Restricting and Sorting Data

Objectives

After completing this lesson, you should be able to do the following:

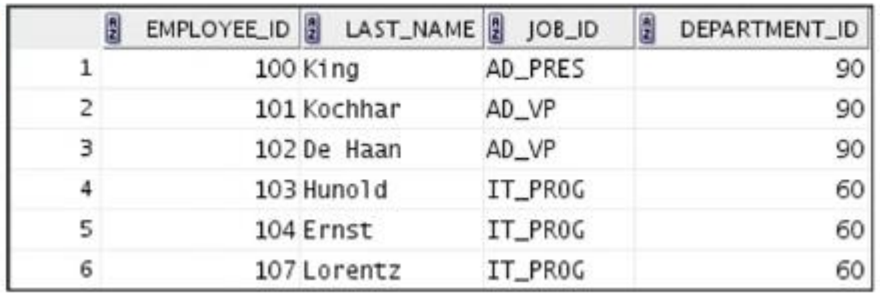
- Limit the rows that are retrieved by a query
- Sort the rows that are retrieved by a query

Lesson Agenda

- Limiting rows with:
  - The WHERE clause
  - The comparison operators using =, <=, BETWEEN, IN, LIKE, and NULL conditions
  - Logical conditions using AND, OR, and NOT operators
- Rules of precedence for operators in an expression
- Sorting rows using the ORDER BY clause
- SQL row limiting clause in a query
- Substitution variables in Oracle
- Assigning values to variables

Limiting Rows by Using a Selection

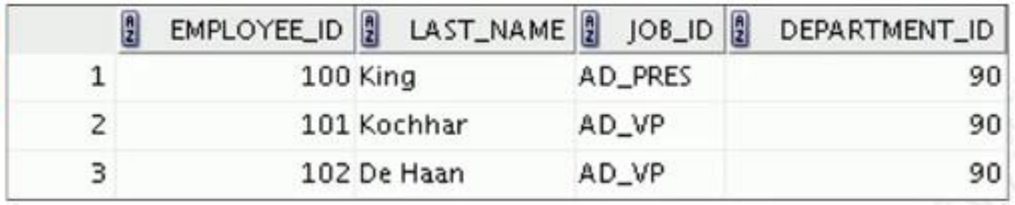
```
SELECT employee_id, last_name, job_id, department_id
FROM employees;
```



	EMPLOYEE_ID	LAST_NAME	JOB_ID	DEPARTMENT_ID
1	100	King	AD_PRES	90
2	101	Kochhar	AD_VP	90
3	102	De Haan	AD_VP	90
4	103	Hunold	IT_PROG	60
5	104	Ernst	IT_PROG	60
6	107	Lorentz	IT_PROG	60

...

What it you want to retrieve all employees in department 90, but not other departments?



	EMPLOYEE_ID	LAST_NAME	JOB_ID	DEPARTMENT_ID
1	100	King	AD_PRES	90
2	101	Kochhar	AD_VP	90
3	102	De Haan	AD_VP	90

Limiting Rows That Are Selected

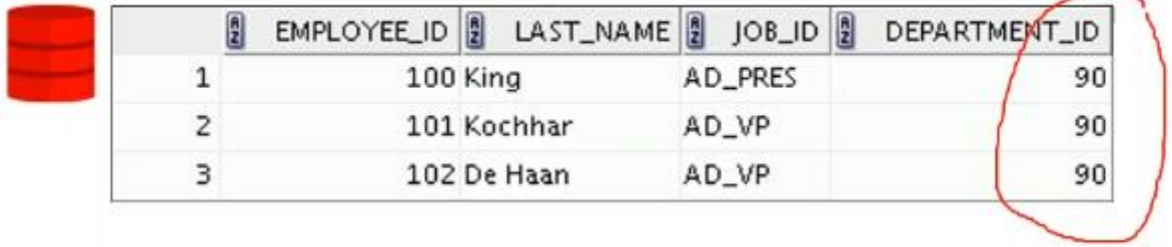
- Restrict the rows that are returned by using the WHERE clause:

```
SELECT   *|{[DISTINCT] column [alias],...}
FROM     table
[WHERE logical expression(s)];
```

- The WHERE clause follows the FROM clause.

Using the WHERE Clause

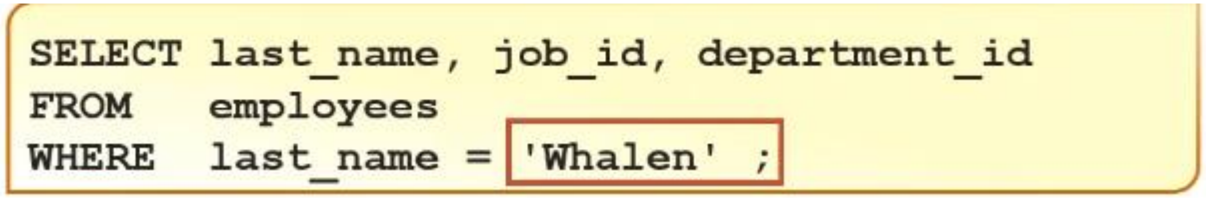
```
SELECT employee_id, last_name, job_id, department_id
FROM   employees
WHERE  department_id = 90 ;
```



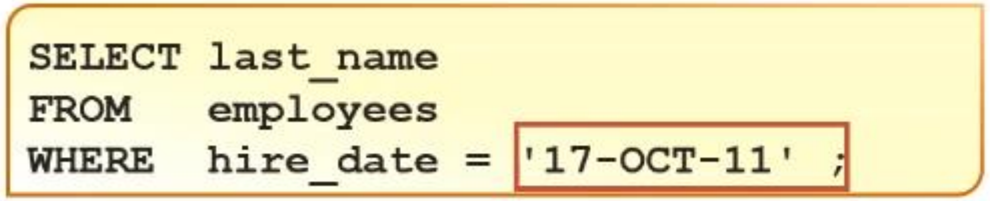
	EMPLOYEE_ID	LAST_NAME	JOB_ID	DEPARTMENT_ID
1	100	King	AD_PRES	90
2	101	Kochhar	AD_VP	90
3	102	De Haan	AD_VP	90

Character Strings and Dates

- Character strings and date values are enclosed within single quotation marks `('')`.
- Character values are case-sensitive and date values are format-sensitive.
- The default display format for date is `DD-MON-RR` in Oracle databases



```sql
SELECT last_name, job_id, department_id
FROM   employees
WHERE  last_name = 'Whalen' ;
```



```sql
SELECT last_name
FROM   employees
WHERE  hire_date = '17-OCT-11' ;
```

```
  LAST_NAME
1 Rais
```

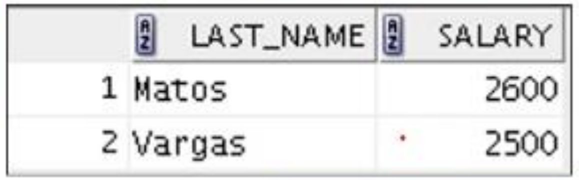
Comparison Operators

Operator	Meaning
`=`	Equal to
`>`	Greater than
`>=`	Greater than or equal to
`<`	Less than
`<=`	Less than or equal to
`<>`	Not equal to
`BETWEEN ...AND...`	Between two values (inclusive)
`IN(set)`	Match any of a list of values
`LIKE`	Match a character pattern
`IS NULL`	Is a null value

Using Comparison Operators

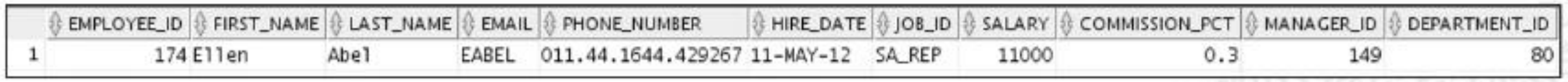
Let us look at some examples:

```
SELECT last_name, salary
FROM   employees
WHERE  salary <= 3000 ;
```



	LAST_NAME	SALARY
1	Matos	2600
2	Vargas	2500

```
SELECT *
FROM   employees
WHERE  last_name = 'Abel';
```



	EMPLOYEE_ID	FIRST_NAME	LAST_NAME	EMAIL	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	COMMISSION_PCT	MANAGER_ID	DEPARTMENT_ID
1	174	Ellen	Abel	EABEL	011.44.1644.429267	11-MAY-12	SA_REP	11000	0.3	149	80

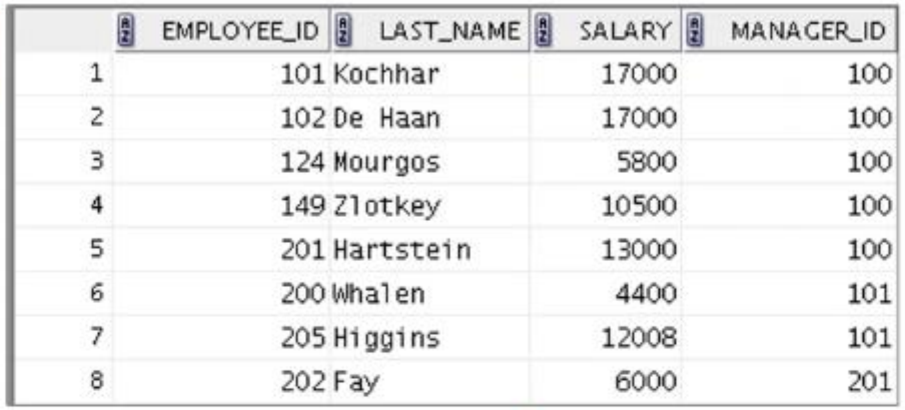
Range Conditions Using the `BETWEEN` Operator

You can use the `BETWEEN` operator to display rows based on a range of values:

```
SELECT last_name, salary
FROM   employees
WHERE  salary BETWEEN 2500 AND 3500 ;
```

Lower limit

Upper limit

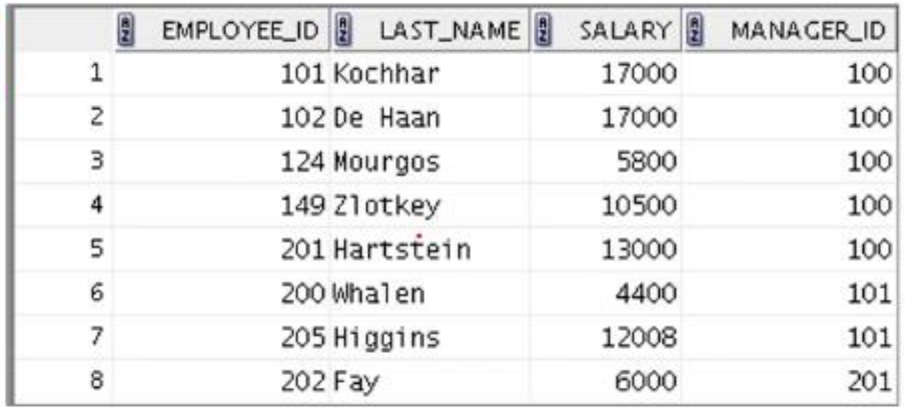


	EMPLOYEE_ID	LAST_NAME	SALARY	MANAGER_ID
1	101	Kochhar	17000	100
2	102	De Haan	17000	100
3	124	Mourgos	5800	100
4	149	Zlotkey	10500	100
5	201	Hartstein	13000	100
6	200	Whalen	4400	101
7	205	Higgins	12008	101
8	202	Fay	6000	201

Using the IN Operator

Use the `IN` operator to test for values in a list:

```
SELECT employee_id, last_name, salary, manager_id
FROM   employees
WHERE  manager_id IN (100, 101, 201) ;
```

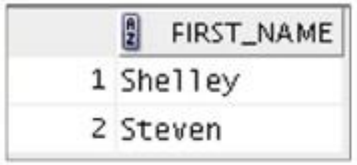


	EMPLOYEE_ID	LAST_NAME	SALARY	MANAGER_ID
1	101	Kochhar	17000	100
2	102	De Haan	17000	100
3	124	Mourgos	5800	100
4	149	Zlotkey	10500	100
5	201	Hartstein	13000	100
6	200	Whalen	4400	101
7	205	Higgins	12008	101
8	202	Fay	6000	201

Pattern Matching Using the `LIKE` Operator

- You can use the `LIKE` operator to perform wildcard searches of valid string patterns.
- The search conditions can contain either literal characters or numbers:
  - % denotes zero or more characters.
  - _ denotes one character.

```
SELECT    first_name
FROM employees
WHEREfirst_name LIKE 'S%' ;
```

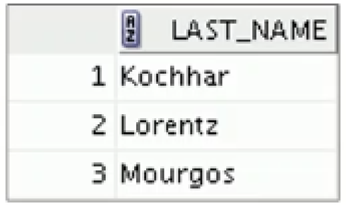


```
    FIRST_NAME
  1 Shelley
  2 Steven
```

Combining Wildcard Symbols

- You can combine the two wildcard symbols (%, _) with literal characters for pattern matching:

```
SELECT last_name
FROM   employees
WHERE  last_name LIKE '_o%' ;
```



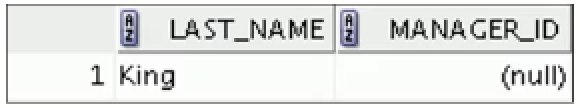
	LAST_NAME
1	Kochhar
2	Lorentz
3	Mourgos

- You can use the ESCAPE identifier to search for the actual % and _ symbols.

Using NULL Conditions

You can use the `IS NULL` operator to test for NULL values in a column.

```
SELECT last_name, manager_id
FROM   employees
WHERE  manager_id IS NULL ;
```



	LAST_NAME	MANAGER_ID
1	King	(null)

Defining Conditions Using Logical Operators

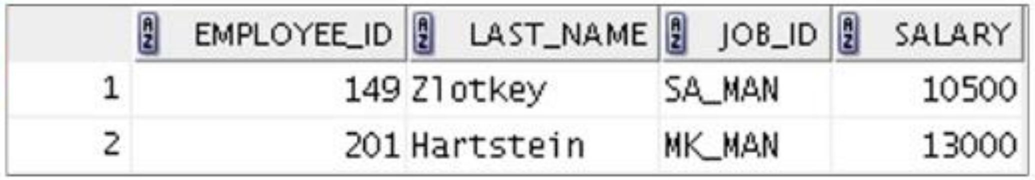
You can use the logical operators to filter the result set based on more than one condition or invert the result set.

Operator	Meaning
AND	Returns TRUE if *both* component conditions are true
OR	Returns TRUE if *either* component condition is true
NOT	Returns TRUE if the condition is false

Using the AND Operator

AND requires both the component conditions to be true:

```
SELECT employee_id, last_name, job_id, salary
FROM   employees
WHERE  salary >= 10000
AND    job_id LIKE '%MAN%' ;
```

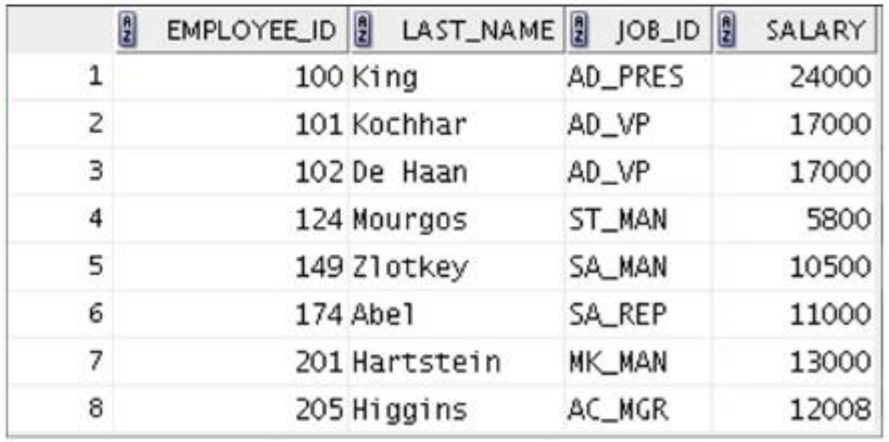


	EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
1	149	Zlotkey	SA_MAN	10500
2	201	Hartstein	MK_MAN	13000

Using the OR Operator

OR requires either component condition to be true:

```
SELECT employee_id, last_name, job_id, salary
FROM   employees
WHERE  salary >= 10000
OR     job_id LIKE '%MAN%' ;
```

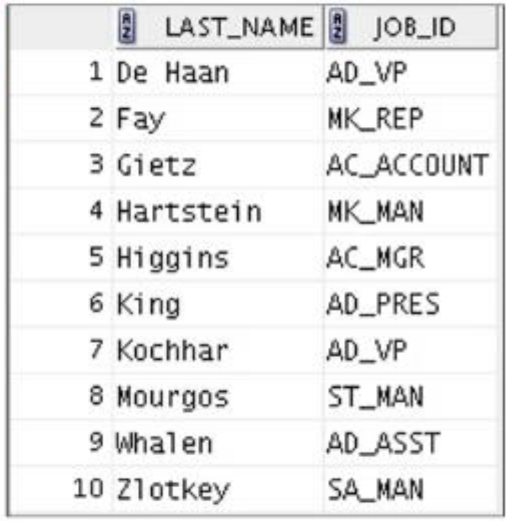


	EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
1	100	King	AD_PRES	24000
2	101	Kochhar	AD_VP	17000
3	102	De Haan	AD_VP	17000
4	124	Mourgos	ST_MAN	5800
5	149	Zlotkey	SA_MAN	10500
6	174	Abel	SA_REP	11000
7	201	Hartstein	MK_MAN	13000
8	205	Higgins	AC_MGR	12008

Using the NOT Operator

NOT is used to negate a condition:

```
SELECT last_name, job_id
FROM   employees
WHERE  job_id
       NOT IN ('IT_PROG', 'ST_CLERK', 'SA_REP');
```



	LAST_NAME	JOB_ID
1	De Haan	AD_VP
2	Fay	MK_REP
3	Gietz	AC_ACCOUNT
4	Hartstein	MK_MAN
5	Higgins	AC_MGR
6	King	AD_PRES
7	Kochhar	AD_VP
8	Mourgos	ST_MAN
9	Whalen	AD_ASST
10	Zlotkey	SA_MAN

Rules of Precedence

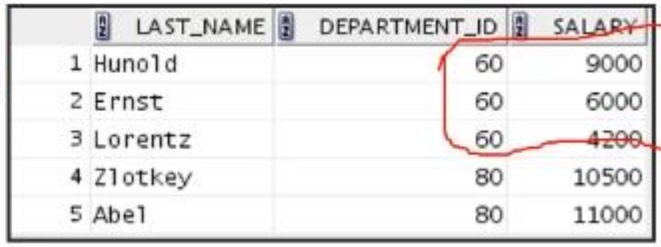
Order	Operator
1	Arithmetic operators
2	Concatenation operator
3	Comparison conditions
4	`IS [NOT] NULL`, `LIKE`, `[NOT] IN`
5	`[NOT] BETWEEN`
6	Not equal to
7	`NOT` logical operator
8	`AND` logical operator
9	`OR` logical operator

You can use parentheses to override rules of precedence.

Rules of Precedence

1

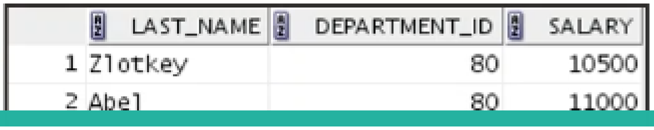
```
SELECT last_name, department_id, salary
FROM   employees
WHERE  department_id = 60
OR     department_id = 80
AND    salary > 10000;
```



	LAST_NAME	DEPARTMENT_ID	SALARY
1	Hunold	60	9000
2	Ernst	60	6000
3	Lorentz	60	4200
4	Zlotkey	80	10500
5	Abel	80	11000

2

```
SELECT last_name, department_id, salary
FROM   employees
WHERE  (department_id = 60
OR     department_id = 80)
AND    salary > 10000;
```



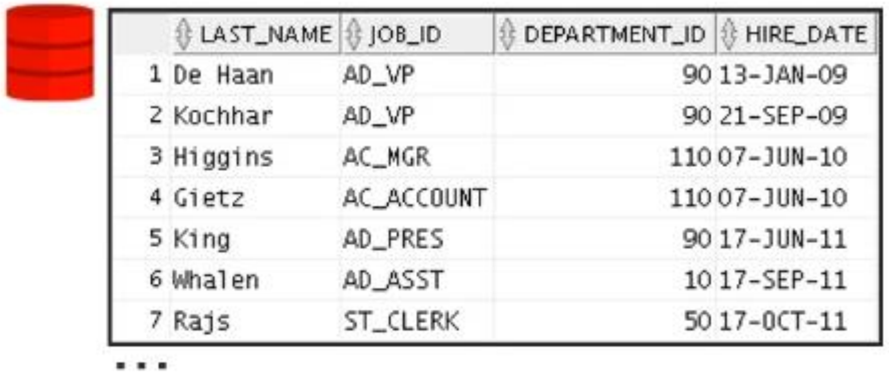
	LAST_NAME	DEPARTMENT_ID	SALARY
1	Zlotkey	80	10500
2	Abel	80	11000

Using the ORDER BY Clause

You can sort the retrieved rows with the `ORDER BY` clause:

- `ASC`: Ascending order, default
- `DESC`: Descending order

```
SELECT   last_name, job_id, department_id, hire_date
FROM     employees
ORDER BY hire_date ;
```



	LAST_NAME	JOB_ID	DEPARTMENT_ID	HIRE_DATE
1	De Haan	AD_VP	90	13-JAN-09
2	Kochhar	AD_VP	90	21-SEP-09
3	Higgins	AC_MGR	110	07-JUN-10
4	Gietz	AC_ACCOUNT	110	07-JUN-10
5	King	AD_PRES	90	17-JUN-11
6	Whalen	AD_ASST	10	17-SEP-11
7	Rajs	ST_CLERK	50	17-OCT-11

...

Sorting

- Sorting in descending order:

1

```
SELECT   last_name, job_id, department_id, hire_date
FROM     employees
ORDER BY department_id DESC ;
```

- Sorting by column alias:

2

```
SELECT employee_id, last_name, salary*12 annsal
FROM   employees
ORDER BY annsal ;
```

Sorting

- Sorting by using the column's numeric position:

3

```
SELECT   last_name, job_id, department_id, hire_date
FROM     employees
ORDER BY 3;
```

- Sorting by multiple columns:

4

```
SELECT last_name, department_id, salary
FROM   employees
ORDER BY department_id, salary DESC;
```

Sorting

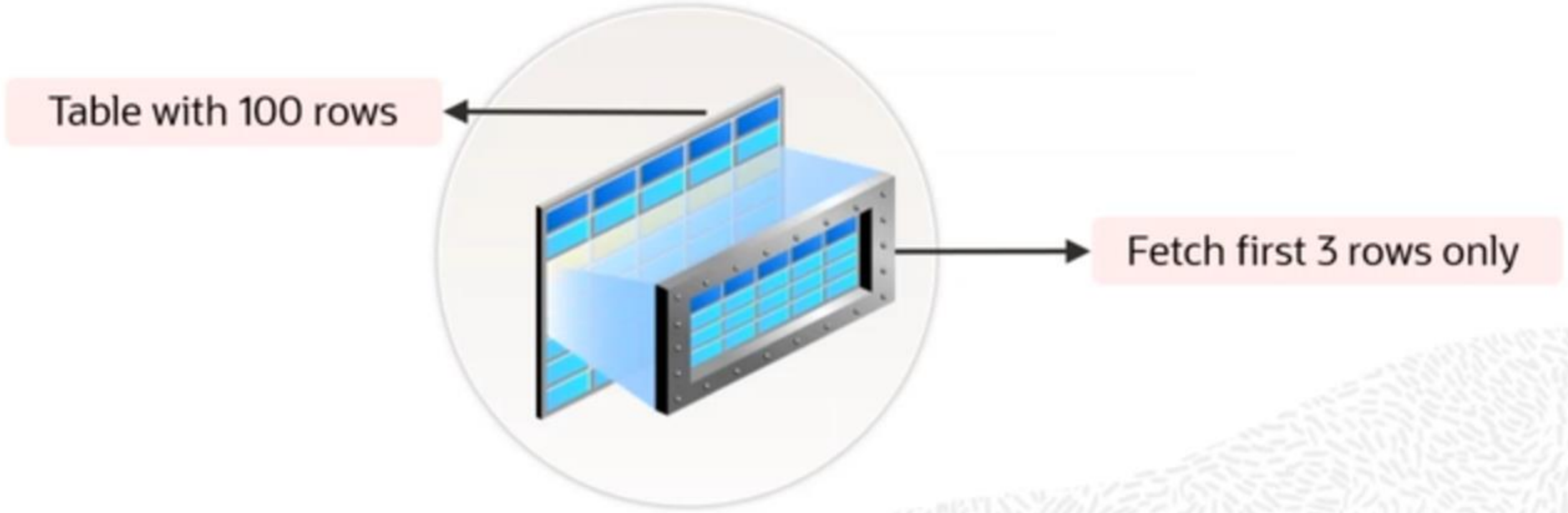
- Sorting by using the column's numeric position:

3

```
             1          2         3             4
SELECT   last_name, job_id, department_id, hire_date
FROM     employees
ORDER BY 3;
```

SQL Row Limiting Clause

- You can use the row limiting clause to limit the rows that are returned by a query.
- You can use this clause to implement Top-N reporting.



Using SQL Row Limiting Clause in a Query in Oracle

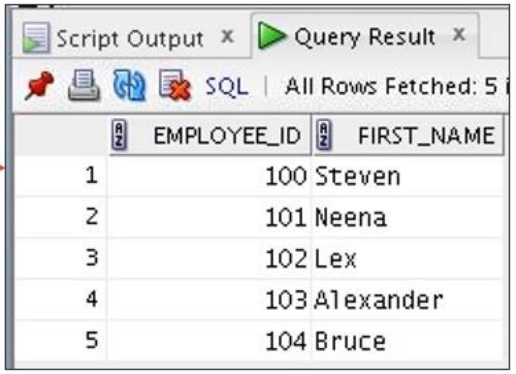
You specify the `row_limiting_clause` in the SQL `SELECT` statement by placing it after the `ORDER BY` clause.

Syntax:

```
SELECT …
   FROM …
 [ WHERE …  ]
 [ ORDER BY …  ]
 [OFFSET offset { ROW | ROWS }]
[FETCH { FIRST | NEXT } [{ row_count | percent PERCENT }] { ROW
| ROWS }
  { ONLY | WITH TIES }]
```

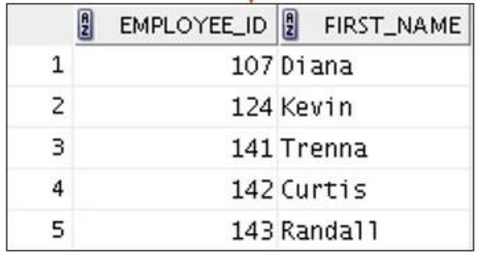
SQL Row Limiting Clause: Example in Oracle

```
SELECT employee_id, first_name
FROM employees
ORDER BY employee_id
FETCH FIRST 5 ROWS ONLY;
```



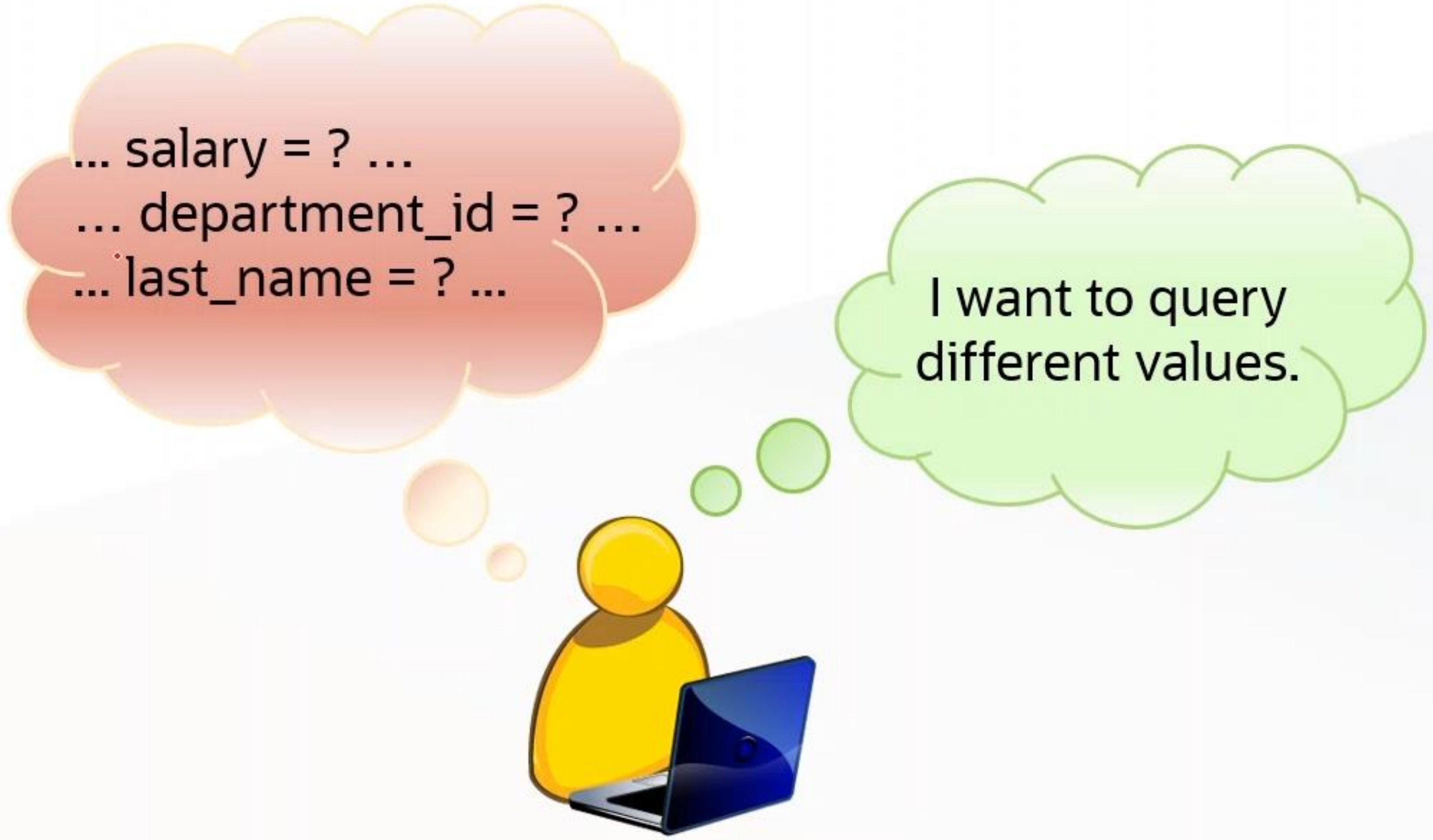
	EMPLOYEE_ID	FIRST_NAME
1	100	Steven
2	101	Neena
3	102	Lex
4	103	Alexander
5	104	Bruce

```
SELECT employee_id, first_name
FROM employees
ORDER BY employee_id
OFFSET 5 ROWS FETCH NEXT 5 ROWS ONLY;
```



	EMPLOYEE_ID	FIRST_NAME
1	107	Diana
2	124	Kevin
3	141	Trenna
4	142	Curtis
5	143	Randall

Substitution Variables in Oracle



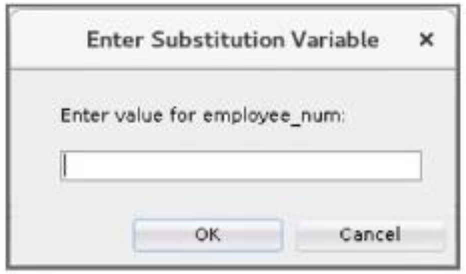
Substitution Variables in Oracle

- Use substitution variables to:
  - Temporarily store values with single-ampersand `(&)` and double-ampersand `(&&)` substitution
- Use substitution variables to supplement the following:
  - `WHERE` conditions
  - `ORDER BY` clauses
  - Column expressions
  - Table names
  - Entire `SELECT` statements

Using the Single-Ampersand Substitution Variable

Use a variable prefixed with an ampersand (&) to prompt the user for a value:

```
SELECT employee_id, last_name, salary, department_id
FROM   employees
WHERE  employee_id = &employee_num ;
```

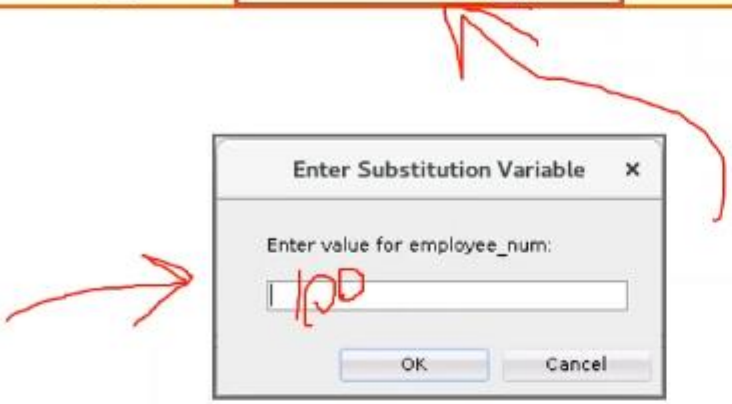


Enter value for employee_num:

Using the Single-Ampersand Substitution Variable

Use a variable prefixed with an ampersand (&) to prompt the user for a value:

```
SELECT employee_id, last_name, salary, department_id
FROM   employees
WHERE  employee_id = &employee_num ;
```


Enter Substitution Variable ×

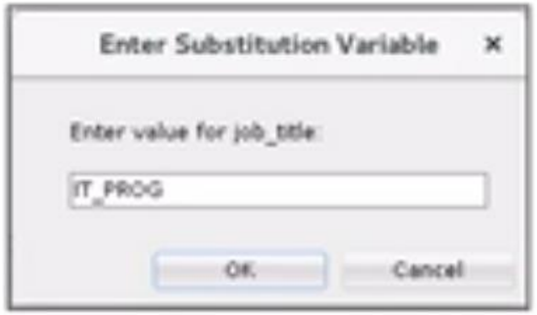
Enter value for employee_num:

100

Character and Date Values with Substitution Variables

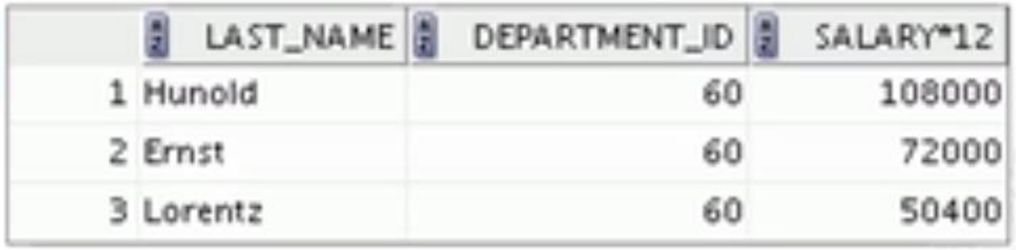
Use single quotation marks for date and character values:

```
SELECT last_name, department_id, salary*12
FROM   employees
WHERE  job_id = '&job_title' ;
```


Enter Substitution Variable

Enter value for job_title:

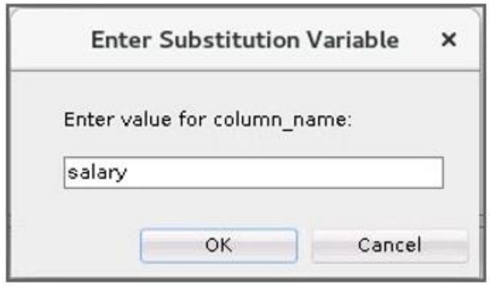
IT_PROG



	LAST_NAME	DEPARTMENT_ID	SALARY*12
1	Hunold	60	108000
2	Ernst	60	72000
3	Lorentz	60	50400

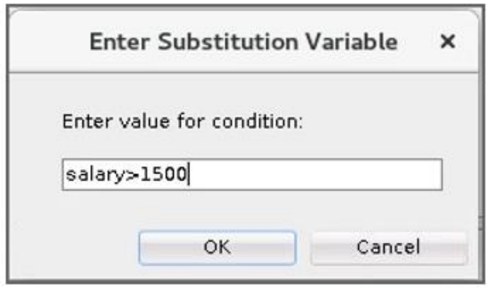
Specifying Column Names, Expressions, and Text

```
SELECT employee_id, last_name, job_id,&column_name
FROM   employees
WHERE  &condition
ORDER BY &order_column ;
```


Enter Substitution Variable

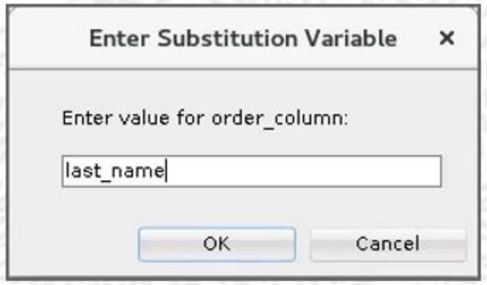
Enter value for column_name:

salary


Enter Substitution Variable

Enter value for condition:

salary>1500


Enter Substitution Variable

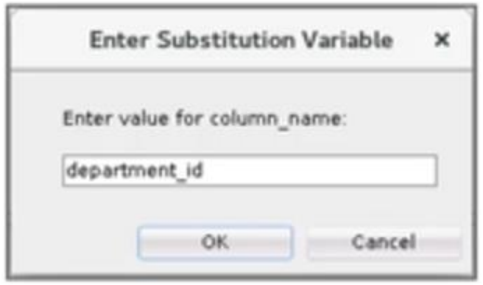
Enter value for order_column:

last_name

Using the Double-Ampersand Substitution Variable

Use double ampersand (`&&`) if you want to reuse the variable value without prompting the user each time:

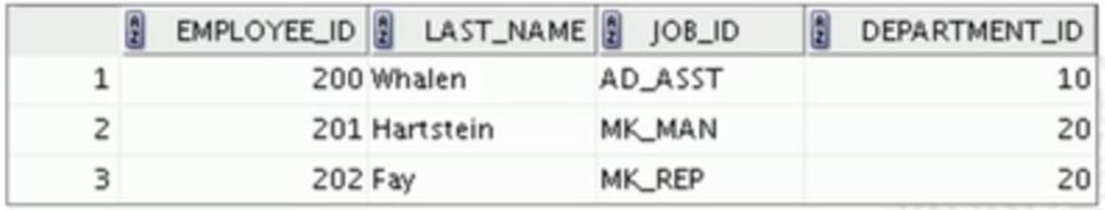
```
SELECT   employee_id, last_name, job_id, &&column_name
FROM     employees
ORDER BY &column_name ;
```



Enter Substitution Variable

Enter value for column_name:

department_id



	EMPLOYEE_ID	LAST_NAME	JOB_ID	DEPARTMENT_ID
1	200	Whalen	AD_ASST	10
2	201	Hartstein	MK_MAN	20
3	202	Fay	MK_REP	20

...

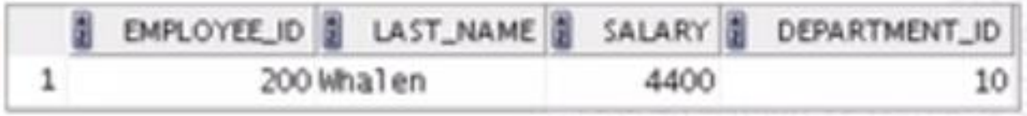
Using the DEFINE Command in Oracle

- Use the `DEFINE` command to create a variable and assign a value to it.
- Use the `UNDEFINE` command to remove a variable.

```
DEFINE employee_num = 200

SELECT employee_id, last_name, salary, department_id
FROM   employees
WHERE  employee_id = &employee_num ;

UNDEFINE employee_num
```



	EMPLOYEE_ID	LAST_NAME	SALARY	DEPARTMENT_ID
1	200	Whalen	4400	10