

Engr 101
Assignment 2
Triangles

August 26, 2019
Due: September 6, 2019

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:

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

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

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

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

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

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

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

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

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

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

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

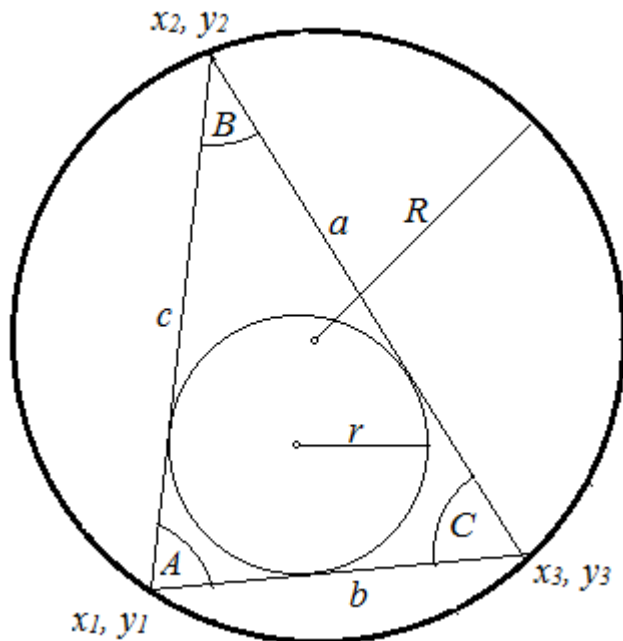


Figure 1
 An arbitrary triangle

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 to verify that your project works.

Print a hard copy of your program and turn it in in class.