**ASSIGNMENT -5**

**QUESTION 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.

**CODE:**

def two\_sum(nums, target):

num\_to\_index = {}

for i, num in enumerate(nums):

complement = target - num

if complement in num\_to\_index:

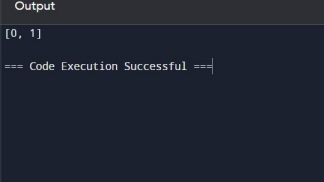
return [num\_to\_index[complement], i]

num\_to\_index[num]=i

nums = [2, 7, 11, 15]

target = 9

print(two\_sum(nums, target))



**RESULT:**

the program is executed successfully.

**QUESTION 2:**

You are given two non-empty linked lists representing two non-negative integers. The digits are stored in reverse order, and each of their nodes contains a single digit. Add the two numbers and return the sum as a linked list. You may assume the two numbers do not contain any leading zero, except the number 0 itself.

**CODE:**

class ListNode:

def init (self, val=0, next=None):

self.val = val

self.next = next

def addTwoNumbers(l1, l2):

dummy = ListNode()

current, carry = dummy, 0

while l1 or l2 or carry:

x = l1.val if l1 else 0

y = l2.val if l2 else 0

carry, out = divmod(x + y + carry, 10)

current.next = ListNode(out)

current = current.next

l1 = l1.next if l1 else None

l2 = l2.next if l2 else None

return dummy.next

def print\_linked\_list(node):

while node:

print(node.val, end=" -> " if node.next else "\n")

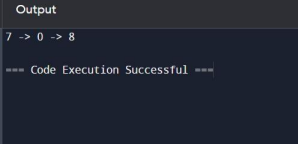
node = node.next

l1 = ListNode(2, ListNode(4, ListNode(3)))

l2 = ListNode(5, ListNode(6, ListNode(4)))

result = addTwoNumbers(l1, l2)

print\_linked\_list(result)



**RESULT:**

the program is executed successfully.

**QUESTION 3:**

Longest Substring without Repeating Characters Given a string s, find the length of the longest substring without repeating characters.

**CODE:**

def lengthOfLongestSubstring(s: str) -> int:

char\_set = set()

left = 0

max\_length = 0

for right in range(len(s)):

while s[right] in char\_set:

char\_set.remove(s[left])

left += 1

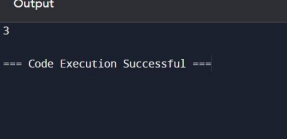
char\_set.add(s[right])

max\_length = max(max\_length, right - left + 1)

return max\_length

s = "abcabcbb"

print(lengthOfLongestSubstring(s))



**RESULT:**

the program is executed successfully.

**QUESTION 4:**

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)).

**CODE:**

def findMedianSortedArrays(nums1, nums2):

if len(nums1) > len(nums2):

nums1, nums2 = nums2, nums1

m, n = len(nums1), len(nums2)

imin, imax, half\_len = 0, m, (m + n + 1) // 2

while imin <= imax:

i = (imin + imax) // 2

j = half\_len - i

if i < m and nums1[i] < nums2[j - 1]:

imin = i + 1

elif i > 0 and nums1[i - 1] > nums2[j]:

imax = i - 1

else:

max\_of\_left = max(nums1[i - 1] if i > 0 else float('-inf'),

nums2[j - 1] if j > 0 else float('-inf'))

if (m + n) % 2 == 1:

return max\_of\_left

min\_of\_right = min(nums1[i] if i < m else float('inf'), nums2[j] if j < n else float('inf'))

return (max\_of\_left + min\_of\_right) / 2.0

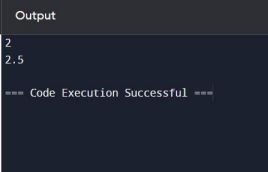
nums1 = [1, 3]

nums2 = [2]

print(findMedianSortedArrays(nums1, nums2)) # Output: 2.0 nums1 = [1, 2]

nums2 = [3, 4]

print(findMedianSortedArrays(nums1, nums2))



**RESULT:**

the program is executed successfully.

**QUESTION 5:**

Given a string s, return the longest palindromic substring in s.

**CODE:**

def longestPalindrome(s: str) -> str:

if not s:

return ""

def expandAroundCenter(left: int, right: int) -> str: while left >= 0 and right < len(s) and s[left] == s[right]: left -= 1

right += 1

return s[left + 1:right]

longest = ""

for i in range(len(s)):

longest = max(longest,

expandAroundCenter(i, i),

expandAroundCenter(i, i + 1),

key=len)

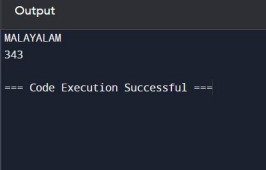
return longest

s1 = "MALAYALAM"

print(longestPalindrome(s1))

s2 = "12343"

print(longestPalindrome(s2))



**RESULT:**

the program is executed successfully.

**QUESTION 6:**

The string "PAYPALISHIRING" is written in a zigzag pattern on a given number of rowslike this: (you may want to display this pattern in a fixed font for better legibility)

**CODE:**

def convert(s: str, numRows: int) -> str:

if numRows == 1 or numRows >= len(s):

return s

rows = [''] \* numRows

current\_row, going\_down = 0, False

for char in s:

rows[current\_row] += char

if current\_row == 0 or current\_row == numRows - 1:

going\_down = not going\_down

current\_row += 1 if going\_down else -1

return ''.join(rows)

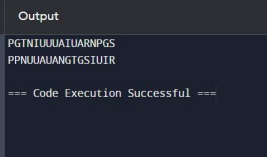
s = "PUNUGUPATIGUNASRI"

numRows = 3

print(convert(s, numRows))

numRows = 4

print(convert(s, numRows))



**RESULT:**

the program is executed successfully.

**QUESTION 7:**

Given a signed 32-bit integer x, return x with its digits reversed. If reversing x causes the value to go outside the signed 32-bit integer range [-231, 231 - 1], then return 0. Assume the environment does not allow you to store 64-bit integers (signed or unsigned).

**CODE:**

def reverse(x: int) -> int:

INT\_MAX = 2\*\*31 - 1

INT\_MIN = -2\*\*31

sign = 1 if x >= 0 else -1

x = abs(x)

result = 0

while x:

result = result \* 10 + x % 10

x //= 10

if result > INT\_MAX:

return 0

return sign \* result

x = 123

print(reverse(x))

x = -123

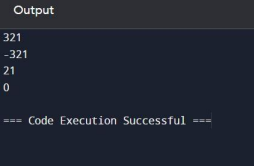
print(reverse(x))

x = 120

print(reverse(x))

x = 1534236469

print(reverse(x))



**RESULT:**

the program is executed successfully.

**QUESTION 8:**

Implement the myAtoi(string s) function, which converts a string to a 32-bit signed integer.

**CODE:**

def myAtoi(s: str) -> int:

INT\_MAX = 2\*\*31 - 1

INT\_MIN = -2\*\*31

s = s.strip()

if not s:

return 0

sign = 1

if s[0] in ('+', '-'):

sign = -1 if s[0] == '-' else 1

s = s[1:]

result = 0

for char in s:

if not char.isdigit():

break

result = result \* 10 + int(char)

if result > INT\_MAX:

return INT\_MAX if sign == 1 else INT\_MIN

return sign \* result

s1 = "42"

print(myAtoi(s1))

s2 = " -42"

print(myAtoi(s2))

s3 = "4193 with words"

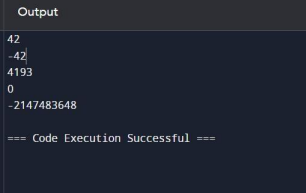
print(myAtoi(s3))

s4 = "words and 987"

print(myAtoi(s4))

s5 = "-91283472332"

print(myAtoi(s5))



**RESULT:**

the program is executed successfully.

**QUESTION 9:**

Given an integer x, return true if x is a palindrome, and false otherwise.

**CODE:**

def isPalindrome(x: int) -> bool:

str\_x = str(x)

return str\_x == str\_x[::-1]

x1 = 121

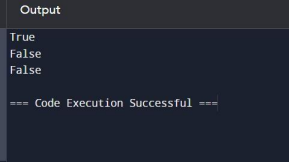
print(isPalindrome(x1))

x2 = -121

print(isPalindrome(x2))

x3 = 10

print(isPalindrome(x3))



**RESULT:**

the program is executed successfully.

**QUESTION 10:**

Given an input string s and a pattern p, implement regular expression matching with support for '.' and '\*' where: ● '.' Matches any single character. ● '\*' Matches zero or more of the preceding element. The matching should cover the entire input string (not partial).

**CODE:**

def isMatch(s: str, p: str) -> bool:

m, n = len(s), len(p)

dp = [[False] \* (n + 1) for \_ in range(m + 1)]

dp[0][0] = True

for j in range(1, n + 1):

if p[j - 1] == '\*':

dp[0][j] = dp[0][j - 2]

for i in range(1, m + 1):

for j in range(1, n + 1):

if p[j - 1] == '.' or p[j - 1] == s[i - 1]:

dp[i][j] = dp[i - 1][j - 1]

elif p[j - 1] == '\*':

dp[i][j] = dp[i][j - 2] or (dp[i - 1][j] and (p[j - 2] == s[i - 1] or p[j - 2] == '.')) return dp[m][n]

s1 = "aa"

p1 = "a"

print(isMatch(s1, p1))

s2 = "aa"

p2 = "a\*"

print(isMatch(s2, p2))

s3 = "ab"

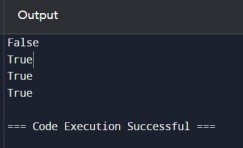
p3 = ".\*"

print(isMatch(s3, p3))

s4 = "aab"

p4 = "c\*a\*b"

print(isMatch(s4, p4))



**RESULT:**

the program is executed successfully.

11. Container With Most Water

You are given an integer array height of length n. There are n vertical lines drawn such that the

two endpoints of the ith line are (i, 0) and (i, height[i]).

Find two lines that together with the x-axis form a container, such that the container contains the

most water.

Return *the maximum amount of water a container can*

*store*.Notice that you may not slant the container.

**CODE:**

def maxArea(A, Len) :

area = 0

for i in range(Len) :

for j in range(i + 1, Len) :

# Calculating the max area

area = max(area, min(A[j], A[i]) \* (j - i))

return area

# Driver codea

= [ 1, 5, 4, 3 ]

b = [ 3, 1, 2, 4, 5 ]

len1 = len(a)

print(maxArea(a, len1))

len2 = len(b)

print(maxArea(b, len2))

**OUTPUT**:



12. Roman numerals are represented by seven different symbols: I, V, X, L, C, D andM. Symbol ValueI

1

V 5

X 10

L 50

C 100

D 500

M 1000

For example, 2 is written as II in Roman numeral, just two one's added together. 12 is written as

XII, which is simply X + II. The number 27 is written as XXVII, which is XX + V + II. Roman numerals are usually written largest to smallest from left to right. However, thenumeral for four is not IIII. Instead, the number four is written as IV. Because the one is beforethe five

we subtract it making four. The same principle applies to the number nine, which is written as

IX. There are six instances where subtraction is used:

● I can be placed before V (5) and X (10) to make 4 and 9.

● X can be placed before L (50) and C (100) to make 40 and 90.

● C can be placed before D (500) and M (1000) to make 400 and 900. Given an integer, convert it to a roman numeral.

**CODE:**

def value(r):if

(r == 'I'):

return 1

if (r == 'V'):

return 5

if (r == 'X'):

return 10

if (r == 'L'):

return 50

if (r == 'C'):

return 100 if

(r == 'D'):

return 500

if (r == 'M'):

return 1000

return -1

def romanToDecimal(str):

res = 0

i = 0

while (i < len(str)):

# Getting value of symbol s[i]s1

= value(str[i])

if (i + 1 < len(str)):

# Getting value of symbol s[i + 1]s2 = value(str[i + 1])

# Comparing both valuesif

(s1 >= s2):

# Value of current symbol is greater# or equal to the next symbol

res = res + s1i

= i + 1

else:

# Value of current symbol is greater# or equal to the next symbol

res = res + s2 - s1i =

i + 2

else:

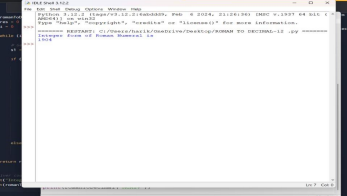
res = res + s1i

= i + 1 return

res

# Driver code

print("Integer form of Roman Numeral is"), print(romanToDecimal("MCMIV")) **OUTPUT:**



13. Roman to Integer

Roman numerals are represented by seven different symbols: I, V, X, L, C, D and M. Symbol Value

I 1

V 5

X 10

L 50

C 100

D 500

M 1000

For example, 2 is written as II in Roman numeral, just two ones added together. 12 is written as

XII, which is simply X + II. The number 27 is written as XXVII, which is XX + V + II. Roman numerals are usually written largest to smallest from left to right. However, thenumeral for four is not IIII. Instead, the number four is written as IV. Because the one is beforethe five

we subtract it making four. The same principle applies to the number nine, which is written as

IX. There are six instances where subtraction is used:

● I can be placed before V (5) and X (10) to make 4 and 9.

● X can be placed before L (50) and C (100) to make 40 and 90.

● C can be placed before D (500) and M (1000) to make 400 and 900.

**CODE:**

roman = {'I':1,'V':5,'X':10,'L':50,'C':100,'D':500,'M':1000}

class Solution:

def romanToInt(self, S: str) -> int:

summ= 0

for i in range(len(S)-1,-1,-1):

num = roman[S[i]]if

3\*num < summ:

summ = summ-num

else:

summ = summ+num

return sum

**OUTPUT:**



14. Longest Common Prefix

Write a function to find the longest common prefix string amongst an array of strings.If there is no common prefix, return an empty string ""

**CODE:**

def longestCommonPrefix( a):

size = len(a)

# if size is 0, return empty stringif

(size == 0):

return ""

if (size == 1):

return a[0]

# sort the array of strings

a.sort()

# find the minimum length from#

first and last string

end = min(len(a[0]), len(a[size - 1]))#

find the common prefix between

# the first and last stringi

= 0

while (i < end and a[0][i]

== a[size - 1][i]):

i += 1

pre = a[0][0: i]

return pre

# Driver Code

if name == " main ":

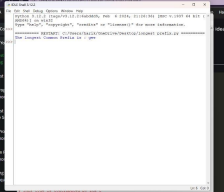
input = ["geeksforgeeks", "geeks",

"geek", "geezer"]

print("The longest Common Prefix is :" ,

longestCommonPrefix(inp)

**OUTPUT:**



15. 3Sum

Given an integer array nums, return all the triplets [nums[i], nums[j], nums[k]] such that i != j, i

!= k, and j != k, and nums[i] + nums[j] + nums[k] == 0.

Notice that the solution set must not contain duplicate triplets. Example 1:

Input: nums = [-1,0,1,2,-1,-4]

Output: [[-1,-1,2],[-1,0,1]]

Explanation:

nums[0] + nums[1] + nums[2] = (-1) + 0 + 1 = 0.

nums[1] + nums[2] + nums[4] = 0 + 1 + (-1) = 0.

nums[0] + nums[3] + nums[4] = (-1) + 2 + (-1) = 0.

The distinct triplets are [-1,0,1] and [-1,-1,2].

Notice that the order of the output and the order of the triplets does not matter.

**CODE:**

def findTriplets(nums, n, Sum):i = 0

j = 0

k = 0

# list to store all unique triplets. triplet = []

# list to store already found triplets# to avoid duplication. uniqTriplets = [] # Variable used to hold triplet# converted to string form. temp = ""

# Variable used to store current # triplet which is stored in vector# if it is unique.

newTriplet = [0, 0, 0]#

Sort the input array.

nums.sort()

# Iterate over the array from the# start and consider it as the

# first element.

for i in range(n - 2):

# index of the first element in# the remaining elements.

j = i + 1

# index of the last element.k = n - 1

while(j < k):

# If sum of triplet is equal to

# given value, then check if #

this triplet is unique or not.

# To check uniqueness, convert#

triplet to string form and

# then check if this string is#

present in set or not. If

# triplet is unique, then store#

it in list.

if(nums[i] + nums[j] + nums[k] == Sum):

temp = str(nums[i]) + ":" + str(nums[j]) + ":" + str(nums[k])if temp not in uniqTriplets:

uniqTriplets.append(temp)

newTriplet[0] = nums[i]

newTriplet[1] = nums[j]

newTriplet[2] = nums[k]

triplet.append(newTriplet)

newTriplet = [0, 0, 0]

# Increment the first index#

and decrement the last

# index of remaining elements.j

+= 1

k -= 1

# If sum is greater than given#

value then to reduce sum

# decrement the last index.

elif(nums[i] + nums[j] + nums[k] > Sum):k -= 1

# If sum is less than given value #

then to increase sum increment

# the first index of remaining# elements.

else:

j += 1

# If no unique triplet is found, then# return 0.

if(len(triplet) == 0):

return 0

# Print all unique triplets stored in# list.

for i in range(len(triplet)):

print(triplet[i], end = ", ")

return 1

# Driver Code

nums = [12, 3, 6, 1, 6, 9]

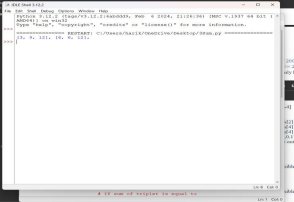
n = len(nums)

Sum = 24

# Function call

if(not findTriplets(nums, n, Sum)): print("No triplets can be formed”)

**OUTPUT:**



16. 3Sum Closest

Given an integer array nums of length n and an integer target, find three integers in nums such

that the sum is closest to target.

Return *the sum of the three integers*.

You may assume that each input would have exactly one solution. **CODE:**

import sys

# Function to return the sum of a#

triplet which is closest to x

def solution(arr, x):

# To store the closest sum

closestSum = sys.maxsize

# Run three nested loops each loop#

for each element of triplet

for i in range (len(arr)) :

for j in range(i + 1, len(arr)): for

k in range(j + 1, len( arr)):

# Update the closestSum

if(abs(x - closestSum) >

abs(x - (arr[i] +

arr[j] + arr[k]))):

closestSum = (arr[i] +

arr[j] + arr[k])

# Return the closest sum found

return closestSum

# Driver code

if name == " main ":

arr = [ -1, 2, 1, -4 ]

x = 1

print(solution(arr, x))

17. Letter Combinations of a Phone Number

Given a string containing digits from 2-9 inclusive, return all possible letter combinations that

the number could represent. Return the answer in any order.

A mapping of digits to letters (just like on the telephone buttons) is given below. Note that 1

does not map to any letters.

**CODE:**

# Python3 implementation of the approach

from collections import deque

# Function to return a list that contains#

all the generated letter combinations

def letterCombinationsUtil(number, n, table):

list = []

q = deque()

q.append("")

while len(q) != 0:

s = q.pop()

# If complete word is generated#

push it in the list

if len(s) == n:

list.append(s)

else:

# Try all possible letters for current digit# in

number[]

for letter in table[number[len(s)]]:

q.append(s + letter)

# Return the generated list

return list

# Function that creates the mapping and# calls letterCombinationsUtil

def letterCombinations(number, n):

# table[i] stores all characters that#

corresponds to ith digit in phone

table = ["0", "1", "abc", "def", "ghi", "jkl", "mno", "pqrs", "tuv", "wxyz"]

list = letterCombinationsUtil(number, n, table)

s = ""

for word in list:

s += word + " "

print(s)

return

# Driver code

number = [2, 3]n

= len(number)

# Function call

letterCombinations(number, n)

**OUTPUT:**

18. 4Sum

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 <= a, b, c, d < n

● a, b, c, and d are distinct.

● nums[a] + nums[b] + nums[c] + nums[d] == target

**CODE:**

# Store the pair of indices

class Pair:

def init (self, x, y):

self.index1 = x

self.index2 = y

# Function to find the all the unique quadruplets#

with the elements at different indices

def GetQuadruplets(nums, target):

# Store the sum mapped to a list of pair indices

map = {}

# Generate all possible pairs for the map

for i in range(len(nums) - 1):

for j in range(i + 1, len(nums)):

# Find the sum of pairs of elements

sum = nums[i] + nums[j]

# If the sum doesn't exist then update with the new pairs

if sum not in map:

map[sum] = [Pair(i, j)]

# Otherwise, add the new pair of indices to the current sum

else:

map[sum].append(Pair(i, j))

# Store all the Quadruplets

ans = set()

for i in range(len(nums) - 1):

for j in range(i + 1, len(nums)):

lookUp = target - (nums[i] + nums[j])

# If the sum with value (K - sum) existsif

lookUp in map:

# Get the pair of indices of sum

temp = map[lookUp]

for pair in temp:

# Check if i, j, k and l are distinct or not

if pair.index1 != i and pair.index1 != j and pair.index2 != i and pair.index2 != j:l1 = [nums[pair.index1], nums[pair.index2], nums[i], nums[j]]

# Sort the list to avoid duplicacy

l1.sort()

# Update the set

ans.add(tuple(l1))

# Print all the Quadruplets

print(\*reversed(list(ans)), sep = '\n')

# Driver Code

arr = [1, 0, -1, 0, -2, 2]

K = 0

GetQuadruplets(arr, K)

19. Remove Nth Node From End of List

Given the head of a linked list, remove the nth node from the end of the list and return its head.

CODE:

# Python code for the deleting a node from end#

in two traversal

class Node:

def init (self, value):

self.data = value self.next

= None

def length(head):

temp = head

count = 0

while(temp != None):

count += 1

temp = temp.next

return count

def printList(head):

ptr = head while(ptr

!= None):

print (ptr.data, end =" ")

ptr = ptr.next

print()

def deleteNthNodeFromEnd(head, n): Length = length(head)

nodeFromBeginning = Length - n + 1prev = None

temp = head

for i in range(1, nodeFromBeginning): prev = temp

temp = temp.next

if(prev == None):

head = head.next

return head

else:

prev.next = prev.next.next

return head

if name == ' main ':

head = Node(1) head.next

= Node(2) head.next.next =

Node(3)

head.next.next.next = Node(4)

head.next.next.next.next = Node(5)

print("Linked List before Deletion:")

printList(head)

head = deleteNthNodeFromEnd(head, 4)

print("Linked List after Deletion:")

printList(head)

OUTPUT:



20. Valid Parentheses

Given a string s containing just the characters '(', ')', '{', '}', '[' and ']', determine if the input string

is valid.

An input string is valid if:

1. Open brackets must be closed by the same type of brackets.

2. Open brackets must be closed in the correct order.

3. Every close bracket has a corresponding open bracket of the same type.

CODE:

def areBracketsBalanced(expr):

stack = []

# Traversing the Expressionfor

char in expr:

if char in ["(", "{", "["]:

# Push the element in the stack

stack.append(char)

else:

# IF current character is not opening#

bracket, then it must be closing.

# So stack cannot be empty at this point.if

not stack:

return False

current\_char = stack.pop()if

current\_char == '(':

if char != ")":

return False

if current\_char == '{':if

char != "}":

return False

if current\_char == '[':if

char != "]":

return False

# Check Empty Stackif

stack:

return False

return True

# Driver Code

if name == " main ":

expr = "{()}[]"

# Function call

if areBracketsBalanced(expr):

print("Balanced")

else:

print("Not Balanced")