Sorting in JAVA

1. **Bubble Sort**

   Idea: if arr[i] > arr[i+1] swap them. To place the element in their respective position, we have to do the following operation N-1 times.

   Time Complexity: $O(N^2)$

   Code

```java
import java.util.*;

class Sorting {
   public static void printArray(int arr[]) {
       for(int i=0; i<arr.length; i++) {
           System.out.print(arr[i]+" ");
       }
       System.out.println();
   }

   public static void main(String args[]) {
       int arr[] = {7, 8, 1, 3, 2};

       //bubble sort
       for(int i=0; i<arr.length-1; i++) {
           for(int j=0; j<arr.length-i-1; j++) {
               if(arr[j] > arr[j+1]) {
                   //swap
                   int temp = arr[j];
                   arr[j] = arr[j+1];
                   arr[j+1] = temp;
               }
           }
       }

       printArray(arr);
   }
```

```
}
```

2. Selection Sort

Idea: The inner loop selects the minimum element in the unsorted array and places the elements in increasing order.

Time complexity: $O(N^2)$

Code

```
import java.util.*;

class Sorting {
   public static void printArray(int arr[]) {
       for(int i=0; i<arr.length; i++) {
           System.out.print(arr[i]+" ");
       }
       System.out.println();
   }

   public static void main(String args[]) {
       int arr[] = {7, 8, 1, 3, 2};

       //selection sort
       for(int i=0; i<arr.length-1; i++) {
           int smallest = i;
           for(int j=i+1; j<arr.length; j++) {
               if(arr[j] < arr[smallest]) {
                   smallest = j;
               }
           }
           //swap
           int temp = arr[smallest];
           arr[smallest] = arr[i];
           arr[i] = temp;
       }

       printArray(arr);
   }
```

```
}
```

3. Insertion Sort

Idea: Take an element from the unsorted array, place it in its corresponding position in the sorted part, and shift the elements accordingly.

Time Complexity: $O(N^2)$

Code

```
import java.util.*;

class Sorting {
   public static void printArray(int arr[]) {
       for(int i=0; i<arr.length; i++) {
           System.out.print(arr[i]+" ");
       }
       System.out.println();
   }

   public static void main(String args[]) {
       int arr[] = {7, 8, 1, 3, 2};

       //insertion sort
       for(int i=1; i<arr.length; i++) {
           int current = arr[i];
           int j = i - 1;
               while(j >= 0 && arr[j] > current) {
                   //Keep swapping
                   arr[j+1] = arr[j];
                   j--;
               }
           arr[j+1] = current;
       }
       printArray(arr);
   }
}
```

`