10 - Searching & Sorting

Ex. No. : 10.1 **Date: 4.6.2024**

Register No.: 231401051 **Name: B.Keerthna**

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Merge Sort

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

For example:

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

Program:

```
a=int(input()) l=[]
l.extend(input().split()) for
i in range(a-1):     for j in
range(a-1):
if(int(l[j])>int(l[j+1])):
            t=int(l[j])
l[j]=int(l[j+1])
l[j+1]=t for i in
range(a):
    print(int(l[i]),end=" ")
```

Output:

	Input	Expected	Got
✔	5 6 5 4 3 8	3 4 5 6 8	3 4 5 6 8
✔	9 14 46 43 27 57 41 45 21 70	14 21 27 41 43 45 46 57 70	14 21 27 41 43 45 46 5
✔	4 86 43 23 49	23 43 49 86	23 43 49 86

Passed all tests! ✔

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Marks for this submission: 1.00/1.00.

Ex. No. : 10.2 Date: 4.6.24

Register No.: 231401051 Name: B.Keerthna

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

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

Program:

```
def bubble_sort(arr):
    n = len(arr)
swaps = 0

    for i in range(n):          for j in range(0, n-
i-1):              if arr[j] > arr[j + 1]:                  #
Swap elements                  arr[j], arr[j + 1] =
arr[j + 1], arr[j]                  swaps += 1

    return swaps

# Input the size of the list n
= int(input())

# Input the list of integers arr =
list(map(int, input().split()))

# Perform bubble sort and count the number of swaps
num_swaps = bubble_sort(arr)

# Print the number of swaps
```

```
print("List is sorted in", num_swaps, "swaps.")

# Print the first element print("First
Element:", arr[0])

# Print the last element print("Last
Element:", arr[-1])
```

Output:

	Input	Expected	Got	
✔	3 3 2 1	List is sorted in 3 swaps. First Element: 1 Last Element: 3	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	List is sorted in 4 swaps. First Element: 1 Last Element: 9	✔

Passed all tests! ✔

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Ex. No. : 10.3 Date: 4.6.2024

Register No.: 231401051 Name: B.Keerthna

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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]

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

Program:

```
def find_peak(arr):
peak_elements = []     # Check for
the first element     if arr[0] >=
arr[1]:
```

```
        peak_elements.append(arr[0])

    # Check for middle elements      for
i in range(1, len(arr) - 1):         if arr[i
- 1] <= arr[i] >= arr[i + 1]:
peak_elements.append(arr[i])

    # Check for the last element
if arr[-1] >= arr[-2]:
        peak_elements.append(arr[-1])

    return peak_elements

# Input the length of the list n
= int(input())

# Input the list of integers arr =
list(map(int, input().split()))

# Find peak elements and print the result
peak_elements = find_peak(arr) print(*peak_elements)
```

Output:

	Input	Expected	Got	
✔	7 15 7 10 8 9 4 6	15 10 9 6	15 10 9 6	✔
✔	4 12 3 6 8	12 8	12 8	✔

Passed all tests! ✔

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Marks for this submission: 1.00/1.00.

Ex. No. : 10.4 **Date: 4.6.2024**

Register No.: 231401051 **Name: B.Keerthna**

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Binary Search

Write a Python program for binary search.

For example:

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

Program:

```
a = input().split(",")
b = input() print(b
in a)
```

Output:

	Input	Expected	Got	
✔	1,2,3,5,8 6	False	False	✔
✔	3,5,9,45,42 42	True	True	✔
✔	52,45,89,43,11 11	True	True	✔

Passed all tests! ✔

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Ex. No. : 10.5 Date: 4.6.2024

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Frequency of Elements

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

Constraints: 1<=n,

arr[i]<=100 **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

Program:

```
def count_frequency(arr):
    frequency = {}
```

```
    # Count the frequency of each number in the list
for num in arr:
        frequency[num] = frequency.get(num, 0) + 1

    # Sort the dictionary based on keys
sorted_frequency = sorted(frequency.items())

    # Print the frequency of each number
for num, freq in sorted_frequency:
        print(num, freq)

# Input the list of numbers arr =
list(map(int, input().split()))

# Count the frequency and print the result
count_frequency(arr)
```

Output:

	Input	Expected	Got	
✔	4 3 5 3 4 5	3 2 4 2 5 2	3 2 4 2 5 2	✔
✔	12 4 4 4 2 3 5	2 1 3 1 4 3 5 1 12 1	2 1 3 1 4 3 5 1 12 1	✔
✔	5 4 5 4 6 5 7 3	3 1 4 2 5 3 6 1 7 1	3 1 4 2 5 3 6 1 7 1	✔

Passed all tests! ✔

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