# WEIGHTED STANDARD DEVIATION

## PURPOSE

Compute the weighted standard deviation of a variable.

## DESCRIPTION

The formula for the standard deviation is:

$$s = \sqrt{\frac{\sum_{i=1}^{N} (x_i - \bar{x})^2}{N - 1}} \qquad \textbf{(EQ 2-21)}$$

while the formula for the weighted standard deviation is:

$$sd_w = \sqrt{\frac{\sum_{i=1}^{N} w_i (x_i - \bar{x}_w)^2}{\frac{(N' - 1)\sum_{i=1}^{N} w_i}{N'}}} \qquad \textbf{(EQ 2-22)}$$

where $w_i$ is the weight for the ith 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.