AI Assisted Coding

Lab Assignment 3.5

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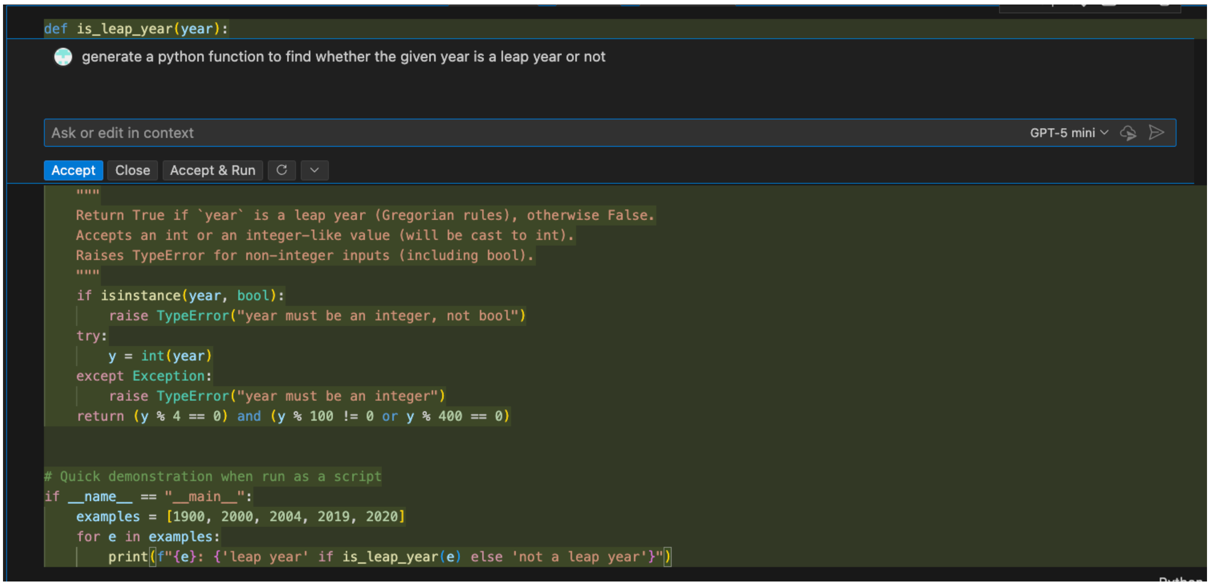
Task -1:

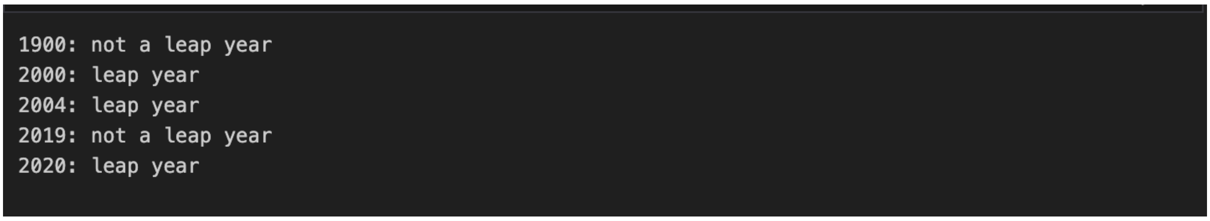
Prompt: generate a python function to find whether the given year is a leap year or not.



generate a python function to find whether the given year is a leap year or not

```python
def is_leap_year(year):
    """
    Return True if `year` is a leap year (Gregorian rules), otherwise False.
    Accepts an int or an integer-like value (will be cast to int).
    Raises TypeError for non-integer inputs (including bool).
    """
    if isinstance(year, bool):
        raise TypeError("year must be an integer, not bool")
    try:
        y = int(year)
    except Exception:
        raise TypeError("year must be an integer")
    return (y % 4 == 0) and (y % 100 != 0 or y % 400 == 0)


# Quick demonstration when run as a script
if __name__ == "__main__":
    examples = [1900, 2000, 2004, 2019, 2020]
    for e in examples:
        print(f"{e}: {'leap year' if is_leap_year(e) else 'not a leap year'}")
```

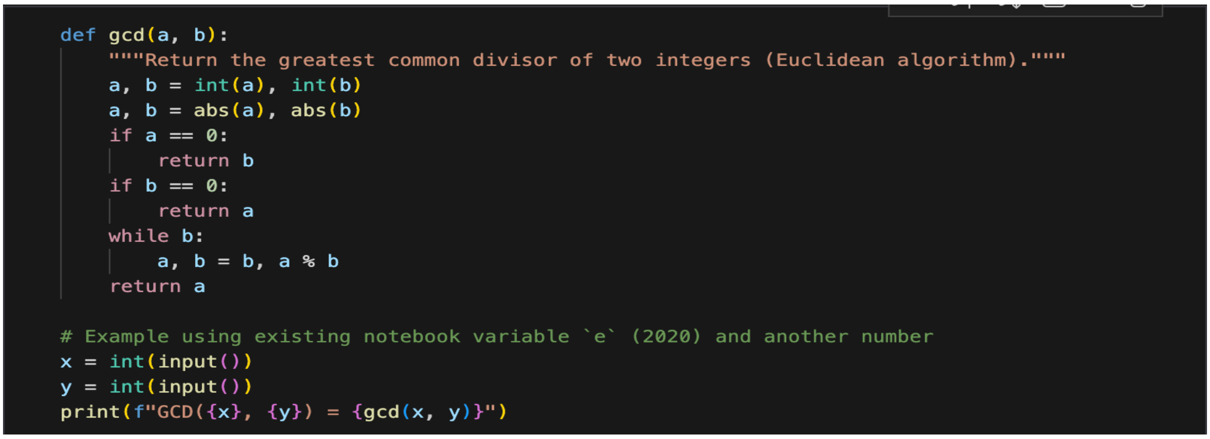
Output :



```
1900: not a leap year
2000: leap year
2004: leap year
2019: not a leap year
2020: leap year
```

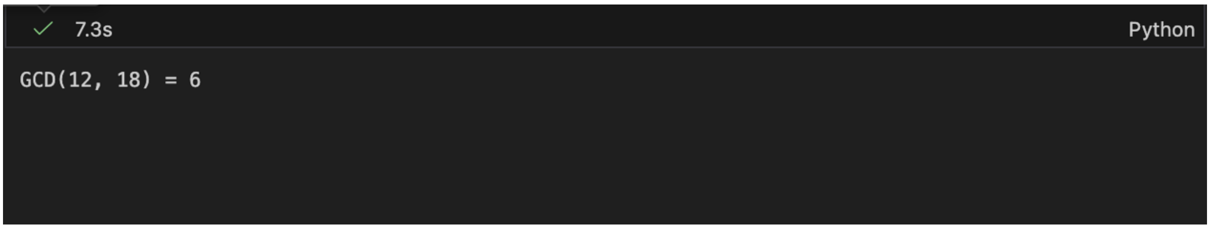
Task 2:

Prompt: generate a python code with one example to find the GCD of two numbers.



```python
def gcd(a, b):
    """Return the greatest common divisor of two integers (Euclidean algorithm)."""
    a, b = int(a), int(b)
    a, b = abs(a), abs(b)
    if a == 0:
        return b
    if b == 0:
        return a
    while b:
        a, b = b, a % b
    return a

# Example using existing notebook variable `e` (2020) and another number
x = int(input())
y = int(input())
print(f"GCD({x}, {y}) = {gcd(x, y)}")
```

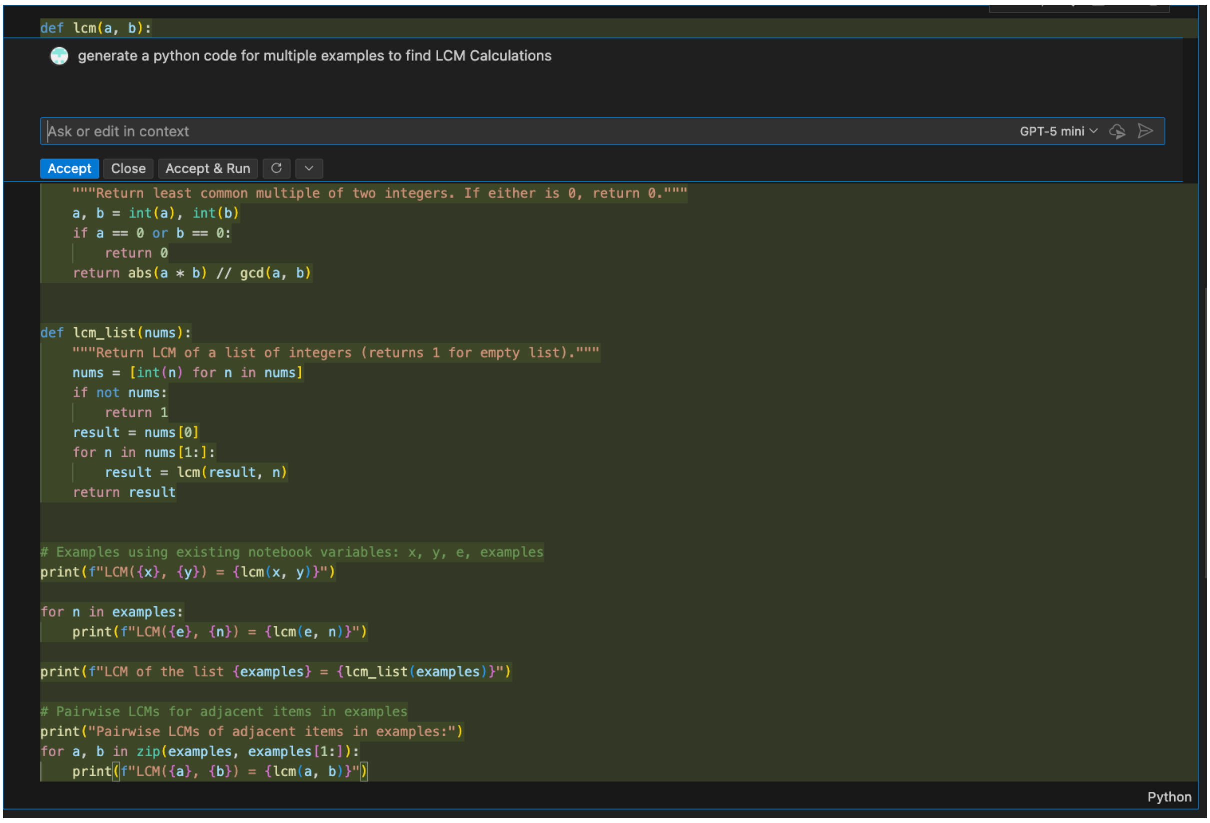
Output:



```
GCD(12, 18) = 6
```

Task 3:

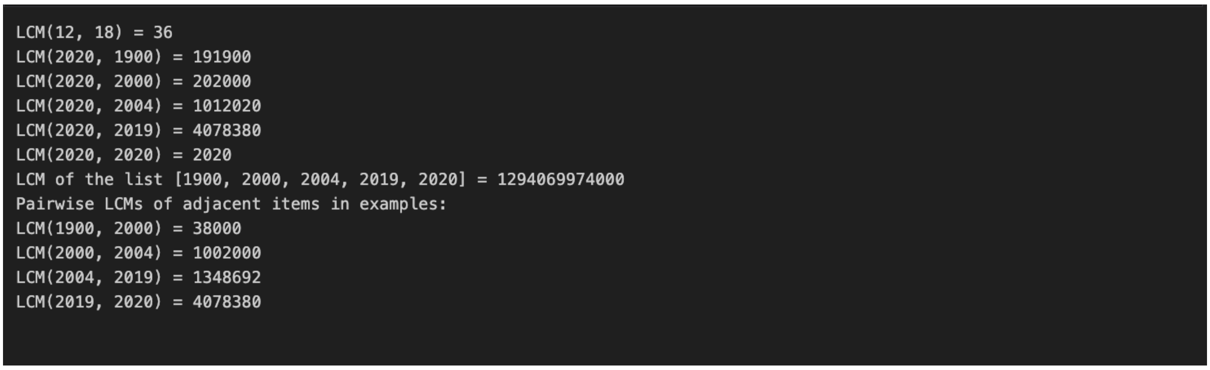
Prompt : generate a python code for multiple examples to find LCM Calculations.



generate a python code for multiple examples to find LCM Calculations

```python
def lcm(a, b):
    """Return least common multiple of two integers. If either is 0, return 0."""
    a, b = int(a), int(b)
    if a == 0 or b == 0:
        return 0
    return abs(a * b) // gcd(a, b)


def lcm_list(nums):
    """Return LCM of a list of integers (returns 1 for empty list)."""
    nums = [int(n) for n in nums]
    if not nums:
        return 1
    result = nums[0]
    for n in nums[1:]:
        result = lcm(result, n)
    return result


# Examples using existing notebook variables: x, y, e, examples
print(f"LCM({x}, {y}) = {lcm(x, y)}")

for n in examples:
    print(f"LCM({e}, {n}) = {lcm(e, n)}")

print(f"LCM of the list {examples} = {lcm_list(examples)}")

# Pairwise LCMs for adjacent items in examples
print("Pairwise LCMs of adjacent items in examples:")
for a, b in zip(examples, examples[1:]):
    print(f"LCM({a}, {b}) = {lcm(a, b)}")
```

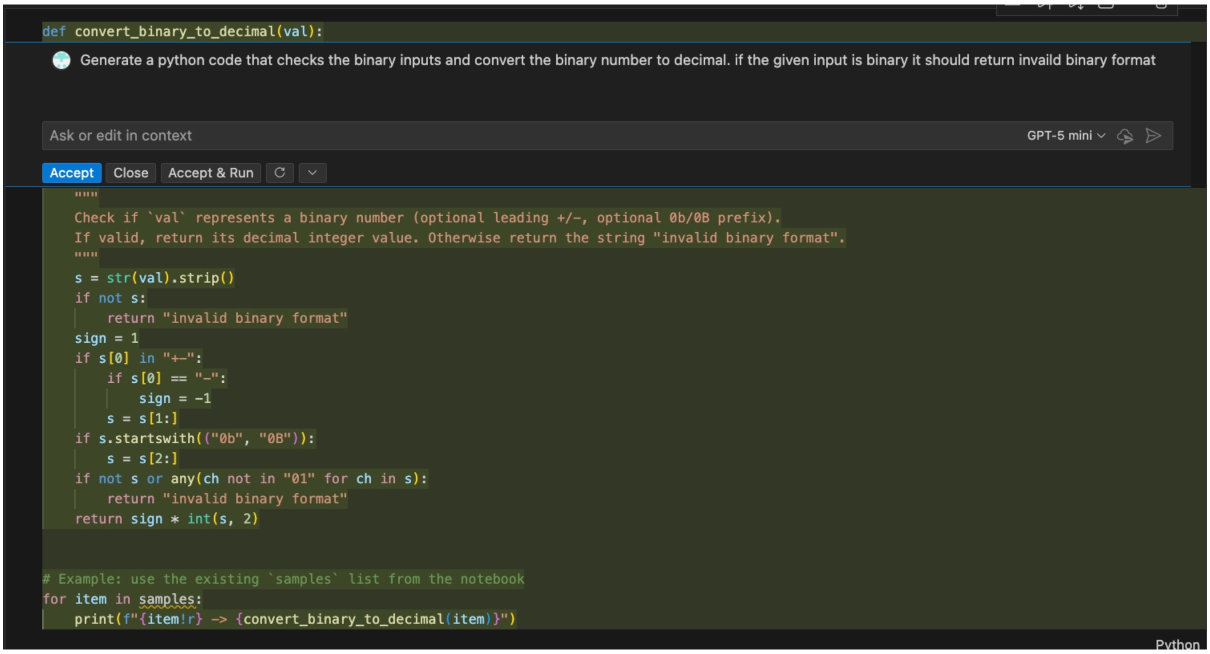
Output :



```
LCM(12, 18) = 36
LCM(2020, 1900) = 191900
LCM(2020, 2000) = 202000
LCM(2020, 2004) = 1012020
LCM(2020, 2019) = 4078380
LCM(2020, 2020) = 2020
LCM of the list [1900, 2000, 2004, 2019, 2020] = 1294069974000
Pairwise LCMs of adjacent items in examples:
LCM(1900, 2000) = 38000
LCM(2000, 2004) = 1002000
LCM(2004, 2019) = 1348692
LCM(2019, 2020) = 4078380
```

Task 4 :

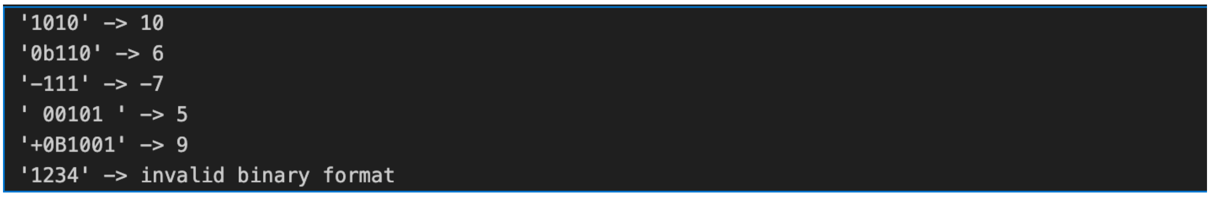
Prompt : Generate a python code that checks the binary inputs and convert the binary number to decimal. if the given input is binary it should return invalid binary format.



Generate a python code that checks the binary inputs and convert the binary number to decimal. if the given input is binary it should return invaild binary format

```python
def convert_binary_to_decimal(val):
    """
    Check if `val` represents a binary number (optional leading +/-, optional 0b/0B prefix).
    If valid, return its decimal integer value. Otherwise return the string "invalid binary format".
    """
    s = str(val).strip()
    if not s:
        return "invalid binary format"
    sign = 1
    if s[0] in "+-":
        if s[0] == "-":
            sign = -1
        s = s[1:]
    if s.startswith(("0b", "0B")):
        s = s[2:]
    if not s or any(ch not in "01" for ch in s):
        return "invalid binary format"
    return sign * int(s, 2)


# Example: use the existing `samples` list from the notebook
for item in samples:
    print(f"{item!r} -> {convert_binary_to_decimal(item)}")
```

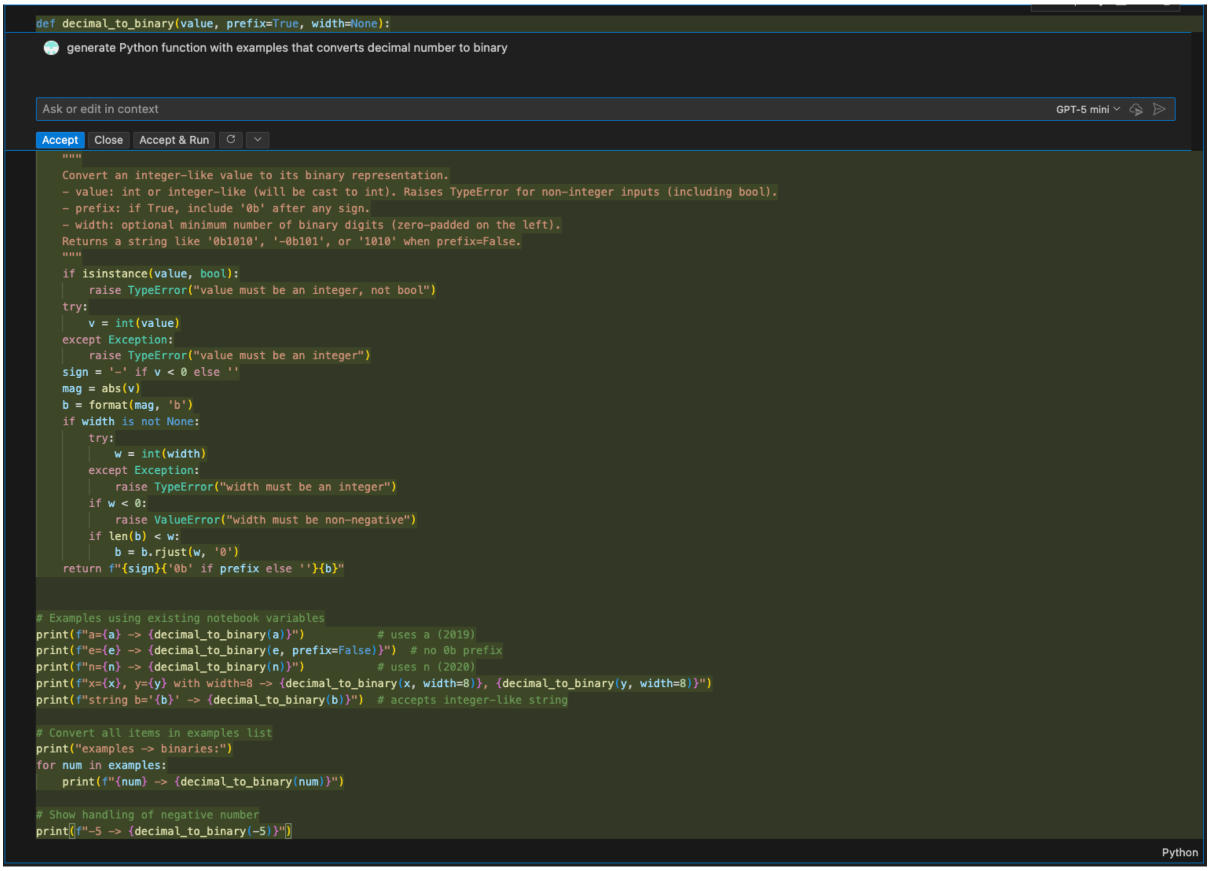
Output :



```
'1010' -> 10
'0b110' -> 6
'-111' -> -7
' 00101 ' -> 5
'+0B1001' -> 9
'1234' -> invalid binary format
```

Task 5 :

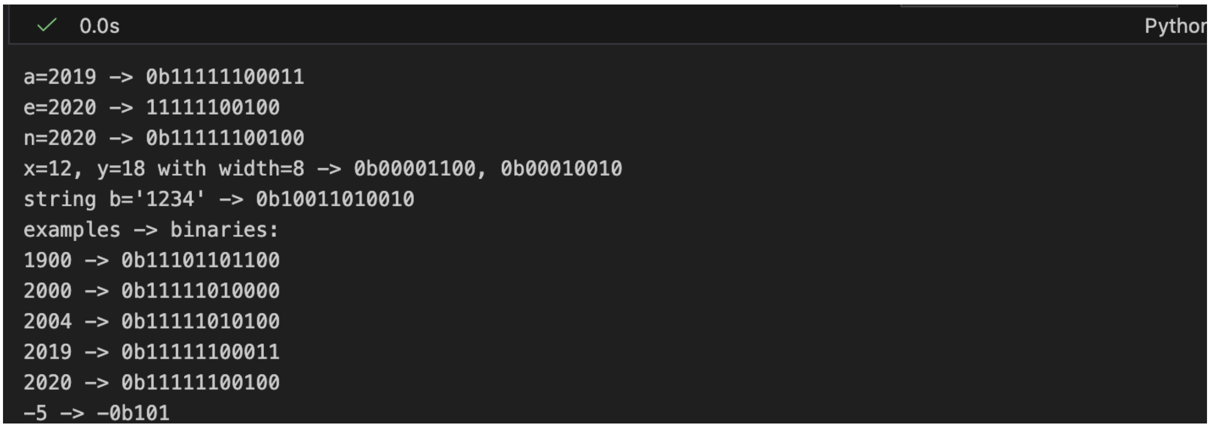
Prompt : generate Python function with examples that converts decimal number to binary.



generate Python function with examples that converts decimal number to binary

```python
def decimal_to_binary(value, prefix=True, width=None):
    """
    Convert an integer-like value to its binary representation.
    - value: int or integer-like (will be cast to int). Raises TypeError for non-integer inputs (including bool).
    - prefix: if True, include '0b' after any sign.
    - width: optional minimum number of binary digits (zero-padded on the left).
    Returns a string like '0b1010', '-0b101', or '1010' when prefix=False.
    """
    if isinstance(value, bool):
        raise TypeError("value must be an integer, not bool")
    try:
        v = int(value)
    except Exception:
        raise TypeError("value must be an integer")
    sign = '-' if v < 0 else ''
    mag = abs(v)
    b = format(mag, 'b')
    if width is not None:
        try:
            w = int(width)
        except Exception:
            raise TypeError("width must be an integer")
        if w < 0:
            raise ValueError("width must be non-negative")
        if len(b) < w:
            b = b.rjust(w, '0')
    return f"{sign}{'0b' if prefix else ''}{b}"


# Examples using existing notebook variables
print(f"a={a} -> {decimal_to_binary(a)}")             # uses a (2019)
print(f"e={e} -> {decimal_to_binary(e, prefix=False)}")  # no 0b prefix
print(f"n={n} -> {decimal_to_binary(n)}")             # uses n (2020)
print(f"x={x}, y={y} with width=8 -> {decimal_to_binary(x, width=8)}, {decimal_to_binary(y, width=8)}")
print(f"string b='{b}' -> {decimal_to_binary(b)}")  # accepts integer-like string

# Convert all items in examples list
print("examples -> binaries:")
for num in examples:
    print(f"{num} -> {decimal_to_binary(num)}")

# Show handling of negative number
print(f"-5 -> {decimal_to_binary(-5)}")
```

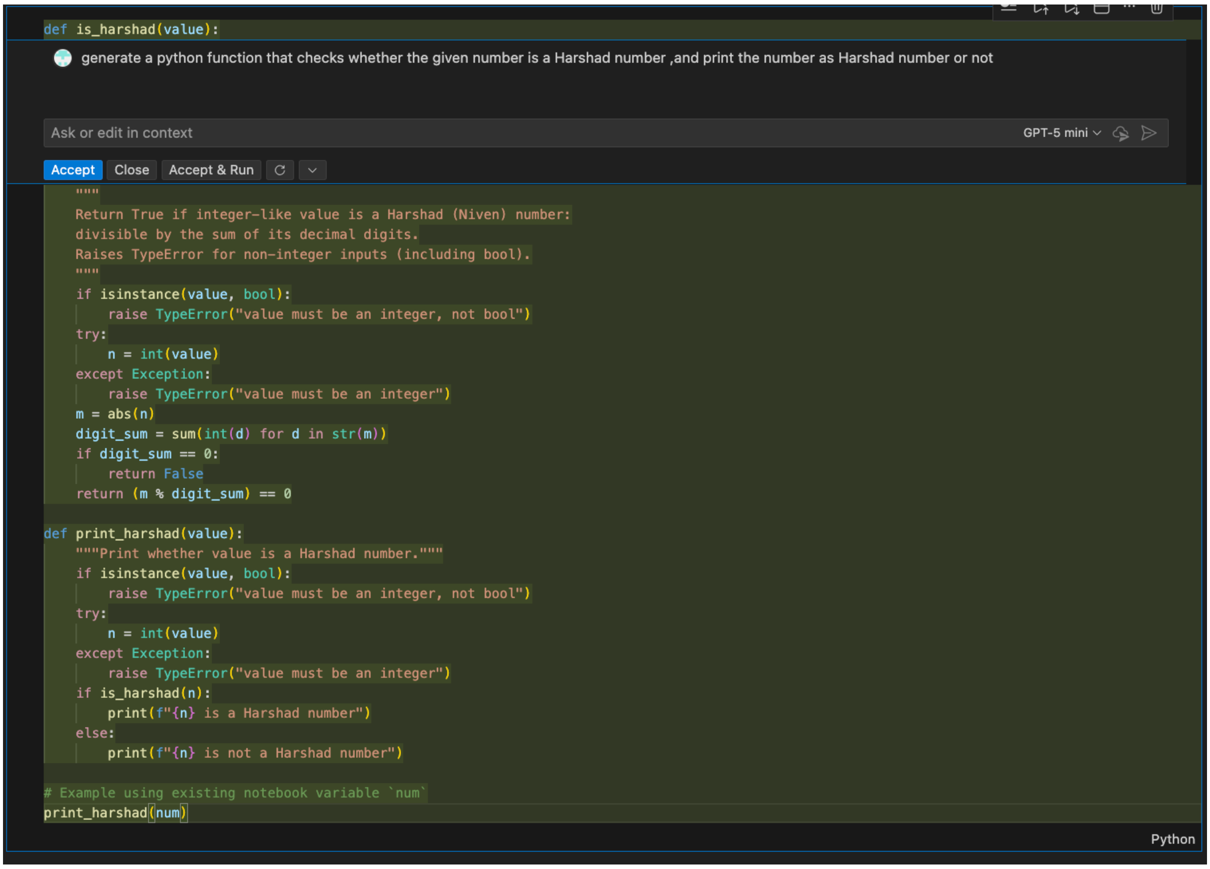
Output:



```
a=2019 -> 0b11111100011
e=2020 -> 11111100100
n=2020 -> 0b11111100100
x=12, y=18 with width=8 -> 0b00001100, 0b00010010
string b='1234' -> 0b10011010010
examples -> binaries:
1900 -> 0b11101101100
2000 -> 0b11111010000
2004 -> 0b11111010100
2019 -> 0b11111100011
2020 -> 0b11111100100
-5 -> -0b101
```

Task 6 :

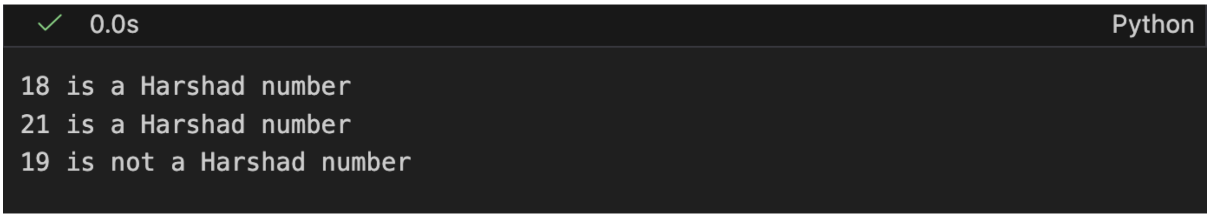
Prompt : generate a python function that checks whether the given number is a Harshad number ,and print the number as Harshad number or not.



generate a python function that checks whether the given number is a Harshad number ,and print the number as Harshad number or not

```python
def is_harshad(value):
    """
    Return True if integer-like value is a Harshad (Niven) number:
    divisible by the sum of its decimal digits.
    Raises TypeError for non-integer inputs (including bool).
    """
    if isinstance(value, bool):
        raise TypeError("value must be an integer, not bool")
    try:
        n = int(value)
    except Exception:
        raise TypeError("value must be an integer")
    m = abs(n)
    digit_sum = sum(int(d) for d in str(m))
    if digit_sum == 0:
        return False
    return (m % digit_sum) == 0

def print_harshad(value):
    """Print whether value is a Harshad number."""
    if isinstance(value, bool):
        raise TypeError("value must be an integer, not bool")
    try:
        n = int(value)
    except Exception:
        raise TypeError("value must be an integer")
    if is_harshad(n):
        print(f"{n} is a Harshad number")
    else:
        print(f"{n} is not a Harshad number")

# Example using existing notebook variable `num`
print_harshad(num)
```

Output :



```
18 is a Harshad number
21 is a Harshad number
19 is not a Harshad number
```