Explain the various constraints in SQL with a customer and loan table.

Constraints in SQL are rules applied to table columns to enforce data integrity and ensure that the data entered into the database adheres to certain standards. Below, we'll discuss various types of constraints using a Customer table and a Loan table as examples.

Example Tables

Customer Table

```
CREATE TABLE Customer (
    CustomerID INT PRIMARY KEY,
    FirstName VARCHAR(50) NOT NULL,
    LastName VARCHAR(50) NOT NULL,
    Email VARCHAR(100) UNIQUE,
    PhoneNumber VARCHAR(15),
    DateOfBirth DATE CHECK (DateOfBirth <= CURRENT_DATE)
);
```

Loan Table

```
CREATE TABLE Loan (
    LoanID INT PRIMARY KEY,
    CustomerID INT,
    Amount DECIMAL(10, 2) NOT NULL,
```

```
    InterestRate DECIMAL(5, 2) CHECK (InterestRate >= 0 AND
InterestRate <= 100),
    LoanDate DATE DEFAULT CURRENT_DATE,
    FOREIGN KEY (CustomerID) REFERENCES Customer(CustomerID) ON
DELETE CASCADE
);
```

Types of Constraints

PRIMARY KEY Constraint

Definition: Ensures that each row in a table has a unique identifier.

Example: In both tables, CustomerID and LoanID serve as primary keys.

Use: Prevents duplicate entries in these columns.

FOREIGN KEY Constraint

Definition: Ensures referential integrity by linking rows between two tables.

Example: CustomerID in the Loan table is a foreign key referencing CustomerID in the Customer table.

Use: Prevents the addition of a loan for a non-existent customer. The ON DELETE CASCADE option ensures that if a customer is deleted, all their associated loans are also deleted.

UNIQUE Constraint

Definition: Ensures that all values in a column are unique across the table, except for NULLs.

Example: The Email column in the Customer table is unique, preventing multiple customers from registering with the same email address.

Use: Maintains unique email addresses for each customer.

NOT NULL Constraint

Definition: Ensures that a column cannot have NULL values.

Example: The FirstName, LastName, and Amount columns in their respective tables cannot be NULL.

Use: Ensures that essential information is provided for customers and loans.

CHECK Constraint

Definition: Ensures that values in a column satisfy a specific condition.

Example:

In the Customer table, DateOfBirth must be less than or equal to the current date.

In the Loan table, InterestRate must be between 0 and 100.

Use: Validates data entries to ensure they are reasonable and meaningful.

DEFAULT Constraint

Definition: Provides a default value for a column when no value is specified during insertion.

Example: The LoanDate in the Loan table defaults to the current date if no date is provided.

Use: Simplifies data entry for the loan date.

Conclusion

Using these constraints helps maintain data integrity and ensures that the data in the Customer and Loan tables is valid, consistent, and meaningful. Constraints prevent errors and enhance the reliability of the database. By effectively designing tables with appropriate constraints, you can enforce business rules directly within the database structure. If you have further questions or need additional examples, feel free to ask!