Insertion Sort Short Notes:

- Insertion Sort ek simple aur efficient sorting algorithm hai.
- Yeh algorithm array ko do hisson mein taqseem karta hai: sorted aur unsorted.
- Har pass mein, ek unsorted element ko lekar use sorted hissay mein sahi jagah par insert karta hai.
- Insertion Sort ka time complexity average cases mein O(N^2) hota hai, lekin iski best case time complexity O(N) hoti hai.
- Yeh algorithm small datasets ke liye behtareen hota hai aur partially sorted ya kareeb-sorted arrays ko tez se sort karta hai.

Java Code for Insertion Sort:

```
import java.util.* ;
import java.io.*;


public class Solution {


   // Insertion Sort Function
   public static void insertionSort(int n, int[] arr) {
      int i, j, x;
      for(i = 1; i < n; i++) {
         j = i - 1;
         x = arr[i];


         // Compare the current element with elements in the sorted part
         while(j > -1 && arr[j] > x) {
            arr[j + 1] = arr[j];
            j--;
         }
         // Insert the current element at the correct position in the sorted part
         arr[j + 1] = x;
      }
   }
```

```
}
```

Explanation:

`insertionSort` function mein, har pass mein ek unsorted element ko lekar use sorted hissay mein sahi jagah par insert kiya jata hai.

- `j` variable sorted part mein traverse karta hai aur sahi jagah dhoondhta hai jahan current element ko insert karna hai.
- `x` variable current element ko represent karta hai.
- Time complexity O(N^2) hoti hai average cases mein, lekin best case mein O(N) hoti hai.