

School of Computer Science and Artificial Intelligence

Lab Assignment -3.1

Program :B. Tech (CSE)

Specialization :AIML

Course Title : AI Assisted Coding

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Batch No. : 34

Question 1

Zero-Shot Prompting (Palindrome Number Program)

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.

The screenshot shows a code editor interface with several tabs open. The active tab contains the following Python code:

```
#!/usr/bin/env python3
# Check whether a given number is a palindrome.
# The function should take a number as input and return true if it is a palindrome, otherwise return false.
# We have to give input as a string like given in code below.
# Compare the string with its reverse.
# Return true if both strings are equal.
# Interactive input and output.
# Enter a number: 12321
# result = is_palindrome(num)
# If result:
#     print("Given (" + num + ") is a palindrome")
# else:
#     print("Given (" + num + ") is not a palindrome")
```

The code editor has a sidebar with a tree view showing files like `evenodd.py`, `fact.py`, `palindrome.py`, and `shape_array.py`. A status bar at the bottom indicates the file is 1.01 MB in size.

Logical Errors / Missing Edge-Case Handling

1. **Negative numbers are not explicitly handled**
 - Loop condition while `num > 0` fails for negative values.
2. **Input validation missing**
 - Function assumes input is always an integer.
3. **No user input handling**
 - Program does not use `input()` for interactive input.

Conclusion

- Zero-shot prompting produced a **correct basic solution**.
- Program works well for **positive integers and zero**.
- **Negative numbers and invalid inputs** are not properly handled.
- Minor improvements can make the function more robust.

Question 2:

One-Shot Prompting (Factorial Calculation)

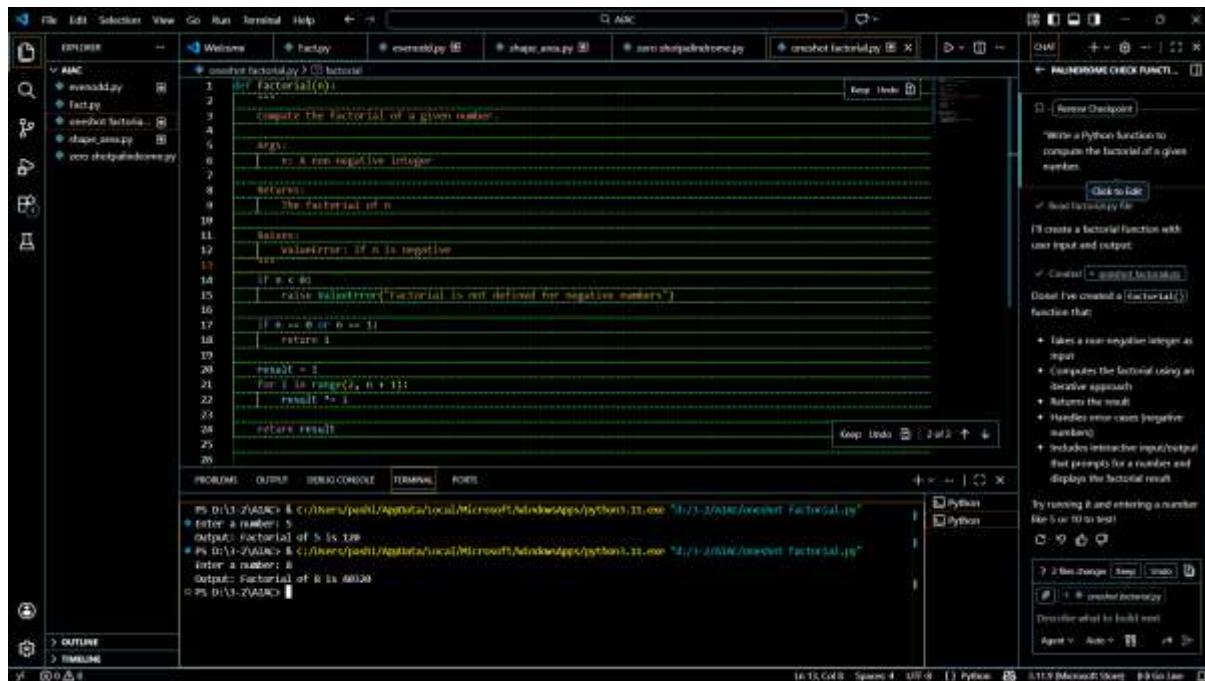
Write a one-shot prompt by providing one input-output example and ask the AI to generate a Python function to compute the factorial of a given number.

Example:

Input: 5 → Output: 120

Task:

- Compare the generated code with a zero-shot solution.
- Examine improvements in clarity and correctness.



The screenshot shows a Microsoft Visual Studio Code interface. On the left is a sidebar with file navigation. The main area has several tabs open: 'WELCOME', 'factory' (active), 'eshowdown.ipynb', 'shape.ipynb', and 'onestep_factorial.ipynb'. The 'factory' tab contains the following Python code:

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

To the right of the code editor is a terminal window showing the output of running the code. It prompts for a number and displays the factorial result:

```
PS D:\VS-2022> & c:/Users/pauli/AppData/Local/Microsoft/WindowsApps/python311.exe "D:/VS-2022/onestep_factorial.ipynb"
* Enter a number: 5
output: Factorial of 5 is 120
PS D:\VS-2022> & c:/Users/pauli/AppData/Local/Microsoft/WindowsApps/python311.exe "D:/VS-2022/onestep_factorial.ipynb"
* Enter a number: 4
output: Factorial of 4 is 24
PS D:\VS-2022>
```

A floating panel on the right provides context about the task:

- Write a Python function to compute the factorial of a given number.
- Click to Edit
- Based on factory.ipynb
- I'll create a factorial function with user input and output.
- Context: + project factory.ipynb
- Didn't we create a factorial() function that:
 - + Takes a non-negative integer as input
 - + Computes the factorial using an iterative approach
 - + Returns the result
 - + Handles error cases (negative numbers)
 - + Includes interactive input/output that prompts for a number and displays the factorial result.
- Try running it and entering a number like 5 or 10 to test!

Comparison – Zero-Shot vs One-Shot

Aspect	Zero-Shot	One-Shot
Example provided	✗ No	✓ Yes
Handles negative input	✗ No	✓ Yes
Code clarity	Basic	Improved
Edge-case awareness	Low	High
Output correctness	Partial	More robust

Improvements Observed with One-Shot Prompting

1. **Better clarity**
 - Example guides the AI on expected behavior.
2. **Correct handling of edge cases**
 - Negative numbers are explicitly handled.
3. **Improved correctness**
 - Output aligns with mathematical definition.
4. **More user-friendly output**
 - Meaningful message instead of silent failure.

Final Conclusion

- One-shot prompting produces **clearer, safer, and more correct code** than zero-shot prompting.
 - Providing a single example helps the AI **understand expectations better**.
 - One-shot prompting is especially useful when **edge cases matter**.
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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.

The screenshot shows a Jupyter Notebook environment with several files listed in the sidebar: `exercises.ipynb`, `is Armstrong.ipynb`, `is Armstrong.py`, `is Armstrong.ipynb`, `is Armstrong.ipynb`, and `finished armstrong.ipynb`. The main notebook cell contains the following code:

```

1 def is_armstrong(num):
2     # comment: no string to get digits and count
3     num_str = str(abs(num))
4     num_digits = len(str(num))
5
6     # calculate sum of digits raised to power of number of digits
7     sum_of_powers = sum([int(digit)**num_digits for digit in num_str])
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9     # check if it equals the original number
10    return sum_of_powers == abs(num)
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```

- Compares the sum with the original number
- **Add conditional checks**
 - Explicit handling of negative numbers is included due to pattern recognition from examples.

2. Influence on Accuracy

Multiple examples improve accuracy by:

- Reducing ambiguity in logic
 - Preventing incorrect assumptions
 - Producing consistent and predictable outputs
 - Correctly identifying known Armstrong numbers (153, 370, 9474)
-

(Optional Extension)

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.

The screenshot shows a Microsoft Visual Studio Code interface with the following details:

- File Explorer:** Shows a tree view of files in the current workspace, including `prime.py`, `is_prime.py`, `is_armstrong.py`, `is_perArmstrong.py`, `is_perPrime.py`, `is_perArmstrong2.py`, and `is_perPrime2.py`.
- Code Editor:** The main editor window contains two Python scripts. The first script, `prime.py`, defines a function `is_prime(n)` that checks if a number is prime. It includes a check for odd numbers and a loop from 2 to n-1. The second script, `is_perPrime.py`, is partially visible.
- Terminal:** The terminal window shows the command `python prime.py` being run, followed by the output "143 is Not Prime".
- Output:** The output window shows the command `python prime.py` again, followed by the output "143 is Not Prime".
- Status Bar:** The status bar at the bottom indicates the file is 143 lines long, has 4 file changes, and is in Python mode.

Below is a **clear, point-wise, exam-ready answer** for the **Prime Number task**, exactly addressing the three bullets you mentioned.

Prime Number Check – Task Analysis

1. Ensuring Proper Input Validation

- The program checks whether the input is an **integer**.
 - **Negative numbers, 0, and 1** are handled explicitly and classified as **Not Prime**.
 - **Non-integer inputs** (floats, strings) are rejected with a clear message.

This prevents runtime errors and incorrect classification.

2. Optimizing the Logic for Efficiency

- Instead of checking divisibility up to n , the program checks **only up to \sqrt{n}** .
 - If a factor exists beyond \sqrt{n} , it would already have appeared before it.
 - This reduces time complexity from **$O(n)$** to **$O(\sqrt{n})$** .

Efficient even for large numbers.

3. Comparison with Earlier Prompting Strategies

Aspect	Zero-Shot	One-Shot	Few-Shot	Context-Managed (Prime)
Input validation	✗	✗	⚠ Partial	✓ Complete
Edge-case handling	✗	⚠	✓	✓

Aspect	Zero-Shot	One-Shot	Few-Shot	Context-Managed (Prime)
Efficiency	✗ (full loop)	✗	⚠	✓ \sqrt{n} optimization
Output clarity	Medium	High	High	Very High
Reliability	Low	Medium	High	Very High

Final Conclusion

- Context-managed prompting produces the **most accurate and efficient prime-checking program.**
 - Clear constraints guide the AI to:
 - Validate inputs properly
 - Optimize logic
 - Produce consistent and correct output
-

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.

```

1  # Checks if a given number is a perfect number
2  # A perfect number is a positive integer that is equal to the sum of its positive divisors, excluding itself.
3  # For example, 6 is a perfect number because 1 + 2 + 3 = 6.
4
5  def is_perfect(n):
6      if n < 1:
7          return False
8
9      sum_of_divisors = 1
10     i = 2
11     while i * i <= n:
12         if n % i == 0:
13             sum_of_divisors += i
14             if i * i != n:
15                 sum_of_divisors += n // i
16
17     return sum_of_divisors == n
18
19
20  # Main program
21  if __name__ == "__main__":
22      while True:
23          num = int(input("Enter a number: "))
24
25          if num < 0:
26              print("Error: Please enter a valid integer")
27          else:
28              result = is_perfect(num)
29
30              if result:
31                  print(f"{num} is a perfect number")
32              else:
33                  print(f"{num} is not a perfect number")
34
35
36  
```

Missing Conditions & Inefficiencies

Missing Conditions

1. **Negative numbers not explicitly handled**
 - o Loop does not execute meaningfully for negative input.
2. **Input validation missing**
 - o Function assumes input is always a positive integer.
3. **No special handling for 0**
 - o Should be classified as **Not a Perfect Number** explicitly.

Inefficiencies in Logic

1. **Inefficient loop**
 - o Loop runs from 1 to num-1
 - o Time complexity: **O(n)**
2. **Can be optimized**
 - o Divisors can be checked only up to **n/2** or \sqrt{n}

Final Conclusion

- Zero-shot prompting produces a **correct but basic solution**.
- Program works for common perfect numbers like **6 and 28**.
- **Missing input validation and inefficient looping** reduce quality.

- Optimization improves **performance and robustness**.

Question-6:

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

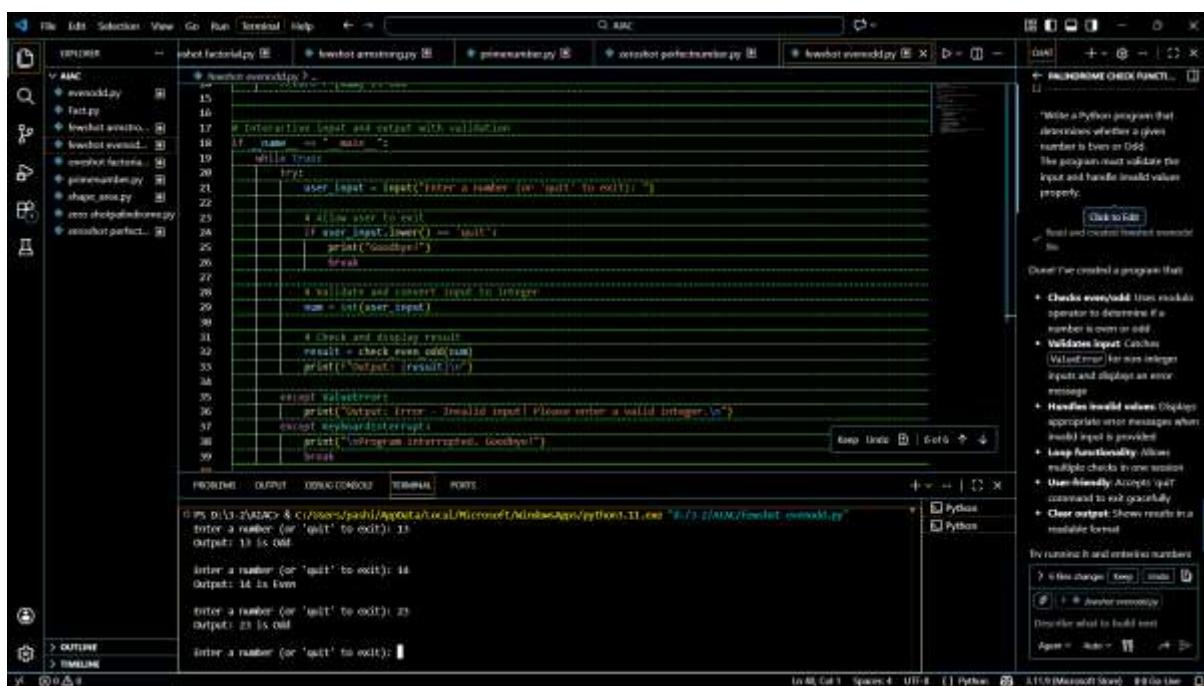
Write a few-shot prompt by providing multiple input-output examples to guide the AI in generating a Python program that determines whether a given number is even or odd, including proper input validation.

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



The screenshot shows a Jupyter Notebook environment with several open files in the sidebar, including `fewshot evenodd.py`, `fewshot armstrong.py`, `primeandcomposite.py`, and `fewshot evenodd2.py`. The main code cell contains the following Python script:

```

# Interactive input and output with validation
user_input = input("Enter a number (or 'quit' to exit): ")
if user_input == "quit":
    break
try:
    num = int(user_input)
    result = check_even_odd(num)
    print(f"Output: {result}")
except ValueError:
    print("Output: Error - Invalid input! Please enter a valid integer.\n")
except KeyboardInterrupt:
    print("\nProgram interrupted. Goodbye!")
    break

```

To the right of the code cell is a detailed description of the task:

Write a Python program that classifies whether a given number is even or odd.
The program must validate the input and handle invalid value properly.

Click to Edit
 Read and create fewshot template file

Describe created a program that

- Checks even/odd** uses modulo operator to determine if a number is even or odd.
- Validates input**: Checks `ValueError` for non-integer inputs and displays an error message.
- Handles invalid values**: Displays appropriate error messages when invalid input is provided.
- Loop functionality**: Allows multiple checks in one session.
- User-friendly**: Accepts `QUIT` command to exit gracefully.
- Clear output**: Shows results in a readable format.

At the bottom of the notebook, there is a status bar showing the current cell, language (Python), and version (Jupyter Notebook 8.1.0 Microsoft Store).