



Relational Database Concepts

Integrity rules

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Objectives

- Understand the key components of a relational database.
- Identify one to many relationships in associated primary keys and foreign keys in a relational database diagram.
- Identify rows with either missing foreign key values or orphan foreign key values.
- Identify foreign keys that are required, that is must not have a missing value and foreign keys that can have missing values.
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What Are Integrity Rules?

- Relational database consists of a collection of tables which are related to each other and controlled by the oracle server.
- To ensure that a database provides meaningful information, Integrity Rules are needed.
- Integrity rules are used to enforce the business rules associated with your company's databases to prevent the entry of invalid information into tables.

Entity integrity: Each table must have a column or combination of columns with unique values. This defines the PRIMARY KEY.

Uniqueness is defined as "no two rows of a table have the same value."

Integrity Rules

In the Student Table below, StdNo is unique. This means that there are no two students with an identical value for the StdNo.

STUDENT TABLE

STDNO	STDFIRSTNAME	STDLASTNAME	STDCITY	ST	STDZIP	STDMAJ	ST	STDGPA
123-45-6789	HOMER	WELLS	SEATTLE	WA	98121-1111	IS	FR	3
124-56-7890	BOB	NORBERT	BOTHELL	WA	98011-2121	FIN	JR	2.7
234-56-7890	CANDY	KENDALL	TACOMA	WA	99042-3321	ACCT	JR	3.5
345-67-8901	WALLY	KENDALL	SEATTLE	WA	98123-1141	IS	SR	2.8
456-78-9012	JOE	ESTRADA	SEATTLE	WA	98121-2333	FIN	SR	3.2
567-89-0123	MARIAH	DODGE	SEATTLE	WA	98114-0021	IS	JR	3.6
578-90-1234	TESS	DODGE	REDMOND	WA	98116-2344	ACCT	SO	3.3
789-01-2345	ROBERTO	MORALES	SEATTLE	WA	98121-2212	FIN	JR	2.5
876-54-3210	CRISTOPHER	COLAN	SEATTLE	WA	98114-1332	IS	SR	4
890-12-3456	LUKE	BRAZZI	SEATTLE	WA	98116-0021	IS	SR	2.2
901-23-4567	WILLIAM	PILGRIM	BOTHELL	WA	98113-1885	IS	SO	3.8

Integrity Rules

In the Enrollment table below, the combination of StdNo and OfferNo is unique because a student can be enrolled in multiple course offerings.

ENROLLMENT TABLE

OFFERNO	STDNO	ENRGRADE
1234	123-45-6789	3.3
1234	234-56-7890	3.5
1234	345-67-8901	3.2
1234	456-78-9012	3.1
1234	567-89-0123	3.8
1234	678-90-1234	3.4
4321	123-45-6789	3.5



Integrity Rules

- Entity integrity ensures that entities (people, things, and events) are uniquely identified in a database.
- This is an important feature for auditing, security, and communication reasons. (you can easily trace them)

Integrity Rules - Referential integrity

Referential integrity: The column values in one table must match the column values in a related table. This defines the FOREIGN KEY.

- For example, the value of StdNo in each row of the Enrollment table must match the value of StdNo in some row of the Student table as shown in the STUDENT and ENROLLMENT tables below.

STUDENT TABLE

STDNO	STDFIRSTNAME	STDLASTNAME	STDCITY	ST	STDZIP	STDMAJ	ST	STDGPA
123-45-6789	HOMER	WELLS	SEATTLE	WA	98121-1111	IS	FR	3
124-56-7890	BOB	NORBERT	BOTHELL	WA	98011-2121	FIN	JR	2.7
234-56-7890	CANDY	KENDALL	TACOMA	WA	99042-3321	ACCT	JR	3.5
345-67-8901	WALLY	KENDALL	SEATTLE	WA	98123-1141	IS	SR	2.8
456-78-9012	JOE	ESTRADA	SEATTLE	WA	98121-2333	FIN	SR	3.2
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Integrity Rules - Referential integrity:

Referential integrity ensures that a database contains valid connections. For example, it is critical that each row of the Enrollment table contains a Social Security number of a valid student.

ENROLLMENT TABLE

OFFERNO	STDNO	ENRGRADE
1234	123-45-6789	3.3
1234	234-56-7890	3.5
1234	345-67-8901	3.2
1234	456-78-9012	3.1
1234	567-89-0123	3.8
1234	678-90-1234	3.4



Integrity Rules

- Otherwise, some enrollments can be meaningless, possibly resulting in students denied enrollment because non-existing students took their places.
- This means that you have to be a student in the university before you can enroll in a class.

Important Integrity Definitions

- **Superkey:** A column or combination of columns containing unique values for each row. The combination of every column in a table is always a superkey because rows in a table must be unique
- **Candidate key:** a minimal superkey. A superkey is minimal if removing any column makes it no longer unique.
- **Null value:** a special value that represents the absence of an actual value. A null value can mean that the actual value is unknown or does not apply to the given row.
- **Primary key:** a specially designated candidate key. The primary key for a table cannot contain null values.
- **Foreign key:** a column or combination of columns in which the values must match those of a candidate key. A foreign key must have the same data type as its associated candidate key.
- In the CREATE TABLE statement of SQL, a foreign key must be associated with a primary key rather than merely a candidate key.



Important Integrity Definitions

- **Entity integrity rule:** No two rows of a table can contain the same value for the primary key. In addition, no row can contain a null value for any column of a primary key.
- **Referential integrity rule:** Only two kinds of values can be stored in a foreign key: a value matching a candidate key value in some row of the table containing the associated candidate key or a null value.