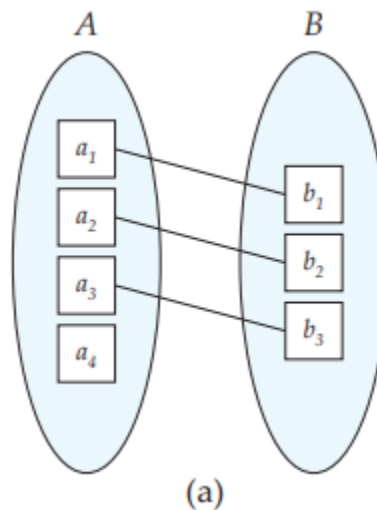


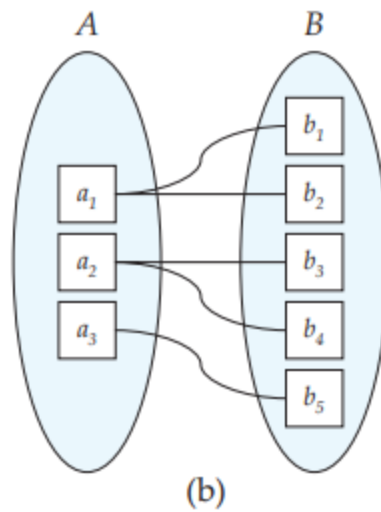
ER Diagram (ERD): Constraints, Keys and Relationship Identification and Participation Constraints

Constraints:

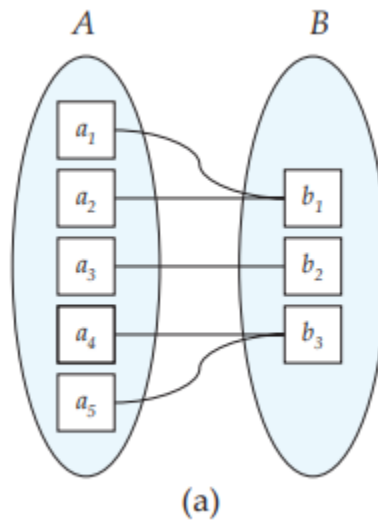
- Mapping cardinalities, or cardinality ratios, express the number of entities to which another entity can be associated via a relationship set.
- Mapping cardinalities are most useful in describing binary relationship sets.
- For a binary relationship set R between entity sets A and B, the mapping cardinality must be one of the following:
 - a. **One-to-one.** An entity in A is associated with at most one entity in B, and an entity in B is associated with at most one entity in A.



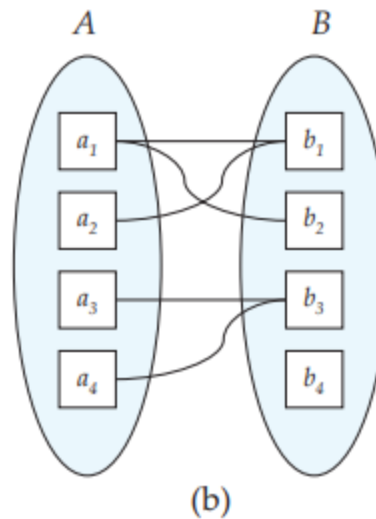
- b. **One-to-many.** An entity in A is associated with any number (zero or more) of entities in B. An entity in B, however, can be associated with at most one entity in A.



- c. **Many-to-one.** An entity in A is associated with at most one entity in B. An entity in B, however, can be associated with any number (zero or more) of entities in A.



- d. **Many-to-many.** An entity in A is associated with any number (zero or more) of entities in B, and an entity in B is associated with any number (zero or more) of entities in A.



Example:

A student can be advised **by only one instructor**, and an instructor can advise several students, then the relationship set from instructor to student is -----.

If a student can be advised **by several instructors**, the relationship set is many-to-many.

Participation Constraints:

- The participation of an entity set E in a relationship set R is said to be total **if every entity in E participates in at least one relationship in R.**
- **If only some entities in E participate in relationships in R,** the participation of entity set E in relationship R is said to be partial.

For example, we expect every student entity to be related to at least one instructor through the advisor relationship. Therefore the participation of student in the relationship set advisor is total. In contrast, an instructor need not advise any students. Hence, it is possible that only some of the instructor entities are related to the student entity set through the advisor relationship, and the participation of instructor in the advisor relationship set is therefore partial.

Keys

- We must have a way to specify how entities within a given entity set are distinguished. Conceptually, individual entities are distinct;

- **A key for an entity is a set of attributes** that suffice to **distinguish entities from each other**.
- **Keys** also help to **identify relationships uniquely**, and thus distinguish relationships from each other.
- Let R be a relationship set involving entity sets E1, E2,..., En.

The composition of the primary key for a relationship set depends on the set of attributes associated with the relationship set R.

If the relationship set R has no attributes associated with it, then the set of attributes
 $\text{primary-key}(E1) \cup \text{primary-key}(E2) \cup \dots \cup \text{primary-key}(En)$
describes an individual relationship in set R.

If the relationship set R has attributes a1, a2,..., am associated with it, then the set of attributes:

$\text{primary-key}(E1) \cup \text{primary-key}(E2) \cup \dots \cup \text{primary-key}(En) \cup \{a1, a2, \dots, am\}$
describes an individual relationship in set R.

- The structure of the primary key for the relationship set depends on the mapping cardinality of the relationship set.
 - As an illustration, consider the entity sets instructor and student, and the relationship set advisor, with attribute date. Suppose that the **relationship set is many-to-many**. Then the primary key of advisor consists of the **union of the primary keys** of instructor and student.
 - If the relationship is **many-to-one from student to instructor**— that is, each student can have at most one advisor— then the primary key of advisor is simply **the primary key of student**.
 - However, if an instructor can advise only one student— that is, if the advisor relationship is **many-to-one from instructor to student**— then the primary key of advisor is simply **the primary key of instructor**.
 - For **one-to-one relationships** either candidate key can be used as the primary key.