LINEAR EQUATION IN TWO VARIABLES

BASIC INTRODUCTION OF LINEAR EQUATION

INTRODUCTION

In earlier classes, we have learnt that a linear equation in one variable x is an equation of the form $ax + b = 0$, where a, b are real numbers such that $a \neq 0$. The value of the variable which satisfies a given linear equation is known as its solution. The solution of a linear equation is also known as its root.

If $ax - b = 0$ is a linear equation, then $x = \frac{b}{a}$ is its solution or root.

In this section, we shall introduce the notion of a linear equation in two variables x and y.

LINEAR EQUATION

An equation in which the highest index of the unknowns present is one, is called a linear equation.

$2(x + 5) = 18$, $3x - 2 = 5$, $x + y = 20$ and $3x - 2y = 5$ are some linear equations.

SIMPLE EQUATION

A linear equation which has only one unknown is called a simple equation

$3x + 4 = 15$ and $2x - 5 = x + 3$ are examples of simple linear equations. The part of an equation which is to the left side of the equality sign is known as the left hand side, abbreviated as L.H.S. The part of an equation which is to the right side of the equality sign is known as the right hand side, abbreviated as R.H.S. The process of finding value of an unknown in an equation is called solving the equation. The value (values) of the unknown found after solving an equation is (are) called the solution(s) or the roots(s) of the equation.

LINEAR EQUATION IN TWO VARIABLES

An equation of the form $ax + by + c = 0$ is linear in two variables, where a, b and c are real numbers and a and b are not both zero and x,y are variables.

For example, $7x - 3y + 5 = 0$,

GENERAL FORM OF LINEAR EQUATION IN TWO VARIABLES

$ax + by + c = 0$, $a \neq 0$, $b \neq 0$ or any one from a & b can zero.

Ex.1 Express the following linear equations in general form and identify coefficients of x, y and constant term.

Sol.

S.No.	Equation	General form	Coeff. of x, y, constant
(1)	$3x - 2y = 5$	$3x - 2y - 5 = 0$	3, –2, –5
(2)	$\frac{3}{7}x - 2 + y = 0$	$\frac{3}{7}x + y - 2 = 0$	$\frac{3}{7}$, 1, –2
(3)	$5y = 2x + 7$	$2x - 5y + 7 = 0$	2, –5, 7
(4)	$18y - 72x = 8$	$72x - 18y + 8 = 0$	72, –18, 8
(5)	$3.7x - y - \frac{1}{7} = 0$	$3.7x - y - \frac{1}{7} = 0$	$3.7, -1, -\frac{1}{7}$
(6)	$y = 5$	$0x + y - 5 = 0$	0, 1, –5
(7)	$\frac{x}{7} = 5$	$\frac{x}{7} + 0.y - 5 = 0$	$\frac{1}{7}$, 0, –5
(8)	$2x + 3 = 0$	$2x + 0y + 3 = 0$	2, 0, 3

Ex.2 Make linear equation by the following statements :

The cost of 2kg of apples and 1 kg of grapes on a day was found to be ₹ 160. After a month, the cost of 4 kg of apples and 2 kg of grapes is ₹ 300. Represent the situation algebraically.

Sol. Let cost of per kg apples & grapes are x & y respectively then by Ist condition :

$2x + y = 160$ .....(i)

& by IInd condition : $4x + 2y = 300$ .....(ii)

Ex.3 Make linear equation by the following statements :

Five years hence, the age of Sachin will be three times that of his son. Five years ago, Sachin's age was seven times that of his son.

Sol. Let present ages of Sachin & his son are

x years and y years.

Five years hence,

age of Sachin $= (x + 5)$ years & his son's age $= (y + 5)$ years

according to question $(x + 5) = 3(y + 5)$

$\Rightarrow x + 5 = 3y + 15$

$\Rightarrow x - 3y = 10$ .....(i)

and 5 years ago age of both were $(x - 5)$ years and $(y - 5)$ years respectively

according to question $(x - 5) = 7(y - 5)$

$\Rightarrow x - 5 = 7y - 35$

$\Rightarrow x - 7y = -30$ ....(ii)

Ex.4 Make linear equation by the following statements :

A fraction becomes $\frac{9}{11}$, if 2 is added to both the numerator and the denominator. If, 3 is added to both the numerator and the denominator it becomes $\frac{5}{6}$.

Sol. Let fraction is $\frac{x}{y}$

Now according to question $\frac{x+2}{y+2}=\frac{9}{11}$

$\Rightarrow 11x + 22 = 9y + 18$

$\Rightarrow 11x - 9y = -4$ .....(i)

and $\frac{x+3}{y+3}=\frac{5}{6} \Rightarrow 6x + 18 = 5y + 15$

$\Rightarrow 6x - 5y = -3$ ....(ii)

Ex.5 Make linear equation by the following statements :

The larger of two supplementary angles exceeds the smaller by 18 degrees.

Sol. Let the two supplementary angles are x and y & $x > y$

Then $x + y = 180°$ .....(i)

and $x = y + 18°$ .....(ii)