


Standard Deviation

A. Find the mean.

Example:


(1)	(2)	(3)	(4)	(5)	(6)
53	61	49	67	55	63

$$= \frac{53+61+49+67+55+63}{6}$$
$$= \frac{348}{6} = 58$$


B. Find the variance (average of the squared differences from the mean)

1. Calculate the difference from the mean for each sample number.
2. Square each number then average the results

Example:


$$= (53-58)^2 + (61-58)^2 + (49-58)^2 + (67-58)^2 + (55-58)^2 + (63-58)^2$$
$$= (-5)^2 + 3^2 + (-9)^2 + 9^2 + (-3)^2 + 5^2$$
$$= 25 + 9 + 81 + 81 + 9 + 25$$
$$= \frac{230}{6} = 38.3333$$


C. Find the square root of the variance

Example:

$$= \sqrt{38.3333}$$
$$= 6.19139$$

*approx. 68% of the sample are within 6.19139 of the mean



Error Bars

Error bars are used to quantify uncertainty in graphs of statistical metrics. When an estimator (typically a mean, or average) is based on a small sample of a much larger population, error bars help depict how far the estimator is likely to be from the true value -- that is not measured directly because the size of the larger population makes that impossible or impractical. A graph with error bars contains values for multiple estimators, each corresponding to different experiment conditions. Each estimator is derived from its own sample, and has its own error bar. You can calculate the size of the error bar.

Instructions

1. Compute the average (i.e., the estimator) for your measurements, by evaluating the following formula:

$$\text{average} = (\text{sample1} + \text{sample2} + \dots + \text{sampleN}) / N$$

Replace "sample1," "sample2," ... "sampleN" by the measurements, and "N" by the total number of measurements in the experiment.

2. Compute the standard deviation. The standard deviation is the measure of dispersion used for error bars.
3. Compute the beginning and end points of the error bars, by evaluating the following formulas:

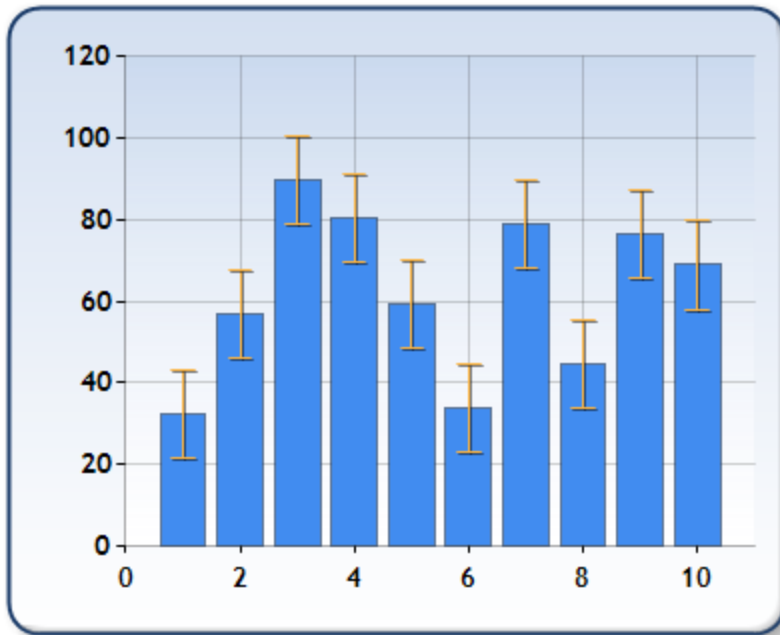
$$\text{barBegin} = \text{average} - \text{stdDev}$$

$$\text{barEnd} = \text{average} + \text{stdDev}$$

The bar begins at "barBegin," is centered at "average," and ends at "barEnd."

Error Bars

Bar Graph Example



Line Graph Example

