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Roll no: 41	Tutorial No: 3	
Title of LAB Assignment: Assignment based on Generics		
DOP: 25-09-2023	DOS: 02-10-2023	
CO Mapped: Co1, Co2	PO Mapped: PO3 , PO6	Signature:

1. Implement bounded types (extend super class) with generics

```
package a3;
```

```
class Shape {
    public double area() {
        return 0.0;
    }
}
```

```
class Circle extends Shape {
    private double radius;

    public Circle(double radius) {
        this.radius = radius;
    }
}
```

```

    }

    @Override
    public double area() {
        return Math.PI * radius * radius;
    }
}

```

```

class Square extends Shape {
    private double side;

    public Square(double side) {
        this.side = side;
    }

    @Override
    public double area() {
        return side * side;
    }
}

```

```

class BoundedShape<T extends Shape> {
    private T shape;

    public BoundedShape(T shape) {
        this.shape = shape;
    }

    public double calculateArea() {
        return shape.area();
    }
}

```

//Main.java

```

public class Main {
    public static void main(String[] args) {
        Circle circle = new Circle(5.0);
        Square square = new Square(4.0);

        BoundedShape<Circle> boundedCircle = new BoundedShape<>(circle);
        BoundedShape<Square> boundedSquare = new BoundedShape<>(square);

        System.out.println("Circle Area: " + boundedCircle.calculateArea());
        System.out.println("Square Area: " + boundedSquare.calculateArea());
    }
}

```

Output:



```
Run a3.Main x
/home/approximator/.jdk/corretto-11.0.21/bin/java -javaagent:/home/approximator/.local/share/JetBrains/Toolbox/apps/intellij-idea-ultimate/lib/idea_rt.jar-34059:/home/approximator/.local/share/JetBrains/Toolbox/apps/intellij-idea-ultimate/bin -Dfile.encoding=UTF-8 -classpath /home/approximator/Personal/Repos/java/Collections/out/production/main a3.Main
Circle Area: 78.53981633974483
Square Area: 16.0
Process finished with exit code 0
```

2. Implement bounded types (implements an interface) with generics:

```
interface Shape {
    double area();
}

class Circle implements Shape {
    private double radius;

    public Circle(double radius) {
        this.radius = radius;
    }

    @Override
    public double area() {
        return Math.PI * radius * radius;
    }
}

class Square implements Shape {
    private double side;

    public Square(double side) {
        this.side = side;
    }

    @Override
    public double area() {
        return side * side;
    }
}

class BoundedShape<T extends Shape> {
    private T shape;

    public BoundedShape(T shape) {
        this.shape = shape;
    }

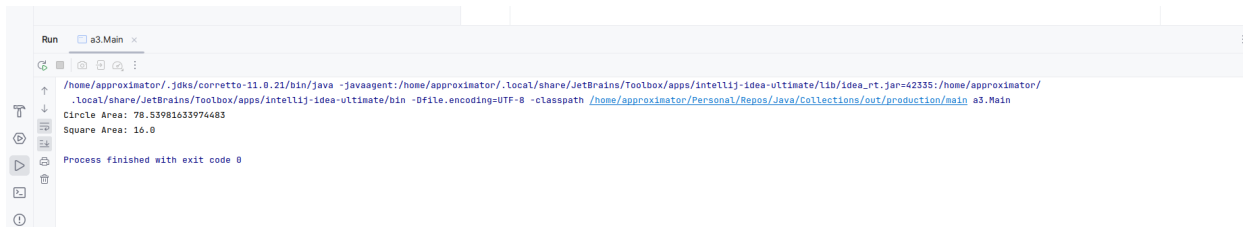
    public double calculateArea() {
        return shape.area();
    }
}
```

```
}  
}
```

//Main.java

```
public class Main {  
    public static void main(String[] args) {  
        Circle circle = new Circle(5.0);  
        Square square = new Square(4.0);  
  
        BoundedShape<Circle> boundedCircle = new BoundedShape<>(circle);  
        BoundedShape<Square> boundedSquare = new BoundedShape<>(square);  
  
        System.out.println("Circle Area: " + boundedCircle.calculateArea());  
        System.out.println("Square Area: " + boundedSquare.calculateArea());  
    }  
}
```

Output:



```
Run a3.Main x  
/home/approximator/.jdk/corretto-11.0.21/bin/java -javaagent:/home/approximator/.local/share/JetBrains/Toolbox/apps/intellij-idea-ultimate/lib/idea_rt.jar-42335:/home/approximator/.local/share/JetBrains/Toolbox/apps/intellij-idea-ultimate/bin -Dfile.encoding=UTF-8 -classpath /home/approximator/Personal/Repos/java/Collections/out/production/main a3.Main  
Circle Area: 78.5398163974483  
Square Area: 16.0  
Process finished with exit code 0
```