WEEK 10

### Question 1

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]<=2x106.

**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)

num\_swaps = 0

for i in range(n):

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

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

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

num\_swaps += 1

return num\_swaps

n = int(input())

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

num\_swaps = bubble\_sort(arr)

print("List is sorted in", num\_swaps, "swaps.")

print("First Element:", arr[0])

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!

### Question 2

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 |

def merge\_sort(arr):

if len(arr) > 1:

mid = len(arr) // 2

left\_half = arr[:mid]

right\_half = arr[mid:]

merge\_sort(left\_half)

merge\_sort(right\_half)

i = j = k = 0

while i < len(left\_half) and j < len(right\_half):

if left\_half[i] < right\_half[j]:

arr[k] = left\_half[i]

i += 1

else:

arr[k] = right\_half[j]

j += 1

k += 1

while i < len(left\_half):

arr[k] = left\_half[i]

i += 1

k += 1

while j < len(right\_half):

arr[k] = right\_half[j]

j += 1

k += 1

def print\_list(arr):

for num in arr:

print(num, end=" ")

n = int(input())

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

merge\_sort(arr)

print\_list(arr)

#### Feedback

|  | **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!

### Question 3

Bubble Sort is the simplest sorting algorithm that works by repeatedly swapping the adjacent elements if they are in wrong order. You read an list of numbers. You need to arrange the elements in ascending order and print the result. The sorting should be done using bubble sort.

Input Format: The first line reads the number of elements in the array. The second line reads the array elements one by one.

Output Format: The output should be a sorted list.

**For example:**

| **Input** | **Result** |
| --- | --- |
| 6  3 4 8 7 1 2 | 1 2 3 4 7 8 |
| 5  4 5 2 3 1 | 1 2 3 4 5 |

def bubble\_sort(arr):

n = len(arr)

for i in range(n):

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

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

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

n = int(input())

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

bubble\_sort(arr)

print(" ".**join**(map(str, 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!

### Question 4

An list contains N numbers and you want to determine whether two of the numbers sum to a given number K. For example, if the input is 8, 4, 1, 6 and K is 10, the answer is yes (4 and 6). A number may be used twice.

Input Format

The first line contains a single integer n , the length of list

The second line contains n space-separated integers, list[i].

The third line contains integer k.

Output Format

Print Yes or No.

Sample Input

7

0 1 2 4 6 5 3

1

Sample Output

Yes

**For example:**

| **Input** | **Result** |
| --- | --- |
| 5  8 9 12 15 3  11 | Yes |
| 6  2 9 21 32 43 43 1  4 | No |

PROGRAM:

n = int(input())

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

k = int(input())

arr.**sort**()

i = 0

j = n - 1

while i < j:

if arr[i] + arr[j] == k:

print("Yes")

exit()

elif arr[i] + arr[j] < k:

i += 1

else:

j -= 1

print("No")

#### OUTPUT:

|  | **Input** | **Expected** | **Got** |  |
| --- | --- | --- | --- | --- |
|  | 5  8 9 12 15 3  11 | Yes | Yes |  |
|  | 6  2 9 21 32 43 43 1  4 | No | No |  |
|  | 6  13 42 31 4 8 9  17 | Yes | Yes |  |

Passed all tests!

### Question 5

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:

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

e = {}

for n in arr:

if n in e:

e[n] += 1

else:

e[n] = 1

s = sorted(e.**items**())

for n, e in s:

print(n, e)

#### 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!