

## Sorting

Sorting is the process of arranging the elements of an array so that they can be placed either in ascending or descending order.

Sorting is of two types :-

1. Internal Sorting
2. External Sorting

### 1. Internal Sorting :-

When the entire collection of data is very small so that sorting can take place in the main memory of the computer, it is called Internal Sorting.

### 2. External Sorting :-

- External Sorting is a type of sorting which can be implemented with the use of Secondary Storage.
- External Sorting is best when data is large enough that cannot be fit in the Primary Storage.

# \* Sorting Techniques :-

## 1. Selection Sort :-

- In Selection Sort, the first element is selected from the unsorted array and placed at the first position.
- After that second smallest element is selected and placed in the second position.
- The Process continues until the array is entirely sorted.

It is used when :-

- A small array is sorted.
- Swapping cost doesn't matter.
- Compulsory to check all elements.

- $A[1], A[2] \dots A[n]$ , let LOC is the location of smallest number in the array. Then interchange  $A[LOC]$  and  $A[1]$  by 

location of smallest element
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Swap =  $A[LOC]$   
 $A[LOC] = A[1]$   
 $A[1] = \text{Swap}$

### Algorithm :-

- Step 1:- Set MIN to location 0
- Step 2:- Search the minimum element in the list
- Step 3:- Swap with value at location MIN.
- Step 4:- Increment MIN to point to next element
- Step 5:- Repeat until list is sorted.

Example: To sort the following elements using selection sort.

Index $\Rightarrow$	1	2	3	4	5	6
	5	1	12	-5	16	2

(a) Initial Array

		1	2	3	4	5	6	
PASS 1	$T=1, LOC=4$	5	1	12	(-5)	16	2	(Swap 5 and -5)

		1	2	3	4	5	6	
PASS 2	$T=2, LOC=2$	-5	(1)	12	5	16	2	No Swap

		1	2	3	4	5	6	
PASS 3	$T=3, LOC=6$	-5	1	12	5	16	(2)	(Swap 12 and 2)

Pass 4 (I = 4, loc = 6)

1	2	3	4	5	6
-5	1	2	5	16	12

(no swap)

Pass 5 (I = 5, loc = 6)

1	2	3	4	5	6
-5	1	2	5	16	12

(Swap 16 and 12)

Pass 6

1	2	3	4	5	6
-5	1	2	5	12	16

-5	1	2	5	12	16
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Final Sorted Array

Time and Space Complexity

Selection sort	Time Complexity	Space Complexity
Average case	$O(n^2)$	0
Worst case	$O(n^2)$	0