Aggregate Functions

```
SELECT avg(salary), max(salary), min(salary)
FROM employee;
```

Functions:
- avg
- sum
- min
- max
- count

Aggregate Functions Examples

```
SELECT max(salary), min(salary)
FROM employee, department
WHERE dno = dnumber AND dname='Research';

SELECT count(*) AS employees
FROM employee;

SELECT count(distinct superssn)
FROM employee;
```

Nested Aggregate Functions

```
SELECT lname, fname
FROM employee
WHERE (SELECT count(*)
       FROM dependent
       WHERE ssn = essn) >= 2;

SELECT lname, fname,
       (SELECT count(*)
        FROM dependent
        WHERE ssn = essn) AS depnr
FROM employee;
```

Nested Aggregate Functions Examples

- List names of supervisors that supervise more than one person.
- List employees making less than the average salary.
- List names of employees that work on at least 3 projects.
- Which employees have more male than female dependents?
- List names of employees that work less than 38 hours on projects.
- (Trickier:) List names of employees that work the longest total time on projects (according to works_on)

Grouping

```
SELECT dno, count(*), avg(salary)
FROM employee
GROUP BY dno;

SELECT pnumber, pname, count(*)
FROM project, works_on
WHERE pnumber = pno
GROUP BY pnumber, pname;
```

Grouping Examples

- List department names with number of locations.
- Display a list of employee names with the number of dependents.
- Same, with all employees, even if they do not have any dependents.
- (Again:) List names of employees that work the longest total time (according to works_on)

Having

Conditions involving groupwise properties, are specified in the HAVING clause.

```
SELECT dno, count(*), avg(salary)
FROM employee
GROUP BY dno
HAVING count(*) >2;
```

```
SELECT dno, count(*), avg(salary)
FROM employee
GROUP BY dno
HAVING avg(salary) >33500;
```

Having Examples

- Retrieve the names of projects on which more than two employees work
- List projects with a total project time less than 40 hours per week.
- List departments in which the average salary is more than 30000 (smallest, largest salary?).
- Trickier: For each department compute the number of employees that make more than 40000, but only include departments with more than 5 employees.
- List employees that have at least two female dependents.

SELECT Syntax

```
SELECT attributes and functions (define aliases)
FROM list of tables (define aliases)
WHERE condition
GROUP BY grouping attributes
HAVING group condition
ORDER BY attribute list
```