CS 104 - Homework 08

ÖZYEĞİN ÜNİVERSİTESİ

The deadline for this homework is Tuesday, 21st of December, 23:59 (midnight). Please name your solution files as solution1.py, solution2.py, solution3.py, solution4.py. Once you're finished with the homework, upload the files to LMS in order to complete the assignment. The assignment can and must be solved with the content we have covered during the first twelve weeks.

1. (25 pts) Please implement a recursive function that checks whether an integer is palindrome or not. You are not allowed to convert the integer to a string. For example *is_palindrome(121)* returns *True* (*assert is_palindrome(121)*) and *is_palindrome(123)* returns *False* (*assert not is_palindrome(123)*) .

2. (25 pts) The formula for Recaman's sequence is as follows: Please implement a function that can print first n terms of Recaman sequence: 0, 1, 3, 6, 2, 7, 13, 20, 12, 21...

$$a_n = \begin{cases} 0 & \text{if } n = 0 \\ a_{n-1} - n & \text{if } a_{n-1} - n > 0 \text{ and is not already in the sequence} \\ a_{n-1} + n & \text{otherwise} \end{cases}$$

3. (25 pts) Please see the linear_search.py and binary_search.py. Please give different values for *n* (10, 100, 1000, 10000, 1000000, 10000000) and *value_to_look_for* (give at least 10 random values) and measure the performance of each search. Create a table to report the performance and explain the outcome.

4. (25 pts) Please implement the code for calculating the Golden Ratio (1.618033988749894...) by using a recursive method and a non-recursive method for Fibonacci numbers. Please time the execution of the programs and prepare a table showing n, the golden ratio calculated and also the execution times measured. Explain the relationship between n and the execution time of each program.

What is the limit of $\frac{\text{fib}(n)}{\text{fib}(n - 1)}$

as n approaches infinity?

It is called the The Golden Ratio
1.6180339887498948482...