

The Quadratic Formula

A common problem in our math classes is to use the quadratic formula to find the roots of a quadratic equation of the form:

$$Ax^2 + Bx + C = 0$$

Here is the quadratic formula again in case you forgot:

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

To take the square root of something in C++, you'll need to use the Math library. This means that you will need to add the **#include <math.h>** statement at the beginning of your file. This will allow you to use the **sqrt()** function to take the square root of a number. You may also find the absolute value function useful, **fabs()**.

Your task is to write a program that calculates the roots of a quadratic formula when the user inputs values for A, B and C.

As you might recall, there are three kinds of results you can expect from solving a quadratic equation: two real roots, a double root and two imaginary roots. Your program should be able to:

1. Print out which of these three cases will occur for a given A,B and C
2. Print out the actual roots of the equation if the solution is not imaginary
3. **Bonus** – Print out all roots, including the imaginary roots in standard form (a + bi).

Here are a few equations to test with:

Real Roots: $x^2 + 2x - 8$

Double Root: $16x^2 - 40x + 25$

Imaginary Roots: $2x^2 + 3x + 5$

The Pythagorean Theorem

Your task is to write a program that solves the Pythagorean Theorem. Allow the user to input two of the three sides of a right triangle and the program will output the missing side. Here is the formula if you have forgotten:

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

Some things to consider:

1. We need some way for the user to let the program know which of the variables to solve for. We can do this by having the user enter a specific value that the computer checks for before doing any calculations....in this case we can use -1 (since a triangle can't have a negative side length). Make sure to let the user know they need to input -1 to indicate the unknown side.
2. Solving for a, b and c are going to all require their own equations.
3. **Bonus** – Have the program output the measures of the unknown angles in the triangle. (Hint: The functions **asin()**, **acos()**, and **atan()** will find the inverse of sine, cosine and tangent respectively)