Section 3.2

Definition: The **range** is the difference between the largest and smallest values of a data distribution.

Exercise 1. Find the range for the following list of numbers: 42, 23, 30, 11, and 520.

Remark: It only takes one value to dramatically alter the range. If 520 was not in the above set, the range would only be $42 - 11 = 31$.

Class Exercise 1. Find the range for the following list of numbers: 39, 19, 23, 56, and 17.

Class Exercise 2. Find the range for the following list of numbers: 21, 19, 39, 12, and 45.

Definition: The standard deviation of a set of sample values, denoted by s, is a measure of the variation of values about the mean.

Here is a formula for the standard deviation:

$$s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}},$$

where n is the number of data values.

The following properties are consequences of the way in which the standard deviation is defined:

(1) The standard deviation is a measure of variation of all values from the *mean*.

(2) The value of the standard deviation s is usually positive. It is zero only when all of the data values are the same number. (It is never negative.) Also, larger values of s indicate greater amounts of variation.

(3) The value of the standard deviation s can increase dramatically with the inclusion of one or more outliers (data values that are very far away from all of the others).

(4) The units of the standard deviation s (such as minutes, feet, pounds, and so on) are the same as the units of the original data values.

Exercise 2. Compute the standard deviation of the following sample values:

1, 4, 5, and 10.

The first step is to find the mean.

We next find the squared deviations:

For 1, the squared deviation is

For 4, the squared deviation is

For 5, the squared deviation is

For 10, the squared deviation is:

After that, we divide the sum of the squared deviations by the number of values - 1.

Finally, we take the square root of the result.

Class Exercise 3. Compute the standard deviation of the following sample values: 2, 4, 7, 10, and 18.

Class Exercise 4. Compute the standard deviation of the following sample values: 1, 9, 10, 15, and 17.

Computation Formula for Sample Standard Deviation

$$s = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$$

Exercise 3. Calculate the standard deviation of the following sample values using the computational formula: 1, 4, 5, and 10.

Class Exercise 5. Compute the standard deviation of the following sample values using the computational formula: 2, 4, 7, 10, and 18.

Class Exercise 6. Compute the standard deviation of the following sample values using the computational formula: 1, 9, 10, 15, and 17.

The variance is another measure of the spread of the data.

Definition: The **variance** of a set of values is a measure of variation equal to the square of the standard deviation.

Exercise 4. Compute the variance of the following sample values:

1, 4, 5, and 10.

We learned that the variance is the square of the standard deviation.

Class Exercise 7. Compute the variance of the following sample values: 2, 4, 7, 10, and 18.

Class Exercise 8. Compute the variance of the following sample values: 1, 9, 10, 15, and 17.

Here is a formula for the *population* standard deviation:

$$\sigma = \sqrt{\frac{\Sigma(x-\mu)^2}{N}}.$$

Here is the computational formula for the *population* standard deviation

$$\sigma = \sqrt{\frac{\Sigma x^2 - (\Sigma x)^2/N}{N}}$$

Exercise 5. Calculate the standard deviation for the population values: 1, 2, and 6.

Student Feedback

My teaching methods are (I hope) continually subject to improvement. If you have any comments, suggestions, or ideas, please email them to me at Sithparran.Vanniasegaram@evc.edu.

Homework

C problems

Section 3.2: 5, 13, 17(a), 17(b), 17(c), 19(a), 19(b), 19(c)

B problems

Section 3.2: 1, 3

A problems

Section 3.2: 7, 9, 11