CIS 6 :: Lab 13 - Algorithm Design and Recursion

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LAB ASSIGNMENTS

Instructions: Use Python IDLE to write and execute below exercises from the related chapter in the textbook. Attach Snipping photos of your **source code and executions of the code** in Python shell.

Chapter 13 - Programming Exercises.

1. Exercise 1:

fibtracing10.py - C:/Users/Naveed/Desktop/school/CIS 6/week 13/fibtracing10.py (3.9.1)

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```python
#This program finds and returns the 10th number of the fibonacci
#sequence and prints tracing information

def fib(n):
    print('Computing fib(' + str(n) + ')') #added print statements for tracing
    if n < 3:
        print('Leaving fib(' + str(n) + ') returning 1')
        return 1
    else:
        fnum = fib(n-1) + fib(n-2) #temp variable so n can be used in string
        print('Leaving fib(' + str(n) + ') returning', fnum)
        return fnum

print('This program calculates the 10th number in the fibonacci sequence\n')
print('fib(10) is', fib(10))
```

IDLE Shell 3.9.1

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```
This program calculates the 10th number in the fibonacci sequence

Computing fib(10)
Computing fib(9)
Computing fib(8)
Computing fib(7)
Computing fib(6)
Computing fib(5)
Computing fib(4)
Computing fib(3)
Computing fib(2)
Leaving fib(2) returning 1
Computing fib(1)
Leaving fib(1) returning 1
Leaving fib(3) returning 2
```

Ln: 226 Col: 4

IDLE Shell 3.9.1

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```
Leaving fib(5) returning 5
Leaving fib(7) returning 13
Computing fib(6)
Computing fib(5)
Computing fib(4)
Computing fib(3)
Computing fib(2)
Leaving fib(2) returning 1
Computing fib(1)
Leaving fib(1) returning 1
Leaving fib(3) returning 2
Computing fib(2)
Leaving fib(2) returning 1
Leaving fib(4) returning 3
Computing fib(3)
Computing fib(2)
Leaving fib(2) returning 1
Computing fib(1)
Leaving fib(1) returning 1
Leaving fib(3) returning 2
Leaving fib(5) returning 5
Computing fib(4)
Computing fib(3)
Computing fib(2)
Leaving fib(2) returning 1
Computing fib(1)
Leaving fib(1) returning 1
Leaving fib(3) returning 2
Computing fib(2)
Leaving fib(2) returning 1
Leaving fib(4) returning 3
Leaving fib(6) returning 8
Leaving fib(8) returning 21
Leaving fib(10) returning 55
fib(10) is 55
>>>
```

Ln: 201 Col: 26

2. Exercise 2:

fibclasscounter.py - C:/Users/Admin/Desktop/School/CIS 6/week 13/fibclasscounter.py (3.9.1)

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```python
#This program calculates the nth number of the fibonacci sequence
#and keeps count of how many times the fib function is called

class FibCounter():
    def __init__(self):
        self.count = 0 #Initialize count variable and sets to 0
    def getCount(self):
        return self.count #returns the fib count
    def fib(self,n): #recursive fib function for nth number in sequence
        self.count += 1 #adds 1 to count variable each call
        if n == 0:
            return 0
        elif n == 1:
            return 1
        else:
            return self.fib(n-1) + self.fib(n-2)
    def resetCount(self): #dont even need this but the book told me to put it
        self.count = 0

print('This program calculates the nth number of the fibonacci sequence\n')
def main():
    n = int(input('What number would you like to calculate (-1 to end): '))
    if n != -1: #allows the user to input -1 to end
        fibn = FibCounter() #creates a new FibCounter variable to call
        print('fib(' + str(n) + ') is', fibn.fib(n), 'and took', fibn.getCount(), 'calls.')
        main()
main()
```

Ln: 26 Col: 14

IDLE Shell 3.9.1

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```
Python 3.9.1 (tags/v3.9.1:1e5d33e, Dec  7 2020, 17:08:21) [MSC v.1927 64 bit (AMD64)] on win
32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
==== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week 13/fibclasscounter.py ===
This program calculates the nth number of the fibonacci sequence

What number would you like to calculate (-1 to end): 5
fib(5) is 5 and took 15 calls.
What number would you like to calculate (-1 to end): 2
fib(2) is 1 and took 3 calls.
What number would you like to calculate (-1 to end): 10
fib(10) is 55 and took 177 calls.
What number would you like to calculate (-1 to end): -1
>>>
```

Ln: 14 Col: 4

3. Exercise 3:
4. Exercise 4:

maxnum.py - C:/Users/Admin/Desktop/School/CIS 6/week 13/maxnum.py (3.9.1)

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```python
#This program checks to find the largest number in a list

def maximum(xlist):
    if len(xlist) == 1: #checks if there is only 1 number
        return xlist[0]
    else:
        maxtemp = maximum(xlist[1:]) #recursively calls max on all but first num
        if maxtemp > xlist[0]: #compares and returns the greater number
            return maxtemp
        else:
            return xlist[0]

def main():
    nums = eval(input("Enter a list of numbers: "))
    print("The max is: ", maximum(nums))

main()
```

Ln: 16 Col: 0

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```
============== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week 13/maxnum.py ==============
Enter a list of numbers: [88, -14, 0.33, 14]
The max is:  88
>>>
============== RESTART: C:/Users/Admin/Desktop/School/CIS 6/week 13/maxnum.py ==============
Enter a list of numbers: [0,14,22,-44,19]
The max is:  22
>>>
```

Ln: 45 Co

5. Exercise 5: