ASSIGNMENT – 2 DAA0666

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))
```

OUTPUT:

12. Roman numerals are represented by seven different symbols: I, V, X, L, C, D and I2
V 4
X 4

M.
Symbol Value
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:

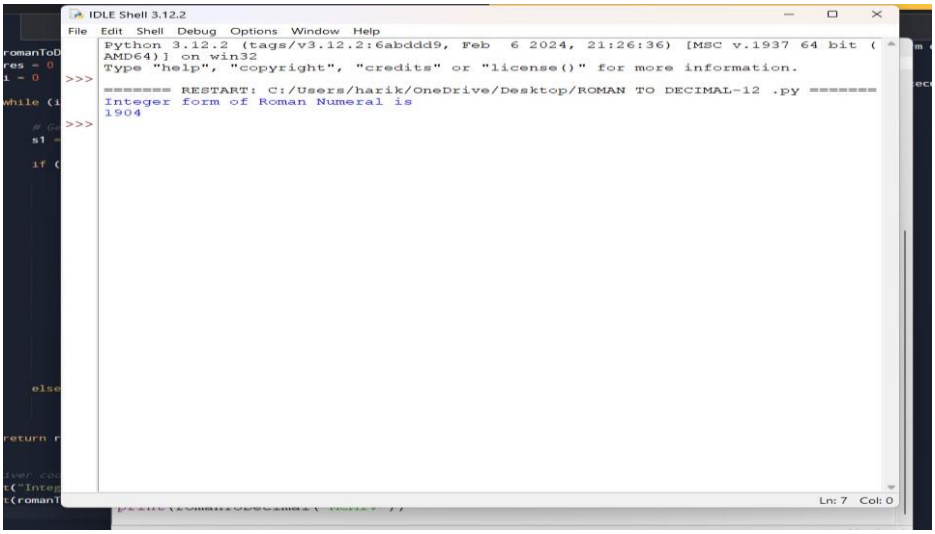
- **I can be placed before V (5) and X (10) to make 4 and 9.**
- **X can be placed before L (50) and C (100) to make 40 and 90.**
- **C can be placed before D (500) and M (1000) to make 400 and 900. Given an integer, convert it to a roman numeral.**

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
romanToDe
cimal(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"))
```

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

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XII, which is simply X + II. The number 27 is written as XXVII, which is XX + V + II.

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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= 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

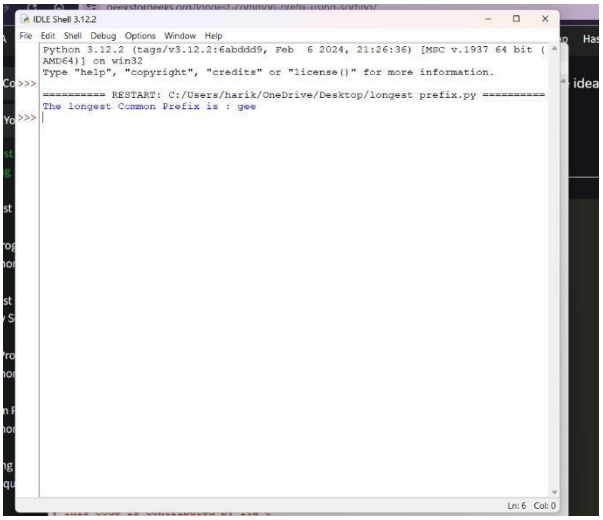
Write a function to find the longest common prefix string amongst an array of strings. If there is no common prefix, return an empty string ""

CODE:

```
def longestCommonPrefix( a):

size = len(a)

# if size is 0, return empty 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)
```

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:

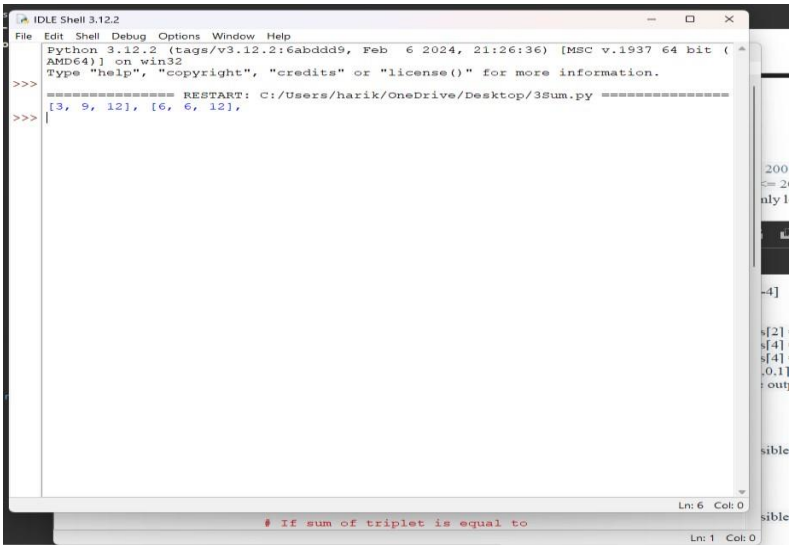
Input: nums = [-1,0,1,2,-1,-4] Output:
[[-1,-1,2],[-1,0,1]] Explanation:
nums[0] + nums[1] + nums[2] = (-1) + 0 + 1 = 0. nums[1]
+ nums[2] + nums[4] = 0 + 1 + (-1) = 0. nums[0] +
nums[3] + nums[4] = (-1) + 2 + (-1) = 0.
The distinct triplets are [-1,0,1] and [-1,-1,2].
Notice that the order of the output 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*.

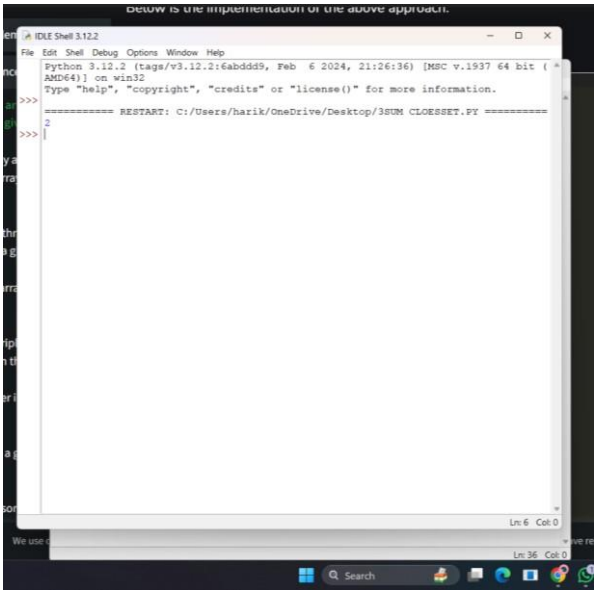
You may assume that each input would have exactly one solution.

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))
```

output:



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:

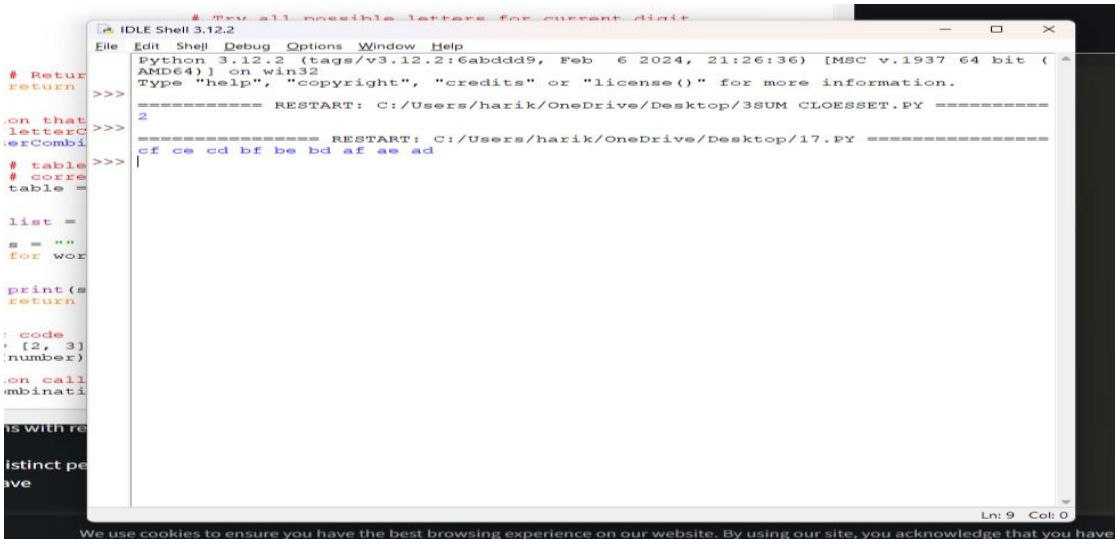
```
# Python3 implementation of the approach from

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) 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 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)
```

OUTPUT:

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 + 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)
```

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 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 Code

if __name__ == "__main__":

expr = "{()}[]"

Function call if

areBracketsBalanced(expr):

print("Balanced") else:

print("Not Balanced")

OUTPUT: