CS 251 OutLab 8 Python

Total score - 50

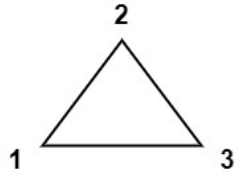
Q.1 Plotting of a polygon Land

Mumbai BMC is developing a new city for citizens on the outskirts of the Mumbai city because in Mumbai there is no more place for new construction and development. The new city is a polygon shaped land with n edges and BMC is trying to divide it into multiple triangular shaped sectors. There should be n-2 sector in the city having n edges. The problem is that BMC has limited funds to do that so it tries to minimise the cost of making the sectors. The cost of making a triangular sector is the product of all the vertices' values in that triangle. As BMC has no intelligent people like you all, they ask the help from IITB CSE students to find the minimum cost. You are given a list of size n with vertices' values of the n-sided land of the new city, where value[i] is the value of the i^{th} vertex of the polygon.(i.e., clockwise order).
Your task is to give them the minimum possible cost for making all the sectors.

Note: There should not be any overlapping sectors.

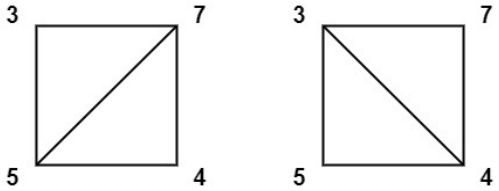
Python Basics (Outlab - Part 2)

Example:1



Values = [1, 2, 3]
Output = 6
Explanation: In the given polygon only one triangular sector is possible.
To run the code use following command:
python polygon_land.py --values 1 2 3

Example:2



Values = [5, 3, 7, 4]
Output = 144
Explanation: There are two types of city possible with cost for the first one is 3*7*5+4*5*7=245 and the cost for the second one is 3*4*5+3*4*7=144. The minimum among these two is the second one which costs 144.
Command:
python polygon_land.py --values 5 3 7 4

Example:3

Values = [1, 3, 1, 4, 1, 5]
Output = 13
Explanation: The min cost of dividing 1*1*3+1*1*4+1*1*5+1*1*1 = 13. It can be shown that no other way has a minimum score than this.
Command:
python polygon_land.py --values 1 3 1 4 1 5

Once function is completed run: ***python test_polygon_land.py***

[20 Marks]

Q.2 You must have learnt about pointers in your coveted CS 101 course. Python supports the feature of function pointers too. Function pointers are entities that locate (in the memory) that are supposed to carry out a subroutine. In this question, you will be implementing a few functions on basic arithmetic and string rotation operations, along with a special `apply` function, which takes in two parameters -

- `fn` → function pointer
- `args` → the arguments of the function

We will call the apply function as - `apply(fn, args)`. See examples below for more information.
Please refer to the python file within the given folder to understand the signature of each function.

Example - Say you have an `add` function within the file that you have implemented, which takes in two parameters to

through the `apply` function.

The question tests your skills to design a versatile entry point to an API. Multiple functions can have varying arguments (number of arguments can be different). This question tests your ability to handle such calls.

[20 Marks]

Q.3 You are a member of the placement team, tasked with a job of utmost importance. There are some X, Y, Z visiting IIT Bombay to hire Bachelors', Masters' and Ph.D.

placement registrations in a csv file containing roll number, programme and cgpa. Your task is to read the csv file into a dataframe and generate the averages in a new dataframe and return it. Specifically, you are expected to do the following things -

a. Implement a read_data function that takes in the path to a csv file (which contains the data) and returns a DataFrame (refer pandas) containing the data.

[2 Marks]

b. Implement a compute_avg function that takes in a DataFrame object and returns another DataFrame object containing the averages.

[8 Marks]

We will run the code as follows -

```
from q4 import read_data, compute_avg

   df = read_data('placement_data.csv')
   avg_df = compute_avg(df)
```

The columns in the csv file -

a. roll_no - Stores the roll number of the student.
b. prog - The programme of the student (either BTech, MTech, MS or PhD).

Python Basics (Outlab - Part 2)


```
   roll_no programme  cgpa
0     1234         MS   8.1
1     21aq         MS   8.3
2     221d      BTech   7.9
3     761a      BTech   9.2
4     7a86        PhD   8.7
5     97sf        PhD   8.1
```

```
==============EXPECTED OUTPUT==============

             cgpa
programme
BTech        8.55
MS           8.20
PhD          8.40
```

Python Basics (Outlab - Part 2)

<roll_no>_outlab8

The unzipped submission directory must look as follows: