Project Report:

Critical Thinking 4 – Abstract Class Shape

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CSC372: Programming 2

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This documentation is part of the Critical Thinking 4 Assignment from CSC372: Programming 2 at Colorado State University Global. This Project Report is an overview of the program's functionality and testing scenarios including console output screenshots. The program is coded in Java JDK-21; and is named Critical Thinking 4 (Abstract Class Shape). The program is composed of the abstract class the Shape, the Sphere class that extents Shape class, the Cone class that extents Shape class, the Cylinder class that extents Shape class, and the ShapeArray class that extends the Application class from the JavaFx library.

The Assignment Direction:

Option #1: **Creating an Abstract Class Shape I**
Create an abstract class "Shape" with the following specifications:
1. An abstract method "surface_area ()" of return type double
2. An abstract method "volume()" of return type double
Put your code in a Java source file named "Shape.java."
I.
Create a class "Sphere" that extends the Shape class with the following specifications:
1. Attributes:
   o Radius
2. Constructor:
   o Implement a parameterized constructor needed to initialize the data.
3. toString:
   o Implement a "toString" method that prints out the surface area and volume.
Implement methods to compute the surface area and volume.
II.
Create a class "Cylinder" that extends the Shape class with the following specifications:
1. Attributes:
   o Radius, height - both of type double
2. Constructor:
   o Implement a parameterized constructor to initialize the data.
3. toString:
   o Implement a "toString" method that prints out the surface area and volume.
Implement methods to compute the surface area and volume.
III.
Create a class "Cone" that extends the Shape class with the following specifications:
1. Attributes:
   o Radius, height - both of type double
2. Constructor:
   o Implement a parameterized constructor to initialize the data.
3. toString:
   o Implement a "toString" method that prints out the surface area and volume.
Implement methods to compute the surface area and volume.

IV.

Create a driver class named "ShapeArray" with the following specifications:
1. Instantiate one sphere.
2. Instantiate one cylinder.
3. Instantiate one cone.
4. Store the class instances into an array named "shapeArray."
5. Loop through the array and print out the instance data of each object using the object instance's "toString" method.

Show a Unified Modeling Language (UML) diagram of your project.

Condense your source files and UML diagram as a zipped folder and submit the zipped file as your critical thinking assignment (CTA).

Students must use appropriate version control for all programmatic assignments created. GIT repositories should be established and screen captures of repositories submitted with each assignment.

⚠ **My notes:**
- I got permission from Dr. Cooper to use the JavaFX library to display the program outputs.
- I added my own icon to the window frame – logo.png
- Changed the surface_area () method name to surfaceArea() to comply with Java naming conventions.
- The surface area of a shape is different than the area of a shape, in this assignment the program computes the surface area of a shape.
- **For the source code please see Shape.java, Sphere.java, Cone.java, Cylinder.java, and ShapeArray.java files**
- **For the UML diagram please see Abstract Class Shape - UML Class Diagram.pdf file.**
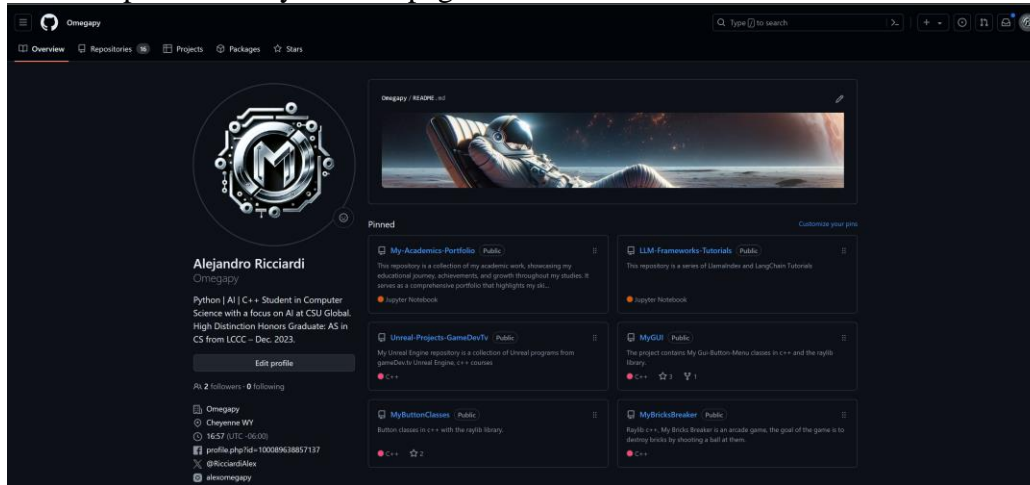
My Program Description:

The program is a small Java program that calculates the surface area and volume of Sphere, Cone, and Cylinder shaped objects.

It uses JavaFX to create a simple GUI that displays the surface area and volume of these shapes.

Git Repository

This is a picture of my GitHub page:

I use [GitHub](#) as my Distributed Version Control System (DVCS), the following is a link to my GitHub, [Omegapy](#).
My GitHub repository that is used to store this assignment is named [My-Academics-Portfolio](#) and the link to this specific assignment is:
https://github.com/Omegapy/My-Academics-Portfolio/tree/main/Programming-2-CSC372/Critical-Thinking-4

Classes Description:

- **The Abstract Shape Class:**
  It is an abstract class that represents a geometric shape. This class defines the interface for all shapes such as spheres, cones, and cylinders.

- **The Sphere Class:**
  The class represents a sphere shape. This class extends the abstract Shape class and computes the surface area and volume of a sphere.

- **The Cone Class:**
  The class represents a cone shape. This class extends the abstract Shape class and computes the surface area and volume of a cone.

- **The Cylinder Class:**
  The class represents a cone shape. This class extends the abstract Shape class and computes the surface area and volume of a Cylinder.

- **The ShapeArray Class:**
  A small JavaFX GUI that displays information about different shapes. This class creates a user interface to show the surface area and volume of a sphere, a cylinder, and a cone. It also extends the Application class from the JavaFx library and contains the main method.

- **Screenshot**

Program Functionality

Figure 1
Display Shapes Information
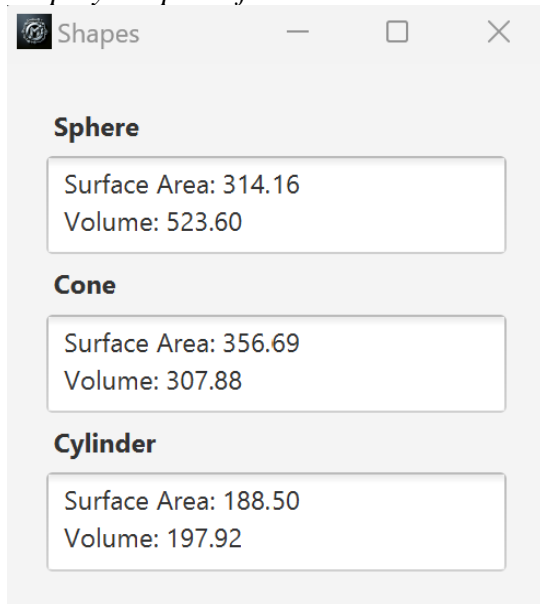
As shown in Figure 1 the program without any issues displaying the correct outputs as expected.