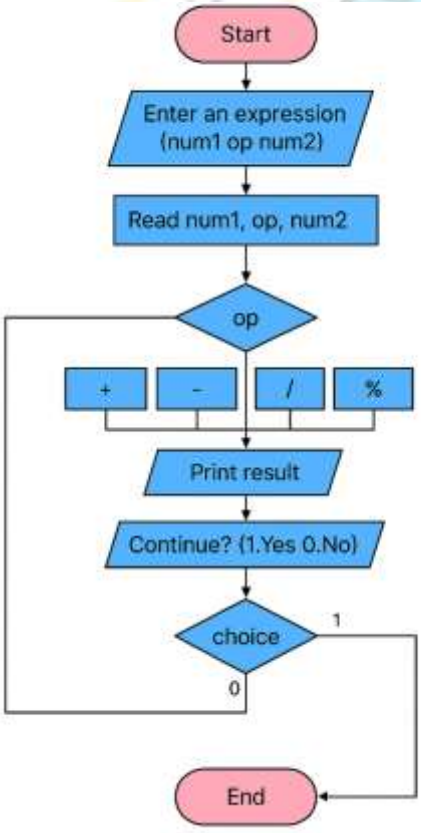
1. Simple Calculator Program

Algorithm:

1. Start
2. Declare `num1`, `num2`, `choice`, and `op`
3. Loop until the user chooses to quit:
    - Prompt user to enter an expression (`num1 op num2`)
    - Read the input values
    - Perform operation based on `op`:
        - `+` → Addition
        - `-` → Subtraction
        - `*` → Multiplication
        - `/` → Division
        - `%` → Modulus
    - Print the result
    - Ask the user if they want to continue
4. If the user enters `0`, exit the loop.
5. End

Flowchart:

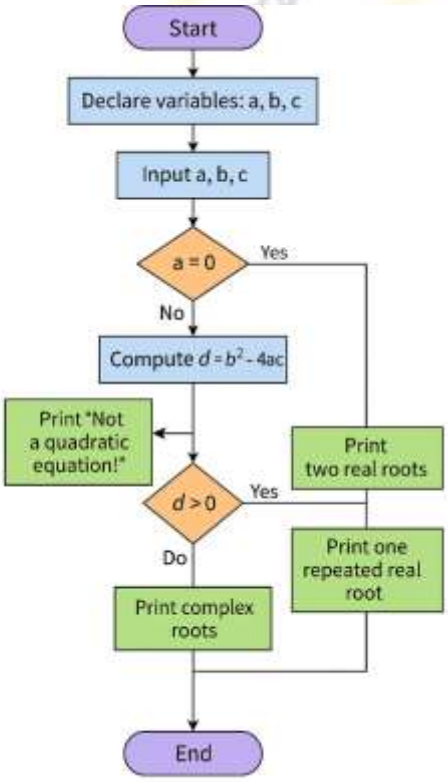


2. Quadratic Equation Solver

Algorithm:

1. Start
2. Declare variables: `a`, `b`, `c`, `d`
3. Prompt user to enter coefficients `a, b, c`
4. Read input values
5. If `a == 0`, print "Not a quadratic equation!" and exit
6. Compute the discriminant: `d = b² - 4ac`
7. If `d > 0`, compute and print two real roots
8. If `d == 0`, compute and print one repeated real root
9. If `d < 0`, compute and print complex roots
10. End

Flowchart:



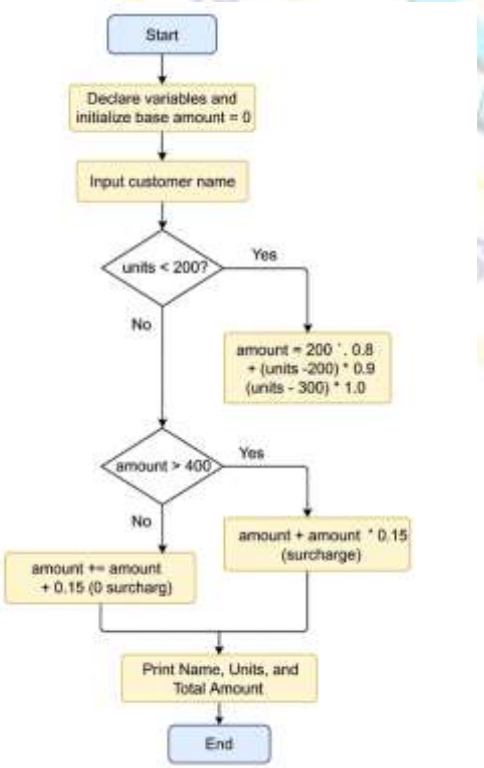
3 .Electricity Bill

An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit: for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of units consumed and print out the charges

Algorithm: Electricity Bill Calculation

1. **Start**
2. Declare variables: `name`, `units`, `bill`
3. Set `bill = 100` (minimum meter charge)
4. Prompt the user to enter `name`
5. Read the `name`
6. Prompt the user to enter `units`
7. Read the `units`
8. **If** `units <= 200`
   → `bill += units * 0.80`
9. **Else if** `units <= 300`
   → `bill += 200 * 0.80 + (units - 200) * 0.90`
10. **Else**
    → `bill += 200 * 0.80 + 100 * 0.90 + (units - 300) * 1.00`
11. **If** `bill > 400`
    → `bill += bill * 0.15` (add 15% surcharge)
12. Display the customer name, units, and final bill
13. **End**

Flowchart:

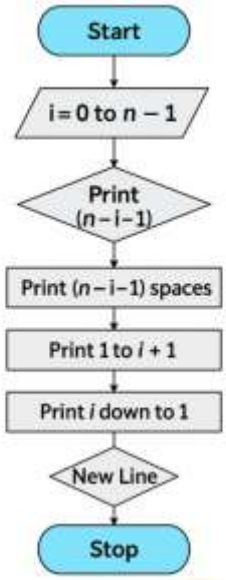


4. Write a C Program to display the following by reading the number of rows as input,

```
     1
   1 2 1
 1 2 3 2 1
1 2 3 4 3 2 1 ---------------------------- nth row
```

Algorithm:

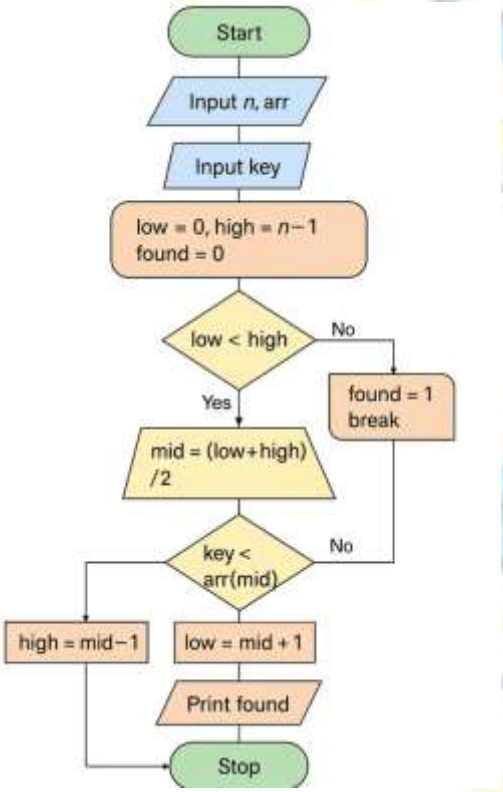
1. **Start**
2. **Input** number of rows `n`
3. **Repeat for** `i = 0` to `n - 1` (row index):
   - Print `(n - i - 1)` spaces
   - Print numbers from `1` to `i + 1`
   - Print numbers from `i` down to `1`
   - Move to the next line
4. **Stop**



5. Implement Binary Search on Integers.

Algorithm:

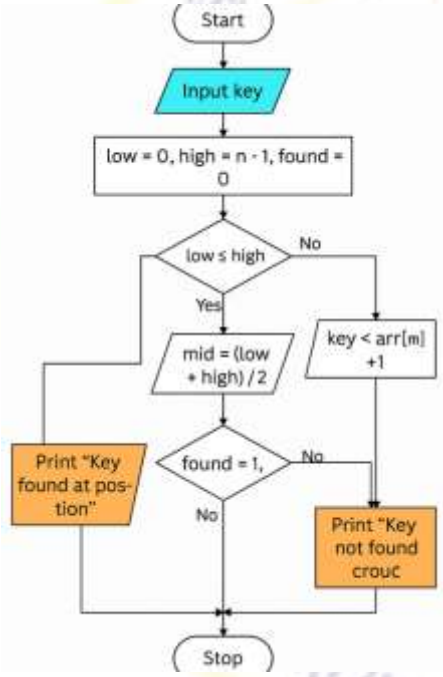
1. Start
2. Input the number of elements (n)
3. Input array elements in ascending order
4. Input key to be searched
5. Initialize `low = 0`, `high = n - 1`, `found = 0`
6. Repeat while `low <= high`
   - Calculate `mid = (low + high)/2`
   - If `arr[mid] == key`, set `found = 1`, break loop
   - Else if `key < arr[mid]`, set `high = mid - 1`
   - Else set `low = mid + 1`
7. If `found == 1`, print position
8. Else, print "Key not found"
9. Stop



6. Implement Matrix multiplication and validate the rules of multiplication.

Algorithm:

1. Start
2. Input dimensions of Matrix 1 (m × n)
3. Input dimensions of Matrix 2 (p × q)
4. If `n != p`, print "Multiplication not possible", exit
5. Input elements of Matrix 1
6. Input elements of Matrix 2
7. Initialize result matrix to 0
8. For each row `i` in Matrix 1
    - For each column `j` in Matrix 2
        - For each element `k`, compute `result[i][j] += mat1[i][k] * mat2[k][j]`
9. Print result matrix
10. Stop



7. Compute Sine and Cosine of an Angle

Compute sin(x)/cos(x) using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriate inferences

Algorithm

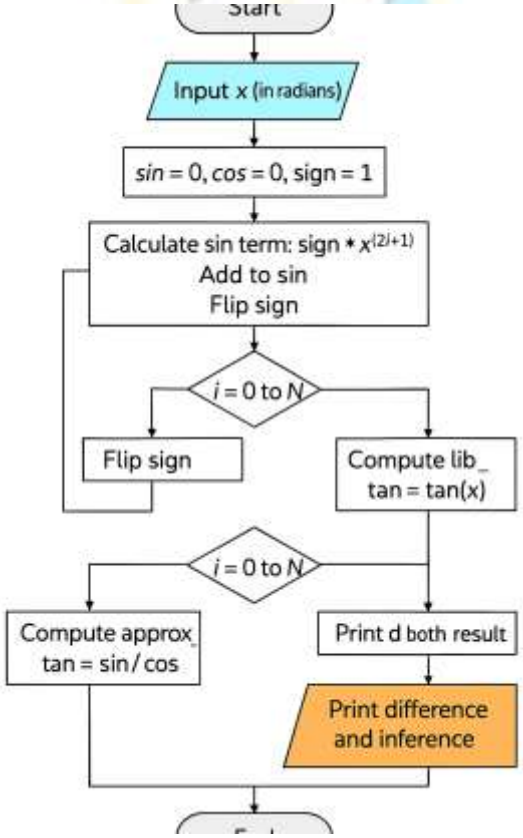
Step 1: Start
Step 2: Input angle x in radians
Step 3: Initialize variables:

- sin = 0, cos = 0, term = 1
- n_terms = number of terms for accuracy (e.g., 10)

Step 4: Compute sin(x) using Taylor series:
sin⁡(x)=x−x33!+x55!−x77!+…\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dotssin(x)=x−3!x3+5!x5−7!x7+…
Step 5: Compute cos(x) using Taylor series:
cos⁡(x)=1−x22!+x44!−x66!+…\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dotscos(x)=1−2!x2+4!x4−6!x6+…
Step 6: Compute sin(x)/cos(x) (i.e., tan(x)) using the approximated values
Step 7: Compute tan(x) using built-in function tan(x) from math library
Step 8: Display both results and compute the difference
Step 9: Print inference:

- If the difference is small, the approximation is accurate

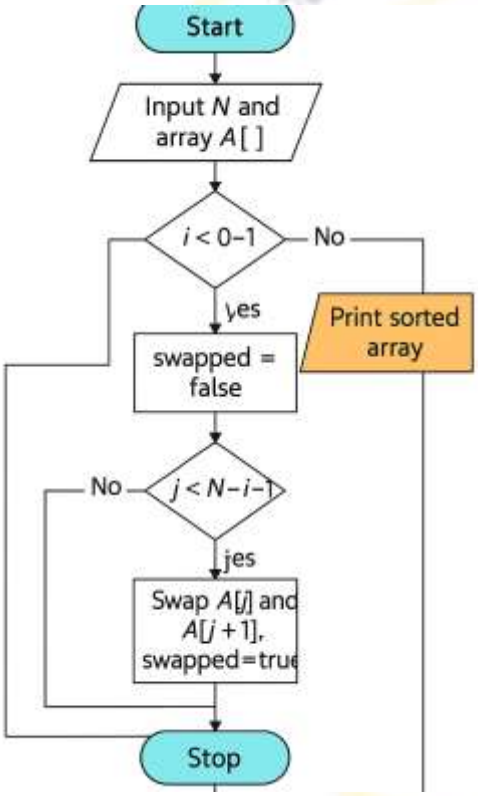
Step 10: End



8 Bubble Sort
Sort the given set of N numbers using Bubble sort

Algorithm: Bubble Sort

1. **Start**
2. Input the number of elements `N` and the array `A[]`.
3. Repeat steps 4 to 7 for `i = 0` to `N - 2`
4. Set `swapped = false`
5. Repeat steps 6 to 7 for `j = 0` to `N - i - 2`
6. If `A[j] > A[j + 1]`, then swap them and set `swapped = true`
7. If `swapped == false`, break the loop (array is sorted)
8. Print the sorted array
9. **Stop**

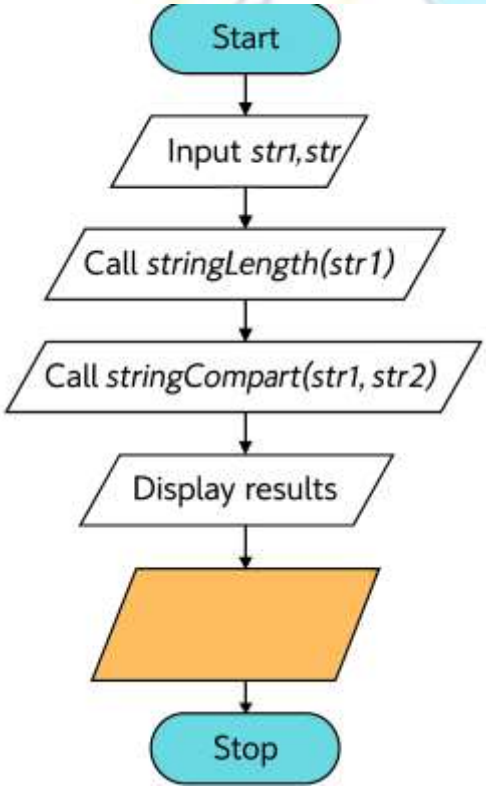


9 String Operations

Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.

Algorithm

1. Start
2. Input two strings: str1 and str2
3. Call function stringLength(str1)
→ Returns length of str1
4. Call function stringCompare(str1, str2)
→ Returns 0 if equal, positive if str1 > str2, negative if str1 < str2
5. Call function stringConcat(str1, str2)
→ Concatenates str2 to str1
6. Display all results
7. Stop



10 C Structures

Implement structures to read, write and compute average- marks and the students scoring above and below the average marks for a class of N students.

Pointers and Arrays

Algorithm

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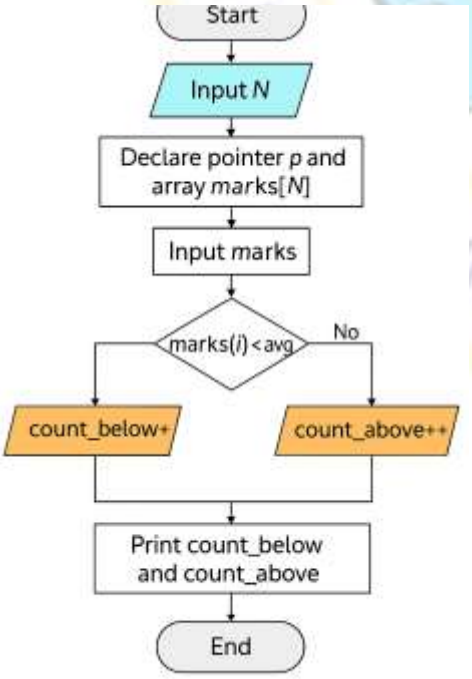
1. **Start**
2. Declare a structure `Student` with:
   - Name
   - Marks
3. Input total number of students `N`
4. Use an array of structures to store data for `N` students
5. Use a loop to:
   - Input name and marks for each student
   - Store in structure
6. Compute **total marks** using a pointer to the structure
7. Calculate **average = total / N**
8. Use another loop to:
   - Compare each student's marks with average
   - Count and print students scoring **above** and **below** average
9. Print average and list of students above/below average
10. **Stop**



11 Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers.

Algorithm

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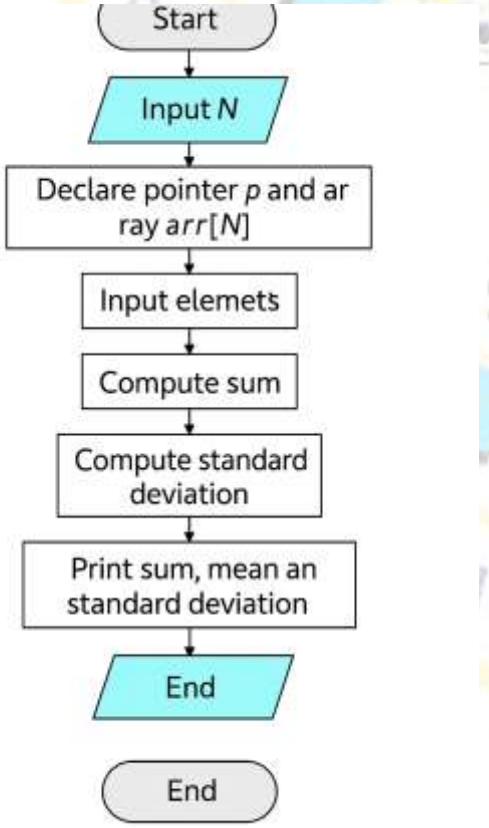
1. **Start**
2. Input number of elements `N`
3. Declare array of size `N` and a pointer to float
4. Input `N` elements using pointer
5. Initialize `sum = 0`, loop through array using pointer to calculate sum
6. Calculate **mean = sum / N**
7. Use pointer to calculate:
   - sum of squares of differences from the mean
8. Compute **standard deviation** using:
   - `sqrt(sum_of_squares / N)`
9. Print sum, mean, and standard deviation
10. **Stop**



12. File Copy

Write a C program to copy a text file to another, read both the input file name and target file name.

Algorithm

1. **Start**
2. Input source (input) file name and target (output) file name
3. Open source file in **read** mode
4. Open target file in **write** mode
5. Check if source file opened successfully:
   - If not, display error and **stop**
6. Read contents of source file character by character
7. Write each character to the target file
8. Repeat until **end of file** is reached
9. Close both files
10. Display success message
11. **Stop**