LINEAR EQUATIONS IN TWO VARIABLES

Substitution method: The substitution method is the algebraic method to solve simultaneous linear equations. As the word says, in this method, the value of one variable from one equation is substituted in the other equation.

Steps: -

* Simplify the given equation by expanding the parenthesis
* Solve one of the equations for either x or y

* Substitute the step 2 solution in the other equation

* Now solve the new equation obtained using elementary arithmetic operations

* Finally, solve the equation to find the value of the second variable

Substitution Method Examples

Example 1: Solve $2x + 3y = 9$

$$x - y = 3$$

Solution: Given: $2x + 3y = 9$ and $x - y = 3$

For solving simultaneous equations,

Let, $2x + 3y = 9$…………………………………..(1)

and $x - y = 3$ ……………………………………….(2)

From Equation (2) we get,

$y = x - 3$……………(3)

Now, in the substitution method,

we find the value of one variable in terms of others and then substitute back.

Now, we know that $y = x - 3$

Substituting the value of y in equation (1), we get

$2x + 3y = 9$

$\Rightarrow 2x + 3(x - 3) = 9$

$\Rightarrow 2x + 3x - 9 = 9$

$\Rightarrow 5x = 18$

$\Rightarrow$ x = 18/5

Now, the value of y can be found out using equation (3).

So, y = x – 3

$\Rightarrow$ y = 18/5 – 3

$\Rightarrow$ y = 3/5

Hence the solution of simultaneous equation will be: x = 18/5 and y = 3/5

Elimination Method Steps. Step 1: Firstly, multiply both the given equations by some suitable non-zero constants to make the coefficients of any one of the variables (either x or y) numerically equal.

Step 2: After that, add or subtract one equation from the other in such a way that one variable gets eliminated.

Step 3 : Solve the equation in one variable (x or y) so obtained to get its value.

Step 4 : Substitute this value of x (or y) in either of the original equations to get the value of the other variable.

Example: solve x +3y = 8   -- (i)

$\qquad$ 2x – 2y = 8 --(ii)

using elimination method.

Solution:

Multiple equation (i) by 2 to match coefficients of x in both the equation

2x + 6y =16   --(i)

2x – 2y = 8   --(ii)   Subtracting (ii) from (i) we get

8y = 8

or y =1

Putting the value of y in equation (1), we get x =5

$\qquad$ x +3y = 8

$\qquad$ $\Rightarrow$ x + 3x1 = 8

$\qquad$ $\Rightarrow$ x + 3 = 8

$\qquad$ $\Rightarrow$ x = 8 – 3 = 5

$\qquad$ $\therefore$ x = 5