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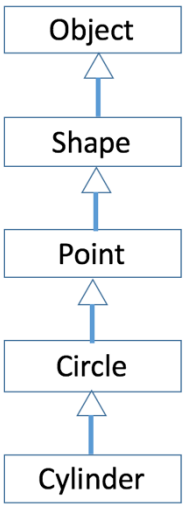
Lab session 3 : Inheritance and Polymorphism

Task 1: Design and Implement the following multi-level inheritance structure:



- Object class is the parent class of all classes in Java
- Shape class is an abstract class and is a child of Object class. Shape class contains two regular methods and one abstract method
  - Regular method calArea(): return the area of the shape
  - Regular method calVolume(): return the volume of the shape
  - Abstract method getName(): return the name of the shape
- Point is a regular class and is a child of Shape class.
  - A point is defined by two coordinates (x & y)
  - Point class inherits/overrides regular methods of Shape class and implements abstract method of Shape class
- Circle is a regular class and is a child of Point class
  - A circle is defined by two coordinates (x & y) of the center and radius r
  - Circle class inherits/overrides regular methods of Shape/Point class and implements abstract methods of Shape/Point class
- Cylinder is a regular class and is a child of Circle class
  - A cylinder is defined by two coordinates (x & y) of the center, radius r and height h
  - Cylinder class inherits/overrides regular methods of Shape/Point/Circle class and implements abstract methods of Shape/Point/Circle class

Task 2: Develop a "ShapeTestDrive" Java program to check the inheritance relationship of Point, Circle, Cylinder with the Shape class.

- Use polymorphism concept to create an array of objects "Point, Circle and Cylinder"
- Browse created polymorphic array to perform the four following operations for each element of the array:
  - Get name of the object to see if it is a Point or a Circle or a Cylinder
  - Calculate the area of the object
  - Calculate the volume of the object
  - Display name, area and volume of each object to the screen

Task 3: Re-do the task 1 and 2 but using Interface instead of abstract classes as much as possible.

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Task 4: Write a Java program to manage the employee information of a company as follows:

- Information of each employee is entered from keyboard, including:
  - Employee ID
  - Employee full name
  - Employee department
  - Basic salary
  - Extra salary
- Number of employees (n) is entered from keyboard
- Information of n employees are saved in a text file named: employees.txt
- Information about total income of each employee is read from the employees.txt file and calculated by the formula:
  - income = basic_salary + extra_salary * 2.5
- Print out to the screen the following information of n employees:
  - Employee ID
  - Employee full name
  - Employee department
  - Employee income