

SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution
Coimbatore-35



Department of Computer Science and Engineering

23ITB201 - Design and Analysis of Algorithms

(For B.Tech., Artificial Intelligence and Machine Learning)
II Year / IV Semester

UNIT – I

TOPIC : FUNDAMENTALS OF PROBLEM SOLVING

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FUNDAMENTALS OF ALGORITHMIC PROBLEM SOLVING

Subject :Design and Analysis of
Algorithm



How projects can be implemented in Software Companies?

Lets' Empathize..

Answer: Fundamentals of Algorithmic Problem Solving



Fundamentals of Algorithmic Problem Solving

Define..

A sequence of steps involved in designing and analyzing an algorithm is shown in the figure

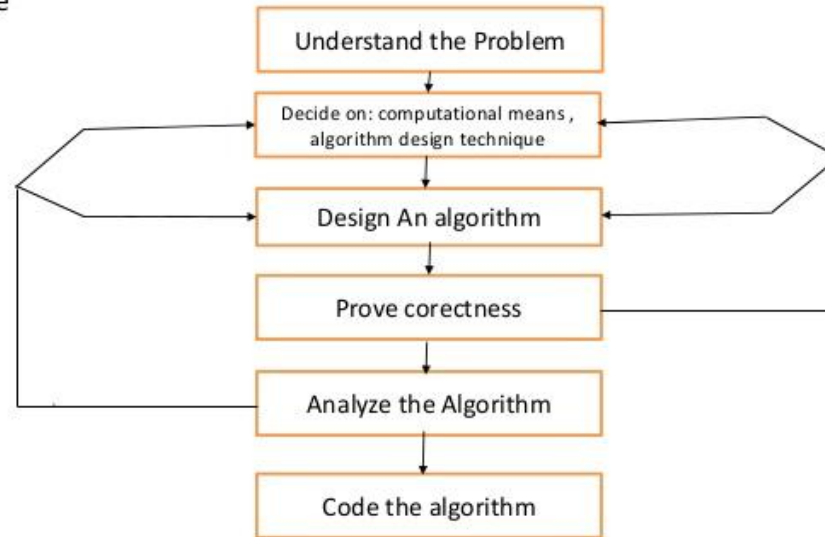


Image
Source: <https://www.slideshare.net/AbhimanyuMishra3/daa-unit-1>

1. Understanding the Problem

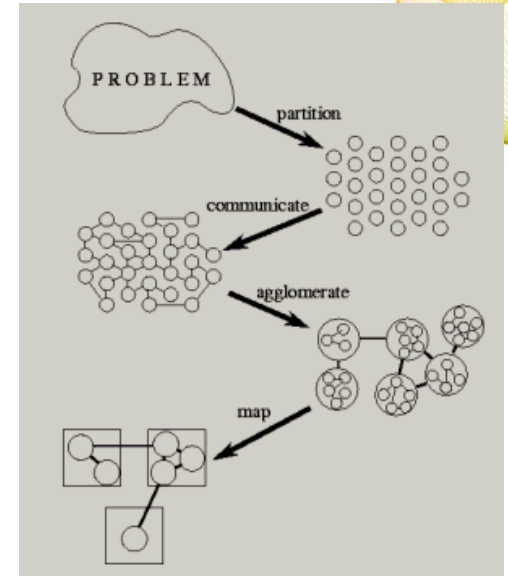
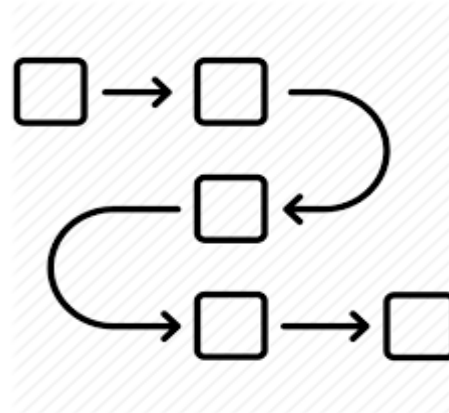
- ❑ This is the first step in **designing of algorithm**.
- ❑ Identify the problem types and **use existing algorithm** to find solution.
- ❑ Input (*instance*) to the problem and range of the input get fixed.



2. Decision making

The Decision making is done on the following:

(a) Ascertaining the Capabilities of the Computational Device



Decision making

(b) Choosing between Exact and Approximate Problem Solving

- ❑ Approximation algorithm.
- ❑ Exact algorithm.

(c) Algorithm Design Techniques

- ❑ Algorithms + *Data Structures* = *Programs*



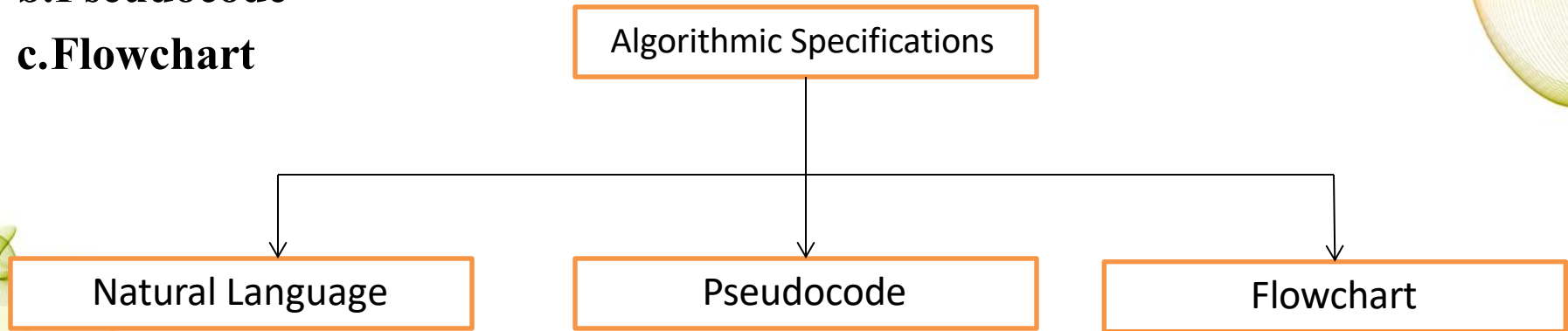
3. Methods of Specifying an Algorithm

There are three ways to specify an algorithm. They are:

a. Natural language

b. Pseudocode

c. Flowchart



Methods of Specifying an Algorithm

a. Natural Language

Example: An algorithm to perform addition of two numbers.

Step 1: Read the first number, say a.

Step 2: Read the first number, say b.

Step 3: Add the above two numbers and store the result in c.

Step 4: Display the result from c.



Methods of Specifying an Algorithm

b. Pseudocode

Pseudocode is a mixture of a natural language and programming language constructs. Pseudocode is usually more precise than natural language.

For Assignment operation left arrow “ \leftarrow ”, for comments two slashes “//”, **if** condition, **for**, **while** loops are used.

ALGORITHM *Sum(a,b)*

//Problem Description: This algorithm performs addition of two numbers

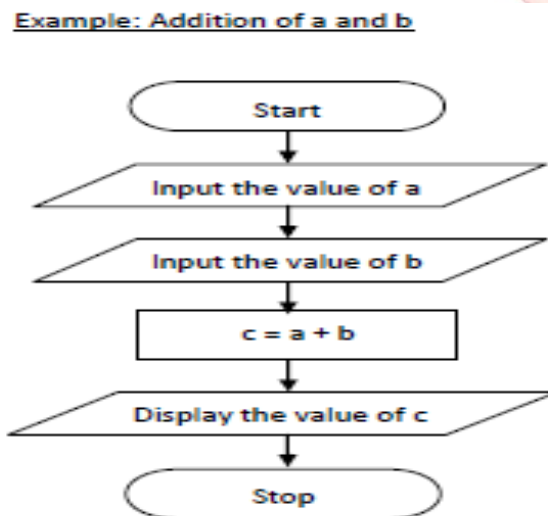
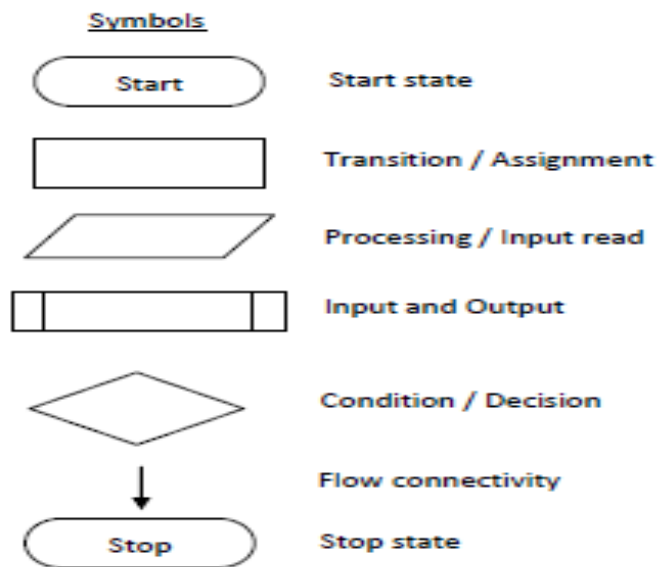
//Input: Two integers a and b

//Output: Addition of two integers $c \leftarrow a+b$

return c

c. Flowchart

Flowchart is a **graphical representation** of an algorithm. It is a method of expressing an algorithm by a collection of connected geometric shapes containing descriptions of the algorithm's step



4. Proving an Algorithm's Correctness

- ❑ Once an algorithm has been specified then its *correctness* must be proved.
- ❑ An algorithm must yields a required **result** for every legitimate input in a finite amount of time.



5. Analyzing an Algorithm

- Time efficiency*, indicating how fast the algorithm runs, and
- Space efficiency*, indicating how much extra memory it uses.
- The efficiency of an algorithm is determined by measuring both time efficiency and space efficiency.

So factors to analyze an algorithm are:

- Time efficiency of an algorithm
- Space efficiency of an algorithm
- Simplicity of an algorithm
- Generality of an algorithm



6.Coding an Algorithm

- The coding / implementation of an algorithm is done by a suitable programming language like C, C++, JAVA.
- It is very essential to write an **optimized code (efficient code)** to reduce the burden of compiler.



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Assessment

1. Two main measures for the efficiency of an algorithm are

- A. Processor and memory
- B. Complexity and capacity
- C. Time and space
- D. Data and space

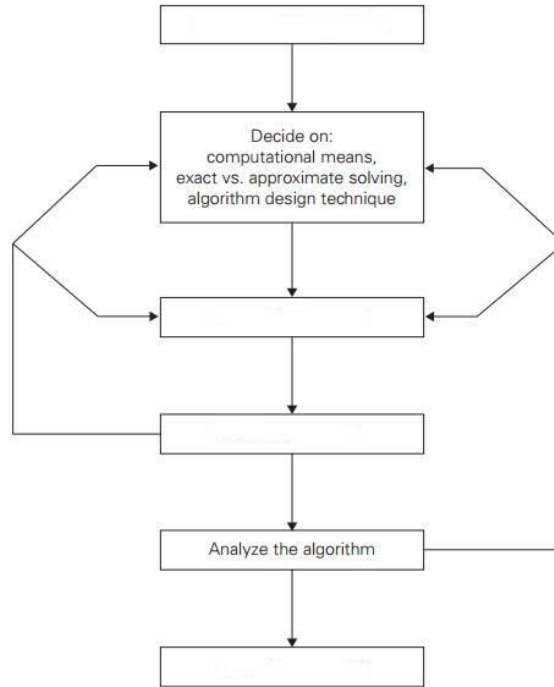
2. There are _____ steps to solve the problem

- A. Seven
- B. Four
- C. Six
- D. Two



Assessment

3. Identify the missing steps.





Thank you!