CS-182
C++ Program #1
Simple Expressions

Date Assigned: **Wednesday, December 6, 2000**
Date Due: **Wednesday, December 13, 2000**

The purpose of the assignment is to be able to translate simple expressions into correct C++ expressions. The program should find the two roots to the following quadratic equation:

$$x^2 - 8x + 15 = 0$$

In general, any quadratic equation of the form:

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

where *A*, *B*, and *C* are constants in the equation (called the coefficients), can be solved by using the quadratic formula, which follows:

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

Write a C++ program that solves the above quadratic equation using the quadratic formula. Write your program so that it prompts the user to input the values of *A*, *B*, and *C*. Be careful that the discriminant is always >= 0. Use the functions intrinsic to the language to compute squares and square roots (ie. *pow(x, y)* and *sqrt (x)*). Be sure to print both roots of the equation to the output file. Once your program is running correctly, print everything that is seen on the screen to an output file as well, along with a copy of your compiler generated source listing. See the back side of this handout for a sample program that generates output to a file. Also, you'll need to have the line:

```
#include <math.h>
```

at the beginning of your file in order to use the `pow()` and `sqrt()` functions. Note, it should also be possible to replace the above statement with `#include <cmath>`

Note: The formula only yields correct answers when the quantity

$$B^2 - 4AC$$

is non-negative. The above quantity is called the discriminant of the quadratic formula. When you test your program with other values for *A*, *B*, and *C*, be sure the discriminant is not negative!

The following program demonstrates how to write output to a file (which can later be printed):

```
#include <fstream>          // necessary for any file I/O
using namespace std;

void main()
{  int num = 12;
      :
      :
   ofstream out("pgm1.out");    // 'out' is a file object

      :
      :
   out << "This string will go to the output file!" << endl;
   out << "The value of num = " << num;
      :
      :
}
```

Please realize that the above program is just an example of how to send output to a file. It is not intended for you to simply copy the exact code above into your program. Rather, use the above program as an example from which you can build a properly working program.

Additional development: If you're able to get the required elements of the assignment working, then try to add a loop that lets the user solve several quadratic equations in one session. This would require the use of variable input from the console (as opposed to just hard coding the coefficients into the formulas).

When you are finished with your assignment, your well-commented program source files can be emailed to blessing@msoe.edu, along with a written report that discusses how you went about meeting the objectives of the assignment. The report serves as 'external documentation' for your work (which is done by the program itself). The report can be in Word .doc format or Acrobat .pdf format (or .txt format, as a last resort).