Power BI Training

Duration: 2 Days

Exercise Manual

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Training Provider Company: JBI International

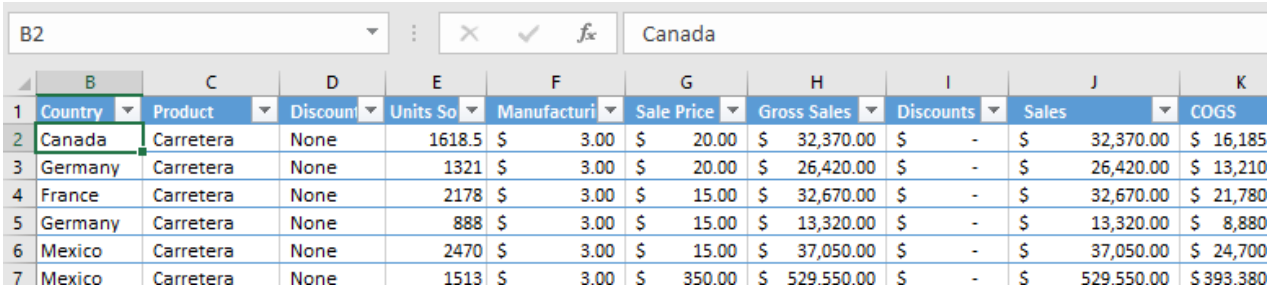
Version M, Nov ‘23

Contents

Chapter 1 – Self-Service Visualisation

Exercise 1-1 – You will visualise Data from a Financial Spreadsheet

1. Open the **Financial Sample.xlsx** file in **Excel**
2. Spend a few minutes familiarising yourself with the data in the **financials** table:

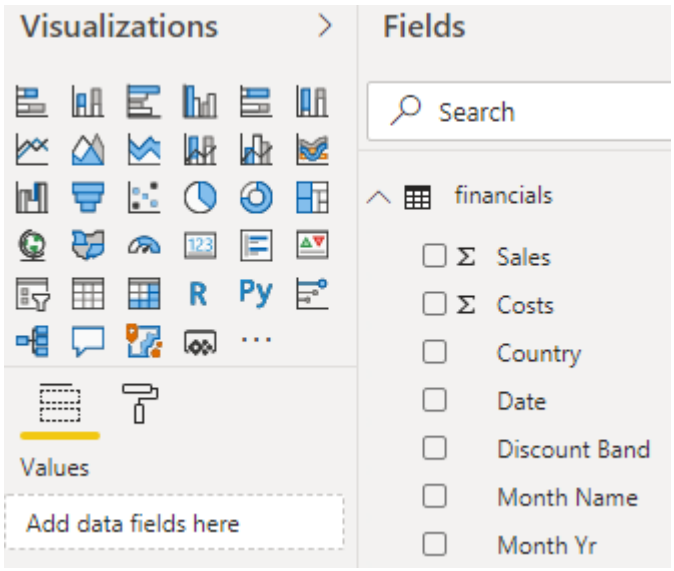


B2 | Canada

	Country	Product	Discount	Units So	Manufacturi	Sale Price	Gross Sales	Discounts	Sales	COGS
2	Canada	Carretera	None	1618.5	$ 3.00	$ 20.00	$ 32,370.00	$ -	$ 32,370.00	$ 16,185
3	Germany	Carretera	None	1321	$ 3.00	$ 20.00	$ 26,420.00	$ -	$ 26,420.00	$ 13,210
4	France	Carretera	None	2178	$ 3.00	$ 15.00	$ 32,670.00	$ -	$ 32,670.00	$ 21,780
5	Germany	Carretera	None	888	$ 3.00	$ 15.00	$ 13,320.00	$ -	$ 13,320.00	$ 8,880
6	Mexico	Carretera	None	2470	$ 3.00	$ 15.00	$ 37,050.00	$ -	$ 37,050.00	$ 24,700
7	Mexico	Carretera	None	1513	$ 3.00	$ 350.00	$ 529,550.00	$ -	$ 529,550.00	$ 393,380

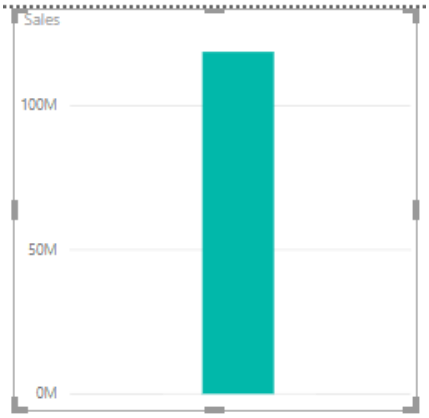
3. Open a new instance of **Power BI**
4. Click **Get Data** (top left)
5. Choose **Excel** and click **Connect**
6. Open the **financial sample.xlsx** file
7. Select **financials** and click **Load**

   The right of your screen should look as follows:



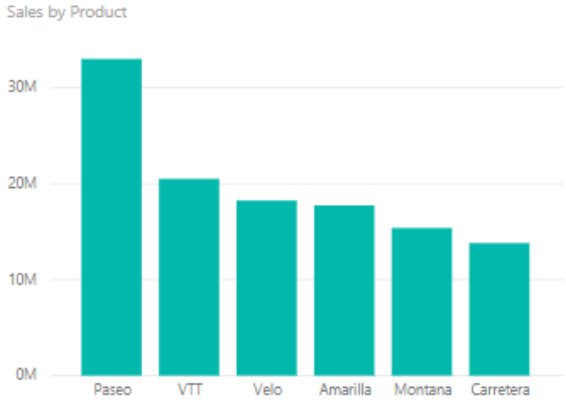
8. Drag the **Sales** field onto the top left corner of your report canvas

   Total Sales is displayed in a single column bar chart.



9. Drag the **Product** field and drop it on the new chart visual.

   A column appears for each product:



10. Drag the **Country** field to the bottom left corner of your report canvas

    A map visual appears.

11. Drag the **Sales** field to the **Size** setting in the **Fields** pane

    The bubbles will be sized according to each Country's total **Sales** figure:

12. Click on an empty part of the report canvas to deselect the two visuals

13. Now from the gallery of visualisation types click the **Doughnut** chart: 

14. From the Field List check **Segment** and **Sales**

    Notice that **Segment** is applied to the **Legend** setting, and **Sales** to **Values**

15. Finally, deselect all visuals and click  to add a **Table** to the bottom right of the report canvas.

16. Add the following fields to the table:
    - Segment
    - Sales
    - COGS
    - Profit

Segment	Sales	COGS	Profit
Channel Partners	1,800,593.64	484K	1,316,803.14
Enterprise	19,611,694.38	20,226K	-614,545.63
Government	52,504,260.67	41,116K	11,388,173.17
Midmarket	2,381,883.08	1,722K	660,103.08
Small Business	42,427,918.50	38,285K	4,143,168.50
Total	**118,726,350.26**	**101,833K**	**16,893,702.26**

17. **Hide** the right hand window panes: **Filters, Visualizations, Data** by clicking the top left **>**.

    Notice how the report canvas expands to show the visuals displaying larger (as they would if pinned to a Dashboard published online).

18. **Expand**/show the right-hand **panes** again, then on the **Table** click **Focus Mode**: 

    Notice that in Focus mode the visual header functions are still available, including column Sort. Focus mode allows you to work on individual visuals.

Customise the Report Canvas

Notice from the **View** menu the **Gridlines** and **Snap to grid** settings can make it a little quicker and easier to design your reports.

When a report is finished check **Lock objects** to prevent visuals from being moved or changed by accident. It is also useful while making presentations.

Customise a Theme

1. From the **View** menu use the **Themes** dropdown to select **Customise Current Theme**.
2. From the **Text -> General** setting set **Font Size** to suit your screen. For example, increase it to **12pt**.
3. Set the **Title** font size to **18pt**.
4. Click **Apply**, and notice how text sizes have changed on your visuals.

Next time you begin a Power BI report these settings will be lost, but you can save your theme.

5. From the **Theme** dropdown click: **Save current theme** -> Click **Save**.

The Theme is saved as a .json file, which can be edited in Notepad.

6. Now reapply the theme from the **Theme** dropdown. Click **Browse for themes ->** select the file **->** click **Open.**

Customise Visuals

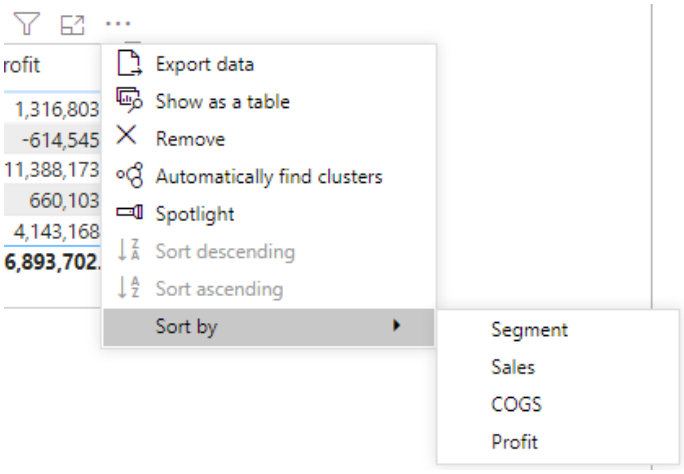
You will adjust text sizes and many other visual settings. Default Font size can still be overridden.

1. Select the **Table** visual and from the **Format** page expand **Grid** and increase **Text Size** to **14** (something different than default).
2. Select the **Doughnut** chart.
3. From the Format page (paint brush)  of the **Visualizations** pane, expand **Detail Labels.**
4. In **Options** -> change **Label contents** to **Percent of total**.
5. From the **General** page, expand **Title.** Amend **Title** Text to: **Sales by Customer Segment**

On the **Table** visual, notice that **clicking column headers sorts** the table by the data in that column.

Click again to reverse the sort direction.

These sort functions are also available from the Visual Header:



7. For the **Column chart**, use the Visual Header to **sort** the bars **by Product, ascending**.

Tooltips

Notice that hovering over the data of any visual displays a popup tooltip (black box).

8. With the **column chart selected**, from the **Data** pane, **drag COGS** to the **Tooltips** field well.

Notice that COGS is now included in the column chart tooltip.

Display units

9. From the **Paintbrush** expand **Specific Column**, select the **COGS** field and set **Display Units** to **Thousands** and **Value decimal places** to **0**.

Notice when you hover again over a chart bar COGS displays unchanged in the popup tooltip.

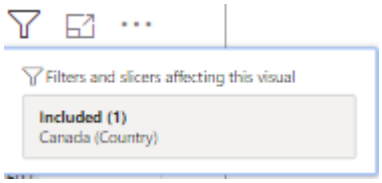
Cross filtering

10. On the **Map** visual **click** the **bubble** for **Canada**.

    Notice how all the other visuals are now cross-filtered.

11. Now **hover** over the **filter icon** of the **Table**:

    Its cross filtering by Canada is reported:



    N.B. You can Ctrl-Click to select more than one bubble, or data in any other visual.

    Later, the **Edit Interactions** exercise will cover how to control which visuals cross-filter which other visuals.

    To cancel data selection in a visual click **inside** it but **outside** its data.

12. For example, in the **Table** click on **Total** to clear your data selection.

Save your work.

13. Right-click on the **Page 1** tab and select **Rename**

14. Name the page **Summary**

15. Save your work as **Financials.pbix**

Exercise 1-2 Customising Fields

You will alter settings that are stored in the data model, *independent* of any visual.

Set default Field Format in Data Model.

You will set **Sales** and **COGS** in the data model to display with **0** decimal places:

16. In the **Fields** list, select each field (**Sales**, then **COGS**) in turn, then from the **Column Tools** tab, in the **Formatting** group click the Decimal Places spin button, which defaults to **Auto** and set it to **0**.

17. Click the big , comma to reinstate thousands separators.

    Notice that the COGS format remains overridden in the table. But Sales and COGS now have the new format everywhere else, including in Tooltips.

You will display **Profit** in accounting format, with brackets around negative numbers.

29. Select **Profit** in the **Fields** pane.

30. From **Column Tools** tab **-> Format** dropdown, type in the following format string:

    #,#;(#,#);"Zero"

31. Verify that **Profit** displays as expected:

Profit
1,316,803
(614,546)
11,388,173

32. **Press Ctrl-S** to save your work.

Congratulations: you have completed Chapter 1 exercises.

Chapter 2 – Explore Measures, Dimensions and Hierarchies

Exercise 2-1 Explore Measure behaviour

1. Click the yellow **+** report tab to create a new blank report page.

2. Add a table visual and add the **Country** and **Sales** fields.

   Notice that **Sales** is summarised by **Country**. Add the **Discount Band** field and drag it up to 2nd position in the Visualisations **Values** list.

   Notice how Sales is now summarised by Discount Band within each Country. This is how Power BI works. Visible category fields are grouped into unique sets, for which measures are summarised.

Now let's check one of the figures in Excel.

3. Switch back to **Excel** and filter the financials table:
   1. Country: Canada
   2. Discount Band: High

4. Select the **Sales** column. Does the **sum** figure in the Excel window footer match?

Return to Power BI and let's break it down further by Year. (Watch closely..)

5. With the table selected click the **Year** field, and drag it up to 3rd position.

   Is that the result you expected?

   Being stored as a numeric datatype, Year is being treated as an *implicit* measure. That is not what we want.

6. Use the drop-down for the **Year** field in the **Values** list and select **Don't Summarise**.

   Verify that the table now displays as you originally expected.

Remove the Year implicit measure.

This section demonstrates the effect of altering the default summarisation of a field already in use.

7. Remove the year field from the Fields list, then add it back in again.

8. Select the **Year** field from the Fields list.

9. From the **Column Tools** tab -> **Properties** group, change **Σ Summarisation** to **Don't Summarise**.

What happened to the **Year** field in the Visualisations **Values** list? Power BI has preserved its function.

10. Once again remove the **Year** field from the **Values** list, and re-add it.

What happened this time? The **Year** field should now be treated as a categorical (Dimension) field rather than a Measure.

Set Filtering in Visual Settings

We will make this table display **High Discount** figures for the year **2013**

Country	Discount Band	Sales	Year	Count of Year
Canada	High	1,327,849.10	2013	13
France	High	1,687,931.78	2013	10
Germany	High	1,384,635.80	2013	7
Mexico	High	2,089,386.86	2013	15
United States of America	High	3,064,483.24	2013	15
Total		**9,554,286.78**		**60**

1. In the **Filters** pane:
    9. Expand **Discount Band (All)**, and select **High**
    10. Expand **Year** (**All**), ensure the **Filter Type** is selected as **Basic Filtering** and select **2013**.

The number 60 against the year 2013 is the number of 2013 rows at High Discount Band in the underlying table.

2. To verify this, drag **Year** into the **Values** list again, and change its summarisation to **Count**.

    This changes the field name to **Count of Year**.

    Notice the total count is 60.

3. Use the **Count of Year** drop-down to rename the column to **Row Count**.
4. In the **Visualisations** -> **Format** page, switch on **Title**.
5. Expand **Title** and set **Title Text** to: **High Discount in 2013**.
6. Set **Font Size** to **18pt**.

Exercise 2-2 Create a Dedicated Row Count measure

1. The **Row Count** field created in the previous exercise will be inaccurate if any rows contain a blank Year.

2. **Right-click** on any of the financials fields (or the financials table header) -> **New Measure**.
3. In the formula bar replace: **Measure =**

   With: **`Row Count = COUNTROWS(financials)`**

   Spend a little time familiarising yourself with the way Intellisense works. Hint: Start typing then use down-arrow to choose the function you want. Press the tab key to select it. Notice that also enters an open bracket: **(** for you. You must later add the close bracket **)** yourself after all function parameters have been added.

4. Press **Enter** to save your new Row Count measure.

5. Add your new **Row Count** measure to the table. Place it side-by-side with the existing **Row Count** column.

   Do the counts match?

6. In the Values list hover over the two **Row Counts** and view the tooltips that pop up to see which one is which.

7. Remove **Count of 'financials'[year]** from the values list.

   It is recommended good practice to replace all useful implicit measures with your own explicit ones.

Exercise 2-3 Create a Profit Margin measure

It might be tempting to think you could use the existing implicit **Profit** and **Sales** measures to create a profit margin measure. You cannot, and IntelliSense is designed to hint at that by not making available **`'financials'[Profit] / 'financials'[ Sales].`** Instead you must reproduce the function of these implicit measures using DAX.

1. Right click -> **New Measure**, enter the formula:

```
Profit Margin = SUM(financials[Profit]) / SUM(financials[ Sales])
```

2. Add your new **Profit Margin** measure to the table.

3. From the **Column Tools** tab -> **Formatting** group, click **%** to display Profit Margin as a percentage.

4. Set Profit Margin decimal places to 0.

Now you will uncover hidden bad news.

5. Add **Segment** to the table, and move it up **after Country**.

   Notice that a number of sales have been unprofitable. Where are the unprofitable sales concentrated? (Sort by **Profit Margin**)

6. Rename the report page **Profit Margins**

Exercise 2-4 The Matrix Visual

You will find out more about where money is being lost with Enterprise customers.

1. Create a new report page called **Enterprise Discounts**.

2. Add a **Matrix** visual to the report canvas.

3. Drag:
   - **Product** to **Rows**
   - **Discount Band** to **Columns**
   - **Profit Margin** to **Values**
   - **Profit** to **Values**
   - **Segment** to **Filters**

4. Set the **Segment** filter to **Enterprise**.

5. From the **Format** page expand **Values,** scroll down and set **Show on Rows** to **On**

6. Expand **Conditional Formatting**, select **Profit** and switch on **Data Bars**.

The result should look as follows:

Product	High	Low	Medium	None	**Total**
Amarilla					
Profit Margin	-9%	1%	-3%	4%	**-4%**
Profit	-107,075	5,690	-14,865	21,098	**-95,153**
Carretera					
Profit Margin	-10%	1%	-4%		**-7%**
Profit	-221,193	8,398	-9,918		**-222,712**
Montana					
Profit Margin	-7%	1%	-3%	4%	**-1%**
Profit	-13,530	10,378	-42,996	15,053	**-31,096**
Paseo					
Profit Margin	-10%	1%	-3%		**-2%**
Profit	-75,646	38,809	-44,903		**-81,740**
Velo					
Profit Margin	-10%	2%	-3%	4%	**-2%**
Profit	-88,666	15,844	-36,790	24,850	**-84,763**
VTT					
Profit Margin	-10%	2%	-5%		**-4%**
Profit	-116,259	22,658	-5,481		**-99,083**
Profit Margin	**-10%**	**2%**	**-3%**	**4%**	**-3%**
Profit	**-622,369**	**101,776**	**-154,953**	**61,000**	**-614,546**

This display indicates that every loss-making sale to the Enterprise segment is for High and Medium discounts. (The Discount Bands are not in a sensible order. You will learn how to fix that later using the Power Query Editor.)

There will be more on Conditional Formatting in Chapter 6.

Exercise 2-5 Create a hierarchy in Visual Settings

1. **Add** a new **Report Page**, rename it to **Matrix Hierarchies**.

2. Add a new **Matrix** visual to the report canvas.

3. Drag:
    1. **Sales** to **Values**
    2. **Country** to **Rows**
    3. **Product** to **Rows** (underneath Country)

If you expand Canada your matrix should look similar to the following:

Country	Sales
Canada	**24,887,655**
Amarilla	3,855,766
Carretera	2,610,204
Montana	2,711,919
Paseo	7,611,521
Velo	3,329,490
VTT	4,768,754
France	**24,354,172**
Germany	**22,975,791**
Mexico	**21,478,902**
United States of America	**25,029,830**
Total	**118,726,350**

Exercise 2-6 Setting up a field sort order

1. Add **Month Name** to your matrix **Columns**

   Are the months displayed correctly? How are they sorted?

   Month Name is sorted alphabetically. We will fix this by telling PowerBI to sort the Month Name field as if it were a different field. Can you see a field in the list that would sort our Months the way we want?

2. **Remove** the **Month Name** field from **Columns** and **replace** it with **Month Number.**

   That is sorted correctly but we want the **Month Name displayed**, but sorted by **Month Number.**

3. In the Fields pane, select **Month Name**, and from the **Column Tools** tab, click **Sort by Column** and choose **Month Number**.

   N.B. Sometimes the **Sort By** button remains **disabled**. If this (incorrect, frustrating) behaviour happens select another field and then re-select **Month Name**.

4. Again, switch **Month Number** in **Columns** back to **Month Name**.

   The result should look similar to the following:

Country	January	February	March	April	May	June	July	August	Sept
Canada	**1,186,256**	**1,482,166**	**811,133**	**1,593,563**	**783,942**	**2,725,979**	**2,109,549**	**952,043**	**1,8**
Amarilla	180,416	705,600	229,104	38,021	191,231	20,416	22,256	183,540	
Carretera	32,370	20,687	281,054	90,956	16,121	338,762	5,217	21,025	
Montana	670,478	3,143	28,325	1,038,083	60,200	43,243	333,188	12,682	
Paseo	261,658	40,576	256,859	24,880	476,513	1,302,473	698,549	75,240	
Velo	5,126	111,860	6,602	74,700	17,605	808,833	1,035,626	114,221	
VTT	36,209	600,300	9,189	326,923	22,271	212,252	14,714	545,334	
France	**1,544,721**	**1,537,438**	**1,559,749**	**1,332,863**	**1,042,777**	**1,629,184**	**1,148,065**	**779,802**	**2,5**
Germany	**874,935**	**1,347,336**	**479,510**	**1,394,813**	**1,317,483**	**1,630,025**	**1,609,550**	**1,046,755**	**2,3**
Mexico	**1,655,823**	**1,597,700**	**946,495**	**1,026,911**	**1,116,760**	**2,210,094**	**926,958**	**1,078,756**	**1,6**
United States of America	**1,346,026**	**1,332,891**	**1,789,974**	**1,616,624**	**1,949,249**	**1,323,611**	**2,308,798**	**2,007,266**	**2,4**
Total	**6,607,762**	**7,297,531**	**5,586,860**	**6,964,775**	**6,210,211**	**9,518,894**	**8,102,920**	**5,864,622**	**10,8**

Exercise 2-7 Hide fields for simplicity

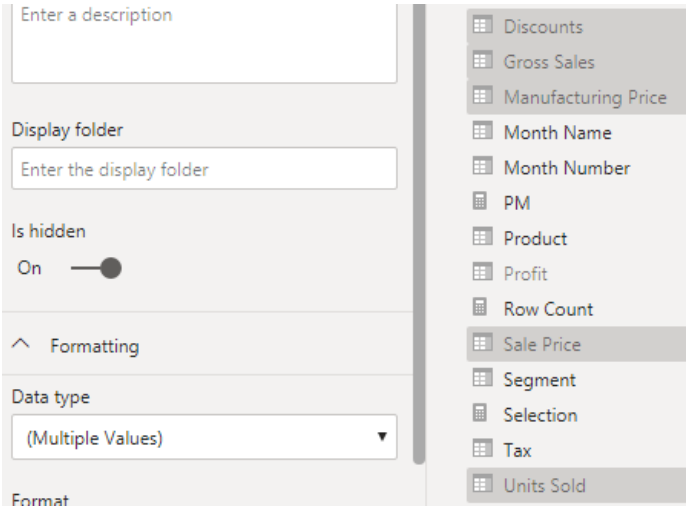
Successful systems tend to be simple to use. Data of no interest to users should be hidden in report view.

1. Select **Month Number**, right-click -> **Hide**

   Fields can be hidden in bulk from Model View

2. In **Model** view select:
   Discounts
   Gross Sales
   Manufacturing Price
   Sale Price
   Units Sold

   then set **Is hidden** to **On**:



Note: In Report view you can right-click -> View Hidden to see hidden fields. In Data view they show as greyed out.

Exercise 2-8 Create a Hierarchy in the Fields Pane

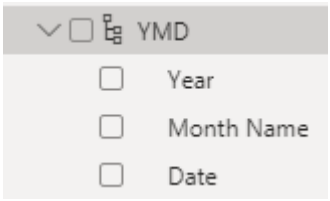
Why does there appear to have been a sudden jump in Sales from September?

1. Add **Year** to **Columns** and drag it above **Month Name.**

   Sales values were being aggregated by Month irrespective of Year.

To help prevent users from falling into this trap we will create a hierarchy for the date dimension in the Fields pane.

2. Select **Year** -> Right Click **-> Create Hierarchy**
3. Select **Month Name ->** Right Click **-> Add To Hierarchy -> Year Hierarchy**
4. Select **Date ->** Right Click **-> Add To Hierarchy -> Year Hierarchy**
5. On **Year Hierarchy** -> **Rename** to **YMD**:



You will now use your **YMD** time hierarchy in a Matrix

6. **Clear** all fields from your matrix **Columns,** and drag **YMD** to **Columns.**

Unfortunately, +/- icons are not supported for Column Headers.
Instead visual header icons enable Drilling up and down:

7. Ensure **Drill on Columns** is selected:

7. Compare and contrast these three ways to drill down a level:
   - The connected down arrow displays the lower level ***within*** the context of upper level.
   - The unconnected down arrow displays the lower level, ***ignoring*** the context of the upper level.
   - In a column header **Right-Click** -> **Drill Down** drills down within the context of the column you right clicked, ***excluding all other columns*** from view.

N.B. more advanced data models use a date table to support time intelligence functions. A date table provides complete flexibility in designing hierarchies. For example, hierarchies including weeks, semesters and even custom defined periods are supported.

By default, Power BI auto-creates a standard YQMD hierarchy for each date field. This feature is often disabled in more sophisticated data models to reduce complexity and increase speed.

Exercise 2-9 Visuals with Errors

1. Notice if you drill down to Date, they are all first of the month, making Date actually a superfluous hierarchy level in this case.

2. From the **Fields** list delete the **Date** level from the **YMD** hierarchy. The visual now displays an error message.

3. Click **Fix This** to remove the missing Date level now marked 

from the visually set hierarchy.

   N.B. Beware, if a visual contains only erroneous settings, clicking Fix This removes that visual from the Report Canvas.

4. **Rename YMD** to **YM** to reflect the fact that Date is now removed from the hierarchy.

Exercise 2-10 Apply a Hierarchy to a Bar Chart

1. Create a new Report Page and call it **Clustered Column Chart**.
2. Add a **Clustered Column Chart** from the visuals gallery.
3. Click **Sales** to add it to **Values**
4. Click **Product** to add it to the **Axis**
5. Drag **Segment** to **Legend**
6. Expand the visual to take up full width of the report canvas.
7. Drag **Country** to add it to the **Axis**
8. Drag **Discount Band** to add it to the **Axis**
9. Drag **YM** to add it to the **Axis**
10. Now successively click the unconnected double down arrow to move through the different hierarchy levels.
11. With the chart visual still selected, click the **Line Chart** icon in the visuals gallery.
12. Click the **up arrow** to move back up through the levels.

Which visual do you think represents the data most clearly: Stacked Columns or Line Chart?

Exercise 2-11 Scatter Chart

You will create a Scatter Chart that plots Profit Margin against Sales, with bubble size indicating the actual Profit figure.

1. Create a new report page called **Scatter Bubbles**.
2. Add a **Scatter Chart** to at the top of the page taking up its full width, and leaving about a third of the space beneath it.
3. Drag:
   - **Sales** to **X Axis**
   - **Profit Margin** to **Y-Axis**

   A single dot is created in the middle of the chart. (Remember Power BI is always summarising.)

4. Hover over the dot to see its tooltip.

   So far no categorical fields have been specified, so everything is summarised to one value for all 700 rows.

5. To help you see what is going on insert a **Table** underneath the scatter chart, and add the same fields to it: **Sales** and **Profit Margin**.
6. Drag **Segment** to the Scatter Chart **Legend**, and also drag **Segment** to the **Table**.

   Notice how each dot in the scatter chart corresponds to each row in the table.

7. Now drag the **Profit** implicit measure to the **Scatter Chart** bubble size field well and the **Table**.

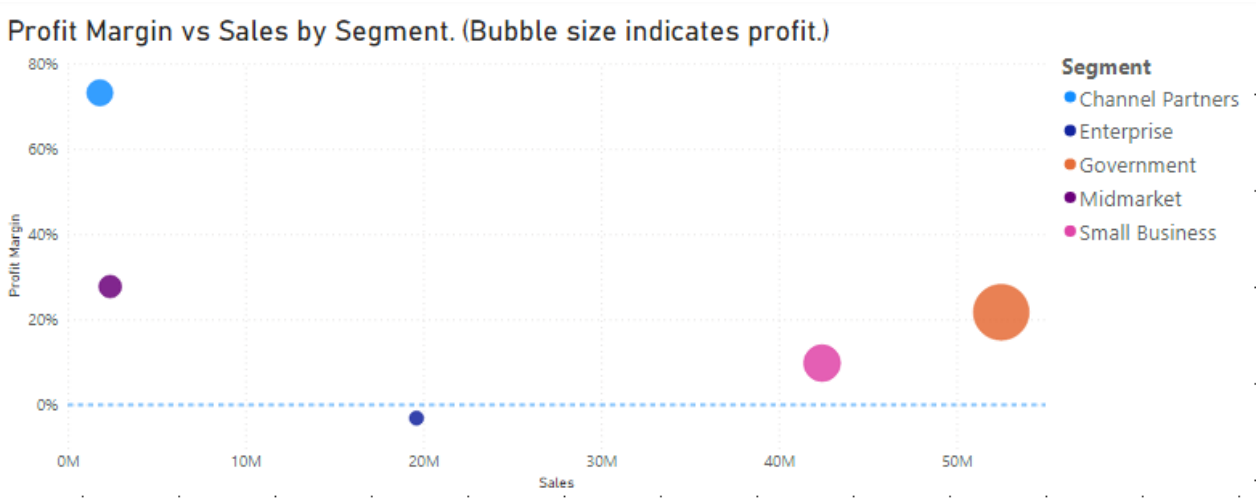
   Now let's improve the user experience of the Scatter Chart.

8. Set its **Title** to:

   Profit Margin vs Sales by Segment. (Bubble size indicates profit.)

9. Set Title **Font Size** to **24** pt
10. Set Legend **Font Size** to 18 pt
11. Set **Legend** -> **Options** -> **Position** to **Right**
12. From the **Analytics** view  -> **Y-Axis Constant Line**, click the **+ Add Line** link.

The result looks as follows:



Sales	Profit Margin	Segment	Profit
1,800,594	73%	Channel Partners	1,316,803
19,611,694	-3%	Enterprise	(614,546)
52,504,261	22%	Government	11,388,173
2,381,883	28%	Midmarket	660,103
42,427,919	10%	Small Business	4,143,169
118,726,350	**14%**		**16,893,702**

In practice you would also remove the table, but it can stay for now.

Congratulations: you have completed all Chapter 2 exercises.

Chapter 3 – Filtering Data

Exercise 3-1 Filtering non-summarised values

1. Create a new blank report page.
2. Name it **Big Transactions**
3. Add a **Table** visual and add **Country** and **Sales** fields:

   Give the table a title:
4. With your table selected, from **Paint roller** -> **Title**, switch on **Title**
5. Set it to **Transactions over 1000,000**

   You will use the Filter pane to filter the table.
6. Expand the **Country** filter.
7. Notice it supports three types of filtering: Basic, Advanced and Top N
8. Now expand the Sales filter, and notice there is no choice of filtering type. It is fixed on Advanced.

Let's find out why.

9. Set **Show items when the value: is greater than** and type in **1000000** (a million)
10. Click **Apply Filter**

Did it work as you expected? This should be the result:

Transactions over 1000,000

Country	Sales
Canada	24,887,655
France	24,354,172
Germany	22,975,791
Mexico	21,478,902
United States of America	25,029,830
Total	**118,726,350**

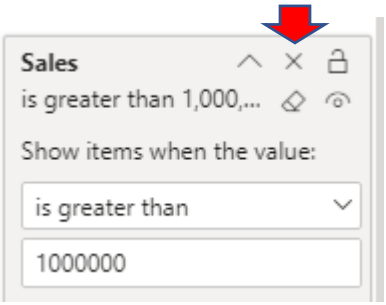
The filtering mechanism is working on the Sum of Sales, which is always well over a million.

11. In the Table field well, change **Sales** summarization to **Don't summarize**

    Did that work? It shows spurious information because the filter is still working on the Sum of Sales. Even clearing the filter with the rubber won't change that.

    You might not have noticed that changing Sales to Don't summarize added a new Sales filter to the Filter pane. This is the filter you need to use for filtering unsummarised Sales figures.

12. Click the **x** to remove the **old Sales filter**.



13. From the new **Sales** filter choose **Advanced filtering**, then just as before:
14. Set **Show items when the value:** to **is greater than** and type in **1000000** (a million)
15. Click **Apply Filter**

Did that work? This should be the result:

Transactions over 1000,000

Country	Sales
Canada	1,035,626
Canada	1,038,083
Germany	1,017,338
United States of America	1,159,200

Check your values against the non-summarised data in **Data** view.

16. To see the top figures, use the **Sales** dropdown to **Sort descending**.

How many transactions are over 1000,000? Five?

Why were only four shown in Report view?

The reason is that Power BI groups data that is unsummarised into unique rows. It doesn't simply list all filtered rows like traditional reporting systems do.

In this case how can you get all five rows to display?

17. Add the **Product** field to the table, to show all five rows:

Transactions over 1000,000

Country	Product	Sales
Canada	Velo	1,035,626
Canada	Montana	1,038,083
Germany	Amarilla	1,017,338
Germany	Velo	1,017,338
United States of America	Paseo	1,159,200

Exercise 3-2 Using Top N

1. Create a new blank report page and name it **Month Summaries**
2. Add a **Table** visual and add **Date**, **Sales, Profit** and **Profit Margin** fields.
3. Select **Date** in the **Fields** pane and format it to display **mmm yy**

Give the table a title:

4. With your table selected, from **Paint roller** -> **Title**, switch on **Title**
5. Set it to **Top Months by Sales**
6. In the **Total** section, set its label to **Overall**

Top Months by Sales

Date	Sales	Profit	Profit Margin
Sep 13	4,484,000	763,603	17%
Oct 13	9,295,611	1,657,795	18%
Nov 13	7,267,203	765,502	11%
Dec 13	5,368,441	691,564	13%
Jan 14	6,607,762	814,029	12%
Feb 14	7,297,531	1,148,547	16%
Mar 14	5,586,860	669,867	12%
Apr 14	6,964,775	929,985	13%
May 14	6,210,211	828,640	13%
Jun 14	9,518,894	1,473,754	15%
Overall	**118,726,350**	**16,893,702**	**14%**

You will now filter the table to show the three highest grossing months, i.e. highest by Sales.

7. Expand the **Month Yr** filter and choose **Top N**.
8. Set the number to **3** and drag the **Sales** to the **by value** field well.
9. Click **Apply Filter.**

This should be the result:

Top Months by Sales

Date	Sales	Profit	Profit Margin
Jun 14	9,518,894	1,473,754	15%
Oct 14	12,375,820	1,781,986	14%
Dec 14	11,998,788	2,025,766	17%
Overall	**33,893,502**	**5,281,506**	**16%**

10. **Right-Click -> Copy** the table

11. Paste a copy with **Ctrl-V** and drag it away to an empty space.

12. In the **Title** replace the word **Sales** with **Profit**

13. Amend the **Date** filter **by value** setting to **Profit**

14. Click **Apply Filter.**

This should be the result:

Top Months by Profit

Date	Sales	Profit	Profit Margin
Oct 13	9,295,611	1,657,795	18%
Oct 14	12,375,820	1,781,986	14%
Dec 14	11,998,788	2,025,766	17%
Total	**33,670,219**	**5,465,547**	**16%**

On this occasion the results are quite similar. This is because the figures are dominated by Segments that perform fairly consistently.

You will now use a Page filter to filter all visuals on the page by Segment.

15. Drag **Segment** to the **Filters on this page** section of the **Filters** pane.
16. Select just **Channel Partners** and **Enterprise**.

This should be the result:

Top Months by Sales

Date	Sales	Profit	Profit Margin
Jul 14	1,851,644	71,387	4%
Oct 14	2,077,673	(13,711)	-1%
Dec 14	2,449,378	92,716	4%
Overall	**6,378,695**	**150,392**	**2%**

Top Months by Profit

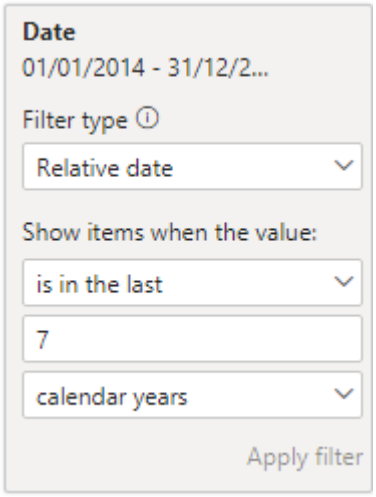
Date	Sales	Profit	Profit Margin
Oct 13	1,253,280	103,344	8%
Apr 14	1,786,634	103,736	6%
Jun 14	1,443,171	117,951	8%
Total	**4,483,086**	**325,032**	**7%**

In this case profit more than doubled on about 2/3rds Sales revenue for the top months by Profit.

Exercise 3-3 Relative date filtering

You will display monthly summaries for the last seven calendar years, i.e. back to January seven years ago. (The data runs out at Dec 14)

1. Copy and Paste one of the tables from the previous exercise and drag it to a new space.
2. Change the **Title** to **Last seven calendar years**
3. Change the **Filter type** to **Relative date filtering**, and set it up as follows:



4. Click **Apply Filter**.

This should be the result:

Last six calendar years

Date	Sales	Profit	Profit Margin
Jan 14	1,023,881	35,280	3%
Feb 14	1,011,073	41,404	4%
Mar 14	1,153,117	45,844	4%
Apr 14	1,786,634	103,736	6%
May 14	1,061,933	12,287	1%
Jun 14	1,443,171	117,951	8%
Jul 14	1,851,644	71,387	4%
Aug 14	1,175,538	37,947	3%
Sep 14	892,270	24,895	3%
Oct 14	2,077,673	(13,711)	-1%
Nov 14	1,038,322	36,388	4%
Dec 14	2,449,378	92,716	4%
Total	**16,964,635**	**606,126**	**4%**

Chapter 4 – Shaping Data with the Power Query Editor

Exercise 4-1 Renaming columns

It is not obvious that **COGS** means *Cost Of Goods Sold*.

1. In the Field pane, right-click on the **COGS** field, select **Rename**, and change **COGS** to **Costs**

2. On the **financials** table header **Right-click** -> **Edit Query**

   The spreadsheet data is previewed in the **Power Query Editor**

3. Notice a step has been added called **Renamed Columns** that renames COGS 'on the fly'.

   This means the column stays renamed when you refresh the data.

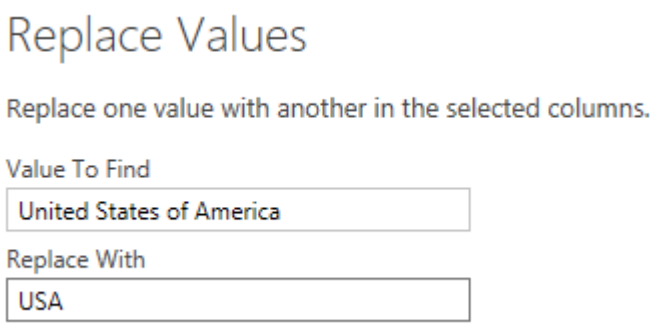
Exercise 4-2 Replace Data Values

You will shorten the country name *United States of America* to USA.

1. Click on an instance of **United States of America** in the **Country** column.

2. From the **Transform** tab -> **Any Column** group, click **Replace Values**

3. Fill in the **Replace Values** dialog as follows:



4. Click **OK**

   A new step is added to **Applied Steps** called **Replaced Value.**

   The preview should reflect the outcome of this new step, showing USA instead.

   If you made a mistake click the **Replaced Value** step gear to bring the dialog back up.

5. Click **Close and Apply** (top left, or from **File** menu).

   Power Query closes and the financials table is refreshed in Power BI.

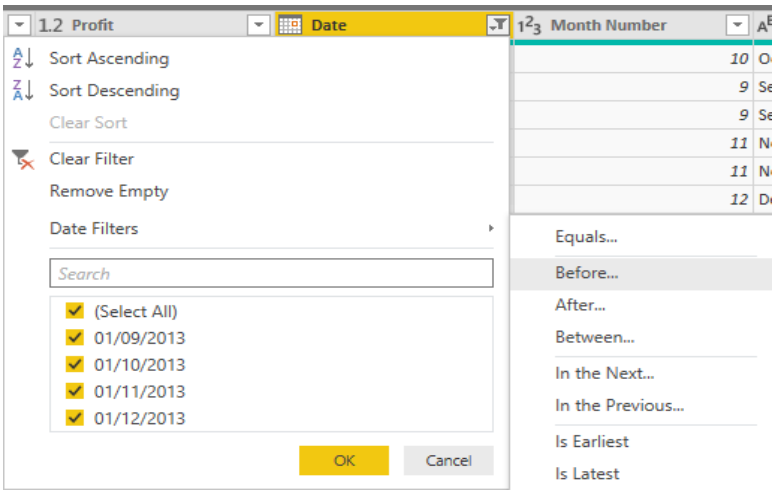
   All visuals involving Country should now reflect the change.

Exercise 4-3 Filter Rows

We will filter out rows from 1st January 2014.

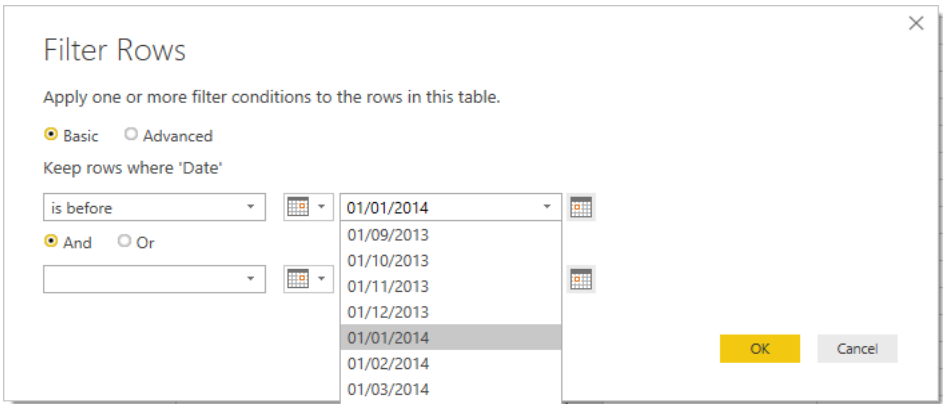
1 In the Fields list on the **financials** table right-click -> **Edit Query**.

2 In Power Query, on the **financials** data preview, click the **drop-down** on the **Date** column:



3. From **Date Filters** choose **Before..**

4. From the dropdown choose **01/01/2014** for the value.



5. Click **OK** and **Close and Apply.**

6. Switch to the **Data** view and observe that applying the changes made in Power Query has resulted in 175 rows in the financials table.

That was just for demonstration purposes. We do actually want to import all the rows from the financials table.

7. Go back into Power Query and **delete** the **Filtered Rows** step that was created above.

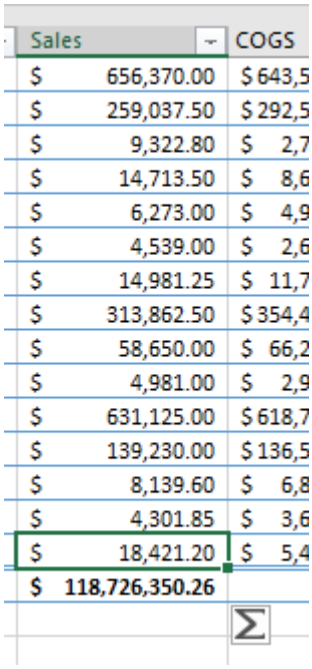
   Observe from the bottom of the Power Query dialog, the number of rows is now back to 700.

8. Click **Close & Apply**

Exercise 4-4 Filter out blank rows

A report may become broken if summaries are added to the source data.

1. Switch back to **Excel** and remove any column filters.
2. Enter a **Sum** beneath the **Sales** column:



Sales	COGS
$ 656,370.00	$ 643,5
$ 259,037.50	$ 292,5
$ 9,322.80	$ 2,7
$ 14,713.50	$ 8,6
$ 6,273.00	$ 4,9
$ 4,539.00	$ 2,6
$ 14,981.25	$ 11,7
$ 313,862.50	$ 354,4
$ 58,650.00	$ 66,2
$ 4,981.00	$ 2,9
$ 631,125.00	$ 618,7
$ 139,230.00	$ 136,5
$ 8,139.60	$ 6,8
$ 4,301.85	$ 3,6
$ 18,421.20	$ 5,4
$ 118,726,350.26	

3. **Save** the spreadsheet.
4. Back in **Power BI**, navigate to your **Summary** page and click **Refresh**

Notice the Sales total double to 237 million, and a (Blank) category appearing in all the visuals. In the table you get a blank Country.

This can be fixed by filtering out rows from the source with, for example, a blank Country. In practise any field that is blank for the offending row can be used.

5. Go back into **Power Query**, and from the **Home** tab click **Refresh Preview**

Notice (bottom left of screen) that there are now 701 rows.

6. Click the **Country** header dropdown, and select **Remove Empty**

Total rows should revert to 700.

7. Rename the new step **Remove Empty Rows**
8. Click **Close and Apply**, to apply your fix.

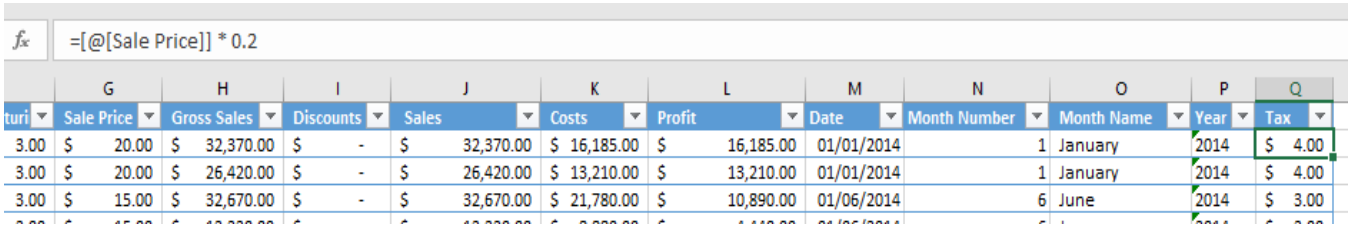
The (Blank) categories and row with blank Country should now have disappeared.

Exercise 4-5 Change Data Source, Adapt M script

1. Go back into Excel and save the file as **Financial Sample2.xlsx**

2. Add a new **Tax** column as **=[@[Sale Price]] * 0.2**

3. Rename **COGS** to **Costs**:

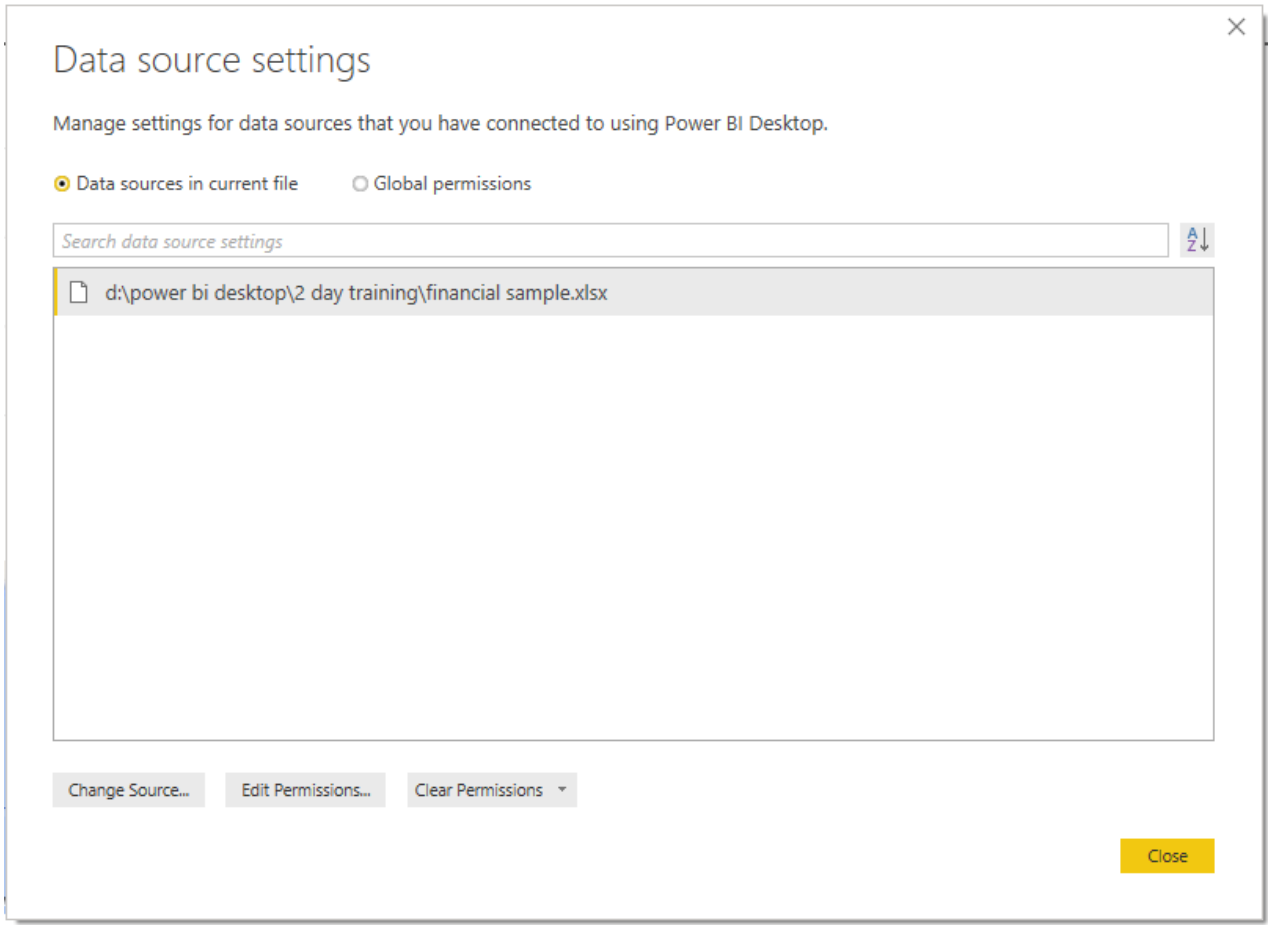


=[@[Sale Price]] * 0.2

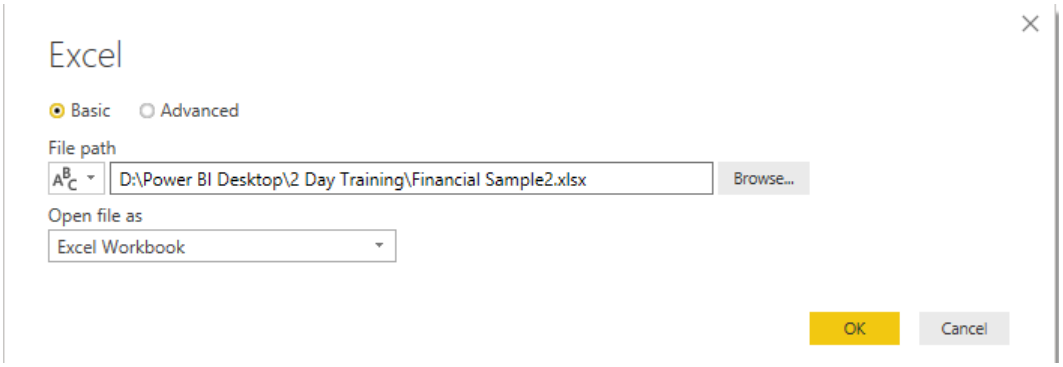
turi	G Sale Price	H Gross Sales	I Discounts	J Sales	K Costs	L Profit	M Date	N Month Number	O Month Name	P Year	Q Tax
3.00	$ 20.00	$ 32,370.00	$ -	$ 32,370.00	$ 16,185.00	$ 16,185.00	01/01/2014	1	January	2014	$ 4.00
3.00	$ 20.00	$ 26,420.00	$ -	$ 26,420.00	$ 13,210.00	$ 13,210.00	01/01/2014	1	January	2014	$ 4.00
3.00	$ 15.00	$ 32,670.00	$ -	$ 32,670.00	$ 21,780.00	$ 10,890.00	01/06/2014	6	June	2014	$ 3.00

We will now update **Financials.pbix** to use this new spreadsheet with an altered column name and the additional column called Tax.

4. Back in PowerBI, from the **Home** tab click: **Transform Data** -> **Data Source Settings**:



5. Click **Change Source…** and alter the Excel **File path** to the one you just saved, and click **OK**:

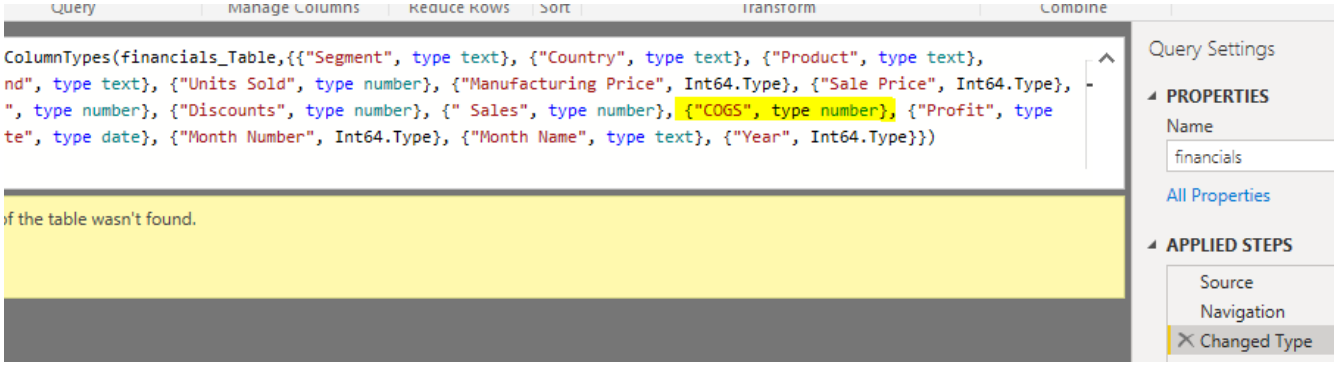


6. In the Fields pane, Right-Click on **financials** -> **Edit Query**

7. In the Power Query Editor, click **Refresh**. An error occurs.
8. Click **GoTo Error**.

   The **Changed Type** step expects a column called **COGS** which no longer exists in the source.

9. In the **Changed Type** step change **COGS** to its new column name in the source: **Costs**



   There is another problem with the Changed Type step: It is unaware of the new Tax column.

10. While still on the **Changed Type** step, from the **Tax** column click the data type drop-down. Confirm it's ok to insert a new step.

    Did it actually insert a new step? Power BI helpfully combines two changed type steps into one when they are adjacent like this.

When you need to set the datatype on many fields there is a quicker/easier way to fix a Changed Type step, which is to delete it and automatically recreate it.

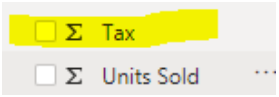
11. Delete the **Changed Type** step, then select all columns (select one column, then click **Ctrl-A**), then from the **Transform** tab click **Detect Data Type**.

This inserts a new Changed Type step that includes the new Tax column.

12. **COGS** has been renamed to **Costs** in the Source, so also delete the **Renamed Columns** step, which is no longer needed.

13. Click **Close & Apply**

    When changes have been applied, the **Costs** field should remain intact, and a new **Tax** implicit measure added:



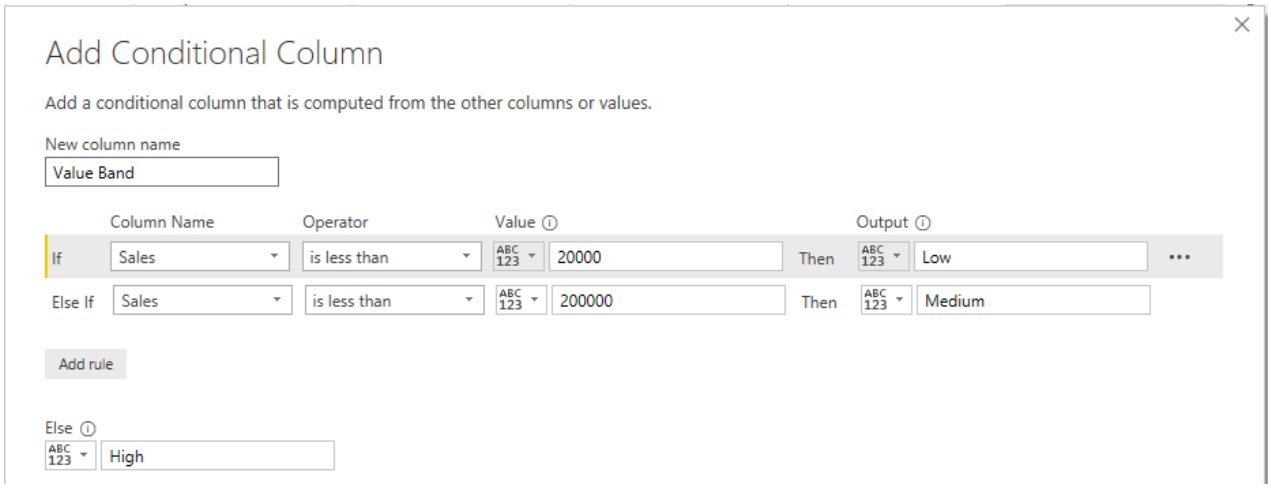
Exercise 4-6 Create a Banding Column

You will create a field called Value Band based on the following criteria on Sales:

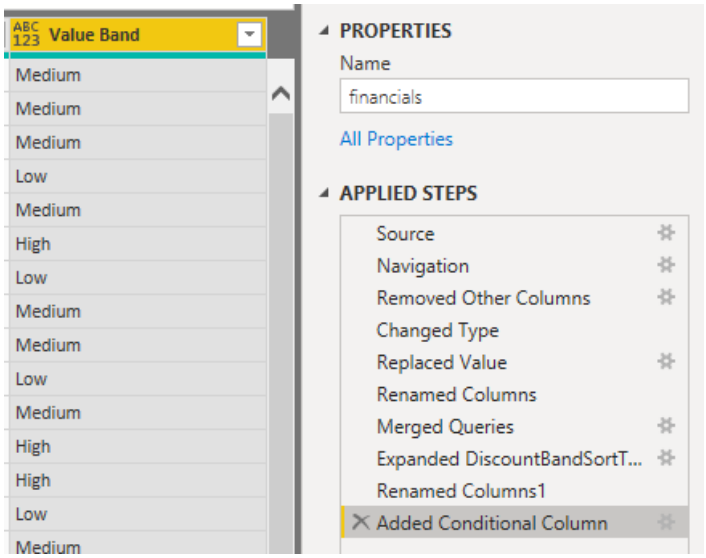
Sales from	To less than	Band
	20,000	Low
20,000	200,000	Medium
200,000		High

1. From the **Add Column** tab, **General** group click **Conditional Column**

2. Fill in the details as follows:



3. Click OK to observe the result of this new step:



4. Rename your new step to **Added Value Band**

5. Drag the **Changed Type** step down to be the last step.

6. Now change the datatype of the new **Value Band** column to **Text**

   The new datatype definition for Value Band should have become integrated into the existing Change Type step.

7. Click **Close and Apply**.

Your new **Value Band** field is now available in Power BI for use as a categorical field.

8. Create a new report tab called **Value Band**.

9. Add a **table** with columns:
   - **Value Band**
   - **Row Count**
   - **Sales**
   - **Profit**
   - **Profit Margin**

10. **Sort** the table in **ascending** order by **Sales**.

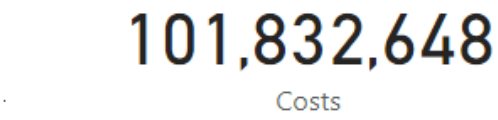
11. Add a card visual to show total **Costs**.

12. Set **Data Label** -> **Display Units** to **None**

    You will use this card in a later exercise when you publish your report into the Power BI Service.

The result looks as follows:

Value Band	Row Count	Sales	Profit	Profit Margin
Low	219	2,345,706	£941,873	40%
Medium	266	15,475,136	£2,896,992	19%
High	215	100,905,508	£13,054,838	13%
Total	**700**	**118,726,350**	**£16,893,702**	**14%**



11. **Save** your Power BI file.

Exercise 4-7 Sort Discount Bands correctly

Discount Bands currently sort in alphabetical order, which is inappropriate. In order to sort them as None, Low, Medium, High you will create a Discount Band Sort field in the financials table. This is best achieved in Power Query by creating a 4-row table of related sort keys, and then merging it with financials, based on matching Discount Band.

1. From the **Home** menu click **Enter Data.**
2. Create a table called **DiscountBands** as follows:

	DiscountBand	DiscountBandSort	*
1	None	1	
2	Low	2	
3	Medium	3	
4	High	4	
*			

3. Click **Transform Data**, to go into **Power Query**
4. Select **financials** from **Queries** pane
5. From the **Home** tab click **Merge Queries -> Merge Queries**
6. Select the **DiscountBands** table, and click to select matching **Discount Band** fields.
7. Click **OK** and use the column expander to select the **DiscountBandSort** field.

Do the sort fields (1,2,3,4) correctly match the **Discount Band** field values? (They should).

8. Click **Close & Apply**.
9. In the **Fields** pane select **Discount Band**.
10. From **Column tools** use **Sort by column** to specify **DiscountBandSort** as the field to sort it by.

Very that Discount Bands now sorted appropriately in your **Enterprise Discounts** tab.

Exercise 4-8 Use Scatter Chart to Show Clustering

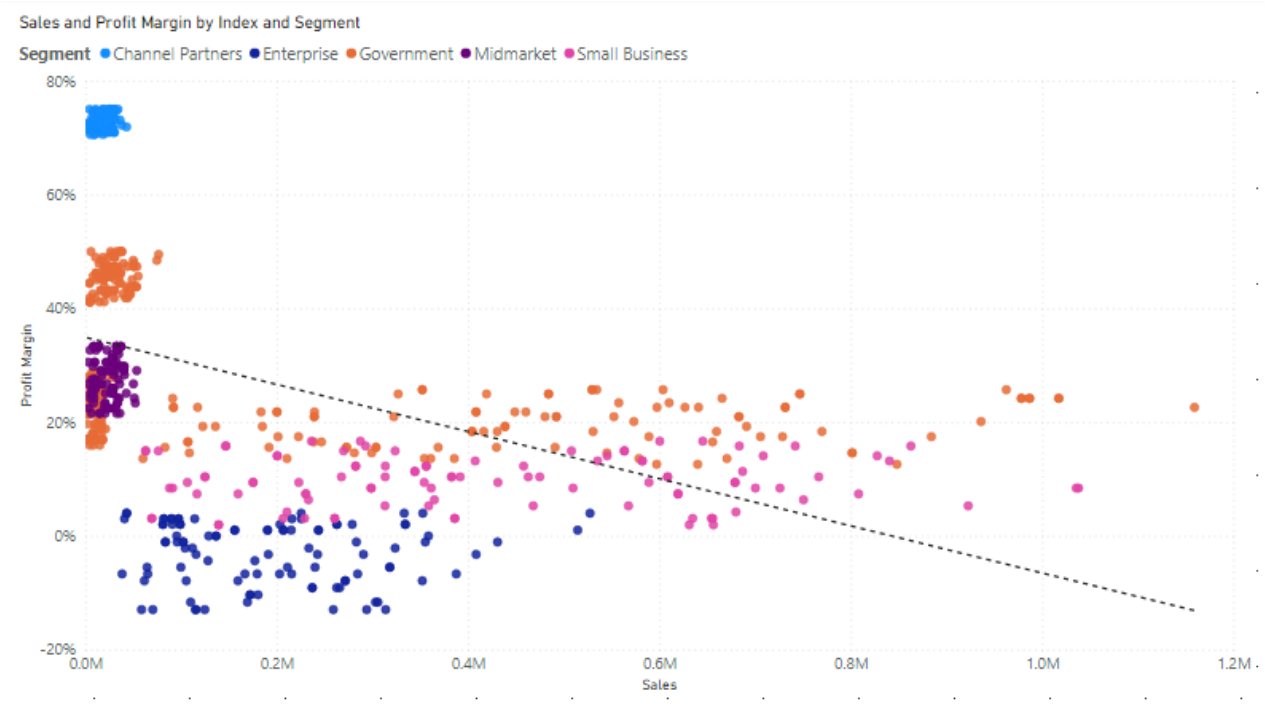
You will observe clustering on a Scatter Chart that shows all 700 data points.

1. Go into **Power Query**, and from the **Add Column** menu click **Index Column -> From 1**
2. Click **File -> Close & Apply**
3. In the **Fields pane** select the new **Index** field and from **Column Tools** set its default **Summarisation** to **Don't Summarise**.
4. Create a new report page called **Scatter Clusters**.
5. Insert a **Scatter Chart** and resize it to take up the whole page.

3. Drag:
   - **Sales** to **X Axis**
   - **Profit Margin** to **Y-Axis**
   - **Segment** to **Legend**
   - **Index** to **Values**

4. From **Analytics** view switch on **Trend line**.

   The result is as follows:



The relationship between Sales and Profit Margin is clearly more complex than that indicated in the simple Value Band table seen earlier.

5. Drag the following fields to the **Tooltips** field well:

   - **Country**
   - **Discount Band**
   - **Product**

   These fields are automatically set to summarise to show the First value in each case. This is because Power BI doesn't realise that each data point represents only one row from the source data.

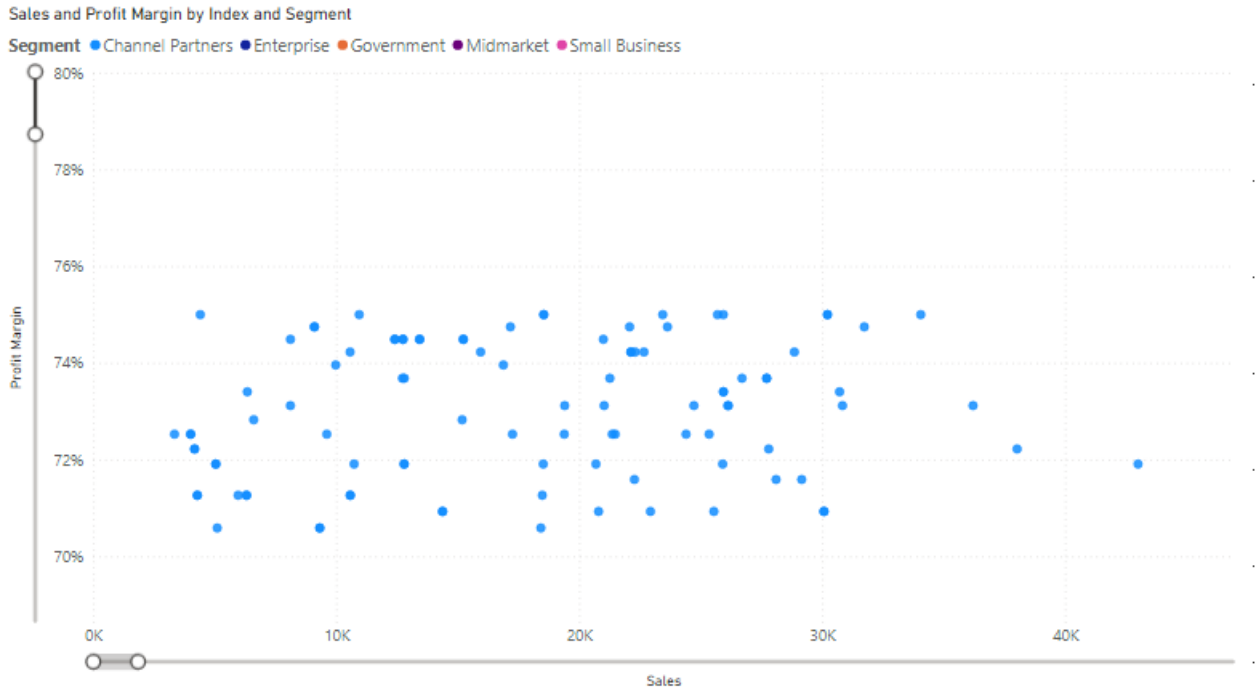
6. For each field in the **Tooltips** field well click the **down arrow** to **Rename for this visual** each field back to its original name.

7. Try hovering over some data points.

   A lot of information is now available for each transaction.

8. From the **Format** view switch on **Zoom slider**, and the zoom into the **Channel Partners** cluster.

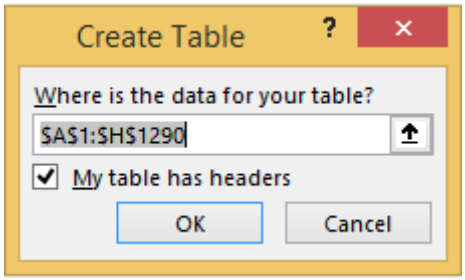
The result looks as follows:



Exercise 4-9 Prepare Excel data for import into Power BI

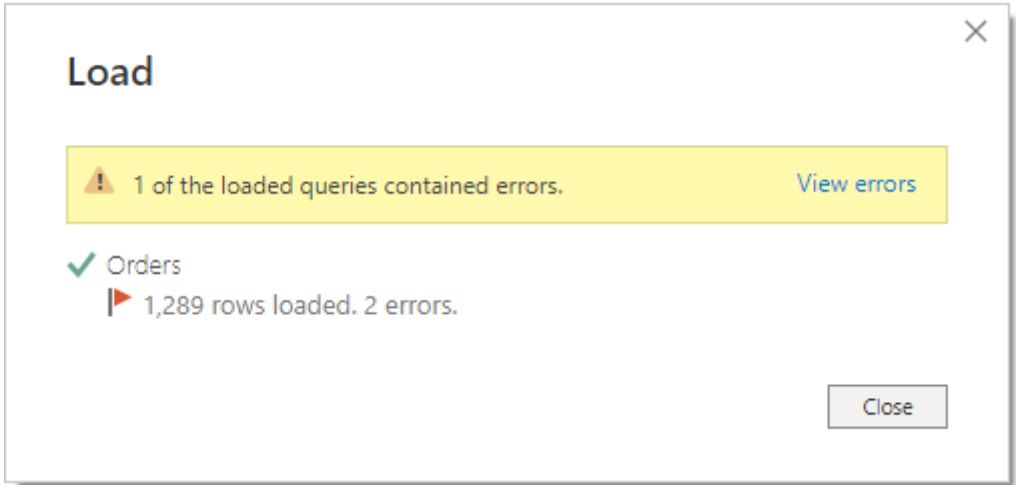
You will format Excel data as a table, import it into Power BI and adjust the table to remove errors.

1. Open **Orders.xlsx** in Excel
2. **Click** to focus in the data, and from the **Insert** tab click **Table**. Ensure the checkbox **My table has headers** is checked, and click **OK**:



3. From the **Table Design** tab, rename the table to **Orders**.
4. Save the Excel file.
5. Back in Power BI, from the **Home** tab click **Excel workbook**, and open **Orders.xlsx**
6. From the Navigation pane check the **Orders** checkbox, and click **Transform Data**.
7. In the Power query window **scroll right** and change **Created Date** datatype to **Date.** On the **Change Column Type** confirmation dialog click **Replace Current**.
8. On the **Updated Date** column header, **Right-click** -> **Remove** to remove the column.
9. From the **Home** tab click **Close & Apply**.

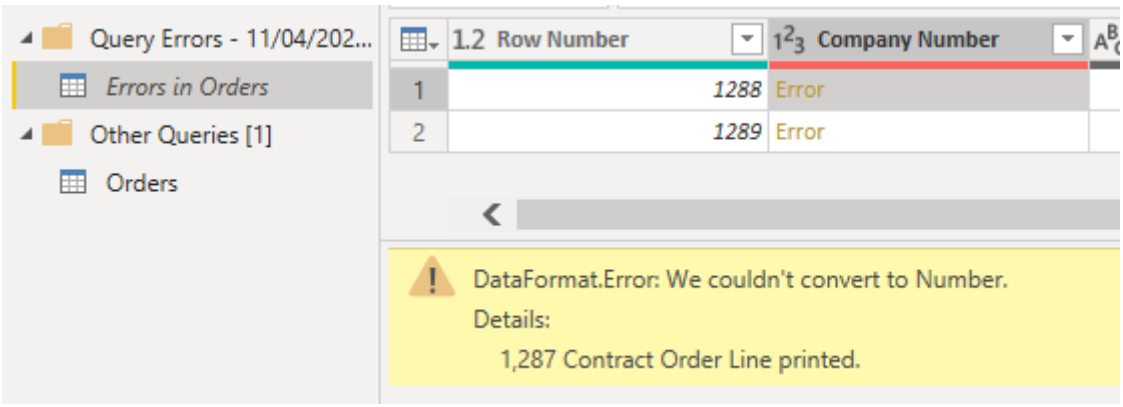
   The load produces errors:



10. Click the **View errors** link, and click **Apply Changes**.
11. Go back into Power query, and in the **Queries** pane click on **Errors in Orders**

    Notice the Errors in the **Company Number** column.

12. Without clicking an Error link (which adds an unwanted step), click in the **first cell** of **Company Number** to see an error description:



This message is indicating an error on line 1287 of the table (1288 of the Excel file).

13. Return to **Orders.xlsx** in Excel and navigate to the bottom of the table.

    Do you see the cause of the error?

14. Hover over the resize handle  at the bottom right of the table and adjust the table to omit the last two rows. Save the Excel file.

15. Back in **Power Query**, from the **Home** tab click **Refresh Preview**.

    Notice that **Errors in Orders** is now an empty table.

16. On the **Query Errors** folder, Right-click **Delete Group**.

17. Click **Close & Apply**.

18. Back in **Power BI**, in the **Fields** pane select **Company number**, and from the **Column Tools** tab set its **Summarization** to **Don't Summarize**.

19. **Save** your Power BI file.

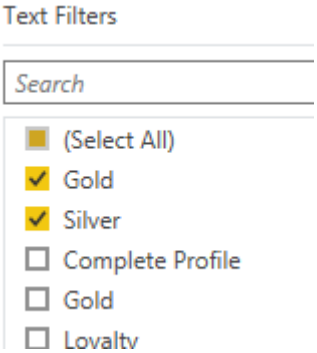
Exercise 4-10 Remove false duplicates by trimming spaces

You will clean the data by trimming spaces from false duplicate Product Names.

1. Create a new report tab called **Product Grouping**.
2. Add a **Table** with column **Product Name**.

   Notice there are two Product Names (Gold and Silver) at the top, not listed in alphabetical order. It is likely they have leading spaces.

3. Go back into **Power Query** and click the **Product Name** drop-down.
4. From the drop-down list select only the first Gold and Silver:



5. Click **OK**

   The M code shows the leading spaces:

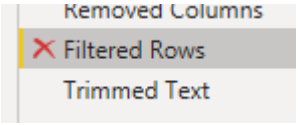
```
each ([Product Name] = " Gold" or [Product Name] = " Silver"))
```

6. Select the Gold cell, and click to focus in the preview pane below, where you also see the a leading space between the flashing cursor and the G.

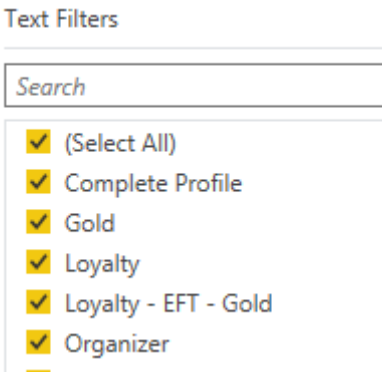
7. Select the **Product Name** column, and from the **Transform** tab click: **Format -> Trim**.

   In the preview pane you will see that the leading space has been removed.

8. In the **APPLIED STEPS** pane, delete the **Filtered Rows** step:



9. Look again in the product name drop-down to check that the duplicates have been removed:



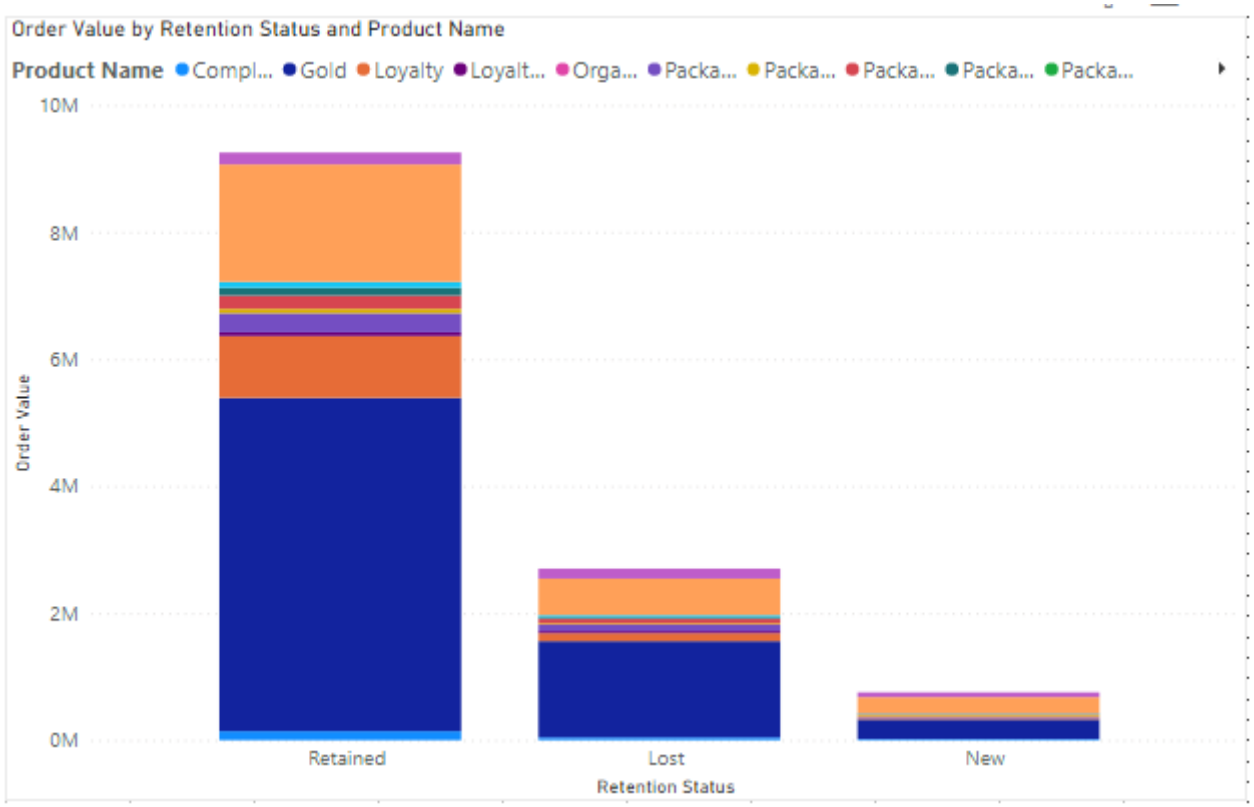
10. Click **Close & Apply**, and verify the duplicates are removed from your Power BI table.

Exercise 4-11 Combine low value categories into a single 'Others' category

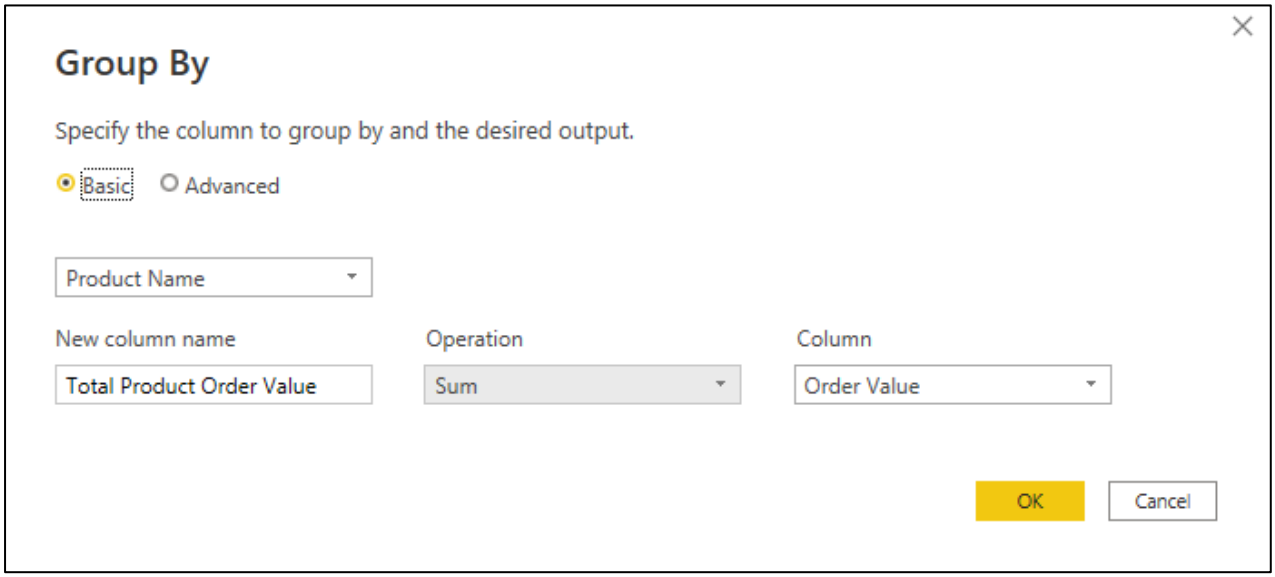
You will add a new column with only high value Product Names, and one called Others.

1. Move your **Table** to the **left** of the report canvas, and add a **Stacked Column Chart** to take up the space on the right.
2. Add:
   - **Retention Status** to **Axis**
   - **Product Name** to **Legend**
   - **Order Value** to **Values**

   The list of Product Names does not fit in the Legend and there are many Product Names of low value. This makes the chart hard to read:



3. Go back into **Power Query**.
4. In the **Queries** pane **Right Click** on **Orders -> Reference**
5. Press **F2** to rename the new query **Product Order Values**
6. Click **Group By** and fill in the Group By dialogue as follows:



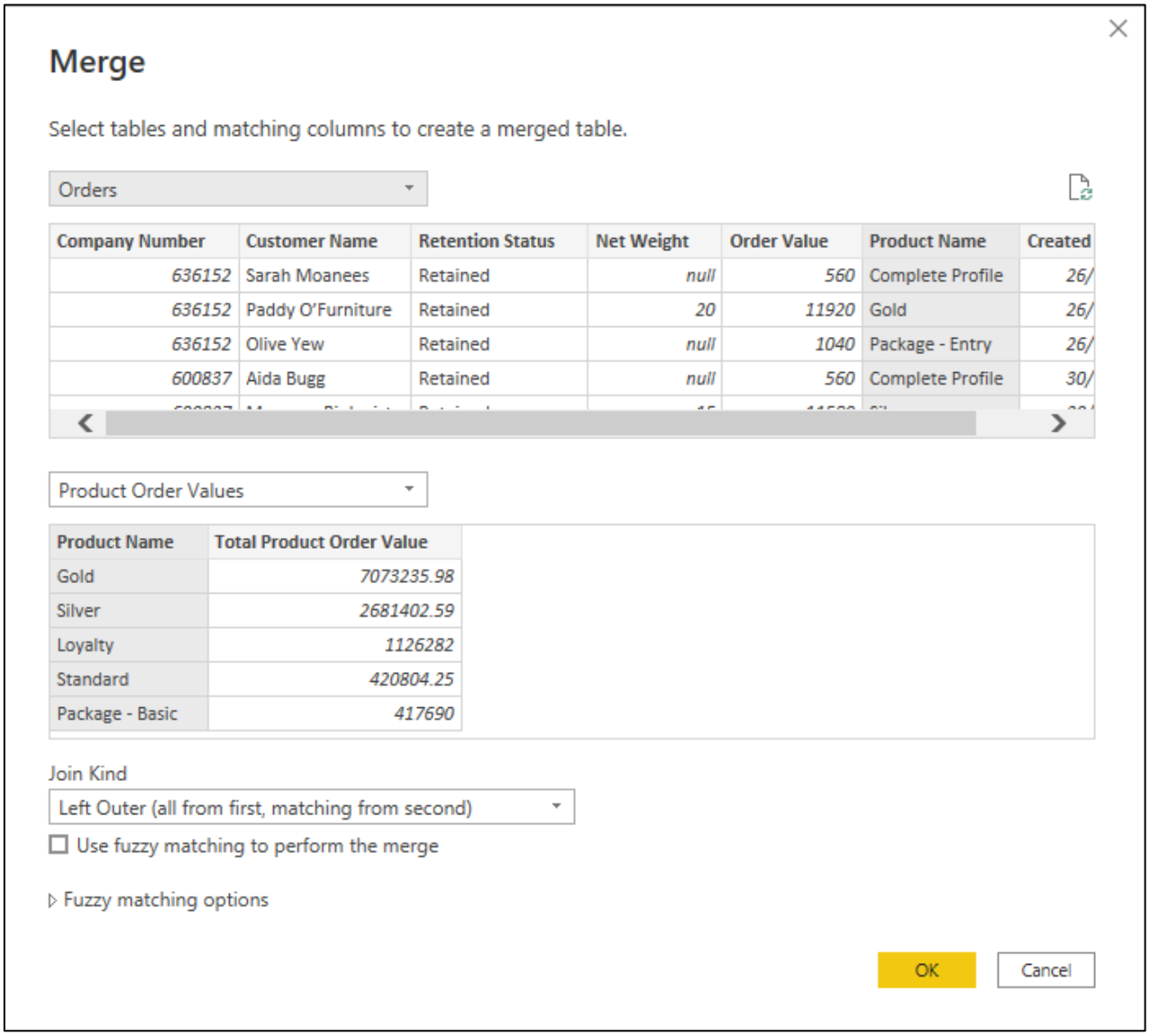
7. Click **OK.**
8. Sort the table by descending **Total Product Order Value.**

The resulting table looks as follows:

	Product Name	Total Product Order Value
1	Gold	7073235.98
2	Silver	2681402.59
3	Loyalty	1126282
4	Standard	420804.25
5	Package - Basic	417690
6	Package - Premium	293620
7	Complete Profile	205520
8	Package - Pro	155210
9	Premium Profile	129410
10	Package - Entry	111280
11	Loyalty - EFT - Gold	92527.5
12	Sharing Fee	2385
13	Package - Sharer	2360
14	Organizer	0

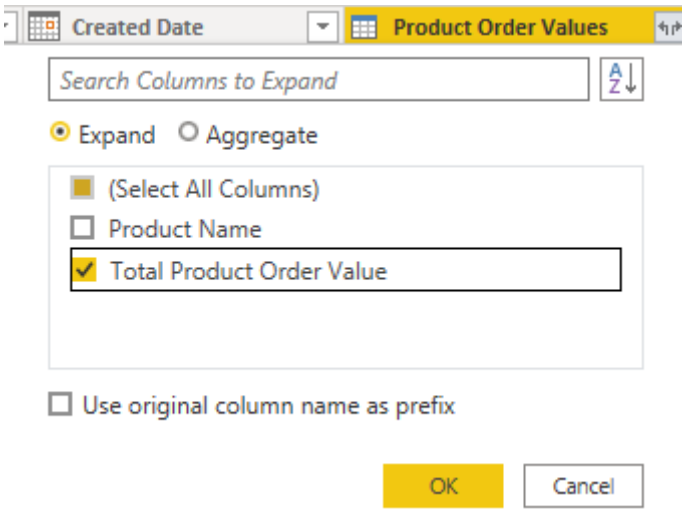
You will now merge this table with Orders to get the Total Product Order Value for each row in Orders.

8. In the **Queries** pane select **Orders**.
9. From the **Home** tab, click the **Merge Queries** drop-down -> **Merge Queries As New**.
10. From the second drop-down select **Product Order Values**.
11. Select the **Product Name** column in both tables:



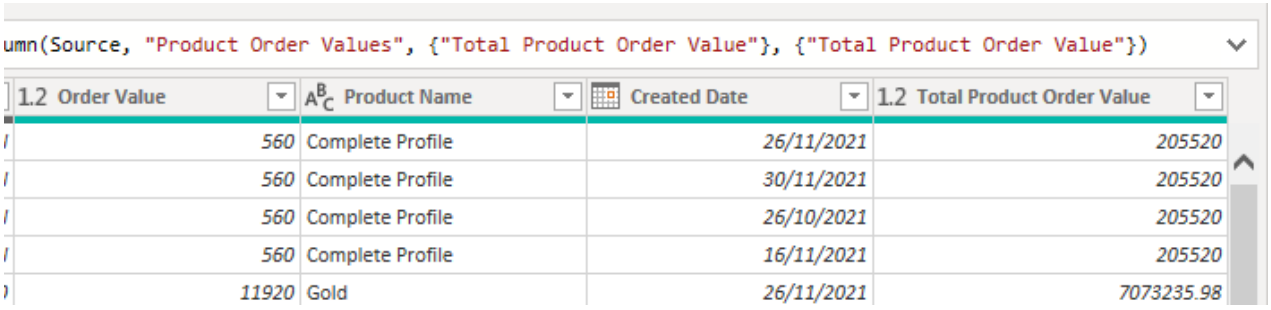
12. Click **OK.**

13. Expand the **Product Order Values** column and check only the **Total Product Order Value** checkbox:



14. Click **OK.**

You should now see a new **Total Product Order Values** column:



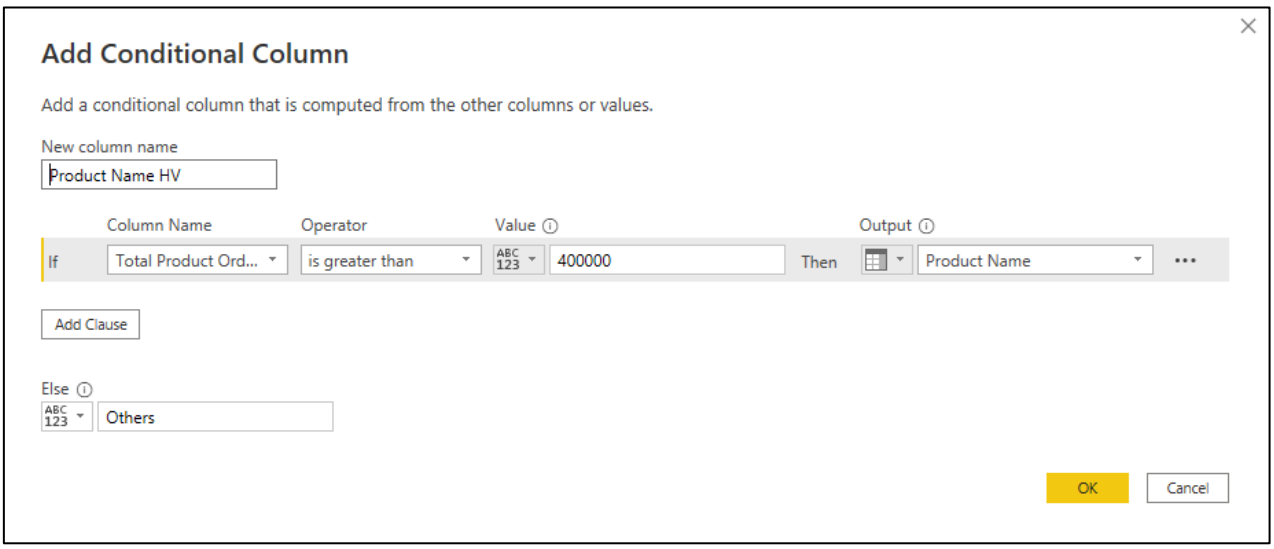
1.2 Order Value	Product Name	Created Date	1.2 Total Product Order Value
560	Complete Profile	26/11/2021	205520
560	Complete Profile	30/11/2021	205520
560	Complete Profile	26/10/2021	205520
560	Complete Profile	16/11/2021	205520
11920	Gold	26/11/2021	7073235.98

15. In the **Queries** pane:

- Rename **Orders** to **Orders1**,
- Rename **Merge1** to **Orders.**
- Right click on **Product Order Values** -> un-tick **Enable Load.**

In the next steps you will add a new column called **Product Name HV** for the product names that have a **Total Product Order Value** greater than **400,000**.

16. From the **Add Column** tab click **Conditional Column**, and fill in the dialog as follows:

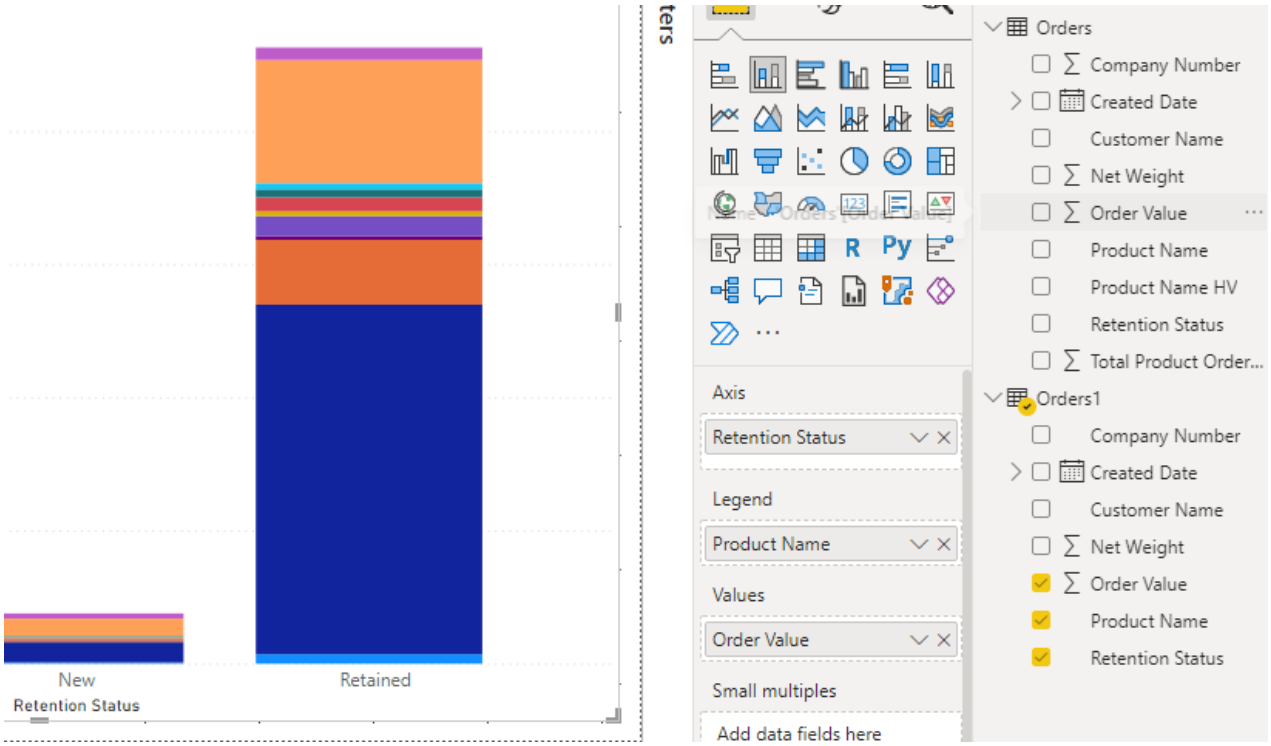


17. Click **OK**, and verify that **Others** appears in the **Product Name HV** column where **Total Product Order Value** is less than **400,000**.

18. Click **File -> Close & Apply**

Next you need to change the Stacked Column Chart field assignments to the required fields of the new Orders table.

19. In the **Fields** pane expand both **Orders** and **Orders1**, and select the stacked column chart:



20. From **Orders** drag**:**

- **Retention Status** into the **Axis** field well, and delete the original **Retention Status** from **Orders1**. (If you forget which is which, try hovering over the field name to see its source table.)
- **Product Name HV** into the **Legend** field well, over **Product Name**,
- **Order Value** over into the **Values** field well, over the original **Order Value**.

21. From **Format** view **-> Legend -> Options**, Position the **Legend** to the **Right,** and set its **Text -> Font** size to **16**.

22. From **General -> Title** set the **Font** size to **20**.

    Your Stacked Column Chart visual is now easier to read.

23. Go back into **Power Query** and in the **Queries** pane **Right Click** -> untick **Enable Load** on **Orders1**

Exercise 4-12 Add Slashes to an Undelimited Date Field

You will rehabilitate the Created Date field by separating day month and year with slashes.

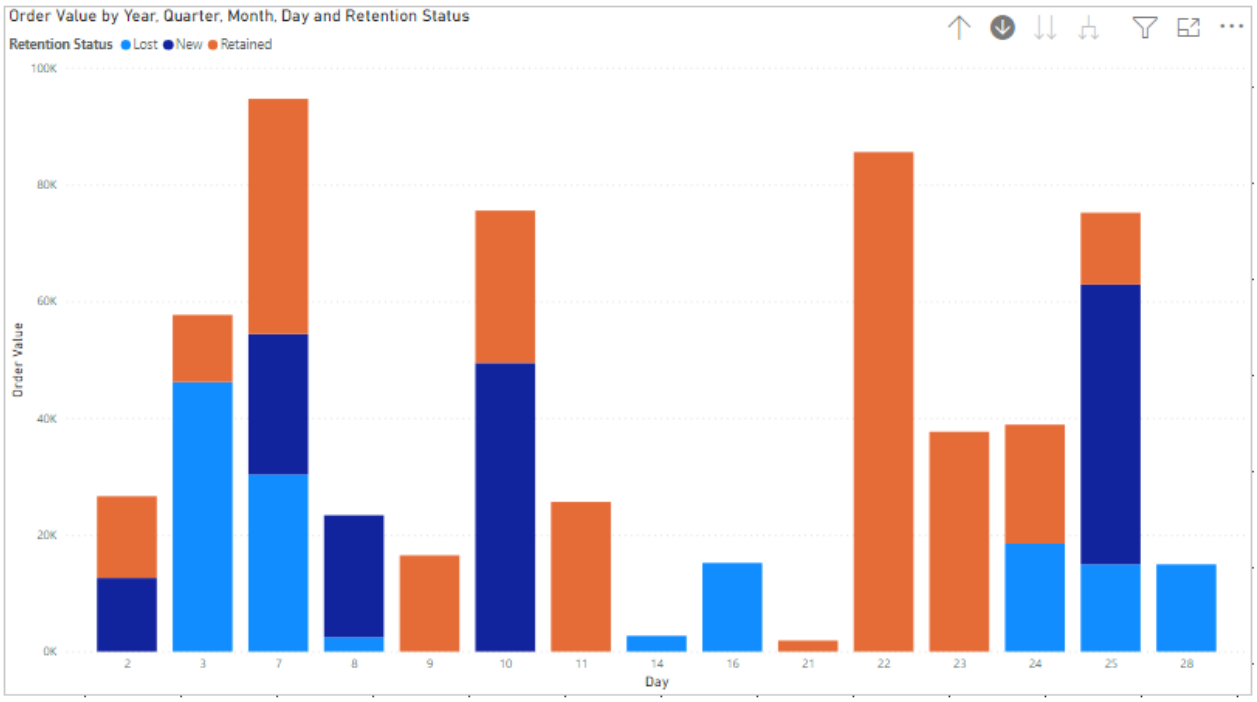
1. Go back into **Power Query**.
2. Rename the **Created Date** field to **Created Date Time**.
3. Select the **Created Date Time** field.
4. From the **Add Column** menu click **Column From Examples -> From Selection**
5. **Scroll** right to ensure **Created Date Time** is visible to you.
6. In **Column1** enter only the date portion of the corresponding value in **Created Date Time**, ensuring you **add slashes** in the correct places.
7. Press **Enter** and choose another row to add in **Column1,** ensuring you choose a different day and different month. (Year can be the same.)

   Two examples are usually enough, but repeat if necessary.

8. Click **OK**, and amend the **M** code to change the column name from **Custom** to **Created Date**. Press **Enter** to save your changes.
9. Set the datatype of **Created Date** to **Date** datatype.
10. On **Created Date Time** Right-Click **-> Remove**.
11. Click **File -> Close & Apply**
12. Create a new report page called **Date Drill Down**.
13. Insert a **Stacked Column Chart** and resize it to take up the whole report canvas.
14. Drag:
    - **Created Date** to **Axis** (leave it with its auto-date hierarchy)
    - **Order Value** to **Values**
    - **Retention Status** to **Legend**

15. In the visual **toolbar** click the **down arrow** to enable single click drill down.
16. **Drill** all the way down through **February 2022** to show individual days.

    The result is as follows:



Congratulations: you have completed all Chapter 4 exercises.

Chapter 5 – Using Filter Context

Exercise 5-1 Adding a Drillthrough Page

When users see summarised information they often say “Show me the detail”. A Drillthrough Page accomplishes that.

1. Add a new report page, rename it to **Drillthru**.

2. On the page tab **Right-click -> Hide Page**

   We want it to display the detail behind our current matrix cells, which are displaying summarised Sales figures. We want the filter context of a selected measure in our source matrix to be applied to any visual on our Drillthrough Page. The measure in our matrix is the implicit measure **Sales**.

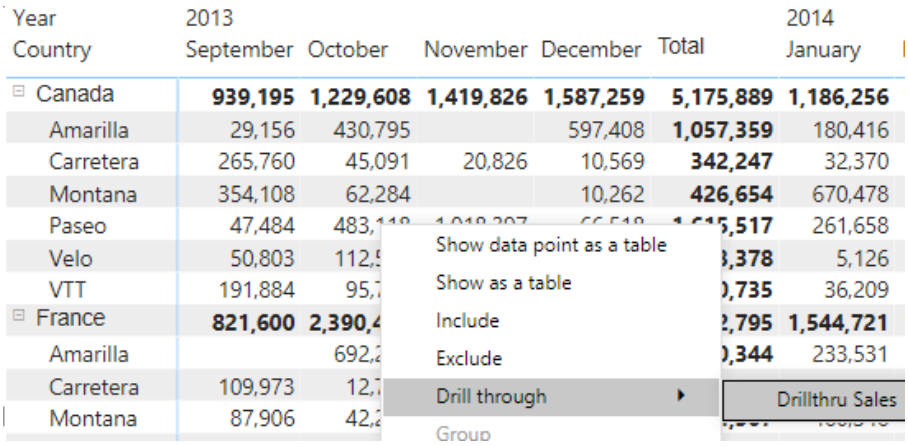
3. Drag **Sales** to **Visualisations** -> **Drillthrough** filter setting, which is watermarked: *Drag drill through fields here*

Add a table to display Drillthrough details

4. Add a **Table** visual to the report canvas. Add the fields:
   1. YM (hierarchy)
   2. Segment
   3. Country
   4. Product
   5. Sales
   6. Profit
   7. Profit Margin
   8. Row Count

Test Drillthrough function

5. Back on your original Matrix, **Right-click** a cell such as **Canada, Paseo**, **October 2013,** and select **Drillthrough** -> **Drillthru** as follows:



Focus will move to your **Drillthru** Page which should display as follows:

Year	Month Name	Segment	Country	Product	Sales	Profit	Profit Margin	Row Count
2013	October	Government	Canada	Paseo	434,701	£101,531	23%	2
2013	October	Channel Partners	Canada	Paseo	25,933	£19,036	73%	1
2013	October	Midmarket	Canada	Paseo	22,485	£5,055	22%	1
Total					**483,118**	**£125,621**	**26%**	**4**

Notice that you are not seeing individual rows from the source data. This can be fixed by adding an index column, because it provides an identifier unique to each underlying row.

6. In the **Fields** pane select the **Index** column and in **Column Tools** change its default **Summarisation** to **None**. That ensures it operates as a categorical field.
7. Drag the **Index** field to **Values**, and drag it up to be the **first** field.
8. In the **Values** list **delete** the **Row Count** field, which is now redundant.

   Index fields should usually be hidden because they often change in value. If not hidden, users might start using them for things like invoice numbers, which becomes problematic for them.
9. Use the **Index** field **Drop-Down** to **Rename** it to single character: **i**
10. In **Format** view -> **Values**, turn **Text Wrap** to **Off**
11. Hover over the **Index column header** -> **right hand boundary** and **drag it left** to reduce its width to nothing.

12. Hover over the table's Visual Header filter icon to see what's filtered:

Notice the **Back button** which was automatically placed *top left* of your Drillthrough page:

13. **Ctrl-Click** the **Back** button to return back to your source matrix.

Exercise 5-2 Page Tooltip

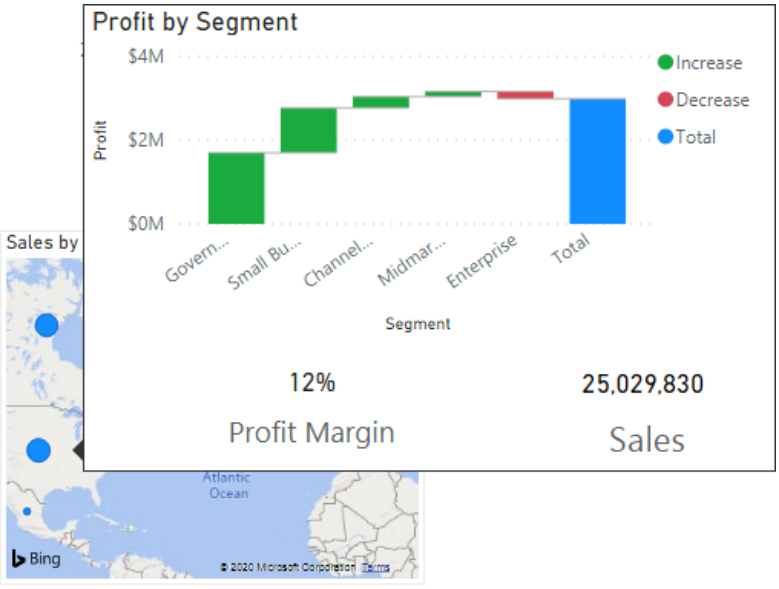
Another helpful way that filter propagation is used is by Page Tooltips. These are more sophisticated windows you customise to show more information, that pops up when you hover over related figures.

You will create a Page Tooltip to display profit breakdown by Segment in a Waterfall chart, whenever you hover over a Sales figure.

1. Create a new page, and name it **Profit Tooltip**.
2. Right-click on the page tab and choose **Hide Page**. This means if you publish your report to the Power BI Service this page will not be visible as a tab, only as a tooltip.
3. From the **Paint roller -> Page Information** set **Tooltip** to **On**
4. In **Page Size**, set **Type** to **Tooltip**
5. Add a **Waterfall** chart to the page.
6. Drag **Segment** to **Category.**
7. Drag **Profit** to **Values.**
8. Now drag **Sales** to the **Drag Tooltip fields here** field well in the **Visualizations** pane **Tooltip** section.

Now try hovering over a summarised Sales figure in any visual. Does it work? Look good?

9. Go back to the **Profit Tooltip** page and increase its **Page Size**, using **Custom** e.g. set to Width: **450**, Height: **300**
10. Make some space at the bottom of the Tooltip Page and add a couple of cards to make the finished article as follows:



Page Tooltips on Grid Visuals

The matrix and table visuals do not automatically display Page tooltips.

You will set up the Profit Tooltip to be launched by the matrix in your Matrix hierarchies tab.

1. Go to your **Matrix hierarchies** tab and select the matrix.
2. From the **Paint Roller**, set **Tooltip -> Page** to **Profit Tooltip.**

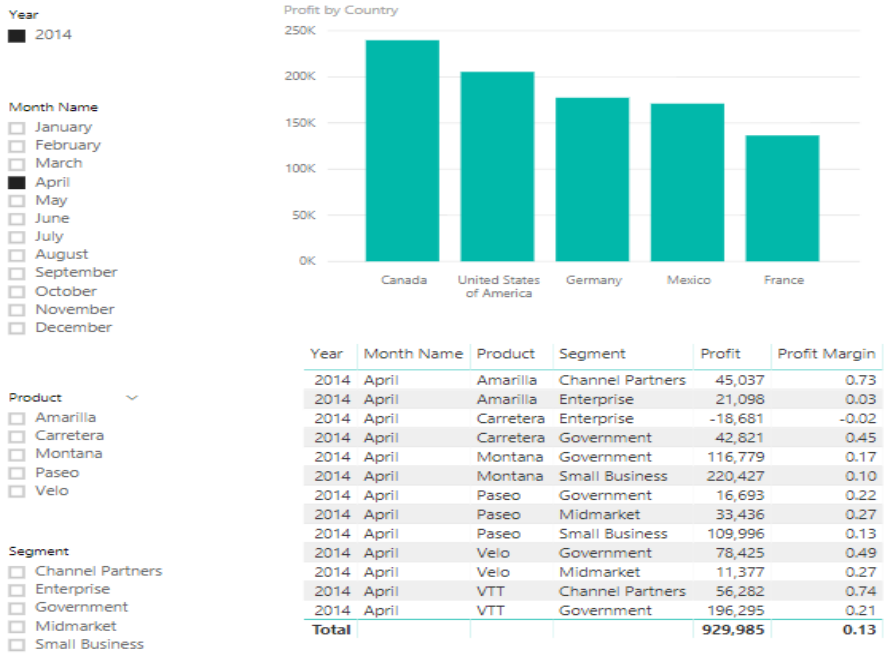
Exercise 5-4 Slicers

The Business Intelligence community has adopted a kitchen metaphor for filtering data: *Slicing* and *Dicing*. As such, interactive filtering mechanisms are often called “Slicers”.

In this exercise you will explore the interaction of slicers with other visuals and also with each other.

1. Add a new report page and call it **Slicers**.
2. Add a slicer visual, top left:  Make **Year** its Field.
3. Add three more slicers below, setting their **Field** to respectively: **Month, Product, Segment**.
4. Set your slicer widths to be narrow, and place them on the left-hand side of the report canvas.
5. Add a stacked column chart to the remaining top half of the report, with a **Country Axis** and **Profit Value**.
6. Add a table below with Fields: **YM, Product, Segment, Profit** and **Profit Margin**.

The report should look similar to this:



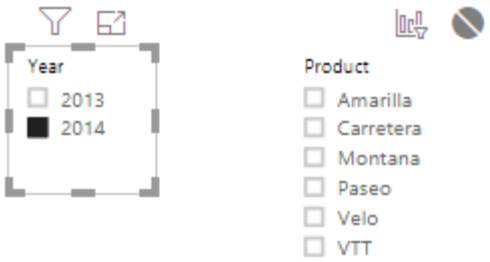
Year	Month Name	Product	Segment	Profit	Profit Margin
2014	April	Amarilla	Channel Partners	45,037	0.73
2014	April	Amarilla	Enterprise	21,098	0.03
2014	April	Carretera	Enterprise	-18,681	-0.02
2014	April	Carretera	Government	42,821	0.45
2014	April	Montana	Government	116,779	0.17
2014	April	Montana	Small Business	220,427	0.10
2014	April	Paseo	Government	16,693	0.22
2014	April	Paseo	Midmarket	33,436	0.27
2014	April	Paseo	Small Business	109,996	0.13
2014	April	Velo	Government	78,425	0.49
2014	April	Velo	Midmarket	11,377	0.27
2014	April	VTT	Channel Partners	56,282	0.74
2014	April	VTT	Government	196,295	0.21
Total				**929,985**	**0.13**

Exercise 5-5 Edit Interactions

The filtering interactions between all these visuals may now confuse some users. Fortunately, you can control which visuals filter which other visuals.

1. Select any visual and from the **Format** tab click the **Edit Interactions** button to toggle it on.

   Icons appear on target visuals to enable them to be filtered or not filtered by the selected source visual:



2. As shown above, with the **Year** slicer selected, clicking to set the **Product** circle black will disable cross filtering of the Product slicer from the Year slicer.

3. Set all interactions so that **none of the slicers is cross filtered by any other visual**.

4. Click the **Edit Interactions** button to deselect it.

5. Experiment with different slicer settings to verify that the report is more usable.

   NB use **Ctrl–Click** to select multiple values in each slicer.

6. Experiment with the **Selection** controls in the **Format** view. For example, try switching on **Select All**, and switching off **Multi-select with CTRL**.

Exercise 5-6 Add a Reset Button

1. From the **Insert** tab in the **Elements** group click the **Buttons** drop-down and insert a **Reset** button onto your report canvas.
2. Reposition and if necessary, resize existing visuals so the reset button can remain in the top left corner.
3. From the **View** tab click the **Bookmarks** checkbox, to display the bookmarks pane.
4. Clear all slicers and filter selections.
5. In the **Bookmarks** pane click **Add**.
6. A new bookmark called **Bookmark 1** is created.
7. Rename **Bookmark 1** to: **Reset Slicers Report Page**
8. Select the **Reset** button and expand **Action** in the **Visualisation** pane.
9. Switch **Action** on, set **Type** to **Bookmark** and set **Bookmark** to **Reset Slicers Report Page**.
10. Set appropriate **Tooltip** text, e.g. **Clear Slicers**

    Now, **Ctrl-click** on the **Reset** button clears all filtering on this report page.

    (When uploaded to the Power BI Service users only have to Click, not Ctrl-click.)

Congratulations: you have completed all Chapter 5 exercises.

Chapter 6 – Conditional formatting

Exercise 6-1 Add traffic light icons to data

We saw Conditional Formatting with data bars in Chapter 2. Conditional Formatting also allows colour modification of some of the text and chart elements in some visuals. It also allows you to specify icons that look like KPIs. Let's start with Icons.

You will make two scorecards that show Segment performance by respectively Profit and Profit Margin:

1. Create a new page and call it **Icons**.
2. From the **Insert** menu insert a **Textbox** at the top of your report canvas, that in large letters says: **Default Icons**

3. Place a matrix beneath the Textbox, with fields:
   9. Rows: **Segment**
   10. Columns: **Discount Band**
   11. Values: **Profit**

4. In **Format** view:
   - Set **General** -> **Title -> Text** to **Profit**
   - Use **Cell elements** to switch on **Icons** for the Matrix
   - Use **Column headers -> Header alignment** to **centre** the headers

5. Copy and paste the Matrix visual, and move the copy beneath the first one.
6. In the lower matrix change **Values** and **Title** to **Profit Margin.**
7. Adjust column widths to visually line up.

The result should look something like as follows:

Profit

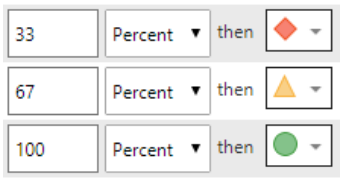
Segment	None	Low	Medium	High	Total
Channel Partners	166,482	313,350	425,838	411,133	**1,316,803**
Enterprise	61,000	101,776	(154,953)	(622,369)	**(614,546)**
Government	1,117,223	4,087,626	3,425,938	2,757,386	**11,388,173**
Midmarket	96,850	128,913	209,601	224,739	**660,103**
Small Business	294,900	1,557,194	1,673,098	617,977	**4,143,169**
Total	**1,736,455**	**6,188,858**	**5,579,523**	**3,388,867**	**16,893,702**

Profit Margin

Segment	None	Low	Medium	High	Total
Channel Partners	75%	74%	73%	71%	**73%**
Enterprise	4%	2%	-3%	-10%	**-3%**
Government	27%	25%	22%	17%	**22%**
Midmarket	33%	31%	29%	24%	**28%**
Small Business	17%	15%	10%	5%	**10%**
Total	**22%**	**18%**	**14%**	**9%**	**14%**

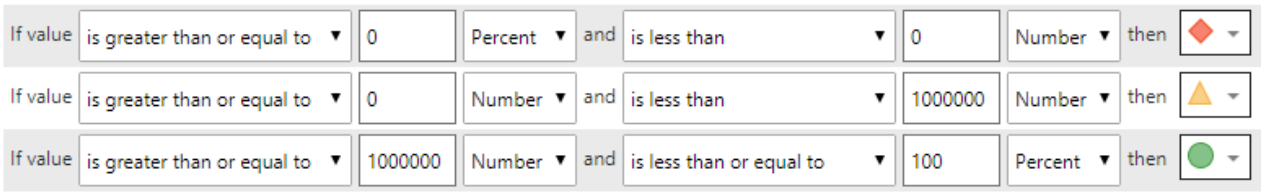
Adjusting Icon Rules

The default rules for allocating icons is to break up the scale into a number of intervals matching the number of icons. In the above case three equal intervals are created and presented as Percentages of the whole scale:



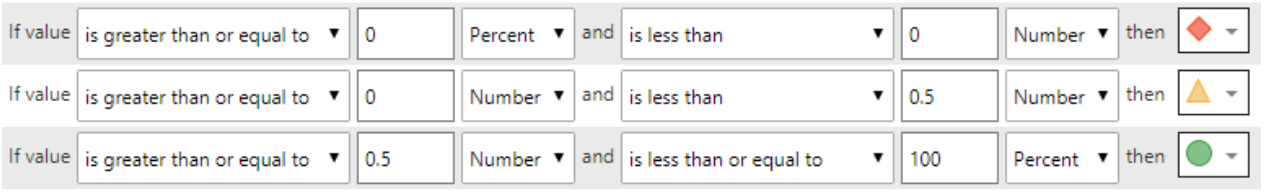
You will next set up rules based on absolute values on a copy of your Icons report page.

1. On your **Icons** report tab **Right-Click** -> **Duplicate**. Name the new tab **Icon Rules**
2. Change the **Textbox** to say **Icons set by Rules**
3. For your **Profit** matrix, under the **Icons** setting click the Advanced controls link, and enter the following set of rules:



Note: Minimum and maximum values can still be specified as **0** and **100 Percent** respectively.

2. Try these rules for **Profit Margin**:



The result is as follows:

Profit

Segment	None	Low	Medium	High	**Total**
Channel Partners	166,482	313,350	425,838	411,133	**1,316,803**
Enterprise	61,000	101,776	(154,953)	(622,369)	**(614,546)**
Government	1,117,223	4,087,626	3,425,938	2,757,386	**11,388,173**
Midmarket	96,850	128,913	209,601	224,739	**660,103**
Small Business	294,900	1,557,194	1,673,098	617,977	**4,143,169**
Total	**1,736,455**	**6,188,858**	**5,579,523**	**3,388,867**	**16,893,702**

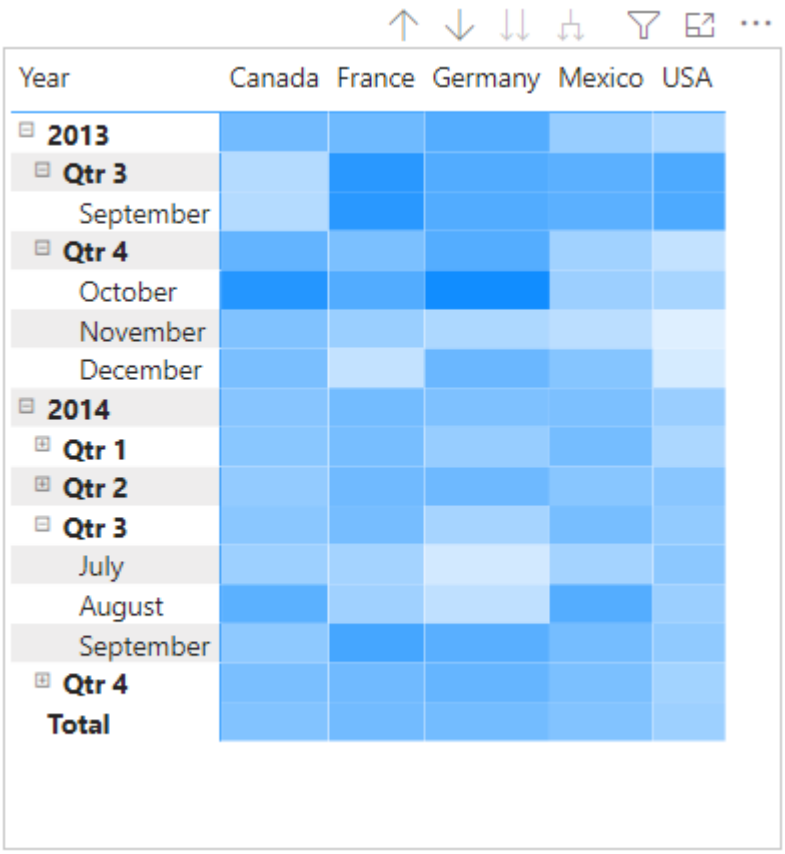
Profit Margin

Segment	None	Low	Medium	High	**Total**
Channel Partners	75%	74%	73%	71%	**73%**
Enterprise	4%	2%	-3%	-10%	**-3%**
Government	27%	25%	22%	17%	**22%**
Midmarket	33%	31%	29%	24%	**28%**
Small Business	17%	15%	10%	5%	**10%**
Total	**22%**	**18%**	**14%**	**9%**	**14%**

Exercise 6-2 Create a heat map

You will create a shaded Heat Map to show Profit Margin by Country over time.

1. Add a new report page called **Heat Map**.
2. Add a **Matrix**, and from the **financials** table and drag:
   - **Date** to **Rows** (Leave date hierarchy in place, but **remove Day**)
   - **Country** to **Columns**
   - **Profit Margin** to **Values**
3. From **Format** view:
   - Turn **General -> Tooltips** to **Off**
   - Turn **Column -> Subtotals** to **Off**
   - In **Visual -> Cell elements** turn on:
     - **Background colour**
     - **Font colour**
4. Still in **Cell elements**, click the **Background colour** *fx* button, change the **Apply to** drop down to **Values and totals**, and click **OK.**
5. Do the same for **Font colour**.
6. Drill on rows to see something like as follows:



Exercise 6-3 Colour numbers beyond a threshold red

You will use **Field Value** Conditional formatting to colour Profit Margins below 12% Red.

Power BI supports the 147 standard colours defined in section 4.3 of this Internet standard document: https://www.w3.org/TR/css-color-3/#svg-color The first few are shown below:

Named	Numeric	Color name	Hex rgb	Decimal
		aliceblue	#F0F8FF	240,248,255
		antiquewhite	#FAEBD7	250,235,215
		aqua	#00FFFF	0,255,255
		aquamarine	#7FFFD4	127,255,212
		azure	#F0FFFF	240,255,255
		beige	#F5F5DC	245,245,220
		bisque	#FFE4C4	255,228,196
		black	#000000	0,0,0
		blanchedalmond	#FFEBCD	255,235,205
		blue	#0000FF	0,0,255
		blueviolet	#8A2BE2	138,43,226
		brown	#A52A2A	165,42,42
		burlywood	#DEB887	222,184,135
		cadetblue	#5F9EA0	95,158,160
		chartreuse	#7FFF00	127,255,0
		chocolate	#D2691E	210,105,30
		coral	#FF7F50	255,127,80
		cornflowerblue	#6495ED	100,149,237

You will use just one colour: **Red**.

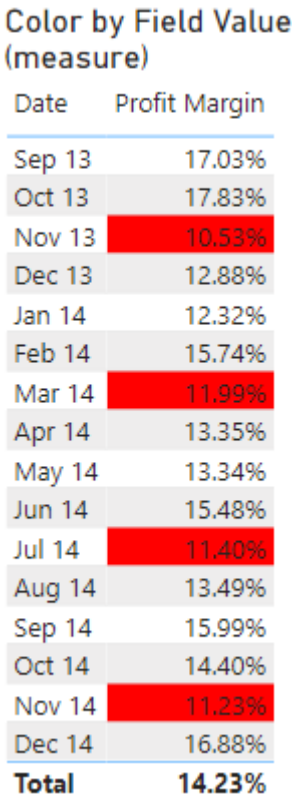
1. Create a new report tab called **Red Highlight**.
2. Create the following measure:

```
RedProfitWarning = IF([Profit Margin] < 0.12, "Red")
```

3. Add a **Table** to the canvas, and from the **financials** table add fields:
   - Date
   - Profit Margin
4. Add a **Title:** `Color by Field Value (measure)`

5. From **Format** view apply: **Cell elements**-> **Profit Margin** field -> switch on **Background Color**
6. Click ***fx*** button -> drop down **Format Style**-> **Field value**
7. Drop down **What field should we base this on?**
8. In the **Search** box type: **warning,** then select field: **financials** -> **`RedProfitWarning`**

The result looks as follows:



Color by Field Value (measure)

Date	Profit Margin
Sep 13	17.03%
Oct 13	17.83%
Nov 13	10.53%
Dec 13	12.88%
Jan 14	12.32%
Feb 14	15.74%
Mar 14	11.99%
Apr 14	13.35%
May 14	13.34%
Jun 14	15.48%
Jul 14	11.40%
Aug 14	13.49%
Sep 14	15.99%
Oct 14	14.40%
Nov 14	11.23%
Dec 14	16.88%
Total	**14.23%**

Congratulations: you have completed all Chapter 6 exercises.

Chapter 7 – Publishing online

If you and your colleagues have Pro licenses, let me know and I will team you up in pairs for these exercises.

Optional Exercise 7-1 Install Power BI Mobile App

1. On you mobile install the Power BI Mobile App
2. Log your mobile App into the Power BI Service with your Pro license, or as:

   User: student2@jbinternational.co.uk

   Password: Pa$$w0rd (0 = zero)

Instructor Demo 7-2 Publish Report to Power BI Service, and Share it

Steps:

1. **Publish** your report into the Power BI Service -> **My Workspace**, while logged in as **student1**.
2. Go to the **Power BI Service** in your Browser.
3. Create a new **Workspace** and **Save a Copy** of your report into it.
4. View the list of objects in the new Workspace.
5. See how to include/exclude objects from the workspace **App**, if saved as an App.
6. Share the report with the other user, (**student2** in my case).
7. (Me only) Login as **student2**.
8. Go to the **Shared with me** section to see the Report newly shared with you/student2.

Instructor Demo 7-3 Create Dashboard online, setup and test an Alert

Steps:

1. Navigate to **My workspace -> Reports -> Financials** the **Value Bands** page of your report
2. **Pin** the **Card** visual to a new Dashboard, named **My Dashboard**
3. Go to the new **My Dashboard**
4. From the ellipsis (…) top-right of the Dashboard's Card tile, choose **Manage Alerts**.
5. Set the Costs threshold to **100,000,000** (without the commas), and **Save**.
6. Back in **Excel financials** table in **Financials Sample2.xlsx** add something to the **Cost** figure in one of the data rows.
7. In **Power BI Desktop**, note the figure on the Card visual in the Value Bands tab.
8. From the **Home** menu click **Refresh**, and verify that the **Costs** figure has increased.
9. **Republish** your report to the same place in the Power BI Service.
10. Back in the **Power BI Service**, **refresh** the webpage.

    You should see that:
    - The bell icon contains a notification. 
    - A notification has appeared on your phone

Congratulations: you have completed Chapter 7 exercises, and the course.

Please fill in an evaluation form using the link provided by the instructor.

Appendix 1 – Power Query Parameters

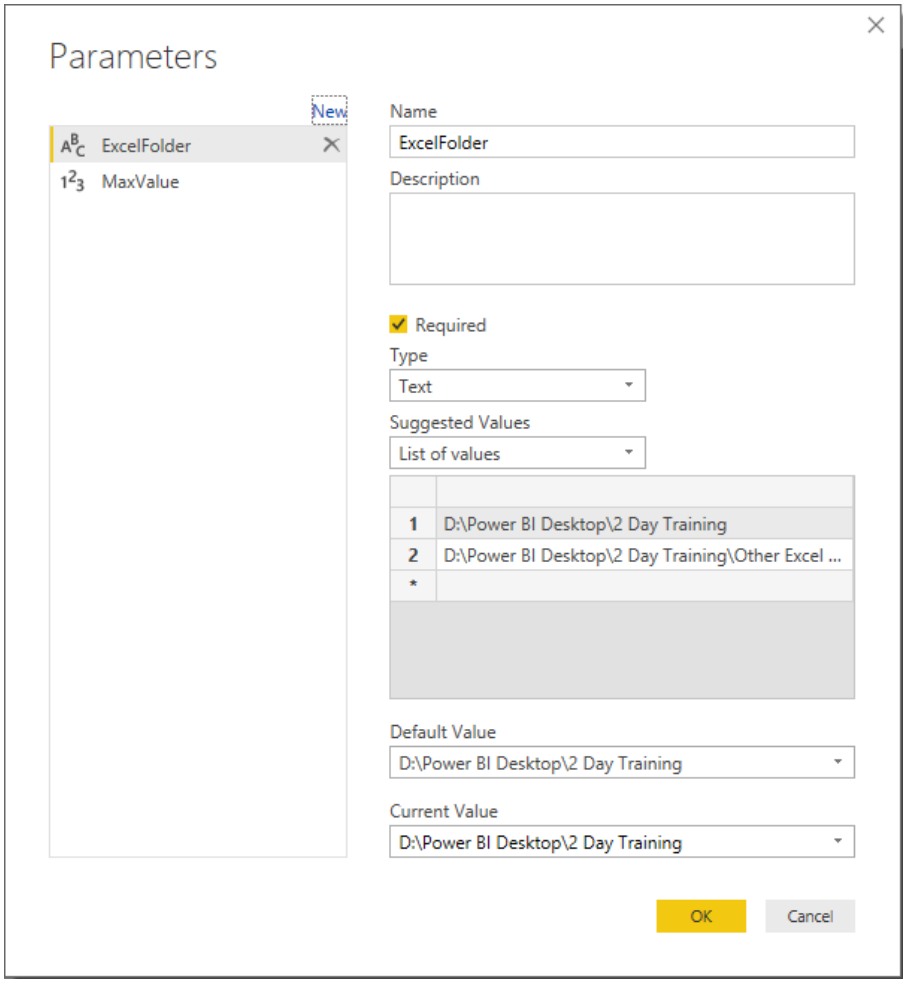
You will set the source folder of multiple spreadsheets to be dependent on a parameter. This means if the source moves, or is stored repeatedly in multiple locations, you only have to make the appropriate parameter selection, instead of recoding every query.

Exercise A-1 Add a Source Folder Parameter

1. Go back to your **Unpivot** report page.

You are going to parameterise the source of this FruitSales data.

2. In Power Query, **Right-click** in the **Queries** pane away from any queries.
3. Choose **New Parameter** and set its name to: **ExcelFolder**
4. Set **Type** to **Text**
5. Set **Suggested Values** to **List of Values**
6. **Double click** in row **1** and enter the name of your current Excel folder path.
7. Enter another folder path so you have at least two folder options, e.g.
   - D:\Power BI Desktop\2 Day Training
   - D:\Power BI Desktop\2 Day Training\Other Excel Files



8. Ensure **Current Value** is set to the folder where your existing **`Transpose and Unpivot Sample.xlsx`** file resides.

9. Amend the **Source** step for both **FruitSales** and **MonthSort** queries as follows:

```
= Excel.Workbook(File.Contents(ExcelFolder & "\Transpose and Unpivot Sample.xlsx"), null, true)
```

Exercise A-2 Use and Test Source Folder Parameter

10. Copy the **`Transpose and Unpivot Sample.xlsx`** file to the other folder listed in your **ExcelFolder** parameter.

11. Amend the data in your new copy of the spreadsheet. For example, change the month numbering to fiscal months:

10	Jan
11	Feb
12	Mar
1	Apr
2	May
3	Jun

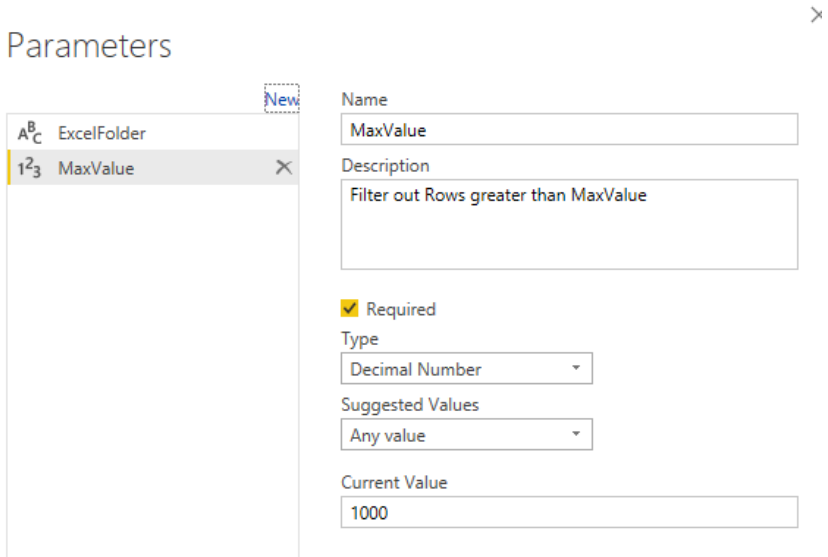
12. Save the change in Excel.

13. Back in Power BI, use **Home** -> **Edit Queries** -> **Edit Parameters** to test switching the source folder for FruitSales data.

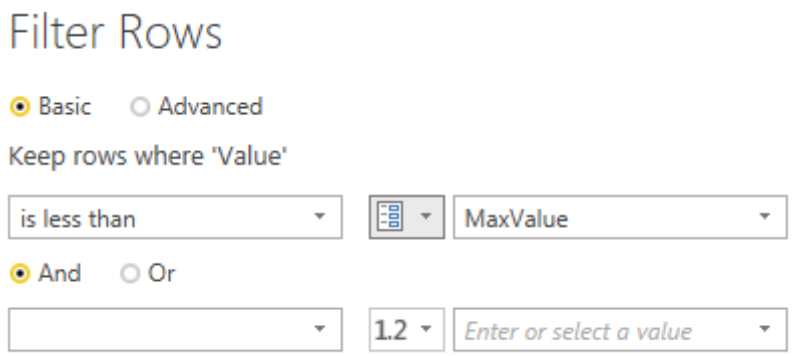
    Note: You are prompted to **Apply Changes** when you change the source folder parameter value.

Exercise A-3 Add a Parameter to filter source data

1. Add the following new Parameter:



2. Add a row filter to the **FruitSales** Query for the **Value** column:



Exercise A-4 Set Multiple Parameter Values

1. Close Power Query

2. In Power BI from the **Home** tab, click the **Edit Queries** dropdown and choose **Edit Parameters**.

3. Observe that you can select the **ExcelFolder** and **MaxValues** parameters for the source of your next data refresh.

Congratulations, you have completed Appendix 1.

Appendix 2 – Gannt Chart

Exercise A-5 Microsoft Gannt chart

Getting started

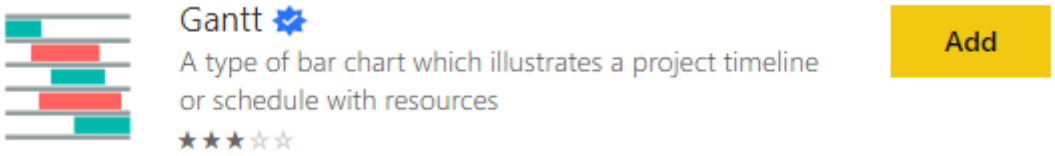
You will import and use the Microsoft Gannt chart to display sample data.

1. Open sample file **GanntData.xlsx** in Excel to familiarise yourself with the data.

This GanntData table contains nine columns of project management and cost data, all of which can be usefully displayed by the Microsoft Gannt chart. The table contains 15 rows, 13 of which are unique tasks, and two milestones.

2. Create a new report page called **Gannt.**
3. From the **Home** tab click **Excel** and select **GanntData.xlsx**
4. **Load** the **GanntData** table into your Power BI data model.
5. From the Gallery of visuals, click **... -> Get more visuals**
6. When the Dialog window comes up **Search** for **Gannt**

The one you want looks as follows:



7. Click **Add** to import this visual into your copy of Power BI Desktop.

You should see a new icon for it appear beneath you existing visuals gallery.

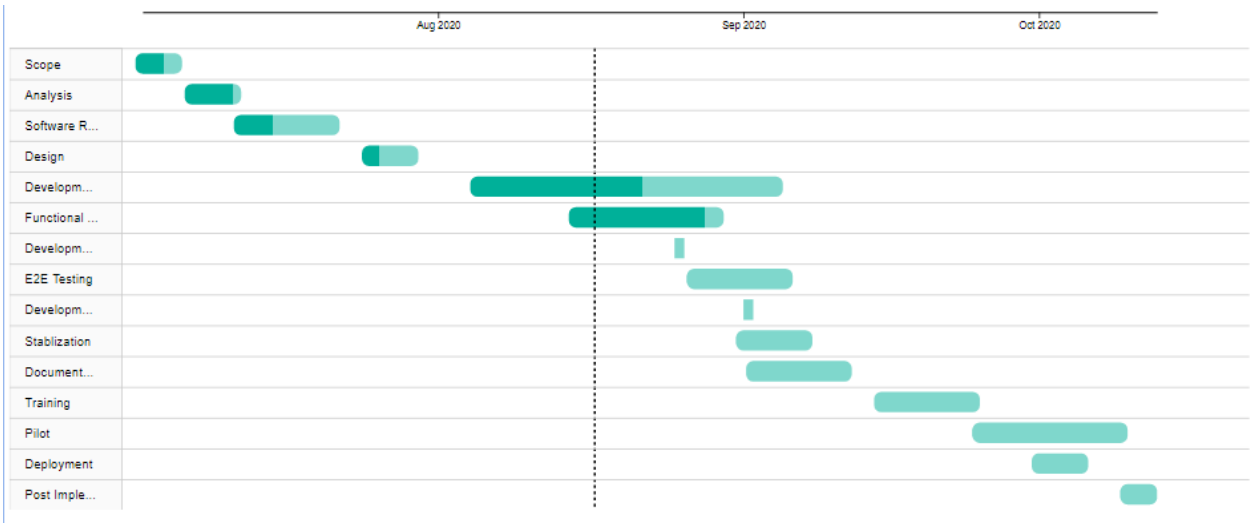
8. Add this Gannt visual to your blank report page
9. Expand it to take up the entire page apart from about a 10% unused blank strip at the top.
10. Assign fields as follows:
    12. **Task Name** to **Task**
    13. **Start** to **Start Date**
    14. **Duration** to **Duration**
    15. **%Completion** to **%Completion**

11. Hover over a green task to see a tooltip.

We have some problems. Dates are in American format.

12. In Paint roller view set:
    16. **Tooltip Settings -> Date format** to **dd MMM yyyy**
    17. **Date Type -> Type** to **Month**
    18. **Title** disabled
    19. **Task Settings -> Height** to **30**

The result should look as follows:

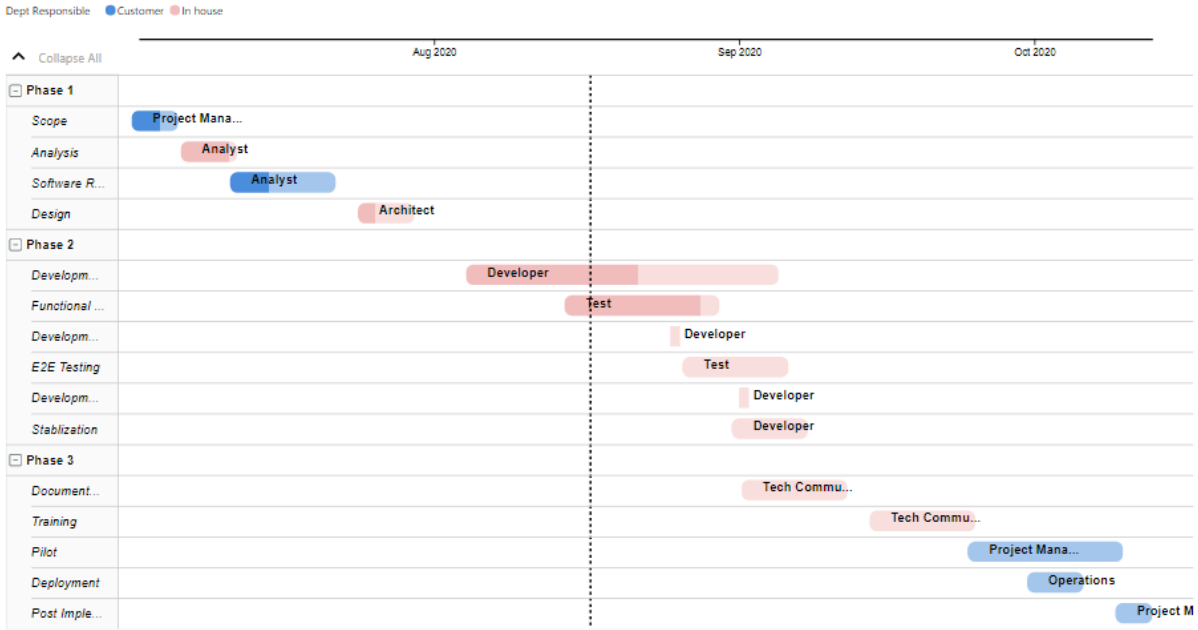


13. Assign further fields as follows:
    20. **Resource** to **Resource**
    21. **Dept Responsible** to **Legend**
    22. **Phase** to **Parent**
    23. **Cost** to **Tooltip**

Let's improve the default Legend colours and a couple of other settings.

14. In Paint roller view set:
    24. **Legend -> Position** to **Top**
    25. **Legend ->** color of **In house** to a pale mauve colour
    26. **Data Labels -> Position** to **Inside**

The result is as follows with collapsible Phases:



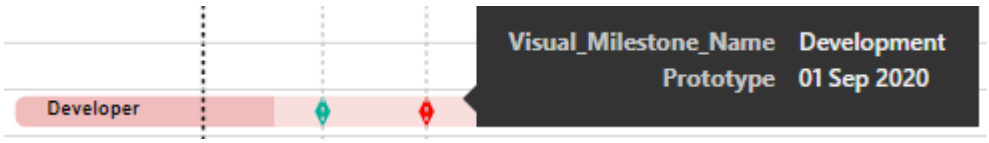
Milestones

1. Assign the **Milestone** field to **Milestones**

The next step will combine these milestones with the task they are part of, and distinguish them by color.

2. In Paint roller view set:
   11. **General -> Group Tasks** to **On**
   12. **Milestones -> Prototype** color to something different, such as **Red**

The result is as follows, with Milestone type, as defined in the data in its own reduced-sized tooltip:

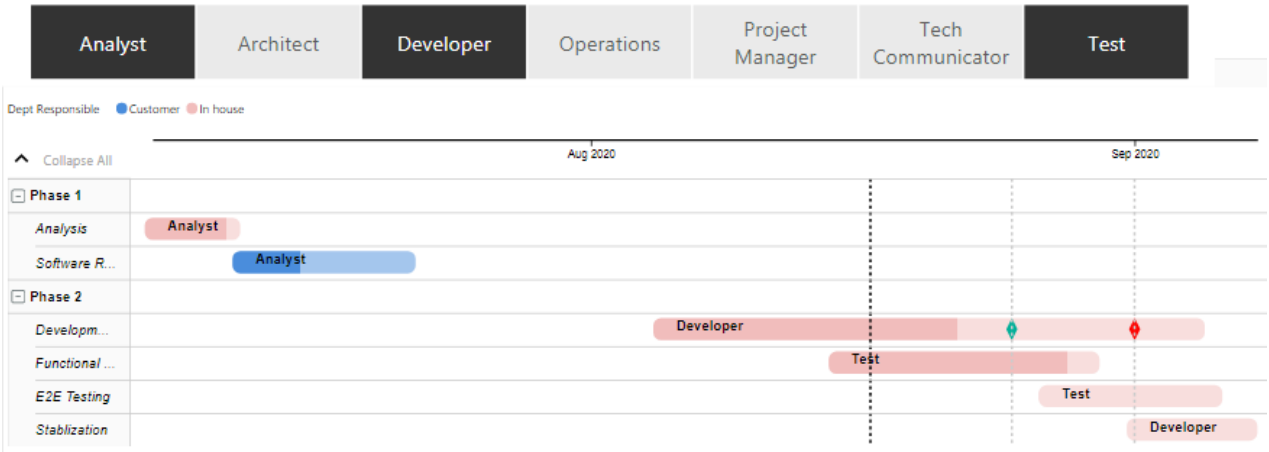


Horizontal Slicer

Different parts of the Gannt chart can be displayed or hidden by a slicer.

1. Add a slicer visual to the top above the Gannt chart.
2. Set its **Field** to **Resources**
3. From **Paint roller** set:
   13. **General -> Orientation** to **Horizontal**
   14. **Selection controls -> Multi-select with CTRL** to **Off**
   15. **Slicer header** to **Off**
4. Expand the slicer width as appropriate.

The result should look as follows:



Congratulations: You have completed Appendix 2.