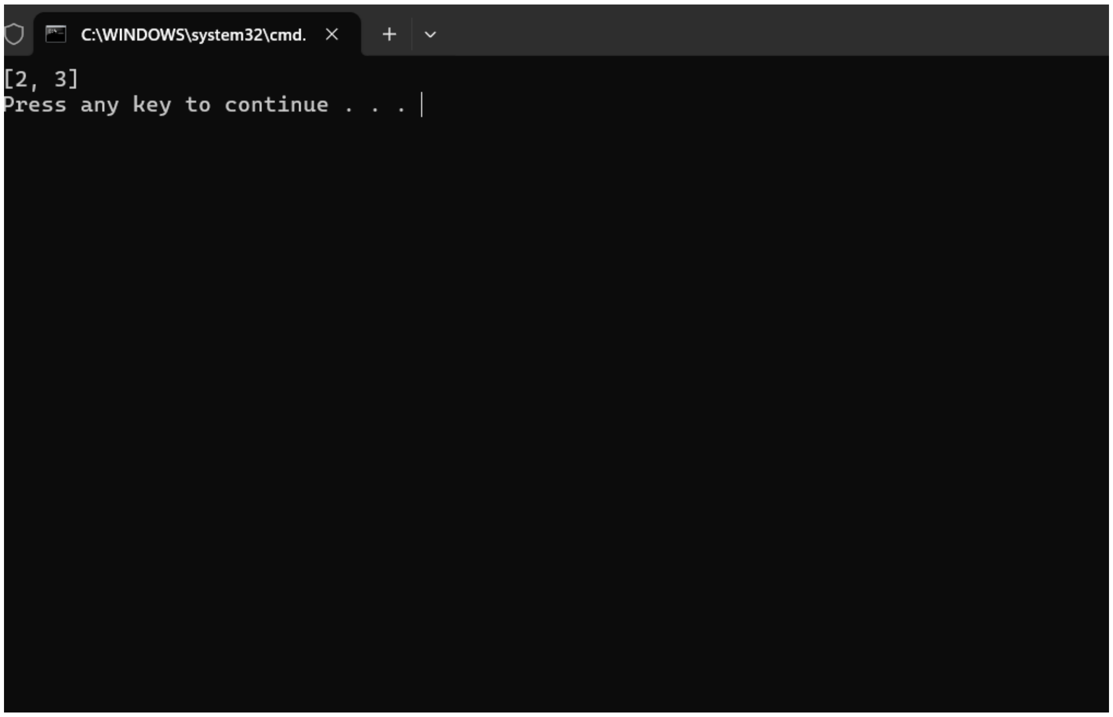
1) Two sum

CODE:

```python
def two_sum(nums, target):
    temp= {}
    for i in range(len(nums)):
        complement = target - nums[i]
        if complement in temp:
            return [temp[complement], i]
        temp[nums[i]] = i
    return None

nums = [2, 7, 11, 15]
target = 26
result = two_sum(nums, target)
   print(result)
```

OUTPUT:

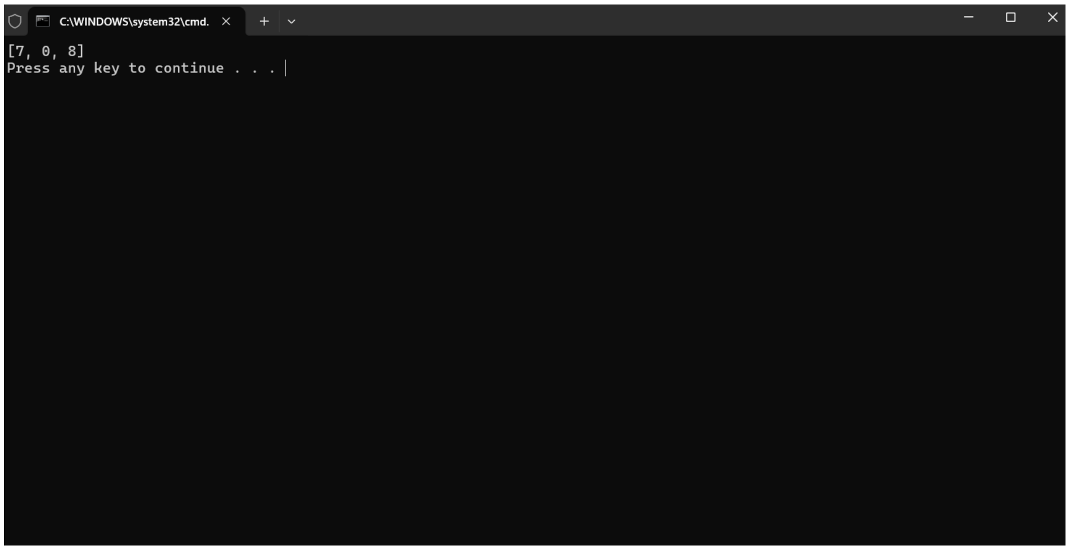


```
[2, 3]
Press any key to continue . . .
```

2)Add two numbers:

CODE:

```python
def add(a,b):
    a.reverse()
    b.reverse()
    anum=int(''.join(map(str,a)))
    bnum=int(''.join(map(str,b)))
    c=[]
    d=anum+bnum
    while d>0:
        r=d%10
        c.append(r)
        d=d//10
    return c
a=[2,4,3]
b=[5,6,4]
print(add(a,b))
```
OUTPUT:



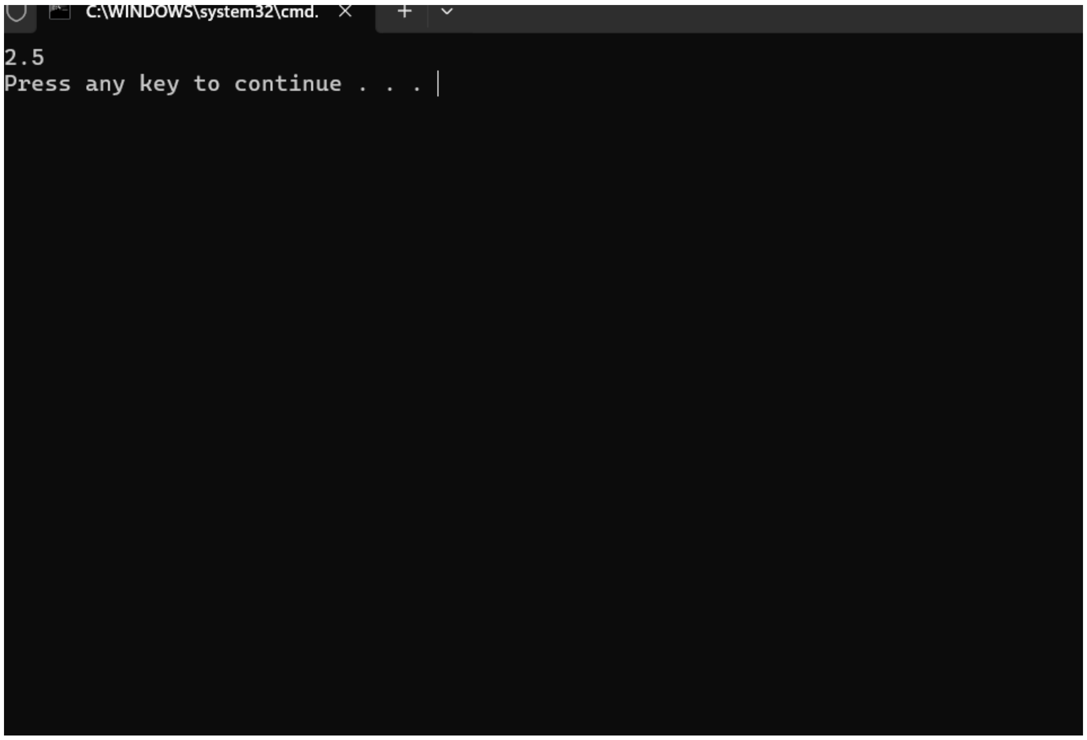
```
[7, 0, 8]
Press any key to continue . . .
```

3)Median of 2 sorted arrays:

CODE:

```
def median(nums1, nums2):
    merged = sorted(nums1 + nums2)
    n = len(merged)
    if n % 2 == 0:
        return (merged[n // 2 - 1] + merged[n // 2]) / 2
    else:
        return merged[n // 2]
nums1 = [1, 2]
nums2 = [3,4]
print(median(nums1, nums2))
```

OUTPUT:



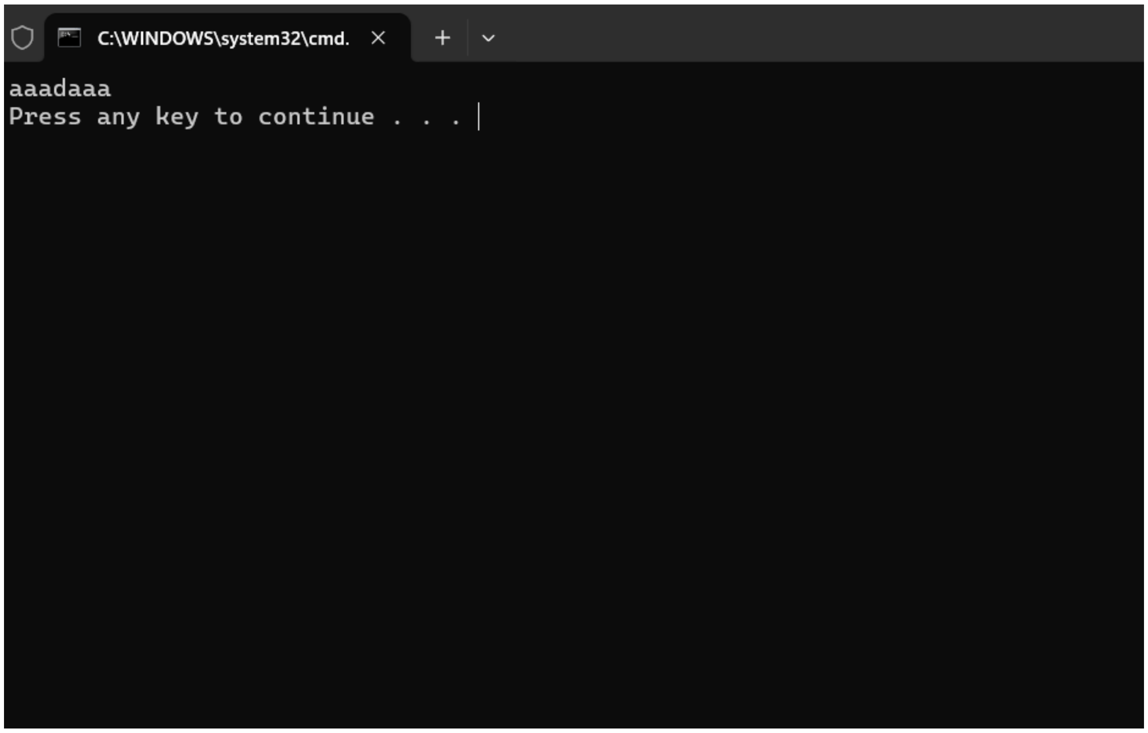
```
2.5
Press any key to continue . . .
```

4)Longest substring palindrome:

CODE:

```python
def palin(s):
    maxpalin=""
    for i in range(len(s)):
        for j in range(i,len(s)):
            substr=s[i:j+1]
            if substr==substr[::-1] and len(substr)>len(maxpalin):
                maxpalin=substr
    return maxpalin
string="babaaadaaa"
print(palin(string))
```

OUTPUT:



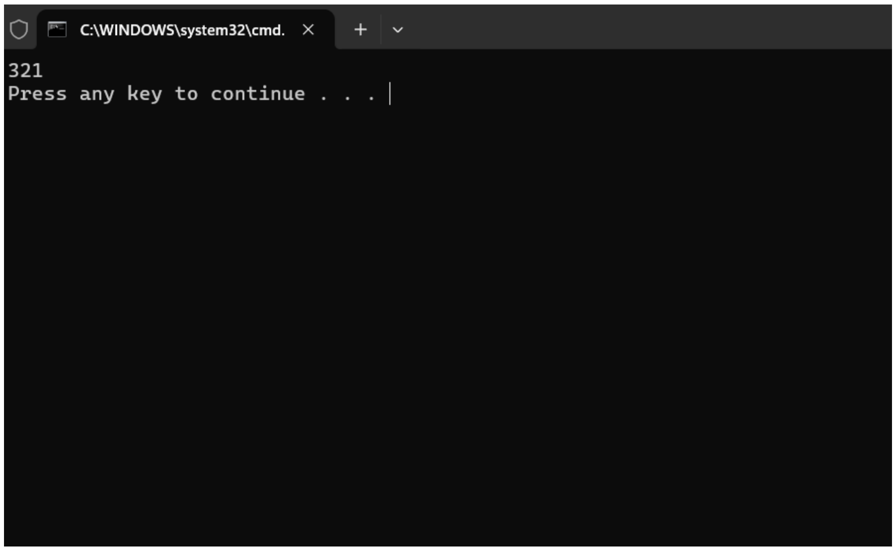
```
aaadaaa
Press any key to continue . . .
```

5)Reverse a number:

CODE:

```
def rev(num):
    n=0
    while num>0:
        r=num%10
        n=(n*10)+r
        num=num//10
    return n
a=123
print(rev(a))
```

OUTPUT:



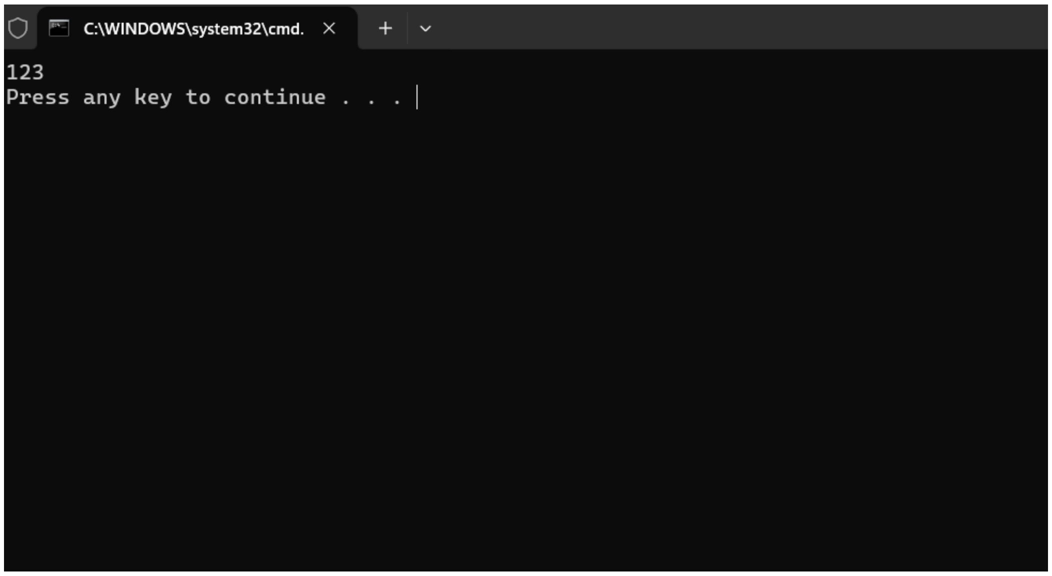
```
C:\WINDOWS\system32\cmd.
321
Press any key to continue . . .
```

6) String to int:

CODE:

```
def string(str):
    return int(str)
a="123"
print(string(a))
```

OUTPUT:



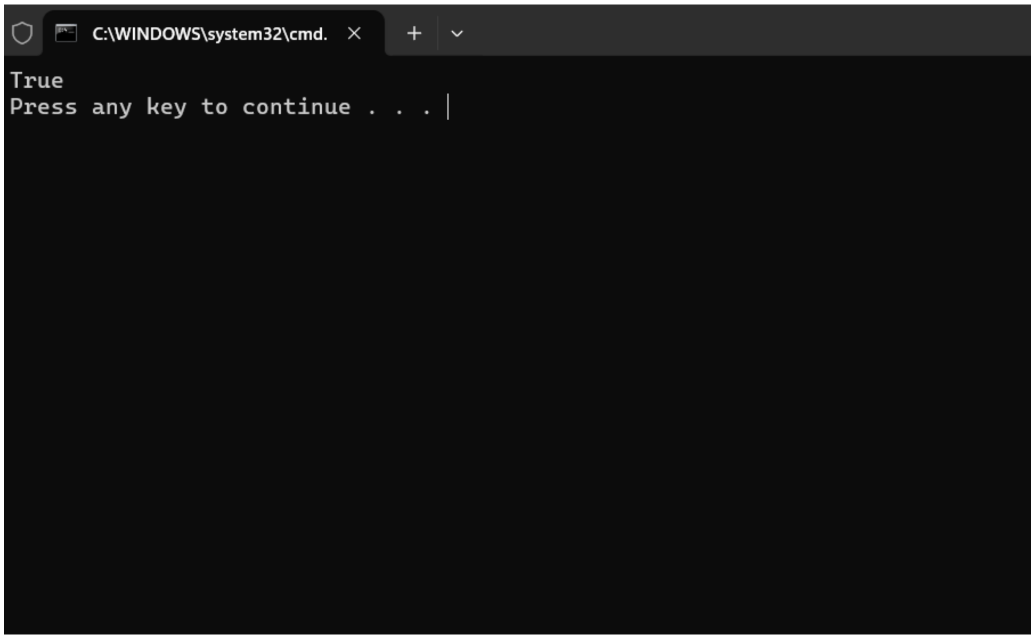
```
C:\WINDOWS\system32\cmd.
123
Press any key to continue . . .
```

7)Palindrome or not number:

CODE:

```
def rev(num):
    og=num
    n=0
    while num>0:
        r=num%10
        n=(n*10)+r
        num=num//10
    if n==og:
        return True
    else:
        return False
a=121
print(rev(a))
```

OUTPUT:



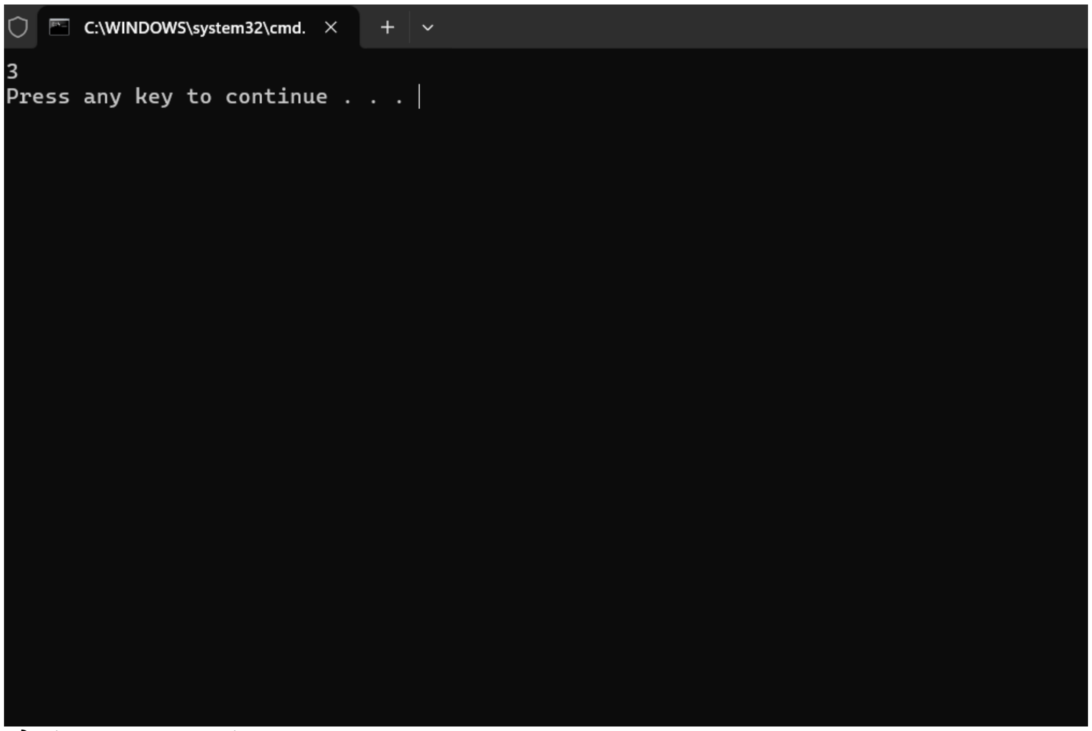
```
True
Press any key to continue . . .
```

8) Longest substring withouy repeating chars:

CODE:

```
def length_of_longest_substring(s):
    char_index = {}
    start = 0
    max_length = 0

    for end in range(len(s)):
        if s[end] in char_index:
            start = max(start, char_index[s[end]] + 1)

        char_index[s[end]] = end
        max_length = max(max_length, end - start + 1)

    return max_length

s = "pwwkew"
print(length_of_longest_substring(s))
```

OUTPUT:

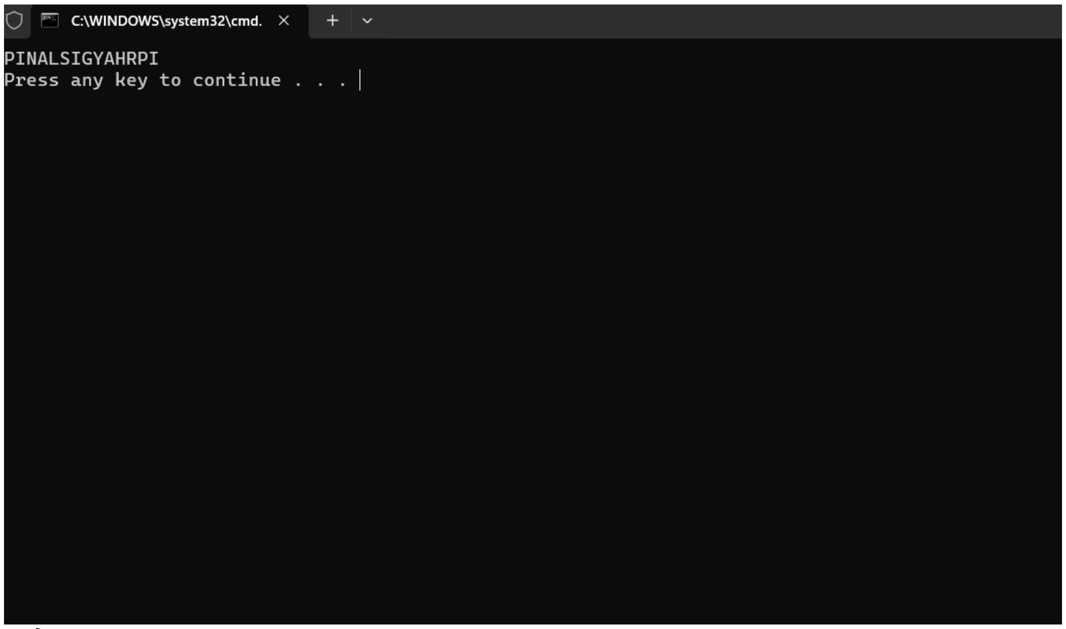


```
3
Press any key to continue . . .
```

9)Zigzag coversion:
CODE:

```
def convert(s, numRows):
    if numRows == 1 or numRows >= len(s):
        return s

    rows = [''] * numRows
    index, step = 0, 1

    for char in s:
        rows[index] += char
        if index == 0:
            step = 1
        elif index == numRows - 1:
            step = -1
        index += step

    return ''.join(rows)

a="PAYPALISHIRING"
b=4
print(convert(a,b))
```

OUTPUT:



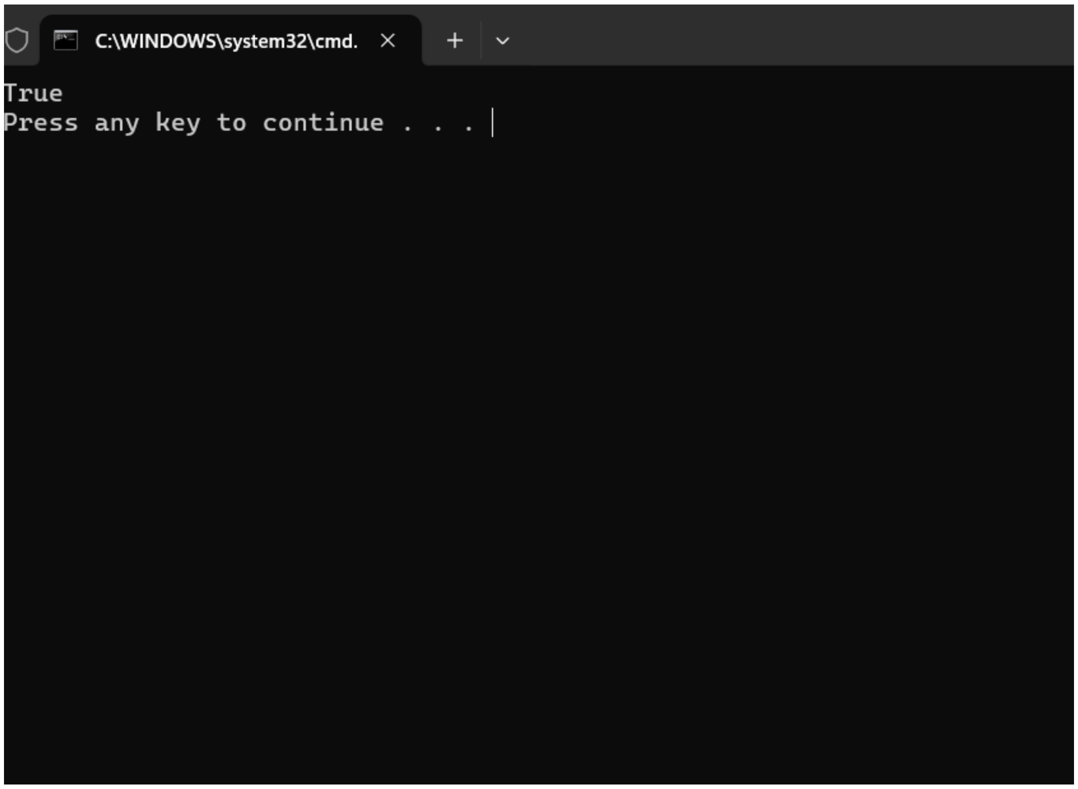
```
PINALSIGYAHRPI
Press any key to continue . . .
```

10)Regular Expression matching:

CODE:

```python
import re

def is_match(s, p):
    pattern = re.compile(p)
    return bool(pattern.fullmatch(s))

s = "ab"
p = ".*"
print(is_match(s, p))
```

OUTPUT:



```
True
Press any key to continue . . .
```

DATE:4-6-24

ASSIGNMENT - 2

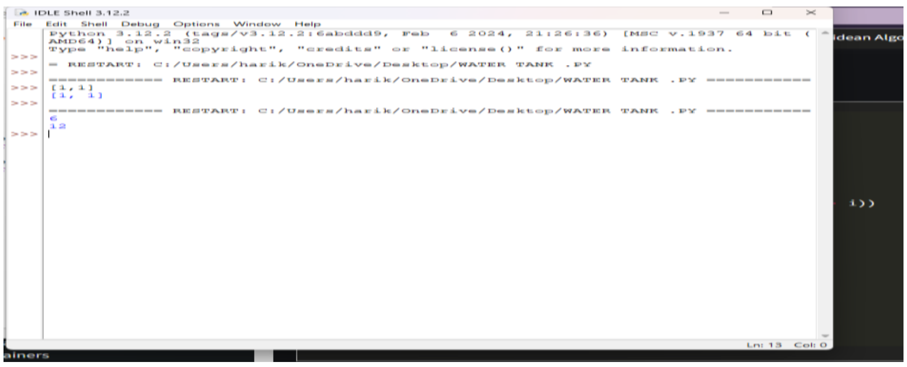
11. Container With Most Water

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) :

# 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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
= RESTART: C:/Users/harik/OneDrive/Desktop/WATER TANK .PY
>>>
============ RESTART: C:/Users/harik/OneDrive/Desktop/WATER TANK .PY ===========
>>> [1,1]
[1,  1]
>>>
============ RESTART: C:/Users/harik/OneDrive/Desktop/WATER TANK .PY ===========
6
12
>>> |
```

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.**

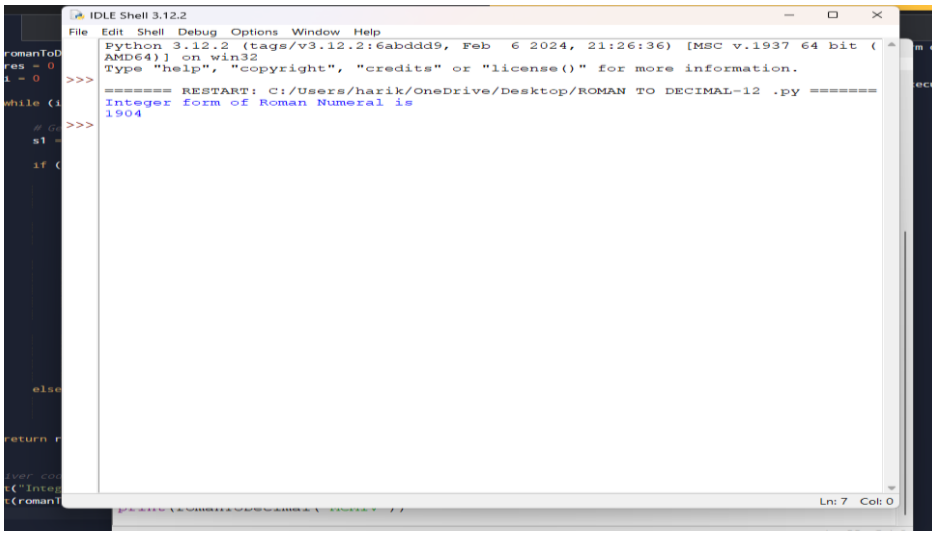
Given an integer, convert it to a roman numeral.

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"))
```

OUTPUT:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: C:/Users/harik/OneDrive/Desktop/ROMAN TO DECIMAL-12 .py =======
Integer form of Roman Numeral is
1904
>>>
```

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, 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:

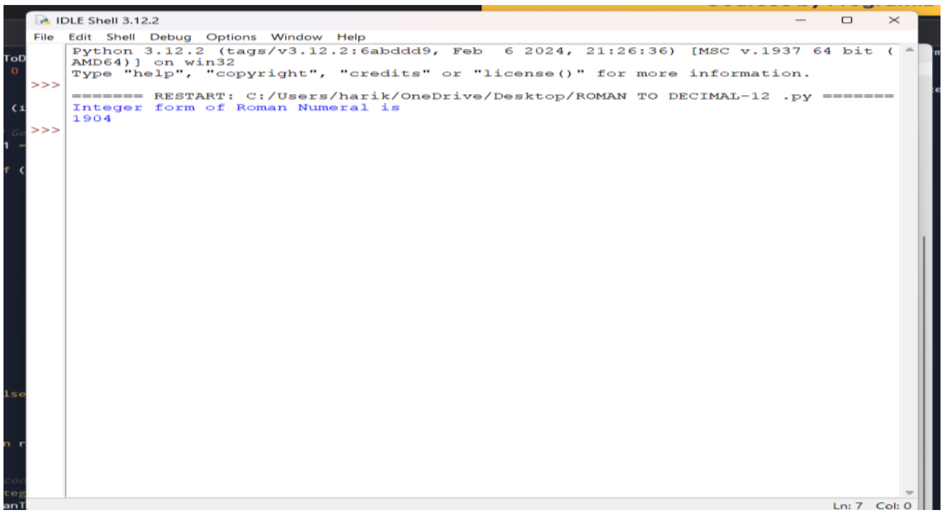
- **I can be placed before V (5) and X (10) to make 4 and 9.**
- **X can be placed before L (50) and C (100) to make 40 and 90.**
- **C can be placed before D (500) and M (1000) to make 400 and 900.**

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:



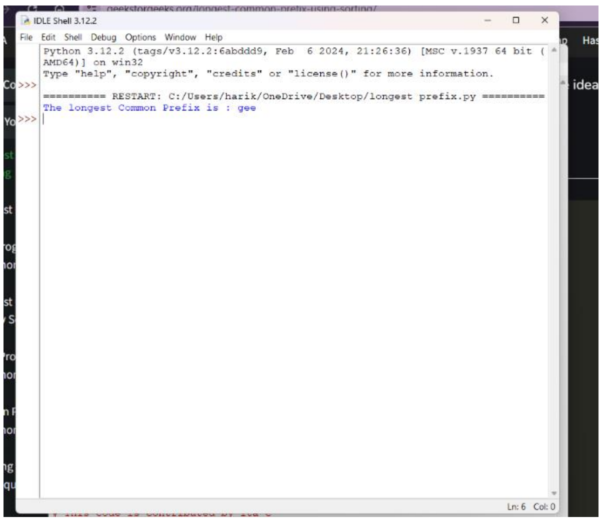
```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
======= RESTART: C:/Users/harik/OneDrive/Desktop/ROMAN TO DECIMAL-12 .py =======
Integer form of Roman Numeral is
1904
>>>
```

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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:/Users/harik/OneDrive/Desktop/longest prefix.py ==========
The longest Common Prefix is : gee
>>>
```

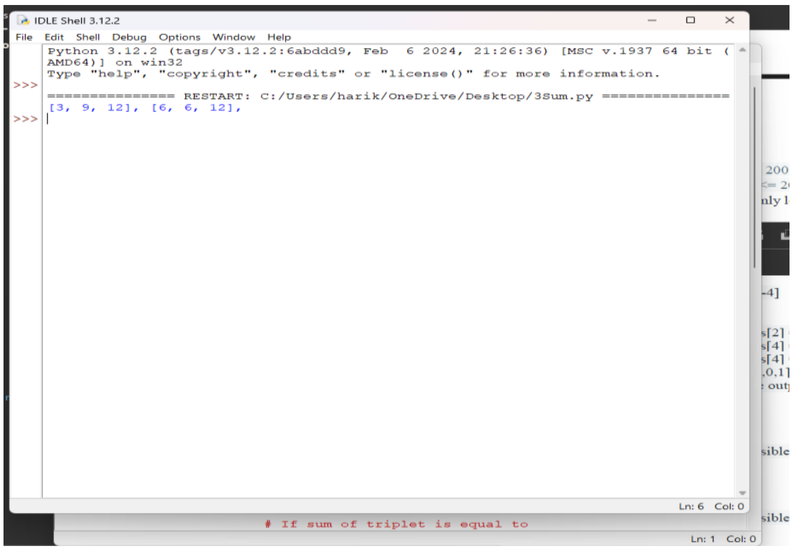
15. 3Sum

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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=============== RESTART: C:/Users/harik/OneDrive/Desktop/3Sum.py ===============
[3, 9, 12], [6, 6, 12],
>>>
```

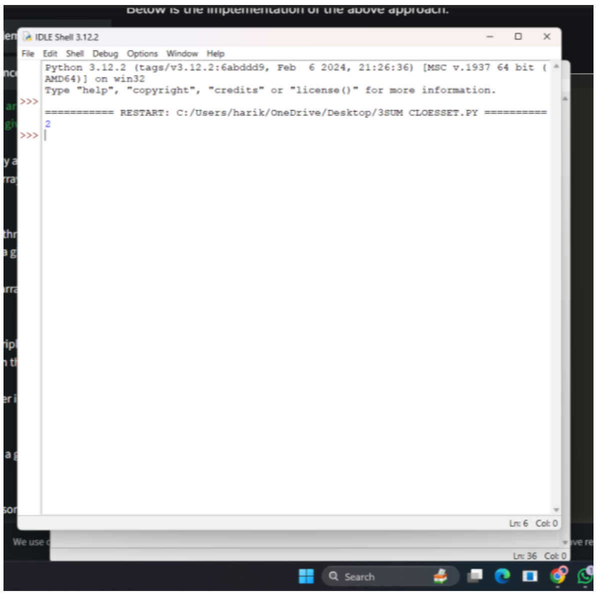
16. 3Sum Closest
Given an integer array nums of length n and an integer target, find three integers in nums such
that the sum is closest to target.
Return *the sum of the three integers*.
You may assume that each input would have exactly one solution.

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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=========== RESTART: C:/Users/harik/OneDrive/Desktop/3SUM CLOESSET.PY ==========
2
>>> 
```

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.

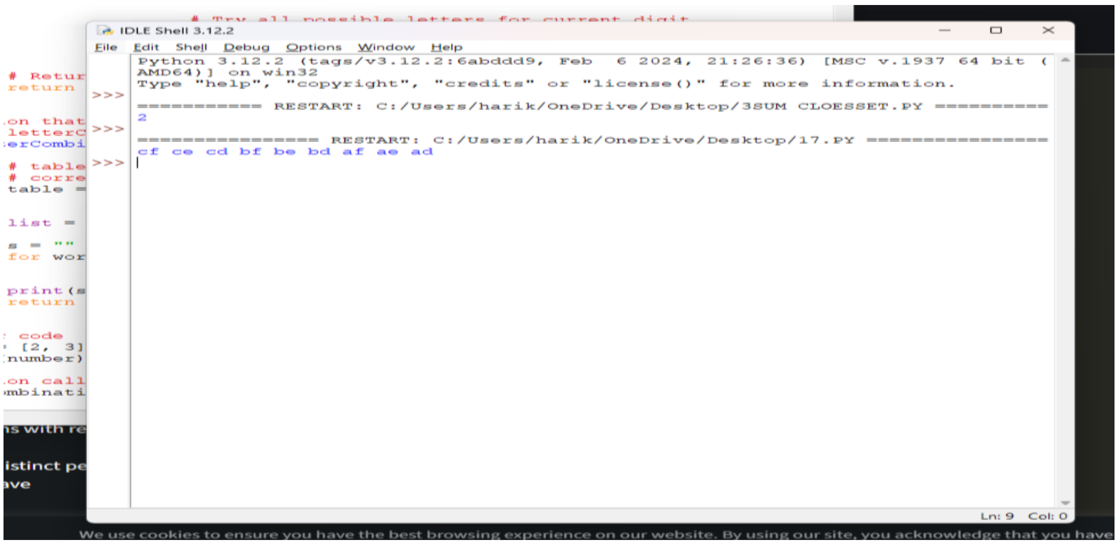
A mapping of digits to letters (just like on the telephone buttons) is given below. Note that 1
does not map to any letters.

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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> 
=========== RESTART: C:/Users/harik/OneDrive/Desktop/3SUM CLOESSET.PY ==========
2
>>> 
================= RESTART: C:/Users/harik/OneDrive/Desktop/17.PY ================
cf ce cd bf be bd af ae ad
>>> |
```

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**

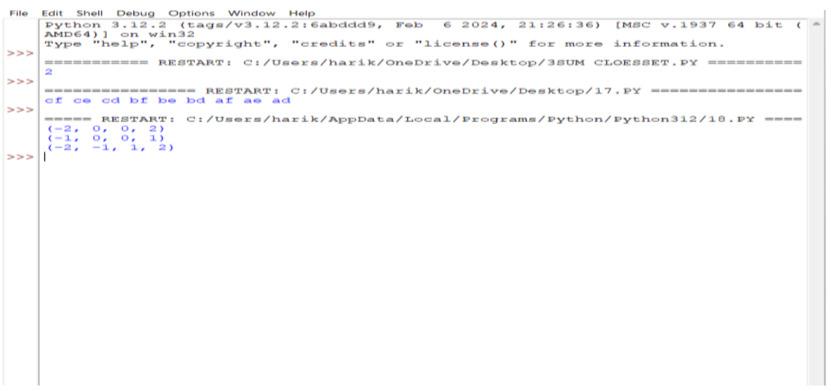
CODE:

```
# 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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=========== RESTART: C:/Users/harik/OneDrive/Desktop/3SUM CLOESSET.PY ==========
2
>>>
================ RESTART: C:/Users/harik/OneDrive/Desktop/17.PY ================
cf ce cd bf be bd af ae ad
>>>
===== RESTART: C:/Users/harik/AppData/Local/Programs/Python/Python312/18.PY ====
(-2, 0, 0, 2)
(-1, 0, 0, 1)
(-2, -1, 1, 2)
>>>
```

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.

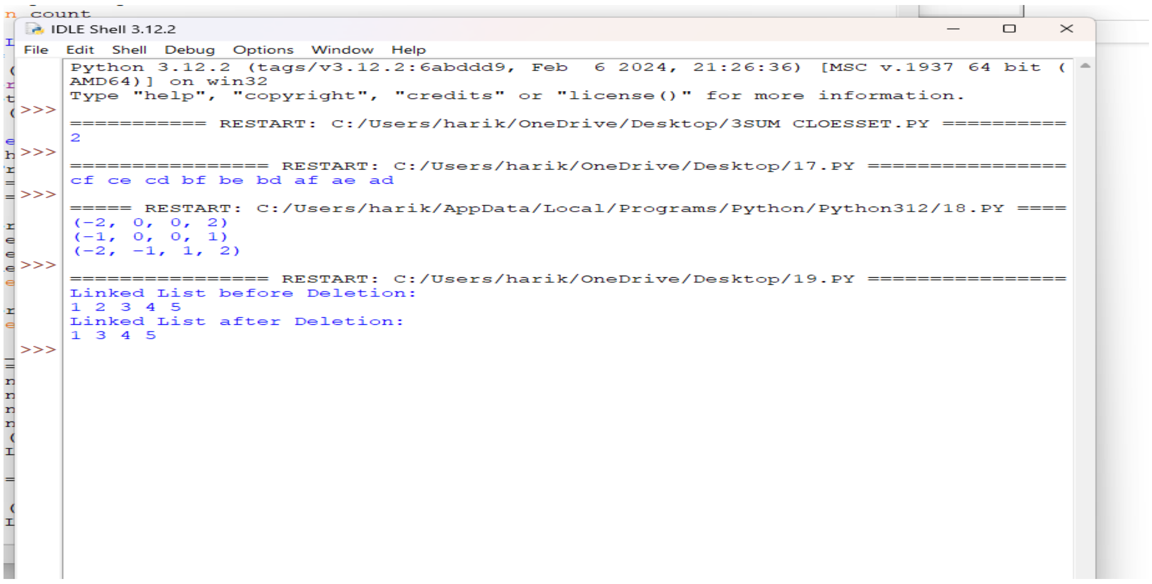
CODE:

```
# 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:



```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=========== RESTART: C:/Users/harik/OneDrive/Desktop/3SUM CLOESSET.PY ==========
2
>>>
================ RESTART: C:/Users/harik/OneDrive/Desktop/17.PY ================
cf ce cd bf be bd af ae ad
>>>
===== RESTART: C:/Users/harik/AppData/Local/Programs/Python/Python312/18.PY ====
(-2, 0, 0, 2)
(-1, 0, 0, 1)
(-2, -1, 1, 2)
>>>
================ RESTART: C:/Users/harik/OneDrive/Desktop/19.PY ================
Linked List before Deletion:
1 2 3 4 5
Linked List after Deletion:
1 3 4 5
>>>
```

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

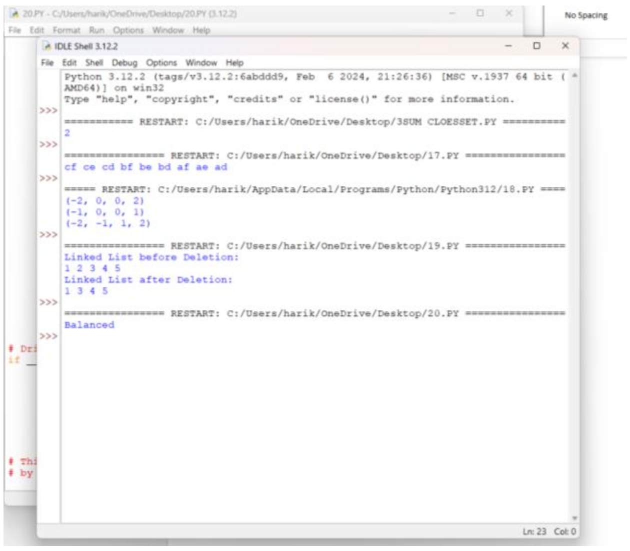
if areBracketsBalanced(expr):

print("Balanced")

else:

print("Not Balanced")

OUTPUT:


20.PY - C:/Users/harik/OneDrive/Desktop/20.PY (3.12.2)
File Edit Format Run Options Window Help
IDLE Shell 3.12.2
File Edit Shell Debug Options Window Help
No Spacing
Ln: 23 Col: 0

```
Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (
AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
=========== RESTART: C:/Users/harik/OneDrive/Desktop/3SUM CLOESSET.PY ==========
2
>>>
================ RESTART: C:/Users/harik/OneDrive/Desktop/17.PY ================
cf ce cd bf be bd af ae ad
>>>
===== RESTART: C:/Users/harik/AppData/Local/Programs/Python/Python312/18.PY ====
(-2, 0, 0, 2)
(-1, 0, 0, 1)
(-2, -1, 1, 2)
>>>
================ RESTART: C:/Users/harik/OneDrive/Desktop/19.PY ================
Linked List before Deletion:
1 2 3 4 5
Linked List after Deletion:
1 3 4 5
>>>
================ RESTART: C:/Users/harik/OneDrive/Desktop/20.PY ================
Balanced
>>>
```