

Lab 05 Assignment

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实验题目

Question01 多态 1 输出/简答题

- 运行 `java Test` , 程序的输出是什么?

```
private f()
```

- 如果将父类中的方法声明为 `public`, 而子类为 `private`, 编译能通过吗? 如果能, 最后会输出什么?

不能。无法在子类中用 `private` 属性的方法去覆盖父类的 `public` 方法。

Question02 多态 2 输出/简答题

- 运行 `java Test` , 程序的输出是什么?

```
sup.field = 0, sup.getField() = 1  
sub.field = 1, sub.getField() = 1, sub.getSuperField() = 0
```

- 类的非静态属性能体现多态性吗?

非静态属性不能。

例如只能通过 `sup.field` 访问父类的属性。而 `getField` 因为是子类的方法, 所以访问的是子类的属性。

Question03 多态 3 输出/简答题

- 运行 `java Test` , 程序的输出是什么?

```
Base staticGet()  
Derived dynamicGet()
```

- 类的静态属性和静态方法能体现多态性吗?

不能。

子类的静态属性或方法会直接把父类对应的属性或方法直接隐藏而不是重写。所以无法体现多态性。

Question04 多态 4 输出/简答题

- 运行 `java Test`，程序的输出是什么？

A() before draw()
 B.draw(), b = 0
 A() after draw()
 B(), b = 5

- 结合之前实验的初始化顺序和多态，给出程序这样输出的解释。

首先，根据之前实验的结果，先完成父类构造函数的装载之后才会装载子类构造函数。

所以一开始先进入了 `A()` 中并输出了 `A() before draw()`。

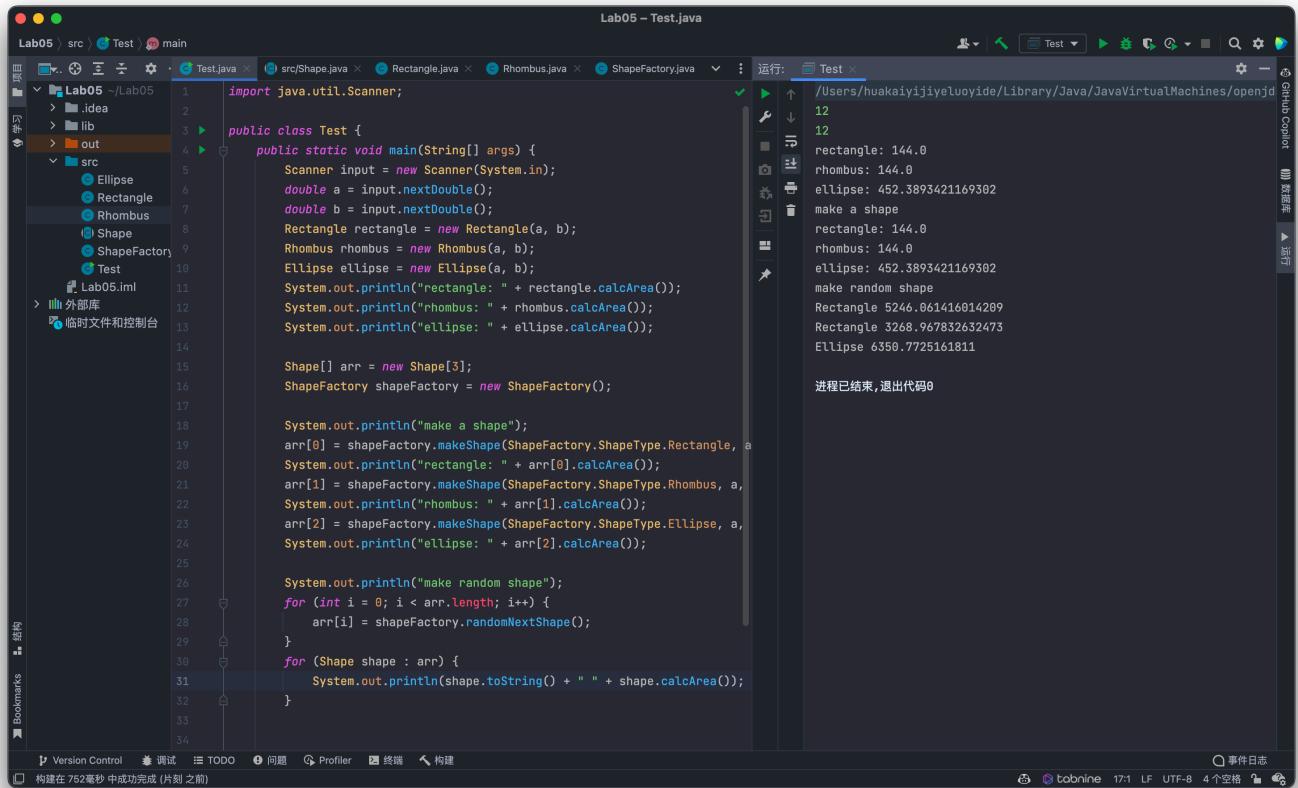
在执行 `draw()` 的时候，因为B中对该方法进行了重写，所以调用的是B类中的 `draw()`。

B的无参构造 `draw()` 的 `b` 的值还没有初始化，所以是0。

然后完成A的装载。

最后才执行B的有参构造函数。

Question05 ShapeFactory 1 编程题



The screenshot shows the IntelliJ IDEA interface with the following details:

- Project Structure:** The project is named "Lab05". The "src" directory contains "Shape.java", "Rectangle.java", "Rhombus.java", "ShapeFactory.java", and "Test.java".
- Code Editor:** The "Test.java" file is open, containing Java code that uses a factory pattern to create shapes and calculate their areas.
- Run Tab:** The "Test" configuration is selected in the run dropdown. The output window shows the following results:

```

Test.java
Lab05 - Test.java
1 import java.util.Scanner;
2
3 public class Test {
4     public static void main(String[] args) {
5         Scanner input = new Scanner(System.in);
6         double a = input.nextDouble();
7         double b = input.nextDouble();
8         Rectangle rectangle = new Rectangle(a, b);
9         Rhombus rhombus = new Rhombus(a, b);
10        Ellipse ellipse = new Ellipse(a, b);
11        System.out.println("rectangle: " + rectangle.calcArea());
12        System.out.println("rhombus: " + rhombus.calcArea());
13        System.out.println("ellipse: " + ellipse.calcArea());
14
15        Shape[] arr = new Shape[3];
16        ShapeFactory shapeFactory = new ShapeFactory();
17
18        System.out.println("make a shape");
19        arr[0] = shapeFactory.makeShape(ShapeFactory.ShapeType.Rectangle, a);
20        System.out.println("rectangle: " + arr[0].calcArea());
21        arr[1] = shapeFactory.makeShape(ShapeFactory.ShapeType.Rhombus, a);
22        System.out.println("rhombus: " + arr[1].calcArea());
23        arr[2] = shapeFactory.makeShape(ShapeFactory.ShapeType.Ellipse, a);
24        System.out.println("ellipse: " + arr[2].calcArea());
25
26        System.out.println("make random shape");
27        for (int i = 0; i < arr.length; i++) {
28            arr[i] = shapeFactory.randomNextShape();
29        }
30        for (Shape shape : arr) {
31            System.out.println(shape.toString() + " " + shape.calcArea());
32        }
33
34    }
35
36 }

12
12
rectangle: 144.0
rhombus: 144.0
ellipse: 452.3893421169302
make a shape
rectangle: 144.0
rhombus: 144.0
ellipse: 452.3893421169302
make random shape
Rectangle 5246.861416014209
Rectangle 3268.967832632473
Ellipse 6350.7725161811
进程已结束,退出代码0

```

Question06 Overload? Override? 简答题

- 这段程序是无法通过编译的，都有哪些原因呢？尝试从继承、覆盖、重载的角度考虑。

- I0 接口中默认的方法是 public 类型的。在 Test01 重写的时候权限变为了 default，权限变小了，导致报错。
- Test02 23 在重写接口中的方法的时候也都出现了权限的问题。
- Test01 实现的两个接口有相同的 f()，不知道应该实现哪一个。
- Test02 在重写的时候，两个方法的传参一样，会产生矛盾。故无法实现重写。
- Test23 中访问 a 时，并没有指定是哪个接口中的属性。

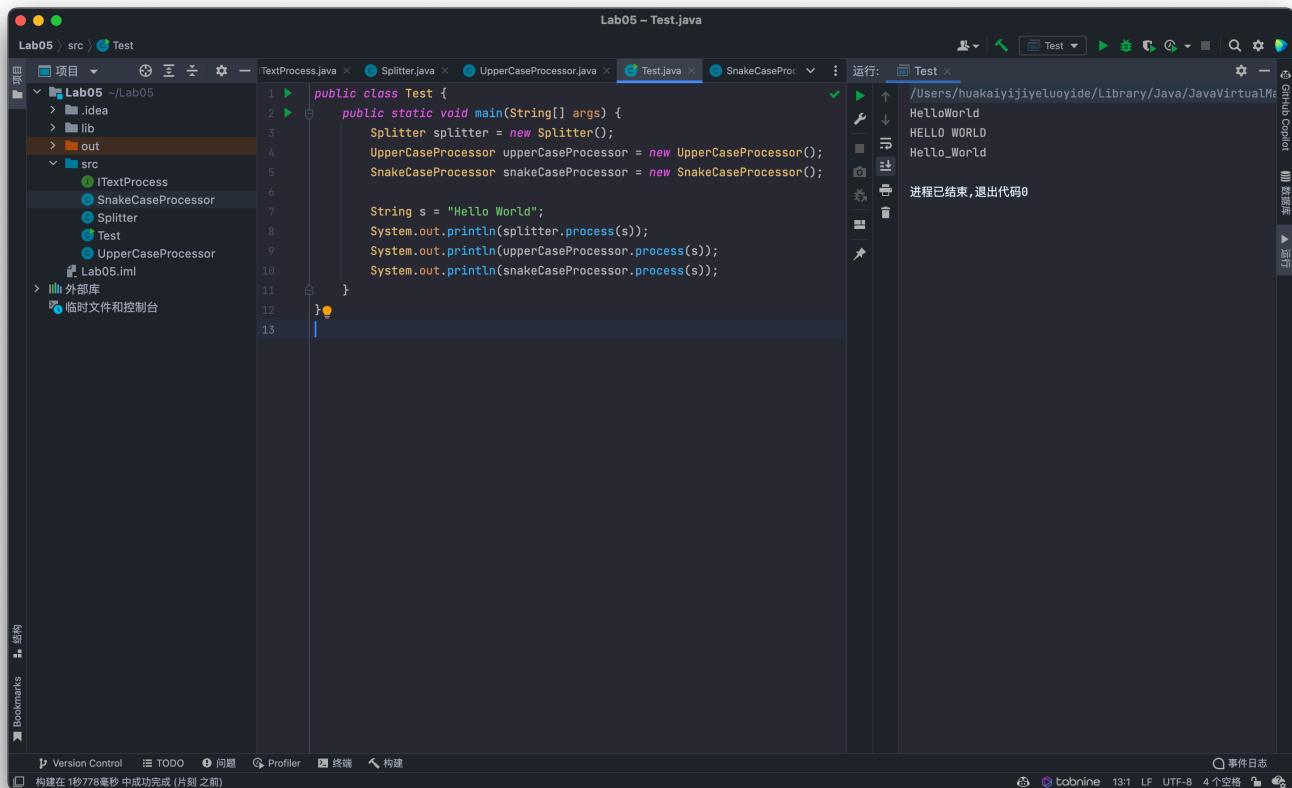
- 如果 I1 extends I0，会引入新的错误吗？I2、I3 也 extends I0 呢？

I1 I3 均不会。I2 会。

这是因为 I2 中 f 的传参与 I1 中的一致，但返回类型不同，所以会报错。

附加题

Extra 1 策略模式 (Strategy Pattern) 编程题



```

public class Test {
    public static void main(String[] args) {
        Splitter splitter = new Splitter();
        UpperCaseProcessor upperCaseProcessor = new UpperCaseProcessor();
        SnakeCaseProcessor snakeCaseProcessor = new SnakeCaseProcessor();

        String s = "Hello World";
        System.out.println(splitter.process(s));
        System.out.println(upperCaseProcessor.process(s));
        System.out.println(snakeCaseProcessor.process(s));
    }
}

```

The screenshot shows the IntelliJ IDEA interface with the 'Test.java' file open. The code implements the Strategy pattern by defining an interface `ITextProcess` and three concrete implementations: `UpperCaseProcessor`, `SnakeCaseProcessor`, and `Splitter`. The `Test` class demonstrates how to use these processors to process a string "Hello World". The output in the terminal shows the original string, its uppercase version, and its snake_case version.

Extra 2 真·工厂方法模式 编程题

```

Lab05 - ShapeFactoriesTest.java

1 import java.util.ArrayList;
2 import java.util.List;
3 import java.util.Scanner;
4
5 public class ShapeFactoriesTest {
6     static Shape makeShape(IShapeFactory factory, double a, double b) {
7         return factory.makeShape(a, b);
8     }
9
10    public static void main(String[] args) {
11        Scanner scanner = new Scanner(System.in);
12        int a = scanner.nextInt();
13        int b = scanner.nextInt();
14
15        List<IShapeFactory> factories = new ArrayList<>();
16        factories.add(new RectangleFactory());
17        factories.add(new RhombusFactory());
18        factories.add(new EllipseFactory());
19
20        for (IShapeFactory factory : factories) {
21            Shape shape = makeShape(factory, a, b);
22            System.out.println(shape.getClass().getName() + ": " + shape.calcArea());
23        }
24    }
25}

```

运行结果:

```

ShapeFactoriesTest
12
12
Rectangle: 144.0
Rhombus: 144.0
Ellipse: 452.3893421169302
进程已结束,退出代码0

```

Extra 3 匿名类的 ShapeFactory 编程题

```

Lab05 - src/ShapeFactoriesTest.java

1 import java.util.Scanner;
2
3 public class ShapeFactoriesTest {
4     static Shape makeShape(IShapeFactory factory, double a, double b) {
5         return factory.makeShape(a, b);
6     }
7
8     /* 测试调用的工厂是否是单例:
9      * 每个工厂重複调用两次，存入数组中，然后输出其地址。
10     * 若发现两次调用地址相同，则是单例。
11     */
12
13     public static void main(String[] args) {
14         Scanner scanner = new Scanner(System.in);
15         int a = scanner.nextInt();
16         int b = scanner.nextInt();
17
18         IShapeFactory[] factories = {
19             RectangleFactory.getFactory(),
20             RhombusFactory.getFactory(),
21             EllipseFactory.getFactory(),
22             RectangleFactory.getFactory(),
23             RhombusFactory.getFactory(),
24             EllipseFactory.getFactory(),
25         };
26
27         for (IShapeFactory factory : factories) {
28             System.out.println(factory);
29             Shape shape = makeShape(factory, a, b);
30             System.out.println(shape.getClass().getName() + ": " + shape.calcArea());
31         }
32     }
33 }

```

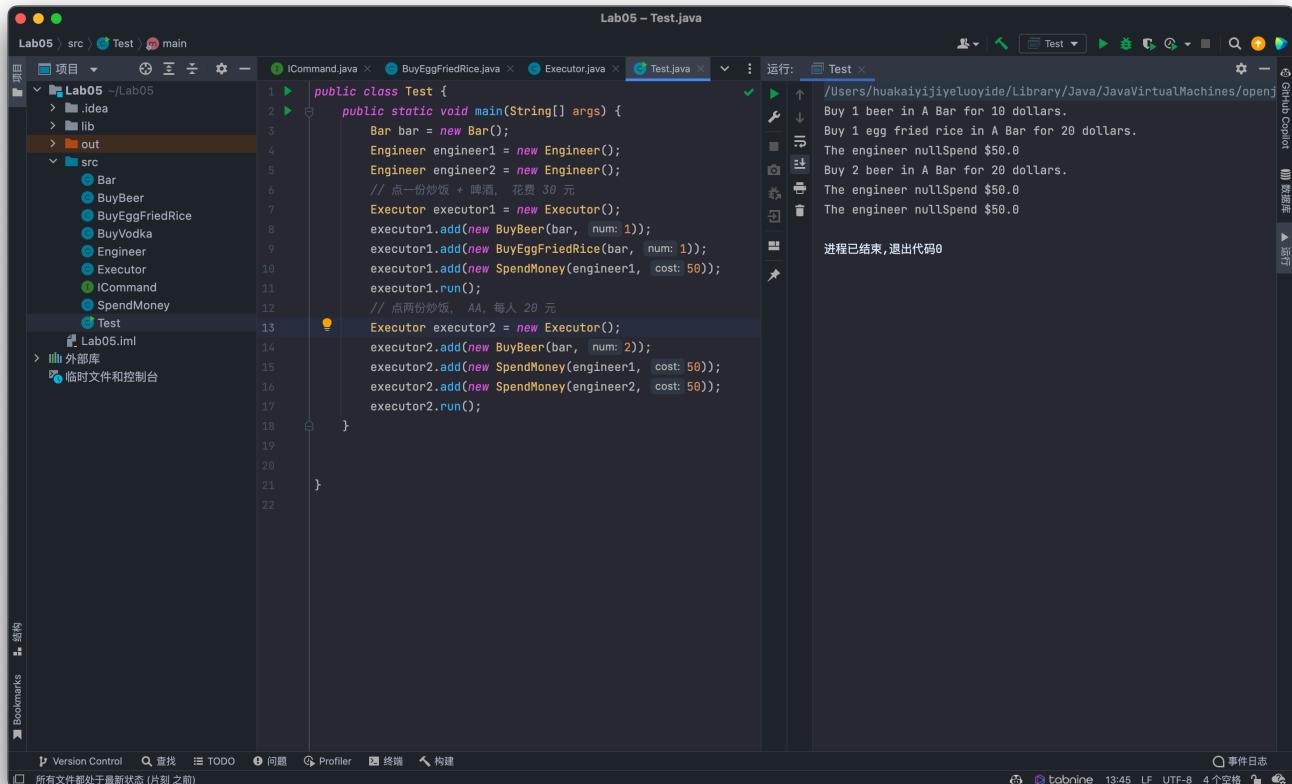
运行结果:

```

ShapeFactoriesTest
12
12
RectangleFactory@b4c966a
Rectangle: 144.0
RhombusFactory@27bc2616
Rhombus: 144.0
EllipseFactory@506e1b77
Ellipse: 452.3893421169302
RectangleFactory@b4c966a
Rectangle: 144.0
RhombusFactory@27bc2616
Rhombus: 144.0
EllipseFactory@506e1b77
Ellipse: 452.3893421169302
进程已结束,退出代码0

```

Extra 4 命令模式 编程题



The screenshot shows an IDE interface with the following details:

- Project Structure:** The project is named "Lab05". The "src" directory contains several source files: Bar.java, BuyBeer.java, BuyEggFriedRice.java, BuyVodka.java, Engineer.java, Executor.java, ICommand.java, SpendMoney.java, and Test.java.
- Code Editor:** The main editor window displays the "Test.java" file. The code implements the Command design pattern. It defines a "Test" class with a static main method. Inside, it creates objects for "Bar", "Engineer", and "Executor". It adds commands (BuyBeer, BuyEggFriedRice, SpendMoney) to an executor and then runs them. The output shows the execution of these commands.
- Output Window:** The right-hand panel shows the console output of the program's execution.
- Bottom Status Bar:** Shows the current time (13:45), file encoding (UTF-8), and other system information.

```

public class Test {
    public static void main(String[] args) {
        Bar bar = new Bar();
        Engineer engineer1 = new Engineer();
        Engineer engineer2 = new Engineer();
        // 点一份炒饭 + 啤酒，花费 30 元
        Executor executor1 = new Executor();
        executor1.add(new BuyBeer(bar, num: 1));
        executor1.add(new BuyEggFriedRice(bar, num: 1));
        executor1.add(new SpendMoney(engineer1, cost: 50));
        executor1.run();
        // 点两份炒饭，AA，每人 20 元
        Executor executor2 = new Executor();
        executor2.add(new BuyBeer(bar, num: 2));
        executor2.add(new SpendMoney(engineer1, cost: 50));
        executor2.add(new SpendMoney(engineer2, cost: 50));
        executor2.run();
    }
}

```