SOLVING SIMULTANEOUS EQUATIONS

SE in *two* unknowns

There are more possible ways how to solve these equations algebraically. One of them is a combination of **elimination** and **substitution**.

E.g. find the values of a and b that satisfy the equations:

$2a + b = 19 \quad \Rightarrow b = 19 - 2a$

$\underline{3a + 4b = 26}$

$3a + 4(19 - 2a) = 26$

$3a + 76 - 8a = 26$

$-5a = -50$

$\underline{a = 10}$

$\underline{b = -1}$

Another method is the **addition method**, i.e. we will eliminate one variable by making the coefficients of a or b the opposite in both equations, and then we add these equations.

E.g. $2a + b = 19 \quad /(-4)$

$\underline{3a + 4b = 26}$

$-8a - 4b = -76$

$\underline{3a + 4b = 26}$

$-5a = -50$

$\underline{a = 10}$

$2.10 + b = 19$

$\underline{b = -1}$

SE in *three* unknowns

The solution is an ordered triplet of numbers. We may solve these equations by arranging them into a triangular shape, i.e. we need to multiply the first equation by such real numbers to eliminate the unknown x from the remaining two equations after their addition with the first one. From the last equation we then need to eliminate the y – unknown.

E.g.:

$x + 2y - 3z = -1 \quad /3, (-2)$

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

$\underline{2x + 3y + 2z = 11}$

x + 2y – 3z = -1

7y –11z = -1

-y + 8z = 13 / 7

x + 2y – 3z = -1

7y –11z = -1

45z = 90

z = 2

y = 3

x = -1

When arranging the simultaneous equations into the triangular shape, we in fact work only with the coefficients of the unknowns. The whole procedure can be notated in the form of a **matrix**.

$$\begin{pmatrix} 1......2.......-3.......-1 \\ -3...1........-2.........2 \\ 2......3..........2.........11 \end{pmatrix}$$

We try to arrange this matrix into the triangular shape and then the result occurs in the last column.