What is SQL Join?

SQL JOIN clause is used to **query** and **access data** from multiple tables by establishing **logical relationships** between them. It can access data from multiple tables simultaneously using common key values shared across different tables. We can use **SQL JOIN** with **multiple tables**. It can also be paired with other clauses, the most popular use will be using JOIN with **WHERE clause** to filter data retrieval.

Example of SQL JOINS

Consider the two tables, **Student** and **StudentCourse**, which share a common column **ROLL_NO**. Using SQL JOINS, we can combine data from these tables based on their **relationship**, allowing us to retrieve meaningful information like student details along with their **enrolled courses**.

Student Table

ROLL_NO	NAME	ADDRESS	PHONE	Age
1	HARSH	DELHI	XXXXXXXXXX	18
2	PRATIK	BIHAR	XXXXXXXXXX	19
3	RIYANKA	SILIGURI	XXXXXXXXXX	20
4	DEEP	RAMNAGAR	XXXXXXXXXX	18
5	SAPTARHI	KOLKATA	XXXXXXXXXX	19
6	DHANRAJ	BARABAJAR	XXXXXXXXXX	20
7	ROHIT	BALURGHAT	XXXXXXXXXX	18
8	NIRAJ	ALIPUR	XXXXXXXXXX	19

StudentCourse Table

COURSE_ID	ROLL_NO
1	1
2	2
2	3
3	4
1	5
4	9
5	10
4	11

Both these tables are connected by one common key (column) i.e **ROLL_NO**. We can perform a JOIN operation using the given SQL query:

Query:

```
SELECT s.roll_no, s.name, s.address, s.phone, s.age, sc.course_id
FROM Student s
JOIN StudentCourse sc ON s.roll_no = sc.roll_no;
```

Output

ROLL_NO	NAME	ADDRESS	PHONE	AGE	COURSE_ID
1	HARSH	DELHI	XXXXXXXXXX	18	1
2	PRATIK	BIHAR	XXXXXXXXXX	19	2

3	RIYANKA	SILGURI	XXXXXXXXXX	20	2
4	DEEP	RAMNAGAR	XXXXXXXXXX	18	3
5	SAPTARHI	KOLKATA	XXXXXXXXXX	19	1

Types of JOIN in SQL

There are many types of Joins in SQL. Depending on the use case, we can use different type of **SQL JOIN** clause. Below, we explain the most commonly used join types with syntax and examples:

- INNER JOIN
- LEFT JOIN
- RIGHT JOIN
- FULL JOIN
- Natural Join

1. SQL INNER JOIN

The **INNER JOIN** keyword selects all rows from both the tables as long as the condition is satisfied. This keyword will create the **result-set** by combining all rows from both the tables where the **condition satisfies** i.e value of the common field will be the same.

Syntax

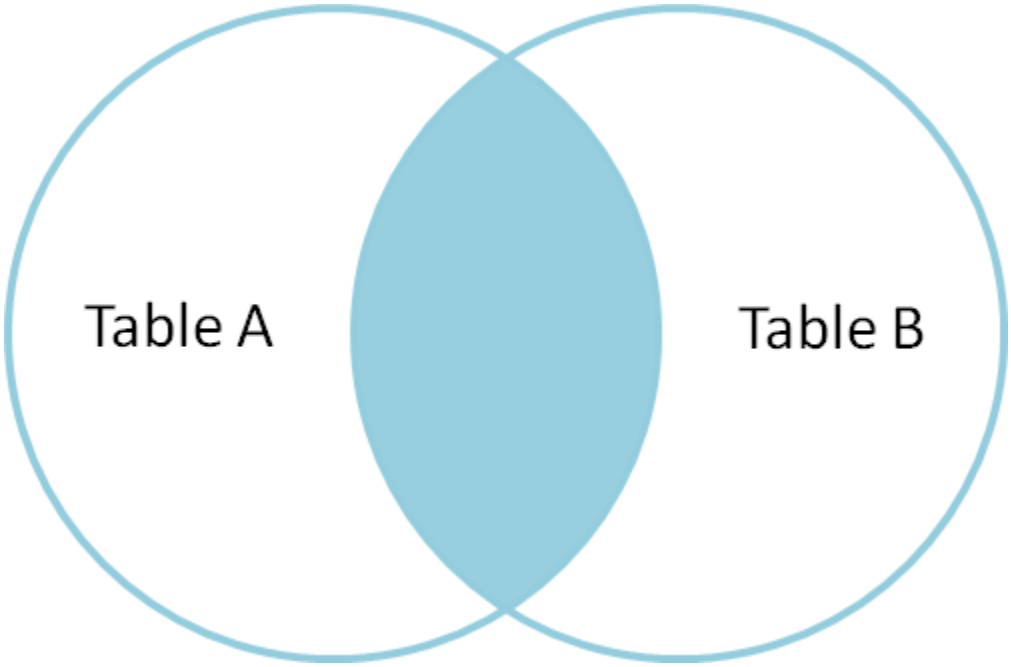
```
SELECT table1.column1,table1.column2,table2.column1,....

FROM table1

INNER JOIN table2

ON  table1.matching_column = table2.matching_column;
```

Key Terms

- **table1**: First table.

- **table2**: Second table
- **matching_column**: Column common to both the tables.

Note: We can also write JOIN instead of INNER JOIN. JOIN is same as INNER JOIN.



INNER JOIN Example

Let's look at the example of **INNER JOIN** clause, and understand it's working. This query will show the names and age of students enrolled in different courses.

Query:

```
SELECT StudentCourse.COURSE_ID, Student.NAME, Student.AGE FROM Student
INNER JOIN StudentCourse
ON Student.ROLL_NO = StudentCourse.ROLL_NO;
```

Output

COURSE_ID	NAME	Age
1	HARSH	18
2	PRATIK	19
2	RIYANKA	20
3	DEEP	18
1	SAPTARHI	19

2. SQL LEFT JOIN

LEFT JOIN returns all the rows of the table on the left side of the join and matches rows for the table on the right side of the join. For the rows for which there is **no matching row** on the right side, the result-set will contain **null**. LEFT JOIN is also known as **LEFT OUTER JOIN**.

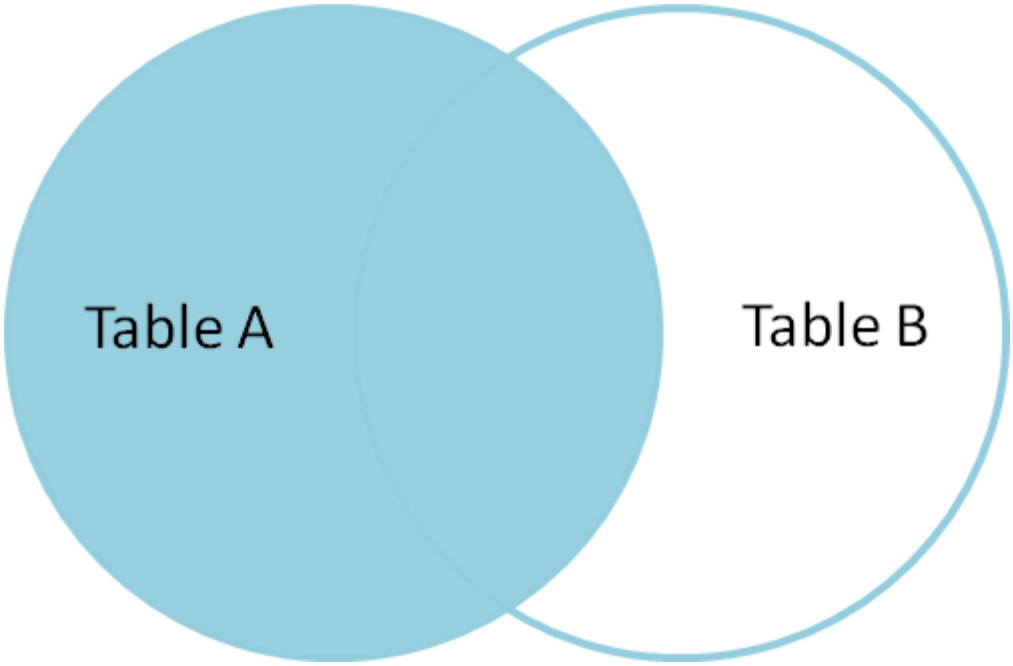
Syntax

```
SELECT table1.column1,table1.column2,table2.column1,....

FROM table1

LEFT JOIN table2

ON table1.matching_column = table2.matching_column;
```

Key Terms

- **table1:** First table.
- **table2**: Second table
- **matching_column**: Column common to both the tables.

Note: We can also use LEFT OUTER JOIN instead of LEFT JOIN, both are the same.



LEFT JOIN Example

In this example, the **LEFT JOIN** retrieves all rows from the **Student** table and the matching rows from the **StudentCourse** table based on the **ROLL_NO** column.

Query:

```
SELECT Student.NAME,StudentCourse.COURSE_ID
FROM Student
LEFT JOIN StudentCourse
ON StudentCourse.ROLL_NO = Student.ROLL_NO;
```

Output

NAME	COURSE_ID
HARSH	1
PRATIK	2
RIYANKA	2
DEEP	3
SAPTARHI	1
DHANRAJ	*NULL*
ROHIT	*NULL*
NIRAJ	*NULL*

3. SQL RIGHT JOIN

RIGHT JOIN returns all the rows of the table on the **right side of the join** and matching rows for the table on the left side of the join. It is very similar to **LEFT JOIN f**or the rows for which there is no matching row on the left side, the result-set will contain **null**. **RIGHT JOIN** is also known as **RIGHT OUTER JOIN**.

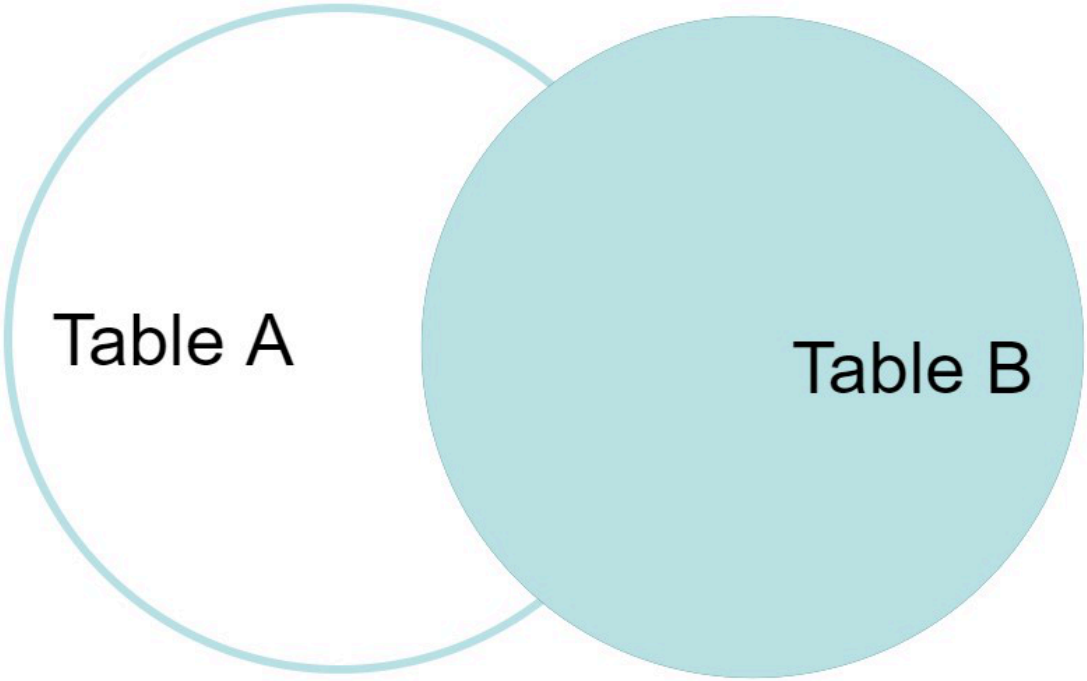
Syntax

```
SELECT table1.column1,table1.column2,table2.column1,....

FROM table1

RIGHT JOIN table2

ON table1.matching_column = table2.matching_column;
```

Key Terms

- **table1**: First table.
- **table2**: Second table
- **matching_column**: Column common to both the tables.

Note: We can also use **RIGHT OUTER JOIN** instead of RIGHT JOIN, both are the same.



RIGHT JOIN Example

In this example, the **RIGHT JOIN** retrieves all rows from the **StudentCourse** table and the matching rows from the **Student** table based on the ROLL_NO column.

Query:

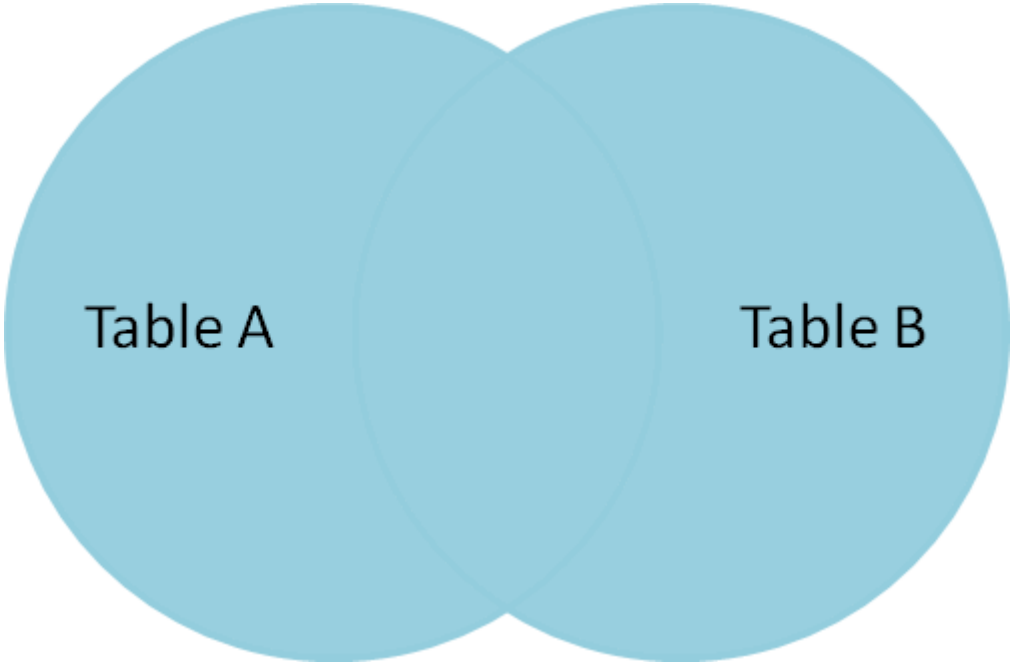
```
SELECT Student.NAME,StudentCourse.COURSE_ID
FROM Student
RIGHT JOIN StudentCourse
ON StudentCourse.ROLL_NO = Student.ROLL_NO;
```

Output

NAME	COURSE_ID
HARSH	1
PRATIK	2
RIYANKA	2
DEEP	3
SAPTARHI	1
NULL	4
NULL	5
NULL	4

4. SQL FULL JOIN

FULL JOIN creates the result-set by combining results of both **LEFT JOIN** and **RIGHT JOIN**. The result-set will contain all the rows from both tables. For the rows for which there is no matching, the result-set will contain *NULL* values.



Syntax

```
SELECT table1.column1,table1.column2,table2.column1,....
FROM table1
```

```
FULL JOIN table2
ON table1.matching_column = table2.matching_column;
```

Key Terms

- **table1**: First table.
- **table2**: Second table
- **matching_column**: Column common to both the tables.

FULL JOIN Example

This example demonstrates the use of a **FULL JOIN**, which combines the results of both **LEFT JOIN** and **RIGHT JOIN**. The query retrieves all rows from the **Student** and **StudentCourse** tables. If a record in one table does not have a matching record in the other table, the result set will include that record with **NULL values** for the missing fields

Query:

```
SELECT Student.NAME,StudentCourse.COURSE_ID
FROM Student
FULL JOIN StudentCourse
ON StudentCourse.ROLL_NO = Student.ROLL_NO;
```

Output

NAME	COURSE_ID
HARSH	1
PRATIK	2

RIYANKA	2
DEEP	3
SAPTARHI	1
DHANRAJ	NULL
ROHIT	NULL
NIRAJ	NULL
NULL	4

NULL	5
NULL	4

5. SQL Natural Join (?)

Natural join can join tables based on the **common columns** in the tables being joined. A natural join returns all rows by matching values in common columns having same name and **data type** of columns and that column should be present in both tables.

- Both table must have at least one common column with same column name and same data type.
- The two table are joined using **Cross join**.
- DBMS will look for a common column with same name and data type. Tuples having exactly same values in common columns are kept in result.

Natural join Example

Look at the two tables below- **Employee** and **Department**

Employee		
Emp_id	Emp_name	Dept_id
1	Ram	10

2	Jon	30
3	Bob	50

Department	
Dept_id	**Dept_name**
10	IT
30	HR
40	TIS

Problem: Find all Employees and their respective departments.

Solution Query: (Employee) ? (Department)

Emp_id	Emp_name	Dept_id	Dept_id	Dept_name
1	Ram	10	10	IT
2	Jon	30	30	HR
Employee data			Department data	