Sub-query and Nested query

Subqueries

- **Some SQL statements can have a SELECT embedded within them.**
- **A subselect can be used in WHERE and HAVING clauses of an outer SELECT, where it is called a *subquery* or *nested query*.**
- **Subselects may also appear in INSERT, UPDATE, and DELETE statements.**

Example : Subquery with Equality

List staff who work in branch at ‘163 Main St’.

```
SELECT staffNo, fName, lName, position
FROM Staff
WHERE branchNo =
      (SELECT branchNo
       FROM Branch
       WHERE street = ‘163 Main St’);
```

Example : Subquery with Equality

- Inner SELECT finds branch number for branch at ‘163 Main St’ (‘B003’).
- Outer SELECT then retrieves details of all staff who work at this branch.
- Outer SELECT then becomes:

```
SELECT staffNo, fName, lName, position
FROM Staff
WHERE branchNo = ‘B003’;
```

Example : Subquery with Equality

staffNo	fName	lName	position
SG37	Ann	Beech	Assistant
SG14	David	Ford	Supervisor
SG5	Susan	Brand	Manager

Example : Subquery with Aggregate

List all staff whose salary is greater than the average salary, and show by how much.

```
SELECT staffNo, fName, lName, position,
  salary – (SELECT AVG(salary) FROM Staff) As SalDiff
FROM Staff
WHERE salary >
            (SELECT AVG(salary)
             FROM Staff);
```

Example : Subquery with Aggregate

- Cannot write 'WHERE salary > AVG(salary)'
- Instead, use subquery to find average salary (17000), and then use outer SELECT to find those staff with salary greater than this:

```
SELECT staffNo, fName, lName, position,
    salary – 17000 As salDiff
FROM Staff
WHERE salary > 17000;
```

Example : Subquery with Aggregate

staffNo	fName	lName	position	salDiff
SL21	John	White	Manager	13000.00
SG14	David	Ford	Supervisor	1000.00
SG5	Susan	Brand	Manager	7000.00

Subquery Rules

- **ORDER BY clause may not be used in a subquery (although it may be used in outermost SELECT).**
- **Subquery SELECT list must consist of a single column name or expression, except for subqueries that use EXISTS.**
- **By default, column names refer to table name in FROM clause of subquery. Can refer to a table in FROM clause of outer query using an *alias*.**

Subquery Rules

- When subquery is an operand in a comparison, subquery must appear on right-hand side.

The SQL below is invalid:

```
SELECT staffNo, fName, lName, position,
  salary – (SELECT AVG(salary) FROM Staff) As SalDiff
FROM Staff
WHERE      (SELECT AVG(salary) FROM Staff)  <  salary ;
```

Example : Nested subquery: use of IN

List properties handled by staff at ‘163 Main St’.

```
SELECT propertyNo, street, city, postcode, type, rooms, rent
FROM PropertyForRent
WHERE staffNo IN
    (SELECT staffNo
     FROM Staff
     WHERE branchNo =
          (SELECT branchNo
           FROM Branch
           WHERE street = ‘163 Main St’));
```

Example : Nested subquery: use of IN

propertyNo	street	city	postcode	type	rooms	rent
PG16	5 Novar Dr	Glasgow	G12 9AX	Flat	4	450
PG36	2 Manor Rd	Glasgow	G32 4QX	Flat	3	375
PG21	18 Dale Rd	Glasgow	G12	House	5	600

ANY and ALL

- ANY and ALL may be used with subqueries that produce a single column of numbers.
- With ALL, condition will only be true if it is satisfied by *all* values produced by subquery.
- With ANY, condition will be true if it is satisfied by *any* values produced by subquery.
- If subquery is empty, ALL returns true, ANY returns false.
- SOME may be used in place of ANY.

Example : Use of ANY

Find staff whose salary is larger than salary of at least one member of staff at branch B003.

```
SELECT staffNo, fName, lName, position, salary
FROM Staff
WHERE salary > ANY
                (SELECT salary
                 FROM Staff
                 WHERE branchNo = 'B003');
```

Example : Use of ANY/SOME

- **Inner query produces set {12000, 18000, 24000} and outer query selects those staff whose salaries are greater than any of the values in this set.**

staffNo	fName	lName	position	salary
SL21	John	White	Manager	30000.00
SG14	David	Ford	Supervisor	18000.00
SG5	Susan	Brand	Manager	24000.00

Example : Use of ALL

Find staff whose salary is larger than salary of every member of staff at branch B003.

```
SELECT staffNo, fName, lName, position, salary
FROM Staff
WHERE salary > ALL
                (SELECT salary
                 FROM Staff
                 WHERE branchNo = 'B003');
```

Example : Use of ALL

staffNo	fName	lName	position	salary
SL21	John	White	Manager	30000.00