Database Final Project Report

FOOD PRODUCTS

Team 3

NAME	NET ID
Chaoran Li	cxl190012
Miao Miao	mxm190020
Yinglu Huang	yxh190064

Project Description

In this project, we design a data system for FOOD PRODUCTS, including data requirements for food products, ER diagram, relational schema, normalization, create table by using SQL/PL

Data Requirement

In this project, we design a data system for FOOD PRODUCTS, including data requirements for food products, ER diagram, relational schema, normalization, create table by using SQL/PL.

1. **Customer and Admin**

   website has two roles, admin and customer. They have several attributes in common, such as name, date of birth, username, and password, so we generalized a superclass People to hold these common features.

   An admin should have an identification. As for Customers, there are payment methods, addresses, and contact to be its specific attributes.
2. **Product**

The product should have an ID as its key attribute. Also there are name, price, and product description as basic attributes to describe a product. We keep an expiration date to see how long could this product be kept in stock.

3. **Batch**

   We use a batch system to manage products' incoming batch and its stock. For a batch, there should be

   a. batch ID: works as an identification;
   b. stock date: when this batch was put into storage;
   c. stock number: how much product there is in one batch;
   d. store number: how much product is still available in this batch.

4. **Order**

   Once a customer places an order on the website, there should be a record of this order saved in the database.

   An order is owned by a customer and related to products that the customer bought. A customer could have more than one order, also could have no order in the record.

   Once a product is removed from the database, the corresponding item in an order should not be removed.

   a. order ID: works as an identification;
   b. purchase date: when the customer placed this order;
   c. comment: feedback from the customer who placed this order.

5. **Shopping Cart**

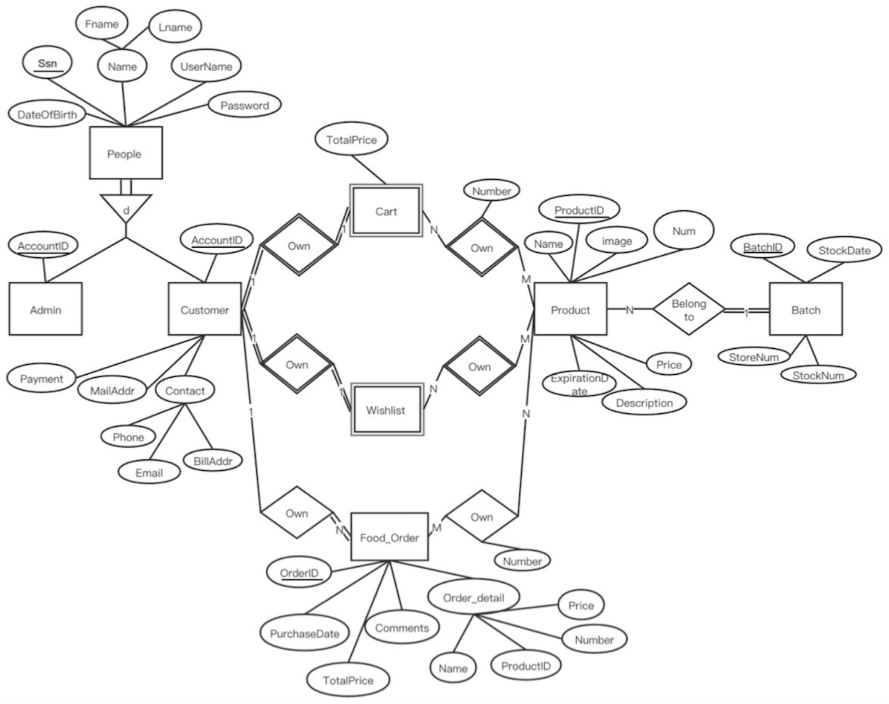
   A shopping cart is owned by a customer, to save items that the customer wants to purchase later. A shopping cart could be empty.

   Items in the cart should correspond to the products. There should be an amount of the product that the customer wants to purchase. Once a product is removed from the database, the item in a shopping cart should also be removed.

6. **Wishlist**

   A customer should also have a wishlist, which is almost a shopping cart without the attribute of the product's amount.

ER Diagram



Relational Model

CUSTOMER (**<u>AccountID</u>**, Fname, Lname, DateOfBirth, SSN, UserName, Password, Payment, MailAddr, BillAddr, Phone, Email)

ADMIN (**<u>AccountID</u>**, Fname, Lname, DateOfBirth, SSN, UserName, Password)

BATCH (**<u>BatchID</u>**, **<u>ProductID</u>**[FK -> PRODUCT.ProductID], StoreNum, StockNum, StockDate)

PRODUCT (**<u>ProductID</u>**, Name, Price, Description, Image, ExpirationDate, Num)

FOOD_ORDER (**<u>OrderID, AccountID</u>**[FK -> CUSTOMER.AccountID], PurchaseDate, TotalPrice, Comments)

ORDERDETAIL (**<u>OrderID</u>**[FK -> ORDER.OrderID], Name, ProductID, Number, Price)

ORDER_OWN_PRODUCT (**<u>OrderID</u>**[FK -> ORDER.OrderID], **<u>ProductID</u>**[FK -> PRODUCT.ProductID], Number)

CART **<u>AccountID</u>**[FK -> CUSTOMER.AccountID], TotalPrice)

CART_OWN_PRODUCT (**<u>AccountID</u>**[FK -> CUSTOMER.AccountID], **<u>ProductID</u>**[FK -> PRODUCT.ProductID], Number)

WISHLIST (**AccountID**[FK -> CUSTOMER.AccountID])

WISHLIST_OWN_PRODUCT (**AccountID**[FK -> CUSTOMER.AccountID], **ProductID**[FK -> PRODUCT.ProductID])

Normalization

There is no functional dependency that would violate 3NF, so the relational model we got from the ER model is already in 3NF.

Create tables

```
CREATE TABLE CUSTOMER (
    AccountID   INT,
    Fname       VARCHAR(25) NOT NULL,
    Lname       VARCHAR(25) NOT NULL,
    DateOfBirth DATE,
    SSN         CHAR(9),
    UserName    VARCHAR(25) NOT NULL,
    Password    VARCHAR(25) NOT NULL,
    Payment     VARCHAR(20) NOT NULL,
    MailAddr    CHAR(50) NOT NULL,
    BillAddr    CHAR(50) NOT NULL,
    Phone       CHAR(10),
    Email       VARCHAR(40),
    PRIMARY KEY (AccountID)
);
```

```
CREATE TABLE ADMIN (
    AccountID   INT,
    Fname       VARCHAR(25) NOT NULL,
    Lname       VARCHAR(25) NOT NULL,
    DateOfBirth DATE,
    SSN         CHAR(9),
    UserName    VARCHAR(25) NOT NULL,
    Password    VARCHAR(25) NOT NULL,
    PRIMARY KEY (AccountID)
);
```

```sql
CREATE TABLE PRODUCT (
    ProductID   INT,
    Name        VARCHAR(50) NOT NULL,
    Price       DECIMAL(10, 2) NOT NULL,
    Description VARCHAR(200),
    Image       VARCHAR(50),
    ExpirationDate  INT NOT NULL,
    Num         INT NOT NULL,
    PRIMARY KEY (ProductID)
);
```

```sql
CREATE TABLE BATCH (
    BatchID     INT,
    ProductID   INT NOT NULL,
    StoreNum    INT NOT NULL,
    StockNum    INT NOT NULL,
    StockDate   DATE NOT NULL,
    PRIMARY KEY (BatchID),
    FOREIGN KEY (ProductID) REFERENCES PRODUCT(ProductID) ON
DELETE CASCADE
);
```

```sql
CREATE TABLE FOOD_ORDER (
    OrderID     INT,
    AccountID   INT NOT NULL,
    PurchaseDate    DATE NOT NULL,
    TotalPrice  DECIMAL(10, 2) NOT NULL,
    Comments    VARCHAR(200),
    PRIMARY KEY (OrderID),
    FOREIGN KEY (AccountID) REFERENCES CUSTOMER(AccountID)
ON DELETE CASCADE
);
```

```
CREATE TABLE ORDER_OWN_PRODUCT (
    OrderID     INT,
    ProductID   INT,
    Number INT NOT NULL,
    PRIMARY KEY (OrderID, ProductID),
    FOREIGN KEY (OrderID) REFERENCES FOOD_ORDER(OrderID) ON
DELETE CASCADE,
    FOREIGN KEY (ProductID) REFERENCES PRODUCT(ProductID) ON
DELETE CASCADE
);
```

```
CREATE TABLE ORDER_DETAIL (
    OrderID     INT,
    ProductID   INT,
    Name        VARCHAR(50) NOT NULL,
    Price       DECIMAL(10, 2) NOT NULL,
    Num         INT NOT NULL,
    PRIMARY KEY (OrderID, ProductID),
    FOREIGN KEY (OrderID) REFERENCES FOOD_ORDER(OrderID) ON
DELETE CASCADE
);
```

```
CREATE TABLE CART (
    AccountID   INT NOT NULL,
    TotalPrice  DECIMAL(10, 2) NOT NULL,
    PRIMARY KEY (AccountID),
    FOREIGN KEY (AccountID) REFERENCES CUSTOMER(AccountID)
ON DELETE CASCADE
);
```

```
CREATE TABLE CART_OWN_PRODUCT (
    AccountID   INT,
    ProductID   INT,
    Num     INT NOT NULL,
    PRIMARY KEY (AccountID, ProductID),
    FOREIGN KEY (AccountID) REFERENCES CUSTOMER(AccountID)
ON DELETE CASCADE,
    FOREIGN KEY (ProductID) REFERENCES PRODUCT(ProductID) ON
DELETE CASCADE
);
```

```
CREATE TABLE WISHLIST (
    AccountID   INT NOT NULL,
    PRIMARY KEY (AccountID),
    FOREIGN KEY (AccountID) REFERENCES CUSTOMER(AccountID)
ON DELETE CASCADE
);
```

```
CREATE TABLE WISHLIST_OWN_PRODUCT (
    AccountID   INT,
    ProductID   INT,
    PRIMARY KEY (AccountID, ProductID),
    FOREIGN KEY (AccountID) REFERENCES CUSTOMER(AccountID)
ON DELETE CASCADE,
    FOREIGN KEY (ProductID) REFERENCES PRODUCT(ProductID) ON
DELETE CASCADE
);
```

PL/SQL

Trigger

1. **Update total price of a shopping cart**

   Add an attribute `TotalPrice` in class cart, to improve database performance. Under the premise of not violating 3NF, increase redundant data and improve efficiency.

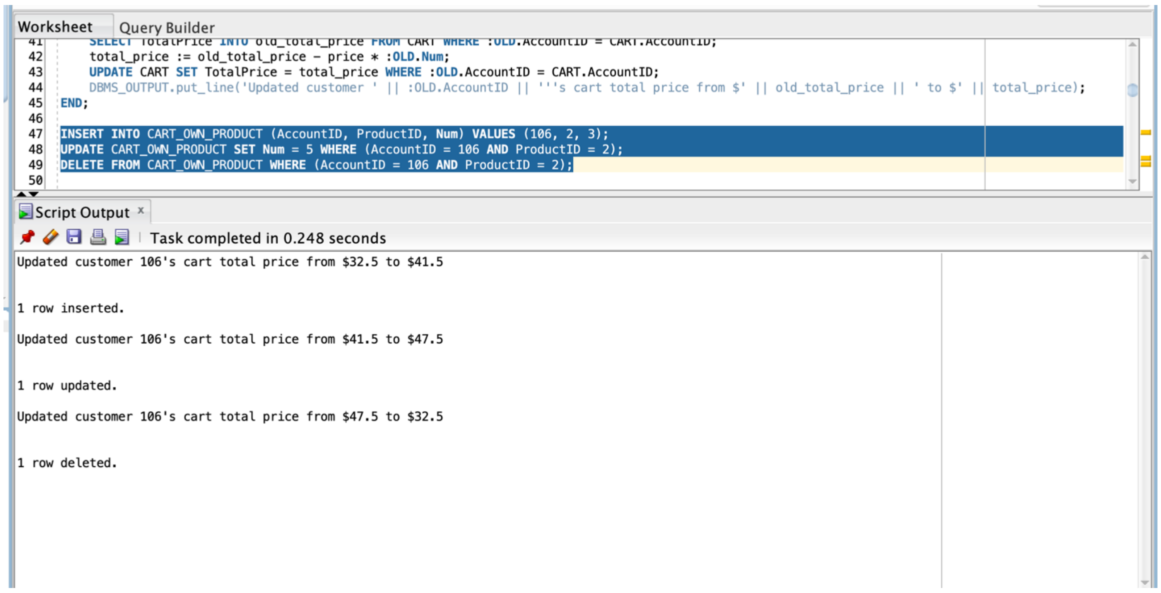
```
--Trigger1 Update TotalPrice in CART after update
CART_OWN_PRODUCT
CREATE or REPLACE TRIGGER UpdateCartPriceForInsert
after INSERT on CART_OWN_PRODUCT
FOR EACH ROW
DECLARE
price           PRODUCT.Price%TYPE;
old_total_price CART.TotalPrice%TYPE;
total_price     CART.TotalPrice%TYPE;
BEGIN
    SELECT Price INTO price FROM PRODUCT WHERE
:NEW.ProductID = PRODUCT.ProductID;
    SELECT TotalPrice INTO old_total_price FROM CART WHERE
:NEW.AccountID = CART.AccountID;
```

```
    total_price := old_total_price + price * :NEW.Num;
    UPDATE CART SET TotalPrice = total_price WHERE
:NEW.AccountID = CART.AccountID;
    DBMS_OUTPUT.put_line('Updated customer ' ||
:NEW.AccountID || '''s cart total price from $' ||
old_total_price || ' to $' || total_price);
END;

CREATE or REPLACE TRIGGER UpdateCartPriceForUpdate
after UPDATE on CART_OWN_PRODUCT
FOR EACH ROW
DECLARE
price           PRODUCT.Price%TYPE;
old_total_price CART.TotalPrice%TYPE;
total_price     CART.TotalPrice%TYPE;
BEGIN
    SELECT Price INTO price FROM PRODUCT WHERE
:NEW.ProductID = PRODUCT.ProductID;
    SELECT TotalPrice INTO old_total_price FROM CART WHERE
:NEW.AccountID = CART.AccountID;
    total_price := old_total_price + price * (:NEW.Num -
:OLD.Num);
    UPDATE CART SET TotalPrice = total_price WHERE
:NEW.AccountID = CART.AccountID;
    DBMS_OUTPUT.put_line('Updated customer ' ||
:NEW.AccountID || '''s cart total price from $' ||
old_total_price || ' to $' || total_price);
END;

CREATE or REPLACE TRIGGER UpdateCartPriceForDelete
after DELETE on CART_OWN_PRODUCT
FOR EACH ROW
DECLARE
price           PRODUCT.Price%TYPE;
old_total_price CART.TotalPrice%TYPE;
total_price     CART.TotalPrice%TYPE;
BEGIN
    SELECT Price INTO price FROM PRODUCT WHERE
:OLD.ProductID = PRODUCT.ProductID;
    SELECT TotalPrice INTO old_total_price FROM CART WHERE
:OLD.AccountID = CART.AccountID;
    total_price := old_total_price - price * :OLD.Num;
    UPDATE CART SET TotalPrice = total_price WHERE
:OLD.AccountID = CART.AccountID;
    DBMS_OUTPUT.put_line('Updated customer ' ||
:OLD.AccountID || '''s cart total price from $' ||
old_total_price || ' to $' || total_price);
END;
```

Achievement Exhibition



```
    SELECT TotalPrice INTO old_total_price FROM CART WHERE :OLD.AccountID = CART.AccountID;
    total_price := old_total_price - price * :OLD.Num;
    UPDATE CART SET TotalPrice = total_price WHERE :OLD.AccountID = CART.AccountID;
    DBMS_OUTPUT.put_line('Updated customer ' || :OLD.AccountID || '''s cart total price from $' || old_total_price || ' to $' || total_price);
END;

INSERT INTO CART_OWN_PRODUCT (AccountID, ProductID, Num) VALUES (106, 2, 3);
UPDATE CART_OWN_PRODUCT SET Num = 5 WHERE (AccountID = 106 AND ProductID = 2);
DELETE FROM CART_OWN_PRODUCT WHERE (AccountID = 106 AND ProductID = 2);
```

Task completed in 0.248 seconds

```
Updated customer 106's cart total price from $32.5 to $41.5


1 row inserted.

Updated customer 106's cart total price from $41.5 to $47.5


1 row updated.

Updated customer 106's cart total price from $47.5 to $32.5


1 row deleted.
```

2. **Update total remaining quantity of the product**

   In class Product, add an attribute `Num` as the total remaining quantity of the product.

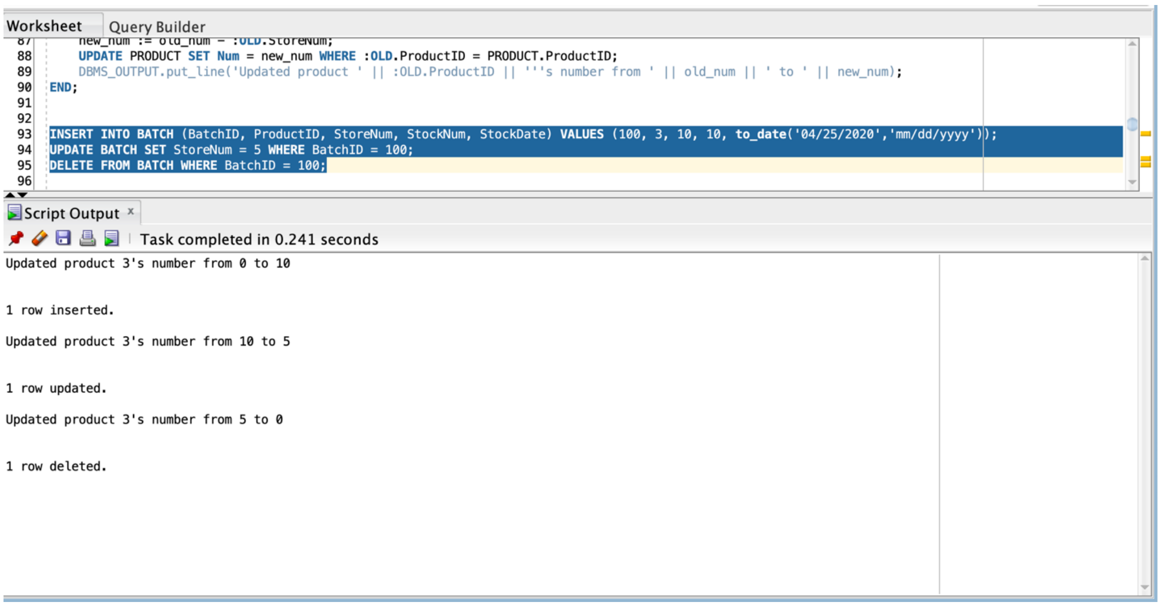
```
--Trigger2 Update Num in PRODUCT after update BATCH
CREATE or REPLACE TRIGGER UpdateProductNumForInsert
after INSERT on BATCH
FOR EACH ROW
DECLARE
old_num          PRODUCT.Num%TYPE;
new_num          PRODUCT.Num%TYPE;
BEGIN
    SELECT Num INTO old_num FROM PRODUCT WHERE
:NEW.ProductID = PRODUCT.ProductID;
    new_num := old_num + :NEW.StoreNum;
    UPDATE PRODUCT SET Num = new_num WHERE :NEW.ProductID =
PRODUCT.ProductID;
    DBMS_OUTPUT.put_line('Updated product ' ||
:NEW.ProductID || '''s number from ' || old_num || ' to ' ||
new_num);
```

```sql
END;

CREATE or REPLACE TRIGGER UpdateProductNumForUpdate
after Update on BATCH
FOR EACH ROW
DECLARE
old_num         PRODUCT.Num%TYPE;
new_num         PRODUCT.Num%TYPE;
BEGIN
    SELECT Num INTO old_num FROM PRODUCT WHERE
:NEW.ProductID = PRODUCT.ProductID;
    new_num := old_num + (:NEW.StoreNum - :OLD.StoreNum);
    UPDATE PRODUCT SET Num = new_num WHERE :NEW.ProductID =
PRODUCT.ProductID;
    DBMS_OUTPUT.put_line('Updated product ' ||
:NEW.ProductID || '''s number from ' || old_num || ' to ' ||
new_num);
END;

CREATE or REPLACE TRIGGER UpdateProductNumForDelete
after DELETE on BATCH
FOR EACH ROW
DECLARE
old_num         PRODUCT.Num%TYPE;
new_num         PRODUCT.Num%TYPE;
BEGIN
    SELECT Num INTO old_num FROM PRODUCT WHERE
:OLD.ProductID = PRODUCT.ProductID;
    new_num := old_num - :OLD.StoreNum;
    UPDATE PRODUCT SET Num = new_num WHERE :OLD.ProductID =
PRODUCT.ProductID;
    DBMS_OUTPUT.put_line('Updated product ' ||
:OLD.ProductID || '''s number from ' || old_num || ' to ' ||
new_num);
END;
```

Achievement Exhibition



```
    new_num := old_num - :OLD.StoreNum;
    UPDATE PRODUCT SET Num = new_num WHERE :OLD.ProductID = PRODUCT.ProductID;
    DBMS_OUTPUT.put_line('Updated product ' || :OLD.ProductID || '''s number from ' || old_num || ' to ' || new_num);
END;


INSERT INTO BATCH (BatchID, ProductID, StoreNum, StockNum, StockDate) VALUES (100, 3, 10, 10, to_date('04/25/2020','mm/dd/yyyy'));
UPDATE BATCH SET StoreNum = 5 WHERE BatchID = 100;
DELETE FROM BATCH WHERE BatchID = 100;
```

Task completed in 0.241 seconds

```
Updated product 3's number from 0 to 10


1 row inserted.

Updated product 3's number from 10 to 5


1 row updated.

Updated product 3's number from 5 to 0


1 row deleted.
```

Procedure

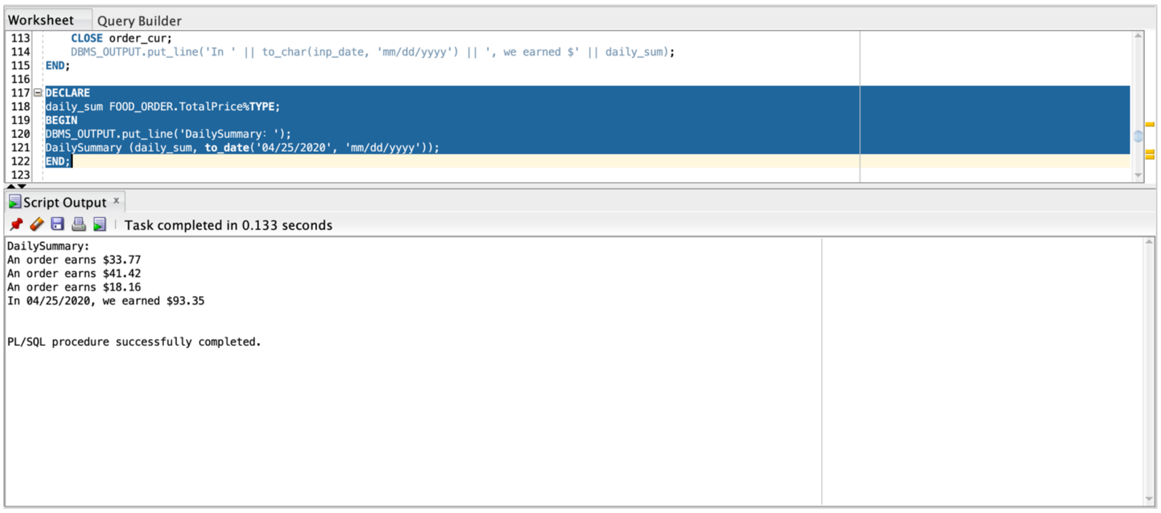
1. **Retrieve the sum of price in a given date**

   Check by day, traverse order_own_product to check the sum of the total price of each order for the same day at the given time. Default date is system day.

```
--Procedure1 Daily summary
CREATE OR REPLACE PROCEDURE DailySummary (inpDate IN
FOOD_ORDER.PurchaseDate%TYPE DEFAULT SYSDATE) AS
    CURSOR order_cur IS SELECT * FROM FOOD_ORDER;
    order_row            FOOD_ORDER%ROWTYPE;
    daily_sum            FOOD_ORDER.TotalPrice%TYPE;
BEGIN
    daily_sum := 0;
    OPEN order_cur;
    LOOP
        FETCH order_cur INTO order_row;
        EXIT WHEN (order_cur%NOTFOUND);
        IF (inpDate = order_row.PurchaseDate) THEN
            daily_sum := daily_sum + order_row.TotalPrice;
            DBMS_OUTPUT.put_line('An order earns $' ||
order_row.TotalPrice);
        END IF;
    END LOOP;
    CLOSE order_cur;
    DBMS_OUTPUT.put_line('In ' || to_char(inpDate,
'mm/dd/yyyy') || ', we earned $' || daily_sum);
```

```
END;
```

Achievement Exhibition



Worksheet Query Builder

```
    CLOSE order_cur;
    DBMS_OUTPUT.put_line('In ' || to_char(inp_date, 'mm/dd/yyyy') || ', we earned $' || daily_sum);
END;

DECLARE
daily_sum FOOD_ORDER.TotalPrice%TYPE;
BEGIN
DBMS_OUTPUT.put_line('DailySummary: ');
DailySummary (daily_sum, to_date('04/25/2020', 'mm/dd/yyyy'));
END;
```

Script Output

Task completed in 0.133 seconds

```
DailySummary:
An order earns $33.77
An order earns $41.42
An order earns $18.16
In 04/25/2020, we earned $93.35


PL/SQL procedure successfully completed.
```

2. **Remove expired batch**

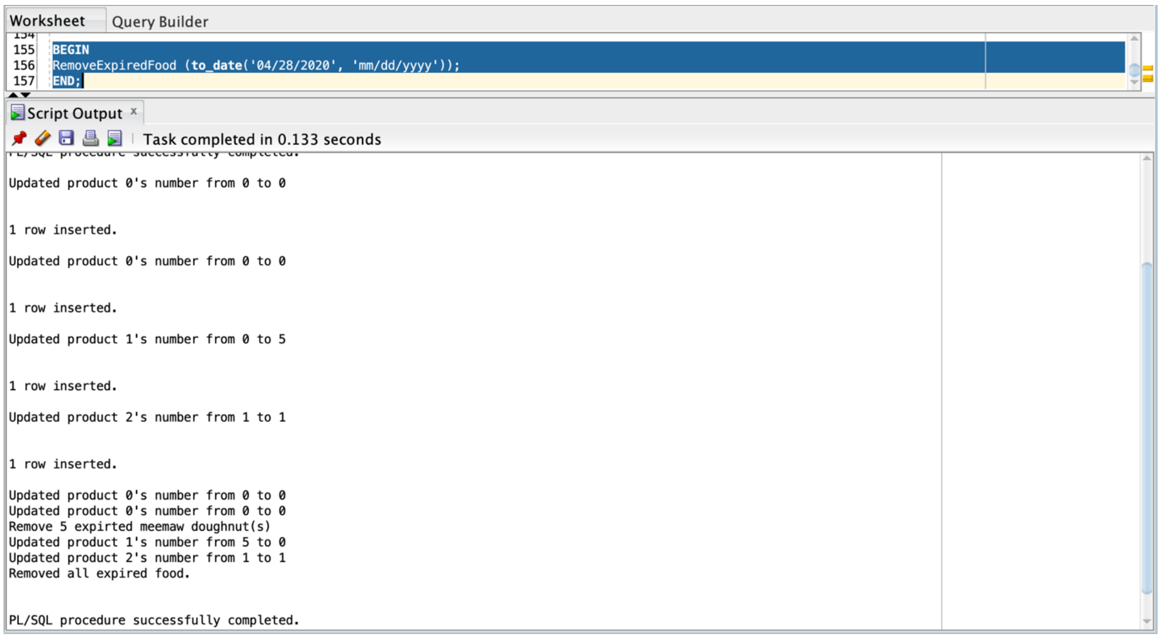
Default input time is the system date. If a batch is not short sold and is removed, the second trigger will be triggered.

```
--Procedure2 Remove Explired Food Batch
CREATE OR REPLACE PROCEDURE RemoveExpiredFood(inpDate IN
FOOD_ORDER.PurchaseDate%TYPE DEFAULT SYSDATE) AS
    product_row         PRODUCT%ROWTYPE;
    difference          INTEGER;
    batch_row           BATCH%ROWTYPE;
    CURSOR batch_cur IS SELECT * FROM BATCH;
BEGIN
    OPEN batch_cur;
    LOOP
        FETCH batch_cur INTO batch_row;
        EXIT WHEN (batch_cur%NOTFOUND);
        SELECT * INTO product_row FROM PRODUCT WHERE
PRODUCT.ProductID = batch_row.ProductID;
        difference := ROUND(to_number(inpDate -
batch_row.StockDate), 0);
        IF (difference > product_row.ExpirationDate) THEN
            IF (batch_row.StoreNum > 0) THEN
                DBMS_OUTPUT.put_line('Remove ' ||
batch_row.StoreNum || ' expirted ' || product_row.Name ||
'(s)');
            END IF;
```

```
                DELETE FROM BATCH WHERE BATCH.BatchID =
batch_row.BatchID;
            END IF;
        END LOOP;
        CLOSE batch_cur;
        DBMS_OUTPUT.put_line('Removed all expired food.');
END;
```

Deleting a record from batch class will trigger the second trigger, so there will be several updates in the result.

The procedure only prints the result when the remove is successful, and does not remove the record when the remaining number of the batch is zero, so there is only one display remove, the others will not display the removing result.



```
BEGIN
RemoveExpiredFood (to_date('04/28/2020', 'mm/dd/yyyy'));
END;
```

```
Updated product 0's number from 0 to 0


1 row inserted.

Updated product 0's number from 0 to 0


1 row inserted.

Updated product 1's number from 0 to 5


1 row inserted.

Updated product 2's number from 1 to 1


1 row inserted.

Updated product 0's number from 0 to 0
Updated product 0's number from 0 to 0
Remove 5 expirted meemaw doughnut(s)
Updated product 1's number from 5 to 0
Updated product 2's number from 1 to 1
Removed all expired food.


PL/SQL procedure successfully completed.
```