

# CS450 – Database System Concepts

Fall 2015

Instructor: Dr. Jessica Lin

## Homework 3 – Due 9/29

**(Do not submit. This homework will not be graded.)**

Consider the following schema for a member-only supermarket inventory and check-out system. Note this is a modified (and simplified) version from the one given in HW1.

Product(UPC, brand, product\_name, product\_description, category, marked\_price, quantity)

Customer(customer\_ID, first\_name, last\_name, age, gender, zip\_code)

Transaction(transaction\_ID, customer\_ID, transaction\_date, payment\_method, total)  
Foreign Key (customer\_ID) references Customer

Transaction\_Contains(transaction\_ID, UPC, quantity)  
Foreign Key (transaction\_ID) references Transaction  
Foreign Key (UPC) references Product

For each relation, the attribute(s) of the primary key is(are) underlined. The foreign key constraints are also specified. Some of the attributes may be irrelevant. For example, some fruits may not have a brand. In such cases, the values of these attributes should be Null.

For simplicity, you can treat transaction\_date as a string and compare dates as follows:  
transaction\_date='09/15/15'

Write the following queries in Relational Algebra.

1. Find the names of all customers who live in zip code "22030."
2. Find the names of all customers who bought something on 09/15/15.
3. Find the customer IDs of all customers who bought Coca Cola products (i.e. brand = "Coca Cola") on 09/15/15.
4. Find the customer IDs of customers who bought Coca Cola or Pepsi products in the past.
5. Find all transactions that contain both Coca Cola products and Pepsi products.
6. Find the names of all customers who bought Coca Cola products and Pepsi products in the same transaction.

7. Find the customer IDs of customers who never made any purchase (It's time for the store to send them some incentives!).
8. Find the most expensive transaction made in August, 2015.