

**VECTOR CROSS PRODUCT****PURPOSE**

Compute the cross product (= vector product) of 2 vectors in  $R^d$  with real elements.

**DESCRIPTION**

The cross product of 2 vectors of length 3 (an error message is generated for vectors that are not of length 3) is a vector (also of length 3) that is perpendicular to both of the original vectors. The formula for the cross product of the vector X with elements  $x_1, x_2,$  and  $x_3$  with the vector Y with elements  $y_1, y_2,$  and  $y_3$  is:

$$X \times Y = ((x_2y_3 - x_3y_2), (x_3y_1 - x_1y_3), (x_1y_2 - x_2y_1))$$

**SYNTAX**

LET <p> = VECTOR CROSS PRODUCT <v1> <v2> <SUBSET/EXCEPT/FOR/qualification>

where <v1> is the variable containing the (real) elements of the first vector;

<v2> is the variable containing the (real) elements of the second vector;

<v3> is the variable containing the (real) elements of the resultant vector;

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

**EXAMPLES**

LET DP = VECTOR CROSS PRODUCT Y1 Y2

**NOTE 1**

The vector  $(x_1, x_2, \dots, x_n)$  represents the line segment from the origin  $(0,0,\dots,0)$  to the point  $(x_1, x_2, \dots, x_n)$ . That is, each element of the vector represents the corresponding value on the corresponding axis. Vectors are sometimes represented in terms of the unit coordinate vectors. For example, for the 3d case the vector  $x=(x_1,x_2,x_3)$  can be written as  $a=x_1i + x_2j + x_3k$  where

$$i = (1,0,0) \quad j = (0,1,0) \quad k = (0,0,1)$$

**NOTE 2**

Storagewise, a DATAPLOT "variable" and a mathematical "vector" are identical. The ordering of elements within a DATAPLOT variable is identical to the ordering of elements within a mathematical vector. Thus to store the vector with elements 4 11 37 8 19 in the variable Y, enter the following command (the READ and SERIAL READ commands can be used to store longer vectors):

LET Y = DATA 4 11 37 8 19

**DEFAULT**

None

**SYNONYMS**

None

**RELATED COMMANDS**

VECTOR DOT PRODUCT	=	Computes a vector dot product.
VECTOR LENGTH	=	Computes the vector length.
VECTOR DISTANCE	=	Computes the vector distance.
VECTOR ANGLE	=	Computes the vector angle.
MATRIX DETERMINANT	=	Compute the determinant of a matrix.

**APPLICATIONS**

Mathematics

**IMPLEMENTATION DATE**

93/10

**PROGRAM**

```
LET Y1 = DATA 4 2 3
LET Y2 = DATA 1 2 4
LET A = VECTOR CROSS PRODUCT Y1 Y2
WRITE Y1 Y2 A
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