MEDIOS Y TECNOLOGÍAS en educación

División de Innovación Educativa

CES Coordinación de Educación en Salud

IMSS

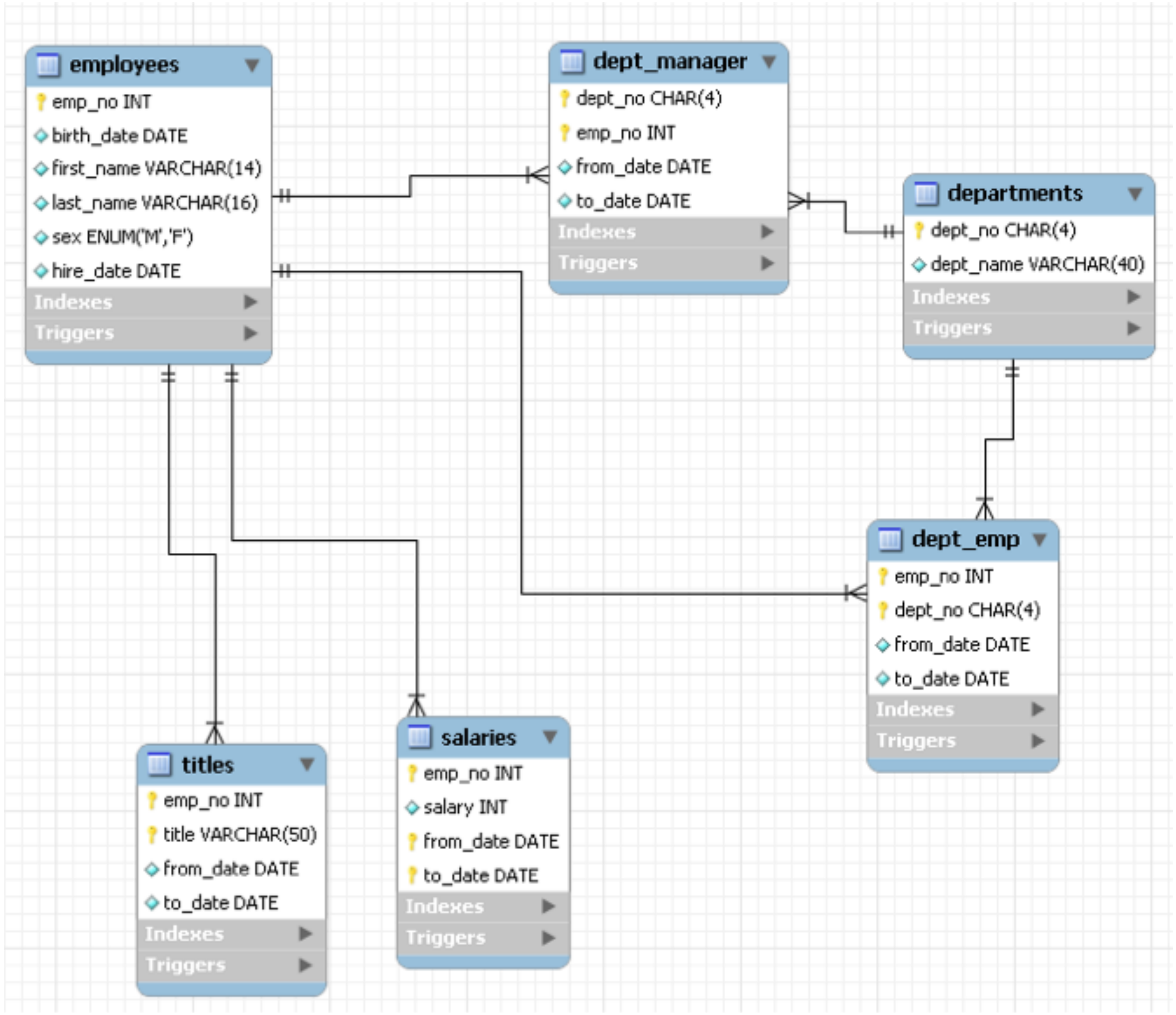
Curso de SQL

Área de Medios y Tecnologías en Educación

Agenda del curso

- ✓ **Día 1:**
  - ✓ Reglas del juego
  - ✓ Iniciando con SQL
- ✓ **Día 2:**
  - ✓ SELECT
  - ✓ WHERE
- ❑ **Día 3:**
  - ➢ **Funciones de agrupamiento**
  - ➢ **Group by**
- ➢ **Día 4,5:**
  - ➢ JOIN
- ❑ **Día 6:**
  - ➢ Set Operations
  - ➢ Sub Queries
- ❑ **Día 7:**
  - ➢ DML, Insert, Update & Delete
- ❑ **Día 8,9:**
  - ➢ DDL
  - ➢ Data types
  - ➢ Managing tables

Schema HR


employees
emp_no INT
birth_date DATE
first_name VARCHAR(14)
last_name VARCHAR(16)
sex ENUM('M','F')
hire_date DATE
Indexes
Triggers
dept_manager
dept_no CHAR(4)
emp_no INT
from_date DATE
to_date DATE
Indexes
Triggers
departments
dept_no CHAR(4)
dept_name VARCHAR(40)
Indexes
Triggers
dept_emp
emp_no INT
dept_no CHAR(4)
from_date DATE
to_date DATE
Indexes
Triggers
titles
emp_no INT
title VARCHAR(50)
from_date DATE
to_date DATE
Indexes
Triggers
salaries
emp_no INT
salary INT
from_date DATE
to_date DATE
Indexes
Triggers

Funciones de formato de tipo de dato

Function	Return Type	Description	Example
to_char(timestamp, text)	text	convert time stamp to string	to_char(current_timestamp , 'dd-mm-yyyy HH24:MI:SS')
to_char(interval, text)	text	convert interval to string	to_char(interval '15h 2m 12s', 'HH24:MI:SS')
to_char(int, text)	text	convert integer to string	to_char(125, '999')
to_char(double precision, text)	text	convert real/double precision to string	to_char(125.8::real, '999D9')
to_char(numeric, text)	text	convert numeric to string	to_char(-125.8, '999D99S')
to_date(text, text)	date	convert string to date	to_date('05 Dec 2000', 'DD Mon YYYY')
to_number(text, text)	numeric	convert string to numeric	to_number('12,454.8-', '99G999D9S')
to_timestamp(text, text)	timestamp with time zone	convert string to time stamp	to_timestamp('05 Dec 2000 ', 'DD Mon YYYY')
to_timestamp(double precision)	timestamp with time zone	convert Unix epoch to time stamp	to_timestamp(1284352323)

https://www.postgresql.org/docs/9.4/static/functions-formatting.html

Function	Return Type	Description	Example	Result
convert(string bytea, src_encoding name,dest_encoding name)	bytea	Convert string to dest_encoding. The original encoding is specified by src_encoding. The string must be valid in this encoding. Conversions can be defined by CREATE CONVERSION. Also there are some predefined conversions. See Table 9-8 for available conversions.	convert('text_in_utf8', 'UTF8', 'LATIN1')	text_in_utf8represented in Latin-1 encoding (ISO 8859-1)
convert_from(string bytea, src_encoding name)	text	Convert string to the database encoding. The original encoding is specified by src_encoding. The string must be valid in this encoding.	convert_from('text_in_utf8', 'UTF8')	text_in_utf8represented in the current database encoding
convert_to(string text, dest_encoding name)	bytea	Convert string to dest_encoding.	convert_to('some text', 'UTF8')	some textrepresented in the UTF8 encoding
rpad(string text, length int[, fill text])	text	Fill up the string to length length by appending the characters fill (a space by default). If the string is already longer than length then it is truncated.	rpad('hi', 5, 'xy')	hixyx
lpad(string text, length int[, fill text])	text	Fill up the string to length length by prepending the characters fill (a space by default). If the string is already longer than length then it is truncated (on the right).	lpad('hi', 5, 'xy')	xyxhi
ltrim(string text [,characters text])	text	Remove the longest string containing only characters from characters (a space by default) from the start of string	ltrim('zzzytest', 'xyz')	test

https://www.postgresql.org/docs/9.4/static/functions-string.html

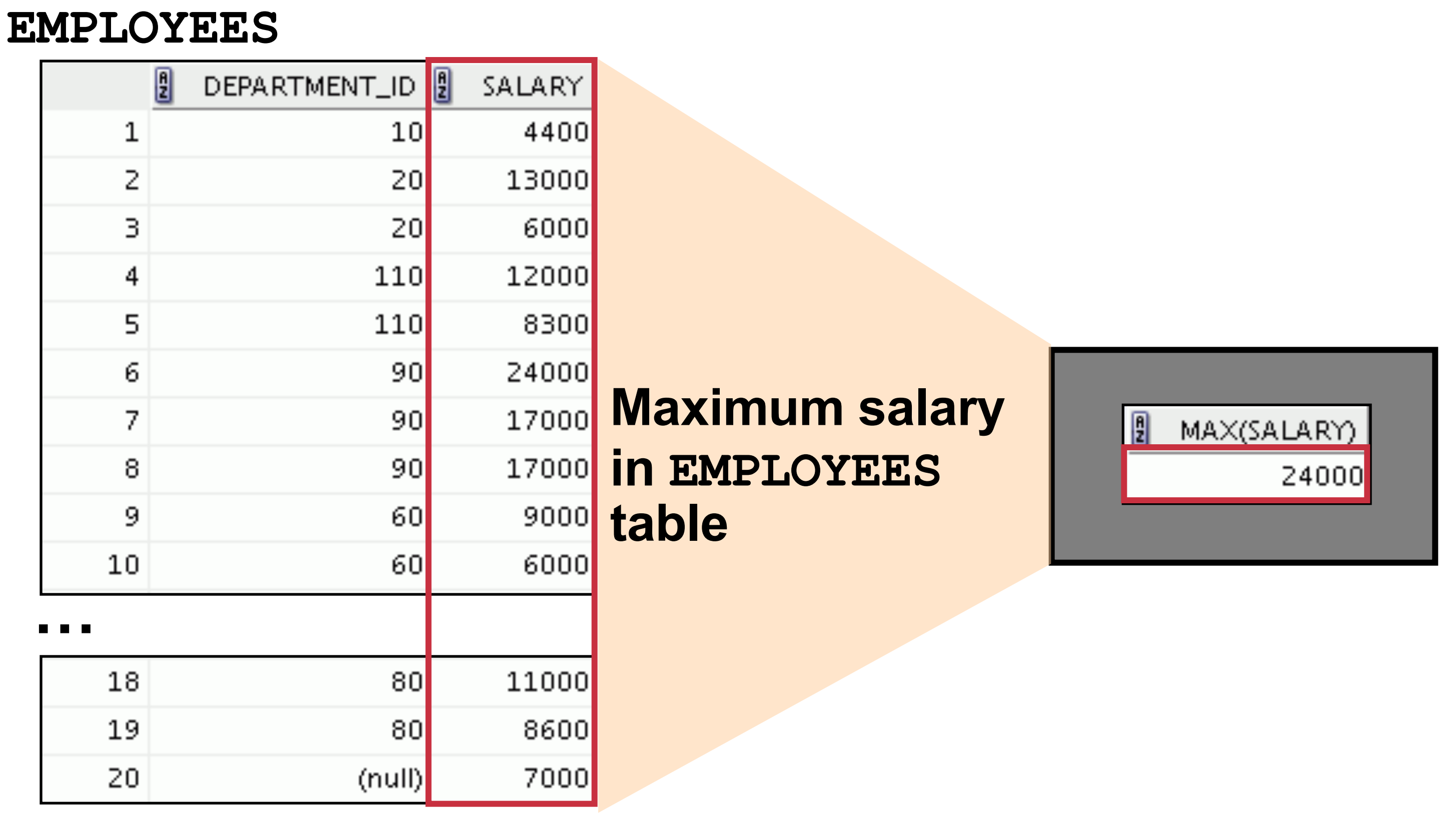
Funciones condicionales

Function	Return Type
Case	CASE WHEN condition THEN result [WHEN ...] [ELSE result] END
Coalesce	COALESCE(value [, ...])
Nullif	NULLIF(value1, value2)
gratest	GREATEST(value [, ...])
LEAST	LEAST(value [, ...])

https://www.postgresql.org/docs/9.4/static/functions-formatting.html

What Are Group Functions?

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



EMPLOYEES

	DEPARTMENT_ID	SALARY
1	10	4400
2	20	13000
3	20	6000
4	110	12000
5	110	8300
6	90	24000
7	90	17000
8	90	17000
9	60	9000
10	60	6000

...

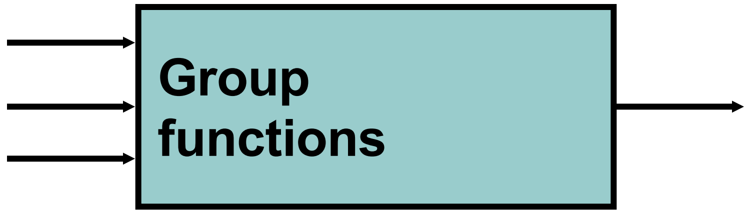
18	80	11000
19	80	8600
20	(null)	7000

Maximum salary in EMPLOYEES table

MAX(SALARY)
24000

Types of Group Functions

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



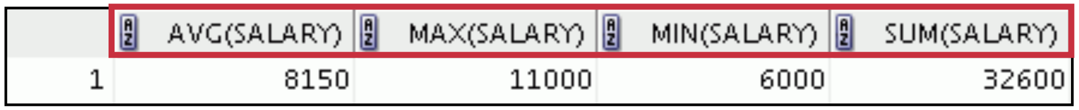
Group Functions: Syntax

```
SELECT      group_function(column), ...
FROM        table
[WHERE      condition]
[ORDER BY    column];
```

Using the AVG and SUM Functions

- You can use AVG and SUM for numeric data.

```
SELECT  AVG(salary), MAX(salary),
        MIN(salary), SUM(salary)
FROM    employees
WHERE   job_id LIKE '%REP%';
```

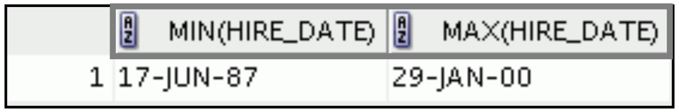


	AVG(SALARY)	MAX(SALARY)	MIN(SALARY)	SUM(SALARY)
1	8150	11000	6000	32600

Using the MIN and MAX Functions

- You can use MIN and MAX for numeric, character, and date data types.

```
SELECT MIN(hire_date), MAX(hire_date)
FROM        employees;
```



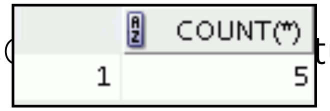
```
   MIN(HIRE_DATE)   MAX(HIRE_DATE)
1  17-JUN-87        29-JAN-00
```

Using the COUNT Function

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

1

```
SELECT  COUNT(*)
FROM    employees
WHERE   department_id = 50;
```

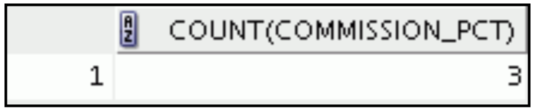


	COUNT(*)
1	5

- C turns the number of rows with non-null values for *expr*:

2

```
SELECT  COUNT(commission_pct)
FROM    employees
WHERE   department_id = 80;
```

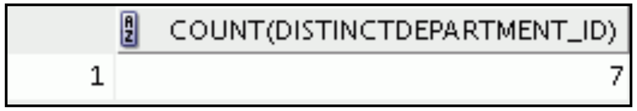


	COUNT(COMMISSION_PCT)
1	3

Using the DISTINCT Keyword

- COUNT(DISTINCT expr) returns the number of distinct non-null values of *expr*.
- To display the number of distinct department values in the EMPLOYEES table:

```
SELECT COUNT(DISTINCT department_id)
FROM   employees;
```



	COUNT(DISTINCTDEPARTMENT_ID)
1	7

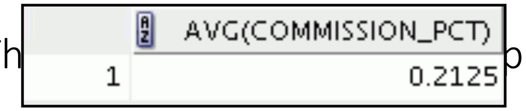
Group Functions and Null Values

- Group functions ignore null values in the column:

1

```
SELECT AVG(commission_pct)
FROM   employees;
```

- Th

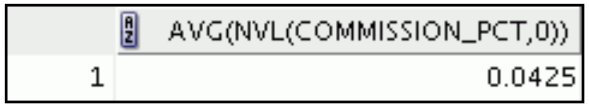


```
   AVG(COMMISSION_PCT)
1               0.2125
```

o functions to include null values:

2

```
SELECT AVG(NVL(commission_pct, 0))
FROM   employees;
```



```
   AVG(NVL(COMMISSION_PCT,0))
1                      0.0425
```

Creating Groups of Data: GROUP BY Clause Syntax

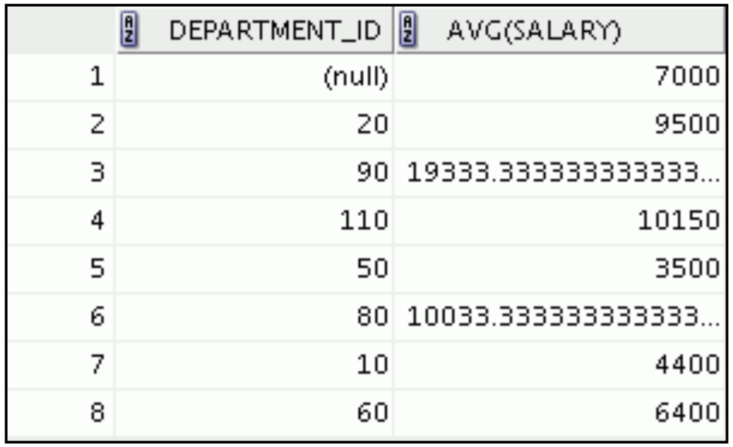
- You can divide rows in a table into smaller groups by using the GROUP BY clause.

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

Using the GROUP BY Clause

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

```
SELECT    department_id, AVG(salary)
FROM      employees
GROUP BY department_id ;
```

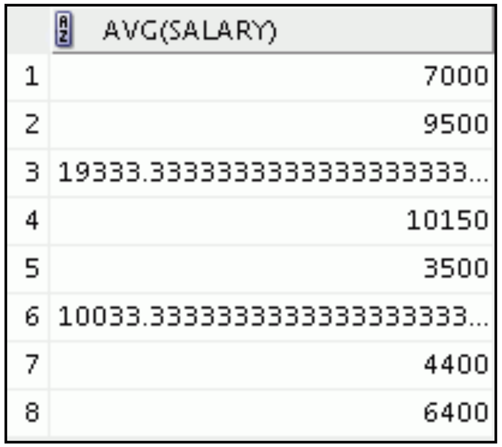


	DEPARTMENT_ID	AVG(SALARY)
1	(null)	7000
2	20	9500
3	90	19333.3333333333...
4	110	10150
5	50	3500
6	80	10033.3333333333...
7	10	4400
8	60	6400

Using the GROUP BY Clause

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

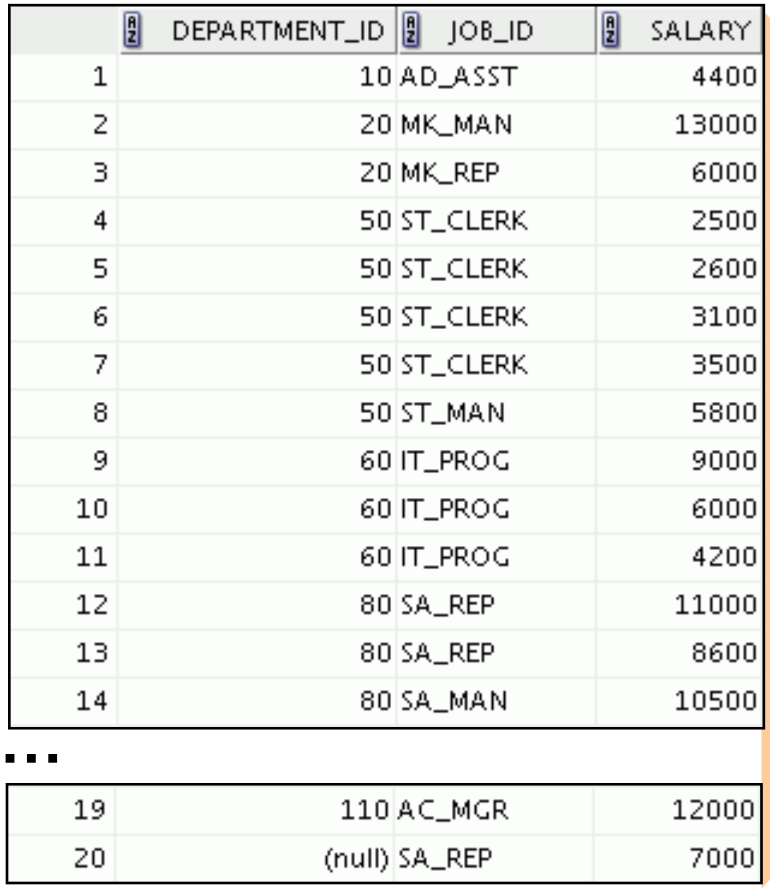
```
SELECT    AVG(salary)
FROM      employees
GROUP BY department_id ;
```



	AVG(SALARY)
1	7000
2	9500
3	19333.3333333333333333333...
4	10150
5	3500
6	10033.3333333333333333333...
7	4400
8	6400

Grouping by More Than One Column

EMPLOYEES

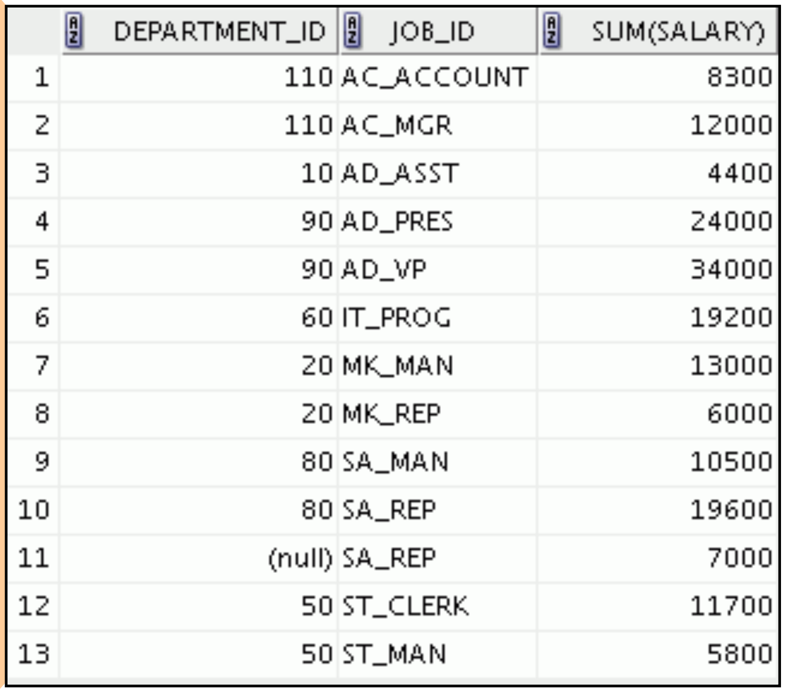


	DEPARTMENT_ID	JOB_ID	SALARY
1	10	AD_ASST	4400
2	20	MK_MAN	13000
3	20	MK_REP	6000
4	50	ST_CLERK	2500
5	50	ST_CLERK	2600
6	50	ST_CLERK	3100
7	50	ST_CLERK	3500
8	50	ST_MAN	5800
9	60	IT_PROG	9000
10	60	IT_PROG	6000
11	60	IT_PROG	4200
12	80	SA_REP	11000
13	80	SA_REP	8600
14	80	SA_MAN	10500

...

19	110	AC_MGR	12000
20	(null)	SA_REP	7000

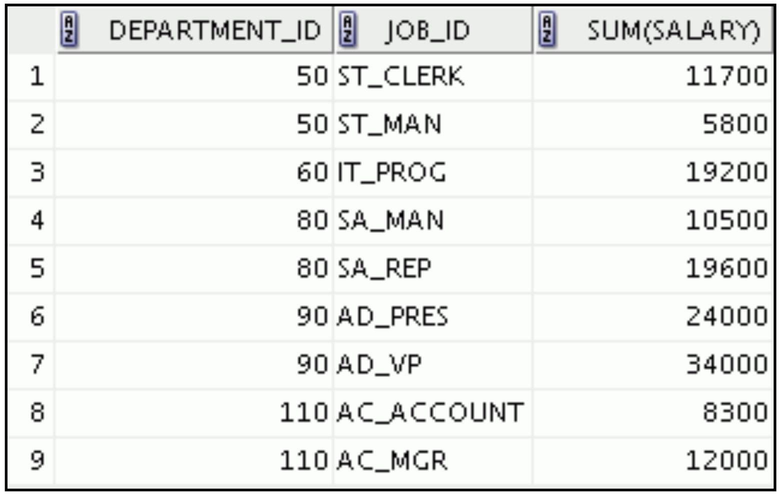
Add the salaries in the EMPLOYEES table for each job, grouped by department.



	DEPARTMENT_ID	JOB_ID	SUM(SALARY)
1	110	AC_ACCOUNT	8300
2	110	AC_MGR	12000
3	10	AD_ASST	4400
4	90	AD_PRES	24000
5	90	AD_VP	34000
6	60	IT_PROG	19200
7	20	MK_MAN	13000
8	20	MK_REP	6000
9	80	SA_MAN	10500
10	80	SA_REP	19600
11	(null)	SA_REP	7000
12	50	ST_CLERK	11700
13	50	ST_MAN	5800

Using the GROUP BY Clause on Multiple Columns

```
SELECT    department_id, job_id, SUM(salary)
FROM      employees
WHERE     department_id > 40
GROUP BY department_id, job_id
ORDER BY department_id;
```

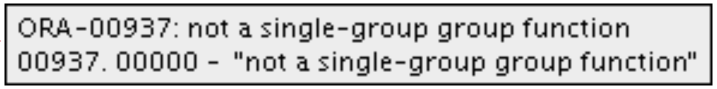


	DEPARTMENT_ID	JOB_ID	SUM(SALARY)
1	50	ST_CLERK	11700
2	50	ST_MAN	5800
3	60	IT_PROG	19200
4	80	SA_MAN	10500
5	80	SA_REP	19600
6	90	AD_PRES	24000
7	90	AD_VP	34000
8	110	AC_ACCOUNT	8300
9	110	AC_MGR	12000

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:

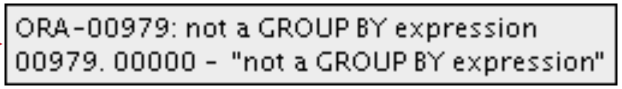
```
SELECT department_id, COUNT(last_name)
FROM   employees;
```



```
ORA-00937: not a single-group group function
00937. 00000 - "not a single-group group function"
```

A GROUP BY clause must be added to count the last names for each department_id.

```
SELECT department_id, job_id, COUNT(last_name)
FROM   employees
GROUP BY department_id;
```



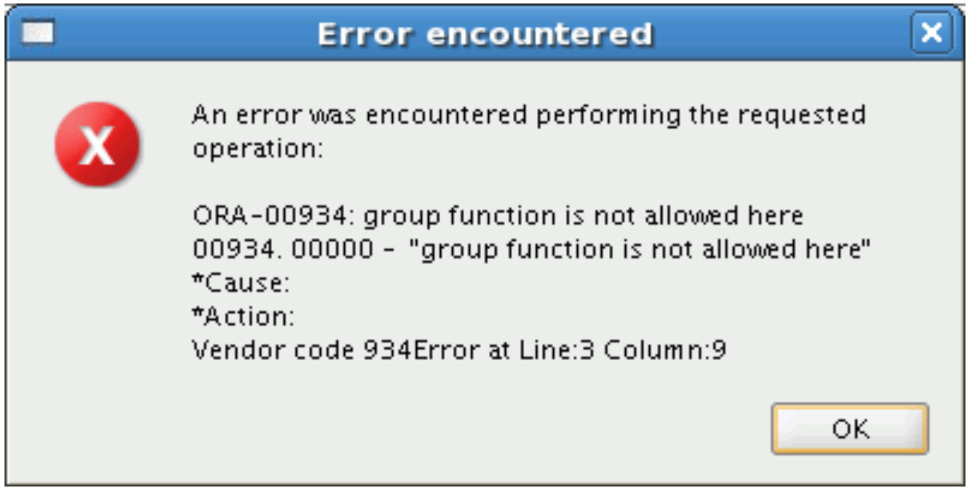
```
ORA-00979: not a GROUP BY expression
00979. 00000 - "not a GROUP BY expression"
```

Either add job_id in the GROUP BY or remove the job_id column from the SELECT list.

Illegal Queries Using Group Functions

- You cannot use the `WHERE` clause to restrict groups.
- You use the `HAVING` clause to restrict groups.
- You cannot use group functions in the `WHERE` clause.

```
SELECT   department_id, AVG(salary)
FROM     employees
WHERE    AVG(salary) > 8000
GROUP BY department_id;
```



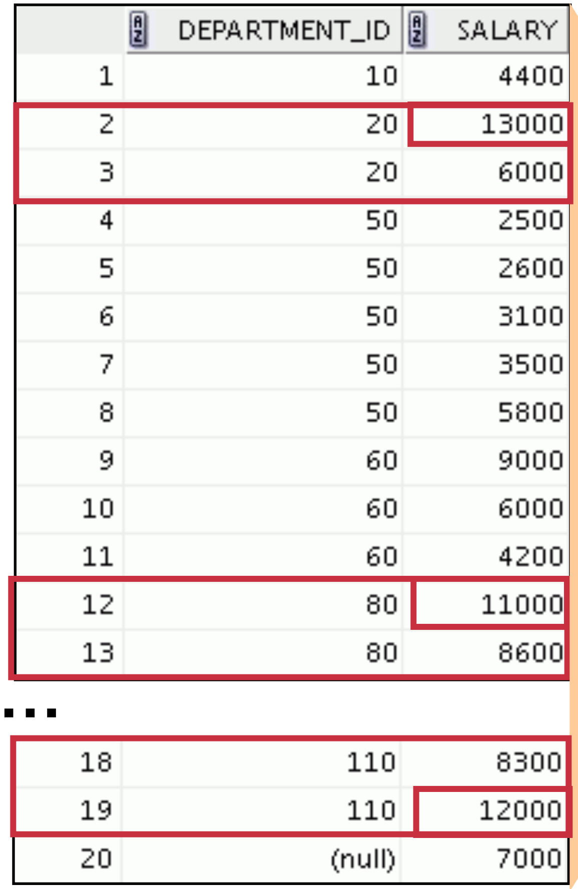
```
An error was encountered performing the requested
operation:

ORA-00934: group function is not allowed here
00934. 00000 - "group function is not allowed here"
*Cause:
*Action:
Vendor code 934Error at Line:3 Column:9
```

Cannot use the `WHERE` clause to restrict groups

Restricting Group Results

EMPLOYEES

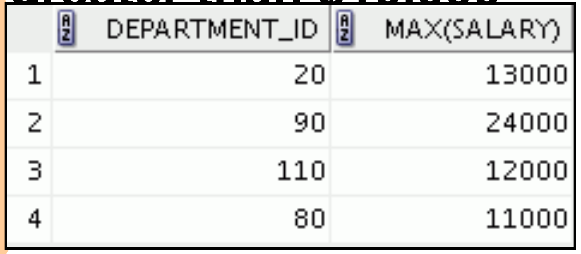


	DEPARTMENT_ID	SALARY
1	10	4400
2	20	13000
3	20	6000
4	50	2500
5	50	2600
6	50	3100
7	50	3500
8	50	5800
9	60	9000
10	60	6000
11	60	4200
12	80	11000
13	80	8600

…

18	110	8300
19	110	12000
20	(null)	7000

The maximum salary per department when it is greater than $10,000



	DEPARTMENT_ID	MAX(SALARY)
1	20	13000
2	90	24000
3	110	12000
4	80	11000

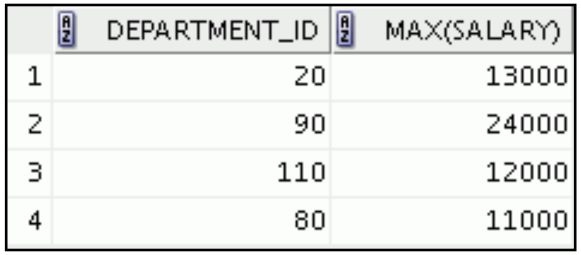
Restricting Group Results with the HAVING Clause

- When you use the HAVING clause, the Oracle server restricts groups as follows:
  1. Rows are grouped.
  2. The group function is applied.
  3. 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

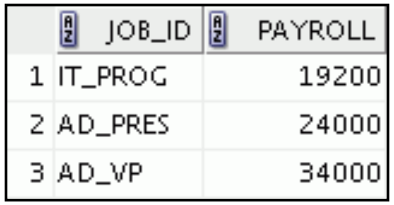
```
SELECT    department_id, MAX(salary)
FROM      employees
GROUP BY  department_id
HAVING    MAX(salary)>10000 ;
```



	DEPARTMENT_ID	MAX(SALARY)
1	20	13000
2	90	24000
3	110	12000
4	80	11000

Using the `HAVING` Clause

```
SELECT    job_id, SUM(salary) PAYROLL
FROM      employees
WHERE     job_id NOT LIKE '%REP%'
GROUP BY job_id
HAVING    SUM(salary) > 13000
ORDER BY SUM(salary);
```



	JOB_ID	PAYROLL
1	IT_PROG	19200
2	AD_PRES	24000
3	AD_VP	34000

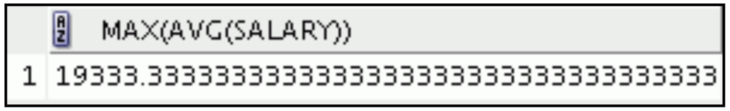
Lesson Agenda

- Group functions:
  - Types and syntax
  - Use `AVG`, `SUM`, `MIN`, `MAX`, `COUNT`
  - Use `DISTINCT` keyword within group functions
  - `NULL` values in a group function
- Grouping rows:
  - `GROUP BY` clause
  - `HAVING` clause
- Nesting group functions

Nesting Group Functions

- Display the maximum average salary:

```
SELECT    MAX(AVG(salary))
FROM      employees
GROUP BY department_id;
```



```
   MAX(AVG(SALARY))
1  19333.333333333333333333333333333333333
```