

# Lab: Joins

**Estimated time needed:** 25 minutes

In this lab, you will run through some SQL practice problems that will provide hands-on experience with the different kinds of join operations.

**How does a CROSS JOIN (also known as Cartesian Join) statement syntax look?**

```
SELECT column_name(s)
FROM table1
CROSS JOIN table2;
```

**How does an INNER JOIN statement syntax look?**

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

**How does a LEFT OUTER JOIN statement syntax look?**

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

**How does a RIGHT OUTER JOIN statement syntax look?**

```
SELECT column_name(s)
FROM table1
RIGHT OUTER JOIN table2
ON table1.column_name = table2.column_name
WHERE condition;
```

**How does a FULL OUTER JOIN statement syntax look?**

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

**How does a SELF JOIN statement syntax look?**

```
SELECT column_name(s)
FROM table1 T1, table1 T2
WHERE condition;
```

## Software Used in this Lab

In this lab, you will use an [IBM Db2 Database](#). Db2 is a Relational Database Management System (RDBMS) from IBM, designed to store, analyze and retrieve data efficiently.

To complete this lab you will utilize a Db2 database service on IBM Cloud. If you did not already complete this lab task earlier in this module, you will not yet have access to Db2 on IBM Cloud, and you will need to follow the lab below first:

- [Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console](#)

## Database Used in this Lab

The database used in this lab is an internal database. You will be working on a sample HR database. This HR database schema consists of 5 tables called **EMPLOYEES**, **JOB\_HISTORY**, **JOBS**, **DEPARTMENTS** and **LOCATIONS**. Each table has a few rows of sample data. The following diagram shows the tables for the HR database:

## SAMPLE HR DATABASE TABLES

### EMPLOYEES

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, Oak Park, IL	100	100000	30001	2
E1002	Alice	James	123457	1972-07-31	F	980 Berry Ln, Elgin, IL	200	80000	30002	5
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary, IL	300	50000	30002	5

### JOB\_HISTORY

EMPL_ID	START_DATE	JOBS_ID	DEPT_ID
E1001	2000-01-30	100	2
E1002	2010-08-16	200	5
E1003	2016-08-10	300	5

### JOBS

JOB_ID	JOB_TITLE	MIN_SALARY	MAX_SALARY
100	Sr. Architect	60000	100000
200	Sr. Software Developer	60000	80000
300	Jr. Software Developer	40000	60000

### DEPARTMENTS

DEPT_ID	DEPT_NAME	MANAGER_ID	LOC_ID
2	Architect Group	30001	L0001
5	Software Development	30002	L0002
7	Design Team	30003	L0003
5	Software	30004	L0004

### LOCATIONS

LOC_ID	DEPT_ID	LOC
L0001	2	
L0002	5	
L0003	7	

**NOTE:** This lab requires you to have all 5 of these tables of the HR database populated with sample data on Db2. If you didn't complete the earlier lab in this module, you won't have the tables above populated with sample data on Db2, so you will need to go through the lab below first:

- [Hands-on Lab : Create tables using SQL scripts and Load data into tables](#)

## Objectives

After completing this lab you will be able to:

- Perform different kinds of join operations

## Instructions

When you approach the exercises in this lab, follow the instructions to run the queries on Db2:

- Go to the [Resource List](#) of IBM Cloud by logging in where you can find the Db2 service instance that you created in a previous lab under **Services** section. Click on the **Db2-xx service**. Next, open the Db2 Console by clicking on **Open Console** button. Click on the 3-bar menu icon in the top left corner and go to the **Run SQL** page. The Run SQL tool enables you to run SQL statements.
  - If needed, follow [Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console](#)

## Exercise

1. Problem:

Select the names and job start dates of all employees who work for the department number 5.

### ▼ Hint

Use the Inner join operation with the EMPLOYEES table as the left table and the JOB\_HISTORY table as the right table.

### ▼ Solution

```
select E.F_NAME, E.L_NAME, JH.START_DATE
from EMPLOYEES as E
INNER JOIN JOB_HISTORY as JH on E.EMP_ID=JH.EMPL_ID
where E.DEP_ID ='5';
```

### ▼ Output

--- Query1A --- select E.F\_NAME,E.L\_NAME, JH...

Run time: 0.010 s

Result set 1

Search

F_NAME	L_NAME	START_DATE
Alice	James	2001-08-0
Steve	Wells	2001-08-1
Santosh	Kumar	2000-08-1
Ann	Jacob	2016-08-1

2. Problem:

Select the names, job start dates, and job titles of all employees who work for the department number 5.

▼ Hint

Perform an INNER JOIN with 3 tables 複EMPLOYEES, JOB\_HISTORY, JOBS.

▼ Solution

```
select E.F_NAME,E.L_NAME, JH.START_DATE, J.JOB_TITLE
from EMPLOYEES as E
INNER JOIN JOB_HISTORY as JH on E.EMP_ID=JH.EMPL_ID
INNER JOIN JOBS as J on E.JOB_ID=J.JOB_IDENT
where E.DEP_ID ='5';
```

▼ Output

--- Query1B --- select E.F\_NAME,E.L\_NAME, JH....

Run time: 0.007 s

Result set 1

Search

F_NAME	L_NAME	START_DATE	JOB_TITL
Alice	James	2001-08-01	Sr.Softwa
Ann	Jacob	2016-08-16	Sr. Design
Steve	Wells	2001-08-16	Jr.Softwa
Santosh	Kumar	2000-08-16	Jr.Softwa

3. Problem:

Perform a Left Outer Join on the EMPLOYEES and DEPARTMENT tables and select employee id, last name, department id and department name for all employees.

▼ Hint

Use the Left Outer Join operation with the EMPLOYEES table as the left table and the DEPARTMENTS table as the right table.

▼ Solution

```
select E.EMP_ID,E.L_NAME,E.DEP_ID,D.DEP_NAME
from EMPLOYEES AS E
LEFT OUTER JOIN DEPARTMENTS AS D ON E.DEP_ID=D.DEPT_ID_DEP;
```

▼ Output



--- Query 2A --- select E.EMP\_ID,E.L\_NAME,E.D...

Run time: **0.004 s**

Result set 1

Search



EMP_ID	L_NAME	DEP_ID	DEP_NAME
E1001	Thomas	2	Architect
E1006	Allen	2	Architect
E1005	Hussain	2	Architect
E1002	James	5	Software
E1010	Jacob	5	Software
E1004	Kumar	5	Software
E1003	Wells	5	Software
E1007	Thomas	7	Design Te
E1009	Jones	7	Design Te
E1008	Gupta	7	Design Te

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## 4. Problem:

*Re-write the previous query but limit the result set to include only the rows for employees born before 1980.*

## ▼ Hint

Use a WHERE clause and Left Outer Join operation. Alternatively, you could also use an INNER JOIN.

## ▼ Solution

```
select E.EMP_ID,E.L_NAME,E.DEP_ID,D.DEP_NAME
from EMPLOYEES AS E
LEFT OUTER JOIN DEPARTMENTS AS D ON E.DEP_ID=D.DEPT_ID_DEP
where YEAR(E.B_DATE) < 1980;
```

## ▼ Output



--- Query 2B --- select E.EMP\_ID,E.L\_NAME,E.D...

Run time: 0.003 s

Result set 1

Search



EMP_ID ▲	L_NAME	DEP_ID	DEP_NAME
E1001	Thomas	2	Architect
E1006	Allen	2	Architect
E1002	James	5	Software
E1007	Thomas	7	Design Te

## 5. Problem:

*Re-write the previous query but have the result set include all the employees but department names for only the employees who were born before 1980.*

## ▼ Hint

Use an AND in the LEFT OUTER JOIN clause.

## ▼ Solution

```
select E.EMP_ID,E.L_NAME,E.DEP_ID,D.DEP_NAME
from EMPLOYEES AS E
LEFT OUTER JOIN DEPARTMENTS AS D ON E.DEP_ID=D.DEPT_ID_DEP
AND YEAR(E.B_DATE) < 1980;
```

## ▼ Output

--- Query 2C --- select E.EMP\_ID,E.L\_NAME,E.D...

Run time: 0.002 s

Result set 1

Search

EMP_ID	L_NAME	DEP_ID	DEP_NAME
E1001	Thomas	2	Architecture
E1002	James	5	Software
E1003	Wells	5	
E1004	Kumar	5	
E1005	Hussain	2	
E1006	Allen	2	Architecture
E1007	Thomas	7	Design Team
E1008	Gupta	7	
E1009	Jones	7	
E1010	Jacob	5	

6. Problem:

Perform a Full Join on the EMPLOYEES and DEPARTMENT tables and select the First name, Last name and Department name of all employees.

▼ Hint

Use the Full Outer Join operation with the EMPLOYEES table as the left table and the DEPARTMENTS table as the right table.

▼ Solution

```
select E.F_NAME,E.L_NAME,D.DEP_NAME
from EMPLOYEES AS E
FULL OUTER JOIN DEPARTMENTS AS D ON E.DEP_ID=D.DEPT_ID_DEP;
```

▼ Output

Result set 1

Search

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F_NAME	L_NAME	DEP_NAME
John	Thomas	Architect
Alice	James	Software
Steve	Wells	Software
Santosh	Kumar	Software
Ahmed	Hussain	Architect
Nancy	Allen	Architect
Mary	Thomas	Design Team
Bharath	Gupta	Design Team
Andrea	Jones	Design Team
Ann	Jacob	Software

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7. Problem:

Re-write the previous query but have the result set include all employee names but department id and department names only for male employees.

▼ Hint

Add an AND in Query 3A to filter on male employees in the ON clause. Alternatively, you can also use Left Outer Join.

▼ Solution

```
select E.F_NAME,E.L_NAME,D.DEPT_ID_DEP, D.DEP_NAME
from EMPLOYEES AS E
FULL OUTER JOIN DEPARTMENTS AS D ON E.DEPT_ID=D.DEPT_ID_DEP AND E.SEX = 'M';
```

▼ Output





--- Query 3B --- select E.F\_NAME,E.L\_NAME,D....

Run time: **0.003 s**

Result set 1

Search



F_NAME	L_NAME	DEPT_ID_DEP	DEP_NAME
John	Thomas	2	Architect
Steve	Wells	5	Software
Santosh	Kumar	5	Software
Ahmed	Hussain	2	Architect
Bharath	Gupta	7	Design Te
Alice	James		
Nancy	Allen		
Mary	Thomas		
Andrea	Jones		
Ann	Jacob		

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## Solution Script

If you would like to run all the solution queries of the SQL problems of this lab with a script, download the script below. Upload the script to the Db2 console and run. Follow [Hands-on Lab : Create tables using SQL scripts and Load data into tables](#) on how to upload a script to Db2 console and run it.

- [JOIN\\_Solution\\_Script.sql](#)

**Congratulations! You have completed this lab, and you are ready for the next topic.**

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