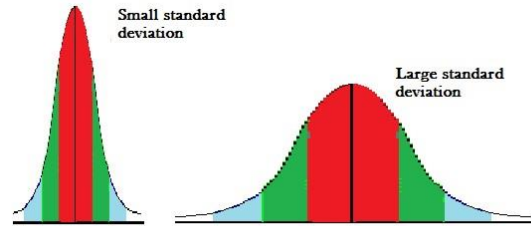


# CST 180 C++ Programming

## Arrays Program Assignment (30 pts)



### Purpose

To build a C++ program involving arrays and array processing.

### Specifications

Write a C++ program to perform a simple statistical analysis of a set of test scores with range 0...100. Your program should read from a text data file (filename [array\\_pgmdata.txt](#)). Then, it should write a simple summary report to the console output area.

Run your program with a common data file found on the course Web page. For the input data set, assume:

- All data values are non-negative integers
- The list is no longer than 500 values

Utilize functions that will receive an array for each of the following operations. Read the specifications carefully and implement each exactly as defined:

Function	Purpose/Description
<b>Input from File</b>	Build array of values from file.  Count the values. Use, as needed, with other functions.
<b>Calculate Average</b>	Calculate the mean (average) value for the data set.  Receive array of integer values, the number of array elements, and return the average of the list as a double value. Do not write the value to the console from this function. Return it to main() where it should be written to the console.
<b>Calculate Max/Min Value</b>	Calculate and return both maximum and minimum value in one function call (a void function that receives an array of values, the number of array elements, and passes back two integers).  Do not write the value to the console from this function, but again write it in main. Do not use a sorting algorithm for this function.

<b>Calculate Standard Deviation</b>	<p>The standard deviation is a statistical measure of how much the values in the data set deviate or vary from the average. It is represented mathematically by the formula:</p> $S = \sqrt{\frac{1}{n} \sum_{i=0}^{n-1} (x_i - \bar{x})^2}$
	<p>The standard deviation is calculated using the following pseudocode:</p> <pre> for i=0 to arraySize-1     sum = sum + (arrayVal[i] - avg)^2 standDev = sqrt((1.0/arraySize)*sum) </pre> <p>Where arrayVal is the array of data for this problem, arraySize is the number of elements in the array, and avg is the mean value of the array data. This function should receive the array, array size, the average value of the dataset, and return the standard deviation as a floating point value.</p>
<b>Determine and Write Quartile Summary</b>	<p>Calculate and write the number of list values in each quartile to the console. This should be a void function that receives an array of values, counts the values in all four quartiles, and writes directly to the console.</p> <p>This quartile analysis is essentially a frequency distribution counting the number of scores that fall in each quartile:</p> <ul style="list-style-type: none"> <li>Quartile 1: Scores 0-24</li> <li>Quartile 2: Scores 25-49</li> <li>Quartile 3: Scores 50-74</li> <li>Quartile 4: Scores 75-100</li> </ul>

Your output should be a clear and well-organized report should contain the following information:

- Number of data elements in data set
- Mean (average)
- Maximum data value
- Minimum data value
- Standard deviation
- Summary of quartiles

### Design Requirement

Sketch a hierarchy diagram indicating the functions you will be using. Indicate the types of parameters being passed, and the return type of each function.

## Final Deliverables

Deliver a single document containing the following:

- Cover page with assignment name, student name, and list of attachments
- Hierarchy chart as detailed above
- Printed copy of source code
- Printed copy of output using the data in the provided file:

Upload the turn-in document **AND** the .cpp source code file for grading into the appropriate dropbox.