

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:

```
1  import math
2
3  def calculate_area_refactored(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("Rectangle Area: {calculate_area_refactored('rectangle', 10, 5)}")
37 print("Square Area: {calculate_area_refactored('square', 7)}")
38 print("Circle Area: {calculate_area_refactored('circle', 3):.2f}")
```

OUTPUT:

```
PS C:\Users\ranch\OneDrive\Desktop\ai> & C:/Users/ranch/AppData/Local/Programs/Python/3.12/python.exe c:/users/ranch/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\ranch\OneDrive\Desktop\ai> & C:/Users/ranch/AppData/Local/Programs/Python/3.12/python.exe c:/users/ranch/OneDrive/Desktop/ai/lab13.4/13.4.3.py
rectangle Area: 50
square Area: 49
circle Area: 28.27
PS C:\Users\ranch\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:

```
idle3.4 > 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()
40
41 △ 0
```

In 1, Col 1 | Spaces: 4

```

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:

```

PS C:\Users\ranch\OneDrive\Desktop\ai> & C:/Users/ranch/AppData/Local/Programs/Python/Python32/python.exe c:/Users/ranch/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\ranch\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:

```

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

```

```

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

```

OUTPUT:

```

PROBLEMS   OUTPUT  DEBUT-20140622 TERMINAL  PUBLISH
HS c:\Users\rach\OneDrive\Desktop\ai> & c:/Users/rach/AppData/Local/Programs/Python/Python312/python.exe c:/Users/rach/OneDrive/Desktop/ai/Lab3.4/11.4.1.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: 280.00
Average Marks: 70.00
HS c:\Users\rach\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\ranch\OneDrive\Desktop\ai> & C:/users/ranch/AppData/Local/Programs/Python/Python32/python.exe c:/users/ranch/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\ranch\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.