

STRUCTURED QUERY LANGUAGE

W4D1



SQL

DATA PERSISTENCE



DATA PERSISTENCE

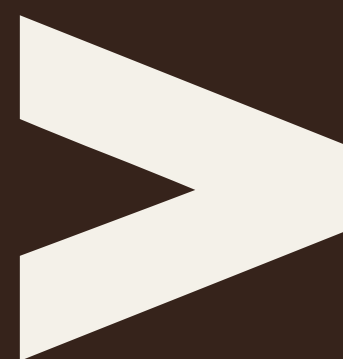
CSV
JSON
XML



RELATIONAL DATABASES

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

DESIGN



DATABASE DENORMALIZATION

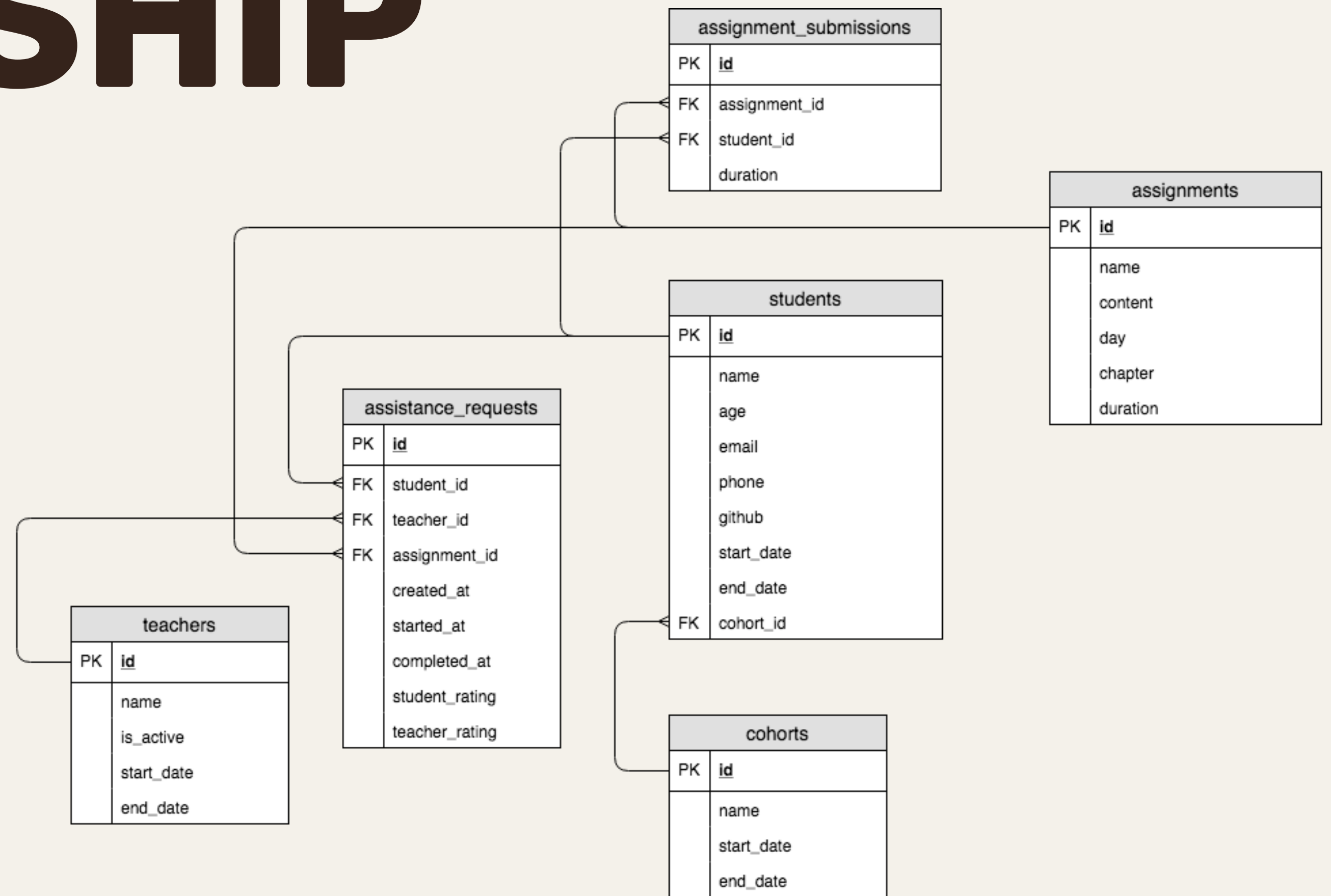
students		
id	name	cohort_name
1	Sam Billings	FEB12
2	Susan Hudson	MAR12
3	Malloy Jenkins	APR09
4	Maximilian Alesio	APR09
5	Pegasus Larue	APR09

DATABASE NORMALIZATION

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

cohorts	
id	name
1	FEB12
2	MAR12
3	APR09

ENTITY RELATIONSHIP DIAGRAM

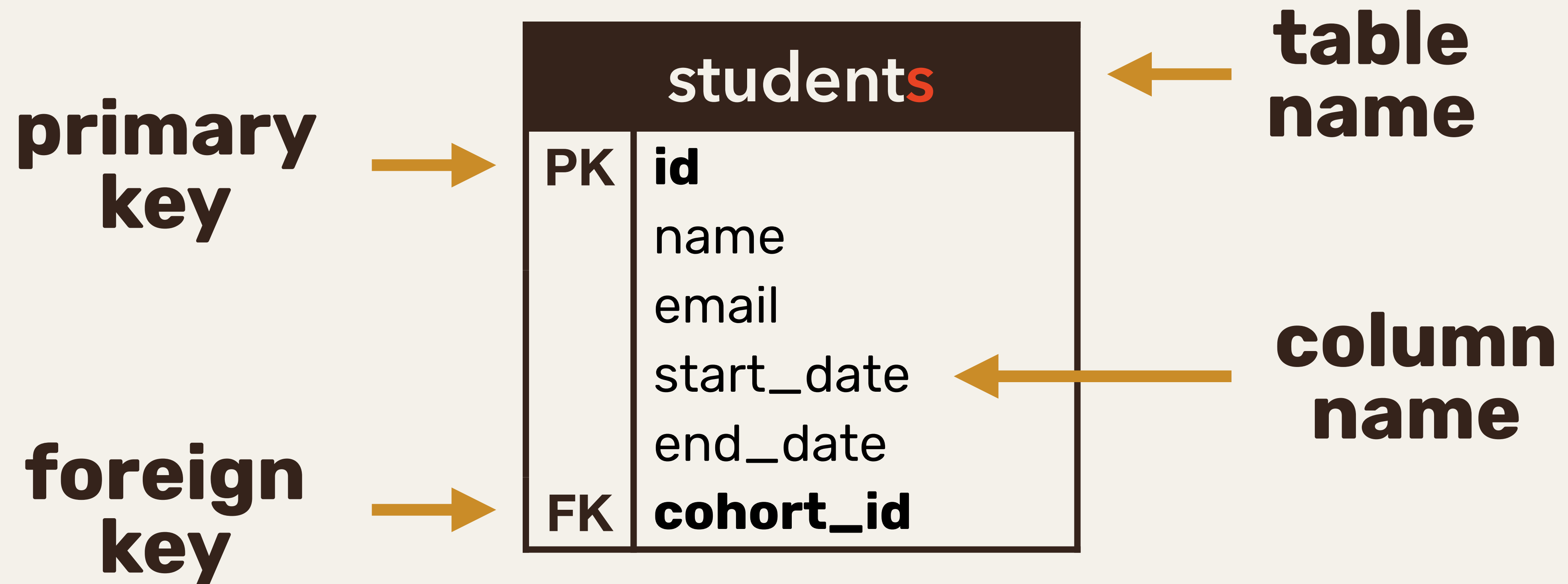


STICK TO CONVENTION!



sssnake_case

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" }  
]
```

```
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.find(student => {  
  return student.id === 'rtwj0V'  
})
```

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 === 'rtwj0V'  
})
```

```
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['rtwj0V']
```

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 < '2018-04-01'
GROUP BY cohort_id
HAVING count(id) ≥ 2
ORDER BY count(id) DESC;
```

students	
cohort_id	student_count
3	5
4	4



**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

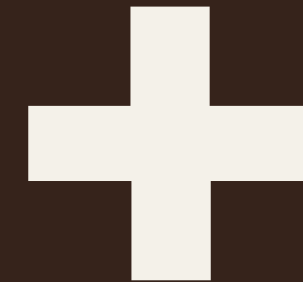
JOIN

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?