A S S I G N M E N T - 3

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1. Counting Elements

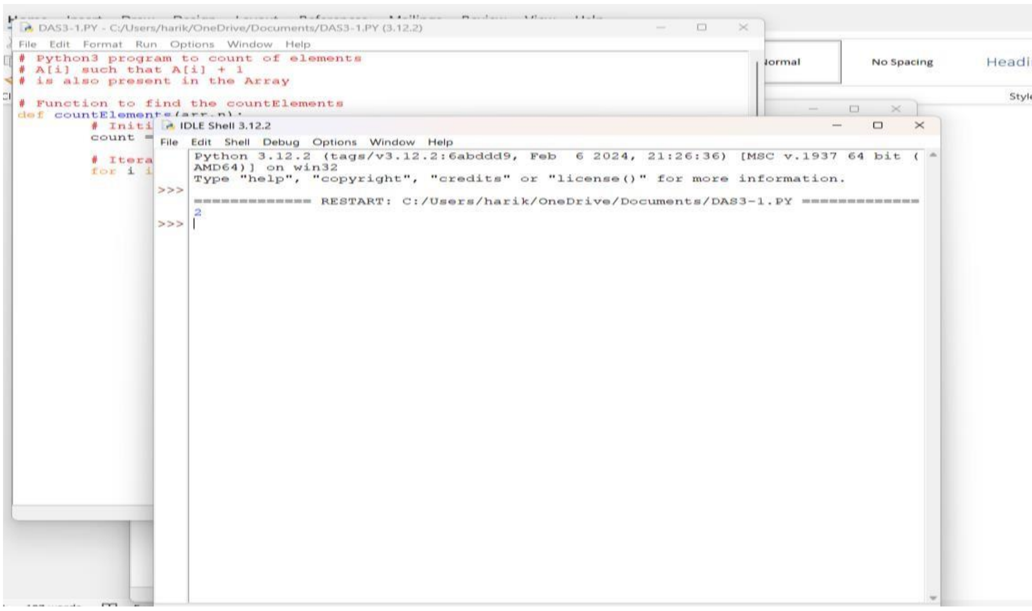
**Given an integer array arr, count how many elements x there are, such that x + 1 is also in
arr. If there are duplicates in arr, count them separately.**

CODE:

```
def countElements(arr,n):
# Initialize count as zero
count = 0
# Iterate over each element
for i in range(n):
# Store element in int x
x = arr[i]
# Calculate x + 1
xPlusOne = x + 1
# Initialize found as false
found = False
# Run loop to search for x + 1
# after the current element
for j in range(i + 1,n,1):
if (arr[j] == xPlusOne):
found = True
break
# Run loop to search for x + 1
# before the current element
k = i - 1
while(found == False and k >= 0):
if (arr[k] == xPlusOne):
found = True
```

```
break
k -= 1
# if found is true, increment count
if (found == True):
count += 1
return count
# Driver program
if __name___== '__main__':
arr = [1, 2, 3]
n = len(arr)
# call countElements function on array
print(countElements(arr,  n))
```

OUTPUT:



2. Perform String Shifts

You are given a string s containing lowercase English letters, and a matrix shift, where shift[i] = [directioni, amounti]:

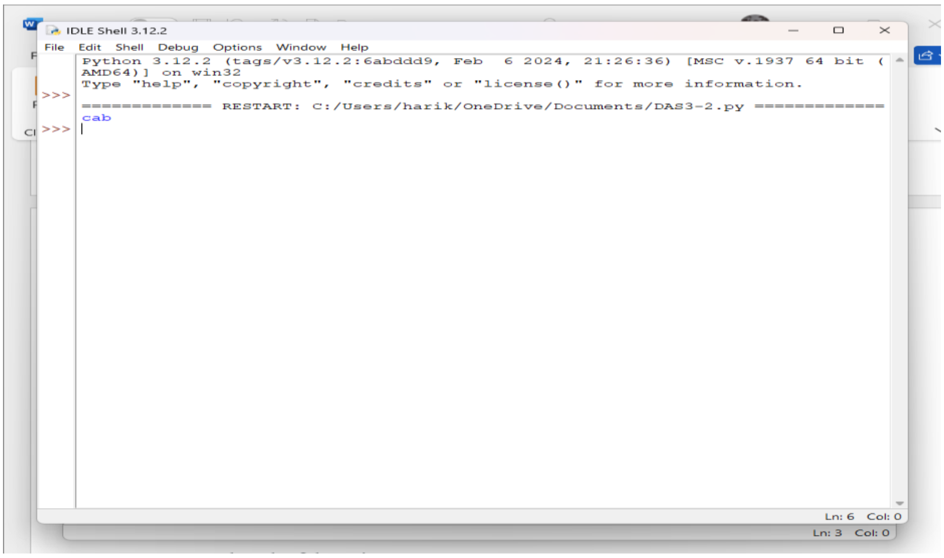
- **directioni can be 0 (for left shift) or 1 (for right shift).**
- **amounti is the amount by which string s is to be shifted.**
- **A left shift by 1 means remove the first character of s and append it to the end.**

● Similarly, a right shift by 1 means remove the last character of s **and add it to the beginning.**
Return the final string after all operations.

CODE:

```
def stringShift(s, shift):
val = 0
for i in range(len(shift)):
# If shift[i][0] = 0, then left shift
# Otherwise, right shift
val += -shift[i][1] if shift[i][0] == 0 else shift[i][1]
# Stores length of the string
Len = len(s)
# Effective shift calculation
val = val % Len
# Stores modified string
result = ""
# Right rotation
if (val > 0):
result = s[Len - val:Len] + s[0: Len - val]
# Left rotation
else:
result = s[-val: Len] + s[0: -val]
print(result)


# Driver Code
s = "abc"
shift = [
[ 0, 1 ],
[ 1, 2 ]
]
stringShift(s, shift)
```

OUTPUT:



3. Leftmost Column with at Least a One
A row-sorted binary matrix means that all elements are 0 or 1 and each row of the matrix
is sorted in non-decreasing order.
Given a row-sorted binary matrix binaryMatrix, return *the index (0-indexed) of the leftmost column with a 1 in it*. If such an index does not exist, return -1.
You can't access the Binary Matrix directly. You may only access the matrix using a BinaryMatrix interface:

- **BinaryMatrix.get(row, col) returns the element of the matrix at index (row, col) (0-indexed).**
- **BinaryMatrix.dimensions() returns the dimensions of the matrix as a list of 2 elements [rows, cols], which means the matrix is rows x cols.**

Submissions making more than 1000 calls to BinaryMatrix.get will be judged *Wrong Answer*. Also, any solutions that attempt to circumvent the judge will result in disqualification.
For custom testing purposes, the input will

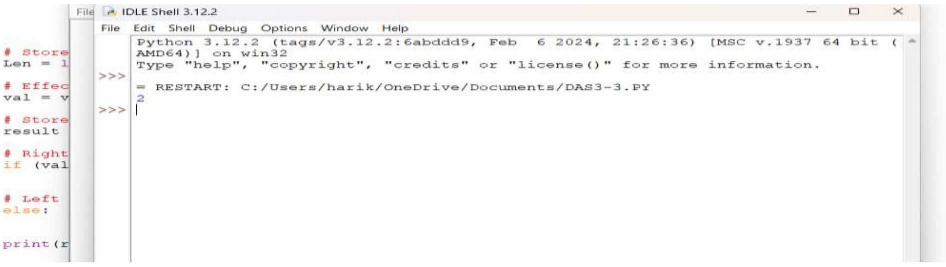
CODE:

```
# Python3 implementation to find the
# Leftmost Column with atleast a
# 1 in a sorted binary matrix
import sys
N = 3


# Function to search for the
# leftmost column of the matrix
```

```
# with atleast a 1 in sorted
# binary matrix
def search(mat, n, m):

a = sys.maxsize

# Loop to iterate over all the
# rows of the matrix
for i in range (n):
low = 0
high = m - 1
ans = sys.maxsize

# Binary Search to find the
# leftmost occurrence of the 1
while (low <= high):
mid = (low + high) // 2

# Condition if the column
# contains the 1 at this
# position of matrix
if (mat[i][mid] == 1):

if (mid == 0):
ans = 0
break

elif (mat[i][mid - 1] == 0):
ans = mid
break
```

```
if (mat[i][mid] == 1):
high = mid - 1
else:
low = mid + 1

# If there is a better solution
# then update the answer
if (ans < a):
a = ans

# Condition if the solution
# doesn't exist in the matrix
if (a == sys.maxsize):
return -1
return a + 1

# Driver Code
if __name__ == "__main__":

mat = [[0, 0, 0],
[0, 0, 1],
[0, 1, 1]]
print(search(mat, 3, 3))
```

OUTPUT:



4.First Unique Number

You have a queue of integers, you need to retrieve the first unique integer in the queue. Implement the FirstUnique class:

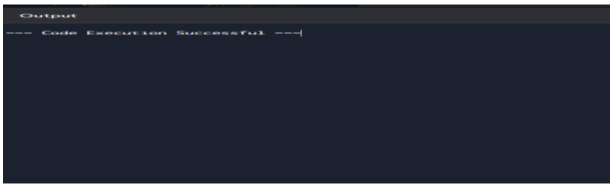
- **FirstUnique(int[] nums) Initializes the object with the numbers in the queue.**
- **int showFirstUnique() returns the value of the first unique integer of the queue, and returns -1 if there is no such integer.**
- **void add(int value) insert value to the queue.**

CODE:

```
class FirstUnique:
def __init__(self, nums: List[int]):
self.cnt = Counter(nums)
self.unique = OrderedDict({v: 1 for v in nums if self.cnt[v] == 1})

def showFirstUnique(self) -> int:
return -1 if not self.unique else next(v for v in self.unique.keys())

def add(self, value: int) -> None:
self.cnt[value] += 1
if self.cnt[value] == 1:
self.unique[value] = 1
elif value in self.unique:
self.unique.pop(value)



# Your FirstUnique object will be instantiated and called as such:
```

```
# obj = FirstUnique(nums)
# param_1 = obj.showFirstUnique()
# obj.add(value)
```

OUTPUT:



5. Check If a String Is a Valid Sequence from Root to Leaves Path in a Binary Tree
Given a binary tree where each path going from the root to any leaf form a valid sequence, check if a given string is a valid sequence in such binary tree.
We get the given string from the concatenation of an array of integers arr and the concatenation of all values of the nodes along a path results in a sequence in the given binary tree.

CODE:

```
# Python program to see if
# there is a root to leaf path
# with given sequence
# Class of Node
class Node:
# Constructor to create a
# node in Binary Tree
def __init__(self, val):
self.val = val
self.left = None
self.right = None
# Util function
def existPathUtil(root, arr, n, index):


# If root is NULL or reached
# end of the array
```

```
if not root or index == n:
return False

# If current node is leaf
if not root.left and not root.right:
if root.val == arr[index] and index == n-1:
return True
return False

# If current node is equal to arr[index] this means
# that till this level path has been matched and
# remaining path can be either in left subtree or
# right subtree.
return ((index < n) and (root.val == arr[index]) and \
(existPathUtil(root.left, arr, n, index+1) or \
existPathUtil(root.right, arr, n, index+1)))

# Function to check given sequence of root to leaf path exist
# in tree or not.
# index represents current element in sequence of rooth to
# leaf path
def existPath(root, arr, n, index):
if not root:
return (n == 0)

return existPathUtil(root, arr, n, 0)

# Driver Code
if __name__ == "__main__":
arr = [5, 8, 6, 7]
```

```
n = len(arr)
root = Node(5)
root.left = Node(3)
root.right = Node(8)
root.left.left = Node(2)
root.left.right = Node(4)
root.left.left.left = Node(1)
root.right.left = Node(6)
root.right.left.right = Node(7)

if existPath(root, arr, n, 0):
print("Path Exists")
else:
print("Path does not Exist")
```

OUTPUT:

6.Kids With the Greatest Number of Candies

There are n kids with candies. You are given an integer array candies, where each candies[i] represents the number of candies the ith kid has, and an integer extraCandies, denoting the number of extra candies that you have.

Return *a boolean array* result *of length* n, *where* result[i] *is* true *if, after giving the* ith *kid all the* extraCandies, *they will have the greatest number of candies among all the kids, or* false *otherwise*.

Note that multiple kids can have the greatest number of candies.

CODE:

```
class Solution:
```

```
def kidsWithCandies(self, candies: List[int], extraCandies: int) -> List[bool]:
n = len(candies)
result = [False]*n
maxCandies = max(candies)
for i in range(n):
if candies[i] + extraCandies >= maxCandies:
result[i] = True
return result
```

OUTPUT:

[true,true,true,false,true]

7. Max Difference You Can Get From Changing an Integer

You are given an integer num. You will apply the following steps exactly two times:

- **Pick a digit x (0 <= x <= 9).**
- **Pick another digit y (0 <= y <= 9). The digit y can be equal to x.**
- **Replace all the occurrences of x in the decimal representation of num by y.**
- **The new integer cannot have any leading zeros, also the new integer cannot be 0.**

Let a and b be the results of applying the operations to num the first and second times, respectively.

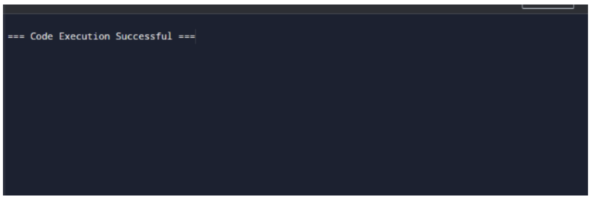
Return *the max difference* between a and b.

Code:

```
class Solution:
    def maxDiff(self, num: int) -> int:
        a, b = str(num), str(num)
        for c in a:
            if c != "9":
                a = a.replace(c, "9")
                break
        if b[0] != "1":
            b = b.replace(b[0], "1")
        else:
```

```
        for c in b[1:]:
            if c not in "01":
                b = b.replace(c, "0")
                break
    return int(a) - int(b)
```

OUTPUT:



8.Check If a String Can Break Another String

Given two strings: s1 and s2 with the same size, check if some permutation of string s1 can break some permutation of string s2 or vice-versa. In other words s2 can break s1 or vice-versa.

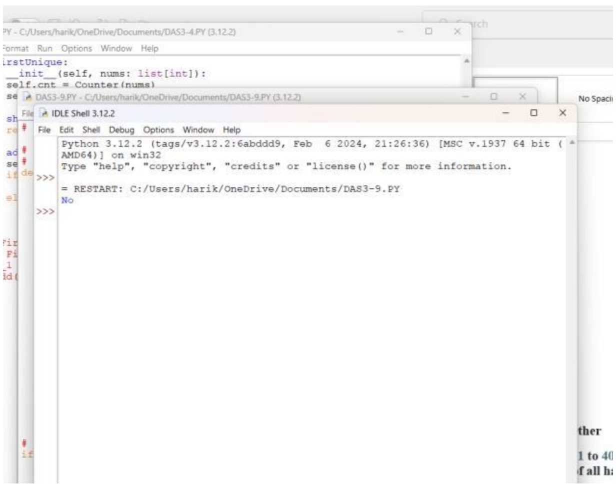
A string x can break string y (both of size n) if x[i] >= y[i] (in alphabetical order) for all i between 0 and n-1.

CODE:

```
def arePermutation(str1, str2):

# Get lengths of both strings
n1 = len(str1)
n2 = len(str2)

# If length of both strings is not same,
# then they cannot be Permutation
if (n1 != n2):
return False

# Sort both strings
a = sorted(str1)
```

```
str1 = " ".join(a)
b = sorted(str2)
str2 = " ".join(b)

# Compare sorted strings
for i in range(0, n1, 1):
if (str1[i] != str2[i]):
return False

return True

# Driver Code
if __name___== '__main__':
str1 = "test"
str2 = "ttew"
if (arePermutation(str1, str2)):
print("Yes")
else:
print("No")
```

OUTPUT:



9.Number of Ways to Wear Different Hats to Each Other

There are n people and 40 types of hats labeled from 1 to 40.
Given a 2D integer array hats, where hats[i] is a list of all hats preferred by the ith person.
Return *the number of ways that the n people wear different hats to each other*.
Since the answer may be too large, return it modulo 109 + 7.

CODE:

```
class Solution:
def numberWays(self, hats: List[List[int]]) -> int:
g = defaultdict(list)
for i, h in enumerate(hats):
for v in h:
g[v].append(i)
mod = 10**9 + 7
n = len(hats)
m = max(max(h) for h in hats)
f = [[0] * (1 << n) for _ in range(m + 1)]
f[0][0] = 1
for i in range(1, m + 1):
for j in range(1 << n):
f[i][j] = f[i - 1][j]
for k in g[i]:
if j >> k & 1:
f[i][j] = (f[i][j] + f[i - 1][j ^ (1 << k)]) % mod
return f[m][-1]
```

OUTPUT:

1

10. Next Permutation

A permutation of an array of integers is an arrangement of its members into a sequence or
linear order.

- **For example, for arr = [1,2,3], the following are all the permutations of arr: [1,2,3], [1,3,2], [2, 1, 3], [2, 3, 1], [3,1,2], [3,2,1].**

The next permutation of an array of integers is the next lexicographically greater permutation of its integer. More formally, if all the permutations of the array are sorted in
one container according to their lexicographical order, then the next permutation of that
array is the permutation that follows it in the sorted container. If such arrangement is not
possible, the array must be rearranged as the lowest possible order (i.e., sorted in ascending
order).

- **For example, the next permutation of arr = [1,2,3] is [1,3,2].**
- **Similarly, the next permutation of arr = [2,3,1] is [3,1,2].**
- **While the next permutation of arr = [3,2,1] is [1,2,3] because [3,2,1] does not have a lexicographical larger rearrangement.**

Given an array of integers nums, *find the next permutation of* nums.
The replacement must be in place and use only constant extra memory.

CODE:

```
def next_permutation(nums):
# Find the first element from the right that is not in decreasing order
i = len(nums) - 2
while i >= 0 and nums[i] >= nums[i + 1]:
i -= 1
# If such an element is found, find the smallest element from the right that is greater than it
if i >= 0:
j = len(nums) - 1
while nums[j] <= nums[i]:
j -= 1
# Swap the two elements
nums[i], nums[j] = nums[j], nums[i]
# Reverse the elements from i+1 to the end to get the next permutation
nums[i + 1:] = reversed(nums[i + 1:])

nums = [3, 2, 1]
next_permutation(nums)
print(nums)
```

OUTPUT:

```
============= RESTART: C:/Users/harik/OneDrive/Documents/DAS3-8.PY =============
>>>
============ RESTART: C:/Users/harik/OneDrive/Documents/DAS3-10P.PY ============
[1, 2, 3]
>>>
============ RESTART: C:/Users/harik/OneDrive/Documents/DAS3-10P.PY ============
[1, 2, 3]
>>>
```