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Title of Experiment : To understand and implement Insertion sort in Python

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EXPERIMENT - 1a

AIM: To understand and implement Insertion sort in Python.

OBJECTIVE: To create a python program that sorts an array of elements using insertion sort method.

THEORY: Insertion sort is a simple sorting algorithm that builds the final array one item at a time. It is not efficient on large lists compared to quicksort, heapsort or merge sort. However, is used in educational settings due to its simplicity.

The basic idea is to iterate through an array, one element at a time and insert is into it correct position within the sorted part of array.

ALGORITHM:

```
for j = 2 to A.length
    key = A [j]
    // insert A[j] into A[1, ------, j-1]
    i = j-1
    while (i >= 0 AND A(i) > key)
        A [i+1] = A[i]
        i -= 1
    A [i+1] = key
```

Conclusion: The insertion sort algorithm is a straight forward but inefficient method for sorting arrays. It works well for small datasets or partially sorted arrays.

WORLD STAR   For Educational Use

Program:

```python
def insertion_sort(arr):
    for i in range(1,len(arr)):
        key=arr[i]
        j=i-1
        while j>=0 and key<arr[j]:
            arr[j+1]=arr[j]
            j-=1
        arr[j+1] =key


arr = [12,8,45,22,1,89]

insertion_sort(arr)
for i in range(0,len(arr)):
    print(arr[i]
```

Output: