CSC 110 2.0 Object Oriented Programming

Tutorial 10

Instructions:

- All questions must be attempted and answers submitted in a handwritten document, **on or before 4.00pm on Tuesday, 28th October 2019, to the Department Office**.
- You must indicate your **Index Number and the Tutorial Class** to which you belong to **(LCS1/ LCS2/ NFC3.1)** clearly on the front page of your submission.
- Recommended Time Duration: **1 hour and 10 minutes**

Examination Practice

01.

i. Consider the partial declaration of the class `Vehicle`.

```
Public class Vehicle {
    private String model;
    protected char fuel;
    public int wheels;
    int passengers;
    ...
    ...
}
```

Suppose class `Car` is a subclass of `Vehicle` and class `Company` has instances of `Vehicle` as data members.

For each data member of the class `Vehicle`, state the classes which can access them directly.

ii. You have been given the definition of the class `Point` below. It is declared to represent the x and y coordinates of a point on a graph.

```
public class Point {
    private double x;
    private double y;

    public Point() {
        this(0.0,0.0);
    }

    public Point(double pX, double pY) {
        x = pX;
        y = pY;
    }
```

```
    public void set(double xx, double yy) {
        x = xx;
        y = yy;
    }

    public double getX(){
        return x;
    }

    public double getY() {
        return y;
    }

    public String toString(){
        return String.format("(%f,%f)", x,y);
    }
}
```

(a) Declare a class named `Triangle` which has instance variables `vertA`, `vertB` and `vertC` to represent the three vertices. Members `vertA`, `vertB` and `vertC` are references to `Point` objects. Include a no argument constructor and one which takes three parameters `pointA`, `pointB` and `pointC`. The objects referenced by the parameters `pointA`, `pointB` and `pointC` are assigned to the `Triangle` object's `vertA`, `vertB` and `vertC` instance variables respectively. Also include

- a method to return the length of the side joining the given two vertices.
- method to find and return the area of the triangle.
- the method `toString` to print the coordinates of the three vertices of the triangle.

(b) Write a program to test your class `Triangle`.

Notes:

If the coordinates of the given vertices are `(x1, y1)` and `(x2, y2)` respectively

The length of the side = $\sqrt{((x1 - x2)^2 + (y1 - y2)^2)}$

If the length of the sides are `a`, `b` and `c`

The area of the triangle = $\sqrt{(s(s-a)(s-b)(s-c))}$

where $s = (a + b + c)/2$

[34 marks]

02.

At DPI College students register to do IT courses. A course includes many quizzes. At the end of the course the instructor finds the average mark of each student and each quiz.

(a) Create a class called `Results` that DPI College might use to process the results of a course. The class `Results` should include a two-dimensional array, `marks` of type int to store the marks of a number of students on multiple quizzes. It should also use two one-dimensional arrays, `avgStud` and `avgQuiz` to store the average mark of each student and the average mark of each quiz respectively.

Your class should have a constructor that creates the arrays to store marks of 5 students and 4 quizzes and another constructor that takes two parameters, namely, the number of students and the number of quizzes and creates the arrays to store marks accordingly. Provide methods to read the marks, calculate the average mark of each student and each quiz and to print the marks and the averages in a table.

(b) There are 15 students registered for a course. The course includes 6 quizzes. Write an application (main method), in Java, using the class you created in part (a) to

- read the marks of quizzes for each student
- compute the average mark for each student.
- compute the average mark for each quiz.
- display the marks and averages in a table.

[33 marks]

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