

10 - Searching & Sorting

For example:

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

Ex. No. : 10.1

Date: 09.06.2024

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Merge Sort

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

```
x=int(input())  
y=[int(i) for i in input().split()]  
y.sort()  
for j in y:  
    print(j,end=" ")
```


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

- $2 \leq n \leq 600$
- $1 \leq a[i] \leq 2 \times 10^6$.

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

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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 bu(arr):

    n = len(arr)

    nu= 0

    for i in range(n):

        for j in range(n - 1):

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

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

                nu+= 1

        return nu

n = int(input(""))

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

nu= bu(arr)

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

```
print(f'First Element: {arr[0]}')
```

```
print(f'Last Element: {arr[-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

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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

$A[i-1] \leq A[i] \geq A[i+1]$ for middle elements. $[0 < i < n-1]$

$A[i-1] \leq A[i]$ for last element $[i=n-1]$

$A[i] \geq A[i+1]$ for first element $[i=0]$

```
n = int(input(""))
```

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

```
p = []
```

```
if n > 1 and arr[0] >= arr[1]:
```

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

```
for i in range(1, n - 1):
```

```
    if arr[i - 1] <= arr[i] >= arr[i + 1]:
```

```
        p.append(arr[i])
```

```
if n > 1 and arr[-1] >= arr[-2]:
```

```
    p.append(arr[-1])
```

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

For example:

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

Ex. No. : 10.4

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Binary Search

Write a Python program for binary search.

```
a=input()
b=[int(num) for num in a.split(",")]
c=int(input())
if c not in b:
    print("False")
else:
    print("True")
```


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

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Frequency of Elements

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

Constraints:

$1 \leq n$, $\text{arr}[i] \leq 100$

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

```
frequency = {}
```

```
for num in arr:
```

```
    frequency[num] = frequency.get(num, 0) + 1
```

```
sort = sorted(frequency.items())
```

```
for num, freq in sort:
```

```
    print(num, freq)
```