Sorting:
- a process of ordering or placing a list of elements from a collection in some kind of order.
- it can be in ascending order or in descending order.
- it arranges the data in a sequence which makes searching easier.

There are many kinds of sorting:
- Bubble sort: it compares one element to its next element and if required, it swaps like a bubble
- Selection sort: it is a sorting algorithm which selects a portion in the elements and compares it to the rest of the position one by one.
- Quick sort: it divides the elements in 2 subsets and again sorts recursively
- Selection sort: it divides the elements to subgroups and then merges them back to make a sorted
- Insertion sort : one element is compared to the one side of array and inserted to the proper position while shifting the rest of the elements accordingly.

Searching:
- it is the process of finding a given value or position in a list of value.
- it decides whether a search key is present in the data or not.

There are many kind of searching:
- Binary search:
Search a sorted array by repeatedly dividing the search interval in half. Begin with an interval covering the whole array. If the value of the search key is less than the item in the middle of the interval, narrow the interval to the lower half. Otherwise narrow it to the upper half. Repeatedly check until the value is found or the interval is empty.
- Linear search: it works by comparing the value to be searched with single element of the array one by one in a sequence until a match is found.

Hashing: it provides O(1) time on average for insert, search and deletion

Hash Function: it maps a big number or string to a small integer that can be used as index in hash table.

Hash Table:
- it is a data structure which stores the data in an associative manner.
- the data is stored in an array format where each data value has its own unique index value.
- therefore, access of data becomes very fast if we know the index of the desired value.

Collision

- it’s when a newly inserted key maps to an already occupied slot in the hash table
- 2 records cannot be stored at the same place
- therefore there are 2 method of resolving collision:

—> Chaining: in this method, each cell of the hash table point to a linked list of records that have the same hash function value.
This method is simple but it requires additional memory outside the table.

—> Open addressing: all elements are stored in hash table it self. The table either contains data or -1. If the location has a sentinel value then the it has place to store the data value, but if there already some data stored at the location, then other slots are examined systematically in the forward direction to find a free slot. If there is no free slot, then there is the overflow condition.

The process of examining memory locations in the hash table is called as *Probing.*
There are many types of probing:
- linear: does a linear search in the array to find empty location
- quadratic

Tree : it is an hierarchal representation of data.

B Tree : a tree in which keys and records can both be stored in the internal nodes as well as in the leafs nodes.
B+ Tree: a tree in which the data can only be stored in leaf nodes while internal nodes can only store key values.

Binary Tree: tree in which each node can have at most 2 children. It is made of a root node, left subtree which is also binary and right which also binary.

Binary Tree: a tree in which the nodes are arranged in a specific order. It is an ordered binary tree.

Graph: A graph can be defined as group of vertices and edges that are used to connect these vertices. A graph can be seen as a cyclic tree, where the vertices (Nodes) maintain any complex relationship among them instead of having parent child relationship.