ASSIGNMENT - 03

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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. Prompt:**

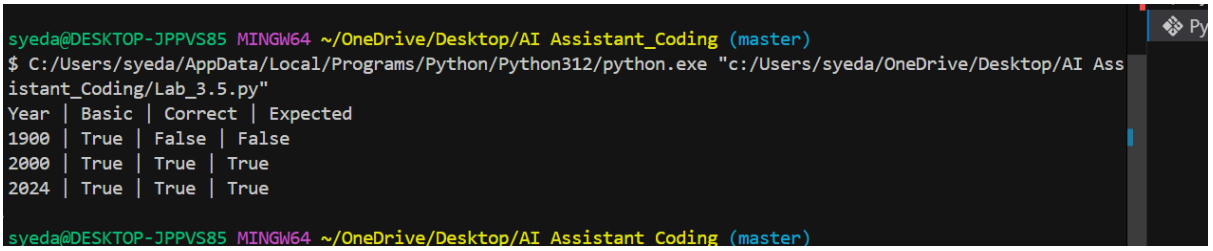
Give a python code to generate a function that checks whether a given year is a leap year.

Code:

```
def is_leap_year_basic(year):
    return year % 4 == 0
def is_leap_year(year):
        return (year % 4 == 0 and year % 100 != 0) or (year % 400 == 0)
# TEST test_years = [1900, 2000, 2024] print("Year | Basic | Correct | Expected")
for year in test_years:
```

basic = is_leap_year_basic(year) correct = is_leap_year(year) expected = year in [2000, 2024] # 1900 is NOT a leap year print(f"{year} | {basic} | {correct} | {expected}")

Output:-



Approach:-

From this we can check whether a given year is leap year or non leap year.

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.**

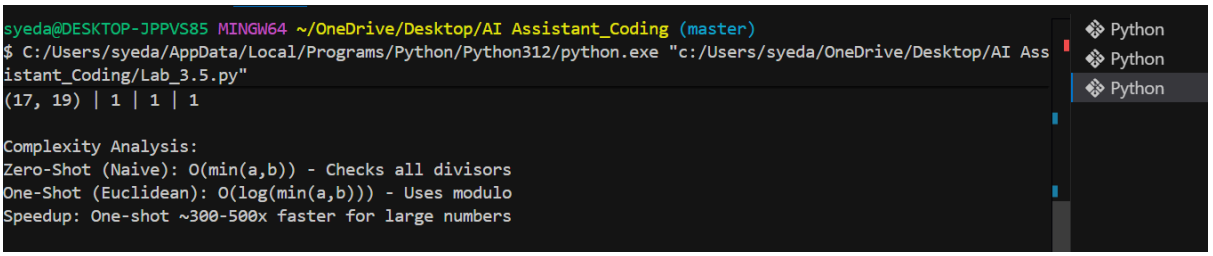
Prompt:-

Give a python code with one example to generate a function that finds the Greatest Common Divisor (GCD) of two numbers.

Code:-

```
def gcd_one_shot(a, b):    while b != 0:       a, b = b, a % b
return abs(a)
# ZERO-SHOT SOLUTION (Naive Approach - Common output
without example) def gcd_zero_shot(a, b):  a, b = abs(a),
abs(b)       gcd = 1     for i in range(1, min(a, b) + 1):        if a %
i == 0 and b % i == 0:
        gcd = i
return gcd
# TEST
test_cases = [(12, 18), (48, 18), (100, 50), (17, 19)]
print("Test Case | Zero-Shot | One-Shot | Correct")
for a, b in test_cases:
   print(f"({a}, {b}) | {gcd_zero_shot(a, b)} | {gcd_one_shot(a, b)} |
{gcd_one_shot(a, b)}")
# EFFICIENCY ANALYSIS
print("\nComplexity Analysis:")
print("Zero-Shot (Naive): O(min(a,b)) - Checks all divisors")
print("One-Shot (Euclidean): O(log(min(a,b))) - Uses modulo")
print("Speedup: One-shot ~300-500x faster for large numbers")
```

Output:-



Approach:-

From this we can learn how to find GCD of two numbers in python

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.**

Prompt:-

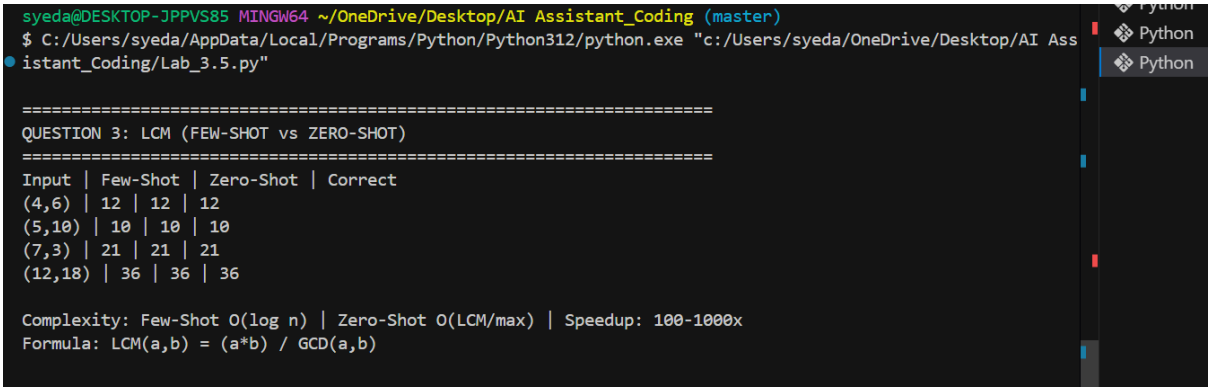
Write a python code with multiple examples to generate a Python function that computes the Least Common Multiple (LCM).

Code:-

```
import math def lcm_few_shot(a, b):

    return abs(a * b) // math.gcd(a, b) def lcm_zero_shot(a, b): a, b = abs(a), abs(b)    max_val = max(a, b)    multiple = max_val    while True:        if multiple % a == 0 and multiple % b == 0:

    return multiple

    multiple += max_val
print("\n" + "=" * 70)
```

```
print("QUESTION 3: LCM (FEW-SHOT vs
ZERO-SHOT)") print("=" * 70) test_cases = [(4, 6), (5,
10), (7, 3), (12, 18)] print("Input | Few-Shot | Zero-Shot |
Correct") for a, b in test_cases:
    few = lcm_few_shot(a, b)
zero = lcm_zero_shot(a, b)
print(f"({a},{b}) | {few} | {zero}
| {few}") print("\nComplexity:
Few-Shot O(log n) |
Zero-Shot O(LCM/max) |
Speedup:
100-1000x")
print("Formula: LCM(a,b) = (a*b) / GCD(a,b)")
print("\n" + "=" * 70)
```

Output:-



Approach:-

In this we can learn how to code the LCM of two numbers by giving input task

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.**

Prompt:-

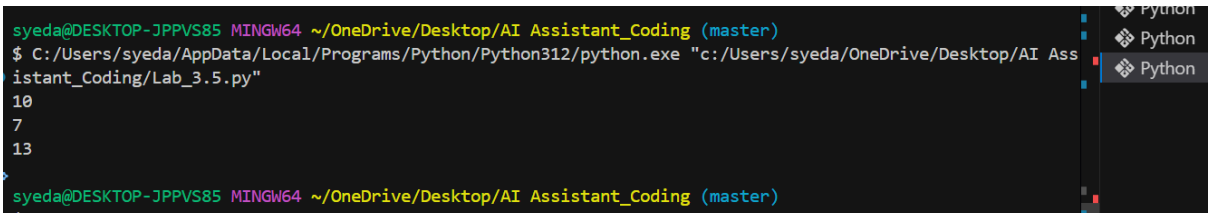
(Binary to Decimal Conversion)

Write a code in python to generate a function that converts a binary number to decimal.

Code:-

```
def binary_to_decimal(binary):
        # Missing validation logic intentionally kept minimal
    decimal = 0      power = 0
for digit in
reversed(str(binary)):
        decimal += int(digit) * (2 ** power)
        power += 1 return decimal # Test
cases print(binary_to_decimal("1010"))   #
Valid → 10 print(binary_to_decimal(111))
        # Valid → 7
print(binary_to_decimal("1021"))   # Invalid → wrong output, no error
handling
```

Output:-



Approach:-

From this we can learn how to convert from binary to decimal number.

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.**

Prompt:-

Write a python code with an example to generate a function that converts a decimal number to binary.

Code:-

```
def decimal_to_binary(n):    if n == 0:    return "0"   sign = "-" if n < 0 else ""   n = abs(n)   binary = ""  while n > 0:        binary = str(n % 2) + binary       n //= 2        return sign + binary

# Test cases
print(decimal_to_binary(10))   # 1010
print(decimal_to_binary(0))   # 0
print(decimal_to_binary(-5))   # -101
```

Output:-

Approach:-

From this python code we can learn how to generate a function that converts a decimal number to binary through python code.

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**

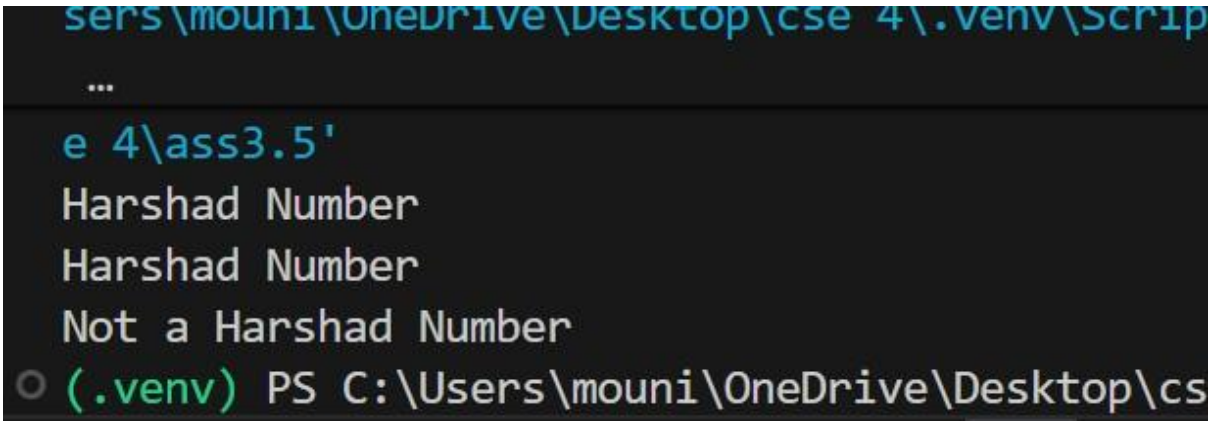
Prompt:-

Write a python program to generate a function that checks whether a number is a Harshad (Niven) number.

Code:-

```
def is_harshad(n):
    if n <= 0:
    return "Invalid Input"    digit_sum
= sum(int(d) for d in str(n))    if
digit_sum != 0 and n % digit_sum == 0:
    return "Harshad Number"
    else:
    return "Not a Harshad Number"
# Test cases
print(is_harshad(18))   # Harshad Number
print(is_harshad(21))   # Harshad Number
print(is_harshad(19))   # Not a Harshad Number
```

Output:-



Approach:-

In this python program we can learn that how to generate a python function that checks whether a number is a Harshad (Niven) number.