



Advanced SQL

(Structured Query Language)

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Join Tables



To Join or Not to Join...

Join Operations

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Types of JOIN:

- Inner Join
- Non-Equijoin
- Outer Join
- Self Join

Thought Process – Develop Queries

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1. What data do I need? – Goes to SELECT statement
2. Where are they located? – Table names from ERD
3. What are the conditions? – Filtering using operators
4. Are all the columns located in a single table? If Yes, STOP. If NO then proceed.
 1. Are the tables related – do they have common column?
 2. If related
 1. What is the name of common columns? STOP.
 3. If tables are not related
 1. Can we use any other table as the bridge to join?

Tables

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Employees

Employee_ID	Last_Name	First_Name	Salary	Department_ID
10001	Smith	John	75000.00	30
10002	Smith	Ron	72000.00	40
10003	Hough	Natalie	78000.00	
10004	Stahl	David	82000.00	30
10005	Eaton	Lucy	88000.00	40

Departments

Department_ID	Department_Name	Location_ID
30	Civil	2500
40	Electric	2501
50	Computer	2600
60	HelpDesk	2601

Inner Joins/ Equijoins

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- ❑ Inner Join returns column values of matching rows from two or more tables.
- ❑ Example:

```
SELECT last_name, first_name, department_name  
FROM employees INNER JOIN Departments  
ON Employees. department_id = Departments.department_id
```

```
SELECT last_name, first_name, department_name  
FROM employees, Departments  
WHERE Employees. department_id = Departments.department_id
```

Example: Equijoins/ Inner Joins

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- Example: Find the Last name, First name, and Department Name.

```
SELECT last_name, first_name, department_name  
FROM employees, Departments  
WHERE Employees. department_id = Departments.department_id  
ORDER BY Last_name
```

Result set:

Last_Name	First_Name	Department_name
Smith	John	Civil
Smith	Ron	Electric
Stahl	David	Civil
Eaton	Lucy	Electric

Group BY on Inner Join

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- Display departments name with more than 5 employees

```
SELECT department_name, Count(employee_id)
FROM employees inner join departments
ON departments.department_id = employees.department_id
GROUP By department_name
Having count(employee_id)>5
```


Join More than Two Tables

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- ❑ Number of condition of multiple join is N-1 (N = total number of tables)
- ❑ Syntax

```
SELECT Last_Name, First_Name, Department_Name, City  
FROM Employees Inner Join Departments  
On Employees.Department_Id = Departments.Department_Id  
Inner Join Location  
On Location.Location_Id = Departments.Location_Id
```

EXERCISE # 5 (INNER JOIN)

- Code a SQL statement that list Employees last name, first name, Salary, and Department Name.
 - Lists the above, but only the employees who's salary is more than 10K.
 - Find number of employees of each departments, and display as department name & total employees.

Non-Equi Joins

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- ❑ NON-EQUIJOIN returns non matching records from two or more tables.
- ❑ Example

```
SELECT last_name, first_name, department_name  
FROM employees, Departments  
WHERE Employees.department_id != Departments.department_id  
ORDER BY Last_name
```

Outer Joins

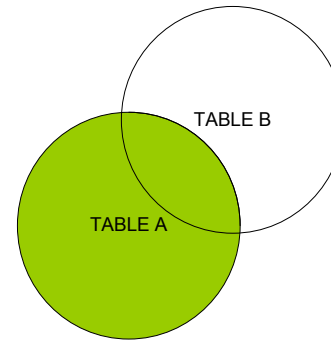
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- ❑ An OUTER JOIN is used to return all rows that exist in one table, even though corresponding rows do not exist in the joined table.
- ❑ Standard SQL use LEFT JOIN, RIGHT JOIN, FULL JOIN keywords to perform outer join
- ❑ In Oracle, the (+) symbol is used to denote an OUTER JOIN in a query. The table with the (+) should be the table that does not have matching rows.

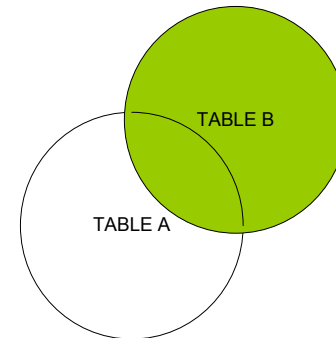
Types of Outer Joins

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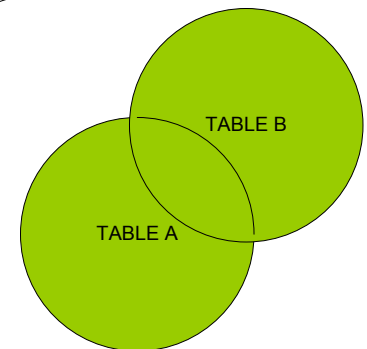
□ Left Outer Join



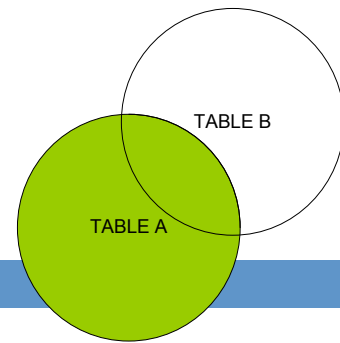
□ Right Outer Join



□ Full Outer Join



Left Outer Join



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- The LEFT JOIN keyword returns all rows from the left table (Employees), even if there are no matches in the right table (Departments).

```
SELECT last_name, first_name, department_name  
FROM employees LEFT JOIN Departments  
ON Employees.department_id = Departments.department_id
```

Example: Outer Joins

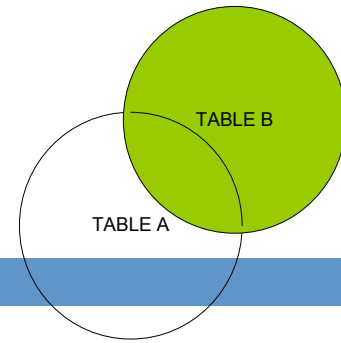
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- Display employees last name, first name, department name. display all rows from employees table.

```
SELECT E.last_name, E.first_name, D.department_name  
FROM employees LEFT JOIN Departments  
ON Employees.department_id = Departments.department_id
```

Last_Name	First_Name	Department_name
Eaton	Lucy	Electric
Hough	Natalie	
Smith	John	Civil
Smith	Ron	Electric
Stahl	David	Civil

Right Outer Join

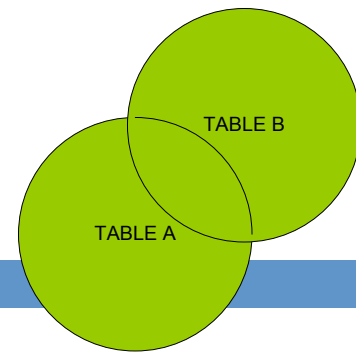


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- The RIGHT JOIN keyword Return all rows from the right table (Employees), even if there are no matches in the left table (Departments).

```
SELECT last_name, first_name, department_name  
FROM employees RIGHT JOIN Departments  
ON Employees.department_id = Departments.department_id
```


Full Outer Join



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- The FULL JOIN keyword return rows when there is a match in one of the tables.

```
SELECT last_name, first_name, department_name  
FROM employees FULL JOIN Departments  
ON Employees.department_id = Departments.department_id
```

EXERCISE # 6 (OUTER JOIN)

Retrieve and display lists of last name, first name, and department name of all employees.

Retrieve and display lists the last name, first name, and department names for all departments.

Using Table Aliases

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- ❑ The use of table aliases means to rename a table in a particular SQL statement.
- ❑ The renaming is a temporary change. The actual table name does not change in the database.
- ❑ The following are some examples of table aliases and the corresponding columns:

```
SELECT E.last_name, E.first_name, D.department_name  
FROM employees E, Departments D  
WHERE E.department_id = D.department_id  
ORDER BY E.Last_name
```

Self Join

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- ❑ The SQL **SELF JOIN** is used to join a table to itself, as if the table were two tables, temporarily renaming at least one table in the SQL statement.
- ❑ Employees table which contains rows for normal employees as well as managers. So, to find out the managers of all the employees, you need a self join.
- ❑ Example:

```
SELECT E1.last_name, E1.first_name, E2.last_name, E2.first_name  
FROM Employees E1, Employees E2  
WHERE E1.Manager_Id = E2.employee_Id  
Order BY last_name
```

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EXERCISE # 7 (SELF JOIN)

Code a select statement that displays the employees first name, last name, and their managers last name.

Union & Union All

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- ❑ The UNION operator is used to combine the result-set of two or more SELECT statements.
- ❑ Notice that each SELECT statement within the UNION must have the same number of columns. The columns must also have similar data types. Also, the columns in each SELECT statement must be in the same order.
- ❑ **Note:** The UNION operator selects only distinct values by default. To allow duplicate values, use UNION ALL.

```
SELECT column_name(s) FROM table_name1  
UNION  
SELECT column_name(s) FROM table_name2
```

```
SELECT column_name(s) FROM table_name1  
UNION ALL  
SELECT column_name(s) FROM table_name2
```

Uses of union

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- Union is mostly used on same queries to find distinct values (rows)
- We use Union when same tables exist in multiple databases, and need to consolidate.

Commit & Rollback

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- ❑ A COMMIT statement in SQL ends a transaction within a relational database management system (RDBMS) and makes all changes visible to other users
- ❑ A rollback is an operation which returns the database to some previous state. Rollbacks are important for database integrity, because they mean that the database can be restored to a clean copy even after erroneous operations are performed

Sub Query

Query inside a query

Sub Query Fundamentals

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- ❑ Sub query or Inner query or Nested query is a query in a query.
- ❑ A sub query is usually added in the WHERE Clause of the SQL statement.
- ❑ Most of the time, a sub query is used when you know how to search for a value using a SELECT statement, but do not know the exact value.
- ❑ Sub queries are an alternate way of returning data from multiple tables.

Example - Sub query

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- Find the highest salaried employee's name, and salary.

```
Select First_Name, Last_Name, Salary
From Employees
Where Salary = (
Select Max(Salary) From Employees
);
```

Exercises - Sub query

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- ❑ Find the second highest salaried employee's name, and salary
- ❑ Find each employees manager name
- ❑ Find the department that has 2nd highest average employees salary
- ❑ Find the department with highest number of employees