

Name Key Hour _____

Calculating Standard Deviation

The standard deviation is used to tell how far on average any data point is from the mean. The smaller the standard deviation, the closer the scores are on average to the mean. When the standard deviation is large, the scores are more widely spread out on average from the mean.

The **standard deviation** is calculated to find the **average distance from the mean**.

Practice Problem #1. Calculate the standard deviation of the following test data by hand. Use the chart to record the steps.

Test Scores: 22, 99, 102, 33, 57, 75, 100, 81, 62, 29

$$\frac{660}{10} = 66$$

mean: 66 = \bar{x} n: 10

Test Score (x)	Difference from the mean (x - \bar{x})	(Difference from the mean) ² (x - \bar{x}) ²
22	22 - 66 = -44	1,936
99	99 - 66 = 33	1,089
102	102 - 66 = 36	1,296
33	33 - 66 = -33	1,089
57	57 - 66 = -9	81
75	75 - 66 = 9	81
100	100 - 66 = 34	1,156
81	81 - 66 = 15	225
62	62 - 66 = -4	16
29	29 - 66 = -37	1,369
Sum of (Difference from the mean) ² $\sum (x - \bar{x})^2$		8338

Sum of (Difference from the mean)² divided by the total number of scores, n. → This is your variance.

$$\frac{\sum (x - \bar{x})^2}{n} = \frac{8338}{10} = 833.8$$

Final Step:

Standard deviation = square root of what you just calculated (variance).

$$\text{Standard Deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} = \sqrt{833.8} = 28.876$$

For the following sets of data, calculate the mean and standard deviation of the data. Describe the mean and standard deviation in words after calculating it.

1. The data set gives the prices (in dollars) of different cordless phones at an electronics store. mean = 60.7 n = 7

	$x - \bar{x}$	$(x - \bar{x})^2$
35	-25.7	660.49
50	-10.7	114.49
60	-0.7	.49
60	-0.7	.49
75	14.3	204.49
65	4.3	18.49
80	19.3	372.49

35, 50, 60, 60, 75, 65, 80

Average price is \$60.7
± \$7.0

$$\frac{\sum(x-\bar{x})^2}{n} = \frac{1371.43}{7} = 195.9195714 \approx 13.997$$

2. The data set gives the number of home runs for the 10 batters who hit the most home runs during the 2018 Major League Baseball regular season. mean = 44 n = 10

	$x - \bar{x}$	$(x - \bar{x})^2$
51	7	49
48	4	16
47	3	9
46	2	4
45	1	1
43	-1	1
41	-3	9
40	-4	16
40	-4	16
39	-5	25

51, 48, 47, 46, 45, 43, 41, 40, 40, 39

On average, batters hit about 44 home runs, ± 3.821 home runs

$$\sqrt{14.6} = 3.821$$

$$\frac{\sum(x-\bar{x})^2}{n} = \frac{146}{10} = 14.6$$

3. The data gives the waiting time (in minutes) of different people at the DMV. mean = 7.2 n = 15

	$x - \bar{x}$	$(x - \bar{x})^2$
11	3.8	14.44
7	-0.2	.04
14	6.8	46.24
2	-5.2	27.04
8	.8	.64
13	5.8	33.64
3	-4.2	17.64
6	-1.2	1.44
10	2.8	7.84
3	-4.2	17.64
8	.8	.64
4	-3.2	10.24
8	.8	.64
7	-0.2	.04

11, 7, 14, 2, 8, 13, 3, 6, 10, 3, 8, 4, 8, 4, 7

average wait time is 7.2 minutes ± 3.5 minutes

$$\frac{\sum(x-\bar{x})^2}{n} = \frac{188.4}{15} = 12.56$$

$$\sqrt{12.56} \approx 3.544$$

4. The data gives the calories in a 1-ounce serving of different breakfast cereals. mean = 114.4 n = 9

	$x - \bar{x}$	$(x - \bar{x})^2$
135	20.6	424.36
115	.6	.36
120	5.6	31.36
110	-4.4	19.36
100	-4.4	19.36
100	-14.4	207.36
105	-9.4	88.36
110	-4.4	19.36
125	10.6	112.36

135, 115, 120, 110, 110, 100, 105, 110, 125

mean = 114.4 n = 9

$$\frac{\sum(x-\bar{x})^2}{n} = \frac{922.24}{9} = 102.47111$$

$$\sqrt{102.47111} \approx 10.123$$

A 1-ounce serving of cereal, on average, is 114.4 calories ± about 10 calories