# Lecture 7

## JOINS.

Inner Join. Full Join. Left Join.
Right Join. Cross Join. Natural Join.
Self Join.

# PostgreSQL JOINS.

**PART I.** PostgreSQL JOINS. Inner Join. Full Join. Left Join. Right Join.

**PART II.** Cross Join. Natural Join. Self Join.

## **PART I.** PostgreSQL JOINS. Inner Join. Full Join. Left Join. Right Join.

# PostgreSQL Joins

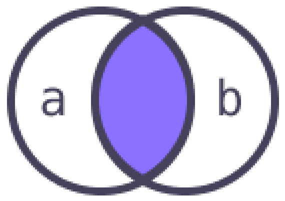
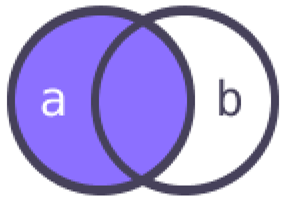
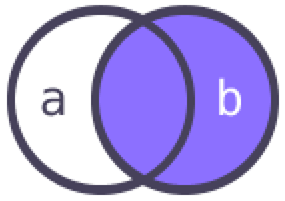
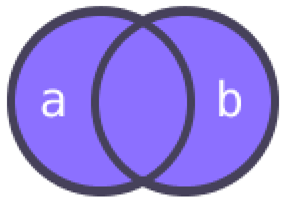
The **SQL Join** clause is used to combine data from two or more tables in a database. When the related data is stored across multiple tables, joins help you to retrieve records combining the fields from these tables using their foreign keys.

Following is the basic syntax of a the **SQL JOIN** CLAUSE:

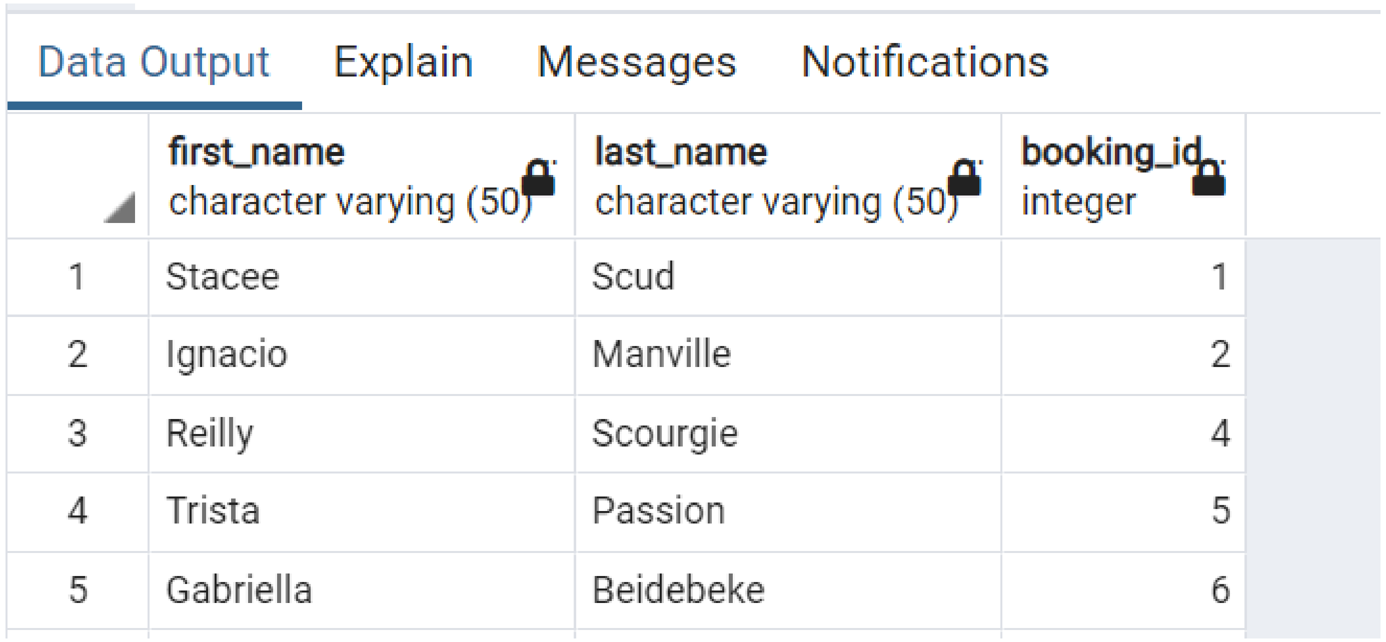
```
SELECT column_name(s)

FROM table1

JOIN table2;
```

| Join type | Visually | Example usage |
|---|---|---|
| Inner join |  | `a JOIN b ON a.id = b.id` |
| Left join |  | `a LEFT JOIN b ON a.id = b.id` |
| Right join |  | `a RIGHT JOIN b ON a.id = b.id` |
| Full outer join |  | `a FULL OUTER JOIN b ON a.id = b.id` |

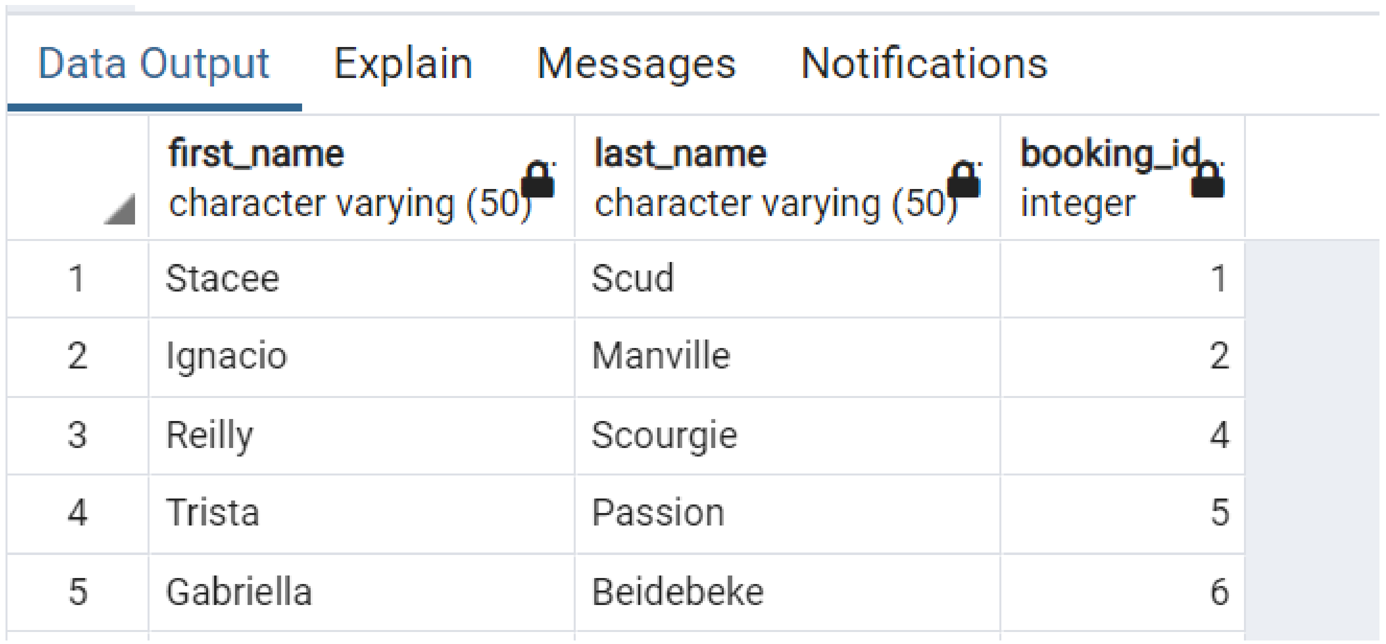
## Example



| | first_name character varying (50) | last_name character varying (50) | booking_id integer |
|---|---|---|---|
| 1 | Stacee | Scud | 1 |
| 2 | Ignacio | Manville | 2 |
| 3 | Reilly | Scourgie | 4 |
| 4 | Trista | Passion | 5 |
| 5 | Gabriella | Beidebeke | 6 |

```
SELECT
    first_name,
    last_name,
    booking_id
FROM
    passengers
JOIN
    booking  ON passengers.passenger_id = booking.passenger_id;
```

## Example



Data Output | Explain | Messages | Notifications

| | first_name<br>character varying (50) | last_name<br>character varying (50) | booking_id<br>integer |
|---|---|---|---|
| 1 | Stacee | Scud | 1 |
| 2 | Ignacio | Manville | 2 |
| 3 | Reilly | Scourgie | 4 |
| 4 | Trista | Passion | 5 |
| 5 | Gabriella | Beidebeke | 6 |

```
SELECT
    p.first_name,
    p.last_name,
    b.booking_id
FROM
    passengers p
JOIN
    booking b ON p.passenger_id = b.passenger_id;
```

## Explanation

- **SELECT**: Specifies the columns you want to retrieve.
- **FROM**: Indicates the primary table (passengers) you are querying from.
- **JOIN**: Combines rows from passengers and booking based on the matching condition.
- **ON**: Specifies the condition for the join (matching passenger_id in both tables).

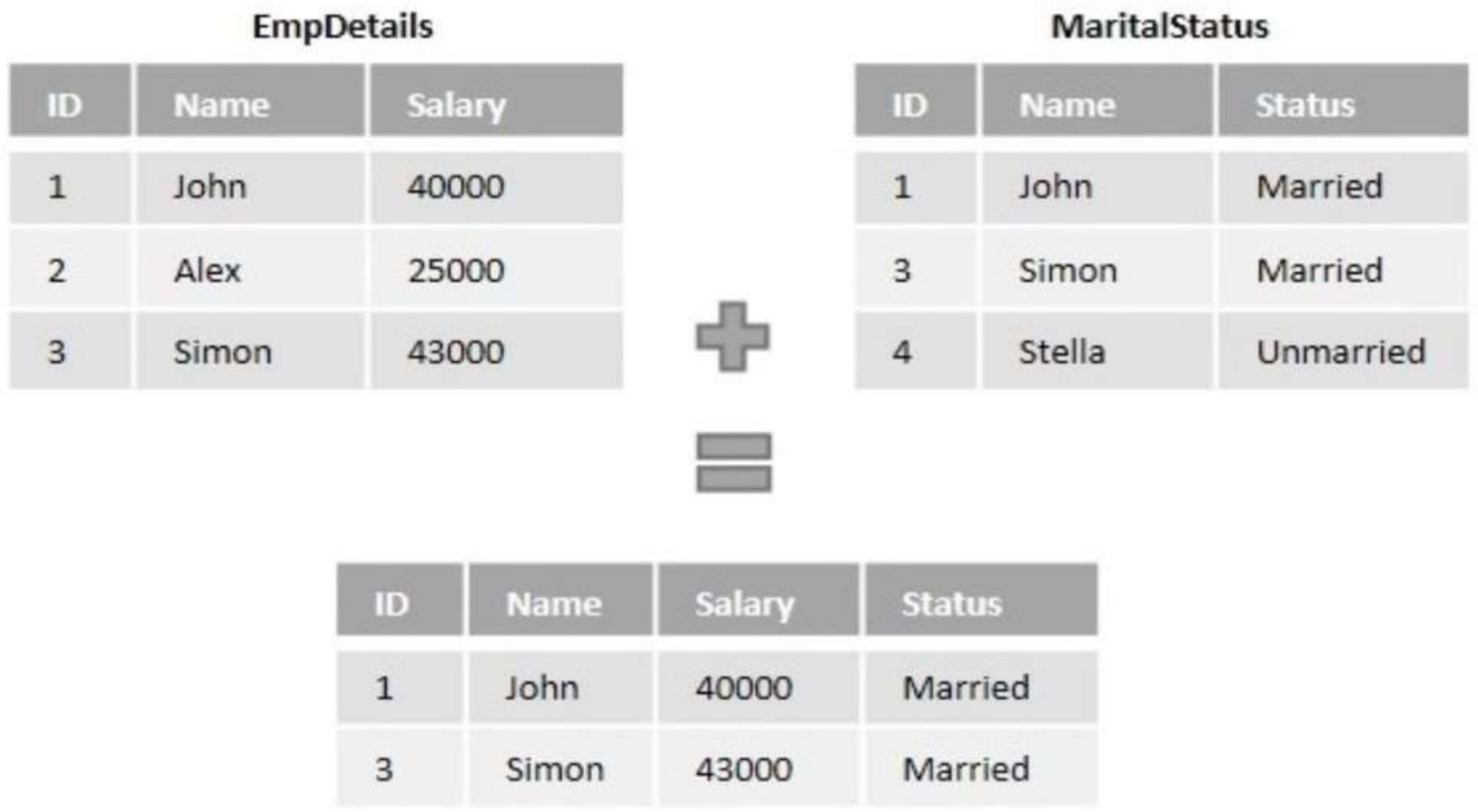
## The SQL Inner Join

The **SQL Inner Join** is a type of join that combines multiple tables by retrieving records that have matching values in both tables (in the common column).

Following is the basic syntax of SQL Inner Join:

```
SELECT column_name(s)
FROM table1
INNER JOIN table2
ON table1.column_name = table2.column_name;
```

## Explanation of Inner Join



EmpDetails

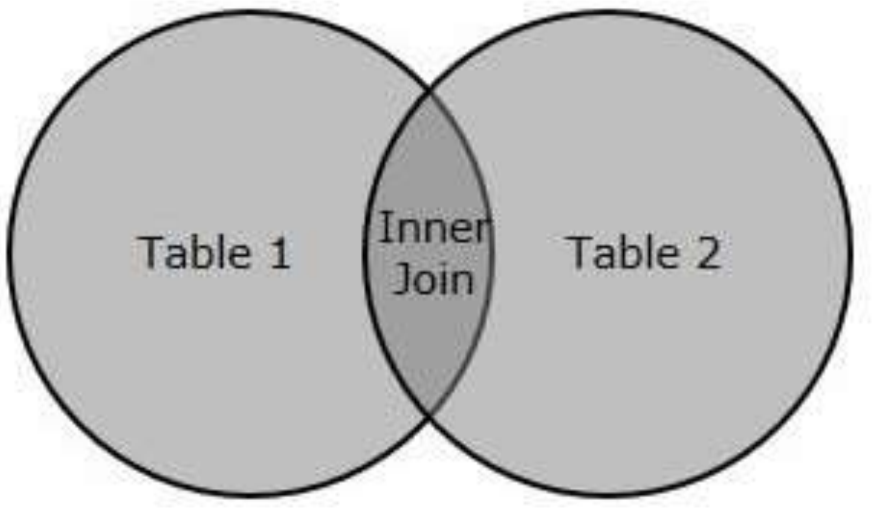
| ID | Name | Salary |
|---|---|---|
| 1 | John | 40000 |
| 2 | Alex | 25000 |
| 3 | Simon | 43000 |

MaritalStatus

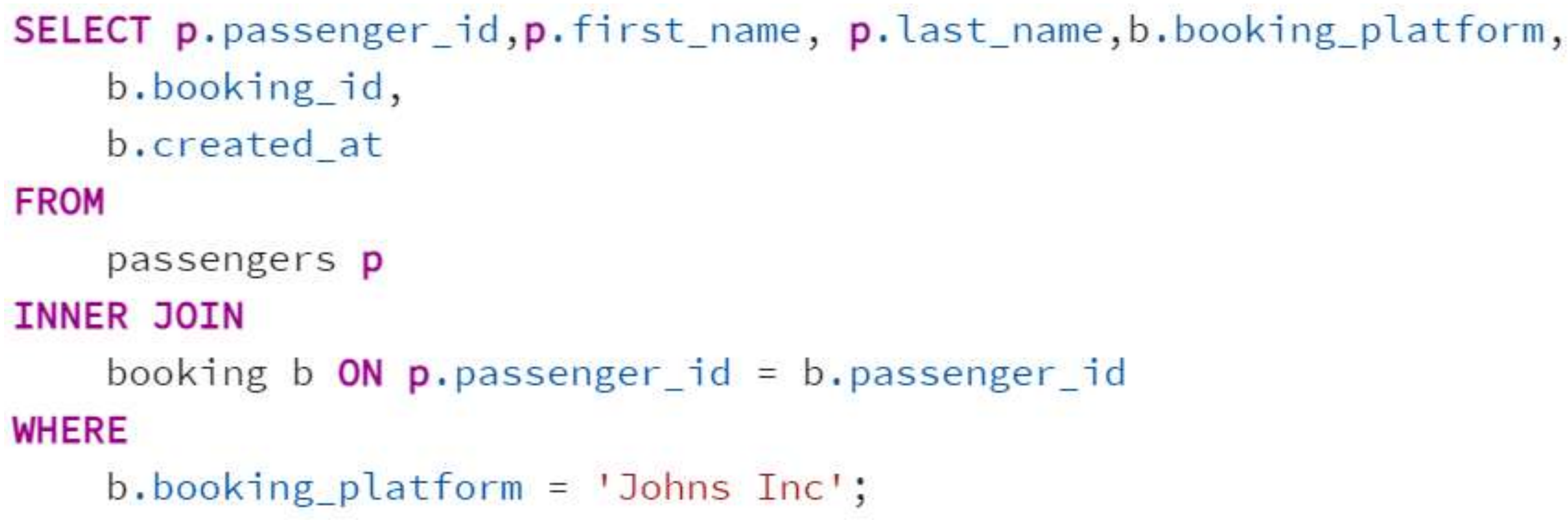
| ID | Name | Status |
|---|---|---|
| 1 | John | Married |
| 3 | Simon | Married |
| 4 | Stella | Unmarried |

| ID | Name | Salary | Status |
|---|---|---|---|
| 1 | John | 40000 | Married |
| 3 | Simon | 43000 | Married |

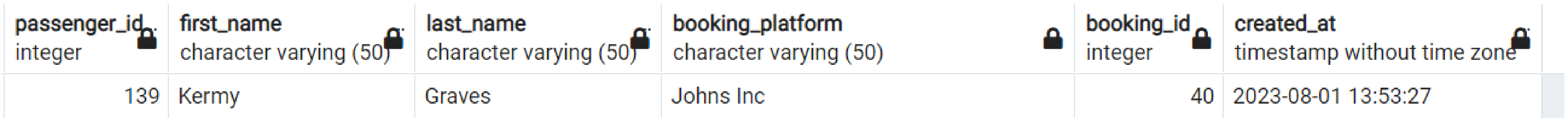
## The following Venn diagram illustrates the inner join:



## Example



```
SELECT p.passenger_id,p.first_name, p.last_name,b.booking_platform,
    b.booking_id,
    b.created_at
FROM
    passengers p
INNER JOIN
    booking b ON p.passenger_id = b.passenger_id
WHERE
    b.booking_platform = 'Johns Inc';
```



| passenger_id integer | first_name character varying (50) | last_name character varying (50) | booking_platform character varying (50) | booking_id integer | created_at timestamp without time zone |
|---|---|---|---|---|---|
| 139 | Kermy | Graves | Johns Inc | 40 | 2023-08-01 13:53:27 |

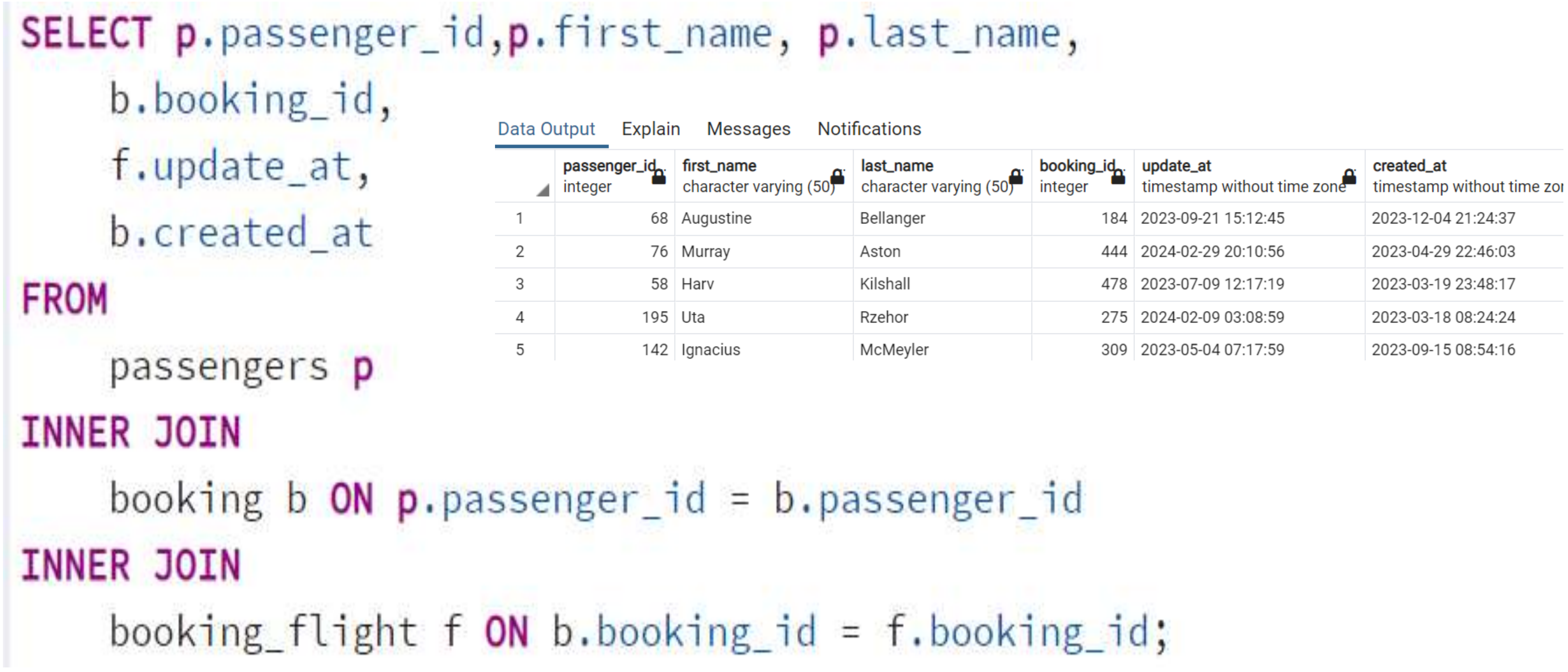
## Joining Multiple Tables Using Inner Join

It is possible to join as many tables as possible, using Inner Join, by specifying the condition :

```
SELECT column1, column2, column3...
FROM table1
INNER JOIN
table2
ON condition_1
INNER JOIN
table3 ON
condition_2

....
INNER JOIN
tableN ON
```

## Example



```
SELECT p.passenger_id,p.first_name, p.last_name,
    b.booking_id,
    f.update_at,
    b.created_at
FROM
    passengers p
INNER JOIN
    booking b ON p.passenger_id = b.passenger_id
INNER JOIN
    booking_flight f ON b.booking_id = f.booking_id;
```

Data Output | Explain | Messages | Notifications

| | passenger_id integer | first_name character varying (50) | last_name character varying (50) | booking_id integer | update_at timestamp without time zone | created_at timestamp without time zo |
|---|---|---|---|---|---|---|
| 1 | 68 | Augustine | Bellanger | 184 | 2023-09-21 15:12:45 | 2023-12-04 21:24:37 |
| 2 | 76 | Murray | Aston | 444 | 2024-02-29 20:10:56 | 2023-04-29 22:46:03 |
| 3 | 58 | Harv | Kilshall | 478 | 2023-07-09 12:17:19 | 2023-03-19 23:48:17 |
| 4 | 195 | Uta | Rzehor | 275 | 2024-02-09 03:08:59 | 2023-03-18 08:24:24 |
| 5 | 142 | Ignacius | McMeyler | 309 | 2023-05-04 07:17:59 | 2023-09-15 08:54:16 |

## The SQL OUTER Join

An **Outer Join** retrieves all the records in two tables even if there is no counterpart row of one table in another table, unlike Inner Join.

Following are the different types of outer Joins:

-**LEFT JOIN** –returns all rows from the left table, even if there are no matches in the right table.

-**RIGHT JOIN** –returns all rows from the right table, even if there are no matches in the left table.

- **FULL JOIN** –returns rows when there is a match in one of the tables.

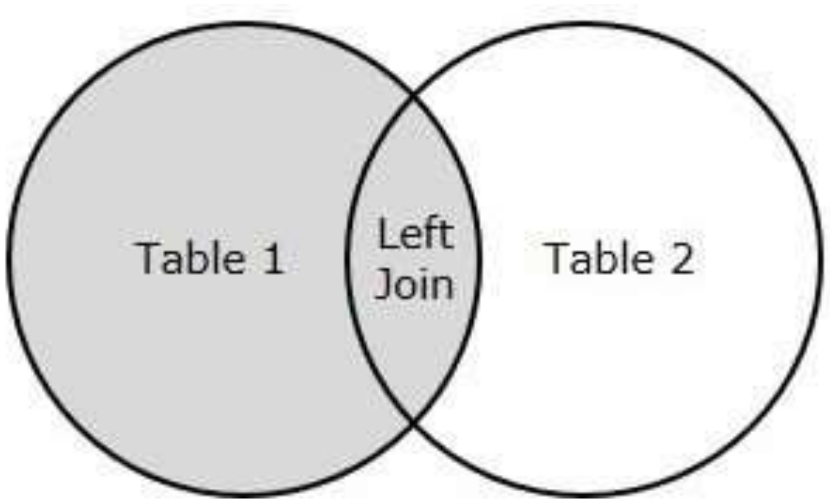
## The SQL Left Join

**Left Join** or **Left Outer Join** in SQL combines two or more tables, where the first table is returned wholly; but, only the matching record(s) are retrieved from the consequent tables.

Following is the basic syntax of Left Join in SQL:

```
SELECT column_name(s)
FROM table1
LEFT JOIN table2
ON table1.column_name = table2.column_name;
```

## The following Venn diagram illustrates the left join:



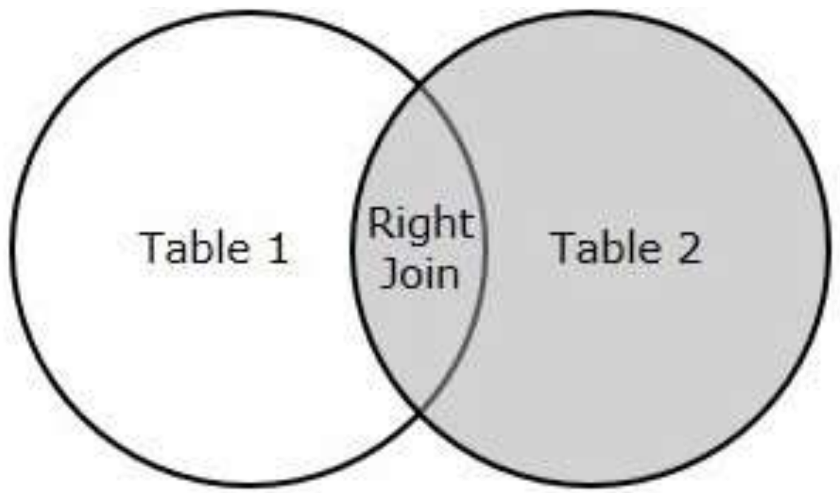
# The SQL Right Join

The **Right Join** or **Right Outer Join** query in SQL returns all rows from the right table, even if there are no matches in the left table.

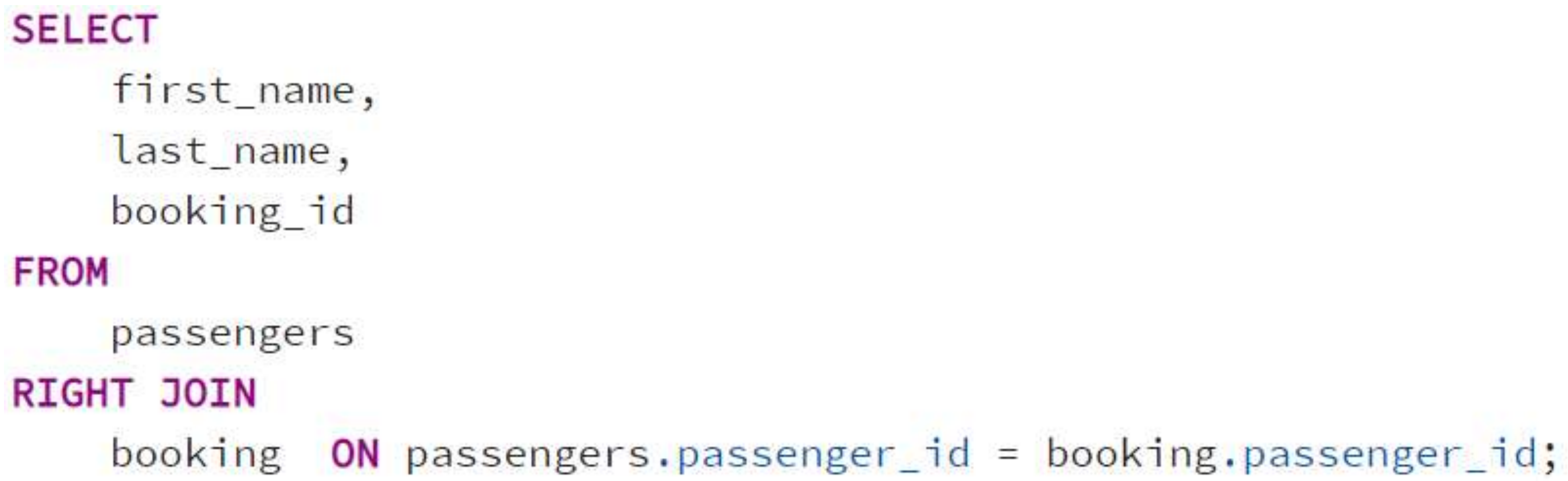
Following is the basic syntax of Right Join in SQL:

```
SELECT table1.column1, table2.column2...
FROM table1
RIGHT JOIN table2
ON table1.common_field =table2.common_field;
```

## The following Venn diagram illustrates the right join:



## Example



```
SELECT
    first_name,
    last_name,
    booking_id
FROM
    passengers
RIGHT JOIN
    booking  ON passengers.passenger_id = booking.passenger_id;
```

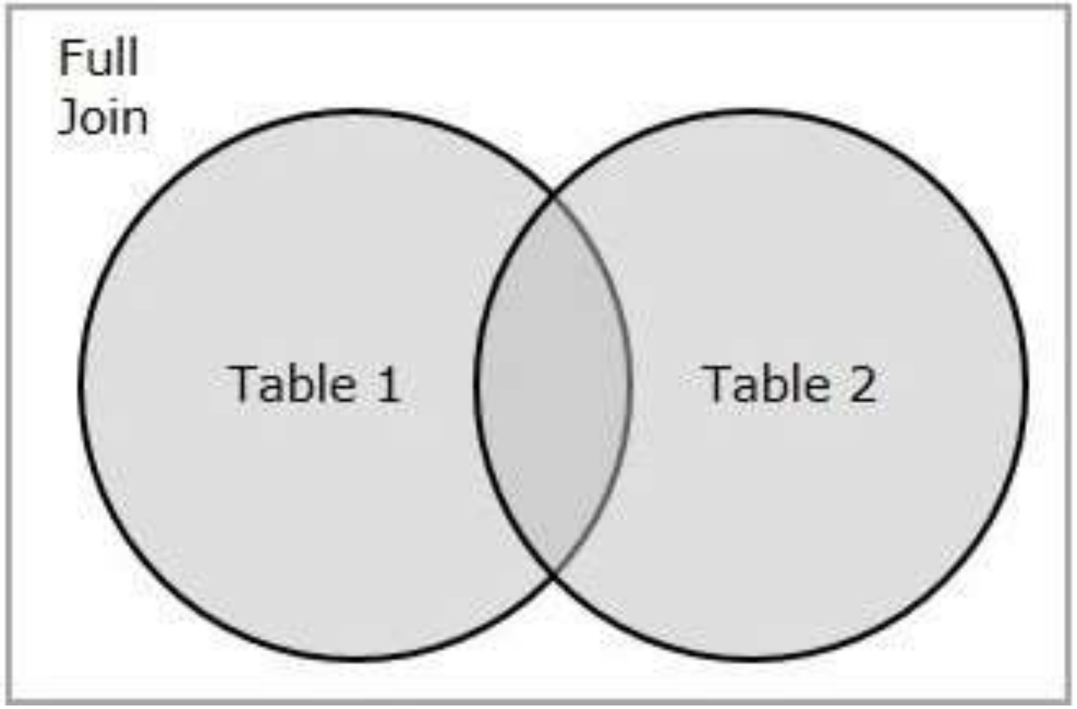
# The SQL Full Join

**SQL Full Join** creates a new table by joining two tables as a whole. The joined table contains all records from both the tables and fills NULL values for missing matches on either side.

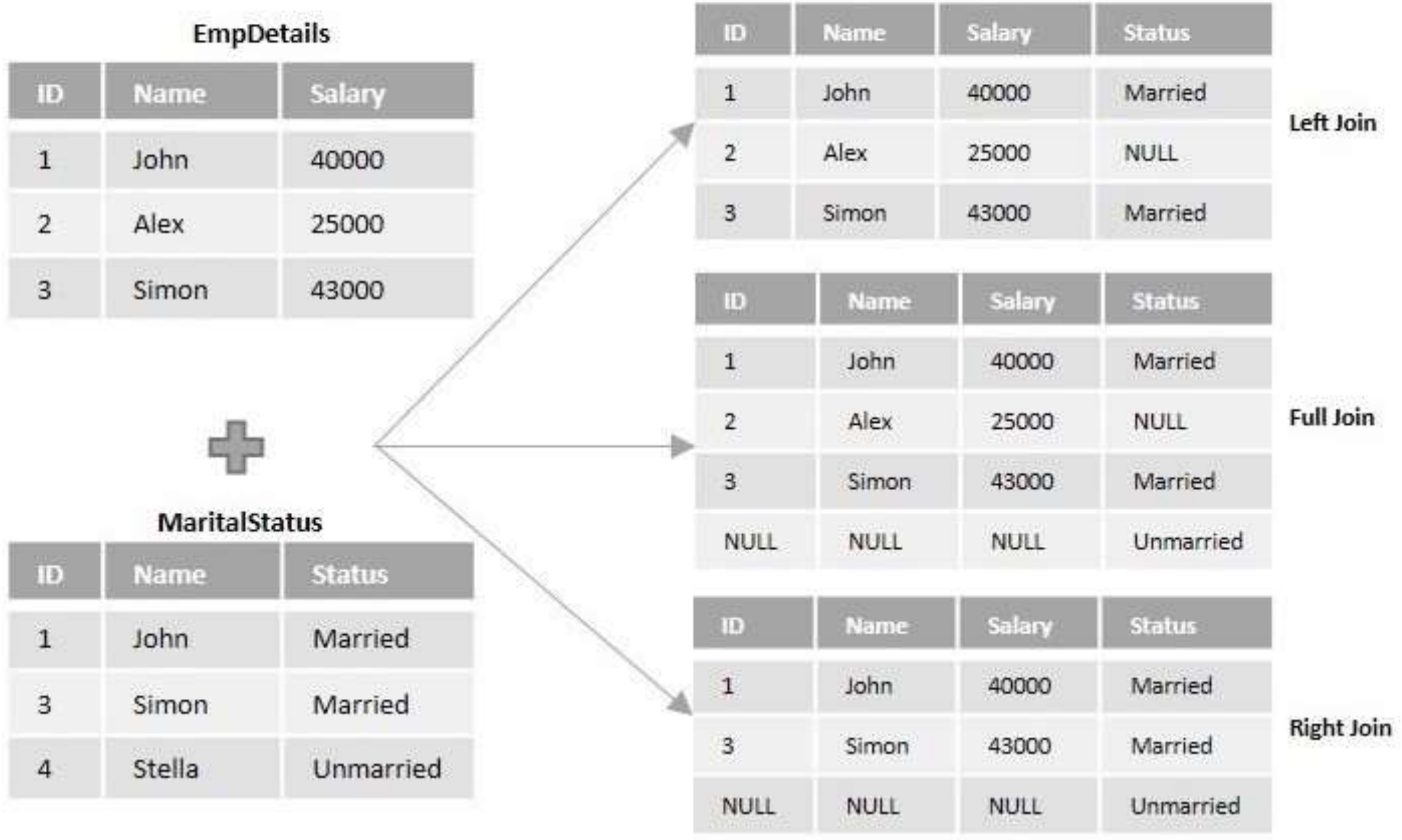
Following is the basic syntax of Full Join in SQL:

```
 SELECT column_name(s)
FROM table1
FULL JOIN table2
ON table1.column_name = table2.column_name;
```

## The following Venn diagram illustrates the full outer join:



# Outer join explanation



EmpDetails

| ID | Name | Salary |
|---|---|---|
| 1 | John | 40000 |
| 2 | Alex | 25000 |
| 3 | Simon | 43000 |

MaritalStatus

| ID | Name | Status |
|---|---|---|
| 1 | John | Married |
| 3 | Simon | Married |
| 4 | Stella | Unmarried |

Left Join

| ID | Name | Salary | Status |
|---|---|---|---|
| 1 | John | 40000 | Married |
| 2 | Alex | 25000 | NULL |
| 3 | Simon | 43000 | Married |

Full Join

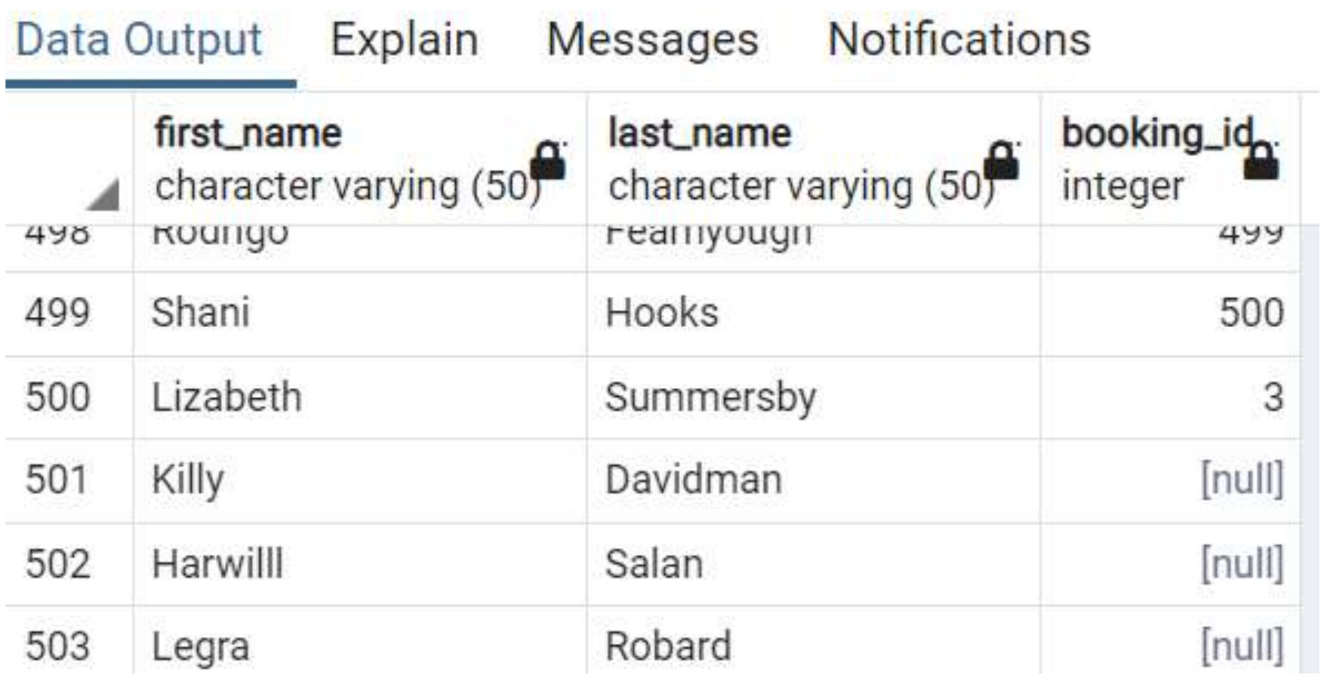
| ID | Name | Salary | Status |
|---|---|---|---|
| 1 | John | 40000 | Married |
| 2 | Alex | 25000 | NULL |
| 3 | Simon | 43000 | Married |
| NULL | NULL | NULL | Unmarried |

Right Join

| ID | Name | Salary | Status |
|---|---|---|---|
| 1 | John | 40000 | Married |
| 3 | Simon | 43000 | Married |
| NULL | NULL | NULL | Unmarried |

## Example

```
SELECT
    first_name,
    last_name,
    booking_id
FROM
    passengers
LEFT JOIN
    booking  ON passengers.passenger_id = booking.passenger_id;
```



Data Output | Explain | Messages | Notifications

| | first_name character varying (50) | last_name character varying (50) | booking_id integer |
|---|---|---|---|
| 498 | Rodrigo | Feamyough | 499 |
| 499 | Shani | Hooks | 500 |
| 500 | Lizabeth | Summersby | 3 |
| 501 | Killy | Davidman | [null] |
| 502 | Harwilll | Salan | [null] |
| 503 | Legra | Robard | [null] |

## **PART II.** Cross Join. Natural Join. Self Join.

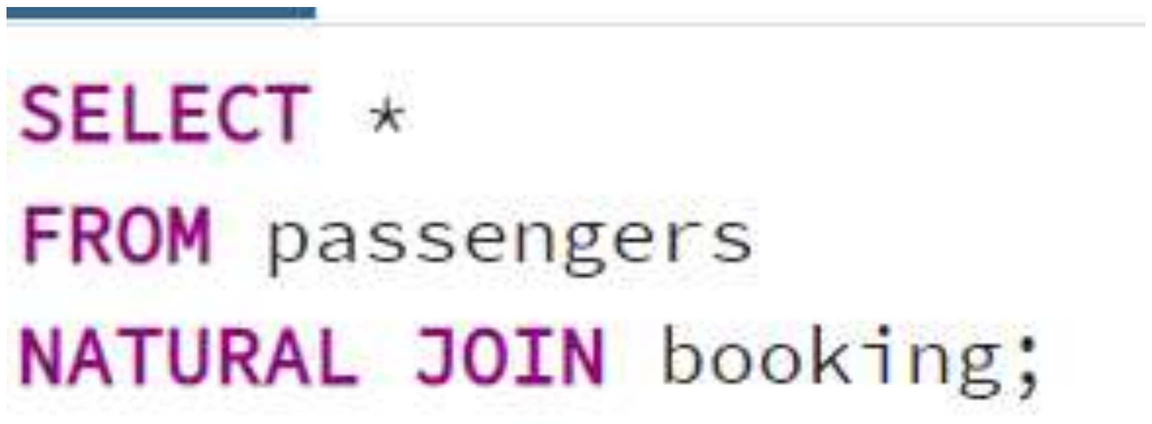
## SQL NATURAL JOIN

A **natural join** is a join that creates an implicit join based on the same column names in the joined tables.

The following shows the syntax of the PostgreSQL natural join:

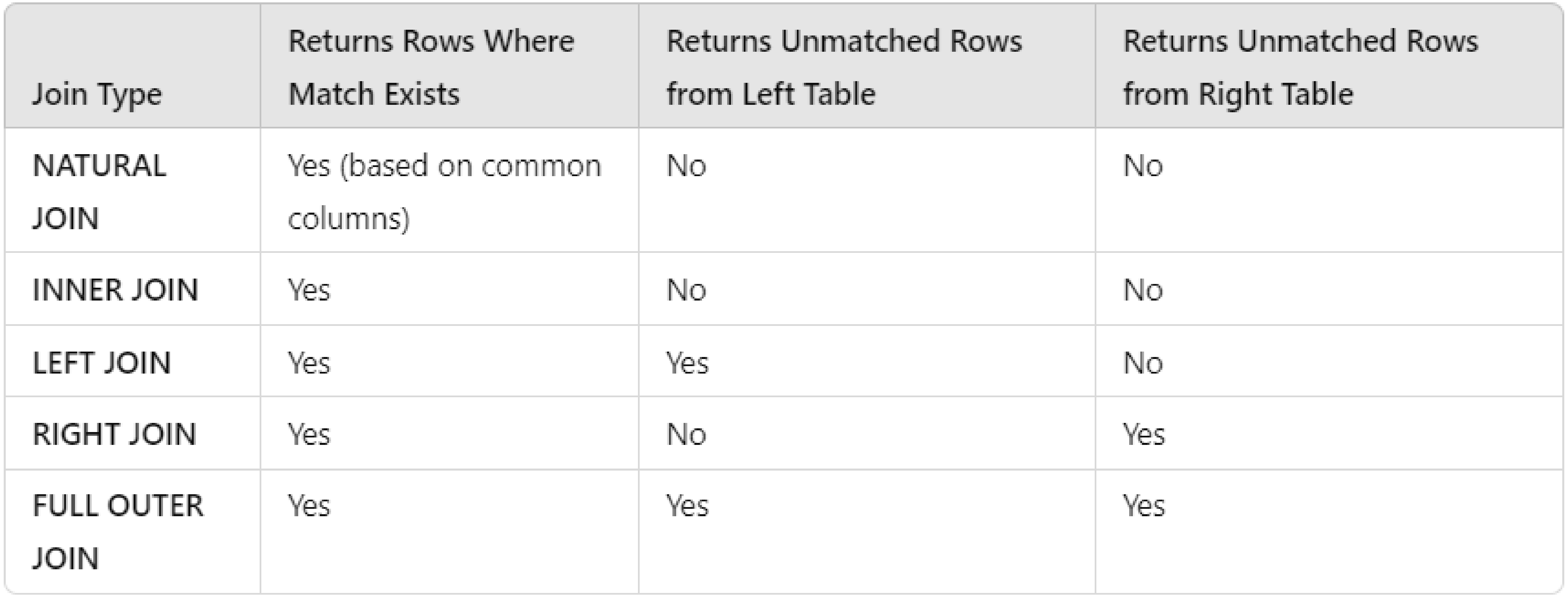
```
SELECT select_list
FROM T1
NATURAL [INNER, LEFT, RIGHT] JOIN T2;
```

## SQL NATURAL JOIN examples



```
SELECT *
FROM passengers
NATURAL JOIN booking;
```

## Differences



| Join Type | Returns Rows Where Match Exists | Returns Unmatched Rows from Left Table | Returns Unmatched Rows from Right Table |
|---|---|---|---|
| NATURAL JOIN | Yes (based on common columns) | No | No |
| INNER JOIN | Yes | No | No |
| LEFT JOIN | Yes | Yes | No |
| RIGHT JOIN | Yes | No | Yes |
| FULL OUTER JOIN | Yes | Yes | Yes |

## Differences

- **NATURAL JOIN** is convenient for combining tables with multiple common columns, but it can lead to unexpected results if not managed carefully.
- **INNER JOIN** is precise for matching records in both tables.
- **LEFT JOIN, RIGHT JOIN, and FULL OUTER JOIN** provide more flexibility for including records even when matches don’t exist, with different orientations (left or right) depending on the focus of the query.

# SQL Self-Join

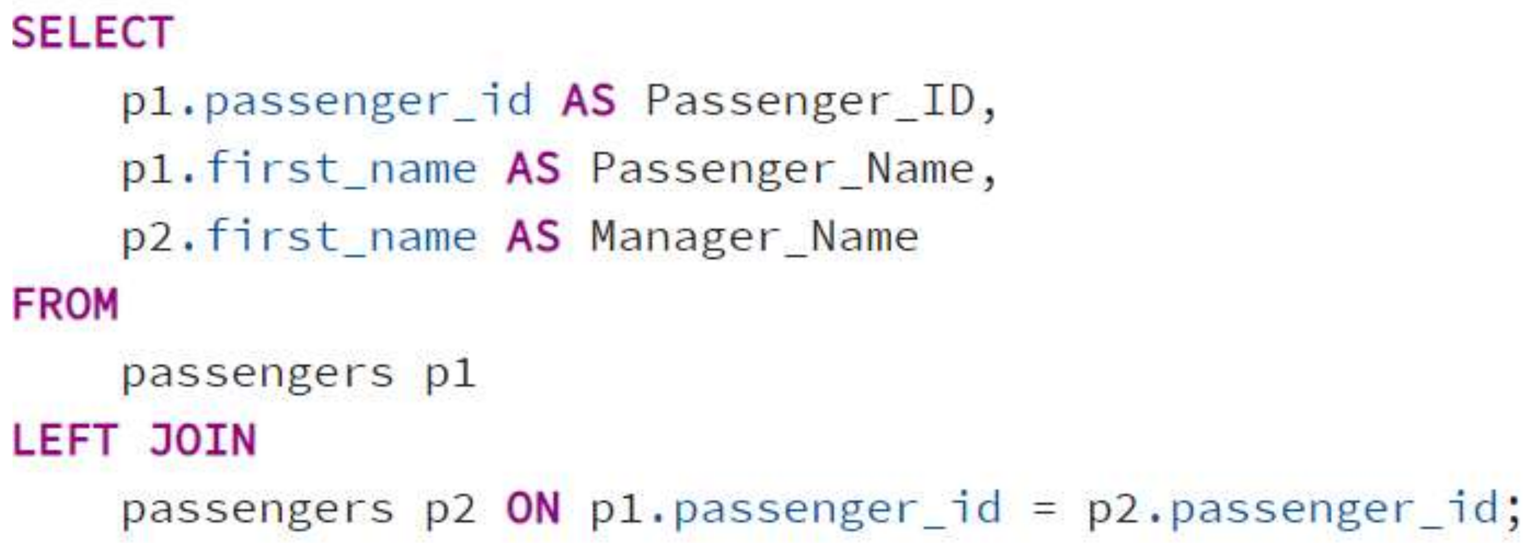
A **self-join** is a regular join that joins a table to itself. In practice, you typically use a self-join to query hierarchical data or to compare rows within the same table.

The following query uses an INNER JOIN that joins the table to itself:

```
SELECT select_list

FROM table_name t1
INNER JOIN table_name t2 on join_predicate;
```

## Example



```
SELECT
    p1.passenger_id AS Passenger_ID,
    p1.first_name AS Passenger_Name,
    p2.first_name AS Manager_Name
FROM
    passengers p1
LEFT JOIN
    passengers p2 ON p1.passenger_id = p2.passenger_id;
```

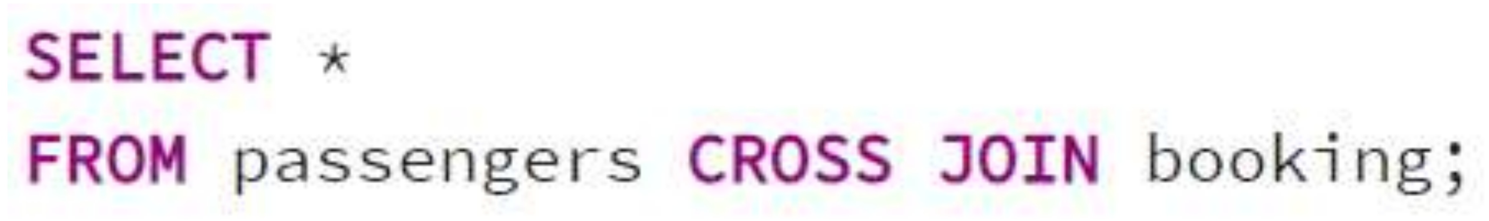
## SQL Cross Join

A **CROSS JOIN** clause allows you to produce a Cartesian Product of rows in two or more tables.

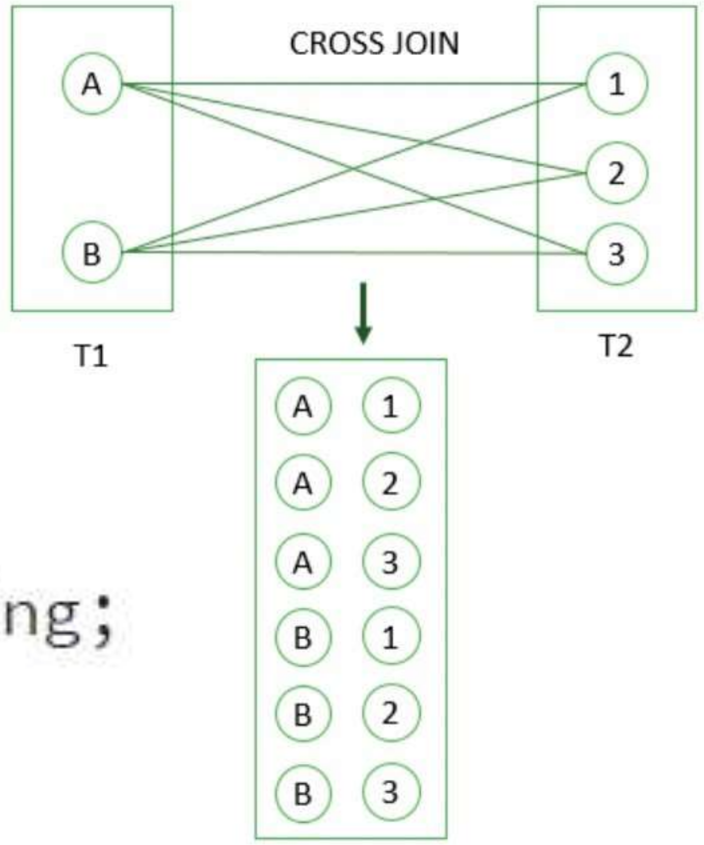
The following illustrates the syntax of the CROSS JOIN syntax:

```
SELECT select_list
FROM T1
CROSS JOIN T2;
```

## SQL CROSS JOIN example



```
SELECT *
FROM passengers CROSS JOIN booking;
```



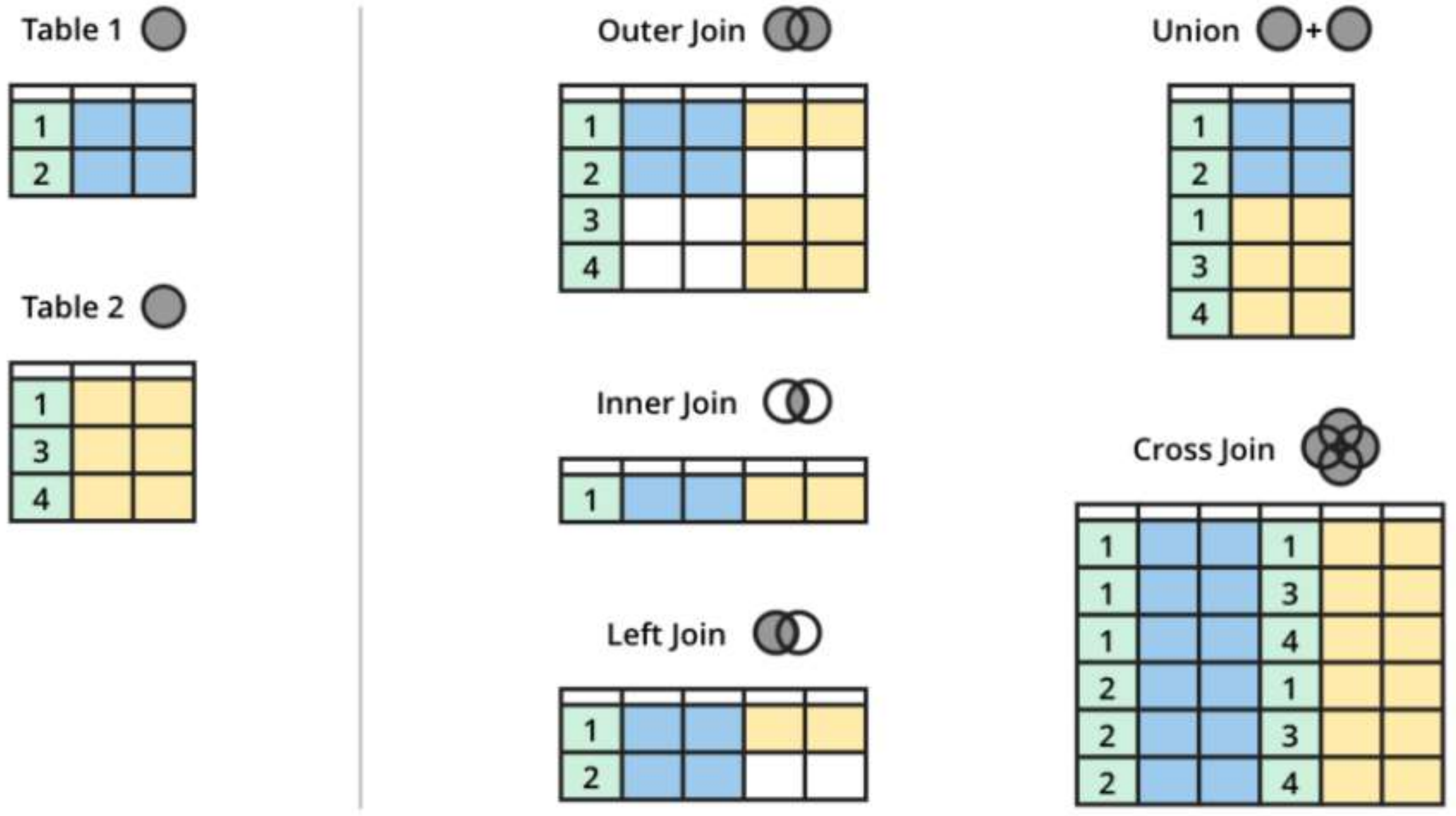


Table 1
Table 2
Outer Join
Inner Join
Left Join
Union
+
Cross Join