

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. [Perform 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:

$$S=1 + 4 + 9+ 16 + \dots+ 100$$

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

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.

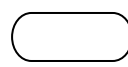
Advantages of using flowchart:

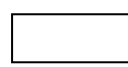
1. Communication: They are good visual aid to understand the program.
2. Quicker grasps of relationships.
3. Effective analysis.
4. Synthesis
5. Proper program documentation
6. Efficient coding
7. Orderly debugging & testing of programs.
8. Efficient program maintenance.

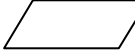
Limitations of using flowchart:

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

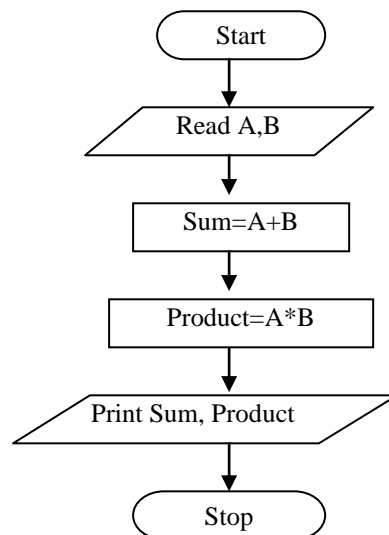
Rhombus

 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:



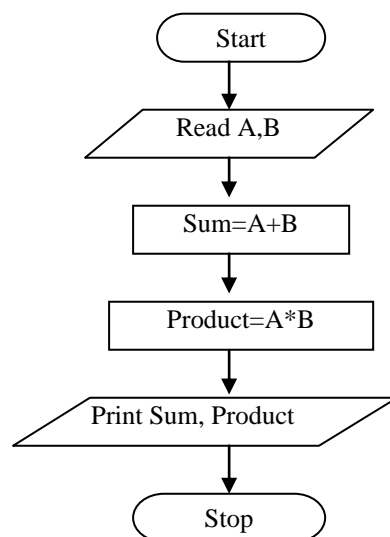
Ex: Write the algorithm and draw the flowchart to find the sum and product of two given numbers.

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