

Sorting in JAVA

1. Bubble Sort

Idea: if $\text{arr}[i] > \text{arr}[i+1]$ 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

```
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);
    }
}
```

