Welcome to the course!

JOINING DATA IN SQL

Chester Ismay
Data Science Evangelist, DataRobot

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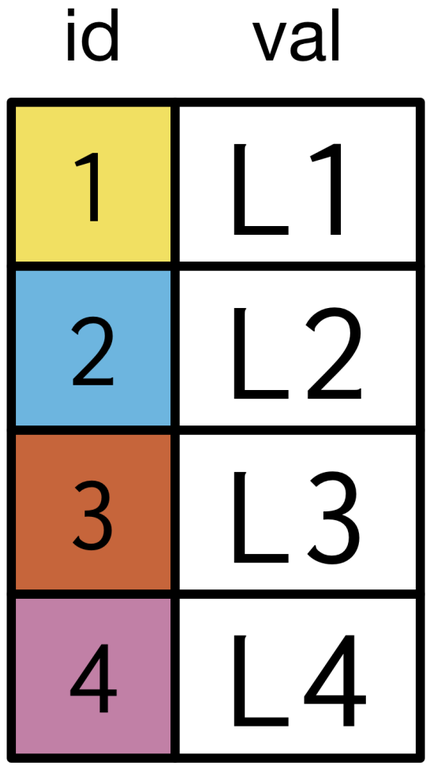
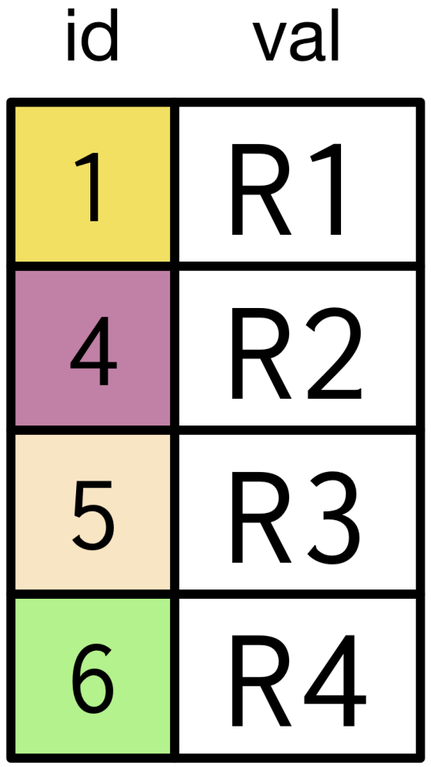
`left_table`



id	val
1	L1
2	L2
3	L3
4	L4

`right_table`



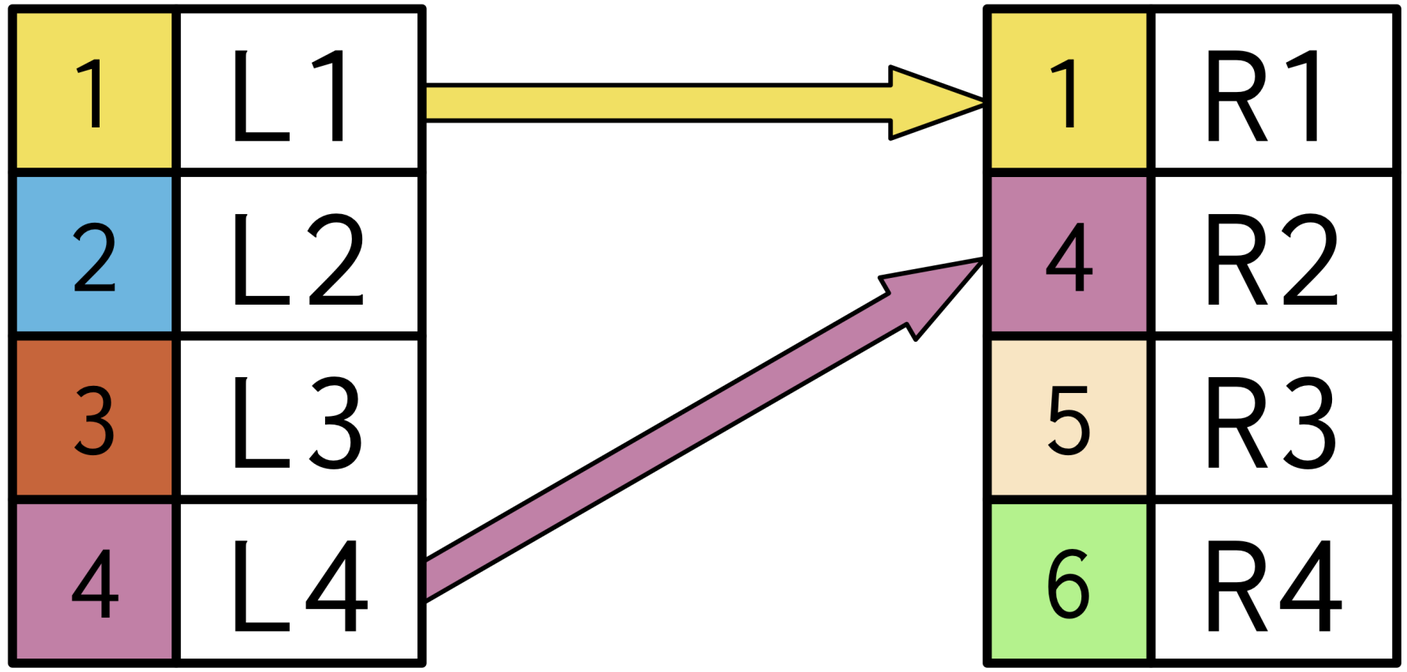
id	val
1	R1
4	R2
5	R3
6	R4

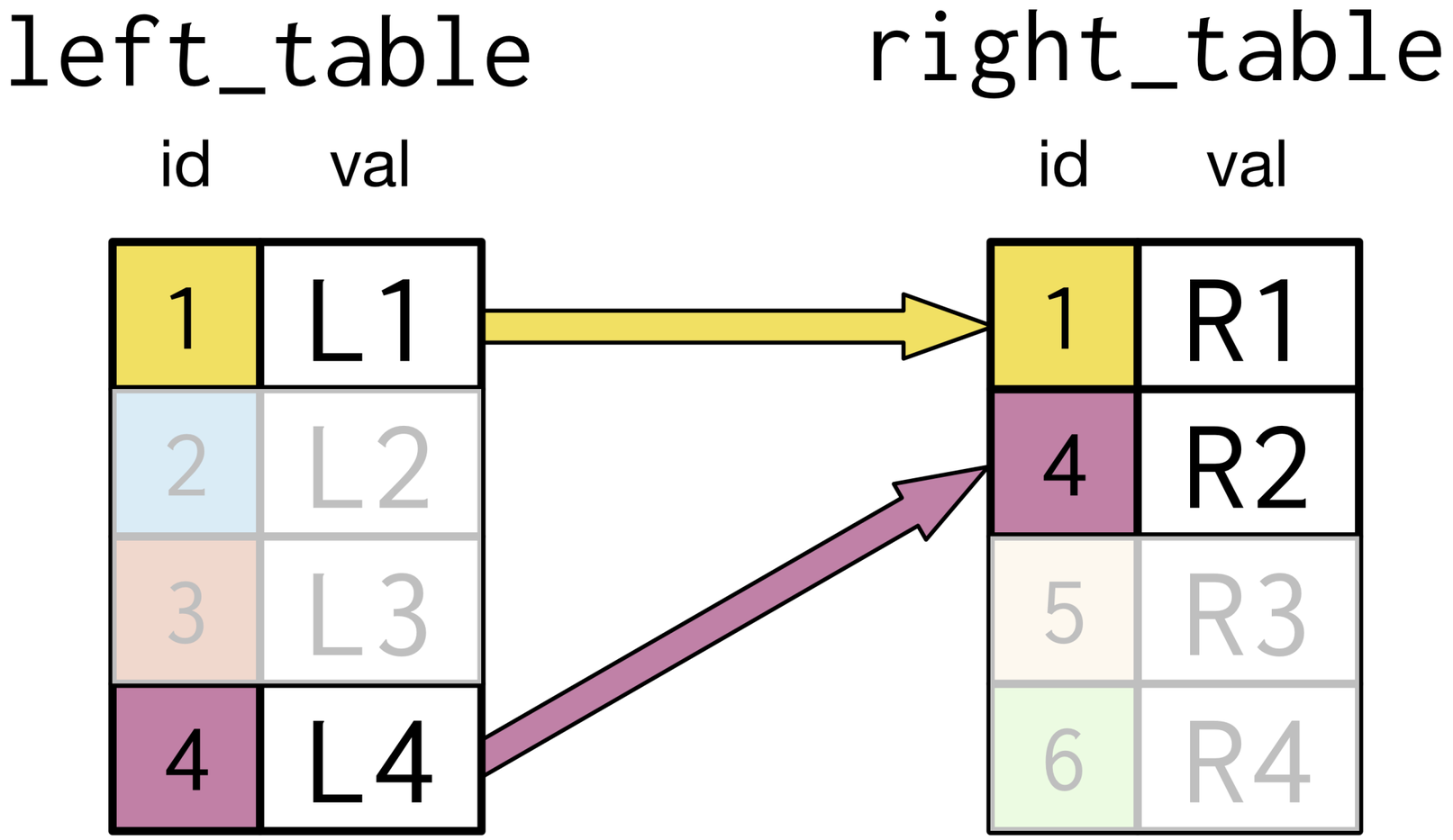
left_table

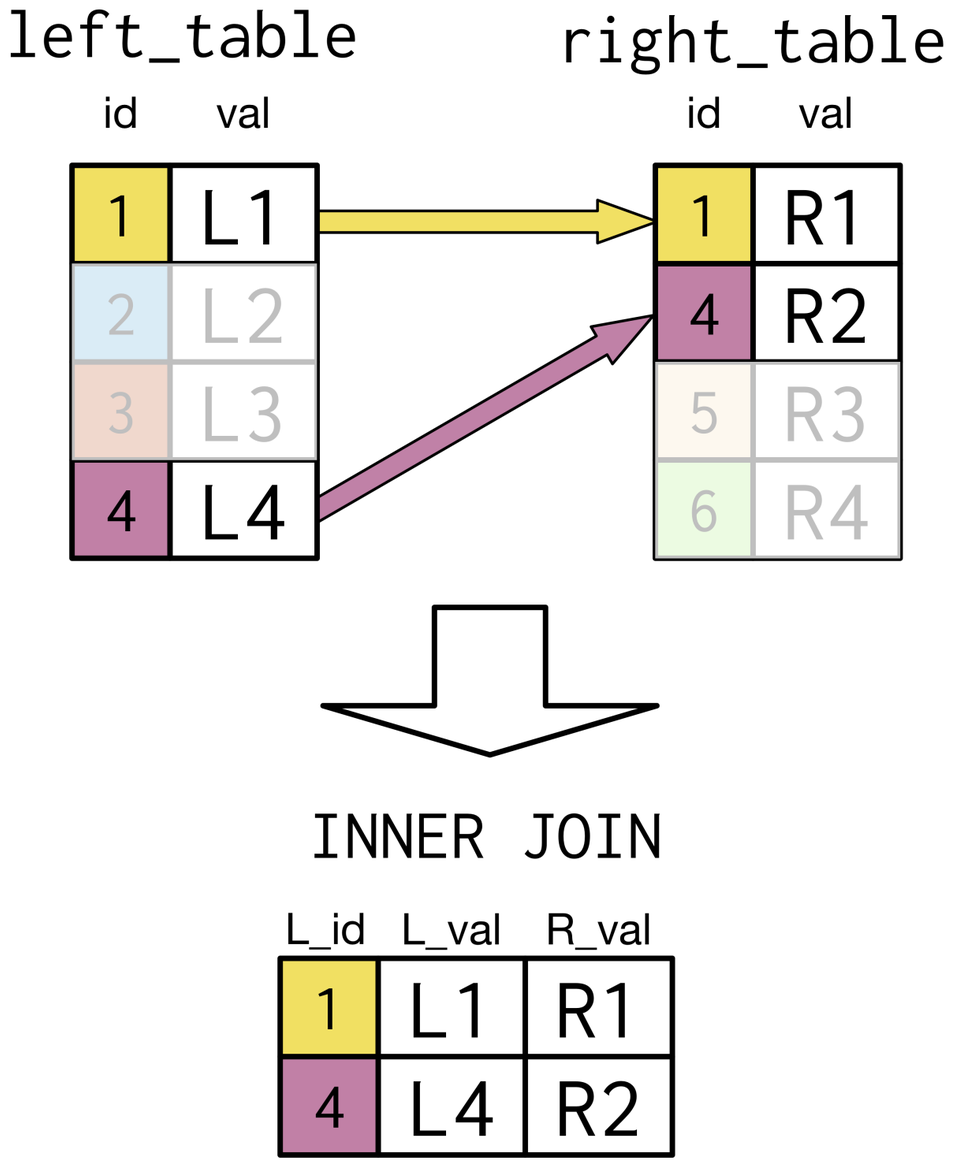
id	val
1	L1
2	L2
3	L3
4	L4

right_table

id	val
1	R1
4	R2
5	R3
6	R4




left_table
id
val
1
L1
2
L2
3
L3
4
L4
right_table
id
val
1
R1
4
R2
5
R3
6
R4


left_table
id
val
1
L1
2
L2
3
L3
4
L4
right_table
id
val
1
R1
4
R2
5
R3
6
R4
INNER JOIN
L_id
L_val
R_val
1
L1
R1
4
L4
R2

prime_ministers table

country	continent	prime_minister
Egypt	Africa	Sherif Ismail
Portugal	Europe	Antonio Costa
Vietnam	Asia	Nguyen Xuan Phuc
Haiti	North America	Jack Guy Lafontant
India	Asia	Narendra Modi
Australia	Oceania	Malcolm Turnbull
Norway	Europe	Erna Solberg
Brunei	Asia	Hassanal Bolkiah
Oman	Asia	Qaboos bin Said al Said
Spain	Europe	Mariano Rajoy

presidents table

```
SELECT *
FROM presidents;
```

```
+-----------+---------------+-------------------------+
| country   | continent     | president               |
|-----------+---------------+-------------------------|
| Egypt     | Africa        | Abdel Fattah el-Sisi    |
| Portugal  | Europe        | Marcelo Rebelo de Sousa |
| Haiti     | North America | Jovenel Moise           |
| Uruguay   | South America | Jose Mujica             |
| Liberia   | Africa        | Ellen Johnson Sirleaf   |
| Chile     | South America | Michelle Bachelet       |
| Vietnam   | Asia          | Tran Dai Quang          |
+-----------+---------------+-------------------------+
```

INNER JOIN in SQL

```
SELECT p1.country, p1.continent,
       prime_minister, president
FROM prime_ministers AS p1
INNER JOIN presidents AS p2
ON p1.country = p2.country;
```

```
+-----------+---------------+--------------------+-------------------------+
| country   | continent     | prime_minister     | president               |
|-----------+---------------+--------------------+-------------------------|
| Egypt     | Africa        | Sherif Ismail      | Abdel Fattah el-Sisi    |
| Portugal  | Europe        | Antonio Costa      | Marcelo Rebelo de Sousa |
| Vietnam   | Asia          | Nguyen Xuan Phuc   | Tran Dai Quang          |
| Haiti     | North America | Jack Guy Lafontant | Jovenel Moise           |
+-----------+---------------+--------------------+-------------------------+
```

Let's practice!

JOINING DATA IN SQL

INNER JOIN via USING

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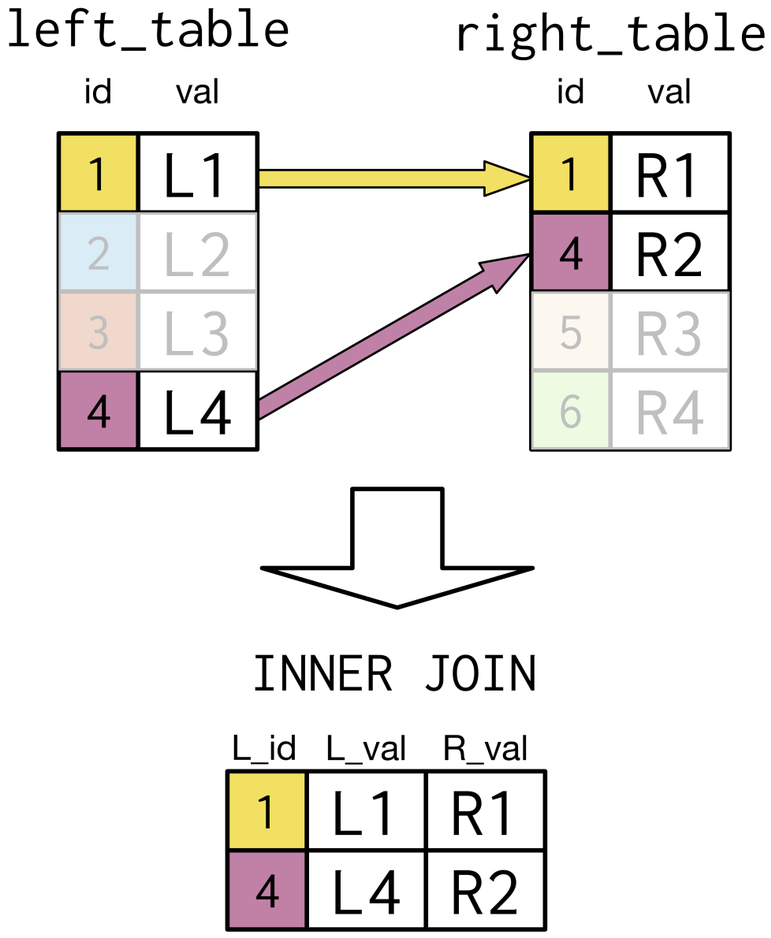
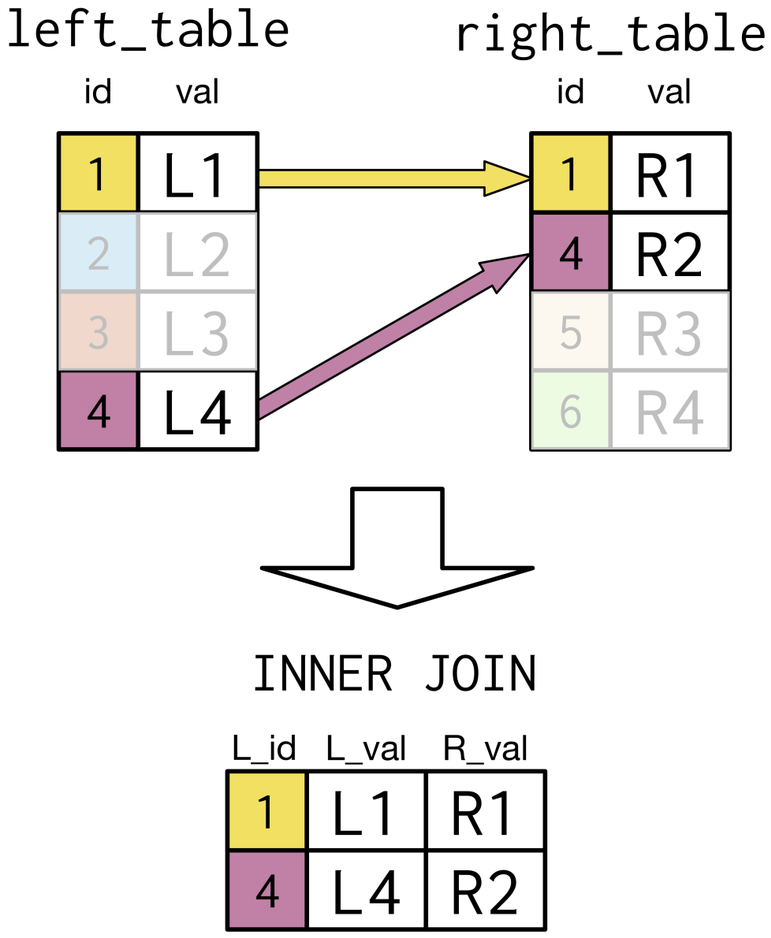
The INNER JOIN diagram again




```
SELECT left_table.id AS L_id,
       left_table.val AS L_val,
       right_table.val AS R_val
FROM left_table
INNER JOIN right_table
ON left_table.id = right_table.id;
```

The INNER JOIN diagram with USING




```
SELECT left_table.id AS L_id,
       left_table.val AS L_val,
       right_table.val AS R_val
FROM left_table
INNER JOIN right_table
USING (id);
```

Countries with prime ministers and presidents

```
SELECT p1.country, p1.continent, prime_minister, president
FROM ___ AS p1
INNER JOIN ___ AS p2
___ (___);
```

One answer:

```
SELECT p1.country, p1.continent, prime_minister, president
FROM presidents AS p1
INNER JOIN prime_ministers AS p2
USING (country);
```

```
+-----------+---------------+--------------------+-------------------------+
| country   | continent     | prime_minister     | president               |
|-----------+---------------+--------------------+-------------------------|
| Egypt     | Africa        | Sherif Ismail      | Abdel Fattah el-Sisi    |
| Portugal  | Europe        | Antonio Costa      | Marcelo Rebelo de Sousa |
| Vietnam   | Asia          | Nguyen Xuan Phuc   | Tran Dai Quang          |
| Haiti     | North America | Jack Guy Lafontant | Jovenel Moise           |
+-----------+---------------+--------------------+-------------------------+
```

Let's practice!

JOINING DATA IN SQL

Self-ish joins, just in CASE

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Join a table to itself?

country	continent	prime_minister
Egypt	Africa	Sherif Ismail
Portugal	Europe	Antonio Costa
Vietnam	Asia	Nguyen Xuan Phuc
Haiti	North America	Jack Guy Lafontant
India	Asia	Narendra Modi
Australia	Oceania	Malcolm Turnbull
Norway	Europe	Erna Solberg
Brunei	Asia	Hassanal Bolkiah
Oman	Asia	Qaboos bin Said al Said
Spain	Europe	Mariano Rajoy

Join prime_ministers to itself?

```
SELECT p1.country AS country1, p2.country AS country2, p1.continent
FROM prime_ministers AS p1
INNER JOIN prime_ministers AS p2
ON p1.continent = p2.continent
LIMIT 14;
```

```
+------------+------------+---------------+
| country1   | country2   | continent     |
|------------+------------+---------------|
| Egypt      | Egypt      | Africa        |
| Portugal   | Spain      | Europe        |
| Portugal   | Norway     | Europe        |
| Portugal   | Portugal   | Europe        |
| Vietnam    | Oman       | Asia          |
| Vietnam    | Brunei     | Asia          |
| Vietnam    | India      | Asia          |
| Vietnam    | Vietnam    | Asia          |
| Haiti      | Haiti      | North America |
| India      | Oman       | Asia          |
| India      | Brunei     | Asia          |
| India      | India      | Asia          |
| India      | Vietnam    | Asia          |
| Australia  | Australia  | Oceania       |
+------------+------------+---------------+
```

Finishing off the self-join on prime_ministers

```
SELECT p1.country AS country1, p2.country AS country2, p1.continent
FROM prime_ministers AS p1
INNER JOIN prime_ministers AS p2
ON p1.continent = p2.continent AND p1.country <> p2.country
LIMIT 13;
```

```
+------------+------------+-------------+
| country1   | country2   | continent   |
|------------+------------+-------------|
| Portugal   | Spain      | Europe      |
| Portugal   | Norway     | Europe      |
| Vietnam    | Oman       | Asia        |
| Vietnam    | Brunei     | Asia        |
| Vietnam    | India      | Asia        |
| India      | Oman       | Asia        |
| India      | Brunei     | Asia        |
| India      | Vietnam    | Asia        |
| Norway     | Spain      | Europe      |
| Norway     | Portugal   | Europe      |
| Brunei     | Oman       | Asia        |
| Brunei     | India      | Asia        |
| Brunei     | Vietnam    | Asia        |
+------------+------------+-------------+
```

CASE WHEN and THEN

name	continent	indep_year
Australia	Oceania	1901
Brunei	Asia	1984
Chile	South America	1810
Egypt	Africa	1922
Haiti	North America	1804
India	Asia	1947
Liberia	Africa	1847
Norway	Europe	1905
Oman	Asia	1951
Portugal	Europe	1143
Spain	Europe	1492
Uruguay	South America	1828
Vietnam	Asia	1945

Preparing indep_year_group in states

```
SELECT name, continent, indep_year,
    CASE WHEN ___ < ___  THEN 'before 1900'
         WHEN indep_year <= 1930 THEN '___'
         ELSE '___' END
         AS indep_year_group
FROM states
ORDER BY indep_year_group;
```

Creating indep_year_group in states

```
SELECT name, continent, indep_year,
    CASE WHEN indep_year < 1900 THEN 'before 1900'
         WHEN indep_year <= 1930 THEN 'between 1900 and 1930'
         ELSE 'after 1930' END
         AS indep_year_group
FROM states
ORDER BY indep_year_group;
```

```
+-----------+---------------+--------------+-----------------------+
| name      | continent     |   indep_year | indep_year_group      |
|-----------+---------------+--------------+-----------------------|
| Brunei    | Asia          |         1984 | after 1930            |
| India     | Asia          |         1947 | after 1930            |
| Oman      | Asia          |         1951 | after 1930            |
| Vietnam   | Asia          |         1945 | after 1930            |
| Liberia   | Africa        |         1847 | before 1900           |
| Chile     | South America |         1810 | before 1900           |
| Haiti     | North America |         1804 | before 1900           |
| Portugal  | Europe        |         1143 | before 1900           |
| Spain     | Europe        |         1492 | before 1900           |
| Uruguay   | South America |         1828 | before 1900           |
| Norway    | Europe        |         1905 | between 1900 and 1930 |
| Australia | Oceania       |         1901 | between 1900 and 1930 |
| Egypt     | Africa        |         1922 | between 1900 and 1930 |
+-----------+---------------+--------------+-----------------------+
```

Let's practice!

JOINING DATA IN SQL

LEFT and RIGHT JOINs

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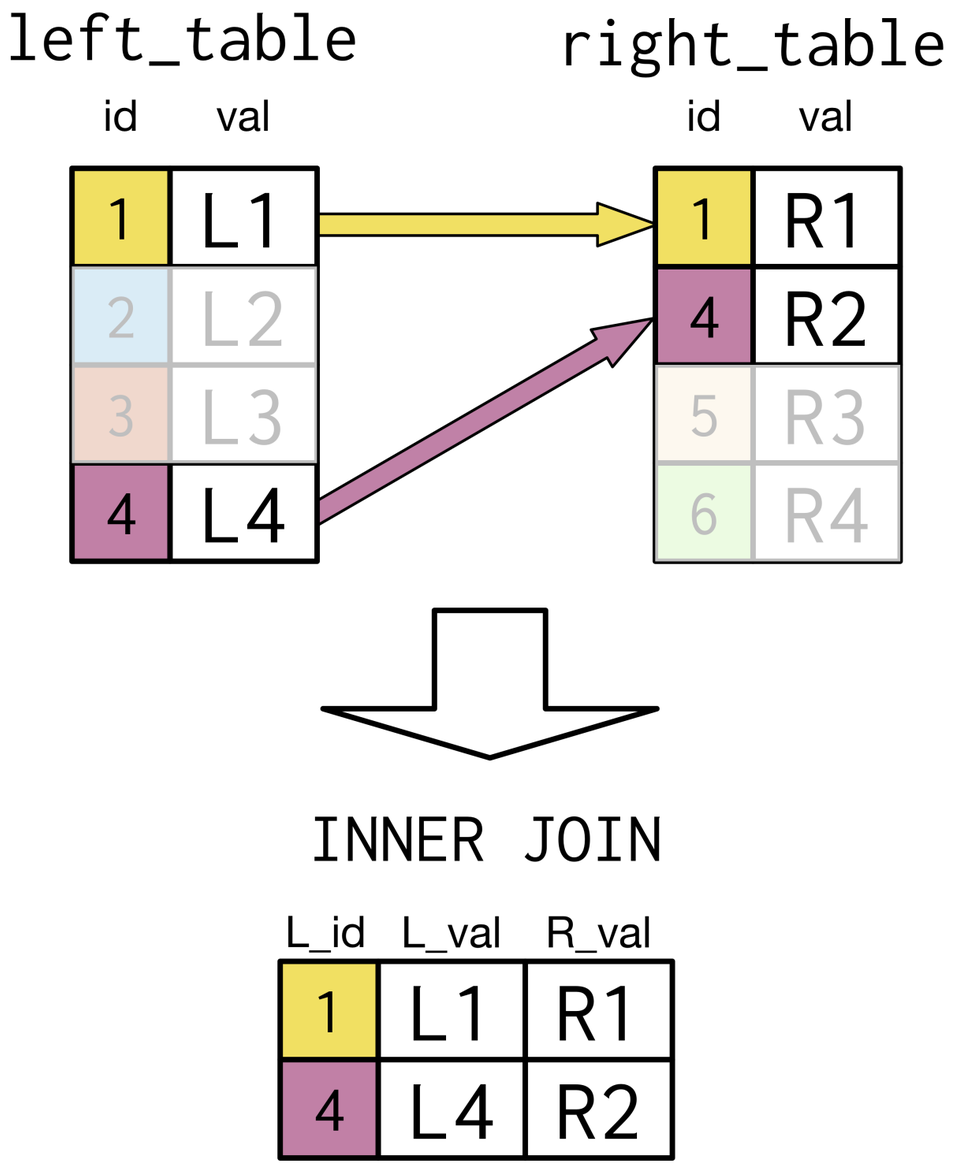
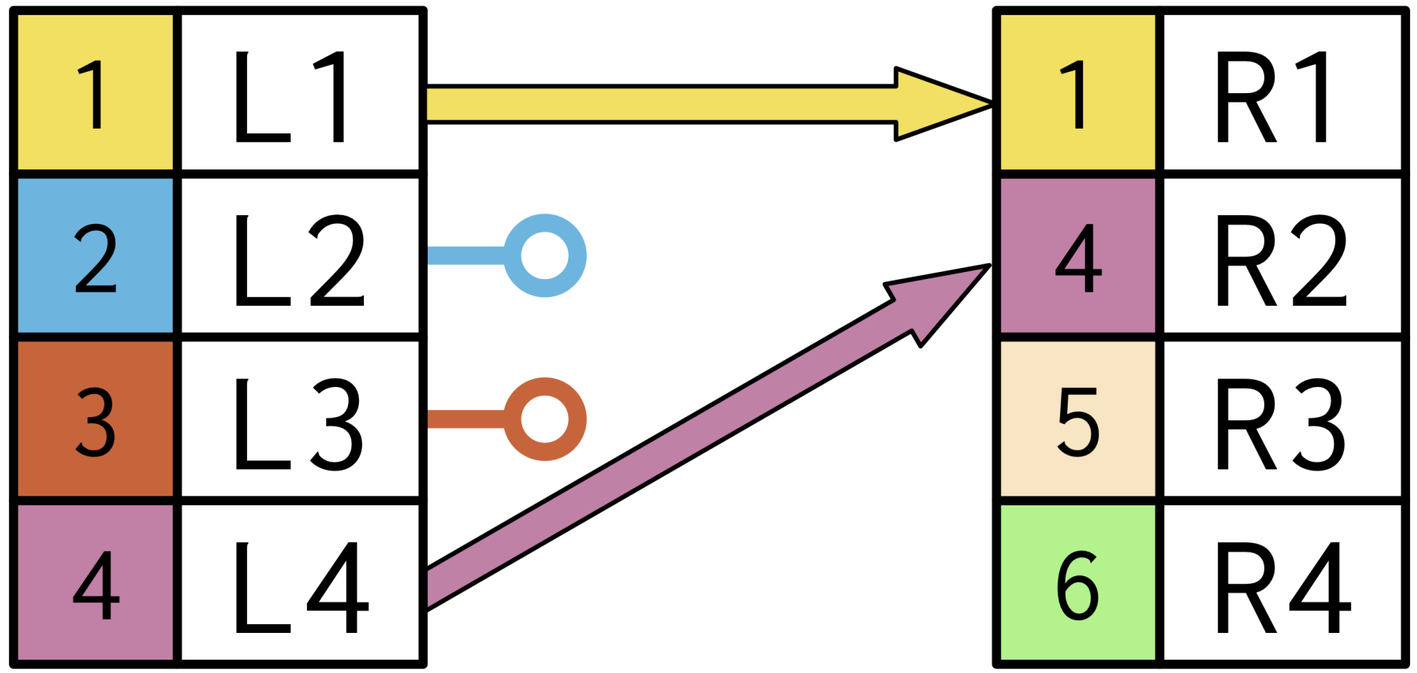

left_table
id
val
1
L1
2
L2
3
L3
4
L4
right_table
id
val
1
R1
4
R2
5
R3
6
R4
INNER JOIN
L_id
L_val
R_val
1
L1
R1
4
L4
R2

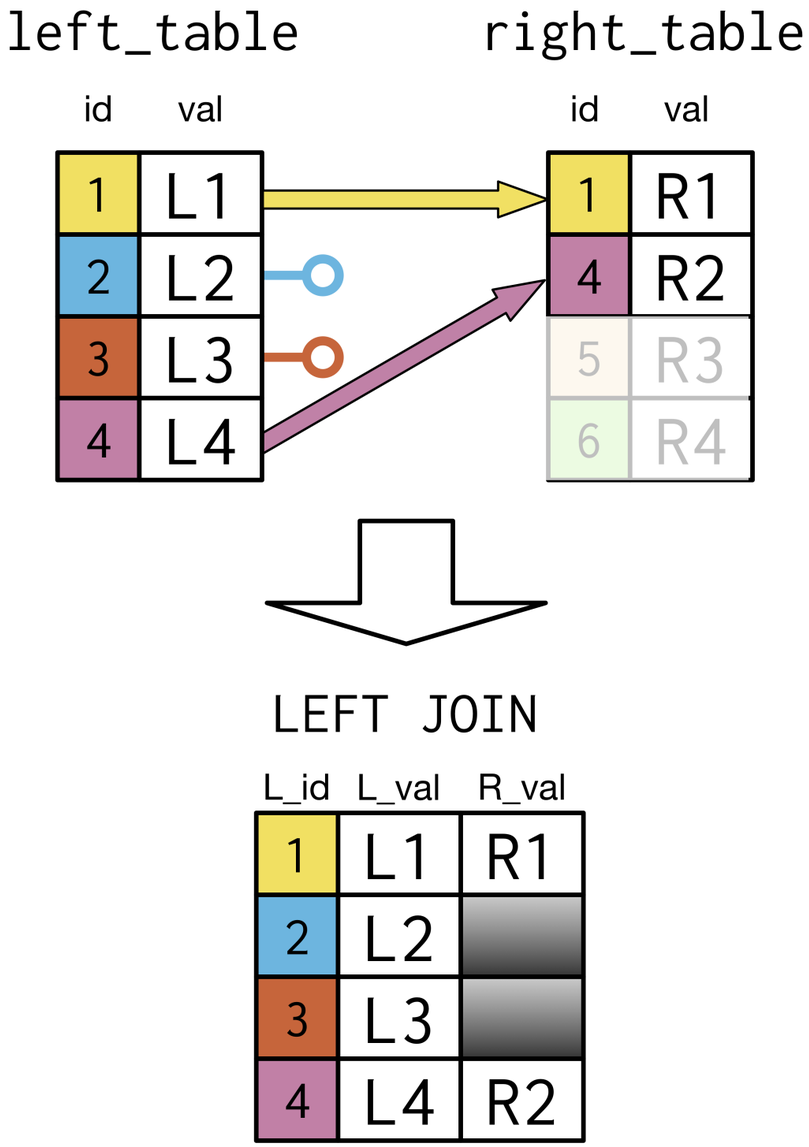
left_table

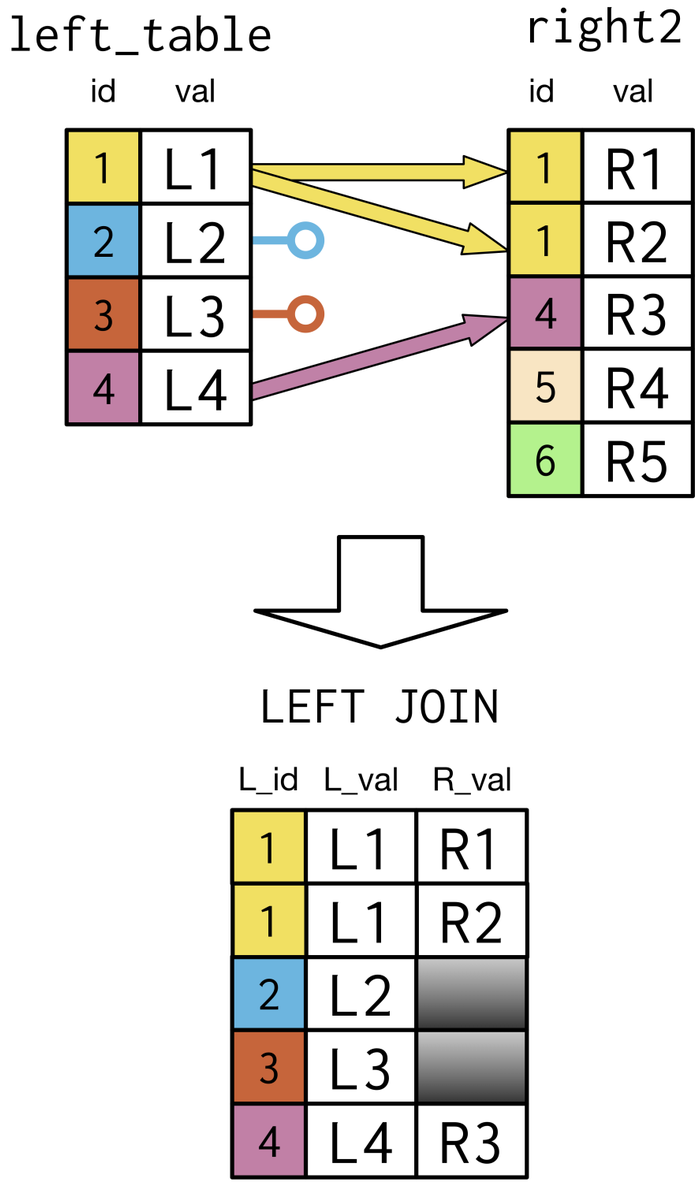
id	val
1	L1
2	L2
3	L3
4	L4

right_table

id	val
1	R1
4	R2
5	R3
6	R4




left_table
id
val
1
L1
2
L2
3
L3
4
L4
right_table
id
val
1
R1
4
R2
5
R3
6
R4
LEFT JOIN
L_id
L_val
R_val
1
L1
R1
2
L2
3
L3
4
L4
R2

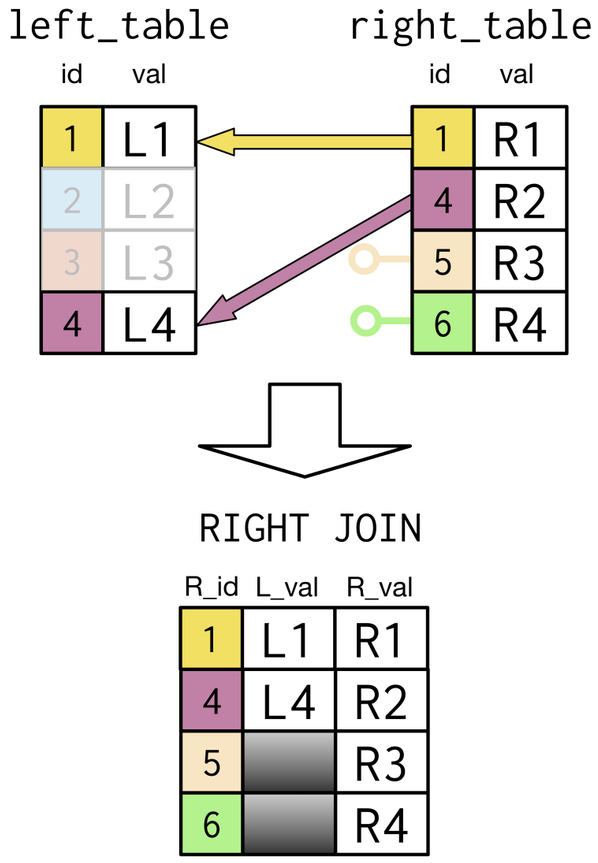

left_table
id val
1 L1
2 L2
3 L3
4 L4
right2
id val
1 R1
1 R2
4 R3
5 R4
6 R5
LEFT JOIN
L_id L_val R_val
1 L1 R1
1 L1 R2
2 L2
3 L3
4 L4 R3

The syntax of a LEFT JOIN

```
SELECT p1.country, prime_minister, president
FROM prime_ministers AS p1
LEFT JOIN presidents AS p2
ON p1.country = p2.country;
```

```
+-----------+-------------------------+-------------------------+
| country   | prime_minister          | president               |
|-----------+-------------------------+-------------------------|
| Egypt     | Sherif Ismail           | Abdel Fattah el-Sisi    |
| Portugal  | Antonio Costa           | Marcelo Rebelo de Sousa |
| Vietnam   | Nguyen Xuan Phuc        | Tran Dai Quang          |
| Haiti     | Jack Guy Lafontant      | Jovenel Moise           |
| India     | Narendra Modi           |                         |
| Australia | Malcolm Turnbull        |                         |
| Norway    | Erna Solberg            |                         |
| Brunei    | Hassanal Bolkiah        |                         |
| Oman      | Qaboos bin Said al Said |                         |
| Spain     | Mariano Rajoy           |                         |
+-----------+-------------------------+-------------------------+
```

RIGHT JOIN




```
SELECT right_table.id AS R_id,
       left_table.val AS L_val,
       right_table.val AS R_val
FROM left_table
RIGHT JOIN right_table
ON left_table.id = right_table.id;
```

Let's practice!

JOINING DATA IN SQL

FULL JOINs

JOINING DATA IN SQL

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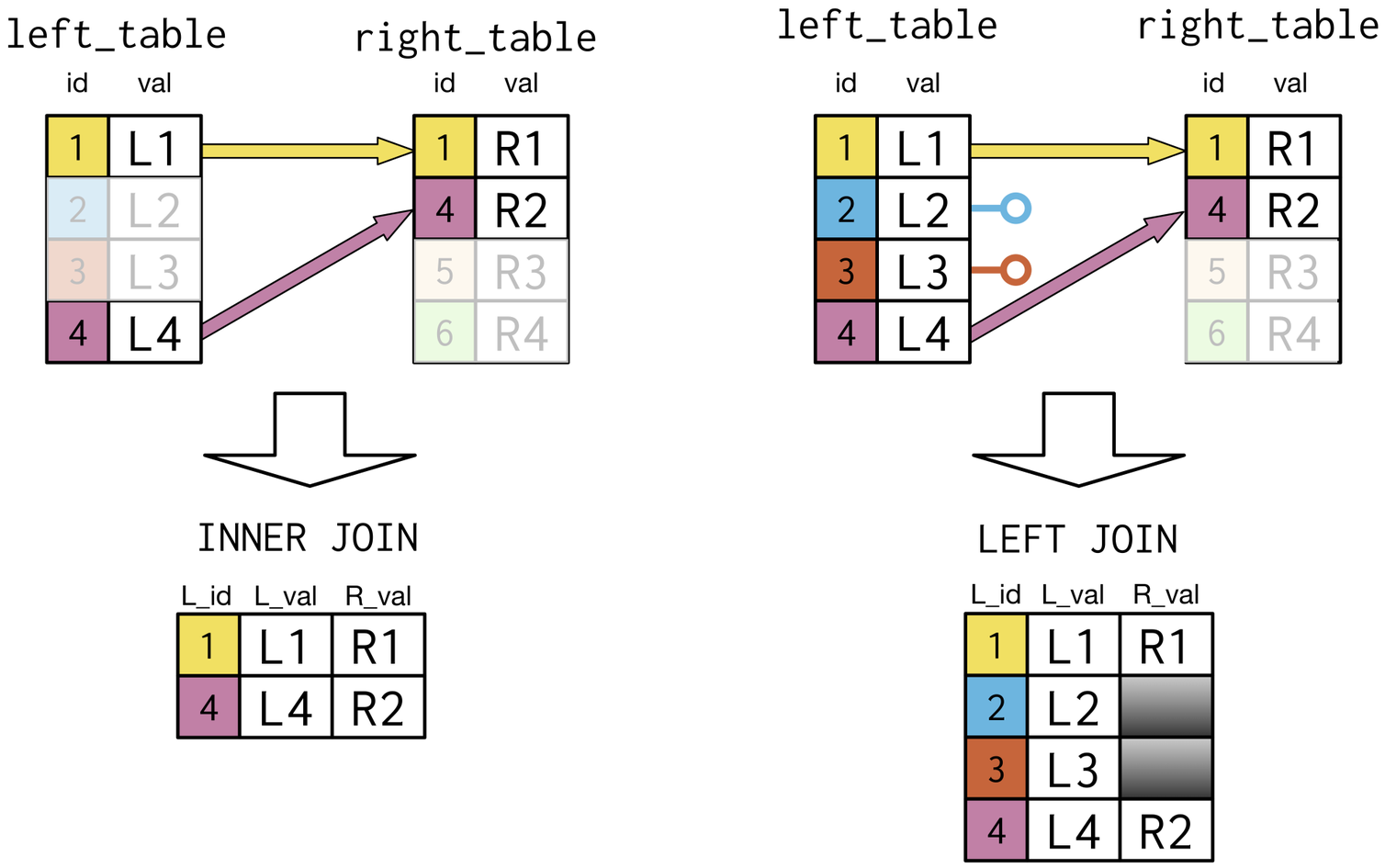
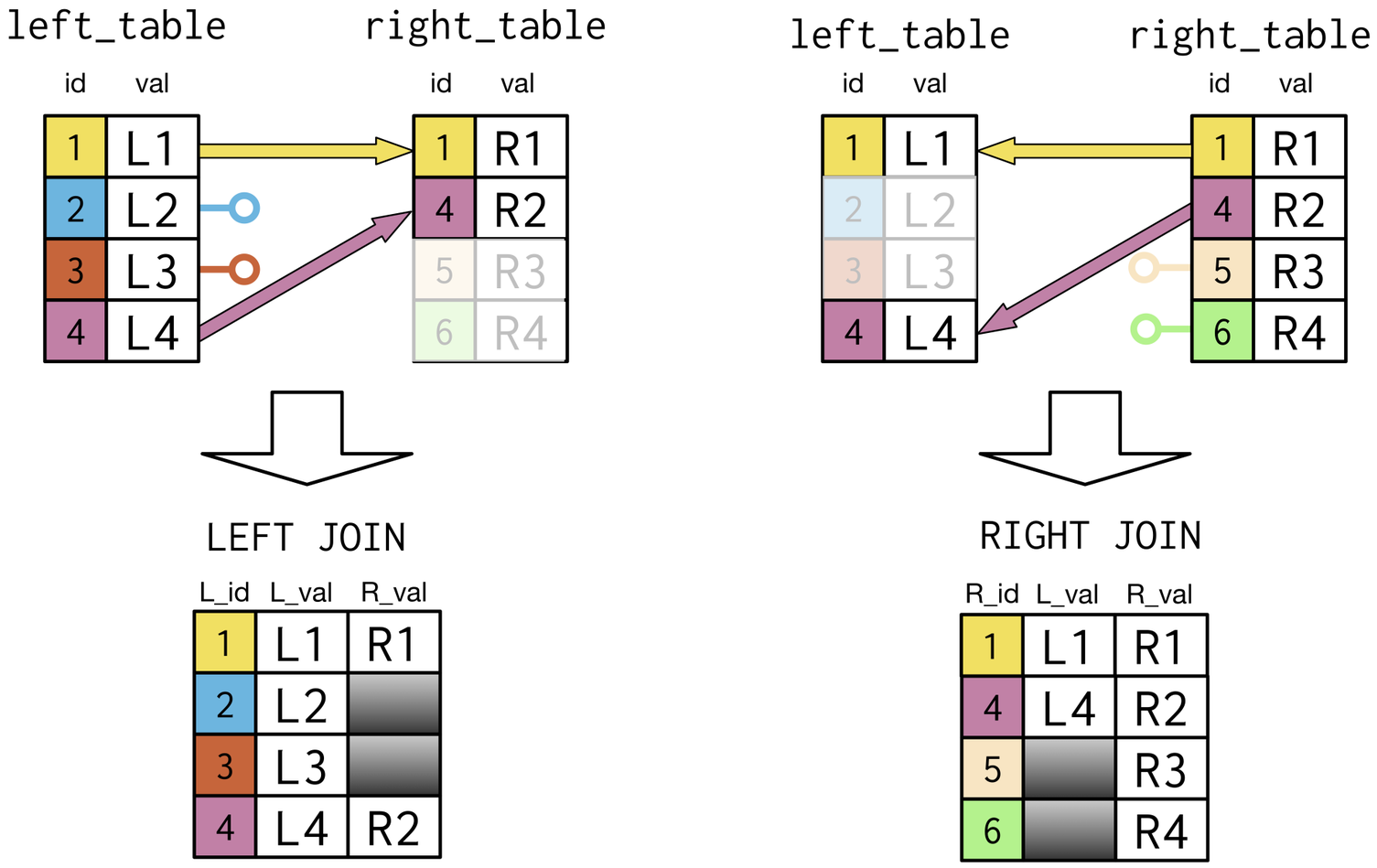
INNER JOIN vs LEFT JOIN



LEFT JOIN vs RIGHT JOIN

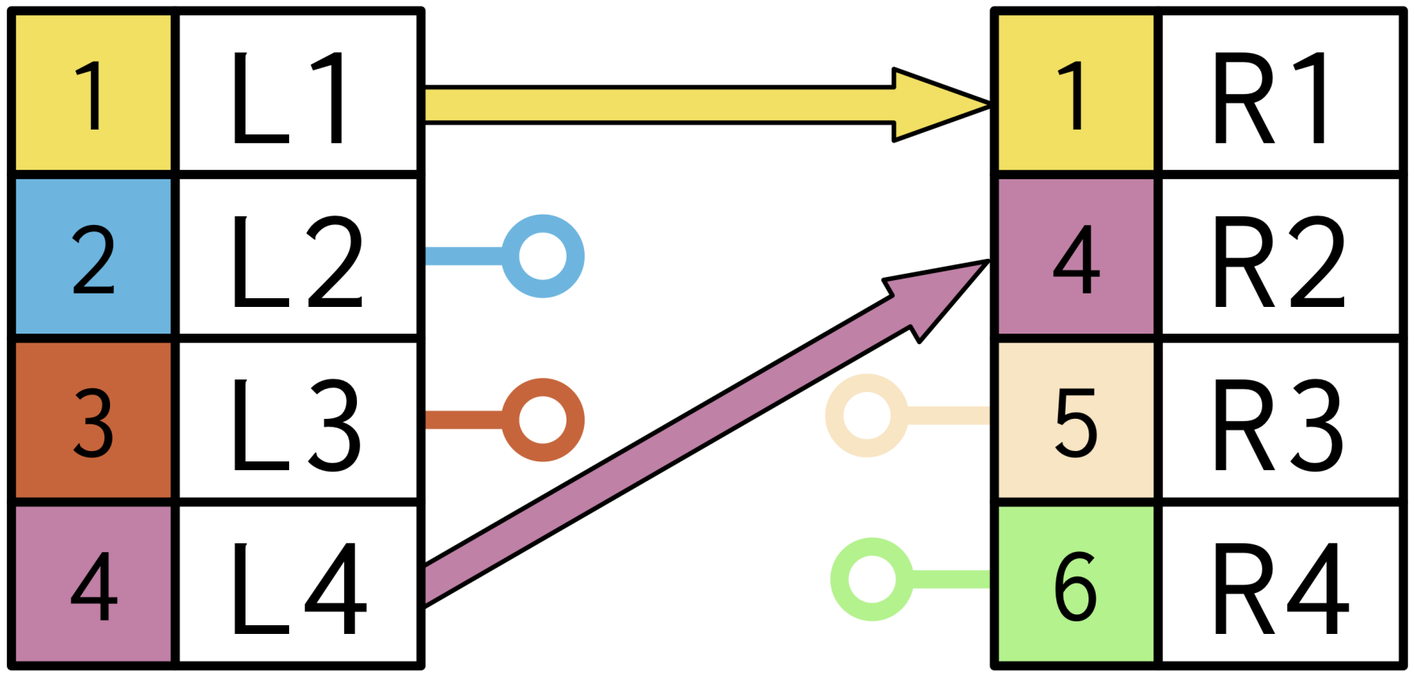


left_table

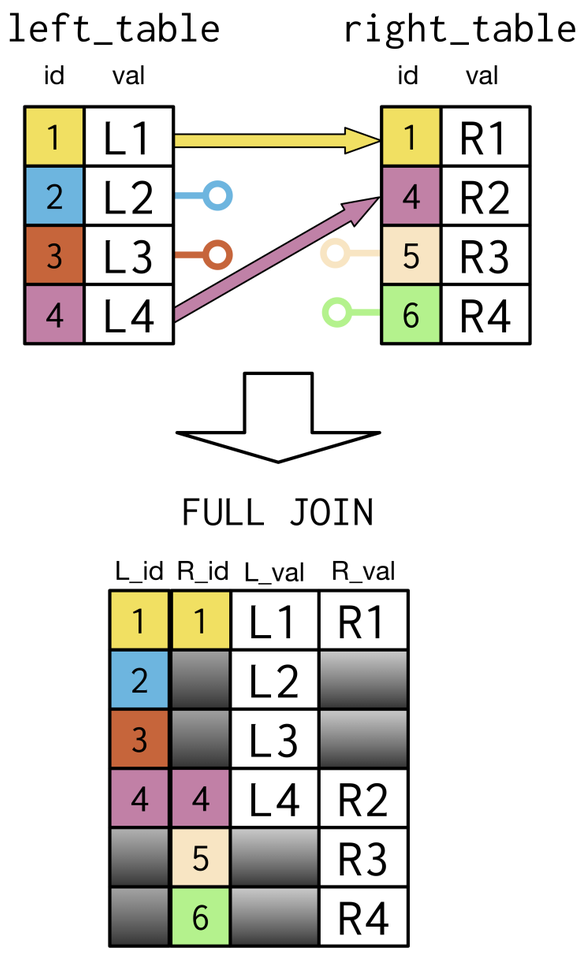
id	val
1	L1
2	L2
3	L3
4	L4

right_table

id	val
1	R1
4	R2
5	R3
6	R4



FULL JOIN diagram




```
SELECT left_table.id AS L_id,
       right_table.id AS R_id,
       left_table.val AS L_val,
       right_table.val AS R_val
FROM left_table
FULL JOIN right_table
USING (id);
```

FULL JOIN example using leaders database

```
SELECT p1.country AS pm_co, p2.country AS pres_co,
    prime_minister, president
```

FULL JOIN example using leaders database

```
SELECT p1.country AS pm_co, p2.country AS pres_co,
    prime_minister, president
FROM prime_ministers AS p1
```

FULL JOIN example using leaders database

```
SELECT p1.country AS pm_co, p2.country AS pres_co,
    prime_minister, president
FROM prime_ministers AS p1
FULL JOIN presidents AS p2
```

FULL JOIN example using leaders database

```
SELECT p1.country AS pm_co, p2.country AS pres_co,
    prime_minister, president
FROM prime_ministers AS p1
FULL JOIN presidents AS p2
ON p1.country = p2.country;
```

FULL JOIN example results using leaders

pm_co	pres_co	prime_minister	president
Egypt	Egypt	Sherif Ismail	Abdel Fattah el-Sisi
Portugal	Portugal	Antonio Costa	Marcelo Rebelo de Sousa
Vietnam	Vietnam	Nguyen Xuan Phuc	Tran Dai Quang
Haiti	Haiti	Jack Guy Lafontant	Jovenel Moise
India		Narendra Modi	
Australia		Malcolm Turnbull	
Norway		Erna Solberg	
Brunei		Hassanal Bolkiah	
Oman		Qaboos bin Said al Said	
Spain		Mariano Rajoy	
	Uruguay		Jose Mujica
	Chile		Michelle Bachelet
	Liberia		Ellen Johnson Sirleaf

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JOINING DATA IN SQL

CROSSing the Rubicon

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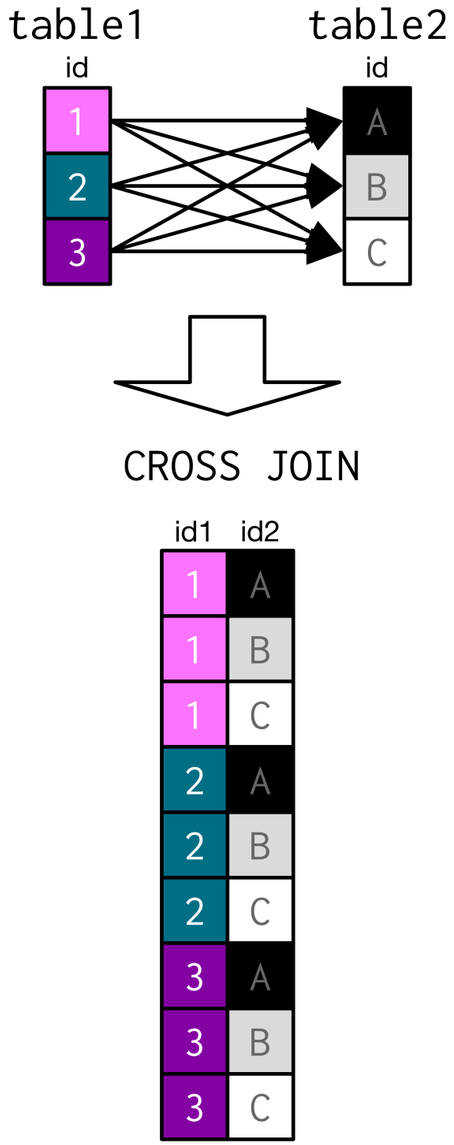
table1
id
1
2
3
table2
id
A
B
C
CROSS JOIN
id1 id2
1 A
1 B
1 C
2 A
2 B
2 C
3 A
3 B
3 C

Pairing prime ministers with presidents

```
SELECT prime_minister, president
FROM prime_ministers AS p1
CROSS JOIN presidents AS p2
WHERE p1.continent IN ('North America', 'Oceania');
```

```
+--------------------+-------------------------+
| prime_minister     | president               |
|--------------------+-------------------------|
| Jack Guy Lafontant | Abdel Fattah el-Sisi    |
| Malcolm Turnbull   | Abdel Fattah el-Sisi    |
| Jack Guy Lafontant | Marcelo Rebelo de Sousa |
| Malcolm Turnbull   | Marcelo Rebelo de Sousa |
| Jack Guy Lafontant | Jovenel Moise           |
| Malcolm Turnbull   | Jovenel Moise           |
| Jack Guy Lafontant | Jose Mujica             |
| Malcolm Turnbull   | Jose Mujica             |
| Jack Guy Lafontant | Ellen Johnson Sirleaf   |
| Malcolm Turnbull   | Ellen Johnson Sirleaf   |
| Jack Guy Lafontant | Michelle Bachelet       |
| Malcolm Turnbull   | Michelle Bachelet       |
| Jack Guy Lafontant | Tran Dai Quang          |
| Malcolm Turnbull   | Tran Dai Quang          |
+--------------------+-------------------------+
```

Let's practice!

JOINING DATA IN SQL

State of the UNION

JOINING DATA IN SQL

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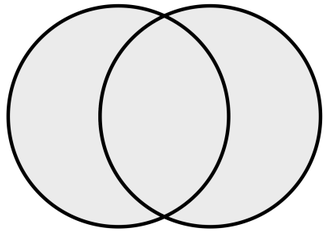
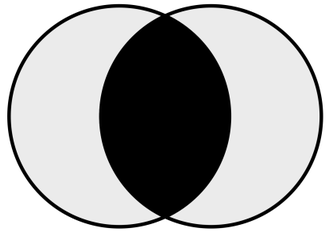
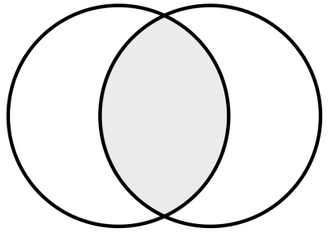
Set Theory Venn Diagrams



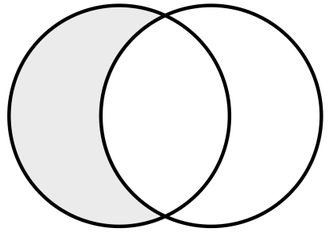
UNION



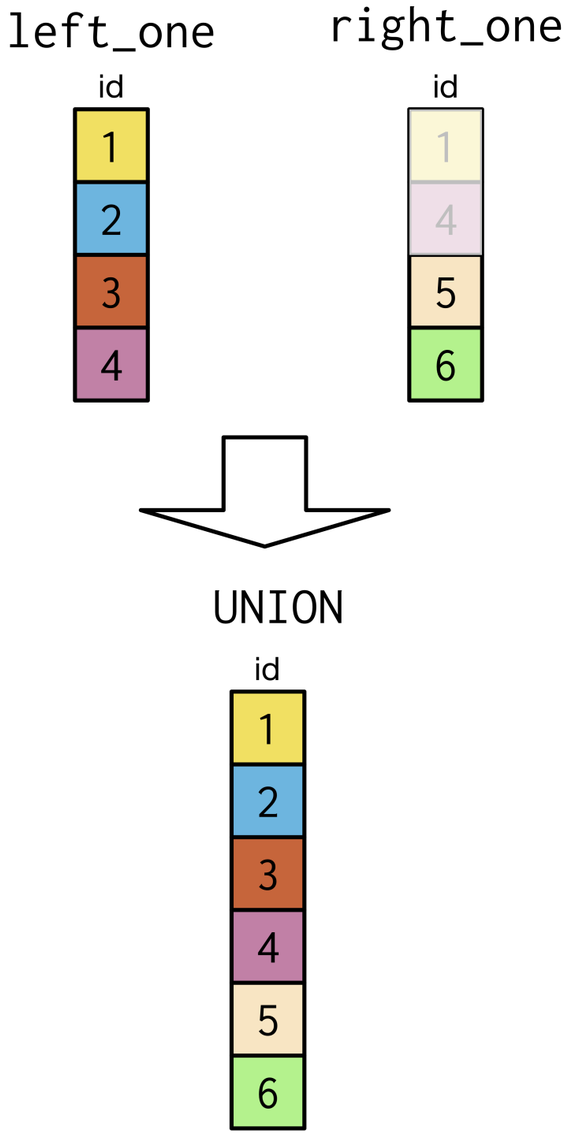
UNION ALL

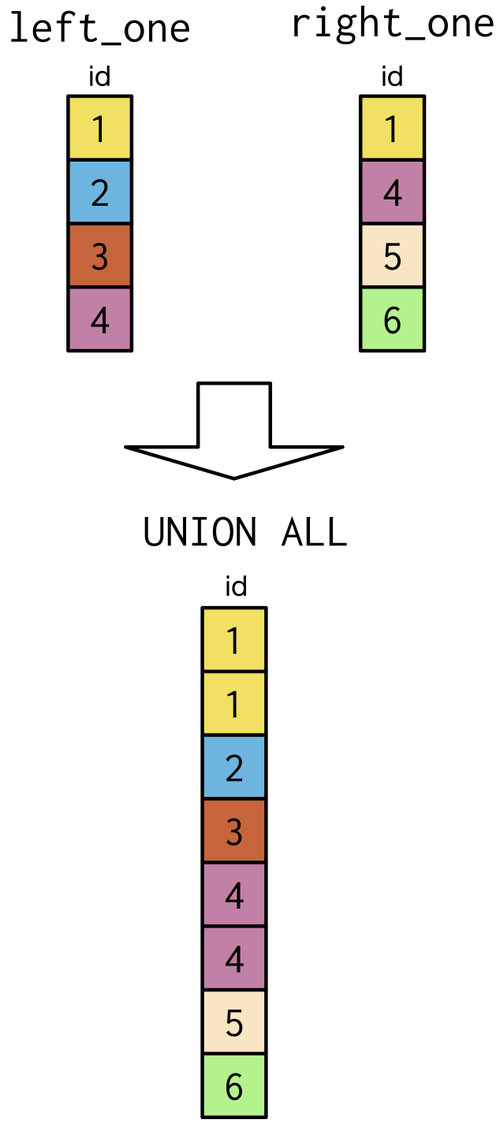


INTERSECT



EXCEPT


left_one
id
1
2
3
4
right_one
id
1
4
5
6
UNION
id
1
2
3
4
5
6


left_one
id
1
2
3
4
right_one
id
1
4
5
6
UNION ALL
id
1
1
2
3
4
4
5
6

monarchs table

```
SELECT *
FROM monarchs;
```

```
+-----------+-------------+--------------------------+
| country   | continent   | monarch                  |
|-----------+-------------+--------------------------|
| Brunei    | Asia        | Hassanal Bolkiah         |
| Oman      | Asia        | Qaboos bin Said al Said  |
| Norway    | Europe      | Harald V                 |
| Spain     | Europe      | Felipe VI                |
+-----------+-------------+--------------------------+
```

All prime ministers and monarchs

```
SELECT prime_minister AS leader, country
FROM prime_ministers
UNION
SELECT monarch, country
FROM monarchs
ORDER BY country;
```

Resulting table from UNION

leader	country
Malcolm Turnbull	Australia
Hassanal Bolkiah	Brunei
Sherif Ismail	Egypt
Jack Guy Lafontant	Haiti
Narendra Modi	India
Harald V	Norway
Erna Solberg	Norway
Qaboos bin Said al Said	Oman
Antonio Costa	Portugal
Mariano Rajoy	Spain
Felipe VI	Spain
Nguyen Xuan Phuc	Vietnam

UNION ALL with leaders

```
SELECT prime_minister AS leader, country
FROM prime_ministers
UNION ALL
SELECT monarch, country
FROM monarchs
ORDER BY country
LIMIT 10;
```

```
+------------------------+-----------+
| leader                 | country   |
|------------------------+-----------|
| Malcolm Turnbull       | Australia |
| Hassanal Bolkiah       | Brunei    |
| Hassanal Bolkiah       | Brunei    |
| Sherif Ismail          | Egypt     |
| Jack Guy Lafontant     | Haiti     |
| Narendra Modi          | India     |
| Erna Solberg           | Norway    |
| Harald V               | Norway    |
| Qaboos bin Said al Said | Oman      |
| Qaboos bin Said al Said | Oman      |
+------------------------+-----------+
```

Let's practice!

JOINING DATA IN SQL

INTERSECTional data science

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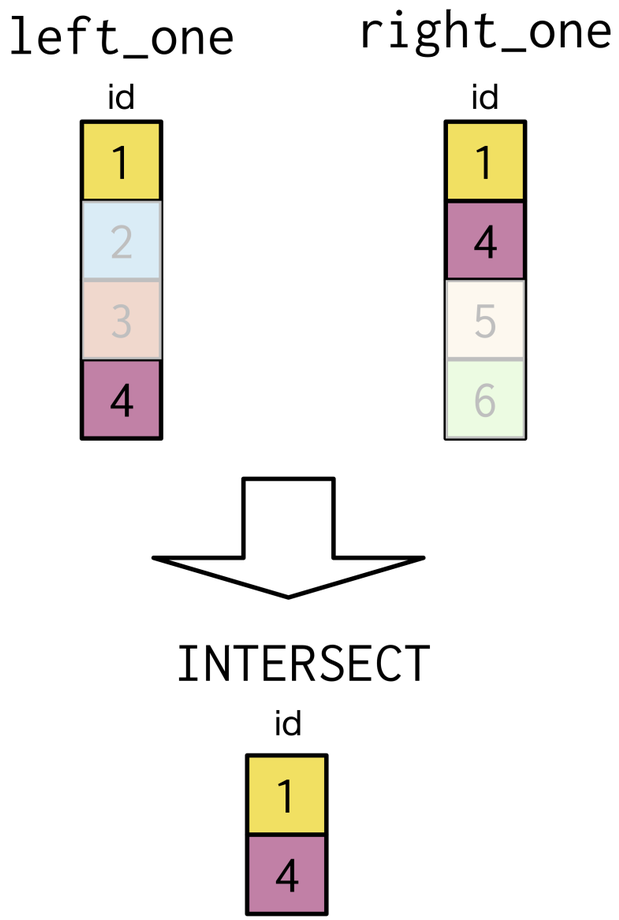
INTERSECT diagram and SQL code




```
SELECT id
FROM left_one
INTERSECT
SELECT id
FROM right_one;
```

Prime minister and president countries

```
SELECT country
FROM prime_ministers
INTERSECT
SELECT country
FROM presidents;
```

```
+-----------+
| country   |
|-----------|
| Portugal  |
| Vietnam   |
| Haiti     |
| Egypt     |
+-----------+
```

INTERSECT on two fields

```
SELECT country, prime_minister AS leader
FROM prime_ministers
INTERSECT
SELECT country, president
FROM presidents;
```

```
+-----------+----------+
| country   | leader   |
|-----------+----------|
+-----------+----------+
```

Let's practice!

JOINING DATA IN SQL

EXCEPTional

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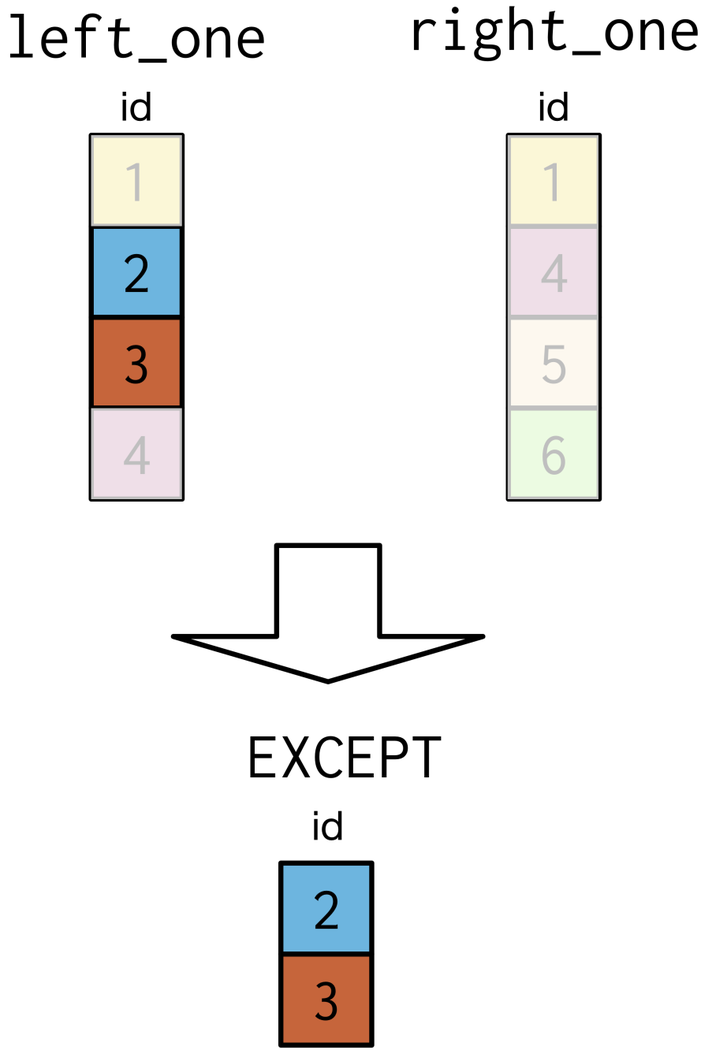
Monarchs that aren't prime ministers

```
SELECT monarch, country
FROM monarchs
EXCEPT
SELECT prime_minister, country
FROM prime_ministers;
```

```
+-----------+-----------+
| monarch   | country   |
|-----------+-----------|
| Harald V  | Norway    |
| Felipe VI | Spain     |
+-----------+-----------+
```


left_one
id
1
2
3
4
right_one
id
1
4
5
6
EXCEPT
id
2
3

Let's practice!

JOINING DATA IN SQL

Semi-joins and Anti-joins

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Building up to a semi-join

```
SELECT name
FROM states
WHERE indep_year < 1800;
```

```
+-----------+
| name      |
|-----------|
| Portugal  |
| Spain     |
+-----------+
```

Another step towards the semi-join

```
SELECT president, country, continent
FROM presidents;
```

```
+------------------------+-----------+---------------+
| president              | country   | continent     |
|------------------------+-----------+---------------|
| Abdel Fattah el-Sisi   | Egypt     | Africa        |
| Marcelo Rebelo de Sousa | Portugal  | Europe        |
| Jovenel Moise          | Haiti     | North America |
| Jose Mujica            | Uruguay   | South America |
| Ellen Johnson Sirleaf  | Liberia   | Africa        |
| Michelle Bachelet      | Chile     | South America |
| Tran Dai Quang         | Vietnam   | Asia          |
+------------------------+-----------+---------------+
```

Finish the semi-join (an intro to subqueries)

```
SELECT president, country, continent
FROM presidents
WHERE country IN
    (SELECT name
     FROM states
     WHERE indep_year < 1800);
```

```
+--------------------------+-----------+-------------+
| president                | country   | continent   |
|--------------------------+-----------+-------------|
| Marcelo Rebelo de Sousa | Portugal  | Europe      |
+--------------------------+-----------+-------------+
```

An anti-join

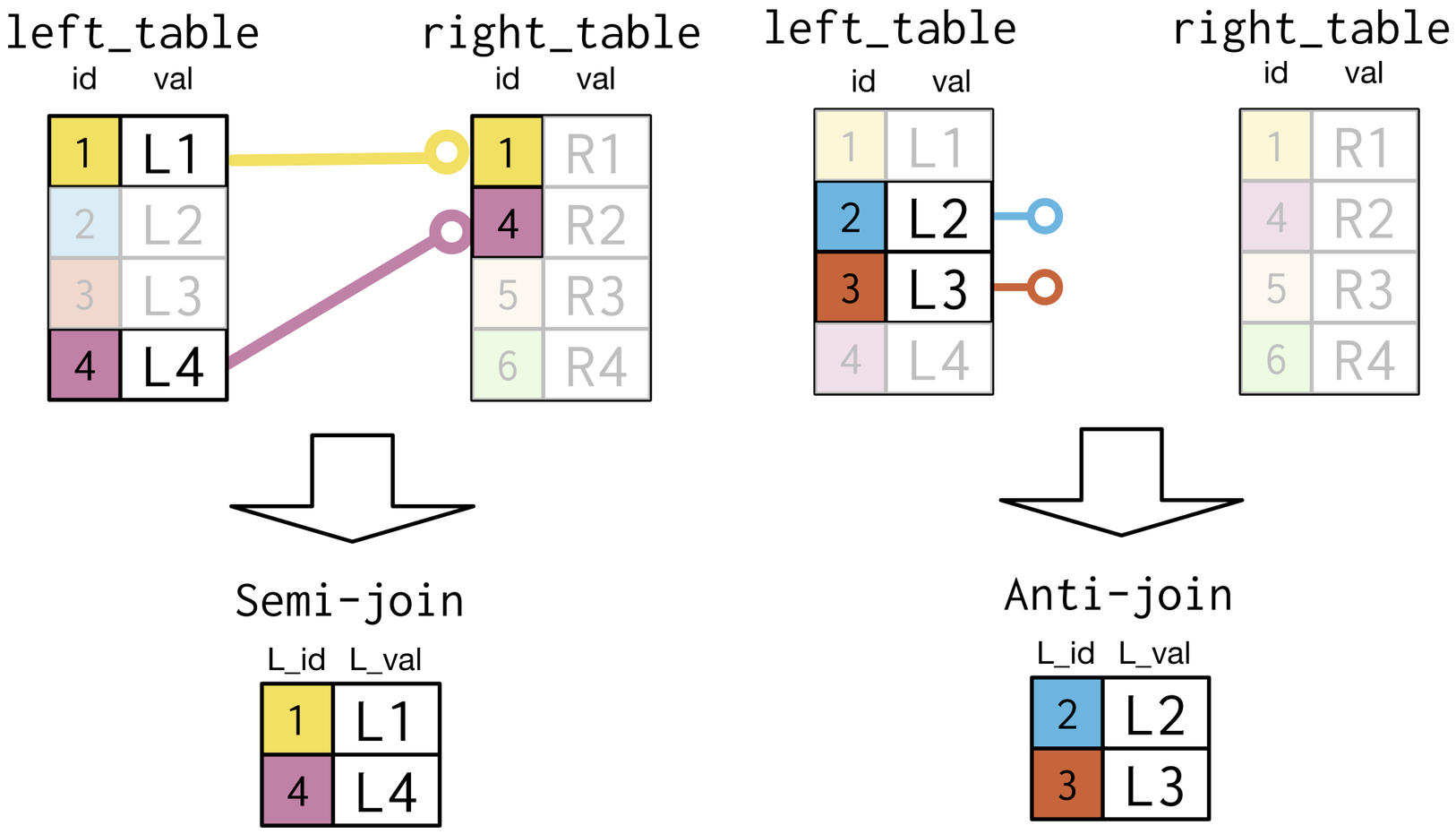
```
SELECT president, country, continent
FROM presidents
WHERE ___ LIKE '___'
    AND country ___ IN
        (SELECT name
         FROM states
         WHERE indep_year < 1800);
```

```
SELECT president, country, continent
FROM presidents
WHERE continent LIKE '%America'
    AND country NOT IN
        (SELECT name
         FROM states
         WHERE indep_year < 1800);
```

The result of the anti-join

president	country	continent
Jovenel Moise	Haiti	North America
Jose Mujica	Uruguay	South America
Michelle Bachelet	Chile	South America

Semi-join and anti-join diagrams



Let's practice!

JOINING DATA IN SQL

Subqueries inside WHERE and SELECT clauses

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Subquery inside WHERE clause set-up

name	indep_year	fert_rate	women_parli_perc
Australia	1901	1.88	32.74
Brunei	1984	1.96	6.06
Chile	1810	1.8	15.82
Egypt	1922	2.7	14.9
Haiti	1804	3.03	2.74
India	1947	2.43	11.58
Liberia	1847	4.64	11.65
Norway	1905	1.93	39.6
Oman	1951	2.75	8.82
Portugal	1143	1.31	34.8
Spain	1492	1.53	38.64
Uruguay	1828	2.03	22.31
Vietnam	1945	1.7	24

Average fert_rate

```
SELECT AVG(fert_rate)
FROM states;
```

```
+----------+
|      avg |
|----------|
| 2.28385  |
+----------+
```

Asian countries below average `fert_rate`

```
SELECT name, fert_rate
FROM states
WHERE continent = 'Asia'
```

Asian countries below average `fert_rate`

```
SELECT name, fert_rate
FROM states
WHERE continent = 'Asia'
    AND fert_rate <
```

Asian countries below average `fert_rate`

```
SELECT name, fert_rate
FROM states
WHERE continent = 'Asia'
    AND fert_rate <
        (SELECT AVG(fert_rate)
         FROM states);
```

Asian countries below average `fert_rate`

```
SELECT name, fert_rate
FROM states
WHERE continent = 'Asia'
    AND fert_rate <
        (SELECT AVG(fert_rate)
         FROM states);
```

```
+---------+-------------+
| name    |   fert_rate |
|---------+-------------|
| Brunei  |        1.96 |
| Vietnam |        1.7  |
+---------+-------------+
```

Subqueries inside SELECT clauses - setup

```
SELECT DISTINCT continent
FROM prime_ministers;
```

```
+---------------+
| continent     |
|---------------|
| Africa        |
| Asia          |
| Europe        |
| North America |
| Oceania       |
+---------------+
```

Subquery inside SELECT clause - complete

```
SELECT DISTINCT continent,
    (SELECT COUNT(*)
     FROM states
     WHERE prime_ministers.continent = states.continent) AS countries_num
FROM prime_ministers;
```

```
+---------------+-----------------+
| continent     |   countries_num |
|---------------+-----------------|
| Africa        |               2 |
| Asia          |               4 |
| Europe        |               3 |
| North America |               1 |
| Oceania       |               1 |
+---------------+-----------------+
```

Let's practice!

JOINING DATA IN SQL

Subquery inside the FROM clause

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Build-up

```
SELECT continent, MAX(women_parli_perc) AS max_perc
FROM states
GROUP BY continent
ORDER BY continent;
```

```
+---------------+------------+
| continent     |   max_perc |
|---------------+------------|
| Africa        |      14.9  |
| Asia          |      24    |
| Europe        |      39.6  |
| North America |       2.74 |
| Oceania       |      32.74 |
| South America |      22.31 |
+---------------+------------+
```

Focusing on records in monarchs

```
SELECT monarchs.continent
FROM monarchs, states
WHERE monarchs.continent = states.continent
ORDER BY continent;
```

```
+-------------+
| continent   |
|-------------|
| Asia        |
| Asia        |
| Asia        |
| Asia        |
| Asia        |
| Asia        |
| Asia        |
| Asia        |
| Europe      |
| Europe      |
| Europe      |
| Europe      |
| Europe      |
| Europe      |
| Europe      |
+-------------+
```

Finishing off the subquery

```
SELECT DISTINCT monarchs.continent, subquery.max_perc
FROM monarchs,
    (SELECT continent, MAX(women_parli_perc) AS max_perc
     FROM states
     GROUP BY continent) AS subquery
WHERE monarchs.continent = subquery.continent
ORDER BY continent;
```

```
+-------------+------------+
| continent   |   max_perc |
|-------------+------------|
| Asia        |       24   |
| Europe      |       39.6 |
+-------------+------------+
```

Let's practice!

JOINING DATA IN SQL

Course Review

JOINING DATA IN SQL

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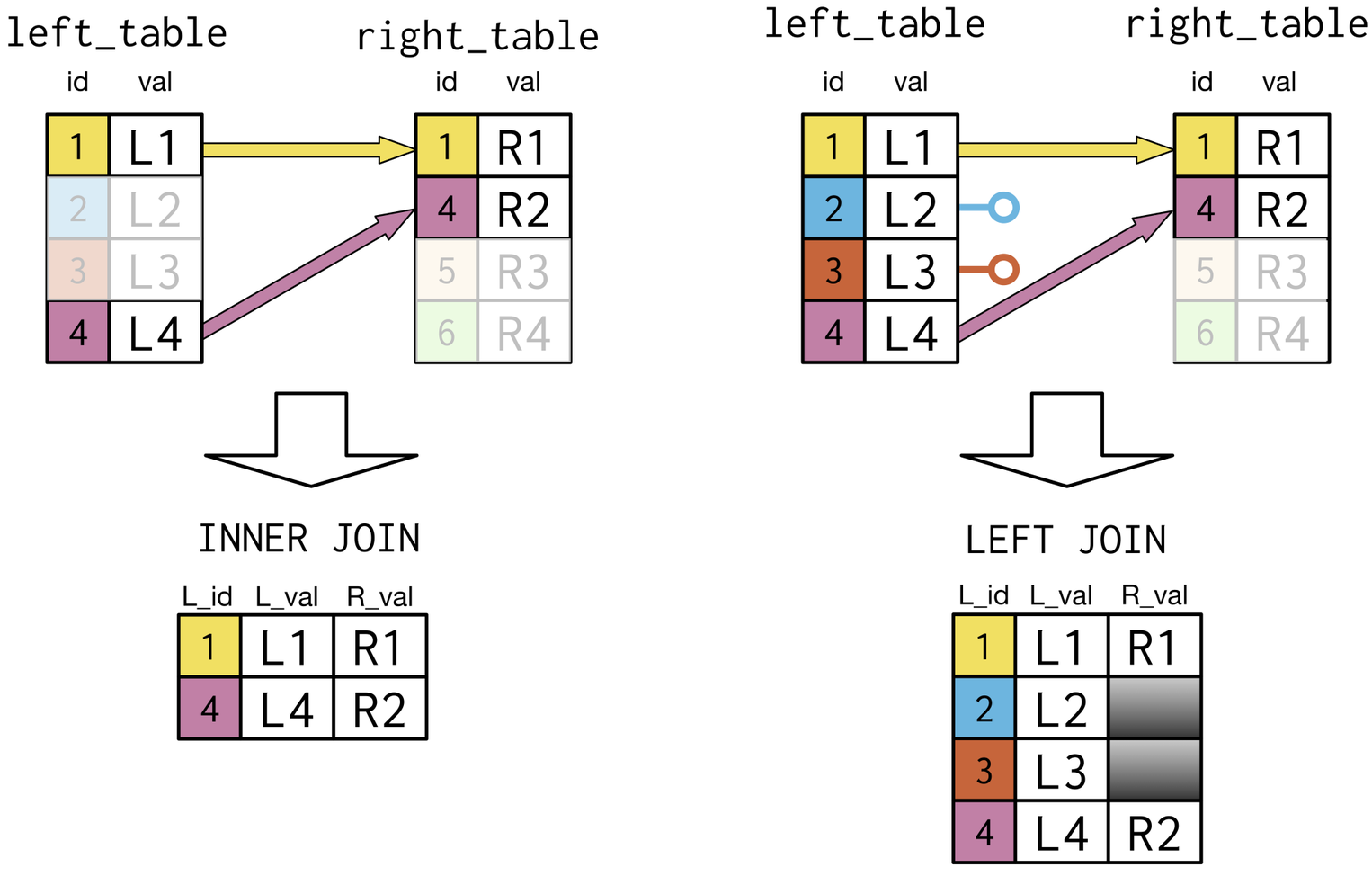
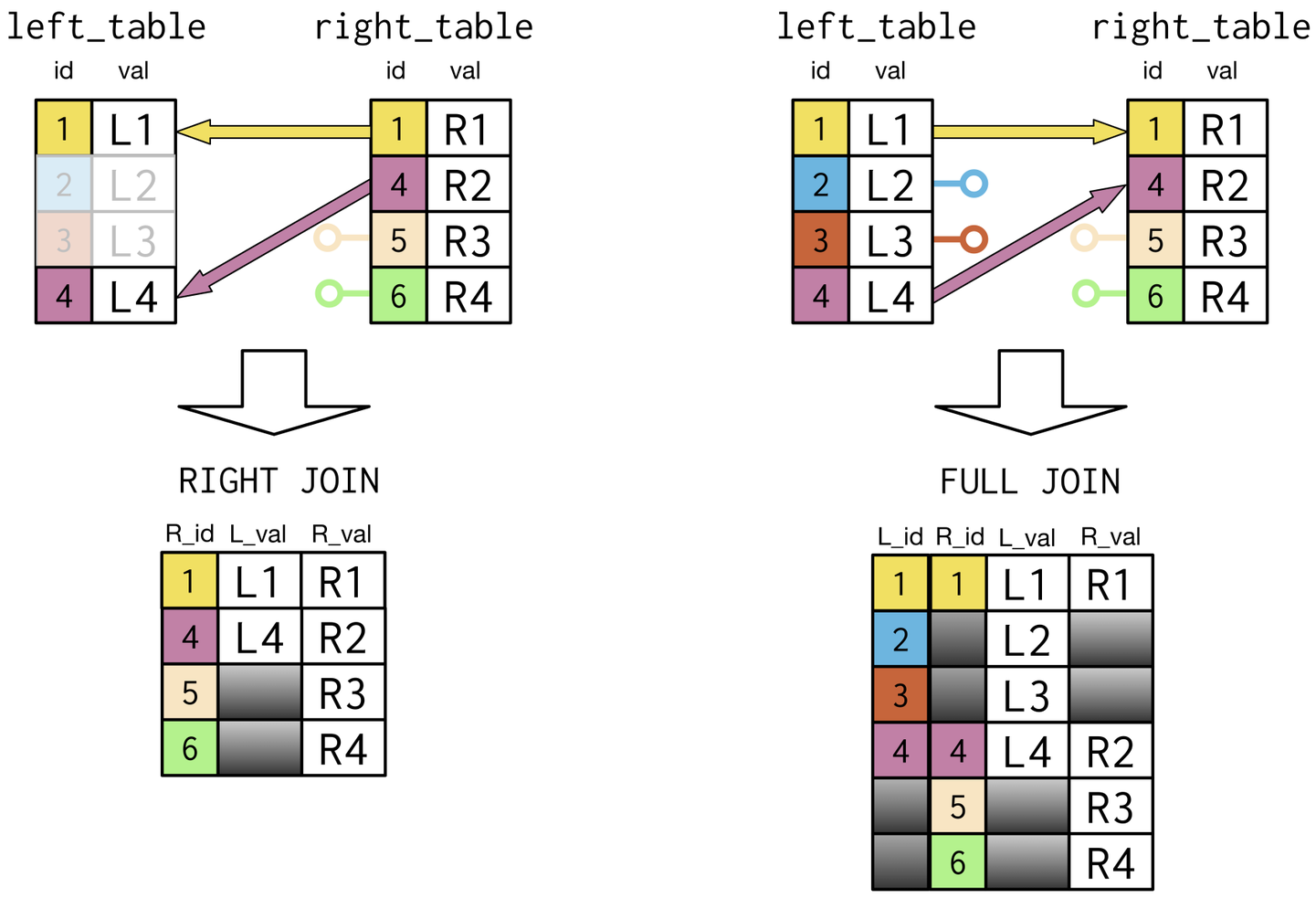
Types of joins

- INNER JOIN
  - Self-joins
- OUTER JOIN
  - LEFT JOIN
  - RIGHT JOIN
  - FULL JOIN
- CROSS JOIN
- Semi-join / Anti-join

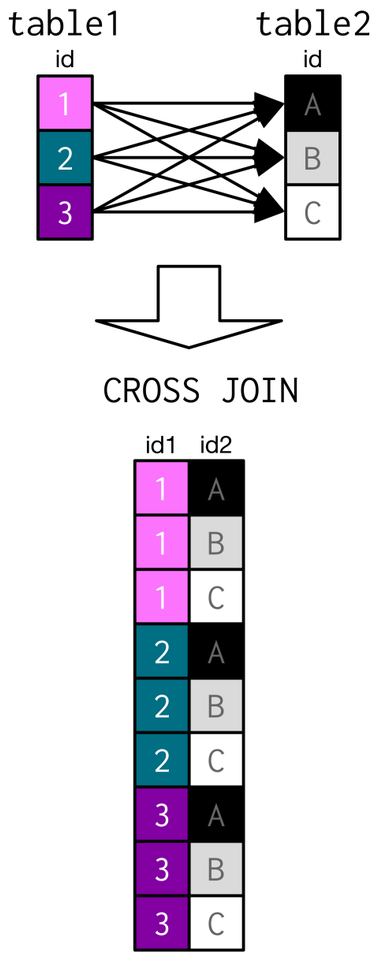
INNER JOIN vs LEFT JOIN



RIGHT JOIN vs FULL JOIN

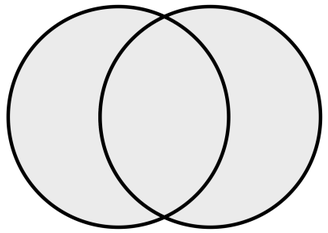


CROSS JOIN with code

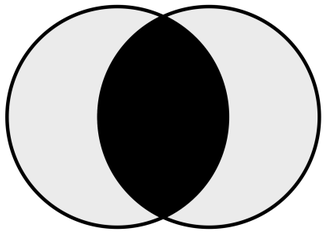



```
SELECT table1.id AS id1,
       table2.id AS id2
FROM table1
CROSS JOIN table2;
```

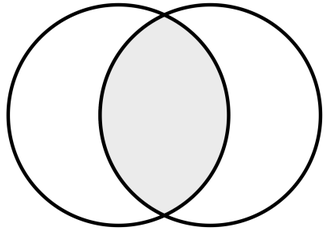
Set Theory Clauses



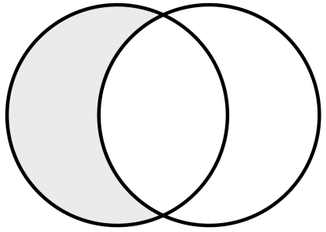
UNION



UNION ALL

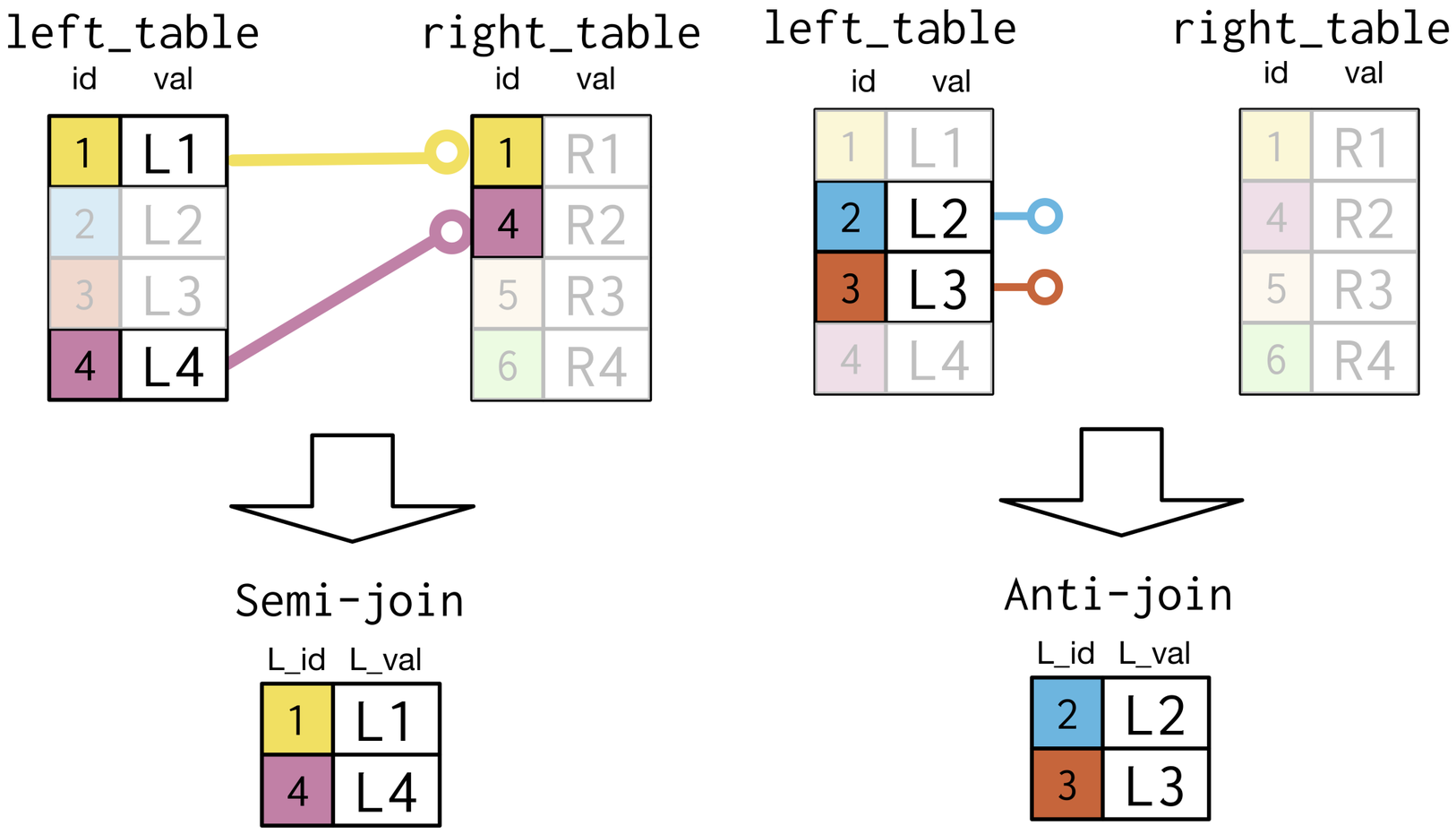


INTERSECT



EXCEPT

Semi-joins and Anti-joins



Types of basic subqueries

- Subqueries inside WHERE clauses
- Subqueries inside SELECT clauses
- Subqueries inside FROM clauses

Own the challenge problems! You got this!

JOINING DATA IN SQL