RAJALAKSHMI ENGINEERING COLLEGE

RAJALAKSHMI NAGAR, THANDALAM – 602 105

RAJALAKSHMI
ENGINEERING COLLEGE

CS23331
DESIGN AND ANALYSIS OF ALGORITHM LAB

Laboratory Observation Note Book

Name : Ishana Sabrish

Year / Branch / Section : 2nd Year/ AIML / A

Register No. : 231501063

Semester : 3rd Semester

Academic Year : 2024-2025

WEEK 03

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

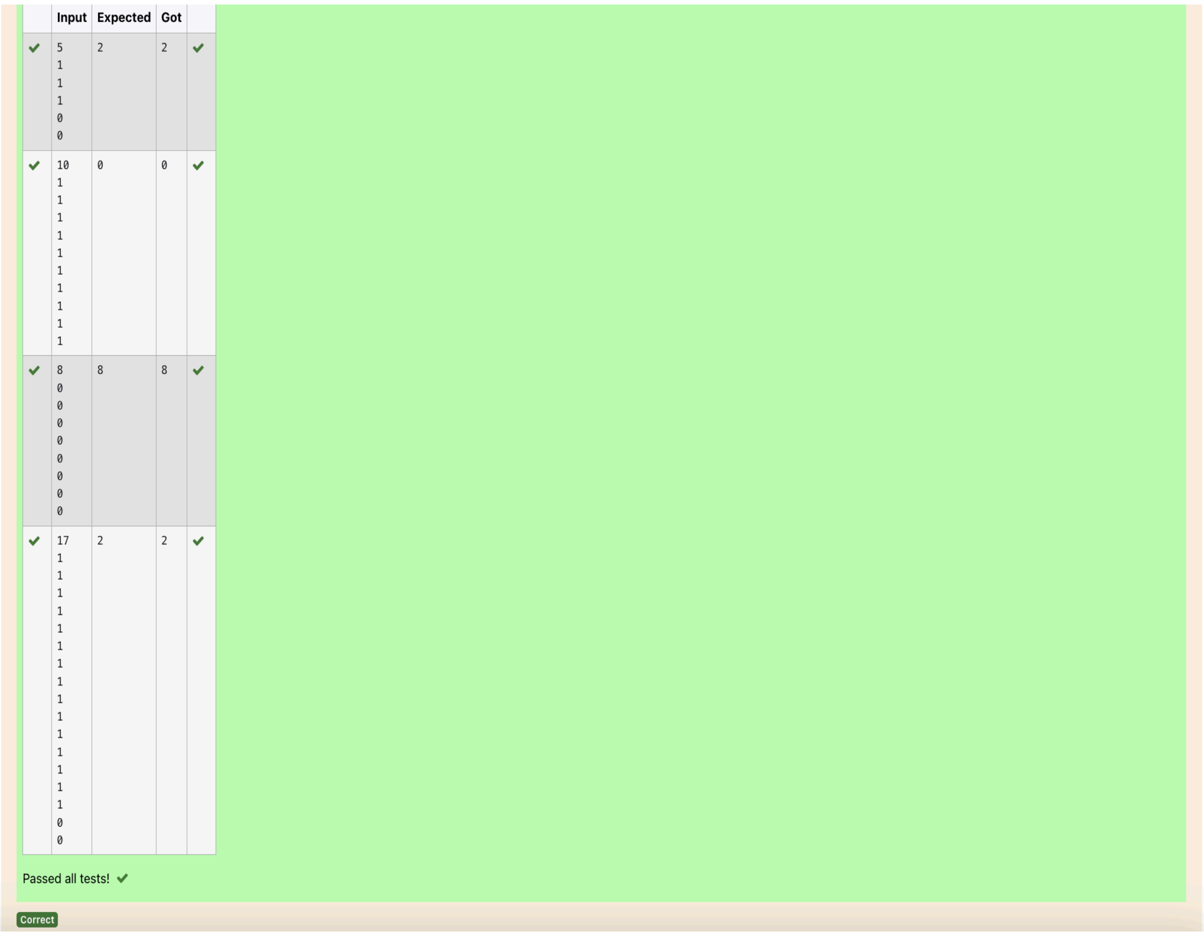
Output Format:

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

CODE:

```
#include<stdio.h>

int conquer(int a[],int start,int end){

   int mid=(start+end)/2;

   if(start==end && a[start]==0){

      return 1;

   }

   if(start==end && a[start]!=0){

      return 0;

   }

   return(conquer(a,start,mid)+conquer(a,mid+1,end));

}

int main(){
    int n,i;
    scanf("%d",&n);
    int a[n];
    for(i=0;i<n;i++){
        scanf("%d",&a[i]);
    }
    int start=0,end=n-1;
    printf("%d",conquer(a,start,end));
}
```

<u>OUTPUT:</u>



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

Passed all tests! ✓

2) Given an array nums of size n, return *the majority element*.

The majority element is the element that appears more than $\lfloor n / 2 \rfloor$ 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 * 10^4**
- **-2^{31} <= nums[i] <= 2^{31} – 1**

For example:

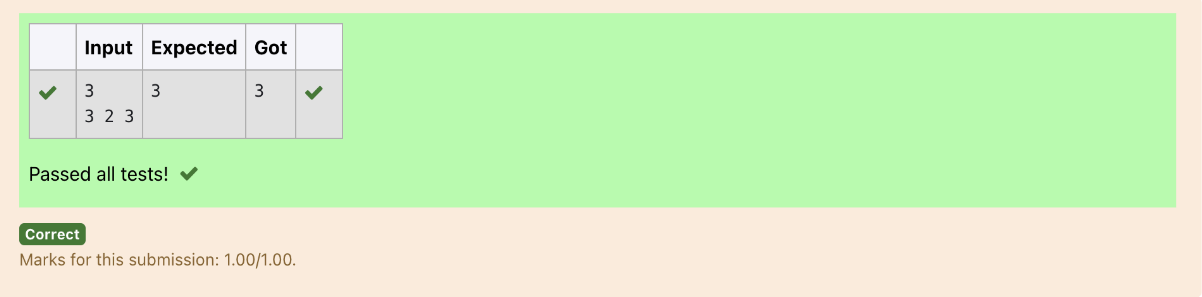
Input	Result
3 3 2 3	3
7 2 2 1 1 1 2 2	2

CODE:

```
#include<stdio.h>
```

```
int main(){
    int n;
    scanf("%d",&n);
    int a[n];
    for(int i=0;i<n;i++){
        scanf("%d",&a[i]);
    }
    for(int i=0;i<n;i++){
        int count=0;
        for(int j=0;j<n;j++){
            if(a[i]==a[j]){
                count++;
            }
        }
        if(count>n/2){
            printf("%d",a[i]);
            break;
        }
    }
}
```

OUTPUT:



	Input	Expected	Got	
✓	3 3 2 3	3	3	✓

Passed all tests! ✓

Correct

Marks for this submission: 1.00/1.00.

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:

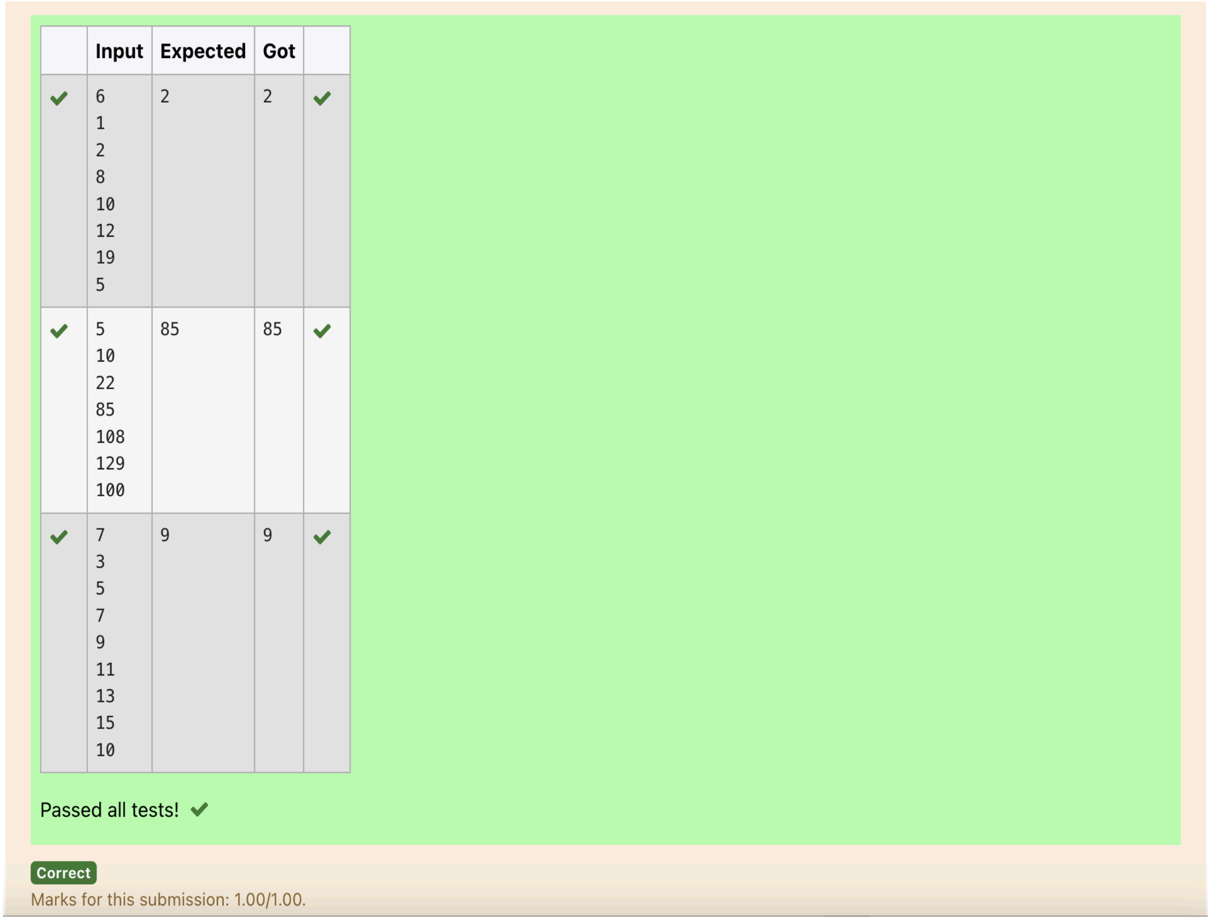
First Line Contains Integer – Floor value for x

<u>CODE:</u>

```
#include<stdio.h>

int main(){

   int n,x,flr,i;

   scanf("%d",&n);

   int a[n];

   for(i=0;i<n;i++)

      scanf("%d",&a[i]);

   scanf("%d",&x);
```

```
    int mid=n/2;
    if(x<a[mid])
    {
        flr=a[0];
        for(i=0;i<mid;i++)
        {
            if(a[i]>=flr)
                if(a[i]<x)
                    flr=a[i];
        }
    }
    else
    {
        flr=a[mid];
        for(i=mid;i<n;i++)
        {
            if(a[i]>=flr)
                if(a[i]<x)
                    flr=a[i];
        }
    }
    printf("%d",flr);
}
```

OUTPUT:



	Input	Expected	Got	
✓	6 1 2 8 10 12 19 5	2	2	✓
✓	5 10 22 85 108 129 100	85	85	✓
✓	7 3 5 7 9 11 13 15 10	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

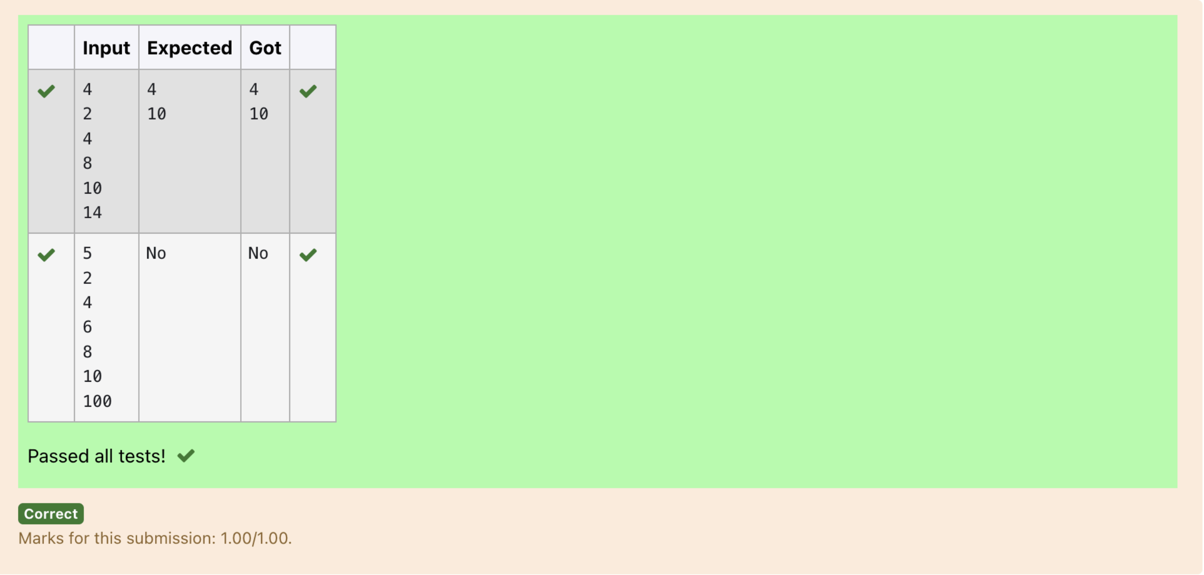
Second Line Contains Integer – Element2 (Element 1 and Elements 2 together sums to value “x”).

CODE:

```
#include<stdio.h>

int main()

{

   int n,i,j,m,p,q,x;

   scanf("%d",&n);

   int a[n];
```

```
    for(i=0;i<n;i++)
        scanf("%d",&a[i]);
    scanf("%d",&x);
    for(i=0;i<n;i++)
    {
        for(j=i+1;j<n;j++){
            if((a[i]+a[j])==x){
                q=a[i]+a[j];
                m=a[i];
                p=a[j];
            }
        }
    }
    if(q==x) {
        printf("%d\n",m);
        printf("%d",p);
    }
    else
        printf("No");
}
```

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:

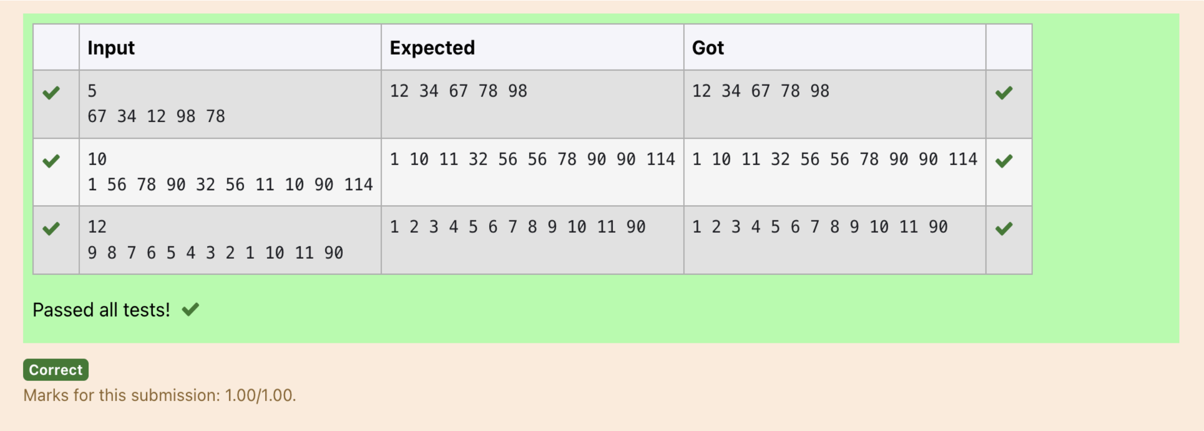
Input	Result
5 67 34 12 98 78	12 34 67 78 98

CODE:

```
#include<stdio.h>
int main()
```

```
{
    int n,i,j,temp;
    scanf("%d",&n);
    int a[n];
    for(i=0;i<n;i++)
    {
        scanf("%d",&a[i]);
    }
    int x;
    scanf("%d",&x);
    for(i=0;i<n;i++)
    {
        for(j=i+1;j<n;j++)
        {
            if(a[i]>a[j])
            {
                temp=a[i];
                a[i]=a[j];
                a[j]=temp;
            }
        }
    }
     for(i=0;i<n;i++)
         printf("%d ",a[i]);
}
```

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 10 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! ✓

Correct

Marks for this submission: 1.00/1.00.