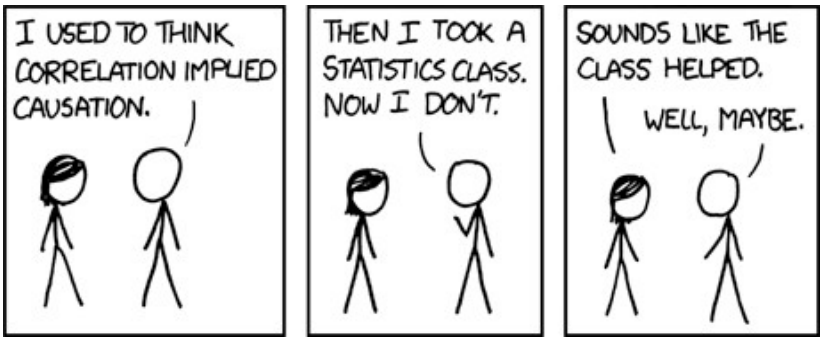
CS 218
Homework, Asst. #8

Purpose: Learn assembly language functions. Additionally, become more familiar with program control instructions, functions, the standard calling convention, and stacks.
Due: Thursday (2/28)
Points: 125

Assignment:
Write a series of simple assembly language functions as described below. You will be provided a main procedure that calls the following procedures/functions (for each set of data).



Source: www.xkcd.com/552

- Write a void function, **combSort()**, to sort the numbers into descending order (large to small). You **must** use the comb sort algorithm (from assignment 7). You will need to modify the algorithm to change the sort order (from ascending to descending).

- Write a void function, **basicStats()**, to find the minimum, maximum, median, sum, and average for a array of numbers. *Note,* for an odd number of items, the median value is defined as the middle value. For an even number of values, it is the integer average of the two middle values.

- Write a value returning function, **iSqrt()**, to calculate and return an integer estimate of the square root of a given number. To estimate the square root of a number, use the following algorithm:

$$iSqrt_{est} = iNumber$$

$$iSqrt_{est} = \frac{\left(\frac{iNumber}{iSqrt_{est}}\right) + iSqrt_{est}}{2} \qquad \text{iterate 50 times}$$

- Write a value returning function, **intStdDev()**, to compute the standard deviation for the array. The formula for standard deviation is as follows:

$$iStandardDeviation = \sqrt{\frac{\sum_{i=0}^{length-1} \left(list[i] - average\right)^2}{length}}$$

Note, perform the summation and division using integer values. A function returns the result in ***eax***. *Note*, due to the data sizes, the summation must be performed as a quad-word. This function will use the **iSqrt()** function.

All data should be treated as *unsigned* integers (MUL and DIV instructions). The functions must be in a separate assembly file. The files will be assembled individually and linked together.

Submission:
When complete, submit:

- A copy of the **source file** via the class web page by 23:55 (11:55 pm). Assignments received after the allotted time will not be accepted!

Updated Linking Instructions
You will be provided a main function that calls the functions. Your functions should be in a separate file. The files will be assembled individually and linked together.

When compiling, assembling, and linking the files for assignment #8, use the provided compile, assemble, and link script file (**`asm8`**). *Note*, **only** the functions file will be submitted. The script file will require execute privilege (i.e., **`chmod +x asm8`**). The submitted functions file will be assembled and linked with the provided main. As such, do not alter the provided main.

Refer to the text, Chapter 12, for more information regarding functions. Refer to the text, Chapter 6, for more information regarding controlling program execution to find logic errors.

Provided Data Sets:
Refer to the provided main for the data sets. Do not change the data types of the provided data. You may define additional variables as required.

The results for data set #1 and #4 are shown for reference:

```
0x804a09c <stdDev1>:        1923

0x804a714 <stdDev4>:        27193
```

In the unlikely event that the program does not work the first time, you should copy-and-paste the data into a spreadsheet and apply the formulas. In this manner you can see not only the final answers, but the intermediate results which can help tremendously in narrowing down what specific code might not be working.