Data Analyst Training Programme

Aggregate Functions

Introduction to Aggregate Functions

Why Are Aggregate Functions?

- Mathematical operations on sets of data
- Transform multiple rows into single values
- Essential for business metrics and KPIs

Core Business Questions

- "How much total revenue did we generate?"
- "What's our average order value?"
- "How many customers do we have?"
- "What's our highest-selling product?"

Key Aggregate Functions

- COUNT(), SUM(), AVG(), MIN(), MAX()
- Work with **GROUP BY** for detailed analysis
- Foundation of business intelligence

COUNT Function Deep Dive

COUNT Variations

- COUNT(*): counts all rows including NULL
- COUNT(column): counts non-NULL values only
- COUNT(DISTINCT column): counts unique values

Common Applications

- Customer counts by region
- Product counts by category
- Order counts by month
- Unique value analysis

NULL Handling Considerations

- COUNT(*) includes NULL rows
- COUNT(column) excludes NULL rows
- Results can differ significantly

SUM and Mathematical Aggregates

SUM Function
- Adds up numeric values
- Ignores NULL values automatically
- Essential for revenue calculations

Mathematical Operations with SUM
- Calculate total revenue: SUM(Quantity * Price)
- Combine multiple columns
- Work with calculated fields

Business Applications
- Total sales revenue
- Inventory valuations
- Cost calculations
- Performance metrics

Common Pitfalls
- Summing non-numerica data
- Forgetting to handle NULL values in calculations

AVG, MIN, and MAX Functions

AVG (Average) Function

- Calculates mean values
- Excludes NULL values from calculation
- Essential for performance benchmarking

MIN and MAX Functions

- Find smallest and largest values
- Work with dates, text, and numbers
- Identify outliers and ranges

Practical Applications

- Average order values
- Price ranges by category
- Performance comparisons
- Quality control metrics

Statistical Insights

- Central tendency (AVG)
- Range analysis (MIN/MAX)
- Outlier identification

Advanced Aggregate Techniques

Conditional Aggregates
- SUM with CASE statements
- COUNT with conditions
- Building custom metrics

Nested Aggregates
- Aggregates of aggregated results
- Subqueries with aggregate functions
- Complex analytical calculations

Performance Considerations
- Index usage with aggregates
- Query optimisation techniques
- Large dataset handling

Business Intelligence Applications
- KPI calculations
- Trend analysis
- Comparative metrics

Assignment

Complete these aggregate function challenges using the Northwind database:

Basic Aggregates

- Calculate total number of products, average price, lowest and highest prices
- Count customers by country and show the country with most customers
- Find the total quantity of all products ever ordered

Revenue Analysis

- Calculate total revenue for the entire business
- Find average order value across all orders
- Determine which product category generates the most revenue

Customer Analytics

- Identify customers who have spent more than £1000 total
- Calculate average number of orders per customer by country
- Find customers with above-average order values

Advanced Challenges

- Create a price analysis showing budget (< £20), standard (£20-£50), and premium (> £50) product counts by category
- Calculate monthly revenue trends showing total sales, average order value, and number of unique customers per month
- Find the top 5 products by total revenue and show what percentage each represents of total business revenue
- Build a customer segmentation showing: one-time buyers, regular customers (2-5 orders), and loyal customers (6+ orders) with their respective average order values

Until Next Week Sunday...

See you next week on Sunday, **[student name]**.

You now possess the mathematical tools that transform raw data into executive dashboards and strategic insights. Aggregate functions are the bridge between individual records and business intelligence; master them well, as every KPI and performance metric you'll ever calculate builds on these foundations.

Thank you, [student name].

Any Questions?