ORACLE Academy

PRIMARY KEY, FOREIGN KEY and CHECK Constraints

What Will I Learn?

In this lesson, you will learn to:

- Define and give an example of a PRIMARY KEY, FOREIGN KEY and CHECK constraint
- Explain the purpose of defining PRIMARY KEY, FOREIGN KEY and CHECK constraints
- Demonstrate the creation of constraints at the column level and table level in a CREATE TABLE statement
- Evaluate a business problem requiring the addition of a PRIMARY KEY and FOREIGN KEY constraint and write the code to execute the change
- Query the data dictionary for USER_CONSTRAINTS and interpret the information returned

Why Learn It?

As discussed in the last section, constraints are used to prevent invalid data entry into database tables. What would happen if, surreptitiously or just through a careless mistake, your personal unique identification was given to another person? What if tomorrow at school someone else was credited with your classes for graduation or was able to eat lunch using your lunch-card number?

Ensuring data integrity is what constraints are all about. After all, you're unique!

Tell Me / Show Me

PRIMARY KEY CONSTRAINTS

A PRIMARY KEY constraint is a column or set of columns that uniquely identifies each row in a table. No primary-key value can appear in more than one row in the table. To satisfy a PRIMARY KEY constraint, both of the following conditions must be true:

- No column that is part of the primary key can contain a null.
- A table can have only one primary key.

Tell Me / Show Me

PRIMARY KEY constraints can be defined at the column or the table level. However, if a composite PRIMARY KEY is created, it must be defined at the table level.

When defining PRIMARY KEY columns, it is a good practice to use the suffix _pk in the constraint name. For example, the constraint name for the PRIMARY KEY column named id in the DJ on Demand d_events table could be d_events_id_pk.

Tell Me / Show Me

In a CREATE TABLE statement, the column-level PRIMARY KEY constraint syntax is stated:

```
CREATE TABLE clients
(client_number NUMBER(4) CONSTRAINT
client_client_num_pk PRIMARY KEY,
first_name VARCHAR2(14),
last_name VARCHAR2(13));
```

Note that the column-level simply refers to the area in the CREATE TABLE statement where the columns are defined. The table level refers to the last lines in the statement below where the individual columns are defined.

Tell Me / Show Me

To define a composite PRIMARY KEY, you must define the constraint at the table level rather than the column level. An example of a composite unique-key constraint name is:

CONSTRAINT id_venue_id_pk PRIMARY KEY (id, venue_id)

Tell Me / Show Me

FOREIGN KEY (REFERENTIAL INTEGRITY) CONSTRAINTS

FOREIGN KEY constraints are also called "referential integrity" constraints.

```
CREATE TABLE clients
(client_number NUMBER(4) CONSTRAINT client_client_num_pk
PRIMARY KEY, first_name VARCHAR2(14),
last_name VARCHAR2(13), department_id VARCHAR2(4,0),
CONSTRAINT clients_dept_id_fk FOREIGN KEY(department_id)
REFERENCES departments(department_id));
```

These constraints designate a column or combination of columns as a foreign key. It establishes a relationship between a primary key or unique key in the same table or a different table with the foreign key.

Tell Me / Show Me

To state a FOREIGN KEY constraints use statements such as:

"The child table column named _____ with a data type of _____ has a CONSTRAINT named _____ which references its parent table called _____ which has a column called _____."

To state a table-level FOREIGN KEY constraint use statements such as:

"There is a table-level CONSTRAINT named _____ which is a FOREIGN KEY (in the _____ table); it REFERENCES the parent _____ table (which has a column named _____)."

Tell Me / Show Me

The table containing the foreign key is called the "child" table and the table containing the referenced key is called the "parent" table. In the tables shown, D_CLIENTS primary-key client_number also appears in D_EVENTS as a foreign-key column.

D_CLIENTS - Parents

CLIENT_NUMBER	FIRST_NAME	LAST_NAME	PHONE	EMAIL
5922	Hiram	Peters	3715832249	hpeters@yahoo.com
5857	Serena	Jones	7035335900	serena.jones@jones.com
6133	Lauren	Vigil	4072220090	lbv@lbv.net

D_EVENTS - Child

ID	NAME	EVENT_DATE	DESCRIPTION	COST	VENUE_ID	PACKAGE_CODE	THEME_CODE	CLIENT_NUMBER
100	Peters Graduation	14-MAY-04	Party for 200, red, white, blue motif	8000	100	112	200	**5922**
105	Vigil Wedding	28-APR-04	Black tie at Four Seasons Hotel	10000	220	200	200	**6133**

Tell Me / Show Me

To satisfy a referential-integrity constraint, a foreign-key value must match an existing value in the parent table or be NULL. In the example, note that a primary-key value can exist without a corresponding foreign-key value; however, a foreign-key must have a corresponding primary key.

D_CLIENTS - Parents

CLIENT_NUMBER	FIRST_NAME	LAST_NAME	PHONE	EMAIL
5922	Hiram	Peters	3715832249	hpeters@yahoo.com
5857	Serena	Jones	7035335900	serena.jones@jones.com
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Tell Me / Show Me

The rule is: before you define a referential-integrity constraint in the child table, the referenced UNIQUE or PRIMARY KEY constraint on the parent table must already be defined. In other words, you must first have a parent primary key defined before you can create a foreign key in a child table.

D_CLIENTS - Parents

CLIENT_NUMBER	FIRST_NAME	LAST_NAME	PHONE	EMAIL
5922	Hiram	Peters	3715832249	hpeters@yahoo.com
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Tell Me / Show Me

To define a FOREIGN KEY constraint, it is good practice to use the suffix _fk in the constraint name.

For example, the constraint name for the FOREIGN KEY column song_id in the DJ on Demand table named d_track_listings could be named d_track_list_ song_id_fk.

Tell Me / Show Me

The syntax for defining a FOREIGN KEY constraint requires a reference to the table and column in the parent table. A FOREIGN KEY constraint in a CREATE TABLE statement can be defined as follows.

Column-level syntax:

song_id NUMBER(5) CONSTRAINT d_track_list_ song_id_fk REFERENCES d_songs(id)

Table-level syntax:

CONSTRAINT d_track_list_ song_id_fk FOREIGN KEY (song_id)

REFERENCES d_songs(id)

Tell Me / Show Me

ON DELETE CASCADE - MAINTAINING REFERENTIAL INTEGRITY

Using the ON DELETE CASCADE option when defining a foreign key enables the dependent rows in the child table to be deleted when a row in the parent table is deleted. If the foreign key does not have an ON DELETE CASCADE option, referenced rows in the parent table cannot be deleted. In other words, the child table FOREIGN KEY constraint includes the ON DELETE CASCADE permission allowing its parent to delete rows that it refers to.

D_CLIENTS - Parents

CLIENT_NUMBER	FIRST_NAME	LAST_NAME	PHONE	EMAIL
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5857	Serena	Jones	7035335900	serena.jones@jones.com
6133	Lauren	Vigil	4072220090	lbv@lbv.net

D_EVENTS - Child

ID	NAME	EVENT_DATE	DESCRIPTION	COST	VENUE_ID	PACKAGE_CODE	THEME_CODE	CLIENT_NUMBER
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Tell Me / Show Me

If the song_id column in D_TRACK_LISTINGS was created with the ON DELETE CASCADE option specified, the DELETE statement issued on the D_SONGS table will execute. If the ON DELETE CASCADE option was not specified when the song_id column in D_TRACK_LISTINGS was created, the attempt to delete song_id = 47 will fail.

DELETE from D_SONGS
WHERE song_id = 47

D_TRACK_LISTINGS

SONG_ID	CD_NUMBER	TRACK
45	92	1
46	93	1
47	**91**	**2**
48	95	5
49	91	3
50	93	4

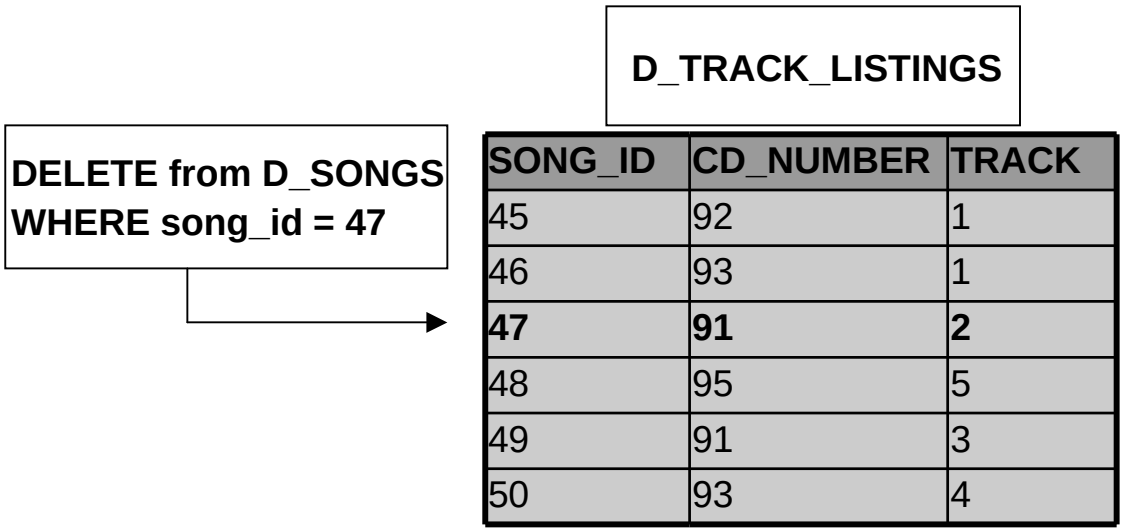
Tell Me / Show Me

Column-level ON DELETE CASCADE syntax:

song_id NUMBER(5) CONSTRAINT d_track_list_ song_id_fk
REFERENCES d_songs(id) ON DELETE CASCADE

Table-level ON DELETE CASCADE syntax:

CONSTRAINT d_track_list_ song_id_fk FOREIGN KEY (song_id)
REFERENCES d_songs(id) ON DELETE CASCADE



Tell Me / Show Me

ON DELETE SET NULL

Rather than having the rows in the child table deleted when using an ON DELETE CASCADE option, the child rows can be filled with null values using the ON DELETE SET NULL option. When do you choose whether to delete a row or simply set the values to null? An example might be when the parent table value is being changed to a new number such as converting inventory numbers to bar-code numbers. You would not want to delete the rows in the child table. When the new bar-code numbers are entered into the parent table, they would then be able to be inserted into the child table without having to totally re-create each child table row.

Tell Me / Show Me

CHECK CONSTRAINTS

The CHECK constraint explicitly defines a condition that must be met. To satisfy the constraint, each row in the table must make the condition either True or unknown (due to a null). The condition of a CHECK constraint can refer to any column in the specified table, but not to columns of other tables.

Tell Me / Show Me

```
CREATE d_cds (cd_number NUMBER CONSTRAINT
d_cds_cd_num_range
    CHECK (cd_number BETWEEN 10 AND 999) ,
year NUMBER(4)  CONSTRAINT d_cds_year_min
    CHECK (year > 1996) ,
producer VARCHAR2(10)  CONSTRAINT d_cds_prod_list
    CHECK (producer IN ('Old Town Records','The Music Man',
        'Middle Earth Records','R&B Inc','Tunes Are US')) ;
```

What is each constraint limiting? The cd_numbers must be between 10 and 999; year must be greater than 1996; the producer must be in the list shown.

Tell Me / Show Me

CHECK Constraint Conditions

- A CHECK constraint must only be on the row where the constraint is defined.
- A CHECK constraint cannot be used in queries that refer to values in other rows.
- The CHECK constraint cannot contain calls to the functions SYSDATE, UID, USER, or USERENV. The statement CHECK(SYSDATE >'05-MAY-99') is not allowed
- The CHECK constraint cannot use the pseudocolumns CURRVAL, NEXTVAL, LEVEL, or ROWNUM. The statement CHECK(NEXTVAL > 0) is not allowed.
- A single column can have multiple CHECK constraints that reference the column in its definition. There is no limit to the number of CHECK constraints that you can define on a column.

Tell Me / Show Me

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

The syntax to define a CHECK constraint is:

Column-level syntax:

salary NUMBER(8,2) CONSTRAINT f_staffs_min_salary CHECK (salary > 0)

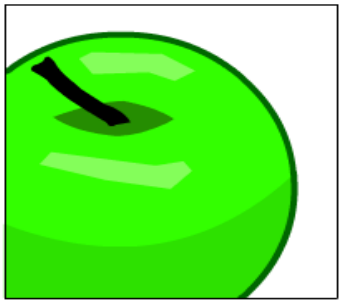
Table-level syntax:

CONSTRAINT f_staffs_min_salary CHECK (salary > 0)

Tell Me / Show Me

Terminology

Key terms used in this lesson include:



PRIMARY KEY constraint

FOREIGN KEY constraint

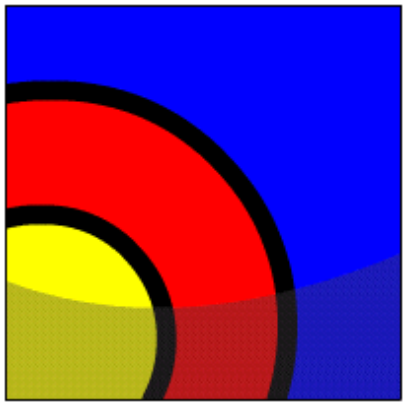
ON DELETE CASCADE

ON DELETE SET NULL

CHECK constraint

NOT NULL

Summary



In this lesson you have learned to:

- Provide an example of a PRIMARY KEY, FOREIGN KEY and CHECK constraint
- Explain the purpose of defining PRIMARY KEY, FOREIGN KEY and CHECK constraints
- Demonstrate the creation of constraints at the column level and table level in a CREATE TABLE statement
- Evaluate a business problem requiring the addition of a PRIMARY KEY and FOREIGN KEY constraint and writing the code to execute the change
- Query the data dictionary for USER_CONSTRAINTS and interpret the information returned

Summary

Practice Guide

The link for the lesson practice guide can be found in the course resources in Section 0.