National University of Computer and Emerging Sciences



Assignment 3

For

Object Oriented Programming

|  |  |
| --- | --- |
| Course Instructor(s) | Mr. Usman Ghous |
| Lab Instructor(s) | Mr. Usman Ghous |
| Semester | Spring 2021 |

**FAST School of Computing**

# Instructions:

1. Make a word document with the naming convention “SECTION\_ LAB#\_ROLLNO” and put all your source code and snapshots of its output in it. Make sure your word file is formatted properly.
2. Plagiarism is strictly prohibited.
3. Do not discuss solutions with one another.

# Useful links

|  |
| --- |
| **Question#1** |

Write a program that converts a number entered in Roman numerals to decimal. Your program should consist of a class, say, romanType. A object of type romanType should do the following:

* Store the number as a Roman numeral.
* Convert and store the number into decimal form.
* Print the number as a Roman numeral or decimal number as requested by the user.

The decimal values of the Roman numerals are:

M 1000

D 500

C 100

L 50

X 10

V 5

I 1

* Test your program using the following Roman numerals: MCXIV, CCCLIX, MDCLXVI.

|  |
| --- |
| **Question#2** |

Design and implement a class dayType that implements the day of the week in a program. The class dayType should store the day, such as Sun for Sunday. The program should be able to perform the following operations on an object of type dayType:

* Set the day.
* Print the day.
* Return the day.
* Return the next day.
* Return the previous day.
* Calculate and return the day by adding certain days to the current day.

For example, if the current day is Monday and we add 4 days, the day to be returned is Friday. Similarly, if today is Tuesday and we add 13 days, the day to be returned is Monday.

g. Add the appropriate constructors.

**Question#3**

Write a program by creating an 'Employee' class having the following functions and print the final salary.  
1 - 'getInfo()' which takes the salary, number of hours of work per day of employee as parameters  
2 - 'AddSal()' which adds $10 to the salary of the employee if it is less than $500.  
3 - 'AddWork()' which adds $5 to the salary of the employee if the number of hours of work per day is more than 6 hours.

|  |
| --- |
| **Question#4** |

Write the definitions of the functions to implement the operations for the class dayType as defined in Programming Exercise 2. Also, write a program to test various operations on this class.

**Question#5**

Write the definition of a class, swimmingPool, to implement the properties of a swimming pool. Your class should have the instance variables to store the length (in feet), width (in feet), depth (in feet), the rate (in gallons per minute) at which the water is filling the pool, and the rate (in gallons per minute) at which the water is draining from the pool.

Add appropriate constructors to initialize the instance variables. Also add member functions to do the following: determine the amount of water needed to fill an empty or partially filled pool; determine the time needed to completely or partially fill or empty the pool; add or drain water for a specific amount of time.

**Question#6**

(Tic-Tac-Toe) Write a program that allows two players to play the tic-tac-toe game. Your program must contain the class ticTacToe to implement a ticTacToe object. Include a 3-by-3 two-dimensional array, as a private member variable, to create the board. If needed, include additional member variables. Some of the operations on a ticTacToe object are printing the current board, getting a move, checking if a move is valid, and determining the winner after each move. Add additional operations as needed.

**Question#7**

The equation of a line in standard form is ax + by = c, wherein both a and b cannot be zero, and a, b, and c are real numbers. If b != 0, then –a / b is the slope of the line. If a = 0, then it is a horizontal line, and if b = 0, then it is a vertical line. The slope of a vertical line is undefined. Two lines are parallel if they have the same slope or both are vertical lines. Two lines are perpendicular if either one of the lines is horizontal and the other is vertical or the product of their slopes is –1. Design the class lineType to store a line. To store a line, you need to store the values of a (coefficient of x), b (coefficient of y), and c. Your class must contain the following operations.

* If a line is nonvertical, then determine its slope.
* Determine if two lines are equal. (Two lines a1x + b1y = c1 and a2x + b2y ¼ c2 are equal if either a1 = a2, b1 = b2, and c1 = c2 or a1 = ka2,b1 = kb2, and c1 = kc2 for some real number k.)
* Determine if two lines are parallel.
* Determine if two lines are perpendicular.
* If two lines are not parallel, then find the point of intersection.

Add appropriate constructors to initialize variables of lineType. Also write a program to test your class.

**Question#8**

It’s time to help your academic officer to automate their Registration Process. Create a  
class student having all essential attributes to store the record of a student. The class  
should maintain a record of total number of students enrolled.  
**2.1.**The registration no. of a student, once assigned, cannot be changed. (Assigned on  
the time of registration(object creation))  
**2.2.**Each student can register at most 5 and at least 3 courses.  
**2.3.**Registered courses can be dropped if that course has been registered for 5 days.  
**2.4.**Students record (e.g. CNIC, Address etc.) can be updated.  
**2.5.**Your program should be menu driven having following options  
**2.5.1.** Register a Student  
**2.5.2.** Register Courses  
**2.5.3.** Drop Courses  
**2.5.4.** Update Record  
**2.5.5.** Delete a Student  
**2.5.6.** Search a Student (Should return an object of Student Class)  
**2.5.7.** Get a list of students (Studying a specific course together)  
**2.5.8.** Total count of Students Enrolled  
**2.6.**Write separate functions for each of the above operations.

**Question#9**

*(****Complex*** *Class)* Create a class called Complex for performing arithmetic with complex numbers. Write a program to test your class. Complex numbers have the form  
 realPart + imaginaryPart \* *i*where *i* is

Use double variables to represent the private data of the class. Provide a constructor that enables  
an object of this class to be initialized when it’s declared. The constructor should contain default  
values in case no initializers are provided. Provide public member functions that perform the following tasks:

* Adding two Complex numbers: The real parts are added together and the imaginary  
  parts are added together.
* Subtracting two Complex numbers: The real part of the right operand is subtracted from  
  the real part of the left operand, and the imaginary part of the right operand is subtracted from the imaginary part of the left operand.
* Printing Complex numbers in the form (a, b), where a is the real part and b is the imaginary part.

**Question#10**

*(****Rational*** *Class)* Create a class called Rational for performing arithmetic with fractions.  
Write a program to test your class. Use integer variables to represent the private data of the class—the numerator and the denominator. Provide a constructor that enables an object of this class to be initialized when it’s declared. The constructor should contain default values in case no initializers are provided and should store the fraction in reduced form. For example, the fraction

2/4

would be stored in the object as 1 in the numerator and 2 in the denominator. Provide public  
member functions that perform each of the following tasks:  
a) Adding two Rational numbers. The result should be stored in reduced form.  
b) Subtracting two Rational numbers. The result should be stored in reduced form.  
c) Multiplying two Rational numbers. The result should be stored in reduced form.  
d) Dividing two Rational numbers. The result should be stored in reduced form.  
e) Printing Rational numbers in the form a/b, where a is the numerator and b is the denominator.  
f) Printing Rational numbers in floating-point format.