

CS3DB3/SE4DB3/SEM03 TUTORIAL

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Introduction

- ◆ Office Hours

- ◆ Wednesday 1:30 -2:30pm, ITB 116

- ◆ Email

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Outline

- ◆ E-R MODEL
- ◆ Relational Operations
- ◆ Introduction to SQL



E-R MODEL (entity sets)

- ◆ An **entity** is an object that exists and is distinguishable from other objects.
- ◆ An **entity set** is a set of entities of the same type that share the same properties.
 - ◆ We use **rectangles** represent entity sets.
 - ◆ Example:

customer

loan

E-R MODEL (relationship sets)

- ◆ A **relationship** is an association among several entities.
- ◆ A **relationship set** is a set of relationships of the same type.
 - ◆ we use **diamonds** to represent relationship set.
 - ◆ Example:

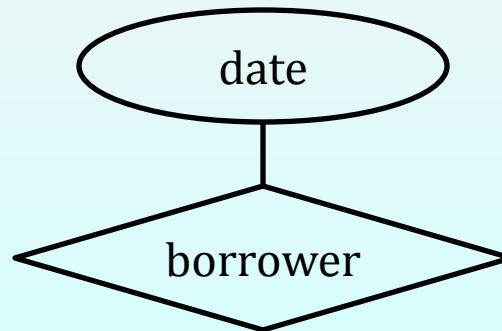


E-R MODEL (attributes)

- ◆ The properties of an entity is represented by a set of **attributes**.
 - ◆ We use **ellipses** to represent attributes.
 - ◆ An entity set with an attribute



- ◆ A relationship set with an attribute



E-R MODEL (attributes)

- ◆ Simple and composite attributes

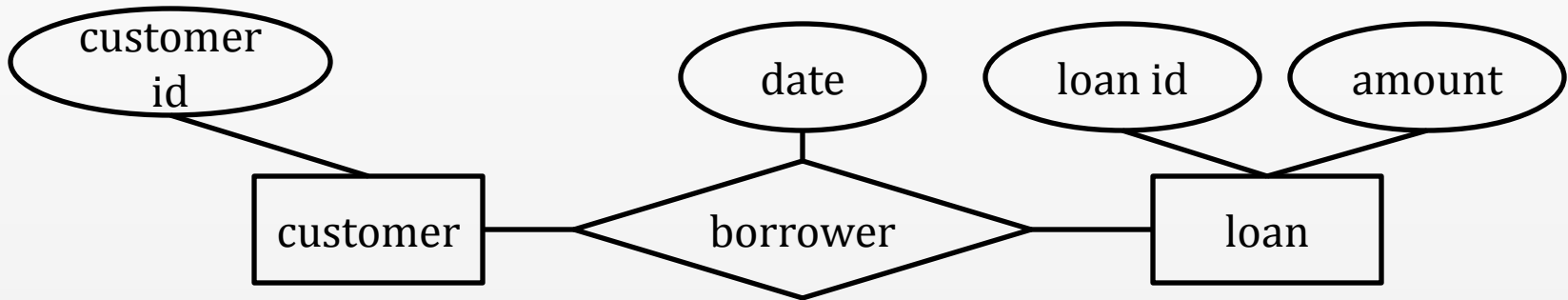


- ◆ Single-valued and multi-valued attributes

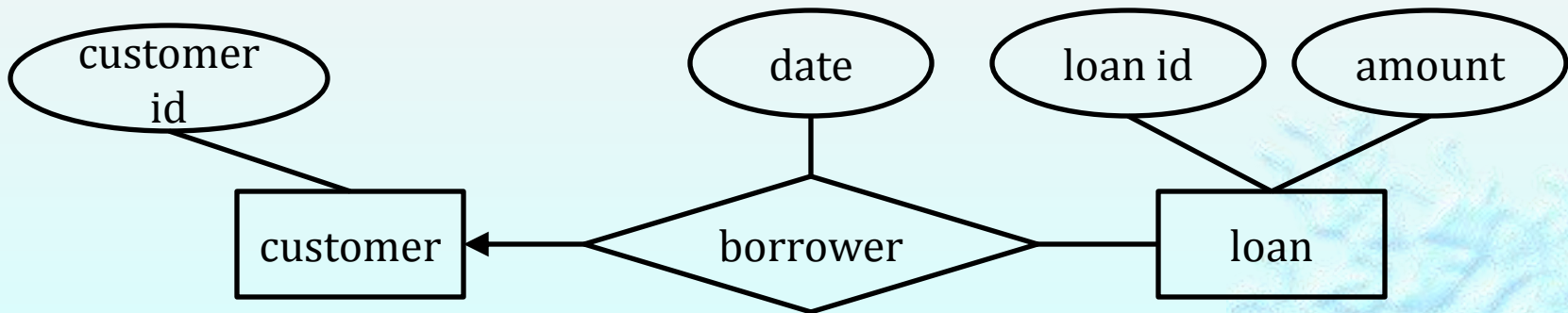


E-R MODEL (mapping)

◆ Many-to-many

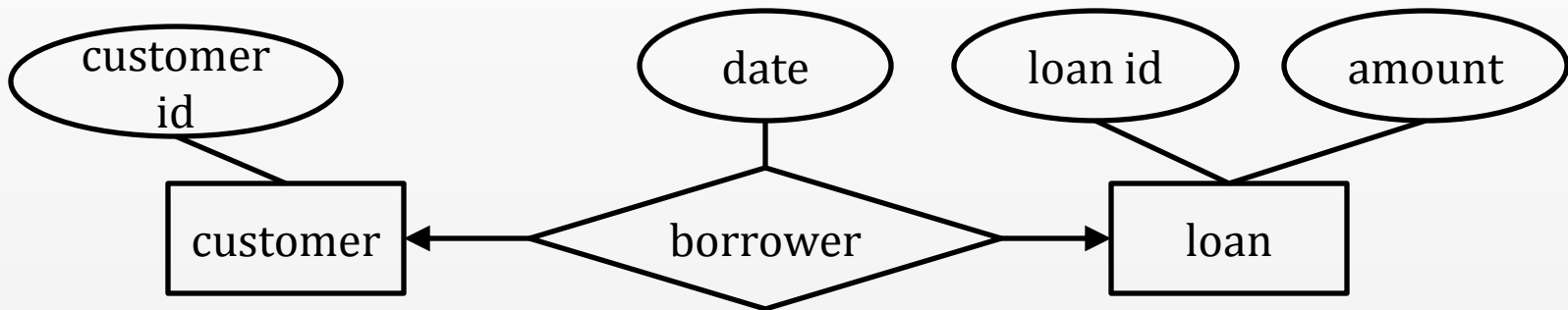


◆ One-to-many



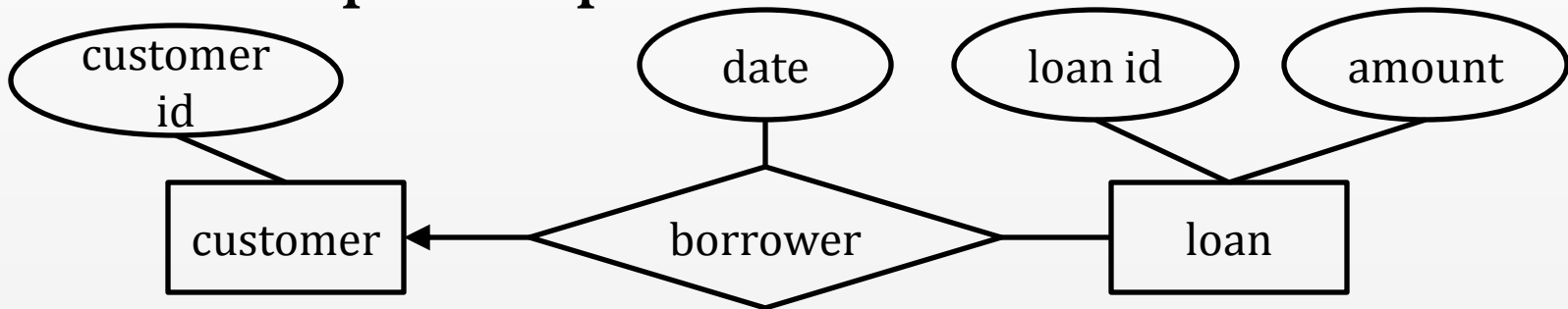
E-R MODEL (mapping)

◆ One-to-one

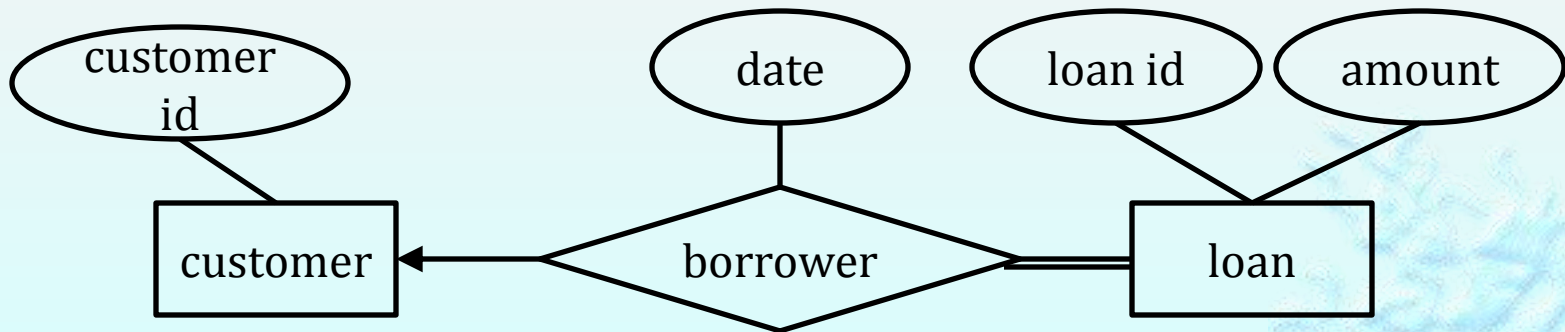


E-R MODEL (participation)

◆ Partial participation

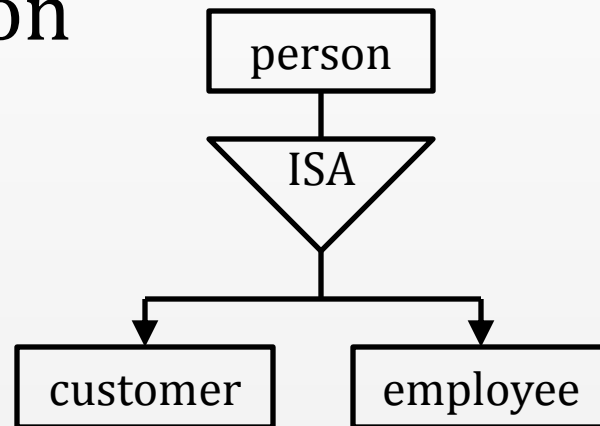


◆ Total participation

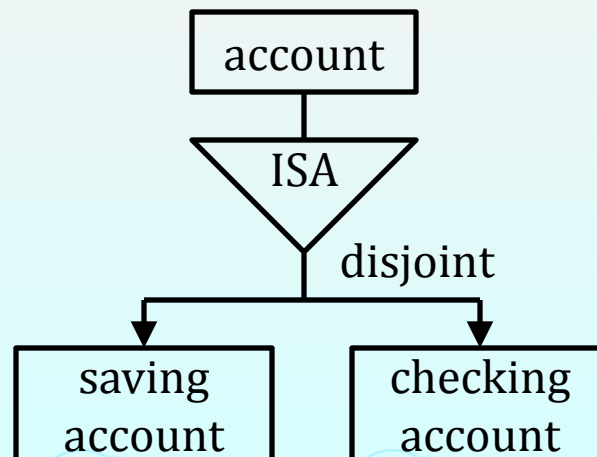


E-R MODEL (specialization)

◆ Specialization

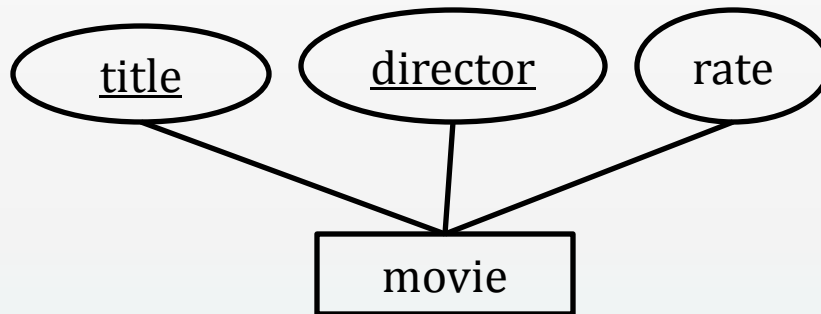


◆ Disjoint



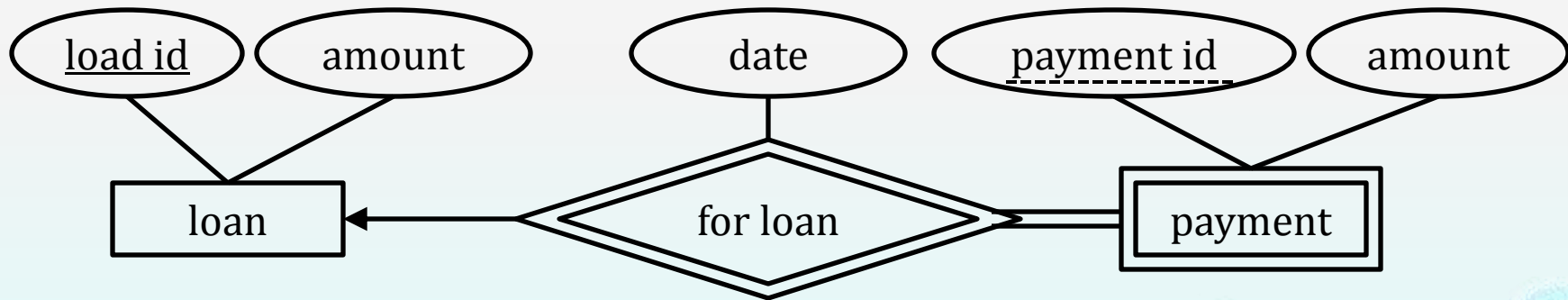
E-R MODEL (primary key)

- ◆ Primary key



E-R MODEL (weak entity sets)

- ◆ Weak Entity Sets
 - ◆ Identifying relationship
 - ◆ Discriminator (Partial key)



Identifying(owner) entity set

Identifying relationship

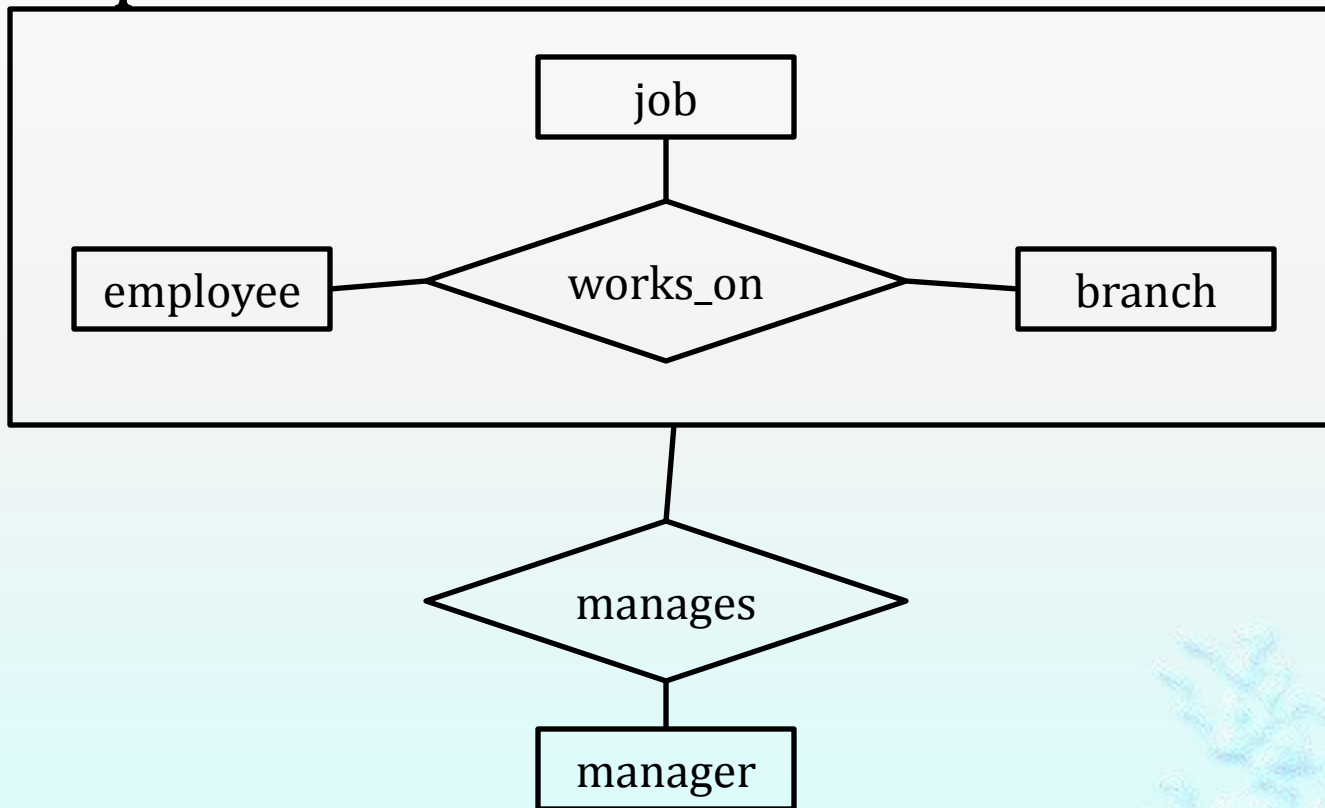
weak entity set

E-R MODEL (aggregation)

- ◆ One limitation of the E-R model
 - ◆ Can not express relationships among relationships
- ◆ Aggregation
 - ◆ Allow us to treat a relationship set as an entity set for purposes of participation in (other) relationships.

E-R MODEL (aggregation)

◆ Example:



E-R MODEL (example)

- ◆ Automobile company



Relational Operations (select)

- ◆ **Select operation** selects tuples that satisfy a given predicate.
 - ◆ It selects rows of the data
- ◆ Operator \rightarrow sigma (σ)
- ◆ Example:

Product name	Unit price
Melon	800G
Apple	120G

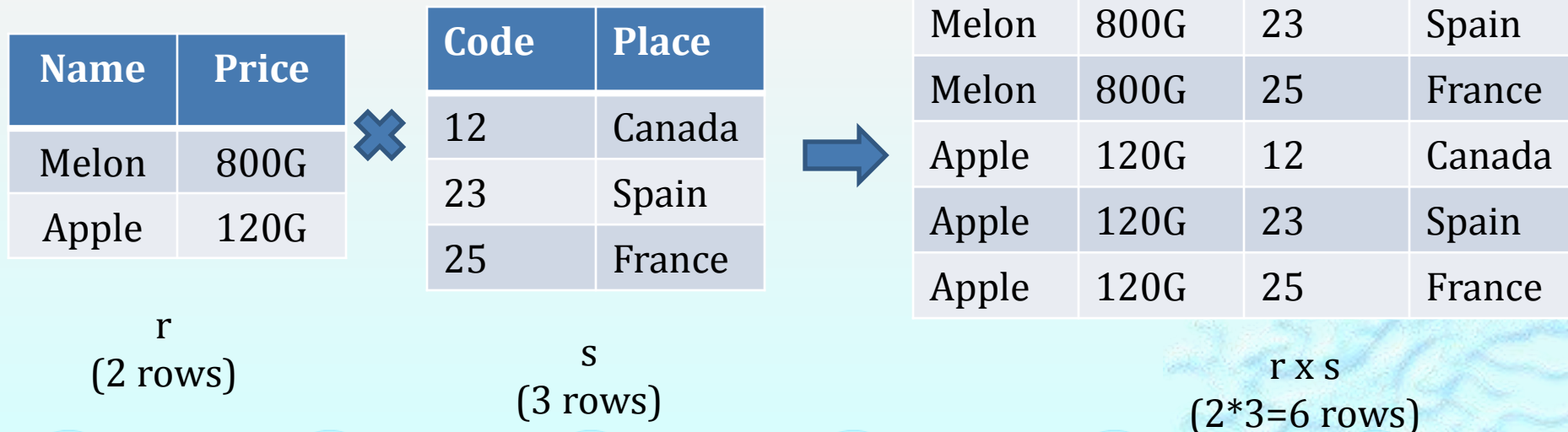
```
SELECT Product name  
Where Unit Price > 500G
```

Melon

Relational Operations

(Cartesian-product)

- ◆ Concatenates tuples of one relation to tuples of other relations.
- ◆ Operator \rightarrow cross (**x**)
- ◆ Example:



Relational Operations (union)

- ◆ Taken between **compatible** relations. (same arity, same domain)
- ◆ Duplicate tuples are removed.
- ◆ Operator $\rightarrow \cup$
- ◆ Example:

Product name	Unit price
Melon	800G
Strawberry	150G
Apple	120G
Lemon	200G

\cup

Product name	Unit price
Melon	800G
Strawberry	150G
Chestnut	100G
Banana	350G



Product name	Unit price
Melon	800G
Strawberry	150G
Apple	120G
Chestnut	100G
Banana	350G
Lemon	200G

Relation Operations (set different)

- ◆ Find tuples that are in one relation but are not in another relation
- ◆ Taken between **compatible** relations. (same arity, same domain).
- ◆ Duplicate tuples are removed.
- ◆ Operator $\rightarrow -$

Product name	Unit price
Melon	800G
Strawberry	150G
Apple	120G
Lemon	200G

—

Product name	Unit price
Melon	800G
Strawberry	150G
Chestnut	100G
Banana	350G



Product name	Unit price
Apple	120G
Lemon	200G

Relation Operations (set intersection)

- ◆ Taken between **compatible** relations. (same arity, same domain)
- ◆ Duplicate tuples are removed.
- ◆ Operator $\rightarrow \cap$
- ◆ $r \cap s = r - (r - s)$

Product name	Unit price
Melon	800G
Strawberry	150G
Apple	120G
Lemon	200G

\cap

Product name	Unit price
Melon	800G
Strawberry	150G
Chestnut	100G
Banana	350G



Product name	Unit price
Melon	800G
Strawberry	150G

Relation Operations (natural join)

- ◆ Allow us to combine certain selections and a Cartesian-product into one operation
- ◆ Operator $\rightarrow \bowtie$

Code	Name	Price
101	Melon	800G
102	Strawberry	150G
103	Apple	120G
104	Lemon	200G



Date	Code	Quantity
11/1	102	1,100
11/1	101	300
11/5	103	1,700
11/8	101	500



Date	Code	Name	Price	Quantity
11/1	101	Melon	800G	300
11/8	101	Melon	800G	500
11/1	102	Strawberry	150G	1,100
11/5	103	Apple	120G	1,700

Introduction to SQL

- ◆ Select-From-Where Statements
 - ◆ **SELECT** desired attributes
 - ◆ **FROM** one or more tables
 - ◆ **WHERE** condition about tuples of the tables

Introduction to SQL

- ◆ Example: (using the university schema)
 - ◆ A) Find the **names** of all **students** who have **taken** at least one **Comp. Sci. course**; make sure there are no duplicate name in the result.
 - ◆ Solution:
 - ◆ **select** *name*
 - ◆ **from** *student* **natural join** *takes* **natural join** *course*
 - ◆ **where** *course.dept* = 'Comp. Sci.'

Introduction to SQL

- ◆ B) Find the **IDs** and **names** of all **students** who have not **taken** any course offering before Spring **2009**
- ◆ Solution:
 - ◆ **select** *id, name*
 - ◆ **From** *student*
 - ◆ **Except**
 - ◆ **Select** *id, name*
 - ◆ **from** *student* **natural join** *takes*
 - ◆ **where** *year < 2009*
- ◆ Note: **except** operator eliminates duplicates, so there is no need to use **select distinct**

Reference

- ◆ **Dr. Tim Brailsford** ,
<http://www.cs.nott.ac.uk/~tjb/dbs/G64DBS.10.03.pdf>

