CPE 111 – Programming with Data Structures
International Sections - January 2021
Laboratory Exercise 12

Objective

This lab is intended to give you practice compiling and running Java programs, and in implementing simple classes of your own.

Instructions

1. Make sure that the Java compiler is installed on your computer. To do this, type:

    ```
    javac -version
    ```

    If Java is not installed, go to
    http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html

    Download and install the correct version of the *Java SE Development Kit* for your operating system.

2. Download the contents of the **Lecture12** directory under **demos**. Run the make file to build **TriangleTester.class**, **TriangleTesterGraphics.class**, and **triangleTester** (a C executable that does the same thing as **TriangleTester.class**). To do this, type:

    ```
    make lab
    ```

3. Run the C executable **triangleTester** and enter the following triangles. Write down the computed perimeter and area for each one on a piece of scrap paper.

X1	Y1	X2	Y2	X3	Y3	Perimeter	Area
5	5	10	5	10	15		
4	5	6	10	8	7		
10	15	15	10	12	5		

4. Run the Java program **TriangleTester** and test the same triangles. To run this program, you must type:

    ```
    java TriangleTester
    ```

5. Test the Java version with the same triangles. You should get (roughly) the same results.

6. Now try running **TriangleTesterGraphics**. This program is identical to TriangleTester except that it also draws each triangle you create. You can use the *Clear* button to clear the drawing area, and the *Exit* button to exit.

7. Look at the code in **Triangle.java** and **TriangleTester.java**. Compare to the corresponding C code (**triangle.c** and **triangleTester.c**). Do you understand what the Java code is doing?

8. Create a new class called **MyRectangle.java**. (We don't call it "Rectangle" because Java already includes a built-in class with that name.) We will consider that a rectangle is defined by two points (two opposite corners). This gives you enough information to know the coordinates of all four corners, assuming that the rectangle is aligned to the X and Y axes.

    You may want to start by copying **Triangle.java** and modifying that code. You should create an initialization function (a constructor, called ***MyRectangle***), a ***getX*** and ***getY*** function (where the 'which' argument can be either 1 or 2) and a version of ***calcPerimeter*** and ***calcArea*** that work for a rectangle.

9. The perimeter of a rectangle can be calculated as **(2 * abs(x1 - x2) + 2 * abs(y1 - y2)**, where (**x1, y1)** are the coordinates of one corner and (**x2, y2)** are the coordinates of the opposite corner. (**abs** means the absolute value function. In Java this is expressed as ***Math.abs()***)

   The area of a rectangle can be calculated as (**abs(x1 - x2)* abs(y1 – y2)).**

   You should removed the *calcLength()* ***function which is not needed for a rectangle.***

10. Compile your *MyRectangle* class as follows:

    ```
    javac MyRectangle.java
    ```

    Fix any compile errors you find.

11. Copy **TriangleTester.java** to a new program called **RectangleTester.java**. Modify it to work with *MyRectangle* instances rather than *Triangle* instances. Don't forget to change the class name in the statement that begins "public class...".

    Compile **RectangleTester.java** and fix any compile errors. Then test it by running:

    ```
    java RectangleTester
    ```

12. Add a ***drawRectangle*** method to **FigureViewer.java** and then create a graphical version of **RectangleTester** called **RectangleTesterGraphics.java** that works like **TriangleTesterGraphics**.

13. Upload **MyRectangle.java, RectangleTester.java,** the modified **FigureViewer.java** and **RectangleTesterGraphics.java**.

    Be sure to change the header comments in each file to include your name, student ID and the date.

Something else to try:

If you do the lab on a Linux computer but you also have another operating system available (Windows or OS/X), install Java Version 8 on the other operating system.

Then copy all the .class files from the Linux system to your other operating system. Try running **TriangleTester.class**, **RectangleTester.class**, and **RectangleTesterGraphics.class** in the other OS. Do the programs work correctly? (You might have some problems if the version of Java on the alternative OS is not the same as the one where you compiled the .java files.)

This is a demonstration of the "Write once, run anywhere" feature of Java!