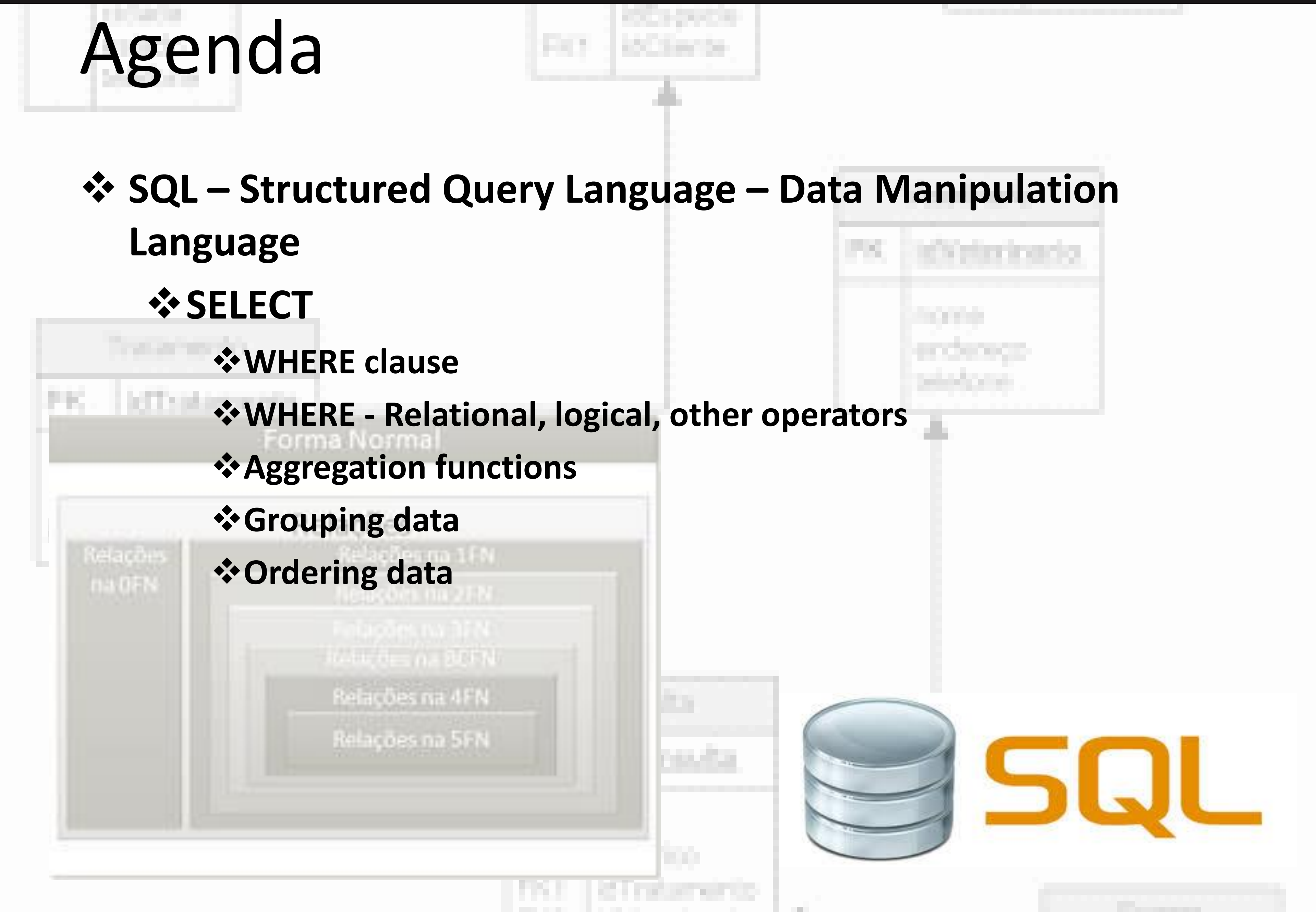
POLITÉCNICO
DO PORTO
ESCOLA
SUPERIOR
DE MEDIA ARTES
E DESIGN

P.PORTO

DATABASES
SQL
Data Manipulation Language
Part I

Tecnologias e Sistemas de Informação para a Web

Agenda



- ❖ SQL – Structured Query Language – Data Manipulation Language
  - ❖ SELECT
    - ❖ WHERE clause
    - ❖ WHERE - Relational, logical, other operators
    - ❖ Aggregation functions
    - ❖ Grouping data
    - ❖ Ordering data

SQL

- SELECT

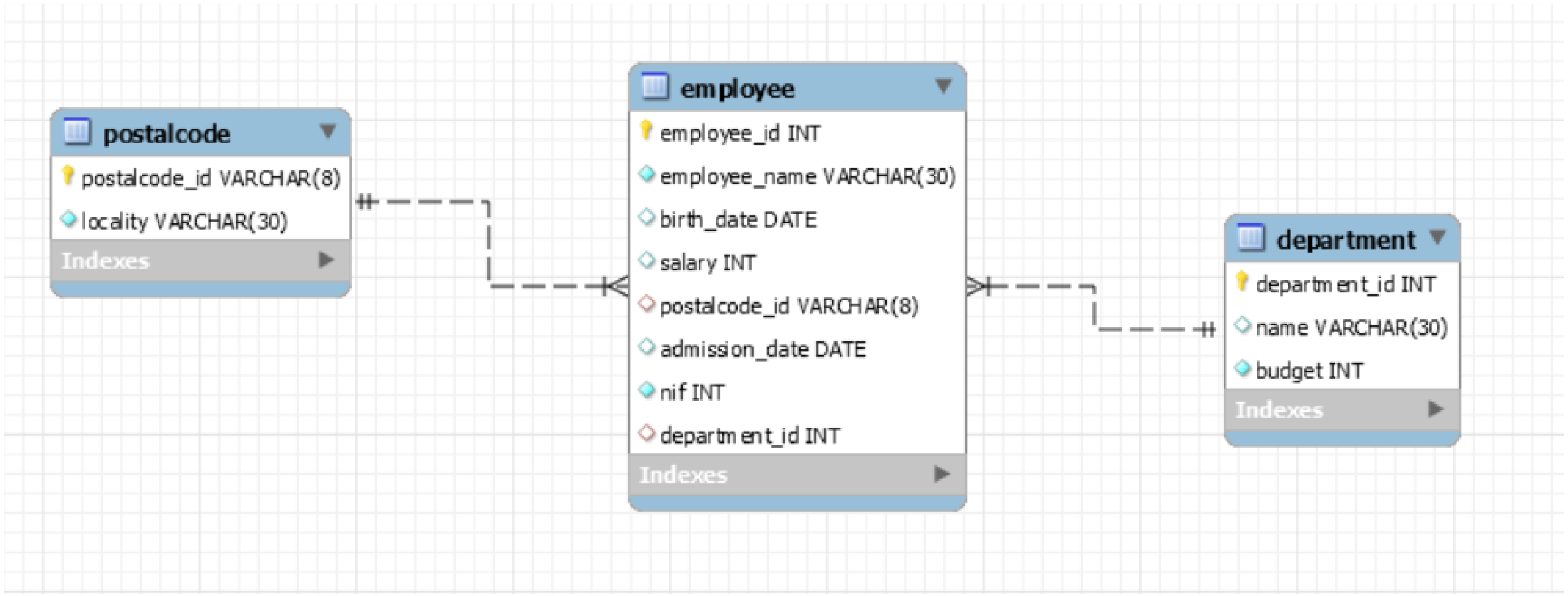
Select, query data from a database

```
SELECT [distinct/all] field, field2, …, fieldn [*]
FROM tables
[WHERE conditions]
[GROUP BY fields]
[HAVING conditions]
[ORDER BY fields]
```

SELECT	: specify the fields that we want to get
FROM	: specifies the source of the data
WHERE:	specifies data query conditions
GROUP BY	: groups rows of the same value in a given field
HAVING	: specifies a condition for the data groups
ORDER BY	: specifies the order (ordering) of the results obtained

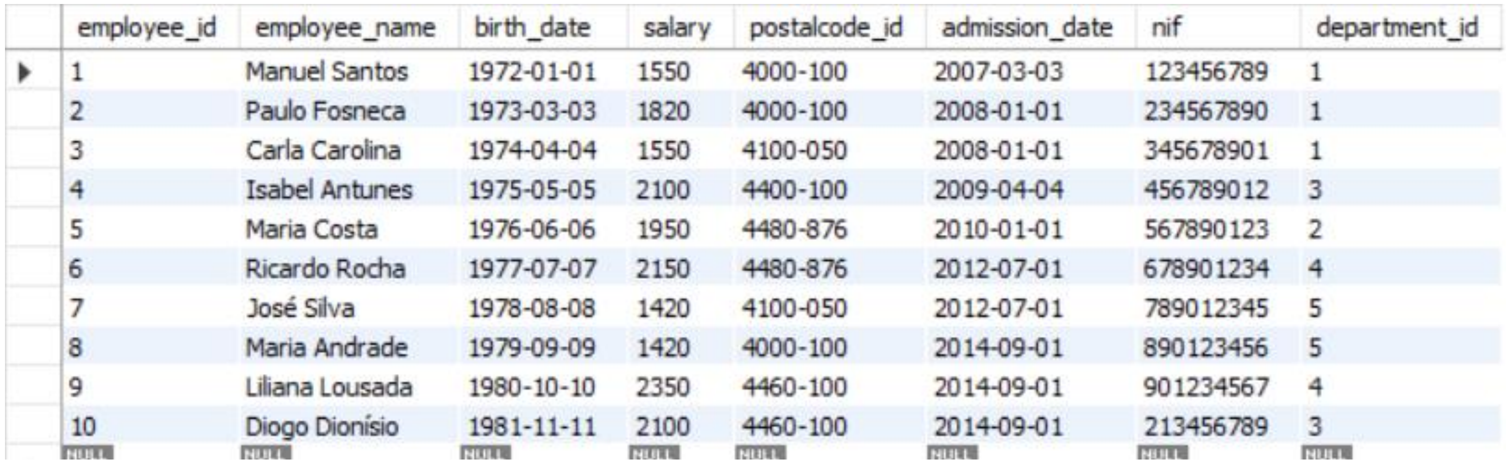
SQL

- Consider the following database schema :

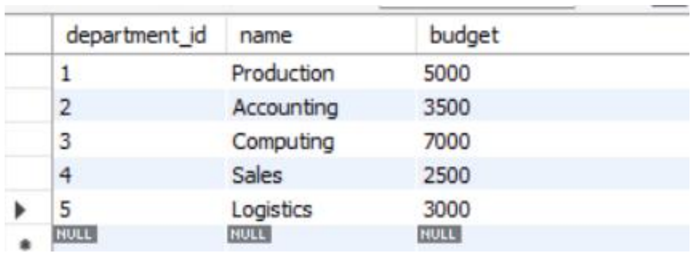


SQL

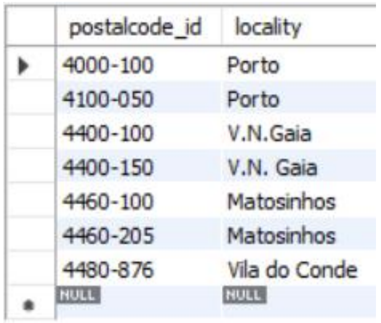
- With the following sample data:



employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL



department_id	name	budget
1	Production	5000
2	Accounting	3500
3	Computing	7000
4	Sales	2500
5	Logistics	3000
NULL	NULL	NULL



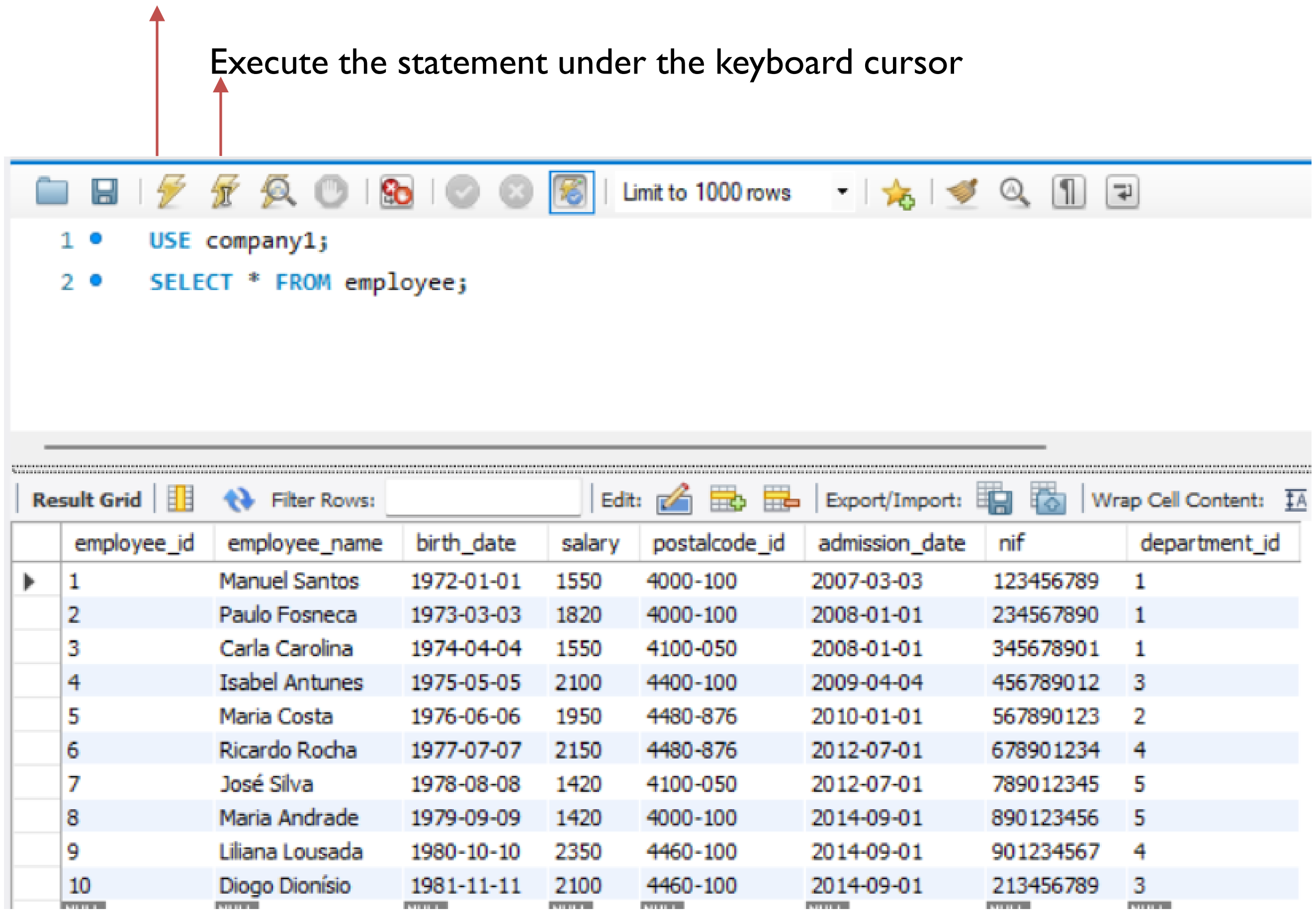
postalcode_id	locality
4000-100	Porto
4100-050	Porto
4400-100	V.N.Gaia
4400-150	V.N. Gaia
4460-100	Matosinhos
4460-205	Matosinhos
4480-876	Vila do Conde
NULL	NULL

SQL

- SELECTS ALL RECORDS IN THE EMPLOYEE TABLE

Execute the selected portion of the script or everything, if there is no selection

Execute the statement under the keyboard cursor

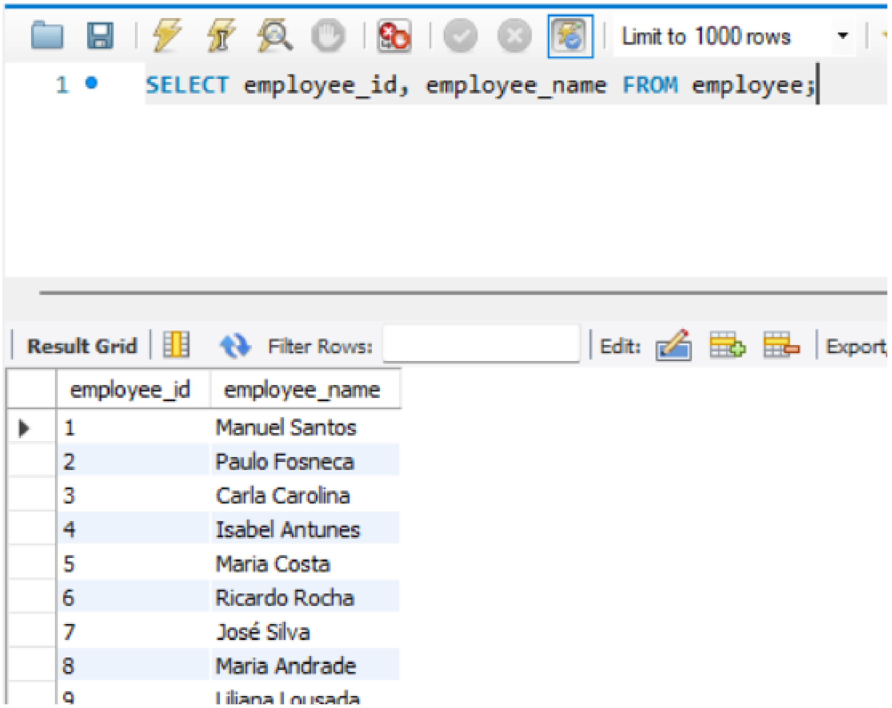


```
USE company1;
SELECT * FROM employee;
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3

SQL

- SELECTS EMPLOYEE_ID AND NAME, ALL RECORDS

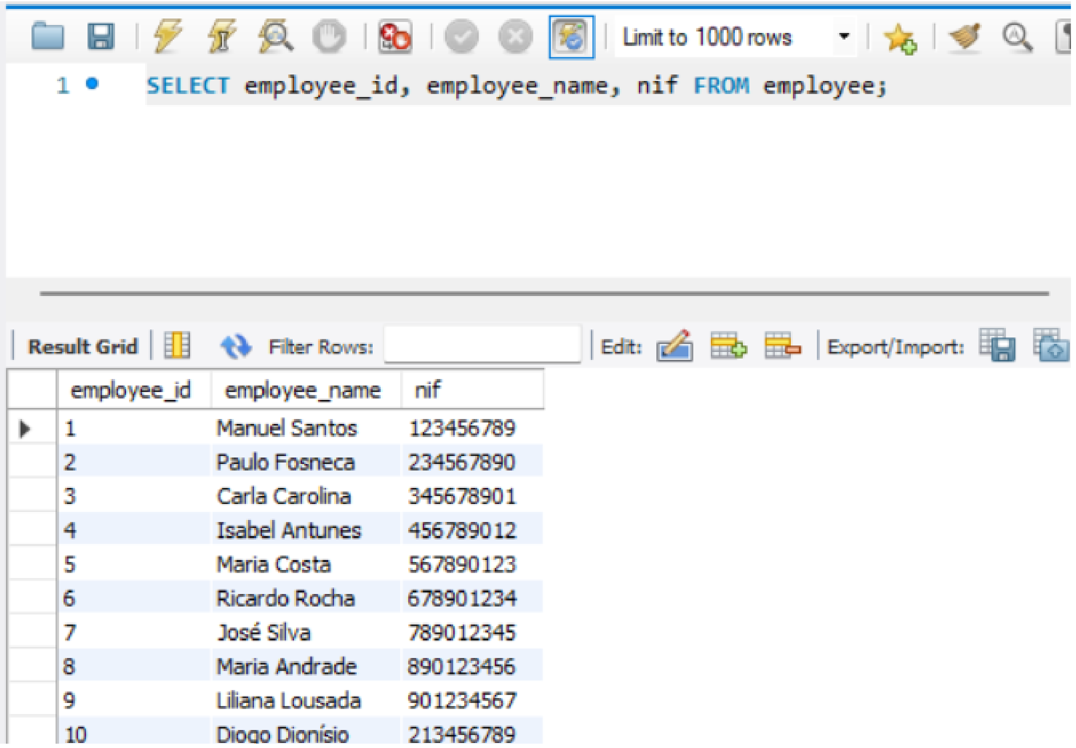


```
SELECT employee_id, employee_name FROM employee;
```

employee_id	employee_name
1	Manuel Santos
2	Paulo Fosneca
3	Carla Carolina
4	Isabel Antunes
5	Maria Costa
6	Ricardo Rocha
7	José Silva
8	Maria Andrade
9	Liliana Lousada

SQL

- SELECTS EMPLOYEE_ID, NAME AND NIF, ALL RECORDS

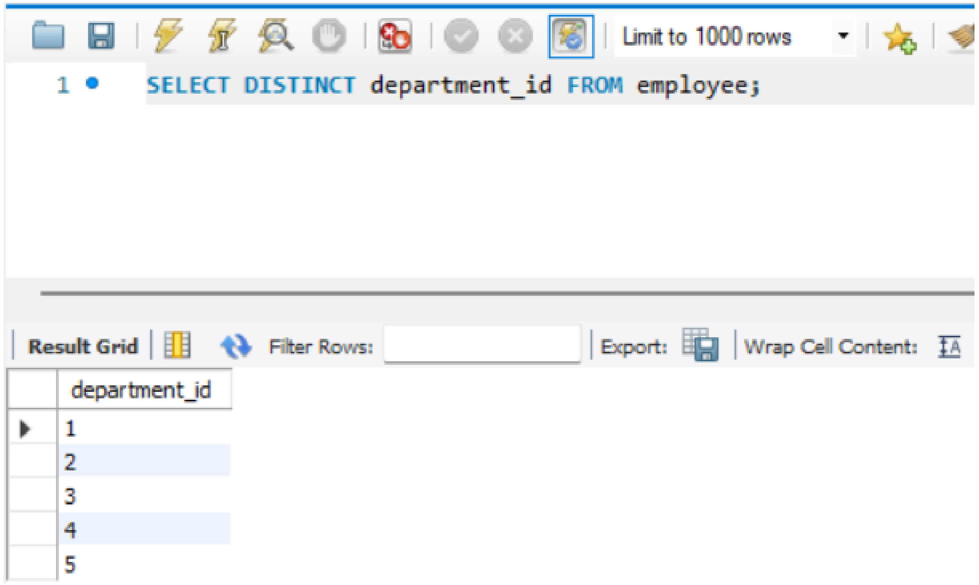


```
SELECT employee_id, employee_name, nif FROM employee;
```

employee_id	employee_name	nif
1	Manuel Santos	123456789
2	Paulo Fosneca	234567890
3	Carla Carolina	345678901
4	Isabel Antunes	456789012
5	Maria Costa	567890123
6	Ricardo Rocha	678901234
7	José Silva	789012345
8	Maria Andrade	890123456
9	Liliana Lousada	901234567
10	Diogo Dionísio	213456789

SQL

- WHEN AN ENTITY ATTRIBUTE CONTAINS (OR MAY CONTAIN) DUPLICATE VALUES, THE
- DISTINCT KEYWORD **RETURNS** ONLY DISTINCT, **DIFFERENT VALUES**.



```
SELECT DISTINCT department_id FROM employee;
```

department_id
1
2
3
4
5

SQL

Restrictions: WHERE keyword

- Lets you impose constraints / conditions on data selection

```
SELECT [distinct/all] field1, field2, …, fieldn [*]
FROM tables
[WHERE condition]
[GROUP BY fields]
[HAVING conditions]
[ORDER BY fields]
```

- Operators:

Relational	Logical	Others
=	AND ou &&	BETWEEN
>	OR ou ||	IN
<	NOT ou !	IS NULL, NOT NULL
>=	XOR (disjunção exclusiva)	LIKE
<=		
<> Ou !=		

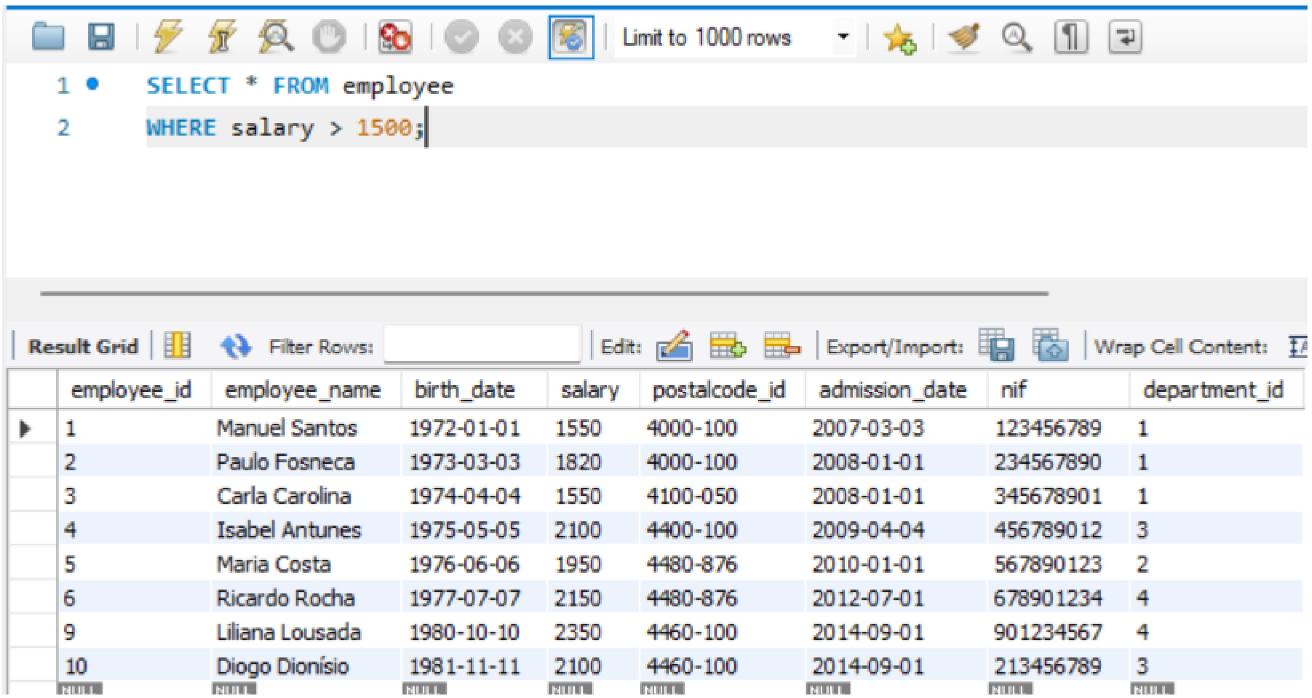
condition 1 AND NOT condition 2

Wilcards: % , _

SQL

Restrictions: WHERE keyword

- SELECTS ALL RECORDS OF THE EMPLOYEE'S ENTITY WHERE THE SALARY IS > 1500



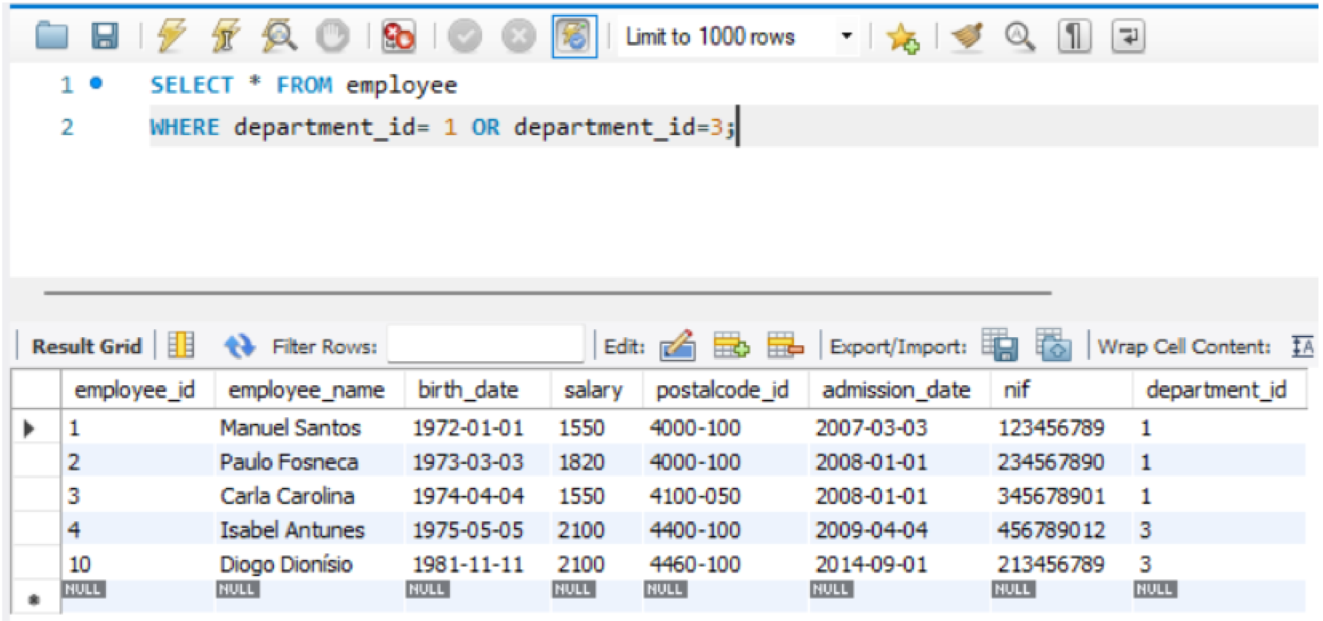
```
SELECT * FROM employee
WHERE salary > 1500;
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE DEPARTMENT IS 1 OR 3



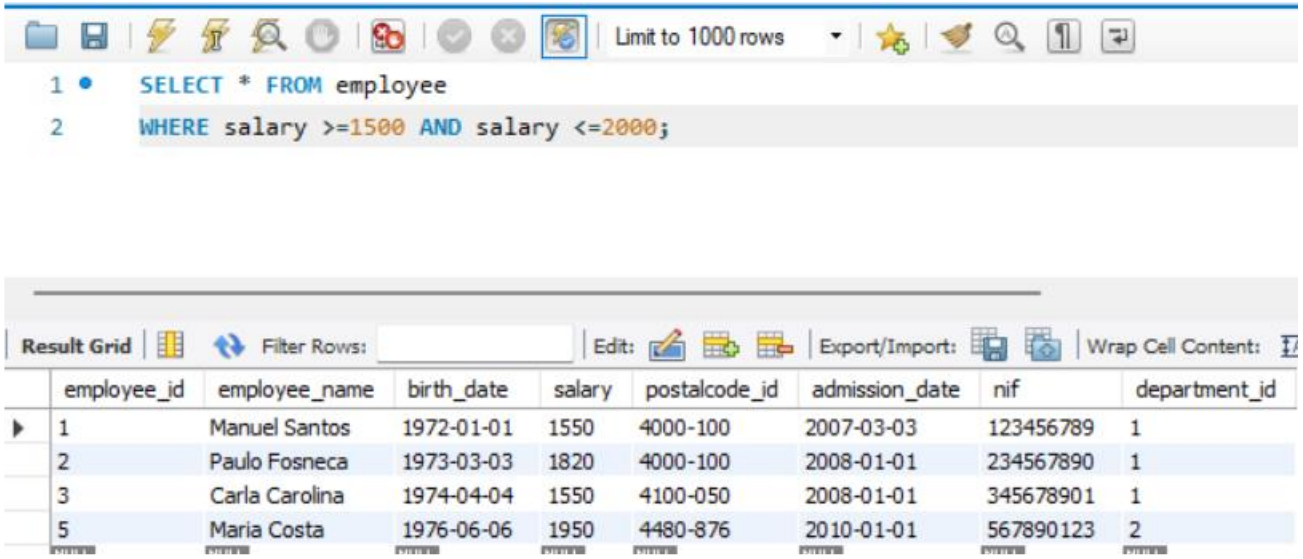
```
SELECT * FROM employee
WHERE department_id= 1 OR department_id=3;
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE SALARY IS BETWEEN 1500 AND 2000



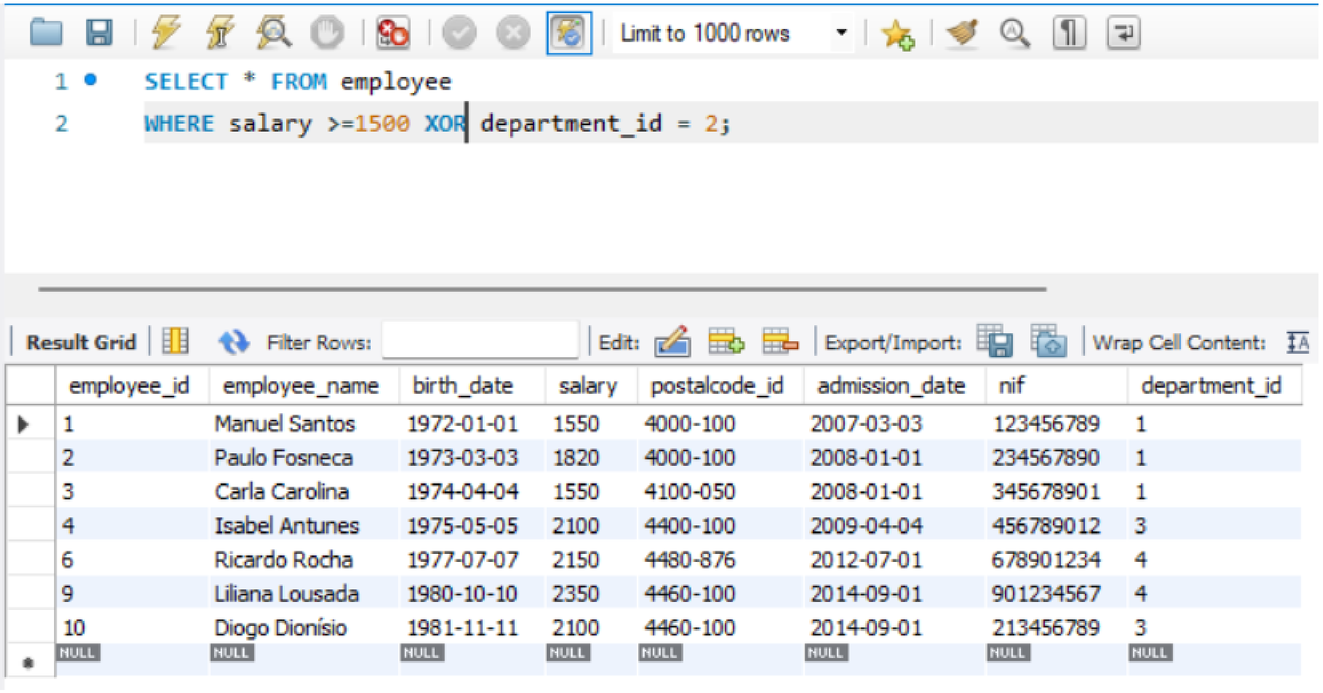
```
SELECT * FROM employee
WHERE salary >=1500 AND salary <=2000;
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE SALARY IS > = 1500 AND THE DEPARTMENT IS NOT 2



```sql
SELECT * FROM employee
WHERE salary >=1500 XOR department_id = 2;
```

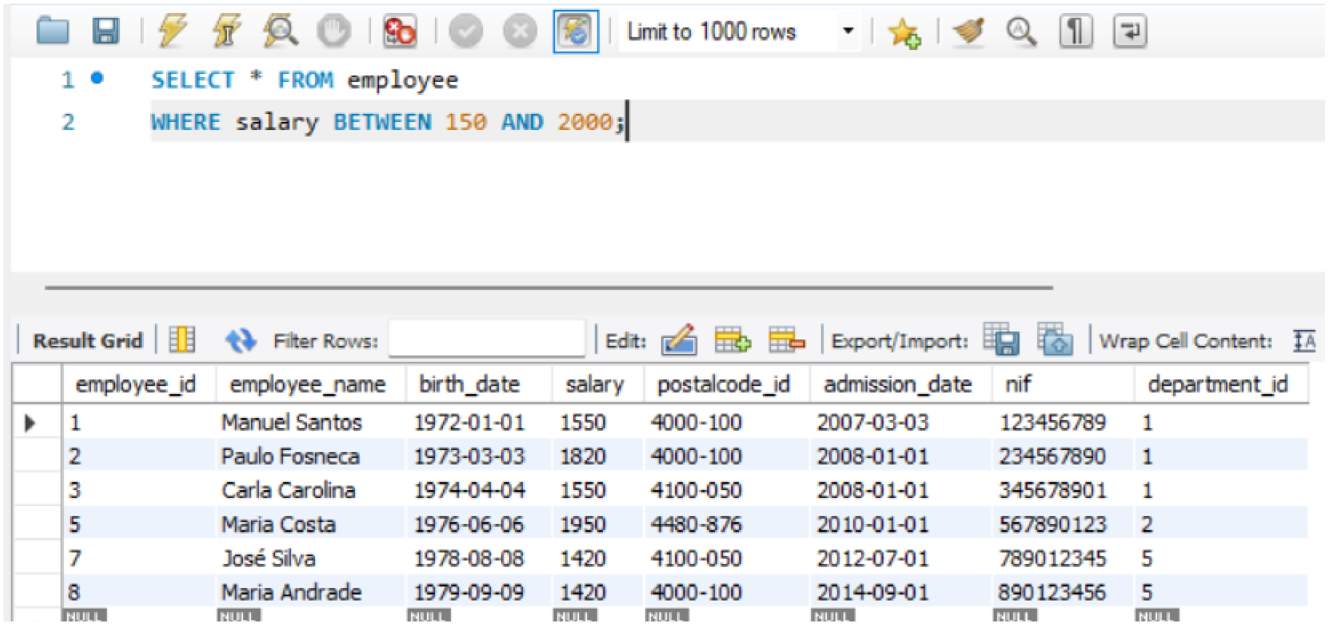
	employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
▶	1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
	2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
	3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
	4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
	6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
	9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
	10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

XOR: denial of condition2

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE SALARY IS BETWEEN 1500 AND 2000



```
SELECT * FROM employee
WHERE salary BETWEEN 150 AND 2000;
```

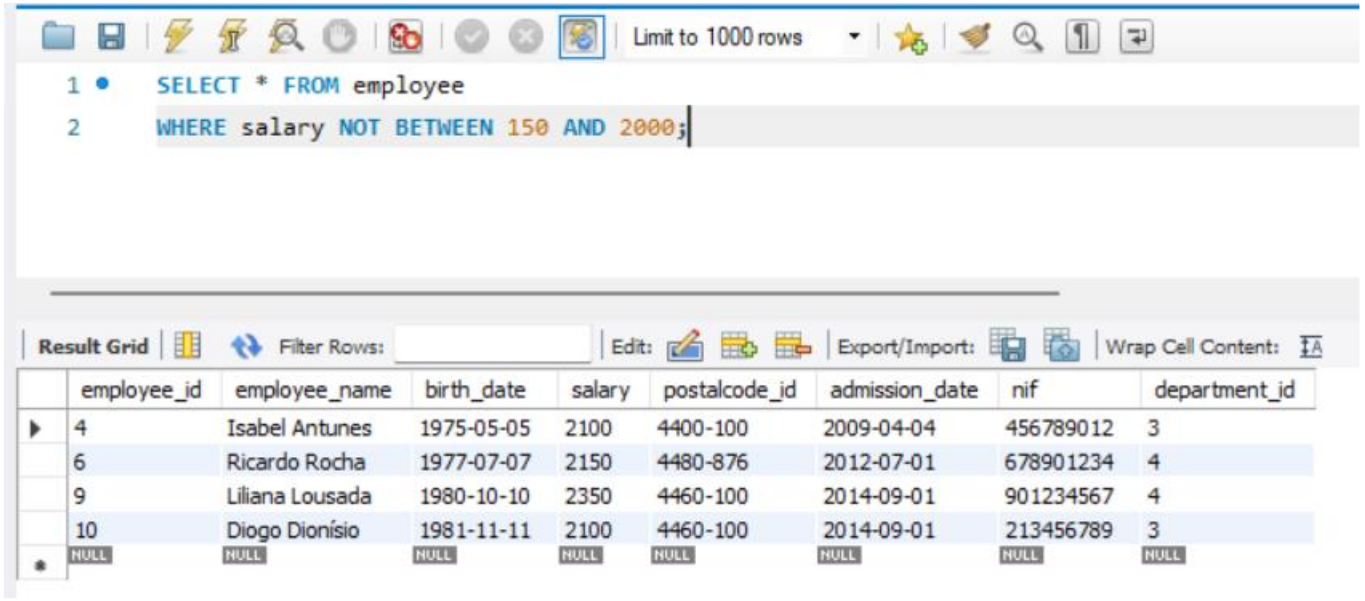
employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

BETWEEN: allows you to specify a range of values

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE SALARY IS NOT BETWEEN 1500 AND 2000



```
SELECT * FROM employee
WHERE salary NOT BETWEEN 150 AND 2000;
```

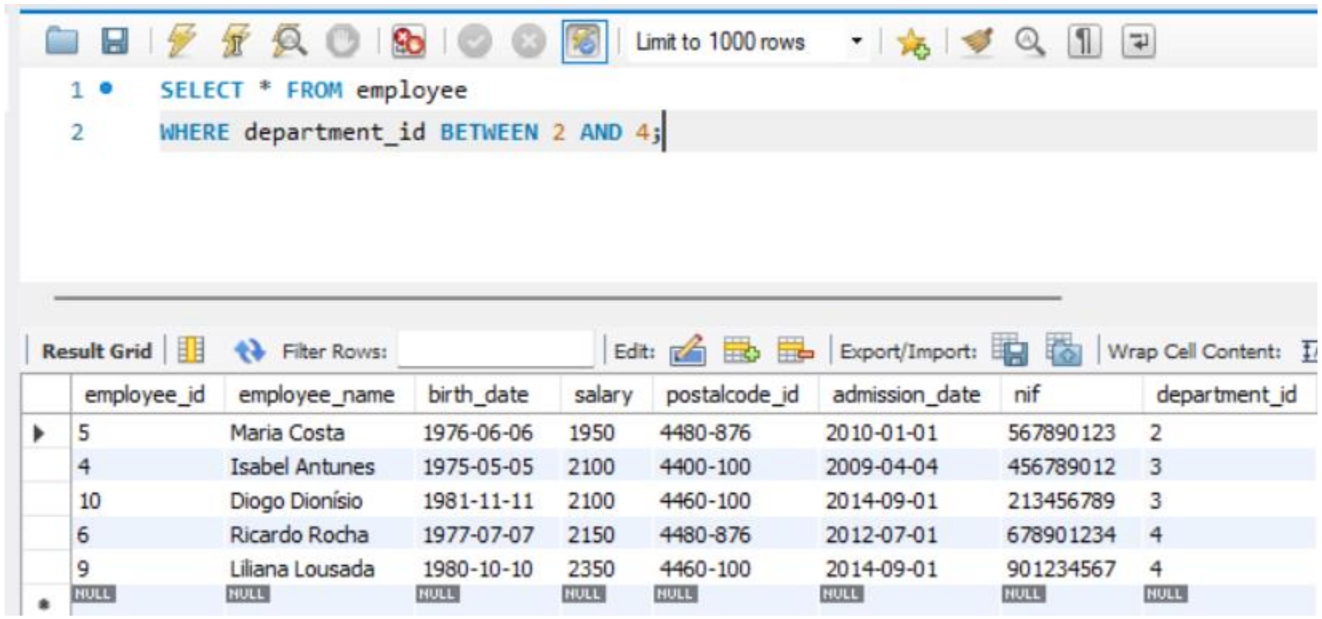
employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

BETWEEN: allows you to specify a range of values

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE DEPARTMENT IS BETWEEN 2 AND 4



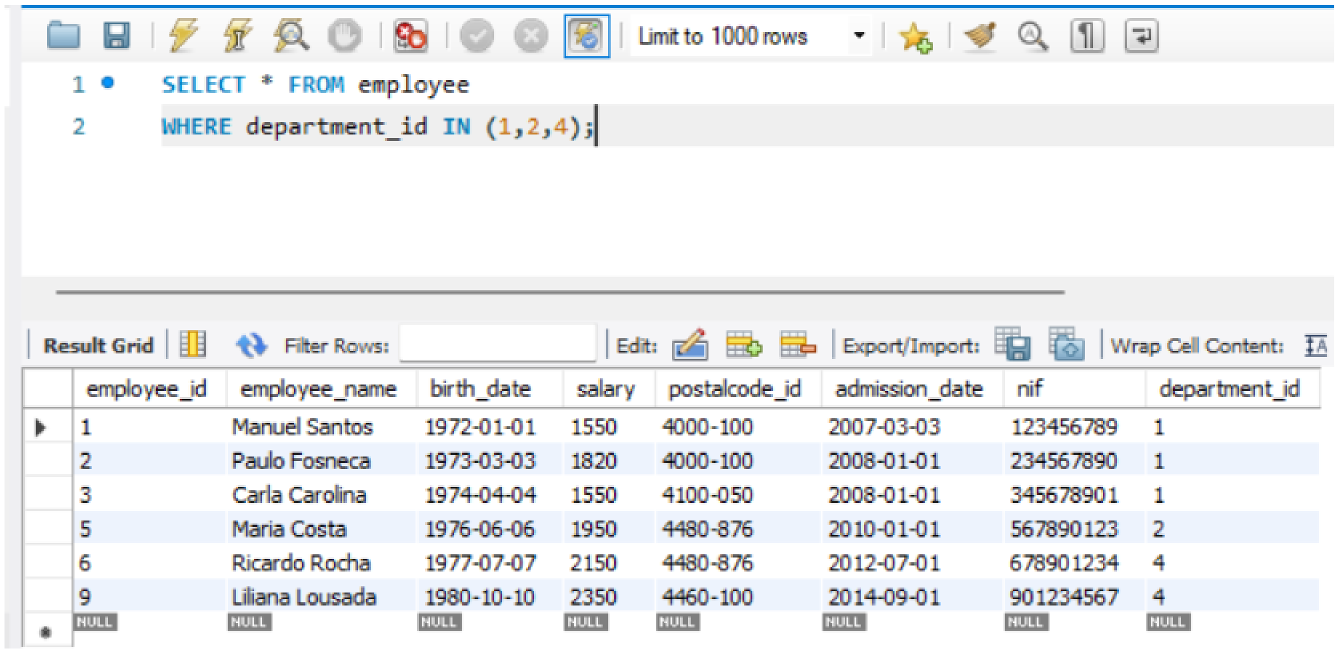
```
SELECT * FROM employee
WHERE department_id BETWEEN 2 AND 4;
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE DEPARTMENT_**ID IS ONE OF THE LIST**: 1,2,4



```
SELECT * FROM employee
WHERE department_id IN (1,2,4);
```

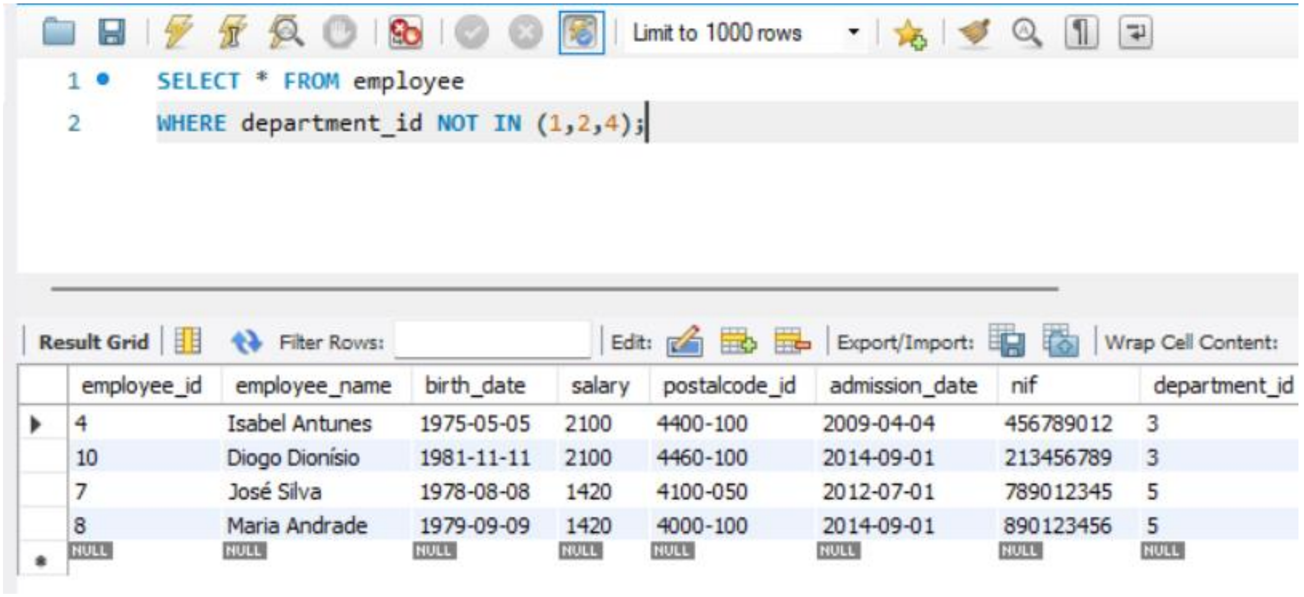
employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

IN : <u>allows you to specify a list of values</u>

SQL

Restrictions: WHERE keyword

- SELECT THE EMPLOYEES WHERE THE DEPARTMENT_ID **IS NOT ON THE LIST**: 1,2,4



```
SELECT * FROM employee
WHERE department_id NOT IN (1,2,4);
```

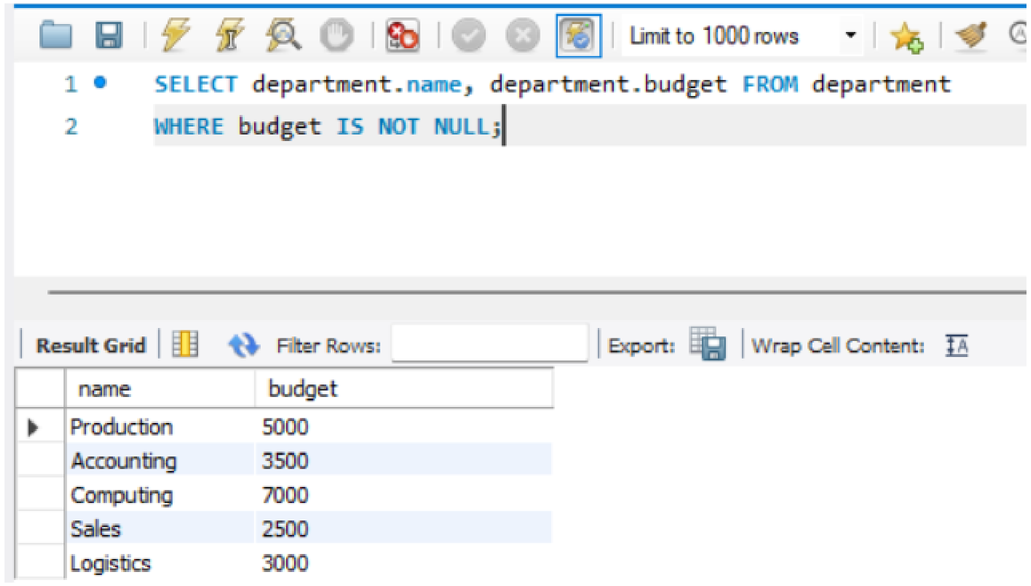
employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

IN : <u>allows you to specify a list of values</u>

SQL

Restrictions: WHERE keyword

- SELECT DEPARTMENTS WITH BUDGET NOT NULL, NOT EMPTY



Limit to 1000 rows

```
SELECT department.name, department.budget FROM department
WHERE budget IS NOT NULL;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

name	budget
Production	5000
Accounting	3500
Computing	7000
Sales	2500
Logistics	3000

NOT NULL : field does not contain null values, is not empty
NULL : field with no value, empty

Notes:
- ❑ Comparison with null values requires the IS operator
- ❑ NULL is not 0, it is a empty field

SQL

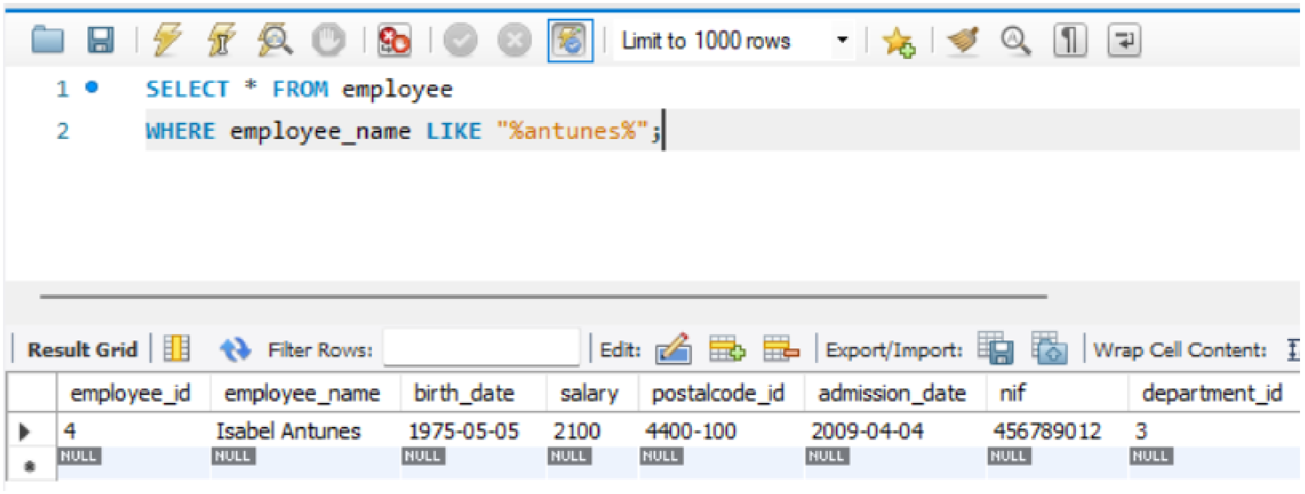
Restrictions: WHERE keyword

- Operator LIKE
  - Comparing strings with relational operators always results in the comparison of the entire string;
  - Operator Like is used to compare parts of Strings;
  - To do so, we can use two *Wilcards*:
    - % : indicates any character set (0 or more);
    - _ : indicates one and only one character

SQL

Restrictions: WHERE keyword

- SELECT EMPLOYEES WHERE NAME INCLUDES "ANTUNES"



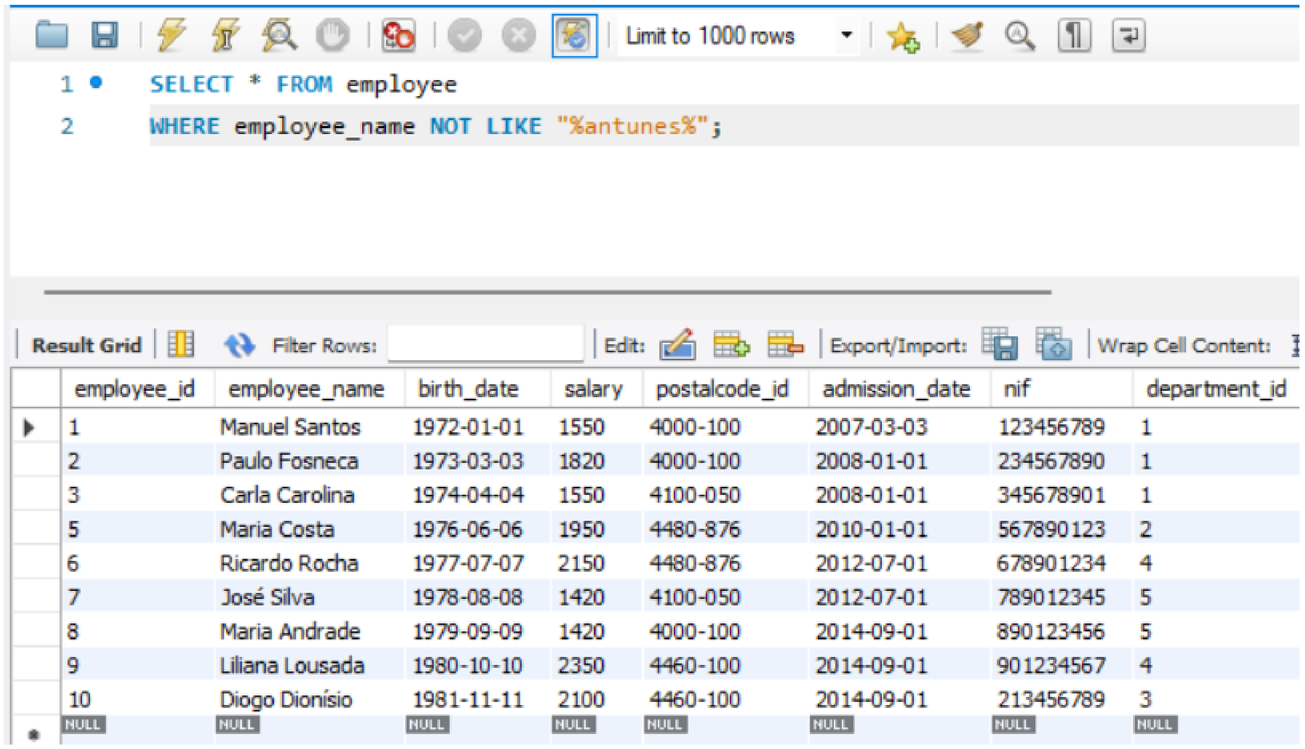
```
SELECT * FROM employee
WHERE employee_name LIKE "%antunes%";
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT EMPLOYEES WHERE NAME NOT INCLUDES "ANTUNES"



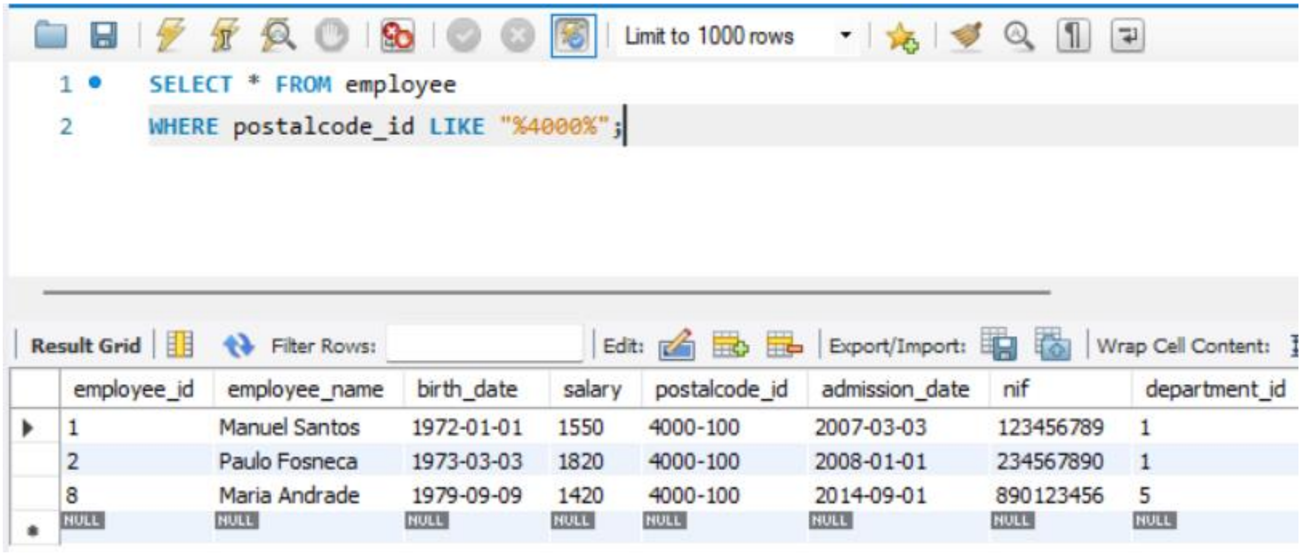
```
SELECT * FROM employee
WHERE employee_name NOT LIKE "%antunes%";
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT EMPLOYEES WHERE POSTALCODE INCLUDES "4000"



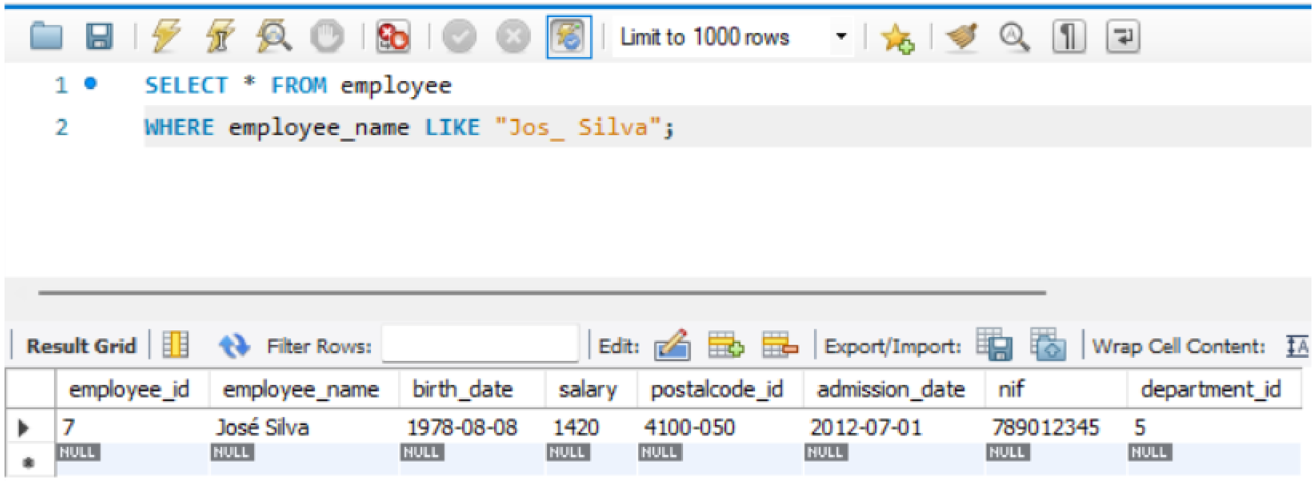
```
SELECT * FROM employee
WHERE postalcode_id LIKE "%4000%";
```

	employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
▶	1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
	2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
	8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT EMPLOYEES WHERE NAME INCLUDES A CHARACTER, WE DON'T KNOW WHICH



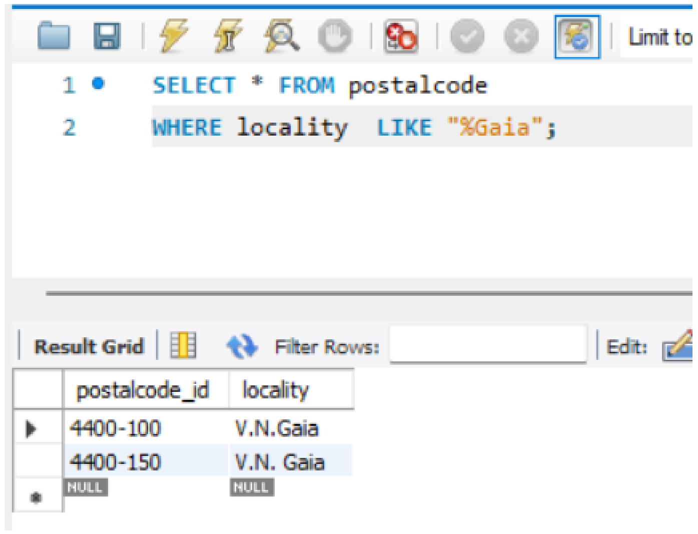
```
SELECT * FROM employee
WHERE employee_name LIKE "Jos_ Silva";
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

SQL

Restrictions: WHERE keyword

- SELECT LOCALITIES THAT ENDS WITH GAIA



```
SELECT * FROM postalcode
WHERE locality  LIKE "%Gaia";
```

postalcode_id	locality
4400-100	V.N.Gaia
4400-150	V.N. Gaia
NULL	NULL

SQL

SQL - Aggregation Functions

- Statistical functions provided by SQL
- They allow to obtain statistical information about sets of records specified in a SELECT, namely in the WHERE clause or on data groups - GROUP BY clause

Functions	Description
COUNT(*)	returns the number of rows/records obtained in a select
MAX	returns the highest value
MIN	returns the lowest value
SUM	returns the sum of a column
AVERAGE	returns the average of the values of a column

SQL

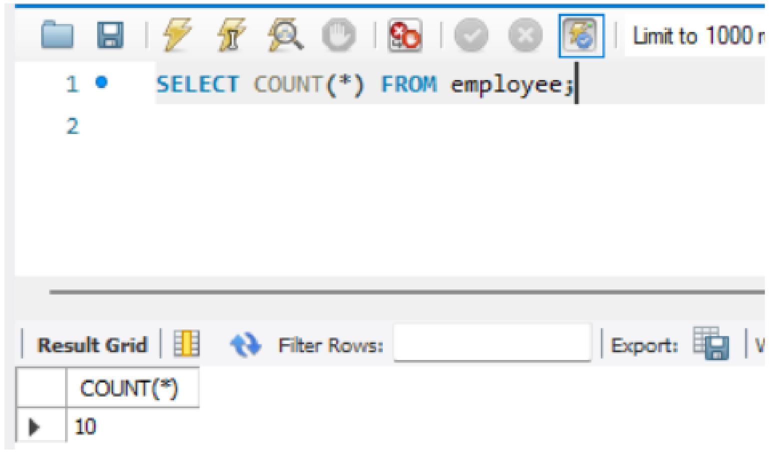
SQL – COUNT function

❑ COUNT(*)	number of rows that results from a select
❑ COUNT(coluna)	number of rows in the indicated column, provided that different from Null
❑ COUNT (DISTINCT coluna)	number of distinct lines in the indicated column

SQL

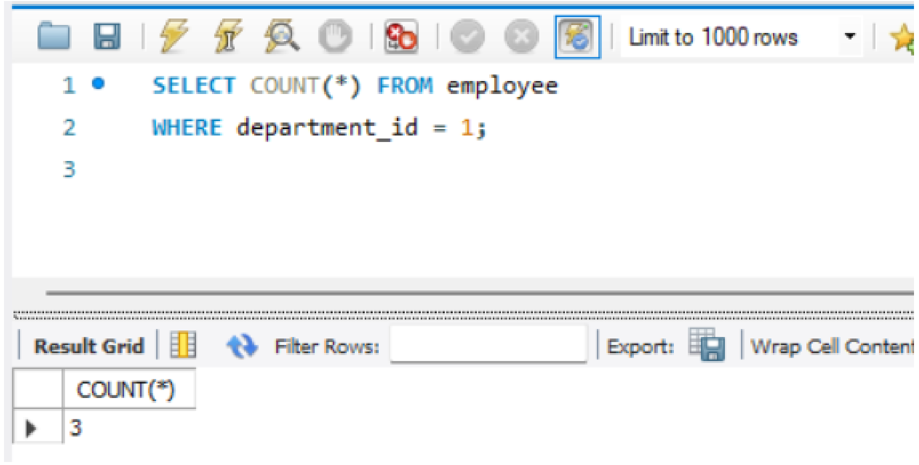
SQL – COUNT

SOME EXAMPLES…



```
SELECT COUNT(*) FROM employee;
```

	COUNT(*)
▶	10



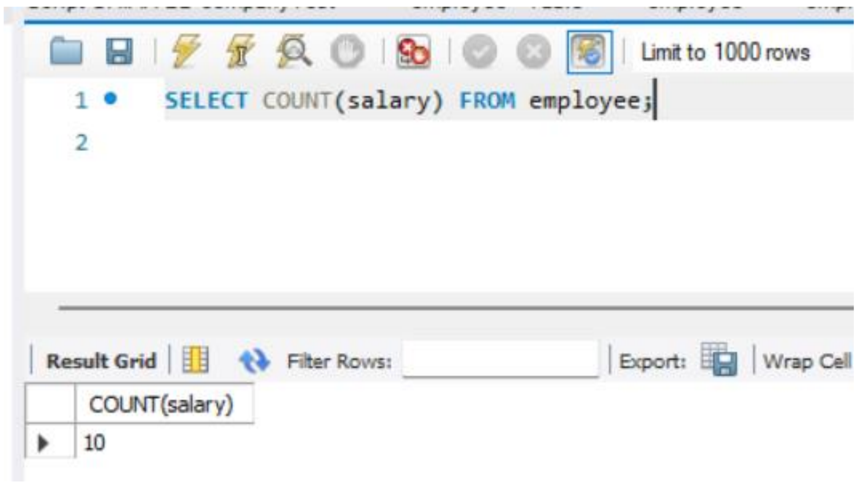
```
SELECT COUNT(*) FROM employee
WHERE department_id = 1;
```

	COUNT(*)
▶	3

SQL

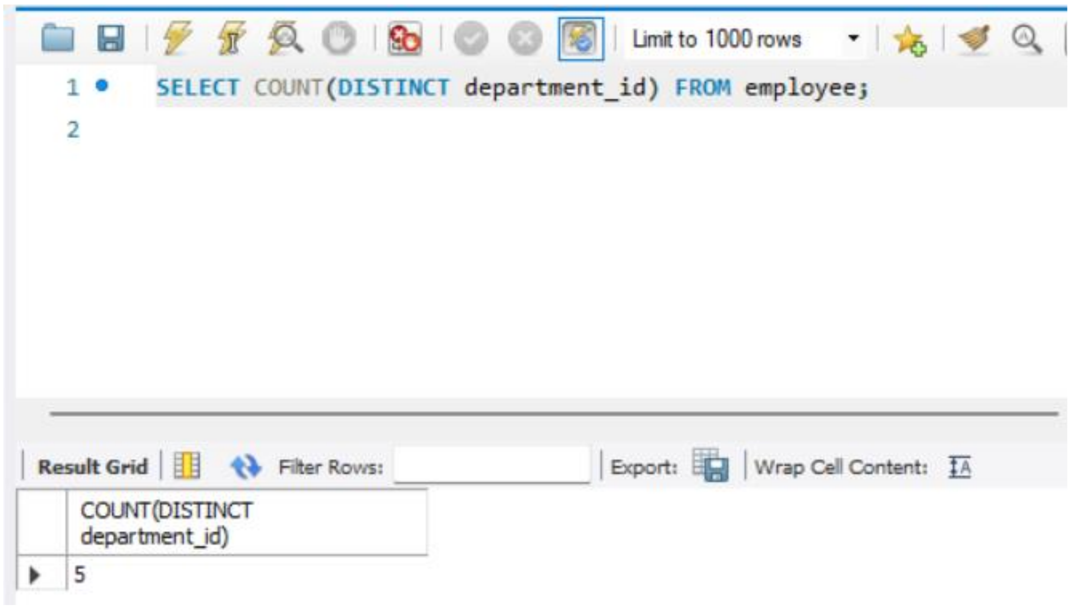
SQL – COUNT

SOME EXAMPLES…



```
SELECT COUNT(salary) FROM employee;
```

```
COUNT(salary)
10
```



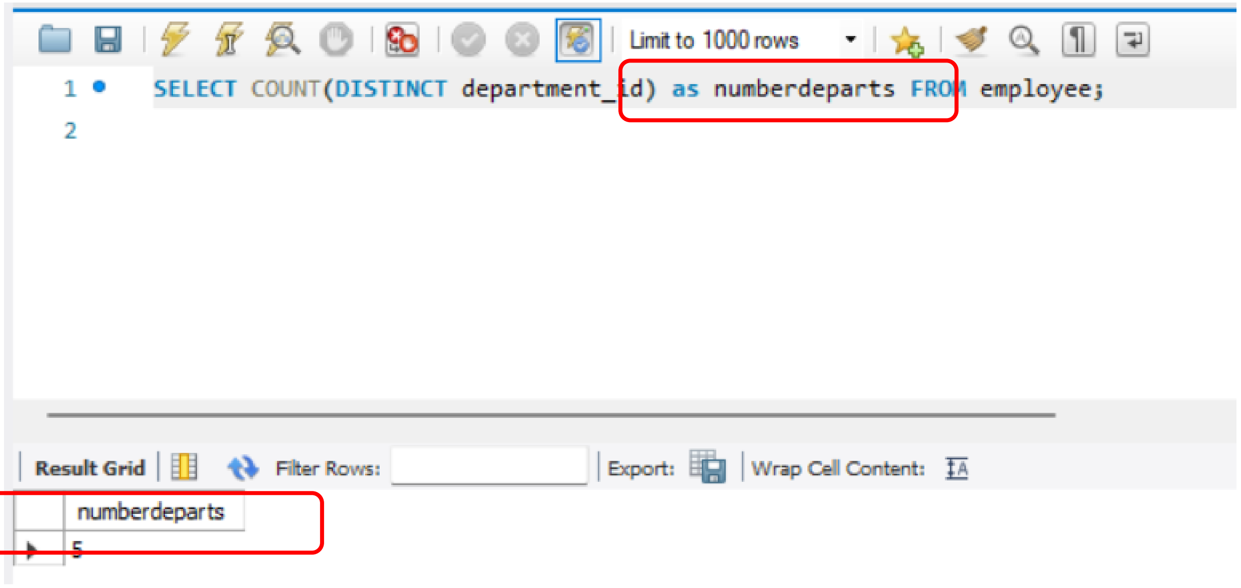
```
SELECT COUNT(DISTINCT department_id) FROM employee;
```

```
COUNT(DISTINCT
department_id)
5
```

SQL

SQL – COUNT

SOME EXAMPLES…



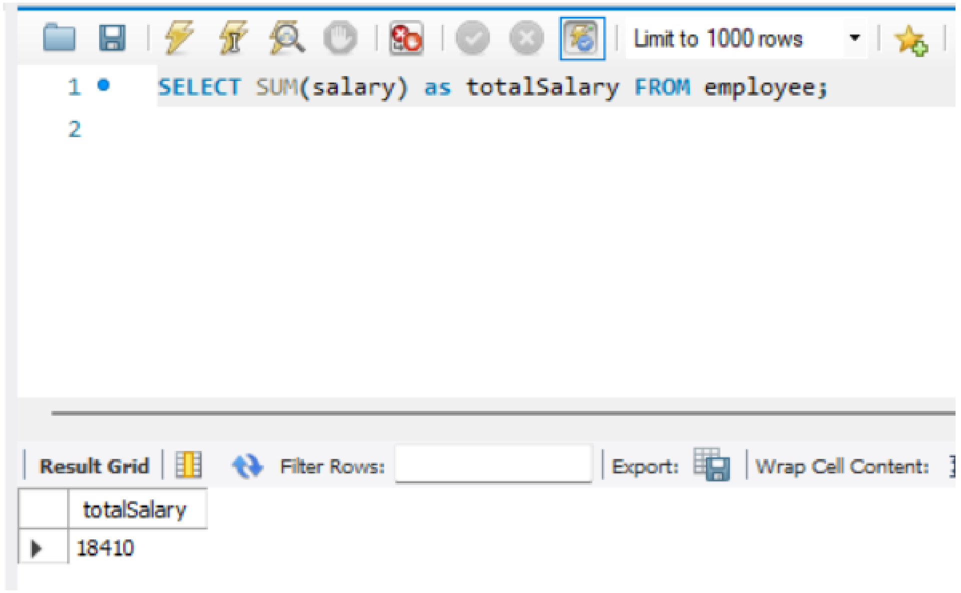
```
SELECT COUNT(DISTINCT department_id) as numberdeparts FROM employee;
```

```
numberdeparts
5
```

SQL

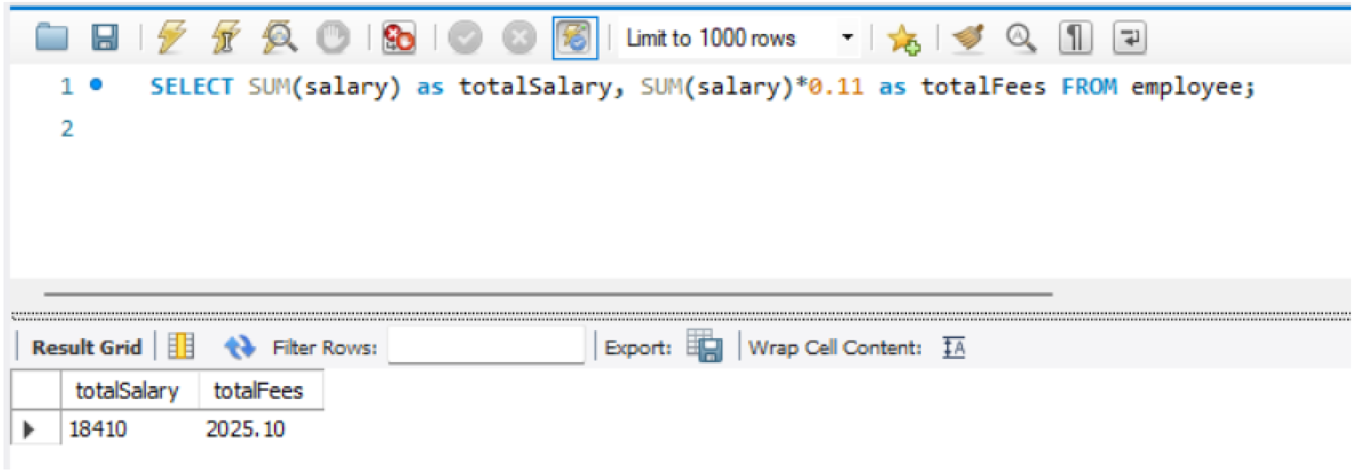
SQL – SUM

SOME EXAMPLES…



```
SELECT SUM(salary) as totalSalary FROM employee;
```

```
totalSalary
18410
```



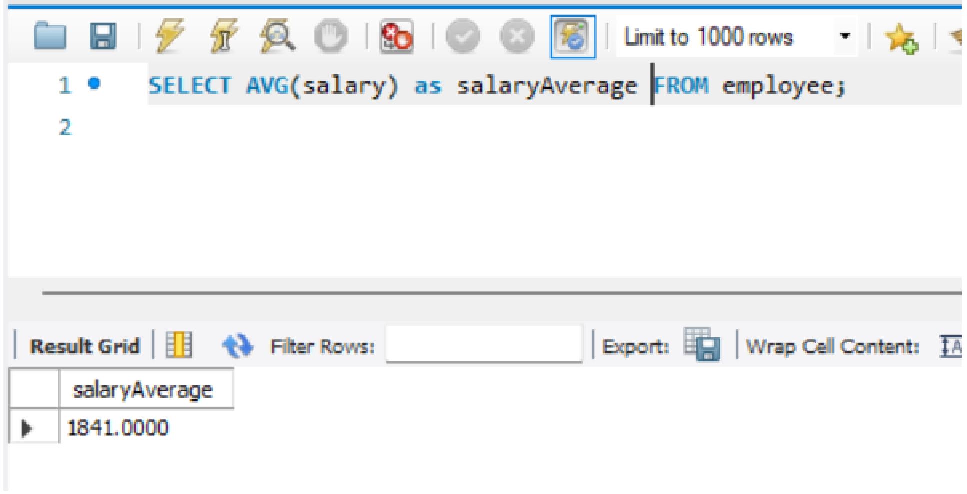
```
SELECT SUM(salary) as totalSalary, SUM(salary)*0.11 as totalFees FROM employee;
```

```
totalSalary   totalFees
18410         2025.10
```

SQL

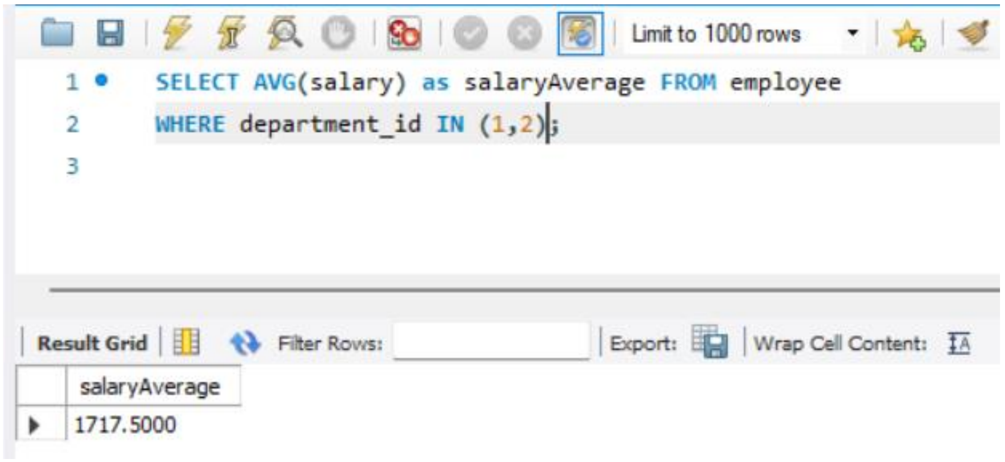
SQL – AVG

SOME EXAMPLES…



```
SELECT AVG(salary) as salaryAverage FROM employee;
```

```
salaryAverage
1841.0000
```



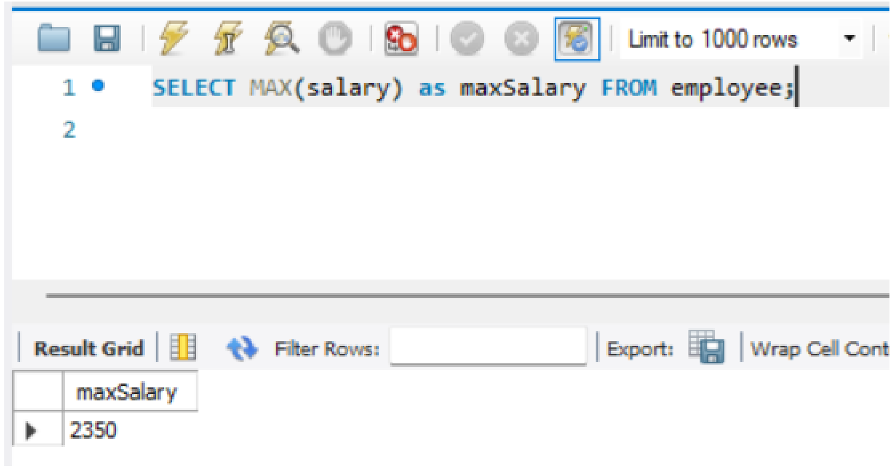
```
SELECT AVG(salary) as salaryAverage FROM employee
WHERE department_id IN (1,2);
```

```
salaryAverage
1717.5000
```

SQL

SQL – MAX and MIN functions

SOME EXAMPLES…

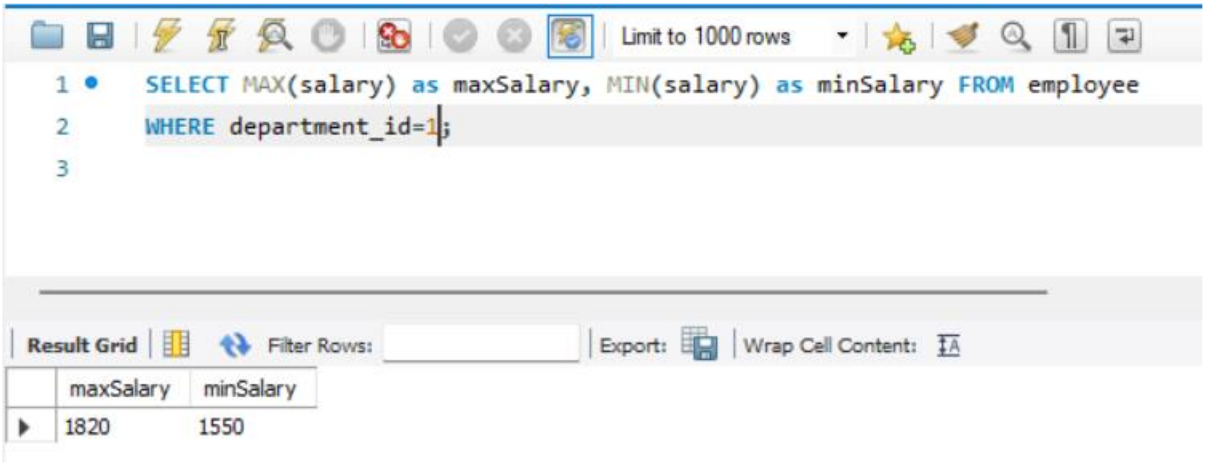


```
SELECT MAX(salary) as maxSalary FROM employee;
```

Limit to 1000 rows

Result Grid | Filter Rows: | Export: | Wrap Cell Cont

maxSalary
2350



```
SELECT MAX(salary) as maxSalary, MIN(salary) as minSalary FROM employee
WHERE department_id=1;
```

Limit to 1000 rows

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

maxSalary	minSalary
1820	1550

SQL

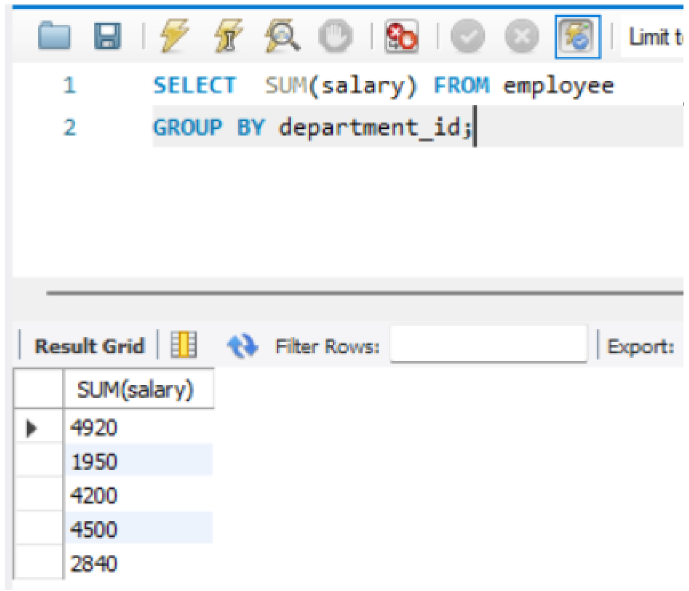
SQL – GROUP BY

- Let's you group data that results from a select
- Data Grouping is particularly useful when coupled with aggregation functions
- GROUP BY Clause:
  - It is used to group data
  - The records are processed in groups of similar characteristics
  - By associating aggregation functions (SUM, AVG, COUNT, ...) we can obtain statistical data about each data group

```
SELECT [distinct/all] filed1, field2, …, fieldn [*]
FROM tables
[WHERE conditions]
[GROUP BY fields]
[HAVING conditions]
[ORDER BY fields]
```

SQL

SQL – GROUP BY

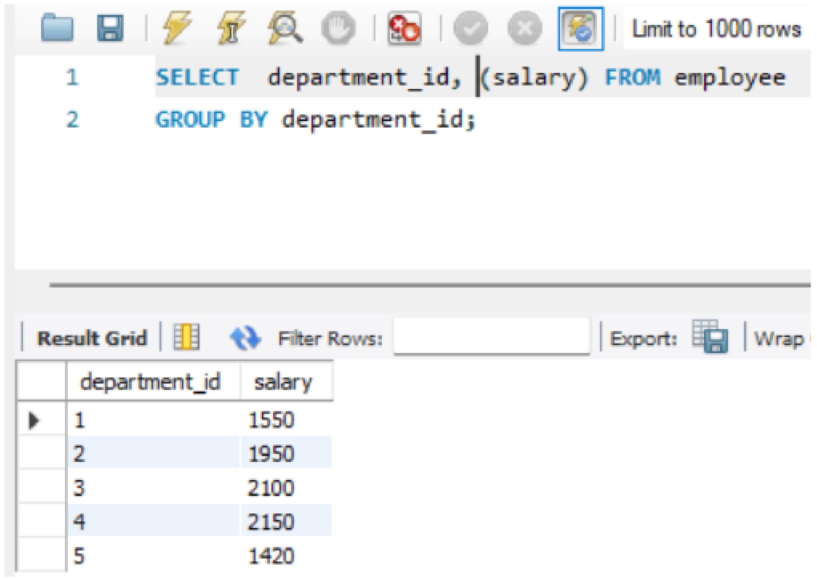

Limit t

```
SELECT  SUM(salary) FROM employee
GROUP BY department_id;
```

Result Grid Filter Rows: Export:

	SUM(salary)
▶	4920
	1950
	4200
	4500
	2840

...


Limit to 1000 rows

```
SELECT  department_id, (salary) FROM employee
GROUP BY department_id;
```

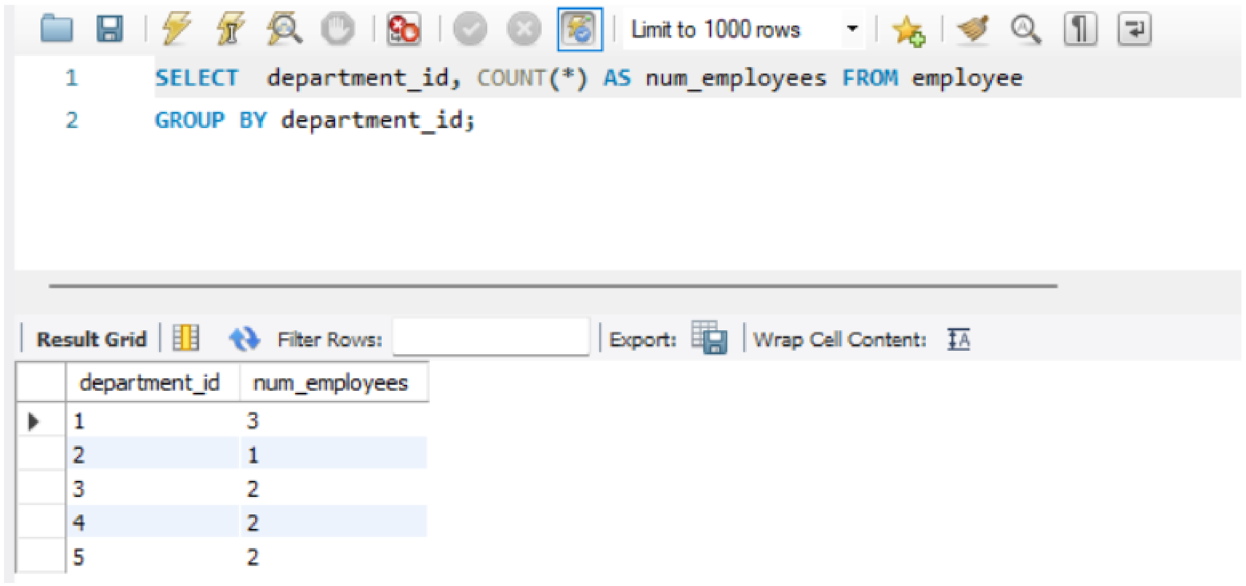
Result Grid Filter Rows: Export: Wrap

	department_id	salary
▶	1	1550
	2	1950
	3	2100
	4	2150
	5	1420

SQL

SQL – GROUP BY

SOME EXAMPLES…



```
SELECT  department_id, COUNT(*) AS num_employees FROM employee
GROUP BY department_id;
```

department_id	num_employees
1	3
2	1
3	2
4	2
5	2

SQL

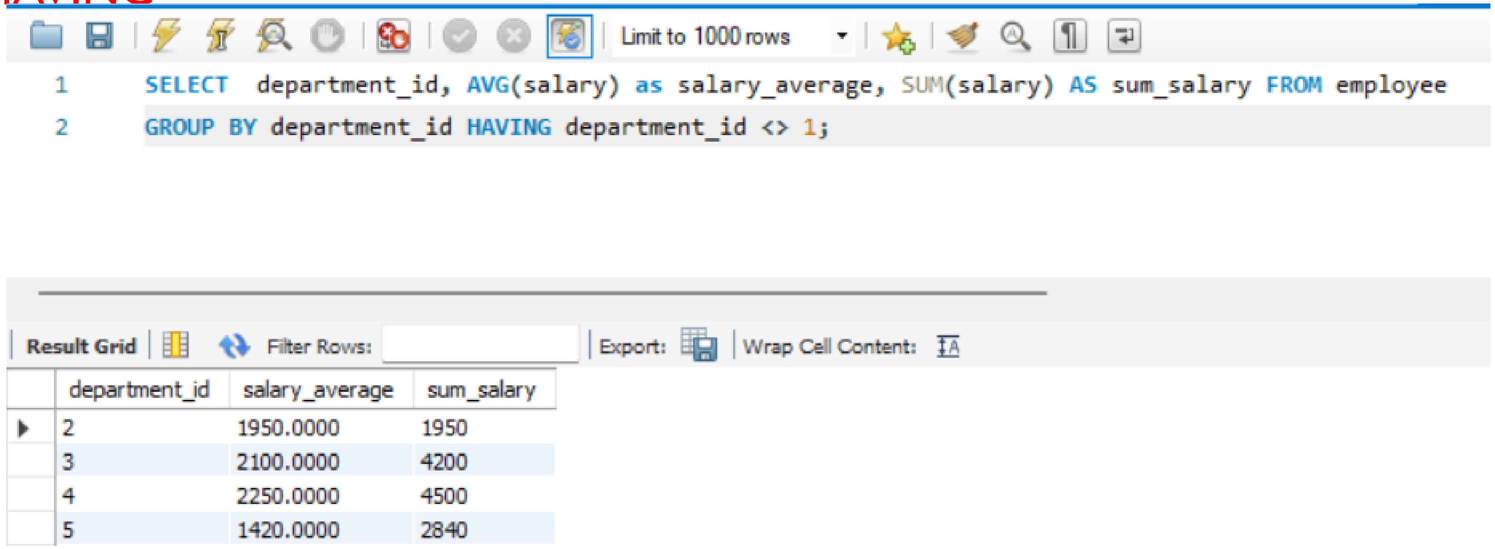
SQL – GROUP BY … HAVING

- HAVING Clause
  - Used to enforce constraints at the data grouping level
  - Acts on data groups
  - The WHERE clause imposes constraints on the level of data selection;
  - The HAVING clause allows you to restrict data at the groups that are formed, after applying data selection

```
SELECT [distinct/all] filed1, field2, …, fieldn [*]
FROM tables
[WHERE conditions]
[GROUP BY fields]
[HAVING conditions]
[ORDER BY fields]
```

SQL

SQL – HAVING

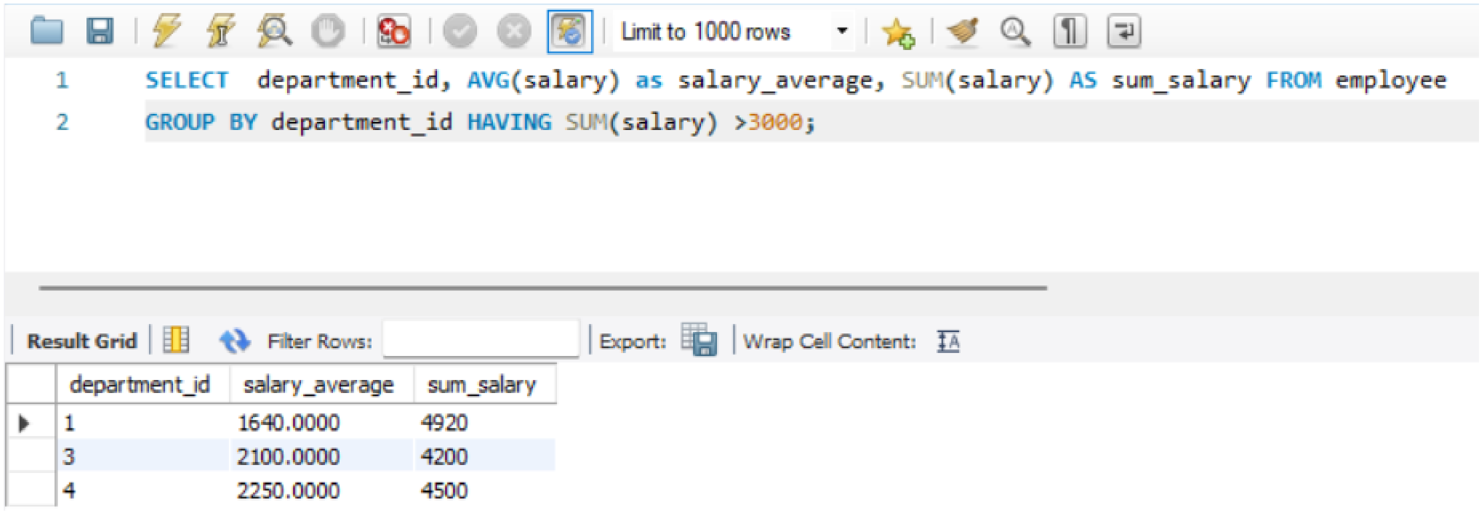


Limit to 1000 rows

```
SELECT  department_id, AVG(salary) as salary_average, SUM(salary) AS sum_salary FROM employee
GROUP BY department_id HAVING department_id <> 1;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

department_id	salary_average	sum_salary
2	1950.0000	1950
3	2100.0000	4200
4	2250.0000	4500
5	1420.0000	2840



Limit to 1000 rows

```
SELECT  department_id, AVG(salary) as salary_average, SUM(salary) AS sum_salary FROM employee
GROUP BY department_id HAVING SUM(salary) >3000;
```

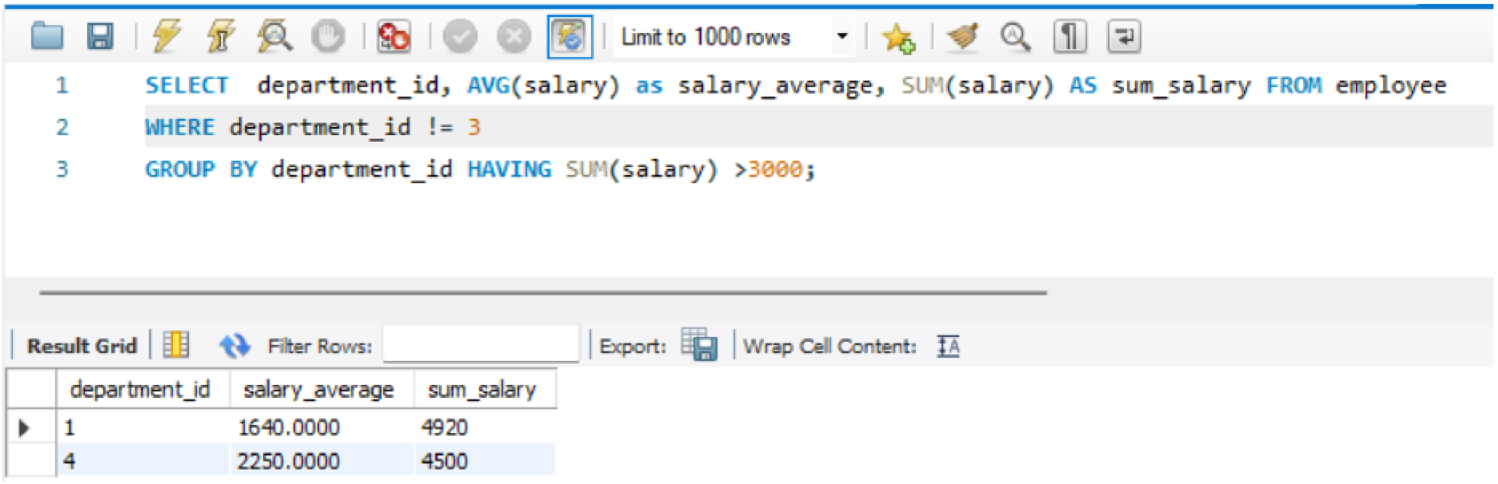
Result Grid | Filter Rows: | Export: | Wrap Cell Content:

department_id	salary_average	sum_salary
1	1640.0000	4920
3	2100.0000	4200
4	2250.0000	4500

SQL

SQL – HAVING

SOME EXAMPLES…



```
SELECT  department_id, AVG(salary) as salary_average, SUM(salary) AS sum_salary FROM employee
WHERE department_id != 3
GROUP BY department_id HAVING SUM(salary) >3000;
```

department_id	salary_average	sum_salary
1	1640.0000	4920
4	2250.0000	4500

SQL

SQL- ORDER BY

- Let's you sort the resulting data from a select
- The ordering is based on the ASCII table
- Digits appear before alphabetic characters; uppercase to lowercase letters
- Some DBMS are case sensitive, others are not ... (MySql is not case sensitive)
- ORDER BY clause
  - The ordering can be Ascending - ASC or Descending - DESC
  - By default, the sort is ascending

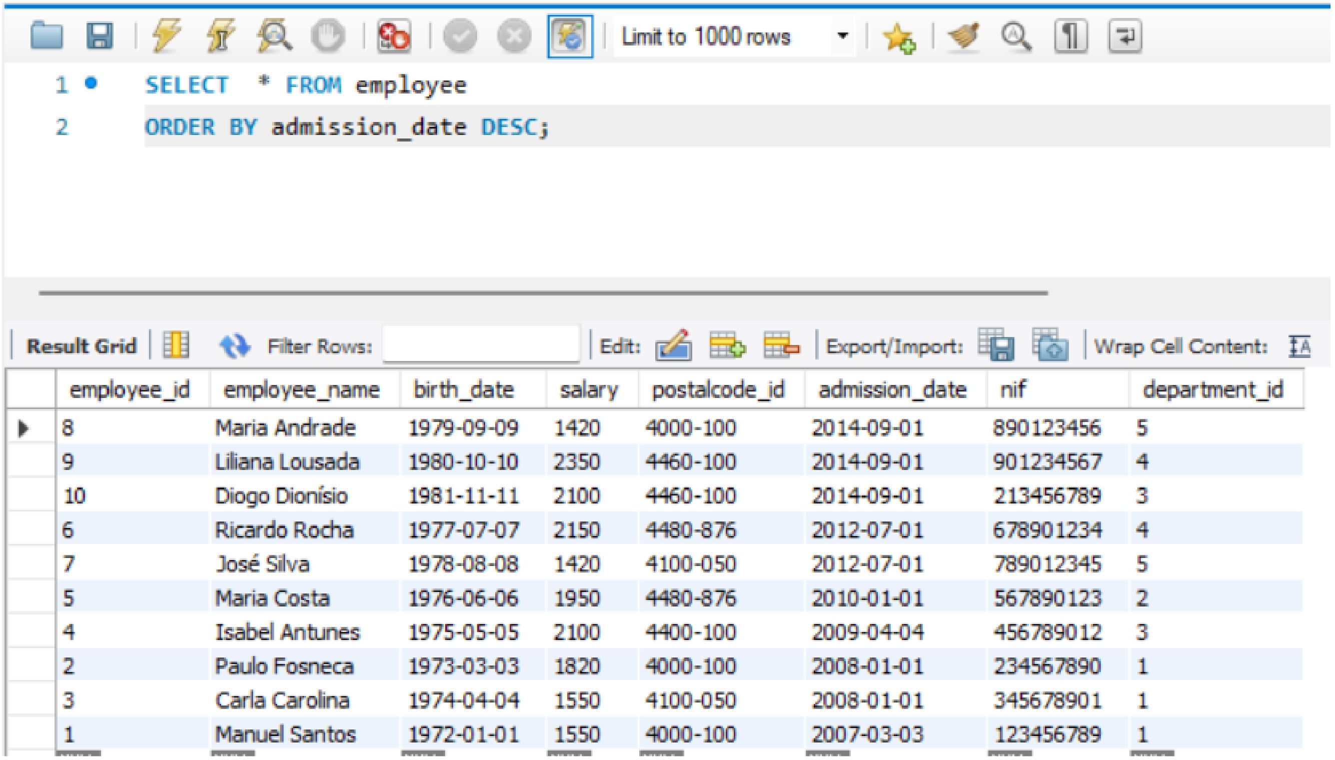
```
SELECT [distinct/all] filed1, field2, …, fieldn [*]
FROM tables
[WHERE conditions]
[GROUP BY fields]
[HAVING conditions]
[ORDER BY fields] [ASC | DESC]
```

SQL

SQL – ORDER BY

- Sorting ASC ou DESC

SOME EXAMPLES…



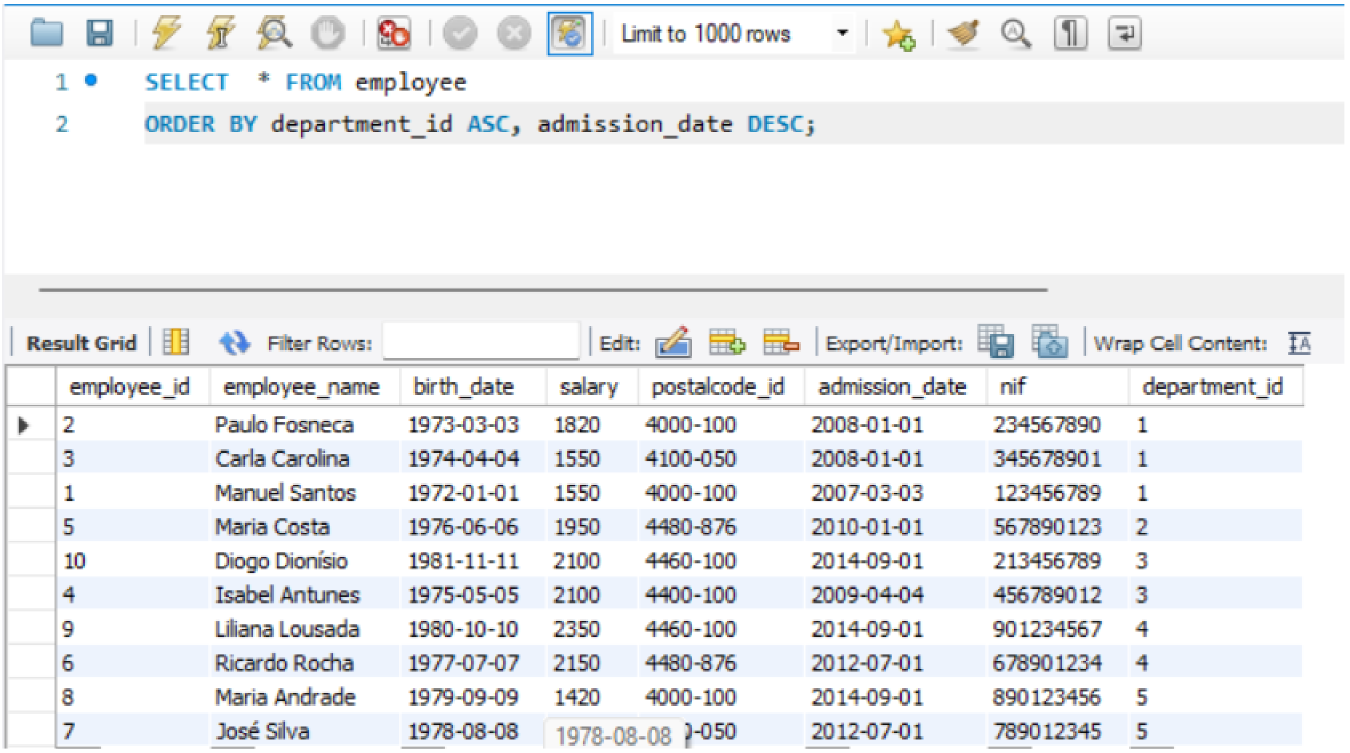
```
SELECT  * FROM employee
ORDER BY admission_date DESC;
```

employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
7	José Silva	1978-08-08	1420	4100-050	2012-07-01	789012345	5
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1

SQL

SQL – ORDER BY

- Sort with sub-ordering



```
SELECT  * FROM employee
ORDER BY department_id ASC, admission_date DESC;
```

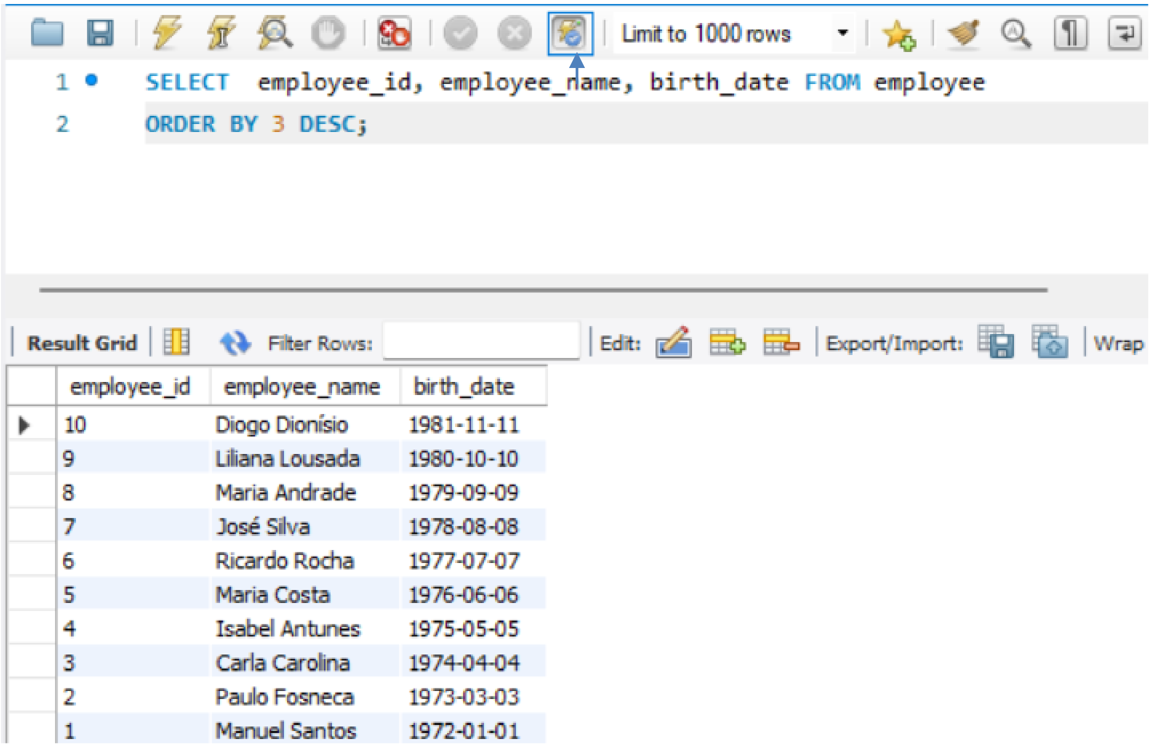
employee_id	employee_name	birth_date	salary	postalcode_id	admission_date	nif	department_id
2	Paulo Fosneca	1973-03-03	1820	4000-100	2008-01-01	234567890	1
3	Carla Carolina	1974-04-04	1550	4100-050	2008-01-01	345678901	1
1	Manuel Santos	1972-01-01	1550	4000-100	2007-03-03	123456789	1
5	Maria Costa	1976-06-06	1950	4480-876	2010-01-01	567890123	2
10	Diogo Dionísio	1981-11-11	2100	4460-100	2014-09-01	213456789	3
4	Isabel Antunes	1975-05-05	2100	4400-100	2009-04-04	456789012	3
9	Liliana Lousada	1980-10-10	2350	4460-100	2014-09-01	901234567	4
6	Ricardo Rocha	1977-07-07	2150	4480-876	2012-07-01	678901234	4
8	Maria Andrade	1979-09-09	1420	4000-100	2014-09-01	890123456	5
7	José Silva	1978-08-08	[illegible]	-050	2012-07-01	789012345	5

Sorting is performed by the indicated first column; for identical values column, it orders by the second column (sub-ordering)

SQL

SQL – ORDER BY

- Sorting by column position in the query



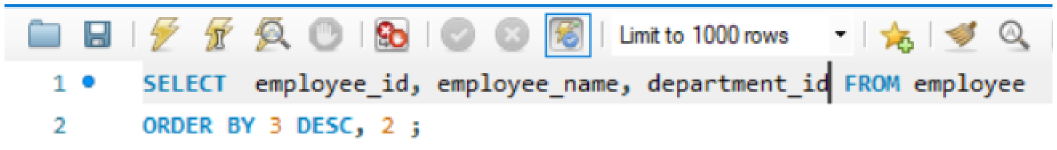
```
SELECT  employee_id, employee_name, birth_date FROM employee
ORDER BY 3 DESC;
```

employee_id	employee_name	birth_date
10	Diogo Dionísio	1981-11-11
9	Liliana Lousada	1980-10-10
8	Maria Andrade	1979-09-09
7	José Silva	1978-08-08
6	Ricardo Rocha	1977-07-07
5	Maria Costa	1976-06-06
4	Isabel Antunes	1975-05-05
3	Carla Carolina	1974-04-04
2	Paulo Fosneca	1973-03-03
1	Manuel Santos	1972-01-01

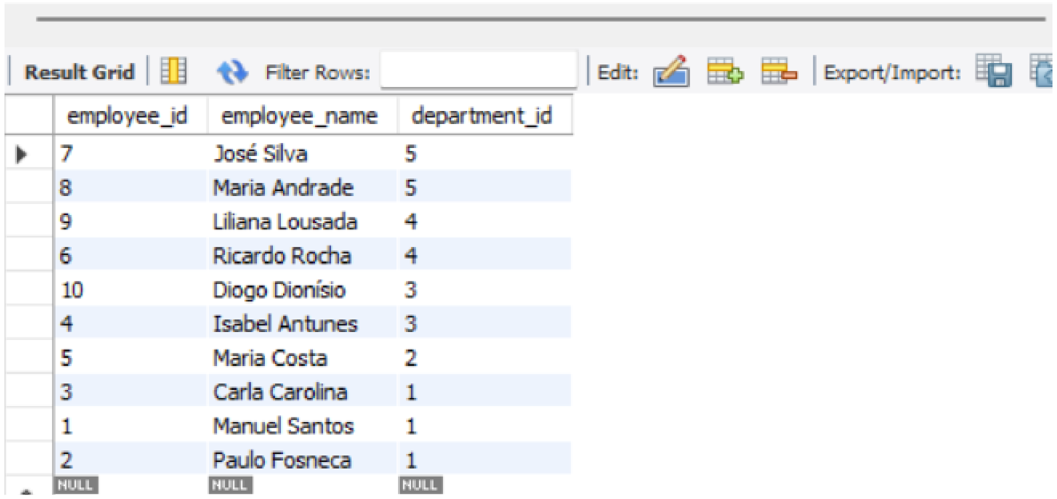
SQL

SQL – ORDER BY

- Sorting by column position in the query



```
SELECT  employee_id, employee_name, department_id FROM employee
ORDER BY 3 DESC, 2 ;
```

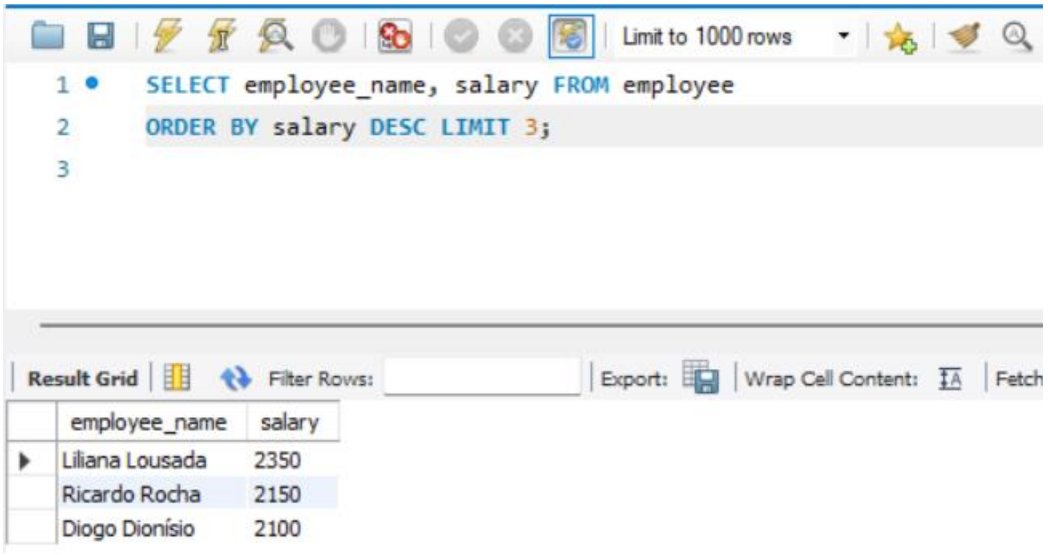


employee_id	employee_name	department_id
7	José Silva	5
8	Maria Andrade	5
9	Liliana Lousada	4
6	Ricardo Rocha	4
10	Diogo Dionísio	3
4	Isabel Antunes	3
5	Maria Costa	2
3	Carla Carolina	1
1	Manuel Santos	1
2	Paulo Fosneca	1
NULL	NULL	NULL

SQL

SQL – LIMIT

- It limits the number of records returned in the query



```
SELECT employee_name, salary FROM employee
ORDER BY salary DESC LIMIT 3;
```

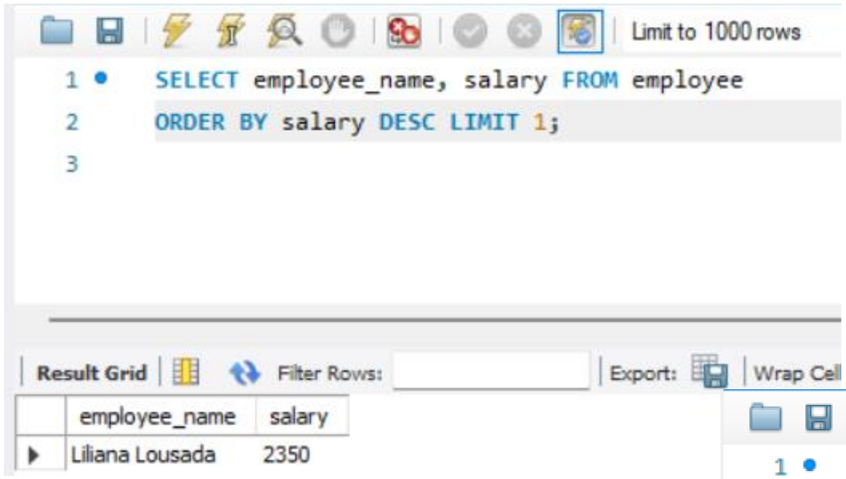
employee_name	salary
Liliana Lousada	2350
Ricardo Rocha	2150
Diogo Dionísio	2100

It returns the top 3

SQL

SQL – LIMIT

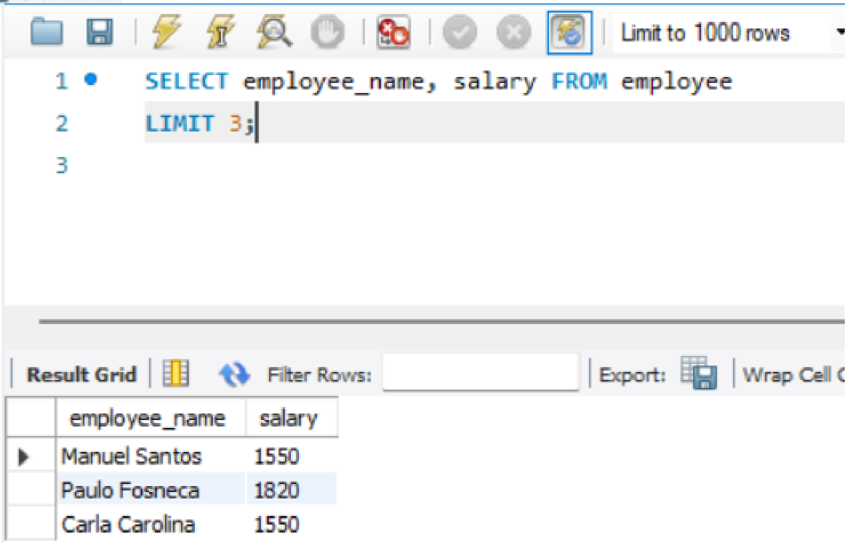
- It limits the number of records returned in the query



```
SELECT employee_name, salary FROM employee
ORDER BY salary DESC LIMIT 1;
```

```
employee_name   salary
Liliana Lousada 2350
```

It returns the top 1



```
SELECT employee_name, salary FROM employee
LIMIT 3;
```

```
employee_name   salary
Manuel Santos   1550
Paulo Fosneca   1820
Carla Carolina  1550
```

It returns the 3 first records (without sorted data)