

* Theory:

+ Sorting

Sorting is the process of arranging the elements of a list or array in a specific order typically in ascending or descending order sorting

- 1) comparison based sorting
- 2) non comparison based sorting

* Insertion sort

Insertion sort builds a sorted array one element at a time. It takes element from the unsorted part and inserts them into the correct position in the sorted part

Array [4, 3, 2, 1]

step 1) Initial Array : [4, 3, 2, 1]

sorted part : [4]

unsorted part [3, 2, 1]

step 2) Insert 3

~~compare 3 with 4 since $3 < 4$ shift 4 to right~~

Inserts [3, 4, 2, 1]

sorted part [3, 4]

Step 3)

Insert 2

Inserts 2 : [2, 3, 4, 1]

sorted part [2, 3, 4]

Step 4) Insert 1

Inserts 1 : [1, 2, 3, 4]

sorted part : [1, 2, 3, 4]

* Shell Sort

Shell sort is an extension of insertion sort. It allows the exchange of items that are far apart. It sorts elements at specific intervals and progressively reduce the gap until it performs a final insertion sort with a gap of one.

Array : [5, 2, 9, 1, 5, 6]

Step 1) Gap 3: Compare and sort elements that are 3 positions apart.

Compare (5, 1) : 1 < 5 swap

[1, 2, 9, 5, 5, 6]

~~No other element to compare since we only have two gaps~~

Step 2) Gap 1 Now perform a normal sort

start with 2, insert it

[1, 2, 9, 5, 5, 6]

Insert 5 before 9
 $[1, 2, 5, 5, 9, 6]$

Insert 6 before 9:
 $[1, 2, 5, 5, 6, 9]$

Sorted Array : $[1, 2, 5, 5, 6, 9]$

* Algorithm:

* Shell sort

Step 1) Start

Step 2) Initialize the value of gap size say

Step 3) Divide the list into smaller sub part. Each must have equal intervals to n

Step 4) Sort these sub-lists using insertion sort

Step 5) Repeat this step Q until the list is sorted

Step 6) print a sorted list

Step 7) stop.

* Insertion sort

Step 1) Start

Step 2) If it is the first element, it is already sorted return 1

Step 3) pick next element

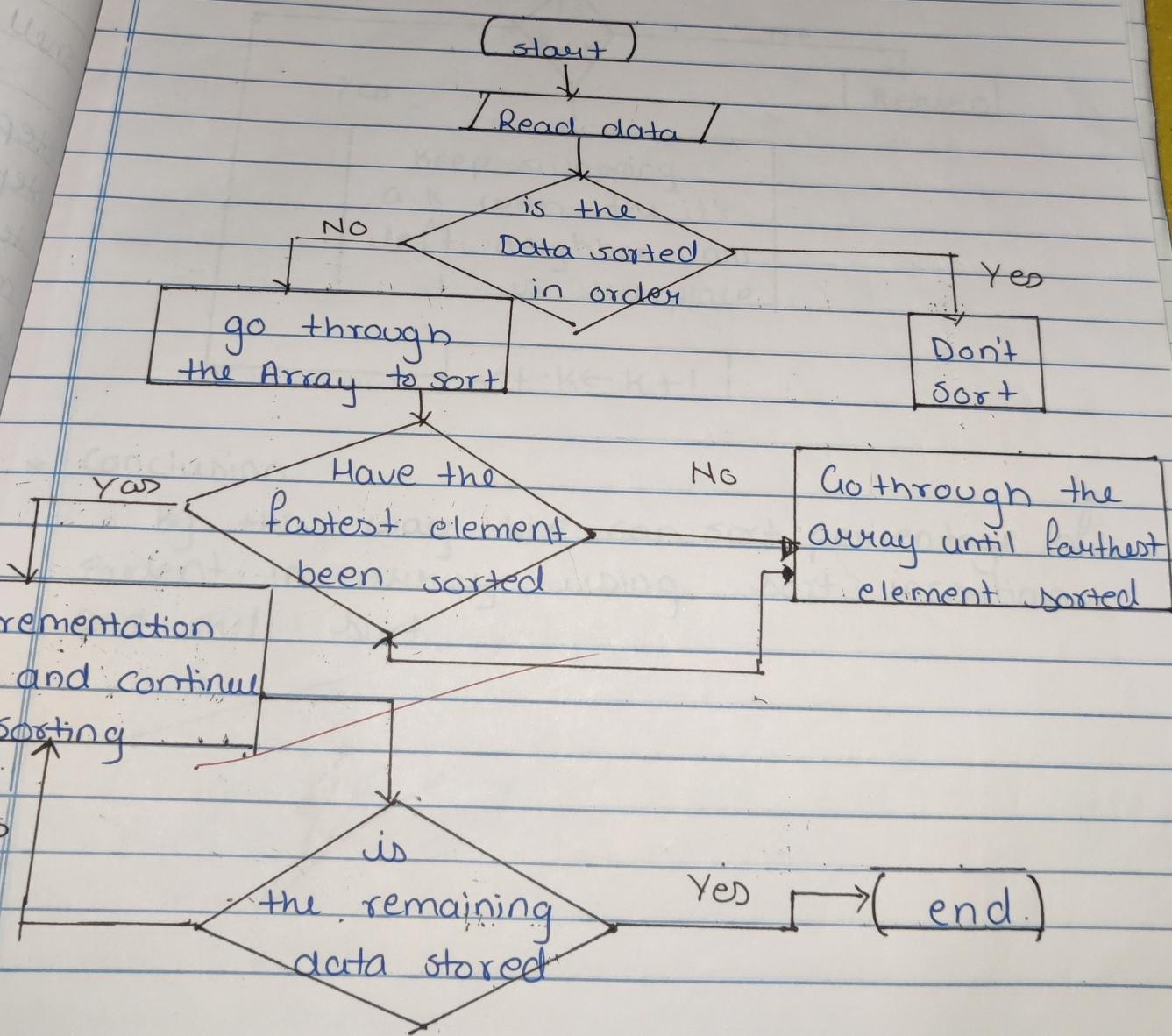
Step 4) compare with all element in the sorted sub list

Step 5) shift all the element in the sorted sub list

that is greater than the value to be sorted
 step 6) insert the value
 step 7) end

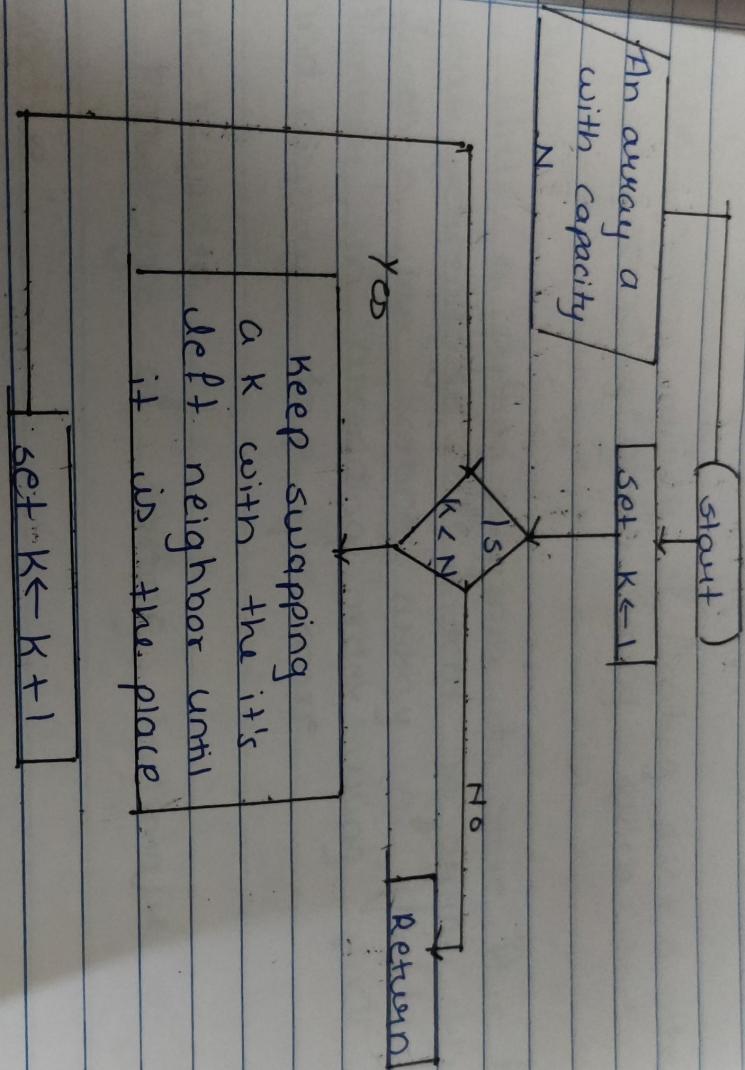
* Flowchart

* shell sort



Insertion Sort

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* Conclusion

By this way we can sort percentage of student in array using sort insertion and shell sort