Task Description

SSA Inc is a multinational company that is expanding its business and plans to open a new branch in a new location. The company has identified about 17,000 alternative location choices. The company uses five criteria to select the best location, namely, the distance of the location from the headquarters, the number of tourist attractions, the population, the income index of the population, and the land price. All these criteria are measured numerically where a higher value is preferred, except for distance where a location closer to the headquarters is preferred.

The headquarters of SSA Inc is located at longitude = -119.562 and latitude = 35.62522471. The distance between point1 (lon1, lat1) and point2 (lon2, lat2) on earth is measured with the Haversine Formula which can be applied in python as follows:

```python
import math
def hitung_jarak(lat1, lon1, lat2, lon2):
    R = 6371  # Earth's radius in kilometers
    dlat = math.radians(lat2 - lat1)
    dlon = math.radians(lon2 - lon1)
    a = math.sin(dlat / 2) ** 2 + math.cos(math.radians(lat1)) * math.cos(math.radians(lat2)) * math.sin(dlon / 2) ** 2
    c = 2 * math.atan2(math.sqrt(a), math.sqrt(1 - a))
    distance = R * c
    return distance
```

Data from all alternative locations are stored in the alternatives.csv file as follows:

alternatif	longitude	latitude	jumlah_atraksi	jumlah_penduduk	indeks_pendapatan	harga_tanah
1	-114.31	34.19	15	5612	1.4936	66900
2	-114.47	34.4	19	7650	1.82	80100
3	-114.56	33.69	17	720	1.6509	85700
....	....	....	....	....	....	....

```
Alternative: alternative location choice
Longitude, latitude: geographical location on the earth map
Number of attractions: the number of tourist attractions around the location
Population: the population around the location
Income index: the income index of the population around the location Land price:
the land price at the location
```

You are asked to process the data in the file to help the company choose the best alternative for the new location. The best alternative is chosen based on its score determined by the following formula 1:

$$\begin{aligned} Nilai\ alternatif &= (bobot\_jarak * jarak) + (bobot\_atraksi * jumlah\_atraksi) \\ &+ (bobot\_penduduk * jumlah\_penduduk) \\ &+ (bobot\_pendapatan * indeks\_pendapatan) + (bobot\_tanah \\ &* harga\_tanah) \end{aligned}$$

Where

$$bobot\_jarak + bobot\_atraksi + bobot\_penduduk + bobot\_pendapatan + bobot\_tanah = 1$$

Create a program in python to process this data. The program must meet the following specifications:

1. Class

The program must use a class named **Alternatif** to represent the alternatives in the file. Each object created from this class must contain complete data for each alternative. The class must have a method named **nilai_default** to calculate the default value of an alternative. The default value is obtained with formula 1 using all weights 0.2.

2. Data structure

The program must use one of the data structures discussed in the lecture (list, set, dictionary) to store all alternatives in the form of objects from the Alternative class

3. Function

In the program, there must be a function named **pilih_alternatif** to display the three best alternatives based on the weight criteria entered by the user. The function must accept input of five weights and all alternatives stored in the selected data structure. Then the function displays the three best alternatives along with the alternative value and its criteria.

4. File operation

The program must open the input file and save the weight calculation results of all alternatives in a file named output.txt. The file contains all alternatives and their values in order of highest to lowest value as shown below.

```
Alternatif, Nilai
90, 12450
78, 11900
6, 10250
........
```

5. Interface

When run, the program must immediately open the input file and process the data in it then display the following choices

```
Selamat datang

1: Tampilkan 3 alternatif terbaik berdasarkan nilai default
2: Tampilkan 3 alternatif terbaik berdasarkan masukan bobot pengguna
3: Keluar

Masukkan pilihan anda:
```

If the user enters the number 1, the program should use the default value in No. 1 to display the 3 best alternatives based on the default value. If the user presses ENTER afterwards, the program should return to the initial menu.

```
Tiga alternatif terbaik berdasarkan masukan nilai default:

[alternatif 12]:
    nilai alternatif: 4781
    jarak: 10 Km
    jumlah atraksi: 40
    jumlah penduduk: 900
    indeks pendapatan: 0.72
    harga tanah: 86000

[alternatif 47]:
    ..................
```

If the user enters the number 2, the program should ask for weight input from the user and use select_alternative in No. 2 to display the 3 best alternatives based on that weight. If the user presses ENTER afterwards, the program should return to the initial menu.

```
Tiga alternatif terbaik berdasarkan masukan bobot pengguna:

[alternatif 3]:
    nilai alternatif: 2478
    jarak: 25 Km
    jumlah atraksi: 10
    jumlah penduduk: 800
    indeks pendapatan: 1.85
    harga tanah: 90000

[alternatif 9]:
    ..................
```

If the user enters the number 3, the program should end. If the user enters input other than 1,2 and 3, the program should give a message that the input is wrong and return to the initial menu.

Instructions:

1. The assignment must be done in group of 4 or 5 students
2. The file to be submitted must be a python file (.ipynb or .py).
3. Make sure the NIM and names of all group members are listed at the top of the file.
4. The submission must be done in brone.ub.ac.id no later than Friday, June 7, 2024, 23:55 WIB.