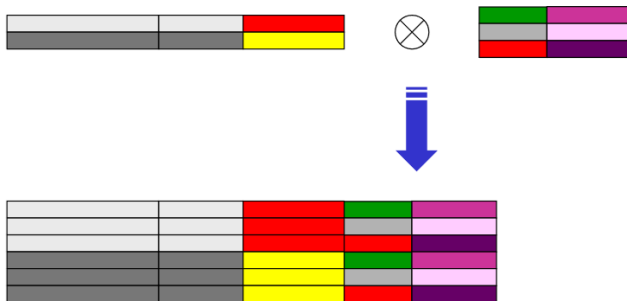# SQL
Joins

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Cross join

- Cross join produces a result set by matching (joining) all rows from one table with all rows from other table
- Number of rows in result set is equal to number of rows in first table times number of rows in second table
- It is also known as Cartesian Product

Cross join

Movies

movie_id	title	year	price
1	Anchorman	2004	10
2	Ghostbusters	1984	5.50
3	Terminator	1984	8.50

Copies

copy_id	movie_id	available
1	1	true
2	1	false
3	2	true
4	3	true
5	3	false

```
SELECT *
FROM movies
 CROSS JOIN copies

id | title        | year | price | copy_id | movie_id | available
---+--------------+------+-------+---------+----------+----------
1  | Anchorman    | 2004 | 10    | 1       | 1        | true
2  | Ghostbusters | 1984 | 5.50  | 1       | 1        | true
3  | Terminator   | 1984 | 8.50  | 1       | 1        | true
...
3  | Terminator   | 1984 | 8.50  | 5       | 3        | false
(15 rows)
```

Natural join

- Natural join produces a result set by matching rows from both tables that have the same values in the columns with the same names
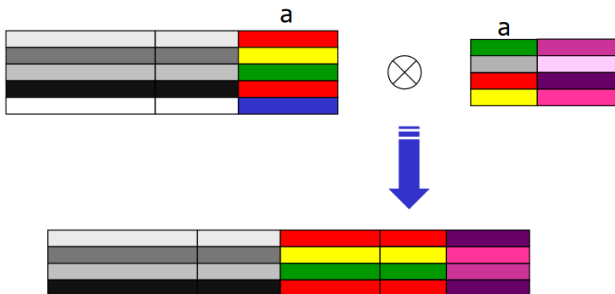
Natural join

Movies

movie_id	title	year	price
1	Anchorman	2004	10
2	Ghostbusters	1984	5.50
3	Terminator	1984	8.50

Copies

copy_id	movie_id	available
1	1	true
2	1	false
3	2	true
4	3	true
5	3	false

```
SELECT *
FROM movies
 NATURAL JOIN copies

id | title        | year | price | copy_id | available
---+--------------+------+-------+---------+----------
1  | Anchorman    | 2004 | 10    | 1       | true
1  | Anchorman    | 2004 | 10    | 2       | false
2  | Ghostbusters | 1984 | 5.50  | 3       | true
3  | Terminator   | 1984 | 8.50  | 4       | true
3  | Terminator   | 1984 | 8.50  | 5       | false
(5 rows)
```

Natural join, selection and projection

Movies

movie_id	title	year	price
1	Anchorman	2004	10
2	Ghostbusters	1984	5.50
3	Terminator	1984	8.50

Copies

copy_id	movie_id	available
1	1	true
2	1	false
3	2	true
4	3	true
5	3	false

```
SELECT copy_id, title, price
FROM movies
 NATURAL JOIN copies
WHERE available = true

copy_id | title        | price
--------+--------------+------
1       | Anchorman    | 10
3       | Ghostbusters | 5.50
4       | Terminator   | 8.50
(3 rows)
```

Multiple joins

Movies

movie_id	title	year	price
1	Anchorman	2004	10
2	Ghostbusters	1984	5.50
3	Terminator	1984	8.50

Copies

copy_id	movie_id	available
1	1	true
2	1	false
3	2	true
4	3	true
5	3	false

Rentals

client_id	copy_id	date_of_rental	date_of_return
1	4	2005-07-04	2005-07-05
2	2	2005-07-19	2005-07-22
1	1	2005-07-24	2005-07-25

```
SELECT copy_id, title, price, date_of_rental
FROM movies
 NATURAL JOIN copies
 NATURAL JOIN rentals

copy_id | title        | price | date_of_rental
--------+--------------+-------+---------------
1       | Anchorman    | 10    | 2005-07-24
2       | Anchorman    | 5.50  | 2005-07-19
...
```

Conditional Join

Movies

movie_id	title	year	price
1	Anchorman	2004	10
2	Ghostbusters	1984	5.50
3	Terminator	1984	8.50

Copies

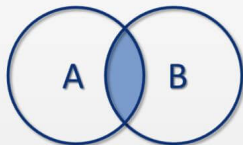| copy_id	movie_id	available
1	1	true
2	1	false
3	2	true
4	3	true
5	3	false

```
SELECT *
FROM movies
 JOIN copies ON copies.movie_id = movies.movie_id

movie_id | title        | year | price | copy_id | movie_id | available
---------+--------------+------+-------+---------+----------+----------
1        | Anchorman    | 2004 | 10    | 1       | 1        | true
1        | Anchorman    | 2004 | 10    | 2       | 1        | false
2        | Ghostbusters | 1984 | 5.50  | 3       | 2        | true
3        | Terminator   | 1984 | 8.50  | 4       | 3        | true
3        | Terminator   | 1984 | 8.50  | 5       | 3        | false
(5 rows)
```

Join types
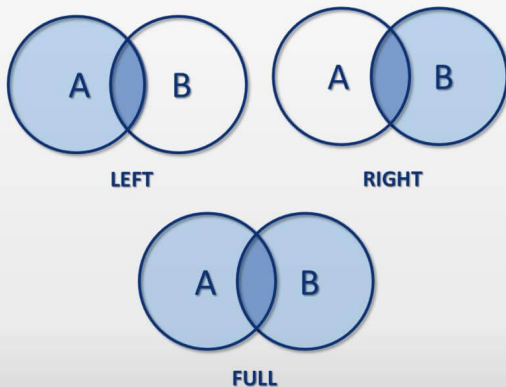
Inner Join

Clients

client_id	first_name	last_name
1	John	Smith
2	Maurice	Turnbull
3	Sam	Davis

Rentals

client_id	copy_id	date_of_rental	date_of_return
1	4	2005-07-04	2005-07-05
2	2	2005-07-19	2005-07-22
1	1	2005-07-24	2005-07-25
	3	2005-07-15	2005-07-18

```
SELECT c.client_id, first_name, last_name, copy_id
FROM clients c
 JOIN rentals r ON c.client_id = r.client_id

client_id | first_name | last_name | copy_id
----------+------------+-----------+--------
1         | John       | Smith     | 4
2         | John       | Smith     | 1
2         | Maurice    | Turnbull  | 2
(3 rows)
```

Left Join

Clients

client_id	first_name	last_name
1	John	Smith
2	Maurice	Turnbull
3	Sam	Davis

Rentals

client_id	copy_id	date_of_rental	date_of_return
1	4	2005-07-04	2005-07-05
2	2	2005-07-19	2005-07-22
1	1	2005-07-24	2005-07-25
	3	2005-07-15	2005-07-18

```
SELECT c.client_id, first_name, last_name, copy_id
FROM clients c
 LEFT JOIN rentals r ON c.client_id = r.client_id

client_id | first_name | last_name | copy_id
----------+------------+-----------+--------
1         | John       | Smith     | 4
2         | John       | Smith     | 1
2         | Maurice    | Turnbull  | 2
3         | Sam        | Davis     |
(4 rows)
```

Right Join

Clients

client_id	first_name	last_name
1	John	Smith
2	Maurice	Turnbull
3	Sam	Davis

Rentals

client_id	copy_id	date_of_rental	date_of_return
1	4	2005-07-04	2005-07-05
2	2	2005-07-19	2005-07-22
1	1	2005-07-24	2005-07-25
	3	2005-07-15	2005-07-18

```
SELECT c.client_id, first_name, last_name, copy_id
FROM clients c
 RIGHT JOIN rentals r ON c.client_id = r.client_id

client_id | first_name | last_name | copy_id
----------+------------+-----------+--------
1         | John       | Smith     | 4
2         | John       | Smith     | 1
2         | Maurice    | Turnbull  | 2
          |            |           | 3
(4 rows)
```

Full Outer Join

Clients

client_id	first_name	last_name
1	John	Smith
2	Maurice	Turnbull
3	Sam	Davis

Rentals

client_id	copy_id	date_of_rental	date_of_return
1	4	2005-07-04	2005-07-05
2	2	2005-07-19	2005-07-22
1	1	2005-07-24	2005-07-25

2

```
SELECT c.client_id, first_name, last_name, copy_id
FROM clients c
 FULL OUTER JOIN rentals r ON c.client_id = r.client_id

client_id | first_name | last_name | copy_id
----------+------------+-----------+--------
1         | John       | Smith     | 4
2         | John       | Smith     | 1
2         | Maurice    | Turnbull  | 2
3         | Sam        | Davis     |
          |            |           | 3
(5 rows)
```