IS475/675 Agenda: 03/03/2025

- Answer questions regarding the first test (scheduled 03/05/2025)
- Review normalization process.
- Complete a normalization exercise related to HW#4
- Review answers to HW#4.

Test information

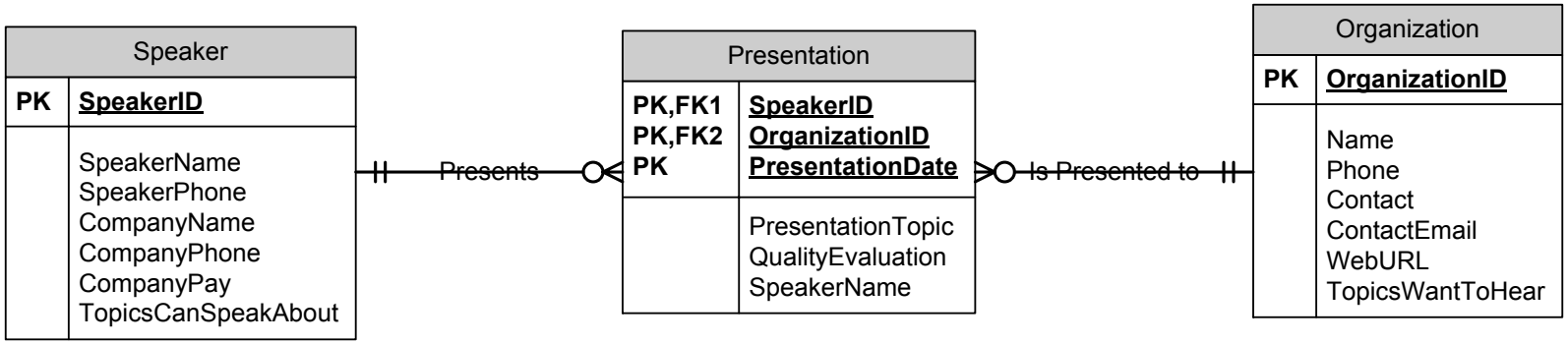
- Document with information available on WebCampus in Weeks 6 & 7 and the Test page – please read it!
- Test structure:
  - 1 database design question – create ERD
  - 1 skeleton ERD question
  - 25-30 multiple choice questions
- Bring to test:
  - #2 pencil
  - Paper to do ERD for database design question
  - 1 8.5 x 11” page of notes (if so desired). Front and back, typed, copied, hand-written, whatever you prefer. You will need to turn it in with the test.
- Scheduled for entire class time. If you finish early, then feel free to leave early.

Normalization Review

- Normalization is a formal, process-oriented approach to data modeling.
- Normalization seeks to understand the relationships among attributes in an entity, rather than define the relationships between entities.

Normal forms

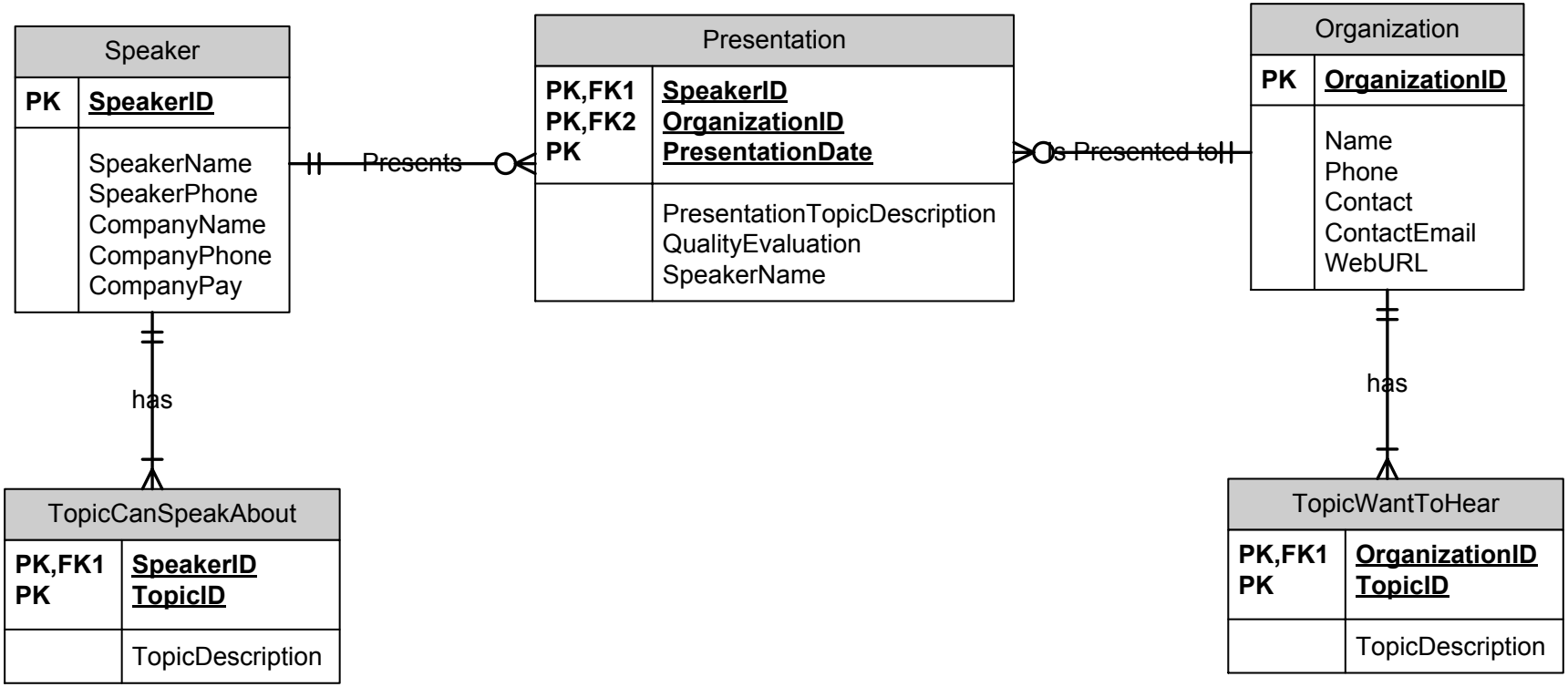
- The three basic “problems” that a designer identifies using normalization:
  1. Multi-valued attributes (also called “repeating groups”).
  2. Partial functional dependencies.
  3. Transitive dependencies.
- Each “problem” is identified during a “step” in normalization, which is referred to as a “normal form.”


Speaker
PK
SpeakerID
SpeakerName
SpeakerPhone
CompanyName
CompanyPhone
CompanyPay
TopicsCanSpeakAbout
Presents
Presentation
PK,FK1
PK,FK2
PK
SpeakerID
OrganizationID
PresentationDate
PresentationTopic
QualityEvaluation
SpeakerName
Is Presented to
Organization
PK
OrganizationID
Name
Phone
Contact
ContactEmail
WebURL
TopicsWantToHear

First Normal Form

- First normal form: Remove multi-valued attributes.
  - A multi-valued attribute is an attribute or group of attributes that can have more than one value for an instance of an entity. If it is a group of attributes, it is called a “repeating group.”
- To see whether a data model is in first normal form:
  - Identify repeating groups/multi-valued attributes and place them as separate entities in the model.
- How to fix the problem:
  - Identify a primary key for the new entity. The primary key will most likely be concatenated.
  - Create the relationships between entities.
  - Divide m:n relationships with appropriate intersection entities.

First Normal Form



SpeakerID -> SpeakerName, SpeakerPhone, CompanyName, CompanyPhone, CompanyPay

SpeakerID, OrganizationID, PresentationDate -> PresentationTopic, QualityEvaluation, SpeakerName

OrganizationID -> Name, Phone, Contact, ContactEmail, WebURL

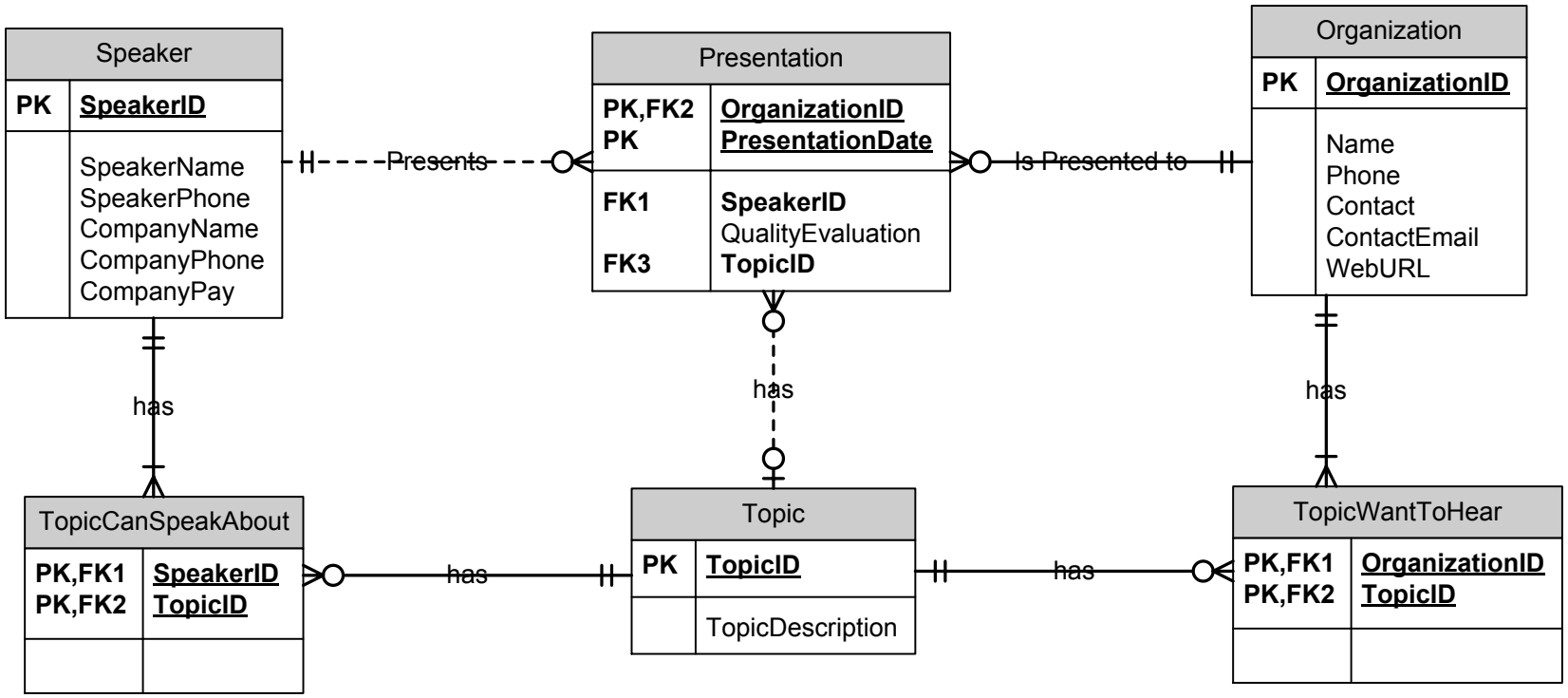
SpeakerID, TopicID -> TopicDescription

OrganizationID, TopicID -> TopicDescription

Second Normal Form

- Second normal form: Remove partial functional dependencies.
- A partial functional dependency is a situation in which one or more non-key attributes are functionally dependent on part, but not all, of the primary key.
  - Partial functional dependencies occur only with concatenated keys.
- Examples of partial functional dependencies:
  - PatientID, TreatmentDateTime → PatName, TstResults, TrtID, LocID
  - CourseID, StudentID → CourseTitle, Grade
- Which entities on the current ERD have a concatenated primary key?

Second Normal Form



SpeakerID -> SpeakerName, SpeakerPhone, CompanyName, CompanyPhone, CompanyPay

OrganizationID, PresentationDate -> SpeakerID, QualityEvaluation, TopicID

OrganizationID -> Name, Phone, Contact, ContactEmail, WebURL

TopicID -> TopicDescription

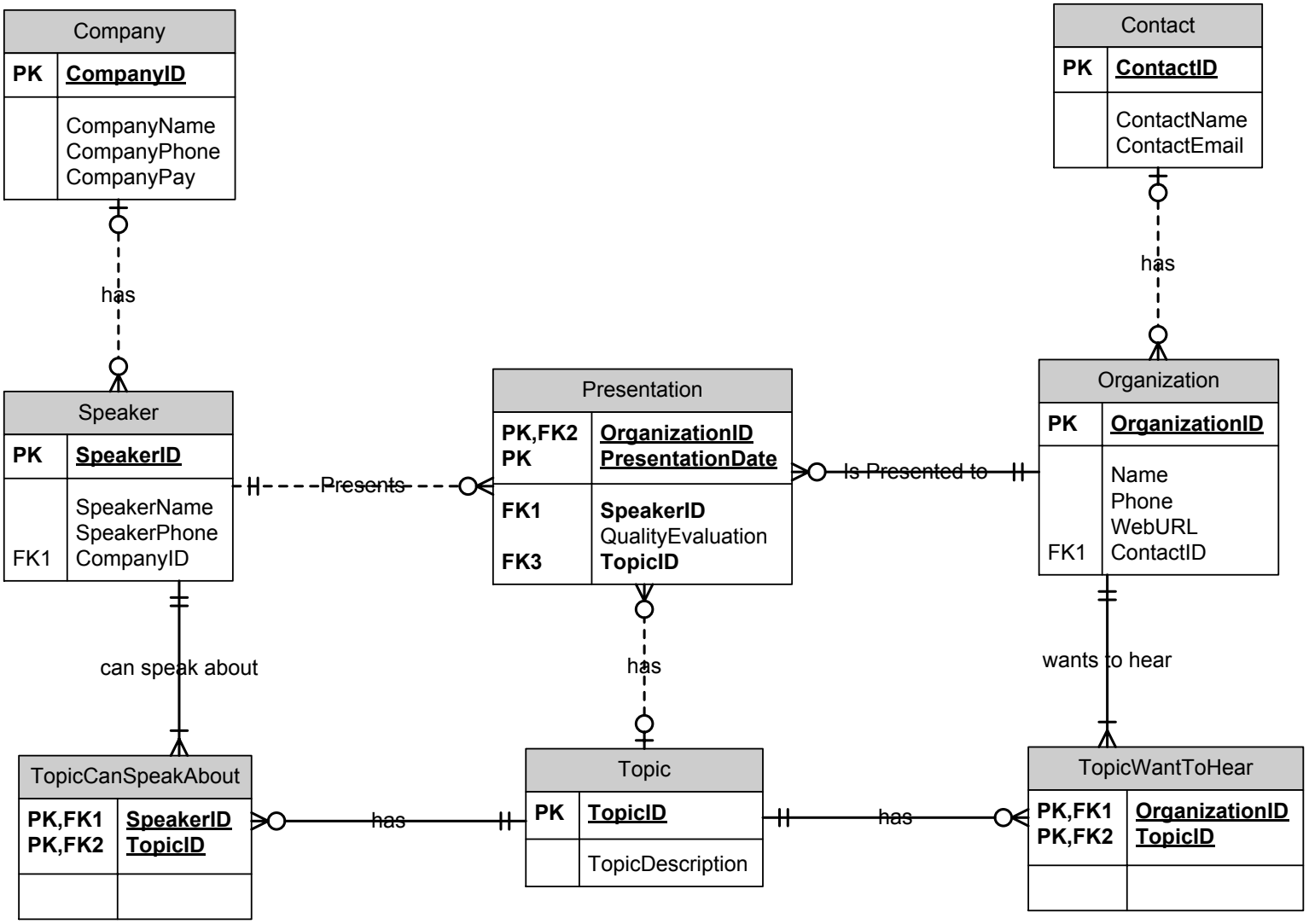
SpeakerID, TopicID ->

OrganizationID, TopicID ->

Third normal form

- Third normal form: Remove transitive dependencies.
  - A transitive dependency occurs when a non-key attribute is functionally dependent on one or more non-key attributes.
- Third normal form examines entities with single primary keys and removes the “floating” or transitive dependencies.
- It may be possible to have attributes that are determined by other attributes, rather than by the primary key. They must be removed into entities with appropriate primary keys.
- Example of transitive dependency:

??->CompanyName, CompanyPhone, CompanyPay



Third Normal Form

Customer's Prescriptions

Select a Customer: Tabitha

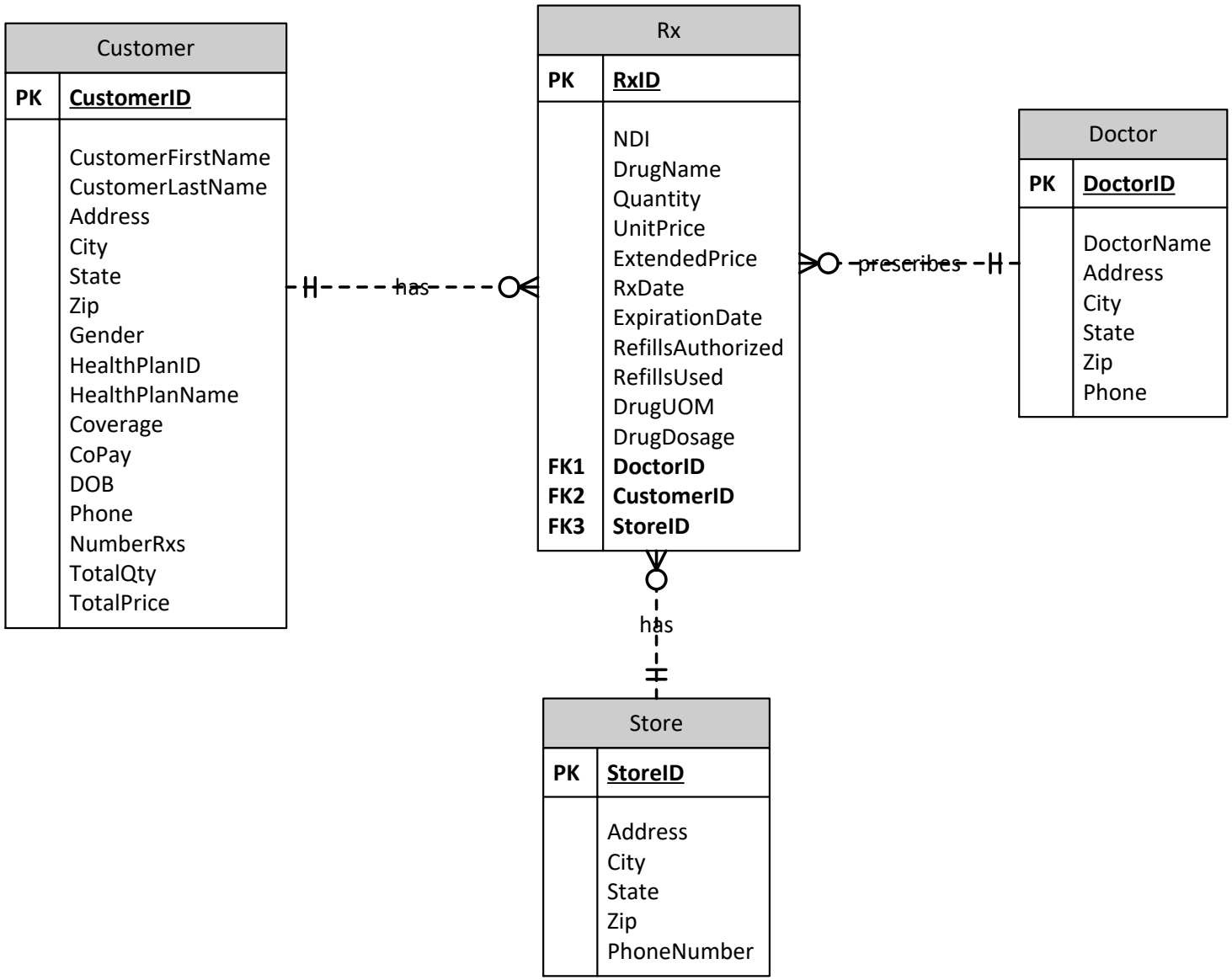
Customer ID: 2
First Name: Tabitha
Last Name: Sabus
Phone: (970) 123-1212
State: CO
Date of Birth: 10/14/1968
Gender: F
Plan ID: 4983

Number of Prescriptions: 8
Total Quantity: 206
Total Price: $868.26

Plan ID	Plan Name	Coverage	CoPay
4983	Southern Rocky Mountains Health Plan	75.00%	$25.00

Record: 1 of 1 | No Filter | Search

Rx ID	Name	Quantity	UnitPrice	ExtendedPrice	RxDate	ExpirationDate	RefillsAuthorized	RefillsUsed	Doctor ID	Doctor's Name
156	Clonazepam	28	$2.52	$70.56	4/15/2017	4/5/2018	8	7	8	Zamarron, Antonio
248	Myobuterol	22	$3.36	$73.92	3/14/2018	8/22/2019	12	12	8	Zamarron, Antonio
247	Warfarin Sodium	11	$2.94	$32.34	8/12/2018	10/14/2019	4	1	12	Gomez, Yolanda
230	Haloperidol	29	$2.73	$79.17	5/12/2021	5/10/2024	12	2	12	Gomez, Yolanda
232	Rizatriptan Benzoate	28	$2.31	$64.68	8/25/2021	12/25/2022	6	2	12	Gomez, Yolanda
231	Propranolol	30	$12.84	$385.05	9/7/2021	11/25/2023	2	1	9	Warric, Joshua
246	Bystolic	22	$1.89	$41.58	8/15/2022	6/12/2024	6	0	17	Banan, Mehdi
39	Abilify	36	$3.36	$120.96	2/18/2022	11/22/2022	3	0	12	Gomez, Yolanda
(New)										


Customer
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CustomerLastName
Address
City
State
Zip
Gender
HealthPlanID
HealthPlanName
Coverage
CoPay
DOB
Phone
NumberRxs
TotalQty
TotalPrice
has
Rx
PK
RxID
NDI
DrugName
Quantity
UnitPrice
ExtendedPrice
RxDate
ExpirationDate
RefillsAuthorized
RefillsUsed
DrugUOM
DrugDosage
FK1
DoctorID
FK2
CustomerID
FK3
StoreID
prescribes
Doctor
PK
DoctorID
DoctorName
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City
State
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Phone
has
Store
PK
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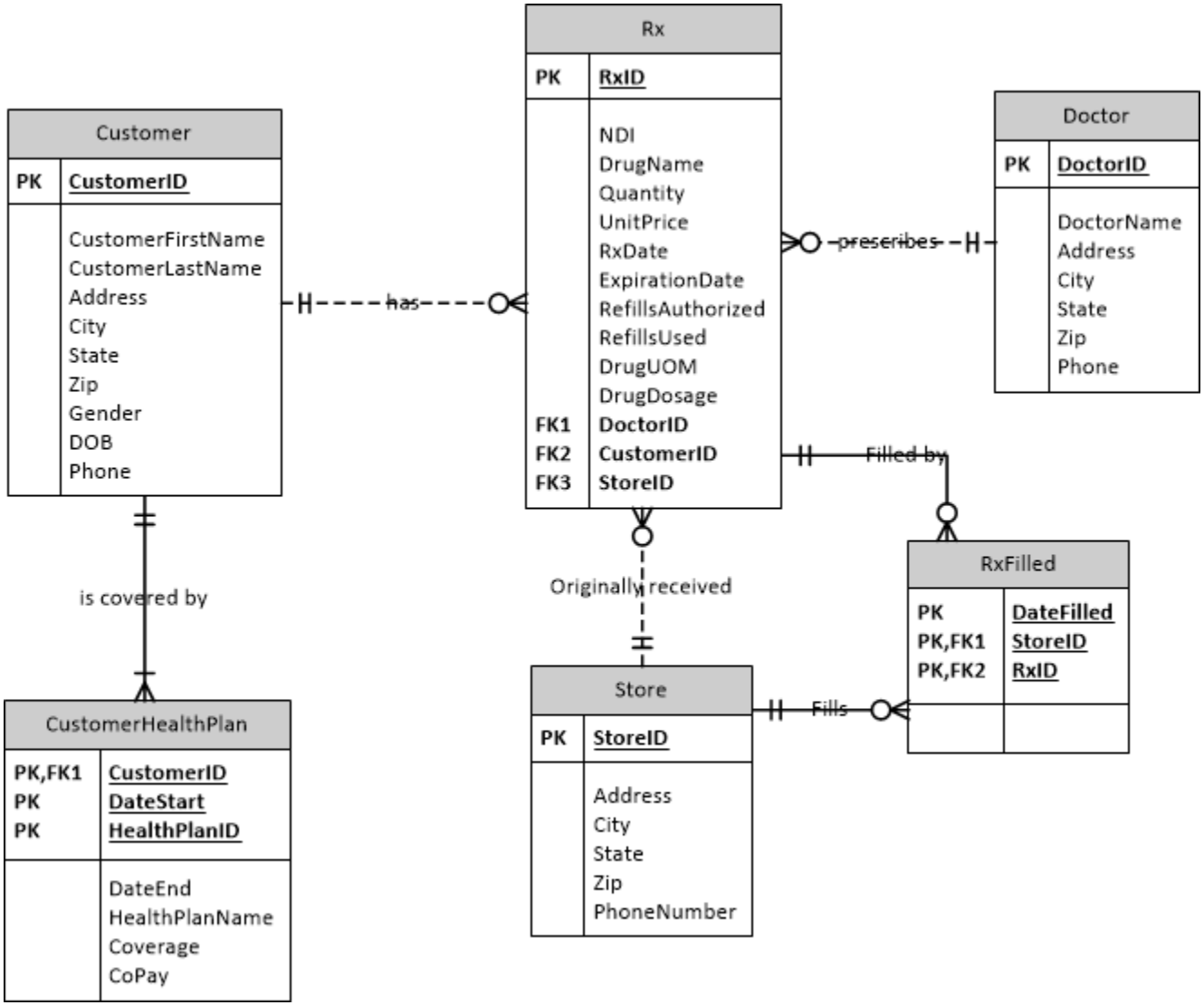
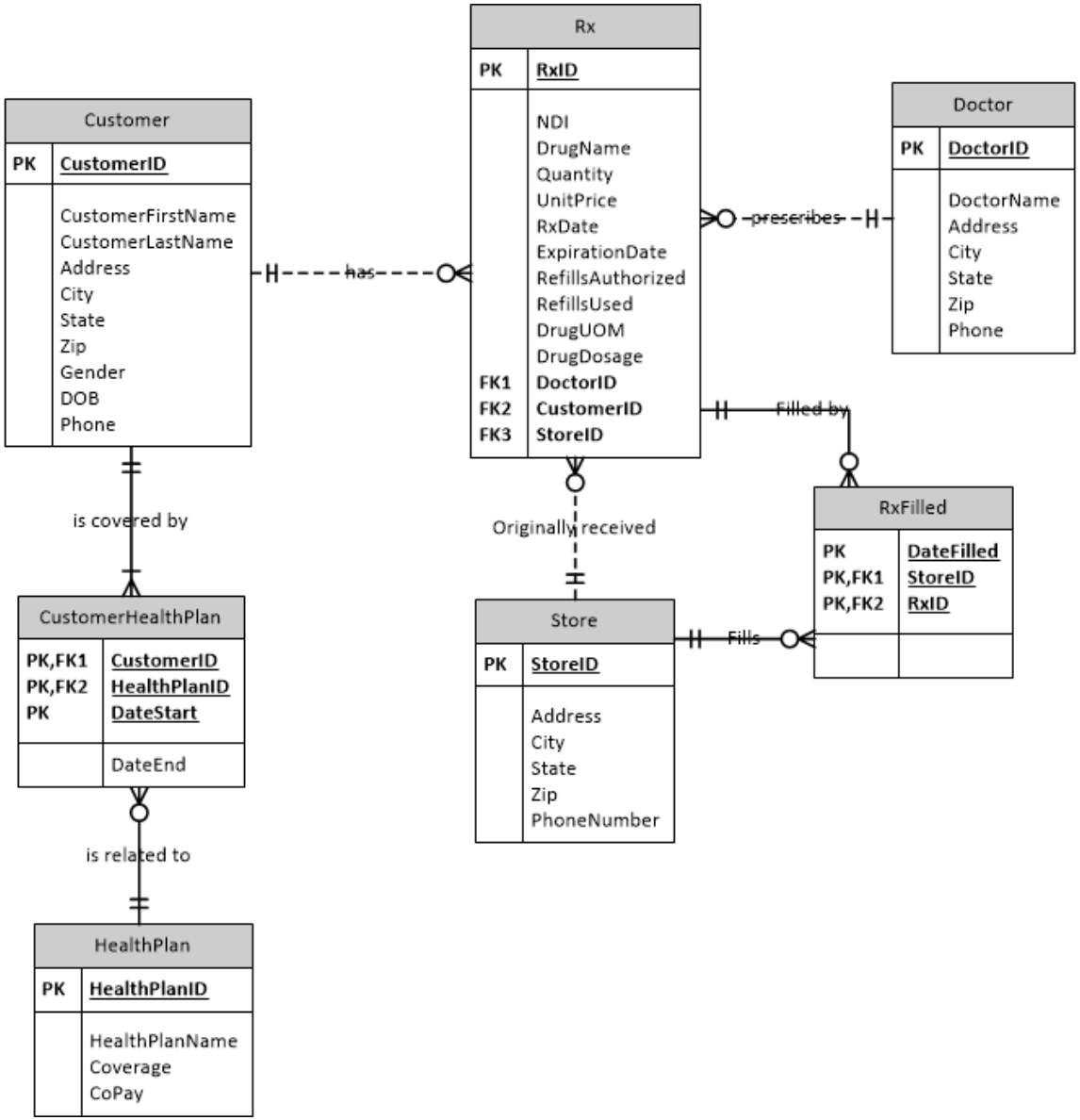
City
State
Zip
PhoneNumber

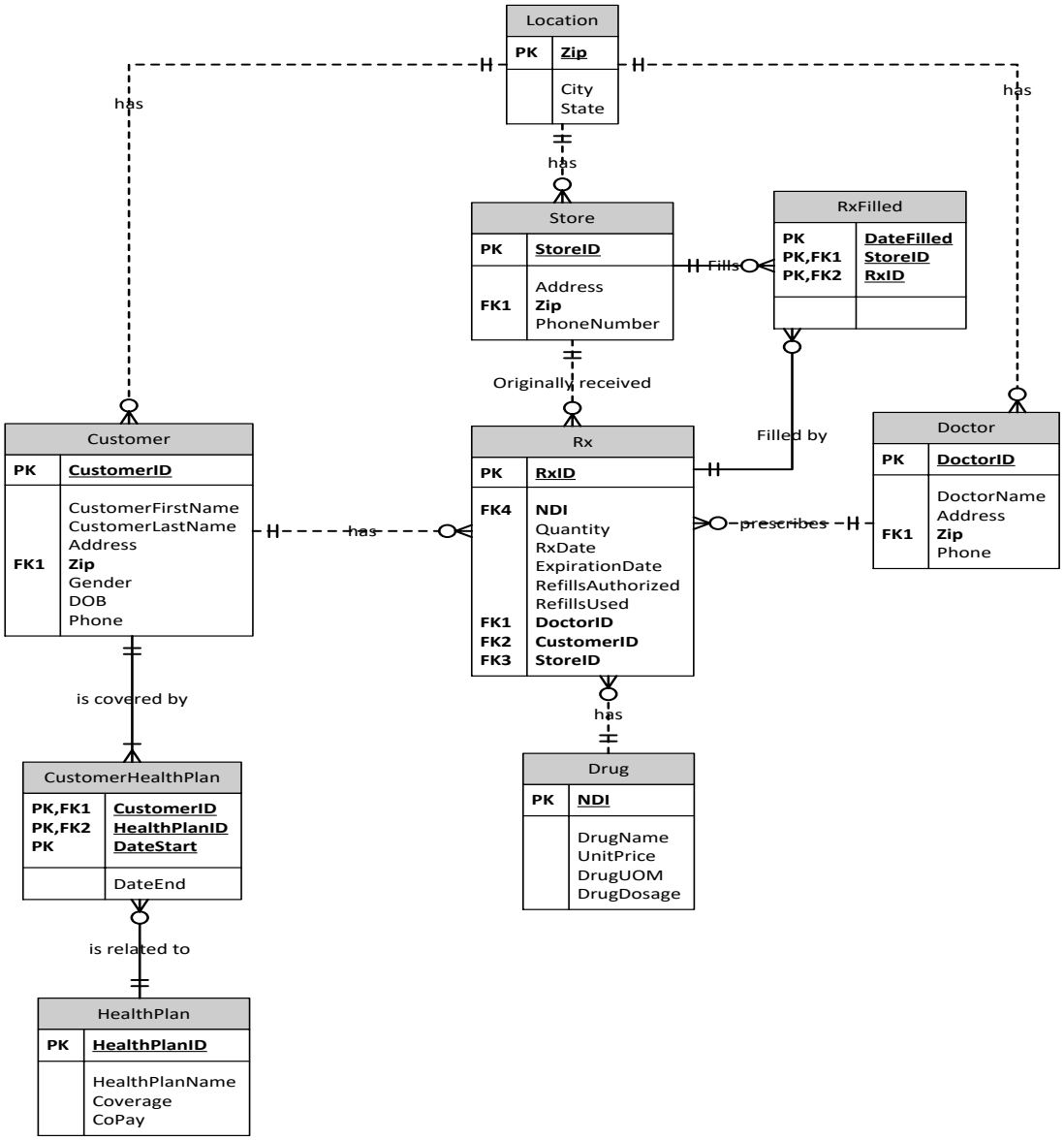
First Normal Form



Second Normal Form



Third Normal Form



Summary of normalization process

- Examine and evaluate the logical data model:
  - Find the **repeating groups and/or multi-valued attributes** and put the model into first normal form. Identify primary key fields for any new entities. Create concatenated keys as necessary. Relate entities with foreign keys.
  - Find the **functional dependencies**. Identify the **partial functional dependencies** and put the model into second normal form. Identify primary key fields for any new entities. Create concatenated keys as necessary. Relate entities with foreign keys.
  - Find the **transitive dependencies** and put the model into third normal form. Identify primary key fields for any new entities. Relate entities with foreign keys.

Normalization exercise

- Find a person who is not part of your group.
- Exchange designs for question #1, HW#4.
- Follow the instructions on the document provided in class.

How to study for the test

- Practice doing database designs.
  - Many questions at the end of chapter 2.
  - I put a few of the questions from chapter 2 in Week 3 along with the answers to those questions.
  - There is a skeleton ERD question and answer available in week 7.
- Read the book.
- Review the PowerPoints.
- Create a personal study guide.
- Create a page of notes for the text.