

## CS 218

### Homework, Asst. #4

Purpose: Learn to use arithmetic instructions, control instructions, compare instructions, and conditional jump instructions.

Due: Monday (6/12)

Points: 45

#### Assignment:

Write a simple assembly language program to find the minimum, middle value, maximum, sum, and integer average of a list of numbers. Additionally, the program should also find the sum, count, and integer average for the positive numbers. The program should also find the sum, count, and integer average for the numbers that are evenly divisible by 3. Do **not** change the data types (double-words) as defined below. Declare the values:

```
lst      dd    1246, 1116, 1542, 1240, 1677
          dd    1635, 2426, 1820, 1246, -2333
          dd    2317, -1115, 2726, 2140, 2565
          dd    2871, 1614, 2418, 2513, 1422
          dd    -2119, 1215, -1525, -1712, 1441
          dd    -3622, -731, -1729, 1615, 1724
          dd    1217, -1224, 1580, 1147, 2324
          dd    1425, 1816, 1262, -2718, 2192
          dd    -1432, 1235, 2764, -1615, 1310
          dd    1765, 1954, -967, 1515, 3556
          dd    1342, 7321, 1556, 2727, 1227
          dd    -1927, 1382, 1465, 3955, 1435
          dd    -1225, -2419, -2534, -1345, 2467
          dd    1315, 1961, 1335, 2856, 2553
          dd    -1032, 1835, 1464, 1915, -1810
          dd    1465, 1554, -1267, 1615, 1656
          dd    2192, -1825, 1925, 2312, 1725
          dd    -2517, 1498, -1677, 1475, 2034
          dd    1223, 1883, -1173, 1350, 1415
          dd    335, 1125, 1118, 1713, 3025

len      dd    100

lstMin   dd    0
lstMid   dd    0
lstMax   dd    0
lstSum   dd    0
lstAve   dd    0

posCnt   dd    0
posSum   dd    0
posAve   dd    0

threeCnt dd    0
threeSum dd    0
threeAve dd    0
```

You may declare additional variables if needed. All data is *signed*. As such, the IDIV/IMUL would be used (not DIV/MUL). The JG/JL/JGE/JLE must be used (as they are for signed data). You may assume the second number in the list is evenly divisible by 3.

Note, for an odd number of items, the middle value is defined as the middle value. For an even number of values, it is the integer average of the two middle values. The 'middle value' does **not** require the numbers to be sorted.

Note, no template is provided. Create the program source file based on the previous assignments.

### **Submission:**

When complete, submit:

- A copy of the **source file** via the class web page (assignment submission link) by class time. Assignments received after the due date/time will not be accepted.

### **Debugger Commands:**

Due to the looping, when debugging assignment #4, you should learn to set breakpoints within the program.

Create an input file for the debugger. Some useful commands might include:

```
x/100dw &lst
x/dw &len
x/dw &lstMin
x/dw &lstMid
x/dw &lstMax
x/dw &lstSum
x/dw &lstAve
x/dw &posCnt
x/dw &posSum
x/dw &posAve
x/dw &threeCnt
x/dw &threeSum
x/dw &threeAve
```

The commands should be placed in a file (such as 'a4in.txt') so they can be read from within the debugger. The debugger command to read a file is "source <filename>". For example, if the command file is named 'a4in.txt',

```
(gdb) source a4in.txt
```

Based on the above commands, the output will be placed in the file 'a4out.txt'.