**Critical Thinking 4**

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abstract class Shape// base class

{

    public abstract double surface\_area();

    public abstract double volume();  //Defines the abstract class Shape

}

class Sphere extends Shape// Child class of Shape

{

    private double radius;

    public Sphere(double radius)  // constructor

    {

        this.radius = radius;

    }

    public String toString(){

        return "Surface area of sphere : "+surface\_area() +" Volume of sphere : "+volume();

    }

    public  double surface\_area(){

        return 4.0\*Math.PI\*radius\*radius;//Calculates surface area of sphere

    }

    public double volume(){

        return 4.0\*Math.PI\*radius\*radius\*radius/3.0;//Calculates volume of sphere

    }

}

class Cylinder extends Shape //Child class of Shape

{

private double radius, height;

public Cylinder(double radius, double height) // constructor

{

    this.radius = radius;

    this.height = height;

}

public String toString()

{

    return "Surface area of cylinder : "+surface\_area() +" Volume of cylinder : "+volume();

}

public  double surface\_area()

{

    return 2.0\*Math.PI\*radius\*(radius + height);//Calculates surface area of cylinder

}

public  double volume()

{

    return Math.PI\*radius\*radius\*height;//Calculates volume of cylinder

}

}

class Cone extends Shape  // Child class of shape

{

private double radius, height;

public Cone(double radius, double height) // constructor

{

    this.radius = radius;

    this.height = height;

}

public String toString()

{

    return "Surface area of cone : "+surface\_area() +" Volume of cone : "+volume();

}

public  double surface\_area()

{

    return Math.PI\*radius\*( radius + Math.sqrt(height\*height + radius\*radius));//Calculates surface area of cone

}

public  double volume()

{

    return Math.PI\*radius\*radius\*height/3.0;//Calculates volume of cone

}

}

class ShapeArray

{

    public static void main (String[] args)//Displays information of the three child classes of shape

    {

        Shape[] shapeArray = new Shape[3];

        shapeArray[0] = new Sphere(4.5);

        shapeArray[1] = new Cylinder(3.5, 6.5);

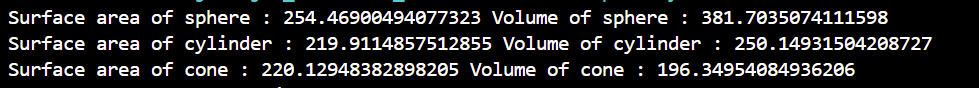
        shapeArray[2] = new Cone(5.0, 7.5);

        for(int i=0;i<3;i++)

        System.out.println(shapeArray[i].toString());

    }

}



https://github.com/Ebberous/CSC320-1-Critical-Thinking/blob/main/CSC320-1%20Critical%20Think%201.docx