PROG2013 Object Oriented Programming

Tutorial

Answer all the questions

1. Consider a student registration program used by the registrar's office. For each student registered, the program maintains the student's name, student id, phone number and the subjects that the student is enrolled. The program keeps track of the total number of registered students. Each subject consists of subject code, subject name and credit hours.

   a. Identify possible objects and derived the classes after noun, responsibility and collaborator analysis.
      i. Underline all the nouns.
      ii. Create Objects or classes, class name, remarks table.

   b. Identify possible operations on classes and draw object interaction diagram.
      i. Underline all the possible operation from the problem statement above.
      ii. Draw the interactions among the objects and label the operation involved.

   c. Draw class diagram for the classes with data and operation.

   d. Implement the class diagram in Java class definition.

   e. Create a test program to receive input (student data) from end user and display all the information of the students. Below is the sample output of the test program after receive two sets of student data. The system should able to display the total number of students.

      Sample Output:
      Student 1:
      Name: Alan Tan
      Student id: D123456
      Phone Number: 019-7234567
      List of subjects:
      1. Subject code: PROG2214
         Subject name: Advanced Java Programming
         Credit hours: 4
      2. Subject code: PROG1133
         Subject name: Multimedia development
         Credit hours: 3

Student 2:
Name: Christina Yap
Student id: D354535
Phone Number: 019-7654321
List of subjects:
1. Subject code: PROG2214
Subject name: Advanced Java Programming
Credit hours: 4
2. Subject code: PROG1010
Subject name: Moral Education
Credit hours: 3
3. Subject code: PROG1045
Subject name: Project I
Credit hours: 5
Total numbers of students registered = 2

2. Given Pet class, Cat class and Dog class as below. Write a program that creates an ArrayList of pets. An item in the list is either a Dog or a Cat. For each pet, enter its name and type ('c' for cat and 'd' for dog). Stop the input when string STOP is entered for the name. After the input is complete, output the name and type for each pet in the list.

```
class Pet {
    private String name;
    public String getName(){
      return name;
    }
    public void setName(String petName){
      name = petName;
    }
    public String speak(){
      return "I'm your cuddly little pet";
    }
}
```

Figure 1: Pet class

```
class Cat extends Pet{
        public String speak() {
            return "Don't give me order.\nI speak only when i want to.";
        }
}
```

Figure 2: Cat class

```
class Dog extends Pet{
        public String speak() {
            return "Yes, master. Fetch i will.";
        }
}
```

Figure 3: Dog class

3. Modify the Dog class to include a new instance variable weight (double) and the Cat class to include a new instance variable coatColor (string). Add the corresponding accessors and mutators for the new instance variables. Modify previous question by inputting additional information appropriate for the type. First you input name and type as previous. If the type is a cat then input its coat color. If the type is a dog, then input its weight. After the input is complete, output the name, type and coat color for the cats and the name, type and weight for the dogs.

4. Based on the problem statement below, answer the following question:
   In payroll calculation problem, assume that there are several types of staff such as clerks, managers and directors. A clerk has base salary and can gets paid for overtime work, a manager has base salary and is entitled to some allowances and the salary of a director is commission based.

   Design an abstract class called Staff and three subclasses which are Clerk, Manager and Director class to extend the Staff class. In Staff class, write an abstract method named calculateSalary() to calculate the monthly salary of each staff.

5. Design an interface named Colorable with a void method named howToColor(). Every class of a colorable object must implement the Colorable interface.

Implement howToColor method to display the color the object.

You are required to implement the Colorable interface in Circle and Cylinder class.

Write a test program that creates an array of 1 Circle object, 1 Cylinder object, 2 strings, and 1 integer number. For each object in the array, invokes its howToColor method if it is colorable.