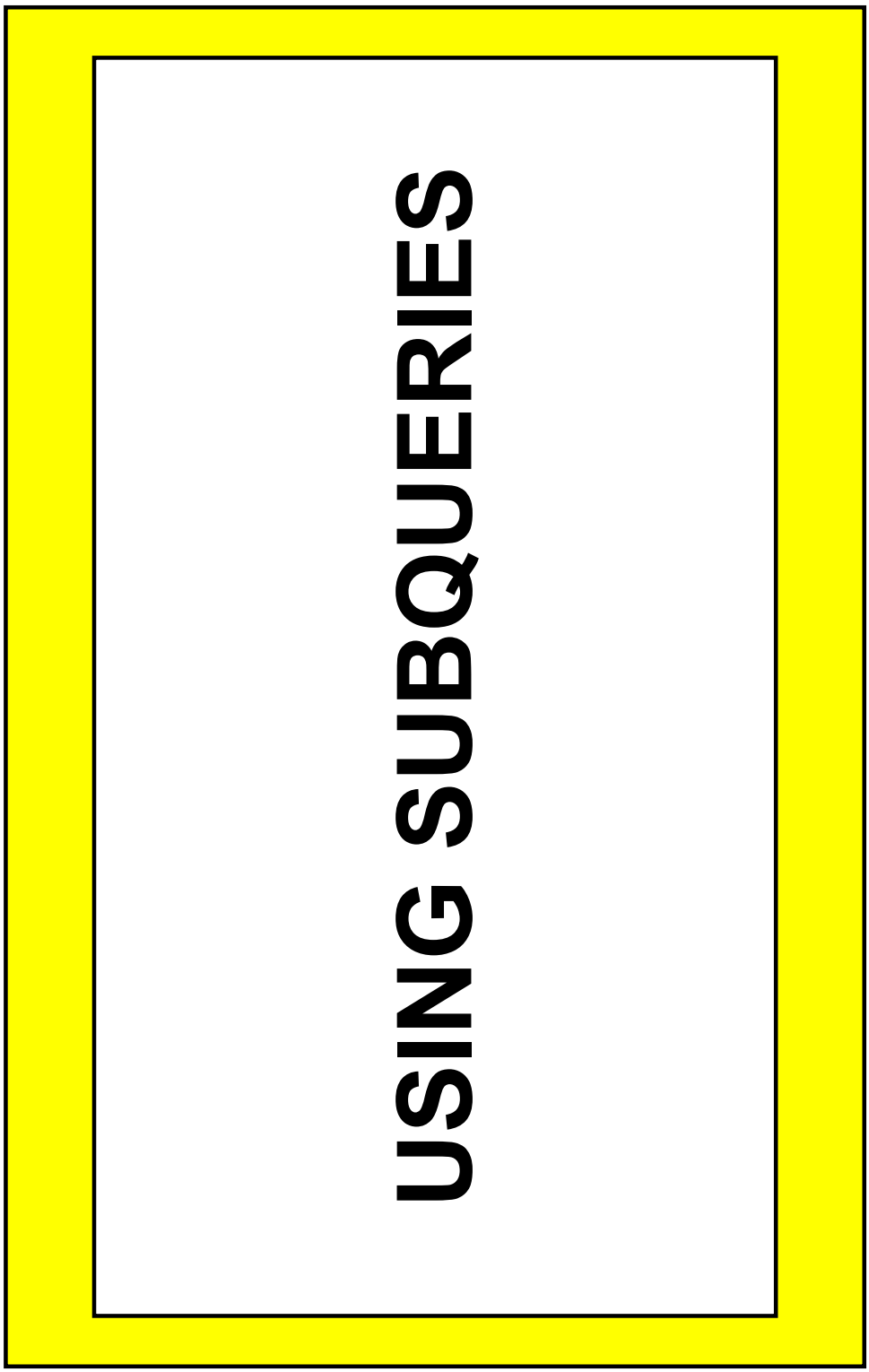


Objectives

After completing this unit, you should be able to:

- Code subqueries using the ALL, ANY/SOME, and EXISTS keywords
- Code correlated subqueries
- Choose the proper type of subquery to use in each case

Subquery With Basic Predicate

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE


```
SELECT EMPNO, LASTNAME, SALARY
       FROM EMPLOYEE
       WHERE SALARY =
             (SELECT MAX(SALARY)
                     FROM EMPLOYEE)
```

MAX(SALARY)

52750.00

EMPNO	LASTNAME	SALARY
000010	HAAS	52750.00

Subquery With IN Predicate

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE

PROJNO	PROJNAME	DEPTNO	RESPEMP
AD3100	ADMIN SERVICES	D01	000010
IF1000	QUERY SERVICES	C01	000030
IF2000	USER EDUCATION	C01	000030

PROJECT

Which employees are responsible for projects within their department ?

```
SELECT EMPNO, LASTNAME
  FROM EMPLOYEE
  WHERE (EMPNO,WORKDEPT) IN
        (SELECT RESPEMP, DEPTNO
        FROM PROJECT)
```

RESPEMP DEPTNO

000010	D01
000030	C01

Subquery With NOT IN Predicate

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE

PROJNO	PROJNAME	DEPTNO	RESPEMP
AD3100	ADMIN SERVICES	D01	000010
IF1000	QUERY SERVICES	C01	000030
IF2000	USER EDUCATION	C01	000030

PROJECT


```
SELECT EMPNO, LASTNAME
       FROM EMPLOYEE
       WHERE EMPNO
             NOT IN
             (SELECT RESPEMP
                     FROM PROJECT)
```

RESPEMP

000010
000030

NOT IN Predicate for Nullable Column

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00
000400	WILSON	NULL	25400.00

EMPLOYEE

DEPTNO	DEPTNAME	MGRNO
A00	SPIFFY COMPUTER SERVICE DIV.	000010
C01	INFORMATION CENTER	000030
D01	DEVELOPMENT CENTER	

DEPARTMENT


```
SELECT DEPTNO, DEPTNAME
       FROM DEPARTMENT
       WHERE DEPTNO
             NOT IN (SELECT WORKDEPT
                     FROM EMPLOYEE)
```

WORKDEPT

A00
C01
NULL

DEPTNO DEPTNAME

EMPTY!!!

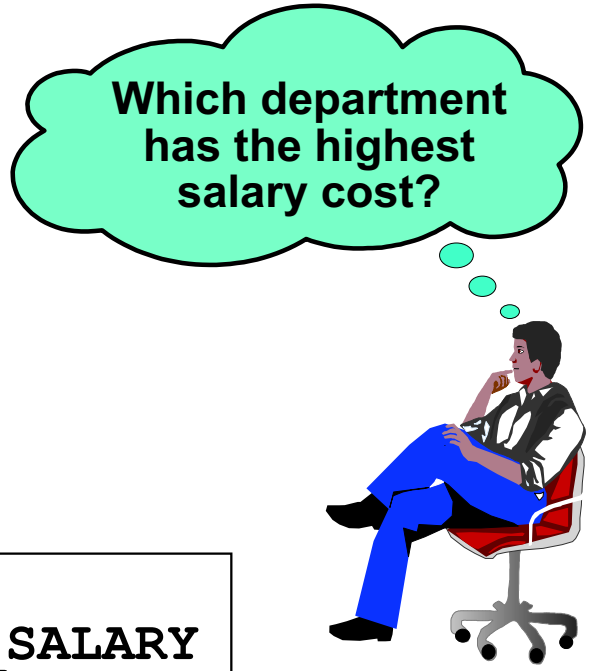
Wrong result!

You must avoid the NULL value!

Subquery With ALL Predicate (Part 1)

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE




```
SELECT WORKDEPT AS DEPTNO,
       SUM(SALARY) AS TOTAL_SALARY
       FROM EMPLOYEE
       GROUP BY WORKDEPT
       HAVING
```

Sum of salaries >=

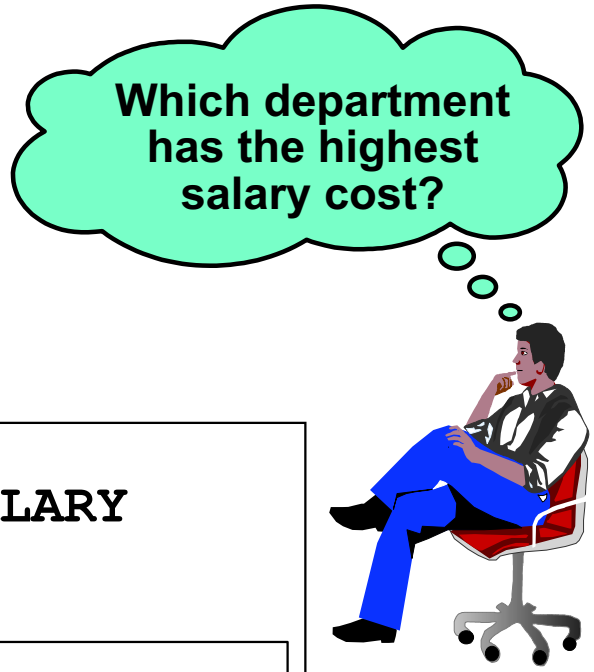
Sum of salaries for **ALL** departments

SUM(SALARY)
82000.00
90470.00

Subquery With ALL Predicate (Part 2)

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE




```
SELECT WORKDEPT AS DEPTNO,
       SUM(SALARY) AS TOTAL_SALARY
       FROM EMPLOYEE
       GROUP BY WORKDEPT
       HAVING SUM(SALARY) >=
              ALL (SELECT SUM(SALARY)
                   FROM EMPLOYEE
                   GROUP BY WORKDEPT)
```

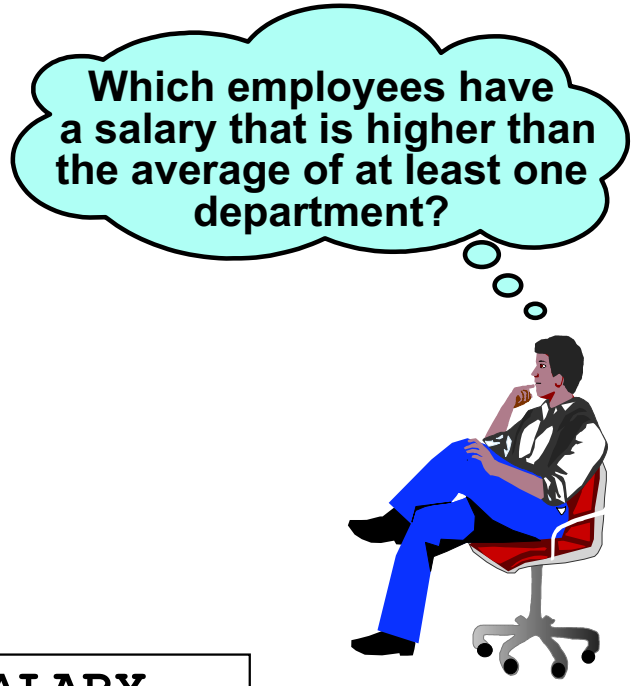
SUM(SALARY)
82000.00
90470.00

DEPTNO	TOTAL_SALARY
C01	90470.00

Subquery With ANY or SOME Predicate (Part 1)

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE




```
SELECT EMPNO, LASTNAME, SALARY
       FROM EMPLOYEE
       WHERE SALARY >
```

Average salary of **ANY** department

AVG(SALARY)

41000.00000000

30156.66666666

Subquery With ANY or SOME Predicate (Part 2)

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE

Which employees have a salary that is higher than the average of at least one department?

```
SELECT EMPNO, LASTNAME, SALARY
       FROM EMPLOYEE
       WHERE SALARY >
          ANY (SELECT AVG(SALARY)
                      FROM EMPLOYEE
                      GROUP BY WORKDEPT)
```

AVG(SALARY)
41000.00000000
30156.66666666

EMPNO	LASTNAME	SALARY
000010	HAAS	52750.00
000030	KWAN	38250.00

Subquery With EXISTS Predicate (Part 1)

EMPNO	LASTNAME	WORKDEPT	SALARY	HIREDATE
000010	HAAS	A00	52750.00	1965-01-01
000030	KWAN	C01	38250.00	1975-04-05
000120	O'CONNELL	A00	29250.00	1963-12-05
000130	QUINTANA	C01	23800.00	1971-07-28
000140	NICHOLLS	C01	28420.00	1976-12-15

EMPLOYEE

I would like to have a list of all employees earning more than 30,000, if there is any employee earning less than 25,000.

```
SELECT EMPNO, LASTNAME, SALARY, HIREDATE
       FROM EMPLOYEE
       WHERE SALARY > 30000 AND
```

EXISTS at least one employee earning less than $25,000

EMPNO	LASTNAME	WORKDEPT	SALARY	HIREDATE
000130	QUINTANA	C01	23800.00	1971-07-28

Subquery With EXISTS Predicate (Part 2)

EMPNO	LASTNAME	WORKDEPT	SALARY	HIREDATE
000010	HAAS	A00	52750.00	1965-01-01
000030	KWAN	C01	38250.00	1975-04-05
000120	O'CONNELL	A00	29250.00	1963-12-05
000130	QUINTANA	C01	23800.00	1971-07-28
000140	NICHOLLS	C01	28420.00	1976-12-15

EMPLOYEE

I would like to have a list of all employees earning more than 30,000, if there is any employee earning less than 25,000.

```
SELECT EMPNO, LASTNAME, SALARY, HIREDATE
       FROM EMPLOYEE
       WHERE SALARY > 30000 AND
```

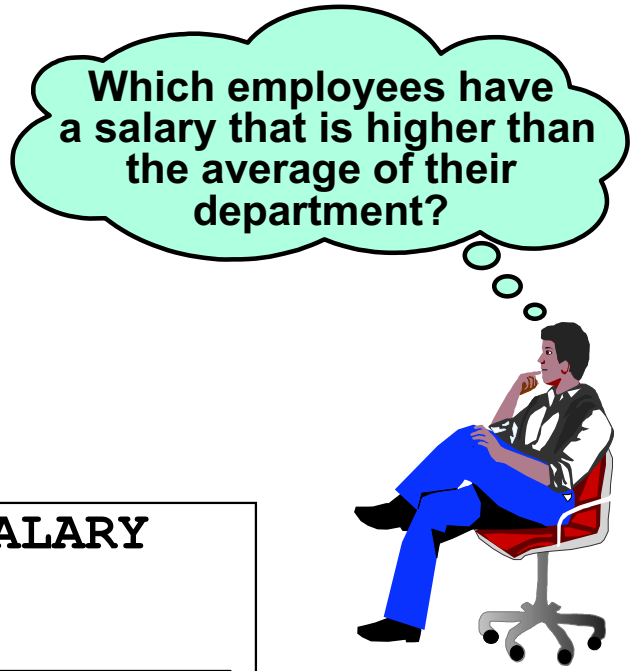
EXISTS (SELECT * FROM EMPLOYEE WHERE SALARY < 25000)

EMPNO	LASTNAME	WORKDEPT	SALARY	HIREDATE
000130	QUINTANA	C01	23800.00	1971-07-28

Correlated Subquery (Part 1)

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE




```
SELECT EMPNO, LASTNAME, SALARY
       FROM EMPLOYEE
       WHERE SALARY >
```

Average salary of **corresponding** department

	AVG(SALARY)
A00	41000.00000000
C01	30156.66666666

Correlated Subquery (Part 2)

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00

EMPLOYEE

```
SELECT EMPNO, LASTNAME, SALARY
       FROM EMPLOYEE E
       WHERE SALARY >
          (SELECT AVG(SALARY)
                  FROM EMPLOYEE
                  WHERE WORKDEPT =
                        E.WORKDEPT)
```

EMPNO	LASTNAME	SALARY
000010	HAAS	52750.00
000030	KWAN	38250.00

Which employees have a salary that is higher than the average of their department?

	AVG(SALARY)
A00	41000.00000000
C01	30156.66666666

Correlated Subquery with EXISTS

EMPNO	LASTNAME	WORKDEPT	SALARY
000010	HAAS	A00	52750.00
000030	KWAN	C01	38250.00
000120	O'CONNELL	A00	29250.00
000130	QUINTANA	C01	23800.00
000140	NICHOLLS	C01	28420.00
000400	WILSON	NULL	25400.00

EMPLOYEE

DEPTNO	DEPTNAME	MGRNO
A00	SPIFFY COMPUTER SERVICE DIV.	000010
C01	INFORMATION CENTER	000030
D01	DEVELOPMENT CENTER	-

DEPARTMENT


```
SELECT DEPTNO, DEPTNAME
  FROM DEPARTMENT D
  WHERE NOT EXISTS
    (SELECT *
       FROM EMPLOYEE
         WHERE
       WORKDEPT = D.DEPTNO)
```

DEPTNO DEPTNAME

D01 DEVELOPMENT CENTER

RESULT

Checkpoint

1. List three quantified predicates used with subqueries.

2. T/F. The EXISTS predicate can be negated.

3. Assume that you need to list the employees that have the highest salaries in their departments. What kind of subquery will you have to use?

Summary

Now that you have completed this unit, you should be able to:

- **Code subqueries using the ALL, ANY/SOME, and EXISTS keywords**
- **Code correlated subqueries**
- **Choose the proper type of subquery to use in each case**