**1️⃣ What is Customer Acquisition Rate (CAR)?**

Customer Acquisition Rate (CAR) measures **how many new customers** a business gains in a given period **relative to its existing customers**. It helps track **growth trends and marketing effectiveness**.

✅ **Formula for CAR:**

* **New Customers** = Customers appearing for the first time in a given month.
* **Total Customers Up to Previous Month** = Customers who existed before that month.
* **Multiplying by 100** converts it into a percentage.

**2️⃣ How Did We Calculate Monthly CAR?**

We followed these **step-by-step** calculations using SQL:

🔹 **Step 1: Identify Unique Customers Per Month** (monthly\_customers)

* Extracted **distinct phone numbers** to get **unique customers** each month.

🔹 **Step 2: Identify Returning Customers** (existing\_customers)

* Found customers **who appeared in any previous month** before a given month.

🔹 **Step 3: Identify First-Time Customers** (new\_customers)

* Found customers **who appeared for the first time in a given month** by checking those **not present in previous months**.

🔹 **Step 4: Compute CAR per Month**

* Counted **new customers per month**.
* Counted **total returning customers before the month**.
* Used the CAR formula to compute a **percentage per month**.

**3️⃣ How We Handled Special Cases**

🔸 **Avoiding Division Errors** → Used GREATEST(COUNT(existing\_customers), 1) to prevent division by zero.  
🔸 **Ensuring No NULL Values** → Used COALESCE(..., 0) to **replace missing values with 0%**.  
🔸 **Ensuring Correct Monthly Order** → Used ORDER BY month\_number.

**What is Customer Conversion Rate (CCR)?**

The **Customer Conversion Rate (CCR)** measures how many newly acquired customers **become engaged customers** by making a **significant number of transactions** (in this case, **more than 3 completed transactions**).

*CCR:*

 **Converted Customers** → Customers who **completed more than 3 transactions** in a given month.

 **Total Acquired Customers** → Customers who were **newly acquired** in that month.

2️⃣ Breaking Down the SQL Query

✅ **What this does:**

* Extracts **unique customers** (phone\_number) who appeared in each month.
* Ensures each customer is counted **only once per month**.
* Creates a **list of newly acquired customers per month**.

✅ **What this does:**

* **Filters transactions where state = 'complete'** (i.e., only completed transactions count).
* **Groups transactions by phone\_number, month, and month\_number**.
* **Uses HAVING COUNT(\*) > 3** to keep only customers who completed **more than 3 transactions** in that month.

✅ **Final Calculation of CCR**

* **Counts distinct converted customers (cc.phone\_number) per month.**
* **Counts distinct acquired customers (ac.phone\_number) per month.**
* **Computes CCR using the formula:** CCR=(Converted CustomersAcquired Customers)×100CCR = \left( \frac{\text{Converted Customers}}{\text{Acquired Customers}} \right) \times 100CCR=(Acquired CustomersConverted Customers​)×100
* **NULLIF(..., 0)** prevents division by zero when no customers exist.
* **COALESCE(..., 0)** ensures months with no conversions display **0% instead of NULL**.
* **Results are ordered by month\_number** to align with the calendar year.

📌 **Key Insights from CCR:**

* **Tracks how effectively new customers become repeat users.**
* **Highlights seasonal trends in engagement and purchases.**
* **Helps businesses optimize marketing and retention strategies.**

**1️⃣ Understanding the Concept of MRR Growth Rate**

**What is Monthly Recurring Revenue (MRR)?**

MRR is the **total revenue generated from recurring transactions in a given month**. It helps businesses track **steady income from subscriptions or repeat customers**.

✅ **Formula for MRR Growth Rate:**

* **MRR in Current Month** → Sum of bs\_revenue for the given month.
* **MRR in Previous Month** → Sum of bs\_revenue from the previous month.

A **positive growth rate** means MRR **increased**, while a **negative rate** means revenue **declined**.

**2️⃣ Breaking Down the SQL Query**

**Step 1: Calculate Total MRR for Each Month**

✅ **What this does:**

* Groups data by **month and month\_number**.
* Sums up the **bs\_revenue** column to get **total MRR for each month**.

Step 2: Retrieve the Previous Month's MRR

✅ **What this does:**

* Uses the **LAG() function** to get the **MRR from the previous month** (prev\_mrr).
* This allows us to **compare MRR across months** and compute growth trends.

Step 3: Compute the MRR Growth Rate

✅ **What this does:**

* **Calculates the MoM Growth Rate** using the formula: (Current MRR−Previous MRR)Previous MRR×100\frac{(\text{Current MRR} - \text{Previous MRR})}{\text{Previous MRR}} \times 100Previous MRR(Current MRR−Previous MRR)​×100
* **Handles missing values:**
  + NULLIF(prev\_mrr, 0) → Prevents division by zero.
  + COALESCE(..., 0) → Ensures months with no growth data display **0% instead of NULL**.
* **Sorts results by month\_number** to align with the calendar year.

**1️⃣ Understanding the Monthly Retention Rate (%) Calculation**

**What is Retention Rate?**

Retention Rate measures the **percentage of customers from the previous month who remained active in the current month**.

✅ **Formula:**

* **Retained Customers** → Customers active in both the previous and current month.
* **Total Customers in Previous Month** → All unique customers who were active in the previous month.

📌 **Why This Matters:**

* High retention = **Loyal customers & strong engagement**.
* Low retention = **Churn problem (customers leaving)**.

**2️⃣ Query Breakdown (Step-by-Step)**

**🔹 Step 1: Extract Unique Customers per Month**

✅ **What this does:**

* Extracts **unique phone numbers (customers)** per month.
* Ensures each customer appears **only once per month**.
* Builds a **baseline dataset** for tracking retention.

🔹 Step 2: Identify Retained Customers

✅ **What this does:**

* Uses a **SELF JOIN** to find customers present in **both the current and previous month**.
* **month\_number = month\_number + 1** ensures that we match each customer in the current month with their past record.
* Creates a list of **retained customers** month by month.

🔹 Step 3: Count Retained Customers & Get Previous Month’s Customer Count

✅ **What this does:**

* **Counts distinct retained customers** (rc.phone\_number).
* **Uses LAG() to get the previous month’s total customers** (prev\_month\_customers).
* **Ensures each month's retention is compared to its previous month's customers**.

🔹 Step 4: Compute the Monthly Retention Rate

✅ **Final Calculation**

* **Divides retained customers by previous month’s customers**.
* **Multiplies by 100 to get a percentage**.
* **Handles NULL values:**
  + NULLIF(prev\_month\_customers, 0) **prevents division by zero**.
  + COALESCE(..., 0) ensures missing values are replaced with **0%** instead of NULL.

**What is Churn Rate?**

Churn Rate measures the percentage of **customers lost** each month relative to the previous month's customer base.

✅ **Formula:**

* **Churned Customers** → Customers active in the previous month but **not active in the current month**.
* **Total Customers in Previous Month** → All unique customers who were active in the previous month.

📌 **Why This Matters:**

* **High churn means customers are leaving, which affects revenue.**
* **Low churn means strong customer retention and loyalty.**

2️⃣ ✅ SQL Query for Monthly Churn Rate (%)

**3️⃣ Explanation of the Query**

**🔹 Step 1: Extract Unique Customers per Month**

✅ **Extracts all unique customers per month** for tracking retention and churn.

🔹 Step 2: Identify Churned Customers

✅ **Uses LEFT JOIN to compare each month to the next month.**  
✅ **If a customer appears in month\_number but not in month\_number + 1, they churned.**  
✅ **Filters out customers who continued into the next month.**

🔹 Step 3: Count Churned Customers & Get Previous Month’s Total

✅ **Counts distinct churned customers per month** (cc.phone\_number).  
✅ **Uses LAG() to get the previous month’s total customers** (prev\_month\_customers).

🔹 Step 4: Compute the Monthly Churn Rate

✅ **Final Calculation**

* **Divides churned customers by previous month’s customers**.
* **Multiplies by 100 to get a percentage**.
* **Handles NULL values:**
  + NULLIF(prev\_month\_customers, 0) **prevents division by zero**.
  + COALESCE(..., 0) ensures missing values are replaced with **0%** instead of NULL.

**1️⃣ What is Customer Lifetime Value (CLV)?**

Customer Lifetime Value (**CLV**) is a key business metric that estimates **the total revenue a company can expect from a customer over their entire engagement period**.

✅ **CLV Formula Used in the Query:**

**🔹 Why is CLV Important?**

* Helps **predict long-term revenue potential** from existing customers.
* Guides **customer acquisition & retention strategies**.
* Helps businesses determine how much they should **spend on customer acquisition (CAC)** to remain profitable.

**2️⃣ How the Query Computes Monthly CLV**

The SQL query **calculates CLV per month** by following these logical steps:

**🔹 Step 1: Calculate Total Monthly Revenue & Unique Customers**

✅ **Why This Step?**

* This step **aggregates** the total revenue (SUM(bs\_revenue)) for each month.
* It also **counts unique customers** per month (COUNT(DISTINCT phone\_number)).
* This gives us the **average revenue per customer per month** in the later calculation.

🔹 Step 2: Estimate the Average Customer Lifespan

✅ **Why This Step?**

* Counts **how many months each customer has been active** in the dataset.
* Represents the **customer lifespan (how long they stay engaged before leaving)**.
* Essential for **predicting long-term value per customer**.

🔹 Step 3: Compute the Average Customer Lifespan

✅ **Why This Step?**

* Takes the **average lifespan across all customers**, giving us a **generalized customer lifespan estimate**.
* Used later in the formula to estimate **future revenue per customer**.

🔹 Step 4: Compute the Monthly CLV

✅ **Final CLV Formula Used:**

✅ **Why These Calculations?**

* **Divides total revenue by active customers** to find **monthly revenue per customer**.
* **Multiplies by the average lifespan** to predict **total revenue expected from each customer**.
* Uses **COALESCE(..., 0)** to **prevent NULL values**, ensuring **clean data reporting**.
* Uses **NULLIF(mr.total\_customers, 0)** to **avoid division by zero errors** when no customers exist in a given month.

📌 **Key Business Insights from CLV:**

* **CLV increasing** → Customers are generating more value, leading to **higher profitability**.
* **CLV decreasing** → Customers are churning faster or spending less, indicating **potential retention issues**.
* **Stable CLV** → Business has **consistent revenue flow from existing customers**.

**4️⃣ Key Business Applications of CLV**

📊 **Optimizing Marketing Spend**

* If **CLV is higher than customer acquisition cost (CAC)**, the business is making a **profit on each new customer**.
* If CLV < CAC, the business is **spending too much to acquire customers** and needs to optimize.

📉 **Customer Retention & Loyalty**

* If **CLV is decreasing**, it may indicate **higher churn or reduced spending** from repeat customers.
* A higher CLV suggests **customers stay engaged for a longer time**, contributing to **better retention**.

🚀 **Revenue Forecasting & Business Growth**

* A stable or increasing CLV means the business can **predict long-term revenue growth** more accurately.
* Helps **investors and stakeholders** assess whether the company is profitable **long-term**.

**📌 Conclusion**

🔹 **This SQL query calculates monthly CLV** by considering **total revenue, unique customers, and customer lifespan**.  
🔹 **It helps businesses understand long-term customer value, optimize acquisition costs, and improve retention strategies**.  
🔹 **Tracking CLV over time provides insights into business growth, customer engagement, and profitability trends**.