

# STRUCTURED QUERY LANGUAGE

W4D1



**SQL**

# DATA PERSISTENCE



# DATA PERSISTENCE

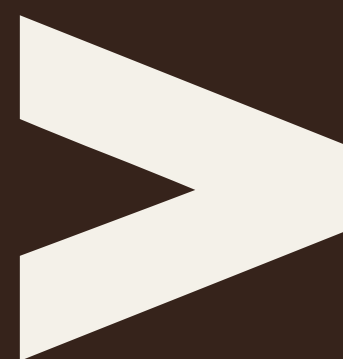
CSV  
JSON  
XML



# RELATIONAL DATABASES

**Reduce** the **duplication** of data.  
Provide a **robust query language**.  
Accurately **model reality**.

# DESIGN



# DATABASE DENORMALIZATION

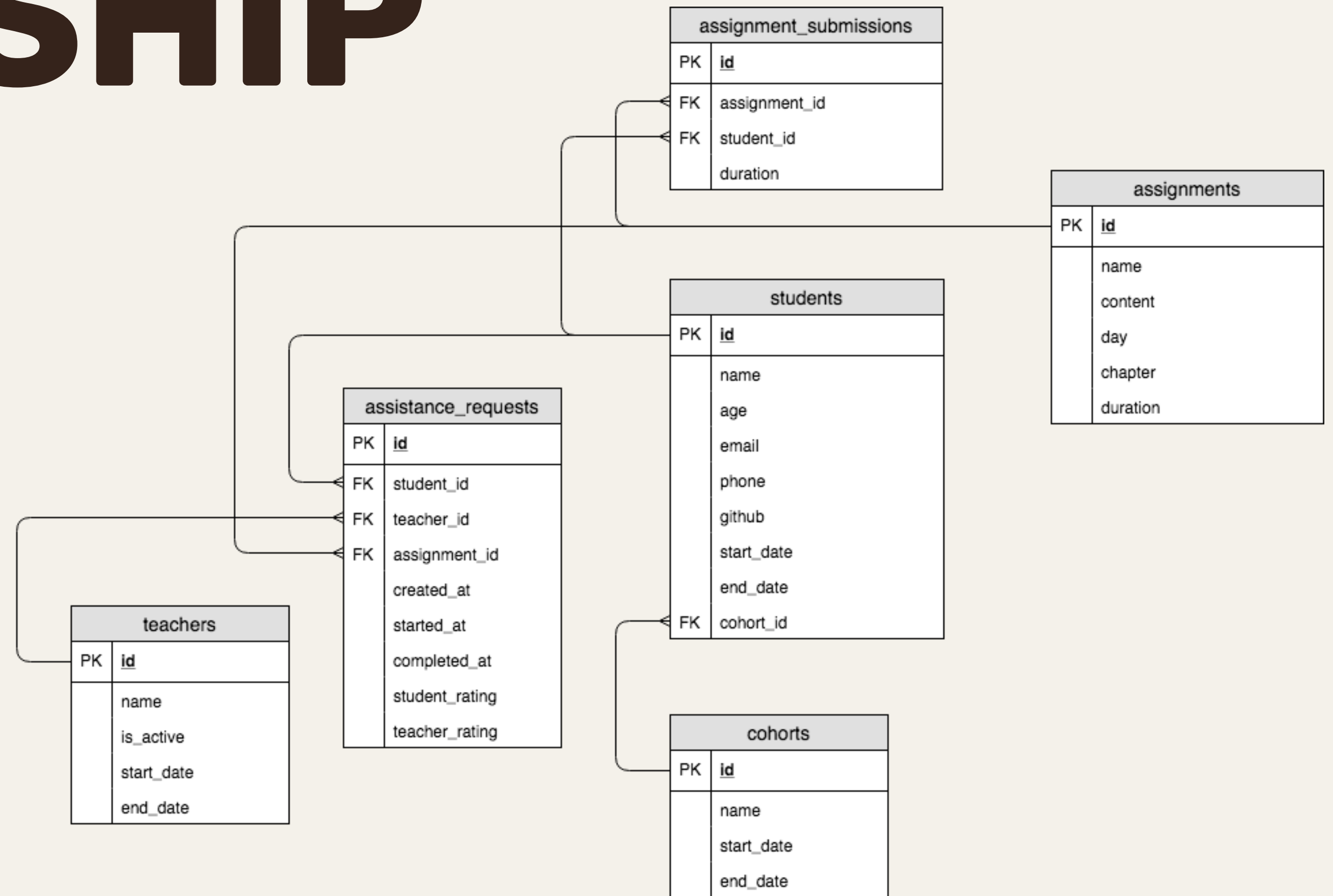
students		
id	name	cohort_name
1	Sam Billings	FEB12
2	Susan Hudson	MAR12
3	Malloy Jenkins	<b>APR09</b>
4	Maximilian Alesio	<b>APR09</b>
5	Pegasus Larue	<b>APR09</b>

# DATABASE NORMALIZATION

students		
id	name	cohort_id
1	Sam Billings	1
2	Susan Hudson	2
3	Malloy Jenkins	<b>3</b>
4	Maximilian Alesio	<b>3</b>
5	Pegasus Larue	<b>3</b>

cohorts	
id	name
1	FEB12
2	MAR12
3	APR09

# ENTITY RELATIONSHIP DIAGRAM

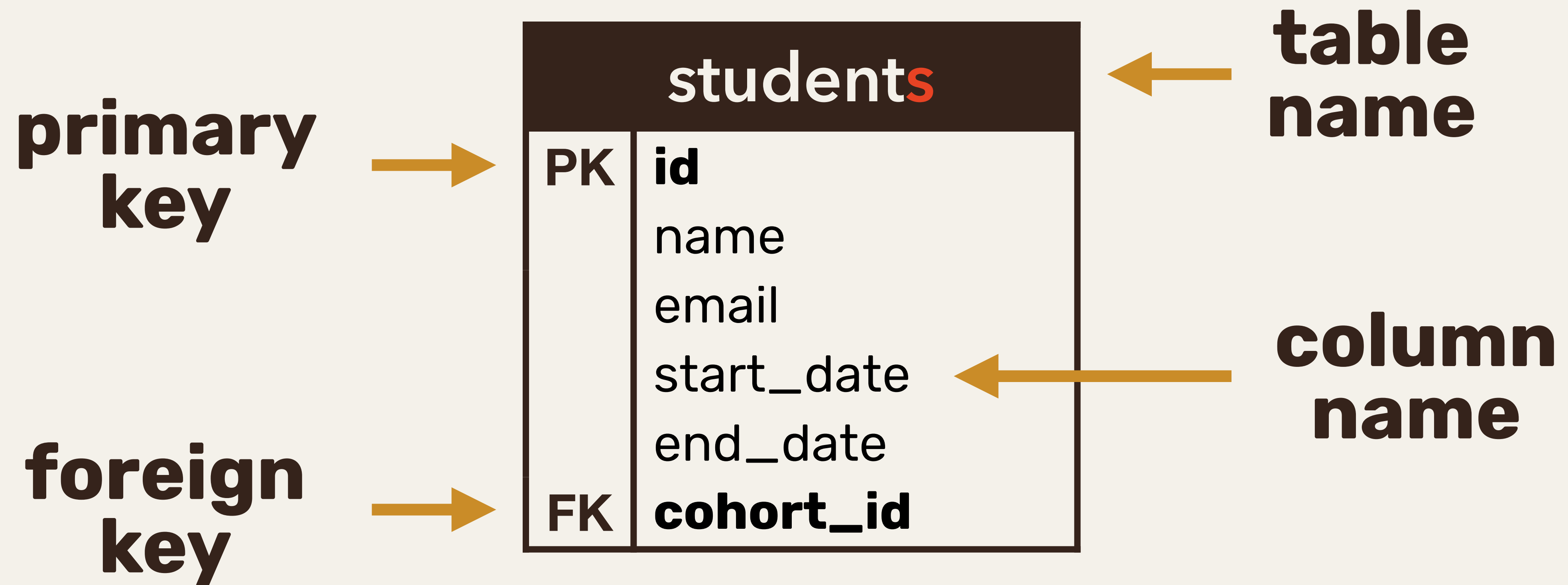




# STICK TO CONVENTION!



# STICK TO CONVENTION!



THE **FOREIGN KEY** IS ON  
THE **MANY SIDE**.



THE **FOREIGN**  
**KEY** IS ON THE  
**MANY SIDE.**

# JOIN TABLES

## assistance\_requests

PK	id
FK	student_id
FK	teacher_id
FK	assignment_id
	created_at
	started_at
	completed_at
	student_rating
	teacher_rating

# SCHEMA



# DATA TYPES

cohorts	
PK	id name start_date end_date

**INTEGER**  
**CHAR**  
**VARCHAR**  
**DATE**  
**TEXT**  
**BOOLEAN**  
*SMALLINT*  
*BIGINT*  
*SERIAL*

**SMALLINT**

**+/- 32,767**

**INTEGER**

**+/- 2,147,483,647**

**BIGINT**

**+/- 9,223,372,036,854,775,807**





# ISO 8601

**2018-04-26T21:36:28+00:00**



**800 555 4567**

**800-555-4567**

**(800)-555-4567**

**+1 800 555 4567**

**+62 78 402 55 45**

**8,005,554,567**

# INDEXING

```
const students = [  
  { id: "cjvbZq", name: "Tajana" },  
  { id: "DJHa7I", name: "Delfina" },  
  { id: "hEWmRa", name: "Filip" },  
  { id: "Ck9YNg", name: "Amie" },  
  { id: "AG7piI", name: "Radoslav" },  
  { id: "rtwj0V", name: "Embla" },  
  { id: "VbnpoA", name: "Natalia" }  
]
```

```
const students = {  
  "cjvbZq": { id: "cjvbZq", name: "Tajana" },  
  "DJHa7I": { id: "DJHa7I", name: "Delfina" },  
  "hEWmRa": { id: "hEWmRa", name: "Filip" },  
  "Ck9YNg": { id: "Ck9YNg", name: "Amie" },  
  "AG7piI": { id: "AG7piI", name: "Radoslav" },  
  "rtwj0V": { id: "rtwj0V", name: "Embla" },  
  "VbnpoA": { id: "VbnpoA", name: "Natalia" }  
}
```

# INDEXING

```
const students = [  
  { id: "cjvbZq", name: "Tajana" },  
  { id: "DJHa7I", name: "Delfina" },  
  { id: "hEWmRa", name: "Filip" },  
  { id: "Ck9YNg", name: "Amie" },  
  { id: "AG7piI", name: "Radoslav" },  
  { id: "rtwj0V", name: "Embla" },  
  { id: "VbnpoA", name: "Natalia" }  
]
```

```
students.find(student => {  
  return student.id === 4  
})
```

```
const students = {  
  "cjvbZq": { id: "cjvbZq", name: "Tajana" },  
  "DJHa7I": { id: "DJHa7I", name: "Delfina" },  
  "hEWmRa": { id: "hEWmRa", name: "Filip" },  
  "Ck9YNg": { id: "Ck9YNg", name: "Amie" },  
  "AG7piI": { id: "AG7piI", name: "Radoslav" },  
  "rtwj0V": { id: "rtwj0V", name: "Embla" },  
  "VbnpoA": { id: "VbnpoA", name: "Natalia" }  
}
```

# INDEXING

```
const students = [  
  { id: "cjvbZq", name: "Tajana" },  
  { id: "DJHa7I", name: "Delfina" },  
  { id: "hEWmRa", name: "Filip" },  
  { id: "Ck9YNg", name: "Amie" },  
  { id: "AG7piI", name: "Radoslav" },  
  { id: "rtwj0V", name: "Embla" },  
  { id: "VbnpoA", name: "Natalia" }  
]
```

```
students.find(student => {  
  return student.id === 4  
})
```

```
const students = {  
  "cjvbZq": { id: "cjvbZq", name: "Tajana" },  
  "DJHa7I": { id: "DJHa7I", name: "Delfina" },  
  "hEWmRa": { id: "hEWmRa", name: "Filip" },  
  "Ck9YNg": { id: "Ck9YNg", name: "Amie" },  
  "AG7piI": { id: "AG7piI", name: "Radoslav" },  
  "rtwj0V": { id: "rtwj0V", name: "Embla" },  
  "VbnpoA": { id: "VbnpoA", name: "Natalia" }  
}
```

```
students['4']
```

# QUERIES



```
CREATE TABLE cohorts (  
  id SERIAL PRIMARY KEY NOT NULL,  
  name VARCHAR(255) NOT NULL,  
  start_date DATE,  
  end_date DATE  
);
```

cohorts	
PK	id name start_date end_date

**cohort\_id**

**INTEGER**

**REFERENCES cohorts(id)**

**ON DELETE CASCADE**

students	
PK	id name
FK	cohort_id



**CREATE  
READ  
UPDATE  
DELETE**



**INSERT**



**SELECT**



**UPDATE**



**DELETE**

**INSERT**

**INTO** cohorts (

name,

start\_date,

end\_date

) **VALUES** (

'FEB12',

'2018-02-12T08:00:00.000Z',

'2018-04-20T07:00:00.000Z'

);

**INSERT**  
(ONE)

```
INSERT INTO cohorts (name)  
VALUES ( 'FEB12' ),  
        ( 'MAR12' ),  
        ( 'APR09' ),  
        ( 'MAY07' );
```

**INSERT**  
(MANY)



**SELECT  
FROM  
WHERE  
GROUP BY  
HAVING  
ORDER BY**

**SELECT \* FROM students;**

students			
id	name	start_date	cohort_id
1	Tajana Meyrick	2018-02-12	1
2	Delfina Hayes	2018-03-12	2
3	Filip Bell	2018-03-12	2
4	Amie Fabbro	2018-04-09	3
5	Radoslav Pavlov	2018-04-09	3
6	Embla Bösch	2018-04-09	3
7	Natalia Armati	2018-04-09	3
8	Juraj Jansons	2018-04-09	3
9	Corona Headley	2018-05-07	4
10	Kwame Bernhardsson	2018-05-07	4
11	Helene Daubney	2018-05-07	4
12	Lucette Bianco	2018-05-07	4

**SELECT** id, name, cohort\_id **FROM** students;

students		
id	name	cohort_id
1	Tajana Meyrick	1
2	Delfina Hayes	2
3	Filip Bell	2
4	Amie Fabbro	3
5	Radoslav Pavlov	3
6	Embla Bösch	3
7	Natalia Armati	3
8	Juraj Jansons	3
9	Corona Headley	4
10	Kwame Bernhardsson	4
11	Helene Daubney	4
12	Lucette Bianco	4

```
SELECT count(id) FROM students;
```

students
count
12

```
SELECT count(id) AS student_count
FROM students
WHERE cohort_id = 3;
```

students
student_count
5



```
SELECT  
    cohort_id,  
    count(id) AS student_count  
FROM students  
GROUP BY cohort_id;
```

students	
cohort_id	student_count
1	1
2	2
3	5
4	4

```
SELECT
    cohort_id,
    count(id) AS student_count
FROM students
GROUP BY cohort_id
HAVING count(id) ≥ 2;
```

students	
cohort_id	student_count
2	2
3	5
4	4

```
SELECT
    cohort_id,
    count(id) AS student_count
FROM students
GROUP BY cohort_id
HAVING count(id) ≥ 2
ORDER BY count(id) DESC;
```

students	
cohort_id	student_count
3	5
4	4
2	2

```
SELECT
    cohort_id,
    count(id) AS student_count
FROM students
WHERE start_date < '2018-05-01'
GROUP BY cohort_id
HAVING count(id) ≥ 2
ORDER BY count(id) DESC;
```

students	
cohort_id	student_count
3	5
2	2



**UPDATE  
DELETE**



```
UPDATE users SET password = '123456';  
DELETE FROM users;
```

**ALWAYS USE WHERE**

**EVEN IF YOU  
WANT TO  
AFFECT THE  
WHOLE TABLE**

**INNER**  
**LEFT OUTER**  
**RIGHT OUTER**  
**FULL OUTER**  
**CROSS**

**JOIN**

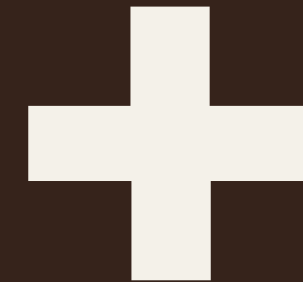
# AMBIGUITY

```
students.id,  
students.name,  
cohorts.name
```



# INNER

students		
id	name	cohort_id
1	Sam Billings	1
2	Susan Hudson	null
3	Malloy Jenkins	3



cohorts	
id	name
1	FEB12
2	MAR12
3	APR09

id	student_name	cohort_name
1	Sam Billings	FEB12
3	Malloy Jenkins	APR09

# INNER

**SELECT**

**students.id,  
students.name AS student\_name,  
cohorts.name AS cohort\_name**

**FROM students**

**INNER JOIN cohorts**

**ON cohorts.id = students.cohort\_id;**

# OUTER

students		
id	name	cohort_id
1	Sam Billings	1
2	Susan Hudson	null
3	Malloy Jenkins	3

+

cohorts	
id	name
1	FEB12
2	MAR12
3	APR09

id	student_name	cohort_name
1	Sam Billings	FEB12
2	Susan Hudson	null
3	Malloy Jenkins	APR09

# OUTER

**SELECT**

**students.id,**

**students.name AS student\_name,**

**cohorts.name AS cohort\_name**

**FROM students**

**LEFT OUTER JOIN cohorts**

**ON cohorts.id = students.cohort\_id;**



**QUESTIONS?**