"SCIENTIFIC CALCULATOR"

A MINI- PROJECT REPORT ON

Submitted in partial fulfillment of the requirements

For the degree of

Bachelor of Engineering

In

Information Technology

by

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(2020)

Ramrao Adik Institute of Technology

(Affiliated to the University of Mumbai)
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CERTIFICATE

This is to certify that,Mini Project entitled

" Scientific Calculator "

is a bonafide work done by

Salonee Powar
Shweta Kadam
Sonali Malage

and is submitted in the partial fulfillment of the requirement for the
degree of

Bachelorof Engineering
in
Information Technology
to the
University of Mumbai

Supervisor
Prof.Nilima M.Dongre

Project Guide   Head of the department

Nilima Dongre   Dr. Ashish Jadhav

Ramrao Adik Institute of Technology

Certificate of Approval by Examiners

This Mini Project report entitled " Scientific Calculator " is a bonafide work done by Salonee Powar, Shweta Kadam and Sonali Malage under the supervision of Prof.Nilima Dongre approved for the award of Bacheor Degree in Information Technology, University of Mumbai.

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DECLARATION

   We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Name and Roll No. of Students   **Signature**

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ACKNOWLEDGEMENT

The project "SCIENTIFIC CALCULATOR" is creative work of many minds. A proper synchronization between individual is must for any project to be completed successfully. One cannot imagine the power of the force that guides us all and neither can we succeed without acknowledging it. We take this opportunity to express my profound gratitude and deep regards to our Guide **Nilima Dongre**, Department of the Information Technology Engineering for her or her exemplary guidance, monitoring and constant encouragement throughout the completion of this mini project.

We would like to express our gratitude to **Dr. Ashish Jadhav,** Head of the department, Information Technology Engineering for encouraging and inspiring us to carry out the project in the department lab. We take this privilege to express my sincere thanksare thankful to **Dr. Mukesh D. Patil, Principal RAIT,** for his constant support and motivation.

We also would like to thank all the staff members Department of the Information Technology Engineering for providing us with the required facilities and support towards the completion of the project.

Last but not the least we are thankful to our parents and friends for their constant Inspiration, encouragement and well wishes by which we have made a challenging project.

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PREFACE

We take great opportunity to present this Mini Project report on "**SCIENTIFIC CALCULATOR"** and put before readers some useful information regarding our project.

We have made sincere attempts and taken every care to present this matter in precise and compact form, the language being as simple as possible. We are sure that the information contained in this volume certainly prove useful for better insight in the scope and dimension of this project in it true perspective.

The task of the completion of the project though being difficult was made quite simple, interesting and successful due to deep involvement and complete dedication of our group members.

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1. INTRODUCTION

1.1.INTRODUCTION TO SCRIPTING LANGUAGES

Scripting is the action of writing scripts using a scripting language. All scripting languages are programming languages. The scripting language is basically a language where instructions are written for a run time environment. They do not require the compilation step and are rather interpreted. It brings new functions to applications and glue complex system together. A scripting language is a programming language designed for integrating and communicating with other programming languages.

There are many scripting languages some of them are discussed below:

- bash: It is a scripting language to work in the Linux interface. It is a lot easier to use bash to create scripts than other programming languages. It describes the tools to use and code in the command line and create useful reusable scripts and conserve documentation for other people to work with.

- Node js: It is a framework to write network applications using JavaScript. Corporate users of Node.js include IBM, LinkedIn, Microsoft, Netflix, PayPal, Yahoo for real-time web applications.

- Ruby: There are a lot of reasons to learn Ruby programming language. Ruby's flexibility has allowed developers to create innovative software. It is a scripting language which is great for web development.

- Python: Python is an interpreted language with dynamic semantics and huge lines of code are scripted and is currently the most hyped language among developers.

- Awk is a scripting language used for manipulating data and generating reports. The awk command programming language requires no compiling, and allows the user to use variables, numeric functions, string functions, and logical operators.

- Perl: A scripting language with innovative features to make it different and popular. Found on all windows and Linux servers. It helps in text manipulation tasks.

Advantages of scripting languages:

- Easy learning: The user can learn to code in scripting languages quickly, not much knowledge of web technology is required.
- Fast editing: It is highly efficient with the limited number of data structures and variables to use.
- Interactivity: It helps in adding visualization interfaces and combinations in web pages. Modern web pages demand the use of scripting languages.
- Functionality: There are different libraries which are part of different scripting languages. They help in creating new applications in web browsers and are different from normal programming languages.

1.2. WHY PARTICULAR SCRIPTING LANGUAGE

Shell scripting is writing a series of command for the shell to execute. It can combine lengthy and repetitive sequences of commands into a single and simple script, which can be stored and executed anytime. This reduces the effort required by the end user. You can create a script with whatever you want to run or execute time and again. You can schedule it through cron. You can give permissions to it so that only those who are supposed to run can run it.

There are many reasons to write shell scripts –

- System monitoring
- Adding new functionality to the shell etc.
- To automate the frequently performed operations
- To run sequence of commands as a single command
- Easy to use
- Portable (It can be executed in any Unix-like operating systems without any modifications)

To Create a script:

- Create a file using a vi editor(or any other editor). Name script file with extension .sh
- Start the script with #! /bin/sh
- Write some code.
- Save the script file as filename.sh
- For executing the script type bash filename.sh

1.3. PROBLEM STATEMENT

In computation of numbers, there ties several kinds of problems in solving tedious arthimetic operation with simple calculator. Having been facing a lot of general problems, the problem identified below relate to computation of numbers:-

i   low and slow speed of the calculator

ii   Inappropriate representation of data

iii   Loss of figure in computation of higher numbers

iv   Inability of handling complex arithmetic operation

1.4. OBJECTIVES

This product will be tested based on the following objectives:-

i. To examine the current procedures employed in computer with regard to the calculator.

ii. To improve the speed of then simple calculator in such a way that it will reduce complexity in solving with simple calculator.

iii. To design a simple calculator that ensure timely processing

iv.   And finally, to reduce the problems immensely and provides a release working environment.

2. LITERATURE SURVEY

2.1. MOTIVATION

Since it is time saying that there is no smoke without fire ,the effort to carry out the research was not first conceived. To particularilize the matter and concept 'what a calculator can do in solving tedious problems and how it is done? There is serious need for this study.

In view of the aforementioned problems inherent in the design of the simple scientific calculator, the purpose of the study is to provide on overview of the simple design calculator.

Finally, the purpose of this work is to improve the speed of the simple calculator in such a way that it will maximize the hardware needed and reduce the cost and complexity of the machine. This will help us to enjoy the anticipated high speed of our calculator.

3. PROPOSED SYSTEM

3.1. INTRODUCTION OF PROPOSED SYSTEM AND ARCHITECTURE

Ever since, tedious mathematical problems in the organization is not a simple one, that is to say, the process can be said to involve a lot of procedures or protocols which ranges from insertion of figures for tedious calculation, processing of numbers and retrieval of errors. However, because of this, there is the need to accomplish an extensive research to discover the intricacies involved in the entire process. So the researcher decided to embark on this work design and implementation of a simple calculator.

Computer have gone from being fantasies of science, fiction of realities of everyday life, especially in the offices, school (educational organization). This work is a research aimed at solving the above problem. When this system actualizes, it would be received of solving tedious calculations and sophisticated mathematical problems

A scientific calculator is a type of electronic calculator, usually but not always handheld, designed to calculate problems in science (especially physics), engineering, and mathematics. They have almost completely replaced slide rules in almost all traditional applications, and are widely used in both education and professional settings.

Architecture:
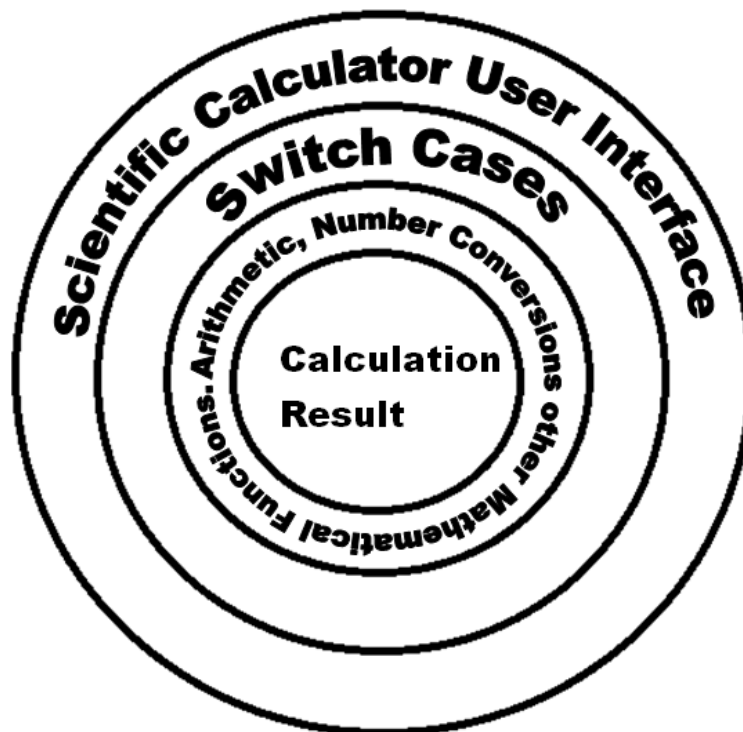
- **User Interface:**

    The user interface (UI) is the point of human-computer interaction and communication in a device.

- **Switch-Case:**

    The switch command can only be used in batch files. It allows you to select a command or group of commands to execute based on the possible values of a variable or a combination of variables and text.

- **Options:**

    It includes different mathematical operations.

- **The mathematical operations are:**

    Addition, Subtraction, Multiplication, Division, Square, Square Root, Raise to the Power and many other functions.

- **Result:**

    When operation is performed the result get produced.

3.2.HARDWARE AND SOFTWARE REQUIREMENTS

Operating System: Unix / Linux

Language: Shell script (bash)
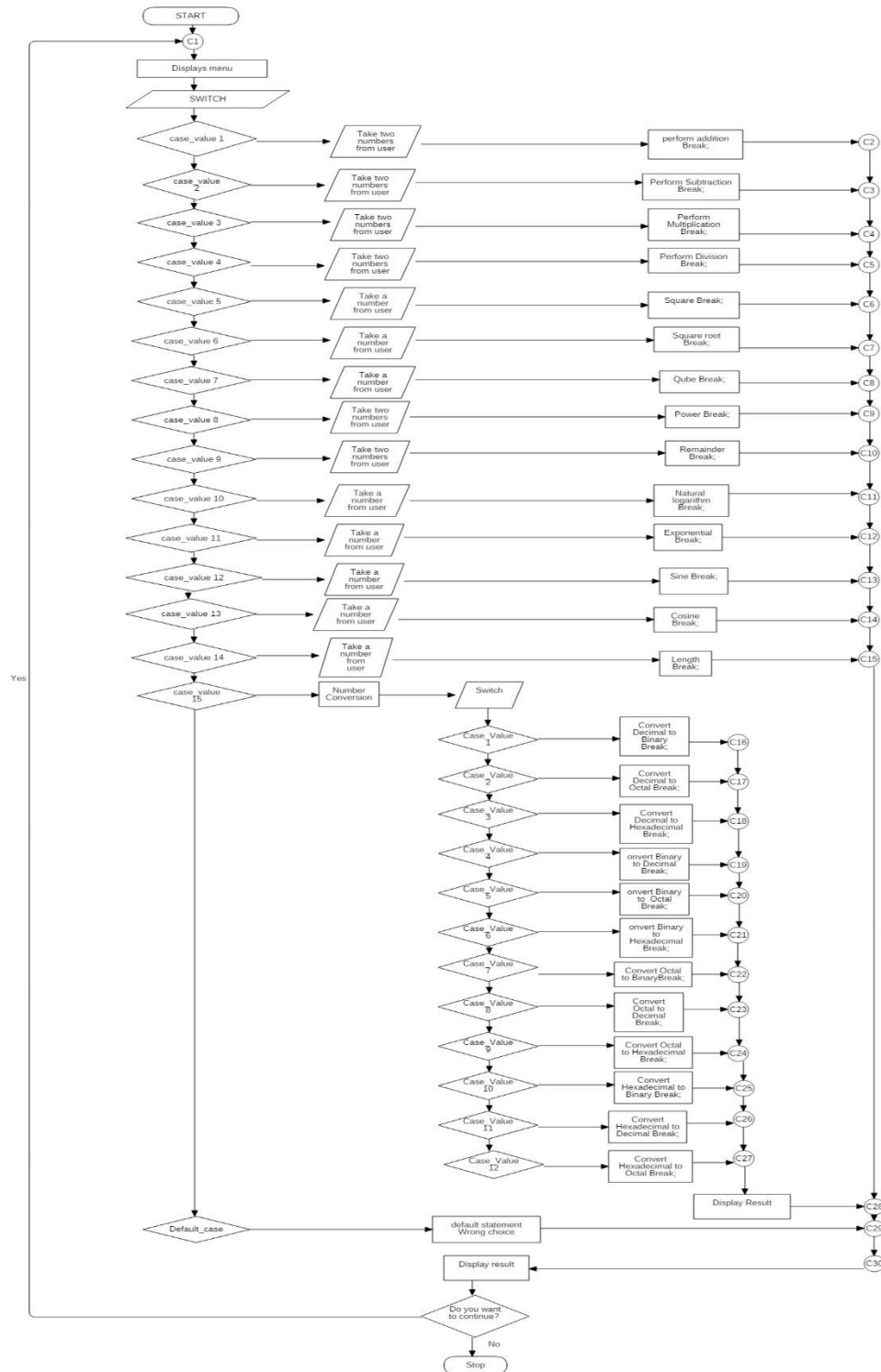
OS Processor: 2 GHz dual core processor

RAM: Minimum 2 GB

Hard disk: 25 GB

4. IMPLEMENTATION
4.1.SYSTEM BLOCK DIAGRAM

Flowchart:

4.2. MODULE DESCRIPTION

Commands / Statement Used:

1. **Echo**
   echo is one of the most used commands. It is used to print a line of text in the standard output $ echo [-neE] [arg ...]

2. **read**
   The read command in the Linux is used to read the input from the keyboard.

3. **Switch-Case**
   When there are a lot of "if" statements in Shell, it becomes confusing. Switch case allows you to select a command or group of commands to execute based on the possible values of a variable or a combination of variables and text.

4. **Basic Commands (BC)**
   BC commands are used in a Command Line Calculator to perform basic Mathmatical Calculations.

5. **While**
   The bash while loop is a control flow statement that allows code commands to be executed repeatedly based on a given condition.

- **Mathematical Operations and Functions in Scientific Calculator:**

   1. **Addition**
      The addition (sum function) is used by clicking on the "+" button or using the keyboard. The function results in a+b. Add two numbers.

   2. **Subtraction**
      The subtraction (minus function) is used by clicking on the "-" button or using the keyboard. The function results in a-b. Subtract a number from second number.

   3. **Multiplication**
      The multiplication (times function) is used by clicking on the "x" button or using the keyboard "*" key. The function results in a*b. Multiply two numbers.

4. **Division**
   The division (divide function) is used by clicking on the "/" button or using the keyboard "/" key. The function results in a/b.

5. **Square**
   The square function is used by clicking on the "x^2" button or type "^2". The function results in x*x.it is the product of some integer with itself.

6. **Square Root**
   The square root function is used by clicking on the "x" button or type "sqrt()". This function represents x^.5 where the result squared is equal to x.

7. **Power**
   The raise to the power (y raised to the x function) is used by clicking on the "y^x" button or type "^".

8. **Natural Exponential**
   The natural exponential (e raised to the x) is used by clicking on the "e^x" button or type "exp()". The result is e (2.71828…) raised to x.

9. **Natural Logarithm**
   The Natural logarithm (LN) is used by clicking on the "LN" button or type "LN()".The natural logarithm of a number is its logarithm to the base of the mathematical constant e.

10. **Cube**
    The cube function is used by clicking the "x3 ".The function results in "x*x*x".

11. **Length**
    to find the length of any given number.

12. **Trig function**
    Sine, cosine : **sin**(θ) and **cos**(θ) — are functions revealing the shape of a right triangle. Looking out from a vertex with angle θ, **sin**(θ) is the ratio of the opposite side to the hypotenuse , while **cos**(θ) is the ratio of the adjacent side to the hypotenuse .

13. **Number Conversions**
    Decimal, Binary, Octal and Hexadecimal **number** systems are positional value **number** systems. To convert binary, octal and hexadecimal to decimal **number** into other number systems.

4.3.CODE

```
clear
i="y"
while [ $i = "y" ]
do
echo "****************** CALCULATOR *************************"
echo "\n\t1. Addition"
echo "\t2. Subtraction"
echo "\t3. Multiplication"
echo "\t4. Division"
echo "\t5. Square"
echo "\t6. Square Root"
echo "\t7. Qube"
echo "\t8. Power"
echo "\t9. Remainder"
echo "\t10. Natural Logarithm"
echo "\t11. Exponential"
echo "\t12. Sine"
echo "\t13. Cosine"
echo "\t14. Length"
echo "\t15. Number Conversion"
echo "\n*****************************************************"
echo "Enter your choice:"
read ch
case $ch in
   1)echo "\nEnter two nos:"
        read n1 n2
     sum=`expr $n1 + $n2`
    echo "Addition = "$sum;;
   2)echo "\nEnter two nos:"
        read n1 n2
        sub=`expr $n1 - $n2`
    echo "Subtraction = "$sub;;
   3)echo "\nEnter two nos:"
        read n1 n2
        mul=`expr $n1 \* $n2`
    echo "Multiplication = "$mul;;
   4)echo "\nEnter two nos:"
        read n1 n2
```

```
        div=`expr $n1 / $n2`
 echo "Division = "$div;;
5)echo "\nEnter the no:"
        read n
        sq=$(echo "$n^2" | bc)
 echo "Square = " $sq;;
6)echo "\nEnter the no:"
        read n
        sqr=$(echo "sqrt($n)" | bc)
 echo "Square root = " $sqr;;
7)echo "\nEnter the no:"
        read n
        qb=$(echo "$n^3" | bc)
 echo "Qube = " $qb;;
8)echo "\nEnter two nos:"
        read n1 n2
        po=$(echo "$n1^$n2" | bc)
 echo "Power = " $po;;
9)echo "\nEnter two nos:"
        read n1 n2
        rem=$(echo "$n1%$n2" | bc)
 echo "Remainder = "$rem;;
10)echo "\nEnter the no:"
        read n
        log=$(echo "l($n)" | bc -l)
 echo "Log = "$log;;
11)echo "\nEnter the no:"
        read n
        exp=$(echo "e($n)" | bc -l)
 echo "Exponential = "$exp;;
12)echo "\nEnter the no:"
        read n
        sin=$(echo "s($n)" | bc -l)
 echo "Sine = "$sin;;
13)echo "\nEnter the no:"
        read n
        cs=$(echo "c($n)" | bc -l)
 echo "Cosine = "$cs;;
14)echo "\nEnter the no:"
        read n
```

```
        ln=$(echo "length($n)" | bc -l)
    echo "Length = "$ln;;


        15)echo "******************* Number Conversion *******************"
echo "\t1. Convert Decimal to Binary"
echo "\t2. Convert Decimal to Octal"
echo "\t3. Convert Decimal to Hexadecimal"
echo "\t4. Convert Binary to Decimal"
echo "\t5. Convert Binary to Octal"
echo "\t6. Convert Binary to Hexadecimal"
echo "\t7. Convert Octal to Binary"
echo "\t8. Convert Octal to Decimal"
echo "\t9. Convert Octal to Hexadecimal"
echo "\t10. Convert Hexadecimal to Binary"
echo "\t11. Convert Hexadecimal to Decimal"
echo "\t12. Convert Hexadecimal to Octal"
echo "\n****************************************************"
echo "Enter your choice:"
        read ch1
        case $ch1 in
        1)echo "\nEnter the Decimal no:"
        read n
        cs=$(echo "obase=2;$n" | bc -l)
    echo "Binary no = "$cs;;
        2)echo "\nEnter the Decimal no:"
        read n
        cs=$(echo "obase=8;$n" | bc -l)
    echo "Octal no = "$cs;;
        3)echo "\nEnter the Decimal no:"
        read n
        cs=$(echo "obase=16;$n" | bc -l)
    echo "Hexadecimal no = "$cs;;
        4)echo "\nEnter the Binary no:"
        read n
        cs=$(echo "ibase=2;$n" | bc -l)
    echo "Decimal no = "$cs;;
        5)echo "\nEnter the Binary no:"
        read n
        cs=$(echo "ibase=2;obase=8;$n" | bc -l)
    echo "Octal no = "$cs;;
```
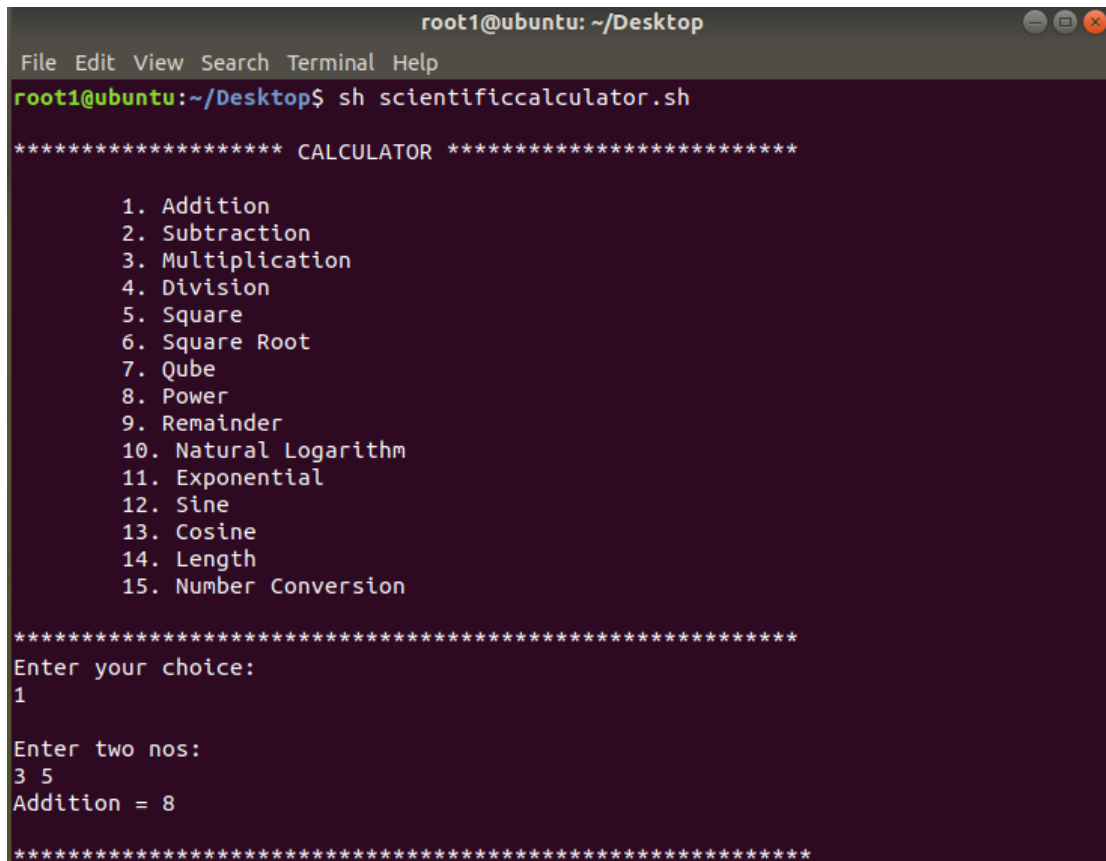
```
        6)echo "\nEnter the Binary no:"
        read n
        cs=$(echo "ibase=2;obase=10000;$n" | bc -l)
    echo "Hexadecimal no = "$cs;;
        7)echo "\nEnter the Octal no:"
        read n
        cs=$(echo "ibase=8;obase=2;$n" | bc -l)
    echo "Binary no = "$cs;;
        8)echo "\nEnter the Octal no:"
        read n
        cs=$(echo "ibase=8;$n" | bc -l)
    echo "Decimal no = "$cs;;
        9)echo "\nEnter the Octal no:"
        read n
        cs=$(echo "ibase=8;obase=16;$n" | bc -l)
    echo "Hexadecimal no = "$cs;;
        10)echo "\nEnter the Hexadecimal no:"
        read n
        cs=$(echo "ibase=16;obase=2;$n" | bc -l)
    echo "Binary no = "$cs;;
        11)echo "\nEnter the Hexadecimal no:"
        read n
        cs=$(echo "ibase=16;$n" | bc -l)
    echo "Decimal no = "$cs;;
        12)echo "\nEnter the Hexadecimal no:"
        read n
        cs=$(echo "ibase=16;obase=8;$n" | bc -l)
    echo "Octal no = "$cs;;
 *)echo "Invalid choice!";;
esac;;
   *)echo "Invalid choice!";;
esac
echo "\n***************************************************"
echo "Do u want to continue ?"
read i
if [ $i != "y" ]
then
   exit
fi
done
```

5. RESULT

5.1 OUTPUT SNAPSHOTS

```
                    root1@ubuntu: ~/Desktop                    ⊖ ⊡ ⊗
 File  Edit  View  Search  Terminal  Help

****************************************************************
Do u want to continue ?
y
******************** CALCULATOR ************************

        1. Addition
        2. Subtraction
        3. Multiplication
        4. Division
        5. Square
        6. Square Root
        7. Qube
        8. Power
        9. Remainder
        10. Natural Logarithm
        11. Exponential
        12. Sine
        13. Cosine
        14. Length
        15. Number Conversion

****************************************************************
Enter your choice:
15
```

After choosing Number Conversion:

```
                    root1@ubuntu: ~/Desktop                    ⊖ ⊡ ⊗
 File  Edit  View  Search  Terminal  Help

Enter your choice:
15
******************** Number Conversion ******************
        1. Convert Decimal to Binary
        2. Convert Decimal to Octal
        3. Convert Decimal to Hexadecimal
        4. Convert Binary to Decimal
        5. Convert Binary to Octal
        6. Convert Binary to Hexadecimal
        7. Convert Octal to Binary
        8. Convert Octal to Decimal
        9. Convert Octal to Hexadecimal
        10. Convert Hexadecimal to Binary
        11. Convert Hexadecimal to Decimal
        12. Convert Hexadecimal to Octal

****************************************************************
Enter your choice:
1

Enter the Decimal no:
5
Binary no = 101

****************************************************************
Do u want to continue ?
n
root1@ubuntu:~/Desktop$ ▮
```

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5.2 TESTING AND VALIDATION

Testing is the major control measure used during software development. Its basic function is to detect errors in the software. During requirement analysis and design, the output is a document that is usually textual and no executable. After the coding phase, computer programs are available that can be executed for testing purpose. This implies that testing not only, has to uncover errors introduced during coding, but also errors introduced during previous phase. Thus the goal of testing is to uncover the requirements, design and coding errors in the programs.

Testing is done to:

- Check the arithmetic operations are working fine- +, -, /, * etc
- Verify that the calculator gives the correct result in case of operations.

The Sourcecode declared above for the program of Scientific Calculator has been tested and it has been found that the above source code is okay and correct.The program involves many type of conversions. These conversions has to done carefully.

6. CONCLUSION AND FUTURE SCOPE

6.1.CONCLUSION

Ever since, tedious mathematical problems in the organization is not a simple one, that is to say, the process can be said to involve a lot of procedures or protocols which ranges from insertion of figures for tedious calculation, processing of numbers and retrieval of errors. However, because of this, there is the need to accomplish an extensive research to discover the intricacies involved in the entire process. So the researcher decided to embark on this work design and implementation of a simple scientific calculator. Easy calculating of tedious mathematical problems, easy to retrieval of errors and it will also be of a good assistance to any researcher on these topics To better understand intangible concepts, through tangible means. To teach logical thinking, and problem-solving skills.The Sourcecode declared above for the program of Scientific Calculator has been tested and it has been found that the above source code is okay and correct.

6.2.FUTURE SCOPE

The process covers only of two approaches used in producing the simple calculator which are logic simulation and algorithm simulation due to the fact that it is difficult to develop a complete scientific calculator that will calculate every existing calculation in all field of study, this research has been limited to arithmetic operation calculation and some scientific calculation.

6.3. BENEFITS TO SOCIETY

      Easy calculating of tedious mathematical problems, easy to retrieval of errors and it will also be of a good assistance to any researcher on these topics. To help others expand the scope of their mental abilities. To better understand intangible concepts, through tangible means. To teach logical thinking, and problem-solving skills.

7. REFERENCES

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ABSTRACT

This work was centered on the Design and implementation of a simple scientific calculator for education organization. The study traced calculator system as a tool to completely change mathematical knowledge and sophisticated problems solving strategies had advanced the field of simulated engine in mathematic.

This project work also focused principally on numbers and arithmetic operation. This researcher investigated the manual system in detail with a view to finding out the need to automate the system. Interestingly, the end result of simple calculator system was its ability to process number and operators, and provides a useful result.

Therefore, this project will help immensely in the following way. Easy calculating of tedious mathematical problems, easy to retrieval of errors and it will also be of a good assistance to any researcher on these topics.

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