10 - Searching & Sorting

Ex. No. : 10.1 **Date: 5-6-24**

Register No.: 231501140 **Name: Sai Senthil .M**

Merge Sort

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

For example:

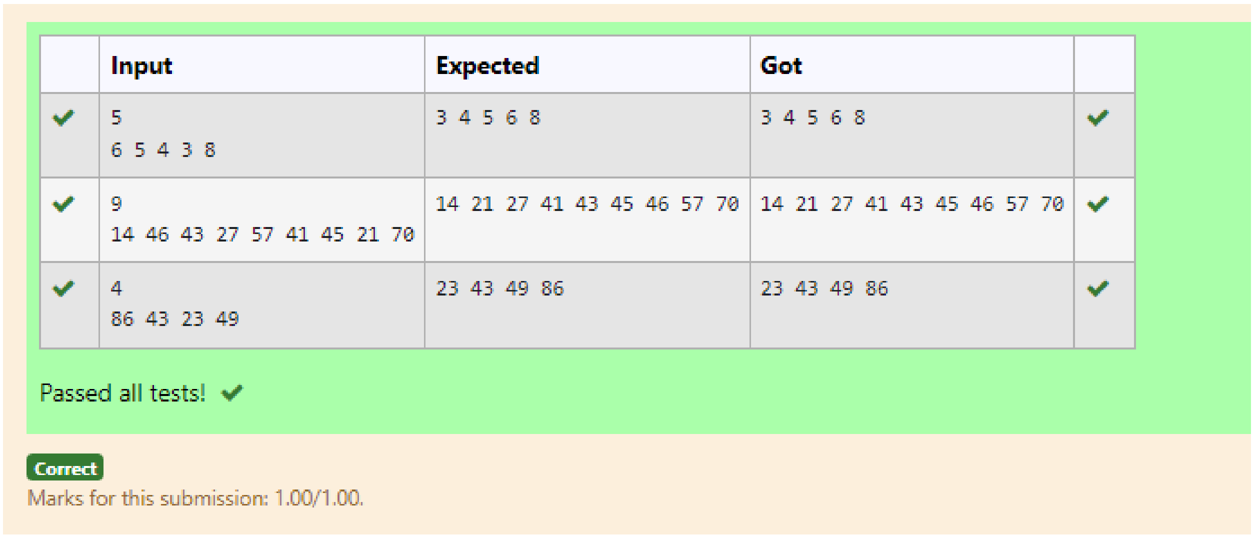
Input	**Result**
5 6 5 4 3 8	3 4 5 6 8

PROGRAM:-

```
def merge(arr):
    if len(arr) > 1:
        mid = len(arr) // 2
        l = arr[:mid]
        r = arr[mid:]
        merge(l)
        merge(r)

        i = j = k = 0

        while i < len(l) and j < len(r):
            if l[i] < r[j]:
                arr[k] = l[i]
                i+=1

            else:
                arr[k] = r[j]
                j+=1
            k+=1

        while i < len(l):
```

```
        arr[k] = l[i]

        i+=1

        k+=1


    while j < len(r):

        arr[k] = r[j]

        j+=1

        k+=1





n = int(input())

arr = list(map(int, input().split()))

merge(arr)

print(*arr)
```

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 57 70	✓
✓	4 86 43 23 49	23 43 49 86	23 43 49 86	✓

Passed all tests! ✓

Correct

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Ex. No. :	**10.2**	**Date: 5-6-24**
Register No.:	**231501140**	**Name: Sai Senthil .M**

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

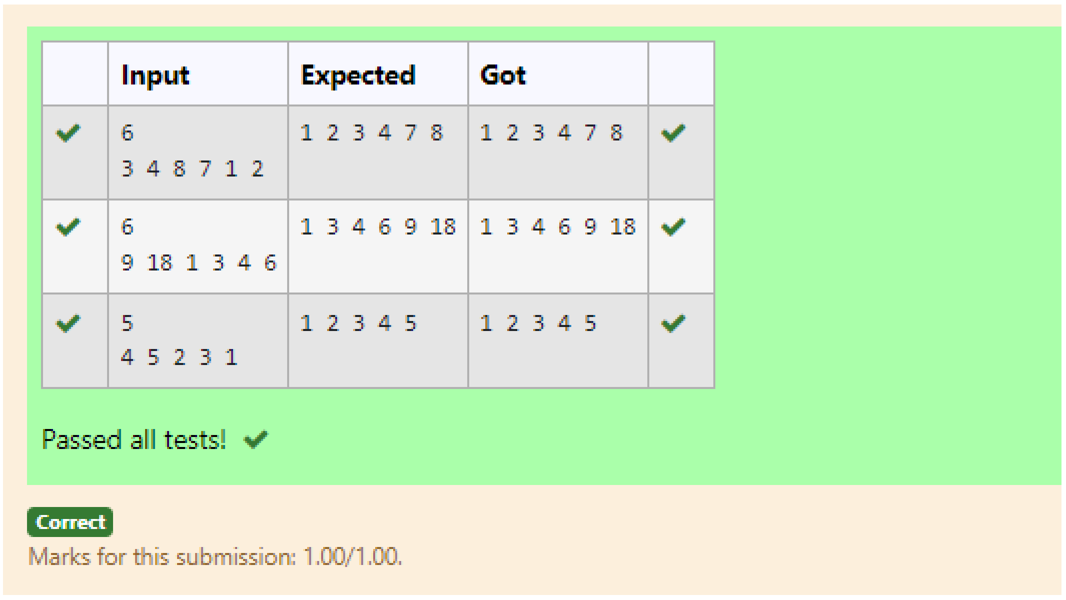
For example:

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:-

```
n = int(input())

arr = list(map(int, input().split()))


for i in range(n):

    swapped = False

    for j in range(0, n-i-1):

        if arr[j] > arr[j+1]:

            arr[j], arr[j+1] = arr[j+1], arr[j]

            swapped = True

    if not swapped:

        break

print(*arr)
```

OUTPUT:-



	Input	Expected	Got	
✓	6 3 4 8 7 1 2	1 2 3 4 7 8	1 2 3 4 7 8	✓
✓	6 9 18 1 3 4 6	1 3 4 6 9 18	1 3 4 6 9 18	✓
✓	5 4 5 2 3 1	1 2 3 4 5	1 2 3 4 5	✓

Passed all tests! ✓

Correct

Marks for this submission: 1.00/1.00.

Ex. No.	**:**	**10.3**	**Date: 5-6-24**
Register No.:		**231501140**	**Name: Sai Senthil .M**

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

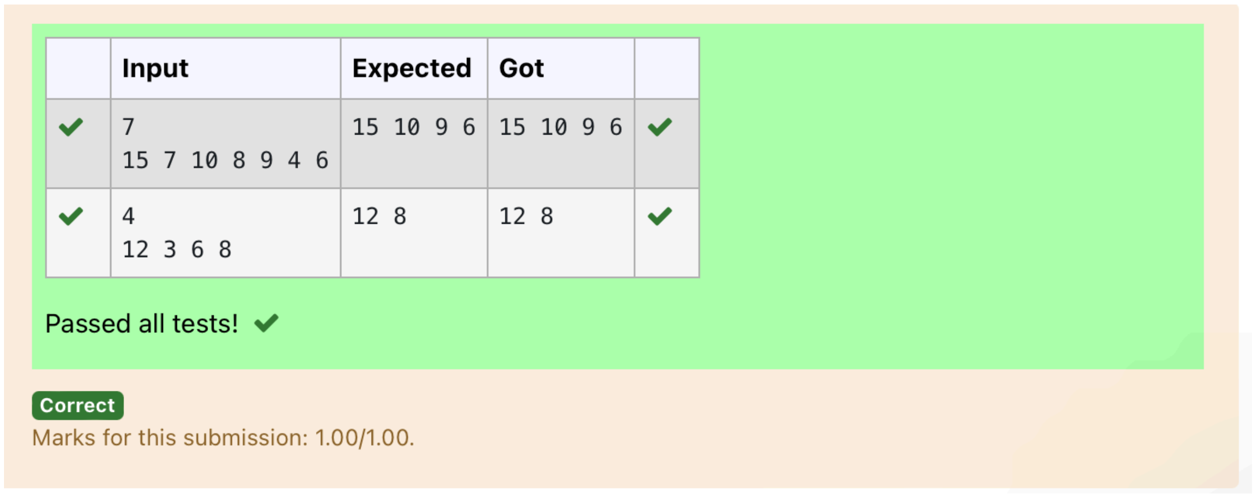
10 6

For example:

Input	Result
4 12 3 6 8	12 8

PROGRAM:-

```
def find_peak(arr):
    peak_elements = []
    if arr[0] >= arr[1]:
        peak_elements.append(arr[0])

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

    if arr[-1] >= arr[-2]:
        peak_elements.append(arr[-1])

    return peak_elements

n = int(input())

arr = list(map(int, input().split()))

peak_elements = find_peak(arr)
print(*peak_elements)
```



	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! ✓

Correct

Marks for this submission: 1.00/1.00.

Ex. No. : 10.4 **Date: 5-6-24**

Register No.: 231501140 **Name: Sai Senthil .M**

Binary Search

Write a Python program for binary search.

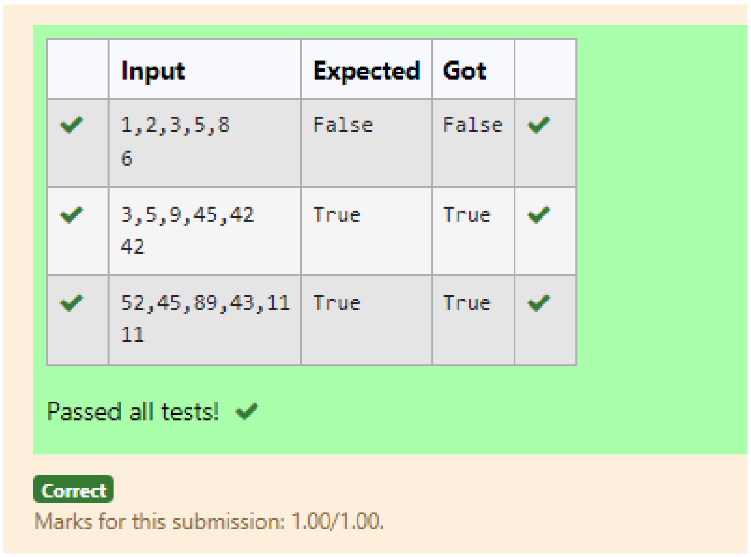
For example:

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

PROGRAM:-

```
def binary(lst,x):
    lst.sort()
    l, r = 0, len(lst)-1
    while l <= r:
        m = (l+r) // 2
        if lst[m] == x:
            return True
        elif lst[m] < x:
            l = m + 1
        else:
            r = m - 1
    return False
num = list(map(int, input().split(',')))
t = int(input())
result = binary(num,t)
print(result)
```

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! ✓

Correct

Marks for this submission: 1.00/1.00.

Ex. No. : 10.5 **Date: 5-6-24**

Register No.: 231501140 **Name: Sai Senthil .M**

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:

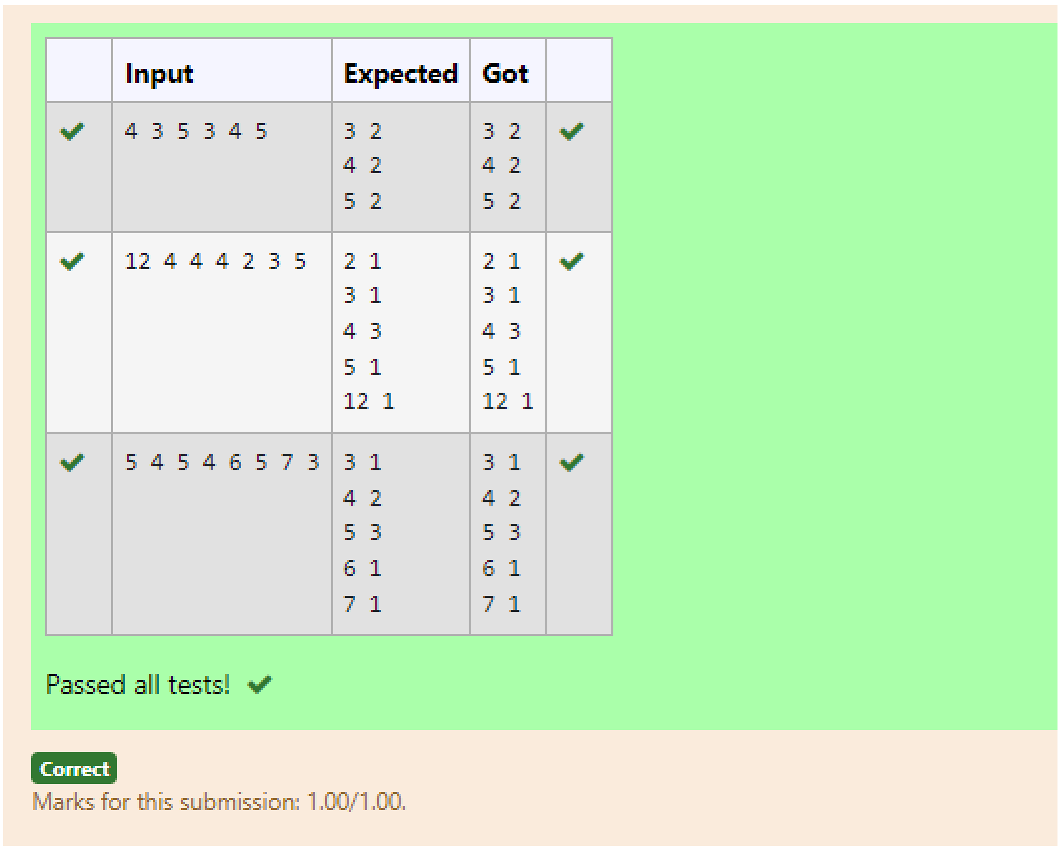
Input	Result

4 3 5 3 4 5	3 2
	4 2
	5 2

PROGRAM:-

```
l = list(map(int, input().split()))
f = {}


for i in l:
    f[i] = f.get(i, 0)+1
s = sorted(f.items())
for i,j in s:
    print(i, j)
```

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! ✓

Correct

Marks for this submission: 1.00/1.00.