

Other than the range, there are two more statistics used to measure the dispersion or "spread" of the data.

One statistic is called the **variance**. The other statistic is the **standard deviation**.

To find the **variance** we square the deviation of each value from the mean and then find the mean of these squares.

Squaring the deviations from the means while making all deviations positive (avoiding absolute values) magnifies the measure of deviation. To find the **standard deviation**, we take the square root of the variance (defined above).

$$\text{mean} = \bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$\text{variance} = \frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \dots + (x_n - \bar{x})^2}{n}$$

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

$$\text{standard deviation} = \sigma = \sqrt{\frac{\sum_{i=1}^n (\bar{x} - x_i)^2}{n}}$$

$$\sigma = \sqrt{\frac{\text{sum of the squares of the deviations from the mean}}{\text{number of elements in the distribution}}} = \sqrt{\text{variance}}$$

Statistical Symbols and variables:

\bar{x} = the mean of the x values

$\sum_{i=1}^n x$ = the sum of the x values

σ^2 = the variance of the x values

σ = the standard deviation of the x values

n = the number of elements in the distribution

Ex 4) Find the variance of the distribution of test scores shown below:

Score	Deviation	Dev. Sq
94	15	225
89	10	100
86	7	49
82	3	9
75	-4	16
72	-7	49
71	-8	64
63	-16	256

79	768
Mean	
Number of Scores	8
	Variance 96
	Standard Deviation 9.80

Ex 5) The stem and leaf plot below shows the distributions of the heights (centimeters) of the members of a high school Basketball Team.

Find the mean and standard deviation for the distribution.

$$\begin{array}{r|l}
 17 & 5, 8 \\
 18 & 0, 0, 1, 4, 4, 4, 5, 5, 8 \\
 19 & 2
 \end{array}$$

Height	Frequency	Height X Frequency	Deviation	Dev. Sq	Dev Sq X Freq
175	1	175	-8	64	64
178	1	178	-5	25	25
180	2	360	-3	9	18
181	1	181	-2	4	4
184	3	552	1	1	3
185	2	370	2	4	8
188	1	188	5	25	25
192	1	192	9	81	81
Sums	12	2196			228
	Mean	183		Variance	19
				Standard Deviation	4.36