Case Study: Online Shopping Cart System(GANESH RAM KAMAL)

Scenario:

You are tasked with developing an online shopping cart system for an e-commerce website. The system should handle products, customers, and orders, allowing customers to add products to their cart, view the cart contents, and proceed to checkout.

Requirements:

1. **Product Class**:
   - Attributes: `productId` (String), `name` (String), `price` (double), and `stockQuantity` (int).
   - Methods: `updateStockQuantity(int quantity)` to adjust stock levels when a product is purchased.

Program:

```
public class Main {

    public static void main(String[] args) {

        // Create Product instances

        Product product1 = new Product("P001", "Laptop", 999.99, 10);

        Product product2 = new Product("P002", "Smartphone", 699.99, 20);

        Product product3 = new Product("P003", "Tablet", 299.99, 15);


        // Display product details

        System.out.println("Product details:");

        System.out.println(product1);

        System.out.println(product2);

        System.out.println(product3);


        // Update stock quantity

        System.out.println("\nUpdating stock quantity...");

        product1.updateStockQuantity(2); // Sold 2 Laptops

        product2.updateStockQuantity(5); // Sold 5 Smartphones


        // Display updated product details
```

```
        System.out.println("\nUpdated product details:");
        System.out.println(product1);
        System.out.println(product2);
        System.out.println(product3);
    }
}

class Product {
    private String productId;
    private String name;
    private double price;
    private int stockQuantity;

    public Product(String productId, String name, double price, int stockQuantity) {
        this.productId = productId;
        this.name = name;
        this.price = price;
        this.stockQuantity = stockQuantity;
    }

    public String getProductId() {
        return productId;
    }

    public String getName() {
        return name;
    }

    public double getPrice() {
```

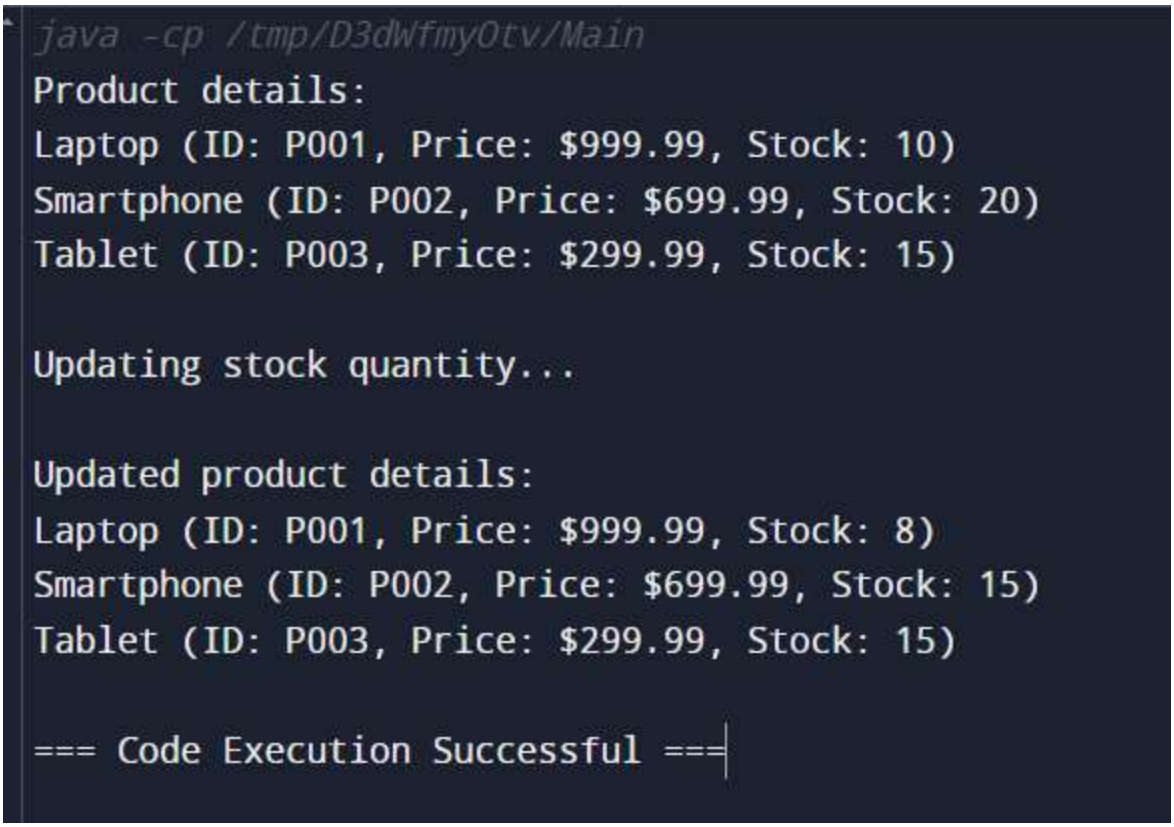
```
        return price;
    }

    public int getStockQuantity() {
        return stockQuantity;
    }

    public void updateStockQuantity(int quantity) {
        if (quantity <= this.stockQuantity) {
            this.stockQuantity -= quantity;
        } else {
            System.out.println("Error: Insufficient stock to update quantity.");
        }
    }

    @Override
    public String toString() {
        return name + " (ID: " + productId + ", Price: $" + price + ", Stock: " + stockQuantity + ")";
    }
}
```

Ouput:



2. **Customer Class**:
    - Attributes: `customerId` (String), `name` (String), `email` (String), and `cart` (List<Product>).
    - Methods: `addToCart(Product product)`, `removeFromCart(Product product)`, `viewCart()`, and `checkout()`.

Program:

```
import java.util.ArrayList;
import java.util.List;

class Product {
    private String productId;
    private String name;
    private double price;
    private int stockQuantity;

    public Product(String productId, String name, double price, int stockQuantity) {
        this.productId = productId;
        this.name = name;
        this.price = price;
        this.stockQuantity = stockQuantity;
    }

    public String getProductId() {
        return productId;
    }

    public String getName() {
        return name;
    }

    public double getPrice() {
        return price;
    }
```

```
    public int getStockQuantity() {
        return stockQuantity;
    }

    public void updateStockQuantity(int quantity) {
        if (quantity <= this.stockQuantity) {
            this.stockQuantity -= quantity;
        } else {
            System.out.println("Error: Insufficient stock to update quantity.");
        }
    }

    @Override
    public String toString() {
        return name + " (ID: " + productId + ", Price: $" + price + ", Stock: " + stockQuantity + ")";
    }
}

class Customer {
    private String customerId;
    private String name;
    private String email;
    private List<Product> cart;

    public Customer(String customerId, String name, String email) {
        this.customerId = customerId;
        this.name = name;
        this.email = email;
```

```
    this.cart = new ArrayList<>();
}

public void addToCart(Product product) {
    cart.add(product);
}

public void removeFromCart(Product product) {
    cart.remove(product);
}

public void viewCart() {
    if (cart.isEmpty()) {
        System.out.println("Your cart is empty.");
    } else {
        System.out.println("Cart contents:");
        for (Product product : cart) {
            System.out.println(product);
        }
    }
}

public void checkout() {
    if (cart.isEmpty()) {
        System.out.println("Your cart is empty. Add items to the cart before checking out.");
    } else {
        Order order = new Order(customerId, cart);
        order.calculateTotalAmount();
        System.out.println("Order placed successfully. Total amount: $" + order.getTotalAmount());
```

```
            cart.clear();
        }
    }
}

class Order {
    private String customerId;
    private List<Product> products;
    private double totalAmount;

    public Order(String customerId, List<Product> products) {
        this.customerId = customerId;
        this.products = new ArrayList<>(products);
        this.totalAmount = 0.0;
    }

    public void calculateTotalAmount() {
        for (Product product : products) {
            totalAmount += product.getPrice();
        }
    }

    public double getTotalAmount() {
        return totalAmount;
    }
}

public class Main {
    public static void main(String[] args) {
```

```
// Create Product instances
Product product1 = new Product("P001", "Laptop", 999.99, 10);
Product product2 = new Product("P002", "Smartphone", 699.99, 20);
Product product3 = new Product("P003", "Tablet", 299.99, 15);

// Create Customer instance
Customer customer = new Customer("C001", "John Doe", "john.doe@example.com");

// Add products to the customer's cart
customer.addToCart(product1);
customer.addToCart(product2);

// View cart contents
System.out.println("Viewing cart:");
customer.viewCart();

// Remove a product from the cart
customer.removeFromCart(product2);

// View cart contents again
System.out.println("\nViewing cart after removing an item:");
customer.viewCart();

// Checkout
System.out.println("\nChecking out:");
customer.checkout();

// View cart contents after checkout
System.out.println("\nViewing cart after checkout:");
```

```
        customer.viewCart();
    }
}
```

Output:

```
java -cp /tmp/GS6AVlgvNI/Main
Viewing cart:
Cart contents:
Laptop (ID: P001, Price: $999.99, Stock: 10)
Smartphone (ID: P002, Price: $699.99, Stock: 20)

Viewing cart after removing an item:
Cart contents:
Laptop (ID: P001, Price: $999.99, Stock: 10)

Checking out:
Order placed successfully. Total amount: $999.99

Viewing cart after checkout:
Your cart is empty.

=== Code Execution Successful ===
```

3. **Order Class**:
    - Attributes: `orderId` (String), `customer` (Customer), `products` (List<Product>), `totalAmount` (double), and `orderDate` (LocalDateTime).
    - Methods: `calculateTotalAmount()` to compute the total cost of the order.

program:

```
import java.time.LocalDateTime;
import java.util.ArrayList;
import java.util.List;

class Product {
    private String productId;
    private String name;
    private double price;
    private int stockQuantity;

    public Product(String productId, String name, double price, int stockQuantity) {
        this.productId = productId;
        this.name = name;
        this.price = price;
        this.stockQuantity = stockQuantity;
    }

    public String getProductId() {
        return productId;
    }

    public String getName() {
        return name;
    }
```

```
    public double getPrice() {
        return price;
    }

    public int getStockQuantity() {
        return stockQuantity;
    }

    public void updateStockQuantity(int quantity) {
        if (quantity <= this.stockQuantity) {
            this.stockQuantity -= quantity;
        } else {
            System.out.println("Error: Insufficient stock to update quantity.");
        }
    }

    @Override
    public String toString() {
        return name + " (ID: " + productId + ", Price: $" + price + ", Stock: " + stockQuantity + ")";
    }
}

class Customer {
    private String customerId;
    private String name;
    private String email;
    private List<Product> cart;
```

```
public Customer(String customerId, String name, String email) {
    this.customerId = customerId;
    this.name = name;
    this.email = email;
    this.cart = new ArrayList<>();
}

public void addToCart(Product product) {
    cart.add(product);
}

public void removeFromCart(Product product) {
    cart.remove(product);
}

public void viewCart() {
    if (cart.isEmpty()) {
        System.out.println("Your cart is empty.");
    } else {
        System.out.println("Cart contents:");
        for (Product product : cart) {
            System.out.println(product);
        }
    }
}

public void checkout() {
    if (cart.isEmpty()) {
        System.out.println("Your cart is empty. Add items to the cart before checking out.");
```

```
        } else {
            Order order = new Order(customerId, cart);
            order.calculateTotalAmount();
            System.out.println("Order placed successfully. Total amount: $" + order.getTotalAmount());
            cart.clear();
        }
    }
}

class Order {
    private String orderId;
    private String customerId;
    private List<Product> products;
    private double totalAmount;
    private LocalDateTime orderDate;

    public Order(String customerId, List<Product> products) {
        this.orderId = "ORD" + System.currentTimeMillis();
        this.customerId = customerId;
        this.products = new ArrayList<>(products);
        this.orderDate = LocalDateTime.now();
    }

    public void calculateTotalAmount() {
        totalAmount = 0;
        for (Product product : products) {
            totalAmount += product.getPrice();
        }
    }
```

```
    public double getTotalAmount() {
        return totalAmount;
    }

    @Override
    public String toString() {
        return "Order ID: " + orderId + "\nCustomer ID: " + customerId + "\nOrder Date: " + orderDate +
"\nTotal Amount: $" + totalAmount;
    }
}

public class Main {
    public static void main(String[] args) {
        // Create Product instances
        Product product1 = new Product("P001", "Laptop", 999.99, 10);
        Product product2 = new Product("P002", "Smartphone", 699.99, 20);
        Product product3 = new Product("P003", "Tablet", 299.99, 15);

        // Create Customer instance
        Customer customer = new Customer("C001", "John Doe", "john.doe@example.com");

        // Add products to the customer's cart
        customer.addToCart(product1);
        customer.addToCart(product2);

        // View cart contents
        System.out.println("Viewing cart:");
        customer.viewCart();
```

```
        // Remove a product from the cart
        customer.removeFromCart(product2);

        // View cart contents again
        System.out.println("\nViewing cart after removing an item:");
        customer.viewCart();

        // Checkout
        System.out.println("\nChecking out:");
        customer.checkout();

        // View cart contents after checkout
        System.out.println("\nViewing cart after checkout:");
        customer.viewCart();
    }
}
```

Output:

4. **Inventory Class**:
   - Attributes: `products` (List<Product>).
   - Methods: `addProduct(Product product)`, `getProductById(String productId)`, and `updateProductStock(String productId, int quantity)`.

Program:

```
import java.time.LocalDateTime;

import java.util.ArrayList;

import java.util.List;


class Product {

   private String productId;
```

```
private String name;
private double price;
private int stockQuantity;

public Product(String productId, String name, double price, int stockQuantity) {
    this.productId = productId;
    this.name = name;
    this.price = price;
    this.stockQuantity = stockQuantity;
}

public String getProductId() {
    return productId;
}

public String getName() {
    return name;
}

public double getPrice() {
    return price;
}

public int getStockQuantity() {
    return stockQuantity;
}

public void updateStockQuantity(int quantity) {
    if (quantity <= this.stockQuantity) {
```

```
            this.stockQuantity -= quantity;
        } else {
            System.out.println("Error: Insufficient stock to update quantity.");
        }
    }

    @Override
    public String toString() {
        return name + " (ID: " + productId + ", Price: $" + price + ", Stock: " + stockQuantity + ")";
    }
}

class Inventory {
    private List<Product> products;

    public Inventory() {
        this.products = new ArrayList<>();
    }

    public void addProduct(Product product) {
        products.add(product);
    }

    public Product getProductById(String productId) {
        for (Product product : products) {
            if (product.getProductId().equals(productId)) {
                return product;
            }
        }
```

```
        return null;
    }

    public void updateProductStock(String productId, int quantity) {
        Product product = getProductById(productId);
        if (product != null) {
            product.updateStockQuantity(quantity);
        }
    }
}

class Customer {
    private String customerId;
    private String name;
    private String email;
    private List<Product> cart;

    public Customer(String customerId, String name, String email) {
        this.customerId = customerId;
        this.name = name;
        this.email = email;
        this.cart = new ArrayList<>();
    }

    public void addToCart(Product product) {
        cart.add(product);
    }

    public void removeFromCart(Product product) {
```

```
        cart.remove(product);
    }

    public void viewCart() {
        if (cart.isEmpty()) {
            System.out.println("Your cart is empty.");
        } else {
            System.out.println("Cart contents:");
            for (Product product : cart) {
                System.out.println(product);
            }
        }
    }

    public void checkout(Inventory inventory) {
        if (cart.isEmpty()) {
            System.out.println("Your cart is empty. Add items to the cart before checking out.");
        } else {
            Order order = new Order(customerId, cart);
            order.calculateTotalAmount();
            System.out.println("Order placed successfully. Total amount: $" + order.getTotalAmount());

            for (Product product : cart) {
                inventory.updateProductStock(product.getProductId(), 1);
            }
            cart.clear();
        }
    }
}
```

```
class Order {
    private String orderId;
    private String customerId;
    private List<Product> products;
    private double totalAmount;
    private LocalDateTime orderDate;

    public Order(String customerId, List<Product> products) {
        this.orderId = "ORD" + System.currentTimeMillis();
        this.customerId = customerId;
        this.products = new ArrayList<>(products);
        this.orderDate = LocalDateTime.now();
    }

    public void calculateTotalAmount() {
        totalAmount = 0;
        for (Product product : products) {
            totalAmount += product.getPrice();
        }
    }

    public double getTotalAmount() {
        return totalAmount;
    }

    @Override
    public String toString() {
```

```
        return "Order ID: " + orderId + "\nCustomer ID: " + customerId + "\nOrder Date: " + orderDate +
"\nTotal Amount: $" + totalAmount;
    }
}

public class Main {
    public static void main(String[] args) {
        // Create Inventory instance
        Inventory inventory = new Inventory();

        // Create Product instances and add them to the inventory
        Product product1 = new Product("P001", "Laptop", 999.99, 10);
        Product product2 = new Product("P002", "Smartphone", 699.99, 20);
        Product product3 = new Product("P003", "Tablet", 299.99, 15);
        inventory.addProduct(product1);
        inventory.addProduct(product2);
        inventory.addProduct(product3);

        // Create Customer instance
        Customer customer = new Customer("C001", "John Doe", "john.doe@example.com");

        // Add products to the customer's cart
        customer.addToCart(product1);
        customer.addToCart(product2);

        // View cart contents
        System.out.println("Viewing cart:");
        customer.viewCart();
```

```
        // Remove a product from the cart
        customer.removeFromCart(product2);

        // View cart contents again
        System.out.println("\nViewing cart after removing an item:");
        customer.viewCart();

        // Checkout
        System.out.println("\nChecking out:");
        customer.checkout(inventory);

        // View cart contents after checkout
        System.out.println("\nViewing cart after checkout:");
        customer.viewCart();

        // View updated stock in inventory
        System.out.println("\nUpdated inventory stock:");
        System.out.println(inventory.getProductById("P001"));
        System.out.println(inventory.getProductById("P002"));
        System.out.println(inventory.getProductById("P003"));
    }
}
```

Output:

```
java -cp /tmp/eLnD9EVxzt/Main
Viewing cart:
Cart contents:
Laptop (ID: P001, Price: $999.99, Stock: 10)
Smartphone (ID: P002, Price: $699.99, Stock: 20)

Viewing cart after removing an item:
Cart contents:
Laptop (ID: P001, Price: $999.99, Stock: 10)

Checking out:
Order placed successfully. Total amount: $999.99

Viewing cart after checkout:
Your cart is empty.

Updated inventory stock:
Laptop (ID: P001, Price: $999.99, Stock: 9)
Smartphone (ID: P002, Price: $699.99, Stock: 20)
Tablet (ID: P003, Price: $299.99, Stock: 15)

=== Code Execution Successful ===
```

Tasks:

1. **Implement the Product Class**:
    - Define the class with appropriate attributes and methods.
    - Implement logic to update the stock quantity when products are purchased.
2. **Implement the Customer Class**:
    - Define the class with attributes and methods to manage the shopping cart.
    - Implement methods to add products to the cart, remove products from the cart, view the cart contents, and proceed to checkout.
3. **Implement the Order Class**:
    - Define the class with attributes and methods to handle order details.
    - Implement the `calculateTotalAmount()` method to compute the total cost of the order.
4. **Implement the Inventory Class**:
    - Define the class to manage the product inventory.
    - Implement methods to add products, retrieve a product by its ID, and update stock levels.
5. **Develop a Main Class to Test the System**:
    - Create instances of `Product`, `Customer`, and `Inventory`.
    - Add products to the inventory.
    - Simulate adding products to the customer's cart, viewing the cart, and checking out.

Main program:

```
import java.time.LocalDateTime;

import java.util.ArrayList;

import java.util.List;
```

```
class Product {
    private String productId;
    private String name;
    private double price;
    private int stockQuantity;

    public Product(String productId, String name, double price, int stockQuantity) {
        this.productId = productId;
        this.name = name;
        this.price = price;
        this.stockQuantity = stockQuantity;
    }

    public String getProductId() {
        return productId;
    }

    public String getName() {
        return name;
    }

    public double getPrice() {
        return price;
    }

    public int getStockQuantity() {
        return stockQuantity;
    }
```

```
    public void updateStockQuantity(int quantity) {
        if (quantity <= this.stockQuantity) {
            this.stockQuantity -= quantity;
        } else {
            System.out.println("Error: Insufficient stock to update quantity.");
        }
    }

    @Override
    public String toString() {
        return name + " (ID: " + productId + ", Price: $" + price + ", Stock: " + stockQuantity + ")";
    }
}

class Inventory {
    private List<Product> products;

    public Inventory() {
        this.products = new ArrayList<>();
    }

    public void addProduct(Product product) {
        products.add(product);
    }

    public Product getProductById(String productId) {
        for (Product product : products) {
            if (product.getProductId().equals(productId)) {
                return product;
```

```
            }
        }
        return null;
    }

    public void updateProductStock(String productId, int quantity) {
        Product product = getProductById(productId);
        if (product != null) {
            product.updateStockQuantity(quantity);
        }
    }
}

class Customer {
    private String customerId;
    private String name;
    private String email;
    private List<Product> cart;

    public Customer(String customerId, String name, String email) {
        this.customerId = customerId;
        this.name = name;
        this.email = email;
        this.cart = new ArrayList<>();
    }

    public void addToCart(Product product) {
        cart.add(product);
    }
```

```
    public void removeFromCart(Product product) {
        cart.remove(product);
    }

    public void viewCart() {
        if (cart.isEmpty()) {
            System.out.println("Your cart is empty.");
        } else {
            System.out.println("Cart contents:");
            for (Product product : cart) {
                System.out.println(product);
            }
        }
    }

    public void checkout() {
        if (cart.isEmpty()) {
            System.out.println("Your cart is empty. Add items to the cart before checking out.");
        } else {
            Order order = new Order(customerId, cart);
            order.calculateTotalAmount();
            System.out.println("Order placed successfully. Total amount: $" + order.getTotalAmount());
            cart.clear();
        }
    }
}

class Order {
```

```
    private String orderId;
    private String customerId;
    private List<Product> products;
    private double totalAmount;
    private LocalDateTime orderDate;

    public Order(String customerId, List<Product> products) {
        this.orderId = "ORD" + System.currentTimeMillis();
        this.customerId = customerId;
        this.products = new ArrayList<>(products);
        this.orderDate = LocalDateTime.now();
    }

    public void calculateTotalAmount() {
        totalAmount = 0;
        for (Product product : products) {
            totalAmount += product.getPrice();
        }
    }

    public double getTotalAmount() {
        return totalAmount;
    }

    @Override
    public String toString() {
        return "Order ID: " + orderId + "\nCustomer ID: " + customerId + "\nOrder Date: " + orderDate +
"\nTotal Amount: $" + totalAmount;
    }
```

```
}

public class Main {
    public static void main(String[] args) {
        Inventory inventory = new Inventory();
        Product product1 = new Product("P001", "Laptop", 1000.0, 10);
        Product product2 = new Product("P002", "Smartphone", 500.0, 20);

        inventory.addProduct(product1);
        inventory.addProduct(product2);

        Customer customer = new Customer("C001", "John Doe", "john@example.com");

        customer.addToCart(product1);
        customer.addToCart(product2);

        customer.viewCart();

        customer.checkout();

        inventory.updateProductStock("P001", 1);
        inventory.updateProductStock("P002", 1);

        System.out.println("Updated inventory:");
        System.out.println(inventory.getProductById("P001"));
        System.out.println(inventory.getProductById("P002"));
    }
}
```

Output:

Output

```
java -cp /tmp/BaV1LHrs8P/Main
Cart contents:
Laptop (ID: P001, Price: $1000.0, Stock: 10)
Smartphone (ID: P002, Price: $500.0, Stock: 20)
Order placed successfully. Total amount: $1500.0
Updated inventory:
Laptop (ID: P001, Price: $1000.0, Stock: 9)
Smartphone (ID: P002, Price: $500.0, Stock: 19)

=== Code Execution Successful ===
```