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### **Task 1: Statistical Summary for Survey Data**

❖ Scenario:

You are a data analyst intern working with survey responses stored as numerical lists.

❖ Task:

Use Google Gemini in Colab to generate a Python function that reads a list of numbers and calculates the mean, minimum, and maximum values.

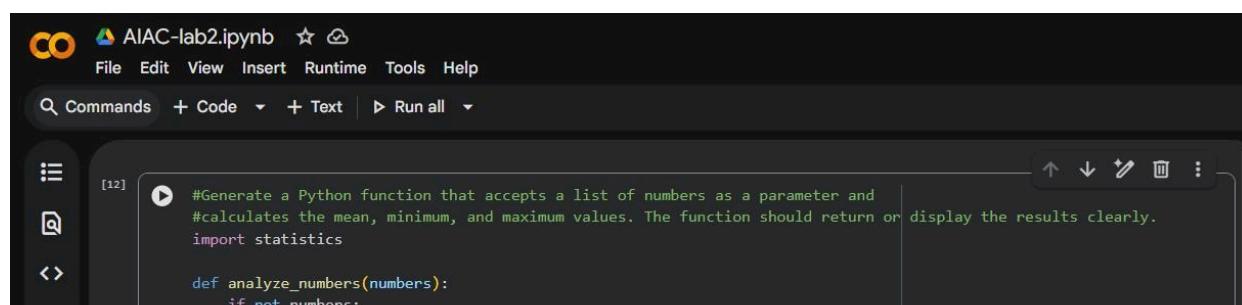
❖ Expected Output:

- Correct Python function
- Output shown in Colab
- Screenshot of Gemini prompt and result

**Prompt:**

Generate a Python function that accepts a list of numbers as a parameter and calculates the mean, minimum, and maximum values. The function should return or display the results clearly.

**Code:**



The screenshot shows the Google Colab interface. At the top, there's a toolbar with File, Edit, View, Insert, Runtime, Tools, Help, and a search bar labeled 'Commands'. Below the toolbar is a code cell. The cell contains a prompt from Gemini asking for a Python function to calculate statistical summary for a list of numbers. The generated code is as follows:

```
#Generate a Python function that accepts a list of numbers as a parameter and
#calculates the mean, minimum, and maximum values. The function should return or display the results clearly.
import statistics

def analyze_numbers(numbers):
    if not numbers:
```

**Output:**

The screenshot shows a Google Colab notebook titled "AIAC-lab2.ipynb". The code cell contains the following Python script:

```
# Example usage:  
my_sample_numbers = [10, 20, 30, 40, 50, 5, 25, 15, 35]  
mean, minimum, maximum = analyze_numbers(my_sample_numbers)  
# Example with an empty list  
empty_numbers_list = []  
mean_empty, min_empty, max_empty = analyze_numbers(empty_numbers_list)  
  
--- Analysis of Given Numbers ---  
Numbers analyzed: [10, 20, 30, 40, 50, 5, 25, 15, 35]  
Mean: 25.555555555555557  
Minimum: 5  
Maximum: 50  
Cannot analyze an empty list.
```

### **Justification:**

The function analyzes a list of survey numbers by calculating the mean, minimum, and maximum values using built-in Python functions. It also checks for empty input to avoid errors and displays the results clearly in Google Colab. This ensures accurate and efficient statistical analysis of the data.

### **Task 2: Armstrong Number – AI Comparison**

#### ❖ Scenario:

You are evaluating AI tools for numeric validation logic.

#### ❖ Task:

Generate an Armstrong number checker using Gemini and GitHub Copilot.

Compare their outputs, logic style, and clarity.

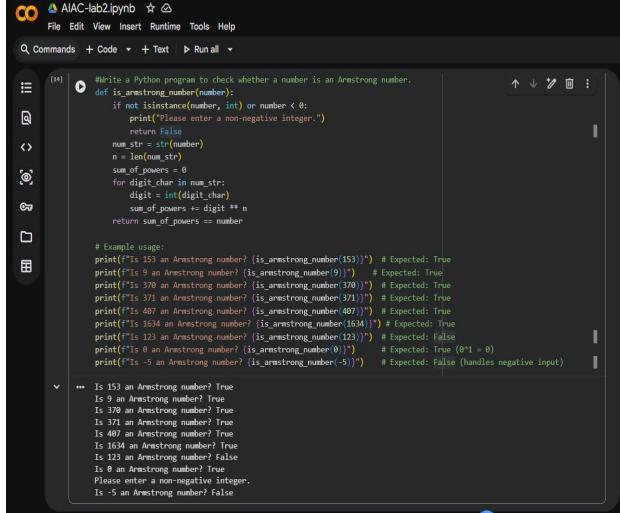
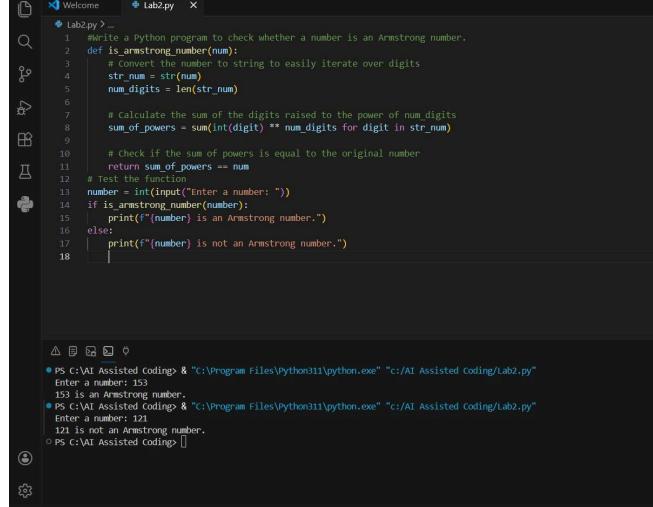
#### ❖ Expected Output:

➢ Side-by-side comparison table

➢ Screenshots of prompts and generated code

### **Prompt:**

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

Aspect	Google Colab	VS Code
<b>Code</b>	 <pre># Write a Python program to check whether a number is an Armstrong number. def is_armstrong_number(number):     if not isinstance(number, int) or number &lt; 0:         print("Please enter a non-negative integer.")         return False     num_str = str(number)     n = len(num_str)     sum_of_powers = 0     for digit_char in num_str:         digit = int(digit_char)         sum_of_powers += digit ** n     return sum_of_powers == number  # Example usage: print("Is 153 an Armstrong number? ", is_armstrong_number(153)) # Expected: True print("Is 9 an Armstrong number? ", is_armstrong_number(9)) # Expected: True print("Is 370 an Armstrong number? ", is_armstrong_number(370)) # Expected: True print("Is 371 an Armstrong number? ", is_armstrong_number(371)) # Expected: True print("Is 407 an Armstrong number? ", is_armstrong_number(407)) # Expected: True print("Is 1634 an Armstrong number? ", is_armstrong_number(1634)) # Expected: True print("Is 123 an Armstrong number? ", is_armstrong_number(123)) # Expected: False print("Is 0 an Armstrong number? ", is_armstrong_number(0)) # Expected: True (0**3 = 0) print("Is -5 an Armstrong number? ", is_armstrong_number(-5)) # Expected: False (handles negative input)  ... 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 407 an Armstrong number? True Is 1634 an Armstrong number? True Is 123 an Armstrong number? False Is 0 an Armstrong number? True Please enter a non-negative integer. Is -5 an Armstrong number? False </pre>	 <pre># Write a Python program to check whether a number is an Armstrong number. def is_armstrong_number(num):     # Convert the number to string to easily iterate over digits     str_num = str(num)     num_digits = len(str_num)      # calculate the sum of the digits raised to the power of num_digits     sum_of_powers = sum(int(digit) ** num_digits for digit in str_num)      # Check if the sum of powers is equal to the original number     return sum_of_powers == num  # Test the function number = int(input("Enter a number: ")) if is_armstrong_number(number):     print(f"{number} is an Armstrong number.") else:     print(f"{number} is not an Armstrong number.")  PS C:\AI Assisted Coding&gt; &amp; "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/Lab2.py" Enter a number: 153 153 is an Armstrong number. PS C:\AI Assisted Coding&gt; &amp; "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/Lab2.py" Enter a number: 121 121 is not an Armstrong number. PS C:\AI Assisted Coding&gt; </pre>
<b>Output</b>	Tests multiple predefined numbers and prints <b>True / False</b> for each case.	Takes a single user input and prints whether it is Armstrong or not.
<b>Logic Style</b>	Step-by-step approach using loops, explicit variables, and manual summation.	Compact logic using Python's <code>sum()</code> with a generator expression.
<b>Input Handling</b>	No user input – uses hard-coded test values.	Accepts user input from the keyboard.
<b>Error Handling</b>	Handles negative and non-integer input with a message.	No explicit validation for negative or invalid input.
<b>Readability</b>	Very clear for beginners, easy to follow line by line.	Short and clean but slightly advanced for beginners.
<b>Reusability</b>	Function is reusable, but demo code is fixed.	Function is reusable and flexible with user input.

### Justification:

The comparison shows how different AI tools generate solutions for the same problem. Google Colab (Gemini) provides step-by-step logic that is easy for beginners to understand and includes basic validation. VS Code (GitHub Copilot) generates concise and efficient code suitable for faster development. This highlights the difference between learning-oriented and productivity-oriented AI tools.

### Task 3: Leap Year Validation Using Cursor AI

#### ❖ Scenario:

You are validating a calendar module for a backend system.

#### ❖ Task:

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.

#### ❖ Expected Output:

- Two versions of code
- Sample inputs/outputs
- Brief comparison

#### Prompt (1):

Generate a Python program that checks whether a given year is a leap year.

#### Code:

A screenshot of the VS Code interface showing the AI Assisted Coding feature. The left sidebar shows a file tree with files like Lab2.py, .github, LAB, .py, Lab1.py, and Lab2.py. The main editor tab is titled 'Lab2.py' with the extension 'Python'. The code is as follows:

```
#generate a Python program that checks whether a given year is a leap year.
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
year = int(input("Enter a year: "))
if is_leap_year(year):
    print(f"{year} is a leap year.")
else:
    print(f"{year} is not a leap year.)
```

#### Output:

The screenshot shows a terminal window with the following text:

```
Problems Output Debug Console Terminal Ports
● PS C:\AI Assisted Coding> & "C:/Program Files/Python311/python.exe" "c:/AI Assisted Coding/Lab2.py"
Enter a year: 2024
2024 is a leap year.
● PS C:\AI Assisted Coding> & "C:/Program Files/Python311/python.exe" "c:/AI Assisted Coding/Lab2.py"
Enter a year: 2027
2027 is not a leap year.
○ PS C:\AI Assisted Coding> 
```

### Prompt (2):

Generate a Python program to check whether a given year is a leap year. Simplify the logic using a single conditional expression instead of nested if statements.

### Code:

The screenshot shows a code editor with the following Python code in a file named `Lab2.py`:

```
File Edit Selection View Go Run Terminal Help
AI Assisted Coding
Lab2.py Extension: Python
Lab2.py > ...
#Generate a Python program to check whether a given year is a leap year.
#Simplify the logic using a single conditional expression instead of nested if statements.
def is_leap_year(year):
    return year % 4 == 0 and (year % 100 != 0 or year % 400 == 0)
year = int(input("Enter a year: "))
if is_leap_year(year):
    print(f"{year} is a leap year.")
else:
    print(f"{year} is not a leap year.")
```

### Output:

The screenshot shows a terminal window with the following text:

```
Problems Output Debug Console Terminal Ports
Enter a year: 2024
2024 is a leap year.
● PS C:\AI Assisted Coding> & "C:/Program Files/Python311/python.exe" "c:/AI Assisted Coding/Lab2.py"
Enter a year: 2020
2020 is a leap year.
● PS C:\AI Assisted Coding> & "C:/Program Files/Python311/python.exe" "c:/AI Assisted Coding/Lab2.py"
Enter a year: 2017
2017 is not a leap year.
○ PS C:\AI Assisted Coding> 
```

### **Comparison of Two Leap Year Programs:**

<b>Feature</b>	<b>Prompt(1) – Nested If Method</b>	<b>Prompt(2) - Single Condition Method</b>
<b>Logic Style</b>	Uses multiple nested <code>if-else</code> blocks	Uses one boolean expression
<b>Lines of Code</b>	More lines	Fewer lines
<b>Readability</b>	Harder to read due to nesting	Clean and easy to understand
<b>Performance</b>	Slightly slower due to multiple checks	Faster due to single evaluation
<b>Maintainability</b>	More complex to modify	Easy to modify
<b>Pythonic Style</b>	Traditional logic	Pythonic and optimized

#### **Justification:**

Two different prompts were given to Cursor AI to generate leap year validation code, resulting in different coding styles. The first version uses nested if–else statements, making the logic clear and easy to understand step by step. The second version simplifies the same logic into a single conditional expression, reducing code length and improving readability. Both versions produce the same correct output for all inputs. This demonstrates how prompt variation can influence code structure and optimization.

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

❖ Scenario:

Company policy requires developers to write logic before using AI.

❖ Task:

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

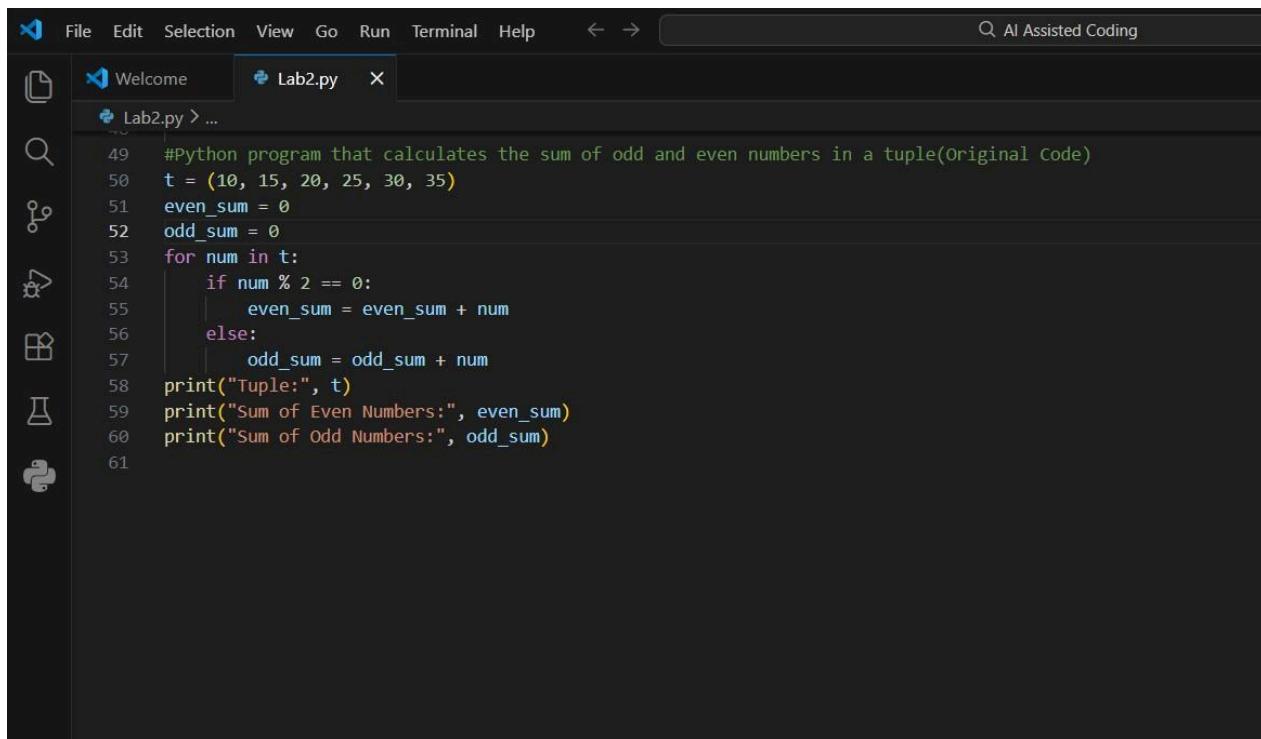
❖ Expected Output:

➢ Original code

➢ Refactored code

➢ Explanation of improvements

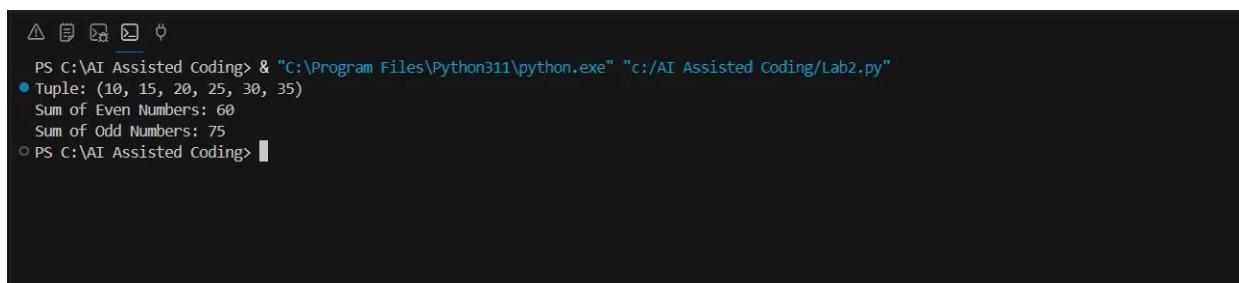
### #Python program that calculates the sum of odd and even numbers in a tuple(My Code)



The screenshot shows a code editor window with a dark theme. The menu bar includes File, Edit, Selection, View, Go, Run, Terminal, Help, and AI Assisted Coding. The left sidebar has icons for file operations like Open, Save, Find, and Refresh. The main area shows a file named Lab2.py with the following code:

```
49 #Python program that calculates the sum of odd and even numbers in a tuple(Original Code)
50 t = (10, 15, 20, 25, 30, 35)
51 even_sum = 0
52 odd_sum = 0
53 for num in t:
54     if num % 2 == 0:
55         even_sum = even_sum + num
56     else:
57         odd_sum = odd_sum + num
58 print("Tuple:", t)
59 print("Sum of Even Numbers:", even_sum)
60 print("Sum of Odd Numbers:", odd_sum)
61
```

### Output:



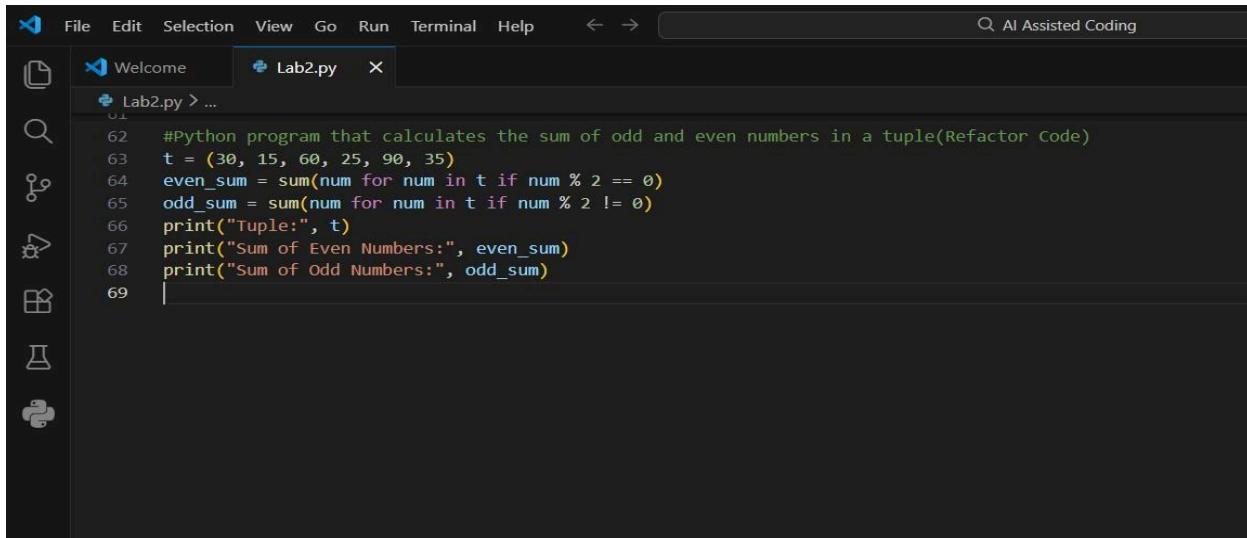
The screenshot shows a terminal window with a dark theme. The command PS C:\AI Assisted Coding> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/Lab2.py" is run. The output shows the tuple and its sums:

```
PS C:\AI Assisted Coding> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/Lab2.py"
● Tuple: (10, 15, 20, 25, 30, 35)
● Sum of Even Numbers: 60
● Sum of Odd Numbers: 75
○ PS C:\AI Assisted Coding>
```

### Prompt:

Python program that calculates the sum of odd and even numbers in a tuple(Refactor Code).

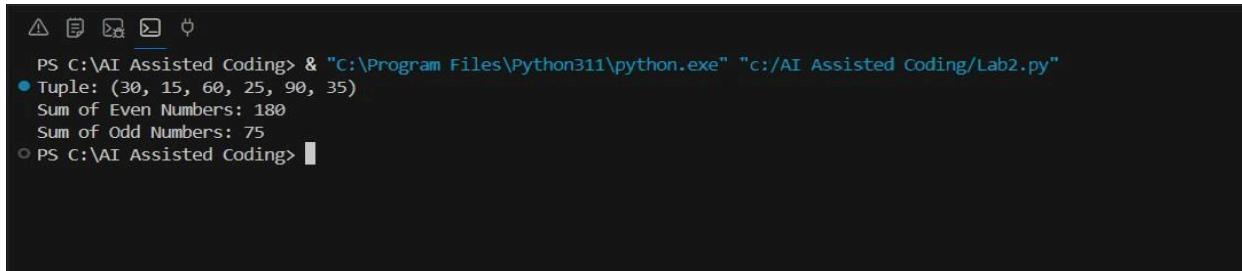
### Code:



The screenshot shows a code editor interface with a dark theme. The menu bar includes File, Edit, Selection, View, Go, Run, Terminal, Help, and an AI Assisted Coding button. On the left is a vertical toolbar with icons for file operations like Open, Save, Find, and Run. The main window shows a file named Lab2.py with the following content:

```
62 #Python program that calculates the sum of odd and even numbers in a tuple(Refactor Code)
63 t = (30, 15, 60, 25, 90, 35)
64 even_sum = sum(num for num in t if num % 2 == 0)
65 odd_sum = sum(num for num in t if num % 2 != 0)
66 print("Tuple:", t)
67 print("Sum of Even Numbers:", even_sum)
68 print("Sum of Odd Numbers:", odd_sum)
69
```

### Output:



The screenshot shows a terminal window with a dark theme. The command PS C:\AI Assisted Coding> & "C:\Program Files\Python311\python.exe" "c:/AI Assisted Coding/Lab2.py" is run. The output shows the execution of the script, printing the tuple and its sums:

```
● Tuple: (30, 15, 60, 25, 90, 35)
  Sum of Even Numbers: 180
  Sum of Odd Numbers: 75
○ PS C:\AI Assisted Coding>
```

### Improvement Comparison Table (Using GitHub Copilot):

Aspect	Original Code	Refactored Code
Logic Style	Uses loop and manual addition with variables.	Uses <code>sum()</code> with generator expressions.
Code Length	More lines and repetitive statements	Shorter and more compact code.
Readability & Efficiency	Clear but slightly lengthy and slower due to manual processing.	Cleaner, easier to read, and more efficient using built-in functions.

### Justification:

Using GitHub Copilot, the original loop-based program was refactored by applying Python's built-in `sum()` function with generator expressions. This reduced the number of lines and eliminated unnecessary variables, making the code cleaner and easier to maintain. The logic became more readable and efficient while producing the same output. This demonstrates how AI tools can improve code quality without changing functionality.