5

Aggregating Data Using Group Functions

ORACLE®

Objectives

At the end of this lesson, you should be able to:

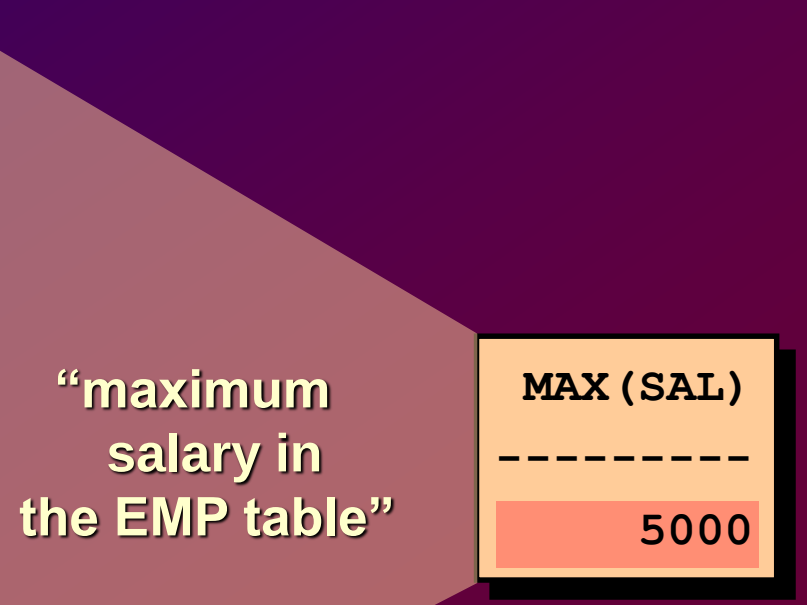
- Identify the available group functions
- Describe the use of group functions
- Group data using the GROUP BY clause
- Include or exclude grouped rows by using the HAVING clause

What Are Group Functions?

Group functions operate on sets of rows to give one result per group.

EMP

DEPTNO	SAL
10	2450
10	5000
10	1300
20	800
20	1100
20	3000
20	3000
20	2975
30	1600
30	2850
30	1250
30	950
30	1500
30	1250



Using AVG and SUM Functions

You can use AVG and SUM for numeric data.

```
SQL> SELECT   AVG(sal), MAX(sal),
  2           MIN(sal), SUM(sal)
  3   FROM    emp
  4   WHERE   job LIKE 'SALES%';
```

AVG(SAL)	MAX(SAL)	MIN(SAL)	SUM(SAL)
1400	1600	1250	5600

Using MIN and MAX Functions

You can use MIN and MAX for any datatype.

```
SQL> SELECT   MIN(hiredate), MAX(hiredate)
  2  FROM     emp;
```

```
MIN(HIRED MAX(HIRED
--------- ---------
17-DEC-80 12-JAN-83
```

Using the COUNT Function

COUNT(*) returns the number of rows in a table.

```
SQL> SELECT   COUNT(*)
  2  FROM     emp
  3  WHERE    deptno = 30;
```

```
  COUNT(*)
----------
         6
```

Using the COUNT Function

COUNT(*expr*) returns the number of nonnull rows.

```
SQL> SELECT   COUNT(comm)
  2  FROM     emp
  3  WHERE    deptno = 30;
```

```
COUNT(COMM)
-----------
          4
```

Group Functions and Null Values

Group functions ignore null values in the column.

```
SQL> SELECT AVG(comm)
  2  FROM   emp;
```

```
 AVG(COMM)
----------
       550
```

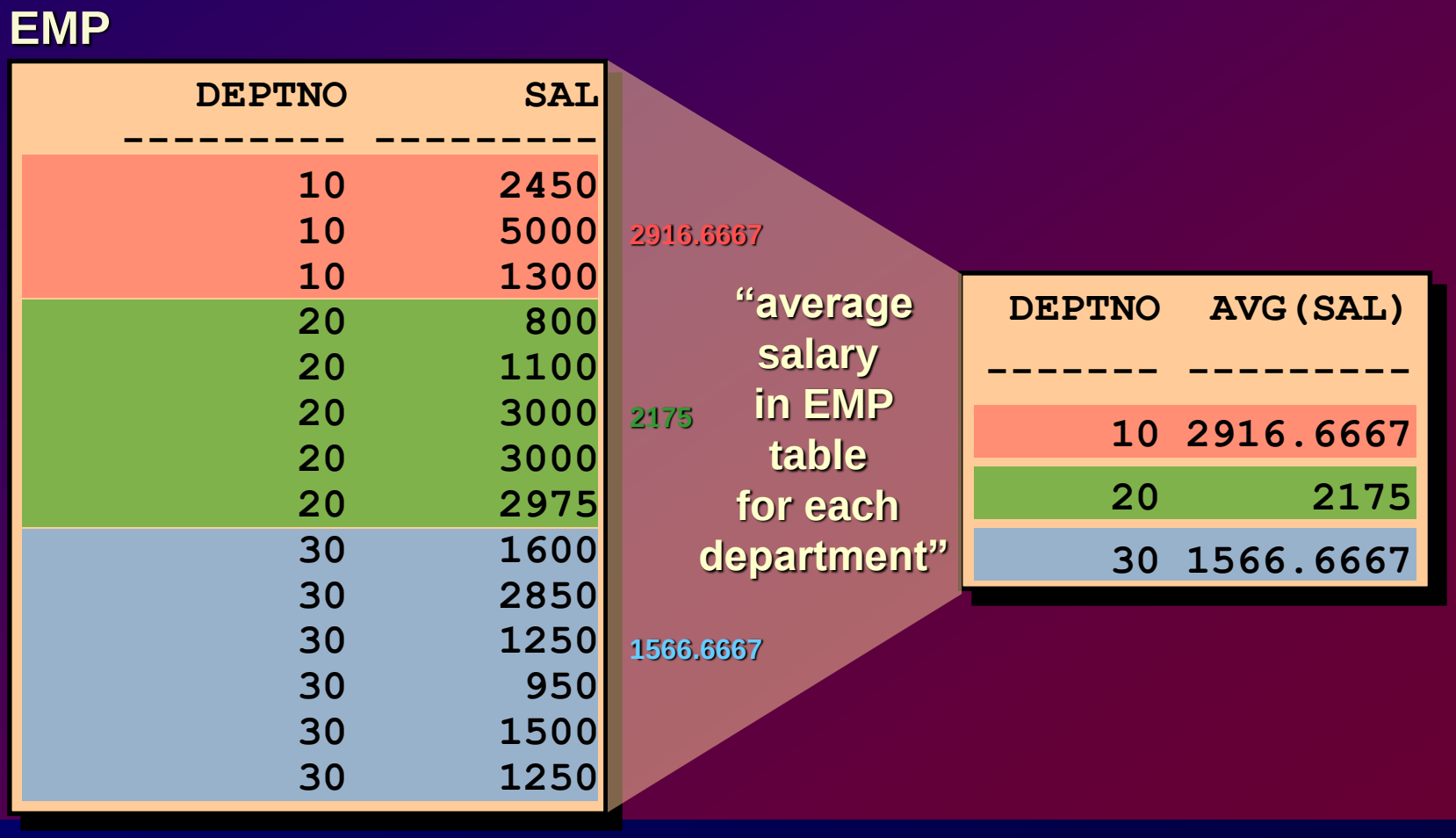
Using the NVL Function with Group Functions

The NVL function forces group functions to include null values.

```
SQL> SELECT AVG(NVL(comm,0))
  2  FROM   emp;
```

```
AVG(NVL(COMM,0))
----------------
      157.14286
```

Creating Groups of Data



Creating Groups of Data: GROUP BY Clause

```
SELECT        column, group_function
FROM          table
[WHERE        condition]
[GROUP BY     group_by_expression]
[ORDER BY     column];
```

Divide rows in a table into smaller groups by using the GROUP BY clause.

Using the GROUP BY Clause

All columns in the SELECT list that are not in group functions must be in the GROUP BY clause.

```
SQL> SELECT   deptno, AVG(sal)
  2  FROM     emp
  3  GROUP BY deptno;
```

```
    DEPTNO   AVG(SAL)
---------- ----------
        10 2916.6667
        20       2175
        30 1566.6667
```

Using the GROUP BY Clause

The GROUP BY column does not have to be in the SELECT list.

```
SQL> SELECT    AVG(sal)
  2  FROM      emp
  3  GROUP BY deptno;
```

```
 AVG(SAL)
---------
2916.6667
      2175
1566.6667
```

Grouping by More Than One Column

EMP

DEPTNO	JOB	SAL
10	MANAGER	2450
10	PRESIDENT	5000
10	CLERK	1300
20	CLERK	800
20	CLERK	1100
20	ANALYST	3000
20	ANALYST	3000
20	MANAGER	2975
30	SALESMAN	1600
30	MANAGER	2850
30	SALESMAN	1250
30	CLERK	950
30	SALESMAN	1500
30	SALESMAN	1250

"sum salaries in the EMP table for each job, grouped by department"

DEPTNO	JOB	SUM(SAL)
10	CLERK	1300
10	MANAGER	2450
10	PRESIDENT	5000
20	ANALYST	6000
20	CLERK	1900
20	MANAGER	2975
30	CLERK	950
30	MANAGER	2850
30	SALESMAN	5600

Using the GROUP BY Clause on Multiple Columns

```
SQL> SELECT   deptno, job, sum(sal)
  2  FROM     emp
  3  GROUP BY deptno, job;
```

```
    DEPTNO JOB         SUM(SAL)
---------- --------- ----------
        10 CLERK           1300
        10 MANAGER         2450
        10 PRESIDENT       5000
        20 ANALYST         6000
        20 CLERK           1900
...
9 rows selected.
```

Illegal Queries Using Group Functions

Any column or expression in the SELECT list that is not an aggregate function must be in the GROUP BY clause.

```
SQL> SELECT   deptno, COUNT(ename)
  2  FROM     emp;
```

```
SELECT deptno, COUNT(ename)
       *
ERROR at line 1:
ORA-00937: not a single-group group function
```

Column missing in the GROUP BY clause

Illegal Queries Using Group Functions

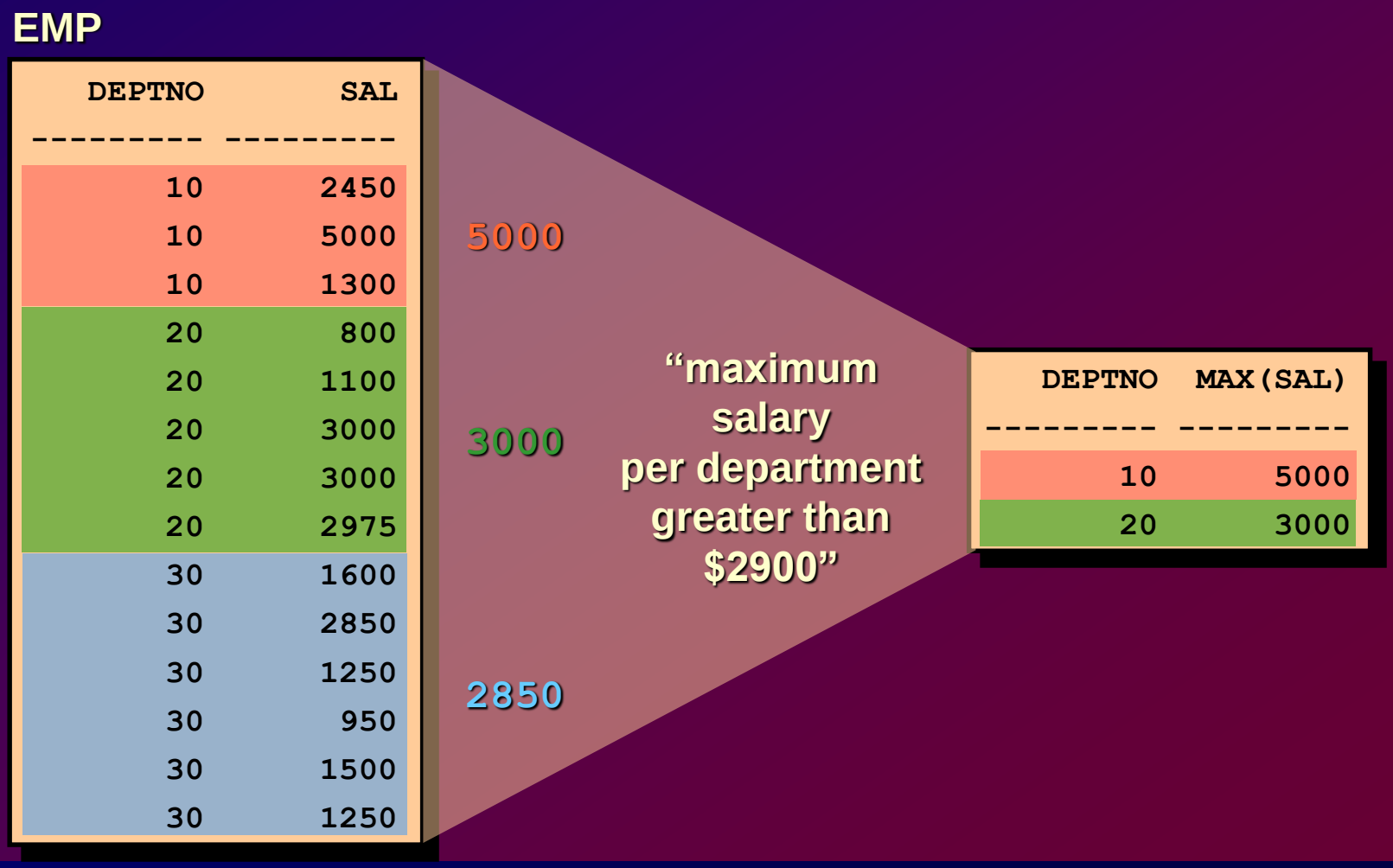
- You cannot use the WHERE clause to restrict groups.
- You use the HAVING clause to restrict groups.

```
SQL> SELECT    deptno, AVG(sal)
  2  FROM      emp
  3  WHERE     AVG(sal) > 2000
  4  GROUP BY  deptno;
```

```
WHERE AVG(sal) > 2000
      *
ERROR at line 3:
ORA-00934: group function is not allowed here
```

Cannot use the WHERE clause to restrict groups

Excluding Group Results



Excluding Group Results: HAVING Clause

Use the HAVING clause to restrict groups

- Rows are grouped.
- The group function is applied.
- Groups matching the HAVING clause are displayed.

```
SELECT      column, group_function
FROM        table
[WHERE      condition]
[GROUP BY   group_by_expression]
[HAVING     group_condition]
[ORDER BY   column];
```

Using the HAVING Clause

```
SQL> SELECT    deptno, max(sal)
  2  FROM      emp
  3  GROUP BY deptno
  4  HAVING    max(sal)>2900;
```

```
    DEPTNO  MAX(SAL)
---------- ---------
        10      5000
        20      3000
```

Using the HAVING Clause

```
SQL> SELECT     job, SUM(sal)  PAYROLL
  2  FROM       emp
  3  WHERE       job NOT LIKE 'SALES%'
  3  GROUP BY   job
  4  HAVING     SUM(sal)>5000
  5  ORDER BY   SUM(sal);
```

```
JOB          PAYROLL
---------  ---------
ANALYST         6000
MANAGER         8275
```

Nesting Group Functions

Display the maximum average salary.

```
SQL> SELECT    max(avg(sal))
  2  FROM      emp
  3  GROUP BY deptno;
```

```
MAX(AVG(SAL))
-------------
    2916.6667
```

Summary

```
SELECT      column, group_function
FROM        table
[WHERE      condition]
[GROUP BY   group_by_expression]
[HAVING     group_condition]
[ORDER BY   column];
```

Practice Overview

- Showing different queries that use group functions
- Grouping by rows to achieve more than one result
- Excluding groups by using the HAVING clause