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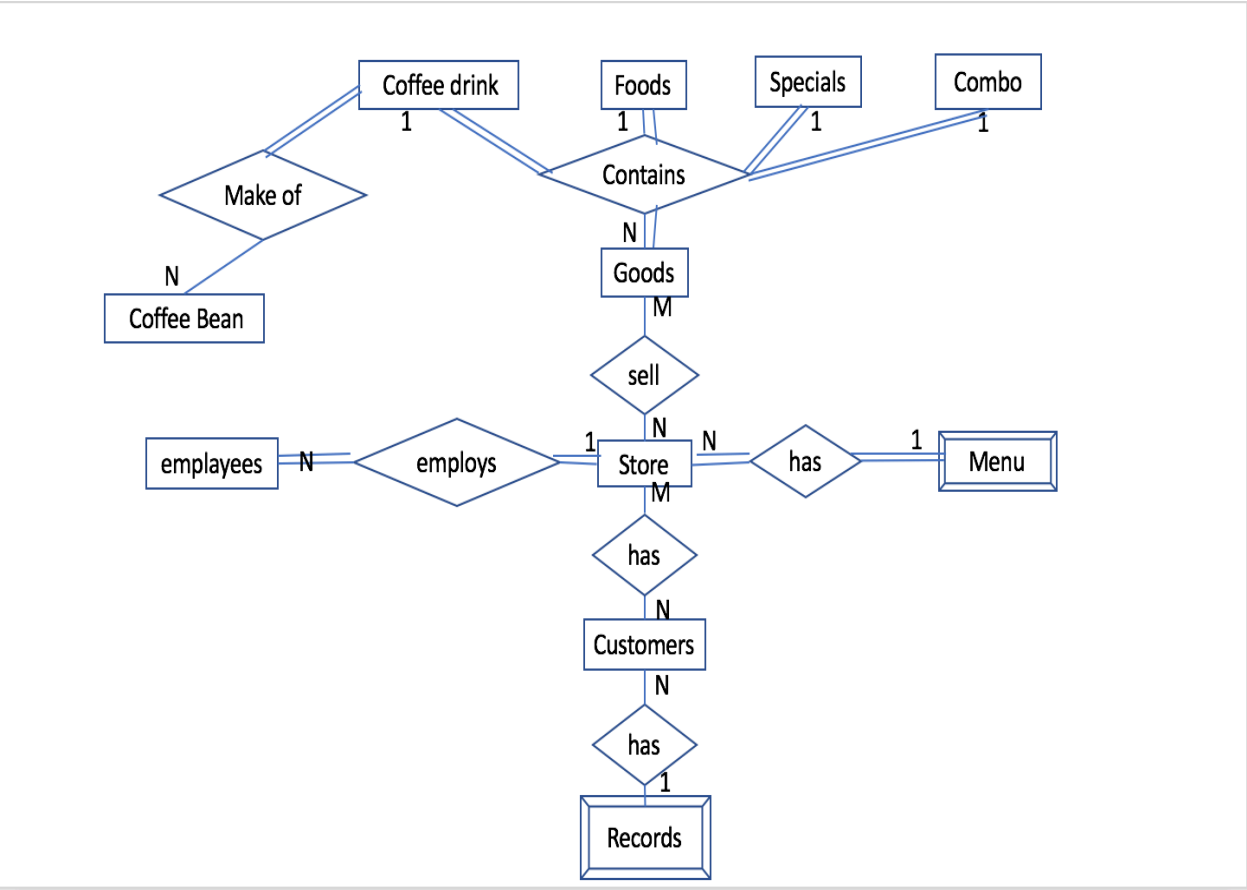
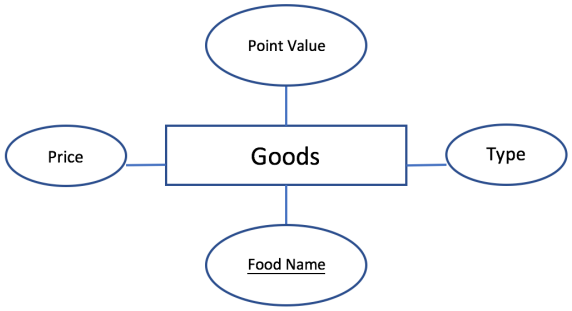
a) The ER diagram is as follow:

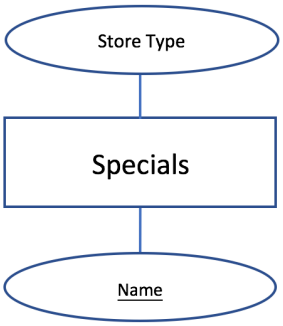


Next, we'll present the detailed attribute design of each entity and the assumptions we made about them respectively:

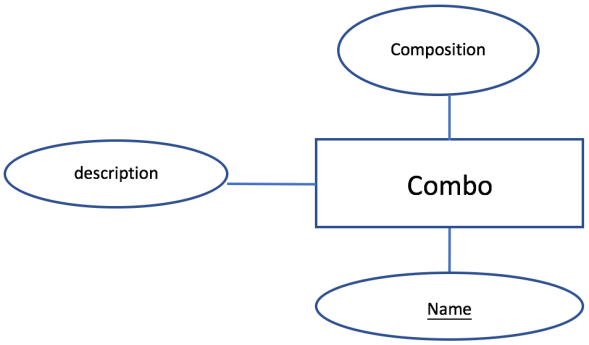
For stores, we assume that each store has its own unique name and address, but the most intuitive attribute to use as the primary key would be their GPS coordinates. We constraint the value of “type” to be either “full service” or “express.”



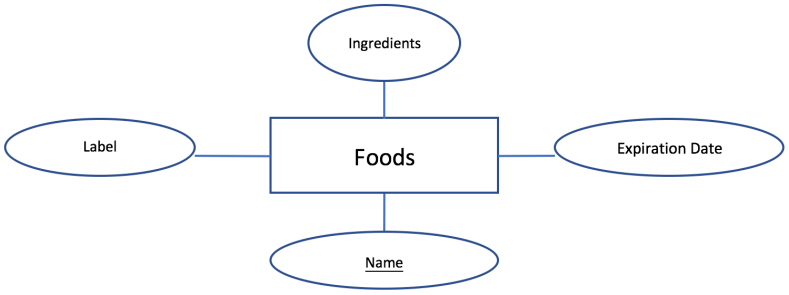
The goods entity stores all possible things that a store can sell, their price, and type (coffee drink, food, combo, or special). The point value stores the points a customer can get after buying the specific good.



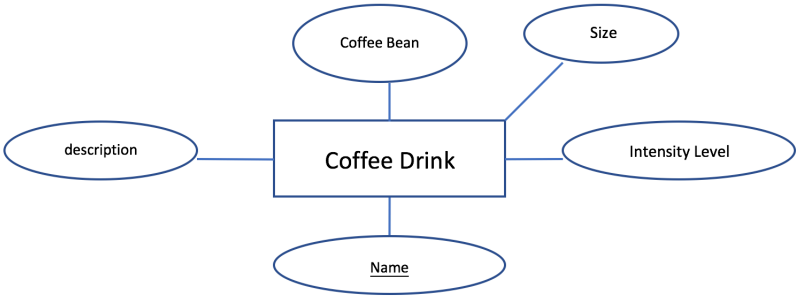
Since each type of store offers different specials, store type needs to be labelled beside each special. The primary key “Name” references to the “Food Name” in entity “Goods.”



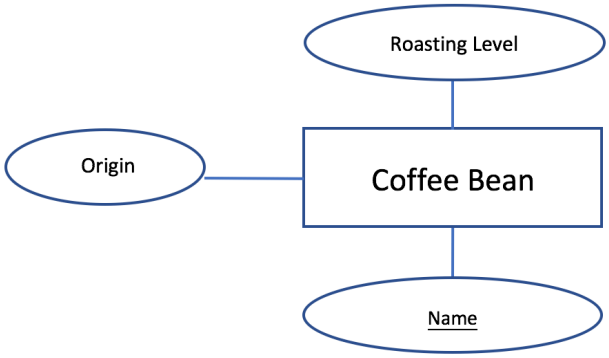
Primary key “Name” references “Food Name” in entity “Goods.”



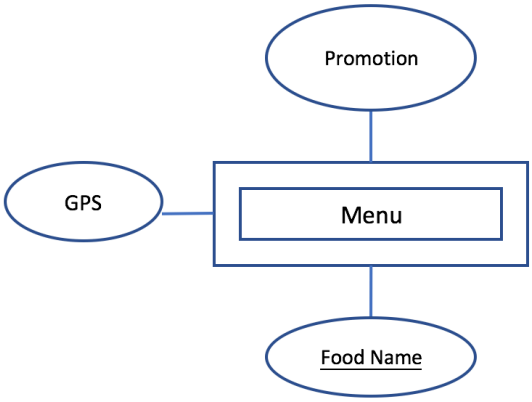
Primary key “Name” references “Food Name” in entity “Goods.”



Primary key “Name” references “Food Name” in entity “Goods.”

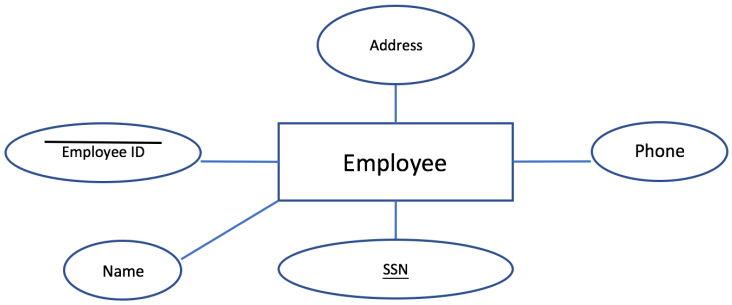


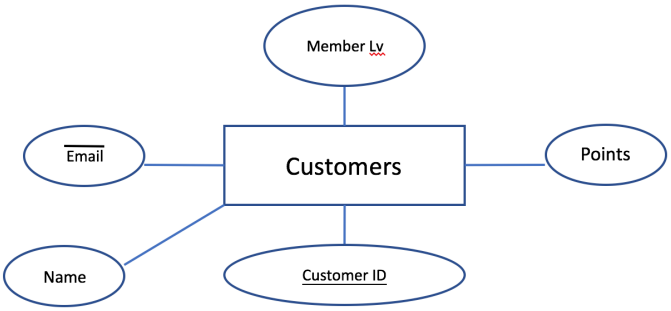
Primary key “Name” references “Coffee Bean” in entity “Coffee Drink.”



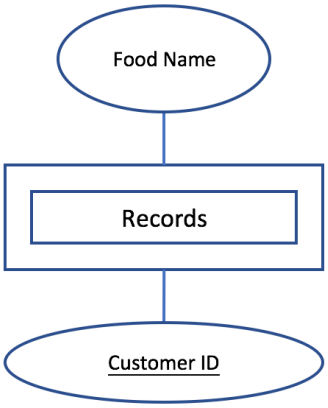
According to the assignment description, each store can have different menus. Therefore, in our design, the menu of each store has their own table (meaning that whenever a new store is added, a new table of Menu should be added.) The GPS attribute is used to tell which store this menu belongs to, which is why menu is a weak entity (it depends on the primary key of other entity).

We assume that each store has their own promotion schedule, and in each store, different goods are promoted during specific time periods of a day. Therefore, we list “Promotion” as an attribute so as to store the period of time when the specific good is promoted in a specific store.





The attribute “Points” stores how many point the customer has accumulated.



The design of the entity “Records” is similar to that of Menu. Each customer has his or her own records, which is kept as a single table in the database.

b)
Store (GPS, Name, Address, Manager, Type)
Primary Key (GPS)
UQ (Name, Address)

Goods (Food_Name, Type, PointValue, Price)
Primary Key (Food_Name)

Coffee_Drink (Name, Size, Intensity_Level, Coffee_bean, Description)
Primary Key (Name)
FK (Coffee_bean)->Coffee_Bean(Name)
FK (Name)->Goods (Food_name)

Foods (Name, Label, Ingredients, Expration_date)
Primary Key (Name)
FK (Name)->Goods (Food_name)

Combo (Name, Composition, Description)
Primary Key (Name)
FK (Name)->Goods (Food_name)

Specials (Name, Store_type)
Primary Key (Name)
FK (Name)->Goods (Food_name)

Coffee_Bean (Name, Origin, Roasting_Level)
Primary Key (Name)

Menu (Food_Name, GPS, Promotion)

Primary Key (Food_Name)

UQ (GPS)

FK (Food_Name)->Goods (Food_Name)

FK (GPS)->Store (GPS)

Customer (Customer_ID, Email, Name, Member_Level, Points, Records)

Primary Key (Customer_ID)

UQ (Email)

FK (Customer_ID)-> Records (Customers_ID)

Employee (SSN, Employee_ID, Name, Address, Phone_number)

Primary Key (SSN)

UQ (Employee_ID, Phone_number)

Records (Customer_ID, Food_name)
Primary Key (Customer_ID)