

User Documentation for the Calculator

Introduction

This calculator is designed for simple and quick execution of basic mathematical operations such as addition, subtraction, multiplication, division, as well as advanced operations like n-th roots, factorials, n-th powers, and logarithms. You can use it for everyday calculations as well as for solving more complex mathematical problems.

System Requirements

The application is compatible with the Ubuntu operating system and requires Python 3 and the tkinter library to ensure the functionality of the graphical user interface (GUI) for the calculator.

Requirements:

- **Operating System:** Ubuntu (with distributions like Ubuntu 24.04 and newer).
- **Python Version:** Python 3.12 or newer.
- **Dependencies:**
 - **Python 3:** The main programming language for both the calculator and StdDev.
 - **tkinter:** A library for creating the graphical user interface (GUI) for the calculator.

If Python 3 or tkinter is not installed, the installation script will take care of installing them automatically.

Installation of the Calculator

If you want to install the calculator, use the following `install.sh` script, which will install the calculator on your system.

Preparing and Running the Installation Script

In the terminal, navigate to the directory where the `install.sh` script is located and run the following commands:

```
chmod +x install.sh
```

```
./install.sh
```

What this script does:

- Installs Python 3 and tkinter if they are not already installed (tkinter is required for the calculator's GUI).
- Checks the correct location of the files and searches for the `src` or `repo/src` directory for the calculator files.
- Creates the installation directory `~/Calculator`.
- Copies the necessary files for the calculator into the correct directory.
- Sets the executable permissions for the scripts and shortcuts for the calculator (including the uninstallation script).
- Creates desktop shortcut for easy launching of the calculator (GUI).

After the installation is complete:

- You can launch it using the desktop shortcut or from the terminal:

```
cd ~/Calculator && make run
```

StdDev Program (Terminal):

In the terminal, navigate to the directory where the `install_stddev.sh` script is located and run the following commands:

```
chmod +x install_stddev.sh
```

```
./install_stddev.sh
```

Launch it using the terminal:

```
cd ~/StdDev && python3 stddev.py
```

Uninstallation

If you want to uninstall the calculator or the StdDev program, use the `uninstall.sh` script.

Running the Uninstallation Script

In the terminal, navigate to the directory where the `uninstall.sh` script is located and run the command:

```
./uninstall.sh
```

What the `uninstall.sh` script does:

- Removes the calculator directory `~/Calculator` and the StdDev program directory `~/StdDev`.
- Removes the desktop shortcuts.

Basic Functions

The calculator offers all common arithmetic operations:

- **Addition (+):** Add two or more numbers.
 - **Subtraction (-):** Subtract one number from another.
 - **Multiplication (×):** Multiply two or more numbers.
 - **Division (÷):** Divide one number by another (an error will appear when dividing by zero).
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Advanced Functions

In addition to the basic functions, the calculator also supports several advanced mathematical operations:

1. N-th Root

To calculate the n-th root of a number, follow this procedure:

Example: You want to calculate the cube root (3rd root) of -27.

On the calculator, enter:

$\sqrt[3]{-27}$

This will give the result **-3**.

Important note:

The n-th root is defined for both positive and negative numbers when **n** is odd. For example:

- The 3rd root of -27 is **-3**.
- The square root of -32 is **-2**.

However, if **n** is negative, for example, calculating $\sqrt[n]{-27, -3}$ This calculation is invalid, and the calculator will return an error. A negative exponent for an n-th root is not defined in standard real numbers and will result in an error message.

2. Factorial

The factorial is an operation used in combinatorics and statistics. You can calculate it as follows:

Example: The factorial of the number 5, which is **5!** = $5 \times 4 \times 3 \times 2 \times 1 = 120$.

On the calculator, enter:

5!

The calculator will return the result **120**.

Important note:

The factorial can only be calculated for non-negative integers. If you enter a negative number or a decimal number, the calculator will return an error.

3. N-th Power

To calculate the n-th power of a number, enter the base number and the exponent:

Example: To calculate 3^4 (three raised to the power of four):

On the calculator, enter:

3^(4)

The calculator will return the result **81**.

Important note:

Exponents for n-th powers can only be positive numbers or zero. If you enter a negative exponent, the calculator will return an error, as n-th powers with negative exponents are not allowed. This applies to all n-th powers (for example, $3-23^{-2}$ is not valid).

4. Logarithm

The calculator supports logarithmic operations, specifically the logarithm with base 10.

Example: The logarithm of the number 1000 with base 10.

On the calculator, enter:

$\log(1000)$

The calculator will return the result **3**, because the logarithm of 1000 is 3.

User Interface

- **Keys for Basic Operations:** The calculator includes buttons for all basic arithmetic operations, which are clearly labeled.
 - **Key for N-th Root:** This function is accessible via a button labeled as $\sqrt{}$ and its syntax is $\sqrt[n]{x}$ x is the number and n is the value for the n-th root.
 - **Key for Factorial:** This function is available through a button labeled as !.
 - **Key for Logarithm:** The button for calculating the logarithm with base 10 is labeled as log.
 - **Help Button:** For quick help and information on using the calculator, you can press the button labeled ?. The help button will open a window with detailed information about the calculator's functions, including guides for both basic and advanced operations. It will also assist with common error messages and their solutions.
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Error Messages

- **Division by Zero:** If you attempt to divide by zero, the calculator will display an error message like:
Error: Division by Zero.
- **Type Error:** If you enter an invalid input (e.g., a negative number for a root or a factorial of a decimal number), the calculator will show an error message:
Error: Invalid Input.
- **Error**
- **ValueError:** This type of error usually occurs when an invalid mathematical input is provided for a certain operation. For example:
 - Attempting to calculate the root of a negative number (if the calculator does not support complex numbers).

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