Queen Mary University of London

EBU5503 Database Systems

Coursework Report

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Contents

1 Description

1.1 Requirements

1.1.1 Customer Management

- The system should allow customers to register and create user accounts.
- Customers should be able to update and modify their personal information such as name, address, phone number, and email.
- Customers should have the ability to view and manage their order history.
- Users should be able to view their favorites.

1.1.2 Seller Management

- The system should allow sellers to register and create user accounts.
- Sellers should have the ability to describe themselves, such as the product category and user reviews.
- Sellers should have the ability to manage their products, including adding new products, updating and modifying product information, and tracking product inventory.

1.1.3 Product Management

- The system should provide a platform for sellers to add, edit, and remove products.
- Each product should have attributes such as name, description, price, category, and sales volume.
- Customers should be able to view product details, including description, price, and seller.
- Customers should be able to search for the product they want.
- Customers should have the ability to record their desired product collection for easy search.
- Customers should have the ability to see coupons for products they own.

1.1.4 Order Management

- The system should store the details of the order, including the order ID, the type of products, the quantity purchased, and the price of the products.
- Customers should be able to add products to their shopping orders and proceed to checkout.
- Sellers should receive notifications of new orders and be able to update the order status.
- Customers should be able to track the status of their orders, including shipping and delivery information.
- The customer should have the ability to check the order history.

1.1.5 Payment Management

- The system should support secure payment processing for customer orders.
- The system should have the ability to record payment information, including payment time, payment amount, payment method, and transaction ID provided by the bank.
- Customers should be able to choose payment methods.

1.1.6 Shopping Cart Management

- The system should record the basic information of the product that the customer puts in the cart, so that the customer can find it quickly.
- Customers should have the ability to view, add, and remove products from the shopping cart.

1.1.7 Coupon Management

- The system should have the ability to record the basic information of the coupon, including the start and end time, the scope of application, the conditions of use, and the discount.
- Customers should have the ability to view coupon information.
- When the coupon is about to expire, users should be reminded to use it as soon as possible.

1.2 Assumptions and Functionalities

1.2.1 Clear User Roles

- Users must clearly register as either a customer (customer) or a merchant (seller), with each role having access to different permissions and functionalities.

1.2.2 Complete Product Information

- It is assumed that all products (product) sold on the platform have complete and accurate information, including name, description, price, and stock quantity.

1.2.3 Shopping Cart Functionality

- Customers can add products to their shopping cart (shoppingcart), and the cart will record the time when products are added.
- Products in the shopping cart will retain their price and quantity at the time of addition, even if the product price or stock changes later.

1.2.4 Order Processing

- Customers can generate orders (order) from the shopping cart, and each order will contain detailed order details (orderdetail), including products, quantities, and prices.
- Once an order is created, the merchant receives notification and can update the order status, such as shipped or completed.

1.2.5 Secure Payments

- Customers can choose from multiple payment methods (payment) to complete order payments, and all payment information will be securely processed and stored.

1.2.6 Coupon Usage

- Coupons (coupon) can only be applied to products that meet specific conditions, and each coupon can only be used once.
- When using a coupon, the system will verify the validity and applicability of the coupon.

1.2.7 Order Tracking and Logistics

- Customers can track the status of their orders, including shipping status and logistics information.
- Merchants are responsible for updating the logistics information of orders to ensure accurate tracking by customers.

1.2.8 Data Security and Integrity

- It is assumed that the system has taken appropriate security measures to protect the security and integrity of user data and transaction information.
- The database design follows best practices for data integrity, such as using foreign key constraints to maintain data consistency.

2 Conceptual Schema

2.1 EER Diagram

The EER Diagram is shown below as Figure 1

2.2 Explanation

2.2.1 Entity and Attribute

The database design includes the following entities and their attributes:

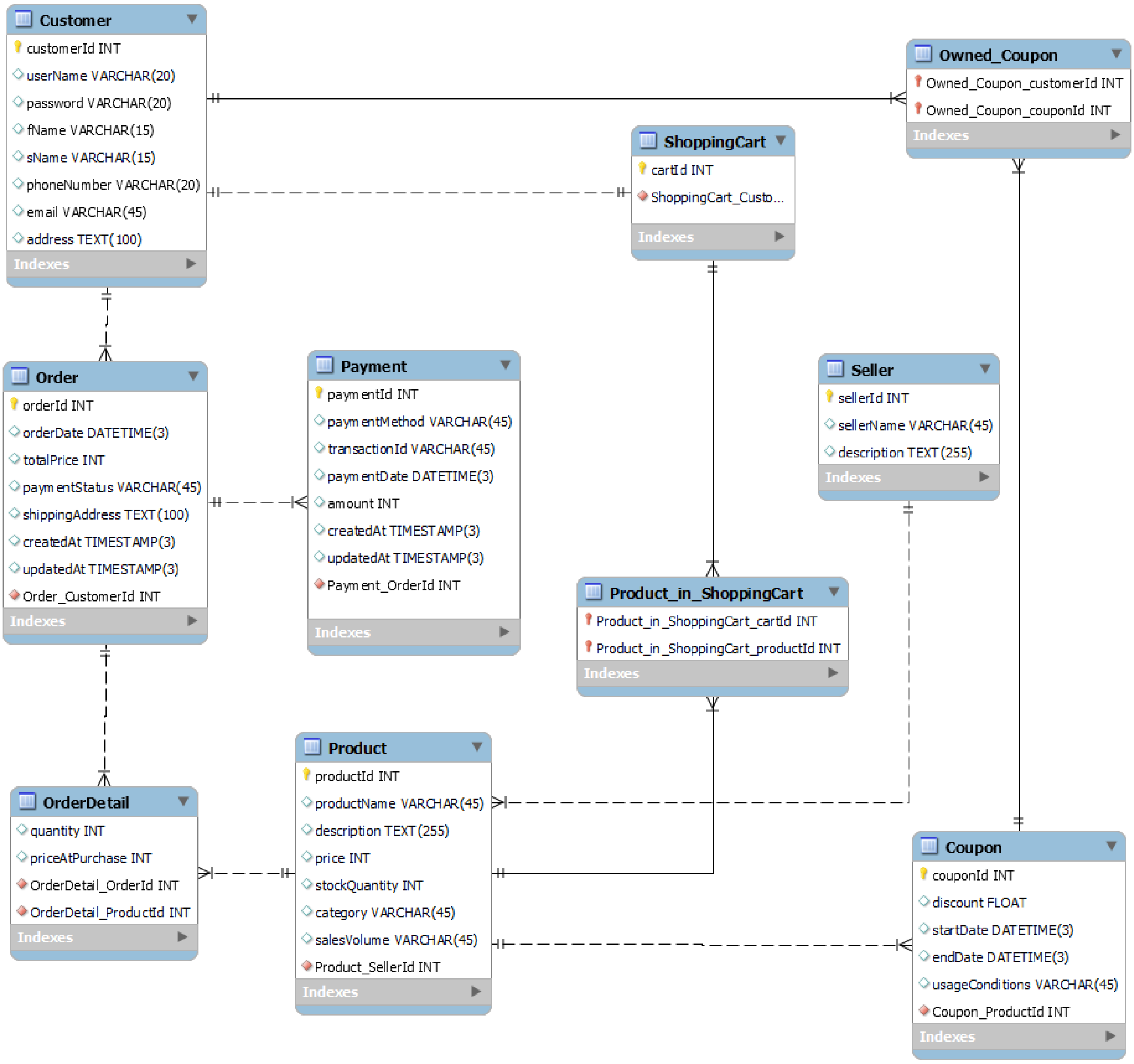


Figure 1: EER diagram

1. **Customer**
    - **Explanation:** Stores all detailed information of customers, including Customer ID (primary key, using INT type to save storage space and enhance search efficiency), username, password, first name, last name, phone number, email, and address.
    - **Introduction:** This entity allows the website to track and manage customer information, supporting functionalities such as user registration, login, personal profile modification, and viewing order history.
2. **Seller**
    - **Explanation:** Stores all detailed information of sellers, including Seller ID (primary key, using INT type) and seller name.
    - **Introduction:** This entity is used for tracking and managing information of merchants on the website, supporting functionalities such as merchant registration, account creation, product category description, and customer reviews.
3. **Product**
    - **Explanation:** Stores all detailed information of products, likely including Product ID, product name, description, price, and stock quantity.
    - **Introduction:** This entity is the core of the website, used for displaying and managing all products for sale, ensuring customers can see and purchase the products they need.
4. **Shopping Cart**
    - **Explanation:** Records information about products added to the customer's shopping cart, including Cart ID (primary key) and Product ID.
    - **Introduction:** This entity allows customers to select products and add them to their shopping cart while browsing the website, preparing for purchase.
5. **Order**
    - **Explanation:** Records information related to the entire order, including Order ID (possibly a primary key), Customer ID (foreign key), and order status.
    - **Introduction:** This entity allows the website to track and manage customer orders, ensuring that orders are processed accurately and timely.
6. **Order Detail**
    - **Explanation:** Records detailed information about each item in an order, including Order Detail ID (possibly a primary key), Order ID (foreign key), Product ID (foreign key), and quantity purchased.
    - **Introduction:** This entity provides more detailed information about orders, including which products were purchased, in what quantity, helping merchants and customers understand the order contents accurately.

7. **Payment**
    - **Explanation:** Records payment information, including Payment ID (possibly a primary key), Order ID (foreign key), payment amount, and payment method.
    - **Introduction:** This entity allows the website to track and manage payment information of orders, ensuring the security and accuracy of the payment process.
8. **Coupon**
    - **Explanation:** Records coupon information, including Coupon ID (primary key), conditions, and validity period.
    - **Introduction:** This entity enables the website to offer coupon functionalities, attracting customers to purchase products, while also validating the effectiveness and applicability of coupons.

2.2.2 Relationship

The database design includes the following relationships between entities:

1. **Customer and Order Relationship**
    - A single Customer can place multiple Orders, establishing a one-to-many (1:m) relationship. This relationship is implemented through the CustomerID foreign key in the Order table.
2. **Order and OrderDetail Relationship**
    - Each Order can include multiple OrderDetails, a one-to-many (1:m) relationship. This is facilitated by the OrderID foreign key in the OrderDetail table.
3. **OrderDetail and Product Relationship**
    - Each OrderDetail corresponds to a specific Product, while a single Product can be associated with multiple OrderDetails, forming a many-to-one (m:1) relationship. This is managed through the ProductID foreign key in the OrderDetail table.
4. **Order and Payment Relationship**
    - An Order can be associated with multiple Payments (such as refunds), a one-to-many (1:m) relationship. This relationship is managed through the OrderID foreign key in the Payment table.
5. **Customer and ShoppingCart Relationship**
    - Each Customer has exactly one ShoppingCart, and each ShoppingCart corresponds to exactly one Customer, establishing a one-to-one (1:1) relationship.
6. **ShoppingCart and Product Relationship**

- A ShoppingCart can contain multiple Products, and a Product can be in different ShoppingCarts, forming a many-to-many (m:m) relationship. This necessitates an associate relationship, Product_in_Shoppingcart, to specifically store the products in each ShoppingCart.

7. **Seller and Product Relationship**

   - A Seller can offer multiple Products, while each Product is associated with only one Seller, forming a one-to-many (1:m) relationship.

8. **Customer and Coupon Relationship**

   - A Customer can have multiple Coupons, and a Coupon can apply to multiple Customers, establishing a many-to-many (m:m) relationship. This requires an associate relationship, Owned_Coupon, to specifically store the coupons owned by each customer.

9. **Coupon and Product Relationship**

   - Each Coupon corresponds to one specific Product, while a Product can have multiple Coupons, forming a many-to-one (m:1) relationship.

3 Relational Database Schema

3.1 Relational Schema

Customer (customerId, userName, password, fName, sName, phoneNumber, email, address)
Seller (sellerId, sellerName, description)
Product (productId, sellerId, productName, description, price, stockQuantity, category, salesVolume)
ShoppingCart (cartId, customerId, productId)
Order (orderId, customerId, orderDate, totalPrice, paymentStatus, shippingAddress, createdAt, updatedAt)
OrderDetail (orderItemId, orderId, productId, quantity, priceAtPurchase)
Payment (paymentId, orderId, paymentMethod, transactionId, paymentDate, amount)
Coupon (couponId, customerId, productId, discount, startDate, endDate, usageCondition)

3.2 Validation using normalisation technique

Customer:

- `customerId` → `userName, password, fName, sName, phoneNumber, Email, Address`

Seller:

- `sellerId` → `sellerName, description`

Product:

- productId → sellerId, productName, description, price, stockQuantity, category, salesVolume

ShoppingCart:

- cartId → customerId, productId

Order:

- orderId → customerId, orderDate, totalPrice, paymentStatus, shippingAddress

OrderDetail:

- orderItemId → orderId, productId, quantity, priceAtPurchase

Payment:

- paymentId → orderId, paymentMethod, transactionId, paymentDate, amount

Coupon:

- couponId → customerId, productId, discount, startDate, endDate, usageCondition

4 Sample Data

The following SQL Insert statements are used to insert sample data:

```sql
-- The customers
INSERT INTO `customer` VALUES('49','DeMorgans','demorgans','Chao','Liu','+8617888888888','jp2022215115@qmul.cn.uk','GuangZhou');
INSERT INTO `customer` VALUES(7,'The Boy Who Lived','Ginny Weasley','Harry','Potter',null,null,' Scottish Highlands, Hogwarts');
INSERT INTO `customer` VALUES('1001', 'DanK1ng', 'password123', 'Dan', 'King', '1234567890', 'danking@example.com', '123 Dan Street');
INSERT INTO `customer` VALUES('1002', 'L1LyQueen', 'pass456789', 'Lily', 'Queen', '0987654321', 'lilyqueen@example.com', '456 Lily Road');
INSERT INTO `customer` VALUES('1003', 'SunnyDay', 'sunny234', 'Sunny', 'Day', '1231231234', 'sunnyday@example.com', '789 Sunny Blvd');
INSERT INTO `customer` VALUES('1004', 'StarNight', 'night321', 'Star', 'Night', '3213214321', 'starnight@example.com', '1010 Star Way');
INSERT INTO `customer` VALUES('1005', 'RiverFlow', 'flow987', 'River', 'Flow', '9876543210', 'riverflow@example.com', '2022 River Rd');
INSERT INTO `customer` VALUES('1006', 'GreenLeaf', 'leaf123', 'Green', 'Leaf', '6543219870', 'greenleaf@example.com', '3030 Leaf Ln');
INSERT INTO `customer` VALUES('1007', 'MoonLight', 'moon456', 'Moon', 'Light', '4567891230', 'moonlight@example.com', '4040 Moon St');
INSERT INTO `customer` VALUES('1008', 'SunRise', 'sunrise123', 'Sun', 'Rise', '1237894560', 'sunrise@example.com', '5050 Sunrise Ave');
INSERT INTO `customer` VALUES('1009', 'WindWhisper', 'wind987', 'Wind', 'Whisper', '9873216540', 'windwhisper@example.com', '6060 Wind Way');
INSERT INTO `customer` VALUES('1010', 'CloudSky', 'cloud123', 'Cloud', 'Sky', '3216549870', 'cloudsky@example.com', '7070 Cloud Rd');
```

```sql

select * from `customer`;



-- The sellers
INSERT INTO `seller` VALUES(40000,'Dark Source Flagship Store','A toy store specializing in warhammer 40K');
INSERT INTO `seller` VALUES(2406,'Ollivanders wand shop','A wand shop with 2,000 years of history.');
INSERT INTO `seller` VALUES('8001', 'Top technology', 'Focus on high-tech electronics');
INSERT INTO `seller` VALUES('8002', 'Acoustic music', 'Provide quality audio equipment');
INSERT INTO `seller` VALUES('8003', 'Home appliance monopoly', 'Supplier of high quality home appliances');
INSERT INTO `seller` VALUES('8004', 'Outdoors Sports', 'Professional outdoor sports equipment supply');
INSERT INTO `seller` VALUES('8005', 'Underwater world', 'Various types of underwater sports equipment are provided');
INSERT INTO `seller` VALUES('8006', 'Tea Garden', 'Professional supply of organic tea');
INSERT INTO `seller` VALUES('8007', 'Moonlight jewelry', 'Specializing in the supply of all kinds of jewelry');
INSERT INTO `seller` VALUES('8008', 'Sunrise food', 'Provide healthy and nutritious breakfast foods');
INSERT INTO `seller` VALUES('8009', 'Wind talk toy', 'Focus on outdoor entertainment toys');
INSERT INTO `seller` VALUES('8010', 'Cloud home', 'Comfortable household items are provided');

select * from `seller`;



-- The products
INSERT INTO `product` VALUES(401,'The Imperial Forbidden Army','Forbidden Guard',209,40,'figure toy',40,40000);
INSERT INTO `product` VALUES(3,'Custom Wand','The wand chooses you.',7,328,'Daily Necessities',null,2406);
INSERT INTO `product` VALUES('5001', 'Smartphone', 'The latest powerful smart phone', '150.00', '50', 'electronics', 12,'8001');
INSERT INTO `product` VALUES('6001', 'Top-tier smart wristband', 'A high-tech smart bracelet made by top technology', '2888', '148', 'electronics', 11,'8001');
INSERT INTO `product` VALUES('5002', 'Bluetooth Headset', 'High quality sound, comfortable to wear', '50.00', '100', 'electronics', 161,'8002');
INSERT INTO `product` VALUES('6002', 'Audio premium Headphones', 'An unparalleled music experience', 1280, '110', 'electronics', 141,'8002');
INSERT INTO `product` VALUES('5003', 'HDTV', 'Ultra HD smart TV, big screen experience', '4888', '30', 'home appliances',1140, '8003');
INSERT INTO `product` VALUES('6003', 'Energy-saving refrigerator', 'Home appliance monopoly recommended energy-saving refrigerator, large capacity, low noise', 3888, 43, 'home appliances',1242, '8003');
INSERT INTO `product` VALUES('5004', 'sports bike', 'A high-performance bike for long rides', '250.00', '40', 'outdoor exercise',204, '8004');
INSERT INTO `product` VALUES('6004', 'hiking shoes', 'Designed for outdoor sports, non-slip, wear resistant', 980.00, '140', 'outdoor exercise',315, '8004');
INSERT INTO `product` VALUES('5005', 'dive watch', 'Waterproof diving watch for diving enthusiasts', 90.00, 60, 'outdoor equipment', 50,'8005');
INSERT INTO `product` VALUES('6005', 'underwater movie camera', 'Underwater World provides underwater cameras with high definition image quality and excellent water resistance', 298.00, 115, 'outdoor equipment', 144,'8005');
INSERT INTO `product` VALUES('5006', 'organic tea', 'Pure organic tea from the mountains', 420.00, '80', 'food',2504, '8006');
INSERT INTO `product` VALUES('6006', 'Green Tea Garden special Longjing', 'The aroma is fresh and the taste is mellow', 680.00, 32, 'food',22, '8006');
INSERT INTO `product` VALUES('5007', 'Moonstone necklace', 'A moonstone necklace with an air of mystery', 120.00, '70', 'jewelry',9, '8007');
INSERT INTO `product` VALUES('6007', 'Moonlight custom necklace', 'Selected gems, exquisite workmanship', 88, 70, 'jewelry',11, '8007');
INSERT INTO `product` VALUES('5008', 'breakfast cereal', 'Nutritious and healthy breakfast options', '55.00', '100', 'food', 4894,'8008');
INSERT INTO `product` VALUES('6008', 'Sunrise cereal', 'Rich in vitamins and minerals', 120, 120, 'food', 3551,'8008');
INSERT INTO `product` VALUES('5009', 'kite', 'High quality kites for all ages', 130.00, '90', 'outdoor toy',112, '8009');
INSERT INTO `product` VALUES('6009', 'Wind talk outdoor kite', 'Unique design and stable flight', 380.00, 54, 'outdoor toy',38, '8009');
INSERT INTO `product` VALUES('5010', 'Cloud cushion', 'Comfortable and soft, suitable for family use', 150.00, 85, 'household supplies',58, '8010');
INSERT INTO `product` VALUES('6010', 'Cloud memory cotton mattress', 'Ergonomically designed to provide the ultimate sleep experience', 588.00, 58, 'household supplies',85, '8010');



-- The order, orderdetail, payment
INSERT INTO `order` VALUES('449','2028-10-1 16:19:25','209','paid','GuangZhou','2028-10-1 16:19:25','2028-10-1 16:19:25',49);
INSERT INTO `orderdetail` VALUES('1','209',449,'401');
INSERT INTO `payment` VALUES('449','WeChat Pay',"TXN2024214394",'2028-10-1 16:20:03',1,'2028-10-1 16:20:03','2028-10-1 16:20:03','449');

INSERT INTO `order` VALUES(7,'1991-07-03 13:07:13','7','paid','Hogwarts, Gryffindor Common Room','1991-07-03 13:07:13','1991-07-03 13:07:13',7);
INSERT INTO `orderdetail` VALUES('1',7,'7','3');
INSERT INTO `payment` VALUES(3,'By galleons',null,'1991-07-03 13:07:33',1,'1991-07-03 13:07:33','1991-07-03 13:07:33',7);

INSERT INTO `order` VALUES('901', '2024-05-15 00:00:00', '300', 'paid', '123 Ding Street', '2024-05-15 00:00:00', '2024-05-15 00:00:00', '1001');
INSERT INTO `orderdetail` VALUES('2', '150.00', '901', '5001');
INSERT INTO `payment` VALUES('601', 'Alipay', 'TXN12345', '2024-05-15 15:17:43', '300.00', '2024-05-15 15:17:43', '2024-05-15 15:17:43', '901');

INSERT INTO `order` VALUES('902', '2024-05-16 14:16:13', '450.00', 'non-payment', '456 Lily Road', '2024-05-16 14:16:13', '2024-05-16 14:16:13', '1002');
INSERT INTO `orderdetail` VALUES('3', '150.00', '902', '5002');
INSERT INTO `payment` VALUES('602', 'WeChat Pay', 'TXN67890', '2024-05-16 14:16:52', '450.00', '2024-05-16 14:16:52', '2024-05-16 14:16:52', '902');

INSERT INTO `order` VALUES('903', '2024-05-17 09:35:25', '550.00', 'paid', '789 Sunny Blvd', '2024-05-17 09:35:25', '2024-05-17 09:35:25', '1003');
INSERT INTO `orderdetail` VALUES( '1', '550.00', '903', '5003');
INSERT INTO `payment` VALUES('603', 'credit card', 'TXN123456', '2024-05-17 09:36:12', '550.00', '2024-05-17 09:36:12', '2024-05-17 09:36:12', '903');

INSERT INTO `order` VALUES('904', '2024-05-18 18:22:16', '750.00', 'non-payment', '1010 Star Way', '2024-05-18 18:22:16', '2024-05-18 18:22:16', '1004');
INSERT INTO `orderdetail` VALUES( '3', '250.00', '904', '5004');
INSERT INTO `payment` VALUES('604', 'PayPal', 'TXN234567', '2024-05-18 18:22:54', '750.00', '2024-05-18 18:22:54', '2024-05-18 18:22:54', '904');

INSERT INTO `order` VALUES('905', '2024-05-19 14:16:15', '180.00', 'paid', '2022 River Rd', '2024-05-19 14:16:15', '2024-05-19 14:16:15', '1005');
INSERT INTO `orderdetail` VALUES( '2', '90.00', '905', '5005');
INSERT INTO `payment` VALUES('605', 'WeChat Pay', 'TXN345678', '2024-05-19 14:18:11' , '180.00', '2024-05-19 14:18:11', '2024-05-19 14:18:11', '905');

INSERT INTO `order` VALUES('906', '2024-05-20 17:20:21', '420.00', 'non-payment', '3030 Leaf Ln', '2024-05-20 17:20:21', '2024-05-20 17:20:21', '1006');
INSERT INTO `orderdetail` VALUES('1', '420.00', '906', '5006');
INSERT INTO `payment` VALUES('606', 'Alipay', 'TXN456789', '2024-05-20 17:20:34', '420.00', '2024-05-20 17:20:34', '2024-05-20 17:20:34', '906');

INSERT INTO `order` VALUES('907', '2024-05-21  21:44:59', '120.00', 'paid', '4040 Moon St', '2024-05-21  21:44:59', '2024-05-21  21:44:59', '1007');
INSERT INTO `orderdetail` VALUES( '1', '120.00', '907', '5007');
INSERT INTO `payment` VALUES('607', 'Credit Card', 'TXN567890', '2024-05-21 21:45:14', '120.00', '2024-05-21 21:45:14', '2024-05-21 21:45:14', '907');

INSERT INTO `order` VALUES('908', '2024-05-22 16:01:43', '55.00', 'non-payment', '5050 Sunrise Ave', '2024-05-22 16:01:43', '2024-05-22 16:01:43', '1008');
INSERT INTO `orderdetail` VALUES( '1', '55.00', '908', '5008');
INSERT INTO `payment` VALUES('608', 'WeChat Pay', 'TXN678901', '2024-05-22 16:02:31', '55.00', '2024-05-22 16:02:31', '2024-05-22 16:02:31', '908');

INSERT INTO `order` VALUES('909', '2024-05-23 10:26:23', '260.00', 'paid', '6060 Wind Way', '2024-05-23 10:26:23', '2024-05-23 10:26:23', '1009');
INSERT INTO `orderdetail` VALUES('2', '130.00', '909', '5009');
INSERT INTO `payment` VALUES('609', 'credit card', 'TXN789012', '2024-05-23 10:26:59', '260.00', '2024-05-23 10:26:59', '2024-05-23 10:26:59', '909');

INSERT INTO `order` VALUES('910', '2024-05-24 11:45:22', '450.00', 'non-payment', '7070 Cloud Rd', '2024-05-24 11:45:22', '2024-05-24 11:45:22', '1010' );
INSERT INTO `orderdetail` VALUES( '3', '150.00', '910', '5010');
INSERT INTO `payment` VALUES('610', 'Alipay', 'TXN890123', '2024-05-24 11:46:22', '450.00', '2024-05-24 11:46:22', '2024-05-24 11:46:22', '910');

```

```


-- The coupon
INSERT INTO ‘coupon‘ VALUES(’449’,’0.8’,’2028-10-1 00:00:00’,’2028-10-7 23:59:59’,’null’,’401’);
INSERT INTO ‘coupon‘ VALUES(7,’0.7’,’1991-07-03 13:07:03’,’1991-07-13 13:07:03’,’You name is Harry Potter’,’3’);
INSERT INTO ‘coupon‘ VALUES(’101’, ’0.85’, ’2024-05-01 00:00:00 ’, ’2024-05-31 23:59:59’, ’It can be used after 100 yuan’, ’5001’);
INSERT INTO ‘coupon‘ VALUES(’102’, ’0.90’, ’2024-05-28 00:00:00’, ’2024-06-10 23:59:59’, ’It can be used after 200 yuan’, ’5002’);
INSERT INTO ‘coupon‘ VALUES(’103’, ’0.80’, ’2024-04-15 00:00:00’, ’2024-06-15 23:59:59’, ’It can be used after 500 yuan’, ’5003’);
INSERT INTO ‘coupon‘ VALUES(’104’, ’0.75’, ’2024-05-01 00:00:00’, ’2024-07-01 23:59:59’, ’It can be used after 300 yuan’, ’5004’);
INSERT INTO ‘coupon‘ VALUES(’105’, ’0.70’, ’2024-04-20 00:00:00’, ’2024-05-20 23:59:59’, ’It can be used after 200 yuan’, ’5005’);
INSERT INTO ‘coupon‘ VALUES(’206’, ’0.70’, ’2024-04-20 00:00:00’, ’2024-05-20 23:59:59’, ’It can be used after 300 yuan’, ’5006’);
INSERT INTO ‘coupon‘ VALUES(’106’, ’0.85’, ’2024-04-20 00:00:00’, ’2024-05-20 23:59:59’,’It can be used after 400 yuan’, ’5006’);
INSERT INTO ‘coupon‘ VALUES(’107’, ’0.80’, ’2024-05-01 00:00:00’, ’2024-06-01 23:59:59’, ’It can be used after 100 yuan’, ’5007’);
INSERT INTO ‘coupon‘ VALUES(’108’, ’0.9’, ’2024-06-01 00:00:00’, ’2024-07-15 23:59:59’, ’It can be used after 50 yuan’, ’5008’);
INSERT INTO ‘coupon‘ VALUES(’208’, ’0.9’, ’2024-06-01 00:00:00’, ’2024-07-15 23:59:59’, ’It can be used after 100 yuan’, ’5008’);
INSERT INTO ‘coupon‘ VALUES(’109’, ’0.85’, ’2024-04-01 00:00:00’, ’2024-05-31 23:59:59’, ’It can be used after 250 yuan’, ’5009’);
INSERT INTO ‘coupon‘ VALUES(’110’,’0.75’, ’2024-05-15 00:00:00’, ’2024-06-30 23:59:59’, ’It can be used after 400 yuan’, ’5010’);
INSERT INTO ‘coupon‘ VALUES(’210’,’0.85’, ’2024-05-15 00:00:00’, ’2024-06-30 23:59:59’, ’It can be used after 200 yuan’, ’5010’);



-- The shoppingcart
INSERT INTO ‘shoppingcart‘ VALUES(’49’,’49’);
INSERT INTO ‘shoppingcart‘ VALUES(7,7);
INSERT INTO ‘shoppingcart‘ VALUES(’201’, ’1001’);
INSERT INTO ‘shoppingcart‘ VALUES(’202’, ’1002’);
INSERT INTO ‘shoppingcart‘ VALUES(’203’, ’1003’);
INSERT INTO ‘shoppingcart‘ VALUES(’204’, ’1004’);
INSERT INTO ‘shoppingcart‘ VALUES(’205’, ’1005’);
INSERT INTO ‘shoppingcart‘ VALUES(’206’, ’1006’);
INSERT INTO ‘shoppingcart‘ VALUES(’207’, ’1007’);
INSERT INTO ‘shoppingcart‘ VALUES(’208’, ’1008’);
INSERT INTO ‘shoppingcart‘ VALUES(’209’, ’1009’);
INSERT INTO ‘shoppingcart‘ VALUES(’210’, ’1010’);




-- The products in shopping cart
```

```sql
INSERT INTO `product_in_shoppingcart` VALUES(49,401);
INSERT INTO `product_in_shoppingcart` VALUES(7,3);
INSERT INTO `product_in_shoppingcart` VALUES('201', '5001');
INSERT INTO `product_in_shoppingcart` VALUES('202', '5002');
INSERT INTO `product_in_shoppingcart` VALUES('202', '6002');
INSERT INTO `product_in_shoppingcart` VALUES('202', '5001');
INSERT INTO `product_in_shoppingcart` VALUES('203', '5003');
INSERT INTO `product_in_shoppingcart` VALUES('203', '6003');
INSERT INTO `product_in_shoppingcart` VALUES('203', '5009');
INSERT INTO `product_in_shoppingcart` VALUES('204', '5004');
INSERT INTO `product_in_shoppingcart` VALUES('204', '6004');
INSERT INTO `product_in_shoppingcart` VALUES('205', '5005');
INSERT INTO `product_in_shoppingcart` VALUES('205', '6005');
INSERT INTO `product_in_shoppingcart` VALUES('206', '5006');
INSERT INTO `product_in_shoppingcart` VALUES('206', '6006');
INSERT INTO `product_in_shoppingcart` VALUES('206', '6010');
INSERT INTO `product_in_shoppingcart` VALUES('206', '6008');
INSERT INTO `product_in_shoppingcart` VALUES('207', '5007');
INSERT INTO `product_in_shoppingcart` VALUES('207', '6007');
INSERT INTO `product_in_shoppingcart` VALUES('207', '6006');
INSERT INTO `product_in_shoppingcart`VALUES('208', '6008');
INSERT INTO `product_in_shoppingcart`VALUES('208', '5008');
INSERT INTO `product_in_shoppingcart` VALUES('209', '5009');
INSERT INTO `product_in_shoppingcart` VALUES('210', '5010');
INSERT INTO `product_in_shoppingcart` VALUES('210', '5003');
INSERT INTO `product_in_shoppingcart` VALUES('210', '6003');



-- The coupons that owned by customers
INSERT INTO `owned_coupon` VALUES(49,449);
INSERT INTO `owned_coupon` VALUES(7,7);
INSERT INTO `owned_coupon` VALUES(1001,101);
INSERT INTO `owned_coupon` VALUES(1002,102);
INSERT INTO `owned_coupon` VALUES(1003,103);
INSERT INTO `owned_coupon` VALUES(1004,104);
INSERT INTO `owned_coupon` VALUES(1005,105);
INSERT INTO `owned_coupon` VALUES(1005,206);
INSERT INTO `owned_coupon` VALUES(1006,106);
INSERT INTO `owned_coupon` VALUES(1007,107);
INSERT INTO `owned_coupon` VALUES(1008,108);
INSERT INTO `owned_coupon` VALUES(1008,208);
INSERT INTO `owned_coupon` VALUES(1009,109);
INSERT INTO `owned_coupon` VALUES(1010,110);
INSERT INTO `owned_coupon` VALUES(1010,210);
```

Listing 1: MySQL Example Code

5 Queries and Results

5.1 Queries

Query 1: Customers with the Most Purchases

```
-- Query the customers who purchased the most and the total number of purchases
SELECT c.customerId, c.fName, c.sName, SUM(od.quantity) AS totalQuantity
FROM customer c
JOIN ‘order‘ o ON c.customerId = o.Order_CustomerId
JOIN orderdetail od ON o.orderId = od.OrderDetail_OrderId
GROUP BY c.customerId, c.fName, c.sName
ORDER BY totalQuantity DESC
LIMIT 1;
```

Query 2: Products Purchased and Still In Stock

```
-- Query all products that customers have purchased and still have in stock
SELECT DISTINCT p.productId, p.productName
FROM product p
JOIN orderdetail od ON p.productId = od.OrderDetail_ProductId
WHERE p.stockQuantity > 0;
```

Query 3: Total Discount for All Customers

```
-- Query the total discount for all customers and their coupons
SELECT c.customerId, c.fName, c.sName, SUM(cou.discount) AS totalDiscount
FROM customer c
LEFT JOIN owned_coupon oc ON c.customerId = oc.Owned_Coupon_customerId
LEFT JOIN coupon cou ON oc.Owned_Coupon_couponId = cou.couponId
GROUP BY c.customerId, c.fName, c.sName;
```

Query 4: Date of Last Purchase for Each Customer

```
-- Query the date of each customer’s last purchase
SELECT c.customerId, c.fName, c.sName, MAX(o.orderDate) AS lastPurchaseDate
FROM customer c
JOIN ‘Order‘ o ON c.customerId = o.Order_CustomerId
GROUP BY c.customerId, c.fName, c.sName;
```

Query 5: Customers Who Placed Orders Within a Certain Date Range

```
-- Query customers who placed orders within a certain date range (within 2024)
   and list the names and quantities of the products they purchased
SELECT MIN(o.orderDate) AS earliestOrderDate, c.customerId, c.fName, c.sName, p.
   productName, SUM(od.quantity) AS quantityPurchased
FROM customer c
```

```sql
JOIN `order` o ON c.customerId = o.Order_CustomerId
JOIN orderdetail od ON o.orderId = od.OrderDetail_OrderId
JOIN product p ON od.OrderDetail_ProductId = p.productId
WHERE o.orderDate BETWEEN '2024-01-01 00:00:00' AND '2024-12-31 00:00:00'
GROUP BY c.customerId, c.fName, c.sName, p.productName;
```

Query 6: Average Price Per Customer

```sql
-- Query the average price per customer
SELECT c.customerId, c.fName, c.sName, AVG(od.priceAtPurchase) AS averagePrice
FROM customer c
JOIN `order` o ON c.customerId = o.Order_CustomerId
JOIN orderdetail od ON o.orderId = od.OrderDetail_OrderId
GROUP BY c.customerId, c.fName, c.sName;
```

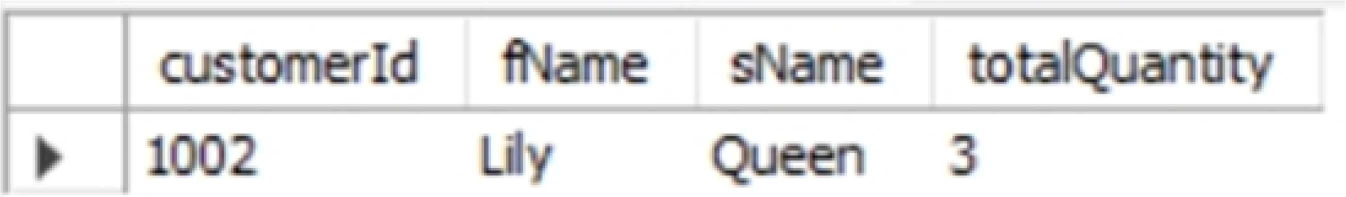
Query 7: Total Price of Items in Each Customer’s Cart

```sql
-- Query the total price of the items in each customer's cart
SELECT sc.cartId, c.customerId, c.fName, c.sName, SUM(p.price) AS totalCartPrice
FROM shoppingcart sc
JOIN customer c ON sc.ShoppingCart_CustomerId = c.customerId
JOIN product_in_shoppingcart pisc ON sc.cartId = pisc.Product_in_ShoppingCart_cartId
JOIN product p ON pisc.Product_in_ShoppingCart_productId = p.productId
GROUP BY sc.cartId, c.customerId, c.fName, c.sName;
```

Query 8: Check for Expiring Coupons in Customer Carts

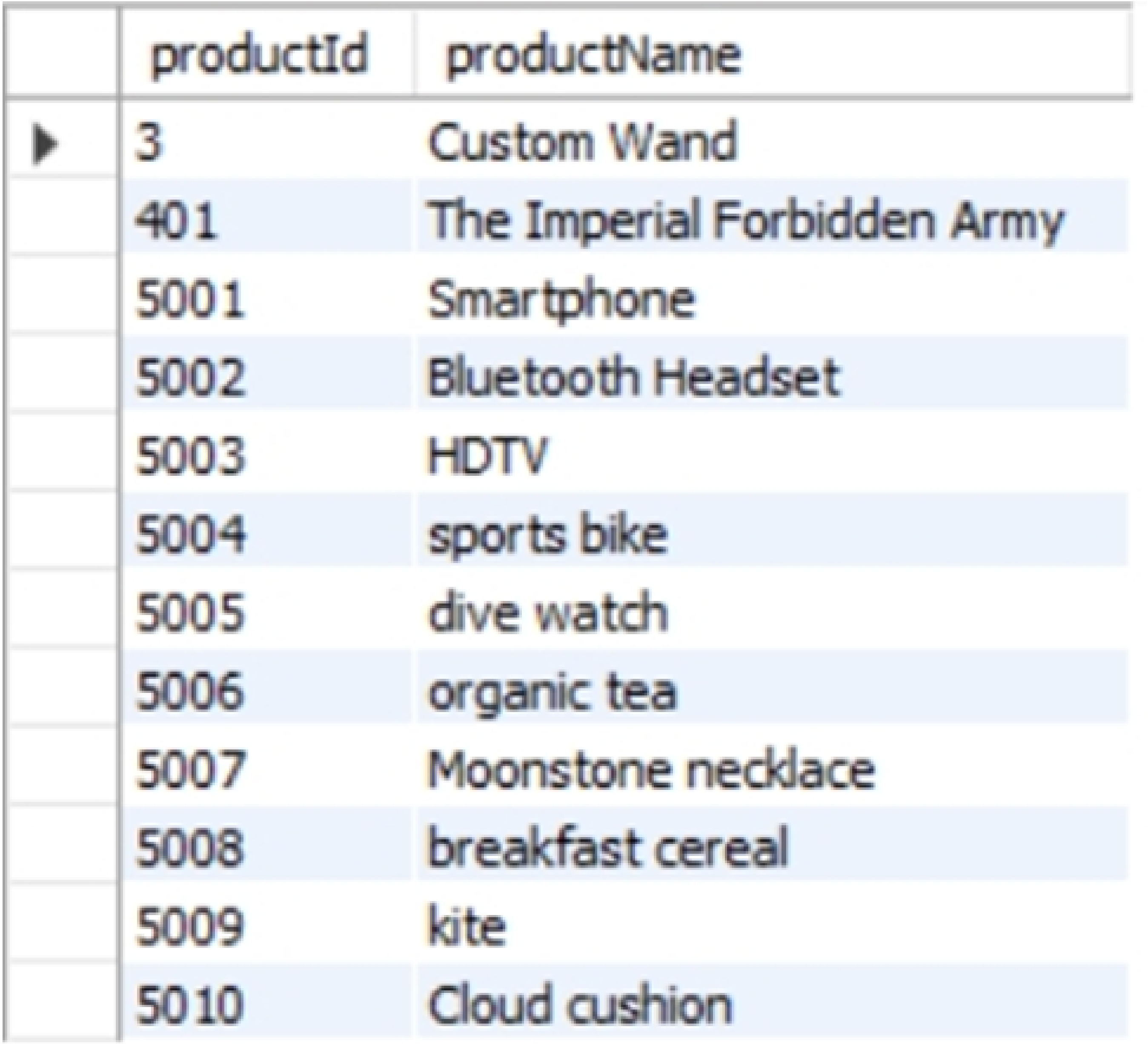
```sql
-- Check each customer's shopping cart to see if there is an item corresponding to an expiring coupon
SELECT DISTINCT c.customerId, c.fName, c.sName
FROM customer c
JOIN shoppingcart sc ON c.customerId = sc.ShoppingCart_CustomerId
JOIN product_in_shoppingcart pisc ON sc.cartId = pisc.Product_in_ShoppingCart_cartId
JOIN product p ON pisc.Product_in_ShoppingCart_productId = p.productId
JOIN owned_coupon oc ON c.customerId = oc.Owned_Coupon_customerId
JOIN coupon cou ON oc.Owned_Coupon_couponId = cou.couponId
WHERE cou.endDate BETWEEN CURTIME() AND DATE_ADD(CURDATE(), INTERVAL 7 DAY)
AND p.productId = cou.Coupon_ProductId;
```

5.2 Results



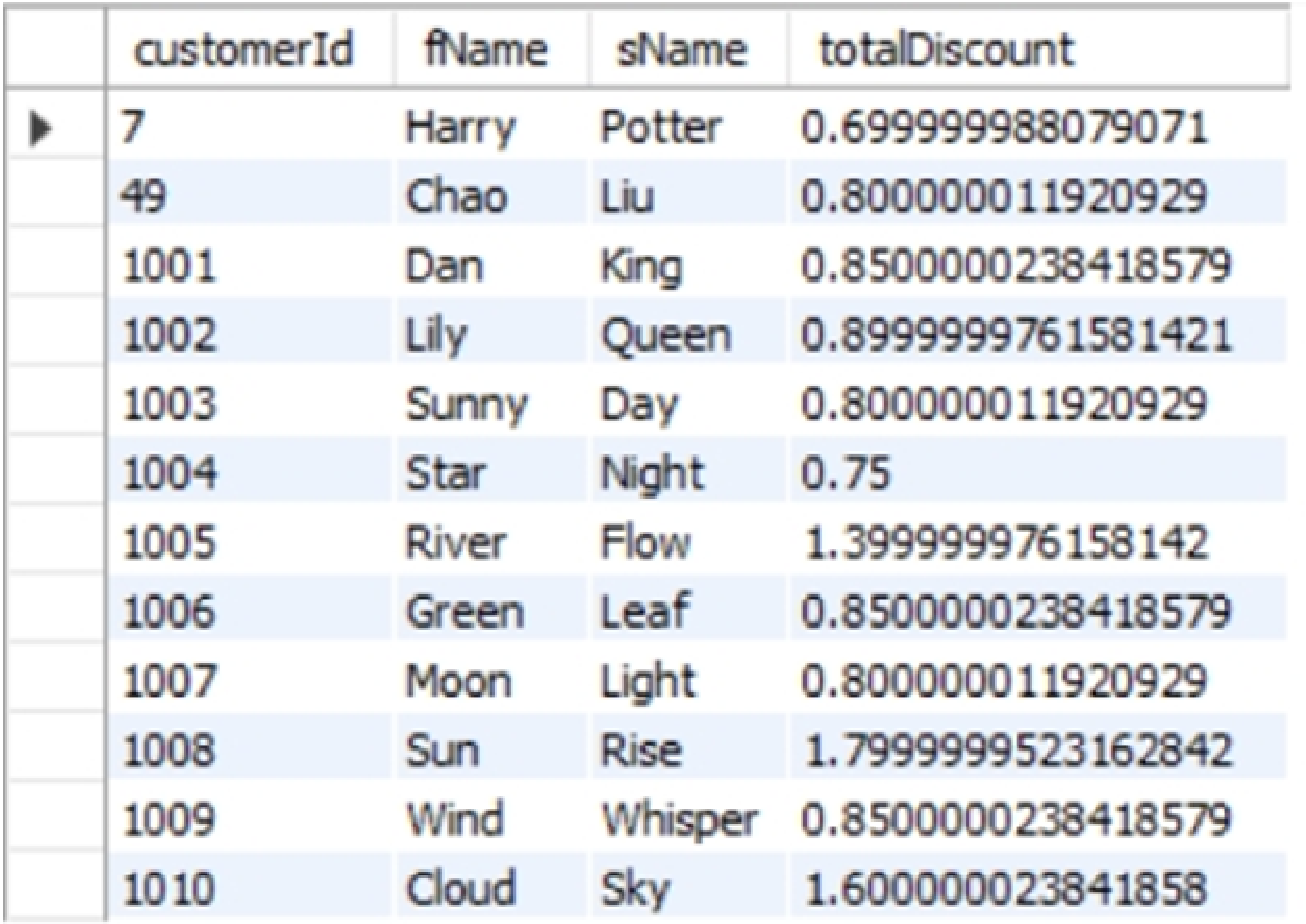
	customerId	fName	sName	totalQuantity
▶	1002	Lily	Queen	3

Figure 2: Result 1



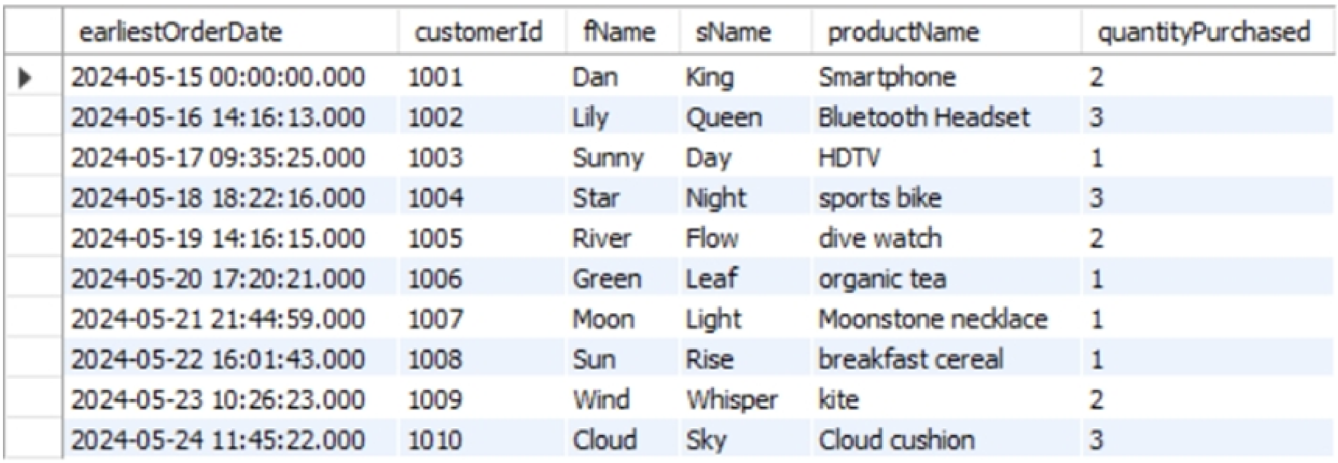
	productId	productName
▶	3	Custom Wand
	401	The Imperial Forbidden Army
	5001	Smartphone
	5002	Bluetooth Headset
	5003	HDTV
	5004	sports bike
	5005	dive watch
	5006	organic tea
	5007	Moonstone necklace
	5008	breakfast cereal
	5009	kite
	5010	Cloud cushion

Figure 3: Result 2



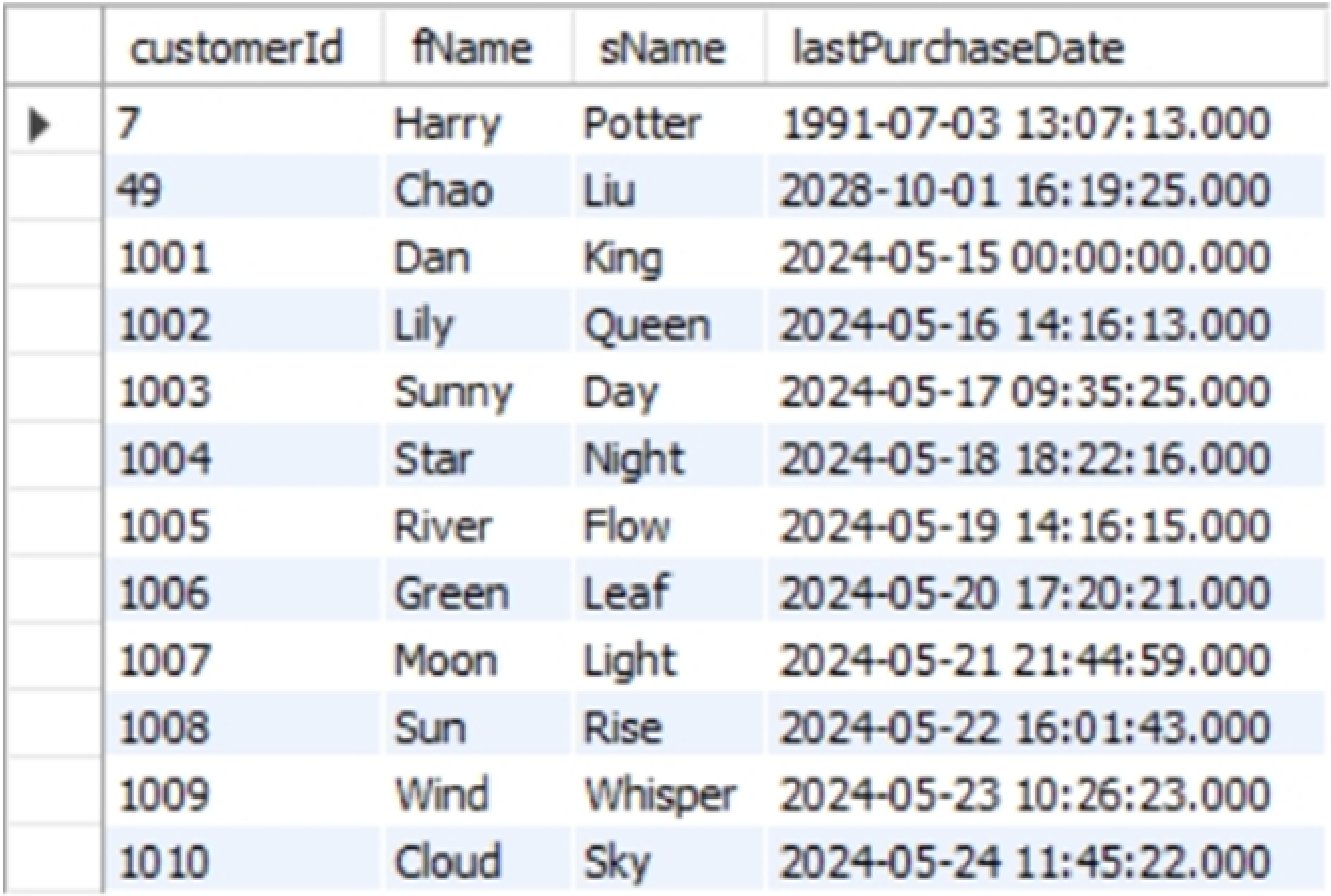
customerId	fName	sName	totalDiscount
7	Harry	Potter	0.699999988079071
49	Chao	Liu	0.800000011920929
1001	Dan	King	0.850000023841858
1002	Lily	Queen	0.899999976158142
1003	Sunny	Day	0.800000011920929
1004	Star	Night	0.75
1005	River	Flow	1.39999997615814
1006	Green	Leaf	0.850000023841858
1007	Moon	Light	0.800000011920929
1008	Sun	Rise	1.79999995231628
1009	Wind	Whisper	0.850000023841858
1010	Cloud	Sky	1.60000002384186

Figure 4: Result 3



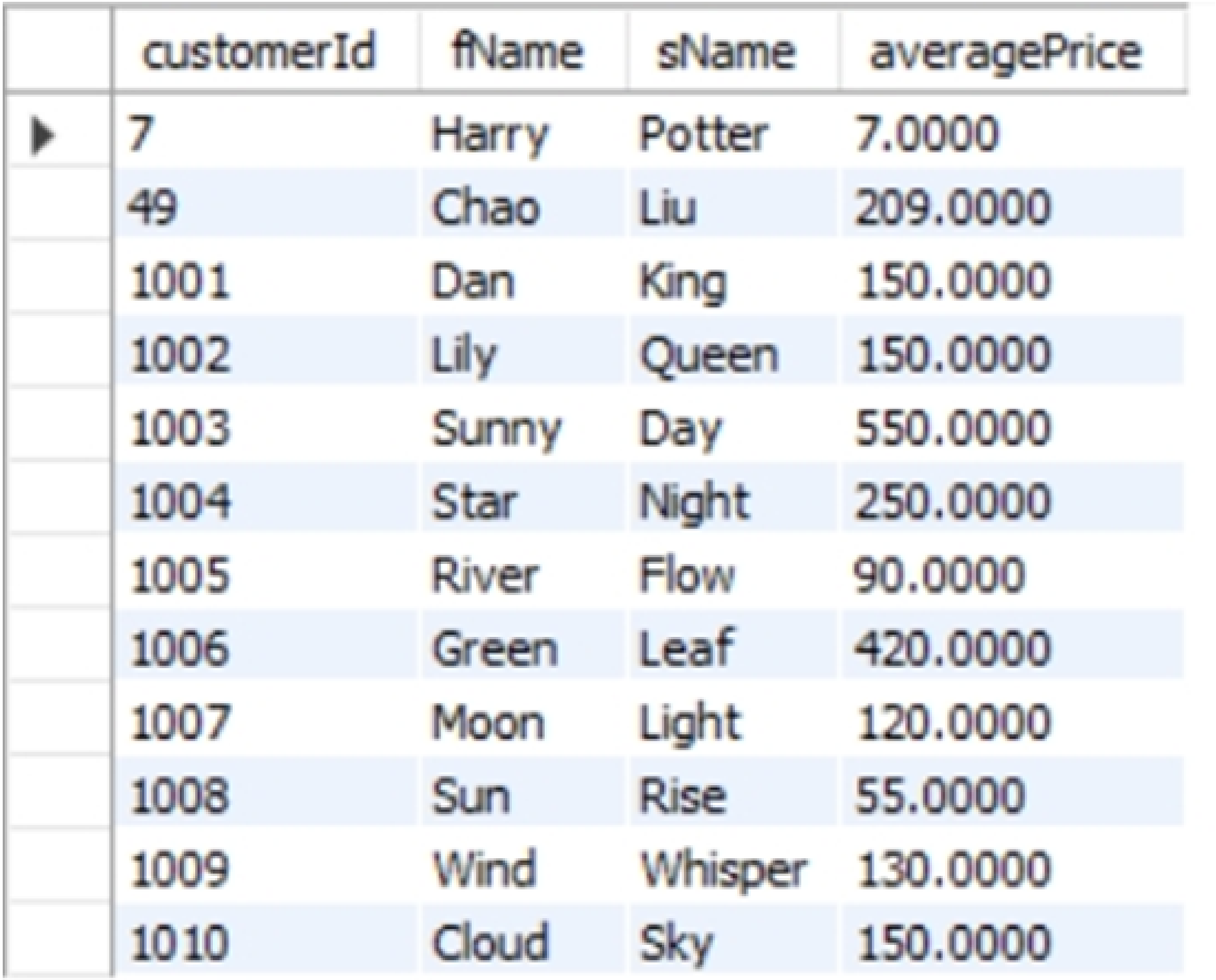
earliestOrderDate	customerId	fName	sName	productName	quantityPurchased
2024-05-15 00:00:00.000	1001	Dan	King	Smartphone	2
2024-05-16 14:16:13.000	1002	Lily	Queen	Bluetooth Headset	3
2024-05-17 09:35:25.000	1003	Sunny	Day	HDTV	1
2024-05-18 18:22:16.000	1004	Star	Night	sports bike	3
2024-05-19 14:16:15.000	1005	River	Flow	dive watch	2
2024-05-20 17:20:21.000	1006	Green	Leaf	organic tea	1
2024-05-21 21:44:59.000	1007	Moon	Light	Moonstone necklace	1
2024-05-22 16:01:43.000	1008	Sun	Rise	breakfast cereal	1
2024-05-23 10:26:23.000	1009	Wind	Whisper	kite	2
2024-05-24 11:45:22.000	1010	Cloud	Sky	Cloud cushion	3

Figure 5: Result 4



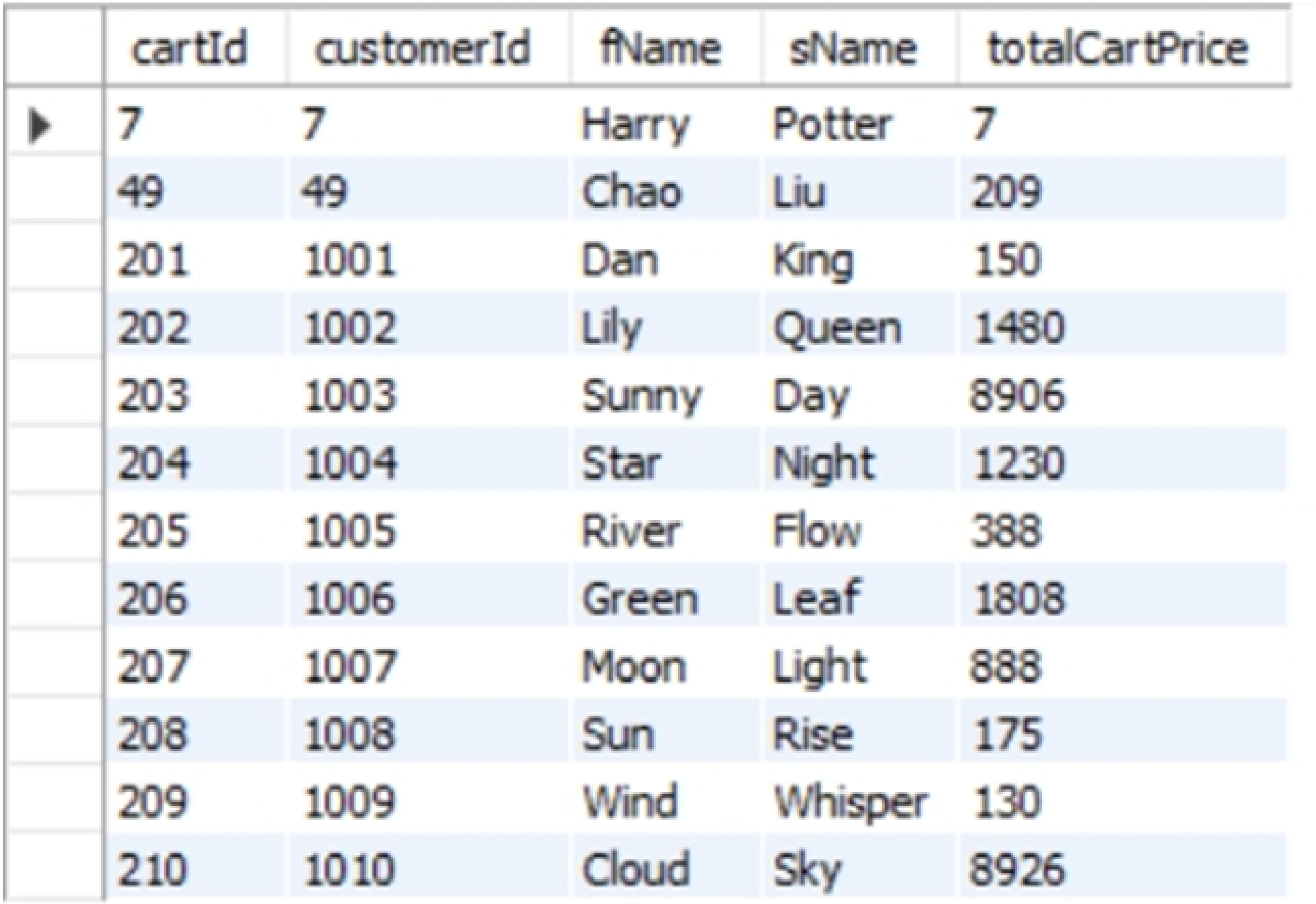
customerId	fName	sName	lastPurchaseDate
7	Harry	Potter	1991-07-03 13:07:13.000
49	Chao	Liu	2028-10-01 16:19:25.000
1001	Dan	King	2024-05-15 00:00:00.000
1002	Lily	Queen	2024-05-16 14:16:13.000
1003	Sunny	Day	2024-05-17 09:35:25.000
1004	Star	Night	2024-05-18 18:22:16.000
1005	River	Flow	2024-05-19 14:16:15.000
1006	Green	Leaf	2024-05-20 17:20:21.000
1007	Moon	Light	2024-05-21 21:44:59.000
1008	Sun	Rise	2024-05-22 16:01:43.000
1009	Wind	Whisper	2024-05-23 10:26:23.000
1010	Cloud	Sky	2024-05-24 11:45:22.000

Figure 6: Result 5



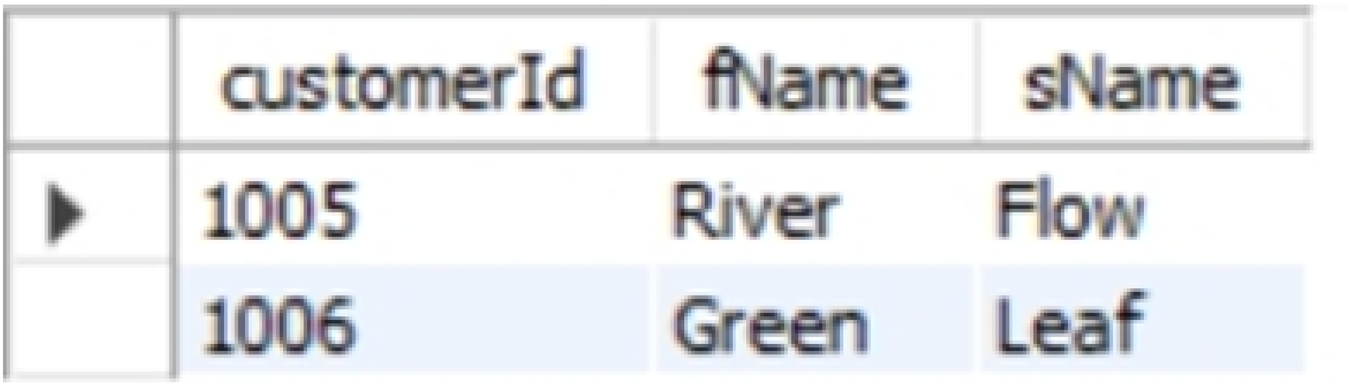
customerId	fName	sName	averagePrice
7	Harry	Potter	7.0000
49	Chao	Liu	209.0000
1001	Dan	King	150.0000
1002	Lily	Queen	150.0000
1003	Sunny	Day	550.0000
1004	Star	Night	250.0000
1005	River	Flow	90.0000
1006	Green	Leaf	420.0000
1007	Moon	Light	120.0000
1008	Sun	Rise	55.0000
1009	Wind	Whisper	130.0000
1010	Cloud	Sky	150.0000

Figure 7: Result 6



cartId	customerId	fName	sName	totalCartPrice
7	7	Harry	Potter	7
49	49	Chao	Liu	209
201	1001	Dan	King	150
202	1002	Lily	Queen	1480
203	1003	Sunny	Day	8906
204	1004	Star	Night	1230
205	1005	River	Flow	388
206	1006	Green	Leaf	1808
207	1007	Moon	Light	888
208	1008	Sun	Rise	175
209	1009	Wind	Whisper	130
210	1010	Cloud	Sky	8926

Figure 8: Result 7



customerId	fName	sName
1005	River	Flow
1006	Green	Leaf

Figure 9: Result 8