

# Day 3: SQL NOTES FROM BASICS TO ADVANCED

## TODAYS TOPICS: SQL CONSTRAINTS

### SQL Constraints:

- NOT NULL
- UNIQUE
- PRIMARY KEY
- FOREIGN KEY
- CHECK
- DEFAULT
- AUTO\_INCREMENT / IDENTITY

### 3. SQL Constraints:

- Constraints are rules applied to database columns to ensure the accuracy and reliability of the data stored. They help maintain the integrity of the data in the database.
- Constraints are like rules for the columns in a database. They make sure that the data stored is accurate and trustworthy.

- When you add data to the database, SQL constraints check if it meets certain rules. Only data that fits these rules is allowed in.

### 3.1 NOT NULL

- Ensures that a column cannot have a NULL value. It is used when you want to enforce that a column must always have a value and cannot be left empty.
- NULL represents an absence of value, indicating that no data is present.
- When a column in a table is defined with a NOT NULL constraint, it means that every record in that column must contain a value; it cannot be left empty.
- In other words, a value is required for any column where the NOT NULL constraint is enforced.

Example:

```
CREATE TABLE Employees (  
    EmployeeID INT NOT NULL,  
    FirstName VARCHAR(50) NOT NULL  
);
```

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## 3.2 UNIQUE

- Ensures that all values in a column or a set of columns are unique across the table. This constraint prevents duplicate values in the specified column(s).
- Columns with a UNIQUE constraint cannot have duplicate values. This means every value in the column must be different.
- You can apply this constraint to one or more columns in a table, allowing for multiple UNIQUE constraints on a single table. You can also use the UNIQUE constraint to modify existing tables.

### Example:

```
CREATE TABLE Employees (  
    ID INT UNIQUE,  
    Email VARCHAR(100) UNIQUE  
);  
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```

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### 3.3 PRIMARY KEY

- A combination of NOT NULL and UNIQUE. It uniquely identifies each row in a table and ensures that the column cannot contain NULL values. Each table can have only one primary key.
- PRIMARY KEY Constraint is a combination of NOT NULL and Unique constraints.
- NOT NULL constraint and a UNIQUE constraint together forms a PRIMARY constraint.
- The column to which we have applied the primary constraint will always contain a unique value and will not allow null values.

Example:

```
CREATE TABLE Employees (  
    ID INT PRIMARY KEY,  
    Name VARCHAR(100)  
);  
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```

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### 3.4 FOREIGN KEY:

- Creates a link between two tables. It ensures that the value in one table must match a value in another table's primary key or unique column. It maintains referential integrity.
- A foreign key is used to maintain referential integrity between two tables.
- When one table references another, a column in the first table corresponds to a column in the second table.
- In this setup, the column in the second table acts as a primary key, while the same column in the first table serves as a foreign key.

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#### Example:

```
CREATE TABLE Departments (  
    DeptID INT PRIMARY KEY,  
    DeptName VARCHAR(100)  
);  
  
CREATE TABLE Employees (  
    ID INT PRIMARY KEY,  
    Name VARCHAR(100),  
    DeptID INT,  
    FOREIGN KEY (DeptID) REFERENCES Departments(DeptID)  
);  
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```

### 3.5 CHECK:

- Ensures that the value in a column meets a specified condition. It's used to enforce domain integrity by restricting the values that can be inserted into a column.
- When a CHECK constraint is applied to a column in a table, any value being inserted into that column must meet specified conditions.
- For instance, consider an 'age' column with a CHECK constraint that requires the age to be greater than 18. If a user tries to insert a value such as 0 or any number less than 18, the CHECK constraint will prevent the insertion of this invalid value, ensuring that only valid data is entered into the column.

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#### Example:

```
CREATE TABLE Employees (  
    ID INT PRIMARY KEY,  
    Age INT CHECK (Age ≥ 18)  
);  
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```

### 3.6 DEFAULT:

- Provides a default value for a column when no value is specified during an insert operation. It's used to assign a standard value to a column.
- When a default constraint is set on a column in a table and no specific value is provided for that column, the system will automatically insert the default value defined in the constraint.

Example:

```
CREATE TABLE Employees (  
    ID INT PRIMARY KEY,  
    Name VARCHAR(100),  
    Status VARCHAR(10) DEFAULT 'Active'  
);
```

```
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```

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### 3.6 AUTO\_INCREMENT / IDENTITY:

Automatically generates a unique number for each row in a column. It's often used for primary keys to ensure a unique identifier for each row.

#### AUTO\_INCREMENT (MySQL and MariaDB):

- **What it Does:** Automatically generates a unique number for a column each time a new row is added. This number starts from 1 and increases by 1 for each new row.
- **When to Use:** Typically used for the primary key column to ensure each row has a unique identifier.
- **How it Works:** You don't need to insert a value for the AUTO\_INCREMENT column; it will automatically get the next number in the sequence.

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**Example:**

```
CREATE TABLE Employees (  
  ID INT AUTO_INCREMENT PRIMARY KEY,  
  Name VARCHAR(100)  
);  
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```

Here, every time you insert a new row, MySQL will automatically assign the next available number to the ID column.



## IDENTITY (SQL Server):

**What it Does:** Similar to AUTO\_INCREMENT, it automatically generates a unique number for a column each time a new row is inserted. The number starts from a seed value (usually 1) and increases by a specified increment (usually 1).

**When to Use:** Also commonly used for primary key columns to ensure uniqueness.

**How it Works:** Just like with AUTO\_INCREMENT, you don't need to provide a value for the IDENTITY column when inserting new rows; SQL Server handles it for you.

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Example:

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```
CREATE TABLE Employees (  
    ID INT IDENTITY(1,1) PRIMARY KEY,  
    Name VARCHAR(100)  
);  
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```

In this example, the ID column starts at 1 and increments by 1 for each new row inserted.

### Quick Summry:

- **NOT NULL:** Ensures a column cannot have NULL values.
- **UNIQUE:** Ensures all values in a column are distinct.
- **PRIMARY KEY:** Combines NOT NULL and UNIQUE; uniquely identifies each row.
- **FOREIGN KEY:** Ensures a column's value matches a value in another table.
- **CHECK:** Ensures values in a column meet specific conditions.
- **DEFAULT:** Sets a default value for a column if none is provided.
- **AUTO\_INCREMENT / IDENTITY:** Automatically generates a unique number for a column, typically used for primary keys. Ensures a column cannot have NULL values.

# Day 3: Keys in Sql

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