EECS268:Lab6

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NOTICE

The majority of these problem are classic recursive problems with lots of solutions online. Do yourself a favor, and DO NOT go seeking solutions. Instead, seek help from our staff. Your better off figuring it out on your own steam, maybe with some guidance from us. Also, looking up a solution and turning it in as your own is still cheating.

Due time

This lab is due 1 week from the start of your lab section.

Overview

This lab will consist of several independent exercises (1 program per exercise) that **must all use recursion** to solve various problems.

Exercise 1: Recursive Parenthesis checker

Create a program that takes a sequence of parenthesis from the command line. Your program will indicate whether or not it's a balanced set of parenthesis (matching left and right, not just an equal number).

Solutions must be recursive!

Example:

```
$>./parens "(())"

The sequence (()) is balanced

$>./parens "))(("
The sequence ))(( is not balanced

$>./parens "(((((((((((((((("
The sequence ((((((((((((((((( is balanced

$>./parens "(()()()()()()()()()())"
The sequence (()()()()()()()()()()()) is balanced
```

Exercise 2: Outbreak Returns

Flu season is upon us and the number of people getting sick is growing.

- On day 1, there was only 1 person with the flu.
- On day 2, it jumped to 8.
- On day 3, there were 22
- Every day since, the number of people who have the flu is equal to the last 3 days combined

You will make a program that will ask the user for what day they want a count of people with the flu for. Then display the amount. You must use recursion to solve the calculation of infected for a given day. Assume the user will input a valid day.

Sample runs:

```
OUTBREAK!
What day do you want a sick count for?: 1
Total people with flu: 1
```

```
OUTBREAK!
What day do you want a sick count for?: 2
Total people with flu: 8
```

```
OUTBREAK!
What day do you want a sick count for?: 3
Total people with flu: 22
```

```
OUTBREAK!
What day do you want a sick count for?: 4
Total people with flu: 31
```

```
OUTBREAK!
What day do you want a sick count for?: 5
Total people with flu: 61
```

```
OUTBREAK!
What day do you want a sick count for?: 0
Invalid day
```

Exercise 3: Good Old Fibonacci

The Fibonacci sequence is a famous numerical series in which every number (after the first two) is the sum of the previous two numbers added together. The sequence is defined as...

$F_0=0$

$F_1=1$

$F_i=F_{i-1} + F_{i-2}$

For your reference, here are the first few numbers in the Fibonacci sequence:

0,1,1,2,3,5,8,12,21,34,55,89

Create a program that takes an integer and a flag from the user. The flag will indicate one of two options:

- -i
  - Short for "ith" where the user wants to know the ith Fibonacci number (note the lowest valid would be zero)
- -v
  - Short for "verify" where the user wants to know if the number given is in the Fibonacci sequnence

Example runs:

```
$>./fib -i 2
1
$>./fib -i 8
```

```
21
$>./fib -i 36
14930352
$>./fib -v 7
7 is not in the sequence
$>./fib -v 75025
75025 is in the sequence
```

Rubric

Your solutions must be recursive. Any solutions that do use recursive will receive a zero.

- [20pts] Exercise 1
- [25pts] Exercise 2
- [35pts] Exercise 3
  - [15pts] -i mode
  - [20pts] -v mode
- [5pts] Clean output
- [5pts] Zero segfaults/crashes
- [10pts] Documentation
  - Comments: Pre conditions, Post conditions, Return descriptions in header files. Not require for hpp/cpp files
  - Formatting: Rational use of white space and indentation. Header and implementation files easily readable

Emailing Your Submission

Once you have created the tarball with your submission files, email it to your TA. The email subject line **must** look like "[EECS 268] *SubmissionName*":

> [EECS 268] Lab 0#

Note that the subject should be *exactly* like the line above. Do not leave out any of the spaces, or the bracket characters ("[" and "]"). In the body of your email, include your name and student ID.
