SQL JOINS

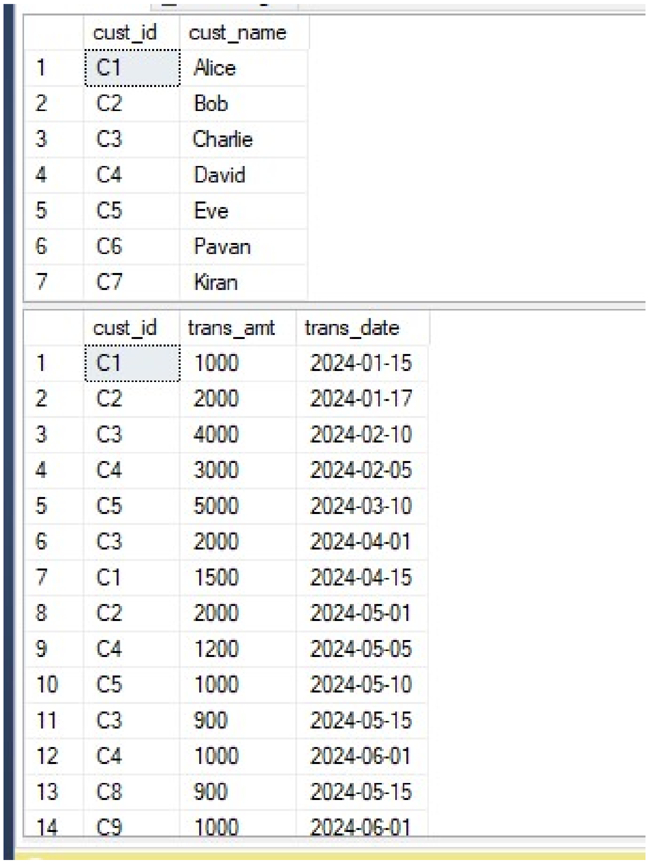
Joins are used to combine multiple tables to retrieve the required information for data processing.

There are 5 types of Joins used in SQL.

1. Inner Join
2. Left Join
3. Right Join
4. FULL Outer Join
5. Cross Join

1.Inner Join: It is used to join two tables, and will return only common records (matched records) between two tables. Unmatched records will be ignored.

Consider two tables' Customers table and Transactions table. Here the common column is cust_id, it will be used for join operation.



	cust_id	cust_name
1	C1	Alice
2	C2	Bob
3	C3	Charlie
4	C4	David
5	C5	Eve
6	C6	Pavan
7	C7	Kiran

	cust_id	trans_amt	trans_date
1	C1	1000	2024-01-15
2	C2	2000	2024-01-17
3	C3	4000	2024-02-10
4	C4	3000	2024-02-05
5	C5	5000	2024-03-10
6	C3	2000	2024-04-01
7	C1	1500	2024-04-15
8	C2	2000	2024-05-01
9	C4	1200	2024-05-05
10	C5	1000	2024-05-10
11	C3	900	2024-05-15
12	C4	1000	2024-06-01
13	C8	900	2024-05-15
14	C9	1000	2024-06-01

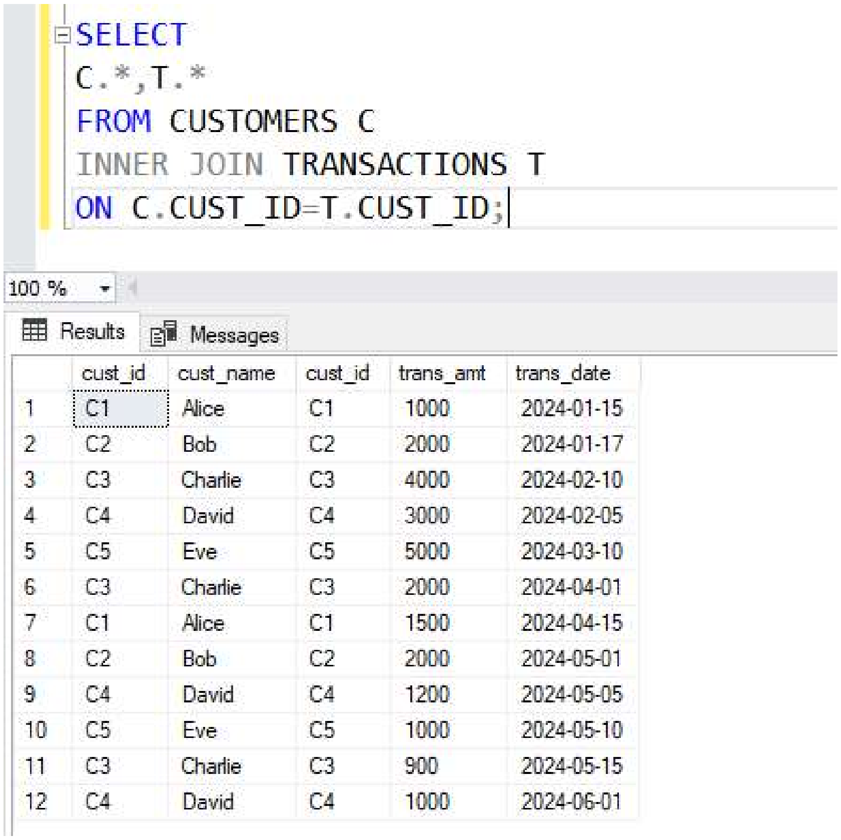
SELECT

C.*, T.*

FROM CUSTOMERS C

INNER JOIN TRANSACTIONS T

ON C.CUST_ID=T.CUST_ID;

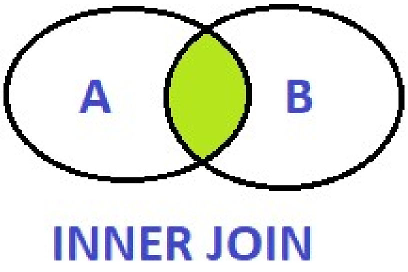


```
SELECT
C.*,T.*
FROM CUSTOMERS C
INNER JOIN TRANSACTIONS T
ON C.CUST_ID=T.CUST_ID;
```

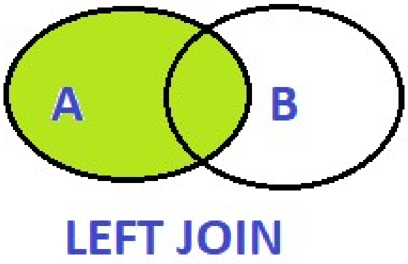
	cust_id	cust_name	cust_id	trans_amt	trans_date
1	C1	Alice	C1	1000	2024-01-15
2	C2	Bob	C2	2000	2024-01-17
3	C3	Charlie	C3	4000	2024-02-10
4	C4	David	C4	3000	2024-02-05
5	C5	Eve	C5	5000	2024-03-10
6	C3	Charlie	C3	2000	2024-04-01
7	C1	Alice	C1	1500	2024-04-15
8	C2	Bob	C2	2000	2024-05-01
9	C4	David	C4	1200	2024-05-05
10	C5	Eve	C5	1000	2024-05-10
11	C3	Charlie	C3	900	2024-05-15
12	C4	David	C4	1000	2024-06-01

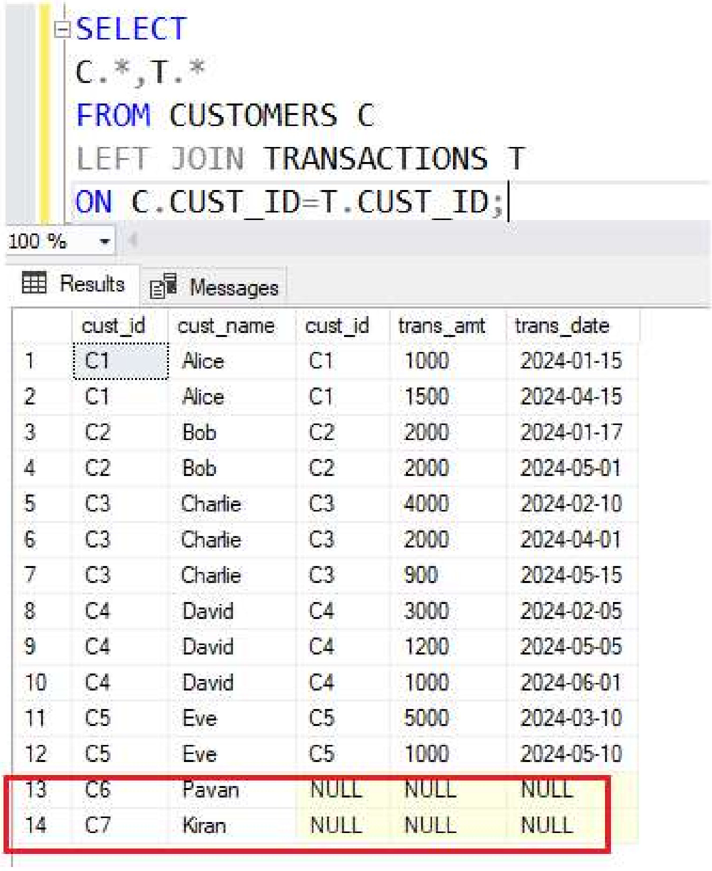
Here, observe that the CUST_ID C6, C7 in Customer table AND C8, C9 in Transaction table were ignored because there is no matching criteria between two tables.

Consider two tables A and B, Inner Join will return only matching records as like below.



2.LEFT JOIN: It will return matched records from both the tables and all unmatched records from left table.





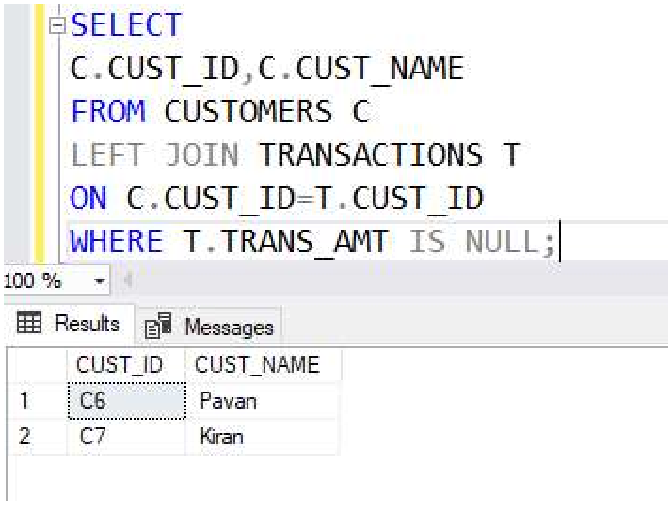
```
SELECT
C.*,T.*
FROM CUSTOMERS C
LEFT JOIN TRANSACTIONS T
ON C.CUST_ID=T.CUST_ID;
```

	cust_id	cust_name	cust_id	trans_amt	trans_date
1	C1	Alice	C1	1000	2024-01-15
2	C1	Alice	C1	1500	2024-04-15
3	C2	Bob	C2	2000	2024-01-17
4	C2	Bob	C2	2000	2024-05-01
5	C3	Charlie	C3	4000	2024-02-10
6	C3	Charlie	C3	2000	2024-04-01
7	C3	Charlie	C3	900	2024-05-15
8	C4	David	C4	3000	2024-02-05
9	C4	David	C4	1200	2024-05-05
10	C4	David	C4	1000	2024-06-01
11	C5	Eve	C5	5000	2024-03-10
12	C5	Eve	C5	1000	2024-05-10
13	C6	Pavan	NULL	NULL	NULL
14	C7	Kiran	NULL	NULL	NULL

Observe that, from above query it fetched matching records between both tables and unmatched records from left table. So C6, C7 were written but there is no data matching in transaction table. So, the values will be written as NULL to represent the not having any values.

Use case of this Join:

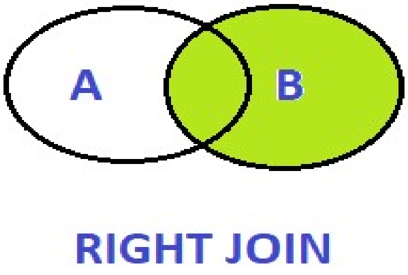
For example, my manager asked like. Pavan provide me the list of customers who did not done any transactions till now?

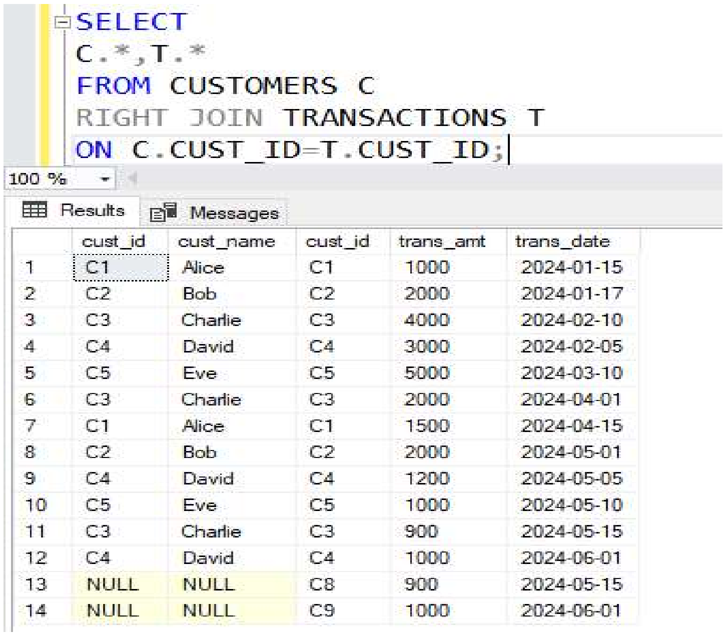


```
SELECT
C.CUST_ID,C.CUST_NAME
FROM CUSTOMERS C
LEFT JOIN TRANSACTIONS T
ON C.CUST_ID=T.CUST_ID
WHERE T.TRANS_AMT IS NULL;
```

	CUST_ID	CUST_NAME
1	C6	Pavan
2	C7	Kiran

3.RIGHT JOIN: It is used to combine two tables and will return the matched records from both tables and unmatched records from right table.





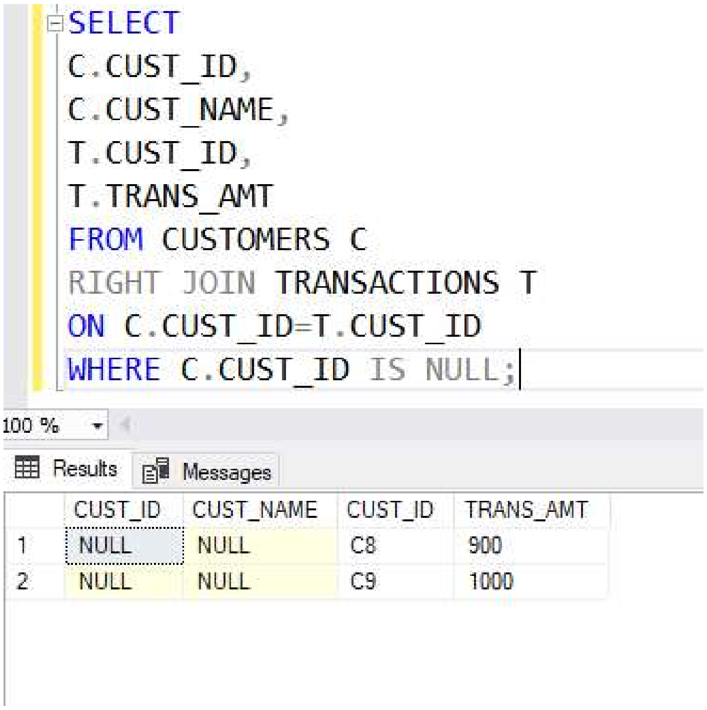
```
SELECT
C.*,T.*
FROM CUSTOMERS C
RIGHT JOIN TRANSACTIONS T
ON C.CUST_ID=T.CUST_ID;
```

	cust_id	cust_name	cust_id	trans_amt	trans_date
1	C1	Alice	C1	1000	2024-01-15
2	C2	Bob	C2	2000	2024-01-17
3	C3	Charlie	C3	4000	2024-02-10
4	C4	David	C4	3000	2024-02-05
5	C5	Eve	C5	5000	2024-03-10
6	C3	Charlie	C3	2000	2024-04-01
7	C1	Alice	C1	1500	2024-04-15
8	C2	Bob	C2	2000	2024-05-01
9	C4	David	C4	1200	2024-05-05
10	C5	Eve	C5	1000	2024-05-10
11	C3	Charlie	C3	900	2024-05-15
12	C4	David	C4	1000	2024-06-01
13	NULL	NULL	C8	900	2024-05-15
14	NULL	NULL	C9	1000	2024-06-01

Observe that from above query output, it fetched all matching records from both table and unmatched records from right table.

Use case of Right Join:

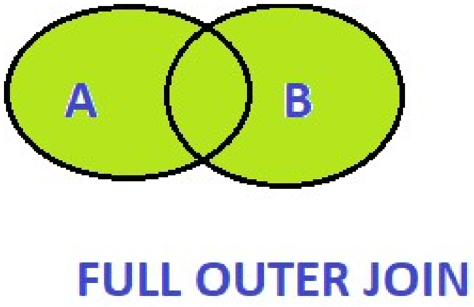
For example, retrieve the list of records where customer name is NULL.

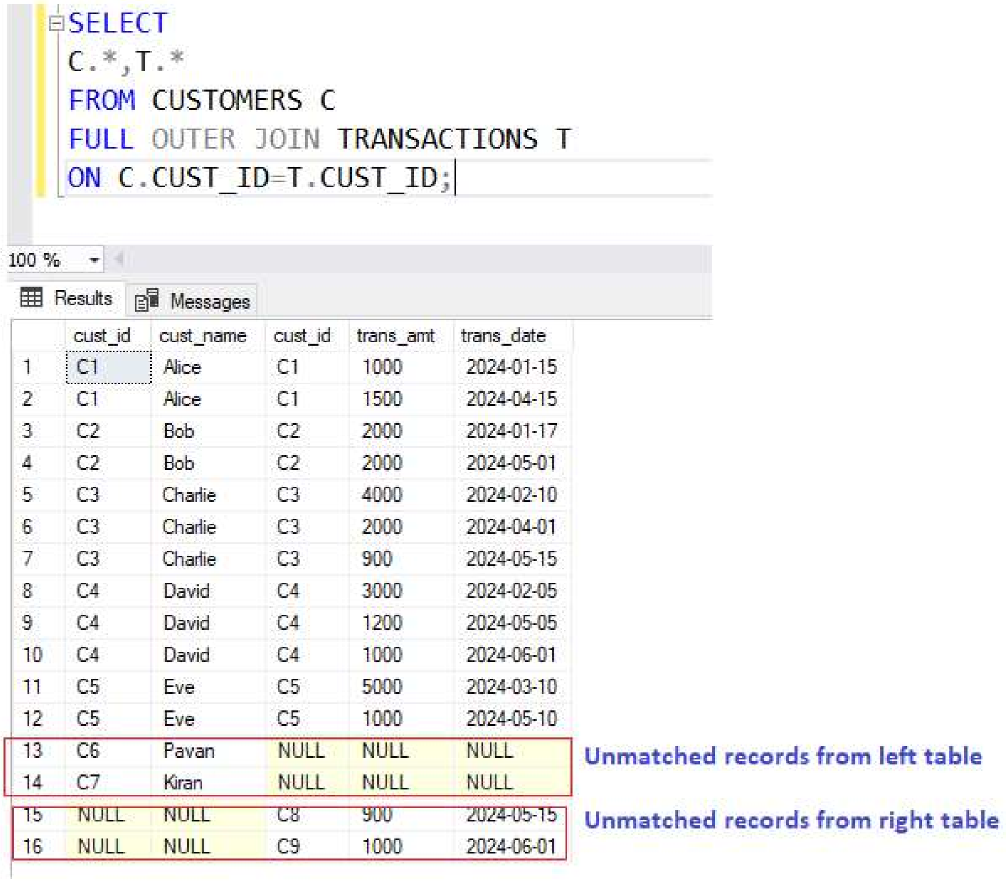


```
SELECT
C.CUST_ID,
C.CUST_NAME,
T.CUST_ID,
T.TRANS_AMT
FROM CUSTOMERS C
RIGHT JOIN TRANSACTIONS T
ON C.CUST_ID=T.CUST_ID
WHERE C.CUST_ID IS NULL;
```

```
   CUST_ID  CUST_NAME  CUST_ID  TRANS_AMT
1  NULL     NULL       C8       900
2  NULL     NULL       C9       1000
```

4.FULL OUTER JOIN: This join will return all the matched records from both tables, including all unmatched records from right and left tables as well.





```
SELECT
C.*,T.*
FROM CUSTOMERS C
FULL OUTER JOIN TRANSACTIONS T
ON C.CUST_ID=T.CUST_ID;
```

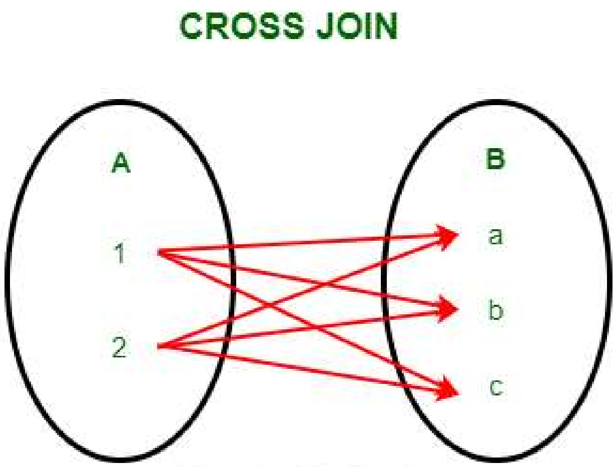
	cust_id	cust_name	cust_id	trans_amt	trans_date
1	C1	Alice	C1	1000	2024-01-15
2	C1	Alice	C1	1500	2024-04-15
3	C2	Bob	C2	2000	2024-01-17
4	C2	Bob	C2	2000	2024-05-01
5	C3	Charlie	C3	4000	2024-02-10
6	C3	Charlie	C3	2000	2024-04-01
7	C3	Charlie	C3	900	2024-05-15
8	C4	David	C4	3000	2024-02-05
9	C4	David	C4	1200	2024-05-05
10	C4	David	C4	1000	2024-06-01
11	C5	Eve	C5	5000	2024-03-10
12	C5	Eve	C5	1000	2024-05-10
13	C6	Pavan	NULL	NULL	NULL
14	C7	Kiran	NULL	NULL	NULL
15	NULL	NULL	C8	900	2024-05-15
16	NULL	NULL	C9	1000	2024-06-01

Unmatched records from left table

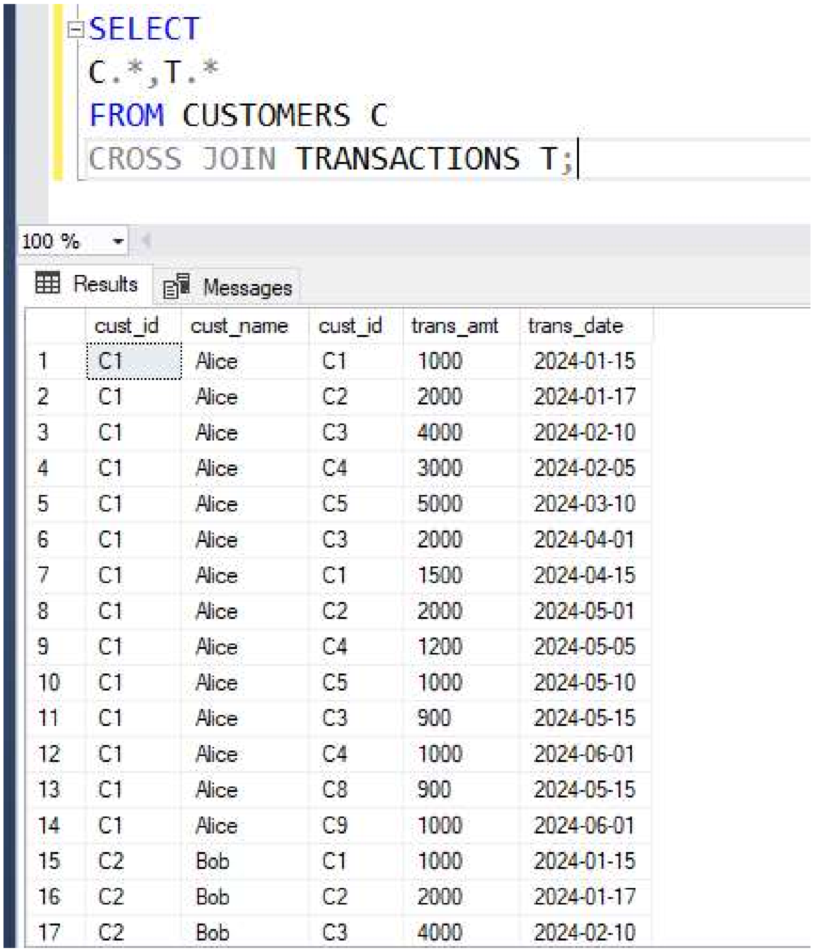
Unmatched records from right table

5.CROSS JOIN: It will return huge dataset of table. Each record of left table will join with each record in right table irrespective of matching condition.

Note: CROSS JOIN can potentially return very large result-sets!



Cross Join B/W Two Sets



```sql
SELECT
C.*,T.*
FROM CUSTOMERS C
CROSS JOIN TRANSACTIONS T;
```

	cust_id	cust_name	cust_id	trans_amt	trans_date
1	C1	Alice	C1	1000	2024-01-15
2	C1	Alice	C2	2000	2024-01-17
3	C1	Alice	C3	4000	2024-02-10
4	C1	Alice	C4	3000	2024-02-05
5	C1	Alice	C5	5000	2024-03-10
6	C1	Alice	C3	2000	2024-04-01
7	C1	Alice	C1	1500	2024-04-15
8	C1	Alice	C2	2000	2024-05-01
9	C1	Alice	C4	1200	2024-05-05
10	C1	Alice	C5	1000	2024-05-10
11	C1	Alice	C3	900	2024-05-15
12	C1	Alice	C4	1000	2024-06-01
13	C1	Alice	C8	900	2024-05-15
14	C1	Alice	C9	1000	2024-06-01
15	C2	Bob	C1	1000	2024-01-15
16	C2	Bob	C2	2000	2024-01-17
17	C2	Bob	C3	4000	2024-02-10

Observe that, Cross join will return all possible pair of values between two tables.