AI Assisted Coding

Assignment 3.5

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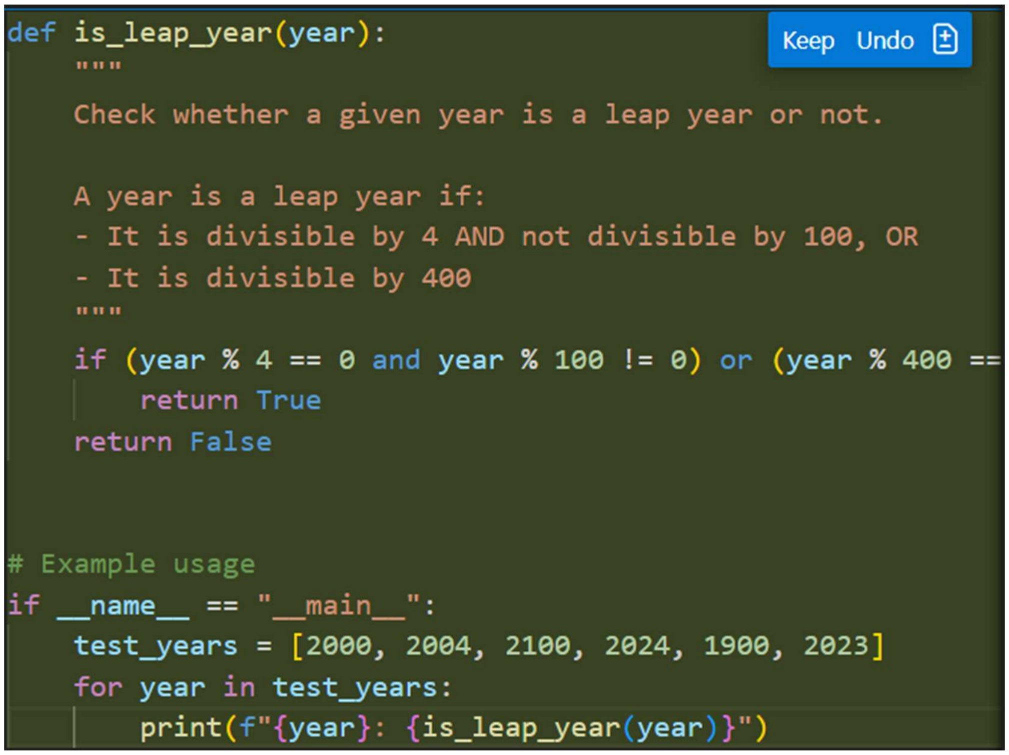
Task-01

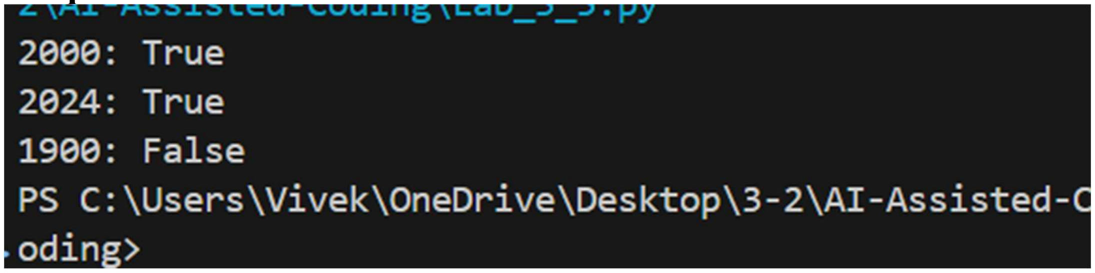
Prompt: py function to check whether a given year is leap year or not



Keep Undo

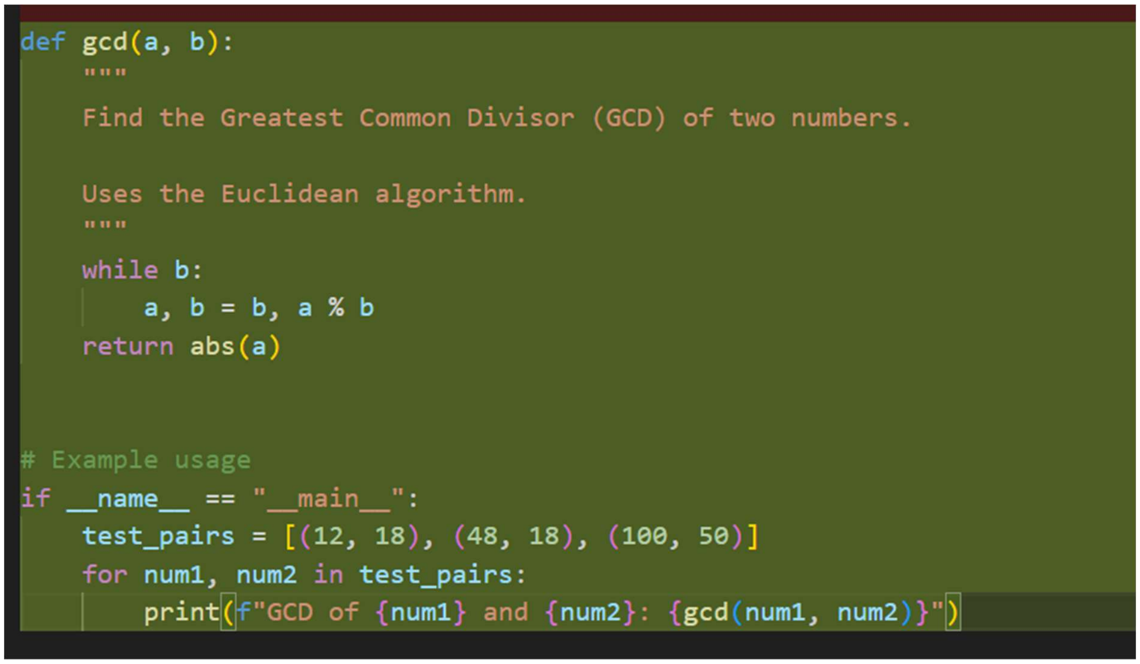
```python
def is_leap_year(year):
    """
    Check whether a given year is a leap year or not.

    A year is a leap year if:
    - It is divisible by 4 AND not divisible by 100, OR
    - It is divisible by 400
    """
    if (year % 4 == 0 and year % 100 != 0) or (year % 400 ==
        return True
    return False


# Example usage
if __name__ == "__main__":
    test_years = [2000, 2004, 2100, 2024, 1900, 2023]
    for year in test_years:
        print(f"{year}: {is_leap_year(year)}")
```

Output:



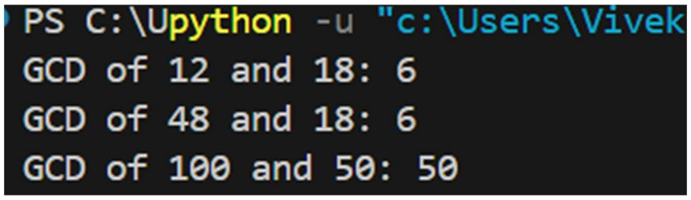
```
2\AI-Assisted-Coding\Lab_3_5.py
2000: True
2024: True
1900: False
PS C:\Users\Vivek\OneDrive\Desktop\3-2\AI-Assisted-C
oding>
```

Task-02
Prompt: Write a Python function to find the Greatest Common Divisor (GCD) of two numbers.
Example:
Input: 12, 18
Output: 6
The function should take two integers as input and return their GCD.



```python
def gcd(a, b):
    """
    Find the Greatest Common Divisor (GCD) of two numbers.

    Uses the Euclidean algorithm.
    """
    while b:
        a, b = b, a % b
    return abs(a)


# Example usage
if __name__ == "__main__":
    test_pairs = [(12, 18), (48, 18), (100, 50)]
    for num1, num2 in test_pairs:
        print(f"GCD of {num1} and {num2}: {gcd(num1, num2)}")
```

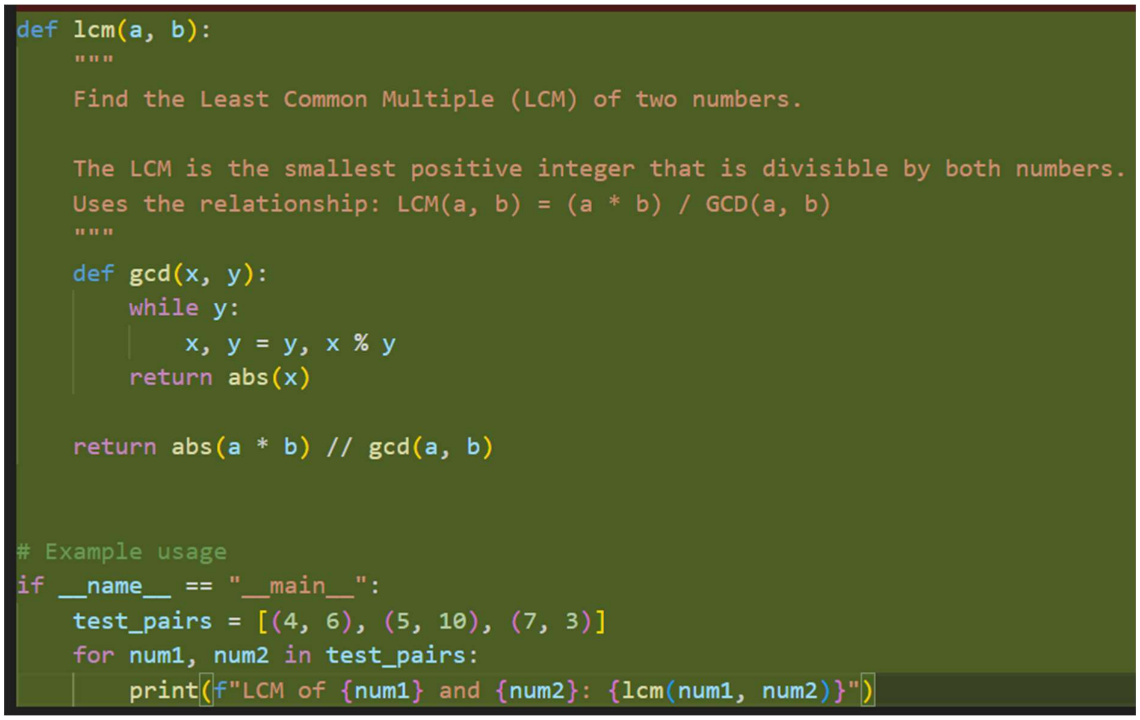
Output:



```
PS C:\Upython -u "c:\Users\Vivek
GCD of 12 and 18: 6
GCD of 48 and 18: 6
GCD of 100 and 50: 50
```

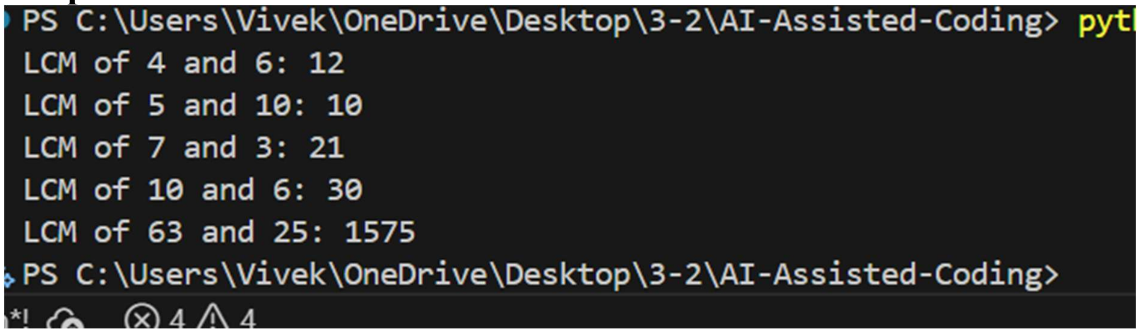
Task 03
prompt:
Write a Python function to compute the Least Common Multiple (LCM) of two numbers.
Examples:
Input: 4, 6 Output: 12
Input: 5, 10 Output: 10
Input: 7, 3 Output: 21
The function should take two integers as input and return their LCM.

CODE:



```python
def lcm(a, b):
    """
    Find the Least Common Multiple (LCM) of two numbers.

    The LCM is the smallest positive integer that is divisible by both numbers.
    Uses the relationship: LCM(a, b) = (a * b) / GCD(a, b)
    """
    def gcd(x, y):
        while y:
            x, y = y, x % y
        return abs(x)

    return abs(a * b) // gcd(a, b)


# Example usage
if __name__ == "__main__":
    test_pairs = [(4, 6), (5, 10), (7, 3)]
    for num1, num2 in test_pairs:
        print(f"LCM of {num1} and {num2}: {lcm(num1, num2)}")
```

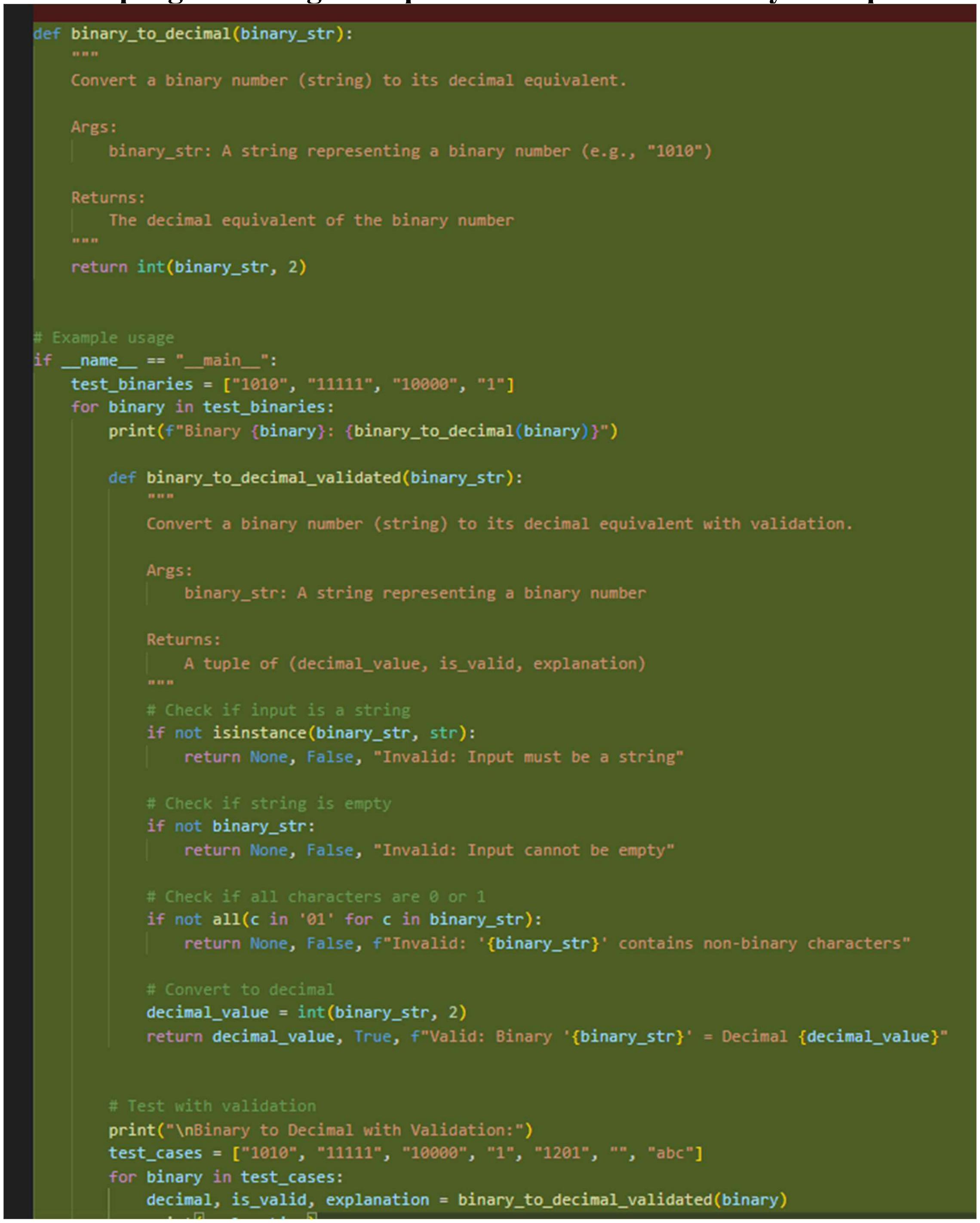
Output:



```
PS C:\Users\Vivek\OneDrive\Desktop\3-2\AI-Assisted-Coding> pyt
LCM of 4 and 6: 12
LCM of 5 and 10: 10
LCM of 7 and 3: 21
LCM of 10 and 6: 30
LCM of 63 and 25: 1575
PS C:\Users\Vivek\OneDrive\Desktop\3-2\AI-Assisted-Coding>
```

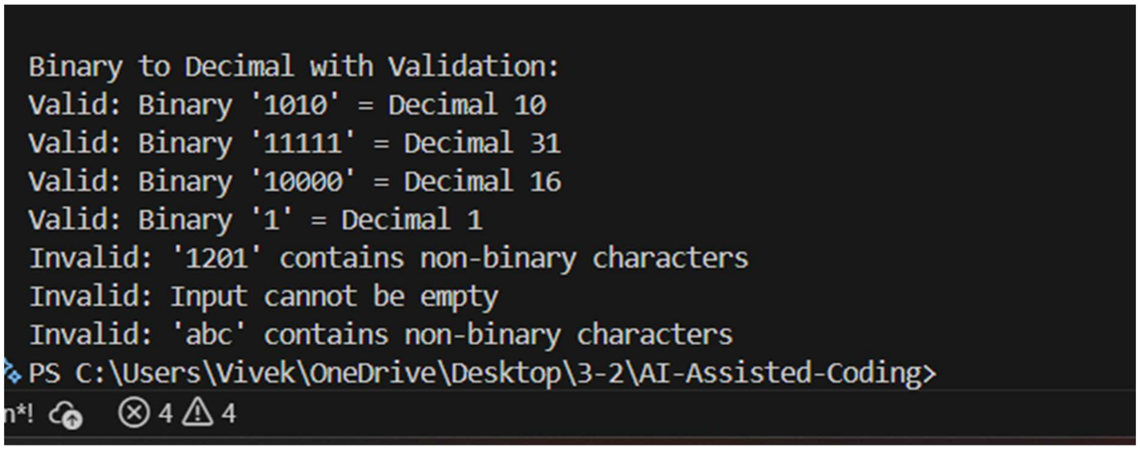
Task 4 :

Write a Python program to convert a binary string to its decimal value. Also give explanation whether the input is valid or invalid Test the program using multiple valid and invalid binary examples.



```python
def binary_to_decimal(binary_str):
    """
    Convert a binary number (string) to its decimal equivalent.

    Args:
        binary_str: A string representing a binary number (e.g., "1010")

    Returns:
        The decimal equivalent of the binary number
    """
    return int(binary_str, 2)


# Example usage
if __name__ == "__main__":
    test_binaries = ["1010", "11111", "10000", "1"]
    for binary in test_binaries:
        print(f"Binary {binary}: {binary_to_decimal(binary)}")

        def binary_to_decimal_validated(binary_str):
            """
            Convert a binary number (string) to its decimal equivalent with validation.

            Args:
                binary_str: A string representing a binary number

            Returns:
                A tuple of (decimal_value, is_valid, explanation)
            """
            # Check if input is a string
            if not isinstance(binary_str, str):
                return None, False, "Invalid: Input must be a string"

            # Check if string is empty
            if not binary_str:
                return None, False, "Invalid: Input cannot be empty"

            # Check if all characters are 0 or 1
            if not all(c in '01' for c in binary_str):
                return None, False, f"Invalid: '{binary_str}' contains non-binary characters"

            # Convert to decimal
            decimal_value = int(binary_str, 2)
            return decimal_value, True, f"Valid: Binary '{binary_str}' = Decimal {decimal_value}"


        # Test with validation
        print("\nBinary to Decimal with Validation:")
        test_cases = ["1010", "11111", "10000", "1", "1201", "", "abc"]
        for binary in test_cases:
            decimal, is_valid, explanation = binary_to_decimal_validated(binary)
```

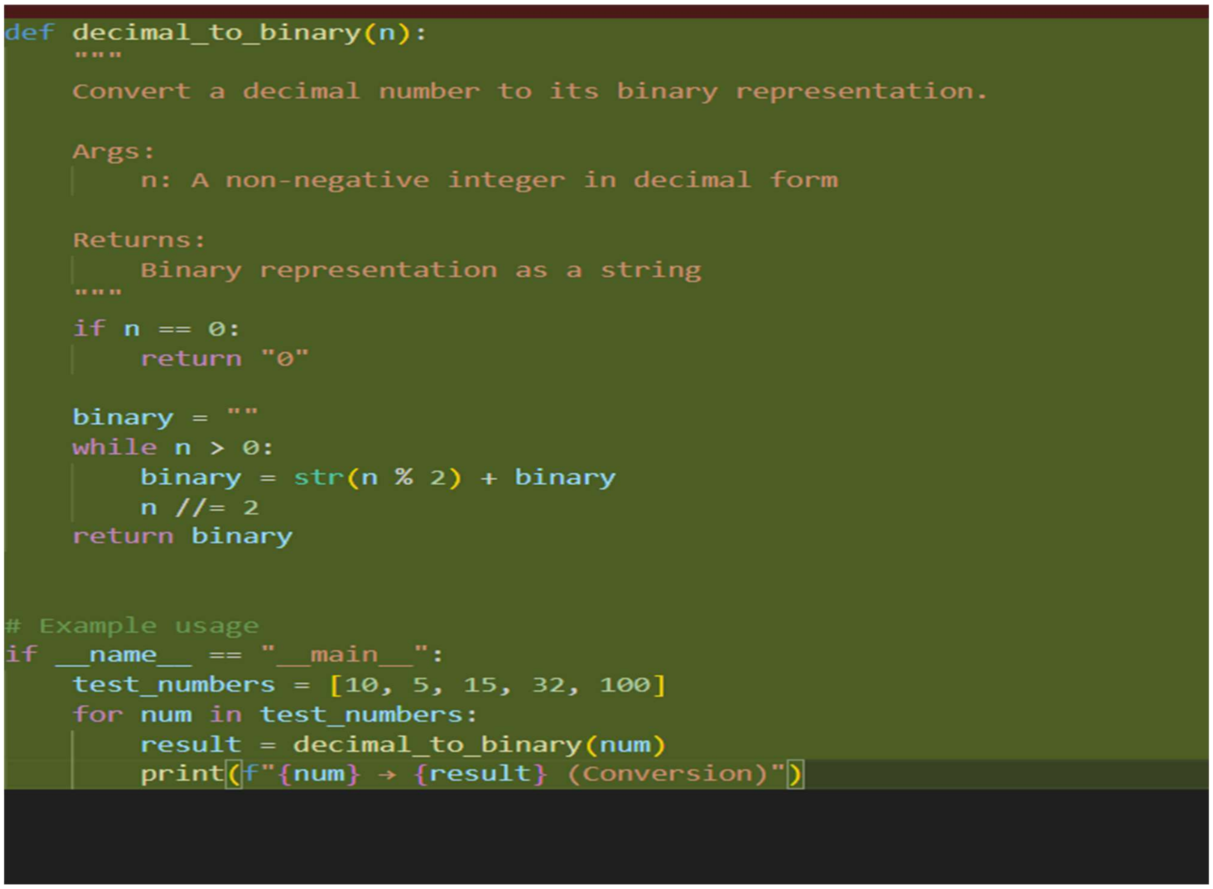
Output:



```
Binary to Decimal with Validation:
Valid: Binary '1010' = Decimal 10
Valid: Binary '11111' = Decimal 31
Valid: Binary '10000' = Decimal 16
Valid: Binary '1' = Decimal 1
Invalid: '1201' contains non-binary characters
Invalid: Input cannot be empty
Invalid: 'abc' contains non-binary characters
PS C:\Users\Vivek\OneDrive\Desktop\3-2\AI-Assisted-Coding>
```

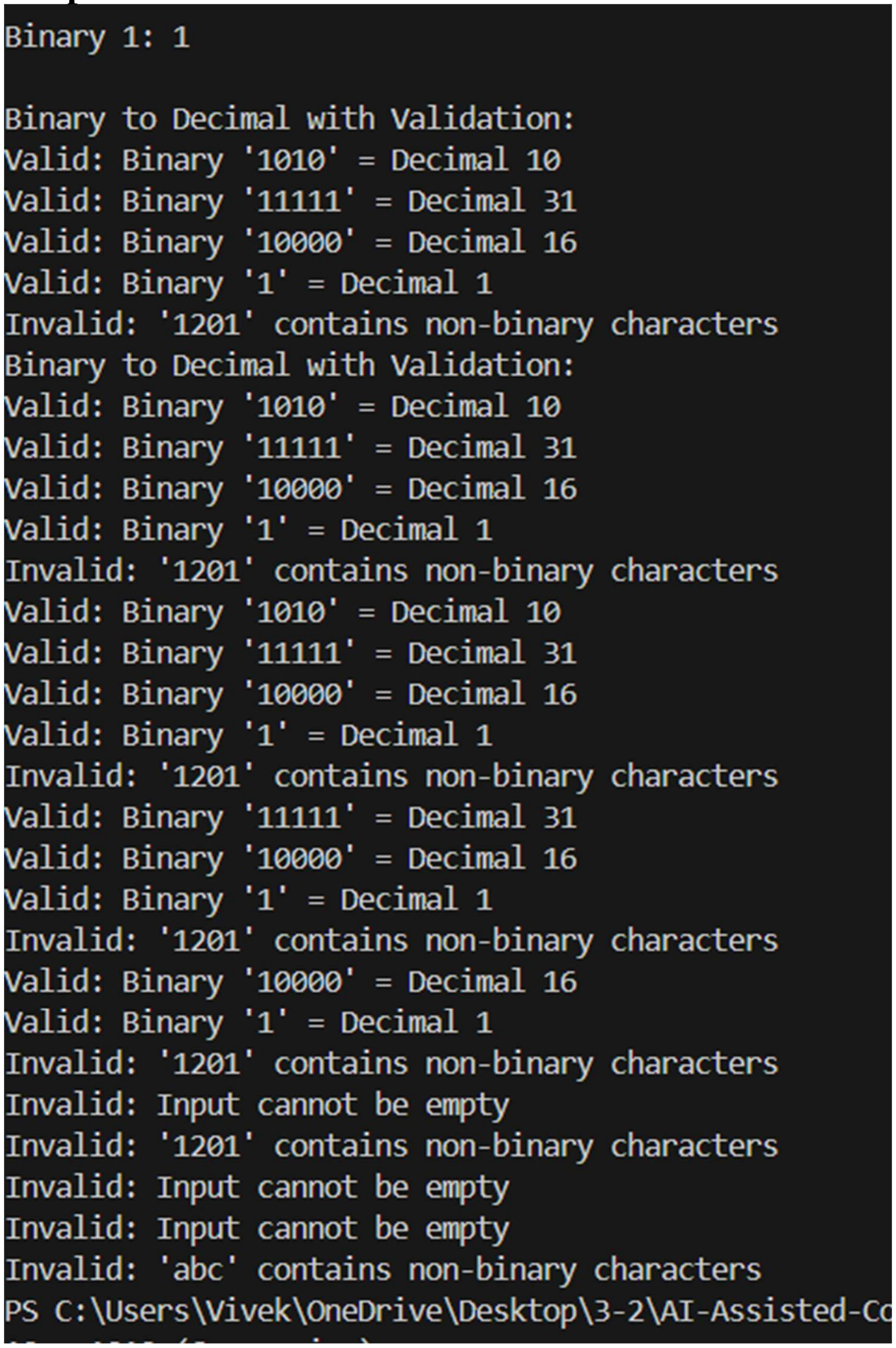
Task-5
prompt :
generate a Python function that converts a decimal number to binary.
Example:
Input: 10 → Output: 1010
also give a one word explanation for outputs

Code:



```python
def decimal_to_binary(n):
    """
    Convert a decimal number to its binary representation.

    Args:
        n: A non-negative integer in decimal form

    Returns:
        Binary representation as a string
    """
    if n == 0:
        return "0"

    binary = ""
    while n > 0:
        binary = str(n % 2) + binary
        n //= 2
    return binary


# Example usage
if __name__ == "__main__":
    test_numbers = [10, 5, 15, 32, 100]
    for num in test_numbers:
        result = decimal_to_binary(num)
        print(f"{num} → {result} (Conversion)")
```

Output:

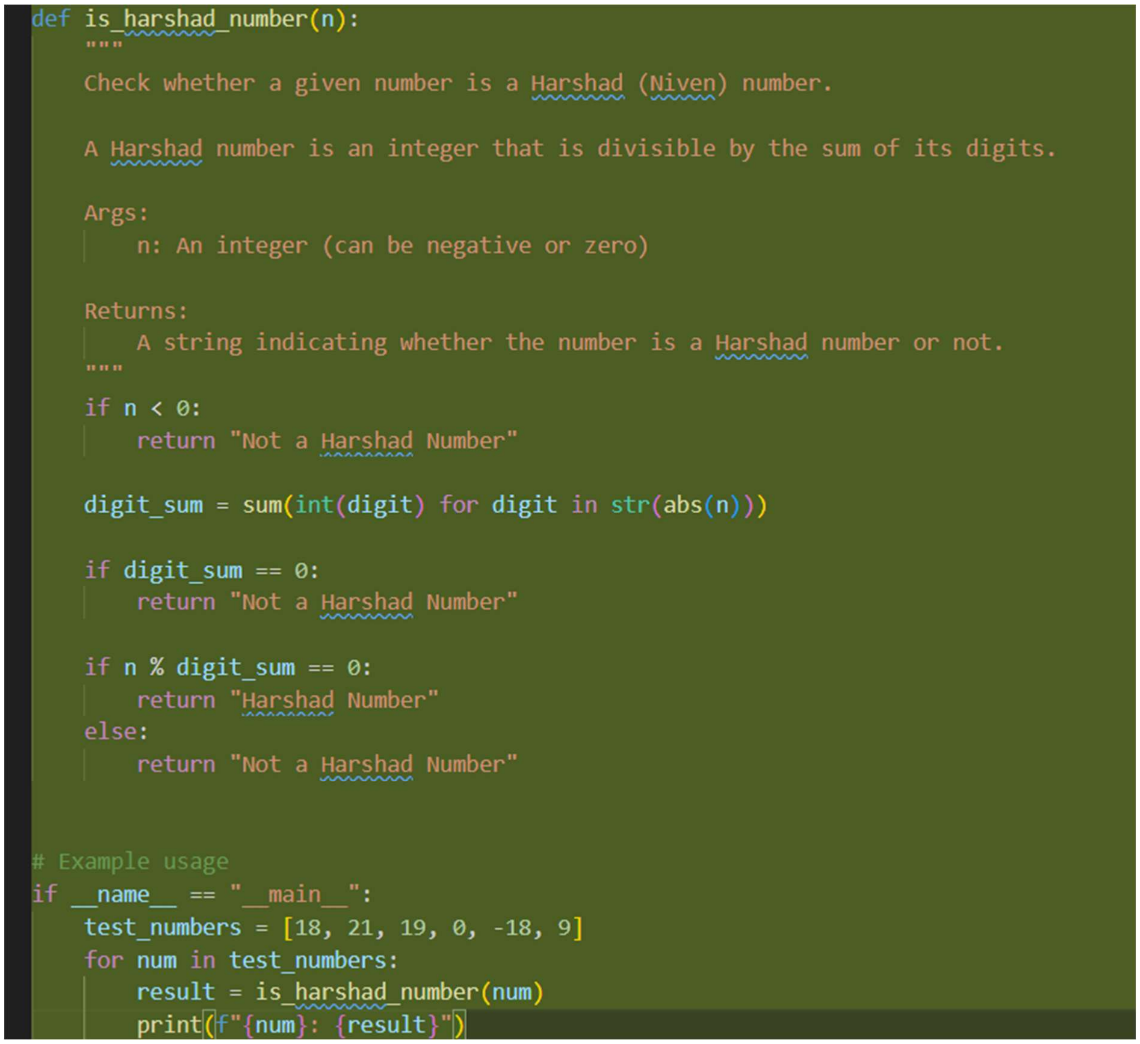


```
Binary 1: 1

Binary to Decimal with Validation:
Valid: Binary '1010' = Decimal 10
Valid: Binary '11111' = Decimal 31
Valid: Binary '10000' = Decimal 16
Valid: Binary '1' = Decimal 1
Invalid: '1201' contains non-binary characters
Binary to Decimal with Validation:
Valid: Binary '1010' = Decimal 10
Valid: Binary '11111' = Decimal 31
Valid: Binary '10000' = Decimal 16
Valid: Binary '1' = Decimal 1
Invalid: '1201' contains non-binary characters
Valid: Binary '1010' = Decimal 10
Valid: Binary '11111' = Decimal 31
Valid: Binary '10000' = Decimal 16
Valid: Binary '1' = Decimal 1
Invalid: '1201' contains non-binary characters
Valid: Binary '11111' = Decimal 31
Valid: Binary '10000' = Decimal 16
Valid: Binary '1' = Decimal 1
Invalid: '1201' contains non-binary characters
Valid: Binary '10000' = Decimal 16
Valid: Binary '1' = Decimal 1
Invalid: '1201' contains non-binary characters
Invalid: Input cannot be empty
Invalid: '1201' contains non-binary characters
Invalid: Input cannot be empty
Invalid: Input cannot be empty
Invalid: 'abc' contains non-binary characters
PS C:\Users\Vivek\OneDrive\Desktop\3-2\AI-Assisted-Co
```

Task-06:
Prompt:
Write a Python function to check whether a given number is a Harshad (Niven) number.
Examples:
Input: 18 Output: Harshad Number

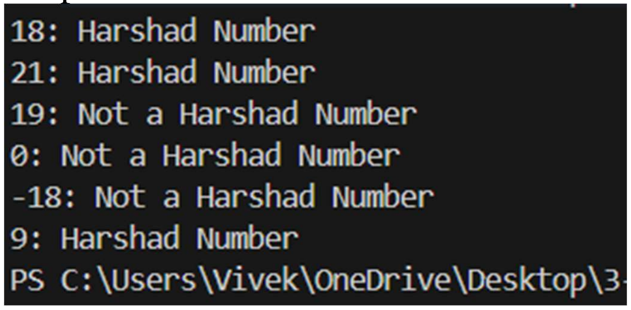
Input: 21 Output: Harshad Number
Input: 19 Output: Not a Harshad Number
The function should calculate the sum of digits and check divisibility. Also test boundary conditions such as single-digit numbers, zero, and negative values to ensure robustness.

Code



```python
def is_harshad_number(n):
    """
    Check whether a given number is a Harshad (Niven) number.

    A Harshad number is an integer that is divisible by the sum of its digits.

    Args:
        n: An integer (can be negative or zero)

    Returns:
        A string indicating whether the number is a Harshad number or not.
    """
    if n < 0:
        return "Not a Harshad Number"

    digit_sum = sum(int(digit) for digit in str(abs(n)))

    if digit_sum == 0:
        return "Not a Harshad Number"

    if n % digit_sum == 0:
        return "Harshad Number"
    else:
        return "Not a Harshad Number"


# Example usage
if __name__ == "__main__":
    test_numbers = [18, 21, 19, 0, -18, 9]
    for num in test_numbers:
        result = is_harshad_number(num)
        print(f"{num}: {result}")
```

Output:



```
18: Harshad Number
21: Harshad Number
19: Not a Harshad Number
0: Not a Harshad Number
-18: Not a Harshad Number
9: Harshad Number
PS C:\Users\Vivek\OneDrive\Desktop\3
```