

**Engr 123**  
**Assignment 1**  
**Triangles**

**January 8, 2018**  
**Due: January 17, 2018**

Reminder: This is a programming project, and work on this assignment should be done individually. Assistance from other students is limited to questions about specific issues as noted in the syllabus.

Define the following parameters for the triangle shown in Figure 1.

- There are three vertices at  $x_1, y_1, x_2, y_2,$  and  $x_3, y_3$
- There are three angle  $A, B,$  and  $C$ .
- There are three sides of length  $a, b,$  and  $c$ .
- There is a circumscribed circle of radius  $R$
- There is an inscribed circle of radius  $r$

If we are given the three vertices we can calculate the following:

$$a = \sqrt{(x_2 - x_3)^2 + (y_2 - y_3)^2}$$

$$b = \sqrt{(x_1 - x_3)^2 + (y_1 - y_3)^2}$$

$$c = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\text{Perimeter } P = a + b + c$$

$$\text{Semi perimeter } s = P/2$$

$$\text{Area } K = \sqrt{s(s-a)(s-b)(s-c)}$$

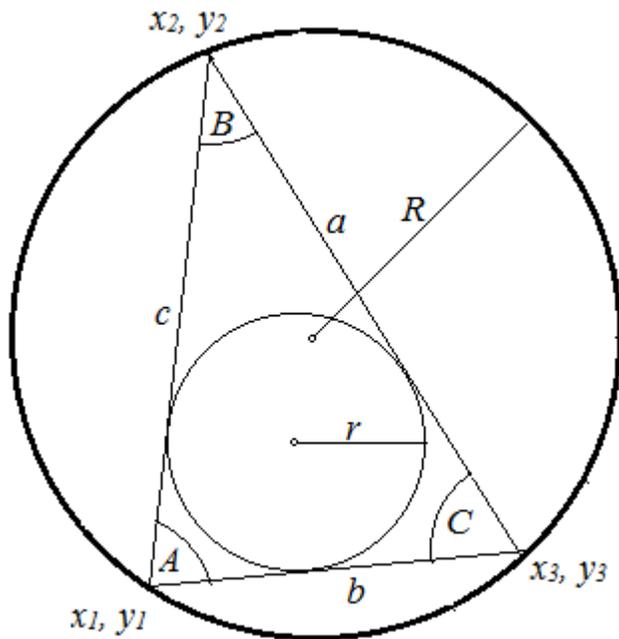
$$\text{Radius } R = abc/(4K)$$

$$\text{Radius } r = \sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$$

$$\text{Angle } A = \cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right)$$

$$\text{Angle } B = \cos^{-1}\left(\frac{c^2 + a^2 - b^2}{2ca}\right)$$

$$\text{Angle } C = \cos^{-1}\left(\frac{a^2 + b^2 - c^2}{2ab}\right)$$



**Figure 1**  
 An arbitrary triangle

Write a program in C which will issue appropriate prompts and input the six doubles representing the vertices of a triangle. Calculate and print with appropriate labels all of the parameters,  $a, b, c, P, s, K, R, r, A, B,$  and  $C$ . Note that the angles  $A, B,$  and  $C$  will be calculated in radians and will need to be converted to degrees before printing. (Use a double precision value for  $\pi = 3.141592653589793$ .)

Before turning your project in you should develop your own test data using a calculator or a program like MATLAB® and use this data to verify that your project works.

After you get your program running correctly, right click on the *project folder* and choose Send To → Compressed zip file. Rename the compressed zip file as Asn01XXX.zip where XXX are you three initials. Upload the renamed file to <\\cecsfp01\users\everyone\Engr123>.