

### Activity 1 – The Meaning of the Mean

Create five line segments using red color tiles, one with each of the following number of tiles: 11, 3, 5, 14, and 7.

Tasks:

1. Push all the red tiles together into one large pile.
2. Redistribute the red tiles into five groups so that each of the groups has the same number of tiles.
3. The number of tiles in each group is the mean of this set, and is the *equal sharing* representation of the mean.

Draw the tiles in the space provided below from each task. Next to your drawings, write out the corresponding step in the written algorithm for calculating the mean. Compare the steps in the task above with the steps used when calculating the mean of your data set.

Tiles

Written Algorithm

Task 1:

Task 2:

Task 3:

Write your conclusions about this activity here:

## Activity 2: The Meaning of the Standard Deviation

### **Example 1: Data Set {11, 3, 5, 14, 7}**

Complete the accompanying recording sheet, step-by-step as we go through it together as a group.

Tasks:

1. Create five line segments using green color tiles, one with each of the following number of tiles: 11, 3, 5, 14, and 7.
2. Line up the red tiles from *the end of* Activity 1 (that is, the mean of the data set) below each of the line segments formed with the green tiles. You will notice that there may be more or fewer red tiles than green. In this particular case, none of the five groups has the same number of green and red tiles in any one pair. Notice that, by setting up this alignment, we are comparing the mean to the original data set.
3. Remove all of the tiles that are 'matched up' with a tile of a different color, leaving five segments. These tiles represent the difference from the mean for each data point in the set.
4. Use each of these segments to represent the length of the side of a square, and then use more tiles to build each square. For example, if the difference in the number of matched tiles is 3, add more tiles to build a 3 X 3 square. If the difference between the numbers of matched tiles is 1, you will not have to add any more tiles, you will have a 1 X 1 square. When completed, you will have five squares - we will call these 'difference squares'.
5. Next, find the mean area of the difference squares by using the equal sharing method used in Activity 1. Arrange each of the five groups to form a square. What is the average area of these difference squares? The average area of the difference squares is the VARIANCE of our data set.
6. What is the side length of these squares? The length of the side of these squares is the standard deviation of the data set.

## Recording Sheet: Standard Deviation

Draw the tiles in the space provided below from each task. Next to your drawings, write out the corresponding step in the written algorithm for calculating the standard deviation. Compare the steps in the task above with the steps used when calculating the standard deviation of your data set.

**Tiles**

**Written Algorithm**

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Task 1:

Task 2:

Task 3:

Task 4:

Task 5:

Task 6:

Discussion and Review Questions:

- a. Review the steps involved in this example and compare your sketches to the mechanics involved in calculating the standard deviation. What did you notice?
- b. Write any new insights you gained with respect to how to visualize the variance and standard deviation of a data set.

**Example 2: Data Set {10, 1, 9, 2, 3, 6, 4, 5}**

Use difference squares to model the process for finding the standard deviation for this data set:

10 1 9 2 3 6 4 5

Write and draw out your work with the tiles and the algorithm on the accompanying recording sheet.

**Example 3: Data Set {6, 2, 13, 5, 9}**

Use difference squares to model the process for finding the standard deviation for this data set:

6 2 13 5 9

Write and draw out your work with the tiles and the algorithm on the accompanying recording sheet.

Answer the following additional discussion questions:

1. Are you able to find the mean of the difference squares? Why or why not?
2. Are you able to find the standard deviation? Why or why not?
3. What limitations did you notice within the color tile model for finding the standard deviation?

**Example 4: Data Set {12, 5, 10, 3, 10, 2}**

Use difference squares to model the process for finding the standard deviation for this data set:

12 5 10 3 10 2

Write and draw out your work with the tiles and the algorithm on the accompanying recording sheet.

Answer the following additional discussion questions:

1. Are you able to find the mean of the difference squares? Why or why not?
2. Are you able to find the standard deviation? Why or why not?
3. What limitations did you notice within the color tile model for finding the standard deviation with this example?