

Day 2 : Data Structures & Algorithms (DSA) with Java – Full Course

Algorithm Basics

Flowchart

Pseudocode & Efficiency

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What is an Algorithm?

- An Algorithm is a step-by-step procedure to solve a specific problem.
- It takes some input, processes it, and produces output.
- Every program or function is built around an algorithm.

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Example of an Algorithm

Problem: Find the largest of two numbers.

Algorithm:

1. Start
2. Read two numbers a and b
3. If $a > b$, print a is greater
4. Else print b is greater
5. Stop

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Characteristics of a Good Algorithm

- Input – Should accept 0 or more inputs.
- Output – Should produce at least one output.
- Definiteness – Each step must be clear and unambiguous.
- Finiteness – Should finish after a finite number of steps.
- Effectiveness – Steps must be basic and executable.

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How to Design an Algorithm

A series of overlapping, semi-transparent geometric shapes, including triangles and polygons, in various shades of gray, arranged in a dynamic, abstract pattern on the right side of the slide.

Algorithm Design Steps:

- Understand the problem completely.
- Identify inputs and expected outputs.
- List possible solutions.
- Choose the most efficient approach.
- Write steps or pseudocode.
- Test and analyze performance.

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Representation of Algorithms

There are 3 main ways to represent an algorithm:

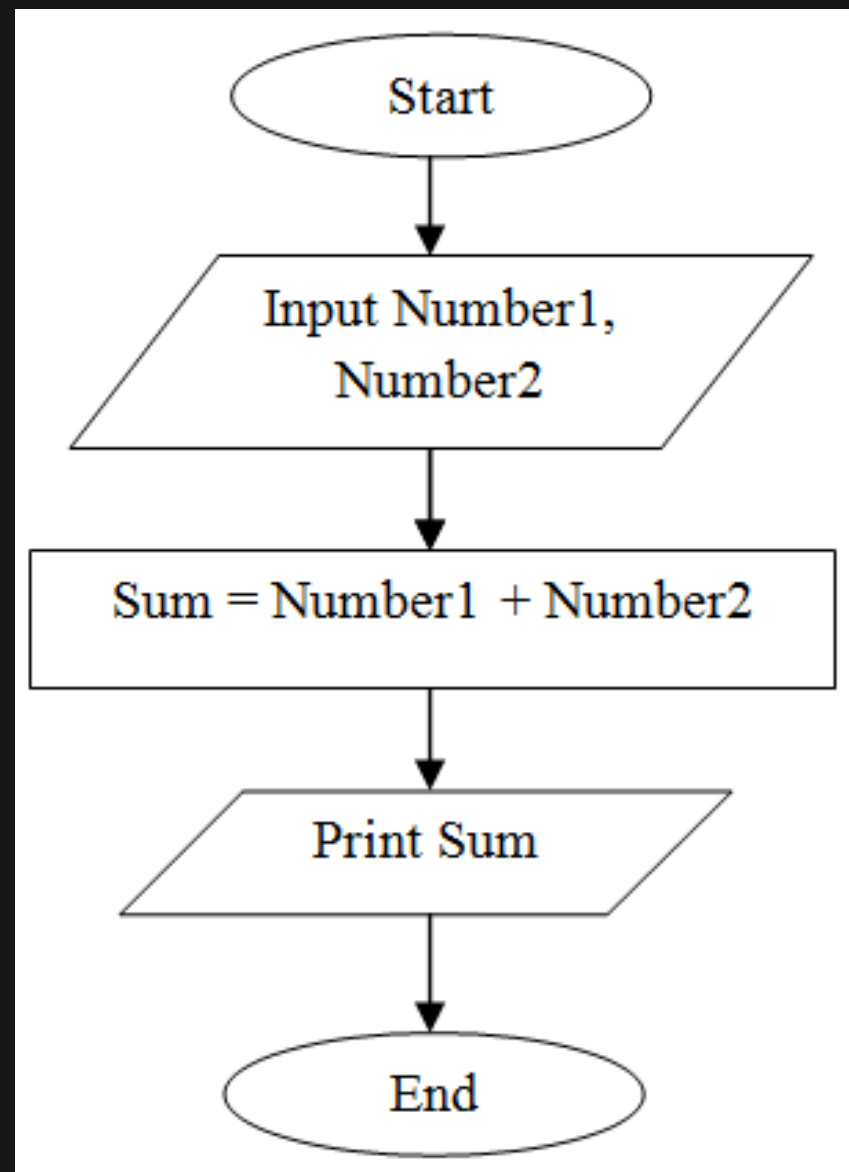
1. Natural Language (simple English steps)
2. Flowcharts (graphical representation)
3. Pseudocode (code-like steps without syntax)

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Flowchart Symbols

Symbol	Meaning	Example
 Oval	Start / End	Start / Stop
 Rectangle	Process	Calculation, assignment
 Diamond	Decision	<code>if</code> , <code>else</code> condition
 Parallelogram	Input / Output	Read / Print statements
 Arrow	Flow of control	Direction of execution

Example Flowchart



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Pseudocode

Pseudocode is a simple, readable description of steps written in a code-like format.

It's not tied to any programming language.

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Pseudocode Example

```
START  
READ a, b  
IF a > b THEN  
    PRINT "A is greater"  
ELSE  
    PRINT "B is greater"  
END IF  
STOP
```

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Algorithm Efficiency

Efficiency of an algorithm is measured using:

1. Time Complexity – How fast it runs.
2. Space Complexity – How much memory it uses.

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Example: Searching Algorithms

- Linear Search: Checks each element one by one.
- Binary Search: Divides list into halves – much faster for sorted lists.

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Pseudocode vs Flowchart

Aspect	Flowchart	Pseudocode
Type	Visual	Textual
Best for	Beginners / Visualization	Programmers / Planning
Advantages	Easy to follow, shows logic flow	Easy to modify and convert to code

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Summary

- ✓ Algorithm = Step-by-step process to solve a problem.
- ✓ Good algorithms have input, output, clarity, and efficiency.
- ✓ Represent algorithms using Flowcharts or Pseudocode.
- ✓ Efficiency matters — focus on time and space.

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Practice Task

Mini Assignment:

Write an algorithm and flowchart for:

1. Finding the largest of three numbers.
2. Calculating the factorial of a number using loops.

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Thank You

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