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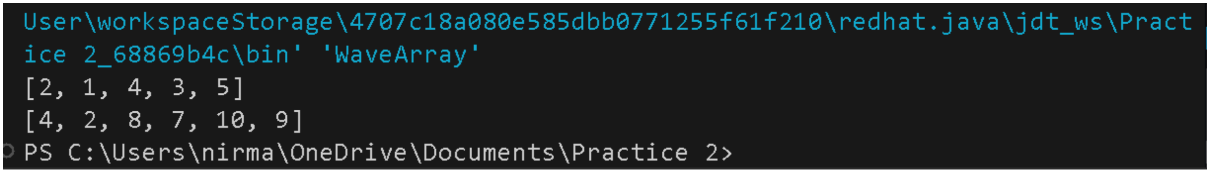
Practice set 5:

1. Wave Array:

   Java code:

```
import java.util.Arrays;
public class WaveArray {
  public static int[] sort(int[] arr){
    Arrays.sort(arr);
    for (int i=0;i<arr.length;i+=2){
      if (i!=arr.length-1){
        int temp=arr[i];
        arr[i]=arr[i+1];
        arr[i+1]=temp;
      }
    }
    return arr;
  }
  public static void main(String[] args) {
    int[] arr1={1, 2, 3, 4, 5};
    int[] arr2={2, 4, 7, 8, 9, 10};
    System.out.println(Arrays.toString(sort(arr1)));
    System.out.println(Arrays.toString(sort(arr2)));
  }
}
```

   Output:



```
User\workspaceStorage\4707c18a080e585dbb0771255f61f210\redhat.java\jdt_ws\Pract
ice 2_68869b4c\bin' 'WaveArray'
[2, 1, 4, 3, 5]
[4, 2, 8, 7, 10, 9]
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

   Time complexity: O(n log n)
   Space complexity: O(1)

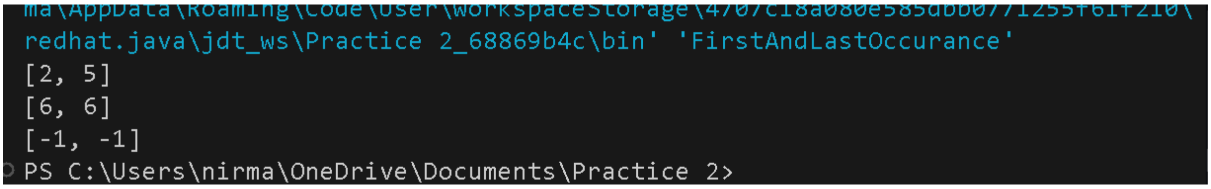
2. First and Last Occurrences:

   Java code:

```
import java.util.ArrayList;;
public class FirstAndLastOccurance {
  public static ArrayList<Integer> find(int[] arr,int x){
    int a=-1,b=-1;
    int low=0,high=arr.length-1;
    while (low<=high){
      if (arr[low]==x){
        a=low;
      }else{
        low++;
      }
      if (arr[high]==x){
        b=high;
      }else{
        high--;
      }
      if (a!=-1 && b!=-1){
        break;
      }
    }
    ArrayList<Integer> r=new ArrayList<>();
    r.add(a);
    r.add(b);
    return r;
  }
  public static void main(String[] args) {
    int[] arr1={1, 3, 5, 5, 5, 5, 67, 123, 125};
    int[] arr3={1, 3, 5, 5, 5, 5, 7, 123, 125};
    int[] arr2={1, 2, 3};
    System.out.println(find(arr1, 5));
    System.out.println(find(arr3, 7));
    System.out.println(find(arr2, 4));

  }
}
```

Output:



```
ma\AppData\Roaming\Code\User\workspaceStorage\4707c18a080e585dbb0771255f61f210\
redhat.java\jdt_ws\Practice 2_68869b4c\bin' 'FirstAndLastOccurance'
[2, 5]
[6, 6]
[-1, -1]
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

Time complexity: O(n)

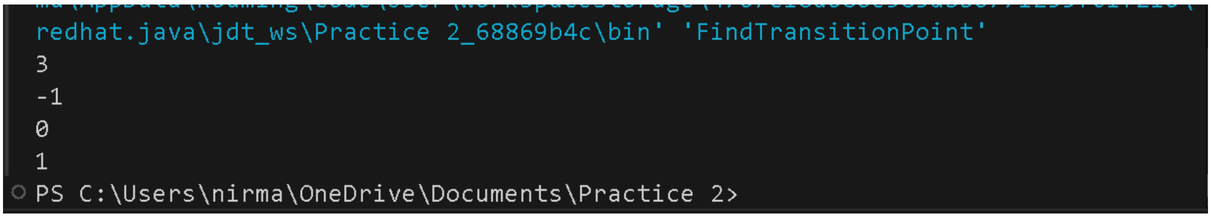
Space complexity: O(1)

3. Find Transition Point:

Java code:

```
public class FindTransitionPoint {
  public static int transitionPoint(int arr[]) {
    int low=0,high=arr.length-1;
    int r=-1;
    while (low<=high){
      int mid=low+(high-low)/2;
      if (arr[mid]==1){
        r=mid;
        high=mid-1;
      }else{
        low=mid+1;
      }
    }
    return r;
  }
  public static void main(String[] args) {
    int[] arr1={0, 0, 0, 1, 1};
    int[] arr2={0, 0, 0, 0};
    int [] arr3={1, 1, 1};
    int[] arr4={0, 1, 1};
    System.out.println(transitionPoint(arr1));
    System.out.println(transitionPoint(arr2));
    System.out.println(transitionPoint(arr3));
    System.out.println(transitionPoint(arr4));
  }
}
```

Output:



```
redhat.java\jdt_ws\Practice 2_68869b4c\bin' 'FindTransitionPoint'
3
-1
0
1
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

Time complexity: O(log n)
Space complexity O(1)

4. Find Repeating Element:

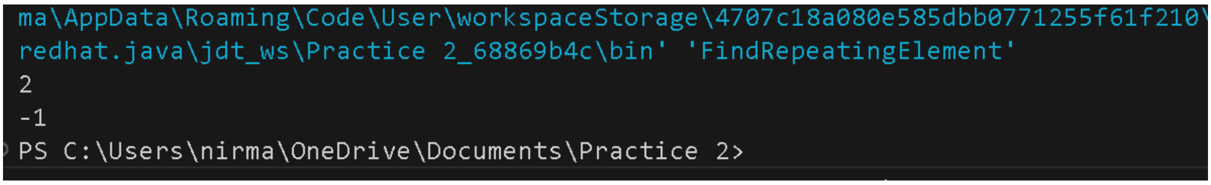
Java code:

```
import java.util.HashMap;

public class FindRepeatingElement {
  public static int find(int[] arr){
    HashMap<Integer,Integer> h=new HashMap<>();
    for (int i:arr){
      h.put(i,h.getOrDefault(i,0)+1);
    }
    for (int j=0;j<arr.length;j++){
      if (h.get(arr[j])>1){
        return j+1;
      }
    }
    return -1;
  }
  public static void main(String[] args) {
    int[] arr1={1, 5, 3, 4, 3, 5, 6};
    int[] arr2={1, 2, 3, 4};
    System.out.println(find(arr1));
    System.out.println(find(arr2));

  }
}
```

Output:



```
ma\AppData\Roaming\Code\User\workspaceStorage\4707c18a080e585dbb0771255f61f210
redhat.java\jdt_ws\Practice 2_68869b4c\bin' 'FindRepeatingElement'
2
-1
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

Time complexity: O(n)
Space complexity: O(n)

5. Remove Duplicates Sorted Array:

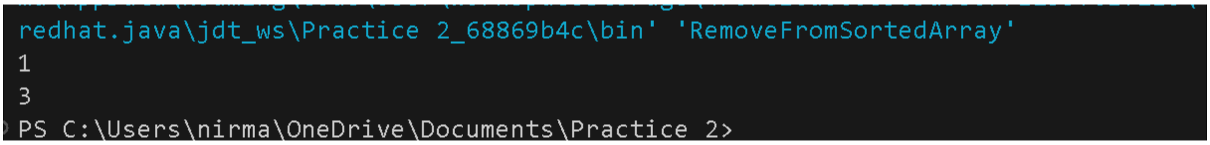
Java code:

```
import java.util.ArrayList;
import java.util.Arrays;
import java.util.List;

public class RemoveFromSortedArray {
  public static int remove(List<Integer> arr){
    int n=arr.size();
    int r=1;
    if (n<=1){
      return n;
    }
    for (int i=1;i<n;i++){
      if (!arr.get(i).equals(arr.get(i-1))){
        arr.set(r,arr.get(i));
        r++;
      }
    }
    return r;
  }
  public static void main(String[] args) {
    List<Integer> arr1=new ArrayList<>(Arrays.asList(2, 2, 2, 2, 2));
    List<Integer> arr2=new ArrayList<>(Arrays.asList(1, 2, 4));
    System.out.println(remove(arr1));
    System.out.println(remove(arr2));

  }
}
```

Output:



```
redhat.java\jdt_ws\Practice 2_68869b4c\bin' 'RemoveFromSortedArray'
1
3
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

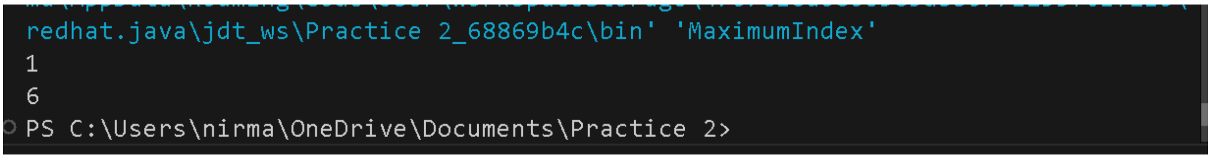
Time complexity: O(n)
Space complexity: O(1)

6. Maximum Index:

Java code:

```
public class MaximumIndex {
    public static int res(int[] arr){
        int n=arr.length;
        int[] a=new int[n];
        int[] b=new int[n];
        a[0]=arr[0];
        for (int i=1;i<n;i++){
            a[i]=Math.min(arr[i],a[i-1]);
        }
        b[n-1]=arr[n-1];
        for (int j=n-2;j>=0;j--){
            b[j]=Math.max(arr[j],b[j+1]);
        }
        int i=0,j=0;
        int r=-1;
        while (i<n && j<n){
            if (a[i]<=b[j]){
                r=Math.max(r,j-i);
                j++;
            }else{
                i++;
            }
        }
        return r;
    }
    public static void main(String[] args) {
        int[] arr1={1, 10};
        int[] arr2={34, 8, 10, 3, 2, 80, 30, 33, 1};
    System.out.println(res(arr1));
    System.out.println(res(arr2));
  }
}
```

Output:



```
redhat.java\jdt_ws\Practice 2_68869b4c\bin' 'MaximumIndex'
1
6
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

Time complexity: O(n)

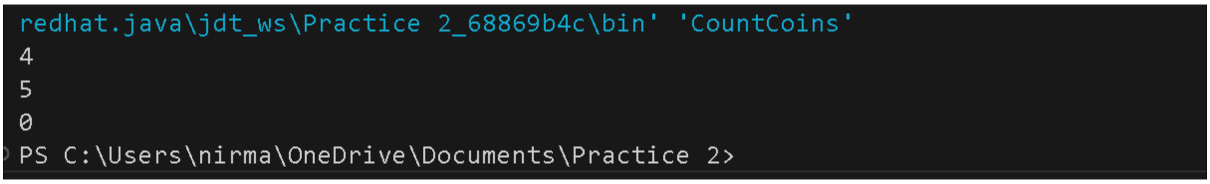
Space complexity: O(n)

7. Coin Change (Count Ways):

Java code:

```
public class CountCoins {
  public static int count(int coins[], int sum) {
    int[] dp=new int[sum+1];
    dp[0]=1;
    for (int i:coins){
      for (int j=i;j<=sum;j++){
        dp[j]+=dp[j-i];
      }
    }
    return dp[sum];
  }
  public static void main(String[] args) {
    int[] arr1={1, 2, 3};
    int[] arr2={2, 5, 3, 6};
    int[] arr3={5, 10};
    int s1=4,s2=10,s3=3;
    System.out.println(count(arr1, s1));
    System.out.println(count(arr2, s2));
    System.out.println(count(arr3, s3));
  }
}
```

Output:



```
redhat.java\jdt_ws\Practice 2_68869b4c\bin' 'CountCoins'
4
5
0
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

Time complexity: O(mxsum)

Space complexity: O(sum)

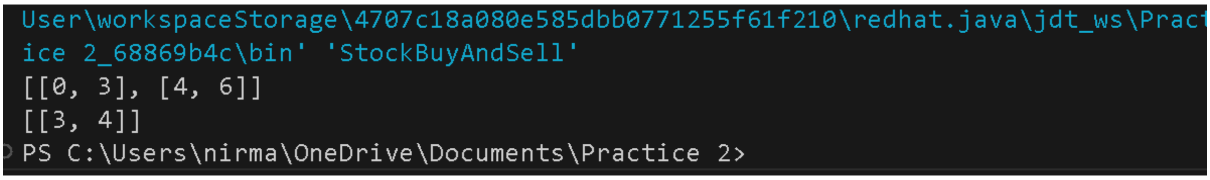
8. Stock buy and sell:

Java code:

```
import java.util.ArrayList;

public class StockBuyAndSell {
  public static ArrayList<ArrayList<Integer>> stock(int A[], int n) {
    ArrayList<ArrayList<Integer>> r=new ArrayList<>();
    int i=0;
    while (i<n-1){
      while (i<n-1 && A[i]>=A[i+1]){
        i++;
      }
      if (i==n-1){
        break;
      }
      int b=i;
      i++;
      while (i<n && A[i]>=A[i-1]){
        i++;
      }
      int s=i-1;
      ArrayList<Integer> p=new ArrayList<>();
      p.add(b);
      p.add(s);
      r.add(p);
    }
    return r;
  }
  public static void main(String[] args) {
    int[] arr1={100,180,260,310,40,535,695};
    int[] arr2={4,2,2,2,4};
    int n1=7,n2=5;
    System.out.println(stock(arr1, n1));
    System.out.println(stock(arr2, n2));
  }
}
```

Output:



```
User\workspaceStorage\4707c18a080e585dbb0771255f61f210\redhat.java\jdt_ws\Pract
ice 2_68869b4c\bin' 'StockBuyAndSell'
[[0, 3], [4, 6]]
[[3, 4]]
PS C:\Users\nirma\OneDrive\Documents\Practice 2>
```

Time complexity: O(n)

Space complexity: O(n)