Algorithm:

An algorithm is a step-by-step problem solving procedure that can be carried out by a computer.

Does algorithm depend on programming language? Justify your answer.

No, an algorithm does not depend on the programming language. Because, an algorithm expresses the steps sequentially for solving a problem only, we can express the algorithm in our natural languages like English etc.

Ex. 1. Write the algorithm to find the sum and product of two given numbers.

Algorithm: To find the sum and product of two given numbers:

Step 1: Read A , B
Step 2: Let Sum= A+B
Step 3: Let Product=A*B
Step 4: Print Sum, Product
Step 5: Stop.

Ex 2: Develop an algorithm to interchange the values assigned to two variables A and B. (For example, if A=2 and B=3, after interchange, it should be A=3 and B=2).

Algorithm: To interchange the values.

1. [Initialize the variables]
   A = 2
   B = 3
2. [Peform the operations]
   TEMP = A
   A = B
   B = TEMP
3. [Print the result]
   Print A, B
4. [Finished]
   Stop

Ex.3: Write an algorithm to find the largest number from 10 given numbers.

Algorithm: To find the largest number from 10 given numbers.

1. [Initialize the variables]
   large = 0
   count = 0
2. [Increment the count]
   count = count+1
3. [Enter number]
   read x
4. [Perform the operations]
   if (t>x) then
      goto step 6
   end if
5. large = x
6. if (count ≤ 10) then
      goto step 2
   end if
7. [Print the result]
   Print large
8. [Finished]
   Stop

Ex 4: Develop an algorithm to evaluate S using the relation:

S=1 + 4 + 9+ 16 + …..+ 100

Algorithm:

1. [Initialize the variables]
   X=1
   S=0
2. [Perform the operations]
   Y = X*X
   S=S + Y
   X=X+1
3. [Check the condition]
   If (X ≤ 100) Then
      Goto step 2
   End if
4. [Print the output]
   Print S
5. [Finished]
   Stop

$$\frac{n(n+1)}{2}$$

Flow-chart?

(i) A flowchart is a diagrammatic representation of algorithm to plan the solution to the problem.

(ii) Constructed by using special geometrical symbols where each symbol represents an activity. The activity would be input/output of data, computation/processing of data etc.

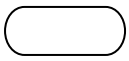
Advantages of using flowchart:

1. Communication: They are good visual aid to understand the program.
2. Quicker grasps of relationships.
3. Effective analysis.
4. Synthesis
5. Proper program documentation
6. Efficient coding
7. Orderly debugging & testing of programs.
8. Efficient program maintenance.

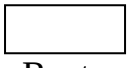
Limitations of using flowchart:

1. Complex logic
2. Alterations & Modifications
3. Reproduction
4. No uniform practice
5. Link between conditions
6. Standardization

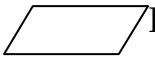
Flowchart symbols:

 Start/Stop

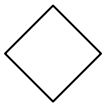
Ellipse

 Expression

Rectangle


I/O Statements

Parallelogram


Decision

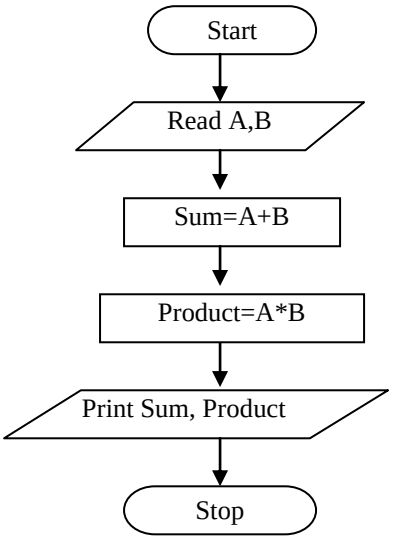
Rhombus


Connecting lines (Flow lines)


Connector with label

Ex. Draw the flowchart to find the sum and product of two given numbers.

Flowchart: To find the sum and product of two given numbers:



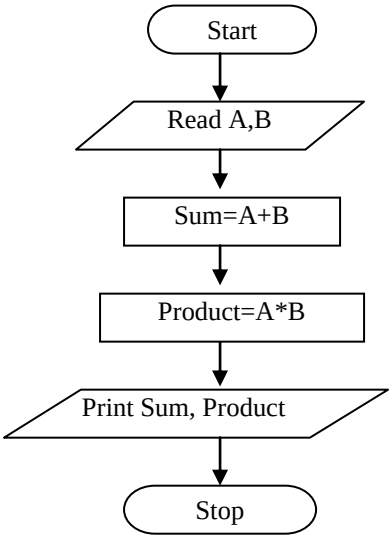
Ex: Write the algorithm and draw the flowchart to find the sum and product of two given numbers.

Solution:

Algorithm: To find the sum and product of two given numbers:

Step 1: Read A , B
Step 2: Let Sum= A+B
Step 3: Let Product=A*B
Step 4: Print Sum, Product
Step 5: Stop.

Flowchart: To find the sum and product of two given numbers:



Ex: What are the advantages and limitations of flowcharts when used to solve a problem?

Solution: Flowcharts have the following advantages when used to solve a problem:

(a) They are brief and to the point.
(b) They express clearly the logic of a given procedure.
(c) They are unambiguous as there can be only one direction of logic at any one time.
(d) They show readily whether all eventualities are covered.

Limitations: Complex and detailed charts can be laborious to plan and draw and the actions to be taken in specified situations can be difficult when many decision paths are involved.

Ex: What is meant by algorithm? Write an algorithm to find and print the smaller number from two given numbers.

Solution: An algorithm is a logical list of procedures or steps for solving a given problem.

Algorithm: To find the smallest number from two given numbers:

1. [Enter numbers]
   Read A, B
2. [Perform the operations]
   If (A<B) then
   Print smallest number is A
   Else
   Print smallest number is B
   End If
3. [Finished]
   Stop

Ex: Write an algorithm to compute the arithmetic mean of n numbers.

Solution:
Algorithm: To compute the arithmetic mean of n numbers.

1. [Enter N]
   Read N
2. [Enter numbers]
   For I=1 to N
   Read A[I]
   End For
3. [Initialize the variables]
   Sum=0
4. [Perform the operations]
   For I=1 to N
   Sum=Sum+A[I]
   End For
   AM=Sum/N
5. [Print the Output]
   Print Sum, AM
6. [Finished]
   Stop

Ex: What is an algorithm? What are its essential properties?

Solution:

Algorithm: An algorithm is a step-by-step problem solving procedure that can be carried out by a computer. The essential properties of an algorithm are:

1. It should be simple.
2. It should be clear with no ambiguity.
3. It should lead to a unique solution of the problem.
4. It should involve a finite number of steps to arrive at a solution.

It should have the capability to handle some unexpected situations which may arise during the solution of a problem (for example, division by zero).

Ex: What are the advantages and disadvantages of algorithm?

Solution:

Advantages of Algorithm:

1. It is a step by step solution to a given problem which is very easy to understand.
2. It has got a definite procedure which can be exacted within a set period of time.
3. It is easy to first develop an algorithm, then convert it into a flowchart and then into a computer program.
4. It has got a beginning and an end within which there are definite procedures to produce output(s) within a specified period of time.
5. It is easy to debug as every step has got its own logical sequence.
6. It is independent of programming language.

Disadvantages of Algorithm:

It is time consuming and cumbersome as an algorithm is developed first which is converted into a flowchart and then into a computer program.

Ex: What do you meant by an algorithm? Discuss the main features of an algorithm.

Solution:

An algorithm is a step of instructions to be followed to solve a problem in computers.

According to D.E. Knuth, a pioneer in the computer science discipline, an algorithm has five important features.

i) **Finiteness:** An algorithm terminates after a fixed number of steps.

ii) **Definiteness:** Each step of the algorithm is precisely defined, i.e. the actions to be carried out should be specified unambiguously.

iii) **Effectiveness:** All the operations used in the algorithm are basic (division, multiplication, comparison., etc.) and can be performed exactly in fixed duration of time.

iv) **Input:** An algorithm has certain precise inputs, i.e. quantities which are specified to it initially, before the execution of the algorithm begins.

v) **Output:** An algorithm has one or more outputs, that is the results of operations which have a specified relation to the inputs.

Ex: Develop an algorithm to read a value of N and to compute and print the value of N!

Algorithm: To read a value of N and to compute and print the value of N!

1. [Enter number]
   read N
2. [Check, if the number is negative]
   if(N<0) then
       stop
   end if
3. [Perform the operation]
   K=1
   For L=2 to N
       K=K*L
   End For
4. [Print the result]
   Print K
5. [Finished]
   Stop

Ex: Does an algorithm depend on the programming language?

Solution: No, an algorithm does not depend on the programming language.

Ex: What is a flowchart? Why is it called a flowchart?

OR

What is a flowchart?

Solution: A flowchart is a picture or a diagram which helps us define a procedure for solving a problem. It is called a flowchart since it shows the logical flow of operations in various steps.

Ex: What is the purpose of a flowchart?

Solution: A flowchart is a picture or a diagram which helps us define a procedure one step at a time, and arrange it in a logical sequence. . It is necessary to draw a flowchart before writing a procedure because it gives a picture of the logical flow of operations. If there is any logical error in the procedure, we can easily identify the error just by looking at the flowchart.

Fig. Flowchart for writing and posting a post card.

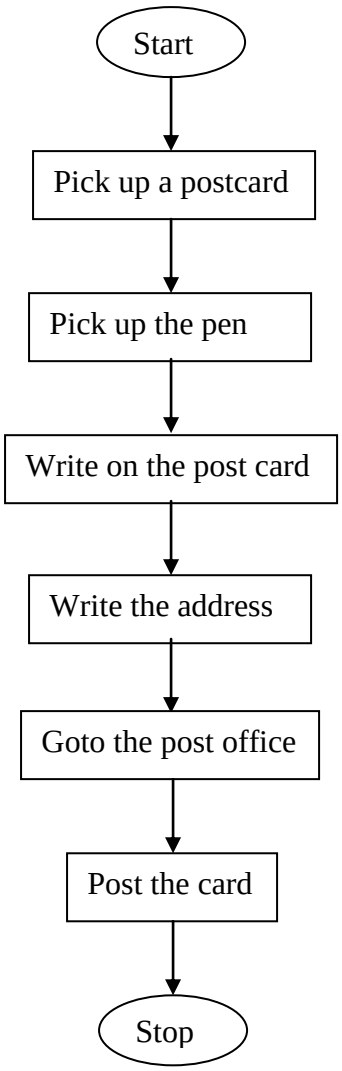
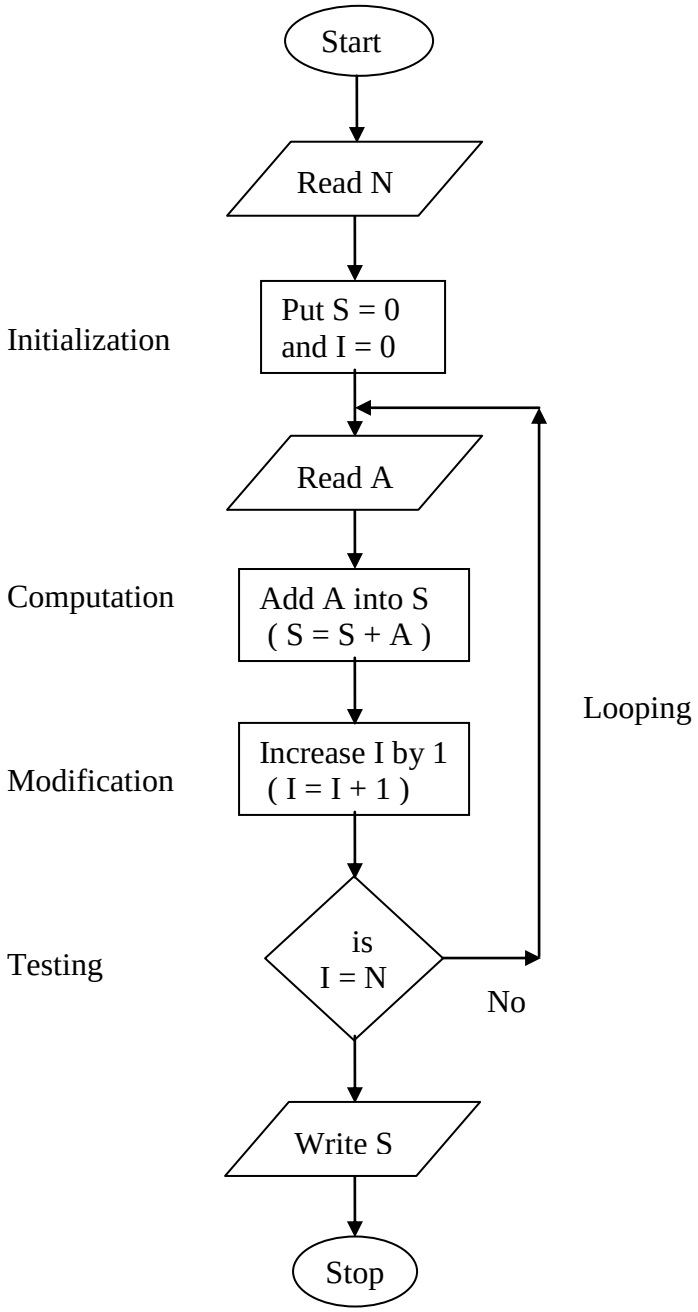
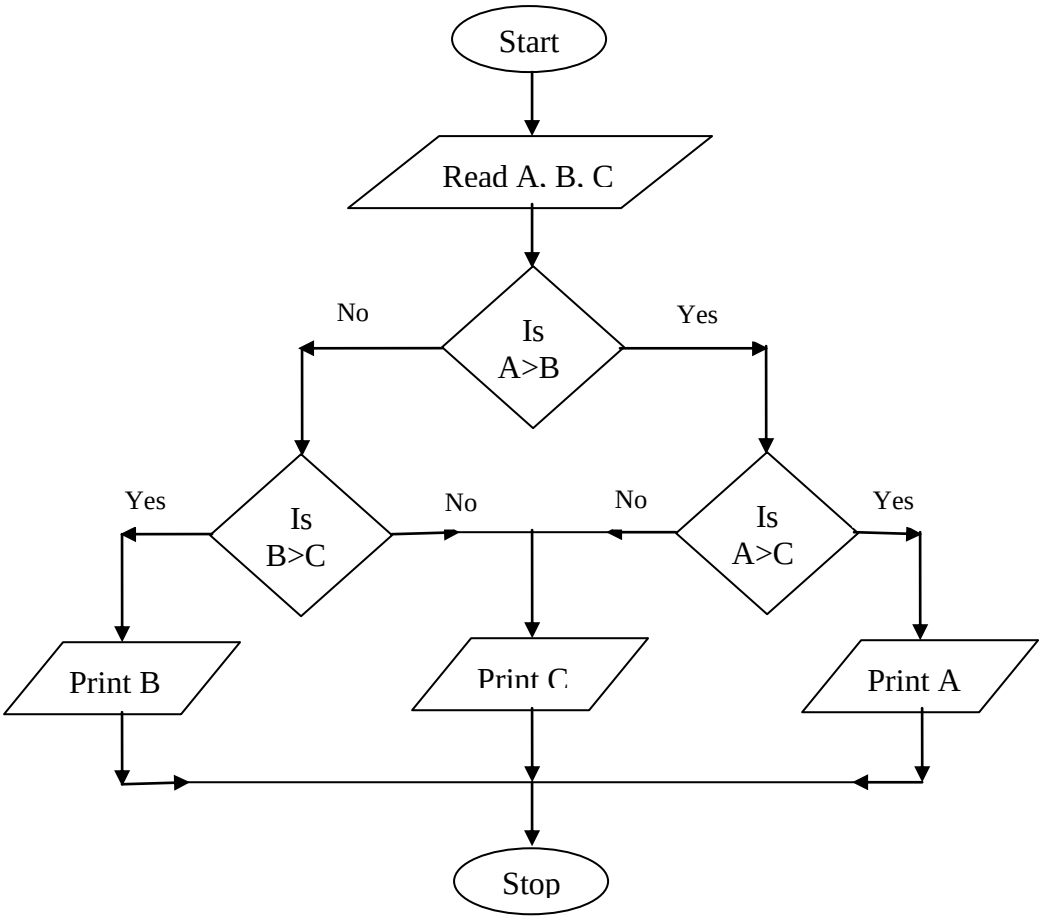


Fig: Summing of N given numbers.



Flowchart: To find the biggest number of three given numbers:

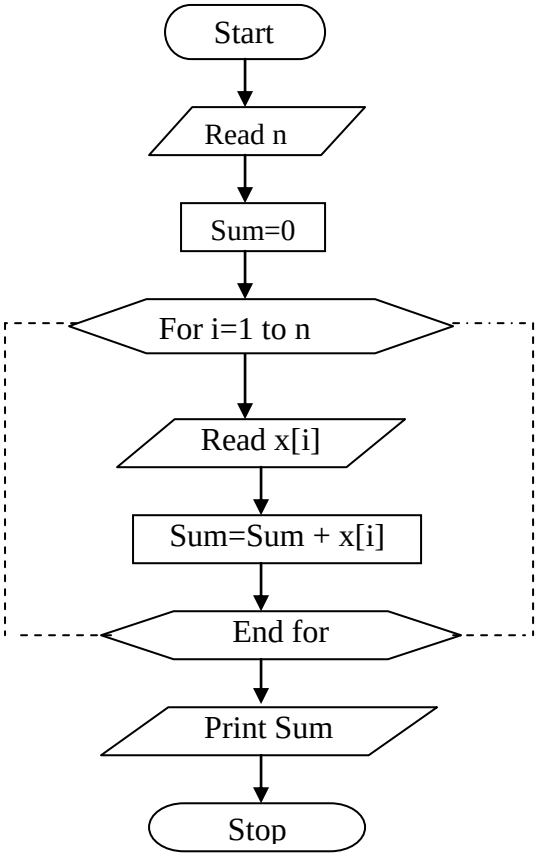


Q.1. Draw a flowchart to find the sum of n given numbers

OR

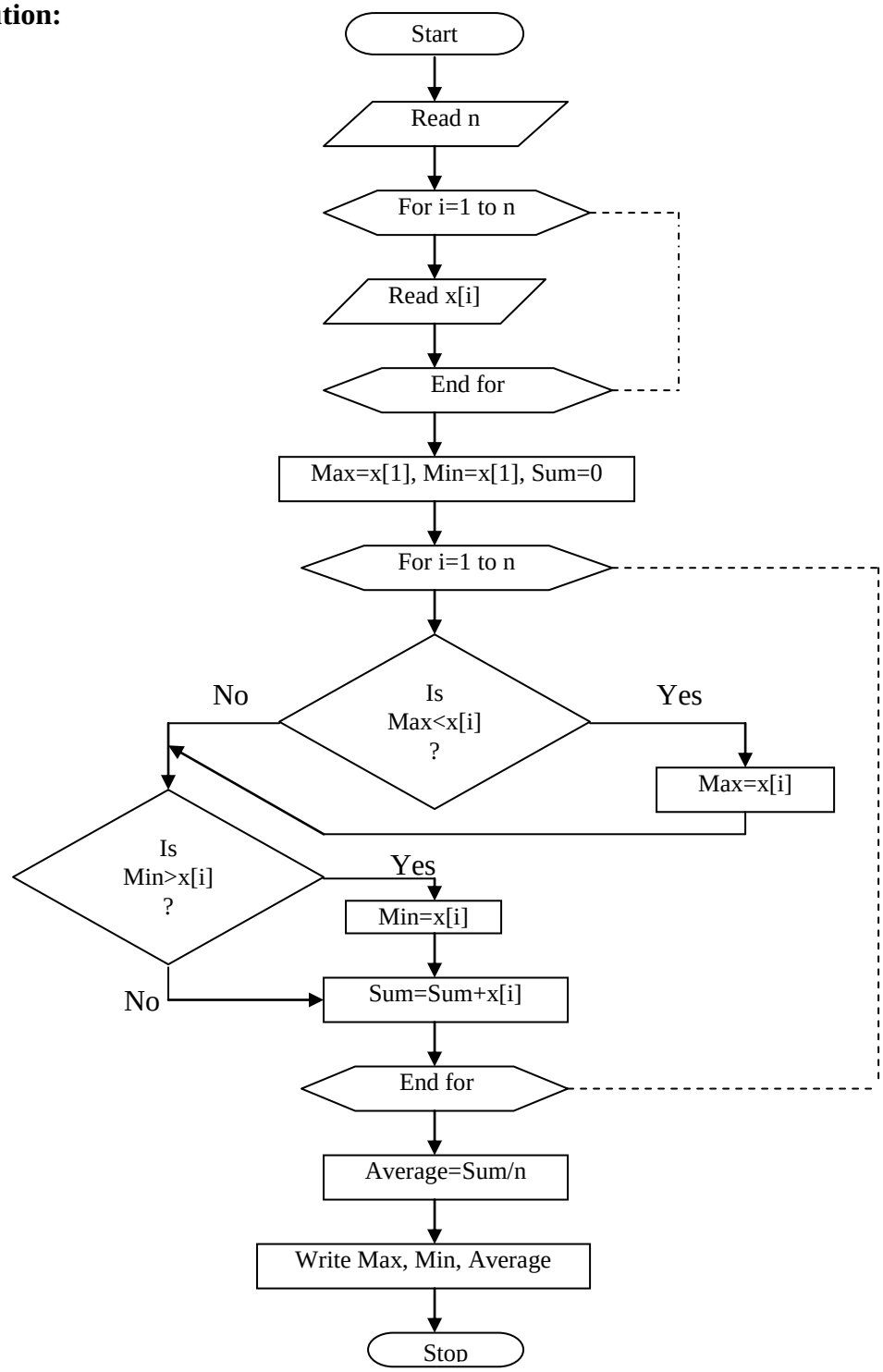
Draw a flowchart to find the sum of n integers given as input.

Solution:



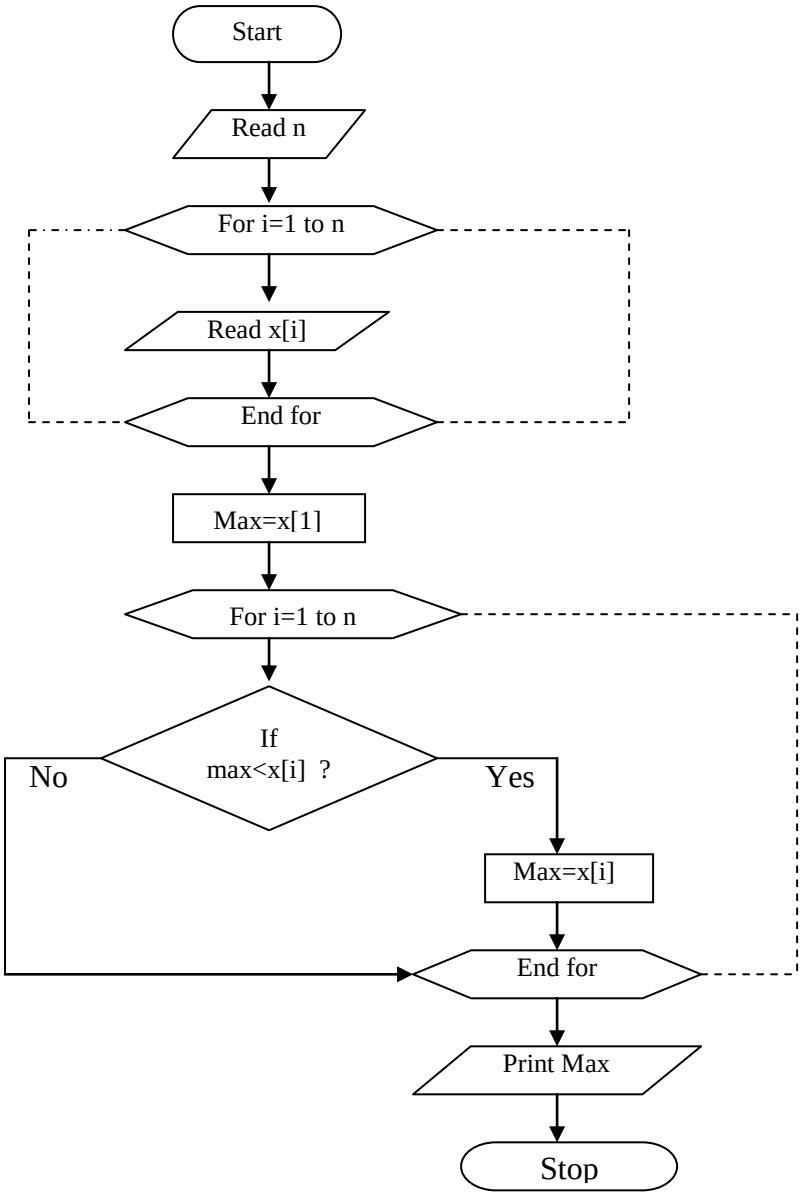
Q.2. Draw a flowchart to find the average, maximum and minimum values of n given numbers.

Solution:



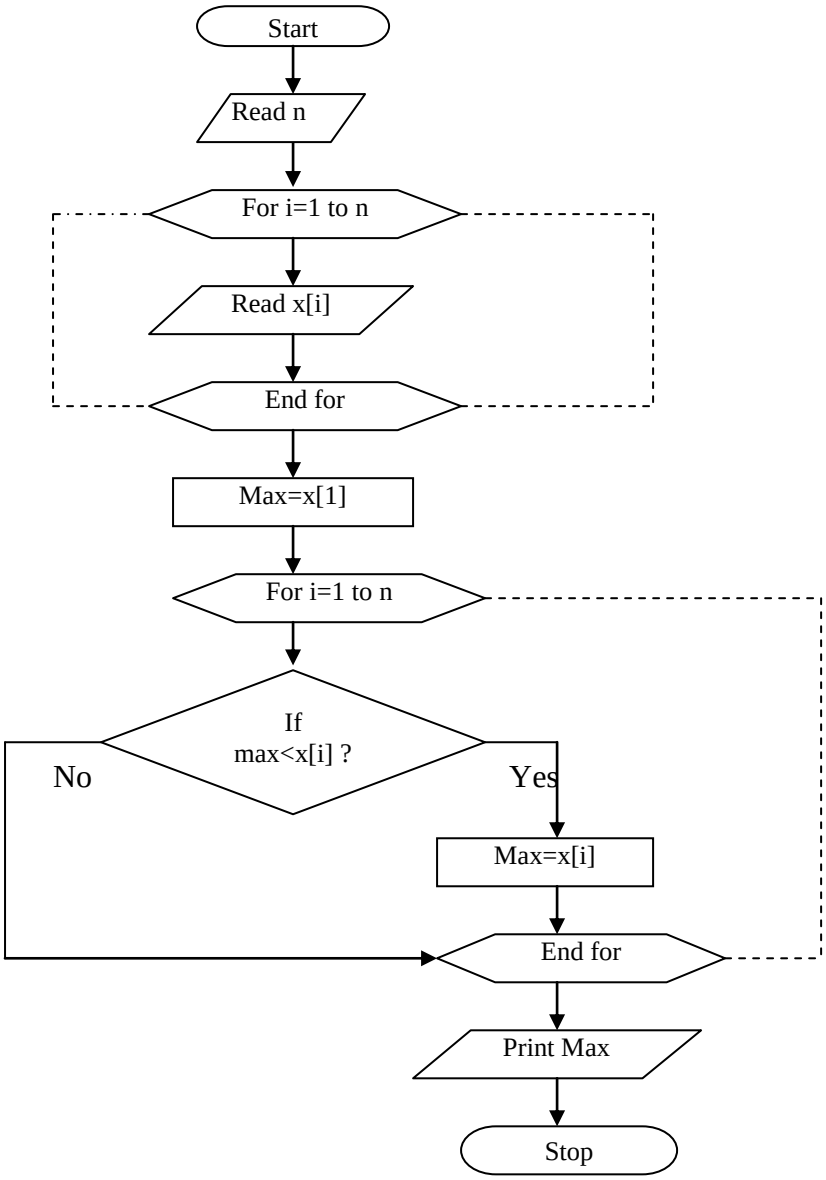
Q.3. Draw a flowchart to read and find the maximum of n given numbers.

Solution:



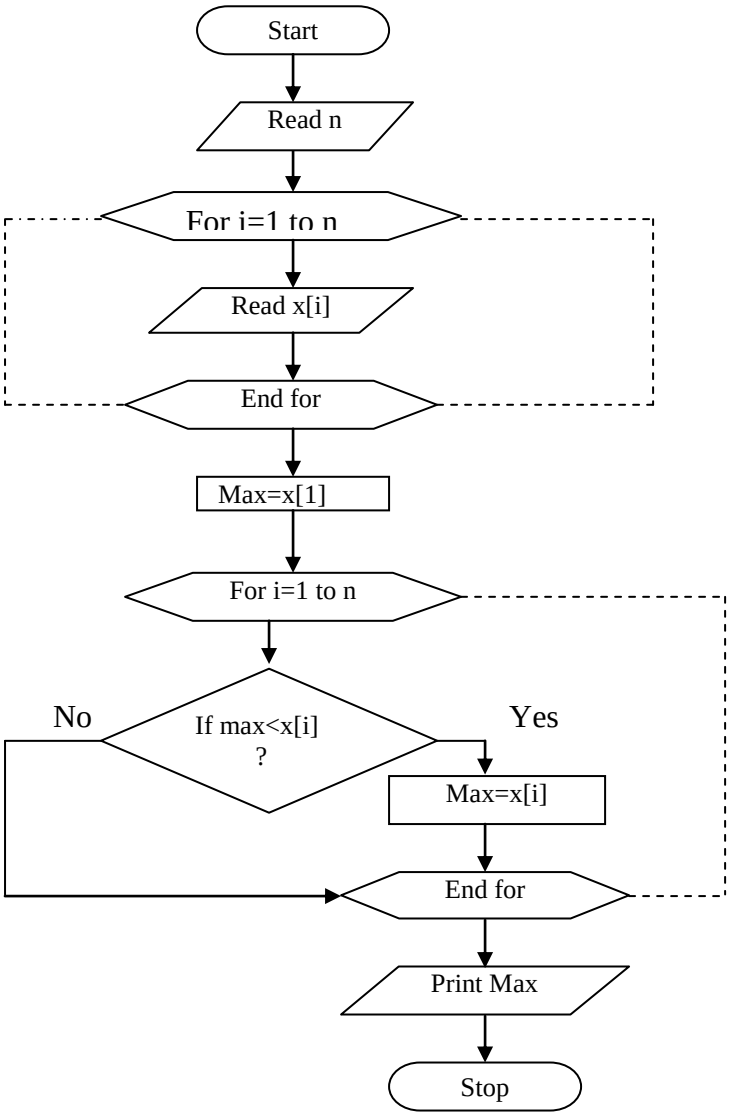
Q.4. Draw a flowchart to find the maximum of n given numbers.

Solution:



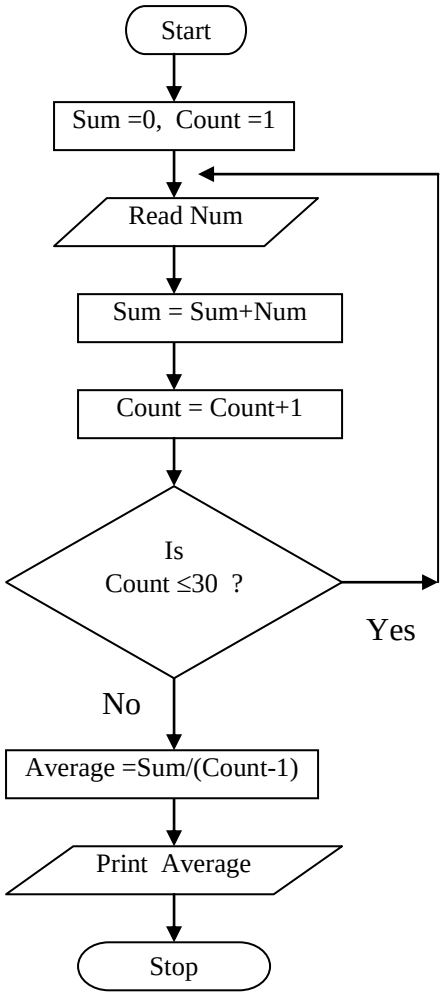
Q.7: Draw a flowchart to print the maximum of n given numbers.

Solution:



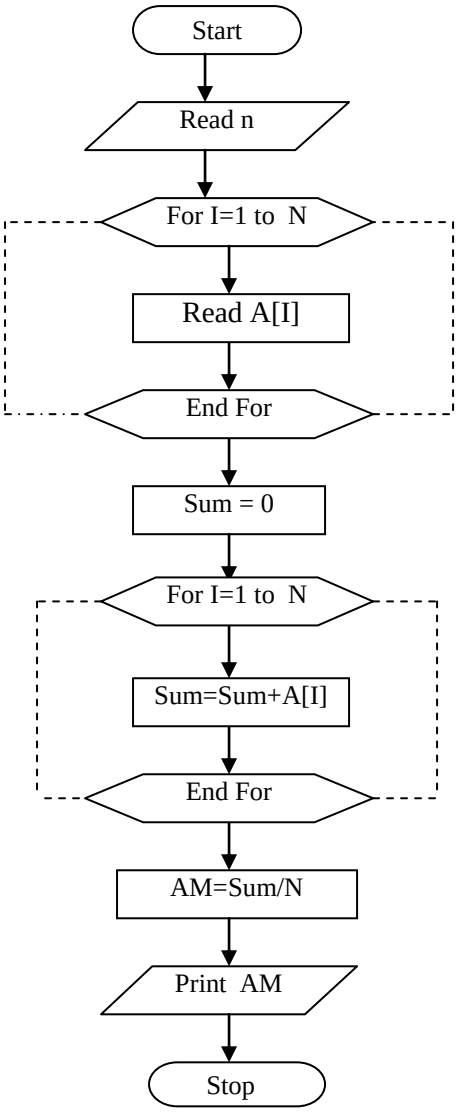
Q.8: Draw a flowchart to determine and print the average of 30 given numbers.

Solution:
Flowchart: To determine and print the average of 30 given numbers.



Q.9: Draw a flowchart to read N numbers and then to compute and print the arithmetic mean of the numbers.

Solution: The flowchart to compute the arithmetic mean of n numbers is shown below.



Q.13: Draw a flowchart to read a value of N and to compute and print the value of N!

Solution:
Flowchart: To read a value of N and to compute and print the value of N!