Matrix Math Functions

There are a variety of matrix functions in Excel that can be used to solve simultaneous equations. The three main functions are MINVERSE, MMULT, and MDETERM.

**MINVERSE** *(array)* – finds the inverse of the argument *array*. *Array* is a range of cells representing a matrix whose inverse is to be found.

**MMULT** *(array1, array2)* – multiplies two matrix arrays (*array1* and *array2*) together to get a product matrix. The first matrix must have the same number of columns as the number of rows in the second matrix. The product will have the same number of rows as the first array and the same number of columns as the second array.

**MDETERM** – finds the determinant of a matrix array. If the determinant of a matrix is zero, it is NOT invertible.

The solution of a set of linear equations involves three matrices: the coefficient matrix, *C*, the variable matrix, *V* and the constant matrix, *N*.

Consider the system of equations:

\[
A x + B y = N_1 \\
C x + D y = N_2
\]

The coefficients of *x* and *y* are *A*, *B*, *C*, and *D*. The constants in the equations are *N₁* and *N₂*. These equations can be written in matrix form as:

\[
\begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} N_1 \\ N_2 \end{bmatrix}
\]

If you have 3x = 6, you solve it by multiplying both sides by the inverse of 3 which is 1/3. You get (1/3)*3x = (1/3)(6) or x = 2. The same kind thing happens with matrices. The coefficient matrix is inverted and multiplied by the constant matrix to get the values of the variables:

\[
\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix}^{-1} \begin{bmatrix} N_1 \\ N_2 \end{bmatrix}
\]

The inverse coefficient matrix is the first array and the constant matrix is the second array in the MMULT function when solving a system of linear equations.