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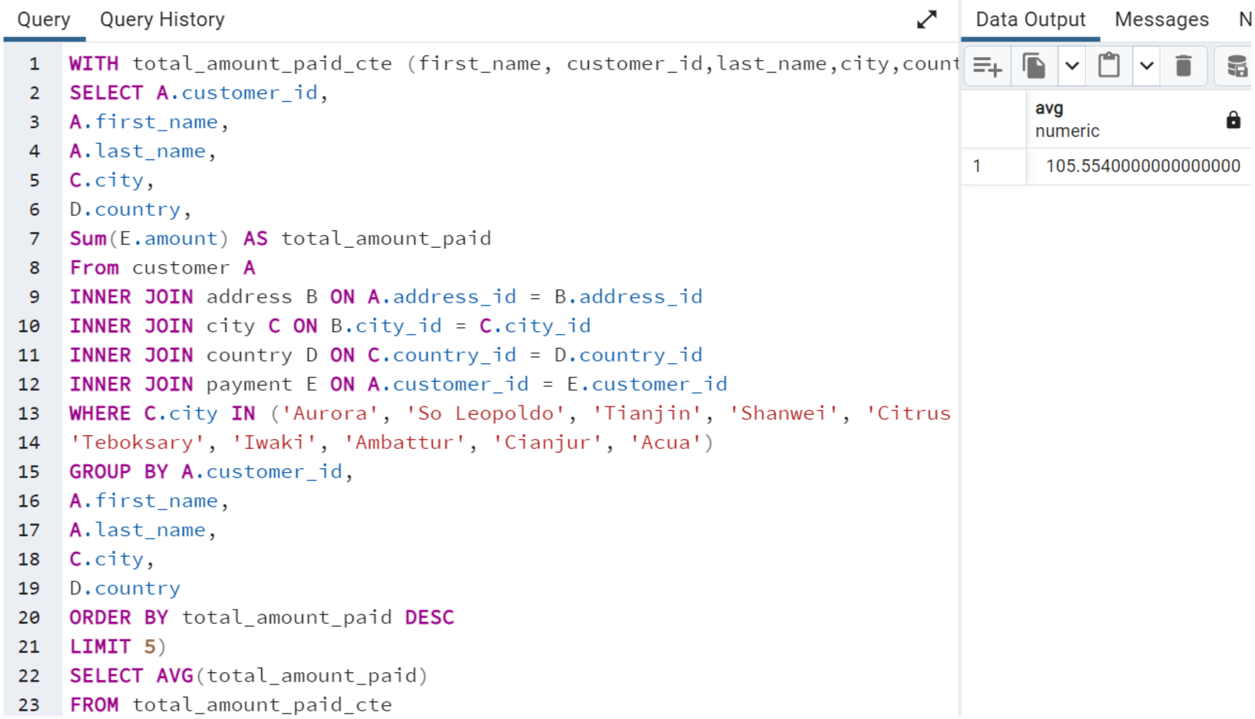
Exercise 3.9

Question 1:

```
WITH total_amount_paid_cte (first_name,
customer_id,last_name,city,country,total_amount_paid) AS(
SELECT A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country,
Sum(E.amount) AS total_amount_paid
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
INNER JOIN payment E ON A.customer_id = E.customer_id
WHERE C.city IN ('Aurora', 'So Leopoldo', 'Tianjin', 'Shanwei', 'Citrus Heights',
'Teboksary', 'Iwaki', 'Ambattur', 'Cianjur', 'Acua')
GROUP BY A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country
ORDER BY total_amount_paid DESC
LIMIT 5)
SELECT AVG(total_amount_paid)
FROM total_amount_paid_cte
```

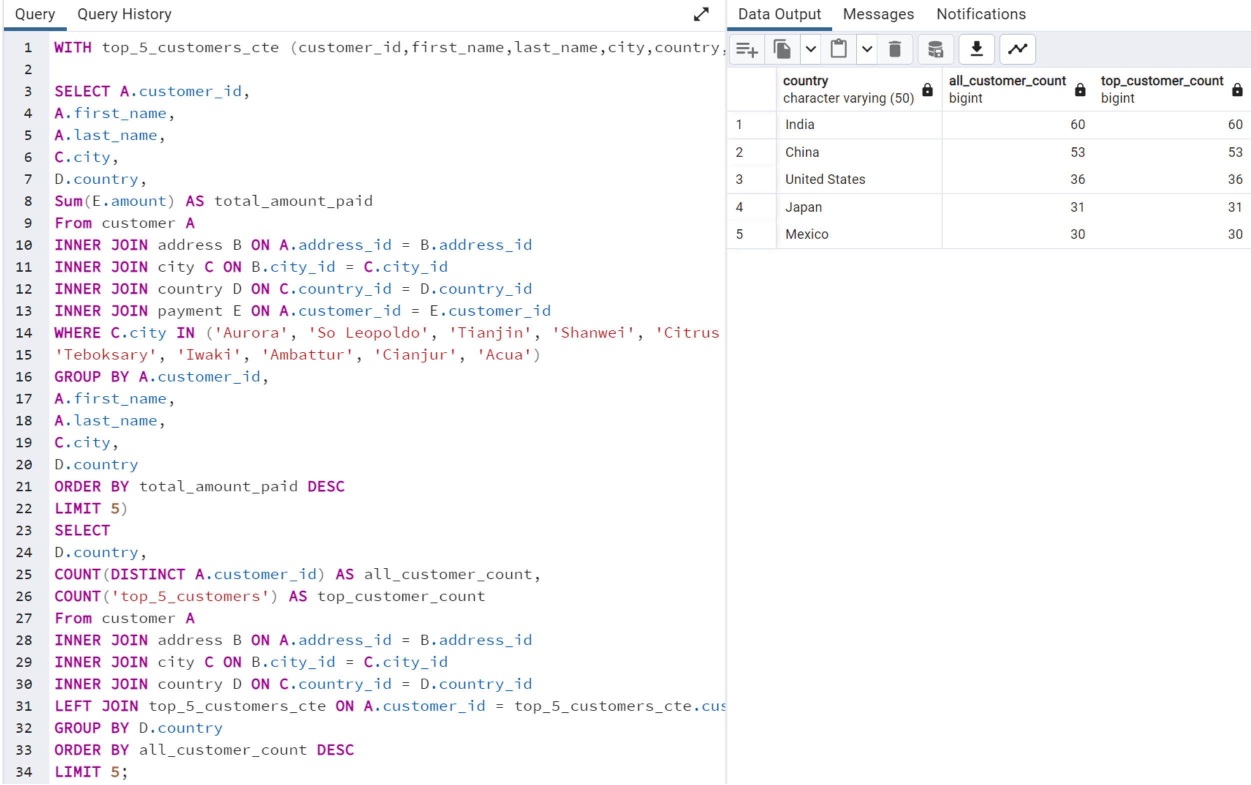


```
WITH total_amount_paid_cte (first_name, customer_id,last_name,city,count
SELECT A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country,
Sum(E.amount) AS total_amount_paid
From customer A
INNER JOIN address B ON A.address_id = B.address_id
INNER JOIN city C ON B.city_id = C.city_id
INNER JOIN country D ON C.country_id = D.country_id
INNER JOIN payment E ON A.customer_id = E.customer_id
WHERE C.city IN ('Aurora', 'So Leopoldo', 'Tianjin', 'Shanwei', 'Citrus
'Teboksary', 'Iwaki', 'Ambattur', 'Cianjur', 'Acua')
GROUP BY A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country
ORDER BY total_amount_paid DESC
LIMIT 5)
SELECT AVG(total_amount_paid)
FROM total_amount_paid_cte
```

```
     avg
     numeric
1    105.5540000000000000
```

```
WITH top_5_customers_cte (customer_id,first_name,last_name,city,country,total_amount_paid)
AS (

SELECT A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country,
Sum(E.amount) AS total_amount_paid
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
INNER JOIN payment E ON A.customer_id = E.customer_id
WHERE C.city IN ('Aurora', 'So Leopoldo', 'Tianjin', 'Shanwei', 'Citrus Heights',
'Teboksary', 'Iwaki', 'Ambattur', 'Cianjur', 'Acua')
GROUP BY A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country
ORDER BY total_amount_paid DESC
LIMIT 5)
SELECT
D.country,
COUNT(DISTINCT A.customer_id) AS all_customer_count,
COUNT('top_5_customers') 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_5_customers_cte ON A.customer_id = top_5_customers_cte.customer_id
GROUP BY D.country
ORDER BY all_customer_count DESC
LIMIT 5;
```



```
WITH top_5_customers_cte (customer_id,first_name,last_name,city,country,

SELECT A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country,
Sum(E.amount) AS total_amount_paid
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
INNER JOIN payment E ON A.customer_id = E.customer_id
WHERE C.city IN ('Aurora', 'So Leopoldo', 'Tianjin', 'Shanwei', 'Citrus
'Teboksary', 'Iwaki', 'Ambattur', 'Cianjur', 'Acua')
GROUP BY A.customer_id,
A.first_name,
A.last_name,
C.city,
D.country
ORDER BY total_amount_paid DESC
LIMIT 5)
SELECT
D.country,
COUNT(DISTINCT A.customer_id) AS all_customer_count,
COUNT('top_5_customers') 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_5_customers_cte ON A.customer_id = top_5_customers_cte.cus
GROUP BY D.country
ORDER BY all_customer_count DESC
LIMIT 5;
```

	country character varying (50)	all_customer_count bigint	top_customer_count bigint
1	India	60	60
2	China	53	53
3	United States	36	36
4	Japan	31	31
5	Mexico	30	30

The second part to the question honestly took me a little while so I played around with the query a bit. The beginning wasn't so hard since all I had to do was write the WITH function and follow up with my CTE and place my average at the bottom instead of the top of the query. The second part I had to rearrange the entire subquery of the top 5 counts of customers and place it all at the bottom.

Question 2:
The CTE is more usable since we are rewriting the query for us to be able to read. Us as analysts won't have full access to the database so this practice using CTE will be beneficial in the future.

	Cost	Run time
First Query	Limit (cost=64.41..64.43 rows=5 width=67)	55 sec
First CTE	Limit (cost=64.41..64.43 rows=5 width=67)	140 msec
Second query	Limit (cost=166..166.68 rows=5 width=25)	51 msec
Second CTE	Limit (cost=166..166.68 rows=5 width=25)	163 msec

The results were honestly not surprising. I figured that the CTE's would have a higher run time but I didn't think that they would have the same cost.

Question 3:
I did face quite a few challenges with the second portion of the first question. I had to reread through the instructions and the summaries to fully grasp what was happening. Once I figured out that I had to rewrite my queries to reverse, I finally understood the task. CTE's are definitely a powerful command and lets us read the database in a better way than we did before.