# ASSIGNMENT_13.1

**HT.NO:2303A51717**

**Task Description #1 (Refactoring – Removing Code Duplication)**

• Task: Use AI to refactor a given Python script that contains multiple repeated code blocks.

• Instructions:

o Prompt AI to identify duplicate logic and replace it with functions or classes.

o Ensure the refactored code maintains the same output.

o Add docstrings to all functions.

• Sample Legacy Code:

```
# Legacy script with repeated logic
print("Area of Rectangle:", 5 * 10)
print("Perimeter of Rectangle:", 2 * (5 + 10))
print("Area of Rectangle:", 7 * 12)
print("Perimeter of Rectangle:", 2 * (7 + 12))
print("Area of Rectangle:", 10 * 15)
print("Perimeter of Rectangle:", 2 * (10 + 15))
```

• Expected Output:

o Refactored code with a reusable function and no duplication.

**CODE**:

```python
def calculate_rectangle_properties(length, width):
    """Calculates and prints the area and perimeter of a rectangle.

    Args:
        length (int or float): The length of the rectangle.
        width (int or float): The width of the rectangle.
    """
    area = length * width
    perimeter = 2 * (length + width)
    print(f"Area of Rectangle: {area}")
    print(f"Perimeter of Rectangle: {perimeter}")

# Original calculations:
# print("Area of Rectangle:", 5 * 10)
# print("Perimeter of Rectangle:", 2 * (5 + 10))
# print("Area of Rectangle:", 7 * 12)
# print("Perimeter of Rectangle:", 2 * (7 + 12))
# print("Area of Rectangle:", 10 * 15)
# print("Perimeter of Rectangle:", 2 * (10 + 15))


# Refactored calls:
calculate_rectangle_properties(5, 10)
calculate_rectangle_properties(7, 12)
calculate_rectangle_properties(10, 15)
```

**OUTPUT**:

```
Area of Rectangle: 50
Perimeter of Rectangle: 30
Area of Rectangle: 84
Perimeter of Rectangle: 38
Area of Rectangle: 150
Perimeter of Rectangle: 50
```

**Task Description #2 (Refactoring – Optimizing Loops and Conditionals)**

• Task: Use AI to analyze a Python script with nested loops and complex conditionals.

• Instructions:

o Ask AI to suggest algorithmic improvements (e.g., replace nested loops with set lookups or comprehensions).

o Implement changes while keeping logic intact.

o Compare execution time before and after refactoring.

• Sample Legacy Code:

# Legacy inefficient code

names = ["Alice", "Bob", "Charlie", "David"]

search_names = ["Charlie", "Eve", "Bob"]

for s in search_names:

found = False

for n in names:

if s == n:

found = True

if found:

print(f"{s} is in the list")

else:

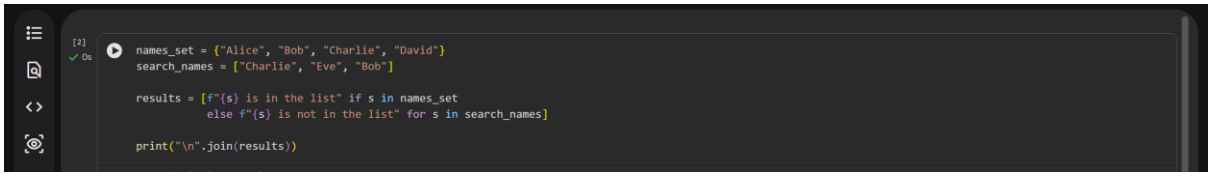
print(f"{s} is not in the list")

• Expected Output:

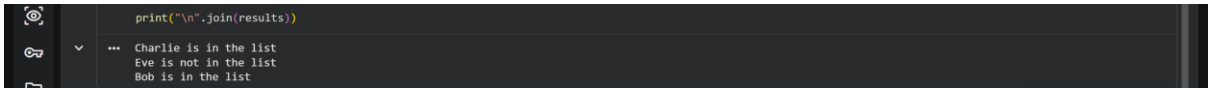
o Optimized code using set lookups with performance

comparison table.

**CODE**:




**OUTPUT:**




**Task Description #3 (Refactoring – Extracting Reusable Functions)**

• Task: Use AI to refactor a legacy script where multiple

calculations are embedded directly inside the main code block.

• Instructions:

o Identify repeated or related logic and extract it into reusable functions.

o Ensure the refactored code is modular, easy to read, and documented with docstrings.

• Sample Legacy Code:

```
# Legacy script with inline repeated logic
price = 250
tax = price * 0.18
total = price + tax
print("Total Price:", total)
price = 500
tax = price * 0.18
total = price + tax
print("Total Price:", total)
```

• Expected Output:

o Code with a function calculate_total(price) that can be reused for multiple price inputs.

**CODE**:

```python
def calculate_total(price):
    """
    Calculates the total price including an 18% tax.

    Args:
        price (float or int): The base price of the item.

    Returns:
        float: The total price after adding tax.
    """
    tax_rate = 0.18
    tax = price * tax_rate
    total = price + tax
    return total

# Demonstrate the refactored function with sample prices

# First price calculation
price1 = 250
total1 = calculate_total(price1)
print(f"Original Price: {price1}, Total Price (with 18% tax): {total1:.2f}")

# Second price calculation
price2 = 500
total2 = calculate_total(price2)
print(f"Original Price: {price2}, Total Price (with 18% tax): {total2:.2f}")
```

**OUTPUT**:

```
print(f"Original Price: {price2}, Total Price (with 18% tax): {total2:.2f}")

Original Price: 250, Total Price (with 18% tax): 295.00
Original Price: 500, Total Price (with 18% tax): 590.00
```

**Task Description #4 (Refactoring – Replacing Hardcoded Values with Constants)**

• Task: Use AI to identify and replace all hardcoded “magic numbers” in the code with named constants.

• Instructions:

o Create constants at the top of the file.

o Replace all hardcoded occurrences in calculations with these constants.

o Ensure the code remains functional and is easier to maintain.

• Sample Legacy Code:

# Legacy script with hardcoded values

print("Area of Circle:", 3.14159 * (7 ** 2))

print("Circumference of Circle:", 2 * 3.14159 * 7)

• Expected Output:

o Code with constants like PI = 3.14159 and RADIUS = 7 used in calculations

**CODE:**

```python
# Constants
PI = 3.14159
RADIUS = 7

# Refactored calculations using constants
area_of_circle = PI * (RADIUS ** 2)
circumference_of_circle = 2 * PI * RADIUS

print(f"Area of Circle: {area_of_circle}")
print(f"Circumference of Circle: {circumference_of_circle}")
```

**OUTPUT**:

```
Area of Circle: 153.93791
Circumference of Circle: 43.98226
```

**Task Description #5 (Refactoring – Improving Variable Naming and Readability)**

• Task: Use AI to improve readability by renaming unclear variables and adding inline comments.

• Instructions:

o Replace vague names with meaningful ones.

o Add comments where logic is not obvious.

o Keep functionality exactly the same.

• Sample Legacy Code:

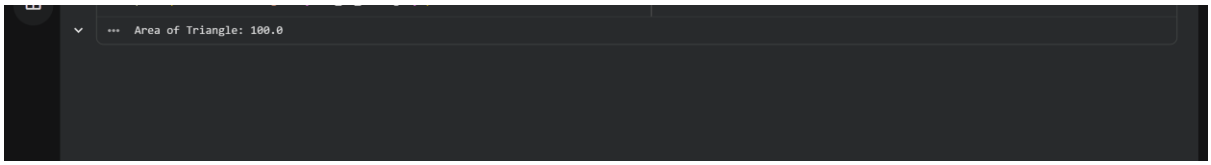
```
# Legacy script with poor variable names
a = 10
b = 20
c = a * b / 2
print(c)
```

• Expected Output:

o Code with descriptive variable names like base, height, area_of_triangle, plus explanatory comments

**CODE**:


**OUTPUT**:




**Task Description #6 (Refactoring – Removing Redundant Conditional Logic)**

• Task: Use AI to refactor a Python script that contains repeated if–else logic for grading students.

• Instructions:

o Ask AI to identify redundant conditional checks.

o Replace them with a reusable function.

o Ensure grading logic remains unchanged.

• Code:

```
marks = 85
if marks >= 90:
print("Grade A")
elif marks >= 75:
print("Grade B")
else:
print("Grade C")
marks = 72
if marks >= 90:
print("Grade A")
```

elif marks >= 75:

print("Grade B")

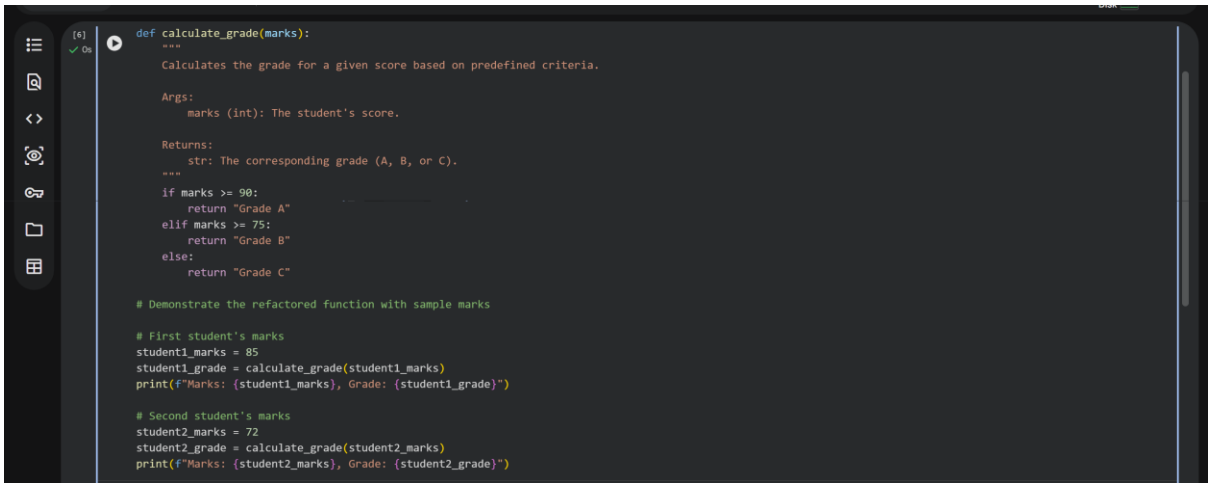
else:

print("Grade C")

• Expected Output:

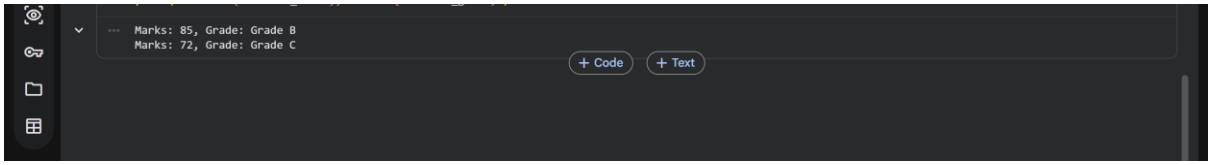
o A reusable function like calculate_grade(marks) with clean logic and docstring**.**

**CODE:**



```
def calculate_grade(marks):
    """
    Calculates the grade for a given score based on predefined criteria.

    Args:
        marks (int): The student's score.

    Returns:
        str: The corresponding grade (A, B, or C).
    """
    if marks >= 90:
        return "Grade A"
    elif marks >= 75:
        return "Grade B"
    else:
        return "Grade C"

# Demonstrate the refactored function with sample marks

# First student's marks
student1_marks = 85
student1_grade = calculate_grade(student1_marks)
print(f"Marks: {student1_marks}, Grade: {student1_grade}")

# Second student's marks
student2_marks = 72
student2_grade = calculate_grade(student2_marks)
print(f"Marks: {student2_marks}, Grade: {student2_grade}")
```

**OUTPUT**:



```
Marks: 85, Grade: Grade B
Marks: 72, Grade: Grade C
```

**Task Description #7 (Refactoring – Converting Procedural Code to Functions)**

• Task: Use AI to refactor procedural input–processing logic into functions.

• Instructions:

o Identify input, processing, and output sections.

o Convert each into a separate function.

o Improve code readability without changing behavior.

• Sample Legacy Code:

num = int(input("Enter number: "))

square = num * num

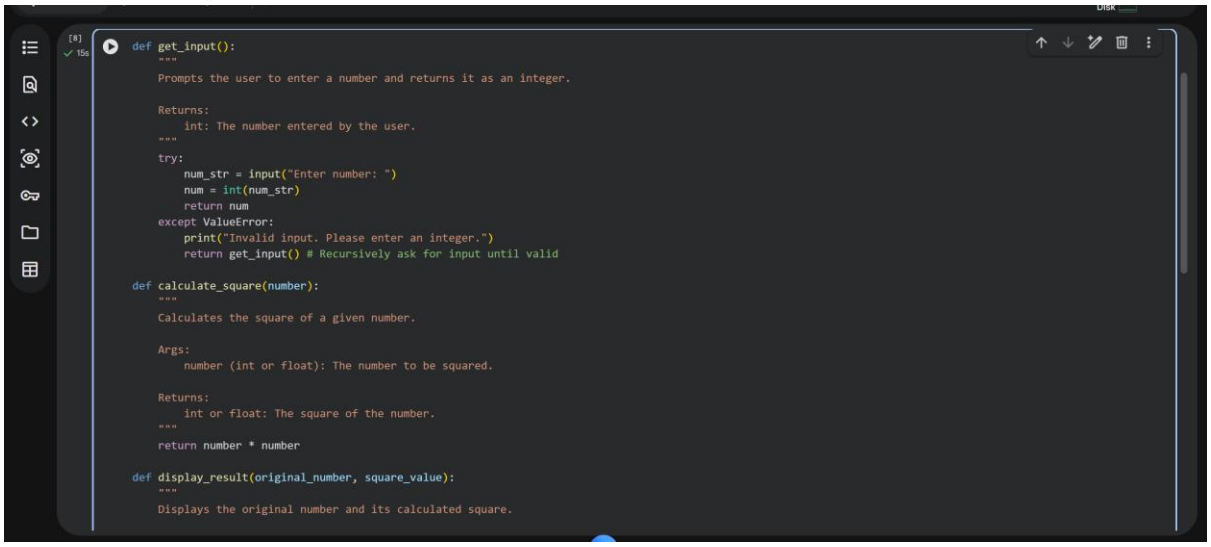
print("Square:", square)

• Expected Output:

o Modular code using functions like get_input(), calculate_square(),

and display_result().

**CODE**:



```
def get_input():
    """
    Prompts the user to enter a number and returns it as an integer.

    Returns:
        int: The number entered by the user.
    """
    try:
        num_str = input("Enter number: ")
        num = int(num_str)
        return num
    except ValueError:
        print("Invalid input. Please enter an integer.")
        return get_input() # Recursively ask for input until valid

def calculate_square(number):
    """
    Calculates the square of a given number.

    Args:
        number (int or float): The number to be squared.

    Returns:
        int or float: The square of the number.
    """
    return number * number

def display_result(original_number, square_value):
    """
    Displays the original number and its calculated square.
```

```
    Displays the original number and its calculated square.

    Args:
        original_number (int or float): The number entered by the user.
        square_value (int or float): The square of the original number.
    """
    print(f"Square of {original_number}: {square_value}")

# Main execution flow using the refactored functions
input_number = get_input()
squared_value = calculate_square(input_number)
display_result(input_number, squared_value)
```

**OUTPUT**:

```
display_result(input_number, squared_value)

Enter number: AKRAM
Invalid input. Please enter an integer.
Enter number: 6300846174
Square of 6300846174: 39700662508410438276
```

**Task Description #8 (Refactoring – Optimizing List Processing)**

• Task: Use AI to refactor inefficient list processing logic.

• Instructions:

o Ask AI to replace manual loops with list comprehensions or built-in

functions.

o Ensure output remains identical.

• Sample Legacy Code:

nums = [1, 2, 3, 4, 5]

squares = []

for n in nums:

squares.append(n * n)

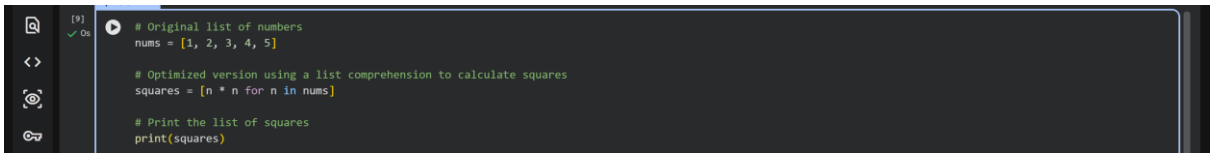
print(squares)

• Expected Output:

o Optimized version using list comprehension with improved

readability

**CODE**:




**OUTPUT**: