



CITS1402 Relational Database Management Systems

Week 3—SQL: Data Manipulation

Objectives

How to retrieve data from database using **SELECT** and:

Use compound **WHERE** conditions.

Use aggregate functions.

Sort query results using **ORDER BY**.

Group data using **GROUP BY** and **HAVING**.

Use subqueries.

Join tables together.

Perform set operations (**UNION**, **INTERSECT**, **EXCEPT**).

Reference book: Database Systems by Thomas Connolly

Objectives

Soon...

How to update database using **INSERT**, **UPDATE**, and **DELETE**.

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How to retrieve data from database using **SELECT** and:

Use compound **WHERE** conditions.

Use **aggregate** functions.

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Use subqueries.

Join tables together.

Perform set operations (**UNION**, **INTERSECT**, **EXCEPT**).

SELECT Statement

```
SELECT [DISTINCT | ALL]
      { * | [columnExpression [AS newName]] [, ...] }
FROM      TableName [alias] [, ...]
[WHERE      condition]
[GROUP BY   columnList]
[HAVING      condition]
[ORDER BY   columnList]
```

SELECT Statement

SELECT	Specifies which columns are to appear in output.
FROM	Specifies table(s) to be used.
WHERE	Filters rows.
GROUP BY	Forms groups of rows with same column value.
HAVING	Filters groups subject to some condition.
ORDER BY	Specifies the order of the output.

SELECT Statement

Order of the clauses cannot be changed.

Only SELECT and FROM are mandatory.

SELECT is akin to PROJECTION (Π) in RA
WHERE is akin to SELECTION (σ) in RA } More on this on 14th March

Before we formally start SQL statements
Know thy SCHEMA

DreamHome Database

Branch	(<u>branchNo</u>, street, city, postcode)
Staff	(<u>staffNo</u> , fName, lName, position, sex, DOB, salary, branchNo)
PropertyForRent	(<u>propertyNo</u>, street, city, postcode, type, rooms, rent, ownerNo, staffNo, branchNo)
Client	(<u>clientNo</u> , fName, lName, telNo, prefType, maxRent, email)
PrivateOwner	(<u>ownerNo</u>, fName, lName, address, telNo, email, password)
Viewing comment)	(<u>clientNo</u> , <u>propertyNo</u> , viewDate,
Registration	(<u>clientNo</u>, <u>branchNo</u>, staffNo, dateJoined)

Example All Columns, All Rows

Table 5.1 Result table for Example 5.1.

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

Example All Columns, All Rows

List full details of all staff.

```
SELECT staffNo, fName, IName,  
        position, sex, DOB, salary, branchNo  
FROM Staff;
```

Can use * as an abbreviation for 'all columns':

```
SELECT *  
FROM Staff;
```

Example All Columns, All Rows

Table 5.1 Result table for Example 5.1.

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000.00	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000.00	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000.00	B005

Example Specific Columns, All Rows

Table 5.2 Result table for Example 5.2.

staffNo	fName	lName	salary
SL21	John	White	30000.00
SG37	Ann	Beech	12000.00
SG14	David	Ford	18000.00
SA9	Mary	Howe	9000.00
SG5	Susan	Brand	24000.00
SL41	Julie	Lee	9000.00

Example Specific Columns, All Rows

Produce a list of salaries for all staff, showing only staff number, first and last names, and salary.

```
SELECT staffNo, fName, lName, salary  
FROM Staff;
```

Table 5.2 Result table for Example 5.2.

staffNo	fName	lName	salary
SL21	John	White	30000.00
SG37	Ann	Beech	12000.00
SG14	David	Ford	18000.00
SA9	Mary	Howe	9000.00
SG5	Susan	Brand	24000.00
SL41	Julie	Lee	9000.00

Example Use of DISTINCT

List the property numbers of all properties that have been viewed.

```
SELECT propertyNo  
FROM Viewing;
```

propertyNo
PA14
PG4
PG4
PA14
PG36

Example Use of DISTINCT

Use DISTINCT to eliminate duplicates:

```
SELECT DISTINCT propertyNo  
FROM Viewing;
```

propertyNo
PA14
PG4
PG36

Example Calculated Fields

Produce list of monthly salaries for all staff, showing staff number, first/last name, and salary.

```
SELECT staffNo, fName, lName, salary/12  
FROM Staff;
```

Table 5.4 Result table for Example 5.4.

staffNo	fName	lName	col4
SL21	John	White	2500.00
SG37	Ann	Beech	1000.00
SG14	David	Ford	1500.00
SA9	Mary	Howe	750.00
SG5	Susan	Brand	2000.00
SL41	Julie	Lee	750.00

Example Calculated Fields AS Clause

To name column, use AS clause:

Table 5.4 Result table for Example 5.4.

staffNo	fName	lName	col4
SL21	John	White	2500.00
SG37	Ann	Beech	1000.00
SG14	David	Ford	1500.00
SA9	Mary	Howe	750.00
SG5	Susan	Brand	2000.00
SL41	Julie	Lee	750.00

Not very informative

```
SELECT staffNo, fName, lName,  
salary/12 AS monthlySalary  
FROM Staff;
```

Row Selection (**WHERE** clause)

Comparison

Range

Set Membership

Pattern Match

Null

Example 6.5 Comparison Search Condition WHERE

List all staff with a salary greater than 10,000.

Table 5.1 Result table for Example 5.1.

staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000.00	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000.00	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000.00	B003
SA9	Mary	H B L					
SG5	Susan						
SL41	Julie						

Table 5.5 Result table for Example 5.5.

staffNo	fName	lName	position	salary
SL21	John	White	Manager	30000.00
SG37	Ann	Beech	Assistant	12000.00
SG14	David	Ford	Supervisor	18000.00
SG5	Susan	Brand	Manager	24000.00

Example 6.5 Comparison Search Condition WHERE

List all staff with a salary greater than 10,000.

```
SELECT staffNo, fName, lName, position, salary
FROM Staff
WHERE salary > 10000;
```

Table 5.5 Result table for Example 5.5.

staffNo	fName	lName	position	salary
SL21	John	White	Manager	30000.00
SG37	Ann	Beech	Assistant	12000.00
SG14	David	Ford	Supervisor	18000.00
SG5	Susan	Brand	Manager	24000.00

Example Comparison Search Condition

WHERE

In SQL the following simple **comparison operators** are available:

=	equals
<>	is not equal to (maybe also !=)
<	is less than
<=	is less than or equal to
>	is greater than
>=	is greater than or equal to

Example Comparison Search Condition

WHERE

More complex predicates can be created using **AND**, **OR**, and **NOT**

Evaluation Order

- An expression is evaluated left to right

- Subexpression in brackets are evaluated first

- NOTs are evaluated before ANDs and ORs

- ANDs are evaluated before ORs

Make life easier => USE BRACKETS!

Example Compound Comparison Search Condition:

AND and **OR** List addresses of all branch offices in London **or** Glasgow.

Table 5.6 Result table for Example 5.6.

branchNo	street	city	postcode
B005	22 Deer Rd	London	SW1 4EH
B003	163 Main St	Glasgow	G11 9QX
B002	56 Clover Dr	London	NW10 6EU

SELECT *

FROM Branch

WHERE city = 'London' **OR city = 'Glasgow';**

