Q1- vip customer: 10 customers have the largest order

```
SELECT customerid, count(distinct invoiceno) AS number_of_order ,
ROUND(SUM(unitprice*quantity)) AS revenue

FROM Online_Retail

WHERE customerid <>''

GROUP BY customerid

ORDER BY number_of_order DESC

limit 10
```

Business Meaning

Customer Loyalty: The customers identified by this query are likely to be the most loyal, as they have placed the highest number of orders.

Revenue Contribution: These customers also contribute significantly to the overall revenue, making them valuable to the business.

Recommendations

customer Retention Programs: Implement loyalty programs or special offers to retain these top customers. Personalized discounts or early access to new products can enhance their loyalty.

Targeted Marketing: Use the insights FROM this data to create targeted marketing campaigns aimed at these high-value customers. Personalized emails or exclusive deals can increase their engagement.

Q2- top products sold for each month

```
SELECT *

FROM (

   SELECT EXTRACT(Year FROM invoicedate ::date) AS year,

   EXTRACT(month FROM invoicedate ::date) AS month, description ,count( description),

   dense_rank() over(partition by EXTRACT(month FROM invoicedate ::date)  order by count(description) desc) as rank

  FROM Online_Retail

 GROUP BY 1,2,3   )   AS  table

WHERE rank=1
```

Business Meaning

Identifying Trends: By extracting the top products sold each month, businesses can identify seasonal trends and understand which products are popular during specific times of the year. This helps in planning marketing campaigns and inventory management.

Inventory Management: Knowing the best-selling products allows businesses to manage their inventory more effectively, ensuring that popular items are always in stock and reducing the risk of overstocking less popular items.

Recommendations

Seasonal Promotions: Use the data to create seasonal promotions for top-selling products. For instance, if certain products are popular in the summer, consider running special summer sales or promotions.

Stock Optimization: Ensure that inventory levels for top-selling products are optimized to meet demand. This might involve increasing stock levels for these items during peak months.

Product Development: Analyze the characteristics of top-selling products to inform the development of new products. If certain features or categories are consistently popular, consider expanding your product line in those areas.

Q3- top products sold for each country

```
SELECT *
FROM (
  SELECT country, description ,count( description),
  rank() over( partition by country order by count( description) desc) as rank
  FROM Online_Retail
   GROUP BY 1,2  )  as  table
WHERE rank =1
```

Business Meaning

Market Insights: By identifying the most popular products in each country, businesses can gain valuable insights into consumer preferences and trends in different regions. This information can help in tailoring marketing strategies and product offerings to better meet local demands.

Inventory Management: Understanding which products are top sellers can assist in optimizing inventory levels. Businesses can ensure they stock sufficient quantities of high-demand items, reducing the risk of stockouts and improving customer satisfaction.

Recommendations

Localized Marketing Campaigns: Use the data to create targeted marketing campaigns that highlight the top-selling products in each country. This can increase engagement and drive sales by appealing directly to local consumer preferences.

Product Diversification: If certain products are top sellers in multiple countries, consider expanding the product line with variations or complementary items. This can capitalize on existing demand and increase overall sales.

Supply Chain Optimization: Ensure that the supply chain is robust enough to handle the demand for top-selling products. This might involve working with local suppliers or optimizing logistics to reduce lead times and costs.

Q4- the monthly revenue growth rate

```
WITH revenue_monthly AS (
        SELECT EXTRACT(Year FROM invoicedate ::date) AS  year,EXTRACT(month FROM
        invoicedate  ::date)  AS month, SUM(unitprice * Quantity)  AS  revenue
         FROM Online_Retail
         WHERE  Quantity >0
         GROUP BY year,month
         ORDER BY year,month
),
revenue_previous_month AS (
           SELECT   year,  month, revenue,
            LAG(revenue) OVER (ORDER BY year,month) AS  previous_revenue
           FROM revenue_monthly
)
      SELECT year, month, ROUND(revenue) as revenue ,
      ROUND(previous_revenue) as previous_revenue,
           CASE
     WHEN previous_revenue IS NULL THEN 0 ELSE ROUND(Cast((revenue –
     previous_revenue) /    previous_revenue * 100 as numeric), 2)
    END AS revenue_growth_rate
   FROM revenue_previous_month
    ORDER BY year ,month
```

Business Meaning

Revenue Tracking: The query aggregates monthly revenue by summing up the product of unit price and quantity sold for each month. This helps in tracking the total revenue generated each month.

Identify Trends: Analyze the monthly revenue growth rates to identify trends. Consistent positive growth indicates a healthy business, while negative growth may signal issues that need addressing.

Growth Rate Calculation: The query calculates the revenue growth rate as a percentage, which indicates how much the revenue has increased or decreased compared to the previous month. This is crucial for understanding the business's financial health and growth trajectory.

Recommendations

Seasonal Patterns: Look for seasonal patterns in the data. If certain months consistently show higher or lower growth, consider adjusting marketing and inventory strategies accordingly.

Investigate Anomalies: Significant deviations in growth rates should be investigated. A sudden drop might indicate problems such as supply chain issues, while a spike could suggest successful marketing campaigns or product launches.

Strategic Planning: Use the growth rate data to inform strategic decisions. For example, if growth is slowing, it might be time to invest in new marketing strategies or product development.

Q5- the monthly orders rate Contributed FROM total

```
WITH orders_monthly AS (
        SELECT EXTRACT(Year FROM invoicedate ::date) AS year,EXTRACT(month FROM
        invoicedate ::date) AS month,
        count( distinct InvoiceNo) as num_of_order  ,sum(count(distinct InvoiceNo)) over()
       as total_order
        FROM Online_Retail
        GROUP BY year,month
        ORDER BY year,month
)
  SELECT  year, month, num_of_order ,total_order,
  ROUND((num_of_order /total_order) *100 ,2) as    percent_FROM_total
  FROM  orders_monthly
```

Business Meaning

Monthly Performance Tracking: By calculating the number of orders each month and their contribution to the total orders, businesses can track their performance over time. This helps in identifying trends, seasonality, and periods of high or low demand.

Resource Allocation: Understanding which months contribute the most to total orders can help in better resource planning. For instance, during peak months, businesses might need to allocate more resources to handle the increased demand.

Recommendations

Identify Peak and Off-Peak Periods: Use the data to identify peak and off-peak periods. During peak periods, ensure that inventory levels, staffing, and logistics are optimized to

handle the increased demand. For off-peak periods, consider running promotions or marketing campaigns to boost sales.

Trend Analysis: Analyze the trends over multiple years to understand if certain months consistently perform better or worse. This can help in long-term planning and forecasting.

Operational Efficiency: Use the data to improve operational efficiency. For example, if certain months have consistently high order volumes, streamline processes to ensure timely fulfillment and delivery.

Q2-

```
WITH fundamental AS (
 SELECT  customerid,
  (SELECT MAX(invoicedate::date) FROM Online_Retail) - MAX(invoicedate::date) AS
   recency,
  CAST(COUNT(DISTINCT invoiceno) AS NUMERIC) AS frequency,
  ROUND(CAST(SUM(unitprice * Quantity) AS NUMERIC), 2) AS monetary
 FROM Online_Retail
 WHERE  customerid <>' ' and  Quantity >0
 GROUP BY 1
),
r_scored AS (
 SELECT customerid, recency, frequency, monetary,
 ROUND((frequency + monetary) /2 ::numeric,2 ) as fm_avg,
  CASE
    WHEN recency BETWEEN 0 AND MAX(recency) OVER () / 5 THEN 5
    WHEN recency BETWEEN MAX(recency) OVER () / 5 + 1 AND MAX(recency) OVER () / 5 *
2 THEN 4
    WHEN recency BETWEEN MAX(recency) OVER () / 5 * 2 + 1 AND MAX(recency) OVER () /
5 * 3 THEN 3
    WHEN recency BETWEEN MAX(recency) OVER () / 5 * 3 + 1 AND MAX(recency) OVER () /
5 * 4 THEN 2
    WHEN recency BETWEEN MAX(recency) OVER () / 5 * 4 + 1 AND MAX(recency) OVER () /
5 * 5 THEN 1
    ELSE 0
    END AS R_Score
 FROM fundamental
```

```
),
fm_scored AS (
 SELECT customerid, recency, frequency, monetary, R_Score,fm_avg,
  CASE
     WHEN fm_avg BETWEEN Min(fm_avg)  AND MAX(fm_avg) OVER () / 5 THEN 1
     WHEN fm_avg BETWEEN MAX(fm_avg) OVER () / 5 + 1 AND MAX(fm_avg) OVER () / 5 * 2
THEN 2
     WHEN fm_avg BETWEEN MAX(fm_avg) OVER () / 5 * 2 + 1 AND MAX(fm_avg) OVER () / 5
* 3 THEN 3
     WHEN fm_avg BETWEEN MAX(fm_avg) OVER () / 5 * 3 + 1 AND MAX(fm_avg) OVER () / 5
* 4 THEN 4
            ELSE 5
     END AS F_M_Score

 FROM r_scored
 GROUP BY 1,2,3,4,5,6
)
SELECT customerid, recency, frequency, monetary, R_Score, F_M_Score,
 CASE
  WHEN R_Score = 5 AND F_M_Score IN (5, 4) THEN 'Champions'
  WHEN R_Score = 4 AND F_M_Score = 5 THEN 'Champions'
  WHEN R_Score IN (5, 4) AND F_M_Score = 2 THEN 'Potential Loyalists'
  WHEN R_Score IN (3, 4) AND F_M_Score = 3 THEN 'Potential Loyalists'
  WHEN R_Score = 5 AND F_M_Score = 3 THEN 'Loyal Customers'
  WHEN R_Score = 4 AND F_M_Score = 4 THEN 'Loyal Customers'
  WHEN R_Score = 3 AND F_M_Score IN (5, 4) THEN 'Loyal Customers'
  WHEN R_Score = 5 AND F_M_Score = 1 THEN 'Recent Customers'
  WHEN R_Score = 4 AND F_M_Score = 1 THEN 'Promising'
```

```
  WHEN R_Score = 3 AND F_M_Score = 1 THEN 'Promising'
  WHEN R_Score = 2 AND F_M_Score IN (2, 3) THEN 'Customers Needing Attention'
  WHEN R_Score = 3 AND F_M_Score = 2 THEN 'Customers Needing Attention'
  WHEN R_Score = 2 AND F_M_Score IN (4, 5) THEN 'At Risk'
  WHEN R_Score = 1 AND F_M_Score = 3 THEN 'At Risk'
  WHEN R_Score = 1 AND F_M_Score IN (4, 5) THEN 'Can not Lose Them'
  WHEN R_Score = 1 AND F_M_Score = 2 THEN 'Hibernating'
  WHEN R_Score = 1 AND F_M_Score = 1 THEN 'Lost'
  ELSE 'Undefined'
  END AS Customer_Segment
FROM fm_scored
order by F_M_Score desc
```

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About data

1. **A negative quantity indicates that the order has been canceled or returned.**
2. **Some description has unit price zero**
3. **Different stock id for same description**
4. **Customer id has out liars total sales**