RAJALAKSHMI ENGINEERING COLLEGE
RAJALAKSHMI NAGAR, THANDALAM – 602 105

RAJALAKSHMI
ENGINEERING COLLEGE

CS23331

DESIGN AND ANALYSIS OF ALGORITHM LAB

Laboratory Observation Note Book

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WEEK 03

DIVIDE AND CONQUER

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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:

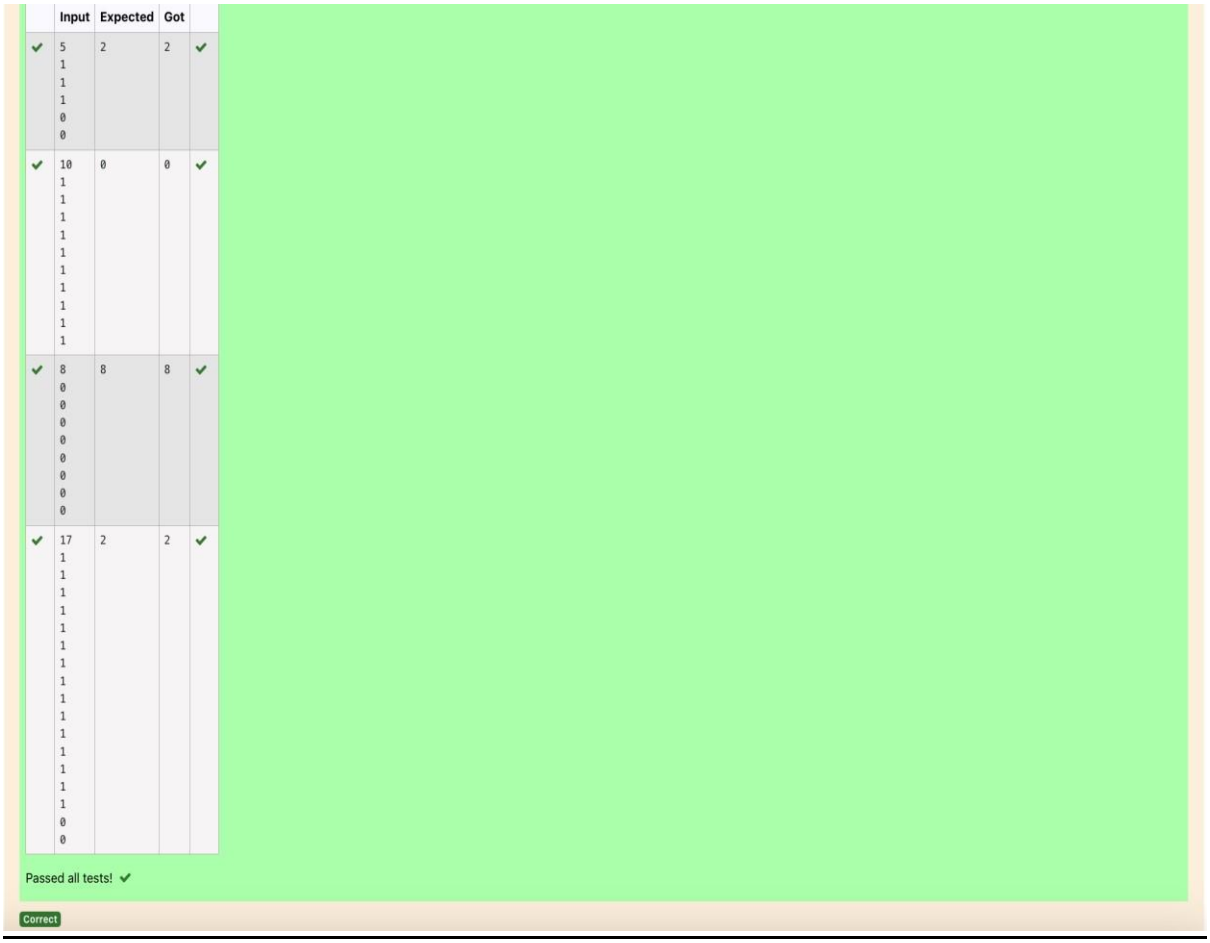
First Line Contains Integer – Number of zeroes present in the given array.

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));
}
```

OUTPUT:



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

The majority element is the element that appears more than ⌊n / 2⌋ 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:**

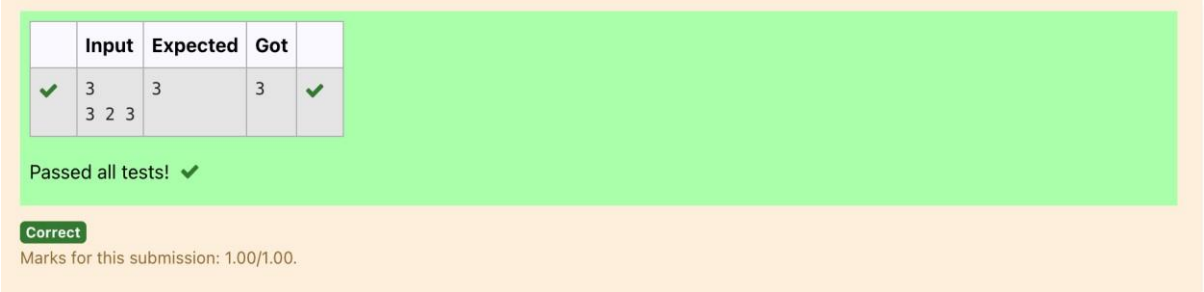
Input	Result
3 3 2 3	3
7 2 2 1 1 1 2 2	2

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:



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

CODE:

```
#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);
}
```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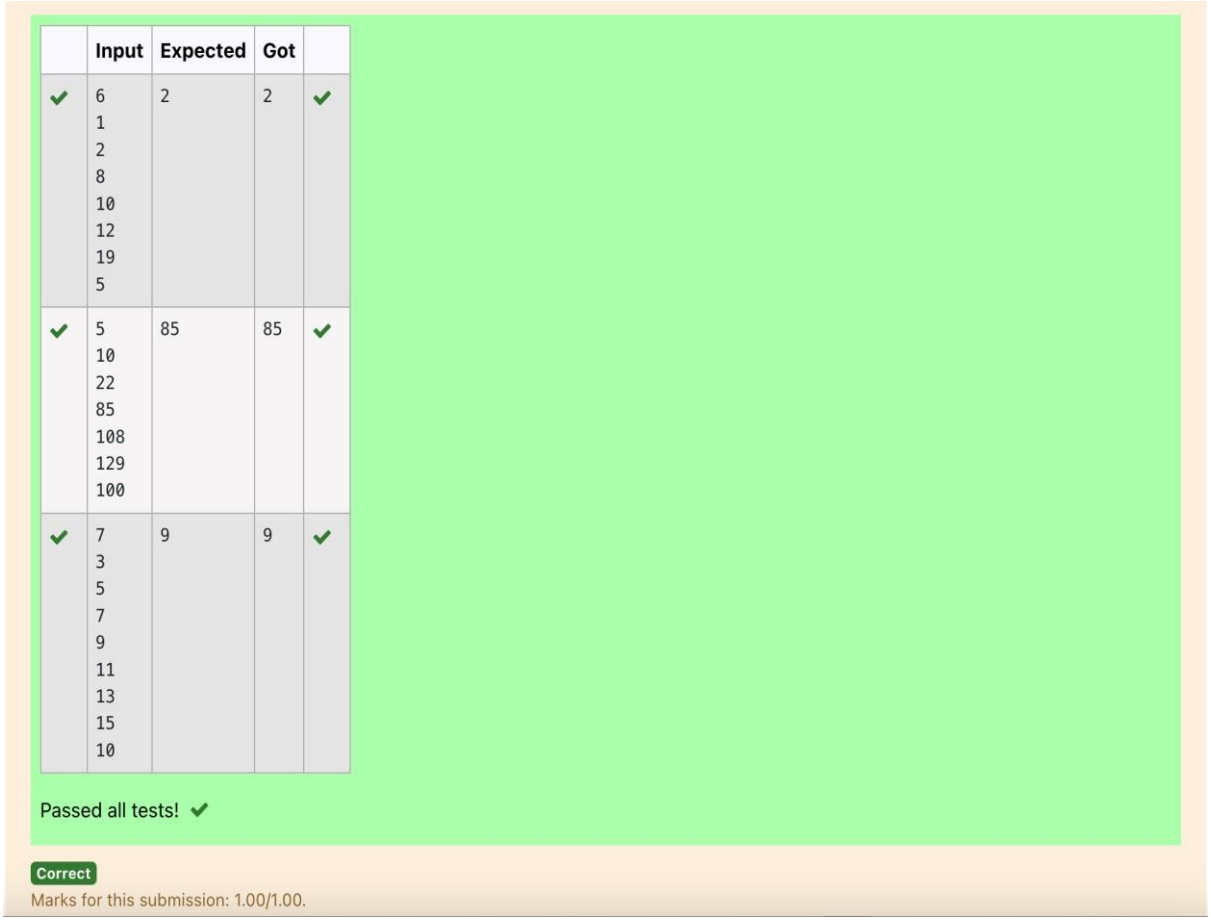
OUTPUT:



	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

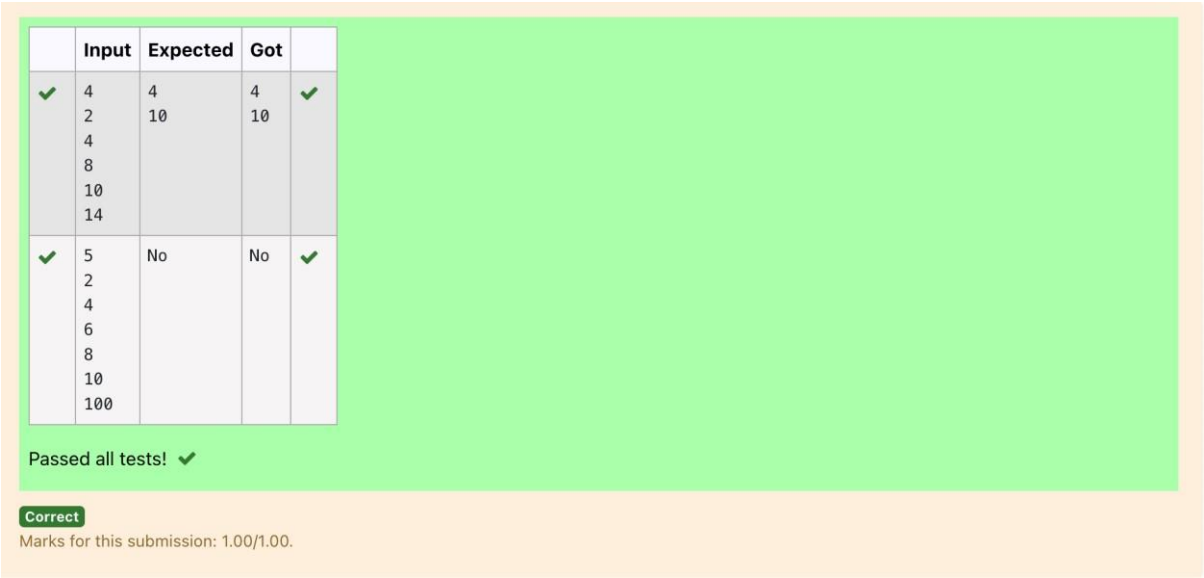
Second Line Contains Integer – Element2 (Element 1 and Elements 2 together sums to value "x").

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.