Assignment 2 - Triangle Area

Due Feb 7 by 11:59pm **Points** 20 **Submitting** a file upload **File Types** h and cpp **Available** until Feb 10 at 12:01am

This assignment was locked Feb 10 at 12:01am.

ST. CHARLES COMMUNITY COLLEGE

CPT-182 - Programming in C++

Programming Assignment - Triangle Area (20 Points)

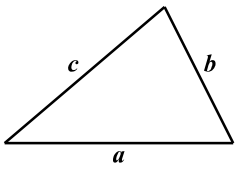
(Number in Question Bank: Assignment **2.1**)

Program Overview

In this assignment, you are going to write a C++ program that reads in the data of some triangles from an input file, calculates the area of the triangles (valid triangles only), and writes the results to an output file.

Triangle Inequalities

The **triangle inequalities** mean that for any triangle, sum of the lengths of any two sides **must** be greater than the length of the third side (see the figure below).



$$a + b > c$$
$$a + c > b$$
$$b + c > a$$

If any of the **3** inequalities is **not** satisfied, then the **3** side lengths **cannot** ~~form a valid triangle~~.

Triangle Area - Heron's Formula

Given the **3** side lengths of a triangle, a, b, and c, the area of the triangle, A, can be calculated using the formula below:

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

where s is the half perimeter which equals to $\frac{a+b+c}{2}$.

The Input File

- The input file is a **plain text file** (filename: `triangles.txt`).
- In each row of the input file, there are exactly **3** positive floating-point numbers (separated by whitespaces), which are the **3** side lengths of a (possible) triangle.
- You **cannot** assume (or guess) the number of triangles in the input file. In other words, no matter how many (possible) triangles are stored in the input file, your program should correctly process all of them.
- Please refer to the **sample input files** to better understand the input file format.

The Output File

- The output file is a **plain text file** (filename `areas.txt`).
- For each (possible) triangle in the input file, your program should write its area to the output file. If the **3** side lengths in the input file **cannot** form a valid triangle, then your program should write **`"Invalid triangle"`** to the output file.
- Each value should be a separate line in the output file.
- Please refer to the **sample output files** to better understand the expected output file format.

Other Development Notes

- Please keep **2** decimal places for the values written to the output file.
- Your program should **use a loop** to read the data in the input file. In each iteration, your program needs to read in the **3** side lengths of the next triangle from the input file (e.g., `fin >> a >> b >> c`).
- After reading in a triangle, your program should first check whether it is a valid triangle (triangle inequalities applied here). If it is **valid**, then calculate its area (Heron's formula applied here) and write it to the output file; if it is **invalid**, then write **`"Invalid triangle"`** to the output file.
- Please review the lecture sample code, "rectangle area", which could be a great help for you to complete this assignment.

Sample Input and Output Files (Click to Download)

Sample Input File 1 (https://drive.google.com/uc?export=download&id=1VBZyMSWMeWZorIVBTPYN4WdPxGusCWwr) **Sample Input File 2**
Sample Output File 1 (https://drive.google.com/uc?export=download&id=1UeKlQNBIqgSm7ZzX7GcjbdKhu9XIUJ4B) **Sample Output File 2**

Assignment Submission and Grading (Please Read)

- Please upload all your **`.h`** (if any) and **`.cpp`** files (**not** the ~~entire Microsoft Visual Studio project folder~~) on Canvas.
- Before the assignment deadline, you can submit your work unlimited times. However, only your latest submission will be graded.
- At least **20**% of your code should be **comments**. All variable, function (if any), and class (if any) names should "make good sense". You should let the grader put **least effort** to understand your code. Grader will **take off points**, even if your program passes all test cases, if he/she has to put extra **unnecessary** effort to understand your code.
- Please **save a backup copy** of all your work in your computer hard drive.
- Your program will be graded (tested) using another valid input file (still named **`triangles.txt`**) to check whether it can generate the expected (correct) output file (with correct format and correct output values in it). As long as the input file is valid, your program should generate a correct output file. In other words, your program should work for **any** valid input file, **not** just the sample input files provided in the assignment instructions.
- In this class, you can assume that the input file (input data) is always **valid** and **has correct format**. You do **not** need to deal with ~~invalid input~~ or ~~error handling~~.
- Your work will be graded after the assignment deadline. All students will receive their assignment grades at (almost) the same time.