**RAJALAKSHMI ENGINEERING COLLEGE**

**RAJALAKSHMI NAGAR, THANDALAM – 602 105**

A logo for a college

Description automatically generated

|  |
| --- |
| **CS23331**  **DESIGN AND ANALYSIS OF ALGORITHM LAB** |
| **Laboratory Observation Note Book** |

A white paper with black dots and blue lines

Description automatically generated with medium confidence

2024-2025

3rd Semester

231501086

LOKESH C

2nd Year/ AIML / B

**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:**

**A screenshot of a computer

Description automatically generated**

**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 \* 104**
* **-231 <= nums[i] <= 231 – 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:**

**A green and white rectangle

Description automatically generated**

**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:**

**A screenshot of a computer

Description automatically generated**

**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:**

**A screenshot of a computer

Description automatically generated**

**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:**

**A screenshot of a computer

Description automatically generated**