Module 2 – Flowcharts & Algorithms

BITS Pilani
Pilani Campus

Dr. Jagat Sesh Challa
Department of Computer Science & Information Systems

Module Overview

- **Steps of Programming Practices**
- **Flowcharts**
- **Algorithms**

innovate achieve lead

BITS Pilani
Pilani Campus

Steps of Programming Practices

Steps of Programming Practices

- **Step1:** Requirements
- **Step2:** Creating a flow chart
- **Step3:** Creating algorithms
- **Step4:** Writing Code
- **Step5:** Debugging
- **Step6:** Documentation

We are going to look at ***Flowcharts*** and ***Algorithms***

innovate achieve lead

BITS Pilani
Pilani Campus

Flowcharts

Flow Chart

- A Graphical representation of a solution to a particular problem
- Created by Von Neumann in 1945
- Flowcharts help in developing logic and algorithms before writing a program

How to make a flow chart

Step1: Identify input and output.

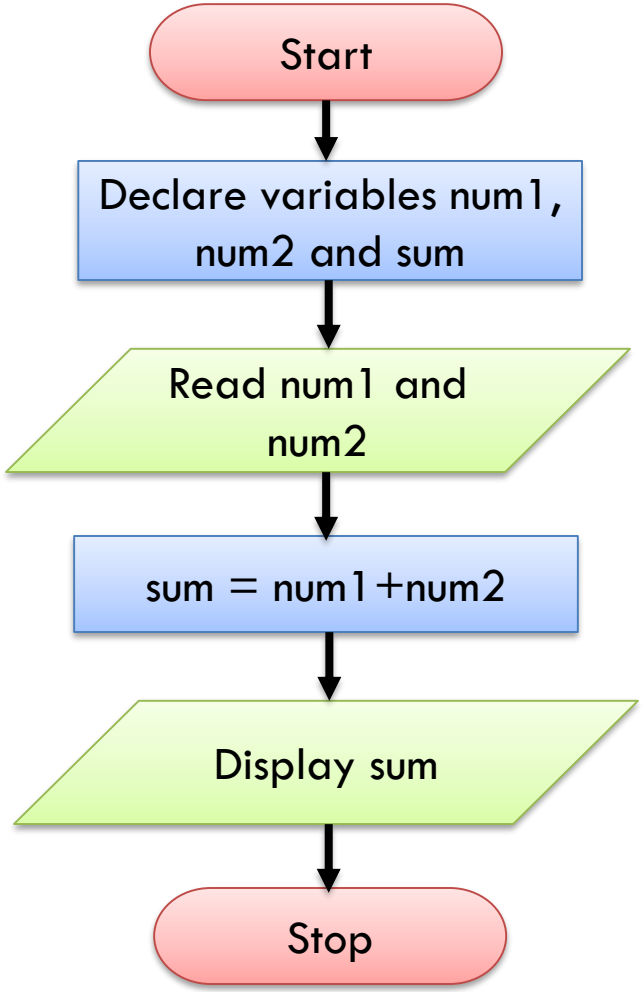
Step2: Apply reasoning skills to solve the problem

Step3: Draw the flowchart using the appropriate **symbols** and **arrows** to show the sequence of steps in solving the problem

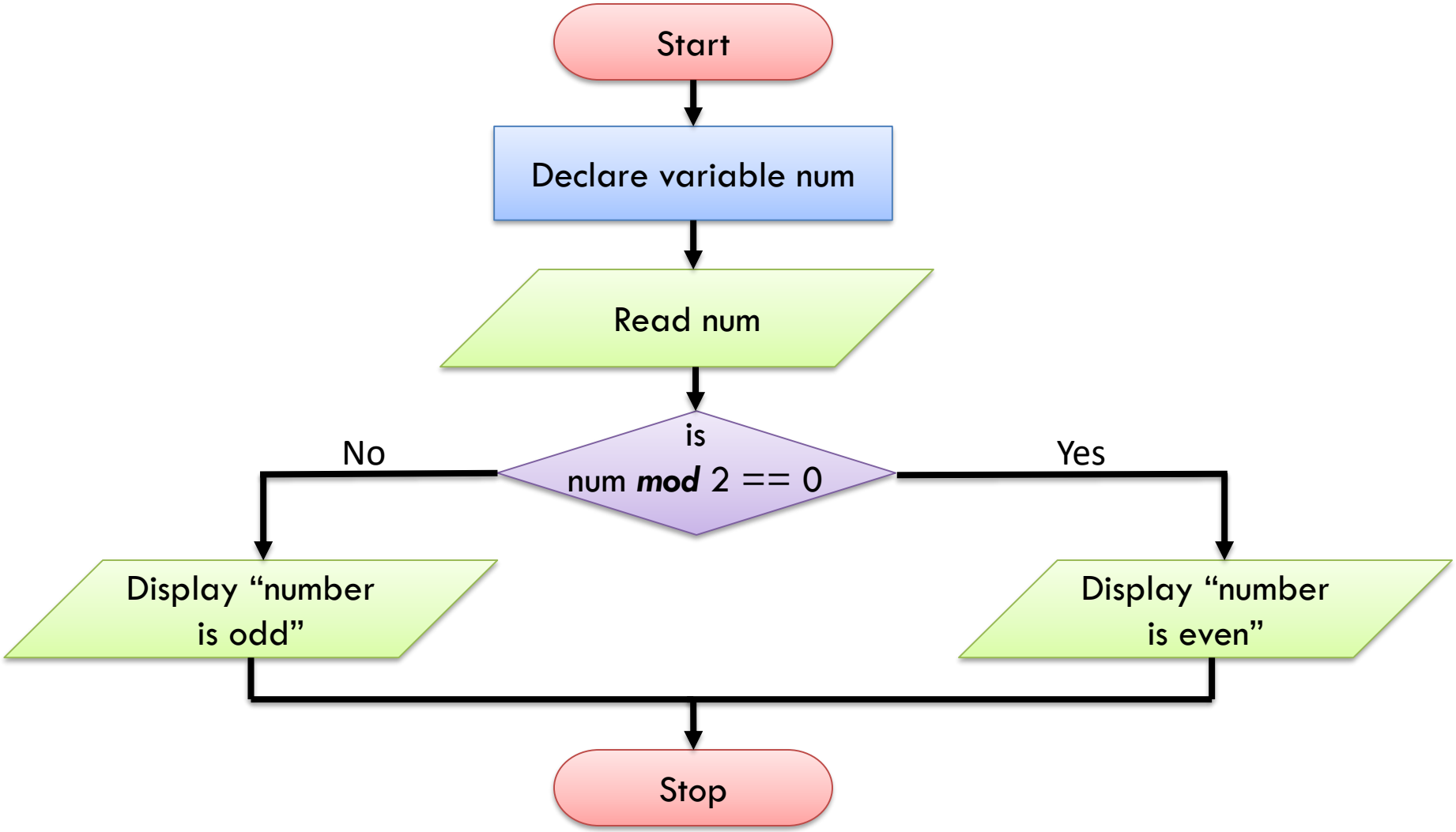
Symbols used in Flow Charts

Start and End Symbol Single Flow Line	Flow Line Shows the logical flow of control
For Input and Output 2 Flow Lines	Decision Symbol One flow of line for Input and two for Output
Process Calculation 2 Flow Lines	Connector Connects separate portions of a flow chart

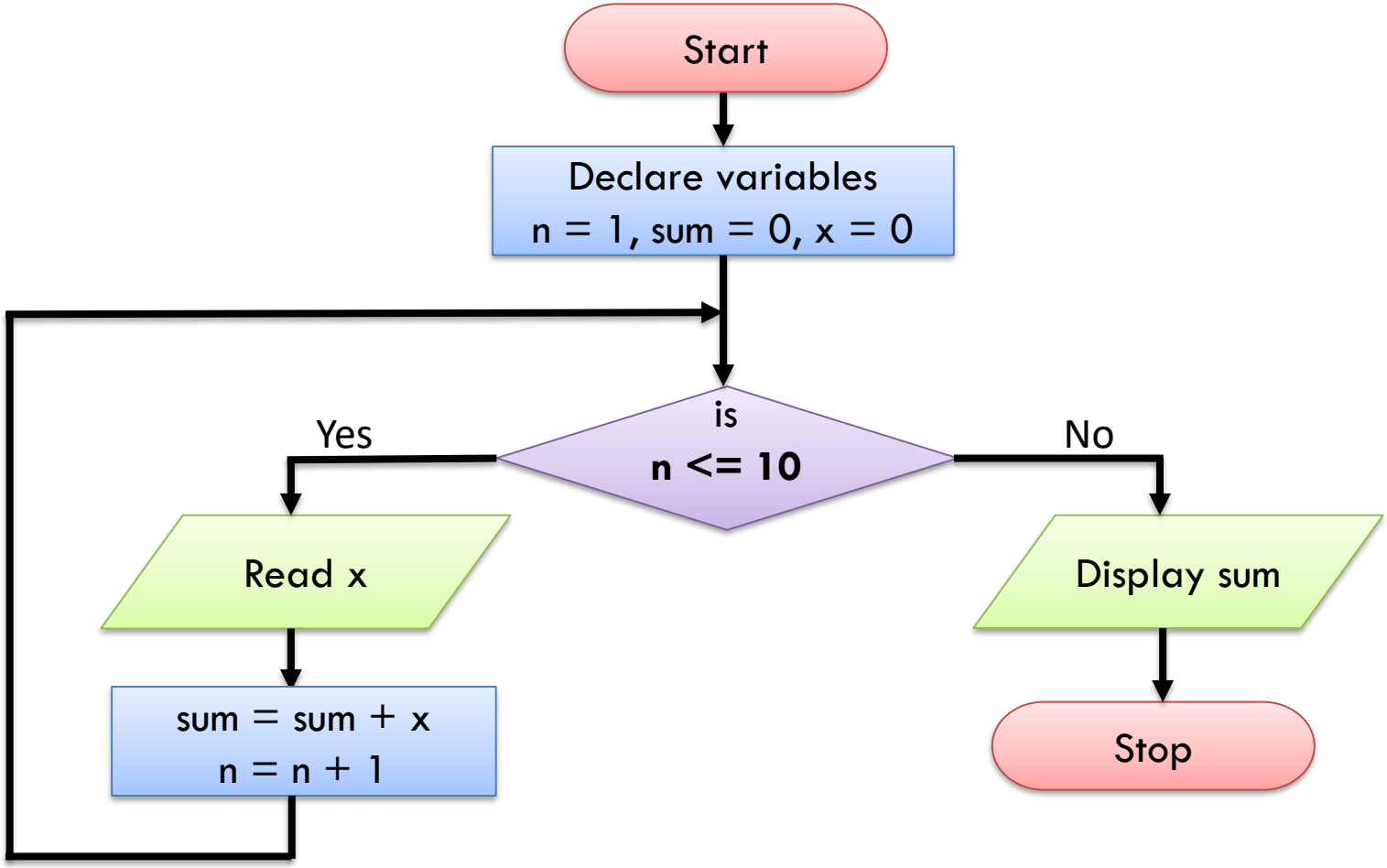
Flow Chart Example 1: Sum of two numbers



Flow Chart Example 2: Whether a number is even or odd



Flow Chart Example 3: Sum of 10 Numbers



innovate achieve lead

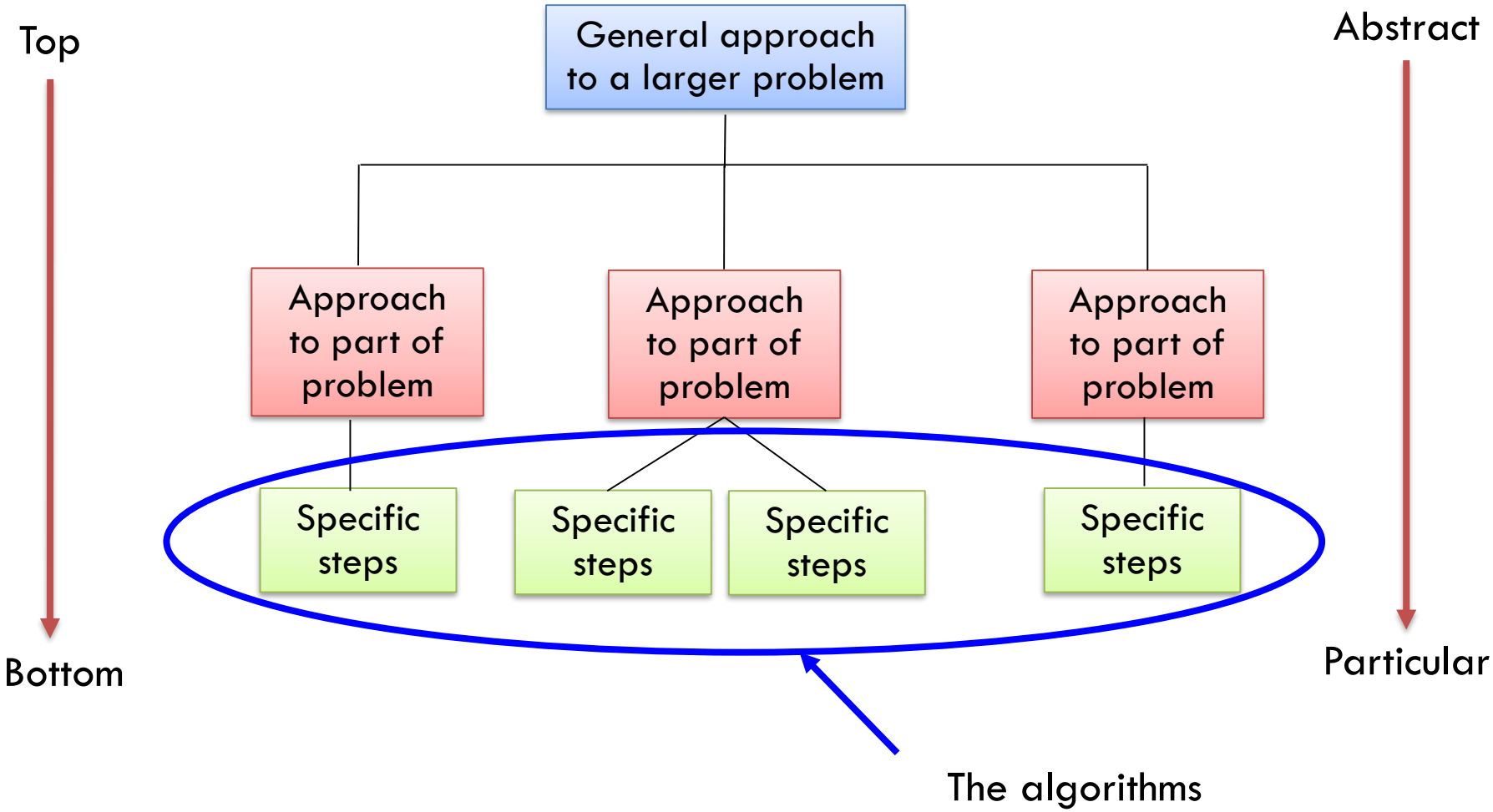
BITS Pilani
Pilani Campus

Algorithms

Algorithms

"Algorithms are a way of laying out a problem independent of the programming language"

Programming Methodologies



Top-down vs Bottom-up Programming

- **Top – Down Programming:**
  - Reverse engineers the finished products by breaking it into smaller, manageable or reusable modules.
  - Big picture is visualized first before breaking it up into separate components.

- **Bottom – UP Programming:**
  - Low level components are designed first without fully knowing the big picture.
  - The components are later integrated to form the complete system.

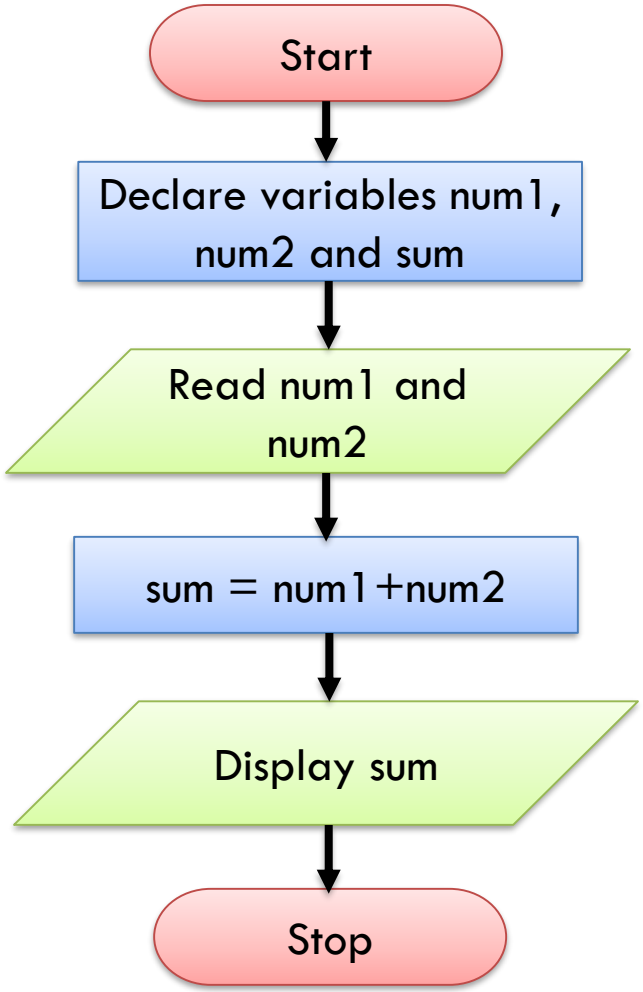
What is an Algorithm?

- Step by step solution to a problem in English like language.
- It is a finite set of clear and unambiguous steps that must be followed to solve a computing problem.
- The programmer can convert the algorithm to a program in any language.

Programming Logic Constructs

- Imperative statements (Actions)
- Conditional statements (Decision Making)
- Iterative Statements (Repetition / Loops)

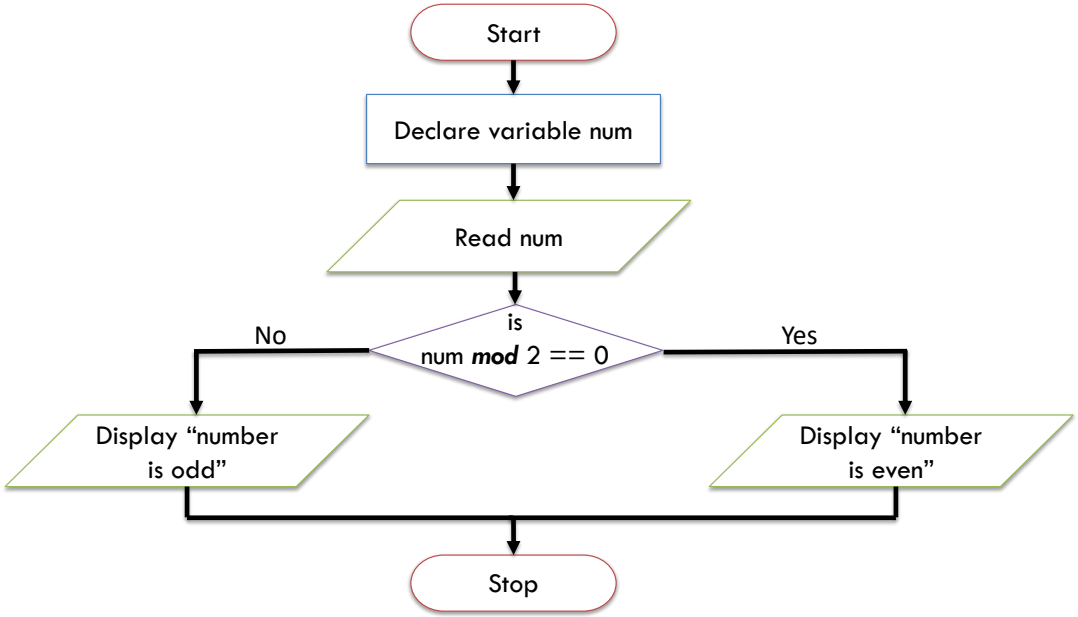
Algorithm Example 1: Sum of two numbers (Imperative)



1. **START**
2. Declare variables num1, num2, sum
3. **INPUT** the numbers num1, num2
4. Set sum = num1 + num2.
5. **PRINT** sum
6. **END**

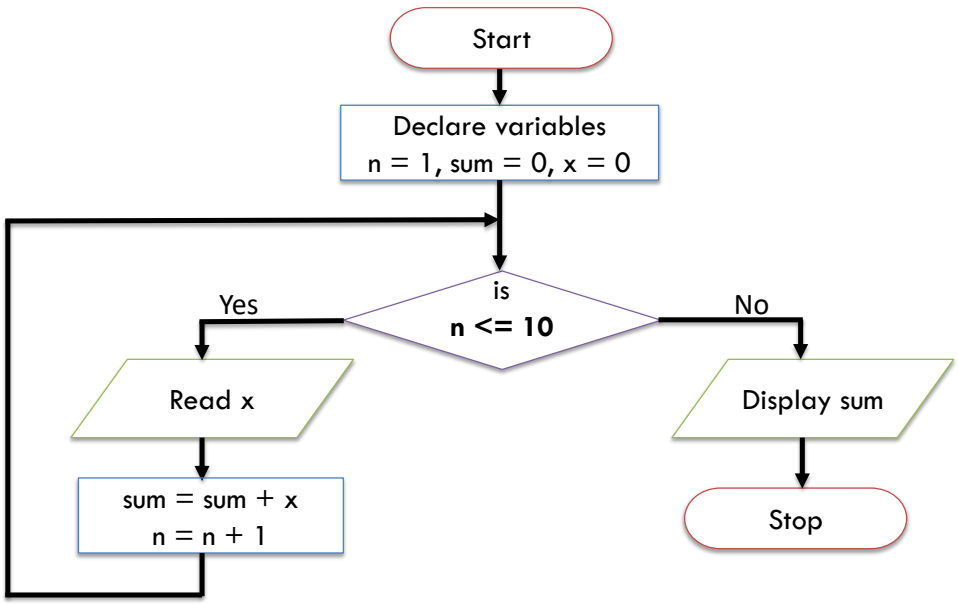
Algorithm Example 2:

Whether a number is even or odd (Conditionals)



1. **START**
2. Declare num
3. **INPUT** the number num
4. **IF** num mod 2 == 0 **THEN GOTO** step 5 **ELSE GOTO** step 7
5. **PRINT** "number is even"
6. **GOTO** step 8
7. **PRINT** "number is ODD"
8. **END**

Algorithm Example 3: Sum of 10 Numbers (Iterative)



1. **START**
2. Declare n=1, sum=0, x=0
3. **IF** n <=10 **THEN GOTO** step 4 **ELSE GOTO** step 8
4. **INPUT** x
5. Set sum = sum + x
6. Set n = n + 1
7. **GOTO** step 3
8. **PRINT** sum
9. **END**

Exercise

Roots of Quadratic equation

$ax^2 + bx + c = 0$ has the following roots:

$$D = b^2 - 4ac$$

If D>0 thenx

$$\text{root 1} = -b + \sqrt{D}/2a$$

$$\text{root 2} = -b - \sqrt{D}/2a$$

- *Draw a flowchart to find roots of the above quadratic equation*
- *Write an equivalent algorithm for the above flow chart*

More Exercises

- Draw a flowchart and write its corresponding algorithm for checking if a number n entered by the user is a prime number or not. [*Hint: Check for all numbers from 1 to n/2 if they divide n with remainder 0 or not. If none of them divides, n is a prime number*]

- Draw a flowchart and write its corresponding algorithm for computing the greatest common divisor (GCD) of two numbers entered by the user. [*Hint: Follow this link to understand what is GCD*]

innovate achieve lead

BITS Pilani
Pilani Campus

Thank you

Q & A