CptS 260 Assignment 3

1. (20 pts) Using SPIM, write and test a program that reads in three integers (positive or negative) and prints out the sum of the largest two of the three. Use the SPIM system calls described on pages A-43 through A-45 of http://pages.cs.wisc.edu/~larus/HP_AppA.pdf to read the integers and print the result.

The format of the output should be:

```
Enter the first integer:
(here's where you enter the first integer
Enter the second integer:
(here's where you enter the second integer)
Enter the third integer:
(here's where you enter the third integer)

The sum of the largest two of these integers is:
(whatever the sum is)
```

Dr.Hauser's program:

```
      .data
m1:   .asciiz "Enter the first integer:\n"
m2:   .asciiz "Enter the second integer:\n"
m3:   .asciiz "Enter the third integer:\n"
m4:   .asciiz "\n"
m5:   .asciiz "The sum of the largest two of these integers is: "

      .text
main:
# read the first integer
      la $a0,m1
      li $v0,4
      syscall
      li $v0,5
      syscall
      move $s0,$v0
# read the second integer
      la $a0,m2
      li $v0,4
      syscall
      li $v0,5
      syscall
      move $s1,$v0
# read the third integer
      la $a0,m3
      li $v0,4
      syscall
      li $v0,5
      syscall
      move $s2,$v0
# print blank line
      la $a0,m4
      li $v0,4
      syscall
# print label for the answer
      la $a0,m5
      li $v0,4
      syscall
# calculate the answer
#   if ($s2>$s0) { xor $s0,$s0,$s2; xor $s2,$s0,$s2; xor $s0,$s0,$s2 }
#       swap $s2 and $s0 if $s2>$s0. So $s0 has the larger value
        ble $s2,$s0,noswap1
        xor $s0,$s0,$s2
        xor $s2,$s0,$s2
        xor $s0,$s0,$s2
noswap1:
#   if ($s2>$s1) { add $s1,$s1,$s2; sub $s2,$s1,$s2; sub $s1,$s1,$s2 }
#       swap $s2 and $s1 if $s2>$s1. So $s1 has the larger value
        ble $s2,$s1,noswap2
        add $s1,$s1,$s2
      sub $s2,$s1,$s2
      sub $s1,$s1,$s2
noswap2:
# Since our largest values are in $s0 and $s1, we add them
#   $s0 = $s0 + $s1
      add $s0,$s0,$s1
      li $v0,1
      move $a0,$s0
      syscall
# print blank line
      la $a0,m4
      li $v0,4
      syscall
      li $v0,10
      syscall #exit
```

2. (5 pts) Describe how your program could be changed to process arbitrarily many integer inputs and respond with the sum of the largest two. (Don't program this, just tell how it could be done.) Suggest some reasonable ways that you could implement for the user to indicate that the end of the list has been reached.

One way to process many values and respond with the sum of the largest two would be as follows:

1. If there are only two values, just respond with the sum
2. Otherwise, input three values and find the largest two values as in the program above. Run a loop and during iteration, input one value and replace the largest values as need be. Proceed in this fashion until all inputs are exhausted
3. Return the sum of the two largest numbers

Reasonable ways to indicate end of list can be (this is not an exhaustive list…)

1. Input the total number of inputs at the beginning of the program
2. Choose some value that will not appear in your input list, for example, negative values (only if it is expected that they are not in the possible set of inputs)
3. Repeat the last input value so that it is understood that the list is over