

## Section 11-7 Standard Deviation

Students will be able to:

- find the standard deviation and variance of a set of values.
- apply standard deviation and variance

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**Measures of Dispersion** indicate the extent to which values are spread around a central value such as mean.

-Examples: Interquartile Range, Range, Mean Deviation, Variance, and Standard Deviation.

Range and IQR are not very reliable to look at because they only use two data values.

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**Standard deviation:** a measure of how far the numbers in a data set are from the mean.

Range and IQR are each a **measure of variation**, describing how the data in a set are spread out.

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Variance and Standard Deviation:

-If a data set has n values, and a mean of  $\bar{x}$ , then the variance and standard deviation are:

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

$$\text{Standard Deviation: } \sigma = \sqrt{\sigma^2}$$

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**Keys to finding Variance and Standard Deviation:**

1. Find the mean of the data set
2. Find how far each data point is from the mean ( $x - \bar{x}$ )
3. Square each difference
4. Find the average of these squares. This is the **variance**.
5. Square root the variance to get the **standard deviation**.



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Find the Standard Deviation and Variance from the test scores example.

Score	$\bar{x}$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
85	90	5	25
91	90	1	1
96	90	6	36
85	90	5	25
93	90	3	9
Total:			96

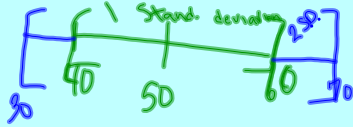
To find Variance:  $\frac{\text{total}}{n} = \frac{96}{5} = 19.2$

Standard Deviation:  $\sqrt{\text{variance}} = 4.38$

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In a data list, every value falls within some number of standard deviations of the mean.

Ex. If the mean is 50 and the standard deviation is 10, then  $40 \leq x \leq 60$  is within one standard deviation from the mean.

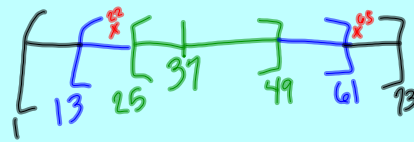


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The mean length of Beethoven's nine symphonies is 37 mins; the standard deviation is 12 mins. Within how many standard deviations from the means is the data?

27, 30, 47, 35, 30, 40, 35, 22, 65 *within 3 Standard deviations*



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