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A Visual Explanation of SQL Joins

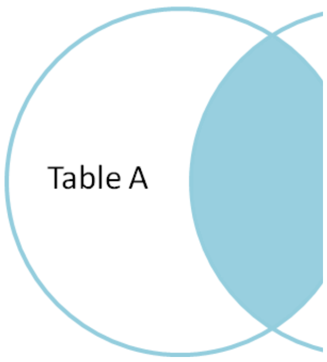
I thought Ligaya Turmelle's post on SQL joins was a great primer for novice developers. Since SQL joins *appear* to be set-based, the use of Venn diagrams to explain them seems, at first blush, to be a natural fit. However, like the commenters to her post, I found that the Venn diagrams didn't quite match the SQL join syntax reality in my testing.

I love the concept, though, so let's see if we can make it work. Assume we have the following two tables. **Table A** is on the left, and **Table B** is on the right. We'll populate them with four records each.

```
id name       id  name
-- ----       --  ----
1  Pirate     1   Rutabaga
2  Monkey     2   Pirate
3  Ninja      3   Darth Vader
4  Spaghetti  4   Ninja
```

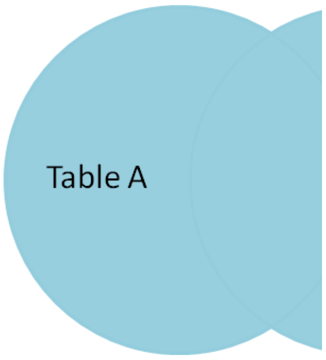
Let's join these tables by the name field in a few different ways and see if we can get a conceptual match to those nifty Venn diagrams.

```
SELECT * FROM TableA
INNER JOIN TableB
ON TableA.name = TableB.name

id  name       id   name
-- ----       --   ----
1   Pirate     2    Pirate
3   Ninja      4    Ninja
```



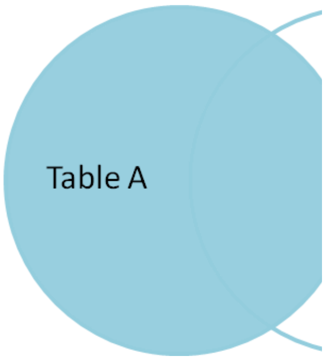
Inner join produces only the set of records that match in both Table A and Table B.

```
SELECT * FROM TableA
FULL OUTER JOIN TableB
ON TableA.name = TableB.name

id    name       id    name



1     Pirate     2     Pirate

2     Monkey     null  null

3     Ninja      4     Ninja

4     Spaghetti  null  null

null  null       1     Rutabaga

null  null       3     Darth Vader
```



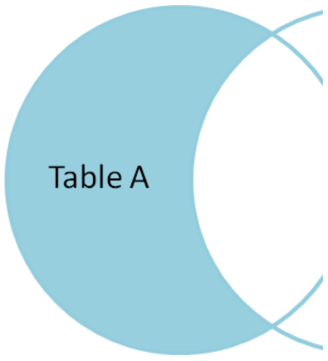
Full outer join produces the set of all records in Table A and Table B, with matching records from both sides where available. If there is no match, the missing side will contain null.

```
SELECT * FROM TableA
LEFT OUTER JOIN TableB
ON TableA.name = TableB.name

id  name       id    name
--  ----       --    ----
1   Pirate     2     Pirate
2   Monkey     null  null
3   Ninja      4     Ninja
4   Spaghetti  null  null
```



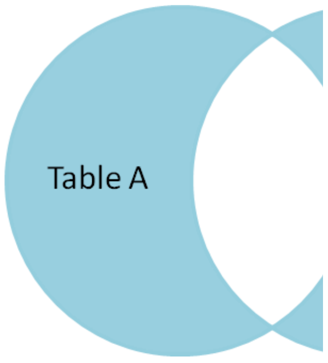
Left outer join produces a complete set of records from Table A, with the matching records (where available) in Table B. If there is no match, the right side will contain null.

```
SELECT * FROM TableA
LEFT OUTER JOIN TableB
ON TableA.name = TableB.name
WHERE TableB.id IS null

id  name       id    name

2   Monkey     null  null

4   Spaghetti  null  null
```



To produce the set of records only in Table A, but not in Table B, we perform the same left outer join, then **exclude the records we don't want from the right side via a where clause**.

```
SELECT * FROM TableA
FULL OUTER JOIN TableB
ON TableA.name = TableB.name
WHERE TableA.id IS null
OR TableB.id IS null

id    name       id    name

2     Monkey     null  null

4     Spaghetti  null  null

null  null       1     Rutabaga

null  null       3     Darth Vader
```



To produce the set of records unique to Table A and Table B, we perform the same full outer join, then **exclude the**

records we don't want from both sides via a where clause.

There's also a cartesian product or **cross join**, which as far as I can tell, can't be expressed as a Venn diagram:

```
SELECT * FROM TableA
CROSS JOIN TableB
```

This joins "everything to everything", resulting in 4 x 4 = 16 rows, far more than we had in the original sets. If you do the math, you can see why this is a *very* dangerous join to run against large tables.

NEXT
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Written by Jeff Atwood

Indoor enthusiast. Co-founder of Stack Overflow and Discourse. Disclaimer: I have no idea what I'm talking about. Find me here: http://twitter.com/codinghorror