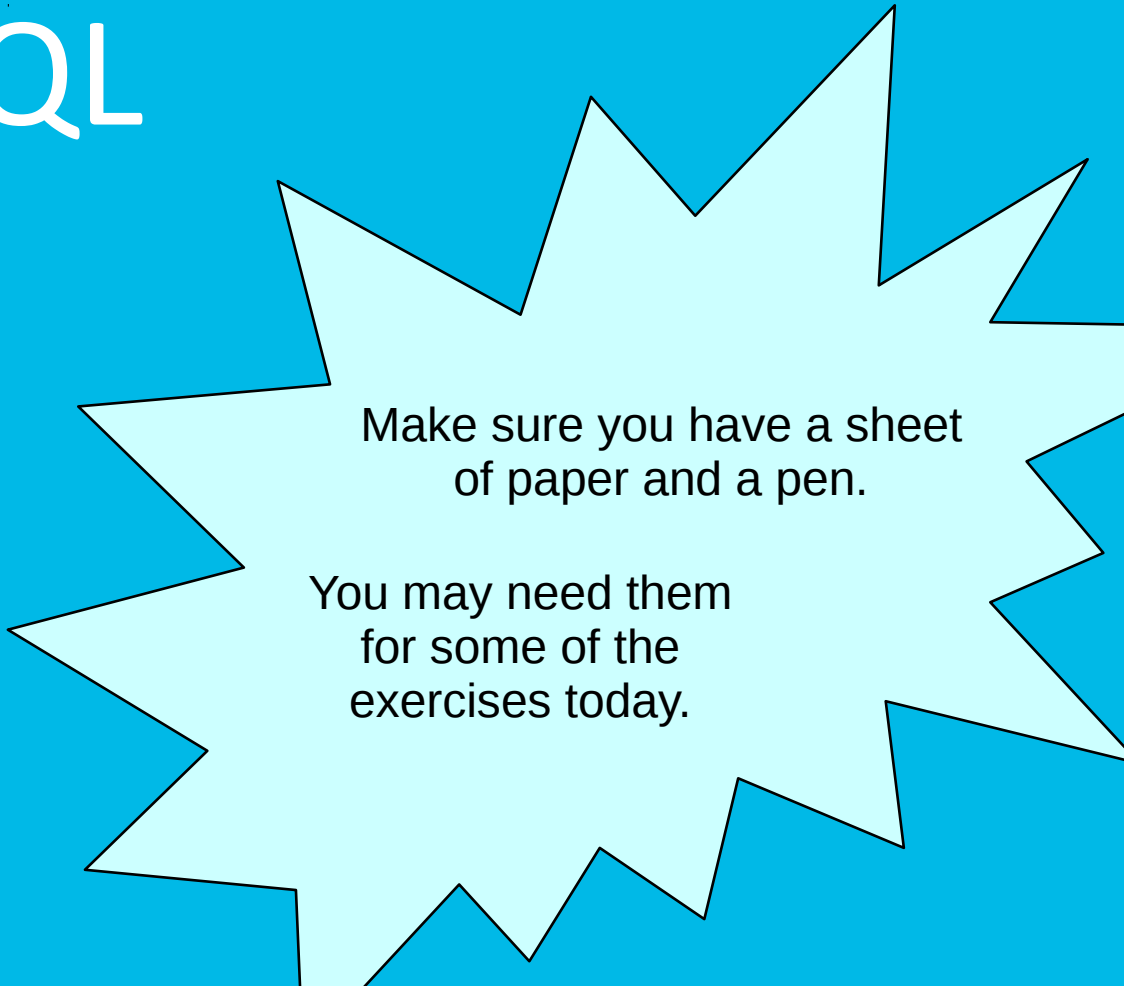


Database Technology

Topic 5: SQL

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Make sure you have a sheet
of paper and a pen.

You may need them
for some of the
exercises today.

Outline

- SQL data model
- SQL as a data definition language
- SQL queries
 - simple queries
 - join queries
 - set operations
 - subqueries
 - grouping + aggregation
- SQL data manipulation operations
- SQL views

SQL Data Model

SQL Data Model

- Based on the relational data model

- Terminology:

Relational Model	SQL
relation	table
tuple	row
attribute	column

- In contrast to the relational model, SQL allows duplicate rows in table and in query results

Question

Go to www.menti.com and use the code **8610 7857**

Why does SQL allow duplicate tuples
in a table or in a query result?

SQL Data Model

- Based on the relational data model
- Terminology:

Relational Model	SQL
relation	table
tuple	row
attribute	column

- In contrast to the relational model, SQL allows duplicate rows in table and in query results
 - Removing duplicates is expensive
 - User may want information about duplicates
 - Aggregation operators (e.g., sum)

SQL DDL

Exercise

- Consider the following two tables

Instructor			Course		
<u>ID</u>	Name	Office	<u>CourseID</u>	<u>Year</u>	Instructor
4	Jennifer	B308	cid444	2012	35
35	Paul	B311	cid598	2013	4
12	Kim	E112	cid444	2013	35

- Assume that the *Instructor* table has already been created; provide the SQL statement to create the *Course* table, including all of its integrity constraints.

Exercise

- Consider the following two tables

Instructor			Course		
<u>ID</u>	Name	Office	<u>CourseID</u>	<u>Year</u>	Instructor
4	Jennifer	B308	cid444	2012	35
35	Paul	B311	cid598	2013	4
12	Kim	E112	cid444	2013	35

- Assume that the *Instructor* table has already been created; provide the SQL statement to create the *Course* table, including all of its integrity constraints.

```
CREATE TABLE Course (  
  CourseID CHAR(6),  
  Year INTEGER,  
  Instructor INTEGER,  
  
  PRIMARY KEY (CourseID, Year),  
  FOREIGN KEY (Instructor) REFERENCES Instructor(ID)  
);
```

SQL Queries

Simple Queries

Quiz

Consider the following two tables

Instructor			Course		
<u>ID</u>	Name	Office	<u>CourseID</u>	<u>Year</u>	Instructor
4	Jennifer	B308	cid444	2012	35
35	Paul	B311	cid598	2013	4
12	Kim	E112	cid444	2013	35

What is the result of the following query?

```
SELECT CourseID FROM Course WHERE Instructor = 35;
```

1:	<table><thead><tr><th>CourseID</th></tr></thead><tbody><tr><td>cid444</td></tr><tr><td>cid598</td></tr><tr><td>cid444</td></tr></tbody></table>	CourseID	cid444	cid598	cid444	2:	<table><thead><tr><th>CourseID</th><th>Instructor</th></tr></thead><tbody><tr><td>cid444</td><td>35</td></tr><tr><td>cid444</td><td>35</td></tr></tbody></table>	CourseID	Instructor	cid444	35	cid444	35	3:	<table><thead><tr><th>CourseID</th></tr></thead><tbody><tr><td>cid444</td></tr></tbody></table>	CourseID	cid444	4:	<table><thead><tr><th>CourseID</th></tr></thead><tbody><tr><td>cid444</td></tr><tr><td>cid444</td></tr></tbody></table>	CourseID	cid444	cid444
CourseID																						
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CourseID																						
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CourseID																						
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cid444																						

SQL Queries

Join Queries

Quiz

Consider the following two tables

Instructor

<u>ID</u>	Name	Office
4	Jennifer	B308
35	Paul	B311
12	Kim	E112

Course

<u>CourseID</u>	<u>Year</u>	Instructor
cid444	2012	35
cid598	2013	4
cid444	2013	35

How many rows do we have in the result of the following query?

SELECT CourseID FROM Course, Instructor WHERE Year = 2013;

- 1) 2 rows
- 2) 4 rows
- 3) 6 rows
- 4) 8 rows

Quiz

Consider the following two tables

Instructor

<u>ID</u>	Name	Office
4	Jennifer	B308
35	Paul	B311
12	Kim	E112

Course

<u>CourseID</u>	<u>Year</u>	Instructor
cid444	2012	35
cid598	2013	4
cid444	2013	35

How many rows do we have in the result of the following query?

```
SELECT Name, CourseID  
FROM Instructor LEFT OUTER JOIN Course ON ID = Instructor;
```

- 1) 2 rows
- 2) 3 rows
- 3) 4 rows
- 4) 6 rows

SQL Queries

Set Operations

Quiz

Consider the following two tables

Instructor

<u>ID</u>	Name	Office
4	Jennifer	B308
35	Paul	B311
12	Kim	E112

Course

<u>CourseID</u>	<u>Year</u>	Instructor
cid444	2012	35
cid598	2013	4
cid444	2013	35

How many rows do we have in the result of the following query?

```
SELECT ID FROM Instructor  
UNION  
SELECT Instructor FROM Course;
```

- 1) 3 rows
- 2) 5 rows
- 3) 6 rows
- 4) none, we get an error message

Exercise

Consider the following two tables

Instructor

<u>ID</u>	Name	Office
4	Jennifer	B308
35	Paul	B311
12	Kim	E112

Course

<u>CourseID</u>	<u>Year</u>	Instructor
cid444	2012	35
cid598	2013	4
cid444	2013	35

Write an SQL query that returns all instructor IDs of instructors who are not assigned to any course.

Hence, for the example data above, the query result should be:

ID
12

www.liu.se