

Assignment-9.1

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Problem 1:

Consider the following Python function:

```
def find_max(numbers):  
    return max(numbers)
```

Task:

- Write documentation for the function in all three formats:

Prompt:

Create a Python function `find_max(numbers)` to return the maximum value from a list and document it using a docstring, inline comments, and Google-style documentation. Include test cases.

Code:

```

8  def find_max(numbers):
9      """Returns the maximum number from a list of numbers.
10
11     Args:
12         numbers (list): A list of numerical values.
13     Returns:
14         int/float: The maximum number in the list.
15     """
16     return max(numbers)
17
18 #(b) Inline comments
19 def find_max(numbers):
20     # Use the built-in max function to find the maximum number in the list
21     return max(numbers)
22
23
24 #(c) Google-style documentation
25 def find_max(numbers):

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

- PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist & C:/Users/sushm/AppData/Local/Programs/Python/Python313/pyxe c:/Users/sushm/OneDrive/Attachments/Desktop/Ai-Assist/Assignment9.1.py

5

-1

3.5
- PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist>

```

#(c) Google-style documentation
def find_max(numbers):
    """Returns the maximum number from a list of numbers.

    Args:
        numbers (list): A list of numerical values.
    Returns:
        int/float: The maximum number in the list.
    """

    return max(numbers)

# Test cases for find_max function
assert find_max([1, 2, 3, 4, 5]) == 5 # Test with a list of positive integers
assert find_max([-1, -2, -3, -4, -5]) == -1 # Test with a list of negative integers
assert find_max([1.5, 2.5, 3.5]) == 3.5 # Test with a list of floating-point numbers
print(find_max([1, 2, 3, 4, 5])) # Should return 5
print(find_max([-1, -2, -3, -4, -5])) # Should return -1
print(find_max([1.5, 2.5, 3.5])) # Should return 3.5

```

Advantages, disadvantages, and suitable use cases of each Style.

- The three documentation styles—docstring, inline comments, and Google-style documentation—each have their own advantages and disadvantages.

- Docstrings are the most commonly used and recommended approach in Python. They are integrated into the Python documentation system and are accessible via `help()` or `__doc__`. They are ideal for documenting functions, classes, and modules in a standardized way.
- Inline comments are useful for explaining specific lines of code that may not be self-explanatory. However, they are not as accessible or standardized as docstrings and can clutter the code if overused.
- Google-style documentation is a popular alternative that provides more structured formatting for documenting parameters, return values, and exceptions. It is especially useful in large projects where consistency in documentation is important.

Mathematical utilities library and justifying answer.

For a mathematical utilities library, docstrings are most effective because they provide clear, accessible documentation that integrates well with Python's ecosystem. They support standard practices for documenting functions and modules in a way that is both readable and maintainable. Additionally, docstrings can be easily accessed by users of the library, making it easier for them to understand how to use the functions without needing to read through the code.

Observation:

The `find_max` function was implemented using the built-in `max()` function. All test cases passed successfully, and documentation was provided in three different formats.

Problem2: Consider the following Python function:

```
def login(user, password, credentials):
    return credentials.get(user) == password
```

Task:

1. Write documentation in all three formats.

Prompt:

Create a Python function `login(user, password, credentials)` to validate user authentication using a dictionary of stored credentials. Provide documentation in three formats: docstring, inline comments, and Google-style documentation. Include test cases to verify functionality.

Code:

```
66  #(a) Docstring
67  def login(user, password, credentials):
68      """Checks if the provided user credentials are valid.
69
70      Args:
71          user (str): The username to be authenticated.
72          password (str): The password to be authenticated.
73          credentials (dict): A dictionary containing username-password pairs for authentication.
74      Returns:
75          bool: True if the credentials are valid, False otherwise.
76      """
77      return credentials.get(user) == password
78  #(b) Inline comments
79  def login(user, password, credentials):
80      # Check if the provided user exists in the credentials dictionary and if the password matches
81      return credentials.get(user) == password
82
83  #(c) Google-style documentation
84  def login(user, password, credentials):
```

```

83  #(c) Google-style documentation
84  def login(user, password, credentials):
85      """Checks if the provided user credentials are valid.
86
87      Args:
88          user (str): The username to be authenticated.
89          password (str): The password to be authenticated.
90          credentials (dict): A dictionary containing username-password pairs for authentication.
91      Returns:
92          bool: True if the credentials are valid, False otherwise.
93      """
94      return credentials.get(user) == password
95
96  # Test cases for login function
97  credentials = {'admin': 'admin123', 'user1': 'password1', 'user2': 'password2'}
98  assert login('admin', 'admin123', credentials) == True  # Test with valid credentials
99  assert login('user1', 'password1', credentials) == True  # Test with valid credentials
100 assert login('user2', 'wrongpassword', credentials) == False  # Test with invalid
101 assert login('nonexistent', 'password', credentials) == False  # Test with non-existent user
102 print(login('admin', 'admin123', credentials))  # Should return True
103 print(login('user1', 'password1', credentials))  # Should return True
104 print(login('user2', 'wrongpassword', credentials))  # Should return False

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> & C:/Users/sushm/AppData/Local/Programs/Python/Python313/python.exe c:/Users/sushm/OneDrive/Attachments/Desktop/Ai-Assist/Assignment9.1.py

```

True
True
False
False

```

Comparison of approaches.

- The three documentation styles—docstring, inline comments, and Google-style documentation—each have their own advantages and disadvantages.
- Docstrings are the most commonly used and recommended approach in Python. They are integrated into the Python documentation system and are accessible via `help()` or `__doc__`. They are ideal for documenting functions, classes, and modules in a standardized way.
- Inline comments are useful for explaining specific lines of code that may not be self-explanatory. However, they are not as accessible or standardized as docstrings and can clutter the code if overused.
- Google-style documentation is a popular alternative that provides more structured formatting for documenting

parameters, return values and exceptions. It is especially useful in large projects where consistency in documentation is important.

Recommend which style would be most helpful for new developers onboarding a project.

For new developers onboarding a project, Google-style documentation would be most helpful. This is because it provides a clear and structured format for documenting functions, parameters, return values, and exceptions.

The consistency in formatting makes it easier for new developers to quickly understand the purpose and usage of each function without having to read through the code

Observation:

The login function was successfully implemented to authenticate users by comparing input credentials with stored values in a dictionary. Documentation was written in three formats, and all test cases passed, confirming correct behavior for valid, invalid, and non-existent users.

Problem 3: Calculator (Automatic Documentation Generation)

Task: Design a Python module named calculator.py and demonstrate automatic documentation generation.

Instructions

Prompt:

Create a calculator.py module with basic arithmetic functions and generate documentation using pydoc.

Code:

The screenshot shows a code editor interface with two main sections. The top section displays the contents of a file named 'calculator.html'. The bottom section shows the terminal output of running 'pydoc' on the 'calculator' module.

calculator.html Content:

```
1  <!DOCTYPE html>
2  <html lang="en">
3  <head>
4  <meta charset="utf-8">
5  <title>Python: module calculator</title>
6  </head><body>
7
8  <table class="heading">
9  <tr class="heading-text decor">
10 <td class="title">&nbsp;<br><strong class="title">calculator</strong></td>
11 <td class="extra"><a href=".">index</a><br><a href="file:///C:/Users/sushm/OneDrive/Desktop/Ai-Assist/calculator.py">Source</a><br><a href="http://127.0.0.1:5000/calculator.html">Simple Calculator Module<br>
12 </td></tr></table>
```

Terminal Output:

```
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> python -m pydoc calculator
>>
● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc calculator
>>
Help on module calculator:

NAME
    calculator

DESCRIPTION
    Simple Calculator Module

● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w calculator
>>
○ wrote calculator.html
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> []
```



```
<calculator.html ...>
  2  <html lang="en">
  6  </head><body>
14  <p>
15  <table class="section">
16  <tr class="decor functions-decor heading-text">
17  <td class="section-title" colspan=3>&nbsp;<br><strong class="bigsection">Functions</strong></td></tr>
18
19  <tr><td class="decor functions-decor"><span class="code">&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;</span></td><td>
20  <td class="singlecolumn"><dl><dt><a name="-add"><strong>add</strong></a>(a, b)</dt><dd><span class="code">Return&
21  <dl><dt><a name="-divide"><strong>divide</strong></a>(a, b)</dt><dd><span class="code">Return&nbsp;quotient&
22  <dl><dt><a name="-multiply"><strong>multiply</strong></a>(a, b)</dt><dd><span class="code">Return&nbsp;product&
23  <dl><dt><a name="-subtract"><strong>subtract</strong></a>(a, b)</dt><dd><span class="code">Return&nbsp;difference</span></dd></dl></td></tr>
```

Terminal Output (Continued):

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> python -m pydoc calculator
>>
● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc calculator
>>
Help on module calculator:

NAME
    calculator

DESCRIPTION
    Simple Calculator Module

● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w calculator
>>
○ wrote calculator.html
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> []
```

```
<calculator.html> ...
2   <html lang="en">
6   </head><body>
14  <p>
-->    <table border="1">
22  |      <tr><td><a href="#" name="divide"><strong>divide</strong></a></td><td><a href="#" name="multiply"><strong>multiply</strong></a>(a, b)</td><td><a href="#" name="subtract"><strong>subtract</strong></a>(a, b)</td><td><a href="#" name="different"><strong>different</strong></a>(a, b)</td></tr>
23  |    </table>
24  </body></html>

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> python -m pydoc calculator
>>
● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc calculator
>>
Help on module calculator:

NAME
    calculator

DESCRIPTION
    Simple Calculator Module

● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w calculator
>>
○ wrote calculator.html
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> []
```

Observation:

The calculator module was created successfully with proper docstrings. Documentation was generated in the terminal and exported as an HTML file.

Problem 4: Conversion Utilities Module

Task:

1. Write a module named conversion.py with functions:
 - o decimal_to_binary(n)
 - o binary_to_decimal(b)
 - o decimal_to_hexadecimal(n)

Prompt: Create a Python module named conversion.py containing functions to convert:

- Decimal to Binary
- Binary to Decimal
- Decimal to Hexadecimal

Use Copilot to auto-generate docstrings.

Generate documentation in the terminal using pydoc and export it in HTML format.

Code:

The screenshot shows a code editor with a dark theme and a terminal window below it. The code editor displays the file conversion.py with the following content:

```
conversion.py > ...
1  """
2  Conversion Utilities Module
3  Provides functions to convert between decimal, binary, and hexadecimal numbers.
4  """
5
6  def decimal_to_binary(n):
7      """
8          Convert a decimal integer to its binary representation.
9
10         Args:
11             n (int): A decimal integer.
12
13         Returns:
14             str: The binary representation of the decimal number.
```

The terminal window shows the following command and output:

```
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc conversion
>>
Help on module conversion:

NAME
    conversion

DESCRIPTION
    Conversion Utilities Module
    Provides functions to convert between decimal, binary, and hexadecimal numbers.
```

At the bottom of the terminal, there is a circular icon with a dot and a checkmark, followed by the text "wrote conversion.html".

```
-- 
13     Returns:
14     |     str: Binary representation of the number.
15     """
16     return bin(n)[2:]
17
18
19 def binary_to_decimal(b):
20     """
21     Convert a binary string to its decimal representation.
22
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc conversion
>>
Help on module conversion:

NAME
    conversion

DESCRIPTION
    Conversion Utilities Module
    Provides functions to convert between decimal, binary, and hexadecimal numbers.

PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w conversion
>>
wrote conversion.html
```

```
-- 
22     Args:
23     |     b (str): A binary number as a string.
24
25     Returns:
26     |     int: Decimal representation of the binary number.
27     """
28     return int(b, 2)
29
30
31
32 def decimal_to_hexadecimal(n):
33     """
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc conversion
>>
Help on module conversion:

NAME
    conversion

DESCRIPTION
    Conversion Utilities Module
    Provides functions to convert between decimal, binary, and hexadecimal numbers.

PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w conversion
>>
wrote conversion.html
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist>
```

```
51
52     def decimal_to_hexadecimal(n):
53         """
54             Convert a decimal integer to its hexadecimal representation.
55
56         Args:
57             n (int): A decimal integer.
58
59         Returns:
60             str: Hexadecimal representation of the number.
61             """
62         return hex(n)[2:]
63
```

Observation:

The conversion.py module was successfully created with three conversion functions.

Docstrings were automatically generated and displayed using pydoc in the terminal.

The documentation was also exported as an HTML file (conversion.html) and opened successfully in a web browser.

Problem 5 – Course Management Module

Task:

1. Create a module course.py with functions:
 - o add_course(course_id, name, credits)
 - o remove_course(course_id)
 - o get_course(course_id)

Prompt:

Create a module course.py to manage courses with functions to add, remove, and retrieve course details. Generate documentation using pydoc and export it in HTML format.

Code:

```
course.py > ⌂ remove_course
1  """
2  Course Management Module
3  Provides functions to manage course information.
4  """
5
6  # Dictionary to store courses
7  courses = {}
8  def add_course(course_id, name, credits):
9      """
10         Add a new course to the course list.
11
12     Args:
13         course_id (str): Unique ID of the course.
14         name (str): Name of the course.
15         credits (int): Number of credits for the course.
16
17     Returns:
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS
xe c:/Users/sushm/OneDrive/Attachments/Desktop/Ai-Assist/course.py
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc course
>>
Help on module course:

NAME
    course

PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w course
>>
wrote course.html
```

```

16     Returns:
17         str: Confirmation message.
18     """
19
20     courses[course_id] = {"name": name, "credits": credits}
21     return "Course added successfully."
22 def remove_course(course_id):
23     """
24     Remove a course from the course list.
25
26     Args:
27         course_id (str): Unique ID of the course.
28
29     Returns:
30         str: Confirmation message if removed.
31     """

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```

xe c:/Users/sushm/OneDrive/Attachments/Desktop/Ai-Assist/course.py
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc course
● >>
Help on module course:

NAME
    course

● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w course
>>
wrote course.html
```

```

22     def remove_course(course_id):
23         if course_id in courses:
24             del courses[course_id]
25             return "Course removed successfully."
26         return "Course not found."
27     def get_course(course_id):
28         """
29             Retrieve details of a specific course.
30
31         Args:
32             course_id (str): Unique ID of the course.
33
34         Returns:
35             dict or str: Course details if found, otherwise message.
36         """
37
38         return courses.get(course_id, "Course not found.")
39
40
41
42
43
44
45
46
47
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```

xe c:/Users/sushm/OneDrive/Attachments/Desktop/Ai-Assist/course.py
PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc course
● >>
Help on module course:

NAME
    course

● PS C:\Users\sushm\OneDrive\Attachments\Desktop\Ai-Assist> py -m pydoc -w course
>>
wrote course.html
```

Observation:

The course.py module was successfully created with three functions for course management. Documentation was generated in the terminal

using pydoc and exported as an HTML file, which opened correctly in a web browser.