

## Assignment 1 Questions - Arrays | DSA

1. Given an array of integers `nums` and an integer `target`, return indices of the two numbers such that they add up to `target`.

You may assume that each input would have exactly one solution, and you may not use the same element twice.

You can return the answer in any order.

**\*\*Example:\*\***

Input: `nums = [2,7,11,15]`, `target = 9`

Output: `[0,1]`

**\*\*Explanation:\*\*** Because `nums[0] + nums[1] == 9`, we return `[0, 1]`

### Solution Code :

```
package in.ineuron.pptAssignment01;
import java.util.HashMap;
import java.util.Map;

public class TwoSum {
    public static int[] twoSum(int[] nums, int target) {
        // Create a hash table to store the elements of the array.
        Map<Integer, Integer> map = new HashMap<>();
        for (int i = 0; i < nums.length; i++) {
            map.put(nums[i], i);
        }

        // Iterate over the array, and for each element, check if its complement exists
        // in the hash table.
        for (int i = 0; i < nums.length; i++) {
            int complement = target - nums[i];
            if (map.containsKey(complement) && map.get(complement) != i) {
                return new int[] { i, map.get(complement) };
            }
        }
        // If no two elements add up to the target, return null.
        return null;
    }

    public static void main(String[] args) {
        int[] nums = { 2, 7, 11, 15 };
        int target = 9;
        int[] numSum = twoSum(nums, target);
        if (numSum != null) {
            System.out.println("Indices of the two numbers that add up to the target: " +
                numSum[0] + ", " + numSum[1]);
        } else {
            System.out.println("No solution found.");
        }
    }
}
```

**Output: [0,1]**

2. Given an integer array `nums` and an integer `val`, remove all occurrences of `val` in `nums` in-place. The order of the elements may be changed. Then return the number of elements in `nums` which are not equal to `val`.

Consider the number of elements in `nums` which are not equal to `val` be `k`, to get accepted, you need to do the following things:

- Change the array `nums` such that the first `k` elements of `nums` contain the elements which are not equal to `val`. The remaining elements of `nums` are not important as well as the size of `nums`.
- Return `k`.

**\*\*Example :\*\***

Input: `nums = [3,2,2,3]`, `val = 3`

Output: 2, `nums = [2,2,_,_]`

**\*\*Explanation:\*\*** Your function should return `k = 2`, with the first two elements of `nums` being 2. It does not matter what you leave beyond the returned `k` (hence they are underscores)

#### Solution Code:

```
package in.ineuron.pptAssignment01;
public class RemoveElement {

    public static void main(String[] args) {
        int[] nums = { 3, 2, 2, 3 };
        int val = 3;

        System.out.println(removeElement(nums, val));
    }

    public static int removeElement(int[] nums, int val) {
        // Create a pointer to keep track of the next available index in the array.
        int count = 0;

        // Iterate over the array, and for each element, check if it is equal to val.
        for (int i = 0; i < nums.length; i++) {
            if (nums[i] != val) {
                // If the element is not equal to val, copy it to the next available index in
                // the array.
                nums[count] = nums[i];
                count++;
            }
        }
        // Return the number of elements in nums which are not equal to val.
        return count;
    }
}
```

```
}  
}
```

**Output: 2**

3. Given a sorted array of distinct integers and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

You must write an algorithm with  $O(\log n)$  runtime complexity.

**\*\*Example 1:\*\***

Input: nums = [1,3,5,6], target = 5

Output: 2

**Solution Code:**

```
package in.ineuron.pptAssignment01;  
public class SearchInsertPosition {  
    public static void main(String[] args) {  
        int[] nums = { 1, 3, 5, 6 };  
        int val = 5;  
  
        System.out.println(searchInsert(nums, val));  
    }  
  
    public static int searchInsert(int[] nums, int target) {  
        // Last and First indexes  
        int start = 0;  
        int end = nums.length - 1;  
  
        // Traverse an array  
        while (start <= end) {  
  
            int mid = (start + end) / 2;  
  
            // if target value found.  
            if (nums[mid] == target) {  
                return mid;  
            }  
  
            // If target value is greater then mid elements's value  
            else if (target > nums[mid]) {  
                start = mid + 1;  
            }  
  
            // otherwise target value is less,  
            else {  
                end = mid - 1;  
            }  
        }  
        // Return the insertion position
```

```
        return end + 1;
    }
}
```

**Output: 2**

4. You are given a large integer represented as an integer array `digits`, where each `digits[i]` is the *i*th digit of the integer. The digits are ordered from most significant to least significant in left-to-right order. The large integer does not contain any leading 0's.

Increment the large integer by one and return the resulting array of digits.

**\*\*Example 1:\*\***

Input: `digits = [1,2,3]`

Output: `[1,2,4]`

**\*\*Explanation:\*\*** The array represents the integer 123.

Incrementing by one gives  $123 + 1 = 124$ .

Thus, the result should be `[1,2,4]`.

**Solution code:**

```
package in.ineuron.pptAssignment01;
import java.util.*;

public class PlusOne {
    public static void main(String[] args) {
        int[] digits = { 1, 2, 3 };
        System.out.println(Arrays.toString(plusOne(digits)));
    }

    public static int[] plusOne(int[] digits) {
        int n = digits.length;
        for (int i = n - 1; i >= 0; i--) {
            if (digits[i] < 9) {
                digits[i]++;
                return digits;
            }
            digits[i] = 0;
        }
        // case : only single digits
        int[] newNumber = new int[n + 1];
        newNumber[0] = 1;
        return newNumber;
    }
}
```

**Output : [1,2,4]**

5. You are given two integer arrays `nums1` and `nums2`, sorted in non-decreasing order, and two integers `m` and `n`, representing the number of elements in `nums1` and `nums2` respectively.

Merge `nums1` and `nums2` into a single array sorted in non-decreasing order.

The final sorted array should not be returned by the function, but instead be stored inside the array `nums1`. To accommodate this, `nums1` has a length of `m + n`, where the first `m` elements denote the elements that should be merged, and the last `n` elements are set to 0 and should be ignored. `nums2` has a length of `n`.

**\*\*Example 1:\*\***

Input: `nums1 = [1,2,3,0,0,0]`, `m = 3`, `nums2 = [2,5,6]`, `n = 3`

Output: `[1,2,2,3,5,6]`

**\*\*Explanation:\*\*** The arrays we are merging are `[1,2,3]` and `[2,5,6]`.

The result of the merge is `[1,2,2,3,5,6]` with the underlined elements coming from `nums1`

#### Solution Code:

```
package in.ineuron.pptAssignment01;
public class MergeSortedArray{
    public static void main(String[] args) {

        int[] nums1 = {1,2,3,0,0,0};
        int[] nums2 = {2,5,6};
        int m = 3;
        int n = 3;

        mergeArrays(nums1,nums2,m,n);
        for (int i = 0;i<m+n ;i++ ) {
            System.out.print(nums1[i]+" ");
        }
    }
    public static void mergeArrays(int[] nums1,int[] nums2,int m,int n){

        int i = m-1;
        int j = n-1;
        int k = m+n-1;

        while (j>=0) {
            if (i>=0 && nums1[i]>nums2[j]) {
                nums1[k] = nums1[i];
                k--;
                i--;
            }
            else{
```

```
        nums1[k] = nums2[j];
        k--;
        j--;
    }
}
}
```

**Output: 1 2 2 3 5 6**

6. Given an integer array nums, return true if any value appears at least twice in the array, and return false if every element is distinct.

**\*\*Example 1:\*\***

Input: nums = [1,2,3,1]

Output: true

**Solution Code :**

```
package in.ineuron.pptAssignment01;
import java.util.HashMap;
import java.util.Map;

public class ContainsDuplicates{
    public static void main(String[] args) {
        int[] nums = {1,2,3,1};
        System.out.println(containsDuplicates(nums));
    }
    public static boolean containsDuplicates(int[] nums){
        Map<Integer,Integer> hm = new HashMap<Integer,Integer>();
        for (int i =0;i <nums.length ;i++ ) {
            if (hm.containsKey(nums[i])) {
                return true;
            }else{
                hm.put(nums[i],i);
            }
        }
        return false;
    }
}
```

**Output : true**

7. Given an integer array `nums`, move all 0's to the end of it while maintaining the relative order of the nonzero elements.

Note that you must do this in-place without making a copy of the array.

**\*\*Example 1:\*\***

Input: `nums = [0,1,0,3,12]`

Output: `[1,3,12,0,0]`

**Solution Code:**

```
package in.ineuron.pptAssignment01;
public class MovesZeroes {
    public static void main(String[] args) {
        int[] nums = { 0, 1, 0, 3, 12 };
        moveZeros(nums);

        System.out.print("Array after moving zeros: ");
        for (int num : nums) {
            System.out.print(num + " ");
        }
    }

    public static void moveZeros(int[] nums) {
        int count = 0;
        for (int i = 0; i < nums.length; i++) {
            if (nums[i] != 0) {
                nums[count++] = nums[i];
            }
        }
        while (count < nums.length) {
            nums[count++] = 0;
        }
    }
}
```

**Output : Array after moving zeros: 1 3 12 0 0**

8. You have a set of integers `s`, which originally contains all the numbers from 1 to `n`. Unfortunately, due to some error, one of the numbers in `s` got duplicated to another number in the set, which results in repetition of one number and loss of another number.

You are given an integer array `nums` representing the data status of this set after the error.

Find the number that occurs twice and the number that is missing and return them in the form of an array.

**\*\*Example 1:\*\***

Input: `nums = [1,2,2,4]`

Output: `[2,3]`

**Solution Code:**

```
package in.ineuron.pptAssignment01;
public class SetMismatch {
    public int[] findErrorNums(int[] nums) {
        int N = nums.length, sum = N * (N + 1) / 2;
        int[] ans = new int[2];
        boolean[] seen = new boolean[N + 1];
        for (int num : nums) {
            sum -= num;
            if (seen[num])
                ans[0] = num;
            seen[num] = true;
        }
        ans[1] = sum + ans[0];
        return ans;
    }

    public static void main(String[] args) {
        SetMismatch test = new SetMismatch();
        int[] nums = { 1, 2, 2, 4 }; // Example input
        int[] result = test.findErrorNums(nums);
        System.out.println("Mismatch Numbers: " + result[0] + ", " + result[1]);
    }
}
```

**Output: Mismatch Numbers: 2, 3**