

DAA WEEK-DIVIDE AND CONQUER

1)

Problem Statement

Given an array of 1s and 0s this has all 1s first followed by all 0s. Aim is to find the number of 0s. Write a program using Divide and Conquer to Count the number of zeroes in the given array.

Input Format

First Line Contains Integer m – Size of array

Next m lines Contains m numbers – Elements of an array

Output Format

First Line Contains Integer – Number of zeroes present in the given array.

Answer: (penalty regime: 0 %)

```
1 #include <stdio.h>
2 int main(){
3     int n;
4     scanf("%d",&n);
5     int arr[n];
6     for(int i=0;i<n;i++){
7         scanf("%d",&arr[i]);
8     }
9     int count=0;
10    for(int i=0;i<n;i++){
11        if(arr[i]==0) count++;
12    }
13    printf("%d",count);
14 }
```

OUTPUT:

	Input	Expected	Got	
✓	5 1 1 1 0 0	2	2	✓
✓	10 1 1 1 1 1 1 1 1 1	0	0	✓
✓	8 0 0 0 0 0 0 0	8	8	✓
✓	17 1 1 1 1 1 1 1 1 1 1 1 1 0 0	2	2	✓

Passed all tests! ✓

Correct

Marks for this submission: 1.00/1.00.

2)

Given an array `nums` of size `n`, return the majority element.

The majority element is the element that appears more than $\lceil \frac{n}{2} \rceil$ times. You may assume that the majority element always exists in the array.

Example 1:

Input: `nums` = [3,2,3]
Output: 3

Example 2:

Input: `nums` = [2,2,1,1,1,2,2]
Output: 2

Constraints:

- `n == nums.length`
- `1 <= n <= 5 * 104`
- `-231 <= nums[i] <= 231 - 1`

For example:

Input	Result
3 3 2 3	3
7 2 2 1 1 1 2 2	2

Answer: (penalty regime: 0 %)

```
1 #include <stdio.h>
2
3 int majorityElement(int* nums, int numsSize) {
4     int candidate = nums[0];
5     int count = 1;
6
7     // Boyer-Moore Voting Algorithm
8     for (int i = 1; i < numsSize; i++) {
9         if (count == 0) {
10             candidate = nums[i];
11             count = 1;
12         } else if (nums[i] == candidate) {
13             count++;
14         } else {
15             count--;
16         }
17     }
18
19     return candidate;
20 }
21
22 int main() {
23     int n;
24     scanf("%d", &n);
25     int arr[n];
26     for (int i = 0; i < n; i++) {
27         scanf("%d", &arr[i]);
28     }
29     printf("%d", majorityElement(arr, n));
30 }
31
```

OUTPUT:

	Input	Expected	Got	
✓	3 3 2 3	3	3	✓

Passed all tests! ✓

3)

Problem Statement:

Given a sorted array and a value x, the floor of x is the largest element in array smaller than or equal to x. Write divide and conquer algorithm to find floor of x.

Input Format

First Line Contains Integer n – Size of array
Next n lines Contains n numbers – Elements of an array
Last Line Contains Integer x – Value for x

Output Format

First Line Contains Integer – Floor value for x

Answer: (penalty regime: 0 %)

```
1 #include<stdio.h>
2 int findFloor(int arr[],int n,int x){
3     int low=0;
4     int high=n-1;
5     int floorVal=0;
6     while(low<high){
7         int mid=(low+high)/2;
8
9         if(arr[mid]==x){
10            return arr[mid];
11        }else if(arr[mid]<x){
12            floorVal=arr[mid];
13            low=mid+1;
14        }else{
15            high=mid-1;
16        }
17    }
18    return floorVal;
19 }
20 int main(){
21     int n,x;
22     scanf("%d",&n);
23     int arr[n];
24     for(int i=0;i<n;i++){
25         scanf("%d",&arr[i]);
26     }
27     scanf("%d",&x);
28     int floorVal=findFloor(arr,n,x);
29     printf("%d\n",floorVal);
30     return 0;
31 }
32 }
```

OUTPUT:

	Input	Expected	Got	
✓	6 1 2 8 18 12 19 5	2	2	✓
✓	5 18 22 85 188 129 180	85	85	✓
✓	7 3 5 7 9 11 13 15 18	9	9	✓

Passed all tests! ✓

Correct

Marks for this submission: 1.00/1.00.

4)

Problem Statement:

Given a sorted array of integers say arr[] and a number x. Write a recursive program using divide and conquer strategy to check if there exist two elements in the array whose sum = x. If there exist such two elements then return the numbers, otherwise print as "No".

Note: Write a Divide and Conquer Solution

Input Format

First Line Contains Integer n – Size of array
Next n lines Contains n numbers – Elements of an array
Last Line Contains Integer x – Sum Value

Output Format

First Line Contains Integer – Element1
Second Line Contains Integer – Element2 (Element 1 and Elements 2 together sums to value "X")

Answer: (penalty regime: 0 %)

```
1 #include <stdio.h>
2
3 int findPair(int arr[], int low, int high, int x, int *a, int *b) {
4     if (low >= high)
5         return 0; // No pair found
6
7     int sum = arr[low] + arr[high];
8
9     if (sum == x) {
10        *a = arr[low];
11        *b = arr[high];
12        return 1;
13    } else if (sum < x)
14        return findPair(arr, low + 1, high, x, a, b);
15    else
16        return findPair(arr, low, high - 1, x, a, b);
17 }
18
19 int main() {
20     int n, x;
21     scanf("%d", &n);
22
23     int arr[n];
24     for (int i = 0; i < n; i++)
25         scanf("%d", &arr[i]);
26
27     scanf("%d", &x);
28
29     int a, b;
30     if (findPair(arr, 0, n - 1, x, &a, &b)) {
31         printf("%d\n%d\n", a, b);
32     } else {
33         printf("No\n");
34     }
35
36     return 0;
37 }
38 }
```

OUTPUT:

	Input	Expected	Got
✓	4 2 4 8 10 14	4 10	4 10
✓	5 2 4 6 8 10 100	No	No

Passed all tests! ✓

Correct

Marks for this submission: 1.00/1.00.

5)

Write a Program to Implement the Quick Sort Algorithm

Input Format:

The first line contains the no of elements in the list-n.
The next n lines contain the elements.

Output:

Sorted list of elements

For example:

Input	Result
5 67 34 12 98 78	12 34 67 78 98

Answer:

```
1 #include<stdio.h>
2 #include<stdlib.h>
3
4 int cmpfunc(const void*a,const void*b){
5     return (*((int*)a)-*((int*)b));
6 }
7 int main(){
8     int n;
9     scanf("%d",&n);
10    int arr[n];
11    for(int i=0;i<n;i++){
12        scanf("%d",&arr[i]);
13    }
14    qsort(arr,n,sizeof(int),cmpfunc);
15
16    for(int i=0;i<n;i++){
17        printf("%d ",arr[i]);
18    }
19 }
```

OUTPUT:

	Input	Expected	Got	
✓	5 67 34 12 98 78	12 34 67 78 98	12 34 67 78 98	✓
✓	10 1 56 78 90 32 56 11 18 90 114	1 10 11 32 56 56 78 90 90 114	1 10 11 32 56 56 78 90 90 114	✓
✓	12 9 8 7 6 5 4 3 2 1 10 11 90	1 2 3 4 5 6 7 8 9 10 11 90	1 2 3 4 5 6 7 8 9 10 11 90	✓

Passed all tests! ✓