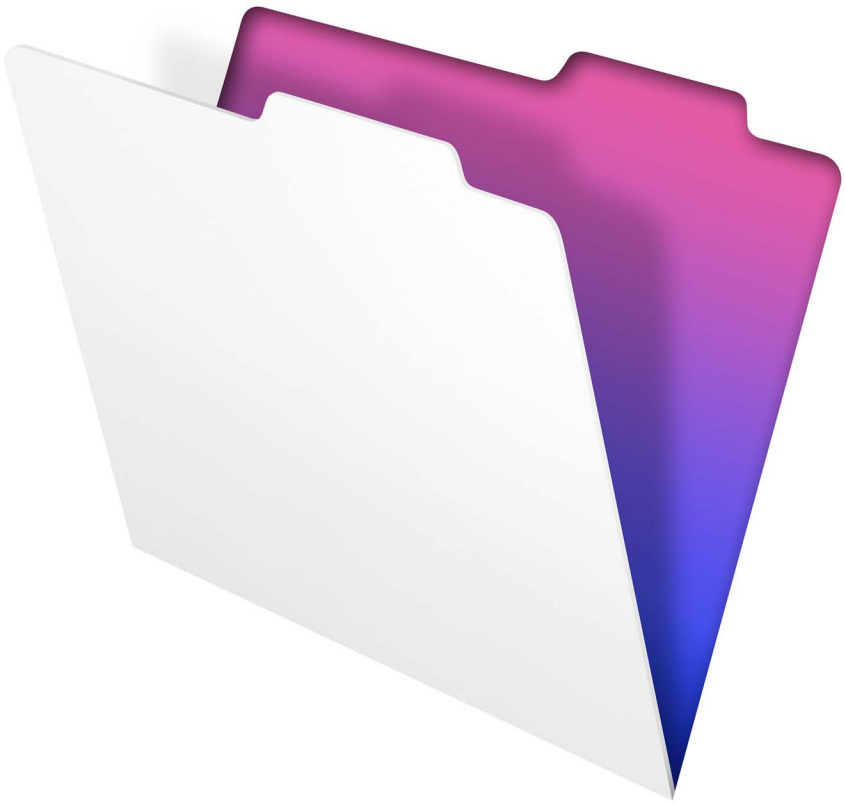
FileMaker® 13

SQL Reference



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Chapter 1
Introduction

As a database developer, you can use FileMaker Pro to create database solutions without any knowledge of SQL. But if you have some knowledge of SQL, you can use a FileMaker database file as an ODBC or JDBC data source, sharing your data with other applications using ODBC and JDBC. You can also use the FileMaker Pro ExecuteSQL function to retrieve data from any table occurrence within a FileMaker Pro database.

This reference describes the SQL statements and standards supported by FileMaker. The FileMaker ODBC and JDBC client drivers support all of the SQL statements described in this reference. The FileMaker Pro ExecuteSQL function supports only the SELECT statement.

About this reference

- For information on using ODBC and JDBC with previous versions of FileMaker Pro, see http://www.filemaker.com/documentation.
- This reference assumes that you are familiar with the basics of using FileMaker Pro functions, coding ODBC and JDBC applications, and constructing SQL queries. Refer to a third-party book for more information on these topics.
- This reference uses “FileMaker Pro” to refer to both FileMaker Pro and FileMaker Pro Advanced, unless describing specific FileMaker Pro Advanced features.

Where to find PDF documentation

To access PDFs of FileMaker documentation:

- In FileMaker Pro, choose **Help** menu > **Product Documentation.**
- In FileMaker Server, choose **Help** menu > **Product Documentation.**
- Visit http://www.filemaker.com/documentation for additional documentation. Any updates to this document are also available from the website.

About SQL

SQL, or Structured Query Language, is a programming language that was designed to query data from a relational database. The primary statement used to query a database is the SELECT statement.

In addition to language for querying a database, SQL provides statements for performing data manipulation, which allow you to add, update, and delete data.

SQL also provides statements for performing data definition. These statements allow you to create and modify tables and indexes.

The SQL statements and standards supported by FileMaker are described in chapter 2, “Supported standards.”

Using a FileMaker database as a data source

When you host a FileMaker database as an ODBC or JDBC data source, FileMaker data can be shared with ODBC- and JDBC-compliant applications. The applications connect to the FileMaker data source using the FileMaker client drivers, construct and execute the SQL queries using ODBC or JDBC, and process the data retrieved from the FileMaker database solution.

See *FileMaker ODBC and JDBC Guide* for extensive information on how you can use FileMaker software as a data source for ODBC and JDBC applications.

The FileMaker ODBC and JDBC client drivers support all of the SQL statements described in this reference.

Using the ExecuteSQL function

The FileMaker Pro ExecuteSQL function lets you retrieve data from table occurrences named in the relationships graph but independent of any defined relationships. You can retrieve data from multiple tables without creating table joins or any relationship between the tables. In some cases, you may be able to reduce the complexity of your relationships graph by using the ExecuteSQL function.

The fields you query with the ExecuteSQL function do not have to be on any layout, so you can use the ExecuteSQL function to retrieve data independent of any layout context. Because of this context independence, using the ExecuteSQL function in scripts may improve the portability of the scripts. You can use the ExecuteSQL function anywhere you can specify calculations, including for charting and reporting.

The ExecuteSQL function supports only the SELECT statement, described in the section “SELECT statement” on page 8.

Also, the ExecuteSQL function accepts only the SQL-92 syntax ISO date and time formats with no braces ({}). The ExecuteSQL function does not accept the ODBC/JDBC format date, time, and timestamp constants in braces.

For information about the syntax and use of the ExecuteSQL function, see FileMaker Pro Help.

Chapter 2
Supported standards

This reference describes the SQL statements and constructs supported by FileMaker. The FileMaker ODBC and JDBC client drivers support all of the SQL statements described in this chapter. The FileMaker Pro ExecuteSQL function supports only the SELECT statement.

Use the client drivers to access a FileMaker database solution from an ODBC- or JDBC-compliant application. The FileMaker database solution can be hosted by either FileMaker Pro or FileMaker Server.

- The ODBC client driver supports ODBC 3.5 Level 1 with some features of Level 2.
- The JDBC client driver provides partial support for the JDBC 3.0 specification.
- The ODBC and JDBC client drivers both support SQL-92 entry-level conformance, with some SQL-92 intermediate features.

Support for Unicode characters

The ODBC and JDBC client drivers support the Unicode API. However, if you're creating a custom application that uses the client drivers, use ASCII for field names, table names, and filenames (in case a non-Unicode query tool or application is used).

Note To insert and retrieve Unicode data, use `SQL_C_WCHAR`.

SQL statements

The ODBC and JDBC client drivers provide support for the following SQL statements:

- SELECT (page 8)
- DELETE (page 17)
- INSERT (page 17)
- UPDATE (page 19)
- CREATE TABLE (page 20)
- ALTER TABLE (page 21)
- CREATE INDEX (page 22)
- DROP INDEX (page 22)

The client drivers also support FileMaker data type mapping to ODBC SQL and JDBC SQL data types. See *FileMaker ODBC and JDBC Guide* for data type conversions. For more information on constructing SQL queries, refer to a third-party book.

Note The ODBC and JDBC client drivers do not support FileMaker portals.

SELECT statement

Use the SELECT statement to specify which columns you're requesting. Follow the SELECT statement with the column expressions (similar to field names) you want to retrieve (for example, last_name). Expressions can include mathematical operations or string manipulation (for example, SALARY * 1.05).

The SELECT statement can use a variety of clauses:

```
SELECT [DISTINCT] {* | column_expression [[AS] column_alias],...}
FROM table_name [table_alias], ...
[ WHERE expr1 rel_operator expr2 ]
[ GROUP BY {column_expression, ...} ]
[ HAVING expr1 rel_operator expr2 ]
[ UNION [ALL] (SELECT...) ]
[ ORDER BY {sort_expression [DESC | ASC]}, ... ]
[ OFFSET n {ROWS | ROW} ]
[ FETCH FIRST [ n [ PERCENT ] ] { ROWS | ROW } {ONLY | WITH TIES } ]
[ FOR UPDATE [OF {column_expression, ...}] ]
```

Items in brackets are optional.

column_alias can be used to give the column a more descriptive name, or to abbreviate a longer column name. For example, to assign the alias department to the column dept:

```
SELECT dept AS department FROM emp
```

Field names can be prefixed with the table name or the table alias. For example, EMP.LAST_NAME or E.LAST_NAME, where E is the alias for the table EMP.

The DISTINCT operator can precede the first column expression. This operator eliminates duplicate rows from the result of a query. For example:

```
SELECT DISTINCT dept FROM emp
```

SQL clauses

The ODBC and JDBC client drivers provide support for the following SQL clauses.

Use this SQL clause	To
FROM (page 9)	Indicate which tables are used in the `SELECT` statement.
WHERE (page 10)	Specify the conditions that records must meet to be retrieved (like a FileMaker Pro find request).
GROUP BY (page 11)	Specify the names of one or more fields by which the returned values should be grouped. This clause is used to return a set of aggregate values by returning one row for each group (like a FileMaker Pro subsummary).
HAVING (page 11)	Specify conditions for groups of records (for example, display only the departments that have salaries totaling more than $200,000).
UNION (page 12)	Combine the results of two or more `SELECT` statements into a single result.
ORDER BY (page 12)	Indicate how the records are sorted.
OFFSET (page 13)	State the number of rows to be skipped before starting to retrieve rows.
FETCH FIRST (page 13)	Specify the number of rows to be retrieved. No more than the specified number of rows are returned although fewer rows may be returned if the query yields less than the number of rows specified.
FOR UPDATE (page 14)	Perform Positioned Updates or Positioned Deletes via SQL cursors.

Note If you attempt to retrieve data from a table with no columns, the `SELECT` statement returns nothing.

FROM clause

The `FROM` clause indicates the tables that are used in the `SELECT` statement. The format is:

```
FROM table_name [table_alias] [, table_name [table_alias]]
```

`table_name` is the name of a table in the current database. The table name must begin with an alphabetic character. If the table name begins with other than an alphabetic character, enclose it in double quotation marks (quoted identifier).

`table_alias` can be used to give the table a more descriptive name, to abbreviate a longer table name, or to include the same table in the query more than once (for example, in self-joins).

Field names begin with an alphabetic character. If the field name begins with other than an alphabetic character, enclose it in double quotation marks (quoted identifier). For example, the `ExecuteSQL` statement for the field named `_LASTNAME` is:

```
SELECT "_LASTNAME" from emp
```

Field names can be prefixed with the table name or the table alias. For example, given the table specification `FROM employee E`, you can refer to the `LAST_NAME` field as `E.LAST_NAME`. Table aliases must be used if the `SELECT` statement joins a table to itself. For example:

```
SELECT * FROM employee E, employee F WHERE E.manager_id =
F.employee_id
```

The equal sign (=) includes only matching rows in the results.

If you are joining more than one table, and you want to discard all rows that don't have corresponding rows in both source tables, you can use `INNER JOIN`. For example:

```
SELECT *
   FROM Salespeople INNER JOIN Sales_Data
   ON Salespeople.Salesperson_ID = Sales_Data.Salesperson_ID
```

If you are joining two tables, but you don't want to discard rows of the first table (the "left" table), you can use `LEFT OUTER JOIN`.

```
SELECT *
   FROM Salespeople LEFT OUTER JOIN Sales_Data
   ON Salespeople.Salesperson_ID = Sales_Data.Salesperson_ID
```

Every row from the "Salespeople" table will appear in the joined table.

Notes

- `RIGHT OUTER JOIN` is not currently supported.
- `FULL OUTER JOIN` is not currently supported.

WHERE clause

The `WHERE` clause specifies the conditions that records must meet to be retrieved. The `WHERE` clause contains conditions in the form:

```
WHERE expr1 rel_operator expr2
```

`expr1` and `expr2` can be field names, constant values, or expressions.

`rel_operator` is the relational operator that links the two expressions. For example, the following `SELECT` statement retrieves the names of employees who make $20,000 or more.

```
SELECT last_name,first_name FROM emp WHERE salary >= 20000
```

The `WHERE` clause can also use expressions such as these:

```
WHERE expr1 IS NULL
WHERE NOT expr2
```

Note If you use fully qualified names in the `SELECT` (projection) list, you must also use fully qualified names in the related `WHERE` clause.

GROUP BY clause

The `GROUP BY` clause specifies the names of one or more fields by which the returned values should be grouped. This clause is used to return a set of aggregate values. It has the following format:

```
GROUP BY columns
```

`columns` must match the column expression used in the `SELECT` clause. A column expression can be one or more field names of the database table separated by commas.

Example

The following example sums the salaries in each department.

```
SELECT dept_id, SUM (salary) FROM emp GROUP BY dept_id
```

This statement returns one row for each distinct department ID. Each row contains the department ID and the sum of the salaries of the employees in the department.

HAVING clause

The `HAVING` clause enables you to specify conditions for groups of records (for example, display only the departments that have salaries totaling more than $200,000). It has the following format:

```
HAVING expr1 rel_operator expr2
```

`expr1` and `expr2` can be field names, constant values, or expressions. These expressions do not have to match a column expression in the `SELECT` clause.

`rel_operator` is the relational operator that links the two expressions.

Example

The following example returns only the departments whose sums of salaries are greater than $200,000:

```
SELECT dept_id, SUM (salary) FROM emp
   GROUP BY dept_id HAVING SUM (salary) > 200000
```

UNION operator

The UNION operator combines the results of two or more SELECT statements into a single result. The single result is all of the returned records from the SELECT statements. By default, duplicate records are not returned. To return duplicate records, use the ALL keyword (UNION ALL). The format is:

```
SELECT statement UNION [ALL] SELECT statement
```

When using the UNION operator, the select lists for each SELECT statement must have the same number of column expressions, with the same data types, and must be specified in the same order. For example:

```
SELECT last_name, salary, hire_date FROM emp UNION SELECT name, pay,
birth_date FROM person
```

This example has the same number of column expressions, and each column expression, in order, has the same data type.

The following example is not valid because the data types of the column expressions are different (SALARY from EMP has a different data type than LAST_NAME from RAISES). This example has the same number of column expressions in each SELECT statement, but the expressions are not in the same order by data type.

```
SELECT last_name, salary FROM emp UNION SELECT salary, last_name FROM
raises
```

ORDER BY clause

The ORDER BY clause indicates how the records are to be sorted. The format is:

```
ORDER BY {sort_expression [DESC | ASC]}, ...
```

sort_expression can be field names, expressions, or the positional number of the column expression to use. The default is to perform an ascending (ASC) sort.

For example, to sort by last_name then by first_name, you could use either of the following SELECT statements:

```
SELECT emp_id, last_name, first_name FROM emp ORDER BY last_name,
first_name
```

or

```
SELECT emp_id, last_name, first_name FROM emp ORDER BY 2,3
```

In the second example, last_name is the second column expression following SELECT, so ORDER BY 2 sorts by last_name.

OFFSET and FETCH FIRST clauses

The OFFSET and FETCH FIRST clauses are used to return a specified range of rows beginning from a particular starting point in a result set. The ability to limit the rows retrieved from large result sets allows you to “page” through the data and improves efficiency.

The OFFSET clause indicates the number of rows to skip before starting to return data. If the OFFSET clause is not used in a SELECT statement, the starting row is 0. The FETCH FIRST clause specifies the number of rows to be returned, either as an unsigned integer greater than or equal to 1 or as a percentage, from the starting point indicated in the OFFSET clause. If both OFFSET and FETCH FIRST are used in a SELECT statement, the OFFSET clause should come first.

The OFFSET and FETCH FIRST clauses are not supported in subqueries.

OFFSET format

The OFFSET format is:

```
OFFSET n {ROWS | ROW} ]
```

n is an unsigned integer. If n is larger than the number of rows returned in the result set, then nothing is returned and no error message appears.

ROWS is the same as ROW.

FETCH FIRST format

The FETCH FIRST format is:

```
FETCH FIRST [ n [ PERCENT ] ] { ROWS | ROW } {ONLY | WITH TIES } ]
```

n is the number of rows to be returned. The default value is 1 if n is omitted, n is an unsigned integer greater than or equal to 1 unless it is followed by PERCENT. If n is followed by PERCENT, the value may be either a positive fractional value or an unsigned integer.

ROWS is the same as ROW.

WITH TIES must be used with the ORDER BY clause.

WITH TIES allows more rows to be returned than specified in the FETCH count value because peer rows, those rows that are not distinct based on the ORDER BY clause, are also returned.

Examples

For example, to return information from the twenty-sixth row of the result set sorted by last_name then by first_name, use the following SELECT statement:

```
SELECT emp_id, last_name, first_name FROM emp ORDER BY last_name,
first_name OFFSET 25 ROWS
```

To specify that you want to return only ten rows:

```
SELECT emp_id, last_name, first_name FROM emp ORDER BY last_name,
first_name OFFSET 25 ROWS FETCH FIRST 10 ROWS ONLY
```

To return the ten rows and their peer rows (rows that are not distinct based on the `ORDER BY` clause):

```
SELECT emp_id, last_name, first_name FROM emp ORDER BY last_name,
first_name OFFSET 25 ROWS FETCH FIRST 10 ROWS WITH TIES
```

FOR UPDATE clause

The `FOR UPDATE` clause locks records for Positioned Updates or Positioned Deletes via SQL cursors. The format is:

```
FOR UPDATE [OF column_expressions]
```

`column_expressions` is a list of field names in the database table that you intend to update, separated by a comma. `column_expressions` is optional, and is ignored.

Example

The following example returns all records in the employee database that have a `SALARY` field value of more than $20,000. When each record is fetched, it is locked. If the record is updated or deleted, the lock is held until you commit the change. Otherwise, the lock is released when you fetch the next record.

```
SELECT * FROM emp WHERE salary > 20000
   FOR UPDATE OF last_name, first_name, salary
```

Additional examples:

Using	Sample SQL
text constant	`SELECT 'CatDog' FROM Salespeople`
numeric constant	`SELECT 999 FROM Salespeople`
date constant	`SELECT DATE '2012-06-05' FROM Salespeople`
time constant	`SELECT TIME '02:49:03' FROM Salespeople`
timestamp constant	`SELECT TIMESTAMP '2012-06-05 02:49:03' FROM Salespeople`
text column	`SELECT Company_Name FROM Sales_Data` `SELECT DISTINCT Company_Name FROM Sales_Data`
numeric column	`SELECT Amount FROM Sales_Data` `SELECT DISTINCT Amount FROM Sales_Data`
date column	`SELECT Date_Sold FROM Sales_Data` `SELECT DISTINCT Date_Sold FROM Sales_Data`
time column	`SELECT Time_Sold FROM Sales_Data` `SELECT DISTINCT Time_Sold FROM Sales_Data`
timestamp column	`SELECT Timestamp_Sold FROM Sales_Data` `SELECT DISTINCT Timestamp_Sold FROM Sales_Data`
BLOB[a] column	`SELECT Company_Brochures FROM Sales_Data` `SELECT GETAS(Company_Logo, 'JPEG') FROM Sales_Data`
Wildcard *	`SELECT * FROM Salespeople` `SELECT DISTINCT * FROM Salespeople`

a. A BLOB is a FileMaker database file container field.

Notes from the examples

A `column` is a reference to a field in the FileMaker database file. (The field can contain many distinct values.)

The asterisk (*) wildcard character is shorthand for “everything”. For the example `SELECT * FROM Salespeople`, the result is all the columns in the `Salespeople` table. For the example `SELECT DISTINCT * FROM Salespeople`, the result is all the unique rows in the `Salespeople` table (no duplicates).

- FileMaker does not store data for empty strings, so the following queries always return no records:

```
SELECT * FROM test WHERE c =''
SELECT * FROM test WHERE c <>''
```

- If you use `SELECT` with binary data, you must use the `GetAs()` function to specify the stream to return. See the following section “Retrieving the contents of a container field: CAST() function and GetAs() function,” for more information.

Retrieving the contents of a container field: CAST() function and GetAs() function

You can retrieve binary data, file reference information, or data of a specific file type from a container field.

If file data or JPEG binary data exists, the `SELECT` statement with `GetAS(field name, 'JPEG')` retrieves the data in binary form; otherwise, the `SELECT` statement with field name returns `NULL`.

To retrieve file reference information from a container field, such as the file path to a file, picture, or QuickTime movie, use the `CAST()` function with a `SELECT` statement. For example:

```
SELECT CAST(Company_Brochures AS VARCHAR(NNN)) FROM Sales_Data
```

In this example, if you:

- Inserted a file into the container field using FileMaker Pro but stored only a reference to the file, the `SELECT` statement retrieves the file reference information as type `SQL_VARCHAR`.
- Inserted the contents of a file into the container field using FileMaker Pro, the `SELECT` statement retrieves the name of the file.
- Imported a file into the container field from another application, the `SELECT` statement displays '?' (the file displays as **Untitled.dat** in FileMaker Pro).

To retrieve data from a container field, use the `GetAs()` function. You may use the `DEFAULT` option or specify the file type. The `DEFAULT` option retrieves the master stream for the container without the need to explicitly define the stream type:

```
SELECT GetAs(Company_Brochures, DEFAULT) FROM Sales_Data
```

To retrieve an individual stream type from a container, use the `GetAs()` function with the file's type based on how the data was inserted into the container field in FileMaker Pro. For example:

- If the data was inserted using the **Insert** > **File** command, specify `'FILE'` in the `GetAs()` function. For example:

```
SELECT GetAs(Company_Brochures, 'FILE') FROM Sales_Data
```

- If the data was inserted using the **Insert** > **Sound** command (Standard sound — MAC OS X raw format), specify `'snd'` in the `GetAs()` function. For example:

```
SELECT GetAs(Company_Meeting, 'snd ') FROM Company_Newsletter
```

- If the data was inserted using the **Insert** > **Picture** command, drag and drop, or paste from the clipboard, specify one of the file types listed in the following table. For example:

```
SELECT GetAs(Company_Logo, 'JPEG') FROM Company_Icons
```

File type	Description	File type	Description
'GIFf'	Graphics Interchange Format	'PNTG'	MacPaint
'JPEG'	Photographic images	'.SGI'	Generic bitmap format
'JP2 '	JPEG 2000	'TIFF'	Raster file format for digital images
'PDF '	Portable Document Format	'TPIC'	Targa
'PNGf'	Bitmap image format	'8BPS'	PhotoShop (PSD)

DELETE statement

Use the DELETE statement to delete records from a database table. The format of the DELETE statement is:

```
DELETE FROM table_name [ WHERE { conditions } ]
```

Note The WHERE clause determines which records are to be deleted. If you don't include the WHERE keyword, all records in the table are deleted (but the table is left intact).

Example

An example of a DELETE statement on the Employee table is:

```
DELETE FROM emp WHERE emp_id = 'E10001'
```

Each DELETE statement removes every record that meets the conditions in the WHERE clause. In this case, every record having the employee ID E10001 is deleted. Because employee IDs are unique in the Employee table, only one record is deleted.

INSERT statement

Use the INSERT statement to create records in a database table. You can specify either:

- A list of values to be inserted as a new record
- A SELECT statement that copies data from another table to be inserted as a set of new records

The format of the INSERT statement is:

```
INSERT INTO table_name [(column_name, ...)] VALUES (expr, ...)
```

column_name is an optional list of column names that provides the name and order of the columns whose values are specified in the VALUES clause. If you omit column_name, the value expressions (expr) must provide values for all columns defined in the table and must be in the same order that the columns are defined for the table. column_name may also specify a field repetition, for example lastDates[4].

expr is the list of expressions giving the values for the columns of the new record. Usually the expressions are constant values for the columns (but they can also be a subquery). You must enclose character string values in pairs of single quotation marks ('). To include a single quotation mark in a character string value enclosed by single quotation marks, use two single quotation marks together (for example, 'Don''t').

Subqueries must be enclosed in parentheses.

The following example inserts a list of expressions:

```
INSERT INTO emp (last_name, first_name, emp_id, salary, hire_date)
   VALUES ('Smith', 'John', 'E22345', 27500, DATE '2013-06-05')
```

Each INSERT statement adds one record to the database table. In this case a record has been added to the employee database table, EMP. Values are specified for five columns. The remaining columns in the table are assigned a blank value, meaning Null.

Note In container fields, you can INSERT text only, unless you prepare a parameterized statement and stream the data from your application. To use binary data, you may simply assign the filename by enclosing it in single quotation marks or use the PutAs() function. When specifying the filename, the file type is deduced from the file extension:

```
INSERT INTO table_name (container_name) VALUES(? AS 'filename.file
extension')
```

Unsupported file types will be inserted as type FILE.

When using the PutAs() function, specify the type: PutAs(col, 'type'), where the type value is a supported file type as described in “Retrieving the contents of a container field: CAST() function and GetAs() function” on page 16.

The SELECT statement is a query that returns values for each column_name value specified in the column name list. Using a SELECT statement instead of a list of value expressions lets you select a set of rows from one table and insert it into another table using a single INSERT statement.

Here's an example of an INSERT statement that uses a SELECT statement:

```
INSERT INTO emp1 (first_name, last_name, emp_id, dept, salary)
   SELECT first_name, last_name, emp_id, dept, salary from emp
   WHERE dept = 'D050'
```

In this type of INSERT statement, the number of columns to be inserted must match the number of columns in the SELECT statement. The list of columns to be inserted must correspond to the columns in the SELECT statement just as it would to a list of value expressions in the other type of INSERT statement. For example, the first column inserted corresponds to the first column selected; the second inserted to the second, and so on.

The size and data type of these corresponding columns must be compatible. Each column in the SELECT list should have a data type that the ODBC or JDBC client driver accepts on a regular INSERT/UPDATE of the corresponding column in the INSERT list. Values are truncated when the size of the value in the SELECT list column is greater than the size of the corresponding INSERT list column.

The SELECT statement is evaluated before any values are inserted.

UPDATE statement

Use the UPDATE statement to change records in a database table. The format of the UPDATE statement is:

```
UPDATE table_name SET column_name = expr, ... [ WHERE { conditions } ]
```

column_name is the name of a column whose value is to be changed. Several columns can be changed in one statement.

expr is the new value for the column.

Usually the expressions are constant values for the columns (but they can also be a subquery). You must enclose character string values in pairs of single quotation marks ('). To include a single quotation mark in a character string value enclosed by single quotation marks, use two single quotation marks together (for example, 'Don''t').

Subqueries must be enclosed in parentheses.

The WHERE clause is any valid clause. It determines which records are updated.

Examples

An example of an UPDATE statement on the Employee table is:

```
UPDATE emp SET salary=32000, exempt=1 WHERE emp_id = 'E10001'
```

The UPDATE statement changes every record that meets the conditions in the WHERE clause. In this case the salary and exempt status are changed for all employees having the employee ID E10001. Because employee IDs are unique in the Employee table, only one record is updated.

Here's an example using a subquery:

```
UPDATE emp SET salary = (SELECT avg(salary) from emp) WHERE emp_id =
'E10001'
```

In this case, the salary is changed to the average salary in the company for the employee having employee ID E10001.

Note In container fields, you can UPDATE with text only, unless you prepare a parameterized statement and stream the data from your application. To use binary data, you may simply assign the filename by enclosing it in single quotation marks or use the PutAs() function. When specifying the filename, the file type is deduced from the file extension:

```
UPDATE table_name SET (container_name) = ? AS 'filename.file
extension'
```

Unsupported file types will be inserted as type FILE.

When using the PutAs() function, specify the type: PutAs(col, 'type'), where the type value is a supported file type as described in “Retrieving the contents of a container field: CAST() function and GetAs() function” on page 16.

CREATE TABLE statement

Use the CREATE TABLE statement to create a table in a database file. The format of the CREATE TABLE statement is:

```
CREATE TABLE table_name ( table_element_list [,
table_element_list...] )
```

Within the statement, you specify the name and data type of each column.

- table_name is the name of the table. table_name has a 100 character limit. A table with the same name must not already be defined. The table name must begin with an alphabetic character. If the table name begins with other than an alphabetic character, enclose it in double quotation marks (quoted identifier).
- The format for table_element_list is:

```
field_name field_type [DEFAULT expr]
[UNIQUE | NOT NULL | PRIMARY KEY | GLOBAL]
[EXTERNAL relative_path_string [SECURE | OPEN calc_path_string]]
```

  - field_name is the name of the field. No field in the same table may have the same name. You specify a field repetition by using a number in square brackets. For example: lastDates[4]. Field names begin with an alphabetic character. If the field name begins with other than an alphabetic character, enclose it in double quotation marks (quoted identifier). For example, the CREATE TABLE statement for the field named _LASTNAME is:

```
CREATE TABLE "_EMPLOYEE" (ID INT PRIMARY KEY, "_FIRSTNAME"
VARCHAR(20), "_LASTNAME" VARCHAR(20))
```

  - field_type may be any of the following: NUMERIC, DECIMAL, INT, DATE, TIME, TIMESTAMP, VARCHAR, CHARACTER VARYING, BLOB, VARBINARY, LONGVARBINARY, or BINARY VARYING. For NUMERIC and DECIMAL, you can specify the precision and scale. For example: DECIMAL(10,0). For TIME and TIMESTAMP, you can specify the precision. For example: TIMESTAMP(6). For VARCHAR and CHARACTER VARYING, you can specify the length of the string. For example: VARCHAR(255).
  - The DEFAULT keyword allows you to set a default value for a column. For expr, you may use a constant value or expression. Allowable expressions are USER, USERNAME, CURRENT_USER, CURRENT_DATE, CURDATE, CURRENT_TIME, CURTIME, CURRENT_TIMESTAMP, CURTIMESTAMP, and NULL.
  - Defining a column to be UNIQUE automatically selects the **Unique** Validation Option for the corresponding field in the FileMaker database file.
  - Defining a column to be NOT NULL automatically selects the **Not Empty** Validation Option for the corresponding field in the FileMaker database file. The field is flagged as a **Required Value** in the **Fields** tab of the Manage Database dialog box in FileMaker Pro.

- To define a column as a container field, use `BLOB`, `VARBINARY`, or `BINARY VARYING` for the `field_type`.
- To define a column as a container field that stores data externally, use the `EXTERNAL` keyword. The `relative_path_string` defines the folder where the data is stored externally, relative to the location of the FileMaker database. This path must be specified as the base directory in the FileMaker Pro Manage Containers dialog box. You must specify either `SECURE` for secure storage or `OPEN` for open storage. If you are using open storage, the `calc_path_string` is the folder inside the `relative_path_string` folder where container objects are to be stored. The path must use forward slashes (/) in the folder name.

Examples

Using	Sample SQL
text column	`CREATE TABLE T1 (C1 VARCHAR, C2 VARCHAR (50), C3 VARCHAR (1001), C4 VARCHAR (500276))`
text column, `NOT NULL`	`CREATE TABLE T1NN (C1 VARCHAR NOT NULL, C2 VARCHAR (50) NOT NULL, C3 VARCHAR (1001) NOT NULL, C4 VARCHAR (500276) NOT NULL)`
numeric column	`CREATE TABLE T2 (C1 DECIMAL, C2 DECIMAL (10,0), C3 DECIMAL (7539,2), C4 DECIMAL (497925,301))`
date column	`CREATE TABLE T3 (C1 DATE, C2 DATE, C3 DATE, C4 DATE)`
time column	`CREATE TABLE T4 (C1 TIME, C2 TIME, C3 TIME, C4 TIME)`
timestamp column	`CREATE TABLE T5 (C1 TIMESTAMP, C2 TIMESTAMP, C3 TIMESTAMP, C4 TIMESTAMP)`
column for container field	`CREATE TABLE T6 (C1 BLOB, C2 BLOB, C3 BLOB, C4 BLOB)`
column for external storage container field	`CREATE TABLE T7 (C1 BLOB EXTERNAL 'Files/MyDatabase/' SECURE)` `CREATE TABLE T8 (C1 BLOB EXTERNAL 'Files/MyDatabase/' OPEN 'Objects')`

ALTER TABLE statement

Use the `ALTER TABLE` statement to change the structure of an existing table in a database file. You can modify only one column in each statement. The formats of the `ALTER TABLE` statement are:

```
ALTER TABLE table_name ADD [COLUMN] column_definition

ALTER TABLE table_name DROP [COLUMN] unqualified_column_name

ALTER TABLE table_name ALTER [COLUMN] column_definition SET DEFAULT
expr

ALTER TABLE table_name ALTER [COLUMN] column_definition DROP DEFAULT
```

You must know the table's structure and how you want to modify it before using the `ALTER TABLE` statement.

Examples

To	Sample SQL
add columns	`ALTER TABLE Salespeople ADD C1 VARCHAR`
remove columns	`ALTER TABLE Salespeople DROP C1`
set the default value for a column	`ALTER TABLE Salespeople ALTER Company SET DEFAULT 'FileMaker'`
remove the default value for a column	`ALTER TABLE Salespeople ALTER Company DROP DEFAULT`

Note `SET DEFAULT` and `DROP DEFAULT` do not affect existing rows in the table, but change the default value for rows that are subsequently added to the table.

CREATE INDEX statement

Use the `CREATE INDEX` statement to speed searches in your database file. The format of the `CREATE INDEX` statement is:

```
CREATE INDEX ON table_name.column_name
CREATE INDEX ON table_name (column_name)
```

`CREATE INDEX` is supported for a single column (multi-column indexes are not supported). Indexes are not allowed on columns that correspond to container field types, summary fields, fields that have the global storage option, or unstored calculation fields in a FileMaker database file.

Creating an index for a text column automatically selects the Storage Option of **Minimal** in **Indexing** for the corresponding field in the FileMaker database file. Creating an index for a non-text column (or a column formatted as Japanese text) automatically selects the Storage Option of **All** in **Indexing** for the corresponding field in the FileMaker database file.

Creating an index for any column automatically selects the Storage Option of **Automatically create indexes as needed** in **Indexing** for the corresponding field in the FileMaker database file.

FileMaker automatically creates indexes as needed. Using `CREATE INDEX` causes the index to be built immediately rather than on demand.

Example

```
CREATE INDEX ON Salespeople.Salesperson_ID
```

DROP INDEX statement

Use the `DROP INDEX` statement to remove an index from a database file. The format of the `DROP INDEX` statement is:

```
DROP INDEX ON table_name.column_name
DROP INDEX ON table_name (column_name)
```

Remove an index when your database file is too large, or you don't often use a field in queries.

If your queries are experiencing poor performance, and you're working with an extremely large FileMaker database file with many indexed text fields, consider dropping the indexes from some fields. Also consider dropping the indexes from fields that you rarely use in `SELECT` statements.

Dropping an index for any column automatically selects the Storage Option of **None** and clears **Automatically create indexes as needed** in **Indexing** for the corresponding field in the FileMaker database file.

The `PREVENT INDEX CREATION` attribute is not supported.

Example

```
DROP INDEX ON Salespeople.Salesperson_ID
```

SQL expressions

Use expressions in `WHERE`, `HAVING`, and `ORDER BY` clauses of `SELECT` statements to form detailed and sophisticated database queries. Valid expression elements are:

- Field names
- Constants
- Exponential/scientific notation
- Numeric operators
- Character operators
- Date operators
- Relational operators
- Logical operators
- Functions

Field names

The most common expression is a simple field name, such as `calc` or `Sales_Data.Invoice_ID`.

Constants

Constants are values that do not change. For example, in the expression `PRICE * 1.05`, the value 1.05 is a constant. Or you might assign a value of 30 to the constant `Number_Of_Days_In_June`.

You must enclose character constants in pairs of single quotation marks ('). To include a single quotation mark in a character constant enclosed by single quotation marks, use two single quotation marks together (for example, `'Don''t'`).

For ODBC and JDBC applications, FileMaker accepts the ODBC/JDBC format date, time, and timestamp constants in braces ({}), for example:

- `{D '2012-06-05'}`
- `{T '14:35:10'}`
- `{TS '2012-06-05 14:35:10'}`

FileMaker allows the type specifier (`D`, `T`, `TS`) to be in upper case or lower case. You may use any number of spaces after the type specifier, or even omit the space.

FileMaker also accepts SQL-92 syntax ISO date and time formats with no braces:

- `DATE 'YYYY-MM-DD'`
- `TIME 'HH:MM:SS'`
- `TIMESTAMP 'YYYY-MM-DD HH:MM:SS'`

The FileMaker Pro ExecuteSQL function accepts only the SQL-92 syntax ISO date and time formats with no braces.

Constant	Acceptable syntax (examples)
Text	`'Paris'`
Number	`1.05`

Date	`DATE '2012-06-05'`
	`{ D '2012-06-05' }`
	`{06/05/2012}`
	`{06/05/12}`
	Note The 2-digit year syntax is not supported for the ODBC/JDBC format or the SQL-92 format.

Time	`TIME '14:35:10'`
	`{ T '14:35:10' }`
	`{14:35:10}`

Timestamp	`TIMESTAMP '2012-06-05 14:35:10'`
	`{ TS '2012-06-05 14:35:10'}`
	`{06/05/2012 14:35:10}`
	`{06/05/12 14:35:10}`
	Make sure **Strict data type: 4-Digit Year Date** is not selected as a validation option in the FileMaker database file for a field using this 2-digit year syntax.
	Note The 2-digit year syntax is not supported for the ODBC/JDBC format or the SQL-92 format.

When entering date and time values, match the format of the database file locale. For example, if the database was created on an Italian language system, use Italian date and time formats.

Exponential/scientific notation

Numbers can be expressed using scientific notation.

Example

```
SELECT column1 / 3.4E+7 FROM table1 WHERE calc < 3.4E-6 * column2
```

Numeric operators

You can include the following operators in number expressions: +, -, *, /, and ^ or ** (exponentiation).

You can precede numeric expressions with a unary plus (+) or minus (-).

Character operators

You can concatenate characters.

Examples

In the following examples, `last_name` is `'JONES '` and first_name is `'ROBERT '`:

Operator	Concatenation	Example	Result
+	Keep trailing blank characters	first_name + last_name	'ROBERT JONES '
-	Move trailing blank characters to the end	first_name - last_name	'ROBERTJONES '

Date operators

You can modify dates.

Examples

In the following examples, `hire_date` is `DATE '2013-01-30'`.

Operator	Effect on date	Example	Result
+	Add a number of days to a date	`hire_date` + 5	DATE '2013-02-04'
-	Find the number of days between two dates	`hire_date - DATE '2013-01-01'`	`29`
	Subtract a number of days from a date	`hire_date - 10`	DATE '2013-01-20'

Additional examples:

```
SELECT Date_Sold, Date_Sold + 30 AS agg FROM Sales_Data
SELECT Date_Sold, Date_Sold - 30 AS agg FROM Sales_Data
```

Relational operators

Operator	Meaning
`=`	Equal
`<>`	Not equal
`>`	Greater than
`>=`	Greater than or equal to
`<`	Less than
`<=`	Less than or equal to
`LIKE`	Matching a pattern
`NOT LIKE`	Not matching a pattern
`IS NULL`	Equal to Null
`IS NOT NULL`	Not equal to Null
`BETWEEN`	Range of values between a lower and upper bound
`IN`	A member of a set of specified values or a member of a subquery
`NOT IN`	Not a member of a set of specified values or a member of a subquery

Operator	Meaning
EXISTS	'True' if a subquery returned at least one record
ANY	Compares a value to each value returned by a subquery (operator must be preceded by =, <>, >, >=, <, or <=); =Any is equivalent to In
ALL	Compares a value to each value returned by a subquery (operator must be preceded by =, <>, >, >=, <, or <=)

Examples

```
SELECT Sales_Data.Invoice_ID FROM Sales_Data
   WHERE Sales_Data.Salesperson_ID = 'SP-1'

SELECT Sales_Data.Amount FROM Sales_Data WHERE Sales_Data.Invoice_ID
<> 125

SELECT Sales_Data.Amount FROM Sales_Data WHERE Sales_Data.Amount > 3000

SELECT Sales_Data.Time_Sold FROM Sales_Data
   WHERE Sales_Data.Time_Sold < '12:00:00'

SELECT Sales_Data.Company_Name FROM Sales_Data
   WHERE Sales_Data.Company_Name LIKE '%University'

SELECT Sales_Data.Company_Name FROM Sales_Data
   WHERE Sales_Data.Company_Name NOT LIKE '%University'

SELECT Sales_Data.Amount FROM Sales_Data WHERE Sales_Data.Amount IS NULL

SELECT Sales_Data.Amount FROM Sales_Data WHERE Sales_Data.Amount IS NOT
NULL

SELECT Sales_Data.Invoice_ID FROM Sales_Data
   WHERE Sales_Data.Invoice_ID BETWEEN 1 AND 10

SELECT COUNT(Sales_Data.Invoice_ID) AS agg
   FROM Sales_Data WHERE Sales_Data.INVOICE_ID IN (50,250,100)

SELECT COUNT(Sales_Data.Invoice_ID) AS agg
   FROM Sales_Data WHERE Sales_Data.INVOICE_ID NOT IN (50,250,100)

SELECT COUNT(Sales_Data.Invoice_ID) AS agg FROM Sales_Data
   WHERE Sales_Data.INVOICE_ID NOT IN (SELECT Sales_Data.Invoice_ID
   FROM Sales_Data WHERE Sales_Data.Salesperson_ID = 'SP-4')

SELECT *
   FROM Sales_Data WHERE EXISTS (SELECT Sales_Data.Amount
   FROM Sales_Data WHERE Sales_Data.Salesperson_ID IS NOT NULL)
```

```
SELECT *
   FROM Sales_Data WHERE Sales_Data.Amount = ANY (SELECT
Sales_Data.Amount
   FROM Sales_Data WHERE Sales_Data.Salesperson_ID = 'SP-1')

SELECT *
   FROM Sales_Data WHERE Sales_Data.Amount = ALL (SELECT
Sales_Data.Amount
   FROM Sales_Data WHERE Sales_Data.Salesperson_ID IS NULL)
```

Logical operators

You can combine two or more conditions. The conditions must be related by `AND` or `OR`, such as:

```
salary = 40000 AND exempt = 1
```

The logical NOT operator is used to reverse the meaning, such as:

```
NOT (salary = 40000 AND exempt = 1)
```

Examples

```
SELECT * FROM Sales_Data WHERE Sales_Data.Company_Name
   NOT LIKE '%University' AND Sales_Data.Amount > 3000

SELECT * FROM Sales_Data WHERE (Sales_Data.Company_Name
   LIKE '%University' OR Sales_Data.Amount > 3000)
   AND Sales_Data.Salesperson_ID = 'SP-1'
```

Operator precedence

As expressions become more complex, the order in which the expressions are evaluated becomes important. This table shows the order in which the operators are evaluated. The operators in the first line are evaluated first, and so on. Operators in the same line are evaluated left to right in the expression.

Precedence	Operator
1	Unary `'-'`, Unary `'+'`
2	^, **
3	*, /
4	+, -
5	=, <>, <, <=, >, >=, Like, Not Like, Is Null, Is Not Null, Between, In, Exists, Any, All
6	Not
7	AND
8	OR

The following example shows the importance of precedence:

```
WHERE salary > 40000 OR hire_date > (DATE '2008-01-30') AND dept =
'D101'
```

Because AND is evaluated first, this query retrieves employees in department D101 hired after January 30, 2008, as well as every employee making more than $40,000, no matter what department or hire date.

To force the clause to be evaluated in a different order, use parentheses to enclose the conditions to be evaluated first. For example:

```
WHERE (salary > 40000 OR hire_date > DATE '2008-01-30') AND dept =
'D101'
```

retrieves employees in department D101 that either make more than $40,000 or were hired after January 30, 2008.

SQL functions

FileMaker SQL supports many functions you can use in expressions. Some of the functions return characters strings, some return numbers, some return dates, and some return values that depend on conditions met by the function arguments.

Aggregate functions

Aggregate functions return a single value from a set of records. You can use an aggregate function as part of a `SELECT` statement, with a field name (for example, `AVG(SALARY)`), or in combination with a column expression (for example, `AVG(SALARY * 1.07)`).

You can precede the column expression with the `DISTINCT` operator to eliminate duplicate values. For example:

```
COUNT (DISTINCT last_name)
```

In this example, only unique last name values are counted.

Aggregate function	Returns
`SUM`	The total of the values in a numeric field expression. For example, `SUM(SALARY)` returns the sum of all salary field values.
`AVG`	The average of the values in a numeric field expression. For example, `AVG(SALARY)` returns the average of all salary field values.
`COUNT`	The number of values in any field expression. For example, `COUNT(NAME)` returns the number of name values. When using `COUNT` with a field name, `COUNT` returns the number of non-null field values. A special example is `COUNT(*)`, which returns the number of records in the set, including records with null values.
`MAX`	The maximum value in any field expression. For example, `MAX(SALARY)` returns the maximum salary field value.
`MIN`	The minimum value in any field expression. For example, `MIN(SALARY)` returns the minimum salary field value.

Examples

```
SELECT SUM (Sales_Data.Amount) AS agg FROM Sales_Data

SELECT AVG (Sales_Data.Amount) AS agg FROM Sales_Data

SELECT COUNT (Sales_Data.Amount) AS agg FROM Sales_Data

SELECT MAX (Sales_Data.Amount) AS agg FROM Sales_Data
   WHERE Sales_Data.Amount < 3000

SELECT MIN (Sales_Data.Amount) AS agg FROM Sales_Data
   WHERE Sales_Data.Amount > 3000
```

Functions that return character strings

Functions that return character strings	Description	Example
CHR	Converts an ASCII code to a one-character string	CHR(67) returns **C**
CURRENT_USER	Returns the login ID specified at connect time	
DAYNAME	Returns the name of the day that corresponds to a specified date	
RTRIM	Removes trailing blanks from a string	RTRIM(' ABC ') returns ' ABC'
TRIM	Removes leading and trailing blanks from a string	TRIM(' ABC ') returns 'ABC'
LTRIM	Removes leading blanks from a string	LTRIM(' ABC') returns 'ABC'
UPPER	Changes each letter of a string to uppercase	UPPER('Allen') returns 'ALLEN'
LOWER	Changes each letter of a string to lowercase	LOWER('Allen') returns 'allen'
LEFT	Returns leftmost characters of a string	LEFT('Mattson',3) returns 'Mat'
MONTHNAME	Returns the names of the calendar month	
RIGHT	Returns rightmost characters of a string	RIGHT('Mattson',4) returns 'tson'
SUBSTR SUBSTRING	Returns a substring of a string, with parameters of the string, the first character to extract, and the number of characters to extract (optional)	SUBSTR('Conrad',2,3) returns 'onr' SUBSTR('Conrad',2) returns 'onrad'
SPACE	Generates a string of blanks	SPACE(5) returns ' '
STRVAL	Converts a value of any type to a character string	STRVAL('Woltman') returns 'Woltman' STRVAL(5 * 3) returns '15' STRVAL(4 = 5) returns 'False' STRVAL(DATE '2008-12-25') returns '2008-12-25'
TIME TIMEVAL	Returns the time of day as a string	At 9:49 PM, TIME() returns **21:49:00**
USERNAME USER	Returns the login ID specified at connect time	

Note The TIME() function is deprecated. Use the SQL standard CURRENT_TIME instead.

Examples

```
SELECT CHR(67) + SPACE(1) + CHR(70) FROM Salespeople

SELECT RTRIM(' ' + Salespeople.Salesperson_ID) AS agg FROM Salespeople

SELECT TRIM(SPACE(1) + Salespeople.Salesperson_ID) AS agg FROM
Salespeople

SELECT LTRIM(' ' + Salespeople.Salesperson_ID) AS agg FROM Salespeople

SELECT UPPER(Salespeople.Salesperson) AS agg FROM Salespeople

SELECT LOWER(Salespeople.Salesperson) AS agg FROM Salespeople

SELECT LEFT(Salespeople.Salesperson, 5) AS agg FROM Salespeople

SELECT RIGHT(Salespeople.Salesperson, 7) AS agg FROM Salespeople

SELECT SUBSTR(Salespeople.Salesperson_ID, 2, 2) +
SUBSTR(Salespeople.Salesperson_ID, 4, 2) AS agg FROM Salespeople

SELECT SUBSTR(Salespeople.Salesperson_ID, 2) +
SUBSTR(Salespeople.Salesperson_ID, 4) AS agg FROM Salespeople

SELECT SPACE(2) + Salespeople.Salesperson_ID AS Salesperson_ID FROM
Salespeople

SELECT STRVAL('60506') AS agg FROM Sales_Data WHERE Sales_Data.Invoice
= 1
```

Functions that return numbers

Functions that return numbers	Description	Example
ABS	Returns the absolute value of the numeric expression	
ATAN	Returns the arc tangent of the argument as an angle expressed in radians	
ATAN2	Returns the arc tangent of x and y coordinates as an angle expressed in radians	
CEIL CEILING	Returns the smallest integer value that is greater than or equal to the argument	
DEG DEGREES	Returns the number of degrees of the argument, which is an angle expressed in radians	
DAY	Returns the day part of a date	`DAY(DATE '2012-01-30')` returns **30**
DAYOFWEEK	Returns the day of week (1-7) of a date expression	`DAYOFWEEK(DATE '2004-05-01')` returns **7**
MOD	Divides two numbers and returns the remainder of the division	`MOD(10,3)` returns **1**

Functions that return numbers	Description	Example
EXP	Returns a value that is the base of the natural logarithm (e) raised to a power specified by the argument	
FLOOR	Returns the largest integer value that is less than or equal to the argument	
HOUR	Returns the hour part of a value	
INT	Returns the integer part of a number	`INT(6.4321)` returns **6**
LENGTH	Returns the length of a string	`LENGTH('ABC')` returns **3**
MONTH	Returns the month part of a date	`MONTH(DATE '2012-01-30')` returns **1**
LN	Returns the natural logarithm of the argument	
LOG	Returns the common logarithm of the argument	
MAX	Returns the larger of two numbers	`MAX(66,89)` returns **89**
MIN	Returns the smaller of two numbers	`MIN(66,89)` returns **66**
MINUTE	Returns the minute part of a value	
NUMVAL	Converts a character string to a number. The function fails If the character string is not a valid number.	`NUMVAL('123')` returns **123**
PI	Returns the constant value of the mathematical constant pi	
RADIANS	Returns the number of radians for an argument that is expressed in degrees	
ROUND	Rounds a number	`ROUND(123.456,0)` returns **123** `ROUND(123.456,2)` returns **123.46** `ROUND(123.456,-2)` returns **100**
SECOND	Returns the seconds part of a value	
SIGN	An indicator of the sign of the argument: -1 for negative, 0 for 0, and 1 for positive	
SIN	Returns the sine of the argument	
SQRT	Returns the square root of the argument	
TAN	Returns the tangent of the argument	
YEAR	Returns the year part of a date	`YEAR(DATE '2013-01-30')` returns **2013**

Functions that return dates

Functions that return dates	Description	Example
`CURDATE` `CURRENT_DATE`	Returns today's date	
`CURTIME` `CURRENT_TIME`	Returns the current time	
`CURTIMESTAMP` `CURRENT_TIMESTAMP`	Returns the current timestamp value	
`TIMESTAMPVAL`	Converts a character string to a timestamp	`TIMESTAMPVAL('2013-01-30 14:00:00')` returns its timestamp value.
`DATE` `TODAY`	Returns today's date	If today is 11/21/2013, `DATE()` returns **2013-11-21**
`DATEVAL`	Converts a character string to a date	`DATEVAL('2013-01-30')` returns **2013-01-30**

Note The `DATE()` function is deprecated. Use the SQL standard CURRENT_DATE instead.

Conditional functions

Conditional functions	Description	Example

`CASE WHEN`	**Simple CASE format**
	
	Compares the value of *input_exp* to the values of *value_exp* arguments to determine the result.
	
	`CASE` *input_exp*
	`{WHEN` *value_exp* `THEN` *result*`...} [ELSE` *result*`]`
	`END`
		`SELECT`
		`  Invoice_ID,`
		`  CASE Company_Name`
		`  WHEN 'Exports UK' THEN 'Exports UK Found'`
		`  WHEN 'Home Furniture Suppliers' THEN 'Home Furniture Suppliers Found'`
		`  ELSE 'Neither Exports UK nor Home Furniture Suppliers'`
		`  END,`
		`  Salesperson_ID`
		`FROM`
		`  Sales_Data`

	Searched CASE format
	
	Returns a result based on whether the condition specified by a WHEN expression is true.
	
	`CASE`
	`{WHEN` *boolean_exp* `THEN` *result...*`} [ELSE` *result*`]`
	`END`
		`SELECT`
		`  Invoice_ID,`
		`  Amount,`
		`  CASE`
		`  WHEN Amount > 3000 THEN 'Above 3000'`
		`  WHEN Amount < 1000 THEN 'Below 3000'`
		`  ELSE 'Between 1000 and 3000'`
		`  END,`
		`  Salesperson_ID`
		`FROM`
		`  Sales_Data`

Conditional functions	Description	Example
COALESCE	Returns the first value that is not NULL	SELECT Salesperson_ID, COALESCE(Sales_Manager, Salesperson) FROM Salespeople
NULLIF	Compares two values and returns NULL if the two values are equal; otherwise, returns the first value.	SELECT Invoice_ID, NULLIF(Amount, -1), Salesperson_ID FROM Sales_Data

Reserved SQL keywords

This section lists reserved keywords that should not be used as names for columns, tables, aliases, or other user-defined objects. If you are getting syntax errors, these errors may be due to using one of these reserved words. If you want to use one of these keywords, you need to use quotation marks to prevent the word from being treated as a keyword.

For example, the following `CREATE TABLE` statement shows how to use the `DEC` keyword as a data element name.

```
create table t ("dec" numeric)
```

ABSOLUTE
ACTION
ADD
ALL
ALLOCATE
ALTER
AND
ANY
ARE
AS
ASC
ASSERTION
AT
AUTHORIZATION
AVG
BEGIN
BETWEEN
BINARY
BIT
BIT_LENGTH
BLOB
BOOLEAN
BOTH
BY
CASCADE
CASCADED
CASE
CAST
CATALOG
CHAR
CHARACTER
CHARACTER_LENGTH
CHAR_LENGTH
CHECK
CHR
CLOSE
COALESCE
COLLATE
COLLATION
COLUMN
COMMIT
CONNECT
CONNECTION
CONSTRAINT
CONSTRAINTS
CONTINUE
CONVERT
CORRESPONDING
COUNT
CREATE
CROSS
CURDATE
CURRENT
CURRENT_DATE
CURRENT_TIME
CURRENT_TIMESTAMP
CURRENT_USER
CURSOR
CURTIME
CURTIMESTAMP
DATE
DATEVAL
DAY
DAYNAME
DAYOFWEEK
DEALLOCATE
DEC
DECIMAL
DECLARE
DEFAULT
DEFERRABLE
DEFERRED
DELETE
DESC
DESCRIBE
DESCRIPTOR
DIAGNOSTICS
DISCONNECT
DISTINCT
DOMAIN
DOUBLE
DROP
ELSE
END
END_EXEC
ESCAPE
EVERY

EXCEPT
EXCEPTION
EXEC
EXECUTE
EXISTS
EXTERNAL
EXTRACT
FALSE
FETCH
FIRST
FLOAT
FOR
FOREIGN
FOUND
FROM
FULL
GET
GLOBAL
GO
GOTO
GRANT
GROUP
HAVING
HOUR
IDENTITY
IMMEDIATE
IN
INDEX
INDICATOR
INITIALLY
INNER
INPUT
INSENSITIVE
NSERT
INT
INTEGER
INTERSECT
INTERVAL
INTO
IS
ISOLATION
JOIN
KEY
LANGUAGE
LAST
LEADING
LEFT
LENGTH
LEVEL
LIKE
LOCAL
LONGVARBINARY
LOWER
LTRIM
MATCH
MAX
MIN
MINUTE
MODULE
MONTH
MONTHNAME
NAMES
NATIONAL
NATURAL
NCHAR
NEXT
NO
NOT
NULL
NULLIF
NUMERIC
NUMVAL
OCTET_LENGTH
OF
OFFSET
ON
ONLY
OPEN
OPTION
OR
ORDER
OUTER
OUTPUT
OVERLAPS
PAD
PART
PARTIAL
PERCENT
POSITION
PRECISION
PREPARE
PRESERVE
PRIMARY
PRIOR
PRIVILEGES
PROCEDURE
PUBLIC
READ
REAL
REFERENCES
RELATIVE
RESTRICT
REVOKE
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ROLLBACK
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SET
SIZE
SMALLINT
SOME
SPACE
SQL
SQLCODE
SQLERROR
SQLSTATE
STRVAL
SUBSTRING
SUM
SYSTEM_USER
TABLE
TEMPORARY
THEN
TIES
TIME
TIMESTAMP
TIMESTAMPVAL
TIMEVAL
TIMEZONE_HOUR
TIMEZONE_MINUTE
TO
TODAY
TRAILING
TRANSACTION
TRANSLATE
TRANSLATION
TRIM
TRUE
UNION
UNIQUE
UNKNOWN
UPDATE
UPPER
USAGE
USER
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