# Experiment 5

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**Subject Name: Ap** **Subject Code: 22CSH-359**

1. **Aim : Sort Colors**

2. **Objective :** Given an array nums with n objects colored red, white, or blue, sort them **in-place** so that objects of the same color are adjacent, with the colors in the order red, white, and blue.

   We will use the integers 0, 1, and 2 to represent the color red, white, and blue, respectively.

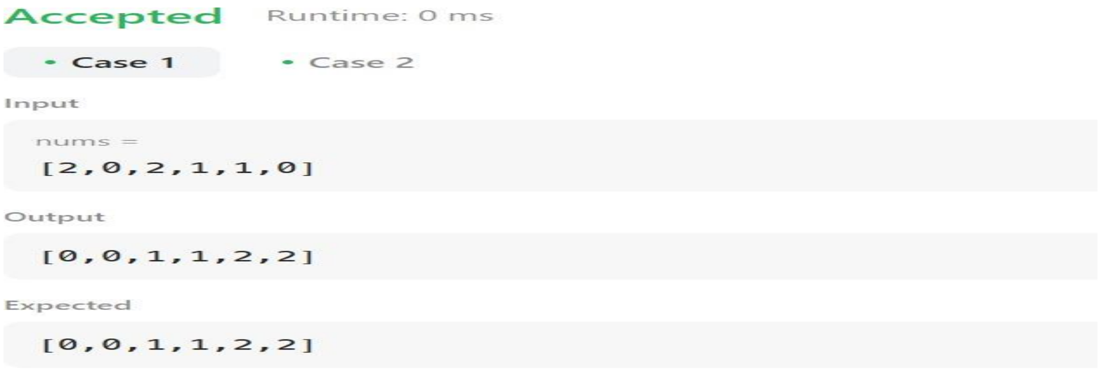
   You must solve this problem without using the library's sort function.

3. **Code:**

```
void sortColors(vector<int>& nums) {

    int low = 0, mid = 0, high = nums.size() - 1;

    while (mid <= high) {

      if (nums[mid] == 0) {

        swap(nums[low++], nums[mid++]);

      } else if (nums[mid] == 1) {

        mid++;

      } else {

        swap(nums[mid], nums[high--]);

      }
```

```
        }

    }
```

## 4. Output:



Accepted Runtime: 0 ms

Input

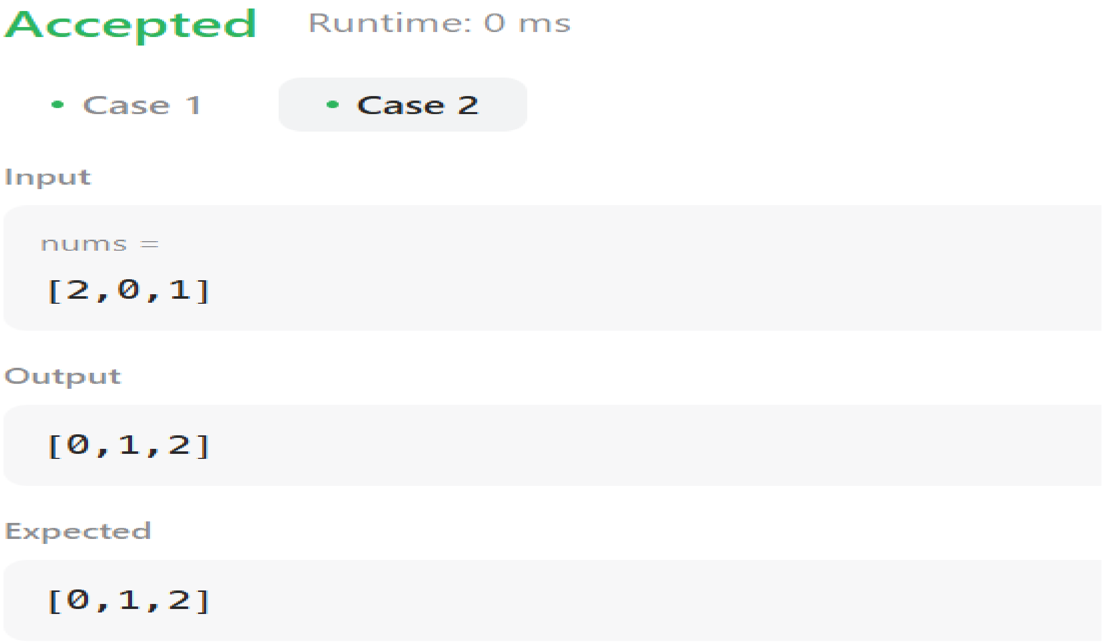
```
nums =
[2,0,2,1,1,0]
```

Output

```
[0,0,1,1,2,2]
```

Expected

```
[0,0,1,1,2,2]
```



Accepted Runtime: 0 ms

Input

```
nums =
[2,0,1]
```

Output

```
[0,1,2]
```

Expected

```
[0,1,2]
```

## 5. Learning Outcomes

- Use of Binary Search Approach in it.
- Use of Swap Functon in it.
- Use of Pointer Approach in it.

1. **Aim** :- **Median of Two Sorted Arrays**

2. **Objective** :- Given two sorted arrays nums1 and nums2 of size m and n respectively, return **the median** of the two sorted arrays. The overall run time complexity should be O(log (m+n)).

3. **Code**:-

```
 void merge(vector<int>& nums1, vector<int>& nums2,vector<long long >&v){

        int k = 0;
        int idx1 = 0;
        int idx2 = 0;

        while(idx1 < nums1.size() and idx2 < nums2.size()){

            if(nums1[idx1] <= nums2[idx2]){
                v.push_back(nums1[idx1++]);
            }else{
                v.push_back(nums2[idx2++]);
            }

        }

        while(idx1 < nums1.size()){
            v.push_back(nums1[idx1++]);
        }
        while(idx2 < nums2.size()){
            v.push_back(nums2[idx2++]);
        }

    }
public:
    double findMedianSortedArrays(vector<int>& nums1, vector<int>& nums2) {

        vector<long long > v;

        merge(nums1,nums2,v);

        int index =  v.size()/ 2;

        if(v.size() % 2 != 0){
            return v[index];
        }else{

            return (double)(v[index] + v[index - 1])/2;

        }
    }
```

4. **OutPut**:-

```
Case 1
Input
nums1 =[1,2]
nums2 =[3,4]
Output
2.50000
Expected
2.50000

Input
nums1 =[1,2]
nums2 =[3,4]
Output
2.50000
Expected
2.50000
```

5. **Learning Outcomes:-**

1. Using MergeSort Approach.
2. we can make it as an ideal approach in it.
3. using of function call.

1. **Aim :-** Kth Smallest Element in a Sorted Matrix

2. **Objective :-** Given an n x n matrix where each of the rows and columns is sorted in ascending order, return *the* k$^{th}$ *smallest element in the matrix*.
   Note that it is the k$^{th}$ smallest element in the sorted order, not
   the k$^{th}$ distinct element.
   You must find a solution with a memory complexity better than O(n$^2$).

3. **Code:-**

```
int kthSmallest(vector<vector<int>>& matrix, int k) {

      priority_queue<int>ans;
      for(int i=0;i<matrix.size();i++){
          for(int j=0;j<matrix.size();j++){

             if(ans.size() < k){
              ans.push(matrix[i][j]);
             }else{

              if(matrix[i][j]<ans.top()){
                  ans.pop();
                  ans.push(matrix[i][j]);
              }
             }
          }
      }
      return ans.top();}
```

4. **Output :-**

**Case 1**
**Input**
**matrix =[[1,5,9],[10,11,13],[12,13,15]]**
**k = 8**
**Output**
**13**
**Expected**
**13**

**Input**
**matrix =[[-5]]**
**k =1**
**Output**
**-5**
**Expected**
**-5**

**5. Learning Outcomes:-**

1. Use of Priority Queue.
2. Use of neasted loop.
3. Using the approach of queue.