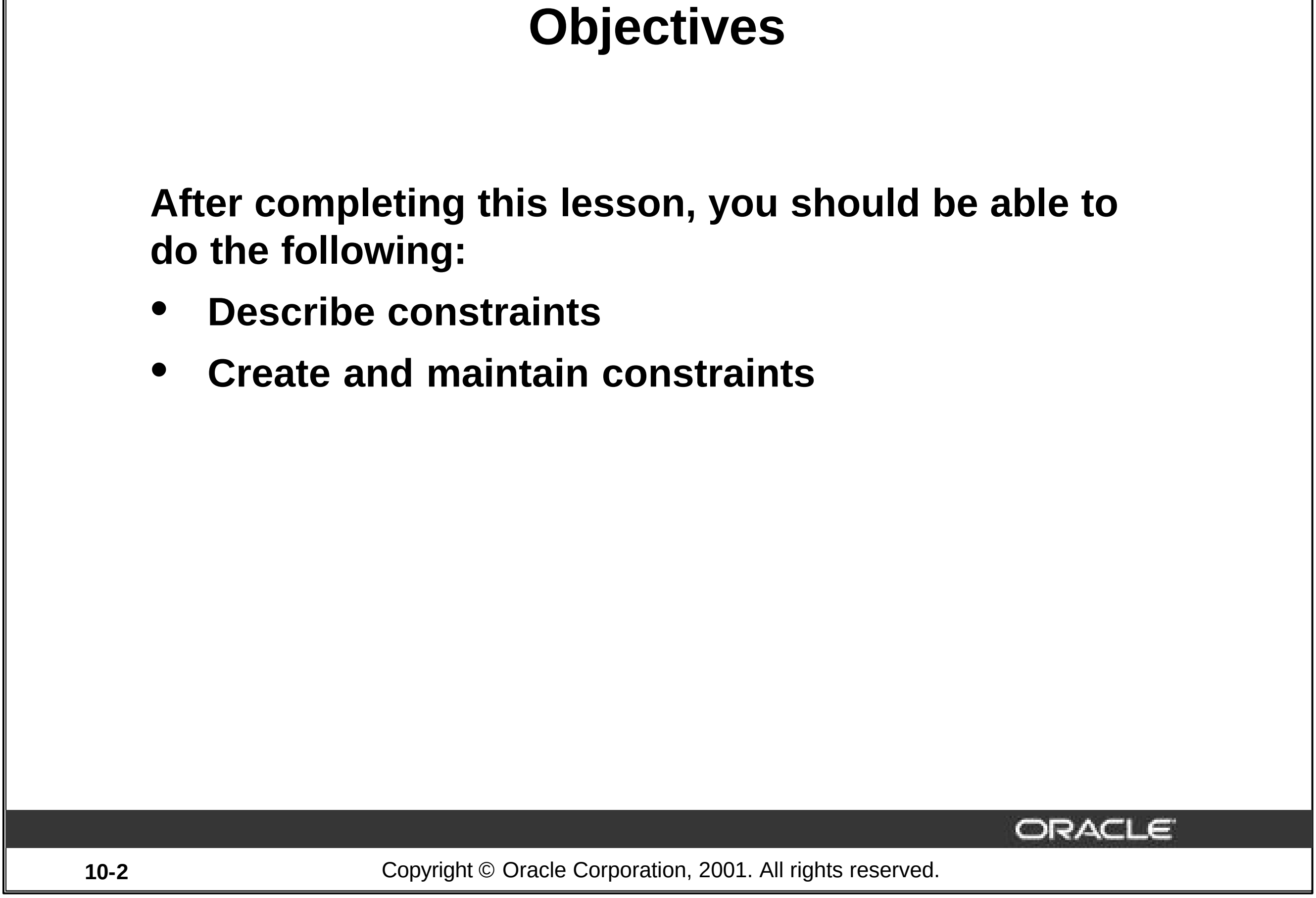
10

Including Constraints

Schedule:	**Timing**	**Topic**
	45 minutes	Lecture
	25 minutes	Practice
	70 minutes	Total



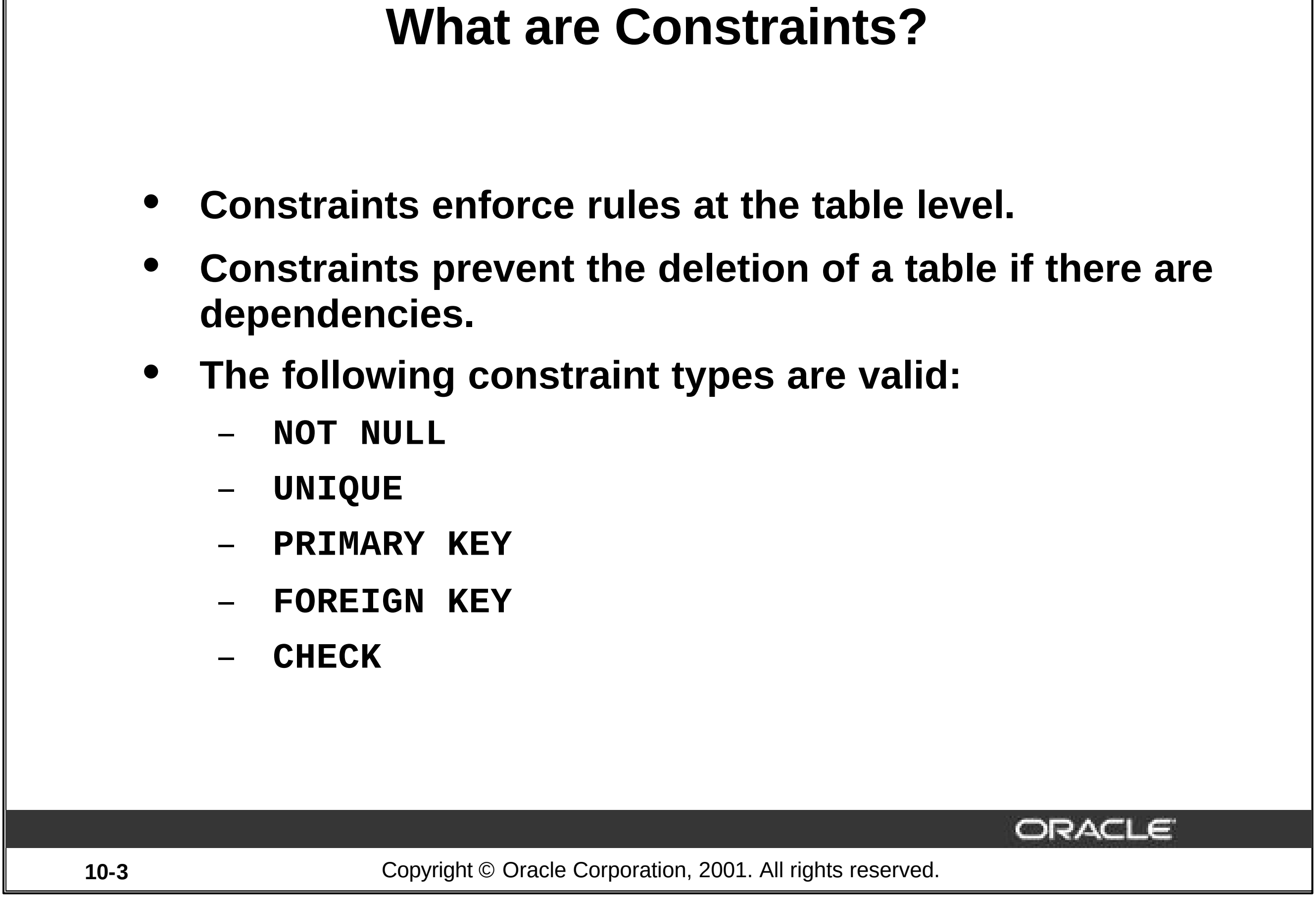
Objectives

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

- **Describe constraints**
- **Create and maintain constraints**

Lesson Aim

In this lesson, you learn how to implement business rules by including integrity constraints.



What are Constraints?

- Constraints enforce rules at the table level.
- Constraints prevent the deletion of a table if there are dependencies.
- The following constraint types are valid:
  - `NOT NULL`
  - `UNIQUE`
  - `PRIMARY KEY`
  - `FOREIGN KEY`
  - `CHECK`

Constraints

The Oracle Server uses *constraints* to prevent invalid data entry into tables.

You can use constraints to do the following:

- Enforce rules on the data in a table whenever a row is inserted, updated, or deleted from that table. The constraint must be satisfied for the operation to succeed.
- Prevent the deletion of a table if there are dependencies from other tables
- Provide rules for Oracle tools, such as Oracle Developer

Data Integrity Constraints

Constraint	**Description**
`NOT NULL`	Specifies that the column cannot contain a null value
`UNIQUE`	Specifies a column or combination of columns whose values must be unique for all rows in the table
`PRIMARY KEY`	Uniquely identifies each row of the table
`FOREIGN KEY`	Establishes and enforces a foreign key relationship between the column and a column of the referenced table
`CHECK`	Specifies a condition that must be true

For more information, see *Oracle9i SQL Reference*, “`CONSTRAINT`.”

Constraint Guidelines

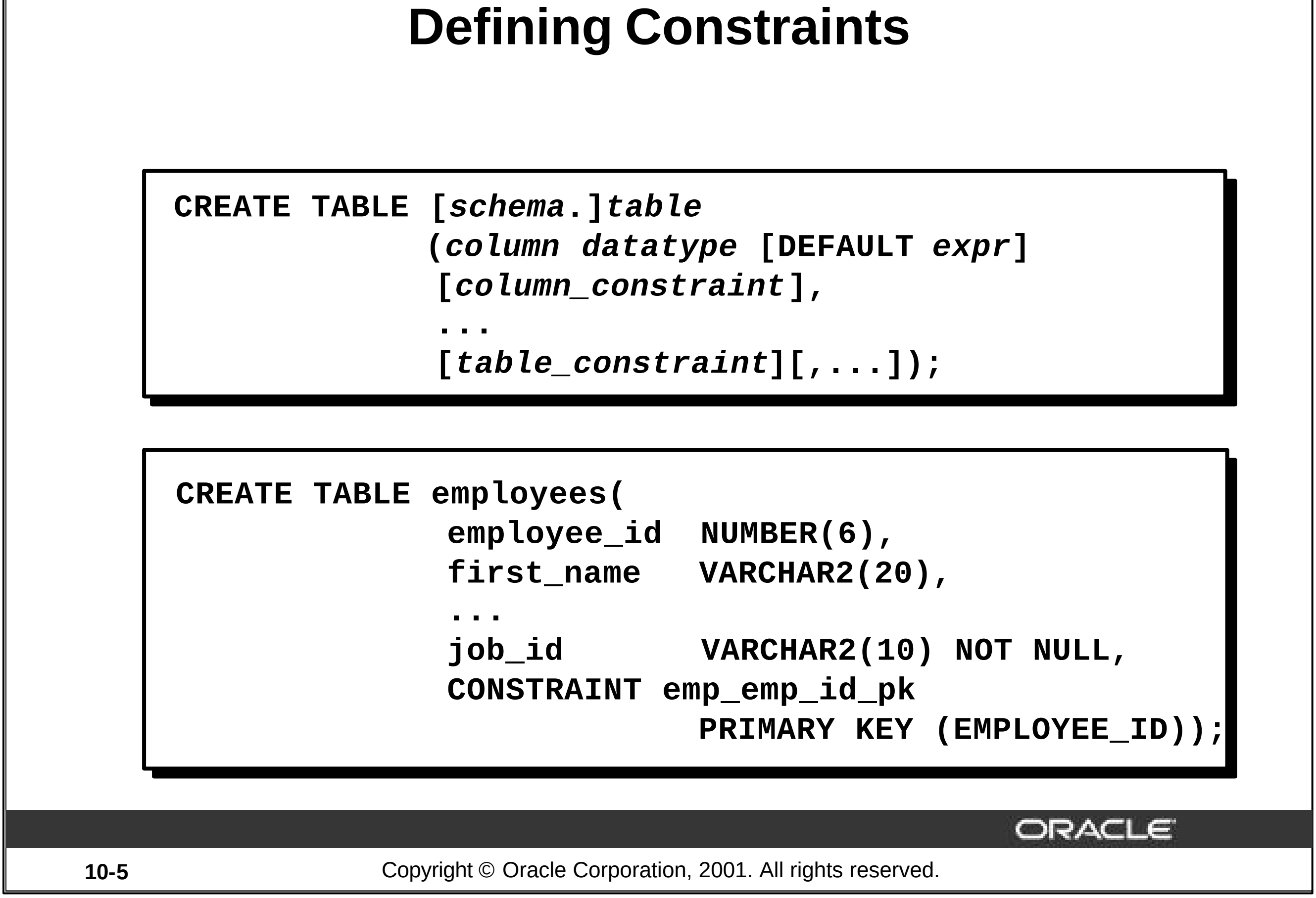
- Name a constraint or the Oracle server generates a name by using the `SYS_C`*n* format.
- Create a constraint either:
  - At the same time as the table is created, or
  - After the table has been created
- Define a constraint at the column or table level.
- View a constraint in the data dictionary.

Constraint Guidelines

All constraints are stored in the data dictionary. Constraints are easy to reference if you give them a meaningful name. Constraint names must follow the standard object-naming rules. If you do not name your constraint, the Oracle server generates a name with the format `SYS_C`*n*, where *n* is an integer so that the constraint name is unique.

Constraints can be defined at the time of table creation or after the table has been created.

You can view the constraints defined for a specific table by looking at the `USER_CONSTRAINTS` data dictionary table.



Defining Constraints

```
CREATE TABLE [schema.]table
             (column datatype [DEFAULT expr]
              [column_constraint],
              ...
              [table_constraint][,...]);
```

```
CREATE TABLE employees(
              employee_id  NUMBER(6),
              first_name   VARCHAR2(20),
              ...
              job_id       VARCHAR2(10) NOT NULL,
              CONSTRAINT emp_emp_id_pk
                           PRIMARY KEY (EMPLOYEE_ID));
```

Defining Constraints

The slide gives the syntax for defining constraints while creating a table.

In the syntax:

schema is the same as the owner's name

table is the name of the table

DEFAULT *expr* specifies a default value to use if a value is omitted in the
INSERT statement

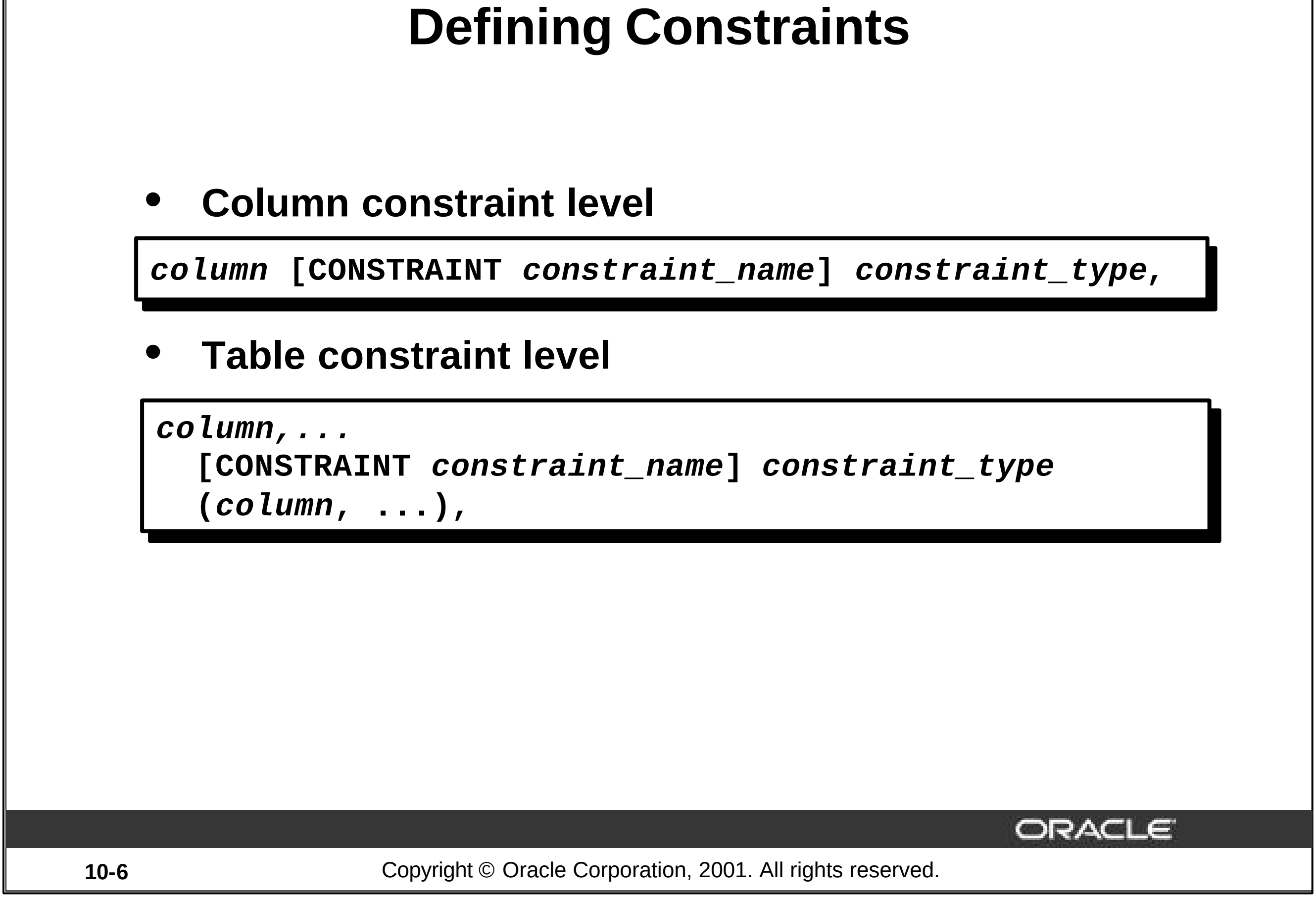
column is the name of the column

datatype is the column's data type and length

column_constraint is an integrity constraint as part of the column definition

table_constraint is an integrity constraint as part of the table definition

For more information, see *Oracle9i SQL Reference,* "CREATE TABLE."



Defining Constraints

- **Column constraint level**

```
column [CONSTRAINT constraint_name] constraint_type,
```

- **Table constraint level**

```
column,...
  [CONSTRAINT constraint_name] constraint_type
  (column, ...),
```

Defining Constraints (continued)

Constraints are usually created at the same time as the table. Constraints can be added to a table after its creation and also temporarily disabled.

Constraints can be defined at one of two levels.

Constraint Level	Description
Column	References a single column and is defined within a specification for the owning column; can define any type of integrity constraint
Table	References one or more columns and is defined separately from the definitions of the columns in the table; can define any constraints except `NOT NULL`

In the syntax:

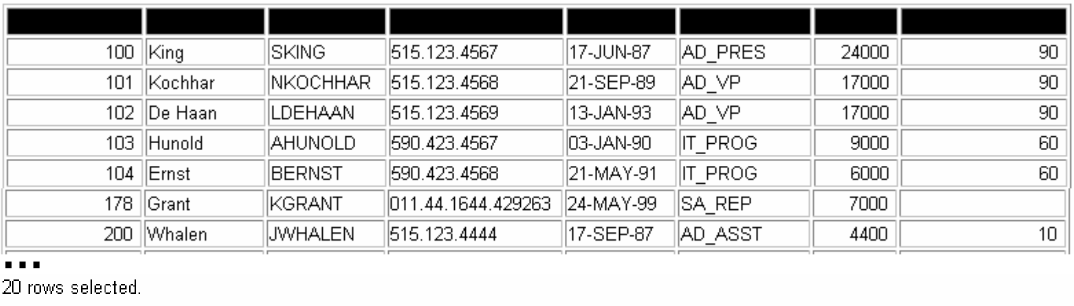
constraint_name	is the name of the constraint
constraint_type	is the type of the constraint

Instructor Note

Explain that the column level and the table level refer to location in the syntax.

The NOT NULL Constraint

Ensures that null values are not permitted for the column:



100	King	SKING	515.123.4567	17-JUN-87	AD_PRES	24000	90
101	Kochhar	NKOCHHAR	515.123.4568	21-SEP-89	AD_VP	17000	90
102	De Haan	LDEHAAN	515.123.4569	13-JAN-93	AD_VP	17000	90
103	Hunold	AHUNOLD	590.423.4567	03-JAN-90	IT_PROG	9000	60
104	Ernst	BERNST	590.423.4568	21-MAY-91	IT_PROG	6000	60
178	Grant	KGRANT	011.44.1644.429263	24-MAY-99	SA_REP	7000	
200	Whalen	JWHALEN	515.123.4444	17-SEP-87	AD_ASST	4400	10

...

20 rows selected.

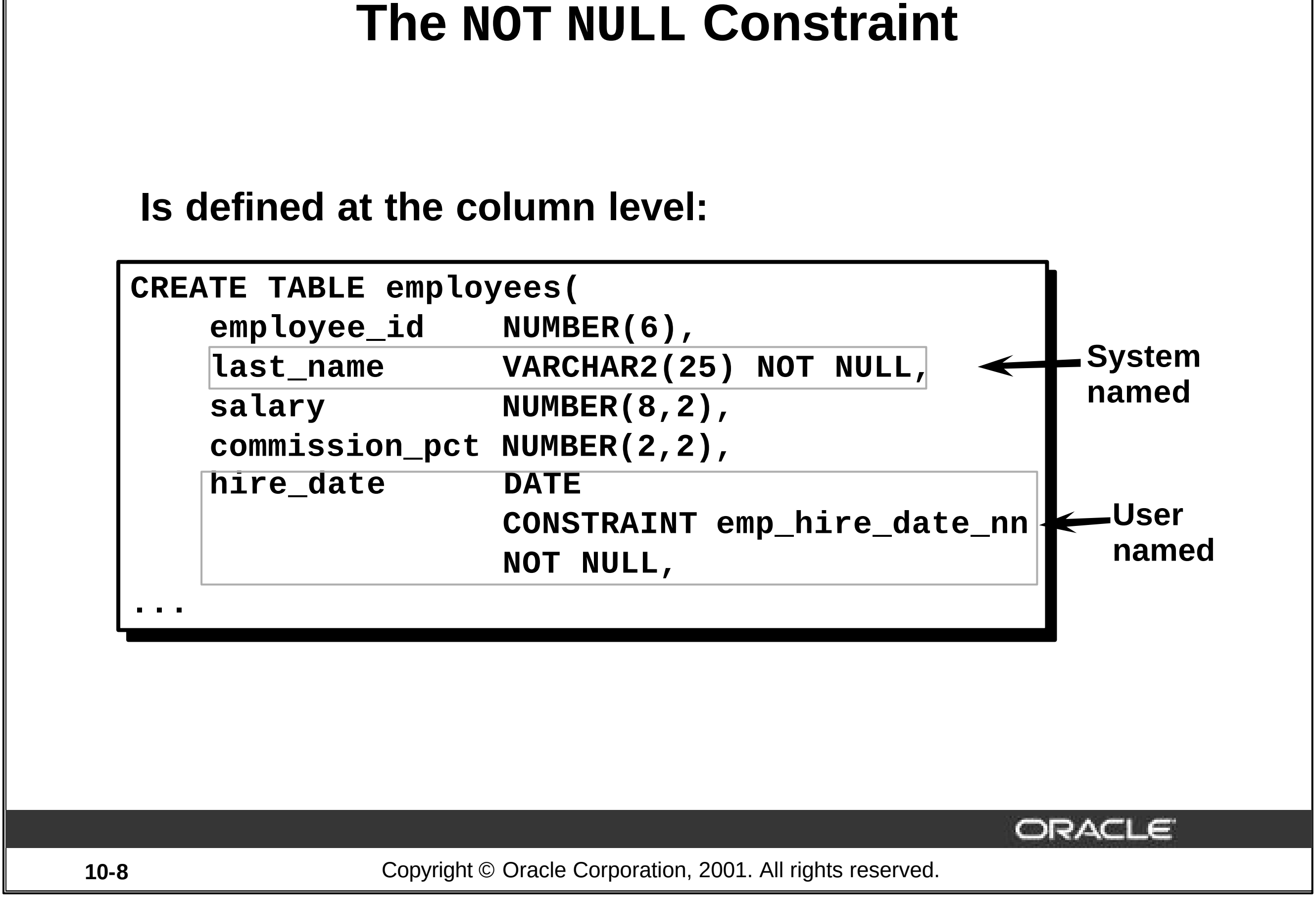
NOT NULL constraint (No row can contain a null value for this column.)

NOT NULL constraint

Absence of NOT NULL constraint (Any row can contain null for this column.)

The NOT NULL Constraint

The NOT NULL constraint ensures that the column contains no null values. Columns without the NOT NULL constraint can contain null values by default.



The NOT NULL Constraint

Is defined at the column level:

```
CREATE TABLE employees(
    employee_id    NUMBER(6),
    last_name      VARCHAR2(25) NOT NULL,
    salary         NUMBER(8,2),
    commission_pct NUMBER(2,2),
    hire_date      DATE
                   CONSTRAINT emp_hire_date_nn
                   NOT NULL,
...
```

System named
User named

The `NOT NULL` Constraint (continued)

The `NOT NULL` constraint can be specified only at the column level, not at the table level.

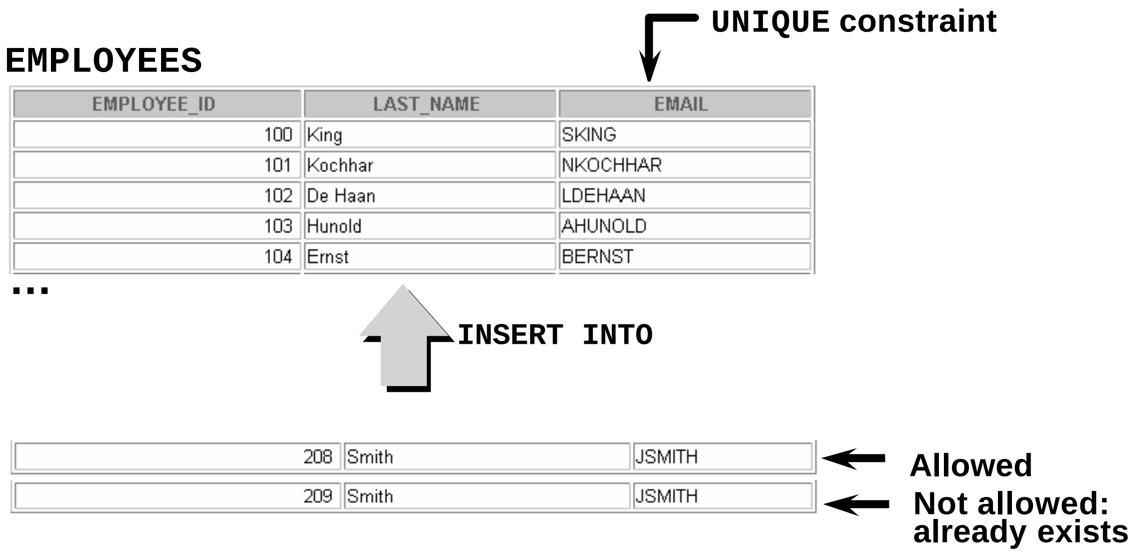
The slide example applies the `NOT NULL` constraint to the `LAST_NAME` and `HIRE_DATE` columns of the `EMPLOYEES` table. Because these constraints are unnamed, the Oracle server creates names for them.

You can specify the name of the constraint when you specify the constraint:

```
... last_name VARCHAR2(25)
      CONSTRAINT emp_last_name_nn NOT NULL...
```

Note: The constraint examples described in this lesson may not be present in the sample tables provided with the course. If desired, these constraints can be added to the tables.

The UNIQUE Constraint



UNIQUE constraint

EMPLOYEES

EMPLOYEE_ID	LAST_NAME	EMAIL
100	King	SKING
101	Kochhar	NKOCHHAR
102	De Haan	LDEHAAN
103	Hunold	AHUNOLD
104	Ernst	BERNST

...

INSERT INTO

208	Smith	JSMITH	Allowed
209	Smith	JSMITH	Not allowed: already exists

The UNIQUE Constraint

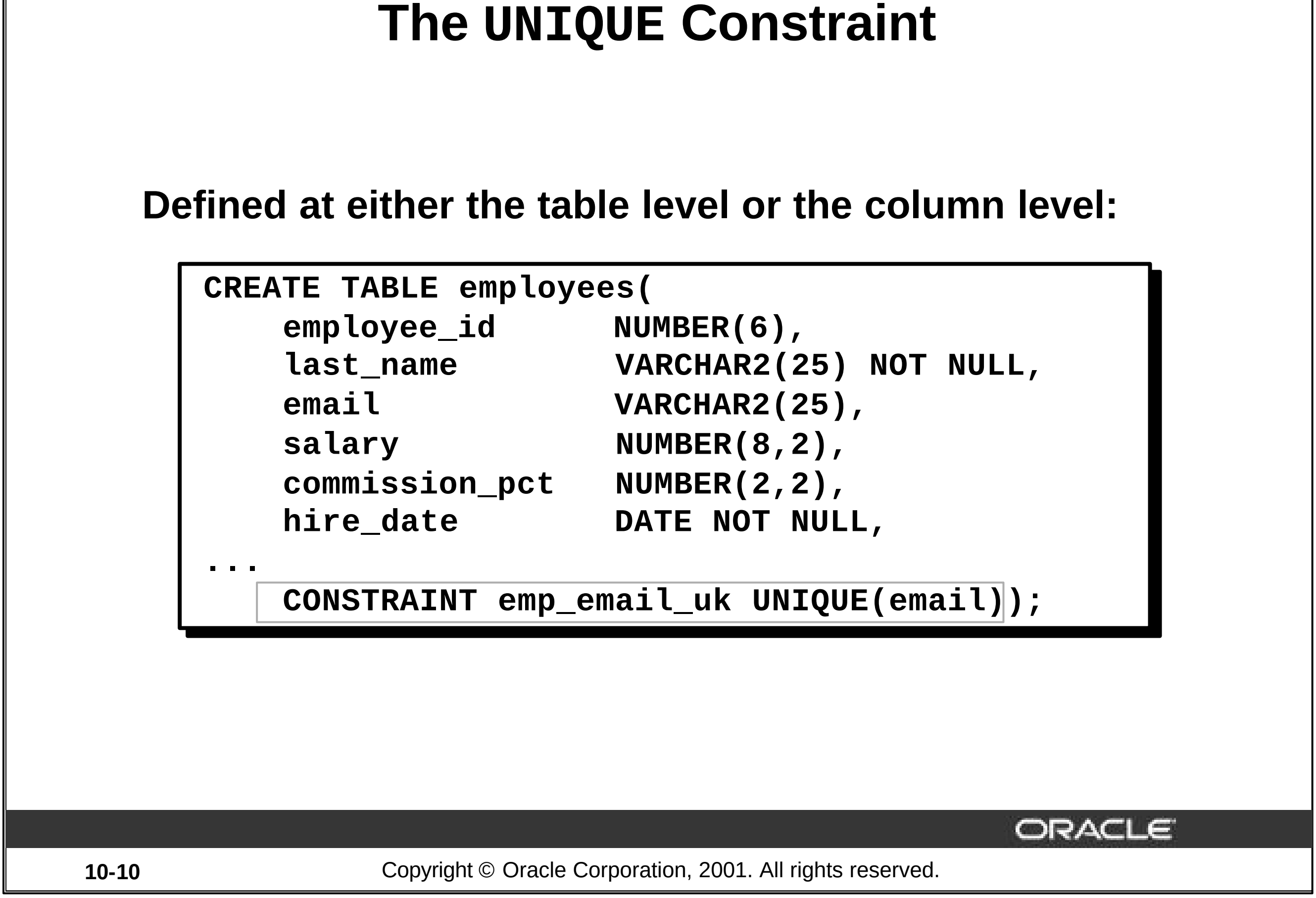
A UNIQUE key integrity constraint requires that every value in a column or set of columns (key) be unique—that is, no two rows of a table can have duplicate values in a specified column or set of columns. The column (or set of columns) included in the definition of the UNIQUE key constraint is called the *unique key*. If the UNIQUE constraint comprises more than one column, that group of columns is called a *composite unique key*.

UNIQUE constraints allow the input of nulls unless you also define NOT NULL constraints for the same columns. In fact, any number of rows can include nulls for columns without NOT NULL constraints because nulls are not considered equal to anything. A null in a column (or in all columns of a composite UNIQUE key) always satisfies a UNIQUE constraint.

Note: Because of the search mechanism for UNIQUE constraints on more than one column, you cannot have identical values in the non-null columns of a partially null composite UNIQUE key constraint.

Instructor Note

Explain to students that since the JSMITH e-mail ID already exists after the first insertion, the second entry is not allowed.



The UNIQUE Constraint

Defined at either the table level or the column level:

```
CREATE TABLE employees(
    employee_id      NUMBER(6),
    last_name        VARCHAR2(25) NOT NULL,
    email            VARCHAR2(25),
    salary           NUMBER(8,2),
    commission_pct   NUMBER(2,2),
    hire_date        DATE NOT NULL,
...
    CONSTRAINT emp_email_uk UNIQUE(email));
```

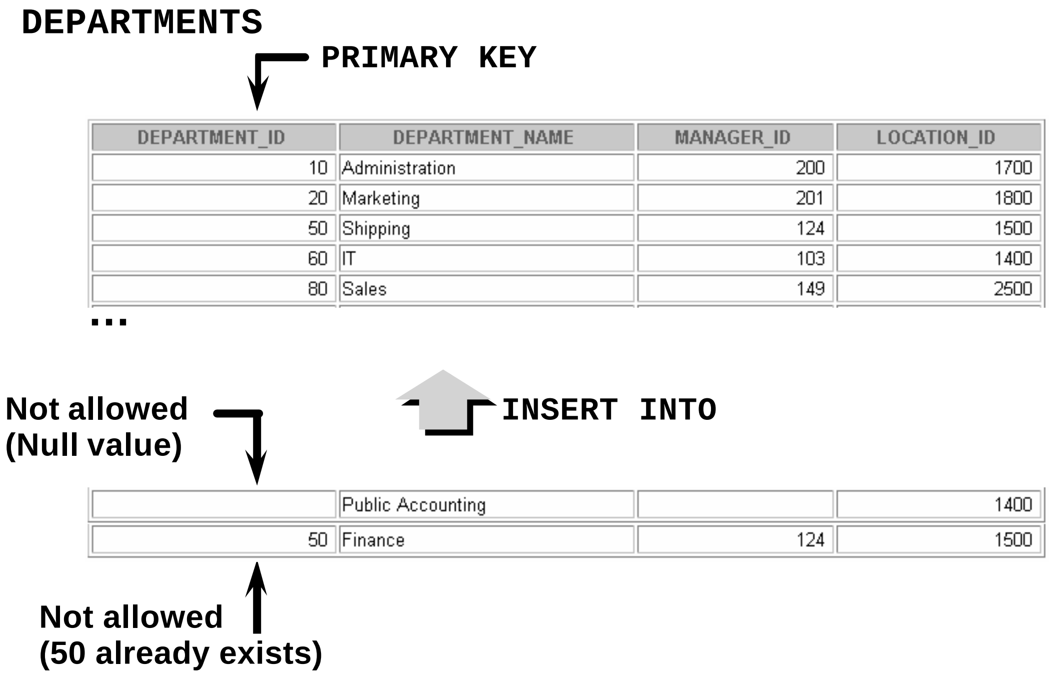
The UNIQUE Constraint (continued)

UNIQUE constraints can be defined at the column or table level. A composite unique key is created by using the table level definition.

The example on the slide applies the UNIQUE constraint to the EMAIL column of the EMPLOYEES table. The name of the constraint is EMP_EMAIL_UK..

Note: The Oracle server enforces the UNIQUE constraint by implicitly creating a unique index on the unique key column or columns.

The PRIMARY KEY Constraint



DEPARTMENTS

PRIMARY KEY

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500

...

INSERT INTO

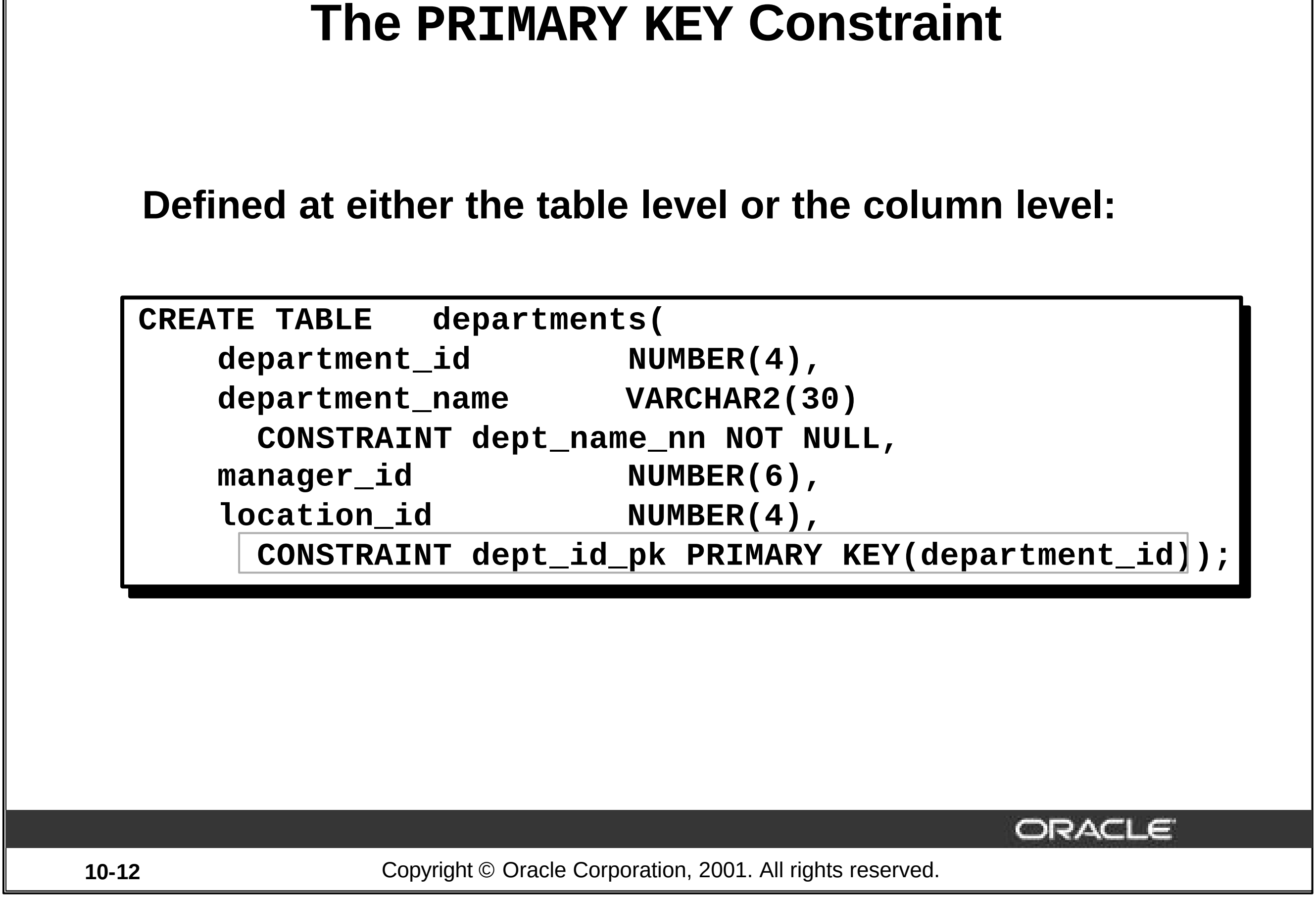
Not allowed
(Null value)

	Public Accounting		1400
50	Finance	124	1500

Not allowed
(50 already exists)

The PRIMARY KEY Constraint

A PRIMARY KEY constraint creates a primary key for the table. Only one primary key can be created for each table. The PRIMARY KEY constraint is a column or set of columns that uniquely identifies each row in a table. This constraint enforces uniqueness of the column or column combination and ensures that no column that is part of the primary key can contain a null value.



The PRIMARY KEY Constraint

Defined at either the table level or the column level:

```
CREATE TABLE   departments(
    department_id        NUMBER(4),
    department_name      VARCHAR2(30)
      CONSTRAINT dept_name_nn NOT NULL,
    manager_id           NUMBER(6),
    location_id          NUMBER(4),
      CONSTRAINT dept_id_pk PRIMARY KEY(department_id));
```

The `PRIMARY KEY` Constraint (continued)

`PRIMARY KEY` constraints can be defined at the column level or table level. A composite `PRIMARY KEY` is created by using the table-level definition.

A table can have only one `PRIMARY KEY` constraint but can have several `UNIQUE` constraints.

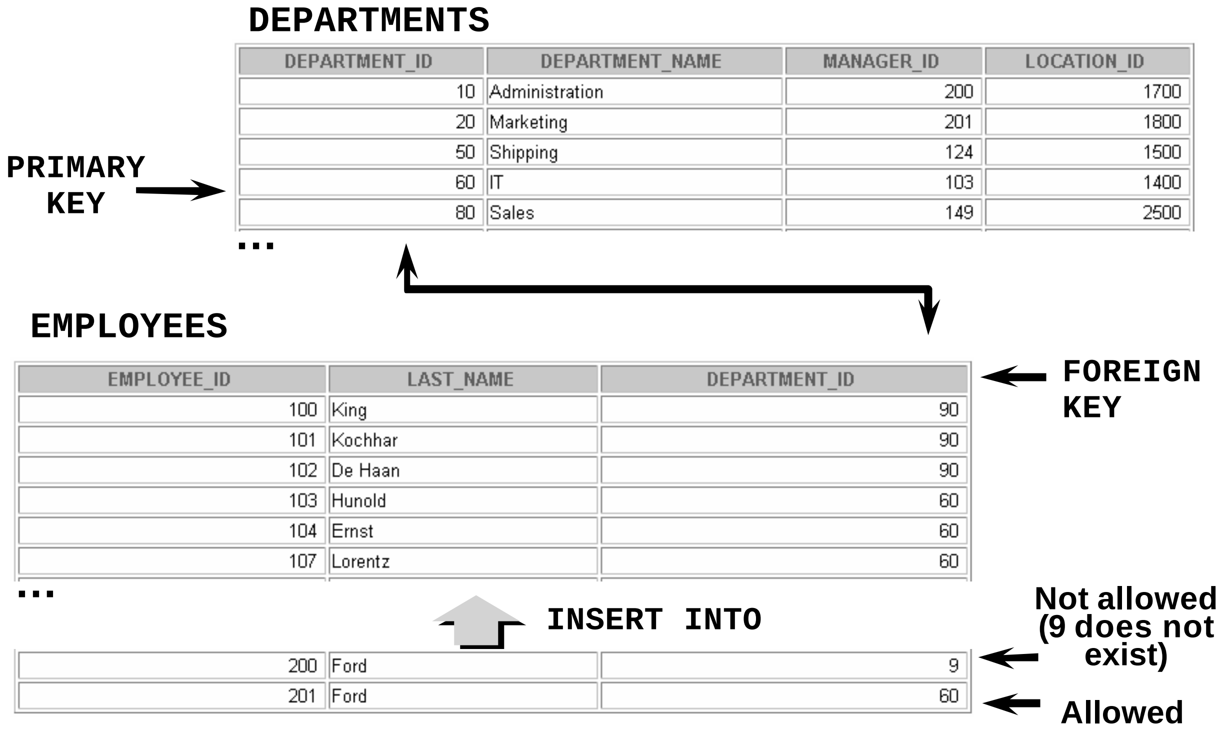
The example on the slide defines a `PRIMARY KEY` constraint on the `DEPARTMENT_ID` column of the `DEPARTMENTS` table. The name of the constraint is `DEPT_ID_PK`.

Note: A `UNIQUE` index is automatically created for a `PRIMARY KEY` column.

Instructor Note

The example shown will not work in your schema because the `DEPARTMENTS` table already exists. To demonstrate this code, modify the name of the table within the script and then run the script.

The FOREIGN KEY Constraint



DEPARTMENTS

DEPARTMENT_ID	DEPARTMENT_NAME	MANAGER_ID	LOCATION_ID
10	Administration	200	1700
20	Marketing	201	1800
50	Shipping	124	1500
60	IT	103	1400
80	Sales	149	2500

...

PRIMARY KEY

EMPLOYEES

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
100	King	90
101	Kochhar	90
102	De Haan	90
103	Hunold	60
104	Ernst	60
107	Lorentz	60

...

FOREIGN KEY

INSERT INTO

200	Ford	9
201	Ford	60

Not allowed (9 does not exist)

Allowed

The FOREIGN KEY Constraint

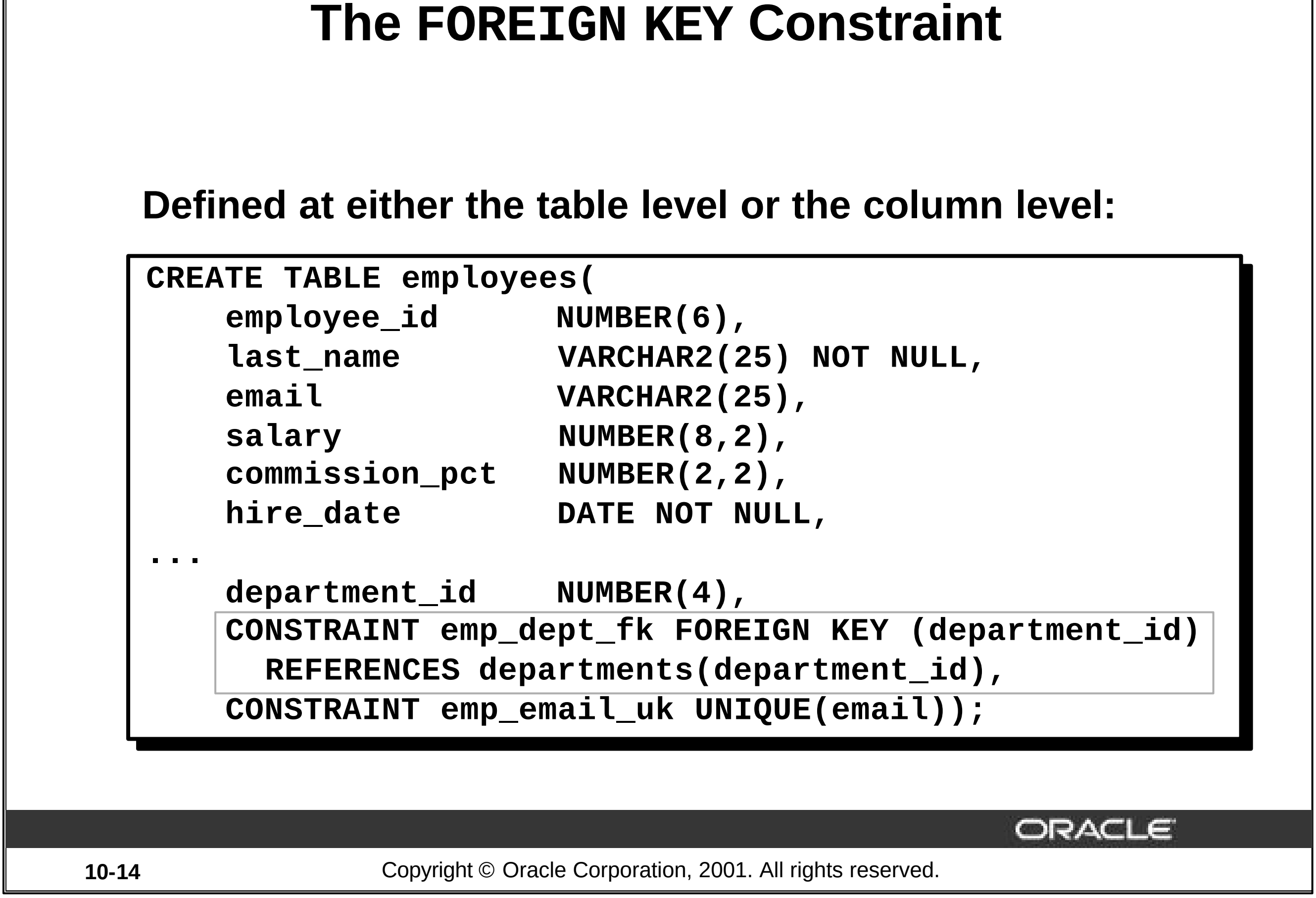
The FOREIGN KEY, or referential integrity constraint, designates a column or combination of columns as a foreign key and establishes a relationship between a primary key or a unique key in the same table or a different table. In the example on the slide, DEPARTMENT_ID has been defined as the foreign key in the EMPLOYEES table (dependent or child table); it references the DEPARTMENT_ID column of the DEPARTMENTS table (the referenced or parent table).

A foreign key value must match an existing value in the parent table or be NULL.

Foreign keys are based on data values and are purely logical, not physical, pointers.

Instructor Note

Explain to students that you cannot create a foreign key without existing primary key values.



The FOREIGN KEY Constraint

Defined at either the table level or the column level:

```
CREATE TABLE employees(
    employee_id      NUMBER(6),
    last_name        VARCHAR2(25) NOT NULL,
    email            VARCHAR2(25),
    salary           NUMBER(8,2),
    commission_pct   NUMBER(2,2),
    hire_date        DATE NOT NULL,
...
    department_id    NUMBER(4),
    CONSTRAINT emp_dept_fk FOREIGN KEY (department_id)
      REFERENCES departments(department_id),
    CONSTRAINT emp_email_uk UNIQUE(email));
```

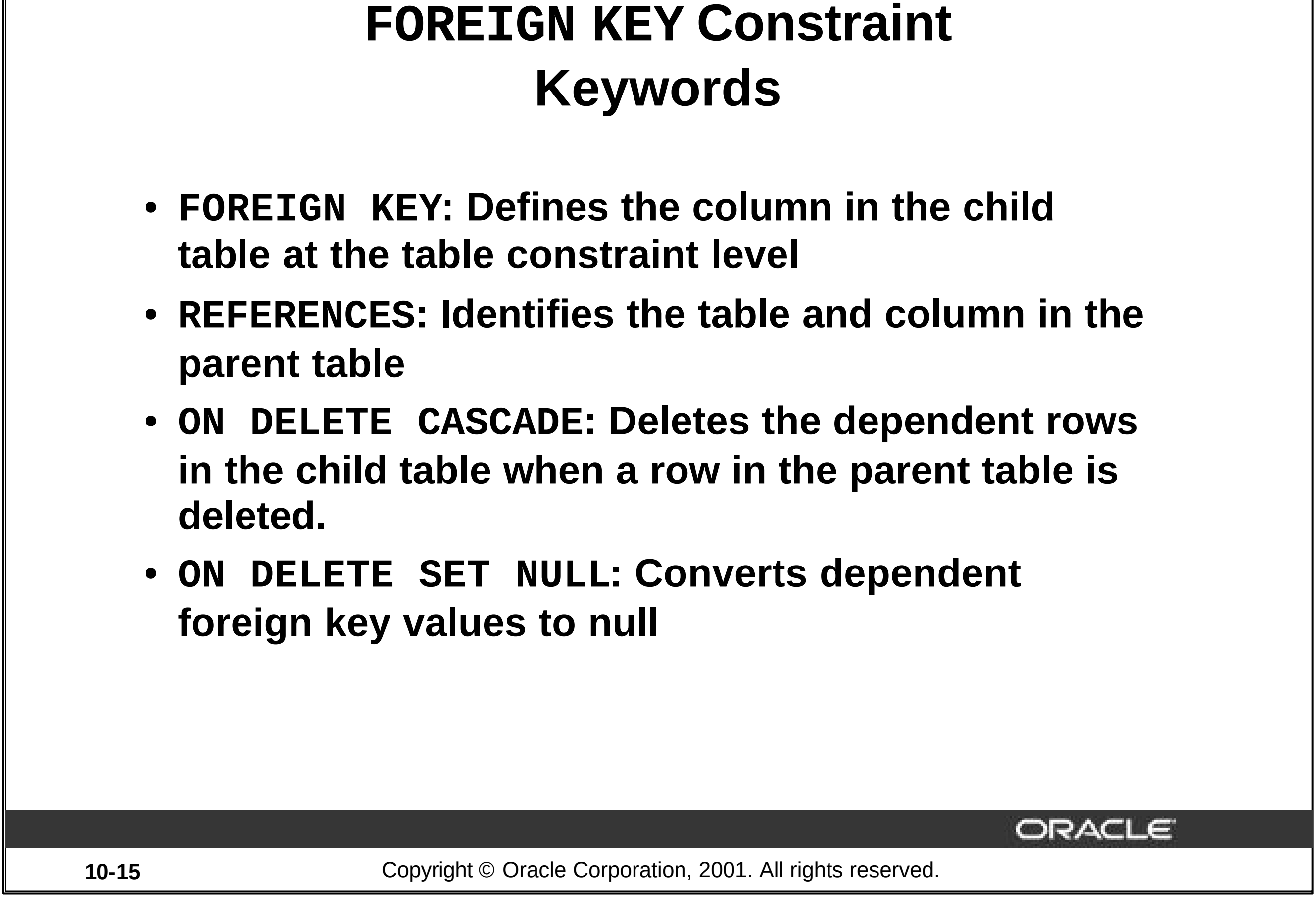
The FOREIGN KEY Constraint (continued)

FOREIGN KEY constraints can be defined at the column or table constraint level. A composite foreign key must be created by using the table-level definition.

The example on the slide defines a FOREIGN KEY constraint on the DEPARTMENT_ID column of the EMPLOYEES table, using table-level syntax. The name of the constraint is EMP_DEPTID_FK.

The foreign key can also be defined at the column level, provided the constraint is based on a single column. The syntax differs in that the keywords FOREIGN KEY do not appear. For example:

```
CREATE TABLE employees
(...
department_id NUMBER(4) CONSTRAINT emp_deptid_fk
    REFERENCES departments(department_id),
...
)
```



FOREIGN KEY Constraint Keywords

- `FOREIGN KEY`: Defines the column in the child table at the table constraint level
- `REFERENCES`: Identifies the table and column in the parent table
- `ON DELETE CASCADE`: Deletes the dependent rows in the child table when a row in the parent table is deleted.
- `ON DELETE SET NULL`: Converts dependent foreign key values to null

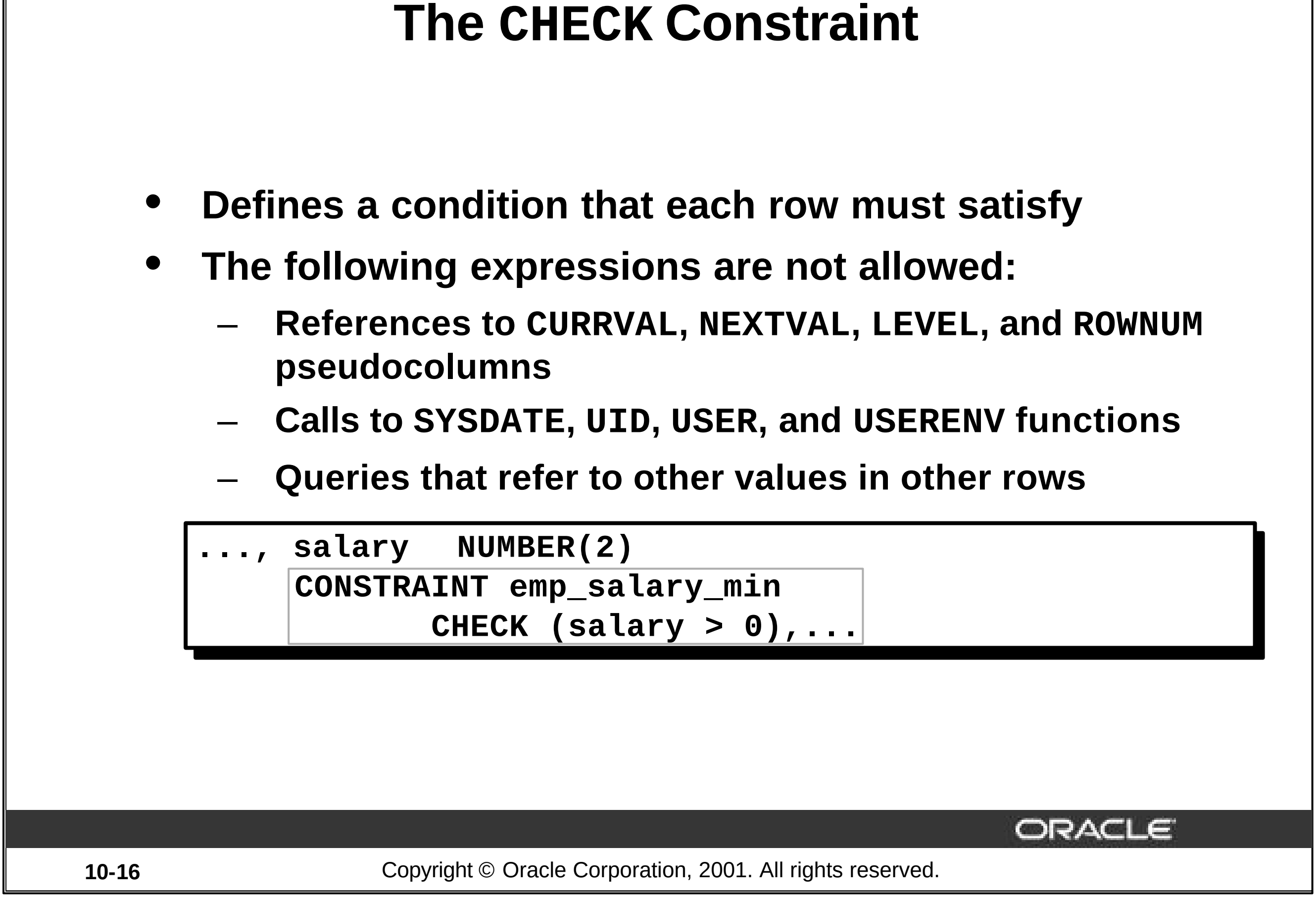
The `FOREIGN KEY` Constraint (continued)

The foreign key is defined in the child table, and the table containing the referenced column is the parent table. The foreign key is defined using a combination of the following keywords:

- `FOREIGN KEY` is used to define the column in the child table at the table constraint level.
- `REFERENCES` identifies the table and column in the parent table.
- `ON DELETE CASCADE` indicates that when the row in the parent table is deleted, the dependent rows in the child table will also be deleted.
- `ON DELETE SET NULL` converts foreign key values to null when the parent value is removed.

The default behavior is called the restrict rule, which disallows the update or deletion of referenced data.

Without the `ON DELETE CASCADE` or the `ON DELETE SET NULL` options, the row in the parent table cannot be deleted if it is referenced in the child table.



The CHECK Constraint

- Defines a condition that each row must satisfy
- The following expressions are not allowed:
  – References to CURRVAL, NEXTVAL, LEVEL, and ROWNUM pseudocolumns
  – Calls to SYSDATE, UID, USER, and USERENV functions
  – Queries that refer to other values in other rows

```
..., salary   NUMBER(2)
     CONSTRAINT emp_salary_min
            CHECK (salary > 0),...
```

The CHECK Constraint

The CHECK constraint defines a condition that each row must satisfy. The condition can use the same constructs as query conditions, with the following exceptions:

- References to the CURRVAL, NEXTVAL, LEVEL, and ROWNUM pseudocolumns
- Calls to SYSDATE, UID, USER, and USERENV functions
- Queries that refer to other values in other rows

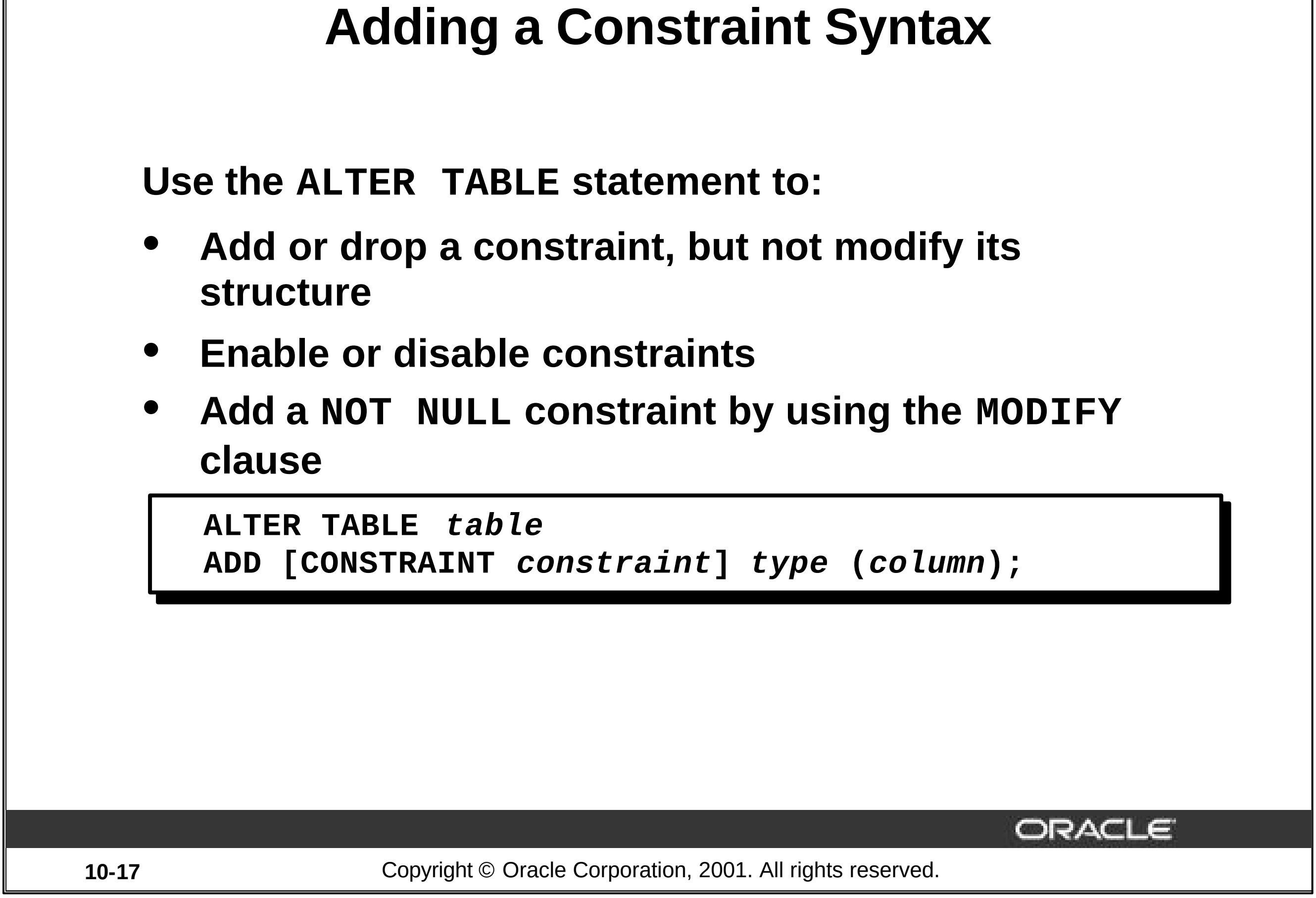
A single column can have multiple CHECK constraints which refer to the column in its definition. There is no limit to the number of CHECK constraints which you can define on a column.

CHECK constraints can be defined at the column level or table level.

```
CREATE TABLE employees
     (...
      salary NUMBER(8,2) CONSTRAINT emp_salary_min
                         CHECK (salary > 0),
     ...
```

Instructor Note

Explain what pseudocolumns are. Pseudocolumns are not actual columns in a table but they behave like columns. For example, you can select values from a pseudocolumn. However, you cannot insert into, update, or delete from a pseudocolumn. Pseudocolumns can be used in SQL statements.



Adding a Constraint Syntax

Use the `ALTER TABLE` statement to:

- Add or drop a constraint, but not modify its structure
- Enable or disable constraints
- Add a `NOT NULL` constraint by using the `MODIFY` clause

```
ALTER TABLE table
ADD [CONSTRAINT constraint] type (column);
```

Adding a Constraint

You can add a constraint for existing tables by using the `ALTER TABLE` statement with the `ADD` clause.

In the syntax:

table	is the name of the table
constraint	is the name of the constraint
type	is the constraint type
column	is the name of the column affected by the constraint

The constraint name syntax is optional, although recommended. If you do not name your constraints, the system will generate constraint names.

Guidelines

- You can add, drop, enable, or disable a constraint, but you cannot modify its structure.
- You can add a `NOT NULL` constraint to an existing column by using the `MODIFY` clause of the `ALTER TABLE` statement.

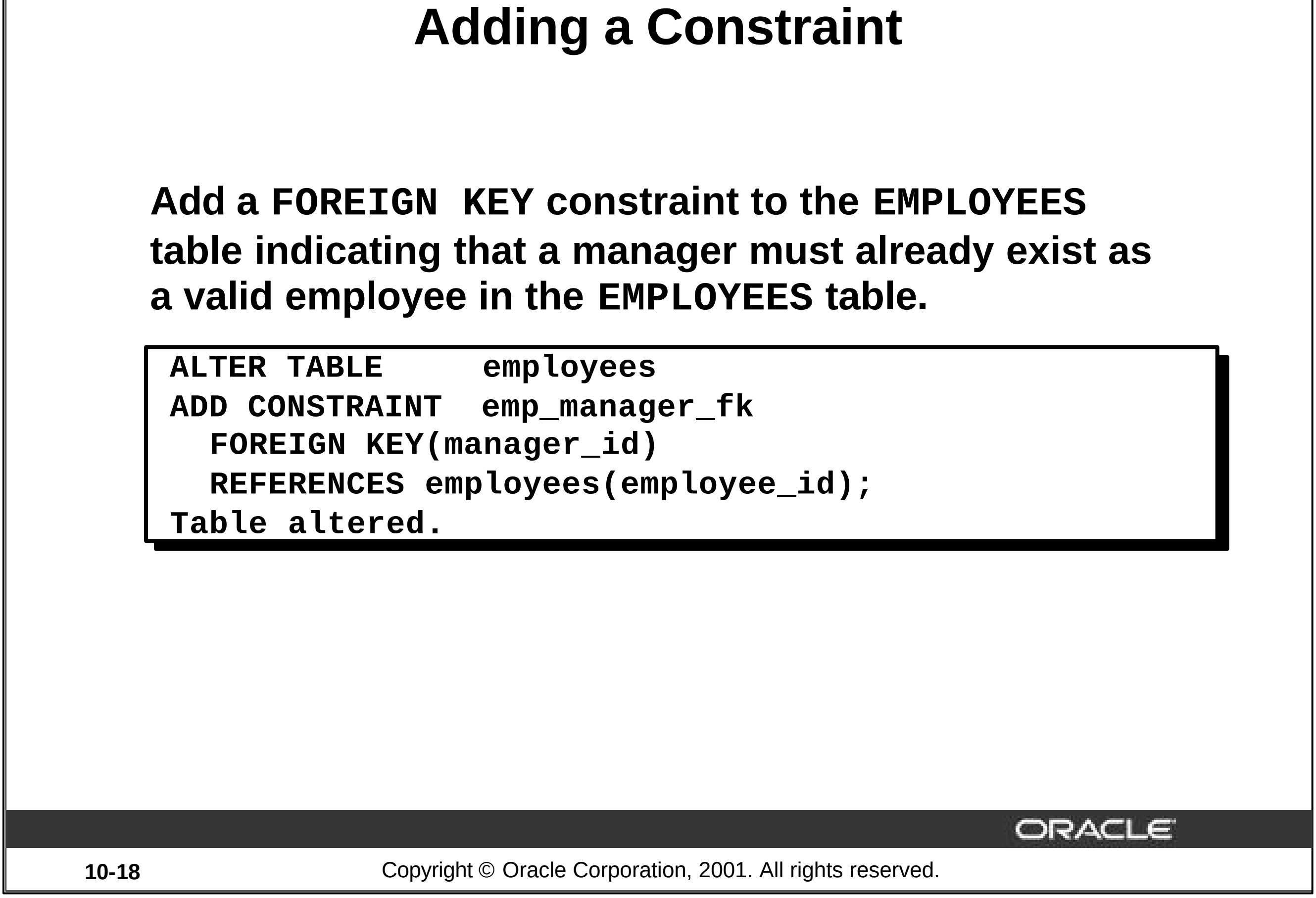
Note: You can define a `NOT NULL` column only if the table is empty or if the column has a value for every row.

Instructor Note

You can defer checking constraints for validity until the end of the transaction.

A constraint is *deferred* if the system checks that it is satisfied only on commit. If a deferred constraint is violated, then committing causes the transaction to roll back.

A constraint is *immediate* if it is checked at the end of each statement. If it is violated, the statement is rolled back immediately.



Adding a Constraint

Add a FOREIGN KEY constraint to the EMPLOYEES table indicating that a manager must already exist as a valid employee in the EMPLOYEES table.

```
ALTER TABLE     employees
ADD CONSTRAINT  emp_manager_fk
  FOREIGN KEY(manager_id)
  REFERENCES employees(employee_id);
Table altered.
```

Adding a Constraint (continued)

The example on the slide creates a `FOREIGN KEY` constraint on the `EMPLOYEES` table. The constraint ensures that a manager exists as a valid employee in the `EMPLOYEES` table.

Instructor Note

To add a `NOT NULL` constraint, use the `ALTER TABLE MODIFY` syntax:

```
ALTER TABLE employees
MODIFY (salary CONSTRAINT emp_salary_nn NOT NULL);
```

Dropping a Constraint

- **Remove the manager constraint from the `EMPLOYEES` table.**

```
ALTER TABLE      employees
DROP CONSTRAINT  emp_manager_fk;
Table altered.
```

- **Remove the `PRIMARY KEY` constraint on the `DEPARTMENTS` table and drop the associated `FOREIGN KEY` constraint on the `EMPLOYEES.DEPARTMENT_ID` column.**

```
ALTER TABLE   departments
DROP PRIMARY KEY CASCADE;
Table altered.
```

Dropping a Constraint

To drop a constraint, you can identify the constraint name from the `USER_CONSTRAINTS` and `USER_CONS_COLUMNS` data dictionary views. Then use the `ALTER TABLE` statement with the `DROP` clause. The `CASCADE` option of the `DROP` clause causes any dependent constraints also to be dropped.

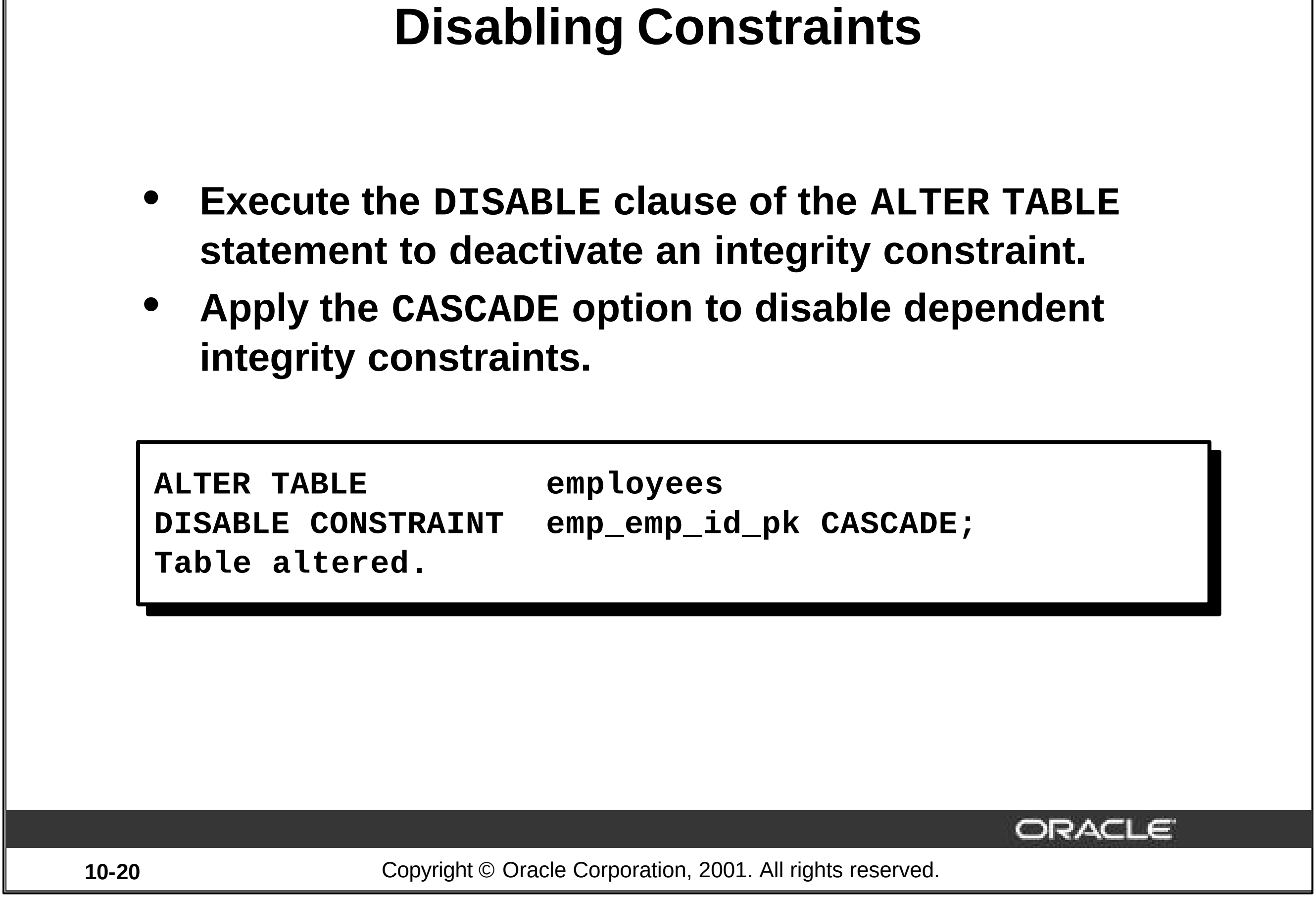
Syntax

```
ALTER TABLE  table
DROP  PRIMARY KEY | UNIQUE (column) |
      CONSTRAINT   constraint  [CASCADE];
```

In the syntax:

table	is the name of the table
column	is the name of the column affected by the constraint
constraint	is the name of the constraint

When you drop an integrity constraint, that constraint is no longer enforced by the Oracle server and is no longer available in the data dictionary.



Disabling Constraints

- Execute the `DISABLE` clause of the `ALTER TABLE` statement to deactivate an integrity constraint.
- Apply the `CASCADE` option to disable dependent integrity constraints.

```
ALTER TABLE          employees
DISABLE CONSTRAINT   emp_emp_id_pk CASCADE;
Table altered.
```

Disabling a Constraint

You can disable a constraint without dropping it or re-creating it by using the ALTER TABLE statement with the DISABLE clause.

Syntax

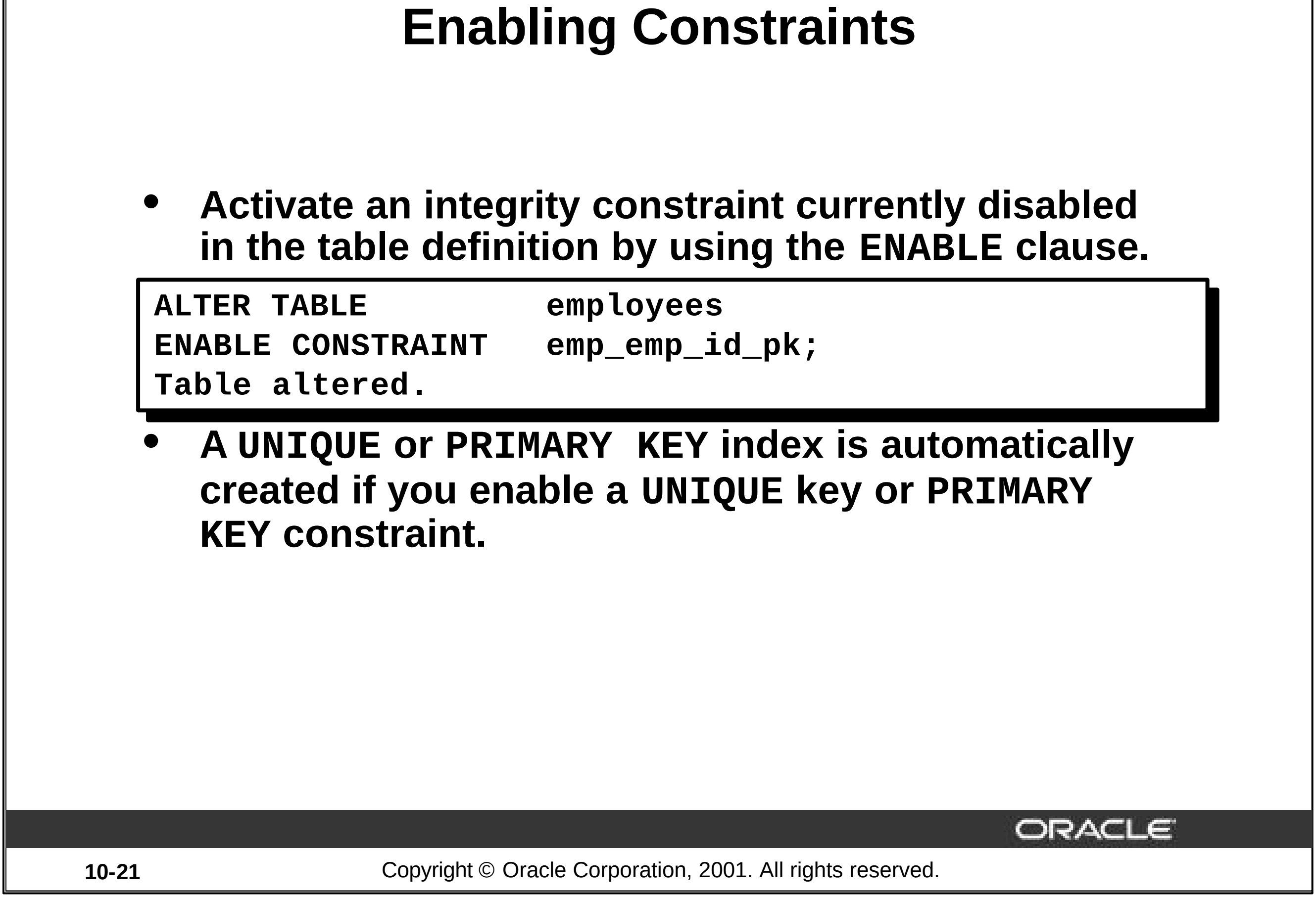
```
 ALTER   TABLE   table
  DISABLE CONSTRAINT constraint [CASCADE];
```

In the syntax:

table	is the name of the table
constraint	is the name of the constraint

Guidelines

- You can use the DISABLE clause in both the CREATE TABLE statement and the ALTER TABLE statement.
- The CASCADE clause disables dependent integrity constraints.
- Disabling a unique or primary key constraint removes the unique index.



Enabling Constraints

- **Activate an integrity constraint currently disabled in the table definition by using the ENABLE clause.**

```
ALTER TABLE         employees
ENABLE CONSTRAINT   emp_emp_id_pk;
Table altered.
```

- **A UNIQUE or PRIMARY KEY index is automatically created if you enable a UNIQUE key or PRIMARY KEY constraint.**

Enabling a Constraint

You can enable a constraint without dropping it or re-creating it by using the ALTER TABLE statement with the ENABLE clause.

Syntax

```
ALTER   TABLE      table
 ENABLE  CONSTRAINT constraint;
```

In the syntax:

table	is the name of the table
constraint	is the name of the constraint

Guidelines

- If you enable a constraint, that constraint applies to all the data in the table. All the data in the table must fit the constraint.
- If you enable a UNIQUE key or PRIMARY KEY constraint, a UNIQUE or PRIMARY KEY index is created automatically.
- You can use the ENABLE clause in both the CREATE TABLE statement and the ALTER TABLE statement.
- Enabling a primary key constraint that was disabled with the CASCADE option does not enable any foreign keys that are dependent upon the primary key.

Instructor Note

Please read the Instructor Note on page 10-29 for information on the VALIDATE and NOVALIDATE options.

Cascading Constraints

- **The `CASCADE CONSTRAINTS` clause is used along with the `DROP COLUMN` clause.**
- **The `CASCADE CONSTRAINTS` clause drops all referential integrity constraints that refer to the primary and unique keys defined on the dropped columns.**
- **The `CASCADE CONSTRAINTS` clause also drops all multicolumn constraints defined on the dropped columns.**

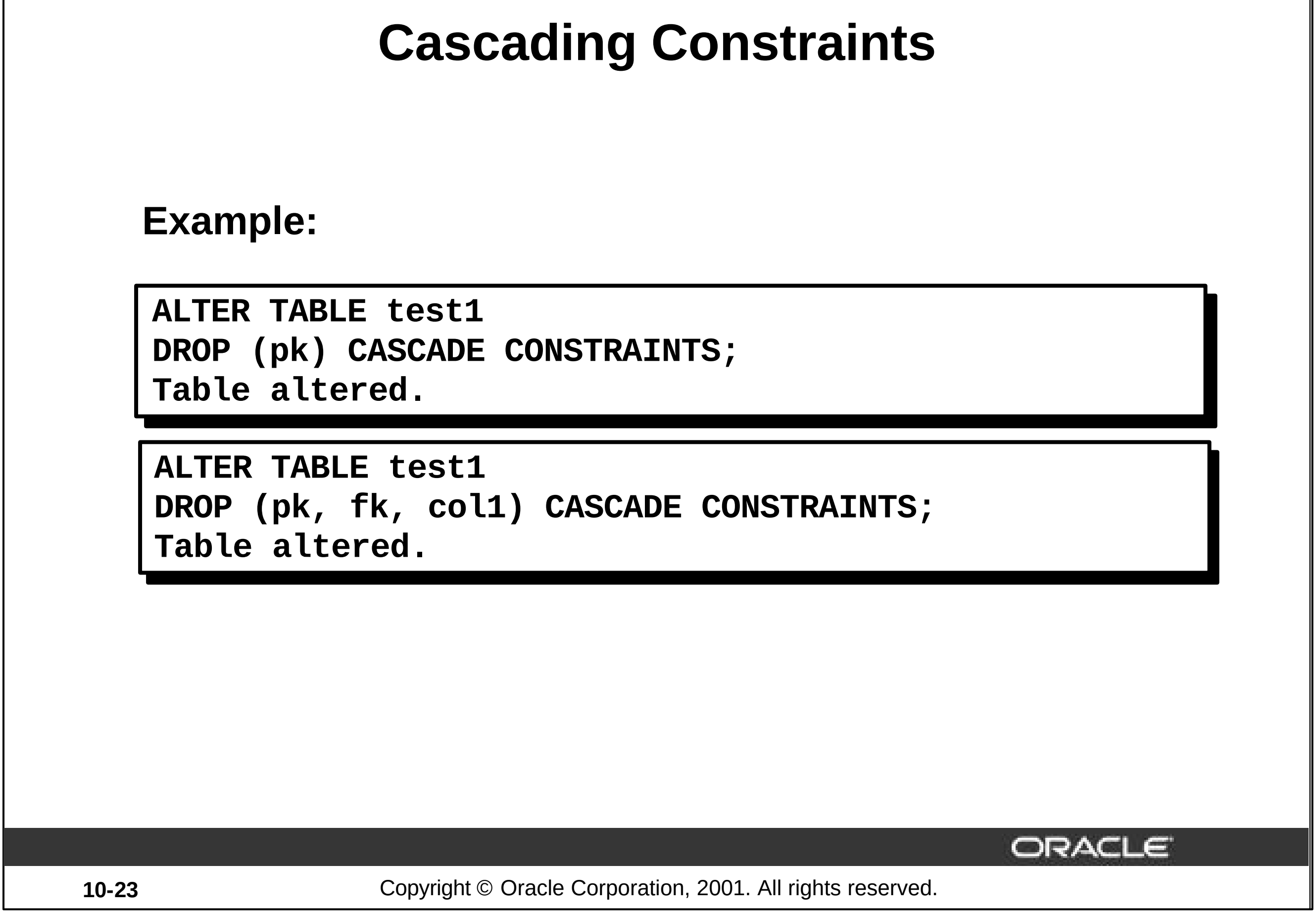
Cascading Constraints

This statement illustrates the usage of the `CASCADE CONSTRAINTS` clause. Assume table `TEST1` is created as follows:

```
CREATE TABLE test1 (
  pk NUMBER PRIMARY KEY,
  fk NUMBER,
  col1 NUMBER,
  col2 NUMBER,
  CONSTRAINT fk_constraint FOREIGN KEY (fk) REFERENCES test1,
  CONSTRAINT ck1 CHECK (pk > 0 and col1 > 0),
  CONSTRAINT ck2 CHECK (col2 > 0));
```

An error is returned for the following statements:

```
  ALTER TABLE test1 DROP (pk);   -- pk is a parent key
  ALTER TABLE test1 DROP (col1); -- col1 is referenced by multicolumn constraint
ck1
```



Cascading Constraints

Example:

```
ALTER TABLE test1
DROP (pk) CASCADE CONSTRAINTS;
Table altered.
```

```
ALTER TABLE test1
DROP (pk, fk, col1) CASCADE CONSTRAINTS;
Table altered.
```

Cascading Constraints (continued)

Submitting the following statement drops column PK, the primary key constraint, the fk_constraint foreign key constraint, and the check constraint, CK1:

```
ALTER TABLE test1 DROP (pk) CASCADE CONSTRAINTS;
```

If all columns referenced by the constraints defined on the dropped columns are also dropped, then CASCADE CONSTRAINTS is not required. For example, assuming that no other referential constraints from other tables refer to column PK, it is valid to submit the following statement without the CASCADE CONSTRAINTS clause:

```
ALTER TABLE test1 DROP (pk, fk, col1);
```

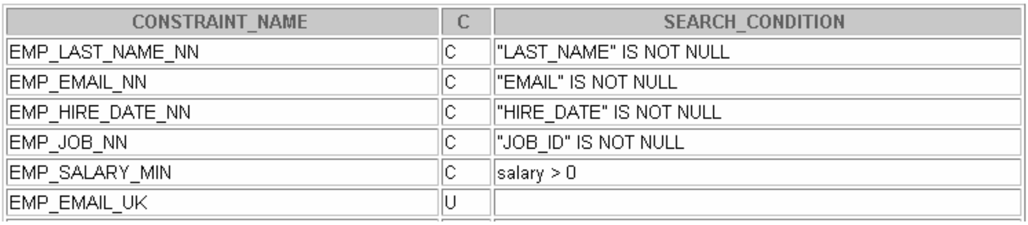
Instructor Note

Let the students know that if any constraint is referenced by columns from other tables or remaining columns in the target table, then you must specify CASCADE CONSTRAINTS. Otherwise, the statement aborts and the error ORA-12991: column is referenced in a multicolumn constraint is returned.

Viewing Constraints

Query the USER_CONSTRAINTS table to view all constraint definitions and names.

```
SELECT   constraint_name, constraint_type,
         search_condition
FROM     user_constraints
WHERE    table_name = 'EMPLOYEES';
```



CONSTRAINT_NAME	C	SEARCH_CONDITION
EMP_LAST_NAME_NN	C	"LAST_NAME" IS NOT NULL
EMP_EMAIL_NN	C	"EMAIL" IS NOT NULL
EMP_HIRE_DATE_NN	C	"HIRE_DATE" IS NOT NULL
EMP_JOB_NN	C	"JOB_ID" IS NOT NULL
EMP_SALARY_MIN	C	salary > 0
EMP_EMAIL_UK	U	

...

Viewing Constraints

After creating a table, you can confirm its existence by issuing a DESCRIBE command. The only constraint that you can verify is the NOT NULL constraint. To view all constraints on your table, query the USER_CONSTRAINTS table.

The example on the slide displays the constraints on the EMPLOYEES table.

Note: Constraints that are not named by the table owner receive the system-assigned constraint name. In constraint type, C stands for CHECK, P for PRIMARY KEY, R for referential integrity, and U for UNIQUE key. Notice that the NOT NULL constraint is really a CHECK constraint.

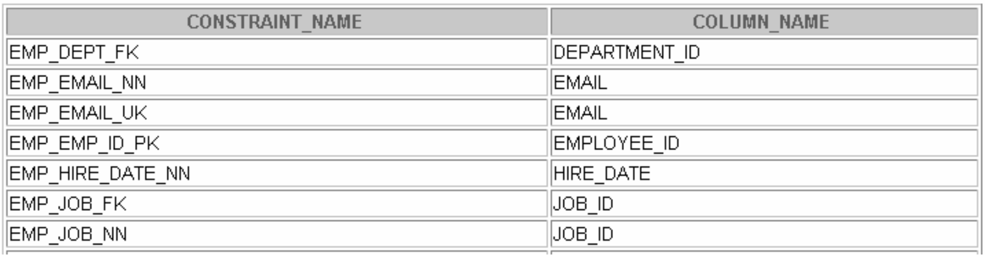
Instructor Note

Point out to students that the NOT NULL constraint is stored in the data dictionary as a CHECK constraint. Draw their attention to the constraint type, for the NOT NULL constraints in the slide. The entry in the constraint_type field is C (as in CHECK) for these constraints.

Viewing the Columns Associated with Constraints

View the columns associated with the constraint names in the `USER_CONS_COLUMNS` view.

```
SELECT   constraint_name, column_name
FROM     user_cons_columns
WHERE    table_name = 'EMPLOYEES';
```

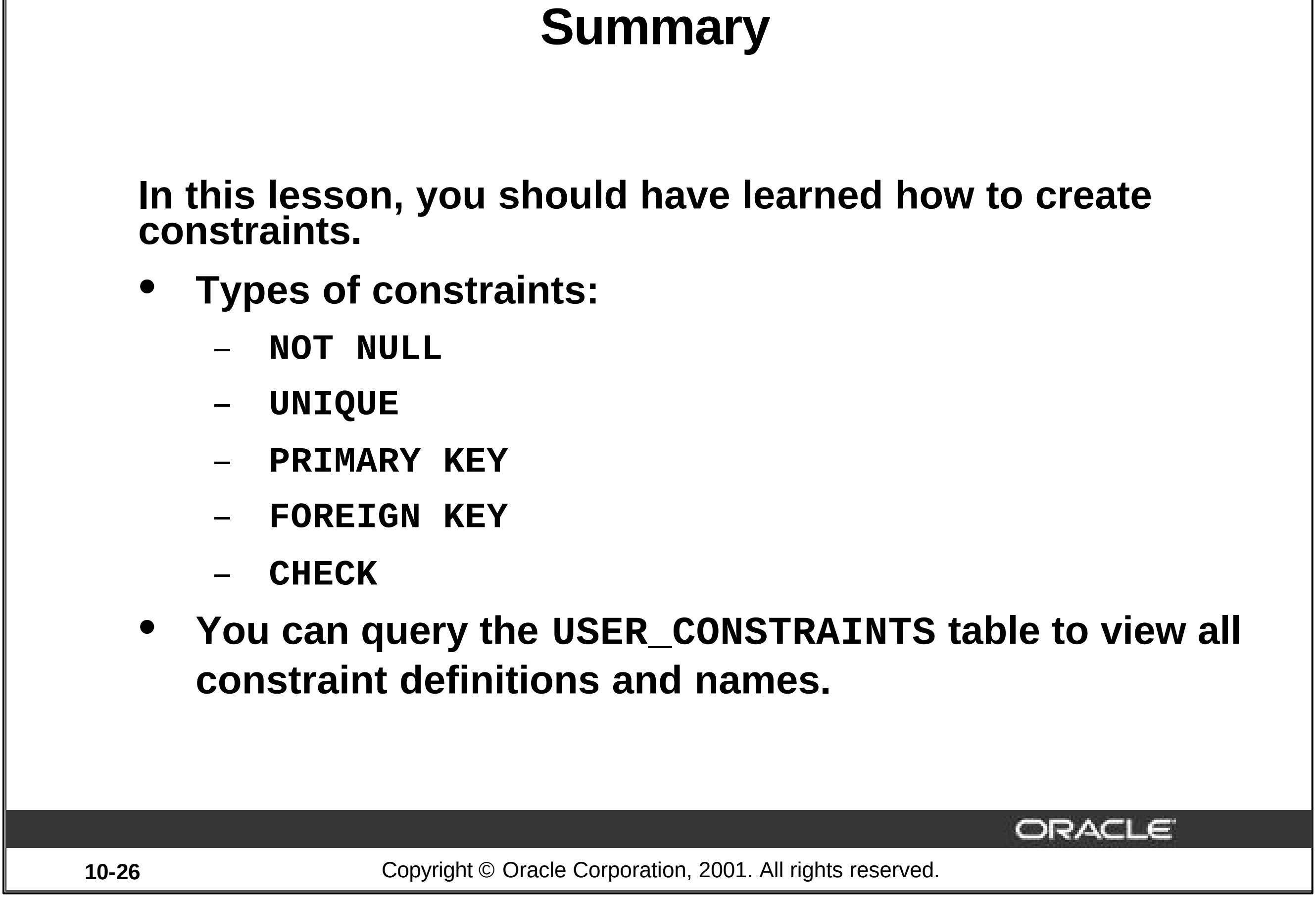


CONSTRAINT_NAME	COLUMN_NAME
EMP_DEPT_FK	DEPARTMENT_ID
EMP_EMAIL_NN	EMAIL
EMP_EMAIL_UK	EMAIL
EMP_EMP_ID_PK	EMPLOYEE_ID
EMP_HIRE_DATE_NN	HIRE_DATE
EMP_JOB_FK	JOB_ID
EMP_JOB_NN	JOB_ID

...

Viewing Constraints (continued)

You can view the names of the columns involved in constraints by querying the `USER_CONS_COLUMNS` data dictionary view. This view is especially useful for constraints that use system-assigned names.



Summary

In this lesson, you should have learned how to create constraints.

- **Types of constraints:**
  - **`NOT NULL`**
  - **`UNIQUE`**
  - **`PRIMARY KEY`**
  - **`FOREIGN KEY`**
  - **`CHECK`**
- **You can query the `USER_CONSTRAINTS` table to view all constraint definitions and names.**

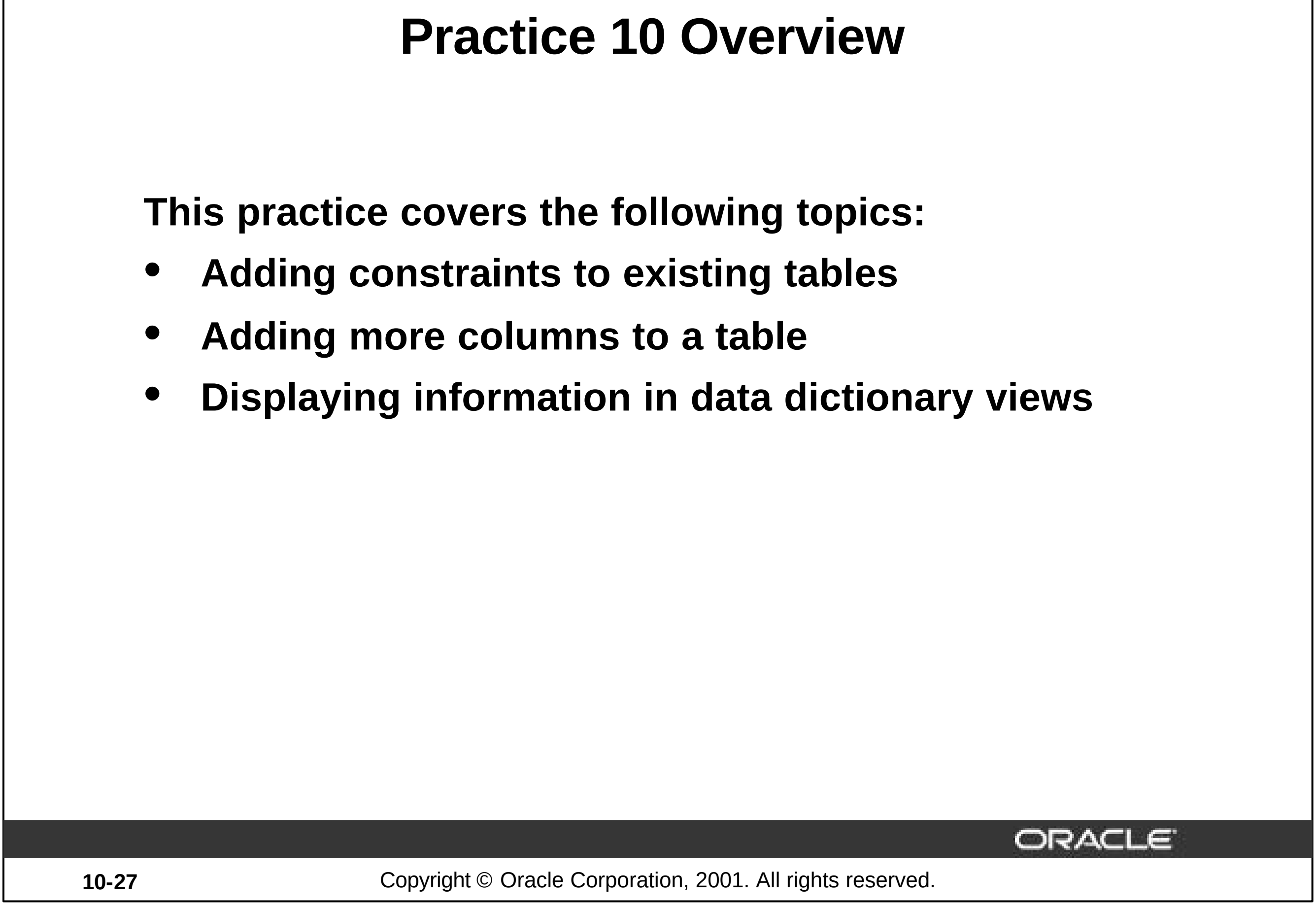
Summary

In this lesson, you should have learned how the Oracle server uses constraints to prevent invalid data entry into tables. You also learned how to implement the constraints in DDL statements.

The following constraint types are valid:

- `NOT NULL`
- `UNIQUE`
- `PRIMARY KEY`
- `FOREIGN KEY`
- `CHECK`

You can query the `USER_CONSTRAINTS` table to view all constraint definitions and names.



Practice 10 Overview

This practice covers the following topics:

- Adding constraints to existing tables
- Adding more columns to a table
- Displaying information in data dictionary views

Practice 10 Overview

In this practice, you will add constraints and more columns to a table using the statements covered in this lesson.

Note: It is recommended that you name the constraints that you define during the practices.

1. Add a table-level PRIMARY KEY constraint to the EMP table on the ID column. The constraint should be named at creation. Name the constraint `my_emp_id_pk`.

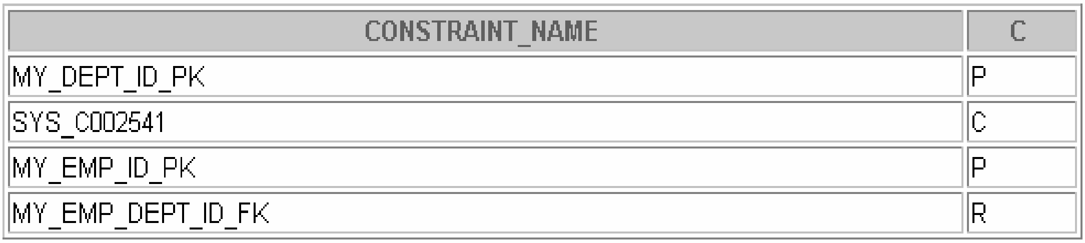
   Hint: The constraint is enabled as soon as the `ALTER TABLE` command executes successfully.

2. Create a `PRIMARY KEY` constraint to the `DEPT` table using the `ID` column. The constraint should be named at creation. Name the constraint `my_dept_id_pk`.

   Hint: The constraint is enabled as soon as the `ALTER TABLE` command executes successfully.

3. Add a column `DEPT_ID` to the `EMP` table. Add a foreign key reference on the `EMP` table that ensures that the employee is not assigned to a nonexistent department. Name the constraint `my_emp_dept_id_fk`.

4. Confirm that the constraints were added by querying the `USER_CONSTRAINTS` view. Note the types and names of the constraints. Save your statement text in a file called `lab10_4.sql`.



CONSTRAINT_NAME	C
MY_DEPT_ID_PK	P
SYS_C002541	C
MY_EMP_ID_PK	P
MY_EMP_DEPT_ID_FK	R

5. `EMP` and `DEPT` tables. Notice that the new tables and a new index were created.

If you have time, complete the following exercise:

6. Modify the `EMP` table. Add a `COMMISSION` column of `NUMBER` data type, precision 2, scale 2. Add a constraint to the commission column that ensures that a commission value is greater than zero.

`DISABLE`, where:

- `VALIDATE` ensures that existing data conforms to the constraint.
- `NOVALIDATE` means that some existing data may not conform to the constraint.

In addition:

- `ENABLE VALIDATE` is the same as `ENABLE`. The constraint is checked and is guaranteed to hold for all rows.
- `ENABLE NOVALIDATE` means that the constraint is checked, but it does not have to be true for all rows. This allows existing rows to violate the constraint while ensuring that all new or modified rows are valid.
- In an `ALTER TABLE` statement, `ENABLE NOVALIDATE` resumes constraint checking on disabled constraints without first validating all data in the table.
- `DISABLE NOVALIDATE` is the same as `DISABLE`. The constraint is not checked and is not necessarily true.
- `DISABLE VALIDATE` disables the constraint, drops the index on the constraint, and disallows any modification of the constrained columns.

Transitions between these states are governed by the following rules:

- `ENABLE` implies `VALIDATE`, unless `NOVALIDATE` is specified.
- `DISABLE` implies `NOVALIDATE`, unless `VALIDATE` is specified.
- `VALIDATE` and `NOVALIDATE` do not have any default implications for the `ENABLE` and `DISABLE` states.
- When a unique or primary key moves from the `DISABLE` state to the `ENABLE` state, and there is no existing index, a unique index is automatically created.
- Similarly, when a unique or primary key moves from `ENABLE` to `DISABLE` and it is enabled with a unique index, the unique index is dropped.
- When any constraint is moved from the `NOVALIDATE` state to the `VALIDATE` state, all data must be checked. (This can be very slow.) However, moving from `VALIDATE` to `NOVALIDATE` simply forgets that the data was ever checked.
- Moving a single constraint from the `ENABLE NOVALIDATE` state to the `ENABLE VALIDATE` state does not block reads, writes, or other DDL statements. It can be done in parallel.

The following statements enable novalidate disabled integrity constraints:

```
ALTER TABLE employees
  ENABLE NOVALIDATE CONSTRAINT EMP_EMAIL_UK;
ALTER TABLE employees
  ENABLE NOVALIDATE PRIMARY KEY
  ENABLE NOVALIDATE UNIQUE (employee_id, last_name);
```

The following statements enable or validate disabled integrity constraints:

```
ALTER TABLE employees
  MODIFY CONSTRAINT emp_email_uk VALIDATE;
ALTER TABLE employees
  MODIFY PRIMARY KEY ENABLE NOVALIDATE;
```