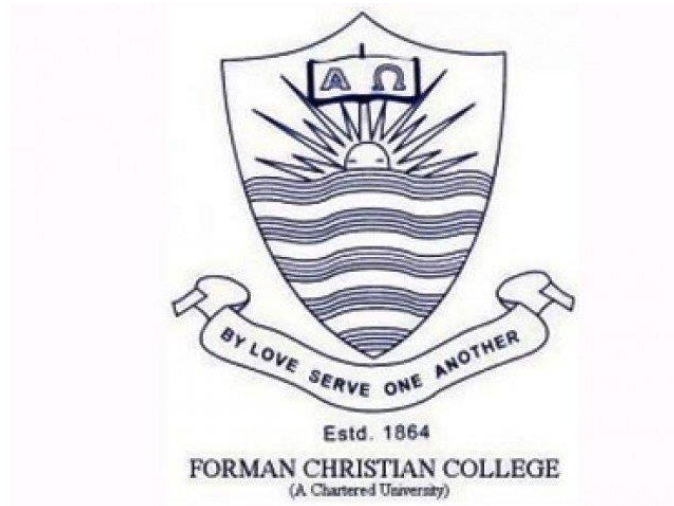


Programming II

Comp 111

Spring 2021



Department of Computer Science
Forman Christian College University

Lab 3

Revision: Recursion

In Lab Problems

Question 1:

Modify the recursive Fibonacci program below that it prints tracing information. Specifically, have the function print a message when it is called and when it returns. For example, the output should contain lines like these:

Computing fib(4)

...

Leaving fib(4) returning 3

Use your modified version of fib to compute fib(10) and count how many times fib(3) is computed in the process.

```
def fib(n):  
    if n < 3:  
        return 1  
    else:  
        return fib(n-1) + fib(n-2)
```

Question 2:

In mathematics, C_k^n denotes the number of different ways that k things can be selected from among n different choices. For example, if you are choosing among six desserts and are allowed to take two, the number of different combinations you could choose is C_2^6 . Here's one formula to compute this value:

$$C_k^n = \frac{n!}{k!(n-k)!}$$

This value also gives rise to an interesting recursion:

$$C_k^n = C_{k-1}^{n-1} + C_k^{n-1}$$

Write a recursive code to calculate the expression.

Hints: when $k = 1$, $C_k^n = n$ and when $n < k$, $C_k^n = 0$.

Question 3:

A palindrome is a sentence that contains the same sequence of letters reading it either forwards or backwards. A classic example is: "Able was I, ere I saw Elba." Write a recursive function that detects whether a string is a palindrome. The basic idea is to check that the first and last letters of the string are the same letter; if they are, then the entire string is a palindrome if everything between those letters is a palindrome. There are a couple of special cases to check for. If either the first or last character of the string is not a letter, you can check to see if the rest of the string is a palindrome with that character removed. Also, when you compare letters, make sure that you do it in a case-insensitive way.

Use your function in a program that prompts a user for a phrase and then tells whether or not it is a palindrome. Here's another classic for testing: "A man, a plan, a canal, Panama!"

Question 4: Draw the environment diagram for the given recursive code.

```
def f(x):  
    if x%5 != 0:  
        if x%2==0:  
            return f(x+2)  
        else:  
            return f(x+1)  
    else:  
        return x
```

|