

AI ASSISTED CODING

LAB-9.1

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Batch-12

Problem 1:

Consider the following Python function:

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

Task:

- Write documentation for the function in all three formats:
 - (a) Docstring
 - (b) Inline comments
 - (c) Google-style documentation
- Critically compare the three approaches. Discuss the advantages, disadvantages, and suitable use cases of each style.
- Recommend which documentation style is most effective for a mathematical utilities library and justify your answer.

(a) Docstring

```

def find_max(numbers):
    """
        Docstring for find_max function.

    Parameters:
        numbers (list): A list of numerical values.

    Returns:
        The maximum value from the list of numbers.
    """

    return max(numbers)
if __name__ == "__main__":
    test_numbers = [3, 7, 2, 9, 5]
    result = find_max(test_numbers)
    print(result)

```

(b) Inline comments

```

$ lab9.py > ...
1 def find_max(numbers): # This function takes a list of numbers and returns the maximum value.
2     return max(numbers) # Test the function
3 if __name__ == "__main__": # This block will only execute if the script is run directly, not imported as a module.
4     test_numbers = [3, 7, 2, 9, 5] # This is a list of numbers to test the function.
5     result = find_max(test_numbers) # This line calls the function with the test numbers and stores the result in
6     print(result) # This line prints the result, which should be the maximum value from the list of numbers.

```

(c) Google-style documentation

```

#Give google-style documentation for the below code
def find_max(numbers):
    """Finds the maximum value in a list of numbers.

    Args:
        numbers (list): A list of numerical values.

    Returns:
        The maximum value from the list of numbers.
    """

    return max(numbers)
if __name__ == "__main__":
    test_numbers = [3, 7, 2, 9, 5]
    result = find_max(test_numbers)
    print(result)

```

Problem 2:

Consider the following Python function:

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

Task:

1. Write documentation in all three formats.
2. Critically compare the approaches.
3. Recommend which style would be most helpful for new developers onboarding a project, and justify your choice.

(a) Docstring

```
def login(user, password, credentials):  
    """  
        Docstring for login  
  
        :param user: Description  
        :param password: Description  
        :param credentials: Description  
    """  
  
    return credentials.get(user) == password  
def main():  
    credentials = {  
        "user1": "password1",  
        "user2": "password2"  
    }  
    user = input("Enter username: ")  
    password = input("Enter password: ")  
    if login(user, password, credentials):  
        print("Login successful!")  
    else:  
        print("Login failed. Please check your username and password.")  
if __name__ == "__main__":  
    main()
```

(b) Inline comments

```

def login(user, password, credentials): # This function checks if the provided username and password match the credentials
    return credentials.get(user) == password # The get method retrieves the value for the given key (user) from the credentials dictionary and compares it with the provided password
def main(): # This is the main function that will be executed when the script runs
    credentials = { # A dictionary to store valid username and password pairs
        "user1": "password1", # Example credentials for user1
        "user2": "password2" # Example credentials for user2
    }
    user = input("Enter username: ") # Prompt the user to enter their username and store it in the variable 'user'
    password = input("Enter password: ") # Prompt the user to enter their password and store it in the variable 'password'
    if login(user, password, credentials): # Call the login function with the provided username, password, and credentials. If it returns True, print a success message
        print("Login successful!")
    else: # If the login fails, print a failure message
        print("Login failed. Please check your username and password.") # If the login fails, print an error message prompting the user to check their credentials
if __name__ == "__main__": # This condition checks if the script is being run directly (as the main program) rather than imported as a module. If it is, call the main function to start the program
    main()

```

(c) Google-style documentation

```

#Give Google-style documentation for the following code:
def login(user, password, credentials):
    """Checks if the provided username and password match the stored credentials.

    Args:
        user (str): The username to check.
        password (str): The password to check.
        credentials (dict): A dictionary containing username-password pairs.

    Returns:
        bool: True if the username exists and the password matches, False otherwise.
    """
    return credentials.get(user) == password

def main():
    credentials = {
        "user1": "password1",
        "user2": "password2"
    }
    user = input("Enter username: ")
    password = input("Enter password: ")
    if login(user, password, credentials):
        print("Login successful!")
    else:
        print("Login failed. Please check your username and password.")
if __name__ == "__main__":
    main()

```

Problem 3: Calculator (Automatic Documentation Generation)

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

Instructions:

1. Create a Python module calculator.py that includes the following functions, each written with appropriate docstrings:

- o add(a, b) – returns the sum of two numbers**
- o subtract(a, b) – returns the difference of two numbers**
- o multiply(a, b) – returns the product of two numbers**

o `divide(a, b)` – returns the quotient of two numbers

2. Display the module documentation in the terminal using Python's documentation tools.

3. Generate and export the module documentation in HTML format using the `pydoc` utility, and open the generated HTML file in a web browser to verify the output.

Prompt:

#Give python code for a calculator that has functions of addition, subtraction, multiplication and division

Docstring

```
#Give python code for a calculator that
def add(a, b):
    """
    Docstring for add

    :param a: Description
    :param b: Description
    """
    return a + b

def subtract(a, b):
    """
    Docstring for subtract

    :param a: Description
    :param b: Description
    """
    return a - b

def multiply(a, b):
    """
    Docstring for multiply

    :param a: Description
    :param b: Description
    """
    return a * b

def divide(a, b):
    """
    Docstring for divide
    """
    Docstring for divide

    :param a: Description
    :param b: Description
    """
    if b == 0:
        raise ValueError("Cannot divide by zero")
    return a / b

#Test the calculator functions
if __name__ == "__main__":
    """Docstring for main"""
    num1 = 10
    num2 = 5
    print("Addition:", add(num1, num2))
    print("Subtraction:", subtract(num1, num2))
    print("Multiplication:", multiply(num1, num2))
    print("Division:", divide(num1, num2))
```

Using pydoc

1) `python -m pydoc filename`

```
Help on module lab9:

NAME
lab9 - #Give python code for a calculator that has functions of addition, subtraction, multiplication and division

FUNCTIONS
add(a, b)
    Docstring for add

    :param a: Description
    :param b: Description

divide(a, b)
    Docstring for divide

    :param a: Description
    :param b: Description

multiply(a, b)
    Docstring for multiply

    :param a: Description
    :param b: Description

subtract(a, b)
    Docstring for subtract

    :param a: Description
    :param b: Description
```

2) python -m pydoc -w filename

3) python -m pydoc -p 8080

```
wrote lab9.html
```

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)**

2. Use Copilot for auto-generating docstrings.

3. Generate documentation in the terminal.

4. Export the documentation in HTML format and open it in a browser.

Given Code:

```
1  """Write python code with functions:  
2  decimal_to_binary(n)  
3  binary_to_decimal(b)  
4  decimal_to_hexadecimal(n)"""  
5  def decimal_to_binary(n):  
6      if n == 0:  
7          return "0"  
8      binary = ""  
9      while n > 0:  
10          binary = str(n % 2) + binary  
11          n //= 2  
12      return binary  
13  def binary_to_decimal(b):  
14      decimal = 0  
15      for i in range(len(b)):  
16          decimal += int(b[-(i + 1)]) * (2 ** i)  
17      return decimal  
18  def decimal_to_hexadecimal(n):  
19      if n == 0:  
20          return "0"  
21      hexadecimal = ""  
22      hex_digits = "0123456789ABCDEF"  
23      while n > 0:  
24          hexadecimal = hex_digits[n % 16] + hexadecimal  
25          n //= 16  
26      return hexadecimal  
27  # Example usage:  
28  print(decimal_to_binary(10))  # Output: "1010"  
29  print(binary_to_decimal("1010"))  # Output: 10  
30  print(decimal_to_hexadecimal(255))  # Output: "FF"  
31
```

Docstring:

```

lab9.py > decimal_to_binary
1  """Write python code with functions:
2  decimal_to_binary(n)
3  binary_to_decimal(b)
4  decimal_to_hexadecimal(n)"""
5  def decimal_to_binary(n):
6      """
7          Docstring for decimal_to_binary
8
9      :param n: Description
10     """
11     if n == 0:
12         return "0"
13     binary = ""
14     while n > 0:
15         binary = str(n % 2) + binary
16         n //= 2
17     return binary
18  def binary_to_decimal(b):
19      """
20          Docstring for binary_to_decimal
21
22      :param b: Description
23     """
24      decimal = 0
25      for i in range(len(b)):
26          decimal += int(b[-(i + 1)]) * (2 ** i)
27      return decimal
28  def decimal_to_hexadecimal(n):
29      """
30          Docstring for decimal_to_hexadecimal
31
32      :param n: Description
33     """
34     if n == 0:
35         return "0"
36     hexadecimal = ""
37     hex_digits = "0123456789ABCDEF"
38     while n > 0:
39         hexadecimal = hex_digits[n % 16] + hexadecimal
40         n //= 16
41     return hexadecimal
42 # Example usage:
43 print(decimal_to_binary(10)) # Output: "1010"
44 print(binary_to_decimal("1010")) # Output: 10
45 print(decimal_to_hexadecimal(255)) # Output: "FF"

```

Using pydoc

1) python -m pydoc filename

```

1010
10
FF
Help on module lab9:

NAME
    lab9

DESCRIPTION
    Write python code with functions:
        decimal_to_binary(n)
        binary_to_decimal(b)
        decimal_to_hexadecimal(n)

FUNCTIONS
    binary_to_decimal(b)

    decimal_to_binary(n)

    decimal_to_hexadecimal(n)

```

2)python -m pydoc -w filename

3)python -m pydoc -p 8080

```
1010  
10  
FF  
wrote lab9.html
```

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)**

2. Add docstrings with Copilot.

3. Generate documentation in the terminal.

4. Export the documentation in HTML format and open it in a browser

Given Code:

Docstrings:

```

#Write a python code with functions add_course(course_id, name, credits), remove_course(course_id), get_course(course_id)
courses = {}
def add_course(course_id, name, credits):
    """
    Docstring for add_course

    :param course_id: Description
    :param name: Description
    :param credits: Description
    """
    courses[course_id] = {'name': name, 'credits': credits}
    print(f"Course {course_id} added successfully.")
def remove_course(course_id):
    """
    Docstring for remove_course

    :param course_id: Description
    """

    if course_id in courses:
        del courses[course_id]
        print(f"Course {course_id} removed successfully.")
    else:
        print(f"Course {course_id} not found.")
def get_course(course_id):
    """
    Docstring for get_course

    :param course_id: Description
    """
    if course_id in courses:
        course = courses[course_id]
        print(f"Course ID: {course_id}, Name: {course['name']}, Credits: {course['credits']}")
    else:
        print(f"Course {course_id} not found.")

# Example usage
add_course("CS101", "Introduction to Computer Science", 3)
add_course("MATH201", "Calculus I", 4)
get_course("CS101")
remove_course("MATH201")
get_course("MATH201")

```

Using pydoc

1) python -m pydoc filename

```

Course CS101 added successfully.
Course MATH201 added successfully.
Course ID: CS101, Name: Introduction to Computer Science, Credits: 3
Course MATH201 removed successfully.
Course MATH201 not found.
Help on module lab9:

NAME
    lab9 - #Write a python code with functions add_course(course_id, name, credits), remove_course(course_id), get_course(course_id)

FUNCTIONS
    add_course(course_id, name, credits)
        Docstring for add_course

        :param course_id: Description
        :param name: Description
        :param credits: Description

    get_course(course_id)
        Docstring for get_course

        :param course_id: Description

    remove_course(course_id)
        Docstring for remove_course

        :param course_id: Description

DATA
    courses = {'CS101': {'credits': 3, 'name': 'Introduction to Computer S...

```

2)python -m pydoc -w filename

3)python -m pydoc -p 8080

```
Course CS101 added successfully.  
Course MATH201 added successfully.  
Course ID: CS101, Name: Introduction to Computer Science, Credits: 3  
Course MATH201 removed successfully.  
Course MATH201 not found.  
wrote lab9.html
```