Algorithmic Thinking

What is an Algorithm?

- A **step-by-step** procedure to solve a problem.
- **Characteristics of an Algorithm**:
- **Definiteness**: Clearly defined steps.
- **Input**: Takes zero or more inputs.
- **Output**: Produces at least one output.
- **Finiteness**: Must terminate after a finite number of steps.
- **Effectiveness**: Each step must be simple enough to execute.
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Example Algorithm: Find the Largest of Two Numbers

1st Start
2ndInput A, B
3rdIf A > B, then print "A is larger"
4th Else print "B is larger"
5th End

Software & Programming Languages

Types of Software

1st **System Software** → OS (Windows, Linux), Compilers, Drivers.
2nd**Application Software** → Word Processors, Web Browsers.
3rd**Programming Software** → IDEs, Debuggers, Compilers.

Programming Languages

- **Low-Level** → Machine Language, Assembly Language.
- **High-Level** → C, Python, Java, JavaScript.
- **Scripting Languages** → Python, Bash, JavaScript.

Actions in Algorithmic Thinking

- **Sequencing** → Steps occur in order.
- **Selection** → Conditional statements (if-else).
- **Iteration** → Loops (for, while).

Data Organization

Name List (Linear Data Structure)

- **Array** → Fixed-size collection of elements.
- **Linked List** → Dynamic collection of elements connected by pointers.

Graph Hierarchies (Non-Linear Structure)

- **Graph** → Collection of nodes (vertices) connected by edges.
- **Hierarchy** → Tree structure (e.g., File System, Organization Chart).

Spreadsheets (Tabular Data Representation)

- Stores **structured data** in rows and columns.
- Used for calculations, data analysis (e.g., MS Excel, Google Sheets).

Text Processing

- Manipulating text (e.g., Search, Replace, Formatting).
- Common applications: **Word Processing, Natural Language Processing (NLP)**.

Patterns in Data

- **Repetitive sequences** used for pattern matching.
- Used in **Data Mining, AI, and Machine Learning**.

Pseudocode & Flow Chart

Pseudocode Example: Sum of First N Numbers

```
plaintext
CopyEdit
Start
Input N
Sum = 0
For i = 1 to N
   Sum = Sum + i
End For
Print Sum
End
```

Flow Chart Symbols

Symbol	Meaning
Oval	Start/End
Rectangle	Process (Calculation)
Diamond	Decision (If/Else)
Parallelogram	Input/Output

This **Algorithmic Thinking Cheat Sheet** covers **algorithms, programming, data organization, spreadsheets, patterns, pseudocode, and flowcharts**. Let me know if you need more details!