

# Algebraic Methods of Solving a Pair of Linear Equations

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## What is a linear equation?

The pair of the [linear equation](#) is in the following form-

$$a_1x + b_1y + c_1 = 0$$

and  $a_2x + b_2y + c_2 = 0$

The most commonly used algebraic methods of solving a pair of linear equations in two variables are –

- a) Substitution method
- b) [Elimination method](#)
- c) [Cross Multiplication method](#)

Let's discuss these methods one by one:

## Substitution Method

Here are the steps which we follow while solving a pair linear equations:

**Step I** – Obtain the two equations. Let the equations be

$$a_1x + b_1y + c_1 = 0$$

and  $a_2x + b_2y + c_2 = 0$  .....(i)

.....(ii)

**Step II** – Choose either of the two equations, say (i), and find the value of one [variable](#), say y, in terms of the other, i.e. x.

**Step III** – Substitute the value of y, obtained in step II, in other equation i.e. (ii) to get an equation in x.

**Step IV** – Solve the equation obtained in step III to get the value of x.

**Step V** – Substitute the value of x obtained in step IV in the [expression](#) for y in terms of x obtained in step II to get the value of y.

**Step VI** – The values of x and y obtained in steps IV and V respectively constitute the solution of the given system of two linear equations.

**Example:** Solve the following system of equations by using the method of substitution:

$$3x - 5y = -1$$

$$x - y = -1$$

Let,  $3x - 5y = -1$  ... (i)

and  $x - y = -1$  ... (ii)

From (ii), we get  $y = x + 1$

Substituting  $y = x + 1$  in (i), we get

$$3x - 5(x + 1) = -1$$

$$-2x - 5 = -1$$

$$-2x = 4$$

$$x = -2$$

Putting  $x = -2$  in  $y = x + 1$  we get  $y = -1$

Hence, the solution of the given system of equations is  $x = -2$  and  $y = -1$ .

### Try these questions now:

1. Solve the following system of equations by using the method of substitution:

$$x + 2y = -1$$

$$2x - 3y = 12$$

(Answer:  $x = 3$  and  $y = -2$ )

2. Solve the following system of equations by using the method of substitution:

$$2x + 3y = 9$$

$$3x + 4y = 5$$

(Answer:  $x = -21$  and  $y = 17$ )

Now try it yourself! Should you still need any help, [click here](#) to schedule live online session with e Tutor!

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## Reference Links :

- [http://en.wikipedia.org/wiki/Linear\\_equation](http://en.wikipedia.org/wiki/Linear_equation)
- <http://en.wikipedia.org/wiki/Variable>
- [http://en.wikipedia.org/wiki/Expression\\_\(mathematics\)](http://en.wikipedia.org/wiki/Expression_(mathematics))

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