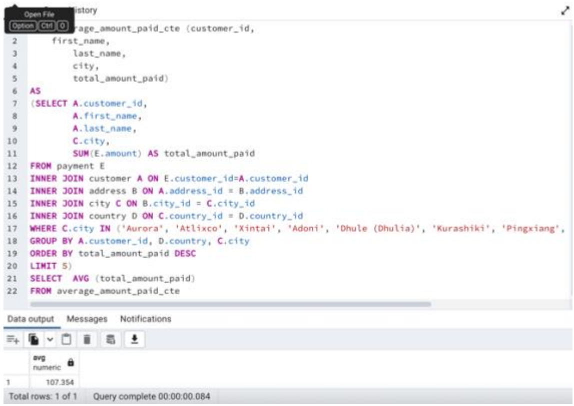
3.9 Common Table Expressions

1. **Find the average amount paid by the top 5 customers ?**

```
WITH average_amount_paid_cte (customer_id,
            first_name,
                        last_name,
                        city,
                        total_amount_paid)
AS
(SELECT A.customer_id,
                        A.first_name,
                        A.last_name,
                        C.city,
                        SUM(E.amount) AS total_amount_paid
FROM payment E
INNER JOIN customer A ON E.customer_id=A.customer_id
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
WHERE C.city IN ('Aurora', 'Atlixco', 'Xintai', 'Adoni', 'Dhule (Dhulia)', 'Kurashiki', 'Pingxiang', 'Sivas',
'Celaya', 'So Leopoldo')
GROUP BY A.customer_id, D.country, C.city
ORDER BY total_amount_paid DESC
LIMIT 5)
SELECT  AVG (total_amount_paid)
FROM average_amount_paid_cte
```



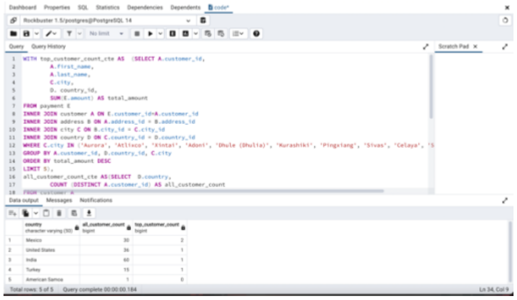
```
rage_amount_paid_cte (customer_id,
    first_name,
        last_name,
        city,
        total_amount_paid)
AS
(SELECT A.customer_id,
        A.first_name,
        A.last_name,
        C.city,
        SUM(E.amount) AS total_amount_paid
FROM payment E
INNER JOIN customer A ON E.customer_id=A.customer_id
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
WHERE C.city IN ('Aurora', 'Atlixco', 'Xintai', 'Adoni', 'Dhule (Dhulia)', 'Kurashiki', 'Pingxiang',
GROUP BY A.customer_id, D.country, C.city
ORDER BY total_amount_paid DESC
LIMIT 5)
SELECT  AVG (total_amount_paid)
FROM average_amount_paid_cte
```

```
   avg
   numeric
1  107.354
Total rows: 1 of 1    Query complete 00:00:00.084
```

2. **Find out how many of the top 5 customers are based within each country?**

```
WITH top_customer_count_cte AS   (SELECT A.customer_id,
                    A.first_name,
                    A.last_name,
                    C.city,
                    D. country_id,
                    SUM(E.amount) AS total_amount
FROM payment E
INNER JOIN customer A ON E.customer_id=A.customer_id
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
WHERE C.city IN ('Aurora', 'Atlixco', 'Xintai', 'Adoni', 'Dhule (Dhulia)', 'Kurashiki', 'Pingxiang',
'Sivas', 'Celaya', 'So Leopoldo')
GROUP BY A.customer_id, D.country_id, C.city
ORDER BY total_amount DESC
LIMIT 5),
all_customer_count_cte AS(SELECT  D.country,
                COUNT (DISTINCT A.customer_id) AS all_customer_count
FROM customer A
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
GROUP BY D.country)

SELECT  D.country,
                COUNT (DISTINCT A.customer_id) AS all_customer_count,
                COUNT (DISTINCT top_customer_count_cte.customer_id) AS
top_customer_count
FROM customer A
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
LEFT JOIN top_customer_count_cte ON D.country_id = top_customer_count_cte.country_id
GROUP BY D.country
ORDER BY top_customer_count DESC
LIMIT 5;
```



```
WITH top_customer_count_cte AS  (SELECT A.customer_id,
        A.first_name,
        A.last_name,
        C.city,
        D. country_id,
        SUM(E.amount) AS total_amount
FROM payment E
INNER JOIN customer A ON E.customer_id=A.customer_id
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
WHERE C.city IN ('Aurora', 'Atlixco', 'Xintai', 'Adoni', 'Dhule (Dhulia)', 'Kurashiki', 'Pingxiang', 'Sivas', 'Celaya', 'S
GROUP BY A.customer_id, D.country_id, C.city
ORDER BY total_amount DESC
LIMIT 5),
all_customer_count_cte AS(SELECT  D.country,
        COUNT (DISTINCT A.customer_id) AS all_customer_count
FROM customer A
```

```
   country                  all_customer_count   top_customer_count
   character varying (50)   bigint               bigint
1  Mexico                                   30                    2
2  United States                            36                    1
3  India                                    60                    1
4  Turkey                                   15                    1
5  American Samoa                            1                    0
Total rows: 5 of 5    Query complete 00:00:00.184                              Ln 34, Col 9
```

3. Step 1. Located the tables in the database that hold the information that I needed 2. Gathered the following; *Customer ID, First_name, last_name, city, total_amount_paid*. 3. Define the CTE using WITH clause, named it, gave is an alias with AS and added the query for the top 5 countries by payment and city and wrote a main statement to query as per requested information (The average amount paid by top 5 customers).

Step 2: Compare the performance of your CTEs and subqueries.

1. My assumption is that the CTE would perform better because it’s easier to read and something that could be reference before the main statement.

2. Query Plan

QUERY	COST
CTE – Step 1	cost=66.09..66.10 rows=1 width=32
CTE – Step 2	cost=168.49..168.50 rows=5 width=25
Subquery - Step 1	cost=66.09..66.10 rows=1 width=32
Subquery - Step 2	cost=168.49..168.50 rows=5 width=25

QUERY	COST
CTE – Step 1	41 msec. 22 rows affected.
CTE – Step 2	33 msec. 45 rows affected.
Subquery - Step 1	42 msec. 22 rows affected.
Subquery - Step 2	44 sec. 45 rows affected.

The results were surprising, because I figured that the more complex and longer query would've taken longer to complete versus the shorter one. Even though the cost of queries for step 1 is the same for both tasks, which leads is to assume that there is no significant difference. For Step 2 – the time is 11 msec. faster, which is a given considering how long the CTW query is.

3. One of the challenges was defining the complex query and creating the CTEs. After I learned how to write two CTEs for the same query, it was challenging to combine them to get the results that we were being asked.