

Programming Fundamentals

Lab 01

Flow Charts

A flowchart is a pictorial description of an algorithm. The flowchart outlines the structure and logic of the algorithm and the sequence of operations to be followed in solving the problem. A flowchart is composed of a set of standard symbols, each of which is unique in shape and represents a particular type of operation. The symbols are connected by straight lines called flowlines. These usually contain arrows to indicate the order in which the operations are performed. A flowchart provides a means of organizing our thinking about a problem solution. Because flowcharts provide pictorial representations of the steps that are to be followed, they assist in both the development and communication of the logic of the problem solution. They are also helpful in detecting and correcting errors in logic and developing more efficient structures.

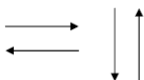



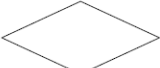
A flowchart is useful for complicated programs which contain numerous branches since it can depict the interrelationships between the various branches and loops. Flowcharts also allow us to quickly test several alternative solutions to a problem since it is much easier to draw the flowchart than to write the program. Once a flowchart has been developed, the task of writing the program is greatly simplified.

Finally, a flowchart is an excellent vehicle for documenting a program. It provides a convenient means of communication between both programmers and non-programmers. This is important during the development of a program, especially when several people are working on the same project. Since a flowchart is not dependent on a particular programming language, it can be understood by another programmer and by people who have limited knowledge of programming. This can be of great benefit during later maintenance and use of the program.

In summary, a flowchart is an analytical tool and is useful for documentation and as a communication device.

Flow Chart Symbols

The symbols used in flowcharts have been standardized by the American National Standards Institute. Arrows are used on the connecting flowlines if the direction of flow is not clear. A flowchart should have one start and one or more stop points and should be arranged so that the direction of processing is from top to bottom and from left to right. Although flowlines can cross, the crossing flowlines are independent of each other. Whenever possible, crossing of flowlines should be avoided, since it makes the flowchart difficult to read. Following figure shows the various flowchart symbols and the operation that they represent.

Symbol	Name	Meaning
	Flowlines	Represent direction of processing
	Terminal	Represents the beginning and end of a program
	Input/Output	Data is read in or results are printed out
	Process	Represent computations or data manipulations
	Decision	Represents the branching to alternative paths based on a test

Terminal Symbol

The terminal symbol, which is oval shaped, represents start and end points of an algorithm. The words START and STOP or END are usually placed as narratives within the start and end symbols, respectively. Typically, there is only one starting point, but there may be more than one end points, one to indicate the end of normal processing and others to indicate an exit resulting from one or more unrecoverable error conditions.

Input/Output Symbol

Both input and output operations are represented by a parallelogram tilted to the right. The nature of the operation to be performed is indicated by including the terms READ and INPUT to denote input operations and the terms PRINT and WRITE to denote output operations.

Processing Symbol

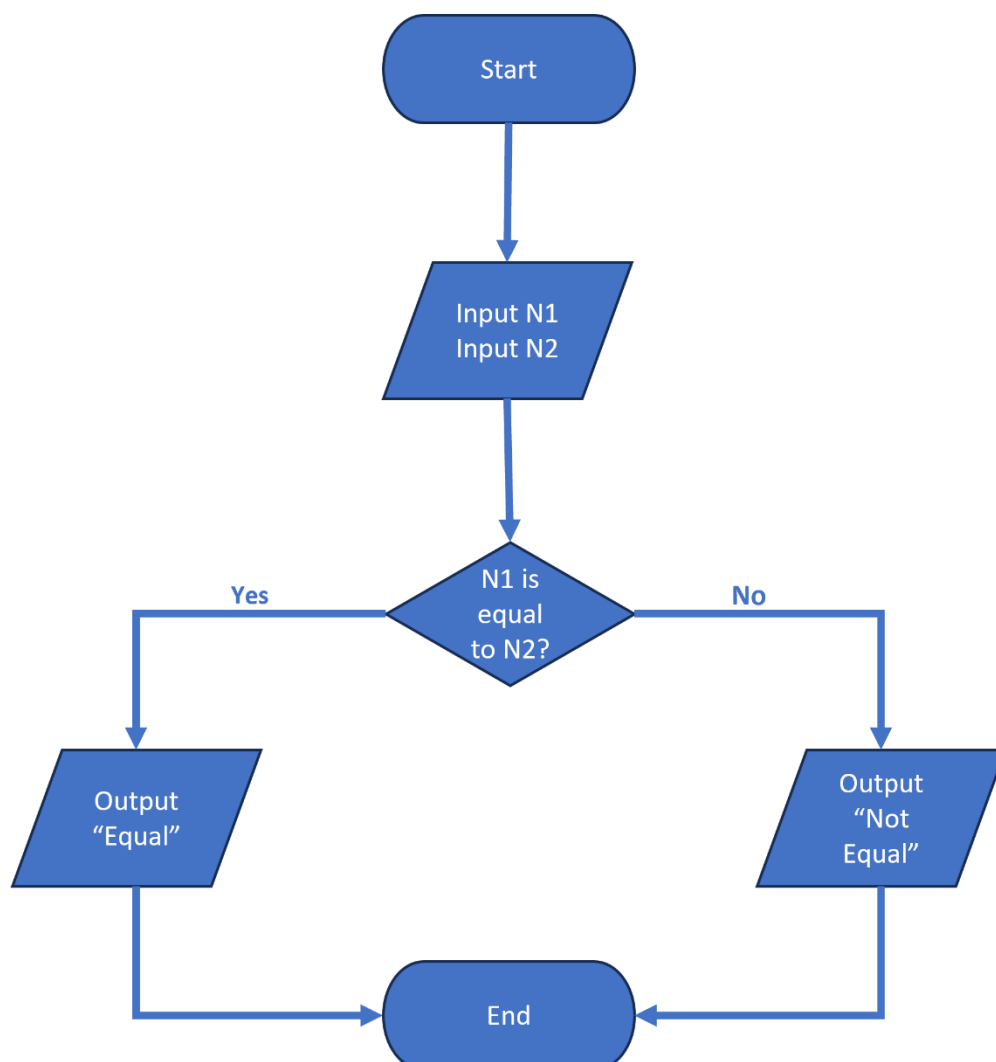
The rectangular processing symbol is used to indicate operations involving arithmetic and data manipulation. This symbol is also used to represent a collection of statements that perform computations.

Decision Symbol

The diamond-shaped decision symbol is used to indicate a point in the algorithm at which a branch to one or more alternative paths is possible. The condition upon which each of the exit paths will be executed is identified within the diamond shaped symbol. Also, flowlines leaving the corners of the diamond are labeled with the decision results associated with each path.

Example

Draw a flowchart to take two inputs from the user, identify if they are equal and print the relevant result ("Equal" if number are same and "Not Equal" if the numbers are different)



Lab Activities

We learned about flowcharts. Now, we will go a little more forward and understand the flowchart in more detail and create a little more complex flowcharts on Paper.

Resources

Visit the following link to get the understanding of flowchart and how to make the flowchart.

<https://www.visual-paradigm.com/tutorials/flowchart-tutorial/>

Tasks

1. Draw a flowchart to take two values from user as input and print the number which is greater (assume that both the values are different).
 - a. Can you think of a way if both the values are similar then what should be changed?
2. Draw a flowchart to take two values from user as input and display their sum.
3. Draw a flowchart for a program that reads two numbers and displays the numbers read in decreasing order.
4. The lengths and breadth of a rectangle and radius of a circle are input through the keyboard. Draw a flow chart to calculate:
 - a. The area & perimeter of the rectangle
 - b. The area & circumference of the circle
5. Construct the flow chart for the following order processing scenario:
 - a. Receive an order by email.
 - b. Record it in the company's database.
 - c. Check for shipping.
 - d. If yes
 - i. Print invoice
 - ii. Send email to confirm shipping.
 - iii. Assemble package and ship.
 - e. If no
 - i. End Process
6. Find out minimum 5 software (both online and offline) available for flowcharting. Compare them with each other. Select one of them, state the selection criteria e.g., why have you chosen the software and left the rest. Create the flowchart of Task 4 & 5 using that software.

How to do it?

1. Tasks 1 – 3 to be performed in the group by mutual discussion.
2. Tasks 4 – 6 to be performed individually.

Note: All the tasks should be completed in the lab timing.

Best of Luck 😊