Assignment 3 (13.05.2022)

Handin until: 20.05.2022, 09:00

1. [10 Points] **WITH or without**

   CTEs help to assemble complex queries from simple building blocks. Identifying these blocks becomes complicated in the presence of correlation, however. Consider the two following queries **1)** and **2)** which contain subqueries:

```sql
CREATE TABLE t (
  x int NOT NULL,
  y int NOT NULL
);

CREATE TABLE p (
  val int NOT NULL
);
```

```sql
INSERT INTO t VALUES
  (2,1),(5,3),(6,4),(7,6),(9,9);



INSERT INTO p VALUES
  (4),(5),(7),(8),(9);
```

```sql
-- 1)
SELECT t.x AS x
FROM   t AS t
WHERE  t.x IN
  (SELECT p.val
   FROM   p
   WHERE  p.val > 5);
```

```sql
-- 2)
SELECT t.x AS x
FROM   t AS t
WHERE  t.x IN
  (SELECT p.val
   FROM   p
   WHERE  p.val > t.y);
```

   (a) For each of the two queries **1)** and **2)**, introduce a CTE **subquery** that represents the subquery of each of the original SQL queries. Rewrite queries **1)** and **2)** without subqueries such that they only refer to the CTE **subquery** instead.

   (b) Why is rewriting one query easier than the other? Explain briefly.

2. [20 Points] **King and Knight**

Familiarize yourself with the *incomplete* SQL file `chess.sql`. It defines a chess board where only black and white king (♔,♚) and knight pieces (♘,♞) can be placed. In chess, knights and kings move in a certain pattern[1].

You are tasked to complete the SQL file. Once completed, running `chess.sql` with its example will produce the following output, where we can see the possible moves for each piece on the board. Of course, this is only one of many possible arrangement of pieces. **The completed SQL file has to work with all possible arrangements.**

```
  | A B C D E F G H
--+---------------
8 | | | | | | | | |
7 | | | |0|0|0| |
6 | | |0|0|♚|0| |
5 | |0| |0|0|0| |
4 | | | |♘| | | |
3 | |0| | | |0| |
2 | | |0| |0| | |
1 | | | | | | | | |
```

Example: Positions reachable by ♘ and ♚ with one move are marked with `0`.

(a) Complete the CTE `board_and_pieces`. Replace the `YOUR QUERY HERE` with your solution.

(b) Complete the CTE `possible_movement`. Replace the `YOUR QUERY HERE` with your solution.

Note: In case you run into problems with the unicode chess piece characters in `chess.sql`, we also provided you with a file `chess-alt.sql` where the unicode chess piece characters ♔, ♚, ♘ and ♞ are replaced with `k`, `K`, `n` and `N` respectively.

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[1]For details about chess, see https://en.wikipedia.org/wiki/Chess.