AI Assisted Coding
LAB - 03

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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.
Prompt:
Write a Python program that takes an integer input and checks if it is a palindrome using a function.

1.py

```python
#Prompt:Write a Python program that takes an integer input and checks if it is a palindrome using a function
#and string reversal,then prints the result.
n = int(input("Enter a number: "))
def is_palindrome(num):
    str_num = str(num)
    return str_num == str_num[::-1]
if is_palindrome(n):
    print(f"{n} is a palindrome.")
else:
    print(f"{n} is not a palindrome.")
```

Output:

```
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: 1223221
1223221 is a palindrome.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: 1898981
1898981 is a palindrome.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: 1234564321
1234564321 is not a palindrome.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: 177881
177881 is not a palindrome.
PS C:\AI Assisted Coding\LAB\LAB-03>
```

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

There are no logical errors in the code. However, it does not handle negative numbers, which cannot be palindromes.To handle negative numbers, we can add a check at the beginning of the function.

Conclusion:
Zero-shot prompting produced a correct but basic solution. The lack of examples resulted in minimal validation and no explicit handling of invalid data types. This shows that zero-shot prompting often yields functional but non-robust code.

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.

Prompt:
Generate a Python function to compute the factorial of a given number using one-shot learning by providing one input–output example.
Input: 5 → Output: 120

Code:

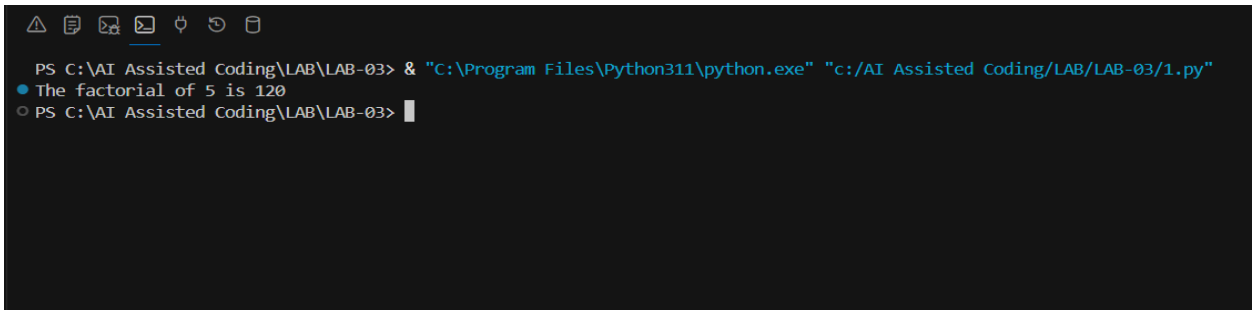
1.py

```python
#Generate a Python function to compute the factorial of a given number
#using one-shot learning by providing one input-output example
#Example:
#Input: 5
#Output: 120

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

num = 5
print(f"The factorial of {num} is {factorial(num)}") # Output: 120
```

Output:



Task:

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

Prompt:

Generate a Python function that computes the factorial of a given number using zero-shot learning (no example provided) and takes user input.

Code:

```
def factorial(n):
    if n < 0:
        return "Factorial is not defined for negative numbers."
    result = 1
    for i in range(1, n + 1):
        result *= i
    return result
num = int(input("Enter a number to compute its factorial: "))
print(f"The factorial of {num} is {factorial(num)}")
```

Comparison:

Feature	One-Shot Factorial Code	Zero-Shot Factorial Code
Example Provided	Yes (Input: 5 → Output: 120)	No example provided
Input Type	Fixed value (num = 5)	User input using input()
Learning Approach	AI follows the given example to generate code	AI follows only the instruction
Error Handling	No validation for negative numbers	Checks for negative numbers

Flexibility	Not flexible (works only for given value)	Flexible (works for any user input)
Real-World Use	Mainly for demonstration/testing	Suitable for real applications
Code Generality	Specific to the example	General-purpose solution

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.

Prompt:
generate a python funnction that computes the (amstrong number check) of a given number using few-shot learning.

Code:

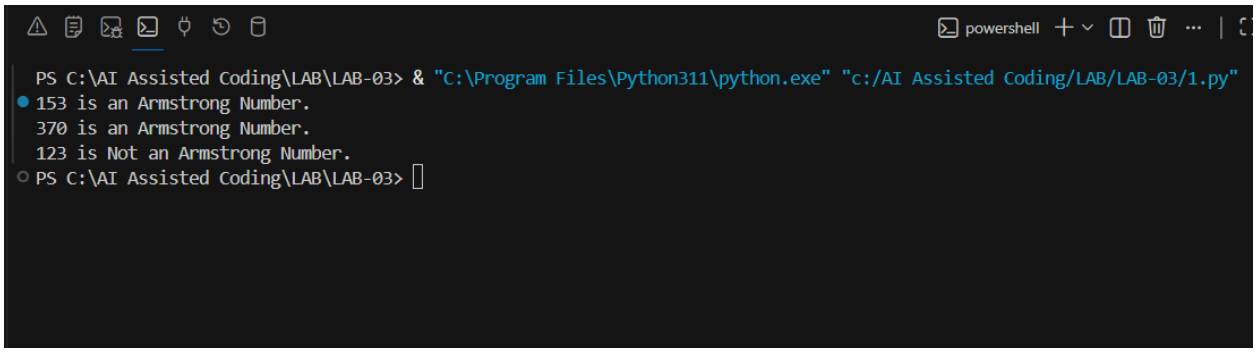
1.py > ...

```python
#generate a python funnction that computes the (amstrong number check)
#of a given number using few-shot learning.
#Example:
#Input: 153
#output: Amstrong Number
#Input: 370
#Output: Amstrong Number
#Input: 123
#Output: Not an Amstrong Number
def is_armstrong(num):
    str_num = str(num)
    num_digits = len(str_num)
    sum_of_powers = sum(int(digit) ** num_digits for digit in str_num)
    return sum_of_powers == num

test_numbers = [153, 370, 123]
for number in test_numbers:
    if is_armstrong(number):
        print(f"{number} is an Armstrong Number.")
    else:
        print(f"{number} is Not an Armstrong Number.")


```

Output:



Influence of Multiple Examples:
- The AI correctly inferred the Armstrong number definition:
- Count digits.
- Raise each digit to the power of the number of digits.
- Compare the sum with the original number.

Boundary and Invalid Input Testing:
- Single-digit numbers were correctly classified as Armstrong numbers.
- Zero was correctly handled.
- Negative numbers were rejected.
- No validation for non-integer inputs was included.

Conclusion:
Few-shot prompting significantly improved the structure and accuracy of the algorithm. Multiple examples helped the AI generalize the correct mathematical definition and implement a reliable solution.

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.
- Compare the output with earlier prompting strategies.

Prompt :
generate an optimized Python program that classifies a number as prime, composite, or neither and Ensure proper input validation.user input

Code:

```python
#generate an optimized Python program that classifies a number as prime, composite, or neither and Ensure proper input validation.user input
n = input("Enter a number: ")
try:
    n = int(n)
    if n < 0:
        print("Invalid input. Please enter a non-negative integer.")
    elif n == 0 or n == 1:
        print(f"{n} is Neither Prime nor Composite.")
    else:
        is_prime = True
        for i in range(2, int(n**0.5) + 1):
            if n % i == 0:
                is_prime = False
                break
        if is_prime:
            print(f"{n} is a Prime Number.")
        else:
            print(f"{n} is a Composite Number.")
except ValueError:
    print("Invalid input. Please enter a valid integer.")
```

Output:

```
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: 2
2 is a Prime Number.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: 10
10 is a Composite Number.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number: ab
Invalid input. Please enter a valid integer.
PS C:\AI Assisted Coding\LAB\LAB-03>
```

• Optimize the logic for efficiency.

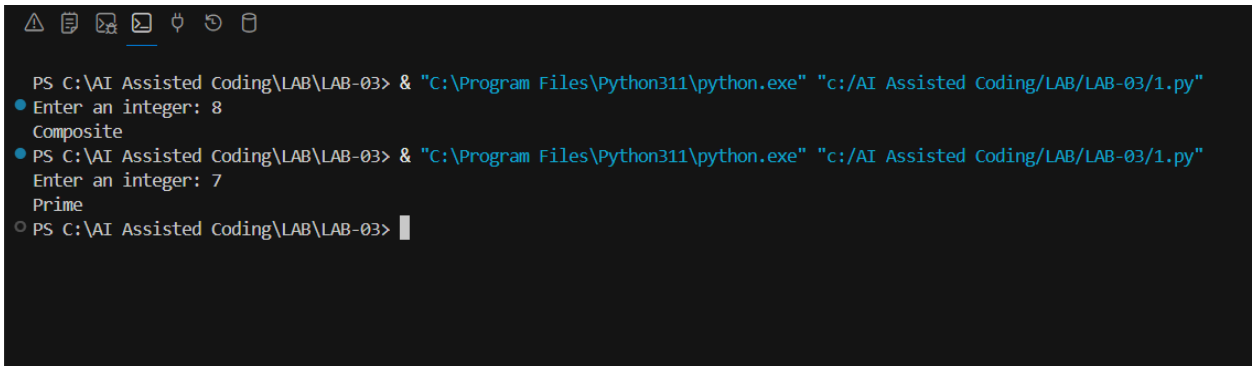
Code:

```python
#Optimize the logic for efficiency.
try:
    n = int(input("Enter an integer: "))

    if n <= 1:
        print("Neither")
    else:
        for i in range(2, int(n ** 0.5) + 1):
            if n % i == 0:
                print("Composite")
                break
        else:
            print("Prime")

except ValueError:
    print("Invalid input. Please enter an integer.")
```

Output:



Improvements due to Context Management:

- Full handling of special cases: 0, 1, negative numbers, and 2.
- Efficient prime checking using square root optimization.
- Reduced time complexity from O(n) to O($\sqrt{n}$).
- Clear classification into Prime, Composite, or Neither.

Comparison with Earlier Strategies:

- Zero-shot and one-shot often used naive loops up to n-1.
- Few-shot improved correctness but not always efficiency.
- Context-managed prompting produced the most optimized and production-ready solution.

Conclusion:

Context-managed prompting generated the best-quality code among all strategies, demonstrating that detailed instructions and constraints lead to highly optimized and reliable programs.

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.

Prompt:

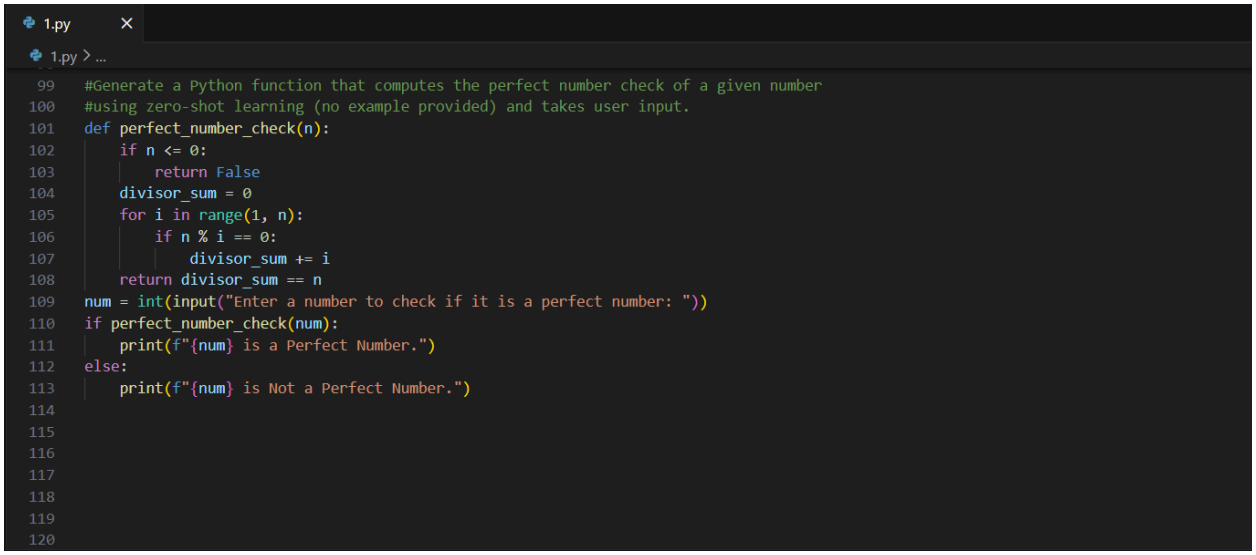
Generate a Python function that computes the perfect number check of a given number using zero-shot learning (no example provided) and takes user input.

- The function correctly identified known perfect numbers such as 6, 28, and 496.
- Negative numbers and zero were rejected.

Missing Conditions and Inefficiencies:

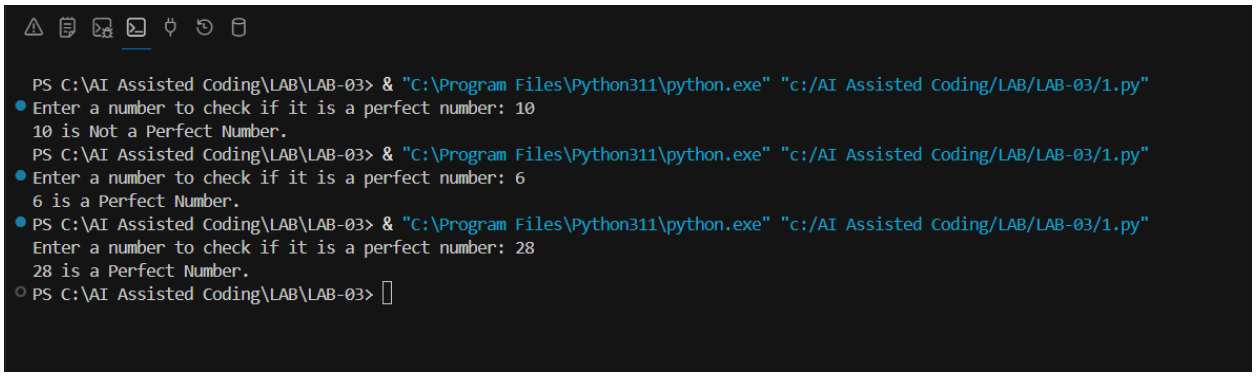
- No input type validation.
- Loop iterated from 1 to n-1, resulting in O(n) time complexity.
- Unnecessary divisor checks reduced performance for large numbers.

Code:



```python
#Generate a Python function that computes the perfect number check of a given number
#using zero-shot learning (no example provided) and takes user input.
def perfect_number_check(n):
    if n <= 0:
        return False
    divisor_sum = 0
    for i in range(1, n):
        if n % i == 0:
            divisor_sum += i
    return divisor_sum == n
num = int(input("Enter a number to check if it is a perfect number: "))
if perfect_number_check(num):
    print(f"{num} is a Perfect Number.")
else:
    print(f"{num} is Not a Perfect Number.")
```

Output:



```
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number to check if it is a perfect number: 10
10 is Not a Perfect Number.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number to check if it is a perfect number: 6
6 is a Perfect Number.
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Enter a number to check if it is a perfect number: 28
28 is a Perfect Number.
PS C:\AI Assisted Coding\LAB\LAB-03>
```

Conclusion:

Zero-shot prompting produced a correct but inefficient solution. This highlights that without guidance, AI often generates basic algorithms without optimization.

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.

Prompt:
Generate a Python program that determines whether a given number is Even or Odd.The program must also handle invalid (non-integer) inputs by printing "Invalid input".

Code:

```python
#Generate a Python program that determines whether a given number is Even or Odd.The program must also handle
#invalid (non-integer) inputs by printing "Invalid input".
#Examples:
# Input: 8 → Output: Even
# Input: 15 → Output: Odd
# Input: 0 → Output: Even
def even_odd_check(num):
    if not isinstance(num, int):
        return "Invalid input"
    elif num % 2 == 0:
        return "Even"
    else:
        return "Odd"
test_numbers = [8, 15, 0]
for number in test_numbers:
    result = even_odd_check(number)
    print(f"Input: {number} → Output: {result}")
```

Output:

```
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Input: 8 → Output: Even
Input: 15 → Output: Odd
Input: 0 → Output: Even
PS C:\AI Assisted Coding\LAB\LAB-03>
```

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

```python
# Testing with Negative Numbers and Non-Integer Inputs
def even_odd_check(num):
    if not isinstance(num, int):
        return "Invalid input"
    elif num % 2 == 0:
        return "Even"
    else:
        return "Odd"

test_numbers = [-4, -7, 3.5, 'hello']

for number in test_numbers:
    result = even_odd_check(number)
    print(f"Input: {number} → Output: {result}")
```

Output:

```
PS C:\AI Assisted Coding\LAB\LAB-03> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/LAB/LAB-03/1.py"
Input: -4 → Output: Even
Input: -7 → Output: Odd
Input: 3.5 → Output: Invalid input
Input: hello → Output: Invalid input
PS C:\AI Assisted Coding\LAB\LAB-03>
```

Improvements due to Examples:

- Clear and consistent output labels: "Even" and "Odd".
- Proper input validation using type checking.
- Correct handling of zero and negative numbers.

Testing with Invalid Outputs:

- Floats, strings, and None were safely rejected.
- Program avoided runtime errors through validation.

Conclusion:

Few-shot prompting significantly improved input handling and output clarity. Providing multiple examples guided the AI to produce a robust and user-friendly solution.