ORACLE* Academy

Database Programming with SQL

8-1 **Group Functions**





Objectives

This lesson covers the following objectives:

- Define and give an example of the seven group functions: SUM, AVG, COUNT, MIN, MAX, STDDEV, VARIANCE
- Construct and execute a SQL query using group functions
- Construct and execute group functions that operate only with numeric data types



Purpose

- What if you were writing an article for the school newspaper and, to make a point, you wanted to know the average age of the students at your school?
- What would you have to do to get this information?
- You could ask each student their age in years, months, and days, add up all of these numbers, and then divide by the number of students in your school.
- That would be one way -- a very slow and difficult way -to find this information.



Purpose

- What if you needed to know this immediately so that you could meet a 3:00 p.m. deadline?
- You might have a problem!
- What if each student's date of birth was in a school database in the STUDENT table?
- It would be so easy then!
- In this lesson, you are going to learn about the power of group functions in SQL.





GROUP Functions

- In SQL, the following group functions can operate on a whole table or on a specific grouping of rows.
- Each function returns one result.







GROUP Functions

- Group Functions:
 - -AVG
 - -COUNT
 - -MIN
 - -MAX
 - -SUM
 - VARIANCE
 - -STDDEV





GROUP Functions List

- MIN: Used with columns that store any data type to return the minimum value.
- MAX: Used with columns that store any data type to return the maximum value.

| DEPT_ID | SALARY |
|---------|--------|
| 90 | 24000 |
| 90 | 17000 |
| 90 | 17000 |
| 60 | 9000 |
| 60 | 6000 |
| 60 | 4200 |
| 50 | 5800 |
| 50 | 3500 |
| 50 | 3100 |
| 50 | 2600 |
| 50 | 2500 |
| | • • • |
| | 7000 |
| 10 | 4400 |

SELECT MAX(salary)
FROM employees;

MAX (SALARY)
24000



GROUP Functions List

- SUM: Used with columns that store numeric data to find the total or sum of values.
- AVG: Used with columns that store numeric data to compute the average.

| DEPT_ID | SALARY |
|---------|--------|
| 90 | 24000 |
| 90 | 17000 |
| 90 | 17000 |
| 60 | 9000 |
| 60 | 6000 |
| 60 | 4200 |
| 50 | 5800 |
| 50 | 3500 |
| 50 | 3100 |
| 50 | 2600 |
| 50 | 2500 |
| | |
| | 7000 |
| 10 | 4400 |

SELECT MAX(salary)
FROM employees;

MAX (SALARY) 24000





GROUP Functions List

- COUNT: Returns the number of rows.
- VARIANCE: Used with columns that store numeric data to calculate the spread of data around the mean.
 - For example, if the average grade for the class on the last test was 82% and the student's scores ranged from 40% to 100%, the variance of scores would be greater than if the student's scores ranged from 78% to 88%.
- STDDEV: Similar to variance, standard deviation measures the spread of data.
 - For two sets of data with approximately the same mean, the greater the spread, the greater the standard deviation





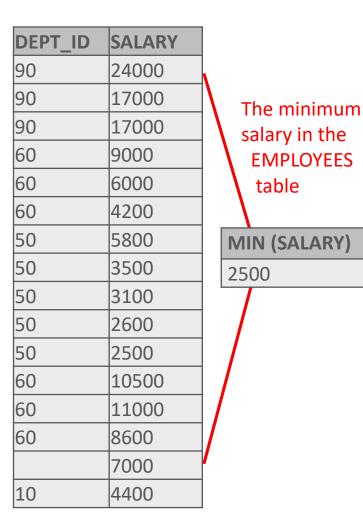
GROUP Functions SELECT Clause

 Group functions are written in the SELECT clause:

```
SELECT column, group_function(column),
..

FROM table
WHERE condition
GROUP BY column;
```

- What are Group Functions?
- Group Functions operate on sets of rows to give one result per group.



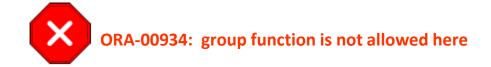




GROUP Function Cautions

- Important things you should know about group functions:
 - Group functions cannot be used in the WHERE clause:

```
SELECT last_name, first_name
FROM employees
WHERE salary = MIN(salary);
```







• MIN: Used with columns that store any data type to return the minimum value.

| Examples: | Result |
|----------------------------------|-------------|
| SELECT MIN(life_expect_at_birth) | 32.62 |
| AS "Lowest Life Exp" | |
| FROM wf_countries; | |
| SELECT MIN(country_name) | Anguilla |
| FROM wf_countries; | |
| SELECT MIN(hire_date) | 17-Jun-1987 |
| FROM employees; | |





 MAX: Used with columns that store any data type to return the maximum value.

| Examples: | Result |
|----------------------------------|----------------|
| SELECT MAX(life_expect_at_birth) | 83.51 |
| AS "Highest Life Exp" | |
| FROM wf_countries; | |
| SELECT MAX(country_name) | Western Sahara |
| FROM wf_countries | |
| SELECT MAX(hire_date) | 29-Jan-2000 |
| FROM employees; | |





• SUM: Used with columns that store numeric data to find the total or sum of values.

| Examples: | Result |
|---------------------------|--------|
| SELECT SUM(area) | 241424 |
| FROM wf_countries | |
| WHERE region_id = 29; | |
| SELECT SUM(salary) | 58000 |
| FROM employees | |
| WHERE department_id = 90; | |





 AVG: Used with columns that store numeric data to compute the average.

| Examples: | Result |
|--------------------------------------|----------|
| SELECT AVG(area) | 9656.96 |
| FROM wf_countries | |
| WHERE region_id = 29; | |
| SELECT ROUND(AVG(salary), 2) | 19333.33 |
| FROM employees | |
| <pre>WHERE department_id = 90;</pre> | |



- VARIANCE: Used with columns that store numeric data to calculate the spread of data around the mean.
- STDDEV: Similar to variance, standard deviation measures the spread of data.

| Examples: | Result |
|---|----------|
| <pre>SELECT ROUND(VARIANCE(life_expect_at_birth),4)</pre> | 143.2394 |
| FROM wf_countries; | |
| <pre>SELECT ROUND(STDDEV(life_expect_at_birth), 4)</pre> | 11.9683 |
| FROM wf_countries; | |





GROUP Function and NULL

- Group functions ignore NULL values.
- In the example below, the null values were not used to find the average commission_pct.

SELECT AVG(commission_pct)
FROM employees;

AVG(COMMISSION_PCT)

.2125

| LAST_NAME | COMMISSION_PCT |
|-----------|----------------|
| King | - |
| Kochhar | - |
| De Haan | - |
| Whalen | - |
| Higgins | - |
| Gietz | - |
| Zlotkey | .2 |
| Abel | .3 |
| Taylor | .2 |
| Grant | .15 |
| Mourgos | - |
| | |



More Than One Group Function

 You can have more than one group function in the SELECT clause, on the same or different columns.

```
SELECT MAX(salary), MIN(salary), MIN(employee_id)
FROM employees
WHERE department_id = 60;
```

| MAX(SALARY) | MIN(SALARY) | MIN(EMPLOYEE_ID) |
|-------------|-------------|------------------|
| 9000 | 4200 | 103 |



Rules for Group Functions

- Group functions ignore null values.
- Group functions cannot be used in the WHERE clause.
- MIN, MAX and COUNT can be used with any data type;
 SUM, AVG, STDDEV, and VARIANCE can be used only with numeric data types.





Terminology

Key terms used in this lesson included:

- AVG
- COUNT
- Group functions
- MAX
- MIN
- STDDEV
- SUM
- VARIANCE



Summary

In this lesson, you should have learned how to:

- Define and give an example of the seven group functions: SUM, AVG, COUNT, MIN, MAX, STDDEV, VARIANCE
- Construct and execute a SQL query using group functions
- Construct and execute group functions that operate only with numeric data types



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