Solving a system of two linear equations with two unknowns using a method of opposite coefficients

Using this method the systems of the linear equations with two unknowns are solved the following way:

- One or bothe equations is multiplied with chosen numbers, so that the ceofficients of one of the unknown to be opposite numbers;
- We add both equations and are left with one equations;
- The equations in this shape is solved and the found value of the unknon is substituted in one of the equations of the system, from which we define the value of the other unknown

Example 1.

$$\begin{cases} 4x + y = 6 \\ 3x + 2y = 7 \end{cases}$$

The first equation is multiplied with (-2):

$$\begin{cases} -2 \cdot 4x - 2 \cdot y = -2 \cdot 6 \\ 3x + 2y = 7 \end{cases}$$

$$\begin{cases} -8x - 2y = -12 \\ 3x + 2y = 7 \end{cases}$$

Both equations are added(left side from one equations is added with the left side of the second equation). We are left with one linear equation with two unknowns

$$-8x - 2y + (3x + 2y) = -12 + 7$$

$$-8x - 2y + 3x + 2y = -5$$
$$-5x = -5$$
$$x = 1$$

The value of the unknown h, is substituted in any equation from the given system

$$4x + y = 6$$
$$4 \cdot 1 + y = 6$$
$$4 + y = 6$$
$$y = 2$$

Solution to the system of equations is $(x, y) = (1,2)$

Example 2.

$$\begin{cases} -2x+3y=-1 \\ 3x-4y=2 \end{cases}$$

In order to eliminate the unknown h, the first equation is multiplied with 3, the second equation is multiplied with 2

$$\begin{cases} 3\cdot(-2x)+3\cdot 3y=3\cdot(-1) \\ 2\cdot 3x-4y\cdot 2=2\cdot 2 \end{cases}$$

$$\begin{cases} -6x+9y=-3 \\ 6x-8y=4 \end{cases}$$

We add both equations

$$-6x+9y+6x-8y=-3+4$$

$$y=1$$

This value of the unknown u, we substitute with the first equation of the given system

$$-2x+3y=-1$$

$$-2x+3\cdot 1=-1$$

$$-2x+3=-1$$

$$-2x=-1-3$$

$$-2x=-4$$

$$x=2$$

Solution to the system is $(x,y)=(2,1)$