2

Restricting and Sorting Data

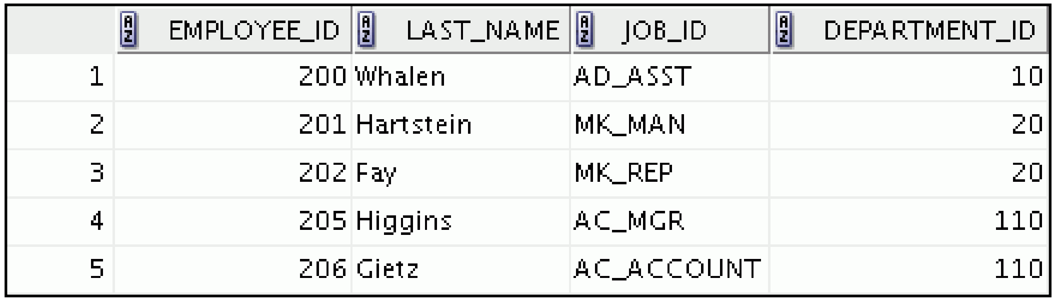
Objectives

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
- Use ampersand substitution to restrict and sort output at run time

Limiting Rows Using a Selection

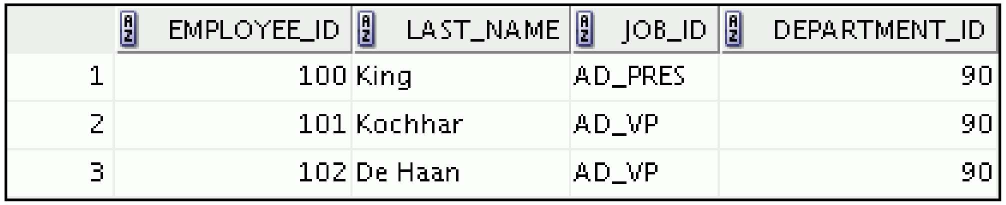
EMPLOYEES



	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
4	205	Higgins	AC_MGR	110
5	206	Gietz	AC_ACCOUNT	110

…

"retrieve all employees in department 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

Limiting the Rows That Are Selected

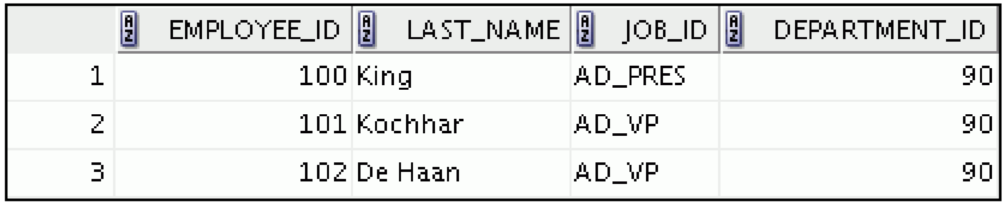
- Restrict the rows that are returned by using the `WHERE` clause:

```
SELECT *|{[DISTINCT] column|expression [alias],...}
FROM   table
[WHERE condition(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 with single quotation marks.
- Character values are case-sensitive and date values are format-sensitive.
- The default date display format is `DD-MON-RR`.

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

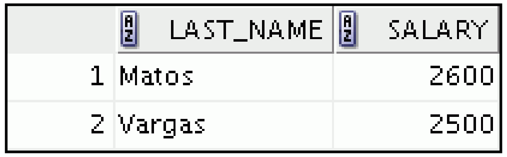
```
SELECT last_name
FROM   employees
WHERE  hire_date = '17-FEB-96' ;
```

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

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



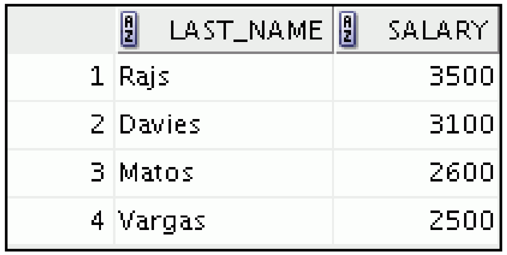
	LAST_NAME	SALARY
1	Matos	2600
2	Vargas	2500

Range Conditions Using the `BETWEEN` Operator

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

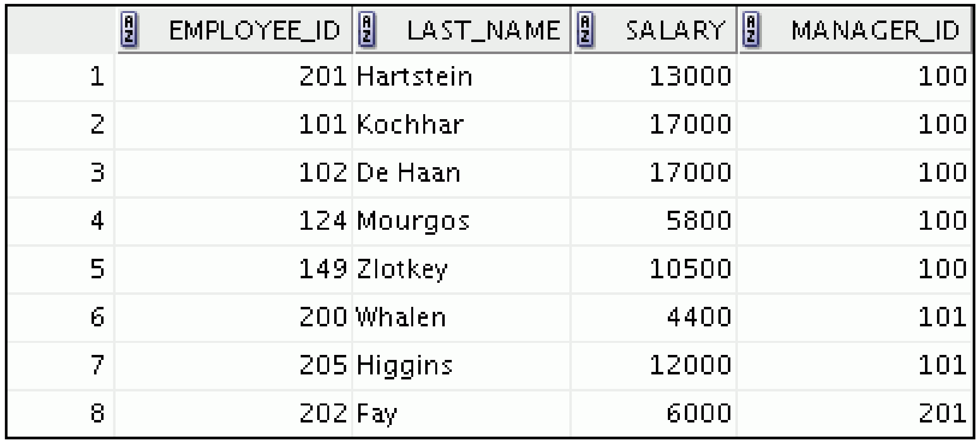


	LAST_NAME	SALARY
1	Rajs	3500
2	Davies	3100
3	Matos	2600
4	Vargas	2500

Membership Condition 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	201	Hartstein	13000	100
2	101	Kochhar	17000	100
3	102	De Haan	17000	100
4	124	Mourgos	5800	100
5	149	Zlotkey	10500	100
6	200	Whalen	4400	101
7	205	Higgins	12000	101
8	202	Fay	6000	201

Pattern Matching Using the `LIKE` Operator

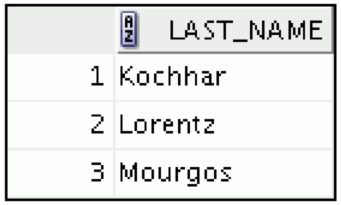
- Use the `LIKE` operator to perform wildcard searches of valid search string values.
- Search conditions can contain either literal characters or numbers:
  - `%` denotes zero or many characters.
  - `_` denotes one character.

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

Combining Wildcard Characters

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

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



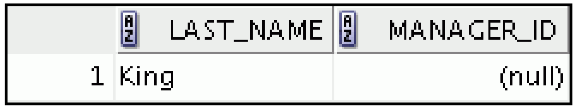
	LAST_NAME
1	Kochhar
2	Lorentz
3	Mourgos

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

Using the NULL Conditions

Test for nulls with the `IS NULL` operator.

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



	LAST_NAME	MANAGER_ID
1	King	(null)

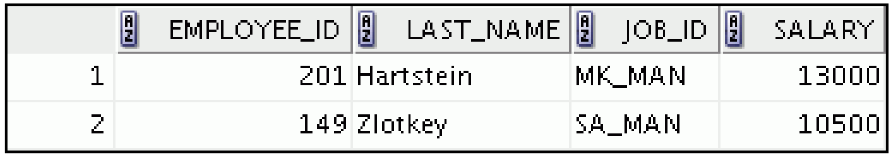
Defining Conditions Using the Logical Operators

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%' ;
```

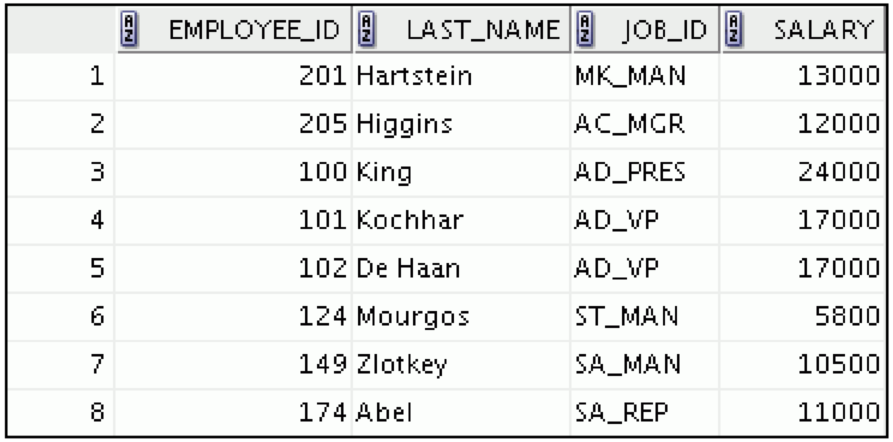


	EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
1	201	Hartstein	MK_MAN	13000
2	149	Zlotkey	SA_MAN	10500

Using the OR Operator

OR requires either component condition to be true:

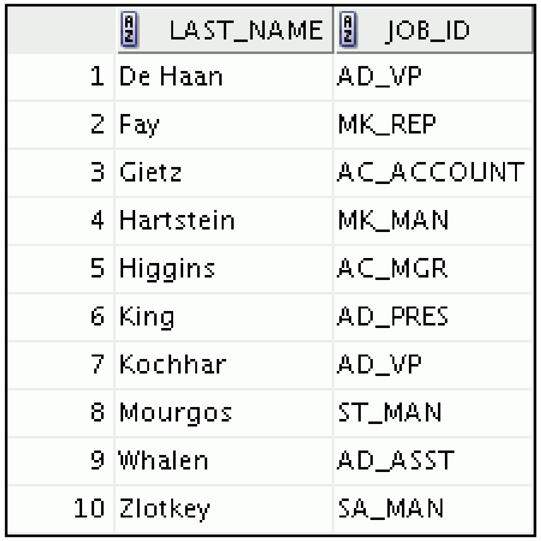
```
SELECT employee_id, last_name, job_id, salary
FROM   employees
WHERE  salary >= 10000
OR     job_id LIKE '%MAN%' ;
```



	EMPLOYEE_ID	LAST_NAME	JOB_ID	SALARY
1	201	Hartstein	MK_MAN	13000
2	205	Higgins	AC_MGR	12000
3	100	King	AD_PRES	24000
4	101	Kochhar	AD_VP	17000
5	102	De Haan	AD_VP	17000
6	124	Mourgos	ST_MAN	5800
7	149	Zlotkey	SA_MAN	10500
8	174	Abel	SA_REP	11000

Using the NOT Operator

```
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

Operator	Meaning
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 condition
8	`AND` logical condition
9	`OR` logical condition

You can use parentheses to override rules of precedence.

Rules of Precedence

1

```
SELECT last_name, job_id, salary
FROM   employees
WHERE  job_id = 'SA_REP'
OR     job_id = 'AD_PRES'
AND    salary > 15000;
```

	LAST_NAME	JOB_ID	SALARY
1	King	AD_PRES	24000
2	Abel	SA_REP	11000
3	Taylor	SA_REP	8600
4	Grant	SA_REP	7000

2

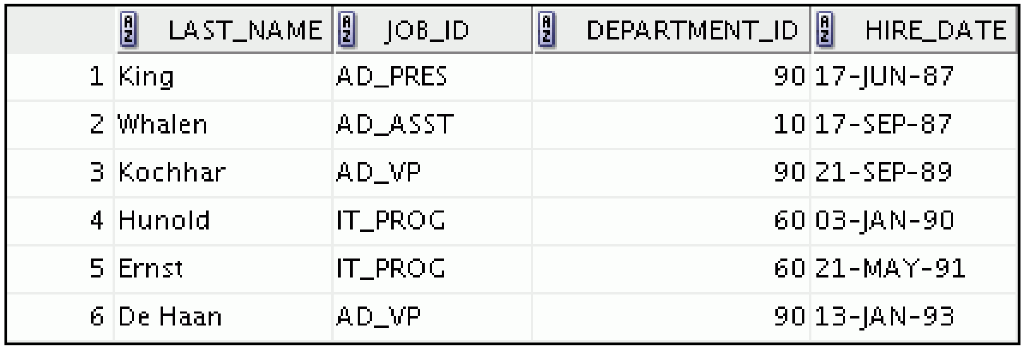
```
SELECT last_name, job_id, salary
FROM   employees
WHERE  (job_id = 'SA_REP'
OR     job_id = 'AD_PRES')
AND    salary > 15000;
```

	LAST_NAME	JOB_ID	SALARY
1	King	AD_PRES	24000

Using the ORDER BY Clause

- Sort the retrieved rows with the ORDER BY clause:
  - ASC: Ascending order, default
  - DESC: Descending order
- The ORDER BY clause comes last in the SELECT statement:

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



	LAST_NAME	JOB_ID	DEPARTMENT_ID	HIRE_DATE
1	King	AD_PRES	90	17-JUN-87
2	Whalen	AD_ASST	10	17-SEP-87
3	Kochhar	AD_VP	90	21-SEP-89
4	Hunold	IT_PROG	60	03-JAN-90
5	Ernst	IT_PROG	60	21-MAY-91
6	De Haan	AD_VP	90	13-JAN-93

...

Sorting

- Sorting in descending order:

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

1

- Sorting by column alias:

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

2

Sorting

- Sorting by using the column's numeric position:

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

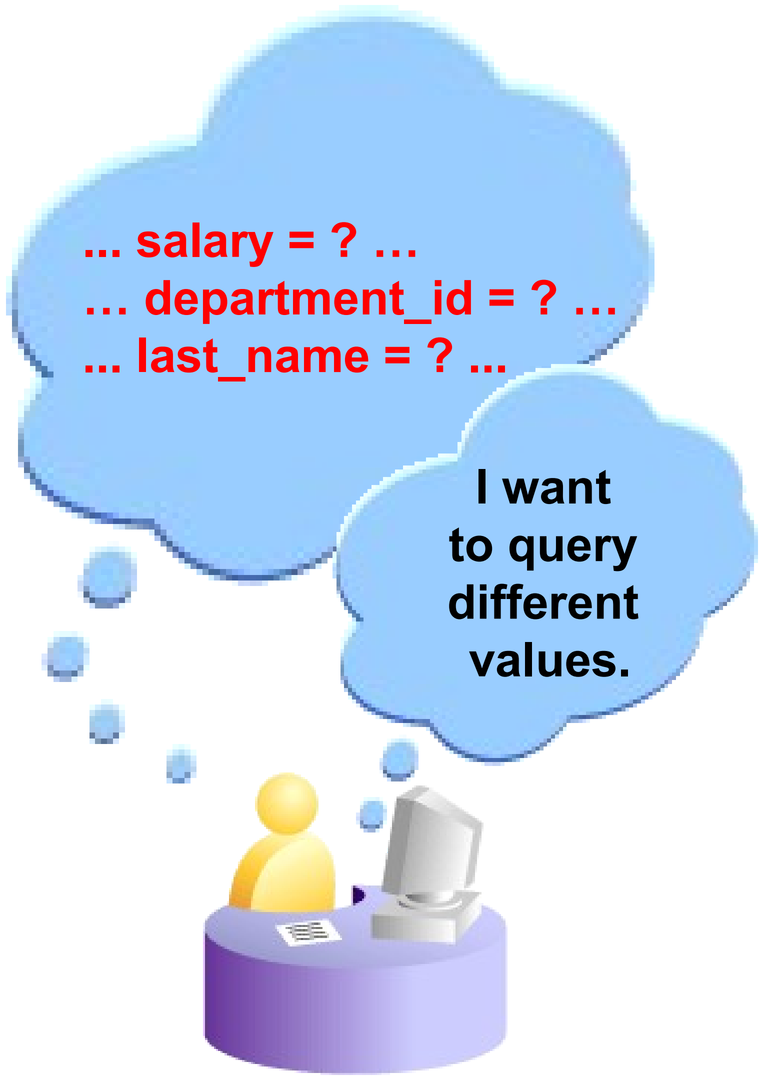
3

- Sorting by multiple columns:

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

4

Substitution Variables



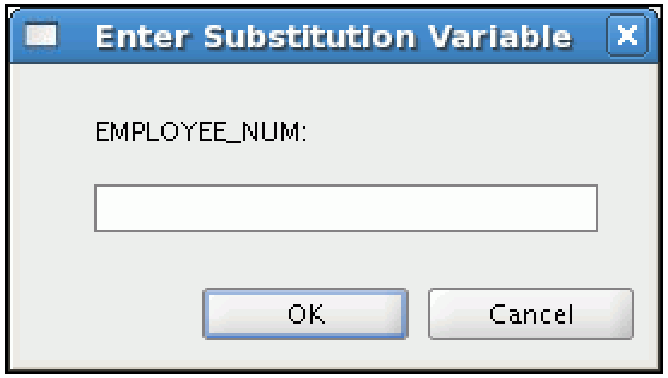
Substitution Variables

- 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

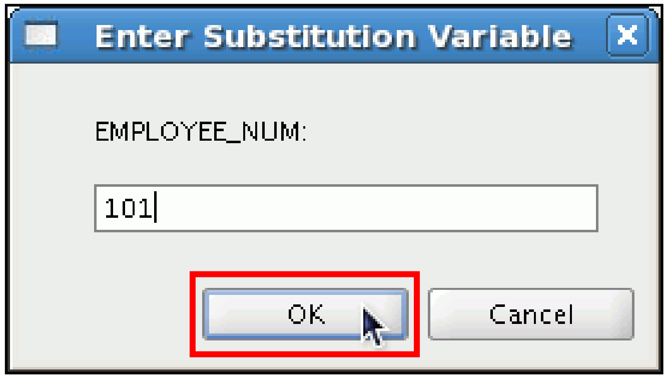
Use a variable prefixed with an ampersand (`&`) to prompt the user for a value:

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


Enter Substitution Variable

EMPLOYEE_NUM:

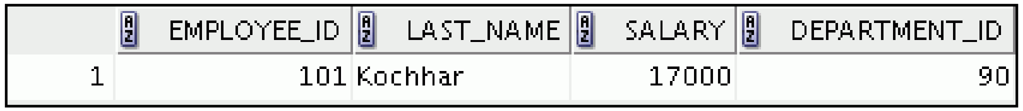
Using the Single-Ampersand Substitution Variable



Enter Substitution Variable

EMPLOYEE_NUM:

101

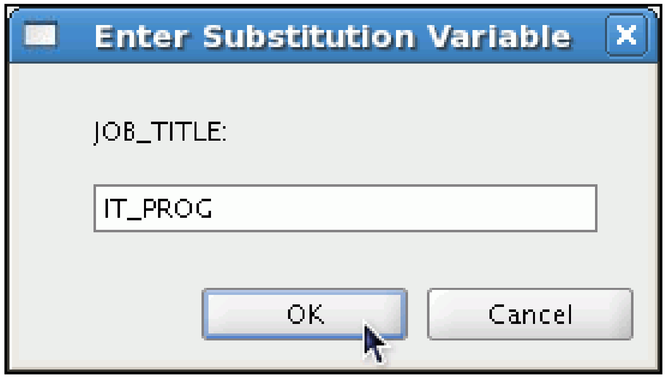


	EMPLOYEE_ID	LAST_NAME	SALARY	DEPARTMENT_ID
1	101	Kochhar	17000	90

Character and Date Values with Substitution Variables

Use single quotation marks for date and character values:

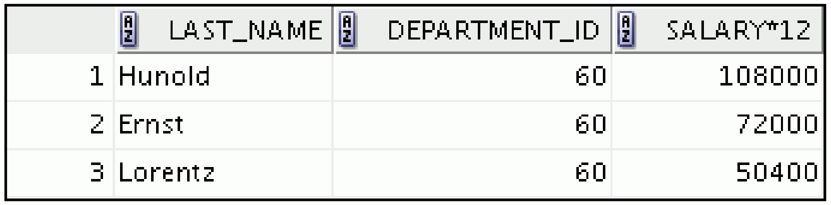
```
SELECT last_name, department_id, salary*12
FROM   employees
WHERE  job_id = '&job_title' ;
```



Enter Substitution Variable

JOB_TITLE:

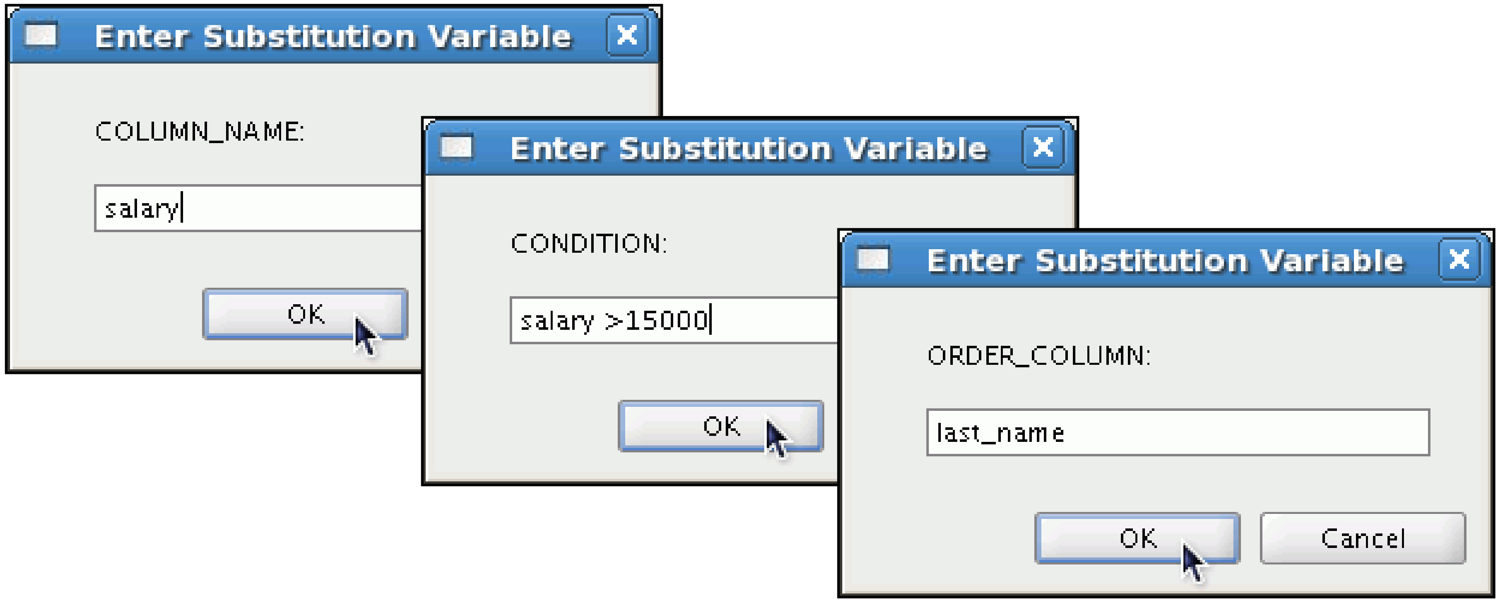
IT_PROG



	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

COLUMN_NAME: salary

Enter Substitution Variable

CONDITION: salary >15000

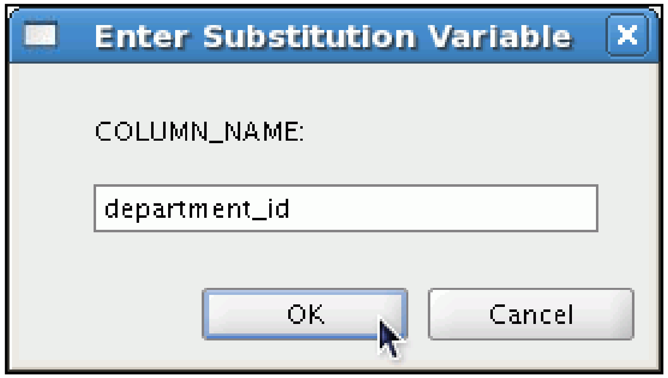
Enter Substitution Variable

ORDER_COLUMN: last_name

Using the Double-Ampersand Substitution Variable

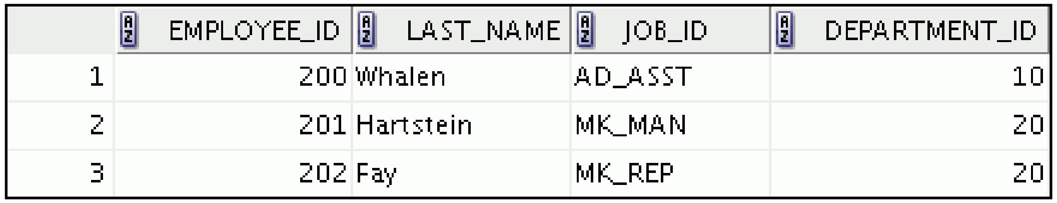
Use double ampersand (`&&`) if you want to reuse the variable value without prompting the user each time:

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



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

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

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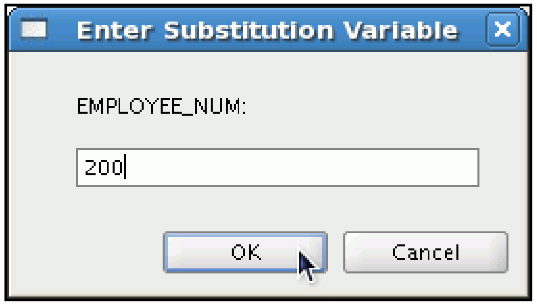
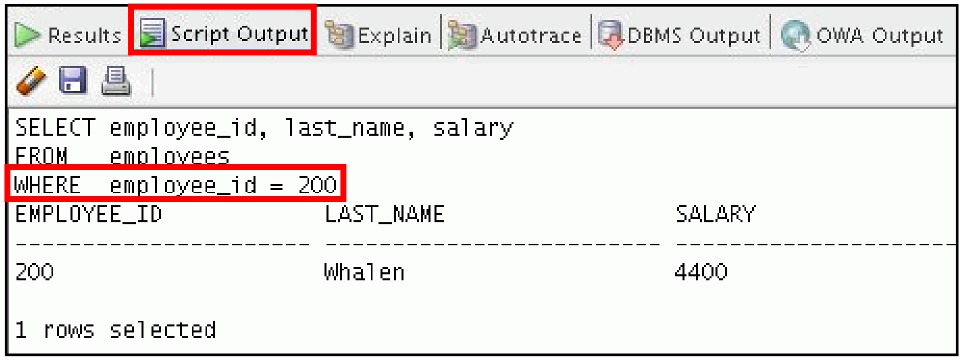
Using the `VERIFY` Command

Use the `VERIFY` command to toggle the display of the substitution variable, both before and after SQL Developer replaces substitution variables with values:

```
SET VERIFY ON
SELECT employee_id, last_name, salary
FROM   employees
WHERE  employee_id = &employee_num;
```





```
SELECT employee_id, last_name, salary
FROM   employees
WHERE  employee_id = 200
EMPLOYEE_ID            LAST_NAME                 SALARY
---------------------- ------------------------- ----------------------
200                    Whalen                    4400

1 rows selected
```

Quiz

Which of the following are valid operators for the `WHERE` clause?

1. `>=`
2. `IS NULL`
3. `!=`
4. `IS LIKE`
5. `IN BETWEEN`
6. `<>`

Summary

In this lesson, you should have learned how to:

- Use the `WHERE` clause to restrict rows of output:
  - Use the comparison conditions
  - Use the `BETWEEN`, `IN`, `LIKE`, and `NULL` operators
  - Apply the logical `AND`, `OR`, and `NOT` operators
- Use the `ORDER BY` clause to sort rows of output:

```
SELECT   *|{[DISTINCT] column|expression [alias],...}
FROM     table
[WHERE   condition(s)]
[ORDER BY {column, expr, alias} [ASC|DESC]] ;
```

- Use ampersand substitution to restrict and sort output at run time