7

Using Subqueries to Solve Queries

Objectives

After completing this lesson, you should be able to do the following:

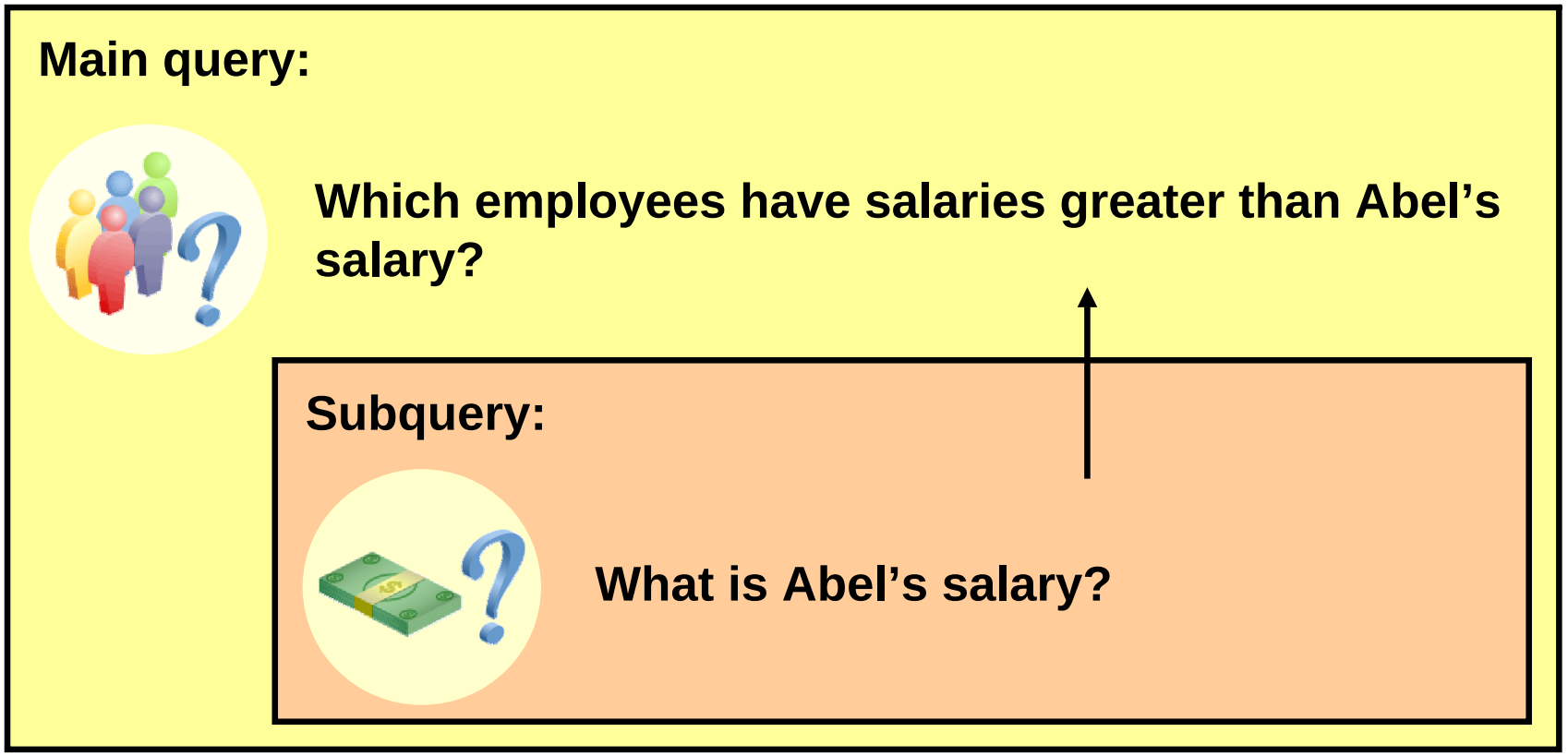
- Define subqueries
- Describe the types of problems that the subqueries can solve
- List the types of subqueries
- Write single-row and multiple-row subqueries

Lesson Agenda

- Subquery: Types, syntax, and guidelines
- Single-row subqueries:
  - Group functions in a subquery
  - `HAVING` clause with subqueries
- Multiple-row subqueries
  - Use `ALL` or `ANY` operator.
- Using the `EXISTS` operator
- Null values in a subquery

Using a Subquery to Solve a Problem

Who has a salary greater than Abel's?



Subquery Syntax

```
SELECT    select_list
FROM      table
WHERE     expr operator
                      (SELECT       select_list
                      FROM          table);
```

- The subquery (inner query) executes *before* the main query (outer query).
- The result of the subquery is used by the main query.

Using a Subquery

```
SELECT last_name, salary
FROM   employees
WHERE  salary >   11000
                  (SELECT salary
                   FROM   employees
                   WHERE  last_name = 'Abel');
```

	LAST_NAME	SALARY
1	Hartstein	13000
2	Higgins	12000
3	King	24000
4	Kochhar	17000
5	De Haan	17000

Guidelines for Using Subqueries

- Enclose subqueries in parentheses.
- Place subqueries on the right side of the comparison condition for readability. (However, the subquery can appear on either side of the comparison operator.)
- Use single-row operators with single-row subqueries and multiple-row operators with multiple-row subqueries.

Types of Subqueries

- Single-row subquery

- Multiple-row subquery

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Single-Row Subqueries

- Return only one row
- Use single-row comparison operators

Operator	Meaning
=	Equal to
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
<>	Not equal to

Executing Single-Row Subqueries

```
SELECT last_name, job_id, salary
FROM   employees
WHERE  job_id =
                (SELECT job_id
                 FROM   employees
                 WHERE  last_name = 'Taylor')
AND    salary >
                (SELECT salary
                 FROM   employees
                 WHERE  last_name = 'Taylor');
```

SA_REP

8600

	LAST_NAME	JOB_ID	SALARY
1	Abel	SA_REP	11000

Using Group Functions in a Subquery

```
SELECT last_name, job_id, salary
FROM   employees
WHERE  salary =
                (SELECT MIN(salary)
                 FROM   employees);
```

2500

	LAST_NAME	JOB_ID	SALARY
1	Vargas	ST_CLERK	2500

HAVING Clause with Subqueries

- The Oracle server executes the subqueries first.
- The Oracle server returns results into the HAVING clause of the main query.

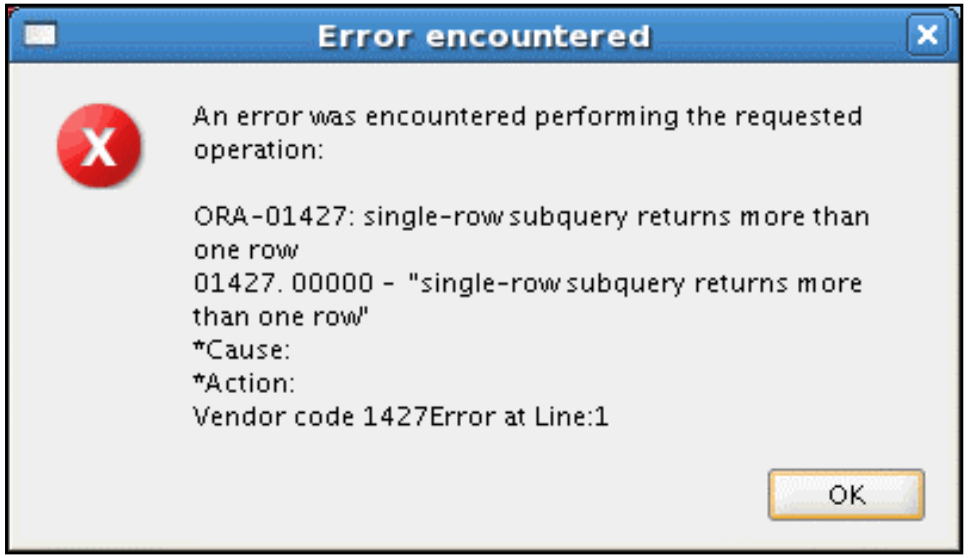
```
SELECT    department_id, MIN(salary)
FROM      employees
GROUP BY  department_id
HAVING    MIN(salary) >
                        (SELECT MIN(salary)
                         FROM   employees
                         WHERE  department_id = 50);
```

2500

	DEPARTMENT_ID	MIN(SALARY)
1	(null)	7000
2	20	6000
3	90	17000
4	110	8300
5	80	8600
6	10	4400
7	60	4200

What Is Wrong with This Statement?

```
SELECT employee_id, last_name
FROM   employees
WHERE  salary =
                (SELECT   MIN(salary)
                 FROM     employees
                 GROUP BY department_id);
```



Single-row operator with multiple-row subquery

No Rows Returned by the Inner Query

```
SELECT last_name, job_id
FROM   employees
WHERE  job_id =
                (SELECT job_id
                 FROM   employees
                 WHERE  last_name = 'Haas');
```

```
0 rows selected
```

Subquery returns no rows because there is no employee named “Haas.”

Lesson Agenda

- Subquery: Types, syntax, and guidelines
- Single-row subqueries:
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- Multiple-row subqueries
  - Use `IN`, `ALL`, or `ANY`
- Using the `EXISTS` operator
- Null values in a subquery

Multiple-Row Subqueries

- Return more than one row
- Use multiple-row comparison operators

Operator	Meaning
IN	Equal to any member in the list
ANY	Must be preceded by =, !=, >, <, <=, >=. Compares a value to each value in a list or returned by a query. Evaluates to FALSE if the query returns no rows.
ALL	Must be preceded by =, !=, >, <, <=, >=. Compares a value to every value in a list or returned by a query. Evaluates to TRUE if the query returns no rows.

Using the ANY Operator in Multiple-Row Subqueries

```
SELECT employee_id, last_name, job_id, salary
FROM   employees
WHERE  salary < ANY
                (SELECT salary
                 FROM   employees
                 WHERE  job_id = 'IT_PROG')
AND    job_id <> 'IT_PROG';
```

9000, 6000, 4200

	EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
1	144	Vargas	ST_CLERK	2500
2	143	Matos	ST_CLERK	2600
3	142	Davies	ST_CLERK	3100
4	141	Rajs	ST_CLERK	3500
5	200	Whalen	AD_ASST	4400

...

9	206	Gietz	AC_ACCOUNT	8300
10	176	Taylor	SA_REP	8600

Using the ALL Operator in Multiple-Row Subqueries

```
SELECT employee_id, last_name, job_id, salary
FROM   employees
WHERE  salary < ALL
                (SELECT salary
                 FROM   employees
                 WHERE  job_id = 'IT_PROG')
AND    job_id <> 'IT_PROG';
```

9000, 6000, 4200

	EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
1	141	Rajs	ST_CLERK	3500
2	142	Davies	ST_CLERK	3100
3	143	Matos	ST_CLERK	2600
4	144	Vargas	ST_CLERK	2500

Using the EXISTS Operator

```
SELECT * FROM departments
WHERE NOT EXISTS
(SELECT * FROM employees
 WHERE employees.department_id=departments.department_id);
```

	DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
1	190	Contracting	(null)	1700

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Null Values in a Subquery

```
SELECT emp.last_name
FROM   employees emp
WHERE  emp.employee_id NOT IN
                            (SELECT mgr.manager_id
                             FROM   employees mgr);
```

```
0 rows selected
```

Quiz

Using a subquery is equivalent to performing two sequential queries and using the result of the first query as the search values in the second query.

1. True
2. False

Summary

In this lesson, you should have learned how to:

- Identify when a subquery can help solve a problem
- Write subqueries when a query is based on unknown values

```
SELECT    select_list
FROM      table
WHERE     expr operator
                      (SELECT select_list
                      FROM    table);
```

Practice 7: Overview

This practice covers the following topics:

- Creating subqueries to query values based on unknown criteria
- Using subqueries to find out the values that exist in one set of data and not in another