Classes and objects exercise

Exercise 1: Advanced Inventory Management System

Task: Create an Inventory class that can store a list of Product objects. The Product class should have attributes like name, price, and quantity. The Inventory class should have methods to:

- Add a new product.
- Remove a product by name.
- Update the quantity of a product.
- Display all products in the inventory sorted by price.
- Find the product with the highest and lowest price.

Exercise 2: Library System

Task: Design a class structure for a library system. You should have at least the following classes:

- Library: Contains a list of Book objects and manages the lending process.
- Book: Contains attributes like title, author, and ISBN.
- Member: Represents a library member with attributes like name and member_id. Each member should have a list of borrowed books.

Implement methods for:

- Borrowing a book.
- Returning a book.
- Checking the availability of a book.
- Displaying all borrowed books by a member.

Exercise 3: Employee Management System

Task: Create a class Employee with attributes name, id, position, and salary. Implement a method to calculate the yearly bonus based on the salary and position.

Create a subclass Manager that has an additional attribute team_size and override the bonus calculation to give a higher bonus for managers based on their team size.

Create another subclass Intern that overrides the bonus calculation to give no bonus.

Exercise 4: E-commerce System

Task: Design an e-commerce system with the following classes:

- Customer: Contains details like name, email, and cart.
- Product: Contains details like name, price, and stock.

Classes and objects exercise

- Order: Represents an order made by a customer and includes a list of Product items and the total cost.

Implement methods to:

- Add products to the cart.
- Remove products from the cart.
- Checkout and create an order, reducing the stock of the purchased items.
- Display the order details including the total cost.

Exercise 5: Banking System

Task: Create a class BankAccount with attributes like account_number, account_holder, and balance. Implement methods for:

- Depositing money.
- Withdrawing money.
- Checking balance.
- Transferring money between two accounts.

Create subclasses SavingsAccount and CheckingAccount that have different rules for withdrawals (e.g., SavingsAccount may have a limit on the number of withdrawals per month).

Exercise 6: University Grading System

Task: Design a system for managing university courses and grades. You should have the following classes:

- Student: Contains details like name, student_id, and a list of enrolled courses.
- Course: Contains details like course_name, course_code, and a list of students.
- Grade: Represents a grade received by a student in a course, with attributes for student_id, course_code, and grade.

Implement methods to:

- Enroll a student in a course.
- Assign a grade to a student.
- Calculate the GPA for a student across all their courses.
- Display a transcript for a student.