軟體品質保證與軟體測試

M2.2

Mission 2 Triangle

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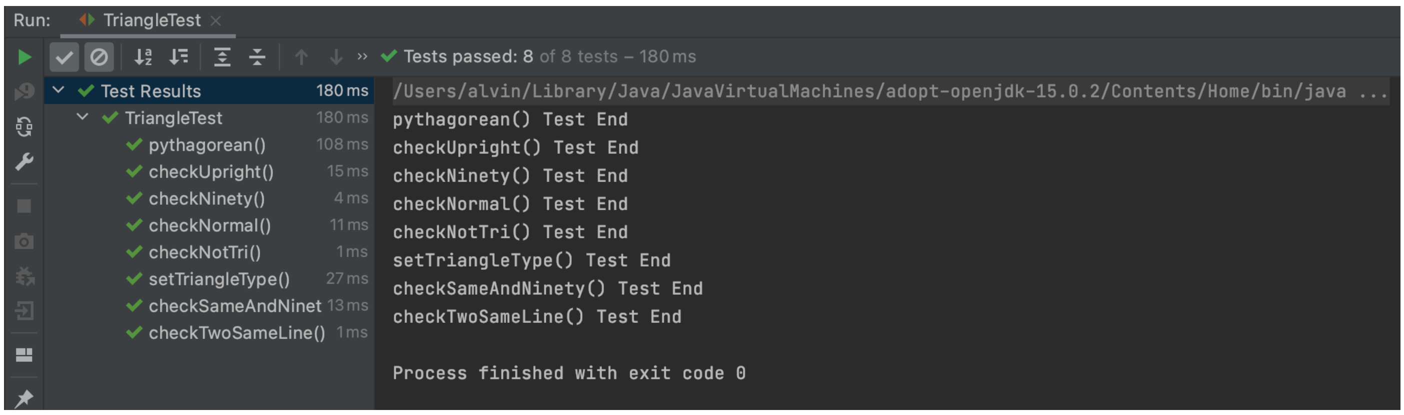
執行畫面



```
Test Results            180 ms
  TriangleTest          180 ms
    pythagorean()       108 ms
    checkUpright()       15 ms
    checkNinety()         4 ms
    checkNormal()        11 ms
    checkNotTri()         1 ms
    setTriangleType()    27 ms
    checkSameAndNinet    13 ms
    checkTwoSameLine()    1 ms
```

```
/Users/alvin/Library/Java/JavaVirtualMachines/adopt-openjdk-15.0.2/Contents/Home/bin/java ...
pythagorean() Test End
checkUpright() Test End
checkNinety() Test End
checkNormal() Test End
checkNotTri() Test End
setTriangleType() Test End
checkSameAndNinety() Test End
checkTwoSameLine() Test End

Process finished with exit code 0
```

Triangle.java

```java
package JUnit;

public class Triangle {

    double[] lines;
    String type;
    double delta = 0.0000000001;//精度誤差

    Triangle(double a1, double a2, double a3) throws Exception {
        lines = new double[]{a1, a2, a3};
    }

    Triangle setTriangleType() throws Exception {
        if (checkUpright()) {
            this.type = "正三角形";
        } else if (checkSameAndNinety()) {
            this.type = "等腰直角三角形";
        } else if (checkNinety()) {
            this.type = "直角三角形";
        } else if (checkTwoSameLine()) {
            this.type = "等腰三角形";
        } else if (checkNormal()) {
            this.type = "一般三角形";
        } else if (checkNotTri()) {
            throw new Exception("Not A Triangle");
        }
        return this;
    }

    boolean checkUpright() {//正三角形 (contain twoSame & Normal)
        boolean sameLine = compareD(this.lines[0], this.lines[1])
                           && compareD(this.lines[1], this.lines[2]);
        return checkNormal() && sameLine;
    }

    boolean checkSameAndNinety() {//等腰直角三角形(contain twoSame & ninety & Normal)
        return checkNinety() && checkTwoSameLine();
    }

    boolean checkNinety() {//直角三角形(contain Normal)
        boolean is_ninety = false;
        for (int i = 0; i < 3; i++) {
            is_ninety = is_ninety || pythagorean(
                                          this.lines[i % 3],
                                          this.lines[(i + 1) % 3],
                                          this.lines[(i + 2) % 3]
                                         )
        }
        return checkNormal() && is_ninety;
    }

    boolean checkTwoSameLine() {//等腰三角形(contain Normal)
        boolean same = false;
        for (int i = 0; i < 3; i++) {
            same = same || compareD(this.lines[i % 3], this.lines[(i + 1) % 3]);
        }
        return checkNormal() && same;
    }
    boolean checkNormal() {//三角形
        boolean twoSumBigger = true;
        boolean noZero = false;
        for (int i = 0; i < 3; i++) {
            twoSumBigger = twoSumBigger &&
              this.lines[i % 3] + this.lines[(i + 1) % 3] > this.lines[(i + 2) % 3];
            noZero = noZero || this.lines[i] > 0;
        }
        return twoSumBigger && noZero;
    }

    boolean checkNotTri() {//不是三角形
        return !checkNormal();
    }

    boolean pythagorean(double a, double b, double c) {
        return compareD(c * c, a * a + b * b);
    }

    boolean compareD(double a, double b) {
        //return if a == b (+-delta)
        return Math.abs(a - b) <= delta;
    }

}
```

TriangleTest.java

```java
package JUnit;

import org.junit.jupiter.api.BeforeEach;
import org.junit.jupiter.api.Test;

import static org.junit.jupiter.api.Assertions.*;

class TriangleTest {
    @Test
    void setTriangleType() throws Exception {
        assertThrows(Exception.class, () -> new Triangle(0,0,0).setTriangleType());
        assertThrows(Exception.class, () -> new Triangle(-1,5,9).setTriangleType());
        assertThrows(Exception.class, () -> new Triangle(3,3,6).setTriangleType());
        assertThrows(Exception.class, () -> new Triangle(1,2,3).setTriangleType());
        assertEquals("正三角形",new Triangle(1, 1, 1).setTriangleType().type);
        assertEquals("等腰三角形",new Triangle(5, 5, 1).setTriangleType().type);
        assertEquals("直角三角形",new Triangle(3, 4, 5).setTriangleType().type);
 assertEquals("等腰直角三角形",new Triangle(1,1,Math.pow(2,0.5)).setTriangleType().type);
        assertEquals("一般三角形",new Triangle(3, 5, 7).setTriangleType().type);
        System.out.println("setTriangleType() Test End");

    }

    @Test
    void checkUpright() throws Exception {
        assertTrue(new Triangle(1, 1, 1).checkUpright());
        assertTrue(new Triangle(2, 2, 2).checkUpright());
        assertFalse(new Triangle(0, 0, 0).checkUpright());
        assertFalse(new Triangle(-1,-1,-1).checkUpright());
        assertFalse(new Triangle(-1,-2,-3).checkUpright());
        assertFalse(new Triangle(1,2,3).checkUpright());
        System.out.println("checkUpright() Test End");
    }


    @Test
    void checkSameAndNinety() throws Exception {
        assertTrue(new Triangle(1,1,Math.pow(2,0.5)).checkNinety());
        assertTrue(new Triangle(1,1,1.41421356237).checkNinety());
        assertFalse(new Triangle(0,0,3).checkNinety());
        assertFalse(new Triangle(1,1,2).checkNinety());
        System.out.println("checkNinety() Test End");
    }

    @Test
    void checkNinety() throws Exception {
        assertTrue(new Triangle(3,4,5).checkNinety());
        assertTrue(new Triangle(5,12,13).checkNinety());
        assertFalse(new Triangle(1,2,3).checkNinety());
        assertFalse(new Triangle(1,1,7).checkNinety());
        assertFalse(new Triangle(-1,-2,-3).checkNinety());
        System.out.println("checkNinety() Test End");
    }

    @Test
    void checkTwoSameLine() throws Exception {
        assertFalse(new Triangle(3,3,6).checkTwoSameLine());
        assertFalse(new Triangle(3,3,7).checkTwoSameLine());
        assertTrue(new Triangle(3,3,5.5).checkTwoSameLine());
        System.out.println("checkTwoSameLine() Test End");
    }

    @Test
    void checkNormal() throws Exception {
        assertTrue(new Triangle(3,4,5).checkNormal());
        assertTrue(new Triangle(5,12,13).checkNormal());
        assertFalse(new Triangle(1,2,3).checkNormal());
        assertFalse(new Triangle(1,1,7).checkNormal());
        assertFalse(new Triangle(-1,-2,-3).checkNormal());
        assertTrue(new Triangle(1, 1, 1).checkNormal());
        assertTrue(new Triangle(2, 2, 2).checkNormal());
        assertFalse(new Triangle(0, 0, 0).checkNormal());
        assertFalse(new Triangle(-1,-1,-1).checkNormal());
        assertFalse(new Triangle(-1,-2,-3).checkNormal());
        assertFalse(new Triangle(1,2,3).checkNormal());
        System.out.println("checkNormal() Test End");
    }

    @Test
    void checkNotTri() throws Exception {
        assertTrue(new Triangle(0,0,0).checkNotTri());
        assertTrue(new Triangle(-1,5,6).checkNotTri());
        assertTrue(new Triangle(1,2,3).checkNotTri());
        assertTrue(new Triangle(3,3,6).checkNotTri());
        System.out.println("checkNotTri() Test End");
    }

    @Test
    void pythagorean() throws Exception {
        assertTrue(new Triangle(0,0,0).pythagorean(3.0,4.0,5.0));
        assertFalse(new Triangle(0,0,0).pythagorean(3.0,4.0,4.9));
        assertFalse(new Triangle(0,0,0).pythagorean(3.0,4.0,4.999));
        assertTrue(new Triangle(0,0,0).pythagorean(3.0,4.0,4.99999999999));
        System.out.println("pythagorean() Test End");
    }

}
```