WEIGHTED STANDARD DEVIATION

PURPOSE
Compute the weighted standard deviation of a variable.

DESCRIPTION
The formula for the standard deviation is:

\[ s = \sqrt{\frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N - 1}} \]  

(EQ 2-21)

while the formula for the weighted standard deviation is:

\[ sd_w = \sqrt{\frac{\sum_{i=1}^{N} w_i (x_i - \bar{x}_w)^2}{(N' - 1) \sum_{i=1}^{N'} w_i}} \]  

(EQ 2-22)

where \( w_i \) is the weight for the \( i \)th observation, \( N' \) is the number of non-zero weights, and \( \bar{x}_w \) is the weighted mean of the observations. An error message is printed if a negative weight is encountered. Weighted standard deviations are often used for frequency data.

SYNTAX
LET <par> = WEIGHTED STANDARD DEVIATION <y> <weights><SUBSET/EXCEPT/FOR qualification>

where <y> is a response variable;  
<weights> is a variable containing the weights;  
<par> is a parameter where the weighted standard deviation is saved;  
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES
LET STANDARD DEVIATION = WEIGHTED MEAN Y1 WEIGHT  
LET STANDARD DEVIATION = WEIGHTED MEAN Y1 WEIGHT SUBSET TAG > 2

DEFAULT
None

SYNONYMS
None

RELATED COMMANDS
MEAN = Compute the mean of a variable.  
MEDIAN = Compute the median of a variable.  
STANDARD DEVIATION = Compute the standard deviation of a variable.  
VARIANCE = Compute the variance of a variable.  
WEIGHTED MEAN = Compute the weighted mean of a variable.  
WEIGHTED VARIANCE = Compute the weighted variance of a variable.

APPLICATIONS
Data Analysis

IMPLEMENTATION DATE
94/11 (there was an error in the computation for earlier versions)
PROGRAM
   LET Y = DATA 2 3 5 7 11 13 17 19 23
   LET W = DATA 1 1 0 0 4 1 2 1 0
   LET A = STANDARD DEVIATION Y
   LET AW = WEIGHTED STANDARD DEVIATION Y W
   PRINT A AW

   The values of A and AW are 7.46 and 5.82 respectively.