# Arrays

Arrays are a type of data structure used to implement a list object. An array has a list of elements all of the same type, for example integers. One Dimensional arrays, or 1D Arrays, have a single row and multiple columns of data. Each element in the array has an “index” which can be used to retrieve and set the data of each element. The index of an array starts at 0 and goes to N - 1, where N is the number of elements in the array.

Since arrays are objects, to initialize an array, you will need to use the keyword new when creating the array. Once you declare the size of an array, unlike ArrayLists, it cannot be changed. When an Array is declared, the element values are automatically set to zero. In order to access reading and setting data in an array, the array name followed by a pair of square brackets is used with the index value inside of the brackets. For example, temp\_data[0] = 2; would set the element at index 0 to a value of 2. In the line int b = temp\_data[3]; the integer b is being set equal to the value of the element in the temp\_data array at index value 3.

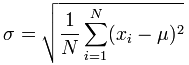
1. **Inspect the example file and describe the properties of the arrays “data” and “dataRaw” when they are declared.**

Unlike ArrayLists, to get the size or length of an array, instead of a method, a “final public” instance variable called length can be accessed. In the example file, the for loop iterates the integer i starting at 0, which is the first index in an array, while “i” is less than data.length. We know “data” in this case is an array and that length is the “final public” instance variable of the array. Therefore, our for loop is designed to iterate “i” through every possible index value for the array “data”.

1. **Review the for loop further and describe the function of the loop.**

In a previous lesson, we calculated the standard deviation for three distance readings with long lines of code and multiple variables for each reading. With a 1D array, we can simply store the data values inside of the array and dynamically loop through them for the calculations.

Recall that the equation for the standard deviation is:



Where sigma is the standard deviation, N is the number of samples, xi is the ith value from the set of values, and mu is the arithmetic mean of the set.

1. **In the example file, underneath the for loop, create another for loop to iterate through each element in data and get the total sum, then calculate the average. Hint: Declare a sum variable before the loop with a starting value of zero. When computing the sum and mean use doubles.**
2. **Add a third for loop to the program underneath the for loop from the previous question. In this for loop, implement the portion of the equation that contains the summation symbol. In this instance, “i” will start at 0 instead of 1 and will increment up to N - 1. Hint: Everything in the equation except the square root and multiplication of (1/N). Remember to declare a sum variable before the for loop.**
3. **As a last step send the mean and standard deviation information to the console with the println() method.**