Introduction to Relational Database Concepts

ORACLE Academy

What Will I Learn?

Objectives

In this lesson, you will learn to:

- Define a primary key
- Define a foreign key
- Define a column-integrity rule
- Identify row, column, primary key, unique key, and foreign key given a diagram of a table containing these elements
- Identify violations of data-integrity rules

Why Learn It?

Purpose

The conceptual data model will be transformed into a relational database design. This means that our entities, attributes, relationships, and unique identifiers will be translated into objects in a relational database.

Compare this to a clothing designer that is taking their design from paper and implementing it with fabric. The designer needs to understand how to sew the designs just like you will need to understand the structure of relational database objects.

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Relational Database Illustrated

A relational database is a database that is seen by the user as a collection of two-dimensional tables.

The table below contains employee data.

EMPLOYEES (table name)

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
100	Steven	King	90
101	Neena	Kochhar	90
102	Lex	De Haan	90
200	Jennifer	Whalen	10
205	Shelley	Higgins	110

Row →

Column ↑

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Language to Access Data

Structured query language (SQL) allows us to access data in relational databases in an efficient way. Instead of going through each row to find the record for employee number 200, we use the following SQL statement:

```
SELECT last_name, department_id
FROM employees
WHERE employee_id = 200;
```

You can see the result of this statement on the next slide.

Tell Me / Show Me

SQL Query Illustrated

EMPLOYEES (table name)

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
100	Steven	King	90
101	Neena	Kochhar	90
102	Lex	De Haan	90
200	Jennifer	Whalen	10
205	Shelley	Higgins	110

```
SELECT last_name, department_id
FROM employees
WHERE employee_id = 200;
```

LAST_NAME	DEPARTMENT_ID
Whalen	10

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Specific SQL Query

To find all the employees in department number 90, we write a different SQL statement:

```
SELECT *
FROM employees
WHERE department_id = 90;
```

Again, you can see the result on the next slide.

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Specific SQL Query (continued)

EMPLOYEES (table name)

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	...	DEPARTMENT_ID
100	Steven	King	...	90
101	Neena	Kochhar	...	90
102	Lex	De Haan	...	90
200	Jennifer	Whalen	...	10
205	Shelley	Higgins	...	110

```
SELECT   *
FROM employees
WHERE department_id = 90;
```

EMPLOYEES (table name)

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	...	DEPARTMENT_ID
100	Steven	King	...	90
101	Neena	Kochhar	...	90
102	Lex	De Haan	...	90

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Primary Key

A primary key (PK) is a column or set of columns that uniquely identifies each row in a table.

ACCOUNTS

BANK_NO	ACCT_NO	BALANCE	DATE_OPENED
104	75760	12,0050.00	21-OCT-89
104	77956	100.10	
105	89570	55,775.00	15-JAN-85
103	55890	15,001.85	10-MAR-91
105	75760	5.00	22-SEP-03

Primary Key

EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	...	DEPARTMENT_ID
100	Steven	King	...	90
101	Neena	Kochhar	...	90
102	Lex	De Haan	...	90
200	Jennifer	Whalen	...	10
205	Shelley	Higgins	...	110

Primary Key

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Primary Key Rules

Each table should have a primary key, and a primary key must be unique.

No part of the primary key can be null.

ACCOUNTS

BANK_NO	ACCT_NO	BALANCE	DATE_OPENED
104	75760	12,0050.00	21-OCT-89
104	77956	100.10	
105	89570	55,775.00	15-JAN-85
103	55890	15,001.85	10-MAR-91
105	75760	5.00	22-SEP-03

Primary Key

EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	...	DEPARTMENT_ID
100	Steven	King	...	90
101	Neena	Kochhar	...	90
102	Lex	De Haan	...	90
200	Jennifer	Whalen	...	10
205	Shelley	Higgins	...	110

Primary Key

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Primary Key Candidates

A table can have more than one column or combination of columns that could serve as the table's primary key. Each of these is called a "candidate" key.

MEMBERS

MEMBER_ID	LAST_NAME	FIRST_NAME	PAYROLL_ID
100	SMITH	DANA	21215
310	ADAMS	TYLER	59877
210	CHEN	LAWRENCE	1101
405	GOMEZ	CARLOS	52
378	LOUNGANI	NEIL	90386

Candidate Key

Candidate Key

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Choose a Candidate Key

Select one candidate key to be the primary key for the table. The other candidates become alternate keys (or unique keys).

MEMBERS

MEMBER_ID	LAST_NAME	FIRST_NAME	PAYROLL_ID
100	SMITH	DANA	21215
310	ADAMS	TYLER	59877
210	CHEN	LAWRENCE	1101
405	GOMEZ	CARLOS	52
378	LOUNGANI	NEIL	90386

Primary Key

Alternate or Unique Key (UK)

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Foreign Key

A foreign key (FK) is a column or combination of columns in one table that refers to a primary key in the same table or another table.

Primary Key

Foreign Key

EMPLOYEES

EMPLOYEE_ID	FIRST_NAME	LAST_NAME	DEPARTMENT_ID
100	Steven	King	90
101	Neena	Kochhar	90
102	Lex	De Haan	90
200	Jennifer	Whalen	10
205	Shelley	Higgins	110

refers to

DEPARTMENTS

DEPARTMENT_ID	DEPARTMENT_NAME
10	Administration
20	Marketing
50	Shipping

Primary Key

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Foreign Key Rules

If a foreign key is part of a primary key, that FK cannot be NULL.

Primary Key

Primary Key

SHELF_NO
A6
A8
B24
Q35

SHELVES

BOOK_NO	SHELF_NO	SHELF_NO
106	A6	LITTLE WOMEN
15	A8	TALE OF TWO CITIES
7987	B24	HARRY POTTER
15	Q35	LEARN TO SPEAK SPANISH

BOOKS

Foreign

refers to

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Column Integrity

A column must contain only values consistent with the defined data format of the column.

ACCOUNTS

BANK_NO	ACCT_NO	BALANCE	DATE_OPENED
104	75760	12,0050.00	21-OCT-89
104	77956	100.10	
105	89570	55,775.00	15-JAN-85
103	55890	15,001.85	10-MAR-91
105	75760	5.00	22-SEP-03

ACCOUNTS Table Definition

Column Name	Data Type	Optionality
BANK_NO	Number (5)	Not null
ACCT_NO	Number (8)	Not null
BALANCE	Number (12,2)	Not null
DATE_OPENED	Date	

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Summary of Data-Integrity Rules

Data-integrity rules (also known as constraints) define the relationally correct state for a database. Data-integrity rules ensure that users can perform only those operations that leave the database in a correct, consistent state.

CONSTRAINT TYPE	EXPLANATION	EXAMPLE
Entity Integrity	A primary key must be unique, and no part of the primary key can be null	The column emp_no in the EMPLOYEES table cannot be null
Referential Integrity	A foreign key must match an existing primary key value (or else be null)	The value in the dept_no column of the EMPLOYEES table must match a value in the dept_no column in the DEPARTMENTS table
Column Integrity	A column must contain only values consistent with the defined data format of the column	The value in the balance column of the ACCOUNTS table must be numeric
User-Defined Integrity	The data stored in a database must comply with the rules of the business	If the value in the balance column of the ACCOUNTS table is below 1.00, we must send a letter to the account owner (this will need extra programming to enforce)

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Terminology

Key terms used in this lesson include:

Candidate key
Column
Foreign key
Primary key
Relational database
Row
Unique key

Summary

Objectives Summarized

In this lesson, you have learned to:

- Define a primary key

- Define a foreign key

- Define a column-integrity rule

- Identify row, column, primary key, unique key, and foreign key given a diagram of a table containing these elements

- Identify violations of data-integrity rules

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Summary

Practice Guide

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