**10 - Searching & Sorting**

**Ex. No. : 10.1**

**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 |

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=" ")

**Ex. No. : 10.2**

**Bubble Sort**

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

1.      [List](http://118.185.187.137/moodle/mod/resource/view.php?id=1068) 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](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).

3.      Last Element: lastElement, the *last* element in the sorted [list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).

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](http://118.185.187.137/moodle/mod/resource/view.php?id=1068) a .  
The second line contains  n,  space-separated integers a[i].

**Constraints**

·         2<=n<=600

·         1<=a[i]<=2x106.

**Output Format**

You must print the following three lines of output:

1.      [List](http://118.185.187.137/moodle/mod/resource/view.php?id=1068) 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](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).

3.      Last Element: lastElement, the *last* element in the sorted [list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).

**Sample Input 0**

3

1 2 3

**Sample Output 0**

[List](http://118.185.187.137/moodle/mod/resource/view.php?id=1068) 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 |

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])

**Ex. No. : 10.3**

**Peak Element**

Given an [list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068), 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 |

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)

**Ex. No. : 10.4**

**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 |

a = input().split(",")

b = input()

print(b in a)

**Ex. No. : 10.5**

**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 |

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)