AI ASSISTED CODING

ASSIGNMENT-3.5

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Question 1: Zero-Shot Prompting (Leap Year Check)

Write a zero-shot prompt to generate a Python function that checks whether a given year is a leap year.

Task:

• Record the AI-generated code.

• Test with years like 1900, 2000, 2024.

• Identify logical flaws or missing conditions.

C: > Users > gudah > OneDrive > Documents > AIAC > Lab_assignment_3.5.py > ...

```python
#Generate a python function that reads year and checks if it is leap year or not.
def is_leap_year(year):
    if year % 4 == 0:
        if year % 100 == 0:
            if year % 400 == 0:
                return True
            else:
                return False
        else:
            return True
    else:
        return False
try:
    year = int(input("Enter a year: "))
    if year < 0:
        print("Invalid year")
    else:
        if is_leap_year(year):
            print(f"{year} is a leap year")
        else:
            print(f"{year} is not a leap year")
except ValueError:
    print("Invalid input")
```

```python
#Generate a python function that reads year and checks if it is leap year or not.
def is_leap_year(year):
    if year % 4 == 0:
        if year % 100 == 0:
            if year % 400 == 0:
                return True
            else:
                return False
        else:
```

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```
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a year: 1900
1900 is not a leap year
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a year: 2000
2000 is a leap year
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a year: 2024
2024 is a leap year
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a year: 0
0 is a leap year
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a year: -1
Invalid year
```

1.The leap year logic is correct but unnecessarily complex due to deep nesting.

2.Checking for negative years is not meaningful for the standard calendar.

3.Year 0 is not handled even though it is not a valid year.

4.A simpler condition can replace multiple if–else statements.

5.Mixing input handling with logic reduces reusability of the function.

Question 2: One-Shot Prompting (GCD of Two Numbers)

Write a one-shot prompt with one example to generate a Python

function that finds the Greatest Common Divisor (GCD) of two numbers.

Example:

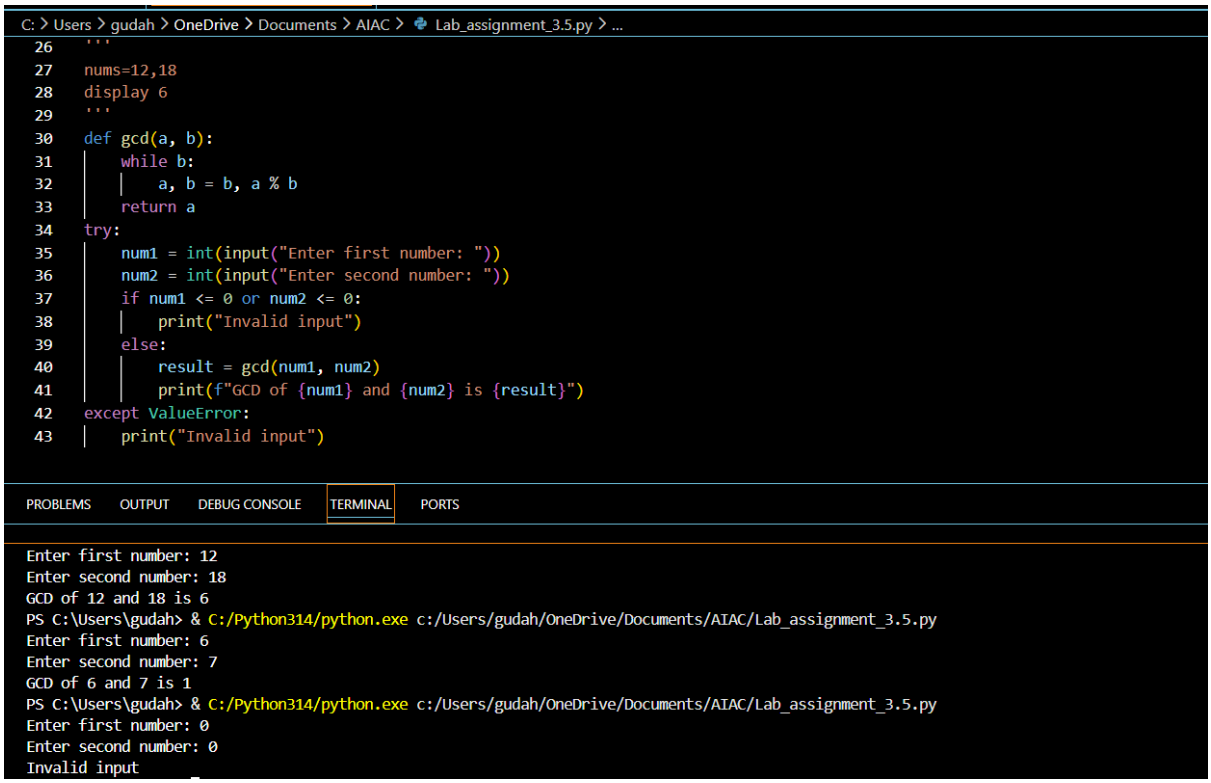
Input: 12, 18 → Output: 6

Task:

• Compare with a zero-shot solution.

• Analyze algorithm efficiency.

One-shot



Zero shot

```python
#Generate a python code that reads two numbers and displays GCD of the numbers
n1=int(input("Enter first number: "))
n2=int(input("Enter second number: "))
try:
    while n2:
        n1, n2 = n2, n1 % n2
    print("GCD is:",n1)
except ValueError:
    print("Invalid input")
```

```
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PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 12
Enter second number: 18
GCD is: 6
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 0
Enter second number: 0
GCD is: 0
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 2
Enter second number: 9
GCD is: 1
```

Efficiency comparison of the two GCD codes:

- Both programs use the **Euclidean Algorithm**, so their **time complexity is the same: O(log min(a, b))**.
- The **One shot code is slightly more efficient in structure** because the GCD logic is placed inside a function, making it reusable and cleaner.
- The **Zero shot code mixes input, logic, and output**, which reduces maintainability but does not change algorithmic efficiency.
- The try–except in the Zero shot code is unnecessary because int(input()) errors occur **before** the loop runs.
- Overall, **performance is equal**, but the **One shot code is better in design and clarity**, making it preferable in practice.

Question 3: Few-Shot Prompting (LCM Calculation)

Write a few-shot prompt with multiple examples to generate a Python

function that computes the Least Common Multiple (LCM).

Examples:

• Input: 4, 6 → Output: 12

• Input: 5, 10 → Output: 10

• Input: 7, 3 → Output: 21

Task:

• Examine how examples guide formula selection.

• Test edge cases.

```
'''
nums=4 6
display 12
nums=5 10
display 10
nums=7 3
display 21
'''
def lcm(a, b):
    def gcd(x, y):
        while y:
            x, y = y, x % y
        return x
    return abs(a * b) // gcd(a, b)
try:
    num1 = int(input("Enter first number: "))
    num2 = int(input("Enter second number: "))
    if num1 <= 0 or num2 <= 0:
        print("Invalid input")
    else:
        result = lcm(num1, num2)
        print(f"LCM of {num1} and {num2} is {result}")
except ValueError:
    print("Invalid input")
```

```
def lcm(a, b):
    def gcd(x, y):
        while y:
            x, y = y, x % y
        return x
    return abs(a * b) // gcd(a, b)
try:
    num1 = int(input("Enter first number: "))
    num2 = int(input("Enter second number: "))
    if num1 <= 0 or num2 <= 0:
        print("Invalid input")
    else:
        result = lcm(num1, num2)
        print(f"LCM of {num1} and {num2} is {result}")
except ValueError:
    print("Invalid input")
```

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```
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 4
Enter second number: 6
LCM of 4 and 6 is 12
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 5
Enter second number: 10
LCM of 5 and 10 is 10
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 7
Enter second number: 3
LCM of 7 and 3 is 21
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter first number: 0
Enter second number: 0
Invalid input
```

Question 4: Zero-Shot Prompting (Binary to Decimal Conversion)

Write a zero-shot prompt to generate a Python function that converts a binary number to decimal.

Task:

• Test with valid and invalid binary inputs.

• Identify missing validation logic.

```python
#Generate a python function that reads a binary number and converts it to decimal number
def binary_to_decimal(binary_str):
    decimal_num = 0
    binary_str = binary_str[::-1]
    for index, digit in enumerate(binary_str):
        if digit == '1':
            decimal_num += 2 ** index
    return decimal_num
try:
    binary_input = input("Enter a binary number: ")
    if not all(char in '01' for char in binary_input):
        print("Invalid binary number")
    else:
        decimal_output = binary_to_decimal(binary_input)
        print(f"Decimal equivalent of binary {binary_input} is {decimal_output}")
except ValueError:
    print("Invalid input")
```

```python
#Generate a python function that reads a binary number and converts it to decimal number
def binary_to_decimal(binary_str):
    decimal_num = 0
    binary_str = binary_str[::-1]
    for index, digit in enumerate(binary_str):
        if digit == '1':
            decimal_num += 2 ** index
    return decimal_num
try:
    binary_input = input("Enter a binary number: ")
    if not all(char in '01' for char in binary_input):
        print("Invalid binary number")
    else:
        decimal_output = binary_to_decimal(binary_input)
        print(f"Decimal equivalent of binary {binary_input} is {decimal_output}")
except ValueError:
    print("Invalid input")
```

```
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PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a binary number: 0101
Decimal equivalent of binary 0101 is 5
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a binary number: 00010110
Decimal equivalent of binary 00010110 is 22
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a binary number: -1
Invalid binary number
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a binary number: 0
Decimal equivalent of binary 0 is 0
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a binary number: 6500010
Invalid binary number
```

1. It does **not check for empty input** (an empty string passes all() and is treated as valid).

2. It does **not handle leading/trailing spaces** (e.g., " 101 " should be stripped).

3. The try–except ValueError is **unnecessary**, because no ValueError can occur in this code.

4. It does not give feedback if the input is **too large**, which could cause performance issues.

5. The validation only checks characters, not **user intent or format** (like negative sign or prefixes such as 0b).

Question 5: One-Shot Prompting (Decimal to Binary Conversion)

Write a one-shot prompt with an example to generate a Python function

that converts a decimal number to binary.

Example:

Input: 10 → Output: 1010

Task:

• Compare clarity with zero-shot output.

• Analyze handling of zero and negative numbers.

```
'''
n=10
display 1010
'''
def decimal_to_binary(num):
    if num == 0:
        return "0"
    binary_str = ""
    while num > 0:
        binary_str = str(num % 2) + binary_str
        num //= 2
    return binary_str
try:
    a = int(input("Enter a decimal number: "))
    if a < 0:
        print("Invalid input")
    else:
        binary_result = decimal_to_binary(a)
        print(binary_result)
except ValueError:
    print("Invalid input")

```

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```
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: 8
1000
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: 0
0
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: -1
Invalid input
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: 10
1010
```

```python
#Generate a python function that reads a number and converts it to binary number
def convert_to_binary(num):
    if num == 0:
        return "0"
    binary_str = ""
    while num > 0:
        binary_str = str(num % 2) + binary_str
        num //= 2
    return binary_str
try:
    a = int(input("Enter a decimal number: "))
    if a < 0:
        print("invalid")
    else:
        binary_result = convert_to_binary(a)
        print(binary_result)
except ValueError:
    print("invalid")
```

```
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PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: 10
1010
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: -1
invalid
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: 0
0
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a decimal number: 7
111
```

Question 6: Few-Shot Prompting (Harshad Number Check)

Write a few-shot prompt to generate a Python function that checks whether a number is a Harshad (Niven) number.

Examples:

• Input: 18 → Output: Harshad Number

• Input: 21 → Output: Harshad Number

• Input: 19 → Output: Not a Harshad Number

Task:

• Test boundary conditions.

• Evaluate robustness

```
'''
n=18
display Harshad Number
n=19
display Not a Harshad Number
n=-5
display Invalid Input
n=abc
display Invalid Input
'''
def is_harshad_number(num):
    if num <= 0:
        return "Invalid Input"
    digit_sum = sum(int(digit) for digit in str(num))
    if num % digit_sum == 0:
        return "Harshad Number"
    else:
        return "Not a Harshad Number"
try:
    a = int(input("Enter a number: "))
    result = is_harshad_number(a)
    print(result)
except ValueError:
    print("Invalid Input")
```

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```
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a number: 19
Not a Harshad Number
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a number: 21
Harshad Number
PS C:\Users\gudah> & C:/Python314/python.exe c:/Users/gudah/OneDrive/Documents/AIAC/Lab_assignment_3.5.py
Enter a number: -1
Invalid Input
```

Robustness of the code:

- The code safely handles **non-numeric input** using try–except, preventing crashes.
- It checks for **invalid values (zero or negative numbers)** before processing.
- The digit sum is calculated reliably by converting the number to a string.
- Returning clear messages like "Harshad Number" and "Invalid Input" improves user feedback.
- Overall, the program is **robust for normal user input**, though returning booleans instead of strings would improve reusability.