CS 100 Lab Eight – Spring 2016

WARNING – Not properly submitting your files correctly will result in a penalty of 20 points.

Create a directory called **lab8** on your machine. Move into that directory. Complete the four tasks shown below.

1. Name this program **count.c** – This program reads in positive integers, stopping when the user enters the value zero, and computes the number of digits in the number that was entered. You must use a recursive function (**count**) to calculate the number of digits in the number. A sample execution is shown below:

```
./a.out
Enter a positive integer or 0 to exit : 15
There are 2 digits in 15
Enter a positive integer or 0 to exit : 98765
There are 5 digits in 98765
Enter a positive integer or 0 to exit : 102030405
There are 9 digits in 102030405
Enter a positive integer or 0 to exit : 0
```

2. Name this program **fib.c** – Calculating Fibonacci numbers is a classic recursive algorithm. The basic recurrence relation for Fibonacci numbers is shown below.

$$Fib(0) = 1$$
$$Fib(1) = 1$$
$$Fib(n) = Fib(n - 1) + Fib(n - 2)$$

Write a program that recursively calculates the Fibonacci value for a number provided on the command line. Using a global variable, keep track of the number of calls to your recursive function. Your program should print out the calculated Fibonacci value and the number of calls to your recursive function that it took to compute this value. You see several sample outputs from this program below

```
./a.out 5
fib(5) = 8 and has 15 recursive calls.
./a.out 10
fib(10) = 89 and has 177 recursive calls.
./a.out 20
fib(20) = 10946 and has 21891 recursive calls.
./a.out 25
fib(25) = 121393 and has 242785 recursive calls.
```

3. Name this program **find.c** – Take your **find.c** program from **lab 7** (the program that searched for a name in linked list) and modify it. Make **find** a recursive routine.

4. Name this program **last.c** – Take your **last.c** program from **lab 7** (the program that returned the last name in a linked list) and modify it. Make **last** a recursive routine.

Submit your lab

First, on your local machine, bundle the files in your **lab8** directory into a single (compressed) file. To do this:

- PC: Using Windows Explorer, right click on the **lab8** directory and select "Send To" and then "Compressed (zipped) folder"
- Mac: Using Finder, use a secondary click on the **lab8** directory and then select "Compress foldername"

Once you have a zip file that contains your four lab8 programs, submit that file to Blackboard.

Attendance: We will circulate a roster sheet shortly after lab starts and again about half-way through the lab. Not being present to sign the roster sheet will result in a deduction of 25 points for each missed signature.