

Mandatory Assignment #01

Foundations of Data Science: Programming and Linear Algebra

[KAN-CDSCO1001U]_E21]

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Deadline: {check your digital exam for exact date and time}

Instructions

1. Please note that you have to upload the solutions before the deadline to the digital exam <http://exam.cbs.dk/>.
2. Please use Python 3 for answering the following questions in case if you need to use Python. Also write a short report/note on the assignment explaining your assumptions/your design choices/ functionality etc. to understand your code in a better manner. It is also a good practice to use comments extensively in your code, so that it will be easy for other people to understand it.
3. The Python code for answering the questions can be either submitted as one single *jupyter* notebook or multiple *jupyter* notebooks. In addition to submitting your *jupyter* notebook/notebooks, please also export the Python code as a file from the *jupyter* notebook ('File' -> 'Download as' -> 'Python (.py)') and upload the exported Python code file, in addition to *jupyter* notebook, as we have seen many times the *jupyter* notebook fails load due to mismatch of versions/OS etc.. Alternatively, if you are using any other IDE (Integrated development environment), then you can also submit your code as one single python file (with .py extension) containing all the source code from different classes/modules/functions etc. You can also add all the code files (.py, *jupyter* notebooks etc.) into one zip file and upload the zip file along with the main report file to the digital exam.

Question 1

[Assignment on control structures]

- a Write a **for loop** to compute the sum of all numbers below 1000 that are a multiple of either 3 or 5.
- b Write a **while loop** to compute the sum of all numbers below 1000 that are a multiple of either 3 or 5.

Question 2

[Assignment on control structures]

For example, in the number 14352, the largest product of 2 adjacent digits (the maximum of product of two consecutive numbers) is $3*5 = 15$. Write python code to compute the largest product of 4 consecutive numbers from a 100-digit number given below.

```
product.py

hundred_digit_str = '731671765313306249192251' \
                    '196744265747423553491949349' \
                    '6983520312774506326239578318' \
                    '016984801869478851843'

hundred_digit_number = int(hundred_digit_str)

print(hundred_digit_number)
```

Question 3

[Assignment on list comprehension]

For any given list of numbers (say list_01), write python code using list comprehension to separate the list into two sub-lists containing even and odd numbers respectively. Test your code using the following list and print the output.

```
list.py

list_01 = [1,2,3,4,5,6,7,8,9]
```



Info: In case if you are in doubt about what it is list comprehension, please refer p.no.63-64 of ICPP (Introduction to Computation and Programming using Python).

Question 4

[Assignment on recursion]

Write a recursive function that will reverse the given String. For example, if your function is given “copenhagen” as an input parameter then the function should return “negahnepoc”.



Info: Please don't use string reversing using indices (e.g. `string[: : -1]`), but please write a recursive function.

Question 5

[Assignment on dictionaries and strings]

A Given a word and a string of characters, find how many times over you can construct that word from the string of characters. For example, let us assume that you were given the word “pot” and string of characters “coptopstoprope”, then you can create “pot” only 2 times using the bold and red characters in “co**pt**o**p**stoprope”.

Let's assume that you are given the word “cat” and string “ccgatcahctatttaaaaccctatcatastadfa”, then write a python program that can compute how many number of times the word “cat” can be constructed from the string of characters.

B This question is nothing but a generalization of the problem above. Create a function that takes 2 arguments: a word and a string of characters and it should return how many times over the word can be created using the letters from string of characters (each letter can only be used 1 time). Provide one test case to check your function works as intended (that is, give a word and a string of your choosing and test your function).



Info: Please note that the given word can contain a repeating character such as in word “caat”, please also keep such kind of scenarios in mind while writing the function.

Question 6

[Assignment on String Manipulation]

Write a Python function that will separate the segments of characters and numbers with a given separator of your choice from a given string. For example, let us say that we have a string: "Copenhagen hosted Cop-09 summit at Bella Centre in 2009, which was attended by delegates from more than 100 countries.", the separator being "_" and then our function should return a tuple (like as follows) containing two strings, where the first string is a string containing extracted segments of characters and second string containing extracted segments of numbers.

```
list.py

string_to_parse = 'Copenhagen hosted Cop-09 summit' \
                  ' at Bella Centre in 2009, which' \
                  ' was attended by delegates from' \
                  ' more than 100 countries.'

separator = '_'

tuple_to_be_returned = (
    'CopenhaghenhostedCop_summit' \
    'atBellaCentrein_whichwasattended' \
    'bydelegatesfrommorethan_countries',
    '09_2009_100'
)
```

Write a python function that takes two strings as input and returns a tuple containing the extracted segments of characters and numbers as indicated above duly appending the segments with separator as indicated above.



Info: Please note that you can ignore all the characters that neither English alphabets nor numbers.