In-Class Exercise: Demonstrating the Three Programming Structures Using Flowgorithm

Objective: Students will use **Flowgorithm** to create and run simple flowcharts that demonstrate the three fundamental programming structures:

1. **Sequence**
2. **Selection (Decision-Making)**
3. **Loop (Iteration)**

Instructions

1. **Download and Install Flowgorithm** (if not already installed).
2. **Follow the given tasks** to create flowcharts demonstrating each programming structure.
3. **Run and test** each flowchart.
4. **Save and submit** your Flowgorithm files.

Flowgorithm Flowchart Symbols & Their Purpose

Symbol	Name	Purpose
◉ Oval	**Terminator (Start/End)**	Marks the beginning and end of a flowchart.
▨ Parallelogram	**Input/Output**	Used to take user input or display output.
▨ Rectangle	**Process**	Represents calculations, assignments, and processing steps.
◇ Diamond	**Decision**	Used for selection structures (IF, IF-ELSE) to make decisions.
🔁 Arrow	**Flowline**	Connects flowchart components and determines the flow of execution.

Flowgorithm Programming Structures

Sequence (Linear Execution)

A **sequence** structure executes instructions in order, one after another.

- Use **Input** to get values.
- Use **Process** for calculations or variable assignments.
- Use **Output** to display the result.

Example:

1. `Input Name`
2. `Display "Hello, " + Name`

Selection (Decision-Making)

A **selection** structure is used for conditional branching in Flowgorithm (making decisions using IF/ELSE). It uses a **Decision (Diamond)** symbol in the flowchart to branch into different paths based on a condition.

Simple IF-ELSE

- In a simple selection, the flowchart splits into two paths (true/false) based on one condition.
  Example:

1. `Input Number`
2. `IF Number MOD 2 == 0 THEN`
     `Output "Even"`
3. `ELSE`
      `Output "Odd"`

Nested IF-ELSE

- Nested selection structures are used when multiple conditions need to be checked in sequence.
  Example:

```
1. Input Score
   IF Score >= 90 THEN
       Output "Grade A"
   ELSE IF Score >= 80 THEN
       Output "Grade B"
   ELSE IF Score >= 70 THEN
       Output "Grade C"
   ELSE
       Output "Fail"
```

Loop (Iteration)

A **loop** structure allows repeating a set of instructions multiple times. Always ensure there is an exit condition to prevent infinite loops.

WHILE Loop

- A **WHILE** loop executes *as long as* a specified condition remains true.
  Example (print numbers 1 to 5):

```
Set Counter = 1
WHILE Counter <= 5
    Output Counter`
    Counter = Counter + 1
```

FOR Loop

- A **FOR** loop executes a *fixed number of times*.
  Example (print numbers 1 to 5):

```
FOR i FROM 1 TO 5
    Output i
```

DO-WHILE Loop (Post-Test Loop)

- A **DO-WHILE** loop executes the loop body **at least once**, then continues *while* a condition remains true (check at the end).
  Example (ask for input until the user enters a positive number):

```
DO
    Input Number
WHILE Number <= 0
```

Nested Loops (Loop Inside a Loop)

A **nested loop** is a loop inside another loop, used for grid-like repetition or when one loop controls repetition of another.
Example (Multiplication Table with nested FOR loops):

```
FOR i FROM 1 TO 5
    FOR j FROM 1 to 5
        Output i * j
```

Common Flowgorithm Functions

Function	Usage Example
Input	Input Name
Output	Output "Hello, " + Name
If-Else	IF Age >= 18 THEN Output "Adult" ELSE Output "Minor"
While	WHILE i <= 5 DO Output i *(with loop body* i = i + 1*)*
For	FOR i FROM 1 TO 5 DO Output i
Do-While	DO Input Number WHILE Number <= 0

Tasks

Task 1: Sequence Structure (Linear Execution)

- **Problem Statement:** Create a flowchart that asks the user for their name, age, and favorite color. Then, display a greeting message including their details.

- **Flowchart Components:**

  - Input: Ask for name, age, and color
  - Process: Concatenate the response into a message
  - Output: Display the message

- **Expected Output Example:**

```
Enter your name: Alice
Enter your age: 20
Enter your favorite color: Blue
Output: Hello Alice! You are 20 years old and your favorite color is Blue.
```

Task 2: Selection Structure (Decision-Making using IF/ELSE)

- **Problem Statement:** Create a flowchart that asks the user for a number. If the number is **even**, display "The number is even"; otherwise, display "The number is odd."

- **Flowchart Components:**

  - Input: Ask the user for a number
  - Process: Use an **if-else** condition to check if the number is even (i.e., number mod 2 = 0)
  - Output: Display "Even" or "Odd"

- **Expected Output Example:**

```
Enter a number: 7
Output: The number is odd.

Enter a number: 8
Output: The number is even.
```

Task 3: Loop Structure (Using a WHILE Loop or FOR Loop)

- **Problem Statement:** Create a flowchart that prints numbers from 1 to 5 using a loop.

- **Flowchart Components:**

  - Process: Initialize a counter variable to 1
  - Loop: Use a **while** loop or **for** loop to repeat the process until the counter reaches 5
  - Output: Print numbers from 1 to 5

- **Expected Output Example:**

```
    Output: 1
    Output: 2
    Output: 3
    Output: 4
    Output: 5
                                        5 / 5
```

Task 4: Loop Structure (User-Defined Range)

- Modify **Task 3** to allow the user to input a number **N**, then print numbers from **1 to N** using a loop.