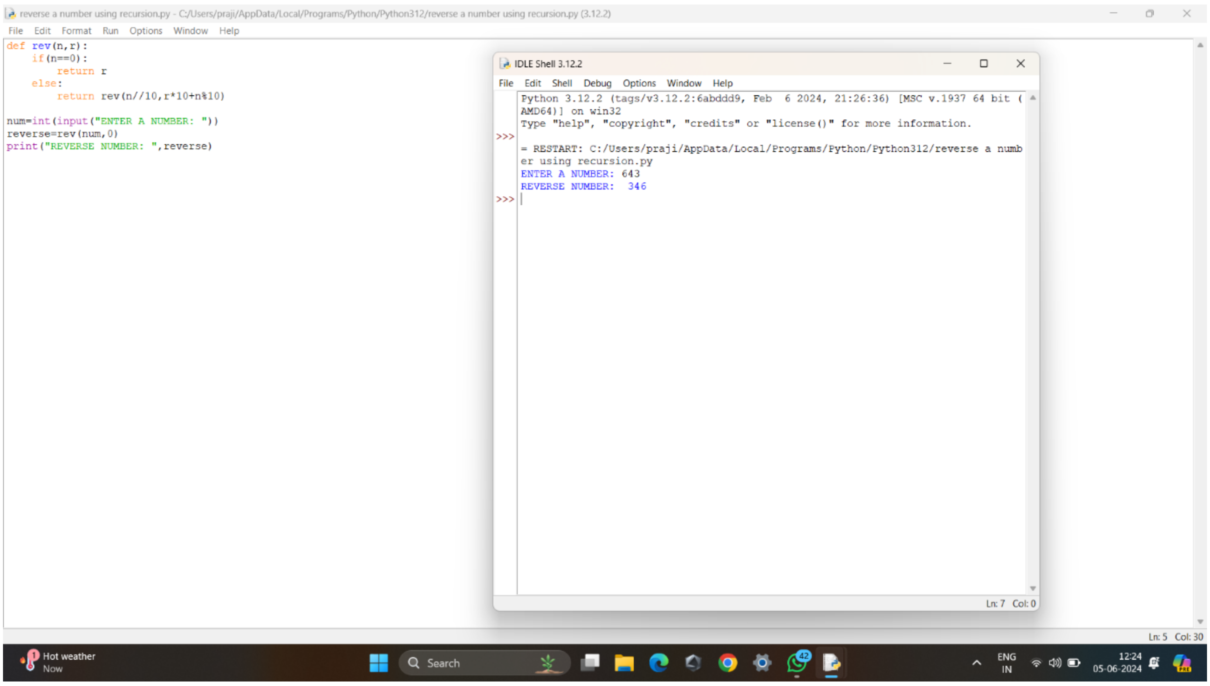
1. Write a program to find the reverse of a given number using recursive.

PROGRAM:

```
def rev(n,r):
   if(n==0):
      return r
   else:
      return rev(n//10,r*10+n%10)

num=int(input("ENTER A NUMBER: "))
reverse=rev(num,0)
print("REVERSE NUMBER: ",reverse)
```

Time:O(n)

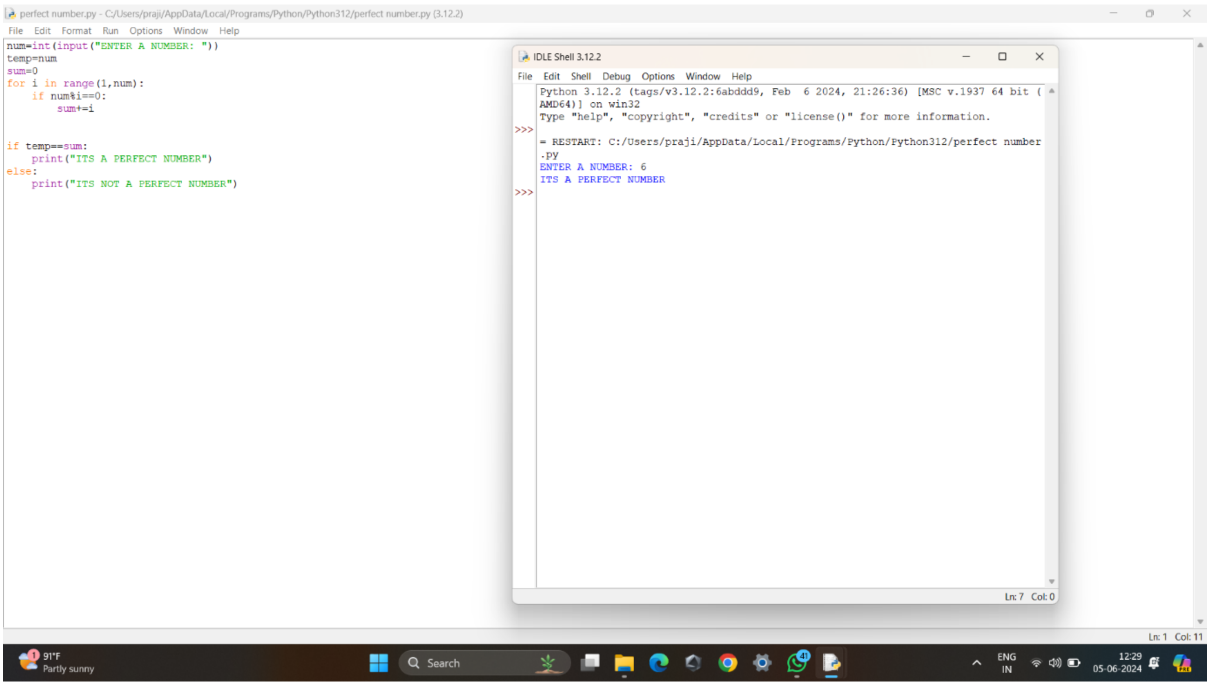


2. Write a program to find the perfect number.

PROGRAM:

```
num=int(input("ENTER A NUMBER: "))
temp=num
sum=0
for i in range(1,num):
    if num%i==0:
        sum+=i
if temp==sum:
    print("ITS A PERFECT NUMBER")
else:
    print("ITS NOT A PERFECT NUMBER")
```

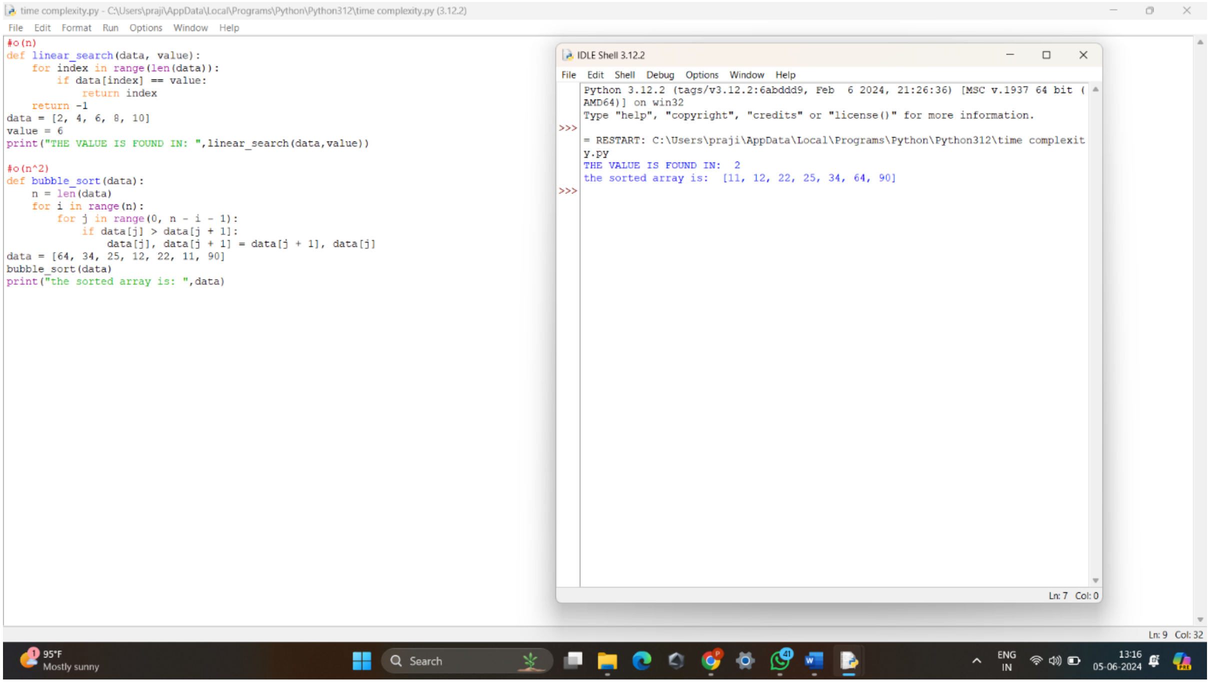
Time:O(n)



3.Write C program that demonstrates the usage of these notations by analyzing the time complexity of some example algorithms.

PROGRAM:

```
#o(n)
def linear_search(data, value):
    for index in range(len(data)):
        if data[index] == value:
            return index
    return -1
data = [2, 4, 6, 8, 10]
value = 6
print("THE VALUE IS FOUND IN: ",linear_search(data,value))



#o(n^2)
def bubble_sort(data):
    n = len(data)
    for i in range(n):
        for j in range(0, n - i - 1):
            if data[j] > data[j + 1]:
                data[j], data[j + 1] = data[j + 1], data[j]
data = [64, 34, 25, 12, 22, 11, 90]
bubble_sort(data)
print("the sorted array is: ",data)
```

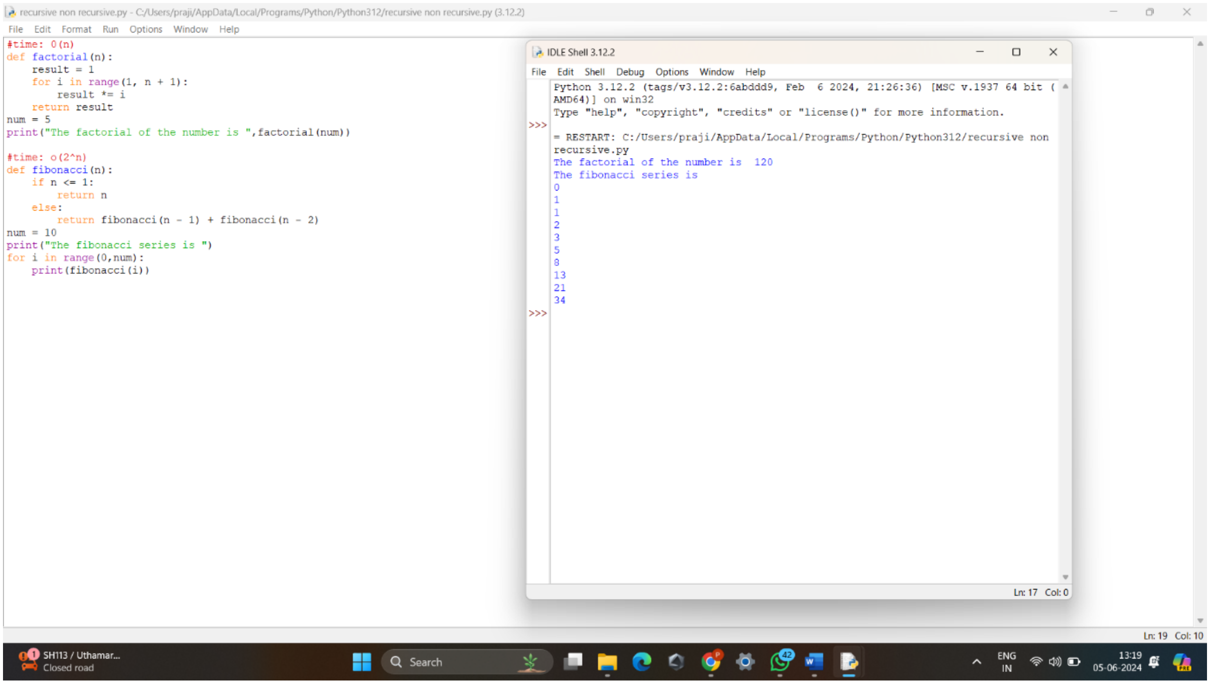


4.Write C programs that demonstrate the mathematical analysis of non-recursive and recursive algorithms.

PROGRAM:

```
#time: 0(n)

def factorial(n):

    result = 1

    for i in range(1, n + 1):

        result *= i

    return result

num = 5

print("The factorial of the number is ",factorial(num))
```

```
#time: o(2^n)

def fibonacci(n):

   if n <= 1:

      return n

   else:

      return fibonacci(n - 1) + fibonacci(n - 2)

num = 10

print("The fibonacci series is ")

for i in range(0,num):

   print(fibonacci(i))
```



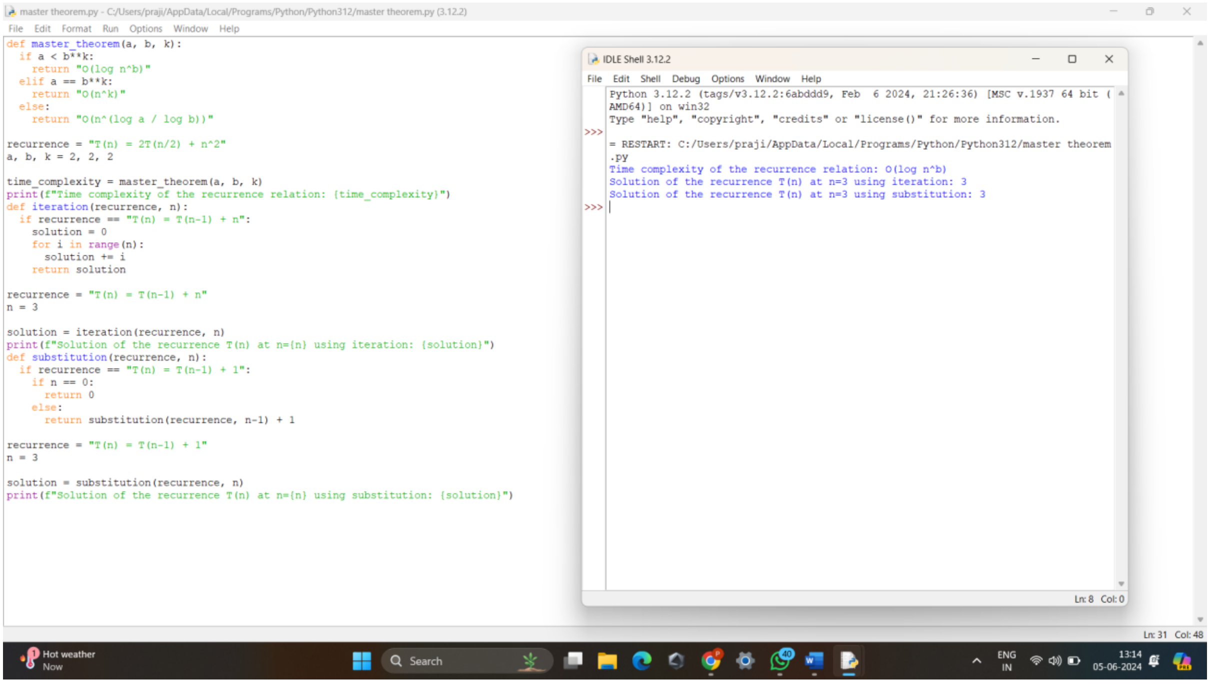
5. Write C programs for solving recurrence relations using the Master Theorem, Substitution Method, and Iteration Method will demonstrate how to calculate the time

PROGRAM:

```
def master_theorem(a, b, k):
  if a < b**k:
    return "O(log n^b)"
  elif a == b**k:
    return "O(n^k)"
  else:
    return "O(n^(log a / log b))"

recurrence = "T(n) = 2T(n/2) + n^2"
a, b, k = 2, 2, 2

time_complexity = master_theorem(a, b, k)
print(f"Time complexity of the recurrence relation: {time_complexity}")
def iteration(recurrence, n):
  if recurrence == "T(n) = T(n-1) + n":
    solution = 0
    for i in range(n):
      solution += i
    return solution

recurrence = "T(n) = T(n-1) + n"
n = 3

solution = iteration(recurrence, n)
print(f"Solution of the recurrence T(n) at n={n} using iteration: {solution}")
def substitution(recurrence, n):
```

```
 if recurrence == "T(n) = T(n-1) + 1":
  if n == 0:
   return 0
  else:
   return substitution(recurrence, n-1) + 1

recurrence = "T(n) = T(n-1) + 1"
n = 3

solution = substitution(recurrence, n)
print(f"Solution of the recurrence T(n) at n={n} using substitution: {solution}")
```

Time:O(N^2)



6. Given two integer arrays nums1 and nums2, return an array of their Intersection. Each element in the result must be unique and you may return the result in any order.

PROGRAM:

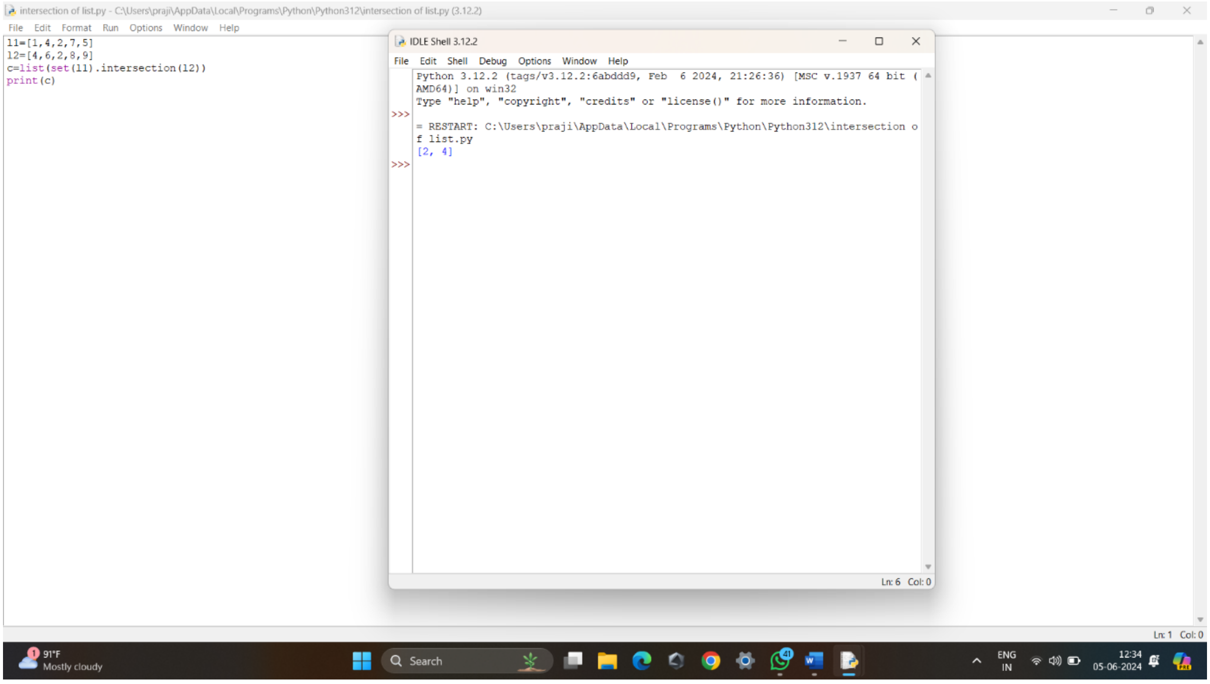
l1=[1,4,2,7,5]

l2=[4,6,2,8,9]

c=list(set(l1).intersection(l2))

print(c)

Time:O(N)



7.Given two integer arrays nums1 and nums2, return an array of their intersection. Each element in the result must appear as many times as it shows in both arrays and you may return the result in any order.

PROGRAM:

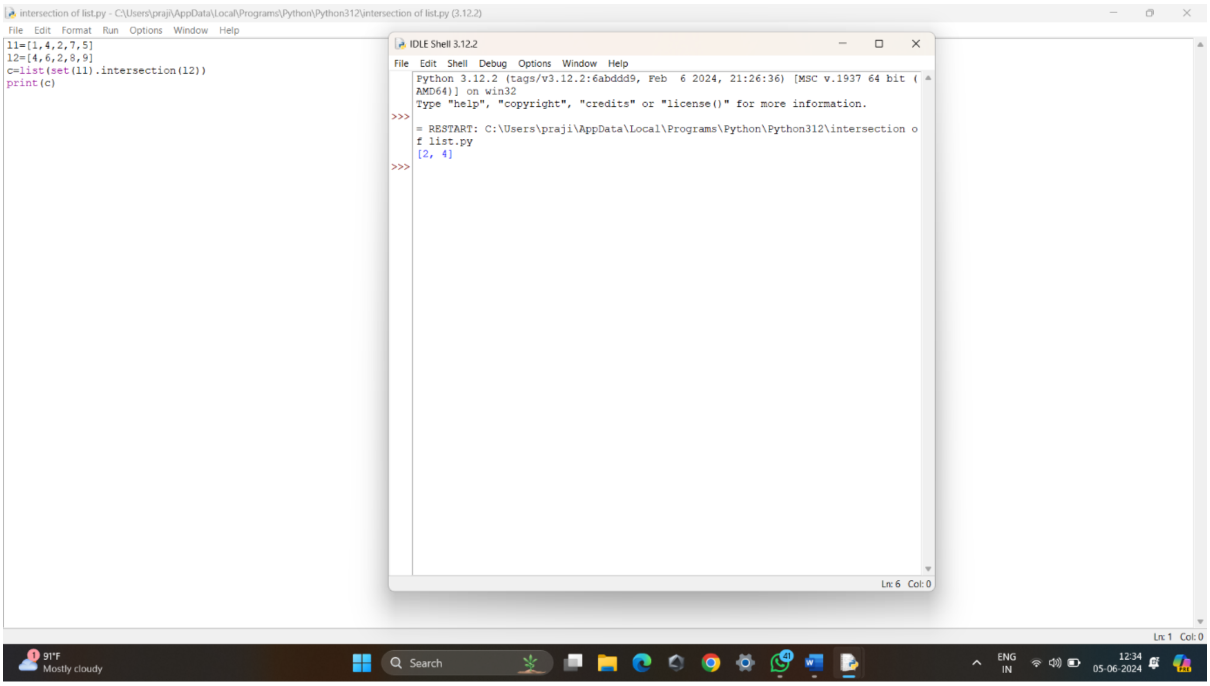
l1=[1,4,2,7,5]

l2=[4,6,2,8,9]

c=list(set(l1).intersection(l2))

print(c)

Time:O(n)



8.Given an array of integers nums, sort the array in ascending order and return it.You must solve the problem without using any built-in functions in O(nlog(n)) time complexity and with the smallest space complexity possible.

PROGRAM:

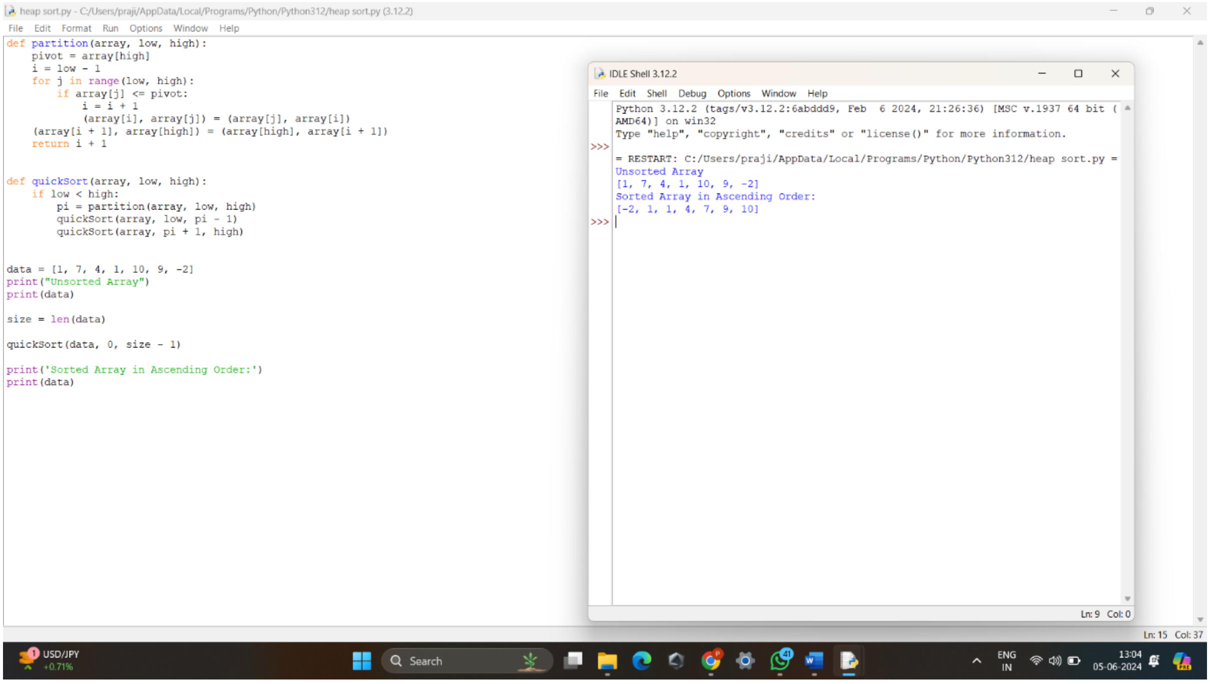
```
def partition(array, low, high):
    pivot = array[high]
    i = low - 1
    for j in range(low, high):
        if array[j] <= pivot:
            i = i + 1
            (array[i], array[j]) = (array[j], array[i])
    (array[i + 1], array[high]) = (array[high], array[i + 1])
    return i + 1


def quickSort(array, low, high):
    if low < high:
        pi = partition(array, low, high)
        quickSort(array, low, pi - 1)
        quickSort(array, pi + 1, high)


data = [1, 7, 4, 1, 10, 9, -2]
print("Unsorted Array")
print(data)

size = len(data)
```

quickSort(data, 0, size - 1)

print('Sorted Array in Ascending Order:')

print(data)

Time:O(nlogn)



9. Given an array of integers nums, half of the integers in nums are odd, and the other half are even.Sort the array so that whenever nums[i] is odd, i is odd, and whenever nums[i] is even, i is even. Return any answer array that satisfies this condition.

PROGRAM:

```
def sort(nums):
   odd=[]
   even=[]
   res=[]
   for num in nums:
      if num%2==0:
         even.append(num)
      else:
         odd.append(num)
   for i in range(len(nums)):
      if i%2==0:
         res.append(even.pop())
      else:
         res.append(odd.pop())
   return res
nums=[1,2,6,7]
sorted_num= sort(nums)
print(sorted_num)
```

Time:O(N)

odd and even in a list.py - C:/Users/praji/AppData/Local/Programs/Python/Python312/odd and even in a list.py (3.12.2)

File Edit Format Run Options Window Help

```python
def sort(nums):
    odd=[]
    even=[]
    res=[]
    for num in nums:
        if num%2==0:
            even.append(num)
        else:
            odd.append(num)
    for i in range(len(nums)):
        if i%2==0:
            res.append(even.pop())
        else:
            res.append(odd.pop())
    return res
nums=[1,2,6,7]
sorted_num= sort(nums)
print(sorted_num)
```

IDLE Shell 3.12.2

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```
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/praji/AppData/Local/Programs/Python/Python312/odd and even i
n a list.py
[6, 7, 2, 1]
>>>
```

Ln: 6 Col: 0

Ln: 12 Col: 34

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