

1.1. Exercise: Configuring a Flat schema

Introduction

At this stage of the course, you should now have a good understanding of three data models commonly used for data analysis in Power BI.

In this exercise, you can apply your knowledge of these data models to configure the Flat schema.

- You will walk through the steps to create a Flat schema in Power BI using the example of an online bicycle store called Adventure Works.
- You'll demonstrate how the store uses a schema to consolidate and analyze data, leading to better business decisions.

Scenario

Adventure Works has seen a rise in customer complaints following incorrect and delayed deliveries. The company suspects inconsistencies in its data have caused the issues.

To fix these issues, Adventure Works needs to create a data model in Power BI that accurately and consistently organizes and integrates its data. You can help the company to develop this data model as a Flat schema.

The company provides you with an Excel file called *AdventureWorksDataSet*. The file consolidates all required data into a table containing all relevant fields related to the company's products and orders.

You must load this dataset into Power BI and develop it as a Flat schema. Be sure to evaluate the data quality and configure the model to ensure that Adventure Works can use it to make informed decisions.

Instructions

Create a new Power BI project called *Exercise-Configuring a Flat schema* and configure a flat schema. Follow the steps below to complete the exercise.

Step 1: Download the Excel Files:

- Download and open the Microsoft Excel workbook AdventureWorksDatasetFlatSchema.xlsx. The workbook contains only one worksheet called AdventureWorksData.

Product ID	Product Category	Product Subcategory	Product Name	Product Description	Product Price	Product Weight	Product Size	Order ID	Customer ID
1001	Mountain Bikes	Cross Country	TrailBlazer 1000	Lightweight and versatile	1200.00	25.0	M	2001	3001
1001	Mountain Bikes	Cross Country	TrailBlazer 1000	Lightweight and versatile	1200.00	25.0	M	2200	3001
1002	Mountain Bikes	Cross Country	TrailBlazer 2000	High-performance mountain bike	1500.00	22.0	L	2002	3002
1002	Mountain Bikes	Cross Country	TrailBlazer 2000	High-performance mountain bike	1500.00	22.0	L	2201	3002
1003	Road Bikes	Racing	SpeedMaster 1000	Agile and aerodynamic road bike	1800.00	18.0	M	2003	3003
1003	Road Bikes	Racing	SpeedMaster 1000	Agile and aerodynamic road bike	1800.00	18.0	M	2003	3003
1004	Road Bikes	Racing	SpeedMaster 2000	Premium racing road bike	2100.00	16.0	L	2004	3004
1004	Road Bikes	Racing	SpeedMaster 2000	Premium racing road bike	2100.00	16.0	L	2004	3004
1005	Touring Bikes	Long Distance	Explorer 1000	Comfortable and durable touring bike	1300.00	27.0	M	2005	3005
1005	Touring Bikes	Long Distance	Explorer 1000	Comfortable and durable touring bike	1300.00	27.0	S	2005	3005
1006	Touring Bikes	Long Distance	Explorer 2000	Advanced touring bike	1600.00	24.0	L	2006	3006
1006	Touring Bikes	Long Distance	Explorer 2000	Advanced touring bike	1600.00	24.0	L	2006	3006
1007	Mountain Bikes	Downhill	GravityMaster 1000	Rugged and durable downhill bike	2200.00	29.0	M	2007	3007
1007	Mountain Bikes	Downhill	GravityMaster 1000	Rugged and durable downhill bike	2200.00	29.0	L	2007	3007
1008	Mountain Bikes	Downhill	GravityMaster 2000	Extreme downhill performance	2500.00	27.0	L	2008	3008
1008	Mountain Bikes	Downhill	GravityMaster 2000	Extreme downhill performance	2500.00	27.0	L	2008	3008
1021	Mountain Bikes	Trail	Pathfinder 1000	Agile trail bike for all skill levels	1100.00	24.0	M	2021	3021
1021	Mountain Bikes	Trail	Pathfinder 1000	Agile trail bike for all skill levels	1100.00	24.0	M	2021	3021
1022	Mountain Bikes	Trail	Pathfinder 2000	High-performance trail bike	1400.00	21.0	L	2022	3022
1022	Mountain Bikes	Trail	Pathfinder 2000	High-performance trail bike	1400.00	21.0	L	2022	3022
1023	Road Bikes	Touring	Voyager 1000	Comfortable touring road bike	1700.00	20.0	M	2023	3023
1023	Road Bikes	Touring	Voyager 1000	Comfortable touring road bike	1700.00	20.0	M	2023	3023

Step 2: Connect to the Excel workbook and load the data into Power BI:

- Connect to the Excel spreadsheet in Power BI.
- Select the table from the dataset and load it into the Power BI data model.
- Open a preview of the table in the Preview pane.

Tip: You can import data using the Get Data drop-down menu.

The screenshot shows the Power BI Desktop interface with the 'Table tools' ribbon selected. The main area displays a data grid titled 'AdventureWorksData' containing 1021 rows of product information. The columns include Product ID, Product Category, Product Subcategory, Product Name, Product Description, Product Price, Product Weight, Product Size, Order ID, and Customer. The data shows various products like Mountain Bikes, Road Bikes, and Touring Bikes across different categories and subcategories.

Step 3: Configure the table properties:

1. Configure the table properties by renaming the table to Product and adding a brief description of the table in Power BI desktop.

Tip: You can configure table properties in the Power Query editor or the Model view of Power BI desktop.

The screenshot shows the Power BI Desktop interface with the 'Home' ribbon selected. The 'Properties' pane on the right is open, showing configuration options for the 'Product' table. The 'General' section includes fields for 'Name' (set to 'Product') and 'Description' (set to 'Includes product data for AdventureWorks'). Other sections like 'Synonyms' and 'Row label' are also visible.

Step 4: Configure the column properties:

1. Order ID should be a unique value for each sales order. It's essential to eliminate all duplicate values in the column to generate accurate analytical results. Identify

and remove all duplicate values in the OrderID column in the worksheet. Review the number of rows in the Query Editor to ensure all duplicate rows have been deleted. Note the number of remaining rows.

Tip: You can remove duplicate values using the Remove Duplicates feature.

2. Change the format of the Product Price column to currency.

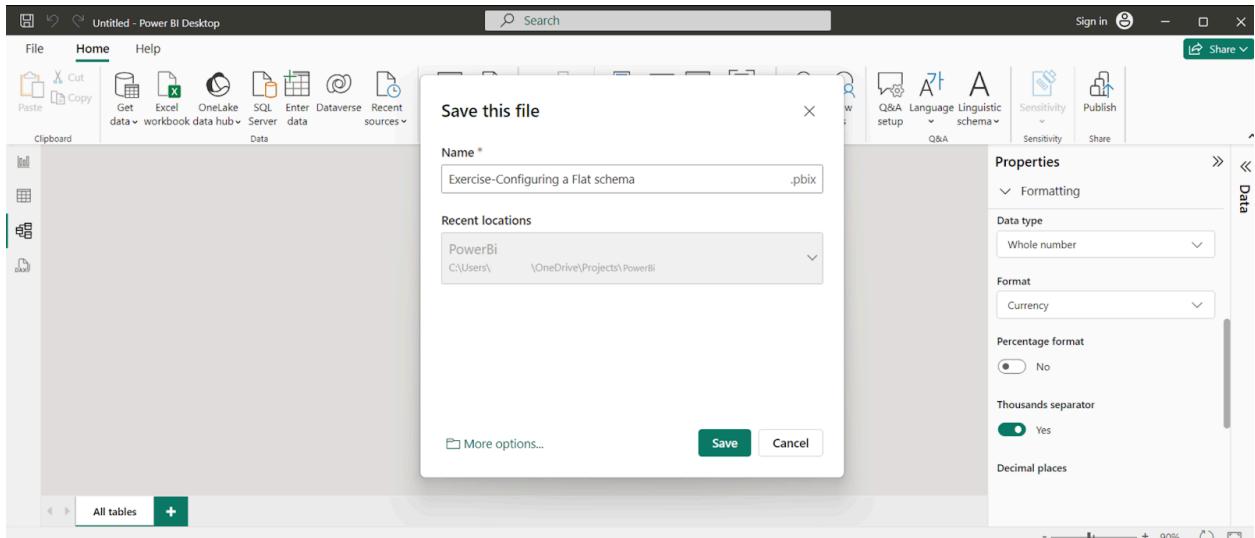
Tip: You can configure column properties in the Model view or Table view of Power BI desktop.

Product ID	Product Category	Product Subcategory	Product Name	Product Description	Product Price	Product Weight	Product Size	Order ID	Customer ID
1001	Mountain Bikes	Cross Country	TrailBlazer 1000	Lightweight and versatile	\$1,200	25	M	2001	
1001	Mountain Bikes	Cross Country	TrailBlazer 1000	Lightweight and versatile	\$1,200	25	M	2200	
1002	Mountain Bikes	Cross Country	TrailBlazer 2000	High-performance mountain bike	\$1,500	22	L	2002	
1002	Mountain Bikes	Cross Country	TrailBlazer 2000	High-performance mountain bike	\$1,500	22	L	2201	
1003	Road Bikes	Racing	SpeedMaster 1000	Agile and aerodynamic road bike	\$1,800	18	M	2003	
1004	Road Bikes	Racing	SpeedMaster 2000	Premium racing road bike	\$2,100	16	L	2004	
1005	Touring Bikes	Long Distance	Explorer 1000	Comfortable and durable touring bike	\$1,300	27	M	2005	
1006	Touring Bikes	Long Distance	Explorer 2000	Advanced touring bike	\$1,600	24	L	2006	
1007	Mountain Bikes	Downhill	GravityMaster 1000	Rugged and durable downhill bike	\$2,200	29	M	2007	
1008	Mountain Bikes	Downhill	GravityMaster 2000	Extreme downhill performance	\$2,500	27	L	2008	
1021	Mountain Bikes	Trail	Pathfinder 1000	Agile trail bike for all skill levels	\$1,100	24	M	2021	
1022	Mountain Bikes	Trail	Pathfinder 2000	High-performance trail bike	\$1,400	21	L	2022	
1023	Road Bikes	Touring	Voyager 1000	Comfortable touring road bike	\$1,700	20	M	2023	
1024	Road Bikes	Touring	Voyager 2000	Advanced touring road bike	\$2,000	18	L	2024	
1025	Touring Bikes	Adventure	Adventurer 1000	Durable bike for long adventures	\$1,500	28	M	2025	
1026	Touring Bikes	Adventure	Adventurer 2000	Premium adventure touring bike	\$1,800	26	L	2026	
1027	Mountain Bikes	Enduro	EnduroMaster 1000	Endurance-focused mountain bike	\$2,300	30	M	2027	
1028	Mountain Bikes	Enduro	EnduroMaster 2000	High-performance enduro mountain bike	\$2,600	28	L	2028	

Step 5: Save the Power BI Project

1. Navigate to the Model view of the Power BI desktop and ensure that all required tables are present in the model.
2. Save your flat schema Power BI project to your local machine and name
Exercise-Configuring a Flat schema

Tip: Select an appropriate project name and folder path for your schema.



Conclusion

It is important to note that while a Flat schema can be convenient for some scenarios, it may not be suitable for complex data relationships or larger datasets. In such cases, a normalized schema with multiple tables and defined relationships is a better option to ensure performance and flexibility.

Exemplar: Configuring a Flat schema

Overview

In the exercise, *Configuring a Flat schema*, you were asked to put your knowledge of data modeling into practice by creating a Flat schema.

Your task in this exercise was to configure a Flat schema as follows:

- Connect Power BI to the data source.
- Load, transform, and shape the data as a Flat schema in Power BI desktop.
- Configure the Flat schema for simplified data analysis and visualization.

This reading provides you with a step-by-step guide for identifying these results. It also includes screenshots that you can compare against your work.

You can review the steps for configuring a Flat schema in the videos [*Introduction to data models*](#), [*Introduction to schemas*](#) and [*Setting up a Flat schema in Power BI*](#). You can also review the reading items [*Schemas cheat sheet*](#) and [*Table and column properties cheat sheet*](#).

Power BI Desktop user interface

While reviewing this reading, you may see some changes in the Power BI user interface (UI) from what's described in the following steps.

Power BI Desktop is updated and released monthly, incorporating customer feedback and new features. You might experience changes in the Power BI Desktop UI that have taken place after the development of this training content.

As a result, the screenshots in the videos, readings, or exercises might not align exactly with how you experience the UI. However, please note that these changes do not impact the functionalities of the UI. So you will still be able to perform all the steps shown in that video, reading, or exercise.

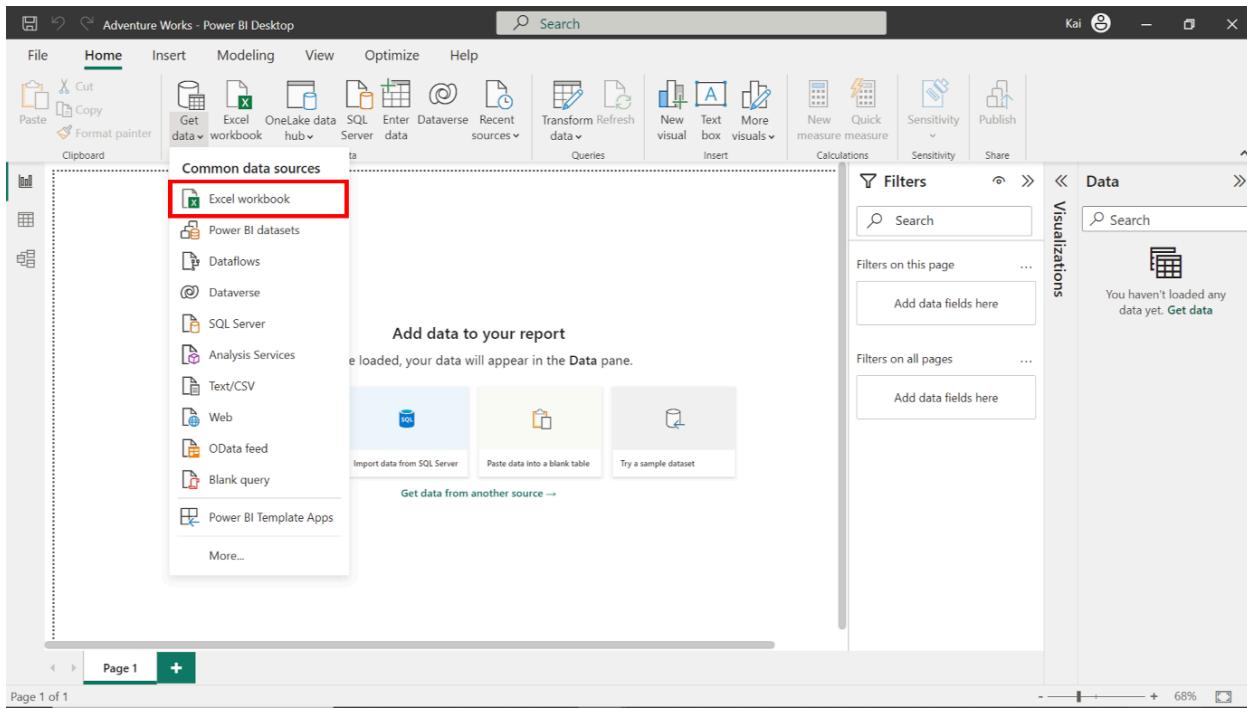
Step 1: Download the Excel Files:

1. Download and open the Microsoft Excel workbook AdventureWorksDataset.xlsx.
The workbook contains one worksheet called AdventureWorksData, which includes information on the company's sales.

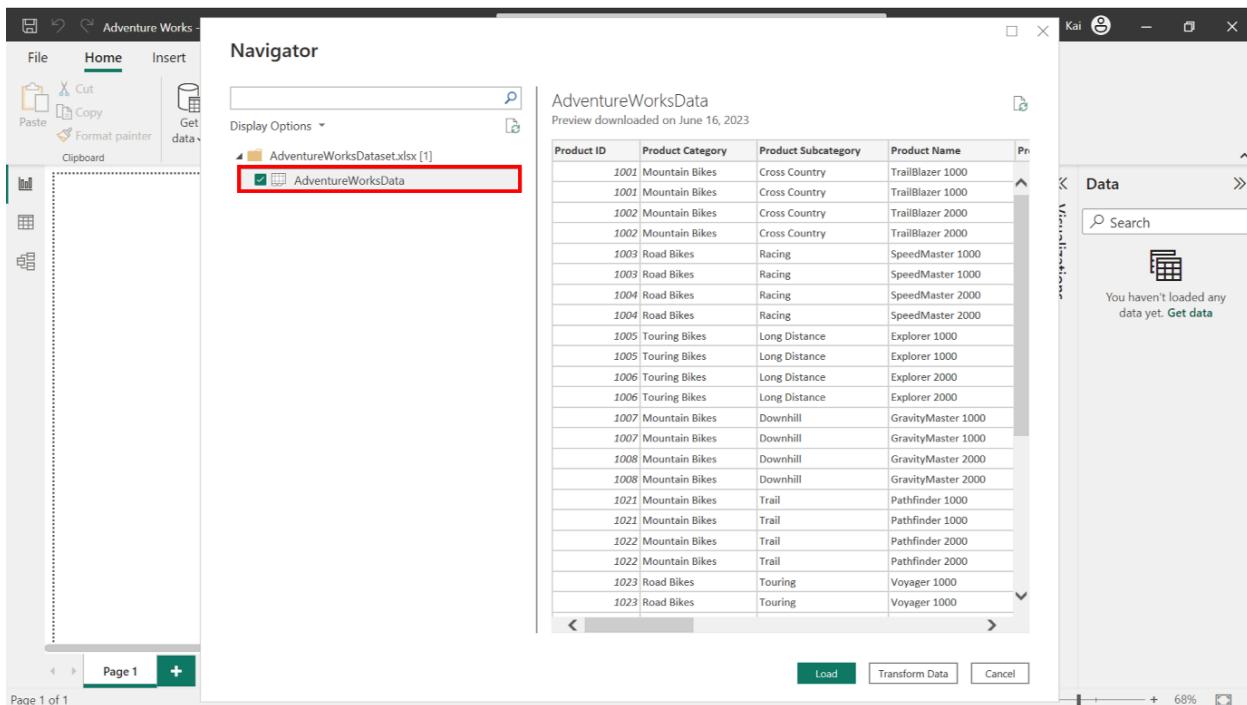
Product ID	Product Category	Product Subcategory	Product Name	Product Description	Product Price	Product Weight	Product Size	Order ID	Customer ID
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1001	Mountain Bikes	Cross Country	TrailBlazer 1000	Lightweight and versatile	1200.00	25.0	M	2200	3001
1002	Mountain Bikes	Cross Country	TrailBlazer 2000	High-performance mountain bike	1500.00	22.0	L	2002	3002
1002	Mountain Bikes	Cross Country	TrailBlazer 2000	High-performance mountain bike	1500.00	22.0	L	2201	3002
1003	Road Bikes	Racing	SpeedMaster 1000	Agile and aerodynamic road bike	1800.00	18.0	M	2003	3003
1003	Road Bikes	Racing	SpeedMaster 1000	Agile and aerodynamic road bike	1800.00	18.0	M	2003	3003
1004	Road Bikes	Racing	SpeedMaster 2000	Premium racing road bike	2100.00	16.0	L	2004	3004
1004	Road Bikes	Racing	SpeedMaster 2000	Premium racing road bike	2100.00	16.0	L	2004	3004
1005	Touring Bikes	Long Distance	Explorer 1000	Comfortable and durable touring bike	1300.00	27.0	M	2005	3005
1005	Touring Bikes	Long Distance	Explorer 1000	Comfortable and durable touring bike	1300.00	27.0	S	2005	3005
1006	Touring Bikes	Long Distance	Explorer 2000	Advanced touring bike	1600.00	24.0	L	2006	3006
1006	Touring Bikes	Long Distance	Explorer 2000	Advanced touring bike	1600.00	24.0	L	2006	3006
1007	Mountain Bikes	Downhill	GravityMaster 1000	Rugged and durable downhill bike	2200.00	29.0	M	2007	3007
1007	Mountain Bikes	Downhill	GravityMaster 1000	Rugged and durable downhill bike	2200.00	29.0	L	2007	3007
1008	Mountain Bikes	Downhill	GravityMaster 2000	Extreme downhill performance	2500.00	27.0	L	2008	3008
1008	Mountain Bikes	Downhill	GravityMaster 2000	Extreme downhill performance	2500.00	27.0	L	2008	3008
1021	Mountain Bikes	Trail	Pathfinder 1000	Agile trail bike for all skill levels	1100.00	24.0	M	2021	3021
1021	Mountain Bikes	Trail	Pathfinder 1000	Agile trail bike for all skill levels	1100.00	24.0	M	2021	3021
1022	Mountain Bikes	Trail	Pathfinder 2000	High-performance trail bike	1400.00	21.0	L	2022	3022
1022	Mountain Bikes	Trail	Pathfinder 2000	High-performance trail bike	1400.00	21.0	L	2022	3022
1023	Road Bikes	Touring	Voyager 1000	Comfortable touring road bike	1700.00	20.0	M	2023	3023
1023	Road Bikes	Touring	Voyager 1000	Comfortable touring road bike	1700.00	20.0	M	2023	3023

Step 2: Connect to the Excel workbook and load the data into Power BI:

1. Launch the Power BI desktop and select Get Data to connect to the source.
2. Navigate to the folder containing the Adventure Works spreadsheet you downloaded.



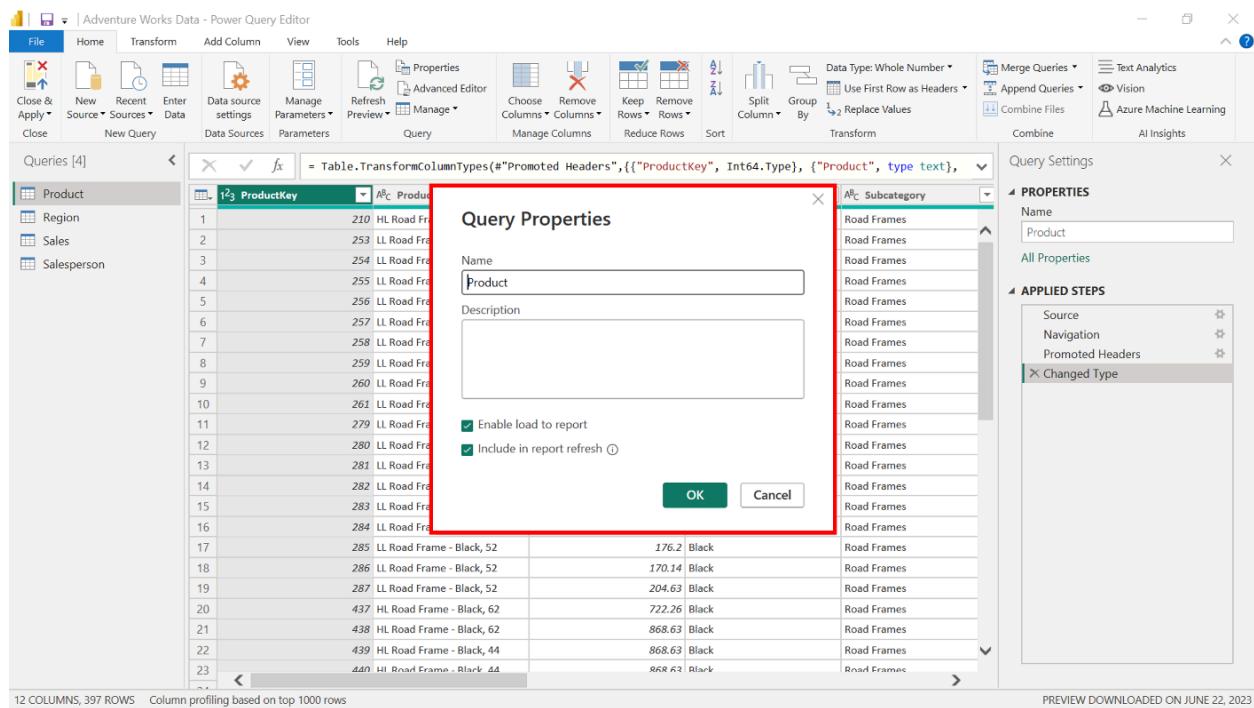
1. A navigator menu appears on the screen displaying a list of tables available within your dataset. In the navigator dropdown menu, select the Adventure Works dataset. Then select Load.



1. A preview of the dataset is visible in the preview pane.

Step 3: Configure the table properties.

1. Open the Home tab and select Transform data to open the Power Query editor.
2. Once in the Power Query editor, select Properties to open the Query Properties dialog box.
3. Change the table's name to Product and add a dataset description.



Step 4: Configure Column Properties.

1. In the Home tab of the query editor, select Remove Rows.
2. Select the Remove duplicates option from the dropdown menu.
3. Select the Product Price column.
4. Open the Column Tools tab in the Power BI desktop interface.
5. Navigate to the formatting group and select Currency from the dropdown menu.
This action displays a \$ sign before the amount in the entire column.

The screenshot shows the Power BI Desktop interface with the 'Adventure Works - Power BI Desktop' project open. The 'Table tools' tab is selected. In the 'Column tools' pane, the 'Product Price' column is being edited. The 'Data type' dropdown is set to 'Whole number'. A red box highlights the 'Whole number' option in the list of formats, which includes 'General', 'Currency', 'Decimal number', and 'Scientific'. The main table view displays 50 rows of product data, including columns for Product Name, Product ID, Product Price, Product Weight, Product Size, Order ID, Customer ID, and Order Date.

Step 5: Evaluate the data model and save the Power BI project

1. To view the dataset loaded to Power BI, select Model View from the left sidebar. The Model view should display only one table with all columns as data attributes. This is the typical structure of a Flat schema.
2. Adventure Works can now use this Flat schema to build visualizations, reports, and dashboards to draw insights into its business operations.

The screenshot shows the Power BI Desktop interface. The ribbon is visible at the top with tabs for File, Home, and Help. Under the Home tab, there are various icons for data sources (Clipboard, Get data from workbook, OneLake data hub, SQL Server, Enter data, Dataverse, Recent sources), data management (Transform Refresh data, Queries, Manage relationships), and modeling (New measure, New column, New table, Calculations, Manage roles, View as, Security). On the right side, there's a Properties pane and a Data pane showing the schema of the AdventureWorksData table.

1. To save the project, access the File menu and select Save As. Provide an appropriate name for the project and a suitable path to the folder on your local machine.

The left screenshot shows the Power BI mobile application's navigation menu with options like New, Open report, Save, Save as, Get data, Import, Export, Publish, Options and settings, Get started, About, and Sign in. The 'Save' option is highlighted. The right screenshot shows the Power BI Desktop ribbon with the 'Save' icon highlighted under the 'File' tab. The Data pane shows a table of product data with columns for Product Price, Product Weight, and Product Name.

Conclusion

Congratulations! You have completed the exercise and configured the Adventure Works dataset as a Flat schema in Power BI. Your data model is now ready for creating reports and visualizations.

1.2. Activity: Configure a Flat schema with multiple sources

Introduction

In the previous lesson, you gained knowledge of the different data models used in Power BI for data analysis. The simplest form of a data model is the Flat schema.

In the exercise, you must apply your knowledge of data models to build and configure a Flat schema in Power BI.

- You'll walk through the steps to create a Flat schema in Power BI using the Adventure Works dataset.
- The goal is to merge two different tables of datasets into a single consolidated dataset to build a Flat schema that can be utilized for data analysis and visualization.

Case study

Adventure Works' system saves sales records into a dataset with attributes like product, category, and unit price. On the other hand, the records of Adventure Works sales team employees are stored in a separate table called Salespersons.

Adventure Works wants to analyze the performance of its sales team. So, it needs to create a data model in Power BI that accurately and consistently organizes and integrates sales data alongside the records of its sales team. You can help the company to develop this data model as a Flat schema.

The company provides you with an Excel file called *AdventureWorksDataSet*, available for download below. The file contains two tables called Sales and Salespersons. You must combine both tables into a consolidated dataset containing all relevant fields related to the company's sales data and sales team.

You must load this dataset into Power BI and develop it as a Flat schema. Be sure to combine the data tables and configure the model to ensure that Adventure Works can use it to make informed decisions.

Step 1: Download the Excel Files.

- Download and open the Microsoft Excel workbook AdventureWorksDataset.xlsx. The workbook contains two worksheets named Sales and Salespersons, as depicted in the screenshots below.

Tip: You can download the workbook from this page by selecting the above Excel file.

SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Sales	Cost
SO43897	2017-08-25	235	312	282	4	2	28.84	57.68	63.45
SO43897	2017-08-25	351	312	282	4	2	2024.99	4049.98	3796.19
SO43897	2017-08-25	348	312	282	4	2	2024.99	4049.98	3796.19
SO43897	2017-08-25	232	312	282	4	2	28.84	57.68	63.45
SO44544	2017-11-18	292	312	282	4	2	818.7	1637.4	1413.62
SO44544	2017-11-18	220	312	282	4	2	20.19	40.38	24.06
SO44544	2017-11-18	351	312	282	4	2	2024.99	4049.98	3796.19
SO44544	2017-11-18	349	312	282	4	2	2024.99	4049.98	3796.19
SO44544	2017-11-18	344	312	282	4	2	2039.99	4079.98	3824.31
SO45321	2018-02-18	346	312	282	4	2	2039.99	4079.98	3824.31
SO45321	2018-02-18	347	312	282	4	2	2039.99	4079.98	3824.31
SO46082	2018-05-23	220	312	282	4	2	20.19	40.38	24.06
SO46082	2018-05-23	346	312	282	4	2	2039.99	4079.98	3824.31
SO46082	2018-05-23	345	312	282	4	2	2039.99	4079.98	3824.31
SO46082	2018-05-23	232	312	282	4	2	28.84	57.68	63.45
SO46082	2018-05-23	344	312	282	4	2	2039.99	4079.98	3824.31
SO46082	2018-05-23	348	312	282	4	2	2024.99	4049.98	3796.19
SO46082	2018-05-23	212	312	282	4	2	20.19	40.38	24.06
SO47028	2018-08-24	410	312	282	4	2	36.45	72.9	53.94
SO47028	2018-08-24	464	312	282	4	2	14.13	28.26	19.43
SO47028	2018-08-24	412	312	282	4	2	180.13	360.26	266.59
SO47028	2018-08-24	420	312	282	4	2	141.62	283.24	209.59

EmployeeKey	EmployeeID	Salesperson	Title	UPN
272	502097814	Stephen Jiang	North American Sales Manager	stephen-jiang@adventureworks.com
277	112432117	Brian Welcker	Director of Sales	brian-welcker@adventureworks.com
281	841560125	Michael Blythe	Sales Representative	michael-blythe@adventureworks.com
282	191644724	Linda Mitchell	Sales Representative	linda-mitchell@adventureworks.com
283	615389812	Jillian Carson	Sales Representative	jillian-carson@adventureworks.com
284	234474252	Garrett Vargas	Sales Representative	garrett-vargas@adventureworks.com
285	716374314	Tsvi Reiter	Sales Representative	tsvi-reiter@adventureworks.com
286	61161600	Pamela Ansmann-Wolfe	Sales Representative	pamela-ansman-wolfe@adventureworks.com
287	139397894	Shu Ito	Sales Representative	shu-ito@adventureworks.com
288	399771412	José Saraiva	Sales Representative	jose-saraiva@adventureworks.com
289	987554264	David Campbell	Sales Representative	david-campbell@adventureworks.com
290	982310417	Amy Alberts	European Sales Manager	amy-alberts@adventureworks.com
291	668991357	Jae Pak	Sales Representative	jae-pak@adventureworks.com
292	134219713	Ranjit Varkey Chudukatil	Sales Representative	ranjit-varkey-chudukatil@adventureworks.com
293	90836195	Tete Mensa-Annan	Sales Representative	tete-mensa-annan@adventureworks.com
294	481044938	Syed Abbas	Pacific Sales Manager	syed-abbas@adventureworks.com
295	954276278	Rachel Valdez	Sales Representative	rachel-valdez@adventureworks.com
296	758596752	Lynn Tsolfias	Sales Representative	lynn-tsolfias@adventureworks.com

Step 2: Get data from the Excel workbook.

1. Import the data from the Excel sheet into Power BI.
2. Open a preview of the table in the Preview pane.

Tip: You can import data using the Get Data drop-down menu.

The screenshot shows the Power BI desktop application. On the left, the Navigator pane displays a list of tables from the 'AdventureWorksDataset.xlsx' file: 'Table_Sales' and 'Table_Salesperson' (both collapsed), and 'Sales' and 'Salesperson' (both expanded). The 'Salesperson' table is shown in the preview pane on the right, displaying columns: EmployeeKey, EmployeeID, Salesperson, and Title. The preview pane also includes buttons for 'Load', 'Transform Data', and 'Cancel'. The status bar at the bottom indicates 'Page 1 of 1'.

EmployeeKey	EmployeeID	Salesperson	Title
272	502097814	Stephen Jiang	North American Sales Manag
277	112432117	Brian Welcker	Director of Sales
281	841560125	Michael Blythe	Sales Representative
282	191644724	Linda Mitchell	Sales Representative
283	615389812	Jillian Carson	Sales Representative
284	234474252	Garrett Vargas	Sales Representative
285	716374314	Tsvi Reiter	Sales Representative
286	61161660	Pamela Anzman-Wolfe	Sales Representative
287	139397894	Shu Ito	Sales Representative
288	399771412	José Saraiña	Sales Representative
289	987554265	David Campbell	Sales Representative
290	982310417	Amy Alberts	European Sales Manager
291	668991357	Jae Pak	Sales Representative
292	134219713	Ranjit Varkey Chudukatil	Sales Representative
293	90836195	Tete Mensa-Annan	Sales Representative
294	481044938	Syed Abbas	Pacific Sales Manager
295	954276278	Rachel Valdez	Sales Representative
296	758596752	Lynn Tsoflias	Sales Representative

Step 3: Load the tables from your data source and merge the tables into one dataset.

1. Identify and remove all duplicate values in the SalesOrderNumber column in the Sales dataset.

Tip: You can remove duplicate values using the Remove Duplicates feature.

The screenshot shows the Power Query Editor interface with the 'Sales' query selected. The 'Sales' table is displayed with columns: SalesOrderNumber, SalesOrderID, OrderDate, ProductKey, ResellerKey, and EmployeeKey. A context menu is open over the first row of the table, specifically over the 'SalesOrderNumber' column. The menu options include: Copy, Remove, Remove Other Columns, Duplicate Column, Add Column From Examples..., Remove Duplicates (which is highlighted with a red box), Remove Errors, Change Type, Transform, Replace Values..., Replace Errors..., Split Column, Group By..., Fill, Unpivot Columns, Unpivot Other Columns, Unpivot Only Selected Columns, Rename..., Move, Drill Down, and Add as New Query. The 'Applied Steps' pane on the right shows a step named 'Changed Type'.

1. Identify common columns with matching or similar values in both tables. These values can be used to merge both tables.

Tip: You can check the columns related to employees at both tables.

1. In the Query Editor, select the Sales table and click on Merge queries. This action opens the Merge dialog box in which you can configure the merge options. You must select the second table to merge with, ensuring you match the column and Join Kind.

Merge

Select a table and matching columns to create a merged table.

Sales

SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity
SO43897	2017-08-25	235	312	282	4	2
SO43897	2017-08-25	351	312	282	4	2
SO43897	2017-08-25	348	312	282	4	2
SO43897	2017-08-25	232	312	282	4	2

Salesperson

EmployeeKey	EmployeeID	Salesperson	Title	UPN
272	S02097814	Stephen Jiang	North American Sales Manager	stephen-jiang@adventureworks.com
277	112432117	Brian Welker	Director of Sales	brian-welker@adventureworks.com
281	841560125	Michael Blythe	Sales Representative	michael-blythe@adventureworks.com
282	191644724	Linda Mitchell	Sales Representative	linda-mitchell@adventureworks.com
283	615389812	Jillian Carson	Sales Representative	jillian-carson@adventureworks.com

Join Kind

Left Outer (all from first, matching from second)

Use fuzzy matching to perform the merge

Fuzzy matching options

The selection matches 57851 of 57851 rows from the first table.

OK Cancel

1. The merged table is displayed as a column at the end of the table. Select the column to expand the merged table. Select Employee ID, Salesperson, and Title columns to expand and select OK.
2. After merging the tables, you can delete the Salesperson table from the model, as this table has been integrated with the Sales table as a Flat schema.

Tip: You can combine tables using Merge queries in the Power Query editor and the Left outer join type.

The screenshot shows the Power Query Editor interface with the title bar "Adventure Works - Power Query Editor". The ribbon menu includes File, Home, Transform, Add Column, View, Tools, and Help. The Home tab is selected. The ribbon also contains sections for Data source settings, Manage Parameters, Refresh, Properties, Advanced Editor, Choose Columns, Manage Columns, Sort, Transform, and various data merging and AI-related tools. On the left, the "Queries [2]" pane shows two queries: "Sales" and "Salesperson". The main area displays a table with columns: Quantity, 1.2 Unit Price, 1.2 Sales, 1.2 Cost, and Salesperson. A context menu is open over the "Salesperson" column, specifically over the "EmployeeKey" column. The menu title is "Table.NestedJoin(#"Changed Type", {"EmployeeKey"}, Salesperson, {"EmployeeKey"}, "Salesperson",)". The menu options include "Expand" (radio button selected), "Aggregate", and checkboxes for "(Select All Columns)", "EmployeeKey", "EmployeeID", "Salesperson", "Title", and "UPN". There is also a checked checkbox for "Use original column name as prefix". At the bottom right of the menu are "OK" and "Cancel" buttons. To the right of the menu, the "Query Settings" pane is open, showing "Properties" (Name: Sales) and "Applied Steps" (Source, Navigation, Promoted Headers, Changed Type, Merged Queries). The status bar at the bottom indicates "11 COLUMNS, 999+ ROWS" and "Column profiling based on top 1000 rows".

Step 4: Configure table and column properties.

1. Configure the table properties by renaming the table Adventure Works Sales Data and adding a brief description of the table in Power BI desktop.

Tip: You can configure table properties in the Model view of the Power BI desktop.

The screenshot shows the Power Query Editor interface. A 'Query Properties' dialog box is open in the center, overlaid on a preview of a table. The dialog box has a red border and contains the following fields:

- Name:** Adventure Works Sales Data
- Description:** (empty)
- Checkboxes:**
 - Enable load to report (checked)
 - Include in report refresh (checked)

Below the dialog box, a preview of the data is visible, showing the following columns and rows:

SalesOrderNumber	OrderDate	EmployeeKey	SalesAmount
SO43897	2018-05-23	348	312
SO43897	2018-05-23	212	312
SO43897	2018-08-24	410	312
SO44544	2018-08-24	464	312
SO44544	2018-08-24	412	312
SO44544	2018-08-24	420	312
SO44544	2018-08-24	468	312

13 COLUMNS, 999+ ROWS

1. Configure column properties as follows:

- Merge queries autogenerated column names. Rename the columns as follows:
 - Saleperson.EmployeeID to Employee ID,
 - Saleperson.Saleperson to Saleperson
 - and Saleperson.Title to Title.
- Change and format the data types of the columns.
- Add additional information to the columns.

Tip: You can configure column properties both in the Power Query editor and in the Model view of the Power BI desktop.

The screenshot shows the Power Query Editor interface with the following details:

- File**: Home, Transform, Add Column, View, Tools, Help
- Queries [2]**: Sales, Salesperson
- Current Query**: Sales
- Preview Area** (highlighted by a red box):

	1.2 Cost	1.3 Salesperson.EmployeeID	A% Salesperson.Salesperson	A% Salesperson.Title
1	57.68	63.45	191644724	Linda Mitchell
2	4049.98	3796.19	191644724	Linda Mitchell
3	4049.98	3796.19	191644724	Linda Mitchell
4	57.68	63.45	191644724	Linda Mitchell
5	1637.4	1413.02	191644724	Linda Mitchell
6	40.38	24.06	191644724	Linda Mitchell
7	4049.98	3796.19	191644724	Linda Mitchell
8	4049.98	3796.19	191644724	Linda Mitchell
9	4079.98	3824.31	191644724	Linda Mitchell
10	4079.98	3824.31	191644724	Linda Mitchell
11	4079.98	3824.31	191644724	Linda Mitchell
12	40.38	24.06	191644724	Linda Mitchell
13	4079.98	3824.31	191644724	Linda Mitchell
14	4079.98	3824.31	191644724	Linda Mitchell
15	57.68	63.45	191644724	Linda Mitchell
16	4079.98	3824.31	191644724	Linda Mitchell
17	4049.98	3796.19	191644724	Linda Mitchell
18	40.38	24.06	191644724	Linda Mitchell
19	72.9	53.94	191644724	Linda Mitchell
20	28.26	19.43	191644724	Linda Mitchell
21	360.26	266.59	191644724	Linda Mitchell
22	283.24	209.59	191644724	Linda Mitchell
23	45.58	31.14	191644724	Linda Mitchell
- Properties Panel** (right side):
 - PROPERTIES**: Name: Sales
 - APPLIED STEPS**: Expanded Salesperson

Step 5: Save the Power BI project.

- Save your Flat schema Power BI project to your local machine.

Tip: Select an appropriate project name and folder path for your schema.

The screenshot shows the Power BI desktop application. On the left, a dark sidebar menu includes options like New, Open report, Save, Save as, Get data, Import, Export, Publish, Options and settings, Get started, About, and Sign in. The main area is titled "Open report" and displays a message: "You haven't opened any reports recently. Select Browse to open a report from your files." A "Browse reports" button is present. On the right, a data view window titled "Data" shows a table with columns: Product Price, Product Weight, and Product Name. The table contains 30 rows of data, with the last row being "AdventureWorksData". The table has sorting arrows for both columns.

Product Price	Product Weight	Product Name
1200	25	M
1200	25	M
1500	22	L
1500	22	L
1800	18	M
2100	16	L
1300	27	M
1600	24	L
2200	29	M
2500	27	L
1100	24	M
1400	21	L
1700	20	N
2000	18	L
1500	28	N
1800	26	L
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M
2500	27	L
1800	26	M
2300	30	N
2600	28	L
1300	32	M
1600	29	L
1900	21	M
2200	19	L
2000	25	M

1.3. Exercise: Configuring a Star schema

Introduction

By now, you should be familiar with data models, cardinality, cross-filter direction and working with advanced data models.

In this exercise, you must apply your knowledge of these concepts by configuring a Star schema for Adventure Works using Microsoft Power BI. By completing this exercise, you'll demonstrate your ability to:

- Improve data analysis.
- Enhance reporting and visualization.
- Ensure data standardization and consistency.
- Simplify data navigation.

Adventure Works case study

Adventure Works wants to analyze its Sales data to generate insights into its business. It needs to create a data model using a Star schema. You can help the company to build this schema using the datasets within the workbook *AdventureWorksData*.

Instructions

Step 1: Download the Excel file and disable autodetect relationships in Power BI

1. Download and save the Excel workbook *AdventureWorksData.xlsx*. The workbook contains four tables of data: Sales, Products, Region, and Salesperson.
2. Disable Power BI's autodetect function.
 - Tip: You can download the workbook from this page by selecting the attached Excel file. Its contents should resemble the following screenshot.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Sales	Cost					
2	SO43897	2017-08-25	235	312	282	4	2	28.84	57.68	63.45					
3	SO43897	2017-08-25	351	312	282	4	2	2024.99	4049.98	3796.19					
4	SO43897	2017-08-25	348	312	282	4	2	2024.99	4049.98	3796.19					
5	SO43897	2017-08-25	232	312	282	4	2	28.84	57.68	63.45					
6	SO44544	2017-11-18	292	312	282	4	2	818.7	1637.4	1413.62					
7	SO44544	2017-11-18	220	312	282	4	2	20.19	40.38	24.06					
8	SO44544	2017-11-18	351	312	282	4	2	2024.99	4049.98	3796.19					
9	SO44544	2017-11-18	349	312	282	4	2	2024.99	4049.98	3796.19					
10	SO44544	2017-11-18	344	312	282	4	2	2039.99	4079.98	3824.31					
11	SO45321	2018-02-18	346	312	282	4	2	2039.99	4079.98	3824.31					
12	SO45321	2018-02-18	347	312	282	4	2	2039.99	4079.98	3824.31					
13	SO46082	2018-05-23	220	312	282	4	2	20.19	40.38	24.06					
14	SO46082	2018-05-23	346	312	282	4	2	2039.99	4079.98	3824.31					
15	SO46082	2018-05-23	345	312	282	4	2	2039.99	4079.98	3824.31					
16	SO46082	2018-05-23	232	312	282	4	2	28.84	57.68	63.45					
17	SO46082	2018-05-23	344	312	282	4	2	2039.99	4079.98	3824.31					
18	SO46082	2018-05-23	348	312	282	4	2	2024.99	4049.98	3796.19					
19	SO46082	2018-05-23	212	312	282	4	2	20.19	40.38	24.06					
20	SO47028	2018-08-24	410	312	282	4	2	36.45	72.9	53.94					
21	SO47028	2018-08-24	464	312	282	4	2	14.13	28.26	19.43					
22	SO47028	2018-08-24	412	312	282	4	2	180.13	360.26	266.59					
23	SO47028	2018-08-24	420	312	282	4	2	141.62	283.24	209.59					

Step 2: Load the data from the Excel workbook.

- Load the data from the Excel sheet into Power BI. Ensure you load all tables in the workbook.
- Open a preview of the table in the Preview pane.
- Tip: You can import data using the Get Data drop-down menu.

Step 3: Configure a Star Schema.

- Once the data is loaded to Power BI, Identify the main fact table in your dataset and determine the unique identifier for the fact table.
- Identify the related dimension tables within your dataset and determine the unique identifiers for each dimension table.
- Establish relationships between the fact and dimension tables based on the common fields.
- Tip: You can create a data model in the Model view of Power BI desktop. If Power BI autodetects the table relationships (as in most cases), you need to delete the existing relationships before you create new ones.
- Next, configure the relationships. For example, establish cardinality type and cross-filter direction between the Fact and dimension tables.

2. Review the data type and formats of the columns and adjust them if necessary.
Apply any necessary transformation to prepare the data for analysis, if needed
(Note that this step is optional).
 - Tip: You can configure relationships in the Edit Relationship dialog box and apply any required transformations in the Power Query editor.

Step 4: Save the Power BI Project.

- Save your Star schema project to your local computer.
- Tip: Select an appropriate project name and folder path for your schema.

Conclusion

Congratulations! You have successfully configured a Star schema for the Adventure Works dataset in Microsoft PowerBI. This new data model should now provide an efficient structure for querying and reporting on the data.

In addition, the knowledge you've gained through this exercise empowers you to tackle complex datasets, uncover meaningful insights, and deliver impactful reports and visualizations to drive informed decision-making.

Exemplar: Configuring a Star schema

Overview

In the exercise *Configuring a Star schema*, you were asked to put into practice your knowledge of data models by configuring a Star schema.

Your tasks in this exercise were to:

- Download the required dataset.
- Load the dataset into Power BI.
- Configure the dataset as a Star schema.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

You can review the techniques for configuring a Star schema in the video [Setting up a Star schema in Power BI](#).

Power BI Desktop User Interface

While reviewing these steps, you may see changes in the user interface (UI). Power BI Desktop is updated and released monthly, incorporating customer feedback and new features.

You might experience changes in the Power BI Desktop UI that have taken place after the development of this training content. As a result, the screenshots in the videos, readings, or exercises might not align exactly with how you experience the UI.

However, please note that these changes do not impact the functionalities of the UI. This means you can still perform all the steps shown in that video, reading, or exercise.

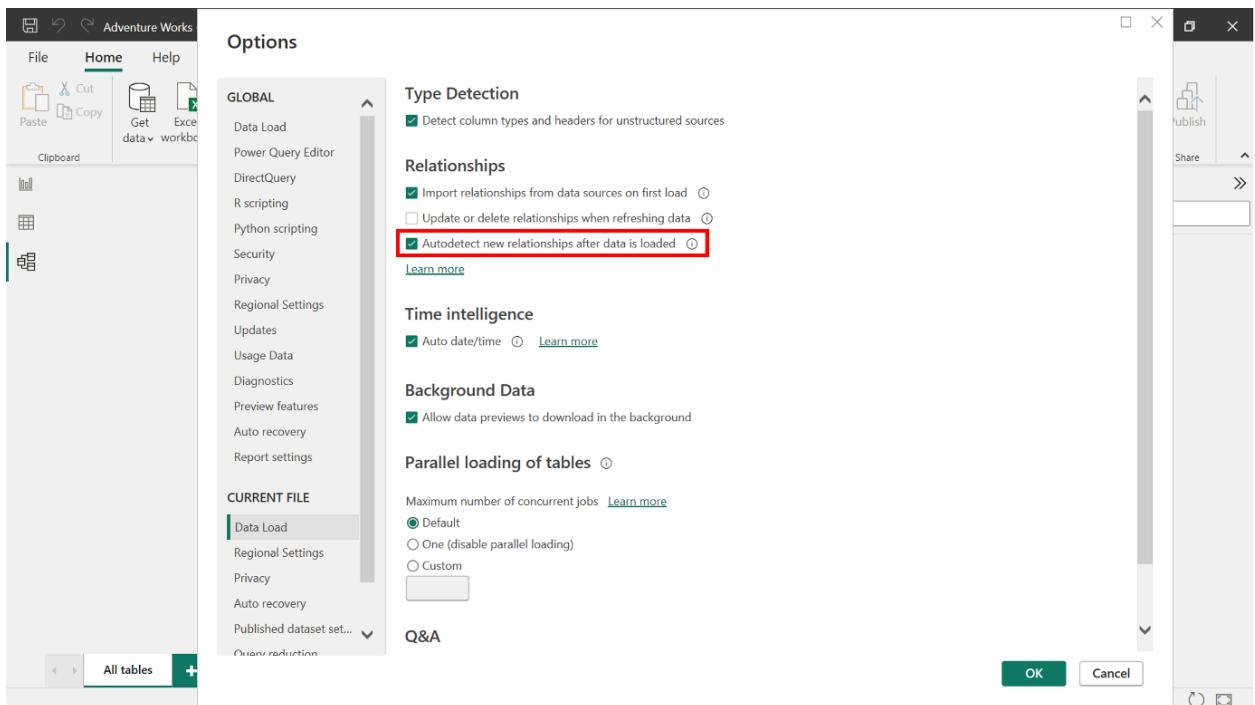
Step 1: Download the dataset and disable autodetect relationships in Power BI.

1. Download the Adventure Works Data.xlsx workbook from the exercise page on the Coursera platform.

The screenshot shows a Microsoft Excel spreadsheet titled "Adventure Works Data". The table has the following structure:

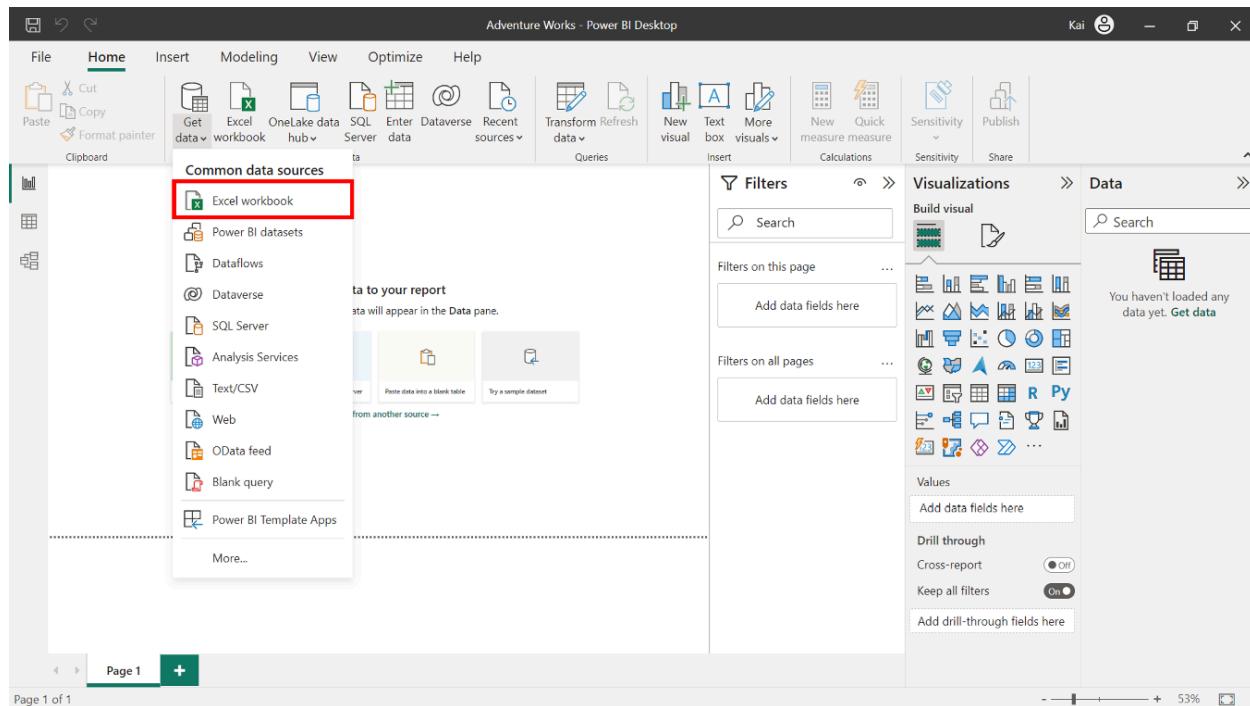
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Sales	Cost					
2	SO43897	2017-08-25	235	312	282	4	2	28.84	57.68	63.45					
3	SO43897	2017-08-25	351	312	282	4	2	2024.99	4049.98	3796.19					
4	SO43897	2017-08-25	348	312	282	4	2	2024.99	4049.98	3796.19					
5	SO43897	2017-08-25	232	312	282	4	2	28.84	57.68	63.45					
6	SO44544	2017-11-18	292	312	282	4	2	818.7	1637.4	1413.62					
7	SO44544	2017-11-18	220	312	282	4	2	20.19	40.38	24.06					
8	SO44544	2017-11-18	351	312	282	4	2	2024.99	4049.98	3796.19					
9	SO44544	2017-11-18	349	312	282	4	2	2024.99	4049.98	3796.19					
10	SO44544	2017-11-18	344	312	282	4	2	2039.99	4079.98	3824.31					
11	SO45321	2018-02-18	346	312	282	4	2	2039.99	4079.98	3824.31					
12	SO45321	2018-02-18	347	312	282	4	2	2039.99	4079.98	3824.31					
13	SO46082	2018-05-23	220	312	282	4	2	20.19	40.38	24.06					
14	SO46082	2018-05-23	346	312	282	4	2	2039.99	4079.98	3824.31					
15	SO46082	2018-05-23	345	312	282	4	2	2039.99	4079.98	3824.31					
16	SO46082	2018-05-23	232	312	282	4	2	28.84	57.68	63.45					
17	SO46082	2018-05-23	344	312	282	4	2	2039.99	4079.98	3824.31					
18	SO46082	2018-05-23	348	312	282	4	2	2024.99	4049.98	3796.19					
19	SO46082	2018-05-23	212	312	282	4	2	20.19	40.38	24.06					
20	SO47028	2018-08-24	410	312	282	4	2	36.45	72.9	53.94					
21	SO47028	2018-08-24	464	312	282	4	2	14.13	28.26	19.43					
22	SO47028	2018-08-24	412	312	282	4	2	180.13	360.26	266.59					
23	SO47028	2018-08-24	420	312	282	4	2	141.62	283.24	209.59					

- To disable autodetect functionality, select File, then Options and Settings, and select Options. This opens the Options dialog box.
- On the left bar of the dialog box, select Data Load and then deselect Autodetect new relationships after the data is loaded. Then select OK.



Step 2: Load the data from the Excel workbook.

1. Launch Power BI desktop and create a new project. To create a new project, select the File menu, then select New.
2. Import the Adventure Works dataset that you have downloaded. In the Home tab, select the Get Data drop-down menu. Then select an appropriate data source.
3. For the current exercise, select Excel Workbook and navigate to the folder containing the Adventure Works dataset.



1. Once you select and load the data, Power BI opens a Navigator dialog box that enlists all the tables available to load in the Excel file and the data preview on the right side of the Navigator.
2. Select the Sales, Product, Region, and Salesperson tables, then select Load.

The screenshot shows the Power BI desktop interface. The left sidebar has a 'Clipboard' icon. The top menu bar includes 'File', 'Home' (selected), and 'Help'. The 'Navigator' pane on the left lists 'Adventure Works Data.xlsx [8]' with four tables selected: 'Product', 'Region', 'Sales', and 'Salesperson'. The main area displays the 'Salesperson' table with columns: EmployeeKey, EmployeeID, Salesperson, and Title. The table contains 296 rows of salesperson data. The bottom right of the interface shows a status bar with '108%' and a battery icon.

1. You can view the loaded dataset on Power BI desktop by selecting the Data view option from the left sidebar of the interface.

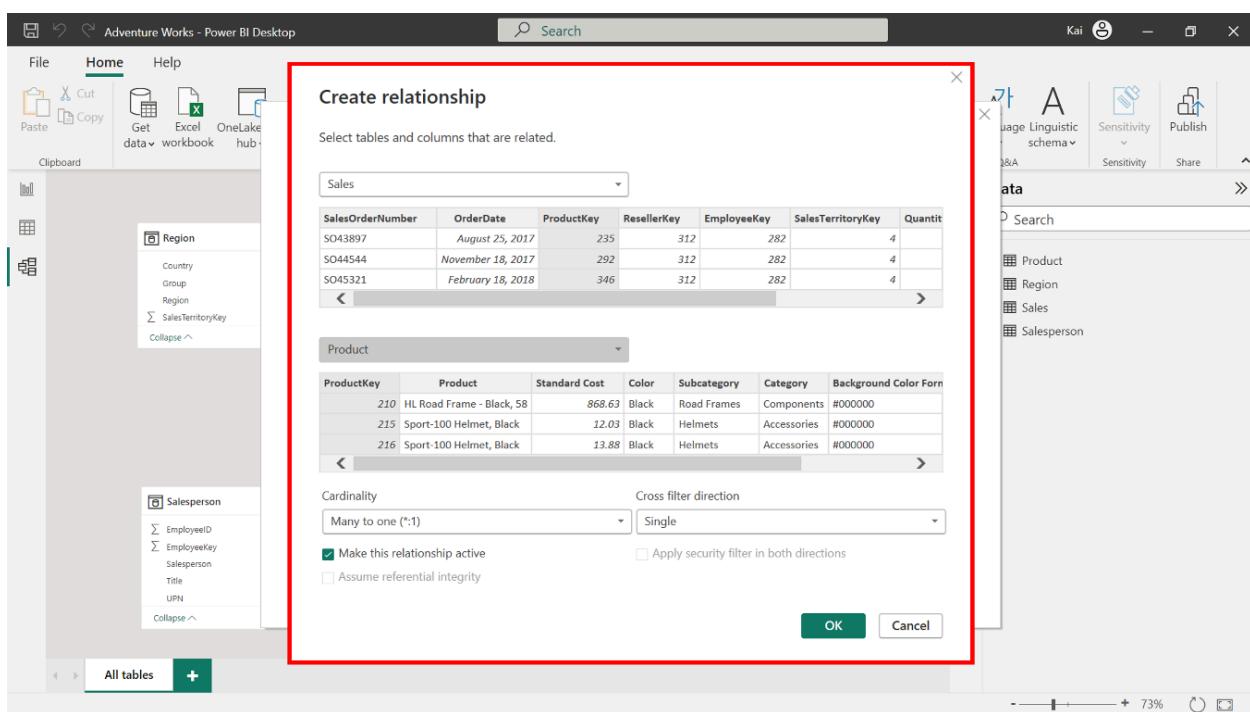
Step 3: Configure a Star schema.

1. A unique identifier is usually an ID column or key column within the data table. Once you select a column, Power BI displays the total number of rows at the bottom left corner of the interface with unique values. For the ID column, the number of rows and unique values should be the same.
2. In the Adventure Works dataset, the Sales table is the fact table that records transactional details.

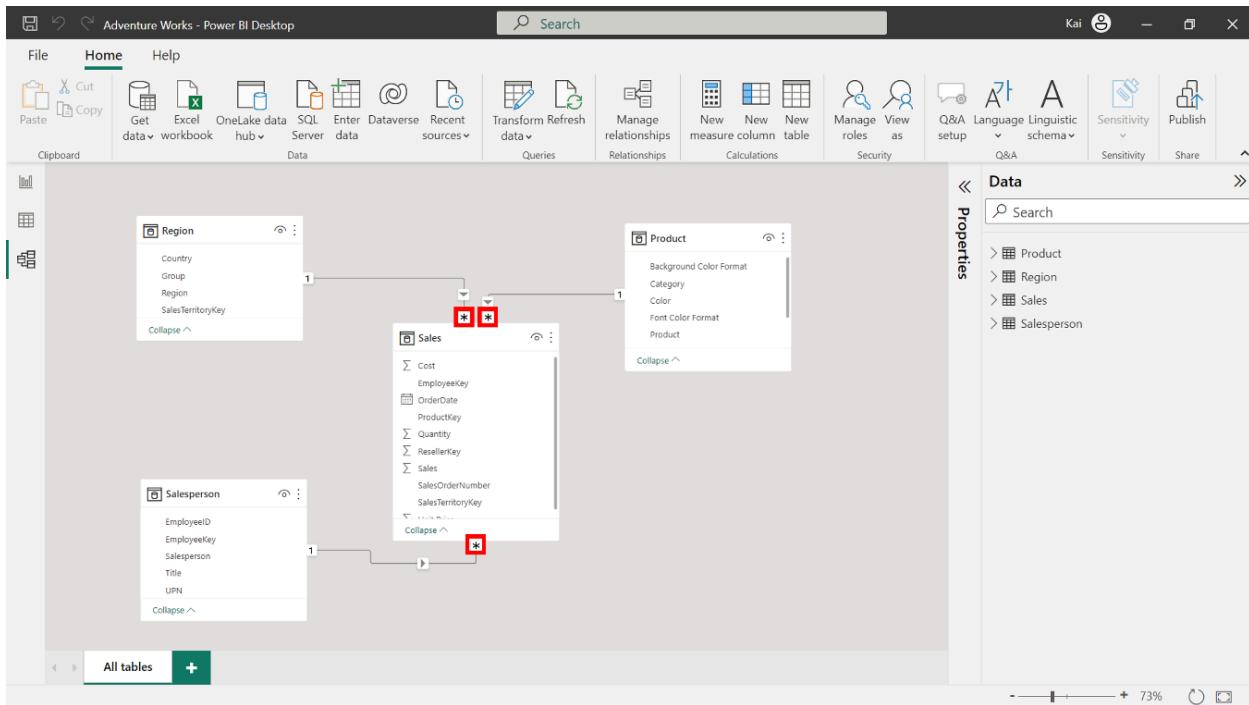
Table: Sales (57,851 rows) Column: SalesOrderNumber (3,616 distinct values)

1. The Products, Region, and Salesperson tables are the dimension tables. To determine the unique identifier, check the total number of rows at the bottom left corner of the interface with unique values.

1. To create the schema and the model relationships between the fact table and the dimension tables, select Model view on the left sidebar of Power BI desktop.
2. You must establish relationships between the fact and dimension tables in the Model view. Select and drag the foreign key fields from the fact table to their corresponding primary key fields in the dimension tables.
3. Connect Sales.ProductKey to Products.ProductKey, then Sales.SalesTerritoryKey to Region.SalesTerritoryKey, and finally, Sales.EmployeeKey to Salesperson.EmployeeKey.
4. Alternatively, you can build relationships using the Create Relationship dialog box. Access the dialog box by selecting Manage Relationship in the Model view of Power BI desktop.



1. Once the relationships are established, double-check to ensure each type is a many-to-one relationship. Select the connector line between the tables to open the Edit Relationship dialog box. Here you can verify that the cardinality is set to Many-to-One and that the cross-filter direction is set to Single.



Step 4: Save the Power BI project.

1. To save the project, open the File menu, select Save As and provide an appropriate name for the project along with a path to the folder on your local machine.

Conclusion

Upon completing these steps, you will have successfully configured a Star schema for the Adventure Works dataset, allowing for easier analysis and reporting of the sales data.

1.4. Activity: Changing your Star schema into a Snowflake schema

Introduction

In this lesson, you discovered how to work with advanced data models in Power BI, including Star and Snowflake schemas. In this exercise, you must apply your knowledge of these advanced data models by changing a Star schema into a Snowflake schema.

- You'll walk through the steps to convert a Star schema into a Snowflake schema in Power BI using a real-world example of Adventure Works.
- The goal is to change the schema type so Adventure Works can perform more accurate data analysis and visualization.

Case study

Adventure Works has created a Star schema to store its sales data. However, the Star schema poses several issues with data analysis and visualization. A solution to these issues is to change the schema to a Snowflake schema. A Snowflake schema will create a more complex structure, leading to better performance and easier maintenance.

Adventure Works provides you with an Excel file called *Adventure Works Data*. The Excel file contains four tables. These tables are called Sales, Product, Region, and Salesperson.

Step 1: Open the Power BI project you created in the previous exercise, *Configuring a Star schema*.

- Access the project from the file path in which it was saved and open it in Power BI.

The screenshot shows the Power BI desktop application. On the left, a dark sidebar menu includes options like 'New', 'Open report', 'Save', 'Save as', 'Get data', 'Import', 'Export', 'Publish', 'Options and settings', 'Get started', 'About', and 'Sign in'. The main area is titled 'Open report' and displays a message: 'You haven't opened any reports recently. Select Browse to open a report from your files.' A 'Browse reports' button is present. To the right, a data grid titled 'Data' shows a list of products with columns for 'Product Price' and 'Product Weight'. The data grid has a search bar at the top and a dropdown menu showing 'AdventureWorksData'. The data grid contains the following rows:

Product Price	Product Weight
1200	25 M
1200	25 M
1500	22 L
1500	22 L
1800	18 M
2100	16 L
1300	27 M
1600	24 L
2200	29 M
2500	27 L
1100	24 M
1400	21 L
1700	20 N
2000	18 L
1500	28 N
1800	26 L
2300	30 N
2600	28 L
1300	32 M
1600	29 L
1900	21 N
2200	19 L
2000	20 N

Step 2: Identify the dimension tables in the star schema that can be normalized further into related tables.

1. In the case of the Adventure Works star schema, two separate dimension tables can be normalized into look-up tables. These are Product and Region. You must normalize the Product table into Category and Subcategory tables to generate a Product hierarchy.

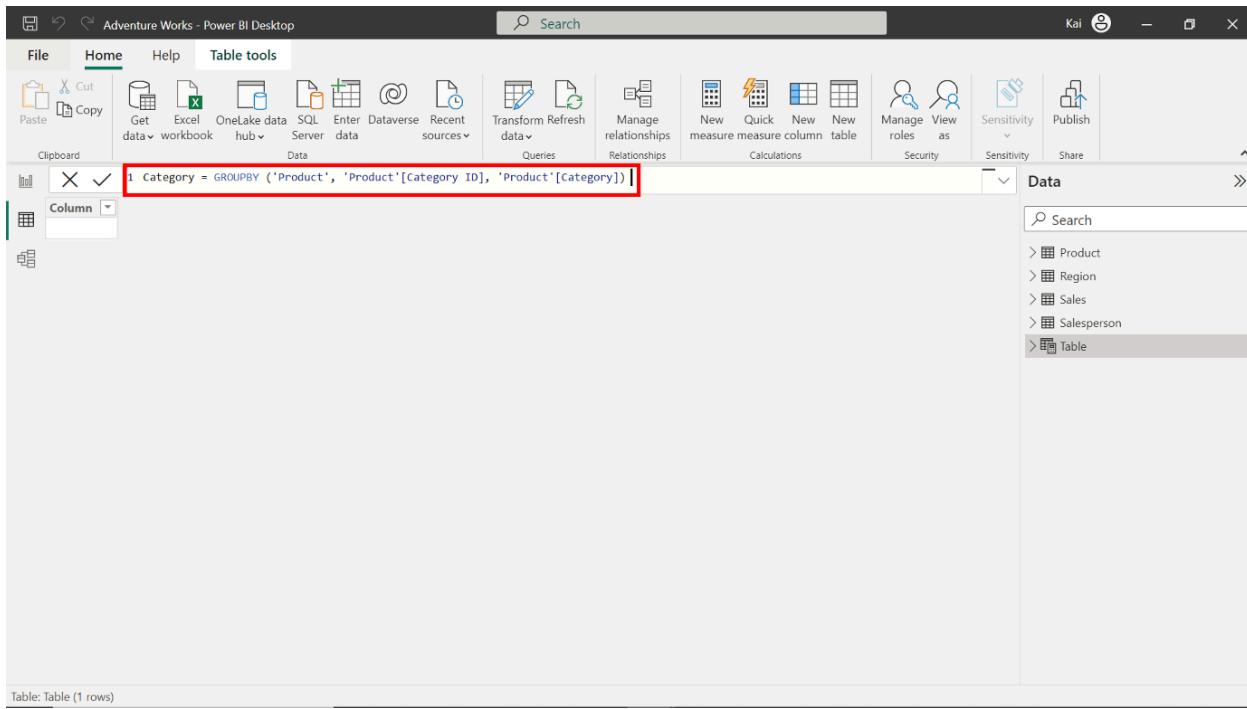
The screenshot shows the Power BI Desktop interface with the 'Data' view selected. A table titled 'Product' (397 rows) is displayed with columns: ProductKey, Product, Standard Cost, Color, Subcategory, Category, Background Color Format, Font Color Format, and Category K. A red box highlights the search bar and the dropdown menu next to it, which includes options like 'Product', 'Region', 'Sales', and 'Salesperson'.

In the Power BI Data view, within the Calculations group, select New Table. Copy and paste the following DAX codes in the formula bar to create a new Category table.

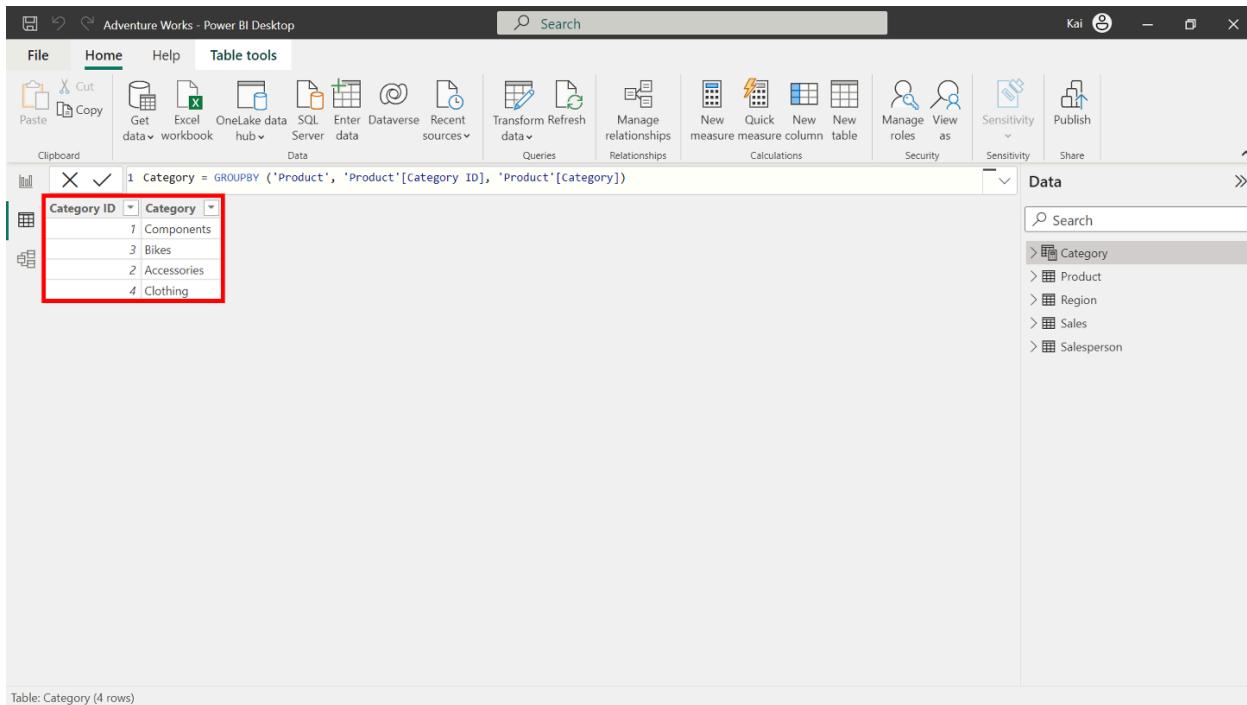
Tip: If you encounter an error with copy/paste, manually type the query.

1. You'll explore DAX in more detail in a later module.

Category = GROUPBY ('Product', 'Product'[Category ID],
'Product'[Category])



3. Once input, the DAX code generates a new table, as shown in the following image.



4. Repeat the same process to create a Subcategory table using the following DAX query.

Tip: If you encounter an error with copy/paste, manually type the query.

Subcategory = GROUPBY ('Product', 'Product'[Subcategory ID],
'Product'[Category ID], 'Product'[Subcategory])

1

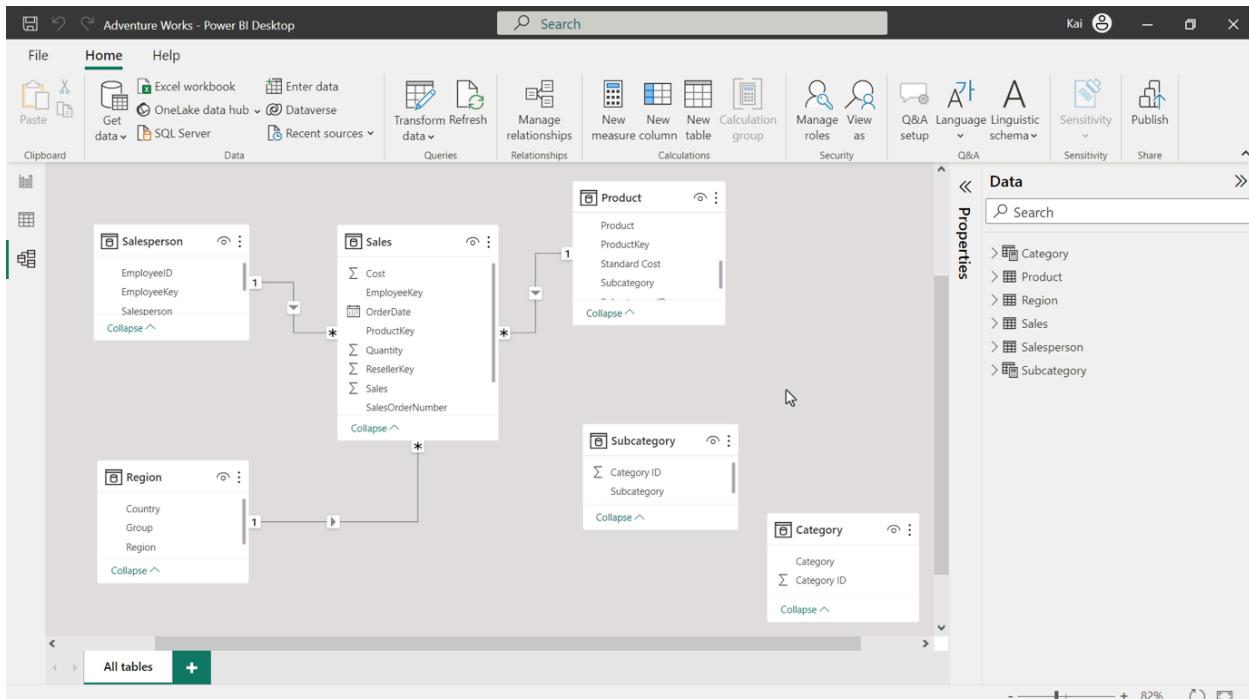
5. Once input, the DAX code generates a new table, as shown in the following image.

The screenshot shows the Power BI Desktop interface with the ribbon menu at the top. The 'Home' tab is selected. In the center, there is a table view showing data with three columns: Subcategory ID, Category ID, and Subcategory. The data consists of 37 rows, each containing a Subcategory ID (ranging from 1 to 23), a Category ID (ranging from 1 to 4), and a corresponding product name. To the right of the table, a 'Data' pane is open, displaying a list of available tables: Category, Product, Region, Sales, Salesperson, and Subcategory. The 'Subcategory' table is currently selected. The status bar at the bottom indicates 'Table: Subcategory (37 rows)'.

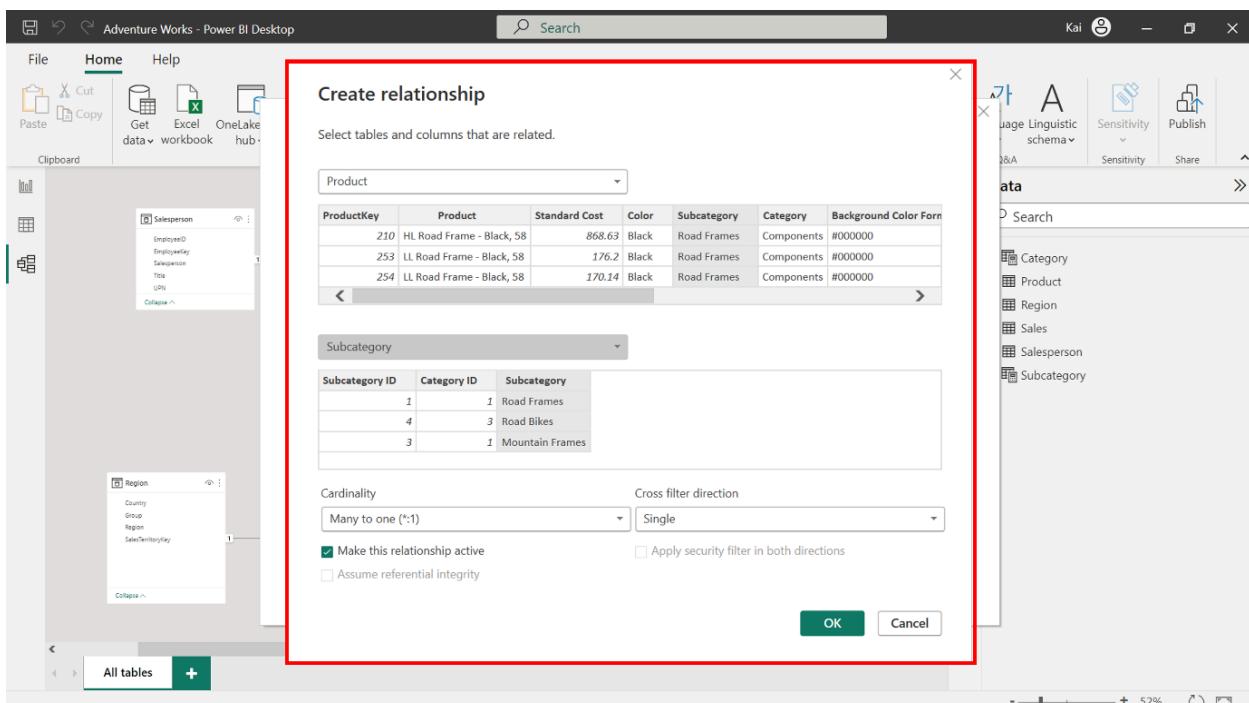
Subcategory ID	Category ID	Subcategory
1	1	Road Frames
4	3	Road Bikes
3	1	Mountain Frames
5	3	Mountain Bikes
2	2	Helmets
6	1	Wheels
7	4	Shorts
8	4	Tights
9	4	Gloves
10	1	Cranksets
11	4	Socks
12	4	Caps
13	4	Jerseys
14	1	Forks
15	1	Headsets
16	1	Handlebars
17	2	Panniers
18	2	Locks
19	2	Pumps
20	2	Lights
21	4	Bib-Shorts
22	4	Vests
23	2	Bottles and Cages

Step 3: Configure the Snowflake schema.

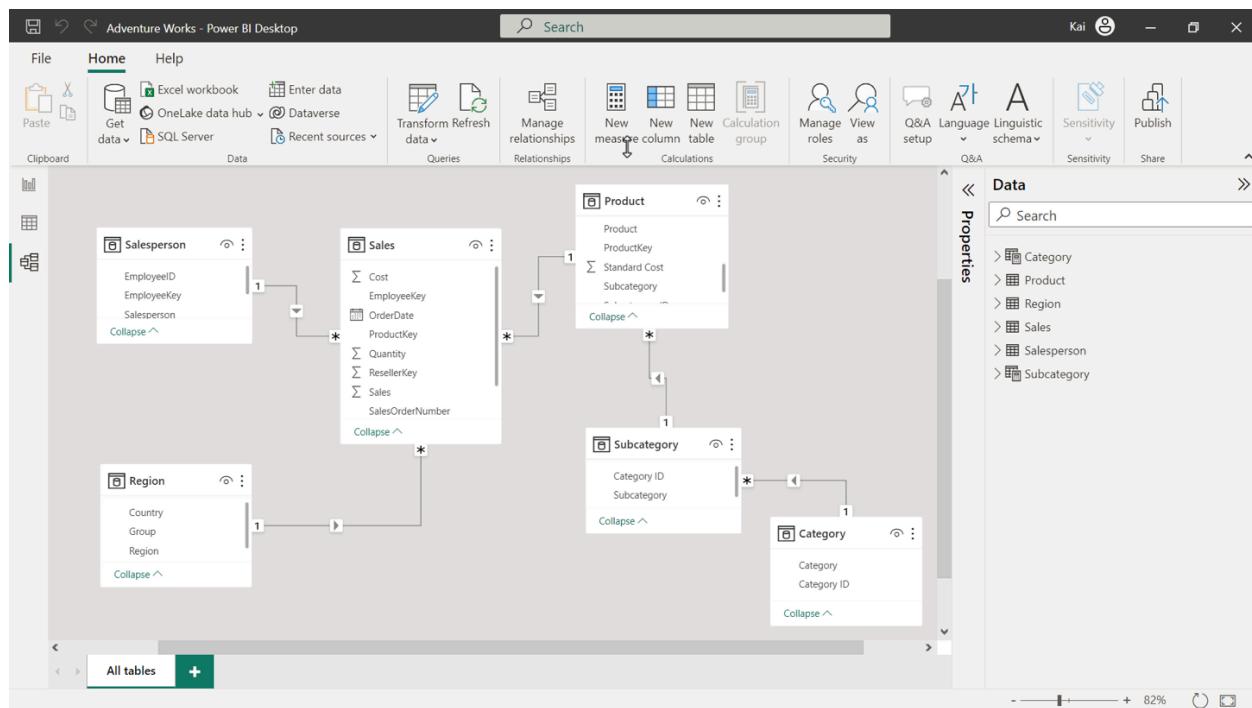
1. Once you finish creating new tables, Power BI attempts to autodetect and establish the relationships between these newly created tables and the already-existing tables. If relationships were automatically created, you need to remove these relationships. Select and right-click the relationship connector, then select delete.



1. Create relationships between the Product table and Subcategory tables based on the Subcategory ID. Create further relationships between the Category and Subcategory tables based on the Category ID. You can create new relationships from the model view of Power BI desktop by selecting Manage relationships in the Home tab of the top Ribbon menu.



- To configure these relationships, access the Manage relationships dialog box from the Model view of Power BI desktop. Make sure the cardinality for each relationship is set to Many-to-one and that all cross-filter directions are set to Single. These new relationships create a Product hierarchy. Any filter applied to the Category table now propagates to the Sales fact table to compute the Sales figures based on each Product category. This helps to analyze top-performing product categories and make strategic decisions.



Step 4: Save the project.

- Save the Snowflake schema as a new project. Ensure to provide an appropriate name and path to the folder on your local computer.

Conclusion

Congratulations! You have successfully migrated a Star schema to a Snowflake schema in Microsoft PowerBI using the Adventure Works database. This new schema will allow for better performance and easier maintenance of your data model.

As an entry-level data analyst, mastering these techniques will help you build efficient and scalable data models for your organization.

2.1. Exercise: Adding a calculated table and column

Introduction

You should now understand how to use DAX formulas and functions in Power BI to create calculated tables and columns.

In this exercise, you'll apply your knowledge of DAX to add a calculated table and column to an existing dataset.

By completing this exercise, you'll demonstrate your ability to:

- Create a calculated table from the existing dataset within your data model.
- Add calculated columns to a specific table within the dataset.
- Ensure data standardization and consistency.

Scenario

Adventure Works needs your help to analyze its sales data to generate insights into its sales performance. However, you must analyze the company's data without altering the original dataset. You must also create summary tables and normalize dimension tables for analysis.

The company provides you with an Excel workbook called *AdventureWorksData.xlsx*. You must download this file and load it to Power BI to complete your assigned task. Be sure to evaluate the data quality and configure the model to ensure that Adventure Works can use it to make informed decisions.

Instructions

Create a new Power BI project called *Exercise – Adding a calculated column and table*. Follow the steps below to complete the exercise.

Step 1: Download and connect to the Adventure Works Dataset.

1. Download and save the Excel workbook *AdventureWorksData.xlsx*. The workbook contains five data tables: Sales, Date, Products, Region, and Salesperson.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Cost						
2	SO43897	2017-08-25	235	312	282	4	2	28.84	63.45						
3	SO43897	2017-08-25	351	312	282	4	2	2024.99	3796.19						
4	SO43897	2017-08-25	348	312	282	4	2	2024.99	3796.19						
5	SO43897	2017-08-25	232	312	282	4	2	28.84	63.45						
6	SO44544	2017-11-18	292	312	282	4	2	818.7	1413.62						
7	SO44544	2017-11-18	220	312	282	4	2	20.19	24.06						
8	SO44544	2017-11-18	351	312	282	4	2	2024.99	3796.19						
9	SO44544	2017-11-18	349	312	282	4	2	2024.99	3796.19						
10	SO44544	2017-11-18	344	312	282	4	2	2039.99	3824.31						
11	SO45321	2018-02-18	346	312	282	4	2	2039.99	3824.31						
12	SO45321	2018-02-18	347	312	282	4	2	2039.99	3824.31						
13	SO46082	2018-05-23	220	312	282	4	2	20.19	24.06						
14	SO46082	2018-05-23	346	312	282	4	2	2039.99	3824.31						
15	SO46082	2018-05-23	345	312	282	4	2	2039.99	3824.31						
16	SO46082	2018-05-23	232	312	282	4	2	28.84	63.45						
17	SO46082	2018-05-23	344	312	282	4	2	2039.99	3824.31						
18	SO46082	2018-05-23	348	312	282	4	2	2024.99	3796.19						
19	SO46082	2018-05-23	212	312	282	4	2	20.19	24.06						
20	SO47028	2018-08-24	410	312	282	4	2	36.45	53.94						
21	SO47028	2018-08-24	464	312	282	4	2	14.13	19.43						
22	SO47028	2018-08-24	412	312	282	4	2	180.13	266.59						
23	SO47028	2018-08-24	420	312	282	4	2	141.62	209.59						

- Load the data from the Excel sheet into Power BI. Ensure you load all tables in the workbook.
- Open a preview of the table in the Preview pane.
 - Tip: You can import data using the Get Data drop-down menu.

Step 2: Remove all duplicate values and set the relationships between the tables.

- Remove all duplicate values from the SalesOrderNumber column of the Sales fact table.
- Ensure that one-to-many relationships exist between the fact table and all dimension tables. Once you load the data, Power BI will establish the table relationships automatically. If any relationship is missing, create it manually.
 - Tip: You can view and configure model relationships in Model view of Power BI desktop. You can create and edit relationships in Manage Relationship view of Power BI desktop.

Step 3: Create a calculated table.

- Create a new calculated table called Yearly Sales by Color that contains the following data:
 - All data from the Sales table,
 - All Product Colordata from the Product table,

- And all Yearly values from the Date table.
1. Note down the total number of columns in the table.

Tip: Create the calculated table using the ADDCOLUMNS and RELATED DAX functions.

ADDCOLUMNS: Adds calculated columns to the given table or table expression. You can add columns to the Sales table from the Date and Product table.

Syntax: ADDCOLUMNS(<table>, <name>, <expression>[, <name>, <expression>]...)

RELATED: Returns a related value from another table. You need to use this function to add Product color from the Product table and Year information from the Date table to the Sales table to create a new calculated table.

- Syntax: RELATED(<column>)

Step 4: Create calculated columns.

1. Create a calculated column in the Date table called Qtr and populate it with data for each quarter of the year.
 2. Create a second calculated column in the Date table called Month and populate it with the name of each month(Display each month's name as just the first three letters of each month's name).
 3. Create a calculated column in the Sales table for Product Color.
- Tip: You can create columns using the New column feature from the table tools tab of Power BI's desktop interface, along with the RELATED, MONTH, and QUARTER DAX functions. You can use the MONTH DAX function to display each month's name.

Step 5: Save your Power BI project.

- Save your Power BI project to your local computer.
- Tip: Make sure you select an appropriate project name and folder path.

Conclusion

By completing these steps, you've successfully created a calculated table by combining data from multiple datasets and user-defined columns using DAX. You can now analyze Adventure Works data based on the analytical and business requirements.

When using DAX formulas, always ensure they are correctly formatted and that the column names match the actual column names in your data.

Exemplar: Adding a calculated table and column

Overview

In the exercise *Adding a calculated table and column*, you were asked to create new calculated tables and columns using DAX within your data model to address specific analytical and visualization concerns.

Your tasks in this exercise were to:

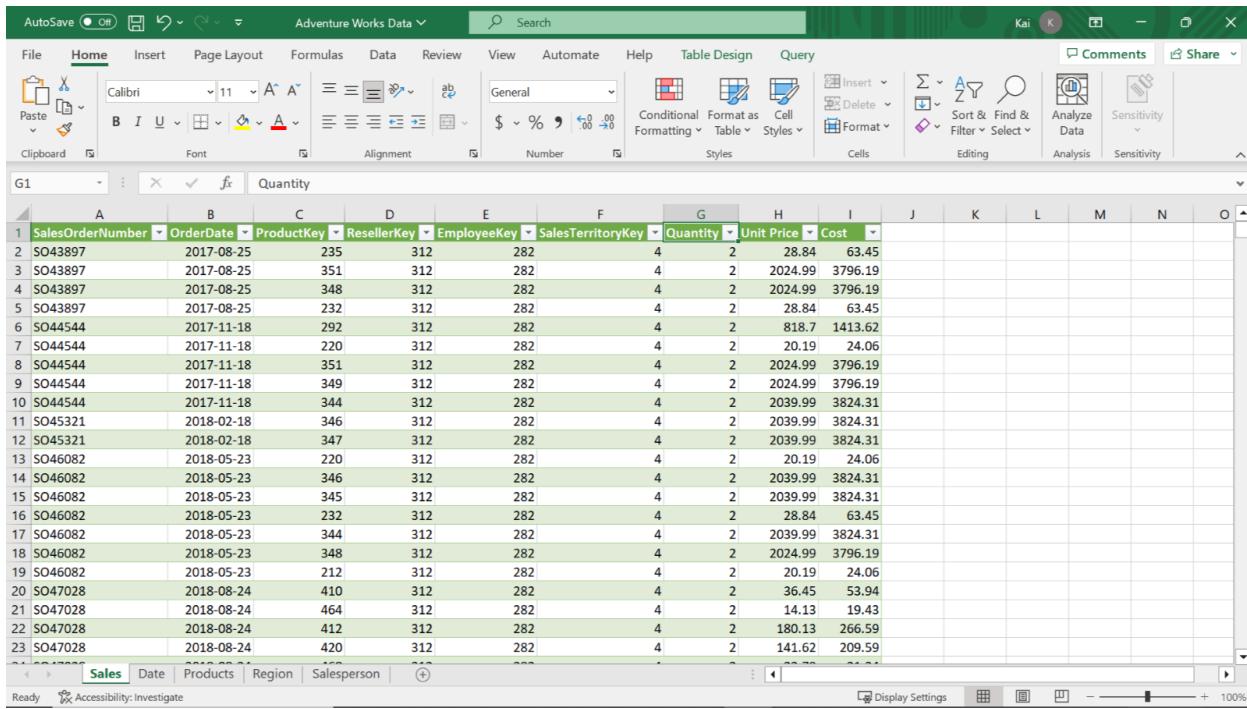
- Create a calculated table from the existing dataset within your data model.
- Add calculated columns to a specific table within the dataset.
- Ensure data standardization and consistency.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

You can also review the [*Introduction to calculated tables*](#) and [*Creating calculated columns*](#) videos for guidance on using DAX in Power BI.

Step 1: Download and connect to the Adventure Works Dataset.

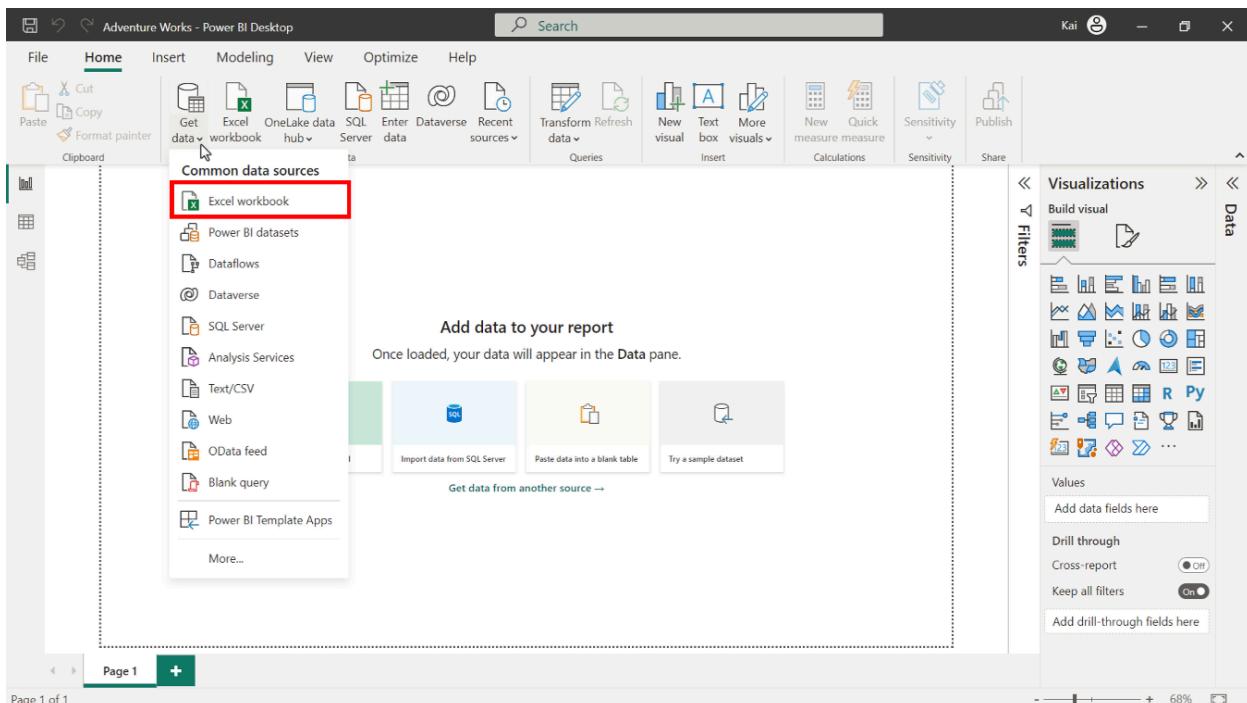
1. Download the workbook from the exercise page on the Coursera platform.



The screenshot shows a Microsoft Excel spreadsheet titled "Adventure Works Data". The "Home" tab is selected. The table has the following structure:

	SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Cost
2	SO43897	2017-08-25	235	312	282	4	2	28.84	63.45
3	SO43897	2017-08-25	351	312	282	4	2	2024.99	3796.19
4	SO43897	2017-08-25	348	312	282	4	2	2024.99	3796.19
5	SO43897	2017-08-25	232	312	282	4	2	28.84	63.45
6	SO44544	2017-11-18	292	312	282	4	2	818.7	1413.62
7	SO44544	2017-11-18	220	312	282	4	2	20.19	40.06
8	SO44544	2017-11-18	351	312	282	4	2	2024.99	3796.19
9	SO44544	2017-11-18	349	312	282	4	2	2024.99	3796.19
10	SO44544	2017-11-18	344	312	282	4	2	2039.99	3824.31
11	SO45321	2018-02-18	346	312	282	4	2	2039.99	3824.31
12	SO45321	2018-02-18	347	312	282	4	2	2039.99	3824.31
13	SO46082	2018-05-23	220	312	282	4	2	20.19	40.06
14	SO46082	2018-05-23	346	312	282	4	2	2039.99	3824.31
15	SO46082	2018-05-23	345	312	282	4	2	2039.99	3824.31
16	SO46082	2018-05-23	232	312	282	4	2	28.84	63.45
17	SO46082	2018-05-23	344	312	282	4	2	2039.99	3824.31
18	SO46082	2018-05-23	348	312	282	4	2	2024.99	3796.19
19	SO46082	2018-05-23	212	312	282	4	2	20.19	40.06
20	SO47028	2018-08-24	410	312	282	4	2	36.45	53.94
21	SO47028	2018-08-24	464	312	282	4	2	14.13	19.43
22	SO47028	2018-08-24	412	312	282	4	2	180.13	266.59
23	SO47028	2018-08-24	420	312	282	4	2	141.62	209.59

1. Launch Power BI desktop. To create a new project, select the File menu, then select New. Import the Adventure Works dataset that you have downloaded. In the Home tab, select the Get Data drop-down menu. Then select an appropriate data source. For the current exercise, select Excel Workbook and navigate to the Adventure Works dataset folder.



The screenshot shows the Power BI Desktop interface with the "Home" tab selected. The "Get data" section is open, and the "Excel workbook" option is highlighted with a red box. The central area displays the message "Add data to your report" and provides options to "Import data from SQL Server", "Paste data into a blank table", or "Try a sample dataset". The "Visualizations" pane on the right shows various chart and table icons.

3. Once you select and load the data, Power BI opens a Navigator dialog box that lists all the tables available to load in the Excel file, along with the data preview on the right side of the Navigator. Select the Sales, Product, Region, Date, and Salesperson tables, then select Load.

The screenshot shows the Power BI Navigator dialog box. On the left, there's a list of tables from the 'Adventure Works Data.xlsx' file, including Table_Region, Table_Sales, Table_Salesperson, Table2, Table6, Date, Products, Region, Sales, and Salesperson. The 'Salesperson' table is currently selected and previewed on the right. The preview table has columns: EmployeeKey, EmployeeID, Salesperson, and Title. The data shows various salespeople with their titles like 'North American Sales Manager', 'Director of Sales', etc. At the bottom of the dialog, there are 'Load', 'Transform Data', and 'Cancel' buttons. To the right of the preview, there's a 'Visualizations' pane with various chart and report icons, and a 'Data' pane with settings for drill-through, cross-report, and keep filters.

EmployeeKey	EmployeeID	Salesperson	Title
272	502097814	Stephen Jiang	North American Sales Manager
277	112432117	Brian Welcker	Director of Sales
281	841560125	Michael Blythe	Sales Representative
282	191644724	Linda Mitchell	Sales Representative
283	615389812	Jillian Carson	Sales Representative
284	234474252	Garrett Vargas	Sales Representative
285	716374314	Tsvi Reiter	Sales Representative
286	61161660	Pamela Anisman-Wolfe	Sales Representative
287	139397894	Shu Ito	Sales Representative
288	399771412	José Saraiva	Sales Representative
289	987554265	David Campbell	Sales Representative
290	982310417	Amy Alberts	European Sales Manager
291	668991357	Jae Pak	Sales Representative
292	134219713	Ranjit Varkey Chudukatil	Sales Representative
293	90836195	Tete Mensa-Annan	Sales Representative
294	481044938	Syed Abbas	Pacific Sales Manager
295	954276278	Rachel Valdez	Sales Representative
296	758596752	Lynn Tsoflias	Sales Representative

Step 2: Remove all duplicate values and set the relationships between the tables.

1. To eliminate all duplicate data, access the Power Query editor, right-click on the SalesOrderNumber columns, and select Remove duplicates from the drop-down menu.

The screenshot shows the Power Query Editor interface with the 'Sales' query selected. The 'Transform' tab is active. A context menu is open over the 'OrderDate' column, listing various transformation steps. The 'Remove Duplicates' option is highlighted with a red box.

1. To configure the model relationships, access the Model view of Power BI desktop and select Manage relationships. From here, you can edit cardinality and cross-filter direction between the tables.

The screenshot shows the Power BI Desktop interface in the Model view. The 'Data' ribbon tab is selected. The 'Relationships' button in the Data ribbon is highlighted with a red box. In the main area, a relationship between the 'Sales' and 'Date' tables is selected, and its properties are displayed in the Properties pane on the right.

Step 3: Create a calculated table.

- Access the Model view in the calculations group to create a new table. Select New table. Copy and paste the following DAX code into the formula bar:

```
Yearly Sales by color =  
ADDCOLUMNS (   
Sales,  
"Year", RELATED ( 'Date'[Year]),  
"Color", RELATED ( Products[Color]))
```

- ADDCOLUMNS:** Adds calculated columns to the given table or table expression. In this instance, the Sales table is the main table to which you need to add two more columns, one from the Date table and one from the Product table.
- Year and Color in double quotes are the names of the new columns to be added in the new calculated table.
- RELATED:** Returns a related value from another table. In this case, Product color values from the Product table and Year information from the Date table.

The screenshot shows the Power BI Desktop interface with the 'Model view' selected. The ribbon at the top has 'Table tools' selected. The 'Column tools' tab is active. In the formula bar, the DAX code for the calculated table is visible:

```
Yearly Sales by color =  
ADDCOLUMNS (   
Sales,  
"Year", RELATED ( 'Date'[Year]),  
"Color", RELATED ( Products[Color]))
```

The table below the formula bar is a preview of the calculated table. It contains the original columns from the Sales table (SalesOrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, SalesTerritoryKey, Quantity, Unit Price, Cost, Year) and two new columns: 'Color' and 'Year'. The 'Color' column shows values like Black, White, and Red. The 'Year' column shows values like 2017 and 2018. The preview shows 3,616 rows.

The Data pane on the right shows the structure of the calculated table, including the newly added columns and their relationships to other tables like Date and Products.

1. Note that the resulting table has 11 columns.

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon tab selected. A calculated column named 'Color' is being defined with the following DAX formula:

```
1 Yearly Sales by color = ADDCOLUMNS(
2   Sales, "Year", RELATED('Date'[Year]),
3   "Color", RELATED(Products[Color]))
```

The Data pane on the right shows the newly created 'Color' column under the 'Yearly Sales by color' table. The table contains 3,616 rows and 11 columns: SalesOrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, SalesTerritoryKey, Quantity, Unit Price, Cost, Year, and Color.

Step 4: Create calculated columns.

1. To create a new column, select the Date table from the Data pane on the right side of Power BI interface. Access Model view in the Calculations group and select New column. Copy and paste the following DAX code into the formula bar:

```
Qtr = QUARTER('Date'[Date])
```

- QUARTER: Returns each quarter as a number from the Date column.
- Date in single quotes is the table, and Date in square brackets is the column within the table.

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon tab selected. A new column named 'Qtr' is being defined, with the formula `1 Qtr = QUARTER('Date'[Date])`. The Data pane on the right displays the structure of the 'Date' table, which includes columns for Date, Year, Month, MonthNum, and the newly created Qtr column.

Date	Year	Month	MonthNum	Qtr
January 1, 2017	2017	January	1	1
January 2, 2017	2017	January	1	1
January 3, 2017	2017	January	1	1
January 4, 2017	2017	January	1	1
January 5, 2017	2017	January	1	1
January 6, 2017	2017	January	1	1
January 7, 2017	2017	January	1	1
January 8, 2017	2017	January	1	1
January 9, 2017	2017	January	1	1
January 10, 2017	2017	January	1	1
January 11, 2017	2017	January	1	1
January 12, 2017	2017	January	1	1
January 13, 2017	2017	January	1	1
January 14, 2017	2017	January	1	1
January 15, 2017	2017	January	1	1
January 16, 2017	2017	January	1	1
January 17, 2017	2017	January	1	1
January 18, 2017	2017	January	1	1
January 19, 2017	2017	January	1	1
January 20, 2017	2017	January	1	1
January 21, 2017	2017	January	1	1
January 22, 2017	2017	January	1	1
January 23, 2017	2017	January	1	1

1. Select the Date table from the Data pane on the right side of Power BI interface. Access Model view in the Calculations group and select New column. Copy and paste the following DAX code into the formula bar:

```
Short Month =LEFT ( 'Date'[Month], 3 )
```

- LEFT: Returns the specified number of characters from the start of a text string.
- Date in single quotes is the table to be referenced, and Month in square brackets is the column name. The number 3 specifies the number of characters in the short month column.

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon tab selected. A new column named 'Short Month' is being created, with the formula `= LEFT('Date'[Month], 3)`. The Data pane on the right displays the structure of the 'Date' table, which includes columns for Date, Year, Month, MonthNum, and Qtr.

- To create a new column, select the Product table from the Data pane on the right side of Power BI interface. Access Model view in the calculations group. Then select New column to expand the formula bar. Copy and paste the following DAX code into the formula bar:

```
Product Color = RELATED ( Products[Color] )
```

- RELATED here is the same as referencing a column from another table.

RELATED() does NOT work with a self-relationship (a table related to itself).

Power BI blocks RELATED() unless the relationship is **between two different tables** with a clear one-to-many direction. Use this formula instead:

```
Product Color =
LOOKUPVALUE (
    Products[Color],
    Products[ProductKey], Products[ProductKey]
)
```

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon tab selected. In the formula bar, there is a red box highlighting the formula '1 Product Color = RELATED(Products[Color])'. The main area displays a table with columns: OrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, SalesTerritoryKey, Quantity, Unit Price, Cost, and Product Color. The Product Color column contains values like Multi, Silver, Blue, Black, NA, and White. The Data pane on the right shows the structure of the table, including relationships to other tables like Products and Sales.

Step 5: Save your Power BI project.

- To save the project, open the File menu, select Save As, and provide an appropriate name for the project along with a path to the folder on your computer.

Conclusion

With these steps, you have successfully created a calculated table by combining data from multiple datasets and user-defined columns using DAX. You can now analyze Adventure Works data based on the analytical and business requirements.

Remember that when using DAX formulas, always ensure they are correctly formatted and that the column names match the actual column names in your data.

2.2. Exercise: Adding a measure

Introduction

You have gained a good understanding of measures and how to create them using DAX and using the quick measure feature of Power BI.

In this exercise, you must apply your knowledge of measures by writing DAX expressions in Power BI for Adventure Works. You go through each step of creating a new measure calculation within your data model to enhance the reporting visualization and answer specific business questions.

By completing this exercise, you will demonstrate your ability to:

- Create a quick measure from the existing dataset within your data model.
- Create a measure by writing DAX expression.
- Format the measures for an appropriate data type.

Scenario

Adventure Works needs your help calculating its sales data using quick measures and DAX. Its main objective is to compute the running total for sales of its product line. This accumulated data will help the company analyze its sales trend based on various factors, like time, categories, salespersons, and resellers. It can then use these insights to make informed decisions.

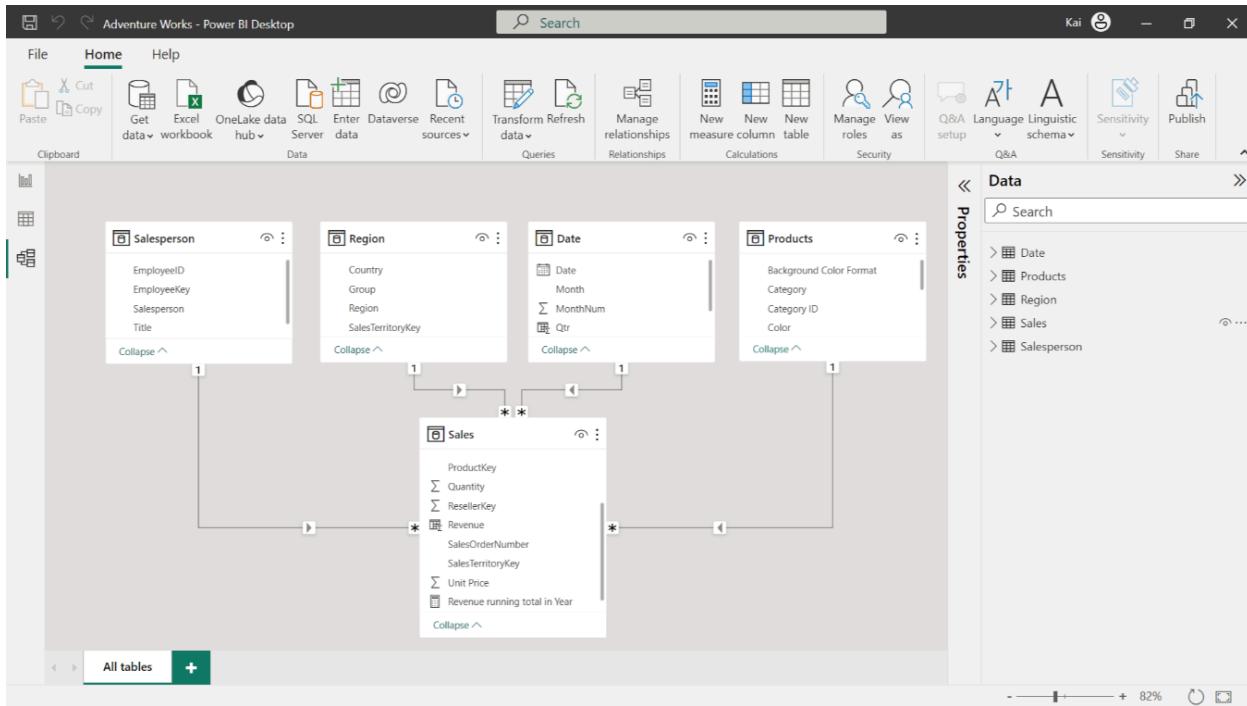
Adventure Works provides a Power BI project file called *AdventureWorks.pbix*. that contains the required data model. You must load this dataset into Power BI, evaluate the data quality, and configure the model to ensure that Adventure Works can use it to make informed decisions.

Instructions

Create a new Power BI project called *Exercise – Adding a measure*. Follow the steps below to complete the exercise.

Step 1: Download the Adventure Works Power BI project.

1. Download and save the Power BI project file Adventure Works.pbix. The file comprises a data model containing five data tables: Salesperson, Region, Date, Products and Sales.



Step 2: Create a Quick Measure.

1. Once the data is loaded into the data model, create a new quick measure called Running Total in Year to calculate the running total of Adventure Work's sales. You must create this measure using the Total Sales column from the Sales table and the Year column from the Date table.
2. Format the measure as currency data type within two decimal places.

Tip: You can create this measure by using Power BI's Quick Measure feature.

Step 3: Create a measure using a DAX query.

1. Create an additional measure in the Sales table called Total Revenue using a DAX query. The measure must calculate Adventure Work's total revenue by multiplying the Quantity of each product by its respective Unit Price.
2. Format the measure as currency data type within two decimal places.

Tip: You can create this measure using the SUMX DAX function in the formula bar of Power BI's desktop interface.

Step 4: Save the Power BI project.

Save your Power BI project to your local computer.

Tip: Make sure you select an appropriate project name and folder path.

Conclusion

With these steps, you have successfully created two measures, one using the quick measure feature and the second by writing a DAX query. These measures will help you analyze Adventure Works data based on the analytical and business requirements.

Remember that when using DAX formulas, always ensure they are correctly formatted and that the column names match the actual column names in your data.

Exemplar: Adding a measure

Overview

In the *Adding a Measure* exercise, you were asked to create new measures using Power BI's quick measures feature and to write a DAX query within your data model to address specific analytical and visualization concerns.

Your tasks in this exercise were to:

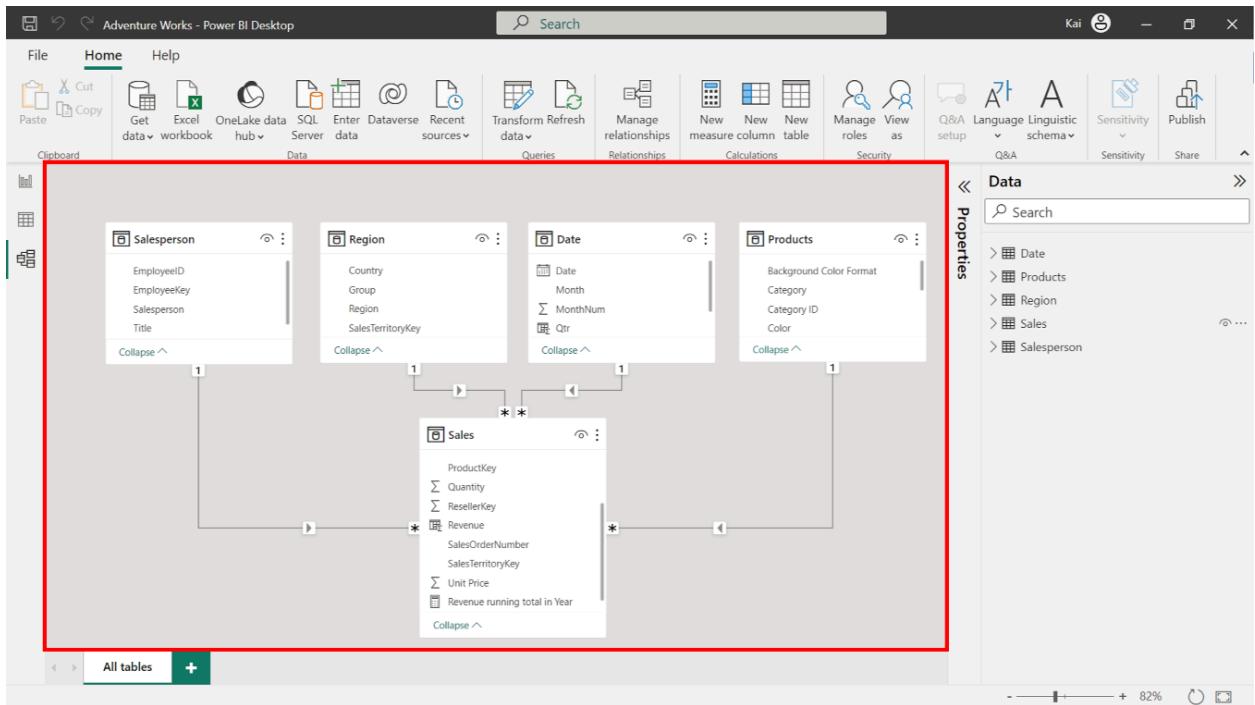
- Download and connect to the required dataset.
- Ensure the correct relationships are set between the tables.
- Create two measures within your data model from the existing datasets.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

You can also review [*Creating quick measures*](#) and [*Creating custom measures with DAX*](#) videos.

Step 1: Download and connect to the Adventure Works Dataset.

1. Download and save the Power BI project AdventureWorks.pbix from the Coursera platform. The model contains five tables of data: Salesperson, Region, Date, Products and Sales.
2. The Power BI project is already configured to remove duplicate values. As the following diagram outlines, you must ensure the model relationships are appropriately set with cardinality and cross-filter direction.



Step 2: Create a Quick Measure.

1. To create the Running total in Year quick measure, access the Data view, then Calculations group, and select Quick measure to open the Quick measure window.

Adventure Works Data - Power BI Desktop

File Home Help Table tools

Name Sales

Structure

Calendars Relationships New measure Quick measure New column New table Calculations

SalesOrderNumber OrderDate ProductKey ResellerKey EmployeeKey SalesTerritoryKey Quantity Unit Price Sales Cost

SO43897	August 25, 2017	235	312	282	4	2	28.84	57.68	63.45
SO44544	November 18, 2017	292	312	282	4	2	818.7	1637.4	1413.62
SO45321	February 18, 2018	346	312	282	4	2	2039.99	4079.98	3824.31
SO46082	May 23, 2018	220	312	282	4	2	20.19	40.38	24.06
SO47028	August 24, 2018	410	312	282	4	2	36.45	72.9	53.94
SO48049	November 19, 2018	401	312	282	4	2	65.6	131.2	97.09
SO49132	February 20, 2019	399	312	282	4	2	33.77	67.54	49.99
SO50294	May 25, 2019	356	312	282	4	2	1242.85	2485.7	2235.71
SO51845	August 27, 2019	591	312	282	4	2	338.99	677.98	616.44
SO57144	November 22, 2019	598	312	282	4	2	323.99	647.98	589.16
SO63283	February 27, 2020	483	312	282	4	2	72	144	89.76
SO69532	May 27, 2020	402	312	282	4	2	72.16	144.32	106.8
SO44113	September 23, 2017	218	187	282	4	2	5.7	11.4	6.79
SO44776	December 23, 2017	349	187	282	4	2	2024.99	4049.98	3796.19
SO45554	March 17, 2018	350	187	282	4	2	2024.99	4049.98	3796.19
SO46362	June 18, 2018	292	187	282	4	2	818.7	1637.4	1413.62
SO47417	September 18, 2018	421	187	282	4	2	196.33	392.66	290.57
SO48356	December 21, 2018	294	187	282	4	2	744.27	1488.54	1321.83
SO49472	March 8, 2019	354	187	282	4	2	1242.85	2485.7	2235.71
SO50702	June 14, 2019	366	187	282	4	2	647.99	1295.98	1196.87
SO53531	September 15, 2019	597	187	282	4	2	323.99	647.98	589.16
SO58975	December 13, 2019	355	187	282	4	2	1391.99	2783.98	2531.24
SO65209	March 10, 2020	551	187	282	4	2	158.43	316.86	289.19

Table: Sales (3,616 rows)

- Under the Calculations dropdown menu, select Running total from the Totals calculation group.

Adventure Works Data - Power BI Desktop

File Home Help Table tools

Name Sales

Structure

Calendars Relationships New measure Quick measure New column New table Calculations

SalesOrderNumber OrderDate ProductKey ResellerKey EmployeeKey SalesTerritoryKey

Quick measure

Select a calculation to create a measure or describe the measure you need and we'll generate suggestions in DAX, which you can customize later.

Calculations Suggestions with Copilot

Select a calculation

Quarter-over-quarter change
Month-over-month change
Rolling average

Totals

Running total

Total for category (filters applied)
Total for category (filters not applied)

Mathematical operations

Add

Subtraction

SO43897	August 25, 2017	235	312	282
SO44544	November 18, 2017	292	312	282
SO45321	February 18, 2018	346	312	282
SO46082	May 23, 2018	220	312	282
SO47028	August 24, 2018	410	312	282
SO48049	November 19, 2018	401	312	282
SO49132	February 20, 2019	399	312	282
SO50294	May 25, 2019	356	312	282
SO51845	August 27, 2019	591	312	282
SO57144	November 22, 2019	598	312	282
SO63283	February 27, 2020	483	312	282
SO69532	May 27, 2020	402	312	282
SO44113	September 23, 2017	218	187	282
SO44776	December 23, 2017	349	187	282
SO45554	March 17, 2018	350	187	282
SO46362	June 18, 2018	292	187	282
SO47417	September 18, 2018	421	187	282
SO48356	December 21, 2018	294	187	282
SO49472	March 8, 2019	354	187	282
SO50702	June 14, 2019	366	187	282
SO53531	September 15, 2019	597	187	282
SO58975	December 13, 2019	355	187	282
SO65209	March 10, 2020	551	187	282

Table: Sales (3,616 rows)

- Drag the Total Sales column from the Sales table and drop it over the base value section. Drag the Year column from the Date table and drop over the Field

section of the Quick measure dialog box. Retain the direction setting of Ascending.

The screenshot shows the Power BI Desktop interface with the 'Adventure Works Data' dataset loaded. The 'Home' tab is selected in the ribbon. A 'Quick measure' dialog box is open on the right side of the screen, overlaid on the main workspace. The dialog box has three main sections: 'Calculations' (selected), 'Suggestions with Copilot', and 'Base value'. The 'Base value' section contains a dropdown menu set to 'Total Sales' and a 'Field' dropdown menu set to 'Year'. Below these is a 'Direction' dropdown menu set to 'Ascending'. A red box highlights the 'Base value', 'Field', and 'Direction' sections. At the bottom right of the dialog box is a green 'Add' button. To the right of the dialog box is the 'Data' pane, which lists various columns from the Sales table, such as SalesOrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, and SalesTerritoryKey. The 'Total Sales' column is currently selected in the Data pane. The status bar at the bottom left indicates 'Table: Sales (3,616 rows) Column: Total Sales (256 distinct values)'.

1. Select Add to complete the addition of your new quick measure. A new Total Sales measure appears in the Data pane under the Sales table.

Select a calculation to create a measure or describe the measure you need and we'll generate suggestions in DAX, which you can customize later.

Calculations

Suggestions with Copilot

Running total

Calculate the running total over a measure in a specific field. [Learn more](#)

Base value

Total Sales

Field

Year

Direction

Ascending

Add

1. Power BI auto-generates the DAX code and names the measure as Total Sales running total in Year. Select the measure from the data pane, and in the formula bar, rename the measure as Running total in Year.

Name: Total Sales running ...

Format: General

Home table: Sales

Data category: Uncategorized

Properties

Structure

Formatting

Properties

Calculations

Total Sales running total in Year =

```

1. Total Sales running total in Year =
2. CALCULATE(
3.     SUM('Sales'[Total Sales]),
4.     FILTER(
5.         ALLSELECTED('Date'[Year]),
6.         ISONORAFTER('Date'[Year], MAX('Date'[Year]), DESC)
7.     )
8. )

```

SalesOrderNumber OrderDate ProductKey ResellerKey EmployeeKey SalesTerritoryKey Quantity Unit Price Total Sales Cost

SO43897 August 25, 2017 235 312 282 4 2 28.84 57.68 63.45

SO44544 November 18, 2017 292 312 282 4 2 818.7 1637.4 1413.62

SO45321 February 18, 2018 346 312 282 4 2 2039.99 4079.98 3824.31

SO46082 May 23, 2018 220 312 282 4 2 20.19 40.38 24.06

SO47028 August 24, 2018 410 312 282 4 2 36.45 72.9 53.94

SO48049 November 19, 2018 401 312 282 4 2 65.6 131.2 97.09

SO49132 February 20, 2019 399 312 282 4 2 33.77 67.54 49.99

SO50294 May 25, 2019 356 312 282 4 2 1242.85 2485.7 2235.71

SO51845 August 27, 2019 591 312 282 4 2 338.99 677.98 616.44

SO57144 November 22, 2019 598 312 282 4 2 323.99 647.98 589.16

SO63283 February 27, 2020 483 312 282 4 2 72 144 89.76

SO69532 May 27, 2020 402 312 282 4 2 72.16 144.32 106.8

SO44113 September 23, 2017 218 187 282 4 2 5.7 11.4 6.79

SO44776 December 23, 2017 349 187 282 4 2 2024.99 4049.98 3796.19

SO45554 March 17, 2018 350 187 282 4 2 2024.99 4049.98 3796.19

SO46362 June 18, 2018 292 187 282 4 2 818.7 1637.4 1413.62

SO47417 September 19, 2018 421 187 282 4 2 106.22 202.66 200.57

Table: Sales (3,616 rows) Column: Total Sales running total in Year (0 distinct values)

Data

Search

Date

Product

Region

Sales

Cost

EmployeeKey

OrderDate

ProductKey

Quantity

ResellerKey

SalesOrderNumber

SalesTerritoryKey

Total Sales

Unit Price

Salesperson

Total Sales running total in Year

1. While selecting the measure, access the Measure tools tab and format the measure as currency with two decimal places.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected in the ribbon. A red box highlights the 'Format' dropdown in the top left, which is set to 'Currency'. Below it, the decimal place selector is set to 2. The formula bar displays a DAX measure named 'Revenue running total in Year' with the following code:

```

1 Revenue running total in Year =
2 CALCULATE(
3     SUM('Sales'[Revenue]),
4     FILTER(
5         ALLSELECTED('Date'[Year]),
6         ISONORAFTER('Date'[Year], MAX('Date'[Year]), DESC)
7     )
8 )

```

The Data pane on the right shows the 'Sales' table with its columns: Cost, EmployeeKey, OrderDate, Product Color, ProductKey, Quantity, ResellerKey, Revenue, and SalesTerritoryKey. The 'Total Revenue' column is checked as a measure. A preview table is shown below the formula bar:

Year	Total Revenue	Revenue running total in Year
2017	\$590,924.06	\$590,924.06
2018	\$1,100,079.37	\$1,691,003.43
2019	\$1,212,477.17	\$2,903,480.60
2020	\$601,859.83	\$3,505,340.43
Total	3,505,340.43	\$3,505,340.43

Step 3: Create a measure using a DAX query.

1. To create a new measure in the Sales table for Total revenue, select the Sales table from the Data pane on the right side of Power BI's interface. Access the calculations group in the data view and select New measure to expand the formula bar. Copy and paste the following DAX code into the formula bar:

```

Total Revenue = SUMX ( Sales, Sales[Unit Price] *
Sales[Quantity] )

```

- Sales is the table name to be referenced.
- Unit price and Quantity in square brackets are the columns that must be multiplied to calculate the total revenue.
- The SUMX function iterates over each table row to calculate the total revenue.

Adventure Works Data - Power BI Desktop

File Home Help Table tools Measure tools

Name: Total Revenue Format: General Data category: Uncategorized

Home table: Sales Structure: New measure measure

Formatting Properties Calculations

Total Revenue = SUMX(Sales, Sales[Unit Price] * Sales[Quantity])

SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Total Sales	Cost
SO43897	August 25, 2017	235	312	282	4	2	28.84	57.68	63.45
SO44544	November 18, 2017	292	312	282	4	2	818.7	1637.4	1413.62
SO45321	February 18, 2018	346	312	282	4	2	2039.99	4079.98	3824.31
SO46082	May 23, 2018	220	312	282	4	2	20.19	40.38	24.06
SO47028	August 24, 2018	410	312	282	4	2	36.45	72.9	53.94
SO48049	November 19, 2018	401	312	282	4	2	65.6	131.2	97.09
SO49132	February 20, 2019	399	312	282	4	2	33.77	67.54	49.99
SO50294	May 25, 2019	356	312	282	4	2	1242.85	2485.7	2235.71
SO51845	August 27, 2019	591	312	282	4	2	338.99	677.98	616.44
SO57144	November 22, 2019	598	312	282	4	2	323.99	647.98	589.16
SO63283	February 27, 2020	483	312	282	4	2	72	144	89.76
SO69532	May 27, 2020	402	312	282	4	2	72.16	144.32	106.8
SO44113	September 23, 2017	218	187	282	4	2	5.7	11.4	6.79
SO44776	December 23, 2017	349	187	282	4	2	2024.99	4049.98	3796.19
SO45554	March 17, 2018	350	187	282	4	2	2024.99	4049.98	3796.19
SO46362	June 18, 2018	292	187	282	4	2	818.7	1637.4	1413.62
SO47417	September 18, 2018	421	187	282	4	2	196.33	392.66	290.57
SO48356	December 21, 2018	294	187	282	4	2	744.27	1488.54	1321.83
SO49472	March 8, 2019	354	187	282	4	2	1242.85	2485.7	2235.71
SO50702	June 14, 2019	366	187	282	4	2	647.99	1295.98	1196.87
SO53531	September 15, 2019	597	187	282	4	2	323.99	647.98	589.16
SO58975	December 13, 2019	355	187	282	4	2	1391.99	2783.98	2531.24

Table: Sales (3,616 rows) Column: Total Revenue (0 distinct values)

- Select the newly created Total Revenue measure from the Data pane under the Sales table. Then access the Measure tools tab and format the measure as currency with two decimal places.

Adventure Works - Power BI Desktop

File Insert Modeling View Optimize Help Format Data / Drill Table tools Measure tools

Name: Total Revenue Format: General Data category: Uncategorized

Home table: Sales Structure: New measure measure

Formatting Properties Calculations

Total Revenue = SUMX(Sales, Sales[Unit Price] * Sales[Quantity])

Year	Total Revenue	Revenue running total in Year
2017	\$90,924.06	\$590,924.06
2018	\$1,100,079.37	\$1,691,003.43
2019	\$1,212,477.17	\$2,903,480.60
2020	\$601,859.83	\$3,505,340.43
Total	\$3,505,340.43	\$3,505,340.43

Visualizations Data

Filters

Build visual

Columns

Drill through

Cross-report

Keep all filters

Add drill-through fields here

Page 1 +

Page 1 of 1

Step 4: Save the Power BI project.

To save the project, open the File menu, select Save As, and provide an appropriate name for the project along with a path to the folder on your computer.

Conclusion

With these steps, you have successfully created a quick measure in using Power BI desktop interface and one by writing DAX query. You can now analyze Adventure Works data based on the analytical and business requirements.

Remember that when using DAX formulas, you must always ensure they're correctly formatted and that the column names match the actual column names in your data.

2.3. Activity: Using the CALCULATE function

Introduction

In this lesson, you discovered how to work with DAX and measures. One key area you focused on was how the CALCULATE function works in DAX to alter the filter context of the calculations.

In this exercise, you must apply your knowledge of DAX to modify the total revenue measure using new calculations to answer business-specific questions.

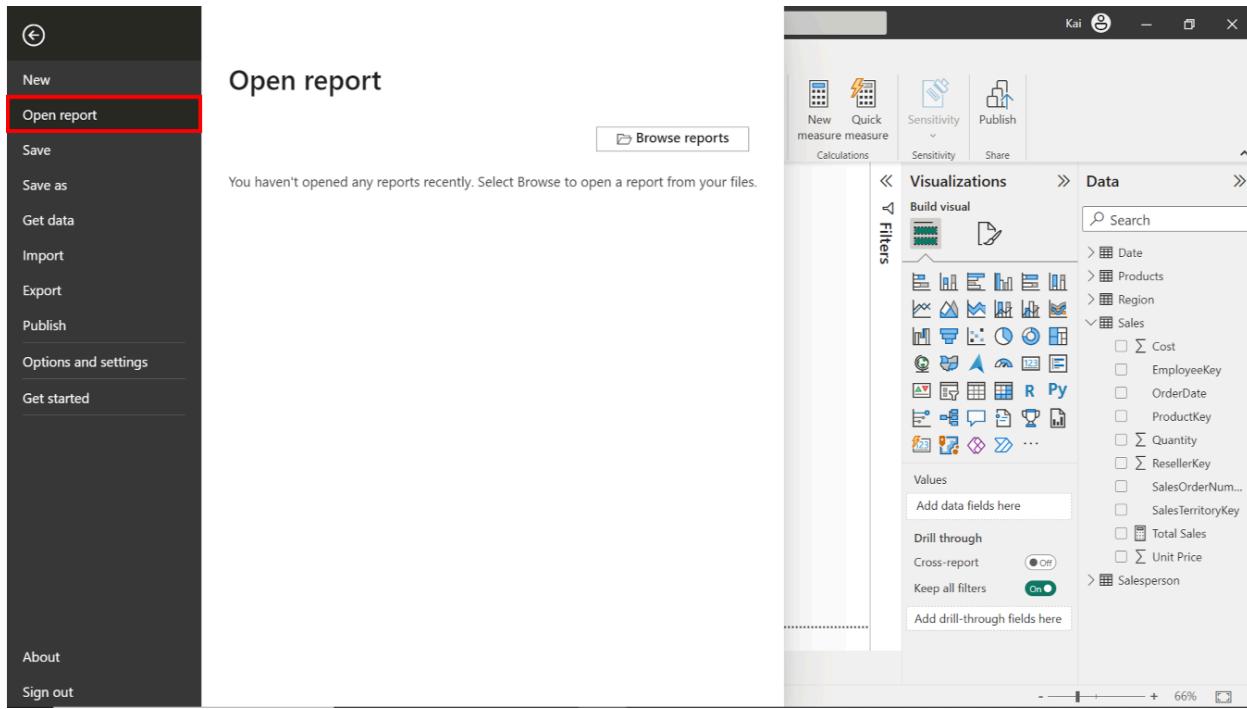
- You'll walk through the steps to modify or create new measures incorporating the CALCULATE function in Power BI.
- The goal is to understand how the CALCULATE function behaves to compute the specific data calculations by changing the context of a DAX expression.

Case study

Adventure Works needs to calculate its total revenue. The company also needs granular information about the sales performance of its employees and sales of specific products by color, subcategory, category, and region. You can help Adventure Works to generate these insights using CALCULATE DAX. This powerful DAX function defines and calculates measures according to the analytical requirements of the business.

Step 1: Open the Power BI project you created in the previous exercise.

Access the project from the file path in which it was saved and open it in Power BI.



Step 2: Access the Total revenue measure you created using the SUMX function and modify it to calculate non-US revenue.

1. In the case of Adventure Works, you have already created a measure called Total revenue that uses row context to compute the company's total revenue by iterating each row of the table. You must now use the CALCULATE function to introduce the new filter context to the calculation.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. A new measure named 'Total Revenue' is being created, with the formula bar displaying the DAX code: `Total Revenue = CALCULATE(SUM(Sales[Revenue]), FILTER(Sales, Sales[OrderDate]=2018 && Sales[Product Color] = "Blue"))`. The Data pane on the right shows the Sales table structure and the newly created measure.

1. In the Power BI Data view or Report view, within the Calculations group, select New Measure and copy and paste the following DAX code in the formula bar to create a new measure for non-US sales.

```
Non-US Sales =
CALCULATE (
    SUMX ( Sales, Sales[Unit Price] * Sales[Quantity] ),
    Region[Country] <> "United States"
)
```

- The expression CALCULATE takes the total revenue measure to compute the total sales.
- It filters the value based on the country column from the Region table.
- We state that the country should not be equal to the value United States (`<>` DAX operator indicates "not equal to.")

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. A red box highlights the formula in the formula bar:

```
Non-US Sales = CALCULATE(
    [Total Revenue],
    FILTER(Region, Region[Country] <> "United States"))
```

The Data pane on the right shows the 'Sales' table and its columns.

Note that the formula uses the previously created Total revenue measure. You can also modify the existing DAX code to gain the same results as follows:

```
Non-US Sales 2 =
CALCULATE (
    SUMX ( Sales, Sales[Unit Price] * Sales[Quantity]
),
    Region[Country] <> "United States"
)
```

- In this DAX expression, instead of using the previously computed Total revenue measure, an expression to compute the total revenue is added with the SUMX function.
- SUMX calculates the total revenue by multiplying Quantities with Unit price columns and iterates each table row.
- FILTER narrows down the sales for non-US countries from the Region table.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. A new measure named 'Non-US Sales 2' has been created. The DAX code for this measure is:

```
= CALCULATE(
    SUMX(Sales, Sales[Quantity] * Sales[Unit Price]),
    FILTER(Region, Region[Country] <> "United States"))
```

The Data pane on the right shows the 'Sales' table and its columns: SalesOrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, SalesTerritoryKey, Quantity, Unit Price, Cost, and Product Color. The 'Non-US Sales 2' measure is highlighted in the Data pane under the 'Sales' category.

- Once executed, the DAX code generates a new measure in the data pane.
- Format the measure as currency with two decimal places. Select the measure you just created, navigate to the Formatting group from the Measure tools tab of Power BI. Select the currency from the format drop-down and enter 2 in the decimal place section that selects Auto by default.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. In the center, there's a table with four columns: Year, Total Revenue, Non-US Sales, and Non-US Sales 2. The data is as follows:

Year	Total Revenue	Non-US Sales	Non-US Sales 2
2017	\$90,924.06	\$123,805.19	\$123,805.19
2018	\$1,100,079.37	\$285,730.41	\$285,730.41
2019	\$1,212,477.17	\$443,891.56	\$443,891.56
2020	\$601,859.83	\$260,413.92	\$260,413.92
Total	3,505,340.43	\$1,113,841.08	\$1,113,841.08

The 'Formatting' section of the ribbon is also highlighted with a red box. On the right side, the 'Data' pane shows the structure of the 'Sales' table, including measures like 'Non-US Sales 2'.

Step 3: Create a measure to compute the sales of black road bikes.

- Adventure Works wants to analyze the sales of black road bikes. You can generate insights into these sales by modifying your existing total revenue measure or creating a new one. You must use the total revenue measure within CALCULATE function to create a new measure. The measure requires that two additional filters be incorporated. The first is the Road bikes value from the subcategory column, and the second is the Product color value of Black from the Color column. The DAX code that you must input into the formula bar to complete this action is as follows:

```
Black Road Bikes Sales =
CALCULATE (
    [Total Revenue],
    Products[Subcategory] = "Road Bikes",
    Products[Color] = "Black"
)
```

- Format the measure as currency with two decimal places, as you did in the previous step.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. In the formula bar, a DAX measure named 'Black Road Bikes Sales' is being defined. The formula uses the 'CALCULATE' function to filter the 'Products' table based on 'Subcategory' ('Road Bikes') and 'Color' ('Black'). The resulting measure is applied to the 'Sales' table. The Data pane on the right displays the structure of the Sales table and the newly created measure.

Step 4: Create a measure to compute the sales by Sales Managers.

- Adventure Works needs to generate insights into the sales performance of its sales managers. You must help them by calculating the total sales generated by each sales manager. To calculate this measure, you need to bring the filter of Employee title from the Salesperson table into the CALCULATE function. You can complete this action by adding the following DAX expression into the formula bar:

```
Sales by Sales Managers =
CALCULATE (
    [Total Revenue],
    FILTER ( Salesperson, CONTAINSSTRING (
        Salesperson[Title], "Manager" ) )
)
```

- The CALCULATE function takes the total revenue measure previously created to compute the sales by sales managers.
- The FILTER function within CALCULATE filters the title column from the salesperson table.

- The CONTAINSSTRING function evaluates the title column with the defined string, in this case, its manager. It returns only the titles containing the word Manager.
- Format the measure as Currency data type with two decimal places, as you did in the previous step.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon selected. In the 'Structure' section, a measure named 'Sales by Sales Managers' is defined with the following DAX code:

```

1 Sales by Sales Managers = CALCULATE(
2     [Total Revenue],
3     FILTER(Salesperson, CONTAINSSTRING(Salesperson[Title], "Manager")))

```

The main area displays a table of sales data with columns: SalesOrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, SalesTerritoryKey, Quantity, Unit Price, Cost, and Product Color. The data shows various sales transactions from August 2017 to September 2019. On the right side, the 'Data' pane is open, showing the data model structure with Sales as the primary table and various filters and measures like Total Revenue and Sales by Sales Managers.

Step 5: Save the project.

Save the project as a new project. Ensure to provide an appropriate name and path to the folder on your local computer.

Conclusion

Congratulations! You have successfully modified and created measures using the CALCULATE function. This DAX function empowers you to create more meaningful calculations to address specific analytical needs. You can combine CALCULATE functions with filters and modifiers to achieve custom analytic goals. Mastering the evaluation context with CALCULATE will help you build efficient and scalable data solutions for your organization.

2.4. Exercise: Adding a role-playing dimension

Introduction

At this stage, you've reviewed the basics of role-playing dimensions and the application of the `USERELATIONSHIP` function in DAX when handling the inactive relationship within a data model in Power BI.

This exercise asks you to apply your knowledge of these concepts by configuring a role-playing dimension between two tables in Power BI.

By completing this exercise, you will demonstrate your ability to:

- Configure a table as a role-playing dimension by creating multiple relationships between the tables.
- Create measures by writing DAX expressions using `USERELATIONSHIP` and `CALCULATE` functions.

Scenario

Adventure Works needs your help to analyze its sales data based on the shipping dates for a specific month. However, its data model does not have a separate Shipping date table. So, you'll need to configure the Date dimension and create a measure for the total sales for August.

The company provides you with an Excel file called `AdventureWorksData.xlsx`. The file consolidates all required data into a table containing all relevant fields related to the company's sales data.

You must load this dataset into Power BI and add a role-playing dimension so that Adventure Works can generate the required insights.

Instructions

Create a new Power BI project called *Exercise –Adding a role-playing dimension*. Follow the steps below to complete the exercise.

Step 1: Download and connect to the Adventure Works Dataset.

1. Download and save the Excel workbook *AdventureWorksData.xlsx*. The workbook contains two tables of data: Sales and Date.
2. The Sales sheet contains several columns such as *ShippingDate* and *SalesAmount* which can be viewed by using the scrollbar.

M	N	O	P	Q	R	S	T	U	V	W	X
1	TerritoryID	BillToAddressID	ShipToAddressID	ShipMethodID	CreditCardID	CreditCardApprovalCode	CurrencyRateID	SubTotal	TaxAmt	Freight	Sales Amount
2	8	23463	23463	1	11528	131046V159524	864	3578.27	286.2616	89.4568	3953.9884
3	4	12930	12930	1	8177	731810V142380	NULL	3578.27	286.2616	89.4568	3953.9884
4	1	20498	20498	1	9144	431815V147219	NULL	3578.27	286.2616	89.4568	3953.9884
5	10	18045	18045	1	4362	331035V122883	880	3578.27	286.2616	89.4568	3953.9884
6	4	14339	14339	1	4050	1031814V121313	NULL	3578.27	286.2616	89.4568	3953.9884
7	4	21205	21205	1	1278	631818V16479	NULL	3578.27	286.2616	89.4568	3953.9884
8	4	20517	20517	1	2503	831897V13066	NULL	3578.27	286.2616	89.4568	3953.9884
9	9	12203	12203	1	4741	1233643V124857	873	3578.27	286.2616	89.4568	3953.9884
10	1	25932	25932	1	13692	333803V170955	NULL	699.0982	55.9279	17.4775	772.5036
11	9	17898	17898	1	6672	935385V134739	873	3578.27	286.2616	89.4568	3953.9884
12	7	28328	28328	1	7236	231034V137533	892	3578.27	286.2616	89.4568	3953.9884
13	1	24810	24810	1	11655	1031808V160230	NULL	3578.27	286.2616	89.4568	3953.9884
14	4	29015	29015	1	9705	531811V150032	NULL	3578.27	286.2616	89.4568	3953.9884
15	4	18368	18368	1	12230	1031902V163240	NULL	3578.27	286.2616	89.4568	3953.9884
16	4	19055	19055	1	8098	533804V141986	NULL	699.0982	55.9279	17.4775	772.5036
17	10	22246	22246	1	11838	1131039V161172	906	3578.27	286.2616	89.4568	3953.9884
18	9	12275	12275	1	310	434455V1576	899	3578.27	286.2616	89.4568	3953.9884
19	9	15598	15598	1	6910	435649V135987	899	3578.27	286.2616	89.4568	3953.9884
20	7	16650	16650	1	11704	531047V160568	918	3578.27	286.2616	89.4568	3953.9884
21	10	16744	16744	1	7938	831750V141055	919	3374.99	269.9992	84.3748	3729.364
22	4	29607	29607	1	NULL	NULL	NULL	3578.27	286.2616	89.4568	3953.9884
23	1	18379	18379	1	3086	1133269V16254	NULL	3374.99	269.9992	84.3748	3729.364

1. Load the data from the Excel sheet into Power BI. Ensure you load all tables in the workbook.

Tip: You can import data using the Get Data drop-down menu.

Step 2: Review the data model and establish relationships.

1. Ensure an appropriate relationship between the Sales table and the Date dimension table is established. Once the data has been loaded, Power BI will attempt to establish the relationship between the tables. If the relationship is missing, create a manual relationship between the Order date field from the Sales table and the Date field from the Date table. This must be an active relationship.
2. Create another relationship between the Shipping date field from the Sales table and the Date field from the Date table. This must be an inactive relationship as the Date table is the role-playing dimension in the data model.

Tip: You can view and configure model relationships in Model view of Power BI desktop. You can also create and edit relationships in Manage Relationship of Power BI desktop.

Step 3: Create a measure by writing a DAX expression.

1. Once you configure the Date table as a role-playing dimension and establish the relationship in the data model, create a new measure on the Sales table called August Sales by Shipping date. You must filter the total sales by month and apply the USERELATIONSHIP function to override the active relationship between the Sales and Date tables.
2. Format the measure as currency with 2 decimal places.

Tip: You can create this measure using the CALCULATE and USERELATIONSHIPDAX functions in the formula bar of Power BI desktop interface.

Step 4: Save the Power BI project.

Save your Power BI project to your local computer.

Tip: Make sure you select an appropriate project name and folder path.

Conclusion

This exercise provides you with hands-on experience of configuring role-playing dimensions and handling inactive relationships within a data model in Power BI. You can assist Adventure Works with analyzing its data from various unique perspectives without creating redundant data tables.

Exemplar: Adding a role-playing dimension

Overview

In the exercise *Adding a role-playing dimension*, you were asked to configure the Date table as a role-playing dimension for the order date and shipping date. Your task was also to create a measure to calculate the total sales for August based on the shipping date by using the USERELATIONSHIP function in DAX.

Your tasks in this exercise were to:

- Download and connect to the required dataset.
- Create an active and inactive relationship between the Sales and the Date table.
- Create a measure within your data model by overriding the default relationship.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

You can also review [Creating quick measures](#) and [Creating custom measures with DAX](#).

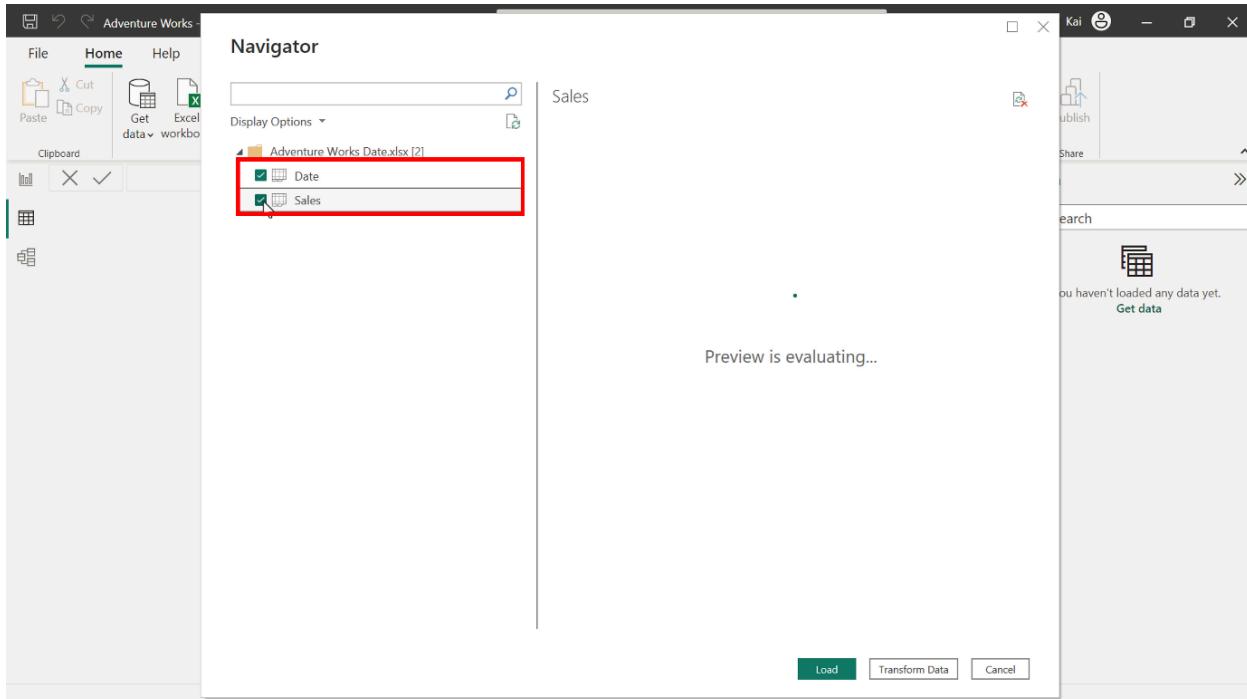
Step 1: Download and connect to the Adventure Works dataset.

1. Download and save the workbook Adventure Works Date.xlsx. The workbook contains two tables of data: Sales and Date. The Sales sheet contains several columns such as ShippingDate and SalesAmount which can be viewed by using the scrollbar.

The screenshot shows a Microsoft Excel spreadsheet titled "Adventure Works Data - Excel". The "Sales" tab is active. The data starts with a header row and 23 data rows. The columns are labeled M through X. The "Sales" tab is highlighted with a red box.

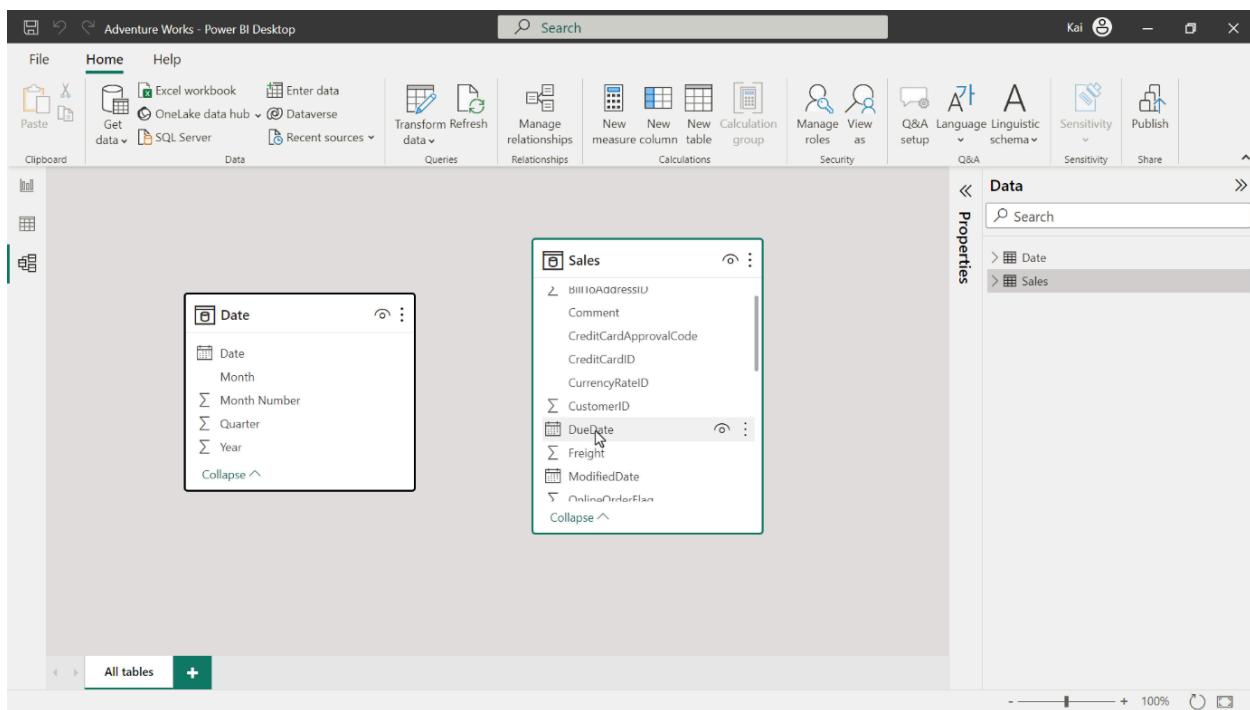
	M	N	O	P	Q	R	S	T	U	V	W	X	
1	TerritoryID	BillToAddressID	ShipToAddressID	ShipMethodID	CreditCardID	CreditCardApprovalCode	CurrencyRateID	SubTotal	TaxAmt	Freight	Sales Amount	Comment	
2	8	23463	23463	1	11528	131046V159524		864	3578.27	286.2616	89.4568	3953.9884 NULL	
3	4	12930	12930	1	8177	731810V142380	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	78203085-206B-47	
4	1	20498	20498	1	9144	431815V147219	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	E23FD863-DB6F-49	
5	10	18045	18045	1	4362	331035V122883		880	3578.27	286.2616	89.4568	3953.9884 NULL	
6	4	14339	14339	1	4050	1031814V121313	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	31C674A5-FDC9-49	
7	4	21205	21205	1	1278	631818V16479	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	A3B03BDB-7051-4	
8	4	20517	20517	1	2503	831897V13066	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	9AA76416-8D28-4	
9	9	12203	12203	1	4741	1233643V124857		873	3578.27	286.2616	89.4568	3953.9884 NULL	
10	1	25932	25932	1	13692	333803V170955	NULL	699.0982	55.9279	17.4775	772.5036 NULL	48D57540-E959-49	
11	9	17898	17898	1	6672	935385V134739		873	3578.27	286.2616	89.4568	3953.9884 NULL	
12	7	28328	28328	1	7236	231034V137533		892	3578.27	286.2616	89.4568	3953.9884 NULL	
13	1	24810	24810	1	11655	1031808V160230	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	B23DD049-129B-4	
14	4	29015	29015	1	9705	531811V150032	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	6BA113EF-066A-48	
15	4	18368	18368	1	12230	1031902V163240	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	3D95CADB-C055-4	
16	4	19055	19055	1	8098	533804V141986	NULL	699.0982	55.9279	17.4775	772.5036 NULL	07EC31A9-6677-4E	
17	10	22246	22246	1	11838	1131039V161172		906	3578.27	286.2616	89.4568	3953.9884 NULL	
18	9	12275	12275	1	310	434455V1576		899	3578.27	286.2616	89.4568	3953.9884 NULL	
19	9	15598	15598	1	6910	435649V135987		899	3578.27	286.2616	89.4568	3953.9884 NULL	
20	7	16650	16650	1	11704	531047V160568		918	3578.27	286.2616	89.4568	3953.9884 NULL	
21	10	16744	16744	1	7938	831750V141055		919	3374.99	269.9992	84.3748	3729.364 NULL	75ADF698-CE13-4
22	4	29607	29607	1	NULL	NULL	NULL	3578.27	286.2616	89.4568	3953.9884 NULL	7A26572C-D8B1-4	
23	1	18379	18379	1	3086	1133269V16254	NULL	3374.99	269.9992	84.3748	3729.364 NULL	AA08797D-ADA6-4	

2. Load the data to Power BI, ensuring you load both data tables available in the workbook to the data model, that is the Sales table and the Date table.



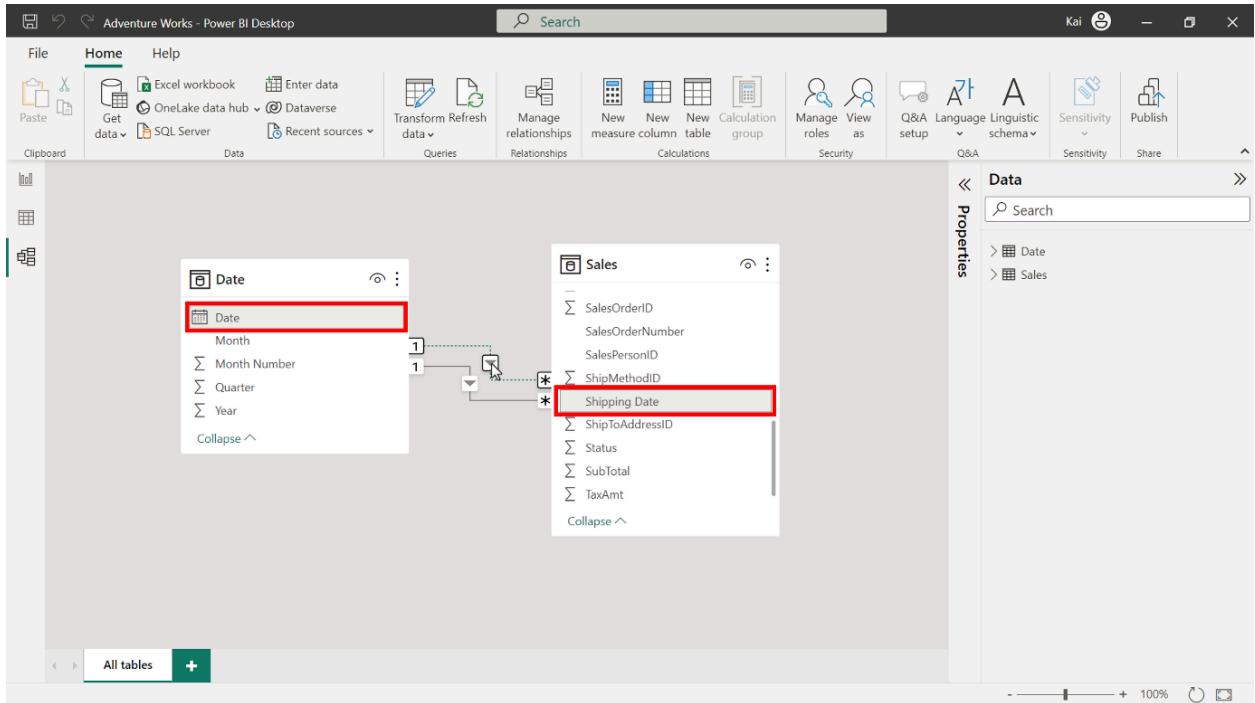
Step 2: Review the data model and establish relationships.

1. Ensure an appropriate relationship between the Sales table and the Date dimension table is established.



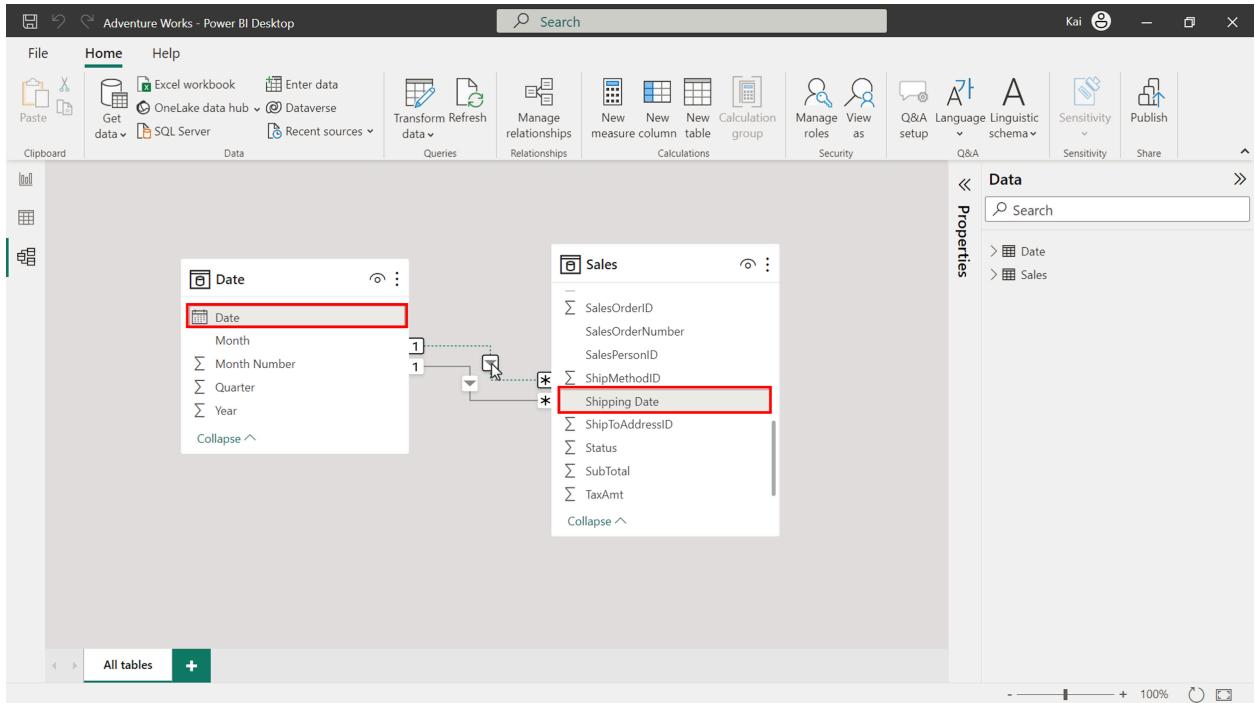
After you Load the data, Power BI attempts to establish the relationship between the tables. If the relationship is missing, create a manual relationship between the sales and date table based on the order date. That is the active relationship.

You can drag and drop the Date field from the Date table to the Order date field in the Sales table. Alternatively, navigate to Manage relationship option from the model view of Power BI desktop. This opens the Manage relationship dialog box. Select New to create a new relationship.



1. Create another relationship between the Shipping date field from the Sales table and the Date field from the Date table. This must be an inactive relationship as the Date table is the role-playing dimension in the data model.

You can repeat the drag-and-drop process. Select the Shipping date column from the Sales table, then drag and drop it to the Date column of the Date table. The dashed line between the Date and the Sales table represents this relationship.



Step 3: Create Measure by writing DAX expression.

1. Once you configure the Date table as a role-playing dimension and establish the relationship in the data model, create a new measure on the Sales table called August Sales by Shipping date.

Go to the Data view. On the Data pane, select the Sales table and then the New measure option from the Calculations group. This action expands the DAX formula bar. Add the DAX expression to compute the measure August sales by shipping date.

The screenshot shows the Power BI Desktop interface. The 'Table tools' ribbon is selected, and the 'New measure' button is highlighted with a red box. Below the ribbon, a table named 'Sales' is displayed with 501 rows. The table has columns for SalesOrderID, RevisionNumber, OrderDate, DueDate, Shipping Date, Status, OnlineOrderFlag, SalesOrderNumber, and PurchaserName. The Data pane on the right shows relationships between the Sales table and other tables like Date and Sales.

7

- The expression calculates the total sales for August based on the shipping date.
- SUM calculates the total Sales column from the Sales table
- FILTER filters the values for August from the Month column of the Date table
- USERELATIONSHIP overrides the table relationship to consider the shipping date instead of the order date, which is the default relationship.

Once you execute the code, a new measure appears in the data pane under the Sales table.

Table: Sales (501 rows) Column: August Sales by Shipping Date (0 distinct values)

1. Format the measure as currency with 2 decimal places.

To format the measure, select the newly created measure from the data pane. Navigate to the formatting group in the Measure tools tab of Power BI. Select Currency from the Format drop-down menu.

Table: Sales (501 rows) Column: August Sales by Shipping Date (0 distinct values)

Enter 2 in the decimal places (which is auto by default). This action formats the measure as Currency within 2 decimal places and is good for visualization.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. In the 'Format' section, the 'Currency' option is chosen, and the decimal places are set to 2. The table below displays sales data, and the new currency format is visible in the 'SalesAmount' column.

SalesOrderID	RevisionNumber	OrderDate	DueDate	Shipping Date	Status	OnlineOrderFlag	SalesOrderNumber	Purc
44159	8	2023-08-05 12:00:00 AM	2023-08-17 12:00:00 AM	2023-08-12 12:00:00 AM	5	1	SO44159	NI
44162	8	2023-08-06 12:00:00 AM	2023-08-18 12:00:00 AM	2023-08-13 12:00:00 AM	5	1	SO44162	NI
44163	8	2023-08-06 12:00:00 AM	2023-08-18 12:00:00 AM	2023-08-13 12:00:00 AM	5	1	SO44163	NI
44164	8	2023-08-06 12:00:00 AM	2023-08-18 12:00:00 AM	2023-08-13 12:00:00 AM	5	1	SO44164	NI
44170	8	2023-08-07 12:00:00 AM	2023-08-19 12:00:00 AM	2023-08-14 12:00:00 AM	5	1	SO44170	NI
44171	8	2023-08-07 12:00:00 AM	2023-08-19 12:00:00 AM	2023-08-14 12:00:00 AM	5	1	SO44171	NI
44178	8	2023-08-09 12:00:00 AM	2023-08-21 12:00:00 AM	2023-08-16 12:00:00 AM	5	1	SO44178	NI
44183	8	2023-08-10 12:00:00 AM	2023-08-22 12:00:00 AM	2023-08-17 12:00:00 AM	5	1	SO44183	NI
44193	8	2023-08-14 12:00:00 AM	2023-08-26 12:00:00 AM	2023-08-21 12:00:00 AM	5	1	SO44193	NI
44197	8	2023-08-15 12:00:00 AM	2023-08-27 12:00:00 AM	2023-08-22 12:00:00 AM	5	1	SO44197	NI
44198	8	2023-08-15 12:00:00 AM	2023-08-27 12:00:00 AM	2023-08-22 12:00:00 AM	5	1	SO44198	NI
44202	8	2023-08-16 12:00:00 AM	2023-08-28 12:00:00 AM	2023-08-23 12:00:00 AM	5	1	SO44202	NI
44203	8	2023-08-16 12:00:00 AM	2023-08-28 12:00:00 AM	2023-08-23 12:00:00 AM	5	1	SO44203	NI
44207	8	2023-08-17 12:00:00 AM	2023-08-29 12:00:00 AM	2023-08-24 12:00:00 AM	5	1	SO44207	NI
44211	8	2023-08-18 12:00:00 AM	2023-08-30 12:00:00 AM	2023-08-25 12:00:00 AM	5	1	SO44211	NI
44212	8	2023-08-18 12:00:00 AM	2023-08-30 12:00:00 AM	2023-08-25 12:00:00 AM	5	1	SO44212	NI
44224	8	2023-08-20 12:00:00 AM	2023-09-01 12:00:00 AM	2023-08-27 12:00:00 AM	5	1	SO44224	NI
44234	8	2023-08-22 12:00:00 AM	2023-09-03 12:00:00 AM	2023-08-29 12:00:00 AM	5	1	SO44234	NI
44241	8	2023-08-23 12:00:00 AM	2023-09-04 12:00:00 AM	2023-08-30 12:00:00 AM	5	1	SO44241	NI
44250	8	2023-08-25 12:00:00 AM	2023-09-06 12:00:00 AM	2023-09-01 12:00:00 AM	5	1	SO44250	NI
44251	8	2023-08-25 12:00:00 AM	2023-09-06 12:00:00 AM	2023-09-01 12:00:00 AM	5	1	SO44251	NI
44253	8	2023-08-26 12:00:00 AM	2023-09-07 12:00:00 AM	2023-09-02 12:00:00 AM	5	1	SO44253	NI

Table: Sales (501 rows) Column: August Sales by Shipping Date (0 distinct values)

You can view the results of the measure in the following diagram:

The screenshot shows a Power BI report page. A table visual is displayed, showing the sum of sales amount for August. The table has three rows: Month, Sum of Sales Amount, and August Sales by Shipping Date. The August row shows a value of 1,396,135.41 and a total value of 1,396,135.41. The report also includes a filter pane on the right side, which is currently filtering by Month and Sales.

Step 4: Save the Power BI project.

- To save the project, open the File menu, select Save As, and provide an appropriate name for the project along with a path to the folder on your computer.

Conclusion

With these steps, you have successfully created one quick measure using the Power BI desktop interface and another by writing a DAX query. You can now analyze Adventure Works data based on the analytical and business requirements.

Remember that when using DAX formulas, always ensure they are correctly formatted and that the column names match the actual column names in your data.

2.5. Exercise: Using time intelligence to compare to previous year

Introduction

You should now understand the fundamentals of DAX and time intelligence at this lesson stage.

This exercise asks you to apply your knowledge of these concepts by creating measures using DAX expressions in Power BI.

By completing this exercise, you will demonstrate your ability to:

- Create measures to compare Adventure Works' year-over-year sales growth.
- Form measures for an appropriate data type.
- Create a matrix to view the results of the time intelligence comparison.

Scenario

Adventure Works needs to analyze the performance of its sales team and growth to plan for the next financial year. The company needs your help to generate the insights required to build this business plan.

Begin by helping Adventure Works to evaluate its sales from the previous year to compare the sales team's performance for the current year. Then calculate Adventure Works' year-over-year change in sales to analyze the company's growth and monthly and annual trends in sales volume.

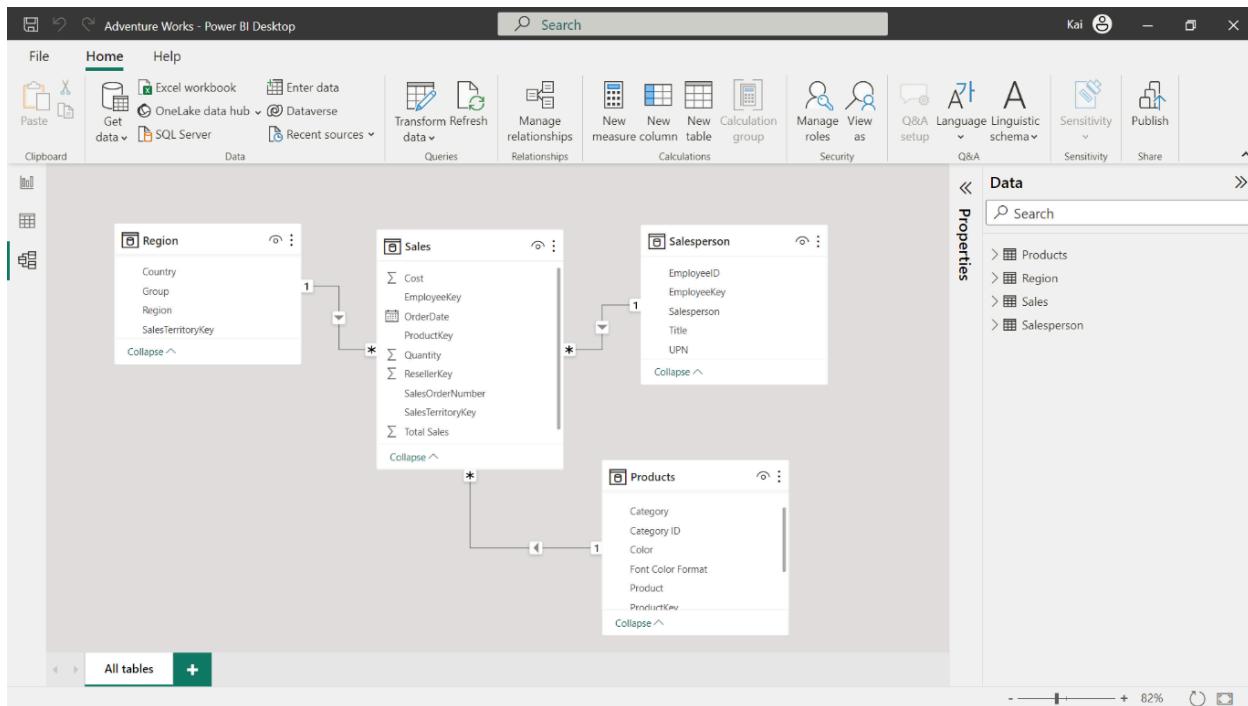
Adventure Works provides a Power BI project file called *AdventureWorks.pbix* that contains the required data model. You must load this dataset into Power BI, evaluate the data quality, and configure the model to ensure that Adventure Works can use it to make informed decisions.

Instructions

Create a new Power BI project called *Exercise - Using Time Intelligence to compare to the previous year*. Follow the steps below to complete the exercise.

Step 1: Download the Adventure Works Power BI project.

1. Download and save the Power BI project Adventure Works.pbix. The Power BI data model contains four tables of data: Sales, Products, Region, and Salesperson.



1. Load the data from the Excel sheet into Power BI. Ensure you load all tables in the workbook.
2. Open a preview of the table in the Preview pane.

Tip: You can import data using the Get Data drop-down menu.

Step 2: Create the Revenue measure.

1. Once the data is loaded into the data model, create a new measure called Revenue. You need to use the Total Sales column from the Sales table and the Quantity column from the Sales table. You'll use this measure to complete the remaining steps in this exercise.
2. Format the measure as currency data type within two decimal places.

Tip: You can create this measure by using the DAX SUMX function.

Step 3: Create the previous year's and year-over-year revenue changes using DAX query.

1. Create an additional measure in the sales table for the previous year's sales called RevenuePY by writing a DAX expression using a time intelligence function.
2. Format the measure as currency data type within two decimal places.

Tip: You can create this measure using the SAMEPERIODLASTYEAR DAX function inside the CALCULATE in the formula bar of the Power BI desktop interface. You can also use variables to write your DAX expression.

1. Create a measure called Revenue YoY to evaluate the year-over-year change in sales for Adventure Works.
2. Format the measure as a percentage data type within two decimal places.

Tip: You can modify the previous year's measure using the DIVIDE function in DAX.

Step 4: Update the matrix in Power BI to view the results of the measures.

1. Update the matrix in Power BI desktop report view by bringing revenue, previous year revenue and revenue year-over year change to the matrix against months and year.

Tip: You can access a premade matrix by navigating to Power BI's Report view.

1. Note the values in all columns of the matrix/table.

Step 5: Save the Power BI project.

- Save your Power BI project to your local computer.

Tip: Make sure you select an appropriate project name and folder path.

Conclusion

With these steps, you have successfully created measures to help Adventure Works analyze its data based on its analytical and business requirements and proven your capabilities with time intelligence functions.

Remember that when using DAX formulas, always ensure they are correctly formatted and that the column names match the actual column names in your data.

Exemplar: Using time intelligence to compare to previous year

Overview

In the exercise *Using time intelligence to compare to previous year*, you were asked to create and format two measures using time intelligence DAX functions to help Adventure Works compare its sales.

Your tasks in this exercise were to:

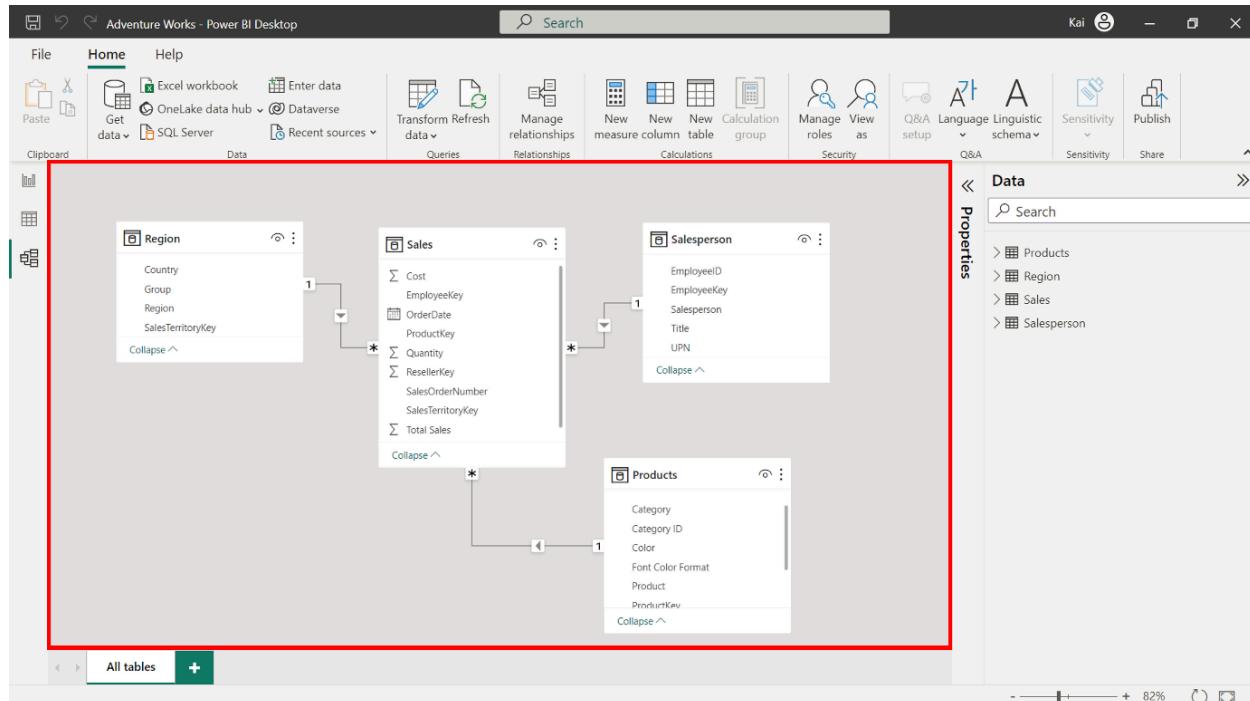
- Download and connect to a dataset and review the model.
- Create two measures using DAX expressions.
- Create a matrix in Power BI to view the results of the measures.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

You can also review *Creating quick measures and creating custom measures with DAX*.

Step 1: Download and connect to the Adventure Works dataset.

1. Download and save the Excel workbook Adventure Works Date.pbix from the exercise page on the Coursera platform.



1. Load the data from the Excel Workbook in Power BI.

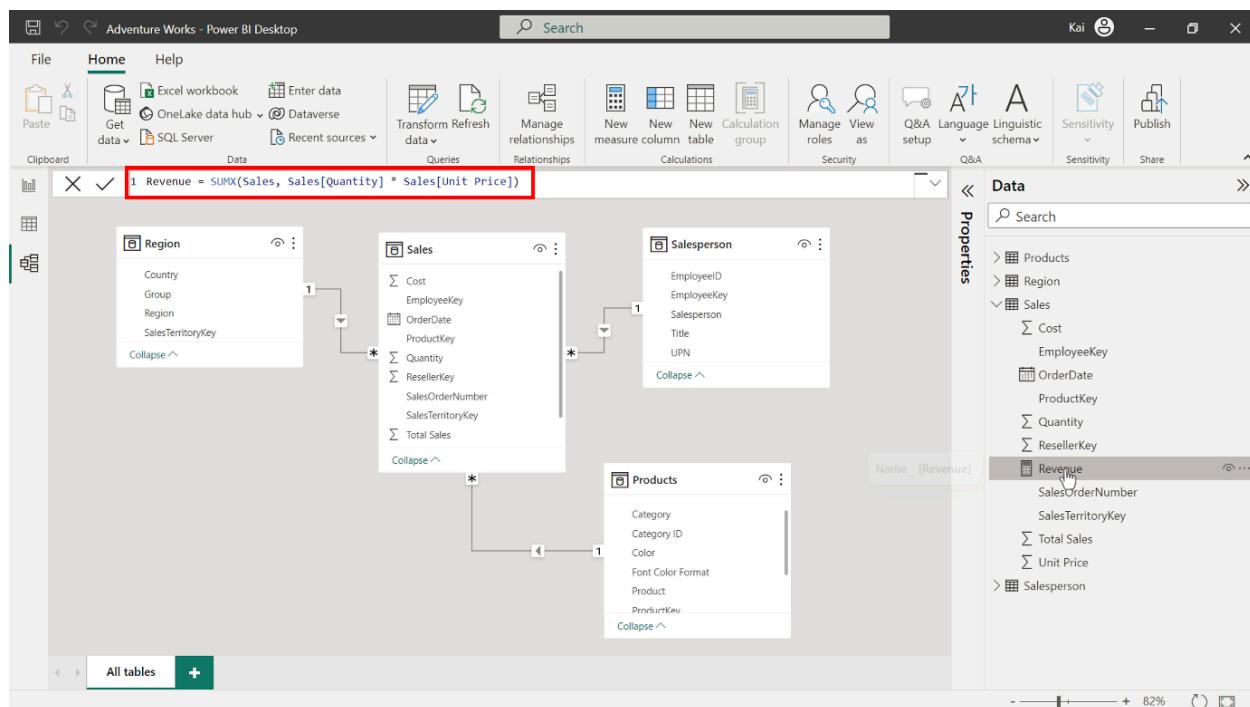
2. Select the Preview pane to open a preview of the table.

Step 2: Create the Revenue measure.

1. To create the revenue measure within your data model, you need to use the Total Sales column from the Sales table and the Quantity column from the Sales table as follows:

```
Revenue = SUMX ( Sales, Sales[Unit Price] *  
Sales[Quantity] )
```

- In this measure, the SUMX function computes the Total sales by multiplying the Unit price by the Quantity column of the Sales table.



1. To format the measure, select the newly created measure from the Data pane. Then navigate to the Format group in the Measure tools tab of Power BI. Select Currency from the Format drop-down menu.

Table: Sales (3,616 rows) Column: Revenue (0 distinct values)

Enter 2 in the decimal places (currently Auto by default). This action formats the measure as a currency data type within two decimal places. This is best practice for visualization purposes.

Table: Sales (3,616 rows) Column: Revenue (0 distinct values)

Step 3: Create the previous year's and year-over-year revenue changes using DAX query.

1. To create a new measure named RevenuePY, access the Data view. Under the Date pane, select the Sales table. Then select New measure from the Calculations group to expand the DAX formula bar. Add the following DAX expression to compute the RevenuePY measure.

```
Revenue PY =  
  
VAR RevenuePreviousYear =  
  
    CALCULATE ([Revenue], SAMEPERIODLASTYEAR  
    (Sales[OrderDate].[Date]))  
  
RETURN  
  
    RevenuePreviousYear
```

- VAR is the variable defined for the previous year's revenue.
- CALCULATE computes the total revenue using the SAMEPERIODLASTYEAR function, which uses the Date column from the Sales table as a parameter.
- Revenue in the square brackets is the previous measure you created.
- RETURN displays the value of the entire expression.

Once you execute the code, the Revenue PY measure appears in the Data pane under the Sales table.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. In the 'Structure' pane, a measure named 'Revenue PY' is defined with the following DAX code:

```

1 Revenue PY =
2 VAR RevenuePreviousYear =
3   CALCULATE ( [Revenue], SAMEPERIODLASTYEAR ( Sales[OrderDate].[Date] ) )
4 RETURN
5 RevenuePreviousYear
6

```

The 'Data' pane on the right lists various dimensions and measures, including 'Revenue PY' which is currently selected.

SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Cost	Total Sales
SO43897	August 25, 2017	235	312	282		4	2	28.84	63.45
SO44544	November 18, 2017	292	312	282		4	2	818.7	1413.62
SO45321	February 18, 2018	346	312	282		4	2	2039.99	3824.31
SO46082	May 23, 2018	220	312	282		4	2	20.19	40.06
SO47028	August 24, 2018	410	312	282		4	2	36.45	53.94
SO48049	November 19, 2018	401	312	282		4	2	65.6	97.09
SO49132	February 20, 2019	399	312	282		4	2	33.77	49.99
SO50294	May 25, 2019	356	312	282		4	2	1242.85	2235.71
SO51845	August 27, 2019	591	312	282		4	2	338.99	616.44
SO57144	November 22, 2019	598	312	282		4	2	323.99	589.16
SO63283	February 27, 2020	483	312	282		4	2	72	89.76
SO69532	May 27, 2020	402	312	282		4	2	72.16	106.8
SO44113	September 23, 2017	218	187	282		4	2	5.7	6.79
SO44776	December 23, 2017	349	187	282		4	2	2024.99	3796.19
SO45554	March 17, 2018	350	187	282		4	2	2024.99	3796.19
SO46362	June 18, 2018	292	187	282		4	2	818.7	1413.62
SO47417	September 18, 2018	421	187	282		4	2	196.33	2905.7
SO48356	December 21, 2018	294	187	282		4	2	744.27	1321.83

- To format the new measure, select it from the data pane. Then navigate to the Formatting group in the Measure tools tab of Power BI. Select currency data type from the Format drop-down menu. Enter a value of 2 in the decimal place field (currently Auto by default). This action formats the measure as Currency data type within two decimal places and is good for visualization. You can view the results of the measure in the following diagram.

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. A red box highlights the 'Format' dropdown menu, which is set to '\$ %'. The DAX code for the measure 'Revenue PY' is displayed in the formula bar:

```

1 Revenue PY =
2 VAR RevenuePreviousYear =
3   CALCULATE ( [Revenue], SAMEPERIODLASTYEAR ( Sales[OrderDate].[Date] ) )
4 RETURN
5 RevenuePreviousYear
6

```

The main area shows a table named 'Sales' with columns: SalesOrderNumber, OrderDate, ProductKey, ResellerKey, EmployeeKey, SalesTerritoryKey, Quantity, Unit Price, Cost, and Total Sales. The table contains 3,616 rows. The right side of the screen displays the Data pane with various sales-related dimensions and measures.

1. Repeat this process to create a new measure named Revenue YoY % using the following DAX code:

```

Revenue YoY % = 

VAR RevenuePreviousYear = CALCULATE ( [Revenue],
SAMEPERIODLASTYEAR (Sales[OrderDate].[Date]) )

RETURN

DIVIDE ( [Revenue] - RevenuePreviousYear,
RevenuePreviousYear)

```

- In the above expression, in addition to the previous calculation, the DIVIDE function computes the change ratio of Sales by dividing the difference of the current year's revenue by the previous year's revenue.

```

1 Revenue YoY % =
2 VAR RevenuePreviousYear =
3   CALCULATE ( [Revenue], SAMEPERIODLASTYEAR ( Sales[OrderDate].[Date] ) )
4 RETURN
5 DIVIDE ( [Revenue] - RevenuePreviousYear, RevenuePreviousYear )
6

```

The screenshot shows the Power BI Desktop interface with the 'Measure tools' ribbon tab selected. A red box highlights the measure definition for 'Revenue YoY %'. The measure uses the VAR function to calculate the same period last year's revenue and then divides the current period's revenue by it.

1. Repeat the formatting process from step 2. In this instance, remember to select Percentage instead of Currency.

The screenshot shows the Power BI Desktop interface with the 'Format' button in the ribbon highlighted. A red box also highlights the 'Percentage' option in the dropdown menu that appears when the button is clicked. This indicates the user is selecting the percentage format for the measure.

Enter a value of 2 in the decimal place field.

Adventure Works - Power BI Desktop

File Home Help Table tools Measure tools

Name: Revenue YoY % Format: Percentage

Home table: Sales Data category: Uncategorized

Structure: Revenue YoY % =
VAR RevenuePreviousYear =
CALCULATE ([Revenue], SAMEPERIODLASTYEAR (Sales[OrderDate].[Date]))
RETURN
DIVIDE ([Revenue] - RevenuePreviousYear, RevenuePreviousYear)

Formatting Properties Calculations

Data

Search: Revenue YoY %

SalesOrderNumber	OrderDate	ProductKey	ResellerKey	EmployeeKey	SalesTerritoryKey	Quantity	Unit Price	Cost	Total Sales
SO43897	August 25, 2017	235	312	282		4	2	28.84	63.45
SO44544	November 18, 2017	292	312	282		4	2	818.7	1413.62
SO45321	February 18, 2018	346	312	282		4	2	2039.99	3824.31
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SO50294	May 25, 2019	356	312	282		4	2	1242.85	2235.71
SO51845	August 27, 2019	591	312	282		4	2	338.99	616.44
SO57144	November 22, 2019	598	312	282		4	2	323.99	589.16
SO63283	February 27, 2020	483	312	282		4	2	72	89.76
SO69532	May 27, 2020	402	312	282		4	2	72.16	106.8
SO44113	September 23, 2017	218	187	282		4	2	5.7	6.79
SO44776	December 23, 2017	349	187	282		4	2	2024.99	3796.19
SO45554	March 17, 2018	350	187	282		4	2	2024.99	3796.19
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SO47417	September 18, 2018	421	187	282		4	2	196.33	290.57
SO48356	December 21, 2018	294	187	282		4	2	744.27	1321.83

Table: Sales (3,616 rows) Column: Revenue YoY % (0 distinct values)

Step 4: Update the matrix in Power BI report view with the measure results.

1. Navigate to the Report view of Power BI desktop.

Adventure Works - Power BI Desktop

File Home Help Table tools Report view

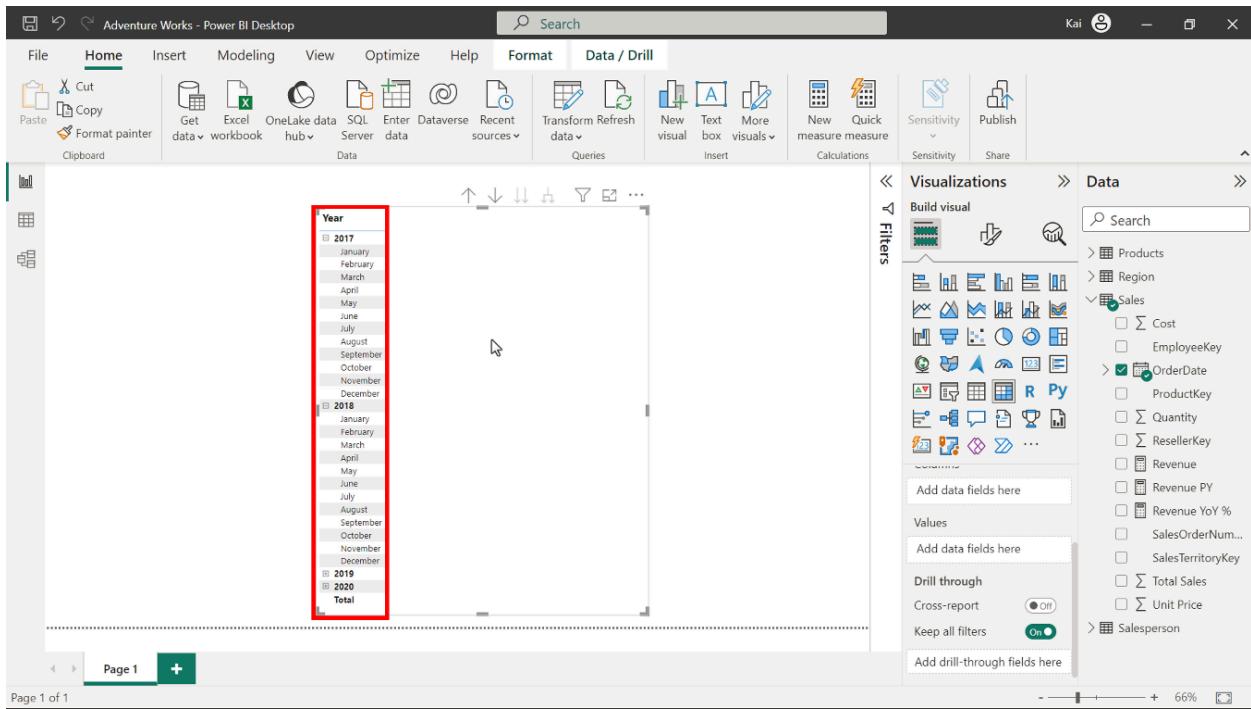
Clipboard Data Queries Relationships Calculations Security

ProductKey Product Standard Cost Color Subcategory Category Background Color Format Font Color Format Category ID

ProductKey	Product	Standard Cost	Color	Subcategory	Category	Background Color Format	Font Color Format	Category ID
210	HL Road Frame - Black, 58	868.63	Black	Road Frames	Components	#000000	FFFFFF	
253	LL Road Frame - Black, 58	176.2	Black	Road Frames	Components	#000000	FFFFFF	
254	LL Road Frame - Black, 58	170.14	Black	Road Frames	Components	#000000	FFFFFF	
255	LL Road Frame - Black, 58	204.63	Black	Road Frames	Components	#000000	FFFFFF	
256	LL Road Frame - Black, 60	176.2	Black	Road Frames	Components	#000000	FFFFFF	
257	LL Road Frame - Black, 60	170.14	Black	Road Frames	Components	#000000	FFFFFF	
258	LL Road Frame - Black, 60	204.63	Black	Road Frames	Components	#000000	FFFFFF	
259	LL Road Frame - Black, 62	176.2	Black	Road Frames	Components	#000000	FFFFFF	
260	LL Road Frame - Black, 62	170.14	Black	Road Frames	Components	#000000	FFFFFF	
261	LL Road Frame - Black, 62	204.63	Black	Road Frames	Components	#000000	FFFFFF	
279	LL Road Frame - Black, 44	176.2	Black	Road Frames	Components	#000000	FFFFFF	
280	LL Road Frame - Black, 44	170.14	Black	Road Frames	Components	#000000	FFFFFF	
281	LL Road Frame - Black, 44	204.63	Black	Road Frames	Components	#000000	FFFFFF	
282	LL Road Frame - Black, 48	176.2	Black	Road Frames	Components	#000000	FFFFFF	
283	LL Road Frame - Black, 48	170.14	Black	Road Frames	Components	#000000	FFFFFF	
284	LL Road Frame - Black, 48	204.63	Black	Road Frames	Components	#000000	FFFFFF	
285	LL Road Frame - Black, 52	176.2	Black	Road Frames	Components	#000000	FFFFFF	
286	LL Road Frame - Black, 52	170.14	Black	Road Frames	Components	#000000	FFFFFF	
287	LL Road Frame - Black, 52	204.63	Black	Road Frames	Components	#000000	FFFFFF	
437	HL Road Frame - Black, 62	722.26	Black	Road Frames	Components	#000000	FFFFFF	
438	HL Road Frame - Black, 62	868.63	Black	Road Frames	Components	#000000	FFFFFF	
439	HL Road Frame - Black, 44	868.63	Black	Road Frames	Components	#000000	FFFFFF	

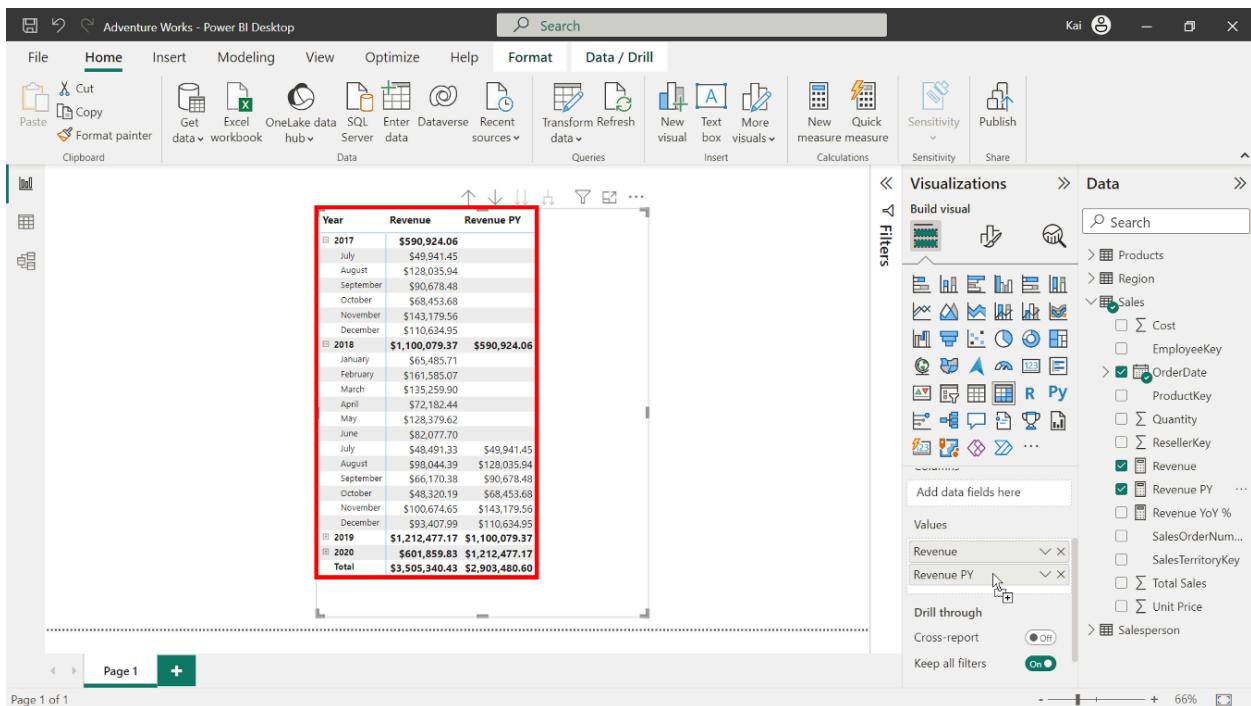
Table: Products (397 rows)

A premade matrix is present with a Year and Month column.



The screenshot shows the Power BI Desktop interface with the 'Home' tab selected. A matrix visual is displayed on the canvas, showing data by Year and Month. The 'Year' column contains values for 2017, 2018, 2019, 2020, and Total. The 'Month' column lists January through December. The matrix cells contain numerical values representing sales. The 'Data' pane on the right shows the data model with the 'Sales' table selected. Under the 'Values' section, the 'Revenue' and 'Revenue PY' measures are listed. The 'Drill through' section has 'Cross-report' turned off and 'Keep all filters' turned on.

Bring the Revenue, Revenue PY and Revenue YoY % measures you have created to the matrix under the Values section.



The screenshot shows the Power BI Desktop interface with the 'Home' tab selected. The matrix visual now includes three additional columns in the Values section: 'Revenue', 'Revenue PY', and 'Revenue YoY %'. The 'Revenue' column shows the current year's revenue, 'Revenue PY' shows the previous year's revenue, and 'Revenue YoY %' shows the percentage change. The matrix visual on the canvas displays the same data structure as before, with years from 2017 to 2020 and months from January to December. The 'Data' pane on the right shows the data model with the 'Sales' table selected. Under the 'Values' section, the 'Revenue', 'Revenue PY', and 'Revenue YoY %' measures are listed. The 'Drill through' section has 'Cross-report' turned off and 'Keep all filters' turned on.

1. Note the values in all columns of the matrix. You can expand the Year by selecting the plus sign on the left side of the Year column in the matrix. A matrix view of the measure's results is visible in the diagram below.

The screenshot shows the Power BI Desktop interface with a matrix visual on the canvas. The matrix has 'Year' as the column header and months from July to December for each year from 2017 to 2020. It includes columns for Revenue, Revenue PY, and Revenue YoY %. The entire matrix is highlighted with a red border. The ribbon at the top shows the Home tab selected. The 'Visualizations' pane on the right lists various chart types, and the 'Filters' pane on the far right shows the fields used in the matrix: OrderDate, Year, Month, Revenue, Revenue PY, and Revenue YoY %.

Year	Revenue	Revenue PY	Revenue YoY %
2017	\$590,924.06		
July	\$49,941.45		
August	\$128,035.94		
September	\$90,678.48		
October	\$68,453.68		
November	\$143,179.56		
December	\$110,634.95		
2018	\$1,100,079.37	\$590,924.06	86.16%
January	\$65,485.71		
February	\$161,585.07		
March	\$135,259.90		
April	\$72,182.44		
May	\$128,379.62		
June	\$82,077.70		
July	\$48,491.33	\$49,941.45	-2.90%
August	\$98,044.39	\$128,035.94	-23.42%
September	\$66,170.38	\$90,678.48	-27.03%
October	\$48,320.19	\$68,453.68	-29.41%
November	\$100,674.65	\$143,179.56	-29.69%
December	\$93,407.99	\$110,634.95	-15.57%
2019	\$1,212,477.17	\$1,100,079.37	10.22%
2020	\$601,859.83	\$1,212,477.17	-50.36%
Total	\$3,505,340.43	\$2,903,480.60	20.73%

Step 5: Save the Power BI project.

- To save your Power BI project, open the File menu, select Save As, and provide an appropriate name for the project along with a path to the folder on your computer.

Conclusion

With these steps, you have successfully created measures to help Adventure Works analyze its data based on its analytical and business requirements and proven your capabilities with time intelligence functions.

Remember that when using DAX formulas, always ensure they are correctly formatted and that the column names match the actual column names in your data.

2.6. Activity: Set up a common date table

Introduction

In this lesson, you've explored the significance of a common-date table in a data model. You've also reviewed the process for creating a common-date table in your models using both DAX and M language in Power BI.

In this exercise, you must apply your knowledge of DAX and Power Query to generate a date dimension table within a data model.

- You'll walk through the steps to create a date dimension table using DAX in Power BI.
- The goal is understanding how Power BI allows you to control your data model according to your analytical needs.

Case study

Adventure Works collects data from a range of different sources and collates this data in a data model that contains the following tables:

- Sales
- Salesperson
- Products
- Reseller
- And Region

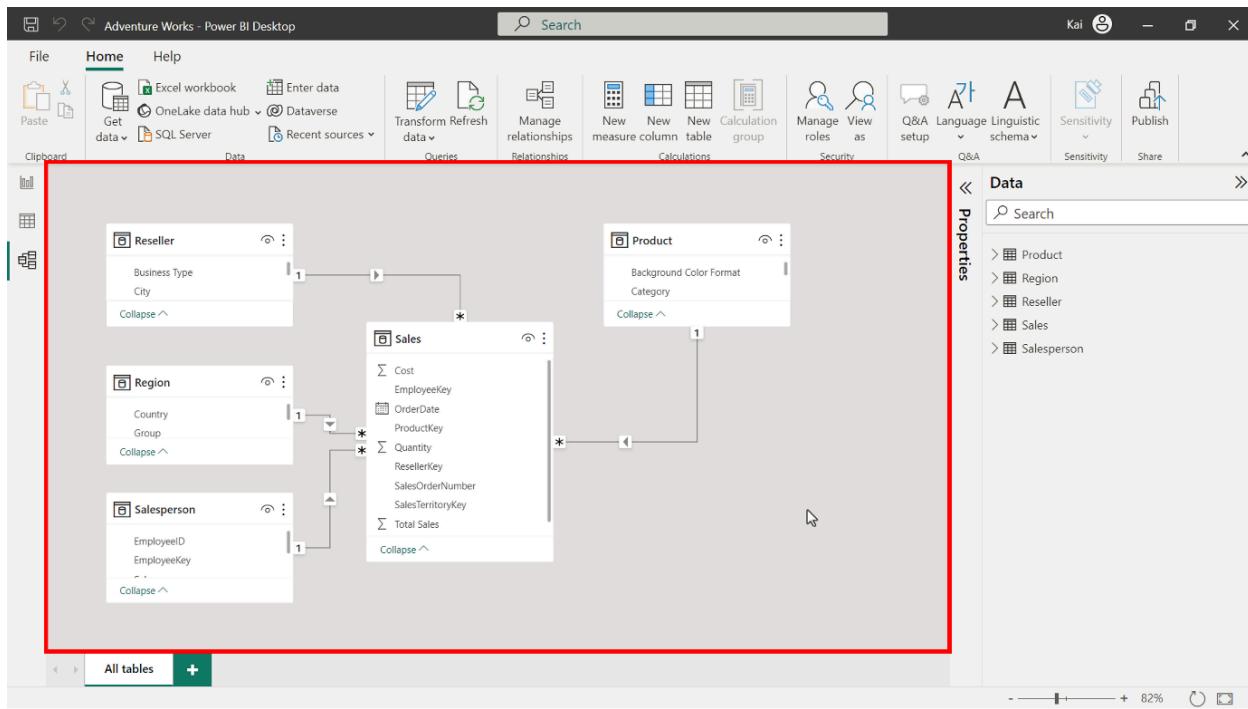
However, there's no date dimension table in these datasets. This makes it difficult to perform time intelligence analysis. Help Adventure Works to create a common-date table in its data model using DAX.

Step 1: Download and launch the Power BI project file AdventureWorks.pbix.

- Adventure Works provides a Power BI project file called AdventureWorks.pbix. that contains the required data model. You must download this dataset and load it into Power BI.

Step 2: Observe the data model and create a date dimension table using DAX.

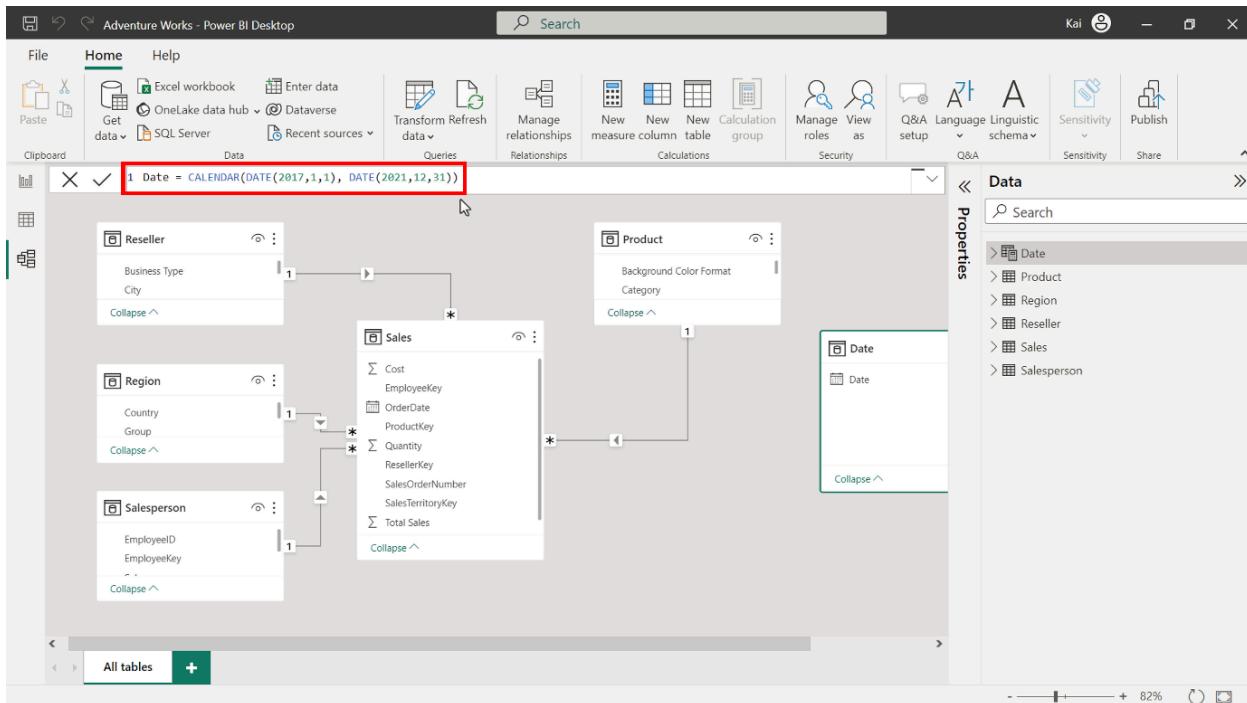
1. Access the Model tab in Power BI to view the data model's tables. Note that there is no date dimension table present.



1. Navigate to the Home tab and select Newtable from the calculations group. In the formula bar, input the following DAX code using the CALENDAR function to create a table with a single column containing dates.

```
Date = CALENDAR ( DATE( 2017, 1, 1 ), DATE ( 2021, 12, 31 ) )
```

In the CALENDAR function, you need to specify the start and end dates. The Adventure Works sales data starts in 2017 and ends in 2020. The start date must occur on or before the date column of the dataset. The end date must be on or after the end date of the dataset. Execute the code to generate a table with a single date column containing a list of dates with time.



1. Now you must format and configure the table. Rename the column as Date and format the column as Date data type. Select the Date column and navigate to the Column tool tab.

The screenshot shows the Power BI Desktop interface with the Column tools tab selected. The 'Date' column is being configured. The 'Data type' dropdown is set to 'Date/time', and the 'Format' dropdown shows '14-03-2001 (dd/m...)' with a red box highlighting it. The Data pane on the right lists the tables: Date, Product, Region, Reseller, Sales, and Salesperson.

Select the appropriate date format from the format drop-down list of options.

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon tab selected. In the table editor, the 'Date' column is selected. The 'Format' dropdown for this column is set to 'General Date'. The 'Common formats' list contains various date and time formats, with '14-03-2001 (dd/mm/yyyy)' highlighted by a red box. The 'Data' pane on the right shows the structure of the data model, with 'Date' being the primary key.

1. Next, you must populate the date dimension table with related columns like year, month number, month, day of the week, and week number. Select New column from the Calculations group of the Column tools tab to expand the DAX formula bar. Then enter the following DAX codes, one in each step.

`Year = YEAR ('Date'[Date])`

`Month = FORMAT ('Date'[Date], "MMMM")`

`Month Number = MONTH ('Date'[Date])`

`Day of the Week = FORMAT (WEEKDAY('Date'[Date]), "dddd")`

`Week Number = WEEKNUM ('Date'[Date])`

- The date-related functions in the above DAX formulas, like YEAR, MONTH, WEEKNUM, WEEKDAY extract the relevant information from the date column of the table.

Adventure Works - Power BI Desktop

Date

Structure

Formatting

Properties

Summarization: Don't summarize

Data category: Uncategorized

Sort by column

Sort

Data groups

Groups

Manage relationships

Relationships

New column

Date

Search

Date

Product

Region

Reseller

Sales

Salesperson

Date

01-01-2017

02-01-2017

03-01-2017

04-01-2017

05-01-2017

06-01-2017

07-01-2017

08-01-2017

09-01-2017

10-01-2017

11-01-2017

12-01-2017

13-01-2017

14-01-2017

15-01-2017

16-01-2017

17-01-2017

18-01-2017

19-01-2017

20-01-2017

21-01-2017

22-01-2017

23-01-2017

Table: Date (1,826 rows) Column: Date (1,826 distinct values)

Copy and paste the following code into the formula bar to add the YEAR data.

Year = YEAR('Date'[Date])

Adventure Works - Power BI Desktop

Year

Structure

Formatting

Properties

Summarization: Sum

Data category: Uncategorized

Sort by column

Sort

Data groups

Groups

Manage relationships

Relationships

New column

Search

Year

Date

Product

Region

Reseller

Sales

Salesperson

Date

01-01-2017

02-01-2017

03-01-2017

04-01-2017

05-01-2017

06-01-2017

07-01-2017

08-01-2017

09-01-2017

10-01-2017

11-01-2017

12-01-2017

13-01-2017

14-01-2017

15-01-2017

16-01-2017

17-01-2017

18-01-2017

19-01-2017

20-01-2017

21-01-2017

22-01-2017

23-01-2017

Table: Date (1,826 rows) Column: Year (5 distinct values)

Copy and paste the following code into the formula bar to add the MONTH data.

Month = **FORMAT ('Date'[Date], "MMMM")**

The screenshot shows the Power BI Desktop interface. In the top navigation bar, 'Adventure Works - Power BI Desktop' is selected. Below it, the ribbon has 'Table tools' and 'Column tools' tabs, with 'Column tools' currently active. The formula bar at the top contains the formula: 'Month = FORMAT('Date'[Date], "MMMM")'. The main area displays a table with three columns: Date, Year, and Month. The Month column shows the value 'January' for all rows from 01-01-2017 to 23-01-2017. To the right, the 'Data' view pane shows the data model with 'Month' selected under the 'Date' node. A status bar at the bottom indicates 'Table: Date (1,826 rows) Column: Month (12 distinct values)'.

Copy and paste the following code into the formula bar to add the DAY OF THE WEEK data.

Day of the Week = **FORMAT (WEEKDAY('Date'[Date]), "dddd")**

Adventure Works - Power BI Desktop

File Home Help Table tools Column tools

Name: Week Number
Data type: Whole number

Format: Whole number
\$ % 0 0

Summarization: Sum
Data category: Uncategorized

Structure: Formatting Properties Sort by column Sort Data groups Groups Manage relationships Relationships New column Calculations

Data

Search

- Date
 - Day
 - Year
 - Month
 - Week Number
- Day of the Week
- Month
- Month Number
- Year
- Product
- Region
- Reseller
- Sales
- Salesperson

Week Number

Table: Date (1,826 rows) Column: Week Number (53 distinct values)

1. Next, mark the newly created date dimension table as a date table. Select the ellipses on the right side of the date table and select Mark as date table from the drop-down list of options. This opens a dialog box that states Mark as date table.

Adventure Works - Power BI Desktop

File Home Help Table tools Column tools

Name: Week Number
Data type: Whole number

Format: Whole number
\$ % 0 0

Summarization: Sum
Data category: Uncategorized

Structure: Formatting Properties Sort by column Sort Data groups Groups Manage relationships Relationships New column Calculations

Data

Search

- Date
 - Day
 - Year
 - Month
 - Week Number
- Day of the Week
- Month
- Month Number
- Year
- Product
- Region
- Reseller
- Sales
- Salesperson

Week Number

Table: Date (1,826 rows) Column: Week Number (53 distinct values)

Mark as date table

Mark as date table

Date table settings

Unhide all

Mark as date table

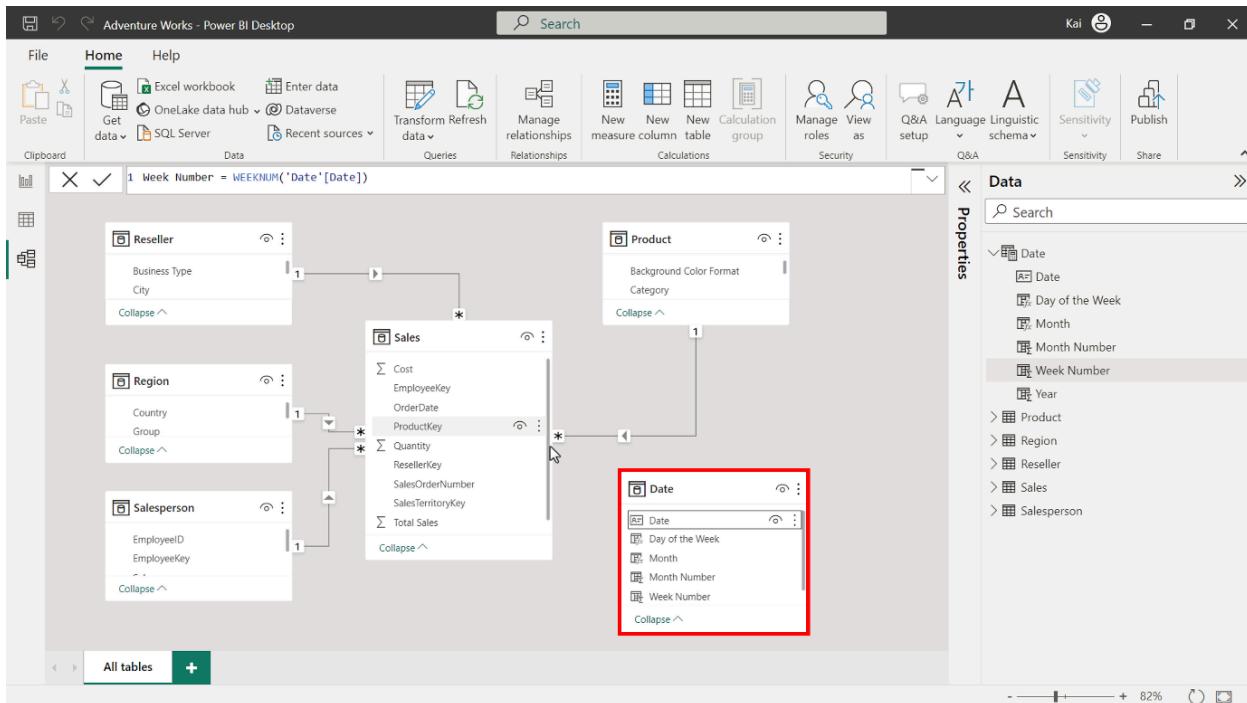
Collapse all

Expand all

Select the Date option from the Date column drop-down menu. Once you select the date column, it displays a message Validate successfully. Select OK.

The screenshot shows the Power BI Desktop interface with the 'Table tools' tab selected. A table named 'Date' is open, displaying columns for Date, Year, Month, and Month Num. A DAX formula, `Week Number = WEEKNUM('Date'[Date])`, is applied to the Week Number column. A context menu is open over the 'Date' column, showing options like 'Mark as date table', 'Mark as time table', and 'Mark as dimension'. A modal dialog box titled 'Mark as date table' is displayed, prompting the user to select a date column. The 'Date' column is selected and highlighted with a red box. The message 'Validate successfully' is shown at the bottom of the dialog. The Power BI Data view on the right shows various tables like Date, Product, Region, Reseller, Sales, and Salesperson.

1. Next, you must establish a relationship between the Date and the Fact table in the data model. A Date dimension table is ready for analysis and reporting in your data model.



Step 4: Save the project.

Save the Power BI project with the new date table as a new project. Ensure to provide an appropriate name and path to the folder at your local computer.

Conclusion

Congratulations! You have successfully created a common date dimension table in your data model using DAX and M queries. This allows you to perform meaningful time intelligence calculations and measures required for the company's comprehensive historical performance, thereby creating future projections and predictive analysis. As a data analyst, mastering the creation and formatting of the date dimension will help you build efficient and scalable data models for your organization.

3.1. Exercise: Improving data model performance

Introduction

In this exercise, you must apply your optimization knowledge to identify performance issues and implement optimization in an Adventure Work Microsoft Power BI report. You will be asked to:

- Use Data view to examine the data in the report.
- Utilize Model view to identify a relationship that requires modification.
- Modify the relationship and adjust the Cardinality and Cross-filter direction settings.

Scenario

Adventure Works is experiencing problems with a key Power BI report. The interface lags, and the visuals are very slow to load. Your manager asks you to help with these issues.

You quickly discover that the reported issues are caused by an unoptimized, bulky data model that accesses and loads the data at a slow pace. To improve the report's performance and efficiency, you must optimize its current data model.

Instructions

Download the Adventure Works Power BI report titled *AdventureWorksSales.pbix* and follow the steps below to complete the exercise.

Step 1: Open Your Project

1. Open Power BI Desktop. Select the File menu and navigate to where the *AdventureWorksSales.pbix* file is saved. Select the file and click Open in the file explorer window to open the saved project in the Power BI Desktop application.

Step 2: Go to Data View

1. Use the icons on the vertical toolbar on the left side of the Power BI interface to switch to Data view.

2. Tip: The Data view icon resembles a table. Data view allows you to see the data contained in your project. Select the Orders view on the right of the screen and take a moment to observe the first 10 records. Note which record has the highest Order Total value.

Step 3: Navigate to Model View

1. Use the icons on the vertical toolbar on the left side of the Power BI interface to switch to Model view. Tip: The Model view icon shows tables linked by connectors.
2. You should now see a diagram representing all the tables in there port, their fields, and how they are related.

Step 4: Select Relationships

1. The lines connecting the tables represent relationships. There is a relationship between the Customers and Orders tables. Observe the line connecting the Customers and Orders tables representing the many-to-many relationship you need to modify.

Tip: The many-to-many relationship is depicted by asterisks on both sides of the line.

1. Double-click the line representing the relationship to access the Edit Relationship dialog.
2. In the Cardinality drop-down, change the selection from its current state to one-to-many.

Tip: One-to-many relationships are simpler and faster for Power BI to navigate when loading data and calculating results.

1. In the Cross filter direction drop-down, choose the Single option to reduce the complexity of the model and limit the direction in which filters are applied.

Step 5: Review and save your Changes

- In Model View, check the relationship connecting Customers to Orders. This should now display the number one (1) attached to the Customers table and an Asterix (*) attached to the Orders table. This visual confirmation ensures the relationships have been set to One-to-many as intended
- Save your Power BI project to your local computer.

Tip: Make sure you select an appropriate project name and folder path.

Conclusion

When you optimize a data model, you improve a report's performance and make the information more accessible. This facilitates efficient decision-making and contributes to the success of the organization.

Exemplar: Improving data model performance

Overview

In the exercise *Improving Data Model Performance*, you were asked to fix a slow-loading Power BI report at Adventure Works. To complete this task, you had to identify bottlenecks in the unoptimized data model and implement changes to improve its efficiency and the overall performance of the report.

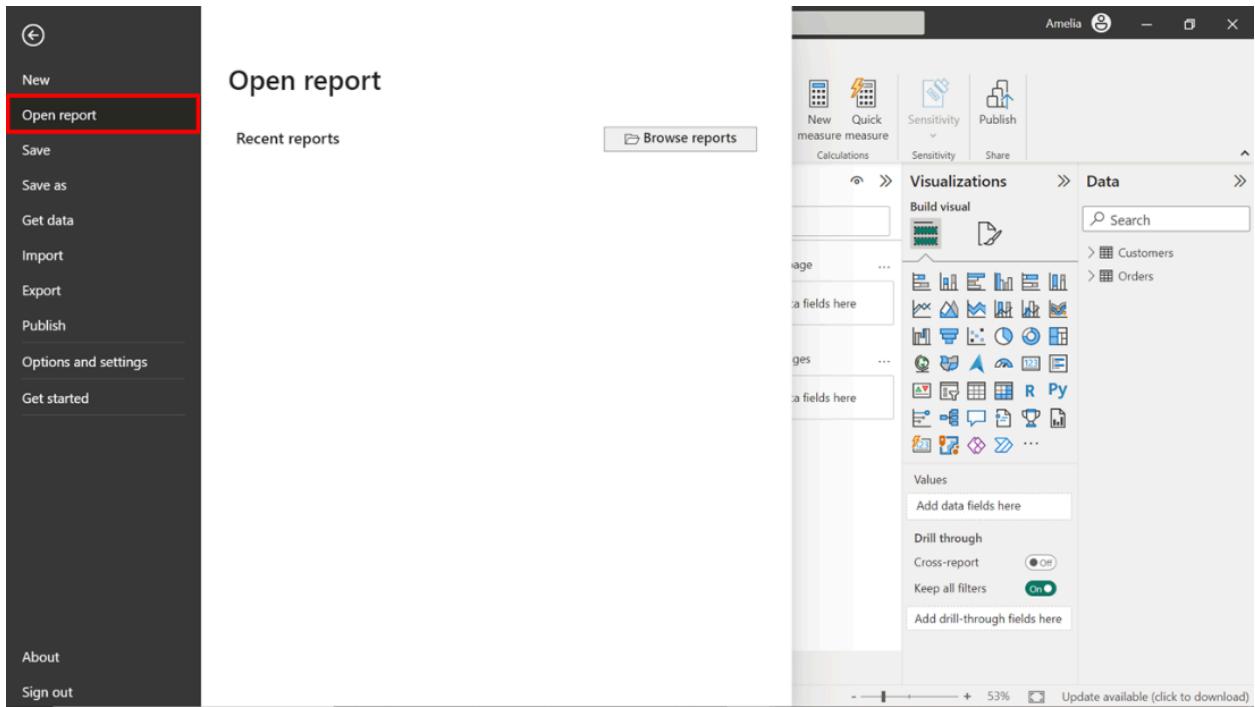
More specifically, you were asked to:

- Download the Adventure Works Power BI report titled *AdventureWorksSales.pbix* and open it in Power BI Desktop.
- Switch to Data view to observe the records contained in the report and understand the scope of data that the model is dealing with.
- Switch to Model view and change the relationship between the Customers and Orders tables from Many-to-many to One-to-many to simplify the relationship and improve performance.
- Save the changes and check to ensure that they have been implemented correctly and that the updated data model aligns with the adjustments.

This reading provides you with a guide that you can use as a benchmark for your solution. You can also refer to the videos *Resolving performance issues in the data model*.

Step 1: Open Your Project

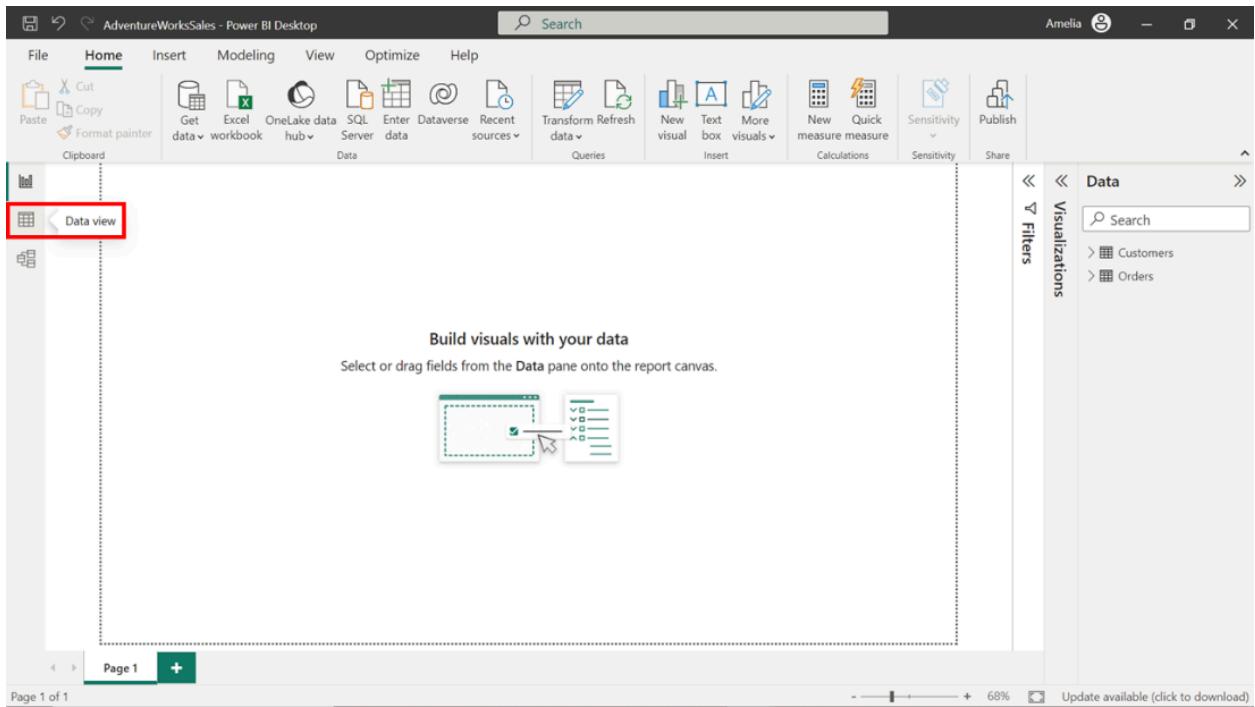
1. In Power BI Desktop, select File in the top left corner. On the File menu, select Open Report.



1. A dropdown menu will then appear where you select Browse Reports. Selecting this causes the file explorer window to open. Navigate to the location where you're the downloaded file *AdventureWorksSalesReport.pbix* is saved.
2. Select the file and click Open in the File explorer window. This action opens the saved project in the Power BI Desktop application.

Step 2: Go to Data View

1. In the Power BI Desktop window, you'll find a vertical toolbar with different icons on the left-hand side. The second icon from the top resembles a table and is the Data view icon. Select this icon to switch to Data view.



1. Power BI switches to Data view and displays the data contained in the project. Viewing this data can help you to understand the granularity and structure of the data at the most basic level. This information about the data and its structures is crucial for any kind of data analysis or data modeling. Select the Orders table on the right of the screen and take a moment to observe the first ten records. The order identified by Order ID 2003 carries the highest Order Total value of \$5400 amongst the first ten records. This could result from various factors such as the quantity of goods ordered, the individual cost of each item, and the application of any taxes, fees, or discounts. It also suggests efficient transaction processing and could indicate a high-value customer.

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon tab selected. A table named 'Orders' is open, displaying 48 rows of data. The columns are: Order ID, Customer ID, Product ID, Order Date, Order Status, Order Quantity, Order Total, and Payment Method. The 'Data' pane on the right shows the schema of the 'Orders' table, with 'Order ID' highlighted.

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	\$2,400	Credit Card
2002	3002	1002	Thursday 2 March 2023	Processing	1	\$1,500	PayPal
2003	3003	1003	Friday 3 March 2023	Cancelled	3	\$5,400	Credit Card
2004	3004	1004	Saturday 4 March 2023	Shipped	1	\$2,100	Credit Card
2005	3005	1005	Sunday 5 March 2023	Processing	2	\$2,600	PayPal
2006	3006	1006	Monday 6 March 2023	Shipped	1	\$1,600	Credit Card
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	\$4,400	PayPal
2008	3008	1008	Wednesday 8 March 2023	Processing	1	\$2,500	Credit Card
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	\$2,200	Credit Card
2022	3022	1022	Wednesday 22 March 2023	Processing	1	\$1,400	PayPal
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	\$5,100	Credit Card
2024	3024	1024	Friday 24 March 2023	Shipped	1	\$2,000	Credit Card
2025	3025	1025	Saturday 25 March 2023	Processing	2	\$3,000	PayPal
2026	3026	1026	Sunday 26 March 2023	Shipped	1	\$1,800	Credit Card
2027	3027	1027	Monday 27 March 2023	Shipped	2	\$4,600	PayPal
2028	3028	1028	Tuesday 28 March 2023	Processing	1	\$2,600	Credit Card
2041	3041	1041	Saturday 11 March 2023	Shipped	2	\$2,600	Credit Card
2042	3042	1042	Sunday 12 March 2023	Processing	1	\$1,600	PayPal
2043	3043	1043	Monday 13 March 2023	Cancelled	3	\$5,700	Credit Card
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	\$2,200	Credit Card
2045	3045	1045	Wednesday 15 March 2023	Processing	2	\$4,000	PayPal
2046	3046	1046	Thursday 16 March 2023	Shipped	1	\$2,300	Credit Card
2047	3047	1047	Friday 17 March 2023	Shipped	2	\$6,000	PayPal

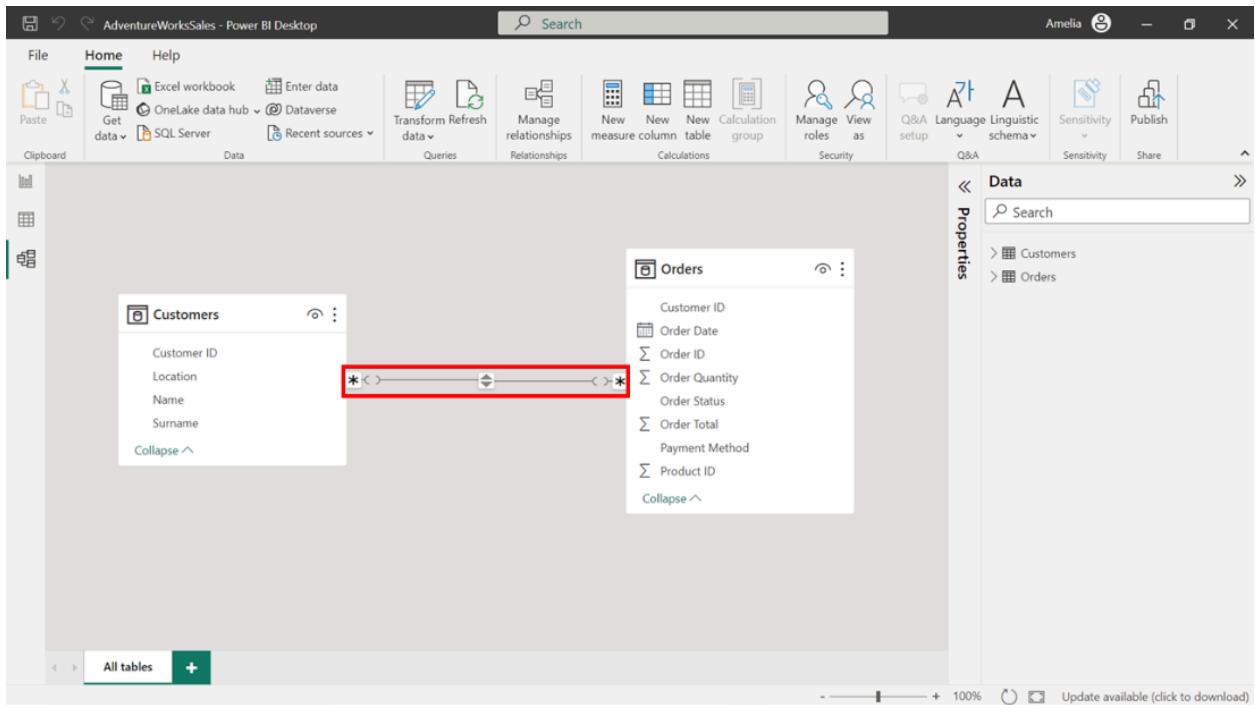
Step 3: Navigate to Model view

1. The next step asks that you switch to Model view. To do this, select a different icon in the vertical toolbar on the left side of the Power BI interface. Choosing the third icon from the top switches to Model view. This icon shows three tables linked with connectors. Select this icon.

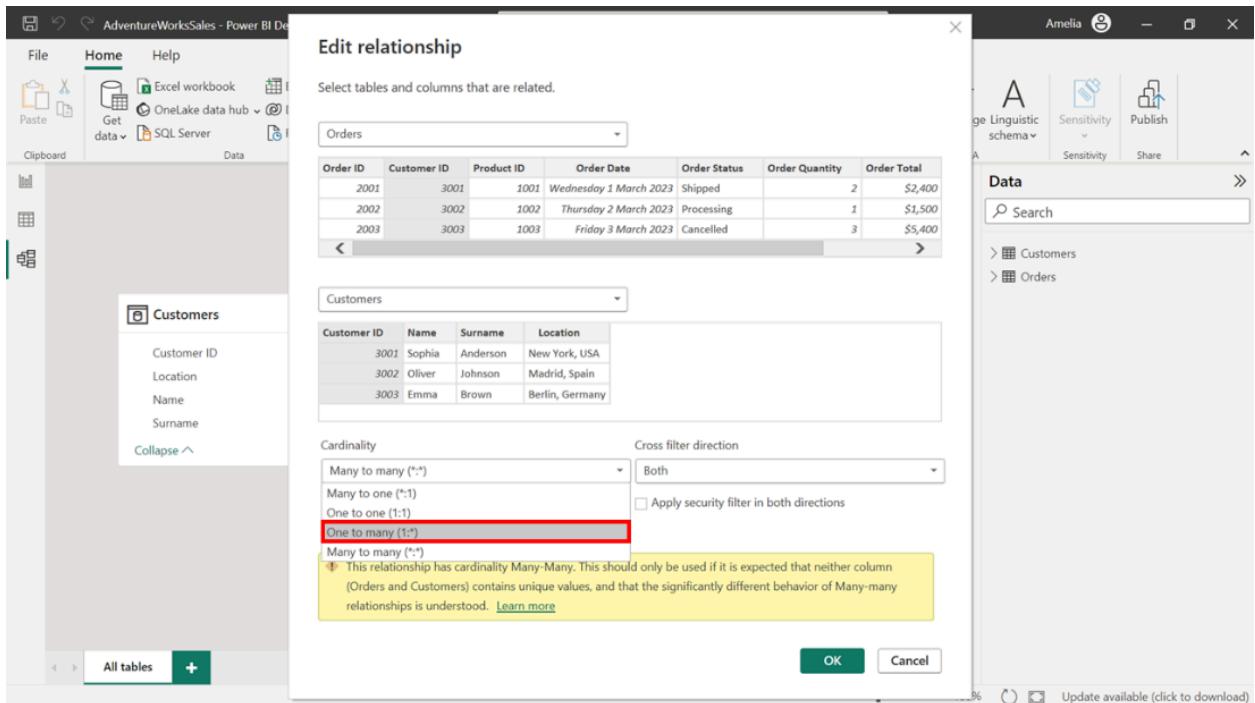
1. Model view displays a graphical representation of the tables in your report and the relationships between them. You can use this high-level overview to quickly identify and understand how different tables are interconnected. This is crucial when making modifications to improve performance.

Step 4: Select Relationships

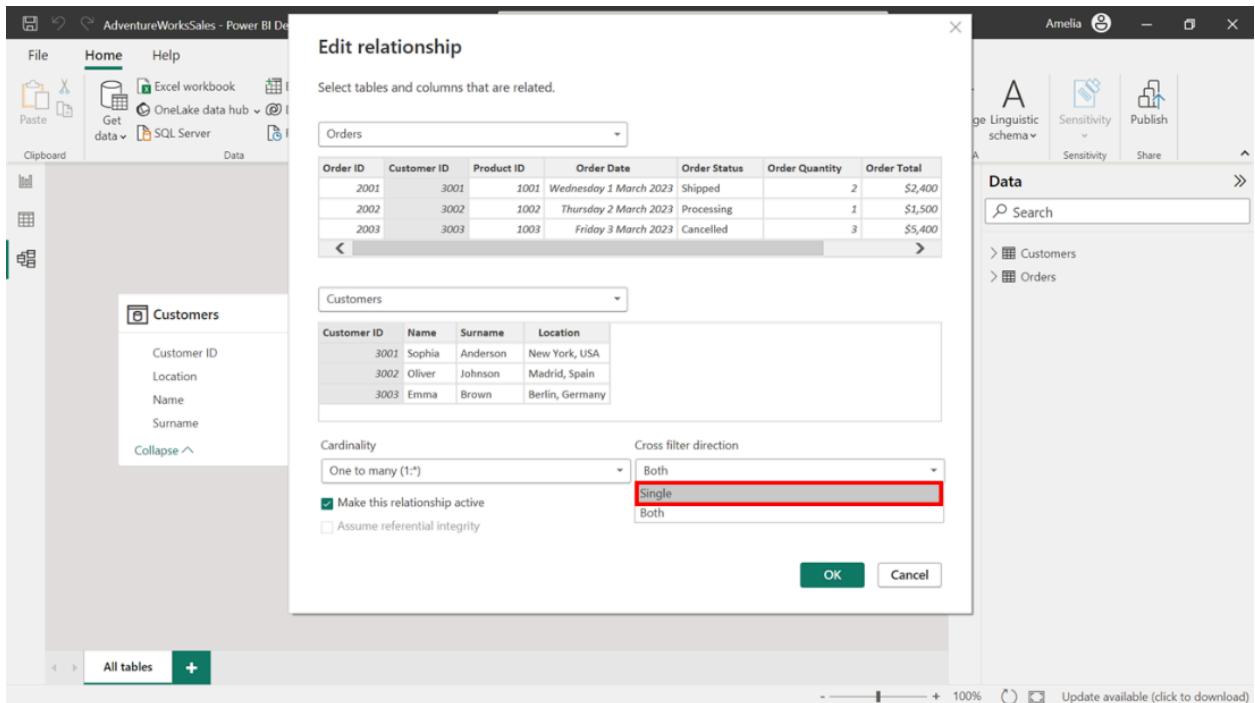
1. Model view displays a network of tables connected by lines that represent the relationships between the tables. The Customers and Orders tables line shows a many-to-many relationship (depicted by asterisks on both sides of line) that you must modify. Modification is important because it lets you configure relationships that are simpler and faster for Power BI to navigate when loading data and calculating results.



1. To modify the relationship, double-click on the line to open the Edit relationship dialog. The dialog box displays the properties of the two linked tables, Customers and Orders, and provides options to edit various aspects of the relationship, including Cross filter direction and Cardinality. To optimize the data model, you'll need to adjust both properties.
2. In the Cardinality drop-down, change the selection from its current state of Many-to-many to One-to-many. Adjusting the Cardinality from Many-to-many to One-to-many can improve performance because One-to-many relationships are simpler and faster for Power BI to navigate when loading data and calculating results.

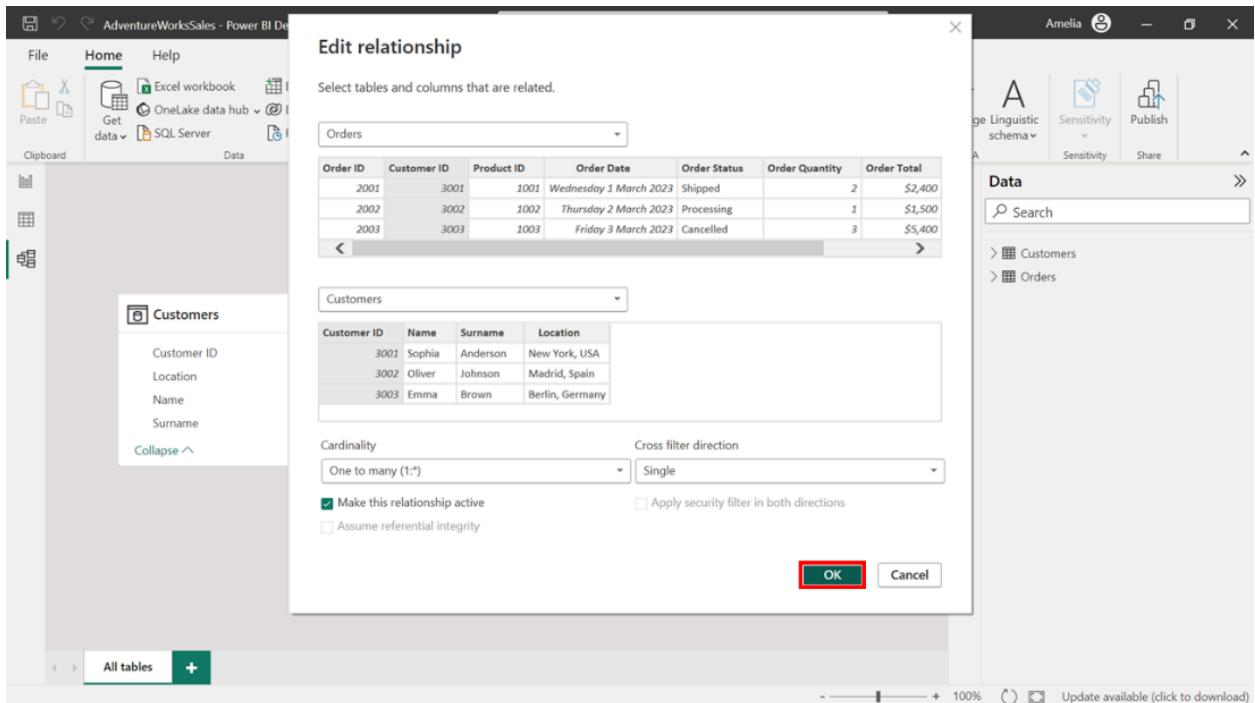


1. In the Cross-filter direction drop-down, choose the Single option to reduce the complexity of the model and limit the direction in which filters are applied. The logic behind these changes is simple: one customer can have many orders, but each order can belong to only one customer. Adjusting these settings to reflect the actual business relationships will improve the efficiency and accuracy of your data model.

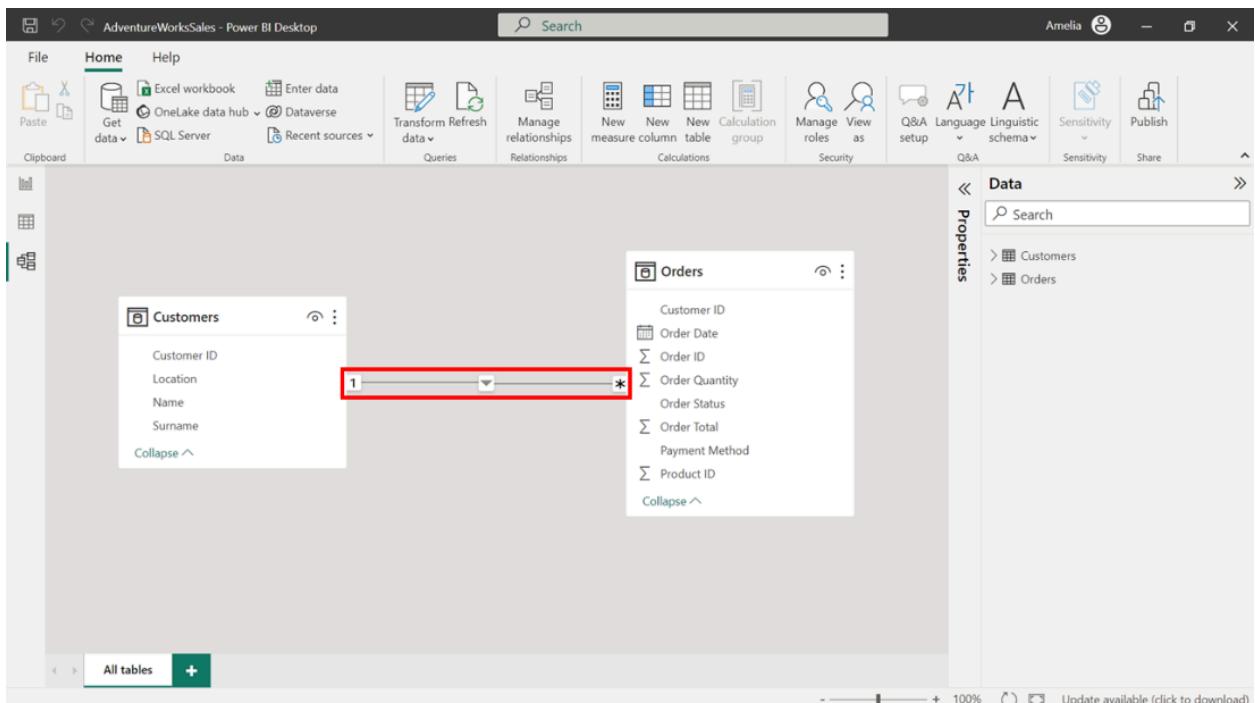


Step 5: Save the Changes

- Once you have modified the relationship properties for Customers and Orders you must save these changes for them to take effect. To save the changes made to the data model, select the OK button located at the bottom right corner of the dialog box.



- Once the changes are saved, review and confirm that they have been implemented by checking the relationships in the Model view. The line connecting Customers to Orders should now display the number one (1) attached to the Customers table and an asterisk (*) attached to the Orders table. This confirms that the relationship has been set to **One-to-many** as intended.



Conclusion

The changes you have made to the data model in this project file will improve the quality and efficiency of the report. Streamlining the relationships in the model allows Power BI to process the data efficiently and generate visuals more quickly. This improved performance will benefit your colleagues in the Sales department who first flagged the poorly performing report. Well done!

Remember, slow-loading reports can be an opportunity, not a problem. It's an invitation to investigate, optimize, and uncover ways to make data work better.

3.2. Activity: Optimizing the columns and Auto date/time

Introduction

You've already gained knowledge of the different ways to optimize the data model in a Microsoft Power BI report. You have been shown techniques to optimize columns and metadata and how to use the Auto date/time feature to the best advantage.

In this exercise, you will apply this knowledge by taking the following series of actions to optimize a data model:

- Identify and remove unnecessary columns.
- Categorize the data.
- Adjust data types for memory efficiency.
- Disable the Auto date/time feature when it's not beneficial.

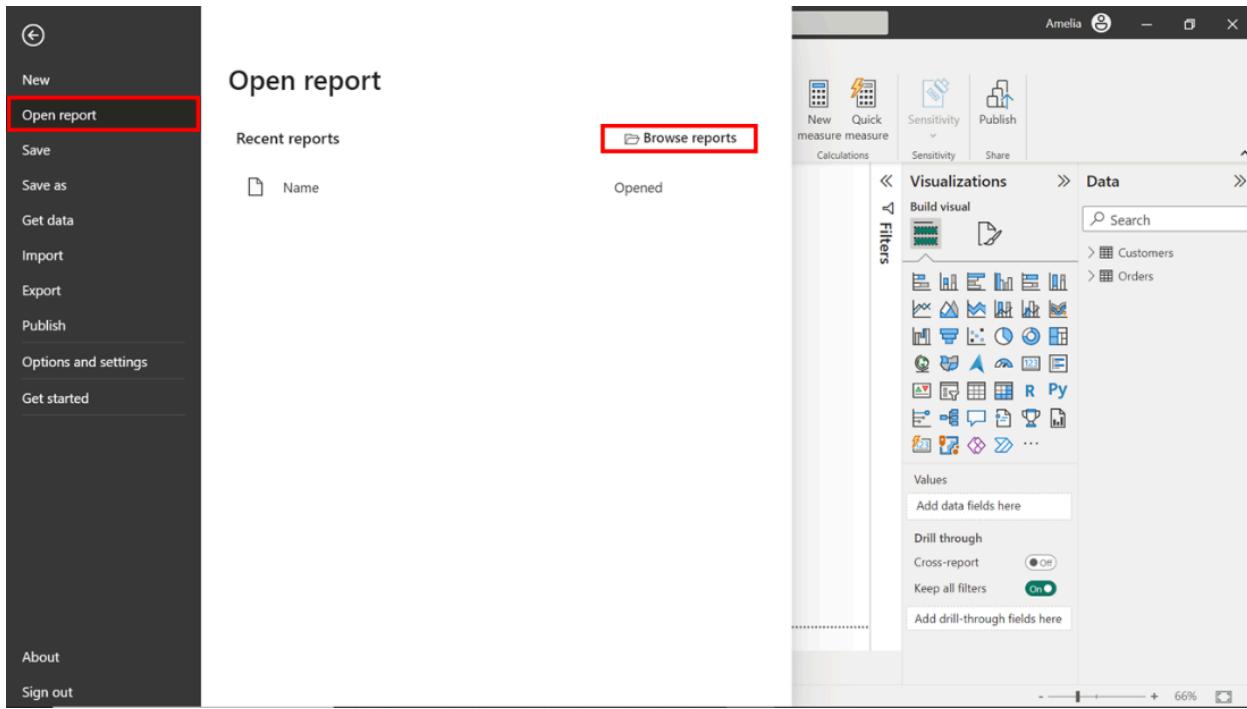
Case Study

An Adventure Works Microsoft Power BI report is running slowly. You have been asked to make changes to improve the report's performance. The report is based on a large dataset that contains a large amount of transactional sales data. You will implement several changes to optimize the data model, which will help generate a fast, efficient, and impactful Power BI report.

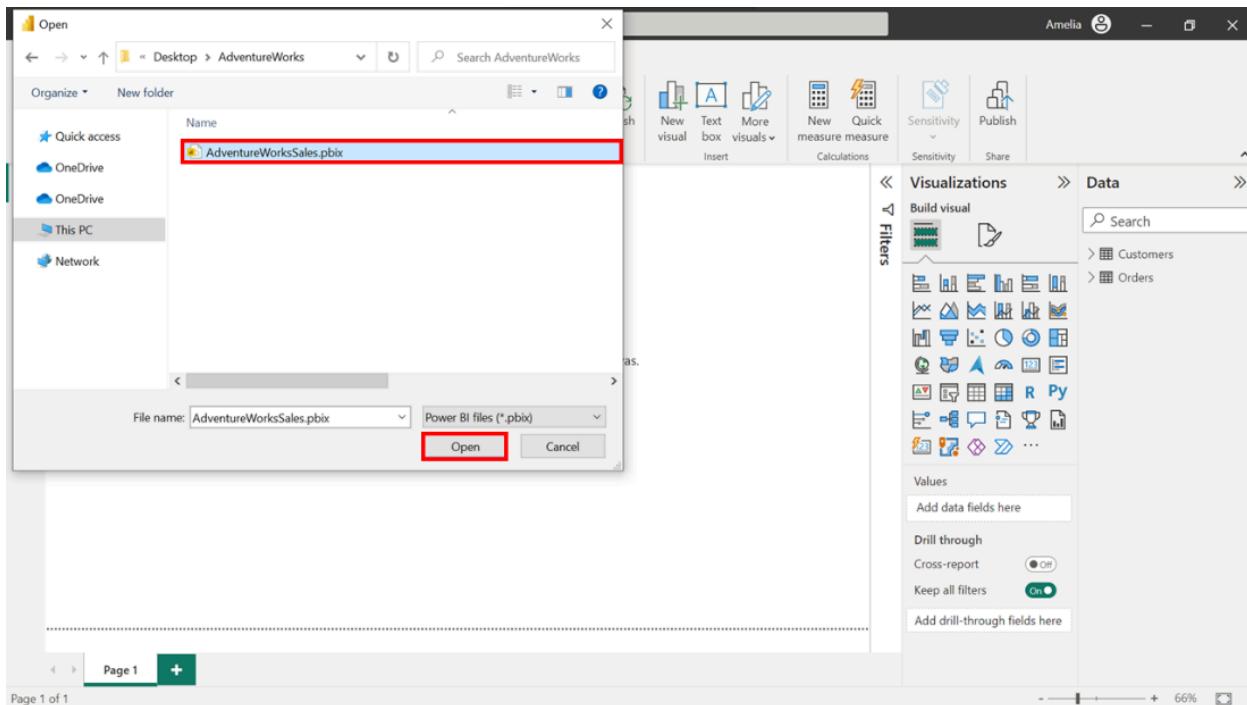
Optimizing columns and the Auto date/time feature is about ensuring that each piece of data, each column, and each feature is functioning as efficiently as possible, and contributing to the smooth, swift execution of the report.

Step 1: Download and open the report

1. Download the *AdventureWorksSales.pbix* Power BI Desktop report file.
1. Open Microsoft Power BI desktop. Choose the File tab in the ribbon area and then Open report from the sidebar menu.



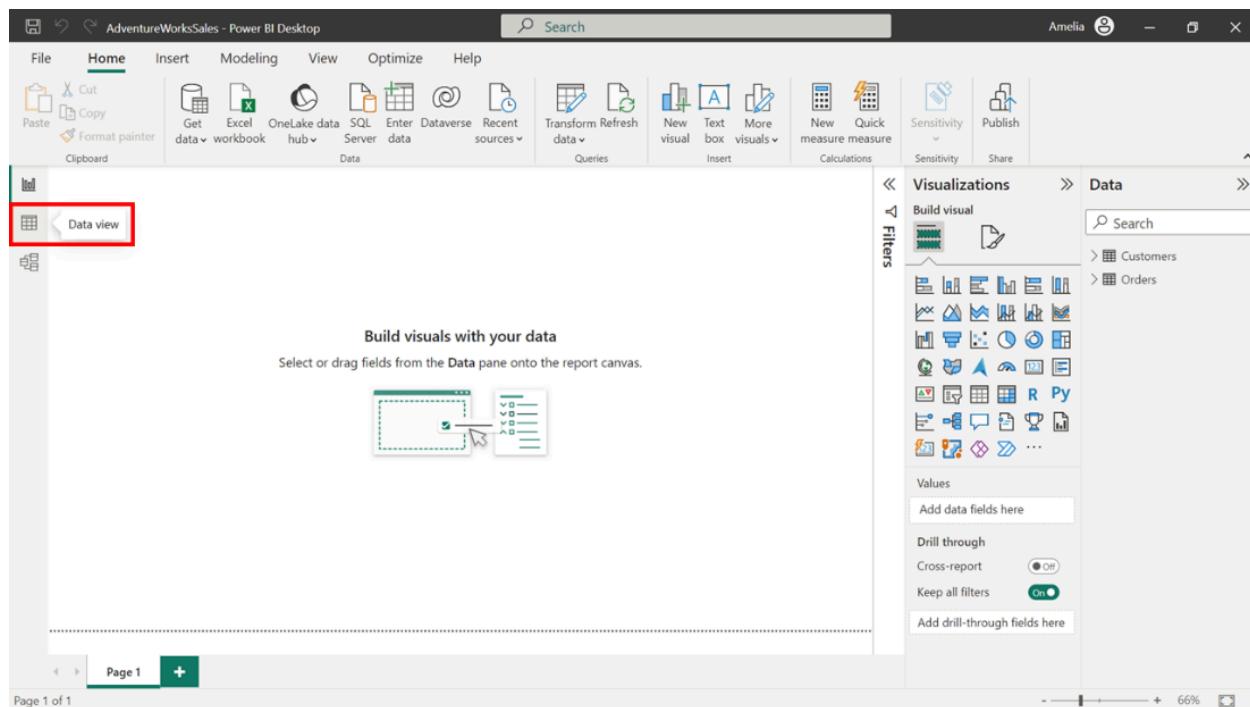
1. Select Browse reports and then navigate to the saved location of the AdventureWorksSales.pbix report on your system. Select the report and select Open to load it.



Step 2: Remove Unnecessary Columns

Redundant data can slow down the performance of a data model. You can create a faster, more efficient model by removing redundant data. In this current model, the Payment Method column is not a contributing value and should be deleted. Let's explore the steps to complete this action.

1. Select the Data view icon to inspect your tables and columns at a granular level. This helps you to understand your model's shape and structure before you optimize it.



1. Expand the Orders table in the Data pane on the right-hand side to display the columns it contains.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Payment Method Format: Text Summarization: Don't summarize Data category: Uncategorized Sort by column: Sort

Structure: Data type: Text Data groups: Groups Manage relationships: Relationships New column: Calculations

Order ID Customer ID Product ID Order Date Order Status Order Quantity Order Total Payment Method

2001	3001	1001	Wednesday 1 March 2023	Shipped	2	\$2,400	Credit Card
2002	3002	1002	Thursday 2 March 2023	Processing	1	\$1,500	PayPal
2003	3003	1003	Friday 3 March 2023	Cancelled	3	\$5,400	Credit Card
2004	3004	1004	Saturday 4 March 2023	Shipped	1	\$2,100	Credit Card
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2007	3007	1007	Tuesday 7 March 2023	Shipped	2	\$4,400	PayPal
2008	3008	1008	Wednesday 8 March 2023	Processing	1	\$2,500	Credit Card
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2045	3045	1045	Wednesday 15 March 2023	Processing	2	\$4,000	PayPal
2046	3046	1046	Thursday 16 March 2023	Shipped	1	\$2,300	Credit Card
2047	3047	1047	Friday 17 March 2023	Shipped	2	\$6,000	PayPal

Table: Orders (48 rows) Column: Payment Method (2 distinct values)

1. Right-click on the Payment Method column header to open the context menu and select Delete. This action declutters your data model's structure and helps it to perform better.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Payment Method Format: Text Summarization: Don't summarize Data category: Uncategorized Sort by column: Sort

Structure: Data type: Text Data groups: Groups Manage relationships: Relationships New column: Calculations

Order ID Customer ID Product ID Order Date Order Status Order Quantity Order Total Payment Method

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2007	3007	1007	Tuesday 7 March 2023	Shipped	2	\$4,400	PayPal
2008	3008	1008	Wednesday 8 March 2023	Processing	1	\$2,500	Credit Card
2021	3021	1021	Thursday 21 March 2023	Shipped	2	\$2,200	Credit Card
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2046	3046	1046	Thursday 16 March 2023	Shipped	1	\$2,300	Credit Card
2047	3047	1047	Friday 17 March 2023	Shipped	2	\$6,000	PayPal

Table: Orders (48 rows) Column: Payment Method (2 distinct values)

Sort ascending

Delete

Step 3: Categorize the columns

With the unnecessary column removed from the Orders table, you can switch focus to the Customers table. If the data in this table is categorized correctly, Power BI can understand it better and offer more relevant features and insights.

1. Select the Location column in the Customers table. Select the Column tools tab in the ribbon area at the top of the screen.

The screenshot shows the Power BI Desktop interface. The ribbon at the top has the 'Column tools' tab selected, highlighted with a red box. Below the ribbon, the 'Customers' table is displayed in a grid format. The 'Location' column is currently selected, indicated by a red box around its header. On the right side of the screen, the 'Data' pane is open, showing the structure of the 'Customers' table. The 'Location' column is listed under the 'Customer ID' category in the Data pane, also highlighted with a red box. The Data pane also lists other columns like 'Name' and 'Surname' under 'Customer ID', and 'Order Date', 'Order ID', etc., under 'Orders'.

1. Select the Data category dropdown to open the dropdown menu. It contains categories such as City, Country, Image URL, and more.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name Location Format Text

Data type Text

Structure

Formatting

Σ Summarization Don't summarize

Data category Uncategorized

Address
Place
City
County
State or Province
Postal code
Country
Continent
Latitude
Longitude
Web URL
Image URL
Barcode

Sort by column Sort Data groups Groups Manage relationships Relationships New column Calculations

Data

Search

Customers Customer ID Location Name Surname

Orders Order ID Order Quantity Order Status Order Total Product ID

Table: Customers (48 rows) Column: Location (18 distinct values)

1. Select the City category as this best represents the content for the Location column.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name Location Format Text

Data type Text

Structure

Formatting

Σ Summarization Don't summarize

Data category Uncategorized

Address
Place
City
County
State or Province
Postal code
Country
Continent
Latitude
Longitude
Web URL
Image URL
Barcode

Sort by column Sort Data groups Groups Manage relationships Relationships New column Calculations

Data

Search

Customers Customer ID Location Name Surname

Orders Order ID Order Quantity Order Status Order Total Product ID

Table: Customers (48 rows) Column: Location (18 distinct values)

Step 4: Optimize the column data types

The next step to optimize your data model involves adjusting the data types assigned to your columns in the Orders table. Power BI takes a “best-guess” approach to assign data types to each column when importing data. However, these automatic assumptions may not always align with memory efficiency. So, you might need to reassign data types as follows.

1. The Order Quantity column contains whole numbers, but the data type is labeled as Text, which would consume more memory than necessary.

The screenshot shows the Power BI Desktop interface with the 'AdventureWorksSales - Power BI Desktop' file open. The ribbon at the top has the 'Table tools' tab selected, specifically the 'Column tools' section. In the main area, a table named 'Orders' is displayed with columns: Order ID, Customer ID, Product ID, Order Date, Order Status, Order Quantity, and Order Total. The 'Order Quantity' column is currently selected. On the ribbon, the 'Data type' dropdown for this column is set to 'Text', which is highlighted with a red box. To the right of the table, the 'Data' pane shows the data model structure, including tables like 'Customers' and 'Orders', and various measures and columns like 'Order Date', 'Order ID', 'Order Quantity', 'Order Status', 'Order Total', and 'Product ID'. The 'Order Quantity' column is explicitly highlighted in the 'Orders' table section of the Data pane.

1. Select the Order Quantity column. Switch to the Column tools tab in the ribbon area and select the Data type dropdown. A drop-down menu opens, which displays the data types.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Order Quantity
Data type: Text

Format: \$%
Summarization: Don't summarize
Data category: Uncategorized

Properties: Sort by column, Data groups, Manage relationships, New column

Sort: Sort by column, Data groups, Manage relationships, New column

Data pane:

- Customers
 - Orders
 - Customer ID
 - Order Date
 - Order ID
 - Order Quantity**
 - Order Status
 - Order Total
 - Product ID

Order ID	Order Date	Order Status	Order Quantity	Order Total	
1001	Wednesday 1 March 2023	Shipped	2	\$2,400	
1002	Thursday 2 March 2023	Processing	1	\$1,500	
1003	Friday 3 March 2023	Cancelled	3	\$5,400	
1004	Saturday 4 March 2023	Shipped	1	\$2,100	
1005	Sunday 5 March 2023	Processing	2	\$2,600	
1006	Monday 6 March 2023	Shipped	1	\$1,600	
1007	Tuesday 7 March 2023	Shipped	2	\$4,400	
1008	Wednesday 8 March 2023	Processing	1	\$2,500	
1021	Tuesday 21 March 2023	Shipped	2	\$2,200	
1022	Wednesday 22 March 2023	Processing	1	\$1,400	
1023	Thursday 23 March 2023	Cancelled	3	\$5,100	
1024	Friday 24 March 2023	Shipped	1	\$2,000	
1025	Saturday 25 March 2023	Processing	2	\$3,000	
1026	Sunday 26 March 2023	Shipped	1	\$1,800	
1027	Monday 27 March 2023	Shipped	2	\$4,600	
1028	Tuesday 28 March 2023	Processing	1	\$2,600	
2041	1041	Saturday 11 March 2023	Shipped	2	\$2,600
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2043	1043	Monday 13 March 2023	Cancelled	3	\$5,700
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2045	1045	Wednesday 15 March 2023	Processing	2	\$4,000
2046	1046	Thursday 16 March 2023	Shipped	1	\$2,300
2047	1047	Friday 17 March 2023	Shipped	2	\$6,000

Table: Orders (48 rows) Column: Order Quantity (3 distinct values)

1. Choose Whole Number from the dropdown list. This is the appropriate type for the Order Quantity column. With every data type correction, you're improving the performance of the data model.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Order Quantity
Data type: Whole number

Format: \$%
Summarization: Sum
Data category: Uncategorized

Properties: Sort by column, Data groups, Manage relationships, New column

Sort: Sort by column, Data groups, Manage relationships, New column

Data pane:

- Customers
 - Orders
 - Customer ID
 - Order Date
 - Order ID
 - Order Quantity**
 - Order Status
 - Order Total
 - Product ID

Order ID	Order Date	Order Status	Order Quantity	Order Total	
1001	Wednesday 1 March 2023	Shipped	2	\$2,400	
1002	Thursday 2 March 2023	Processing	1	\$1,500	
1003	Friday 3 March 2023	Cancelled	3	\$5,400	
1004	Saturday 4 March 2023	Shipped	1	\$2,100	
1005	Sunday 5 March 2023	Processing	2	\$2,600	
1006	Monday 6 March 2023	Shipped	1	\$1,600	
1007	Tuesday 7 March 2023	Shipped	2	\$4,400	
1008	Wednesday 8 March 2023	Processing	1	\$2,500	
1021	Tuesday 21 March 2023	Shipped	2	\$2,200	
1022	Wednesday 22 March 2023	Processing	1	\$1,400	
1023	Thursday 23 March 2023	Cancelled	3	\$5,100	
1024	Friday 24 March 2023	Shipped	1	\$2,000	
1025	Saturday 25 March 2023	Processing	2	\$3,000	
1026	Sunday 26 March 2023	Shipped	1	\$1,800	
1027	Monday 27 March 2023	Shipped	2	\$4,600	
1028	Tuesday 28 March 2023	Processing	1	\$2,600	
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2046	1046	Thursday 16 March 2023	Shipped	1	\$2,300
2047	1047	Friday 17 March 2023	Shipped	2	\$6,000

Table: Orders (48 rows) Column: Order Quantity (3 distinct values)

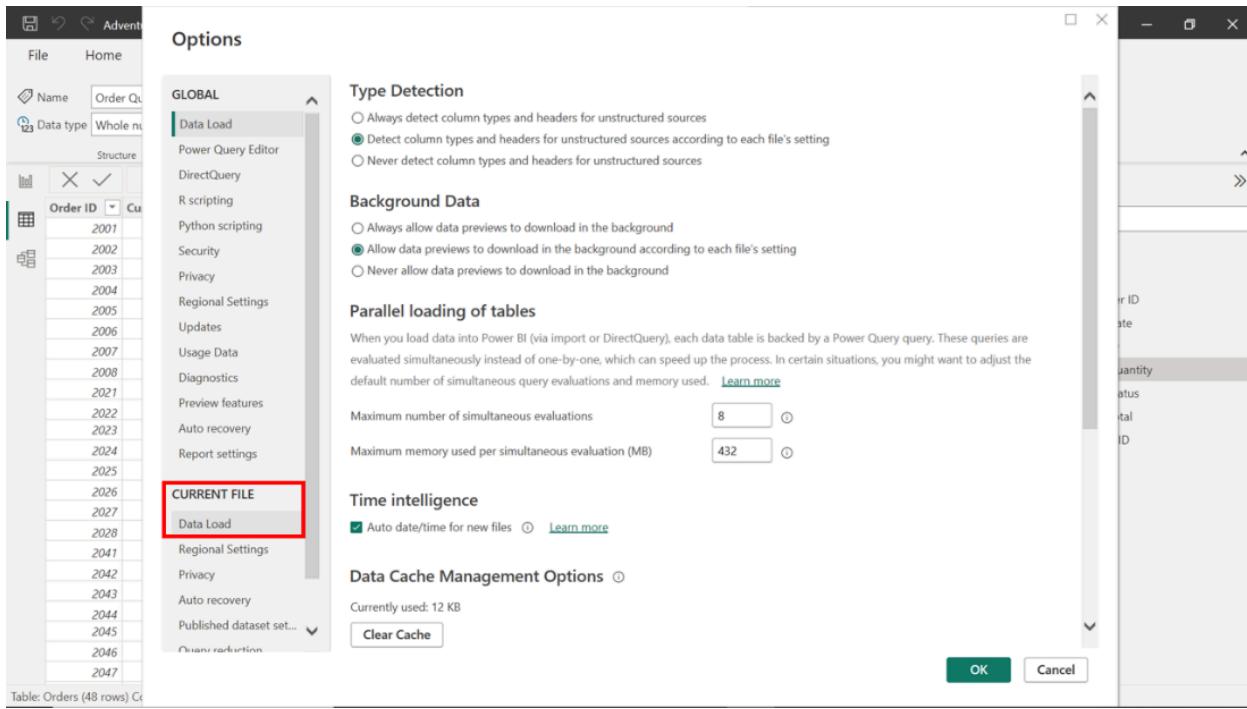
Step 5: Disable the Auto Date/Time feature

You have now optimized your Power BI data model. However, one more feature needs your attention: the Auto Date/Time feature in Power BI. This box is checked by default, which means the feature is currently enabled. Power BI automatically generates hidden date tables whenever you introduce a field with a Date or Date/Time data type into your data model. This can cause slowdowns with large datasets. So let's disable the feature.

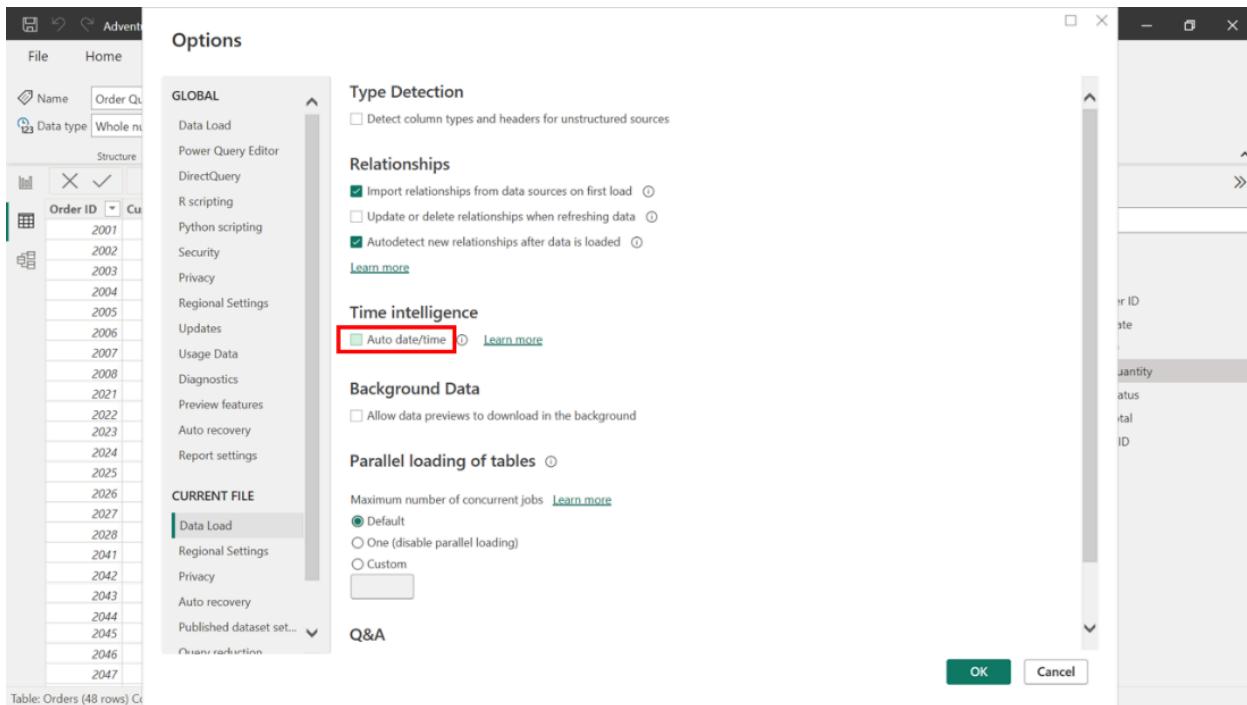
1. Select the File tab in the ribbon area. In the sidebar menu, select Options and settings, and then Options in the submenu.

The screenshot shows two windows side-by-side. On the left is the 'File' ribbon with the 'Options and settings' option highlighted. A red box highlights the 'Options' button in the main content area. On the right is the 'Data' view, showing a table of data with columns for Order Status, Order Quantity, and Order Total. The 'Data' pane on the right displays the schema: Customers -> Orders -> Order ID, Order Date, Order Quantity, Order Status, Order Total, and Product ID.

1. The Options window appears with the Global options choices shown by default. In the panel on the left, select Data Load from the Current file section.



1. Identify the Auto date/time checkbox in the Data Load options. The box is checked by default. Uncheck this box to disable the current file's Auto date/time feature. Then select OK to apply the changes.



Conclusion

You've optimized your data model by decluttering your data, categorizing it properly, assigning accurate data types, and disabling the Auto Date/Time feature. All these steps contribute to the overall performance and speed of your report.

3.3. Walk-through: Optimizing a DirectQuery model

Overview

The aim of this reading is to give you an example of how to optimize DirectQuery using query reduction and table storage modes. This is an example of the steps you would take if you had access to an SQL Server.

At this point in the lesson, you've explored DirectQuery connectivity and its behavior in Microsoft Power BI. And you've reviewed the limitations and benefits of using DirectQuery with real-world scenarios. To maximize the benefits of DirectQuery, you must optimize various layers of the solution, such as the data source, the model, and the report or visualization.

In this step-by-step tutorial, you are going to be taken through the required steps to optimize DirectQuery using query reduction and table storage modes.

By the end of this walkthrough, you'll have learned how to:

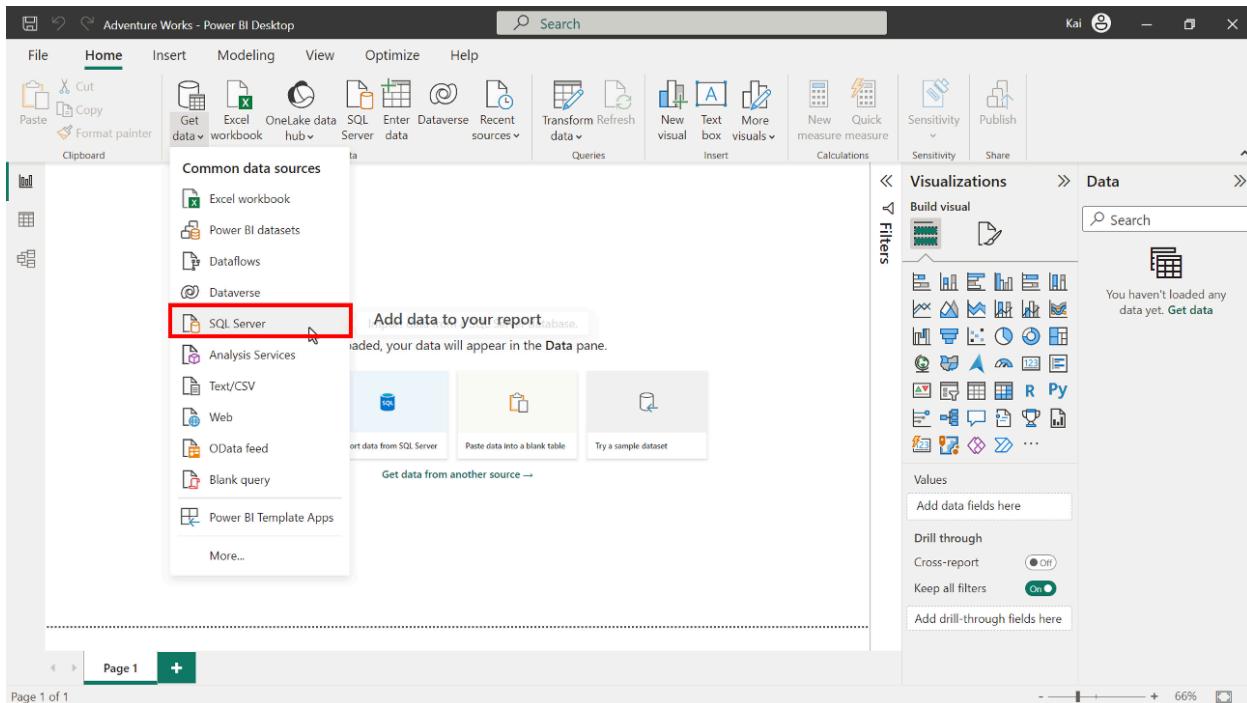
- Establish a DirectQuery connection in Power BI with SQL Server.
- Optimize the connection by query reduction.
- Optimize the query performance by table storage modes.

Note: To practice the steps yourself, you would need access to an SQL Server.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

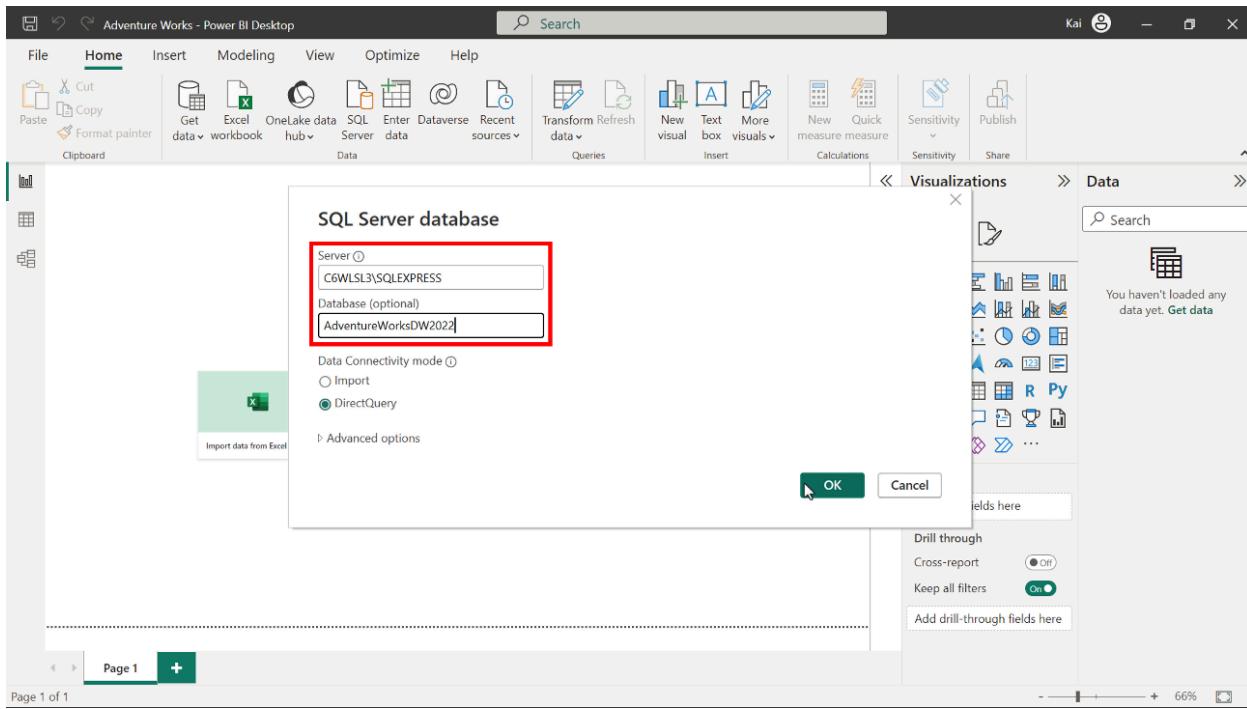
Step 1: Establish a DirectQuery connection to Adventure Works database from Power BI.

1. Launch Power BI desktop and connect to the SQL server. Navigate to the Home tab of Power BI desktop and select Get data. From the drop-down menu, select SQL Server.

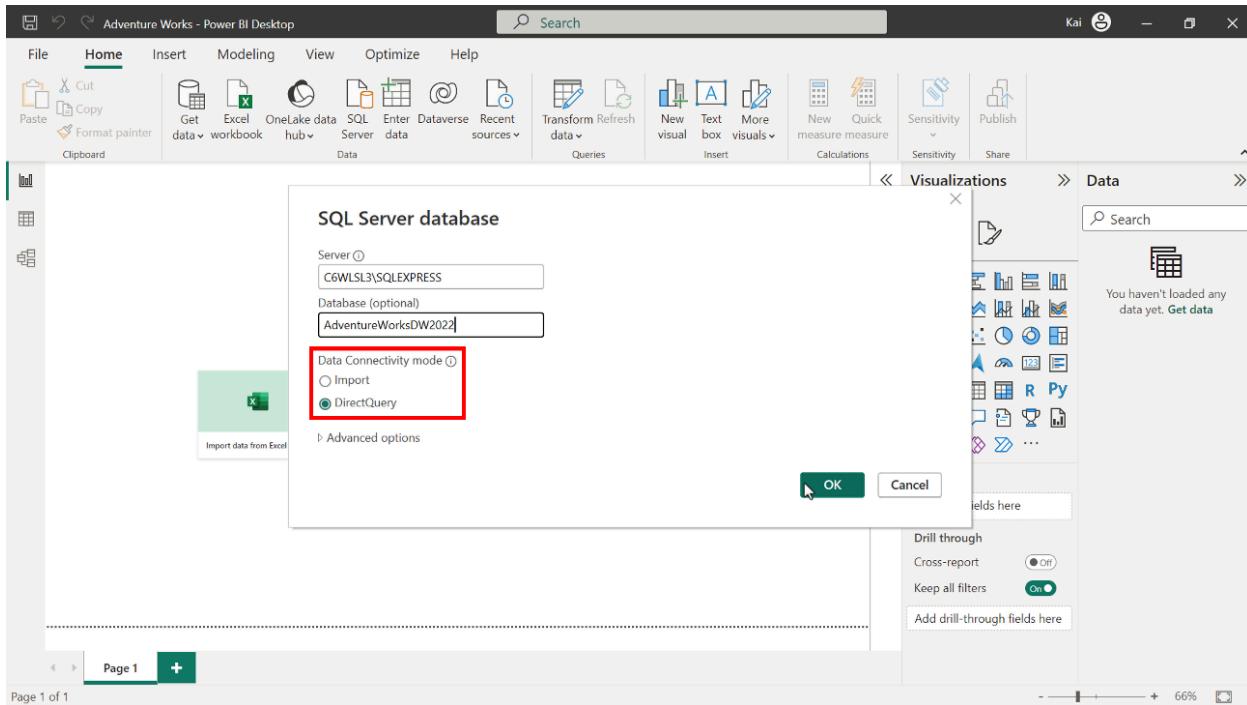


1. This opens a SQL Server database dialog box. Enter the server's name and database name. Once you enter the server's name, a connection is established with the SQL Server hosting all databases.

Tip: The SQL server does not require a database name for the connection, but if you have a lot of databases in the Server, defining the database name while connecting will save you time navigating through the required database.



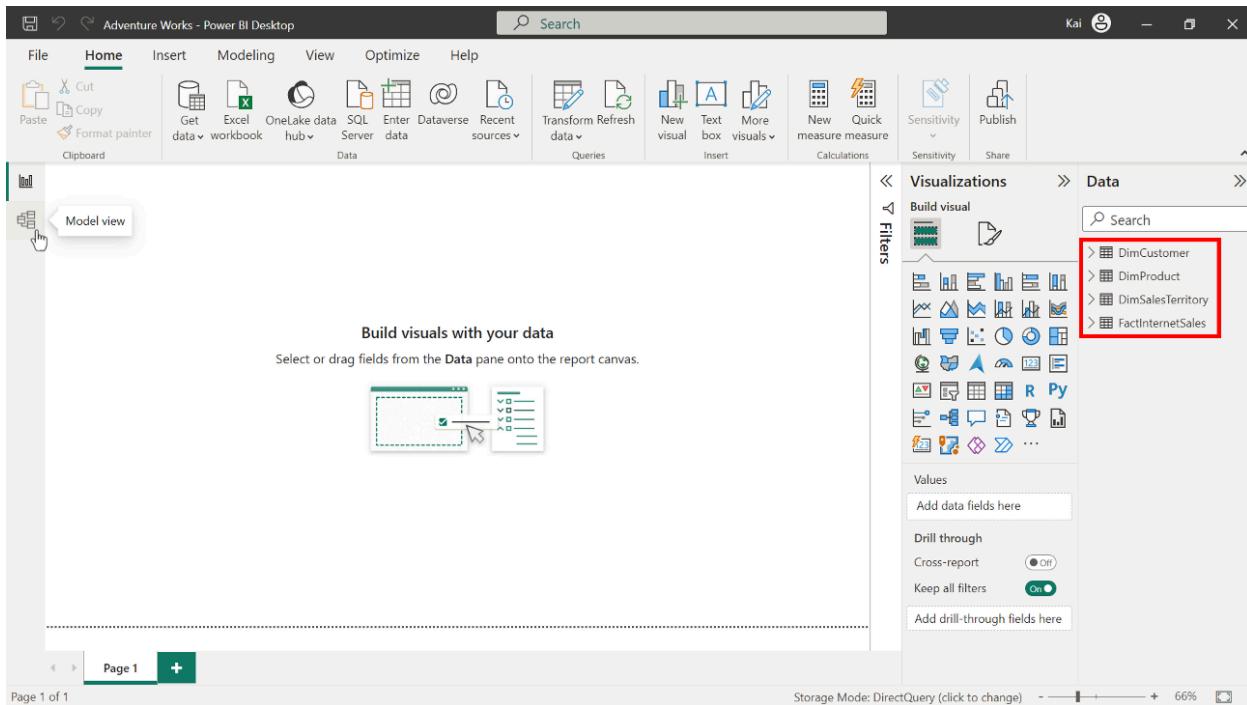
1. Check the DirectQuery option for the data connectivity mode. If your SQL Server is installed on your local machine, you can add localhost in the server's name section.



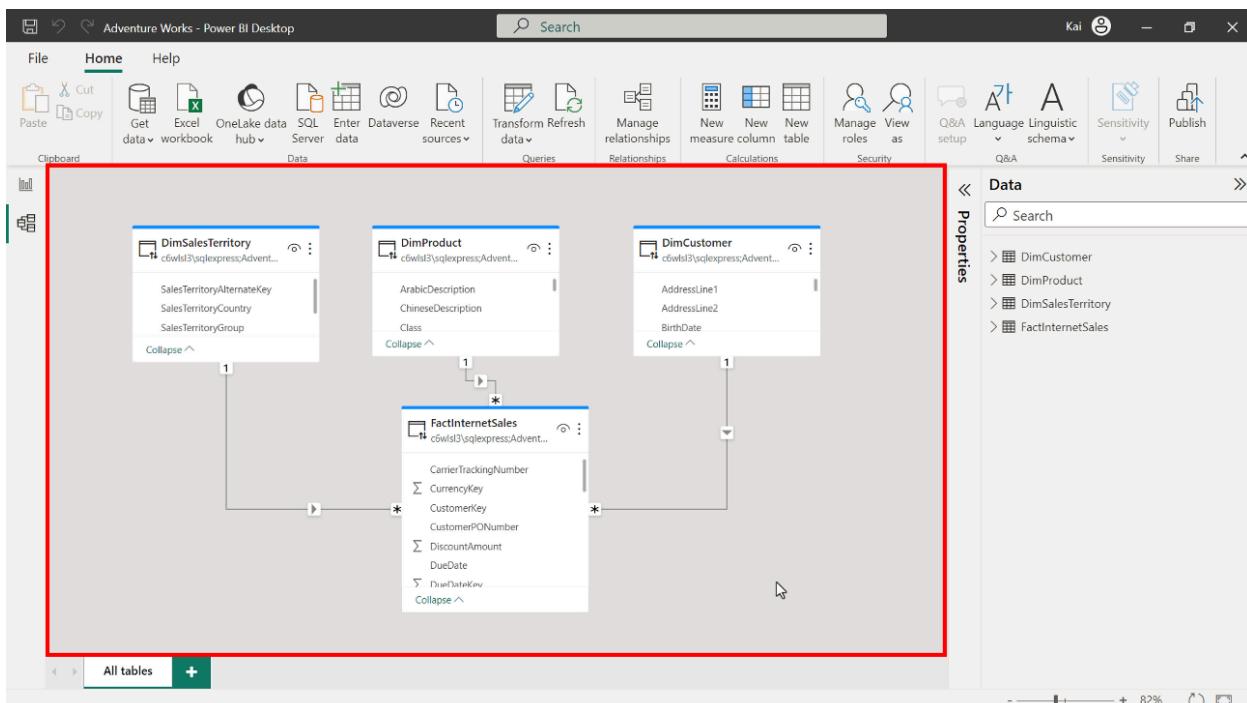
- Once the connection is established, Microsoft Power BI opens the navigator window, which lists all the tables available to load in the database. Select the following tables and then select Load on the bottom right:
 - dbo.FactInternetSales
 - dbo.dimProduct
 - dbo.dimCustomer
 - dbo.dimSalesTerritory

The screenshot shows the Microsoft Power BI application interface. On the left, the 'Navigator' pane is open, displaying a list of tables from the 'Adventure Works' database. A red box highlights the table 'FactInternetSales' in the list. To the right of the navigator is a preview pane showing the first few rows of the 'FactInternetSales' table. The table has columns: ProductKey, OrderDateKey, DueDateKey, ShipDateKey, CustomerKey, and Pro. Below the preview, a message says 'The data in the preview has been truncated due to size limits.' At the bottom of the navigator pane, there are buttons for 'Load' (highlighted with a red box), 'Transform Data', and 'Cancel'. The main workspace on the right is currently empty, showing a message 'You haven't loaded any data yet. Get data'.

The tables are loaded to the data model of Power BI as a DirectQuery.

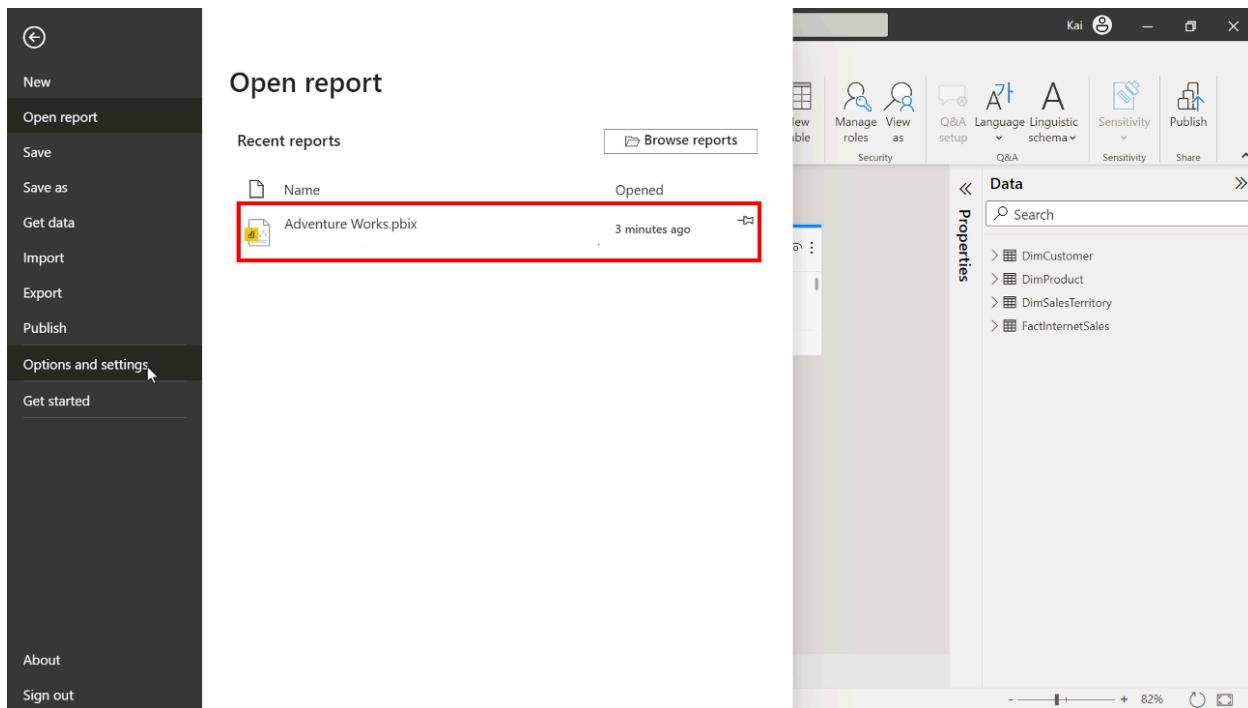


1. Establish relationships between the Fact table and the dimension tables as you did with import data. Note that there is no data view available when connecting to DirectQuery because data is not imported to Microsoft Power BI.

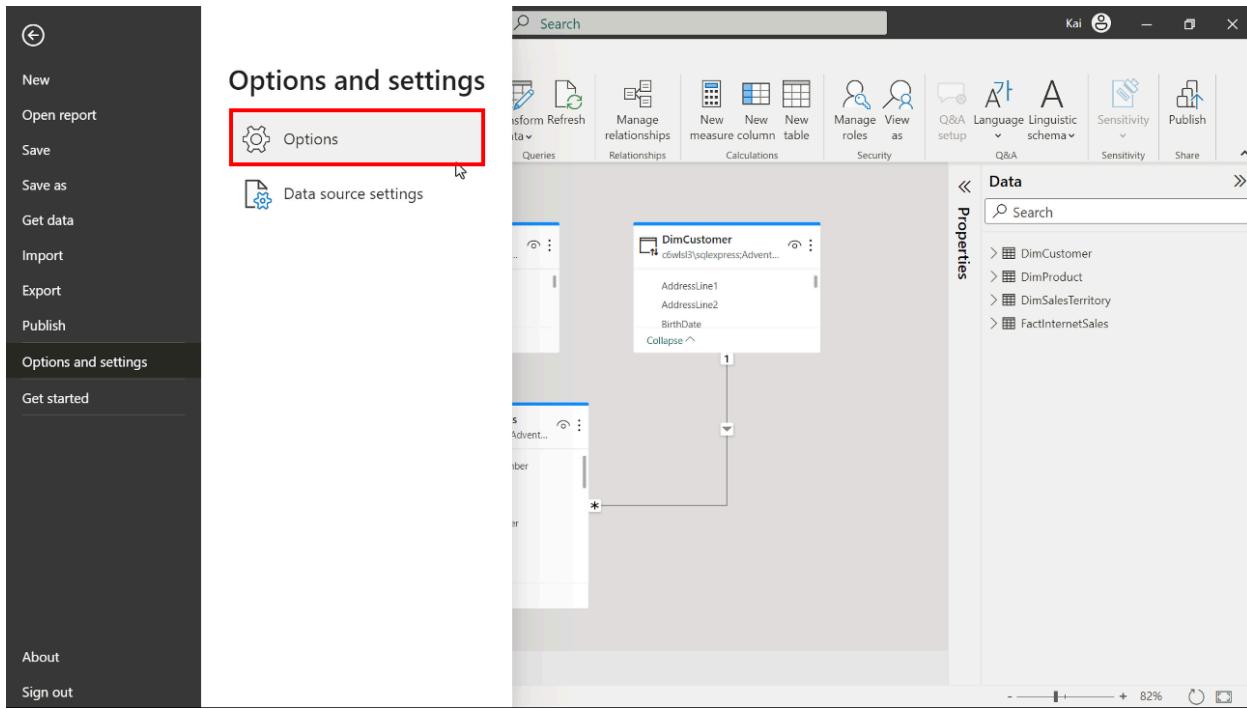


Step 2: Optimize DirectQuery by query reductions.

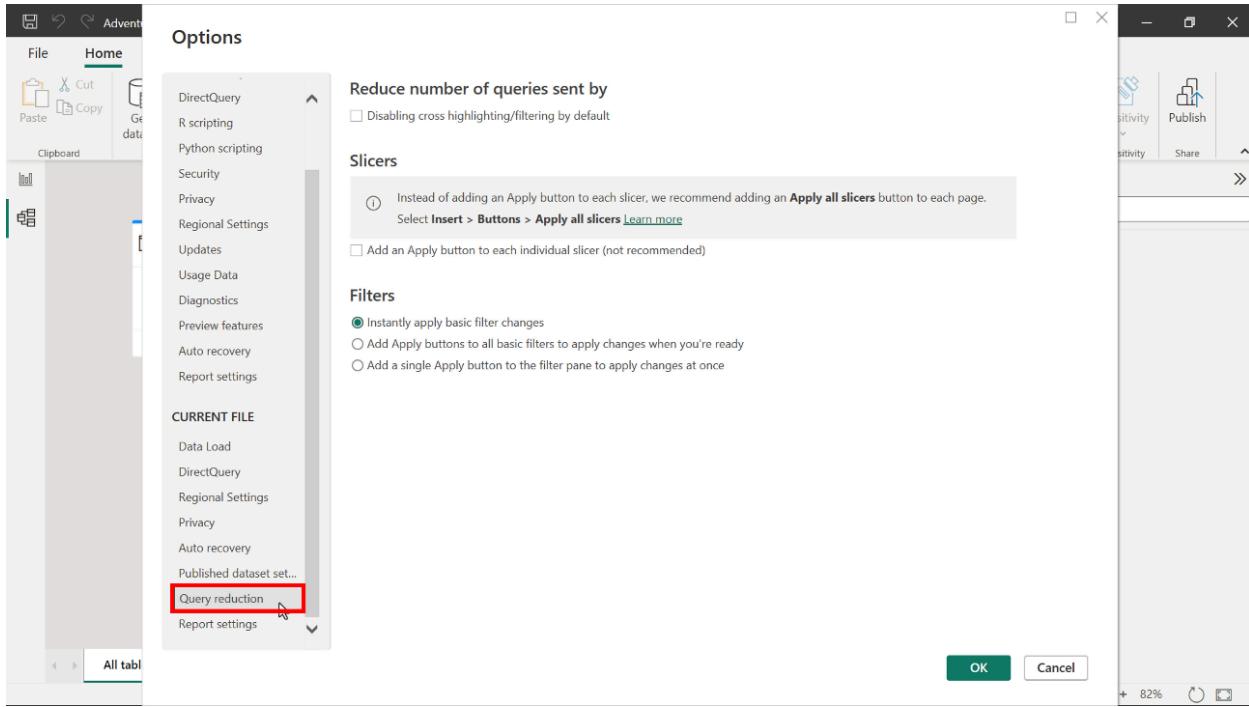
1. Now that a connection has been established to the dataset via DirectQuery and the desired tables loaded into the data model, you need to optimize the performance via query reduction. Select File and then Options and settings from the sidebar menu to navigate the query reduction options.



1. Select Options to open the Options dialog box when the submenu opens.

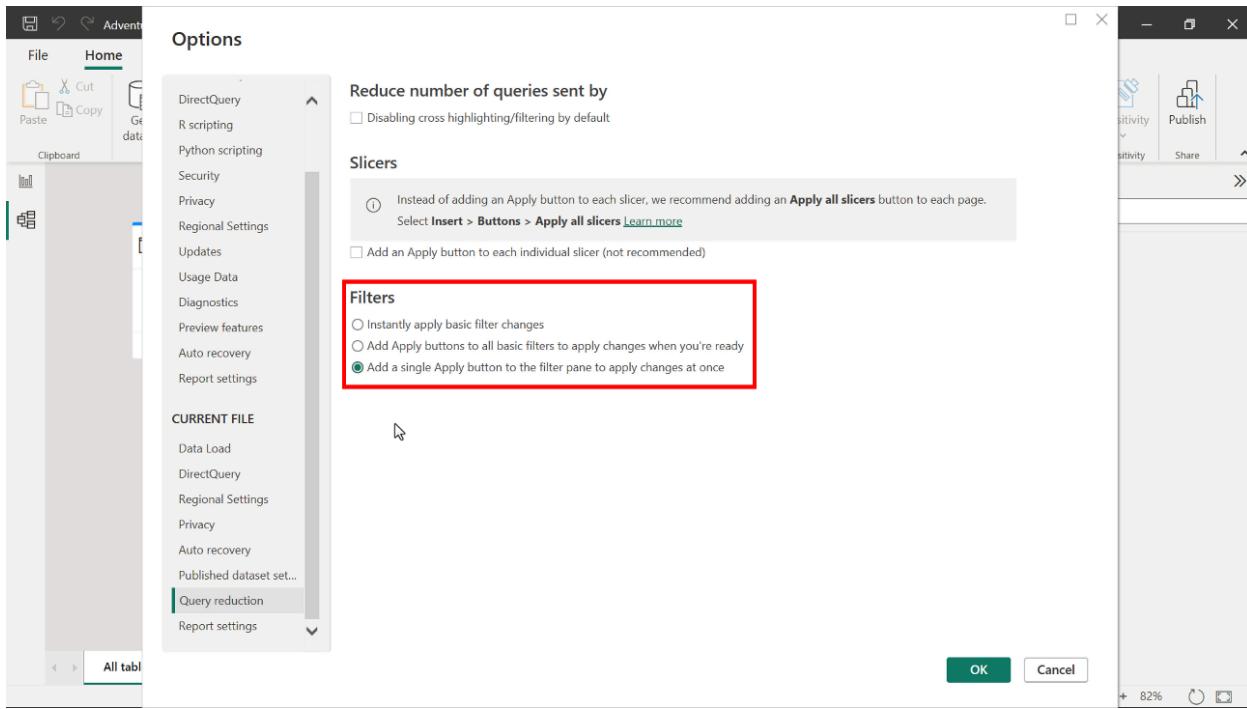


1. Scroll down the page and select Query reduction from the left sidebar to display three options:
 - The first is Reduce number of queries sent by. Selecting this option disables cross-highlighting or filtering, the primary feature in Power BI, which makes it an interactive visualization tool. If cross-highlighting or filtering is enabled, other visuals will be highlighted or filtered when you select one visual. If you have some visuals in the report that do not interact with each other, enabling this option will reduce the number of queries sent to the database.
 - Slicers, the second option, is more relevant for visualizations. It's useful for multi-select slicers and filters.



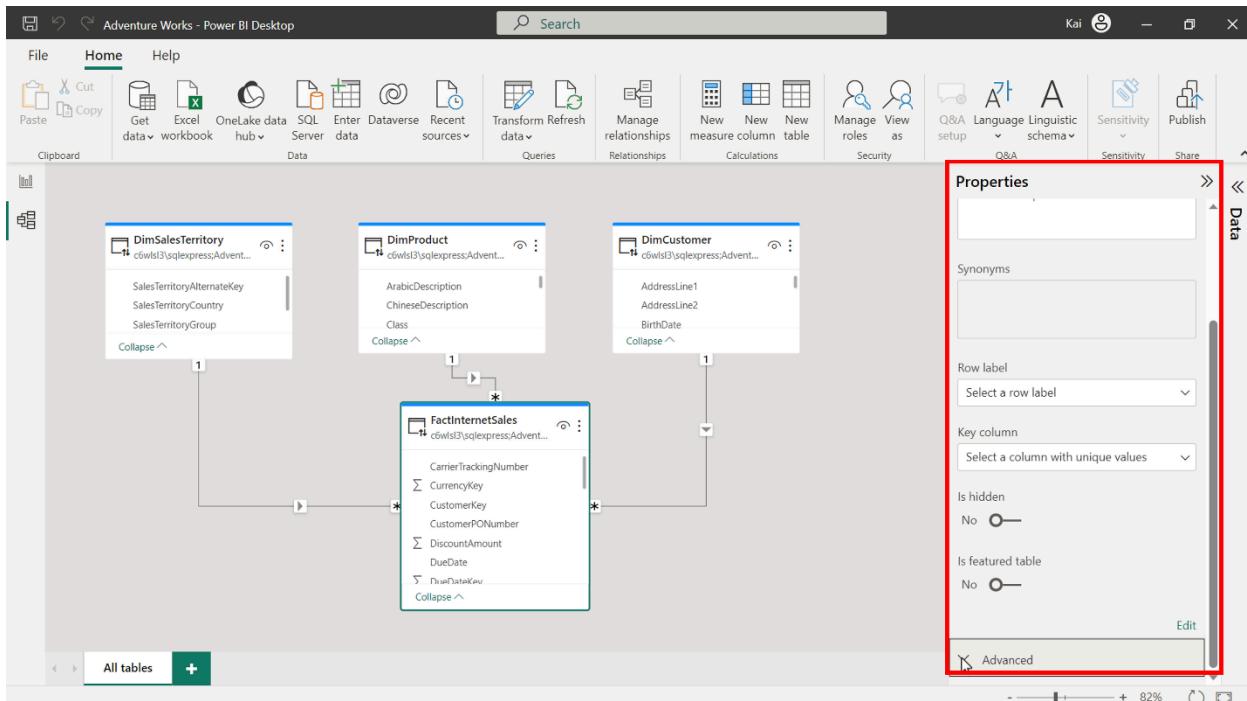
1. The third heading is Filters, which offers three choices:
 - Instantly apply basic filter changes is selected by default.
 - Add Apply button to all basic filters to apply changes when you are ready adds an Apply button to all basic filters.
 - Add a single Apply button to the filter pane to apply changes at once adds a single Apply button to the entire Power BI filter pane. Any changes you make will not execute until you select the Apply button.

Tip: The third option is highly recommended to avoid unwanted changes, especially when you have a multi-selection filter. You can choose to have one Apply button for the entire filter pane, which is helpful in query reduction.

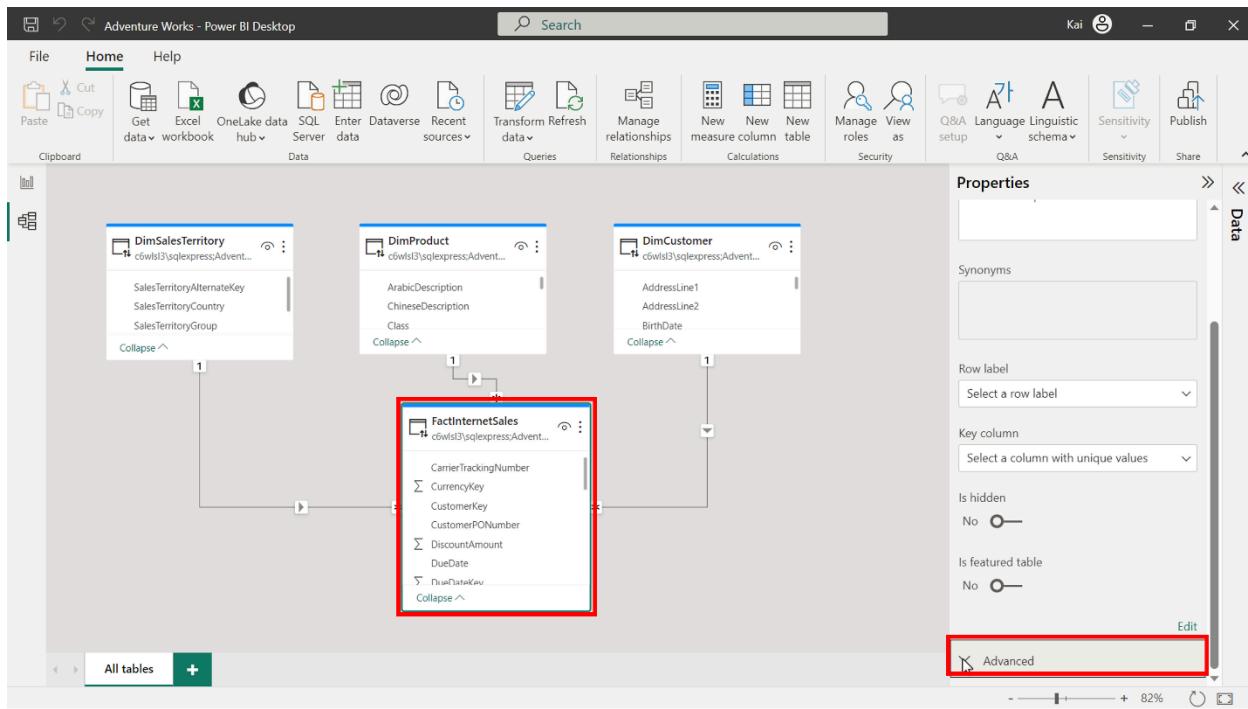


Step 3: Optimize DirectQuery by table storage mode of Power BI.

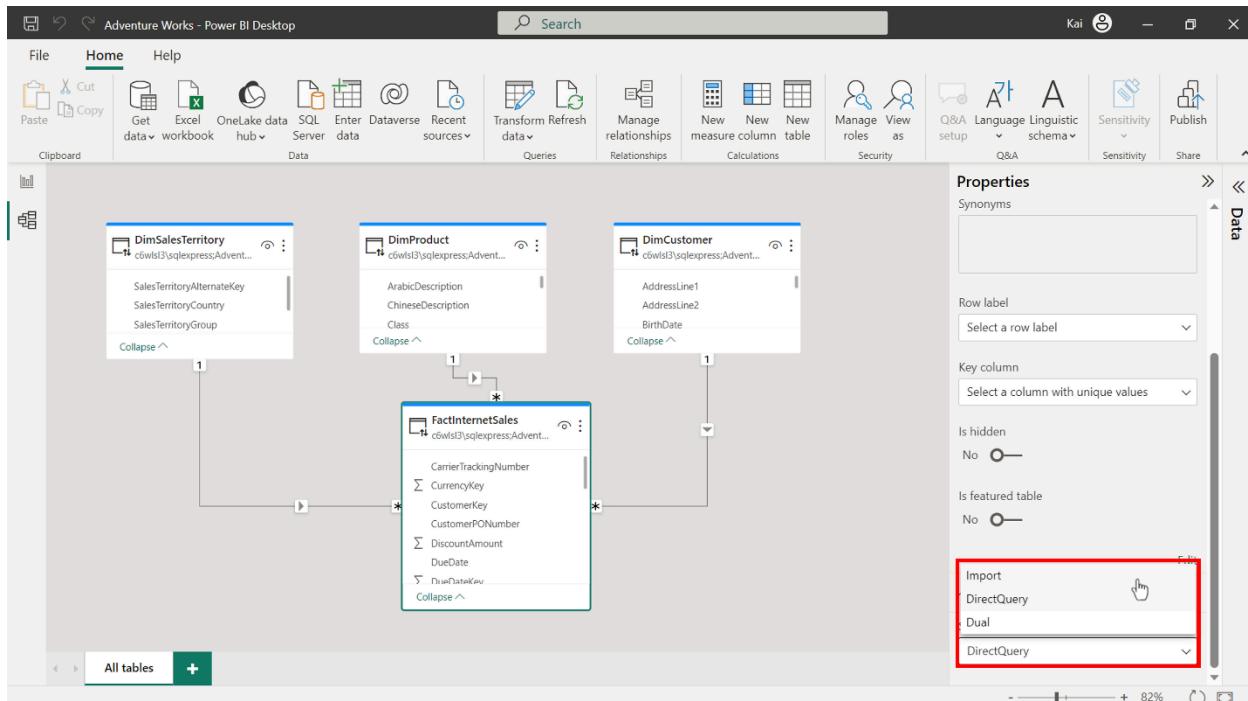
1. You now need to optimize the performance via table storage. Select Model view and expand the Properties pane on the right-hand side.



1. Select the dbo.FactInternetSales table to display the properties for that table.
Scroll down the Properties pane and expand the Advanced section.

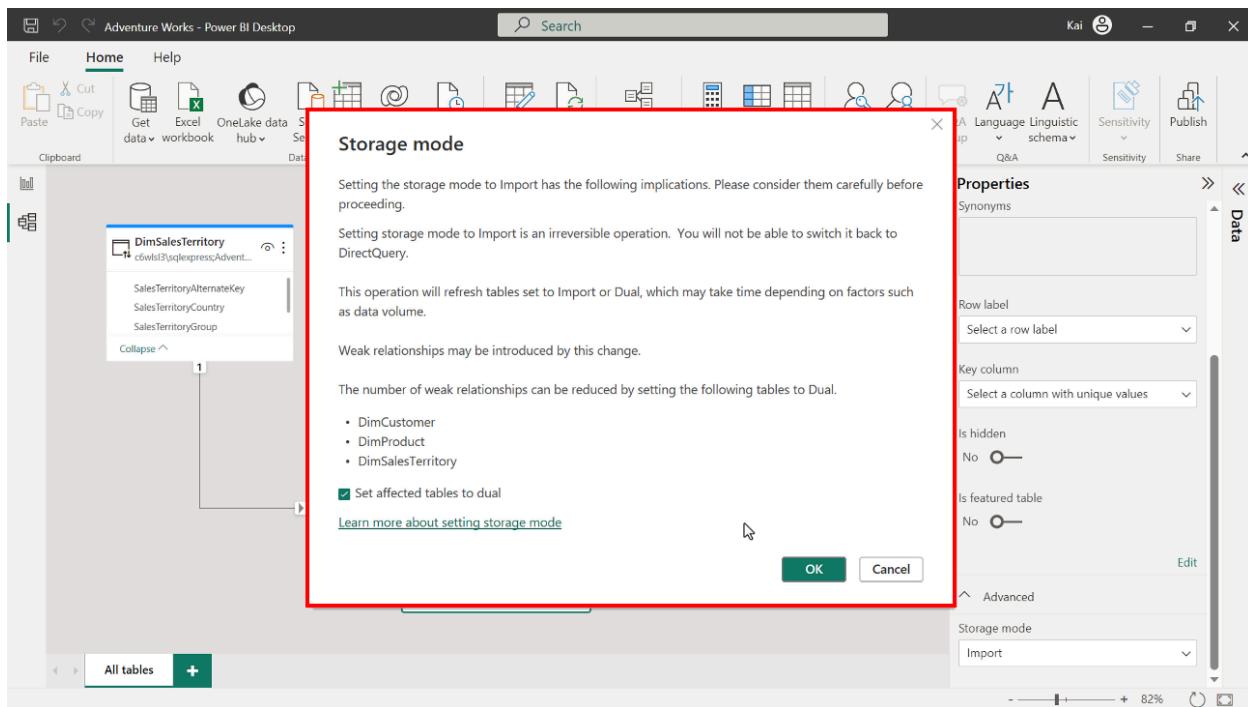


1. Expand the Storage mode drop-down menu and select Import storage mode.



1. A dialog box appears onscreen, showing a warning stating that setting the storage mode to import is irreversible. You will not be able to switch back to DirectQuery. Select OK. This imports the Sales table to the in-memory engine of Microsoft Power BI. Each time you interact with the report via filters or slicers, Power BI sends queries to the underlying data source for dimension tables. The dimension tables filter relevant data from the imported fact table, reducing the number of queries sent to the underlying database.

Tip: In the real world, you can optimize(according to the analytical needs of the business) which tables to import and which to keep in the DirectQuery connection.



Step 4: Save the Power BI project.

- Save your Microsoft Power BI project to your local computer.

Tip: To save the project, open the File menu, select Save As, and provide an appropriate name for the project along with a path to the folder on your computer.

Conclusion

DirectQuery provides a way to handle larger datasets and analyze real-time data. However, the performance depends on multiple factors such as server configuration, network speed, data size, and the report and visualizations. When dealing with DirectQuery connection in Power BI, optimizing the query performance is the key.

In this walkthrough, Query reduction and table storage provided a way to optimize DirectQuery and achieve a seamless connection and smooth user experience.

3.4. Exercise: Adding an aggregation

Introduction

You have gained a thorough understanding of creating and managing aggregations in Microsoft Power BI while working with a DirectQuery connection. You have also learned how aggregations can help improve query performance.

In this exercise, you can apply this knowledge by creating and managing an aggregation in Power BI using import data. You will also be able to observe how significantly it reduces the size of the data table.

By completing this exercise, you will demonstrate your ability to:

- Create an aggregation based on specific granularity of analytics.
- Configure the data types of aggregated columns and source columns.
- Manage the aggregation in Power BI desktop.

Scenario

One of the Adventure Works data sets used in a Power BI report is very large. The report performance has been negatively impacted by the need to query the entire data table each time a user interacts with visuals and filters. You feel that creating an aggregation will solve the issue.

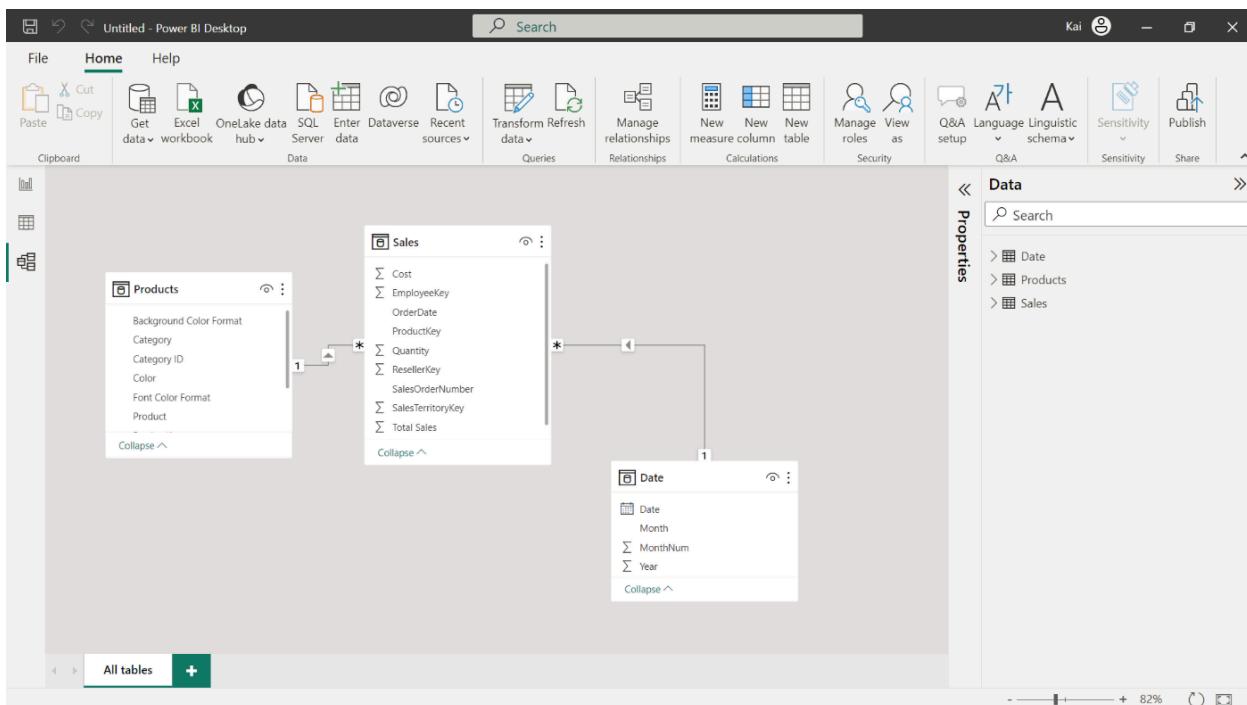
To implement this solution, you must create a new aggregated table, establish relationships, and then manage the aggregations within Microsoft Power BI desktop.

Adventure Works provides a Power BI project file called AdventureWorks.pbix. that contains the required data model and an Excel spreadsheet Adventure Works Data.xlsx. You must download these files and load it into Power BI.

Step 1: Download the Adventure Works Power BI project.

1. Download and save the Power BI file *Adventure Works.pbix*. The data model has three tables of data: Sales, Products, and Date.
2. Download and save the Excel spreadsheet *Adventure Works Data.xlsx*.
3. Next, select on File in the top-left corner of the screen. In the dropdown menu, hover over Options and settings, and then select Data source settings.

4. A new window titled Data source settings will appear. Here, you'll see a list of all the data sources currently used in your Power BI reports.
5. After selecting the data source, click on Change Source... to modify its details. Navigate to the file location of the Adventure Works Data spreadsheet.
6. Once you've made the necessary changes, select OK to confirm and Power BI will validate the new connection.



Step 2: Create an aggregated table.

1. Within your data model, create an aggregation named "SalesAgg". You need to use the Power Query editor to create an aggregation while keeping the original fact table intact.
2. Group the aggregation by Order Date field. Create TotalQuantityCount, SumTotalSales, and SumCost as aggregate columns in the new aggregations.
3. Note the number of rows in the original fact table and in the aggregated table.

Tip: You can create this aggregation in the Query editor of Power BI. You can also employ the Choose columns and group by features of the Power Query editor.

Step 3: Establish a relationship and manage aggregation in Power BI.

1. Establish a relationship between the SalesAgg table and Date table based on the Order Date field.
2. Ensure the data types of aggregate columns match the source columns.

Tip: You can create relationships in the Model view of Power BI. You can navigate back to the Query editor to match the data types. And you can manage aggregations in the Microsoft Power BI Modeling tab.

Step 4: Save the Power BI project.

1. Save your Power BI project.

Tip: Make sure you select an appropriate project name and folder path.

Conclusion

With these steps, you have successfully created an aggregation within Power BI to significantly reduce the size of the original dataset, which was a fact table containing millions of rows. This approach helps to optimize the query performance and visual refresh time. These optimization measures will help you analyze Adventure Works data based on the required granularity levels.

Exemplar: Adding an aggregation

Overview

In the exercise *Creating an aggregation*, you were asked to create and manage an aggregation in Power Query editor to reduce the data size of the Fact table and optimize query performance.

Your tasks in the exercise include:

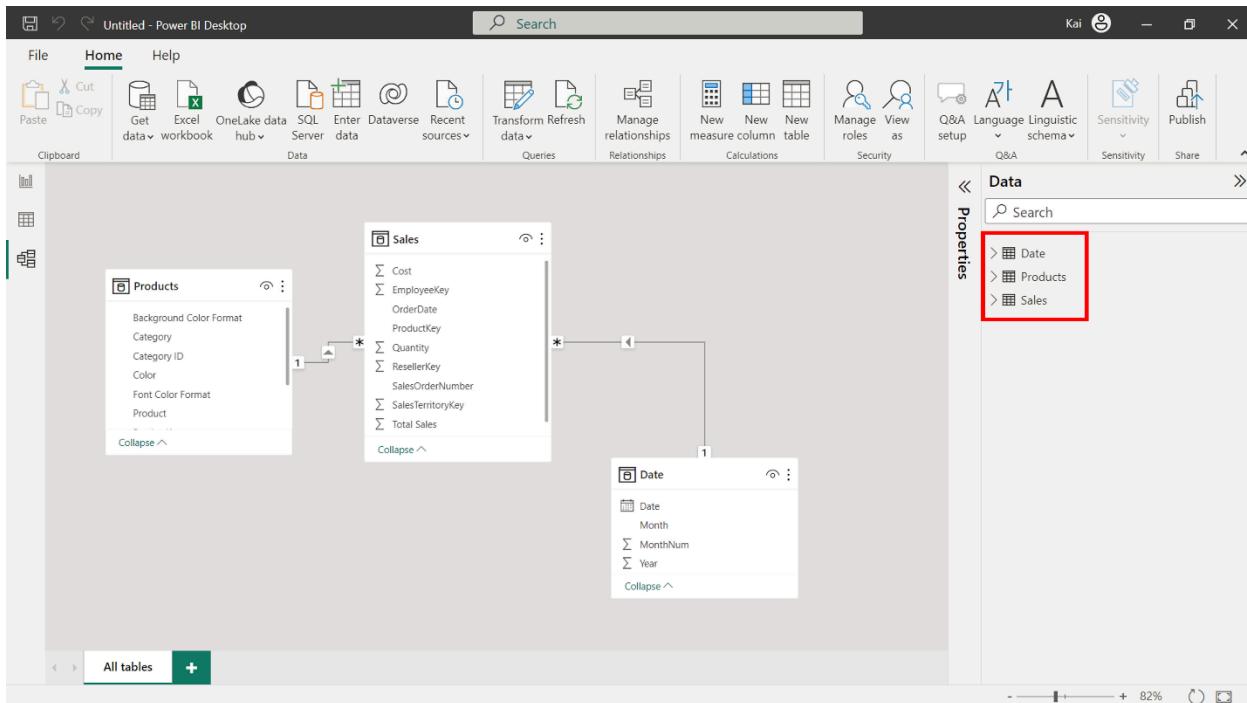
- Create an aggregation based on the Fact table (Sales table) according to the required granularity.
- Configuring the data types of the aggregated columns and the source columns.
- Manage the aggregation in Power BI desktop.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your work.

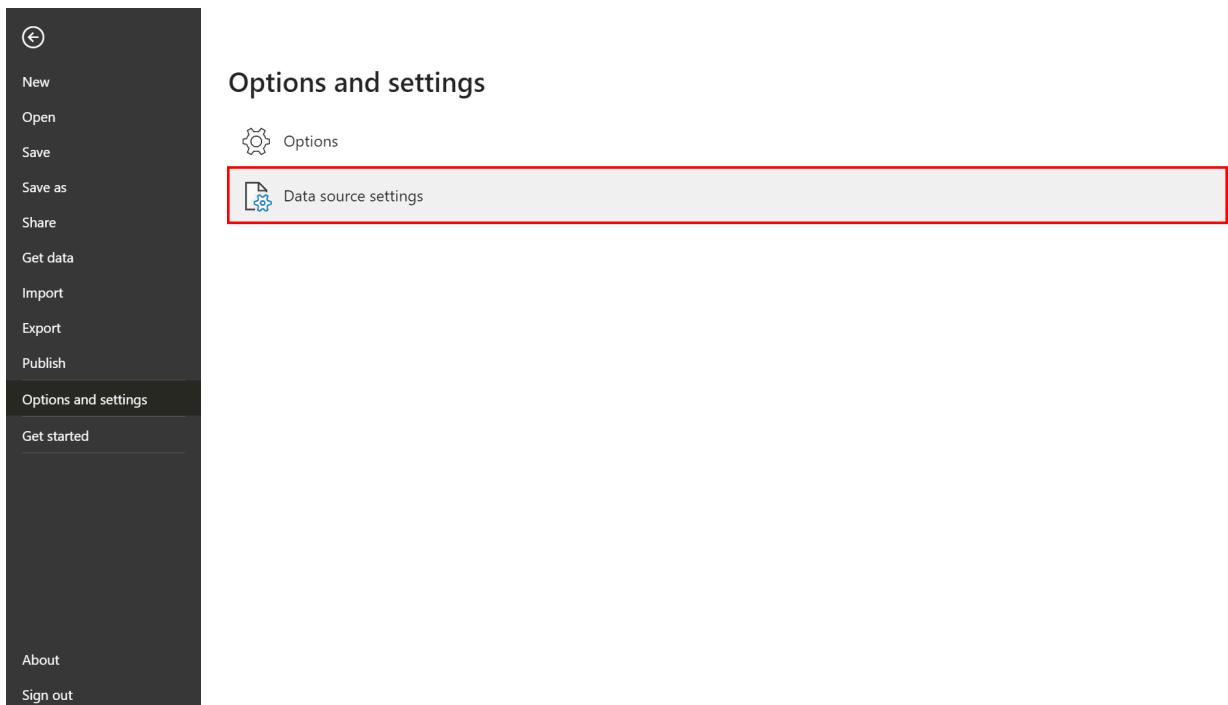
You can also review the [*Creating an aggregation*](#) and [*Managing aggregations*](#) videos.

Step 1: Download the Adventure Works Power BI project.

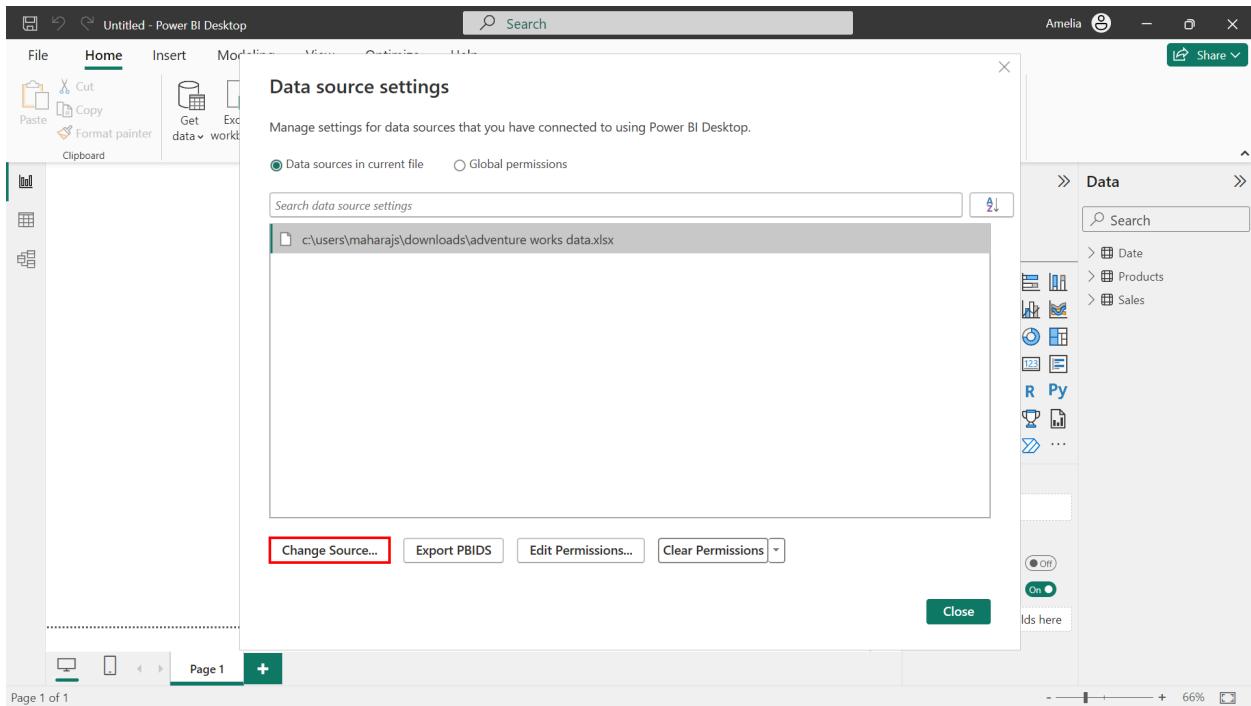
1. Download and save the file Adventure Works.pbix. Load the data from the workbook into Power BI. Select the Preview pane to open a table preview. The data model has three tables of data: Sales, Products, and Date.



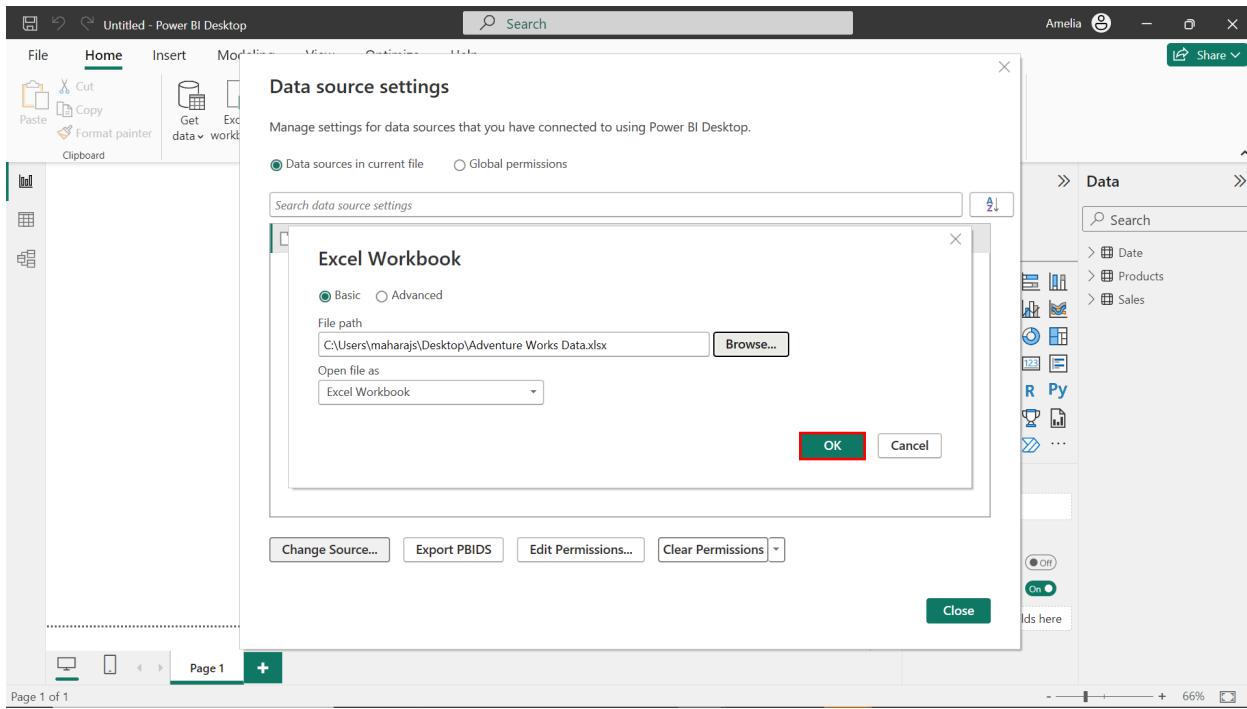
1. Download and save the Excel spreadsheet Adventure Works Data.xlsx.
2. Next, select on File in the top-left corner of the screen. In the dropdown menu, hover over Options and settings, and then select Data source settings.



1. A new window titled Data source settings will appear. Here, you'll see a list of all the data sources currently used in your Power BI reports.
2. After selecting the data source, click on Change Source... to modify its details. Navigate to the file location of the Adventure Works Data spreadsheet.

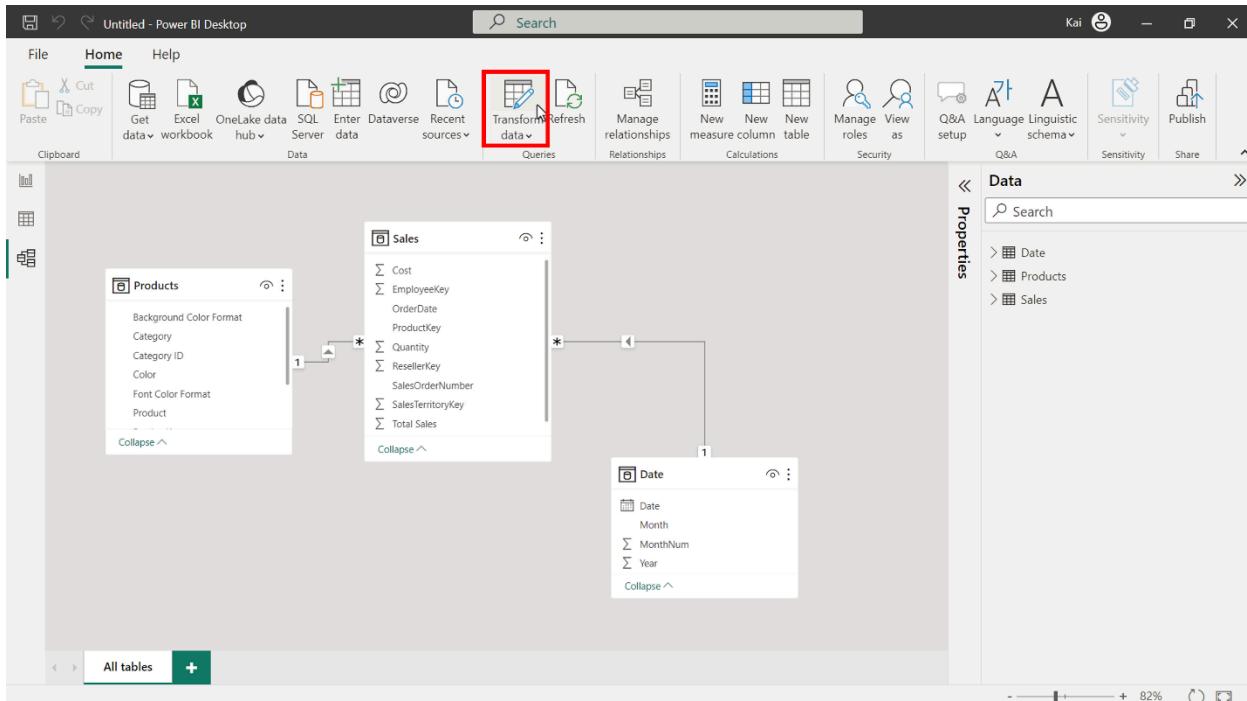


1. Once you've made the necessary changes, select OK to confirm and Power BI will validate the new connection.



Step 2: Create an aggregated table named SalesAgg

1. On the Home tab, select Transform data and then Transform data from the drop-down menu.



1. In the Power Query editor window, select the Sales table from the Queries pane on the left and right-click to open the context menu. Select Reference to duplicate the table. Use right-click again to re-open the menu.

The screenshot shows the Power Query Editor interface. The 'Sales' table is selected in the 'Queries [3]' pane. A context menu is open over the table, with the 'Reference' option highlighted and enclosed in a red box. Other options in the menu include Copy, Paste, Delete, Rename, Enable load, Include in report refresh, Duplicate, and Properties. The main workspace shows the transformed query: `= Table.TransformColumnTypes(#"Promoted Headers",{("SalesOrderNumber", type text), ("OrderDate", type date), ("ProductKey", type number), ("ResellerKey", type number), ("EmployeeKey", type number)})`. The 'APPLIED STEPS' pane on the right shows the 'Changed Type' step. The status bar at the bottom indicates '10 COLUMNS, 999+ ROWS' and 'Column profiling based on top 1000 rows'.

1. In the Rename field, rename the new table to SalesAgg. Duplications save the original tables for other analytics needs. So always copy the source table and create an aggregate from the duplicate copy.

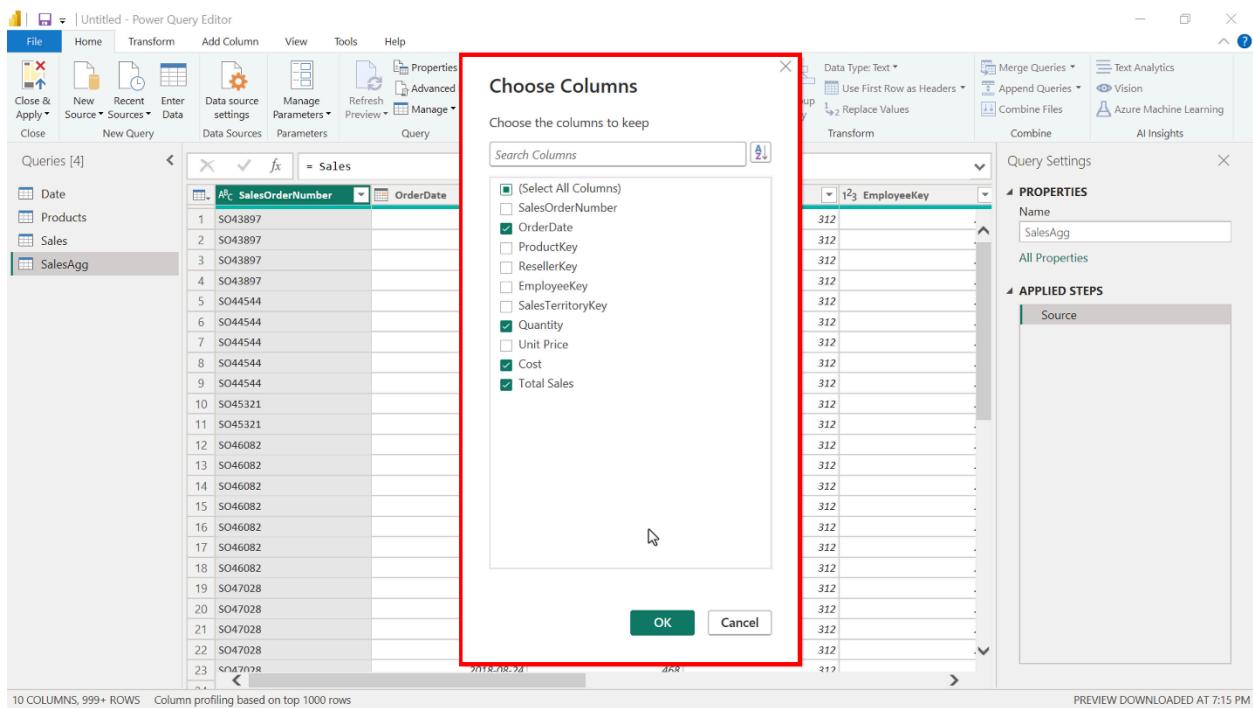
The screenshot shows the Power Query Editor interface. The 'Sales' query is open. In the 'Queries' list, 'SalesAgg' is selected and highlighted with a red box. The ribbon at the top has the 'Home' tab selected. The 'Choose Columns' button in the 'Transform' tab is also highlighted with a red box. The main preview area shows a table with columns: SalesOrderNumber, OrderDate, ProductKey, ResellerKey, and EmployeeKey. The preview status at the bottom right says 'PREVIEW DOWNLOADED AT 7:15 PM'.

1. Choose the columns that you want to keep in the aggregated table from the source table by selecting the Choose column option on the Home tab in the Power Query editor window.

This screenshot is identical to the one above, showing the Power Query Editor with the 'Sales' query open and the 'SalesAgg' step selected. The 'Home' tab is active, and the 'Choose Columns' button in the ribbon is highlighted with a red box. The preview area and status bar are also the same.

1. In the Choose column window select the following columns:

- OrderDate (This column is added to group data and will be used for the group by step)
- Total Sales
- Quantity
- Cost



1. Next, select the Transform tab in the Power Query editor window and then Group by. This opens the Group by window, where you can define aggregate columns and mathematical operations to compute the aggregation.

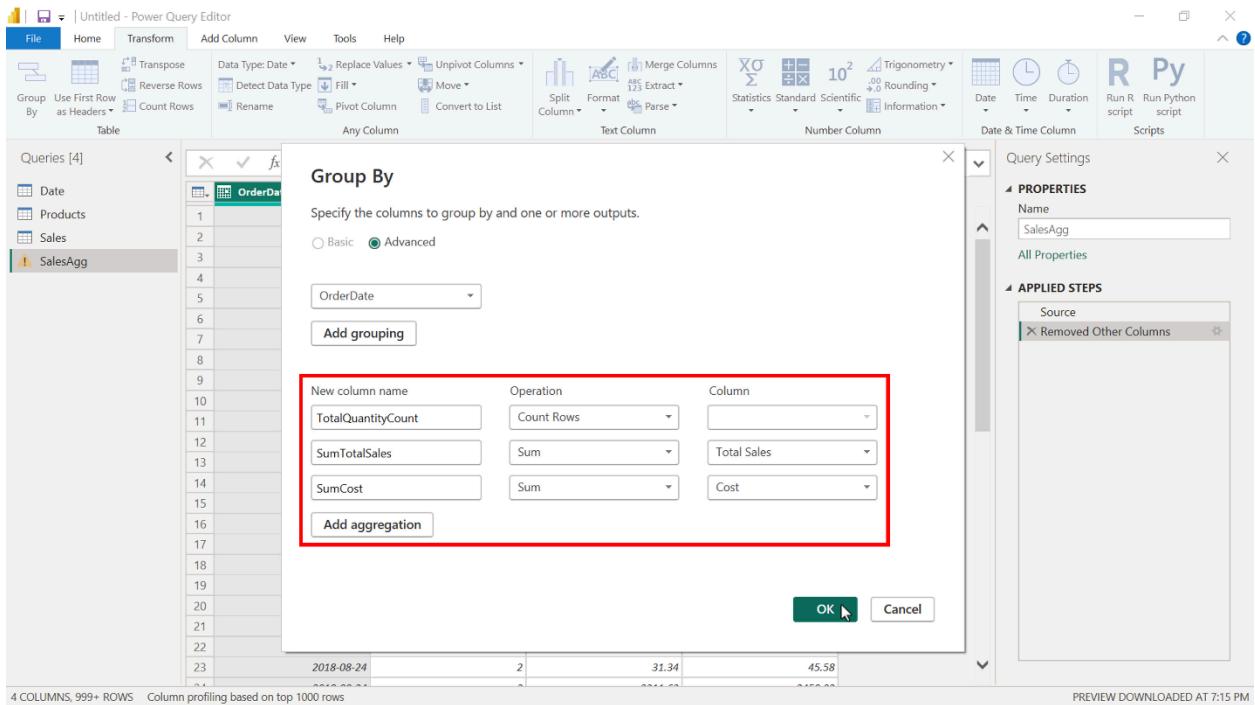
The screenshot shows the Power Query Editor interface with the 'Group By' window open. The 'Group By' button is highlighted with a red box in the top-left corner of the ribbon. The main area displays a table with columns: OrderDate, Quantity, Cost, and Total Sales. The 'SalesAgg' query is selected in the Queries list. The 'APPLIED STEPS' pane shows a single step: 'Removed Other Columns'. The preview pane at the bottom right shows the data with a timestamp: 'PREVIEW DOWNLOADED AT 7:15 PM'.

1. Group the aggregation by the OrderDate field in the Group by window.

The screenshot shows the Power Query Editor with the 'Group By' dialog box open. The dialog box is highlighted with a red border. It contains fields for 'New column name' (set to 'Count'), 'Operation' (set to 'Count Rows'), and 'Column' (set to 'OrderDate'). Below these fields is a button labeled 'Add aggregation'. The background shows the same sales data table and the 'SalesAgg' query in the Queries list. The preview pane at the bottom right shows the data with a timestamp: 'PREVIEW DOWNLOADED AT 7:15 PM'.

1. Create the following aggregate columns in the Group by window:
 - TotalQuantityCount that uses the Count function as an operation.

- SumTotalSales, which performs a Sum as a mathematical operation and uses Total Sales as the column reference.
- SumCost also uses the Sum function and Cost as the column reference.



1. Select OK to apply all changes to the aggregation.

Group By

Specify the columns to group by and one or more outputs.

Basic Advanced

OrderDate

Add grouping

New column name	Operation	Column
TotalQuantityCount	Count Rows	
SumTotalSales	Sum	Total Sales
SumCost	Sum	Cost

Add aggregation

OK Cancel

1. Select Close and apply on the Home tab to close the Power Query editor and return to the Microsoft Power BI desktop interface.

Close & Apply

Properties

Transform

Query Settings

Properties

Transform

Query Settings

Removed Other Columns

Grouped Rows

1. Select the table from the Data pane to display the total number of rows. In the Sales table, the number of rows is 57851. The number of rows in the SalesAgg

aggregated table is only 990, which is 1.71% of the original rows, a significant reduction in data size.

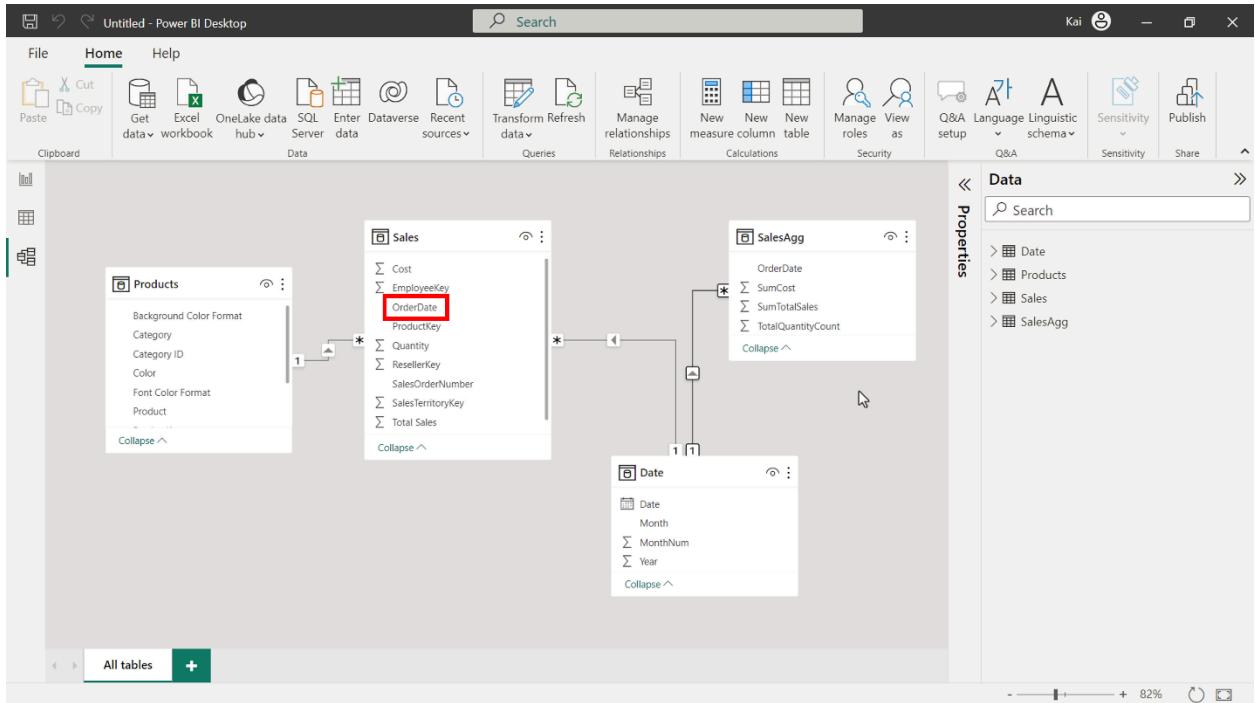
The screenshot shows the Power BI Desktop interface with the 'Table tools' ribbon selected. The table is named 'SalesAgg' and contains four columns: OrderDate, TotalQuantityCount, SumTotalSales, and SumCost. The data grid shows approximately 990 rows of sales data from 2017 to 2020. In the Data pane on the right, the table 'SalesAgg' is listed under the 'Tables' section. A red box highlights the table name 'SalesAgg' in the Data pane.

OrderDate	TotalQuantityCount	SumTotalSales	SumCost
August 25, 2017	19	55580.79	52260.18
November 18, 2017	16	21348.02	19851.08
February 18, 2018	70	190428.86	182987.86
May 23, 2018	31	61435.37	58265.52
August 24, 2018	193	245675.82	239563.78
November 19, 2018	59	74654.56	69959.84
February 20, 2019	33	46652.69	43203.1
May 25, 2019	82	78281.09	69464.57
August 27, 2019	147	148487.69	150438.38
November 22, 2019	129	175855.89	171082.22
February 27, 2020	123	260934.75	264962.92
May 27, 2020	166	262048.84	256668.07
September 23, 2017	56	140837.42	133232.25
December 23, 2017	61	191969.9	181974.15
March 17, 2018	49	114066.02	107757.88
June 18, 2018	16	17762.28	32905.83
September 18, 2018	115	138905.42	132252.25
December 21, 2018	27	27573.14	24081.86
March 8, 2019	42	28662.21	26783.33
June 14, 2019	69	93080.34	89158.93
September 15, 2019	102	121603.09	121535.47
December 13, 2019	178	198573.78	188404.61
March 10, 2020	141	165749.26	160587.09

Table: SalesAgg (990 rows)

Step 3: Establish relationship and manage aggregation in Power BI.

1. The new aggregated SalesAgg Fact table does not have a relationship with the Date table. Switch to Model view and establish a relationship between the two tables based on the OrderDate field.



1. Open the Power Query editor again to ensure that the data types of the aggregate columns match the data types of the source columns as follows using the Data type icon to the left of each column:
 - The data type of the column using Count must be set to Whole number.

The data type of SumTotalSales and SumCost must be Fixed decimal number.

•

You can change the data type by selecting the Data type icon on the left side of the column name in the Power Query editor. Once you have completed the data type configuration, select Close and apply to return to Power BI desktop interface.

Step 4: Save the Power BI project.

- Save the Power BI project to your local computer.

To save the project, open the File menu, select Save As, and provide an appropriate name for the project along with a path to the folder on your computer.

Conclusion

With these steps, you have successfully created and configured an aggregation within the data model of Microsoft Power BI to reduce the data size significantly. You are now in the situation to help Adventure Works optimize the query performance and enhance user experience while interacting with the reports and visualizations.

4. Exercise: Building and optimizing a data model

Introduction

You should now understand the fundamentals of data modeling in Power BI. In this exercise, you'll apply your knowledge of these concepts by building and optimizing a data model in Power BI.

By completing this exercise, you'll demonstrate your ability to:

- Work with advanced data models.
- Make use of DAX in Power BI.
- And optimize a model for performance in Power BI.

Scenario

Adventure Works' sales are stagnating, and a growing inventory issue contributes to the problem. You're provided with sales figures, manufacturing data, and inventory levels. You need to turn this information into actionable insights so Adventure Works can solve its issues.

By building and optimizing an efficient data model, you can revolutionize how Adventure Works operates and help to align its products, markets, and strategies for success.

Instructions

Download and open the Adventure Works Power BI report titled *AdventureWorksSales.pbix* and follow the prompts below to complete the exercise.

Step 1: Download and import the data model.

1. Download and save the Power BI report *AdventureWorksSales.pbix*. The data model contains two datasets: Customers and Orders.
2. Access the model for editing by selecting Data view.

Step 2: Optimize data types.

Your next step is to optimize the data types for the Customers and Orders tables so that the data model functions efficiently and accurately.

Optimizing Data Types for the Customers table

1. Select the Customers table from the fields pane.
2. Access the Column tools tab on the top toolbar and navigate to the Data type option.
3. Assign data types to each column as follows:
 - Name = Text
 - Surname = Text
 - Location = Text
 - Date of Birth = Date
 - Phone Number = Text
 - Membership Tier = Text
 - Customer Source = Text

Optimizing Data Types for the Orders table

1. Now that you have optimized the data types for the Customers table, you need to do the same for the Orders table. Select the Orders table from the Fields pane.
2. Take a moment to observe the first 10 records. Note which record has the highest Order Quantity value. Next, note which payment method was most used.
3. Access the Column tools tab on the top toolbar and navigate to the Data type option.
4. Assign data types to each column as follows:
 - Order Total = Decimal number
 - Order ID = Whole Number
 - Customer ID = Whole Number
 - Product ID = Whole Number
 - Order Date = Date
 - Order Status = Text
 - Order Quantity = Whole Number
 - Payment Method = Text
 - Billing Address = Text
 - Discounts = Decimal Number
 - Shipping Fee = Decimal Number
 - Tracking Number = Text

Tip: You can assign a data type by accessing the Column Tools tab on the toolbar and selecting the Data Type option.

Step 4: Build and configure the model relationship.

1. Access Model view to view the tables in your data model.
2. Connect the Customers and Orders table using the Customer ID fields.
3. Define the relationship between these two tables as One-to-many.
4. Change the cardinality selection from its current state to One-to-many.
5. Establish a Single cross filter direction.
6. Save the changes made to the data model.

Tip: You can define a relationship by double-clicking the connecting line.

Step 5: Disable Auto date/time.

1. Your final task is to disable the Auto date/time feature so you can manually maximize your model's performance. Access and disable the Auto Date/Time feature.
2. Apply your changes.

Tip: You can access the Auto Date/Time feature from the Options menu's Data load option.

Conclusion

By following these steps, you have demonstrated your ability to work with advanced data models, use DAX in Power BI, and optimize a model for performance in Power BI.

In addition, by building and optimizing an efficient data model, you've revolutionized how Adventure Works operates and helped the company to align its products, markets, and strategies for success.

Exemplar: Building and optimizing a data model

Overview

In the exercise *Building and optimizing a data model*, you were asked to put into practice what you have learned about building and optimizing data models in Microsoft Power BI.

Your task in this exercise was to build and optimize a data model for Adventure Works to help the company align its business for success. More specifically, you were asked to:

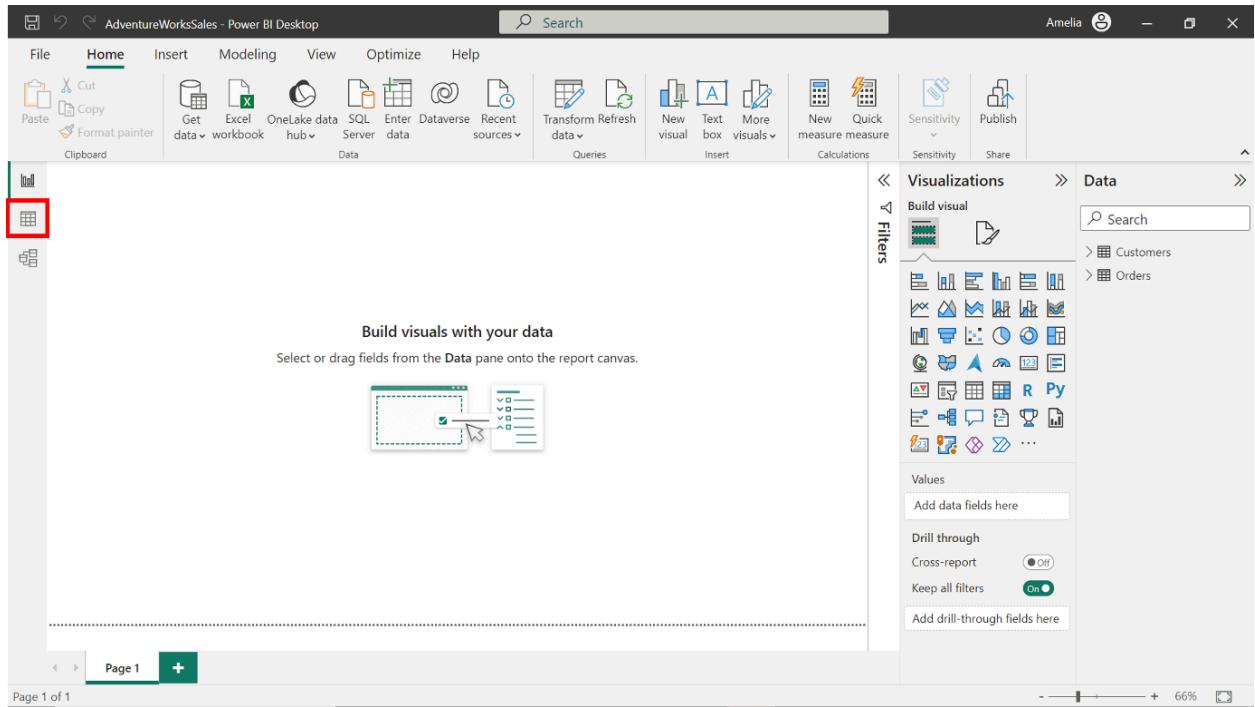
- Optimize the data types in the Customers and Orders tables to ensure efficiency and precision in data processing and calculations.
- Identify potential relationships between datasets and highlight the relationship between Customer ID columns in the Customers and Orders tables.
- Construct a one-to-many relationship between these tables, interpreting the connection that one customer can have multiple orders.
- To further streamline your data model's performance, you were required to deactivate Power BI's Auto Date/Time feature, giving you more control over date fields.

This reading provides you with a step-by-step guide for completing these tasks. It also includes screenshots that you can compare against your own work.

You can review the techniques for this exercise in this course's video items.

Step 1: Download and import the data model.

1. Download the workbook from the exercise page on the Coursera platform. Open the workbook on the Microsoft Power BI platform.
2. Select the Data View icon on the left vertical toolbar to switch your workspace to the Data View, where tables and their corresponding fields are displayed.



Step 2: Optimizing data types.

Optimizing Data Types for Customers Table

- Select the column labeled Customer ID.

Screenshot of Power BI Desktop showing the Column tools tab selected in the ribbon. The 'Customer ID' column is selected, and its data type is set to 'Text'. The Data pane on the right shows 'Customers' and 'Orders'.

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1999	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

- Access the Column tools tab on the top toolbar. Select the option labeled Data type.

Screenshot of Power BI Desktop showing the Column tools tab selected in the ribbon. The 'Customer ID' column is selected, and its data type is set to 'Text'. A tooltip indicates: 'Set the data type to make sure the data for this field is stored, calculated and visualized properly.' The Data pane on the right shows 'Customers' and 'Orders'.

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1999	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

- Upon selecting the Data type option, a dropdown will appear. For unique identifiers that are numbers, Whole Number is often the best fit.

Screenshot of Power BI Desktop showing the Column tools ribbon tab selected. The Customer ID column is being edited, with its Data type set to Text and Format set to Whole number. A red box highlights the 'Whole number' option in the dropdown menu.

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

- Select Whole Number to assign it to the Customer ID column. Accurately classifying the Customer ID as a whole number safeguards against potential data mismatches or misinterpretations during future analysis.

Screenshot of Power BI Desktop showing the Customer ID column selected for editing. The Data type is set to Whole number and the Format is set to Whole number. A red box highlights the 'Whole number' option in the dropdown menu.

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
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3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

- a. The Adventure Works Customers dataset contains multiple columns, and each must be optimized to ensure accurate reporting. To complete the optimization of the data types, repeat steps 1 - 4 for the remaining columns as follows:
- Change the data type of the Name column to Text.

The screenshot shows the Power BI Desktop interface with the 'AdventureWorksSales' dataset loaded. The 'Column tools' ribbon tab is active. In the main area, the 'Name' column is selected and highlighted with a red box. The 'Data type' dropdown for this column is also highlighted with a red box, showing 'Text' selected. The table below displays 48 rows of customer data, with columns for Customer ID, Name, Surname, Location, Phone Number, Date of Birth, Membership Tier, and Customer Source. The 'Name' column contains values like Sophia, Oliver, Emma, Liam, Ava, Noah, etc.

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
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3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
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3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

- Change the data type of the Surname column to Text.

AdventureWorks Sales - Power BI Desktop

Table tools **Column tools**

Name: Surname **Format:** Text **Data type:** Text

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

Table: Customers (48 rows) Column: Surname (29 distinct values)

- Change the data type of the Location column to Text

AdventureWorks Sales - Power BI Desktop

Table tools **Column tools**

Name: Location **Format:** Text **Data type:** Text

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

Table: Customers (48 rows) Column: Location (18 distinct values)

- Change the data type of the Phone number column to Text.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Phone Number
Data type: Text

Summarization: Don't summarize
Data category: Uncategorized

Sort by column
Data groups
Manage relationships
New column

Structure Formatting Properties

Data

Search

Customers
Orders

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

Table: Customers (48 rows) Column: Phone Number (12 distinct values)

- Change the data type of the Date of Birth column to Date.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Date of Birth
Data type: Date

Summarization: Don't summarize
Data category: Uncategorized

Sort by column
Data groups
Manage relationships
New column

Structure Formatting Properties

Data

Search

Customers
Customer Source
Date of Birth
Membership Tier
Phone Number
Customer ID
Location
Name
Surname
Orders

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
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3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
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3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
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3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

Table: Customers (48 rows) Column: Date of Birth (48 distinct values)

- Change the data type of the Membership Tier column to Text.

AdventureWorks Sales - Power BI Desktop

File Home Help Table tools Column tools

Name: Membership Tier
Data type: Text

Summarization: Don't summarize
Data category: Uncategorized

Sort by column
Data groups
Manage relationships
New column

Structure Formatting Properties Sort Groups Relationships Calculations

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
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3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

Table: Customers (48 rows) Column: Membership Tier (4 distinct values)

- Change the data type of the Customer Source column to Text.

AdventureWorks Sales - Power BI Desktop

File Home Help Table tools Column tools

Name: Customer Source
Data type: Text

Summarization: Don't summarize
Data category: Uncategorized

Sort by column
Data groups
Manage relationships
New column

Structure Formatting Properties Sort Groups Relationships Calculations

Customer ID	Name	Surname	Location	Phone Number	Date of Birth	Membership Tier	Customer Source
3001	Sophia	Anderson	New York, USA	555-123-4567	Tuesday 15 May 1990	Silver	Website
3002	Oliver	Johnson	Madrid, Spain	555-987-6543	Saturday 21 September 1985	Gold	Referral
3003	Emma	Brown	Berlin, Germany	555-567-8901	Tuesday 3 November 1998	Bronze	In-Store
3004	Liam	Davis	Rome, Italy	555-234-5678	Sunday 11 July 1982	Platinum	Website
3005	Ava	Taylor	Seoul, South Korea	555-876-5432	Friday 28 March 1975	Silver	Email Campaign
3006	Noah	Wilson	Paris, France	555-345-6789	Wednesday 7 December 1994	Gold	Website
3007	Isabella	Taylor	Mexico City, Mexico	555-678-9012	Friday 30 June 1989	Bronze	Referral
3008	Sophia	Martinez	Shanghai, China	555-210-9876	Sunday 19 April 1987	Platinum	In-Store
3021	Ethan	Garcia	Buenos Aires, Argentina	555-890-1234	Wednesday 14 February 1996	Silver	Website
3022	Mia	Robinson	Sydney, Australia	555-543-2109	Monday 25 August 1980	Gold	Email Campaign
3023	Lucas	Lee	Seoul, South Korea	555-456-7890	Monday 12 October 1992	Bronze	Website
3024	Amelia	Lewis	London, UK	555-901-2345	Monday 9 January 1978	Platinum	In-Store
3025	Harper	Hall	Toronto, Canada	555-123-4567	Thursday 3 April 1997	Silver	Referral
3026	Benjamin	Wright	New York, USA	555-987-6543	Sunday 18 September 1983	Gold	Website
3027	Evelyn	Lopez	Barcelona, Spain	555-567-8901	Tuesday 25 December 1990	Bronze	Email Campaign
3028	Samuel	Perez	Mexico City, Mexico	555-234-5678	Wednesday 7 June 1972	Platinum	Website
3041	Elizabeth	Miller	Chicago, USA	555-876-5432	Monday 22 March 1999	Silver	Referral
3042	Alexander	Clark	Sydney, Australia	555-345-6789	Friday 14 February 1986	Gold	Website
3043	Sofia	Green	Moscow, Russia	555-678-9012	Wednesday 28 November 1984	Bronze	In-Store
3044	Michael	Martinez	Los Angeles, USA	555-210-9876	Thursday 1 July 1993	Platinum	Website
3045	Abigail	Scott	Dublin, Ireland	555-890-1234	Monday 10 September 1979	Silver	Referral
3046	Daniel	Sanchez	Madrid, Spain	555-543-2109	Monday 6 May 1991	Gold	Email Campaign
3047	Charlotte	Smith	New York, USA	555-456-7890	Tuesday 2 August 1988	Bronze	Website

Table: Customers (48 rows) Column: Customer Source (4 distinct values)

Optimizing Data Types for the Orders table

- Select the Orders table from the Fields pane to bring its columns into focus.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools

Name Orders

Mark as date table v Manage relationships New Quick New measure measure column New table Calculations

Structure Data

Search

Customers Orders

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	2400	Credit Card	123 Main St
2002	3002	1002	Thursday 2 March 2023	Processing	1	1500	PayPal	456 Oak Ave
2003	3003	1003	Friday 3 March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd
2004	3004	1004	Saturday 4 March 2023	Shipped	1	2100	Credit Card	234 Maple Ln
2005	3005	1005	Sunday 5 March 2023	Processing	2	2600	PayPal	567 Pine Dr
2006	3006	1006	Monday 6 March 2023	Shipped	1	1600	Credit Card	890 Birch Ct
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	4400	PayPal	123 Willow St
2008	3008	1008	Wednesday 8 March 2023	Processing	1	2500	Credit Card	456 Cedar Ave
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	2200	Credit Card	789 Oak Rd
2022	3022	1022	Wednesday 22 March 2023	Processing	1	1400	PayPal	234 Maple Dr
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	5100	Credit Card	567 Elm St
2024	3024	1024	Friday 24 March 2023	Shipped	1	2000	Credit Card	890 Birch Ave
2025	3025	1025	Saturday 25 March 2023	Processing	2	3000	PayPal	123 Pine Rd
2026	3026	1026	Sunday 26 March 2023	Shipped	1	1800	Credit Card	456 Willow Ct
2027	3027	1027	Monday 27 March 2023	Shipped	2	4600	PayPal	789 Cedar St
2028	3028	1028	Tuesday 28 March 2023	Processing	1	2600	Credit Card	345 Oak Ave
2041	3041	1041	Saturday 11 March 2023	Shipped	2	2600	Credit Card	678 Elm Rd
2042	3042	1042	Sunday 12 March 2023	Processing	1	1600	PayPal	901 Maple Ln
2043	3043	1043	Monday 13 March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	2200	Credit Card	567 Birch Ct
2045	3045	1045	Wednesday 15 March 2023	Processing	2	4000	PayPal	890 Willow St
2046	3046	1046	Thursday 16 March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave

Table: Orders (48 rows)

- Observe the first ten records. The Credit Card payment method was selected six times, notably more frequently than other payment methods. Product ID 1003 was ordered three times. Its repeated appearance suggests a high demand for this product.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools

Name Orders

Mark as date table v Manage relationships New Quick New measure measure column New table Calculations

Structure Data

Search

Customers Orders

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	2400	Credit Card	123 Main St
2002	3002	1002	Thursday 2 March 2023	Processing	1	1500	PayPal	456 Oak Ave
2003	3003	1003	Friday 3 March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd
2004	3004	1004	Saturday 4 March 2023	Shipped	1	2100	Credit Card	234 Maple Ln
2005	3005	1005	Sunday 5 March 2023	Processing	2	2600	PayPal	567 Pine Dr
2006	3006	1006	Monday 6 March 2023	Shipped	1	1600	Credit Card	890 Birch Ct
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	4400	PayPal	123 Willow St
2008	3008	1008	Wednesday 8 March 2023	Processing	1	2500	Credit Card	456 Cedar Ave
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	2200	Credit Card	789 Oak Rd
2022	3022	1022	Wednesday 22 March 2023	Processing	1	1400	PayPal	234 Maple Dr
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	5100	Credit Card	567 Elm St
2024	3024	1024	Friday 24 March 2023	Shipped	1	2000	Credit Card	890 Birch Ave
2025	3025	1025	Saturday 25 March 2023	Processing	2	3000	PayPal	123 Pine Rd
2026	3026	1026	Sunday 26 March 2023	Shipped	1	1800	Credit Card	456 Willow Ct
2027	3027	1027	Monday 27 March 2023	Shipped	2	4600	PayPal	789 Cedar St
2028	3028	1028	Tuesday 28 March 2023	Processing	1	2600	Credit Card	345 Oak Ave
2041	3041	1041	Saturday 11 March 2023	Shipped	2	2600	Credit Card	678 Elm Rd
2042	3042	1042	Sunday 12 March 2023	Processing	1	1600	PayPal	901 Maple Ln
2043	3043	1043	Monday 13 March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	2200	Credit Card	567 Birch Ct
2045	3045	1045	Wednesday 15 March 2023	Processing	2	4000	PayPal	890 Willow St
2046	3046	1046	Thursday 16 March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave

Table: Orders (48 rows)

1. Access the Column tools tab on the top toolbar. Select the option labeled Data type.

The screenshot shows the Power BI Desktop interface with the 'Column tools' tab selected in the top ribbon. A red box highlights the 'Data type' dropdown for the 'Customer ID' column, which is currently set to 'Whole number'. The table below displays 48 rows of order data. The 'Data' pane on the right lists various columns from the 'Orders' table, including 'Customer ID' (selected), 'Order Date', 'Order ID', 'Order Quantity', 'Order Status', 'Order Total', 'Payment Method', and 'Billing Address'.

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	2400	Credit Card	123 Main St
2002	3002	1002	Thursday 2 March 2023	Processing	1	1500	PayPal	456 Oak Ave
2003	3003	1003	Friday 3 March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd
2004	3004	1004	Saturday 4 March 2023	Shipped	1	2100	Credit Card	234 Maple Ln
2005	3005	1005	Sunday 5 March 2023	Processing	2	2600	PayPal	567 Pine Dr
2006	3006	1006	Monday 6 March 2023	Shipped	1	1600	Credit Card	890 Birch Ct
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	4400	PayPal	123 Willow St
2008	3008	1008	Wednesday 8 March 2023	Processing	1	2500	Credit Card	456 Cedar Ave
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	2200	Credit Card	789 Oak Rd
2022	3022	1022	Wednesday 22 March 2023	Processing	1	1400	PayPal	234 Maple Dr
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	5100	Credit Card	567 Elm St
2024	3024	1024	Friday 24 March 2023	Shipped	1	2000	Credit Card	890 Birch Ave
2025	3025	1025	Saturday 25 March 2023	Processing	2	3000	PayPal	123 Pine Rd
2026	3026	1026	Sunday 26 March 2023	Shipped	1	1800	Credit Card	456 Willow Ct
2027	3027	1027	Monday 27 March 2023	Shipped	2	4600	PayPal	789 Cedar St
2028	3028	1028	Tuesday 28 March 2023	Processing	1	2600	Credit Card	345 Oak Ave
2041	3041	1041	Saturday 11 March 2023	Shipped	2	2600	Credit Card	678 Elm Rd
2042	3042	1042	Sunday 12 March 2023	Processing	1	1600	PayPal	901 Maple Ln
2043	3043	1043	Monday 13 March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	2200	Credit Card	567 Birch Ct
2045	3045	1045	Wednesday 15 March 2023	Processing	2	4000	PayPal	890 Willow St
2046	3046	1046	Thursday 16 March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave
2047	3047	1047	Friday 17 March 2023	Shipped	2	6200	Credit Card	456 Cedar Ln

1. Each column in Adventure Works' Orders table holds significant business value. To complete the optimization of the table, assign the following data types to the columns:
- Change the data type of the Order Total column to Decimal number.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Order Total Format: Whole number Summarization: Sum Data category: Uncategorized Sort by column: Sort Data groups: Groups Manage relationships: Relationships New column: Calculations

Structure Formatting Properties

Order ID Customer ID Product ID Order Date Order Status Order Quantity Order Total Payment Method Billing Address

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	2400	Credit Card	123 Main St
2002	3002	1002	Thursday 2 March 2023	Processing	1	1500	PayPal	456 Oak Ave
2003	3003	1003	Friday 3 March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd
2004	3004	1004	Saturday 4 March 2023	Shipped	1	2100	Credit Card	234 Maple Ln
2005	3005	1005	Sunday 5 March 2023	Processing	2	2600	PayPal	567 Pine Dr
2006	3006	1006	Monday 6 March 2023	Shipped	1	1600	Credit Card	890 Birch Ct
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	4400	PayPal	123 Willow St
2008	3008	1008	Wednesday 8 March 2023	Processing	1	2500	Credit Card	456 Cedar Ave
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	2200	Credit Card	789 Oak Rd
2022	3022	1022	Wednesday 22 March 2023	Processing	1	1400	PayPal	234 Maple Dr
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	5100	Credit Card	567 Elm St
2024	3024	1024	Friday 24 March 2023	Shipped	1	2000	Credit Card	890 Birch Ave
2025	3025	1025	Saturday 25 March 2023	Processing	2	3000	PayPal	123 Pine Rd
2026	3026	1026	Sunday 26 March 2023	Shipped	1	1800	Credit Card	456 Willow Ct
2027	3027	1027	Monday 27 March 2023	Shipped	2	4600	PayPal	789 Cedar St
2028	3028	1028	Tuesday 28 March 2023	Processing	1	2600	Credit Card	345 Oak Ave
2041	3041	1041	Saturday 11 March 2023	Shipped	2	2600	Credit Card	678 Elm Rd
2042	3042	1042	Sunday 12 March 2023	Processing	1	1600	PayPal	901 Maple Ln
2043	3043	1043	Monday 13 March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	2200	Credit Card	567 Birch Ct
2045	3045	1045	Wednesday 15 March 2023	Processing	2	4000	PayPal	890 Willow St
2046	3046	1046	Thursday 16 March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave

Table: Orders (48 rows) Column: Order Total (32 distinct values)

- Change the data type of the Order ID column to Whole number.

AdventureWorksSales - Power BI Desktop

File Home Help Table tools Column tools

Name: Order ID Format: Whole number Summarization: Count Data category: Uncategorized Sort by column: Sort Data groups: Groups Manage relationships: Relationships New column: Calculations

Structure Formatting Properties

Order ID Customer ID Product ID Order Date Order Status Order Quantity Order Total Payment Method Billing Address

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	2400	Credit Card	123 Main St
2002	3002	1002	Thursday 2 March 2023	Processing	1	1500	PayPal	456 Oak Ave
2003	3003	1003	Friday 3 March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd
2004	3004	1004	Saturday 4 March 2023	Shipped	1	2100	Credit Card	234 Maple Ln
2005	3005	1005	Sunday 5 March 2023	Processing	2	2600	PayPal	567 Pine Dr
2006	3006	1006	Monday 6 March 2023	Shipped	1	1600	Credit Card	890 Birch Ct
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	4400	PayPal	123 Willow St
2008	3008	1008	Wednesday 8 March 2023	Processing	1	2500	Credit Card	456 Cedar Ave
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	2200	Credit Card	789 Oak Rd
2022	3022	1022	Wednesday 22 March 2023	Processing	1	1400	PayPal	234 Maple Dr
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	5100	Credit Card	567 Elm St
2024	3024	1024	Friday 24 March 2023	Shipped	1	2000	Credit Card	890 Birch Ave
2025	3025	1025	Saturday 25 March 2023	Processing	2	3000	PayPal	123 Pine Rd
2026	3026	1026	Sunday 26 March 2023	Shipped	1	1800	Credit Card	456 Willow Ct
2027	3027	1027	Monday 27 March 2023	Shipped	2	4600	PayPal	789 Cedar St
2028	3028	1028	Tuesday 28 March 2023	Processing	1	2600	Credit Card	345 Oak Ave
2041	3041	1041	Saturday 11 March 2023	Shipped	2	2600	Credit Card	678 Elm Rd
2042	3042	1042	Sunday 12 March 2023	Processing	1	1600	PayPal	901 Maple Ln
2043	3043	1043	Monday 13 March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	2200	Credit Card	567 Birch Ct
2045	3045	1045	Wednesday 15 March 2023	Processing	2	4000	PayPal	890 Willow St
2046	3046	1046	Thursday 16 March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave

Table: Orders (48 rows) Column: Order ID (48 distinct values)

- Change the data type of the Customer ID column to Whole number.

AdventureWorksSales - Power BI Desktop

Table tools **Column tools**

Name: Customer ID **Format:** Whole number
Data type: Whole number

Summarization: Don't summarize **Data category:** Uncategorized

Sort by column: Sort **Groups:** Data groups **Relationships:** Manage relationships **New column:** New column

Properties: Search

Structure: Order ID, Customer ID, Product ID, Order Date, Order Status, Order Quantity, Order Total, Payment Method, Billing Address

Formatting: \$ % 0.00

Sort: Sort by column, Sort by row, Sort by value, Sort by date, Sort by time, Sort by label, Sort by count, Sort by average, Sort by max, Sort by min, Sort by sum, Sort by product, Sort by standard deviation, Sort by variance, Sort by quartile, Sort by median, Sort by mode, Sort by rank, Sort by frequency, Sort by density, Sort by entropy, Sort by gini, Sort by kurtosis, Sort by skewness, Sort by range, Sort by distance, Sort by correlation, Sort by covariance, Sort by p-value, Sort by t-value, Sort by f-value, Sort by r-value, Sort by s-value, Sort by d-value, Sort by a-value, Sort by b-value, Sort by c-value, Sort by d-value, Sort by e-value, Sort by f-value, Sort by g-value, Sort by h-value, Sort by i-value, Sort by j-value, Sort by k-value, Sort by l-value, Sort by m-value, Sort by n-value, Sort by o-value, Sort by p-value, Sort by q-value, Sort by r-value, Sort by s-value, Sort by t-value, Sort by u-value, Sort by v-value, Sort by w-value, Sort by x-value, Sort by y-value, Sort by z-value.

Groups: Data groups, Groups, Relationships, New column, Calculations

Relationships: Manage relationships

New column: New column

Calculations: Calculations

Data: Search

> Customers

< Orders

- Billing Address
- Discounts
- Shipping Fee
- Tracking Number
- Customer ID
- > Order Date
- Order ID
- Order Quantity
- Order Status
- Order Total
- Payment Method
- Product ID

Table: Orders (48 rows) Column: Customer ID (48 distinct values)

- Change the data type of the Product ID column to Whole Number.

AdventureWorksSales - Power BI Desktop

Table tools **Column tools**

Name: Product ID **Format:** Whole number
Data type: Whole number

Summarization: Count **Data category:** Uncategorized

Sort by column: Sort **Groups:** Data groups **Relationships:** Manage relationships **New column:** New column

Properties: Search

Structure: Order ID, Customer ID, Product ID, Order Date, Order Status, Order Quantity, Order Total, Payment Method, Billing Address

Formatting: \$ % 0.00

Sort: Sort by column, Sort by row, Sort by value, Sort by date, Sort by time, Sort by label, Sort by count, Sort by average, Sort by max, Sort by min, Sort by sum, Sort by product, Sort by standard deviation, Sort by variance, Sort by quartile, Sort by median, Sort by mode, Sort by rank, Sort by frequency, Sort by density, Sort by entropy, Sort by gini, Sort by kurtosis, Sort by skewness, Sort by range, Sort by distance, Sort by correlation, Sort by covariance, Sort by p-value, Sort by t-value, Sort by f-value, Sort by r-value, Sort by s-value, Sort by d-value, Sort by a-value, Sort by b-value, Sort by c-value, Sort by d-value, Sort by e-value, Sort by f-value, Sort by g-value, Sort by h-value, Sort by i-value, Sort by j-value, Sort by k-value, Sort by l-value, Sort by m-value, Sort by n-value, Sort by o-value, Sort by p-value, Sort by q-value, Sort by r-value, Sort by s-value, Sort by t-value, Sort by u-value, Sort by v-value, Sort by w-value, Sort by x-value, Sort by y-value, Sort by z-value.

Groups: Data groups, Groups, Relationships, New column, Calculations

Relationships: Manage relationships

New column: New column

Calculations: Calculations

Data: Search

> Customers

< Orders

- Billing Address
- Discounts
- Shipping Fee
- Tracking Number
- Customer ID
- > Order Date
- Order ID
- Order Quantity
- Order Status
- Order Total
- Payment Method
- Product ID

Table: Orders (48 rows) Column: Product ID (48 distinct values)

- Change the data type of the Order Date column to Date.

AdventureWorksSales - Power BI Desktop

Table tools **Column tools**

Name: Order Date **Format:** Wednesday 14 Mar... **Data type:** Date

Summarization: Don't summarize **Data category:** Uncategorized

Sort by column: Sort **Groups:** Data groups **Relationships:** Manage relationships **New column:** New column

Properties: Search **Sort:** Sort by column **Groups:** Data groups **Relationships:** Manage relationships **Calculations:** New column

Data: Search **Customers:** Orders **Orders:** Billing Address, Discounts, Shipping Fee, Tracking Number, Customer ID

Order Date: Order ID, Order Quantity, Order Total, Payment Method, Billing Address

Customer ID: Order ID, Order Quantity, Order Total, Payment Method, Product ID

Order Status: Order ID, Order Quantity, Order Total, Payment Method, Product ID

Order Total: Order ID, Order Quantity, Payment Method, Product ID

Payment Method: Order ID, Order Quantity, Order Total, Product ID

Product ID: Order ID, Order Quantity, Order Total, Payment Method

Table: Orders (48 rows) Column: Order Date (40 distinct values)

- Change the data type of the Order Status column to Text.

AdventureWorksSales - Power BI Desktop

Table tools **Column tools**

Name: Order Status **Format:** Text **Data type:** Text

Summarization: Don't summarize **Data category:** Uncategorized

Sort by column: Sort **Groups:** Data groups **Relationships:** Manage relationships **New column:** New column

Properties: Search **Sort:** Sort by column **Groups:** Data groups **Relationships:** Manage relationships **Calculations:** New column

Data: Search **Customers:** Orders **Orders:** Billing Address, Discounts, Shipping Fee, Tracking Number, Customer ID

Order Date: Order ID, Order Quantity, Order Total, Payment Method, Billing Address

Customer ID: Order ID, Order Quantity, Order Total, Payment Method, Product ID

Order Status: Order ID, Order Quantity, Order Total, Payment Method, Product ID

Order Total: Order ID, Order Quantity, Payment Method, Product ID

Payment Method: Order ID, Order Quantity, Order Total, Product ID

Product ID: Order ID, Order Quantity, Order Total, Payment Method

Table: Orders (48 rows) Column: Order Status (3 distinct values)

- Change the data type of the Order Quantity column to Whole Number.

AdventureWorks Sales - Power BI Desktop

File Home Help Table tools Column tools

Name: Order Quantity
Data type: Whole number

Format: \$ % 0

Summarization: Sum
Data category: Uncategorized

Sort by column
Data groups
Manage relationships
New column

Structure
Formatting Properties

Order ID Customer ID Product ID Order Date Order Status Order Quantity Order Total Payment Method Billing Address

Order ID	Customer ID	Product ID	Order Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address
2001	3001	1001	Wednesday 1 March 2023	Shipped	2	2400	Credit Card	123 Main St
2002	3002	1002	Thursday 2 March 2023	Processing	1	1500	PayPal	456 Oak Ave
2003	3003	1003	Friday 3 March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd
2004	3004	1004	Saturday 4 March 2023	Shipped	1	2100	Credit Card	234 Maple Ln
2005	3005	1005	Sunday 5 March 2023	Processing	2	2600	PayPal	567 Pine Dr
2006	3006	1006	Monday 6 March 2023	Shipped	1	1600	Credit Card	890 Birch Ct
2007	3007	1007	Tuesday 7 March 2023	Shipped	2	4400	PayPal	123 Willow St
2008	3008	1008	Wednesday 8 March 2023	Processing	1	2500	Credit Card	456 Cedar Ave
2021	3021	1021	Tuesday 21 March 2023	Shipped	2	2200	Credit Card	789 Oak Rd
2022	3022	1022	Wednesday 22 March 2023	Processing	1	1400	PayPal	234 Maple Dr
2023	3023	1023	Thursday 23 March 2023	Cancelled	3	5100	Credit Card	567 Elm St
2024	3024	1024	Friday 24 March 2023	Shipped	1	2000	Credit Card	890 Birch Ave
2025	3025	1025	Saturday 25 March 2023	Processing	2	3000	PayPal	123 Pine Rd
2026	3026	1026	Sunday 26 March 2023	Shipped	1	1800	Credit Card	456 Willow Ct
2027	3027	1027	Monday 27 March 2023	Shipped	2	4600	PayPal	789 Cedar St
2028	3028	1028	Tuesday 28 March 2023	Processing	1	2600	Credit Card	345 Oak Ave
2041	3041	1041	Saturday 11 March 2023	Shipped	2	2600	Credit Card	678 Elm Rd
2042	3042	1042	Sunday 12 March 2023	Processing	1	1600	PayPal	901 Maple Ln
2043	3043	1043	Monday 13 March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr
2044	3044	1044	Tuesday 14 March 2023	Shipped	1	2200	Credit Card	567 Birch Ct
2045	3045	1045	Wednesday 15 March 2023	Processing	2	4000	PayPal	890 Willow St
2046	3046	1046	Thursday 16 March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave

Data

Search

Customers
Orders
Billing Address
Discounts
Shipping Fee
Tracking Number
Customer ID
Order Date
Order ID
Order Quantity
Order Status
Order Total
Payment Method
Product ID

Table: Orders (48 rows) Column: Order Quantity (3 distinct values)

- Change the data type of the Payment Method column to Text.

AdventureWorks Sales - Power BI Desktop

File Home Help Table tools Column tools

Name: Payment Method
Data type: Text

Format: \$ % 0

Summarization: Don't summarize
Data category: Uncategorized

Sort by column
Data groups
Manage relationships
New column

Structure
Formatting Properties

Order ID Order Status Order Quantity Order Total Payment Method Billing Address Discounts Shipping Fee Tracking Number

Order ID	Order Status	Order Quantity	Order Total	Payment Method	Billing Address	Discounts	Shipping Fee	Tracking Number
1	March 2023 Shipped	2	2400	Credit Card	123 Main St	\$5.00	\$8,00	TRK123456789
2	March 2023 Processing	1	1500	PayPal	456 Oak Ave	\$0.00	\$12,50	TRK987654321
3	March 2023 Cancelled	3	5400	Credit Card	789 Elm Rd	\$10.00	\$6,25	TRK654123789
4	March 2023 Shipped	1	2100	Credit Card	234 Maple Ln	\$2.50	\$9,00	TRK321789654
5	March 2023 Processing	2	2600	PayPal	567 Pine Dr	\$0.00	\$7,50	TRK456321789
6	March 2023 Shipped	1	1600	Credit Card	890 Birch Ct	\$15.00	\$5,00	TRK987654321
7	March 2023 Shipped	2	4400	PayPal	123 Willow St	\$8,00	\$10,00	TRK321789654
8	March 2023 Processing	1	2500	Credit Card	456 Cedar Ave	\$0.00	\$8,75	TRK654123789
9	March 2023 Shipped	2	2200	Credit Card	789 Oak Rd	\$5.00	\$6,00	TRK456321789
10	March 2023 Processing	1	1400	PayPal	234 Maple Dr	\$0.00	\$9,50	TRK123456789
11	March 2023 Cancelled	3	5100	Credit Card	567 Elm St	\$3.00	\$7,25	TRK654123789
12	March 2023 Shipped	1	2000	Credit Card	890 Birch Ave	\$0.00	\$5,50	TRK987654321
13	March 2023 Processing	2	3000	PayPal	123 Pine Rd	\$12.00	\$8,50	TRK321789654
14	March 2023 Shipped	1	1800	Credit Card	456 Willow Ct	\$0.00	\$10,25	TRK456321789
15	March 2023 Shipped	2	4600	PayPal	789 Cedar St	\$7.50	\$5,75	TRK654123789
16	March 2023 Processing	1	2600	Credit Card	345 Oak Ave	\$5.50	\$7,00	TRK876543210
17	March 2023 Shipped	2	2600	Credit Card	678 Elm Rd	\$0.00	\$9,75	TRK012345678
18	March 2023 Processing	1	1600	PayPal	901 Maple Ln	\$3.75	\$6,50	TRK765432109
19	March 2023 Cancelled	3	5700	Credit Card	234 Pine Dr	\$0.00	\$8,25	TRK980123456
20	March 2023 Shipped	1	2200	Credit Card	567 Birch Ct	\$6.00	\$5,25	TRK210987654
21	March 2023 Processing	2	4000	PayPal	890 Willow St	\$0.00	\$7,50	TRK543210987
22	March 2023 Shipped	1	2300	Credit Card	123 Cedar Ave	\$9.50	\$6,75	TRK678901234

Data

Search

Customers
Orders
Billing Address
Discounts
Shipping Fee
Tracking Number
Customer ID
Order Date
Order ID
Order Quantity
Order Status
Order Total
Payment Method
Product ID

Table: Orders (48 rows) Column: Payment Method (2 distinct values)

- Change the data type of the Billing Address column to Text.

AdventureWorksSales - Power BI Desktop

Table tools **Column tools**

Name: Billing Address **Format:** Text **Summarization:** Don't summarize **Data category:** Uncategorized

Billing Address **Discounts** **Shipping Fee** **Tracking Number**

Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address	Discounts	Shipping Fee	Tracking Number
March 2023	Shipped	2	2400	Credit Card	123 Main St	\$5.00	\$8.00	TRK123456789
March 2023	Processing	1	1500	PayPal	456 Oak Ave	\$0.00	\$12.50	TRK987654321
March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd	\$10.00	\$6.25	TRK654123789
March 2023	Shipped	1	2100	Credit Card	234 Maple Ln	\$2.50	\$9.00	TRK321789654
March 2023	Processing	2	2600	PayPal	567 Pine Dr	\$0.00	\$7.50	TRK456321789
March 2023	Shipped	1	1600	Credit Card	890 Birch Ct	\$15.00	\$5.00	TRK987654321
March 2023	Shipped	2	4400	PayPal	123 Willow St	\$8.00	\$10.00	TRK210987654
March 2023	Processing	1	2500	Credit Card	456 Cedar Ave	\$0.00	\$8.75	TRK654123789
March 2023	Shipped	2	2200	Credit Card	789 Oak Rd	\$5.00	\$6.00	TRK456321789
March 2023	Processing	1	1400	PayPal	234 Maple Dr	\$0.00	\$9.50	TRK123456789
March 2023	Cancelled	3	5100	Credit Card	567 Elm St	\$3.00	\$7.25	TRK654123789
March 2023	Shipped	1	2000	Credit Card	890 Birch Ave	\$0.00	\$5.50	TRK987654321
March 2023	Processing	2	3000	PayPal	123 Pine Rd	\$12.00	\$8.50	TRK321789654
March 2023	Shipped	1	1800	Credit Card	456 Willow Ct	\$0.00	\$10.25	TRK456321789
March 2023	Shipped	2	4600	PayPal	789 Cedar St	\$7.50	\$5.75	TRK654123789
March 2023	Processing	1	2600	Credit Card	345 Oak Ave	\$5.50	\$7.00	TRK876543210
March 2023	Shipped	2	2600	Credit Card	678 Elm Rd	\$0.00	\$9.75	TRK012345678
March 2023	Processing	1	1600	PayPal	901 Maple Ln	\$3.75	\$6.50	TRK765432109
March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr	\$0.00	\$8.25	TRK890123456
March 2023	Shipped	1	2200	Credit Card	567 Birch Ct	\$6.00	\$5.25	TRK210987654
March 2023	Processing	2	4000	PayPal	890 Willow St	\$0.00	\$7.50	TRK543210987
March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave	\$9.50	\$6.75	TRK678901234

Table: Orders (48 rows) Column: Billing Address (42 distinct values)

Change the data type of the Discounts column to Decimal Number.

AdventureWorksSales - Power BI Desktop

Table tools **Column tools**

Name: Discounts **Format:** General **Summarization:** Sum **Data category:** Uncategorized

Discounts **Shipping Fee** **Tracking Number**

Date	Order Status	Order Quantity	Order Total	Payment Method	Billing Address	Discounts	Shipping Fee	Tracking Number
March 2023	Shipped	2	2400	Credit Card	123 Main St	500	\$8.00	TRK123456789
March 2023	Processing	1	1500	PayPal	456 Oak Ave	0	\$12.50	TRK987654321
March 2023	Cancelled	3	5400	Credit Card	789 Elm Rd	1000	\$6.25	TRK654123789
March 2023	Shipped	1	2100	Credit Card	234 Maple Ln	250	\$9.00	TRK321789654
March 2023	Processing	2	2600	PayPal	567 Pine Dr	0	\$7.50	TRK456321789
March 2023	Shipped	1	1600	Credit Card	890 Birch Ct	1500	\$5.00	TRK987654321
March 2023	Shipped	2	4400	PayPal	123 Willow St	800	\$10.00	TRK321789654
March 2023	Processing	1	2500	Credit Card	456 Cedar Ave	0	\$8.75	TRK654123789
March 2023	Shipped	2	2200	Credit Card	789 Oak Rd	500	\$6.00	TRK456321789
March 2023	Processing	1	1400	PayPal	234 Maple Dr	0	\$9.50	TRK123456789
March 2023	Cancelled	3	5100	Credit Card	567 Elm St	300	\$7.25	TRK654123789
March 2023	Shipped	1	2000	Credit Card	890 Birch Ave	0	\$5.50	TRK987654321
March 2023	Processing	2	3000	PayPal	123 Pine Rd	1200	\$8.50	TRK321789654
March 2023	Shipped	1	1800	Credit Card	456 Willow Ct	0	\$10.25	TRK456321789
March 2023	Shipped	2	4600	PayPal	789 Cedar St	750	\$5.75	TRK654123789
March 2023	Processing	1	2600	Credit Card	345 Oak Ave	550	\$7.00	TRK876543210
March 2023	Shipped	2	2600	Credit Card	678 Elm Rd	0	\$9.75	TRK012345678
March 2023	Processing	1	1600	PayPal	901 Maple Ln	375	\$6.50	TRK765432109
March 2023	Cancelled	3	5700	Credit Card	234 Pine Dr	0	\$8.25	TRK890123456
March 2023	Shipped	1	2200	Credit Card	567 Birch Ct	600	\$5.25	TRK210987654
March 2023	Processing	2	4000	PayPal	890 Willow St	0	\$7.50	TRK543210987
March 2023	Shipped	1	2300	Credit Card	123 Cedar Ave	950	\$6.75	TRK678901234

Table: Orders (48 rows) Column: Discounts (22 distinct values)

Change the data type of the Shipping Fee column to Decimal Number.

AdventureWorks Sales - Power BI Desktop

Table tools **Column tools**

Name: Shipping Fee **Format:** General **Summarization:** Sum **Data category:** Uncategorized

Sort by column: Sort **Data groups:** Groups **Manage relationships:** Relationships **New column:** Calculations

Structure: **Formatting:** **Properties:**

Shipping Fee **Tracking Number**

Table: Orders (48 rows) Column: Shipping Fee (22 distinct values)

- Change the data type of the Tracking Number column to Text.

AdventureWorks Sales - Power BI Desktop

Table tools **Column tools**

Name: Tracking Number **Format:** Text **Summarization:** Don't summarize **Data category:** Uncategorized

Sort by column: Sort **Data groups:** Groups **Manage relationships:** Relationships **New column:** Calculations

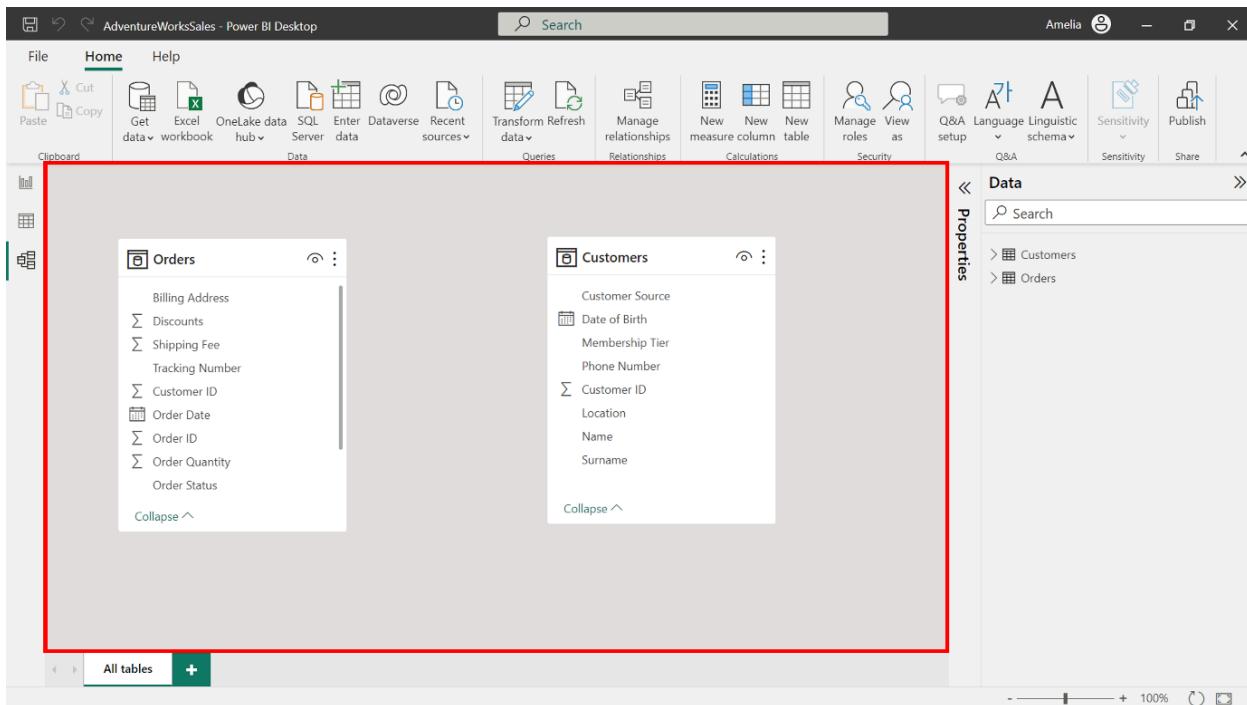
Structure: **Formatting:** **Properties:**

Tracking Number

Table: Orders (48 rows) Column: Tracking Number (18 distinct values)

Step 4: Build and configure the model relationships.

1. Locate and select the Model icon on the left toolbar. This transitions your workspace into the Model View, which vividly represents tables and their inter-relationships.



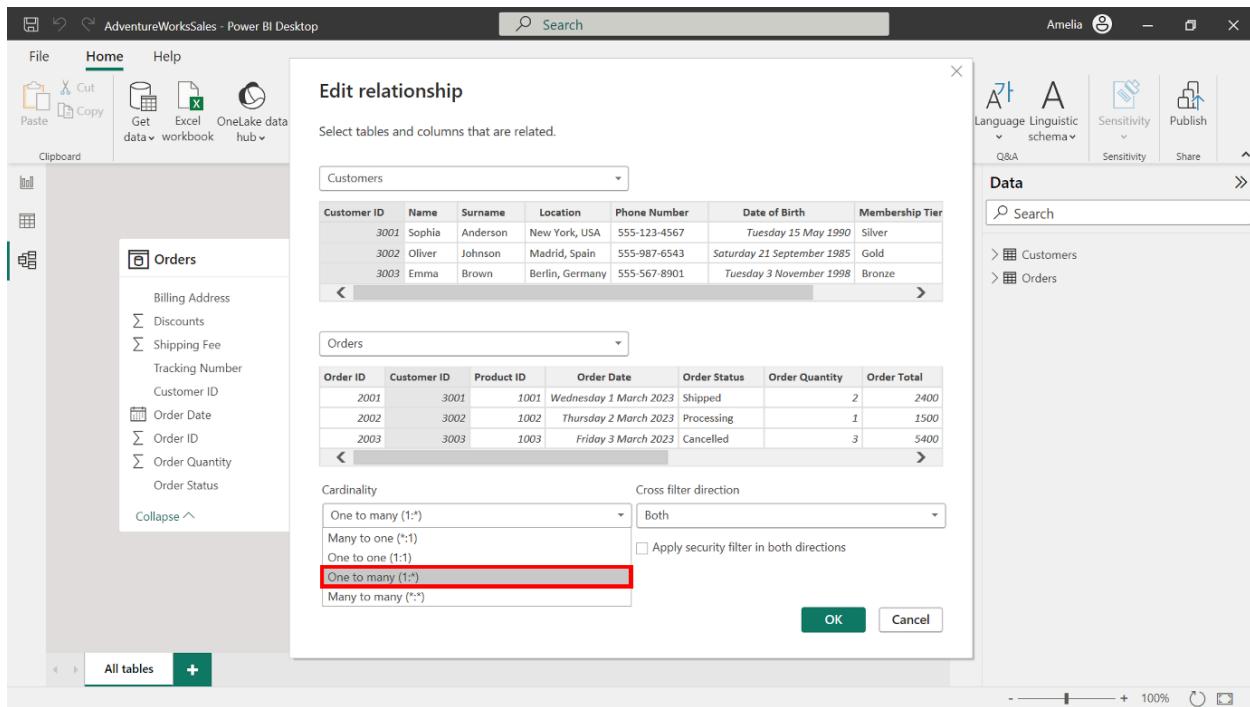
1. In the Customers table, the Customer ID is a unique identifier for every customer. The Customer ID column also exists on the Orders table. This indicates which customer placed each order. This commonality between the tables can be used to establish a relationship. Select the Customer ID field in the Customers table. Hold down the selection and drag a connecting line to the Customer ID field in the Orders table.

The screenshot shows the Power BI Desktop interface with the 'AdventureWorksSales' dataset loaded. On the left, the 'Tables' pane lists 'Orders' and 'Customers'. The 'Orders' table has columns like 'Billing Address', 'Discounts', 'Shipping Fee', 'Tracking Number', 'Customer ID', 'Order Date', 'Order ID', 'Order Quantity', and 'Order Status'. The 'Customers' table has columns like 'Customer Source', 'Date of Birth', 'Membership Tier', 'Phone Number', 'Customer ID', 'Location', 'Name', and 'Surname'. A red box highlights the 'Customer ID' column in both tables, and a connecting line is drawn between them, indicating a relationship.

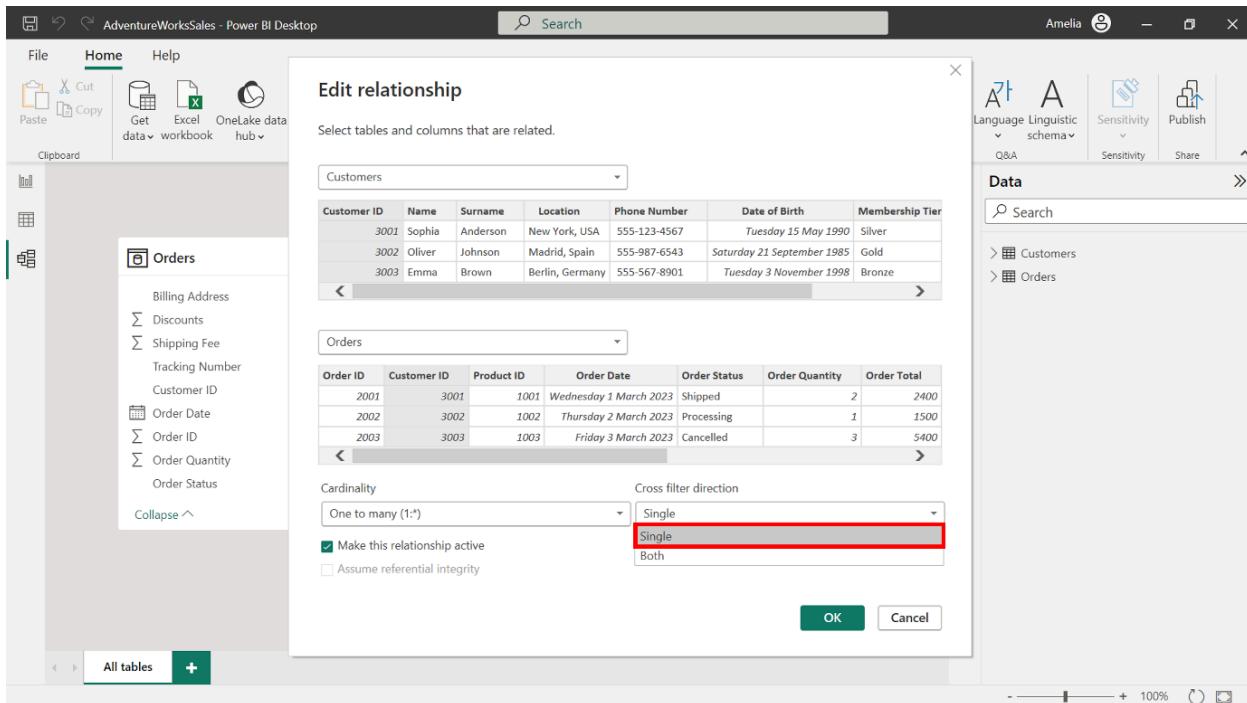
1. Next, let's define the type of relationship. Double-click on the connecting line you've drawn between the tables to open the Properties pane. In the context of Adventure Works, one customer (from the Customers table) can have multiple orders (in the Orders table). Hence, this is a One-to-many relationship.

The screenshot shows the 'Edit relationship' dialog box in Power BI Desktop. The dialog box is highlighted with a red box. It displays two tables: 'Customers' and 'Orders'. The 'Customers' table has columns: Customer ID, Name, Surname, Location, Phone Number, Date of Birth, and Membership Tier. The 'Orders' table has columns: Order ID, Customer ID, Product ID, Order Date, Order Status, Order Quantity, and Order Total. Below the tables, the 'Cardinality' section shows 'One to one (1:1)' and 'Both'. There are two checkboxes at the bottom: 'Make this relationship active' (which is checked) and 'Assume referential integrity'.

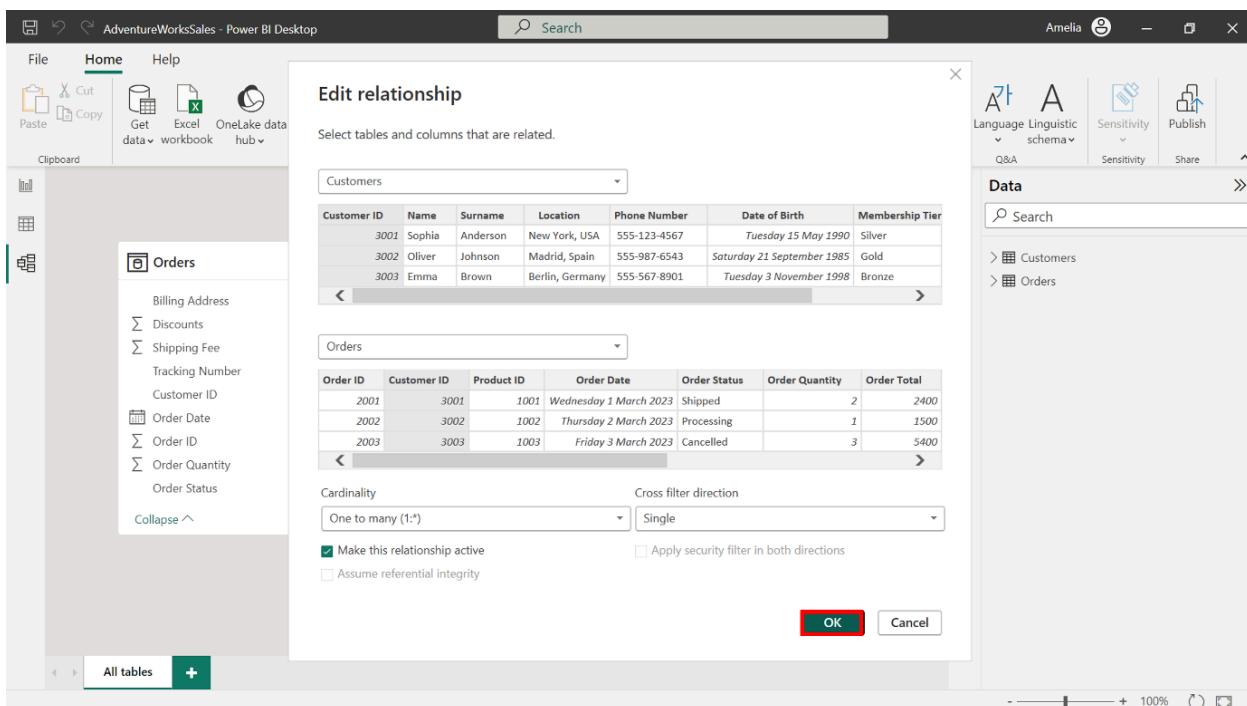
1. For Cardinality, change the selection from its current state to One-to-many to improve performance (One-to-many relationships are often simpler and faster for Power BI to navigate when loading data and calculating results.)



1. To establish a cross-filter direction, choose the Single option. By keeping the filter direction singular, you can maintain a simplified data model, ensuring quick and efficient data retrievals.

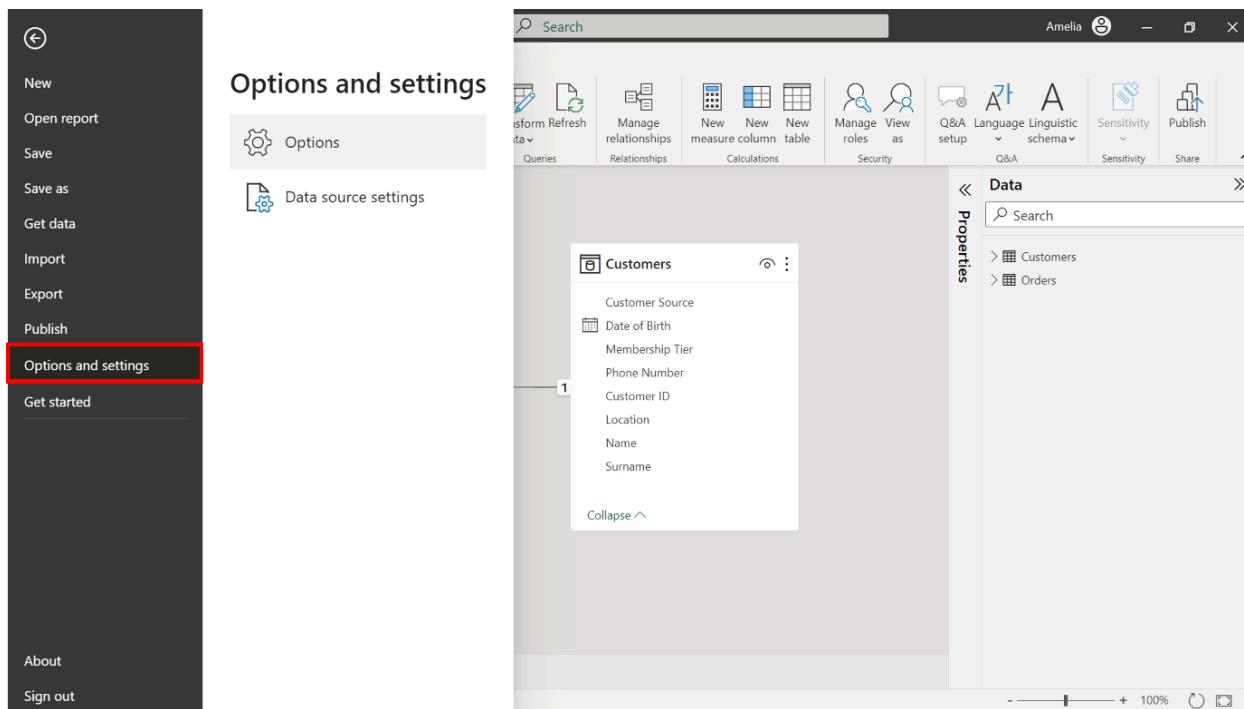


1. To save the changes made to the data model, select the OK button at the bottom right corner of the dialog box.

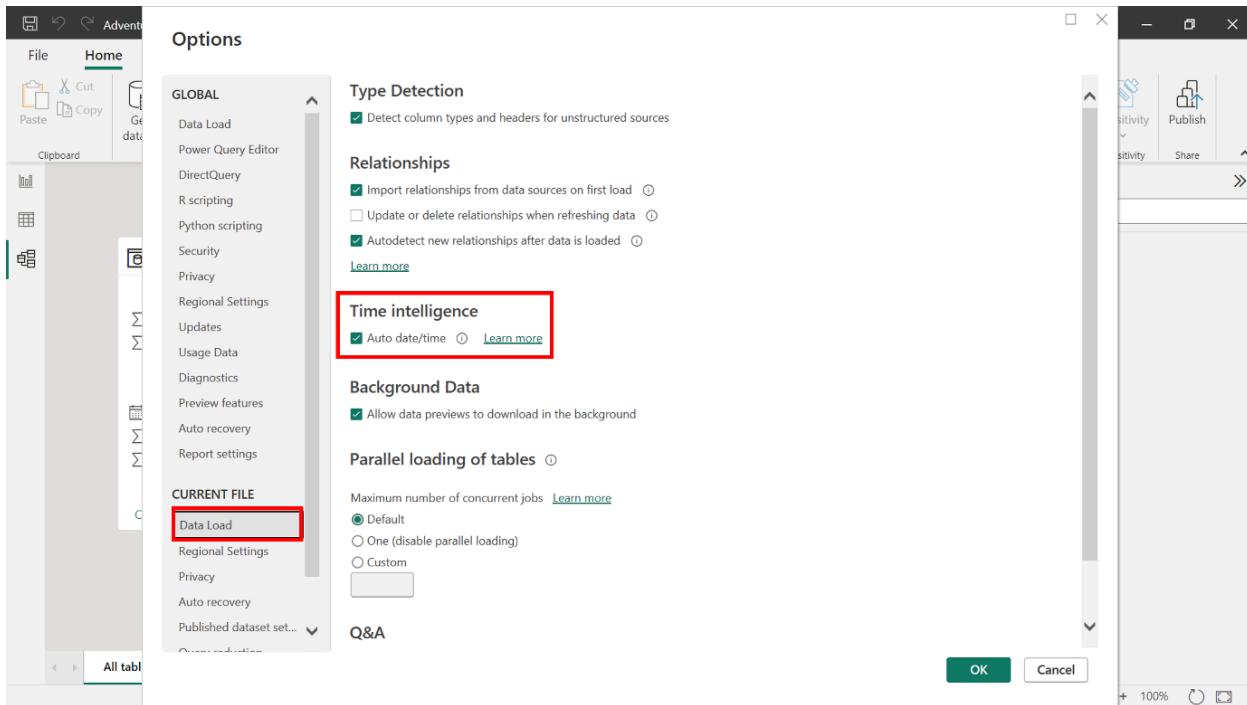


Step 5: Disable Auto/Date Time

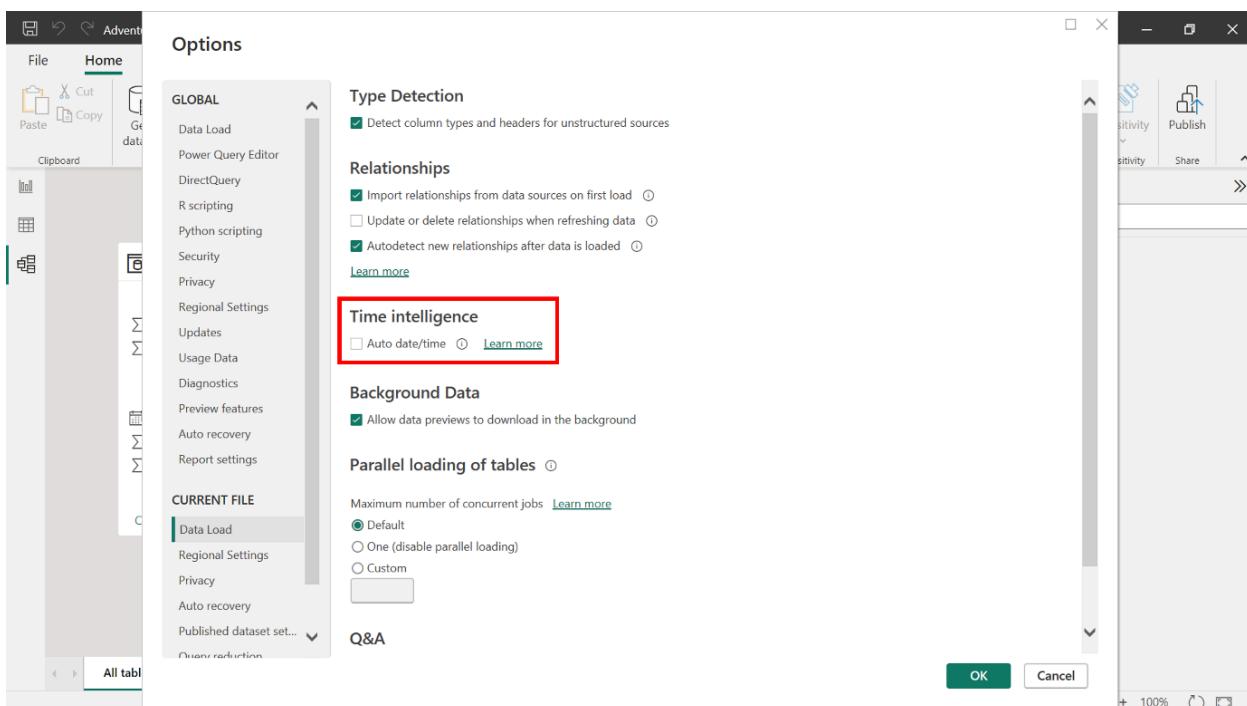
1. Select the File tab in the toolbar. From the dropdown menu, select Options and settings, then select Options. This option contains several sub-options that allow you to customize and control various aspects of Power BI.



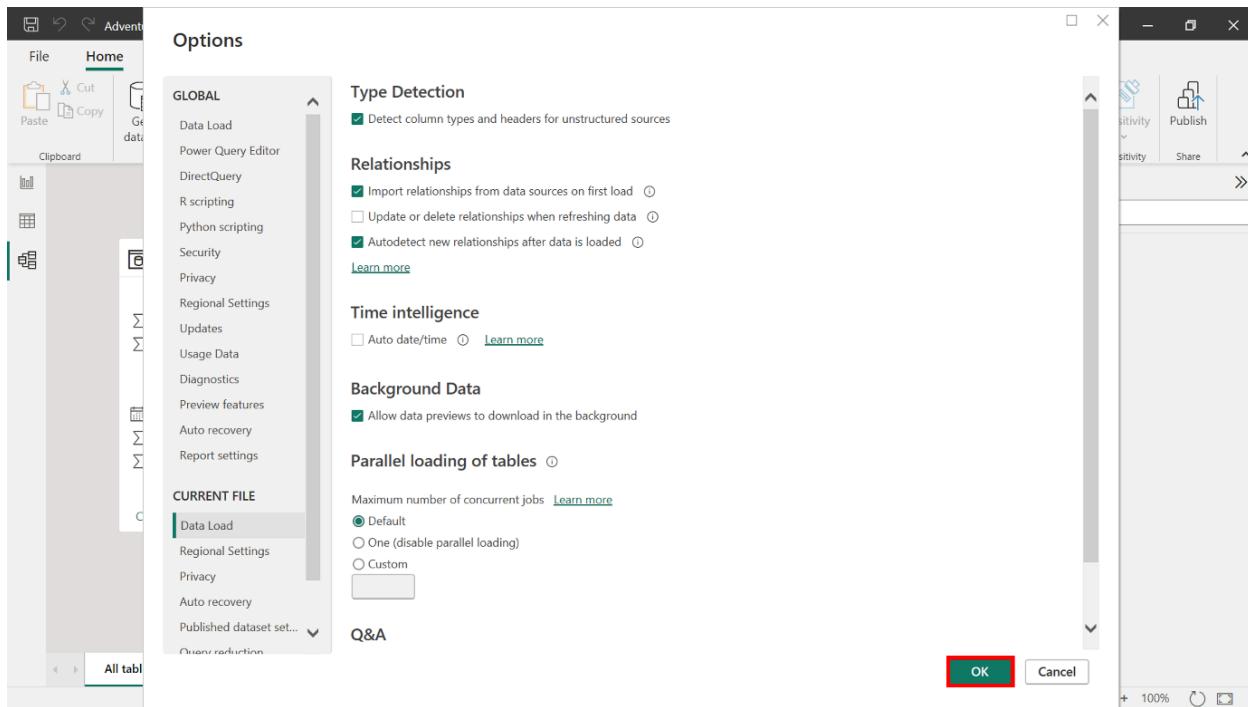
1. An Options window appears onscreen. Select Data Load under the Current file section from the Options on the left-hand side of the window.



1. In the Data Load options is a checkbox labeled Auto date/time. This box is checked by default, which means the feature is enabled. Uncheck this box to turn off the current file's Auto Date/Time feature.



- Select OK to apply the changes. This enables Adventure Works teams to retain greater control over how date information is displayed in their reports.



The screenshot shows the Power BI Desktop interface with the 'AdventureWorksSales' dataset open. The 'Table tools' tab is selected in the ribbon. The 'Orders' table is visible in the main area, showing columns: Order ID, Customer ID, Product ID, Order Date, Order Status, Order Quantity, Order Total, and Payment Method. The 'Customer ID' column is currently selected. The 'Column tools' ribbon tab is also selected. The 'Data' pane on the right shows the data model with 'Customers' and 'Orders' expanded. The 'Orders' node is highlighted with a red box. The 'Customer ID' node under 'Orders' is also highlighted with a red box. The 'OK' button from the previous screenshot is visible at the bottom right of the dialog.

By completing these steps, you have successfully built, configured, and optimized a data model for Adventure Works.