Lab Assignment – 2

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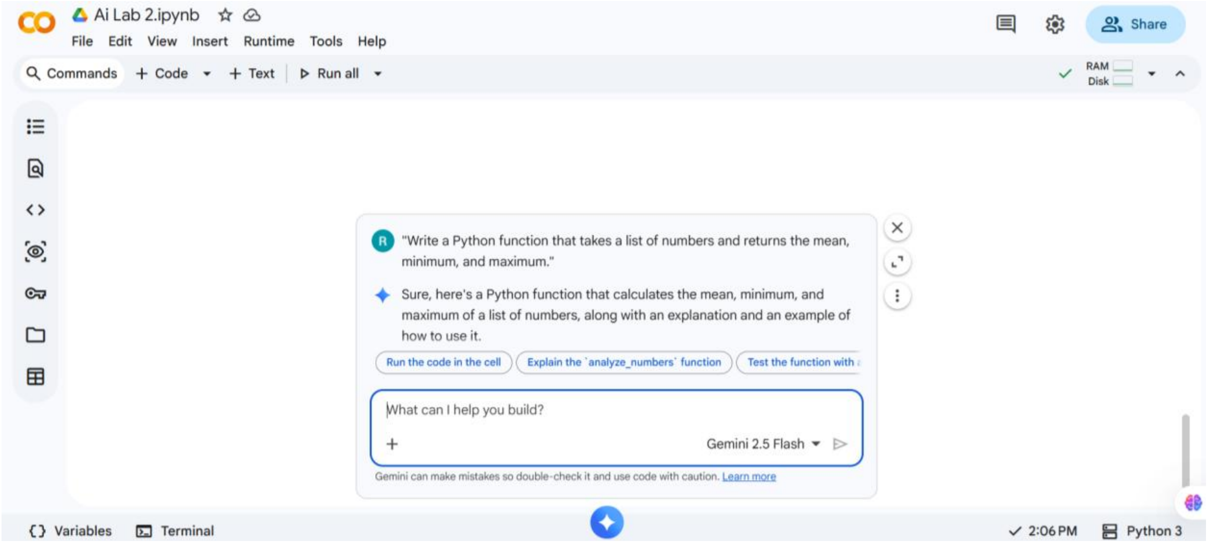
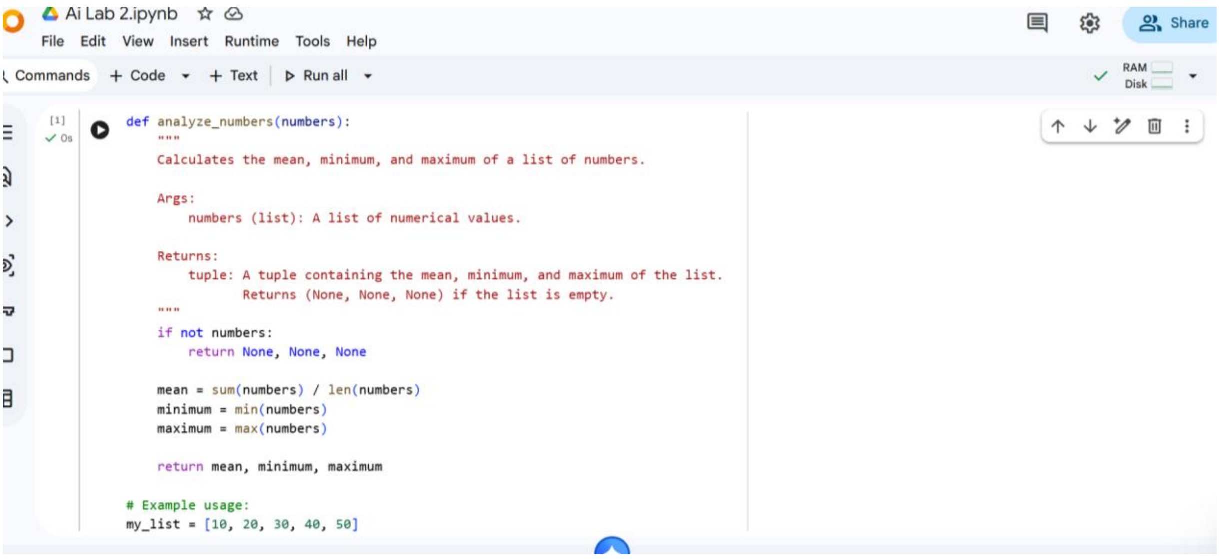
Task 1: Statistical Summary for Survey Data
Use Google Gemini in Colab to generate a Python function that reads a list of numbers and calculates the **mean, minimum, and maximum** values.

1 . Screenshot of Gemini prompt and result

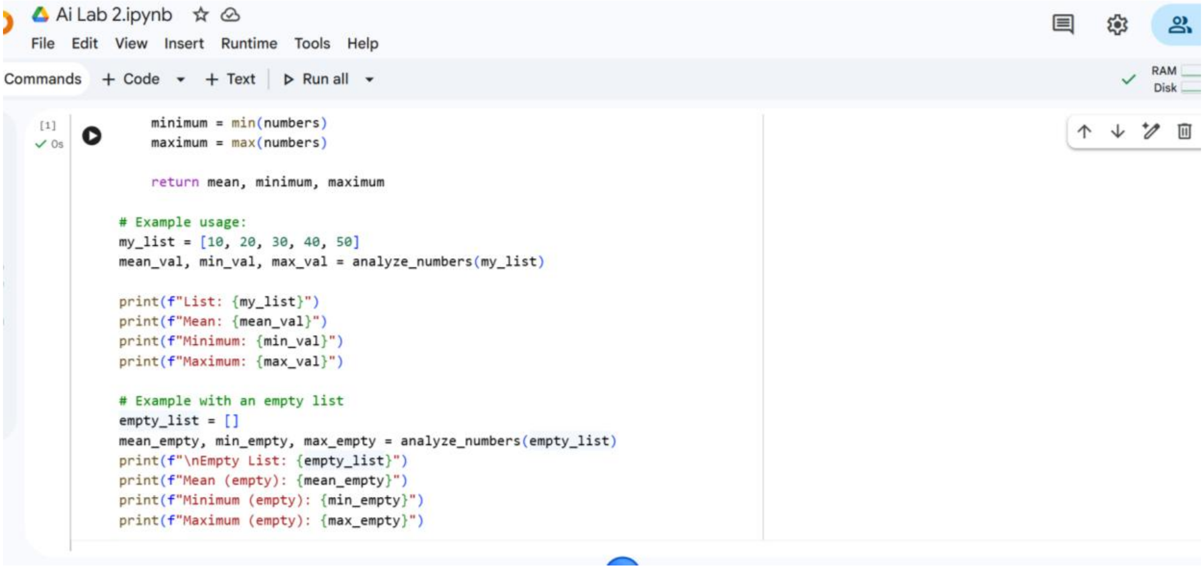

Ai Lab 2.ipynb
File Edit View Insert Runtime Tools Help
Commands + Code + Text Run all
Share
RAM
Disk
Run the code in the cell
Explain the `analyze_numbers` function
Test the function with
What can I help you build?
Gemini 2.5 Flash
Gemini can make mistakes so double-check it and use code with caution. Learn more
Variables
Terminal
2:06 PM
Python 3

"Write a Python function that takes a list of numbers and returns the mean, minimum, and maximum."

Sure, here's a Python function that calculates the mean, minimum, and maximum of a list of numbers, along with an explanation and an example of how to use it.

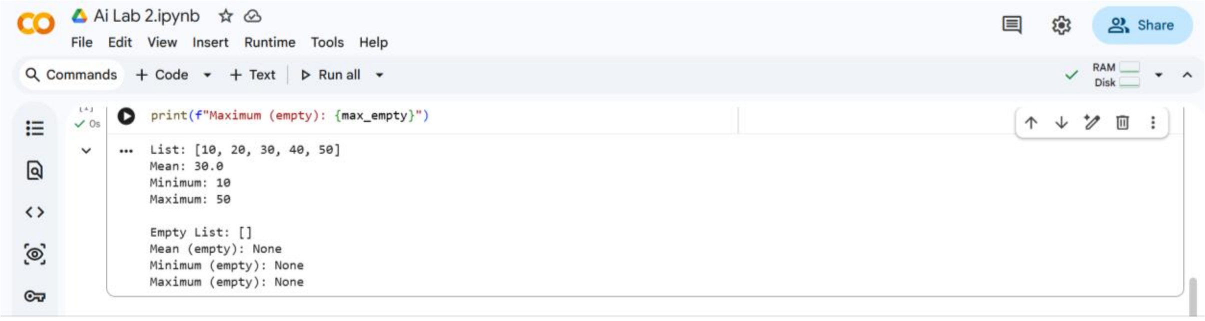

Ai Lab 2.ipynb
File Edit View Insert Runtime Tools Help
Commands + Code + Text Run all
Share
RAM
Disk
[1]
0s

```
def analyze_numbers(numbers):
    """
    Calculates the mean, minimum, and maximum of a list of numbers.

    Args:
        numbers (list): A list of numerical values.

    Returns:
        tuple: A tuple containing the mean, minimum, and maximum of the list.
               Returns (None, None, None) if the list is empty.
    """
    if not numbers:
        return None, None, None

    mean = sum(numbers) / len(numbers)
    minimum = min(numbers)
    maximum = max(numbers)

    return mean, minimum, maximum

# Example usage:
my_list = [10, 20, 30, 40, 50]
```



```
    minimum = min(numbers)
    maximum = max(numbers)

    return mean, minimum, maximum

# Example usage:
my_list = [10, 20, 30, 40, 50]
mean_val, min_val, max_val = analyze_numbers(my_list)

print(f"List: {my_list}")
print(f"Mean: {mean_val}")
print(f"Minimum: {min_val}")
print(f"Maximum: {max_val}")

# Example with an empty list
empty_list = []
mean_empty, min_empty, max_empty = analyze_numbers(empty_list)
print(f"\nEmpty List: {empty_list}")
print(f"Mean (empty): {mean_empty}")
print(f"Minimum (empty): {min_empty}")
print(f"Maximum (empty): {max_empty}")
```

OUTPUT :



```
print(f"Maximum (empty): {max_empty}")
```

```
List: [10, 20, 30, 40, 50]
Mean: 30.0
Minimum: 10
Maximum: 50

Empty List: []
Mean (empty): None
Minimum (empty): None
Maximum (empty): None
```

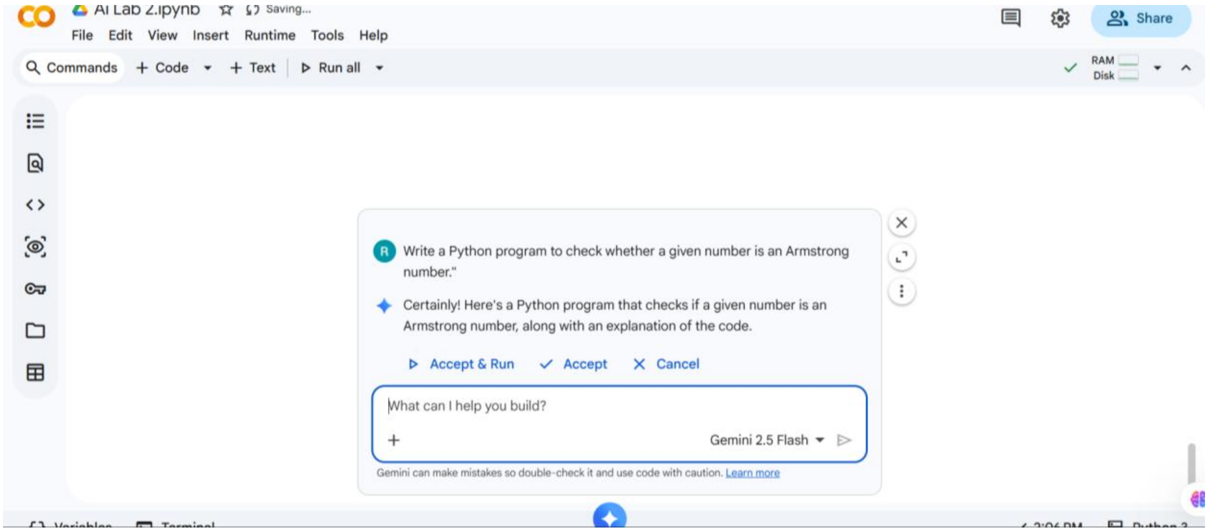
Explanation

- **def analyze_numbers(numbers):**: This defines a function named analyze_numbers that takes one argument, numbers, which is expected to be a list.
- **Docstring**: The triple-quoted string explains what the function does, its arguments (Args), and what it returns (Returns). This is good practice for documenting your code.
- **if not numbers:**: This line checks if the input list numbers is empty. If it is, the function returns (None, None, None) to avoid errors (like division by zero for the mean or min()/max() on an empty list).
- **mean = sum(numbers) / len(numbers)**: Calculates the mean (average) by summing all numbers in the list using sum() and dividing by the count of numbers using len().
- **minimum = min(numbers)**: Finds the smallest number in the list using the built-in min() function.
- **maximum = max(numbers)**: Finds the largest number in the list using the built-in max() function.

- **return mean, minimum, maximum**: The function returns these three calculated values as a tuple.

Task 2: Armstrong Number – AI Comparison

Generate an Armstrong number checker using Gemini and GitHub Copilot.

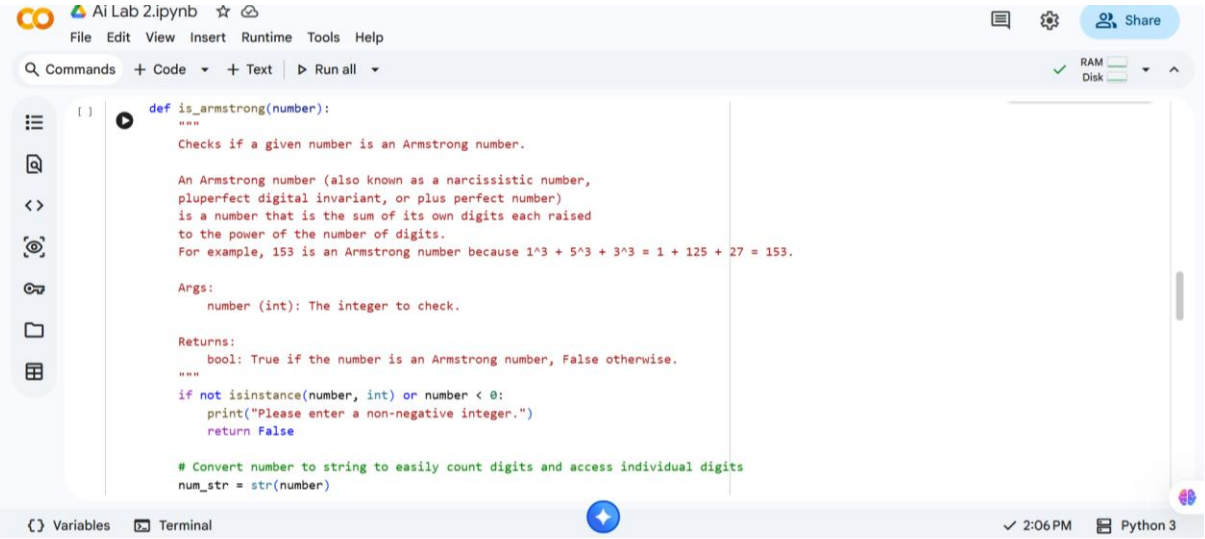


Write a Python program to check whether a given number is an Armstrong number."

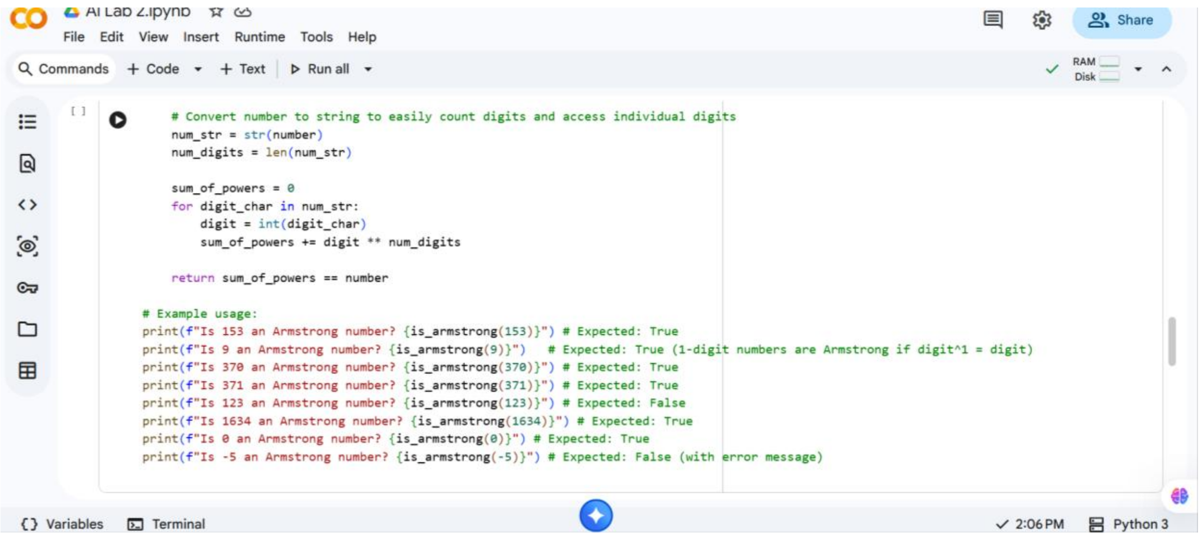
Certainly! Here's a Python program that checks if a given number is an Armstrong number, along with an explanation of the code.

What can I help you build?

Gemini can make mistakes so double-check it and use code with caution. Learn more

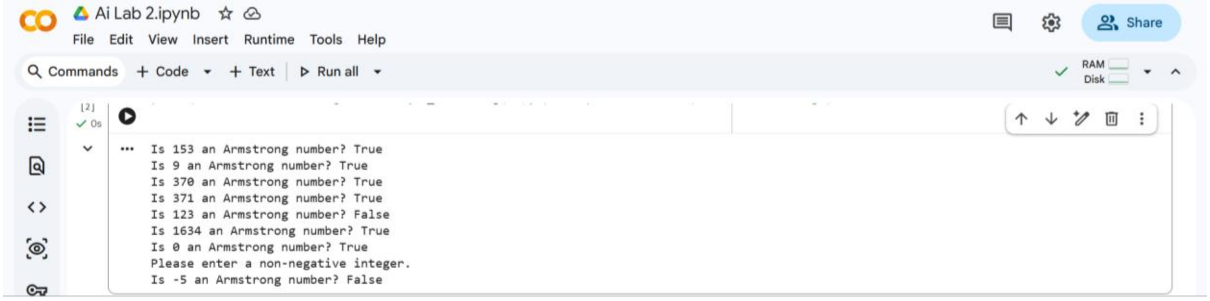


```
def is_armstrong(number):
    """
    Checks if a given number is an Armstrong number.

    An Armstrong number (also known as a narcissistic number,
    pluperfect digital invariant, or plus perfect number)
    is a number that is the sum of its own digits each raised
    to the power of the number of digits.
    For example, 153 is an Armstrong number because 1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153.

    Args:
        number (int): The integer to check.

    Returns:
        bool: True if the number is an Armstrong number, False otherwise.
    """
    if not isinstance(number, int) or number < 0:
        print("Please enter a non-negative integer.")
        return False

    # Convert number to string to easily count digits and access individual digits
    num_str = str(number)
```

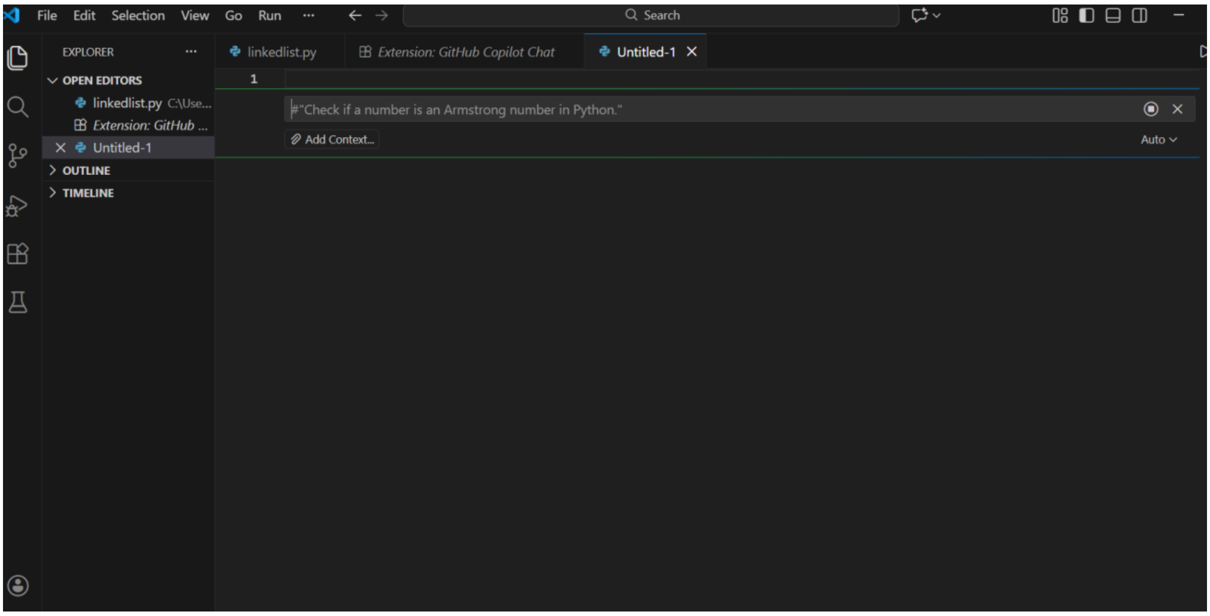


```
    # Convert number to string to easily count digits and access individual digits
    num_str = str(number)
    num_digits = len(num_str)

    sum_of_powers = 0
    for digit_char in num_str:
        digit = int(digit_char)
        sum_of_powers += digit ** num_digits

    return sum_of_powers == number

# Example usage:
print(f"Is 153 an Armstrong number? {is_armstrong(153)}") # Expected: True
print(f"Is 9 an Armstrong number? {is_armstrong(9)}")   # Expected: True (1-digit numbers are Armstrong if digit^1 = digit)
print(f"Is 370 an Armstrong number? {is_armstrong(370)}") # Expected: True
print(f"Is 371 an Armstrong number? {is_armstrong(371)}") # Expected: True
print(f"Is 123 an Armstrong number? {is_armstrong(123)}") # Expected: False
print(f"Is 1634 an Armstrong number? {is_armstrong(1634)}") # Expected: True
print(f"Is 0 an Armstrong number? {is_armstrong(0)}") # Expected: True
print(f"Is -5 an Armstrong number? {is_armstrong(-5)}") # Expected: False (with error message)
```

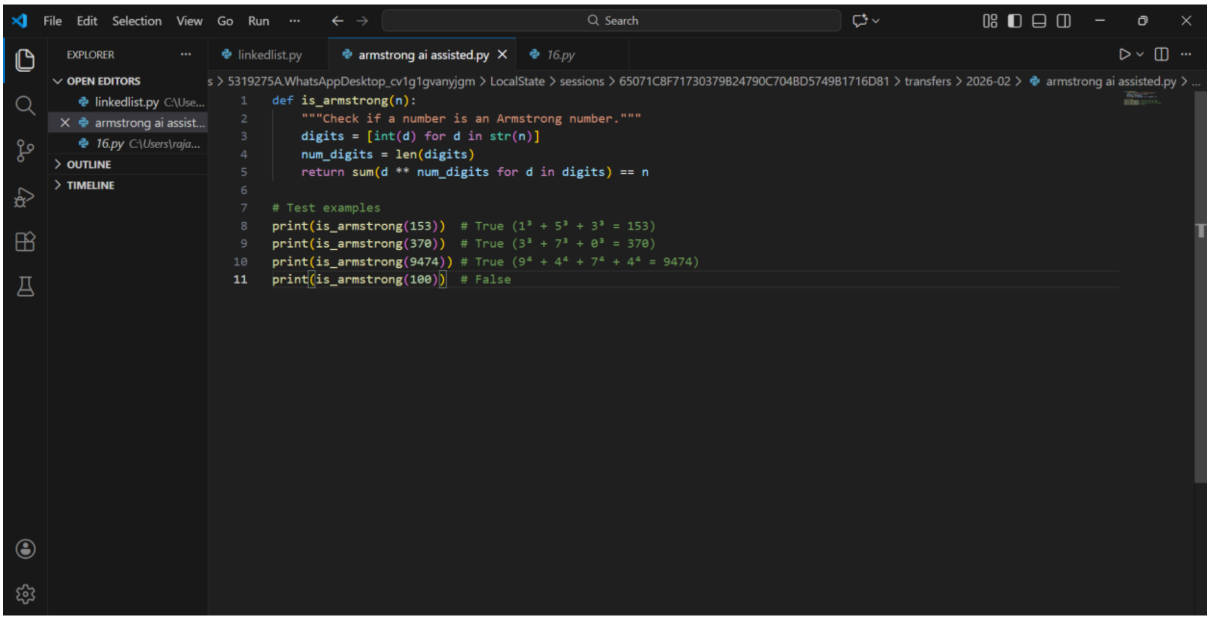
OUTPUT :



```
Is 153 an Armstrong number? True
Is 9 an Armstrong number? True
Is 370 an Armstrong number? True
Is 371 an Armstrong number? True
Is 123 an Armstrong number? False
Is 1634 an Armstrong number? True
Is 0 an Armstrong number? True
Please enter a non-negative integer.
Is -5 an Armstrong number? False
```



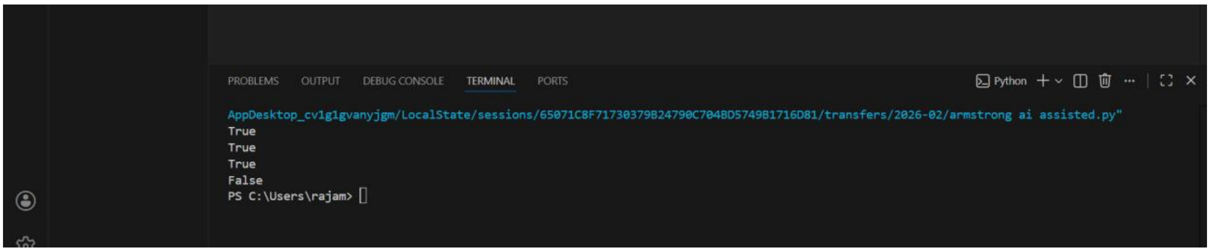
#"Check if a number is an Armstrong number in Python."



s > 5319275A.WhatsAppDesktop_cv1g1gvanyjgm > LocalState > sessions > 65071C8F71730379B24790C704BD5749B1716D81 > transfers > 2026-02 > armstrong ai assisted.py > ...

```python
def is_armstrong(n):
    """Check if a number is an Armstrong number."""
    digits = [int(d) for d in str(n)]
    num_digits = len(digits)
    return sum(d ** num_digits for d in digits) == n

# Test examples
print(is_armstrong(153))  # True (1³ + 5³ + 3³ = 153)
print(is_armstrong(370))  # True (3³ + 7³ + 0³ = 370)
print(is_armstrong(9474)) # True (9⁴ + 4⁴ + 7⁴ + 4⁴ = 9474)
print(is_armstrong(100))  # False
```

OUTPUT :



```
AppDesktop_cv1g1gvanyjgm/LocalState/sessions/65071C8F71730379B24790C704BD5749B1716D81/transfers/2026-02/armstrong ai assisted.py"
True
True
True
False
PS C:\Users\rajam> 
```

Explanation :

- **def is_armstrong(number):**: This defines a function named is_armstrong that takes one argument, number, which is expected to be an integer.
- **Docstring**: The triple-quoted string explains what the function does, its arguments (Args), and what it returns (Returns). It also clarifies the definition of an Armstrong number.
- **Input Validation**: if not isinstance(number, int) or number < 0: checks if the input is a non-negative integer. Armstrong numbers are typically defined for non-negative integers. If invalid, it prints a message and returns False.
- **Convert to String**: num_str = str(number) converts the input number to a string. This makes it easy to:
  - num_digits = len(num_str): Get the number of digits.
  - Iterate through each digit.
- **Calculate Sum of Powers**:
  - sum_of_powers = 0 initializes a variable to store the sum.
  - The for loop iterates through each character (digit_char) in the num_str.
  - digit = int(digit_char) converts the character back to an integer.
  - sum_of_powers += digit ** num_digits calculates the digit raised to the power of the total number of digits and adds it to the running sum.
- **Comparison**: Finally, return sum_of_powers == number compares the calculated sum with the original number. If they are equal, the number is an Armstrong number, and the function returns True; otherwise, it returns False.

Comparison Table

Feature	**Google Gemini**	**GitHub Copilot**
Logic Style	Uses string conversion	Uses mathematical operations
Code Structure	Function-based	Inline procedural code

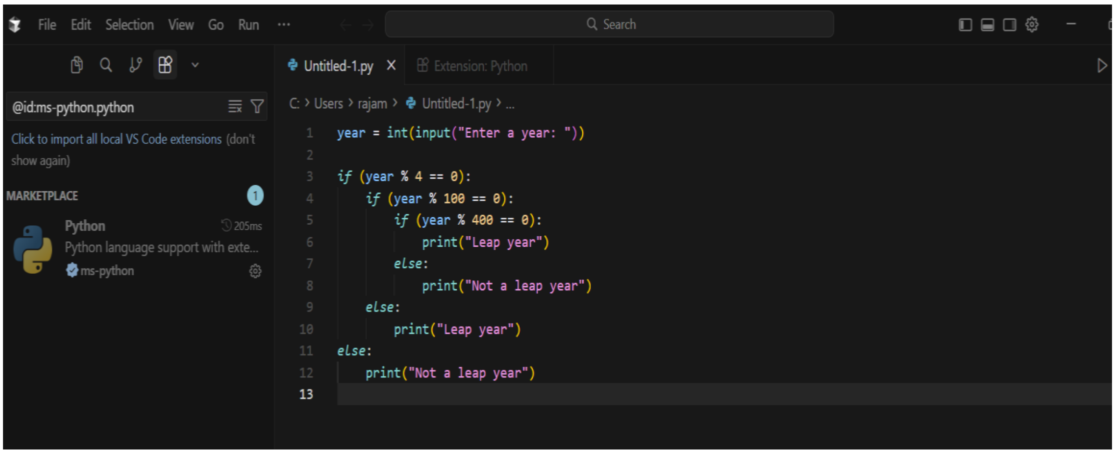
Feature	**Google Gemini**	**GitHub Copilot**
Readability	Very clear and beginner-friendly	Slightly complex but efficient
Lines of Code	More	Fewer
Ease of Understanding	High	Medium
Suitability for Beginners	Excellent	Good

Task 3: Leap Year Validation Using Cursor AI

Use Cursor AI to generate a Python program that checks whether a given year is a leap year.
Use at least two different prompts and observe changes in code.

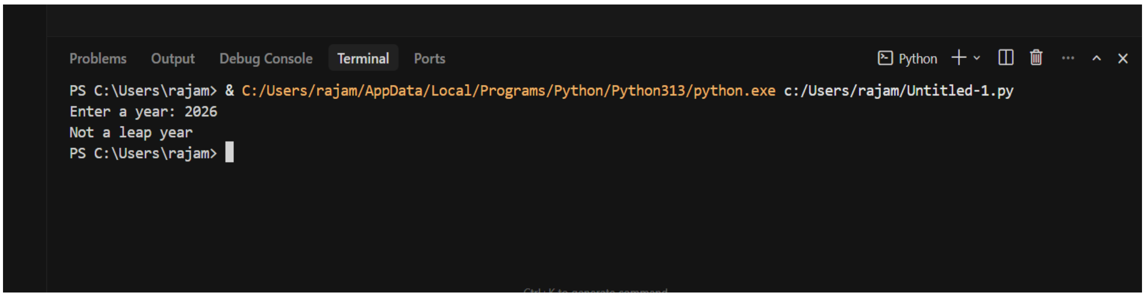
Prompt 1

Write a Python program to check whether a given year is a leap year


File
Edit
Selection
View
Go
Run
Search
Untitled-1.py
Extension: Python
@id:ms-python.python
Click to import all local VS Code extensions (don't show again)
MARKETPLACE
Python
205ms
Python language support with exte...
ms-python
C: > Users > rajam > Untitled-1.py > ...

```python
year = int(input("Enter a year: "))

if (year % 4 == 0):
    if (year % 100 == 0):
        if (year % 400 == 0):
            print("Leap year")
        else:
            print("Not a leap year")
    else:
        print("Leap year")
else:
    print("Not a leap year")
```

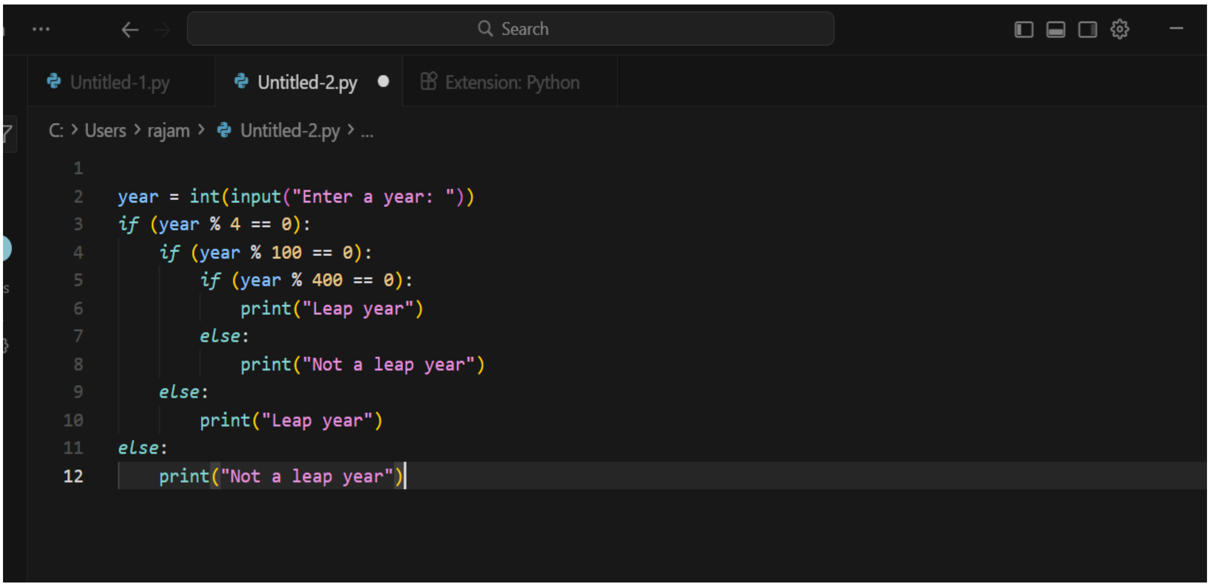
OUTPUT :



```
PS C:\Users\rajam> & C:/Users/rajam/AppData/Local/Programs/Python/Python313/python.exe c:/Users/rajam/Untitled-1.py
Enter a year: 2026
Not a leap year
PS C:\Users\rajam> 
```

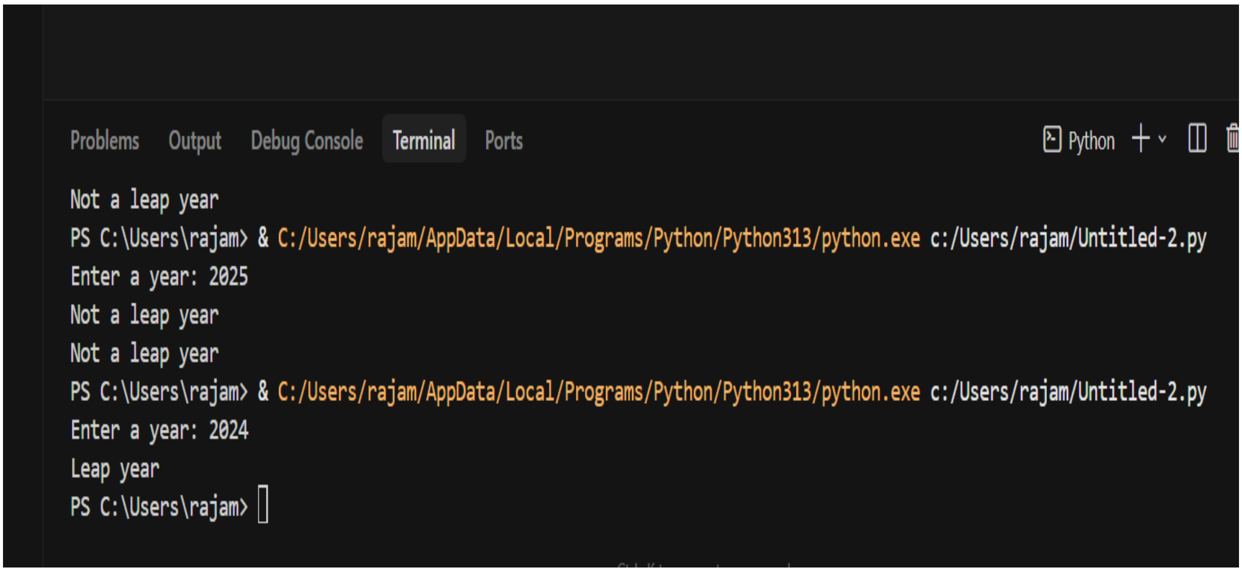
Prompt 2

Write an optimized and user-friendly Python program to validate leap year with proper comments



```python

year = int(input("Enter a year: "))
if (year % 4 == 0):
    if (year % 100 == 0):
        if (year % 400 == 0):
            print("Leap year")
        else:
            print("Not a leap year")
    else:
        print("Leap year")
else:
    print("Not a leap year")
```

OUTPUT



```
Not a leap year
PS C:\Users\rajam> & C:/Users/rajam/AppData/Local/Programs/Python/Python313/python.exe c:/Users/rajam/Untitled-2.py
Enter a year: 2025
Not a leap year
Not a leap year
PS C:\Users\rajam> & C:/Users/rajam/AppData/Local/Programs/Python/Python313/python.exe c:/Users/rajam/Untitled-2.py
Enter a year: 2024
Leap year
PS C:\Users\rajam> 
```

Comparison Between the Two Versions

Feature	Version 1	Version 2
Prompt Type	Simple	Optimized
Code Structure	Procedural	Function-based

Feature	Version 1	Version 2
Readability	Good	Very Good
Reusability	Low	High
Comments & Documentation	No	Yes
Suitable for Backend Systems	Medium	High

Conclusion:

Using different prompts in Cursor AI results in improved code quality, better structure, and higher maintainability.

Task 4: Student Logic + AI Refactoring (Odd/Even Sum)

Write a Python program that calculates the **sum of odd and even numbers in a tuple**, then refactor it using any AI tool.

Original code

```
t = (1, 2, 3, 4, 5, 6)
even_sum = 0
odd_sum = 0
for i in t:
    if i % 2 == 0:
        even_sum = even_sum + i
    else:
        odd_sum = odd_sum + i
print("Sum of even numbers:", even_sum)
print("Sum of odd numbers:", odd_sum)
```

Output

```
Sum of even numbers: 12
Sum of odd numbers: 9
```

Refactored Code

```
t = (1, 2, 3, 4, 5, 6)

even_sum = sum(num for num in t if num % 2 == 0)

odd_sum = sum(num for num in t if num % 2 != 0)

print(f"Sum of even numbers: {even_sum}")

print(f"Sum of odd numbers: {odd_sum}")
```

Output

```
Sum of even numbers: 12

Sum of odd numbers: 9
```

Explanation of Improvements

Aspect	**Original Code**	**Refactored Code**
Code Length	More lines	Fewer lines
Logic Style	Traditional loop	Pythonic (list comprehension)
Readability	Good	Very clear and concise
Performance	Normal	Slightly optimized
Maintainability	Medium	High