

## AI ASSISTED CODING

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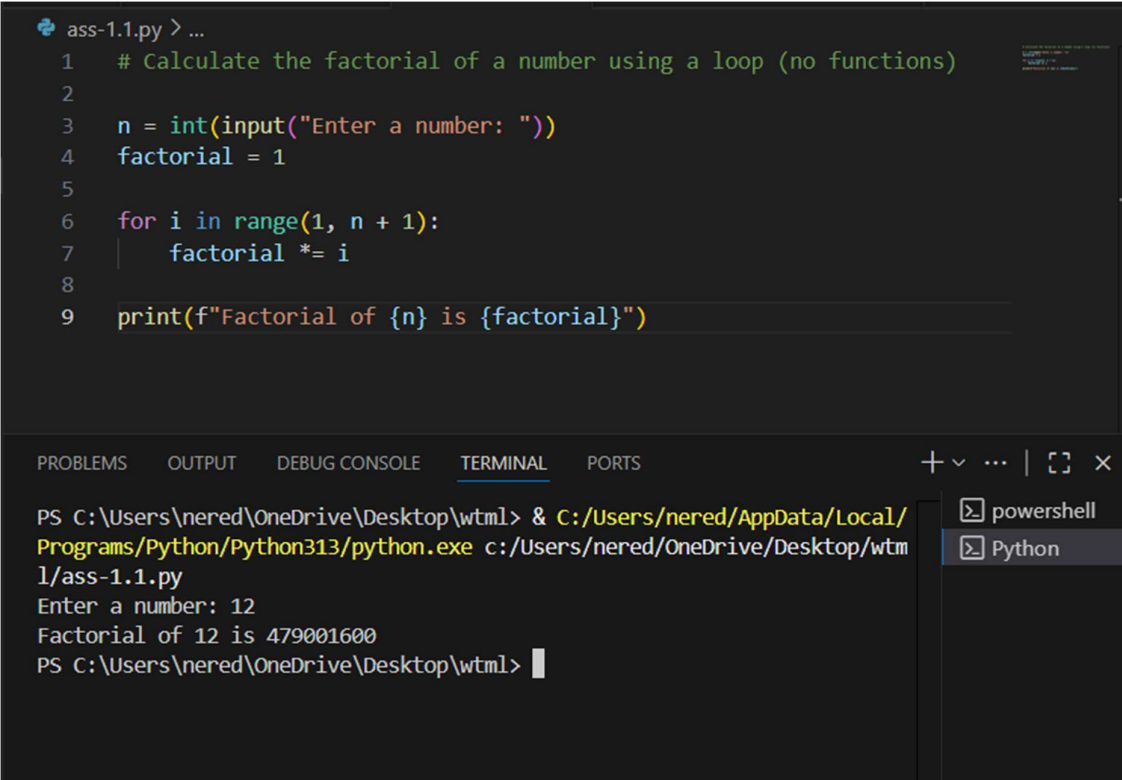
BATCH NUMBER :14

### 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):



```
ass-1.1.py > ...
1  # Calculate the factorial of a number using a loop (no functions)
2
3  n = int(input("Enter a number: "))
4  factorial = 1
5
6  for i in range(1, n + 1):
7      factorial *= i
8
9  print(f"Factorial of {n} is {factorial}")
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```
PS C:\Users\nered\OneDrive\Desktop\wtm1> & C:/Users/nered/AppData/Local/Programs/Python/Python313/python.exe c:/Users/nered/OneDrive/Desktop/wtm1/ass-1.1.py
Enter a number: 12
Factorial of 12 is 479001600
PS C:\Users\nered\OneDrive\Desktop\wtm1> |
```

powerShell  
Python

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):

The screenshot shows a code editor window titled "Untitled-3.py > ...". The code defines a function to calculate the factorial of a number. It uses a loop to multiply numbers from 2 up to the input number.

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

Below the code editor, there is a terminal window with tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL, and PORTS. The TERMINAL tab is active, showing the command prompt running the script:

```
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:

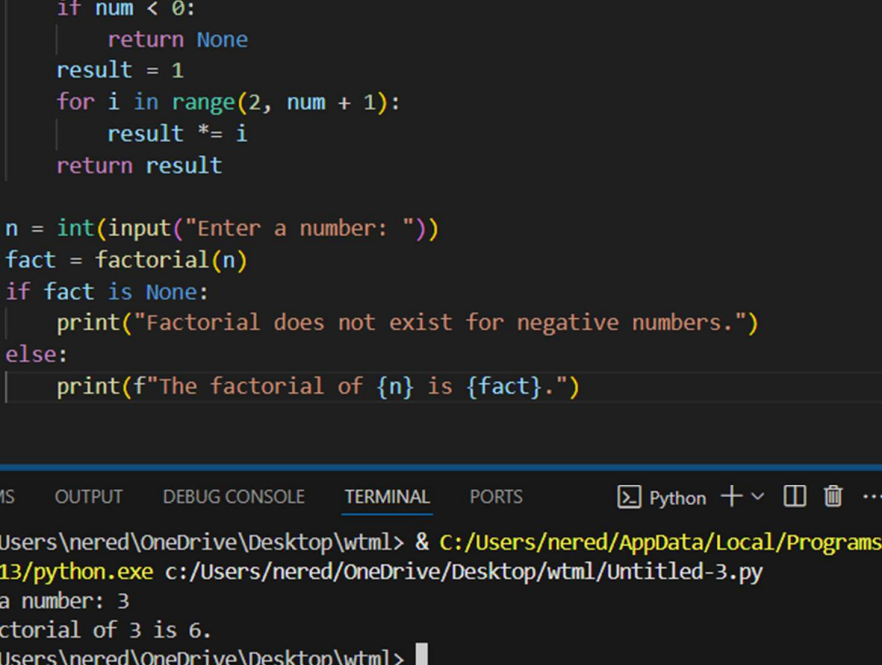
- `num = int(input("Enter a number: "))`  
Prompts the user to enter a number and converts the input to an integer.
- `if num < 0:`  
Checks if the number is negative.

- `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):



```
1 def factorial(num):
2     if num < 0:
3         return None
4     result = 1
5     for i in range(2, num + 1):
6         result *= i
7     return result
8
9 n = int(input("Enter a number: "))
10 fact = factorial(n)
11 if fact is None:
12     print("Factorial does not exist for negative numbers.")
13 else:
14     print(f"The factorial of {n} is {fact}.")
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

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: 3

The factorial of 3 is 6.

PS C:\Users\nered\OneDrive\Desktop\wtml>

Code explanation:

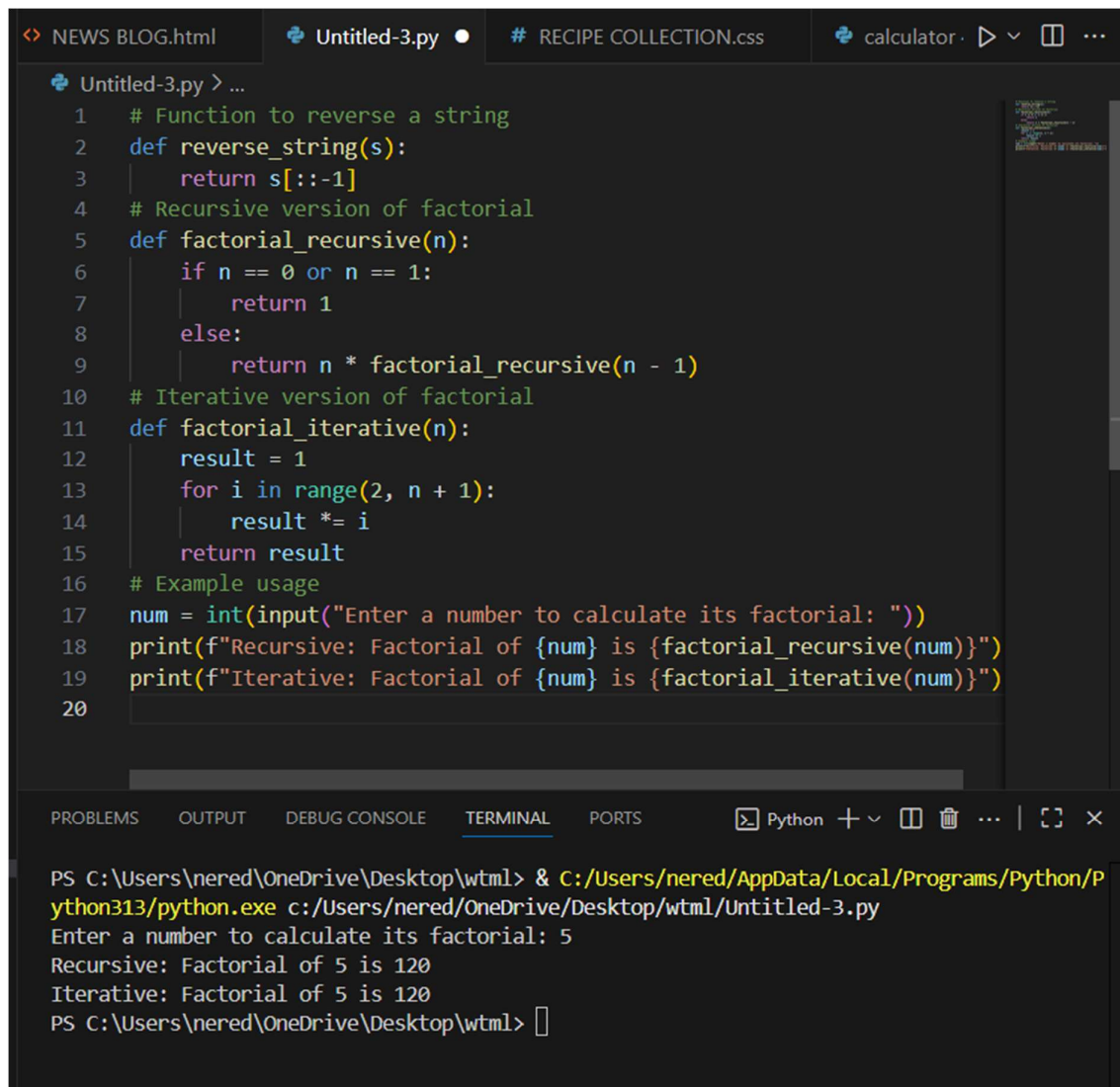
This program calculates the factorial of a number using a user-defined function:

- 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):



The image shows a code editor with a dark theme. The top bar has tabs for 'NEWS BLOG.html', 'Untitled-3.py', '# RECIPE COLLECTION.css', and 'calculator'. The 'Untitled-3.py' tab is active, showing Python code. The code defines a function to reverse a string, a recursive factorial function, and an iterative factorial function. It also includes example usage code that prompts the user for a number and prints the results of both factorial functions. Below the code editor is a terminal window showing the command to run the script and its output.

```
1 # Function to reverse a string
2 def reverse_string(s):
3     return s[::-1]
4 # Recursive version of factorial
5 def factorial_recursive(n):
6     if n == 0 or n == 1:
7         return 1
8     else:
9         return n * factorial_recursive(n - 1)
10 # Iterative version of factorial
11 def factorial_iterative(n):
12     result = 1
13     for i in range(2, n + 1):
14         result *= i
15     return result
16 # Example usage
17 num = int(input("Enter a number to calculate its factorial: "))
18 print(f"Recursive: Factorial of {num} is {factorial_recursive(num)}")
19 print(f"Iterative: Factorial of {num} is {factorial_iterative(num)}")
20
```

Terminal output:

```
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.

- **Example usage:**

### 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):

```

1  # Iterative version of factorial
2  def factorial_iterative(n):
3      """
4      Calculates factorial using a loop.
5      Returns 1 for n=0 or n=1.
6      """
7      result = 1
8      for i in range(2, n + 1):
9          result *= i
10     return result
11
12 # Recursive version of factorial
13 def factorial_recursive(n):
14     """
15     Calculates factorial using recursion.
16     Returns 1 for n=0 or n=1 (base case).
17     """
18     if n == 0 or n == 1:
19         return 1
20     else:
21         return n * factorial_recursive(n - 1)
22
23 # Example usage
24 num = int(input("Enter a number: "))
25 print(f"Iterative: Factorial of {num} is {factorial_iterative(num)}")
26 print(f"Recursive: Factorial of {num} is {factorial_recursive(num)}")
27
28 # Comparison:
29 # - Logic: Iterative uses a loop to multiply numbers; recursive calls itself, reducing n each time.
30 # - Performance: Iterative is generally faster and uses less memory, as recursion adds call stack overhead.
31 # - Execution flow: Iterative runs in a single loop; recursive breaks the problem into smaller subproblems until the base case is reached.

```

PROBLEMS OUTPUT DEBUG CONSOLE **TERMINAL** PORTS

```

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.