



Funny otter memes



 AnimalSpot.net

 MyAnimalSpot

 AnimalSpotNet

Module 2-3

Joins

Objectives

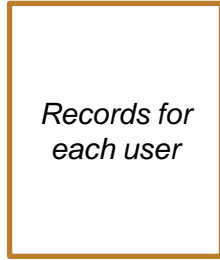
- Keys (Primary, Natural, Surrogate, Foreign)
- Cardinality (1-1, 1-M, M-M)
- SQL Joins (Inner and Left Join)
- Unions
- Create a new database (MovieDB)

Create the MovieDB and insert some data

```
/usr/bin/bash --login -i
✓ ~/workspace/NLR-3/te-curriculum/module-2/03_Joins/lecture-student/postgres [release_v2_4|
17:08 $ winpty createdb -U postgres MovieDB
Password:
✓ ~/workspace/NLR-3/te-curriculum/module-2/03_Joins/lecture-student/postgres [release_v2_4|
+ 2]
17:08 $ psql -U postgres -d MovieDB -f MovieDB-data.psql |
```

Amazon Scenario

Users table



Shipping_Addresses table



Products table



Purchases table



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

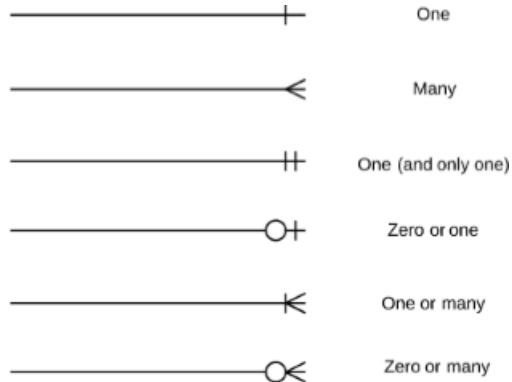
Keys

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)**.

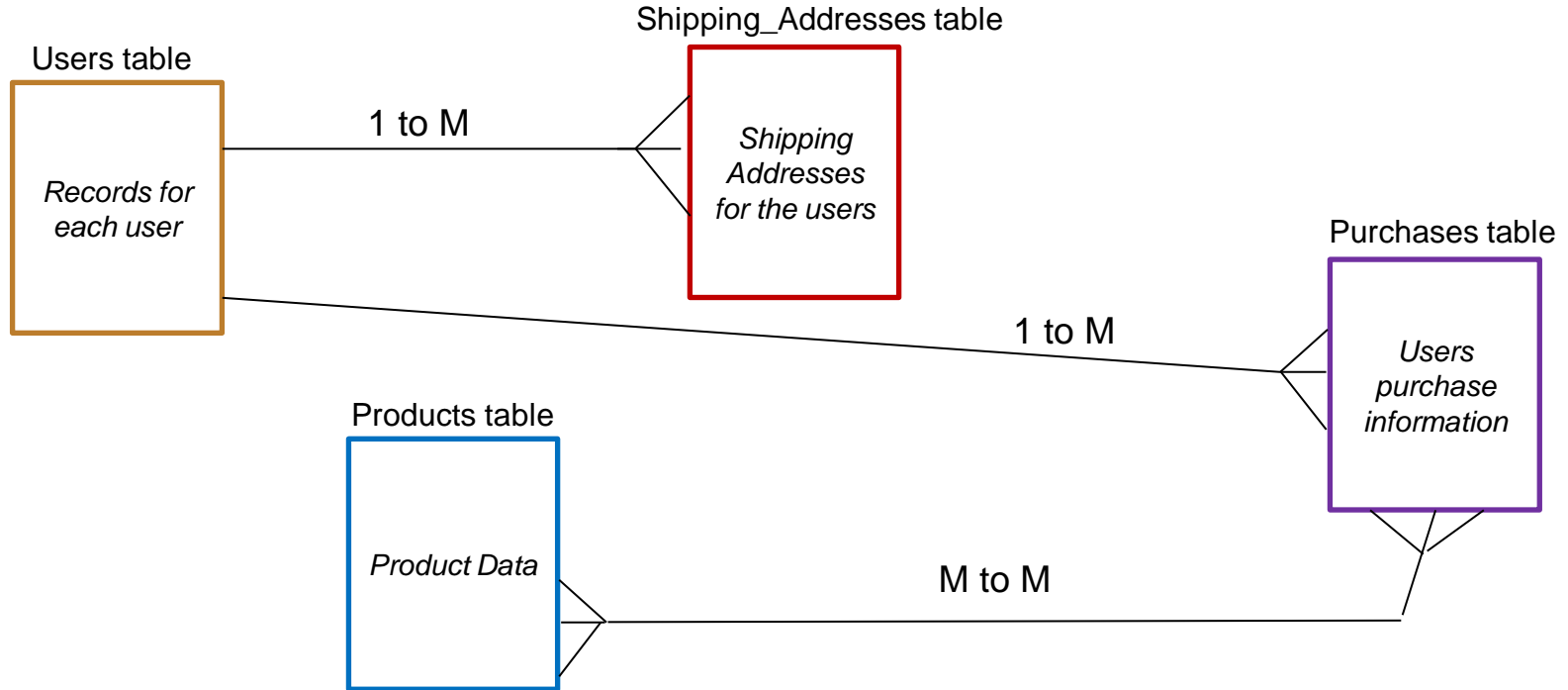
- **Primary Key:** column or columns in a table that uniquely identify the row. These cannot be duplicated.
 - If you say that SSN is your key, there cannot be more than one row with the same SSN.
- **Foreign Key:** A key that exists in another table, in which the latter is the primary key.

Cardinality

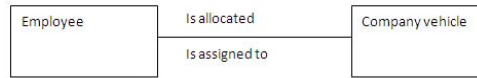
- Describes relationship between two tables
- Relationship between a row in one table and a row of another table.
- Options are one or many
- 1 to 1, 1 to M, M to M



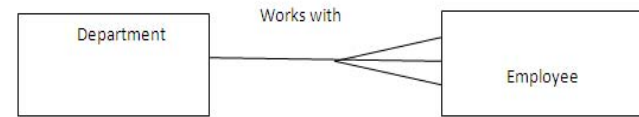
Amazon Scenario



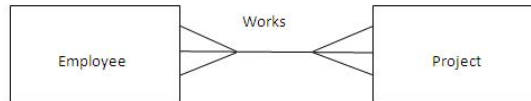
Other examples



a one-to-one relationship



a one-to-many relationship

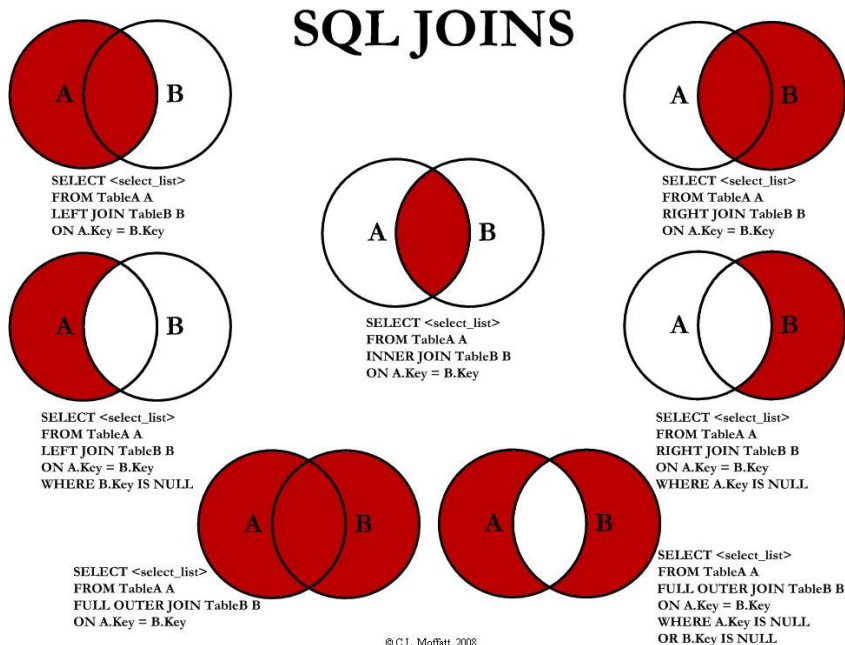


a many-to-many relationship

Joins

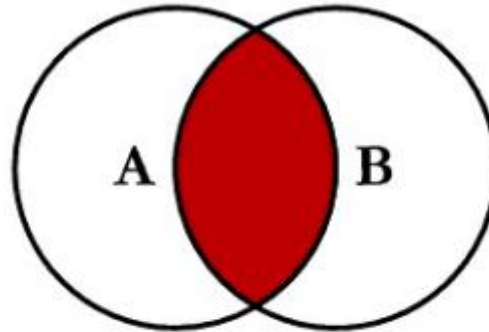
Joins in SQL allow us to pull in data from several tables.

A JOIN is an INNER JOIN



Joins : Inner Join or 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.

*	countrycode	language	isofficial	percentage
1	AFG	Pashto	true	52.4
2	NLD	Dutch	true	95.6
3	ANT	Papiamentu	true	86.2
4	ALB	Albaniana	true	97.9
5	DZA	Arabic	true	86.0
6	ASM	Samoan	true	90.6
7	AND	Spanish	false	44.6
8	AGO	Ovimbundu	false	37.2

*	code	name	continent	region	surfacearea	indepyear	population	li
1	AFG	Afghanistan	Asia	Southern and Central Asia	652090.0	1919	22720000	
2	NLD	Netherlands	Europe	Western Europe	41526.0	1581	15864000	
3	ANT	Netherlands Antilles	North America	Caribbean	800.0	(null)	217000	
4	ALB	Albania	Europe	Southern Europe	28748.0	1912	3401200	
5	DZA	Algeria	Africa	Northern Africa	2381741.0	1962	31471000	


- 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 code and on the countrylanguage table this is referred to as countrycode.


Joins : Inner Join Example

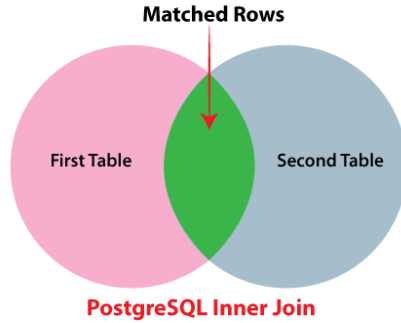
We can combine all of these facts to write a query that combines these two tables:

```
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

luxury_cars	
 l_id	INTEGER
luxury_car_names	CHARACTER VARYING(250)

sports_cars	
 s_id	INTEGER
sports_car_names	CHARACTER VARYING(250)



```

4
5 SELECT L_ID, luxury_car_names, S_ID, sports_car_names
6 FROM Luxury_cars
7 INNER JOIN Sports_cars
8 ON luxury_car_names= sports_car_names;
9
a

```

```

24
25 SELECT L_ID, luxury_car_names, S_ID, sports_car_names
26 FROM Luxury_cars
27 JOIN Sports_cars
28 ON luxury_car_names= sports_car_names;
29
30
31

```

31:1 [712] INS

Log

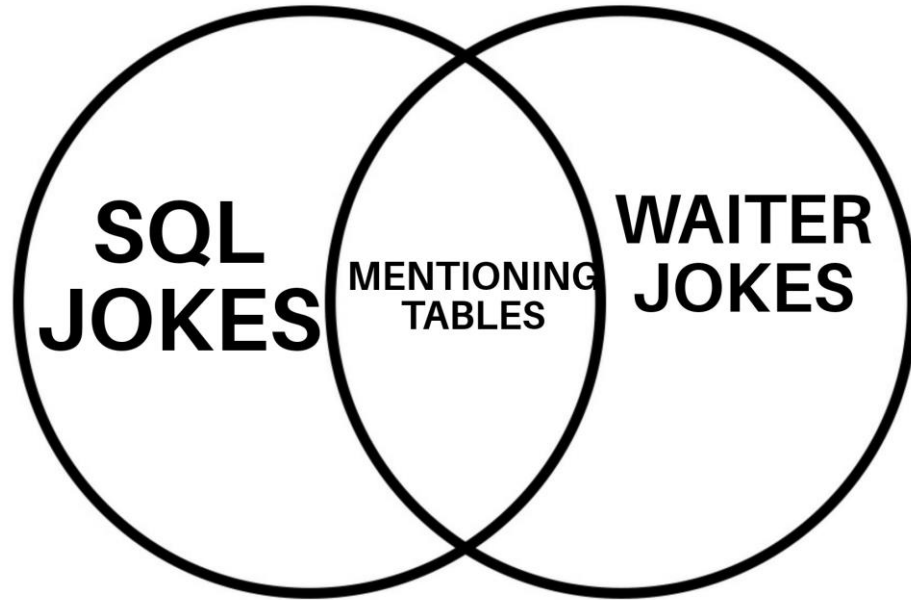
1: Luxury_cars [2] x

Log

* l_id	luxury_car_names	s_id	sports_car_names
1	1 Chevrolet Corvette	3	3 Chevrolet Corvette
2	2 Mercedes Benz SL Class	4	4 Mercedes Benz SL Class

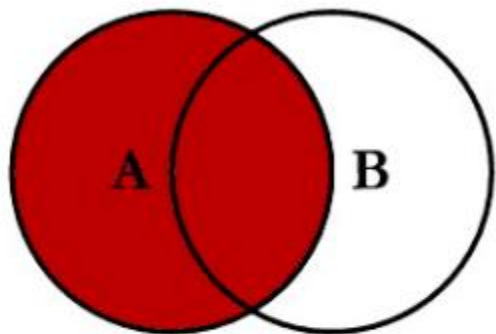
<https://www.javatpoint.com/postgresql-join>

Let's write some inner join queries!



Joins : Left Outer Join (can also be called Left 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

```
SELECT A.name, B.language  
FROM COUNTRY A  
LEFT 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 Join vs Inner Join

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


```
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

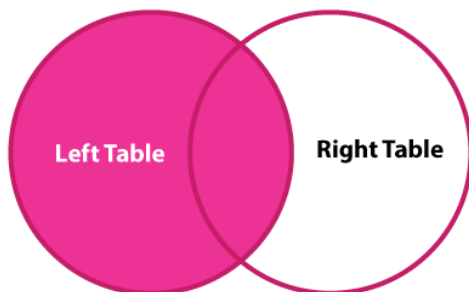
With the INNER JOIN, the rows for which there are no matches on the key are dropped from the final result set.

```
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
	Switzerland	(null)
	China	(null)

luxury_cars	
 l_id	INTEGER
luxury_car_names	CHARACTER VARYING(250)

sports_cars	
 s_id	INTEGER
sports_car_names	CHARACTER VARYING(250)



PostgreSQL Left Join

```

31
32 SELECT L_ID, luxury_car_names, S_ID, sports_car_names
33 FROM Luxury_cars
34 LEFT OUTER JOIN Sports_cars
35 ON luxury_car_names= sports_car_names;
36
37

```

```

30
31
32 SELECT L_ID, luxury_car_names, S_ID, sports_car_names
33 FROM Luxury_cars
34 LEFT JOIN Sports_cars
35 ON luxury_car_names= sports_car_names;
36
37

```


15:36 [853] INS


Log 1: Luxury_cars [5] ×



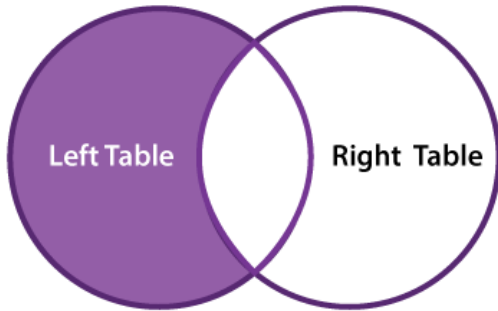
* l_id	luxury_car_names	s_id	sports_car_names
1	1 Chevrolet Corvette	3	3 Chevrolet Corvette
2	2 Mercedes Benz SL Class	4	4 Mercedes Benz SL Class
3	3 Audi A7	(null)	(null)
4	4 Genesis G90	(null)	(null)
5	5 Lincoln Continental	(null)	(null)

<https://www.javatpoint.com/postgresql-join>

luxury_cars	
 l_id	INTEGER
luxury_car_names	CHARACTER VARYING(250)

sports_cars	
 s_id	INTEGER
sports_car_names	CHARACTER VARYING(250)

**Left Outer Join: Select
Rows From the Left table**



```

45
46 SELECT L_ID, luxury_car_names, S_ID, sports_car_names
47 FROM Luxury_cars
48 LEFT JOIN Sports_cars
49 ON luxury_car_names= sports_car_names
50 WHERE S_ID IS NULL;

```

50:22 [1191] INS

Log 1: Luxury_cars [3] ×

* l_id	luxury_car_names	s_id	sports_car_names
1	3 Audi A7	(null)	(null)
2	4 Genesis G90	(null)	(null)
3	5 Lincoln Continental	(null)	(null)

<https://www.javatpoint.com/postgresql-join>

Let's write some left join queries!



Unions

A union is a combination of two result sets. The following pattern is used:

[SQL Query 1]

UNION

[SQL Query 2]

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

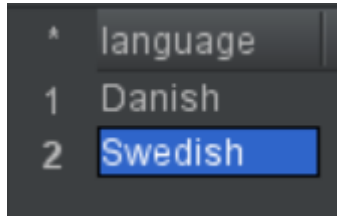
Result of query first query
(language = 'Danish')

Result of query second query
(language = 'Swedish')

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 not taken into account.

most_reliable_cars	
car_name	CHARACTER VARYING
launch_year	SMALLINT

top_rated_cars	
car_name	CHARACTER VARYING
launch_year	SMALLINT

```
81
82 SELECT * FROM top_rated_cars;
```

82:30 [1763] INS

Log 1: top_rated_cars [3] ×

	car_name	launch_year
1	Chevrolet Silveradon	2020
2	Nissan Rogue	2020
3	Mercedes-Benz GLB	2019

```
83
84 SELECT * FROM most_reliable_cars;
```

84:34 [1798] INS

Log 1: most_reliable_cars [3] ×

	car_name	launch_year
1	Toyota Prius Prime	2020
2	Nissan Rogue	2020
3	Kia Forte	2019

```
86
87 SELECT * FROM top_rated_cars
88 UNION
89 SELECT * FROM most_reliable_cars;
```

89:36 [1875] INS

Log 1: top_rated_cars [5] ×

	car_name	launch_year
1	Chevrolet Silveradon	2020
2	Mercedes-Benz GLB	2019
3	Nissan Rogue	2020
4	Toyota Prius Prime	2020
5	Kia Forte	2019

```
91
92 SELECT * FROM top_rated_cars
93 UNION ALL
94 SELECT * FROM most_reliable_cars;
```

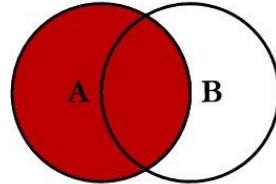
94:36 [1956] INS

Log 1: top_rated_cars [6] ×

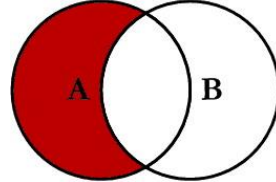
	car_name	launch_year
1	Chevrolet Silveradon	2020
2	Nissan Rogue	2020
3	Mercedes-Benz GLB	2019
4	Toyota Prius Prime	2020
5	Nissan Rogue	2020
6	Kia Forte	2019

Joins

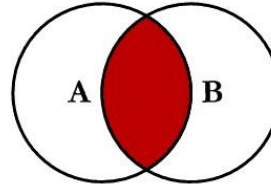
SQL JOINS



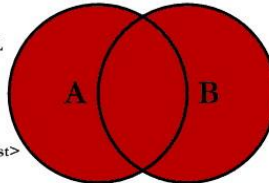
```
SELECT <select_list>  
FROM TableA A  
LEFT JOIN TableB B  
ON A.Key = B.Key
```



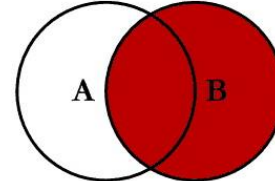
```
SELECT <select_list>  
FROM TableA A  
LEFT JOIN TableB B  
ON A.Key = B.Key  
WHERE B.Key IS NULL
```



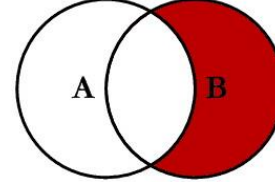
```
SELECT <select_list>  
FROM TableA A  
INNER JOIN TableB B  
ON A.Key = B.Key
```



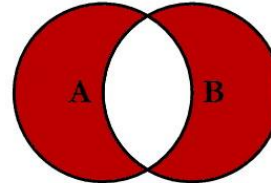
```
SELECT <select_list>  
FROM TableA A  
FULL OUTER JOIN TableB B  
ON A.Key = B.Key
```



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



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



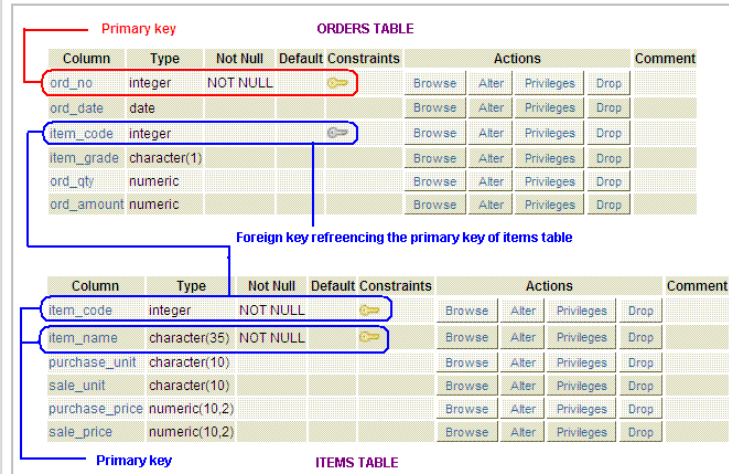
```
SELECT <select_list>  
FROM TableA A  
FULL OUTER JOIN TableB B  
ON A.Key = B.Key  
WHERE A.Key IS NULL  
OR B.Key IS NULL
```

© C.L. Moffatt, 2008

Objectives

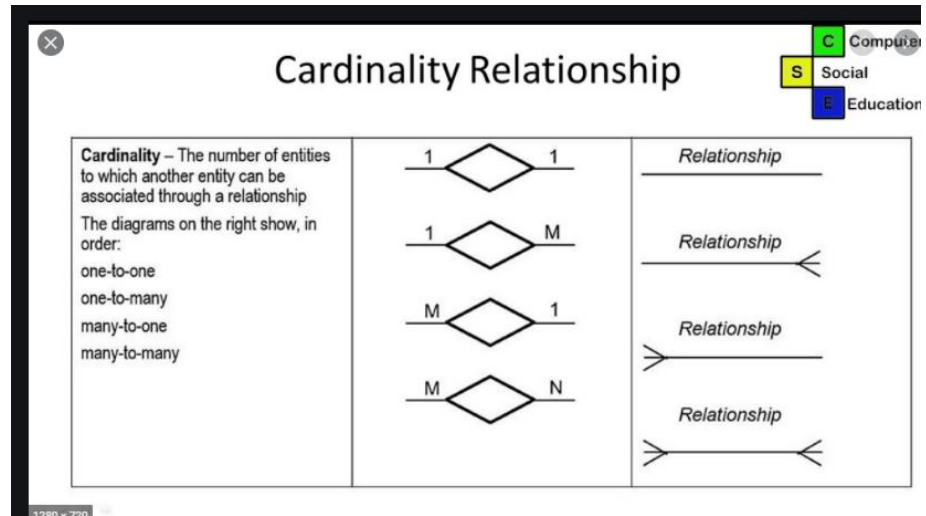
- Keys (Primary, Natural, Surrogate, Foreign)

Pictorial representation of FOREIGN KEY constraint



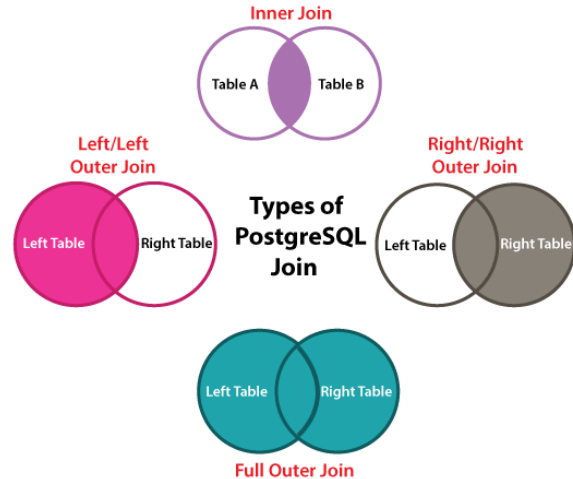
Objectives

- Keys (Primary, Natural, Surrogate, Foreign)
- Cardinality (1-1, 1-M, M-M)



Objectives

- Keys (Primary, Natural, Surrogate, Foreign)
- Cardinality (1-1, 1-M, M-M)
- SQL Joins



Objectives

- Keys (Primary, Natural, Surrogate)
- Cardinality (1-1, 1-M, M-M)
- SQL Joins
- Unions

We have a database named Demo with the following tables:

Book:

```
Demo=# select * from book;
 id |      name
----+-----
 1  | PostgreSQL for Beginners
 2  | PostgreSQL, A Step-by-Step Guide
 3  | PostgreSQL for Advanced Users
 4  | Learn PostgreSQL in 7 Days
 5  | PostgreSQL Made Easy
(5 rows)
```

Price:

```
Demo=# SELECT * FROM Price;
 id | price
----+-----
 1  | 200
 2  | 250
 3  | 220
 4  | 190
 5  | 300
(5 rows)
```

Let us run the following command:

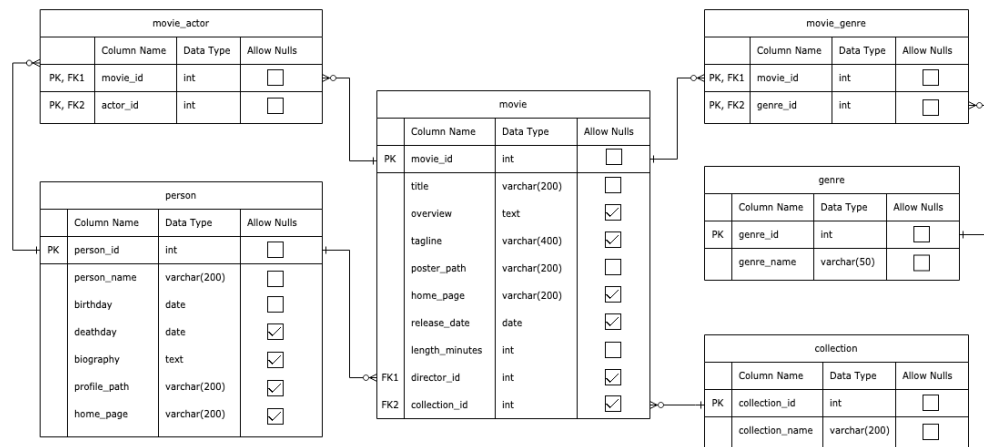
```
SELECT id
FROM Book
UNION
SELECT id
FROM Price;
```

The command will return the following:

```
Demo=# SELECT id
Demo=# FROM Book
Demo=# UNION
Demo=# SELECT id
Demo=# FROM Price;
 id
--
 2
 5
 4
 3
 1
(5 rows)
```


Objectives

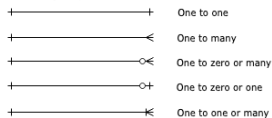
- Keys (Primary, Natural, Surrogate, Foreign)
- Cardinality (1-1, 1-M, M-M)
- SQL Joins
- Unions
- Create a new Database



Key

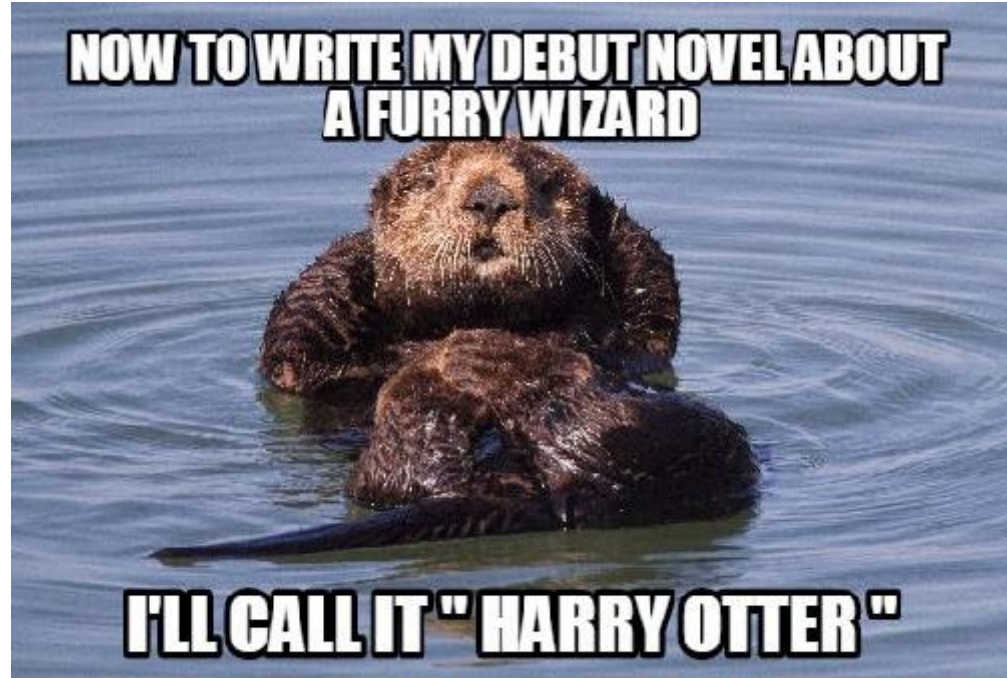
PK primary key

FK foreign key



This diagram was made with draw.io, a free-to-use online diagram app and editor.

Let's write some unions!



AnimalSpot.net



MyAnimalSpot



AnimalSpotNet