of these methods. The idea here is to search an appropriate solution to the problem under consideration. The end result of this stage is a broad overview of the sequence of operations that are to be carries out to solve the given problem.

3. Developing the solution: Here the overview of the sequence of operations that was the result of analysis stage is expanded to form a detailed step by step solution to the problem under consideration.

4. Coding and implementation: The last stage of the problem solving is the conversion of the detailed sequence of operations in to a language that the computer can understand. Here each step is converted to its equivalent instruction or instructions in the computer language that has been chosen for the implantation.

1.2 Algorithm

Definition

A set of sequential steps usually written in Ordinary Language to solve a given problem is called **Algorithm**.

It may be possible to solve to problem in more than one ways, resulting in more than one algorithm. The choice of various algorithms depends on the factors like reliability, accuracy and easy to modify. The most important factor in the choice of algorithm is the time requirement to execute it, after writing code in High-level language with the help of a computer. The algorithm which will need the least time when executed is considered the best.

Steps involved in algorithm development

An algorithm can be defined as "a complete, unambiguous, finite number of logical steps for solving a specific problem "

Step1. Identification of input: For an algorithm, there are quantities to be supplied called input and these are fed externally. The input is to be indentified first for any specified problem.

Step2: Identification of output: From an algorithm, at least one quantity is produced, called for any specified problem.

Step3 : Identification the processing operations : All the calculations to be performed in order to lead to output from the input are to be identified in an orderly manner.

Step4 : Processing Definiteness : The instructions composing the algorithm must be clear and there should not be any ambiguity in them.

Step5 : Processing Finiteness : If we go through the algorithm, then for all cases, the algorithm should terminate after a finite number of steps.

Step6 : Possessing Effectiveness : The instructions in the algorithm must be sufficiently basic and in practice they can be carries out easily.

An algorithm must possess the following properties

1. Finiteness: An algorithm must terminate in a finite number of steps

2. Definiteness: Each step of the algorithm must be precisely and unambiguously stated

3. Effectiveness: Each step must be effective, in the sense that it should be primitive easily convert able into program statement) can be performed exactly in a finite amount of time.

4. Generality: The algorithm must be complete in itself so that it can be used to solve problems of a specific type for any input data.

5. Input/output: Each algorithm must take zero, one or more quantities as input data produce one or more output values. An algorithm can be written in English like sentences or in any standard representation sometimes, algorithm written in English like languages are called Pseudo Code

Example

1. Suppose we want to find the average of three numbers, the algorithm is as follows

Step 1 Read the numbers a, b, c

Step 2 Compute the sum of a, b and c

Step 3 Divide the sum by 3

Step 4 Store the result in variable d

Step 5 Print the value of d

Step 6 End of the program

1.2.2 Algorithms for Simple Problem

Write an algorithm for the following

1. Write an algorithm to calculate the simple interest using the formula.

Simple interest = P*N*R/100.

Where P is principle Amount, N is the number of years and R is the rate of interest.

Step 1: Read the three input quantities' P, N and R.

Step 2 : Calculate simple interest as

Simple interest = P*N*R/100

Step 3: Print simple interest.

Step 4: Stop.

2. Area of Triangle: Write an algorithm to find the area of the triangle.

Let b, c be the sides of the triangle ABC and A the included angle between the given sides.

Step 1: Input the given elements of the triangle namely sides b, c and angle between the sides A.

Step 2: Area = (1/2) *b*C* sin A

Step 3: Output the Area

Step 4: Stop.

3. Write an algorithm to find the largest of three numbers X, Y,Z.

Step 1: Read the numbers X,Y,Z.

Step 2: if (X > Y)Big = X else BIG = Y Step 3 : if (BIG < Z)Step 4: Big = Z Step 5: Print the largest number i.e. Big Step 6: Stop. 4. Write down an algorithm to find the largest data value of a set of given data values

```
Algorithm largest of all data values:

Step 1: LARGE \leftarrow 0

Step 2: read NUM

Step 3: While NUM >= 0 do

3.1 if NUM > LARGE

3.1.1 then

3.1.1.1 LARGE \leftarrow NUM

3.2. read NUM

Step 4: Write "largest data value is", LARGE

Step 5: end.
```

5. Write an algorithm which will test whether a given integer value is prime or not.

Algorithm prime testing:

Step 1: $M \leftarrow 2$ Step 2: read N Step 3: MAX \leftarrow SQRT (N) Step 4: While M <= MAX do 4.1 if (M* (N/M) = N 4.1.1 then 4.1.1.1 go to step 7 4.2. $M \leftarrow M + 1$ Step 5: Write "number is prime" Step 6: go to step 8 Step 7: Write "number is not a prime" Step 8: end. 6. Write algorithm to find the factorial of a given number N

Step 1: PROD \leftarrow 1

Step 2: $I \leftarrow 0$

Step 3: read N

Step 4: While I < N do

4.1 I ← I + 1

4.2. PROD \leftarrow PROD* I

Step 5: Write "Factorial of", N, "is", PROD

Step 6: end.

7. Write an algorithm to find sum of given data values until negative value is entered.

Algorithm Find - Sum

Step 1: SUM $\leftarrow 0$

Step 2: $I \leftarrow 0$

Step 3: read NEW VALUE

Step 4: While NEW VALUE $\leq = 0$ do

 $4.1 \text{ SUM} \leftarrow \text{SUM} + \text{NEW VALUE}$

 $4.21 \leftarrow I + 1$

4.3 read NEW VALUE

Step 5: Write "Sum of", I, "data value is, "SUM

Step 6: END

8. Write an algorithm to calculate the perimeter and area of rectangle. Given its length and width.

Step 1: Read length of the rectangle.

Step 2: Read width of the rectangle.

- Step 3: Calculate perimeter of the rectangle using the formula perimeter = 2^* (length + width)
- Step 4: Calculate area of the rectangle using the formula area = length *width.

Step 5: Print perimeter.

Step 6: Print area.

Step 7: Stop.

1.3 Flowchart

A flow chart is a step by step diagrammatic representation of the logic paths to solve a given problem. Or A flowchart is visual or graphical representation of an algorithm.

The flowcharts are pictorial representation of the methods to b used to solve a given problem and help a great deal to analyze the problem and plan its solution in a systematic and orderly manner. A flowchart when translated in to a proper computer language, results in a complete program.

Advantages of Flowcharts

1. The flowchart shows the logic of a problem displayed in pictorial fashion which felicitates easier checking of an algorithm.

2. The Flowchart is good means of communication to other users. It is also a compact means of recording an algorithm solution to a problem.

3. The flowchart allows the problem solver to break the problem into parts. These parts can be connected to make master chart.

4. The flowchart is a permanent record of the solution which can be consulted at a later time.

Differences between Algorithm and Flowchart

Algorithm	Flowchart
1. A method of representing the	1. Flowchart is diagrammatic
step-by-step logical procedure for	representation of an algorithm. It is
solving a problem	constructed using different types of boxes
2. It contains step-by-step English	and symbols.
descriptions, each step representing	2. The flowchart employs a series of blocks
a particular operation leading to	and arrows, each of which represents a
solution of problem	particular step in an algorithm
3. These are particularly useful for	3. These are useful for detailed
small problems	representations of complicated programs
4. For complex programs,	4. For complex programs, Flowcharts
algorithms prove to be Inadequate	prove to be adequate

1.4 Symbols used in Flow-Charts

The symbols that we make use while drawing flowcharts as given below are as per conventions followed by International Standard Organization (ISO).

a. Oval: Rectangle with rounded sides is used to indicate either START/STOP of the program. ..



b. Input and output indicators: Parallelograms are used to represent input and output operations. Statements like INPUT, READ and PRINT are represented in these Parallelograms.



c. Process Indicators: - Rectangle is used to indicate any set of processing operation such as for storing arithmetic operations.

d. Decision Makers: The diamond is used for indicating the step of decision making and therefore known as decision box. Decision boxes are used to test the conditions or ask questions and depending upon the answers, the appropriate actions are taken by the computer. The decision box symbol is



e. Flow Lines: Flow lines indicate the direction being followed in the flowchart. In a Flowchart, every line must have an arrow on it to indicate the direction. The arrows may be in any direction



f. On- Page connectors: Circles are used to join the different parts of a flowchart and these circles are called on-page connectors. The uses of these connectors give a neat shape to the flowcharts. Ina complicated problems, a flowchart may run in to several pages. The parts of the flowchart on different

pages are to be joined with each other. The parts to be joined are indicated by the circle.



g. Off-page connectors: This connector represents a break in the path of flowchart which is too large to fit on a single page. It is similar to on-page connector. The connector symbol marks where the algorithm ends on the first page and where it continues on the second.



1.4.1 Simple Problems using Flow Chart

Draw the Flowchart for the following

1. Draw the Flowchart to find Roots of Quadratic equation $ax^2 + bx + c = 0$. The coefficients a, b, c are the input data



2. Draw a flowchart to find out the biggest of the three unequal positive numbers.



3. Draw a flowchart for adding the integers from 1 to 100 and to print the sum.



4. Draw a flowchart to find the factorial of given positive integer N.



5. Develop a flowchart to illustrate how to make a Land phone telephone call



Flowchart for Telephone call

6. 6. ABC company plans to give a 6% year-end bonus to each of its employees earning Rs 6,000 or more per month , and a fixed Rs 250/- - bonus to the remaining employees. Draw a flowchart for calculating the bonus for an employee



The Pseudo code is neither an algorithm nor a program. It is an abstract form of a program. It consists of English like statements which perform the specific operations. It is defined for an algorithm. It does not use any graphical representation. In pseudo code, the program is represented in terms of words and phrases, but the syntax of program is not strictly followed.

Advantages: * Easy to read, * Easy to understand, * Easy to modify.

Example: Write a pseudo code to perform the basic arithmetic operations.

```
Read n1, n2

Sum = n1 + n2

Diff = n1 - n2

Mult = n1 * n2

Quot = n1/n2

Print sum, diff, mult, quot

End.
```