Sub Queries

(Nested Queries)

Some SQL queries can have a complete SELECT statement ***embedded*** within them.

- INNER SELECT
- OUTER SELECT

The result of the INNER SELECT is used in the OUTER SELECT to get the final result.

Consider the relation *Staff*

Staff

StaffNo	Surname	Forename	Bno	Salary
1	SMITH	JOHN	10	$25,000.00
2	JONES	MARY	30	$35,000.00
3	KELLY	MICHAEL	10	$28,500.00
4	KENNY	JOAN	20	$52,000.00
5	WOODS	JAMES	30	$36,000.00
6	DUGGAN	ANNE	40	$85,000.00
0			0	$0.00

Consider the relation *Branch*

Branch

Bno	Street	Town	County	TelNo
10	MAIN ST	KILLARNEY	CO.KERRY	064312556
20	HIGH STREET	KENMARE	CO.KERRY	064325569
30	IVERAGH ROAD	KILLORGLIN	CO.KERRY	0669761314
40	THE BARRACKS	CAHIRCIVEEN	CO.KERRY	0669488922
0				

List all staff who work at the branch at 'Killarney.

There are two parts to this query

1. Find the branch (Bno) number for the branch at 'Killarney'
2. Find the staff details for all staff who work at this branch number

Find the branch (Bno) number for the branch at 'Killarney'

```
SELECT Bno
FROM Branch
WHERE Town = 'KILLARNEY';
```

Query1

Bno
10
0

Find the staff details for all staff who work at this branch number.

```
SELECT *
FROM Staff
WHERE Bno = 10;
```

Query2

StaffNo	Surname	Forename	Bno	Salary
1	SMITH	JOHN	10	$25,000.00
3	KELLY	MICHAEL	10	$28,500.00
0			0	0.00

This can be written as:

```
SELECT *
FROM Staff
WHERE Bno = (SELECT Bno
             FROM Branch
             WHERE Town = 'KILLARNEY');
```


The ***inner*** SELECT finds the branch number of the branch at 'Killarney' (assume there is only one) - 10

The outer SELECT then uses the value returned by the inner select.

The sub-query is ***always*** enclosed in parenthesis.

A sub-query can be used immediately following a relational operator (=,>,< <>, e.t.c) in a WHERE or HAVING clause.

Some Examples

List all staff whose salary is greater than the average salary.

```
SELECT *
FROM Staff
WHERE Salary > (SELECT AVG(salary)
                FROM staff);
```


An **ORDER BY** clause can not be used in a sub-query but can be used in the outer query.

The sub-query **SELECT** list must have a single column name or expression EXCEPT for sub-queries that use the keyword **EXISTS**.

An invalid sub query ....

```
SELECT *
FROM Staff
WHERE Salary > (SELECT *
                FROM Staff);
```

several values

a single value

A valid sub query ....

```
SELECT *
FROM Staff
WHERE Salary EXISTS (SELECT *
                     FROM Staff);
```

EXISTS not used very often!

An invalid sub query:

```
SELECT *
FROM Staff
WHERE (SELECT AVG(salary)
       FROM Staff) < Salary;
```

Nested query must be on **RHS** of relational operator.

The IN Operator

The IN operator may be used when you wish to select rows from a table for which there may be more than one satisfying value.

List the properties that are handled by staff working at the branch at 'Killarney'.

1. Find the branch number ***Bno*** for branch at Killarney.
2. Find all staff who work at this branch.
3. Find the properties overseen by all of these staff

1. To find the branch number for branch at Killarney.

```
SELECT Bno
FROM Branch
WHERE Town  = 'Killarney';
```

In our example, this returns a single value.
Bno = 10.

2. Find all staff who work at this branch (10).

```
SELECT *
FROM Staff
WHERE Bno = (SELECT Bno
             FROM Branch
             WHERE Town =  'Killarney');
```

This returns the following records:

Query2

StaffNo	Surname	Forename	Bno	Salary
1	SMITH	JOHN	10	$25,000.00
3	KELLY	MICHAEL	10	$28,500.00
0			0	0.00

We are only interested in the ***StaffNo*** so the query should be written:

```
SELECT StaffNo
FROM Staff
WHERE Bno = (SELECT Bno
             FROM Branch
             WHERE Town =  'Killarney');
```


3. Find the properties overseen by the staff at this branch.

```
SELECT *
FROM Properties
WHERE StaffNo IN (SELECT StaffNo
                  FROM Staff
                  WHERE Bno = (SELECT Bno
                               FROM branch
                               WHERE Town = Killarney'));
```


Query1

PropNo	Street	Town	County	Typ	Staffi	MonthlyRer
4	GLEBE LANE	KILLARNEY	CO.KERRY	A	1	$750.00
0					0	0.00

The SOME Operator

Find staff whose salary is larger than the salary of <u>at least one</u> member of staff at branch 30.

```
SELECT *
FROM Staff
WHERE Salary > SOME (SELECT Salary
                     FROM Staff
                     WHERE Bno =30);
```

You could solve this by finding
- the minimum salary in branch 30
- then find all staff earning more than this minimum salary.

```
SELECT *
FROM Staff
WHERE Salary > (SELECT MIN(Salary)
                FROM Staff
                WHERE Bno =30);
```


The ALL Operator

Find staff whose salary is larger than the salary of every member of staff at branch 30.

```
SELECT *
FROM Staff
WHERE Salary > ALL (SELECT Salary
                    FROM Staff
                    WHERE Bno =30);
```


You could solve this by finding
- the maximum salary in branch 30
- then find all staff earning more than this minimum salary.

```
SELECT *
FROM Staff
WHERE Salary > (SELECT MAX(Salary)
                FROM Staff
                WHERE Bno =30);
```