

Given an m x n binary matrix mat, return the distance of the nearest 0 for each cell. The distance between two adjacent cells is 1. Input: mat = [[0,0,0],[0,1,0],[0,0,0]] Output: [[0,0,0],[0,1,0],[0,0,0]]
Input: mat = [[0,0,0],[0,1,0],[1,1,1]] Output: [[0,0,0],[0,1,0],[1,2,1]]

```
from collections import deque

def updateMatrix(mat):
    rows, cols = len(mat), len(mat[0])
    queue = deque()

    for i in range(rows):
        for j in range(cols):
            if mat[i][j] == 0:
                queue.append((i, j))
            else:
                mat[i][j] = float('inf')

    directions = [(0, 1), (0, -1), (1, 0), (-1, 0)]

    while queue:
        cell = queue.popleft()
        for d in directions:
            new_i, new_j = cell[0] + d[0], cell[1] + d[1]
            if 0 <= new_i < rows and 0 <= new_j < cols and mat[new_i][new_j] > mat[cell[0]][cell[1]] + 1:
                mat[new_i][new_j] = mat[cell[0]][cell[1]] + 1
                queue.append((new_i, new_j))

    return mat

# Test Cases
mat1 = [[0, 0, 0], [0, 1, 0], [0, 0, 0]]
mat2 = [[0, 0, 0], [0, 1, 0], [1, 1, 1]]
```

```
print(updateMatrix(mat1)) # Output: [[0, 0, 0], [0, 1, 0], [0, 0, 0]]
print(updateMatrix(mat2)) # Output: [[0, 0, 0], [0, 1, 0], [1, 2, 1]]
```

Given two integer arrays arr1 and arr2, return the minimum number of operations (possibly zero) needed to make arr1 strictly increasing. In one operation, you can choose two indices $0 \leq i < \text{arr1.length}$ and $0 \leq j < \text{arr2.length}$ and do the assignment $\text{arr1}[i] = \text{arr2}[j]$. If there is no way to make arr1 strictly increasing, return -1. Example 1: Input: arr1 = [1,5,3,6,7], arr2 = [1,3,2,4] Output: 1 Explanation: Replace 5 with 2, then arr1 = [1, 2, 3, 6, 7].

```
def min_operations(arr1, arr2):
    n, m = len(arr1), len(arr2)
    dp = {0: -arr1[0] - 1}
    for i in range(1, n):
        ndp = {}
        for key in dp:
            if arr1[i] > dp[key]:
                ndp[key] = max(ndp.get(key, 0), arr1[i])
        for j in range(m):
            if arr2[j] > dp[key]:
                ndp[key + 1] = max(ndp.get(key + 1, 0), arr2[j])
        dp = ndp
    if dp:
        return n - max(dp)
    return -1
```

Example

```
arr1 = [1, 5, 3, 6, 7]
arr2 = [1, 3, 2, 4]
print(min_operations(arr1, arr2)) # Output: 1
```

Given two strings **a** and **b**, return the minimum number of times you should repeat string **a** so that string **b** is a substring of it. If it is impossible for **b** to be a substring of **a** after repeating it, return -1. Notice: string "abc" repeated 0 times is "", repeated 1 time is "abc" and repeated 2 times is "abcbabc". Example 1: Input: a = "abcd", b = "cdababcdab" Output: 3 Explanation: We return 3 because by repeating a three times "abcdababcdab", b is a substring of it.

```
def min_repeats(a, b):  
  
    if b in a:  
        return 1  
  
    for i in range(1, len(b)):  
        if b.startswith(a[-i:]):  
            return i + 1  
  
    return -1  
  
# Example  
a = "abcd"  
b = "cdababcdab"  
print(min_repeats(a, b)) # Output: 3
```

Given an array **nums** containing **n** distinct numbers in the range **[0, n]**, return the only number in the range that is missing from the array. Example 1: Input: nums = [3,0,1] Output: 2 Explanation: n = 3 since there are 3 numbers, so all numbers are in the range [0,3]. 2 is the missing number in the range since it does not appear in nums.

```
def missing_number(nums):  
  
    n = len(nums)  
    total_sum = n * (n + 1) // 2  
    actual_sum = sum(nums)  
    return total_sum - actual_sum  
  
# Example  
nums = [3, 0, 1]  
print(missing_number(nums)) # Output: 2
```

You are given an $n \times n$ integer matrix `grid`. Generate an integer matrix `maxLocal` of size $(n - 2) \times (n - 2)$ such that: `maxLocal[i][j]` is equal to the largest value of the 3×3 matrix in `grid` centered around row $i + 1$ and column $j + 1$. In other words, we want to find the largest value in every contiguous 3×3 matrix in `grid`. Return the generated matrix. Input: `grid = [[9,9,8,1],[5,6,2,6],[8,2,6,4],[6,2,2,2]]` Output: `[[9,9],[8,6]]` Explanation: The diagram above shows the original matrix and the generated matrix. Notice that each value in the generated matrix corresponds to the largest value of a contiguous 3×3 matrix in `grid`.

```
def largestValues(grid):

    n = len(grid)

    maxLocal = [[0] * (n - 2) for _ in range(n - 2)]

    for i in range(n - 2):
        for j in range(n - 2):
            maxLocal[i][j] = max(grid[i][j], grid[i][j + 1], grid[i][j + 2],
                                   grid[i + 1][j], grid[i + 1][j + 1], grid[i + 1][j + 2],
                                   grid[i + 2][j], grid[i + 2][j + 1], grid[i + 2][j + 2])

    return maxLocal

grid = [[9, 9, 8, 1], [5, 6, 2, 6], [8, 2, 6, 4], [6, 2, 2, 2]]
largest_values = largestValues(grid)
print(largest_values)
```

Given the head of a linked list, return the list after sorting it in ascending order. Input: `head = [4,2,1,3]` Output: `[1,2,3,4]`

```
class ListNode:

    def __init__(self, val=0, next=None):
        self.val = val
        self.next = next

def sortList(head):
```

```
if not head or not head.next:
```

```
    return head
```

```
mid = get_mid(head)
```

```
left = sortList(head)
```

```
right = sortList(mid)
```

```
return merge(left, right)
```

```
def get_mid(head):
```

```
    slow = head
```

```
    fast = head
```

```
    while fast.next and fast.next.next:
```

```
        slow = slow.next
```

```
        fast = fast.next.next
```

```
mid = slow.next
```

```
slow.next = None
```

```
return mid
```

```
def merge(left, right):
```

```
    dummy = ListNode()
```

```
    curr = dummy
```

```
    while left and right:
```

```
        if left.val < right.val:
```

```
            curr.next = left
```

```
            left = left.next
```

```
        else:
```

```

        curr.next = right

        right = right.next

    curr = curr.next

curr.next = left or right

return dummy.next

# Example
head = ListNode(4)
head.next = ListNode(2)
head.next.next = ListNode(1)
head.next.next.next = ListNode(3)

sorted_head = sortList(head)
result = []
while sorted_head:
    result.append(sorted_head.val)
    sorted_head = sorted_head.next

print(result)

```

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

```

from collections import Counter

def majority_element(nums):
    counts = Counter(nums)
    return max(counts, key=counts.get)

```

Example

```
nums = [3, 2, 3]
```

```
print(majority_element(nums)) # Output: 3
```

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 $O(\log(m+n))$. Example 1: Input: nums1 = [1,3], nums2 = [2] Output: 2.00000 Explanation: merged array = [1,2,3] and median is 2.

```
def findMedianSortedArrays(nums1, nums2):  
    nums = sorted(nums1 + nums2)  
    n = len(nums)  
    if n % 2 == 0:  
        return (nums[n // 2 - 1] + nums[n // 2]) / 2  
    else:  
        return nums[n // 2]
```

Example

```
nums1 = [1, 3]
```

```
nums2 = [2]
```

```
print(findMedianSortedArrays(nums1, nums2)) # Output: 2.00000
```

Given an array nums of n integers, return an array of all the unique quadruplets [nums[a], nums[b], nums[c], nums[d]] such that: $0 \leq a, b, c, d < n$ a, b, c, and d are distinct. $nums[a] + nums[b] + nums[c] + nums[d] == target$ You may return the answer in any order. Example 1: Input: nums = [1,0,-1,0,-2,2], target = 0 Output: [[-2,-1,1,2],[-2,0,0,2],[-1,0,0,1]] Example 2: Input: nums = [2,2,2,2,2], target = 8 Output: [[2,2,2,2]]

```
def fourSum(nums, target):  
    nums.sort()  
    result = []  
    n = len(nums)  
    for i in range(n - 3):  
        if i > 0 and nums[i] == nums[i - 1]:
```

```

        continue
    for j in range(i + 1, n - 2):
        if j > i + 1 and nums[j] == nums[j - 1]:
            continue
        left, right = j + 1, n - 1
        while left < right:
            total = nums[i] + nums[j] + nums[left] + nums[right]
            if total == target:
                result.append([nums[i], nums[j], nums[left], nums[right]])
                while left < right and nums[left] == nums[left + 1]:
                    left += 1
                while left < right and nums[right] == nums[right - 1]:
                    right -= 1
                left += 1
                right -= 1
            elif total < target:
                left += 1
            else:
                right -= 1
    return result

```

Example 1

```

nums1 = [1, 0, -1, 0, -2, 2]
target1 = 0
print(fourSum(nums1, target1))

```

Example 2

```

nums2 = [2, 2, 2, 2, 2]
target2 = 8
print(fourSum(nums2, target2))

```


