

More on Recursive Functions

Review for the Final Exam

CS 8: Introduction to Computer Science, Winter 2019
Lecture #16

Ziad Matni, Ph.D.
Dept. of Computer Science, UCSB

Administrative

- HW 8 due today!
- Left to-do:
 - Project due Thursday

FINAL IS COMING!

- Material: **Everything!**
- Homework, Labs, Lectures, Textbook
- **Wednesday, 3/20 in this classroom**
- **Starts at 8:00 AM **SHARP****
- *Bring your UCSB IDs and arrive 10-15 minutes early*
- Duration: **3 hours long** (but really designed for 1.5 – 2 hours)
- Closed book: no calculators, no phones, no computers
- Allowed: 1 sheet (**single**-sided) of written notes
 - Must be no bigger than 8.5" x 11"
 - **You have to turn it in with the exam**
- **You will write your answers on the exam sheet itself.**



**STUDY
GUIDE NOW
ONLINE!**

Lecture Outline

- Recursive Functions
- Exercises

Example of Recursive Functions: Linear Series

- **Mathematical Linear Series**

Example:

$$S(n) = 0, 1, 4, 13, 40, \dots \quad \text{for } n = 0 \text{ to } \infty$$

What's the pattern?

Linear series: $S_{n+1} = A.S_n + B$ where A & B are constants

In the example above: $A = 3$ and $B = 1$

What is our base-case?

What is our recursion?

Example: Linear Series

- Mathematical Linear Series

Example:

$$S(n) = 0, 1, 4, 13, 40, \dots \quad \text{for } n = 0 \text{ to } \infty$$

Linear series: $S_{n+1} = 3.S_n + 1$ and $S_0 = 0$
recursion *base case*

```
def series(n):  
    if n <= 0:  
        return 0  
    return (3*series(n-1) + 1)
```

Example: Reversing a String

- **Recursion in strings**

Example: Reverse a string

Given a string (e.g. “**hello**”), you would need to return “**olleh**”

What does a recursive algorithm look like? What is my base-case?

Hints: if `s = 'hello'`, what is `s[1:]` ?

```
def revStr(s):  
    if len(s) == 0:  
        return s  
    return revStr(s[1:]) + s[0]
```


What is the exact output?

```
ucsb_classes = ['CS8', 'CS16', 'CS24', 'ECON1', 'COMM88',  
                'MATH3A', 'CHEM6A']  
l = []  
# Note that: chr(65) = 'A'  
for c in ucsb_classes:  
    if c[0] == chr(67):  
        l.append(c.lower() + "!")  
print(l)
```

Exercise

Write a Python function, **AddG(s)** that takes a string **s** as a parameter and returns a string with “g” after each character in the original string. For instance if **s="abcd"** then, **AddG(s)** becomes **"agbgcgdg"**.

Exercise

Write a Python function, **CollectNamesAges()**, that has no input arguments, and that asks users to input names of people AND their ages that it will put in a dictionary *that it returns*. Users will be continually asked for names until they enter “END”.

For example:

Please enter a name: **Jim**

Please enter age for Jim: **30**

Please enter a name: **END**

When they do so, the function will print out a message that says:

“You have entered N names of people, whose average age is A ”

Where N is an integer number and A is a floating-point number with only 2 decimals showing after the point. The string “END” must not be placed in the list and must not be counted towards the number N .

FIN

</LECTURE>