University of Colombo School of Computing

Orientation Program – 2022 Batch

Flow Charts

***Outline*:**

- *Introduction to Flow Charts*
- *Basic Rules*
- *Control Structures*

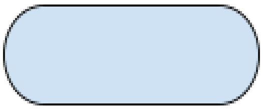
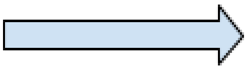
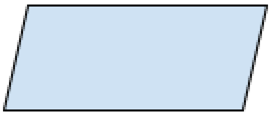
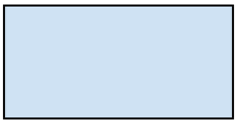
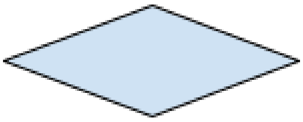
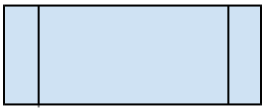
Flow Charts

A flowchart is a diagram that is used in designing and documenting a process, system or computer algorithm. Flowcharts use rectangles, ovals, diamonds and potentially numerous other shapes to define the type of step, along with connecting arrows to define flow and sequence. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analyzing, designing, documenting or managing a process or program in various fields such as computing, education, sales, manufacturing and engineering.

Using a flowchart has a variety of benefits.

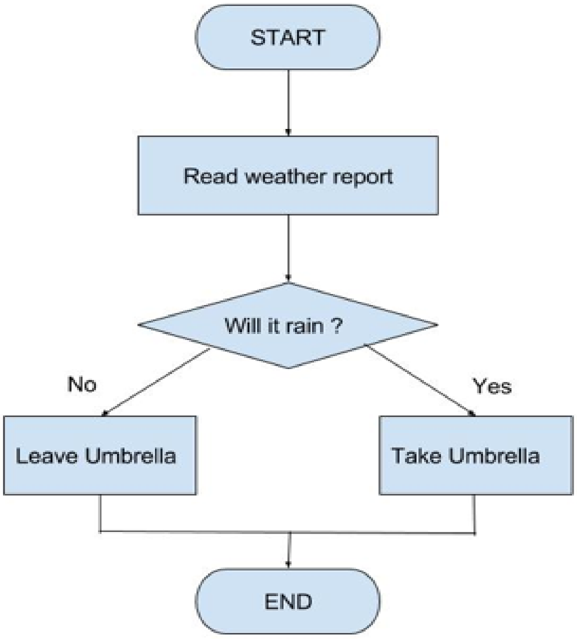
- It helps to clarify complex processes.
- It helps team members to gain a shared understanding of the process and use this knowledge to collect data, identify problems, focus discussions, and identify resources.
- It serves as a basis for designing new processes.

1.1 Basic symbols

Symbol	Name	Function
	Start/End	An Oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/output	A parallelogram represents input or output.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.
	Sub Process	Indicates a sub process.

Example 1

Draw a simple flowchart to represent how you make the decision of taking an umbrella when you go out.



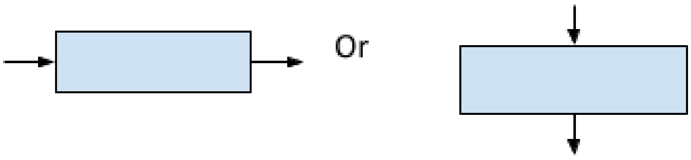
1.2 Computer Program Flow Charts

Computer program flowcharts are used to show the logic of a computer program. Sometimes it is used to show an algorithm without writing the code. Sometimes they are used for training purposes for beginner programmers who don't know programming codes but can understand graphical symbols in flowcharts.

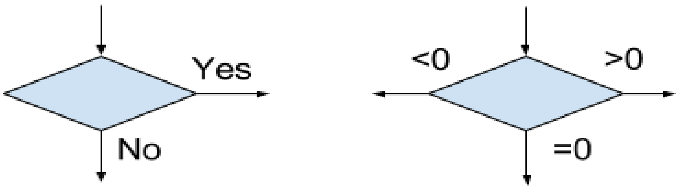
1.2.1 Basic Rules to follow in constructing a flow chart

1. The usual direction of the flow of a process is from left to right or top to bottom.

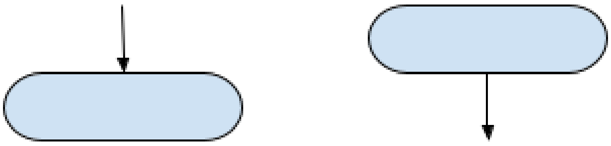
2. Processes have only one entry point and one exit point.



3. Only one flow line should enter a decision symbol, but two or three flow lines, one for each possible answer, should leave the decision symbol.



4. Only one flow line is used in conjunction with the start or end (terminal) symbol.



5. Ensure that the flowchart has a logical start and end.

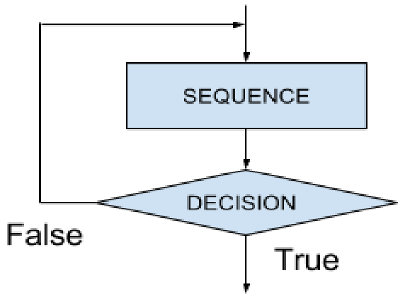
1.3 Several Control Structures

1.3.1 LOOP

In computer programming, a loop is a sequence of instructions that is continually repeated until a certain condition is reached.

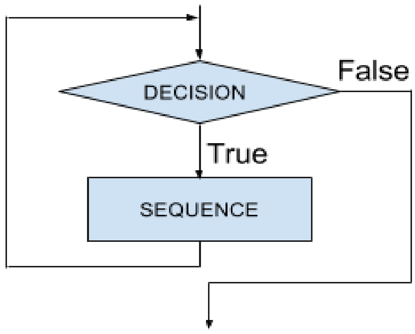
Loop Structure 1:

This structure depicts a situation where the process precedes the decision. This means that the loop will always execute the process (sequence of processes) part at least once.



Loop Structure 2:

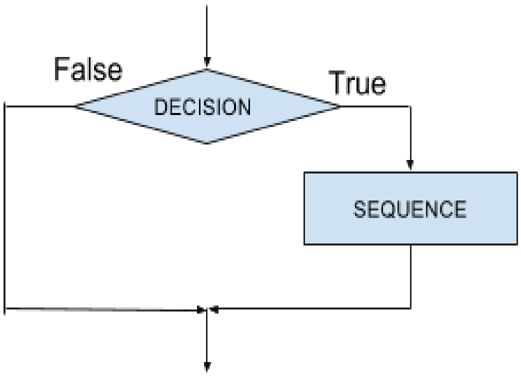
In this structure the decision comes first, followed by the process. This structure is usually drawn so that the loop iterates only while the condition in the decision is true.



1.3.2 IF…THEN

This structure indicates what process to follow if the decision condition is TRUE. No process is followed if the decision condition is FALSE.

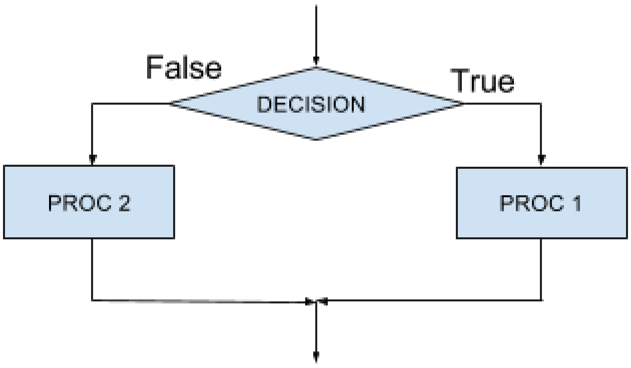
Eg: If the “Age” of a child is greater than 06 years, send the child to a school.



1.3.3 IF…THEN … ELSE

This structure indicates what process to follow if the decision condition is TRUE and what to follow if the decision condition is FALSE.

Eg: If the "Age" of a child is greater than 06 years, send the child to a school, else send the child to a Montessori.



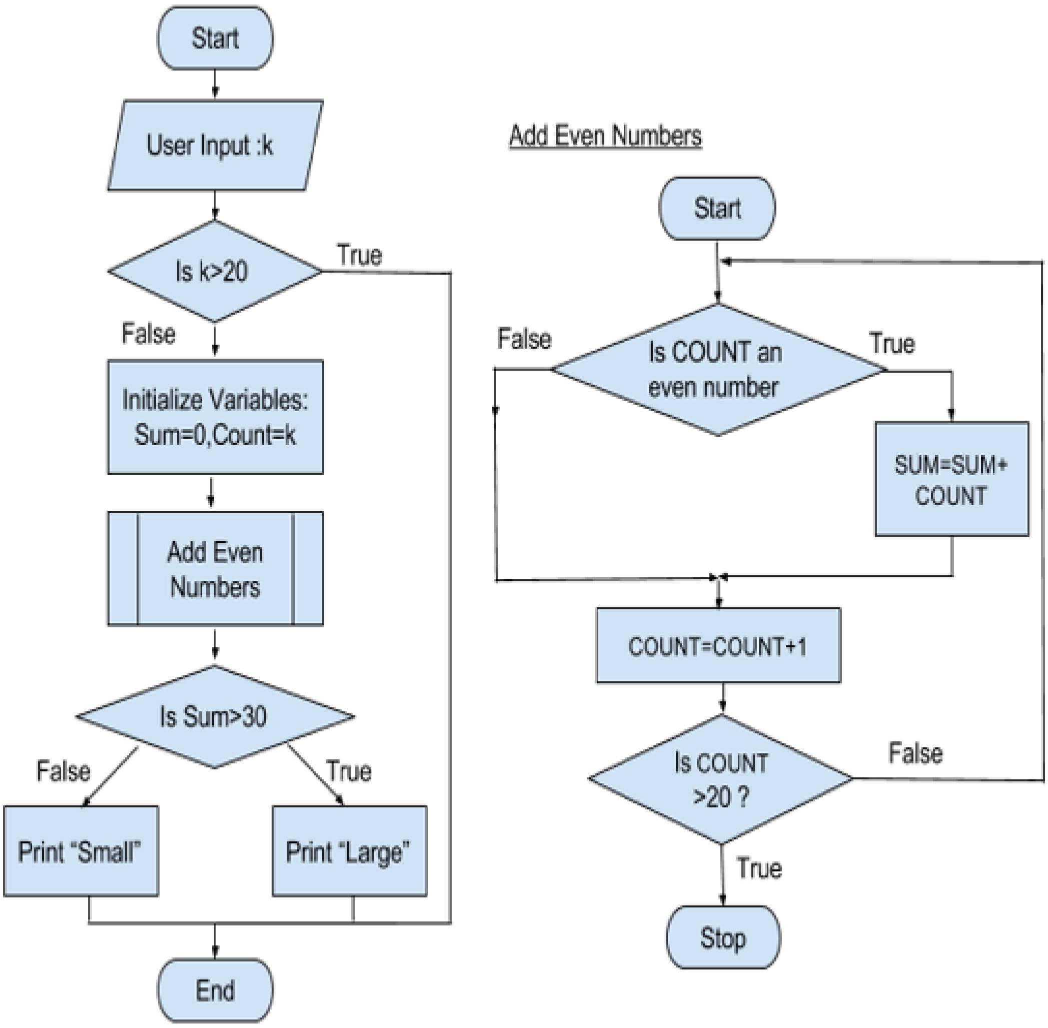
1.4 Sub process

The sub-process within a flow chart is useful because:

- It provides a means of simplifying programs by making common processes available to a wide number of programs.
- It permits the modularization of complex programs.
- It makes for more reliable programs since once it is shown that a process works then it can be made a sub process and no need of being tested again.

Example 2

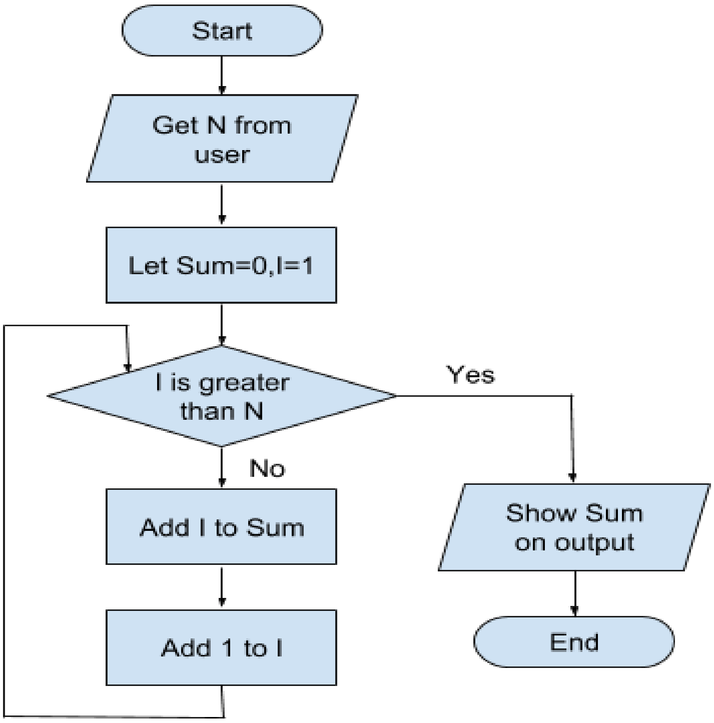
Find the sum of all even integers between a user given input k and 20 and print “Small” if the sum is smaller than or equal to 30 and print “Large” if the sum is greater than 30. If the user given input is larger than 20, the program should terminate.



“Add even numbers” is defined as a separate process in another flowchart and it is used as a sub process in the main flow chart. Thus, the complexity of the main flow chart is reduced.

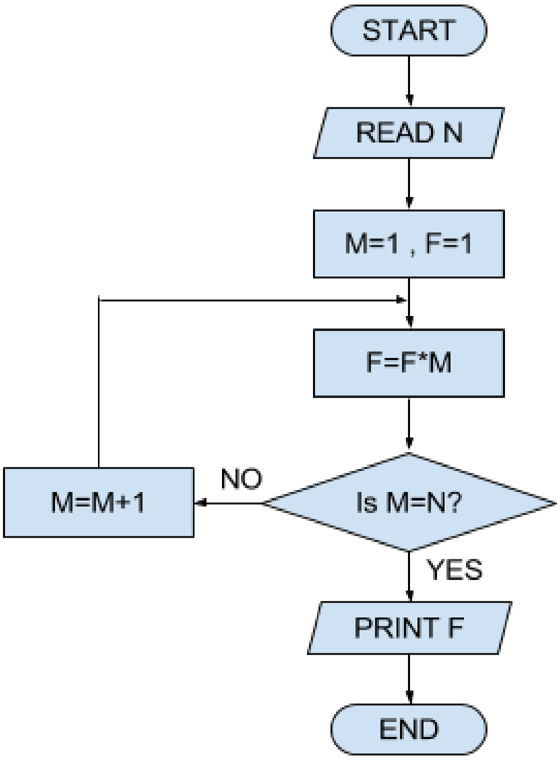
Example 3

Draw a flowchart to calculate the sum of numbers from 1 to N, where N is a number provided by the user.



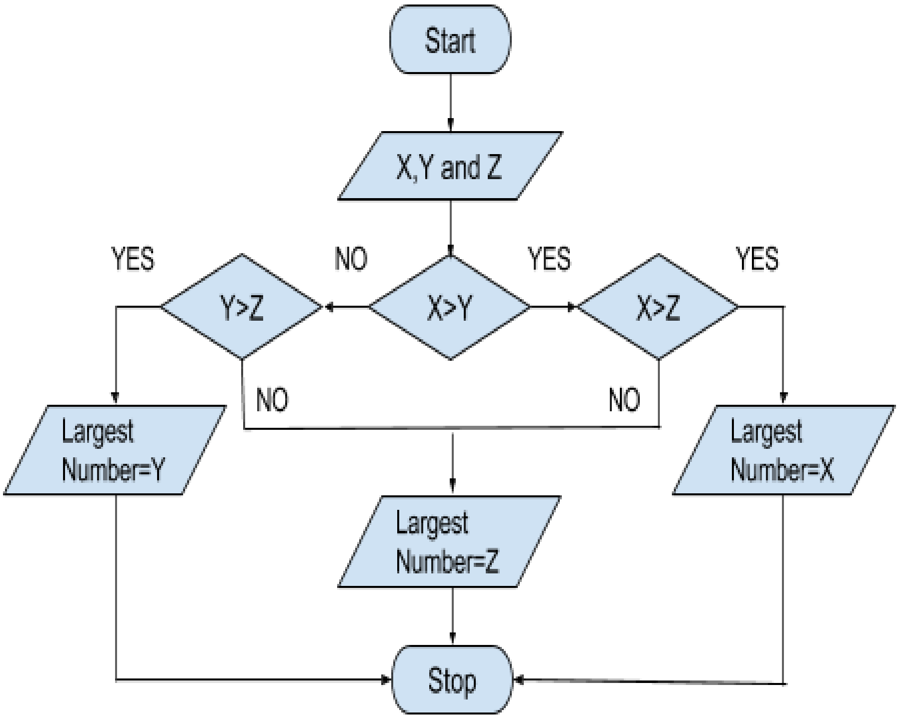
Example 4

Draw a flowchart for computing factorial N (N!): N! = 1 x 2 x 3 x …… N



Example 5

Draw a flowchart to find the largest of three numbers X, Y and Z.


Start
X,Y and Z
YES
Y>Z
NO
X>Y
YES
X>Z
YES
NO
NO
Largest Number=Y
Largest Number=X
Largest Number=Z
Stop