CSE 174 – Spring 2019
PROGRAM #3: 30 points – Due Sunday, Sep 15, by 11:59 p.m.

Outcomes:

SOLVING A REAL-WORLD PROBLEM

- Write programs that obtain user input.
- Write programs that compute mathematical results.
- Write programs that work with Strings.
- Write programs that display numbers formatted according to a given specification.
- Format and comment source code that adheres to a given set of formatting guidelines.

Scoring:

At a bare minimum, the program you submit must have the assigned source code, and your source code must compile and run without crashing.

- If you do not submit a zip file containing your source code (.java file), your score will be zero. (PUT ALL FILES IN A FOLDER, THEN COMPRESS THE FOLDER)
- If you submit source code that does not compile, your score will be zero.
- If you submit source code that roughly resembles the requirements and it compiles, but it crashes under normal operating conditions (nice input from the user), your score will be reduced by 75%.
- Deductions will be made for not meeting the usual requirements:
  - Source code that is not formatted according to guidelines
  - File and class names that do not meet specifications

	Full credit	No credit or Partial credit
Get console input (8 points)	Using a Scanner, the program obtains user input, formatted as specified	Program does not use keyboard input, or uses it in a manner inconsistent with specifications
Compute Triangle measures (14 points)	Program correctly computes all mathematical measures, program is not using too many variables	There are mathematical errors in computation, or too many variables are defined
Format console output (6 points)	Screen output is formatted exactly as specified, using printf() statements, including converting vertex letters to uppercase	Screen output does not match specifications, or not using printf()
Format and comment source code (2 points)	Indentation, empty lines for separation, comments at the top and inside the code,	You did not follow some or all of the formatting requirements.

Preliminaries:

Before beginning to code, use the following website and study them,

https://www.mathsisfun.com/algebra/trig-finding-angle-right-triangle.html
https://everydaycalculation.com/right-triangle-calculator.php
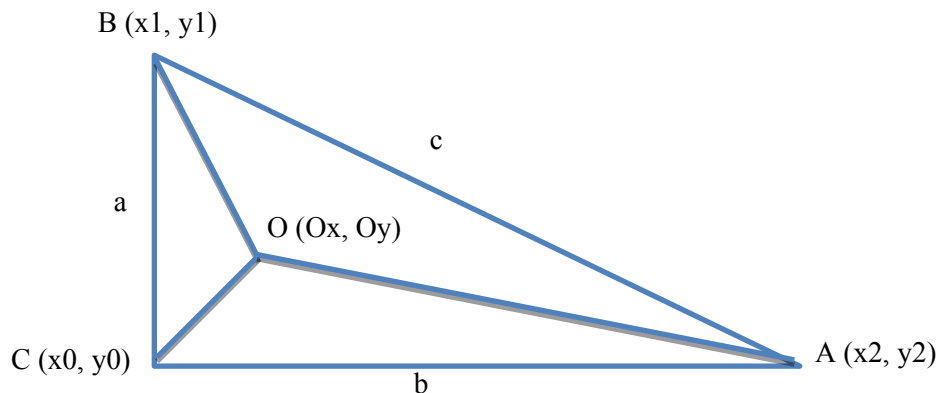https://www.mathopenref.com/coordcentroid.html

to learn about properties of a right triangle. You need to learn to calculate the hypotenuse and angles from the sides (hint: you did that in Lab2). This will be useful as you code, because it will let you create triangles to test with your Java program.

Consider the following sketch:

Where:

- A, B, and C are the vertices of the right triangle.
- a,b, and c are the length of the sides of the right triangle.
- Notice that in the triangle ABC, x0 is the same as x1, and y0 is the same as y2.
- For this assignment, assume that x0, y0, x1, y1, x2, and y2 are positive numbers (they could be decimal numbers too) i.e. $x0 \geq 0.0$, $y0 \geq 0.0$, $x1 \geq 0.0$, $y1 \geq 0.0$, $x2 \geq 0.0$, and $y2 \geq 0.0$
- O is the Centroid of the triangle. Ox and Oy are the coordinates of O.

Calculations:

- The above sketch shows a triangle ABC with three vertices A, B, and C; and the three coordinates of the three vertices.
- Given the coordinates for the vertices A and B, compute the following measures for the triangle ABC:
    a. Find the coordinates of C.
    b. Find the length of side a, b, and c.
    c. Find the angle A, angle B and angle C.
    d. Find the area, and perimeter of the triangle.
    e. Find the coordinates of the centroid O.

Your program should match this format.

Sample run 1:

> run RightAngledTriangle

```
Enter three letter name of the triangle:    abc
Enter the coordinates of a:   5 0
Enter the coordinates of b:   0 3
##### Right Triangle Calculation for the abc Traingle #####
** The coordinates of the triangles are: **
A : (5.000, 0.000)
B : (0.000, 3.000)
C : (0.000, 0.000)
** The Side lengths are **
Side a = 3.000 units
Side b = 5.000 units
Side c = 5.831 units
** The angle are **
Angle A = 30.964 degrees
Angle B = 59.036 degrees
Angle C = 90.000 degrees
** The area and perimeter **
Area = 7.500 sq units
Perimeter =   13.831 units
** The centroid coordinate **
O : (1.667, 1.000)
>
```

Sample run 2:

> run RightAngledTriangle

```
Enter three letter name of the triangle:    xyz
Enter the coordinates of x:   10 20
Enter the coordinates of y:   5.5 3.1
##### Right Triangle Calculation for the xyz Traingle #####
** The coordinates of the triangles are: **
X : (10.000, 20.000)
Y : (5.500, 3.100)
Z : (5.500, 20.000)
** The Side lengths are **
Side x = 16.900 units
Side y = 4.500 units
Side z = 17.489 units
** The angle are **
Angle X = 75.090 degrees
Angle Y = 14.910 degrees
Angle Z = 90.000 degrees
** The area and perimeter **
Area = 38.025 sq units
Perimeter =   38.889 units
** The centroid coordinate **
O : (7.000, 14.367)
> |
```

Requirements: Your program should meet all the following requirements:
- The class name should be **RightAngledTriangle**
- Prompt the user to enter the three-letter <u>name</u> of the triangle as a String. Each letter name is a vertex of the triangle. <u>The user should type in this name as one String without any spaces.</u>
- Prompt the user to enter the <u>coordinates </u>for vertex A (or its equivalent name) and vertex B (or its equivalent name) of a right triangle (given in order corresponding to the letters the user entered)
- When displaying the name of the vertices and angles, these need to be converted to uppercase.
- When displaying the name of the sides, these need to be converted to lowercase.
- Using `System.out.printf()`, display all the messages and results of calculations for that triangle:
  - A : (x2, y2) (or its equivalent name),
  - B : (x1, y1) (or its equivalent name),
  - C : (x0, y0) (or its equivalent name),
  - Side a (or its equivalent name),
  - Side b (or its equivalent name),
  - Side c (or its equivalent name),
  - Angle A (or its equivalent name),
  - Angle B (or its equivalent name),
  - Angle C (or its equivalent name),
  - Area
  - Perimeter
  - O: (Ox, Oy)
- Do not use println or print. You must use only printf.
- Prevent having long lines. Split a line in two lines if it is very long.
- Try to minimize the number of variables that need to be defined.
- Check the scoring table in page 1 to make sure your work meets all important aspects.

Create a folder and call it <u>program3</u>. Copy and paste <u>Triangle.java</u> source code inside the folder. Compress the folder as a .zip file. Submit your <u>program3.zip</u> file only.