Graphical Method of Solution of a Pair of Linear Equations

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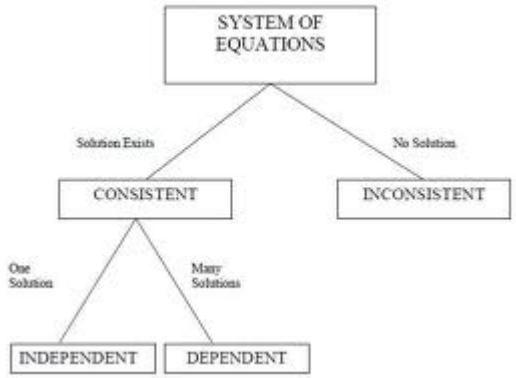
System of simultaneous Linear Equations



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

Examples of System of simultaneous Linear Equations :

- **x + 2y = 3**
  2x - y = 5

- **2u + 5v +1 = 0**
  u – 2v + 9 = 0

Solution of a system of Linear equations in two variables

A pair of values of the variables x and y satisfying each one of the equations in a given system of two simultaneous linear equations in x and y is called a solution of the system.

Clearly, x = 2, y = -1 is a solution of the system of simultaneous linear equations

x + y = 1
2x – 3y = 7

Consistent System

A system of simultaneous linear equations is said to be consistent, if it has at least one solution.

In – Consistent System

A system of simultaneous linear equations is said to be in – consistent, if it has no solution.

Graphical representation of Linear Equations

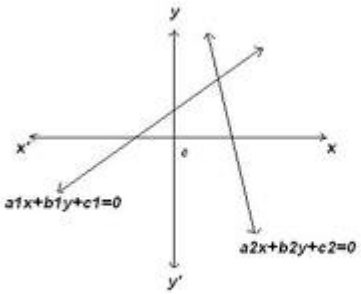
A pair of linear equations in two variables will be represented by two straight lines, both to be considered together. Also if two given lines are there in a plane then one of the following three possibilities can happen :

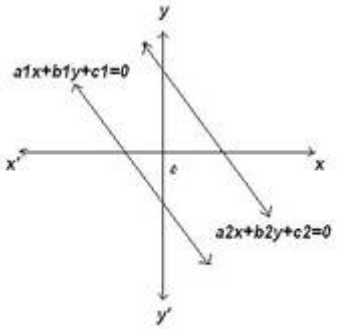
a) The two lines intersect at one point.

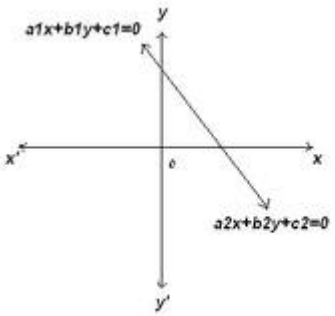
b) The two lines are parallel i.e. they do not intersect however far they are extended.

c) The two lines are coincident lines i.e. one line overlaps the other line.

Thus, the graphical representation of a pair of simultaneous linear equations in two variables will be in one of the following forms :







In order to solve a system of simultaneous linear equations in two variables by graphical method, we follow the steps written below :

Step I – Obtain the given system of simultaneous linear equations in x and y.

Let the system of simultaneous linear equations be

$a1x + b1y = c1$ … (i)

$a2x + b2y = c2$ … (ii)

Step II – Draw the graphs of the equations (i) and (ii) in step I.

Let the lines l1 and l2 represent the graphs of (i) and (ii) respectively.

Step III – If the lines l1 and l2 intersect at a point and (?, ?) are the coordinates of this point, then the given system has a unique solution given by x = ?, y = ?. Otherwise, go to step IV.

Step IV – If the lines l1 and l2 are coincident, then the system is consistent and has infinitely many solutions. In this case, every solution of one of the equations is a solution of the system. Otherwise, go to step V.

Step V – If the lines l1 and l2 are parallel, then the given system of equations is in – consistent i.e. it has no solution.

To get a more clear idea, let's explain with an example :

Example: Solve graphically the system of equations :

x + y = 3

3x – 2y = 4

Graph of the equation x + y = 3:

x + y = 3

y = 3 – x

When x = 1, we have y = 3 -1 = 2

When x = 2, we have y = 3 -2 = 1

Thus, we have the following table :

x	1	2
y	2	1

Plotting the points (1, 2) and (2, 1) on the graph paper and drawing a line joining them, we obtain the graph of the equation x + y = 3

Graph of the equation 3x – 2y = 4 :

We have, 3x – 2y = 4
2y = 3x – 4

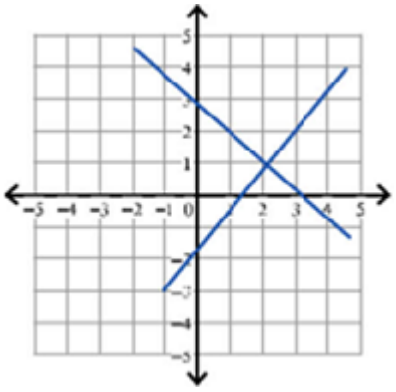
y = (3x – 4)/2

When x = 0, we have y = (3 x 0 – 4)/2 = -2

When x = 4, we have y = (3 x 4 – 4)/2 = 4

x	0	4
y	-2	4

Plotting the points (0, -2) and (4, 4) on the graph paper and drawing a line joining them, we obtain the graph of the equation 3x - 2y = 4



Clearly, the two lines intersect at point (2, 1). Hence, x = 2, y = 1 is the solution of the given system.

Now try it yourself! Should you still need any help,click here to schedule live online session with e Tutor!

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Reference Links :

- http://en.wikipedia.org/wiki/System_of_linear_equations
- http://ceee.rice.edu/Books/LA/consist/index.html

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