# AI ASSISTED CODING

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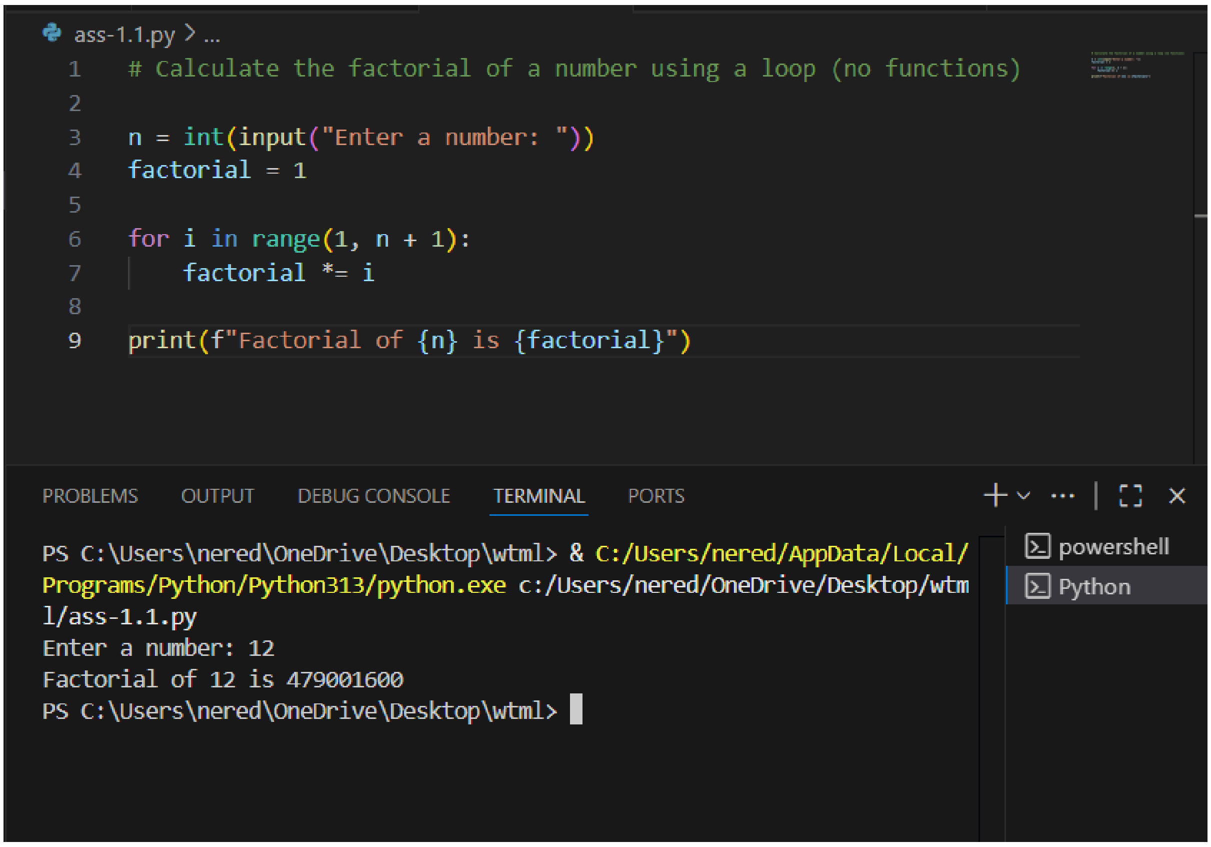
BATCH NUMBER :13

Lab assignment-1.1

Prompt 1: Factorial without Functions

Use GitHub Copilot to generate a Python program that calculates the
factorial of a number without defining any functions (using loops
directly in the main code)

Code(screenshot):



```python
# Calculate the factorial of a number using a loop (no functions)

n = int(input("Enter a number: "))
factorial = 1

for i in range(1, n + 1):
    factorial *= i

print(f"Factorial of {n} is {factorial}")
```

```
PS C:\Users\nered\OneDrive\Desktop\wtml> & C:/Users/nered/AppData/Local/
Programs/Python/Python313/python.exe c:/Users/nered/OneDrive/Desktop/wtm
l/ass-1.1.py
Enter a number: 12
Factorial of 12 is 479001600
PS C:\Users\nered\OneDrive\Desktop\wtml>
```

## Code explanation:

This code calculates the factorial of a user-provided number using a loop:

- It prompts the user to enter a number and stores it in n.
- It initializes factorial to 1.
- It uses a for loop from 1 to n, multiplying factorial by each number in the range.
- After the loop, it prints the result, which is the factorial of the input number.

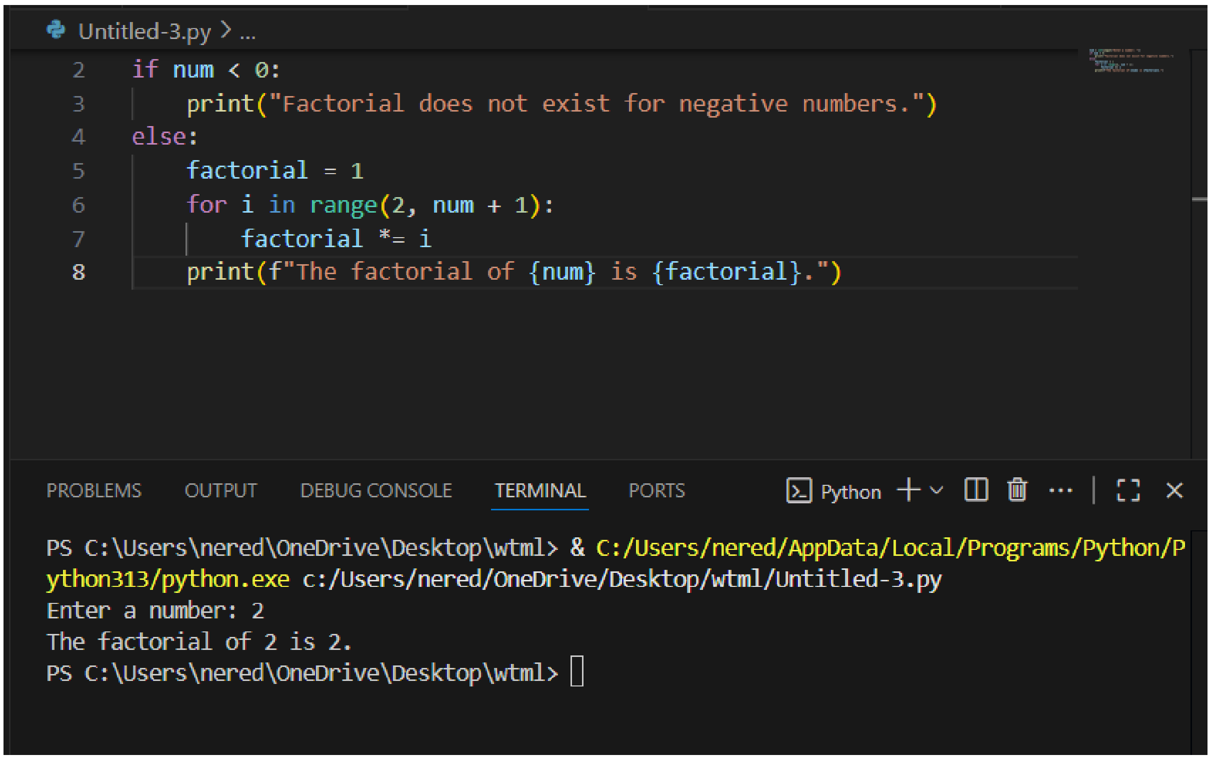
## Prompt 2: Improving Efficiency

• Description:

Examine the Copilot-generated code from Task 1 and

demonstrate
how its efficiency can be improved (e.g., removing
unnecessary
variables, optimizing loops).

Code(screen shot):



Untitled-3.py > ...

```python
if num < 0:
    print("Factorial does not exist for negative numbers.")
else:
    factorial = 1
    for i in range(2, num + 1):
        factorial *= i
    print(f"The factorial of {num} is {factorial}.")
```

```
PS C:\Users\nered\OneDrive\Desktop\wtml> & C:/Users/nered/AppData/Local/Programs/Python/P
ython313/python.exe c:/Users/nered/OneDrive/Desktop/wtml/Untitled-3.py
Enter a number: 2
The factorial of 2 is 2.
PS C:\Users\nered\OneDrive\Desktop\wtml> 
```

# Code explanation:

This code calculates the factorial of a number entered by the user:

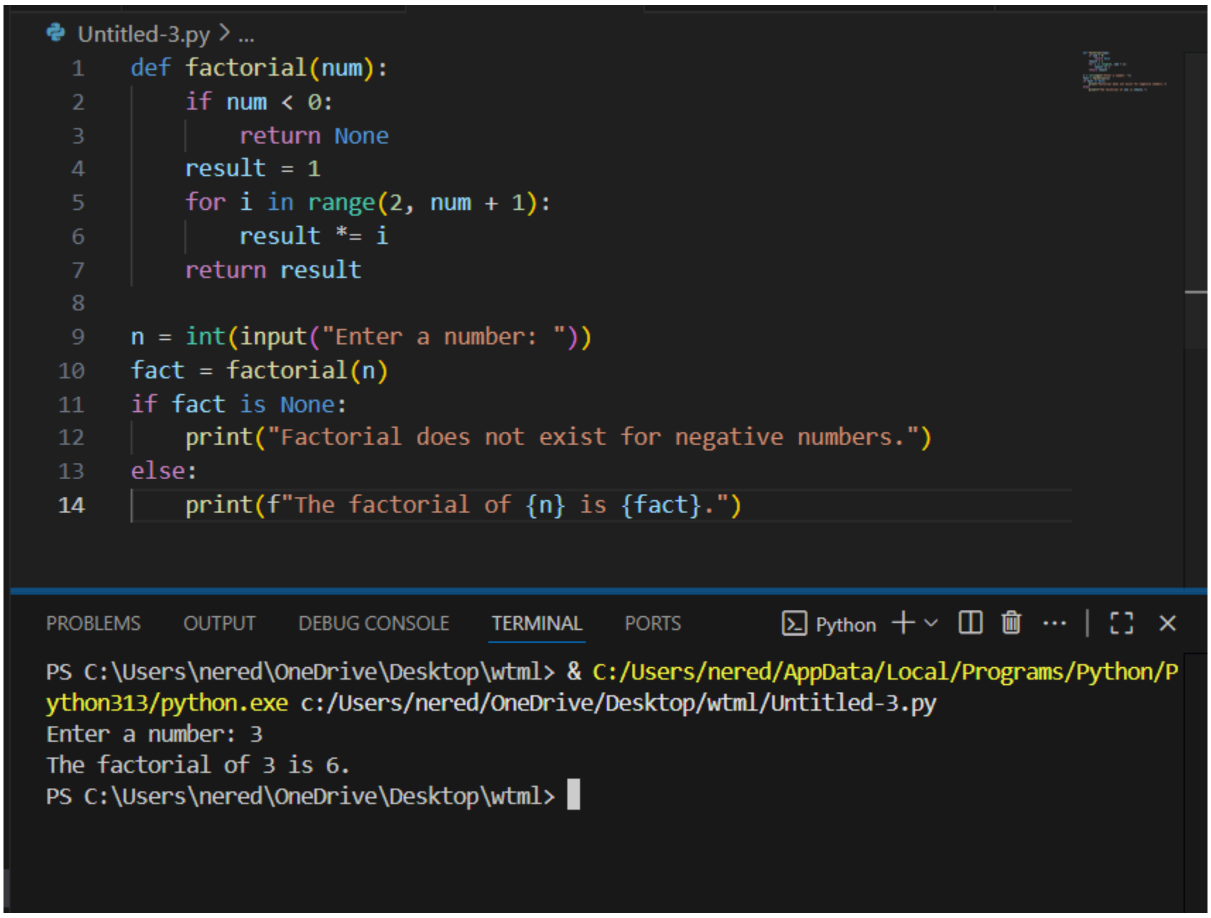
- num = int(input("Enter a number: "))
  Prompts the user to enter a number and converts the input to an integer.
- if num < 0:
  Checks if the number is negative.

- print("Factorial does not exist for negative numbers.")
  If negative, prints a message since factorials are only defined for non-negative integers.
- else:
  If the number is zero or positive:
  - factorial = 1
    Initializes the factorial result to 1.
  - for i in range(2, num + 1):
    Loops from 2 up to and including num.
    - factorial *= i
      Multiplies factorial by each value of i in the loop.
  - print(f"The factorial of {num} is {factorial}.")
    Prints the final factorial value

## prompt 3: Factorial with Functions

Use GitHub Copilot to generate a Python program that calculates the
factorial of a number using a user-defined function.

## Code(screen shot):



```python
def factorial(num):
    if num < 0:
        return None
    result = 1
    for i in range(2, num + 1):
        result *= i
    return result

n = int(input("Enter a number: "))
fact = factorial(n)
if fact is None:
    print("Factorial does not exist for negative numbers.")
else:
    print(f"The factorial of {n} is {fact}.")
```

```
PS C:\Users\nered\OneDrive\Desktop\wtml> & C:/Users/nered/AppData/Local/Programs/Python/P
ython313/python.exe c:/Users/nered/OneDrive/Desktop/wtml/Untitled-3.py
Enter a number: 3
The factorial of 3 is 6.
PS C:\Users\nered\OneDrive\Desktop\wtml> 
```

## Code explanation:

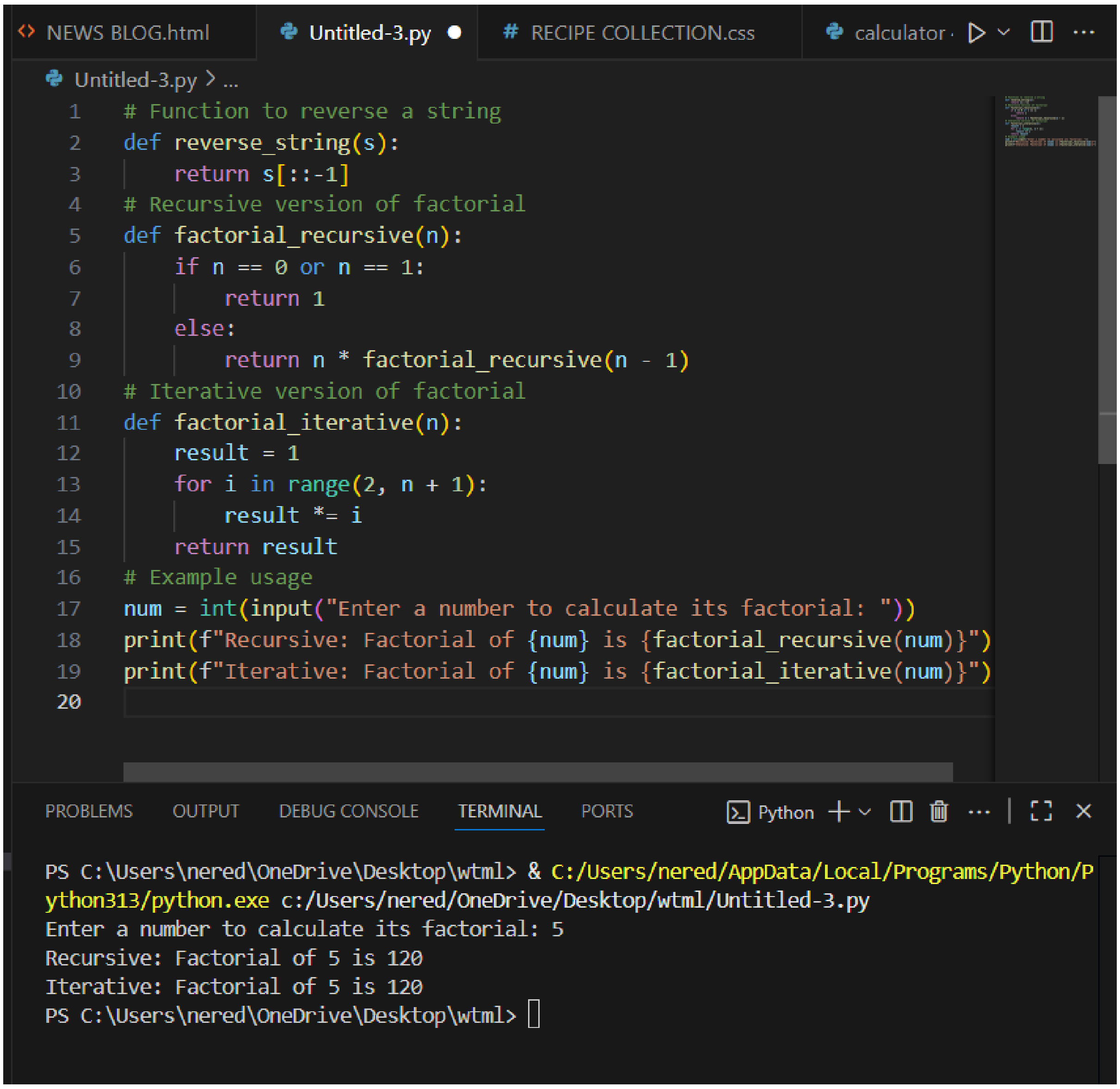
This program calculates the factorial of a number using a user-defined function:

- The factorial(num) function checks if the input is negative. If so, it returns None.
- If the input is zero or positive, it initializes result to 1 and multiplies it by each integer from 2 up to num.
- The main code gets a number from the user, calls the factorial function, and stores the result.
- If the result is None, it prints a message for negative numbers. Otherwise, it prints the factorial value.

Prompt 4: Comparative Analysis – With vs Without Functions

Differentiate between the Copilot-generated factorial program with functions and without functions in terms of logic, reusability, and execution

Code(screen shot):



```python
# Function to reverse a string
def reverse_string(s):
    return s[::-1]
# Recursive version of factorial
def factorial_recursive(n):
    if n == 0 or n == 1:
        return 1
    else:
        return n * factorial_recursive(n - 1)
# Iterative version of factorial
def factorial_iterative(n):
    result = 1
    for i in range(2, n + 1):
        result *= i
    return result
# Example usage
num = int(input("Enter a number to calculate its factorial: "))
print(f"Recursive: Factorial of {num} is {factorial_recursive(num)}")
print(f"Iterative: Factorial of {num} is {factorial_iterative(num)}")
```

```
PS C:\Users\nered\OneDrive\Desktop\wtml> & C:/Users/nered/AppData/Local/Programs/Python/Python313/python.exe c:/Users/nered/OneDrive/Desktop/wtml/Untitled-3.py
Enter a number to calculate its factorial: 5
Recursive: Factorial of 5 is 120
Iterative: Factorial of 5 is 120
PS C:\Users\nered\OneDrive\Desktop\wtml>
```

Code explanation:

- **reverse_string(s):**
  This function takes a string s and returns its reverse using slicing (s[::-1]).
- **factorial_recursive(n):**
  This function calculates the factorial of n recursively.
  - If n is 0 or 1, it returns 1 (base case).
  - Otherwise, it returns n * factorial_recursive(n - 1).
- **factorial_iterative(n):**
  This function calculates the factorial of n using a loop.
  - It initializes result to 1.
  - Then multiplies result by each number from 2 to n.
- **Example usage:**
  - The user is prompted to enter a number.
  - The program prints the factorial of that number using both the recursive and iterative functions.

Prompt 5:Iterative vs Recursive Factorial

● Description:

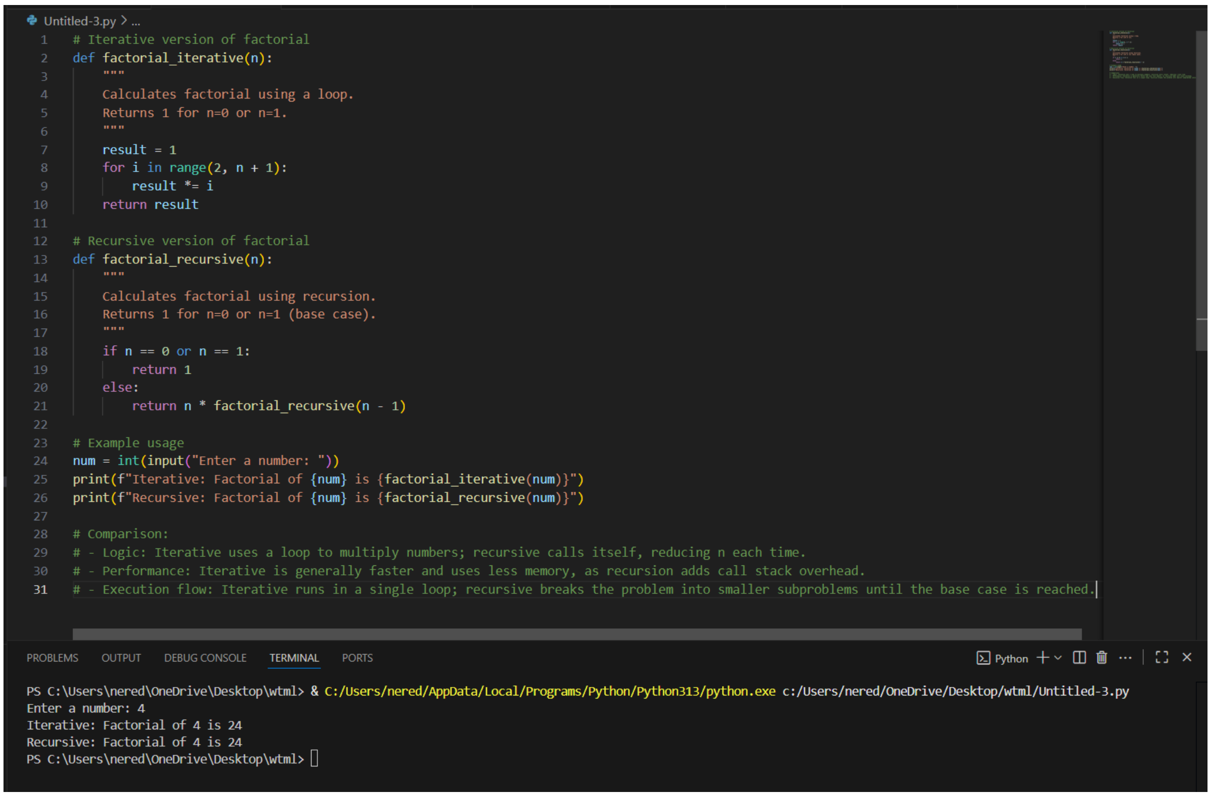
Prompt GitHub Copilot to generate both iterative and recursive versions of the factorial function.

● Expected Output:

o Two correct implementations.

o A documented comparison of logic, performance, and execution flow between iterative and recursive approaches.

Code (screen shot):



```python
# Iterative version of factorial
def factorial_iterative(n):
    """
    Calculates factorial using a loop.
    Returns 1 for n=0 or n=1.
    """
    result = 1
    for i in range(2, n + 1):
        result *= i
    return result

# Recursive version of factorial
def factorial_recursive(n):
    """
    Calculates factorial using recursion.
    Returns 1 for n=0 or n=1 (base case).
    """
    if n == 0 or n == 1:
        return 1
    else:
        return n * factorial_recursive(n - 1)

# Example usage
num = int(input("Enter a number: "))
print(f"Iterative: Factorial of {num} is {factorial_iterative(num)}")
print(f"Recursive: Factorial of {num} is {factorial_recursive(num)}")

# Comparison:
# - Logic: Iterative uses a loop to multiply numbers; recursive calls itself, reducing n each time.
# - Performance: Iterative is generally faster and uses less memory, as recursion adds call stack overhead.
# - Execution flow: Iterative runs in a single loop; recursive breaks the problem into smaller subproblems until the base case is reached.
```

```
PS C:\Users\nered\OneDrive\Desktop\wtml> & C:/Users/nered/AppData/Local/Programs/Python/Python313/python.exe c:/Users/nered/OneDrive/Desktop/wtml/Untitled-3.py
Enter a number: 4
Iterative: Factorial of 4 is 24
Recursive: Factorial of 4 is 24
PS C:\Users\nered\OneDrive\Desktop\wtml>
```

Code explanation:

The code provides two ways to calculate the factorial of a number:

1. **Iterative Version (factorial_iterative)**
   - Uses a loop to multiply numbers from 2 up to n.
   - Returns 1 for n = 0 or n = 1.
   - Efficient in terms of speed and memory.
2. **Recursive Version (factorial_recursive)**
   - Calls itself with n - 1 until it reaches the base case (n = 0 or n = 1).
   - Returns 1 for the base case.
   - Less efficient for large n due to call stack overhead.

**Example usage:**

- Prompts the user for a number.
- Prints the factorial using both methods.

**Comparison:**

- *Logic:* Iterative uses a loop; recursive breaks the problem into smaller subproblems.

- *Performance:* Iterative is faster and uses less memory.
- *Execution flow:* Iterative runs in a single loop; recursive uses multiple function calls until the base case.