Week 1 Database organisations
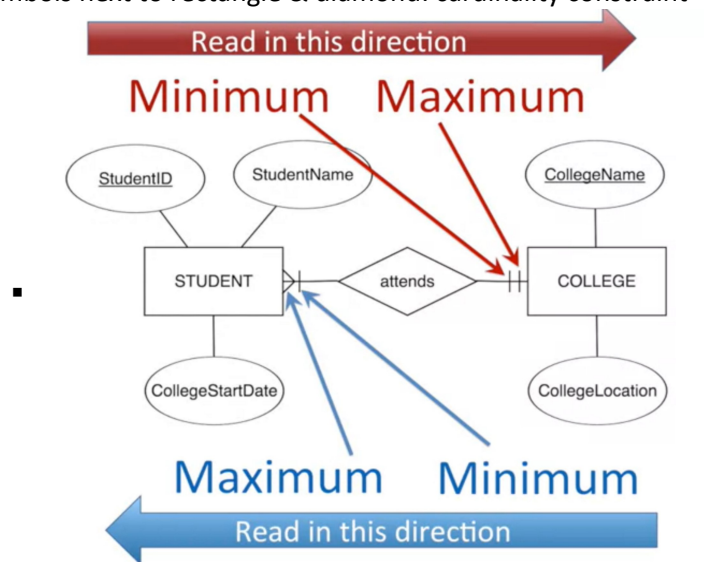
18 June 2020   23:55

- Based on set theory
- ## Entity-Relationship Diagrams (ER diagrams)
  - databases are **collections of tables** that each have their own unified theme; these tables are **linked by one or more columns** with the same values.
  - Components
    - ○ Boxes: entities - categories of similar but unique measurements -> table
      - ▪ entity instance: a single occurrence of an entity type -> a row
      - ▪ **double rectangle**: weak entity
    - ○ Ovals: attributes - unique measurement within a category -> columns
      - ▪ has to be connected to at least one entity
      - ▪ must be unique to the entity
      - ▪ **underline**: unique attribute (keys/identifiers) - an attribute with a unique value in each entity instance -> unique for every row in a table
      - ▪ **dashed underline**: partial key
        - □ become unique iff connected to the unique key of the entity with a double diamond
      - ▪ composite attribute: important attribute that can be created by combining other attributes being tracked and saved. (usually not a column to save space)
      - ▪ **double oval**: multivalued attribute
      - ▪ **dashed oval**: derived attribute
    - ○ Diamond: relationship
      - ▪ shows how many instances of one entity are associated with how many instances of another entity
      - ▪ **double diamond**
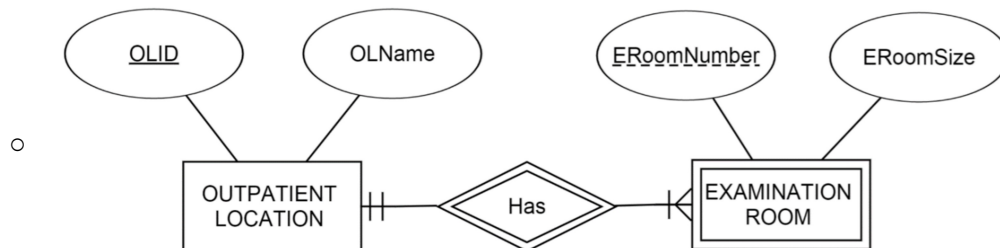   - ○ Symbols next to rectangle & diamond: cardinality constraint
      - ▪
      - ▪ Cardinality Symbols

        | One

        ⋖ Many

        M   Infinite

        O   Optional
      - ▪ numbers take precedence over symbols; always in terms of (min, max)

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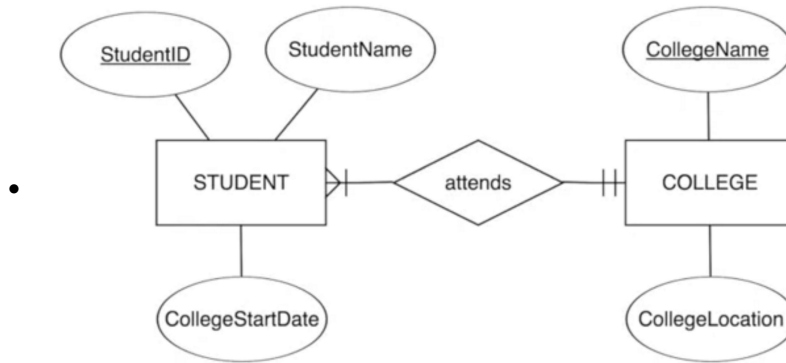
  - each college must be attended by at least one student. but can be attended by many students
  - each student attends a min of 1 but no more than one college
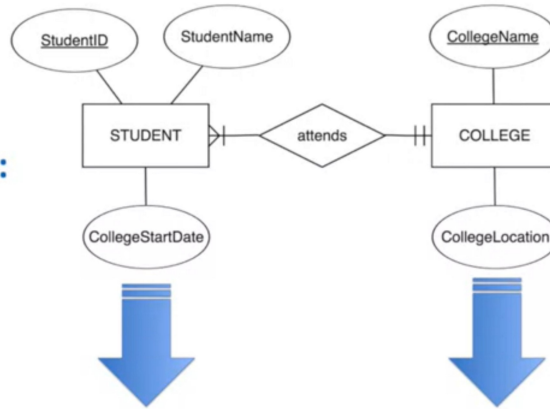- Weak entity
  -

  - examination rooms within different outpatient locations can have different ERoomNumber; but within the same outpatient location, ERoomNumber is unique

Relational schemas
- describe how a database is actually organised (a plan)
- components
  - tables (relations)
    - columns, field (attribute) - no order
    - row (tuple) - no order; no duplicate in theory, but can have duplicate in practice
  - primary keys: column (or set of columns) whose value is unique for every row in a table
    - underlined
    - cannot have null values
    - other unique attributes can contain null, and are marked with (U)
  - foreign keys
    - columns that refers to the primary key of another table (do not have to use the same name)
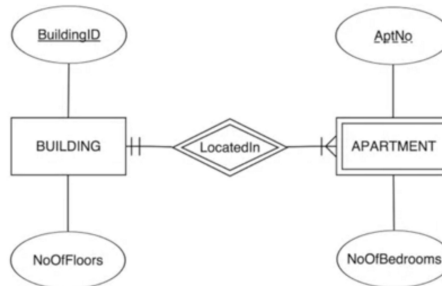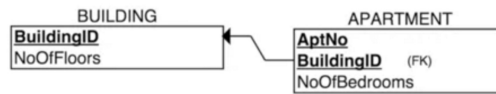   - marked with (FK)

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  - ER Diagram:
  - Relational Schema:
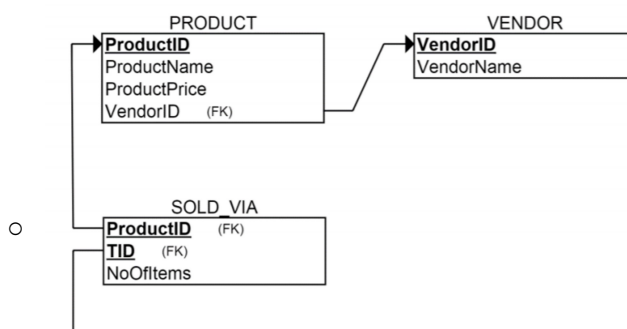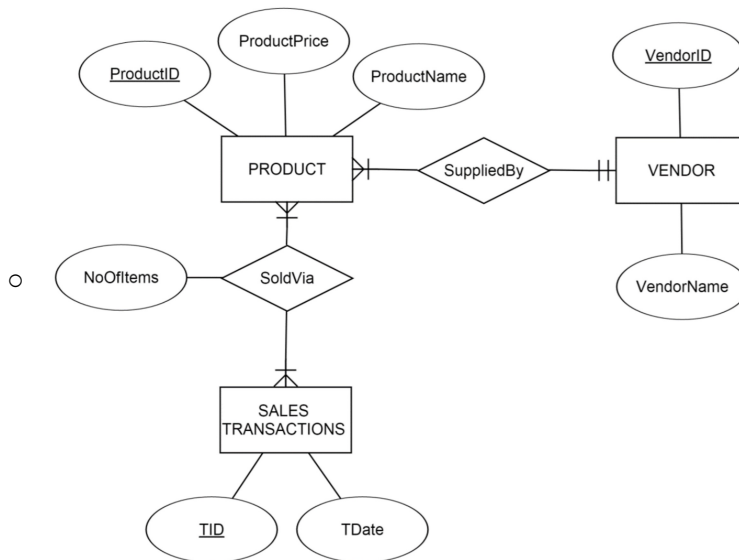   - ○ FK chosen to have single value
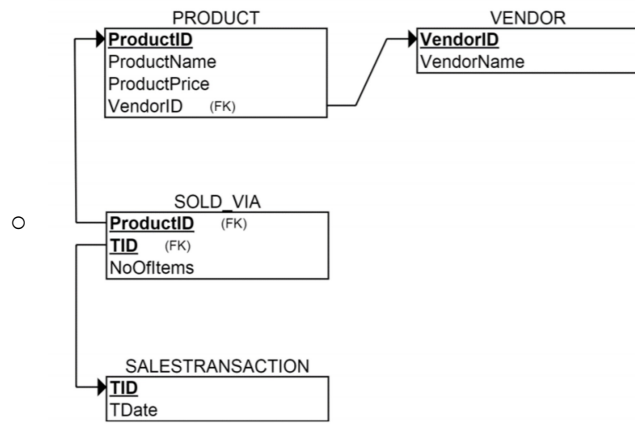- Weak entity
  - ER Diagram:
    - ○
  - Relational Schema:
- Many-to-many relationships
  - ○
  - ○

PRODUCT
| **ProductID** |
| ProductName |
| ProductPrice |
| VendorID   (FK) |

VENDOR
| **VendorID** |
| VendorName |

SOLD_VIA
| **ProductID**   (FK) |
| **TID**   (FK) |
| NoOfItems |

SALESTRANSACTION
| **TID** |
| TDate |

- Multiple values: always stored in a separate table to avoid keying in other columns many times

Making ER diagram using ERDPlus