Linear equation

Linear equations

S.no	**Type of equation**	**Mathematical representation**	**Solutions**
1	Linear equation in one Variable	ax+b=0 ,a≠0 a and b are real number	One solution
2	Linear equation in two Variable	ax+by+c=0 , a≠0 and b≠0 a, b and c are real number	Infinite solution possible
3	Linear equation in three Variable	ax+by+cz+d=0 , a≠0 ,b≠0 and c≠0 a, b, c, d are real number	Infinite solution possible

Graphical Representation of Linear equation in one and two variable

Linear equation in two variables is represented by straight line the Cartesian plane.

Every point on the line is the solution of the equation.

Infact Linear equation in one variable can also be represented on Cartesian plane, it will be a straight line either parallel to x –axis or y –axis

x-2=0 (straight line parallel to y axis). It means (2,<any value on y axis) will satisfy this line

y-2=0 (straight line parallel to x axis). It means (<any value on x-axis),2) will satisfy this line

Steps to Draw the Given line on Cartesian plane

1) Suppose the equation given is

ax+by+c=0 , a≠0 and b≠0

2) Find the value of y for x=0

y=-c/b

This point will lie on Y –axis. And the coordinates will be (0,-c/b)

3) Find the value of x for y=0

x=-c/a

This point will lie on X –axis. And the coordinates will be (-c/a, 0)

4) Now we can draw the line joining these two points

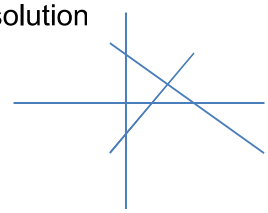
Simultaneous pair of Linear equation:

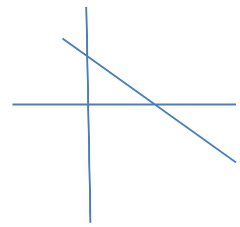
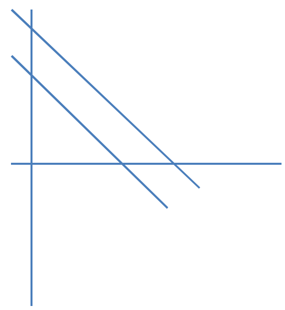
A pair of Linear equation in two variables

$a_1x+b_1y+c_1=0$

$a_2x+b_2y+c_2=0$

Graphically it is represented by two straight lines on Cartesian plane.

Simultaneous pair of Linear equation	**Condition**	**Graphical representation**	**Algebraic interpretation**
$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ Example x-4y+14=0 3x+2y-14=0	$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines. The intersecting point coordinate is the only solution 	One unique solution only.
$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coincident lines. The any coordinate on the line is the solution.	Infinite solution.

Example $2x+4y=16$ $3x+6y=24$			
$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ Example $2x+4y=6$ $4x+8y=18$	$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$	Parallel Lines 	No solution

The graphical solution can be obtained by drawing the lines on the Cartesian plane.

<u>Algebraic Solution of system of Linear equation</u>

S.no	**Type of method**	**Working of method**
1	Method of elimination by substitution	1) Suppose the equation are $a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ 2) Find the value of variable of either x or y in other variable term in first equation 3) Substitute the value of that variable in second equation 4) Now this is a linear equation in one variable. Find the value of the variable 5) Substitute this value in first equation and get the

		second variable
2	Method of elimination by equating the coefficients	1) Suppose the equation are $a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ 2) Find the LCM of a_1 and a_2 .Let it k. 3) Multiple the first equation by the value k/a_1 4) Multiple the first equation by the value k/a_2 4) Subtract the equation obtained. This way one variable will be eliminated and we can solve to get the value of variable y 5) Substitute this value in first equation and get the second variable
3	Cross Multiplication method	1) Suppose the equation are $a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ 2) This can be written as $\frac{x}{\begin{matrix} b_1 & c_1 \\ b_2 & c_2 \end{matrix}} = \frac{-y}{\begin{matrix} a_1 & c_1 \\ a_2 & c_2 \end{matrix}} = \frac{1}{\begin{matrix} a_1 & b_1 \\ a_2 & b_2 \end{matrix}}$ 3) This can be written as $\frac{x}{b_1c_2-b_2c_1} = \frac{-y}{a_1c_2-a_2c_1} = \frac{1}{a_1b_2-a_2b_1}$ 4) Value of x and y can be find using the x => first and last expression y=> second and last expression

Simultaneous pair of Linear equation in Three Variable

Three Linear equation in three variables

$a_1x + b_1y+c_1z+d_1=0$

$a_2x + b_2y+c_2z+d_2=0$

$a_3x + b_3y+c_3z+d_3=0$

Steps to solve the equations

1) Find the value of variable z in term of x and y in First equation

2) Substitute the value of z in Second and third equation.

3) Now the equation obtained from 2 and 3 are linear equation in two variables. Solve them with any algebraic method

4) Substitute the value x and y in equation first and get the value of variable z