Late Nighterz

Kool Kalculator

User's Manual

Version 1.0

Revision History

Date	Version	Description	Author
11/30/23	1.0	Started and finished the user manual document	David Donaldson, Ian Collins, Noah O'Grady, Ky Jost, Humzeh Al-Tamari

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User Manual

1. Purpose

This user manual guides the user through Kool Kalculator, a C++ program designed to solve various equations.

2. Introduction

Kool Kalculator is a calculator program that solves equations using PEMDAS order of operations. Kool Kalculator contains an order of operations solver and robust error handling, in which it informs the user of various errors in their equation. These errors include arithmetic errors, like dividing by zero or taking the square root of an exponent, and syntax errors such as unmatched parenthesis, missing operators, or invalid characters.

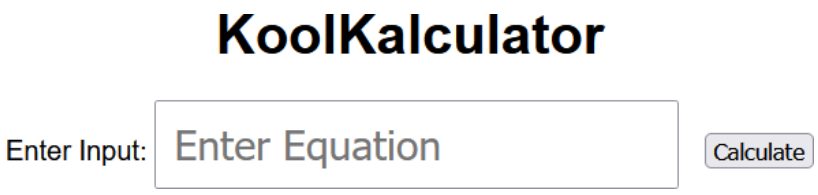
To install Kool Kalculator, first install the program Node.js. Once you have that, download the folder relevant to your operating system from this link. Kool Kalculator works in both Linux and Windows. Once the folder is downloaded, navigate to the folder in your terminal. From there, run `npm install`. Once this is done, run `node server.js`. This runs the server that Kool Kalculator operates off. The server is local, so once everything is downloaded and installed, you will not need internet. Next, click on the link.

```
k429j715@cycle2:~/Classwork/348_Lab/project$ node server.js
Server is running at http://localhost:3000
```

This is done by Ctrl+Click on the link 'http://localhost:3000'. This takes you to the Kool Kalculator webpage. Once you've arrived at the webpage, you can start solving problems!

3. Getting started

Enter Expressions:
Upon opening the HTML file, the user will be prompted with a webpage looking like this:



The user enters the input (with no whitespaces) in the box labeled "Enter Equation". Upon entering the equation, the user either clicks "Calculate" or presses the enter button.

Use Operators/Functions:

Kool Kalculator accepts the following operators/functions:

- Addition Operator +
- Subtraction Operator -
- Multiplication Operator *
- Division Operator /
- Modulus Operator %
- Exponential ^

- Parenthesis (and)

These operators/functions, along with the digits 0-9, are Kool Kalculator's valid characters. Characters that are not one of these operators or a digit will result in an error.

Interpret Results:

Upon calculation, the program returns the answer below the box. If there are no errors, the webpage will display "Result: 'ANSWER'" (with the answer in place of 'ANSWER'). If there are errors, the webpage will display "Result: 'ERROR'" (with the relevant error in place of 'ERROR'). If there are more than one errors with the expression, each error will be displayed on its own line.

4. Advanced features

Kool Kalculator runs off a JavaScript file server. The file server runs on the local machine and provides an easy-to-use webpage that parses expressions. An explanation on how to set up the file server can be found in Section 2: Introduction of this manual. The webpage is coded in HTML. It uses JavaScript to create a file server that sends the expression to a C++ program. The C++ program parses the expression, solves it or finds its errors, and returns it to the server. The result is then sent back to the webpage, where it is displayed for the user to see.

5. Troubleshooting

Troubleshooting Options:

- **Missing Dependencies:** User must have Node.js installed on their computer. To fix missing dependencies run `npm install` from the terminal after navigating to the application folder
- **The file server is running, but the webpage isn't working:** ensure the webpage and the file server are on the same system. If you are running the file server on a remote server and the webpage on your personal computer, they will be on different networks and won't connect.

6. Examples

Valid Expressions:

- 4+5*3 Result: 19
- 3^2-8/2+6 Result: 11
- ((5-3)*8)/4 Result: 4
- (3-1)^2 Result: 4
- 7%(2+3) Result: 2

Invalid Expressions:

- (4-5+2 Result: Mismatch Parentheses Error
- 3-4)(5*8 Result: Missing Operator and Mismatch Parentheses Error
- (4+6)5 Result: Missing Operator Error
- 9+*7 Result: Repeated Operator Error
- 8-7/0 Result: Divide by Zero Error
- (9%8)/(4-2^2) Result: Divide by Zero Error
- (3-4)^(½) Result: Root of a Negative Error
- 9+4&5 Result: Invalid Character Error

7. Glossary of terms

Definitions:

- **Mathematic Problem:**
    - String of numbers, operators, and parentheses that form an expression that can be reduced to a final answer through mathematics.
- **Mathematic Operator:**
    - Symbol used for specifying relationship and transformation of numbers

- **Order of Operations:**
    - The specific order in which arithmetic statements are solved given their operation and position.
- **Arithmetic:**
    - Mathematical operations that perform work upon real numbers of the real number line. One of the oldest forms of math.
- **Algebra:**
    - The solving of mathematical problems that contain one or more variables.
- **Addition (ADD):**
    - Operation that finds the sum of two numbers.
- **Subtraction (SUB)**:
    - Operation that finds the difference between two numbers.
- **Multiplication (MUL)**:
    - Operation that calculates the product of two numbers.
- **Division (DIV)**:
    - Operation that divides one number by another to find the quotient.
- **Exponentiation (POW)**:
    - Operation that raises a base number to a specified power.
- **Parentheses (BRACKETS)**:
    - Symbols "(" and ")" used to group expressions and control the order of operations.
- **Syntax Error**:
    - An error that occurs when the input expression is not formatted correctly or violates the rules of the calculator's syntax.
- **Uncalculatable Error**:
    - An error that occurs when the calculator cannot perform a calculation, often due to dividing by zero or taking the square root of a negative number.

Acronyms:

- **PEMDAS:**
    - Parenthesis, Exponible, Multiplication, Division, Addition, Subtraction
- **GUI:**
    - Graphical User Interface

8. FAQ

Can I run this program on my personal computer?

Yes. The program can be run on any Windows or Linux computer that has Node.js downloaded.

Do I need an internet connection to run this program?

No. The server and webpage both run from your computer. When you run the server using Node.js, you can run the program without an internet connection.

Does this program do algebra?

No. This program parses arithmetic expressions and determines errors. It will not solve algebraic problems.