Chapter 5: Statistics

5.3 Standard Deviation

a measure of _____ from the mean

> **When is standard deviation useful?** Consider this situation:
>
> *Two English classes both have an average mark of 70%... In which class is it more difficult to get an A?*

FORMULA FOR STANDARD DEVIATION:

$$\sigma = \sqrt{\frac{sum\ of\ the\ squares\ of\ the\ differences\ from\ the\ mean}{number\ of\ values}}$$

OR

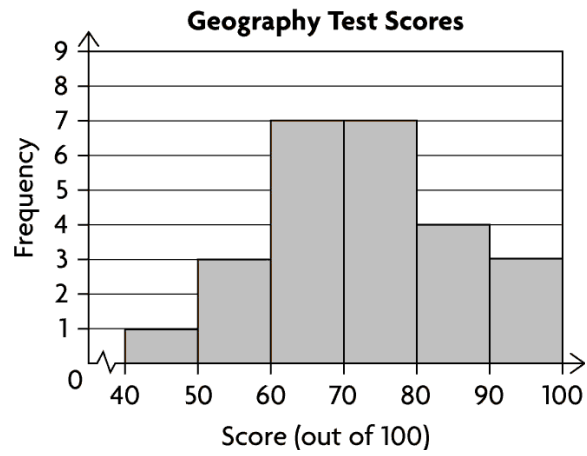$$\sigma = \sqrt{mean\ of\ the\ squares - mean\ squared}$$

OR

Use the calculator!!!

Example #1: Find the Standard Deviation for the following set of numbers:

5,6,7,8,9

Example #2: Find the Standard Deviation for the following histogram

Geography Test Scores

Assignment

$$\sigma = \sqrt{\frac{sum\ of\ the\ squares\ of\ the\ differences\ from\ the\ mean}{number\ of\ values}}$$

1) Determine the standard deviation of test marks:

Class A: 94, 56, 89, 67, 84

       mean =

Number - Mean	Squared
Sum	

$$\sigma = \sqrt{\frac{sum}{number\ of\ values}}$$

$$\sigma =$$

Class B: 84, 77, 76, 81, 74

       mean =

Number - Mean	Squared
Sum	

$$\sigma = \sqrt{\frac{sum}{number\ of\ values}}$$

$$\sigma =$$

Which class had more consistent results? Explain.

2. Ali bowls in a peewee league. Use your calculator to determine the mean and standard deviation of Ali's bowling scores, rounded to two decimal places.
135, 141, 109, 156, 127, 131, 118, 124, 129, 133, 139, 123

3. The bowling scores for the six players on Ali's team are shown in the table.

Scores	Frequency
101-105	1
106-110	3
111-115	4
116-120	7
121-125	9
126-130	14
131-135	11
136-140	8
141-145	6
146-150	5
151-155	3
156-160	1

a) Use your calculator to determine the mean and standard deviation, rounded to two decimal places.

b) Compare Ali's data from question #2 to the team's data in question #3

4. Marie, a Métis beadwork artist, ordered packages of beads from two online companies. She is weighing the packages because the sizes seem inconsistent. The standard deviation of the masses of the packages from company A is 11.7g. The standard deviation of the masses of the packages from company B is 18.2g.

   a) What does this information tell you about the dispersion of the masses of the packages from each company?

   b) Marie is working on an important project. She needs to make sure that her next order will contain enough beads to complete the project. Should she order from company A or company B?

5. Nazra and Diko are laying patio stones. Their supervisor records how many stones they lay each hour. Determine the standard deviation for each person:

Nazra: 34,41,40,38,38,45
      mean =

Number - Mean	Squared
Sum	

$$\sigma = \sqrt{\dfrac{sum}{number\ of\ values}}$$

$$\sigma =$$

Diko: 51,28,36,44,41,46
      mean =

Number - Mean	Squared
Sum	

$$\sigma = \sqrt{\dfrac{sum}{number\ of\ values}}$$

$$\sigma =$$

a) Which person lays more stones during the day?

b) Which worker is more consistent?

6) The manager of a customer support line currently has 200 unionized employees. Their contract states that the mean number of calls that an employee should handle per day is 45 with a standard deviation of 6 calls. The manager tracked the number of calls that each employee handles. Does the manager need to hire more employees if the calls continue in this pattern?

Daily Calls	Frequency
26-30	2
31-35	13
36-40	42
41-45	53
46-50	42
51-55	36
56-60	8
61-65	4

Answer Key

1) class A: 14.27   class B: 3.61   therefore, class B is more consistent
2) mean: 130.42 points   standard deviation: 11.51 points
3) mean: 130.36 points   standard deviation: 12.05 points
      Ali's average is close to the team's, therefore he is an average player
4) a) The mean number of beads in company B's packages is much less consistent than the mean number of beads in company A's packages.
   b) Company A
5) a) Diko   b) Nazra
6) Yes: Mean: 45.0 calls   standard deviation: 7.1 calls