अभय **CLASS 10**

PAIR OF LINEAR EQUATION IN 2 VARABLES

CHAPTER - 3

Pair of Linear Eqⁿ in two variables

Pair — Two

Linear — $\theta = 1$

variables — x, y

Pair:

$$a_1 x' + b_1 y' = c_1 \quad \longrightarrow \quad L_1$$

$$a_2 x' + b_2 y' = c_2 \quad \longrightarrow \quad L_2$$

Condition for (Consistency) and Inconsistency :

Coincident ≡ Dependent
(nick-name)

✓ Coincident

General form

$$a_1 x + b_1 y = c_1$$
$$a_2 x + b_2 y = c_2$$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

↳ Infinitely many sol.

Intersecting
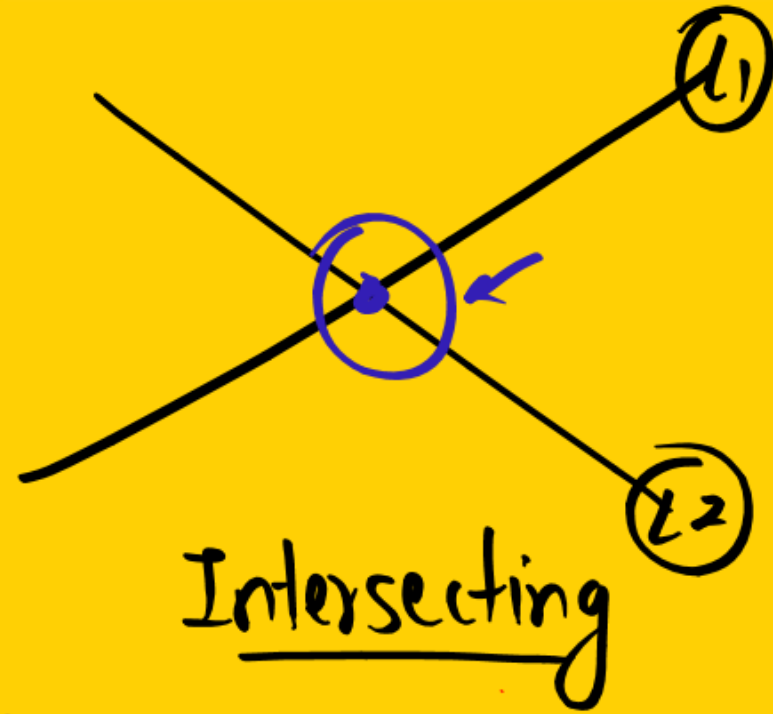
$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

unique solution

→ Consistent Pair

✓ Parallel

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

↳ No solution.

⇒ Inconsistent

$$3x + 4y - 3 = 0$$
$$4x - 3y + 2 = 0$$
$$\left.\right] \text{int} / \text{coin} / \text{lle} ??$$

K³B : First convert lines in general form.

$$3x + 4y = 3$$
$$4x - 3y = -2$$

$$\frac{a_1}{a_2} = \frac{3}{4} \quad \left| \quad \frac{b_1}{b_2} = \frac{4}{-3} \quad \right| \quad \frac{c_1}{c_2} = \frac{3}{-2}$$

Since, $\boxed{\frac{a_1}{a_2} \neq \frac{b_1}{b_2}}$ → Intersecting lines → Unique Solution.

#LP : For the pair of equations kx + 3y = -7 , 2x - 6y = 14 to have infinitely many solutions , find the value of 'k' .

$$kx + 3y = -7$$

$$2x - 6y = 14$$

Inf. many solution
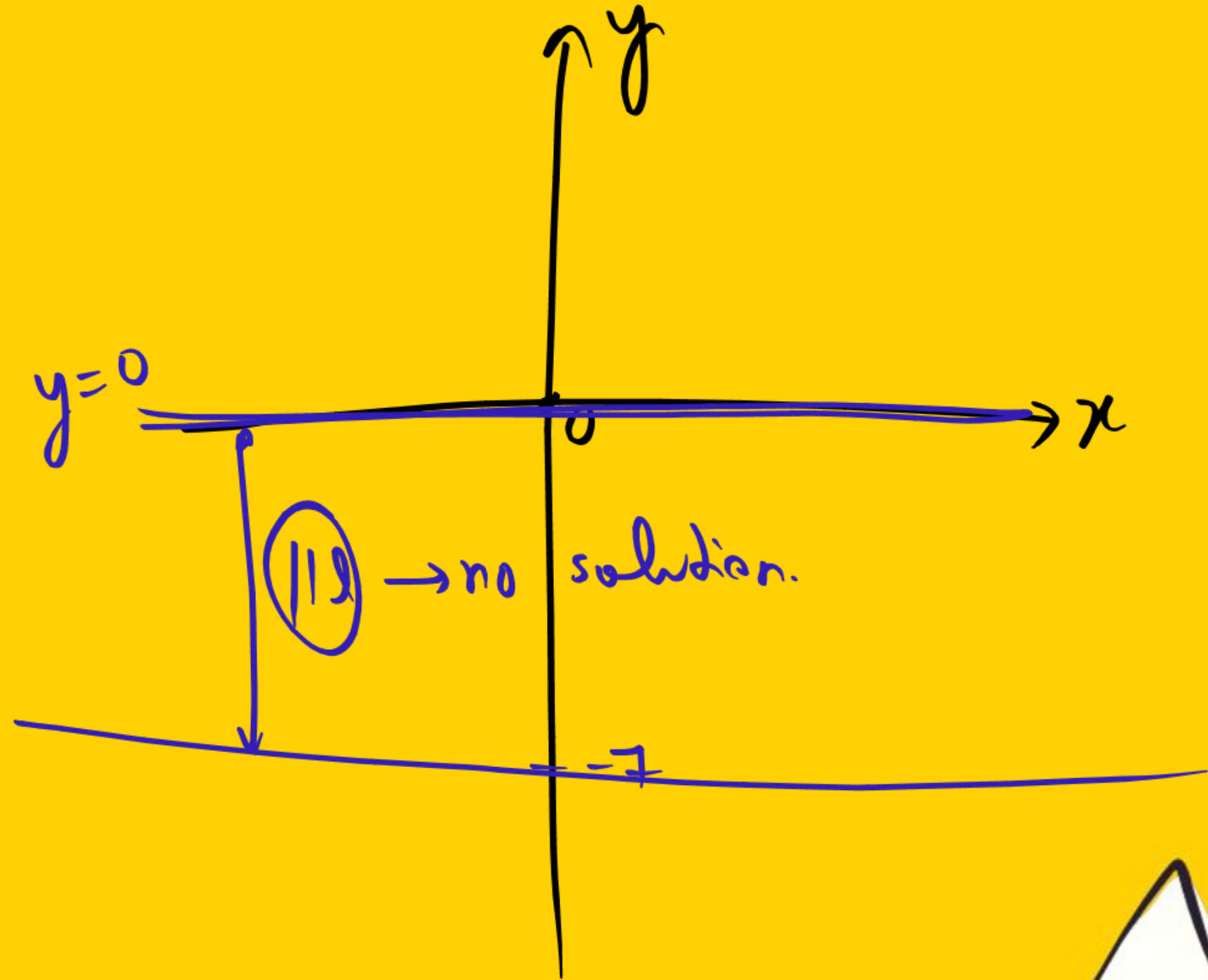
——————— Coincident

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{k}{2} = \frac{3}{-6} = \frac{-7}{14}$$

$$\frac{k}{2} = -\frac{3}{6_2} \Rightarrow k = -1$$

#LP : The pair of equations y = 0 and y = -7 has:
A. One Solutions
B. Two solutions
C. Infinitely Many solutions
D. No solutions

$y = 0$

$||^{e}$ → no solution.

$= -7$

<u>Algebraic methods of finding solutions</u>/roots/zeroes

$$a_1 x + b_1 y = c_1$$
$$a_2 x + b_2 y = c_2$$

→ Substitution Method

→ Elimination Method

#LP : Solving the following systems of equations by using the method of substitution: → एक eq में से किसी भी एक var. की value उठाकर दूसरी eq" में पटक दो।

$x + 2y = -1;\ 2x - 3y = 12$

$x + 2y = -1$

$x = -2y - 1$

$2x - 3y = 12$

$2(-2y - 1) - 3y = 12$

$-4y - 2 - 3y = 12$

$-7y = 12 + 2$

$-7y = 14 \Rightarrow \boxed{y = -2} \checkmark$

$x = -2y - 1$

$= -2(-2) - 1$

$\Rightarrow 4 - 1 \Rightarrow \boxed{3}\ \checkmark$

Same Q by Elimination:-

→ क्या दिया (किसी भी एक variable को Eliminate कर देंगे।)

कैसे ?? जिसको भी eliminate करना है उसके co-eff. same कर दो

$1x + 2y = -1$ ──×2

$2x - 3y = 12$

$2x + 4y = -2$
$2x - 3y = 12$
$- \quad + \quad -$
──────────────
$7y = -14$

$\boxed{y = -2}$

put in any eq^n

$x + 2(-2) = -1$

$x - 4 = -1$

$x = 4 - 1$

$\boxed{x = 3}$ ✓

#LP : A part of monthly hostel charges is fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 20 days, she has to pay Rs. 1000 as hostel charges whereas a student B, who takes food for 26 days, pays Rs.1180 as hostel charges. Find the fixed charges and the cost of food per day.

let fixed charge ₹ x

per day charge ₹ y

(A) (20 day)

$$x + 20y = 1000 \quad \text{①}$$

Ⓑ (26 days)

$$\boxed{x + 26y = 1180} \quad \text{①}$$

$$x + 20y = 1000$$

$$\overline{\qquad\qquad}$$

$$6y = 180$$

$$y = \frac{\cancel{180}^{30}}{\cancel{6}}$$

$$\boxed{y = 30} \quad \boxed{₹ 30}$$

$$x + 20(30) = 1000$$

$$x + 600 = 1000$$

$$x = 1000 - 600 = ₹400$$

#LP : Solve for x and y :

$x/10 + y/5 + 1 = 15$; $x/8 + y/6 = 15$

$$\frac{x}{10} + \frac{y}{5} + 1 = 15$$

$$\frac{x}{10} + \frac{y}{5} = 14$$
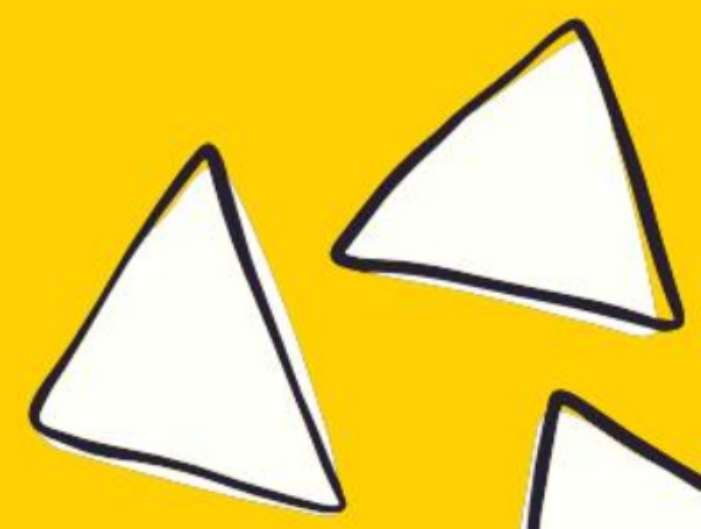
$$\frac{x+2y}{10} = 14$$

$$\boxed{x + 2y = 140} - ⓘ$$

$$\frac{x}{8} + \frac{y}{6} = 15$$

$$\frac{3x + 4y}{24} = 15$$

$$\boxed{3x + 4y = 360} - ⑪$$

solve by elim.

$$
\begin{array}{l}
x \\
15 \\
2y \\
\hline
60 \\
30x \\
\hline
3 \quad 0
\end{array}
$$

#LP : Solve the following pair of equations : (coefficients interchange)

$49x + 51y = 499$ —— ①

$51x + 49y = 501$ —— ②

तरीका एक बार add
                     एक बार subt.

② + ①

$100x + 100y = 1000$

$100(x+y) = 1000$

$$\boxed{x+y = 10}$$ —— ①

↙ solving
    elim.

① - ②

$49x + 51y = 499$

$51x + 49y = 501$

——————————————

$-2x + 2y = -2$

$\cancel{2}(-x+y) = -\cancel{2}$

$-x + y = -1$

$+(x-y) = +1$

$$\boxed{x - y = 1}$$ —— ②

#LP : Solve for x and y :

$$\frac{10}{x+y} + \frac{2}{x-y} = 4; \qquad \frac{15}{x+y} - \frac{5}{x-y} = -2$$

$$x + y \neq 0$$

$$x - y \neq 0$$

$$let$$
$$\frac{1}{x+y} = p$$
$$\frac{1}{x-y} = q$$

$$\frac{10}{x+y} + \frac{2}{x-y} = 4$$

$$\boxed{10p + 2q = 4}$$

$$\frac{15}{x+y} - \frac{5}{x-y} = -2$$

$$\boxed{15p - 5q = -2}$$

Solve & find p, q.

#LP : Find the values of p and q for which the following system of equations has infinite number of solutions:

$2x + 3y = 7$

$(p + q)x + (2p - q)y = 21$

$2x + 3y = 7$

$(p+q)x + (2p-q)y = 21$

coincident

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{2}{p+q} = \frac{3}{2p-q} = \frac{7}{21} \frac{1}{3}$$

$$\frac{2}{p+q} = \frac{1}{3}$$

$$\boxed{p+q = 6} \ -Ⓘ$$

$$\frac{3}{2p-q} = \frac{1}{3}$$

$$\boxed{2p-q = 9} -Ⓘ$$

#LP : The pair of equations $3^{x+y} = 81$; $81^{x-y} = 3$ has:
A. No Solutions
B. Two solutions
C. Infinitely Many solutions
D. None of these

$$(a^m)^n = a^{mn}$$

3	81
3	27
3	9
3	3
	1

$$3^{x+y} = 81$$

$$3^{x+y} = 3^4$$

comparing

$$\boxed{x + y = 4}$$
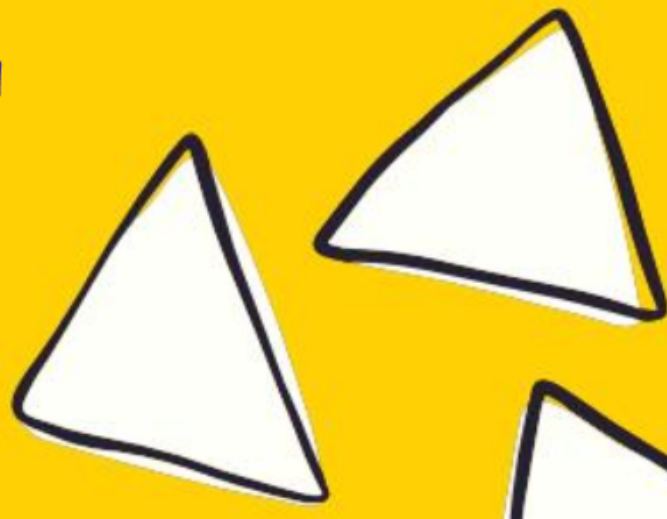
$$81^{x-y} = 3$$

$$(3^4)^{x-y} = 3$$

$$3^{4(x-y)} = 3^1$$

comparing.

$$\boxed{4x - 4y = 1}$$

#LP : Solve for x and y :

$$\frac{x}{a} = \frac{y}{b}; \quad ax + by = a^2 + b^2$$

$$\frac{x}{a} = \frac{y}{b}$$

$$x = \frac{a}{b}y$$

$$x = \frac{a(b)}{b}$$

$$x = a$$

$$ax + by = a^2 + b^2$$

$$a\left(\frac{a}{b}y\right) + by = a^2 + b^2$$

$$\frac{a^2y}{b} + by = a^2 + b^2$$

$$\frac{a^2y + b^2y}{b} = a^2 + b^2$$

$$a^2y + b^2y = b(a^2 + b^2)$$

$$y(a^2 + b^2) = b(a^2 + b^2)$$

$$y = b$$

अभय

#LP : Yash scored (40) marks in a test , getting 3 marks for each right answer and losing 1 mark for each wrong answer . Had 4 marks been awarded for each correct answer and 2 marks been deduced for each incorrect answer , then Yash would have scored 50 marks . How many questions were there in the test ?

$15 + 5 = (20)$

$$\left[\text{Let correct questions are } (x) \atop \text{incorrect no. of quest} = y \right] \quad \boxed{\text{Total} = x + y}$$

final Ans

Ist Case :-

$$3x - 1y = 40 \quad \text{—(I)}$$

$$4x - 2y = 50 \quad \text{—(II)}$$

IInd Case :-

$$\left. \begin{array}{c} \\ \\ \end{array} \right\} \rightarrow x \, \& \, y$$

[digits वाला सवाल]

#LP : The sum of the digits of a two digit number is 8 and the difference between the number and that formed by reversing the digits is 18. Find the number.

tens units

$4\underset{\downarrow}{3} = 4 \times 10 + 3 \times 1$

$97 = 9 \times 10 + 7 \times 1$

$34 = 3 \times 10 + 4 \times 1$

$N = 10x + y$

$= 10(5) + 3$

$N = 53$

Let units place digit is y & tens place digit is x.

So, Number = $10 \times x + y \times 1$

$$N = 10x + y$$

A₁Q $\boxed{x + y = 8}$ ①

$x = 5$
$y = 3$

reversing the digits.

Unit = x, tens = y

$$N' = 10y + x$$

A₂Q $N - N' = 18$

$(10x + y) - (10y + x) = 18$

$10x + y - 10y - x = 18$

$9x - 9y = 18$

$9(x - y) = 18$

$x - y = 2$

[Age वाली Question]

अभय

#LP : The age of the father is twice the sum of the ages of his 2 children . After 20 years , his age will be equal to the sum of the ages of his children . Find the age of the father .

Let present ages of two children are x & y

ATQ Present age of father $= 2(x+y)$

After 20 yrs

$$\boxed{F = 2(x+y)}$$

ATQ

$$\boxed{F' = (x+20) + (y+20)}$$

$\downarrow$ After 20 yrs

$$\boxed{F' = 2(x+y) + 20} - \text{(I)}$$

(II)

$\text{(I)} = \text{(II)}$

$2(x+y) + 20 = x + 20 + y + 20$

$2x + 2y = x + y + 20$

$2x - x + 2y - y = 20$

$\boxed{x + y = 20}$

$\longrightarrow F = 2(x+y)$

$= 2(20) = 40 \text{ yrs}$
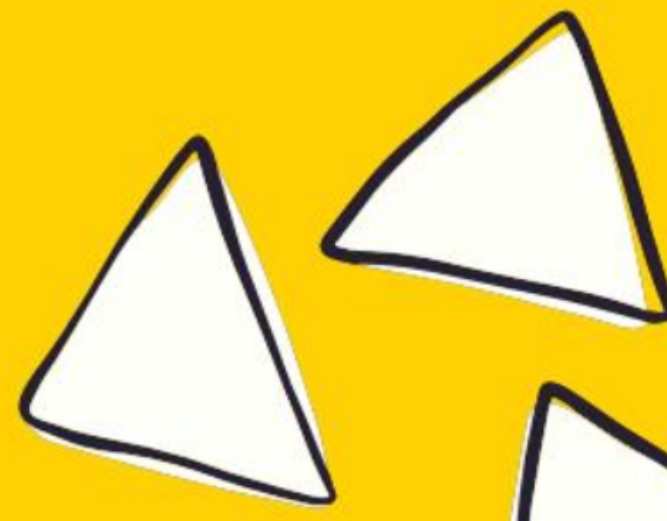
LP: A fraction becomes 9/11 if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator it becomes 5/6, find the fraction.

let fraction is $\dfrac{x}{y}$ $\left[\begin{array}{l} \text{Num} = x \\ \text{den} = y \end{array}\right]$

ATQ $\dfrac{x+2}{y+2} = \dfrac{9}{11}$

$\dfrac{x+3}{y+3} = \dfrac{5}{6}$

x.y find

Ans = $\dfrac{x}{y}$