Power BI for the Business Analyst

Online

Power BI Training Developed and Delivered by Matt Allington

Microsoft MVP (Power BI), Author of the books Supercharge Power BI and Supercharge Excel

Matt has been teaching **Power BI for the Business Analyst** as a live, face-to-face training course in Australia for 7 years. Over this time, Power BI has constantly changed and evolved into the great product it is today. Matt's training course has also evolved to cover the most important topics to help you get started.

Now Matt is offering this same training content via Skillwave.Training and as a participant you obtained this Student Guide. The student guide will help you as a ready reckoner of the content you have learnt in the course

You can search for what you are looking for in this this guide and get to know the lesson where you have learnt / you can learn it. Go to the online lesson video and view it for the explanation and illustration.

This Student Guide is for your reference only and please do not distribute.

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Power BI for the Business Analyst

Introduction

This student guide serves you as a ready reckoner of the topics you learn during this training course **Power BI for the Business Analyst**. It is not a substitute for the training but helps you identify the lesson where you have learnt a specific topic/feature/concept. View the video in the online lesson to learn /re-cap the specifics. The sections in this guide follow the same structure as the lessons in the training course. List of the DAX formulas that you have learnt in this course is given at the end of this guide.

Session 1 - Topic 1 Introduction to Power BI for the Business Analyst

With this topic, you begin your training course

- Getting an overall view of this training course and how to proceed with your study.
- Downloading the training files and slide deck.
- Installing Power BI Desktop on your system.
- Learning about the Power BI Eco System.
- Learning about the Sample Database that is used in the training and using which you practice your exercises.

Training Course Overview

- An overall view of this training course and how to proceed with your study.

Introduction to Power BI

Follow along the course, doing the exercises.

You have learnt
- Why Power BI is important.
- Power BI Eco System.
- Four Stages of Self-Service BI.
- Steps in Training Course.

Introduction to Adventure Works Sample Database

You have learnt
- About Adventure Works database (sample database).
- How it is organised and what data it contains.

Summary – Introduction

- We have kicked off the online training course and you got familiarised with the structure of the course and your learning curve.
- You have learnt what Power BI is as a self-service BI tool.
- You got accustomed to the sample database Adventure Works that will be used in the demos and practice exercises.
- Time to move on to start the study.

Session 1 - Topic 2 Power BI Desktop – Building Your First Report

In this topic, you have learnt how to build your first report starting with a data model that is already prepared and loaded for you. You have learnt how to build a data model by yourself in the sessions 3&4.

You have learnt about different ways of adding a visual to the report, different ways of adding field to a visual, formatting features, filtering and so on.

The first report that you built looks as shown below.
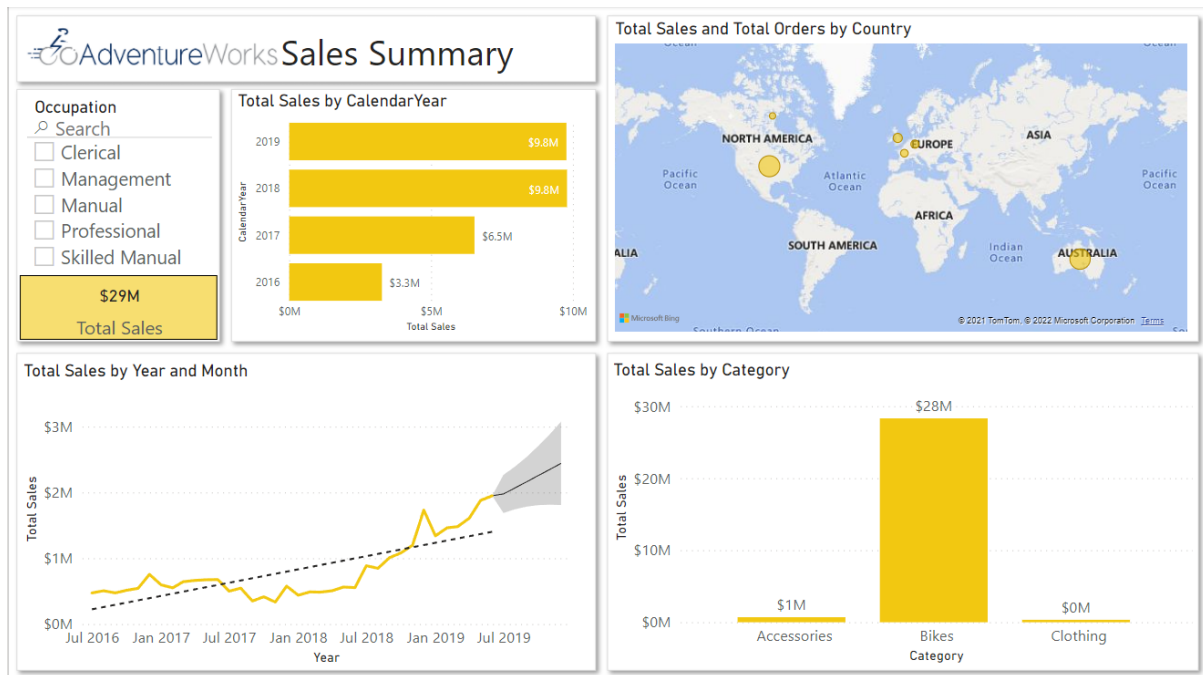
Introduction to Building Reports
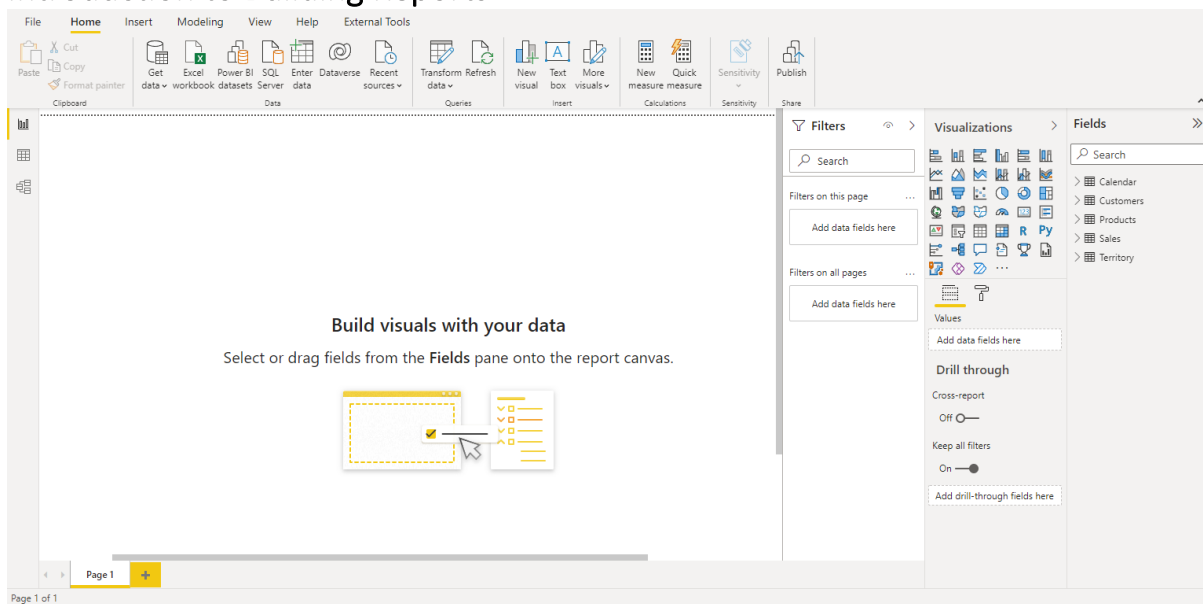
- Sample data files – download and unzip them.
- Open the starting file that is already loaded with the sample data.

You have learnt
- about Power BI Desktop UI.
- about the 3 different views – Report View, Data View, Model View.

Adding Logo and Title to Report
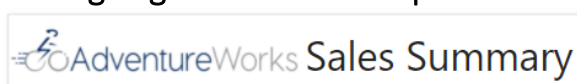
You have learnt how to
- add a logo to the report.
- add a background image to the report page.
- add a Title to the Report.
- make logo and title optically aligned.
- save the file with a new name.
- make the colour of the logo and colour of the title same.

Adding a Visual to the Report
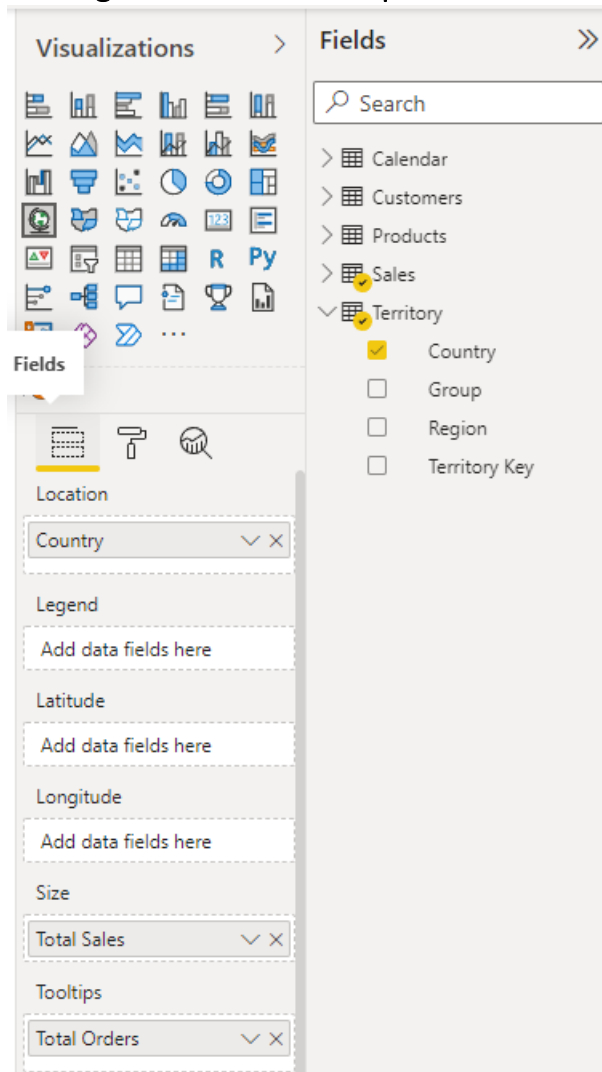
You have learnt different ways of adding visuals to the report in the lessons of this topic.
- Firstly, you added a visual to the report by putting a check mark for a column.
- learnt to move and resize the visual.
- observed the columns in a table in the right panel.
- learnt about the different icons displayed.
- added another column or measure to the visual.
- understood the Fields well.

Measures have many benefits that You have learnt in Sessions 3 and 4.

Visual Fields Options and Tooltips

You have learnt how
- Fields section depends on the visual that is selected.
- Tooltip is displayed when you hover the mouse on a data point.
- Tooltip displays the values of the fields that the data point represents.
- you can add more values to the Tooltips with columns/measures from the tables.

Adding a Visual using Q&A Feature
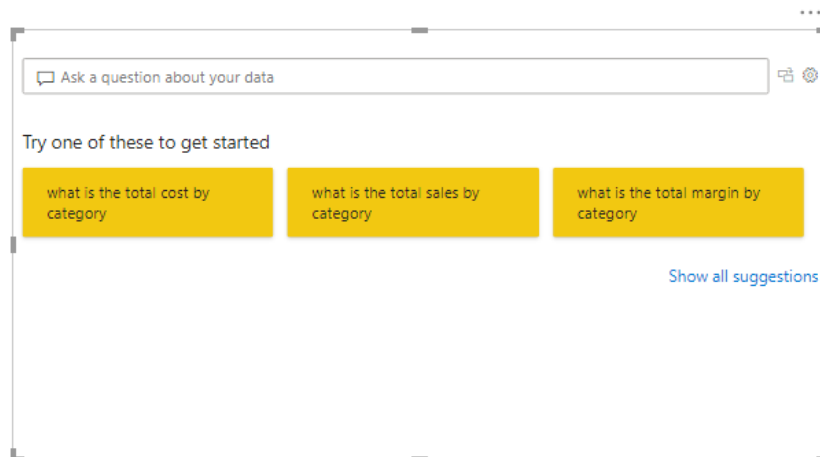
This is the second technique to add a visual to the report.

You have learnt
- how to add a visual with the Q&A visual and typing what you want to display.
- how you can convert the Q&A visual to the actual type of the visual that it is displaying.

  Note that it cannot be undone. That is, once you convert a Q&A visual to any other normal visual, you can no longer edit the Q&A.

Data Hierarchies
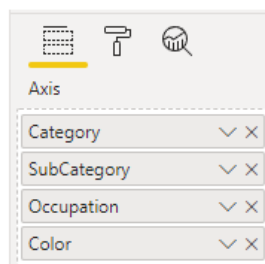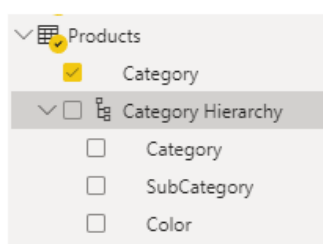
You have learnt
- that you can filter columns in Data view to explore the data and this will not have any impact on the visuals in the report.
- how to use adhoc hierarchy.
- how to create a permanent hierarchy.
- how to add a hierarchy to a visual.
- how to drill down and drill up to move through the hierarchy.

Visual Headers

You have learnt that
- Visual headers appear on the top right corner of any visual.
- Visual headers contain
    - Focus Mode.
    - Filters applied on the visual.
    - Drill up/down buttons.
    - Visual options menu.

Formatting Features
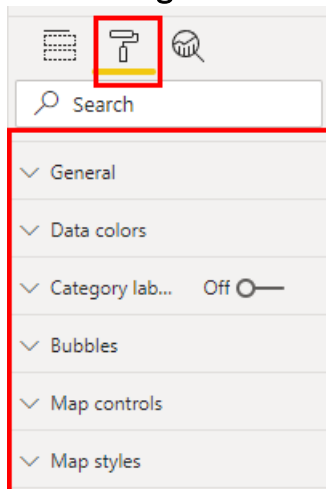
You have learnt that
- every visual has its own formatting features.
- they are displayed under Format pane.
- You can use formatting to enhance the visual appearance in the report.

Repurposing an Existing Visual
This is the third technique to add a visual to the report.

You have learnt
- How to duplicate an existing visual and change it to another visual.

Cross Filtering

You have learnt how to
- Cross-filter across all the visuals in the report by selecting a data point in a visual.
- Multiselect data points from the same or different visuals (keeping the Ctrl key pressed).

Slicers and Filters
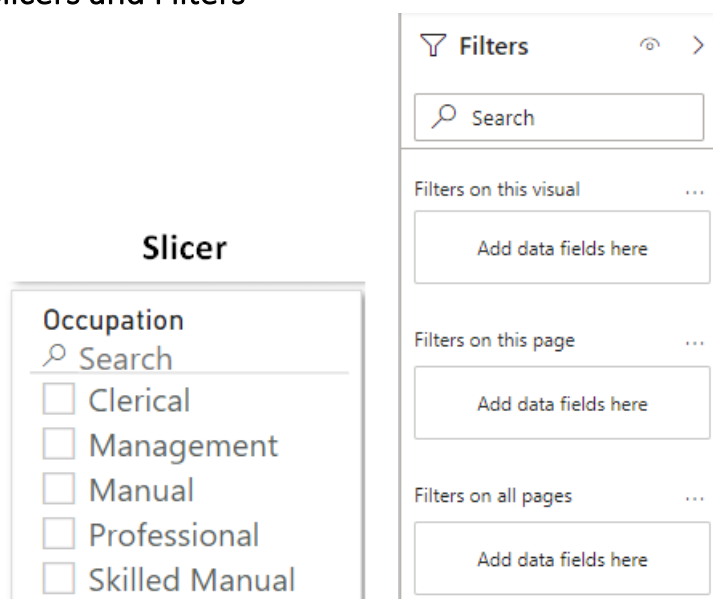
You have learnt how
- Slicers and Filters are used to slice and dice the data for visualisation.
- Slicers and Filters serve the same purpose.
- Slicer is a visual that appears as part of the report.
- Filter options appear in the Filters pane on the right side.

Adding a Visual to Display a Single Value

This is the fourth technique to add a visual to the report.

You have learnt how to use a Card visual to display a single value.

More Formatting Features

You have learnt some more formatting features to make the visual reflect the value prominently.

Adding a Visual from Visualizations Pane
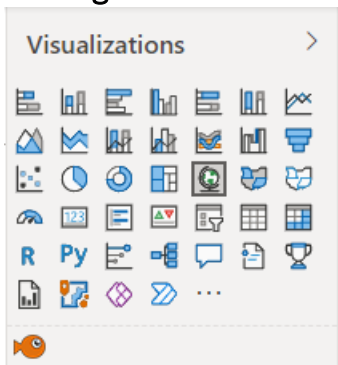
This is the fifth technique to add a visual to the report.

You have learnt how to choose a visual icon from the Visualizations pane.

Analytics Features in Power BI
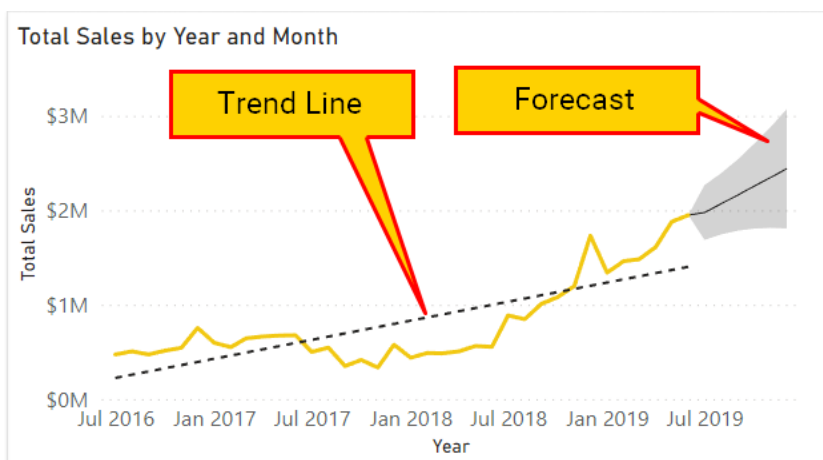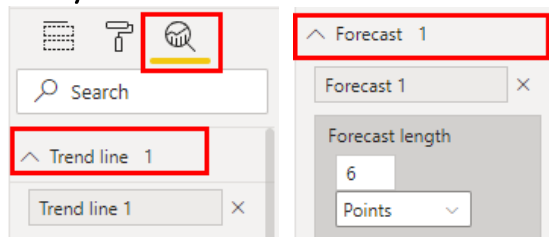
You have learnt how to

- use the "Analytics" button to apply different analytics to the line chart.
- use Trend line and see the results.
- use Forecast and see the results.

AI Capability of Power BI
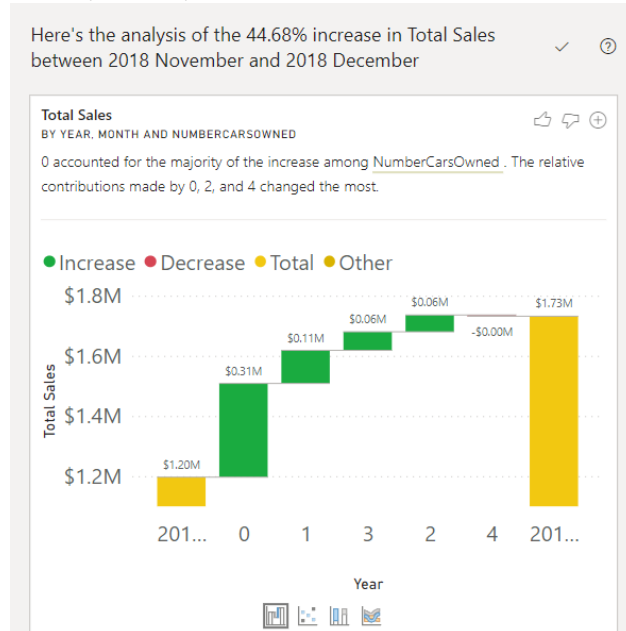
You have learnt that

- Power BI has AI Capabilities.
- you can ask and find out why there is a sudden increase in a value such as Total Sales.

Bookmarks and Buttons
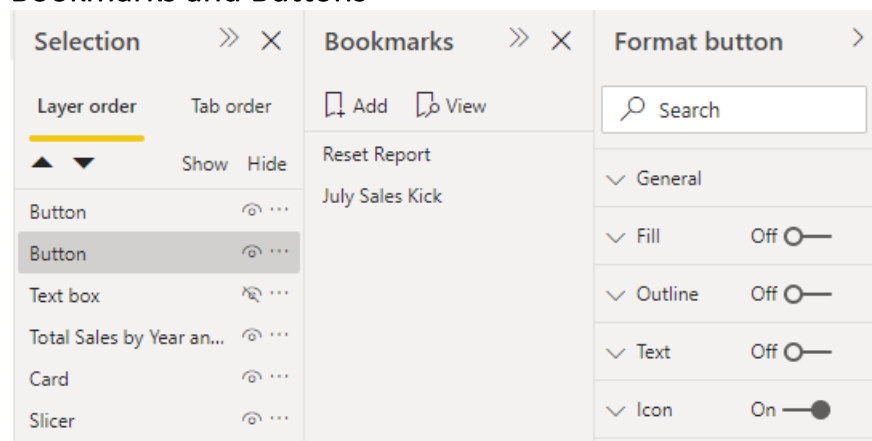
You have learnt how to

- use Selection Pane to select the visuals to be displayed in the report.
- use buttons to assign actions.
- use Bookmarks Pane to add and use bookmarks to navigate through the reports.

Summary
In this topic you have

- opened a Power BI Desktop file.
- covered a cross section of different visuals.
- learnt
  - Data hierarchies.
  - Slicers and Filters.
  - Repurposing Visuals.
  - Cross filter interactions.
  - Date hierarchies.
  - Analytics Features.
  - AI Capabilities.
  - Bookmarks.
  - Buttons.

Session 1 - Topic 3 Power BI Desktop – Different Types of Reports

Creating a New Report in the Same Workbook

AdventureWorks Top 20 Customers

You have learnt how to
- create a new Page.
- re-purpose the Report title.

Visual to Display Top 20 Customers

You have learnt how to
- filter Products table to visualise the customers who made the top 20 total sales.
- use options in Format Pane to make the visual look better.

Conditional Formatting

CustomerKey	Name	Total Sales	OrderQuantity
12650	Aaron Wright	$10,814	9
12300	Adriana Gonzalez	$13,243	10
12307	Brad She	$13,173	11
12124	Brandi Gill	$13,196	12
12296	Francisco Sara	$13,165	12
11439	Janet Munoz	$12,489	14
11420	Jordan Turner	$11,201	17
12132	Kaitlyn Henderson	$13,294	14
13263	Kate Anand	$10,872	12
11417	Lacey Zheng	$11,248	17
11242	Larry Munoz	$11,068	12
12655	Larry Vazquez	$10,900	11
12323	Lawrence Alonso	$10,837	11
11241	Lisa Cai	$11,469	25
12308	Margaret He	$13,269	14
11433	Maurice Shan	$12,910	12
12301	Nichole Nara	$13,295	13
12131	Randall Dominguez	$13,266	11
12321	Rosa Hu	$13,216	15
12333	Terrance Rodriguez	$10,829	11
Total		**$243,753**	**263**

You have learnt
- Conditional Formatting from Fields Well.

- Conditional Formatting from Format Pane.
- how Conditional Formatting brings out data insights.

Drill through Report

You have learnt how to

- filter on the Report Page.
- use Drill through field.
- make Drill through work.

Bookmarks and Buttons Revisited

CustomerKey	Name
11241	Lisa Cai

SalesOrder Number	Product Key	ProductName	Category	SubCategory	OrderDate	Total Orders	Total Sales
SO49675	360	Mountain-200 Black, 42	Bikes	Mountain Bikes	Wednesday, 14 March 2018	1	$2,049
SO51192	214	Sport-100 Helmet, Red	Accessories	Helmets	Monday, 2 July 2018	1	$35
SO51192	363	Mountain-200 Black, 46	Bikes	Mountain Bikes	Monday, 2 July 2018	1	$2,295
SO55623	214	Sport-100 Helmet, Red	Accessories	Helmets	Saturday, 6 October 2018	1	$35
SO55623	467	Half-Finger Gloves, L	Clothing	Gloves	Saturday, 6 October 2018	1	$24
SO55623	490	Short-Sleeve Classic Jersey, L	Clothing	Jerseys	Saturday, 6 October 2018	1	$54
SO55623	528	Mountain Tire Tube	Accessories	Tires and Tubes	Saturday, 6 October 2018	1	$5
SO55623	535	LL Mountain Tire	Accessories	Tires and Tubes	Saturday, 6 October 2018	1	$25
SO55623	591	Mountain-500 Silver, 40	Bikes	Mountain Bikes	Saturday, 6 October 2018	1	$565
SO57891	214	Sport-100 Helmet, Red	Accessories	Helmets	Tuesday, 13 November 2018	1	$35
SO57891	530	Touring Tire Tube	Accessories	Tires and Tubes	Tuesday, 13 November 2018	1	$5
SO57891	541	Touring Tire	Accessories	Tires and Tubes	Tuesday, 13 November 2018	1	$29
SO57891	568	Touring-3000 Yellow, 44	Bikes	Touring Bikes	Tuesday, 13 November 2018	1	$742
SO61171	477	Water Bottle - 30 oz.	Accessories	Bottles and Cages	Monday, 31 December 2018	1	$5
SO61171	479	Road Bottle Cage	Accessories	Bottles and Cages	Monday, 31 December 2018	1	$9
SO61171	605	Road-750 Black, 48	Bikes	Road Bikes	Monday, 31 December 2018	1	$540
Total						**25**	**$11,469**

You have learnt

- how to use back button on the target report page.
- hide the target report page and navigate only through the drill through feature.
- How you can have more than one drill through page and have interactive reports.
- how to notify that it is an interactive report.
- how Bookmarks and Buttons give good end user experience – but it requires thorough testing to ensure the correctness of the working of the same.

Tool Tip Report (Custom Tool Tips)
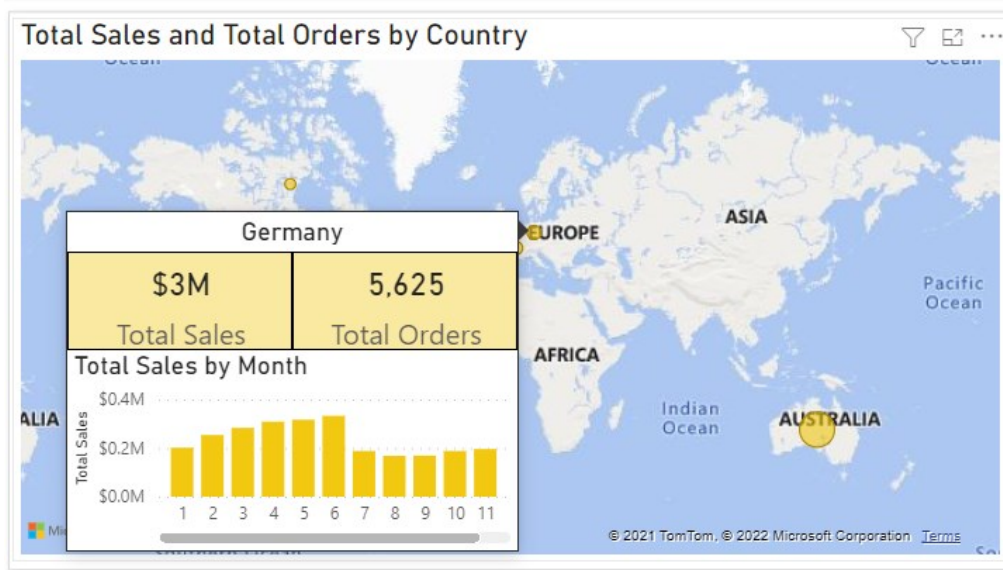
You have learnt how to
- create a Tool Tip Report.
- use it in place of default tooltip in the visuals.

Mobile Layout
You have learnt how to
- author the Power BI report for mobile view in portrait mode.
- toggle between report page and mobile view.

Summary – Different Types of Reports
We have covered a good number of Power BI features that enable you to create interactive user-friendly reports.

- TopN to create a Top 20 Customers report.
- Drill through to create a Drill through report.
- Bookmarks and Buttons to traverse between these two reports.
- Using a Text box to write instructions on how to use the report.
- Conditional Formatting to highlight the variations present in the data.
- Tooltip Page format to create a custom tool tip report.
- Mobile Layout to customise your reports to view in portrait mode in mobile devices.

Session 2 – Topic 1 PowerBI.com
An Introduction to Sharing Power BI Reports
- You have learnt about several visualisation capabilities of the tool.
- The capabilities are being improved and added over time and with what you have learnt and by a little trial and error you will be able to pick up on those.
- The next step is sharing the reports that you created.
- Before sharing you need to make sure that your report is ready to share.
- The report should be given a suitable and relevant name for the users.

An Introduction to Power BI.com
You have learnt

- how to create an account in Power BI.com.
- how to login into Power BI.com.
- how to turn on New Look.
- about the Menu in the left panel.
- about My Workspace.
- about Group Workspaces.

Workspaces in Power BI.com

You have learnt

- what Workspaces are.
- what My Workspace is.
- how to use My Workspace.
- what Group Workspace is.
- how to use Group Workspaces.
- how to share a report with end users.

Publishing Reports to My Workspace

You have learnt the following.

- Publishing a report from Power BI Desktop to My Workspace.
- Complete Report and database get published.
- In Power BI.com Report appears in Reports and database in Datasets.

My Workspace for Personal Use and Personal Sharing

You have learnt

- about Report in My Workspace.
- that Reports work exactly as they do in Power BI Desktop.
- about Sharing Report from My Workspace.
- that PRO version is required for both you and the person with whom you are sharing.

Creating a Group Workspace

We have reviewed what you learnt about Workspaces.
You have learnt

- how to create a new Group Workspace.
- that you require permission from your organisation to create a Group Workspace.
- that Group Workspace must be unique in the organisation.
- various settings that you need to set while creating Group Workspace.
- that Dataflows section appears in Group Workspace but not in My Workspace.
- how to Switch between My Workspace and Group Workspace.

Publishing Reports to Group Workspace

- You have learnt how to publish your report from Power BI Desktop to Group Workspace.
- The Report and Database appear under both My Workspace and Group Workspace.

Creating Reports in Power BI.com

You have learnt how to

- create a new Report in Power BI.com using the Dataset.
- save the new Report.

Editing Reports in Power BI.com

You have learnt how to

- edit the Published Report and save it.
- refresh the Report in Power BI Desktop and again publish it.
- refresh the report in Power BI.com.

You have understood the difference between created report and published report.

Importing PBIX Files into Power BI.com

You have learnt
- how to Import PBIX files directly into Power BI.com.
- about the different ways to import the file.
- How Reports and databases get added to the Workspace.

Providing Access to Group Workspace

You have learnt the following.
- Workspaces are for development purpose and not for distribution.
- Group Workspaces are shared for collaboration in the organisation.

Summary – PowerBI.com

This topic opened up Power BI.com wherein you can share your reports.
You have learnt about the Workspaces in Power BI.com.
You have learnt how to
- create an account and login into Power BI.com.
- prepare a report to publish to Power BI.com.
- publish a report to My Workspace in Power BI.com.
- use My Workspace for yourself and your personal sharing.
- create a Group Workspace.
- publish a report to Group Workspace.
- create reports in Power BI.com.
- edit reports in Power BI.com.
- import PBIX files directly into Power BI.com.
- provide access to Group Workspace for collaboration in your organisation.

Session 2 – Topic 2 Dashboards in PowerBI.com

Introduction to Dashboards in Power BI.com

You have learnt
- What Dashboards are.
- How Dashboards are different from Reports.

Creating Dashboards

You have learnt
- how to create a Dashboard.
- how to Pin Visuals to Dashboard from Reports.
- that a Visual on a Dashboard is referred to as a Tile on a Dashboard.
- how Dashboard summarises information for various Reports.
- about Q&A in a Dashboard in Power BI.com.
- about various ways of adding Tiles to Dashboard.

Summary – Dashboards in PowerBI.com

You have learnt

- what dashboards are in Power BI.com.
- how you can create a dashboard from one or more reports.
- about the Q&A feature in Power BI.com that can be used to create a visual and add it to dashboard.

Session 2 – Topic 3 Power BI.com Salient Features

Importing Excel Files into Power BI.com
You have learnt how you can
- import Excel files into Power BI.com.
- edit the Excel workbooks in Power BI.com using Excel Online.
- Include a snapshot from the workbook in a dashboard.

Quick Insights
You have learnt
- how to generate data insights from your dataset in Power BI.com.
- how you can pick up the insights that look suitable for your report/dashboard

Analyze in Excel
You have
- learnt how to use the Analyze in Excel feature in Power BI.com.
- understood how an Excel workbook gets connected to the data set in Power BI.com
- learnt how to create a Pivot Table from the dataset.
- understood how you can save a thin workbook that do not take much space.

Adding Comments to Reports
You have learnt how to
- add comments to a report in Power BI.com
- track the comments

Subscribing to Emails
You have learnt how subscribe to emails for your reports in Power BI.com so that you will get alerts in your mailbox when changes are made in the reports.

Bookmarks in Power BI.com
You have learnt
- how to add bookmarks in the reports in Power BI.com.
- how a bookmark facilitates you to get the view you are interested in to appear when you open the report

Power BI.com - Other Important Features
You have learnt the following features in Power BI.com.
- Downloading the PBIX File from Power BI.com.
- Exporting Data to PowerPoint and PDF.
- Embedding Report.
- Generating a QR Code.
- Lineage View.
- Related Content.
- Reset to Default.

Summary – Power BI.com Salient Features

You have learnt a good number of important Power BI features such as

- Quick Insights.
- Analyze in Excel.
- Adding Comments to Reports.
- Subscribing to Emails.
- Bookmarks in Power BI.com.
- Downloading the PBIX File from Power BI.com.
- Exporting Data to PowerPoint and PDF.
- Embedding Report.
- Generating a QR Code.
- Lineage View.
- Related Content.
- Reset to Default.

Session 2 – Topic 4 Sharing Production Reports to End Users

Creating and Sharing Power BI Workspace App

You have learnt how to

- share a production quality report with end users.
- create a Workspace App from a Group Workspace.
- add/delete elements to the app based on how you want to share and to whom you are sharing.

You understood how Power BI Workspace App can be accessed by the end user and how it appears to the end user.

Mobile App

You have learnt how to create a Mobile layout for your report in Session 1 – Topic 3.
In this lesson you have learnt how that Mobile Layout appears in a Mobile App.

Summary – Sharing Production Reports to End Users

You have learnt

- how to create a Power BI Workspace App to share with your end users.
- about the Mobile app to view the reports that you have created in Mobile Layout in Session 1- Topic 3.

Session 2 – Topic 5 Power Query

Introduction to Power Query

You have learnt the following.

- Power Query is the tool for Data Acquisition.
- Built into Power BI Desktop and Excel.
- Also referred to as Get Data, Get and Transform Data and Transform Data.
- 2 scenarios – Cleansing Data and File Consolidation.
- The sample data for illustrating these scenarios.

You have learnt

- about Power BI Desktop Menu for Power Query.
- how to use the Get Data menu.
- how to use the Navigator options.
- how to open Power Query Editor.

Cleansing Data Using Power Query

You have learnt
- about the UI in Power Query Editor.
- various features of Power Query that can be used to cleanse the data.
- how to go step by step to cleanse the data.
- how to incrementally transform the data to make it suitable for reporting.
- how 'M' language is used in transforming the data.
- how data types are set.
- about column profiling.
- how to read the error messages and correct.
- how Power Query is a repeatable process that cleans the data when the data changes without human intervention.
- how to change the shape of the data using Unpivot Columns feature to make it suitable for reporting.
- how to change the name of the query.
- about the Transform and Add Column ribbons.
- how to load the transformed data into Power BI data model.

Visualising the Cleansed Data

You have learnt
- how to check the cleansed data by visualising it.
- how particular data may be misinterpreted by Power BI and not display it correctly.

Reshaping the Data for Accurate Visualisation

You have learnt
- how to re-edit a query.
- how to add a new column for Country
- how to add a column for City, Country
- how to use custom column to add a column
- how to use column from examples to add a column.
- how to load the reprocessed data into the data model.

Visualising the Reshaped Data

You have learnt about data hierarchies in Session 1 – Topic 2.

In this lesson you have learnt how to
- use the new column you added to create
  - an adhoc hierarchy, or
  - an in-built hierarchy
  for accurate visualisation.
- use the Country, City column for accurate visualisation.
- set the Data Category for a column.

File Consolidation Using Power Query

You have learnt
- how to consolidate the data that you periodically receive
- how to use Combine & Transform Data.
- about Query Dependencies view.
- how to edit sample query to get the required transformation of data.

- how to edit the combined query to remove any errors caused because of the sample query edit.
- How to merge columns.

Visualising the Consolidated Data

You have learnt
- how to Visualise the data that you have consolidated
- how easy to repeat the process when you receive data later.

Summary – Power Query

You have learnt
- how to get data into Power BI Desktop and edit it in Power Query to make it usable in the data model.
- how to use Power Query in 2 scenarios.
  Scenario 1: Cleansing Data
  Scenario 2: File Consolidation

Session 3 – Topic 1 Introduction to Data Modelling with Power BI

Review of the Four Stages of Self-Service BI

We have reviewed the Four Stages of Self-Service BI that you have learnt in the lesson Introduction to Power BI in Session 1 – Topic 1.

Introduction to Data Modelling

You have learnt the following.
- Purpose of Data Modelling.
- Raw data prepared to make it suitable to draw insights by end user.
- Steps in Data Modelling
  o Deciding what data is required to load
  o Deciding how to arrange this data in tables and columns.
  o Creating Relationships.
  o Creating measures with DAX formulas following business logic.

Thinking of Data in Tables

You have learnt the following.
- to start thinking about data in tables and not in scalars.
- the difference between a table and a scalar value.
- that you need to use the DAX language to derive the insights in Power BI.

Review of Adventure Works Sample Database

You have learnt about Adventure Works Sample Database in the lesson - Introduction to Adventure Works Sample Database in Session 1 – Topic 1.

- In this lesson you have learnt about how the data is structured in this sample database.
- You have learnt how all this works and how you can use it in the later lessons.

Summary - Intro to Data Modelling with Power BI

You have learnt
- what data modelling is.
- how to think of data in tables.

We had a review of the 4 stages of Self-Service BI, Modelling being the 3rd stage.
We have also revisited the sample database - Adventure Works.

Session 3 – Topic 2 Power BI Data Model

Introduction to Loading Data

You have learnt
- how to Load the Data from Excel.
- how to decide on the format of the data to be loaded.

Loading Data

You have learnt the following.
- Open a new Power BI Desktop file.
- Power Query menu in the Ribbon.
  - Various data sources that can be connected.
- Load the data from the sample Excel file.
- Power Query loads the data into Power BI Desktop.
- Look at the User Interface and look at the data view.
- Understand how data is stored in the tables.

Two Types of Power BI Tables

You have learnt
- about Lookup tables and Data tables.
- what they contain and how they are represented in the data model.
- examples of Lookup tables and Data tables.

Relationships in Power BI

You have learnt
- about the Model view.
- about Collie Layout Methodology.
- how to create relationships in the Power BI data model.
- how the relationships are displayed.
- how the relationships work.
- how to remove/change a relationship.
- How a relationship is a replacement of writing a VLOOKUP.

Data Compression

You have understood
- how actually an Excel file is stored and the size of the Excel file.
- how a Power BI file with a data model is 3 times smaller than the source Excel file.
- that you can expect data compression to the order of magnitude 5 to 10 times in a Power BI file.

Default Aggregations, Custom Themes, Summary

You have learnt
- about the automatic aggregation of values in a column.
- how you can change the type of aggregation.
- how to change the report theme.

We have reviewed about the table types and Star Schema.

You have learnt that Star Schema is the Optimal shape for the data in Power BI data model.

Planning Your Data Model

You have learnt that

- you may not get the data in a structured format.
- how to plan your data model identifying the transaction table for data table.
- how to ask yourself Who, What, When, Where to arrive at the Lookup tables.

Best Practices and Tips

- Aim for single noun names for your tables.
- Remove prefixes (e.g., dim, fct) from your table names.
- Only bring in the columns of data you need.
- Place your lookup tables at the top, and the data tables underneath.
- Resize default fonts https://exceleratorbi.com.au/changing-defaults-in-power-bi.

Summary - Power BI Data Model

You have learnt about the data model in Power BI and how to load data into the data model.
You have learnt about

- the two types of tables - lookup tables and data tables.
- the relationships between the lookup tables and data tables.
- data compression in the data model.
- default aggregations of values.
- custom themes.
- how to plan your data model.
- best practices and tips.

Session 3 – Topic 3 Writing DAX Formulas

Measures and Calculated Columns

You have learnt the following.

- Introduction to DAX (**D**ata **A**nalysis E**x**pressions).
- DAX is a functional language and is used to create measures and calculated columns in the data model.
- Creating Calculated Columns.
- Why Calculated Columns are not to be Used.
- Exceptions When Calculated Columns can be created.
- Measures - Implicit Measures and Explicit Measures.
- Creating Measures.
- Using the Intellisense.
- Formatting the Measures.
- Checking the values if they are as expected.
- Reusability of Measures.
- Sorting a column based on another column.
- Creating Calculated Columns.
- Using AND and OR operators.
- Grouping of the values using UI.
- Using 'in' Operator.
- Comparison - Calculated Columns and Measures.
- Lookup Tables can have more columns but not Data Tables.

You have learnt to write the following DAX formulas to create Measures and check the values by placing them in a visual.

Total Sales =   SUM(Sales[ExtendedAmount])

Total Tax = SUM(Sales[TaxAmt])

Total Sales inc GST = [Total Sales] + [Total Tax]

Category	Total Sales	Total Tax	Total Sales inc GST
Accessories	$700,760	$56,061	$756,821
Bikes	$28,318,145	$2,265,452	$30,583,596
Clothing	$339,773	$27,182	$366,954
Total	**$29,358,677**	**$2,348,694**	**$31,707,371**

You have learnt when a Measure cannot be used and hence requires a Calculated Column.

You have learnt to write the following DAX formulas to create Calculated Columns and check the values by placing them in a visual.

Day Type =

    IF(

        'Calendar'[DayNumberOfWeek] = 1 || 'Calendar'[DayNumberOfWeek] = 7,

        "Weekend", "Weekday"

)
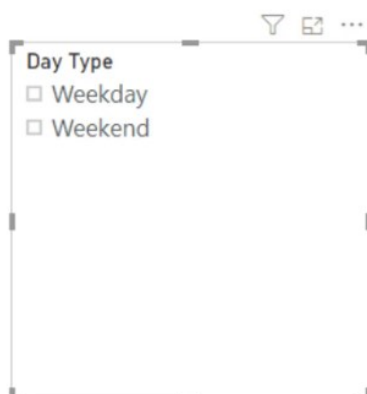
Day Type		DayName	Total Sales		Day Type	Total Sales
☐ Weekday		Sunday	$4,231,642		⊟ **Weekday**	**$20,784,362**
☐ Weekend		Monday	$4,154,920		Monday	$4,154,920
		Tuesday	$4,153,093		Tuesday	$4,153,093
		Wednesday	$4,127,215		Wednesday	$4,127,215
		Thursday	$4,113,749		Thursday	$4,113,749
		Friday	$4,235,386		Friday	$4,235,386
		Saturday	$4,342,674		⊟ **Weekend**	**$8,574,316**
		Total	**$29,358,677**		Sunday	$4,231,642
					Saturday	$4,342,674
					Total	**$29,358,677**

Day Type =

    IF(

        'Calendar'[DayNumberOfWeek] IN {1,7},

        "Weekend", "Weekday"

)

DAX Functions

You have learnt to write DAX formulas using

- DISTINTCOUNT() Function.
- COUNTROWS() Function.
- DIVIDE() Function.

You have learnt how to derive business insights from the data model by writing DAX formulas.

Total Invoices = DISTINCTCOUNT(Sales[SalesOrderNumber])

Total Line Items = COUNTROWS(Sales)

Avg Line Items per Invoice =
        DIVIDE(

                [Total Line Items], [Total Invoices]

)

Avg Invoice Value = DIVIDE([Total Sales], [Total Invoices])

Category	Total Sales	Total Invoices	Total Line Items	Avg Line Items per Invoice	Avg Invoice Value
Accessories	$700,760	18,208	36,092	2.0	$38.49
Bikes	$28,318,145	15,205	15,205	1.0	$1,862.42
Clothing	$339,773	7,461	9,101	1.2	$45.54
Total	**$29,358,677**	**27,659**	**60,398**	**2.2**	**$1,061.45**

Why to write DAX Formulas
You have learnt
- why it is required to create explicit measures to derive the values required.
- how measures can be reused across the data model.
- how measures can be used in Q&A feature.
- how to derive data insights using measures.

Practice Exercises
Create the following measures.

- **[Total Customers]** in our customer database

    Tip - Use the customer table

- **[Total Customers that Purchased]**

    Tip – use the Sales table, not the Customer table

Only use the functions we have learnt so far:

SUM, DISTINCTCOUNT COUNTROWS, DIVIDE

For those customers that have actually purchased - don't use AVERAGE()

- **[Avg Invoices per Customer that Purchased]**
- **[Avg Sales per Customer that Purchased]**

Answers to Practice Exercises
Total Customers = COUNTROWS(Customers)

Total Customers that Purchased = DISTINCTCOUNT(Sales[Customerkey])

Average Invoices per Customer that Purchased =

        DIVIDE(

                [Total Invoices], [Total Customers that Purchased]

)

Average Sales per Customer that Purchased =

    DIVIDE(

        [Total Sales], [Total Customers that Purchased]

)

Category	Total Sales	Total Customers	Total Customers that Purchased	Avg Invoices per Customer that Purchased	Avg Sales per Customer that Purchased
Accessories	$700,760	18,484	15,114	1.2	$46.36
Bikes	$28,318,145	18,484	9,132	1.7	$3,100.98
Clothing	$339,773	18,484	6,852	1.1	$49.59
Components		18,484			
Total	**$29,358,677**	**18,484**	**18,484**	**1.5**	**$1,588.33**

Accurate Visualisation of Data Insights

You have learnt
- why In the above visual Total Customers has the same value for all the rows.
- how to visualise such data.

Category	Total Sales
Accessories	$700,760
Bikes	$28,318,145
Clothing	$339,773
Total	**$29,358,677**
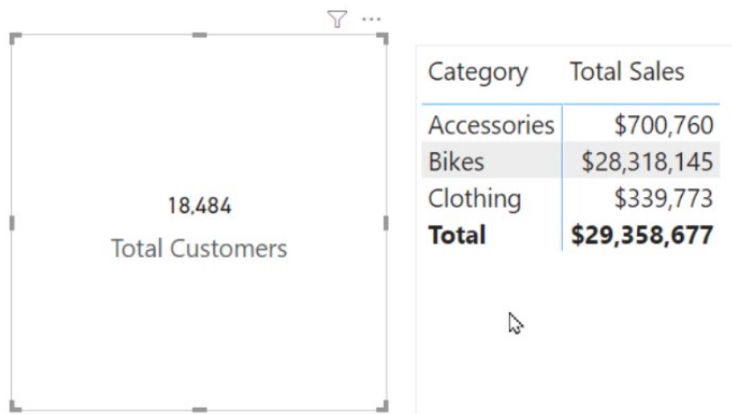
Filter Behaviour

You have learnt
- that **Filtering** is the **foundation** of **data modelling,** and you MUST understand clearly how it works.
- how Rows and Columns filter the data model.
- how filters come in from various places.
- the purpose of a relationship in a data model.
- how filtering happens in the data model.
- That filters flow downwards and not upwards.

Bidirectional Filtering

- You have learnt how to change a relationship to bidirectional filtering.
- You have understood why it should not be used.

Summary - Writing DAX Formulas

You have learnt

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- how to write DAX formulas for Measures and Calculated Columns.
- the difference between the two and why Measures are preferrable to Calculated Columns, though exceptions exist.
- why to write DAX formulas in Power BI.
- how to write the DAX formulas using the DAX functions - SUM, COUNT, DISTINCTCOUNT and DIVIDE.

Note: You should always have a visual to which you can add your new measures to check the values and thereby check the correctness of the DAX formula.

Session 4 – Topic 1 The CALCULATE Function Explained

The CALCULATE Function

You have learnt the following.
- CALCULATE is the most important function in DAX language.
- CALCULATE changes the natural filtering behaviour that comes from visuals.
- CALCULATE function syntax.

= CALCULATE(<measure expression>, <filter1>, <filter2>,…)

- Examples –

Total Bike Sales = CALCULATE([Total Sales], Product[Category] = "Bikes")

% Sales of Bikes = DIVIDE([Total Bike Sales], [Total Sales])

Country	Total Sales	% Sales of Bikes
Australia	$9,061,001	97.7%
Canada	$1,977,845	92.1%
France	$2,644,018	96.6%
Germany	$2,894,312	97.0%
United Kingdom	$3,391,712	96.8%
United States	$9,389,790	95.8%
Total	**$29,358,677**	**96.5%**

Debugging Your DAX Formulas - 6 Step Process
- You have learnt the techniques to debug DAX formulas when you face a problem.
- The 6 step process is available as a download file.

Walkthrough of Live Examples

You have learnt the following.
- Live examples for debugging formulas viewing a demo.
- Every value in a visual has its own unique filters.

Filter Behaviour Revisited

You have learnt the following.
- How to think like a Power BI engine.
- Filtering behaviour illustrated.
- How CALCULATE works illustrated.

KEEPFILTERS Function

You have learnt the following.
- How KEEPFILTERS retains the filter behaviour.
- Example –

= CALCULATE(

    [Total Sales],

    KEEPFILTERS(Products[Category] = "Bikes")

)

Category	Total Sales	Total Bike Sales
Accessories	$700,760	
Bikes	$28,318,145	$28,318,145
Clothing	$339,773	
Total	**$29,358,677**	**$28,318,145**

- Summary of the key points.

Summary - CALCULATE Function

- You have learnt how to
  - o use CALCULATE function for changing the context of the evaluation of the resulting value.
  - o debug complex DAX formulas
- You have viewed the live examples to understand debugging of DAX formulas.
- You have learnt in depth about Filter Behaviour.
- You have also learnt about KEEPFILTERS DAX function.

Session 4 – Topic 2 Leveraging the CALCULATE Function

Percentage of Totals Problem

- You have learnt about the Percentage of Totals problem and how you can solve it without writing DAX.
- You have understood the issue with this approach.

Color	Total Sales	%CT Total Sales
Black	$8,838,412	30.10%
Red	$7,724,331	26.31%
Silver	$5,113,389	17.42%
Yellow	$4,856,756	16.54%
Blue	$2,279,096	7.76%
NA	$435,117	1.48%
Multi	$106,471	0.36%
White	$5,106	0.02%
Total	**$29,358,677**	**100.00%**

The ALL Function

You have learnt the following.

- how to solve the Percentage of Totals problem so that the result can be used in other calculations.
- ALL function increases the capability of CALCULATE function.
- ALL function removes all filters.

Total All Product Sales = CALCULATE([Total Sales], ALL(Products))

- Rows for which there is no data are hidden by default. It can be turned on.

% of All Product Sales = DIVIDE([Total Sales], [Total All Product Sales])

Color	Total Sales	Total All Product Sales	% of ALL Product Sales
Black	$8,838,412	$29,358,677	30.1%
Red	$7,724,331	$29,358,677	26.3%
Silver	$5,113,389	$29,358,677	17.4%
Yellow	$4,856,756	$29,358,677	16.5%
Blue	$2,279,096	$29,358,677	7.8%
NA	$435,117	$29,358,677	1.5%
Multi	$106,471	$29,358,677	0.4%
White	$5,106	$29,358,677	0.0%
Grey		$29,358,677	
Silver/Black		$29,358,677	
Total	**$29,358,677**	**$29,358,677**	**100.0%**

Alternatives in Using ALL Function

You have learnt the following.

- REMOVEFILTERS function is an alternative way to use ALL function.

Total All Product Sales = CALCULATE([Total Sales], REMOVEFILTERS(Products))

- When a column from a different table is used for Rows, the behaviour will be different as ALL does not find any filter to remove.

Occupation	Total Sales	Total All Product Sales
Professional	$9,907,977	$9,907,977
Skilled Manual	$6,440,081	$6,440,081
Management	$5,467,862	$5,467,862
Clerical	$4,684,787	$4,684,787
Manual	$2,857,971	$2,857,971
Total	**$29,358,677**	**$29,358,677**

- When you add a slicer from the same table, it once again removes filter with slicer selection.

Category
- ☐ Accessories
- ☐ Bikes
- ■ Clothing
- ☐ Components

Occupation	Total Sales	Total All Product Sales
Professional	$106,502	$9,907,977
Skilled Manual	$89,127	$6,440,081
Management	$58,987	$5,467,862
Clerical	$50,567	$4,684,787
Manual	$34,590	$2,857,971
Total	**$339,773**	**$29,358,677**

- ALL function parameter can be a table or a column.

Total All Product Sales = CALCULATE([Total Sales], ALL(Products[Color]))

Category	Total Sales	Total All Product Sales
Bikes	$28,318,145	$28,318,145
Accessories	$700,760	$700,760
Clothing	$339,773	$339,773
Total	**$29,358,677**	**$29,358,677**

Total All Product Sales = CALCULATE(

    [Total Sales],

    ALL(Products[Color], Products[Category], Products[SubCategory])

)

Category	Total Sales	Total All Product Sales
Bikes	$28,318,145	$29,358,677
Accessories	$700,760	$29,358,677
Clothing	$339,773	$29,358,677
Components		$29,358,677
Total	**$29,358,677**	**$29,358,677**

- CALCULATE can have any number of filters.

Total All Product Sales = CALCULATE(

       [Total Sales],

       ALL(Products[Color], Products[Category], Products[SubCategory]),

       ALL(Customers),

       ALL(Territory)

)

- You can remove all the filters from all the tables.

Total All Product Sales = CALCULATE([Total Sales], ALL())

Year	Total Sales	Total All Product Sales
2003	$9,791,060	$29,358,677
2004	$9,770,900	$29,358,677
2002	$6,530,344	$29,358,677
2001	$3,266,374	$29,358,677
Total	**$29,358,677**	**$29,358,677**

Enhancing the Readability of the Data Model

You have learnt the following.

- The description in the measure should be same as the logic in the DAX formula.
- You can add text descriptions to measures to enhance the readability.
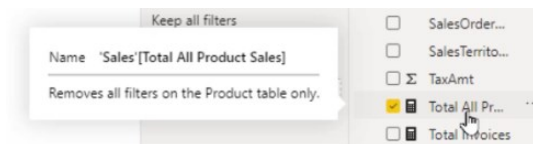
- Hide the interim measures that are created to be used in other measures.

Practice Exercises

- Create measures for
  - Total All Customer Sales
  - % of All Customer Sales

Occupation	Total Sales ▼	Total All Customer Sales	% of All Customer Sales
Professional	$9,907,977	$29,358,677	33.7%
Skilled Manual	$6,440,081	$29,358,677	21.9%
Management	$5,467,862	$29,358,677	18.6%
Clerical	$4,684,787	$29,358,677	16.0%
Manual	$2,857,971	$29,358,677	9.7%
Total	**$29,358,677**	**$29,358,677**	**100.0%**

o % of All Region Sales

Answers to Practice Exercises

Total Sales to All Customers = CALCULATE([Total Sales], All(Customers))

% of All Customer Sales = DIVIDE ([Total Sales], [Total Sales to All Customers])

Total Sales to All Regions = CALCULATE([Total Sales], All(Territory[Region]))

% of All Region Sales = DIVIDE ([Total Sales], [Total Sales to All Regions])

Summary - Leveraging the CALCULATE Function

You have learnt
- how to use CALCULATE function in various scenarios.
- how to use ALL function as a parameter of CALCULATE function.
- variants of the usage of ALL in CALCULATE function
- how to provide descriptions to measures for enhancing the readability of the data model.

You had hands-on experience solving the practice exercises.

Session 4 – Topic 3 Time Intelligence

Introduction to Time Intelligence

You have learnt the following.
- Time Intelligence is used in Business Intelligence to make calculations based on date.
- E.g.
    o Running Totals
    o Change vs Prior Month/Year
- Power BI has capabilities and functions to enable Time Intelligence.

Three Types of Time Intelligence

You have learnt about the 3 types of Time Intelligence in Power BI and how they work.
- Auto Time Intelligence.
- In-built Time Intelligence.
- Custom Time Intelligence.

Rules of a Date Table

You have learnt the following.
- Date table (also called Calendar table).
- Rules for Date table to use In-built Time Intelligence.

Removing Aggregations on Calendar Columns

You have learnt the following.

- the Calendar columns have default aggregations.
- how you can remove those default aggregations.

Sorting Calendar Values

You have learnt the following.
- always place a visual on the report and add the created measure to check the correctness of the values.
- this is required for all the measures in general, and time intelligence in particular.
- How to sort Calendar column values.

Auto Time Intelligence

You have learnt
- about auto time intelligence in Power BI.
- the default date hierarchies in the data model.
- how you can use the date hierarchies.
- how you can turn off auto time intelligence.

Running Totals - TOTALYTD Function

You have learnt
- how to use inbuilt time intelligence to create a year-to-date sales measure.

Total Sales YTD = TOTALYTD([Total Sales], 'Calendar'[Date])

Year	MonthName	Total Sales	Total Sales YTD
2001	July	$473,388	$473,388
2001	August	$506,192	$979,580
2001	September	$473,943	$1,453,523
2001	October	$513,329	$1,966,852
2001	November	$543,993	$2,510,846
2001	December	$755,528	$3,266,374
2002	January	$596,747	$596,747
2002	February	$550,817	$1,147,563
2002	March	$644,135	$1,791,698
2002	April	$663,692	$2,455,391
2002	May	$673,556	$3,128,947
2002	June	$676,764	$3,805,711
2002	July	$500,365	$4,306,076
2002	August	$546,001	$4,852,077
2002	September	$350,467	$5,202,544
2002	October	$415,390	$5,617,934
2002	November	$335,095	$5,953,030
2002	December	$577,314	$6,530,344
2003	January	$438,865	$438,865
2003	February	$489,090	$927,956
2003	March	$485,575	$1,413,530
Total		**$29,358,677**	**$9,770,900**

Total Sales FYTD = TOTALYTD([total sales], 'calendar'[Date], "30/6")

Change vs Prior Year/Month - SAMEPERIODLASTYEAR, DATEADD Functions

You have learnt

- how to use inbuilt time intelligence to create total sales prior year measure.

Total Sales Prior Year = CALCULATE([Total Sales],SAMEPERIODLASTYEAR('Calendar'[Date])

Total Sales Prior Year = CALCULATE([Total Sales],DATEADD('Calendar'[Date],-1,YEAR))

- how to use inbuilt time intelligence to create total sales prior month measure.

Total Sales Prior Month = CALCULATE([Total Sales],DATEADD('Calendar'[Date],-1,MONTH))

Year		Total Sales	Total Sales Prior Mpnth
⊞	2001	$3,266,374	$2,510,846
⊟	2002	$6,530,344	$6,708,557
	January	$596,747	$755,528
	February	$550,817	$596,747
	March	$644,135	$550,817
	April	$663,692	$644,135
	May	$673,556	$663,692
	June	$676,764	$673,556
	July	$500,365	$676,764
	August	$546,001	$500,365
	September	$350,467	$546,001
	October	$415,390	$350,467
	November	$335,095	$415,390
	December	$577,314	$335,095
⊞	2003	$9,791,060	$8,636,587
⊞	2004	$9,770,900	$11,502,688
	Total	$29,358,677	$29,358,677

Summary - Time Intelligence

You have learnt a brand-new concept - Time Intelligence.

You have learnt how to arrive at running totals, change vs prior year/month using DAX Inbuilt Time Intelligence functions such as TOTALYTD, SAMEPERIODLASTYEAR and DATEADD.

Session 4 – Topic 4 The FILTER Function Explained

The FILTER Function
You have learnt the following.
- syntax of FILTER FUNCTION.
- recap of CALCULATE function.

Filter Function is like a Calculated Column
You have learnt that Filter Function is like a Calculated Column but is more efficient and effective compared to Calculated Column.

Total Large Customers = CALCULATE(

       [Total Customers],

       FILTER(Customers, [Total Sales] >= 2000)

)

FILTER Function Pattern to get Business Insights
You have learnt how to use Filter Function to count the things that did not happen.

Total Products = COUNTROWS(Products)

Count of Products that Sold = COUNTROWS(FILTER(Products,[Total Sales]>0))

Count of Products that have not Sold = COUNTROWS(FILTER(Products,[Total Sales]=0))

Summary - Filter Function
In this FILTER function explained topic you have learnt

- the FILTER function syntax and how it is used in DAX formulas.
- how FILTER function is like a True/False calculated column.
- how FILTER function used as Table filter parameter in CALCULATE function.

- how FILTER function can be used to derive business insights.

Session 4 – Topic 5 Multiple Data Tables

Introduction to Multiple Data Tables
You have understood the data in the second data table that you will be loading into your data model.

Loading and Connecting a Second Data Table
You have learnt the following.
- how to load the data from .csv file.
- A recap on the type of tables in Power BI data model.
- that the table you loaded is a data table.
- how to join the Lookup tables to the new data table.

Deriving Business Insights from 2 Data Tables
- You have learnt to create the following measures.

Total Support Tickets = COUNTROWS(WebTIX)

Total Support Minutes = SUM(WebTIX[MinutesSpent])

Total Tickets per $100,00 turn over = DIVIDE([Total Support Tickets], [Total Sales])*100000

- You have learnt that the data tables are connected to the common lookup tables and hence you can view the values from the 2 data tables in the same visual.

Country	Total Sales	Total Support Tickets	Total Support Minutes
Australia	$9,061,001	1,797	66,725
Canada	$1,977,845	1,548	56,834
France	$2,644,018	1,559	57,644
Germany	$2,894,312	1,553	55,962
United Kingdom	$3,391,712	1,798	67,888
United States	$9,389,790	4,349	158,623
Total	**$29,358,677**	**12,604**	**463,676**

- You have learnt how you can derive business insights by writing measures and visualising them.

Country	Total Sales	Total Support Tickets	Total Tickets per $100,000 turn over	Total Support Minutes
Canada	$1,977,845	1,548	78.3	56,834
France	$2,644,018	1,559	59.0	57,644
Germany	$2,894,312	1,553	53.7	55,962
United Kingdom	$3,391,712	1,798	53.0	67,888
United States	$9,389,790	4,349	46.3	158,623
Australia	$9,061,001	1,797	19.8	66,725
Total	**$29,358,677**	**12,604**	**42.9**	**463,676**

Summary - Multiple Data Tables
In this topic you have learnt how to
- load a second data table into your Power BI data model.
- connect the second data table to the common lookup tables.
- derive business insights from the 2 data tables.

Session 4 – Topic 6 What-if Analysis

What-if Analysis in Power BI
You have learnt
- to create a hard-coded measure to start with.

Total Cost of Support = [Total Support Minutes] * 0.7
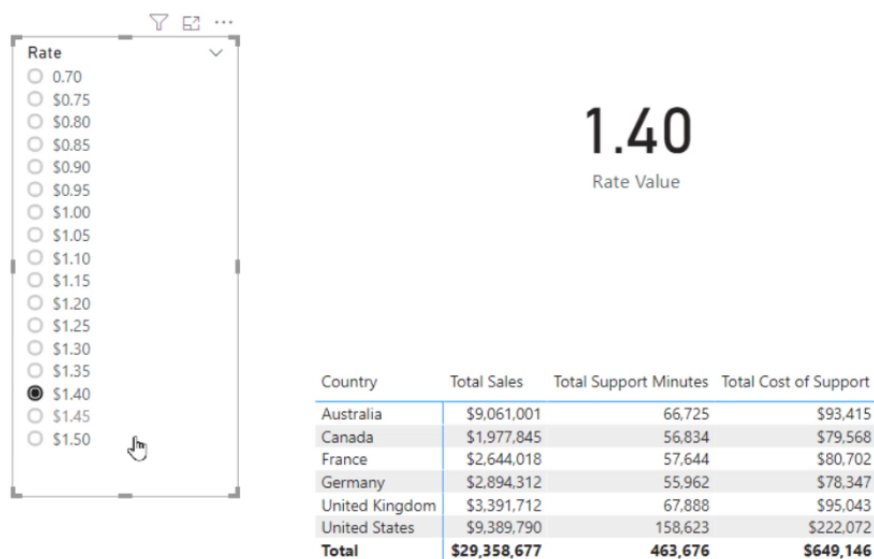
Country	Total Sales	Total Support Minutes	Total Cost of Support
Australia	$9,061,001	66,725	$46,708
Canada	$1,977,845	56,834	$39,784
France	$2,644,018	57,644	$40,351
Germany	$2,894,312	55,962	$39,173
United Kingdom	$3,391,712	67,888	$47,522
United States	$9,389,790	158,623	$111,036
Total	**$29,358,677**	**463,676**	**$324,573**

- that you can change the hard-coded measure in Power BI Desktop but not in a published report.
- that you can facilitate change of parameters by the end user by using What-if Analysis.
- how to use What-if analysis in Power BI.
- how What-if analysis works in Power BI.
- how to use GENERATESERIES function.
- that you can have a disconnected table in your data model.
- how to use SELECTEDVALUE function.
- how to rewrite your hard-coded measure to use the selected value from Slicer.

Total Cost of Support = [Total Support Minutes] * [Rate Value]

- how the visual updates when the Slicer selection is changed.

Rate

- 0.70
- $0.75
- $0.80
- $0.85
- $0.90
- $0.95
- $1.00
- $1.05
- $1.10
- $1.15
- $1.20
- $1.25
- $1.30
- $1.35
- ● $1.40
- $1.45
- $1.50

1.40
Rate Value

Country	Total Sales	Total Support Minutes	Total Cost of Support
Australia	$9,061,001	66,725	$93,415
Canada	$1,977,845	56,834	$79,568
France	$2,644,018	57,644	$80,702
Germany	$2,894,312	55,962	$78,347
United Kingdom	$3,391,712	67,888	$95,043
United States	$9,389,790	158,623	$222,072
Total	**$29,358,677**	**463,676**	**$649,146**

Changing Filter Behaviour to Display the Results

You have learnt how to visualise all the values at once without having to select from Slicer.

Rate	Total Cost of Support
$0.70	$324,573
$0.75	$347,757
$0.80	$370,941
$0.85	$394,125
$0.90	$417,308
$0.95	$440,492
$1.00	$463,676
$1.05	$486,860
$1.10	$510,044
$1.15	$533,227
$1.20	$556,411
$1.25	$579,595
$1.30	$602,779
$1.35	$625,963
$1.40	$649,146
$1.45	$672,330
$1.50	$695,514
Total	

Using Single Value to Display the Results

You have learnt
- how to make the Slicer a Single Value Slicer.
- How to type in a number in the Slicer to make the visual to display the relevant values.
- How to hide the slider and display only the single value in the Slicer.

Summary - What-if Analysis

In this topic you have learnt how to use What-if analysis to produce interactive reports in Power BI. You have learnt how to
- use the What-if feature in Power BI.
- modify the slicer table values to suit your purpose.
- use the Slicer to display the selected value.
- modify the DAX formula of your measure so that the values in the visual get modified based on the selection in the Slicer.
- modify the filter behaviour in your visual using the What-if parameter.
- allow the end user to just type in a single value to display the results based on that value.

Session 4 – Topic 7 Building DAX Knowledge

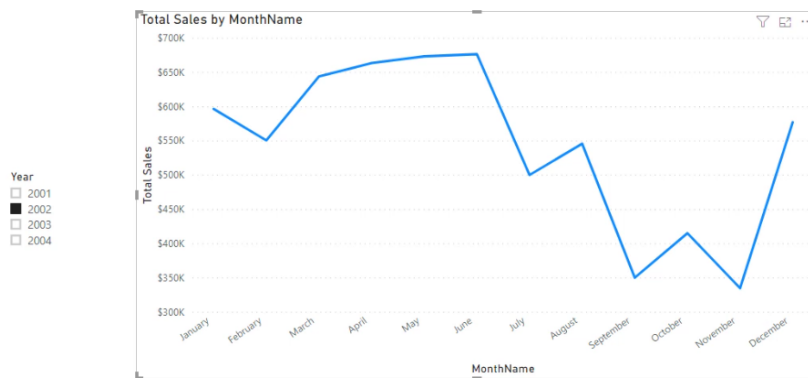## Chart Title and Values based on the Selected Measure

You have learnt about an example of a chart that displays based on Slicer selection
- the values.
- the chart title.

Setting up the Chart

You have learnt to set up a chart displaying Total Sales across months for the selected year in the Slicer.
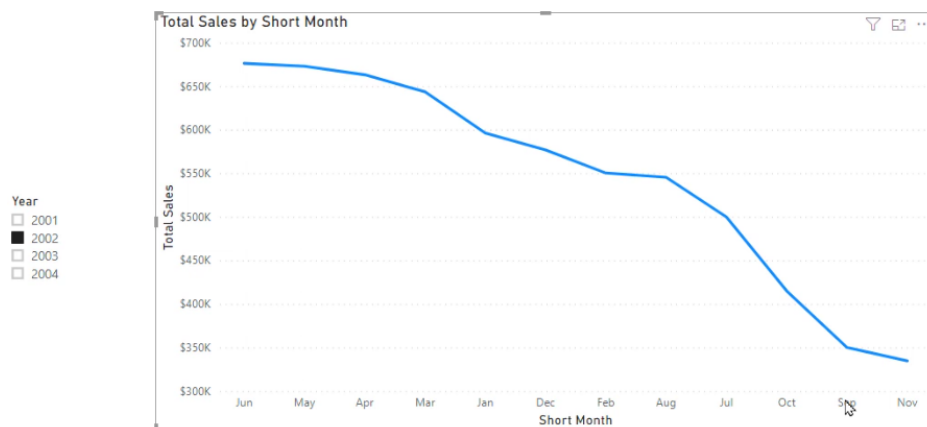
Displaying Short Month Name

- Short month names look great on a chart axis.
- You have learnt how to create a column with short month names using
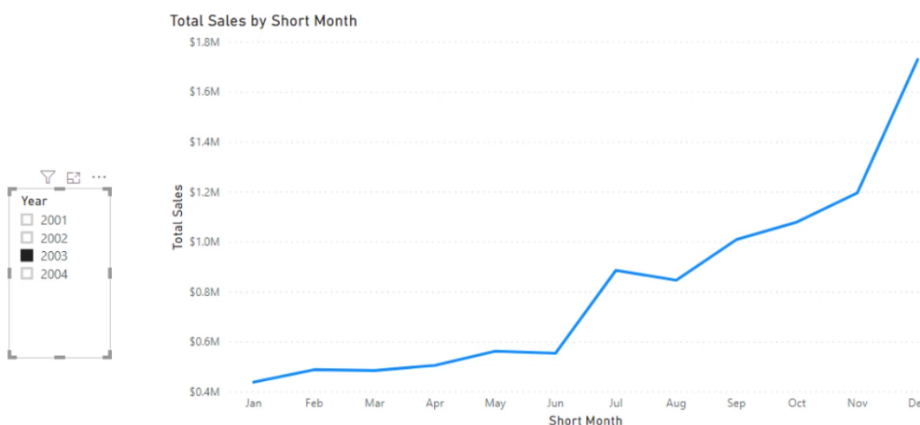 - DAX
  - Power Query
- DAX formula

Short Month = LEFT('Calendar'[MonthName], 3)

- In Power Query
  - Add a column extracting first 3 characters from MonthName column.

Setting up the Chart - Contd.

You have learnt how to sort the Chart by Short Month in ascending order.

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SELECTEDVALUE Function

You have learnt
- how to use Enter data option in Power BI to create a new table.
- how to add the column from the new table to the Slicer so that you can select a value from the slicer.
- that the new table is a disconnected table.
- how to create a measure to extract the ID of the selected value in the Slicer.

Chart Selection = SELECTEDVALUE(ChartSelector[ID])

- that the measure displays the ID value based on the selected value in the Slicer.
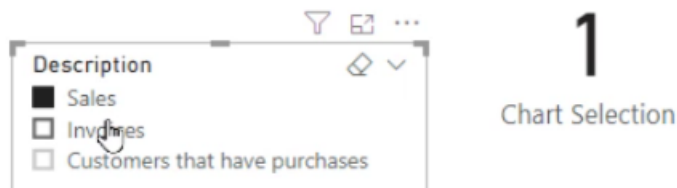
The SWITCH Function

You have learnt to write the SWITCH measure.

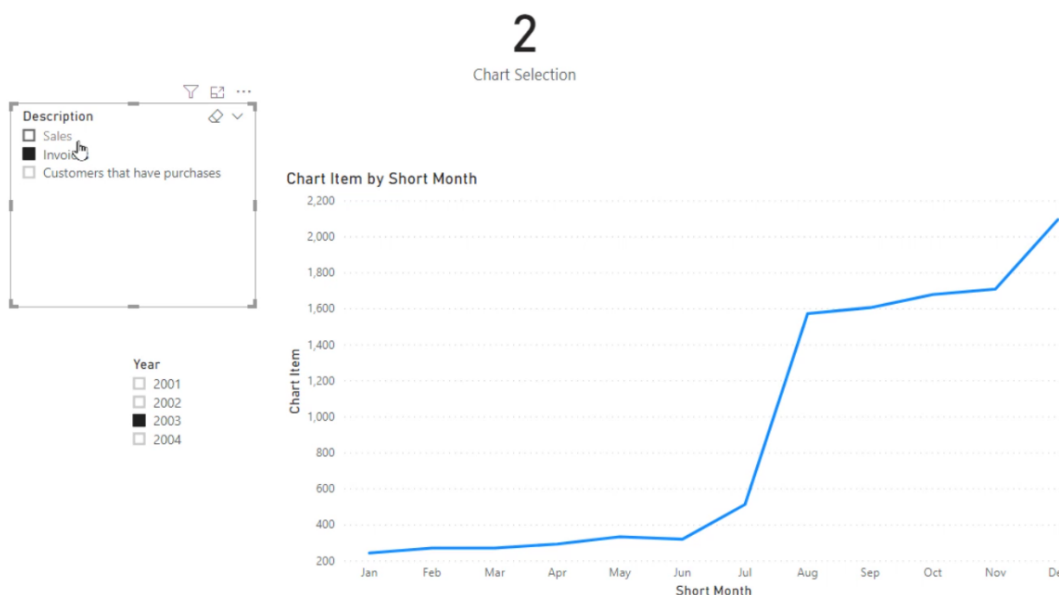Chart Item = SWITCH([Chart Selection]

　　　　1, [Total Sales],

　　　　2, [Total Invoices],

　　　　3, [Total Customers that purchased]

)

You have understood how the chart displays the values based on Slicer selection with the Switch measure added to the chart.

## Harvester Measure to Display Dynamic Chart Title

You have learnt

- How to create a measure to build up the dynamic chart title.

Chart Title =

> "Chart showing " & SELECTEDVALUE('Chart Selector'[Description]) &
>
> " for the year " & SELECTEDVALUE('Calendar'[CalendarYear])

- How to do the Conditional formatting for Title of the chart in Format pane to display the value of the measure [Chart Title].
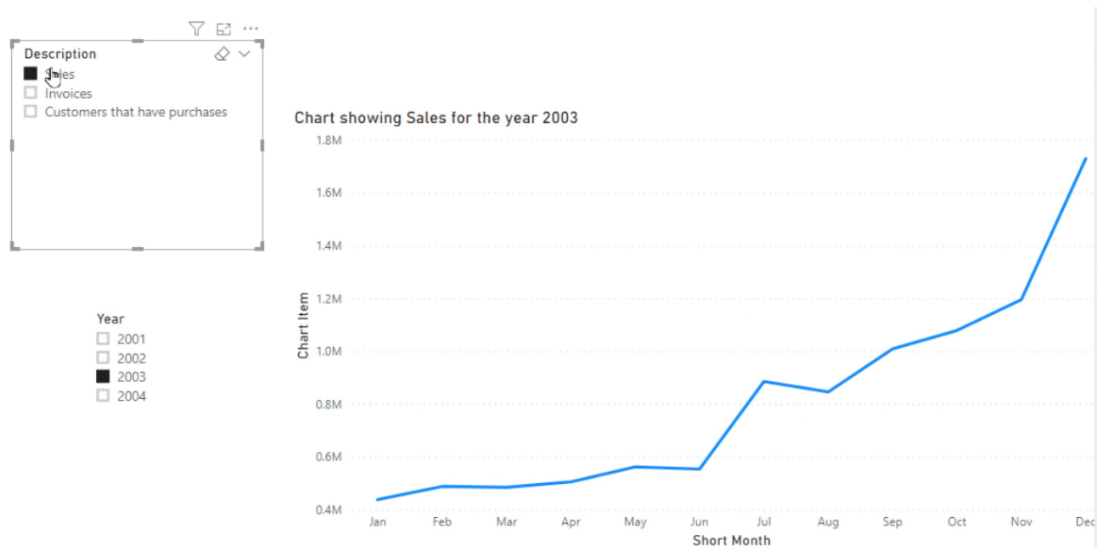
- You have understood how you have created an end user friendly interactive report.

Next Steps

You have understood what you need to do after the training.

Summary - Building DAX Knowledge

In this topic, you have learnt the following.

- SELECTEDVALUE function.
- SWITCH function.
- how to set up a chart that displays values of the measure selected from the slicer.
- how to write a harvester measure to display a dynamic chart title from the selections from the slicers.
- how to produce short month names that make the chart axis look clean.

Finally you have learnt what to do next after completing this training.