Digital Systems

3.1 Data Modeling with
Entity Relationship Diagrams (ERDs)

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ROADMAP

START

Week 1:
Introduction & Systems Analysis
- Course Description
- Systems Thinking

Week 2:
Digital Product Management & Introduction to Process Mapping
- Max Labs 1a & 1b
- Systems & Processes
- Swim Lane Diagrams

Week 3:
Data Modeling with Entity Relationship Diagrams
- Swim Lane Diagrams
- ERD Diagrams

Week 4:
Digital Systems – Learn IT! #1
- ERD Diagrams
- Learn IT Kickoff

Week 5:
Exam #1, Max Labs & Information Systems: Part I & II
- CRM & ERP

Week 9:
Exam #2 & JavaScript Unit #1 - Part I & II
- Hello World, Variables

Week 8:
Cybersecurity & AI – Part I & II
- Protection Protocols
- Artificial Intelligence

Week 7:
Platforms & Digital Business Models: Part I & II
- Platforms & Digital Models
- APIs

Week 6:
Information Systems: Part III & IV
- Data Analytics
- SCM

Week 10:
JavaScript Unit #2 Functions
- Operator types
- Strings

Week 11:
JavaScript Unit #3 Logical Operators & Conditional Logic
- Logical Operators
- Conditional Types

Week 12:
JavaScript Unit #4 Loops
- Intro to Loops
- While and Do

Week 13:
JavaScript Unit #4 Working with Loops
- Writing the code

Week 14:
HTML & CSS Unit
- HTML basics
- CSS basics
- Course Reflection

FINISH

Business Systems Innovation Labs
Pre-lab Pre-flight Checklist

"Distinctive, Impressive BizTech Student Blog"
(Backstory)

SJSU Business Systems student Max sets out to blog her class,
stumbles into a startup adventure, and invites you to follow along.

Prep: What do you need to start?

To get the most out of this pre-lab, you need a healthy curiosity, a sense of humor and a little imagination.
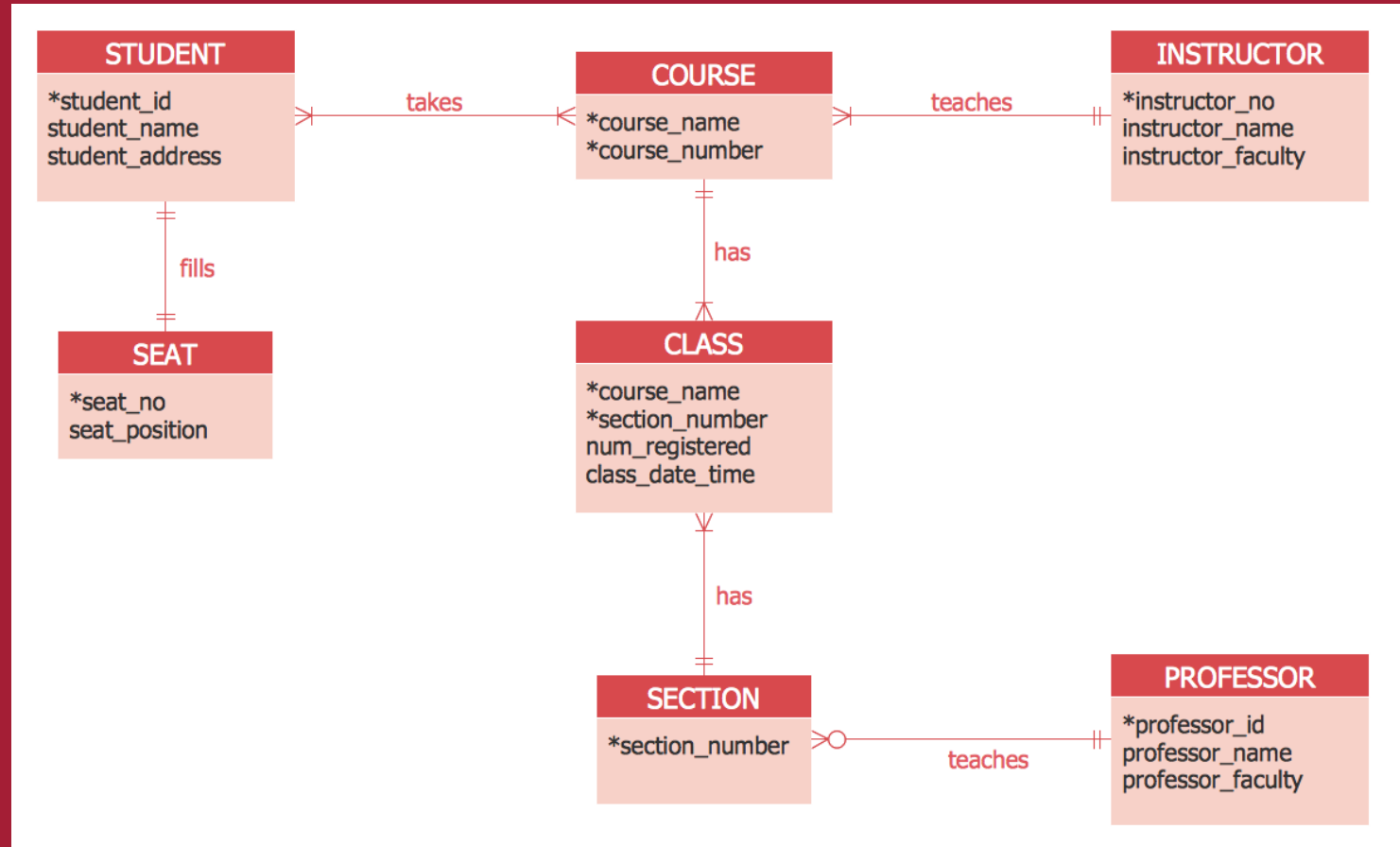Focus, read for understanding, and put yourself in Max's shoes so you don't just read it—you *experience it*.

Assignment 5:
Max Labs 3a/3b

Fall 2021

Deadline: Monday
Sep 20 by 11:59 PM

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What is an "Entity Relationship Diagram"?
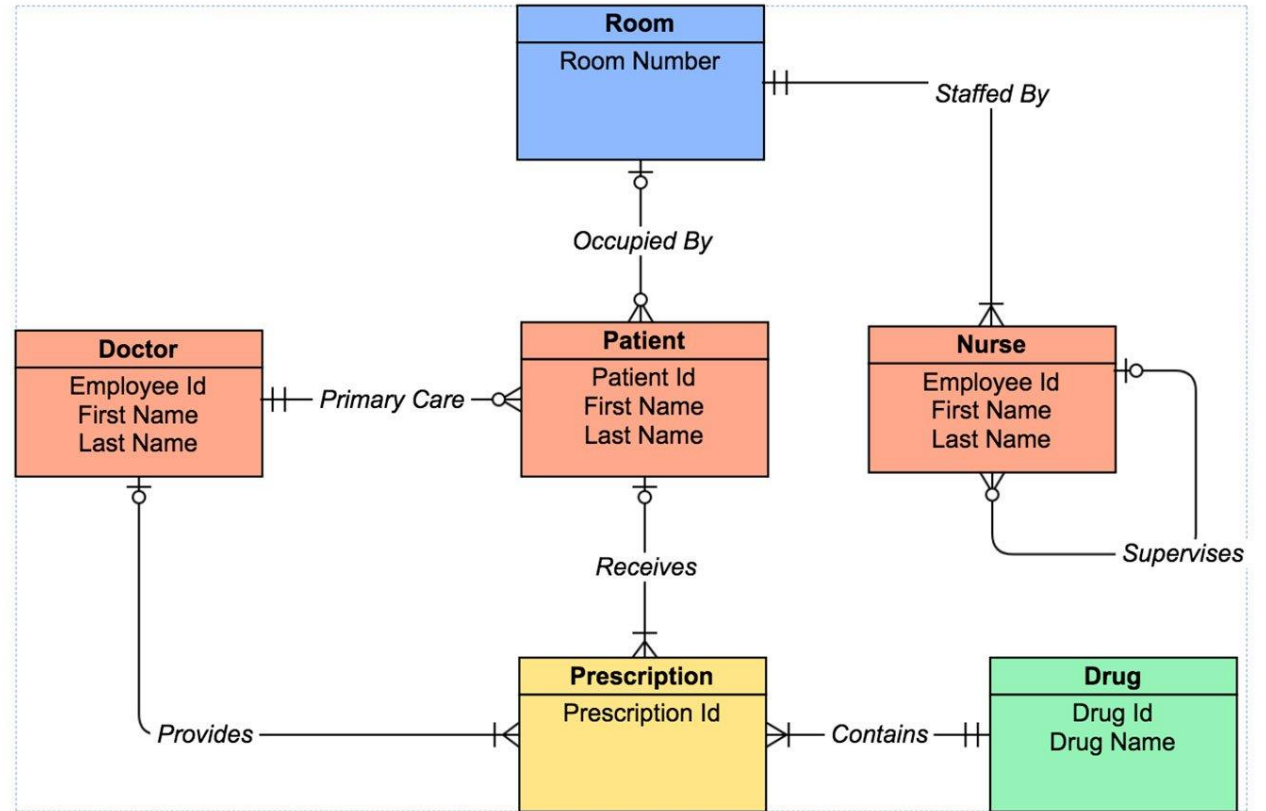

Data Model

Entity = Noun | Attribute = Adjective | Relationship = Verb

What is an Entity Relationship Diagram?

❖ An Entity Relationship Diagram (ERD) is a visual representation of different data using conventions that describe how these data are related to each other.
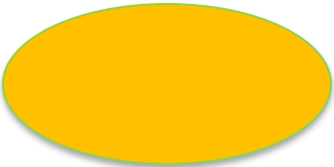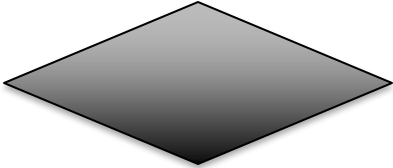
ERD Symbols

1. Chen's Database Notation

2. Crow's Foot Database Notation

ERD Symbols

Chen's Database Notation

Chen's Database Notation

| Symbol	Description
	Entity = noun ex: shopper, item
	Attribute = adjective/characteristic ex: item price
	Relationship = verb ex: buys

Chen's Database Notation

A shopper walks into a store to buy an item. When the shopper makes a purchase, the system is updated with information about the person, including their name, loyalty card id and zip code. The store also records which items were purchased, including details like item name, price and item source.
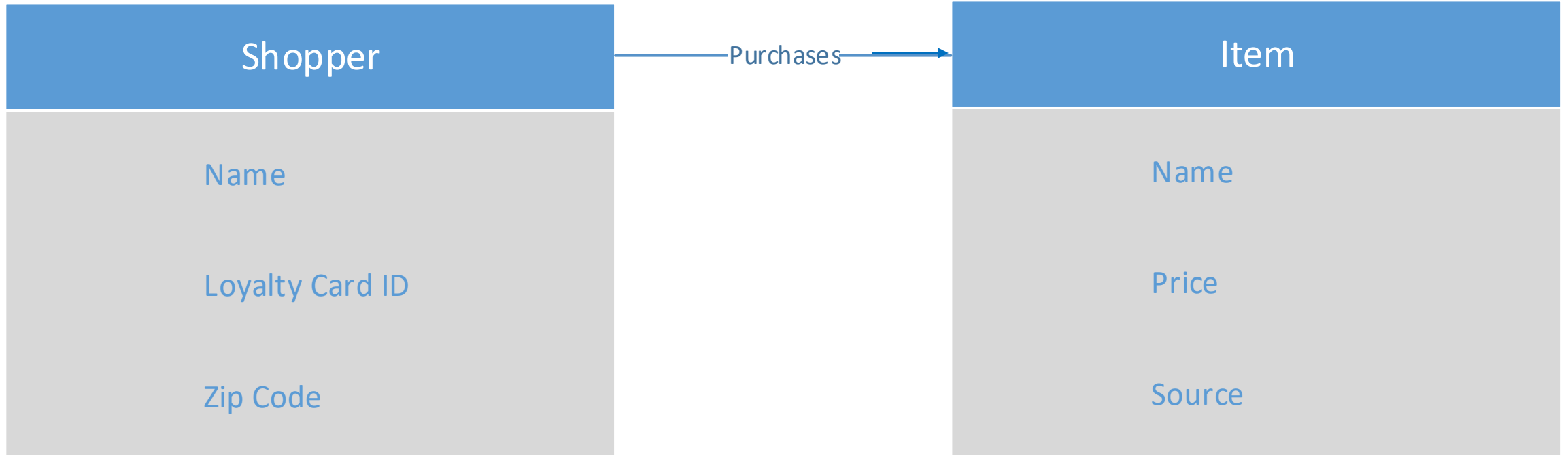
Chen's Database Notation

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Chen's Database Notation

Entity Relationship Diagram (ERD)
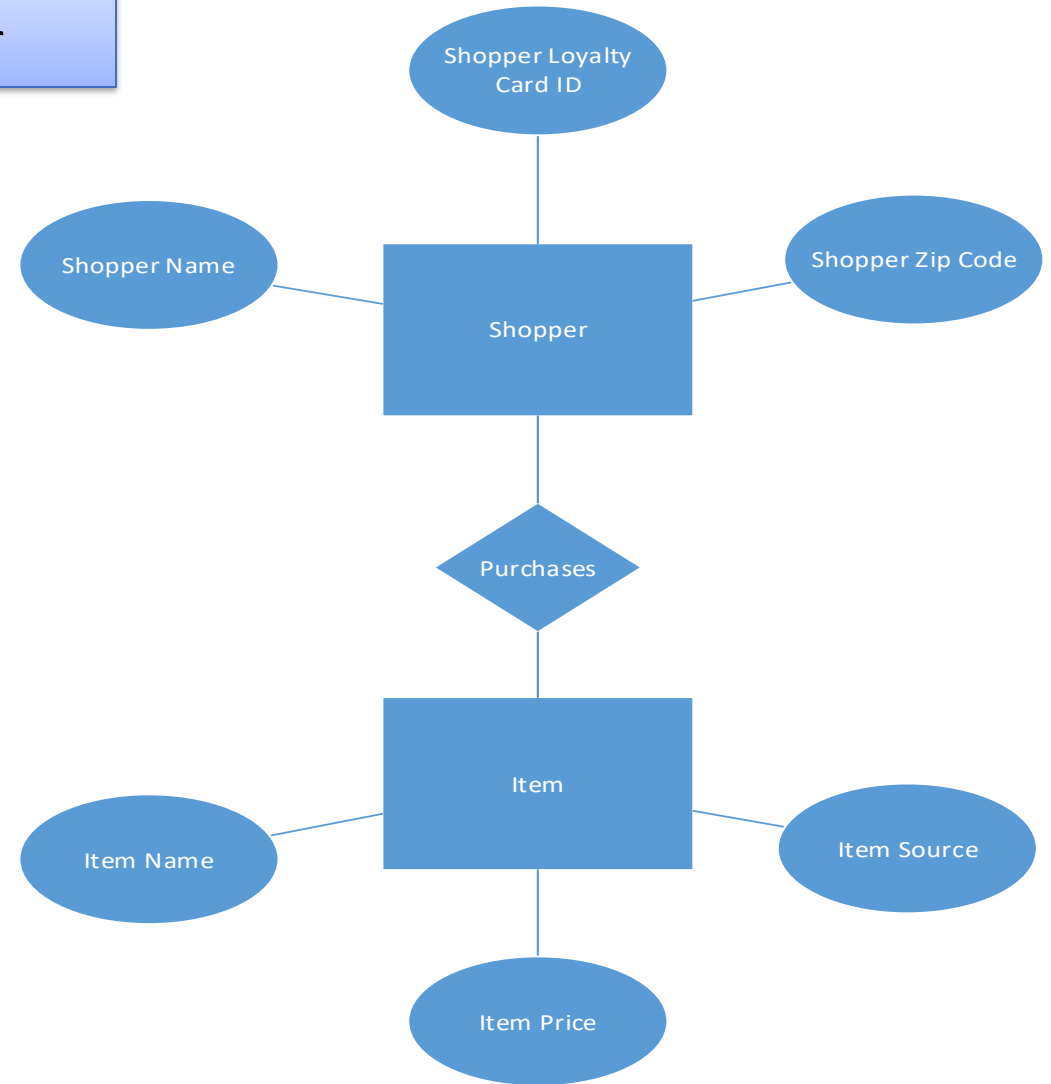
ERD Symbols

Crow's Foot Database Notation

Crow's Foot Database Notation

Shopper
Name
Loyalty Card ID
Zip Code

Purchases →

| Item |
| --- |
| Name |
| Price |
| Source |

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Entity Relationship Diagram: Recap

A shopper walks into a store to buy an item. When the shopper makes a purchase, the system is updated with information about the person, including their name, loyalty card id and zip code. The store also records which items were purchased, including details like item name, price and item source.
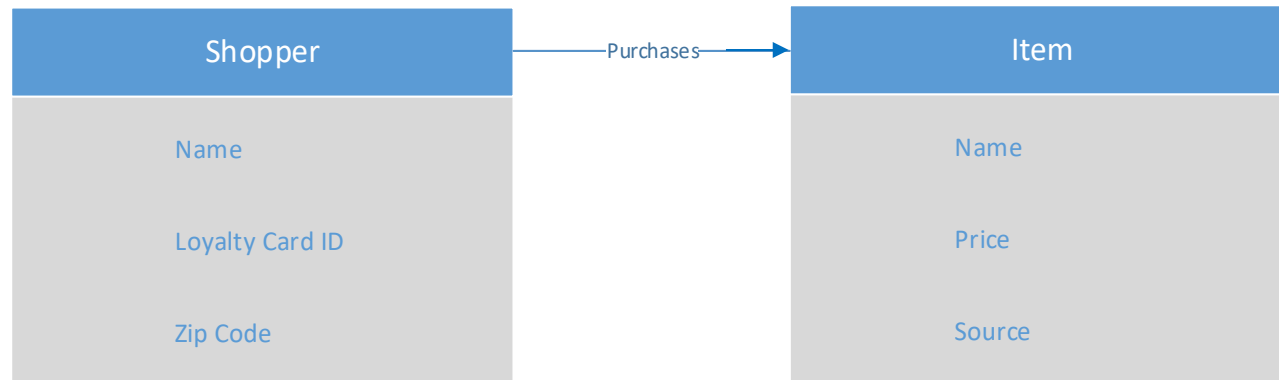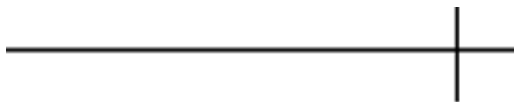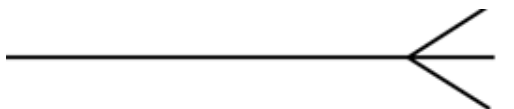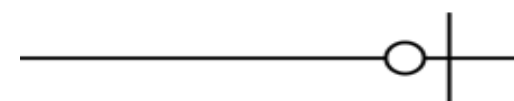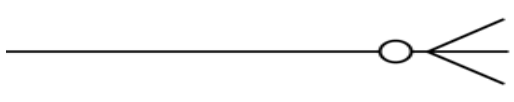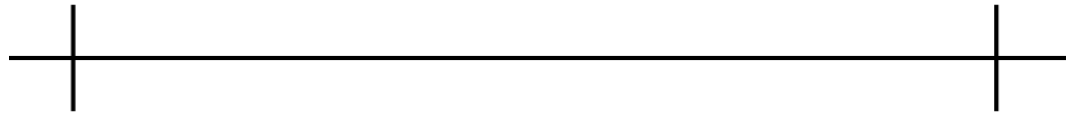

Crow's Foot Database Notation
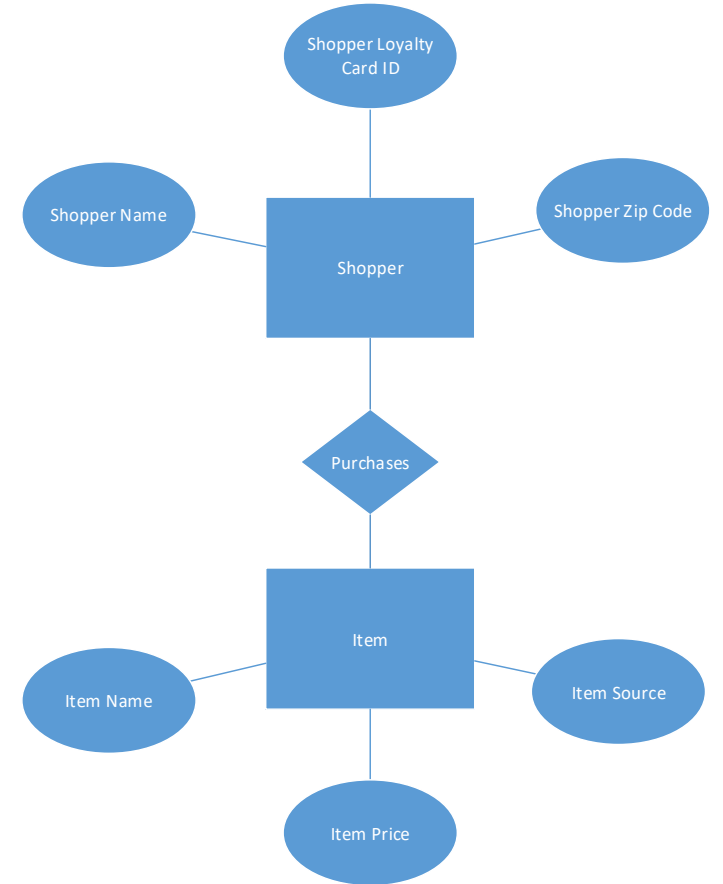
Chen's Database Notation
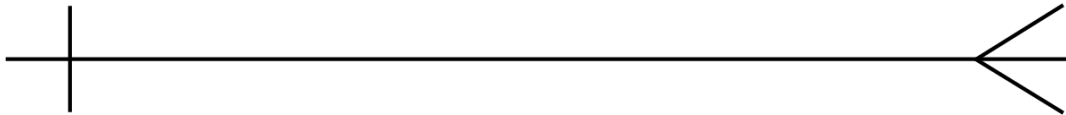
Cardinality in Data Modeling: Relationships

Cardinality describes a fundamental characteristic of the relationship between two entities.

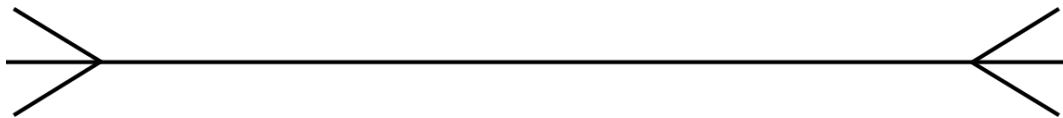| Symbol	Description
	One (Mandatory one)
	Many (Mandatory many)
	Zero or one (Optional one)
	Zero or many (Optional many)

Cardinality in Data Modeling: Relationships

1:1 = a **one to one** relationship
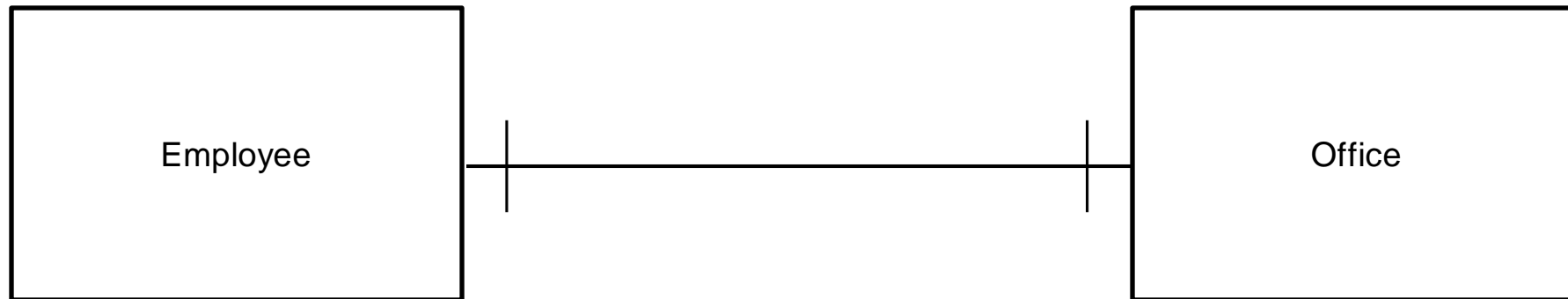
1:m = a **one to many** relationship

m:m = a **many to many** relationship

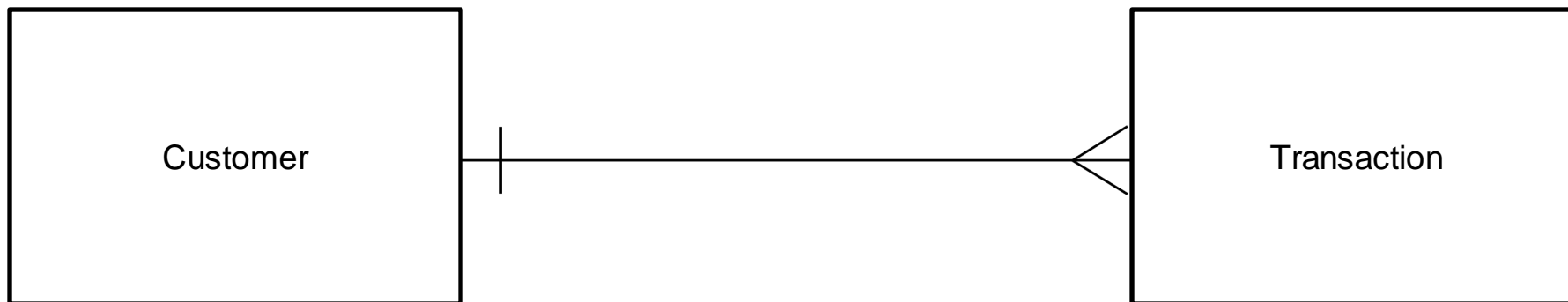# Cardinality in Data Modeling: Relationships

❖ Below is an example of a **1:1** relationship between *employee* and *office*.

Cardinality in Data Modeling: Relationships

❖ Below is an example of a **1:m** relationship between *customer* and *transaction*.

❖ These entities have a 1:m relationship because a customer can book multiple transactions, but a transaction belongs to one and only one customer.
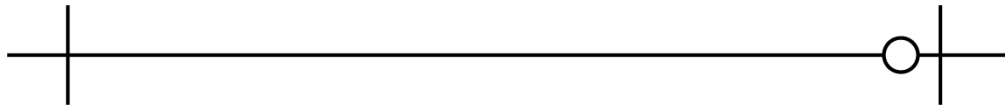
Cardinality in Data Modeling: Relationships

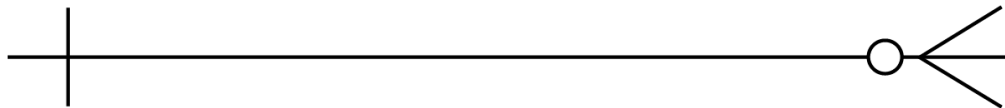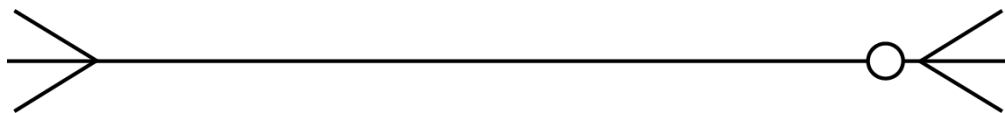❖ Below is an example of a **m:m** relationship between *library* and *book*.

Cardinality in Data Modeling: Relationships

1:01 = a <u>one to zero or one</u> relationship

1:0m = a <u>one to zero or many</u> relationship

m:0m = a <u>many to zero or many</u> relationship

Cardinality in Data Modeling: Relationships

❖ Below is an example of a **1:0m** relationship between *customer* and *product*.
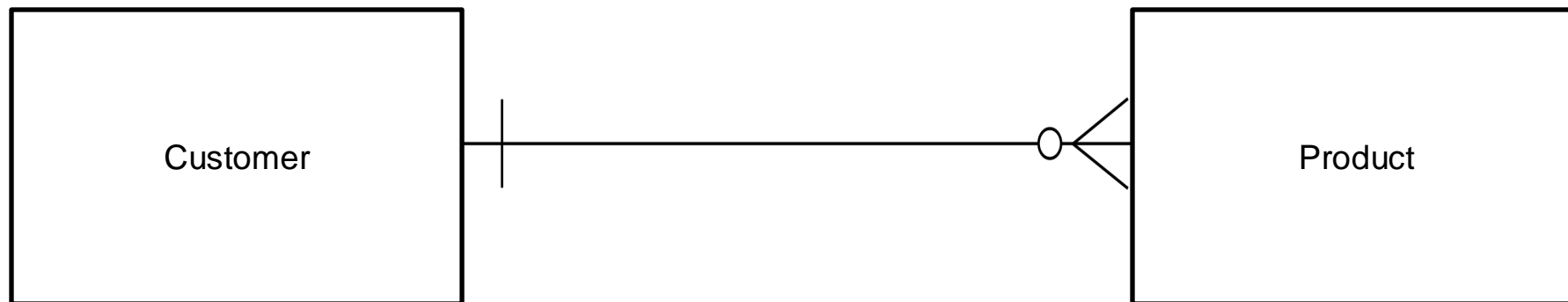
Cardinality in Data Modeling: Relationships

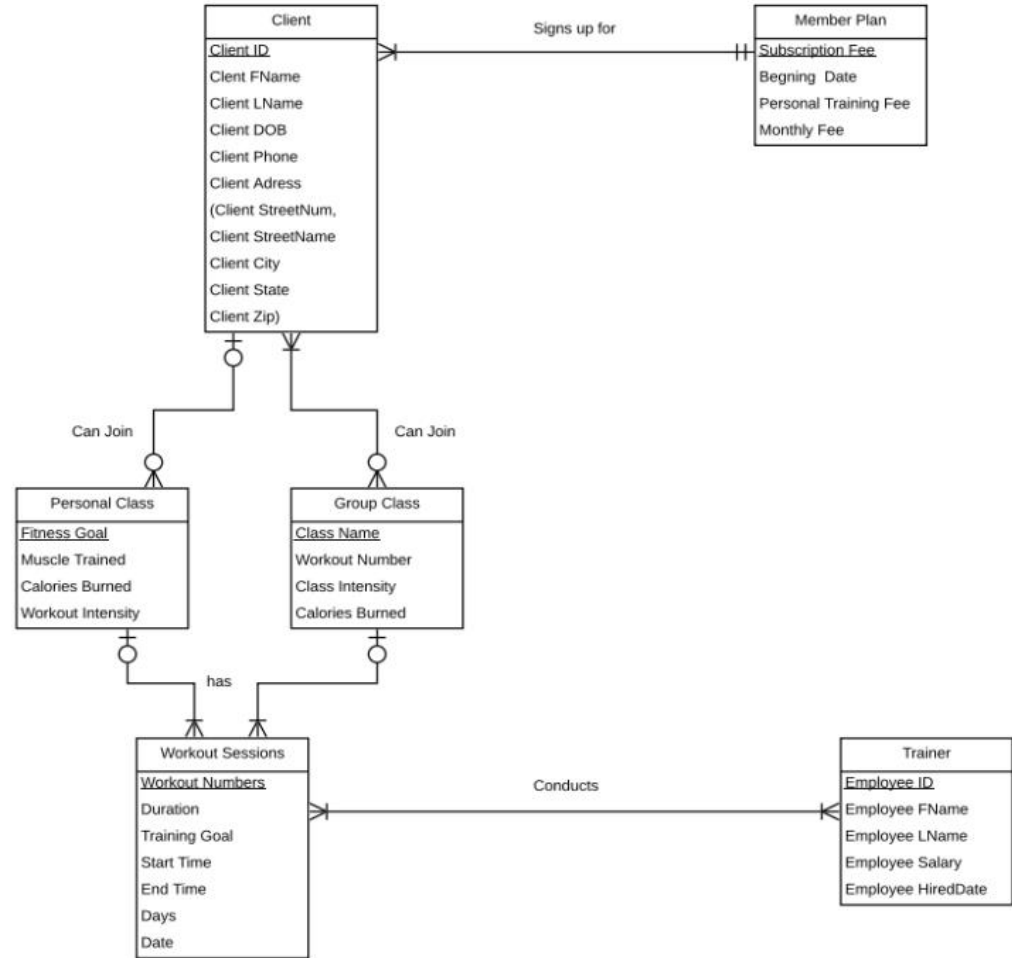The Organization modeled below displays a fitness center database system. Our fitness center consists of 7 employees and 1 primary location. We offer group classes and personal traning sessons to meet the needs all of our clients.

Fitness Center

Order to Cash (O2C)

The process starts when the customer contacts Sales to place an order. The person in Sales creates the sales order. As part of doing this, the person in sales first checks to see if the customer has enough available credit to cover the order. They do this by looking up the customer's credit on a report that is generated by Accounting and sent to Sales every Monday morning. If the customer doesn't have enough available credit then the person in sales notifies the customer who can then either update or cancel their order. Next the person in sales checks to see if the items being ordered are in stock. They do this by checking a report on inventory that the Warehouse created at the end of each day. If the items being ordered are not in stock then the person in Sales notifies the customer who can then update or cancel their order. If the report indicates the items are in stock then the order goes to the Warehouse where the workers there will pick the order. Since Sales is looking at a report that is only updated at the end of each day, there is a chance that they accepted an order for an item that is not really in stock. If that is the case the Warehouse notifies Sales who then notifies the customer who can update or cancel their order…

Order to Cash (O2C)

…Once the people in the warehouse pick the order, the people in Accounting have to make sure that the customer actually has enough credit to cover the order. Since the people in Sales use a credit report that is generated on Monday morning, there is a chance that the information on the credit report is old. If the customer doesn't have enough available credit then Accounting notifies Sales who then notifies the customer who can then choose to update or cancel their order. If the customer has enough available credit then their available credit is reduced by the total cost of the order and the warehouse is notified and they pack and ship the order. As soon as the order is shipped the people in the warehouse notify accounting and accounting generates and sends the invoice to the customer. When the customer pays the invoice the people in Accounting increase the customer's available credit by the amount of the payment, they post the payment and we're done.

Order to Cash (Legacy Systems Low-Level)
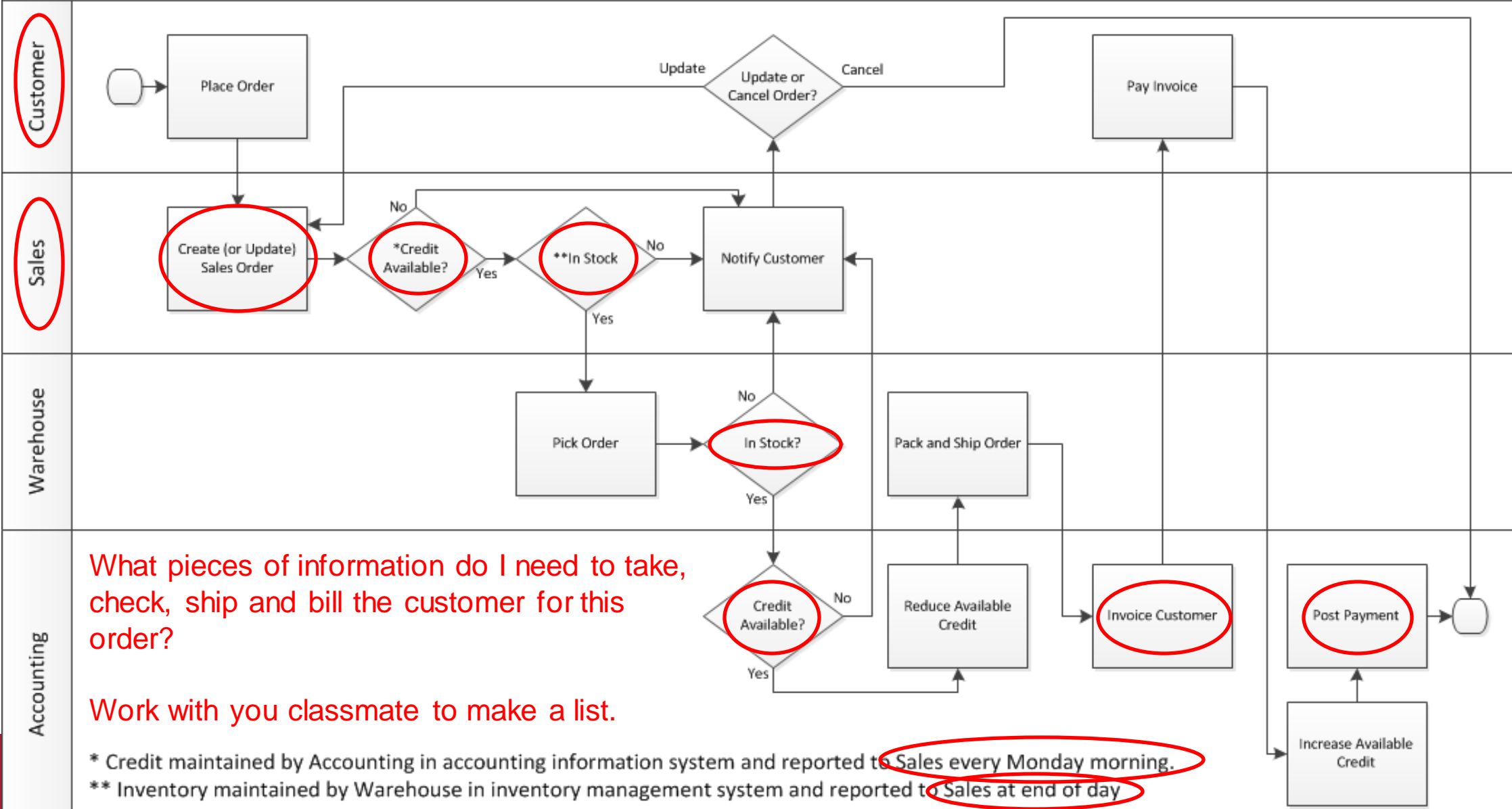
What pieces of information do I need to take, check, ship and bill the customer for this order?

Work with you classmate to make a list.

* Credit maintained by Accounting in accounting information system and reported to Sales every Monday morning.
** Inventory maintained by Warehouse in inventory management system and reported to Sales at end of day

ERD: tables

- Relationship, i.e. verb is written on the arrow
- Entity listed at the top of the table
- Attributes are listed under the entity

Legend :
- PK : Primary Key
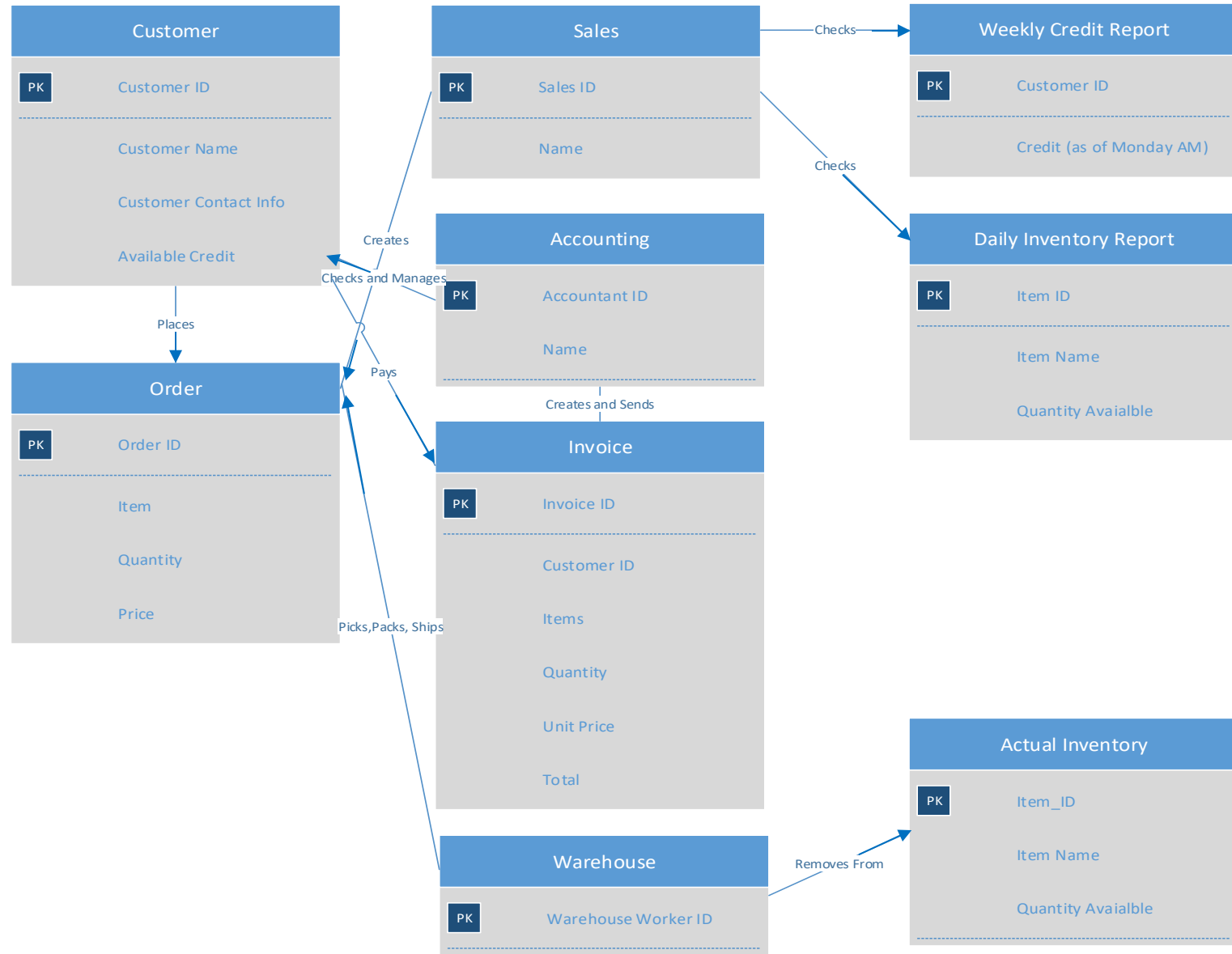
More to Come

Prepare with Readings & Videos before our next class!!!