**SQL JOINS**

In SQL Server, **joins** are used to retrieve data from multiple tables based on a related column between them. There are several types of joins, each serving a different purpose depending on how you want to combine the data. Let’s go through the most common types of joins with examples.

**1. INNER JOIN**

An **INNER JOIN** returns records that have matching values in both tables.

**Example:**

Suppose we have two tables:

* Employees table:

|  |  |  |
| --- | --- | --- |
| **EmployeeID** | **Name** | **DepartmentID** |
| 1 | Alice | 1 |
| 2 | Bob | 2 |
| 3 | Charlie | 3 |

Departments table:

|  |  |
| --- | --- |
| **DepartmentID** | **DepartmentName** |
| 1 | HR |
| 2 | IT |
| 3 | Finance |

SQL Query:

SELECT Employees.Name, Departments.DepartmentName

FROM Employees

INNER JOIN Departments ON Employees.DepartmentID = Departments.DepartmentID;

Result:

|  |  |
| --- | --- |
| **Name** | **DepartmentName** |
| Alice | HR |
| Bob | IT |
| Charlie | Finance |

**2. LEFT JOIN (or LEFT OUTER JOIN)**

A **LEFT JOIN** returns all records from the left table, and the matched records from the right table. If there is no match, NULL values will be returned for columns from the right table.

**Example:**

SELECT Employees.Name, Departments.DepartmentName

FROM Employees

LEFT JOIN Departments ON Employees.DepartmentID = Departments.DepartmentID;

Result

|  |  |
| --- | --- |
| **Name** | **DepartmentName** |
| Alice | HR |
| Bob | IT |
| Charlie | Finance |
| David | NULL |

**3. RIGHT JOIN (or RIGHT OUTER JOIN)**

A **RIGHT JOIN** is the reverse of the LEFT JOIN. It returns all records from the right table and the matched records from the left table. If there is no match, NULL values will be returned for columns from the left table.

**Example:**

SELECT Employees.Name, Departments.DepartmentName

FROM Employees

RIGHT JOIN Departments ON Employees.DepartmentID = Departments.DepartmentID;

Result

|  |  |
| --- | --- |
| **Name** | **DepartmentName** |
| Alice | HR |
| Bob | IT |
| Charlie | Finance |
| NULL | Marketing |

**4. FULL JOIN (or FULL OUTER JOIN)**

A **FULL JOIN** returns all records when there is a match in either the left or the right table. Records with no match in either table will still appear in the result, but with NULLs in the columns where there's no match.

**Example:**

SELECT Employees.Name, Departments.DepartmentName

FROM Employees

FULL JOIN Departments ON Employees.DepartmentID = Departments.DepartmentID;

Result

|  |  |
| --- | --- |
| **Name** | **DepartmentName** |
| Alice | HR |
| Bob | IT |
| Charlie | Finance |
| David | NULL |
| NULL | Marketing |

**5. CROSS JOIN**

A **CROSS JOIN** returns the Cartesian product of both tables, meaning it will combine each row of the first table with each row of the second table.

**Example:**

SELECT Employees.Name, Departments.DepartmentName

FROM Employees

CROSS JOIN Departments;

Result:

|  |  |
| --- | --- |
| **Name** | **DepartmentName** |
| Alice | HR |
| Alice | IT |
| Alice | Finance |
| Bob | HR |
| Bob | IT |
| Bob | Finance |
| Charlie | HR |
| Charlie | IT |
| Charlie | Finance |

**6. SELF JOIN**

A **SELF JOIN** is simply a regular join, but where a table is joined with itself.

**Example:**

Assume there’s an Employees table with a ManagerID that refers to another employee in the same table:

* Employees table:

|  |  |  |
| --- | --- | --- |
| **EmployeeID** | **Name** | **ManagerID** |
| 1 | Alice | NULL |
| 2 | Bob | 1 |
| 3 | Charlie | 1 |

SELECT e.Name AS Employee, m.Name AS Manager

FROM Employees e

LEFT JOIN Employees m ON e.ManagerID = m.EmployeeID;

Result:

|  |  |
| --- | --- |
| **Employee** | **Manager** |
| Alice | NULL |
| Bob | Alice |
| Charlie | Alice |

**Summary of Joins**

* **INNER JOIN**: Returns rows with matching values.
* **LEFT JOIN**: Returns all rows from the left table, and matched rows from the right table.
* **RIGHT JOIN**: Returns all rows from the right table, and matched rows from the left table.
* **FULL JOIN**: Returns all rows when there is a match in either table.
* **CROSS JOIN**: Returns the Cartesian product of both tables.
* **SELF JOIN**: A join where a table is joined with itself.