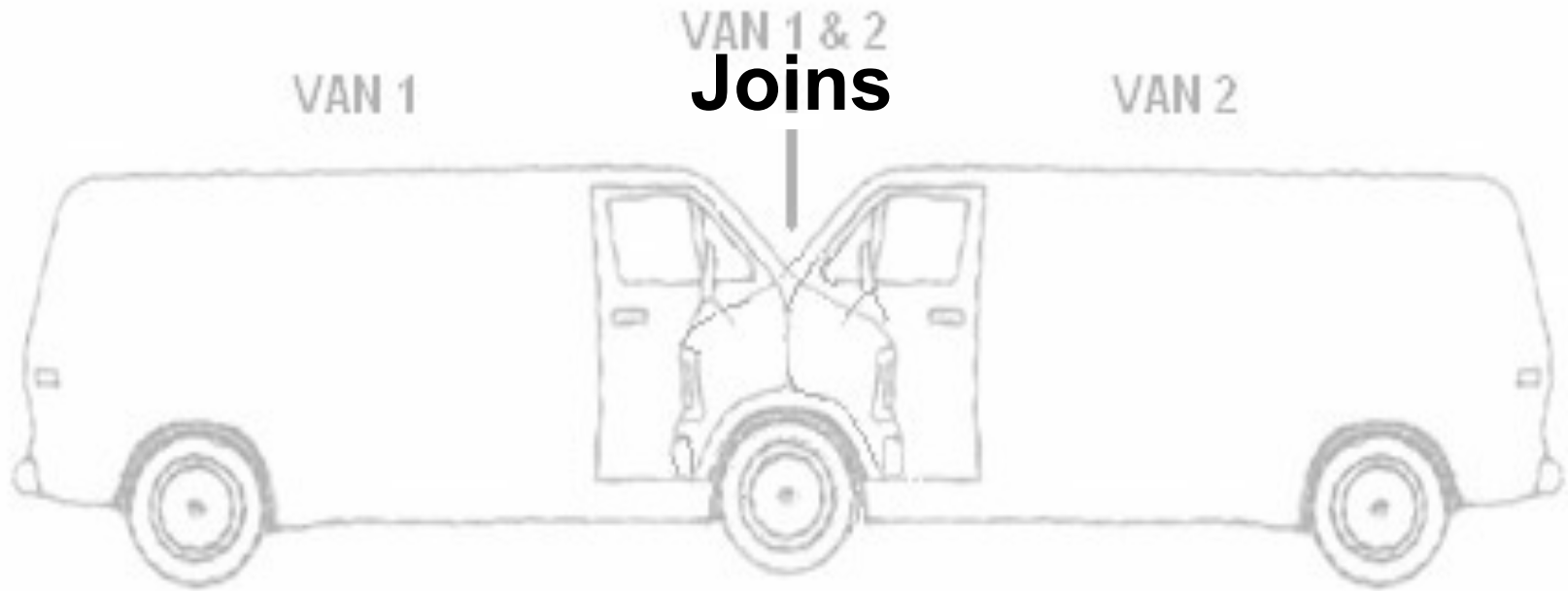


Module 2-3



VAN DIAGRAM

Module 2 Day 3

Can you ... ?

- ... explain Keys (Primary, Natural, Surrogate, Foreign)
- ... explain Cardinality (1-1, 1-N, N-M)
- ... explain and use SQL Joins (INNER AND LEFT JOIN)
- ... explain and use Unions

Keys

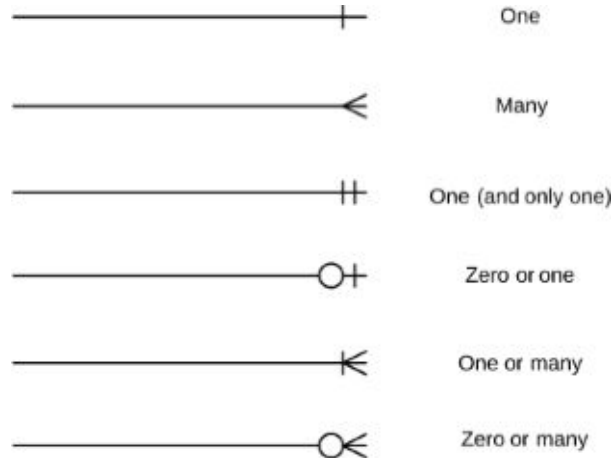
In a relational database, all rows must be unique. The column or combination of columns that make it unique are referred to as **key(s)**.

- **Natural Key:** From real world data, SSN's, customer account numbers, driver license numbers
- **Surrogate Key:** Keys artificially created by an application to make a row unique
- **Primary Key:** column or columns in a table that uniquely identify the row. These cannot be duplicated.
 - If you say that SSN is your key, there cannot be more than one row with the same SSN.
- **Foreign Key:** A key that exists in another table, in which the latter is the primary key.

Cardinality (and Ordinality): The Notation of Relationships

- A **relationship** in a relational database is an association between two tables.
- **Cardinality** refers to the maximum number of times that an instance of one entity can be associated with instances of a related entity
- Cardinality is often combined with **Ordinality**, the minimum number of times it must be associated.

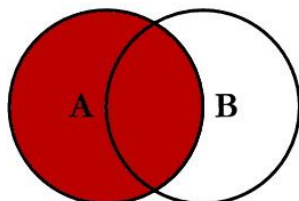
Knowing that a foreign key is used to reference records in another table where the primary key is held, consider the following notation. This is commonly referred to as “Crow’s Foot” notation and is used in **Entity Relationship Diagrams** (ERDs).



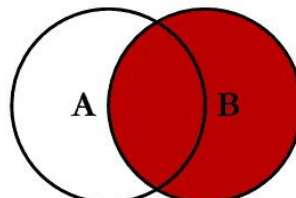
Joins

Joins in SQL allow us to pull in data from several tables.

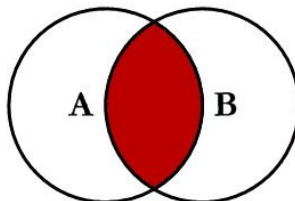
SQL JOINS



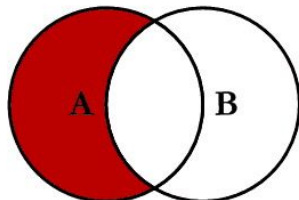
```
SELECT <select_list>  
FROM TableA A  
LEFT JOIN TableB B  
ON A.Key = B.Key
```



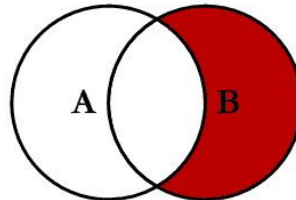
```
SELECT <select_list>  
FROM TableA A  
RIGHT JOIN TableB B  
ON A.Key = B.Key
```



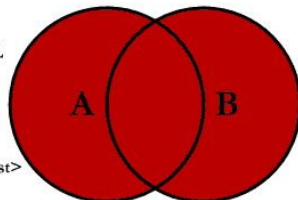
```
SELECT <select_list>  
FROM TableA A  
INNER JOIN TableB B  
ON A.Key = B.Key
```



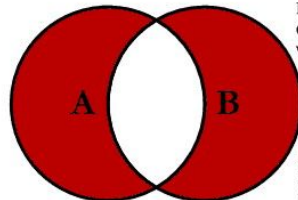
```
SELECT <select_list>  
FROM TableA A  
LEFT JOIN TableB B  
ON A.Key = B.Key  
WHERE B.Key IS NULL
```



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



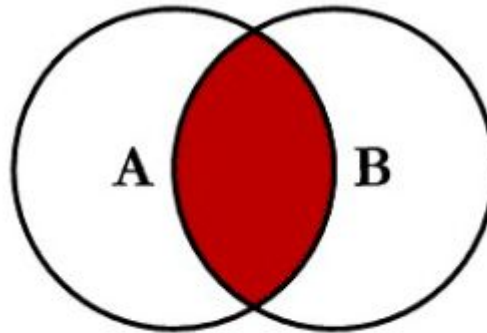
```
SELECT <select_list>  
FROM TableA A  
FULL OUTER JOIN TableB B  
ON A.Key = B.Key
```



```
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
```

Joins : Inner Join

An inner join returns the rows in Table A that has a matching key value in Table B, the Venn Diagram representation is as follows:



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

Joins : Inner Join Example

Consider the following example: **We need a SQL query that returns all the languages spoken in South Africa. In my result, I want to see the full country name (not the code) followed by a language spoken in the country..**

- The countrylanguage table contains the list of languages by country code... but it is missing the full country name.
- The country table contains the list of all countries, but it has no data for languages.
- What we need to do is combine both tables:
 - Fortunately, these two tables are “related” via the country code value. On country, this is called countrycode and on the countrylanguage table this is referred to as code.

Joins : Inner Join Example

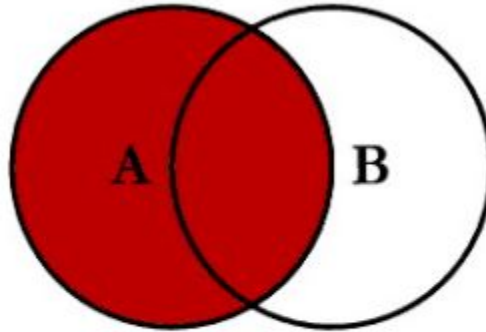
We can combine all of these facts to write a query that combines these two tables:

```
SELECT language  
FROM countrylanguage A  
INNER JOIN country B  
ON A.countrycode = B.code  
WHERE B.name = 'South Africa';
```

*	language
1	Zulu
2	Xhosa
3	Afrikaans
4	Northsotho
5	English
6	Tswana
7	Southsotho
8	Tsonga
9	Swazi
10	Venda
11	Ndebele

Joins : Left Outer Join

The Left Outer Join returns all the rows on the “left” side table of the join, it will attempt to match to the right side. If there is match... If it can't find a match it includes it in the result, but with NULL values.



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

Joins : Left Outer Join Example

For this example, I have manually removed all the rows on the **countrylanguage** table for China and Switzerland.

```
SELECT A.name, B.language  
FROM COUNTRY A  
LEFT OUTER JOIN countrylanguage B  
ON A.code = B.countrycode  
WHERE name IN ('Switzerland', 'China', 'Belize');
```

*	name	language
1	Belize	English
2	Belize	Maya Languages
3	Belize	Garifuna
4	Switzerland	(null)
5	China	(null)

Note that the country codes for China and Switzerland don't exist, so the Left Outer Join instead creates these NULL placeholders.

Joins : Left Outer Join vs Inner Join

With the same data set as the previous slide, let's compare the INNER JOIN vs a LEFT OUTER JOIN.

```
SELECT A.name, B.language
FROM COUNTRY A
INNER JOIN countrylanguage B
ON A.code = B.countrycode
WHERE name IN ('Switzerland', 'China', 'Belize');
```

*	name	language
1	Belize	English
2	Belize	Maya Languages
3	Belize	Garifuna

With the INNER JOIN, the rows with no matches are dropped from the final result set.

```
SELECT A.name, B.language
FROM COUNTRY A
LEFT OUTER JOIN countrylanguage B
ON A.code = B.countrycode
WHERE name IN ('Switzerland', 'China', 'Belize');
```

*	name	language
1	Belize	English
2	Belize	Maya Languages
3	Belize	Garifuna
4	Switzerland	(null)
5	China	(null)

Unions

A UNION join is a combination of two identical result sets.
This is the UNION syntax:

[SQL Query 1]

UNION

[SQL Query 2]

ORDER BY <Column Name(s),...,... >;

Unions Example

Consider the following query:

```
SELECT countrycode, language, percentage FROM countrylanguage where language = 'Danish'  
UNION  
SELECT countrycode, language, percentage FROM countrylanguage where language = 'Swedish'  
ORDER BY countrycode;
```

*	countrycode	language	percentage
1	DNK	Danish	93.5
2	FRO	Danish	0.0
3	NOR	Danish	0.4
4	GRL	Danish	12.5
5	DNK	Swedish	0.3
6	SWE	Swedish	89.5
7	NOR	Swedish	0.3
8	FIN	Swedish	5.7

Result of first query (language = 'Danish')

Result of second query (language = 'Swedish')

Union - Duplicate Behavior & Union All

Suppose we changed the previous to only return the language instead:

```
SELECT language FROM countrylanguage where language = 'Danish'  
UNION  
SELECT language FROM countrylanguage where language = 'Swedish'  
ORDER BY language
```



	language
1	Danish
2	Swedish

Note that the query only returns the unique values associated with countrylanguage

Union All

In situations like this, we can override this behavior by specifying UNION ALL instead:

```
SELECT language FROM countrylanguage where language = 'Danish'  
UNION ALL  
SELECT language FROM countrylanguage where language = 'Swedish'  
ORDER BY language
```

*	language
1	Danish
2	Danish
3	Danish
4	Danish
5	Swedish
6	Swedish
7	Swedish
8	Swedish

Duplicates are now included in the result set