

成绩	
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重庆邮电大学

实验报告

2020-2021 学年第 2 学期

计算机科学导论

(第 3 次试验)

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课程名称： 计算机科学导论

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实验地点： 综合实验大楼 A511/A512

1 实验名称

Methods

2 实验目的

- Be able to write methods
- Be able to call methods
- Be able to write javadoc comments
- Be able to create HTML documentation for our Java class using javadoc

3 实验内容

Task#1 void Methods

Write a simple method which has no return value and no parameters to just print a menu.

Task #2 Value-Returning Methods

Write the other 6 methods, which does some types of calculation. As a whole, we should implement the calculation of area and circumference/perimeter of circle, rectangle and triangle. Each method implements one.

Task #3 Calling Methods

Call our methods in main method to get correct answers.

Task #4 Java Documentation

Write JavaDoc documentation for each method, which is a standard of comment. With JavaDoc, IDE can show some information of our methods to hint the programmer.

4 实验方法(原理、流程图)

The development environment is:

- OS: Ubuntu 20.04.2 LTS on Windows 10 (WSL1, Kernel build 19041)
- IDE/Editor: Visual Studio Code
- Java Runtime: OpenJDK 14.0.2 (build 14.0.2+12-Ubuntu-120.04)

For Task #1, just write a `static void` method and print the menu. Use “\n” and operator + to concatenate multi-line string.

For Task #2, the type of return value of our methods should be `double`. And all parameters should be `double` too. Just define a method with `static double`

prefix, and write the correct formal parameter list in the brackets after the method name. With the formulas given in PDF, we can easily implement all methods.

For Task #3, we should call our methods in main method to make use of them. For each method-call, pass the correct actual parameter list to the method, and make a variable assigned to it.

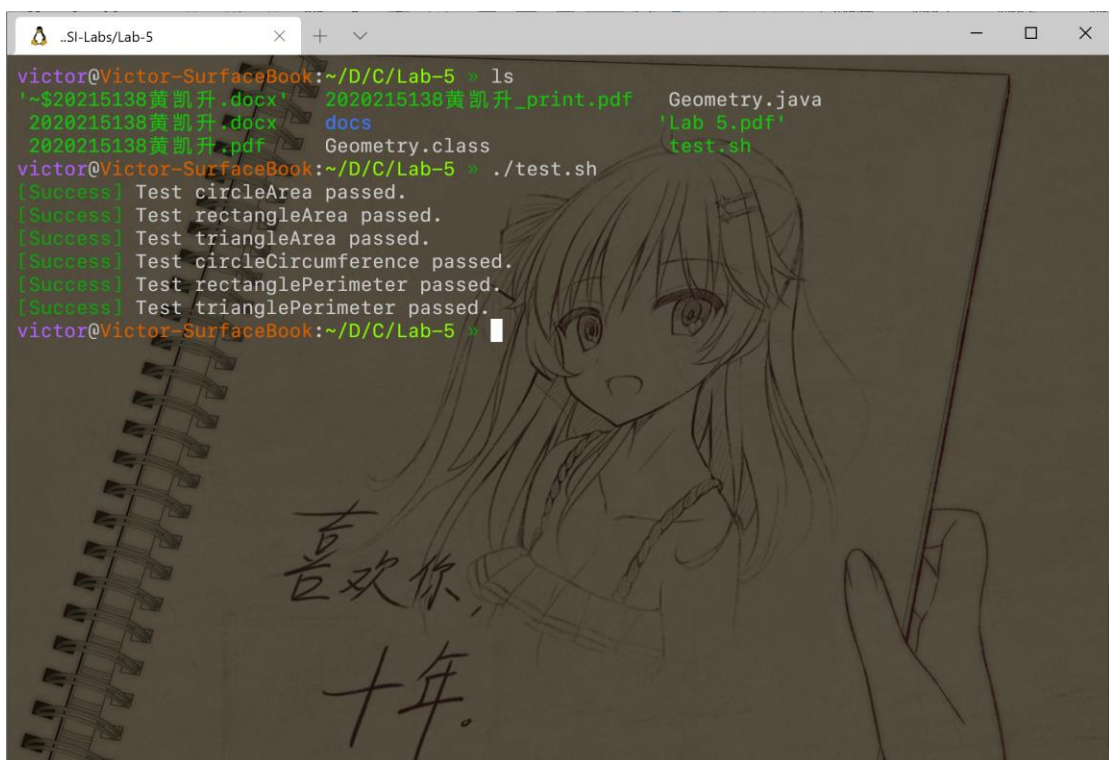
For Task #4, we have to generate Javadoc documentation for each method. Luckily, Visual Studio Code can automatically do a lot of work. When we type “/**”, it will intelligently ask us if we need Javadoc. Then write summary and description inside the comment block. And annotate the parameters after @params, annotate the return value after @return. After all, we use `javadoc -private .. /Geometry.java` to generate a HTML Javadoc.

5 实验结论

The lab has finished successfully. The program can completely achieve all goals. Here are some screenshots with several test cases.

For the data is not specified, so I wrote a bash script to make test cases, which needs be installed in PATH. Source code is shown in [section 7 \(test.sh\)](#).

And all test cases have successfully passed.



Here is the JavaDoc HTML view:

方法概要		
所有方法	静态方法	具体方法
修饰符和类型	方法	说明
(专用程序包) static double	circleArea(double r)	Calculate area of circle
(专用程序包) static double	circleCircumference(double r)	Calculate circumference of circle
static void	main(java.lang.String[] args)	
(专用程序包) static void	printMenu()	Print the main menu Calling this to get a menu printed to stdout
(专用程序包) static double	rectangleArea(double l, double w)	Calculate area of rectangle
(专用程序包) static double	rectanglePerimeter(double l, double w)	Calculate perimeter of rectangle
(专用程序包) static double	triangleArea(double b, double h)	Calculate area of triangle
(专用程序包) static double	trianglePerimeter(double a, double b, double c)	Calculate perimeter of triangle

6 实验体会和收获

This lab shows the power of method. It encapsulates the complexity inside the method, and make the program structure clearer. And in this lab, I also practiced bash script to make test cases and use JavaDoc to generate great documentation.

7 程序代码

Geometry.java:

```
import java.util.Scanner;

/**
 * This program demonstrates static methods
 */
public class Geometry {
    /**
     * Print the main menu
     * Calling this to get a menu printed to stdout
     */
    static void printMenu() {
        System.out.print("This is a geometry calculator \n" +
            "Choose what you would like to calculate \n" +
            "1. Find the area of a circle \n" +
            "2. Find the area of a rectangle \n" +
            "3. Find the area of a triangle \n" +
            "4. Find the circumference of a circle \n" +
            "5. Find the perimeter of a rectangle \n" +
            "6. Find the perimeter of a triangle \n" +
            "Enter the number of your choice: ");
    }

    /**
     * Calculate area of circle
     * @param r radius of circle
     * @return area
     */
    static double circleArea(double r) {
        return Math.PI * Math.pow(r, 2);
    }

    /**
     * Calculate area of rectangle
     * @param l length
     * @param w width
     * @return area
     */
    static double rectangleArea(double l, double w) {
        return l * w;
    }

    /**
     * Calculate area of triangle
     * @param b base
     * @param h height
     */
}
```

```

    * @return area
    */
    static double triangleArea(double b, double h) {
        return 0.5 * b * h;
    }

    /**
     * Calculate circumference of circle
     * @param r radius of circle
     * @return circumference
     */
    static double circleCircumference(double r) {
        return 2 * Math.PI * r;
    }

    /**
     * Calculate perimeter of rectangle
     * @param l length
     * @param w width
     * @return perimeter
     */
    static double rectanglePerimeter(double l, double w) {
        return 2 * (l + w);
    }

    /**
     * Calculate perimeter of triangle
     * @param a side A
     * @param b side B
     * @param c side C
     * @return perimeter
     */
    static double trianglePerimeter(double a, double b, double c) {
        return a + b + c;
    }

    public static void main(String[] args) {
        int choice; // the user's choice
        double value = 0; // the value returned from the method
        char letter; // the Y or N from the user's decision to exit
        double radius; // the radius of the circle
        double length; // the length of the rectangle
        double width; // the width of the rectangle
        double height; // the height of the triangle
        double base; // the base of the triangle
        double side1; // the first side of the triangle
        double side2; // the second side of the triangle
        double side3; // the third side of the triangle

        // create a scanner object to read from the keyboard
        Scanner keyboard = new Scanner(System.in);

        // do loop was chose to allow the menu to be displayed first
        do {
            // call the printMenu method
            printMenu();
            choice = keyboard.nextInt();

            switch (choice) {
                case 1:
                    System.out.print("Enter the radius of the circle: ");
                    radius = keyboard.nextDouble();
                    // call the circleArea method and store the result in the value
                    value = circleArea(radius);
                    System.out.println("The area of the circle is " + value);
                    break;
                case 2:
                    System.out.print("Enter the length of the rectangle: ");
                    length = keyboard.nextDouble();
                    System.out.print("Enter the width of the rectangle: ");
                    width = keyboard.nextDouble();
                    // call the rectangleArea method and store the result in the value
                    value = rectangleArea(length, width);
                    System.out.println("The area of the rectangle is " + value);
                    break;
                case 3:
                    System.out.print("Enter the height of the triangle: ");
                    height = keyboard.nextDouble();

```

```

        System.out.print("Enter the base of the triangle: ");
        base = keyboard.nextDouble();
        // call the triangleArea method and store the result in the value
        value = triangleArea(base, height);
        System.out.println("The area of the triangle is " + value);
        break;
    case 4:
        System.out.print("Enter the radius of the circle: ");
        radius = keyboard.nextDouble();
        // call the circumference method and store the result in the value
        value = circleCircumference(radius);
        System.out.println("The circumference of the circle is " + value);
        break;
    case 5:
        System.out.print("Enter the length of the rectangle: ");
        length = keyboard.nextDouble();
        System.out.print("Enter the width of the rectangle: ");
        width = keyboard.nextDouble();
        // call the perimeter method and store the result in the value
        value = rectanglePerimeter(length, width);
        System.out.println("The perimeter of the rectangle is " + value);
        break;
    case 6:
        System.out.print("Enter the length of side 1 of the triangle: ");
        side1 = keyboard.nextDouble();
        System.out.print("Enter the length of side 2 of the triangle: ");
        side2 = keyboard.nextDouble();
        System.out.print("Enter the length of side 3 of the triangle: ");
        side3 = keyboard.nextDouble();
        // call the perimeter method and store the result in the value
        value = trianglePerimeter(side1, side2, side3);
        System.out.println("The perimeter of the triangle is " + value);
        break;
    default:
        System.out.println("You did not enter a valid choice.");
    }

    // consumes the new line character after the number
    keyboard.nextLine();
    System.out.println("Do you want to exit the program (Y/N)? ");
    String answer = keyboard.nextLine();
    letter = answer.charAt(0);
    } while (letter != 'Y' && letter != 'y');
}
}

```

test.sh:

```

#!/bin/bash
RED='\033[31m'
GREEN='\033[32m'
RESET='\033[0m'
JAVA_PI=3.141592653589793
rand() {
    expr $RANDOM % 100
}
testExpr() {
    standard=$(printf %.6lf $(bc <<< "1.0 * ($2)"))
    output=$(printf %.6lf $3)
    if [ "$standard" = "$output" ]; then
        echo "$GREEN[Success]$RESET$ENDL Test $1 passed."
    else
        echo "$RED[Failure]$RESET$ENDL Test $1 not passed. output is $output, standard is $standard."
    fi
}
execute() {
    echo -e "$1\n$2\nY\n" | java Geometry | tail -n 2 | head -n 1 | rev | cut -d ' ' -f 1 | rev
}
circleAreaTest() {
    RADIUS=$(rand)
    testExpr circleArea "$JAVA_PI * $RADIUS * $RADIUS" "$(execute 1 $RADIUS)"
}
rectangleAreaTest() {
    LENGTH=$(rand)
    WIDTH=$(rand)
}

```

```

        testExpr rectangleArea "$LENGTH * $WIDTH" "$$(execute 2 $LENGTH\\n$WIDTH)"
    }
    triangleAreaTest() {
        BASE="$(rand)"
        HEIGHT="$(rand)"
        testExpr triangleArea "0.5 * $BASE * $HEIGHT" "$$(execute 3 $BASE\\n$HEIGHT)"
    }
    circleCircumferenceTest() {
        RADIUS="$(rand)"
        testExpr circleCircumference "2 * $JAVA_PI * $RADIUS" "$$(execute 4 $RADIUS)"
    }
    rectanglePerimeterTest() {
        LENGTH="$(rand)"
        WIDTH="$(rand)"
        testExpr rectanglePerimeter "2 * ($LENGTH + $WIDTH)" "$$(execute 5 $LENGTH\\n$WIDTH)"
    }
    trianglePerimeterTest() {
        SIDE1="$(rand)"
        SIDE2="$(rand)"
        SIDE3="$(rand)"
        testExpr trianglePerimeter "$SIDE1 + $SIDE2 + $SIDE3" "$$(execute 6 $SIDE1\\n$SIDE2\\n$SIDE3)"
    }
}
circleAreaTest
rectangleAreaTest
triangleAreaTest
circleCircumferenceTest
rectanglePerimeterTest
trianglePerimeterTest

```