

SQL: Structured Query Language

Grouping Queries

SQL SELECT statement has two more clauses to support grouping operations: `GROUP BY` and `HAVING` clauses.

GROUP BY Clause

The syntax of a `GROUP BY` clause is

```
GROUP BY <AttributeName>,...,<AttributeName>
```

The `GROUP BY` clause is added to the `SELECT` statement after the `WHERE` clause (or, if there is no `WHERE` clause, after the `FROM` clause).

`GROUP BY` clause causes the DBMS to separate the cartesian product of all tables referenced in the `FROM` clause into **groups** of tuples.

Each group of tuples *must agree on all values* of attributes listed in the `GROUP BY` clause

Grouping operation is used to **allow for computation and reporting of aggregate operations over groups** in the `SELECT` statement.

Consider, for example the relational table

```
Student(FirstName, LastName, GPA, Class, Grade, School)
```

The following query

```
SELECT School, COUNT(*)  
FROM Student  
GROUP BY School;
```

will output the number of students enrolled in each school.

The following rules need to be observed concerning the content of the `SELECT` clause. If a `GROUP BY` clause appears in the `SELECT` statement, then the `SELECT` can contain only the following:

- Attributes that are listed in the **GROUP BY** clause.
- Aggregate operations on attributes not listed in the **GROUP BY** clause.
- **COUNT(*)**

HAVING Clause

GROUP BY clause transforms the cartesian product from a relation of tuples into a relation of groups of tuples.

HAVING clause to the groups is what **WHERE** clause to the individual tuples. It provides a condition, and filters out the groups that fail it.

The syntax of **HAVING** clause is:

```
HAVING <Condition>
```

Here, the condition is a boolean combination of conditions that involve:

- Attributes from the **GROUP BY** list
- Aggregate expressions over attributes **not** from the **GROUP BY** list.

For example

```
SELECT School, COUNT(*)  
FROM Student  
GROUP BY School  
HAVING AVG(GPA) > 3.0;
```

returns the number of students enrolled in each school, which has average student GPA over 3.0.