CHAPTER 3 Mathematics LET Subcommands

The execution of a variety of mathematical operations is done via subcommands under the LET command, as in

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LET A = SUM X
LET B = INTEGRAL F WRT X FOR X = 0 TO 10
LET C = SORT X
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The math operations are of 5 types:

1. the operation is applied to a variable and the result is a parameter.
2. the operation is applied to a variable and the result is a variable.
3. the operation is applied to a function.
4. the operation generates sequences or patterns.
5. the operation is applied to a matrix.

A parameter is a single scalar value while a variable is a list of one or more data values. This chapter documents the first four types of operations while chapter 4 documents the matrix subcommands.

Basic operations and data transformations:

CODE	Code the elements in a variable.
CODE2	Binary code the elements in a variable.
CODE4	Quartile code the elements in a variable.
CODE8	Octal code the elements in a variable.
COCODE	Code one variable by another variable.
COCOPY	Code one variable by another variable.
CUMULATIVE SUM	Compute the partial sums of the elements in a variable.
CUMULATIVE PRODUCT	Compute the partial products of the elements in a variable.
DISTINCT (or SET DISTINCT)	Extract the distinct elements from a variable.
FREQUENCY	Compute the frequency of elements in a variable.
PRODUCT	Compute the product of elements in a variable.
RANK	Rank the elements in a variable.
SEQUENTIAL DIFFERENCE	Compute the sequential differences of elements in a variable.
SORT	Sort the elements in a variable in increasing order.
SORTC	Sort one variable and carry one or more other variables.
SUM	Compute the sum of elements in a variable.
WEIBULL ADJUSTED RANKS	Compute the Weibull adjusted ranks.

Generate sequences and patterns

CANTOR NUMBERS	Generate Cantor numbers.
DATA	Place numbers in a variable.
FIBONNACCI NUMBERS	Generate Fibonnacci numbers.

FRACTAL	Generate a fractal sequence.
LOGISTIC NUMBERS	Generate numbers from a logistic sequence.
PATTERN	Generate a patterned sequence within a variable.
PRIME NUMBERS	Generate prime numbers.
SEQUENCE	Generate a sequence within a variable.

Derivatives, integrals, convolution, differential equations, and roots

CONVOLUTION	Compute the convolution of the elements in 2 variables.
CUMULATIVE INTEGRAL	Compute the partial integrals of elements in a variable.
DECONVOLUTION	Compute the deconvolution of the elements in a variable.
DERIVATIVE	Compute the analytic derivative of a function.
INTEGRAL	Compute the definite integral of a function or the integral of the elements in a variable.
ROOTS	Compute the roots of a function.
RUNGE KUTTA	Solve a first or second order ordinary differential equation using the Runge-Kutta method.

Interpolation

BILINEAR INTERPOLATION	Compute a bilinear interpolation from a grid to random points of a 2D series of points.
BIVARIATE INTERPOLATION	Compute a bivariate interpolation from a grid to random points of a 2D series of points.
INTERPOLATION	Carry out a cubic spline interpolation.
LINEAR INTERPOLATION	Compute a linear interpolation of a series of points.
2D INTERPOLATION	Compute a bivariate interpolation from a 2D series of points to a rectangular grid.

Fourier and related transforms:

COSINE TRANSFORM	Compute the cosine transform.
FFT	Compute the fast Fourier transform.
FOURIER TRANSFORM	Compute the Fourier transform.
INVERSE FFT	Compute the inverse fast Fourier transform.
INVERSE FOURIER TRANSFORM	Compute the inverse Fourier transform.
SINE TRANSFORM	Compute the sine transform.

Complex arithmetic

COMPLEX ADDITION	Compute a complex addition.
COMPLEX CONJUGATES	Compute a complex conjugate.
COMPLEX DIVISION	Compute a complex division.
COMPLEX EXPONENTIATION	Compute a complex exponentiation.
COMPLEX MULTIPLICATION	Compute a complex multiplication.
COMPLEX ROOTS	Compute complex roots.
COMPLEX SQUARE ROOTS	Compute a complex square roots.
COMPLEX SUBTRACTION	Compute a complex subtraction.

Polynomial arithmetic

POLYNOMIAL ADDITION	Compute a polynomial addition.
POLYNOMIAL DIVISION	Compute a polynomial division.
POLYNOMIAL EVALUATION	Compute a polynomial evaluation.
POLYNOMIAL MULTIPLICATION	Compute a polynomial multiplication.

POLYNOMIAL SQUARE	Compute a polynomial squaring.
POLYNOMIAL SUBTRACTION	Compute a polynomial subtraction.
Vector operations:	
VECTOR ADDITION	Compute a vector addition.
VECTOR ANGLE	Compute a vector angle.
VECTOR CROSS PRODUCT	Compute a vector cross product.
VECTOR DISTANCE	Compute a vector distance.
VECTOR DOT PRODUCT	Compute a vector dot product.
VECTOR LENGTH	Compute a vector length.
VECTOR SUBTRACTION	Compute a vector subtraction.
Set operations:	
SET CARDINALITY	Compute the set cardinality.
SET CARTESIAN PRODUCT	Carry out set cartesian product.
SET COMPLEMENT	Carry out set complement.
SET INTERSECTION	Carry out set intersection.
SET UNION	Carry out set union.
Logical operations:	
LOGICAL AND	Carry out logical and.
LOGICAL IFF	Carry out logical iff.
LOGICAL IFTHEN	Carry out logical ifthen.
LOGICAL NAND	Carry out logical nand.
LOGICAL NOR	Carry out logical nor.
LOGICAL NOT	Carry out logical not.
LOGICAL OR	Carry out logical or.
LOGICAL XOR	Carry out logical xor.