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10-Searching&Sorting

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**Ex.No. : 10.1 Date:29/05/2024**

**RegisterNo.: 231401073 Name:Nithin S**

# Merge Sort

WriteaPythonprogramtosortalist ofelementsusingthemergesortalgorithm.

## Forexample:

|  |  |
| --- | --- |
| **Input** | **Result** |
| 5  65438 | 34568 |

**Answer:**

def mergeSort(arr):iflen(arr)>1:

mid =len(arr)//2left\_half= arr[:mid]right\_half=arr[mid:]

mergeSort(left\_half)mergeSort(right\_half)

i=j=k=0

whilei<len(left\_half)andj <len(right\_half):ifleft\_half[i]<right\_half[j]:

arr[k]=left\_half[i]i+=1

else:

arr[k] =right\_half[j]

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j+=1

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k+=1

whilei<len(left\_half):arr[k] =left\_half[i]

i+=1

k+=1

whilej<len(right\_half):arr[k]=right\_half[j]

j+=1

k+=1

n=int(input().strip())

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

mergeSort(arr)print(\*arr)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Input** | **Expected** | **Got** |  |
|  | 5  65438 | 34568 | 34568 |  |
|  | 9  1446432757414521 70 | 142127414345465770 | 142127414345465770 |  |
|  | 4  864323 49 | 234349 86 | 234349 86 |  |

**Ex.No. : 10.2 Date:29/05/2024**

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# BubbleSort

Given anlistofintegers, sort the array in ascending order using the*BubbleSort*algorithmabove.Oncesorted,printthefollowingthreelines:

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 thattookplace.
2. FirstElement:firstElement,the*first*elementinthesorted[list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).
3. LastElement:lastElement,the*last*elementinthesorted[list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).

Forexample,givenaworst-casebutsmallarray to sort: a=[6,4,1]. It took 3 swaps tosortthearray.Outputwouldbe

Arrayissortedin3swaps.FirstElement:1

LastElement:6

## InputFormat

Thefirstlinecontainsaninteger,n,thesizeofthe[list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068)a.Thesecondlinecontainsn,space-separatedintegersa[i].

## Constraints

· 2<=n<=600

· 1<=a[i]<=2x106.

## OutputFormat

Youmustprintthefollowingthreelinesofoutput:

1. [List](http://118.185.187.137/moodle/mod/resource/view.php?id=1068)issortedinnumSwapsswaps.,wherenumSwapsisthenumberofswapsthattookplace.
2. FirstElement:firstElement,the*first*elementinthesorted[list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).
3. LastElement:lastElement,the*last*elementinthesorted[list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068).

## SampleInput0

3

123

## SampleOutput0

[List](http://118.185.187.137/moodle/mod/resource/view.php?id=1068)is sorted in 0 swaps.FirstElement:1

LastElement:3

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## Forexample:

|  |  |
| --- | --- |
| **Input** | **Result** |
| 3  321 | List is sorted in 3 swaps.FirstElement:1  LastElement:3 |
| 5  19284 | List is sorted in 4 swaps.FirstElement:1  LastElement:9 |

**Answer:**

defbubbleSort(arr):n=len(arr)numSwaps=0

foriinrange(n):swapped=False

forjinrange(0,n-i-1):ifarr[j]>arr[j+1]:

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

swapped=True

ifnotswapped:break

print("Listissortedin",numSwaps,"swaps.")print("FirstElement:",arr[0])

print("LastElement:",arr[-1])

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n=int(input().strip())

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Input | Expected | Got |  |  |
|  | 3 | Listis sortedin3 swaps. | Listis sortedin3 swaps. |  |
| 321 | FirstElement:1 | FirstElement:1 |
|  | LastElement:3 | LastElement:3 |
|  | 5 | Listis sortedin4 swaps. | Listis sortedin4 swaps. |  |
| 19284 | FirstElement:1 | FirstElement:1 |
|  | LastElement:9 | LastElement:9 |

**Ex.No. : 10.3 Date:29/05/2024**

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# PeakElement

Givenan[list](http://118.185.187.137/moodle/mod/resource/view.php?id=1068),findpeakelementinit.Apeakelementisanelementthatisgreaterthanitsneighbors.

Anelementa[i]isapeakelementif

A[i-1]<=A[i]>=a[i+1]formiddleelements.[0<i<n-1]A[i-1]<=A[i]forlastelement[i=n-1]

A[i]>=A[i+1]forfirstelement[i=0]

## InputFormat

Thefirstlinecontainsasingleintegern,thelengthofA.Thesecondlinecontainsnspace-separatedintegers,A[i].

## OutputFormat

**Print** peaknumbersseparatedbyspace.

## SampleInput

5

891026

## SampleOutput

106

## Forexample:

|  |  |
| --- | --- |
| **Input** | **Result** |
| 4  12368 | 128 |

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**Answer:**

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deffind\_peaks(nums):peaks=[]

foriinrange(len(nums)):ifi==0:

ifnums[i]>= nums[i+1]:peaks.append(nums[i])

elifi==len(nums)-1:

ifnums[i]>=nums[i-1]:peaks.append(nums[i])

else:

ifnums[i]>=nums[i-1]andnums[i]>=nums[i+1]:peaks.append(nums[i])

returnpeaks

n=int(input())

nums=list(map(int,input().split()))peaks=find\_peaks(nums)

print(' '.join(map(str,peaks)))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Input** | **Expected** | **Got** |  |
|  | 7  157108946 | 151096 | 151096 |  |
|  | 4  12368 | 128 | 128 |  |

**Ex.No. : 10.4 Date:29/05/2024**

**RegisterNo.: 231401073 Name:Nithin S**

# BinarySearch

WriteaPythonprogramforbinarysearch.

## Forexample:

|  |  |
| --- | --- |
| **Input** | **Result** |
| 12358  6 | False |
| 3594542  42 | True |

**Answer:**

defbinary\_search(arr,target):left,right= 0,len(arr)-1whileleft<=right:

mid = (left +right) //2ifarr[mid]==target:

returnTrue

elifarr[mid]<target:left=mid+1

else:

right = mid - 1returnFalse

arr\_input=input()target\_input=input()

arr=list(map(int,arr\_input.split(',')))target=int(target\_input)

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arr.sort()

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result=binary\_search(arr,target)print(result)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **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 |  |

**Ex.No. : 10.5 Date:29/05/2024**

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# FrequencyofElements

Tofindthefrequencyofnumbersinalistanddisplayinsortedorder.

**Constraints:**1<=n,arr[i]<=100**Input:**

1687949068145

## output:

12

42

51

682

791

901

## Forexample:

|  |  |
| --- | --- |
| **Input** | **Result** |
| 435345 | 32  42  52 |

**Answer:**

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deffrequencySorted(arr):freq\_dict={}

fornum inarr:

ifnuminfreq\_dict:freq\_dict[num]+=1

else:

freq\_dict[num]=1

sorted\_freq=sorted(freq\_dict.items())forkey,valueinsorted\_freq:

print(key,value)

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Input** | **Expected** | **Got** |  |
|  | 435345 | 32  42  52 | 32  42  52 |  |
|  | 12444235 | 21  31  43  51  121 | 21  31  43  51  121 |  |
|  | 54546573 | 31  42  53  61  71 | 31  42  53  61  71 |  |