3.9 Common Table Expressions

Step 1: Business questions from step 1 and 2 of task 3.8 using CTEs

    Step 1 of 3.8

```sql
WITH total_amount (customer_id, country, city, total_amount) AS
(
    SELECT A.customer_id,
        D.country,
        C.city,
        SUM(F.amount) AS total_amount
    FROM payment F
    INNER JOIN customer A ON F.customer_id = A.customer_id
    LEFT JOIN address B ON A.address_id = B.address_id
    LEFT JOIN city C ON B.city_id = C.city_id
    LEFT JOIN country D ON C.country_id = D.country_id
    WHERE city IN ('Aurora', 'Tokat', 'Tarsus', 'Atlixco', 'Emeishan',
'Pontianak', 'Shimoga', 'Aparecida de Goinia', 'Zalantun', 'Taguig')
    GROUP BY
        A.customer_id,
        D.country,
        C.city
    ORDER BY total_amount DESC LIMIT 5)
SELECT
    AVG(total_amount) AS average_amount
FROM total_amount;
```

average_amount
120.3220000000000000

Step 2 of 3.8

```sql
WITH top_customer (customer_id, first_name, last_name, country, city,
total_amount) AS
(
    SELECT
        A.customer_id,
        A.first_name,
        A.last_name,
        D.country,
        C.city,
        SUM(F.amount) AS total_amount
    FROM payment F
    INNER JOIN customer A ON F.customer_id = A.customer_id
    LEFT JOIN address B ON A.address_id = B.address_id
    LEFT JOIN city C ON B.city_id = C.city_id
    LEFT JOIN country D ON C.country_id = D.country_id
    WHERE city IN ('Aurora', 'Tokat', 'Tarsus', 'Atlixco', 'Emeishan',
```

```
        'Pontianak', 'Shimoga', 'Aparecida de Goinia', 'Zalantun',
'Taguig')
    GROUP BY A.customer_id, D.country, C.city
    ORDER BY total_amount DESC
    LIMIT 5)
SELECT
    country.country AS country,
    COUNT(customer.customer_id) AS all_customer_count,
    COUNT(top_customer.customer_id) AS top_customer_count
FROM customer customer
INNER JOIN address address ON customer.address_id = address.address_id
INNER JOIN city city ON address.city_id = city.city_id
INNER JOIN country country ON city.country_id = country.country_id
LEFT JOIN top_customer ON customer.customer_id =
top_customer.customer_id
GROUP BY country.country
ORDER BY top_customer_count DESC;
```

Country	all_customer_count	top_customer_count
China	53	1
United States	36	1
Mexico	30	1
Indonesia	14	1
Turkey	15	1

First, I simply wrote "WITH" followed by the table and column names in the brackets with an "AS". Second, I copied the subquery. Third I copied the outer query, placed it at the end and if required made some adjustments – for example, if I chose a different column name.

Step 2: Performance of CTEs and subqueries.
Which approach do you think will perform better and why?
Maybe CTE - because the CTE first must create a new "table" which might leads to more power needed whereas the subquery can be more optimized.

Cost in ms	Subquery	CTE
Step 1	200	246
Step 2	280	551

Did the results surprise you? Write a few sentences to explain your answer.
I expected CTE to consume more computing resources but didn't think it would make such a "huge" difference – in step 2 requiring almost twice as much time.

Step 3
Write 1 to 2 paragraphs on the challenges you faced when replacing your subqueries with CTEs.
At the beginning I had to figure out how I have to use CTE's and then I simply copy pasted 90% of the code, made some small adjustments, tried some things out and at the end it worked.