



DATABASE FOUNDATIONS

ORACLE ACADEMY



6 DE MAYO DE 2025

<https://academy.oracle.com/>

[HTTPS://GITHUB.COM/ISC-UPA/2025-2-ISC05-DB](https://github.com/ISC-UPA/2025-2-ISC05-DB)

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1. Introduction

Directrices para Fundamentos de bases de datos					
Duración de la sesión: 45 minutos					
	Sesión 1	Sesión 2	Sesión 3	Sesión 4	Sesión 5
Semana 1	Introducción				
Semana 2					
Semana 3	Bases de datos y modelado de datos				
Semana 4					
Semana 5					
Semana 6	Acotación del modelo de datos				
Semana 7					
Semana 8					
Semana 9	Revisión del examen de mitad de trimestre			Examen de mitad de trimestre	
Semana 10	Oracle SQL Developer Data Modeler				
Semana 11					
Semana 12	Asignación al modelo físico				
Semana 13	Introducción a SQL				
Semana 14					
Semana 15					
Semana 16					
Semana 17					
Semana 18	Revisión del examen final			Examen final	

Database Foundations – Español : Dfo 1-1: Introducción al curso (Diapositivas de la lección)

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Course Progress Save and Continue

PowerPoint Presentation 3 / 13 67%

Hoja de ruta

Y es importante que los alumnos pulsen ese botón para registrar sus progresos.

Introducción al curso

Introducción a las bases de datos

Tipos de modelos de bases de datos

Requisitos de negocio

Introducción a SQL

Introducción a Oracle SQL Developer Data Modeler

Asignación al modelo físico

Revisión del examen de mitad de trimestre

Examen de mitad de trimestre

Revisión del examen final

Examen final

Database Foundations – Español

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Sections in Course

Difficulty

Status in Progress

En este curso, los estudiantes con poca experiencia en database aprenden técnicas de diseño de bases de datos, diseñar bases de datos con una herramienta de modelado y reciben una introducción a SQL para implementar y realizar consultas en bases de datos por medio de actividades prácticas y estimulantes.

Course Outline

Sección 0 - Recursos del curso

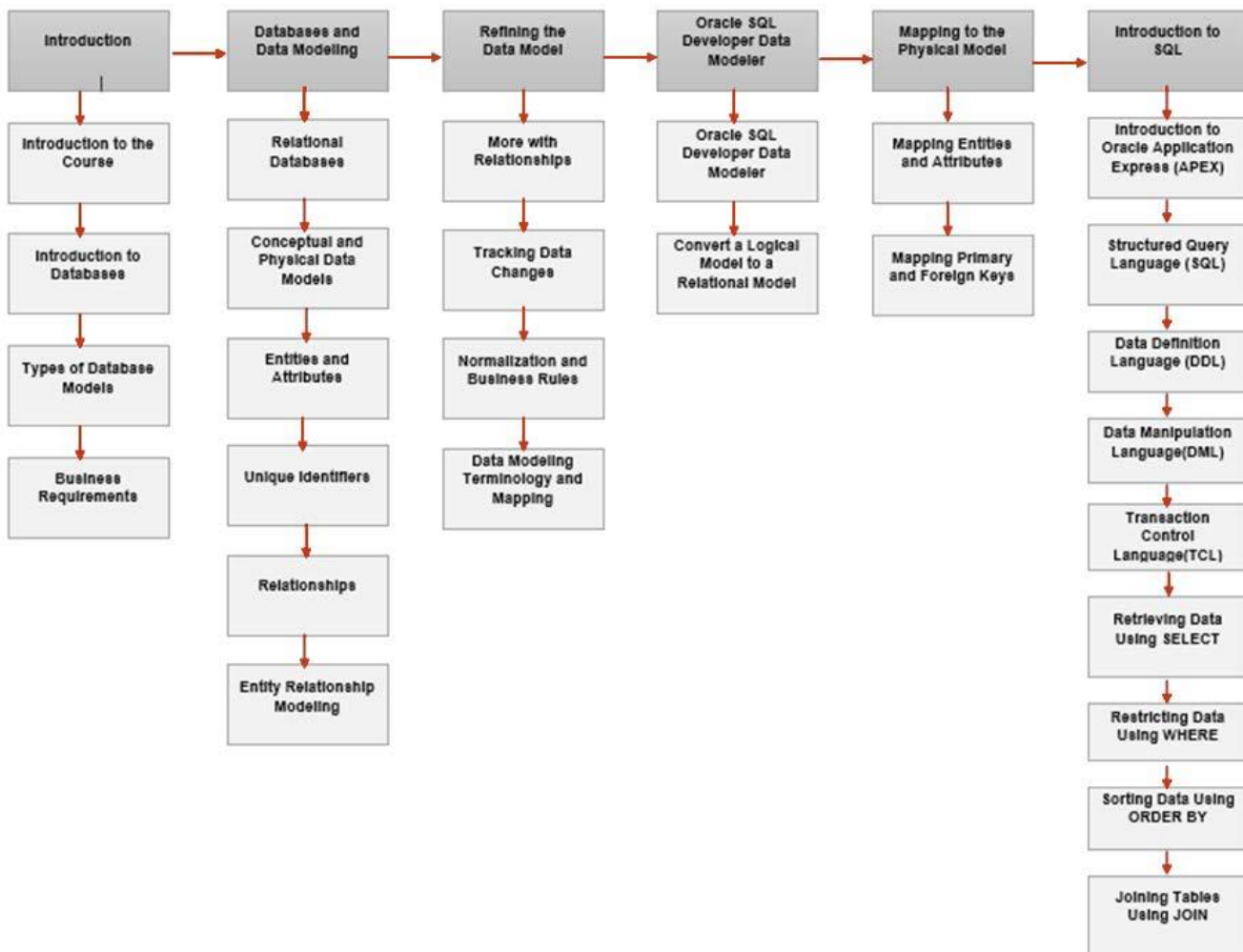
Sección 1 - Introducción

Sección 2 - Bases de datos y modelado de datos

Sección 3 - Acotación del modelo de datos

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1.1. Introduction



Technological Requirements:

Oracle SQL Developer or Oracle APEX application
Oracle Data Modeler

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1.2. Introduction to Databases

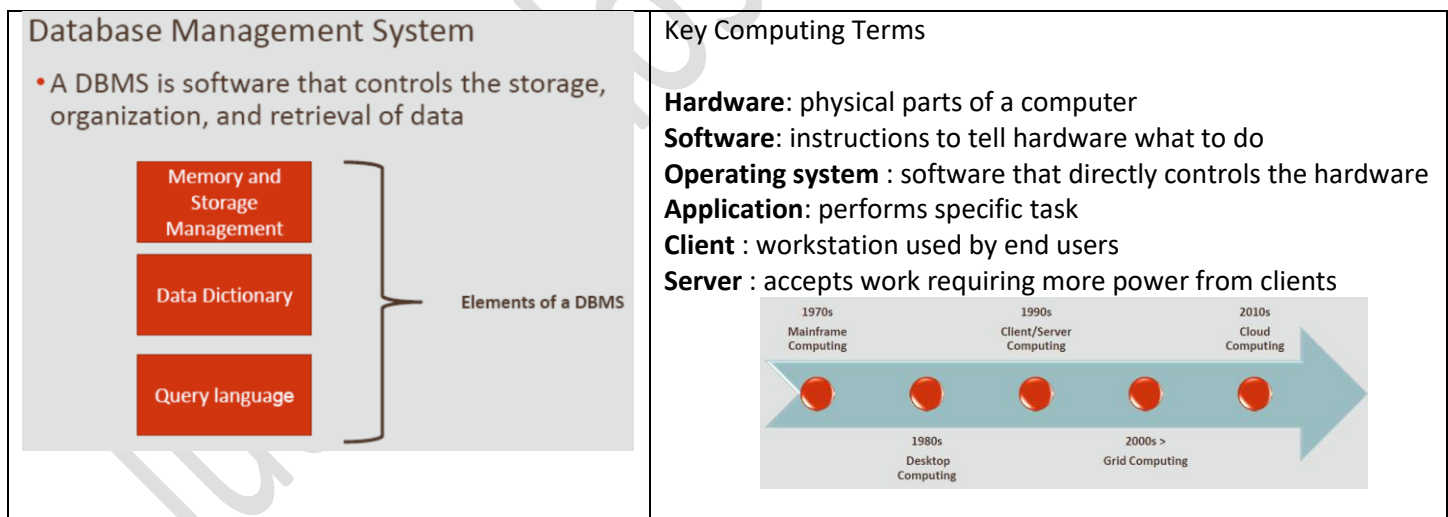
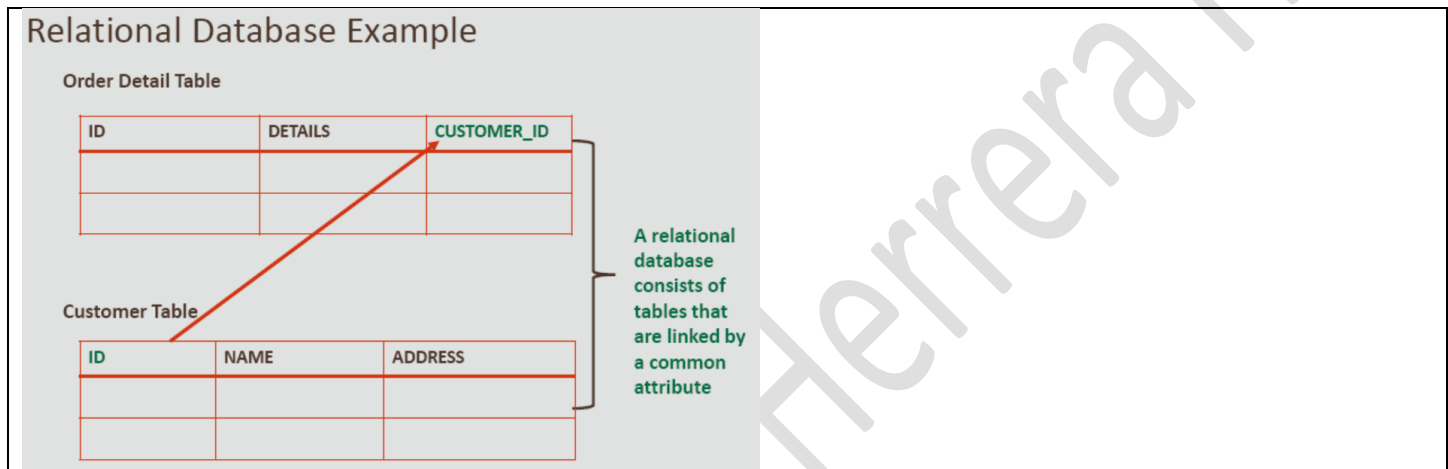
Data vs Information.

Data: Collected facts about a topic or item

Information: The result of combining, comparing, and performing calculations on data.

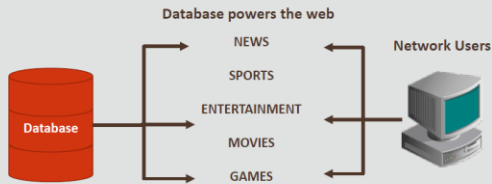
Introduction to Relational Databases

- A relational database stores information in tables with rows and columns
- A table is a collection of records
- A row is called a record (or instance)
- A record is a collection of fields
- A column is referred to as a field (or attribute)



2000s: Grid Computing (Shared Processing)

- In the grid-computing model, all of an organization's computers in different locations can be utilized just like a pool of computing resources
- Grid computing builds a software infrastructure that can run on a large number of networked servers
- A user makes a request for information or computation from his or her workstation and that request is processed somewhere in the grid as efficiently as possible



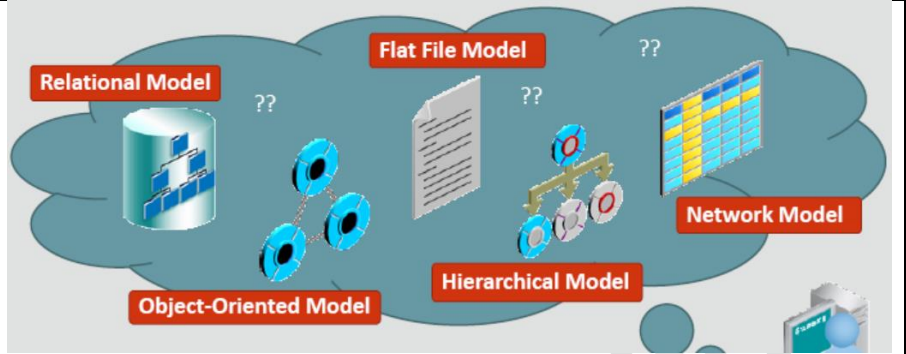
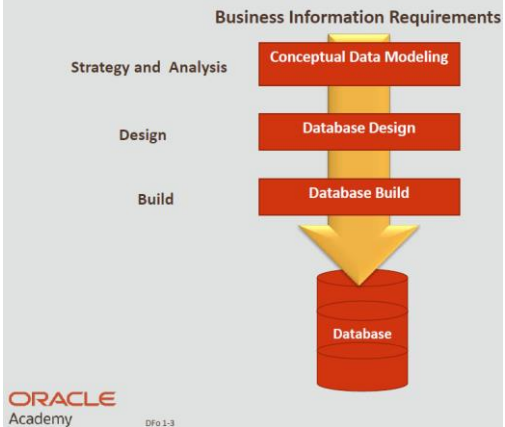
2010s: Cloud Computing (Internet Based Processing)

- Databases run from the web (as a service)
-
- The diagram shows a blue cloud containing three red cylinders labeled 'Database'. Arrows point from the cloud to three service categories: INFRASTRUCTURE (IaaS), PLATFORM (PaaS), and SOFTWARE (SaaS). These categories are then connected by arrows to a computer icon labeled 'Web Users'.
- Cloud computing allows the delivery of computing services over the Internet
 - The three main categories of cloud services are:
 - IaaS – Allows you to rent cloud based servers, storage, operating systems etc
 - PaaS – Gives access to an online environment for developing and testing software without any setup or management costs
 - SaaS – Delivers software direct from the Internet. Users normally access it through a web browser

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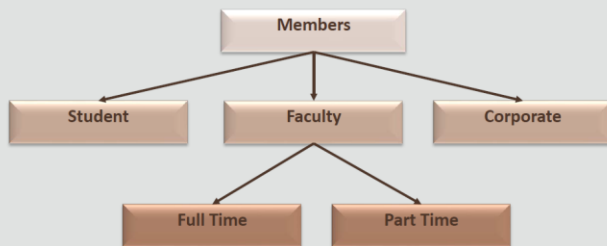
1.3. Types of Database Models

Database Development Process

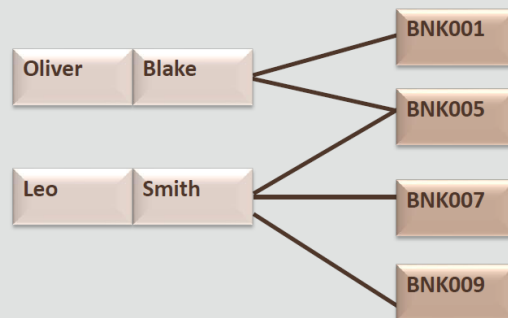


Example of a Hierarchical Model

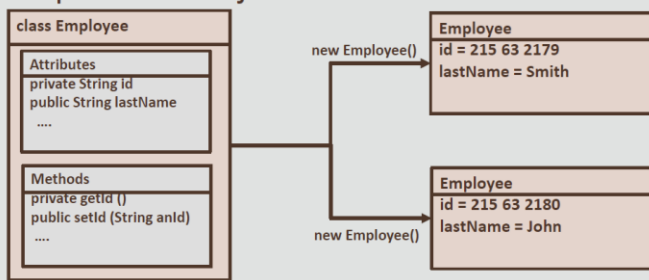
- Data is organized in a tree-like structure and stored as records that are connected to one another through links



Example of a Network Model



Example of an Object-Oriented Model



Los nombres de clases son en Singular

Los nombres de las tablas son en Plural

Example of a Relational Model

EMPLOYEE			
EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
100	Steven	King	90
101	Neena	Kochhar	90
102	Lex	De Haan	90
200	Jennifer	Whalen	10
205	Shelley	Higgins	110

DEPARTMENT	
DEPARTMENT_ID	DEPARTMENT_NAME
10	Administration
20	Marketing
50	Shipping

In this example a relationship is created between the two tables using the common field of DEPARTMENT_ID

Foreign Key (points to DEPARTMENT_ID in EMPLOYEE table)

Primary Key (points to DEPARTMENT_ID in DEPARTMENT table)

refers to (points from DEPARTMENT_ID in DEPARTMENT table to DEPARTMENT_ID in EMPLOYEE table)

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1.4. Business Requirements

Case Scenario: Need a Database Solution

	STUDENT_ID	SPORT_1	PRICE_1	SPORT_2	PRICE_2
Record 1	ST0001	Tennis	\$100	Badminton	\$150
Record 2	ST0002	Soccer	\$175	Tennis	\$100
Record 3	ST0003	Cycling	\$200	Badminton	\$150
.....

Case Scenario: Possible Database Solution

Student Details Table

ID	FIRST_NAME	LAST_NAME
ST0001	Sean	Smith

Sport Details Table

ID	NAME	PRICE
TN001	Tennis	\$100

Participant Details Table

STUDENT_ID	SPORT_ID	SEMESTER_DETAILS
ST0001	TN001	Fall2017

Flat file was split into three tables eliminating issues related to:

- Redundancy
- Data entry anomalies
- Inconsistency

Importance of Business Rules

It is important to identify and document business rules when designing a database

Business rules:

- Allow the developer/architect to understand the relationship and constraints of the participating entities
- Help you understand the standardization procedure that an organization follows when handling huge data
- Should be simple and easy to understand
- Must be kept up-to-date

Note: Not all business rules can be modeled in a database, but must be documented

Case Scenario: Identifying Key Business Rules, Problems, and Assumptions

- Business rule: Used to understand business processes and the nature, role, and scope of the data
- Assumption: Can be defined as a fact or a statement that has been taken for granted
- Problem: Can be defined as a situation or scenario that requires attention and a possible solution to alleviate the situation

Example:

Note	Business Rule	Assumption	Problem
To ensure that new book arrivals happen on the 21 st of every month.			
Librarian cannot easily identify DVDs that are seriously overdue (more than two weeks late).			
Our current system probably uses Oracle Database 10g and is on UNIX.			

Identify the statements as a business rule, a problem, or an assumption.



2. Databases and Data Modeling

2.1. Relational Databases

Relational Database: Example

STUDENTS

ID	LAST_NAME	DATE_OF_BIRTH	ADDRESS	COURSE_ID

Foreign Key

Primary Key

Relationship

Each table is assigned a PRIMARY_KEY column which uniquely identifies the entity instance

A PRIMARY_KEY column in one table is designated as a FOREIGN_KEY column in a related table to form a relationship between the tables

ID	NAME	DURATION

COURSES

This relationship between the STUDENTS table and the COURSES table lets you store the data and query it to determine the specific courses that a student is attending (or has attended)

Relational Tables

- A table is a simple structure where data is organized and stored

Table: EMPLOYEES

columns

EMPLOYEE_ID	LAST_NAME	FIRST_NAME	DEPARTMENT_ID	PAYROLL_ID	NICKNAME
100	SMITH	DANA	10	21215	Dana
310	ADAMS	TYLER	15	59877	Ty
210	CHEN	LAWRENCE	10	1101	Larry
405	GOMEZ	CARLOS	10	52	Chaz
378	LOUNGANI	NEIL	22	90386	Neil

rows

Primary Key
Column (PK)

Foreign Key
Column (FK)

Unique Key
Column (UK)

Rules for Relational Database Tables

- Each table has a distinct name
- Each table may contain multiple rows
- Each table has a value to uniquely identify the rows
- Each column in a table has a unique name
- Entries in columns are single values
- Entries in columns are of the same kind
- Order of rows and columns is insignificant

Key Terms

Table –A basic storage structure

Column–attribute that describes the information in the table

Primary Key –the unique identifier for each row

Foreign Key –a column that refers to a primary key column in another table

Row–data for one table instance

Field –the one value found at the intersection of a row and column

Modeling Performed :

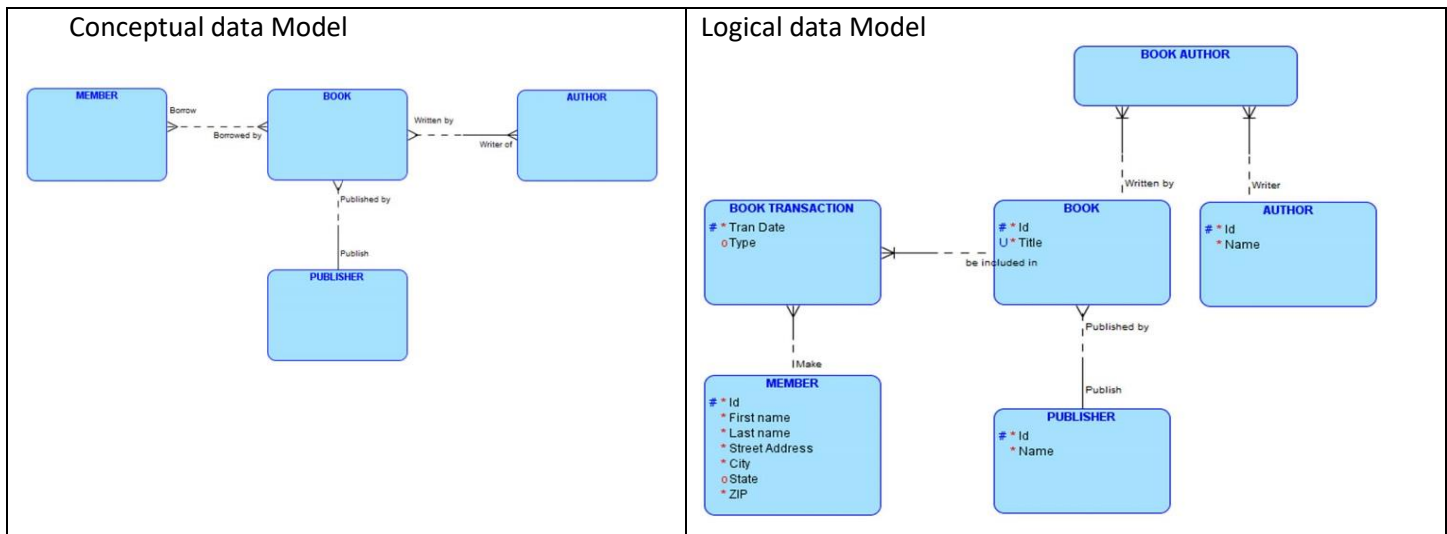
Entities -> Tables

Attributes -> Columns

Relationships -> Foreign keys

→

2.2. Conceptual and Physical Data Models \$\$

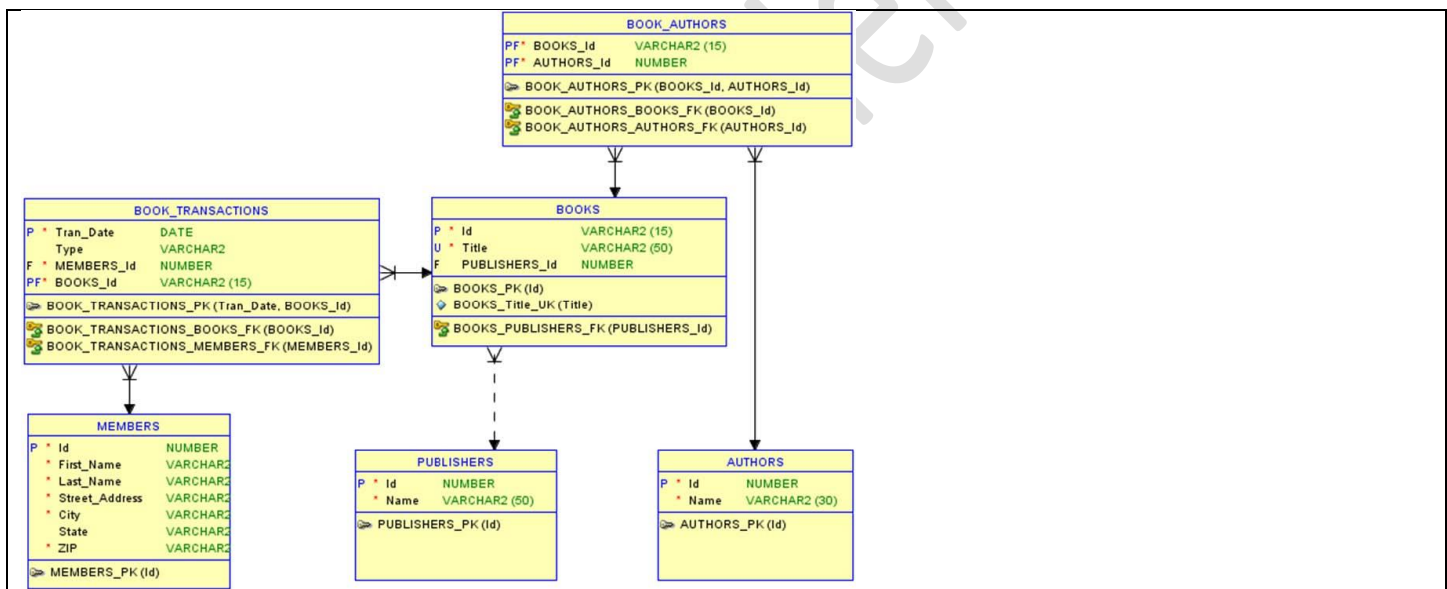


Physical data Model: Entities ->

Relationships ->

Attributes ->

Constraints



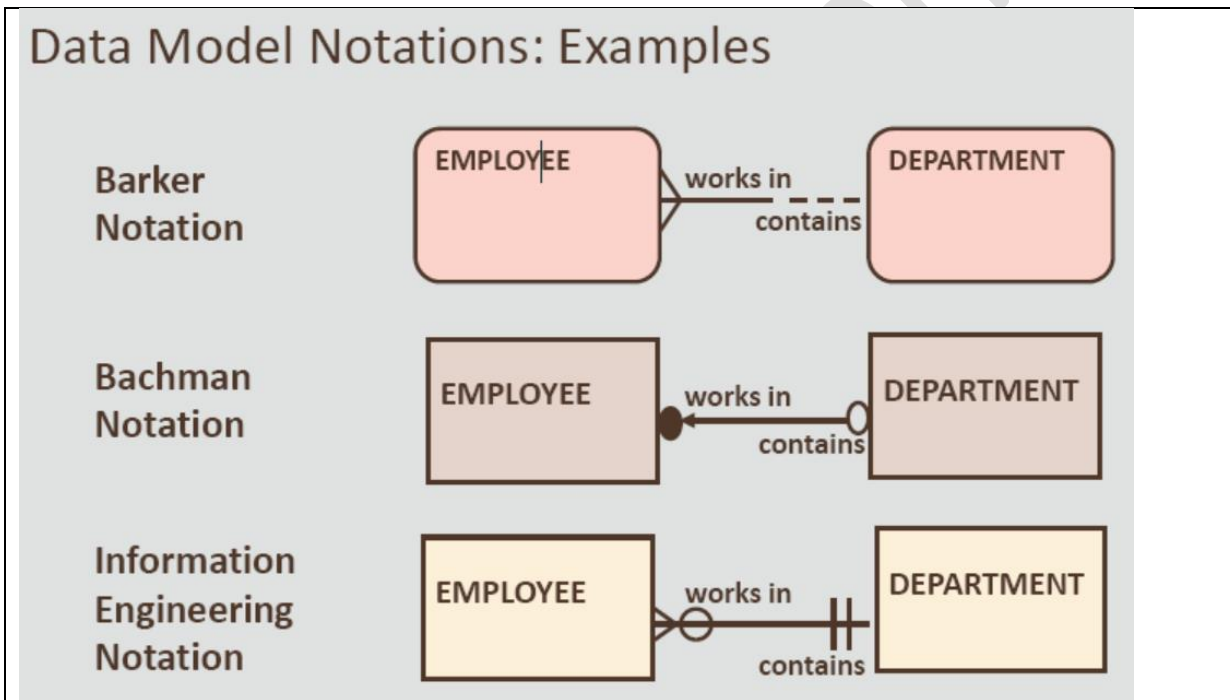
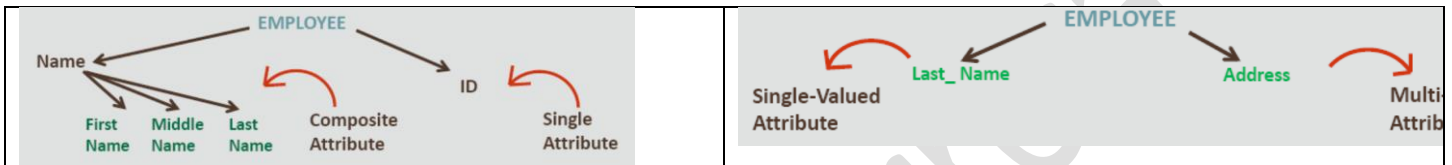
2.3. Entities and Attributes

Identify mandatory(*), optional(o), volatile(age), and nonvolatile(birthDate) attributes

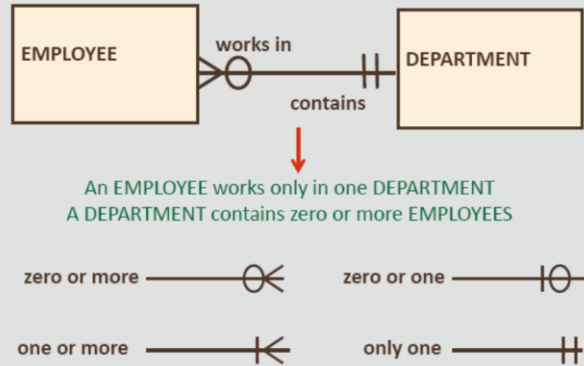
Entity Types

An entity can be classified as one of the following types:

Name	Description	Example
Prime	Exists independently	CUSTOMER, INSTRUCTOR
Characteristic	Exists because of another (prime) entity	ORDER, CLASS OFFERING
Intersection	Exists because of two or more entities	ORDER ITEM, CLASS ENROLLMENT



Information Engineering Notation



Data Model Notations

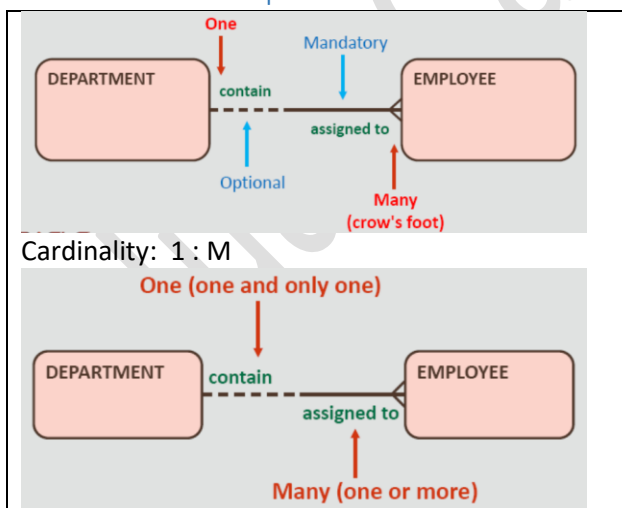
Notation (Read left to right)	Barker Notation	Bachman Notation	Information Engineering
Zero or one	--- □	○ — □	○ ⊖ □
Only one	— □	● — □	⊞ □
Zero or more	--- ⊗	○ — □	○ ⊕ □
One or more	— ⊗	● — □	⊞ ⊕ □
Primary Key/Unique key	#	P	

Note: Barker notation is used for this course

2.4. Unique Identifiers



2.5. Relationships



Foreign Key Examples

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
100	Steven	King	90
101	Neena	Kochhar	90
102	Lex	De Haan	90
103	Alexander	Hunold	60
104	Bruce	Ernst	60

Foreign Key ←

refers to

DEPARTMENT_ID	DEPARTMENT_NAME
10	Administration
20	Marketing
50	Shipping

Primary Key →

Cardinality M : N

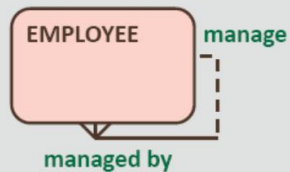


Cardinality 1 : 1



Recursive Relationships

- A recursive relationship is a relationship with an entity and itself

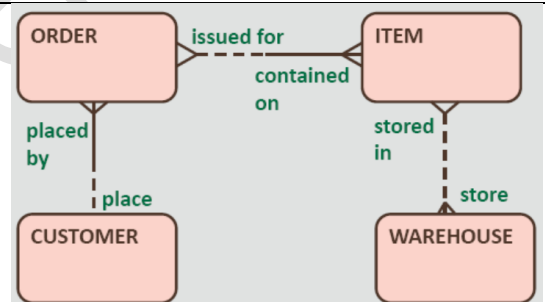


• Business rules:

- Each EMPLOYEE may manage one or more EMPLOYEE
- Each EMPLOYEE must be managed by one and only one EMPLOYEE

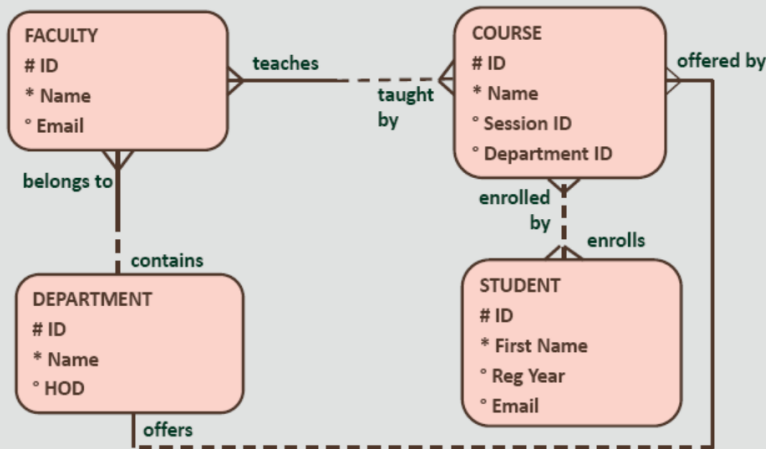
Relationship Matrix: Mapping the Contents

	CUSTOMER	ITEM	ORDER	WAREHOUSE
CUSTOMER			place	
ITEM			contained on	stored in
ORDER	placed by	issued for		
WAREHOUSE		store		

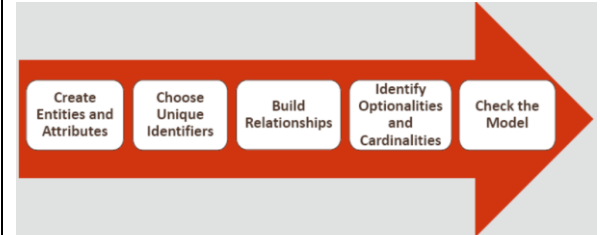


2.6. Entity Relationship Modeling (ERDs)

Logical Modeling: Example



Steps to Build an ERD

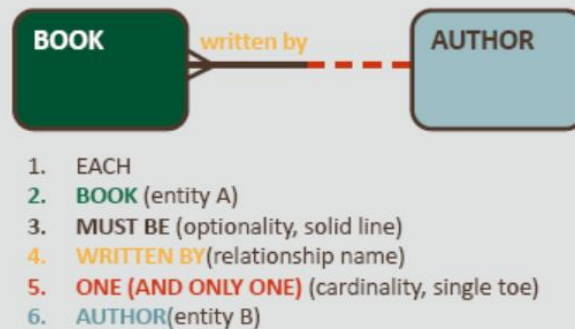


Components of ERDish

- EACH
- Entity A
- OPTIONALITY (must be/may be)
- RELATIONSHIP NAME
- CARDINALITY (one and only one/ one or more)
- Entity B

ERDish Example

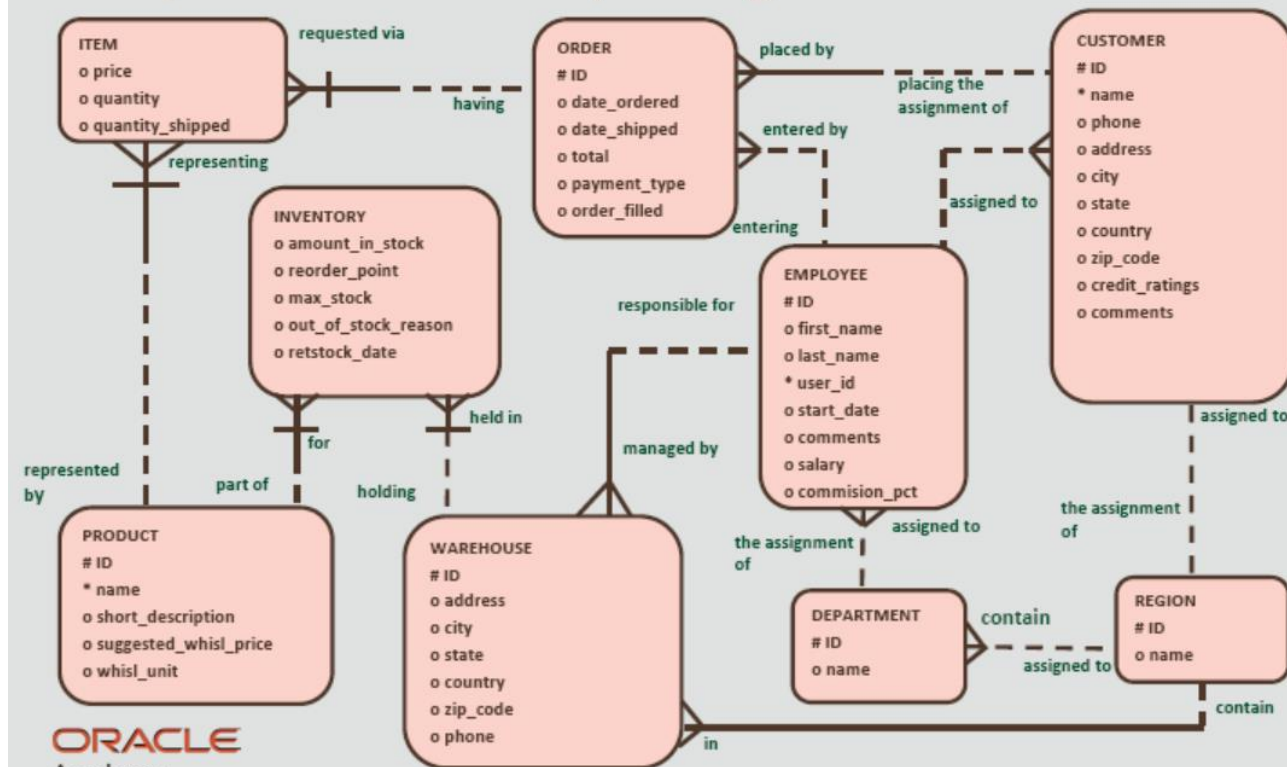
Because a relationship has two sides, first read one side from left to right.



1. EACH
2. **AUTHOR** (entity B)
3. **MAY BE** (optionality, dotted line)
4. **THE AUTHOR OF** (relationship name)
5. **ONE OR MORE** (cardinality, crow's foot)
6. **BOOK** (entity A)

Next, read the relationship from right to left.

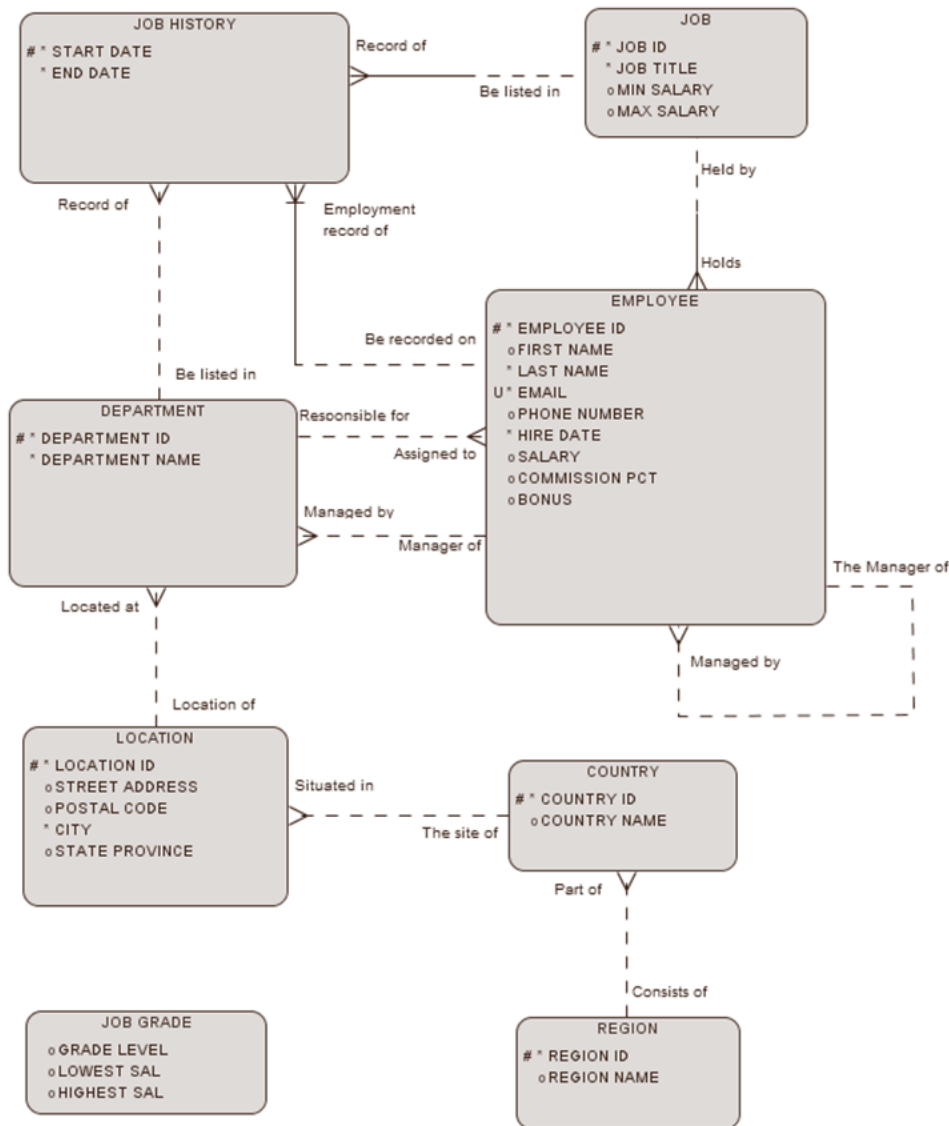
Sample Solution for Sporting Goods ERD

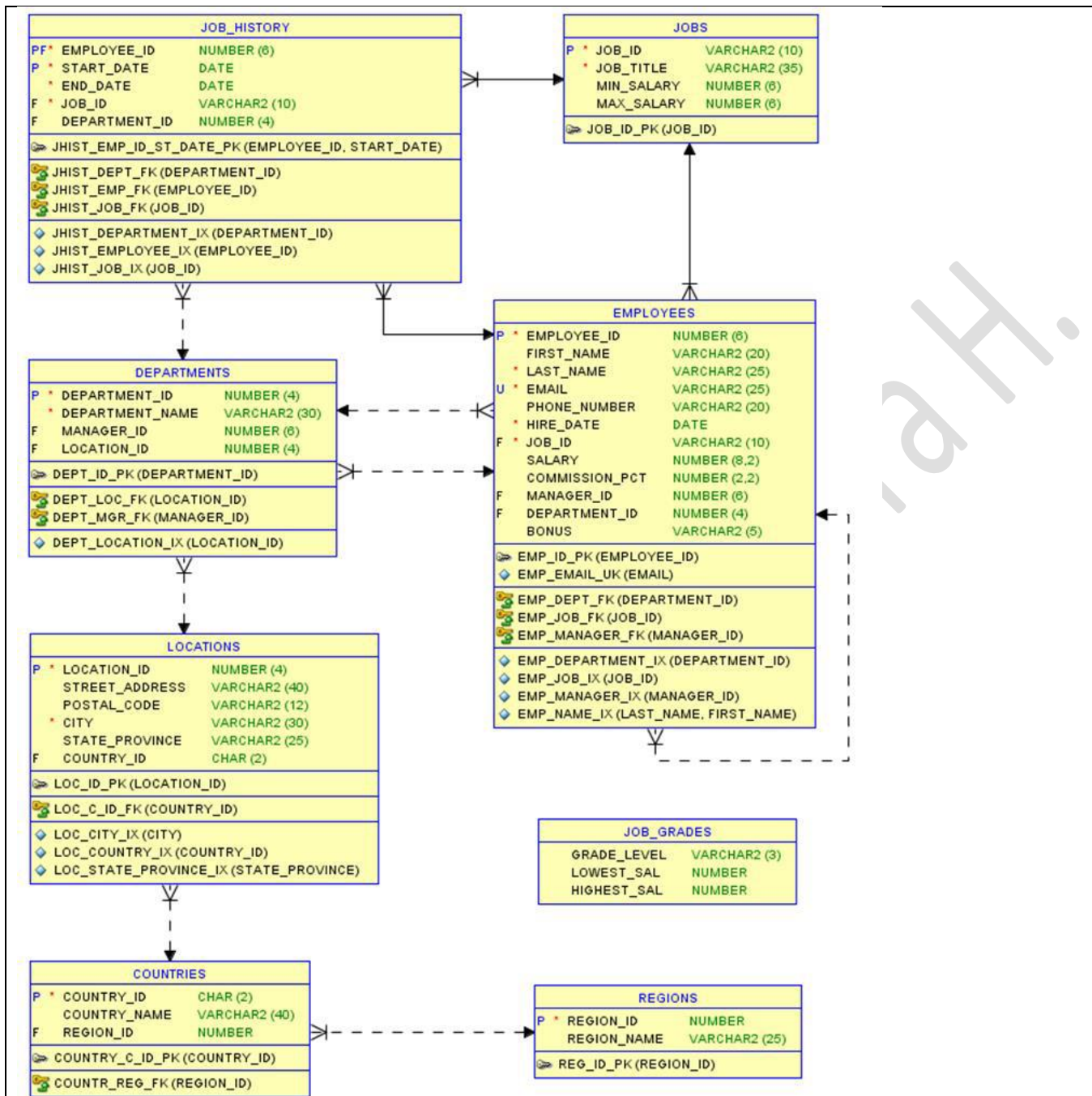


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Entity Relationship Modeling (ERDs)

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3. Refining the Data Model

3.1. More with Relationships

3.2. Tracking Data Changes

3.3. Normalization and Business Rules

3.4. Data Modeling Terminology and Mapping



Juan Carlos Herrera H.

4. Oracle SQL Developer Data Modeler

4.1. Oracle SQL Developer Data Modeler

4.2. Convert a Logical Model to a Relational Model



Juan Carlos Herrera H.

5. Mapping to the Physical Model

5.1. Mapping Entities and Attributes

5.2. Mapping Primary and Foreign Keys



Juan Carlos Herrera H.

6. Introduction to SQL

- 6.1. Introduction to Oracle Application Express
- 6.2. Structured Query Language (SQL)
- 6.3. Data Definition Language (DDL)
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Juan Carlos Herrera H.