

Name:balaji

Rollno:2403A51102

Batch:06

lab Assingment 3.3

Q.No	Question	Expe cted Time to com plete
1	<p>Lab 3: Prompt Engineering – Improving Prompts and Context Management</p> <p><b>Lab Objectives:</b></p> <ul style="list-style-type: none"><li>• To understand how prompt structure and wording influence AI-generated code.</li></ul>	03.0 8.20 25 EOD

- |  |                                                                                                                                                                                                                                                                                                                 |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"><li>• To explore how context (like comments and function names) helps AI generate relevant output.</li><li>• To evaluate the quality and accuracy of code based on prompt clarity.</li><li>• To develop effective prompting strategies for AI-assisted programming.</li></ul> |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Lab Outcomes (LOs):**

After completing this lab, students will be able to:

- Generate Python code using Google Gemini in Google Colab.
- Analyze the effectiveness of code explanations and suggestions by Gemini.

- |  |                                                                                                                                                                                                                                                             |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"><li>• Set up and use Cursor AI for AI-powered coding assistance.</li><li>• Evaluate and refactor code using Cursor AI features.</li><li>• Compare AI tool behavior and code quality across different platforms.</li></ul> |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Task Description#1**

- Try 3 different prompts to generate a factorial function.
- Prompts

**1.program to calculate the factorial of the given number by user input**

**2. Write a Python function factorial(n) that returns n! using an iterative approach**

### 3. Create a Python function factorial(n: int) int using recursion.

```
factorial.py > ...
1 def factorial(n):
2     """Calculate factorial of a number"""
3     if n < 0:
4         return "Factorial is not defined for negative numbers"
5     elif n == 0 or n == 1:
6         return 1
7     else:
8         result = 1
9         for i in range(2, n + 1):
10             result = result * i
11         return result
12
13 # Get input from user
14 print("Factorial Calculator")
15 num = int(input("Enter a number: "))
16
17 # Calculate and display result
18 result = factorial(num)
19 print(f"Factorial of {num} is: {result}")
20
```

Review next file >

Problems Output Debug Console **Terminal** Ports

```
> python -u "d:\AI programming\factorial.py"
Factorial Calculator
Enter a number: 5
Factorial of 5 is: 120
PS D:\AI programming>
```

**Prompt1** is very basy and simple  
**prompt 2** is best for learning basics —  
minimal features, focuses on concept  
clarity.

```
factorial.py > ...
1 def factorial(n):
2     """Return n! using an iterative approach."""
3     result = 1
4     i = 2
5     while i <= n:
6         result *= i
7         i += 1
8     return result
9
10 if __name__ == "__main__":
11     print("=== Factorial Calculator ===")
12     n = int(input("Enter a non-negative integer: "))
13     print(f"{n}! = {factorial(n)}")
14
```

take user input

Thought for 8s

I'll update fact for a number a keeping it simple handling.

Read factorial.py

factorial.py

- Updated factorial number and

Run:

- python factorial

Example:

- Input: 5
- Output: 5! =

Review Chat

Problems Output Debug Console Terminal Ports

PS D:\AI programming> py

> python -u "d:\AI programming\factorial.py"

=== Factorial Calculator ===

Enter a non-negative integer: 5

5! = 120

PS D:\AI programming> |

## Prompt 3 balances learning recursion and safety — more professional but still educational

```
factorial.py > ...
1 def factorial(n: int) -> int:
2     """Return n! using a recursive approach.
3     """
4     raise ValueError("n must be non-negative")
5     if n == 0 or n == 1:
6         return 1
7     return n * factorial(n - 1)
8
9 if __name__ == "__main__":
10     print("=== Factorial Calculator ===")
11     n = int(input("Enter a non-negative integer: "))
12     if n < 0:
13         print("n must be non-negative")
14     else:
15         print(f"{n}! = {factorial(n)}")
16
```

Create a Python using recursion taking input

Thought for 17s

I'll add a simple the user and existing recursive

factorial.py

- Added CLI to integer and recursive factorial

Run:

- python factorial

Example:

- Input: 6
- Output: 6! =

Review Chat

Problems Output Debug Console Terminal Ports

PS D:\AI programming> py

> python -u "d:\AI programming\factorial.py"

=== Factorial Calculator ===

Enter a non-negative integer: 8

8! = 40320

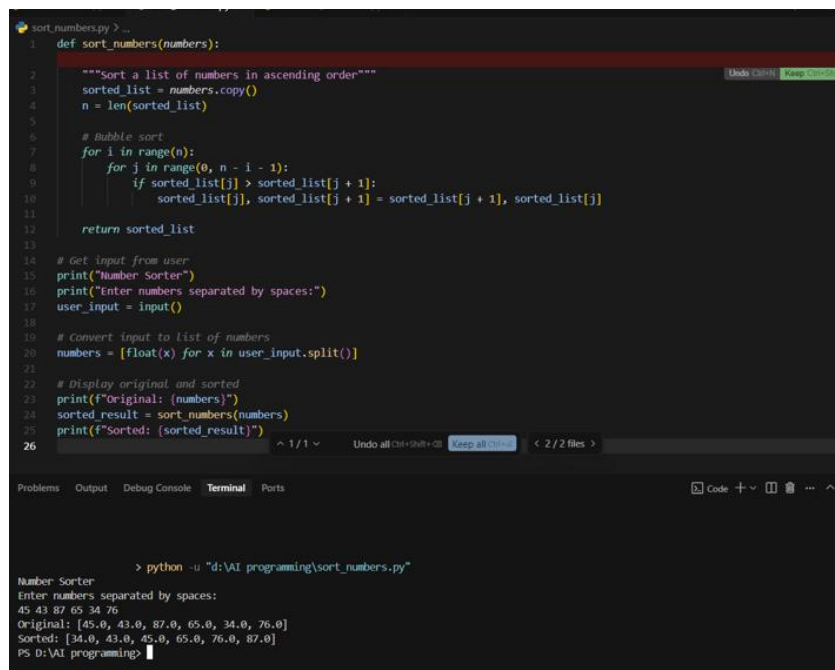
PS D:\AI programming> |

## Expected Output#1

- Comparison of AI-generated code styles

## Task Description#2

- Provide a clear example input-output prompt to generate a sorting function.



```
sort_numbers.py > ...
1 def sort_numbers(numbers):
2     """Sort a list of numbers in ascending order"""
3     sorted_list = numbers.copy()
4     n = len(sorted_list)
5
6     # Bubble sort
7     for i in range(n):
8         for j in range(0, n - i - 1):
9             if sorted_list[j] > sorted_list[j + 1]:
10                 sorted_list[j], sorted_list[j + 1] = sorted_list[j + 1], sorted_list[j]
11
12     return sorted_list
13
14 # Get input from user
15 print("Number Sorter")
16 print("Enter numbers separated by spaces:")
17 user_input = input()
18
19 # Convert input to list of numbers
20 numbers = [float(x) for x in user_input.split()]
21
22 # Display original and sorted
23 print(f"Original: {numbers}")
24 sorted_result = sort_numbers(numbers)
25 print(f"Sorted: {sorted_result}")
26
```

Problems Output Debug Console **Terminal** Ports

```
> python -u "d:\AI programming\sort_numbers.py"
Number Sorter
Enter numbers separated by spaces:
45 43 87 65 34 76
Original: [45.0, 43.0, 87.0, 65.0, 34.0, 76.0]
Sorted: [34.0, 43.0, 45.0, 65.0, 76.0, 87.0]
PS D:\AI programming>
```

## Output#2

```
python -u 0:VAI_programming\sort_numbers.py
Number Sorter
Enter numbers separated by spaces:
45 43 87 65 34 76
Original: [45.0, 43.0, 87.0, 65.0, 34.0, 76.0]
Sorted: [34.0, 43.0, 45.0, 65.0, 76.0, 87.0]
PS D:\VAI_programming>
```

- Functional sorting code from AI


## Task Description#3

- Start with the vague prompt  
“Generate python code to  
calculate power bill” and improve  
it step-by-step

```
power_bill_calculator.py > calculate_power_bill_slab
17 def calculate_power_bill(units_consumed, rate_per_unit):
21     total_bill = units_consumed * rate_per_unit
22     return total_bill
23
24 def main():
25     print("=== Power Bill Calculator ===")
26     print("1. Fixed Rate Billing")
27     print("2. Slab-based Billing")
28
29     choice = input("\nSelect billing method (1 or 2): ")
30
31     units = float(input("Enter units consumed (kwh): "))
32
33     if choice == "1":
34         rate = float(input("Enter rate per unit (Rs/kwh): "))
35         bill = calculate_power_bill(units, rate)
36         print(f"\nFixed Rate Billing:")
37         print(f"Rate per Unit: Rs. {rate}")
38     else:
39         bill = calculate_power_bill_slab(units)
40         print(f"\nSlab-based Billing:")
41         print(f"Rates: 0-100: Rs.3.50, 101-200: Rs.4.50, 201-300: Rs.5.50, 300+: Rs.6.50")
42
43     # Display result
44     print(f"Units Consumed: {units} kwh")
45     print(f"Total Bill: Rs. {bill:.2f}")
46
47 if __name__ == "__main__":
48     main()
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```

### Expected Output#3

- Enhanced AI output with clearer prompts

- 

```
1. Fixed Rate Billing
2. Slab-based Billing

Select billing method (1 or 2): 2
Enter units consumed (kwh): 200

Slab-based Billing:
Rates: 0-100: Rs.3.50, 101-200: Rs.4.50, 201-300: Rs.5.50, 300+: Rs.6.50
Units Consumed: 200.0 kwh
Total Bill: Rs. 900.00
PS D:\AI programming>
```

### Task Description#4

- Write structured comments to help AI generate two linked functions (e.g., login\_user() and



register\_user()).

```
new.py > ...
1  """
2  Simple Data Management System with Linked Functions
3  =====
4
5  This module demonstrates how to create two linked functions that work together
6  to provide a basic data management solution. The functions are designed
7  to be easily understood by AI systems through structured comments.
8
9  Linked Functions:
10 - save_data(): Stores data in a simple text format
11 - load_data(): Retrieves previously saved data
12
13 These functions are linked because:
14 1. save_data() creates the data that load_data() will later retrieve
15 2. Both functions share the same data format and storage location
16 3. They use complementary operations (write/read) on the same data source
17
18 Author: AI Assistant
19 Version: 1.0
20 """
21
22 # Simple file for storing data
23 DATA_FILE = "simple_data.txt"
24
25 def save_data(user_data):
26     """
27     Save user data to a simple text file.
28     """
29     with open(DATA_FILE, "a") as f:
30         f.write(f"{user_data}\n")
31
32 def load_data():
33     """
34     Load user data from a simple text file.
35     """
36     with open(DATA_FILE, "r") as f:
37         users = f.readlines()
38     return [user.strip() for user in users]
39
40 if __name__ == "__main__":
41     # Save some sample data
42     save_data("alice: Alice Johnson:28:alice@example.com")
43     save_data("bob: Bob Smith:35:bob@example.com")
44     save_data("charlie: Charlie Brown:22:charlie@example.com")
45
46     # Load the data
47     users = load_data()
48     print("Loaded users:")
49     for user in users:
50         print(user)
51
52     # Demonstrate data persistence
53     print("\nDemonstrating data persistence...")
54     save_data("dave: Dave Miller:40:dave@example.com")
55     users = load_data()
56     print("Data after saving more:")
57     for user in users:
58         print(user)
59
60     print("\nData has been saved and can be loaded in future sessions!")
61     print("Check the generated text file to see the stored data.")
62
63 PS D:\AI programming>
```

```

25 def save_data(user_data):
26     This function is linked to load_data() as it creates the data file
27     that load_data() will later read from. The relationship is:
28     - save_data() writes data → load_data() reads the same data
29     - Both functions use the same file format
30     - Data is stored in a simple text format for easy reading
31
32     Args:
33     | user_data (dict): Dictionary containing user information to save
34
35     Returns:
36     | bool: True if save operation successful, False otherwise
37
38     Linked Functions:
39     | - load_data(): Reads the data that this function saves
40
41     Data Format:
42     | The function saves data in simple text format:
43     | username:name:age:email
44     | Each user on a new line
45
46     Example Usage:
47     | user_info = {"john": "John Doe:25:john@example.com"}
48     | if save_data(user_info):
49     |     print("Data saved successfully!")
50     | else:
51     |     print("Failed to save data")
52     """
53
54     try:
55         # Open file for writing
56         with open(DATA_FILE, 'w') as file:
57             # Write each user's data on a separate line
58             for username, user_info in user_data.items():
59                 file.write(f"{username}:{user_info}\n")
60
61         print(f"✅ Data saved successfully to {DATA_FILE}")
62         return True
63
64     except:
65         print("❌ Error saving data")
66         return False
67
68
69

```

--	--	--

```

def load_data():
    """Load user data from a file and return it as a dictionary"""
    user_data[username] = user_info

    file.close()
    print(f"✅ Data loaded successfully from {DATA_FILE}")

except:
    print(f"❌ No data file found or error reading file")

return user_data

def main():
    """
    Main function demonstrating the linked functions in action.

    This function shows how save_data() and load_data() work together
    to provide a complete data management solution.

    The demonstration flow:
    1. Create sample user data
    2. Save data using save_data()
    3. Load data using load_data()
    4. Verify data integrity between operations
    """
    print("=== Simple Data Management System Demo ===\n")

    # Sample user data in simple format
    sample_users = {
        "alice": "Alice Johnson:28:alice@example.com",
        "bob": "Bob Smith:35:bob@example.com",
        "charlie": "Charlie Brown:22:charlie@example.com"
    }

    print("1. Saving sample user data...")
    if save_data(sample_users):
        print("✅ Data saved successfully")

    print("\n2. Loading saved data...")
    loaded_users = load_data()
    if loaded_users:
        print(f"✅ Loaded {len(loaded_users)} users")
        for username, user_info in loaded_users.items():

```

```

122 def main():
141     "charlie": "Charlie Brown:22:charlie@example.com"
142     }
143
144     print("1. Saving sample user data...")
145     if save_data(sample_users):
146         print("✅ Data saved successfully")
147
148     print("\n2. Loading saved data...")
149     loaded_users = load_data()
150     if loaded_users:
151         print(f"✅ Loaded {len(loaded_users)} users")
152         for username, user_info in loaded_users.items():
153             print(f"    - {username}: {user_info}")
154     else:
155         print("❌ No data loaded")
156
157     print("\n3. Demonstrating data persistence...")
158     print("    Data has been saved and can be loaded in future sessions!")
159     print("    Check the generated text file to see the stored data.")
160
161 if __name__ == "__main__":
162     main()
163
Ctrl+L to chat, Ctrl+K to generate

```

```
def load_data():
    """
    Load user data from the text file.

    This function is linked to save_data() as it reads the data file
    that save_data() previously created. The relationship is:
    - load_data() reads data ← save_data() wrote the data
    - Both functions maintain data format consistency
    - Data is read from the same file that was written to

    Returns:
    dict: Loaded user data dictionary, or empty dict if no data exists

    Linked Functions:
    - save_data(): Provides the data that this function loads

    Data Format:
    The function reads data in the same format that save_data() writes:
    username:name:age:email
    Each user on a new line

    Example Usage:
    user_data = load_data()
    if user_data:
        print(f"Loaded {len(user_data)} users")
    else:
        print("No user data found")
    """
    user_data = {}

    try:
        # Check if file exists
        file = open(DATA_FILE, 'r')

        # Read each line and parse user data
        for line in file:
            line = line.strip() # Remove extra spaces
            if line: # Skip empty lines
                parts = line.split(':')
                if len(parts) >= 2:
                    username = parts[0]
                    user_info = ':'.join(parts[1:]) # Join remaining parts
```

## Expected Output#4

- Consistent functions with shared logic

```
Problems Output Debug Console Terminal Ports
2. Loading saved data...
✓ Data loaded successfully from simple_data.txt
✓ Loaded 3 users
  - alice: Alice Johnson:28:alice@example.com
  - bob: Bob Smith:35:bob@example.com
  - charlie: Charlie Brown:22:charlie@example.com

3. Demonstrating data persistence...
   Data has been saved and can be loaded in future sess
   Check the generated text file to see the stored data
PS D:\AI programming>
```

## Task Description#5

- Analyzing Prompt Specificity:  
Improving Temperature  
Conversion Function with Clear

## Instructions

```
temperature_converter.py > celsius_to_fahrenheit
27 def display_menu():
28     """Display the menu options for the program"""
29     print("1. Celsius to Fahrenheit")
30     print("2. Celsius to Kelvin")
31     print("3. Fahrenheit to Celsius")
32     print("4. Fahrenheit to Kelvin")
33     print("5. Kelvin to Celsius")
34     print("6. Kelvin to Fahrenheit")
35     print("7. Exit")
36
37
38 def main():
39     """Main temperature conversion program"""
40     print("Welcome to Temperature Converter!")
41
42     while True:
43         display_menu()
44         choice = input("\nEnter your choice (1-7): ")
45
46         if choice == '7':
47             print("Thank you for using Temperature Converter!")
48             break
49
50         if choice in ['1', '2', '3', '4', '5', '6']:
51             try:
52                 # Get temperature input
53                 temp = float(input("Enter temperature: "))
54
55                 # Perform conversion based on choice
56                 if choice == '1':
```

## Output#5

```
Programs | Output | Debug Console | Terminal | Tools
2. Loading saved data...
  [x] Data loaded successfully from simple_data.txt
  [x] Loaded 3 users
    - alice: Alice Johnson;28;alice@example.com
    - bob: Bob Smith;35;bob@example.com
    - charlie: Charlie Brown;22;charlie@example.com

3. Demonstrating data persistence...
  Data has been saved and can be loaded in future sessions!
  Check the generated text file to see the stored data.
PS D:\VAI programming>
```

**Note: Report should be submitted a word document for all tasks in a single document with prompts, comments &**

**code explanation, and output and if required, screenshots**

**Evaluation Criteria:**

<b>Criteria</b>	<b>Max Marks</b>
Factorial Function (Task#1)	0.5
Sorting Function (Task#2)	0.5
Vogue Vs. Specific Prompting (Task #3)	0.5
Linked Functions (Task #4)	0.5
Temperature Conversion Function (Task #5)	0.5



	<b>Total</b>	<b>2.5 Marks</b>		
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