

CHAPTER : 3 PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

MIND MAPS LEARNING MADE SIMPLE

By Substitution

Solve: $7x - 15y = 2$ -(i)
 $x + 2y = 3$ -(ii)

Solution: From equation (ii), $x = 3 - 2y$
substitute value of x in eq. (i)
 $7(3 - 2y) - 15y = 2$

$$-29y = -19 \Rightarrow y = \frac{19}{29}$$

Now, from $x = 3 - 2y$

$$x = 3 - 2\left(\frac{19}{29}\right) = \left(\frac{49}{29}\right)$$

Algebraic Methods

By Elimination

Solve: $x + 3y = 6$ -(i)
 $2x + 3y = 12$ -(ii)
Now, Adding equation (i) and (ii)
 $3x = 18$ or $x = 6$
Again, from (i) $\times 2$ - (ii)
 $3y = 0$ or, $y = 0$
Hence, $x = 6, y = 0$

By Cross-Multiplication

Solve: $2x + 3y - 46 = 0$ -(i)
 $3x + 5y - 74 = 0$ -(ii)

Solution: By cross-multiplication method

$$\frac{x}{3(-74) - 5(-46)} = \frac{y}{(-46)(3) - (-74)(2)} = \frac{1}{2(5) - 3(3)}$$

$$\frac{x}{-222 + 230} = \frac{y}{-138 + 148} = \frac{1}{10 - 9}$$

$$\frac{x}{8} = \frac{y}{10} = \frac{1}{1} \Rightarrow \frac{x}{8} = \frac{y}{10} = 1$$

i.e. $x = 8$ and $y = 10$

Pair of Linear Equations in Two Variables

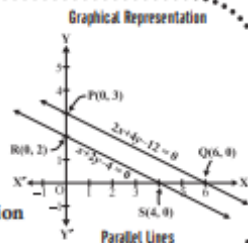
Graphical Representation

Pair of Lines = $x + 2y - 4 = 0$
 $2x + 4y - 12 = 0$

$$\frac{a_1}{a_2} = \frac{1}{2}, \frac{b_1}{b_2} = \frac{2}{4}, \frac{c_1}{c_2} = \frac{-4}{-12}$$

$$\text{Compare the Ratios} = \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Algebraic Interpretation : No solution
- Inconsistent



General Form

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

$$a_1, b_1, c_1, a_2, b_2, c_2 - \text{Real numbers}$$

Each solution (x, y) , corresponds to a point on the line representing the equation and vice-versa

Solution Graphically

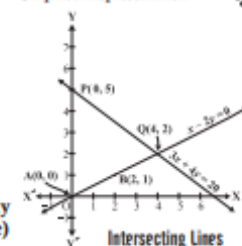
Pair of Lines = $x - 2y = 0$
 $3x + 4y - 20 = 0$

$$\frac{a_1}{a_2} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{-2}{4}, \frac{c_1}{c_2} = \frac{0}{-20}$$

$$\text{Compare the Ratios} = \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

Algebraic Interpretation : Exactly one solution - consistent (unique)

Graphical Representation



Pair of Lines = $2x + 3y - 9 = 0$
 $4x + 6y - 18 = 0$

$$\frac{a_1}{a_2} = \frac{2}{4}, \frac{b_1}{b_2} = \frac{3}{6}, \frac{c_1}{c_2} = \frac{-9}{-18}$$

$$\text{Compare the Ratios} = \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

Algebraic Interpretation = Infinitely many solutions - Dependent

Graphical Representation

