10 - Searching & Sorting

For example:

Input	Result
5 6 5 4 3 8	3 4 5 6 8

Ex. No. : 10.1 **Date:**

Register No.: **Name:**

Merge Sort

Write a Python program to sort a list of elements using the merge sort algorithm.

```
def bubble_sort(arr):
    n = len(arr)
    for i in range(n):
        for j in range(0, n-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]
    return arr

num_elements = int(input().strip())
array = list(map(int, input().strip().split()))

sorted_array = bubble_sort(array)

print(" ".join(map(str, sorted_array)))
```

Input Format

The first line contains an integer,n , the size of the list a . The second line contains n, space-separated integers a[i].

Constraints

- 2<=n<=600
- 1<=a[i]<=2x10^6.

Output Format

You must print the following three lines of output:

1. List is sorted in numSwaps swaps., where numSwaps is the number of swaps that took place.
2. First Element: firstElement, the *first* element in the sorted list.
3. Last Element: lastElement, the *last* element in the sorted list.

Sample Input 0

3

1 2 3

Sample Output 0

List is sorted in 0 swaps.

First Element: 1

Last Element: 3

For example:

Input	Result
3 3 2 1	List is sorted in 3 swaps. First Element: 1 Last Element: 3
5 1 9 2 8 4	List is sorted in 4 swaps. First Element: 1 Last Element: 9

Ex. No. : 10.2 **Date:**

Register No.: **Name:**

Bubble Sort

Given an listof integers, sort the array in ascending order using the *Bubble Sort* algorithm above. Once sorted, print the following three lines:

1. List is sorted in numSwaps swaps., where numSwaps is the number of swaps that took place.
2. First Element: firstElement, the *first* element in the sorted list.
3. Last Element: lastElement, the *last* element in the sorted list.

For example, given a worst-case but small array to sort: a=[6,4,1]. It took 3 swaps to sort the array. Output would be

```
Array is sorted in 3 swaps.
First Element: 1
Last Element: 6
```

```
def bubble_sort(arr):
    n = len(arr)
    num_swaps = 0
    for i in range(n):
        for j in range(0, n-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]
                num_swaps += 1
    return arr, num_swaps

num_elements = int(input().strip())
array = list(map(int, input().strip().split()))
```

```
sorted_array, num_swaps = bubble_sort(array)

print(f"List is sorted in {num_swaps} swaps.")

print(f"First Element: {sorted_array[0]}")

print(f"Last Element: {sorted_array[-1]}")
```

Input Format

The first line contains a single integer n , the length of A .
The second line contains n space-separated integers,A[i].

Output Format

Print peak numbers separated by space.

Sample Input

5

8 9 10 2 6

Sample Output

10 6

For example:

Input	Result
4 12 3 6 8	12 8

Ex. No. : 10.3 **Date:**

Register No.: **Name:**

Peak Element

Given an list, find peak element in it. A peak element is an element that is greater than its neighbors.

An element a[i] is a peak element if

A[i-1] <= A[i] >=a[i+1] for middle elements. [0<i<n-1]

A[i-1] <= A[i] for last element [i=n-1]

A[i]>=A[i+1] for first element [i=0]

```
a=int(input())
lst1=[str(x) for x in input().split(" ")]
lst2=[]
lst=[]
g=0
for i in lst1:
    if i.isdigit():
        g=int(i)
        lst.append(g)
for i in range(0,a):
    if(i==0):
        if(lst[i]>=lst[i+1]):
            lst2.append(lst[i])
    elif(i>0 and i<a-2):
        if(lst[i]>=lst[i-1] and lst[i]>=lst[i+1]):
            lst2.append(lst[i])
    elif(i==a-1):
        if(lst[i]>=lst[i-1]):
            lst2.append(lst[i])
for i in lst2:
```

```
print(i,end=" ")
```

For example:

Input	Result
1 2 3 5 8 6	False
3 5 9 45 42 42	True

Ex. No. : 10.4 **Date:**

Register No.: **Name:**

Binary Search

Write a Python program for binary search.

```
def binary_search(arr, target):
    left, right = 0, len(arr) - 1

    while left <= right:
        mid = (left + right) // 2
        if arr[mid] == target:
            return True
        elif arr[mid] < target:
            left = mid + 1
        else:
            right = mid - 1

    return False

sorted_list = list(map(int, input().split(',')))
target = int(input())

sorted_list.sort()
```

```
result = binary_search(sorted_list, target)

print(result)
```

Input:

1 68 79 4 90 68 1 4 5

output:

1 2

4 2

5 1

68 2

79 1

90 1

For example:

Input	Result
4 3 5 3 4 5	3 2 4 2 5 2

Ex. No. : 10.5 **Date:**

Register No.: **Name:**

Frequency of Elements

To find the frequency of numbers in a list and display in sorted order.

Constraints:

1<=n, arr[i]<=100

```
def count_frequencies(arr):
    frequency_dict = {}
    for num in arr:
        if num in frequency_dict:
            frequency_dict[num] += 1
        else:
            frequency_dict[num] = 1

    sorted_keys = sorted(frequency_dict.keys())
    for key in sorted_keys:
        print(key, frequency_dict[key])

# Read input from the user
input_list = list(map(int, input().split()))

# Count frequencies and display the result
count_frequencies(input_list)
```