Math Olympiads

Arithmetic Expression Evaluator

User’s Manual

Version <1.0>

Revision History

Date	Version	Description	Author
<11/12/24>	<1.0>	<First version of manual written>	<Entire Team>

Table of Contents

1. Purpose 4
2. Introduction 4
3. Getting started 4
4. Advanced features 4
5. Troubleshooting 4
6. Example of uses 4
7. Glossary 5
8. FAQ 5

User’s Manual

1. Purpose

The purpose of this document is to demonstrate how to use the Arithmetic Expression Evaluator. This User’s Manual covers the set-up and usage of the software.

2. Introduction

The Arithmetic Expression Evaluator is a standalone command line program that can interpret and evaluate mathematical expressions inputted by the user. Expressions containing addition, subtraction, multiplication, division, exponents, and parentheses are supported. Evaluation follows standard operator precedence. Refer to Section 8 for a full description of the supported operators.

The software can be used through a command line interface. Simply execute the provided executable by typing in its file path.

To compile the software manually, ensure you have the requirements to compile a c++ program. In the terminal, move to the directory containing the provided make file and execute “make setup” then “make”. This should result in an executable in the bin folder.

3. Getting started

The program will prompt to to input an expression once it starts:

“Please input your expression:”

From here, you can type in a mathematical expression into the terminal. In your expression, you may use any valid integer along with the following characters to represent operators:

- +
- -
- *
- /
- ^

Parentheses () may also be used to group expressions together.
Please refer to Section 6 for examples of supported expressions, and refer to Section 8 for more details. Once you are ready, you may press Enter/Return to send it to the calculator

For example, you may enter the following expression:

“(1 + 2) * 2”

Upon entering your expression, you should receive a result promptly. If an unsupported expression was inputted, an error may appear and you will be prompted to enter a different expression, please refer to Section 5 for more details.

“Result: 6”
“Do you want to input another expression? (Y/n):”

After receiving your result, you may input another expression.
Enter Y, y, or enter to continue to the input screen.
Otherwise, you may enter N or n to exit the program.

4. Advanced features

This calculator supports certain additional features when writing expressions.

- Parentheses may be used to group terms together. Nested parentheses are also supported, and will correctly follow the order of operations.
- For extra readability, alternate brackets [] and {} may be used to group terms as well.
- Terms can be optionally separated with spaces if desired. The calculator will properly ignore whitespaces.

5. Troubleshooting

See Section 8 FAQ "**Why am I getting _____ error?**"

6. Examples

Use this section as a reference for the different kinds of problems that the program is able to evaluate.
These can also be used as examples of how your equations should be formatted, minimizing any issues the evaluator may experience.

Single operator expressions:

- 1 + 1
- 2 - 2
- 3 * 3
- 4 / 4
- 5^(5)

Multi operator expressions (these will be solved following PEMDAS):

- 1 + 4 / 2
- 3^3 - 0 * 8
- 1 + 4 * 0 / 9^4 - 5

Parenthesis and more complex expressions:

- (1 + 5 - 3) * 10
- 7 * 2 / (8 - 1)
- (4 * (7 + 3)) / 5
- 2^(3 + 3) - (1 * 4 / 2)

7. Glossary of terms

- Terminal: In this document, terminal refers to any compatible command-line interface. Depending on your platform you may have a different one provided. Examples include, but are not limited to, the following: Command Prompt, Windows PowerShell, macOS Terminal.

8. FAQ

How do I input an expression?

To input a calculation, simply type your mathematical expression using numbers, operators, and parentheses as needed. For example, you can enter:

3 + 5 * (2 - 4)

After typing your expression, press Enter to see the result or an error message if your input is invalid. The calculator will evaluate the expression and display the result.

What operators are supported by the calculator?

The calculator supports the following operators:

- Addition (+)
- Subtraction (-)
- Multiplication (*)
- Division (/)
- Exponential (^)

Can I enter spaces in my input?

Yes, you may enter spaces in your input.

What is the maximum length of an expression I can input?

There is no maximum expression length.

Does the calculator support decimal numbers?

No, the calculator does not support decimal numbers.

How can I exit the calculator?

You may enter N or n when prompted to enter another expression.

Pressing Ctrl+C will exit the program at any point as well.

Why am I getting _____ error?

"Operator in invalid position"

- This error means that the expression contains an operator in an invalid position. Operators must appear between digits or parentheses in the expression.

"Empty parentheses or invalid use of ')'"

- Your expression contains "()" or the first parentheses in the expression is a closing parenthesis.

"Invalid character in input"

- Your expression contains an invalid character. Your expression must contain only digits, parentheses, and valid operators (see "**What operators are supported by the calculator?**").

"Expression ends with an operator"

- Your expression ends with an operator, which is invalid. Operators must appear between digits or parentheses in the expression.

"Invalid expression"

- Your expression is invalid. Enter another expression and try again.