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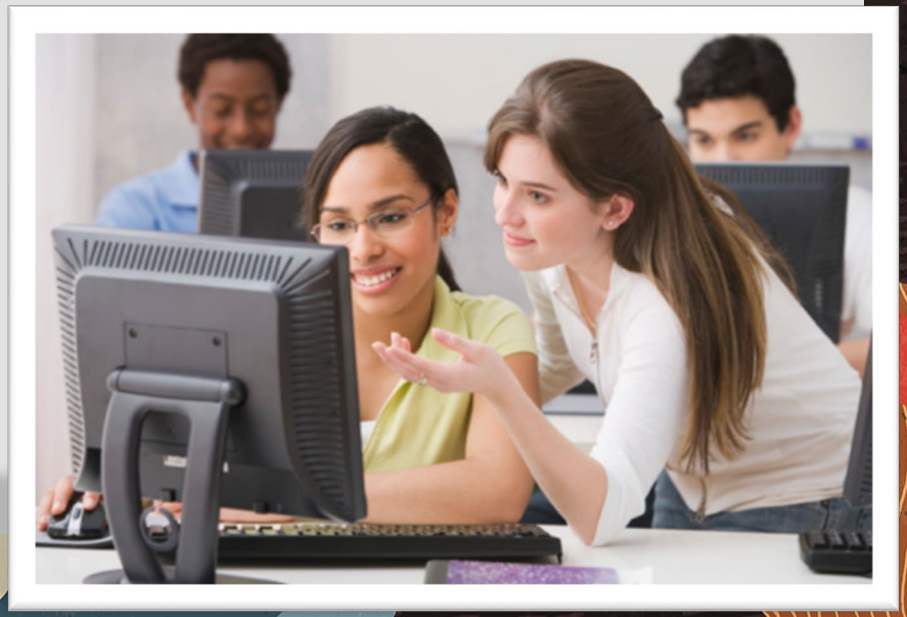
Database Programming with SQL

8-1

Group Functions



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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

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
60	10500
60	11000
60	8600
	7000
10	4400

The minimum salary in the EMPLOYEES table

MIN (SALARY)
2500

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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);
```

ORA-00934: group function is not allowed here

GROUP Function examples

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

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

GROUP Function examples

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

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

GROUP Function examples

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

Example:	Result
SELECT SUM(area) FROM wf_countries	241424
SELECT SUM (salary) FROM employees WHERE department_id = 90;	58000

GROUP Function examples

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

Example:	Result
SELECT AVG(area) FROM wf_countries WHERE region_id = 29;	9656.96
SELECT ROUND(AVG(salary), 2) FROM employees WHERE department_id = 90;	19333.33

- 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

Example:	Result
SELECT ROUND(VARIANCE(life_expect_at_birth),4) FROM wf_countries;	143.2394
SELECT ROUND(STDDEV(life_expect_at_birth), 4) FROM wf_countries;	11.9683

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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