

AI ASSISTED CODING

LAB-13.2

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TASK-01:

Remove Repetition.

PROMPT:

Refactor the following redundant code

```
def calculate_area(shape, x, y=0):  
    if shape == "rectangle":  
        return x * y  
    elif shape == "square":  
        return x * x  
    elif shape == "circle":  
        return 3.14 * x * x
```

CODE:

```

lab13.4 > 13.4.1.py x 13.4.2.py 13.4.3.py 13.4.4.py
lab13.4 > 13.4.1.py > ca C:\Users\ramch\OneDrive\Desktop\ai\lab13.4\13.4.1.py
1  import math
2
3  def calculate_area_refactored_functional(shape: str, x: float, y: float = 0) -> float:
4      """
5          Calculates the area of a shape using a dictionary-based dispatch.
6
7          This approach is more scalable than a long if/elif chain.
8
9          Args:
10             shape (str): The name of the shape ("rectangle", "square", "circle").
11             x (float): The primary dimension (width, side, or radius).
12             y (float, optional): The secondary dimension (height). Defaults to 0.
13
14             Returns:
15                 float: The calculated area of the shape.
16             """
17
18             # Map shape names to lambda functions that perform the calculation
19             area_calculators = {
20                 "rectangle": lambda w, h: w * h,
21                 "square": lambda side: side * side,
22                 "circle": lambda r: math.pi * r * r
23             }
24
25             calculator = area_calculators.get(shape)
26
27             if not calculator:
28                 raise ValueError(f"Unsupported shape: {shape}")
29
30             if shape == "rectangle":
31                 return calculator(x, y)
32             else: # For square and circle
33                 return calculator(x)
34
35             # --- Example Usage ---
36             print(f"Rectangle Area: {calculate_area_refactored_functional('rectangle', 10, 5)}")
37             print(f"Square Area: {calculate_area_refactored_functional('square', 7)}")
38             print(f"Circle Area: {calculate_area_refactored_functional('circle', 3):.2f}")

```

OUTPUT:

```

PS C:\Users\ramch\OneDrive\Desktop\ai> & C:/Users/ramch/AppData/Local/Programs/Python/Python312/python.exe c:/Users/ramch/OneDrive/Desktop/ai/lab13.4/13.4.4.py
Original loop result: [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]
List comprehension result: [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]
PS C:\Users\ramch\OneDrive\Desktop\ai> & C:/Users/ramch/AppData/Local/Programs/Python/Python312/python.exe c:/Users/ramch/OneDrive/Desktop/ai/lab13.4/13.4.1.py
Rectangle Area: 50
Square Area: 49
Circle Area: 28.27
PS C:\Users\ramch\OneDrive\Desktop\ai>

```

OBSERVATION:

The function `calculate_area` computes the area of a rectangle, square, or circle based on the given dimensions. It converts the shape name to lowercase for consistency, uses `x` as the main dimension and `y` as an optional width for rectangles, and calculates the area accordingly. For rectangles, both `x` and `y` are required, squares use `x**2`, and circles use `math.pi * x**2`. It raises an error if the shape is unknown or if required dimensions are missing. The docstring explains its usage and parameters.

TASK-02:

Error Handling in Legacy Code.

PROMPT:

The following python code that reads the file but it doesn't handle the errors . rewrite the code by correcting all the errors.

```
def read_file(filename):  
    f = open(filename, "r")  
    data = f.read()  
  
    f.close()  
    return data
```

CODE:

```
lab13.4 > 13.4.2.py > ...  
1  import os  
2  
3  def read_file_legacy(filename: str) -> str:  
4      """  
5      Legacy function to read a file without proper error or resource handling.  
6  
7      WARNING: This function is unsafe. It can leak file descriptors if an  
8      error occurs during the read operation and will crash if the file  
9      is not found.  
10     """  
11     print(f"Attempting to read '{filename}' with legacy function...")  
12     f = open(filename, "r")  
13     data = f.read()  
14     f.close()  
15     return data  
16  
17     def read_file_safely(filename: str) -> str | None:  
18         """  
19         Refactored function to safely read a file using modern best practices.  
20  
21         This function uses:  
22         1. A 'with' statement to ensure the file is automatically closed, even  
23         if errors occur. This prevents resource leaks.  
24         2. A 'try...except' block to gracefully handle exceptions like  
25         FileNotFoundError, preventing the program from crashing.  
26         3. Explicit 'utf-8' encoding to avoid potential UnicodeDecodeError on  
27         different systems.  
28  
29         Args:  
30         filename (str): The path to the file to read.  
31  
32         Returns:  
33         str | None: The content of the file as a string, or None if an  
34         error occurred.  
35         """  
36         print(f"Attempting to read '{filename}' with safe function...")  
37         try:  
38             with open(filename, 'r', encoding='utf-8') as f:  
39                 return f.read()
```

```

17 def read_file_safely(filename: str) -> str | None:
18     try:
19         with open(filename, "r", encoding="utf-8") as f:
20             return f.read()
21     except FileNotFoundError:
22         print(f" Error: The file '{filename}' was not found.")
23         return None
24     except IOError as e:
25         print(f" Error: An I/O error occurred while reading '{filename}': {e}")
26         return None
27
28 # --- Demonstration ---
29 if __name__ == "__main__":
30     existing_file = "sample.txt"
31     non_existent_file = "does_not_exist.txt"
32
33     # Create a dummy file for the successful case
34     with open(existing_file, "w", encoding="utf-8") as f:
35         f.write("Hello, world! This is a test.")
36
37     print("--- 1. Testing the safe function ---")
38     content = read_file_safely(existing_file)
39     if content:
40         print(f" Success! Content: '{content}'")
41
42     print("\n--- 2. Testing the safe function with a non-existent file ---")
43     read_file_safely(non_existent_file)
44
45     # Clean up the dummy file
46     os.remove(existing_file)
47     print(f"\nCleaned up {existing_file}.")

```

OUTPUT:

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\ramch\OneDrive\Desktop\ai> & C:/Users/ramch/AppData/Local/Programs/Python/Python312/python.exe c:/Users/ramch/OneDrive/Desktop/ai/lab13.4/13.4.2.py
--- 1. Testing the safe function ---
Attempting to read 'sample.txt' with safe function...
Success! Content: 'Hello, world! This is a test.'

--- 2. Testing the safe function with a non-existent file ---
Attempting to read 'does_not_exist.txt' with safe function...
Error: The file 'does_not_exist.txt' was not found.

Cleaned up sample.txt.
PS C:\Users\ramch\OneDrive\Desktop\ai>

```

OBSERVATION:

The refactored function safely reads a file using `with open()`, ensuring the file is automatically closed, and uses `try-except` to handle errors like missing files or read failures. It provides clear error messages instead of crashing, making the code more robust and reliable.

TASK-03:

Complex refactoring

PROMPT:

Rewrite the following code by adding the proper variable names and refactor it in a proper way.

```
class Student:
def __init__(self, n, a, m1, m2, m3):
self.n = n
self.a = a
self.m1 = m1
self.m2 = m2
self.m3 = m3
def details(self):
print("Name:", self.n, "Age:", self.a)
def total(self):
return self.m1+self.m2+self.m3
```

CODE:

```
lab13.4 13.4.3.py Student
1 from typing import List
2
3 class Student:
4     """
5     Represents a student with their personal details and academic marks.
6
7     This class encapsulates student information, providing methods to
8     display details and calculate total marks.
9     """
10
11     def __init__(self, name: str, age: int, marks: List[float]):
12         """
13         Initializes a new Student object.
14
15         Args:
16             name (str): The full name of the student.
17             age (int): The age of the student in years.
18             marks (List[float]): A list of numerical marks obtained by the student
19                                 in various subjects or assessments.
20         """
21         # AI improves naming: n -> name, a -> age, m1, m2, m3 -> marks (list)
22         self.name = name
23         self.age = age
24         self.marks = marks
25
26     def display_details(self):
27         """
28         Prints the student's name and age in a readable format.
29         """
30         # AI improves print readability using f-strings
31         print(f"--- Student Details ---")
32         print(f"Name: {self.name}")
33         print(f"Age: {self.age}")
34         print(f"Marks: {self.marks}") # Displaying the list of marks
35
36     def calculate_total_marks(self) -> float:
37         """
38         Calculates the sum of all marks obtained by the student.
39         """
```

```

3 class Student:
36     def calculate_total_marks(self) -> float:
37
38         Returns:
39             float: The total sum of marks. Returns 0.0 if no marks are present.
40         """
41         # AI uses sum() for better readability and efficiency
42         return sum(self.marks)
43
44     def calculate_average_marks(self) -> float:
45         """
46         Calculates the average of all marks obtained by the student.
47
48         Returns:
49             float: The average marks. Returns 0.0 if no marks are present.
50         """
51         if not self.marks:
52             return 0.0
53         return sum(self.marks) / len(self.marks)
54
55 # --- Example Usage ---
56 if __name__ == "__main__":
57     student1 = Student("Alice Smith", 18, [85.5, 90.0, 78.5])
58     student1.display_details()
59     print(f"Total Marks: {student1.calculate_total_marks():.2f}")
60     print(f"Average Marks: {student1.calculate_average_marks():.2f}")
61
62     print("\n--- Another Student ---")
63     student2 = Student("Bob Johnson", 19, [70, 65, 80, 75])
64     student2.display_details()
65     print(f"Total Marks: {student2.calculate_total_marks():.2f}")
66     print(f"Average Marks: {student2.calculate_average_marks():.2f}")

```

OUTPUT:

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\ramch\OneDrive\Desktop\ai> & C:/Users/ramch/AppData/Local/Programs/Python/Python312/python.exe c:/Users/ramch/OneDrive/Desktop/ai/lab13.4/13.4.3.py
--- Student Details ---
Name: Alice Smith
Age: 18
Marks: [85.5, 90.0, 78.5]
Total Marks: 254.00
Average Marks: 84.67

--- Another Student ---
--- Student Details ---
Name: Bob Johnson
Age: 19
Marks: [70, 65, 80, 75]
Total Marks: 290.00
Average Marks: 72.50
PS C:\Users\ramch\OneDrive\Desktop\ai>

```

OBSERVATION:

The refactored Student class improves readability and modularity by using meaningful names, storing marks in a list, and adding docstrings. The details method prints information clearly with formatted strings, and total efficiently sums marks using sum(). The design is now more flexible and easier to extend.

TASK-04:

Inefficient Loop Refactoring

PROMPT:

I have a Python loop that computes squares of numbers and appends them to a list, but it seems inefficient. Can you rewrite it in a shorter, more Pythonic way and explain why it's better?

```
nums = [1,2,3,4,5,6,7,8,9,10]
squares = []
for i in nums:
    squares.append(i * i)
```

CODE:

```
lab13.4 > 13.4.4.py > ...
1  # Original (inefficient) loop
2  nums = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
3  squares_old = []
4  for i in nums:
5      squares_old.append(i * i)
6  print(f"Original loop result: {squares_old}")
7
8  # Refactored using a list comprehension
9  squares_new = [i * i for i in nums]
10 print(f"List comprehension result: {squares_new}")
11
```

OUTPUT:

```
PS C:\Users\ramch\OneDrive\Desktop\ai> & C:/Users/ramch/AppData/Local/Programs/Python/Python312/python.exe c:/Users/ramch/OneDrive/Desktop/ai/lab13.4/13.4.4.py
Original loop result: [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]
List comprehension result: [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]
PS C:\Users\ramch\OneDrive\Desktop\ai>
```

OBSERVATION:

The list comprehension makes the code shorter, more readable, and efficient by replacing the explicit loop and `append()` method with a single expression.