

## Common Table Expressions (CTE)

### Rewriting the subqueries into CTE's:

Subquery 1, into CTE:

```
WITH top_5_customers AS (  
  SELECT  
    customer.customer_id,  
    customer.first_name,  
    customer.last_name,  
    city.city,  
    country.country,  
    SUM(payment.amount) AS total_amount_paid  
  FROM country  
  INNER JOIN city ON country.country_id = city.country_id  
  INNER JOIN address ON city.city_id = address.city_id  
  INNER JOIN customer ON address.address_id = customer.address_id  
  INNER JOIN payment ON customer.customer_id = payment.customer_id  
  WHERE city.city IN (  
    'Aurora', 'Atlixco', 'Xintai', 'Adoni', 'Dhule (Dhulia)', 'Kurashiki',  
    'Pingxiang', 'Sivas', 'Celaya', 'So Leopoldo'  
  )  
  AND country.country IN (  
    'India', 'China', 'United States', 'Japan', 'Mexico', 'Brazil',  
    'Russian Federation', 'Philippines', 'Turkey', 'Indonesia'  
  )  
  GROUP BY customer.customer_id, customer.first_name,  
    customer.last_name, city.city, country.country  
  ORDER BY total_amount_paid DESC  
  LIMIT 5  
)  
  
SELECT AVG(total_amount_paid) AS average  
FROM top_5_customers;
```

Subquery 2, into CTE:

```
WITH top_5_customers AS (  
  SELECT  
    customer.customer_id,  
    country.country  
  FROM country  
  INNER JOIN city ON country.country_id = city.country_id  
  INNER JOIN address ON city.city_id = address.city_id  
  INNER JOIN customer ON customer.address_id = address.address_id  
  INNER JOIN payment ON customer.customer_id = payment.customer_id
```

```

WHERE city.city IN (
    'Aurora', 'Atlixco', 'Xintai', 'Adoni', 'Dhule (Dhulia)', 'Kurashiki',
    'Pingxiang', 'Sivas', 'Celaya', 'So Leopoldo'
)
AND country.country IN (
    'India', 'China', 'United States', 'Japan', 'Mexico', 'Brazil',
    'Russian Federation', 'Philippines', 'Turkey', 'Indonesia'
)
GROUP BY customer.customer_id, country.country
ORDER BY SUM(payment.amount) DESC
LIMIT 5
)

SELECT
    country.country,
    COUNT(DISTINCT customer.customer_id) AS all_customer_count,
    COUNT(DISTINCT top_5_customers.customer_id) AS top_customer_count
FROM country
INNER JOIN city ON country.country_id = city.country_id
INNER JOIN address ON city.city_id = address.city_id
INNER JOIN customer ON customer.address_id = address.address_id
LEFT JOIN top_5_customers ON top_5_customers.customer_id =
customer.customer_id
GROUP BY country.country
ORDER BY all_customer_count DESC;

```

#### Output step one:

"average"

107.3540000000000000

#### Output step two:

"country"	"all_customer_count"	"top_customer_count"
"India"	60	1
"China"	53	0
"United States"	36	1
"Japan"	31	0
"Mexico"	30	2
"Brazil"	28	0
"Russian Federation"	28	0
"Philippines"	20	0
"Turkey"	15	1
"Indonesia"	14	0
"Nigeria"	13	0
"Argentina"	13	0

"South Africa"	11	0
"Taiwan"	10	0
"United Kingdom"	9	0
"Iran"	8	0
"Poland"	8	0
"Italy"	7	0
"Germany"	7	0
"Venezuela"	7	0
"Egypt"	6	0
"Ukraine"	6	0
"Vietnam"	6	0
"Colombia"	6	0
"Spain"	5	0
"Canada"	5	0
"Saudi Arabia"	5	0
"Netherlands"	5	0
"Pakistan"	5	0
"South Korea"	5	0
"Peru"	4	0
"France"	4	0
"Yemen"	4	0
"Israel"	4	0
"Algeria"	3	0
"Switzerland"	3	0
"Tanzania"	3	0
"United Arab Emirates"	3	0
"Morocco"	3	0
"Bangladesh"	3	0
"Chile"	3	0
"Thailand"	3	0
"Malaysia"	3	0
"Austria"	3	0
"Paraguay"	3	0
"Mozambique"	3	0
"Ecuador"	3	0
"Dominican Republic"	3	0
"Sudan"	2	0
"Bolivia"	2	0
"Greece"	2	0
"Belarus"	2	0
"Bulgaria"	2	0
"Yugoslavia"	2	0
"Cambodia"	2	0
"Cameroon"	2	0
"Romania"	2	0
"Puerto Rico"	2	0

"Kazakstan"	2	0
"Kenya"	2	0
"Angola"	2	0
"Latvia"	2	0
"Azerbaijan"	2	0
"Congo, The Democratic Republic of the"	2	0
"Oman"	2	0
"Myanmar"	2	0
"French Polynesia"	2	0
"Zambia"	1	0
"American Samoa"	1	0
"Anguilla"	1	0
"Armenia"	1	0
"Bahrain"	1	0
"Brunei"	1	0
"Chad"	1	0
"Czech Republic"	1	0
"Estonia"	1	0
"Ethiopia"	1	0
"Faroe Islands"	1	0
"Finland"	1	0
"French Guiana"	1	0
"Gambia"	1	0
"Greenland"	1	0
"Holy See (Vatican City State)"	1	0
"Hong Kong"	1	0
"Hungary"	1	0
"Iraq"	1	0
"Kuwait"	1	0
"Liechtenstein"	1	0
"Lithuania"	1	0
"Madagascar"	1	0
"Malawi"	1	0
"Moldova"	1	0
"Nauru"	1	0
"Nepal"	1	0
"New Zealand"	1	0
"North Korea"	1	0
"Runion"	1	0
"Saint Vincent and the Grenadines"	1	0
"Senegal"	1	0
"Slovakia"	1	0
"Sri Lanka"	1	0

"Sweden"	1	0
"Tonga"	1	0
"Tunisia"	1	0
"Turkmenistan"	1	0
"Tuvalu"	1	0
"Virgin Islands, U.S."	1	0
"Afghanistan"	1	0

### **Compare the performance of your CTEs and subqueries.**

I prefer using CTEs because the readability, the structured thinking, resonates much more with my own thought process than writing queries with subqueries.

Also, CTEs seem easier when the query is complex — they make code clearer, reusable, and easier to debug than deeply nested subqueries.