DIVIDE AND CONQUER

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.

Answer: (penalty regime: 0 %)

```c
#include <stdio.h>

int countZeroes(int arr[], int m) {
    int left = 0, right = m - 1;
    int result = -1;
    while (left <= right) {
        int mid = left + (right - left) / 2;
        if (arr[mid] == 0) {
            result = mid;
            right = mid - 1;
        } else {
            left = mid + 1;
        }
    }
    if (result == -1) {
        return 0;
    }
    return m - result;
}

int main() {
    int m;
    scanf("%d", &m);
    int arr[m];
    for (int i = 0; i < m; i++) {
        scanf("%d", &arr[i]);
    }
    int result = countZeroes(arr, m);
    printf("%d\n", result);
    return 0;
}
```

	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 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! ✔

Correct

Marks for this submission: 1.00/1.00.

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

Answer: (penalty regime: 0 %)

```c
#include<stdio.h>

int largest(int nums[], int low, int high) {
    if (low == high) {
        return nums[low];
    }
    int mid = low + (high - low) / 2;
    int left_major = largest(nums, low, mid);
    int right_major = largest(nums, mid + 1, high);
    if (left_major == right_major) {
        return left_major;
    }
    int left_count = 0;
    int right_count = 0;
    for (int i = low; i <= high; i++) {
        if (nums[i] == left_major) left_count++;
        if (nums[i] == right_major) right_count++;
    }
    return (left_count > right_count) ? left_major : right_major;
}

int majority_element(int nums[], int n) {
    return largest(nums, 0, n - 1);
}

int main() {
    int n;
    scanf("%d", &n);
    int nums[n];
    for (int i = 0; i < n; i++) {
        scanf("%d", &nums[i]);
    }
    printf("%d", majority_element(nums, n));
    return 0;
}
```

	Input	Expected	Got	
✔	3 3 2 3	3	3	✔

Passed all tests! ✔

Correct

Marks for this submission: 1.00/1.00.

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

Answer: (penalty regime: 0 %)

```c
#include <stdio.h>

int findFloor(int arr[], int n, int x) {
    int left = 0, right = n - 1;
    int floor = -1;
    while (left <= right) {
        int mid = left + (right - left) / 2;
        if (arr[mid] == x) {
            return arr[mid];
        } else if (arr[mid] < x) {
            floor = arr[mid];
            left = mid + 1;
        } else {
            right = mid - 1;
        }
    }
    return floor;
}

int main() {
    int n, x;
    scanf("%d", &n);
    int arr[n];
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    scanf("%d", &x);
    int floorValue = findFloor(arr, n, x);
    printf("%d\n", floorValue);
    return 0;
}
```

	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! ✔

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")

Answer: (penalty regime: 0 %)

```c
#include <stdio.h>

int binarySearch(int arr[], int low, int high, int target) {
    if (low > high) return -1;
    int mid = low + (high - low) / 2;
    if (arr[mid] == target) return mid;
    else if (arr[mid] > target) return binarySearch(arr, low, mid - 1, target);
    else return binarySearch(arr, mid + 1, high, target);
}

void findPair(int arr[], int low, int high, int x) {
    if (low >= high) {
        printf("No\n");
        return;
    }
    int c = x - arr[low];
    int i = binarySearch(arr, low + 1, high, c);
    if (i != -1) {
        printf("%d\n%d\n", arr[low], arr[i]);
    } else {
        findPair(arr, low + 1, high, x);
    }
}

int main() {
    int n;
    scanf("%d", &n);
    int arr[n];
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    int x;
    scanf("%d", &x);
    findPair(arr, 0, n - 1, x);
    return 0;
}
```

	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! ✔

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

Answer:

```c
#include <stdio.h>

void swap(int *a, int *b) {
    int temp = *a;
    *a = *b;
    *b = temp;
}

int partition(int arr[], int low, int high) {
    int pivot = arr[high];
    int i = low - 1;
    for (int j = low; j < high; j++) {
        if (arr[j] < pivot) {
            i++;
            swap(&arr[i], &arr[j]);
        }
    }
    swap(&arr[i + 1], &arr[high]);
    return i + 1;
}

void quickSort(int arr[], int low, int high) {
    if (low < high) {
        int pivotIndex = partition(arr, low, high);
        quickSort(arr, low, pivotIndex - 1);
        quickSort(arr, pivotIndex + 1, high);
    }
}

void printArray(int arr[], int n) {
    for (int i = 0; i < n; i++) {
        printf("%d ", arr[i]);
    }
    printf("\n");
}

int main() {
    int n;
    scanf("%d", &n);
    int arr[n];
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    quickSort(arr, 0, n - 1);
    printArray(arr, n);
    return 0;
}
```

	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! ✔