

CBSE CURRICULUM

LAB MANUAL

MATHEMATICS

Class : X



LAB MANUAL MATHS X

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EXPERIMENT - 1

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

AIM

To obtain the conditions for the consistency of a system of linear equations in two variables by graphical method. The two lines may intersect, may be parallel or coincident.

PRE-REQUISITE KNOWLEDGE

Plotting points on a graph paper

MATERIALS REQUIRED

3 graph papers, scale, pencil, eraser, etc

PROCEDURE

- Take the first pair of linear equations in two variables of the form
 $a_1x + b_1y + c_1 = 0$, $a_2x + b_2y + c_2 = 0$
 eg : 1. $2x - 3y = 3$, 2. $3x - 4y = 5$
- Obtain a table of ordered pairs (x, y) which satisfy the given equation. Find at least 3 such pairs for each equation.

For linear equation - (1) (1st pair) $2x - 3y = 3$

x	3	4.5	5
y	1	2	3

For linear equation - (2) (2nd pair) $3x - 4y = 5$

x	1.5	3	7
y	0.0	1	2

- Plot the points on the graph paper for linear equation - (1) and linear equation - (2) as shown in fig.1

Graph 1

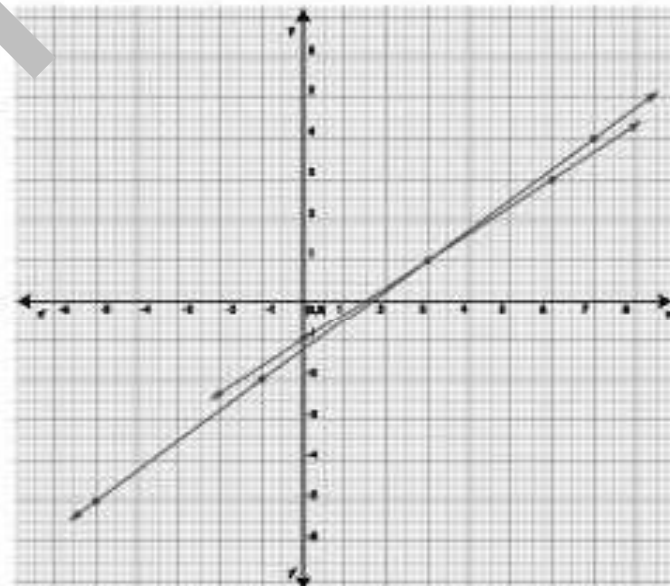


Fig 1(a)

iv) Comparing the first pair of linear equations we get

$$\frac{a_1}{a_2} = \frac{2}{3}, \frac{b_1}{b_2} = \frac{3}{4}, \frac{c_1}{c_2} = \frac{3}{5}$$

Observation

Here we can see that $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. So the lines are intersecting

Take the second pair of linear equation in two variables.

Linear equation (II pair)

$$6x + 10y = 4 \dots\dots\dots (1)$$

$$3x + 5y = -11 \dots\dots\dots(2)$$

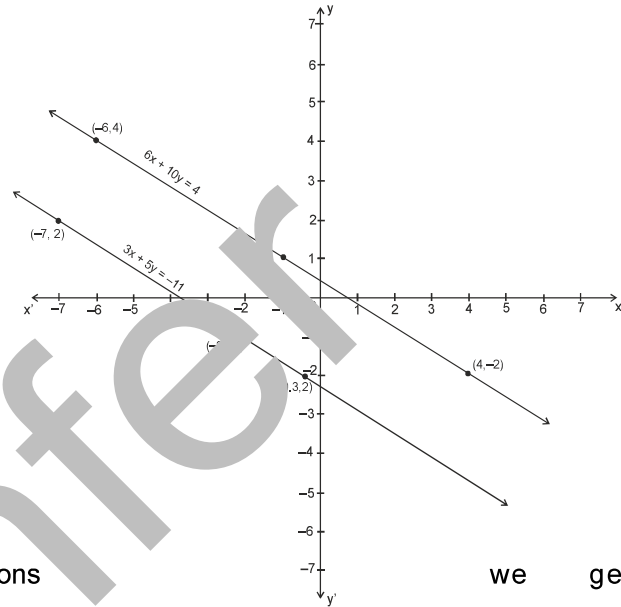
Repeat the steps from ii to iv

For $6x + 10y = 4$

x	-1	4	-6
y	1	-2	4

For $3x + 5y = -11$

x	-2	-7	-0.3
y	-1	2	-2.02



Observation

Comparing the second pair of linear equations

$$\frac{a_1}{a_2} = \frac{6}{3}, \frac{b_1}{b_2} = \frac{10}{5}, \text{ i.e. } \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

as $\frac{a_1}{a_2} = \frac{b_1}{b_2}$ the given linear equations are parallel

we get

Take the third pair of linear equations in two variables

$$x - 2y = 5, \quad 2x - 4y = 10$$

Repeat the steps from ii to iv

For $x - 2y = 5$

x	-1	1	3
y	-3	-2	-1

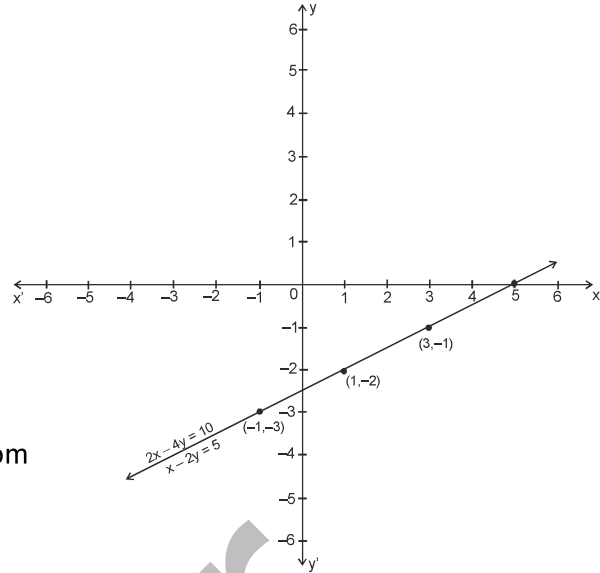
For $2x - 4y = 10$

x	-1	1	3
y	-3	-2	-1

Comparing the third pair of linear equations we get $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(ix) Observe the following observation table.

Type of linear	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$
Intersecting	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{3}{5}$
Parallel	$\frac{6}{3} = \frac{2}{1}$	$\frac{10}{5} = \frac{2}{1}$	$\frac{-4}{11}$
Coincident	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$



(x) Obtain the condition for 2 lines to be intersecting, parallel and coincident from the observation table by comparing

the values of $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$

Conclusion

We observe that, For intersecting lines $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

For parallel lines $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$. For coincident lines $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Learning Advantage

Learners can identify if the pair of lines represented by a pair of linear equation in two variables is intersecting, parallel or coincident.

VIVA-VOCE

After completing the table answer the following questions.

- Write the condition for having no solution in the following pair of linear equations $lx + my = n$ and $px + qy = r$.
- Without actually drawing graph can you comment on type of graph of a given pair of linear equations in two variables?
- If the ratio of coefficients of x is not equal to ratio of coefficients of y in a given pair of linear equations in two variables, then what will be the type of graph?
- Write 2 more equations of lines parallel to $2x - 4y = 6$.
- Comment on type of solution and type of graph of following pair of linear equations.
 $4x + 12 = 20$, $3x + 8y = 15$
- For what value of 'p', the pair of equation $px + 2y = 5$, $3x - 4y = 10$ has no solution.
- Find the value of 'k' for which the pair of equations $x + 2y = 3$, $5x + ky + 7 = 0$ has a unique solution.