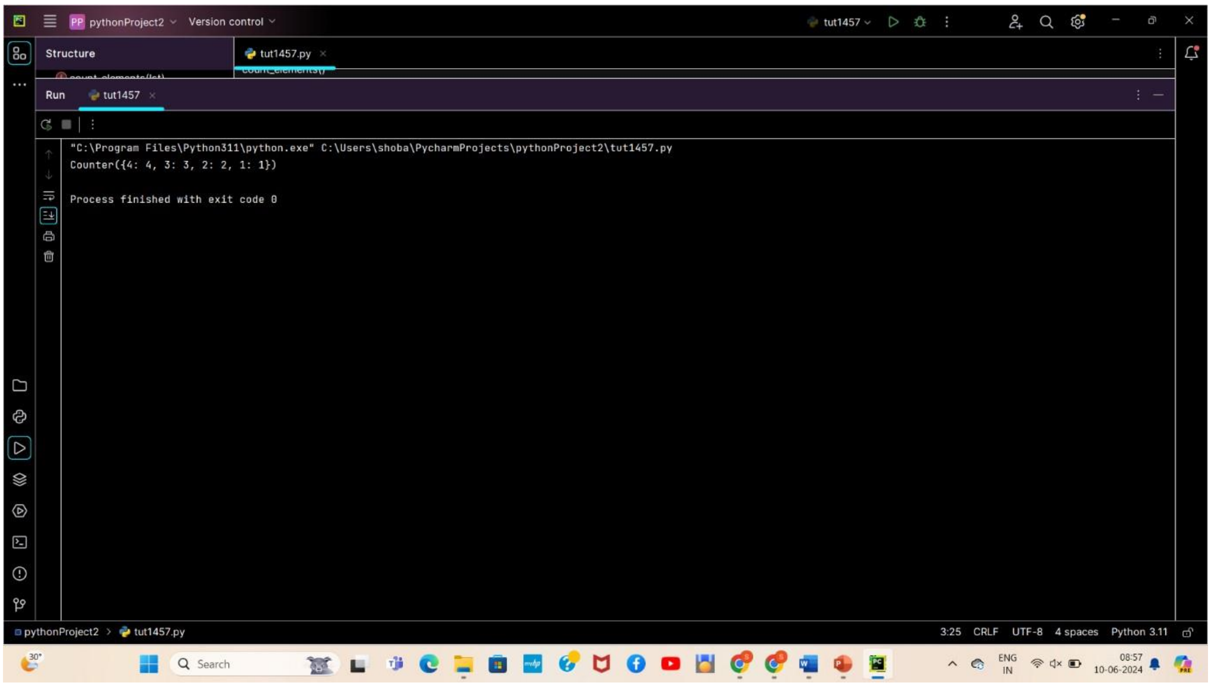
# Assignment 3

## 1. Counting Elements.

Program: -

```
from collections import Counter
 def
count_elements(lst):
return Counter(lst)

# Example usage:
elements = [1, 2, 2, 3, 3, 3, 4, 4, 4, 4]
element_counts = count_elements(elements)
print(element_counts)
```

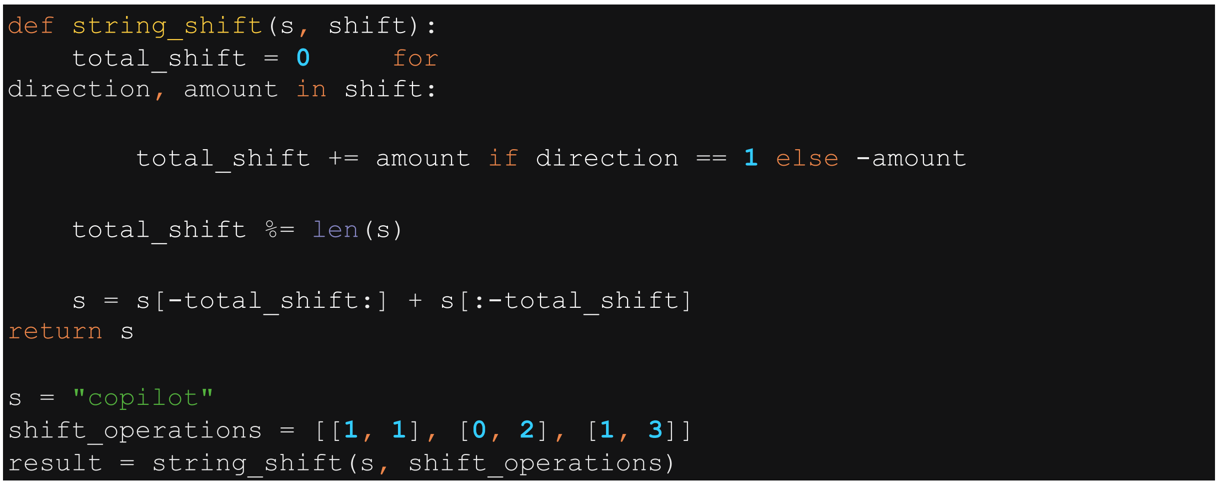
Output:



```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
Counter({4: 4, 3: 3, 2: 2, 1: 1})

Process finished with exit code 0
```

## 2. Performing String Shifting.

Program:



```
def string_shift(s, shift):
    total_shift = 0      for
direction, amount in shift:

        total_shift += amount if direction == 1 else -amount

    total_shift %= len(s)

    s = s[-total_shift:] + s[:-total_shift]
return s

s = "copilot"
shift_operations = [[1, 1], [0, 2], [1, 3]]
result = string_shift(s, shift_operations)
```

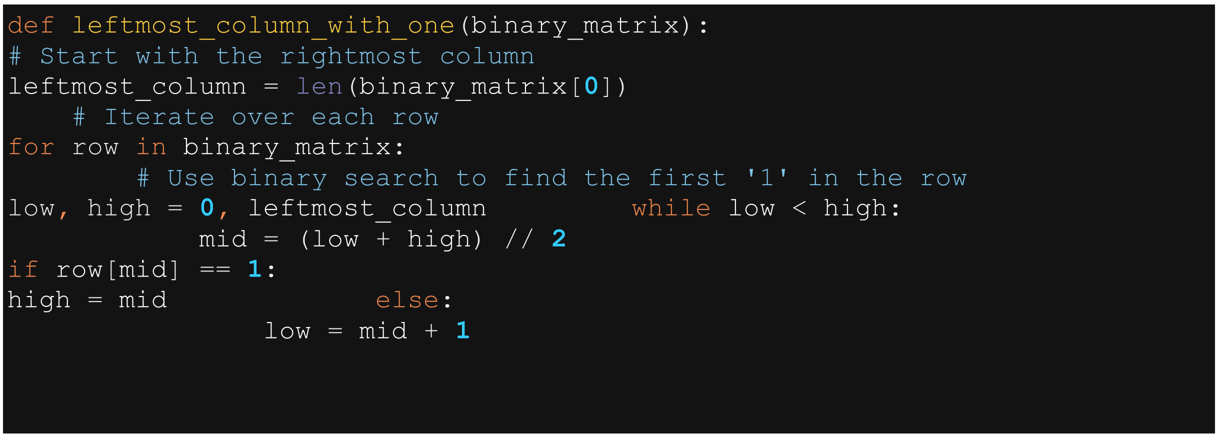
Output:

Copilot

[[1,1],[0,2],[1,3]]

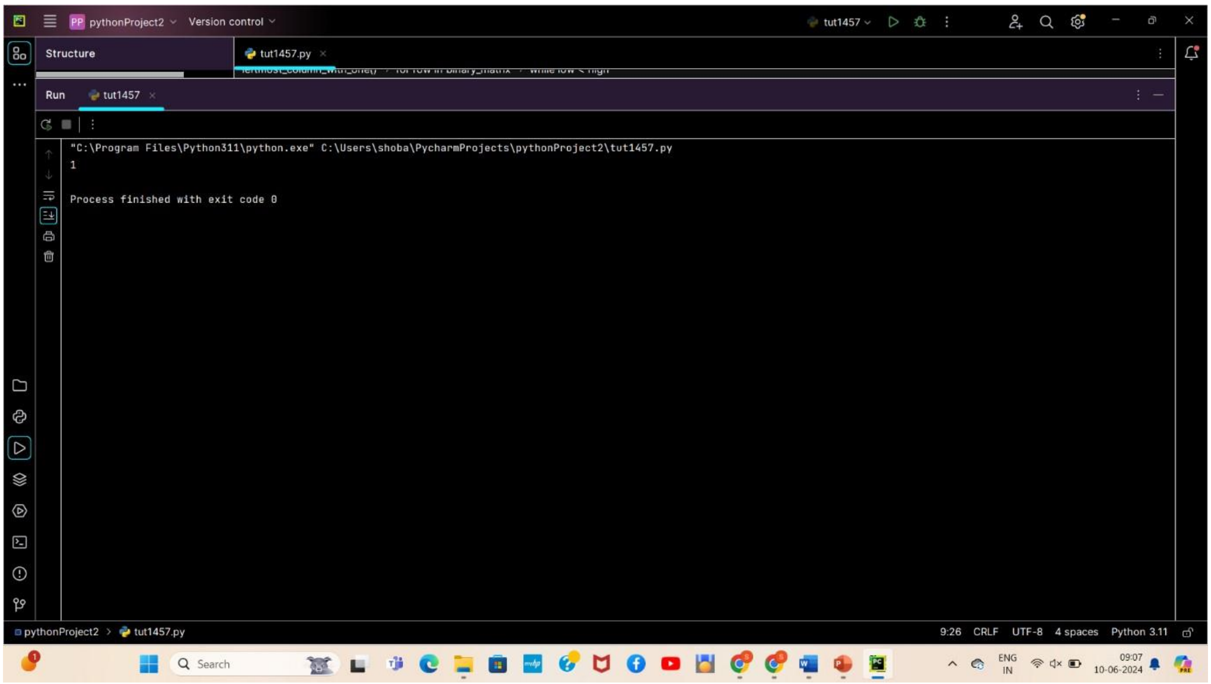
## 3. Leftmost Column with least a One.

Program:



```
def leftmost_column_with_one(binary_matrix):
# Start with the rightmost column
leftmost_column = len(binary_matrix[0])
    # Iterate over each row
for row in binary_matrix:
        # Use binary search to find the first '1' in the row
low, high = 0, leftmost_column         while low < high:
            mid = (low + high) // 2
if row[mid] == 1:
high = mid             else:
                low = mid + 1
        # Update the index of the leftmost column with '1'
leftmost_column = min(leftmost_column, high)

    # If we have not found any '1', return -1
    return -1 if leftmost_column == len(binary_matrix[0]) else
leftmost_column
  binary_matrix
= [      [0, 0,
0, 1],
    [0, 1, 1, 1],
    [0, 0, 1, 1],
    [0, 0, 0, 0]
]
print(leftmost_column_with_one(
    binary_matrix))  # Output will be 1, which is the index of the leftmost
column with at least a '1'
```

Output:



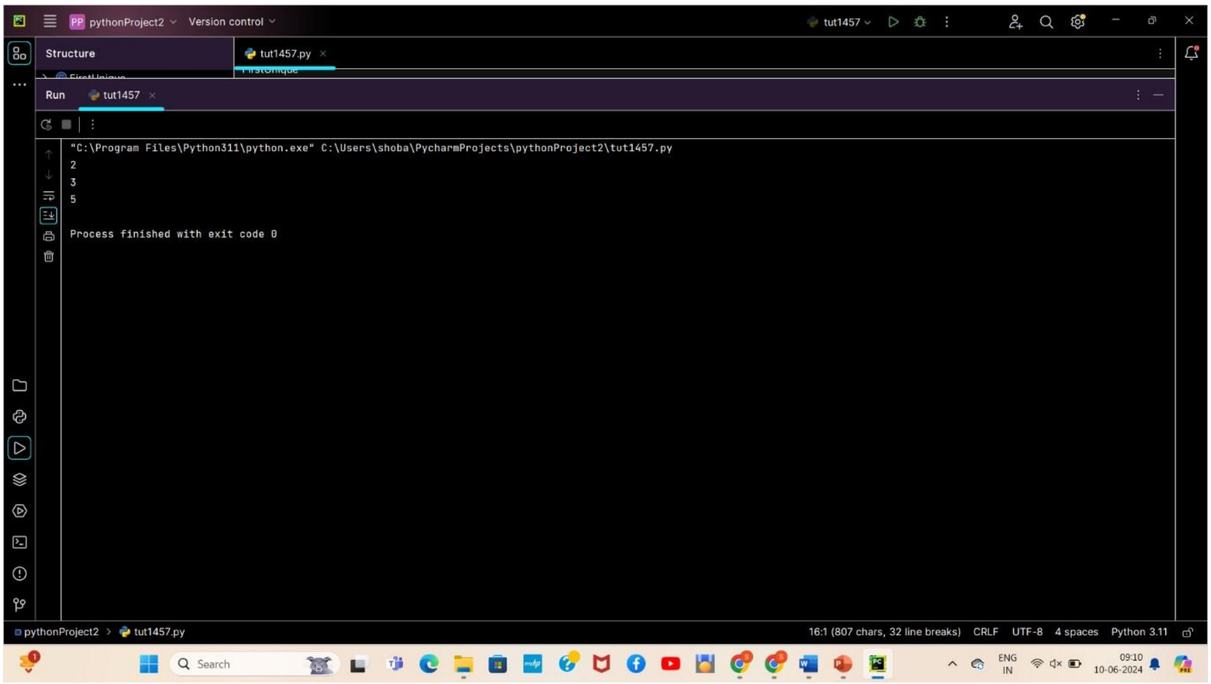
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
1

Process finished with exit code 0
```

## 4. First Unique Number.

Program:

```
from collections import OrderedDict
  class FirstUnique:      def
__init__(self, nums):
self.queue = OrderedDict()
self.is_unique = {}          for
num in nums:
self.add(num)
     def showFirstUnique(self):
for num in self.queue:
if self.is_unique[num]:
                return num
return -1
     def add(self, value):          if
value not in self.is_unique:
self.is_unique[value] = True
self.queue[value] = None          elif
self.is_unique[value]:
self.is_unique[value] = False
self.queue.pop(value)



# Example usage:
firstUnique = FirstUnique([2, 3, 5])
print(firstUnique.showFirstUnique())
firstUnique.add(2)
print(firstUnique.showFirstUnique())
firstUnique.add(3)
print(firstUnique.showFirstUnique())
```

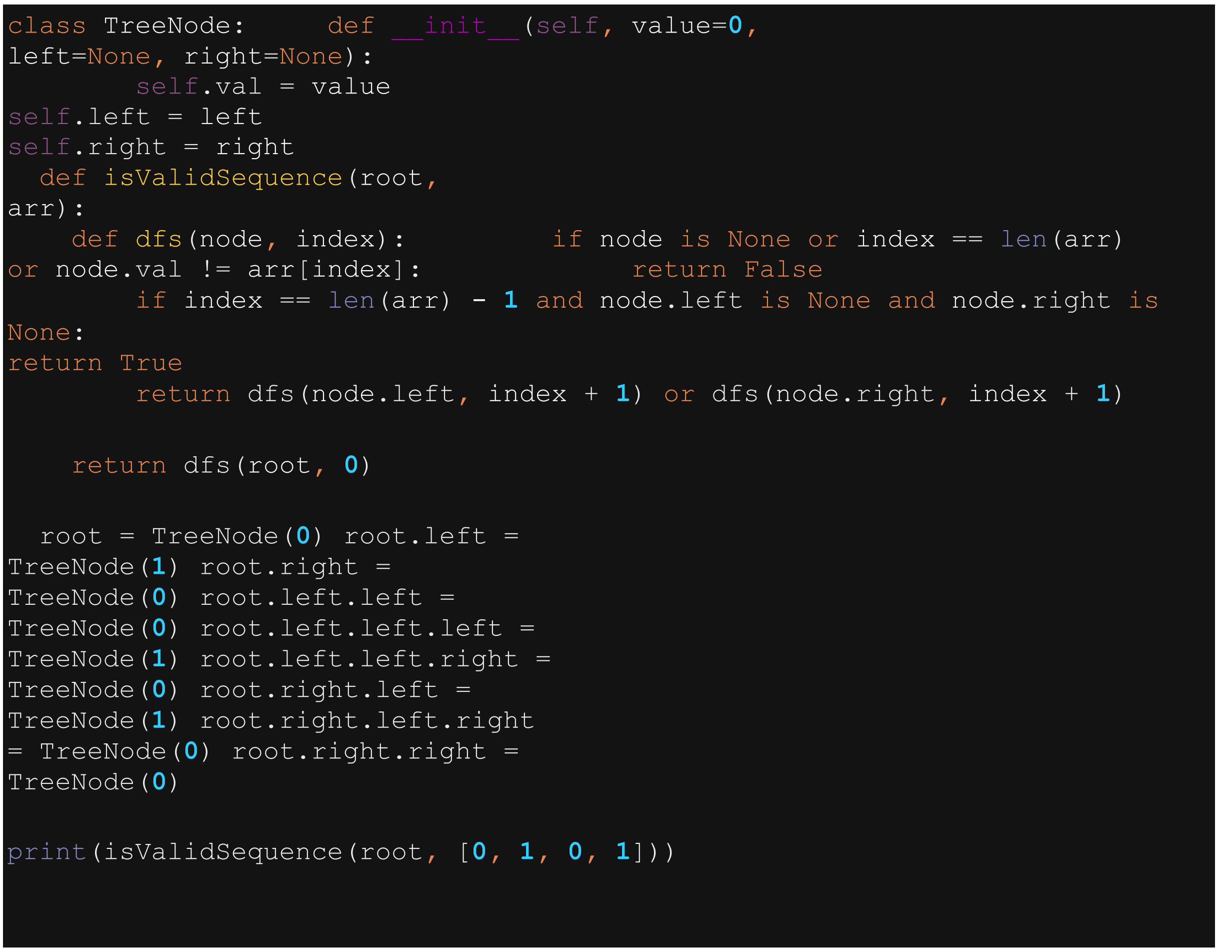
# Output:



```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
2
3
5

Process finished with exit code 0
```

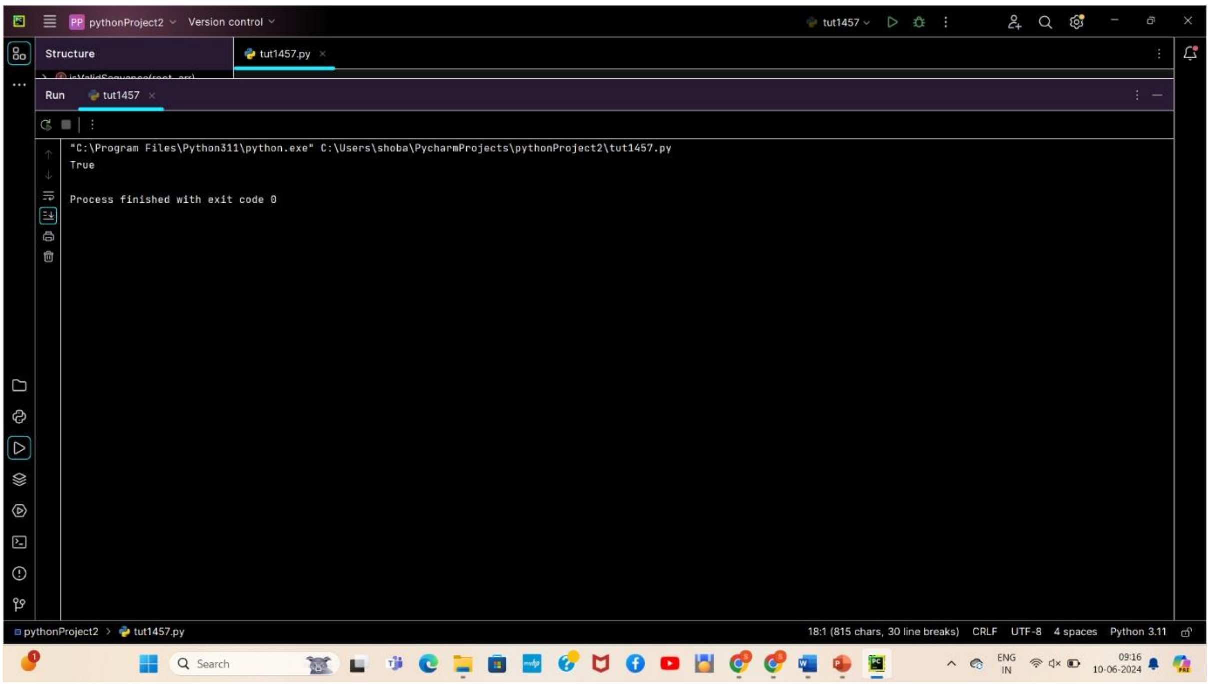
## 5. Check If a String Is a Valid Sequence from Root to Leaves Path in a Binary Tree.

Program:



```
class TreeNode:     def __init__(self, value=0,
left=None, right=None):
        self.val = value
self.left = left
self.right = right
  def isValidSequence(root,
arr):
    def dfs(node, index):         if node is None or index == len(arr)
or node.val != arr[index]:             return False
        if index == len(arr) - 1 and node.left is None and node.right is
None:
return True
        return dfs(node.left, index + 1) or dfs(node.right, index + 1)

    return dfs(root, 0)

  root = TreeNode(0) root.left =
TreeNode(1) root.right =
TreeNode(0) root.left.left =
TreeNode(0) root.left.left.left =
TreeNode(1) root.left.left.right =
TreeNode(0) root.right.left =
TreeNode(1) root.right.left.right
= TreeNode(0) root.right.right =
TreeNode(0)

print(isValidSequence(root, [0, 1, 0, 1]))
```

Output:



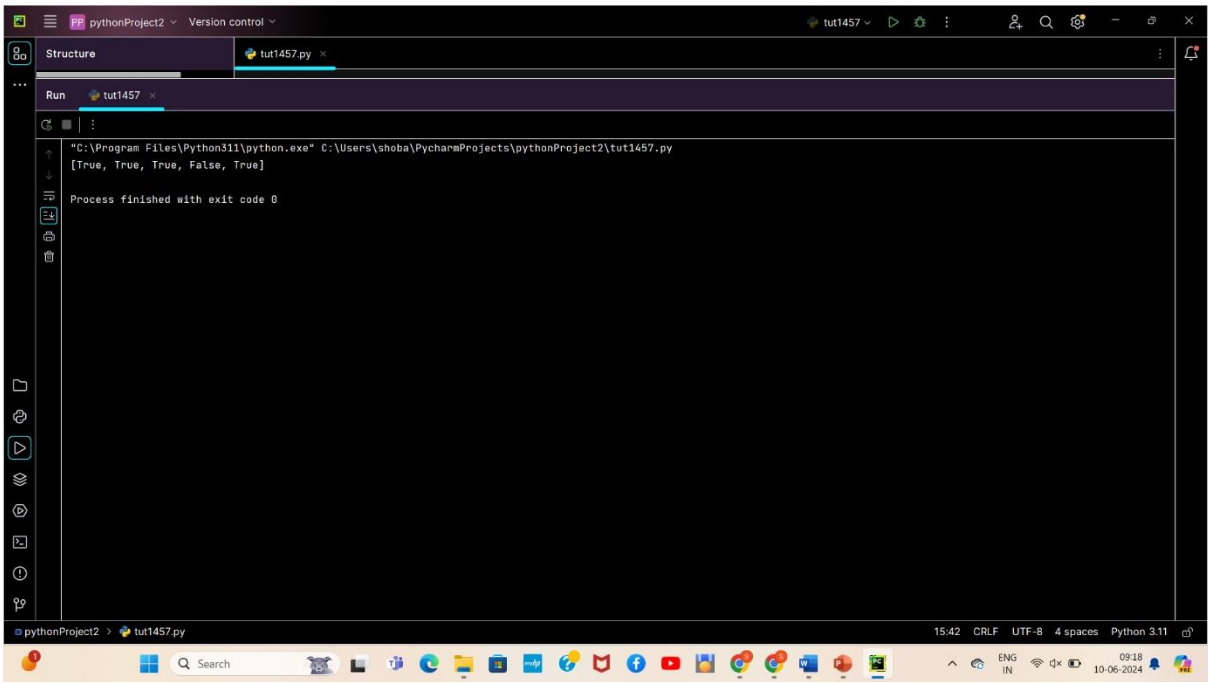
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
True

Process finished with exit code 0
```

## 6. Kids With the Greatest Number of Candies.

## Program:

```
def kids_with_candies(candies, extra_candies):
    max_candies = max(candies)

    result = []
     for candy in
candies:
        result.append(candy + extra_candies >= max_candies)
     return
result

candies = [2, 3, 5, 1, 3] extra_candies = 3
print(kids_with_candies(candies,
extra_candies))
# Output: [True, True, True, False, True]
```

## Output:



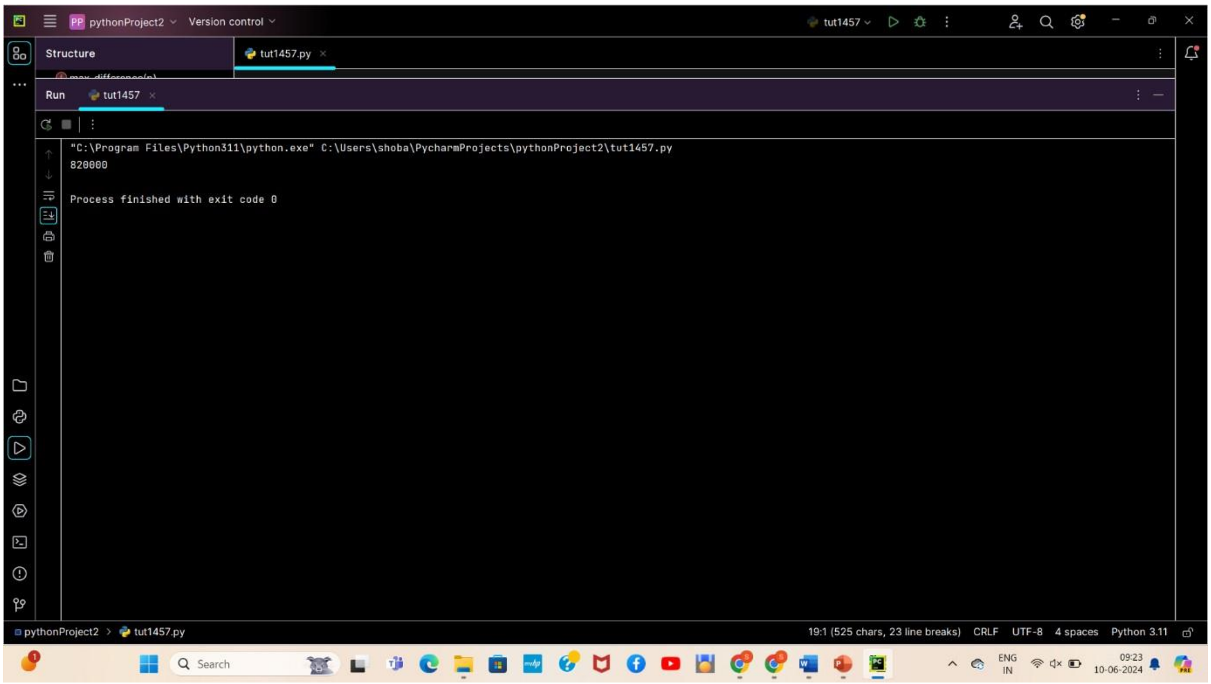
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
[True, True, True, False, True]

Process finished with exit code 0
```

## 7. Max Difference You Can Get From Changing an Integer.

Program:

```
def max_difference(n):
    str_n = str(n)
    max_val, min_val = str_n, str_n
     for i, digit in
enumerate(str_n):          if digit
!= '9':
            max_val = str_n[:i] + '9' + str_n[i + 1:]
break
     if str_n[0] !=
'1':
        min_val = '1' + str_n[1:]
else:
        for i, digit in enumerate(str_n[1:], start=1):
            if digit > '0':
                min_val = str_n[:i] + '0' + str_n[i + 1:]
break
     return int(max_val) -
int(min_val)
  n =
123456
print(max_difference(n))
```

Output:



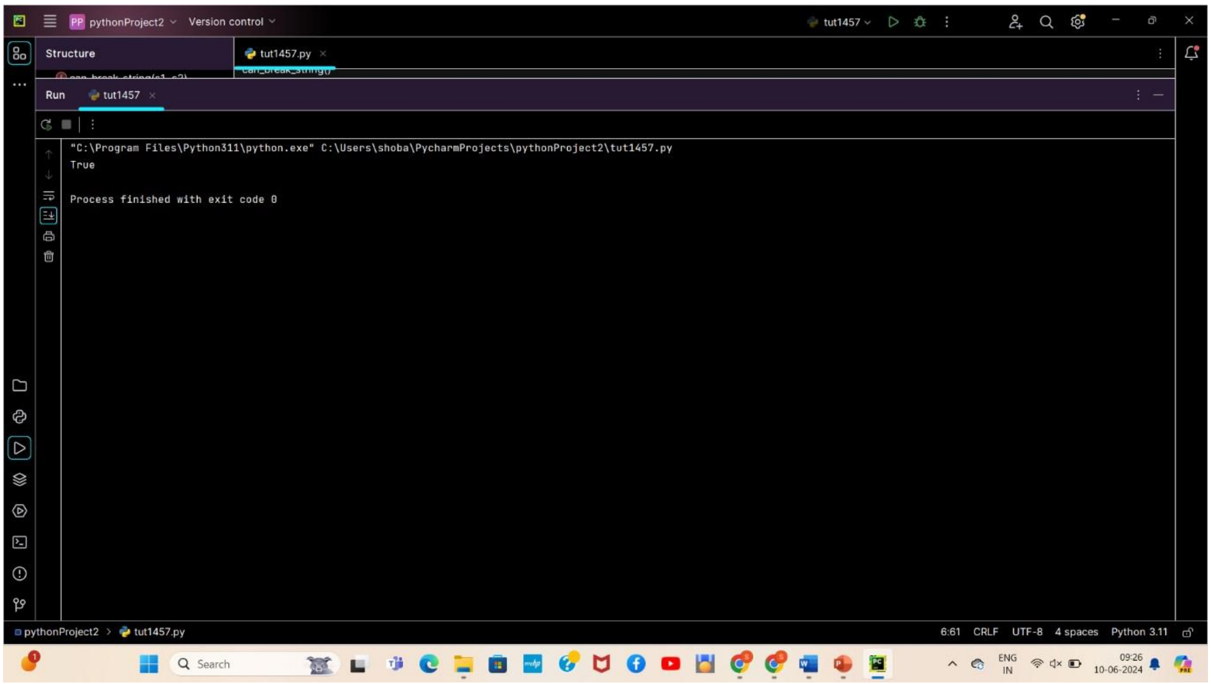
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
820000

Process finished with exit code 0
```

# 8. Check If a String Can Break Another String.

## Program:

```
def can_break_string(s1, s2):
     sorted_s1 =
sorted(s1)      sorted_s2
= sorted(s2)
     can_s1_break_s2 = all(c1 >= c2 for c1, c2 in zip(sorted_s1,
sorted_s2))

    can_s2_break_s1 = all(c2 >= c1 for c1, c2 in zip(sorted_s1, sorted_s2))
     return can_s1_break_s2 or
can_s2_break_s1

  s1 =
"abc" s2
= "xya"
print(can_break_string(s1, s2))
```

## output:



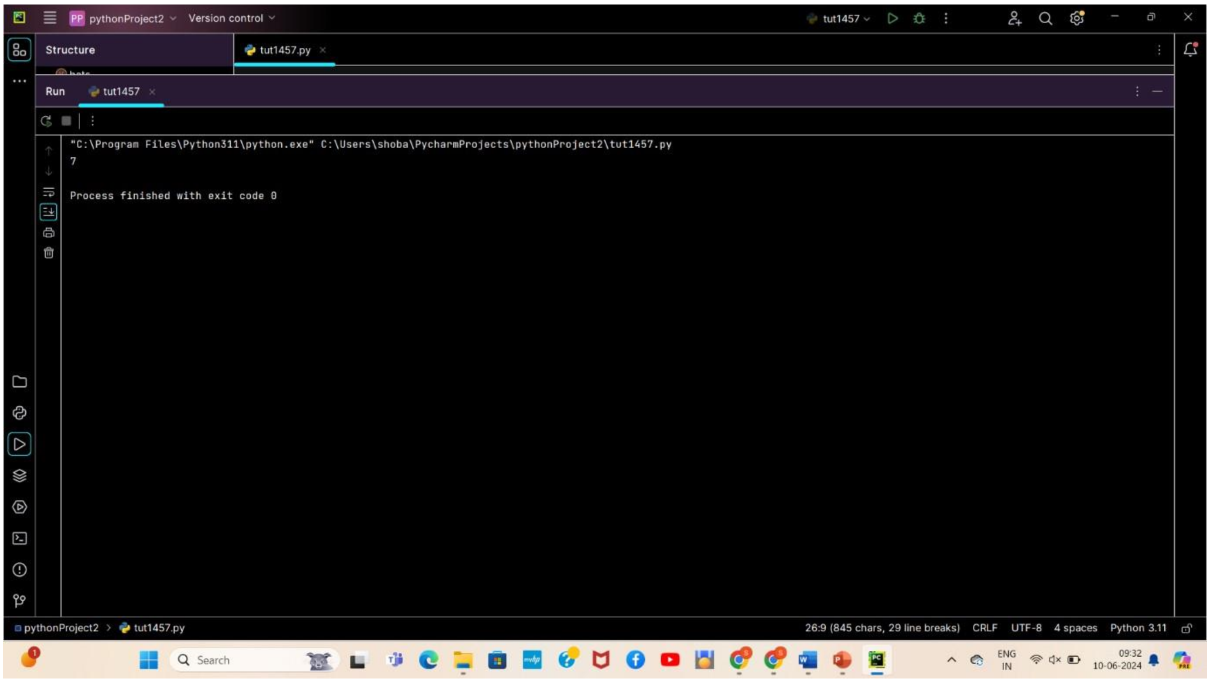
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
True

Process finished with exit code 0
```

## 9. Number of Ways to Wear Different Hats to Each Other.

### Program:

```
def number_ways(hats):
# Number of people
n = len(hats)
    # All hat numbers available
all_hats = set(range(1, 41))
    # Map each hat to the list of people who can wear
it     hat_to_people = {i: [] for i in range(1, 41)}
for i, person_hats in enumerate(hats):         for hat
in person_hats:
            hat_to_people[hat].append(i)
     def backtrack(assigned,
available_hats):
        if len(assigned) == n:
            return 1
ways = 0
        next_person = len(assigned)         for
hat in available_hats:             if
next_person in hat_to_people[hat]:
                ways += backtrack(assigned + [hat], available_hats - {hat})
return ways


    return backtrack([], all_hats)
  hats = [
    [1, 2, 3], [2, 3, 4],
]
print(number_ways(hats))  # Output will be the number of ways to wear different
hats
```

## Output:


pythonProject2
Version control
tut1457
Structure
tut1457.py
Run
tut1457
pythonProject2 > tut1457.py
26:9 (845 chars, 29 line breaks)  CRLF  UTF-8  4 spaces  Python 3.11
Search
ENG IN
09:32
10-06-2024

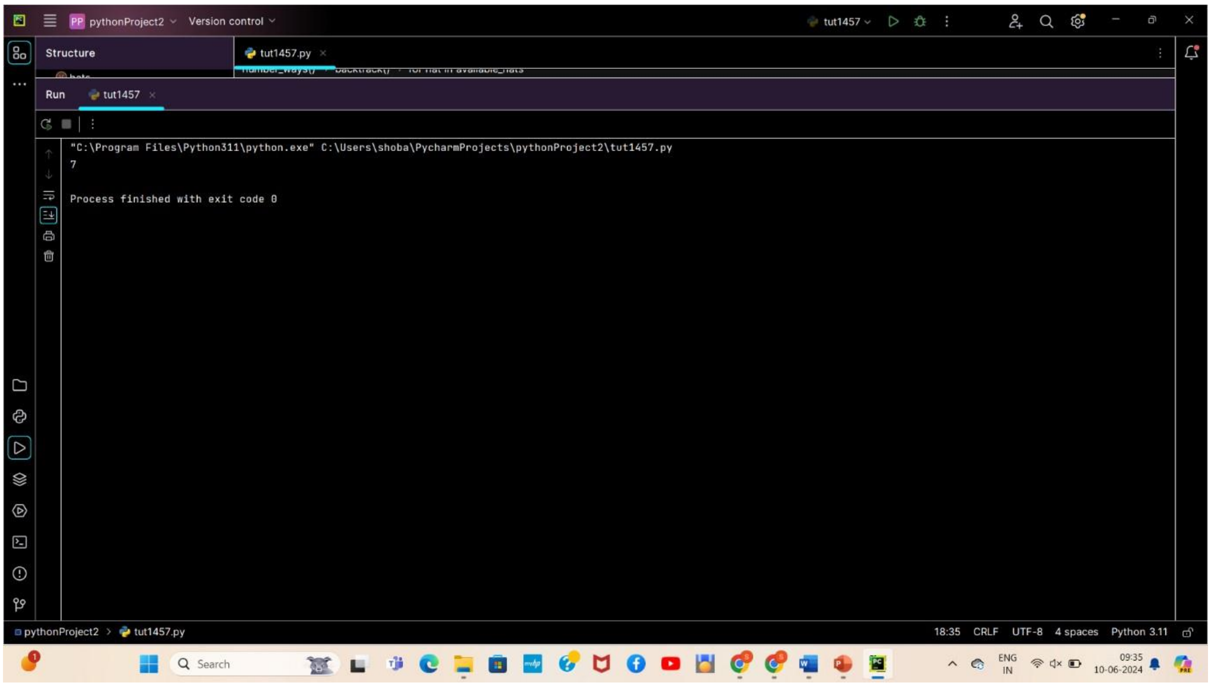
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
7

Process finished with exit code 0
```

# 10. Next Permutations.

## Program:

```
def number_ways(hats):
# Number of people     n
= len(hats)
    # All hat numbers available
all_hats = set(range(1, 41))
    # Map each hat to the list of people who can wear it
hat_to_people = {i: [] for i in range(1, 41)}     for i,
person_hats in enumerate(hats):         for hat in
person_hats:
            hat_to_people[hat].append(i)
    def backtrack(assigned, available_hats):
        if len(assigned) == n:
            return 1
ways = 0
        next_person = len(assigned)         for
hat in available_hats:                  if
next_person in hat_to_people[hat]:
                ways += backtrack(assigned + [hat], available_hats - {hat})
return ways

    return backtrack([], all_hats)

hats = [
    [1, 2, 3], [2, 3, 4],
]
print(number_ways(hats))  # Output will be the number of ways to wear
different hats
```

# Output:



```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
7

Process finished with exit code 0
```