# Exercise 1: Are you still good at SQL?

1. Given those two simple tables:

| **Animal** |
|---|
| Dog |
| Lion |
| Elephant |

| **Animal** |
|---|
| Cat |
| Tiger |
| Dog |

Which query would give the following output?

| **Animal** | **Animal** |
|---|---|
| Dog | Dog |
| Lion | `NULL` |
| Elpehant | `NULL` |
| `NULL` | Cat |
| `NULL` | Tiger |

2. Let's define an `ExamResults` table

| **Student** | **Ewam** | **Pass?** |
|---|---|---|
| Steve | Maths | true |
| Steve | Physics | true |
| Steve | English | false |
| Steve | CS | true |
| Eleanor | CS | false |

Knowing that to pass in next year, students have to pass all the exams in the `MandatoryExams` table:

| **Exam** |
|---|
| Maths |
| Physics |

| Exam |
| --- |
| CS |

How can you output the list of distinct students, with a boolean indicated that they passed their year or not? (There are **many** solutions here)

3. A query to debug

The following query is producing "wrong results": users complain that some clients do not show up. Moreover, the average_order_amount value is different that in another query that uses the `AVG()` function. FInally "cost" metric is also completely **wrong**. How would you fix it?

```
SELECT
  customer_name
  SUM(o.amount) / COUNT(0) AS average_order_amount,
  SUM(o.shipping_cost + o.cost) AS cost
FROM
  customers c
  LEFT JOIN orders o
  ON o.customer_id = c.customer_id
WHERE
  o.amount < 10000
  AND
  c.country IN ('France', 'UK', NULL)
GROUP BY
  customer_name
```

# Exercise 2: Statistics

1. Connect to your instance with **pgadmin** and create a database or use an existing one
2. Create a table. Insert many records in the table using the `generate_series()` function.
3. Check the estimated cardinality of your table with

```
SELECT reltuples AS estimate FROM pg_class where relname = '<your_table>';
```

4. Check the collected statistics in the `pg_stats` table
5. Run `ANALYZE <your_table>`
6. Check again the previous queries. Try again the entire flow to see how often things are updated.

## Questions

- What is the purpose of the `ANALYZE` command?
- What is inside `pg_stats`? How does this help for query execution?

# Exercice 3: B-Trees

1. Go to https://www.cs.usfca.edu/~galles/visualization/BTree.html
2. Insert all the numbers from the Fibonacci suite up to 144
3. Delete 13