Assignment 3

Name: Shoban Herbert

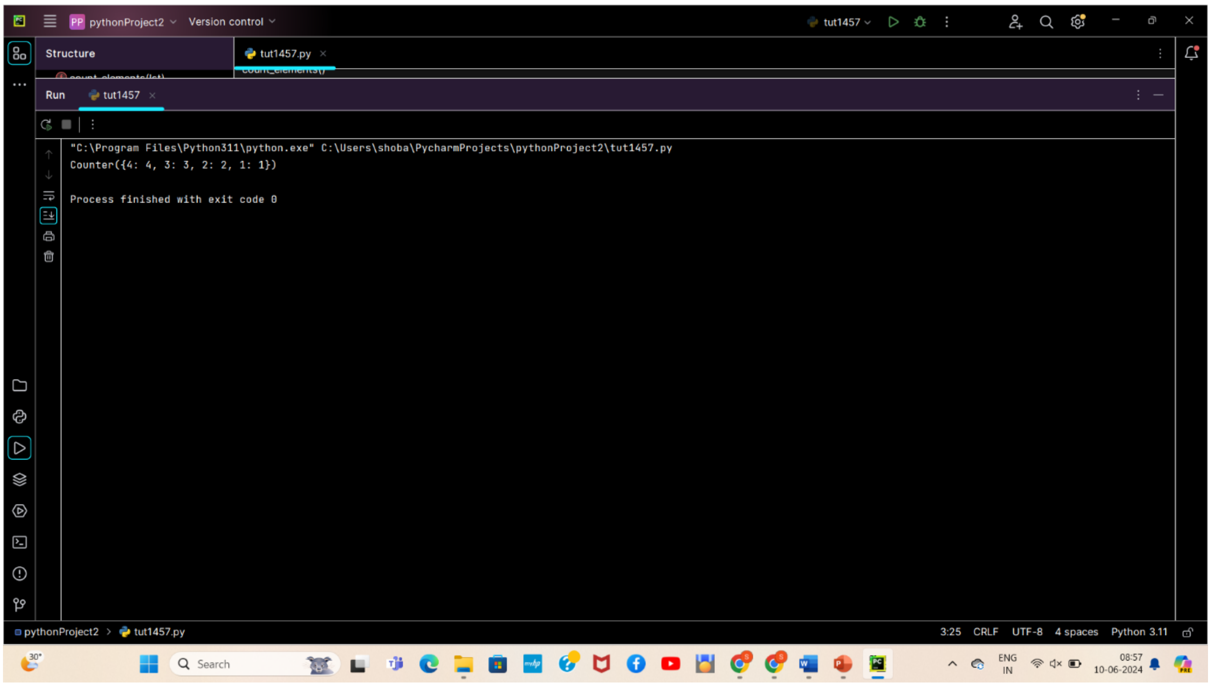
RegNo : 192324063

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)
```

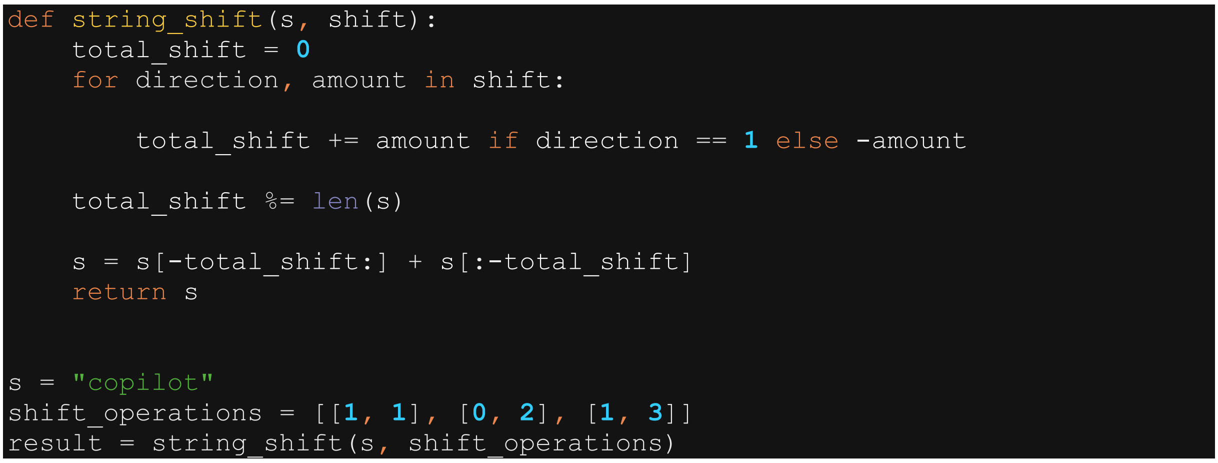
Output:



```
"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)
```

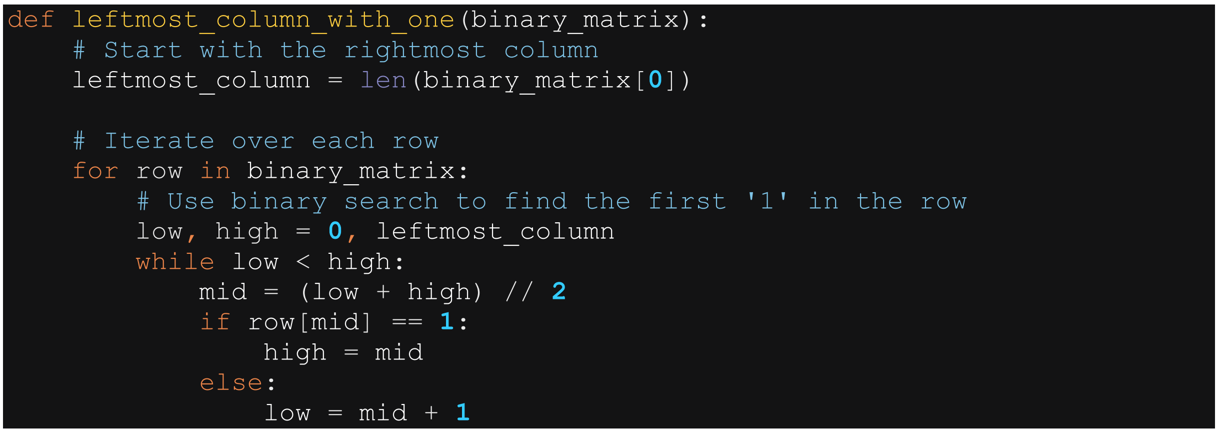
Output:

Copilot

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

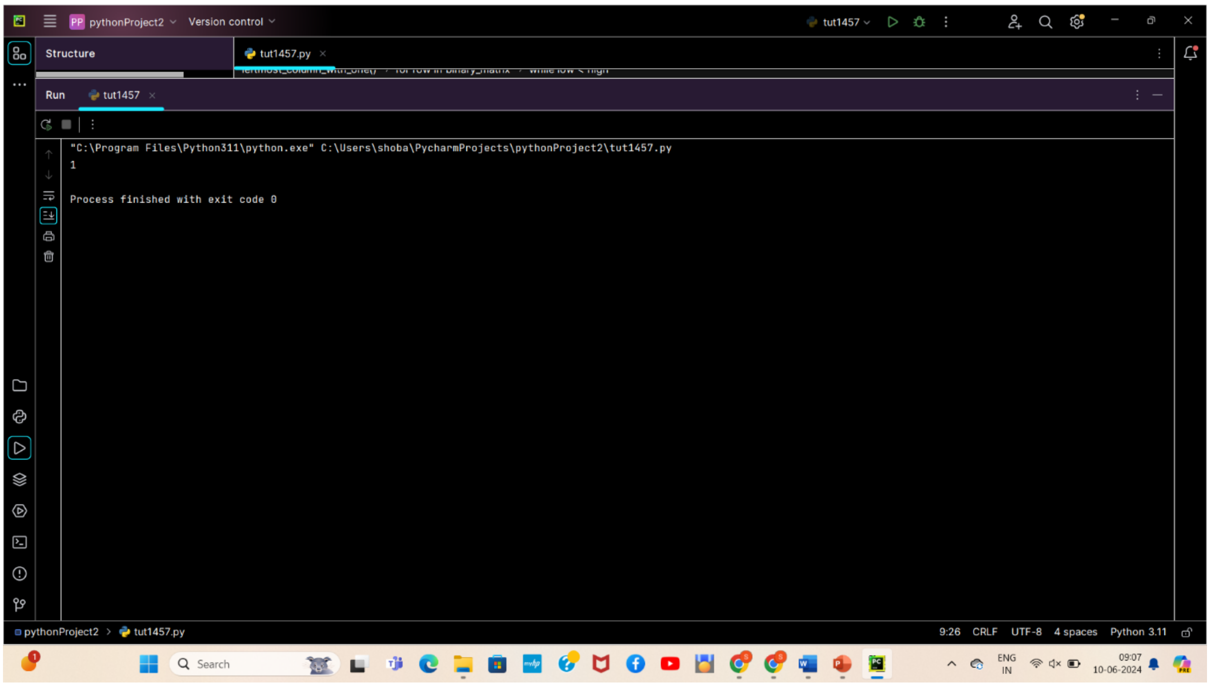
3.Leftmost Column with least a One.

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'
```

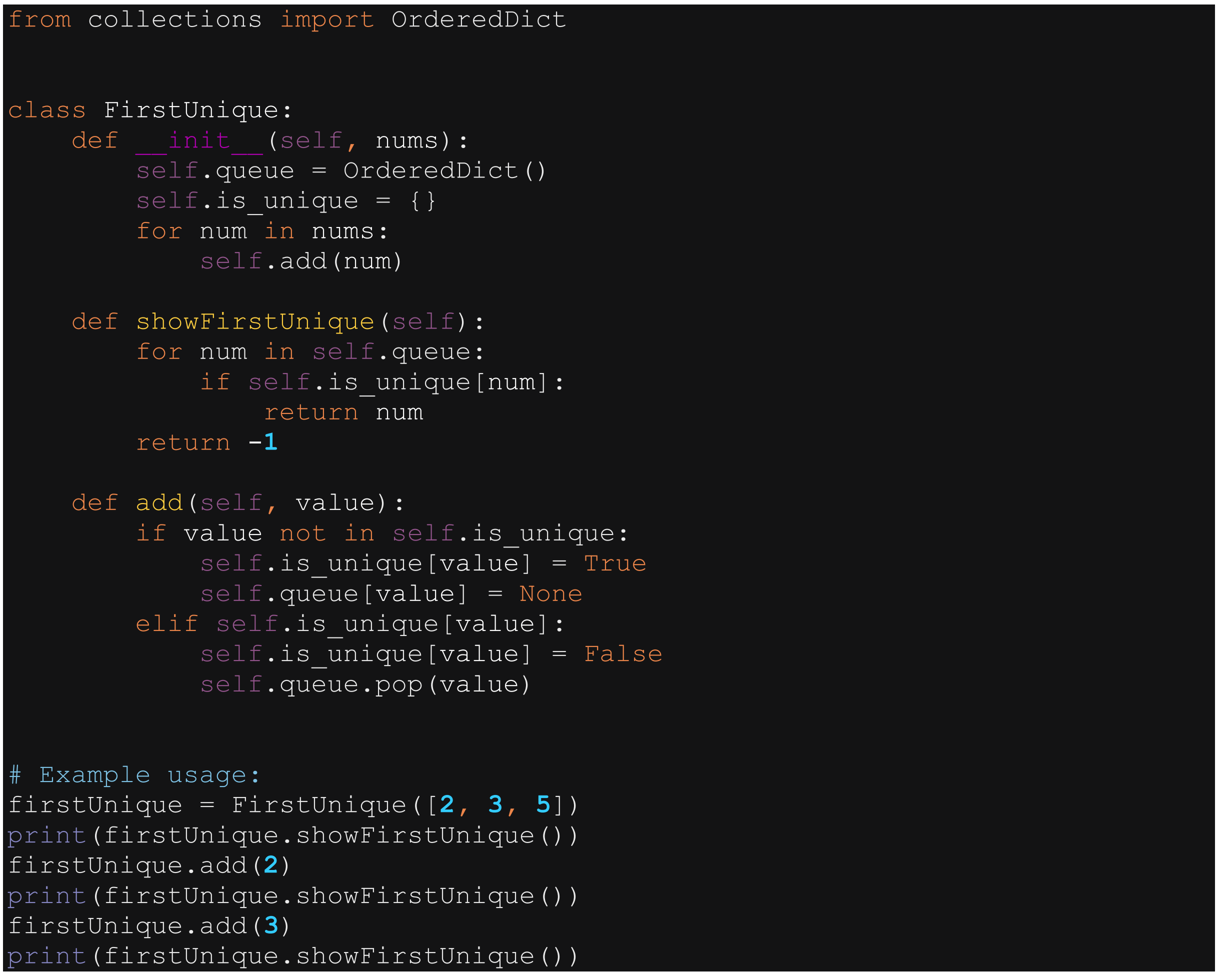
Output:



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

Process finished with exit code 0
```

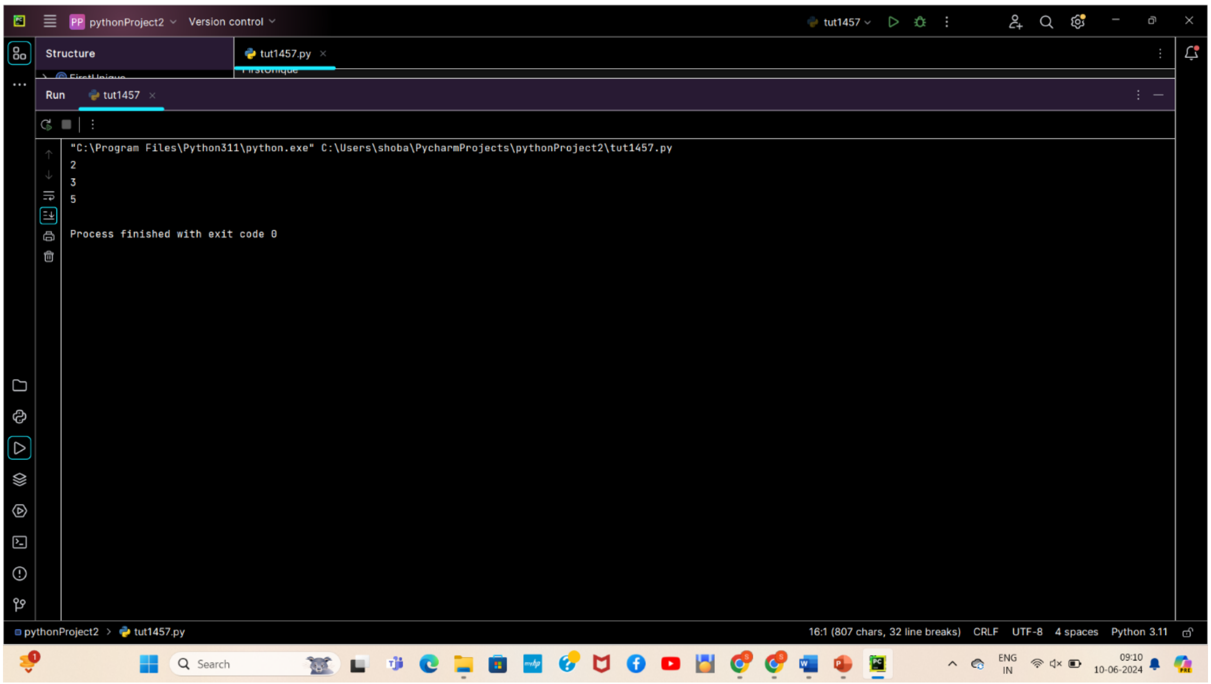
4. First Unique Number.

Program:



```python
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:



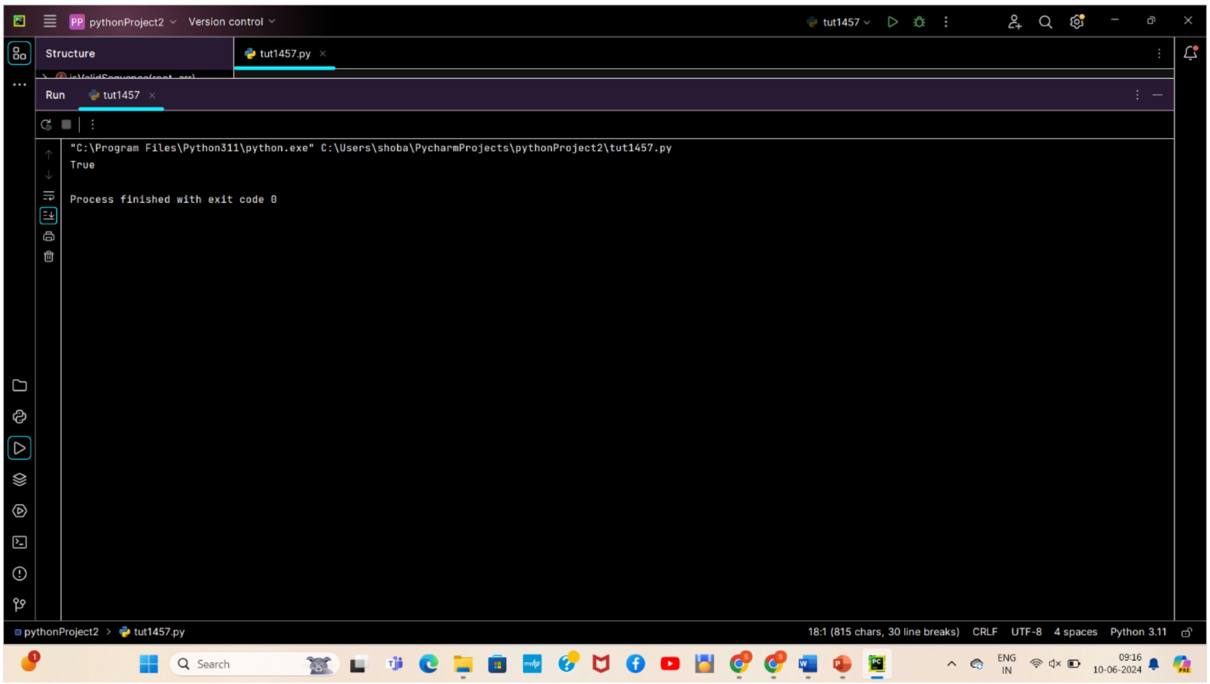
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
2
3
5

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:

```python
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:



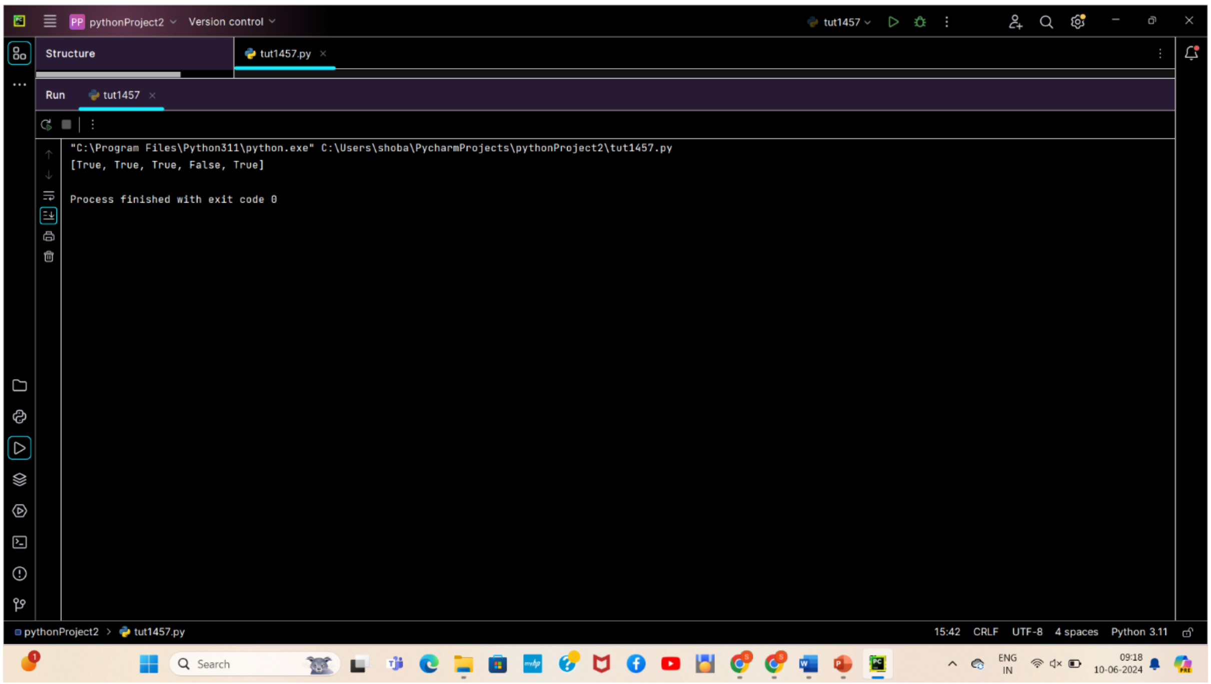
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
True

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:



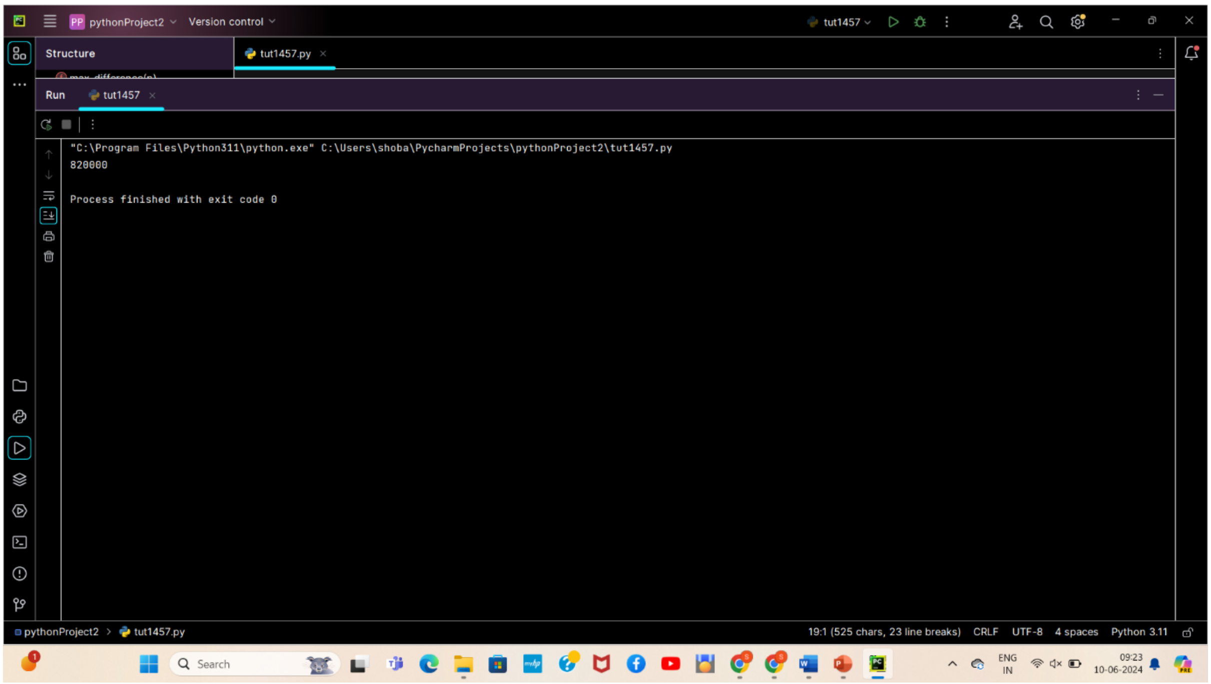
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
[True, True, True, False, True]

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:



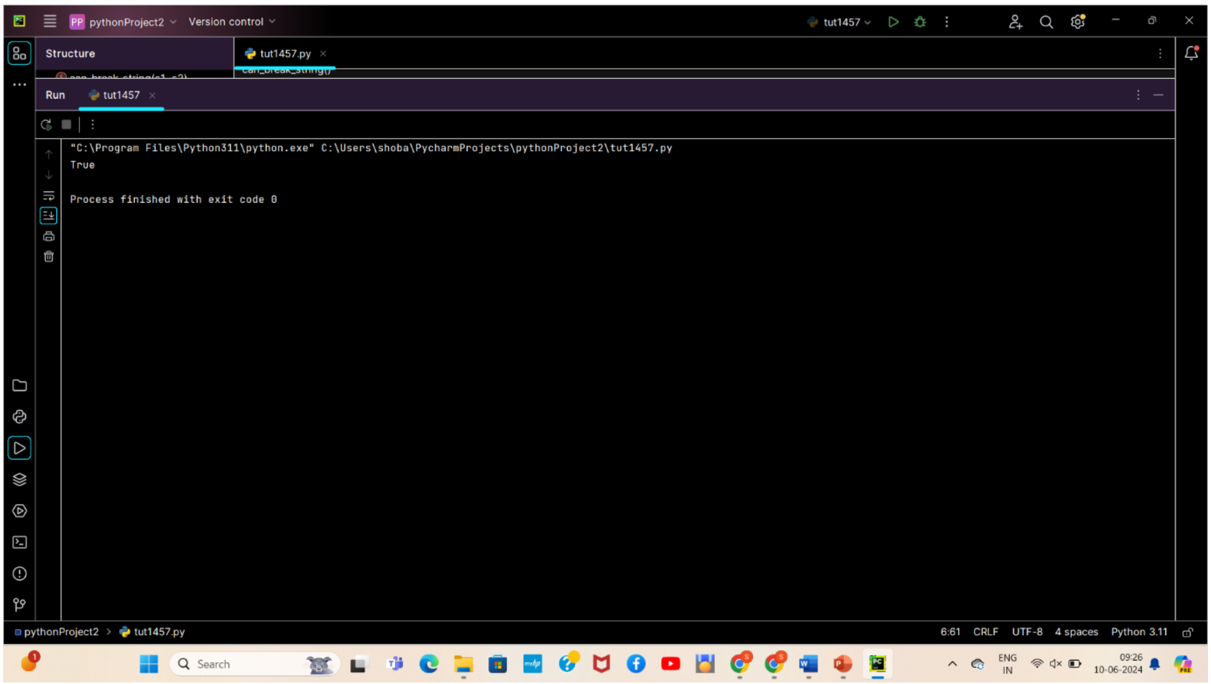
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
820000

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))
```

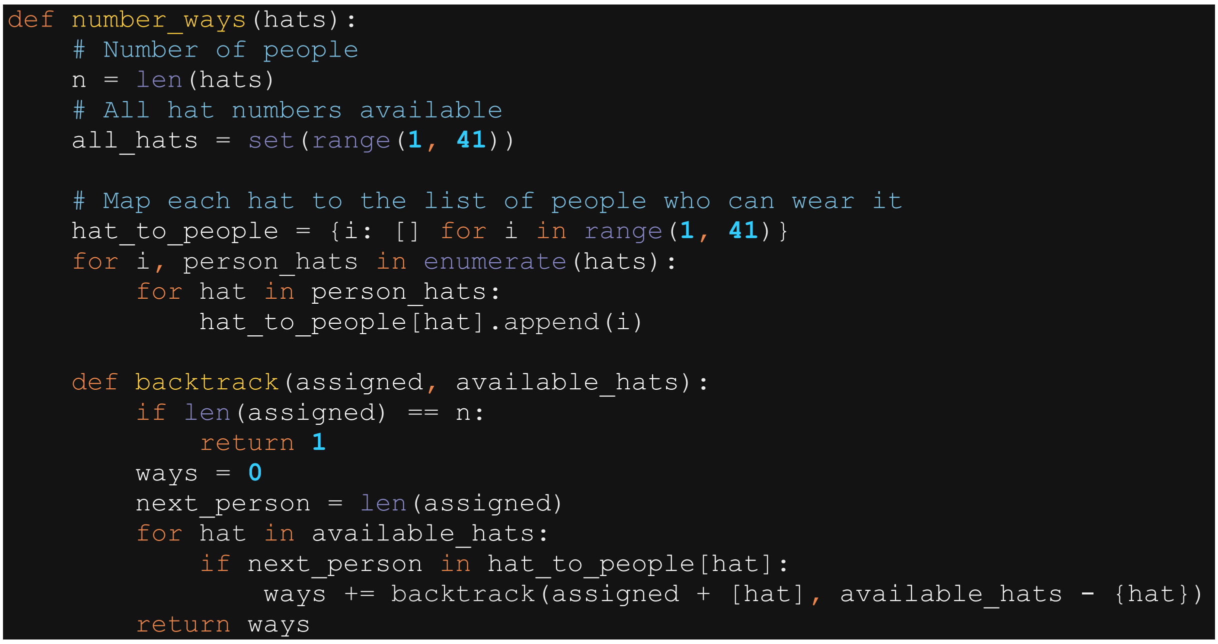
output:



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

Process finished with exit code 0
```

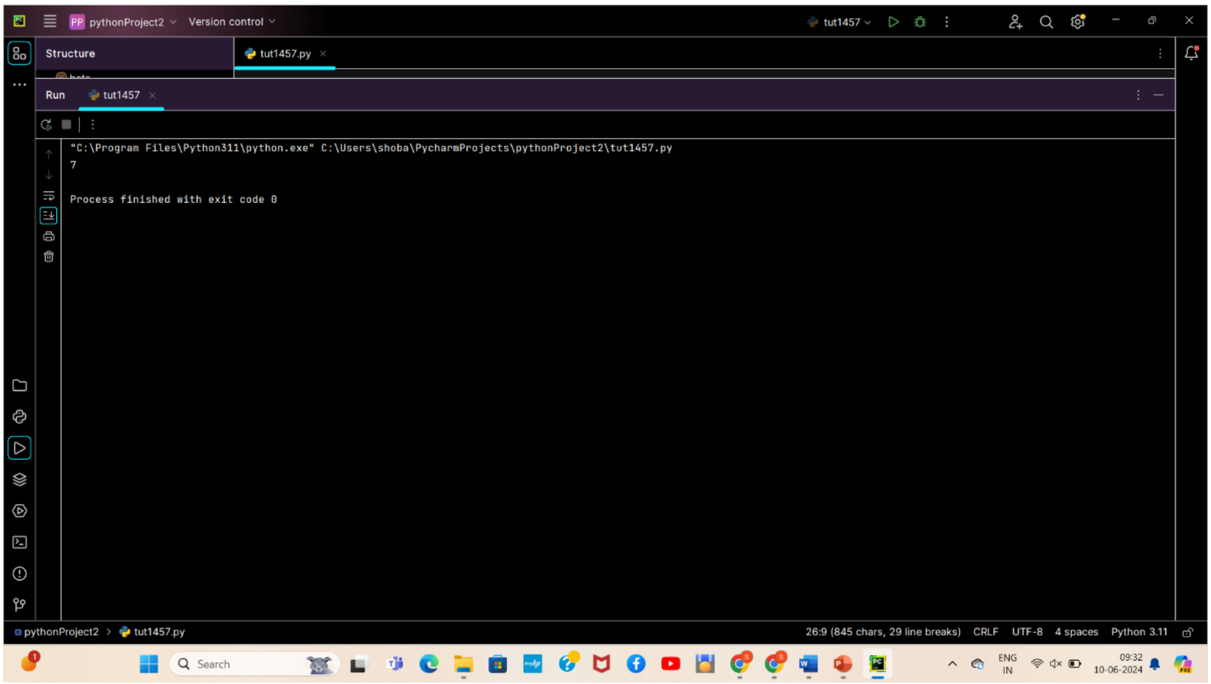
9. Number of Ways to Wear Different Hats to Each Other.

Program:



```python
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:



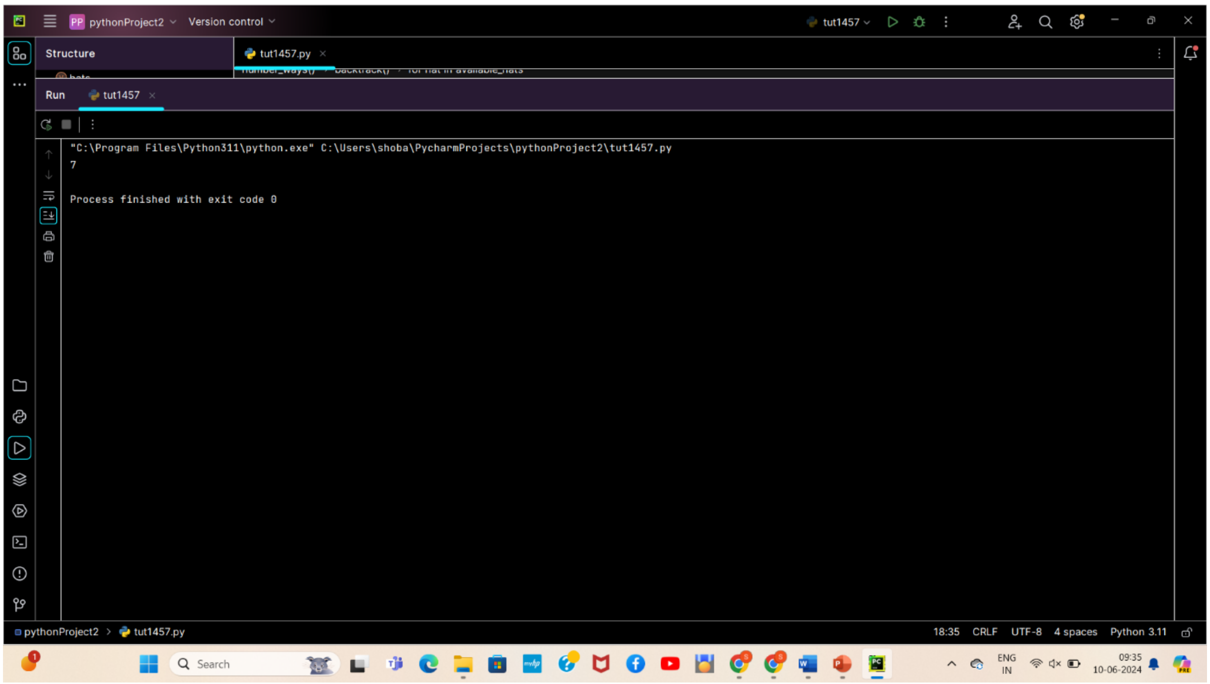
```
"C:\Program Files\Python311\python.exe" C:\Users\shoba\PycharmProjects\pythonProject2\tut1457.py
7

Process finished with exit code 0
```

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
```