

# RAJALAKSHMI ENGINEERING COLLEGE

RAJALAKSHMI NAGAR, THANDALAM – 602 105



**RAJALAKSHMI**  
**ENGINEERING COLLEGE**

**CS23331**

**DESIGN AND ANALYSIS OF ALGORITHM LAB**

**Laboratory Observation Note Book**

Name : ..... MONISH S .....

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

Register No. : . . . . .

Semester : ..... 3<sup>rd</sup> 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));
}

```

### OUTPUT:

|   | Input  | Expected | Got |   |
|---|--|----------|-----|---|
| ✓ | 5<br>1<br>1<br>1<br>1<br>0<br>0<br>0   | 2        | 2   | ✓ |
| ✓ | 10<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1                                    | 0        | 0   | ✓ |
| ✓ | 8<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0  | 8        | 8   | ✓ |
| ✓ | 17<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>0<br>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 == nums.length`
- `1 <= n <= 5 * 104`
- `-231 <= nums[i] <= 231 - 1`

**For example:**

| Input              | Result |
|--------------------|--------|
| 3<br>3 2 3         | 3      |
| 7<br>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<br>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<br>1<br>2<br>8<br>10<br>12<br>19<br>5       | 2        | 2   | ✓ |
| ✓ | 5<br>10<br>22<br>85<br>108<br>129<br>100      | 85       | 85  | ✓ |
| ✓ | 7<br>3<br>5<br>7<br>9<br>11<br>13<br>15<br>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<br>2<br>4<br>8<br>10<br>14       | 4<br>10  | 4<br>10 | ✓ |
| ✓ | 5<br>2<br>4<br>6<br>8<br>10<br>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              | 12 34 67 78 98 |
| 67 34 12 98 78 |                |

### 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<br>67 34 12 98 78                 | 12 34 67 78 98                | 12 34 67 78 98                | ✓ |
| ✓ | 10<br>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<br>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.