Intro to SQL

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	
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	
4	Lisa N.	20	F	4

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	l
4	Lisa N.	20	F	4

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

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	
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;

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	
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.	6065 I	Elsewhere	IL
4	I4 Main St.	60650	Chicago	IL

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	I
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.	6065 I	Elsewhere	IL
4	14 Main St.	60650	Chicago	IL

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

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	М	2
3	Beth M.	23	F	I
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.	6065 I	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

ID	Name	Age	Gender	Address
1	Nick D.	20	M	2
2	Andy D.	28	M	2
3	Beth M.	23	F	
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.	6065 I	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 Adresses.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

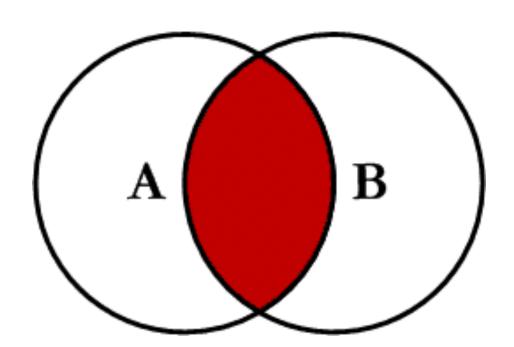
- INSERT: Insert new rows into a table
- SELECT: Get data from a database
- UPDATE: Update existing rows in a table
- DELETE: Delete rows from a table

CREATE / DROP: Make / delete new dbs/tables/views/indexes

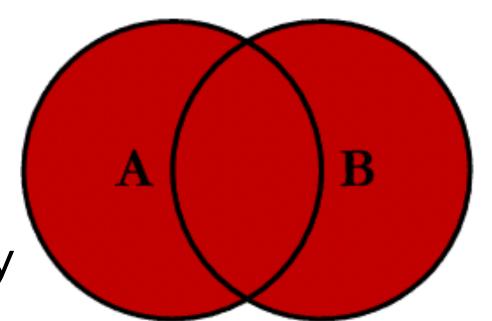


Inner Join

Outer Join



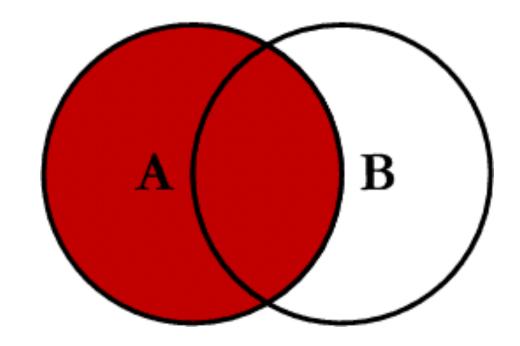
SELECT *
FROM A
INNER JOIN B
ON A.Key = B.Key



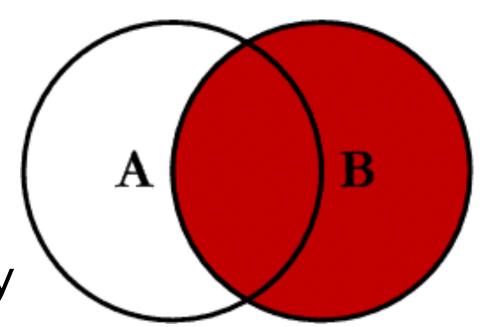
SELECT *
FROM A
FULL OUTER JOIN B
ON A.Key = B.Key

Left Join

Right Join



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

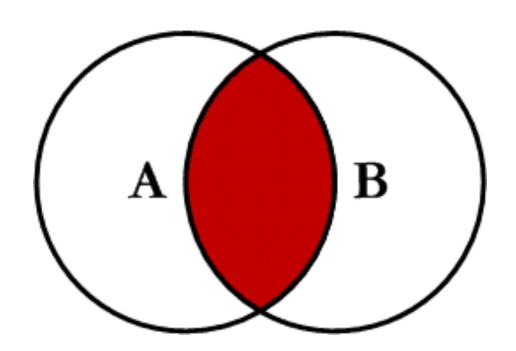


SELECT *
FROM A
RIGHT JOIN B
ON A.Key = B.Key

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



Inner Join



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

OVVNERS

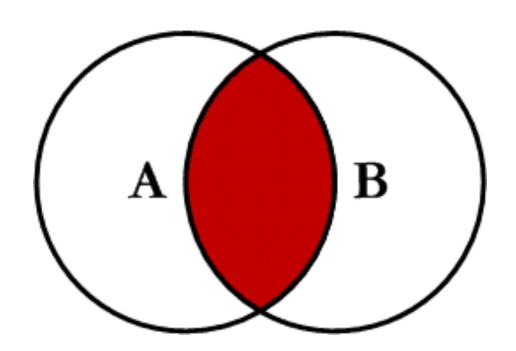
ID	name
I	Geordi
2	Janeway
3	Data
4	Spock

PETS

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



Inner Join



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

OWNERS

ID	name
l	Geordi
2	Janeway
3	Data
4	Spock

PETS

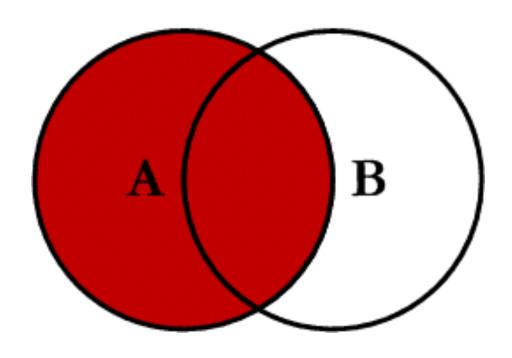
ID	ownerID	type	name
- 1	4	Monkey	Mittens
2	null	Lizard	Carol
3		Dog	Rufus
4	2	Cat	Fireball

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



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

Left Join



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

OWNERS

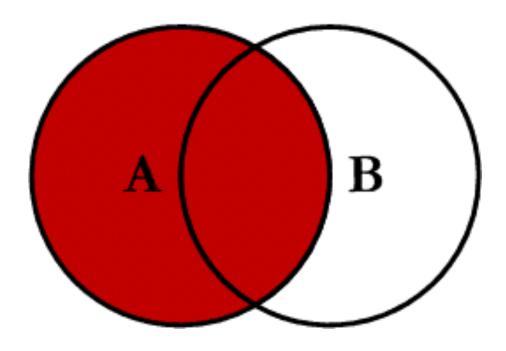
ID	name	
I	Geordi	
2	Janeway	
3	Data	
4	Spock	



ID	ownerID	type	name
I	4	Monkey	Mittens
2	null	Lizard	Carol
3		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	
I	Geordi	
2	Janeway	
3	Data	
4	Spock	

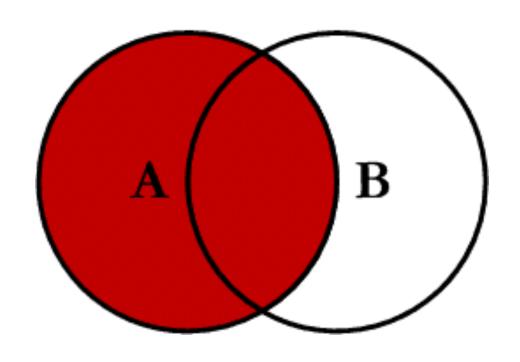


ID	ownerID	type	name
I	4	Monkey	Mittens
2	null	Lizard	Carol
3		Dog	Rufus
4	2	Cat	Fireball

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	
I	Geordi	
2	Janeway	
3	Data	
4	Spock	

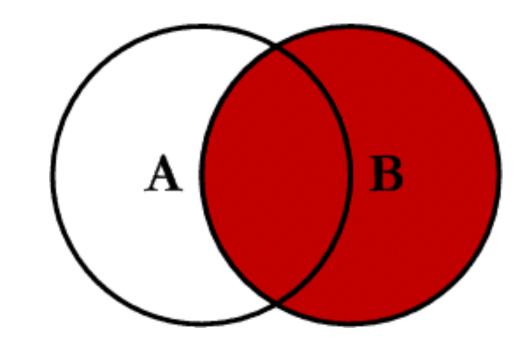


ID	ownerID	type	name
-	4	Monkey	Mittens
2	null	Lizard	Carol
3		Dog	Rufus
4	2	Cat	Fireball

OWNERS

ID	name
I	Geordi
2	Janeway
3	Data
4	Spock

Right Join



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



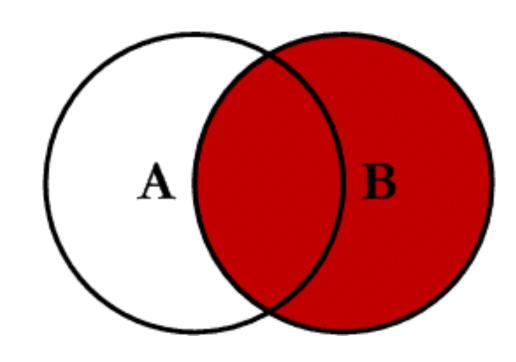
pets.name	owners.name
Mittens	Spock
Carol	null
Rufus	Geordi
Fireball	Janeway

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

OWNERS

ID	name
I	Geordi
2	Janeway
3	Data
4	Spock

Right Join



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



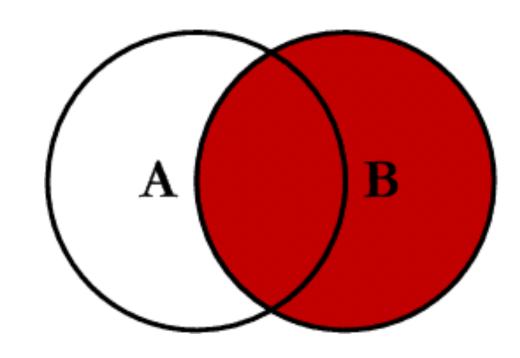
pets.name	owners.name
Mittens	Spock
Carol	null
Rufus	Geordi
Fireball	Janeway

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

OWNERS

ID	name
	Geordi
2	Janeway
3	Data
4	Spock

Right Join



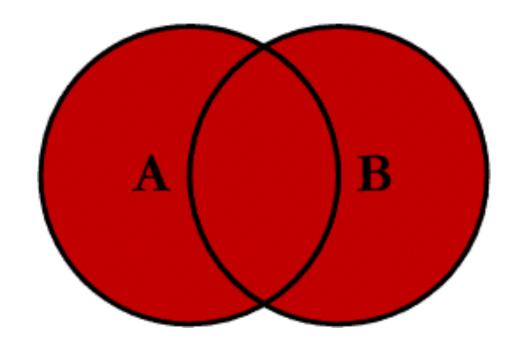
SELECT pets.name, owners.name
FROM owners
RIGHT JOIN pets
ON pets.ownerID = owners.ID



OWNERS

ID	name
	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

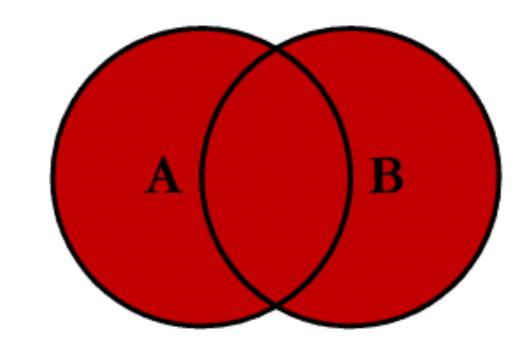
ID	ownerID	type	name
1	4	Monkey	Mittens
2	null	Lizard	Carol
3	I	Dog	Rufus
4	2	Cat	Fireball



OWNERS

ID	name
	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	ID	ownerID	type
Mittens	Spock		4	Monkey
Carol	null	2	null	Lizard
Rufus	Geordi	3		Dog
Fireball	Janeway	4	2	Cat
null	Data			

name

Mittens

Carol

Rufus

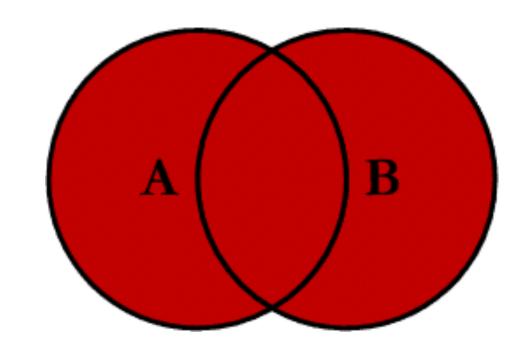
Fireball



OWNERS

ID	name
	Geordi
2	Janeway
3	Data
4	Spock

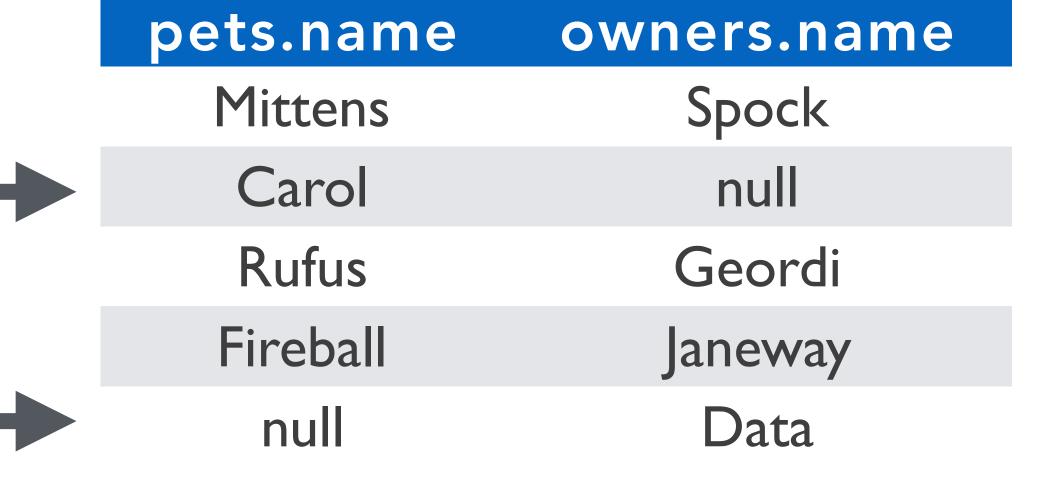
Outer Join



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

PETS

ID	ownerID	type
	4	Monkey
2	null	Lizard
3		Dog
4	2	Cat



name

Mittens

Carol

Rufus

Fireball

D	Name	Age
I	Bart S.	10

8

tudentID	SchoolID	

D	Name	Level
	Springfield	E

M

Н

Brook Middle

Elementary

Springbrook High

Springfield University

13 3 Jim F. Joan B. 15

Lisa S.

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;

Ś	>	

2

3

4

Bart S. 10

Name

Jim F.

Joan B.

Age

13

15

StudentID SchoolID

Springfield Elementary

AS

Lisa S. 8

2

3

4

Brook Middle

Name

Springbrook High

2

3

4 Springfield University

U

Level

M

Н

SELECT *	
FROM Student AS st	
INNER JOIN Enrollment AS	e
<pre>ON st.ID = e.StudentID</pre>	
INNER JOIN School as sc	
ON e.SchoolID = sc.ID;	
ON CIDOMOCTED BOILD!	

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



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

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

SELECT *
FROM Student st
INNER JOIN Enrollment e
<pre>ON st.ID = e.StudentID</pre>
INNER JOIN School sc
<pre>ON e.SchoolID = sc.ID;</pre>

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



GROUP BY + COUNT

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

StudentID	SchoolID
I	I
2	
3	2
4	3

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

```
SELECT Name, COUNT(*)
FROM School
INNER JOIN Enrollment
ON School.ID = Enrollment.StudentID
GROUP BY Name;
```



GROUP BY + COUNT

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

StudentID	SchoolID
I	I
2	I
3	2
4	3

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

SELECT Name, COUNT(*)
FROM School
INNER JOIN Enrollment
<pre>ON School.ID = Enrollment.StudentID</pre>
GROUP BY Name;

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



ORDER BY

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

StudentID	SchoolID
2	
3	2
4	3

ID	Name	Level
	Springfield Elementary	Е
2	Brook Middle	M
3	Springbrook High	Н
4	Springfield University	U

SELECT *
 FROM Student
 ORDER BY Age DESC;



ORDER BY

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

StudentID	SchoolID
2	
3	2
4	3

ID	Name	Level
I	Springfield Elementary	Ε
2	Brook Middle	M
3	Springbrook High	Н
4	Springfield University	U

SELECT	*		
FROM	Stud	dent	
ORDER	R BY	Age	DESC;

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

SUB-QUERIES

SELECT ID, Name, Age

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

entID	SchoolID	ID
2	I	2
	2	3
ļ	3	4

```
ID Name Level

Springfield Elementary E

Brook Middle M

Springbrook High H

Springfield University U
```

```
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	

1141110	7.95	
		-
Bart S.	10	

Age

15

StudentID	SchoolID

SUB-QUERIES

2	Lisa S.	8	
3	Jim F.	13	

Joan B.

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	L
	Springfield Elementary	
2	Brook Middle	
3	Springbrook High	
4	Springfield University	

ID	Name	Age
	Bart S.	10

WORKSHOP