

SCIENTIFIC CALCULATOR

INTRODUCTION

Scientific calculator is a type of electronic calculator, usually but always hand held designed to calculate problems in science, engineering and mathematics.

The electronic calculator can carry out the exponential, trigonometric functions, etc. and other advanced operations.

Some operations that can be performed in calculator :-

- 1 .standard calculations
2. higher power of number
3. factorial of number
4. exponential of a number
5. logarithmic of a number
6. Trigonometric function
7. Inverse trigonometric function
8. Integration(u.v method)
9. Differentiation(Jacobian matrix, lebnitz theorem)
10. vector product, scalar product
11. conversion of c-digits
12. conversion of units
13. physical constant

14. quadratic equation
15. Operation on matrices
16. Conversion of coordinates
17. operation on vectors
18. Equation of Planes
19. Help
20. Square root

In this programme firstly we will give the choice to the user to select the operation he would like to perform in which we will provide a bunch of **operation** in our index and user have to choose any one of them by writing appropriate no. Every operator will have a **unique integer** which will represent that particular operation.

Inside every operation there will be further

Provide more choices to the user so that he could specify exactly which operation he wants to perform.

In a particular operation like if user chooses

Trigonometric function then inside this function the programme will ask that which trigonometric function he would like to use (sin, cos, tan, cot, cosec, sec) now if he chooses sin then there will be a **separate function**

to calculate $\sin x$ but before this the programme will ask at what **angle** user want to calculate that value.

To calculate all the exponential, logarithmic, trigonometric function, inverse

trigonometric function, hyperbolic functions, inverse hyperbolic functions we made use of **taylor expansions** of every operator.

And to convert numbers from one **base** to another, firstly the programme will ask that which conversion user wants to do like (binary to decimal, decimal to hexadecimal, signed, unsigned etc.) and then do the conversions accordingly.

The program also gives a facility to solve **simultaneous equations** and **quadratic equations**. It also performs simple operations on **matrices** like finding determinants and inverse, etc.

This program gives an option to convert **co-ordinates** from spherical and polar to rectangular co-ordinates and vice versa.

This program also gives the values different **scientific constants** mentioned in user manual.

Our program also carries out **integration** and **differentiation** of some simple functions by using numerical methods. It calculates the value using the limits specified by user.

We will use **graphics** in our program by which when the user compiles a program then a window will open showing picture of calculator.

This program has a special option known as **SEARCH** option in which the program will connect to internet through hyperlink by which the user can search the mathematical definition of different functions. For instance user wants to know about vector product then he can do it by using this option.

We also have **UNDO** option from which the user can erase the mistakes done by him.

FUNCTIONS DEFINED ARE:

1.STANDARD CALCULATIONS

This function will do some simple calculations like addition, subtraction, multiplication, division, etc. By taking required values from user.

2. LOGARITHMIC

This function will calculate the logarithmic value of the number given by user.

3. EXPONENTIAL

This function will calculate the exponential value of the number given by user.

4. FACTORIAL

This function will perform simple iteration to calculate factorial of a number.

5. TRIGONOMETRY

This function first checks whether the value given by user lies in the domain of the function and then calculates the value of it by using appropriate expansion.

6. INVERSE TRIGONOMETRY

This function first checks that the value given by user lies in the domain of the operator then calculates the value of it by using appropriate expansion.

7. INTEGRATION

This function will integrate the different function given by the user by using numerical methods.

8.DIFFERENTIATION

This function will differentiates the function given by the by using numerical method.

9. SOLVING QUADRATIC EQUATIONS

This function will take the coefficients of the quadratic equation than computes the value of unknown variable in the given equation using shri dharacharya formula.

10. CONVERSION OF BASE OF NUMBERS

This function converts numbers from one base to another. Initially it asks the user about which conversion he wants to perform and then converts it accordingly.(eg.binary to decimal,decimal to hexadecimal etc...)

1.Binary to decimal(signed).

2.Binary to decimal(unsigned).

3.Decimal to Binary.

4.Octal to decimal(signed).

5.Hexadecimal to decimal.

11. CONVERSION OF UNITS

This function convert one type of unit to other(eg.cm to m,kg to gm,lts to gallon etc..) Initially it asks the user about which conversion he wants to perform and then converts it accordingly.

1.in-cm

2.cm-in

3.ft-m

4.m-ft

5.yd-m

6.m-yd

7.mile-km

8.km-mile

9.acre-m²

10.m²-acre

11.fahrenheit-celsius

12.celsius_fahrenheit

13.joules-calorie

14.calorie-joule

15.gallon-litre

16.liter-gallon

17.atm-pascal

18.pascal-atm

19.hp-W

20.W-hp

12. PHYSICAL CONSTANTS

This functions helps the user to get values of different scientific constants. It asks the user to enter the value of number associated with the constant which is the mentioned in the list. The list shows up when option of physical constants is chosen.

The function will give the desired constant to the user.

1.Mass of proton

2.Mass of neutron

3.Mass of electron

4.Bohr's radius

5.Planks' constant

6.Avogadro's no.

7.Boltzman constant .

8.Gas constant

9.Acceleration due to gravity(g)

- 10. Electronic charge (e)
- 11. Stefan-boltzman constant constant .
- 12. Gravitational constant(G)
- 13. Magnetic constant.
- 14. Electric constant.
- 15. Compton wavelength
- 16. Faraday constant (F)
- 17. Fine structure constant
- 18. Atomic mass unit(u)
- 19. Rydberg's constant
- 20. Molar volume
- 21. Speed of light (c) in vacuum

13 MATRICES

This function first ask the user that he want's to compute determinant of some matrix or he want's to find the value of unknown variable by solving simultaneous linear equation using matrix.

14. HELP

This is the most interesting function, this act as a maths dictionary in which user can search for any mathematical definition of all functions and operators.

15. CONVERSION OF COORDINATES

This function helps user to convert one form of coordinates to other eg. Rectangular coordinates to polar co-ordinates.

It also validates the input given by the user.

16. PERMUTATIONS AND COMBINATIONS

In this function user wants to calculates nCr and nPr and it will be done by the use of iteration.

17. VECTORS

In this function operations vectors is carried out.

It asks the user whether he wants to use vector with three co-ordinates or with two co-ordinates and carries operations like vector product , scalar product, addition, etc. on the vectors.

18. COMPLEX NUMBERS

In this function standard operations on complex numbers is carried out.

19. EQUATION OF PLANE

In this function user can take out the equation of a plane under 2 different circumstances:

a) Plane passing through given point and a normal on that point.

b) Plane passing through 3 known points.

20. SQUARE ROOT

In this function we can take square root of any real positive no. Upto three decimal places.