CSC1016S Assignment 7

Subtyping and Inheritance

Assignment Instructions

This assignment involves constructing programs in Java using copy constructors and inheritance.

Furthermore**,** in this assignments, your solutions will be evaluated for correctness and for the following qualities:

- The use of object types, object creation, and the use of inheritance as appropriate.
- The use of appropriate constructors and methods as appropriate.
- Documentation
    - Use of comments at the top of your code to identify program purpose, author and date.
    - Use of comments within your code to explain each non-obvious functional unit of code.
- General style/readability
    - The use of meaningful names for variables and functions.

These criteria will be manually assessed by tutors and commented upon. Marks will be deducted for non-compliance with the above-mentioned qualities. **20** marks will be allocated to manual marking in this assignment.

Question 1 [20 marks]

Write a program to demonstrate the use of inheritance by creating and outputting 3 simple objects, where the classes for the second and third objects inherit from the class for the first object.

The first object is a Shape with a name and colour. The second object is a Rectangle with additional length and width. The third object is a Circle with additional radius.

Use the provided *Question1.java* file. Use constructors and override methods as appropriate.

Sample Output:

```
Pentagon Blue
Circle Purple Radius 3.0
Rectangle Red Length 6.0 Width 8.0
```

Question 2 [60 marks]

Part I [10 marks]

Create a class called Person. Assume that all persons have a name, age and gender.

Create another class called Student derived from the Person class. A student has the following additional attributes, name of institution, programme of study, year of study and hobbies.

Include constructors and accessor methods for these classes as appropriate.

Part II [50 marks]

This second part of the question makes use of some object(s) created in `Part I` above. Now, your task is to create two classes. You have to create a class called Car that is derived from Vehicle satisfying the following specifications:

class Vehicle

A vehicle object that has the following attributes: number of cylinders, name of the manufacturer and the owner (type Student).

Constructors

Vehicle (int numCylinders, String maker, Student owner)

// create a new Vehicle object.

// The vehicle owner is a Student

Methods

public String toString()

//print a string representation of the Vehicle object information.

class Car

A car object that inherits from a Vehicle object. A Car object has the following additional attributes: seating capacity and weight.

Constructors

Car(int numCylinders, String maker, Student owner, int passengers, double carWeight)

//Create a new car object.

Methods

@Override

public String toString()

//print a string representation of the Car object information.

Last but not least, write a program called `Question2.java` which acts as your driver class to test your classes above. Your driver class, having the main method, must conform to the sample input output given below:

Sample I/O *(The input from the user is shown in bold font)*:

```
Enter the vehicle manufacturer:
Land Rover
Enter the name of the vehicle owner:
Kennedy Monroe
Enter the owner's programme of study:
Chemical Engineering
Enter the number of cylinders in the engine:
6
Enter the owner's age:
22
Land Rover, 6 cylinders, owned by Kennedy Monroe, a 22-year old Male
studying Chemical Engineering at UCT.

Enter the Car manufacturer:
Toyota
Enter the name of the car owner:
Thabo Manong
Enter the number of cylinders in the engine:
4
Enter the car seating capacity:
5
Enter the weight of the car:
23000
Toyota, 4 cylinders, owned by Lebeko Poulo, a 22-year old Male
studying Chemical Engineering at UCT.
It is a 5-seater weighing 23000.0 kg
```

Marking and Submission

Submit `Shape.java, Rectangle.java, Circle.java, Person.java, Student.java, Vehice.java, Car.java` and `Question2.java`, (as well any other Java files you have created) in a single .ZIP folder to the automatic marker.

The zipped folder should have the following naming convention:

yourstudentnumber.zip