DATE:7-6-24

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

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 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)):
s1 = value(str[i])
if (i + 1 < len(str)):
s2 = value(str[i + 1])
if (s1 >= s2):
res = res + s1
i = i + 1
else:
res = res + s2 - s1
i = i + 2
else:
res = res + s1
i = i + 1
return res

print("Integer form of Roman Numeral is"),
print(romanToDecimal("MCMIV"))
```

OUTPUT:

13. Roman to Integer

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Symbol Value

I 1

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= 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

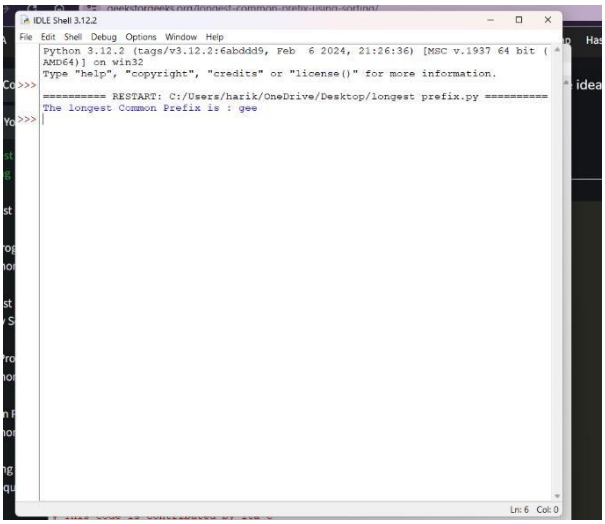
Write a function to find the longest common prefix string amongst an array of strings. If there is no common prefix, return an empty string ""

CODE:

```
def longestCommonPrefix( a):

size = len(a)

if (size == 0):
return ""

if (size == 1):
return a[0]

a.sort()

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

```
i = 0
while (i < end and
a[0][i] == a[size - 1][i]):
i += 1

pre = a[0][0: i]
return pre

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.

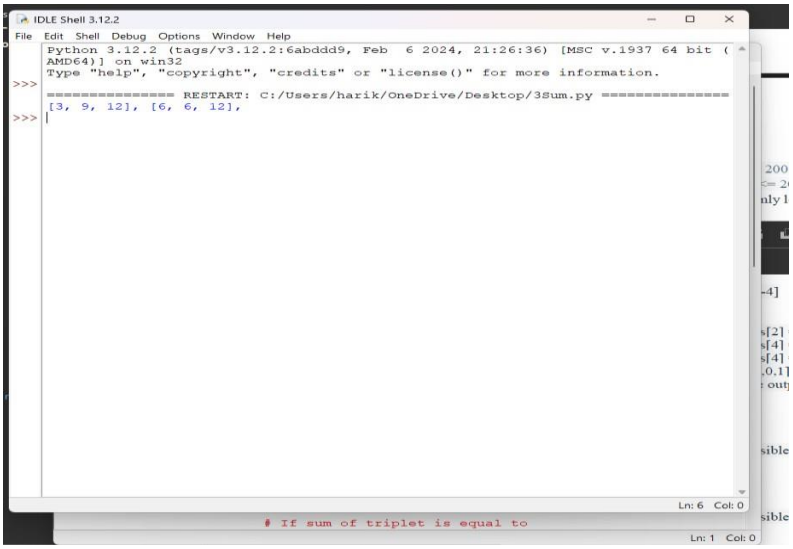
CODE:

```
def findTriplets(nums, n, Sum):
i = 0
j = 0
k = 0
triplet = []
uniqTriplets = []
temp = ""
newTriplet = [0, 0, 0]
nums.sort()

for i in range(n - 2):
j = i + 1
k = n - 1


while(j < k):
```

```
  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]

j += 1
  k -= 1

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

```
else:
  j += 1
  if(len(triplet) == 0):
  return 0
  for i in range(len(triplet)):
  print(triplet[i], end = ", ")
  return 1
nums = [12, 3, 6, 1, 6, 9]
  n = len(nums)
  Sum = 24
if(not findTriplets(nums, n, Sum)):
print("No triplets can be formed.")
```

output:



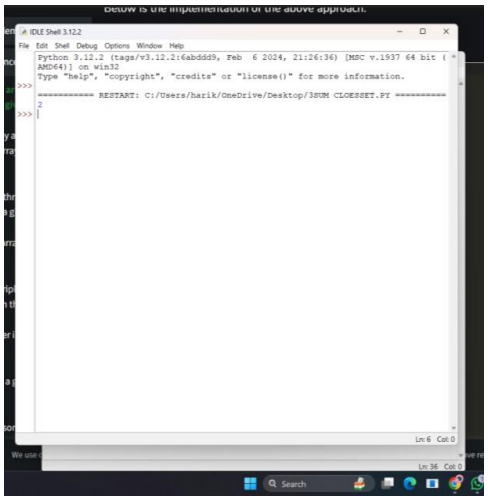
16. 3Sum Closest

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

def solution(arr, x):

closestSum = sys.maxsize


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

  if(abs(x - closestSum) >
  abs(x - (arr[i] +
  arr[j] + arr[k]))):
  closestSum = (arr[i] +
  arr[j] + arr[k])

return closestSum

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.

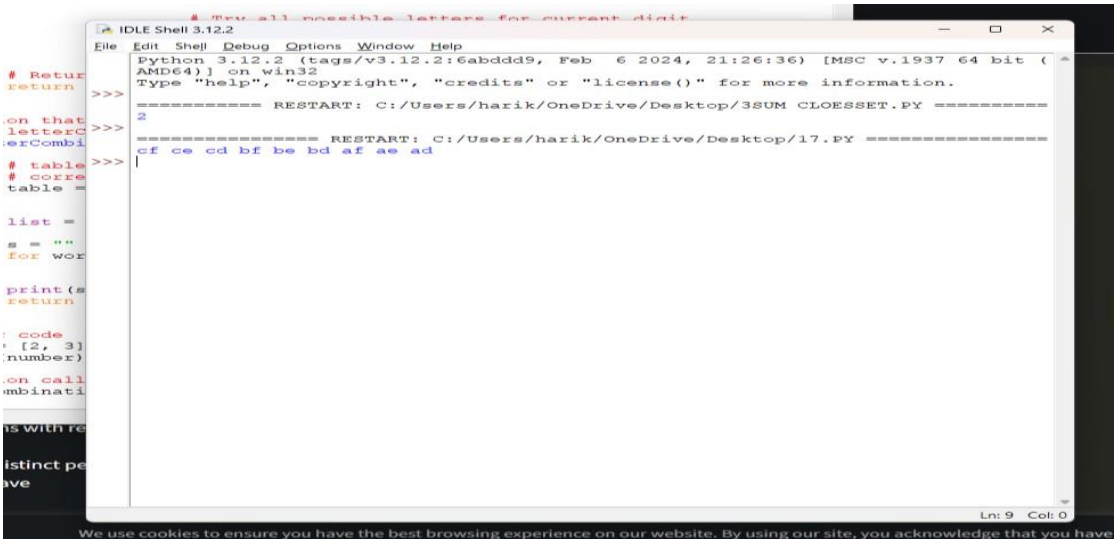
A mapping of digits to letters (just like on the telephone buttons) is given below. Note that 1
does not map to any letters.

CODE:

```
from collections import deque
def letterCombinationsUtil(number, n, table):
        list = []
        q = deque()
        q.append("")

        while len(q) != 0:
                s = q.pop()

                if len(s) == n:
                        list.append(s)
                else:

                        for letter in table[number[len(s)]]:
                                q.append(s + letter)


 def letterCombinations(number, n):

        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


number = [2, 3]
n = len(number)

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:

```
class Pair:
def __init__(self, x, y):
self.index1 = x
self.index2 = y

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])
lookUp in map:
  temp = map[lookUp]

  for pair in temp:
  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]]
l1.sort()
  ans.add(tuple(l1))
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

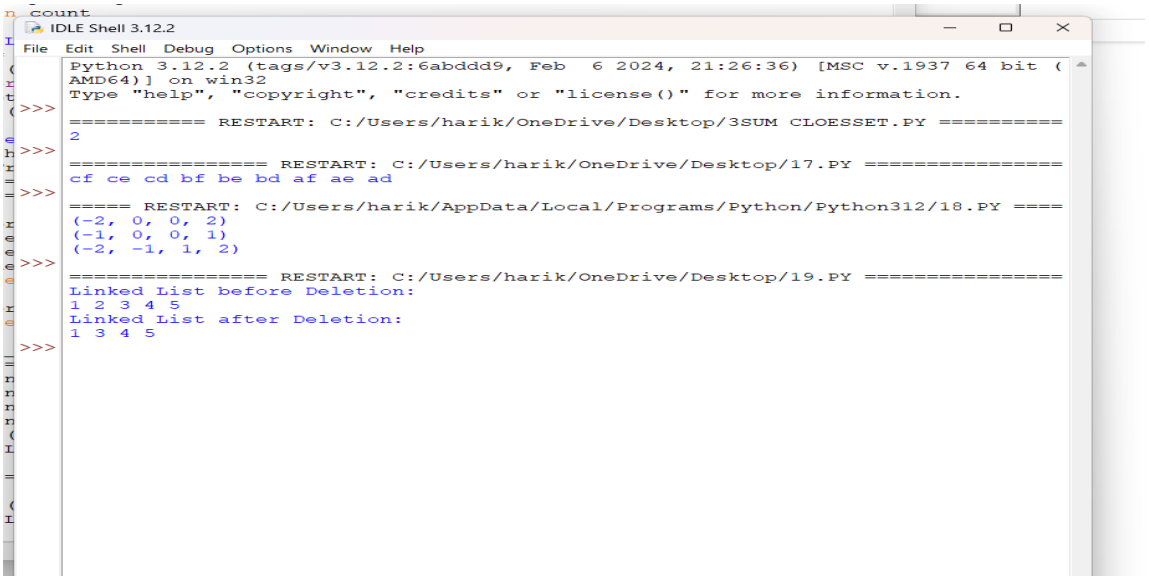
Given the head of a linked list, remove the nth node from the end of the list and return its head.

CODE:

```
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 = []
for char in expr:
if char in ["(", "{", "["]:
stack.append(char)
else:
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
if stack:
return False
return True

if _name___== "_main_":
expr = "{()}[]"

# Function call
if areBracketsBalanced(expr):
print("Balanced")
else:
print("Not Balanced")
```

OUTPUT: