10 - Searching & Sorting

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

Register No.: 231801140 **Name: ROSHINI R**

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

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Ex. No. : 10.2 **Date: 5/6/24**

Register No.: 231801140 **Name: ROSHINI R**

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! ✔

Correct

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Ex. No. : 10.3 **Date: 5/6/24**

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

Register No.: 231801140 **Name: ROSHINI R**

Binary Search

Write a Python program for binary search.

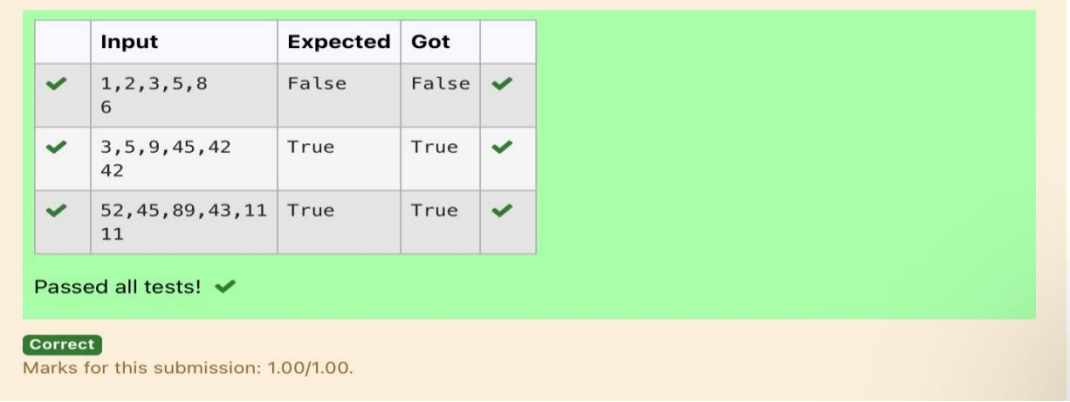
For example:

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: 5/6/24**

Register No.: 231801140 **Name: ROSHINI R**

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! ✔

Correct

Marks for this submission: 1.00/1.00.