**ASSIGNMENT - 2**

**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 code

a = [ 1, 5, 4, 3 ]

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

len1 = len(a)

print(maxArea(a, len1))

len2 = len(b)

print(maxArea(b, len2))

**12. 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 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, the**

**numeral**

**for four is not IIII. Instead, the number four is written as IV. Because the one is before**

**the 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 values

if (s1 >= s2):

# Value of current symbol is greater

# or equal to the next symbol

res = res + s1

i = i + 1

else:

# Value of current symbol is greater

# or equal to the next symbol

res = res + s2 - s1

i = i + 2

else:

res = res + s1

i = i + 1

return res

# Driver code

print("Integer form of Roman Numeral is"),

print(romanToDecimal("MCMIV"))

**13. Roman to Integer**

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

**Symbol Value**

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**V 5**

**X 10**

**L 50**

**C 100**

**D 500**

**M 1000**

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**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= 0for 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

**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 string

if (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 string

i = 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)

**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.")

**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 closestSumif(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)

**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) exists**

**if 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 setans.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 = Nonedef 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 + 1

prev = 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)

**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 Expression

for 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 Stack

if stack:

return False

return True

# Driver Codeif \_\_name\_\_ == "\_\_main\_\_":

expr = "{()}[]"

# Function call

if areBracketsBalanced(expr):

print("Balanced")

else:

print("Not Balanced")