C.I.S. 1.5 (Science Section)
Brooklyn College
Professor Langsam

Assignment #5

Once again, your instructors are very busy calculating and assigning your grades (that you so richly deserve). Write a program that will process student test grades. Each student has four test grades, and you are to compute the average for each student and some statistics for the tests. The input will consist of a datafile giving his/her first and last names and four test grades. Store this data in five arrays.

Keep a count of the number of students processed and have your program detect when all of the data has been processed.

After the data has been read, compute the average for each student. Call a function **print**, described below, to print out the data.

Using a function, **sort**, sort the data into *descending* order by average. (The student with the highest average comes first.) When you sort the data, don't forget to swap all of the data associated with the student. Now call **print** again to print the data in the new order.

Skip to a new page and print out the statistics for each test. For each test use functions, **mean**, **median**, **mode**, and **sd** described below to compute the mean, median, mode and standard deviation. Print these four pieces of information for each test, and label them accordingly. The mean should have 2 places to the right of the decimal point and the standard deviation should have 4 places to the right of the decimal point.

Once again call **print** to print the arrays a third time. (This should be identical with the second time it was printed.)

Finally, skip to a new page and print the students' scores, again using **print**, calculating the average after dropping the lowest score. Indicate which score has been dropped by printing an *** in its place.

Functions **mean**, **median**, **mode**, and **sd** are functions having two arguments, an array x, and an integer n (where n is the number of students determined earlier in your program). They return the mean, median, mode, and the standard deviation of the first n elements of the array x. The mean is the average and is defined by:

$$\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$$

The standard deviation is:

$$\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(X_i - \bar{X})^2}$$

The median is the value such that half of the scores lie above it and half of the scores lie below it. To find the median, the function **median** calls a function **sort** which sorts the first n elements of the array x. After sorting, the median is the middle number (if n is odd), while it is the average of the two middle numbers if n is even.

The function **mode** accepts an array and returns the element most often repeated in the array. If several elements are repeated equally frequently, return their average.

sort is a function whose arguments are an array x and an integer n. It sorts the first n elements of x.

Note: You are not allowed to rearrange the data for the students, so the argument for **median** must be a different array.

print is a function which prints the data for the students. First it skips to a new page and prints column headings as follows:

Name	Test1	Test2	Test3	Test4	Average

Be sure to underline the headings. It then prints the data for all of the students. For average, print two places to the right of the decimal point.

Note: You are to print out the student scores a total of *four* times.

Data: Use the following datafile when you run the program.

Name	Test1	Test2	Test3	Test4
Albert Einstein	53	75	92	68
Charles Babbage	96	72	85	92
Claude Shannon	91	86	87	41
John vonNeumann	40	93	92	78
Niklaus Wirth	59	83	91	67
Ada Lovelace	91	84	98	63
Thomas Bayes	70	81	92	100
Sofia Kovalevskaya	31	46	53	61
Blaise Pascal	90	72	80	75
Grace Hopper	81	92	73	80
Isaac Newton	32	85	93	67

All output is to be to a file. Be sure to use the structured programming techniques discussed in class as well as meaningful variables and appropriate comments. Submit your program and input and output files.