COURSE TECHNOLOGY
CENGAGE Learning™

Oracle 11g: SQL

Group Functions

Objectives

- Differentiate between single-row and multiple-row functions
- Use the SUM and AVG functions for numeric calculations
- Use the COUNT function to return the number of records containing non-NULL values
- Use COUNT(*) to include records containing NULL values
- Use the MIN and MAX functions with nonnumeric fields

Objectives (continued)

- Determine when to use the GROUP BY clause to group data
- Identify when the HAVING clause should be used
- List the order of precedence for evaluating WHERE, GROUP BY, and HAVING clauses
- State the maximum depth for nesting group functions
- Nest a group function inside of a single-row function

Objectives (continued)

- Calculate the standard deviation and variance of a set of data, using the STDDEV and VARIANCE functions
- Use composite columns and concatenated groupings in grouping operations

Group Functions

- Return one result per group of rows processed
- Are also called multiple-row and aggregate functions
- All group functions ignore NULL values except COUNT(*)
- Use DISTINCT to suppress duplicate values

Added Clauses

```
SELECT *|columnname, columnname…
FROM tablename
[WHERE condition]
[GROUP BY columnname, columnname…]
[HAVING group condition];
```

SUM Function

- Calculates total amount stored in a numeric column for a group of rows

Enter SQL Statement:

```
SELECT SUM((paideach-cost)*quantity) "Total Profit"
 FROM orderitems JOIN books USING (isbn)
 WHERE order# = 1007;
```

Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	Total Profit
1	119.48

AVG Function

- Calculates the average of numeric values in a specified column

Enter SQL Statement:

```
SELECT AVG(retail-cost) "Average Profit"
 FROM books
 WHERE category = 'COMPUTER';
```

Results | Script Output | Explain | Autotrace | DBMS Output

Results:

	Average Profit
1	18.2625

COUNT Function

- Two purposes
  - Count non-NULL values
  - Count total records, including those with NULL values

COUNT Function – Non-NULL Values

- Include column name in argument to count number of occurrences

Enter SQL Statement:

```
SELECT COUNT(DISTINCT category)
 FROM books;
```

Results | Script Output | Explain | Autotrace | DBMS Output

Results:

	COUNT(DISTINCTCATEGORY)
1	8

COUNT Function – NULL Values

- Include asterisk in argument to count number of rows

Enter SQL Statement:

```
SELECT COUNT(*)
 FROM orders
 WHERE shipdate IS NULL;
```

Results | Script Output | Explain | Autotrace | DBMS Output

Results:

	COUNT(*)
1	6

MAX Function

- Returns largest value

Enter SQL Statement:

```
SELECT MAX(retail-cost) "Highest Profit"
 FROM books;
```

Results | Script Output | Explain | Autotrace | DBMS Output

Results:

	Highest Profit
1	41.95

MIN Function

- Returns the smallest value

Enter SQL Statement:

```
SELECT MIN(pubdate)
 FROM books;
```

Results | Script Output | Explain | Autotrace | DBMS Output

Results:

	MIN(PUBDATE)
1	09-MAY-03

Datatypes

- The COUNT, MIN, and MAX functions can be used on values with character, numeric, and date datatypes

Grouping Data

- GROUP BY clause
  - Used to group data
  - Must be used for any individual column in the SELECT clause with a group function
  - Cannot reference column aliases

GROUP BY Example

Enter SQL Statement:

```
SELECT category, TO_CHAR(AVG(retail-cost), '999.99') "Profit"
 FROM books
 GROUP BY category;
```

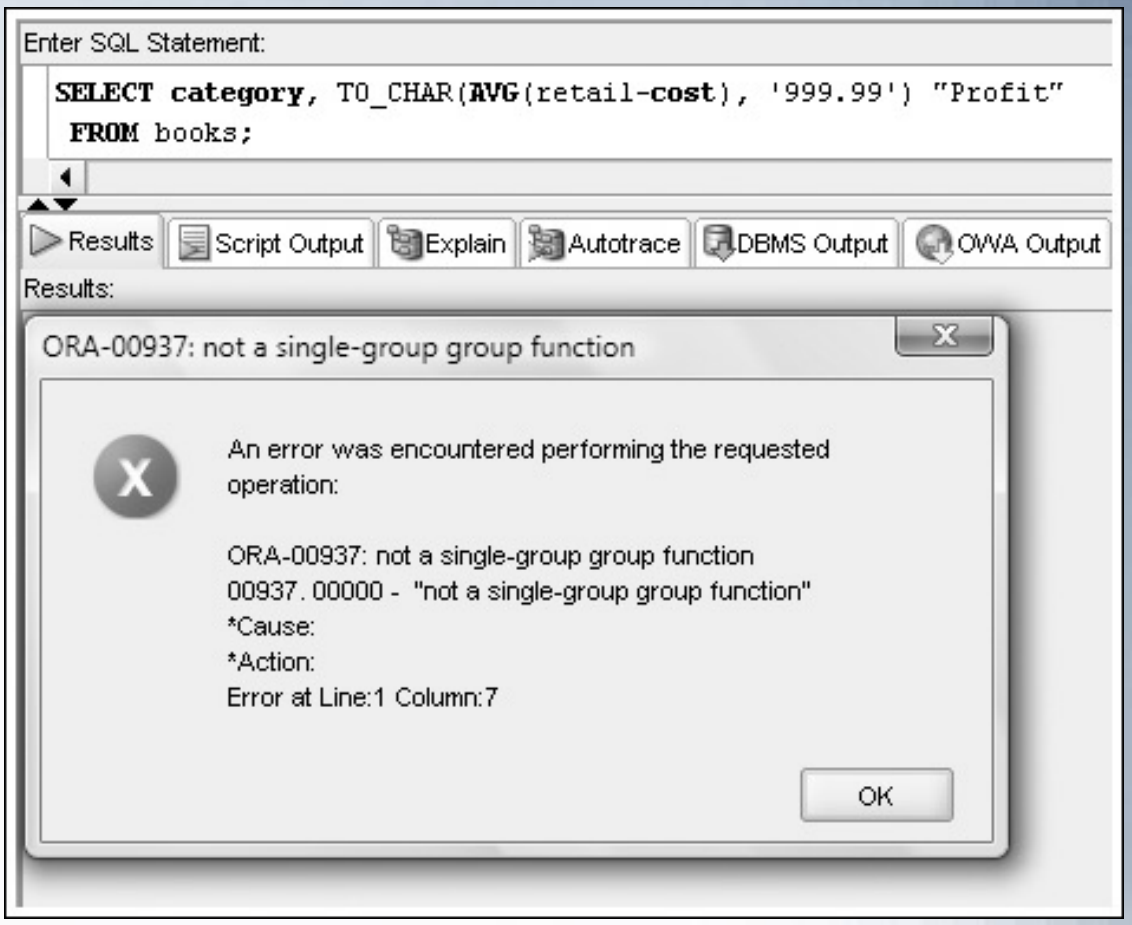
Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	CATEGORY	Profit
1	COMPUTER	18.26
2	COOKING	8.60
3	CHILDREN	12.89
4	LITERATURE	18.10
5	BUSINESS	16.55
6	FITNESS	12.20
7	FAMILY LIFE	24.88
8	SELF HELP	12.10

Common Error

- A common error is missing a GROUP BY clause for nonaggregated columns in the SELECT clause



Restricting Aggregated Output

- HAVING clause serves as the WHERE clause for grouped data

Enter SQL Statement:

```
SELECT category, TO_CHAR(AVG(retail-cost), '999.99') "Profit"
 FROM books
 GROUP BY category
 HAVING AVG(retail-cost) > 15;
```

Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	CATEGORY	Profit
1	COMPUTER	18.26
2	LITERATURE	18.10
3	BUSINESS	16.55
4	FAMILY LIFE	24.88

Restricting Aggregated Output (continued)

- When included in the same SELECT statement, the clauses are evaluated in the order of:
  - WHERE
  - GROUP BY
  - HAVING

Restricting Aggregated Output (continued)

Enter SQL Statement:

```
SELECT category, TO_CHAR(AVG(retail-cost), '999.99') "Profit"
 FROM books
 WHERE pubdate > '01-JAN-05'
 GROUP BY category
 HAVING AVG(retail-cost) > 15;
```

Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	CATEGORY	Profit
1	COMPUTER	16.17
2	LITERATURE	18.10

Nesting Functions

- Inner function is resolved first
- Maximum nesting depth: 2

Enter SQL Statement:

```
SELECT AVG(SUM(quantity*paideach)) "Average Order Total"
 FROM orders JOIN orderitems USING (order#)
 GROUP BY order#;
```

Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	Average Order Total
1	80.3833333333333333333333333333333333333

Statistical Group Functions

- Based on normal distribution
- Includes:
  - STDDEV
  - VARIANCE

STDDEV Function

Enter SQL Statement:

```
SELECT category, COUNT(*), TO_CHAR(AVG(retail-cost),'999.99') "Avg",
       TO_CHAR(STDDEV(retail-cost),'999.9999') "Stddev"
 FROM books
 GROUP BY category;
```

Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	CATEGORY	COUNT(*)	Avg	Stddev
1	COMPUTER	4	18.26	11.2267
2	COOKING	2	8.60	1.6263
3	CHILDREN	2	12.89	13.0956
4	LITERATURE	1	18.10	.0000
5	BUSINESS	1	16.55	.0000
6	FITNESS	1	12.20	.0000
7	FAMILY LIFE	2	24.88	24.1477
8	SELF HELP	1	12.10	.0000

VARIANCE Function

- Determines data dispersion within a group

Enter SQL Statement:

```
SELECT category, TO_CHAR(VARIANCE(retail-cost),'999.99') "Var",
   MIN(retail-cost) "Min", MAX(retail-cost) "Max"
 FROM books
 GROUP BY category;
```

Results | Script Output | Explain | Autotrace | DBMS Output | OWA Output

Results:

	CATEGORY	Var	Min	Max
1	COMPUTER	126.04	3.2	28.7
2	COOKING	2.65	7.45	9.75
3	CHILDREN	171.50	3.63	22.15
4	LITERATURE	.00	18.1	18.1
5	BUSINESS	.00	16.55	16.55
6	FITNESS	.00	12.2	12.2
7	FAMILY LIFE	583.11	7.8	41.95
8	SELF HELP	.00	12.1	12.1

Summary

- The AVG, SUM, STDDEV, and VARIANCE functions are used only with numeric fields
- The COUNT, MAX, and MIN functions can be applied to any datatype
- The AVG, SUM, MAX, MIN, STDDEV, and VARIANCE functions all ignore NULL values
- By default, the AVG, SUM, MAX, MIN, COUNT, STDDEV, and VARIANCE functions include duplicate values

Summary (continued)

- The GROUP BY clause is used to divide table data into groups
- If a SELECT clause contains both an individual field name and a group function, the field name must also be included in a GROUP BY clause
- The HAVING clause is used to restrict groups in a group function
- Group functions can be nested to a depth of only two. The inner function is always performed first, using the specified grouping. The results of the inner function are used as input for the outer function.

Summary (continued)

- The STDDEV and VARIANCE functions are used to perform statistical analyses on a set of data