CSE 1201

Data Structure

Week-1

Lecture 01

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Basic Terminology

Data: It is simply a value or set of values

Data Item: refers to single unit of values

Entity: It is something that has certain properties or attributes
Example: In an organization *Employee* is an entity, its attributes are (ID, Name, Age, Sex, Salary) etc.

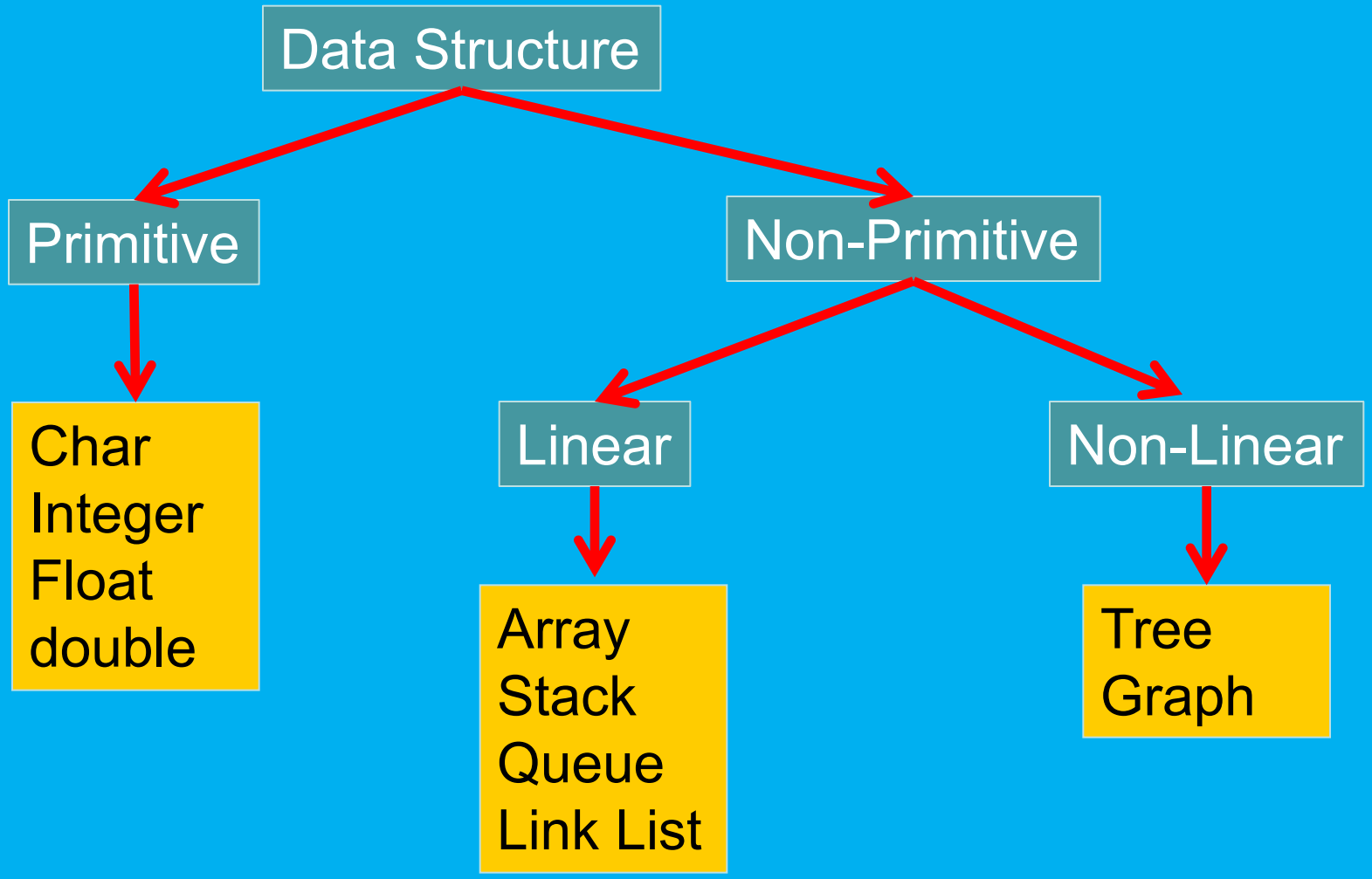
Information: refers to meaningful or processed data.
Example: 21 is simply a data but if it is an age then it is an information

Field: One attribute refers to a field
Record: Several fields constitute a record
File: Several records constitute a file
Database: Several file makes a database

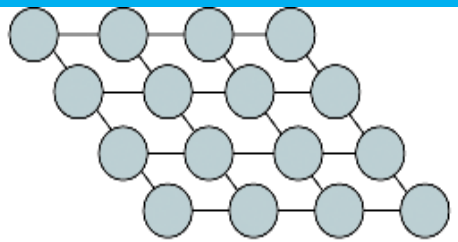
Key: a filed that can uniquely identify a record (ID, Roll, SSN etc)

Basics of Data Structure

What is Data Structure : A data structure is **a specialized format for organizing, processing, retrieving and storing data. DS Types**

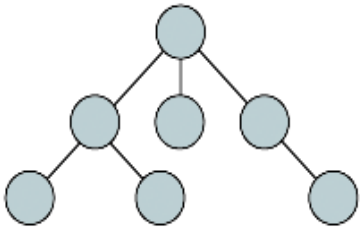


Example of Data Structure

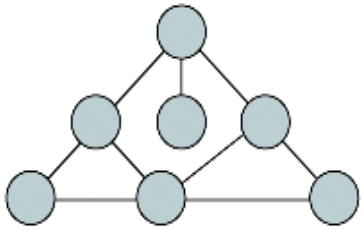


(a) Matrix

(b) Linear list



(c) Tree



(d) Graph

FIGURE 1-1 Some Data Structures

Linear vs Non-Linear Data Structure

Linear data structure: A linear data structure traverses the data elements sequentially, in which only one data element can directly be reached. **Ex:** Arrays, Linked Lists

Non-Linear data structure: Every data item is attached to several other data items in a way that is specific for reflecting relationships. The data items are not arranged in a sequential structure. Ex: Trees, Graphs

Data Structure Operation

Four Basic Operations

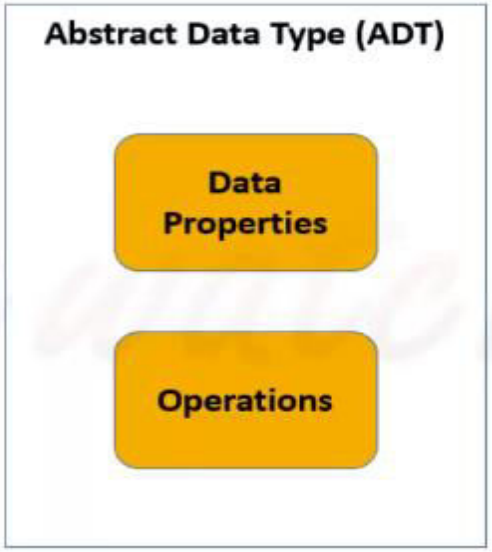
1. **Traversing:**: Accessing each record exactly once so that certain items in the record may be processed.
2. **Searching:**: Finding the location of the record(s) with a given key value/conditions.
3. **Inserting:**: Adding a new record to the structure.
4. **Deleting:**: Removing a record from the structure.

Two Special Operations

1. **Sorting:**: Arranging the records in some logical order.
2. **Merging:**: Combining records from different files.

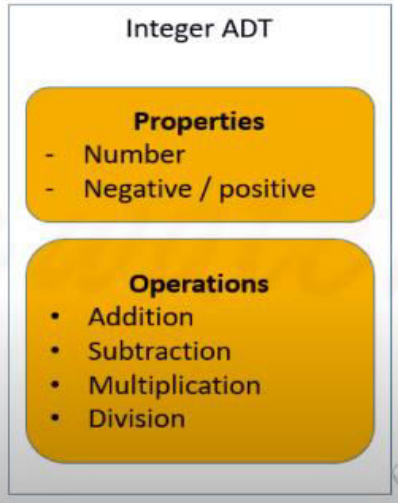
Abstract Data Type

- **Model** of a data type
  - Properties of the data
  - Operations that can be performed on that data
- ***Definition:*** *Abstract data type* (ADT) is a **mathematical model** with a collection of operations defined on that model.

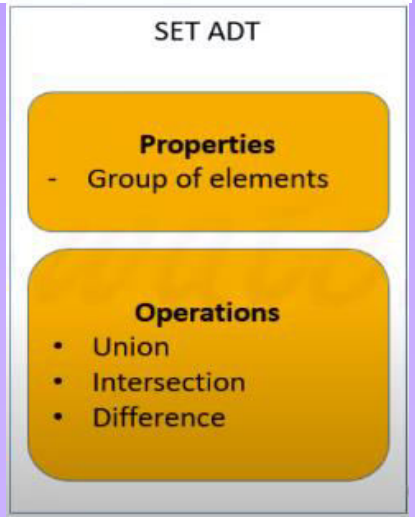


Example of Abstract Data Type (ADT)

- Integer
  - ...., -4, -3, -2, -1, 0, 1, 2, 3, 4 ...



- SET
  - {2,4,6,8,10}

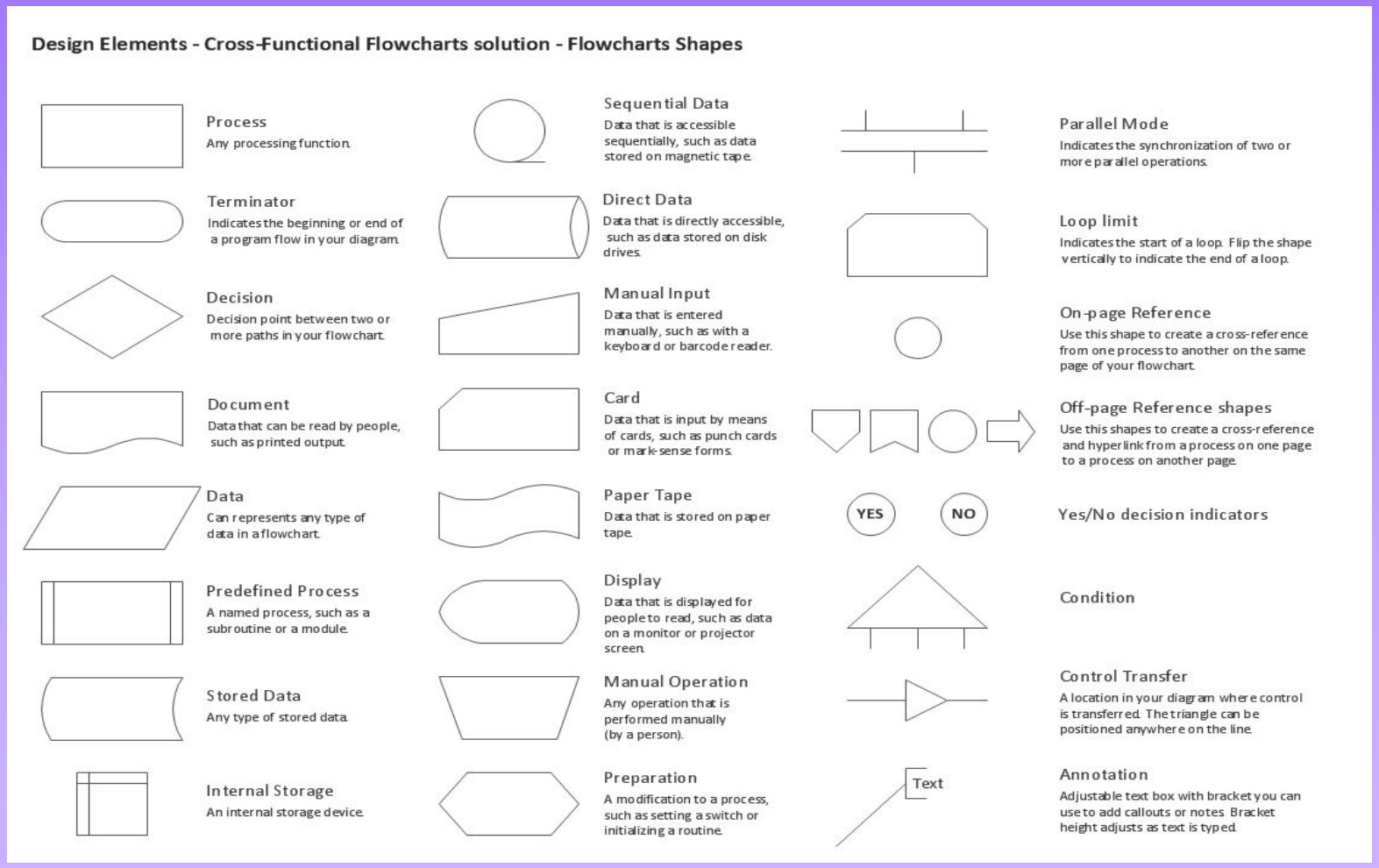


- Implementation of an ADT means writing a program in a programming language.
- Data structure deals with the implementation of various ADTs.
- In this course we will examine mathematical model of various data types and implement those using C programming language.

Algorithm & Flow Chart

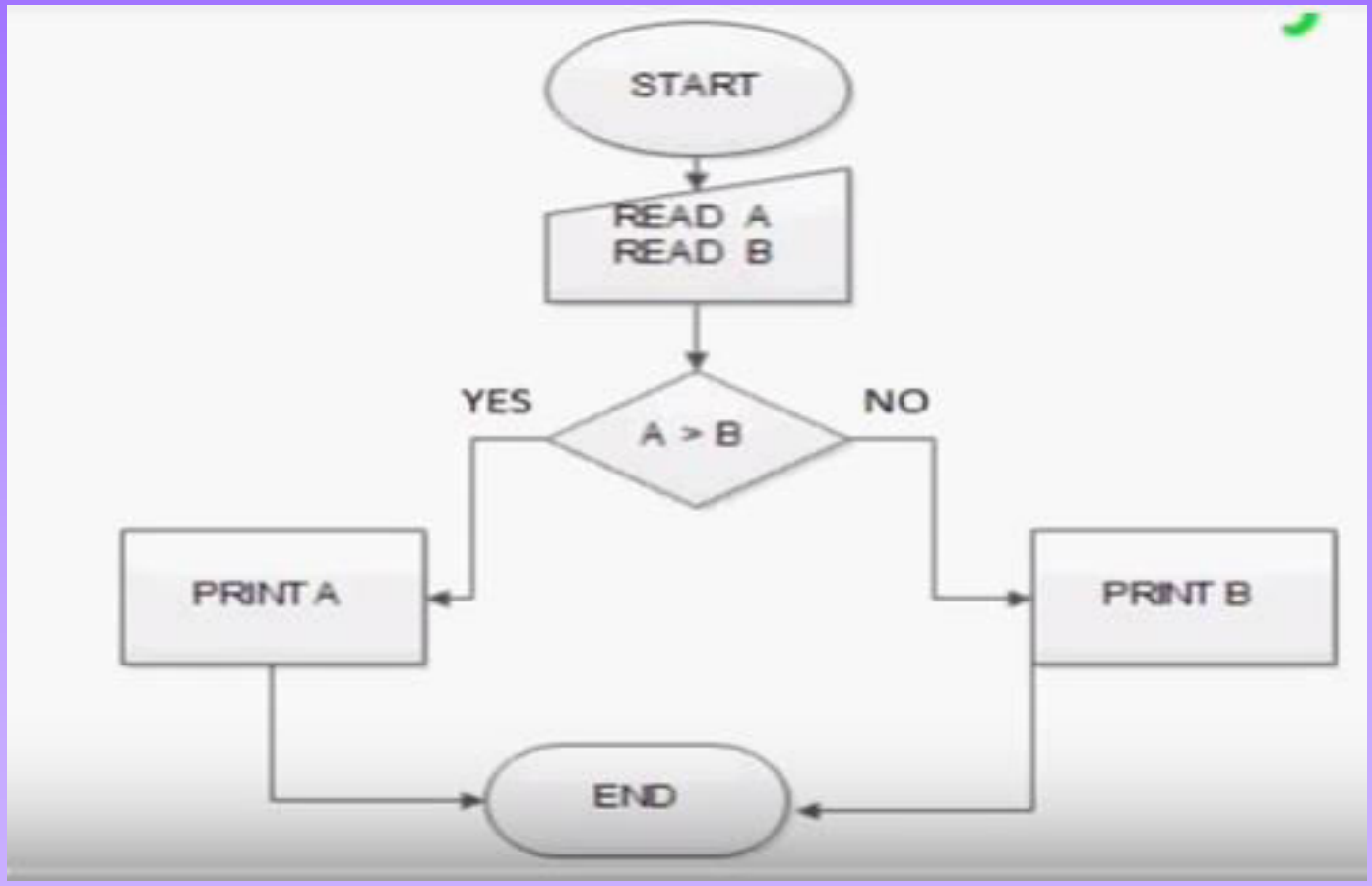
Algorithm is a step-by-step solution of problem

Flowchart is a pictorial presentation of an algorithm



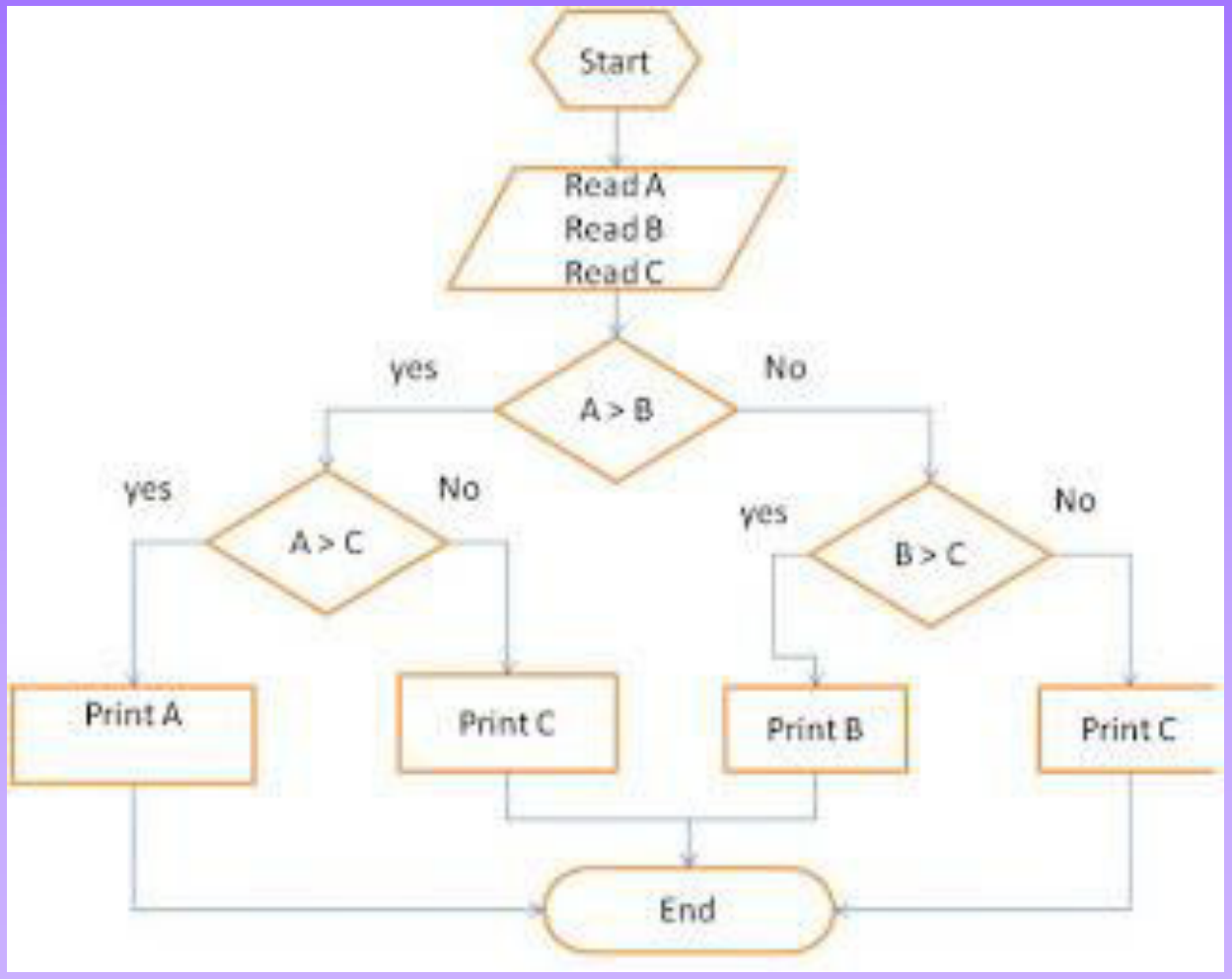
Examples of Flow Chart

Prob: Find the bigger between two numbers.



Examples of Flow Chart

Prob: Find the biggest among three numbers.



Algorithms: Complexity, Time-Space Tradeoff

Complexity:: The complexity of an algorithm is the function which gives the running time and/or space in terms of input size.

Time-Space Trade-Off in Algorithms: A tradeoff is a situation where one thing increases and another thing decreases. It is a way to solve a problem in:

- Either in less time and by using more space, or
- In very little space by spending a long amount of time.

The best Algorithm is that which helps to solve a problem that requires less space in memory and also takes less time to generate the output.

Quiz Time

Let's have some fun!

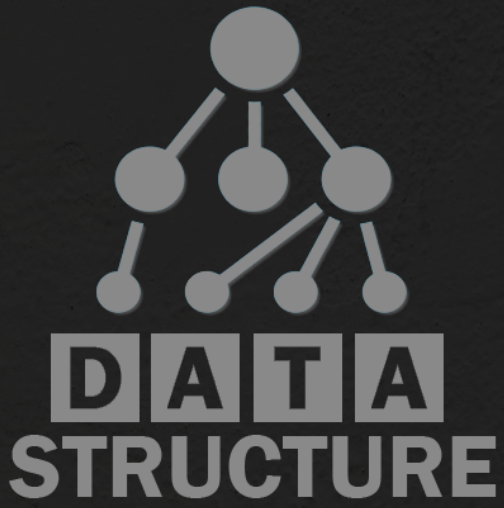
Q1: A(n) _____ has different properties

A. Field

B. Entity

C. File

D. Record



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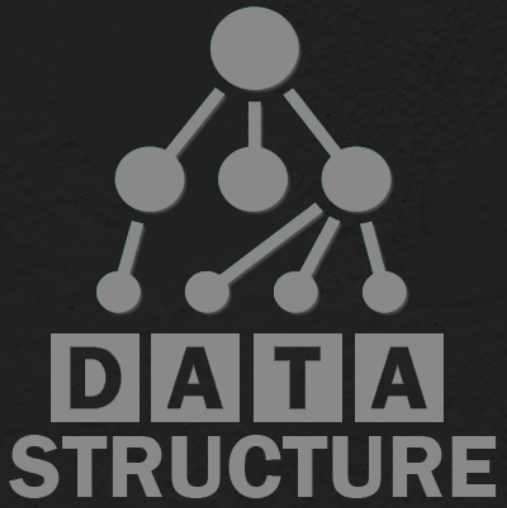
Q2: Which in NOT a primitive data structure?

A Boolean

B Arrays

C Integer

D Character



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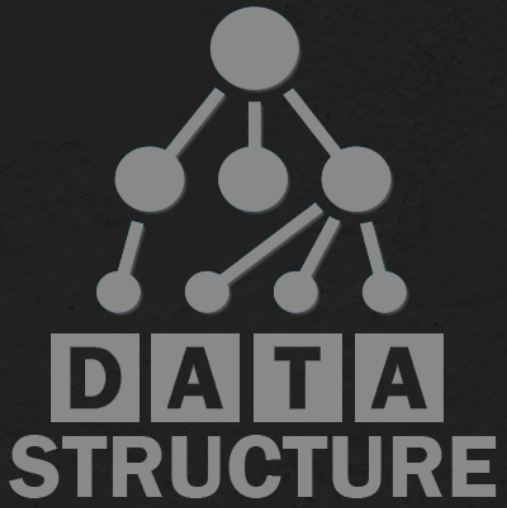
Q2: Which is a non-linear data structure?

A Arrays

B List

C Stack

D Graph



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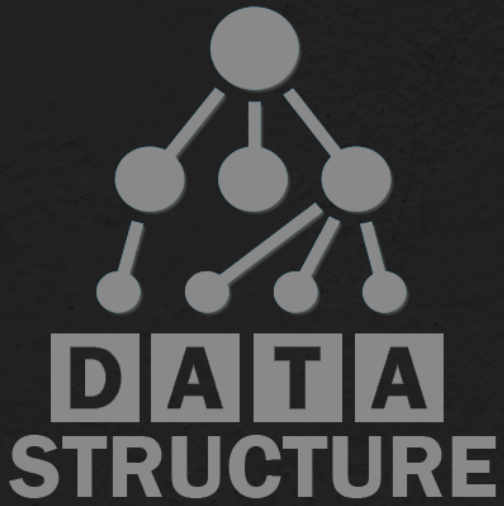
Q4: Which operation accesses each record exactly once so that contain item may be processed?

A Inserting

B Deleting

C Searching

D Traversing



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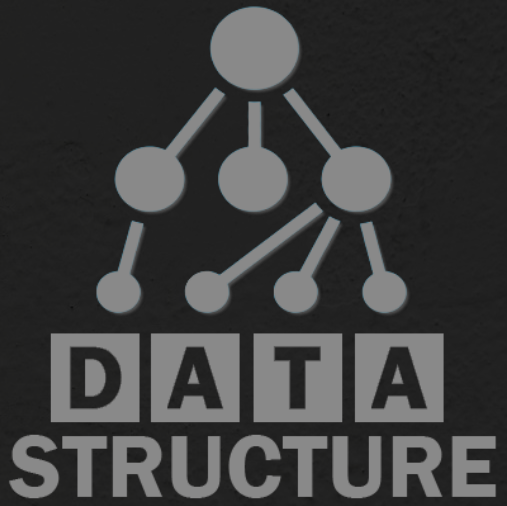
Q5: _____ involves arranging the records in a logical order

A Merging

B Sorting

C Searching

D Traversing



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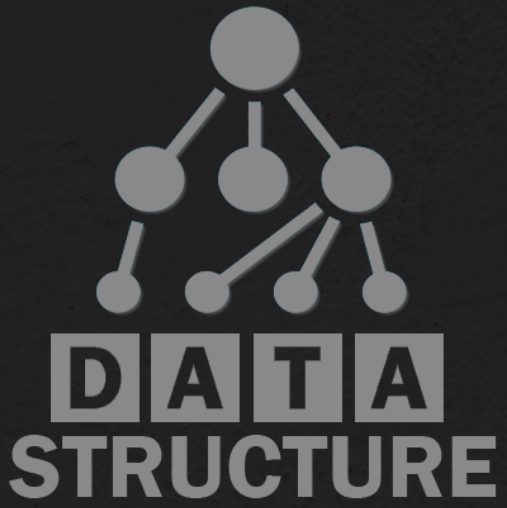
Q6: Complexity is a function of _____

A. Input data size

B. Output data size

C. Amount of time taken

D. Total space taken



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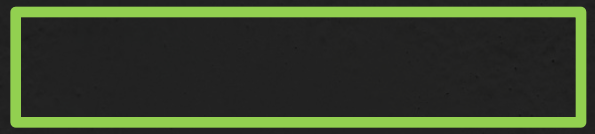
Q7: Which symbol is used for decision making?

A



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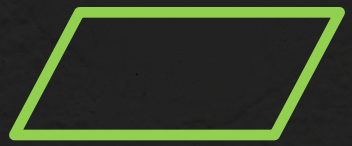

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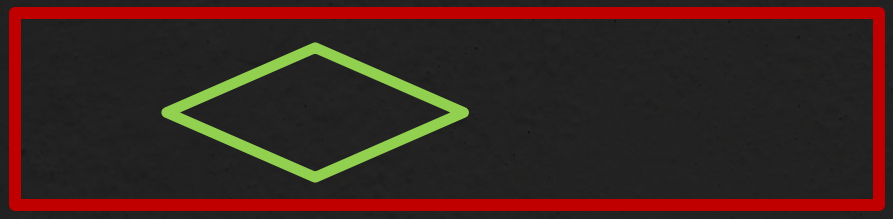

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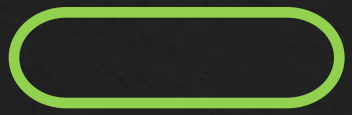

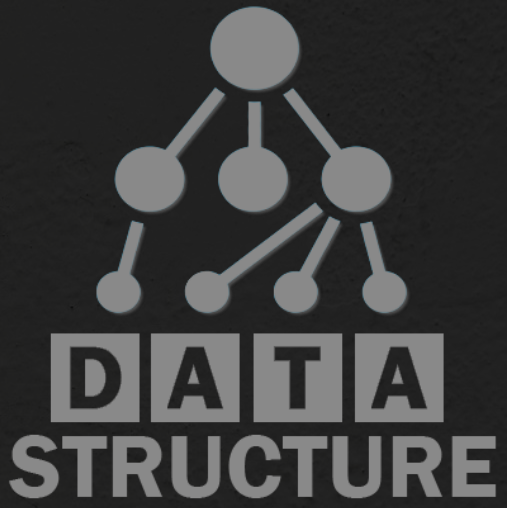

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Q8: Identify the device?

A HDD

B SDD

C SSD

D RAM

HDD	SSD
✗ More Physical Damage	✓ Less Physical Damage
✗ Noisy, Vibrate, Hot	✓ No Noise/Vibration or Heat
✗ Consumes More Power	✓ Consumes Less Power
✗ Bootup 30-40 Sec	✓ Bootup 10-13 Sec
✗ Write = 50-120MBps	✓ Write = 200-500MBps
✗ File Opens 30% Slower	✓ 30% Faster than HDD
✓ 1TB HDD = 5-7k BDT	✗ 1TB SSD = 30-32k BDT

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