

# Intro to SQL

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*SQL*

# Example DB

Students

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	1
4	Lisa N.	20	F	4

Addresses

ID	Street	Zip	City	State
1	423 Main St.	60647	Chicago	IL
2	13 Main St	60655	Barrington	IL
3	15 Main St	60651	Elsewhere	IL
4	14 Main St	60650	Chicago	IL

# All 20 Year Old Students

Students

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	1
4	Lisa N.	20	F	4

20 Year Old Students

ID	Name	Age
1	Nick D.	20
4	Lisa N.	20

```
SELECT ID, Name, Age  
FROM Students  
WHERE Age = 20;
```

# Students

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	1
4	Lisa N.	20	F	4

# Addresses

ID	Street	Zip	City	State
1	423 Main St.	60647	Chicago	IL
2	13 Main St.	60655	Barrington	IL
3	15 Main St.	60651	Elsewhere	IL
4	14 Main St.	60650	Chicago	IL

```
SELECT Students.ID, Name, Street, Zip, City  
FROM Students  
JOIN Addresses  
ON Students.Address = Addresses.ID
```

# Students with Addresses

Student.ID	Name	Street	Zip	City
1	Nick D.	13 Main St.	60655	Barrington
2	Andy D.	13 Main St.	60655	Barrington
3	Beth M.	423 Main St.	60647	Chicago
4	Lisa N.	14 Main St.	60650	Chicago

# Students

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	1
4	Lisa N.	20	F	4

# Addresses

ID	Street	Zip	City	State
1	423 Main St.	60647	Chicago	IL
2	13 Main St.	60655	Barrington	IL
3	15 Main St.	60651	Elsewhere	IL
4	14 Main St.	60650	Chicago	IL

```
SELECT Student.ID, Name, Street, Zip, City  
FROM Students  
JOIN Addresses  
ON Students.Address = Addresses.ID  
WHERE Addresses.City = 'chicago';
```

# Students with Addresses

Student.ID	Name	Street	Zip	City
3	Beth M.	423 Main St.	60647	Chicago
4	Lisa N.	14 Main St.	60650	Chicago



# Some Common SQL Keywords

Keyword	Action
SELECT	Which COLUMNS to include in output table (shrinks the result horizontally!)
FROM	Which TABLE to pull data from
JOIN	Another TABLE to glue / concatenate to the output
ON	What COLUMNS must match when joining two tables
WHERE	Which ROWS to include in the output table (shrinks the result vertically!)

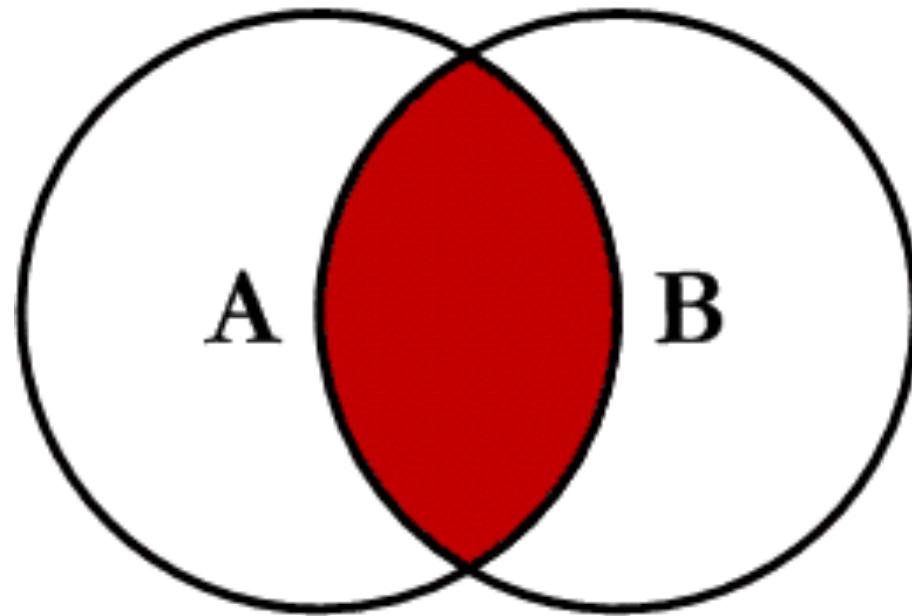
# CRUD Operations

**SQL is used to create/read/update/delete (CRUD) data from a database**

- **INSERT:** Insert new rows into a table
- **SELECT:** Get data from a database
- **UPDATE:** Update existing rows in a table
- **DELETE:** Delete rows from a table
- **CREATE / DROP:** Make / delete new dbs/tables/views/indexes

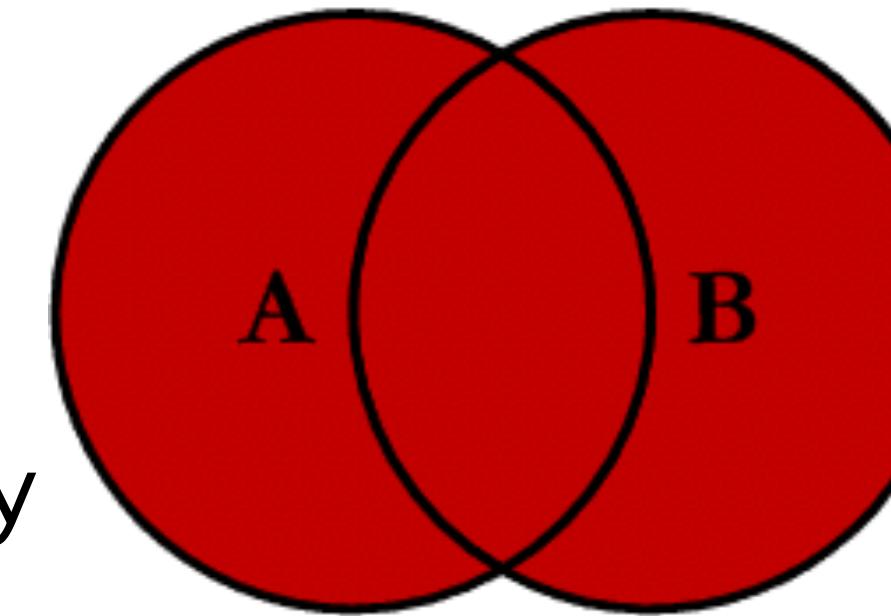


# Inner Join



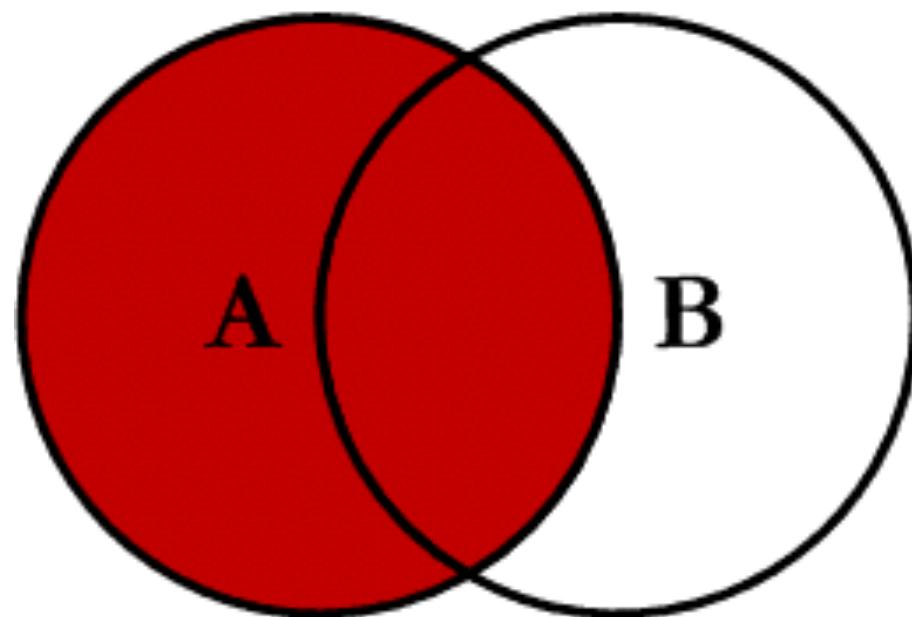
```
SELECT *  
FROM A  
INNER JOIN B  
ON A.Key = B.Key
```

# Outer Join



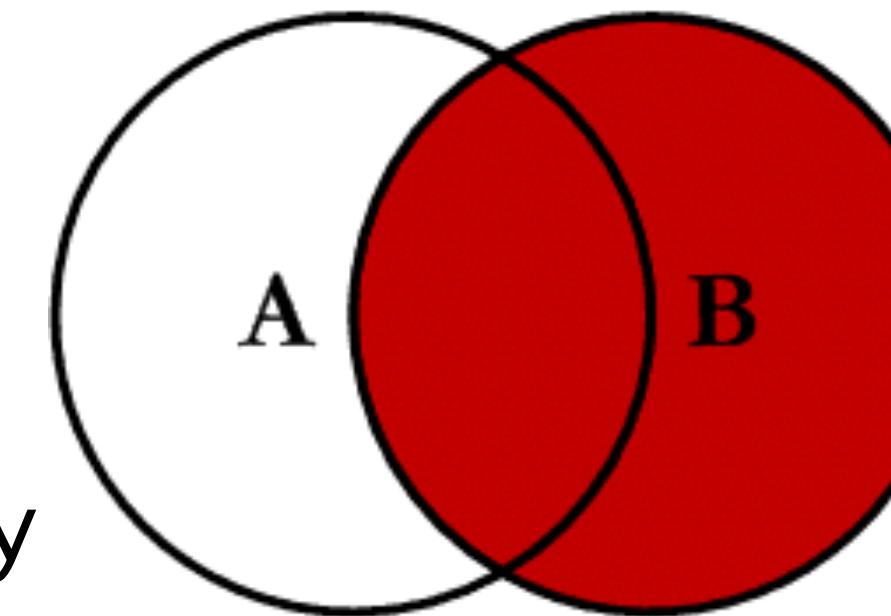
```
SELECT *  
FROM A  
FULL OUTER JOIN B  
ON A.Key = B.Key
```

# Left Join



```
SELECT *  
FROM A  
LEFT JOIN B  
ON A.Key = B.Key
```

# Right Join



```
SELECT *  
FROM A  
RIGHT JOIN B  
ON A.Key = B.Key
```

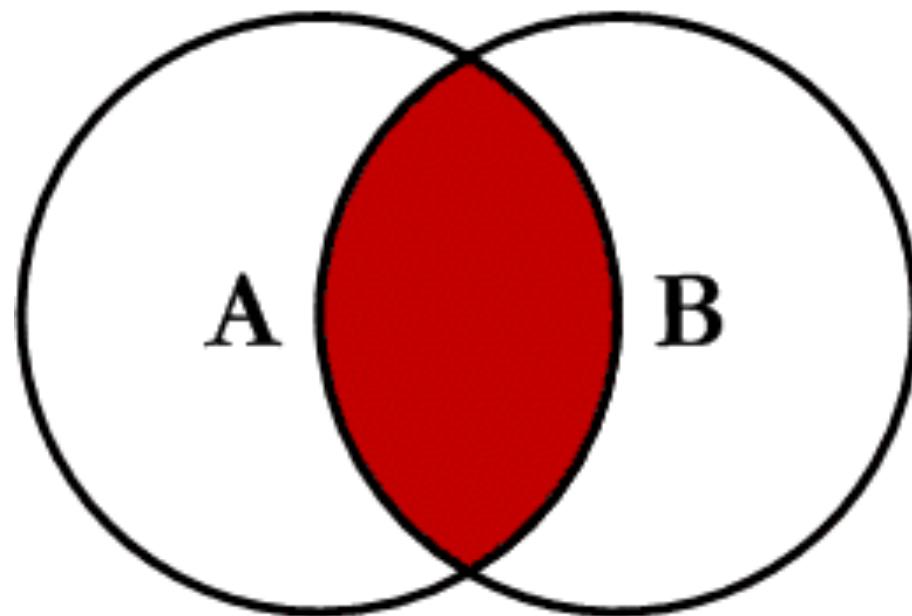
<http://www.codeproject.com/Articles/33052/Visual-Representation-of-SQL-Joins>



# OWNERS

ID	name
1	Geordi
2	Janeway
3	Data
4	Spock

# Inner Join



```
SELECT pets.name, owners.name  
FROM owners  
INNER JOIN pets  
ON pets.ownerID = owners.ID
```

# PETS

ID	ownerID	type	name
1	4	Monkey	Mittens
2	null	Lizard	Carol
3	1	Dog	Rufus
4	2	Cat	Fireball

pets.name	owners.name
Mittens	Spock
Rufus	Geordi
Fireball	Janeway



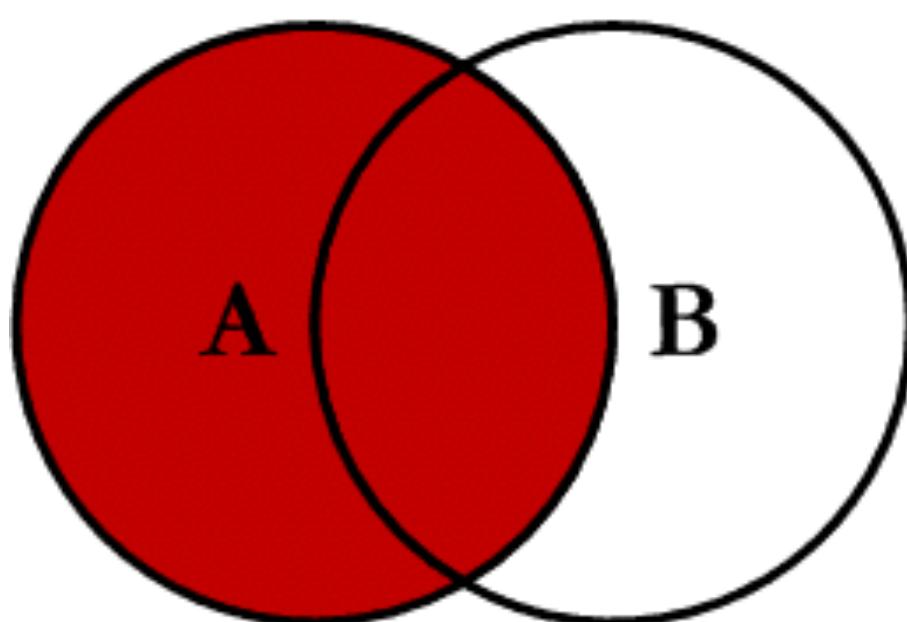
# PETS

ID	ownerID	type	name
1	4	Monkey	Mittens
2	null	Lizard	Carol
3	1	Dog	Rufus
4	2	Cat	Fireball

pets.name	owners.name
Mittens	Spock
Rufus	Geordi
Fireball	Janeway
null	Data



## Left Join



```
SELECT pets.name, owners.name
FROM owners
LEFT JOIN pets
ON pets.ownerID = owners.ID
```

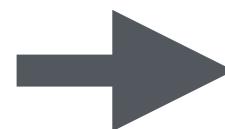
## OWNERS

ID	name
1	Geordi
2	Janeway
3	Data
4	Spock



# PETS

pets.name	owners.name
Mittens	Spock
Carol	null
Rufus	Geordi
Fireball	Janeway

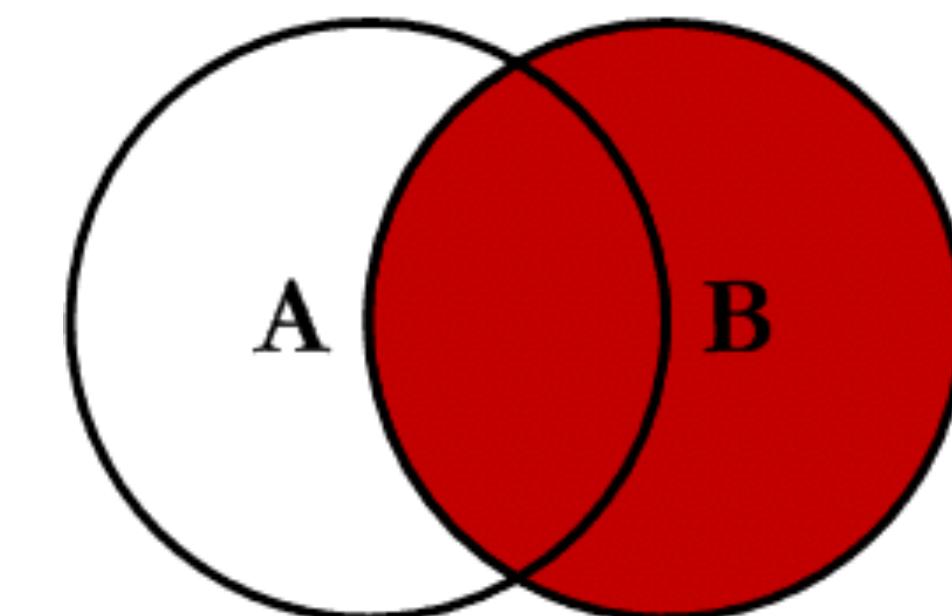


ID	ownerID	type	name
1	4	Monkey	Mittens
2	null	Lizard	Carol
3	1	Dog	Rufus
4	2	Cat	Fireball

# OWNERS

ID	name
1	Geordi
2	Janeway
3	Data
4	Spock

# Right Join



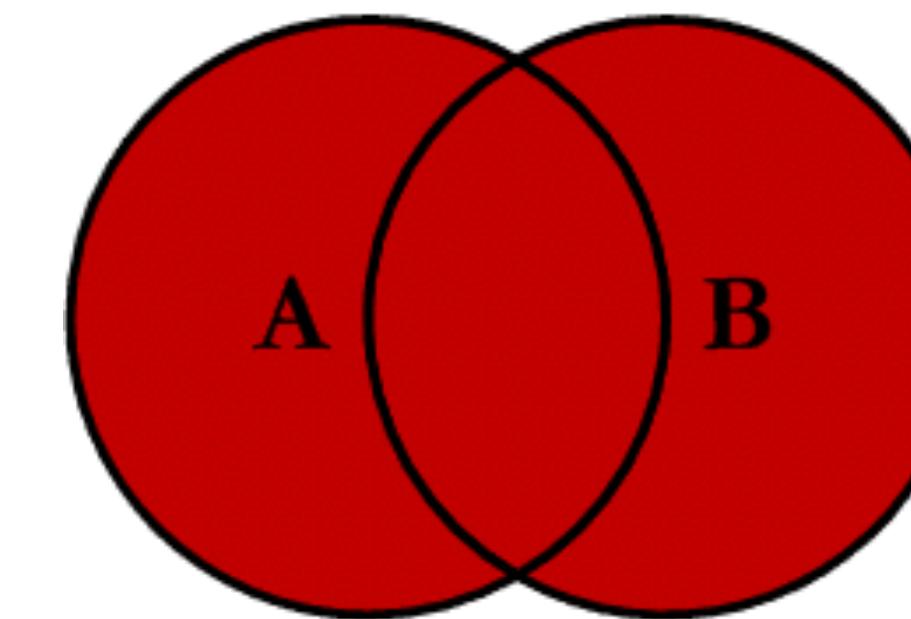
```
SELECT pets.name, owners.name
FROM owners
RIGHT JOIN pets
ON pets.ownerID = owners.ID
```



# OWNERS

ID	name
1	Geordi
2	Janeway
3	Data
4	Spock

# Outer Join



```
SELECT pets.name, owners.name
FROM owners
FULL OUTER JOIN pets
ON pets.ownerID = owners.ID
```

# PETS

pets.name	owners.name
Mittens	Spock
Carol	null
Rufus	Geordi
Fireball	Janeway
→ null	Data

ID	ownerID	type	name
1	4	Monkey	Mittens
2	null	Lizard	Carol
3	1	Dog	Rufus
4	2	Cat	Fireball



ID	Name	Age	StudentID	SchoolID	ID	Name	Level
1	Bart S.	10	1	1	1	Springfield Elementary	E
2	Lisa S.	8	2	1	2	Brook Middle	M
3	Jim F.	13	3	2	3	Springbrook High	H
4	Joan B.	15	4	3	4	Springfield University	U

```
SELECT *
FROM Student AS st
INNER JOIN Enrollment AS e
ON st.ID = e.StudentID
INNER JOIN School as sc
ON e.SchoolID = sc.ID;
```

st.ID	st.Name	Age	StudentID	SchoolID	sc.ID	sc.Name	Level
1	Bart S.	10	1	1	1	Springfield Elementary	E
2	Lisa S.	8	2	1	1	Springfield Elementary	E
3	Jim F.	13	3	2	2	Brook Middle	M
4	Joan B.	15	4	3	3	Springbrook High	H



# AS (without AS)

```
SELECT *
FROM Student st
INNER JOIN Enrollment e
ON st.ID = e.StudentID
INNER JOIN School sc
ON e.SchoolID = sc.ID;
```

ID	Name	Age	StudentID	SchoolID	ID	Name	Level
1	Bart S.	10	1	1	1	Springfield Elementary	E
2	Lisa S.	8	2	1	2	Brook Middle	M
3	Jim F.	13	3	2	3	Springbrook High	H
4	Joan B.	15	4	3	4	Springfield University	U

st.ID	st.Name	Age	StudentID	SchoolID	sc.ID	sc.Name	Level
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1	Bart S.	10	1	1	1	Springfield Elementary	E
2	Lisa S.	8	2	1	1	Springfield Elementary	E
3	Jim F.	13	3	2	2	Brook Middle	M
4	Joan B.	15	4	3	3	Springbrook High	H



# GROUP BY

+

# COUNT

```
SELECT Name, COUNT(*)  

FROM School  

INNER JOIN Enrollment  

ON School.ID = Enrollment.StudentID  

GROUP BY Name;
```

ID	Name	Age
1	Bart S.	10
2	Lisa S.	8
3	Jim F.	13
4	Joan B.	15

StudentID	SchoolID
1	1
2	1
3	2
4	3

ID	Name	Level
1	Springfield Elementary	E
2	Brook Middle	M
3	Springbrook High	H
4	Springfield University	U

Name	COUNT(*)
Springfield Elementary	2
Brook Middle	1
Springbrook High	1
Springfield University	0



# ORDER BY

```
SELECT *
FROM Student
ORDER BY Age DESC;
```

ID	Name	Age
1	Bart S.	10
2	Lisa S.	8
3	Jim F.	13
4	Joan B.	15

StudentID	SchoolID
1	1
2	1
3	2
4	3

ID	Name	Level
1	Springfield Elementary	E
2	Brook Middle	M
3	Springbrook High	H
4	Springfield University	U

ID	Name	Age
4	Joan B.	15
3	Jim F.	13
1	Bart S.	10
2	Lisa S.	8



# SUB-QUERIES

```

SELECT ID, Name, Age
FROM Student
INNER JOIN Enrollment
    ON Student.ID = Enrollment.StudentID
INNER JOIN (
    SELECT SchoolID
    FROM Student
    WHERE Student.Name = 'Lisa S.'
    INNER JOIN Enrollment
        ON Student.ID = Enrollment.StudentID
) AS LisaSchools
    ON LisaSchools.SchoolID = Enrollment.SchoolID
WHERE Name != 'Lisa S.';
```

ID	Name	Age
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StudentID	SchoolID
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ID	Name	Level
----	------	-------

1	Bart S.	10	1	1
2	Lisa S.	8	2	1

3	Jim F.	13	3	2
---	--------	----	---	---

4	Joan B.	15	4	3
---	---------	----	---	---

1	Springfield Elementary	E
2	Brook Middle	M
3	Springbrook High	H
4	Springfield University	U

ID	Name	Age
1	Bart S.	10

# WORKSHOP