# 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.