

ENGR GSET: Programming Summer 2022

Lab 6: If Else Elseif

Overview :

Every engineer needs a good understanding of Trigonometry. In this exercise you are going to use the trigonometry tools that are built into MATLAB to solve a simple geometry problem.

Area of a Polygon :

You will be calculating the side length and area of a triangle and a quadrilateral (4 sided polygon). You have been given several formulas on the next page.

Trigonometric Functions in MATLAB :

All of the trigonometric functions that you may remember and need are included in the *built in functions* library (this is not a complete list). The default units for angle in MATLAB are *radians*.

- $\sin()$ - sine
- $\cos()$ - cosine
- $\tan()$ - tangent
- $\sin^{-1}()$ - inverse aka arc-sine
- $\cos^{-1}()$ - inverse aka arc-cosine
- $\tan^{-1}()$ - inverse aka arc-tangent

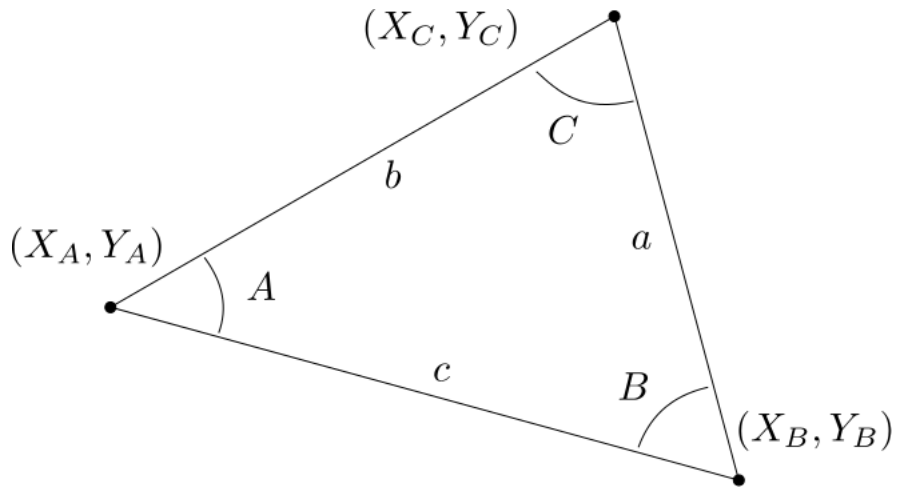
Array Functions in MATLAB :

Remember that there are many functions designed to be used with arrays (this is not a complete list).

- $\max()$ - largest element
- $\min()$ - smallest element
- $\text{mean}()$ - average of all elements
- $\text{length}()$ - number of elements
- $\text{size}()$ - dimensions of the matrix
- $\text{sum}()$ - sum of all elements

Equations that you will need :

- **Distance Formula:** $D_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}$
- **Heron's Formula(Area):** $A = \sqrt{s(s - a)(s - b)(s - c)}$
- **Perimeter Formula:** $p = a + b + c$ and $s = p/2$



- **Law of Cosines:**

$$a^2 = b^2 + c^2 - 2bc \times \cos(A)$$

$$b^2 = a^2 + c^2 - 2ac \times \cos(B)$$

$$c^2 = a^2 + b^2 - 2ab \times \cos(C)$$

Assignment : You are required to write a program to complete the problem described below.

Part 1 : Triangle

1. Ask the user to enter the 3 vertices of a triangle using the *input()* function. The data should be stored into 2 separate arrays, 1 array for x data and 1 array for y data.
2. Show the triangle using the plot function.
3. Calculate the length of each side of the triangle. Show these results in the command window with *fprintf()*.
4. Calculate each of the internal angles of the triangle. Show these results in the command window with *fprintf()*.
5. Calculate the area of the triangle. Show this result in the command window with *fprintf()*.
6. Use one or more if statements to determine what type of triangle is formed by the three points. There are six categories shown below. Your program should print category to the command window.
 - Equilateral
 - Right
 - Isosceles
 - Scalene
 - Acute
 - Obtuse

Submission :

- Your program needs a proper *Header* or title block on it (name, date, etc.). Please see this discussion in the notes for details.
- Your script file needs to be named properly. Please see the *naming convention* document on ilearn.
- Submit your file on ilearn in the *Project 6Assignments Folder*. You can resubmit as many times as you would like but please wait at least 2 minute between submissions. Your latest submission will be the only one graded.