Revision : chapter-3 : pair of linear equations in 2 variables

linear equations [Degree 1]

Standard form : $ax + b = 0$ [1 variable linear equation]

✓ Standard form $ax + by + c = 0$ [linear equation in 2 variable]

$ax + by + c = 0$

x & y are the variables.

Solution for linear equation in 2 variables

1) equation has only one solution or unique solution. [consistent pair of equation] $x = a$, $y = b$
2) Equation have infinitely many solution [consistent pair of equation] $0 = 0$ or $3 = 3$
3) Equation have no solution. [inconsistent pair of equation] $0 = 3$ or $9 = 7$

Algebraic method of solving a pair of linear equations

1) Substitution method

2) Elimination method

3) cross multiplication method

Substitution method

1) $7x - 5y = 2$ —— (1)

$x + 2y = 3$ —— (2)

from (2) $\Longrightarrow$ $x = 3 - 2y$ —— (3)

Sub (3) in (1),

$$7[3 - 2y] - 5y = 2$$

$$21 - 14y - 5y = 2$$

$$21 - 19y = 2$$

$$-19y = 2 - 21$$

$$-19y = -19$$

$$y = \frac{-19}{-19} = \underline{\underline{1}}$$

Sub, $y = 1$ in (3),

$$x = 3 - [2 \times 1]$$

$$= 3 - 2$$

$$= \underline{\underline{1}}$$

$x = 1$ & $y = 1$ are the solutions

Elimination method

1) $x + y = 5 \quad \text{—— (1)}$

$2x - 3y = 4 \quad \text{—— (2)}$

Multiply (1) with 3 $\Rightarrow$

$$
\begin{array}{r}
3x + \cancel{3y} = 15 \quad \text{—— (3)} \\
2x - \cancel{3y} = 4 \\
\hline
5x = 19
\end{array}
$$

$$x = \frac{19}{5}$$

Sub $x = \frac{19}{5}$ in (1) $\Rightarrow$ $\frac{19}{5} + y = 5$

$$\Rightarrow y = 5 - \frac{19}{5} = \frac{25 - 19}{5} = \underline{\underline{\frac{6}{5}}}$$

Graphical Method

consistent	intersecting lines ✕ (a,y)	unique solution ✓
consistent	coincident lines	infinitely many solution ✓
inconsistent	parallel lines	no solution ✓

$a_1x + b_1y + c_1 = 0$ — (1)

$a_2x + b_2y + c_2 = 0$ — (2)

are (i) intersecting, then $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$.

(ii) coincident, then $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

(iii) parallel, then $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$.