SQL Overview

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Software for class

Open source SQL database system

Database IDE – Many databases, one tool

Getting started…

Download *"Exercise"* SQLite database.

Download & run script to create schema in Postgres: Jupiter.

Overview of SQL

Terminology

SQL	SAS
Table	Data Set
Row	Observation
Column	Variable

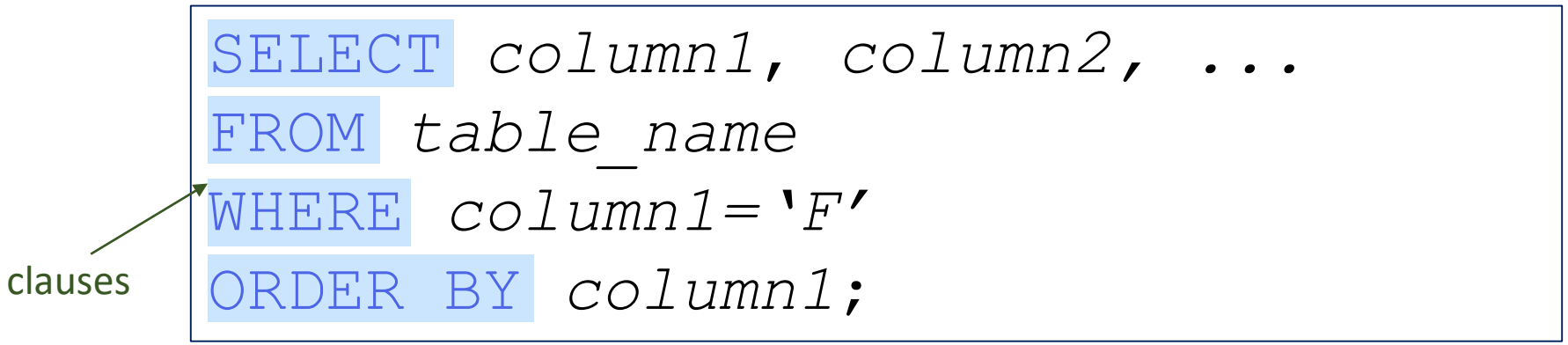
Select Statement

A SELECT statement is **used to query one or more tables**. The results of the SELECT statement are written to the default output destination:

```
SELECT column1, column2, ...
FROM table_name;
```

Select Statement

A SELECT statement contains smaller building blocks called clauses.



Although it can contain multiple clauses, each SELECT statement begins with the SELECT keyword

Select Statement: Required Clauses

A SELECT statement contains smaller building blocks called clauses.

```
SELECT column1, column2, ...
FROM table_name;
```

- The **SELECT** clause specifies the columns and column order.
- The **FROM** clause specified the data sources

Select Statement: Optional Clauses

```
SELECT column1, column2, ...
FROM table_name
WHERE sql-expression
GROUP BY column_name
HAVING sql-expression
ORDER BY column_name <DESC>;
```

- The **WHERE** clause specifies data that meets certain conditions.
- The **GROUP BY** clause groups data for processing.
- The **HAVING** clause specifies groups that meet certain conditions.
- The **ORDER BY** clause specifies an order for the data.

The specified order of the above clauses within the SELECT statement is required.

Additional SQL Statements

```
SELECT expression;
CREATE expression;
DESCRIBE expression;
INSERT expression;

… and many more.
```

Specifying Columns

Querying All Columns in a Table

To print all of a table's columns in the order in which they were stored, specify an asterisk in a SELECT clause.

```
SELECT * FROM table_name;
```

```
SELECT *
FROM "schema".table_name;
```

Querying Specific Columns in a Table

List the columns that you want and the order to display them in the SELECT clause.

```
SELECT column1, column2, ...
FROM table_name;
```

```
SELECT "column1", "column2"
FROM "schema".table_name;
```

Naming a column

Name the new column using the AS keyword.

```
SELECT column1 as name
FROM table_name;
```

```
SELECT "column1" as name
FROM "schema".table_name;
```

Table: **`jupiter.employee_payroll`**
Display: Employee_ID, Salary and create a new Column **Bonus,** which contains an amount equal to 10% of the employee's salary

Table: **`exercise.records`**
Display: ID, Capital_Gain and create a new Column **Bonus,** which contains an amount equal to 10% of the Capital_Gain

Core Functions

Postgres core functions:
https://www.postgresql.org/docs/12/functions.html

Example: floor(), ceil (), log(), position(), substring()

SQLite core functions:
https://www.sqlite.org/lang_corefunc.html

Example: abs(), round(), substr(), trim(), upper()

Creating a Table

Creating and Populating a Table

```
CREATE TABLE table-name AS
SELECT column1 as name
FROM table_name;
```

Table: **`jupiter.employee_payroll`**

Create a table TEMP:

Employee_ID, Salary and Bonus

Table: **`exercise.records`**

Create a table Exercise.TEMP:

ID, Capital_Gain and Bonus

Specifying Rows

Eliminating Duplicate Rows

Use the *DISTINCT* keyword to eliminate duplicate rows.

```
SELECT distinct Department
FROM employee_information;
```

The DISTINCT keyword applies to all columns in the SELECT list. One row is displayed for each unique combination of values.

Subsetting with the WHERE Clause

Use a WHERE clause to specify a condition that the data must satisfy **before being selected**.

```
SELECT Department
FROM employee_information
WHERE salary > 30000;
```

A WHERE clause is evaluated before the SELECT clause.

Using the previous query:
Display: only those employees who receive bonuses less than $3000

Using the previous query:
Display: only those employees who receive bonuses greater than $200

ANSI Standard

One solution is to repeat the calculation in the WHERE clause.

```
proc sql;
select Employee_ID, Employee_Gender,
       Salary, Salary*.10 as Bonus
   from jupiter.employee_information
   where Salary*.10<3000;
quit;
```

What does the Postgres manual say?

- SQL standard: column aliases can be referenced in ORDER BY, GROUP BY and HAVING clauses.

- **However**, in Postgres: An output column's name can be used to refer to the column's value in ORDER BY and GROUP BY clauses, but not in the WHERE or HAVING clauses; there you must write out the expression instead.

- Reference: https://www.postgresql.org/docs/current/sql-select.html#SQL-SELECT-LIST

How does SQLite allow it?

- SQL standard: column aliases can be referenced in ORDER BY, GROUP BY and HAVING clauses.

- As an **extension**, SQLite also allows column aliases in WHERE and JOIN ON clauses, but again, such usage is non-standard (though very convenient at times).

- Neither the standard nor SQLite implementation allow referencing aliases in the SELECT clause.