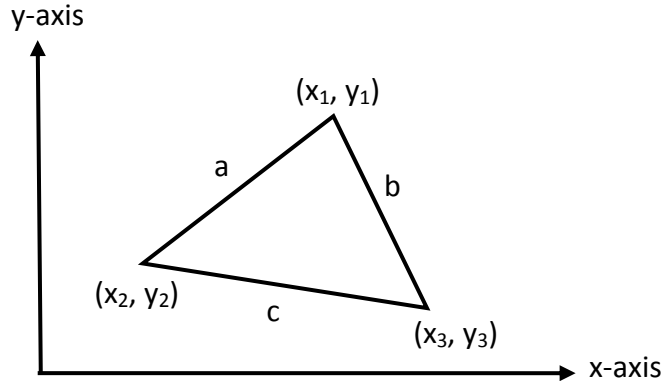


Homework-1

Assignment Date	: 26.02.2014
Due Date	: 12.03.2014 at 18:00
Duration	: 2 weeks

In this homework, you will write a C program to analyse triangles in coordinate system.



INPUTS

First, program should ask user to enter the number (N) of triangles.

Then, in a counter-controlled repetition loop, user will enter the (x_1, y_1) , (x_2, y_2) , and (x_3, y_3) coordinates (float) for three vertices of a triangle.

OUTPUTS

For each triangle, program should generate the outputs described below.

- 1) Calculate and display the lengths (distances) for three edges a, b, c of triangle.

Distance formula for a = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

- 2) Determine and display a message whether the *Triangle Inequality Rule* holds.

Triangle Inequality Rule: The length of any side of a triangle should not exceed the sum of lengths of the other two sides. Perform the following tests to determine the result.

$$|b - c| < a < b + c, \quad \text{and}$$

$$|a - c| < b < a + c, \quad \text{and}$$

$$|a - b| < c < a + b$$

If the rule does not hold for a triangle, program should display "Invalid triangle" message and should skip calculating any further outputs for that triangle.

- 3) Calculate and display the area of triangle.

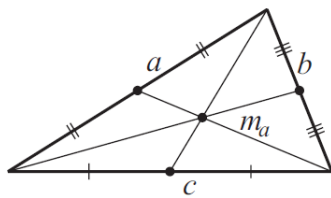
$$\text{Area} = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

- 4) Calculate and display the coordinates for the Center of Gravity (C_x, C_y) of triangle.

$$C_x = \frac{x_1 + x_2 + x_3}{3} \quad C_y = \frac{y_1 + y_2 + y_3}{3}$$

5) Calculate and display the lengths for three Medians of triangle.

A straight line through a vertex of a triangle and the midpoint of the opposite side is called a *median* of the triangle. The three medians of a triangle intersect in a single point, which is called the *centroid* or *center of gravity* of the triangle.



The length of the median m_a to the opposite side a is equal to

$$m_a = \frac{1}{2} \sqrt{2(b^2 + c^2) - a^2}$$

6) Determine and display a message about the type(s) of triangle.

Depending on the relation between the side lengths, a triangle is said to be:

1. “*Regular Triangle*” (or equilateral) if all sides have the same length.

$$a=b=c$$

2. “*Isosceles Triangle*” if two of the sides are of equal length.

$$a=b \text{ and } b \neq c, \text{ or}$$

$$a=c \text{ and } c \neq b, \text{ or}$$

$$b=c \text{ and } c \neq a$$

3. “*Scalene Triangle*” if all sides have different length.

$$a \neq b \neq c$$

4. “*Right Triangle*” if the triangle has a *hypotenuse*.

The side opposite to the right angle (90°) is called the *hypotenuse*.

$$a^2 + b^2 = c^2, \text{ or}$$

$$a^2 + c^2 = b^2, \text{ or}$$

$$b^2 + c^2 = a^2$$

SAMPLE TEST DATA

The followings are given for validation purposes only. Your program should be general and should work with any data values.

Triangle Type	x_1	y_1	x_2	y_2	x_3	y_3
Isosceles	0	0	3	0	3	3
Scalene and Right	0	0	3	0	3	4
Scalene	0	0	3	0	3	3
Regular	0	0	2	0	1	1.7320508
Invalid	1	1	2	2	3	3

NOTICE

You should use the following built-in C functions, which are defined in the <math.h> header file.

`fabs(x)` : Gives absolute value of x. Example : `fabs(-5) --> 5`

`sqrt(x)` : Gives square root of x. Example : `sqrt(4.0) --> 2.0`