



Calculator

Using Bash Script

Introduction

Welcome to our presentation on creating an advanced calculator using Bash scripting. In this presentation, we'll walk through the code and functionalities of our calculator script.

Overview of the script

The script provides a command-line interface for performing various mathematical operations. Users can choose from a menu of operations, including basic arithmetic, logarithms, and trigonometric functions.

```
#!/bin/bash
echo "Calculator"
echo "1. Addition"
echo "2. Subtraction"
echo "3. Multiplication"
echo "4. Division"
echo "5. Square"
echo "6. Cube"
echo "7. Square Root"
echo "8. Cubic Root"
echo "9. Logarithm"
echo "10. Sine"
echo "11. Cosine"
echo "12. Tangent"
echo -n "Enter your choice: "
read choice

echo -n "Enter number: "
read num1

to_radians() {
    echo "scale=10; $1 * (3.14159265358979323846264338327950288419716939937510 / 180)" | bc -l
}

case $choice in
    1) echo -n "Enter second number: "
        read num2
        result=$(( num1 + num2 )) ;;
    2) echo -n "Enter second number: "
        read num2
        result=$(( num1 - num2 )) ;;
    3) echo -n "Enter second number: "
        read num2
        result=$(( num1 * num2 )) ;;
    4) echo -n "Enter second number: "
        read num2
        result=$(awk "BEGIN {printf \"%.2f\\\", $num1 / $num2}") ;;
    5) result=$(( num1 * num1 )) ;;
    6) result=$(( num1 * num1 * num1 )) ;;
    7) result=$(awk "BEGIN {printf \"%.2f\\\", sqrt($num1)}") ;;
    8) result=$(awk "BEGIN {printf \"%.3f\\\", $num1^(1/3)}") ;;
    9) echo -n "Enter base (default: 10): "
        read base
        base=${base:-10}
        result=$(awk "BEGIN {printf \"%.2f\\\", log($num1)/log($base)}") ;;
    10) result=$(echo "s$(to_radians $num1)" | bc -l) ;;
    11) result=$(echo "c$(to_radians $num1)" | bc -l) ;;
    12) result=$(echo "scale=4; s$(to_radians $num1)/c$(to_radians $num1)" | bc -l) ;;
    *) echo "Invalid choice"
        exit 1 ;;
esac

echo "Result: $result"
```

Let's break down the elements in the script

- ❑ **case**: Control statement that performs different actions based on the value of an expression. It is often used with `esac`, which marks the end of the case block.
- ❑ **awk**: A powerful programming language for pattern scanning and processing. In this script, it's used to perform arithmetic operations or more complex computations.
- ❑ **BEGIN**: To initialize some variables, set the output format, or print some initial information.
- ❑ **log**: A mathematical function that calculates the natural logarithm of a given expression.
- ❑ **bc**: An arbitrary precision calculator language. It's used in this script for more advanced mathematical calculations.
- ❑ **scale**: A variable used in `bc` to define the number of decimal places used in division and other operations.
- ❑ **to_radians()**: This function takes an angle in degrees as input and converts it to radians

User Interface

Users are presented with a menu displaying different operations. They can select an operation by entering the corresponding number.

```
cashmahmood@CashMahmood:~/Project$ nano calculator.sh
cashmahmood@CashMahmood:~/Project$ chmod +x calculator.sh
cashmahmood@CashMahmood:~/Project$ ./calculator.sh
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 1
```

Basic Arithmetic

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 1
Enter number: 10
Enter second number: 20
Result: 30
```

Addition

```
1) echo -n "Enter second number: "
read num2
result=$(( num1 + num2 )) ;;
```

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 2
Enter number: 20
Enter second number: 10
Result: 10
```

Subtraction

```
2) echo -n "Enter second number: "
read num2
result=$(( num1 - num2 )) ;;
```

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 3
Enter number: 10
Enter second number: 15
Result: 150
```

Multiplication

```
3) echo -n "Enter second number: "
read num2
result=$(( num1 * num2 )) ;;
```

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 4
Enter number: 50
Enter second number: 10
Result: 5.00
```

Division

```
4) echo -n "Enter second number: "
read num2
result=$(awk "BEGIN {printf \"%.2f\\n\", $num1 / $num2}"); ;;
```

The script supports addition, subtraction, multiplication, and division. Users input two numbers for these operations, and the script computes the result.

Exponentiation and Roots

Users can calculate squares, cubes, square roots, and cubic roots of a single number.

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 5
Enter number: 6
Result: 36
```

Square

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 6
Enter number: 5
Result: 125
```

Cube

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 7
Enter number: 36
Result: 6.00
```

Square Root

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 8
Enter number: 125
Result: 5.000
```

Cubic Root

```
5) result=$(( num1 * num1 )) ;;
6) result=$(( num1 * num1 * num1 )) ;;
7) result=$(awk "BEGIN {printf \"%.2f\\\", sqrt($num1)}") ;;
8) result=$(awk "BEGIN {printf \"%.3f\\\", $num1^(1/3)}") ;;
```

Logarithms

The script computes the logarithm of a number with a specified base.

```
Calculator
1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent
Enter your choice: 9
Enter number: 10
Enter base (default: 10): 10
Result: 1.00
```

Logarithm

```
9) echo -n "Enter base (default: 10): "
read base
base=${base:-10}
result=$(awk "BEGIN {printf \"%.2f\\n\", log($num1)/log($base)}") ;;
```


Trigonometric Functions

Sine, cosine, and tangent functions are supported. Angles are expected in degrees and converted to radians for computation.

Advanced Calculator

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent

Enter your choice: 10

Enter number: 90

Result: .9999999999999999838

Sin

Advanced Calculator

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent

Enter your choice: 11

Enter number: 90

Result: .00000000179489661923

Cos

Advanced Calculator

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent

Enter your choice: 12

Enter number: 45

Result: .9998

Tan

```
10) result=$(echo "s($(to_radians $num1))" | bc -l) ;;
11) result=$(echo "c($(to_radians $num1))" | bc -l) ;;
12) result=$(echo "scale=4; s($(to_radians $num1))/c($(to_radians $num1))" | bc -l) ;;
```

Advanced Calculator

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Square
6. Cube
7. Square Root
8. Cubic Root
9. Logarithm
10. Sine
11. Cosine
12. Tangent

Enter your choice: 13

Enter number: 21

Invalid choice

Out of range

Conclusion

Our Bash script provides a calculator with a wide range of mathematical functionalities.

It demonstrates the flexibility of scripting languages for solving computational tasks.

Thank You

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