

Class 10 Mathematics – Chapter: Pair of Linear Equations in Two Variables

1. Introduction

A pair of linear equations in two variables involves two equations, each of the form:

$$ax + by + c = 0$$

where a, b, c are constants and x, y are variables.

2. Solutions of a Pair of Linear Equations

A solution is an ordered pair (x, y) that satisfies both equations simultaneously.

3. Methods of Solving

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Graphical Method: Plotting both equations on a graph; the point of intersection is the solution.

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Substitution Method: Solve one equation for one variable and substitute into the other.

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Elimination Method: Add or subtract equations to eliminate one variable and solve for the other.

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Cross-Multiplication Method: For equations:

$$a_1x + b_1y + c_1 = 0 \quad a_2x + b_2y + c_2 = 0 \quad a_1x + b_1y + c_1 = 0 \quad a_2x + b_2y + c_2 = 0$$

The solution is given by:

$$x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}, y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$

4. Types of Solutions

- Unique solution: Lines intersect at one point.
 - No solution: Lines are parallel.
 - Infinite solutions: Lines coincide.
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5. Consistency and Inconsistency

- Consistent: If there is at least one solution.
- Inconsistent: No solution.

6. Conditions for Solutions

Given equations:

$$a_1x + b_1y + c_1 = 0 \quad a_2x + b_2y + c_2 = 0 \quad a_1x + b_1y + c_1 = 0 \quad a_2x + b_2y + c_2 = 0$$

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Unique solution if: $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

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No solution if: $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

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Infinite solutions if: $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

7. Word Problems

Translate real-life situations into linear equations and solve using the above methods.

8. Important Exam Tips

- Carefully form equations from word problems.
- Choose the appropriate method to solve.
- Check the consistency conditions before solving.
- Verify solutions by substituting back into the original equations.