

Awkash 1

Advanced Calculator

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**National University of Computer & Emerging
Sciences
Karachi Campus**



Advanced Calculator

**Project Report
Programming Fundamentals
Section: BCS1-F**

Group Members

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Abstract:

This project is a **Advanced Calculator** made in C language. It helps us to make our concept good in programming, it covers from basic arithmetic calculations to Matrix, roots, and history track with time etc. The system has Menu for each program like: Trigonometric, Unit conversion and the whole the control will remain in that menu until and unless user do not ask for exit. Since this was our first big console based C project, we practiced using functions, file handling, error handling, and creating a user friendly menu system. Overall, this project helped us to understand how different C concepts come together in one working concept file.

Our console based calculator will never overflow because it is designed with proper ERROR handling.

1. Introduction:

We have developed a console based **Advanced Calculator** using the **C Programming Language**. The system is to do multiple calculations at one place with user friendly environment, including Menu for different major calculations. This System includes Arithmetic, Scientific, Matrix, Quadratic equation solver, Unit conversion, show HISTORY. We understand from this how bigger programs are structured using functions, file handling, and give proper user desire. In a case if user enters a wrong input then it will warn it that you entered wrong input and will never overflow. It has a separate text file that will automatically update and save all calculations done by user & will also show the date and time when user performed it, and this is the main thing that keeps our project different from others.

2. Objectives :

In today's time, people have to calculate many things at a single platform. Keeping track of past calculations, handling , menus control, making sure to stay in a specific mode, taking inputs and making sure of error handling messages. So we tried to do a mini-version of a advanced calculator to make calculation and store that at one place for future access.

- To build a small but User friendly calculator with advance features.
- To add or subtract multiple numbers many times in very easy way.
- To learn and apply file handling, arrays and nested loops
- To store data permanently using text files.
- To practice for big work using functions to make every part as function our work is becoming easy.

The idea was not to create fancy(GUI) But to see how these students' tasks can be handled through programming.

Project Specification:

Our Advanced Calculator includes these types of operations:

- **Basic Operations**
- **Scientific Functions**
- **Matrix Operations**
- **Quadratic Equation Solver**
- **Unit Conversion**
- **Calculation History (with backend text files)**
- **Showing History any time during code**
- **Error Handling**
- **User-Friendly Interface**

Main features in our System:

- Menu(along with Exit each mode option)
- System (cls) to provide a amazing display control
- Saving of all calculations in files with that TIME of execution performed.
- If file is closed & opened again then previous data will NOT loss.
- Keep track of infinite cases in calculation
- If user want to perform only matrix operation then control will remain their till the user wants to exit that mode.

Flow of Advanced Calculator:

Start___ Choose Mode(:Mentioned above)___Display inner menu___ Perform tasks
Data Saved___ display message for next operation___ Exit.

Problem Analysis:

Calculator usually handles many of the tasks at once. Some issues that we identified:

- Performing determinant without loop because it is of that type So we didn't use loop.
- Hard to handle error on each step (that increased size of our code)
- Display and manipulate all Menus with error handling.
- Handling infinite cases in trigonometric operations.

- To save data in text file with that corresponding calculation (eg. Addition, matrix, conversion, product etc)

Solution Design:

1. File Handling

- Calc_history.txt

2. Sub Menu(s)

- Each option has different options using nested switch statements.

3. Choice and execution system

When a user choose any mode:

- It goes according to choice (using switch)
- If it is a wrong choice it will display error
- Can use a menu infinite times.

4. History save and display method

- Every calculation saved with that time info and calculation mode.

Extra Features:

- **User can watch history any time he wants.**
- **User can see time of that operation performance.**
- **After a calculation it will display “Press any key...” then the above content will be hidden for user and the next content will be shown.**
- **User friendly Menu**

Implementation:

Language: C

Compiler/IDE: Code: Dev C++ / Visual studio (vs code)

All the information such as menu operations, sub menu info, and all other functions operations will save itself in text files so nothing gets lost when the program closes. We used loops and conditions to make a simple step-by-step menu that is easy for the user to follow. Each user type his/her choice, and it has separate functions so the program stays organized and easier to understand. Overall, the implementation is focused on keeping the code clean, dividing the work into small parts, and giving the user a smooth and simple experience.

Testing system (Output Screenshots):

- The welcome screen displays main menu and the user to interact and proceed accordingly. following are some outputs of my system:

Main Interface:

```
=====
                        Advanced Calculator
=====
1) Basic Arithmetic Operations.
2) Scientific Operations
3) Matrix Operations
4) Quadratic Equation Solver.
5) Units Conversion.
6) Watch Hitory
7) Exit.
-----
Enter choice: █
```


1.Sub menu after a choice (eg. Unit conversion)

```
=====
                        Unit Conversion
=====

1. Length Conversion
2. Temperature Conversion
3. Exit Unit Conversion Mode
-----
Choice : 1

=====
                        Length Converter
=====

2. Kilometers to Meters
3. Centimeters to Meters
4. Meters to Centimeters
5. Inches to Centimeters
6. Centimeters to Inches
7. Feet to Meters
8. Meters to Feet
9. Miles to Kilometers
10. Kilometers to Miles
11. Exit form Length mode
-----
Choice = █
```

Calculation Example:

```
=====
                        Trigonometric Operations
=====
1: sin
2: cos
3: tan
4: sec
5: cosec
6: cot
7: Exit trigonometric mode..
-----
Enter choice: 3

1... for degrees
2... for radians
choose 1 or 2: 1

Enter angle: 90
tan(90.00) is IFINITY
Press Enter to continue...|
```

```
=====
                        Trigonometric Operations
=====
1: sin
2: cos
3: tan
4: sec
5: cosec
6: cot
7: Exit trigonometric mode..
-----
Enter choice: 1

1... for degrees
2... for radians
choose 1 or 2: 1

Enter angle: 23
sin(23.00) is 0.39
Press Enter to continue...|
```

History Display:

```
=====
                          Advanced Calculator
=====
1) Basic Arithmetic Operations.
2) Scientific Operations
3) Matrix Operations
4) Quadratic Equation Solver.
5) Units Conversion.
6) Watch History
7) Exit.
-----
Enter choice: 6

===== Saved History =====
[2025-11-20 23:17:50] Addition: sum = 18.0000
[2025-11-21 13:12:52] Trigonometric: tan(90.00 deg) = INFINITY
[2025-11-21 13:14:00] Trigonometric: sin(23.00 deg) = 0.390731
===== End of History =====

Press Enter to continue...|
```

Some Matrix Manipulations:

```
=====
                        Matrices
=====
1. Addition
2. Subtraction
3. Multiplication
4. Determinant
5. Exit Matrix Mode
-----
Enter Choice : 3
Enter rows: 1
Enter columns: 2
Enter Matrix1:

Enter Row 1 elements:
Enter [1][1] element: 4

Enter [1][2] element: 5

Enter rows of other Matrix : 2
Enter columns of other Matrix: 2

Enter Matrix2:

Enter Row 1 elements:
Enter [1][1] element: 2

Enter [1][2] element: 3

Enter Row 2 elements:
Enter [2][1] element: 4

Enter [2][2] element: 5

Matrices Multiplication =
28 37

Press Enter to continue...

```

Conclusion:

The Advanced Calculator makes possible basic operations and advanced calculations at one application. work easier by organizing menu(s) ,sub menu, choices, error handling like infinite cases and wrong inputs and storing all calculation in text file at any instance. Building this project helped us to get real practice with file handling, use of functions, loops, multiple conditions, and some extra libraries.

- File handling
- math.h library
- time.h library
- Loops and conditional logic
- Stdlib.h, windows.h (for clear screen looks good in console)

Limitations

- No GUI based (Console-only)
- No advanced features like integration, derivation.

Future Improvements:

- Add a graphical user interface.
- Will try to reduce the length of code.
- Will add more functions (eg. Cubic eq. solver, derivative)

References:

- Let us c.
- geeksforgeeks.org
- class notes and online lectures (apna college, college wallah) and prior knowledge.