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### DIVIDE AND CONQUER

#### PROGRAM 1:

Question 1 | Correct Mark 1.00 out of 1.00 [Flag question](#)

##### 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 %)

```
1 #include <stdio.h>
2
3 int find_first_zero(int arr[], int low, int high) {
4     int result = -1;
5     while (low <= high) {
6         int mid = (low + high) / 2;
7         if (arr[mid] == 0) {
8             result = mid;
9             high = mid - 1;
10        } else {
11            low = mid + 1;
12        }
13    }
14    return result;
15 }
16
17 int main() {
18     int m;
19     scanf("%d", &m);
20
21     int arr[m];
22     for (int i = 0; i < m; i++) {
23         scanf("%d", &arr[i]);
24     }
25
26     int first_zero_index = find_first_zero(arr, 0, m - 1);
27
28     if (first_zero_index == -1) {
29         printf("0\n");
30     } else {
31         printf("%d", m - first_zero_index);
32     }
33
34     return 0;
35 }
36 }
```

	<b>Input</b>	<b>Expected</b>	<b>Got</b>	
✓	5 1 1 1 0 0	2	2	✓
✓	10 1 1 1 1 1 1 1 1	0	0	✓
✓	8 0 0 0 0 0 0 0	8	8	✓
✓	17 1 1 1 1 1 1 1 1 1 1 1 1 0 0	2	2	✓

## PROGRAM 2:

Question 1 | Correct Mark 1.00 out of 1.00 [Flag question](#)

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	3
3 2 3	
7	2
2 2 1 1 1 2 2	

**Answer:** (penalty regime: 0 %)

```
1 #include <stdio.h>
2
3 int majorityElement(int nums[], int numsSize) {
4     int count = 0, candidate = 0;
5
6     for (int i = 0; i < numsSize; i++) {
7         if (count == 0) {
8             candidate = nums[i];
9             count = 1;
10        } else if (nums[i] == candidate) {
11            count++;
12        } else {
13            count--;
14        }
15    }
16    return candidate;
17}
18
19 int main() {
20     int n;
21     scanf("%d", &n);
22
23     int nums[n];
24     for (int i = 0; i < n; i++) {
25         scanf("%d", &nums[i]);
26     }
27
28     int result = majorityElement(nums, n);
29     printf("%d\n", result);
30
31     return 0;
32}
33
```

	Input	Expected	Got	
✓	3 3 2 3	3	3	✓

Passed all tests! ✓

# PROGRAM 3:

Question 1 | Correct Mark 1.00 out of 1.00 [Flag question](#)

**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 %)

```
1 #include <stdio.h>
2
3 int findFloor(int arr[], int n, int x) {
4     int low = 0, high = n - 1;
5     int floor = -1;
6
7     while (low <= high) {
8         int mid = low + (high - low) / 2;
9
10        if (arr[mid] == x) {
11            return arr[mid];
12        }
13        else if (arr[mid] < x) {
14            floor = arr[mid];
15            low = mid + 1;
16        }
17        else {
18            high = mid - 1;
19        }
20    }
21
22    return floor;
23 }
24
25 int main() {
26     int n, x;
27     scanf("%d", &n);
28     int arr[n];
29
30     for (int i = 0; i < n; i++) {
31         scanf("%d", &arr[i]);
32     }
33     scanf("%d", &x);
34
35     int result = findFloor(arr, n, x);
36     printf("%d\n", result);
37
38     return 0;
39 }
40 }
```

	<b>Input</b>	<b>Expected</b>	<b>Got</b>	
✓	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! ✓

# PROGRAM 4:

Question 1 | Correct Mark 1.00 out of 1.00 [Flag question](#)

## 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 %)

```
1 #include <stdio.h>
2
3 int elem1 = 0, elem2 = 0;
4
5 int findPair(int arr[], int left, int right, int x) {
6     if (left >= right) {
7         return 0;
8     }
9
10    int sum = arr[left] + arr[right];
11    if (sum == x) {
12        elem1 = arr[left];
13        elem2 = arr[right];
14        return 1;
15    }
16    else if (sum < x) {
17        return findPair(arr, left + 1, right, x);
18    }
19    else {
20        return findPair(arr, left, right - 1, x);
21    }
22}
23
24 int main() {
25     int n, x;
26     scanf("%d", &n);
27     int arr[n];
28
29     for (int i = 0; i < n; i++) {
30         scanf("%d", &arr[i]);
31     }
32     scanf("%d", &x);
33
34     if (findPair(arr, 0, n - 1, x)) {
35         printf("%d\n%d\n", elem1, elem2);
36     } else {
37         printf("No\n");
38     }
39
40     return 0;
41 }
42 }
```

	Input	Expected	Got	
✓	4	4	4	✓
	2	10	10	
	4			
	8			
	10			
	14			

  

✓	5	No	No	✓
	2			
	4			
	6			
	8			
	10			
	100			

Passed all tests! ✓

**Correct**

Marks for this submission: 1.00/1.00.

## PROGRAM 5:

Question 1 | Correct Mark 1.00 out of 1.00  Flag question

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	

Answer:

```
1 #include <stdio.h>
2
3 void swap(int *a, int *b) {
4     int temp = *a;
5     *a = *b;
6     *b = temp;
7 }
8
9 int partition(int arr[], int low, int high) {
10    int pivot = arr[high];
11    int i = low - 1;
12
13    for (int j = low; j <= high - 1; j++) {
14        if (arr[j] <= pivot) {
15            i++;
16            swap(&arr[i], &arr[j]);
17        }
18    }
19    swap(&arr[i + 1], &arr[high]);
20    return i + 1;
21 }
22
23 void quickSort(int arr[], int low, int high) {
24    if (low < high) {
25        int pi = partition(arr, low, high);
26
27        quickSort(arr, low, pi - 1);
28        quickSort(arr, pi + 1, high);
29    }
30 }
31
32 int main() {
33    int n;
34    scanf("%d", &n);
35
36    int arr[n];
37    for (int i = 0; i < n; i++) {
38        scanf("%d", &arr[i]);
39    }
40
41    quickSort(arr, 0, n - 1);
42
43    for (int i = 0; i < n; i++) {
44        printf("%d ", arr[i]);
45    }
46    printf("\n");
47
48    return 0;
49 }
50
```

	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 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.