# **Chinook Database Analysis**

## **1.Introduction**

This project analyzes the Chinook database, which simulates a digital music store. Using MySQL, key insights were drawn from customer data, invoice records, Track details, album, artist and genre information. The goal is to understand the data and answer a set of objective and subjective questions to support business decisions-making through data analysis.

## **2. Objective Questions**

**1. Does any table have missing values or duplicates? If yes, how would you handle it?**

Ans: To answer this question I have used the following MySQL query:

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Answer:

* **Null Values Check**
  + **Table:** Customer
  + **Findings:** There were no missing values in critical fields such as Customer ID, First Name, Last Name, Email, or Country.However, some optional fields like Fax had missing values (NULLs).
  + To replaced those missing value with 'Not Provided' I have used COALESCE(fax, 'Not Provided')
* **Duplicates Check**
  + **Method:** Employed COUNT(\*) with grouping by customer id.
  + **Findings:** No duplicate rows were found in the customer table.

**2. Find the top-selling tracks and top artists in the USA and identify their most famous genres.**

To answer this question, I have used the following MySQL query:

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**Output Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| **track\_name** | **artist\_name** | **genre\_name** | **total\_count** |
| War Pigs | Cake | Alternative | 6 |
| You Know I'm No Good (feat. Ghostface Killah) | Amy Winehouse | R&B/Soul | 5 |
| Violent Pornography | System Of A Down | Metal | 4 |
| I Looked At You | The Doors | Rock | 4 |
| Scentless Apprentice | Nirvana | Rock | 4 |

**Table 1: Top 5 track sold in USA by genre**

**Insight:**

* The analysis shows the top 5 most-sold tracks in the USA. "War Pigs" led with 6 sales, followed by Amy Winehouse's track at 5.
* Notably, Rock genre appears twice among the top tracks, suggesting a strong listener base.
* R&B/Soul and Metal also appear, indicating genre diversity.

These insights are valuable for deciding which genres or artists to prioritize in marketing or playlist curation.

**3. What is the customer demographic breakdown (age, gender, location) of Chinook's customer base?**

To answer this question, I have used the following MySQL query:

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**Output table:**

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**Output Table:**

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 Since age and gender data were not available in the Chinook customer base, we are unable to categorize customers by these factors. Instead, we can consider categories such as country, state and city.

 I have identified the number of customers from each country by city and state

.

* USA has the highest customer count, followed by Canada, Brazil, and France, with customer counts of 13, 8, 5, and 5, respectively.

**4. Calculate the total revenue and number of invoices for each country, state, and city:**

To answer this question, I have used the following MySQL query:

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**Output table:**

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* The table above displays the total revenue and the number of invoices for each country, state, and city.

 The first graph illustrates the total revenue by country, while the second graph shows the total number of invoices by each country. USA has the highest total revenue of **1040.49** and the highest total number of invoices **131**.

**5. Find the top 5 customers by total revenue in each country**

To answer this question, I have used the following MySQL syntax:

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**Output table:**

|  |  |  |
| --- | --- | --- |
| **full\_name** | **billing\_country** | **total\_revenue** |
| DiegoGutiérrez | Argentina | 39.6 |
| MarkTaylor | Australia | 81.18 |
| AstridGruber | Austria | 69.3 |
| DaanPeeters | Belgium | 60.39 |
| LuísGonçalves | Brazil | 108.9 |
| FernandaRamos | Brazil | 106.92 |
| RobertoAlmeida | Brazil | 82.17 |
| AlexandreRocha | Brazil | 69.3 |
| EduardoMartins | Brazil | 60.39 |
| FrançoisTremblay | Canada | 99.99 |
| EdwardFrancis | Canada | 91.08 |
| EllieSullivan | Canada | 75.24 |
| AaronMitchell | Canada | 70.29 |
| JenniferPeterson | Canada | 66.33 |
| LuisRojas | Chile | 97.02 |
| FrantišekWichterlová | Czech Republic | 144.54 |
| HelenaHolý | Czech Republic | 128.7 |
| KaraNielsen | Denmark | 37.62 |
| TerhiHämäläinen | Finland | 79.2 |
| WyattGirard | France | 99.99 |
| CamilleBernard | France | 79.2 |
| IsabelleMercier | France | 73.26 |
| DominiqueLefebvre | France | 72.27 |
| MarcDubois | France | 64.35 |
| FynnZimmermann | Germany | 94.05 |
| HannahSchneider | Germany | 85.14 |
| LeonieKöhler | Germany | 82.17 |
| NiklasSchröder | Germany | 73.26 |
| LadislavKovács | Hungary | 78.21 |
| ManojPareek | India | 111.87 |
| PujaSrivastava | India | 71.28 |
| HughO'Reilly | Ireland | 114.84 |
| LucasMancini | Italy | 50.49 |
| JohannesVan der Berg | Netherlands | 65.34 |
| BjørnHansen | Norway | 72.27 |
| StanisławWójcik | Poland | 76.23 |
| JoãoFernandes | Portugal | 102.96 |
| MadalenaSampaio | Portugal | 82.17 |
| EnriqueMuñoz | Spain | 98.01 |
| JoakimJohansson | Sweden | 75.24 |
| PhilHughes | United Kingdom | 98.01 |
| SteveMurray | United Kingdom | 79.2 |
| EmmaJones | United Kingdom | 68.31 |
| JackSmith | USA | 98.01 |
| DanMiller | USA | 95.04 |
| HeatherLeacock | USA | 92.07 |
| KathyChase | USA | 91.08 |
| RichardCunningham | USA | 86.13 |

The result shows top revenue-generating customers in each country. These customers can be prioritized for loyalty programs and targeted campaigns.

**6. Identify the top-selling track for each customer**

To answer this question, I have used the following MySQL syntax:

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**Output table:**

|  |  |  |
| --- | --- | --- |
| **full\_name** | **track\_name** | **total\_revenue** |
| François Tremblay | Sting Me | 1.98 |
| Eduardo Martins | Like A Bird | 1.98 |
| Roberto Almeida | Love And Marriage | 1.98 |
| Fernanda Ramos | 24 Caprices, Op. 1, No. 24, for Solo Violin, in A Minor | 1.98 |
| Julia Barnett | Get What You Need | 1.98 |
| João Fernandes | Train In Vain | 1.98 |
| Fynn Zimmermann | Radio/Video | 1.98 |
| Isabelle Mercier | Tease Me Please Me | 1.98 |
| Hugh O'Reilly | N.I.B. | 1.98 |
| Johannes Van der Berg | Confusion | 1.98 |
| Stanisław Wójcik | Faceless | 1.98 |
| Luís Gonçalves | Put Your Lights On | 0.99 |
| Leonie Köhler | Cochise | 0.99 |
| Bjørn Hansen | Welcome to the Jungle | 0.99 |
| František Wichterlová | Rapidamente | 0.99 |

**Table : Top Revenue generating track per Customer (top 15 customer)**

**Insight:**

* Each customer has a different top track based on how much they spent.
* Most top tracks generated revenue of $0.99, suggesting many purchases are single-track.
* A few tracks generated $1.98, indicating they were likely purchased more than once by the same customer.

**Recommendation:**

Promote tracks like "Sting Me", "Like A Bird", and "Faceless", which are repeatedly purchased and generate higher revenue.

**7. Are there any patterns or trends in customer purchasing behaviour (e.g., frequency of purchases, preferred payment methods, average order value)?**

To Analysed customer purchasing behaviour for patterns or trends—such as purchase frequency, preferred payment methods, and average order value, I have used the following MySQL syntax:

* **Frequency of Purchases by Customers**:

To determine purchase frequency, we can calculate how often each customer makes a purchase, which will help us to identify regular customers.

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**Output table:**

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* From the output, we can see that **František Wichterlová** has the highest purchase count, with a total of **18**.

**Key Insights**: This highlights which customers are the most frequent buyers.

* **Preferred Payment Methods**:
  + Since the Chinook database does not include a column for payment methods, we cannot analyse which payment methods are used most frequently without additional information.
  + If there were a column representing payment methods, we could analysed which methods customers use most often.
  + **Hypothetical Analysis**: If there were a payment method column:

**SELECT**

**payment\_method,**

**COUNT(invoice\_id) AS invoice\_count**

**FROM invoice**

**GROUP BY payment\_method**

**ORDER BY invoice\_count DESC;**

**Average Order Value**:

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**Output table:**

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The average order value varies across customers. François Tremblay has the highest average order value at $11.11, followed by Helena Holly and Robert Brown. This indicates these customers may be purchasing more items or higher-priced products per order. Such customers could be targeted for loyalty programs or upselling opportunities.

**8. What is the customer churn rate?**

Customer churn rate represents the percentage of customers who stop transacting or disengage with the business over a specific period — in this case, monthly. Monitoring churn helps evaluate customer loyalty, identify retention issues, and improve service quality.

To answer this question, I have used the following MySQL syntax:

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**Insight**: The churn rate fluctuates significantly across different months, indicating inconsistent customer retention patterns:

The highest churn rate was observed in:

2019-10 at 66.67% and 2018-09 at 64.29%

The lowest churn was around 2019-05 at 6.67% and 2018-07,2017-07 both near 8.33%, indicating better customer retention during those months.

**Recommendation**:

* Investigate high churn months for root causes — such as service gaps, pricing changes, or limited customer engagement.
* Consider implementing loyalty programs, personalized communication, and feedback collection to improve customer retention.

**9. Calculate the percentage of total sales contributed by each genre in the USA and identify the best-selling genres and artists.**

This analysis determines each genre’s contribution to total music sales in the USA and identifies the top-selling artist within each genre. This helps recognize customer preferences and informs inventory or marketing decisions.

To answer this question, I have used the following MySQL syntax:

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**Output table:**

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**Insight:**

Hip Hop/Rap has the highest USA sales share (79%), with House Of Pain as the top artist. Other strong genres include TV Shows, Soundtrack, and Heavy Metal. Van Halen, Eric Clapton, and Marvin Gaye are top-selling artists across genres in the US.

**Recommendation:**

Focus marketing and promotional efforts on top-performing genres (e.g., Hip Hop/Rap, Heavy Metal, Blues) and leading artists in those genres. This can drive more localized sales and customer engagement in the US market.

**10. Find customers who have purchased tracks from at least 3 different genres**

To answer this question, I have used the following MySQL syntax:

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**Output table:**

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**Insight** :

* Many customers have purchased track from a wide variety of genres, with several exploring 10 or more genres.
* Leonie Köhler is the most diverse listener, purchasing from 14 genres.
* Many others, like František Wichterlová, Helena Holý, and Madalena Sampaio, have purchased from 12 to 13 genres.

**Recommendation:**

Suggest more track from different genres to customers who already explore many genres. This can increase their interest and drive more purchases.

**11. Rank genres based on their sales performance in the USA**

To answer this question, I have used the following MySQL syntax:

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**Insight:**

* Rock is the top-selling genre in the USA with a total sale amount of $5568.75, followed by Alternative & Punk and Metal.
* Genres like TV Shows, Soundtrack, and Classical have the lowest sales, indicating less popularity in the U.S. market.

**Recommendation**:

* Prioritize high-performing genres like Rock, Alternative & Punk, and Metal in marketing campaigns, playlists, and promotions to drive higher revenue.
* Combine low-selling genres (e.g., Classical, Soundtrack, TV Shows) with popular ones to boost visibility and sales.

**12. Identify customers who have not made a purchase in the last 3 months**

To answer this question, I have used the following MySQL syntax:

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**Insight** :

The customers listed in the output have not made any purchases in the past 3 months. Their last purchase dates are older than the 3-month cutoff from their first purchase date.

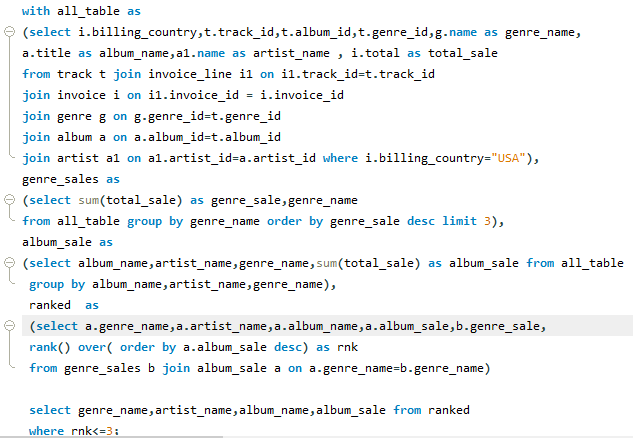
**Recommendation:**

These inactive customers can be targeted with promotional offers, loyalty benefits, or personalized marketing campaigns to encourage repeat purchases and improve customer retention.

**3. Subjective Questions**

**1. Recommend the three albums from the new record label that should be prioritised for advertising and promotion in the USA based on genre sales analysis.**

SQL Query used:

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**Output Table:**

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**Insight:**

* All top-performing albums belong to the Rock genre, indicating strong demand in this category.
* The top three albums have significantly higher sales than others, showing strong fan base and popularity in the U.S. market.
* Artists like Nirvana, Jimi Hendrix, and Van Halen are well-established and have consistent commercial appeal.

**Recommendation**

Prioritize the following three albums for advertising and promotion campaigns in the U.S. market:

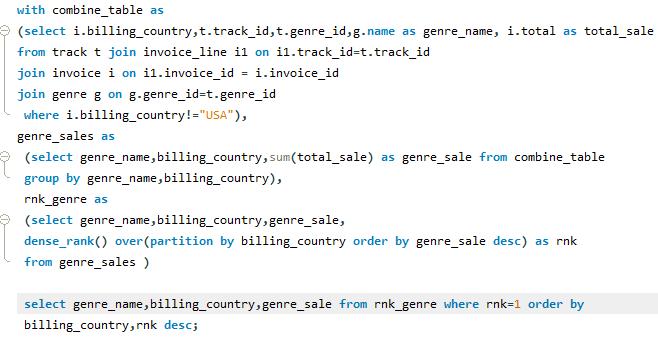
1. From the Muddy Banks of the Wishkah by Nirvana

2. Are You Experienced by Jimi Hendrix

3. The Best of Van Halen by Van Halen

**2. Determine the top-selling genres in countries other than the USA and identify any commonalities or differences.**

SQL Query used:

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**Output table:**

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**Insight:**

* Rock is the top-selling genre in most non-USA countries
* Alternative & Punk appears as the top genre only in Argentina and Australia, indicating a regional preference.
* Countries like Canada, Brazil, and Czech Republic show particularly high sales figures for Rock, suggesting a strong market presence and fan base.
* Sales volume varies significantly by country — for example, Canada leads with 3536 sales while Denmark shows a much lower 119.

**Commonalities:**

* The Rock genre is the most popular across many countries outside the USA.
* Countries like Brazil, Canada, Chile, Czech Republic, and others consistently have Rock as their top-selling genre.
* This shows that Rock music has global popularity and appeals to listeners in different regions and cultures.

**Differences:**

* Alternative & Punk performs best in Argentina and Australia, which sets them apart from the Rock-heavy trend elsewhere.
* Sales volume disparity between countries may indicate differences in market size, digital adoption, or genre popularity.

**Recommendation**

* Focus international promotion efforts primarily on Rock music, given its consistent top ranking across diverse markets.
* Consider localized marketing strategies for countries like Argentina and Australia, where Alternative & Punk shows stronger performance.

**3.** **Customer Purchasing Behaviour Analysis: How do the purchasing habits (frequency, basket size, spending amount) of long-term customers differ from those of new customers? What insights can these patterns provide about customer loyalty and retention strategies?**

Analysed and compare the purchasing habits, frequency, basket size, and spending of long-term customers versus new customers to identify patterns related to customer loyalty and retention.

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**Output table:**

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**Insights**

* Long-term customers make an average of 10.41 purchases, indicating frequent engagement.
* They purchase around 80.63 items on average, showing larger basket sizes.
* Their average total spending is 78.66, which suggests they are more profitable customers.
* This behaviour highlights the value of customer loyalty, as long-term customers not only buy more frequently but also spend more over time.

**Recommendation**

* Strengthen customer retention programs to maintain and grow this high-value segment.
* Offer loyalty rewards, personalized offers, and early access to new content.

**4. Product Affinity Analysis: Which music genres, artists, or albums are frequently purchased together by customers? How can this information guide product recommendations and cross-selling initiatives?**

To conduct a Product Affinity Analysis in the context of music purchases, we can explore which music genres, artists, or albums are frequently bought together.

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**Output table:**

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**Insight**

* Rock is the most commonly co-purchased genre — appears with Metal, Alternative, Latin, R&B, etc.
* This suggests Rock serves as a central taste bridge, connecting multiple genres.
* Customers who like Alternative or Metal often also buy Rock — strong opportunity for cross-genre recommendations.

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**Insight**

Artists like Green Day, Nirvana, and Queens frequently appear in pairs, indicating strong fan overlap.

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**Insight**

* **Strong Connections with "Mezmerize":** The album "**Mezmerize**" is frequently purchased alongside several other albums, including "**Are You Experienced?"** and "**Vault: Def Leppard's Greatest Hits**," suggesting it is a popular choice among customers who enjoy rock music.
* **Mutual Popularity:** Albums like "**The Singles**" and "**Dark Side Of The Moon**" are often bought together, indicating that customers who appreciate one of these albums are likely to be interested in the other, showing overlapping fan bases among these artists.

**Combined Recommendation**

Use affinity data to build:

* Genre-based bundles: e.g., Rock + Metal, Alternative + Rock
* Artist playlists or combo packs: e.g., Green Day + Nirvana, U2 + Queens pair promotions: Offer discounts when users buy both albums frequently bought together.
* Integrate these insights into product recommendation engines and cross-selling campaigns.
* This approach will likely increase average order value, conversion, and customer satisfaction.

**5. Regional Market Analysis: Do customer purchasing behaviors and churn rates vary across different geographic regions or store locations? How might these correlate with local demographic or economic factors?**

To perform a **Regional Market Analysis** that examines customer purchasing behaviours and churn rates across different geographic regions, I have used the following SQL query:

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**Insight:**

* Canada and Brazil are high-performing markets in terms of both total spent and customer base.
* Australia has a high average spending per purchase despite only 1 customer — suggesting a strong individual purchasing power.
* Most countries show similar average basket sizes, which suggests consistent product pricing or buying habits across markets.

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**Insight:**

* Brazil and Germany show significant churn (40–50%), which may point to issues in satisfaction, service, or product-market fit.
* USA and Canada have lower churn rates, suggesting relatively stronger customer retention.

**6. Customer Risk Profiling: Based on customer profiles (age, gender, location, purchase history), which customer segments are more likely to churn or pose a higher risk of reduced spending? What factors contribute to this risk?**

SQL query used:

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**Output table:**

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**Insight:**

* The High Risk segment includes the majority of customers (45), but they have lower average spending (₹78.12) and slightly fewer purchases (10.27), indicating a risk of churn or declining engagement.
* The Low Risk group, though small (7 customers), shows the highest average spending (₹96.45) and most frequent purchases (11), making them the most valuable segment.
* Moderate Risk customers have mid-range values, suggesting they are stable but could become high risk if not engaged effectively

**Recommendation**

* Engage high-risk customers with targeted retention campaigns such as:
* Personalized offers or discounts, Re-engagement emails or notifications, Surveys to understand dissatisfaction or needs.
* Nurture low-risk customers with loyalty programs, early access, or premium benefits to maintain loyalty.
* Monitor moderate-risk segment closely — they are easier to convert to low-risk with the right incentives.

**7. Customer Lifetime Value Modelling: How can you leverage customer data (tenure, purchase history, engagement) to predict the lifetime value of different customer segments? This could inform targeted marketing and loyalty program strategies. Can you observe any common characteristics or purchase patterns among customers who have stopped purchasing?**

To predict **Customer Lifetime Value (CLV)**, we can leverage historical customer data such as tenure, purchase history, and engagement patterns.

**Tenure** generally refers to the length of time that someone holds a particular position within an organization.

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**Insight:**

Active customers have slightly higher average spending and CLV compared to churned ones. Churned customers tend to have slightly lower engagement, which could be an early signal for drop-off risk.

**Recommendation:**

Focus retention efforts on customers with decreasing frequency or low spending to prevent future churn. Personalized engagement or loyalty rewards may help increase CLV.

**8. If data on promotional campaigns (discounts, events, email marketing) is available, how could you measure their impact on customer acquisition, retention, and overall sales?**

If data on promotional campaigns (such as discounts, events, or email marketing) is available, we can measure their impact on:

**1.Customer Acquisition:**

We can check how many new customers made their first purchase during a campaign period.

**MYSQL Syntax:**

Assume a discount campaign ran in May 2013:

SELECT COUNT(\*) AS new\_customers

FROM customer c

JOIN invoice i ON c.customer\_id = i.customer\_id

WHERE i.invoice\_date BETWEEN '2013-05-01' AND '2013-05-31'

AND c.customer\_id NOT IN (

SELECT DISTINCT customer\_id

FROM invoice

WHERE invoice\_date < '2013-05-01');

**Insight**: This gives the number of customers whose first-ever purchase happened during the campaign — indicating acquisition impact.

**2.Customer Retention**

Track whether customers who bought during the campaign returned to make purchases after the campaign.

WITH campaign\_customers AS (

SELECT DISTINCT customer\_id

FROM invoice

WHERE invoice\_date BETWEEN '2013-05-01' AND '2013-05-31'

),

retained\_customers AS (

SELECT DISTINCT i.customer\_id

FROM invoice i

JOIN campaign\_customers c ON i.customer\_id = c.customer\_id

WHERE i.invoice\_date > '2013-05-31'

)

SELECT COUNT(\*) AS retained\_customer\_count

FROM retained\_customers;

**Insight:** This counts how many customers returned after the campaign — a measure of retention.

**3. Overall sales impact**

Compare total sales before, during, and after the campaign.

SELECT CASE

WHEN invoice\_date BETWEEN '2013-04-01' AND '2013-04-30' THEN 'Before Campaign'

WHEN invoice\_date BETWEEN '2013-05-01' AND '2013-05-31' THEN 'During Campaign'

WHEN invoice\_date BETWEEN '2013-06-01' AND '2013-06-30' THEN 'After Campaign'

END AS period,

ROUND(SUM(total), 2) AS total\_sales,

COUNT(DISTINCT customer\_id) AS customer\_count

FROM invoice

WHERE invoice\_date BETWEEN '2013-04-01' AND '2013-06-30'

GROUP BY period;

**Insight:** This compares revenue and customer count over 3 months.

**9. How would you approach this problem, if the objective and subjective questions weren't given?**

If the objective and subjective questions were not provided, I would approach the Chinook database analysis using a structured, data-driven method to explore the business insights. My steps would be:

**1. Understand the Business Context**

Chinook is a digital music store. So, the main entities include customers, tracks, albums, artists, invoices, and invoiceline. The goal would be to analyse sales, customer behaviour, and product performance to support business decisions.

**2. Explore the Database Schema**

Review all available tables (e.g., Customer, Invoice, Invoiceline, Track, Genre, album, Artist).

Understand how tables are related using foreign keys.

**3.** Check total revenue, number of customers, top-selling genres or artists.

Explore customer purchase patterns and regional sales.

Identify high- and low-performing areas in terms of sales or product categories.

**4. Define Key Areas of Analysis**

* What genres, tracks, or albums perform best?
* Who are the most valuable customers? Which regions generate more sales?
* Product Analysis: Are certain genres, albums etc performing better?

**5. Creating Questions**

What are the top 5 genres by revenue?

Which country has the highest customer base?

Who are the top 5 customers based on purchase amount?

Which tracks are most frequently purchased?

Analyzing all customers are long-term and short-term by seeing their past purchases.

**6. Derive Insights and Recommendations**

After running queries and analyzing the data, I would summarize:

Key insights (e.g., U.S. generates the most revenue, rock is the top-selling genre). recommendations (e.g., focus marketing on high-value customers, promote top-selling genres).

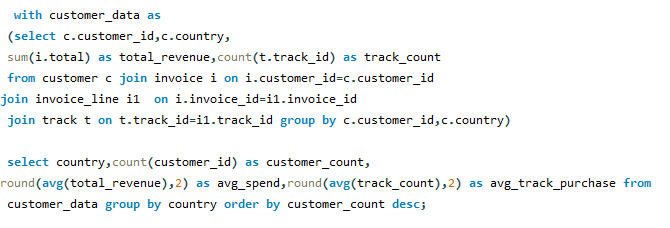
**10. How can you alter the "Albums" table to add a new column named "ReleaseYear" of type INTEGER to store the release year of each album?**

To add a new column named ReleaseYear of type INTEGER to the **”Albums”** table, I have used the following SQL ALTER TABLE statement:

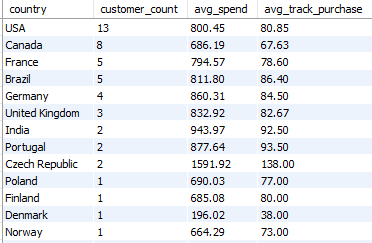


**11. Chinook is interested in understanding the purchasing behavior of customers based on their geographical location. They want to know the average total amount spent by customers from each country, along with the number of customers and the average number of tracks purchased per customer. Write an SQL query to provide this information.**

SQL query used:

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**Output table:**

****

**Insight:**

* Czech Republic shows the highest average spend and purchase volume.
* India and Portugal also display high value purchasing patterns.
* USA and Canada have larger customer bases but more modest spend per user.

**Recommendation:**

* Expand marketing efforts in high-value regions like Czech Republic and India.
* Explore cross-sell and loyalty programs for countries with large customer bases but lower average spending (e.g., USA, Canada).