Including Constraints

Objectives

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

• Describe constraints

• Create and maintain 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`

Constraint Guidelines

- 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.

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

- Column constraint level

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

- Table constraint level

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

The `NOT NULL` Constraint

Ensures that null values are not permitted for the column:

EMPLOYEE_ID	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	DEPARTMENT_ID
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

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,
...
```
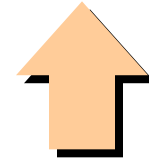
System named

User named

The `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
209	Smith	JSMITH

Allowed

Not allowed: already exists

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 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

...

Not allowed (Null value)

INSERT INTO

	Public Accounting		1400
50	Finance	124	1500

Not allowed (50 already exists)

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 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

EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
200	Ford	9
201	Ford	60

← **Not allowed (9 does not exist)**

← **Allowed**

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));
```

`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 `CHECK` Constraint

- Defines a condition that each row must satisfy
- NOTE The following expressions are not allowed queries that refer to other values in other rows
- When using `CURRENT_TIMESTAMP` the time that will be used is the insert or update time of the record

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

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

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.
```

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.
```

Summary

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

- Types of constraints:
  - NOT NULL
  - UNIQUE
  - PRIMARY KEY
  - FOREIGN KEY
  - CHECK

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