

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.



CPT-182 - Programming in C++

Programming Assignment - Triangle Area (20 Points)

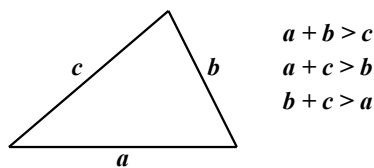
(Number in Question Bank: Assignment 2.1)

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**).



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 [📄 \(https://drive.google.com/uc?export=download&id=1VBZyMSWMeWZorlVBTPYN4WdPxGusCWwr\)](https://drive.google.com/uc?export=download&id=1VBZyMSWMeWZorlVBTPYN4WdPxGusCWwr) **Sample Input File 2** [📄](#)
Sample Output File 1 [📄 \(https://drive.google.com/uc?export=download&id=1UeKIQNBIqgSm7ZzX7GcjbdKhu9XIUJ4B\)](https://drive.google.com/uc?export=download&id=1UeKIQNBIqgSm7ZzX7GcjbdKhu9XIUJ4B) **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.