ECE 2305 – Introduction to C Programming

Programming Project 02
Quadratic Equation Solver

Program Features: Branch structure, variables, data input and output, mathematical operators, function calls.

Design a C++ application that calculates and displays all solutions to quadratic algebraic equations of the form

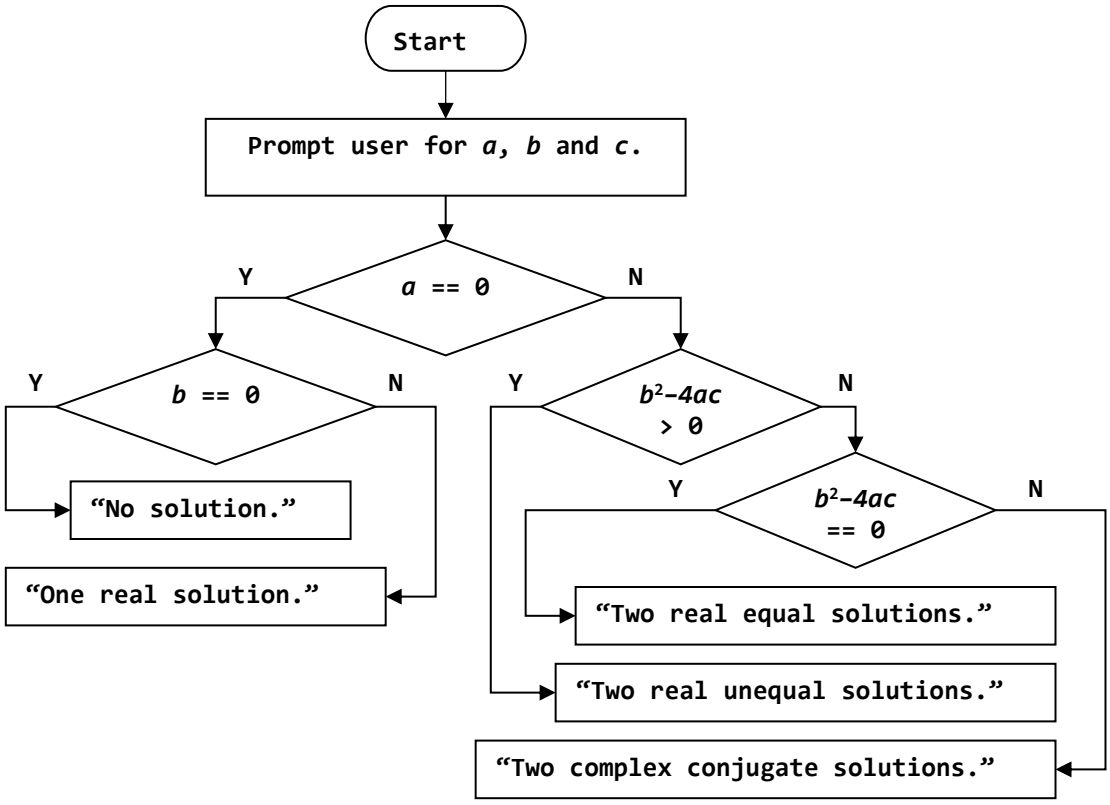
$$ax^2 + bx + c = 0$$

with real-numbered values of the constant coefficients *a*, *b* and *c* entered by the user. Your application should rely on the standard quadratic formulas:

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Structure the program as shown in the following Flow Chart. It is recommended that you perfect the structure of the program before including the calculations.



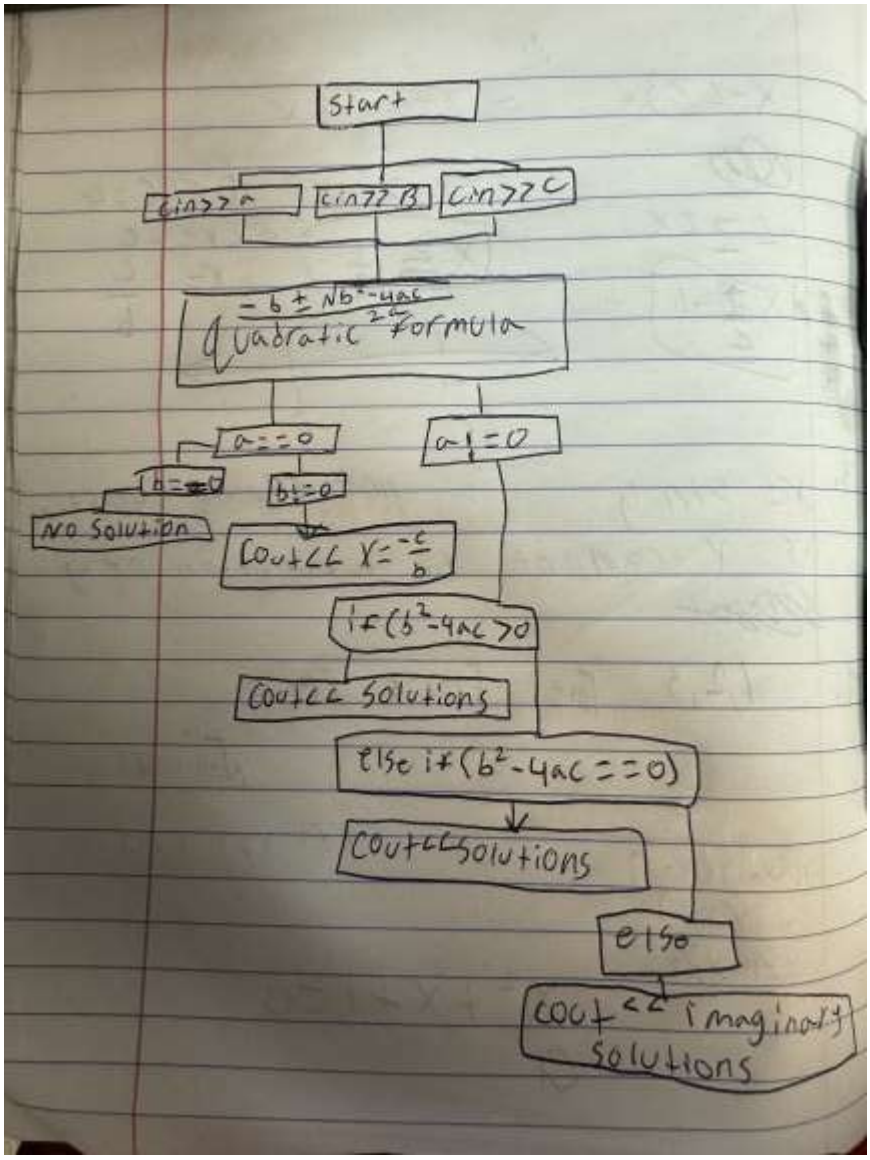
Following a common practice among electrical engineers, use the symbol *j* in your display to represent the square root of –1.

Document the program with the following sections:

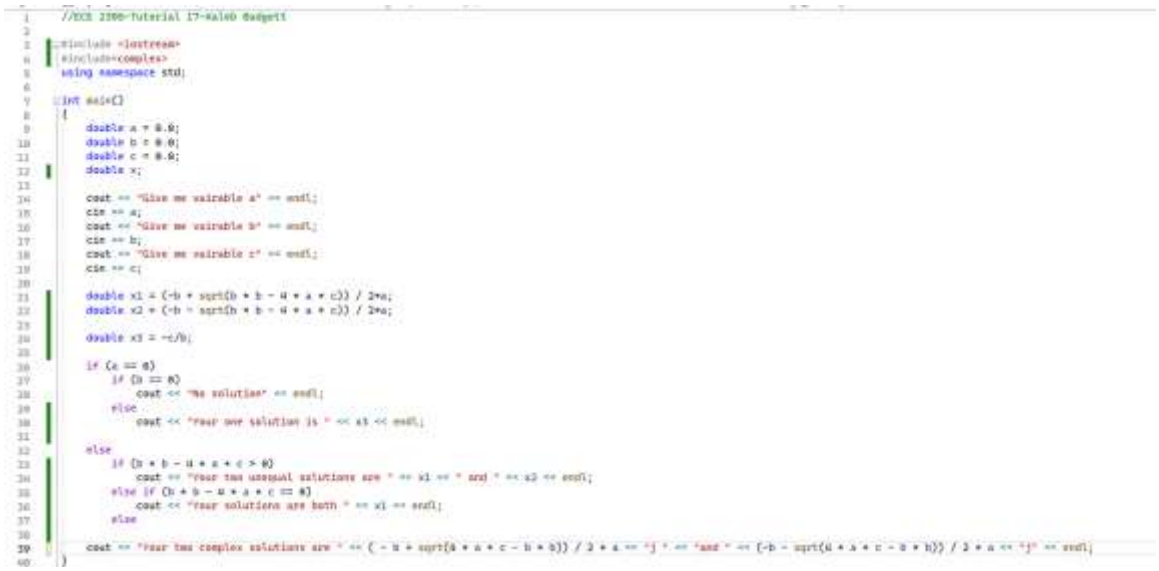
A. A brief written description of the purpose of the program including the inputs, the outputs and a description of the structure of the programming.

The point of this program is to print out the solutions to the quadratic equation with any inputs given by the user.

B. A flowchart including all of the equations for the various solutions.

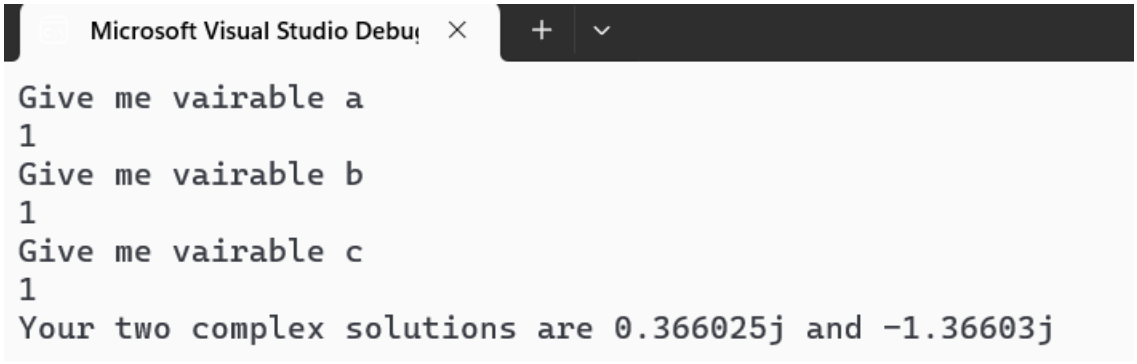


C. The code listing.



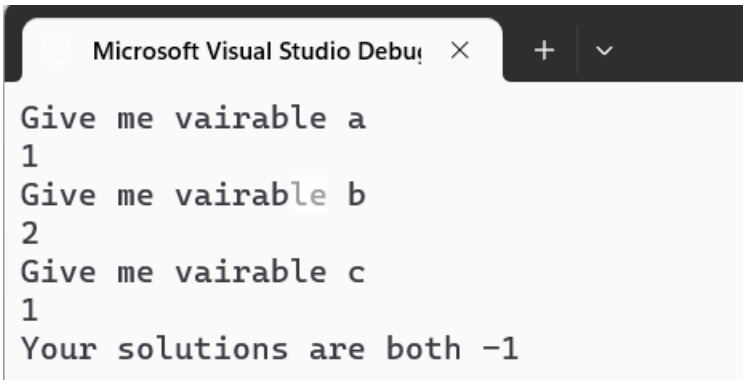
```
//ECE 2300-Tutorial 17-Kaleb Padgett

#include <iostream>
#include<complex>
using namespace std;

int main()
{
    double a = 0.0;
    double b = 0.0;
    double c = 0.0;
    double x;

    cout << "Give me vairable a" << endl;
    cin >> a;
    cout << "Give me vairable b" << endl;
    cin >> b;
    cout << "Give me vairable c" << endl;
    cin >> c;

    double x1 = (-b + sqrt(b * b - 4 * a * c)) / 2*a;
    double x2 = (-b - sqrt(b * b - 4 * a * c)) / 2*a;

    double x3 = -c/b;

    if (a == 0)
        if (b == 0)
            cout << "No solution" << endl;
        else
            cout << "Your one solution is " << x3 << endl;

    else
        if (b * b - 4 * a * c > 0)
            cout << "Your two unequal solutions are " << x1 << " and " << x2 << endl;
        else if (b * b - 4 * a * c == 0)
            cout << "Your solutions are both " << x1 << endl;
        else

    cout << "Your two complex solutions are " << ( - 4 * sqrt(4 * a * c - b * b)) / 2 * a << "j " << "and " << (-b - sqrt(4 * a * c - 4 * b)) / 2 * a << "j" << endl;
}
```

D. Screen capture images showing the operation of the program for each of the possible solutions.

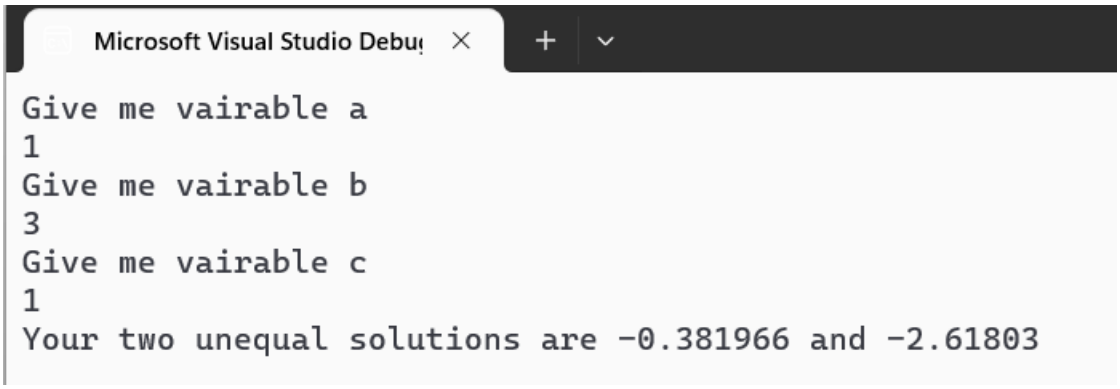


```
Microsoft Visual Studio Debu
Give me vairable a
1
Give me vairable b
1
Give me vairable c
1
Your two complex solutions are 0.366025j and -1.36603j
```

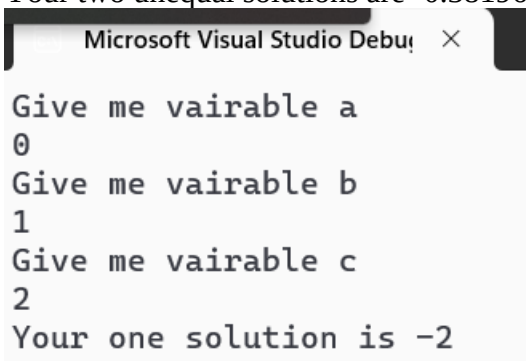
Give me vairable a
1
Give me vairable b
1
Give me vairable c
1
Your two complex solutions are 0.366025j and -1.36603j



Give me vairable a
1
Give me vairable b
2
Give me vairable c
1
Your solutions are both -1

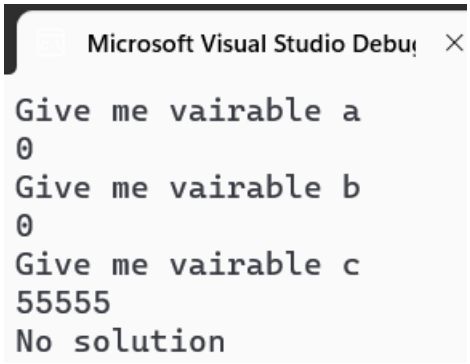


Give me vairable a
1
Give me vairable b
3
Give me vairable c
1
Your two unequal solutions are -0.381966 and -2.61803



Give me vairable a

0
Give me vairable b
1
Give me vairable c
2
Your one solution is -2



Give me vairable a
0
Give me vairable b
0
Give me vairable c
55555
No solution

Submit the documentation in a *PDF* document on *Blackboard*.