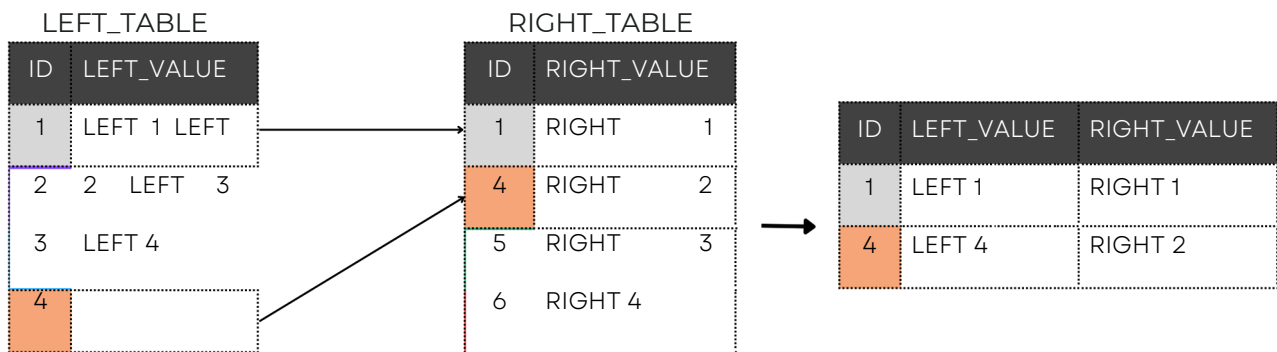


SQL Joins

v/s

Python Pandas

INNER JOIN



SQL

```
SELECT * FROM LEFT_TABLE AS LT INNER JOIN RIGHT_TABLE AS RT  
ON LT.ID = RT.ID
```

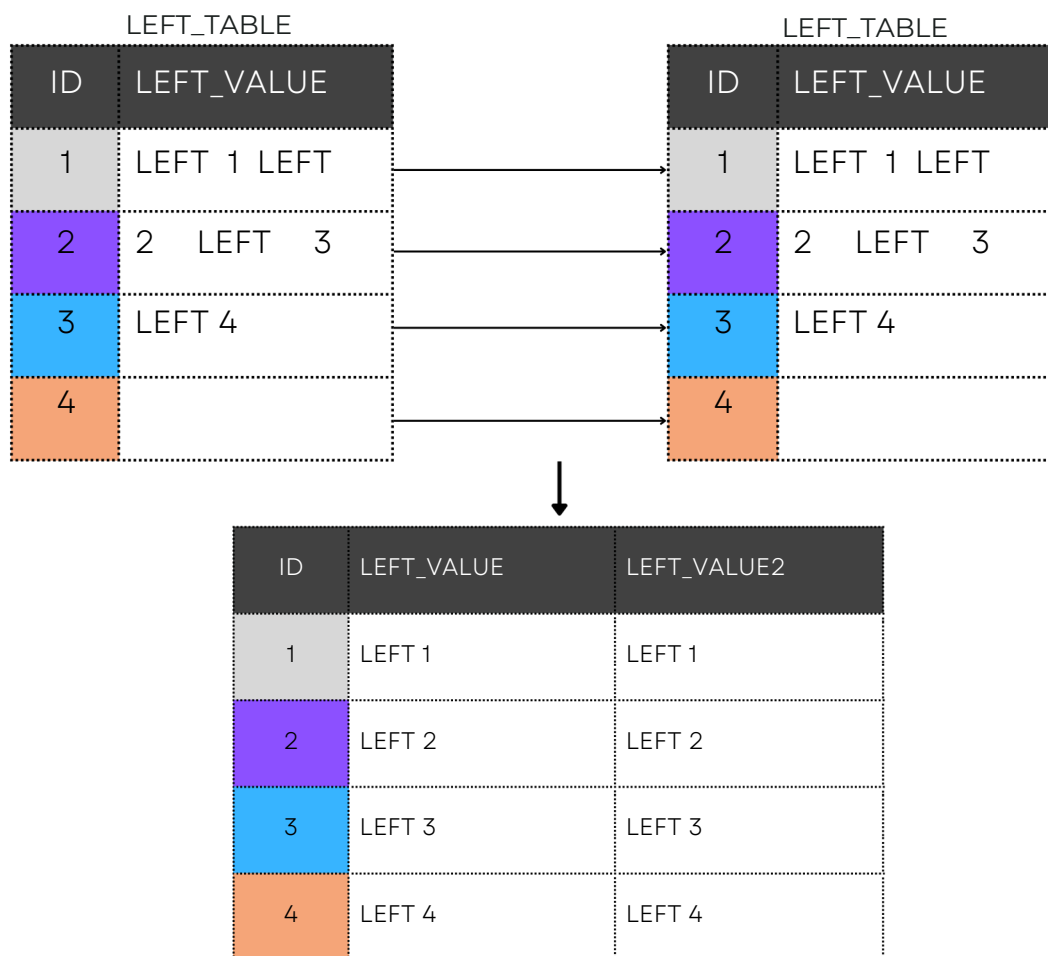
PANDAS

```
import pandas as pd  
  
left_table = pd.DataFrame(  
    data={  
        'ID': [1, 2, 3, 4],  
        'VALUE': ['LEFT 1', 'LEFT 2', 'LEFT 3', 'LEFT 4']  
    }  
)  
  
right_table = pd.DataFrame(  
    data={  
        'ID': [1, 4, 5, 6],  
        'VALUE': ['RIGHT 1', 'RIGHT 2', 'RIGHT 3', 'RIGHT 4']  
    }  
)
```

```
left_table.merge(right_table, left_on='ID', right_on='ID', suffixes=('_LEFT', '_RIGHT'))
```

	ID	VALUE_LEFT	VALUE_RIGHT
0	1	LEFT 1	RIGHT 1
1	4	LEFT 4	RIGHT 2

SELF JOIN



SQL

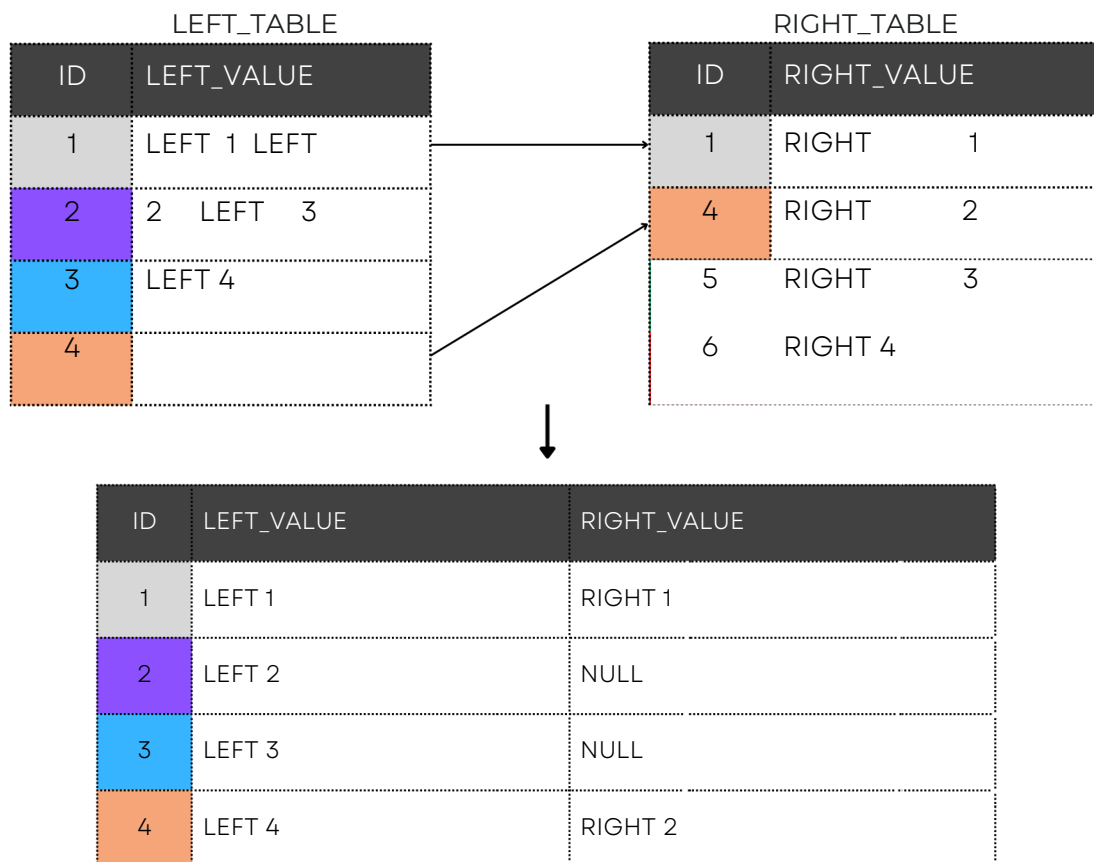
```
SELECT * FROM LEFT_TABLE AS LT INNER JOIN LEFT_TABLE AS LT2  
ON LT.ID = LT2.ID
```

PANDAS

```
left_table.merge(left_table, left_on='ID', right_on='ID', suffixes=('_LEFT', '_LEFT2'))
```

	ID	VALUE_LEFT	VALUE_LEFT2
0	1	LEFT 1	LEFT 1
1	2	LEFT 2	LEFT 2
2	3	LEFT 3	LEFT 3
3	4	LEFT 4	LEFT 4

LEFT JOIN



SQL

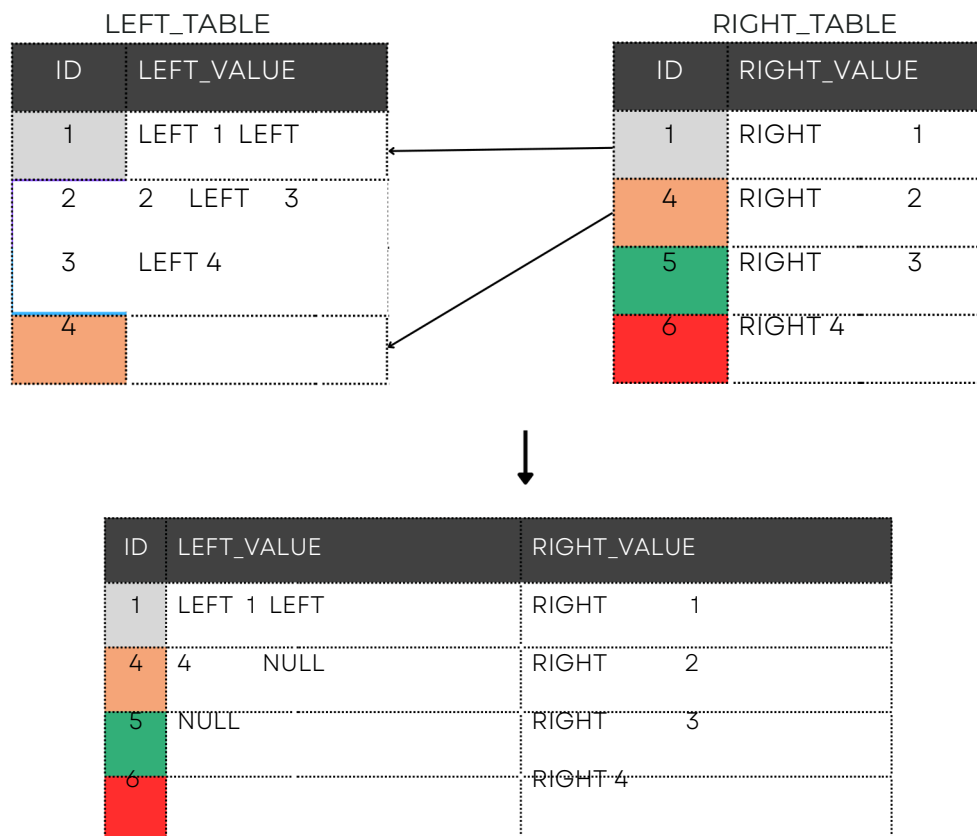
```
SELECT * FROM LEFT_TABLE AS LT LEFT JOIN RIGHT_TABLE AS RT  
ON LT.ID = RT.ID
```

PANDAS

```
# on='ID' -> left_on='ID', right_on='ID'  
left_table.merge(right_table, how='left', on='ID', suffixes=('_LEFT', '_RIGHT'))
```

	ID	VALUE_LEFT	VALUE_RIGHT
0	1	LEFT 1	RIGHT 1
1	2	LEFT 2	NaN
2	3	LEFT 3	NaN
3	4	LEFT 4	RIGHT 2

RIGHT JOIN



SQL

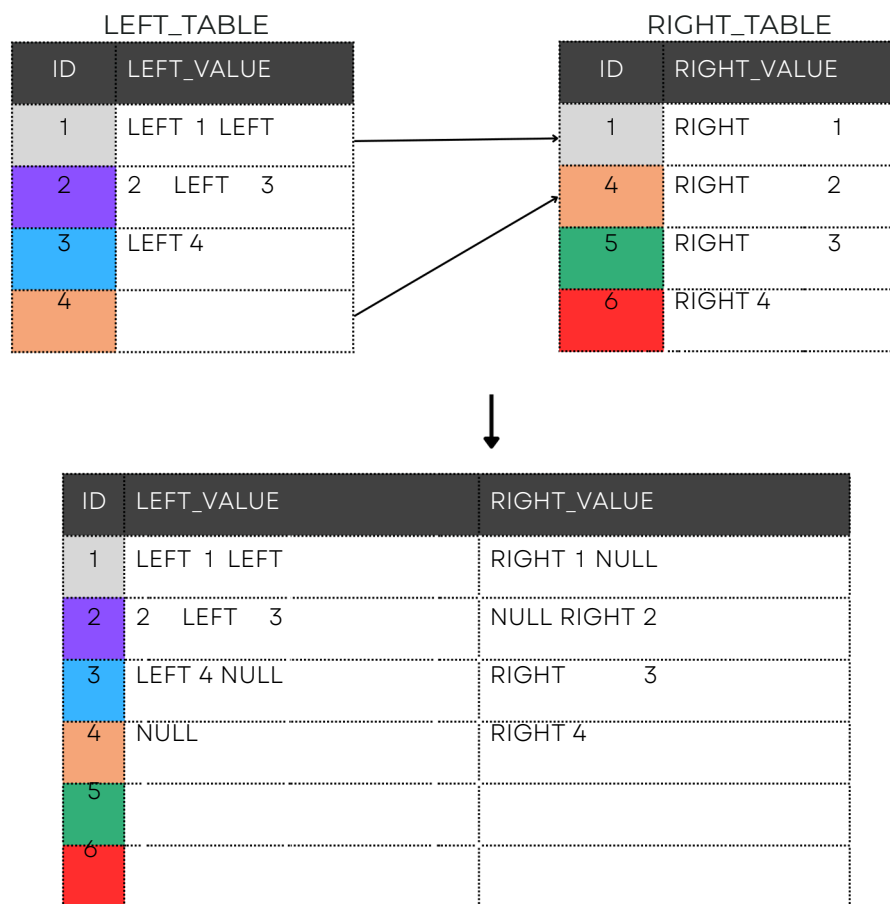
```
SELECT * FROM LEFT_TABLE AS LT RIGHT JOIN RIGHT_TABLE AS RT  
ON LT.ID = RT.ID
```

PANDAS

```
left_table.merge(right_table, how='right', on='ID', suffixes=('_LEFT', '_RIGHT'))
```

	ID	VALUE_LEFT	VALUE_RIGHT
0	1	LEFT 1	RIGHT 1
1	4	LEFT 4	RIGHT 2
2	5	NaN	RIGHT 3
3	6	NaN	RIGHT 4

FULL JOIN



SQL

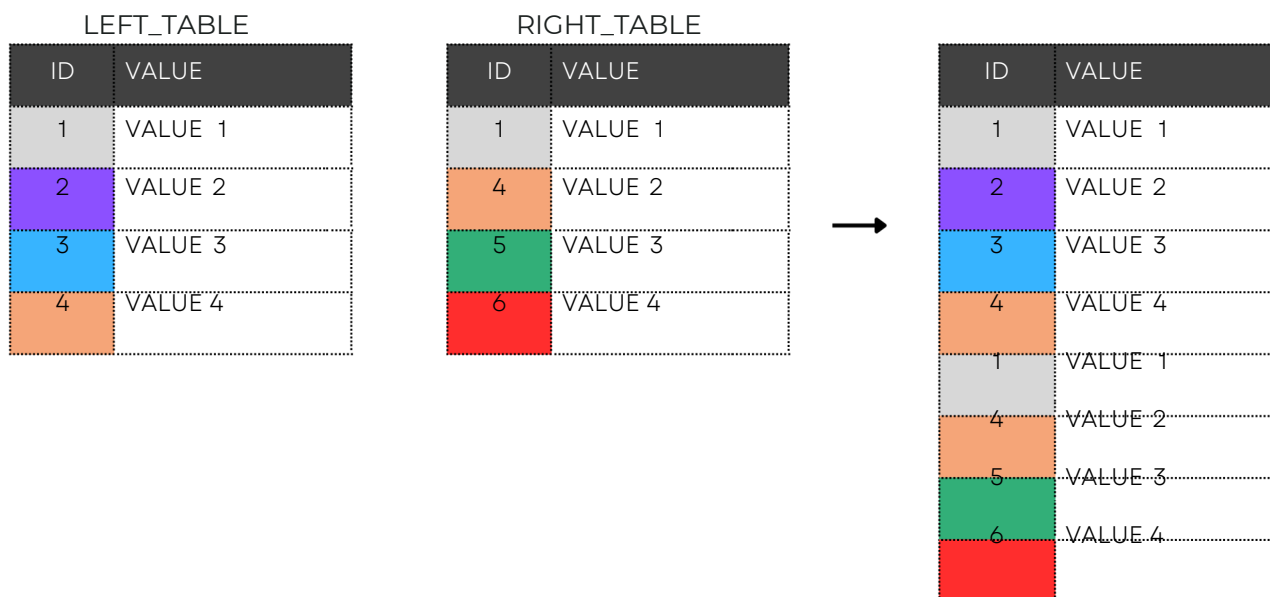
```
SELECT * FROM LEFT_TABLE AS LT FULL OUTER JOIN RIGHT_TABLE  
AS RT ON LT.ID = RT.ID
```

PANDAS

```
left_table.merge(right_table, how='outer', on='ID', suffixes=('_LEFT', '_RIGHT'))
```

	ID	VALUE_LEFT	VALUE_RIGHT
0	1	LEFT 1	RIGHT 1
1	2	LEFT 2	NaN
2	3	LEFT 3	NaN
3	4	LEFT 4	RIGHT 2
4	5	NaN	RIGHT 3
5	6	NaN	RIGHT 4

UNION ALL



SQL

`SELECT * FROM LEFT_TABLE UNION ALL SELECT * FROM RIGHT_TABLE`

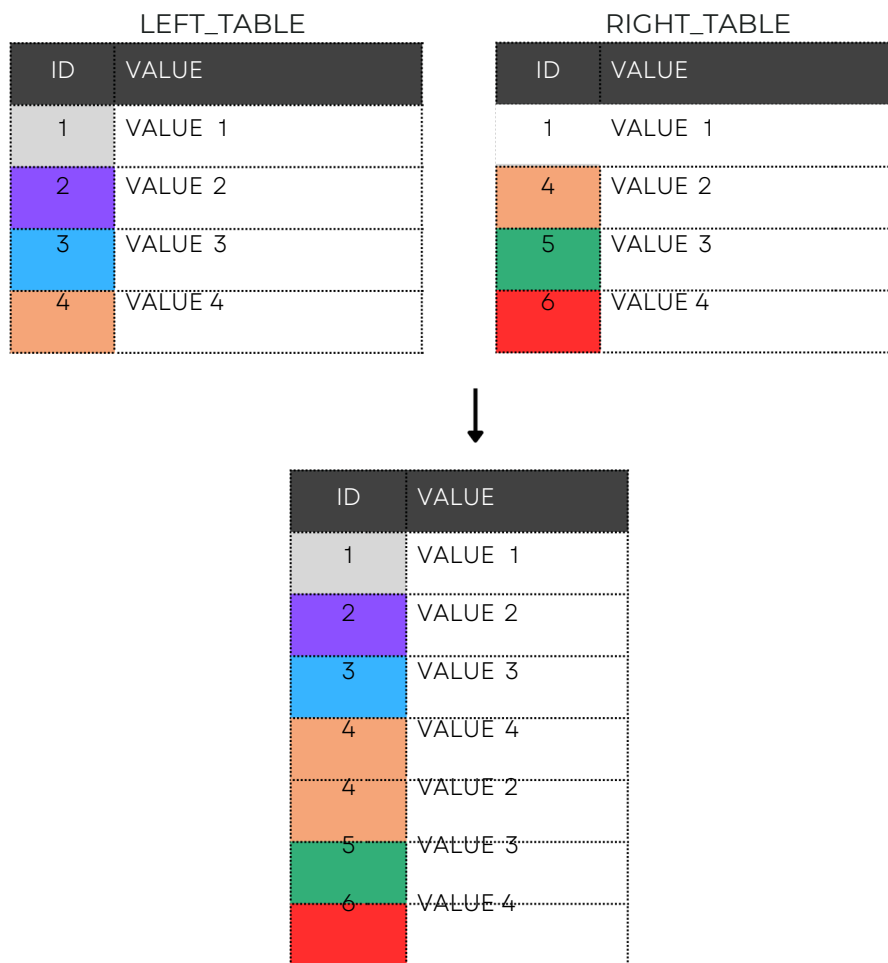
PANDAS

```
left_table = pd.DataFrame(  
    data={  
        'ID': [1, 2, 3, 4],  
        'VALUE': ['VALUE 1', 'VALUE 2', 'VALUE 3', 'VALUE 4']  
    }  
)  
right_table = pd.DataFrame(  
    data={  
        'ID': [1, 4, 5, 6],  
        'VALUE': ['VALUE 1', 'VALUE 2', 'VALUE 3', 'VALUE 4']  
    }  
)
```

```
pd.concat([left_table, right_table], ignore_index=True)
```

	ID	VALUE
0	1	VALUE 1
1	2	VALUE 2
2	3	VALUE 3
3	4	VALUE 4
4	1	VALUE 1
5	4	VALUE 2
6	5	VALUE 3
7	6	VALUE 4

UNION



SQL

```
SELECT * FROM LEFT_TABLE UNION SELECT * FROM RIGHT_TABLE
```

PANDAS

```
pd.concat([left_table, right_table], ignore_index=True).drop_duplicates()
```

	ID	VALUE
0	1	VALUE 1
1	2	VALUE 2
2	3	VALUE 3
3	4	VALUE 4
5	4	VALUE 2
6	5	VALUE 3
7	6	VALUE 4

INTERSECT

LEFT_TABLE		RIGHT_TABLE	
ID	VALUE	ID	VALUE
1	VALUE 1	1	VALUE 1
2	VALUE 2	4	VALUE 2
3	VALUE 3	5	VALUE 3
4	VALUE 4	6	VALUE 4

↓

ID	VALUE
1	VALUE 1

SQL

```
SELECT * FROM LEFT_TABLE INTERSECT SELECT * FROM RIGHT_TABLE
```

PANDAS

```
left_table.merge(right_table, how='inner')
```

	ID	VALUE
0	1	VALUE 1

EXCEPT

LEFT_TABLE		RIGHT_TABLE	
ID	VALUE	ID	VALUE
1	VALUE 1	1	VALUE 1
2	VALUE 2	4	VALUE 2
3	VALUE 3	5	VALUE 3
4	VALUE 4	6	VALUE 4



ID	VALUE
2	VALUE 2
3	VALUE 3
4	VALUE 4

SQL

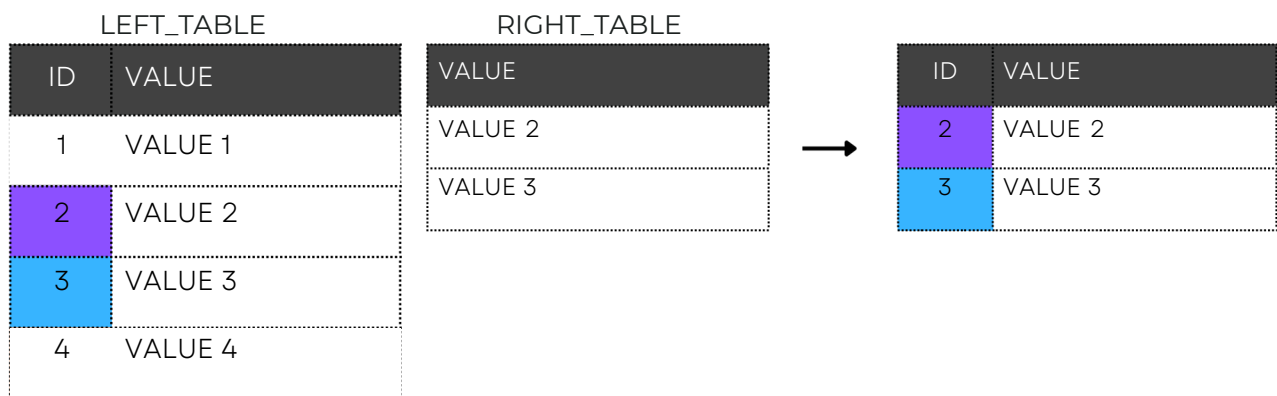
```
SELECT * FROM LEFT_TABLE EXCEPT SELECT * FROM RIGHT_TABLE
```

PANDAS

```
intersect = left_table.merge(right_table, how='inner')
except_ = pd.concat([left_table, intersect]).drop_duplicates(keep=False)
except_
```

	ID	VALUE
1	2	VALUE 2
2	3	VALUE 3
3	4	VALUE 4

SEMI JOIN



SQL

```
SELECT * FROM LEFT_TABLE WHERE VALUE IN (SELECT VALUE FROM RIGHT_TABLE)
```

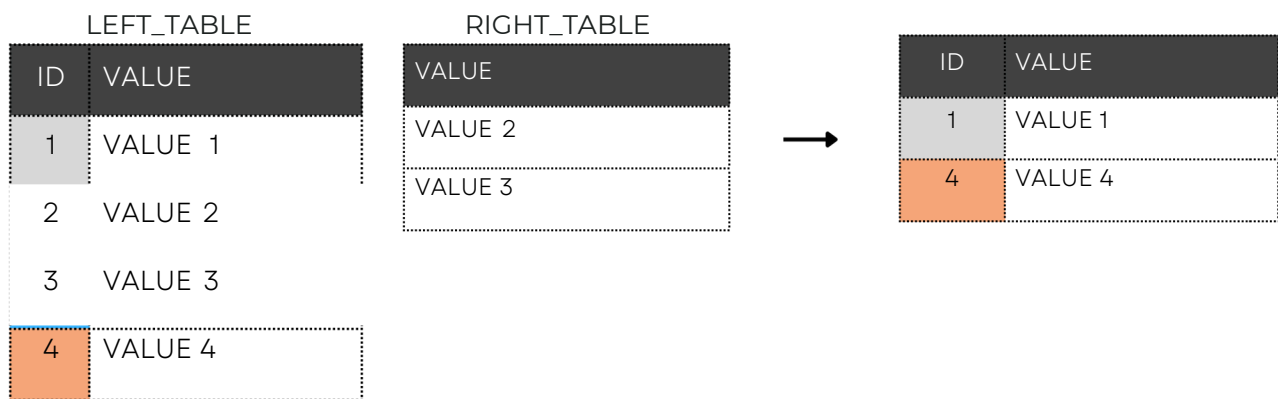
PANDAS

```
left_table = pd.DataFrame(  
    data={  
        'ID': [1, 2, 3, 4],  
        'VALUE': ['VALUE 1', 'VALUE 2', 'VALUE 3', 'VALUE 4']  
    }  
)  
right_table = pd.DataFrame(  
    data={  
        'VALUE': ['VALUE 2', 'VALUE 3']  
    }  
)
```

```
outer = left_table.merge(right_table, on='VALUE', how='outer', indicator=True)  
semi = outer.query('_merge == "both"').drop(columns='_merge')  
semi
```

	ID	VALUE
1	2	VALUE 2
2	3	VALUE 3

ANTI JOIN



SQL

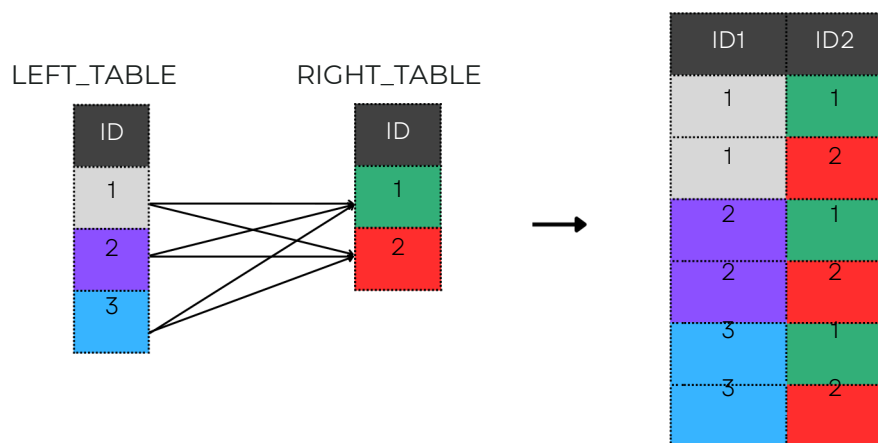
```
SELECT * FROM LEFT_TABLE WHERE VALUE NOT IN (SELECT VALUE FROM RIGHT_TABLE )
```

PANDAS

```
outer = left_table.merge(right_table, on='VALUE', how='outer', indicator=True)
anti = outer.query('_merge != "both"]').drop(columns='_merge')
anti
```

	ID	VALUE
0	1	VALUE 1
3	4	VALUE 4

CROSS JOIN



SQL

```
SELECT * FROM LEFT_TABLE CROSS JOIN RIGHT_TABLE
```

PANDAS

```
left_table = pd.DataFrame(  
    data={'ID': [1, 2, 3]}  
)  
right_table = pd.DataFrame(  
    data={'ID': [1, 2]}  
)
```

```
left_table.merge(right_table, how='cross', suffixes=('_LEFT', '_RIGHT'))
```

	ID_LEFT	ID_RIGHT
0	1	1
1	1	2
2	2	1
3	2	2
4	3	1
5	3	2