

Chapter-03

Pair of Linear Equation in Two Variables

- **Algebraic Expression:** A combination of constants and variables, connected by four fundamental arithmetical operations of $+$, $-$, \times and \div is called an algebraic expression. For example, $3x^2 + 4xy - 5y^2$ is an algebraic expression.
- **Equation:** An algebraic expression with equal to sign ($=$) is called the equation. Without an equal to sign, it is an expression only. For example, $3x + 9 = 0$ is an equation, but $3x + 9$ is an expression.
- **Linear Equation:** If the greatest exponent of the variable(s) in a equation is one, then equation is said to be a linear equation.
- The most general form of a pair of linear equations is:

$$a_1x + b_1y + c_1 = 0$$

$$a_2x + b_2y + c_2 = 0 \text{ Where } a_1, a_2, b_1, b_2, c_1, c_2 \text{ are real numbers and}$$

$$a_1$$

$$2 + b_1$$

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

- The graph of a pair of linear equations in two variables is represented by two lines;
 - If the lines intersect at a point, the pair of equations is consistent. The point of intersection gives the unique solution of the equation.
 - 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.
 - If the lines are parallel, the pair of the linear equations has no solution. The pair of linear equations is inconsistent.
- If a pair of linear equations is given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$
 - $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ the pair of linear equations is consistent. (Unique solution).
 - $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is inconsistent (No solution).
 - $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$ the pair of linear equations is dependent and consistent (infinitely many solutions).