Video 1: Installation

- Download and install **Power BI Desktop** from the Microsoft website.
- After installation, open **Power BI Desktop** to explore the interface.
- The main sections of Power BI include:
    - **Home Ribbon**: Contains options to import data, transform data, and create visualizations.
    - **Report View**: Where you design and build reports with charts and graphs.
    - **Data View**: Displays imported tables in a structured format.
    - **Model View**: Helps define relationships between tables.

Transform Data

- The **Power Query Editor** is used to clean and prepare data before loading it into Power BI.
- You can perform actions like:
    - Removing unnecessary columns
    - Changing data types
    - Filtering out irrelevant rows
    - Splitting columns and merging data
    - Adding calculated columns
- **"Close & Apply"** saves changes and loads the transformed data into Power BI.

Applied Steps

- **Applied Steps Pane** records each transformation made in the Power Query Editor.
- You can edit or delete any step in the sequence.
- Helps track data modifications, making it easier to adjust changes without reloading data.

Table View Tab

- This tab displays data in a tabular format, similar to an Excel spreadsheet.
- Allows you to inspect values, change column properties, and create calculated columns.

Model Tab for Joins

- Used to create relationships between tables using **primary and foreign keys**.
- Relationship types include **one-to-many**, **one-to-one**, and **many-to-many**.

- Ensures proper data connectivity for accurate analysis.

Report Tab

- The main workspace where you build visual reports.
- You can add more data sources, create **visualizations**, and write **DAX queries**.
- Provides features to **insert charts, add calculations, and publish reports** using the top toolbar.

Right-Side Tab (Visualizations & Data)

- The **Fields Pane** (right-side tab) lists all available tables and columns from imported data.
- The **Visualizations Pane** lets you choose from different chart types and customize them.
- The **Filters Pane** allows you to filter data at different levels (visual, page, or report level).

Legend Under Visualizations

- Legends help categorize data visually.
- Used in charts to differentiate data points by color.
- You can enable/disable and customize the legend under the **Format Pane**.

Choosing Graph Type

- Power BI offers multiple visualization options such as bar charts, pie charts, line graphs, maps, and more.
- Choose the most appropriate chart type depending on the data you're analyzing.

Drag Data Into Visualizations

- Dragging a field (column) from the **Fields Pane** into a visualization automatically maps the data.
- Fields can be placed in different areas such as:
    - **Axis** (X-axis or category)
    - **Values** (Y-axis or measurement)
    - **Legend** (Categorization)
    - **Filters** (To narrow down displayed data)

Clustered Bar Chart

- A bar chart that groups data into categories with side-by-side bars for comparison.
- Useful for comparing multiple values across different categories.

Turning Off Rounding in Visuals

- In a visual, navigate to the **Format Pane**.
- Under **Values**, change the **Display Units** to "None" to display full numeric values instead of rounded numbers.

Power Query Overview

- **Power Query Editor** is a data transformation tool within Power BI that allows users to **clean, reshape, and manipulate** data before loading it into the report.
- After **getting data** from a source (Excel, SQL, CSV, etc.), Power Query enables various transformations to prepare the data for analysis.

Transforming Data in Power Query

- Once data is imported, you can perform transformations before loading it into Power BI.
- Common transformations include **changing data types, removing null values, deleting unnecessary columns, and reshaping data**

Understanding Column Data Types

- Power Query assigns a **data type** to each column automatically, but you can manually change it if necessary.
- **Data types in Power Query:**
    - **Abc → Text** (stores words, names, and other non-numeric data).
    - **Abc123 → Any Data Type** (a flexible type that can contain both numbers and text).
    - **123 → Whole Number** (stores integer values without decimals).
    - **1.23 → Decimal Number** (stores numbers with decimal points).
    - **Fixed Decimal Number** → A precise decimal type used for financial calculations.

Changing Data Type to Fixed Decimal Number

- **Fixed Decimal Number** is useful for monetary values or precise decimal calculations.
- To change the data type:
    1. Select the column.

2. Click on the **Data Type dropdown** in the Power Query toolbar.
3. Choose **Fixed Decimal Number** to store numbers with a fixed precision.

Removing Null Values

- **Null values** represent missing or empty data in a dataset.
- To remove null values:
    1. Click on the column with null values.
    2. Open the **Filter dropdown** (small arrow in the column header).
    3. Uncheck **null** to exclude rows with missing data.
    4. Click **OK**, and Power Query will remove rows containing nulls.

Removing Columns

- If a column is unnecessary, you can remove it to optimize data storage and processing.
- To remove a column:
    1. Select the column.
    2. Click **Remove Columns** in the toolbar.
    3. This step is recorded under **Applied Steps**, allowing you to undo it if needed.

Unpivot Columns

- **Unpivoting** is used when data is in a wide format and needs to be transformed into a **long format** (better for analysis).

- Example:

1. **Before Unpivoting (Wide Format)**

Year	Product A	Product B	Product C
2022	100	200	300
2023	150	250	350

2.
After Unpivoting (Long Format)

Year	Product	Sales

2022	Product A	100
2022	Product B	200
2022	Product C	300
2023	Product A	150
2023	Product B	250
2023	Product C	350

- **How to Unpivot:**

  1. Select multiple **column headers** that you want to convert into a single column.
  2. Click **Transform** > **Unpivot Columns**.
  3. Power Query will restructure the data, making it easier to analyze in Power BI.

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1. Model Tab on Left

- **Accessing the Model View:**
  In Power BI Desktop, click on the **Model icon** (often found as one of the icons on the left-hand side) to switch to the Model View. This view provides a graphical representation of all your tables and their relationships.
- **Purpose:**
  It allows you to visually inspect how tables are connected, identify missing relationships, and verify that the data flows correctly across your model.

2. Double Click on Join to Edit Relationship

- **Editing Relationships:**
  In the Model View, relationships are shown as lines connecting tables. By **double-clicking** on one of these join lines, you open the **Edit Relationship** dialog.
- **What You Can Do:**
  In this dialog, you can modify various properties such as:
  - The specific columns that define the relationship.
  - The relationship type (cardinality).
  - The cross-filter direction.

- **Benefits:**
  This feature is helpful for fine-tuning how data is linked between tables, ensuring the relationship behaves as expected during analysis.

3. Cardinality

- **Definition:**
  Cardinality describes the nature of the relationship between two tables.
- **Types of Cardinality:**
  - **One-to-Many (1:*):**
    A single record in one table relates to multiple records in another. This is the most common type of relationship.
  - **One-to-One (1:1):**
    Each record in one table corresponds to exactly one record in another table.
  - **Many-to-Many (*:*):**
    Records in both tables can have multiple matches in the other table. This requires careful management and sometimes the use of a bridge table.
- **Why It Matters:**
  Correct cardinality ensures accurate data aggregation and filtering, and helps maintain the integrity of your analyses.

4. Both Directions (Cross Filter Direction)

- **Understanding Cross Filter Direction:**
  This setting determines how filters applied to one table propagate to related tables.
- **Options:**
  - **Single Direction:**
    Filters flow from one table to the other, but not vice versa. This is the default in many cases.
  - **Both Directions:**
    Filters propagate in both directions between tables, allowing for more flexible interactions in your reports.
- **Considerations:**
  Using **both directions** can simplify report creation but might also lead to ambiguous filtering situations or performance issues if not managed properly. Always assess whether two-way filtering is necessary for your specific data model.

5. Making Relationships from Scratch

- **When to Create Relationships Manually:**
  Sometimes Power BI might not automatically detect relationships between your tables, or you may need to establish custom relationships.
- **How to Create Them:**
  1. **Drag and Drop:**
     In the Model View, click on a column from one table and drag it to the corresponding column in another table.
  2. **Configure Settings:**
     When prompted, set the relationship details such as the **cardinality** and **cross-filter direction**.
  3. **Verify Relationship:**
     Ensure that the relationship is correctly established and that the data flows as expected.
- **Benefits:**
  Creating relationships from scratch gives you precise control over how your tables interact, which is crucial for complex data models or when working with non-standard data sources.

Introduction to DAX

- **DAX (Data Analysis Expressions)** is a formula language used in Power BI for creating custom calculations in calculated columns, measures, and tables.
- DAX functions are similar to Excel formulas but are optimized for relational data and dynamic reporting.

1. Create New Measure

- **Measures** are dynamic calculations that respond to filters and context in your report.
- **How to Create a Measure:**
  - In the **Fields pane**, right-click a table and select **New Measure**, or use the **Modeling** tab on the ribbon.
  - Write your DAX formula in the formula bar.

Example:
Total Sales = SUM(Sales[Amount])

-
- **Usage:** Measures are used in visuals for aggregations like totals, averages, and percentages that update based on slicers or filters.

2. DAX Count

- **COUNT Functions:**
  - **COUNT:** Counts the number of non-blank values in a column.
  - **COUNTROWS:** Counts the number of rows in a table.

Example:
Number of Orders = COUNT(Orders[OrderID])

-
- **Usage:** Useful for determining the number of entries, such as transactions or records.

3. DAX Sum

- **SUM Function:**
  - Adds up all the numeric values in a specified column.

Example:
Total Revenue = SUM(Revenue[Amount])

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- **Usage:** Commonly used for calculating total sales, revenue, or any aggregated numeric data.

4. SUM vs. SUMX

- **SUM:**
  - Directly adds up the values in a column.
  - **Example:** `Total Sales = SUM(Sales[Amount])`
- **SUMX:**
  - An iterator function that evaluates an expression for each row, then sums the results.

Example:
Total Discounted Sales = SUMX(Sales, Sales[Amount] * (1 - Sales[Discount]))

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- **Key Differences:**
  - **SUM** is straightforward and works directly on columns.
  - **SUMX** allows you to perform row-by-row calculations, which is necessary when the sum involves complex expressions or additional calculations.

5. Add Column and Create New Columns Using Formulas

- **Calculated Columns:**
  - Added to your data model to store results of DAX expressions.
  - Calculated row by row during data refresh, and then stored in your model.
- **How to Create a Calculated Column:**
  - Right-click on a table in the **Fields pane** and select **New Column**.
  - Enter your DAX formula.

Example:
Profit = Sales[Revenue] - Sales[Cost]

-
- **Usage:** Useful for creating new data fields for categorization, segmentation, or further analysis.

6. WEEKDAY() and Other Date Functions

- **WEEKDAY() Function:**
  - Returns a number representing the day of the week from a date.
  - **Syntax:** `WEEKDAY(<date>, <return_type>)`
    - `<return_type>` defines the numbering system (e.g., 1 for Sunday or Monday as 1).

Example:
DayOfWeek = WEEKDAY('Date'[Date], 2)

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- **Other Date Functions:**
  - **TODAY(), NOW(), YEAR(), MONTH(), DAY(), DATE()**
  - These functions allow you to extract date components, perform date arithmetic, and create date values.
- **Usage:** Essential for time intelligence calculations like period comparisons, filtering data by date ranges, or computing differences between dates.

7. IF() Function

- **IF Function:**
  - Used for conditional logic within DAX.
  - **Syntax:** `IF(<logical_test>, <value_if_true>, <value_if_false>)`

Example:
Sales Category = IF(Sales[Amount] > 1000, "High", "Low")

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- **Usage:** Allows you to create conditional statements in both calculated columns and measures to dynamically categorize or segment data.

Drill Down Functionality in Power BI

- **What is Drill Down?**
    - Drill down allows you to explore data in greater detail by navigating through different levels of a hierarchy within a chart.
    - It turns a high-level visualization into a detailed one, giving you insights into the underlying data.

How to Set Up Drill Down

- **Adding Hierarchical Data:**
    - To enable drill down, you need to add more than one field to the axis of your visual. For example, if you're using a bar chart:
        - The top level might show "Year."
        - By adding "Month" or "Quarter" under the "Year," you create a hierarchy.
    - Depending on your chart type (x-axis for column or bar charts, or y-axis for others), add the additional piece of data to form the desired hierarchy.
- **Building a Hierarchy:**
    - Arrange your data fields in order of hierarchy (e.g., Country > State > City) in the Axis area.
    - Power BI will automatically create a drillable hierarchy, allowing users to click on a high-level category to see more detailed information.

Interacting with Drill Down

- **Using the Drill Down Button:**
    - Once your visual has a hierarchy, you'll notice drill down buttons appear on the top of the chart.
    - Clicking the **drill down button** (often an arrow or a forked arrow icon) will take you to the next level of detail.

    - You can also use the **drill up button** to return to the previous level.
- **Right-Click Options:**
    - In many visuals, right-clicking on a data element (like a bar or a segment) will provide a context menu with drill down options.
- **Benefits:**
    - **Enhanced Analysis:** Easily switch between summary and detailed views.
    - **Interactive Exploration:** Users can explore data patterns without leaving the report.
    - **Better Insights:** Identify trends, anomalies, or outliers at multiple granularity levels.

Usage Scenarios

- **Time Series Analysis:**
    - Drill down from years to quarters or months to see seasonal trends.
- **Geographical Data:**
    - Start with a country overview and drill down to regions or cities for localized insights.
- **Product Performance:**
    - Begin with overall sales and drill down to individual product categories or even specific products.

Conditional Formatting in Power BI

Conditional formatting lets you visually enhance your reports by changing the appearance of your data (like color, font, and style) based on rules or data values. It makes trends and outliers more apparent, and improves the overall readability of your visualizations.

1. How to Change Conditional Formatting

- **Accessing Conditional Formatting:**
    - In Power BI, select the visual you want to format.
    - Go to the **Format Pane** (paint roller icon) and locate the field (or data point) you want to conditionally format.
- **Applying Conditional Formatting:**
    - Click on the drop-down next to the field (often under "Values").
    - Choose **Conditional Formatting** to open the formatting options.
- **Customization:**

    - You can choose between several formatting types (like color scales, data bars, icons, etc.) and set custom rules or conditions based on your data.

2. Data Bars

- **What They Are:**
    - Data bars are visual indicators (horizontal bars) embedded within a table or matrix cell that represent the value's magnitude.
- **How to Apply:**
    - In the conditional formatting options, choose **Data Bars**.
    - Set the minimum and maximum values, and customize the color of the bars.
- **Usage:**
    - They allow for a quick, intuitive understanding of how individual values compare within a range.

3. Gradient

- **What It Means:**
    - A gradient applies a color scale to your data. The color changes gradually from one hue to another based on the cell's value.
- **How to Set Up:**
    - In the conditional formatting settings, select the **Color Scale** option.
    - Choose colors for the minimum, mid-point (if applicable), and maximum values.
- **Usage:**
    - Useful for highlighting trends, where a light color indicates lower values and a darker (or contrasting) color indicates higher values.

4. Rules

- **Defining Rules:**
    - Rules allow you to set specific conditions that dictate the formatting.
    - You can define rules based on numeric thresholds, text values, or date ranges.
- **How to Create Rules:**
    - In the conditional formatting dialog, choose **Rules**.
    - Specify the condition (e.g., "if value is greater than 100") and the corresponding formatting (like a specific background color).
- **Usage:**
    - Ideal for highlighting particular ranges or outlier values that meet specific criteria.

5. Icons

- **What They Do:**
    - Icon sets add visual symbols (such as arrows, circles, or flags) to your data, helping to quickly communicate trends or statuses.
- **How to Apply Icons:**
    - In the conditional formatting settings, select **Icons**.
    - Choose an icon set, and configure the rules that determine which icon appears based on your data.
- **Usage:**
    - They can be used to indicate performance metrics (e.g., up/down arrows for growth or decline) or statuses like "good" or "bad."

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1. New Group

- **What It Is:**
    - The **New Group** feature in Power BI lets you create custom groupings or buckets of data.
    - It effectively creates a new column in your dataset where each row is categorized based on the grouping logic you define.
- **How It Works:**
    - Similar to an **IF statement**, you can define conditions or ranges to group data. For example, grouping sales figures into "Low," "Medium," and "High" categories.
    - This is particularly useful when you need to segment continuous data into discrete categories.

2. Bins with Numbers

- **Creating Numeric Bins:**
    - Bins are used to group numerical data into intervals or ranges.
    - In Power BI, you can right-click on a numeric column and choose **New Group** or **New Bin**.
- **How to Set Up:**
    - Define the **bin size** (e.g., grouping ages into intervals of 10 years, or sales amounts into ranges of $1000).
    - Power BI automatically creates a new column representing these bins, which can then be used in your visuals.
- **Benefits:**
    - Simplifies the analysis by summarizing data into manageable groups.
    - Helps in spotting trends and patterns that might be less visible with individual values.

3. Bins with Dates

- **Grouping Date Values:**
    - You can also create bins for date fields, which can help you analyze data over time.
- **Sorting by Different Time Intervals:**
    - Power BI allows you to group dates by **seconds, minutes, hours, days, months, quarters, or years**.
    - This is useful for time-series analysis, where you might want to see trends or patterns over different periods.
- **How to Set Up:**
    - Right-click on your date field, select **New Group** or **New Bin**, and choose the desired time interval.
    - The resulting column will group dates into the specified intervals, making it easier to compare trends across these periods.

4. Using Groups/Bins for Drill Down

- **Enhancing Interactivity:**
    - Once you have grouped or binned your data, these new fields can be used as levels in a drill down hierarchy.
- **Creating Hierarchies:**
    - For example, if you have binned dates by month, you can set up a hierarchy that allows users to drill from yearly summaries down to monthly details.
    - Similarly, numeric bins can help create drill-down paths in visuals, where clicking on a bin shows more detailed data related to that range.
- **Benefits for Reporting:**
    - This technique improves the user experience by enabling more interactive and detailed explorations of the data.
    - It makes complex datasets more digestible, allowing users to focus on specific segments or time frames as needed.

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1. Stacked Bar Chart

- **Overview:**
  A stacked bar chart displays data using horizontal bars, where each bar is divided into segments representing sub-categories.
- **Usage:**
    - Ideal for comparing the contribution of individual categories to a whole.

    - Visualizes both total values and the distribution within each category.
- **Example Scenario:**
  Comparing total sales by region while also showing the breakdown by product category.

2. 100% Stacked Column Chart

- **Overview:**
  This chart type displays vertical columns where each column represents 100% of the data, with segments showing the percentage contribution of each sub-category.
- **Usage:**
    - Useful for comparing proportional relationships across categories.
    - Makes it easy to see the relative percentage contributions regardless of the absolute values.
- **Example Scenario:**
  Displaying market share percentages of different brands across multiple regions.

3. Line Chart

- **Overview:**
  A line chart connects individual data points with a continuous line, making it great for showing trends over time or sequential data.
- **Usage:**
    - Ideal for time series analysis, tracking changes, or identifying trends.
    - Can display multiple lines to compare different series.
- **Example Scenario:**
  Visualizing monthly revenue trends over several years.

4. Line and Clustered Column Chart

- **Overview:**
  This hybrid chart combines the features of a line chart and a clustered column chart.
- **Usage:**
    - Enables comparison of two different types of data (often with different scales) in one visualization.
    - Columns can represent one measure (e.g., sales volume) while the line represents another (e.g., profit margin).
- **Example Scenario:**
  Comparing quarterly sales (columns) alongside profit percentage (line) in a single chart.

5. Scatter Chart

- **Overview:**
  A scatter chart plots individual data points based on two numeric axes, helping to reveal relationships, correlations, or patterns between variables.
- **Usage:**
  - Excellent for identifying clusters, trends, and outliers.
  - Enhances analysis with additional dimensions using color, size, or tooltips.
- **Example Scenario:**
  Analyzing the correlation between marketing spend and sales growth.

6. Donut Chart

- **Overview:**
  A donut chart is similar to a pie chart but with a blank center, often used to display proportions of a whole.
- **Usage:**
  - Useful for emphasizing part-to-whole relationships.
  - The center space can sometimes be used to display a key metric, such as a total value.
- **Example Scenario:**
  Showing the percentage breakdown of expenses across different departments.

7. Card Visualization

- **Overview:**
  A card displays a single, important number—often a KPI or summary metric—prominently on your report.
- **Usage:**
  - Ideal for highlighting critical metrics such as total sales, average revenue, or count of orders.
  - Provides a quick, at-a-glance insight into key performance indicators.
- **Example Scenario:**
  Displaying the current month's total revenue or the total number of active users.

8. Table (Excel-like)

- **Overview:**
  A table visual presents data in a grid format, similar to an Excel spreadsheet, displaying rows and columns of detailed information.
- **Usage:**
  - Best for detailed, granular data where users may want to sort, filter, or drill into individual data points.

    - Ideal when you need to display multiple measures and dimensions in a structured format.
- **Example Scenario:**
  Presenting a detailed list of transactions with columns for date, customer, amount, and product category.