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Sorting is the process of arranging a list of elements in a particular order (Ascending or Descending). Insertion sort is an algorithm that arranges a list of elements in a particular order. In insertion sort’s algorithm, every iteration moves an element from unsorted portion to a sorted portion until all the elements are sorted in the list.

Insertion sort works in the similar way as we sort cards in our hand in a card game. We assume that the first card is already sorted then, we select an unsorted card. If the unsorted card is greater than the card in hand, it is placed on the right otherwise, to the left. In the same way, other unsorted cards are taken and put at their right place. A similar approach is used by insertion sort. Insertion sort is a sorting algorithm that places an unsorted element at its suitable place in each iteration.

**Implementation of Insertion sort is as follows**:

Step 1 − If it is the first element, it is already sorted. return 1;

Step 2 − Pick next element

Step 3 − Compare with all elements in the sorted sub-list

Step 4 − Shift all the elements in the sorted sub-list that is greater than the value to be sorted

Step 5 − Insert the value

Step 6 − Repeat until list is sorted

**Pseudocode for the insertion sort:**

Insertion-Sort (A) // A is the array of numbers to be sorted

1. for j = 2 to A.length

2. key = A[j]

3. i = j – 1 //A[j] is inserted into the sorted sequence A[1 … j-1]

4. while i > 0 and A[i] > key

5. A[i+1] = A[i]

6. i = i -1

7. A[i+1] = key

**Input to the algorithm:** The sequence of numbers, a1, a2, a3, …, an.

**Output from the algorithm:** The reordering of numbers, a1’, a2’, a3’, …, an’ such that a1’ < a2’ < a3’ < … < an’.

The worst case running time of insertion sort is O(*n*2) where n is the length of the array. It’s best case running time would be O(n). It’s auxiliary space would be O(1). Its’s boundary cases such as when Insertion sort would take maximum time to sort, is if elements are sorted in reverse order and it takes minimum time (Order of n) when elements are already sorted. The paradigm used to implement insertion sort is the incremental approach. Insertion sort is used when number of elements is small. It can also be useful when input array is almost sorted, only few elements are misplaced in complete big array.