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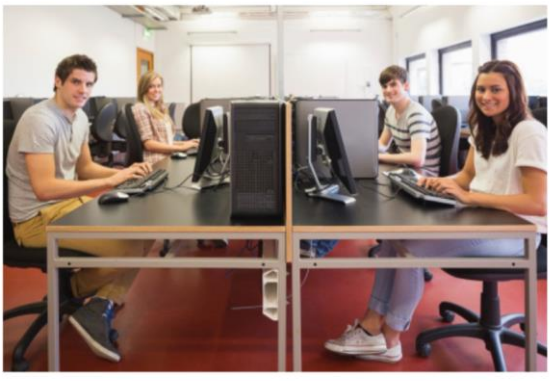
Database Programming with SQL

10-2

Single-Row Subqueries



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Objectives

- This lesson covers the following objectives:
  - Construct and execute a single-row subquery in the WHERE clause or HAVING clause
  - Construct and execute a SELECT statement using more than one subquery
  - Construct and execute a SELECT statement using a group function in the subquery

Purpose

- As you have probably realized, subqueries are a lot like Internet search engines
- They are great at locating the information needed to accomplish another task
- In this lesson, you will learn how to create even more complicated tasks for subqueries to do for you
- Keep in mind that subqueries save time in that you can accomplish two tasks in one statement

Facts About Single-row Subqueries

- They:
  - Return only one row
  - Use single-row comparison operators (=, >,>=, <, <=, <>)
- Always:
  - Enclose the subquery in parentheses
  - Place the subquery on the right hand side of the comparison condition

Additional Subquery Facts

- The outer and inner queries can get data from different tables
- Only one ORDER BY clause can be used for a SELECT statement, and if specified, it must be the last clause in the main SELECT statement
- The only limit on the number of subqueries is the buffer size that the query uses

Subqueries from Different Tables

- The outer and inner queries can get data from different tables
- Who works in the Marketing department?

```
SELECT last_name, job_id, department_id
FROM employees
WHERE department_id =
    (SELECT department_id
     FROM departments
     WHERE department_name = 'Marketing')
ORDER BY job_id;
```

Result of subquery

DEPARTMENT_ID
20

LAST_NAME	JOB_ID	DEPARTMENT_ID
Hartstein	MK_MAN	20
Fay	MK_REP	20

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The subquery finds the department_id for 'Marketing', the outer query uses the returned department_id to display rows from the employees table.

Subqueries from Different Tables

- More than one subquery can return information to the outer query

```
SELECT last_name, job_id, salary, department_id
FROM employees
WHERE job_id =
   (SELECT job_id
    FROM employees
    WHERE employee_id = 141)
AND department_id =
   (SELECT department_id
    FROM departments
    WHERE location_id = 1500);
```

Result of 1st subquery

JOB_ID
ST_CLERK

Result of 2nd subquery

DEPARTMENT_ID
50

LAST_NAME	JOB_ID	SALARY	DEPARTMENT_ID
Rajs	ST_CLERK	3500	50
Davies	ST_CLERK	3100	50
Matos	ST_CLERK	2600	50
Vargas	ST_CLERK	2500	50

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The first subquery returns the job_id of employee 141 (ST_CLERK). The second subquery uses the departments table to find the department_id at location_id 1500 (50).

The outer query then returns rows from the employees table that match both these values.

Note: in this instance, as each department is situated at only one location, it is safe to use a singe-row subquery. If a department could be in multiple locations, we would need to use a multiple-row subquery.

Group Functions in Subqueries

- Group functions can be used in subqueries
- A group function without a GROUP BY clause in the subquery returns a single row
- The query on the next slide answers the question, "Which employees earn less than the average salary?"

Group Functions in Subqueries

- The subquery first finds the average salary for all employees, the outer query then returns employees with a salary of less than the average

```
SELECT last_name, salary
FROM employees
WHERE salary <
   (SELECT AVG(salary)
    FROM employees);
```

Result of subquery

AVG(SALARY)
8775

LAST_NAME	SALARY
Whalen	4400
Gietz	8300
Taylor	8600
Grant	7000
Mourgos	5800
Rajs	3500
Davies	3100
Matos	2600
Vargas	2500
Ernst	6000
Lorentz	4200
Fay	6000

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Subqueries in the HAVING Clause

- Subqueries can also be placed in the HAVING clause
- Remember that the HAVING clause is similar to the WHERE clause, except that the HAVING clause is used to restrict groups and always includes a group function such as MIN, MAX, or AVG
- Because the HAVING clause always includes a group function, the subquery will nearly always include a group function as well

Subquery Example

- Which departments have a lowest salary that is greater than the lowest salary in department 50?
- In this example, the subquery selects and returns the lowest salary in department 50

```
SELECT department_id, MIN(salary)
FROM employees
GROUP BY department_id
HAVING MIN(salary) >
       (SELECT MIN(salary)
       FROM employees
       WHERE department_id = 50);
```

DEPARTMENT_ID	MIN(SALARY)
-	7000
90	17000
20	6000
110	8300
80	8600
10	4400
60	4200

Result of subquery

MIN(SALARY)
2500

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Subquery Example

- The outer query uses this value to select the department ID and lowest salaries of all the departments whose lowest salary is greater than that number
- The HAVING clause eliminated those departments whose MIN salary was less than department 50's MIN salary

```
SELECT department_id, MIN(salary)
FROM employees
GROUP BY department_id
HAVING MIN(salary) >
       (SELECT MIN(salary)
       FROM employees
       WHERE department_id = 50);
```

DEPARTMENT_ID	MIN(SALARY)
-	7000
90	17000
20	6000
110	8300
80	8600
10	4400
60	4200

Result of subquery

MIN(SALARY)
2500

Summary

- In this lesson, you should have learned how to:
  - Construct and execute a single-row subquery in the WHERE clause or HAVING clause
  - Construct and execute a SELECT statement using more than one subquery
  - Construct and execute a SELECT statement using a group function in the subquery


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