**Data types**

**-----------------**

**String Type**

**-----------------**

CHAR(size) A FIXED length string (can contain letters, numbers, and special characters). The size parameter specifies the column length in characters - can be from 0 to 255. Default is 1

VARCHAR(size) A VARIABLE length string (can contain letters, numbers, and special characters). The size parameter specifies the maximum column length in characters - can be from 0 to 65535

BINARY(size) Equal to CHAR(), but stores binary byte strings. The size parameter specifies the column length in bytes. Default is 1

VARBINARY(size) Equal to VARCHAR(), but stores binary byte strings. The size parameter specifies the maximum column length in bytes.

TINYBLOB For BLOBs (Binary Large Objects). Max length: 255 bytes

TINYTEXT Holds a string with a maximum length of 255 characters

TEXT(size) Holds a string with a maximum length of 65,535 bytes

BLOB(size) For BLOBs (Binary Large Objects). Holds up to 65,535 bytes of data

MEDIUMTEXT Holds a string with a maximum length of 16,777,215 characters

MEDIUMBLOB For BLOBs (Binary Large Objects). Holds up to 16,777,215 bytes of data

LONGTEXT Holds a string with a maximum length of 4,294,967,295 **characters**

**Numeric Type**

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BIT(size) A bit-value type. The number of bits per value is specified in size. The size parameter can hold a value from 1 to 64. The default value for size is 1.

TINYINT(size) A very small integer. Signed range is from -128 to 127. Unsigned range is from 0 to 255. The size parameter specifies the maximum display width (which is 255)

BOOL Zero is considered as false, nonzero values are considered as true.

BOOLEAN Equal to BOOL

SMALLINT(size) A small integer. Signed range is from -32768 to 32767. Unsigned range is from 0 to 65535. The size parameter specifies the maximum display width (which is 255)

MEDIUMINT(size) A medium integer. Signed range is from -8388608 to 8388607. Unsigned range is from 0 to 16777215. The size parameter specifies the maximum display width (which is 255)

INT(size) A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295. The size parameter specifies the maximum display width (which is 255)

INTEGER(size) Equal to INT(size)

BIGINT(size) A large integer. Signed range is from -9223372036854775808 to 9223372036854775807. Unsigned range is from 0 to 18446744073709551615. The size parameter specifies the maximum display width (which is 255)

FLOAT(size, d) A floating point number. The total number of digits is specified in size. The number of digits after the decimal point is specified in the d parameter. This syntax is deprecated in MySQL 8.0.17, and it will be removed in future MySQL versions

FLOAT(p) A floating point number. MySQL uses the p value to determine whether to use FLOAT or DOUBLE for the resulting data type. If p is from 0 to 24, the data type becomes FLOAT(). If p is from 25 to 53, the data type becomes DOUBLE()

DOUBLE(size, d) A normal-size floating point number. The total number of digits is specified in size. The number of digits after the decimal point is specified in the d parameter

DOUBLE PRECISION(size, d)

DECIMAL(size, d) An exact fixed-point number. The total number of digits is specified in size. The number of digits after the decimal point is specified in the d parameter. The maximum number for size is 65. The maximum number for d is 30. The default value for size is 10. The default value for d is 0.

DEC(size, d) Equal to DECIMAL(size,d)

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**Date and Time Data Types**

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DATE A date. Format: YYYY-MM-DD. The supported range is from '1000-01-01' to '9999-12-31'

DATETIME(fsp) A date and time combination. Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'. Adding DEFAULT and ON UPDATE in the column definition to get automatic initialization and updating to the current date and time

TIMESTAMP(fsp) A timestamp. TIMESTAMP values are stored as the number of seconds since the Unix epoch ('1970-01-01 00:00:00' UTC). Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1970-01-01 00:00:01' UTC to '2038-01-09 03:14:07' UTC. Automatic initialization and updating to the current date and time can be specified using DEFAULT CURRENT\_TIMESTAMP and ON UPDATE CURRENT\_TIMESTAMP in the column definition

TIME(fsp) A time. Format: hh:mm:ss. The supported range is from '-838:59:59' to '838:59:59'

YEAR A year in four-digit format. Values allowed in four-digit format: 1901 to 2155, and 0000.

MySQL 8.0 does not support year in two-digit format.

**What are MyISAM and InnoDB**

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MyISAM and InnoDB are MySQL storage engines. Storage engines are database management system components used to manipulate data from in database.

MyISAM

MyISAM stands for Indexed Sequential Access Method. It was the default storage engine for MySQL until December 2009. With the release of MySQL 5.5, MyISAM was replaced with InnoDB.

MyISAM is based on an ISAM algorithm that displays information from large data sets fast. It has a small data footprint and is best suitable for data warehousing and web applications.

InnoDB

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InnoDB has been the default storage engine for MySQL since the release of MySQL 5.5. It is best suited for large databases that hold relational data.

InnoDB focuses on high reliability and performance, making it great for content management systems. One of the most known uses of InnoDB is MediaWiki software that powers Wikipedia.

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## SQL Arithmetic Operators

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operator | | Description | |  |
| + | | Add | |  |
| - | Subtract | |  | |
| \* | Multiply | |  | |
| / | Divide | |  | |
| % | Modulo | |  | |

## SQL Comparison Operators

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operator | | Description |  | |
| = | | Equal to |  | |
| > | Greater than | | |  |
| < | Less than | | |  |
| >= | Greater than or equal to | | |  |
| <= | Less than or equal to | | |  |
| <> | Not equal to | | |  |

## SQL Compound Operators

|  |  |
| --- | --- |
| Operator | Description |
| += | Add equals ex: a=a+1 , a+= 1 |
| -= | Subtract equals ex: a=a-1, a-=1 |
| \*= | Multiply equals |
| /= | Divide equals |
| %= | Modulo equals |
| &= | Bitwise AND equals |
| ^-= | Bitwise exclusive equals |
| |\*= | Bitwise OR equals |

## SQL Logical Operators

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operator | Description | | Example | |
| ALL | TRUE if all of the subquery values meet the condition | |  | |
| AND | | TRUE if all the conditions separated by AND is TRUE | |  |
| ANY | | TRUE if any of the subquery values meet the condition | |  |
| BETWEEN | | TRUE if the operand is within the range of comparisons | |  |
| EXISTS | | TRUE if the subquery returns one or more records | |  |
| IN | | TRUE if the operand is equal to one of a list of expressions | |  |
| LIKE | | TRUE if the operand matches a pattern | |  |
| NOT | | Displays a record if the condition(s) is NOT TRUE | |  |
| OR | | TRUE if any of the conditions separated by OR is TRUE | |  |
| SOME | | TRUE if any of the subquery values meet the condition | |  |

## SQL Constraints

SQL constraints are used to specify rules for the data in a table.

Constraints are used to limit the type of data that can go into a table. This ensures the accuracy and reliability of the data in the table. If there is any violation between the constraint and the data action, the action is aborted.

Constraints can be column level or table level. Column level constraints apply to a column, and table level constraints apply to the whole table.

The following constraints are commonly used in SQL:

* [NOT NULL](https://www.w3schools.com/sql/sql_notnull.asp) - Ensures that a column cannot have a NULL value
* [UNIQUE](https://www.w3schools.com/sql/sql_unique.asp) - Ensures that all values in a column are different
* [PRIMARY KEY](https://www.w3schools.com/sql/sql_primarykey.asp) - A combination of a NOT NULL and UNIQUE. Uniquely identifies each row in a table
* [FOREIGN KEY](https://www.w3schools.com/sql/sql_foreignkey.asp) - Prevents actions that would destroy links between tables

**The PRIMARY KEY and The FOREIGN KEY**

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The PRIMARY KEY constraint uniquely identifies each record in a table.

Primary keys must contain UNIQUE values, and cannot contain NULL values.

A table can have only ONE primary key; and in the table, this primary key can consist of single or multiple columns (fields).

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The FOREIGN KEY constraint is used to prevent actions that would destroy links between tables.

A FOREIGN KEY is a field (or collection of fields) in one table, that refers to the PRIMARY KEY in another table.

The table with the foreign key is called the child table, and the table with the primary key is called the referenced or parent table.

**SQL KeyWords**

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|  |  |
| --- | --- |
| Keyword | Description |
| [ADD](https://www.w3schools.com/sql/sql_ref_add.asp) | Adds a column in an existing table |
| [ADD CONSTRAINT](https://www.w3schools.com/sql/sql_ref_add_constraint.asp) | Adds a constraint after a table is already created |
| [ALL](https://www.w3schools.com/sql/sql_ref_all.asp) | Returns true if all of the subquery values meet the condition |
| [ALTER](https://www.w3schools.com/sql/sql_ref_alter.asp) | Adds, deletes, or modifies columns in a table, or changes the data type of a column in a table |
| [ALTER COLUMN](https://www.w3schools.com/sql/sql_ref_alter_column.asp) | Changes the data type of a column in a table |
| [ALTER TABLE](https://www.w3schools.com/sql/sql_ref_alter_table.asp) | Adds, deletes, or modifies columns in a table |
| [AND](https://www.w3schools.com/sql/sql_ref_and.asp) | Only includes rows where both conditions is true |
| [ANY](https://www.w3schools.com/sql/sql_ref_any.asp) | Returns true if any of the subquery values meet the condition |
| [AS](https://www.w3schools.com/sql/sql_ref_as.asp) | Renames a column or table with an alias |
| [ASC](https://www.w3schools.com/sql/sql_ref_asc.asp) | Sorts the result set in ascending order |
| [BACKUP DATABASE](https://www.w3schools.com/sql/sql_ref_backup_database.asp) | Creates a back up of an existing database |
| [BETWEEN](https://www.w3schools.com/sql/sql_ref_between.asp) | Selects values within a given range |
| [CASE](https://www.w3schools.com/sql/sql_ref_case.asp) | Creates different outputs based on conditions |
| [CHECK](https://www.w3schools.com/sql/sql_ref_check.asp) | A constraint that limits the value that can be placed in a column |
| [COLUMN](https://www.w3schools.com/sql/sql_ref_column.asp) | Changes the data type of a column or deletes a column in a table |
| [CONSTRAINT](https://www.w3schools.com/sql/sql_ref_constraint.asp) | Adds or deletes a constraint |
| [CREATE](https://www.w3schools.com/sql/sql_ref_create.asp) | Creates a database, index, view, table, or procedure |
| [CREATE DATABASE](https://www.w3schools.com/sql/sql_ref_create_database.asp) | Creates a new SQL database |
| [CREATE INDEX](https://www.w3schools.com/sql/sql_ref_create_index.asp) | Creates an index on a table (allows duplicate values) |
| [CREATE OR REPLACE VIEW](https://www.w3schools.com/sql/sql_ref_create_or_replace_view.asp) | Updates a view |
| [CREATE TABLE](https://www.w3schools.com/sql/sql_ref_create_table.asp) | Creates a new table in the database |
| [CREATE PROCEDURE](https://www.w3schools.com/sql/sql_ref_create_procedure.asp) | Creates a stored procedure |
| [CREATE UNIQUE INDEX](https://www.w3schools.com/sql/sql_ref_create_unique_index.asp) | Creates a unique index on a table (no duplicate values) |
| [CREATE VIEW](https://www.w3schools.com/sql/sql_ref_create_view.asp) | Creates a view based on the result set of a SELECT statement |
| [DATABASE](https://www.w3schools.com/sql/sql_ref_database.asp) | Creates or deletes an SQL database |
| [DEFAULT](https://www.w3schools.com/sql/sql_ref_default.asp) | A constraint that provides a default value for a column |
| [DELETE](https://www.w3schools.com/sql/sql_ref_delete.asp) | Deletes rows from a table |
| [DESC](https://www.w3schools.com/sql/sql_ref_desc.asp) | Sorts the result set in descending order |
| [DISTINCT](https://www.w3schools.com/sql/sql_ref_distinct.asp) | Selects only distinct (different) values |
| [DROP](https://www.w3schools.com/sql/sql_ref_drop.asp) | Deletes a column, constraint, database, index, table, or view |
| [DROP COLUMN](https://www.w3schools.com/sql/sql_ref_drop_column.asp) | Deletes a column in a table |
| [DROP CONSTRAINT](https://www.w3schools.com/sql/sql_ref_drop_constraint.asp) | Deletes a UNIQUE, PRIMARY KEY, FOREIGN KEY, or CHECK constraint |
| [DROP DATABASE](https://www.w3schools.com/sql/sql_ref_drop_database.asp) | Deletes an existing SQL database |
| [DROP DEFAULT](https://www.w3schools.com/sql/sql_ref_drop_default.asp) | Deletes a DEFAULT constraint |
| [DROP INDEX](https://www.w3schools.com/sql/sql_ref_drop_index.asp) | Deletes an index in a table |
| [DROP TABLE](https://www.w3schools.com/sql/sql_ref_drop_table.asp) | Deletes an existing table in the database |
| [DROP VIEW](https://www.w3schools.com/sql/sql_ref_drop_view.asp) | Deletes a view |
| [EXEC](https://www.w3schools.com/sql/sql_ref_exec.asp) | Executes a stored procedure |
| [EXISTS](https://www.w3schools.com/sql/sql_ref_exists.asp) | Tests for the existence of any record in a subquery |
| [FOREIGN KEY](https://www.w3schools.com/sql/sql_ref_foreign_key.asp) | A constraint that is a key used to link two tables together |
| [FROM](https://www.w3schools.com/sql/sql_ref_from.asp) | Specifies which table to select or delete data from |
| [FULL OUTER JOIN](https://www.w3schools.com/sql/sql_ref_full_outer_join.asp) | Returns all rows when there is a match in either left table or right table |
| [GROUP BY](https://www.w3schools.com/sql/sql_ref_group_by.asp) | Groups the result set (used with aggregate functions: COUNT, MAX, MIN, SUM, AVG) |
| [HAVING](https://www.w3schools.com/sql/sql_ref_having.asp) | Used instead of WHERE with aggregate functions |
| [IN](https://www.w3schools.com/sql/sql_ref_in.asp) | Allows you to specify multiple values in a WHERE clause |
| [INDEX](https://www.w3schools.com/sql/sql_ref_index.asp) | Creates or deletes an index in a table |
| [INNER JOIN](https://www.w3schools.com/sql/sql_ref_inner_join.asp) | Returns rows that have matching values in both tables |
| [INSERT INTO](https://www.w3schools.com/sql/sql_ref_insert_into.asp) | Inserts new rows in a table |
| [INSERT INTO SELECT](https://www.w3schools.com/sql/sql_ref_insert_into_select.asp) | Copies data from one table into another table |
| [IS NULL](https://www.w3schools.com/sql/sql_ref_is_null.asp) | Tests for empty values |
| [IS NOT NULL](https://www.w3schools.com/sql/sql_ref_is_not_null.asp) | Tests for non-empty values |
| [JOIN](https://www.w3schools.com/sql/sql_ref_join.asp) | Joins tables |
| [LEFT JOIN](https://www.w3schools.com/sql/sql_ref_left_join.asp) | Returns all rows from the left table, and the matching rows from the right table |
| [LIKE](https://www.w3schools.com/sql/sql_ref_like.asp) | Searches for a specified pattern in a column |
| [LIMIT](https://www.w3schools.com/sql/sql_ref_limit.asp) | Specifies the number of records to return in the result set |
| [NOT](https://www.w3schools.com/sql/sql_ref_not.asp) | Only includes rows where a condition is not true |
| [NOT NULL](https://www.w3schools.com/sql/sql_ref_not_null.asp) | A constraint that enforces a column to not accept NULL values |
| [OR](https://www.w3schools.com/sql/sql_ref_or.asp) | Includes rows where either condition is true |
| [ORDER BY](https://www.w3schools.com/sql/sql_ref_order_by.asp) | Sorts the result set in ascending or descending order |
| [OUTER JOIN](https://www.w3schools.com/sql/sql_ref_outer_join.asp) | Returns all rows when there is a match in either left table or right table |
| [PRIMARY KEY](https://www.w3schools.com/sql/sql_ref_primary_key.asp) | A constraint that uniquely identifies each record in a database table |
| [PROCEDURE](https://www.w3schools.com/sql/sql_ref_procedure.asp) | A stored procedure |
| [RIGHT JOIN](https://www.w3schools.com/sql/sql_ref_right_join.asp) | Returns all rows from the right table, and the matching rows from the left table |
| [ROWNUM](https://www.w3schools.com/sql/sql_ref_rownum.asp) | Specifies the number of records to return in the result set |
| [SELECT](https://www.w3schools.com/sql/sql_ref_select.asp) | Selects data from a database |
| [SELECT DISTINCT](https://www.w3schools.com/sql/sql_ref_select_distinct.asp) | Selects only distinct (different) values |
| [SELECT INTO](https://www.w3schools.com/sql/sql_ref_select_into.asp) | Copies data from one table into a new table |
| [SELECT TOP](https://www.w3schools.com/sql/sql_ref_select_top.asp) | Specifies the number of records to return in the result set |
| [SET](https://www.w3schools.com/sql/sql_ref_set.asp) | Specifies which columns and values that should be updated in a table |
| [TABLE](https://www.w3schools.com/sql/sql_ref_table.asp) | Creates a table, or adds, deletes, or modifies columns in a table, or deletes a table or data inside a table |
| [TOP](https://www.w3schools.com/sql/sql_ref_top.asp) | Specifies the number of records to return in the result set |
| [TRUNCATE TABLE](https://www.w3schools.com/sql/sql_ref_truncate_table.asp) | Deletes the data inside a table, but not the table itself |
| [UNION](https://www.w3schools.com/sql/sql_ref_union.asp) | Combines the result set of two or more SELECT statements (only distinct values) |
| [UNION ALL](https://www.w3schools.com/sql/sql_ref_union_all.asp) | Combines the result set of two or more SELECT statements (allows duplicate values) |
| [UNIQUE](https://www.w3schools.com/sql/sql_ref_unique.asp) | A constraint that ensures that all values in a column are unique |
| [UPDATE](https://www.w3schools.com/sql/sql_ref_update.asp) | Updates existing rows in a table |
| [VALUES](https://www.w3schools.com/sql/sql_ref_values.asp) | Specifies the values of an INSERT INTO statement |
| [VIEW](https://www.w3schools.com/sql/sql_ref_view.asp) | Creates, updates, or deletes a view |
| [WHERE](https://www.w3schools.com/sql/sql_ref_where.asp) | Filters a result set to include only records that fulfill a specified condition |

### Syntax

CREATE DATABASE databasename;

CREATE DATABASE testDB;

CREATE TABLE Persons (  
    PersonID int,  
    LastName varchar(255),  
    FirstName varchar(255),  
    Address varchar(255),  
    City varchar(255)   
);