

# Java Programming II

## Lab5

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Fall 2020

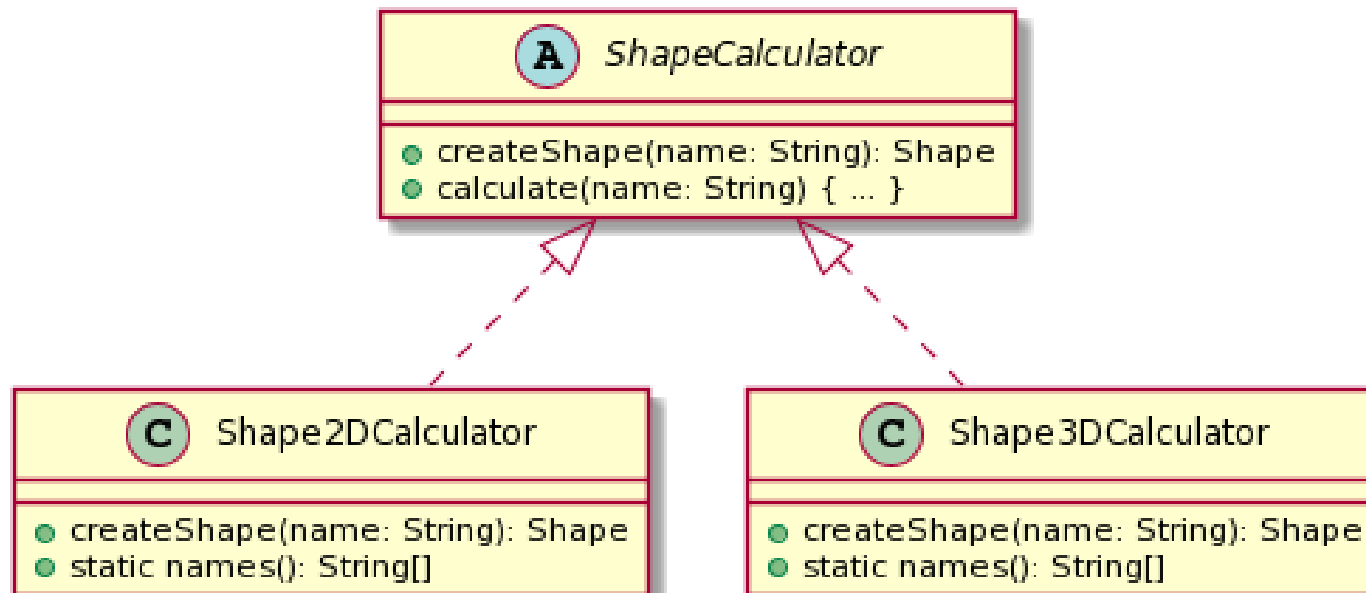
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# Lab5

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- Practice to write a program that calculate 2D shape's area and 3D shape's volume using **Factory pattern**.
  - **ShapeCalculator** has calculate(String name) method that **creates** a shape, and then call **shape.getUserInput()** and **shape.calculate()**.
  - **Shape2DCalculator** creates Shape2D, e.g. Triangle, Rectangle, etc.
  - **Shape3DCalculator** creates Shape3D, e.g. Cone, Sphere, etc.

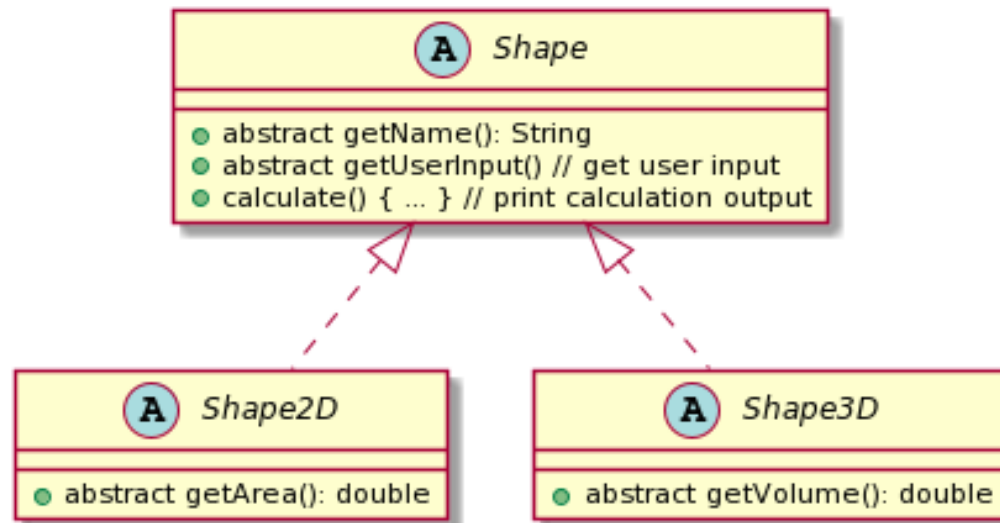


# Lab5

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- **Shape** has getUserInput() and calculate() method.

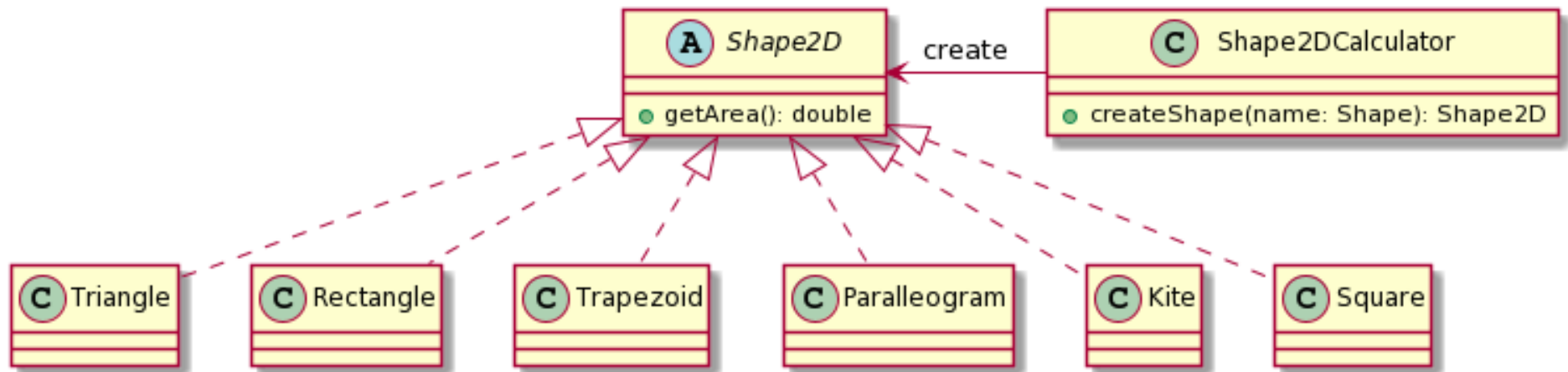
```
public abstract class Shape {  
    public abstract String getName();  
    public abstract void getUserInput(); // get input  
    public void calculate() { // print calculation  
        System.out.println(..);  
    }  
}
```



# Lab5

- **Shape2D's** `getArea()` calculates its own area.

```
public abstract class Shape2D extends Shape {  
    public abstract double getArea();  
}
```



# Lab5

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## □ Shape2D class

- Triangle (직각삼각형) – base, height
- Rectangle (직각사각형) – width, height
- Trapezoid (이등변사다리꼴) – top, bottom, height
- Parallelogram (평행사변형) – base, height
- Kite (연꼴) – horizontalDiagonal, verticalDiagonal
- Square (정사각형) – side

```

public class Triangle extends Shape2D {
    private double base;
    private double height;
    public Triangle() { this(1,1); }
    public Triangle(double base, double height) {
        this.base = base; this.height = height;
    }
    @Override
    public double getArea() { return base * height /
2.0; }
    @Override
    public String getName() { return "TRIANGLE"; }
    @Override
    public void getUserInput() {
        System.out.print("Please enter Triangle Base:");
        base = UserInput.getDouble();
        System.out.print("Please enter Triangle Height:");
        height = UserInput.getDouble();
    }
}

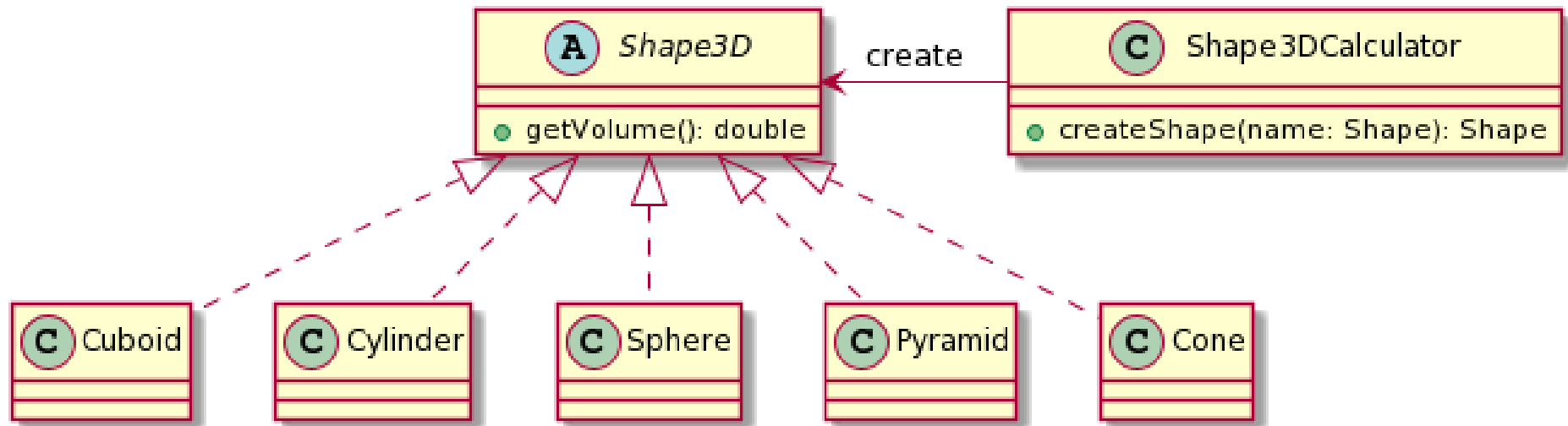
```

# Lab5

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- **Shape3D's** `getVolume()` calculates its own volume.

```
public abstract class Shape3D extends Shape {  
    public abstract double getVolume();  
}
```



# Lab5

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## □ Shape3D class

- Cuboid (육면체) – width, height, length
- Cylinder (원통) – radius, height
- Sphere (구) – radius
- Pyramid (정사각뿔) – base, height
- Cone (원뿔) – radius, height



## Lab5

```
public class ShapeCalculatorFactory {
    public static ShapeCalculator
    getShapeCalculator(int mode) {
        if (mode == 1)
            return new Shape2DCalculator();
        else if (mode == 2)
            return new Shape3DCalculator();
        else
            return null;
    }
    public static String[] getShapeNames(int mode) {
        if (mode == 1)
            return Shape2DCalculator.names();
        else if (mode == 2)
            return Shape3DCalculator.names();
        else
            return null;
    }
}
```

## Lab5

```
public class ShapeMainTest {
    public static void main(String[] args[]) {
        System.out.println("Please select 1 (Shape2DCalculator)
                            or 2 (Shape3DCalculator):");
        int mode = UserInput.getIntegerBetween(1,2);
        ShapeCalculator shapeCalculator =
            ShapeCalculatorFactory.getShapeCalculator(mode);
        String[] names =
            ShapeCalculatorFactory.getShapeNames(mode);
        for (String name : names) {
            shapeCalculator.calculate(name); // calculate
        }
    }
}
```

# Submit to e-learning

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- Add your code (e.g., additional method, class, routine, etc) in the Lab5 assignment.
- Submit the Lab5 assignment (JAVA20-2-Lab5-ID-name.zip including the report) to e-learning.