Chapter 4
Constraints

Oracle 10g: SQL
Objectives

• Explain the purpose of constraints in a table
• Distinguish among PRIMARY KEY, FOREIGN KEY, UNIQUE, CHECK, and NOT NULL constraints and the appropriate use for each constraint
• Understand how constraints can be created when creating a table or modifying an existing table
• Distinguish between creating constraints at the column level and table level
Objectives (continued)

- Create PRIMARY KEY constraints for a single column and a composite primary key
- Create a FOREIGN KEY constraint
- Create a UNIQUE constraint
- Create a CHECK constraint
Objectives (continued)

• Create a NOT NULL constraint using the ALTER TABLE…MODIFY command
• Include constraints during table creation
• Use DISABLE and ENABLE commands
• Use the DROP command
Constraints

• Rules used to enforce business rules, practices, and policies
• Rules used to ensure accuracy and integrity of data
# Constraint Types

<table>
<thead>
<tr>
<th>CONSTRAINT</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY KEY</td>
<td>Determines which column(s) uniquely identifies each record. The primary key cannot be NULL, and the data value(s) must be unique.</td>
</tr>
<tr>
<td>FOREIGN KEY</td>
<td>In a one-to-many or parent-child relationship, the constraint is added to the “many” table. The constraint ensures that if a value is entered into a specified column, it must already exist in the “one” table, or the record is not added.</td>
</tr>
<tr>
<td>UNIQUE</td>
<td>Ensures that all data values stored in a specified column are unique. The UNIQUE constraint differs from the PRIMARY KEY constraint in that it allows NULL values.</td>
</tr>
<tr>
<td>CHECK</td>
<td>Ensures that a specified condition is true before the data value is added to a table. For example, an order’s ship date cannot be earlier than its order date.</td>
</tr>
<tr>
<td>NOT NULL</td>
<td>Ensures that a specified column cannot contain a NULL value. The NOT NULL constraint can be created only with the column-level approach to table creation.</td>
</tr>
</tbody>
</table>

**FIGURE 4-1** List of constraint types
Creating Constraints

• Use the optional CONSTRAINT keyword during creation to assign a name
• Let the server name the constraint using the default format SYS_Cn
• Informative names can assist in debugging
Creating Constraints (continued)

• When:
  – During table creation
  – After table creation, by modifying the existing table

• How:
  – Column level approach
  – Table level approach
Creating Constraints at the Column Level

- If a constraint is being created at the column level, the constraint applies to the column specified

\[
\text{columnname [CONSTRAINT constraintname] constrainttype,}
\]

FIGURE 4-3 Syntax for creating a column-level constraint
Creating Constraints at the Table Level

• Approach can be used to create any constraint type except NOT NULL
• Required if constraint is based on multiple columns

```
[CONSTRAINT constraintname] constrainttype
(columnname, ...),
```

**FIGURE 4-4** Syntax for creating a table-level constraint
Enforcement of Constraints

- All constraints are enforced at the table level
- If a data value violates a constraint, the entire row is rejected
Adding Constraints to Existing Tables

• Constraints are added to an existing table with the ALTER TABLE command
• Add a NOT NULL constraint using MODIFY clause
• All other constraints are added using ADD clause
Using the PRIMARY KEY Constraint

- Ensures that columns do not contain duplicate or NULL values
- Only one per table is allowed

```
ALTER TABLE promotion
ADD CONSTRAINT promotion_gift_pk PRIMARY KEY (gift);
```

**FIGURE 4-6** Adding a PRIMARY KEY constraint
PRIMARY KEY Constraint for Composite Key

• List column names within parentheses separated by commas

**FIGURE 4-8** Adding a composite PRIMARY KEY constraint
Using the FOREIGN KEY Constraint

• Requires a value to exist in the referenced column of another table
• NULL values are allowed
• Enforces referential integrity
• Maps to the PRIMARY KEY in parent table
FOREIGN KEY Constraint Example

```
ALTER TABLE orders
ADD CONSTRAINT orders_customer#_fk FOREIGN KEY (customer#)
REFERENCES customers (customer#);
```

**FIGURE 4-12** Command to add a FOREIGN KEY constraint to the ORDERS table
Deletion of Foreign Key Values

- You cannot delete a value in a parent table referenced by a row in a child table.
- Use ON DELETE CASCADE keywords when creating FOREIGN KEY constraint—it automatically deletes a parent row when the row in a child table is deleted.
Using the UNIQUE Constraint

- No duplicates are allowed in the referenced column
- NULL values are permitted

```
ALTER TABLE books
ADD CONSTRAINT books_title_uk UNIQUE (title);
```

**FIGURE 4-18** Creating a UNIQUE constraint
Using the CHECK Constraint

- Updates and additions must meet specified condition

```sql
ALTER TABLE orders
ADD CONSTRAINT orders_shipdate_ck
CHECK (orderdate<=shipdate);
```

**FIGURE 4-20** Adding a CHECK constraint to the ORDERS table
Using the NOT NULL Constraint

• The NOT NULL constraint is a special CHECK constraint with IS NOT NULL condition
• Can only be created at column level
• Included in output of DESCRIBE command
• Can only be added to an existing table using ALTER TABLE...MODIFY command
NOT NULL Constraint Example

FIGURE 4-24 Adding a NOT NULL constraint without a name
Including Constraints During Table Creation – Column Level

- Include in column definition

![SQL code example for creating a table with constraints]

**FIGURE 4-26** Creating a table with constraints defined at the column level
Including Constraints During Table Creation – Table Level

• Include at end of column list

```sql
CREATE TABLE acctmanager2
  (amid CHAR(4),
   amfirst VARCHAR2(12) CONSTRAINT acctmanager2_amfirst_nn NOT NULL,
   amlast VARCHAR2(12) CONSTRAINT acctmanager2_amlast_nn NOT NULL,
   amedate DATE DEFAULT SYSDATE,
   region CHAR(2) NOT NULL,
   CONSTRAINT acctmanager2_amid_pk PRIMARY KEY (amid),
   CONSTRAINT acctmanager2_region_ck
       CHECK (region IN ('N', 'NW', 'S', 'SE', 'SW', 'W', 'E')));
```

**FIGURE 4-27** CREATE TABLE command including constraints created with the table-level approach
Multiple Constraints on a Single Column

- A column may be included in multiple constraints
- The order# column is included in a primary key and a foreign key constraint

```
CREATE TABLE orderitems
(Order# NUMBER(4) NOT NULL,
 Item# NUMBER(2) NOT NULL,
 ISBN VARCHAR2(10),
 QUANTITY NUMBER(3),
 CONSTRAINT orderitems_pk PRIMARY KEY (order#, item#),
 CONSTRAINT orderitems_order#_fk FOREIGN KEY (order#)
    REFERENCES orders (order#));
```

Figure 4-28 Assigning multiple constraints to a column
Viewing Constraints – USER_CONSTRAINTS

• Can display name, type, and condition of CHECK constraints

FIGURE 4-30  Query of constraint information
Using DISABLE/ENABLE

- Use DISABLE or ENABLE clause of ALTER TABLE command

![ALTER TABLE command example](image_url)

FIGURE 4-32 Disabling and enabling constraints

Oracle 10g: SQL
Dropping Constraints

- Constraints cannot be modified; they must be dropped and recreated
- Actual syntax depends on type of constraint
  - PRIMARY KEY - just list type of constraint
  - UNIQUE - include column name
  - All others - reference constraint name
ALTER TABLE...DROP Syntax

ALTER TABLE tablename
DROP PRIMARY KEY | UNIQUE (columnname) | CONSTRAINT constraintname;

FIGURE 4-33 Syntax for the ALTER TABLE command to delete a constraint
Drop Constraint Example

```
ALTER TABLE acctmanager2
DROP CONSTRAINT acctmanager2_amname_nn;
```

**FIGURE 4-34** Dropping a NOT NULL constraint by name
Drop Constraint Example - Error

![Image showing SQL code and error message]

```
ALTER TABLE customers
DROP PRIMARY KEY;
```

```
ALTER TABLE customers
*

ERROR at line 1:
ORA-02273: this unique/primary key is referenced by some foreign keys
```

**FIGURE 4-35** Error dropping a PRIMARY KEY referenced by a FOREIGN KEY
Summary

• A constraint is a rule that is applied to data being added to a table
  – The constraint represents business rules, policies, and/or procedures
  – Data violating the constraint is not added to the table
• A constraint can be included during table creation as part of the CREATE TABLE command or added to an existing table using the ALTER TABLE command
Summary (continued)

• A PRIMARY KEY constraint does not allow duplicate or NULL values in the designated column
• Only one PRIMARY KEY constraint is allowed in a table
• A FOREIGN KEY constraint requires that the column entry match a referenced column entry in the referenced table or be NULL
• A UNIQUE constraint is similar to a PRIMARY KEY constraint except it allows NULL values to be stored in the specified column
Summary (continued)

• A constraint can be disabled or enabled using the ALTER TABLE command and the DISABLE and ENABLE keywords

• A constraint cannot be modified
  – To change a constraint, the constraint must first be dropped with the DROP command and then re-created