

Mean, Variance, and Standard Deviation

Mean

Mean is the average of the numbers, a calculated "central" value of a set of numbers

Formula

$$\bar{x} = \frac{\bar{x}_1 + \bar{x}_2 + \bar{x}_3 \dots + \bar{x}_n}{n}$$

Formula values

- \bar{x} = mean
- $\bar{x}_{1,2,3,n}$ = population
- n = number of occurrence

Example: Find the mean for the following list of values 13, 18, 13, 14, 13, 16, 14, 21, 13

Add all the values then divide by the number of occurrence of a value:

$$(13 + 18 + 13 + 14 + 13 + 16 + 14 + 21 + 13) \div 9 = 15$$

Variance

Variance is the average of the squared differences from the MEAN

Formula

$$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

Formula values

- s^2 = variance
- i = starting point
- n = number of samples
- \sum (operation) = calculation done recursively until n times

Example: Find the variance for the following list of values 13, 18, 13, 14, 13, 16, 14, 21, 13

Given a mean of 15, take each occurrence, subtract the mean then square. Add together, then divide.

$$[(13 - 15)^2 + (18 - 15)^2 + (13 - 15)^2 + (14 - 15)^2 + (13 - 15)^2 + (16 - 15)^2 + (14 - 15)^2 + (21 - 15)^2 + (13 - 15)^2] \div 9 = \mathbf{7.11}$$

Standard Deviation

Standard deviation is a quantity calculated to indicate the extent of deviation for a group as a whole.

Formula

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}}$$

Formula values

- s = standard deviation
- i = starting point
- n = number of samples
- $\Sigma(\text{operation})$ = calculation done recursively until n times

Example: Find the variance for the following list of values 13, 18, 13, 14, 13, 16, 14, 21, 13 given a mean of 15.

Complete the same operation as variance, just take the square root of the given variance.

$$\{[(13 - 15)^2 + (18 - 15)^2 + (13 - 15)^2 + (14 - 15)^2 + (13 - 15)^2 + (16 - 15)^2 + (14 - 15)^2 + (21 - 15)^2 + (13 - 15)^2] \div 9\}^{(1/2)} = \mathbf{2.67}$$

$$\text{Or just take } \sqrt{7.11} = \mathbf{2.67}$$