

# Data Modelling

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- Scenario:
  - A college has two departments. Teachers from each department list their course offerings before the beginning of each semester. These lists are collected and displayed on the enrollment website. Each department offers courses to students. Students can enroll in several courses in each semester. Fee for the courses needs to be deposited before the start of the semester

# Data Modelling – Solution

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- Step 1: Identify key data things
  - Hint: Identify the nouns (things or concepts) in the scenario statement
- Step 2: Define the key “nouns”
  - Hint: Think from the perspective of all stakeholders
- Step 3: Construct a Conceptual Data Model
  - Hint: Use the key “nouns” identified and their relationships with each other
- Step 4: Construct a Logical Data Model

# Data Modelling – Solution

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- Step 1: Identify key data things
  - A **college** has two **departments**. **Teachers** from each department list their **course** offerings before the beginning of each **semester**. These lists are collected and displayed on the **enrollment** website. Each department **offers courses to students**. **Students** can **enroll in several courses** in each semester. **Fee** for the courses needs to be deposited before the start of the semester

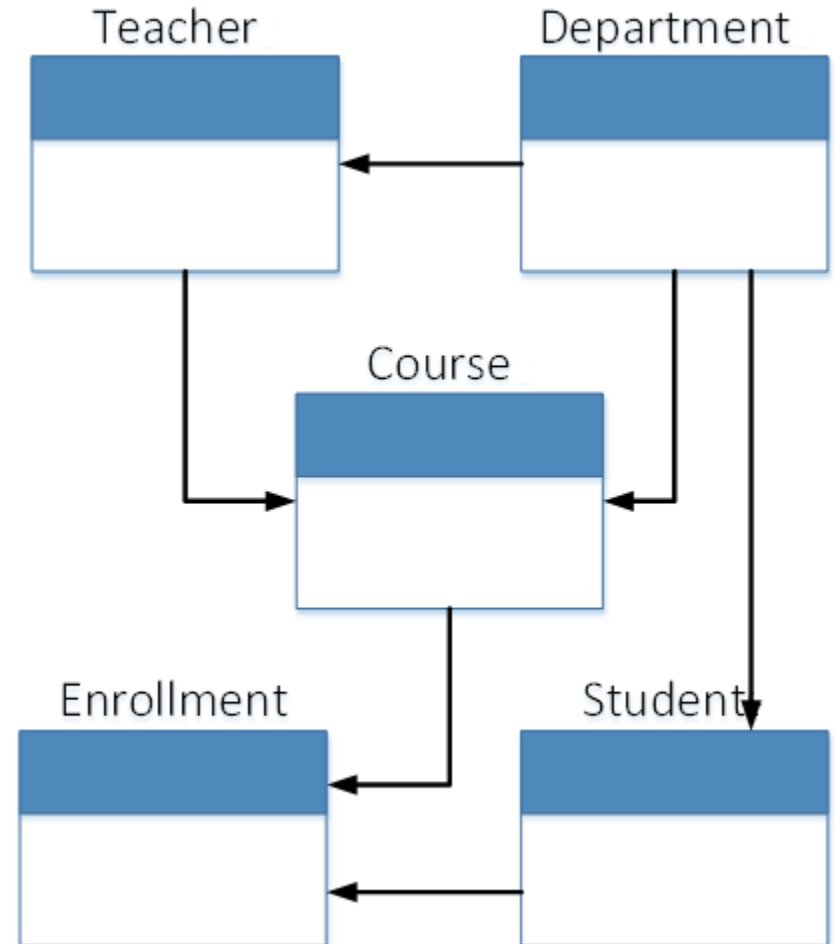
# Data Modelling – Solution

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- Step 2: Define the key nouns, for example:
  - Students
    - Study in a department at the college
    - Can enroll in several courses
    - Have to pay fee
- Note: It is important to avoid assumptions
  - Consult relevant stake holders i.e. students, college administration, faculty, ...?
  - Remember the difference between “must” and “should”

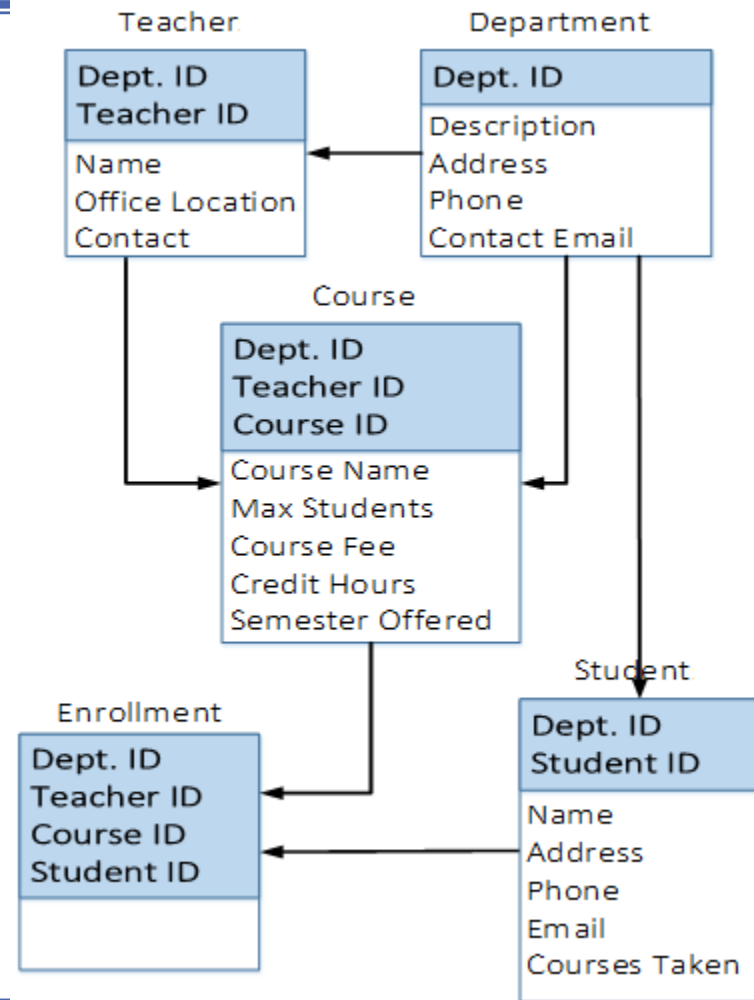
# Solution – Conceptual Data Model

Step 3:  
Construct a Conceptual Data Model



# Solution – Logical Data Model

Step 4:  
Construct a Logical Data Model



# Naming Conventions

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- Entity names - Required to:
    - Be descriptive of the objects in the business environment
    - Use terminology that is familiar to the users
  - Attribute name - Required to be descriptive of the data represented by the attribute
  - Proper naming:
    - Facilitates communication between parties
    - Promotes self-documentation
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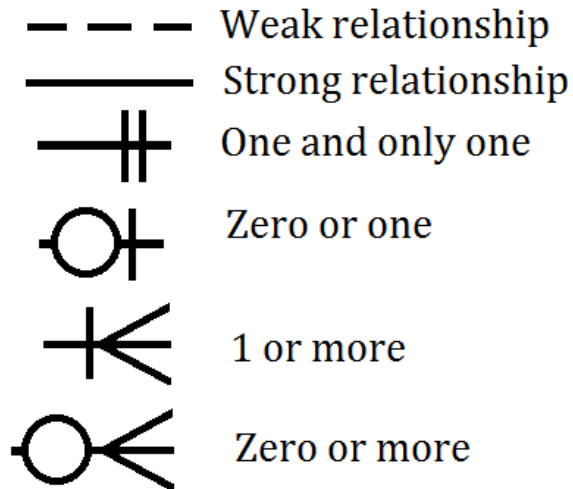
# Data Model Basic Building Blocks

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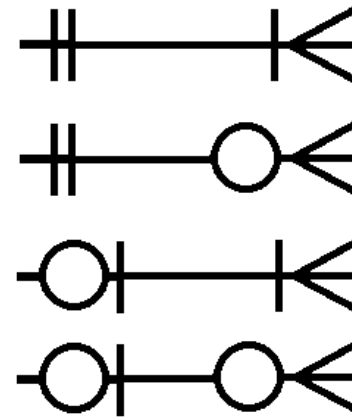
- **Entity:** Unique and distinct object used to collect and store data
    - **Attribute:** Characteristic of an entity
  - **Relationship:** Describes an association among entities
    - **One-to-many (1:M)**
    - **Many-to-many (M:N or M:M)**
    - **One-to-one (1:1)**
  - **Constraint:** Set of rules to ensure data integrity
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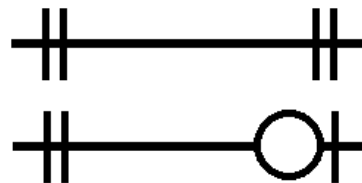
# Types of Relationships



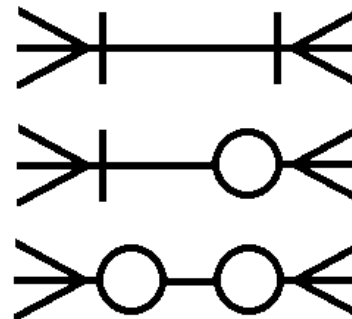
## One-to-Many (1:M)



## One-to-One (1:1)



## Many-to-Many (M:N)



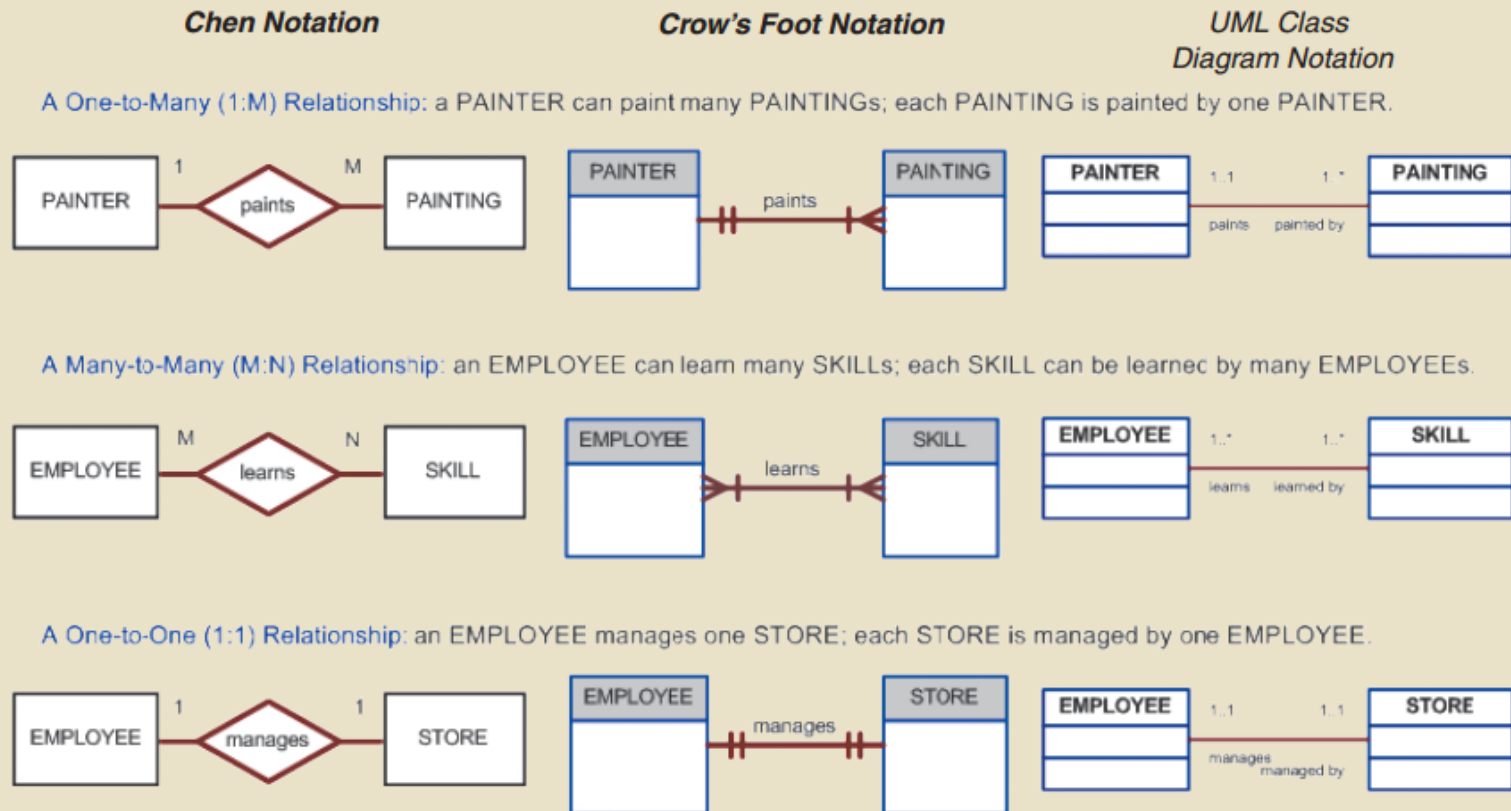
# Data Modeling Notations

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- Several notations used for high-level data models
  - Choice depends on purpose and audience
  - Also depends on the choice of tool used, if any
  - Should not be tied down to using only one notation
    - Use organization's standard notation, if any
- Recommended to use tools that can generate Data Definition Language (DDL) or scripts for creating databases

# Data Modelling Notations

FIGURE 2.3 THE ER MODEL NOTATIONS



# Group Exercise

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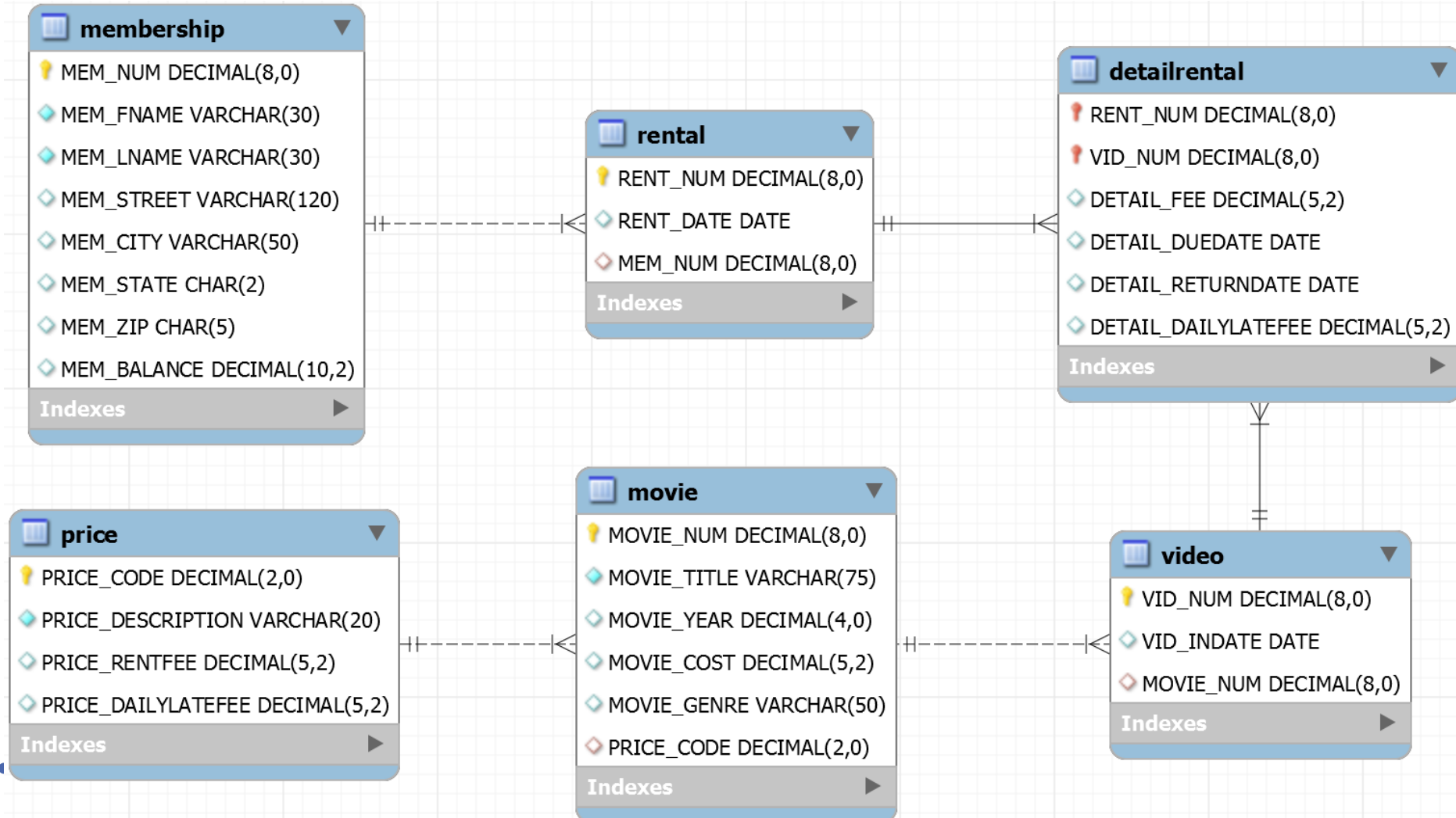
- In groups discuss and sketch a conceptual, logical and physical data model for a database that stores “all” data for a video rental store
  - Step 1: Identify important business rules. For example,
    - The store may have several copies of a movie
    - Regular customers get 10% discount on new movies
    - A movie can be rented for 3 days
  - Step 2: Identify entities and relationships
  - Step 3: Identify attributes of each entity
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# Group Exercise

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- Step 4: For a physical model, identify the constraints and the datatype for each attribute
  - For this store, you might want to consider:
    - How regular customers will be identified?
    - How new movies are identified?
    - How rental price is determined?
    - What happens when movies are returned late?
    - How are movies organized?
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# Example – ERD of a Video Rental Database



# Data Types

- Databases support the following data types:
  - Numeric
  - Character (Text, String)
  - Date (DateTime)
  - Logical

MS Access data types →

← MySQL data types

