Microsoft Power Platform

Power BI
Data Modeling and Shaping

Maintained by: Microsoft Corporation

Overview

The estimated time to complete this lab is 3 hours and 45 minutes.

In this lab you will learn how to upload multiple tables from a single data source. As well as create a new dimension for the model and enhance an existing dimension. You will learn how to create a fact table for a budget. You will also learn how to create parameters and a dynamic path to your data sources.

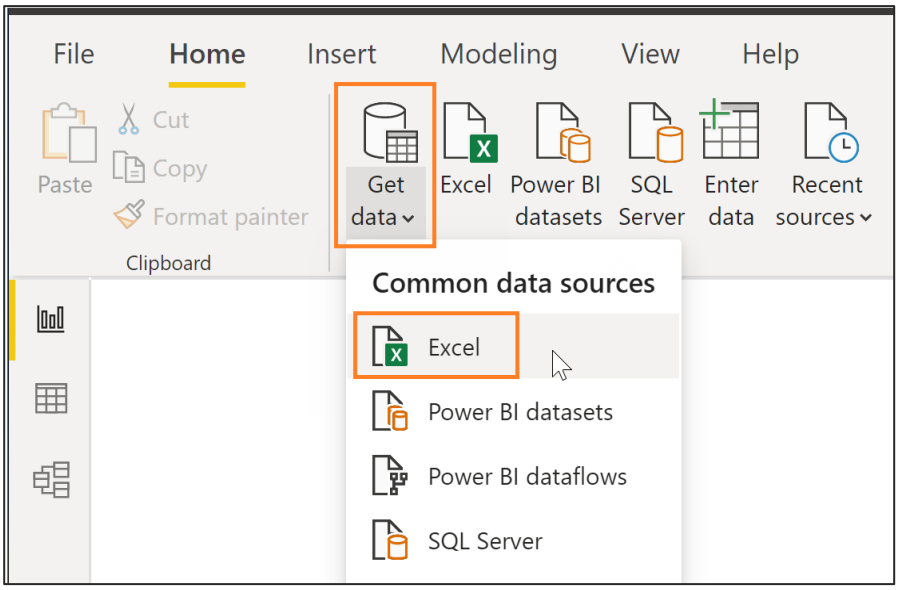
Data Shaping Labs

Lab 1a: Import multiple tables from a single source file

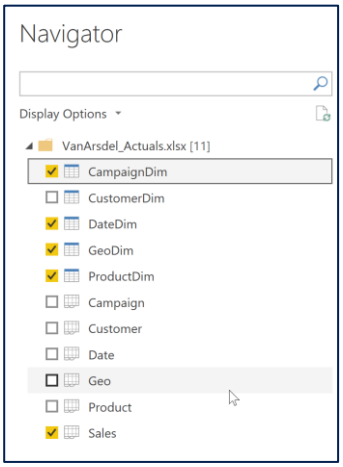
Task: Import multiple tables from a single excel source file.

The estimated time to complete this lab is 15 minutes.

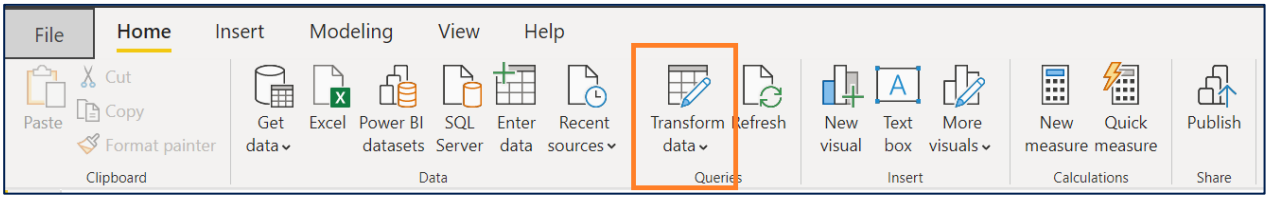
1. **GetData** > from Excel **C:\Power BI_Adv_M\VansArsdel_Actuals.xlsx**



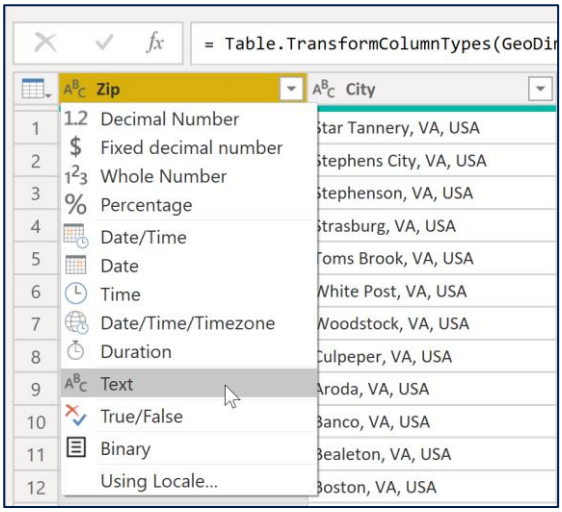
2. Select the following Tables (All but CustomerDim):
    a. **CampaignDim**
    b. **GeoDim**
    c. **ProductDim**
    d. **DateDim**
    e. **Sales**



3. After tables are loaded click on **Transform Data**



4. In **GeoDim**, change the **Zip** data type to **Text**

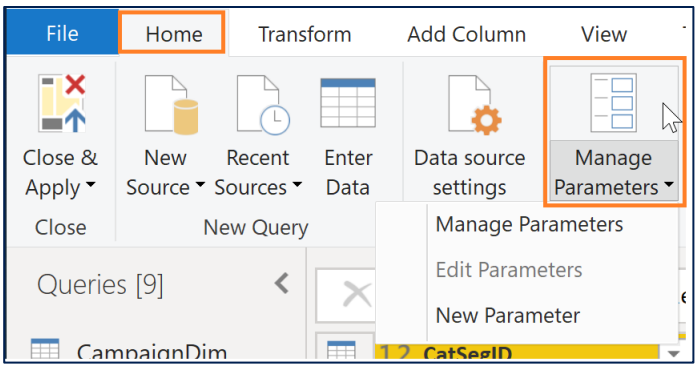


Lab 1b: Create lab parameters

Task: Create new parameters

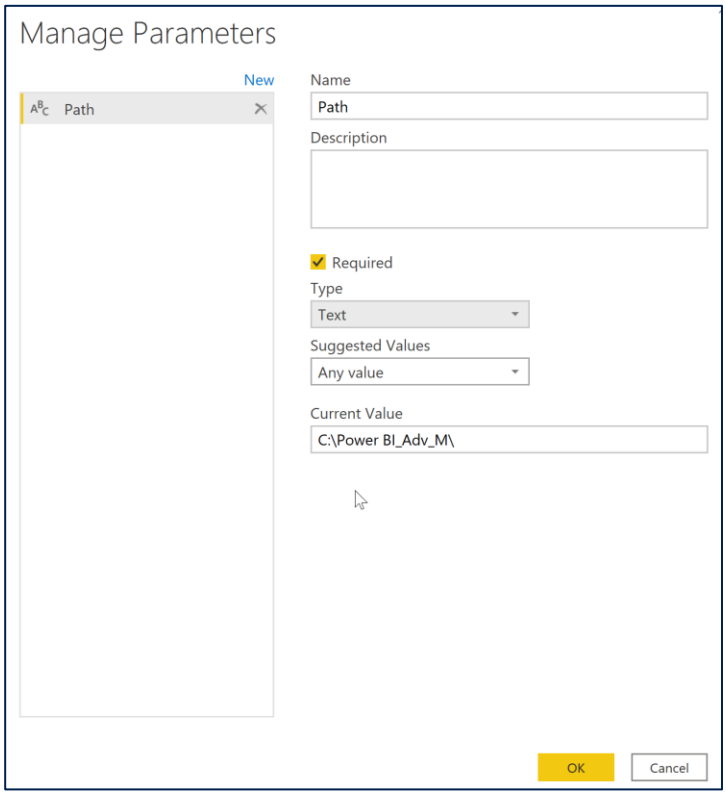
The estimated time to complete this lab is 15 minutes.

1. Click on **Transform Data**
2. From the **Home** Ribbon > **Manage Parameters**



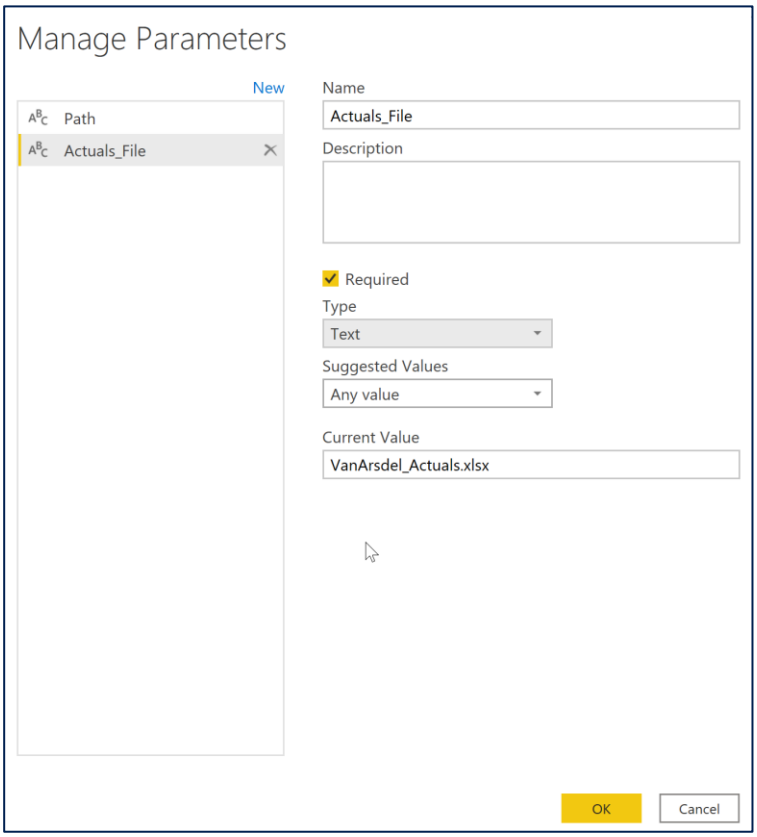
3. Create a new **Parameter**

   a. Parameter Name: **Path**
   b. Type: **Text**
   c. Current Value = **C:\Power BI_Adv_M**



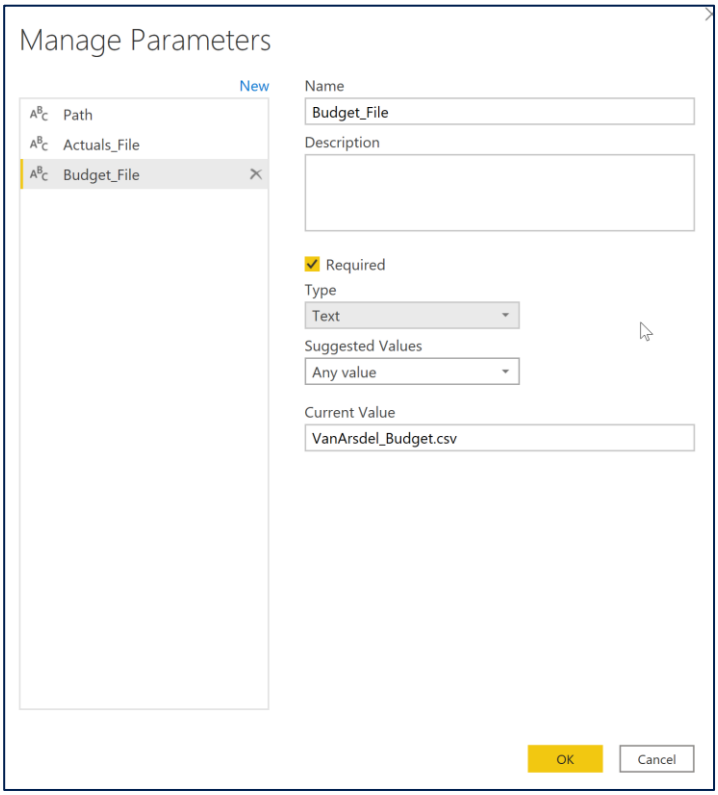
4. Create a new **Parameter**

    a. Parameter Name: **Actuals_File**
    b. Type: **Text**
    c. Current Value = **VanArsdel_Actuals.xlsx**



5. Create a new **Parameter**

    a. Parameter Name: **Budget_File**
    b. Type: **Text**
    c. Current Value = **VanArsdel_Budget.csv**



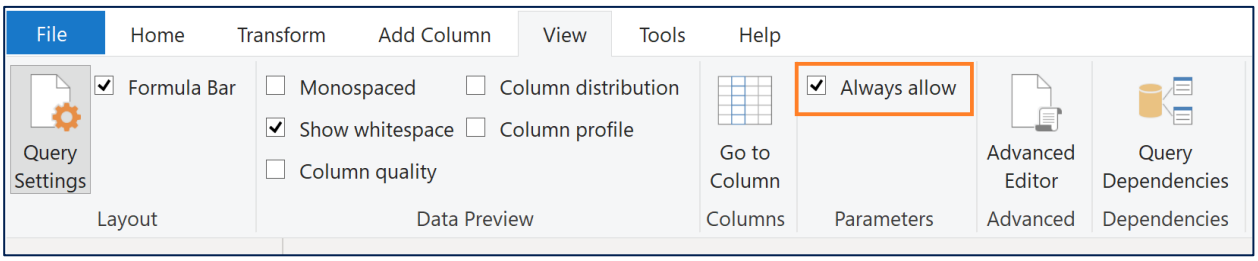
6. Update the text files to ensure the parameter names are consistent

Lab 2a: Create CatSegDim

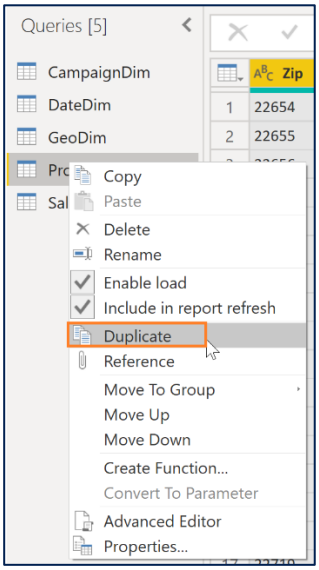
Task: Create a dimension using Category and Segment attributes from the Product dimension

The estimated time to complete this lab is 30 minutes.

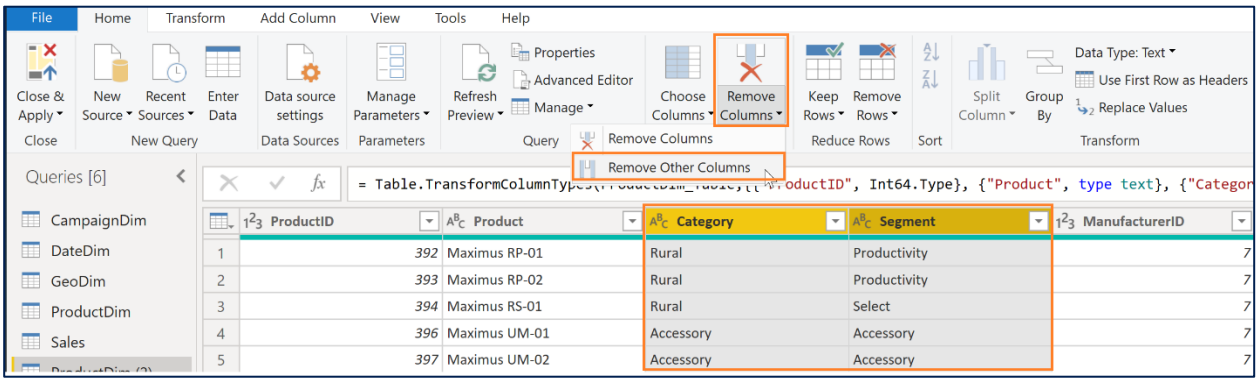
1. From the **View** ribbon check "**Always Allow**"



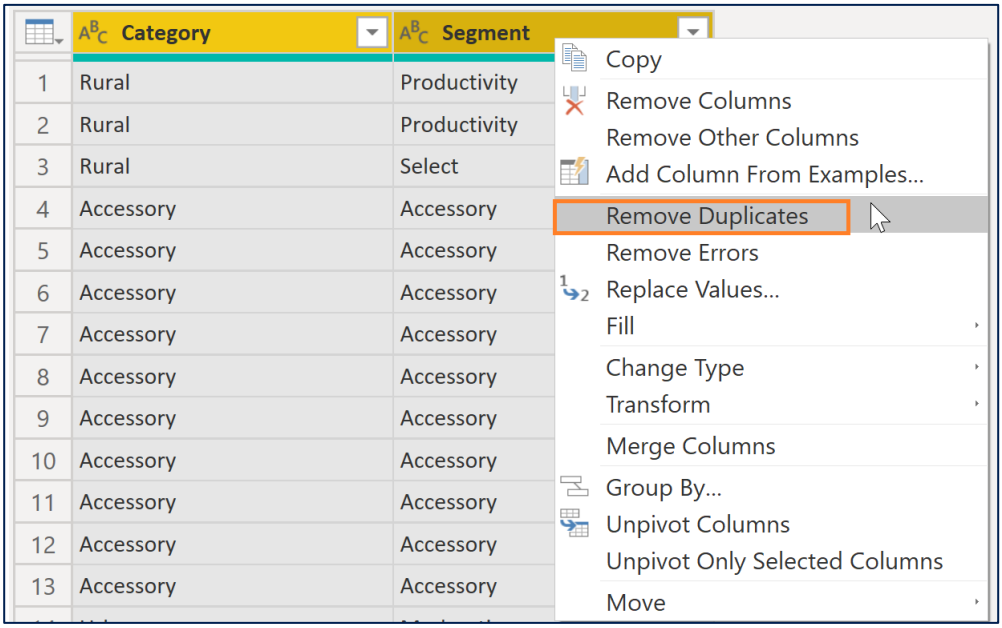
2. **Duplicate** the **ProductDim** query



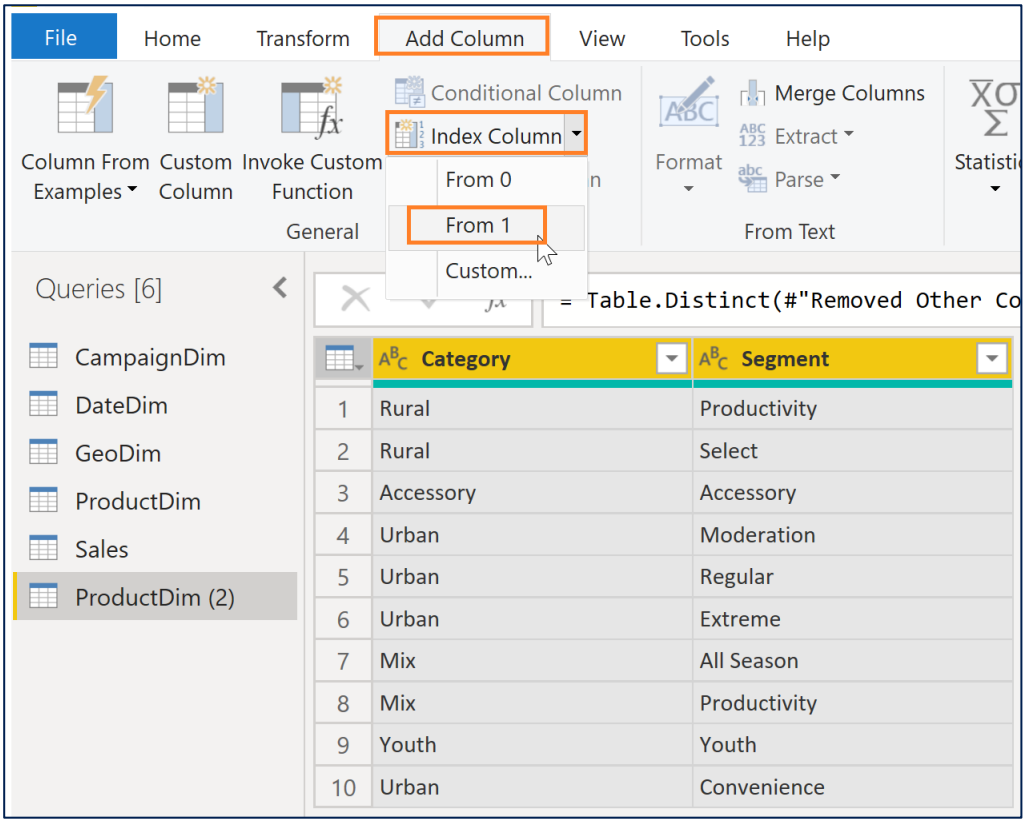
3. Highlight **Category** and **Segment**, and **Remove other columns**



4. Highlight **Category** and **Segment**, and **Remove Duplicates**



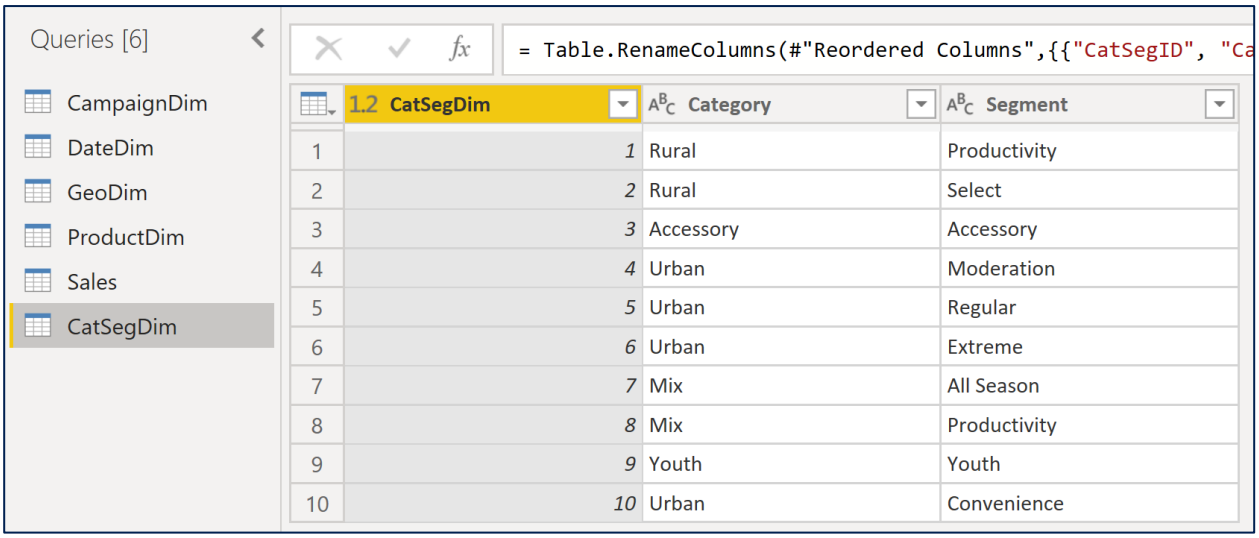
5. **Add Column**> Add **Index** Column starting at 1, with column name **CatSegID**



6. Reorder Columns: **CatSegID**, **Category**, **Segment**

1.2 CatSegID	Category	Segment
1	Rural	Productivity
2	Rural	Select
3	Accessory	Accessory
4	Urban	Moderation
5	Urban	Regular
6	Urban	Extreme
7	Mix	All Season
8	Mix	Productivity
9	Youth	Youth
10	Urban	Convenience

7. Rename the query "**CatSegDim**"



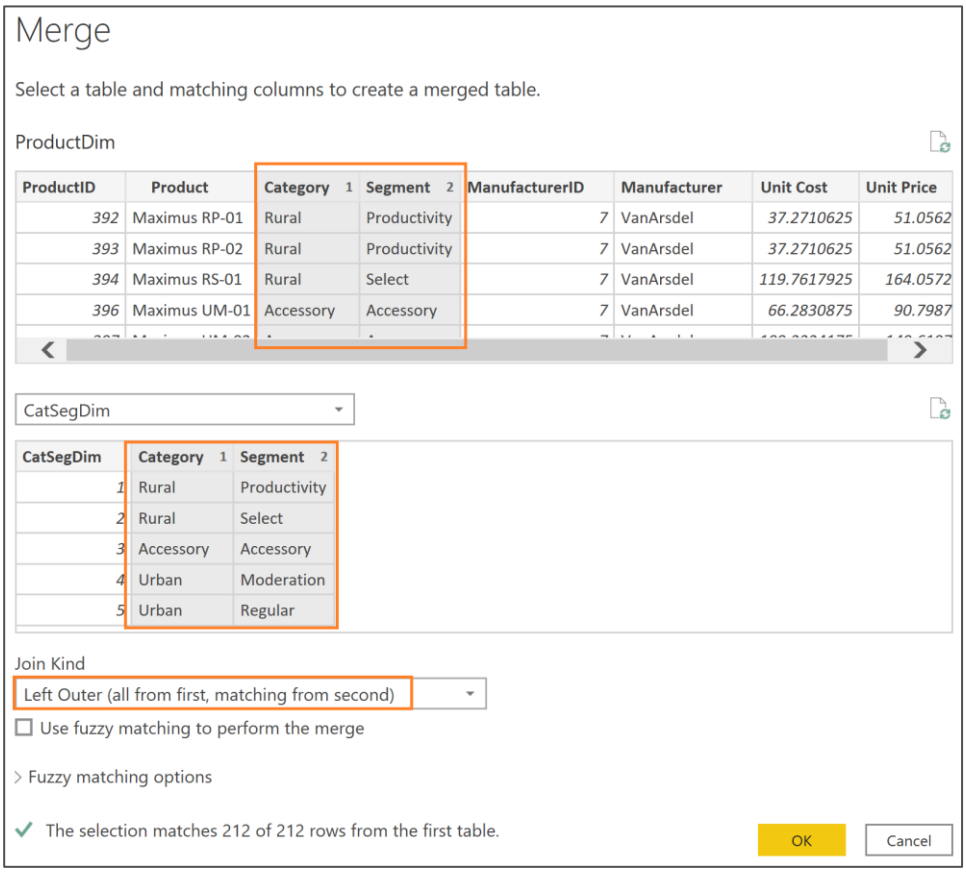
Lab 2b: Update Product dimension

Task: Update the Product dimension

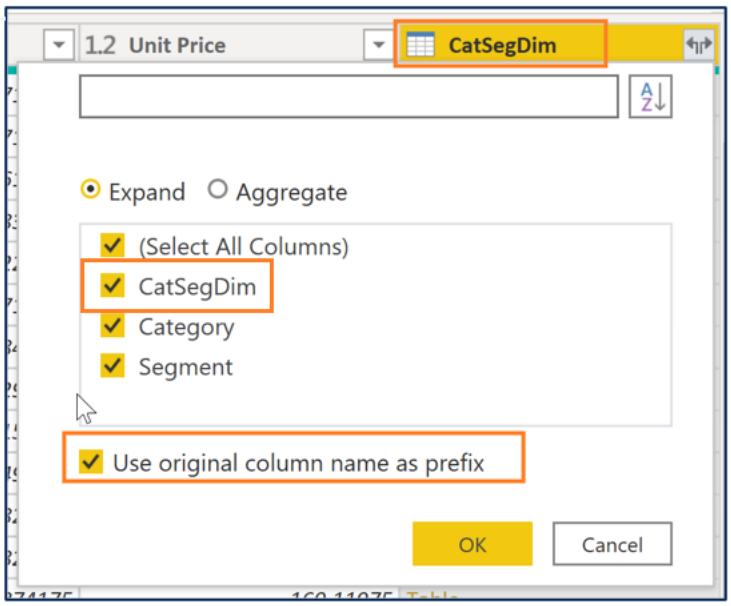
The estimated time to complete this lab is 15 minutes.

1. Select the **ProductDim** query

2. From **Home** Ribbon > **Merge Queries** > Select **CatSegDim**
   a. From **ProductDim**, highlight **Category** and **Segment**
   b. From **CatSegDim**, highlight **Category** and **Segment**
   c. Note the Join Kinds available, and leave **Left Outer**



   d. Expand the **NewColumn** > Select **CatSegID** and deselect **"Use Original column name as prefix"**



3. Remove columns: **Manufacturer ID**,and **Manufacturer**.
    a. **Hint**: There is only one manufacturer name and one manufacturer ID, so we don't need this information!

4. Reorder columns: **ProductID, Product, CatSegID, Unit Price, Unit Cost, Category, Segment**

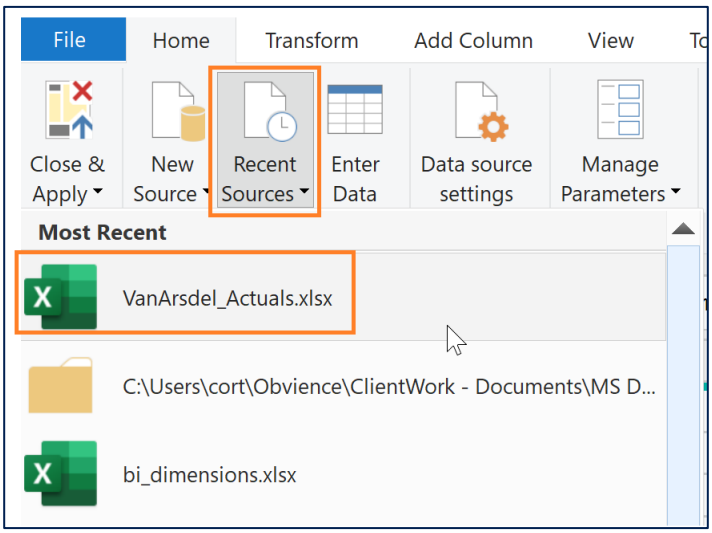
	ProductID	CatSegID	Product	Unit Price	Unit Cost
1	392	1	Maximus RP-01	51.05625	37.2710625
2	393	1	Maximus RP-02	51.05625	37.2710625
3	394	2	Maximus RS-01	164.05725	119.7617925
4	396	3	Maximus UM-01	90.79875	66.2830875
5	397	3	Maximus UM-02	149.61975	109.2224175

Lab 2c: Create Customer dimension

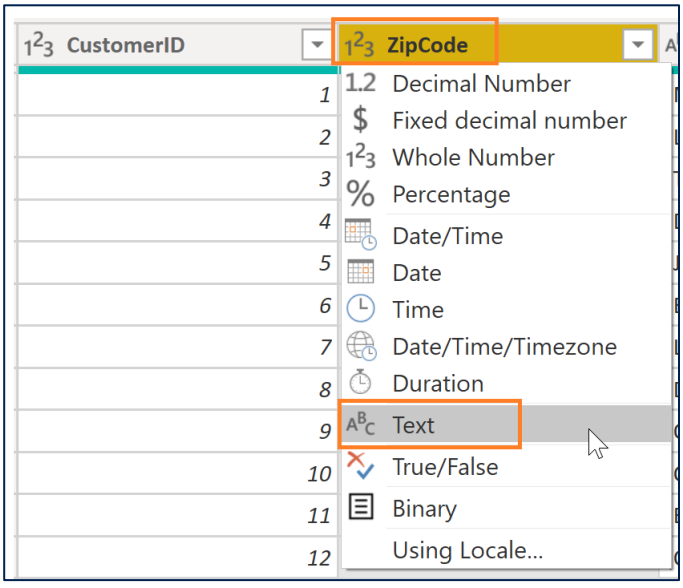
Task: Create a Customer dimension

The estimated time to complete this lab is 30 minutes.

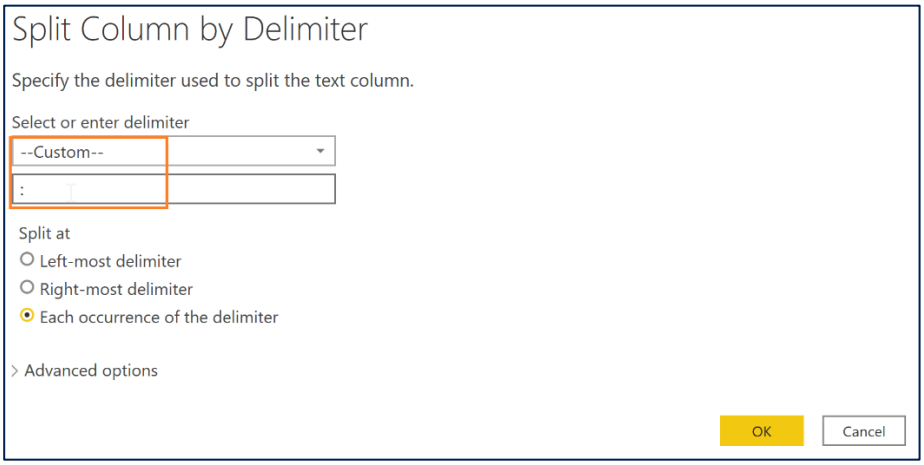
1. Use **Recent Sources** to get **CustomerDim** from Excel



2. Change the **ZipCode** column data type to **Text**

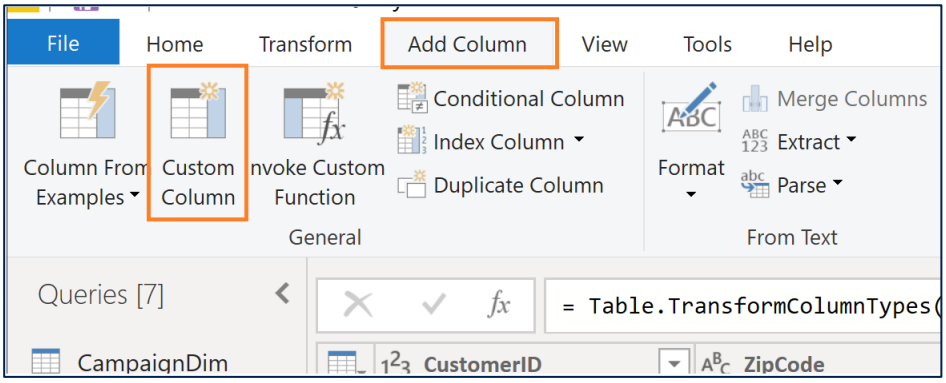


3. Split **Email Name** by Delimiter Custom": " (colon space)



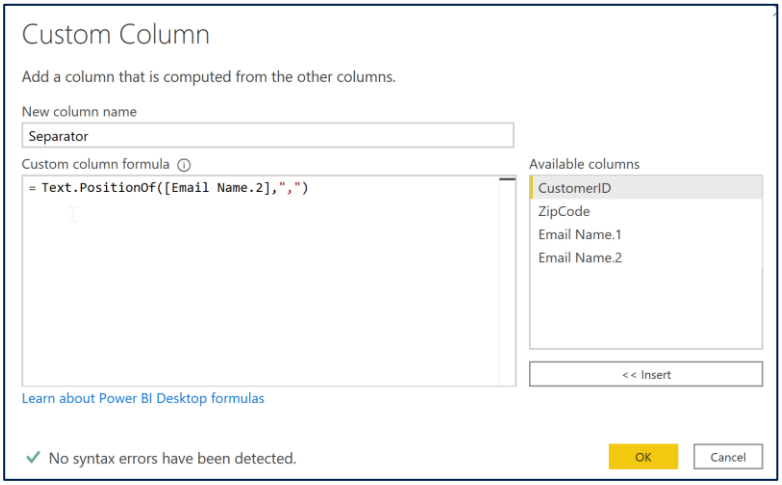
4. **Add Column** to find Text.PositionOf() the comma

    a. **Add Column** > **Custom Column**



    b. Name = "**Separator**"

    c. Formula = ***Text.PositionOf([Email Name.2],",")***



5. Use position of comma to split **Last Name** and **First Name**

6. **Add Columns** for **First Name, Last Name and Full Name**

    a. Last Name = ***Text.Start([Email Name.2], [Separator])***
    b. First Name = ***Text.Range([Email Name.2],[Separator]+2)***
    c. Full Name = ***[First Name] & " " & [Last Name]***

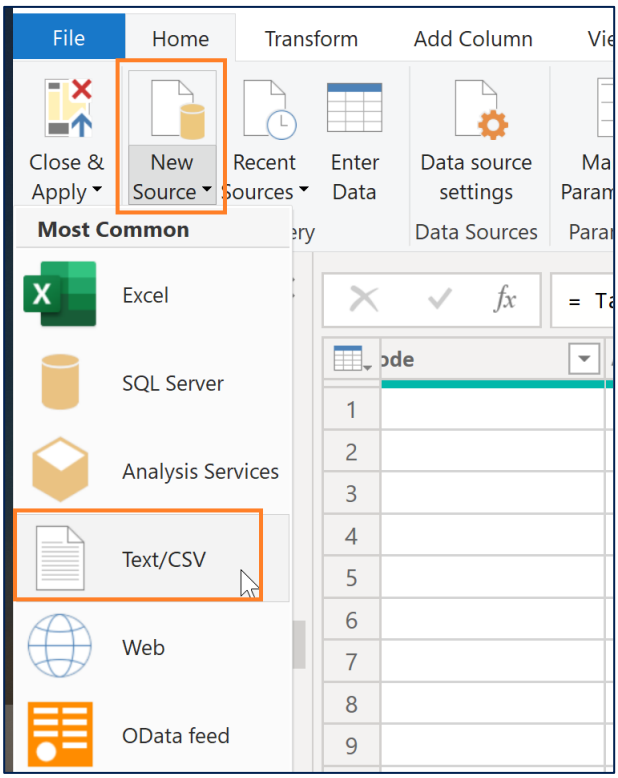
7. Remove **Separator** column

Lab 2d: Create Budget Fact table

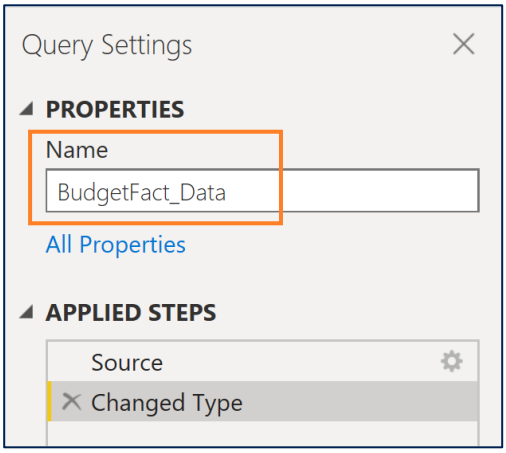
Task: Create Budget fact table

The estimated time to complete this lab is 45 minutes.

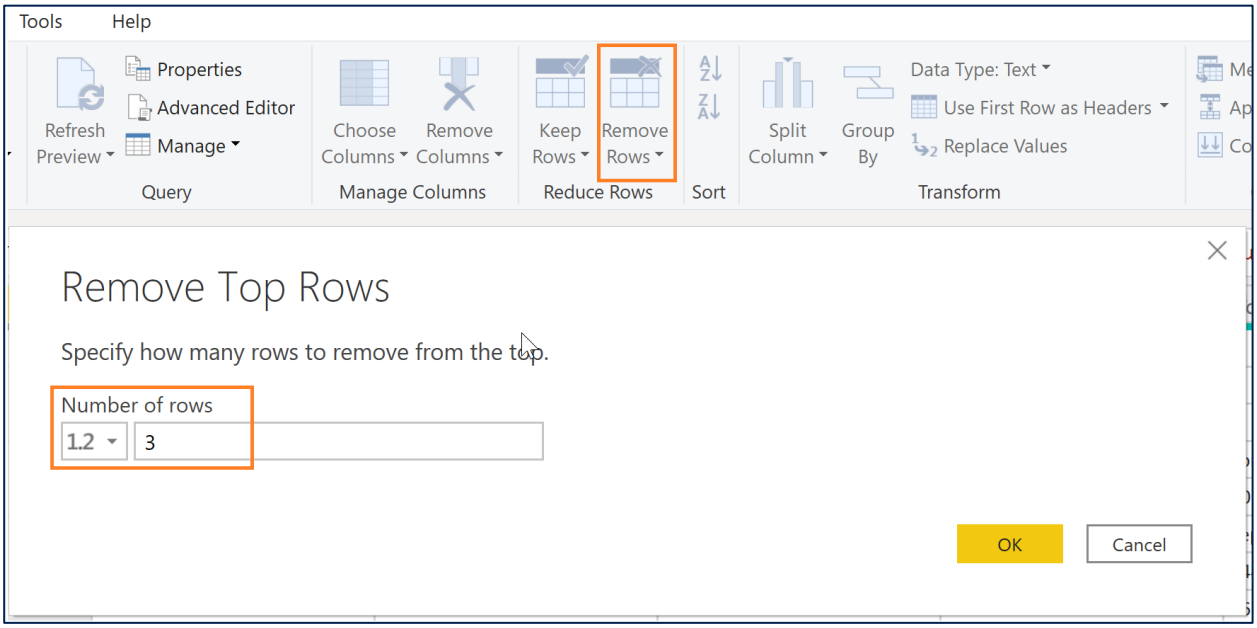
1. Import CSV document **"C:/Power BI Adv_M/VanArsdel_Budget.csv"**



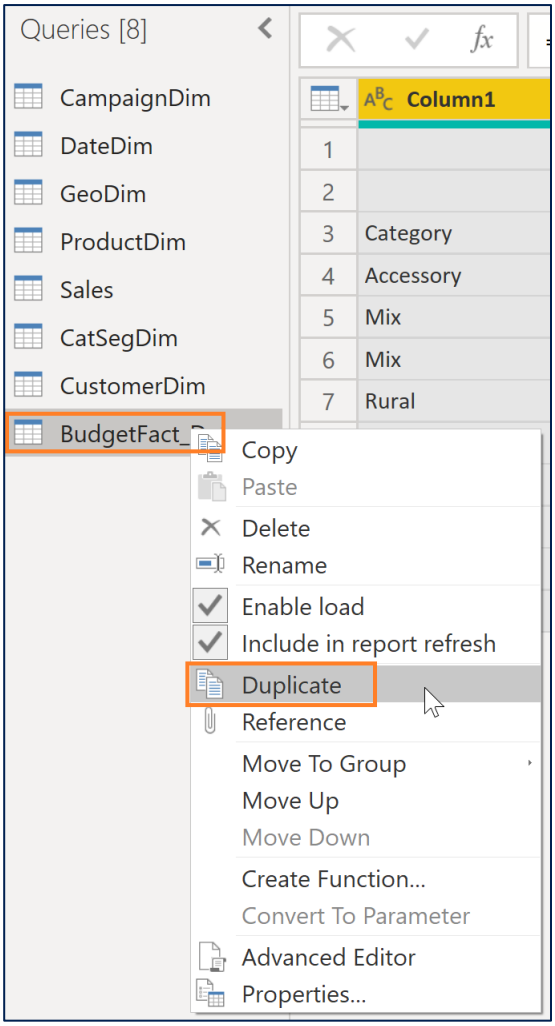
2. Rename query from **VanArsdel_Budget** to **BudgetFact_Data**



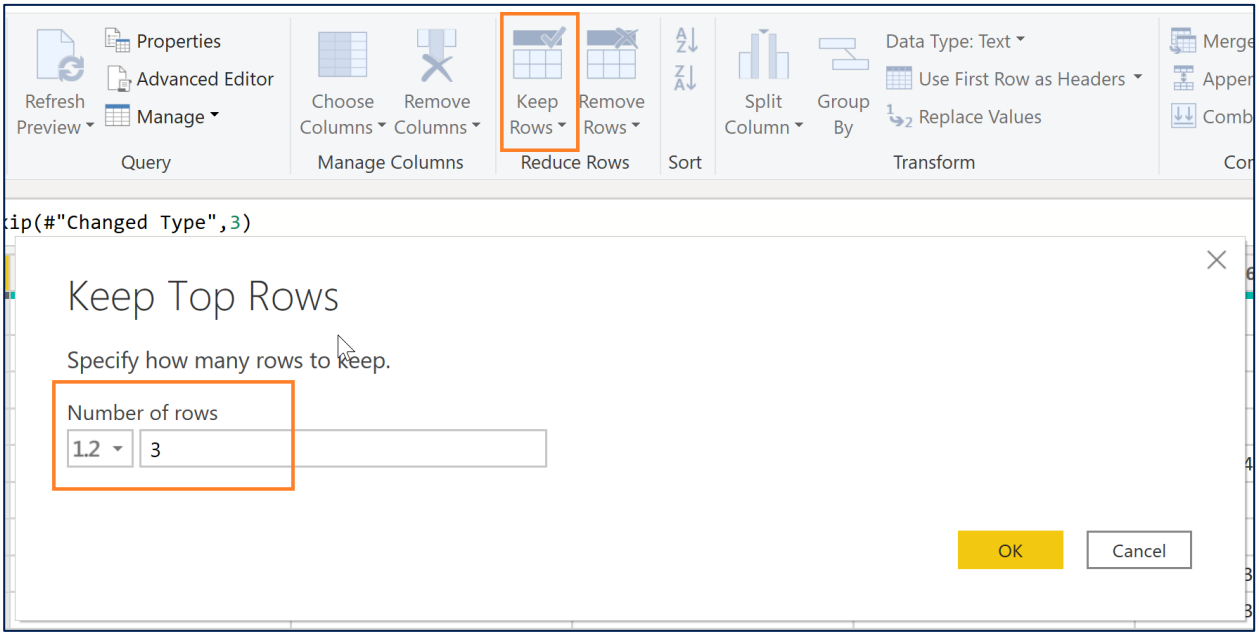
3. **Remove Rows** > Remove Top Rows, enter 3 (to remove the first 3 rows)



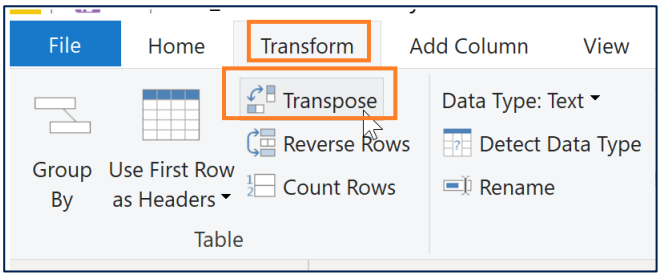
4. **Duplicate** query **BudgetFact_Data** rename to "**BudgetFact**"



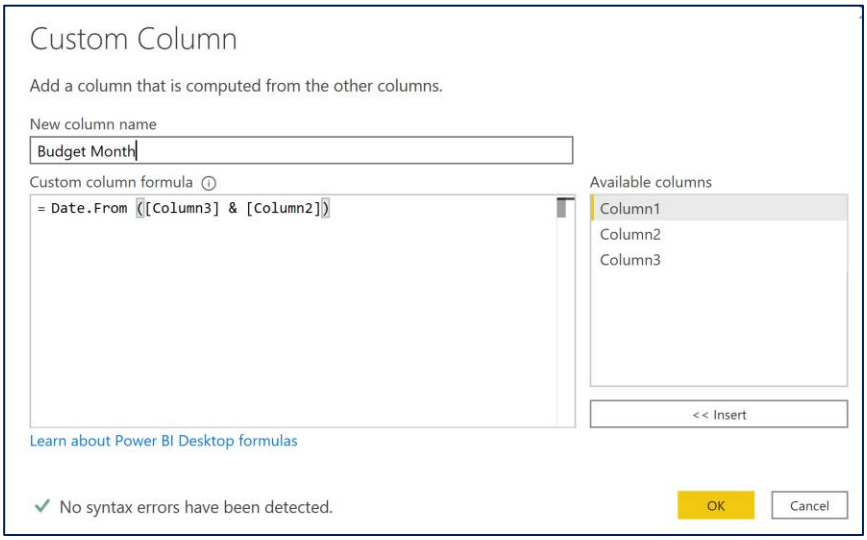
5. **Keep Rows** > Keep Top Rows, enter 3 (to keep the first three rows)



6. **Transform**> **Transpose**

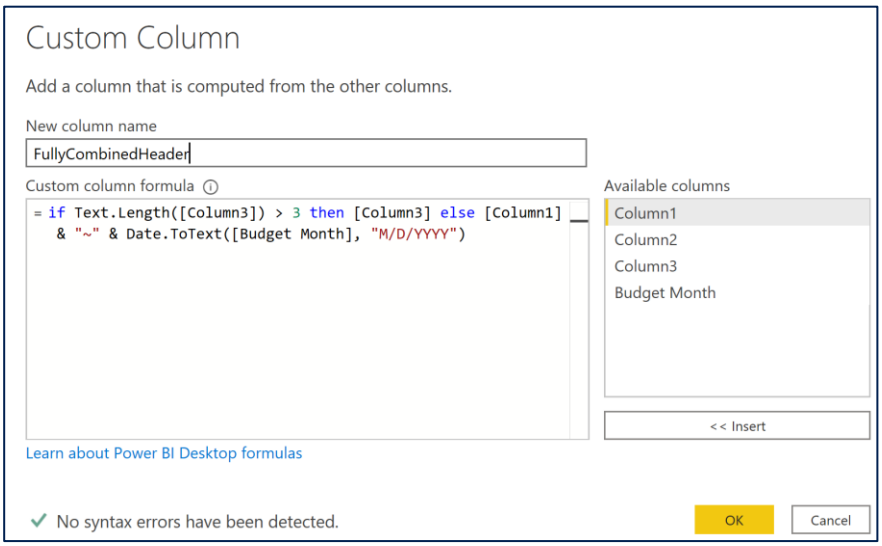


7. **Add Column** to combine month and year into a date a
    a. Add Column > **Custom Column**
    b. Name = "**Budget Month**"
    c. Formula = ***Date.From ([Column3] & [Column2])***

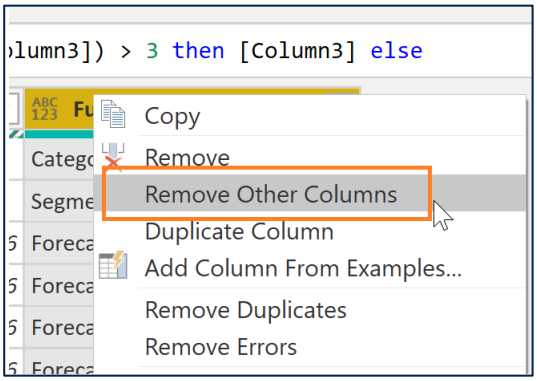


8. **Add Column** to combine Month and Scenario

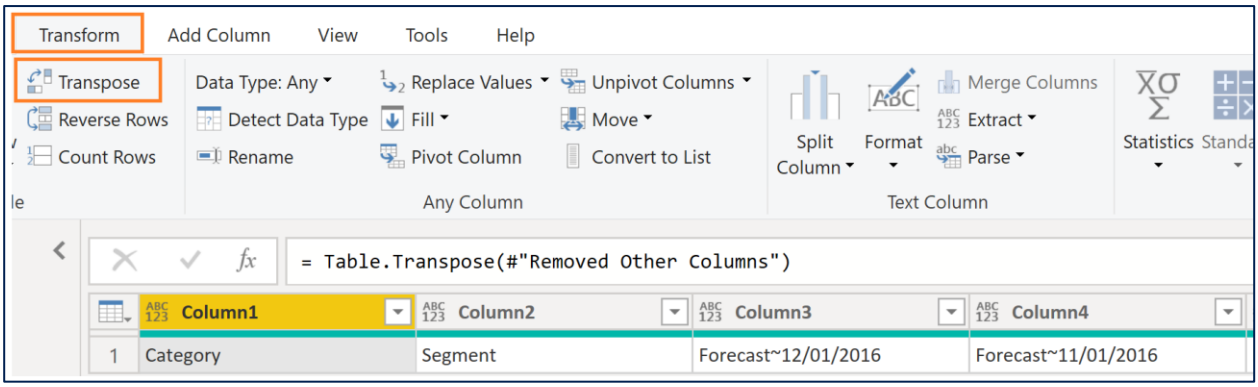
    d. Add Column > **Custom Column**
    e. Name = "**FullyCombinedHeader**"
    f. Formula = ***if Text.Length([Column3]) > 3 then [Column3] else [Column1] & "~" & Date.ToText([Budget Month], "M/D/YYYY")***
    g. **Hint**: Day did not come through correctly, as it is case sensitive. Update to "MM/dd/yy"



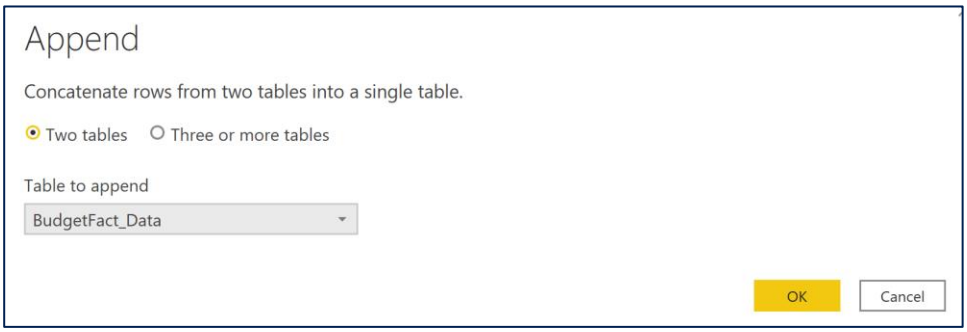
9. **Remove all** columns except for **FullyCombinedHeader**



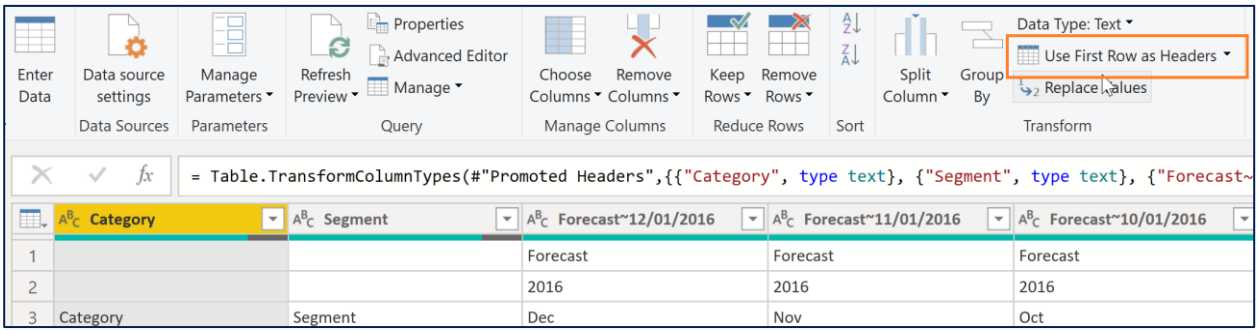
10. **Transform**> **Transpose** to transpose back to wide



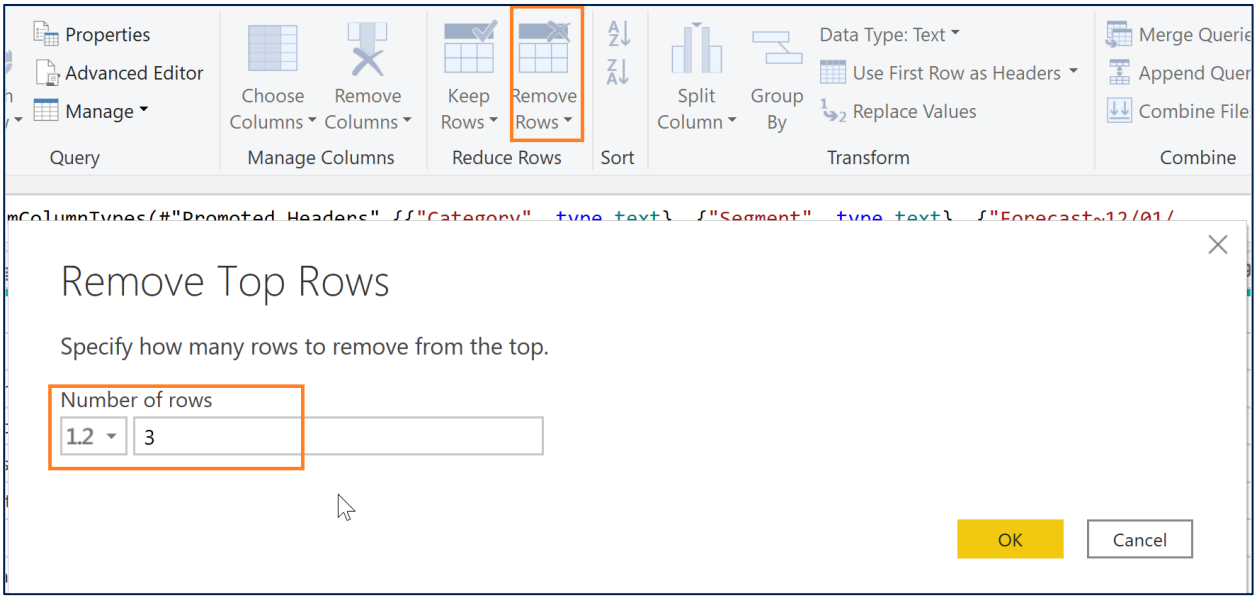
11. **Append** query **BudgetFact_Data**



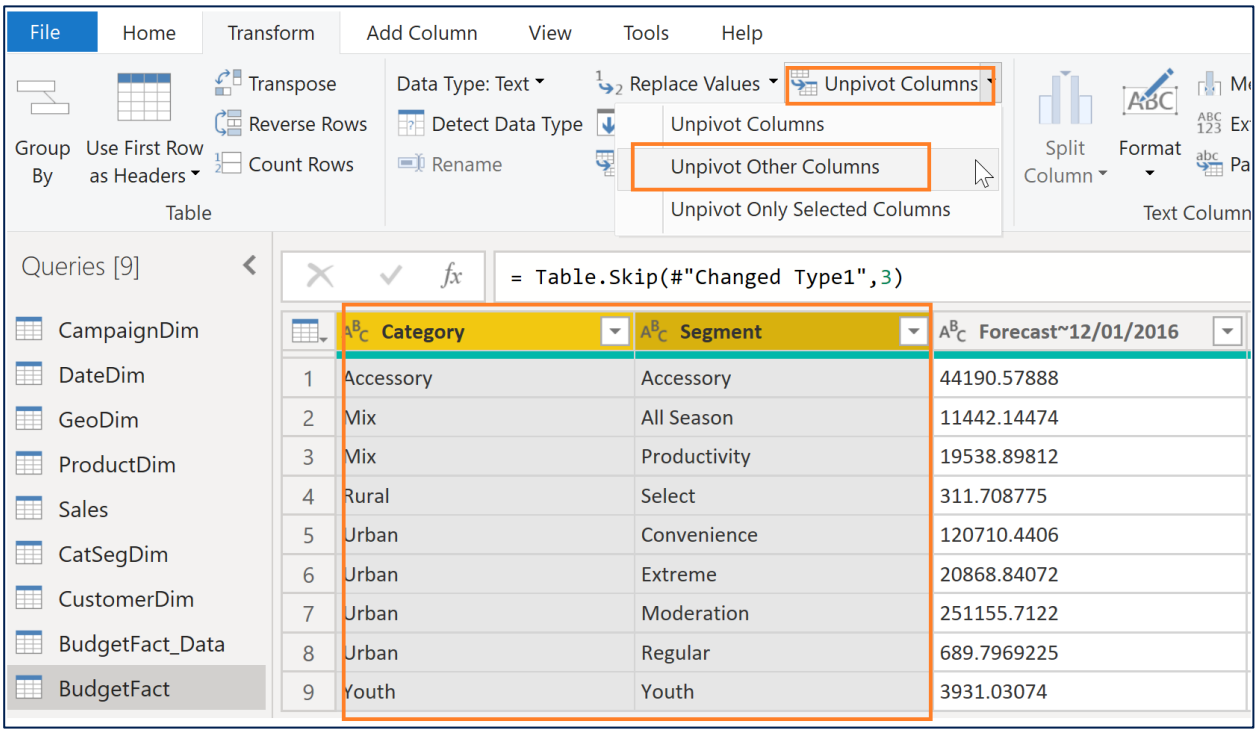
12. **Use First Row as Header** to promote the newly fixed header row



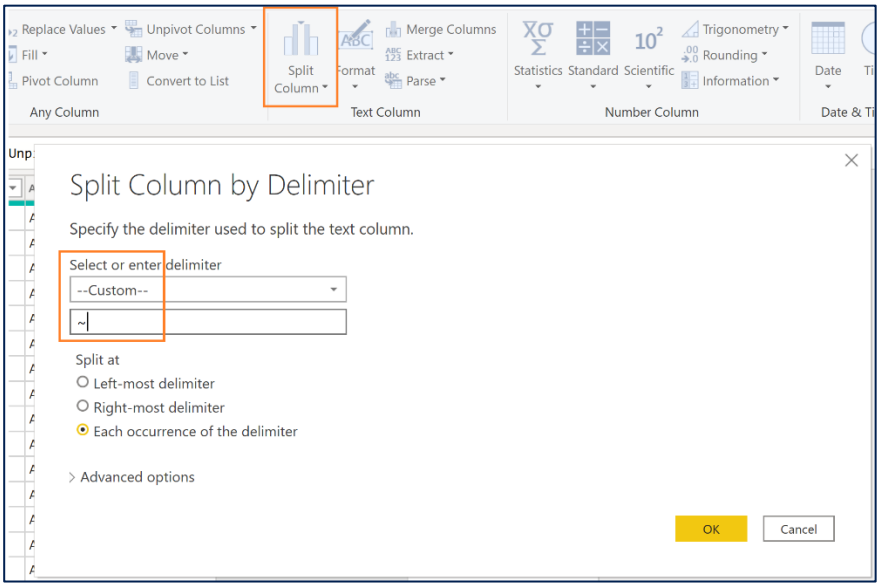
13. **Remove Rows** > Remove Top Rows, enter 3 (to remove the first 3 rows – the old header rows)



14. Highlight **Category** and **Segment** and **Transform**> **Unpivot Other Columns**



15. Highlight **Attribute** and navigate to **Home** > **Split Column** > By Delimiter > "~"

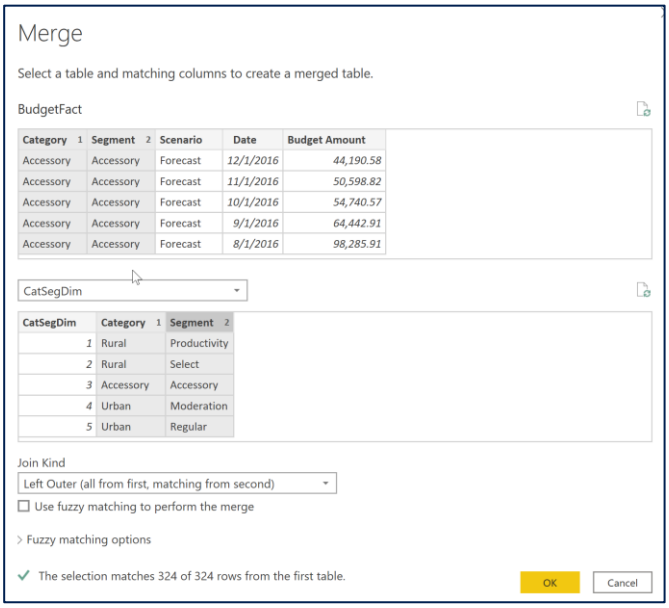


16. Rename: Attribute.1 = "**Scenario**", Attribute.2 = "**Date**", Value = "**Budget Amount**"

Scenario	Date	Budget Amount
Forecast	*12/1/2016*	44190.57888
Forecast	*11/1/2016*	50598.81566
Forecast	*10/1/2016*	54740.5709

17. Change the Data Types: **Budget Amount** = **Fixed Decimal, Date = Date**

18. **Home** > **Merge Queries** > Select **CatSegDim**
    h. a) From the CatSegDim highlight both **Category** and **Segment**
    i. b) Go back up to BudgetFact, highlight both **Category** and **Segment**
    j. c) Show the Join Kinds available, and leave "**Left Outer**"
    k. d) Expand NewColumn > Select "**CatSegID**" and deselect "Use Original column name as prefix"

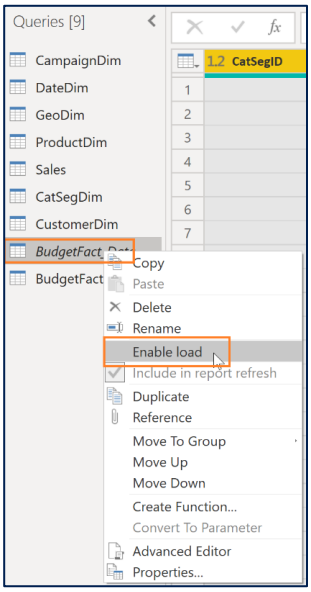


19. Remove: **Category**, **Segment**

20. Reorder: **CatSegID,Scenario, Date, Budget Amount**

	1.2 CatSegID	Scenario	Date	$ Budget Amount
1	3	Forecast	12/1/2016	44,190.58
2	3	Forecast	11/1/2016	50,598.82
3	3	Forecast	10/1/2016	54,740.57

21. **Disable** the load of **BudgetFact_Data**

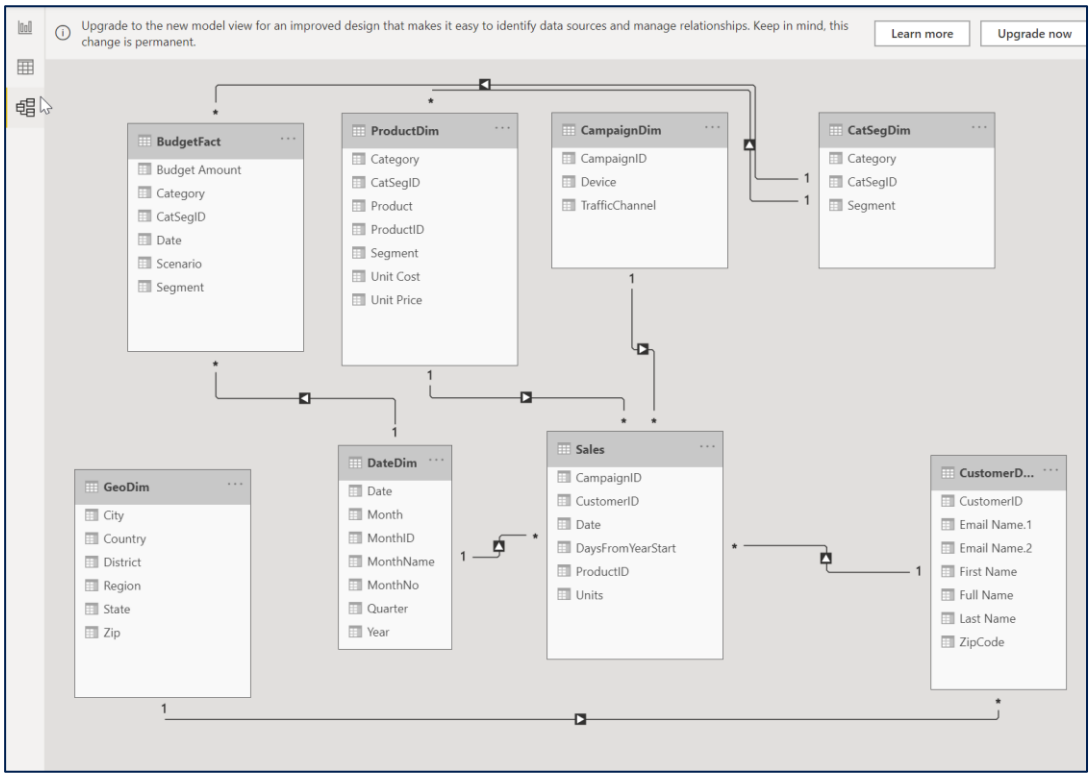


Lab 3: Create relationships between tables

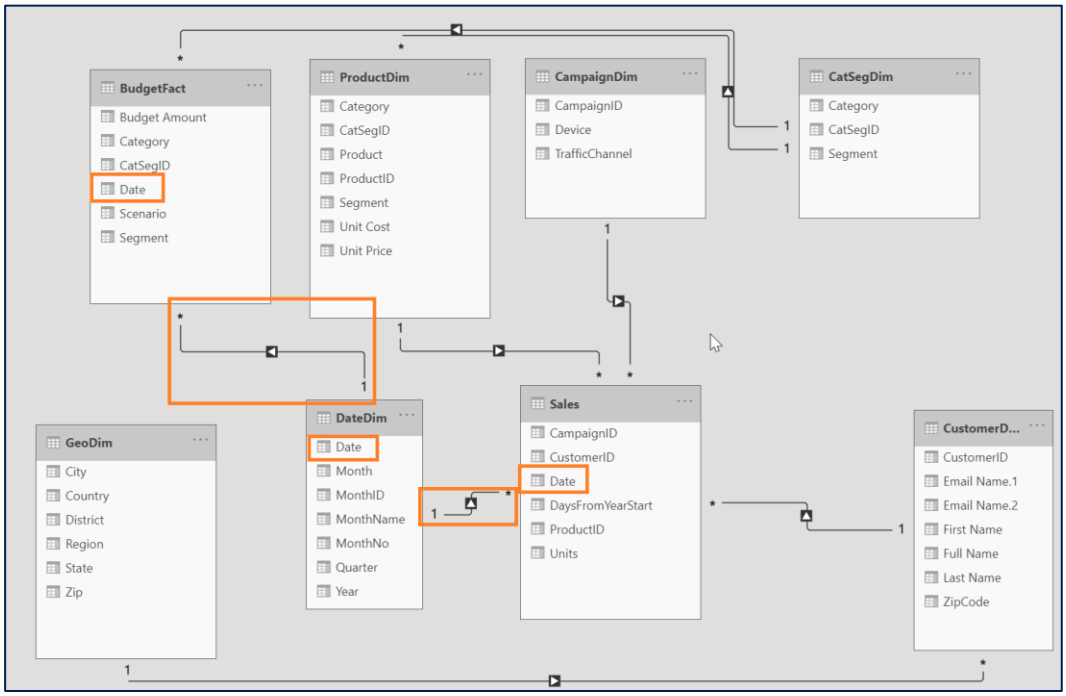
Task: Create relationships between multiple tables.

The estimated time to complete this lab is 20 minutes.

1. Navigate to **model** view.



2. Drag a **relationship** line between **Date** field from **Sales** table to **Date** field from **DateDim** table, create the same relationship between the **Date** table and the **BudgetFact** table

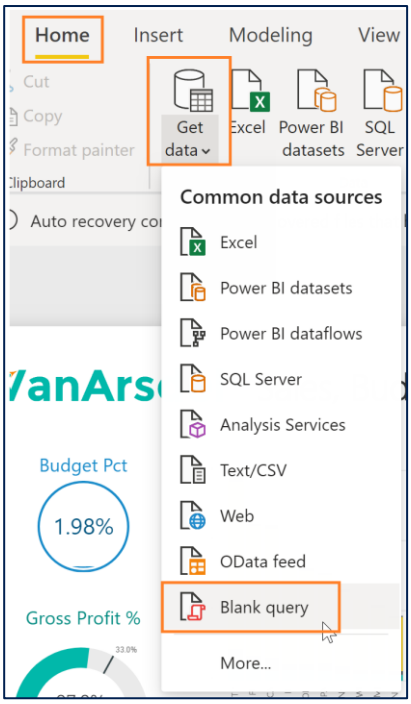

BudgetFact
Budget Amount
Category
CatSegID
Date
Scenario
Segment
ProductDim
Category
CatSegID
Product
ProductID
Segment
Unit Cost
Unit Price
CampaignDim
CampaignID
Device
TrafficChannel
CatSegDim
Category
CatSegID
Segment
GeoDim
City
Country
District
Region
State
Zip
DateDim
Date
Month
MonthID
MonthName
MonthNo
Quarter
Year
Sales
CampaignID
CustomerID
Date
DaysFromYearStart
ProductID
Units
CustomerD...
CustomerID
Email Name.1
Email Name.2
First Name
Full Name
Last Name
ZipCode

Lab 4a: Create dynamic path to excel source file

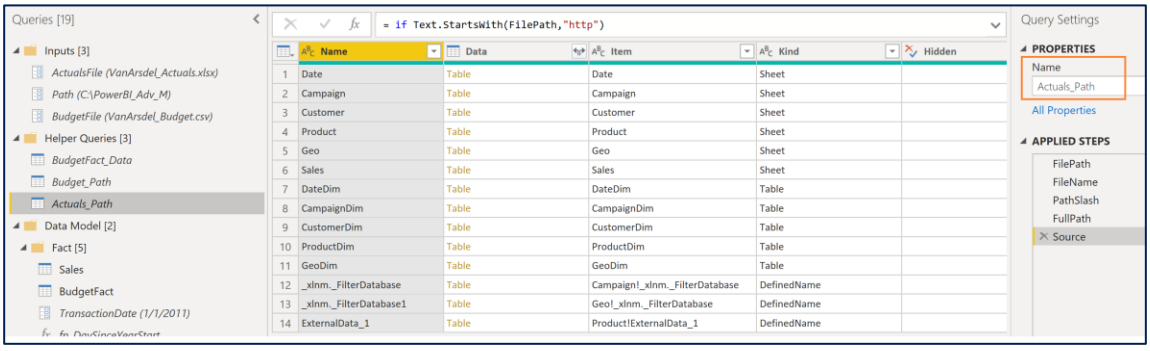
Task: Create a dynamic path to the excel source file

The estimated time to complete this lab is 15 minutes.

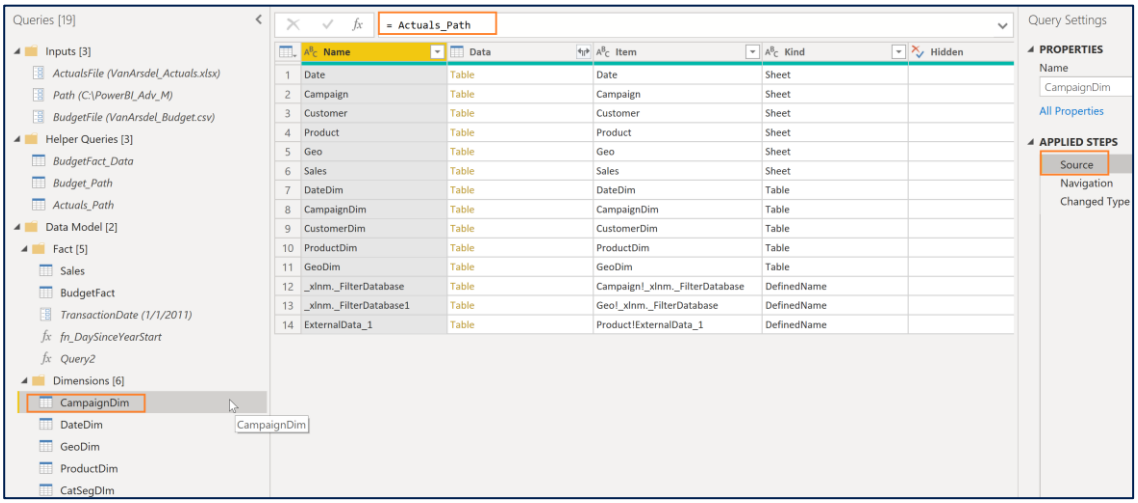
1. Create a new blank query
    a. a) Query Name: “Actuals_Path”



    b. b) Copy in text from the file Actuals_Path.txt



2. Update Source Applied Step to use Resolved Path = “Actuals_Path” to the following Queries: • CampaignDim • CustomerDim • ProductDim • CatSegDim • Date • GeoDim • Sales

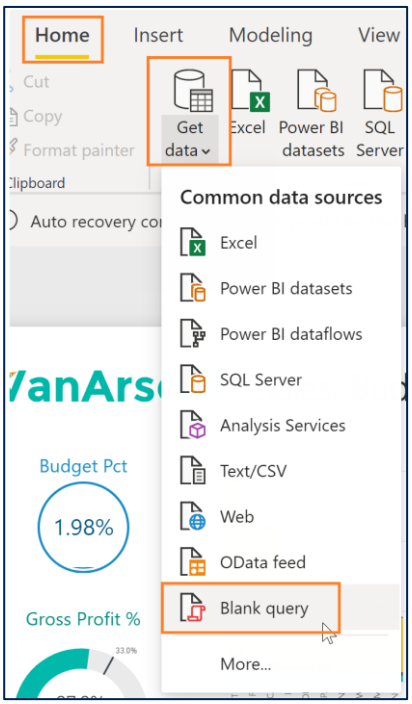

Queries [19]
Inputs [3]
ActualsFile (VanArsdel_Actuals.xlsx)
Path (C:\PowerBI_Adv_M)
BudgetFile (VanArsdel_Budget.csv)
Helper Queries [3]
BudgetFact_Data
Budget_Path
Actuals_Path
Data Model [2]
Fact [5]
Sales
BudgetFact
TransactionDate (1/1/2011)
fn_DaySinceYearStart
Query2
Dimensions [6]
CampaignDim
DateDim
GeoDim
ProductDim
CatSegDim
CampaignDim
= Actuals_Path
Name
Data
Item
Kind
Hidden
1 Date Table Date Sheet
2 Campaign Table Campaign Sheet
3 Customer Table Customer Sheet
4 Product Table Product Sheet
5 Geo Table Geo Sheet
6 Sales Table Sales Sheet
7 DateDim Table DateDim Table
8 CampaignDim Table CampaignDim Table
9 CustomerDim Table CustomerDim Table
10 ProductDim Table ProductDim Table
11 GeoDim Table GeoDim Table
12 _xlnm._FilterDatabase Table Campaign!_xlnm._FilterDatabase DefinedName
13 _xlnm._FilterDatabase1 Table Geo!_xlnm._FilterDatabase DefinedName
14 ExternalData_1 Table Product!ExternalData_1 DefinedName
Query Settings
PROPERTIES
Name
CampaignDim
All Properties
APPLIED STEPS
Source
Navigation
Changed Type

Lab 4b: Create dynamic path to csv source file

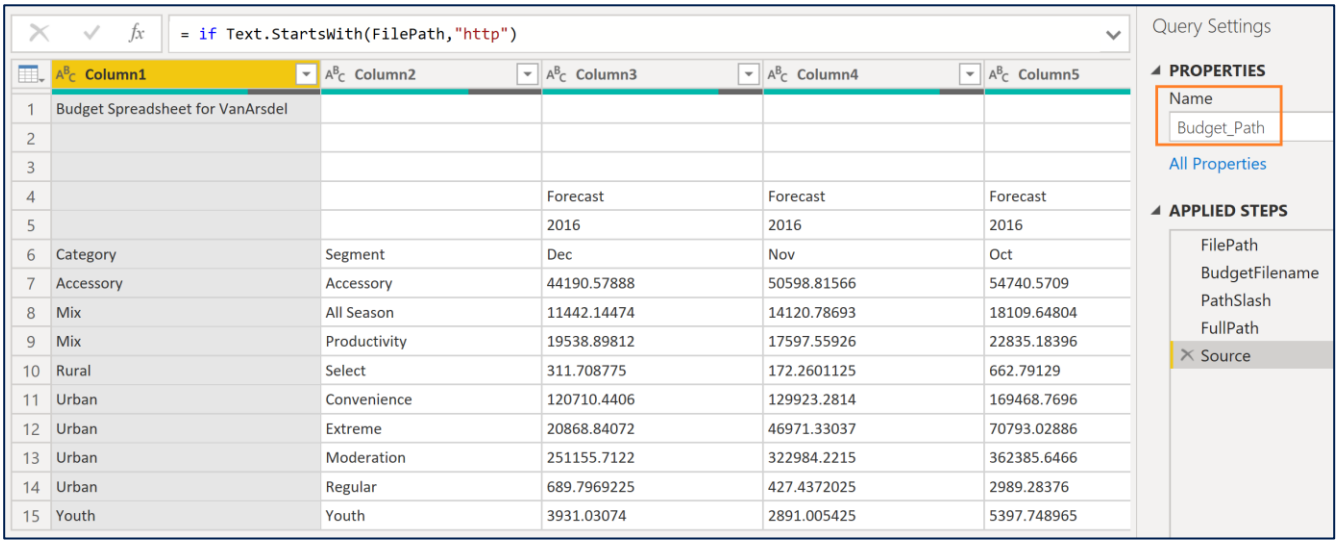
Task: Create a dynamic path to csv source file

The estimated time to complete this lab is 15 minutes.

1. Create a new blank query a) Query Name: “Budget_Path”

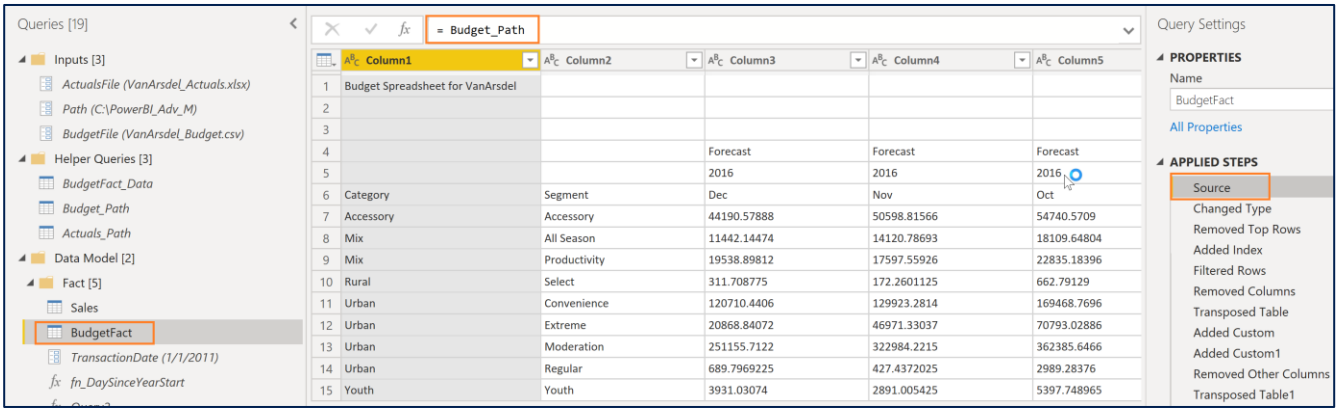


2. Copy in text from Budget_Path.txt



	Column1	Column2	Column3	Column4	Column5
1	Budget Spreadsheet for VanArsdel				
2					
3					
4			Forecast	Forecast	Forecast
5			2016	2016	2016
6	Category	Segment	Dec	Nov	Oct
7	Accessory	Accessory	44190.57888	50598.81566	54740.5709
8	Mix	All Season	11442.14474	14120.78693	18109.64804
9	Mix	Productivity	19538.89812	17597.55926	22835.18396
10	Rural	Select	311.708775	172.2601125	662.79129
11	Urban	Convenience	120710.4406	129923.2814	169468.7696
12	Urban	Extreme	20868.84072	46971.33037	70793.02886
13	Urban	Moderation	251155.7122	322984.2215	362385.6466
14	Urban	Regular	689.7969225	427.4372025	2989.28376
15	Youth	Youth	3931.03074	2891.005425	5397.748965

3. UpdateSource Applied Step to use ResolvedBudgetPath = “Budget_Path” to the following Queries: • BudgetFact • BudgetFact_Data

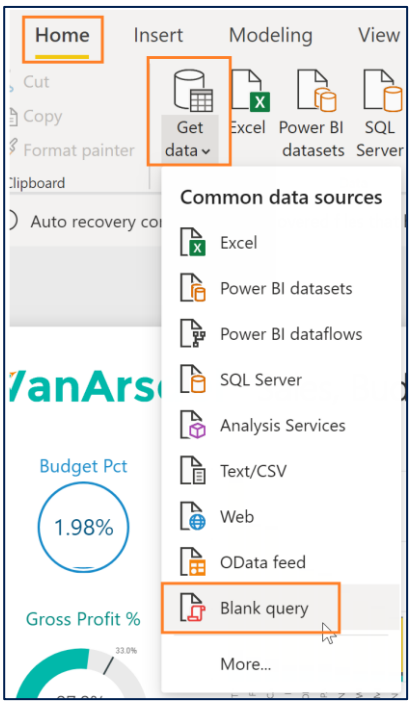


Lab 4c: Create a custom function

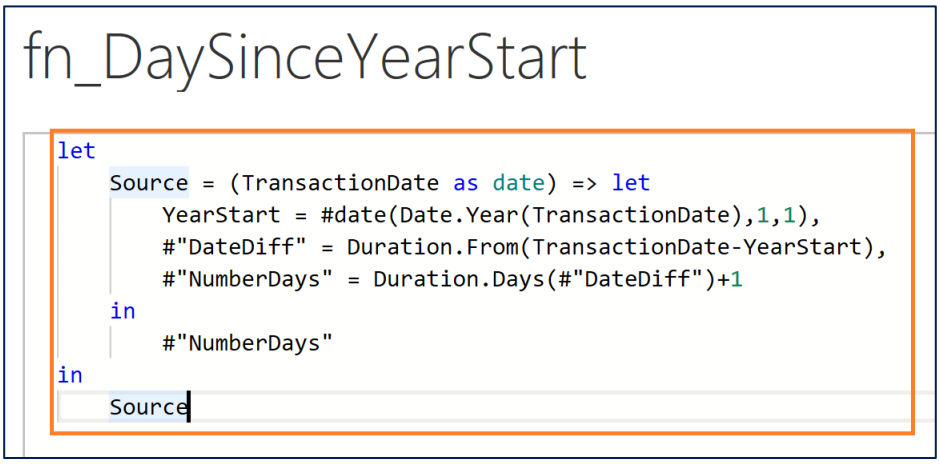
Task: Create a custom function

The estimated time to complete this lab is 15 minutes.

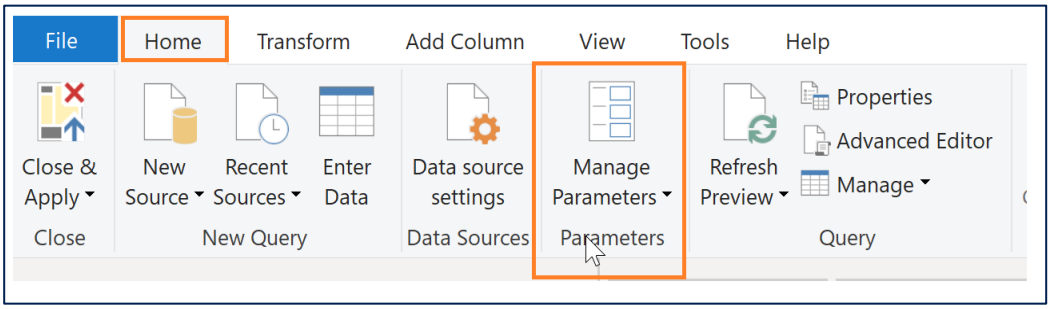
1. Create a new blank query



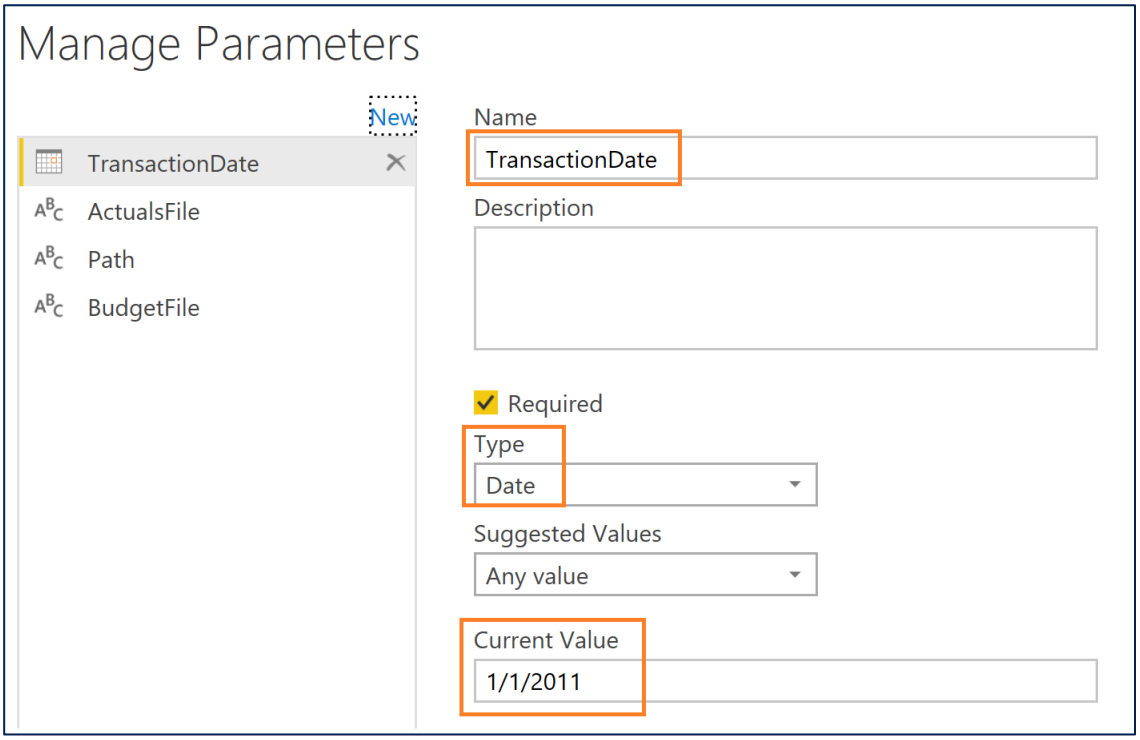
   a. Query Name: "**fn_DaySinceYearStart**"
   b. In Advanced Editor copy in text from **Number_Days.txt**



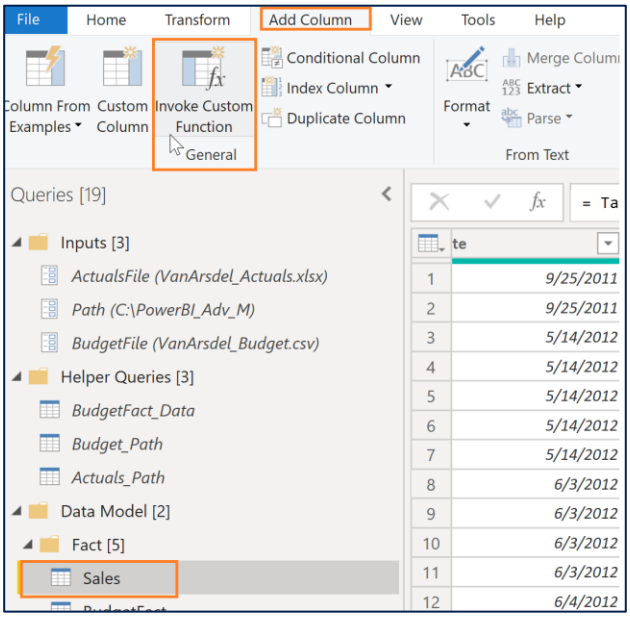
2. Create a new Parameter



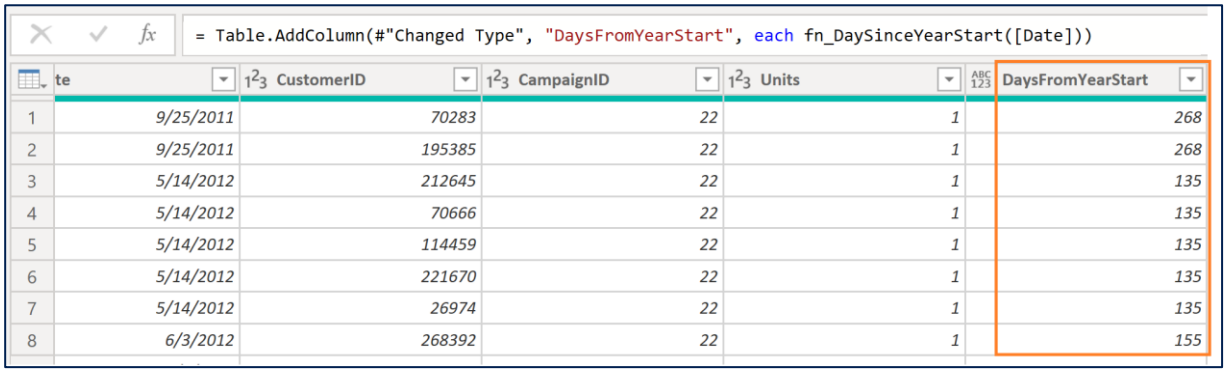
a. Parameter Name: **TransactionDate**
b. Type: **Date**
c. Current Value = **1/1/2011**



3. Update Sales query
   a. **Add Column -> Invoke Custom Function**

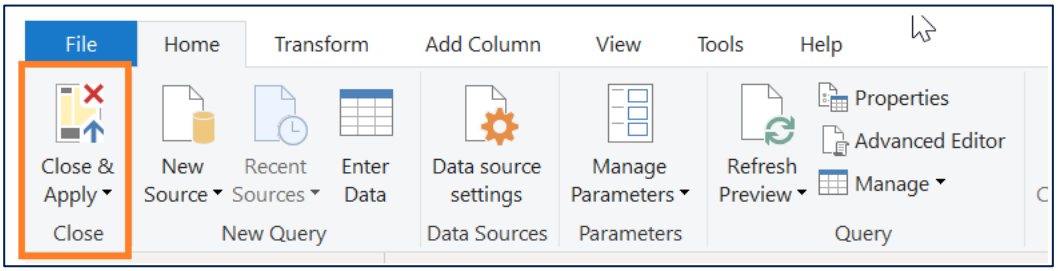


b. New Column Name: **DaysFromYearStart**
c. Function query: **fn_DaySinceYearStart**
d. Transaction Date = **Select current date from calendar**



	te	CustomerID	CampaignID	Units	DaysFromYearStart
1	9/25/2011	70283	22	1	268
2	9/25/2011	195385	22	1	268
3	5/14/2012	212645	22	1	135
4	5/14/2012	70666	22	1	135
5	5/14/2012	114459	22	1	135
6	5/14/2012	221670	22	1	135
7	5/14/2012	26974	22	1	135
8	6/3/2012	268392	22	1	155

4. Click **Close & Apply** to exit Power Query



5. Close and Save the pbi file.

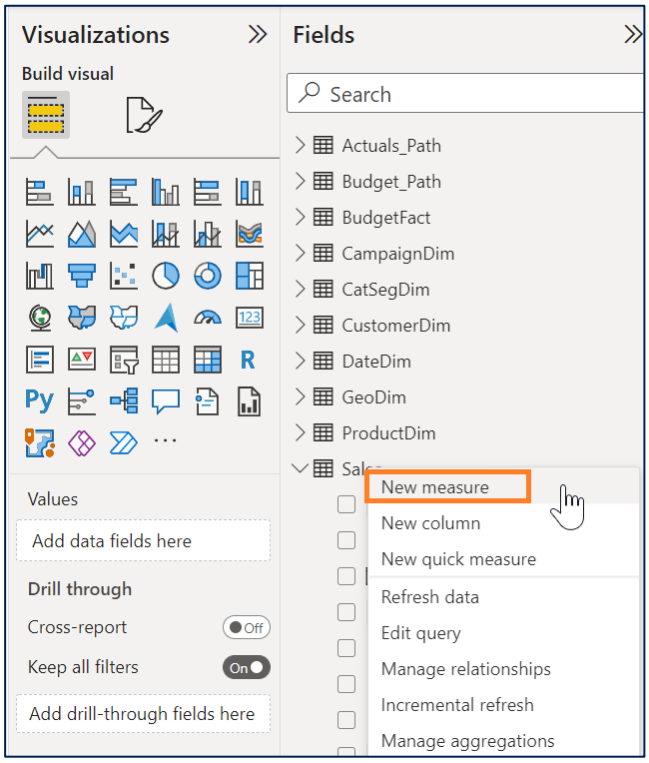
Lab 5: Create new measures and columns

Tasks: You will create a new measure for Total Units Sold, a new calculated column that combines Product Category and Campaign Traffic together, and create visualizations to test the new measure and column

Task 1. Create **Total Units Sold** measure

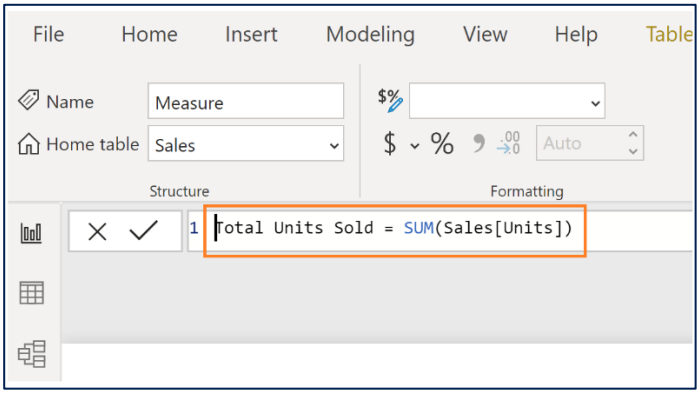
The estimated time to complete this lab is 30 minutes.

1. Select **Sales** Table. From the ribbon select **Modeling -> New Measure**

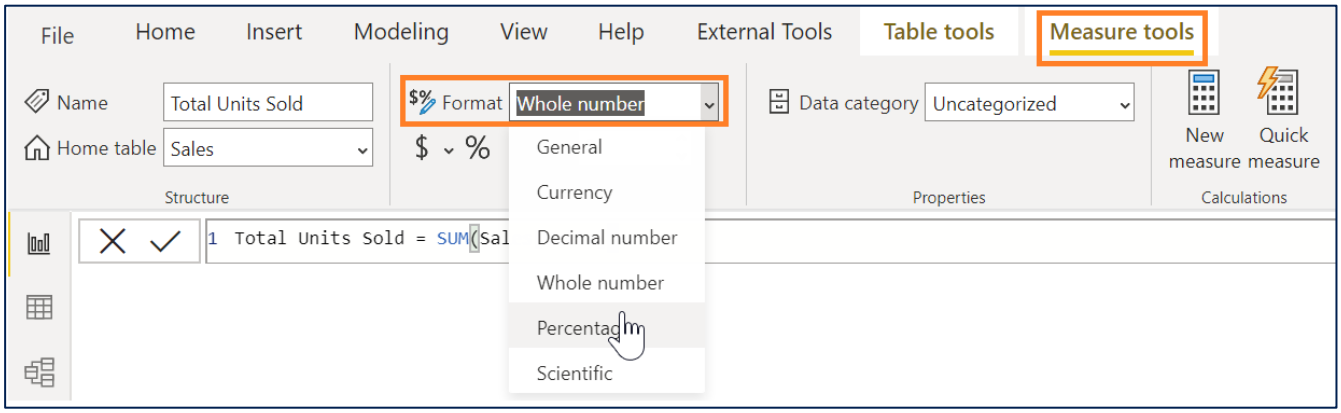


2. In the formula bar enter:

Total Units Sold = SUM(Sales[Units])

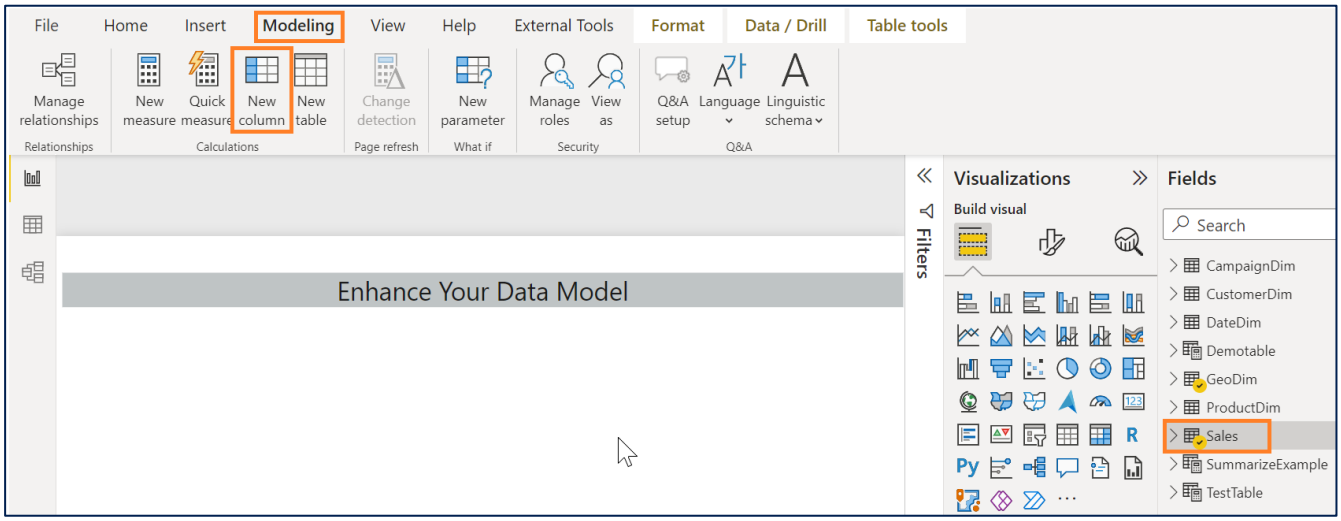


3. From the **Measure tools** ribbon select **Format -> Whole number** to format the measure



Task 2: Create calculated column that combines Category and TrafficChannel

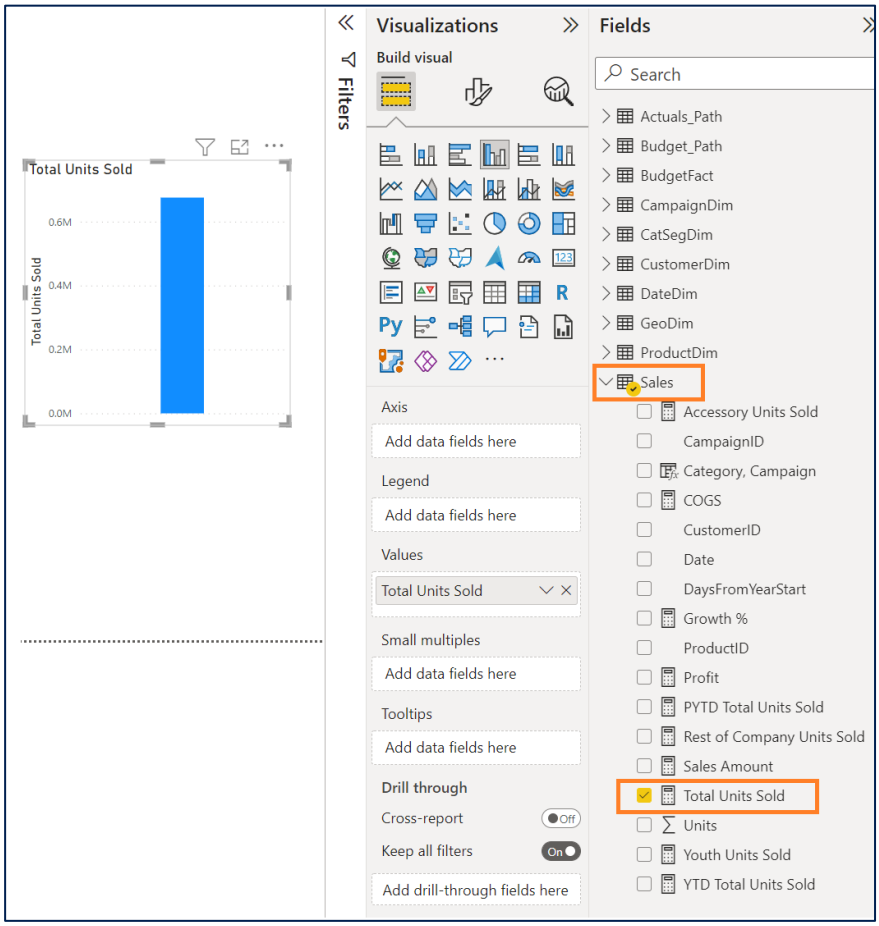
4. Select **Sales** table. From the ribbon select **Modeling -> New Column**.



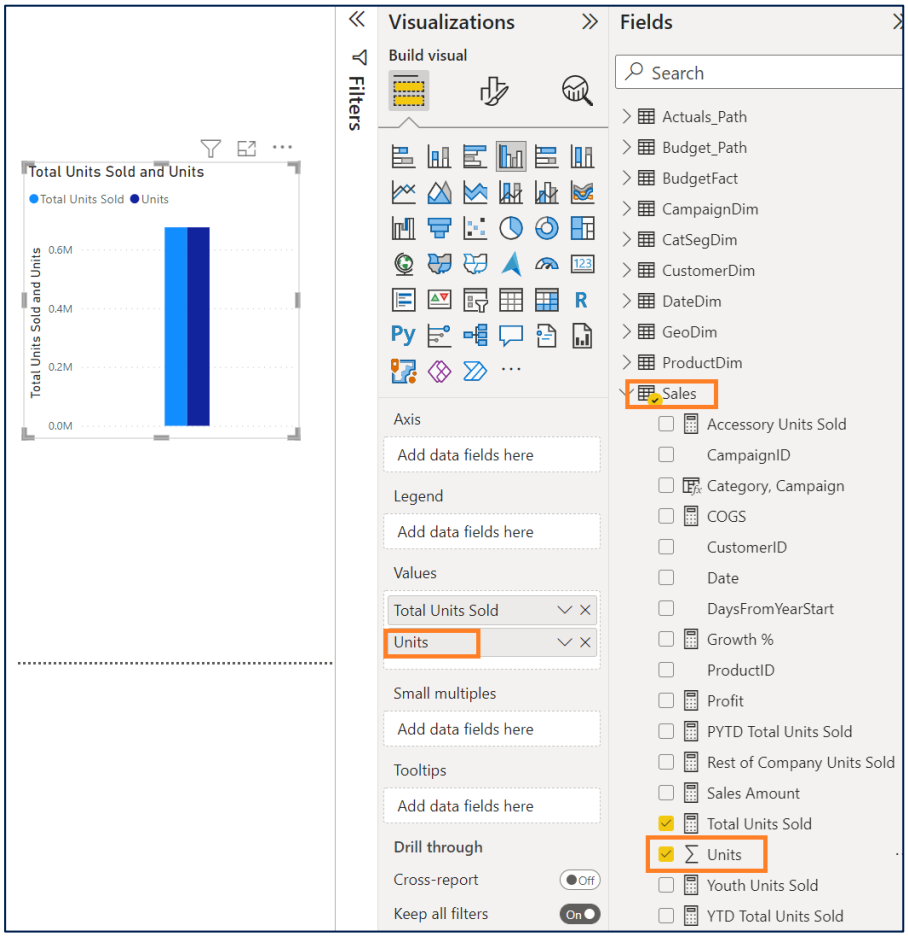
5. In the formula bar enter:

Category, Campaign = RELATED(ProductDim[Category]) & ", " & RELATED(CampaignDim[TrafficChannel])

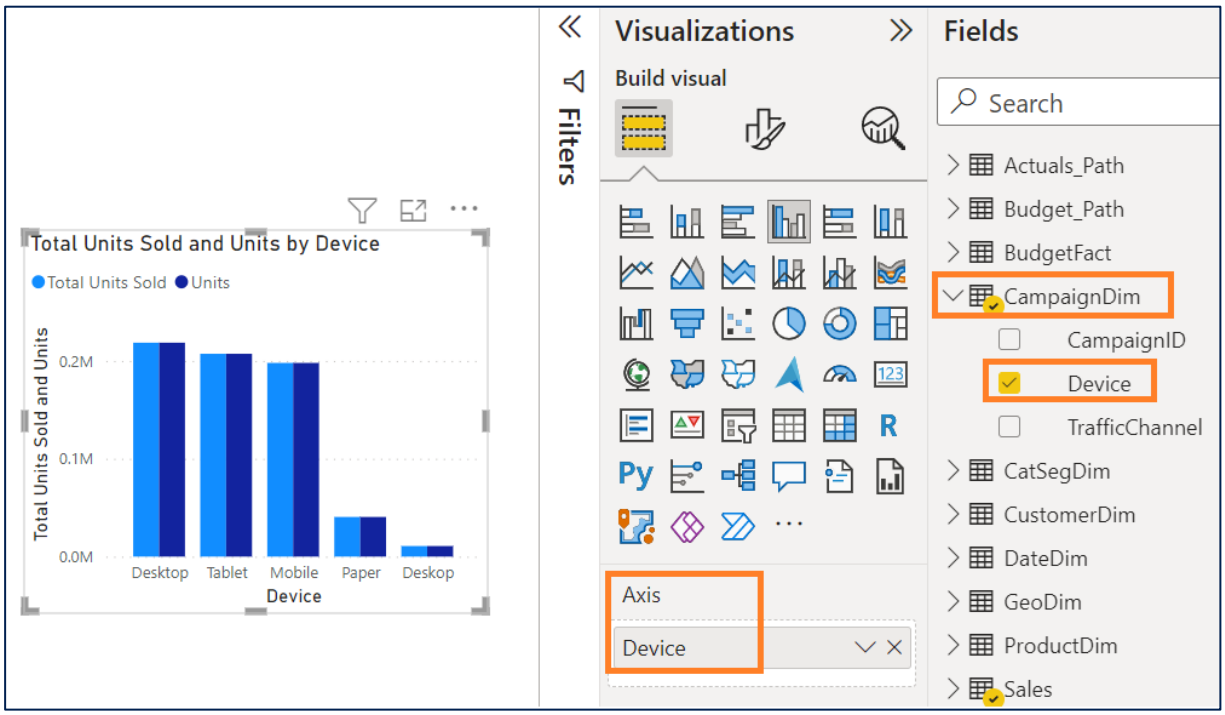
6. Drag newly created **Total Units Sold** measure to the canvas. A clustered column chart is created



7. Drag **Units** field from **Sales** table to this visual



8. Select **Device** field from **CampaignDim** table

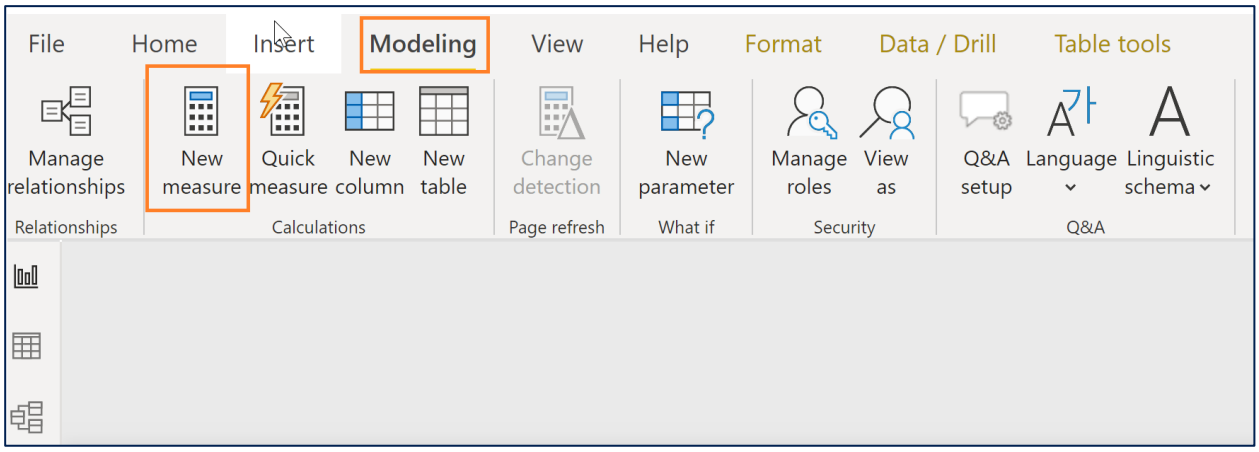


Lab 6: Create a report for the VP in charge of the Youth and Accessory Segments

Task 3: Create three new measures and a PowerBI visualization

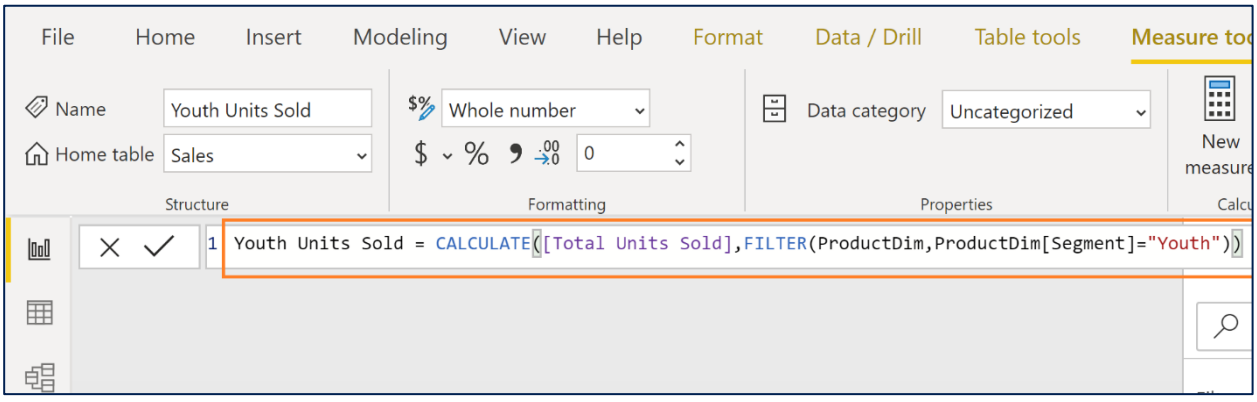
The estimated time to complete this lab is 45 minutes.

1. Select **Sales** Table. From the ribbon select **Modeling -> New Measure**.

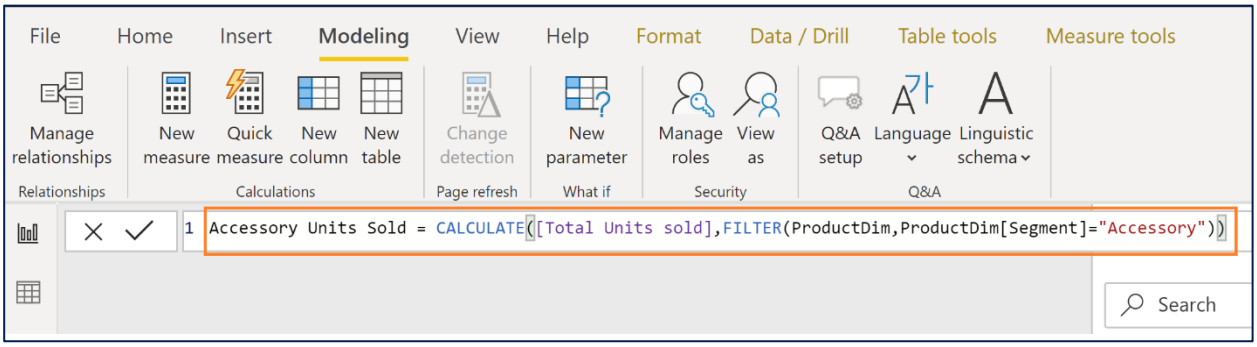


2. Create 3 measures:

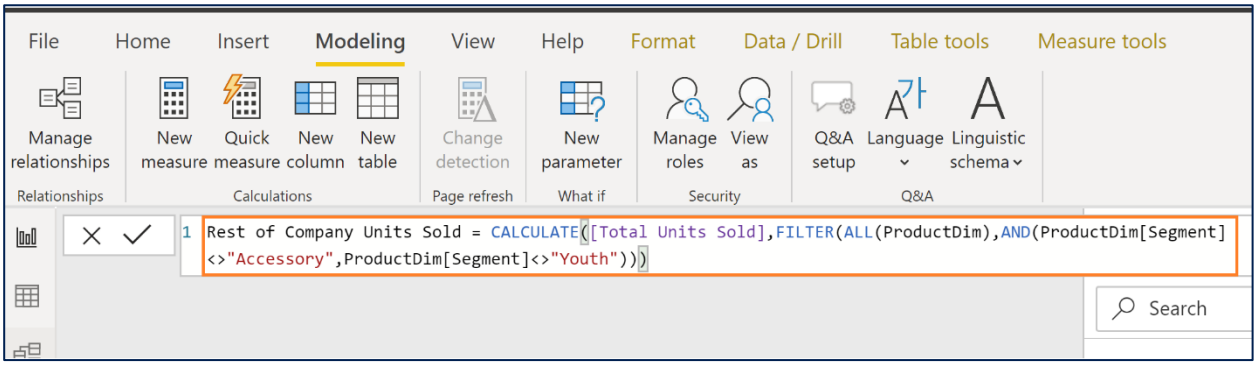
Youth Units Sold = CALCULATE([Total Units Sold],FILTER(ProductDim,ProductDim[Segment]="Youth"))



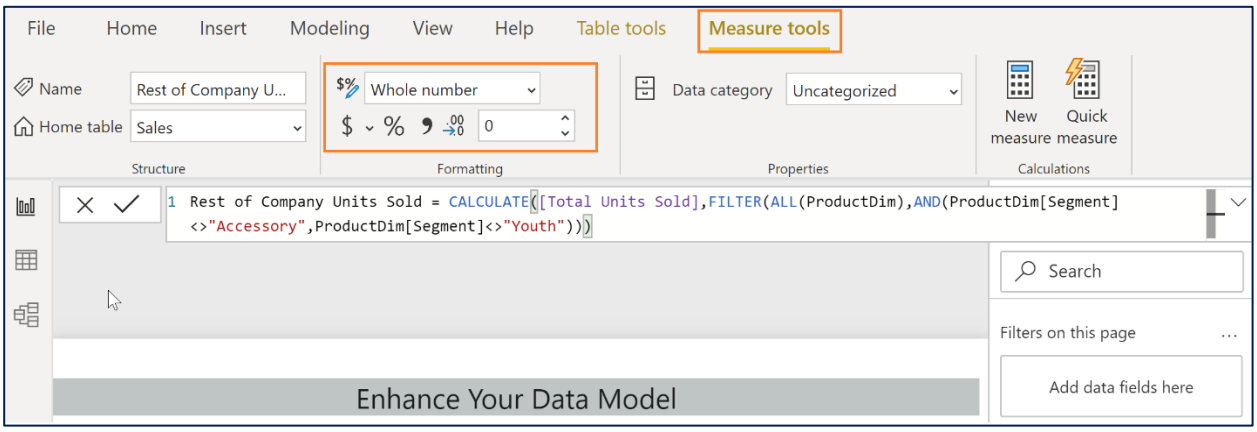
Accessory Units Sold = CALCULATE([Total Units sold],FILTER(ProductDim,ProductDim[Segment]="Accessory"))



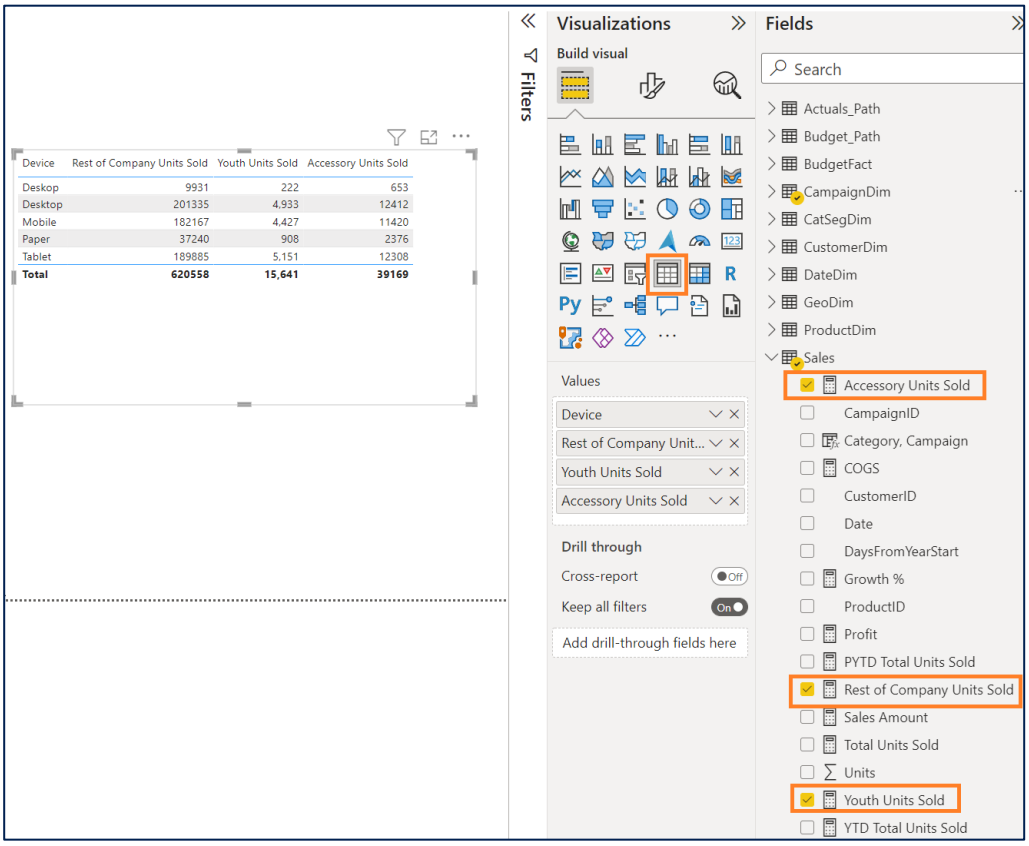
Rest of Company Units Sold = CALCULATE([Total Units Sold],FILTER(ALL(ProductDim),AND(ProductDim[Segment]<>"Accessory",ProductDim[Segment]<>"Youth")))



3. From the ribbon select **Measure tools -> Whole Number and Comma** to format the measure

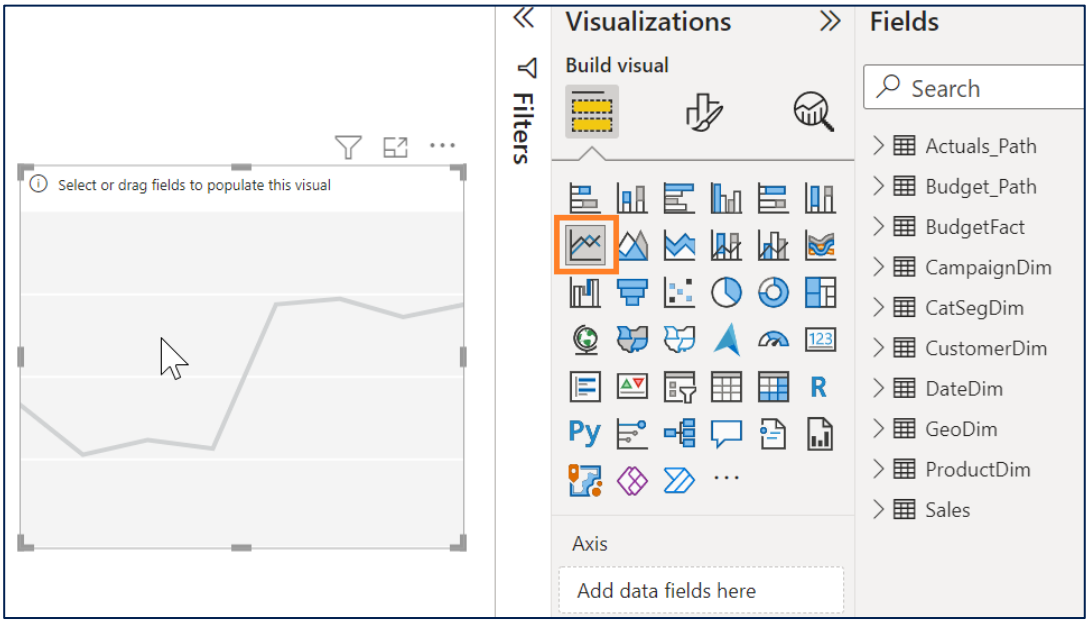


4. Add a table visual and drag **CampaignDim -> Device** and the **3 newly created measures**

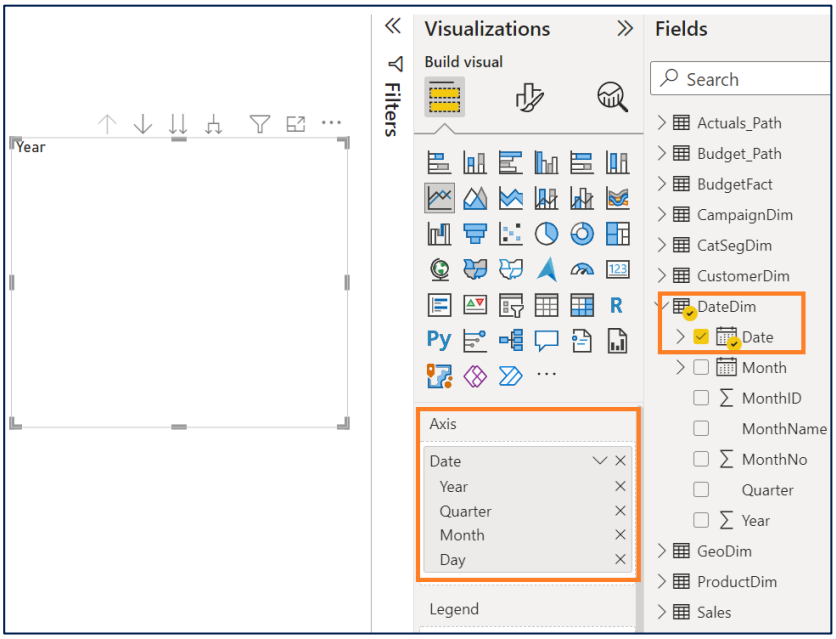


Device	Rest of Company Units Sold	Youth Units Sold	Accessory Units Sold
Deskop	9931	222	653
Desktop	201335	4,933	12412
Mobile	182167	4,427	11420
Paper	37240	908	2376
Tablet	189885	5,151	12308
Total	**620558**	**15,641**	**39169**

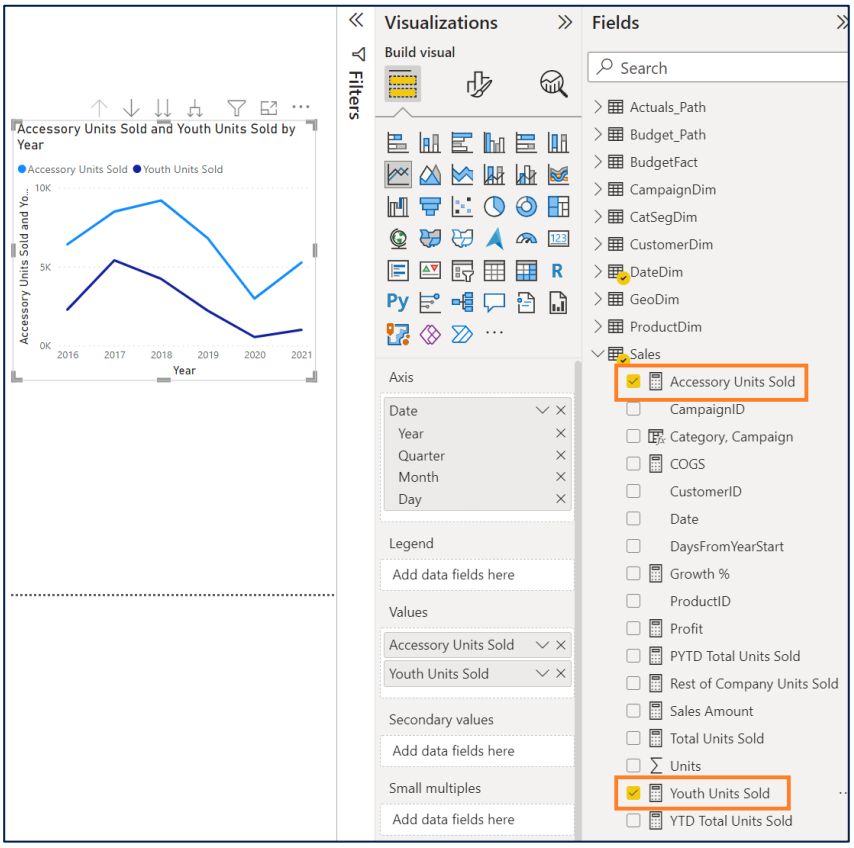
5. Select **Line Chart** visual.



6. Select **Date** from Date table

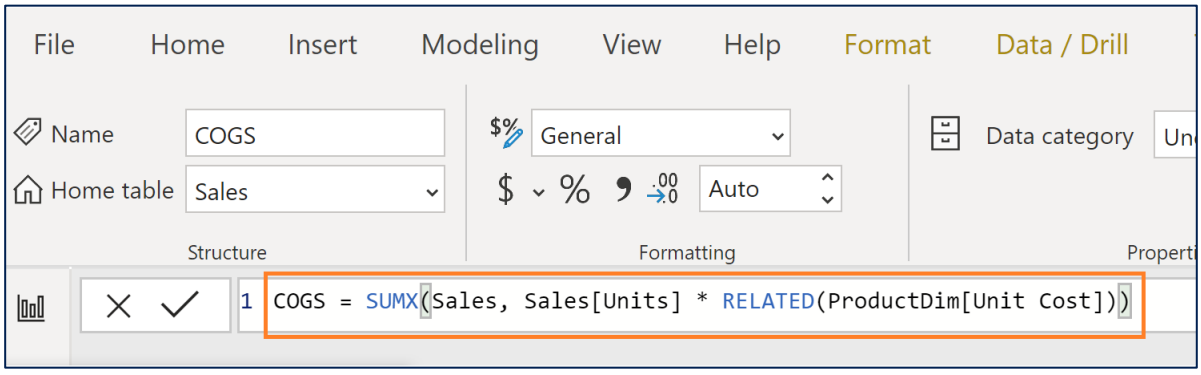


7. Select **Youth Units Sold** and **Accessory Units sold** measures.

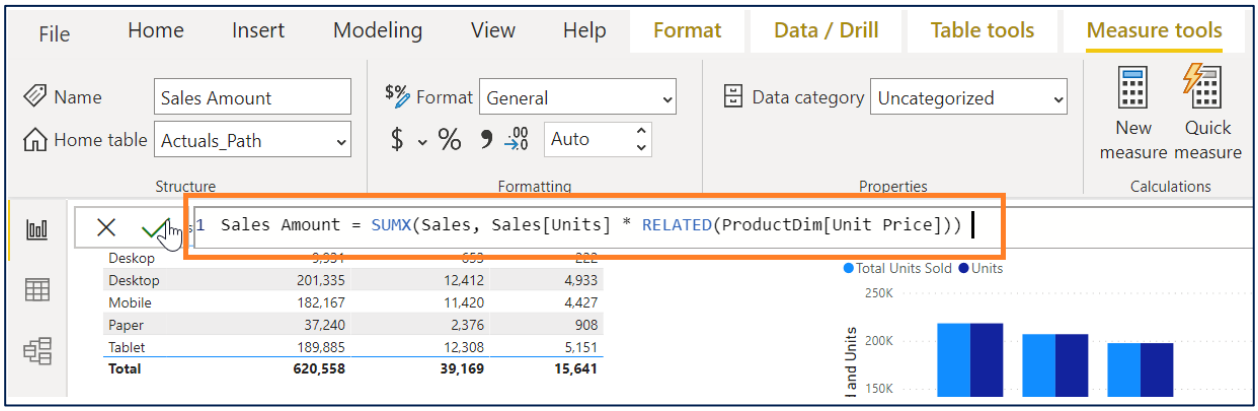


8. Create following measures and use a visual to analyze data.

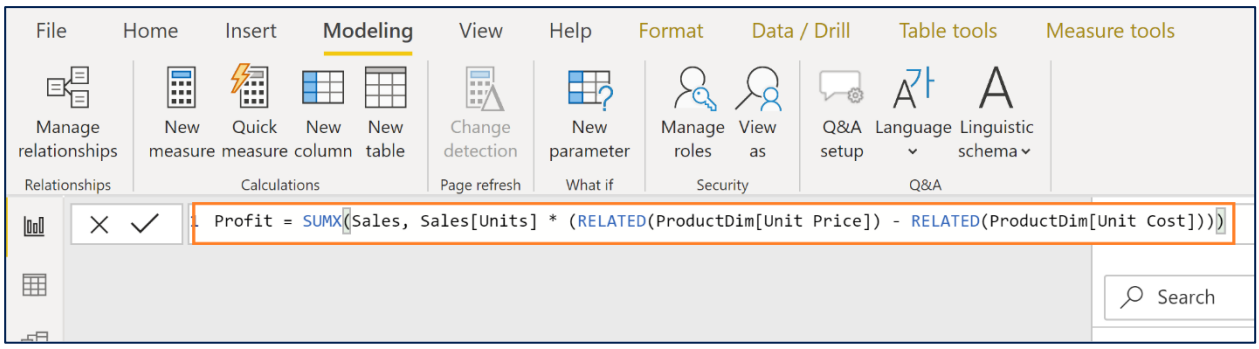
COGS = SUMX(Sales, Sales[Units]) * RELATED(ProductDim[Unit Cost]))



Sales Amount = SUMX(Sales, Sales[Units] * RELATED(ProductDim[Unit Price]))



Profit = SUMX(Sales, Sales[Units] * (RELATED(ProductDim[Unit Price]) - RELATED(ProductDim[Unit Cost])))



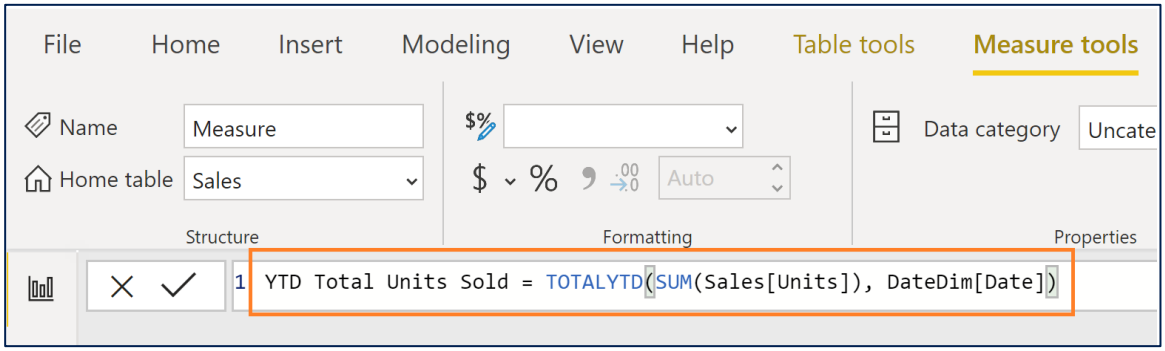
Lab 7a: Performance Best Practices

Task: Analyze DAX formulas to ensure you're using the best practices

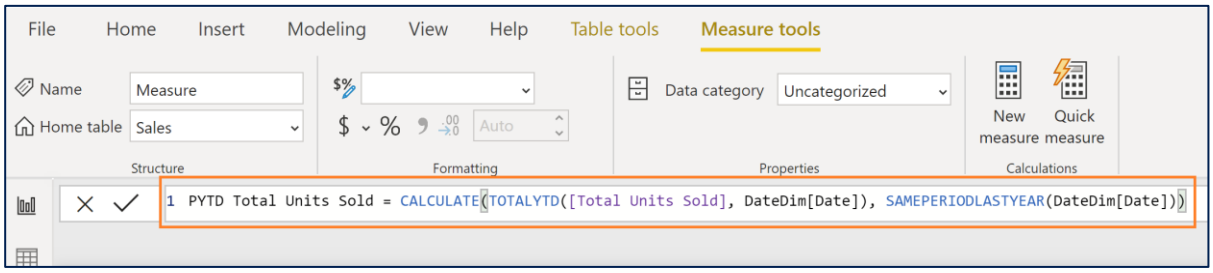
The estimated time to complete this lab is 30 minutes.

1. Create the three measures below.

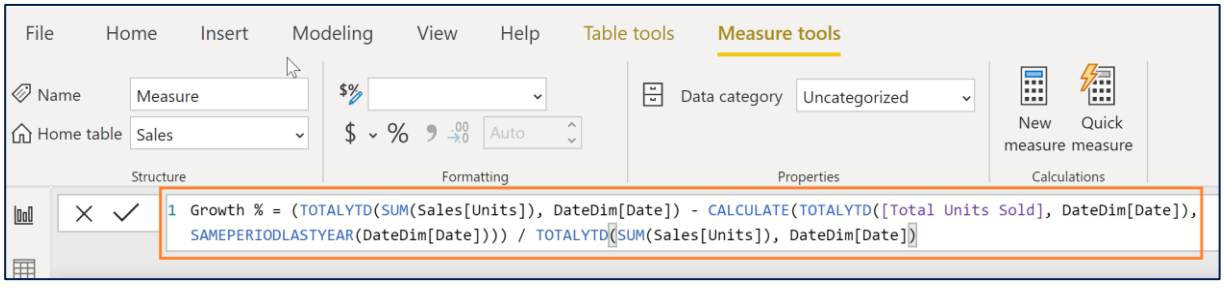
YTD Total Units Sold = TOTALYTD(SUM(Sales[Units]), DateDim[Date])



PYTD Total Units Sold = CALCULATE(TOTALYTD([Total Units Sold], DateDim[Date]), SAMEPERIODLASTYEAR(DateDim[Date]))



Growth % = (TOTALYTD(SUM(Sales[Units]), DateDim[Date]) - CALCULATE(TOTALYTD([Total Units Sold], DateDim[Date]), SAMEPERIODLASTYEAR(DateDim[Date]))) / TOTALYTD(SUM(Sales[Units]), DateDim[Date])



2. Rewrite the DAX formulas to ensure performance best practices

YTD Total Units Sold = TOTALYTD([Total Units Sold], DateDim[Date])

PYTD Total Units Sold = CALCULATE([YTD Total Units Sold], SAMEPERIODLASTYEAR(DateDim[Date]))

Growth % = ([YTD Total Units Sold] – [PYTD Total Units Sold]) / [PYTD Total Units Sold]

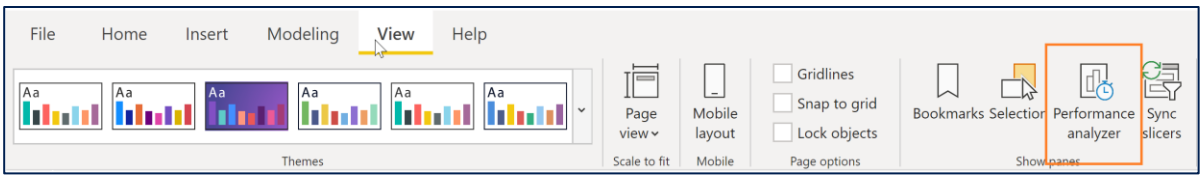
3. **Challenge**: how were the formulas changed to increase performance?

Lab 7b: Using Performance Analyzer

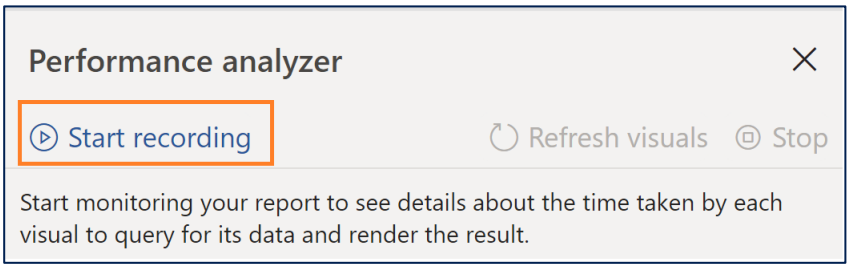
Task: Use performance analyzer to test the performance of individual charts

The estimated time to complete this lab is 15 minutes.

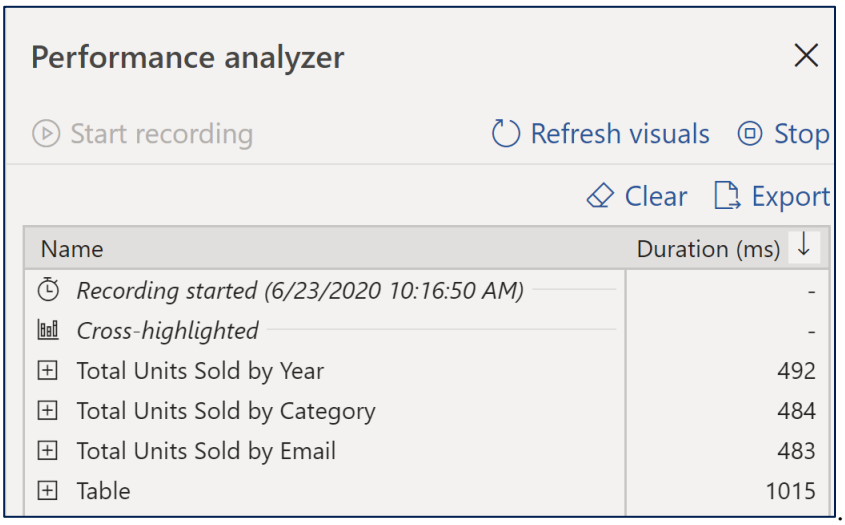
1. Click on the View tab and open the Performance Analyzer



2. Start recording and click on Refresh visuals



3. Analyze the data collected



4. **Challenge**: What changes can you make to improve performance?

Summary

In this lab, you uploaded multiple tables from a single data source. You learned how to create a brand new dimension for the model as well as enhance existing dimensions. You will have created a new budget fact table for the model. In the end you will have created new parameters and dynamic paths to your data sources.

In this lab, you have also enhanced the model by adding additional measures and columns. In the end you will have tested the new measures and columns using Power BI data visualizations as well as worked with best practices and analyzed report performance.

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