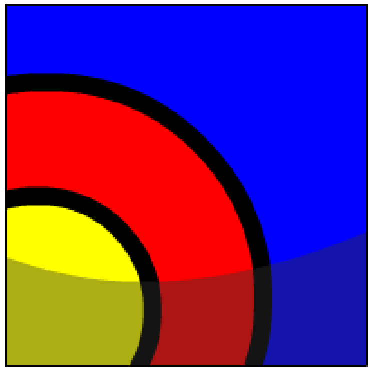
Multiple-Row Subqueries

What Will I Learn?

In this lesson, you will learn to:



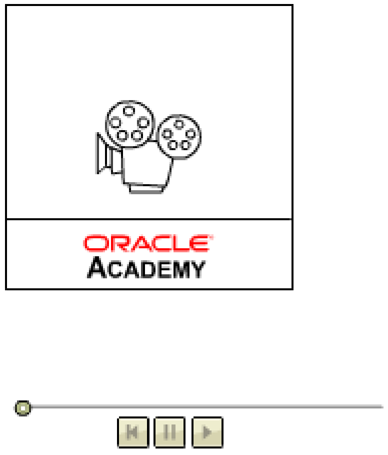
- Use the comparison operators IN, ANY and ALL correctly in multiple-row subqueries
- Construct and execute a multiple-row subquery in the WHERE clause or HAVING clause
- Describe what happens if a multiple-row subquery returns a null value
- Understand when multiple-row subqueries should be used, and when it is safe to use a single-row subquery.

Why Learn It?

A subquery is designed to find information you don't know so you can find information you want to know.

However, single-row subqueries can return only one row. What if you need to find information based on several rows and several values? The subquery will need to return several rows.

We achieve this using multiple-row subqueries, and three comparison operators: IN, ANY, and ALL.



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Whose salary is equal to the salary of an employee in department 20 ?

```
SELECT first_name, last_name
FROM employees
WHERE salary =
   (SELECT salary
    FROM employees
    WHERE department_id = 20);
```

LAST_NAME	DEPT_ID	SALARY
Hartstein	20	13000
Fay	20	6000

Why does this example not work? Because there is more than one employee in department 20, so the subquery returns multiple rows. We call this a multiple-row subquery.

The problem is the equals sign (=) in the WHERE condition. How can one value be equal to (or not equal to) more than one value? It's a silly question, isn't it?

ORA-01427: single-row subquery returns more than one row

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IN, ANY, and ALL

Subqueries that return more than one value are called multiple-row subqueries.

Because we cannot use the single-row comparison operators (=, < and so on), we need different comparison operators for multiple-row subqueries.

The multiple-row operators are: IN, ANY, and ALL. The NOT operator can be used with any of these three operators.

```
SELECT title, year
FROM d_cds
WHERE year IN
    (SELECT year
        FROM d_cds);
```

D_CDS

TITLE	YEAR
The Celebrants Live in Concert	1997
Songs from My Childhood	1999
Party Music for All Occasions	2000
Carpe Diem	2000

YEAR
1997
2000
2002

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IN

The IN operator is used when the outer query WHERE clause is designed to select only those rows which are equal to one of the list of values returned from the inner query.

For example, we are interested in all the CD titles that have the same year as the CD numbers less than 93. Since we are not sure what the years are for the CDs numbered below 93, the inner query will return a list of years.

The outer query will then return any title that has the same year as any year in the inner query list.

```
SELECT title, year
FROM d_cds
WHERE year IN
    (SELECT year
     FROM d_cds
     WHERE cd_number < 93);
```

D_CDS

TITLE	YEAR
The Celebrants Live in Concert	1997
Party Music for All Occasions	2000
Back to the Shire	2002

YEAR
1997
2000
2002

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ANY

The ANY operator is used when we want the outer-query WHERE clause to select the rows which are equal to, less than or greater than at least one value in the subquery result set.

The example shown will return any CD title whose year is less than at least one CD title year produced by "The Music Man.“

```
SELECT title, producer
FROM d_cds
WHERE year < ANY
 (SELECT year
  FROM d_cds
  WHERE producer = 'The Music Man');
```

D_CDS

TITLE	PRODUCER	YEAR
The Celebrants Live in Concert	Old Town Records	1997
Graduation Songbook	Tunes are Us	1998
Songs from my Childhood	Old Town Records	1999
Party Music for all Occasions	The Music Man	2000
Carpe Diem	R&B Inc.	2000

D_CDS

YEAR
2000
2001

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ALL

The ALL operator is used when we want the outer-query WHERE clause to select the rows which are equal to, less than or greater than all the values in the subquery result set.

The example shown will return any CD title whose year is greater than all the CD title years produced by "The Music Man.“

The ALL operator compares a value to every value returned by the inner query.

```
SELECT title, producer,year
FROM d_cds
WHERE year > ALL
 (SELECT year
  FROM d_cds
  WHERE producer = ‘The Music Man’);
```

D_CDS

TITLE	PRODUCER	YEAR
Back to the Shire	Middle Earth Records	2002
Whirled Peas	Old Town Records	2004

D_CDS

YEAR
2000
2001

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NULL VALUES

Suppose that one of the values returned by a multiple-row subquery is null, but other values are not.

- if IN or ANY are used, the outer query will return rows which match the non-null values
- if ALL is used, the outer query returns no rows. This is because ALL compares the outer query row with every value returned by the subquery, including the null. And comparing anything with null results in null not true.

The example lists those employees who are managers.

```
SELECT last_name, employee_id
FROM employees
WHERE employee_id IN
(SELECT manager_id
 FROM employees);
```

LAST_NAME	EMPLOYEE_ID
King	100
Kochhar	101
De Haan	102
Hunold	103
Mourgos	124

MANAGER_ID
(null)
100
100
102
103
103
100
124

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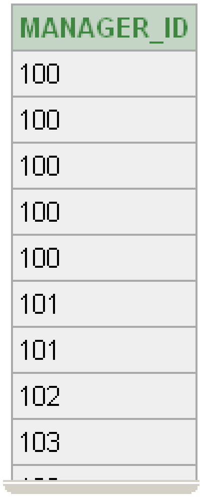
NULL Values in Subqueries

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



MANAGER_ID
100
100
100
100
100
101
101
102
103

Now, none of the values returned by the inner query is a null value, thus it works.

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GROUP BY and HAVING

As you might suspect, the GROUP BY clause, and the HAVING clause can also be used with multiple-row subqueries.

LAST_NAME	DEPT_ID	SALARY
Whalen	10	4400
Hartstein	20	13000
Fay	20	6000

What if you wanted to find the departments whose minimum salary is less than the salary of any employee who works in department 10 or 20?

DEPARTMENT_ID	MIN(SALARY)
10	4400
20	6000
50	2500
60	4200
80	8600
110	8300
(null)	7000

We need a multiple-row subquery which returns the salaries of employees in departments 10 and 20. The outer query will use a group function (MIN) so we need to GROUP the outer query BY department_id.

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GROUP BY and HAVING

Here is the needed SQL statement:

```
SELECT department_id, MIN(salary)
FROM employees
GROUP BY department_id
HAVING MIN(salary) <ANY
  (SELECT salary
   FROM employees
   WHERE department_id IN (10,20));
```

LAST_NAME	DEPT_ID	SALARY
Whalen	10	4400
Hartstein	20	13000
Fay	20	6000

DEPARTMENT_ID	MIN(SALARY)
10	4400
20	6000
50	2500
60	4200
80	8600
110	8300
(null)	7000

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GROUP BY and HAVING

You can even have a GROUP BY clause in the subquery !

DEPARTMENT_ID	MIN(SALARY)
10	4400
20	6000

Which departments have a minimum salary which is greater than the minimum salaries in departments less than 50? Here is the needed SQL statement:

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

DEPARTMENT_ID	MIN(SALARY)
80	8600
90	17000
110	8300
(null)	7000

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ONE LAST POINT ABOUT SUBQUERIES

Some subqueries may return a single row or multiple rows, depending on the data values in the rows. If there is even a possibility of multiple rows, make sure you write a multiple-row subquery.

For example: who does the same job as Ernst? This single-row subquery works correctly because there is only one Ernst in the table.

But what if later, the business hires a new employee called Susan Ernst?

```
SELECT first_name, last_name, job_id
FROM employees
WHERE job_id =
   (SELECT job_id
    FROM employees
    WHERE last_name = ‘Ernst’);
```

FIRST_NAME	LAST_NAME	JOB_ID
Bruce	Ernst	IT_PROG

FIRST_NAME	LAST_NAME	JOB_ID
Bruce	Ernst	IT_PROG
Alexander	Hunold	IT_PROG
Diana	Lorentz	IT_PROG

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ONE LAST POINT ABOUT SUBQUERIES

It would be better to write a multiple-row subquery.

The multiple-row subquery syntax will still work even if the subquery returns a single row.

If in doubt, write a multiple-row subquery !

```
SELECT first_name, last_name, job_id
FROM employees
WHERE job_id IN
   (SELECT job_id
    FROM employees
    WHERE last_name = 'Ernst');
```

FIRST_NAME	LAST_NAME	JOB_ID
Bruce	Ernst	IT_PROG
Susan	Ernst	SA_MAN

FIRST_NAME	LAST_NAME	JOB_ID
Bruce	Ernst	IT_PROG
Alexander	Hunold	IT_PROG
Diana	Lorentz	IT_PROG
Susan	Ernst	SA_MAN
Eleni	Zlotkey	SA_MAN

Summary

In this lesson you have learned to:

- Use the comparison operators IN, ANY and ALL correctly in multiple-row subqueries
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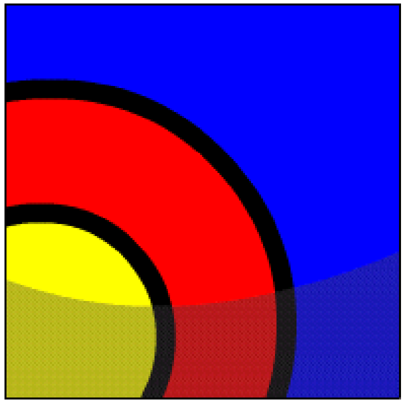

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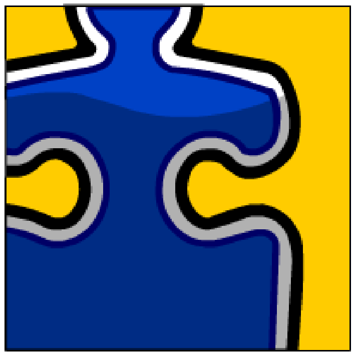
Summary

Practice Guide



The link for the lesson practice guide can be found in the course resources in Section 0.