6

Subqueries

Objectives

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

- Describe the types of problems that subqueries can solve
- Define subqueries
- 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 Jones'?"

Main Query

"Which employees have a salary greater than Jones' salary?"

Subquery

"What is Jones' salary?"

Subqueries

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

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

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Using a Subquery

```
SQL> SELECT ename
  2  FROM   emp          2975
  3  WHERE  sal >
  4                (SELECT sal
  5                 FROM   emp
  6                 WHERE  empno=7566);
```

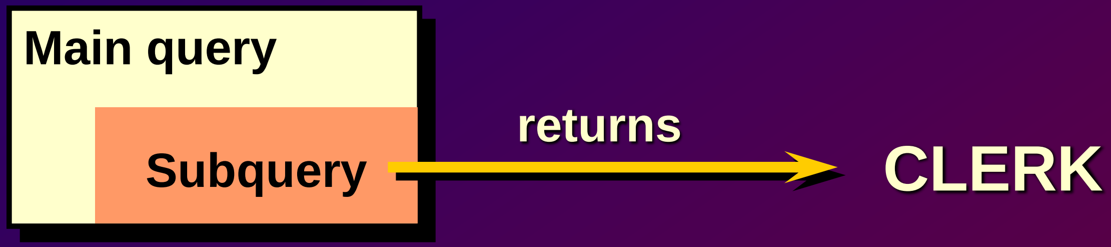
```
ENAME
----------
KING
FORD
SCOTT
```

Guidelines for Using Subqueries

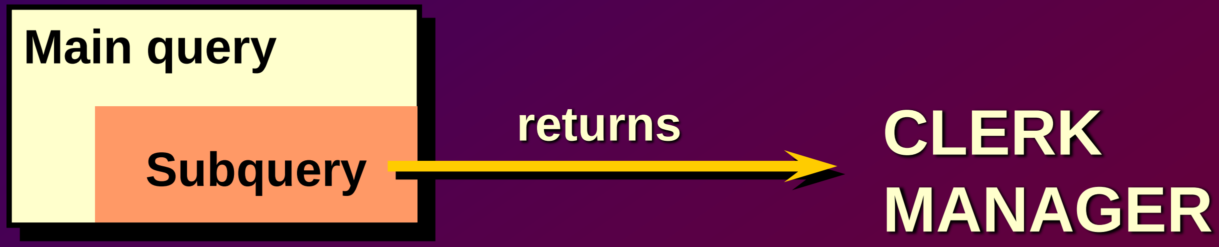
- Enclose subqueries in parentheses.
- Place subqueries on the right side of the comparison operator.
- Do not add an ORDER BY clause to a subquery.
- Use single-row operators with single-row subqueries.
- Use multiple-row operators with multiple-row subqueries.

Types of Subqueries

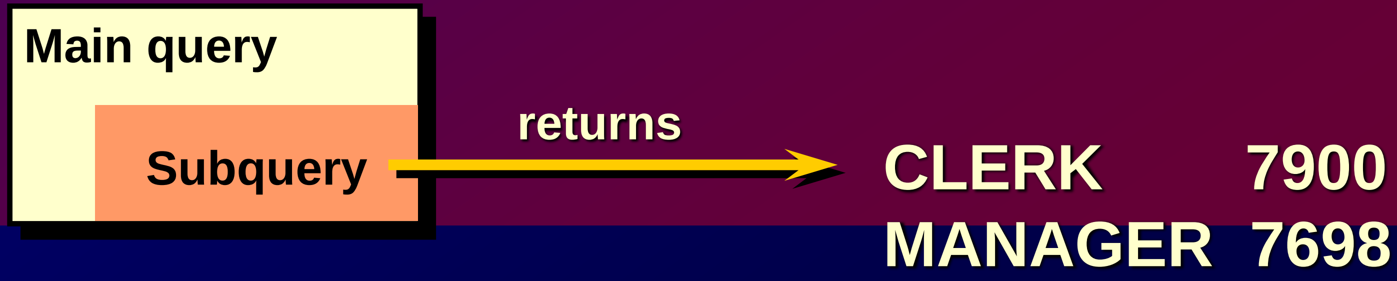
- Single-row subquery



- Multiple-row subquery



- Multiple-column 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

```
SQL> SELECT   ename, job
  2  FROM     emp
  3  WHERE    job =                           CLERK
  4                 (SELECT      job
  5                  FROM        emp
  6                  WHERE       empno = 7369)
  7  AND      sal >                           1100
  8                 (SELECT      sal
  9                  FROM        emp
 10                  WHERE       empno = 7876);
```

```
ENAME      JOB
---------- ---------
MILLER     CLERK
```

Using Group Functions in a Subquery

```
SQL> SELECT   ename, job, sal
  2  FROM     emp
  3  WHERE    sal =
  4                    (SELECT       MIN(sal)
  5                    FROM          emp);
```

800

```
ENAME      JOB              SAL
---------- --------- ----------
SMITH      CLERK            800
```

HAVING Clause with Subqueries

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

```
SQL> SELECT        deptno, MIN(sal)
  2  FROM          emp
  3  GROUP BY      deptno                     800
  4  HAVING        MIN(sal) >
  5                          (SELECT     MIN(sal)
  6                           FROM       emp
  7                           WHERE      deptno = 20);
```

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What Is Wrong with This Statement?

```
SQL> SELECT empno, ename
  2  FROM   emp
  3  WHERE  sal =
  4                (SELECT    MIN(sal)
  5                 FROM      emp
  6                 GROUP BY  deptno);
```

Single-row operator with multiple-row subquery

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

no rows selected
```

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Will This Statement Work?

```
SQL> SELECT ename, job
  2  FROM   emp
  3  WHERE  job =
  4                (SELECT job
  5                 FROM   emp
  6                 WHERE  ename='SMYTHE');
```

```
no rows selected
```

Subquery returns no values

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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

Using ANY Operator in Multiple-Row Subqueries

```
SQL> SELECT   empno, ename, job  1300
  2  FROM     emp              1100
  3  WHERE    sal < ANY         800
                               950
  4                       (SELECT   sal
  5                        FROM     emp
  6                        WHERE    job = 'CLERK')
  7  AND      job <> 'CLERK';
```

```
     EMPNO ENAME      JOB
---------- ---------- ---------
      7654 MARTIN     SALESMAN
      7521 WARD       SALESMAN
```

Using ALL Operator in Multiple-Row Subqueries

```
SQL> SELECT   empno, ename, job                1566.6667
  2  FROM     emp                     2175
  3  WHERE    sal > ALL             2916.6667
  4                (SELECT        avg(sal)
  5                 FROM          emp
  6                 GROUP BY      deptno);
```

```
     EMPNO ENAME      JOB
---------- ---------- ---------
      7839 KING       PRESIDENT
      7566 JONES      MANAGER
      7902 FORD       ANALYST
      7788 SCOTT      ANALYST
```

Summary

Subqueries are useful when a query is based on unknown values.

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

Practice Overview

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

6

Creating Views

Objectives

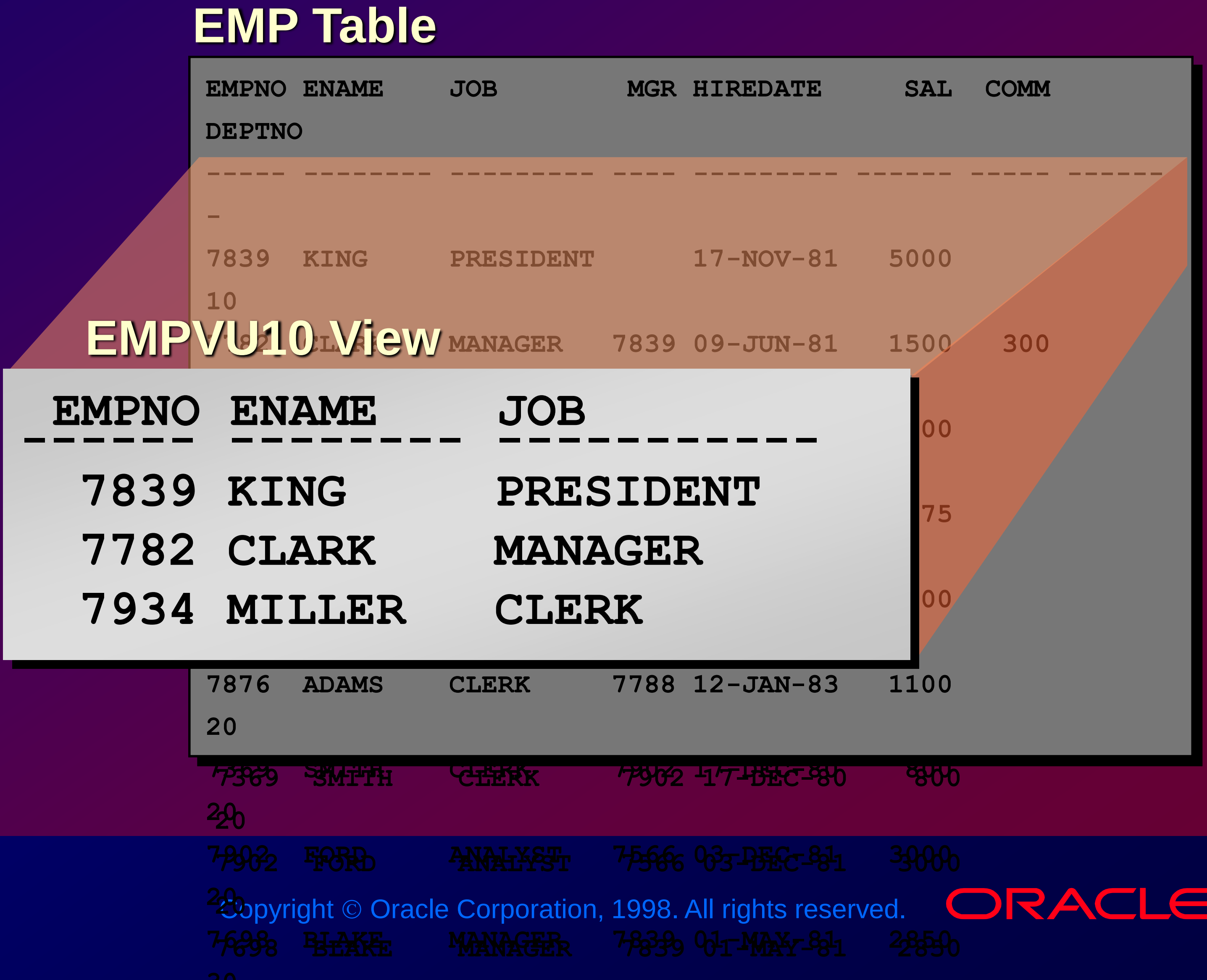
After completing this lesson, you should be able to do the following:

- Describe a view
- Create a view
- Retrieve data through a view
- Alter the definition of a view
- Insert, update, and delete data through a view
- Drop a view

Database Objects

Object	Description
Table	Basic unit of storage; composed of rows and columns
View	Logically represents subsets of data from one or more tables
Sequence	Generates primary key values
Index	Improves the performance of some queries
Synonym	Alternative name for an object

What Is a View?


EMP Table

```
EMPNO ENAME      JOB            MGR  HIREDATE       SAL    COMM
DEPTNO
----- -------- --------- ---- --------- ------ ----- ------
-
7839  KING      PRESIDENT       17-NOV-81     5000
10
[illegible]               MANAGER    7839 09-JUN-81     1500     300
                                                   00
                                                   75
                                                   00
7876  ADAMS     CLERK      7788 12-JAN-83     1100
20
7369  SMITH     CLERK      7902 17-DEC-80      800
20
7902  FORD      ANALYST    7566 03-DEC-81     3000
20
7698  BLAKE     MANAGER    7839 01-MAY-81     2850
```

EMPVU10 View

```
 EMPNO  ENAME      JOB
------- --------- -----------
   7839 KING       PRESIDENT
   7782 CLARK      MANAGER
   7934 MILLER     CLERK
```

Why Use Views?

- To restrict database access
- To make complex queries easy
- To present different views of the same data

Simple Views and Complex Views

Feature	Simple Views	Complex Views
Number of tables	One	One or more
Contain functions	No	Yes
Contain groups of data	No	Yes
DML through view	Yes	Not always

Creating a View

- You embed a subquery within the CREATE VIEW statement.

```
CREATE [OR REPLACE] [FORCE|NOFORCE] VIEW view
  [(alias[, alias]...)]
AS subquery
[WITH CHECK OPTION [CONSTRAINT constraint]]
[WITH READ ONLY]
```

- The subquery can contain complex SELECT syntax.
- The subquery cannot contain an ORDER BY clause.

Creating a View

- Create a view, EMPVU10, that contains details of employees in department 10.

```
SQL> CREATE VIEW     empvu10
  2  AS SELECT       empno, ename, job
  3  FROM            emp
  4  WHERE           deptno = 10;
View created.
```

- Describe the structure of the view by using the SQL*Plus DESCRIBE command.

```
SQL> DESCRIBE empvu10
```

Creating a View

- Create a view by using column aliases in the subquery.

```
SQL> CREATE VIEW    salvu30
  2  AS SELECT      empno EMPLOYEE_NUMBER, ename NAME,
  3                 sal SALARY
  4  FROM           emp
  5  WHERE          deptno = 30;
View created.
```

- Select the columns from this view by the given alias names.

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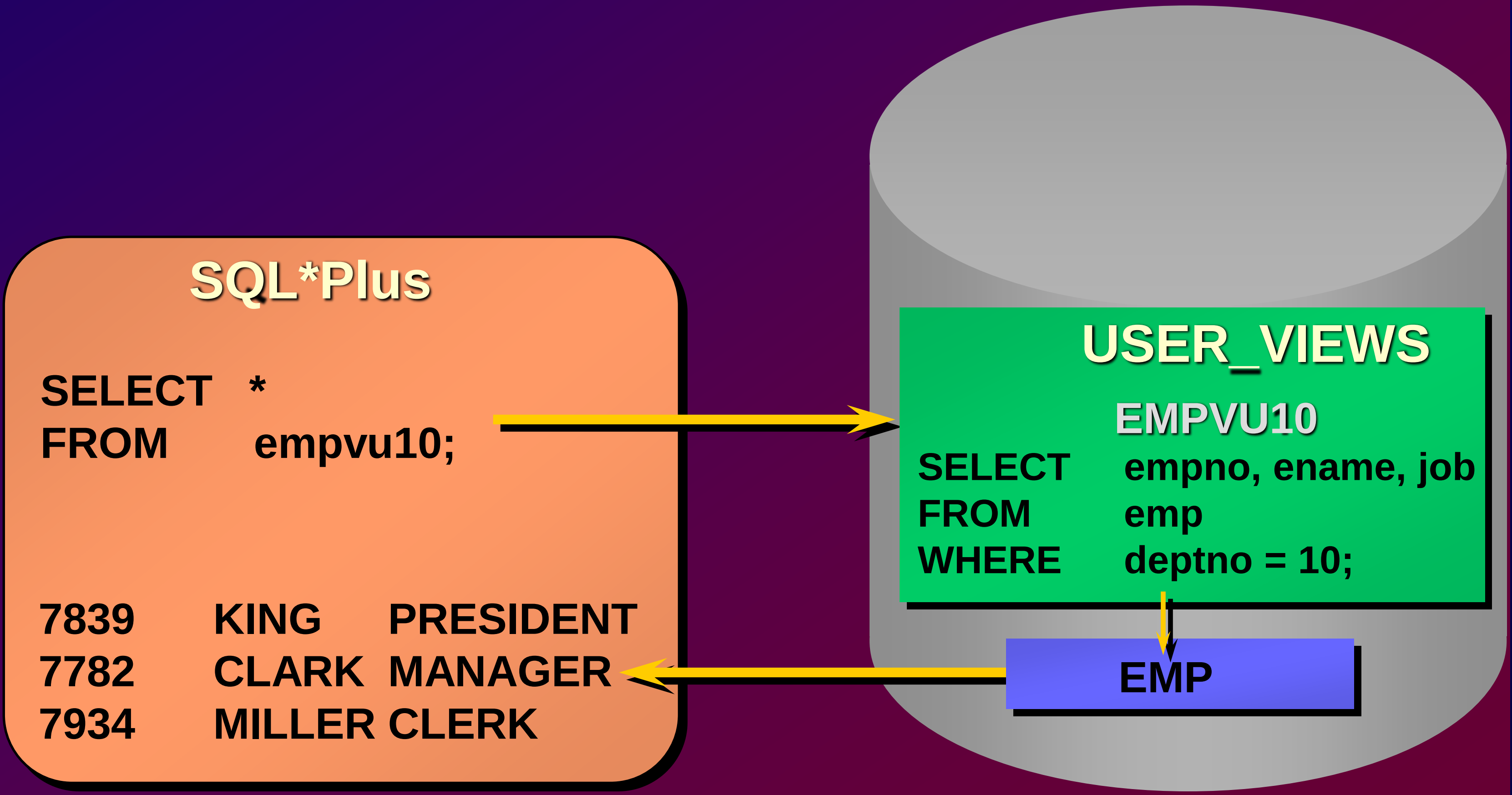
Retrieving Data from a View

```
SQL>  SELECT *
  2   FROM    salvu30;
```

```
EMPLOYEE_NUMBER NAME           SALARY
--------------- ---------- ----------
           7698 BLAKE            2850
           7654 MARTIN           1250
           7499 ALLEN            1600
           7844 TURNER           1500
           7900 JAMES             950
           7521 WARD             1250

6 rows selected.
```

Querying a View



```
SELECT   *
FROM     empvu10;
```

```
SELECT   empno, ename, job
FROM     emp
WHERE    deptno = 10;
```

```
7839    KING    PRESIDENT
7782    CLARK   MANAGER
7934    MILLER  CLERK
```

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Modifying a View

- Modify the EMPVU10 view by using CREATE OR REPLACE VIEW clause. Add an alias for each column name.

```
SQL> CREATE OR REPLACE VIEW empvu10
  2           (employee_number, employee_name, job_title)
  3  AS SELECT       empno, ename, job
  4  FROM            emp
  5  WHERE           deptno = 10;
View created.
```

- Column aliases in the CREATE VIEW clause are listed in the same order as the columns in the subquery.

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Creating a Complex View

Create a complex view that contains group functions to display values from two tables.

```
SQL> CREATE VIEW    dept_sum_vu
  2                 (name, minsal, maxsal, avgsal)
  3  AS SELECT      d.dname, MIN(e.sal), MAX(e.sal),
  4                 AVG(e.sal)
  5  FROM           emp e, dept d
  6  WHERE          e.deptno = d.deptno
  7  GROUP BY       d.dname;
View created.
```

Rules for Performing DML Operations on a View

- You can perform DML operations on simple views.
- You cannot remove a row if the view contains the following:
  - Group functions
  - A GROUP BY clause
  - The DISTINCT keyword

Rules for Performing DML Operations on a View

- You cannot modify data in a view if it contains:
  - Any of the conditions mentioned in the previous slide
  - Columns defined by expressions
  - The ROWNUM pseudocolumn
- You cannot add data if:
  - The view contains any of the conditions mentioned above or in the previous slide
  - There are NOT NULL columns in the base tables that are not selected by the view

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Using the WITH CHECK OPTION Clause

- You can ensure that DML on the view stays within the domain of the view by using the WITH CHECK OPTION clause.

```
SQL> CREATE OR REPLACE VIEW empvu20
  2  AS SELECT       *
  3  FROM            emp
  4  WHERE           deptno = 20
  5  WITH CHECK OPTION CONSTRAINT empvu20_ck;
View created.
```

- Any attempt to change the department number for any row in the view will fail because it violates the WITH CHECK OPTION constraint.

Denying DML Operations

- You can ensure that no DML operations occur by adding the WITH READ ONLY option to your view definition.

```
SQL> CREATE OR REPLACE VIEW empvu10
  2         (employee_number, employee_name, job_title)
  3  AS SELECT      empno, ename, job
  4  FROM           emp
  5  WHERE          deptno = 10
  6  WITH READ ONLY;
View created.
```

- Any attempt to perform a DML on any row in the view will result in Oracle Server error.

Removing a View

Remove a view without losing data because a view is based on underlying tables in the database.

```
DROP VIEW view;
```

```
SQL> DROP VIEW empvu10;
View dropped.
```

Summary

- A view is derived from data in other tables or other views.
- A view provides the following advantages:
  - Restricts database access
  - Simplifies queries
  - Provides data independence
  - Allows multiple views of the same data
  - Can be dropped without removing the underlying data

Practice Overview

- Creating a simple view
- Creating a complex view
- Creating a view with a check constraint
- Attempting to modify data in the view
- Displaying view definitions
- Removing views