CSC 256 - Machine Structures
Project 3

Assigned : March 4th, 2017
Due : March 10th, 2017 @ midnight
Total Points: 60 Points

Description For project three, your objective is to convert the given C++ code into MIPS assembly. Please do not modify the C++ code itself. You are only allowed to make modifications to the assembly file. Start writing your code below the main: label and above the exit: label. For this project stay BETWEEN these labels.

When doing a C++ to MIPS conversion, it can be done in the following steps:

1 Assign variables to registers. When inspecting code, any constant values in if-statements or expressions may need to be assigned to temporary registers.

2 Initialize variables to registers. (actually put the values into the registers.)

3 Then move onto the rest of the code.

Expected Output:

```
Value of a: 25
Value of b: 31
Value of c: 18
Value of d: 49
```

Submission
When you have completed the assignment please upload your .s file to ilearn. PLEASE DO NOT UPLOAD ANY OTHER TYPE OF FILE.

Base MIPS Code

```
    .data
        endl:    .asciiz  "\n"   # used for cout << endl;
        albl:    .asciiz  "Value of a: " # label for a
        blbl:    .asciiz  "Value of b: " # label for b
        clbl:    .asciiz  "Value of c: " # label for c
        dlbl:    .asciiz  "Value of d: " # label for d
    .text

# a --> $s0
# b --> $s1
# c --> $s2
# d --> $s3
main:


exit:
    la   $a0, albl      # puts albl into arg0 (a0 register) for cout
    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a
       string
    syscall             # make a syscall to system

    move $a0, $s0       # puts a into arg0 (a0 register) for cout
    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
    syscall             # make a syscall to system

    la   $a0, endl      # puts the address of the string endl into a0
    addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
    syscall

    la   $a0, blbl      # puts blbl into arg0 (a0 register) for cout
    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing an
       string
    syscall             # make a syscall to system

    move $a0, $s1       # puts b into arg0 (a0 register) for cout
    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
    syscall             # make a syscall to system

    la   $a0, endl      # puts the address of the string endl into a0
    addi $v0, $0, 4     # puts 4 into v0 saying we are printing a string
    syscall

    la   $a0, clbl      # puts clbl into arg0 (a0 register) for cout
    addi $v0, $0, 4     # puts 4 in v0 which denotes we are printing a
       string
    syscall             # make a syscall to system

    move $a0, $s2       # puts c into arg0 (a0 register) for cout
    addi $v0, $0, 1     # puts 1 in v0 to denote we are printing an int
    syscall             # make a syscall to system
```

```
48
49      la   $a0, endl       # puts the address of the string endl into a0
50      addi $v0, $0, 4      # puts 4 into v0 saying we are printing a string
51      syscall
52
53      la   $a0, dlbl       # puts dlbl into arg0 (a0 register) for cout
54      addi $v0, $0, 4      # puts 4 in v0 which denotes we are printing a
            string
55      syscall              # make a syscall to system
56
57      move $a0, $s3        # puts d into arg0 (a0 register) for cout
58      addi $v0, $0, 1      # puts 1 in v0 to denote we are printing an int
59      syscall              # make a syscall to system
60
61      la   $a0, endl       # puts the address of the string endl into a0
62      addi $v0, $0, 4      # puts 4 into v0 saying we are printing a string
63      syscall
64
65      addi $v0,$0, 10
66      syscall
```

p3codeBase.s

C++ Equivalent

```cpp
#include <iostream>

using namespace std;



int main(void)
{

    int a = 5;
    int b = 6;
    int c = 7;
    int d;

    d = -1;

    if ( a < 10){
        a++;
    }else{
        a--;
    }

    d = a + c;
    c = a + d;

    if( b < 10 ) {
        b++;
        c--;
    }else{
        b--;
        c++;
    }

    a = c + b;
    b = c + d;

    if(b < c && b > a){
        d = a + b;
    }else if (b > c || c < a){
        d = b + c;
    }

    cout << "Value of a: " << a << endl;
    cout << "Value of b: " << b << endl;
    cout << "Value of c: " << c << endl;
    cout << "Value of d: " << d << endl;
    return 0;
}
```

p3code.cpp