Standard Deviation Formula

Standard deviation of a data set is the square root of the calculated variance of a set of data.

The formula for variance (s^2) is the sum of the squared differences between each data point and the mean, divided by the number of data points.

When working with data from a complete population the sum of the squared differences between each data point and the mean is divided by the size of the data set, n. When working with a sample, divide by the size of the data set minus 1, n - 1.

The formula for variance for a population is:

$$\text{Variance} = \sigma^2 = \frac{\Sigma(x_i - \mu)^2}{n}$$

The formula for variance for a sample set of data is:

$$\text{Variance} = s^2 = \frac{\Sigma(x_i - \bar{x})^2}{n - 1}$$

Take the square root of the population variance to get the standard deviation.

Population standard deviation = $\sqrt{\sigma^2}$

Take the square root of the sample variance to get the standard deviation.

Standard deviation of a sample = $\sqrt{s^2}$

For additional explanation of standard deviation and how it relates to a bell curve distribution, see Wikipedia's page on [Standard Deviation](#).

Statistics Formulas and Calculations Used by This Calculator

Sum

The sum is the total of all data values $x_1 + x_2 + x_3 + ... + x_n$

$$\text{Sum} = \sum_{i=1}^{n} x_i$$

Size or count is the number of data points in a data set.

$$\text{Size} = n = \text{count}(x_i)_{i=1}^{n}$$

Mean

The mean of a data set is the sum of all of the data divided by the size. The mean is also known as the average.

For a Population

$$\mu = \frac{\sum_{i=1}^{n} x_i}{n}$$

For a Sample

$$\overline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Sum of Squares

The sum of squares is the sum of the squared differences between data values and the mean.

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For a Population

$$SS = \sum_{i=1}^{n}(x_i - \mu)^2$$

For a Sample

$$SS = \sum_{i=1}^{n}(x_i - \overline{x})^2$$

Standard Deviation

Standard deviation is a measure of dispersion of data values from the mean. The formula for standard deviation is the square root of the sum of squared differences from the mean divided by the size of the data set.