



Programming for Engineers

Fall 2021-2022

Assignment 3

| STUDENT INFORMATION | | | | | GRADE |
|---------------------|------------|--------------------|--------------|-----------|-------|
| Session No | Student No | Name and Surname | Dept. | Signature | |
| 1 | 64180006 | Gülsüm İkbal Avşar | CoE - EEE | | |

Problem Definition

People living in Turkey are classified as locals and foreigners. For locals, we are interested in the **TC ID**, **name**, **age**, and **city of residency**. For foreigners, we are interested in the **TC ID**, **name**, **age**, **number of years spent in Turkey**, their **country of origin**, and **city of residency** in Turkey.

- a) Define a base class and a derived class to represent residents (local and foreign) of Turkey. The data described above should be in the private part of the classes.
- b) Add in each of the classes a constructor to set the values of its variables to corresponding parameters passed in the header.
- c) Add to each class a print function to print all possible characteristics of objects of that class-type.
- d) Add to each class a read function to input all possible characteristics of objects of that class-type.
- e) Add an **overloaded** function for pre-increment (++) to increase the age of a person by 1. For foreigners, the function should also increase the number of years spent in Turkey by 1.
- f) Add to each class a function to change the city of residency of a person.

```
class Locals{
protected:
    int TC;
    int age;
    string name;
    string cityOfResidency;
public:
    Locals(int TCC, int agee, string namee, string cityOfResidencyy ){ // constructor
        this->TC= TCC;
        this->age = agee;
        this->name = namee;
        this->cityOfResidency = cityOfResidencyy;
    }
    Locals() {
        TC= 0;
        name = "Unknown";
        age = 0;
        cityOfResidency = "Unknown";
    }
}
```

Figure-1/ Base Class Named Locals and Constructors of it

```

    void read(){
        cout << "Please enter your TC ID: ";
        cin >> TC;

        cout << "Please enter your age: ";
        cin >> age;

        cout << "Please enter your name: ";
        cin >> name;

        cout << "Please enter city of residence: ";
        cin >> cityOfResidency;
    }

    Locals operator++(int){
        this-> age++;
        return *this;
    }

```

Figure-2 / Read and Age for Increasing Functions

```

    void changeResidency(string newResidency){
        cityOfResidency = newResidency;
    }

    string getName() {
        return name;
    }

    void printClass(){
        cout<< endl;
        cout << "TC: " << TC << endl;
        cout << "Age: " << age << endl;
        cout << "Name: " << name << endl;
        cout << "CityOfResidency: " << cityOfResidency << endl;
    }

```

Figure-3/ For Changing Residency and Printing Information about Class Functions

(End of the Base Class)

```

class Foreign : public Locals{
private:
    int numOfYear;
    string countryOfOrigin;
public:
    Foreign(int TC, int age, std::string name, std::string cityOfResidency, int numOfYear, string countryOfOrigin) :
    Locals(TC, age, name, cityOfResidency){
        this->numOfYear = numOfYear;
        this->countryOfOrigin = countryOfOrigin;
    }

    Foreign() {
        numOfYear = 0;
        countryOfOrigin = "Unknown";
    }
}

```

Figure-4/ Foreign Class which is derived from base Locals Class and Constructors of it

```

void read(){
    Locals::read();
    cout << "Please enter your number of years spent in Turkey: ";
    cin >> numOfYear;

    cout << "Please enter your country of origin: ";
    cin >> countryOfOrigin;
}

Foreign operator++(int){
    this-> age++;
    this-> numOfYear++;
    return *this;
}

```

Figure-5/ Further Functions about Foreign Class

```

void printClass(){
    Locals::printClass();
    cout << "Number of Years Spent in Turkey: "<< numOfYear << endl;
    cout << "CityOfResidency: "<< countryOfOrigin << endl;
    cout << endl;
}

```

Figure-6 / To display all information about Foreign Class

```

int main() {

    // Create a list of residents with at least 5 locals and 5 foreigners.
    int rand1 = 5 + rand() % 3 ;
    int rand2 = rand1 + 2;

    Locals localss[rand1];
    Foreign foreignn[rand2];

    cout<< "In the resident,Locals: " << rand1<<"<< endl;
    cout<< "In the resident,Foreigns: " << rand2<<"<< endl;

    cout <<"***** Locals *****"<< endl;

    for(int ii = 0; ii< rand1;ii++){
        localss[ii].read();
    }

    cout <<"***** Foreigns ***** "<< endl;

    for(int ii = 0; ii < rand2; ii++){
        foreignn[ii].read();
    }

    string newCityLocal;
    string newCityForeign;
    int year = 1;
    while(year <6){
        cout<< "*** Year: "<< year<<"***"<< endl;

        int randx = rand() % 6 +1;
        //Each year, at least one foreigner or local is leaving the country and a new
        //foreigner is coming to Turkey.
        if(randx % 2 == 0){ //local is leaving
            localss[rand1-1].erasee();
        }else{
            foreignn[rand2-1].erasee();
        }
        foreignn[rand2-1].read();

        //Each year, at least one local and one foreigner change their city.
        cout<<"Please enter the new city for a local: ";
        cin>>newCityLocal;
        localss[rand1-2].changeResidency( newResidency: newCityLocal);

        cout<<"Please enter the new city for a foreign: ";
        cin>> newCityForeign;
        foreignn[rand2-2] .changeResidency( newResidency: newCityForeign);

        //Each year, update the ages and years of residency for all residents
        for(int jj= 0; jj< rand1; jj++){
            localss[jj].operator++(1);
        }

        for(int jj = 0; jj< rand2; jj++){
            foreignn[jj].operator++(1);
        }

        //Print the current information of all residents at the end of each year.
        for(int kk= 0; kk< rand1; kk++){
            localss[kk].printClass();
        }

        for(int kk= 0; kk< rand2; kk++){
            foreignn[kk].printClass();
        }
        year++;
    }
    return 0;
}
}

```

Figure-7 / Main Function

Program Outputs

```
In the resident,Locals: 7
In the resident,Foreigns: 9
***** Locals *****

Please enter your TC ID:111
Please enter your age:11
Please enter your name:Ikbal
Please enter city of residence:Istanbul

Please enter your TC ID:222
Please enter your age:12
Please enter your name:Gulsum
Please enter city of residence:Istanbul

Please enter your TC ID:333
Please enter your age:13
Please enter your name:Ahmet
Please enter city of residence:Istanbul

Please enter your TC ID:444
Please enter your age:14
Please enter your name:Polat
Please enter city of residence:Istanbul

Please enter your TC ID:555
Please enter your age:15
Please enter your name:Turgut
Please enter city of residence:Istanbul
```

Figure-8

```
***** Foreigns *
*****

Please enter your TC ID:888
Please enter your age:17
Please enter your name:Emre
Please enter city of residence:Istanbul
Please enter you
r number of years spent in Turkey:8
Please enter your country of origin:US

Please enter your TC ID:999
Please enter your age:19
Please enter your name:Husna
Please enter city of residence:Istanbul
Please enter you
r number of years spent in Turkey:9
Please enter your country of origin:US
```

Figure-9

In the console, Figure-8 and Figure-9 are displays to get the information about locals and foreigners. However, these are some parts of inputs since it is not possible and not needed to show all inputs.

```
*** Year: 1***

Deleting Local...

Please enter your TC ID:1017
Please enter your age:34
Please enter your name:Selim
Please enter city of residence:Istanbul
Please enter you
r number of years spent in Turkey:8
Please enter your country of origin:US
Please enter the new city for a local:Ankara
Please en
ter the new city for a foreign:Mugla
```

Each year, at least one foreigner or local is leaving the country and a new foreigner is coming to Turkey. In here, program deletes the last people in the list, and added the new people to foreigners. Moreover, each year, t least one local and one foreigner change their city. The new cities are gotten from user.

***** Information about Locals *****
TC: 111
Age: 12
Name: Ikbal
CityOfResidency: Istanbul

***** Information about Locals *****
TC: 222
Age: 13
Name: Gulsum
CityOfResidency: Istanbul

***** Information about Locals *****
TC: 333
Age: 14
Name: Ahmet
CityOfResidency: Istanbul

***** Information about Locals *****
TC: 444
Age: 15
Name: Polat
CityOfResidency: Istanbul

***** Information about Foreigns *****

***** Information about Locals *****
TC: 888
Age: 18
Name: Emre
CityOfResidency: Istanbul

Number of Years Spent in Turkey: 9
CityOfResidency: US

***** Information about Foreigns *****

***** Information about Locals *****
TC: 999
Age: 20
Name: Husna
CityOfResidency: Istanbul

Number of Years Spent in Turkey: 10
CityOfResidency: US

***** Information about Locals *****
TC: 0
Age: 1
Name: Unknown
CityOfResidency: Unknown

In here, the informations of Locals are shown. Also, the last person on the list is erased.

The information of Foreigners are shown.