

# 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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Year / Branch / Section : 2<sup>nd</sup> Year / AIML / A .....

Register No. : . . . 23150159 .....

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**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));
}

```

### **OUTPUT:**

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

Passed all tests! ✓

Correct

**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:**

- $n == \text{nums.length}$
- $1 \leq n \leq 5 * 10^4$
- $-2^{31} \leq \text{nums}[i] \leq 2^{31} - 1$

**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

#### 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);
}
```



## 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.