CSCI165 Computer Science II
Lab Exercise
Object Oriented Composition

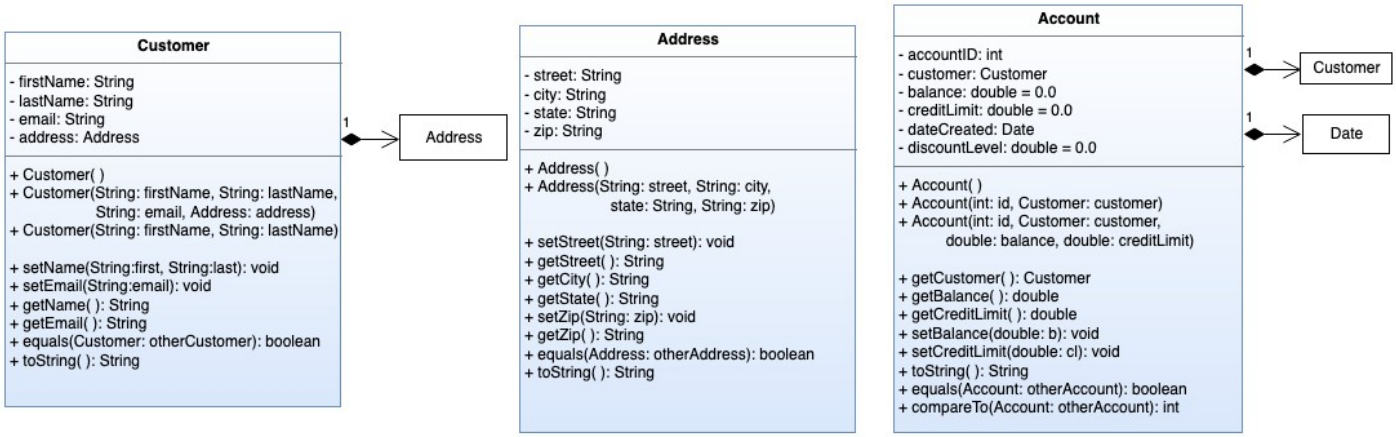
This is part one of this lab. Expect more later this week

In UML Composition is 

represented by:

Lab Task One: Define properly encapsulated Java classes to represent the following composition diagram. Use the Date class that was included in the code for this week.

Privacy Leaks must be prevented



Domain Validation:

- **Customer:**
  - **Email:**
    - must contain an **@** and only one **@**
    - a top-level domain of either ***2 or 3 characters***
    - The top-level domain must be at the end of the email
    - @ must occur **before** the domain
    - If email is invalid set the field to “none on file”

- **Address:**
  - **City, State:** These fields should be populated automatically by specifying a zip code. I have included an offline version of ***zip_code_database.csv*** or you could research and figure out how to talk to the USPS Web Tools API: https://www.usps.com/business/web-tools-apis/welcome.htm Validate the zip code also . . . if it is invalid decide on a way to handle this. I can help you brainstorm. I am interested in your design choices.

- **Account:**
  - **Credit Limit:** Cannot be more than 200% of the balance. If it is, make it 200% of the balance.
  - **Balance, Credit Limit and Discount Level:** Cannot be negative
  - **Discount Level:** For every year the account has been active it gets a 2% discount.

- **Product:**
  - **SKU:** Must be 10-character length string starting with one of the following
    - 001, 002, 003, 004, 110
  - **Price:** Cannot be negative

Unit Test: Define unit tests for each of the requirements above. Be sure to include full coverage. If you are unsure of this, talk to me.

Driver:

- Define a Driver class that demonstrates that you can create instances of the Invoice class. Demonstrate that you can stack toString and equals calls. Ensure that there are no null pointers.

- Open **customers.txt** and build an array of 1000 Customer objects with this data. A postal code is provided, the city and state will need to be pulled from the zip code database.

Lab Part 2: Application

Ask questions if anything is unclear

Products: Create an array of 1000 products

- The products are listed in the file **products.txt** This is randomly generated data so expect the names and descriptions to not be logical. This is not relevant, and I do not want to debate it. These data are tab separated.

Accounts: Create an array of 1000 accounts

- **Customer:** Randomly assign from provided list. You can just go sequentially.
- **Date Created:** generate a random valid date within the last 15 years
- **Account ID:** Take the customer first and last name and
    - Remove all vowels
    - Convert the consonants to all upper case, concatenate together
    - Concatenate the date created with no slashes ***mmddyyyy*** pad with zeros if necessary
    - Calculate a ***check digit*** by summing the ASCII/Unicode values of the name consonants and modulus length_of_name_with_vowels_removed
    - **Example:** Ken 03/06/2020 => KN030620201
        - K = 75, N = 78
        - 75 + 78 = 153
        - Length of “KN” = 2
        - 153 % 2 = 1 => check digit equals 1
        - Concatenate check digit to the ID
    - You do not have to worry about handling ID clashes
- **Discount Level:** Assign discount level based on date created
- **Balance:** Randomly generate
- **Credit Limit:** Initialize to 10% of balance

Invoice: Create an array of 1000 Invoice objects

- Implement compareTo on the amount due
- Randomly select accounts. They can be duplicated
- For each Invoice randomly add between 1 and 20 products

- Implement a selection sort on the Invoice array. Do not use an API sort method. Write your own
    - https://en.wikipedia.org/wiki/Selection_sort
    - https://www.cs.usfca.edu/~galles/visualization/ComparisonSort.html

- Once the array is sorted, iterate through the array showing the toString for each invoice. Pause the display at each invoice and allow for a button press to advance to the next display.
- **Submit:** push ***Invoice.java, Customer.java. Product.java, Account.java, Address.java***, all text files and all unit test files