Lab 12C
Statistics Package

Objectives:

To reinforce skills in defining and manipulating arrays and to introduce the **vector** class.
To calculate statistical features in a menu-driven program. To read numbers from a file.

Assignment:

Part I

Create a text file containing anywhere from 20 to 50 integers (remember, there is an "Add file" button in the Files window on the left side of Replit). Write a program that reads the data into a **`vector`**. Determine how many elements are in the vector, display the vector to the screen in a presentable fashion (10-20 integers per line), sort the vector from smallest to largest, and display the sorted vector. Note: you **must** use a vector, not a "C-style" array like the ones used in the mini golf lab.

Part II

Add a menu function to the above program to create a menu-driven statistics toolkit that will compute all of the following. The program should run until the user elects to quit.
Each option should have its own function and return the desired value.

- Range — Difference between the largest and smallest values
- Mean — Arithmetic average
- Median — Middle value if the length of the vector is odd; average of the two middle values if the length of the vector is even
- Mode(s) — Most frequently occuring value. Note that there can be more than one mode. Try to find all of them. This function can simply display the answer(s) rather than returning a value.
- Standard Deviation — Use the formula below, where x_i is each number, $\bar{x}$ is the average of all the numbers, n is the number of numbers, and the $\sum_{i=1}^{n}$ means add up each $(x_i - \bar{x})^2$.

$$\sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

For example, if the numbers are 10, 20, 30, then $n = 3$, $\bar{x} = 20$, and $(x_i - \bar{x})$ = -10, 0 and 10 so the standard deviation is: $\sqrt{\frac{(-10)^2+0^2+10^2}{3-1}} = \sqrt{\frac{200}{2}} = 10$

Reference Documents Used: Arrays and Vectors, Reading and Writing to Files.

Copy your completed code here and turn in on Classroom:

Don't forget you can start your own program in Replit by clicking "+Create" on the left side. Be sure to select C++ and add `using namespace std;` at the top.

Reference Documents Used: Arrays and Vectors, Reading and Writing to Files.