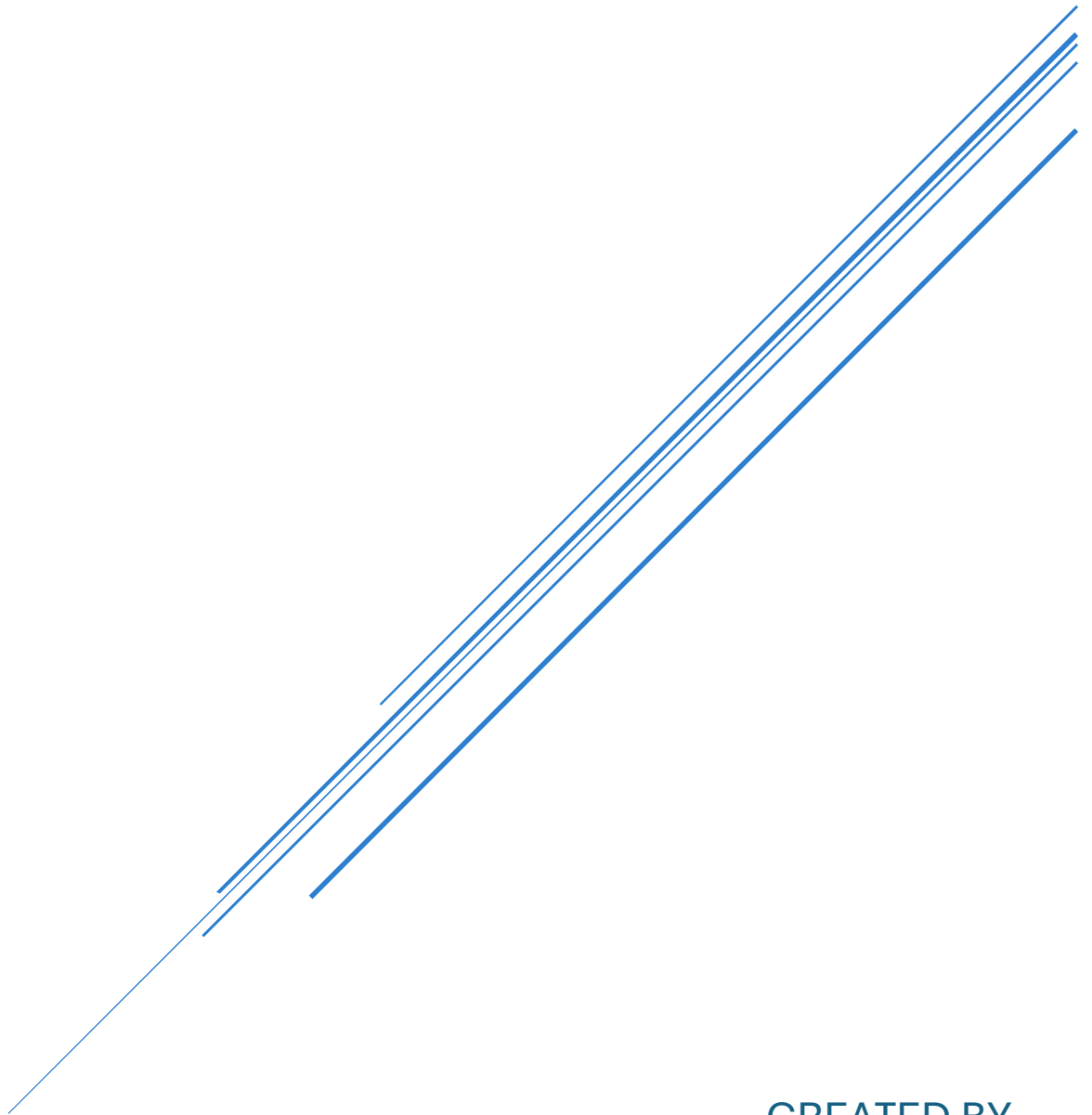


# DATA ANALYSIS

SQL, EXCEL, TABLEAU, POWERBI, Python



CREATED BY  
YERRA KEERTHANA

## SQL QUERY CATEGORIZED FOR ACCOUNTING AND TAXATION TASKS:

Category	Query Description	SQL Query Example
Basic Data Retrieval	Retrieve all transactions	SELECT * FROM transactions;
	Retrieve transactions for a specific date	SELECT * FROM transactions WHERE transaction_date = '2024-12-01';
	Retrieve transactions for a specific customer	SELECT * FROM transactions WHERE customer_id = 101;
Summarization	Calculate total revenue	SELECT SUM(amount) AS total_revenue FROM transactions WHERE type = 'income';
	Calculate total expenses	SELECT SUM(amount) AS total_expenses FROM transactions WHERE type = 'expense';
	Calculate monthly revenue and expenses	SELECT MONTH(transaction_date) AS month, SUM(amount) AS total FROM transactions GROUP BY MONTH(transaction_date);
Tax Calculations	Calculate sales tax for a period	SELECT SUM(amount) * 0.07 AS sales_tax FROM transactions WHERE type = 'sale' AND transaction_date >= '2024-01-01';
	Identify transactions with missing tax amounts	SELECT * FROM transactions WHERE tax_amount IS NULL;
	Calculate VAT (Value Added Tax)	SELECT SUM(amount) * 0.2 AS vat FROM transactions WHERE type = 'sale';
Customer Reports	List of customers with outstanding balances	SELECT customer_id, SUM(balance) AS outstanding_balance FROM customers WHERE balance > 0 GROUP BY customer_id;

Category	Query Description	SQL Query Example
	Retrieve customers with high transaction volumes	SELECT customer_id, COUNT(*) AS transactions FROM transactions GROUP BY customer_id HAVING COUNT(*) > 100;
	Calculate total spending per customer	SELECT customer_id, SUM(amount) AS total_spent FROM transactions GROUP BY customer_id;
<b>Vendor Reports</b>	List all payments to vendors	SELECT * FROM payments WHERE payee_type = 'vendor';
	Calculate total payment to a specific vendor	SELECT vendor_id, SUM(amount) AS total_paid FROM payments WHERE vendor_id = 202;
<b>Aging Reports</b>	Retrieve aging report for receivables	SELECT customer_id, invoice_id, DATEDIFF(NOW(), due_date) AS days_due FROM receivables WHERE paid = 0;
	Retrieve aging report for payables	SELECT vendor_id, invoice_id, DATEDIFF(NOW(), due_date) AS days_due FROM payables WHERE paid = 0;
<b>Account Reconciliation</b>	Compare income vs expenses	SELECT (SUM(CASE WHEN type = 'income' THEN amount ELSE 0 END) - SUM(CASE WHEN type = 'expense' THEN amount ELSE 0 END)) AS net_income FROM transactions;
	Identify unreconciled transactions	SELECT * FROM transactions WHERE reconciled = 0;
	Match transactions to bank statements	SELECT * FROM transactions t LEFT JOIN bank_statements b ON t.transaction_id = b.transaction_id WHERE b.transaction_id IS NULL;

Category	Query Description	SQL Query Example
Audit and Compliance	Find duplicate invoices	SELECT invoice_number, COUNT(*) FROM invoices GROUP BY invoice_number HAVING COUNT(*) > 1;
	Retrieve transactions outside normal business hours	SELECT * FROM transactions WHERE HOUR(transaction_time) NOT BETWEEN 9 AND 18;
	Retrieve transactions exceeding a specific limit	SELECT * FROM transactions WHERE amount > 10000;
Advanced Analytics	Identify top 10 customers by revenue	SELECT customer_id, SUM(amount) AS total_revenue FROM transactions GROUP BY customer_id ORDER BY total_revenue DESC LIMIT 10;
	Calculate revenue growth year over year	SELECT YEAR(transaction_date) AS year, SUM(amount) AS revenue FROM transactions GROUP BY YEAR(transaction_date);

Query Type	Example Query	Explanation
SELECT	SELECT * FROM sales;	Retrieves all columns from the sales table.
WHERE Clause	SELECT * FROM sales WHERE region = 'North';	Filters sales data for the North region.
JOIN	SELECT a.id, a.name, b.amount FROM customers a JOIN sales b ON a.id = b.customer_id;	Joins customers and sales tables.
GROUP BY	SELECT region, SUM(amount) FROM sales GROUP BY region;	Groups sales data by region and calculates totals.

Query Type	Example Query	Explanation
HAVING	SELECT region, SUM(amount) FROM sales GROUP BY region HAVING SUM(amount) > 1000;	Filters grouped results.
Subqueries	SELECT * FROM sales WHERE amount > (SELECT AVG(amount) FROM sales);	Uses a subquery to filter sales.
Window Functions	SELECT id, amount, AVG(amount) OVER (PARTITION BY region) FROM sales;	Applies a window function to sales data.

	Query Description	SQL Query Example
<b>Joins</b>	Combine customer and transaction data	SELECT c.customer_id, c.name, t.amount FROM customers c INNER JOIN transactions t ON c.customer_id = t.customer_id;
	Retrieve unpaid invoices with vendor details	SELECT i.invoice_id, i.amount, v.name FROM invoices i LEFT JOIN vendors v ON i.vendor_id = v.vendor_id WHERE i.status = 'unpaid';
	List customers with no transactions	SELECT c.customer_id, c.name FROM customers c LEFT JOIN transactions t ON c.customer_id = t.customer_id WHERE t.transaction_id IS NULL;
	Match invoices with payments	SELECT i.invoice_id, i.amount, p.payment_id, p.amount_paid FROM invoices i FULL OUTER JOIN payments p ON i.invoice_id = p.invoice_id;
<b>Views</b>	Create a view for taxable income	CREATE VIEW taxable_income AS SELECT customer_id, SUM(amount) AS income FROM transactions WHERE type = 'income' GROUP BY customer_id;

	View overdue invoices	CREATE VIEW overdue_invoices AS SELECT invoice_id, due_date, DATEDIFF(NOW(), due_date) AS days_overdue FROM invoices WHERE paid = 0 AND due_date < NOW();
	Drop a view	DROP VIEW taxable_income;
<b>Triggers</b>	Automatically record tax calculations on insert	sql CREATE TRIGGER tax_calculation AFTER INSERT ON transactions FOR EACH ROW BEGIN UPDATE transactions SET tax_amount = NEW.amount * 0.1 WHERE id = NEW.id; END;
	Prevent duplicate invoice numbers	sql CREATE TRIGGER prevent_duplicates BEFORE INSERT ON invoices FOR EACH ROW BEGIN IF EXISTS (SELECT 1 FROM invoices WHERE invoice_number = NEW.invoice_number) THEN SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = 'Duplicate invoice'; END IF; END;
	Log updates to payment status	sql CREATE TRIGGER log_payment_updates AFTER UPDATE ON payments FOR EACH ROW BEGIN INSERT INTO payment_logs (payment_id, status, updated_at) VALUES (NEW.payment_id, NEW.status, NOW()); END;
<b>Functions</b>	Calculate monthly revenue	sql CREATE FUNCTION monthly_revenue(month INT, year INT) RETURNS DECIMAL(10,2) BEGIN RETURN (SELECT SUM(amount) FROM transactions WHERE MONTH(transaction_date) = month AND YEAR(transaction_date) = year AND type = 'income'); END;

	Calculate total tax for a customer	sql CREATE FUNCTION customer_tax(customer_id INT) RETURNS DECIMAL(10,2) BEGIN RETURN (SELECT SUM(tax_amount) FROM transactions WHERE customer_id = customer_id); END;
	Drop a function	DROP FUNCTION customer_tax;
<b>Procedures</b>	Generate customer account statement	sql CREATE PROCEDURE customer_statement(IN customer_id INT) BEGIN SELECT transaction_id, amount, type, transaction_date FROM transactions WHERE customer_id = customer_id ORDER BY transaction_date; END;
	Update payment status for overdue invoices	sql CREATE PROCEDURE update_overdue_status() BEGIN UPDATE invoices SET status = 'overdue' WHERE paid = 0 AND due_date < NOW(); END;
	Call a procedure	CALL customer_statement(101);
<b>ACID Compliance</b>	Implement a transaction for payment and balance update	sql START TRANSACTION; UPDATE accounts SET balance = balance - 500 WHERE account_id = 1; INSERT INTO payments (account_id, amount) VALUES (1, 500); COMMIT;
	Rollback on error	sql START TRANSACTION; BEGIN TRY UPDATE accounts SET balance = balance - 500 WHERE account_id = 1; INSERT INTO payments (account_id, amount) VALUES (1, 500); COMMIT; END TRY BEGIN CATCH ROLLBACK; END CATCH;
<b>Normalization</b>	Split customer data into 3NF tables	1NF: CREATE TABLE customers (customer_id INT, name VARCHAR(255), phone VARCHAR(15));

		2NF: Separate addresses: CREATE TABLE customer_addresses (address_id INT, customer_id INT, address_line VARCHAR(255), city VARCHAR(100));
		3NF: Add ZIP mapping: CREATE TABLE zip_codes (zip_id INT, zip_code VARCHAR(10), city VARCHAR(100));
	De-normalize for performance	SELECT c.name, t.amount, t.transaction_date, a.city FROM customers c JOIN transactions t ON c.customer_id = t.customer_id JOIN customer_addresses a ON c.customer_id = a.customer_id;

EXCEL FORMULA

Category	Formula/Function	Syntax	Example	Description
Taxation & Accounting	SUM	=SUM(range)	=SUM(A1:A10)	Adds all the numbers in the specified range.
	SUMIF	=SUMIF(range, criteria, [sum_range])	=SUMIF(B1:B10, "Taxable", A1:A10)	Adds values based on a condition (e.g., tax-related).
	TAX CALCULATION	Custom formula: =income * tax_rate	=A1 * 0.20	Custom formula for calculating taxes (income * tax rate).



Category	Formula/Function	Syntax	Example	Description
	<b>IF for Tax Brackets</b>	=IF(income > 50000, income * 0.30, income * 0.20)	=IF(A1 > 50000, A1 * 0.30, A1 * 0.20)	Use IF to apply tax brackets (e.g., 30% if income > 50,000, 20% otherwise).
	<b>PMT (Loan Calculation)</b>	=PMT(rate, nper, pv, [fv], [type])	=PMT(5%/12, 60, 10000)	Calculates the monthly payment for a loan (PMT) based on rate, term, and present value (pv).
	<b>FV (Future Value)</b>	=FV(rate, nper, pmt, [pv], [type])	=FV(0.05/12, 120, -200, 10000)	Calculates the future value of an investment or loan (e.g., for tax savings or compound interest).
	<b>CUMIPMT (Cumulative Interest)</b>	=CUMIPMT(rate, nper, pv, start_period, end_period, type)	=CUMIPMT(5%/12, 60, 10000, 1, 12, 0)	Calculates cumulative interest over a specific range of periods.
	<b>XNPV (Net Present Value with dates)</b>	=XNPV(rate, values, dates)	=XNPV(0.05, A1:A10, B1:B10)	Calculates the net present value of cash flows with non-

Category	Formula/Function	Syntax	Example	Description
				periodic dates (useful for taxation and investment scenarios).
Accounting	Net Income Calculation	=revenue - expenses	=A1 - A2	Basic net income formula for accounting purposes.
	Balance Sheet Formula	=Assets = Liabilities + Equity	=A1 = B1 + C1	Ensures the balance sheet follows the accounting equation (Assets = Liabilities + Equity).
Statistics	AVERAGE	=AVERAGE(range)	=AVERAGE(A1:A10)	Calculates the mean of the data in the specified range.
	STDEV	=STDEV(range)	=STDEV(A1:A10)	Calculates the standard deviation of a data set.
	MEDIAN	=MEDIAN(range)	=MEDIAN(A1:A10)	Returns the median of the data in the range.

Category	Formula/Function	Syntax	Example	Description
	<b>MODE</b>	=MODE(range)	=MODE(A1:A10)	Returns the most frequently occurring value in a range.
	<b>VAR</b>	=VAR(range)	=VAR(A1:A10)	Calculates the variance of a data set.
	<b>CORREL (Correlation)</b>	=CORREL(range1, range2)	=CORREL(A1:A10, B1:B10)	Calculates the correlation coefficient between two data sets.
	<b>PERCENTILE</b>	=PERCENTILE(range, k)	=PERCENTILE(A1:A10, 0.5)	Returns the k-th percentile (e.g., median is the 50th percentile).
	<b>RANK</b>	=RANK(number, range, [order])	=RANK(A1, A1:A10)	Returns the rank of a number within a range.
	<b>Z-SCORE</b>	=STANDARDIZE(x, mean, standard_dev)	=STANDARDIZE(A1, AVERAGE(A1:A10), STDEV(A1:A10))	Calculates the Z-score for a given value.

Category	Formula/Function	Syntax	Example	Description
<b>Pivot Tables &amp; Dashboards</b>	<b>Creating a Pivot Table</b>	Insert > PivotTable	N/A	Steps to create a PivotTable: Select data, choose PivotTable, select row/column values, and define aggregations.
	<b>Grouping in Pivot Table</b>	Right-click on field > "Group"	N/A	Group dates, numbers, or other fields into ranges in a PivotTable (e.g., by month, year).
	<b>Calculated Fields in Pivot Table</b>	Insert > Calculated Field	N/A	Create custom calculations in PivotTables by adding a calculated field (e.g., Profit = Revenue - Cost).
	<b>Pivot Table Filter</b>	Insert > Filter	N/A	Add filters to PivotTable to slice data by categories (e.g., by Tax

Category	Formula/Function	Syntax	Example	Description
				Year or Region).
	<b>SUMIFS in Pivot Table</b>	=SUMIFS(sum_range, criteria_range1, criteria1, ...)	=SUMIFS(A1:A10, B1:B10, ">10")	Use SUMIFS within a PivotTable to aggregate data based on multiple conditions.
	<b>Pivot Table Drill-Down</b>	Double-click on a value	N/A	Drill down into data to view detailed records behind a PivotTable summary.
	<b>Create Dashboards</b>	Combine multiple PivotTables, Charts, and Slicers	N/A	Design dashboards using PivotTables, charts, and interactive slicers for data exploration.
<b>Pivot Table Tricks</b>	<b>Pivot Table Slicer</b>	Insert > Slicer	N/A	Use slicers for interactive filtering in PivotTables and dashboards.

Category	Formula/Function	Syntax	Example	Description
	<b>Pivot Table Timeline</b>	Insert > Timeline	N/A	Use timeline for date-based filtering in PivotTables (e.g., by year, quarter).
	<b>Pivot Table Show Values As</b>	Right-click value > "Show Values As" > "% of Total"	N/A	Display values as percentages, running totals, or other variations.
	<b>Pivot Table Sorting</b>	Right-click value > "Sort"	N/A	Sort PivotTable data in ascending or descending order.
	<b>Dynamic Pivot Table with Formula</b>	Use formula to reference Pivot Table	=GETPIVOTDATA("Total Sales", A1)	Use GETPIVOTDATA to dynamically pull data from PivotTables for custom reporting or further analysis.
	<b>Refresh Pivot Table</b>	Right-click > "Refresh"	N/A	Refresh PivotTables to update them

Category	Formula/Function	Syntax	Example	Description
				with the latest data after changes to the source data.

Here’s a table with **keyboard shortcuts** for **advanced usage** of **Computer**, **Excel**, and **Word** to boost productivity and streamline your tasks.

**General Computer Shortcuts:**

Action	Shortcut	Description
Open Task Manager	Ctrl + Shift + Esc	Opens Task Manager to view running programs and processes.
Switch between open apps	Alt + Tab	Switch between open applications.
Open File Explorer	Windows + E	Opens File Explorer to browse files and folders.
Minimize all windows	Windows + D	Minimizes all windows and shows the desktop.
Take a screenshot	Windows + Print Screen	Takes a screenshot and saves it automatically to the Pictures folder.
Lock computer	Windows + L	Locks your computer screen.
Open Settings	Windows + I	Opens Windows Settings.
Open Run Dialog	Windows + R	Opens the Run dialog box to run commands.
Open Start Menu	Windows	Opens the Start Menu.
Snap window to left/right	Windows + Left/Right Arrow	Snap the active window to the left or right side of the screen.

Action	Shortcut	Description
<b>Open Action Center</b>	Windows + A	Opens the Action Center to view notifications and quick settings.

#### Excel Keyboard Shortcuts:

Action	Shortcut	Description
<b>Open a new workbook</b>	Ctrl + N	Creates a new blank workbook.
<b>Open an existing workbook</b>	Ctrl + O	Opens an existing workbook.
<b>Save workbook</b>	Ctrl + S	Saves the current workbook.
<b>Copy selection</b>	Ctrl + C	Copies the selected cells to the clipboard.
<b>Cut selection</b>	Ctrl + X	Cuts the selected cells.
<b>Paste selection</b>	Ctrl + V	Pastes the copied or cut cells.
<b>Undo action</b>	Ctrl + Z	Undoes the previous action.
<b>Redo action</b>	Ctrl + Y	Redoes the previously undone action.
<b>Select entire column</b>	Ctrl + Space	Selects the entire column of the active cell.
<b>Select entire row</b>	Shift + Space	Selects the entire row of the active cell.
<b>Add a new worksheet</b>	Shift + F11	Inserts a new worksheet in the current workbook.
<b>Insert a function</b>	Shift + F3	Opens the Insert Function dialog box to insert a function.
<b>Open the Go To dialog box</b>	Ctrl + G or F5	Opens the Go To dialog to navigate to a specific cell or range.
<b>Freeze panes</b>	Alt + W, F, F	Freezes the selected row or column.



Action	Shortcut	Description
<b>Open the Format Cells dialog</b>	Ctrl + 1	Opens the Format Cells dialog to modify cell formatting.
<b>Quick Sum (AutoSum)</b>	Alt + =	Automatically inserts the SUM function for the selected range.
<b>Show or hide the Ribbon</b>	Ctrl + F1	Hides or shows the Ribbon.
<b>Switch between worksheets</b>	Ctrl + Page Up/Page Down	Switches between worksheets in the current workbook.
<b>Move to next worksheet</b>	Ctrl + Tab	Switches to the next worksheet in the workbook.
<b>Open the Find dialog</b>	Ctrl + F	Opens the Find dialog to search within the workbook.
<b>Open the Replace dialog</b>	Ctrl + H	Opens the Replace dialog to search and replace text.

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## Word Keyboard Shortcuts

Action	Shortcut	Description
Open a new document	Ctrl + N	Creates a new blank document.
Open an existing document	Ctrl + O	Opens an existing document.
Save document	Ctrl + S	Saves the current document.
Print document	Ctrl + P	Opens the Print dialog to print the document.
Bold selected text	Ctrl + B	Bolds the selected text.
Italicize selected text	Ctrl + I	Italicizes the selected text.
Underline selected text	Ctrl + U	Underlines the selected text.
Copy selected text	Ctrl + C	Copies the selected text to the clipboard.
Cut selected text	Ctrl + X	Cuts the selected text.
Paste copied/cut text	Ctrl + V	Pastes the copied or cut text.
Undo action	Ctrl + Z	Undoes the previous action.
Redo action	Ctrl + Y	Redoes the previously undone action.
Select all text	Ctrl + A	Selects all text in the document.
Open Find and Replace	Ctrl + H	Opens the Find and Replace dialog to search and replace text.
Bold/Italic/Underline toggle	Ctrl + Shift + B/I/U	Toggles bold, italic, or underline formatting on or off.
Align text to the left	Ctrl + L	Aligns the selected text to the left.
Center-align text	Ctrl + E	Centers the selected text.
Right-align text	Ctrl + R	Right-aligns the selected text.
Increase font size	Ctrl + Shift + >	Increases the font size of the selected text.

Action	Shortcut	Description
Decrease font size	Ctrl + Shift + <	Decreases the font size of the selected text.
Insert hyperlink	Ctrl + K	Opens the Insert Hyperlink dialog to insert a link.
Open the Styles pane	Alt + Ctrl + Shift + S	Opens the Styles pane for formatting styles in the document.
Insert a table	Alt + N, T	Inserts a table into the document.
Show/hide formatting marks	Ctrl + Shift + 8	Toggles visibility of non-printing characters (spaces, tabs, etc.).
Insert page break	Ctrl + Enter	Inserts a page break at the cursor position.
Move to next comment	Ctrl + Alt + N	Moves to the next comment in a document (useful in reviewing).

#### Advanced Tips:

- **Excel:** Use Ctrl + Shift + L to quickly apply filters to your data.
- **Word:** Use Ctrl + Alt + M to insert a comment when reviewing a document.
- **Windows:** Use Windows + X to open the Quick Link menu, which gives you quick access to various system tools like Device Manager, PowerShell, etc.

#### CHEAT SHEET FOR CREATING DASHBOARDS IN TABLEAU, INCLUDING STEPS, COMMON FORMULAS, AND FUNCTIONS IN A TABLE FORMAT:

Step/Task	Description/Action
1. Connect to Data	- Open Tableau and select the data source (Excel, SQL, etc.)
2. Data Preparation	- Clean, filter, or transform data as needed using the Data Source tab

Step/Task	Description/Action														
3. Create a Worksheet	- Drag dimensions (e.g., Category, Date) and measures (e.g., Sales, Revenue) into Rows/Columns shelf														
4. Build Views	- Choose chart type (Bar, Line, Pie, etc.) and drop fields onto Marks shelf (Color, Size, Shape, Label)														
5. Create Calculations	- Create new calculated fields (Analysis > Create Calculated Field)														
<table border="1"> <thead> <tr> <th data-bbox="199 961 472 1031">Function/Formula</th><th data-bbox="472 961 1027 1031">Description</th></tr> </thead> <tbody> <tr> <td data-bbox="199 1031 472 1150"><b>SUM()</b></td><td data-bbox="472 1031 1027 1150">- Adds up values in a field (e.g., SUM(Sales))</td></tr> <tr> <td data-bbox="199 1150 472 1270"><b>AVG()</b></td><td data-bbox="472 1150 1027 1270">- Calculates the average of a field (e.g., AVG(Profit))</td></tr> <tr> <td data-bbox="199 1270 472 1390"><b>COUNT()</b></td><td data-bbox="472 1270 1027 1390">- Counts the number of records (e.g., COUNT(Customer ID))</td></tr> <tr> <td data-bbox="199 1390 472 1509"><b>COUNTD()</b></td><td data-bbox="472 1390 1027 1509">- Counts distinct records (e.g., COUNTD(Product))</td></tr> <tr> <td data-bbox="199 1509 472 1629"><b>IF</b></td><td data-bbox="472 1509 1027 1629">- Conditional logic (e.g., IF [Sales] &gt; 1000 THEN 'High' ELSE 'Low' END)</td></tr> <tr> <td data-bbox="199 1629 472 1841"><b>CASE</b></td><td data-bbox="472 1629 1027 1841">- Similar to IF but with multiple conditions (e.g., CASE [Region] WHEN 'East' THEN 'East Coast' ELSE 'Other' END)</td></tr> </tbody> </table>	Function/Formula	Description	<b>SUM()</b>	- Adds up values in a field (e.g., SUM(Sales))	<b>AVG()</b>	- Calculates the average of a field (e.g., AVG(Profit))	<b>COUNT()</b>	- Counts the number of records (e.g., COUNT(Customer ID))	<b>COUNTD()</b>	- Counts distinct records (e.g., COUNTD(Product))	<b>IF</b>	- Conditional logic (e.g., IF [Sales] > 1000 THEN 'High' ELSE 'Low' END)	<b>CASE</b>	- Similar to IF but with multiple conditions (e.g., CASE [Region] WHEN 'East' THEN 'East Coast' ELSE 'Other' END)	- Combine multiple sheets onto a single dashboard (Dashboard > New Dashboard)
Function/Formula	Description														
<b>SUM()</b>	- Adds up values in a field (e.g., SUM(Sales))														
<b>AVG()</b>	- Calculates the average of a field (e.g., AVG(Profit))														
<b>COUNT()</b>	- Counts the number of records (e.g., COUNT(Customer ID))														
<b>COUNTD()</b>	- Counts distinct records (e.g., COUNTD(Product))														
<b>IF</b>	- Conditional logic (e.g., IF [Sales] > 1000 THEN 'High' ELSE 'Low' END)														
<b>CASE</b>	- Similar to IF but with multiple conditions (e.g., CASE [Region] WHEN 'East' THEN 'East Coast' ELSE 'Other' END)														

Step/Task	Description/Action
<p><b>DATEPART()</b> - Extracts a part of a date (e.g., DATEPART('month', [Order Date]))</p> <p><b>DATENAME()</b> - Extracts the name of a date part (e.g., DATENAME('month', [Order Date]))</p> <p><b>DATEDIFF()</b> - Calculates the difference between two dates (e.g., DATEDIFF('day', [Order Date], TODAY()))</p> <p><b>ZN()</b> - Converts NULL values to 0 (e.g., ZN([Sales]))</p> <p><b>WINDOW_SUM()</b> - Calculates the sum across a window of data (e.g., WINDOW_SUM([Sales]))</p> <p><b>LOOKUP()</b> - Accesses data in previous or next rows (e.g., LOOKUP([Sales], -1) to get the previous row's value)</p> <p><b>RANK()</b> - Ranks data based on a field (e.g., RANK([Sales]))</p> <p><b>RUNNING_SUM()</b> - Calculates a running total (e.g., RUNNING_SUM(SUM([Sales])))</p> <p><b>ROUND()</b> - Rounds a number to the nearest integer or specified decimal (e.g., ROUND([Profit], 2))</p> <p><b>DATE()</b> - Converts a string or number to a date (e.g., DATE('2024-01-01'))</p> <p><b>6. Build Dashboard</b></p>	
<p><b>7. Add Interactivity</b></p>	<p>- Add filters, highlight actions, and URL actions to make dashboards interactive</p>

Step/Task	Description/Action
<b>8. Format Dashboard</b>	- Adjust size, colors, labels, and fonts for a clean layout (Format > Borders, Fonts, etc.)
<b>9. Publish</b>	- Publish to Tableau Server, Tableau Online, or export as image/PDF

### Common Tableau Formulas & Functions

### Dashboard Tips & Tricks

Tip/Trick	Description
<b>Use Containers</b>	- Group elements in horizontal or vertical containers to keep the layout organized.
<b>Use Dashboard Actions</b>	- Add filter actions, highlight actions, or URL actions to create interactivity.
<b>Optimize Performance</b>	- Minimize the number of filters, use extracts for large datasets, and avoid complex calculations on the fly.
<b>Responsive Design</b>	- Adjust dashboard size and layout to fit different devices (Desktop, Tablet, Mobile).
<b>Use Color Wisely</b>	- Avoid overuse of colors; use color to highlight important data trends or patterns.

### Power BI Steps for Creating Dashboards

Step/Task	Description/Action
<b>1. Connect to Data</b>	- Open Power BI Desktop and select the data source (Excel, SQL, etc.)

Step/Task	Description/Action
<b>2. Data Transformation</b>	- Use Power Query Editor to clean, transform, and load data (Transform Data button)
<b>3. Create Reports</b>	- Drag fields to the report canvas; select chart types (Bar, Line, Pie, etc.) from Visualizations pane
<b>4. Add Filters</b>	- Apply filters to visuals or create slicers for interactivity (Filters pane or Visualizations pane)
<b>5. Create Measures</b>	- Create new DAX measures for advanced calculations (Modeling tab > New Measure)
<b>6. Build Dashboard</b>	- Combine multiple report elements into a single dashboard (Pin visuals to Dashboard in Power BI Service)
<b>7. Add Interactivity</b>	- Use slicers, drillthrough, and tooltips to create interactive reports
<b>8. Format Report</b>	- Format the visuals using the Formatting pane (adjust colors, fonts, labels, etc.)
<b>9. Publish</b>	- Publish to Power BI Service to share dashboards with others or export reports (Publish button)

### Common Power BI DAX Formulas & Functions

Function/Formula	Description
<b>SUM()</b>	- Adds up values in a column (e.g., SUM(Sales))
<b>AVERAGE()</b>	- Calculates the average of a column (e.g., AVERAGE(Profit))
<b>COUNT()</b>	- Counts the number of rows (e.g., COUNT(Customer ID))
<b>DISTINCTCOUNT()</b>	- Counts the number of distinct values in a column (e.g., DISTINCTCOUNT(Product))
<b>IF()</b>	- Conditional logic (e.g., IF(Sales > 1000, "High", "Low"))
<b>SWITCH()</b>	- Multiple conditions in a single formula (e.g., SWITCH([Region], "East", "East Coast", "Other"))

## Function/Formula Description

<b>DATEADD()</b>	- Shifts a date by a specified number of intervals (e.g., DATEADD([Date], 1, MONTH))
<b>DATEDIFF()</b>	- Calculates the difference between two dates (e.g., DATEDIFF([Order Date], TODAY(), DAY))
<b>TODAY()</b>	- Returns the current date (e.g., TODAY())
<b>CALCULATE()</b>	- Changes the context of a calculation (e.g., CALCULATE(SUM(Sales), [Region] = "East"))
<b>FILTER()</b>	- Filters data based on specified conditions (e.g., FILTER(Sales, Sales > 1000))
<b>ALL()</b>	- Removes filters from columns (e.g., ALL(Sales))
<b>YEAR()</b>	- Extracts the year from a date (e.g., YEAR([Order Date]))
<b>MONTH()</b>	- Extracts the month from a date (e.g., MONTH([Order Date]))
<b>RANKX()</b>	- Ranks values in a column (e.g., RANKX(ALL(Sales), SUM(Sales)))
<b>RELATED()</b>	- Retrieves a related value from another table (e.g., RELATED(Products[Category]))
<b>LOOKUPVALUE()</b>	- Looks up a value from a table based on conditions (e.g., LOOKUPVALUE(Products[Price], Products[Name], "Laptop"))

## Power BI Tips & Tricks

Tip/Trick	Description
<b>Use Measures for Flexibility</b>	- Instead of using calculated columns, use measures for dynamic calculations that adjust based on filters.
<b>Use Conditional Formatting</b>	- Apply conditional formatting to highlight specific data points (e.g., color scales, data bars).
<b>Drillthrough</b>	- Enable drillthrough functionality to allow users to right-click on a visual and see more detailed data.



Tip/Trick	Description
<b>Create Hierarchies</b>	- Create hierarchies (e.g., Year > Quarter > Month > Day) for easier drill-downs.
<b>Use Bookmarks</b>	- Capture and save different states of a report (e.g., filters or visuals) to navigate easily.
<b>Use Slicers</b>	- Add slicers for easy filtering across multiple visuals simultaneously.
<b>Optimize Performance</b>	- Use aggregated tables, limit the amount of data, and avoid complex row-level filters on large datasets.
<b>Pin Visuals to Dashboard</b>	- Pin frequently used visuals to your Power BI Service dashboard for easy access.

## COMPREHENSIVE GUIDE TO DATA ANALYSIS, COVERING THE STEPS, TOOLS, FUNCTIONS, AND THE IMPLEMENTATION PROCESS:

### Data Analysis Steps

Step	Description
<b>1. Define the Problem</b>	- Clearly identify the problem or objective. Define the goals of the analysis to understand what you need.
<b>2. Collect Data</b>	- Gather relevant data from various sources (databases, APIs, spreadsheets, etc.). Ensure data quality.
<b>3. Data Cleaning</b>	- Clean the data by handling missing values, removing duplicates, and correcting errors.
<b>4. Data Exploration</b>	- Perform exploratory data analysis (EDA) to understand data distribution, relationships, and patterns.
<b>5. Data Transformation</b>	- Transform data (e.g., normalize, aggregate, or join datasets) to prepare for analysis or modeling.

Step	Description
<b>6. Apply Statistical Analysis</b>	- Conduct statistical tests, calculate summary statistics, and find correlations to understand relationships.
<b>7. Build Models</b>	- If needed, apply machine learning models or algorithms (e.g., regression, classification) for predictions.
<b>8. Interpret Results</b>	- Analyze and interpret the results to gain insights. Translate these findings into actionable decisions.
<b>9. Communicate Findings</b>	- Visualize results using charts, graphs, or dashboards and present findings to stakeholders.
<b>10. Take Action</b>	- Implement the recommendations based on the analysis to improve business processes or solve the problem.

### Data Analysis Tools

Tool	Description
<b>Excel</b>	- Widely used for small to medium datasets, offering powerful features like pivot tables, functions, and charts.
<b>SQL</b>	- Essential for querying databases to extract and manipulate data using structured queries.
<b>Python</b>	- A versatile programming language for data analysis with libraries like Pandas, NumPy, Matplotlib, and Scikit-learn.
<b>R</b>	- A programming language focused on statistical analysis and visualizations (e.g., ggplot2, dplyr).
<b>Power BI</b>	- Business intelligence tool for creating interactive reports and dashboards using various data sources.
<b>Tableau</b>	- Data visualization tool for creating interactive and shareable dashboards with strong visual analytics.
<b>Google Analytics</b>	- Used for analyzing website traffic and user behavior, providing insights into web performance.

Tool	Description
<b>AWS</b>	- Cloud-based tools for large-scale data storage, processing (e.g., AWS S3, AWS Redshift), and analysis.
<b>Google BigQuery</b>	- Data warehouse for performing large-scale data analysis using SQL on Google Cloud.
<b>Hadoop/Spark</b>	- Frameworks for processing large datasets (Big Data) across distributed systems.

### Common Data Analysis Functions

Function	Description
<b>SUM()</b>	- Calculates the total of a column or range (e.g., SUM(Sales)).
<b>AVERAGE()</b>	- Calculates the mean of a set of values (e.g., AVERAGE(Profit)).
<b>COUNT()</b>	- Counts the number of entries in a column (e.g., COUNT(Orders)).
<b>MEDIAN()</b>	- Returns the middle value in a dataset (e.g., MEDIAN(Income)).
<b>MODE()</b>	- Returns the most frequent value in a dataset (e.g., MODE(Age)).
<b>CORREL()</b>	- Calculates the correlation between two variables (e.g., CORREL(Sales, Advertising Spend)).
<b>VLOOKUP()</b>	- Searches for a value in the first column of a table and returns a corresponding value from another column.
<b>IF()</b>	- Conditional logic for evaluating if a condition is true or false (e.g., IF([Sales]>1000, "High", "Low")).
<b>GROUPBY()</b>	- Groups data based on one or more columns (e.g., GROUPBY(Product, SUM(Sales))).
<b>PIVOT()</b>	- Transforms unique values from one column into multiple columns (e.g., pivoting regions into individual columns).
<b>REGEX()</b>	- Applies regular expressions for pattern matching (e.g., extracting emails or phone numbers from text).

Function	Description
<b>LEFT() / RIGHT()</b>	- Extracts characters from the left or right side of a string (e.g., LEFT(Name, 3) for the first 3 letters).
<b>DATE()</b>	- Converts a string or number to a date (e.g., DATE(2024, 12, 31)).

## Data Analysis Implementation Process

### 1. Data Collection & Access

- Ensure data is accurate, timely, and relevant. Use appropriate tools (e.g., APIs, databases, spreadsheets).

### 2. Data Cleaning & Transformation

- Handle missing values (e.g., impute, delete, or flag them). Remove duplicates, correct data types, and normalize data.

### 3. Exploratory Data Analysis (EDA)

- Perform initial analysis to visualize distributions, trends, and identify outliers using graphs (histograms, box plots).
- Use descriptive statistics like mean, median, standard deviation.

### 4. Modeling and Analysis

- For predictive analysis, apply statistical models or machine learning algorithms (e.g., regression, clustering, classification).
- Choose the right model based on the objective and validate using techniques like cross-validation.

### 5. Data Visualization

- Create meaningful charts (e.g., bar, line, pie, scatter plots) to represent findings.
- Use Power BI, Tableau, or Excel for creating dashboards and reports that summarize key insights.

### 6. Interpretation of Results

- Assess the results from statistical tests or models. Look for significant patterns, relationships, or anomalies in the data.

- Draw insights and translate these findings into actionable business recommendations.

## 7. Reporting & Presentation

- Communicate the findings clearly through visualizations and reports.
- Tailor reports to the audience (e.g., business executives, technical teams).

## 8. Take Action & Iterate

- Implement recommendations based on the analysis. Measure the impact of changes.
- Iterate the analysis process as needed based on feedback or new data.

Python cheat sheet with commonly used code snippets and functions for various tasks:

## 9. 1. Basic Python Syntax

Task	Code
<b>Print to Console</b>	<code>print("Hello, World!")</code>
<b>Variable Assignment</b>	<code>x = 10</code>
<b>Commenting</b>	<code># This is a comment</code>
<b>Multi-line Comment</b>	<code>''' This is a multi-line comment '''</code>
<b>Input from User</b>	<code>name = input("Enter your name: ")</code>
<b>Check Data Type</b>	<code>type(x)</code>
<b>Type Casting</b>	<code>int("10"), float("10.5"), str(100)</code>

## 10. 2. Data Structures

Task	Code
<b>List (Array)</b>	<code>my_list = [1, 2, 3, 4, 5]</code>
<b>Access List Item</b>	<code>my_list[0]</code>
<b>List Slicing</b>	<code>my_list[1:4]</code>
<b>Add Item to List</b>	<code>my_list.append(6)</code>
<b>Remove Item from List</b>	<code>my_list.remove(3)</code>
<b>Tuple</b>	<code>my_tuple = (1, 2, 3, 4)</code>
<b>Set</b>	<code>my_set = {1, 2, 3, 4}</code>
<b>Dictionary (HashMap)</b>	<code>my_dict = {"key1": "value1", "key2": "value2"}</code>
<b>Access Dictionary Value</b>	<code>my_dict["key1"]</code>

Task	Code
Add Key-Value Pair	<code>my_dict["key3"] = "value3"</code>

### 11.3. Control Flow

Task	Code
If Statement	<code>if x &gt; 10: print("x is greater than 10")</code>
If-Else Statement	<code>if x &gt; 10: print("x is greater than 10") else: print("x is less than or equal to 10")</code>
Elif Statement	<code>if x &gt; 10: print("x is greater") elif x == 10: print("x is 10") else: print("x is smaller")</code>
For Loop	<code>for i in range(5): print(i)</code>
While Loop	<code>while x &lt; 10: x += 1</code>
Break	<code>for i in range(5): if i == 3: break</code>
Continue	<code>for i in range(5): if i == 3: continue</code>

### 12.4. Functions

Task	Code
Define Function	<code>def my_function(): print("Hello from function!")</code>
Function with Parameters	<code>def greet(name): print(f"Hello, {name}!")</code>
Return Value from Function	<code>def add(a, b): return a + b</code>
Lambda Function	<code>add = lambda a, b: a + b</code>

### 13.5. String Manipulation

Task	Code
Concatenate Strings	<code>full_name = "John" + " " + "Doe"</code>
String Length	<code>len("Hello")</code>
Convert to Upper Case	<code>"hello".upper()</code>
Convert to Lower Case	<code>"HELLO".lower()</code>
Substring	<code>"Hello, World!"[7:12]</code>
Find Substring	<code>"Hello, World!".find("World")</code>
Replace Substring	<code>"Hello, World!".replace("World", "Python")</code>
Split String	<code>"Hello, World!".split(",")</code>

### 14.6. File Handling

Task	Code
<b>Open a File</b>	<code>file = open("example.txt", "r")</code>
<b>Read File</b>	<code>content = file.read()</code>
<b>Read Line by Line</b>	<code>lines = file.readlines()</code>
<b>Write to a File</b>	<code>file = open("example.txt", "w"); file.write("Hello, World!")</code>
<b>Close a File</b>	<code>file.close()</code>

## 15. 7. List Comprehension

Task	Code
<b>Basic List Comprehension</b>	<code>[x**2 for x in range(5)]</code>
<b>List Comprehension with Condition</b>	<code>[x for x in range(10) if x % 2 == 0]</code>

## 16. 8. Error Handling

Task	Code
<b>Try-Except Block</b>	<code>try: x = 10 / 0 except ZeroDivisionError: print("Cannot divide by zero")</code>
<b>Finally Block</b>	<code>try: x = 10 / 0 except ZeroDivisionError: print("Error!") finally: print("This runs always")</code>

## 17. 9. Working with Libraries

Task	Code
<b>Importing a Library</b>	<code>import math</code>
<b>Using a Library Function</b>	<code>math.sqrt(16)</code>
<b>Install a Library (using pip)</b>	<code>pip install pandas</code>
<b>Import Specific Function</b>	<code>from math import sqrt</code>

## 18. 10. NumPy for Numerical Operations

Task	Code
<b>Import NumPy</b>	<code>import numpy as np</code>
<b>Create NumPy Array</b>	<code>arr = np.array([1, 2, 3, 4, 5])</code>
<b>Array Reshaping</b>	<code>arr.reshape(5, 1)</code>
<b>Array Operations</b>	<code>arr + 10, arr * 2</code>
<b>Array Slicing</b>	<code>arr[1:4]</code>
<b>Array Statistics</b>	<code>np.mean(arr), np.median(arr), np.std(arr)</code>

## 19. 11. Pandas for Data Handling

Task	Code
<b>Import Pandas</b>	<code>import pandas as pd</code>
<b>Create DataFrame</b>	<code>df = pd.DataFrame({"Name": ["Alice", "Bob"], "Age": [25, 30]})</code>
<b>Read CSV File</b>	<code>df = pd.read_csv("data.csv")</code>
<b>View Data</b>	<code>df.head()</code>
<b>Basic Statistics</b>	<code>df.describe()</code>
<b>Filter Data</b>	<code>df[df["Age"] &gt; 25]</code>
<b>Group By</b>	<code>df.groupby("Age").mean()</code>

## 20. 12. Matplotlib for Plotting

Task	Code
<b>Import Matplotlib</b>	<code>import matplotlib.pyplot as plt</code>
<b>Simple Plot</b>	<code>plt.plot([1, 2, 3], [4, 5, 6]); plt.show()</code>
<b>Bar Plot</b>	<code>plt.bar([1, 2, 3], [4, 5, 6]); plt.show()</code>
<b>Histogram</b>	<code>plt.hist([1, 2, 2, 3, 4, 5]); plt.show()</code>
<b>Scatter Plot</b>	<code>plt.scatter([1, 2, 3], [4, 5, 6]); plt.show()</code>