MATHEMATICS

CLASS – X

CHAPTER 3 - PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Recall, from class IX, that an equation which can be put in the form **a x + b y + 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.

NOTE: Each solution (x , y) of a linear equation in two variables, a x + b y + c = 0, corresponds to a point on the line representing the equation, and vice versa.

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Consider the equations : $y = ½ x$

$$And, 3 x + 4 y = 20$$

These two linear equations (taken together) are in the *same two variables x and y*.

Equations like these are called **a pair of linear equations in two variables**.

GENERAL FORM :

The general form of a pair of linear equations in two variables x and y is

$$a_1 x + b_1 y + c_1 = 0$$

and, $a_2 x + b_2 y + c_2 = 0$, where a_1, b_1, c_1, a_2, b_2 and 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 are :

$2 x + 3 y – 7 = 0$ and $9 x – 2 y + 8 = 0$
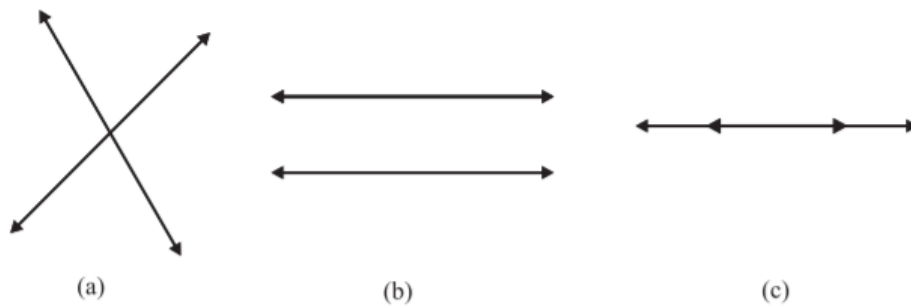
$X + y = 7$ and $17 = y$

Recall, that the geometrical representation of a linear equation in two variables is a straight line.

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

The two lines will;

  a) intersect at one point.
  b) not intersect ,ie, they are parallel.
  c) be coincident.

(a)   (b)   (c)

Let us now learn to draw the graph of a pair of linear equations in two variables.

Example 1(NCERT PAGE NUMBER 41)

Represent the given situation algebraically and graphically.

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.

SOLUTION

Let the number of the rides , she had be x

And the number of times she played Hoopla be y

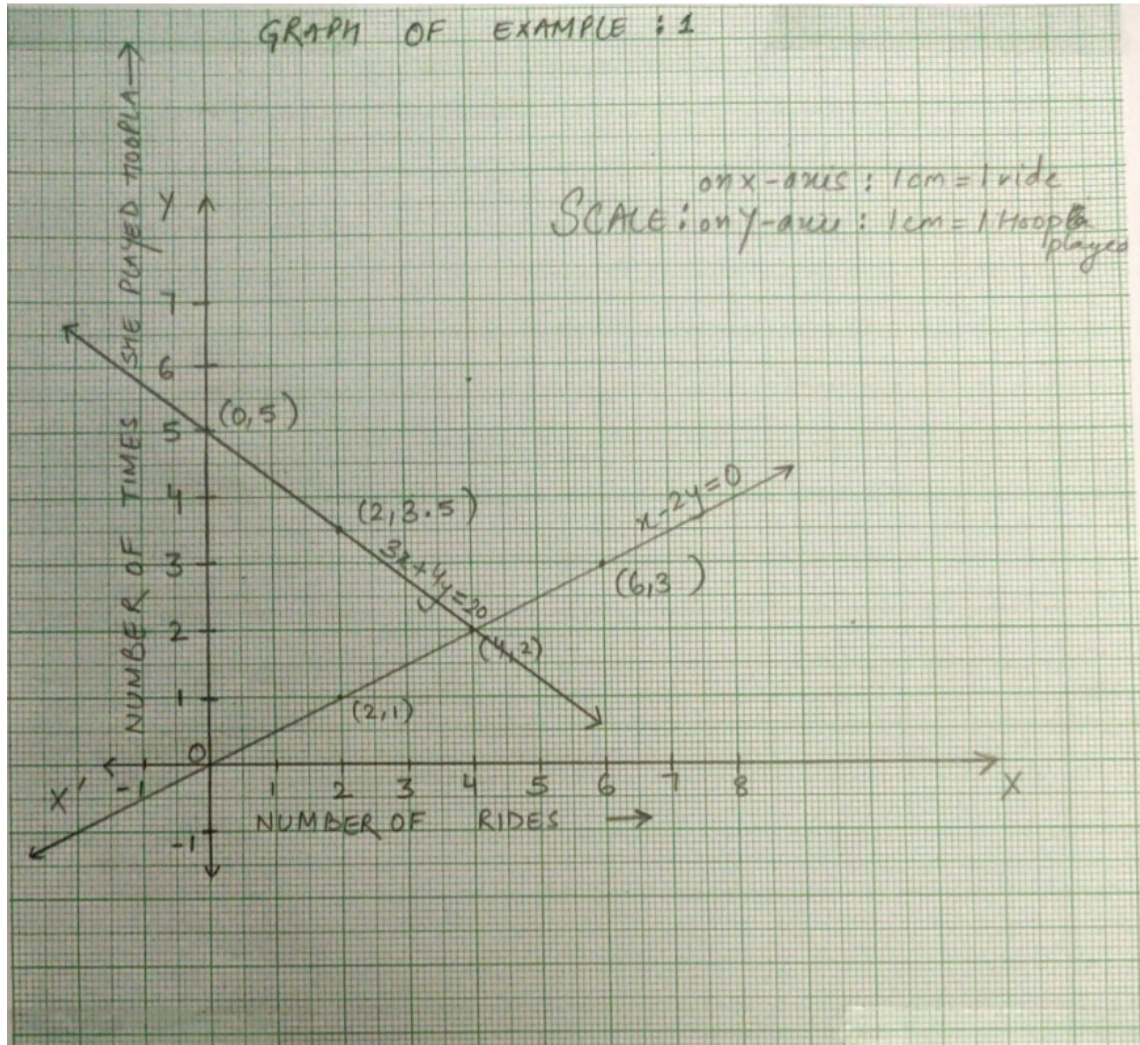Then, according to question, $y = \frac{1}{2} x$ that is, $x - 2y = 0$ ……….(1)

And, $3x + 4y = 20$ ………………(2)

Solution table for equation (1) is

x	2	4	6
y	1	2	3

Solution table for equation (2) is

x	0	4	2
y	5	2	3.5

GRAPH OF EXAMPLE : 1

OBSERVATION: We observe that the two lines representing the two equations intersect at (4 , 2).

Now, watch the video

Solve+pair+of+linear
+equations+in+two+v

Example 2 : Romila went to a stationery shop and purchased 2 pencils and 3 erasers for Rs 9. Her friend Sonali saw the new variety of pencils and erasers with Romila, and she also bought 4 pencils and 6 erasers of the same kind for Rs 18. Represent this situation algebraically and graphically.

SOLUTION:

Let the cost of 1 pencil be   x and the cost of 1 eraser be   y.
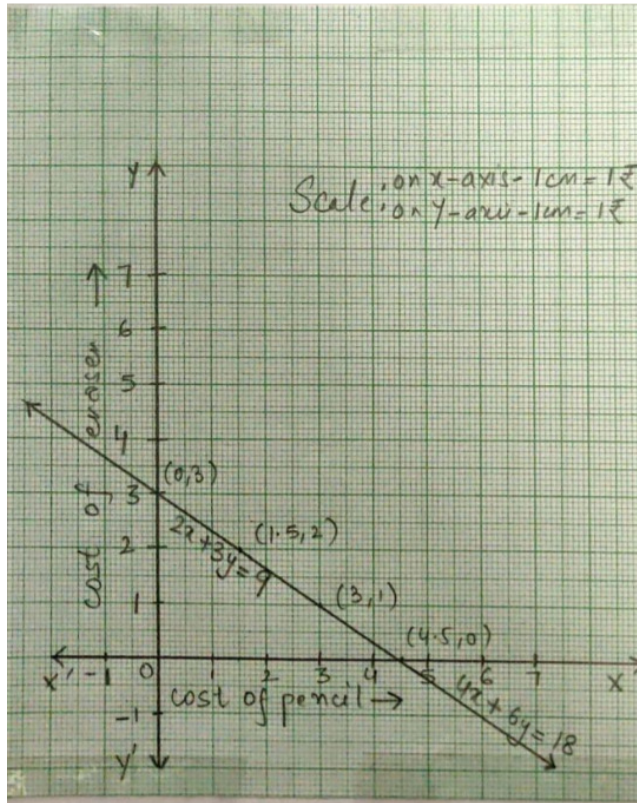
According to question, $2x + 3y = 9$ …………….(1)

And, $4x + 6y = 18$ ……………(2)

Solution table for equation (1) is

x	0	3	1.5
y	3	1	2

Solution table for equation (2) is

x	0	4.5	3
y	3	0	1

OBSERVATION: We observe that both the lines coincide . This is so, because, both the equations are equivalent , that is, one can be derived from the other.

EXAMPLE 3(NCERT PAGE NUMBER 42)

Two rails are represented by the equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$.
Represent this situation graphically.

SOLUTION: The equations are $x + 2y - 4 = 0$ ……….. (1)
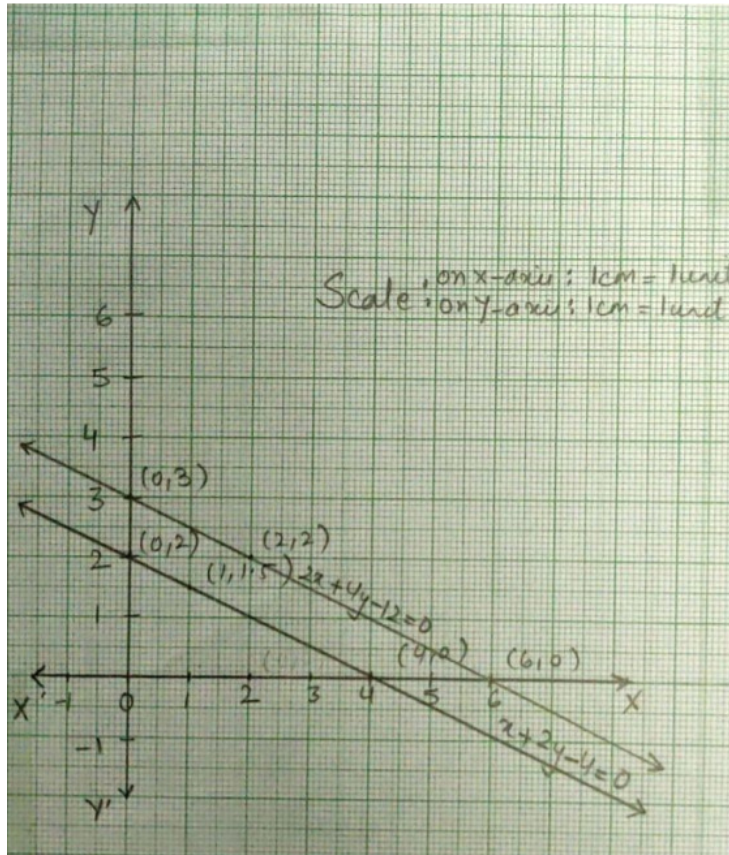
And, $2x + 4y - 12 = 0$ ……..(2)

Solution table for equation (1) is

x	0	4	1
y	2	0	1.5

Solution table for equation (2) is

x	0	6	2
y	3	0	2

OBSERVATION: We observe that the lines do not intersect anywhere, that is, they are parallel.

PRACTICE QUESTIONS:

1. Draw the graph of the following pair of linear equations :
   (a) $x + y = 3$; $3x - 2y = 4$
   (b) $2x + 4y = 10$; $3x + 6y = 12$
   (c) $3x - y = 2$; $9x - 3y = 6$

   (**NOTE** : PASTE THE GRAPHS OF THE ABOVE QUESTIONS IN MATH LAB FILE)

2. NCERT PAGE NUMBER 44
   Exercise 3.1 Question 1 to 3
   (**NOTE** : REPRESENT THE SITUATIONS ALGEBRAICALLY ONLY)