

# MySQL Primary Key

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**Summary:** in this tutorial, you will learn how to use the **MySQL primary key** constraint to create the primary key for a table.

## Introduction to the MySQL primary key

In MySQL, a primary key is a column or a set of columns that uniquely identifies each row in the table. A primary key column must contain unique values.

If the primary key consists of multiple columns, the combination of values in these columns must be unique. Additionally, a primary key column cannot contain NULL.

A table can have either zero or one primary key, but not more than one.

## Defining a single-column primary key

Typically, you define a primary key for a table when you [create the table](#). Here's the syntax for defining the primary key that consists of one column:

```
CREATE TABLE table_name(  
    column1 datatype PRIMARY KEY,  
    column2 datatype,  
    ...
```

```
);
```

In this syntax, you define the `PRIMARY KEY` constraint as a *column constraint*.

Additionally, you can put the `PRIMARY KEY` at the end of the column list:

```
CREATE TABLE table_name(  
    column1 datatype,  
    column2 datatype,  
    ...,  
    PRIMARY KEY(column1)  
);
```

In this syntax, you define the `PRIMARY KEY` constraint as a *table constraint*.

## Defining a multi-column primary key

If the primary key consists of two or more columns, you need to use a table constraint to define the primary key:

```
CREATE TABLE table_name(  
    column1 datatype,  
    column2 datatype,  
    column3 datatype,  
    ...,  
    PRIMARY KEY(column1, column2)  
);
```

In this syntax, you list the primary key columns inside parentheses, separated by commas, followed by the `PRIMARY KEY` keywords.

## Adding a primary key to an existing table

If an existing table does not have a primary key, you can add a primary key to the table using the

`ALTER TABLE ... ADD PRIMARY KEY` statement:

```
ALTER TABLE table_name  
ADD PRIMARY KEY(column1, column2, ...);
```

## Removing a primary key

In practice, you'll rarely remove a primary key. However, if you want to do so, you can use the

`ALTER TABLE ... DROP PRIMARY KEY` statement:

```
ALTER TABLE table_name  
DROP PRIMARY KEY;
```

## MySQL PRIMARY KEY examples

We'll explore some examples of defining primary keys.

### 1) Defining a single-column primary key example

The following example [creates a table](#) called `products`, which has the `id` column as the primary key:

```
CREATE TABLE products(  
    id INT PRIMARY KEY,  
    name VARCHAR(255) NOT NULL  
);
```

When you [insert data](#) into the `products` table, you need to ensure the uniqueness of values in the `id` column. For example:

```
INSERT INTO products (id, name)  
VALUES  
    (1, 'Laptop'),  
    (2, 'Smartphone'),  
    (3, 'Wireless Headphones');
```

If you attempt to insert a duplicate value into the primary key column, you'll get an error. For example:

```
INSERT INTO products (id, name)  
VALUES  
    (1, 'Bluetooth Speaker');
```

Error:

```
ERROR 1062 (23000): Duplicate entry '1' for key 'products.PRIMARY'
```

The output indicates that MySQL found a duplicate entry 1 for the primary key of the `products` table.

Keeping track of primary key values manually can be challenging. To simplify this process, MySQL provides the [AUTO INCREMENT](#) attribute, which automatically assigns a unique value to the primary key each time you insert a new record.

## 2) Defining a single-column primary key with AUTO\_INCREMENT attribute example

The following statements re-create the `products` table with the primary key that uses the `AUTO_INCREMENT` attribute:

```
DROP TABLE products;

CREATE TABLE products(
  id INT AUTO_INCREMENT PRIMARY KEY,
  name VARCHAR(255) NOT NULL
);
```

Now, you can insert new rows into the `products` table without having to provide the values for the primary key column. For example:

```
INSERT INTO products (name)
VALUES
  ('Laptop'),
  ('Smartphone'),
  ('Wireless Headphones');
```

MySQL automatically generates sequential integer values for the `id` column when a new row is inserted.

Here's the contents of the `products` table:

```
SELECT * FROM products;
```

Output:

```
+-----+-----+
| id | name                |
+-----+-----+
|  1 | Laptop              |
|  2 | Smartphone           |
|  3 | Wireless Headphones |
+-----+-----+
3 rows in set (0.00 sec)
```

### 3) Defining a multi-column primary key example

We'll create a new table called `customers` :

```
CREATE TABLE customers(
  id INT AUTO_INCREMENT PRIMARY KEY,
  first_name VARCHAR(255) NOT NULL,
  last_name VARCHAR(255) NOT NULL,
  email VARCHAR(255) NOT NULL
);
```

Suppose each customer has some favorite products and each product is favored by some customers.

To model this relationship, you need to create a table called `favorites` :

```
CREATE TABLE favorites(
  customer_id INT,
  product_id INT,
  favorite_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
  PRIMARY KEY(customer_id, product_id)
);
```

The `favorites` table has a primary that consists of two columns `customer_id` and `product_id`.

Note that in the [foreign key tutorial](#), you'll learn how to define a foreign key for the `customer_id` column that references the `id` column of the `customers` table and a foreign key for the `product_id` column that references the `id` column of the `products` table.

## 4) Adding a primary key to a table example

The following statement creates a table called `tags` without a primary key:

```
CREATE TABLE tags(  
  id INT,  
  name VARCHAR(25) NOT NULL  
);
```

To make the `id` column the primary key, you use the `ALTER TABLE ... ADD PRIMARY KEY` statement:

```
ALTER TABLE tags  
ADD PRIMARY KEY(id);
```

## 5) Removing the primary key from a table

The following statement removes the primary key from the `tags` table:

```
ALTER TABLE tags  
DROP PRIMARY KEY;
```

## Summary

- A primary key is a unique identifier for a row in a table.
- Use the `PRIMARY KEY` constraint to define a primary key for a table.

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