

## D1265154 曾郁珊 Mina C programming assignment 2 report

### Challenges Faced:

1. User Input Validation: One of the initial challenges was to ensure valid user input for the coefficients (a, b, and c). Invalid inputs like non-integer values or a zero 'a' coefficient could result in unexpected program behavior.

Solution: Input validation was added to check for valid integer inputs. If a coefficient 'a' is entered as zero, the program handles it as a non-quadratic equation.

2. Handling Different Coefficient Values: Determining how to display the equation with varying coefficient values while maintaining readability was a challenge.

Solution: The program employs conditional statements to format the equation display according to the values of 'a' and 'b'. This includes handling cases where 'a' is 1, -1, or not equal to 0, and similarly for 'b'.

3. Discriminant Calculation: The calculation of the discriminant ( $b^2 - 4 * a * c$ ) to determine the type of roots (real, multiple real, or complex) was a critical part of the program.

Solution: The program calculates the discriminant and utilizes conditional statements to distinguish between the root types.

4. Handling Complex Roots: Dealing with complex roots, including the formatting and display of complex numbers, was a complex task.

Solution: The program uses conditional statements to properly format and display complex roots. It handles cases where 'b' is zero separately.

5. Accuracy of Real Roots: Ensuring the accuracy of real roots, especially in the presence of very small coefficients, was challenging.

Solution: To maintain accuracy, a small epsilon value ( $1e-8$ ) was added when displaying real roots to account for floating-point precision limitations.

6. Complex Number Handling: Dealing with complex numbers required careful

consideration, especially when calculating square roots.

Solution: The program utilizes the 'sqrt' function for calculating square roots and follows proper formatting for complex numbers.

Conclusion:

The program successfully addresses the challenges encountered during development, providing solutions for quadratic equations with real, multiple real, and complex roots. Proper input validation, careful coefficient handling, and discriminant calculation were implemented to ensure the accuracy and readability of results. This program serves as a useful tool for solving quadratic equations and can be further improved by adding additional error handling and advanced mathematical features.