SQL - Review

ORACLE

Oracle Academy Study Materials

Retrieving Data Using SQL SELECT Statement

Joining Tables - Types of Joins:

- Natural join with the `NATURAL JOIN` clause
- Join with the `USING` Clause
- Join with the `ON` Clause
- `OUTER` joins:
  - `LEFT OUTER JOIN`
  - `RIGHT OUTER JOIN`
  - `FULL OUTER JOIN`
- Cross joins

```
SELECT    table1.column, table2.column
FROM      table1
[NATURAL JOIN table2] |
[JOIN table2 USING (column_name)] |
[JOIN table2 ON (table1.column_name = table2.column_name)]|
[LEFT|RIGHT|FULL OUTER JOIN table2
  ON (table1.column_name = table2.column_name)]|
[CROSS JOIN table2];
```

Qualifying Ambiguous Column Names

- Use table prefixes to qualify column names that are in multiple tables.
- Use table prefixes to improve performance.
- Instead of full table name prefixes, use table aliases.
- Table alias gives a table a shorter name - keeps SQL code smaller, uses less memory
- Use column aliases to distinguish columns that have identical names, but reside in different tables.

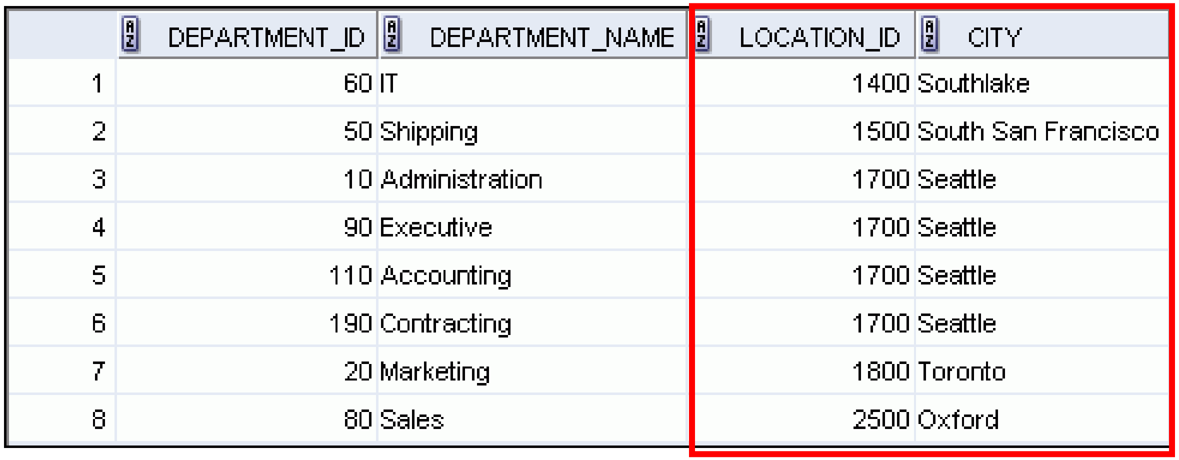
Guidelines

- Table aliases can be up to 30 characters in length, but shorter aliases are better than longer ones.
- If a table alias is used for a particular table name in the `FROM` clause, that table alias must be substituted for the table name throughout the `SELECT` statement.
- Table aliases should be meaningful.
- The table alias is valid for only the current `SELECT` statement.

Creating Natural Joins

- The `NATURAL JOIN` clause is based on all the columns in the two tables that have the same name.
- It selects rows from the two tables that have equal values in all matched columns.
- If the columns having the same names have different data types, an error is returned.

```
SELECT department_id, department_name,
       location_id, city
FROM   departments
NATURAL JOIN locations ;
```



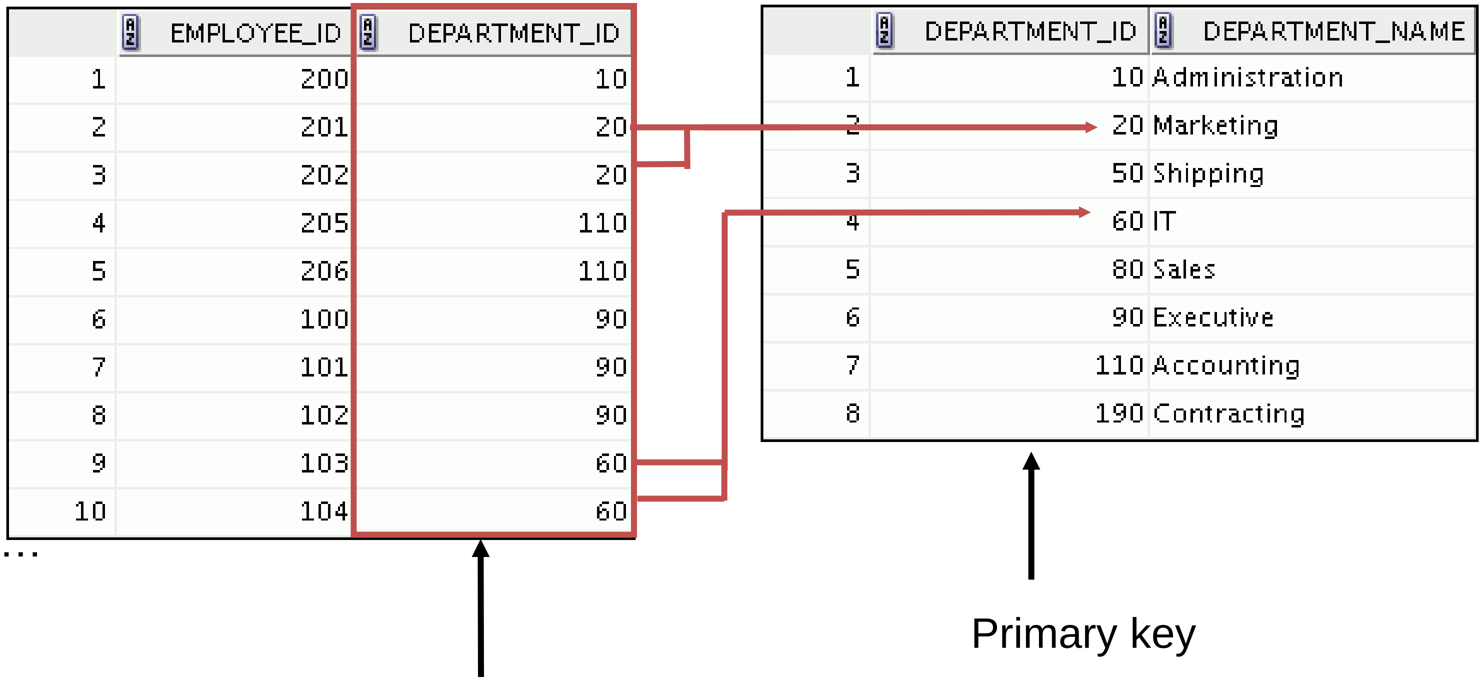
	DEPARTMENT_ID	DEPARTMENT_NAME	LOCATION_ID	CITY
1	60	IT	1400	Southlake
2	50	Shipping	1500	South San Francisco
3	10	Administration	1700	Seattle
4	90	Executive	1700	Seattle
5	110	Accounting	1700	Seattle
6	190	Contracting	1700	Seattle
7	20	Marketing	1800	Toronto
8	80	Sales	2500	Oxford

Creating Joins with the USING Clause

- If several columns have the same names but the data types do not match, use the `USING` clause to specify the columns for the equijoin.
- Use the `USING` clause to match only one column when more than one column matches.
- The `NATURAL JOIN` and `USING` clauses are mutually exclusive.

EMPLOYEES

DEPARTMENTS



	EMPLOYEE_ID	DEPARTMENT_ID
1	200	10
2	201	20
3	202	20
4	205	110
5	206	110
6	100	90
7	101	90
8	102	90
9	103	60
10	104	60

...

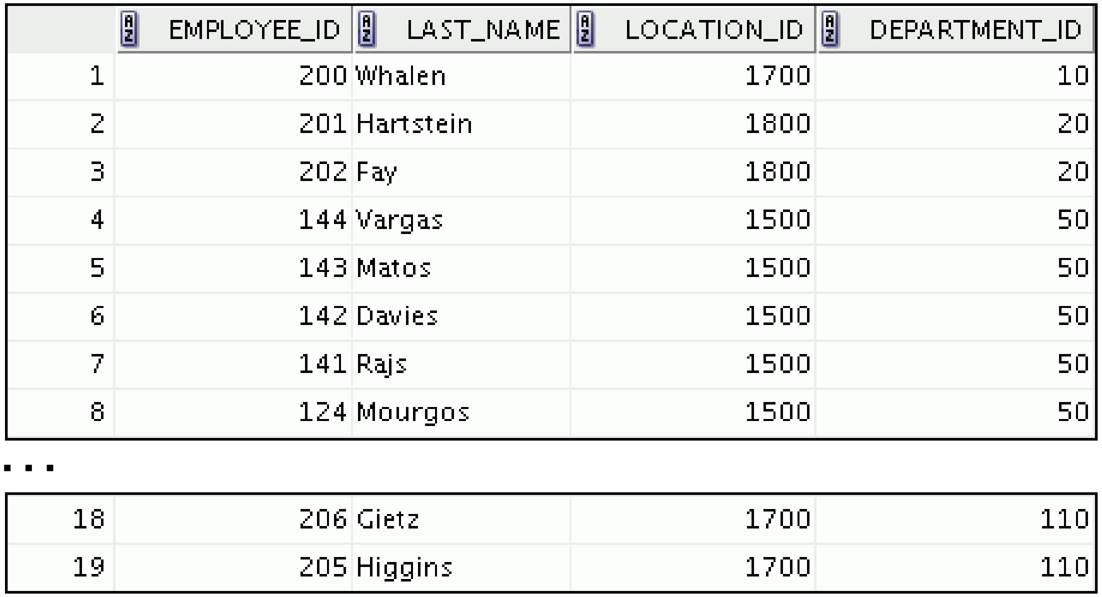
	DEPARTMENT_ID	DEPARTMENT_NAME
1	10	Administration
2	20	Marketing
3	50	Shipping
4	60	IT
5	80	Sales
6	90	Executive
7	110	Accounting
8	190	Contracting

Primary key

Foreign key

Retrieving Records with the USING Clause

```
SELECT employee_id, last_name,
       location_id, department_id
FROM   employees JOIN departments
USING (department_id) ;
```

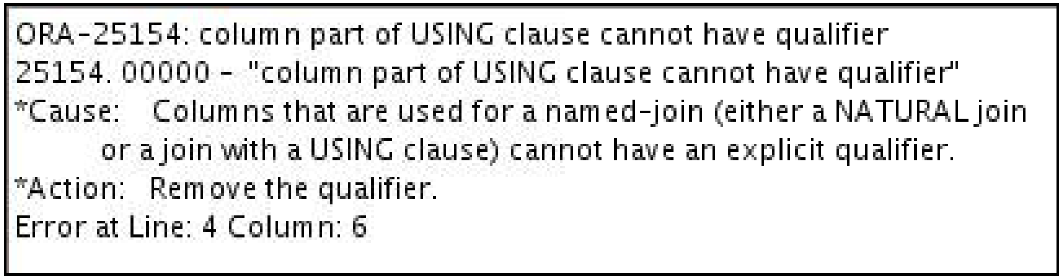


	EMPLOYEE_ID	LAST_NAME	LOCATION_ID	DEPARTMENT_ID
1	200	Whalen	1700	10
2	201	Hartstein	1800	20
3	202	Fay	1800	20
4	144	Vargas	1500	50
5	143	Matos	1500	50
6	142	Davies	1500	50
7	141	Rajs	1500	50
8	124	Mourgos	1500	50
...				
18	206	Gietz	1700	110
19	205	Higgins	1700	110

Using Table Aliases with the USING Clause

- Do not qualify a column that is used in the USING clause.
- If the same column is used elsewhere in the SQL statement, do not alias it.

```
SELECT l.city, d.department_name
FROM   locations l JOIN departments d
USING (location_id)
WHERE d.location_id = 1400;
```

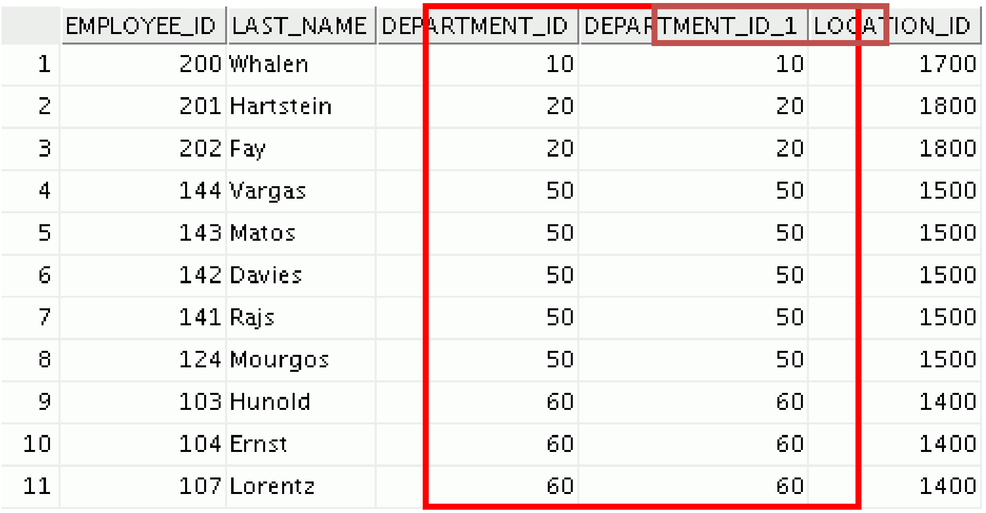


```
ORA-25154: column part of USING clause cannot have qualifier
25154. 00000 -  "column part of USING clause cannot have qualifier"
*Cause:    Columns that are used for a named-join (either a NATURAL join
           or a join with a USING clause) cannot have an explicit qualifier.
*Action:   Remove the qualifier.
Error at Line: 4 Column: 6
```

Creating Joins with the ON Clause

- The join condition for the natural join is basically an equijoin of all columns with the same name.
- Use the ON clause to specify arbitrary conditions or specify columns to join.
- The join condition is separated from other search conditions.
- The ON clause makes code easy to understand.

```
SELECT e.employee_id, e.last_name, e.department_id,
       d.department_id, d.location_id
FROM   employees e JOIN departments d
ON     (e.department_id = d.department_id);
```



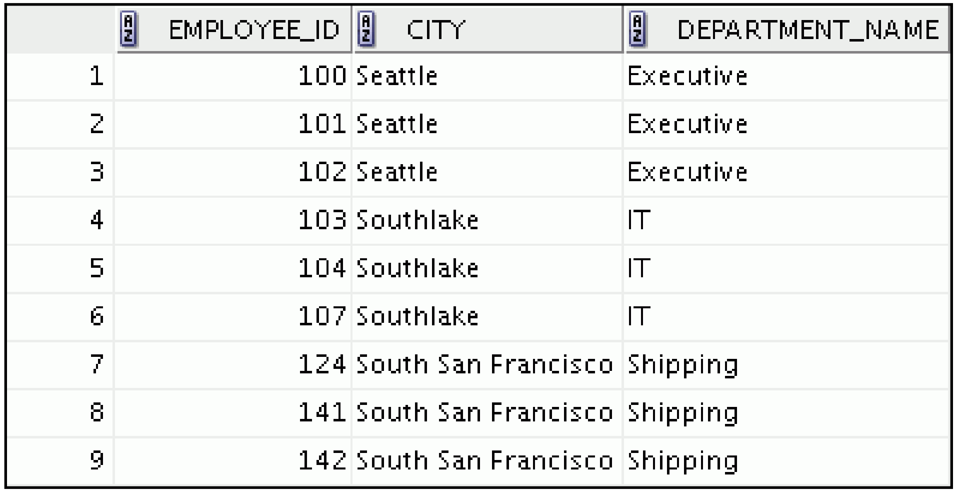
	EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_ID_1	LOCATION_ID
1	200	Whalen	10	10	1700
2	201	Hartstein	20	20	1800
3	202	Fay	20	20	1800
4	144	Vargas	50	50	1500
5	143	Matos	50	50	1500
6	142	Davies	50	50	1500
7	141	Rajs	50	50	1500
8	124	Mourgos	50	50	1500
9	103	Hunold	60	60	1400
10	104	Ernst	60	60	1400
11	107	Lorentz	60	60	1400

...

Creating Joins with the ON Clause

Creating Three-Way Joins with the ON Clause

```
SELECT employee_id, city, department_name
FROM   employees e
JOIN   departments d
ON     d.department_id = e.department_id
JOIN   locations l
ON     d.location_id = l.location_id;
```



	EMPLOYEE_ID	CITY	DEPARTMENT_NAME
1	100	Seattle	Executive
2	101	Seattle	Executive
3	102	Seattle	Executive
4	103	Southlake	IT
5	104	Southlake	IT
6	107	Southlake	IT
7	124	South San Francisco	Shipping
8	141	South San Francisco	Shipping
9	142	South San Francisco	Shipping

…

Applying Additional Conditions to a Join

– Use the AND clause or the WHERE clause to apply additional conditions:

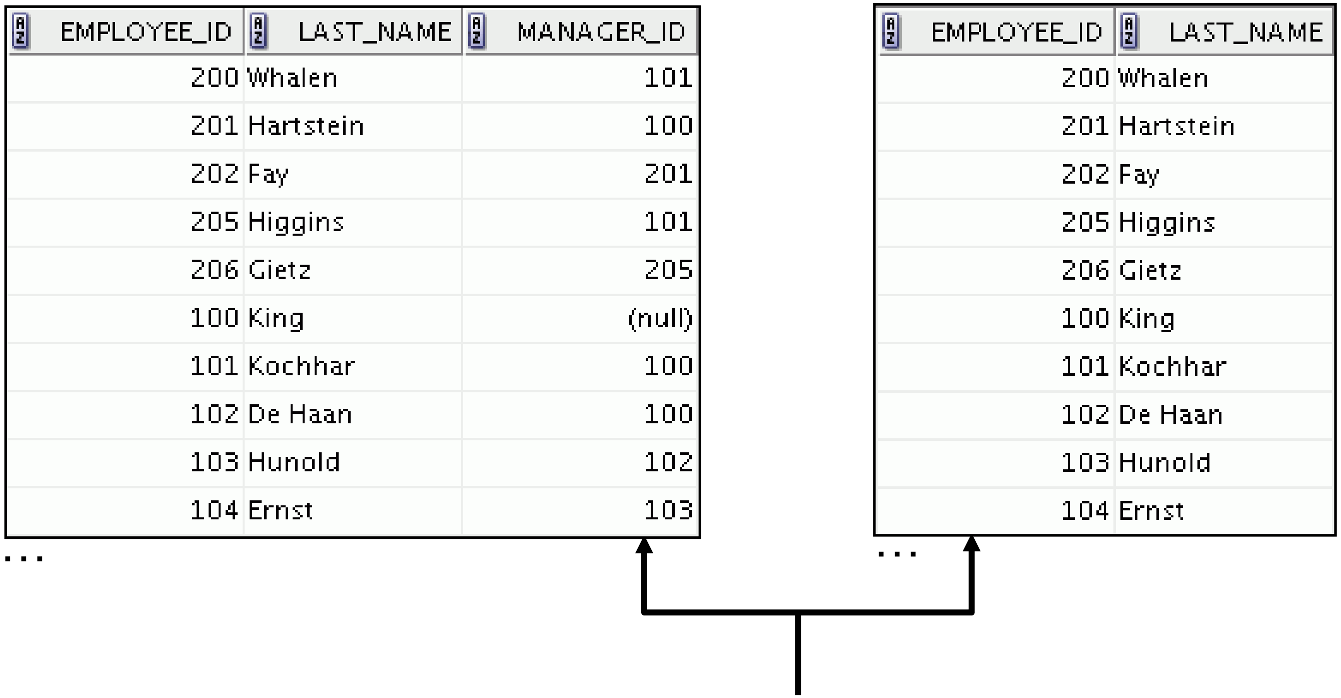
```
SELECT e.employee_id, e.last_name, e.department_id,
       d.department_id, d.location_id
FROM   employees e JOIN departments d
ON     (e.department_id = d.department_id)
AND    e.manager_id = 149 ;
```

Or

```
SELECT e.employee_id, e.last_name, e.department_id,
       d.department_id, d.location_id
FROM   employees e JOIN departments d
ON     (e.department_id = d.department_id)
WHERE   e.manager_id = 149 ;
```

Self-join

Joining a Table to Itself



EMPLOYEES (WORKER)

EMPLOYEE_ID	LAST_NAME	MANAGER_ID
200	Whalen	101
201	Hartstein	100
202	Fay	201
205	Higgins	101
206	Gietz	205
100	King	(null)
101	Kochhar	100
102	De Haan	100
103	Hunold	102
104	Ernst	103

…

EMPLOYEES (MANAGER)

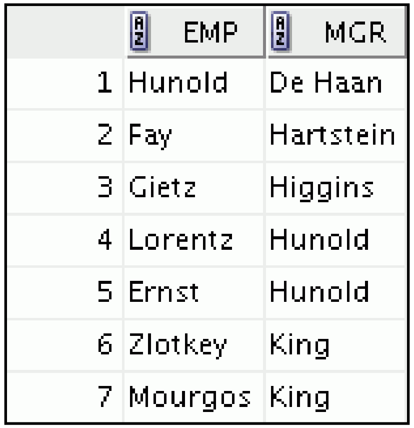
EMPLOYEE_ID	LAST_NAME
200	Whalen
201	Hartstein
202	Fay
205	Higgins
206	Gietz
100	King
101	Kochhar
102	De Haan
103	Hunold
104	Ernst

…

MANAGER_ID in the WORKER table is equal to EMPLOYEE_ID in the MANAGER table.

Self-Joins Using the ON Clause

```
SELECT worker.last_name emp, manager.last_name mgr
FROM   employees worker JOIN employees manager
ON    (worker.manager_id = manager.employee_id);
```

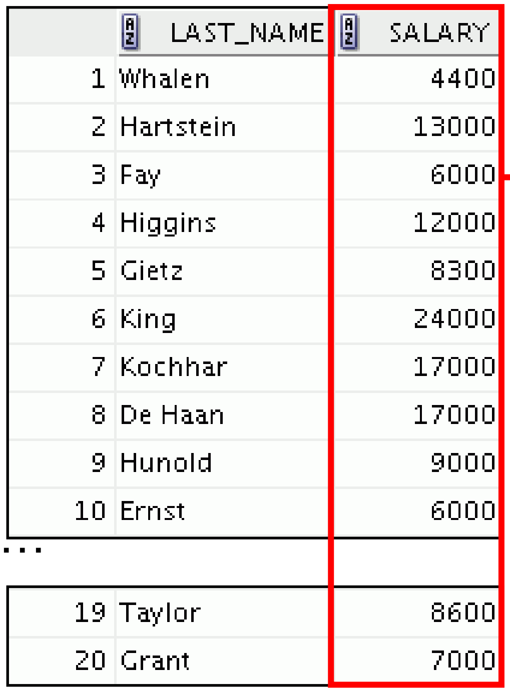


	EMP	MGR
1	Hunold	De Haan
2	Fay	Hartstein
3	Gietz	Higgins
4	Lorentz	Hunold
5	Ernst	Hunold
6	Zlotkey	King
7	Mourgos	King

…

Nonequijoins

EMPLOYEES

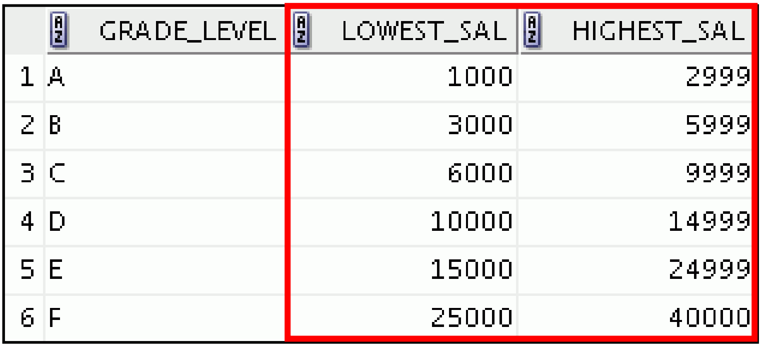


	LAST_NAME	SALARY
1	Whalen	4400
2	Hartstein	13000
3	Fay	6000
4	Higgins	12000
5	Gietz	8300
6	King	24000
7	Kochhar	17000
8	De Haan	17000
9	Hunold	9000
10	Ernst	6000

…

19	Taylor	8600
20	Grant	7000

JOB_GRADES

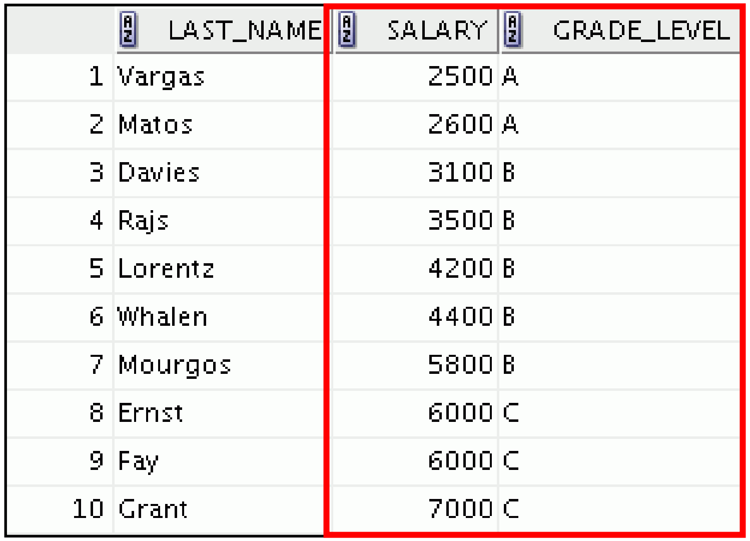


	GRADE_LEVEL	LOWEST_SAL	HIGHEST_SAL
1	A	1000	2999
2	B	3000	5999
3	C	6000	9999
4	D	10000	14999
5	E	15000	24999
6	F	25000	40000

The `JOB_GRADES` table defines the `LOWEST_SAL` and `HIGHEST_SAL` range of values for each `GRADE_LEVEL`. Therefore, the `GRADE_LEVEL` column can be used to assign grades to each employee.

Nonequijoins

```
SELECT e.last_name, e.salary, j.grade_level
FROM   employees e JOIN job_grades j
ON     e.salary
       BETWEEN j.lowest_sal AND j.highest_sal;
```

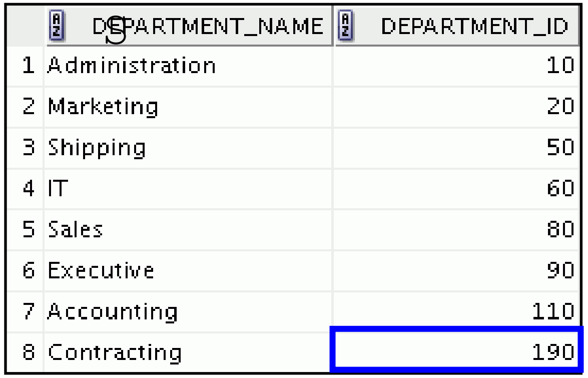


	LAST_NAME	SALARY	GRADE_LEVEL
1	Vargas	2500	A
2	Matos	2600	A
3	Davies	3100	B
4	Rajs	3500	B
5	Lorentz	4200	B
6	Whalen	4400	B
7	Mourgos	5800	B
8	Ernst	6000	C
9	Fay	6000	C
10	Grant	7000	C

...

Returning Records with No Direct Match Using OUTER Joins

DEPARTMENT

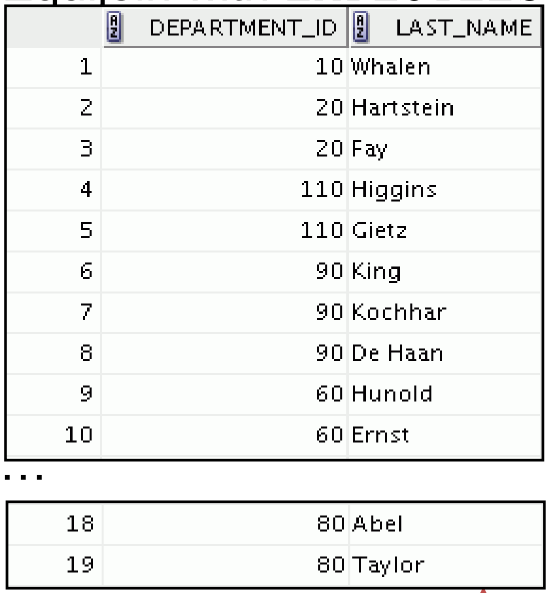


	DEPARTMENT_NAME	DEPARTMENT_ID
1	Administration	10
2	Marketing	20
3	Shipping	50
4	IT	60
5	Sales	80
6	Executive	90
7	Accounting	110
8	Contracting	190

There are no employees in department 190.

Employee “Grant” has not been assigned a department ID.

Equijoin with EMPLOYEES

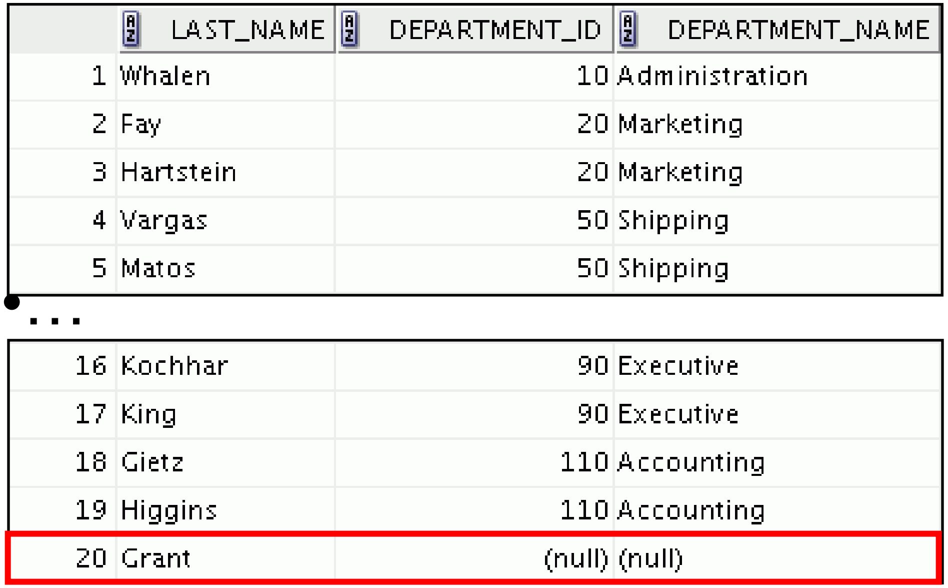


	DEPARTMENT_ID	LAST_NAME
1	10	Whalen
2	20	Hartstein
3	20	Fay
4	110	Higgins
5	110	Gietz
6	90	King
7	90	Kochhar
8	90	De Haan
9	60	Hunold
10	60	Ernst
. . .		
18	80	Abel
19	80	Taylor

- In SQL:1999, the join of two tables returning only matched rows is called an INNER join.
- A join between two tables that returns the results of the INNER join as well as the unmatched rows from the left (or right) table is called a left (or right) OUTER join.
- A join between two tables that returns the results of an INNER join as well as the results of a left and right join is a full OUTER join.

LEFT OUTER JOIN

```
SELECT e.last_name, e.department_id, d.department_name
FROM   employees e LEFT OUTER JOIN departments d
ON    (e.department_id = d.department_id) ;
```



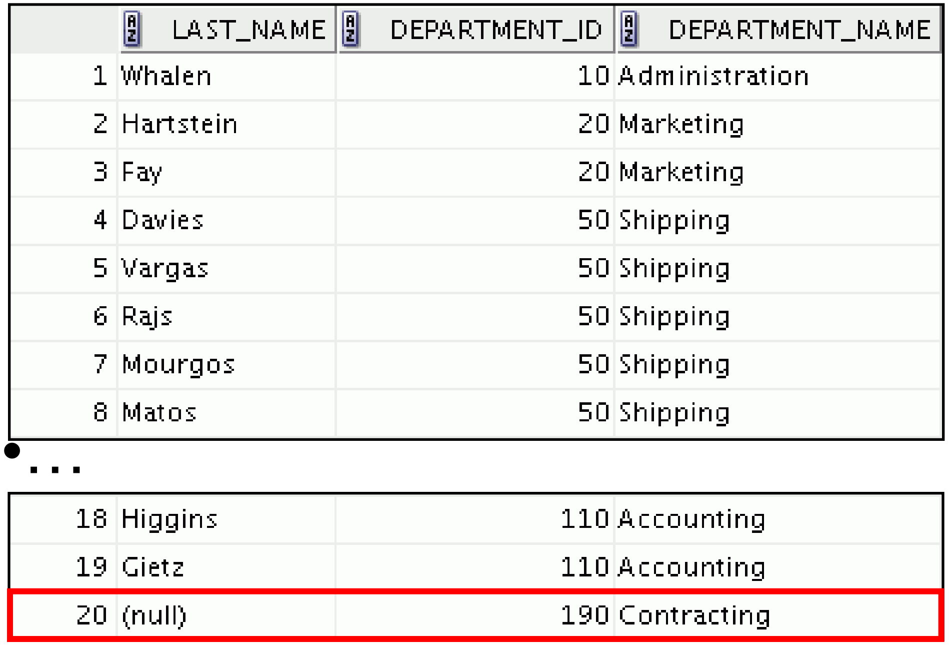
	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Fay	20	Marketing
3	Hartstein	20	Marketing
4	Vargas	50	Shipping
5	Matos	50	Shipping

• ...

	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
16	Kochhar	90	Executive
17	King	90	Executive
18	Gietz	110	Accounting
19	Higgins	110	Accounting
20	Grant	(null)	(null)

RIGHT OUTER JOIN

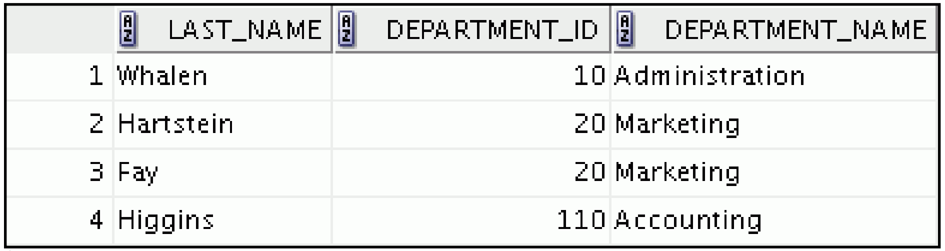
```
SELECT e.last_name, d.department_id, d.department_name
FROM   employees e RIGHT OUTER JOIN departments d
ON     (e.department_id = d.department_id) ;
```



	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Hartstein	20	Marketing
3	Fay	20	Marketing
4	Davies	50	Shipping
5	Vargas	50	Shipping
6	Rajs	50	Shipping
7	Mourgos	50	Shipping
8	Matos	50	Shipping
...			
18	Higgins	110	Accounting
19	Gietz	110	Accounting
20	(null)	190	Contracting

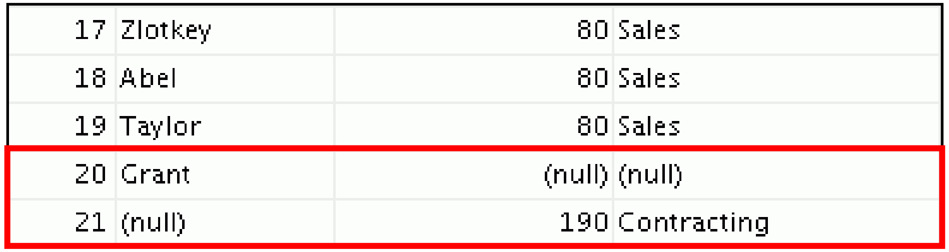
FULL OUTER JOIN

```
SELECT e.last_name, d.department_id, d.department_name
FROM   employees e FULL OUTER JOIN departments d
ON   (e.department_id = d.department_id) ;
```



	LAST_NAME	DEPARTMENT_ID	DEPARTMENT_NAME
1	Whalen	10	Administration
2	Hartstein	20	Marketing
3	Fay	20	Marketing
4	Higgins	110	Accounting

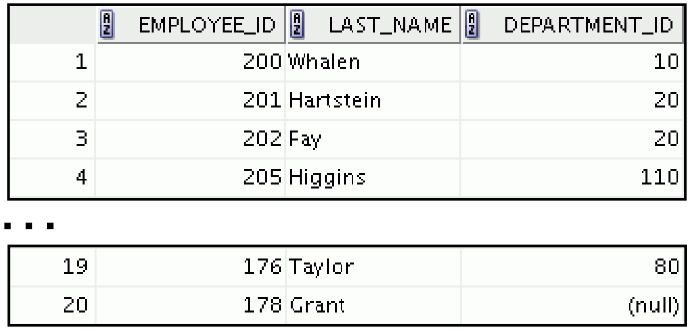
- ...



17	Zlotkey	80	Sales
18	Abel	80	Sales
19	Taylor	80	Sales
20	Grant	(null)	(null)
21	(null)	190	Contracting

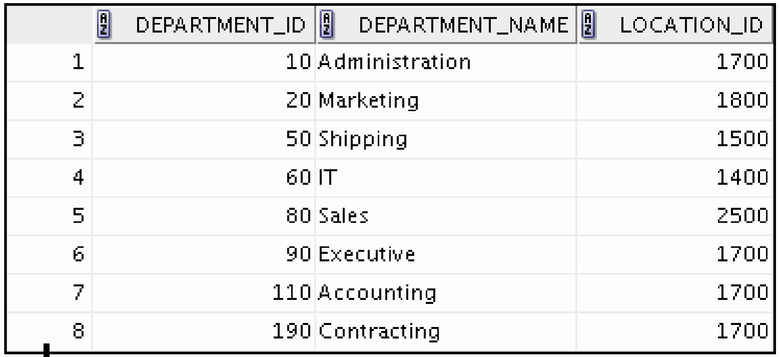
Cartesian Products

EMPLOYEES (20 rows)



	EMPLOYEE_ID	LAST_NAME	DEPARTMENT_ID
1	200	Whalen	10
2	201	Hartstein	20
3	202	Fay	20
4	205	Higgins	110
…			
19	176	Taylor	80
20	178	Grant	(null)

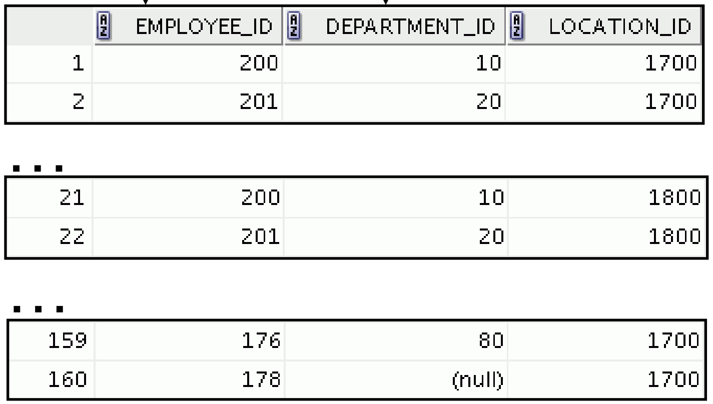
DEPARTMENTS (8 rows)



	DEPARTMENT_ID	DEPARTMENT_NAME	LOCATION_ID
1	10	Administration	1700
2	20	Marketing	1800
3	50	Shipping	1500
4	60	IT	1400
5	80	Sales	2500
6	90	Executive	1700
7	110	Accounting	1700
8	190	Contracting	1700

Cartesian product:

20 x 8 = 160 rows

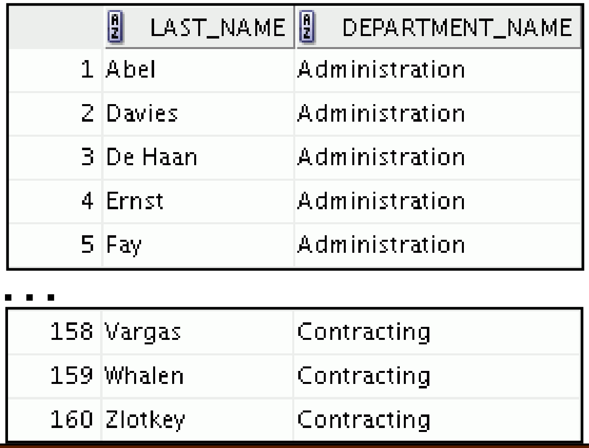


	EMPLOYEE_ID	DEPARTMENT_ID	LOCATION_ID
1	200	10	1700
2	201	20	1700
…			
21	200	10	1800
22	201	20	1800
…			
159	176	80	1700
160	178	(null)	1700

Cartesian Products vs Cross Join

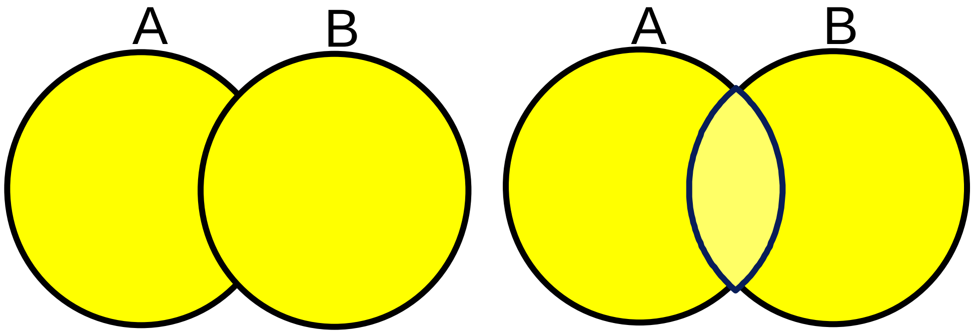
- A Cartesian product is formed when:
  - A join condition is omitted
  - A join condition is invalid
  - All rows in the first table are joined to all rows in the second table
- Always include a valid join condition if you want to avoid a Cartesian product.
- The CROSS JOIN clause produces the cross-product of two tables.
- This is also called a Cartesian product between the two tables.

```
SELECT last_name, department_name
FROM   employees
CROSS JOIN departments ;
```

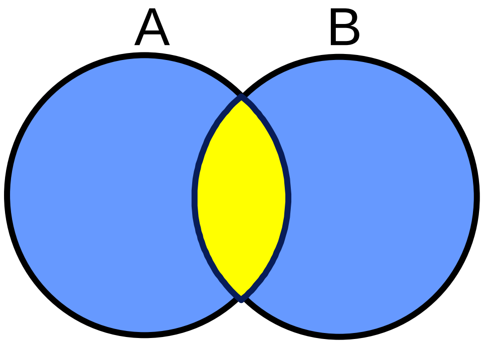


	LAST_NAME	DEPARTMENT_NAME
1	Abel	Administration
2	Davies	Administration
3	De Haan	Administration
4	Ernst	Administration
5	Fay	Administration
...		
158	Vargas	Contracting
159	Whalen	Contracting
160	Zlotkey	Contracting

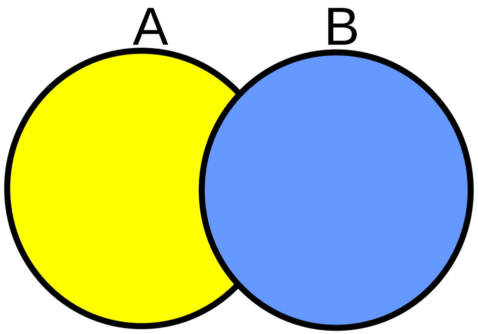
Set Operators



UNION/UNION ALL



INTERSECT



MINUS

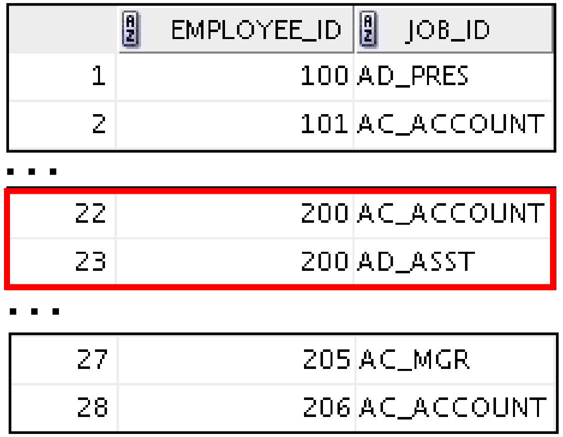
Set Operator Guidelines

- The expressions in the SELECT lists must match in number.
- The data type of each column in the second query must match the data type of its corresponding column in the first query.
- Parentheses can be used to alter the sequence of execution.
- ORDER BY clause can appear only at the very end of the statement.
- Duplicate rows are automatically eliminated except in UNION ALL.
- Column names from the first query appear in the result.
- The output is sorted in ascending order by default except in UNION ALL.

Using the UNION Operator

The UNION operator returns rows from both queries after eliminating duplications.

```
SELECT employee_id, job_id
FROM   employees
UNION
SELECT employee_id, job_id
FROM   job_history;
```

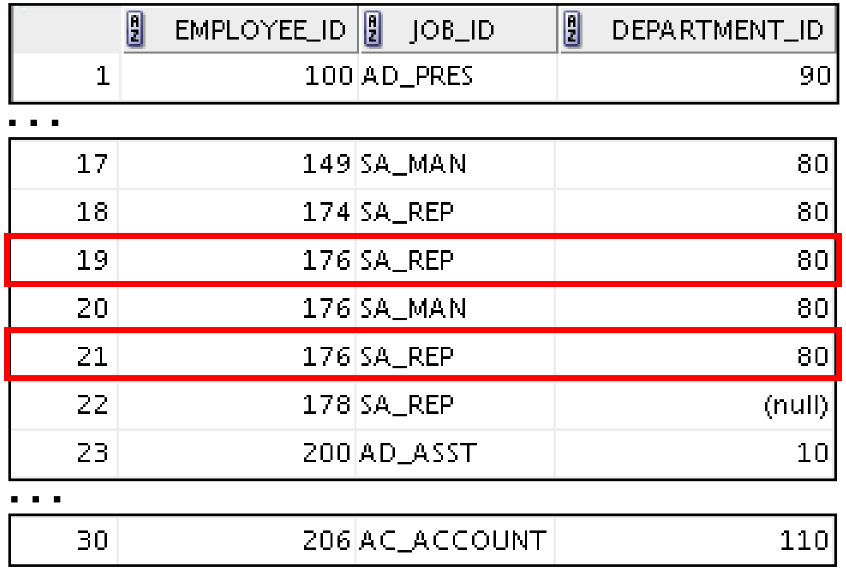


	EMPLOYEE_ID	JOB_ID
1	100	AD_PRES
2	101	AC_ACCOUNT
...		
22	200	AC_ACCOUNT
23	200	AD_ASST
...		
27	205	AC_MGR
28	206	AC_ACCOUNT

UNION ALL Operator

The UNION ALL operator returns rows from both queries, including all duplications.

```
SELECT employee_id, job_id, department_id
FROM   employees
UNION ALL
SELECT employee_id, job_id, department_id
FROM   job_history
ORDER BY  employee_id;
```



	EMPLOYEE_ID	JOB_ID	DEPARTMENT_ID
1	100	AD_PRES	90

...

17	149	SA_MAN	80
18	174	SA_REP	80
19	176	SA_REP	80
20	176	SA_MAN	80
21	176	SA_REP	80
22	178	SA_REP	(null)
23	200	AD_ASST	10

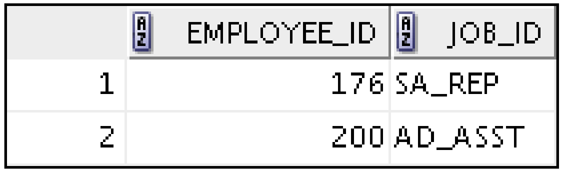
...

30	206	AC_ACCOUNT	110

INTERSECT Operator

– The INTERSECT operator returns rows that are common to both queries

```
SELECT employee_id, job_id
FROM   employees
INTERSECT
SELECT employee_id, job_id
FROM   job_history;
```

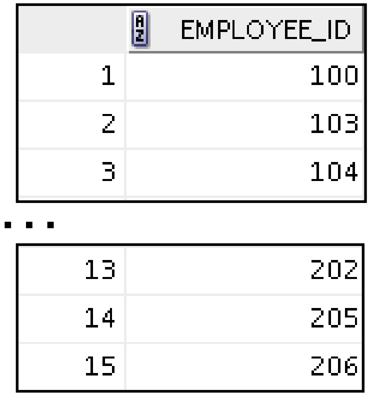


	EMPLOYEE_ID	JOB_ID
1	176	SA_REP
2	200	AD_ASST

MINUS Operator

The `MINUS` operator returns all the distinct rows selected by the first query, but not present in the second query result set.

```
SELECT employee_id
FROM   employees
MINUS
SELECT employee_id
FROM   job_history;
```



	EMPLOYEE_ID
1	100
2	103
3	104

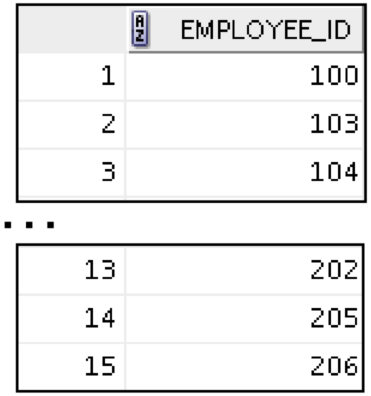
...

13	202
14	205
15	206

MINUS Operator

The MINUS operator returns all the distinct rows selected by the first query, but not present in the second query result set.

```
SELECT employee_id
FROM   employees
MINUS
SELECT employee_id
FROM   job_history;
```



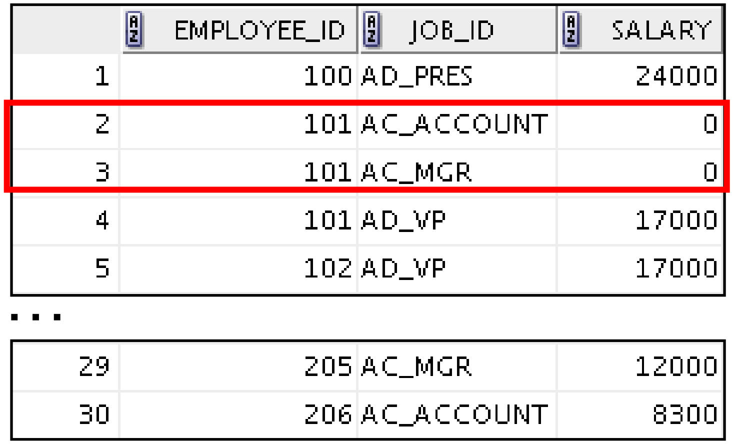
	EMPLOYEE_ID
1	100
2	103
3	104
…	
13	202
14	205
15	206

Matching the SELECT Statements

- Using the UNION operator, display the location ID, department name, and the state where it is located.
- You must match the data type (using the TO_CHAR function or any other conversion functions) when columns do not exist in one or the other table.

```
SELECT location_id, department_name "Department",
                              TO_CHAR(NULL) "Warehouse location"
          FROM departments
UNION
SELECT location_id, TO_CHAR(NULL) "Department", state_province
          FROM locations;
```

```
SELECT employee_id, job_id,salary
FROM   employees
UNION
SELECT employee_id, job_id,0
FROM   job_history;
```



	EMPLOYEE_ID	JOB_ID	SALARY
1	100	AD_PRES	24000
2	101	AC_ACCOUNT	0
3	101	AC_MGR	0
4	101	AD_VP	17000
5	102	AD_VP	17000
...			
29	205	AC_MGR	12000
30	206	AC_ACCOUNT	8300

Using the ORDER BY Clause in Set Operations

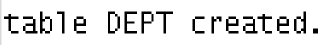
- The ORDER BY clause can appear only once at the end of the compound query.
- Component queries cannot have individual ORDER BY clauses.
- The ORDER BY clause recognizes only the columns of the first SELECT query.
- By default, the first column of the first SELECT query is used to sort the output in an ascending order.

```
SELECT employee_id, job_id,salary
FROM   employees
UNION
SELECT employee_id, job_id,0
FROM   job_history
ORDER BY 2;
```

Using DDL Statements to Create and Manage Tables

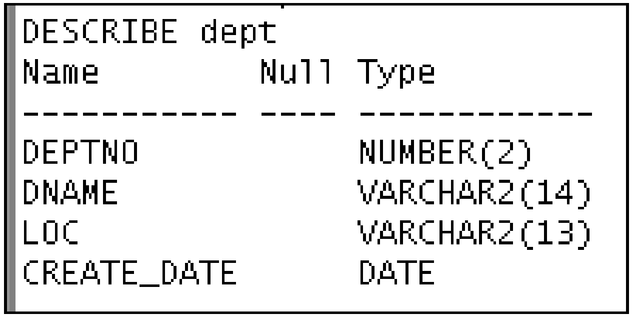
```
CREATE TABLE [schema.]table
          (column datatype [DEFAULT expr][, ...]);
```

```
CREATE TABLE dept
        (deptno      NUMBER(2),
         dname       VARCHAR2(14),
         loc         VARCHAR2(13),
         create_date DATE DEFAULT SYSDATE);
```



```
table DEPT created.
```

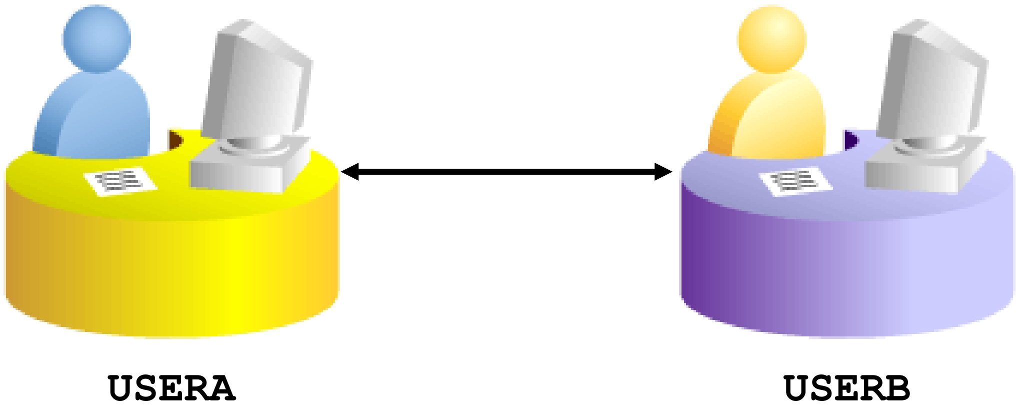
```
DESCRIBE dept
```



```
DESCRIBE dept
Name         Null Type         
------------ ---- ------------ 
DEPTNO            NUMBER(2)    
DNAME             VARCHAR2(14) 
LOC               VARCHAR2(13) 
CREATE_DATE       DATE         
```

Referencing Another User's Tables

- Tables belonging to other users are not in the user's schema.
- You should use the owner's name as a prefix to those tables.



```
SELECT *
FROM userB.employees;
```

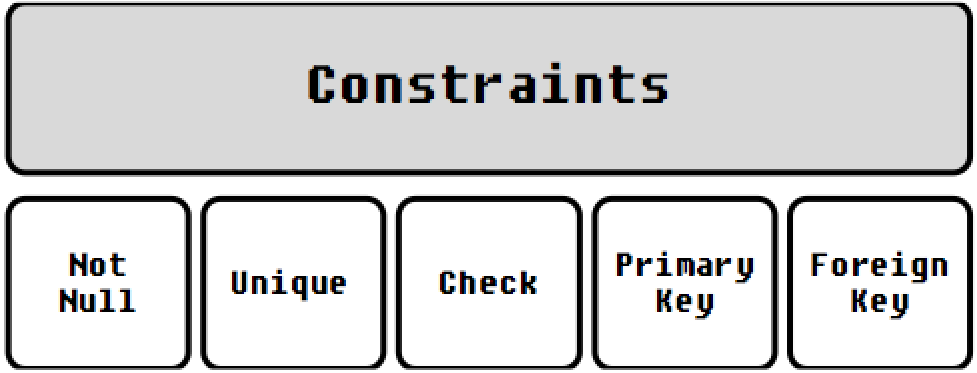
```
SELECT *
FROM userA.employees;
```

Data Types

Data Type	Description
VARCHAR2(*size*)	Variable-length character data
CHAR(*size*)	Fixed-length character data
NUMBER(*p*, *s*)	Variable-length numeric data
DATE	Date and time values
LONG	Variable-length character data (up to 2 GB)
CLOB	Character data (up to 4 GB)
RAW and LONG RAW	Raw binary data
BLOB	Binary data (up to 4 GB)
BFILE	Binary data stored in an external file (up to 4 GB)
ROWID	A base-64 number system representing the unique address of a row in its table

Defining Constraints

- Constraints enforce rules at the table level.
- Constraints prevent the deletion of a table and its contents if there are dependencies.
- The following constraint types are valid:
  - NOT NULL
  - UNIQUE
  - PRIMARY KEY
  - FOREIGN KEY
  - CHECK



Constraints

Not Null

Unique

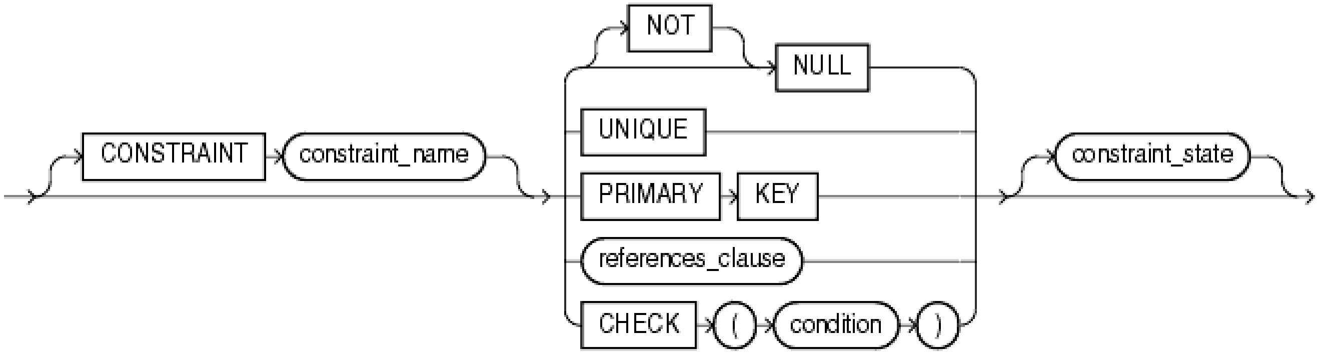
Check

Primary Key

Foreign Key

Constraint Guidelines

- You can name a constraint, or the Oracle server generates a name by using the SYS_Cn format.
- Create a constraint at either of the following times:
  - At the same time as the creation of the table
  - After the creation of the table
- Define a constraint at the column or table level.
- View a constraint in the data dictionary.
- Constraints are easy to reference if you give them a meaningful name.



Defining Constraints

```
CREATE TABLE [schema.]table
        (column datatype [DEFAULT expr]
        [column_constraint],
        ...
        [table_constraint][,...]);
```

Column-level constraint syntax:

```
column [CONSTRAINT constraint_name] constraint_type,
```

Table-level constraint syntax:

```
column,...
  [CONSTRAINT constraint_name] constraint_type
  (column, ...),
```

Defining Constraints

Example of a column-level constraint:

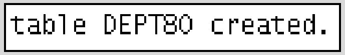
```
CREATE TABLE employees(
  employee_id  NUMBER(6)
    CONSTRAINT emp_emp_id_pk PRIMARY KEY,
  first_name   VARCHAR2(20),
  ...);
```

Example of a table-level constraint:

```
CREATE TABLE employees(
  employee_id  NUMBER(6),
  first_name   VARCHAR2(20),
  ...
  job_id       VARCHAR2(10) NOT NULL,
  CONSTRAINT emp_emp_id_pk
    PRIMARY KEY (EMPLOYEE_ID));
```

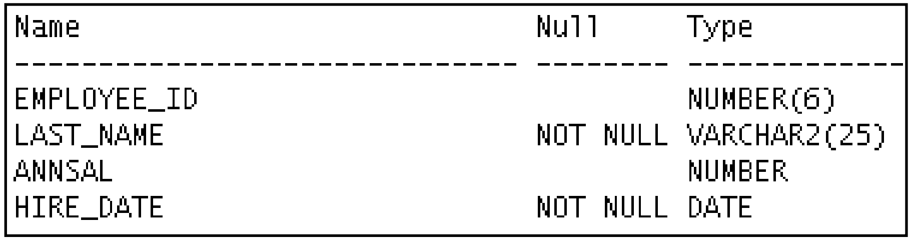
Creating a Table Using a Subquery

```
CREATE TABLE   dept80
  AS
    SELECT  employee_id, last_name,
            salary*12 ANNSAL,
            hire_date
    FROM    employees
    WHERE   department_id = 80;
```



```
table DEPT80 created.
```

```
DESCRIBE dept80
```

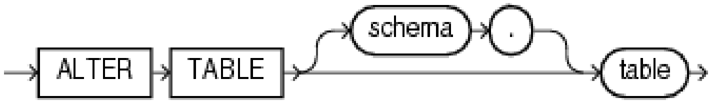


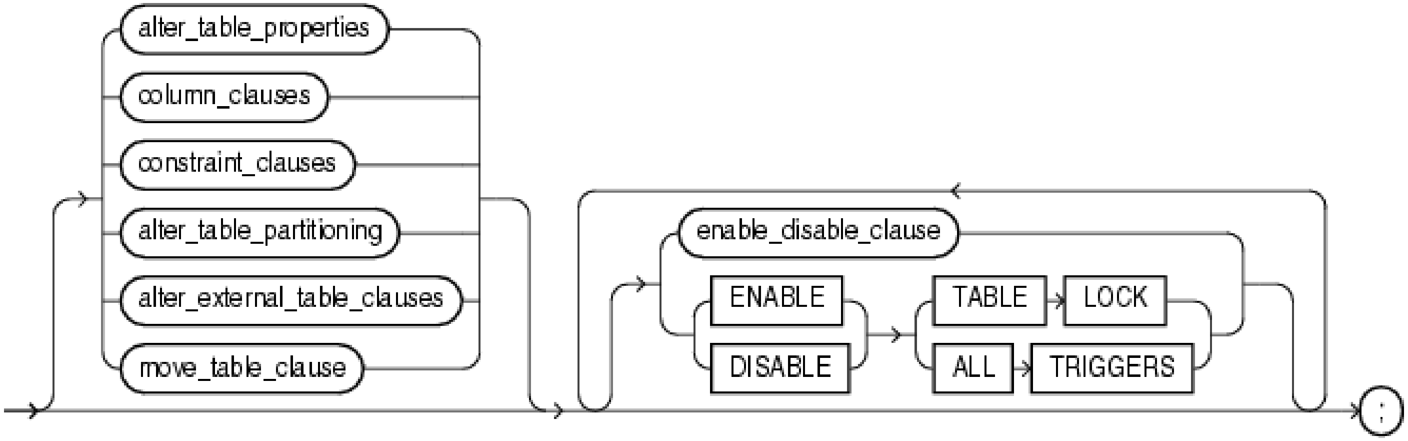
```
Name                           Null     Type
------------------------------ -------- -------------
EMPLOYEE_ID                             NUMBER(6)
LAST_NAME                      NOT NULL VARCHAR2(25)
ANNSAL                                  NUMBER
HIRE_DATE                      NOT NULL DATE
```

ALTER TABLE Statement

Use the ALTER TABLE statement to:

- Add a new column
- Modify an existing column definition
- Define a default value for the new column
- Drop a column
- Rename a column
- Change table to read-only status





Read-Only Tables

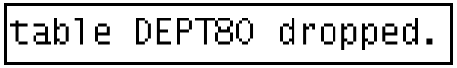
- You can use the ALTER TABLE syntax to:
- Put a table into read-only mode, which prevents DDL or DML changes during table maintenance
- Put the table back into read/write mode

```
ALTER TABLE employees READ ONLY;

-- perform table maintenance and then
-- return table back to read/write mode

ALTER TABLE employees READ WRITE;
```

Dropping a Table

- Moves a table to the recycle bin
- Removes the table and all its data entirely if the PURGE clause is specified
- Invalidates dependent objects and removes object privileges on the table

```
DROP TABLE dept80;
```



```
table DEPT80 dropped.
```

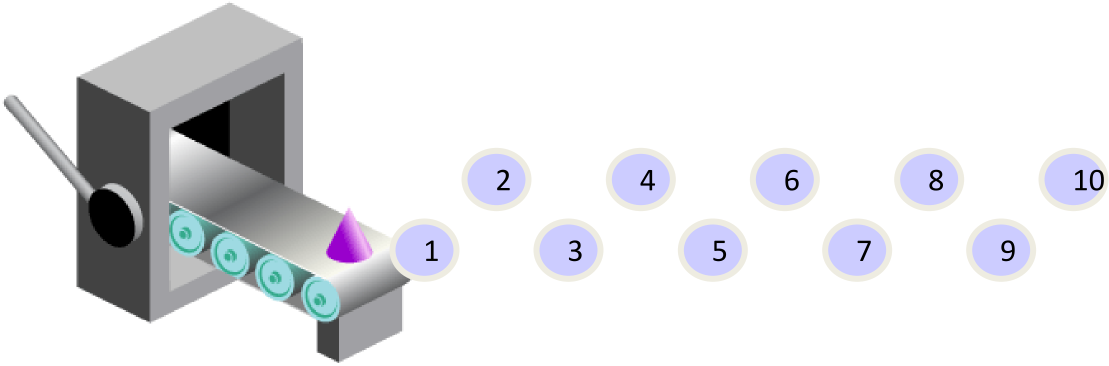
Guidelines

- All the data is deleted from the table.
- Any views and synonyms remain, but are invalid.
- Any pending transactions are committed.
- Only the creator of the table or a user with the DROP ANY TABLE privilege can remove a table.
- Use the FLASHBACK TABLE statement to restore a dropped table from the recycle bin.

Sequences

A sequence:

- Can automatically generate unique numbers
- Is a shareable object
- Can be used to create a primary key value
- Replaces application code
- Speeds up the efficiency of accessing sequence values when cached in memory

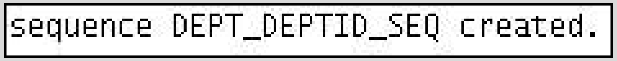


Sequences

Define a sequence to generate sequential numbers automatically:

```
CREATE SEQUENCE sequence
       [INCREMENT BY n]
       [START WITH n]
       [{MAXVALUE n | NOMAXVALUE}]
       [{MINVALUE n | NOMINVALUE}]
       [{CYCLE | NOCYCLE}]
       [{CACHE n | NOCACHE}];
```

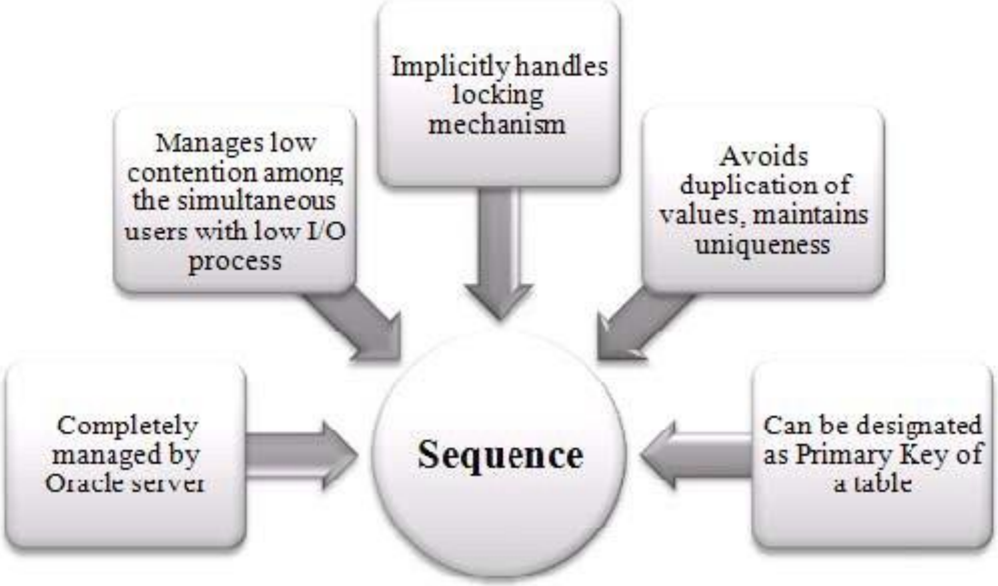
```
CREATE SEQUENCE dept_deptid_seq
                INCREMENT BY 10
                START WITH 120
                MAXVALUE 9999
                NOCACHE
                NOCYCLE;
```



```
sequence DEPT_DEPTID_SEQ created.
```

NEXTVAL and CURRVAL Pseudocolumns

- NEXTVAL returns the next available sequence value. It returns a unique value every time it is referenced, even for different users.
- CURRVAL obtains the current sequence value.
- NEXTVAL must be issued for that sequence before CURRVAL contains a value.



Implicitly handles locking mechanism
Manages low contention among the simultaneous users with low I/O process
Avoids duplication of values, maintains uniqueness
Completely managed by Oracle server
Sequence
Can be designated as Primary Key of a table

Using a Sequence

- Insert a new department named “Support” in location ID 2500:

```
INSERT INTO departments(department_id,
            department_name, location_id)
VALUES      (dept_deptid_seq.NEXTVAL,
            'Support', 2500);
```

```
1 rows inserted
```

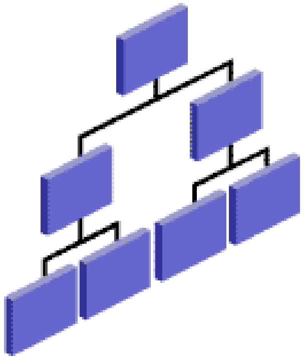
- View the current value for the `DEPT_DEPTID_SEQ` sequence:

```
SELECT     dept_deptid_seq.CURRVAL
FROM       dual;
```

Indexes

An index:

- Is a schema object
- Can be used by the Oracle server to speed up the retrieval of rows by using a pointer
- Can reduce disk input/output (I/O) by using a rapid path access method to locate data quickly
- Is dependent on the table that it indexes
- Is used and maintained automatically by the Oracle server



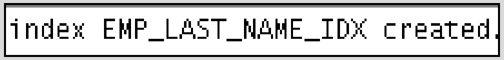
How Are Indexes Created?

- Automatically: A unique index is created automatically when you define a PRIMARY KEY or UNIQUE constraint in a table definition.

```
CREATE [UNIQUE][BITMAP]INDEX index
ON table (column[, column]...);
```

- Manually: Users can create nonunique indexes on columns to speed up access to the rows.

```
CREATE INDEX emp_last_name_idx
ON employees(last_name);
```



```
index EMP_LAST_NAME_IDX created.
```

Index Creation Guidelines

Create an index when:	
✓	A column contains a wide range of values
✓	A column contains a large number of null values
✓	One or more columns are frequently used together in a WHERE clause or a join condition
✓	The table is large and most queries are expected to retrieve less than 2% to 4% of the rows in the table
Do not create an index when:	
✗	The columns are not often used as a condition in the query
✗	The table is small or most queries are expected to retrieve more than 2% to 4% of the rows in the table
✗	The table is updated frequently
✗	The indexed columns are referenced as part of an expression