finish the work in x days and 1 man alone can finish it in y days. Then,

One woman one day work = $1x\frac{1}{x}$

One man one day work = $1y\frac{1}{y}$

2 women's one day work = $2x\frac{2}{x}$

5 men's one day work = $5y\frac{5}{y}$

Since 2 women and 5 men can finish the work in 4 days

$4(2x+5y)=14(\frac{2}{x}+\frac{5}{y})=1$

$8x+20y=1\frac{8}{x}+\frac{20}{y}=1$ ——(i)

3 women and 6 men can finish the work in 3 days

$3(3x+6y)=13(\frac{3}{x}+\frac{6}{y})=1$

$9x+18y=1\frac{9}{x}+\frac{18}{y}=1$ ——(ii)

Putting $1x=u\frac{1}{x}=u$ and $1y=v\frac{1}{y}=v$ in equation (i) and (ii) we get

8u + 20v – 1 = 0 —— (iii)

9u + 18v – 1 = 0 —— (iv)

By using cross multiplication we have

Now,

$u(20\times-1)-(18\times-1)=-v(8\times-1)-(9\times-1)=1(8\times18)-(9\times20)$

$\frac{u}{(20\times-1)-(18\times-1)}=\frac{-v}{(8\times-1)-(9\times-1)}=\frac{1}{(8\times18)-(9\times20)}$ $u-20+18=-v-8+9=1144-180$

$\frac{u}{-20+18}=\frac{-v}{-8+9}=\frac{1}{144-180}$ $u-2=-v1=1-36$ $\frac{u}{-2}=\frac{-v}{1}=\frac{1}{-36}$ $u=-2-36$ $u=\frac{-2}{-36}$ $u=118$ $u=\frac{1}{18}$ $v=-1-36$

$v=\frac{-1}{-36}$ $v=136$ $v=\frac{1}{36}$

Now,

$u=118$ $u=\frac{1}{18}$ $1x=118$ $\frac{1}{x}=\frac{1}{18}$

x = 18

$v=136$ $v=\frac{1}{36}$ $1y=136$ $\frac{1}{y}=\frac{1}{36}$

y = 36

Hence, the time taken by 1 woman alone to finish the embroidery is **18 days**.

The time taken by 1 man alone to finish the embroidery is **36 days.**

**Q 15: Meena went to a bank to withdraw Rs. 2000. Shw 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.**

**Soln:**

Let x and y be the number of notes of Rs. 50 and Rs. 100 respectively

If Meena ask for Rs. 50 and Rs. 100 notes only, then the equation will be,

50x + 100y = 2000

Divide both sides by 50 then we get,

x + 2y = 40 ——- (i)

If Meena got 25 notes in all then the equation will be,

x + y = 25 —— (ii)

By subtracting the equation (ii) from (i) we get

y = 15

Substituting y = 15 in equation (ii), we get

x + y = 25

x + 15 = 25

x = 25 – 15

x = 10

Therefore x = 10 and y = 15

Hence, Meena has **10** notes of Rs. 50 and **15** notes of Rs. 100

**Q 16: A wizard having powers of mystic in candations and magical medicines seeing a cock fight going on, spoke privately to both the owners of cocks. To one he said; if your bird wins, then you give me your stake-money, but if you do not win, I shall give you two third of that. Going to the other, he promised in the same way to give three fourth. From both of them his gain would be only 12 gold coins. Find the stake of money each of the cock-owners have.**

**Soln:**

Let the strike money of first cock-owner be Rs. x and of second cock-owner be Rs. y respectively.

Then we have,

$x - 34y = 12 x - \frac{3}{4}y = 12 \quad 4x - 3y4 = 12 \frac{4x-3y}{4} = 12$

4x – 3y = 48 —— (i)

For second cock-owner according to given condition we have,

$y - 23x = 12 y - \frac{2}{3}x = 12 \quad 3y - 2x3 = 12 \frac{3y-2x}{3} = 12$

3y – 2x = 36 —— (ii)

By subtracting (ii) from (i), we have

2x = 84

x = 84/2 = 42

Putting x = 42 in equation (ii) we get,

3y – 2x = 36

3y – 84 = 36

3y = 36 + 84

3y = 120

y = 120/3 = 40

Hence the stake of money of first cock-owner is **Rs. 42** and of second cock-owner is **Rs. 40**.

**Q 17: The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in arrow there would be 2 rows more. Find the number of students in the class.**

**Soln:**

Let the number of students be x and the number of rows be y. Then,

Number of students in each row = $xy \frac{x}{y}$

Where three students is extra in each row, there are one row less that is when each row has $(xy + 3)$

$(\frac{x}{y} + 3)$ students the number of rows is (y – 1)

Total number of students = number of rows x number of student in each row

x=(xy+3)(y−1)$x = (\frac{x}{y} + 3)(y - 1)$ x=(x+3y−xy−3)$x = (x + 3y - \frac{x}{y} - 3)$ 0=−xy+x−x+3y−3 $0 = \frac{-x}{y} + x - x + 3y - 3$

0=−xy+3y−3$0 = \frac{-x}{y} + 3y - 3$ —— (i)

If three students are less in each row then there are 2 rows more that is when each row has (xy−3)(y+2) $(\frac{x}{y} - 3)(y + 2)$

Therefore, total number of students = number of rows x number of students in each row

x=(xy−3)(y+2)$x = (\frac{x}{y} - 3)(y + 2)$ x=x−3y+2yx−6$x = x - 3y + \frac{2y}{x} - 6$ 0=2xy+x−x−3y−6 $0 = \frac{2x}{y} + x - x - 3y - 6$

0=2xy−3y−6$0 = \frac{2x}{y} - 3y - 6$ —— (ii)

Putting xy=u$\frac{x}{y} = u$ in (i) and (ii) we get

-u + 3y – 3 = 0 —— (iii)

2u – 3y – 6 = 0 —— (iv)

Adding (iii) and (iv) we get

u – 9 = 0

u = 9

Putting u = 9 in equation (iii) we get

-u + 3y – 3 = 0

-9 + 3y – 3 = 0

3y – 12 = 0

3y = 12

y = 12/3 = 4

Now,

xy=9$\frac{x}{y} = 9$ x4=9$\frac{x}{4} = 9$

x = 36

Hence, the number of students in the class is **36**.

**Q 18: One says, "Give me 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?**

**Soln:**

Let the money with first person be Rs. x and the money with the second person be Rs. y. Then,

$(x + 100) = 2(y – 100)$

$(y + 10) = 6(x – 10)$

If first person gives Rs. 100 to second person then the second person will become twice as rich as first person. According to the given condition, we have,

$(x + 100) = 2(y – 100)$

$x + 100 = 2y – 200$

$x – 2y + 100 + 200 = 0$

$x – 2y + 300 = 0$ ——– (i)

If second person gives Rs. 10 to first person then the first person will become six times as rich as second person. According to given condition, we have

$(y + 10) = 6(x – 10)$

$y + 10 = 6x – 60$

$0 = 6x – 60 – y – 10$

$0 = 6x – y – 70$ ——— (ii)

Multiplying (ii) by 2 we get,

$12x – 2y – 140 = 0$ —— (iii)

By subtracting (iii) from (i), we get

$-11x + 440 = 0$

$-11x = -440$

$x = 440/11 = 40$

Putting x = 40 in (i) we get,

$x – 2y + 300 = 0$

$40 – 2y + 300 = 0$

$-2y + 340 = 0$

$2y = 340$

$y = 340/2 = 170$

Hence, first person's capital will be **Rs. 40**.

Second person's capital will be **Rs. 170**.