```
 1: /*  SSS_Basic.c
 2:
 3:     This program solves the side-side-side ( SSS ) problem in trigonometry.
 4:
 5:     More specifically, if the lengths of three sides of a triangle are known,
 6:     this program will solve for the three angles.
 7:
 8:     Units:  The units of input for the three side lengths is actually
 9:     unimportant, so long as all three sides are given in the same units.
10:     This program reports results in both radians and degrees.
11:
12:     Written August 2011 by John Bell, as a sample solution to HW1 for CS 109
13:
14:     Revised January 2013 by John Bell from C++ to straight C for CS 107
15:
16:     This version fulfills the basic assignment, without any optional
17:     enhancements.
18:
19: */
20:
21: #include <stdlib.h>       // For standard library functions
22: #include <stdio.h>        // For standard input and output
23: #include <math.h>          // For sines and cosines, etc.
24:
25: int main( void ) {
26:
27:     // First to declare necessary variables.
28:
29:     double sideA, sideB, sideC;                 // 3 sides, any dimensions
30:     double angleA, angleB, angleC;              // in radians
31:     double angleA_deg, angleB_deg, angleC_deg;  // in degrees
32:     double numerator, denominator;              // For use in cosine law
33:
34:     // Next to explain the program to the user
35:
36:     printf( "\nWelcome to program SSS_Basic.\n\n" );
37:     printf( "Written August 2011 by John Bell, jbell, for CS 109.\n" );
38:     printf( "Converted from C++ to C January 2013 for CS 107\n\n" );
39:     printf( "This program will find the three angles of a triangle,\n" );
40:     printf( "given the lengths of the three sides.\n\n" );
41:     printf( "Input can be given in any consistent units.\n" );
42:     printf( "Results are reported in both radians and degrees.\n\n" );
43:
44:     // Now get input from the user.  No error checking in this version.
45:
46:     printf( "Please enter the length of the longest side: " );
47:     scanf( "%lf", &sideC );
48:     printf( "Now please enter the length of the second side: " );
49:     scanf( "%lf", &sideA );
50:     printf( "And finally, please enter the length of the third side: " );
51:     scanf( "%lf", &sideB );
52:
53:     // First calculate angle C using the cosine law
54:
55:     numerator = sideA * sideA + sideB * sideB - sideC * sideC;
56:     denominator = 2.0 * sideA * sideB;
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57:     angleC = acos( numerator / denominator );
58:
59:     // Next calculate angles A and B using the sine law
60:
61:     angleA = asin( sideA / sideC * sin( angleC ) );
62:     angleB = asin( sideB / sideC * sin( angleC ) );
63:
64:     // Convert angles from radians to degrees
65:
66:     angleA_deg = angleA * 180.0 / M_PI;  // M_PI defined in <cmath>
67:     angleB_deg = angleB * 180.0 / M_PI;
68:     angleC_deg = angleC * 180.0 / M_PI;
69:
70:     // And finally, echo input and report results.
71:     // No formatting in this version.
72:
73:     printf( "\n\nHere are your results:\n\n" );
74:     printf( "   Side                    Opposing Angle\n" );
75:     printf( "  Length              ( radians )      ( degrees )\n" );
76:     printf( " %f\t\t%f\t%f\n", sideC, angleC, angleC_deg );
77:     printf( " %f\t\t%f\t%f\n", sideA, angleA, angleA_deg );
78:     printf( " %f\t\t%f\t%f\n\n", sideB, angleB, angleB_deg );
79:
80:     // Tha tha tha that's all folks !
81:
82:     system( "PAUSE" );    // Only needed for Dev C++
83:
84:     return 0;
85:
86: } // main
87:
```