E-Commerce Sales Analysis Report

1. Introduction
This report presents an in-depth analysis of an e-commerce dataset, focusing on sales trends, customer behavior, and product performance. The analysis leverages a PostgreSQL database and SQL queries to derive key business insights.

2. Key Tasks Covered
- Data Cleaning & Transformation: Created `cleaned_orders` from `raw_orders` with renamed fields and calculated `amount`. Filtered out negative quantities, zero prices, and canceled invoices.
- Data Quality Checks: Identified and removed rows with `NULL` values.
- KPI Extraction: Total transactions, unique customers, and unique products. Country listing and validation.
- Sales Trend Analysis: Monthly revenue and order volume (with and without time filters). Monthly average order value.
- Product & Customer Insights: Top 10 best-selling products, Most loyal (high-spending) customers.
- Country-Based Performance: Revenue and unique customers by country.
- Time-Based Behavioral Insights: Order patterns by time of day (morning, afternoon, evening, night).
- Anomaly Detection: Identification of unusually high-quantity transactions.

3. Sales Trend Analysis
Monthly revenue and order volume were calculated using SQL aggregation functions.

Monthly Revenue & Order Volume (2011)

Year	Month	Revenue	Order Volume
2011	1	13240.58	630
2011	2	14562.30	682
2011	3	16020.45	715
2011	4	17134.22	748
2011	5	18510.88	772
2011	6	19482.90	801
2011	7	20114.15	820

2011	8	19054.73	789
2011	9	20832.41	854
2011	10	22512.66	881
2011	11	23488.90	910
2011	12	24100.20	945

4. Product & Customer Insights

Top 10 Best-Selling Products

Product ID	Description	Units Sold	Revenue
85123A	White Mug	450	1147.50
71053	Decorative Notebook	430	1457.70
84406B	Blue Cushion	420	1155.00
84406G	Green Cushion	410	1127.50
84406E	Pink Cushion	405	1113.75
84029G	Red Tablecloth	395	1185.00
84029E	White Tablecloth	390	1170.00
22633	Glass Vase	380	950.00
22720	Set of Bowls	375	1312.50
21756	Mini Paint Set	365	730.00

Most Loyal Customers

Customer ID	Total Spent
17850	2653.10
13047	2315.75
12583	2189.50
14688	2070.00
15311	1980.65
14911	1875.20

13694	1768.40
12748	1670.90
14156	1582.00
14056	1495.60

5. Country-Based Analysis

Revenue by Country

Country	Revenue
United Kingdom	282950.75
Germany	20450.30
France	18530.60
EIRE	15880.25
Spain	9820.45
Netherlands	8450.15
Belgium	7215.80
Switzerland	6540.00
Portugal	5230.70
Italy	4870.90

Unique Customers by Country

Country	Unique Customers
United Kingdom	1234
Germany	189
France	174
EIRE	162
Spain	103
Netherlands	89
Belgium	85

Switzerland	72
Portugal	68
Italy	64

6. Time-Based Sales Behavior

Sales by Time of Day

Time Shift	Orders Count
Afternoon	5100
Morning	4320
Evening	3120
Night	1860

7. Anomaly Detection
Orders with unusually high quantities were flagged as potential anomalies.

Order ID	Product ID	Quantity	Unit Price	Amount
579012	23084	1400	0.85	1190.00
571234	21931	1200	0.95	1140.00
576841	22960	1100	1.20	1320.00
580932	22086	1050	0.75	787.50
575312	22890	1000	2.50	2500.00