JOINs

Joined Tables

- A joined table is a table derived from two other (real or derived) tables according to the rules of the particular join type.
- Inner, outer, and cross-joins are available.
- The general syntax of a joined table is:

```
T1 join_type T2 [  join_condition ]
```

Joined Tables

- Parentheses can be used around `JOIN` clauses to control the join order.
- In the absence of parentheses, `JOIN` clauses nest left-to-right.

CROSS JOIN

```
T1 CROSS JOIN T2
```

- For every possible combination of rows from T1 and T2 (i.e., a Cartesian product), the joined table will contain a row consisting of all columns in T1 followed by all columns in T2.

- If the tables have N and M rows respectively, the joined table will have N * M rows.

CROSS JOIN

- FROM T1 CROSS JOIN T2 is equivalent to
- FROM T1 INNER JOIN T2 ON TRUE
- It is also equivalent to FROM T1, T2

CROSS JOIN

- `SELECT T1.ID, T2.ID FROM T1 CROSS JOIN T2`

- `SELECT T1.ID, T2.ID FROM T1 INNER JOIN T2 ON TRUE`

- `SELECT T1.ID, T2.ID FROM T1, T2`

```
 num | name
-----+------
   1 | a
   2 | b
   3 | c
```

```
 num | value
-----+-------
   1 | xxx
   3 | yyy
   5 | zzz
```

```
SELECT * FROM t1 CROSS JOIN t2;
```

```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
   1 | a    |   3 | yyy
   1 | a    |   5 | zzz
   2 | b    |   1 | xxx
   2 | b    |   3 | yyy
   2 | b    |   5 | zzz
   3 | c    |   1 | xxx
   3 | c    |   3 | yyy
   3 | c    |   5 | zzz
```

Qualified joins

- `T1 { [INNER] | { LEFT | RIGHT | FULL } [OUTER] } JOIN T2 ON boolean_expression`

- `T1 { [INNER] | { LEFT | RIGHT | FULL } [OUTER] } JOIN T2 USING ( join column list )`

- `T1 NATURAL { [INNER] | { LEFT | RIGHT | FULL } [OUTER] } JOIN T2`

Qualified joins

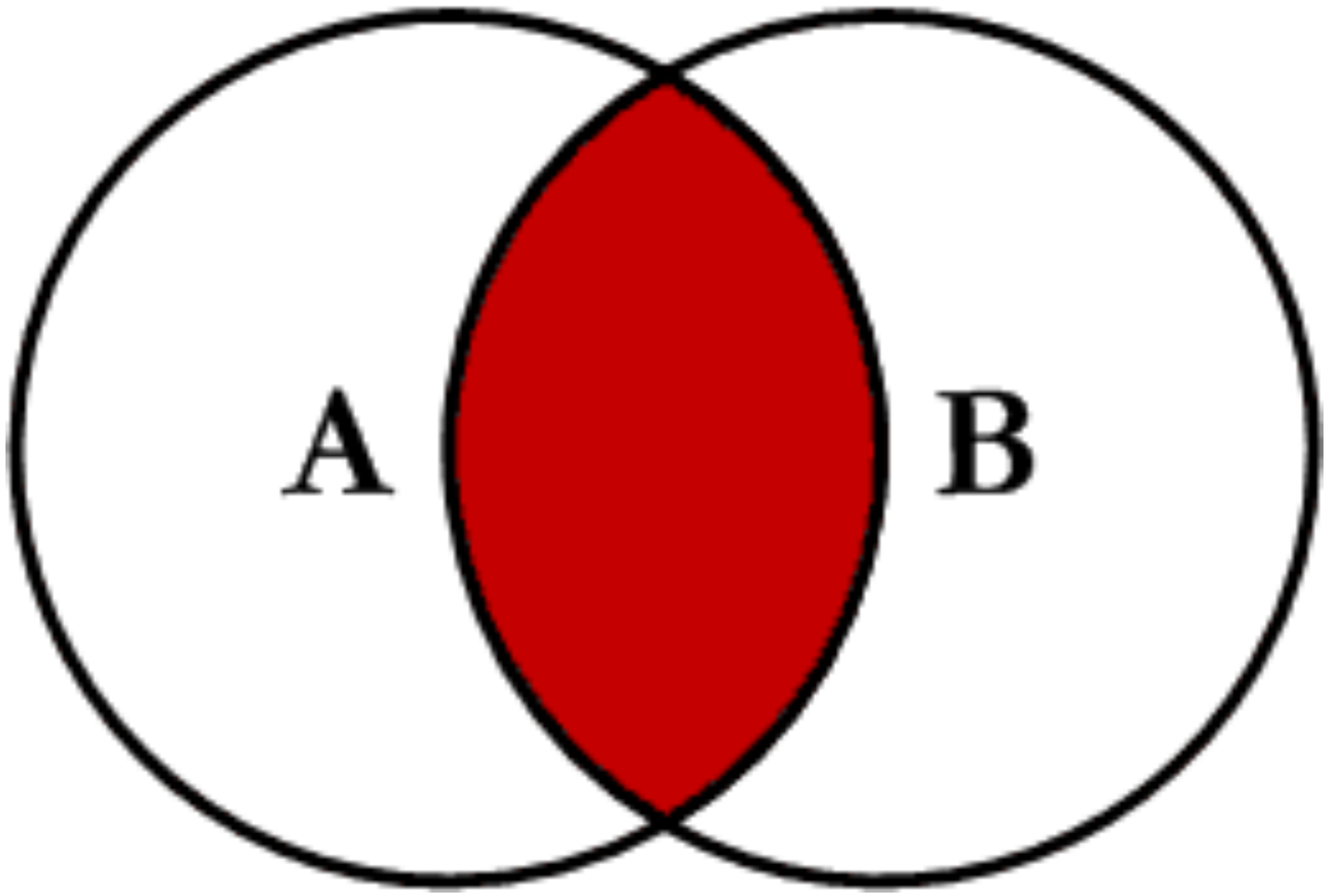
- The words INNER and OUTER are optional in all forms.
- INNER is the default; LEFT, RIGHT, and FULL imply an outer join.
- The join condition is specified in the ON or USING clause, or implicitly by the word NATURAL.
- The join condition determines which rows from the two source tables are considered to “match”

INNER JOIN

- For each row R1 of T1, the joined table has a row for each row in T2 that satisfies the join condition with R1.

INNER JOIN

```
SELECT * FROM A INNER JOIN B ON A.ID = B.ID
```



```
SELECT * FROM t1 INNER JOIN t2 ON t1.num = t2.num;
```

```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
   3 | c    |   3 | yyy
```

```
SELECT * FROM t1 INNER JOIN t2 USING (num);
```

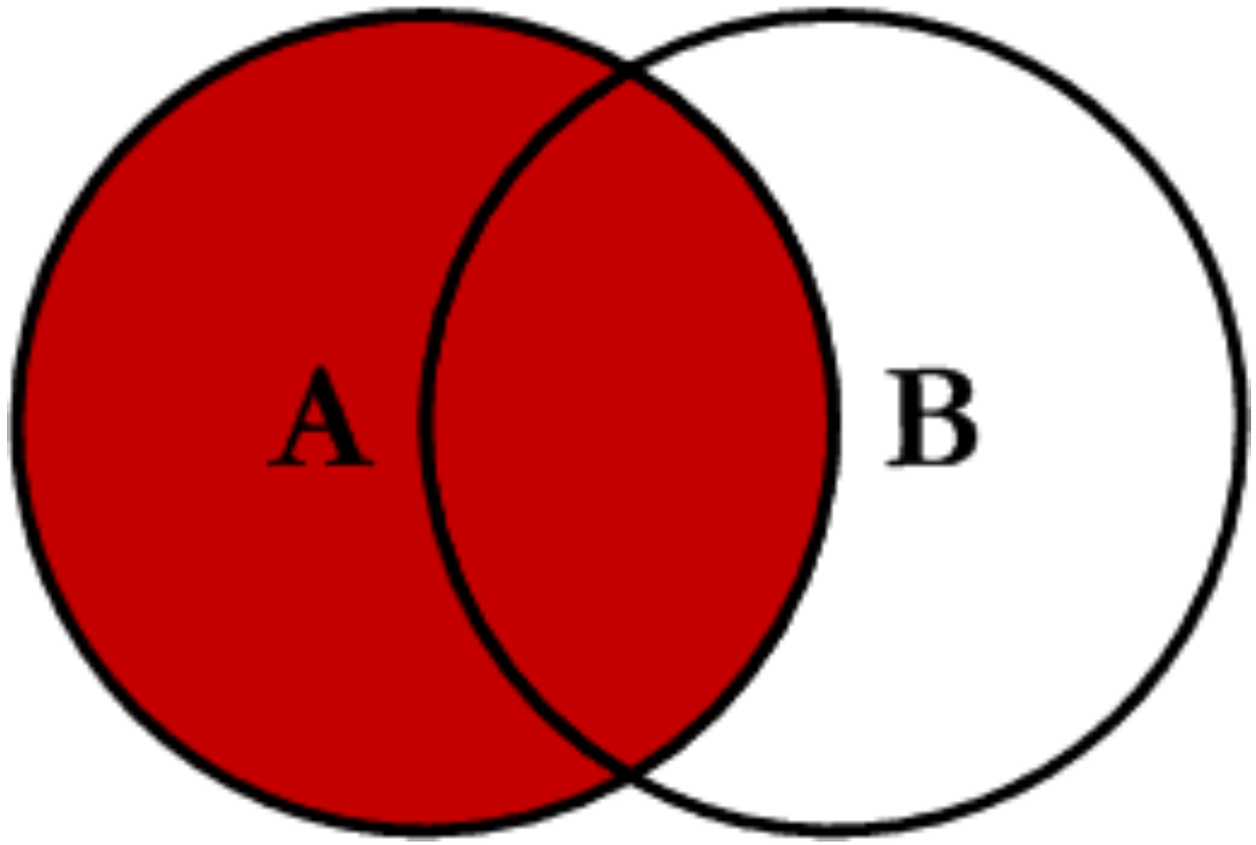
```
 num | name | value
-----+------+-------
   1 | a    | xxx
   3 | c    | yyy
```

```
SELECT * FROM t1 NATURAL INNER JOIN t2;
```

```
 num | name | value
-----+------+-------
   1 | a    | xxx
   3 | c    | yyy
```

LEFT JOIN

```
SELECT * FROM A LEFT JOIN B ON A.ID = B.ID
```




```
SELECT * FROM A LEFT OUTER JOIN B ON A.ID = B.ID
```

```
SELECT * FROM t1 LEFT JOIN t2 ON t1.num = t2.num;
```

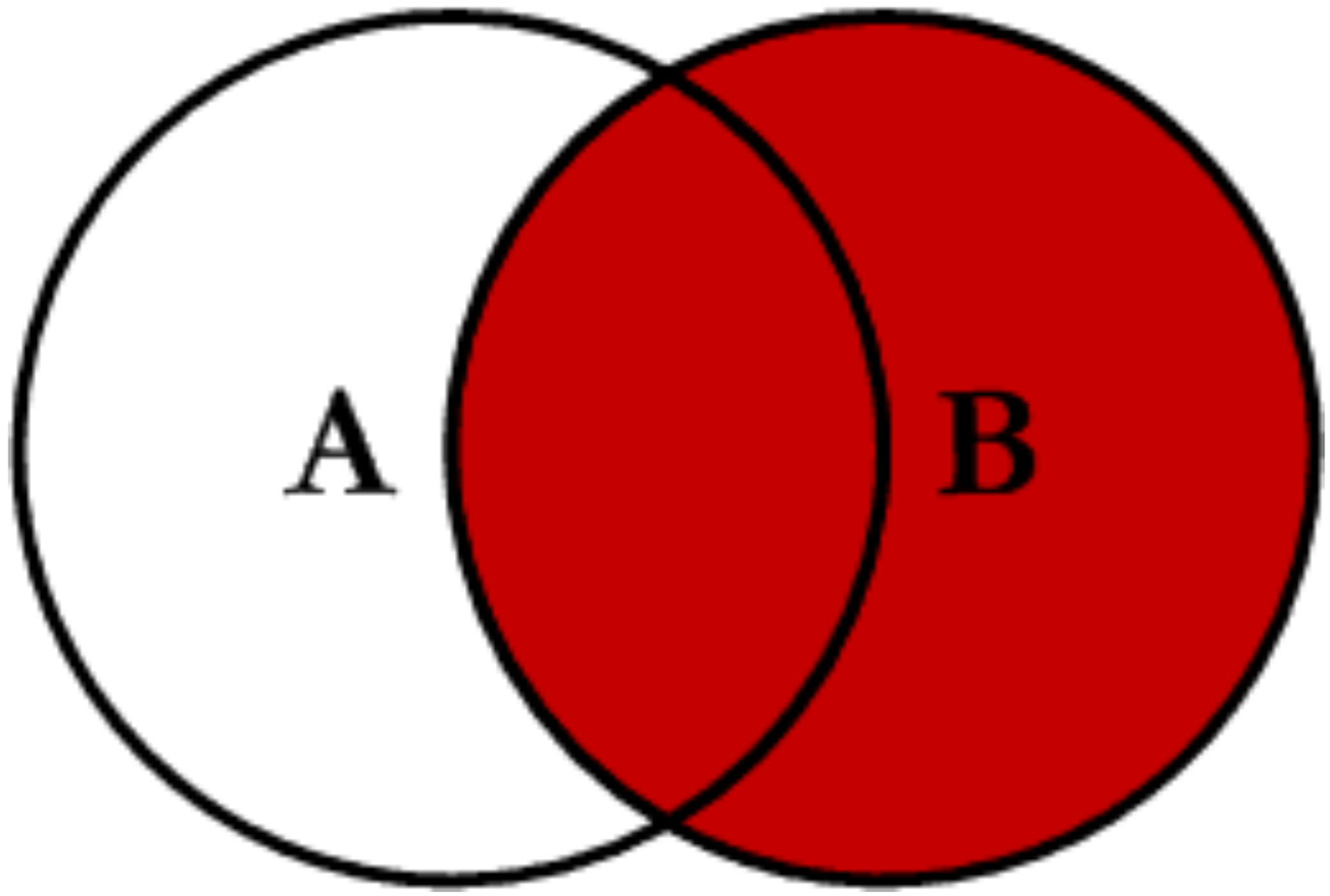
```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
   2 | b    |     |
   3 | c    |   3 | yyy
```

```
SELECT * FROM t1 LEFT JOIN t2 USING (num);
```

```
 num | name | value
-----+------+-------
   1 | a    | xxx
   2 | b    |
   3 | c    | yyy
```

RIGHT JOIN

```
SELECT * FROM A RIGHT JOIN B ON A.ID = B.ID
```



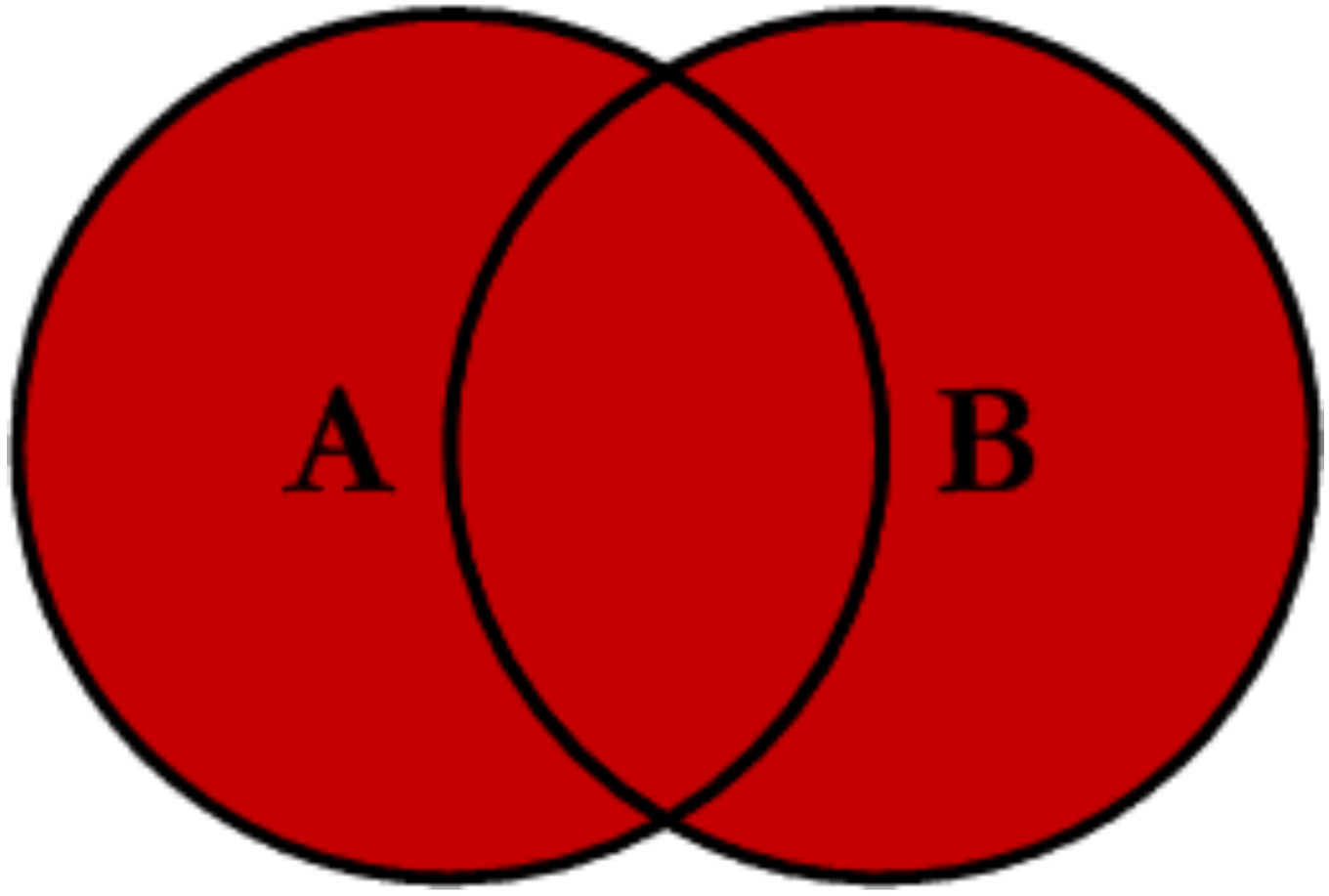

```
SELECT * FROM A RIGHT OUTER JOIN B ON A.ID = B.ID
```

```
SELECT * FROM t1 RIGHT JOIN t2 ON t1.num = t2.num;
```

```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
   3 | c    |   3 | yyy
     |      |   5 | zzz
```

FULL JOIN

```
SELECT * FROM A FULL JOIN B ON A.ID = B.ID
```




```
SELECT * FROM A FULL OUTER JOIN B ON A.ID = B.ID
```

```
SELECT * FROM t1 FULL JOIN t2 ON t1.num = t2.num;
```

```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
   2 | b    |     |
   3 | c    |   3 | yyy
     |      |   5 | zzz
```

JOIN

- The join condition specified with `ON` can also contain conditions that do not relate directly to the join.

- This can prove useful for some queries but needs to be thought out carefully.

```
SELECT * FROM t1 LEFT JOIN t2 ON t1.num = t2.num
AND t2.value = 'xxx';
```

```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
   2 | b    |     |
   3 | c    |     |
```

```
SELECT * FROM t1 LEFT JOIN t2 ON t1.num = t2.num
WHERE t2.value = 'xxx';
```

```
 num | name | num | value
-----+------+-----+-------
   1 | a    |   1 | xxx
```

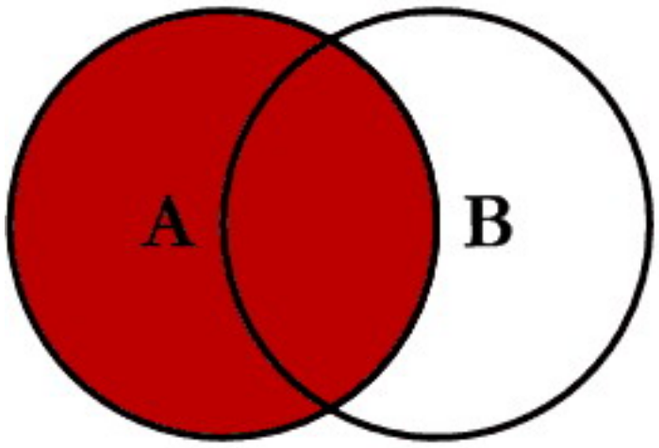
JOIN

- Notice that placing the restriction in the WHERE clause produces a different result

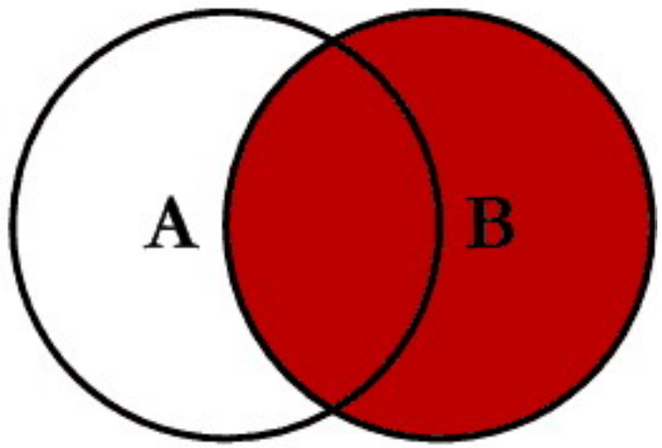
- This is because a restriction placed in the ON clause is processed before the join, while a restriction placed in the WHERE clause is processed after the join.

- That does not matter with inner joins, but it matters a lot with outer joins.

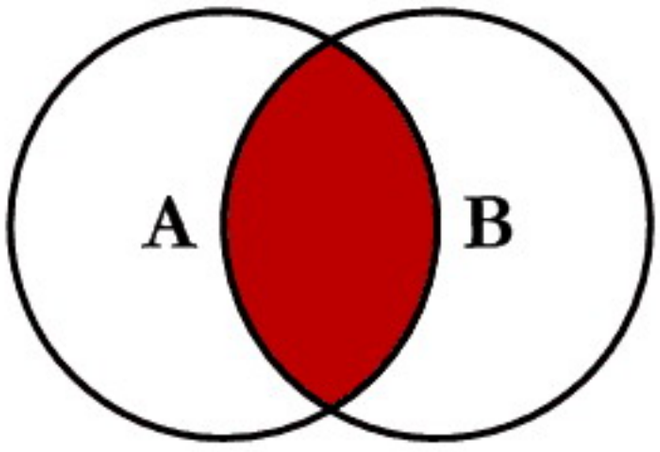
SQL JOINS



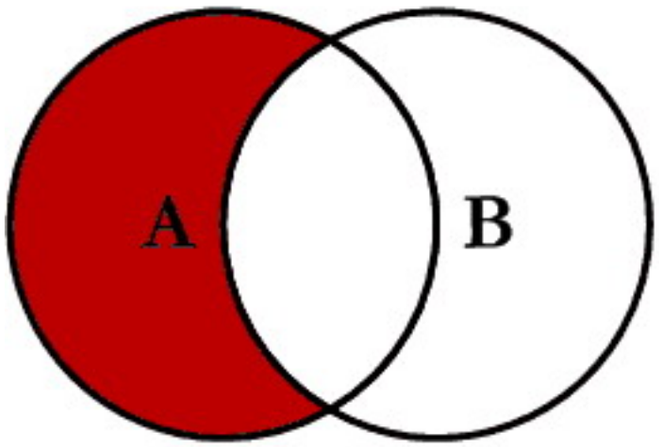

```
SELECT <select_list>
FROM TableA A
LEFT JOIN TableB B
ON A.Key = B.Key
```



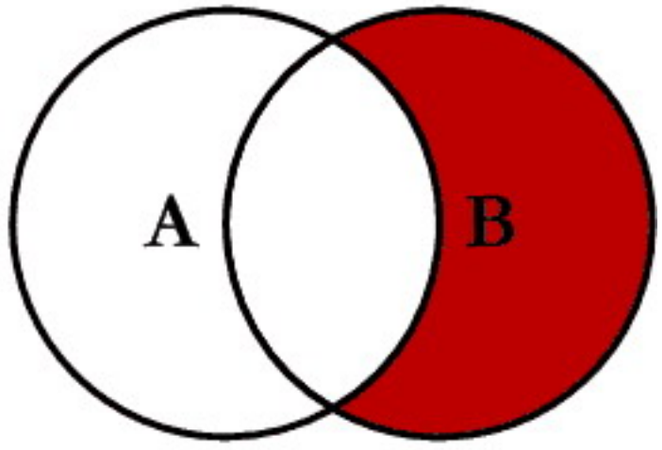

```
SELECT <select_list>
FROM TableA A
RIGHT JOIN TableB B
ON A.Key = B.Key
```



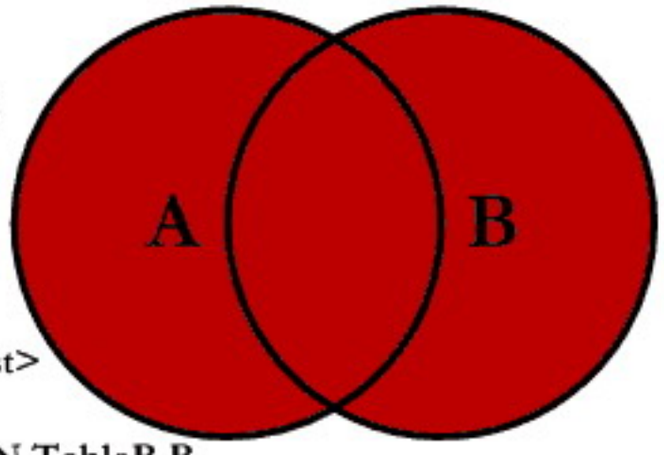

```
SELECT <select_list>
FROM TableA A
INNER JOIN TableB B
ON A.Key = B.Key
```



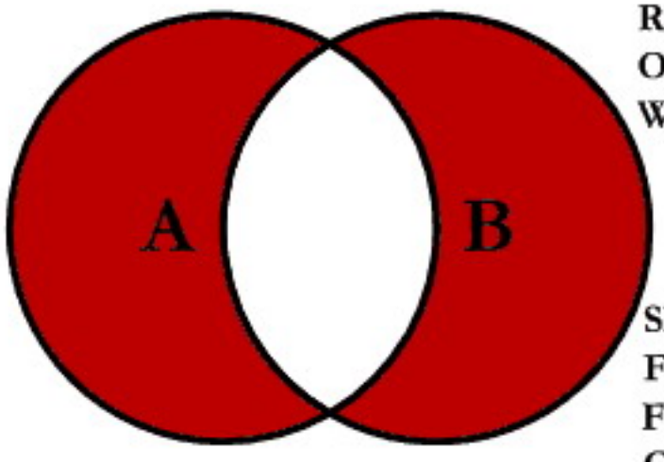

```
SELECT <select_list>
FROM TableA A
LEFT JOIN TableB B
ON A.Key = B.Key
WHERE B.Key IS NULL
```




```
SELECT <select_list>
FROM TableA A
RIGHT JOIN TableB B
ON A.Key = B.Key
WHERE A.Key IS NULL
```




```
SELECT <select_list>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.Key = B.Key
```




```
SELECT <select_list>
FROM TableA A
FULL OUTER JOIN TableB B
ON A.Key = B.Key
WHERE A.Key IS NULL
OR B.Key IS NULL
```

Questions?