

AI Assisted Coding Lab Ass-6.1

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Task Description #1 (AI-Based Code Completion for Loops) Task:

Use an AI code completion tool to generate a loop-based program.

Prompt:

“Generate Python code to print all even numbers between 1 and N using a loop.”

Expected Output:

- AI-generated loop logic.
- Identification of loop type used (for or while).
- Validation with sample inputs.

The screenshot displays the BLACKBOX AI coding assistant interface. On the left, there is a sidebar with a 'New in v3.5' section containing information about unlimited agent requests, open source CLI, and remote agents. Below this is an 'Upgrade to PRO' button. The main area is titled 'AI-Generated Loop Logic' and contains a Python function definition:

```
def print_even_numbers(N):  
    """  
    Prints all even numbers between 1 and N using a for loop.  
    """  
    print(f"Even numbers between 1 and {N}:")  
    for i in range(1, N + 1):  
        if i % 2 == 0:  
            print(i)  
  
    ### Identification of Loop Type  
  
    # The AI-generated code uses a `for` loop.  
  
    ### Validation with Sample Inputs  
    # Sample Input 1: N = 10  
    print_even_numbers(10)  
  
    # Sample Input 2: N = 5  
    print_even_numbers(5)  
  
    # Sample Input 3: N = 1  
    print_even_numbers(1)
```

 Below the code, the output is shown for three sample inputs: N=10, N=5, and N=1, each displaying the even numbers in the range. The interface also includes a bottom bar with a search icon and a prompt 'Ask Blackbox to do anything...'.

Task Description #2 (AI-Based Code Completion for Loop with

Conditionals)

Task: Use an AI code completion tool to combine loops and conditionals.

Prompt:

“Generate Python code to count how many numbers in a list are even and odd.”

Expected Output:

- AI-generated code using loop and if condition.
- Correct count validation.
- Explanation of logic flow.

```
# Task: Generate Python code to count how many numbers in a list are even and odd.
# AI-generated code using loop and if condition.
def count_even_odd(numbers):
    """Counts the number of even and odd integers in a list.

    Args:
        numbers (list): A list of integers.

    Returns:
        tuple: A tuple containing (even_count, odd_count).

    even_count = 0
    odd_count = 0
    for num in numbers:
        if num % 2 == 0:
            even_count += 1
        else:
            odd_count += 1
    return even_count, odd_count

# Correct count validation.
print("### Validation with Sample Inputs")

# Sample Input 1
my_list_1 = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
even, odd = count_even_odd(my_list_1)
print(f"List: {my_list_1}")
print(f"Even numbers: {even}, Odd numbers: {odd}")

# Sample Input 2
my_list_2 = [15, 22, 38, 41, 58]
even, odd = count_even_odd(my_list_2)
print(f"List: {my_list_2}")
print(f"Even numbers: {even}, Odd numbers: {odd}")

# Sample Input 3
my_list_3 = []
even, odd = count_even_odd(my_list_3)
print(f"List: {my_list_3}")
print(f"Even numbers: {even}, Odd numbers: {odd}")

# Explanation of Logic Flow
print("### Explanation of Logic Flow")
print("The 'count_even_odd' function works as follows:")
print("1. Initialization: 'even_count' and 'odd_count' are set to 0.")
print("2. Iteration: A 'for' loop goes through each number in the input list.")
print("3. Conditional Check: Inside the loop, 'if num % 2 == 0' checks if the number is even (remainder is 0 when divided by 2). If true, 'even_count' is incremented; otherwise, 'odd_count' is incremented.")
print("4. Return Value: After checking all numbers, the function returns both 'even_count' and 'odd_count'.")

### Validation with Sample Inputs
List: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Even numbers: 5, Odd numbers: 5
List: [15, 22, 38, 41, 58]
Even numbers: 3, Odd numbers: 2
List: []
Even numbers: 0, Odd numbers: 0

### Explanation of Logic Flow
The 'count_even_odd' function works as follows:
1. Initialization: 'even_count' and 'odd_count' are set to 0.
2. Iteration: A 'for' loop goes through each number in the input list.
3. Conditional Check: Inside the loop, 'if num % 2 == 0' checks if the number is even (remainder is 0 when divided by 2). If true, 'even_count' is incremented; otherwise, 'odd_count' is incremented.
4. Return Value: After checking all numbers, the function returns both 'even_count' and 'odd_count'.
```

Task Description #3 (AI-Based Code Completion for Class

Attributes Validation)

Task: Use an AI tool to complete a Python class that validates user input.

Prompt:

“Generate a Python class User that validates age and email using conditional statements.”

Expected Output:

- AI-generated class with validation logic.

- Verification of condition handling.
- Test cases for valid and invalid inputs.

```

class Student:
    """A class representing a student with attributes name, roll number, and marks, and methods to calculate total and average marks."""

    def __init__(self, name: str, roll_number: int, marks: list[int]):
        """Initialize the student object with name, roll number, and marks.

        Parameters:
            name (str): The student's name.
            roll_number (int): The student's roll number.
            marks (list[int]): A list of marks obtained by the student.

        Raises:
            ValueError: If roll_number is not an integer or marks is not a list of integers.
        """
        if not isinstance(roll_number, int):
            raise ValueError("roll_number must be an integer")
        if not isinstance(marks, list) or not all(isinstance(m, int) for m in marks):
            raise ValueError("marks must be a list of integers")

        self.name = name
        self.roll_number = roll_number
        self.marks = marks

    def calculate_total_marks(self) -> int:
        """Calculate the total marks obtained by the student.

        Returns:
            int: The total marks.
        """
        return sum(self.marks)

    def calculate_average_marks(self) -> float:
        """Calculate the average marks obtained by the student.

        Returns:
            float: The average marks.
        """
        return self.calculate_total_marks() / len(self.marks)

    def __str__(self) -> str:
        """Return a string representation of the student object.

        Returns:
            str: A string representation of the student object.
        """
        return f"Student(name='{self.name}', roll_number={self.roll_number}, marks={self.marks})"

    def __repr__(self) -> str:
        """Return a string representation of the student object.

        Returns:
            str: A string representation of the student object.
        """
        return f"Student(name='{self.name}', roll_number={self.roll_number}, marks={self.marks})"

# Test cases for the Student class
def test_student_init():
    """Test the __init__ method of the Student class."""
    student = Student("John Doe", 12345, [85, 90, 78, 92])
    assert student.name == "John Doe"
    assert student.roll_number == 12345
    assert student.marks == [85, 90, 78, 92]

def test_calculate_total_marks():
    """Test the calculate_total_marks method of the Student class."""
    student = Student("John Doe", 12345, [85, 90, 78, 92])
    total_marks = student.calculate_total_marks()
    assert total_marks == 345

def test_calculate_average_marks():
    """Test the calculate_average_marks method of the Student class."""
    student = Student("John Doe", 12345, [85, 90, 78, 92])
    average_marks = student.calculate_average_marks()
    assert average_marks == 86.25

def test_str_repr():
    """Test the __str__ and __repr__ methods of the Student class."""
    student = Student("John Doe", 12345, [85, 90, 78, 92])
    str_repr = str(student)
    repr_repr = repr(student)
    assert str_repr == "Student(name='John Doe', roll_number=12345, marks=[85, 90, 78, 92])"
    assert repr_repr == "Student(name='John Doe', roll_number=12345, marks=[85, 90, 78, 92])"

# Run the test cases
if __name__ == "__main__":
    test_student_init()
    test_calculate_total_marks()
    test_calculate_average_marks()
    test_str_repr()

```

Task Description #4 (AI-Based Code Completion for Classes) Task:

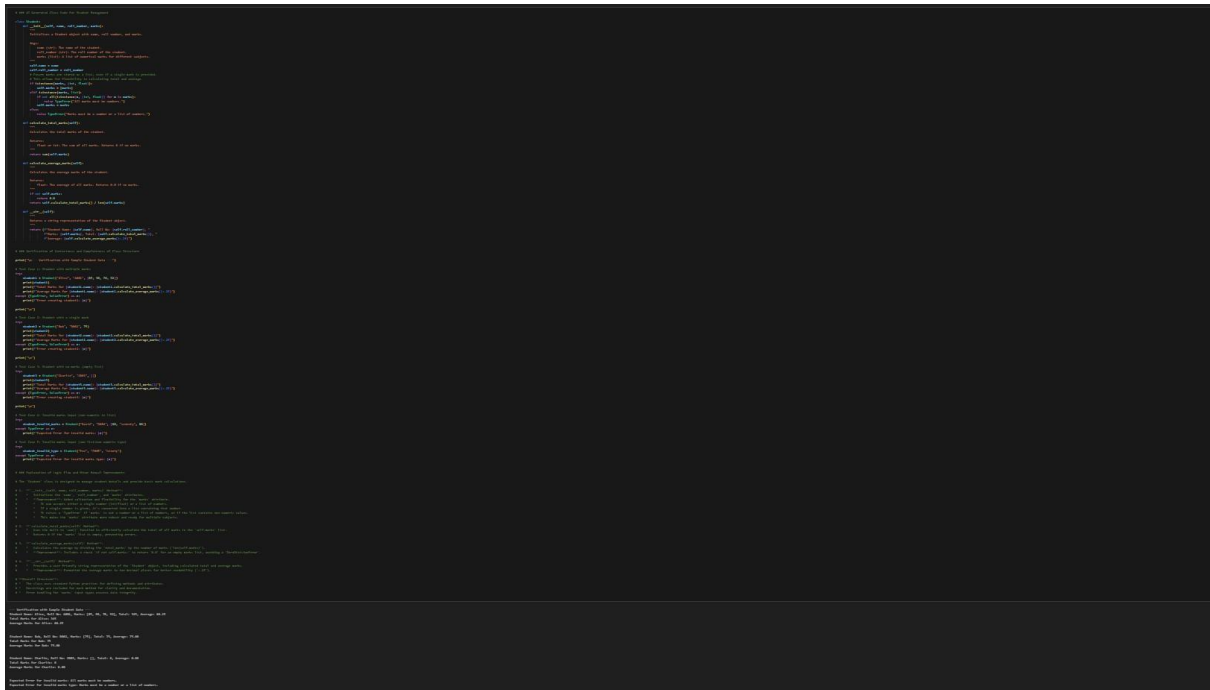
Use an AI code completion tool to generate a Python class for managing student details.

Prompt:

“Generate a Python class Student with attributes (name, roll number, marks) and methods to calculate total and average marks.”

Expected Output:

- AI-generated class code.
- Verification of correctness and completeness of class structure.
- Minor manual improvements (if needed) with justification.



Task Description 5 (AI-Assisted Code Completion Review) Task:

Use an AI tool to generate a complete Python program using classes, loops, and conditionals together.

Prompt:

“Generate a Python program for a simple bank account system using class, loops, and conditional statements.”

Expected Output:

- Complete AI-generated program.
- Identification of strengths and limitations of AI suggestions.
- Reflection on how AI assisted coding productivity.

```
% Generate + Code + Markdown | Run All ...
# *** AI-Generated Bank Account System Program

class BankAccount:
    def __init__(self, account_number, owner_name, initial_balance=0.0):
        if not isinstance(account_number, str) or not account_number.isdigit():
            raise ValueError("Account number must be a string containing only digits.")
        if not isinstance(owner_name, str) or not owner_name.strip():
            raise ValueError("Owner name cannot be empty.")
        if not isinstance(initial_balance, (int, float)) or initial_balance < 0:
            raise ValueError("Initial balance must be a non-negative number.")

        self.account_number = account_number
        self.owner_name = owner_name
        self.balance = initial_balance
        print(f"Account {self.account_number} created for {self.owner_name} with initial balance {self.balance:.2f}.")

    def deposit(self, amount):
        if not isinstance(amount, (int, float)) or amount <= 0:
            print("Invalid deposit amount. Amount must be a positive number.")
            return False
        self.balance += amount
        print(f"Deposited {amount:.2f}. New balance: {self.balance:.2f}." )
        return True

    def withdraw(self, amount):
        if not isinstance(amount, (int, float)) or amount <= 0:
            print("Invalid withdrawal amount. Amount must be a positive number.")
            return False
        if amount > self.balance:
            print("Insufficient funds. Withdrawal denied.")
            return False
        self.balance -= amount
        print(f"Withdrew {amount:.2f}. New balance: {self.balance:.2f}." )
        return True

    def get_balance(self):
        return self.balance

    def __str__(self):
        return f"Account Number: {self.account_number} | Owner: {self.owner_name} | Balance: ${self.balance:.2f}"

def run_bank_system():
    print("\n--- Welcome to Simple Bank Account System ---")
    account = None
    while account is None:
        try:
            acc_num = input("Enter new account number (digits only): ")
            owner = input("Enter account owner name: ")
            initial_bal_str = input("Enter initial balance (optional, default 0): ")
            initial_bal = float(initial_bal_str) if initial_bal_str else 0.0
            account = BankAccount(acc_num, owner, initial_bal)
        except ValueError as e:
            print(f"Error creating account: {e} | Please try again.")
        except Exception as e:
            print(f"An unexpected error occurred: {e} | Please try again.")

    while True:
        print("\n--- Menu ---")
        print("1. Deposit")
        print("2. Withdraw")
        print("3. Check Balance")
        print("4. Account Details")
        print("5. Exit")

        choice = input("Enter your choice: ")

        if choice == '1':
            try:
                amount = float(input("Enter amount to deposit: "))
                account.deposit(amount)
            except ValueError:
                print("Invalid input. Please enter a numerical amount.")
        elif choice == '2':
            try:
                amount = float(input("Enter amount to withdraw: "))
                account.withdraw(amount)
            except ValueError:
                print("Invalid input. Please enter a numerical amount.")
        elif choice == '3':
            print(f"Current Balance: {account.get_balance():.2f}")
        elif choice == '4':
            print(str(account))
        elif choice == '5':
            break
        else:
            print("Invalid choice. Please select a valid option (1-5).")

    # Run the program
    run_bank_system()

# *** Identification of Strengths and Limitations of AI Suggestions

# Strengths
# 1. "Rapid Prototyping": The AI quickly generated a functional base for a bank account system, saving significant initial development time.
# 2. "Correct Structure": It correctly used a class to encapsulate account logic, leaving room for interactive menu and conditionals for transaction validation and menu navigation.
# 3. "Basic Validation": The generated code included basic input validation (e.g., positive deposit/withdrawal amounts, sufficient balance, non-empty owner name, digit-only account number) which is crucial for robust applications.
# 4. "Clear Method Separation": Methods like deposit, withdraw, and get_balance were well-defined and followed good object-oriented principles.
# 5. "Interactive Loop": The while True loop for the menu provides a good user experience for interacting with the system.

# Limitations
# 1. "Limited Persistence": The system lacks any form of data persistence (e.g., saving accounts to a file or database). All data is lost when the program ends.
# 2. "Single Account Management": The program only allows managing one account at a time. A real system would need to manage multiple accounts, perhaps using a list or dictionary of BankAccount objects.
# 3. "Security": No security measures (e.g., password, PIN) are implemented for transactions or account access.
# 4. "Error Handling Sophistication": While basic validation is present, more robust error handling (e.g., specific error codes, custom exceptions for different types of failures) could be implemented.
# 5. "User Experience (UX) Enhancements": The text-based interface is functional but basic. A more user-friendly interface might involve clearing the screen or providing more detailed feedback.
# 6. "Edge Cases": While some validation is present, more comprehensive checks for edge cases (e.g., very large numbers, specific formatting requirements for account numbers) could be added.

# *** Reflection on How AI Assisted Coding Productivity

# AI significantly boosts coding productivity by acting as a powerful co-pilot. For this task:
# 1. "Reduced Boilerplate": The AI eliminated the need to write the basic class structure, method definitions, and initial validation from scratch. This is often the most time-consuming and repetitive part of starting a new module.
# 2. "Conceptualization to Code": It translated a high-level prompt ("Bank account system with class, menu, conditionals") directly into working code, bridging the gap between idea and implementation very quickly.
# 3. "Learning and Best Practices": For someone new to Python or object-oriented programming, the generated code serves as a good example of how to structure a class, use properties, and implement basic error handling. It implicitly guides towards common design patterns.
# 4. "Focus on Refinement": Instead of spending time on initial coding, I could immediately focus on identifying areas for improvement, adding advanced features (like data persistence or multiple accounts), and refining the existing logic. This shifts the effort from pure creation to enhancement.
# 5. "Debugging Reduction": The initial code is generally free of syntax errors and common logical pitfalls, reducing the time spent on early-stage debugging. Any issues are usually conceptual or related to missing features rather than fundamental code errors.

# Overall, AI didn't just write code; it provided a high-quality foundation that accelerated the entire development cycle, allowing for more strategic thinking and less tactical coding.
```

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```
--- Welcome to Simple Bank Account System ---  
Enter new account number (digits only): 6757  
Enter account owner name: gg  
Enter initial balance (optional, default 0):  
Account 6757 created for gg with initial balance 0.00.
```

```
--- Menu ---  
1. Deposit  
2. Withdraw  
3. Check Balance  
4. Account Details  
5. Exit  
Enter your choice: 1  
Enter amount to deposit: 6666  
Deposited 6666.00. New balance: 6666.00.
```

```
--- Menu ---  
1. Deposit  
2. Withdraw  
3. Check Balance  
4. Account Details  
5. Exit  
Enter your choice: 3  
Current Balance: $6666.00
```

```
--- Menu ---  
1. Deposit  
2. Withdraw  
3. Check Balance  
4. Account Details  
5. Exit  
Enter your choice: 5  
Thank you for using our bank system. Goodbye!
```