AI ASSISTED CODING

ASSIGNMENT-3

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Question 1: Zero-Shot Prompting (Palindrome Number Program)

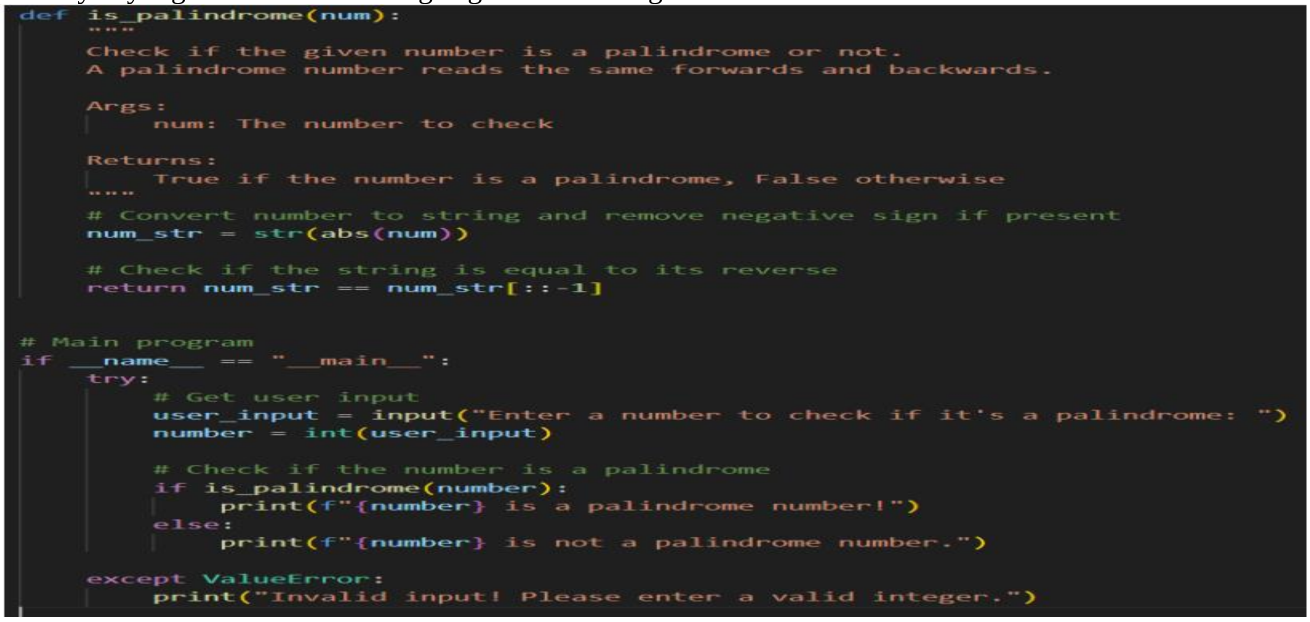
Write a zero-shot prompt (without providing any examples) to generate a Python function that checks whether a given number is a palindrome.

Task:

• Record the AI-generated code.

• Test the code with multiple inputs.

• Identify any logical errors or missing edge-case handling.



```python
def is_palindrome(num):
    """
    Check if the given number is a palindrome or not.
    A palindrome number reads the same forwards and backwards.

    Args:
        num: The number to check

    Returns:
        True if the number is a palindrome, False otherwise
    """
    # Convert number to string and remove negative sign if present
    num_str = str(abs(num))

    # Check if the string is equal to its reverse
    return num_str == num_str[::-1]


# Main program
if __name__ == "__main__":
    try:
        # Get user input
        user_input = input("Enter a number to check if it's a palindrome: ")
        number = int(user_input)

        # Check if the number is a palindrome
        if is_palindrome(number):
            print(f"{number} is a palindrome number!")
        else:
            print(f"{number} is not a palindrome number.")

    except ValueError:
        print("Invalid input! Please enter a valid integer.")
```

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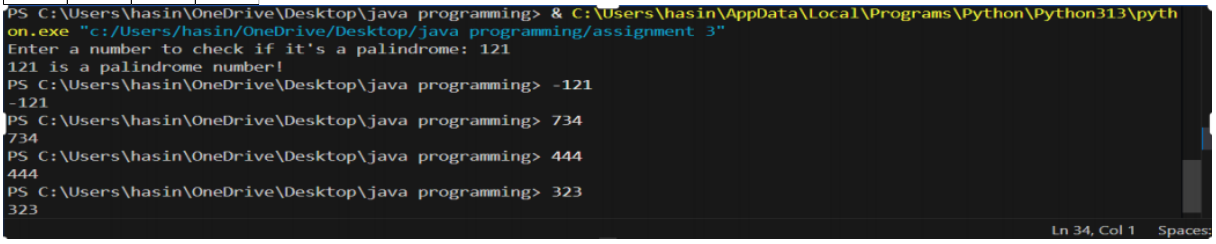


```
PS C:\Users\hasin\OneDrive\Desktop\java programming> & C:\Users\hasin\AppData\Local\Programs\Python\Python313\python.exe "c:/Users/hasin/OneDrive/Desktop/java programming/assignment 3"
Enter a number to check if it's a palindrome: 121
121 is a palindrome number!
PS C:\Users\hasin\OneDrive\Desktop\java programming> -121
-121
PS C:\Users\hasin\OneDrive\Desktop\java programming> 734
734
PS C:\Users\hasin\OneDrive\Desktop\java programming> 444
444
PS C:\Users\hasin\OneDrive\Desktop\java programming> 323
323
                                                              Ln 34, Col 1   Spaces:
```

There are no logical errors in the code generated. Negative Numbers and invalid input(Strings) are handled using try and except.

Question 2: One-Shot Prompting (Factorial Calculation)

Write a one-shot prompt by providing one input-output example and ask the AI to generate a Python function to compute the factorial of a given number.

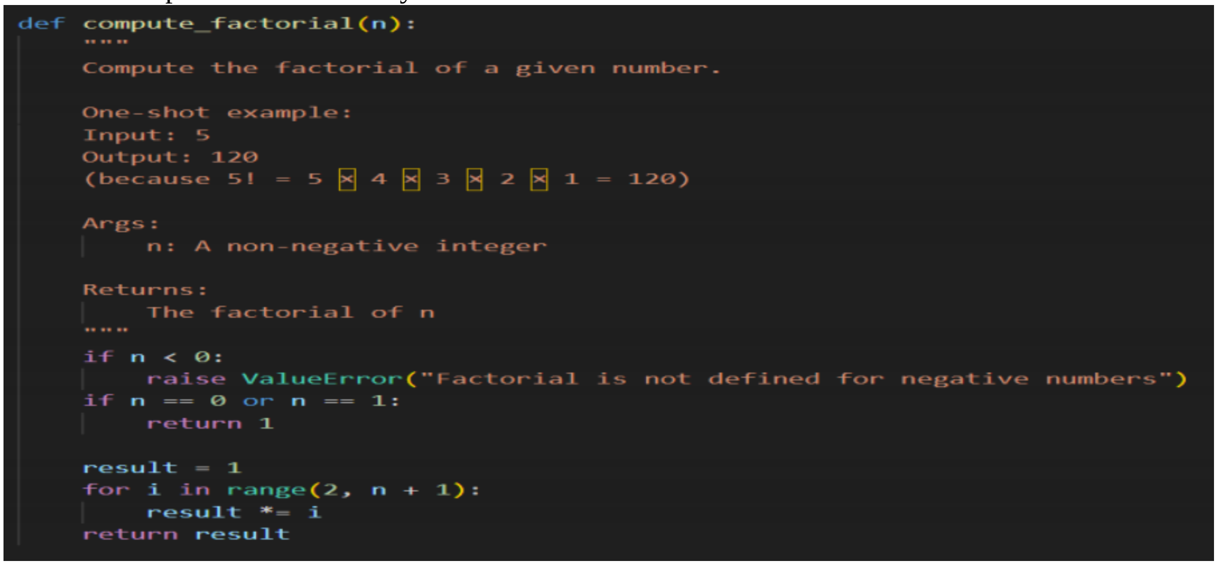
Example:

Input: 5 → Output: 120

Task:

• Compare the generated code with a zero-shot solution.

• Examine improvements in clarity and correctness.



```python
def compute_factorial(n):
    """
    Compute the factorial of a given number.

    One-shot example:
    Input: 5
    Output: 120
    (because 5! = 5 ⊠ 4 ⊠ 3 ⊠ 2 ⊠ 1 = 120)

    Args:
        n: A non-negative integer

    Returns:
        The factorial of n
    """
    if n < 0:
        raise ValueError("Factorial is not defined for negative numbers")
    if n == 0 or n == 1:
        return 1

    result = 1
    for i in range(2, n + 1):
        result *= i
    return result
```

Comparison of Factorial Programs Using One-Shot and Zero-Shot Prompts

Aspect	**Program 1: One-Shot Prompt**	**Program 2: Zero-Shot Prompt**
Definition	Provides a single example and directly computes the factorial	Solves the problem without prior examples using logic and validation
Program Structure	Single block of code	Function-based with main execution logic
Modularity	Not modular	Modular design
Correctness for Positive Integers	Produces correct results	Produces correct results
Handling of Zero (0!)	Correctly returns 1	Correctly returns 1
Handling of Negative Numbers	Not handled; produces incorrect output	Properly handled with validation message
Invalid Input Handling	No handling for invalid input	Uses exception handling (try–except)

Aspect	Program 1: One-Shot Prompt	Program 2: Zero-Shot Prompt
Code Readability	Simple and easy to understand	Clear, structured, and professional
Reusability	Cannot be reused	Can be reused multiple times
Maintainability	Difficult to modify or extend	Easy to maintain and extend
Scalability	Limited	Suitable for larger applications
Programming Best Practices	Partially followed	Fully followed
Suitability for Assignments	Basic demonstration	Highly suitable
Overall Robustness	Low	High

Question 3: Few-Shot Prompting (Armstrong Number Check)

Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python function to check whether a given number is an Armstrong number.

Examples:

• Input: 153 → Output: Armstrong Number

• Input: 370 → Output: Armstrong Number

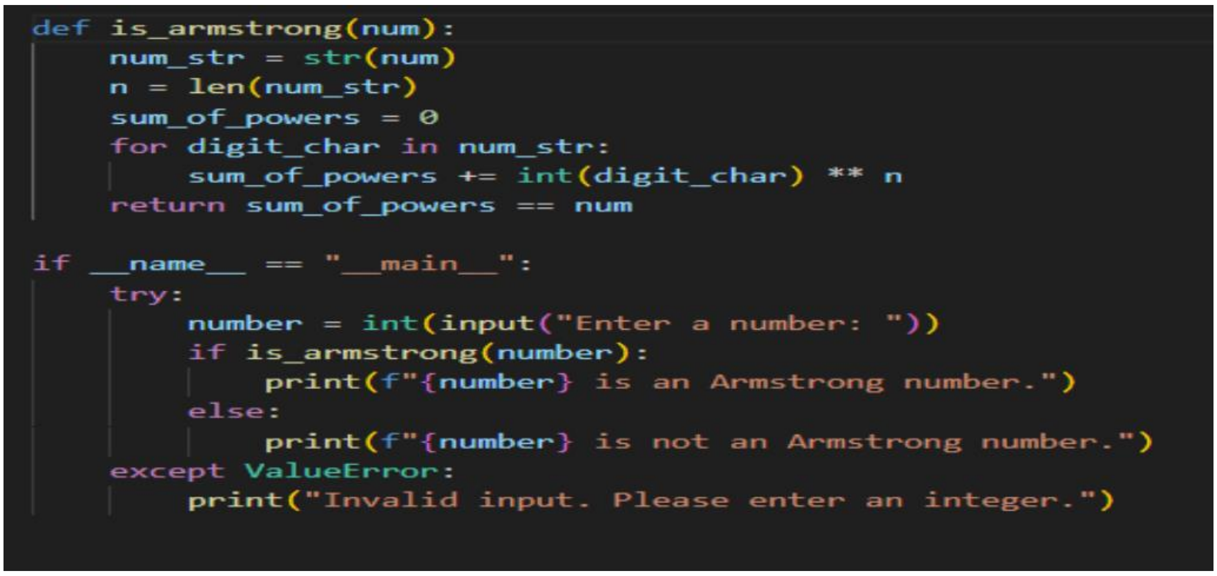
• Input: 123 → Output: Not an Armstrong Number

Task:

• Analyze how multiple examples influence code structure and

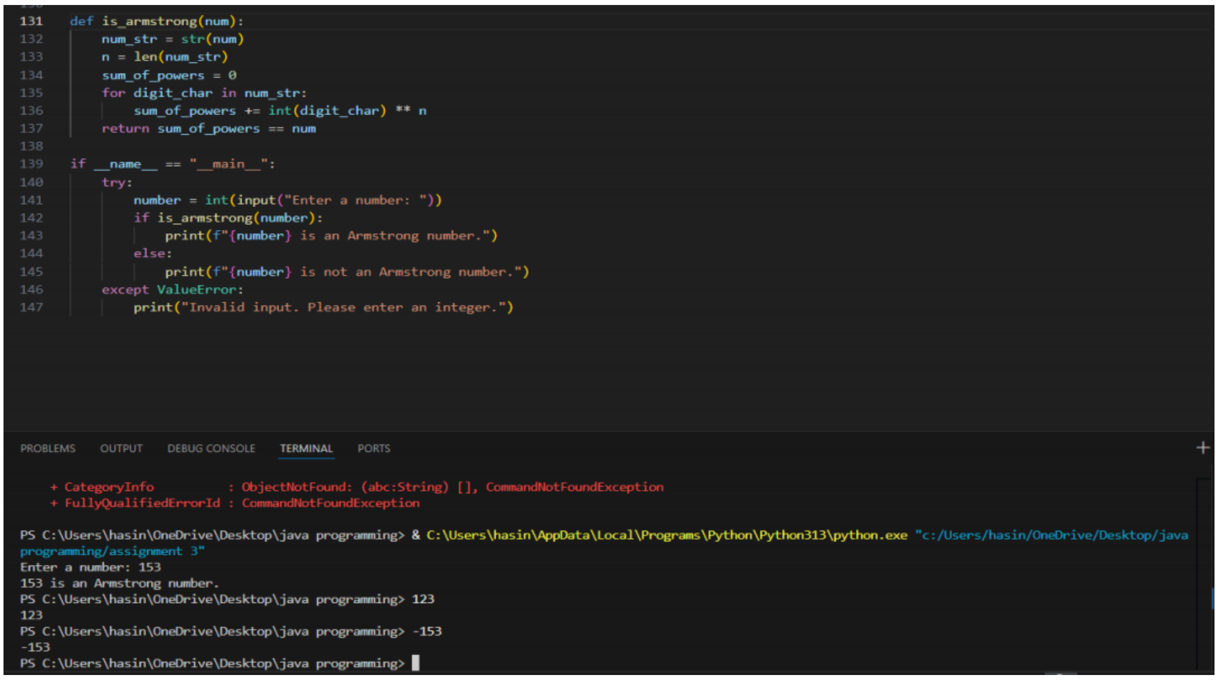
accuracy.

• Test the function with boundary values and invalid inputs.



```python
def is_armstrong(num):
    num_str = str(num)
    n = len(num_str)
    sum_of_powers = 0
    for digit_char in num_str:
        sum_of_powers += int(digit_char) ** n
    return sum_of_powers == num

if __name__ == "__main__":
    try:
        number = int(input("Enter a number: "))
        if is_armstrong(number):
            print(f"{number} is an Armstrong number.")
        else:
            print(f"{number} is not an Armstrong number.")
    except ValueError:
        print("Invalid input. Please enter an integer.")
```



```python
def is_armstrong(num):
    num_str = str(num)
    n = len(num_str)
    sum_of_powers = 0
    for digit_char in num_str:
        sum_of_powers += int(digit_char) ** n
    return sum_of_powers == num

if __name__ == "__main__":
    try:
        number = int(input("Enter a number: "))
        if is_armstrong(number):
            print(f"{number} is an Armstrong number.")
        else:
            print(f"{number} is not an Armstrong number.")
    except ValueError:
        print("Invalid input. Please enter an integer.")
```

```
    + CategoryInfo          : ObjectNotFound: (abc:String) [], CommandNotFoundException
    + FullyQualifiedErrorId : CommandNotFoundException

PS C:\Users\hasin\OneDrive\Desktop\java programming> & C:\Users\hasin\AppData\Local\Programs\Python\Python313\python.exe "c:/Users/hasin/OneDrive/Desktop/java programming/assignment 3"
Enter a number: 153
153 is an Armstrong number.
PS C:\Users\hasin\OneDrive\Desktop\java programming> 123
123
PS C:\Users\hasin\OneDrive\Desktop\java programming> -153
-153
PS C:\Users\hasin\OneDrive\Desktop\java programming>
```

Question 4: Context-Managed Prompting (Optimized Number Classification)

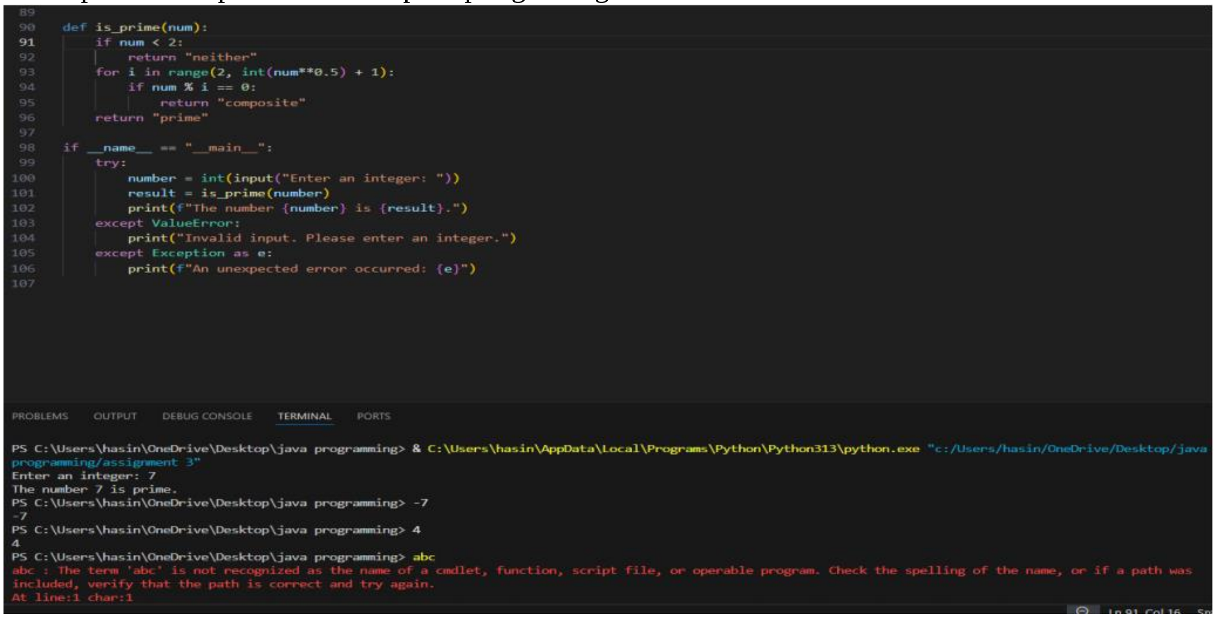
Design a context-managed prompt with clear instructions and constraints to generate an optimized Python program that classifies a number as prime, composite, or neither.

Task:

• Ensure proper input validation.

• Optimize the logic for efficiency.

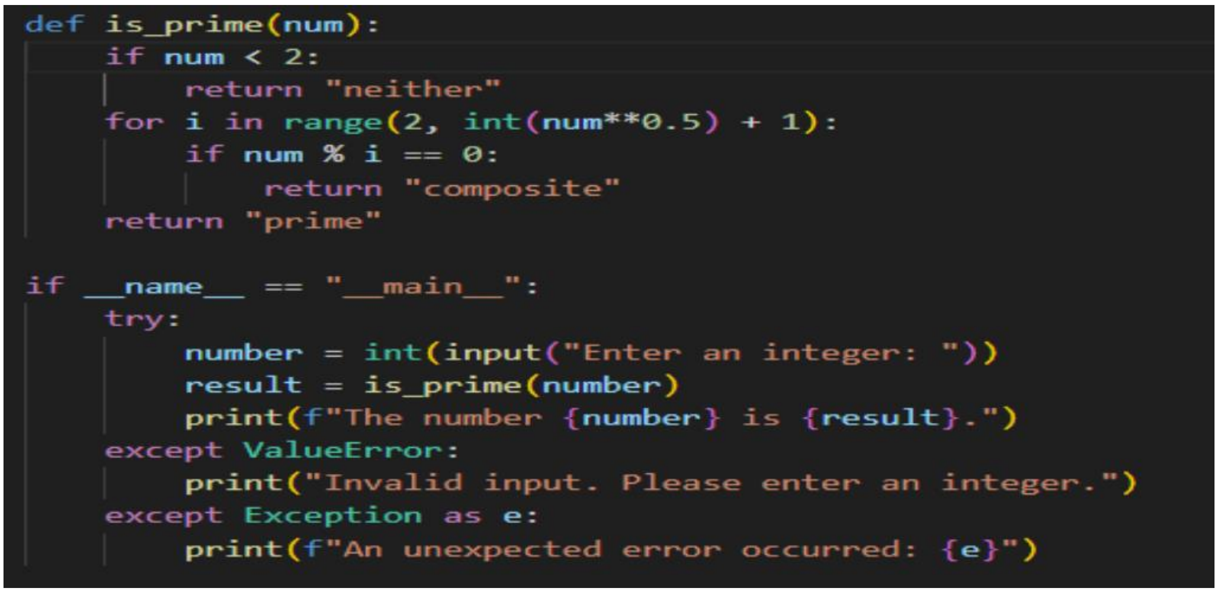
• Compare the output with earlier prompting strategies.



```python
def is_prime(num):
    if num < 2:
        return "neither"
    for i in range(2, int(num**0.5) + 1):
        if num % i == 0:
            return "composite"
    return "prime"

if __name__ == "__main__":
    try:
        number = int(input("Enter an integer: "))
        result = is_prime(number)
        print(f"The number {number} is {result}.")
    except ValueError:
        print("Invalid input. Please enter an integer.")
    except Exception as e:
        print(f"An unexpected error occurred: {e}")
```

```
PS C:\Users\hasin\OneDrive\Desktop\java programming> & C:\Users\hasin\AppData\Local\Programs\Python\Python313\python.exe "c:/Users/hasin/OneDrive/Desktop/java programming/assignment 3"
Enter an integer: 7
The number 7 is prime.
PS C:\Users\hasin\OneDrive\Desktop\java programming> -7
-7
PS C:\Users\hasin\OneDrive\Desktop\java programming> 4
4
PS C:\Users\hasin\OneDrive\Desktop\java programming> abc
abc : The term 'abc' is not recognized as the name of a cmdlet, function, script file, or operable program. Check the spelling of the name, or if a path was included, verify that the path is correct and try again.
At line:1 char:1
```



```python
def is_prime(num):
    if num < 2:
        return "neither"
    for i in range(2, int(num**0.5) + 1):
        if num % i == 0:
            return "composite"
    return "prime"

if __name__ == "__main__":
    try:
        number = int(input("Enter an integer: "))
        result = is_prime(number)
        print(f"The number {number} is {result}.")
    except ValueError:
        print("Invalid input. Please enter an integer.")
    except Exception as e:
        print(f"An unexpected error occurred: {e}")
```

Comparison (optimized vs earlier prompting strategy)

- **Original prompt:** Role:Effecient python programmer Task:Write a python code to classify the given number as prime or composite or neither for only positive numbers.
- **Original outcome:** classify_number used vanilla trial division from 2 to int(num**0.5)+1; accepted zero as positive (if a < 0), no type hints, no stdlib helpers.
- **Optimized changes:**
    - **Algorithm:** early-case for 2, early even-number rejection, loop only odd divisors: for i in range(3, math.isqrt(num)+1, 2).
    - **Implementation:** uses math.isqrt, adds type hints def classify_number(num: int) -> str.
    - **Validation:** input check tightened to reject a <= 0 (zero treated as non-positive).
- **Performance impact:** same asymptotic complexity O(sqrt(n)) but halves divisor checks (skip evens) and uses integer sqrt for a small constant-speed gain; noticeably faster for large odd numbers.
- **Readability / correctness:** clearer intent, fewer iterations, safer integer sqrt, and explicit types improve maintainability.
- **Tradeoffs / next steps:** still brute-force; for very large inputs consider Miller–Rabin (probabilistic, much faster) or optimized sieves if classifying many numbers.

Question 5: Zero-Shot Prompting (Perfect Number Check)

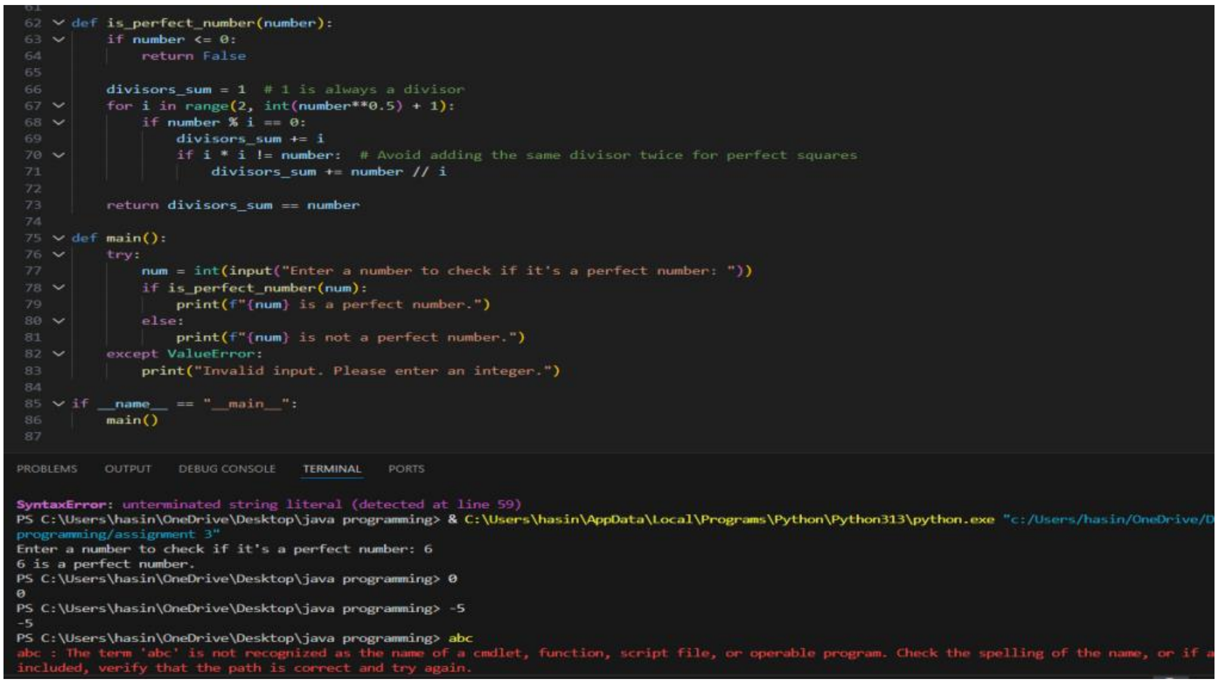
Write a zero-shot prompt (without providing any examples) to generate a Python function that checks whether a given number is a perfect number.

Task:

• Record the AI-generated code.

• Test the program with multiple inputs.

• Identify any missing conditions or inefficiencies in the logic.



```python
def is_perfect_number(number):
    if number <= 0:
        return False

    divisors_sum = 1  # 1 is always a divisor
    for i in range(2, int(number**0.5) + 1):
        if number % i == 0:
            divisors_sum += i
            if i * i != number:  # Avoid adding the same divisor twice for perfect squares
                divisors_sum += number // i

    return divisors_sum == number

def main():
    try:
        num = int(input("Enter a number to check if it's a perfect number: "))
        if is_perfect_number(num):
            print(f"{num} is a perfect number.")
        else:
            print(f"{num} is not a perfect number.")
    except ValueError:
        print("Invalid input. Please enter an integer.")

if __name__ == "__main__":
    main()
```

```
SyntaxError: unterminated string literal (detected at line 59)
PS C:\Users\hasin\OneDrive\Desktop\java programming> & C:\Users\hasin\AppData\Local\Programs\Python\Python313\python.exe "c:/Users/hasin/OneDrive/D
programming/assignment 3"
Enter a number to check if it's a perfect number: 6
6 is a perfect number.
PS C:\Users\hasin\OneDrive\Desktop\java programming> 0
0
PS C:\Users\hasin\OneDrive\Desktop\java programming> -5
-5
PS C:\Users\hasin\OneDrive\Desktop\java programming> abc
abc : The term 'abc' is not recognized as the name of a cmdlet, function, script file, or operable program. Check the spelling of the name, or if a
included, verify that the path is correct and try again.
```

1. The program is **logically correct**, but it redundantly checks for negative numbers both inside the function and in the main code.

2. It does not explicitly handle or explain why **0 and 1 are not perfect numbers**.

3. The divisor calculation is **inefficient (O(n))** as it checks all numbers from 1 to num−1.

4. The logic does not use the **square-root optimization**, causing unnecessary iterations.

5. For large inputs, the program may be **slow and inefficient**, even though the result is correct.

Question 6: Few-Shot Prompting (Even or Odd Classification with Validation)

Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python program that determines whether a given number is even or odd, including proper input validation.

Examples:

• Input: 8 → Output: Even

• Input: 15 → Output: Odd

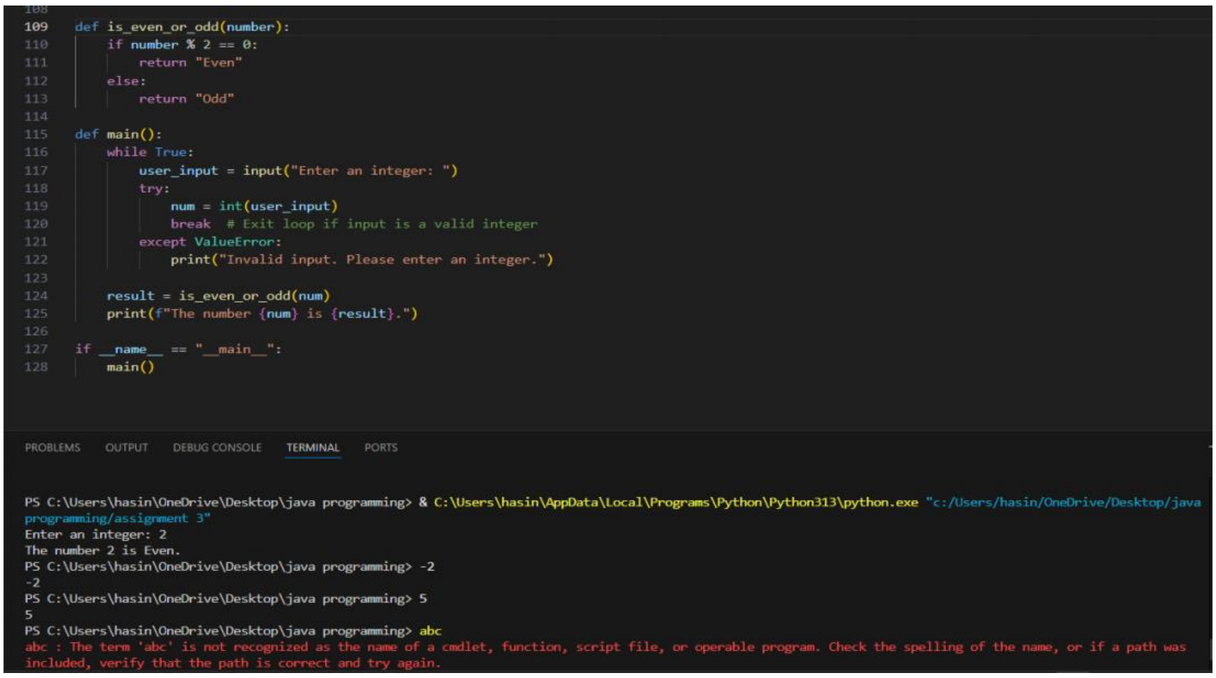
• Input: 0 → Output: Even

Task:

• Analyze how examples improve input handling and output

clarity.

• Test the program with negative numbers and non-integer inputs.



```python
def is_even_or_odd(number):
    if number % 2 == 0:
        return "Even"
    else:
        return "Odd"

def main():
    while True:
        user_input = input("Enter an integer: ")
        try:
            num = int(user_input)
            break  # Exit loop if input is a valid integer
        except ValueError:
            print("Invalid input. Please enter an integer.")

    result = is_even_or_odd(num)
    print(f"The number {num} is {result}.")

if __name__ == "__main__":
    main()
```

```
PS C:\Users\hasin\OneDrive\Desktop\java programming> & C:\Users\hasin\AppData\Local\Programs\Python\Python313\python.exe "c:/Users/hasin/OneDrive/Desktop/java
programming/assignment 3"
Enter an integer: 2
The number 2 is Even.
PS C:\Users\hasin\OneDrive\Desktop\java programming> -2
-2
PS C:\Users\hasin\OneDrive\Desktop\java programming> 5
5
PS C:\Users\hasin\OneDrive\Desktop\java programming> abc
abc : The term 'abc' is not recognized as the name of a cmdlet, function, script file, or operable program. Check the spelling of the name, or if a path was
included, verify that the path is correct and try again.
```