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SQL Cheat Sheet

Background: What is SQL? Why do we need it?

SQL is a database language used to query and manipulate the data in the database.

Main objectives:

* To provide an efficient and convenient environment
* Manage information about users who interact with the DBMS

The SQL statements can be categorized as

Data Definition Language(DDL) Commands:

* CREATE: creates a new database object, such as a table.
* ALTER: used to modify the database object
* DROP: used to delete the objects.

Data Manipulation Language(DML) Commands:

* INSERT: used to insert a new data row record in a table.
* UPDATE: used to modify an existing record in a table.
* DELETE: used delete a record from the table.

Data Control Language(DCL) Commands:

* GRANT: used to assign permission to users to access database objects.
* REVOKE: used to deny permission to users to access database objects.

Data Query Language(DQL) Commands:

* SELECT: it is the DQL command to select data from the database.

Data Transfer Language(DTL) Commands:

* COMMIT: used to save any transaction into the database permanently.
* ROLLBACK: restores the database to the last committed state.

Identifying Data Types

[Data types](https://en.wikibooks.org/wiki/Structured_Query_Language/Data_Types) specify the type of data that an object can contain, such as integer data or character data. We need to specify the data type according to the data to be stored.

Following are some of the essential data types:

|  |  |
| --- | --- |
| Data Type | Used to Store |
| int | Integer data |
| smallint | Integer data |
| tinyint | Integer data |
| bigint | Integer data |
| decimal | Numeric data type with a fixed precision and scale. |
| numeric | numeric data type with a fixed precision and scale. |
| float | floating precision data |
| money | monetary data |
| datetime | data and time data |
| char(n) | fixed length character data |
| varchar(n) | variable length character data |
| text | character string |
| bit | integer data with 0 or 1 |
| image | variable length binary data to store images |
| real | floating precision number |
| binary | fixed length binary data |
| cursor | cursor reference |
| sql\_variant | different data types |
| timestamp | unique number in the database that is updated every time in a row that contains timestamp is inserted or updated. |
| table | temporary set of rows returned as a result set of a table-valued function. |
| xml | store and return xml values |

Managing Tables

Create Table

Table can be created using the CREATE TABLE statement. The syntax is as follows:

CREATE TABLE table\_name

( col\_name1 datatype,

col\_name2 datatype,

col\_name3 datatype,

…

);

Example: Create a table named EmployeeLeave in Human Resource schema with the following attributes:

|  |  |  |
| --- | --- | --- |
| Columns | Data Type | Checks |
| EmployeeID | int | NOT NULL |
| LeaveStartDate | date | NOT NULL |
| LeaveEndDate | date | NOT NULL |
| LeaveReason | varchar(100) | NOT NULL |
| LeaveType | char(2) | NOT NULL |

**CREATE** **TABLE** HumanResources.EmployeeLeave

(

EmployeeID int **NOT** **NULL**,

LeaveStartDate datetime **NOT** **NULL**,

LeaveEndDate datetime **NOT** **NULL**,

LeaveReason varchar(100),

LeaveType char(2) **NOT** **NULL** );

Constraints in SQL

Constraints define rules that must be followed to maintain consistency and correctness of data. A constraint can be created by using either of the following statements:

**CREATE** **TABLE** **statement**

**ALTER** **TABLE** **statement**

**CREATE** **TABLE** table\_name

(

column\_name **CONSTRAINT** constraint\_name constraint\_type

)

Types of Constraints:

|  |  |  |
| --- | --- | --- |
| Constraint | Description | Syntax |
| Primary key | Columns or columns that uniquely identify all rows in the table. | CREATE TABLE table\_name  ( col\_name [CONSTRAINT constraint\_name PRIMARY KEY] (col\_name(s))  ) |
| Unique key | Enforces uniqueness on non primary key columns. | **CREATE** **TABLE** table\_name  ( col\_name [**CONSTRAINT** constraint\_name **UNIQUE** **KEY**] (col\_name(s))  ) |
| Foreign key | Is used to remove the inconsistency in two tables when the data depends on other tables. | **CREATE** **TABLE** table\_name  ( col\_name [**CONSTRAINT** constraint\_name **FOREIGN** **KEY**] (col\_name)  **REFERENCES** table\_name (col\_name)  ) |
| Check | Enforce domain integrity by restricting the values to be inserted in the column. | **CREATE** **TABLE** table\_name  ( col\_name [**CONSTRAINT** constraint\_name] **CHECK** (expression) (col\_name(s)) )  expression:  **IN**, **LIKE**, **BETWEEN** |

3.2 Modifying Tables

Modify table using ALTER TABLE statement when:

1. Adding column
2. Altering data type
3. Adding or removing constraints

Syntax of ALTER TABLE:

**ALTER** **TABLE** table\_name

**ADD** column\_name;

**ALTER** **TABLE** table\_name

**DROP** **COLUMN** column\_name;

**ALTER** **TABLE** table\_name

**ALTER** **COLUMN** column\_name data\_type;

Renaming a Table

A table can be renamed whenever required using RENAME TABLE statement:

RENAME TABLE old\_table\_name TO new\_table\_name;

Dropping a Table versus Truncate Table

A table can be dropped or deleted when no longer required using DROP TABLE statement:

**DROP** **TABLE** table\_name;

The contents of the table can be deleted when no longer required without deleting the table itself using TRUNCATE TABLE statement:

**TRUNCATE** **TABLE** table\_name;

Manipulating Data

Storing Data in a Table

Syntax:

**INSERT** **INTO** table\_name (col\_name1, col\_name2, col\_name3…)

**VALUES** (value1, value2, value3…);

Example: Inserting data into Student table.

**INSERT** **INTO** Student (StudentID, FirstName,LastName,Marks)

**VALUES** (‘101’,’John’,’Ray’,’78’);

Example: Inserting multiple data into Student table.

**INSERT** **INTO** Student

**VALUES** (101,’John’,’Ray’,78),

(102,‘Steve’,’Jobs’,89),

(103,‘Ben’,’Matt’,77),

(104,‘Ron’,’Neil’,65),

(105,‘Andy’,’Clifton’,65),

(106,‘Park’,’Jin’,90);

Copying Data from one table to another:

**INSERT** **INTO** table\_name2

**SELECT** \* **FROM** table\_name1

**WHERE** [condition]

Updating Data in a Table

Data can be updated in the table using UPDATE DML statement:

SELECT table\_name

SET col\_name1 = value1 , col\_name2 = value2…

WHERE condition

Example update marks of Andy to 85

SELECT table\_name

SET Marks = 85

WHERE FirstName = ‘Andy’

Deleting Data from a Table

A row can be deleted when no longer required using DELETE DML statement.

Syntax:

**DELETE** **FROM** table\_name

**WHERE** condition

**DELETE** **FROM** Student

**WHERE** StudentID = ‘103’

Deleting all records from a table:

DELETE table\_name

Retrieving Attributes

One or more column can be displayed while retrieving data from the table.

One may want to view all the details of the Employee table or might want to view few columns.

Required data can be retrieved data from the database tables by using the SELECT statement.

The syntax of SELECT statement is:

**SELECT** [**ALL** | **DISTINCT**] select\_column\_list

[**INTO** [new\_table\_name]]

[**FROM** [table\_name | view\_name]]

[**WHERE** **search** condition]

Consider the following Student table:

|  |  |  |  |
| --- | --- | --- | --- |
| StudentID | FirstName | LastName | Marks |
| 101 | John | Ray | 78 |
| 102 | Steve | Jobs | 89 |
| 103 | Ben | Matt | 77 |
| 104 | Ron | Neil | 65 |
| 105 | Andy | Clifton | 65 |
| 106 | Park | Jin | 90 |

Retrieving Selected Rows

To retrieve selected rows from a table use WHERE clause in the SELECT statement.

**SELECT** \*

**FROM** Student

**WHERE** StudentID = 104;

HAVING Clause is used instead of WHERE for aggregate functions.

Comparison Operators

Comparison operators test for the similarity between two expressions.

Syntax:

SELECT column\_list

FROM table\_name

WHERE expression1 comparison\_operatore expression2

Example of some comparison operators:

**SELECT** StudentID,Marks

**FROM** Student

**WHERE** Marks = 90;

**SELECT** StudentID,Marks

**FROM** Student

**WHERE** StudentID > 101;

**SELECT** StudentID,Marks

**FROM** Student

**WHERE** Marks != 89;

**SELECT** StudentID,Marks

**FROM** Student

**WHERE** Marks >= 50;

Logical Operators

Logical operators are used to SELECT statement to retrieve records based on one or more conditions. More than one logical operator can be combined to apply multiple search conditions.

Syntax:

**SELECT** column\_list

**FROM** table\_name

**WHERE** conditional\_expression1 [**NOT**]

conditional\_expression2

Types of Logical Operators:

OR Operator

**SELECT** StudentID,Marks,

**FROM** Student

**WHERE** Marks= 40 **OR** Marks=56 **OR** Marks = 65;

AND Operator

**SELECT** StudentID,Marks,

**FROM** Student

**WHERE** Marks= 89 **AND** Marks=56 **AND** Marks = 65;

NOT Operator

**SELECT** StudentID,Marks,

**FROM** Student

**WHERE** **NOT** LastName = “Jobs”;

Range Operator

Range operator retrieves data based on range.

Syntax:

**SELECT** column\_name1, col\_name2….

**FROM** table\_name

**WHERE** expression1 range\_operator expression2 **AND** expression3

Types of Range operators:

BETWEEN

**SELECT** StudentID,Marks

**FROM** Student

**WHERE** Marks **BETWEEN** 40 **AND** 70;

NOT BETWEEN

**SELECT** FirstName,Marks,

**FROM** Student

**WHERE** Marks **NOT** **BETWEEN** 40 **AND** 50;

Retrieve Records That Match a Pattern

Data from the table can be retrieved that match a specific pattern.

The LIKE keyword matches the given character string with a specific pattern.

**SELECT** \*

**FROM** Student

**WHERE** FirstName **LIKE** ‘Ro%’

**SELECT** \*

**FROM** Student

**WHERE** FirstName **LIKE** ‘\_e%’

Displaying in a Sequence

Use ORDER BY clause to display the data retrieved in a specific order.

**SELECT** StudentID, LastName,

**FROM** Student

**ORDER** **BY** Marks **DESC**;

Displaying without Duplication

The DISTINCT keyword is used to eliminate rows with duplicate values in a column.

Syntax:

**SELECT** [**ALL** | **DISTINCT**] col\_names

**FROM** table\_name

**WHERE** search\_condition

**SELECT** **DISTINCT** Marks

**FROM** Student

**WHERE** LastName **LIKE** ‘o%’;

JOINS

Joins are used to retrieve data from more than one table together as a part of a single result set. Two or more tables can be joined based on a common attribute.

Types of JOINS:

Consider two tables Employees and EmployeeSalary

|  |  |  |  |
| --- | --- | --- | --- |
| EmployeeID (PK) | FirstName | LastName | Title |
| 1001 | Ron | Brent | Developer |
| 1002 | Alex | Matt | Manager |
| 1003 | Ray | Maxi | Tester |
| 1004 | August | Berg | Quality |

|  |  |  |
| --- | --- | --- |
| EmployeeID (FK) | Department | Salary |
| 1001 | Application | 65000 |
| 1002 | Digital Marketing | 75000 |
| 1003 | Web | 45000 |
| 1004 | Software Tools | 68000 |

INNER JOIN

An inner join retrieves records from multiple tables by using a comparison operator on a common column.

Syntax:

**SELECT** column\_name1,colomn\_name2, …

**FROM** table1 **INNER** **JOIN** table2

**ON** table1.column\_name = table2.column\_name

Example:

**SELECT** e.LastName, e.Title, es.salary,

**FROM** e.Employees **INNER** **JOIN** es.EmployeeSalary

**ON** e.EmployeeID = es.EmployeeID

OUTER JOIN

An outer join displays the resulting set containing all the rows from one table and the matching rows from another table.

An outer join displays NULL for the column of the related table where it does not find matching records.

Syntax:

**SELECT** column\_name1,colomn\_name2, …

**FROM** table1 [**LEFT**|**RIGHT**|**FULL**]**OUTER** **JOIN** table2

**ON** table1.column\_name = table2.column\_name

Types of Outer Join

LEFT OUTER JOIN: In left outer join all rows from the table on the left side of the LEFT OUTER JOIN keyword is returned, and the matching rows from the table specified on the right side are returned the result set.

Example:

**SELECT** e.LastName, e.Title, es.salary,

**FROM** e.Employees **LEFT** **OUTER** **JOIN** es.EmployeeSalary

**ON** e.EmployeeID = es.EmployeeID

RIGHT OUTER JOIN: In right outer join all rows from the table on the right side of the RIGHT OUTER JOIN keyword are returned, and the matching rows from the table specified on the left side are returned is the result set.

Example:

**SELECT** e.LastName, e.Title, es.salary,

**FROM** e.Employees **LEFT** **OUTER** **JOIN** es.EmployeeSalary

**ON** e.EmployeeID = es.EmployeeID

FULL OUTER JOIN: It is a combination of left outer join and right outer join. This outer join returns all the matching and non-matching rows from both tables. Whilst, the matching records are displayed only once.

Example:

**SELECT** e.LastName, e.Title, es.salary,

**FROM** e.Employees **FULL** **OUTER** **JOIN** es.EmployeeSalary

**ON** e.EmployeeID = es.EmployeeID

CROSS JOIN

Also known as the Cartesian Product between two tables joins each row from one table with each row of another table. The rows in the result set is the count of rows in the first table times the count of rows in the second table.

Syntax:

**SELECT** column\_name1,colomn\_name2,column\_name1 + column\_name2 **AS** new\_column\_name

**FROM** table1 **CROSS** **JOIN** table2

EQUI JOIN

An Equi join is the same as inner join and joins tables with the help of foreign key except this join is used to display all columns from both tables.

SELF JOIN

In self join, a table is joined with itself. As a result, one row is in a table correlates with other rows in the same table. In this join, a table name is mentioned twice in the query. Hence, to differentiate the two instances of a single table, the table is given two aliases. Syntax:

**SELECT** t1.c1,t1.c2 **AS** column1,t2.c3,t2.c4 **AS** column2

**FROM** table1 t1 **JOIN** table2 t2

**WHERE** condition

Subqueries

An SQL statement that is used inside another SQL statement is termed as a subquery.

They are nested inside WHERE or HAVING clause of SELECT, INSERT, UPDATE and DELETE statements.

* Outer Query: Query that represents the parent query.
* Inner Query: Query that represents the subquery.

Using IN Keyword

If a subquery returns more than one value, we might execute the outer query if the values within the columns specified in the condition match any value in the result set of the subquery.

Syntax:

**SELECT** **column**, **column**

**FROM** table\_name

**WHERE** **column** [**NOT**] **IN**

(**SELECT** **column**

**FROM** table\_name [**WHERE** conditional\_expression] )

Using EXISTS Keyword

EXISTS clause is used with subquery to check if a set of records exists.

TRUE value is returned by the subquery in case if the subquery returns any row.

Syntax:

**SELECT** **column**, **column**

**FROM** table\_name

**WHERE** **EXISTS**

(**SELECT** column\_name **FROM** table\_name **WHERE** condition)

Using Nested Subqueries

A subquery can contain more than one subqueries. Subqueries are used when the condition of a query is dependent on the result of another query, which is, in turn, is dependent on the result of another subquery.

Syntax:

**SELECT** **column**, **column**

**FROM** table\_name

**WHERE** column\_name expression\_operator

(**SELECT** column\_list **FROM** table\_name

**WHERE** column\_name expression\_operator

(**SELECT** column\_list **FROM** table\_name

**WHERE** [condition] ) )

Correlated Subquery

A correlated subquery can be defined as a query that depends on the outer query for its evaluation.

Using Functions to Customize ResultSet

Various in-built functions can be used to customize the result set.

Syntax:

**SELECT** function\_name (**parameters**)

Using String Functions

String values in the result set can be manipulated by using string functions.

They are used with char and varchar data types.

Following are the commonly used string functions are:

|  |  |
| --- | --- |
| Function Name | Example |
| left | **SELECT** **left**  (‘RICHARD’ ,4) |
| len | **SELECT** **len**  (‘RICHARD’) |
| lower | **SELECT** **lower**  (‘RICHARD’) |
| reverse | **SELECT** **reverse**  (‘**ACTION**’) |
| right | **SELECT** **right**  (‘RICHARD’ ,4) |
| space | **SELECT** ‘RICHARD’ + **space**(2) + ‘HILL’ |
| str | **SELECT** **str** (123.45,6,2) |
| substring | **SELECT** **substring** (‘Weather’ ,2,2) |
| upper | **SELECT** **upper**  (‘RICHARD’) |

Using Date Functions

Date functions are used to manipulate date time values or to parse the date values.

Date parsing includes extracting components, such as day, month, and year from a date value.

Some of the commonly used date functions are:

|  |  |  |
| --- | --- | --- |
| Function Name | Parameters | Description |
| dateadd | (date part, number, date) | Adds the number of date parts to the date. |
| datediff | (date part, date1, date2) | Calculates the number of date parts between two dates. |
| Datename | (date part, date) | Returns date part from the listed as a character value. |
| datepart | (date part, date) | Returns date part from the listed as an integer. |
| getdate | 0 | Returns current date and time |
| day | (date) | Returns an integer, which represents the day. |
| month | (date) | Returns an integer, which represents the month. |
| year | (date) | Returns an integer, which represents the year. |

Using Mathematical Functions

Numeric values in a result set can be manipulated in using mathematical functions.

The following table lists the mathematical functions:

|  |  |  |
| --- | --- | --- |
| Function Name | Parameters | Description |
| abs | (numeric\_expression) | Returns an absolute value |
| acts,asin,atan | (float\_expression) | Returns an angle in radians |
| cos, sin, cot,tan | (float\_expression) | Returns the cosine, sine, cotangent, or tangent of the angle in radians. |
| degrees | (numeric\_expression) | Returns the smallest integer greater than or equal to specifies value. |
| exp | (float\_expression) | Returns the exponential value of the specified value. |
| floor | (numeric\_expression) | Returns the largest integer less than or equal to the specified value. |
| log | (float\_expression) | Returns the natural logarithm of the specified value. |
| pi | 0 | Returns the constant value of 3.141592653589793 |
| power | (numeric\_expression,y) | Returns the value of numeric expression to the value of y |
| radians | (numeric\_expression) | Converts from degrees to radians. |
| rand | ([seed]) | Returns a random float number between 0 and 1. |
| round | (numeric\_expression,length) | Returns a numeric expression rounded off to the length specified as an integer expression. |
| sign | (numeric\_expression) | Returns positive, negative or zero. |
| sqrt | (float\_expression) | Returns the square root of the specified value. |

Using Ranking Functions

Ranking functions are used to generate sequential numbers for each row to give a rank based on specific criteria.

Ranking functions return a ranking value for each row. Following functions are used to rank the records:

* row\_number Function: This function returns the sequential numbers, starting at 1, for the rows in a result set based on a column.
* rank Function: This function returns the rank of each row in a result set based on specified criteria.
* dense\_rank Function: The dense\_rank() function is used where consecutive ranking values need to be given based on specified criteria.

These functions use the OVER clause that determines the ascending or descending sequence in which rows are assigned a rank.

Using Aggregate Functions

The aggregate functions, on execution, summarize the values for a column or group of columns and produce a single value.

Syntax:

**SELECT** aggrgate\_function ([**ALL** | **DISTINCT**] expression)

**FROM** table\_name

Following are the aggregate functions:

|  |  |
| --- | --- |
| Function Name | Description |
| avg | returns the average of values in a numeric expression, either all or distinct. |
| count | returns the number of values in an expression, either all or distinct. |
| min | returns the lowest value in an expression. |
| max | returns the highest value in an expression. |
| sum | returns the total of values in an expression, either all or distinct. |

GROUPING DATA

Grouping data means to view data that match a specific criteria to be displayed together in the result set.

Data can be grouped by using GROUP BY, COMPUTE,COMPUTE BY and PIVOT clause in the SELECT statement.

GROUP BY Clause

Summarizes the result set into groups as defined in the query by using aggregate functions.

Syntax:

**SELECT** column\_list

**FROM** table\_name

**WHERE** condition

[**GROUP** **BY** [**ALL**] expression]

[**HAVING** search\_condition]

COMPUTE and COMPUTE BY Clause

This COMPUTE clause, with the SELECT statement, is used to generate summary rows by using aggregate functions in the query result.

The COMPUTE BY clause can be used to calculate summary values of the result set on a group of data.

Syntax:

**SELECT** column\_list

**FROM** table\_name

**ORDER** **BY** column\_name

**COMPUTE** aggregate\_function (column\_name)

[**BY** column\_name]

PIVOT Clause

The PIVOT operator is used to transform a set of columns into values, PIVOT rotates a table-valued expression by turning the unique values from one column in the expression into multiple columns in the output.

Syntax:

**SELECT** \*

**FROM** table\_name

**PIVOT** (**aggregate** **function** (value\_column)

**FOR** pivot\_column

**IN** (column\_list)

) table\_alias