Project 5 — Online Groceries

PART 2

CS 2370

Background

In this program, you add to part 1 and complete this application.

With the COVID-19 quarantine, many people have ordered their groceries online for home delivery. This project will print a report of online orders from a fictional grocery chain. There are 3 input files to process:

- *customers.txt (you did this in part 1)*
- *items.txt (you did this in part 1)*
- *orders.txt*

(From part 1):
The first file holds customer data in a single text line the following:

810003,Kai Antonikov,31 Prairie Rose Street,Philadelphia,PA,19196,215-975-7421,kantonikov0@4shared.com

The data fields are the customer id, name, street, city, state, zip, phone, and email.

The file *items.txt* has fields item_id, description, and price:

57464,Almonds Ground Blanched,2.99

(New in Part 2):
Orders.txt holds **2 lines per order**. The first line contains the customer id, order number, order date, and then a variable-length list of `item_id-quantity` pairs:

762212,1,2020-03-15,10951-3,64612-2,57544-1,80145-1,27515-2,16736-1,79758-2,29286-2,51822-3,39096-1,32641-3, …

In the line above 3 items of product #10951 were ordered, 2 of product #64612, etc. Note that all fields in all files are comma-separated, and that the `item_id-quantity` pairs in *orders.txt* are separated by a dash.

The second line contains payment information in the form of payment code, and payment information. There are 3 types of payments:

- 1 = credit card (card number and expiration date)
- 2 = PayPal (paypal_id only)
- 3 = wire transfer (bank_id and account_id)

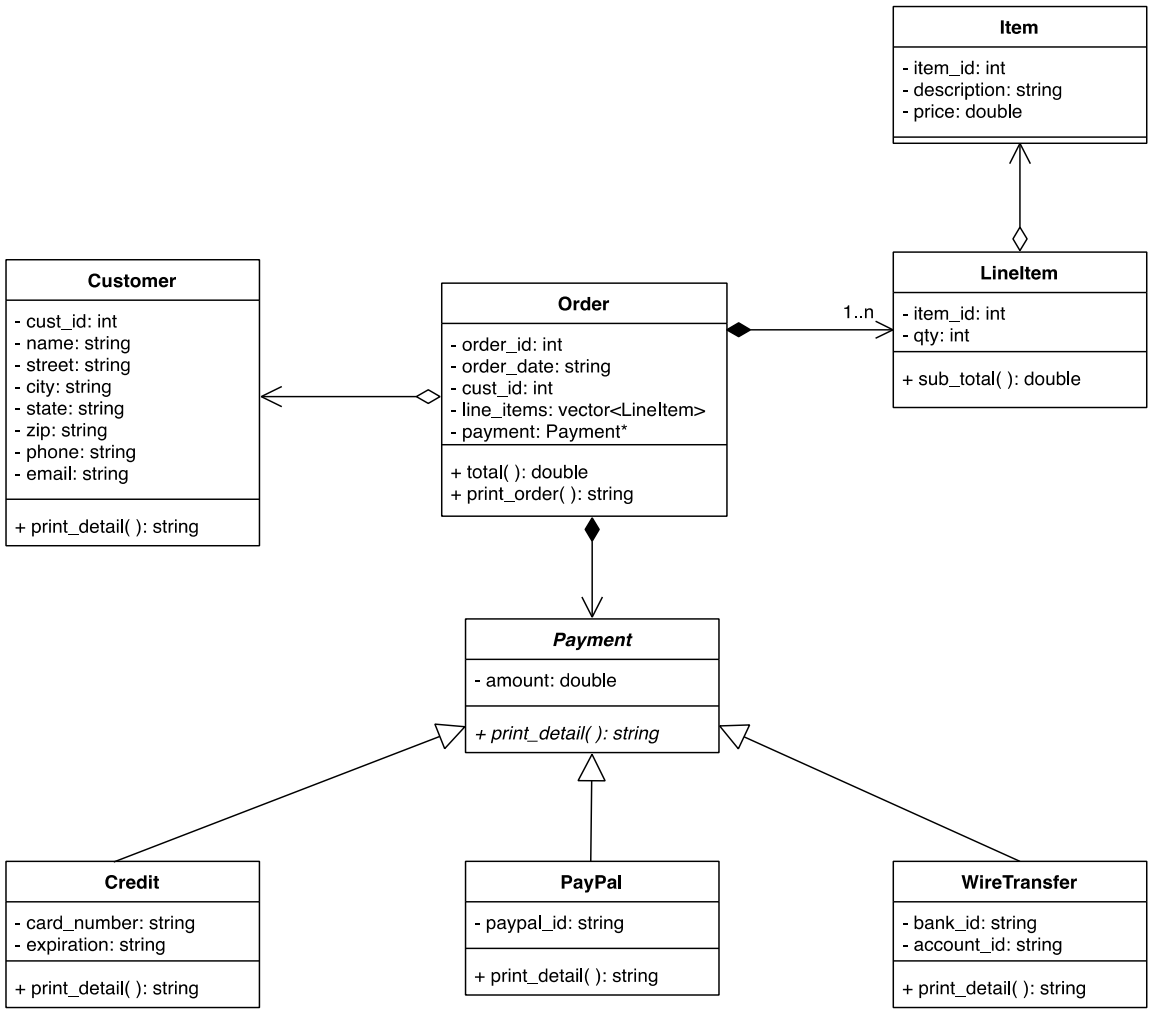
Here are respective examples:

```
1,373975319551257,12-2023
2,cfeeham3s
3,72-2201515,68196-140
```

Requirements

To make this project manageable, observe the following:

- Write all code in a *single file*, *groceries.cpp*
- Define all classes with all functions *inline* (*in-situ* within each class)
- Use the design I provide in the following UML class diagram



All components of **Order** should be precomputed and available before an **Order** object is created. No setters! Pass everything to a parameterized **Order** constructor.

Order::total computes the grand total for the order and sets the amount field in the **Payment** object directly.

Write the following global functions:

- **read_customers**( )
- **read_items**( )
- **read_orders**( )

The first two functions above populate global *vectors*. The third populates a global *list* (using **std::list**).

UML Class Diagram

Note that **Payment** is an *abstract class*. Its derived classes must override **print_detail** which returns a string which becomes part of printing an order as illustrated below. **Order::print_order** calls **Customer::print_detail** and **Payment::print_detail** to do its work.

I also provide the **main** function:

```
int main() {
    read_customers("customers.txt");
    read_items("items.txt");
    read_orders("orders.txt");

    ofstream ofs("order_report.txt");
    for (const auto& order: orders)
        ofs << order.print_order() << endl;
}
```

The global functions **read_customers** and **read_items** are to create respectively global **vector**s of **Customer** and **Item** objects obtained from file input. You should be able to use these two functions from part 1. The **read_orders** function populates a global **std::list** with Order objects obtained from file input. I laid out my code in a file named *groceries.cpp* as follows

```
[Code pertaining to Customers]

[Code pertaining to Items and LineItems]

[Code pertaining to Payments]

[Code pertaining to Orders]

[main function]
```

The order of the first two sections above are immaterial. The bulk of the work is done in **read_orders** and **Order::print_order**. **Order::read_orders** gathers all information for the order and then adds a new **Order** object to the global **std::list<Order>** named **orders**. Orders must be a list and not a vector!

Your output should be in a file named *order_report.txt* that looks like the following:

```
============================
Order #1, Date: 2020-03-15
Amount: $100.23, Paid by Credit card 373975319551257, exp. 12-2023

Customer ID #762212:
Yolanda McAlarney, ph. 505-136-7715, email: ymcalarney2u@wordpress.com
705 Corscot Hill
Albuquerque, NM 87190

Order Detail:
       Item 10951: "Syrup - Monin Swiss Choclate", 3 @ 3.00
       Item 16736: "Wine - Red Cooking", 1 @ 2.00
       Item 16974: "Pastry - Lemon Danish - Mini", 3 @ 1.19
       Item 23022: "Beef - Short Ribs", 1 @ 5.00
       Item 26461: "Bread - Crumbs Bulk", 1 @ 3.00
       Item 26860: "Waffle Stix", 2 @ 2.99
       Item 27515: "Longos - Burritos", 2 @ 4.00
       Item 29286: "Lemonade - Strawberry 591 Ml", 2 @ 2.25
       Item 32641: "Pie Filling - Cherry", 3 @ 0.89
       Item 39096: "Oil - Peanut", 1 @ 0.95
       Item 51822: "Pasta - Rotini Colour Dry", 3 @ 1.19
       Item 57544: "Peach - Halves", 1 @ 0.79
       Item 63725: "Black Currants", 3 @ 0.79
```

Item 64007: "Juice - Propel Sport", 2 @ 1.99
Item 64612: "Pie Shells 10", 2 @ 7.00
Item 75536: "Quail - Whole Boneless", 2 @ 8.79
Item 79758: "Beef Flat Iron Steak", 2 @ 5.49
Item 80145: "Bread - Country Roll", 1 @ 2.29

==========
Order #2, Date: 2020-03-15
Amount: $74.48, Paid by Credit card 201741963232463, exp. 02-2022

Customer ID #258572:
Garey Baraja, ph. 260-560-6065, email: gbaraja5r@fda.gov
42 Kenwood Parkway
Fort Wayne, IN 46862

Order Detail:
Item 18329: "Scallops - In Shell", 1 @ 4.49
Item 21316: "Tomatoes - Roma", 3 @ 2.50
Item 22248: "Basil - Seedlings Cookstown", 2 @ 3.89
Item 30346: "Pasta - Orzo Dry", 1 @ 0.99
Item 37948: "Shrimp - Black Tiger 16/20", 3 @ 7.60
Item 47680: "Sandwich Wrap", 3 @ 2.00
Item 56107: "Numi - Assorted Teas", 1 @ 5.99
Item 56833: "Jolt Cola", 1 @ 1.29
Item 59695: "Dr. Pepper - 355ml", 1 @ 1.59
Item 63498: "Vinegar - Raspberry", 1 @ 1.79
Item 66295: "Bread - Dark Rye Loaf", 1 @ 2.99
Item 70616: "Lemonade - Black Cherry 591 Ml", 1 @ 2.89
Item 80237: "Juice - Orange", 2 @ 2.19
Item 96497: "Scampi Tail", 1 @ 4.00

…
==========
Order #8, Date: 2020-03-18
Amount: $113.63, Paid by Wire transfer from Bank ID 72-2201515, Account# 68196-140

Customer ID #217686:
Marisa Gossipin, ph. 239-305-6322, email: mgossipin1b@fema.gov
4 Charing Cross Lane
Fort Myers, FL 33994

Order Detail:
Item 11770: "Rice - Jasmine Sented", 1 @ 2.69
Item 12946: "Hagen Daza - Dk Choocolate", 1 @ 5.99
Item 17714: "Flour Pastry Super Fine", 3 @ 4.95
Item 21801: "Coffee - Ristretto Coffee Capsule", 2 @ 3.69
Item 23276: "Juice Peach Nectar", 1 @ 2.45
Item 24314: "Snapple - Mango Maddness", 1 @ 2.00
Item 39096: "Oil - Peanut", 2 @ 0.95
Item 39140: "Whmis Spray Bottle Graduated", 3 @ 1.99
Item 49318: "Green Scrubbie Pad H.duty", 3 @ 3.99
Item 54452: "Bananas", 2 @ 0.79
Item 55222: "Artichoke - Fresh", 2 @ 2.39
Item 59695: "Dr. Pepper - 355ml", 2 @ 1.59
Item 67408: "Pasta - Penne Primavera Single", 3 @ 1.49
Item 70461: "Pasta - Ravioli", 1 @ 1.25
Item 79084: "Red Cod Fillets - 225g", 2 @ 5.59
Item 79298: "Shiratamako - Rice Flour", 3 @ 3.49
Item 89924: "Towel - Roll White", 2 @ 2.19
Item 94416: "Shrimp - Baby Cold Water", 1 @ 4.99
Item 98317: "Stainless Steel Cleaner Vision", 3 @ 4.05

==========
Order #9, Date: 2020-03-18
Amount: $111.05, Paid by Paypal ID: tsantello5c

```
Customer ID #196547:
Alison Threader, ph. 703-698-2694, email: athreader5c@zimbio.com
50 Shopko Plaza
Washington, DC 20041

Order Detail:
       Item 20755: "Sansho Powder", 2 @ 2.05
       Item 21809: "Salmon - Atlantic Fresh Whole", 3 @ 4.75
       Item 23022: "Beef - Short Ribs", 2 @ 5.00
       Item 25956: "Energy Drink - Franks Pineapple", 3 @ 2.00
       Item 37019: "Instant Coffee", 3 @ 6.00
       Item 44214: "Wakami Seaweed", 1 @ 4.00
       Item 47680: "Sandwich Wrap", 3 @ 2.00
       Item 48704: "Beans - French", 1 @ 1.05
       Item 51822: "Pasta - Rotini Colour Dry", 1 @ 1.19
       Item 54044: "Sole - Fillet", 2 @ 3.99
       Item 57544: "Peach - Halves", 1 @ 0.79
       Item 64612: "Pie Shells 10", 2 @ 7.00
       Item 67193: "Cheese - Cheddar Old White", 2 @ 1.88
       Item 84418: "Soup - Knorr Country Bean", 2 @ 1.69
       Item 90349: "Soup - Campbells Beef Noodle", 3 @ 1.19
       Item 90475: "Chicken - Whole", 2 @ 6.49
…
============================
Order #609, Date: 2020-12-30
Amount: $101.69, Paid by Credit card 3538527630422753, exp. 04-2024

Customer ID #409485:
Jaye Martinho, ph. 361-111-4183, email: jmartinho7x@dion.ne.jp
2339 Magdeline Plaza
Corpus Christi, TX 78410

Order Detail:
       Item 12527: "Bagelers - Cinn / Brown Sugar", 3 @ 3.99
       Item 12568: "Cabbage - Red", 2 @ 0.69
       Item 16724: "Blueberries", 3 @ 2.99
       Item 17981: "Halibut - Fletches", 1 @ 8.00
       Item 32641: "Pie Filling - Cherry", 3 @ 0.89
       Item 41142: "Vinegar - Red Wine", 3 @ 1.25
       Item 44214: "Wakami Seaweed", 1 @ 4.00
       Item 56826: "Flour - Bread", 2 @ 4.00
       Item 57464: "Almonds Ground Blanched", 2 @ 2.99
       Item 58524: "Thyme - Lemon Fresh", 1 @ 2.19
       Item 64067: "Magnotta Bel Paese Red", 2 @ 3.39
       Item 67408: "Pasta - Penne Primavera Single", 3 @ 1.49
       Item 78265: "Syrup - Monin Irish Cream", 3 @ 3.00
       Item 80145: "Bread - Country Roll", 2 @ 2.29
       Item 81169: "Table Cloth 90x90 White", 1 @ 3.99
       Item 86456: "Rice - Long Grain", 1 @ 2.29
       Item 86494: "Crackers - Trio", 2 @ 2.35
       Item 95662: "Garlic Powder", 3 @ 2.99
```

Each order begins with a dashed line and has 3 parts, each followed by an empty line. The orders appear in the order they are read from the file, but the items in each order are sorted by **item_id**.

Submit your *groceries.cpp* and *order_report.txt* files in Canvas by the due date.

Implementation Notes

(From part 1):

I have provided a file, *split.h*, which contains a **split** function that returns all fields that were separated by some character as a vector of strings:

```cpp
#include "split.h"

#include <iostream>
#include <string>
#include <vector>
using namespace std;

int main() {
    string s = "715608,Vergil Heelis,61070 Marcy Park,Fort Worth,TX,76115,682-583-
7160,vheelis4@blogger.com";
    auto fields = split(s, ',');
    for (const auto& fld: fields)
        cout << fld << endl;
    cout << endl;
}

/* Output:
715608
Vergil Heelis
61070 Marcy Park
Fort Worth
TX
76115
682-583-7160
vheelis4@blogger.com
*/
```

You can also use this function to separate the item_id-quantity pairs using a dash as the split character.

To call **std::sort** to sort the line items of an order, #include the <algorithm> header and add the following compare function to your **LineItem** class:

```cpp
  friend bool operator<(const LineItem& item1, const LineItem& item2) {
       return item1.item_id < item2.item_id;
  }
```

Note that to achieve runtime polymorphism with the **Payment** objects, the payment member of **Order** must be a *pointer***.** In our case, the concrete **Payment** instances (**Credit**, **PayPal**, **WireTransfer**) are allocated on the heap using the **new** operator. Your **read_orders** function needs to check the payment code (1, 2, or 3) and create the appropriate payment subtype, storing it in a Payment*. Then **read_orders** adds a new **Order** object to your global list of orders.

This is the most challenging program of the semester. My *groceries.cpp* has about 250 lines of code, and it's pretty succinct. Start early and ask questions.

Here is a suggested development sequence for you to follow:

1. Start with **main**, as written.
   Comment out the loop that does the **print_order**

Create empty-body functions the other three.
Run it and it will do nothing (just to have it compile correctly)

2. Write the **Item** class
   Declare the global **Item** vector
   Write **read_items()** to fill in the vector
   Print out the items vector to verify you read in the data correctly.
3. Follow a similar procedure as in #2 for **Customer**
4. Do the **Payment** classes and generate different kinds of payments. Verify that they print correctly
5. Define the **Orders** class
6. Do **read_orders**
7. Complete **Orders::print_order**

Order should have a destructor that deletes its payment pointer to avoid memory leaks.

FAQs

Q. How do I find the Customer or Item entries in the global arrays given a cust_id or item_id?
A. You'll have to search the vectors for them. I added the following functions to my solution:

```
int find_cust_idx(int cust_id);
int find_item_idx(int item_id);
```

Q. How do you sort the vector of LineItems?
A. Include the following line either in your Order constructor or in read_orders:

```
sort(line_items.begin(), line_items.end());
```

Q. I heard global data is "evil".
A. It can be problematic, but it makes this project doable in the time allotted by keeping things simple. In production we would probably have a Grocery namespace and the global data would be defined there, but that's an implementation detail not worth worrying about here. Namespace/static data is stored the same way as global data—only the access is different.

Q. Why didn't you make all the data of type **std::string**?
A. Well, prices must be **double**s so you can do arithmetic. Also, I want you to use **std::stoi** and **std::stod** for practice.

Q. Why is this project harder than the others?
A. Because you can't see the benefit of object-oriented programming on tiny projects. OOP was invented to organize larger projects. This is the smallest one I could think of that had virtual functions and would help you see the practical, organizational power of OOP.

Q. Where do I set the payment amount for an order.
A. In the **Order** constructor. You have everything you need to compute it. Also, **Order** is a friend of **Payment**, so you set it directly: **payment->** …