



Programming in C++



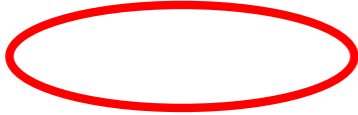


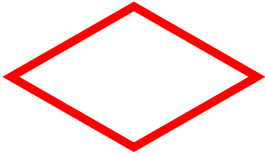



Flowcharts and Algorithms

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Flowcharts

- ❖ **A flowchart** is a sequence of connected symbols and shapes used to **represent the steps and operations** needed to solve a computer problems.
- ❖ Flowcharts help in visualizing the logic of a program before writing the actual code.

Symbols of Flowchart

Symbol	Description
	Start / End Symbol: Indicates the beginning and end of the program or process
	Input / Output Symbol: Represents reading the input or displaying the output
	Processing Symbol: Used for data processing or arithmetic operations
	Decision Symbol: Represents a decision point, usually a condition with “Yes” or “No” branches
	Connector Symbol: Connects different parts of the flowchart, especially when it continues on another page or section
	Flow Lines: Show the direction of the flow from one step to another
	Subroutine Symbol: Represents a predefined process or a module (e.g., a function or procedure)

Algorithm

- An **algorithm** is a **step-by-step set of instructions** designed to perform a specific task or solve a particular problem.
 - To enter information (**input, read**)
 - For output (**print, display**)
- **Relationship Between Algorithm and Flowchart:**
 - An **algorithm** describes the **steps in words**.
 - A **flowchart** represents the **same steps visually** using symbols and arrows.

Flowchart and algorithm

- **Example:** Draw a flowchart and write the algorithm to find the sum of two numbers and display the result.

- **Answer:**

Algorithm:

- **Input: two numbers (A, B)**
- **Output: The Sum**

Step 1: Start

Step 2: read number A

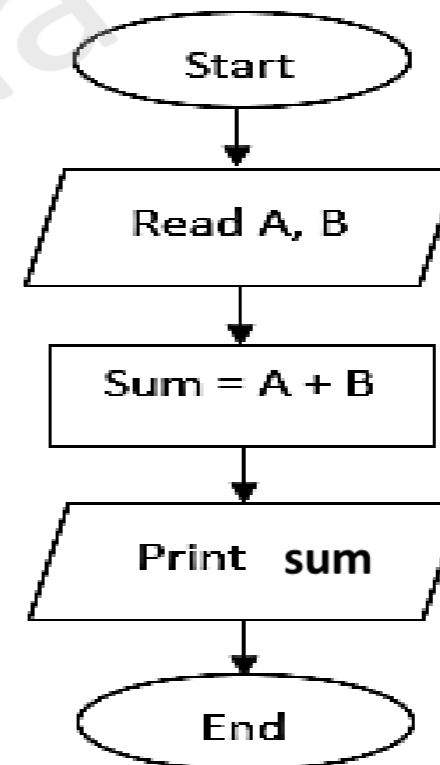
Step 3: read number B

Step 4: $\text{Sum} = A + B$

Step 5: Print Sum

Step 6: End

Flowchart:



Flowchart and algorithm

- **Example:** Draw flowchart and write the algorithm to find $Y = (A / B) + (A \times C)$ and display the result.

- **Answer:**

Algorithm:

Input: the numbers A,B,C

- **Output:** The value of Y

Step1: Start

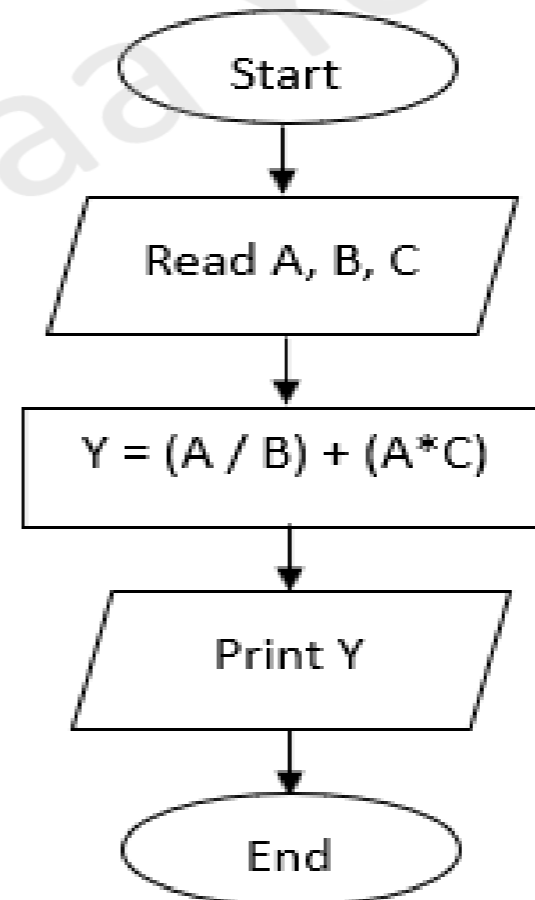
Step2: Input A, B, and C

Step3: Compute $Y = (A / B) + (A * C)$

Step4: Print the value of Y

Step5: End

Flowchart:



Flowchart and algorithm

- **Example:** Draw a flowchart and write the algorithm to check whether the **input numbers** are **odd or even**.

- Answer:

Algorithm:

Input: Number

- **Output: The number is odd or even**

Step 1: Start

Step 2: Input N

Step 3: Compute $Y = N \% 2$ // (reminder)

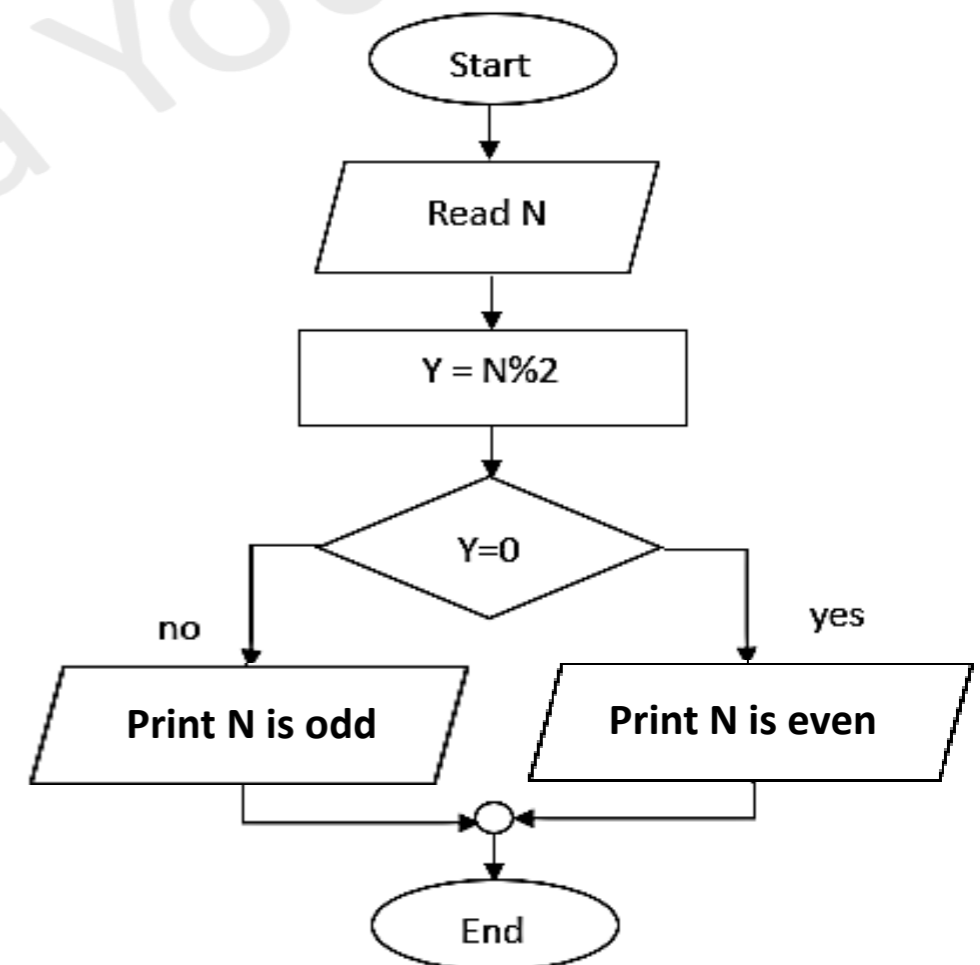
Step 4: If the value of $Y = 0$

Print the number N is even

Else print the number N is odd

Step 5: End

Flowchart:



Flowchart and algorithm

- Example: Draw a flowchart and write an algorithm to read the marks of **3 subjects** for a student. Calculate the **Average**. If the average is **50 or more**, print "PASS", otherwise print "FAIL".

- Answer:

Algorithm:

Input: three marks A, B, C

Output: print the student is "PASS" or "FAIL"

Step 1: Start

Step 2: Read three marks A, B, C

Step 3: $Av = (A+B+C) / 3$

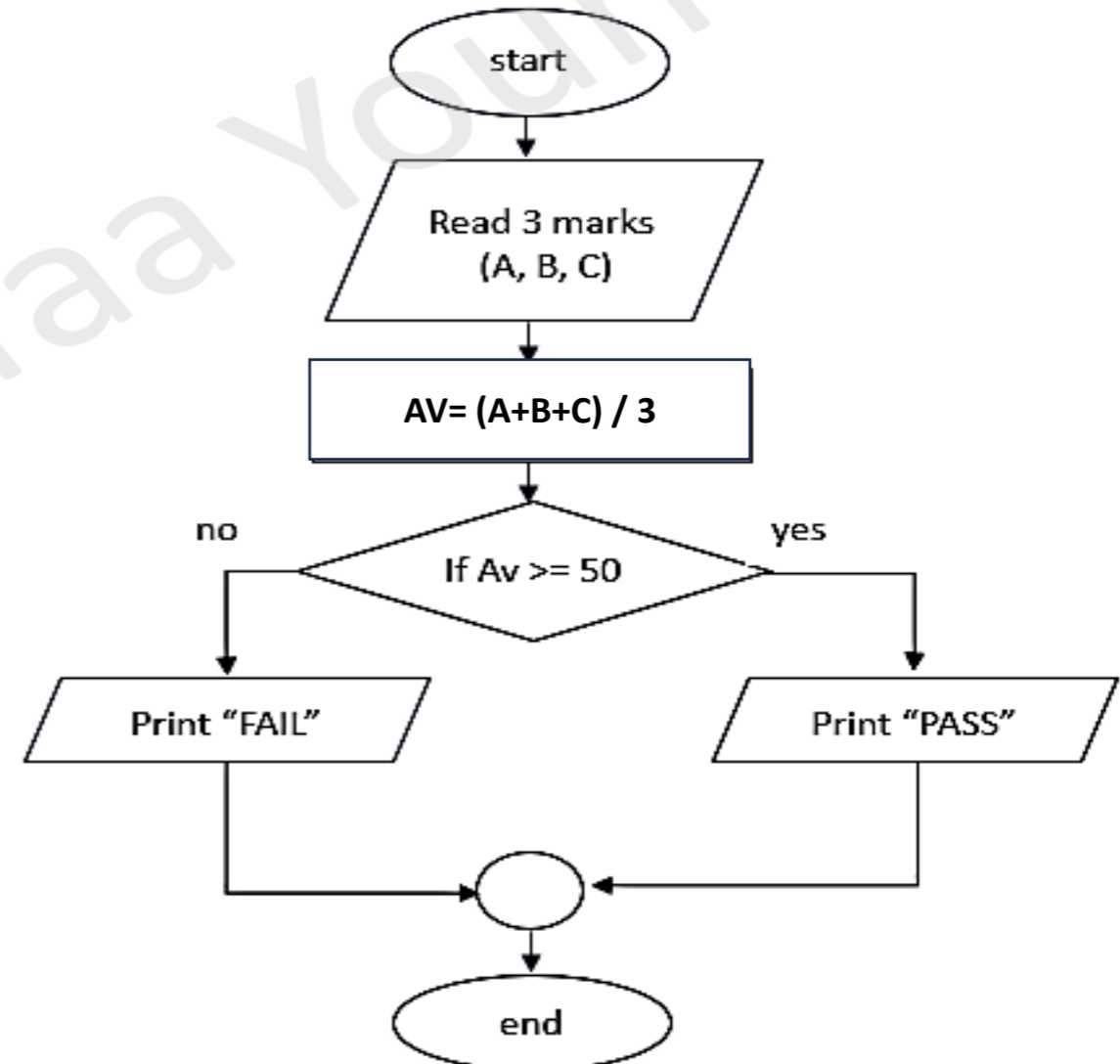
Step 4: if $Av \geq 50$

 Print "PASS".

 else Print "FAIL"

Step 5: end

Flowchart:



Flowchart and algorithm

- **Example:** Draw a flowchart and write the algorithm to find the Average of 100 numbers

- Answer:

Algorithm:

- **Input:** 100 numbers
- **Output:** The Average

Step 1: Start

Step 2: Set $\text{Sum} = 0$, $i = 1$

Step 3: While $i \leq 100$ repeat:

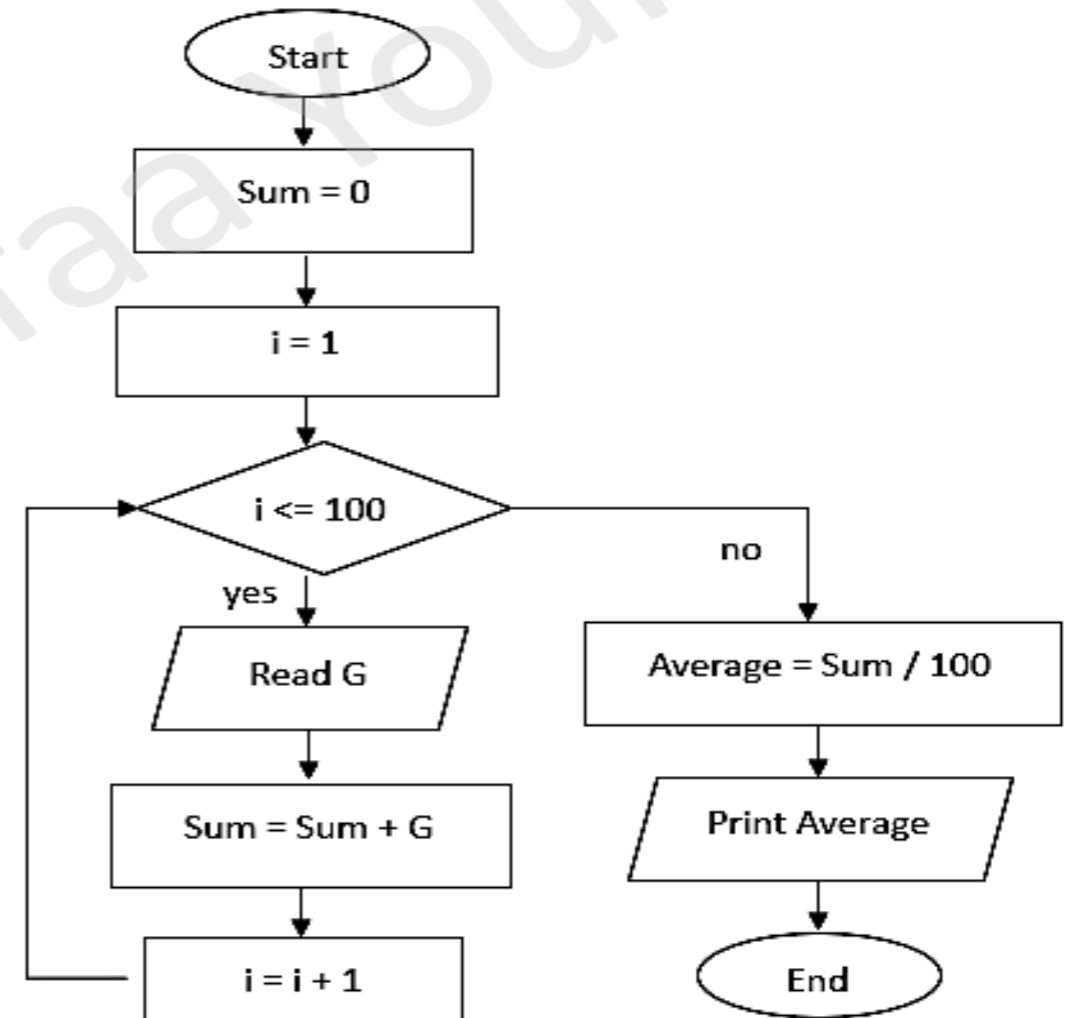
- a. read the number G
- b. $\text{Sum} = \text{Sum} + G$
- c. $i = i + 1$

Step 4: Compute $\text{Average} = \text{Sum} / 100$

Step 5: Print Average

Step 6: End

Flowchart:



References

- Gaddis, T. (2014). *Starting out with C++: From control structures through objects* (8th ed.). Pearson.
- Soulié, J. (2007, April 24). C++ language tutorial. cplusplus.com.
- Tutorials Point. (n.d.). *Learn C++ programming language*. Tutorials Point.