Bubble Sort Short Notes:

- Bubble Sort ek simple aur straightforward sorting algorithm hai.
- Yeh algorithm adjacent elements ko compare karta hai aur agar woh ghalat order mein hain toh unhein swap karta hai.
- Har pass mein, sabse bada element apne sahi sthan par pahunchta hai.
- Time complexity O(N^2) hoti hai, lekin ismein swaps ki sankhya bhi O(N^2) hoti hai, isliye large datasets ke liye efficient nahi hota.
- Bubble Sort ka code aasan hota hai, lekin efficient sorting algorithms jaise ki Merge Sort aur Quick Sort isse zyada tez hote hain.

Java Code for Bubble Sort:

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


public class Solution {


   // Bubble Sort Function
   public static void bubbleSort(int[] arr, int n) {
      int i, j, temp;


      // Outer loop for the number of passes
      for(i = 0; i < n; i++) {


         // Inner loop for pairwise comparison and swapping
         for(j = 0; j < n - i - 1; j++) {


            // Check if the current element is greater than the next one
            if(arr[j] > arr[j + 1]) {


               // Swap the elements if they are in the wrong order
               temp = arr[j];
               arr[j] = arr[j + 1];
```

```
                arr[j + 1] = temp;
            }
        }
    }
}
```

Explaination:

`bubbleSort` function mein, har pass mein adjacent elements ko compare karte hain aur agar woh ghalat order mein hain toh unhein swap karte hain.

- **Outer Loop:** Yeh loop passes ko control karta hai, aur har pass mein ek element ko apne sahi sthan par pahunchata hai.
- **Inner Loop:** Yeh loop adjacent elements ke comparison aur swapping ko control karta hai.
- `temp` variable ka istemal swap karne ke liye hota hai.
- Har pass ke baad, sabse bada element apne sthan par pahunchta hai, isliye next pass mein usko consider nahi kiya jata hai (`n - i - 1` tak ke elements ke saath hi kaam hota hai).
- Bubble sort ka time complexity O(N^2) hota hai, lekin ismein bhi swaps ki sankhya O(N^2) hoti hai, isliye yeh efficient nahi hota jab elements zyada hote hain.