Solution of a Pair of Linear Equations in Two Variables

Graphically Method

A pair of Linear equation in two variables
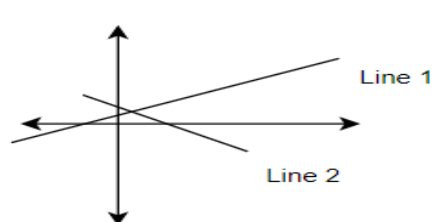
$$a_1x+b_1y+c_1=0$$
$$a_2x+b_2y+c_2=0$$

we know that Graphically it is represented by two straight lines on Cartesian plane.
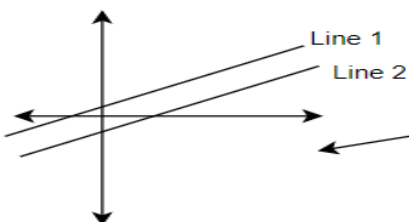
Now there are three possibilities.

(a) The two lines will intersect at a point.
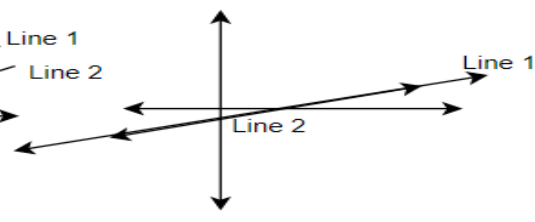
(b) The two lines will not intersect, i.e., they are parallel.
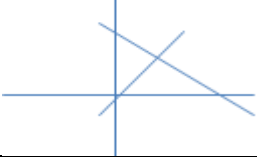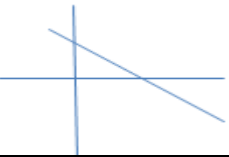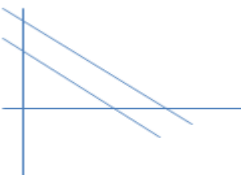
(c) The two lines will be coincident.

(i) Intersecting Lines (ii) Parallel lines (iii) Coincident lines

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** $x-4y+14=0$ $3x+2y-14=0$	$a_1b_2 \neq b_1a_2$	Intersecting lines. The intersecting point coordinate is the only solution	One unique solution only.
$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ **Example** $2x+4y=16$ $3x+6y=24$	$a_1b_2 = b_1a_2$ **and** $b_1c_2 = c_1b_2$	Coincident lines. The any coordinate on the line is the solution.	Infinite solution.
$a_1x+b_1y+c_1=0$ $a_2x+b_2y+c_2=0$ **Example** $2x+4y=6$ $4x+8y=18$	$a_1b_2 = b_1a_2$	Parallel Lines	No solution

Q. Solve in Graphically

$x - 7y = -42$ _____ (i)

$x - 3y = 6$ _____ (ii)

Taking eqn. (i)

     $x - 7y = -42$

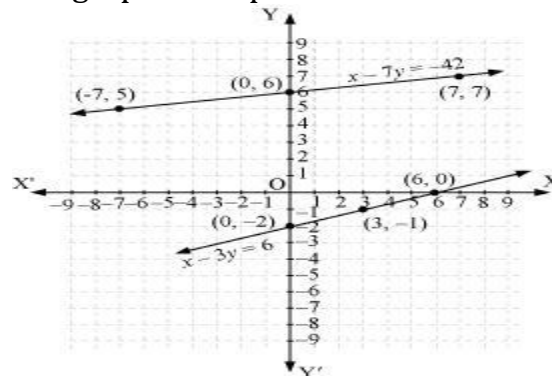Three solutions of this equation can be written in a table as follows:

x	-7	0	7
y	5	6	7

Taking eqn. (ii)

     $x - 3y = 6$

Three solutions of this equation can be written in a table as follows:

x	6	3	0
y	0	-1	-2

The graphical representation is as follows:

Q. 10 students of Class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz.

Ans. Let the number of boys & the number of girls be = x & y respectively

Given that total number of students is 10

Therefore $x + y = 10$

$\therefore x = 10 - y$

Putting $y = 0$, $\therefore x = 10 - 0 = 10$

Putting $y = 5$ $\therefore x = 10 - 5 = 5$

Putting $y = 10$ $\therefore x = 10 - 10 = 0$

x	10	5	0
y	0	5	10

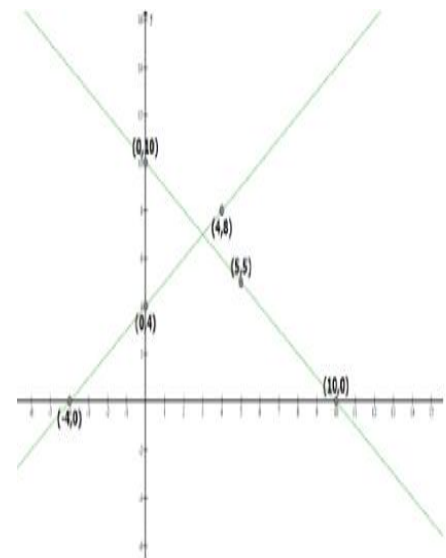Given: the number of girls is 4 more than the number of boys

$\therefore y = x + 4$

Putting $x = -4$ $\therefore y = -4 + 4 = 0$

Putting $x = 0$ $\therefore y = 0 + 4 = 4$

Putting $x = 4$ $\therefore y = 4 + 4 = 8$

x	-4	0	4
y	0	4	8

Solve in Graphically

(i) $2x + 3y = 2$
    $x - 2y = 8$

(ii) $3x + 2y = 4$
    $2x - 3y = 7$

(iii) $2x + 3y = 8$
    $x - 2y = -3$

(iv) $2x + 3y = 12$
    $x + 2y = 6$

(v) $3x - 2y = 12$
    $6x - 4y = 24$