COS1512 Assignment 3 2022

UNIQUE NUMBER	**170001**
DUE DATE:	**22 August 2022**
TUTORIAL MATTER:	**Chapters 10, 11 and 12 of the Study Guide (Tutorial Letter 102 available under Additional Resources on the COS1512 website on myUnisa)** **Chapters 10, 11 and 12 (excluding “Creating a Namespace”) Appendices 7 and 8 in Savitch**
MARKS	**75**
WEIGHT:	**35%**

Question 1 **(5)**

Consider the following structure used to keep an address:

```
struct Address
{
string streetName;
int streetNr;
string city;
string postalCode;
}
```

Turn the address record into a class type rather than a structure type. The address record class should have `private` member variables for all the data. Include `public` member functions for each of the following:

- a default constructor that initialises the street name and the city to a blank string, the street number to 0 and the postal code to a string of four 0’s;
- member functions to set each of the member variables to a value given as an argument to the function (i.e. mutators);
- and member functions to retrieve the data from each of the member variables (i.e. accessors).

Use this class in a program which prints an address. The program should input a value for each of the member variables and then print an address consisting of the values for the member variables in proper address format. Use the keyboard to supply input and display the output on the screen. Test your program with the following input:

Street name:	Preller St

Street number: 543
City: Muckleneuk
Postal code: 0002

Question 2 **(5)**

A theatre sells seats for shows and needs a system to keep track of the seats they have sold tickets for. Define a class for a type called `ShowTicket`.

The class should contain private member variables for the row, seat number and whether a ticket has been sold or not. Your class should include the following member functions:

- a default constructor that initialises the row and seat number to 0 and the sold status to false
- an overloaded constructor which accepts as arguments the row and seat number and sets the sold status to false
- a member function to check if the ticket has been sold
- a member function to update the ticket status to sold
- a member function to print the row, seat number and sold status
- a destructor.

Embed your class definition in a test program which creates some `ShowTicket` objects, set some tickets as sold, and prints each of them out.

Question 3 **(10)**

Consider the class `Movie` that contains information about a movie. The class has the following attributes:

- The movie name
- The SA Film and Publication Board (FPB) rating (for example, A, PG, 7-9 PG, 10-12 PG, 13, 16, 18, X18, XX) [1]
- The number of people that have rated this movie as 1 (Terrible)
- The number of people that have rated this movie as 2 (Bad)
- The number of people that have rated this movie as 3 (OK)
- The number of people that have rated this movie as 4 (Good)
- The number of people that have rated this movie as 5 (Great)

[1] https://www.flicks.co.za/page/classifications/

Implement the class with accessor and mutator functions for the movie name and FPB rating. Write a function addRating that takes an integer as an input parameter. The function should verify that the parameter is a number between 1 and 5, and if so, increment the number of people rating the movie that match the input parameter. For example, if 3 is the input parameter, the number of people that rated the movie as a 3, should be incremented by 1. Write another function, getAverage, that returns the average value for all of the movie ratings. Finally, add a constructor that allows the programmer to create the object with a specified name and FPB rating. The number of people rating the movie should be set to 0 in the constructor.

Test the class by writing a main function that creates at least two objects, adds at least five ratings for each movie, and outputs the movie name, the FPB rating, and the average rating for each movie object.

Question 4 (5)

The class Movie you created in Question 3, can be implemented more efficiently if we use an array instead of 5 different member variables to count the number of people rating a movie at a specific score. Adjust your class Movie to use an array to count the score ratings for a movie, and test it with the same main function as in question 3.

Question 5 (30)

The questions below refer to the class declaration of the class Money, which represents the South African currency. The class has two integer data members, rands and cents.

```
#include <iostream>
using namespace std;
class Money
{
   public:
   Money(); // default constructor
   Money(int r, int c); // constructor
   ~Money(); // destructor
   int theRands() const;
   int theCents() const;
   Money Plus(Money m);
   Money operator+ (Money & m);
   bool GreaterThan(Money m);
private:
   int rands;
   int cents;
};
```

```
int main()
{
   Money m1;
   Money m2(15,90);
   Money m3(5,15);
   m1 = m2.Plus(m3);
   cout << m1 << " + " << m2 << " gives " << m1.Plus(m2) <<
   endl;
   m1 = m2 + m3;
   cout << m2 << " + " << m3 << " gives " << m1 << endl;
   if (m2.GreaterThan(m1))
   cout << m2 << " is greater than " << m1 << endl;
   else
   cout << m2 << " is less than " << m1 << endl;
   return 0;
}
```

(a) What is the purpose of the keywords `public` and `private` in the class declaration? (2)

(b) What is the purpose of a constructor? (1)

(c) Give implementations of the default constructor and the second constructor, as well as the destructor. (3)

(d) Implement the `theRands` and the `theCents` member functions. `theRands` returns the number of rands and `theCents` returns the number of cents. (2)

(e) Implement the `Plus()` member function. The `Plus()` member function should add a `Money` object to the existing `Money` object, and return the sum as a `Money` object. (5)

(f) Implement the overloaded `operator+` that adds a `Money` object to the existing `Money` object, and returns the sum as a `Money` object. (5)

(g) The member function `greaterThan()` is used to compare two `Money` objects with each other. Give an implementation for this member function. (3)

(h) Overload the stream insertion operator as a friend function. It should use the member functions the `theRands` and the `theCents` to write the value of the `Money` object to the given output stream. (3)

(i) The statement

```
   if (m1 > m2)
      cout << m2 << " is greater than " << m1 << endl;
   else
      cout << m2 << " is less than " << m1 << endl;
```

displays a message to indicate which value is bigger. Give three different implementations for the overloaded operator > to accomplish this:

- using the member function `greaterThan()`

- implementing the overloaded operator > as a friend function
- implementing the overloaded operator > as a member function. Hint: See chapter 11 in the study guide, Appendix F. (3)

(i) Run your program three times: each time with a different version of the overloaded operator >; comment the other two versions out during each run using "//". (3)

Question 6 (10)

This question requires you to practice defining classes as Abstract Data Types (ADTS) and using separate compilation. Along with inheritance, encapsulation and abstraction form the three central principles of object-oriented programming.

(a) Turn the class `Movie` in question 4 into an ADT that uses separate files for the interface and the implementation. Use separate compilation and the same program as in question 4 to test your ADT.

(b) Turn the `Money` class in question 5 into an ADT that uses separate files for the interface and implementation. Use separate compilation and the same main program as in question 5(i) to test the ADT implementation.

Question 7 (5)

In this question you should use the class `Address` which you defined in question 1. It also works with files.

Convert the class `Address` to an ADT. Overload the stream extraction operator >> for the class `Address` to input an object of class `Address` either from the keyboard or from a file. Also overload the stream insertion operator << to output an `Address` object either to the screen or to a file.

Use separate compilation to write an application program that requests the user to specify a postal code and uses the overloaded extraction operator >> to extract `Address` objects one by one from a file named `Address.dat`. Compare the postal code supplied by the user to the postal code of each object extracted from the file. If the postal codes are the same, put the object into an array of `Address` objects. Assume that the array will never need to contain more than 20 `Address` objects. Once all the objects have been extracted from the file and compared to the user-specified postal code, use the overloaded insertion operator << to display all the `Address` objects in the array.

Use the following data for the file `Address.dat`:

```
Hope St
67
Clarence
```

```
0917
Nelson Mandela Drive
643
Pretoria
0181
Albert St
91
Pretoria
0181
Church St
14
Wellington
6734
Main St
907
Soweto
0912
Bushbuck St
89
Polokwane
3452
```

If the user input 0181 as the postal code, your program should display the two addresses in Pretoria on the screen.

Enrichment exercise:
Adapt the application program to use a vector instead of an array. It should not be necessary to change the class interface or implementation file in any way.

Question 8 **(5)**

Earlier in the year we talked about 21st century skills. One of the ways to develop critical thinking (an important 21st century skill) is to reflect on one's learning experiences. See the quote from the Open University (https://www.open.edu/openlearn) below:

"When we reflect, we consider deeply something that we might not otherwise have given much thought to. This helps us to learn. Reflection is concerned with consciously looking at and thinking about our experiences, actions, feelings, and responses, and then interpreting or analyzing them in order to learn from them (Atkins and Murphy, 1994; Boud et al., 1994). Typically we do this by asking ourselves questions about what we did, how we did it, and what we learnt from doing it."
(https://www.open.edu/openlearn/ocw/mod/oucontent/olink.php?id=13840&targetdoc=Activity+11%3A+What+is+reflection%3F+Doc)

This question requires you to reflect on your learning experiences while doing this assignment.

The purpose of reflection on your learning is to answer the question “What would I change to make my work better?”

Please follow this link to go directly to the questionnaire used for reflection:

https://forms.office.com/r/rHEUKwH3Kj

There is no right or wrong answer to this question, but it is designed to help you monitor your learning and improve your learning experience.

“Without ambition one starts nothing. Without work one finishes nothing. The prize will not be sent to you. You have to win it.” Socrates