Using the Unified Modeling Language

The assignment is to create the appropriate UML diagrams for each of the problems listed. Some problems may require more than one diagram.

You are encouraged to use modeling tools. There are a few inside confluence. You may also consider using violet, the UML extension for eclipse, or papyrus. There's a long list of tools at Wikipedia if you don't like any of these. Hand-drawn models may be submitted, but the images must be clear and not require massive magnification.

Problem 1: Represent a Business's Customer

Produce a class diagram to capture the essence of the following objects:

1) A customer is someone who shops at stores. A customer has a name, billing address, a phone number, and a wallet. A business may assign a unique ID to each customer. A customer's wallet may have any number of credit cards. A credit card has a type (AMEX, MC, Visa, Discover), a number that is unique, an expiration date, a three or four digit code, and an issuing bank. A customer may have linked a bank account, which is identified by a routing number and an account number. A customer has a unique user name and password. Passwords must be at least eight (8) characters long.

Problem 2: Model Netflix Customers

Produce a class diagram to capture the essence of the following objects by extending the entities created in the "Business's customer" question:

1) Customers have an age, which is derived from birthday or provided as a number.
2) Customers have a playlist of videos watched or are currently watching.
3) For each entry in the playlist, a pointer to where in the video the customer is presently is kept.
4) Customers may self-identify favorites, either genres or specific titles.
5) Titles may be individual videos or series.
6) Titles have a name, a rating, a genre, a length, the names of the directors and actors, and an identifier of its type (high definition or standard definition)

Problem 3: Model Streaming Video

Produce a class diagram to capture the essence of the following objects:

1) A pixel has four properties: red, green, blue, and intensity. A picture is a *l* by *w* collection of pixels (where *l* means *length* and *w* means *width*) where the position of any given pixel in the picture is given as (*l*, *w*).
2) Audio is a collection of encoded samples, where the encoding can be one of MP3, Vorbis, AAC or Opus. MP3 is an ordered collection of frames, with each frame being an MP3 header and MP3 data.
3) A video is a collection of pictures and audio synchronized by time. Thus, video is sequencing through a number of pictures (frames) at a given rate (meaning in plain speak, moving pictures are created by flipping through 30 pictures a second) along with playing

the audio samples that correspond to the same time segment (meaning in plain speak, the audio track is flipping through the audio samples for the same second as the video). A video comes in standard definition, high definition, blu-ray, and ultra-high definition (4K), meaning the corresponding video is of a certain picture density (number of pixels).

Problem 4: Coffee Shop

Supply the appropriate diagrams for each part of the problem.

Part 1. Considering *Use Case$_0$* in the lecture notes, present use case diagrams from the customer's and from the barista's perspective.

Suppose the coffee shop in *Use Case$_0$* wants to add food to its menu:

4) Starts when the customer approaches the counter and the cashier says "How may I help you?"
5) The customer tells the cashier what she wants. The cashier acknowledges the item.
6) The cashier enters the item into the point-of-sale system (POS)
7) This dialogue continues until the customer either stops talking or says "that's it."
8) The cashier then repeats the entire order.
9) If the order includes one or more drinks, the cashier gets a cup for each drink.
10) The cashier asks for the customer's name and notes it on the order and on each cup.
11) The customer pays for the order
12) The cashier records the payment
13) If there are drinks that require the expresso machine, the cashier communicates the order details to the barista. In parallel, if there are food items in the order, the cashier communicates the order details to the food handler.
14) If there are drinks that do not require the expresso machine, the cashier prepares each of these drinks and hands them to the customer.
15) The food handler prepares the food order. When each item is done, the food handler places the item on the pick-up counter and calls out the type of food the item is.
16) The barista prepares the beverage order.
17) Upon completion of the order, the barista places the beverages on the pick-up counter and calls the customer's name
18) The customer picks up the beverage and walks away. FIN.

Part 2. Extend the use case diagrams for the customer's and cashier's perspective.
Part 3. Create a static data model for the extended coffee shop example.
Part 4. Create a sequence diagram for the extended coffee shop example.

Problem 5: Model a Grocery Store

Propose a UML information model to cover shopping at a grocery store. You can make it a plain vanilla store or you can make it fancy like Whole Foods.

For scope, your model should cover everything needed to answer questions about products, products on shelves (which products are on which shelves), and product prices. In other words, your model should be able to answer questions that would enable a shopper to peruse shelves, pick products, and put products into a cart.

More details about the information the model should support:

1. Products may be food or non-food items

2. Food products may be packaged or loose

3. All products have a price.

4. All products may be a sale item (discounted).

5. Loose products are sold by count or weight.

6. All packaged products have a UPC code.

7. All loose products have store code.

8. Food products are not taxed. Non food items are taxed (6%).

9. Customers may be known to the store. They may not be known. They are known through phone numbers.

10. Customers may have a wallet, which may have zero or more credit cards.

11. Customers may select which credit card to pay for a purchase. Customers may have a preferred credit card (a default card).

12. Credit cards are composed of a cc number, expiration date, user's name, CVV, type (AMEX, MC, Visa, Discover), and possibly a bank.

13. Customers may pay in cash.

14. Receipts contain information about day/time, customer, items purchased, taxation, item categories (e.g. dairy, produce, deli, packaged goods, dry goods), cashier number, register id, payment method.
15. Cashiers have names and ID numbers.

16. Cash registers have ID numbers.

17. Shelves can handle a fixed number of items based on the size of the items. Shelves are arranged into rows. More than one shelf may be in a row. Rows have names (numbers). Shelves have names (numbers).

Your modeling should include behaviors for shopping and check-out. Assume normal credit validations during check-out. Check-out generates a receipt, which saved for later data science work.