

ASSIGNMENT 9.5

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Problem 1: String Utilities Function

Consider the following Python function:

```
def reverse_string(text):  
    return text[::-1]
```

Task:

1. Write documentation in:
 - o (a) Docstring
 - o (b) Inline comments
 - o (c) Google-style documentation
2. Compare the three documentation styles.
3. Recommend the most suitable style for a utility-based string library.

```

assignment0.py > ...
8  import math_utils
9  import attendance
10
11 # =====
12 # PROBLEM 1: String Utilities Function
13 # =====
14 print("\n" + "="*40)
15 print("PROBLEM 1: String Utilities Function")
16 print("="*40)
17
18 # (a) Docstring
19 def reverse_string_docstring(text):
20     """Reverses the input string and returns it."""
21     return text[::-1]
22
23 # (b) Inline comments
24 def reverse_string_inline(text):
25     # Use string slicing with a step of -1 to reverse the string
26     return text[::-1]
27
28 # (c) Google-style documentation
29 def reverse_string_google(text):
30     """
31     Reverses the given string.
32
33     Args:
34         text (str): The string to be reversed.
35
36     Returns:
37         str: The reversed string.
38     """
39     return text[::-1]
40
41 print("Test Output: (reverse_string_google('Documentation'))")
42
43 print("\n--- Analysis ---")
44 print("Comparison:")
45 print("1. Docstrings: Good for quick help() lookups.")
46 print("2. Inline: Good for explaining 'how' the slicing works.")
47 print("3. Google-style: Best for generating external docs (Sphinx/MkDocs).")
48 print("\nRecommendation:")
49 print("For a utility library, Google-style is recommended because it clearly")
50 print("defines arguments and return types, which is essential for public APIs.")
51
52

```

Output:

```

=====
PROBLEM 1: String Utilities Function
=====
Test Output: noitatnemucod

--- Analysis ---
Comparison:
1. Docstrings: Good for quick help() lookups.
2. Inline: Good for explaining 'how' the slicing works.
3. Google-style: Best for generating external docs (Sphinx/MkDocs).

Recommendation:
For a utility library, Google-style is recommended because it clearly
defines arguments and return types, which is essential for public APIs.
=====
```

Justification:

1. Docstring:

- Provides a short explanation of what the function does.
- Useful for quick references via help() in Python.
- Limitation: Does not specify arguments or return types explicitly.

2. Inline comments:

- Explain the logic step by step inside the function.
- Helps beginners understand how string slicing works ([::-1]).
- Limitation: Comments are only useful in the code editor; they don't help automated documentation tools.

3. Google-style documentation:

- Specifies the function purpose, arguments, return type, and description.
- Can be automatically parsed by documentation tools like Sphinx or MkDocs.
- Best choice for **utility libraries** or APIs, as it makes usage very clear to other developers.

Recommendation: Google-style is preferred because it clearly defines **what input the function expects** and **what output it produces**, which is critical for external developers or automated documentation.

Problem 2: Password Strength Checker

Consider the function:

```
def check_strength(password):  
    return len(password) >= 8
```

Task:

1. Document the function using docstring, inline comments, and Google style.
2. Compare documentation styles for security-related code.
3. Recommend the most appropriate style.

Input:

```
# ======  
# PROBLEM 2: Password Strength Checker  
# ======  
print("\n" + "="*40)  
print("PROBLEM 2: Password Strength Checker")  
print("-"*40)  
  
# (a) Docstring  
def check_strength_docstring(password):  
    """Checks if password length is at least 8 characters."""  
    return len(password) >= 8  
  
# (b) Inline comments  
def check_strength_inline(password):  
    # Check if the length of the password is greater than or equal to 8  
    return len(password) >= 8  
  
# (c) Google-style  
def check_strength_google(password):  
    """  
        Evaluates the strength of a password based on length.  
  
        Args:  
            password (str): The password string to check.  
  
        Returns:  
            bool: True if password length is >= 8, False otherwise.  
    """  
    return len(password) >= 8  
  
print(f"Test Output (Weak): {check_strength_google('1234')}" )  
print(f"Test Output (Strong): {check_strength_google('12345678')}" )  
  
print("\n--- Analysis ---")  
print("Comparison:")  
print("Security code requires absolute clarity on validation rules.")  
print("Inline comments are redundant here as the code is self-explanatory.")  
print("\nRecommendation:")  
print("Google-style is most appropriate. It explicitly states the return condition")  
print("(True/False), which is critical for security logic integration.")
```

Output:

```
=====
PROBLEM 2: Password Strength Checker
=====
Test Output (Weak): False
Test Output (Strong): True

--- Analysis ---
Comparison:
Security code requires absolute clarity on validation rules.
Inline comments are redundant here as the code is self-explanatory.

Recommendation:
Google-style is most appropriate. It explicitly states the return condition
(True/False), which is critical for security logic integration.
```

Justification:

1. Docstring:

- o Simple description of the function purpose (“checks if password length is \geq 8”).
- o Easy for `help()` lookup.

2. Inline comments:

- o Explain the comparison operation (`len(password) >= 8`).
- o Useful for beginners but redundant for experienced programmers since the code is straightforward.

3. Google-style documentation:

- o Clearly specifies:
 - Argument: `password` (string)
 - Return type: Boolean
 - Condition for True/False
- o Critical in **security-sensitive code**, where clarity avoids misinterpretation.

Recommendation: Google-style is best. In security applications, explicit argument and return specifications help prevent logic errors and ensure correct integration with other modules.

Problem 3: Math Utilities Module

Task:

1. Create a module `math_utils.py` with functions:

- o `square(n)`
- o `cube(n)`
- o `factorial(n)`

2. Generate docstrings automatically using AI tools.

3. Export documentation as an HTML file.

Input:

```

# -----
# PROBLEM 3: Math Utilities Module
# -----
print("\n" + "*40)
print("PROBLEM 3: Math Utilities Module")
print("*40)

# Demonstrating the module created in math_utils.py
print(f"Square of 5: {math_utils.square(5)}")
print(f"Cube of 3: {math_utils.cube(3)}")
print(f"Factorial of 5: {math_utils.factorial(5)}")

print("\n[INFO] To export documentation as HTML:")
print("Run: python -m pydoc -w math_utils")

```

Output:

```

=====
PROBLEM 3: Math Utilities Module
=====
Square of 5: 25
Cube of 3: 27
Factorial of 5: 120

[INFO] To export documentation as HTML:
Run: python -m pydoc -w math_utils

```

Justification:

- Demonstrates usage of a custom module (`math_utils`) with functions like `square()`, `cube()`, `factorial()`.
- Documenting the module allows other developers to understand how to use the functions without reading the source code.
- Generating **HTML documentation with `pydoc`** ensures the module can be published for external use.

Recommendation: Use Google-style or standard docstrings for modules to make them easily documentable. This allows **consistent API documentation** and easier code maintenance.

Problem 4: Attendance Management Module

Task:

1. Create a module `attendance.py` with functions:

- o mark_present(student)
- o mark_absent(student)
- o get_attendance(student)

2. Add proper docstrings.

3. Generate and view documentation in terminal and browse



```
# =====
# PROBLEM 4: Attendance Management Module
# =====
print("\n" + "="*40)
print("PROBLEM 4: Attendance Management Module")
print("="*40)

# Demonstrating the module created in attendance.py
attendance.mark_present("Alice")
attendance.mark_absent("Bob")
print(f"Alice's Status: {attendance.get_attendance('Alice')}")

print("[INFO] To view documentation in terminal:")
print("Run: python -m pydoc attendance")
```

Output:

```
=====
Success: Alice marked as Present.
Success: Bob marked as Absent.
Alice's Status: Present

[INFO] To view documentation in terminal:
Run: python -m pydoc attendance
```

Justification:

- Demonstrates the module (attendance) for marking attendance.
- Provides a clear example of how functions like `mark_present()`, `mark_absent()`, and `get_attendance()` can be used.
- Terminal documentation (`python -m pydoc attendance`) gives quick access to usage instructions without opening the code.

Recommendation: Google-style documentation is preferred for modules because it helps other developers **understand functions, arguments, and expected results** clearly. Inline comments are insufficient for API-level understanding.

Problem 5: File Handling Function

Consider the function:

```
def read_file(filename):
```

with open(filename, 'r') as f:

```
return f.read()
```

Task:

1. Write documentation using all three formats.
2. Identify which style best explains exception handling.
3. Justify your recommendation.

```
print("\n" + "="*40)
print("PROBLEM 5: File Handling Function")
print("-"*40)

# (a) Docstring
def read_file_docstring(filename):
    """Reads and returns content of a file."""
    with open(filename, 'r') as f:
        return f.read()

# (b) Inline comments
def read_file_inline(filename):
    # Open the file in read mode using a context manager
    with open(filename, 'r') as f:
        # Read the entire content and return it
        return f.read()

# (c) Google-style
def read_file_google(filename):
    """
    Reads the content of a file.

    Args:
        filename (str): The path to the file.

    Returns:
        str: The content of the file.

    Raises:
        FileNotFoundError: If the file does not exist.
        IOError: If an error occurs during file reading.
    """
    with open(filename, 'r') as f:
        return f.read()

print("\n--- Analysis ---")
print("Comparison:")
print("File operations are prone to runtime errors (missing files, permissions).")
print("Standard docstrings often omit exception details.")
print("\nRecommendation:")
print("Google-style is the best choice because it includes a 'Raises' section.")
print("This warns the developer to handle potential FileNotFoundError exceptions.")
```

Output:

```
=====
PROBLEM 5: File Handling Function
=====

--- Analysis ---
Comparison:
Comparison:
File operations are prone to runtime errors (missing files, permissions).
Standard docstrings often omit exception details.
Standard docstrings often omit exception details.

Recommendation:
Google-style is the best choice because it includes a 'Raises' section.
This warns the developer to handle potential FileNotFoundError exceptions.
PS C:\Users\hp\OneDrive\Desktop\ai>
```

Justification:

1. Docstring:

- o Provides a simple explanation (“reads and returns file content”).
- o Limited because it does not mention possible exceptions like `FileNotFoundException`.

2. Inline comments:

- Explain each step of opening and reading the file.
- Useful for beginners but verbose for experienced developers.

3. Google-style documentation:

- Includes:
 - Arguments (`filename`)
 - Return type (`str`)
 - Potential exceptions (`FileNotFoundException`, `IOError`)
- Essential for **file operations**, where errors are common.
- Helps other developers **anticipate and handle exceptions properly**.

Recommendation: Google-style is the best choice for **robust, production-ready file handling functions**, because it communicates all necessary details to users, including exceptions.