

NTOU Java Programming

Exercise 5



Exercise Goals

2

- Understanding Inheritance and Polymorphism
- Applying Class Hierarchies
- Implementing Abstract Classes

Requirement₁

3

- Please develop a simple shopping cart system in Java.
- The system should be able to handle various types of products and provide basic shopping cart functionalities.

Requirement₂

4

- Product Class (provided): an abstract class with the following attributes:
 - ▣ *name* (String): the name of the product.
 - ▣ *price* (double): the price of the product.
 - ▣ *quantity* (int): the quantity of the produc.It has an abstract method:
 - ▣ *double calculateProductItemPrice()*
- Book and Clothing Classes: subclasses of the Product class .
 - ▣ Each of these classes has its own unique attribute
 - “*author*” for *Book* and “*size*” for *Clothing*.
 - ▣ You should override the *calculateProductItemPrice()* method in each class for the total price based on the quantity.
 - Basic rule for calculating the subtotal price: *price* * *quantity*.
 - The total price of *Book* will apply a 10% discount.

Requirement₃

5

- Specialized Product Classes: subclasses of the Book and Clothing classes.
 - ▣ They are specialized product classes representing different brands or types of products.
 - ▣ You should add unique attributes to these specialized classes:
 - “*genre*” for *Novel* and “*material*” for *Shirt*.
 - ▣ You don’t need to override *calculateProductItemPrice()* for these two classes.

Requirement₄

6

- ShoppingCart: representing the shopping cart to maintain purchase items and calculate the total price.
 - ▣ Maintain a list of products added to the cart using *ArrayList*.
 - ▣ Provide a method *addItem(Product product, int quantity)* to add a product to the cart with a specified quantity.
 - ▣ Implement a method *calculateTotalPrice()* to calculate the total price of all products in the cart.
 - ▣ Include a method *applyDiscount(double discountPercentage)* to apply a discount to the total price.
 - For example, the original price is \$1,000 and it will be reduced to \$800 after 20% discount.

Requirement₅

7

- ShoppingCartTest Class (provided):
 - ▣ It creates instances of various product classes and add them to the shopping cart.
 - ▣ It tests the functionality of adding items, calculating the total price, and applying discounts.
 - ▣ The expected output of the ShoppingCartTest Class is shown in ex5-result.txt.

Submission

8

- ❑ The naming should conform to the **CamelCase** style.
- ❑ “Package” is required: `ntou.cs.java2024`.
- ❑ Please submit `.java` files and `.class` files (upload them to TronClass).
- ❑ Code that fails to compile or execute is not accepted.