Courseova

DSA

HANDWRITTEN NOTES

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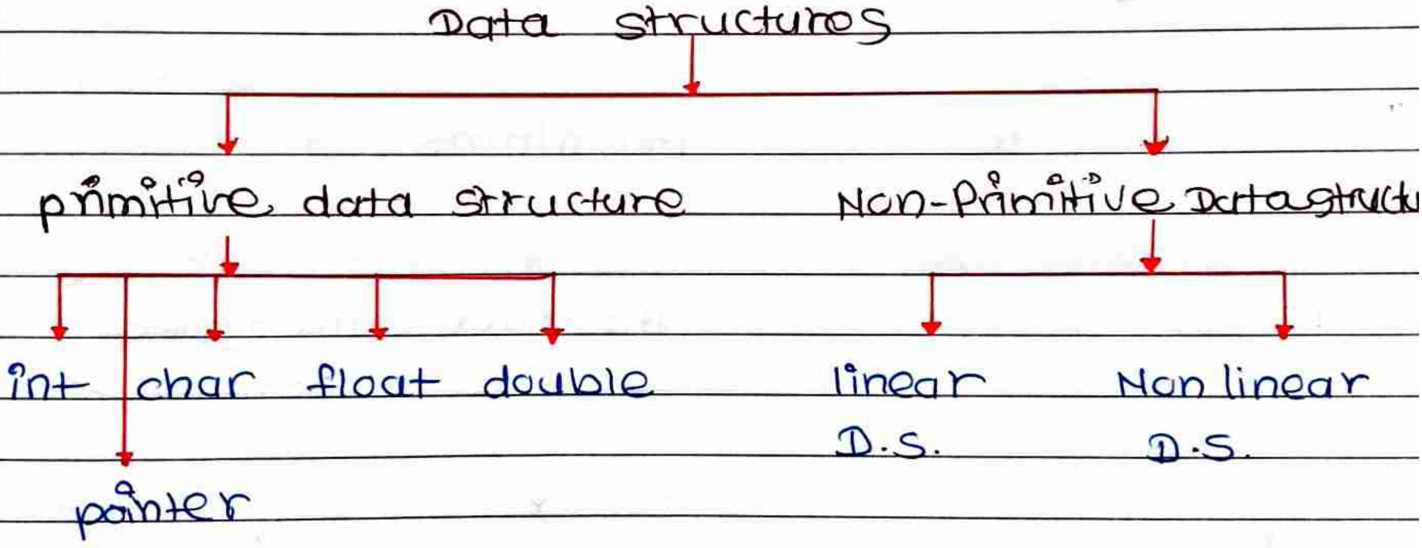
What is Data structure ?

→ Data structure is a way to store and organize data so that it can be used efficiently.

As per name indicates itself that organizing the data in memory.

The data structure is not any programming language like c, c++, Java etc.
It is set of algorithms that we can use in any programming language to structure data in memory.



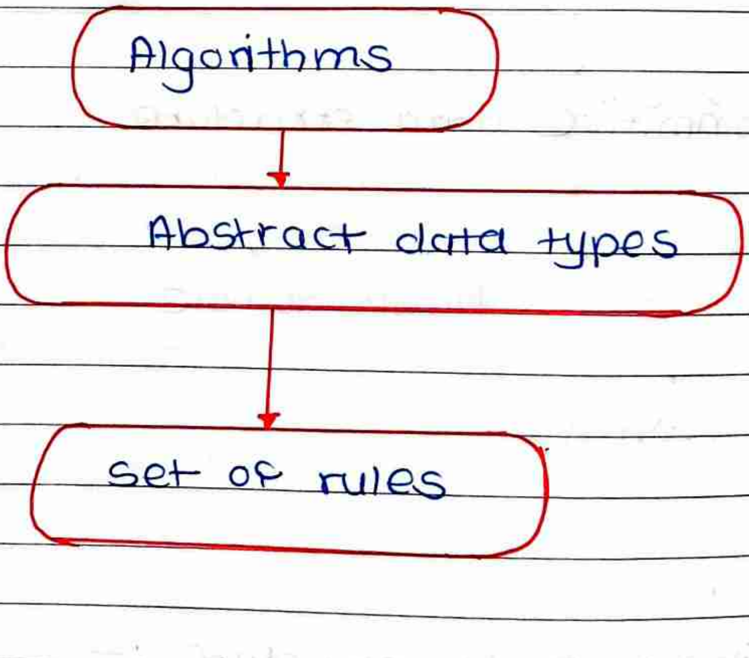
Linear Data structure :-

The arrangement of data in the sequential manner is known as linear data structur
The data structure used for this purpose are Arrays, linked list, stacks and queues.

In this data structures, one element is connected to only one another element in a linear form.

Non-linear data structure :-
When one element is connected to the 'n' number of elements known as non-linear data structures.
Example :- trees and graphs.
In this case, elements are arranged in a random manner.

Algorithms and Abstract Data types ??



Why →

TO structure the data in memory, 'n' number of algorithms are proposed, and all these algorithms are knowns as Abstract Data Types.

An Abstract Data Type tells what is to be done and data structure tells how is to be done ?

ADT gives us the blueprint while data structure provides the implementation part.

What is Data ?

Data can be defined as the elementary value / collection of values.
forexample :- student's name and its id are the data about student.

What is Record ?

Record can be defined as collection of various data items
example :- student entity→ name, address, course and marks can be grouped together to form record.

What is File ?

File is a collection of various records of one type of entity
example :- if there are 20 employees in class, then there will be 20 records in related file where record contains info of employee

What is Attribute and Entity ?

An entity represents class of certain objects. it contains various attributes. each attribute represents particular property of that entity.

What is need of data structures?

As applications are getting complexed and amount of data is increasing day by day, there may arrise following problems :-

Processor speed :- As data is growing day by day to the billions of files per entity, processor may fail to deal with that amount of data.

Data Structure :- consider an inventery size of 106 items in store, if our application needs to search for a particullar item, it needs to transverse 106 items every time, results in slowing down process

multiple requests :- If thousands of users are searching data simultaneously on a web server, then there are chances that to be failed to search during that process.

To solve this problems, data structures are used. Data is organized to form a data structure in a such way that all items are not required to be searched and require data can be searched instantly.

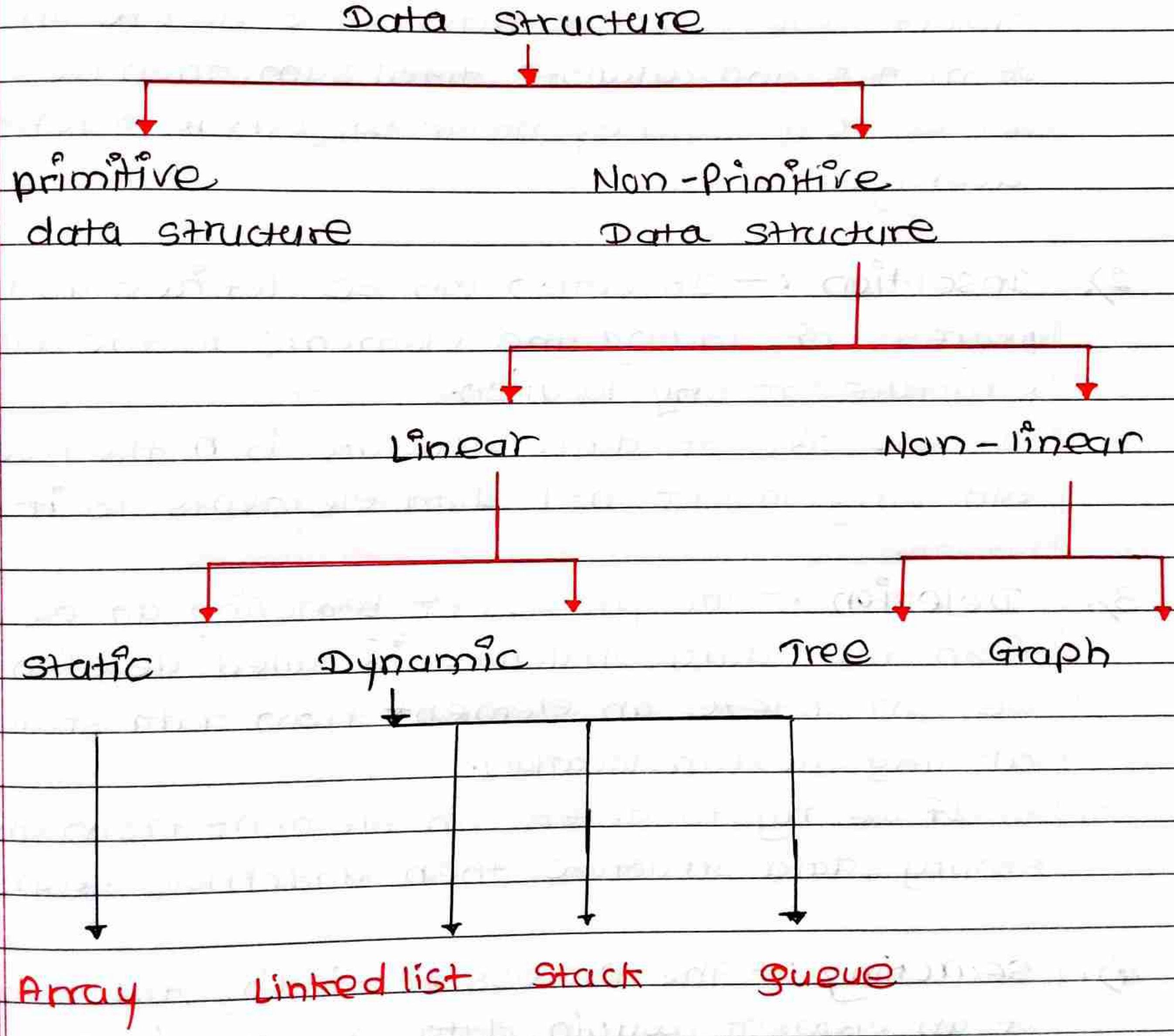
Advantages of data structure :-

Efficiency :- If the choice of a data structure for implementing a particular ADT is proper, it makes program very efficient in terms of time and space.

Reusability :- The data structure provides reusability means that multiple client programs can use the data structure.

Abstraction :- The data structure specified by the ADT also provides level of abstraction. The client cannot see interval working of data structure, so it does not have to worry about implementation.

* Data structure classification :-



Operations on data structure :-

1). Traversing :- Every data structure contains a set of data elements. Traversing data structure means visiting each element of data structure in order to perform some specific operation like searching or sorting.

Example :- If we need to calculate average of marks obtained by a student in 6 different subject, we need to traverse complete array of marks and calculate total sum, then we will devide that sum by no. of subjects ie. 6 to find average.

2). Insertion :- Insertion can be defined as the process of adding the elements to the data structure at any location.

If the size of data structure is n then we can only insert n-1 data elements to it.

3). Deletion :- The process of removing an element from the data structure is called deletion. we can delete an element from data structure at any random location.

If we try to delete an element from an empty data structure then underflow occurs.

4). searching :- The process of finding the location of an element within data structure is called searching. There are two algorithms to perform