

CSCI 203: Introduction to Computer Science I
Bucknell University
Computer Science Department

<http://www.eg.bucknell.edu/~csci203>

Project 4

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1. Description

In this project you will perform calculations with triangles. A triangle is defined by the x - and y -coordinates of its three corner points.

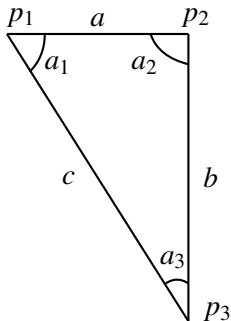
Your job is to display a given triangle and compute the following properties:

- the lengths of all sides
- the perimeter
- the area
- the angles of all corners

2. Triangle Class Details

For this project you will write a `Triangle` class. This class should have the following constructor and methods.

- A single constructor which accepts three `Point2D.Double` objects that describe the three corners of the triangle. In the rest of this description, I will refer to these points as p_1 , p_2 and p_3 .
- Three separate methods that will return the length of each of the three sides of the triangle. a is the length of the side between p_1 and p_2 , b is the length of the side between p_2 and p_3 , and c is the length of the side between p_3 and p_1 .



- A method that will return the perimeter of the triangle.
- A method that will return the area of the triangle. Use *Heron's formula* to compute the area. Let s be the *semiperimeter*, or half the triangle's perimeter. Then, the area is given by

$$\text{area} = \sqrt{s(s-a)(s-b)(s-c)}.$$

- Three separate methods to compute each of the angles in degrees. Let a , b , and c be the lengths of the sides as defined above, and a_1 , a_2 and a_3 be the three angles shown in the diagram. Then you can compute the angles in *radians* using the following

formulas.

$$a_1 = \arccos\left(\frac{a^2 + c^2 - b^2}{2ac}\right)$$

$$a_2 = \arccos\left(\frac{a^2 + b^2 - c^2}{2ab}\right)$$

$$a_3 = \arccos\left(\frac{b^2 + c^2 - a^2}{2bc}\right)$$

Refer to the table on page 150 of your text for information on how to compute the arc cosine and how to convert an angle to degrees.

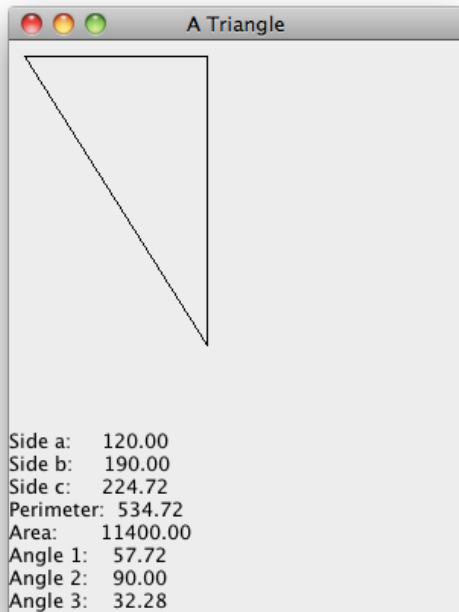
None of these methods should have any parameters! You may use more methods if you find it useful.

3. Triangle Component

Create a triangle component class that you will use to display a triangle and information about it.

- Your component class will need a constructor which will accept a triangle object as a parameter.
- Display information about the triangle at the *bottom* of the window using the Graphics2D method drawString. This information should stay at the bottom of the window even if it is resized.

Here is how your output should look when $p_1 = (10,10)$, $p_2 = (130,10)$, and $p_3 = (130,200)$. Note that you should display the values with two places after the decimal point.



4. Check List

- Be sure to have a class comment for each of your classes.
- Each method should have a Javadoc comment.
- Your name and the date should appear at the top of each file.
- Make sure that the names you use in your program are descriptive and that they follow Sun's naming conventions.
- Use the sample points that we have provided in your program.

5. What to Submit

Drag your [proj4-xyz01](#) folder in the the drop box with your instructor's name, *not* the lab drop box.