USING SUBQUERIES TO SOLVE QUERIES

Dr. Mohammed A. Mohammed

University of Sulaimani | College of science | Computer dept.

2024 - 2025

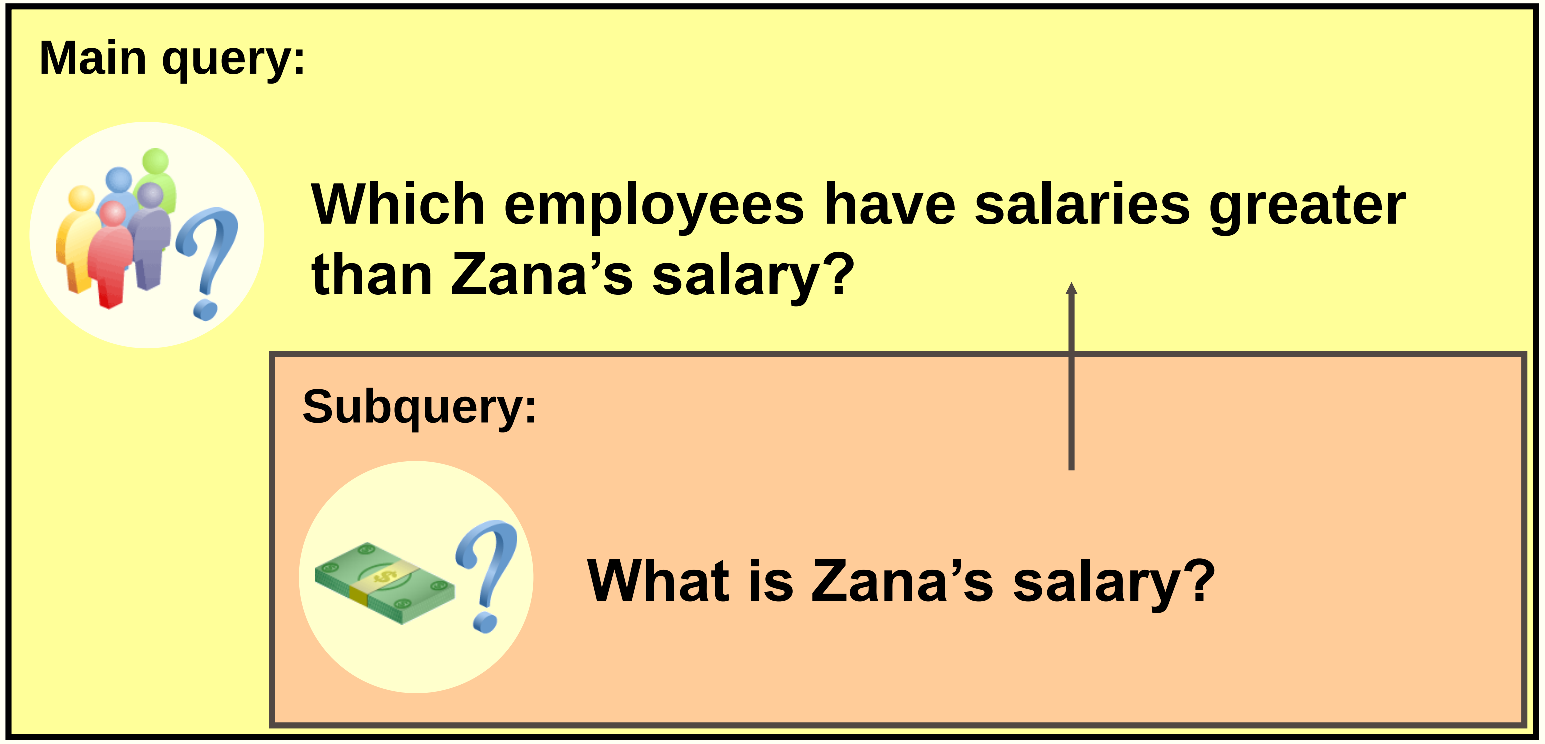
Objectives

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

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

Using a Subquery to Solve a Problem

Who has a salary greater than Zana’s salary?



Main query:

Which employees have salaries greater than Zana’s salary?

Subquery:

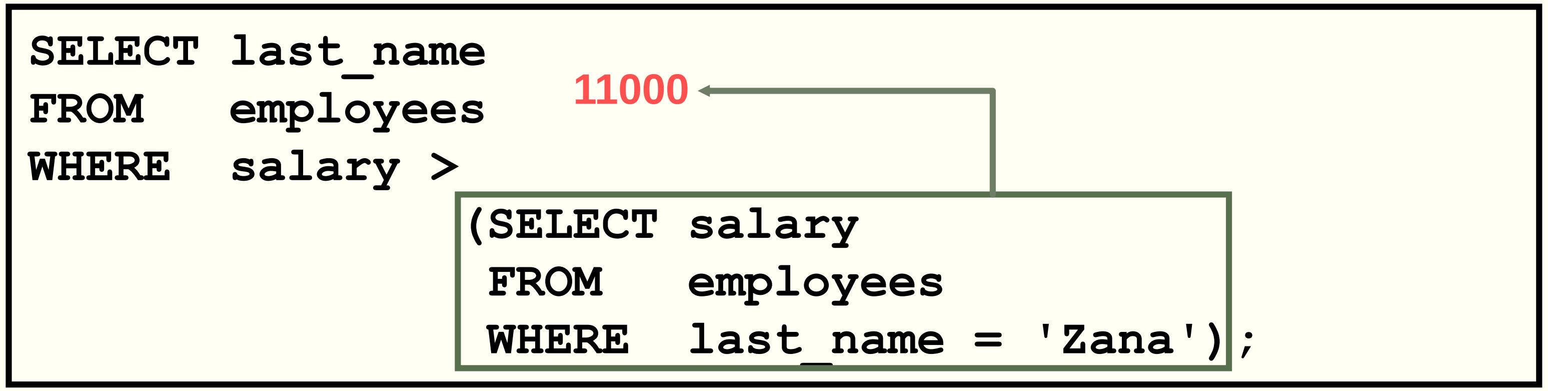
What is Zana’s salary?

Subquery Syntax

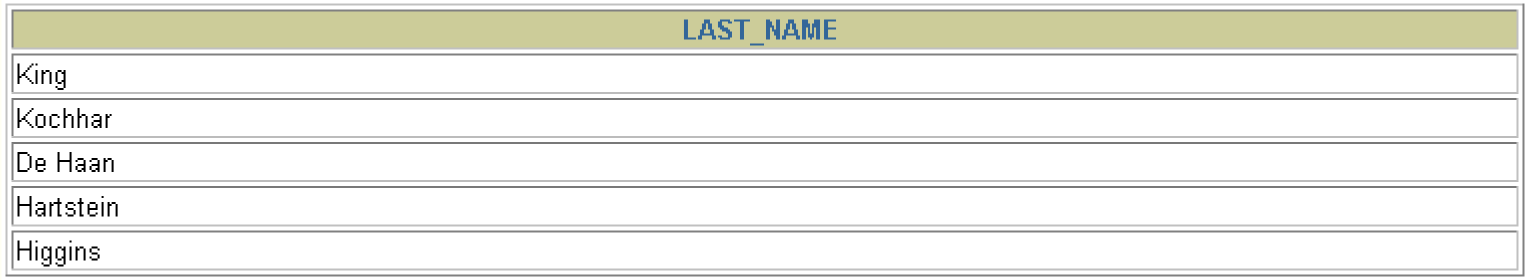
```
SELECT   select_list
FROM     table
WHERE    expr operator
                    (SELECT      select_list
                     FROM        table);
```

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

Using a Subquery



```
SELECT last_name
FROM   employees
WHERE  salary >
                (SELECT salary
                 FROM   employees
                 WHERE  last_name = 'Zana');
```



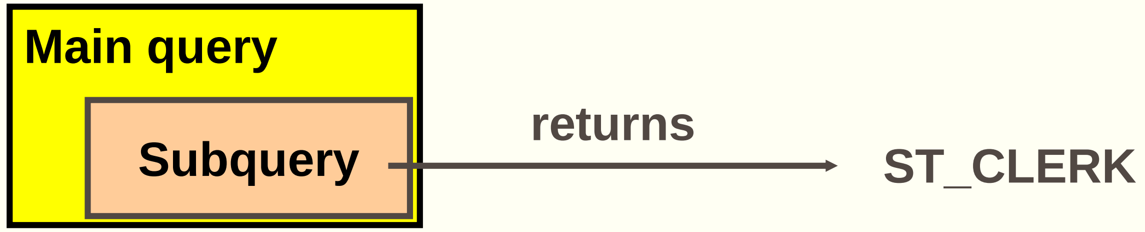
LAST_NAME
King
Kochhar
De Haan
Hartstein
Higgins

Guidelines for Using Subqueries

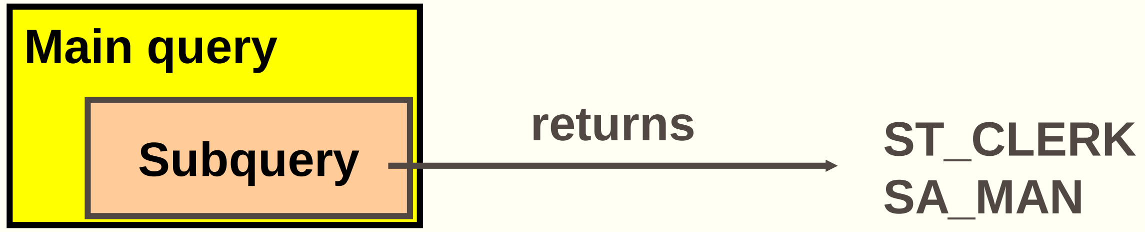
- Enclose subqueries in parentheses.
- Place subqueries on the right side of the comparison condition.
- Use single-row operators with single-row subqueries, and use multiple-row operators with multiple-row subqueries.

Types of Subqueries

- Single-row subquery



- Multiple-row subquery

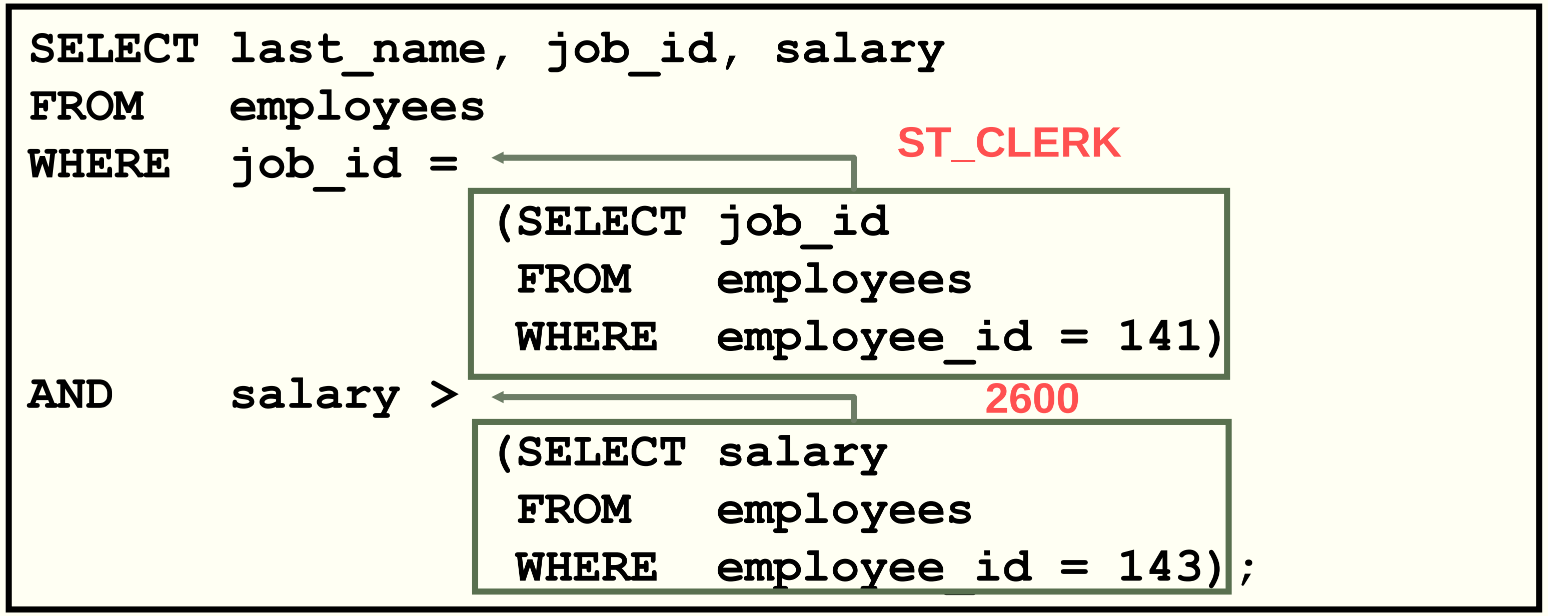


Single-Row Subqueries

- 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  employee_id = 141)
AND    salary >
                (SELECT salary
                 FROM   employees
                 WHERE  employee_id = 143);
```

LAST_NAME	JOB_ID	SALARY
Rajs	ST_CLERK	3500
Davies	ST_CLERK	3100

Using Group Functions in a Subquery

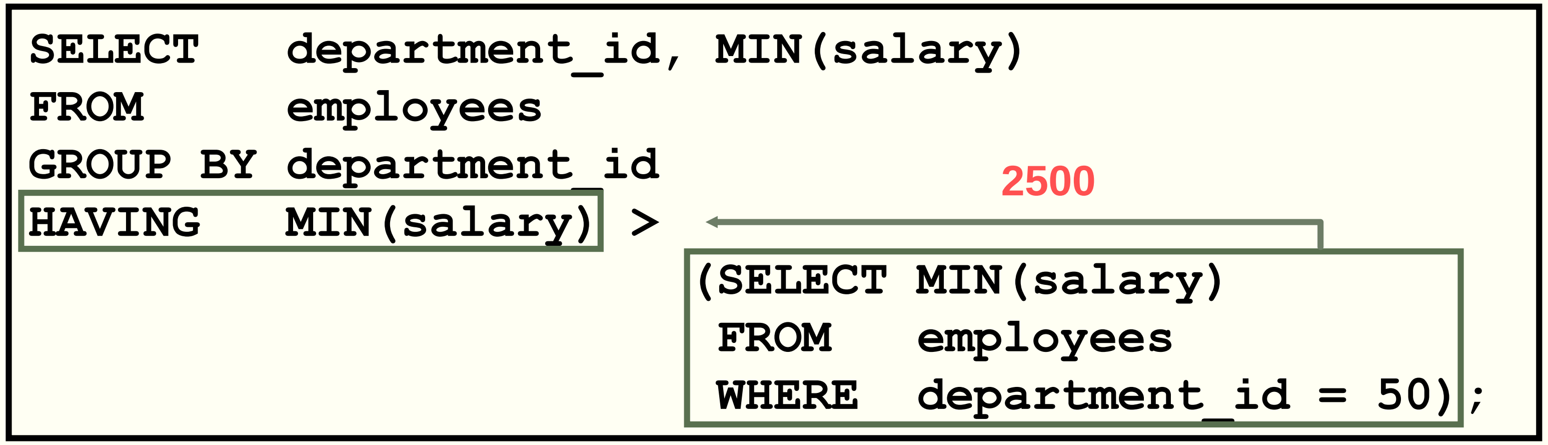
```
SELECT last_name, job_id, salary
FROM   employees
WHERE  salary =
                (SELECT MIN(salary)
                 FROM   employees);
```

2500

LAST_NAME	JOB_ID	SALARY
Vargas	ST_CLERK	2500

The `HAVING` Clause with Subqueries

- The Oracle server executes 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);
```

What Is Wrong with This Statement?

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

```
ERROR at line 4:
ORA-01427: single-row subquery returns more than
one row
```

Single-row operator with multiple-row subquery

Will This Statement Return Rows?

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

```
no rows selected
```

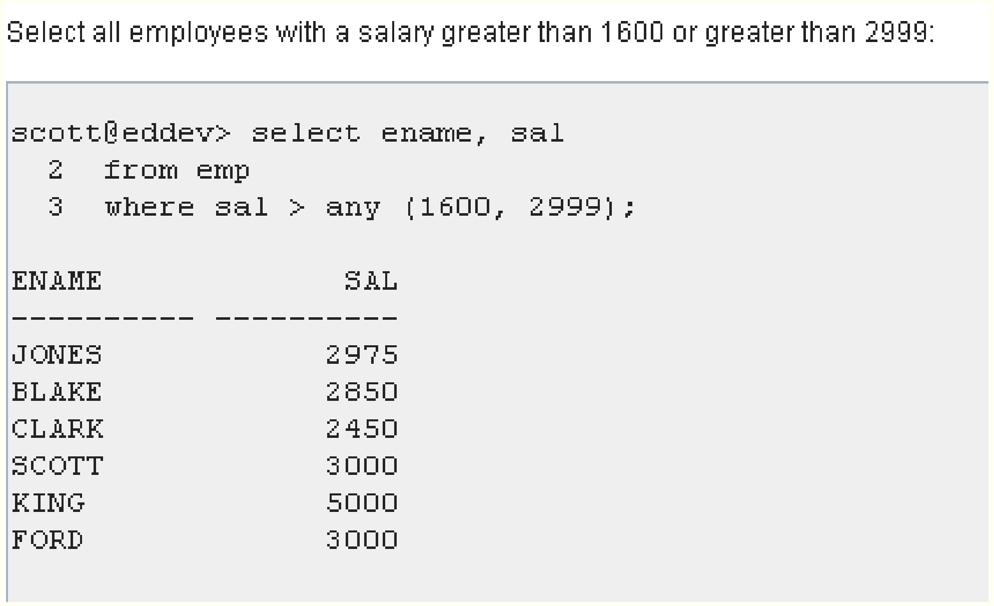
Subquery returns no values.

Multiple-Row Subqueries

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

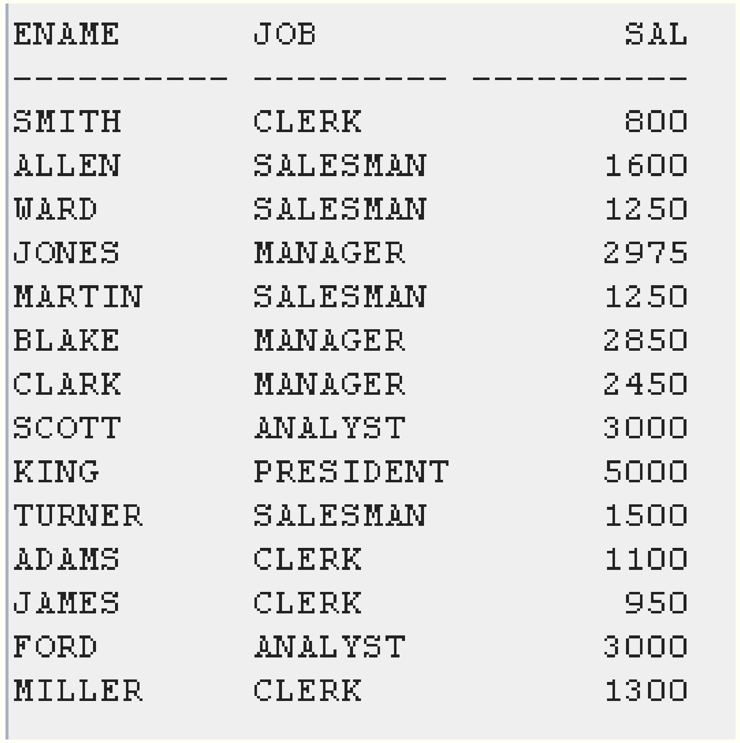
Operator	Meaning
`IN`	Equal to any member in the list
`ANY`	Compare value to each value returned by the subquery
`ALL`	Compare value to every value returned by the subquery

ANY

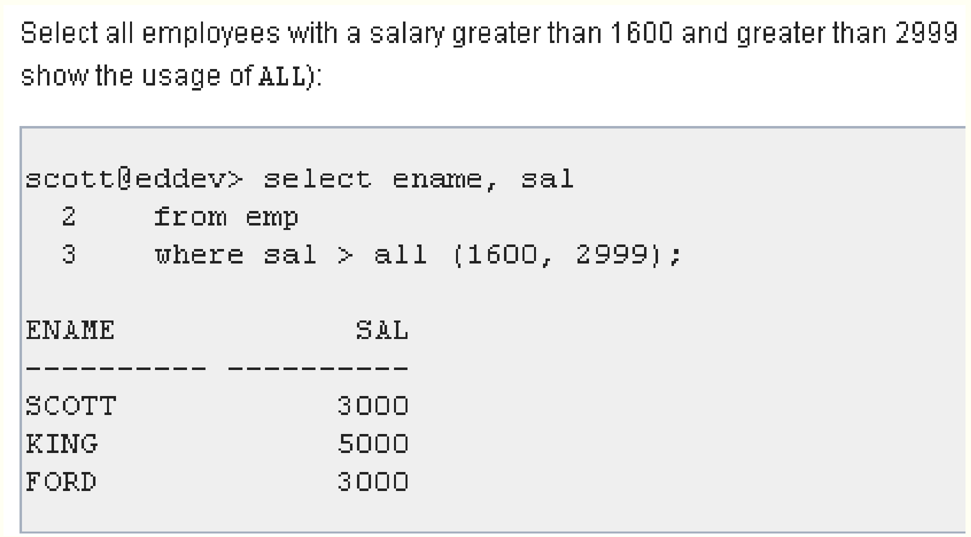

Select all employees with a salary greater than 1600 or greater than 2999:

```
scott@eddev> select ename, sal
  2  from emp
  3  where sal > any (1600, 2999);

ENAME             SAL
---------- ----------
JONES            2975
BLAKE            2850
CLARK            2450
SCOTT            3000
KING             5000
FORD             3000
```



```
ENAME      JOB              SAL
---------- --------- ----------
SMITH      CLERK            800
ALLEN      SALESMAN        1600
WARD       SALESMAN        1250
JONES      MANAGER         2975
MARTIN     SALESMAN        1250
BLAKE      MANAGER         2850
CLARK      MANAGER         2450
SCOTT      ANALYST         3000
KING       PRESIDENT       5000
TURNER     SALESMAN        1500
ADAMS      CLERK           1100
JAMES      CLERK            950
FORD       ANALYST         3000
MILLER     CLERK           1300
```


Select all employees with a salary greater than 1600 and greater than 2999 show the usage of ALL):

```
scott@eddev> select ename, sal
  2    from emp
  3    where sal > all (1600, 2999);

ENAME             SAL
---------- ----------
SCOTT            3000
KING             5000
FORD             3000
```

ALL

Using the ANY Operator in Multiple-Row Subqueries

```
SELECT employee_id, last_name, job_id, salary
FROM   employees          9000, 6000, 4200
WHERE  salary < ANY
                     (SELECT salary
                      FROM   employees
                      WHERE  job_id = 'IT_PROG')
AND    job_id <> 'IT_PROG';
```

EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
124	Mourgos	ST_MAN	5800
141	Rajs	ST_CLERK	3500
142	Davies	ST_CLERK	3100
143	Matos	ST_CLERK	2600
144	Vargas	ST_CLERK	2500

...

10 rows selected.

Using the `ALL` Operator in Multiple-Row Subqueries

9000, 6000, 4200

```
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';
```

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

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);

no rows selected
```

Summary

In this lesson, you should have learned how to:

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

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