# Project 5 — Online Groceries

CS 2370

## Background

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*
- *items.txt*
- *orders.txt*

The first file holds customer data in a single text line as follows:

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

*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.

The second line contains payment information in the form of payment code (explained below), 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:

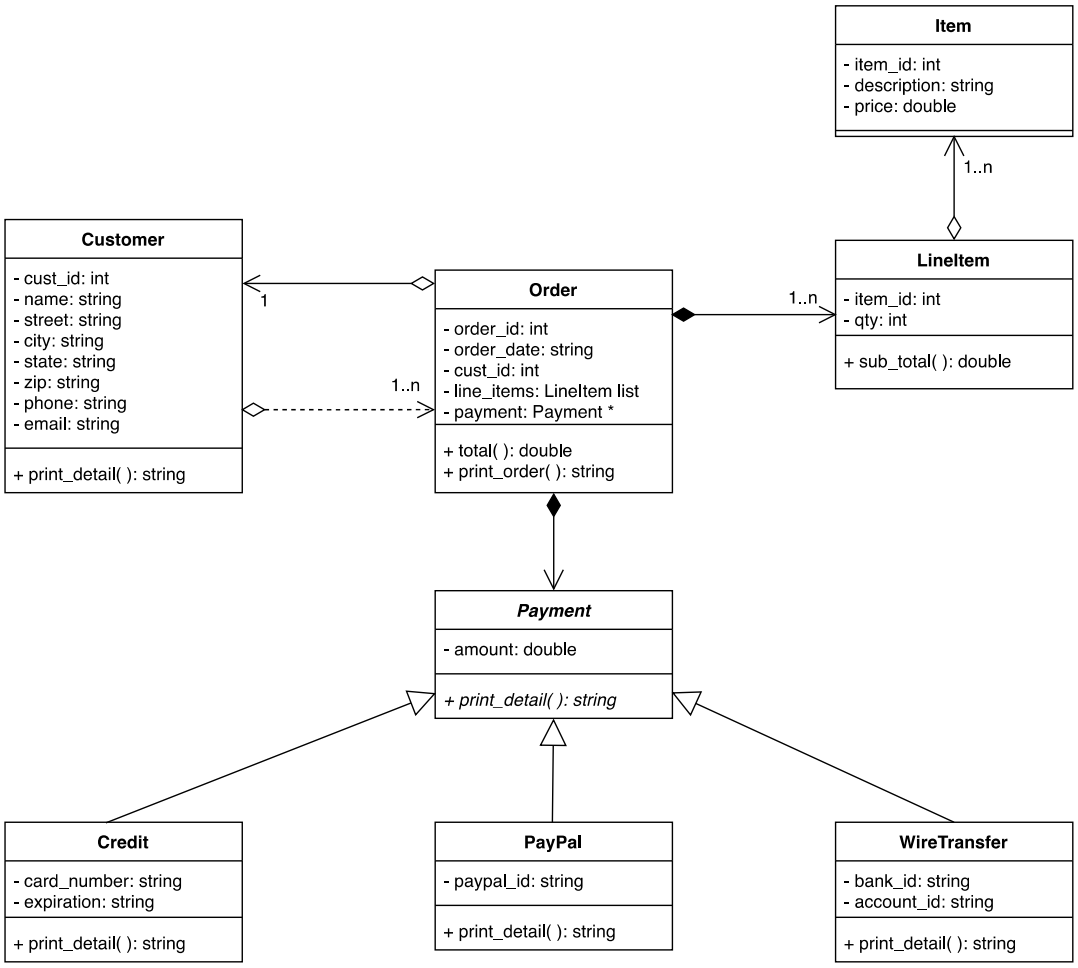
1,373975319551257,12-2023
2,cfeeham3s
3,72-2201515,68196-140

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.

## Requirements

To make this project manageable, observe the following:

- Write all code in a *single file*, *groceries.cpp*
- Define all classes/structs with all functions *inline* (*in-situ* within each class/struct)
- I made Customer and Item structs since they mainly just hold data
- Use the design I provide in the following UML class diagram




- Order is a **friend** of Payment to access the amount
- Order is a **friend** of LineItem to access its data

(Payment and LineItem are *not* meant to be stand-alone)

All components of Order should be precomputed and passed to the Order constructor upon creation of the Order object. No setters. Order::total computes the grand total for the order and sets the amount field in the Payment object directly.

- Customer and Item are just structs, they mainly hold data
- Order::payment isn't really a raw pointer, use **unique_ptr**<Payment> and initialize it in Order's initializer list

Write the following global functions:

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

Each of the above populate global vectors

*Figure 1 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");

   for (const auto& order: orders)
      cout << order.print_order() << endl;
}
```

The first 3 functions are global functions you write. They create respectively global vectors of Customer, Item, and Order. I laid out my *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 r**ead_orders** and **Order::print_order**.

Your output should be a report 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 #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

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:

```
#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.

To call **std::sort** to sort the line items of an order, add the following to your LineItem class:

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

Make Order a **friend** of LineItem and Payment so you don't have to write a slew of getters. This is standard C++ practice when classes are related and not intended to be used separately in other unrelated projects. It is the same principle that leads us to make stream functions and functions like **operator<** *friends* of the classes to which they pertain and is called the **Interface Principle**—components that are part of the *same interface* should be "friendly". It is a technical language detail that stream functions can't be member functions, but they still "belong" to their class. Aficionados of other object-oriented programming languages complain that this "breaks encapsulation", but those languages do the same thing with "package access". Different ways of accomplishing the same thing.

Note that to achieve runtime polymorphism with the Payment objects, the payment member of Order must be a *pointer*. That means that the concrete Payment instances are allocated on the

heap using the **new** operator. To avoid memory management problems, we declare **Order::payment** as unique_ptr<Payment> payment;. 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*. It is then passed to the unique_ptr<Payment> member in the Order constructor, which is then added to your global vector of orders. When you add entries to a vector, use **emplace_back** instead of **push_back** so you don't have to create a temporary object.

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.

## 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 for them. You can write a loop, but you might find it easier to use **std::find_if** from <**algorithm**>. Write a function to do the job, regardless. I added the following functions to my solution:

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

**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 class and the global data from our project would be static data in that class, but that's an implementation detail not worth worrying about here. 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. They were made 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**. How do I read the variable number of item-quantity pairs?
**A**. **split** did the work for you when you first called it. Then split each pair on a dash.