ASSIGMNENT -5

ARRAYS

QUESTION 1

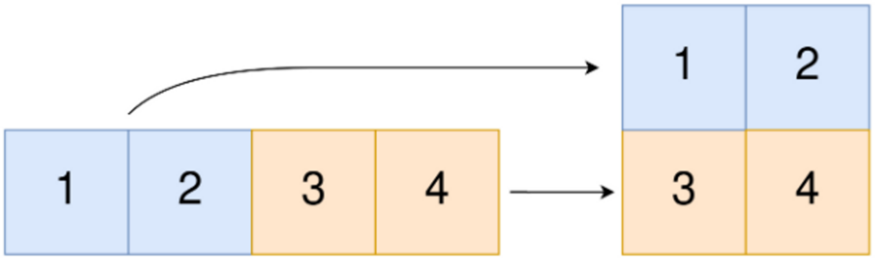
Convert 1D Array Into 2D Array

You are given a **0-indexed** 1-dimensional (1D) integer array original, and two integers, m and n. You are tasked with creating a 2-dimensional (2D) array with m rows and n columns using **all** the elements from original.

The elements from indices 0 to n - 1 (**inclusive**) of original should form the first row of the constructed 2D array, the elements from indices n to 2 * n - 1 (**inclusive**) should form the second row of the constructed 2D array, and so on.

Return *an* m x n *2D array constructed according to the above procedure, or an empty 2D array if it is impossible*.

Example 1:



Input: original = [1,2,3,4], m = 2, n = 2

Output: [[1,2],[3,4]]

Explanation: The constructed 2D array should contain 2 rows and 2 columns.

The first group of n=2 elements in original, [1,2], becomes the first row in the constructed 2D array.

The second group of n=2 elements in original, [3,4], becomes the second row in the constructed 2D array.

SOLUTION:

TC: O(n), SC: O(n)

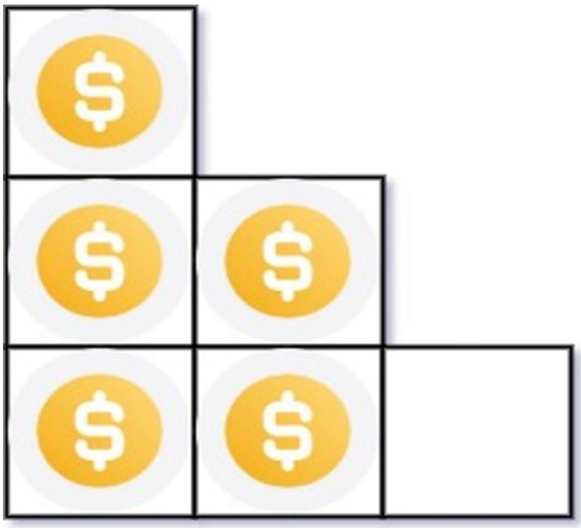
CODE:

```
class Solution:
    def construct2DArray(self, original: List[int], m: int, n: int) -> 
List[List[int]]:
        ans = []
        if len(original) == m*n:
            for i in range(0, len(original), n):
                ans.append(original[i:i+n])
        return ans
```

QUESTION 2

You have n coins and you want to build a staircase with these coins. The staircase consists of k rows where the ith row has exactly i coins. The last row of the staircase **may be** incomplete.

Given the integer n, return *the number of* ***complete rows*** *of the staircase you will build*.



SOLUTION:

TC: **O(logn)**, SC: **O(1)**

Code:

```
class Solution:
            #approach 1 binary solution
    def arrangeCoins(self, n: int) -> int:
        # return int((math.sqrt(8 * n + 1)-1)/2)
        # approach 3
        low,total=1,n
        res=0
        while low<=total:
            mid=(low+total)//2
            count=(mid/2)*(mid+1)
            if count<=n:
                res=mid
                max(res,mid)
                low=mid+1
            else:
                total=mid-1
        return res
```

QUESTION 3

Given an integer array nums sorted in **non-decreasing** order, return *an array of* ***the squares of each number*** *sorted in non-decreasing order*.

Example 1:

Input: nums = [-4,-1,0,3,10]

Output: [0,1,9,16,100]

Explanation: After squaring, the array becomes [16,1,0,9,100]. After sorting, it becomes [0,1,9,16,100]

SOLUTION:

TC: **O(nlogn),** SC: **O(1)**

Code:

```
class Solution:
      def sortedSquares(self, A: List[int]) -> List[int]:
        return sorted([v**2 for v in A])
```

QUESTION 4

Given two **0-indexed** integer arrays nums1 and nums2, return *a list* answer *of size* 2 *where:*

- answer[0] *is a list of all* ***distinct*** *integers in* nums1 *which are* ***not*** *present in* nums2*.*
- answer[1] *is a list of all* ***distinct*** *integers in* nums2 *which are* ***not*** *present in* nums1.

Note that the integers in the lists may be returned in **any** order.

Example 1:

Input: nums1 = [1,2,3], nums2 = [2,4,6]

Output: [[1,3],[4,6]]

Explanation:

For nums1, nums1[1] = 2 is present at index 0 of nums2, whereas nums1[0] = 1 and nums1[2] = 3 are not present in nums2. Therefore, answer[0] = [1,3].

For nums2, nums2[0] = 2 is present at index 1 of nums1, whereas nums2[1] = 4 and nums2[2] = 6 are not present in nums2. Therefore, answer[1] = [4,6].

SOLUTION:

CODE:

```
class Solution:
    def findDifference(self, nums1: List[int], nums2: List[int]) ->
List[List[int]]:
        n1=set(nums1)
        n2=set(nums2)
        r1=list(set(x for x in nums1 if x not in n2))
        r2=list(set(x for x in nums2 if x not in n1))
        return [r1,r2]
```

QUESTION 5

Given two integer arrays arr1 and arr2, and the integer d, *return the distance value between the two arrays*.

The distance value is defined as the number of elements arr1[i] such that there is not any element arr2[j] where |arr1[i]-arr2[j]| <= d.

Example 1:

Input: arr1 = [4,5,8], arr2 = [10,9,1,8], d = 2

Output: 2

Explanation:

For arr1[0]=4 we have:

|4-10|=6 > d=2

|4-9|=5 > d=2

|4-1|=3 > d=2

|4-8|=4 > d=2

For arr1[1]=5 we have:

|5-10|=5 > d=2

|5-9|=4 > d=2

|5-1|=4 > d=2

|5-8|=3 > d=2

For arr1[2]=8 we have:

|8-10|=2 <= d=2

|8-9|=1 <= d=2

|8-1|=7 > d=2

|8-8|=0 <= d=2

SOLUTION:

TC: O(logn), SC: O(1)

CODE:

```
class Solution:
    def findTheDistanceValue(self, arr1: List[int], arr2: List[int], d: 
int) -> int:
        arr2.sort()
        distance = len(arr1)
        for num in arr1:
            start = 0
            end = len(arr2) - 1
            while start <= end:
                mid = (start+end)//2
                if abs(num- arr2[mid]) <= d:
                    distance -= 1
                    break
                elif arr2[mid] > num :
                    end = mid-1
                elif arr2[mid] < num :
                    start = mid+1
        return distance
```

QUESTION 6

Given an integer array nums of length n where all the integers of nums are in the range [1, n] and each integer appears **once** or **twice**, return *an array of all the integers that appears* ***twice***.

You must write an algorithm that runs in O(n) time and uses only constant extra space.

Example 1:

Input: nums = [4,3,2,7,8,2,3,1]

Output:

[2,3]

SOLUTION:

TC: O(n), SC: O(1)

CODE:

```
class Solution:
    def findDuplicates(self, nums: List[int]) -> List[int]:
        ans = []
        for i in range(len(nums)):
            if nums[abs(nums[i])-1]>0:
                nums[abs(nums[i])-1] = -nums[abs(nums[i])-1]
            else:
                ans.append(abs(nums[i]))
        return ans
```

QUESTION 7

Suppose an array of length n sorted in ascending order is **rotated** between 1 and n times. For example, the array nums = [0,1,2,4,5,6,7] might become:

- [4,5,6,7,0,1,2] if it was rotated 4 times.
- [0,1,2,4,5,6,7] if it was rotated 7 times.

Notice that **rotating** an array [a[0], a[1], a[2], ..., a[n-1]] 1 time results in the array [a[n-1], a[0], a[1], a[2], ..., a[n-2]].

Given the sorted rotated array nums of **unique** elements, return *the minimum element of this array*.

You must write an algorithm that runs in O(log n) time.

Example 1:

Input: nums = [3,4,5,1,2]

Output: 1

Explanation:

The original array was [1,2,3,4,5] rotated 3 times.

SOLUTION:

TC: O(log n), SC: O(1)

CODE:

```
class Solution:
    def findMin(self, nums: List[int]) -> int:
        low=0
        high=len(nums)-1
        res=nums[0]
        while low<=high:
            if nums[low]<nums[high]:
                res=min(res,nums[low])
                break
            mid=(low+high)//2
            res=min(res,nums[mid])
            if nums[mid]>=nums[low]:
                low=mid+1
            else:
                high=mid-1
        return res
```

QUESTION 8

An integer array original is transformed into a **doubled** array changed by appending **twice the value** of every element in original, and then randomly **shuffling** the resulting array.

Given an array changed, return original *if* changed *is a **doubled** array. If* changed *is not a **doubled** array, return an empty array. The elements in* original *may be returned in **any** order*.

Example 1:

Input: changed = [1,3,4,2,6,8]

Output: [1,3,4]

Explanation: One possible original array could be [1,3,4]:

- Twice the value of 1 is 1 * 2 = 2.
- Twice the value of 3 is 3 * 2 = 6.
- Twice the value of 4 is 4 * 2 = 8.

Other original arrays could be [4,3,1] or [3,1,4].

SOLUTION:

TC: O(nlogn), SC: O(n)

Code:

```
class Solution:
    def findOriginalArray(self, changed: List[int]) -> List[int]:
        c = Counter(changed)
```

```
zeros, m = divmod(c[0], 2)
if m: return []
ans = [0]*zeros

for n in sorted(c.keys()):
    if c[n] > c[2*n]: return []
    c[2*n]-= c[n]
    ans.extend([n]*c[n])

return ans
```