

AI ASSISTED

LAB-13.2

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BATCH:04

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 > cal 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    # Map shape names to lambda functions that perform the calculation
18    area_calculators = {
19        "rectangle": lambda w, h: w * h,
20        "square": lambda side: side * side,
21        "circle": lambda r: math.pi * r * r
22    }
23
24    calculator = area_calculators.get(shape)
25
26    if not calculator:
27        raise ValueError(f"Unsupported shape: {shape}")
28
29    if shape == "rectangle":
30        return calculator(x, y)
31    else: # For square and circle
32        return calculator(x)
33
34    # --- Example Usage ---
35    print(f"Rectangle Area: {calculate_area_refactored_functional('rectangle', 10, 5)}")
36    print(f"Square Area: {calculate_area_refactored_functional('square', 7)}")
37    print(f"Circle Area: {calculate_area_refactored_functional('circle', 3):.2f}")
38

```

OUTPUT:

```

PS C:\Users\ramch\OneDrive\Desktop\ai> & C:\Users\ramch\AppData\Local\Programs\Python\Python312\python.exe c:/Users/ramch/OneDrive/Desktop/ai/lab13.4/13.4.4.4.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()
```

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```

17 def read_file_safely(filename: str) -> str | None:
18     """Read a file safely, ensuring it's closed, and return its content or None if an error occurs.
19     """
20     try:
21         with open(filename, "r", encoding="utf-8") as f:
22             return f.read()
23     except FileNotFoundError:
24         print(f" Error: The file '{filename}' was not found.")
25         return None
26     except IOError as e:
27         print(f" Error: An I/O error occurred while reading '{filename}': {e}")
28         return None
29
30 # --- Demonstration ---
31 if __name__ == "__main__":
32     existing_file = "sample.txt"
33     non_existent_file = "does_not_exist.txt"
34
35     # Create a dummy file for the successful case
36     with open(existing_file, "w", encoding="utf-8") as f:
37         f.write("Hello, world! This is a test.")
38
39     print("--- 1. Testing the safe function ---")
40     content = read_file_safely(existing_file)
41     if content:
42         print(f" Success! Content: '{content}'")
43
44     print("\n--- 2. Testing the safe function with a non-existent file ---")
45     read_file_safely(non_existent_file)
46
47     # Clean up the dummy file
48     os.remove(existing_file)
49     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         """

```

```

35 class Student:
36     def calculate_total_marks(self) -> float:
37         """
40         Returns:
41             float: The total sum of marks. Returns 0.0 if no marks are present.
42         """
43         # AI uses sum() for better readability and efficiency
44         return sum(self.marks)
45
46     def calculate_average_marks(self) -> float:
47         """
48         Calculates the average of all marks obtained by the student.
49
50         Returns:
51             float: The average marks. Returns 0.0 if no marks are present.
52         """
53         if not self.marks:
54             return 0.0
55         return sum(self.marks) / len(self.marks)
56
57 # --- Example Usage ---
58 if __name__ == "__main__":
59     student1 = Student("Alice Smith", 18, [85.5, 90.0, 78.5])
60     student1.display_details()
61     print(f"Total Marks: {student1.calculate_total_marks():.2f}")
62     print(f"Average Marks: {student1.calculate_average_marks():.2f}")
63
64     print("\n--- Another Student ---")
65     student2 = Student("Bob Johnson", 19, [70, 65, 80, 75])
66     student2.display_details()
67     print(f"Total Marks: {student2.calculate_total_marks():.2f}")
68     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.