

CSC401- Assignment 6

Jay Tang

Due Wednesday, May 25, 11:59pm

Reading

Read **Chapter 10** in Introduction to Computing using Python: An Application Development Focus, Second Edition by Ljubomir Perković.

Logistics

You need to do this assignment on a computer which has Python 3 installed on it.
[Python 3.10 download page can be found here.](#)

You are encouraged to work with your classmates on the assignments. If you do work with someone on the assignments, please include the name of your collaborators at the top of the file you submit. If you worked alone, please indicate that at the top of your submission. **A submission without collaboration information will not receive credit.**

A submission that includes code which does not run will not get any points for the part unless specifically documented reason of the error.

Submission

Submit the assignment using Assignment 6 folder. Submit only a **single python file** using your name as file name (e.g. Jay_Tang_Assign_6.py).

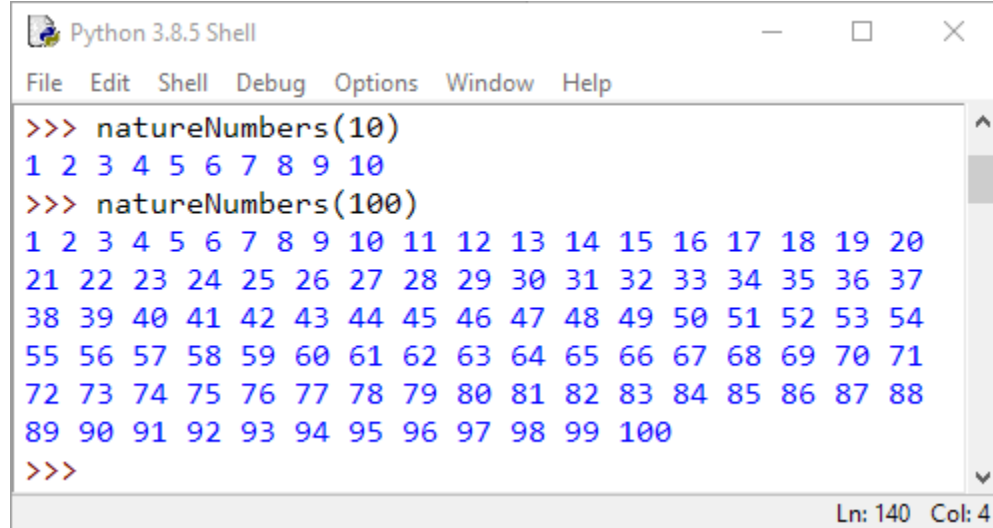
This assignment is due Wednesday, May 25, 11:59pm. Submissions after the deadline will be automatically rejected by the system.

Assignment

1. Recursion (80pts)

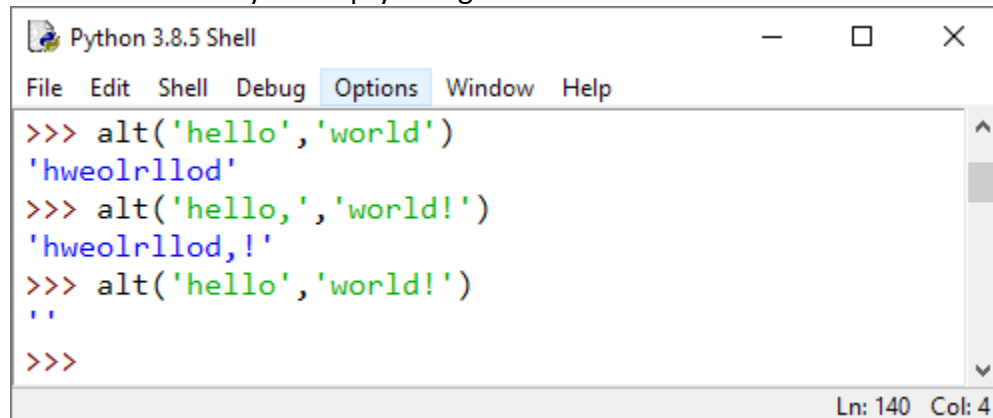
In this part, you **must use recursion** to solve the problems. No iteration of any kind is allowed (no loops, list comprehension, lambda, etc.). No recursion, no points.

- a. (30pts) Write a function `natureNumbers(n)` that prints the first `n` natural numbers using recursion.



```
Python 3.8.5 Shell
File Edit Shell Debug Options Window Help
>>> natureNumbers(10)
1 2 3 4 5 6 7 8 9 10
>>> natureNumbers(100)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
89 90 91 92 93 94 95 96 97 98 99 100
>>>
```

- b. (50pts) You have come up with a new idea for encrypting two texts: you mix them, by alternating between them, e.g. **hello** and **world** become **hweolrllod** (colors just so you can tell where each letter comes from). Write a function `alt(s, t)` that uses recursion to mix two strings `s` and `t` in this way and **returns the result**. Check that `s` and `t` have the same length, otherwise return immediately an empty string.



```
Python 3.8.5 Shell
File Edit Shell Debug Options Window Help
>>> alt('hello','world')
'hweolrllod'
>>> alt('hello,', 'world!')
'hweolrllod,!'
>>> alt('hello', 'world!')
''
>>>
```

2. Run Time Analysis (20pts)

Develop two versions of factorial function to calculate $n!$:

- 1) `factorial(n)` : using iteration technique.
- 2) `factorialRecur(n)` : using recursion.

Then compare the run time of these two versions when calculating factorial of a very large number.