

Template

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Feb 5, 2023

SELECT-FROM-WHERE SEMANTICS

- ▶ What if there are several relations in the FROM clause?
1. Start with cross-product of all relation(s) listed in the From clause. Every tuple in R_1 paired up with every tuple in R_2 paired up with ...
 2. Consider each tuple one after the other, eliminating those that do not satisfy the WHERE clause.
 3. For each remaining tuple, create a return tuple with columns for each expression (column name) in the SELECT clause.

Step 2 and 3 are just the same as before.

```
SELECT actor, birth, movie  
FROM Role, Person  
WHERE actor = name and birth > 1940;
```

AMBIGUOUS COLUMN NAMES

- ▶ Same name may be used for two (or more) columns (in different relations)
- ▶ Must **qualify** the column name with the relation name to prevent ambiguity

```
SELECT name, date, product, quantity
FROM Customer, Sale, LineItem
WHERE price > 100 AND Customer.custid = Sale.custid AND
      Sale.saleid = LineItem.saleid;
```

- ▶ Note
- ▶ If SELECT clause includes custid, it must specify whether to use Customer.custid or Sale.custid even though the values are guaranteed to be identical.

2-Relation SELECT-FROM-WHERE

```
SELECT award, actor, persona, Role.movie  
FROM Honours, Role  
WHERE category = 'actor' AND winner = actor  
      AND Honours.movie = Role.movie
```

TABLES AS SETS IN SQL

1. Duplicate tuples may appear in query results

From duplicates in base tables From projecting out distinguishing columns

2. Keyword DISTINCT in the SELECT clause eliminates duplicates

SET OPERATIONS

1. Results treated as a set (no duplicates)
 - ▶ UNION, EXCEPT (difference), INTERSECT
 - ▶ Corresponding multiset (bag) operations
2. Arguments must be union-compatible
 - ▶ Same number of columns
 - ▶ Corresponding columns of same type

Query 4 Make a list of all project numbers for projects that involve an employee whose last name is 'Smith', either as a worker or as a manager of the department that controls the project.

```
Q4A:  (SELECT DISTINCT Pnumber
      FROM PROJECT, DEPARTMENT, EMPLOYEE
      WHERE Dnum = Dnumber AND Mgr_ssn=Ssn
      AND Lname='Smith'
      UNION
      (SELECT DISTINCT Pnumber
```

OTHER OPERATIONS

1) Standard arithmetic operators:

- ▶ Addition (+), subtraction (-), multiplication (*), and division (/)

2) [NOT] LIKE comparison operator

- ▶ Used for string pattern matching
- ▶ Percent sign (%) matches zero or more characters
- ▶ Underscore (_) matches a single character e.g., to also match Tommy Lee Jones as supporting actor:

```
SELECT award, actor, persona, Role.movie
FROM Honours, Role
WHERE category LIKE '%actor' AND winner = actor
      AND Honours.movie = Role.movie;
```

OTHER OPERATIONS

- ▶ [NOT] BETWEEN comparison operator

```
WHERE year BETWEEN 1990 AND 2010
```

```
equivalent to WHERE year >= 1990 AND YEAR <= 2010
```