

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

Vehicle(Vehicle v)

// Copy constructor

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.

Car(Car C)

// Copy constructor

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 gender:

Male

Enter the owner's programme of study:

BSc in Engineering in Chemical Engineering

Enter the owner's Institution name:

University of Cape Town

Enter the owner's hobbies:

hiking

Enter the owner's age:

21

Enter the number of cylinders in the engine:

8

Enter the car seating capacity:

6

Enter the weight of the car:

25500

Land Rover, 8 cylinders, owned by Kennedy Monroe, a 21-year old Male studying BSc in Engineering in Chemical Engineering at University of Cape Town. Kennedy Monroe likes hiking.

The car is a 6-seater weighing 25500.0 kg

Marking and Submission

Submit `Shape.java`, `Rectangle.java`, `Circle.java`, `Person.java`, `Student.java`, `Vehicle.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`