

SSS.txt  
Documentation for Program SSS  
=====

Written August 2011 by John Bell, jbell, for CS 109

This document actually describes two programs, SSS\_Basic.cpp and SSS\_Enhanced.cpp. The first program fulfills the basic requirements for the first homework assignment for CS 109, taught Fall 2011 at the University of Illinois Chicago. The second enhances the first with the addition of some optional features.

Both programs solve the side-side-side (SSS) problem in trigonometry. More specifically, given the lengths of three sides of a triangle, these programs will determine the three angles, and report them in both radians and degrees.

Lengths may be entered in any units, so long as the same units are used for all three lengths. Lengths must be greater than zero, the longest length must be entered first, and the sum of the remaining two sides must exceed the length of the longest side.

SSS\_Basic.cpp does not check the user input for validity, and formats the output in a rudimentary fashion.

SSS\_Enhanced does check user input, and uses proper formatting for the output results. In addition it sends results only to the standard output and all other messages to the standard error device, and furthermore adds the following enhanced features:

1. The perpendicular heights of the triangle are calculated relative to each of the three sides as a base, and these heights are reported along with the corresponding area.
2. The difference between 180 degrees and the sum of the angles calculated is reported as an error, using both double precision and standard float data types. For several of the test cases tried the error calculated using floats was on the order of  $10E-6$ , and the error reported using doubles was on the order of  $10E-15$  or less.
3. The user may repeat the calculations for as many different triangles as they wish.

Known weaknesses: The output formatting was adjusted using triangles with a longest side of length approximately 25. Triangles with much larger or smaller dimensions may cause unattractive output. As mentioned above, SSS\_Basic does not check user input for validity.