ATOMIC ENERGY EDUCATION SOCIETY

CLASS:X

MATHEMATICS

3.Pair Of Linear Equations In Two Variables

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AECS 4 RBT

The whole chapter has been divided into 5 modules

Module 1:

- The basic concepts of pair of linear equations in two variables
- Representing a pair of linear equations in both algebraic & geometric ways

Module2:Graphical method of solution of a pair of linear equations in two variables

Module 3:algebraic methods of solving a pair of linear equations(substitution method)

Module 4:algebraic methods of solving a pair of linear equations(elimination method)

Module 5:algebraic methods of solving a pair of linear equations(cross-multiplication method)

The basic concepts of pair of linear equations in two variables

INTRODUCTION:

You must have come across situations like the one given below :

Akhila went to a fair in her village. She wanted to enjoy rides on the Giant Wheel and play Hoopla (a game in which you throw a ring on the items kept in a stall, and if the ring covers any object completely, you get it). The number of times she played Hoopla is half the number of rides she had on the Giant Wheel. If each ride costs Rs 3, and a game of Hoopla costs Rs 4, how would you find out the number of rides she had and how many times she played Hoopla, provided she spent Rs 20

How we can graphically represent a pair of linear equations in two variables as two lines?

Let us try this approach.
Denote the number of rides that Akhila had by x, and the number of times she played Hoopla by y. Now the situation can be represented by the two equations:

$$y = \frac{1}{2}x \quad \text{which implies } x-2y=0 \qquad (1)$$

$$3x + 4y - 20 = 0 \qquad (2)$$

an equation which can be put in the form ax + by + c = 0,
where a, b and c are real numbers, and **a and b are not both zero**, is called a linear equation in two variables x and y.

Pair of Linear Equations in Two Variables

The general form for a pair of linear equations in two variables x and y is $a_1x + b_1y + c_1 = 0$ *and* $a_2x + b_2y + c_2 = 0$*, where* $a_1, b_1, c_1, a_2, b_2, c_2$ *are all real numbers and* $a_1^2 + b_1^2 \neq 0$, $a_2^2 + b_2^2 \neq 0$.

Some examples of pair of linear equations in two variables are:
$2x + 3y - 7 = 0$ *and* $9x - 2y + 8 = 0$
$5x = y$ *and* $-7x + 2y + 3 = 0$
$x + y = 7$ *and* $17 = y$

Given two lines in a plane, only one of the following three possibilities can happen:

(i) The two lines will intersect at one point.

(ii) The two lines will not intersect, i.e., they are parallel.

(iii) The two lines will be coincident.

We show all these possibilities in Fig. 3.1:

In Fig. 3.1 (a), they intersect.

In Fig. 3.1 (b), they are parallel.

In Fig. 3.1 (c), they are coincident.

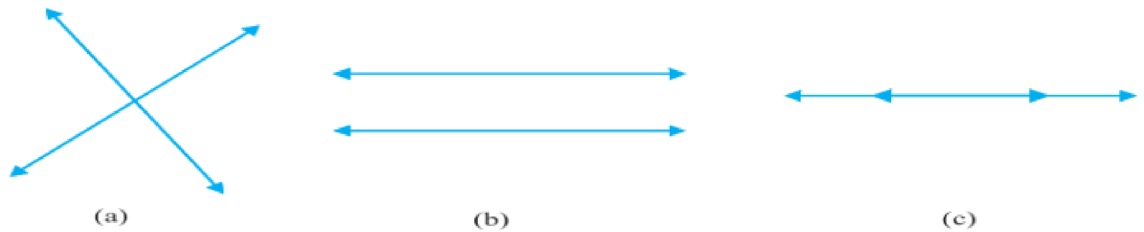

Fig. 3.1

Let us try to represent x – 2y = 0 & 3x + 4y = 20 graphically

For this, we need at least two solutions for each equation. We give these solutions in Table 3.1.

Table 3.1

x	0	2
$y = \frac{x}{2}$	0	1

(i)

x	0	$\frac{20}{3}$	4
$y = \frac{20-3x}{4}$	5	0	2

(ii)

Plot the points A(0, 0), B(2, 1) and P(0, 5), Q(4, 2), corresponding to the solutions in Table 3.1.

Now draw the lines AB and PQ, representing the equations x–2y=0 and 3x+4y=20, as shown in Fig. 3.2.

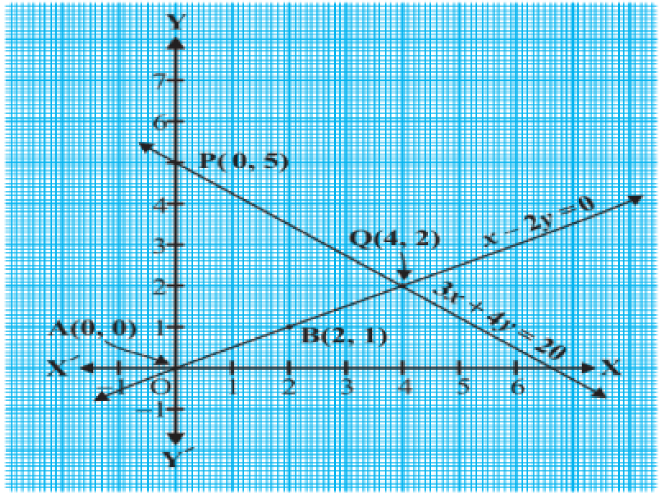

Fig. 3.2

observe that the two lines representing the two equations are intersecting at the point (4, 2)

Let us take example 2

$2x + 3y = 9$ & $4x + 6y = 18$

To obtain the equivalent geometric representation, we find two points on the line representing each equation. That is, we find two solutions of each equation.

These solutions are given below in Table 3.2.

Table 3.2

x	0	4.5
$y = \frac{9-2x}{3}$	3	0

(i)

x	0	3
$y = \frac{18-4x}{6}$	3	1

(ii)

We plot these points in a graph paper and draw the lines. We find that both the lines coincide (see Fig. 3.3). This is so, because, both the equations are equivalent, i.e., one can be derived from the other.

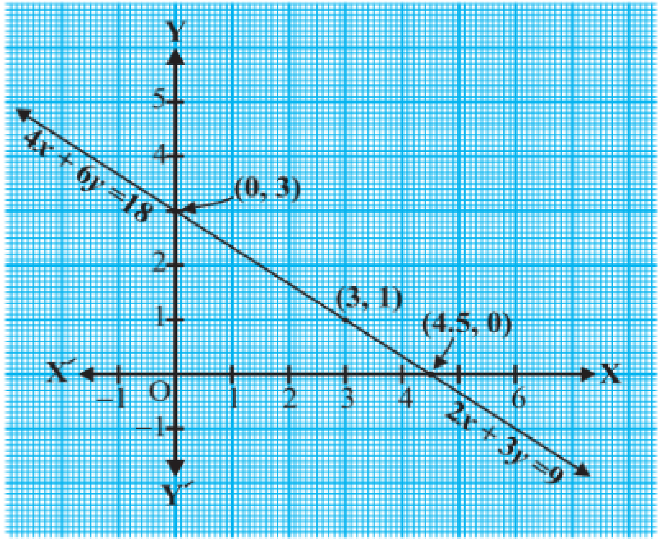

Fig. 3.3

Let us take example 3

$x + 2y - 4 = 0$ & $2x + 4y - 12 = 0$

Two solutions of each of the equations are given in Table 3.3

Table 3.3

x	0	4
$y = \frac{4 - x}{2}$	2	0

(i)

x	0	6
$y = \frac{12 - 2x}{4}$	3	0

(ii)

To represent the equations graphically, we plot the points R(0, 2) and S(4, 0), to get the line RS and the points P(0, 3) and Q(6, 0) to get the line PQ.We observe in Fig. 3.4, that the lines do not intersect anywhere, i.e.,they are parallel.

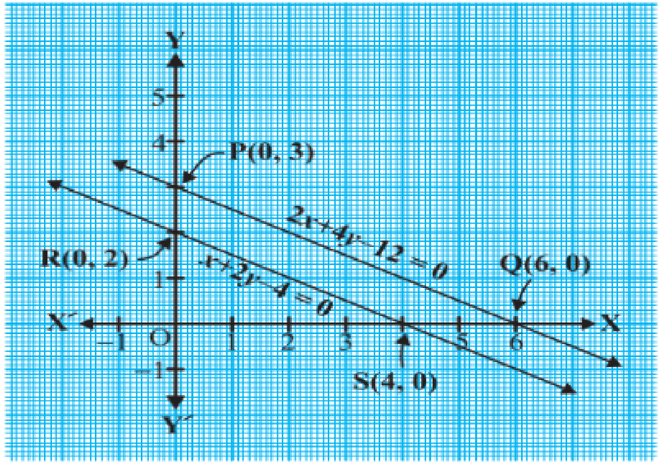

Fig. 3.4

Thank You