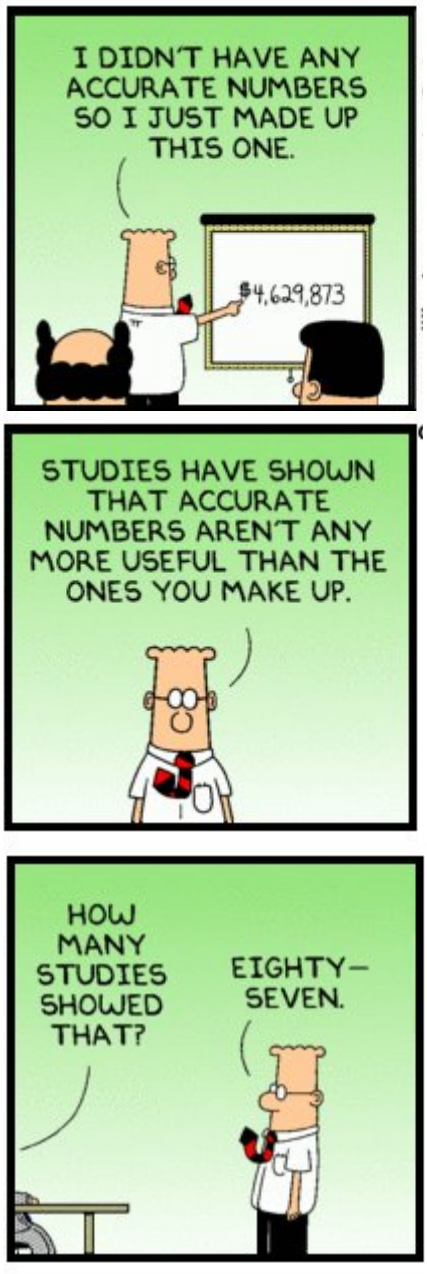
CS 218 - Assignment #8

Purpose:	Learn assembly language functions. Additionally, become more familiar with program control instructions, function handling, and stacks.
Due:	Tuesday (2/21)
Points:	125

Assignment:

Write the assembly language functions described below.



- Write a value returning function, **listEstMedian()**, to find the estimated median for an unsorted list of numbers. The estimates the median is computed by summing the first, last, and two middle values and dividing by 4 for even length lists and 3 for odd length lists.
- Write a void function, **selectionSort()**, to sort the numbers into descending order (large to small). You **must** use the selection sort algorithm and modify the sort order.
- Write a value returning function, **lstAverage()**, to find the average for a list of numbers.
- Write a void function, **listStats()**, to find the minimum, maximum, average, and median for a list of numbers. The function must call the **lstAverage()** functions to find the average of the passed list. The function should also calculate the integer percent error[1] between the estimated median and the actual median using the following formula:

$$pctErr = \frac{\left(\left| estMedian - median \right| \times 100 \right)}{median}$$

- Write a value returning function, **betaValue()**, to compute the alpha-beta statistic for the data set. The formula is as follows:

$$\alpha = \sum_{i=0}^{length-1} list[i]^3$$

$$\beta = \frac{\alpha}{(length + length/2)}$$

Note, must perform the summation for the dividend (top) as a quad value.

All data should be treated as *unsigned* integers (MUL, and DIV).
The functions must be in a separate assembly file.

1 For more information, refer to: https://en.wikipedia.org/wiki/Relative_change_and_difference

Submission:
When complete, submit:

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

Updated Compile, Assemble, and 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.

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.

Results
The results for data set #1 are shown for reference:

```
LIST 1:
0x601038:  223 199 190 175
0x601048:  161 160 150 146
0x601058:  141 137 133 133
0x601068:  130 130 127 127
0x601078:  123 122 121 120
0x601088:  120 120 119 118
0x601098:  112 112 110 110
0x6010a8:  103

length:    0x6010ac:   29
estMed:    0x6010b0:   151
min:       0x6010b4:   103
med:       0x6010b8:   127
max:       0x6010bc:   223
ave:       0x6010c0:   136
beta:      0x6010c8:   1977688
pctErr:    0x6010c4:   18
```

It is suggested that you copy-and-paste the data into a spreadsheet to verify the results for the other data sets. Remember to set the values as integers. In this manner you can also check intermediate results (in the unlikely event the program does not work the first time).