CBSE Class–10 Mathematics

Revision Notes

CHAPTER 03

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

1. Pair of Linear Equations in Two Variables
2. Graphical Method of Solution
3. Algebraic Methods of Solution
4. Substitution Method
5. Elimination Method
6. Cross-Multiplication Method
7. Equations Reducible to a Pair of Linear Equations

1. A pair of linear equations in two variables is said to form a system of simultaneous linear equations in two variables.

The most general form of a pair of linear equations is :

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0$$

Where $a_1, a_2, b_1, b_2, c_1, c_2$ are real numbers and

$$a_1^2 + b_1^2 \neq 0, a_2^2 + b_2^2 \neq 0$$

- The solution of a linear equation is a pair of values, one for x and one for y. This pair of values is called **Ordered pair**.
- A pair of values of x and y satisfying each of the equations in the given system of two simultaneous equations in x and y is called a **solution of the system**.
- A pair of linear equations will have either (a) **a unique solution** or (b) **infinitely many solutions** or (c) **no solution**.

2. The graph of a pair of linear equations in two variables is represented by two lines;

(i) If the lines intersect at a point, the pair of equations is consistent.The point of intersection gives the unique solution of the equations.

(ii) If the lines coincide, then there are infinitely many solutions. The pair of equations is consistent. Each point on the line will be a solution.

(iii) If the lines are parallel, the pair of the linear equations has no solution. The pair of linear equations is inconsistent.

Thus, corresponding to each solution (x, y) of the linear equation ax + by + c = 0, there exists a point on the line representing the equation ax + by + c = 0 and vice versa.

3. If a pair of linear equations is given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

(i) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\Rightarrow$the pair of linear equations is consistent. (Unique solution).

(ii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\Rightarrow$ the pair of linear equations is inconsistent(No solution).

(iii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ $\Rightarrow$ the pair of linear equations is dependent andconsistent (infinitely many solutions).

4. **Solution of pairs of linear equations in two variables algebraically**:

Solution by **Substitution method**:

Let the pair of equations be $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

- From one of the equations, express one of the variables say y in terms of the other variable i.e., x.
- Substitute the value of y, obtained in above step, in other equation, the getting an equation in x.
- Solve the equation and get the value of x.
- Sustitute the value of x in expression for y obtained in first step and get the value of y.

Solution by **Elimination method**, i.e., by **equating the coefficients**:

- in the two given equations, make the coefficients of one of the variables numerically equal. To do so, multiply these coefficients by suitable constant.
- Add or subtract the equations obtained in above step according as the terms having same coefficients are of the opposite or of the same signs and get an equation in only one variable.

- Solve the equation found and get the value of one of the variable.
- Sustitute the value of this variable in either of the two given equations and find the value of the other variable.

Solution by **Cross Multiplication method**:

Let the pair of equations be $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

To find the values of x and y, we have the formulae:

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