CS 218
Homework, Asst. #9

Purpose:	Learn assembly language functions and standard calling convention. Additionally, become more familiar with program control instructions, functions handling, and stacks.
Due:	Wednesday (6/21)
Points:	150

Assignment:
Write the assembly language functions described below. You will be provided a C++ main program that calls the following functions.

- Void function, **bubbleSort()**, modified to sort the numbers into ascending order (small to large).
- Void function, **simpleStats()**, to find the minimum, median, and maximum for a list of numbers. *Note*, for an odd number of items, the median value is defined as the middle value.
- Value returning function, **iAverage()**, to computer and return the integer average for a list of numbers.
- Value returning function, **variance()**, to compute and return the variance for a list of numbers.

In addition, write a function **readTernaryNumber()** that will read a ternary number, in ASCII format, from the user. The routine should use the system service for reading data from the keyboard (into a buffer), call a routine to convert the ASCII input (from the buffer) into an integer, and return the integer. The number must be between 0 and MAXNUM (defined constant). The function should re-prompt for invalid/incorrect input. When the end of input is received (a return with no characters on the line), the function should return a NOSUCCESS code (indicating no more input).

In addition, the **readTernaryNumber()** function should call a **ternary2int()** function to convert the ternary string to an integer. This function will be used on a future assignment.

All functions should use the stack for local variables. No static variables should be declared! All provided data items are *unsigned* integers (MUL and DIV instructions). The functions must be in a separate assembly file. The files will be assembled individually and linked together. Refer to the text for more information regarding functions.

Submission:
When complete, submit:

- A copy of the ***source file*** (functions only) via the class web page by class time.
  Assignments received after the allotted time will not be accepted!

Testing
A script file to execute the program on a series of predefined inputs will be provided. *Note*, please follow the I/O examples. The test utility should be downloaded into an empty directory and the program executable placed in that directory. The test script, named `a9tst`, can be executed as follows:

```
ed-vm% ./a9tst a9main
```

The test script compares the program output to predefined expected output (based on the example I/O).

Updated Compile, Assemble, and Linking Instructions

You should use the provided script file, **asm9**, to perform the assemble and link commands. For example, assuming the provided C++ main is named **main.cpp** and the functions file is named **ast9prs.asm** the following command;

```
ed-vm% ./asm9 main ast9prs
```

will produce the executable file **main** (which can be executed by typing **./main**). You can change the file names as desired. *Note*, only the functions file will be submitted.

Note, the DDD debugger will display the source for both the C++ and assembly files, depending on which is being executed at that time. Refer to the text for more information regarding controlling program execution to find logic errors.

Example Execution:

The following is an example execution demonstrating various error handling:

```
ed-vm% ./a9main
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Enter Ternary Number: 1000
Enter Ternary Number: 1001
Enter Ternary Number: 1002
Enter Ternary Number: 1003
Error, re-enter: 1010
Enter Ternary Number: 1011
Enter Ternary Number: 1012
Enter Ternary Number: two
Error, re-enter: 1021
Enter Ternary Number: 1022
Enter Ternary Number: 1023
Error, re-enter: 1100
Enter Ternary Number:


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Program Results

Sorted List:
        27          28          29          30          31
        32          34          35          36

Statistical Results:
   Length   =  9
   Minimum  =  27
   Maximum  =  36
   Median   =  31
   Average  =  31
   Variance =  81

ed-vm%
```