**Assignment#3**

// ICE#13.2 - Circle.java

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// 2023-02-20

public class Circle extends GeometricObject {

private double radius;

public Circle() {

}

public Circle(double radius) {

this.radius = radius;

}

/\*\* Return radius \*/

public double getRadius() {

return radius;

}

/\*\* Set a new radius \*/

public void setRadius(double radius) {

this.radius = radius;

}

@Override /\*\* Return area \*/

public double getArea() {

return radius \* radius \* Math.PI;

}

/\*\* Return diameter \*/

public double getDiameter() {

return 2 \* radius;

}

@Override /\*\* Return perimeter \*/

public double getPerimeter() {

return 2 \* radius \* Math.PI;

}

/\* Print the circle info \*/

public void printCircle() {

System.out.println("The circle is created " + getDateCreated() +

" and the radius is " + radius);

}

@Override /\*\* Return a string representation of a Circle object \*/

public String toString() {

return super.toString() + " radius: " + radius;

}

}

// Colorable.java

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public interface Colorable {

public void howToColor();

}

// GeometricObject.java

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public abstract class GeometricObject {

private String color;

private boolean filled;

private java.util.Date dateCreated;

protected GeometricObject() {

dateCreated = new java.util.Date();

}

protected GeometricObject(String color, boolean filled) {

dateCreated = new java.util.Date();

this.color = color;

this.filled = filled;

}

public String getColor() {

return color;

}

public void setColor(String color) {

this.color = color;

}

public boolean isFilled() {

return filled;

}

public void setFilled(boolean filled) {

this.filled = filled;

}

public java.util.Date getDateCreated() {

return dateCreated;

}

public String toString() {

return "created on " + dateCreated + "\ncolor: " + color + " and filled: " + filled;

}

public abstract double getArea();

public abstract double getPerimeter();

}

//ICE#13.3 - Rectangle.java

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public class Rectangle extends GeometricObject {

private double width;

private double height;

public Rectangle() {

}

public Rectangle(double width, double height) {

this.width = width;

this.height = height;

}

/\*\* Return width \*/

public double getWidth() {

return width;

}

/\*\* Set a new width \*/

public void setWidth(double width) {

this.width = width;

}

/\*\* Return height \*/

public double getHeight() {

return height;

}

/\*\* Set a new height \*/

public void setHeight(double height) {

this.height = height;

}

@Override /\*\* Return area \*/

public double getArea() {

return width \* height;

}

@Override /\*\* Return perimeter \*/

public double getPerimeter() {

return 2 \* (width + height);

}

@Override /\*\* Return a string representation of a Rectangle object \*/

public String toString() {

return super.toString() + " width: " + width + " height: " + height;

}

}

// Square.java

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public class Square extends GeometricObject implements Colorable {

private double side;

public Square() {

side = 0;

}

public Square(double side) {

this.side = side;

}

public double getSide() {

return side;

}

public void setSide(double side) {

this.side = side;

}

public double getArea() {

return side \* side;

}

public double getPerimeter() {

return 4 \* side;

}

public void howToColor() {

System.out.println("Color all four sides");

}

}

// TestGeometricObject.java

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public class TestGeometricObject {

public static void main(String[] args) {

GeometricObject[] shapes = new GeometricObject[5];

shapes[0] = new Square(3.5);

shapes[1] = new Circle(4.5);

shapes[2] = new Square(6);

shapes[3] = new Rectangle(2, 5);

shapes[4] = new Square(5.5);

for (int i = 0; i < shapes.length; i++) {

System.out.print("Area of " + shapes[i].getClass().getSimpleName() + " ");

if (shapes[i] instanceof Square) {

System.out.printf("with side: %.1f is: %.2f\n", ((Square)shapes[i]).getSide(), shapes[i].getArea());

((Square)shapes[i]).howToColor();

} else {

System.out.printf("with ");

if (shapes[i] instanceof Circle) {

System.out.printf("radius: %.1f ", ((Circle)shapes[i]).getRadius());

} else if (shapes[i] instanceof Rectangle) {

System.out.printf("width of : %.1f and height of %.1f ", ((Rectangle)shapes[i]).getWidth(), ((Rectangle)shapes[i]).getHeight());

}

System.out.printf("is: %.2f\n", shapes[i].getArea());

}

}

}

}

**Program output Screen Shot**

Area of Square with side: 3.5 is: 12.25

Color all four sides

Area of Circle with radius: 4.5 is: 63.62

Area of Square with side: 6.0 is: 36.00

Color all four sides

Area of Rectangle with width of : 2.0 and height of 5.0 is: 10.00

Area of Square with side: 5.5 is: 30.25

Color all four sides

Text

Description automatically generated

**UML**

|  |
| --- |
| <<interface>>  Colorable |
| +howToColor():void |

|  |
| --- |
| GeometricObject |
| -color: String  -filled: boolean  -dateCreated: java.util.Date |
| #GeometricObject()  #GeometricObject(color:String, filled:boolean)  +getColor(): String  +setColor(color:String): void  +isFilled(): boolean  +setFilled(filled:boolean): void  +getDateCreated(): java.util.Date  +toString(): String  +*getArea(): double*  +*getPerimeter(): double* |

|  |
| --- |
| Circle |
| -radius: double |
| +Circle()  +Circle(radius: double)  +Circle(radius: double, color: String, filled: boolean)  +getRadius(): double  +setRadius(radius: double) : void  +getArea(): double  +getDiameter(): double  +getPerimeter(): double  +printCircle(): void  +toString(): String |

|  |
| --- |
| Rectangle |
| -width: double  -height: double |
| +Rectangle()  +Rectangle(width: double, height: double)  +getWidth(): double  +setWidth(width: double): void  +getHeight(): double  +setHeight(height: double): void  +getArea(): double  +getPerimeter(): double  +toString(): String |

|  |
| --- |
| Square |
| -side: double |
| +Square()  +Square(side: double)  +Square(side: double, color: String, filled: boolean)  +getSide(): double  +setSide(side: double): void  +getArea(): double  +getPerimeter(): double  +toString(): String  +howToColor(): void |

**Relationship between classes**

* The **GeometricObject** class is the parent class of the **Circle**, **Rectangle**, and **Square** classes. This is denoted by an open arrow from the child class to the parent class.
* The **Circle**, **Rectangle**, and **Square** classes inherit properties and methods from the **GeometricObject** class. This is denoted by an open arrow from the child class to the parent class.
* The **Square** class implements the **Colorable** interface. This is denoted by a dotted line with an arrowhead pointing to the **Colorable** interface.
* The **TestGeometricObject** class uses instances of the **Circle**, **Rectangle**, and **Square** classes. This is denoted by a line with an arrowhead pointing from the **TestGeometricObject** class to each of the three classes.