Introduction to sorting

→ sorting is a method of arranging elements in sorted order (ascending or descending).

→ Term sorting comes into picture with the term searching

→ sorting arranges data in a sequence which makes searching easier. Every record which is going to be sorted will contain one key.

Eg: student database in College.

- sorting techniques mainly depends on two parameters

① Execution time

② Space.

→ Sorting can be done in 2 ways based on the source of data.

* External sorting
* Internal sorting.

External sorting:

→ Sorting done with large blocks of data

→ Types of external sorting

Polyphase sorting

Oscillation "

Merge sort

→ After performing sorting data will be moved to secondary memory.

Internal sorting:

→ Process of sorting the data in the main memory.

Bubble sort (or) sinking sort

- The idea of bubble sort is to repeatedly move the smallest element to the lowest index position in the list.
- To find the smallest element, the bubble sort algorithm begins by comparing the first element of the list with its next element, and upto the end of the list and interchange the two elements if they are not in proper order.
- In either case after such a pass, the smaller element will be in the lowest index position of the list.

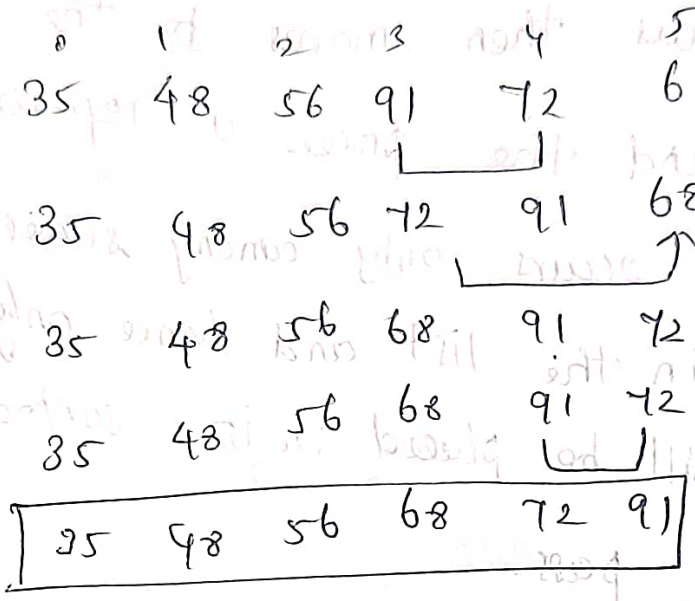
- The focus then moves to the next smaller element and the process is repeated.
- swapping occurs only among successive elements in the list and hence only one element will be placed in its sorted order after each pass.

Routine:-

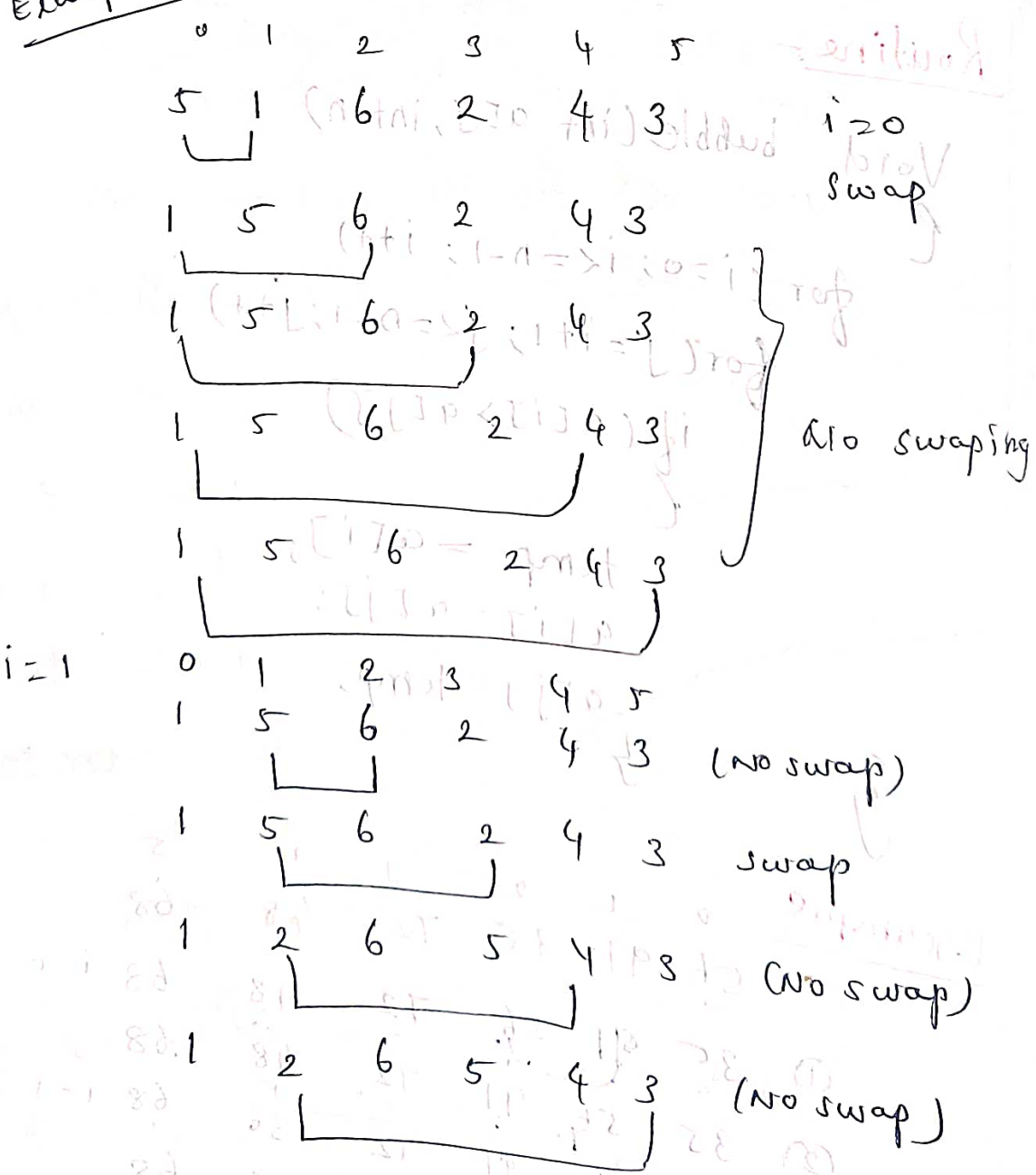
```
Void bubble(int a[], int n)
{
    for(i=0; i<=n-1; i++)
        for(j=i+1; j<=n-1; j++)
            if(a[i]>a[j])
            {
                temp = a[i];
                a[i] = a[j];
                a[j] = temp;
            }
}
```

Example

	0	1	2	3	4	5	
	56	91	35	72	48	68	
①	35	91	56	72	48	68	i=0
②	35	56	91	72	48	68	
③	35	48	91	72	56	68	i=1
	35	48	72	91	56	68	
	35	48	56	91	72	68	i=2


0 1 2 3 4 5
35 48 56 91 72 68
i=3
35 48 56 72 91 68
35 48 56 68 91 72
i=4
35 48 56 68 91 72
35 48 56 68 72 91

Example 2


0 1 2 3 4 5
5 1 6 2 4 3
i=0
swap
1 5 6 2 4 3
1 5 6 2 4 3
1 5 6 2 4 3
1 5 6 2 4 3
No swaping
i=1
0 1 2 3 4 5
1 5 6 2 4 3
(No swap)
1 5 6 2 4 3
swap
1 2 6 5 4 3
(No swap)
1 2 6 5 4 3
(No swap)

i = 2

0 1 2 3 4 5

1 2 6 5 4 3 (swap)

1 2 5 6 4 3 (swap)

1 2 4 6 5 3 (swap)

1 2 3 6 5 4

i = 3

0 1 2 3 4 5

1 2 3 6 5 4 (swap)

1 2 3 5 6 4 (swap)

1 2 3 4 6 5

i = 4

0 1 2 3 4 5

1 2 3 4 6 5 (swap)

1 2 3 4 5 6 sorted.

Time complexity of bubble sort

- The complexity of sorting algorithm is depends upon the no of comparisons that are made

- The total comparisons in bubble sort is $n(n-1)/2 \approx n^2 - n$.

Best case - $O(n^2)$

Worst case - $O(n^2)$

Average case - $O(n^2)$