RD Sharma Solutions Class 10 Maths Chapter 3 Exercise 3.4: Exercise 3.4 of RD Sharma's Class 10 Maths focuses on solving pairs of linear equations in two variables using various methods, including substitution, elimination, and graphical representation. Students learn to set up equations based on given word problems and solve them to find the values of the variables.

This exercise emphasizes understanding the relationship between the equations, identifying consistent, inconsistent, and dependent systems, and interpreting the solutions in real-world contexts. By practicing these problems, students enhance their problem-solving skills and gain confidence in handling linear equations effectively.

RD Sharma Solutions Class 10 Maths Chapter 3 Exercise 3.4 Overview

Exercise 3.4 of RD Sharma's Class 10 Maths, focusing on pairs of linear equations in two variables, is crucial for developing algebraic problem-solving skills. It teaches students to apply methods like substitution, elimination, and graphical representation to find solutions.

Mastering this exercise is essential for understanding how to model real-life situations mathematically, as many practical problems can be represented as linear equations. Furthermore, it lays the foundation for advanced topics in mathematics and other subjects, enhancing logical reasoning and analytical thinking, which are valuable skills in academic and everyday decision-making.

RD Sharma Solutions Class 10 Maths Chapter 3 Exercise 3.4 Pair of Linear Equations in Two Variables

Below is the RD Sharma Solutions Class 10 Maths Chapter 3 Exercise 3.4 Pair of Linear Equations in Two Variables -

Solve each of the following systems of equations by the method of cross-multiplication:

1. $x + 2y + 1 = 0$

$2x - 3y - 12 = 0$

Solution:

The given systems of equations are

$x + 2y + 1 = 0$

2x – 3y – 12 = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method,

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

$$\frac{x}{-21} = \frac{-y}{-14} = \frac{1}{-7}$$

Now,

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

=x= 3

And,

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

=y=-2

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

2. 3x + 2y + 25 = 0

2x + y + 10 = 0

Solution:

The given system of equations is

3x + 2y + 25 = 0

2x + y + 10 = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method,

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

$$\frac{x}{-5} = \frac{-y}{-20} = \frac{1}{-1}$$

Now,

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

=x= 5

And,

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

=y=-20

Hence, the solution for the given system of equations is x = 5 and y = -20.

3. 2x + y = 35, 3x + 4y = 65

Solution:

The given system of equations can be written as

2x + y – 35 = 0

3x + 4y – 65 = 0

For cross-multiplication, we use,

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method,

$$\frac{x}{-65+140} = \frac{-y}{-130+105} = \frac{1}{8-3}$$

$$\frac{x}{75} = \frac{-y}{-25} = \frac{1}{5}$$

Now,

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

$=x = 15$

And,

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

$=y=5$

Hence, the solution for the given system of equations is x = 15 and y = 5.

4. 2x – y = 6, x – y = 2

Solution:

The given system of equations can be written as

2x – y – 6 = 0

x – y – 2 = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method,

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

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

Now,

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

$= x = 4$

And,

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

$= y = 2$

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

5. (x + y)/ xy = 2

(x – y)/ xy = 6

Solution:

The given system of equations is

(x + y)/ xy = 2 ⇒ 1/y + 1/x = 2…….. (i)

(x – y)/ xy = 6 ⇒ 1/y – 1/x = 6……… (ii)

Let 1/x = u and 1/y = v, so the equation becomes

u + y = 2….. (iii)

u – y = 6……(iv)

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations (iii) & (iv) with the general form, we get

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

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

By cross multiplication method,

$$\frac{u}{6-2} = \frac{-v}{6+2} = \frac{1}{-1-1}$$

$$\frac{u}{4} = \frac{-v}{8} = \frac{1}{-2}$$

Now,

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

$=u= -2$

And,

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

$=v=4$

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

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

Hence, the solution for the given system of equations is x = -1/2 and y = 1/4.

6. ax + by = a-b

bx – ay = a+b

Solution:

The given system of equations can be written as

ax + by – (a-b) = 0

bx – ay – (a+b) = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

$a_1 = a$, $b_1 = b$, $c_1 = -(a-b)$

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

By cross multiplication method,

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

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

Now,

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

=x= 1

And,

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

=y=-1

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

7. x + ay = b

ax + by = c

Solution:

The given system of equations can be written as

x + ay – b = 0

ax + by – c = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method,

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

Now,

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

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

And,

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

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

Hence, the solution for the given system of equations is $x = (b^2 + ac)/(a^2 + b^2)$.

and $y = (-c^2 + ab)/(a^2 + b^2)$.

8. $ax + by = a^2$

$bx + ay = b^2$

Solution:

The given system of equations can be written as

$ax + by - (a^2) = 0$

$bx + ay - (b^2) = 0$

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

$a_1x+b_1y+c_1=0$

$a_2x+b_2y+c_2=0$

$\Rightarrow \frac{x}{b_1c_2-b_2c_1} = \frac{-y}{a_1c_2-a_2c_1} = \frac{1}{a_1b_2-a_2b_1}$

Here, According to the question,

$a_1= a$, $b_1= b$, $c_1= a^2$

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

By cross multiplication method,

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

Now,

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

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

And,

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

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

Hence, the solution for the given system of equations is $x = (a^2 + ab + b^2)/(a + b)$ and $y = -ab / (a+ b)$.

9. 5/(x + y) – 2/(x -y) = -1

15/(x + y) + 7/(x – y) = 10

Solution:

Let's substitute 1/(x + y) = u and 1/(x – y) = v, so the given equations becomes

5u – 2v = -1

15u + 7v = 10

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method,

$$\frac{u}{20-7} = \frac{-v}{-50-15} = \frac{1}{35+30}$$

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

Now,

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

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

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

=x+y=5 ....(i)

And,

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

=v=1

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

=x-y =1 .... (ii)

Adding equation (i) and (ii)

2x= 6

=x=3

Substituting the value of x in equation (i)

3+y=5

=y=2

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

10. 2/x + 3/y = 13

5/x – 4/y = -2

Solution:

Let 1/x = u and 1/y = v, so the equation becomes

2u + 3y = 13 ⇒ 2u + 3y – 13 = 0

5u – 4y = -2 ⇒ 5u – 4y + 2 = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

$a_1 = 2$, $b_1 = 3$, $c_1 = -13$

$a_2 = 5$, $b_2 = -4$, $c_2 = 2$

By cross multiplication method,

$\frac{u}{6-52} = \frac{-v}{4+65} = \frac{1}{-8-15}$

$\frac{u}{-46} = \frac{-v}{69} = \frac{1}{-23}$

Now,

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

=u= 2

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

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

And,

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

=v=3

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

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

Hence, the solution for the given system of equations is x = 1/2 and y = 1/3.

11. 57/(x + y) + 6/(x – y) = 5

38/(x + y) + 21/(x – y) = 9

Solution:

Let’s substitute 1/(x + y) = u and 1/(x – y) = v, so the given equations becomes

57u + 6v = 5 ⇒ 57u + 6v – 5 = 0

38u + 21v = 9 ⇒ 38u + 21v – 9 = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

$a_1 = 57$, $b_1 = 6$, $c_1 = -5$

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

By cross multiplication method,

$$\frac{u}{-54+105} = \frac{-v}{-513+190} = \frac{1}{1193-228}$$

$$\frac{u}{51} = \frac{-v}{-323} = \frac{1}{969}$$

Now,

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

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

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

=x+y=19 ....(i)

And,

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

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

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

=x-y =3 .... (ii)

Adding equation (i) and (ii)

2x= 22

=x=11

Substituting the value of x in equation (i)

11+y=19

=y=8

Hence, the solution for the given system of equations is x = 11 and y = 8.

12. xa – yb = 2

ax – by = a^2-b^2

Solution:

The given system of equations can be written as xa – yb – 2 **= 0**

ax – by – (a^2-b^2) = 0

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method

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

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

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

x= a

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

=y=b

Hence, the solution for the given system of equations is x = a and y = b.

13. x/a + y/b = a + b

x/a^2 + y/b^2 = 2

Solution:

The given system of equations can be written as

x/a + y/b – (a + b) **= 0**

x/a^2 + y/b^2 – 2 **= 0**

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

$a_1 = \frac{1}{a}$, 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

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

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

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

$= x = a^2$

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

$= y = b^2$

Hence, the solution for the given system of equations is $x = a^2$ and $y = b^2$.

14. x/a = y/b

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

Solution:

The given system of equations can be written as

x/a – y/b **= 0**

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

For cross-multiplication, we use

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - a_2c_1} = \frac{1}{a_1b_2 - a_2b_1}$$

Comparing the above two equations with the general form, we get

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

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

By cross multiplication method

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

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

$=x=a$

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

$=y=b$

Hence, the solution for the given system of equations is x = a and y = b.

Benefits of Solving RD Sharma Solutions Class 10 Maths Chapter 3 Exercise 3.4

Solving RD Sharma Solutions for Class 10 Maths, Chapter 3, Exercise 3.4 on pairs of linear equations in two variables offers several benefits:

Conceptual Understanding: It helps students grasp fundamental concepts of linear equations, enhancing their ability to formulate and solve problems effectively.

Problem-Solving Skills: Engaging with a variety of problems improves analytical and critical thinking skills, essential for tackling complex mathematical challenges.

Application of Methods: Students learn different methods such as substitution, elimination, and graphical representation, equipping them to choose the most effective approach for various problems.

Real-Life Applications: Understanding how to model and solve real-world situations through linear equations fosters practical application of mathematics in everyday life.

Exam Preparation: Regular practice of these exercises aids in exam readiness, boosting confidence and performance in assessments related to linear equations.

Foundation for Advanced Topics: Mastery of this chapter lays a solid foundation for higher-level mathematics, making it easier to grasp advanced concepts in algebra and related fields.