Group 22

Arithmetic Parser

User's Manual

Version 1.3

Revision History

Date	Version	Description	Author
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11/20/24	1.1	Edit of Sections 3 & 8	Janna Dungao
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Test Case

1. Purpose

The user manual for our *Arithmetic Parser* is an easy-to-understand guide on how to use the software and includes the following sections: Introduction, Getting Started, Advanced Features, Troubleshooting, Examples, Glossary Terms, and FAQ.

2. Introduction

The software for our *Arithmetic Parser* was created in C++ using the Qt Framework. The purpose was to utilize the existing Qt Framework to create our project and create essentially a basic scientific calculator. Its features include the + (addition), - (subtraction), */x (multiplication), ÷ / (division), % (modulo), and **/^ (exponentiation) operators. Additional features we implemented that were not specifically required for this project include trig functions (sin, cos, tan), natural log (ln), logarithm (log), reciprocal (1/x), squared (number xx 2), and more! Decimal numbers are also functional. Additionally, pi and e are available for use.

In order to use this software, users will be provided with an executable file that can simply be downloaded, clicked, and run on Linux/Windows and can be downloaded and run using wine on MacOS.

3. Getting started

Computing simple arithmetic expressions:

1. *For Mac Users* - Download wine here: https://gitlab.winehq.org/wine/wine/-/wikis/Download
2. *For Mac Users* - Run "wine calculator.exe" in terminal.
3. *For Windows/Linux" – Click calculator.exe file to run.
4. Enter arithmetic expression by clicking the corresponding buttons OR for convenience by entering an expression via your keyboard.
    a. For example, if you would like to calculate 2 + 2, simply click '2', then '+', and then '2'.
    b. For example, you could type "2*2" in the expression line.
5. Once the expression completely entered, click the '=' to complete the computation.
6. The result of the expression will be displayed on the screen.
7. To clear computed or non-computed expressions, press the 'c' button.

Using the advanced operator buttons:

1. To use parenthesis, click '(', enter the expression inside the parenthesis, and then enter ')'. Be sure to enter the correct amount of closing parenthesis to not have an error as a result.
2. To compute an exponent of a number, 3 to the fourth power for example, click '3', 'x', 'x', '4', and then '='.
3. To compute the modulo (%), or remainder, 3 mod 4 for example, click '3', '%', '4', and then '='.
4. To utilize the trig functions, click 'sin', 'cos', or 'tan', then the number the user would like to have inside the parenthesis of the trig function, and then finally the closing parenthesis ')'.
5. To use the natural log (ln) or logarithm (log), click 'ln' or 'log' and then enter the expression needed inside the parenthesis, then ')', and then '='.
6. To use the reciprocal button (1/x), press the button and the number in place of x.
7. To compute the square of a number you may do one of the following:
    a. Enter the number, then click 'x^2' and then '='.
    b. Enter the number, then click 'x', 'x', and then '='.
8. To compute the absolute value of a number, click 'abs', then the number you would like the absolute value of, and then '='. To use in a longer expression, be sure to add a ')' after the number.

How to interpret the results:

1. Keep operator precedence in mind as the arithmetic parser utilizes PEMDAS rules and will function as a scientific calculator.

4. Advanced features

1. Unclosed parenthesis will be automatically closed by the parser on the backend of the application.
2. Additional mathematical functions (ln, log, abs, e^x) and mathematical constants (e, pi) are available to the user.
3. Division by zero and infinite results are handled gracefully inside the calculator.
4. Clicking the output bar will remove characters one-by-one, allowing the user to fix input mistakes in an easy manner.
5. History can be viewed by clicking the button with the clock icon in the top-left corner of the UI.
6. Sign can be safely changed between positive/negative via the +/- button.

5. Troubleshooting

Issue: Incorrect result/computation
Solution: Double check that parenthesis are entered correctly and that the parser is cleared with the 'c' button before new expressions are entered.

Issue: Mismatched Input Type
Solution: There are two kinds of input types that this calculator can evaluate, However, you cannot mix characters typed directly into the expression with button of the calculator.
Ex) 2x2**2 will not compute because "x" is a button operator and "**" is a type in operator

Issue: Executable not opening correctly on Mac.
Solution: Make sure you have wine properly installed. If using the wine command in terminal doesn't work, try double clicking directly on the executable file.

6. Examples

After pressing the correct buttons, use the equal sign (=) button to evaluate the expression. The evaluation will be displayed where the equation was previously inputted and displayed.

Ex. (5+4)/4
Click buttons in order: [(), 5, 4, (), /, 4] Evaluation
will display 2.25.

Ex. 5+(0÷0) "5+(0÷0)"
Evaluation will display Undefined.

7. Glossary of terms

- Modulo (%) – Computes the remainder of the number preceding the '%' divided by the number after the '%'.
- Trig functions – refers to the sine, cosine, and tangent functions.
- ln – computing the natural logarithm base of a number.

8. FAQ

Q: *"*Can I use the calculator offline?*"*

- A: Yes, the calculator is fully functional offline.

Q: *"*I accidentally cleared my result, but I forgot what the expression was."

- A: We have added a History Button located in the top left corner of the calculator. This button opens a list of all recently entered expressions and their results. You can find your previous calculations and reapply them if needed.

Q: *"*Can I customize the color scheme of the calculator??*"*

- A: No, you cannot. We do not have options to change the appearance of the calculator currently. Q: *"*I accidentally pressed the wrong button. What can I do?*"*
- A: No worries, you can either press the backspace key if you are directly typing in your expression to or you can press the backspace button on the screen if you are entering the expression with each button press. You cannot use the backspace button when typing in your expression and vice versa.

Q: "Can the parser handle very large numbers or extremely small decimal values?"

- A: Yes. The parser can and should handle a wide range of number sizes and may display very large or very small values using scientific notation. If you encounter performance issues, consider simplifying the expression or breaking it into smaller parts.

Q: "Do I need to worry about uppercase vs. lowercase letters for functions like 'sin', 'cos', or 'tan'?"

- A: Yes, the parser is case-sensitive.