

MATRIX MULTIPLICATION**PURPOSE**

Multiply 2 matrices, a matrix and a vector, or a matrix and a parameter.

DESCRIPTION

In matrix multiplication, each row of matrix 1 is multiplied by each column of matrix 2. For example:

$$\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix} \times \begin{bmatrix} 4 & 7 \\ 5 & 8 \\ 6 & 9 \end{bmatrix} = \begin{bmatrix} 1x4 + 2x5 + 3x6 & 1x7 + 2x8 + 3x9 \\ 3x4 + 2x5 + 1x6 & 3x7 + 2x8 + 1x9 \end{bmatrix} \quad (\text{EQ 4-70})$$

If a matrix is multiplied by a parameter, each element of the matrix is multiplied by the parameter. If a matrix is multiplied by a vector, the vector is multiplied with each column of the matrix (i.e., the corresponding rows are multiplied).

SYNTAX 1

LET <mat3> = MATRIX MULTIPLICATION <mat1> <mat2> <SUBSET/EXCEPT/FOR qualification>

where <mat1> is a matrix;

<mat2> is a matrix;

<mat3> is a matrix where the resulting matrix multiplication is saved;

and where the <SUBSET/EXCEPT/FOR qualification> is optional and rarely used in this context.

This syntax is used for 2 matrices.

SYNTAX 2

LET <mat3> = MATRIX MULTIPLICATION <mat1> <par> <SUBSET/EXCEPT/FOR qualification>

where <mat1> is a matrix;

<par> is a number or a parameter;

<mat3> is a matrix where the resulting matrix multiplication is saved;

and where the <SUBSET/EXCEPT/FOR qualification> is optional and rarely used in this context.

This syntax is used for a matrix and a parameter.

SYNTAX 3

LET <mat3> = MATRIX MULTIPLICATION <mat1> <var> <SUBSET/EXCEPT/FOR qualification>

where <mat1> is a matrix;

<var> is a variable;

<mat3> is a matrix where the resulting matrix multiplication is saved;

and where the <SUBSET/EXCEPT/FOR qualification> is optional and rarely used in this context.

This syntax is used for a matrix and a vector.

EXAMPLES

LET C = MATRIX MULTIPLICATION A B

LET C = MATRIX MULTIPLICATION A 2

LET C = MATRIX MULTIPLICATION A V

NOTE

For 2 matrices, the number of columns in the first matrix must match the number of rows in the second matrix. For a matrix and a vector, the number of rows must be the same. An error message is printed if either one of these conditions is violated. For 2 matrices, the resulting matrix has a dimension equal to the number of rows in matrix 1 and the number of columns in matrix 2.

DEFAULT

None

SYNONYMS

None

RELATED COMMANDS

MATRIX ADDITION	=	Perform a matrix addition.
MATRIX SUBTRACTION	=	Perform a matrix subtraction.
MATRIX EIGENVALUES	=	Compute the matrix eigenvalues.
MATRIX EUCLID NORM	=	Compute the matrix Euclidean norm.
MATRIX INVERSE	=	Compute a matrix inverse.
MATRIX SOLUTION	=	Solve a system of linear equations.
SINGULAR VALUES	=	Compute the singular values of a matrix.

REFERENCE

Any standard text on linear algebra.

APPLICATIONS

Linear Algebra

IMPLEMENTATION DATE

87/10

PROGRAM

```
READ MATRIX A
1 2 3
3 2 1
END OF DATA
READ MATRIX B
4 7
5 8
6 9
END OF DATA
LET C = MATRIX MULTIPLICATION A B
PRINT C
```

The resulting matrix C contains:

```
MATRIX C  --      2 ROWS
           --      2 COLUMNS
```

```
VARIABLES--C1      C2
```

```
0.3200000E+02 0.5000000E+02
0.2800000E+02 0.4600000E+02
```