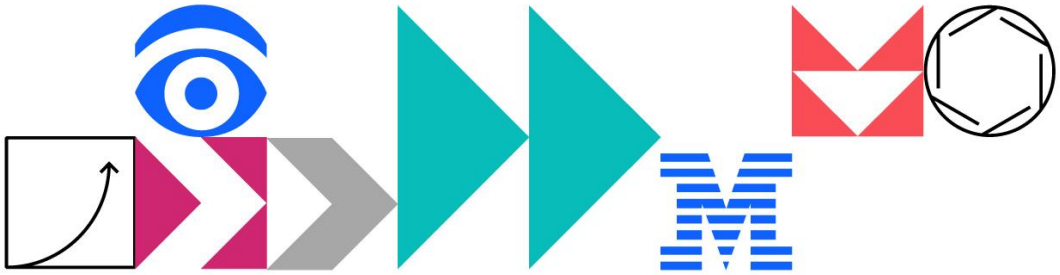
IBM TechXchange



Dive into Universal Reports with Planning Analytics for Excel

Session 4315

Lab Exercise Guide

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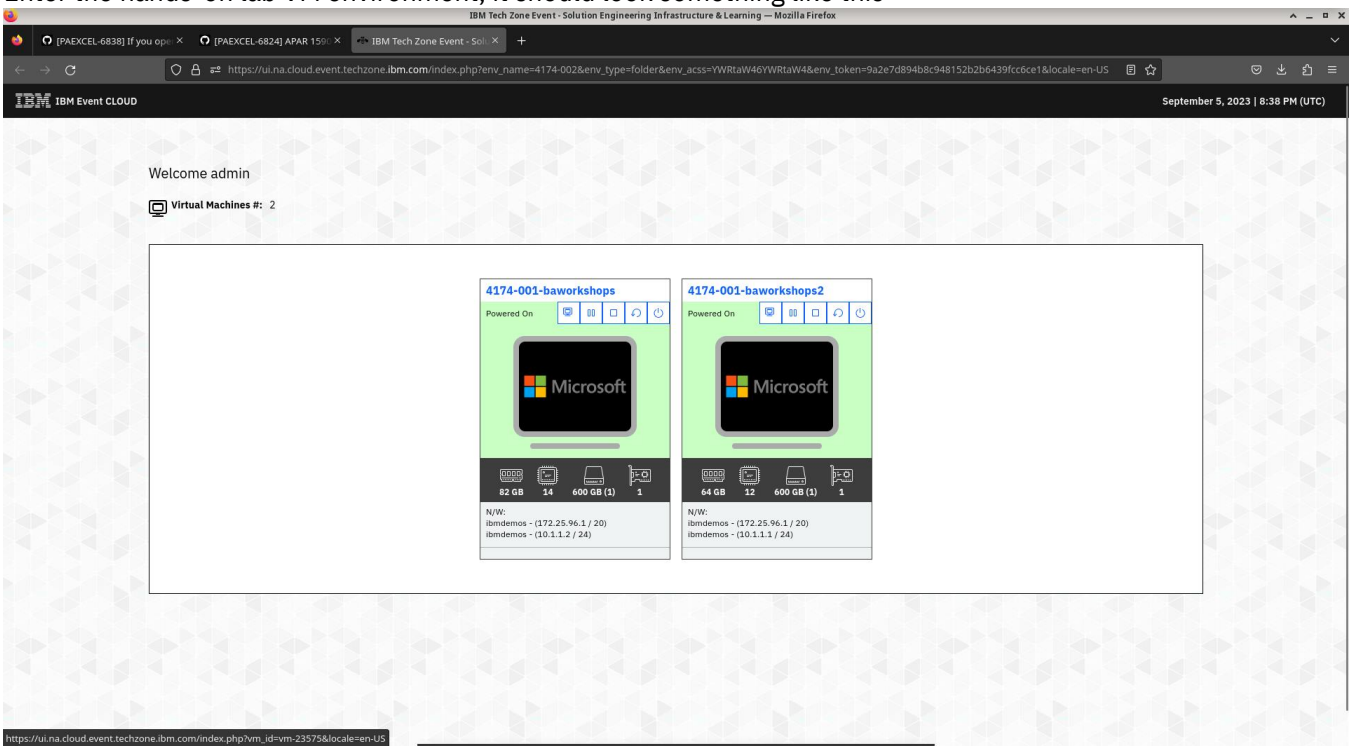
Table of Contents

1 Getting Started

Note any updates provided by the session speakers.

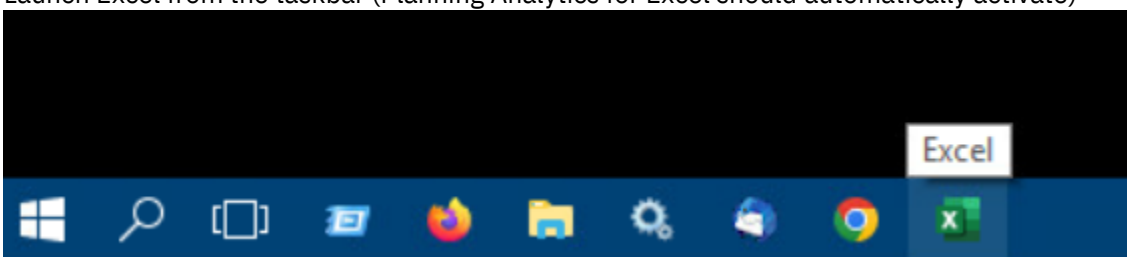
Enter the hands-on lab VM environment, it should look something like this



Click the appropriate workshop VM tile (you may only have one option; the name may vary)

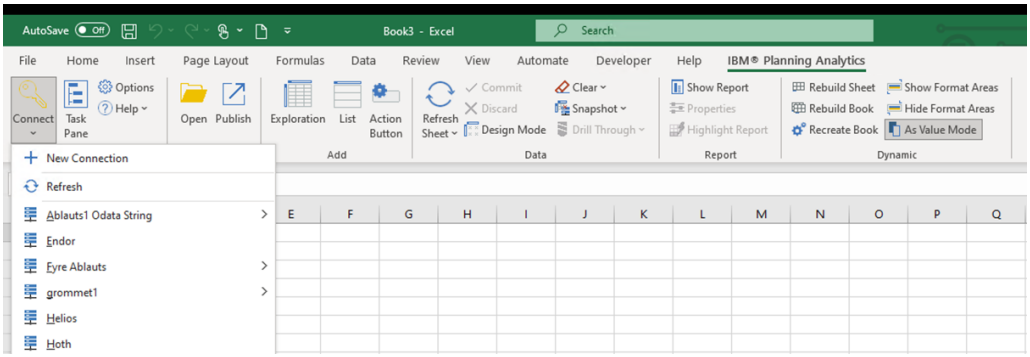
You can click on the diagram of the ‘screen’ to open it

Launch Excel from the taskbar (Planning Analytics for Excel should automatically activate)



2 Exercise – Intro to Universal Reports and customizing formats

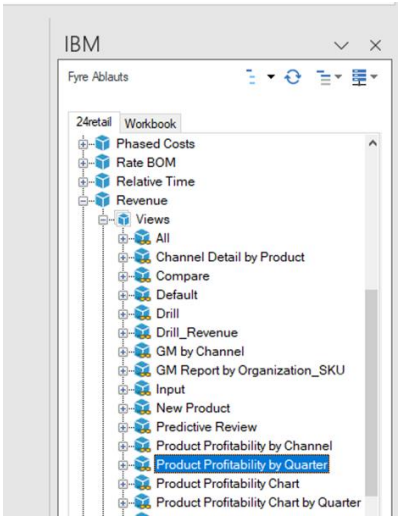
2.1.1 **Connect to Planning Analytics Server**



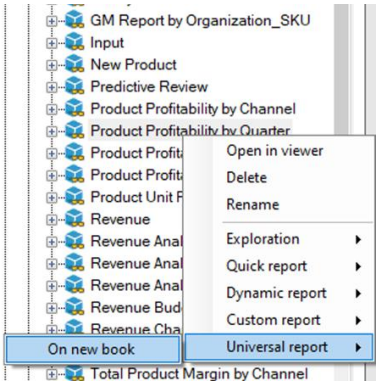
Server: IBM Demos
User ID: pm
Password: IBMDem0s
Database: 24retail

2.1.2 **Create Report**

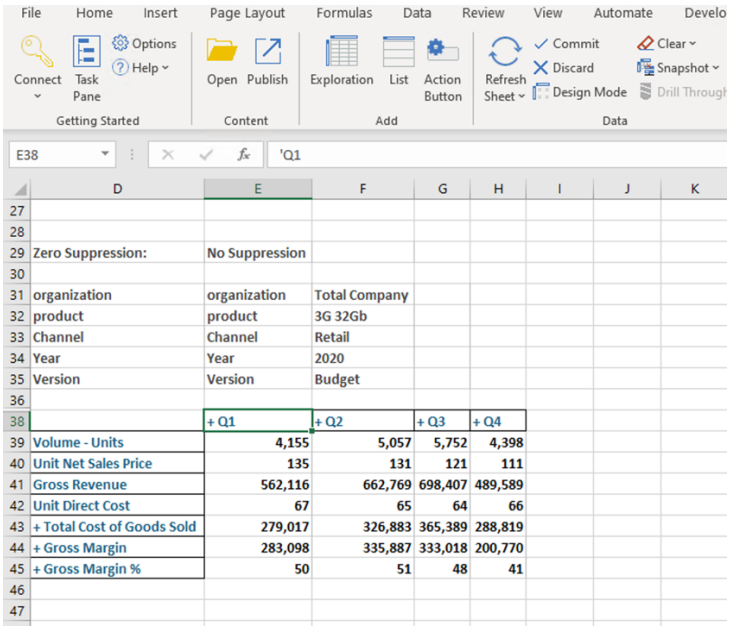
Find the Revenue cube in the task pane and navigate to “Product Profitability by Quarter” view.



Right click on “Product Profitability by Quarter” and select “Universal report / On new book”



Your new report should be like this:



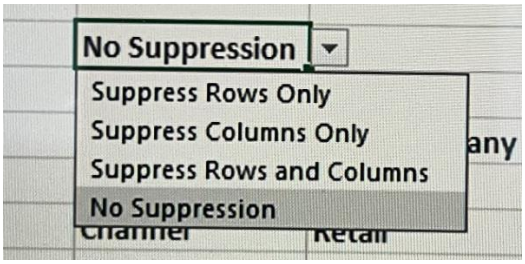
	D	E	F	G	H	I	J	K
27								
28								
29	Zero Suppression:	No Suppression						
30								
31	organization	organization	Total Company					
32	product	product	3G 32Gb					
33	Channel	Channel	Retail					
34	Year	Year	2020					
35	Version	Version	Budget					
36								
38		+ Q1	+ Q2	+ Q3	+ Q4			
39	Volume - Units	4,155	5,057	5,752	4,398			
40	Unit Net Sales Price	135	131	121	111			
41	Gross Revenue	562,116	662,769	698,407	489,589			
42	Unit Direct Cost	67	65	64	66			
43	+ Total Cost of Goods Sold	279,017	326,883	365,389	288,819			
44	+ Gross Margin	283,098	335,887	333,018	200,770			
45	+ Gross Margin %	50	51	48	41			
46								
47								

Explore report by expanding rows, columns and explore the Suppression feature.

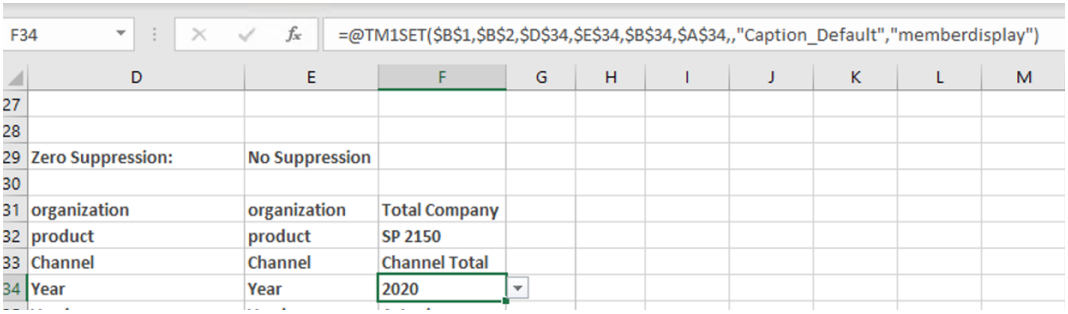
	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
27															
28															
29	Zero Suppression:	No Suppression													
30															
31	organization	organization	Total Company												
32	product	product	SP 2150												
33	Channel	Channel	Retail												
34	Year	Year	2020												
35	Version	Version	Actual												
36															
38		- Q1	Jan	Feb	Mar	- Q2	Apr	May	Jun	- Q3	Jul	Aug	Sep	- Q4	Oct	No
39	Volume - Units	613	204	205	204	606	203	203	200	581	200	200	180	733	239	
40	Unit Net Sales Price	1,208	1,213	1,208	1,203	1,193	1,198	1,193	1,188	1,165	1,184	1,179	1,127	1,165	1,170	
41	Gross Revenue	739,714	247,108	247,484	245,123	722,746	242,788	241,817	238,140	676,200	237,188	236,239	202,773	854,013	279,614	
42	Unit Direct Cost	769	765	772	770	764	763	763	766	760	772	766	740	614	623	
43	- Total Cost of Goods Sold	470,920	155,840	158,110	156,970	462,960	154,700	154,700	153,560	441,320	154,700	153,560	133,060	450,450	149,010	
44	Direct COGS	467,920	154,840	157,110	155,970	459,960	153,700	153,700	152,560	438,320	153,700	152,560	132,060	447,450	148,010	
45	Indirect COGS	3,000	1,000	1,000	1,000	3,000	1,000	1,000	1,000	3,000	1,000	1,000	1,000	3,000	1,000	
46	+ Gross Margin	268,794	91,268	89,374	88,153	259,786	88,088	87,117	84,580	234,880	82,488	82,679	69,713	403,563	130,604	
47	- Gross Margin %	36	37	36	36	36	36	36	36	35	35	35	34	47	47	
48	- Gross Margin	268,794	91,268	89,374	88,153	259,786	88,088	87,117	84,580	234,880	82,488	82,679	69,713	403,563	130,604	
49	Gross Revenue	739,714	247,108	247,484	245,123	722,746	242,788	241,817	238,140	676,200	237,188	236,239	202,773	854,013	279,614	
50																

Universal Reports New Capabilities to explore:

Zero Suppression is now available on the sheet.

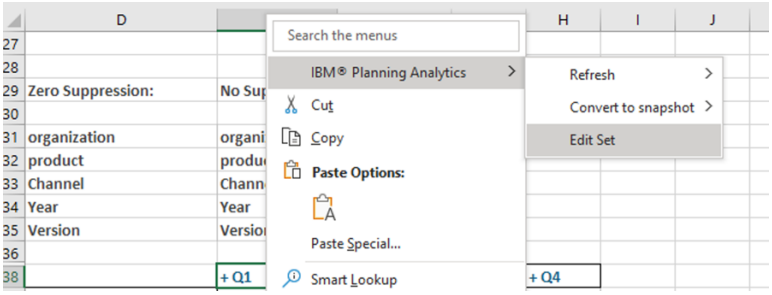


TM1SET widely used, which means you can use Hierarchies for each dimension.

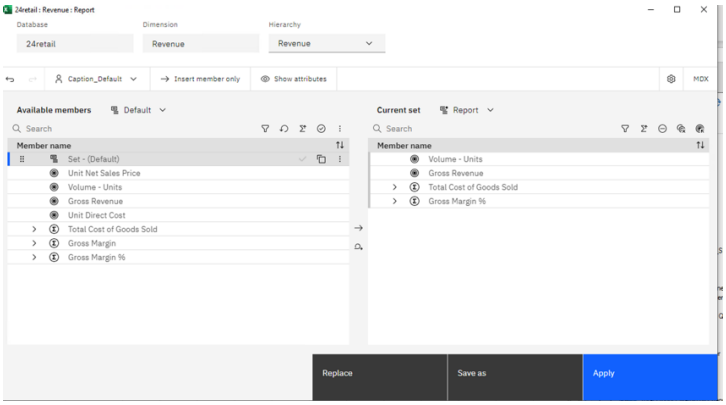


Edit Set

Universal Reports allows users to change the content of the report Rows and Columns using “Edit Set”. Users can right click on any row or column header, then select “Edit Set” on the “IBM Planning Analytics” menu.



Use Set Editor to change Row or Column content. Hierarchies are fully supported.

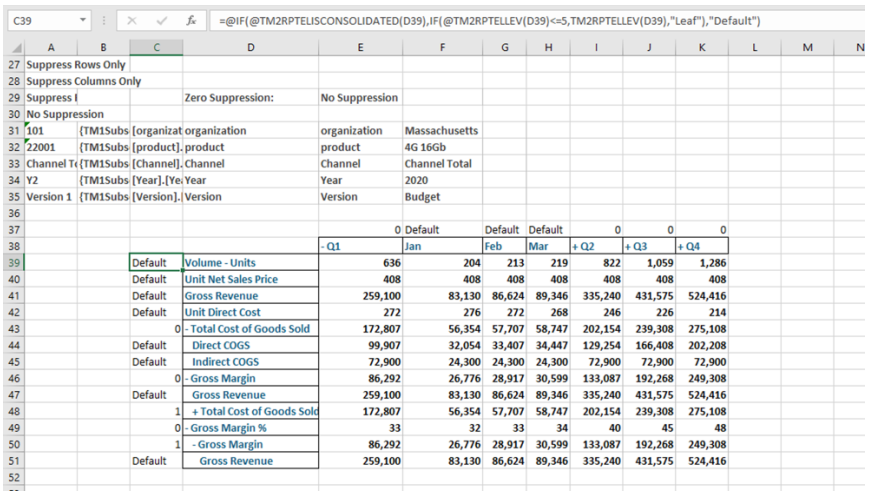


7					
8					
9	Zero Suppression:	No Suppression			
10					
11	organization	organization	Total Company		
12	product	product	SP 2150		
13	Channel	Channel	Channel Total		
14	Year	Year	2020		
15	Version	Version	Actual		
16					
18		+ Q1	+ Q2	+ Q3	+ Q4
19	Volume - Units	941	938	935	1,133
20	Gross Revenue	1,130,769	1,118,797	1,088,401	1,319,473
21	+ Total Cost of Goods Sold	717,310	707,290	695,950	734,950
22	+ Gross Margin %	37	37	36	44
23					
24					
25					

2.1.3 **Formatting Reports**

Universal Reports use standard MS Excel conditional formatting function. Formatting rules that allow you to control the format of the Row Headers, Column Headers and number grid are included. Defaults are supplied; however, you are free to setup your own custom formatting rules as required.

Unhide the first column to the left of the report row headers.
Unhide row immediately above the column headers.

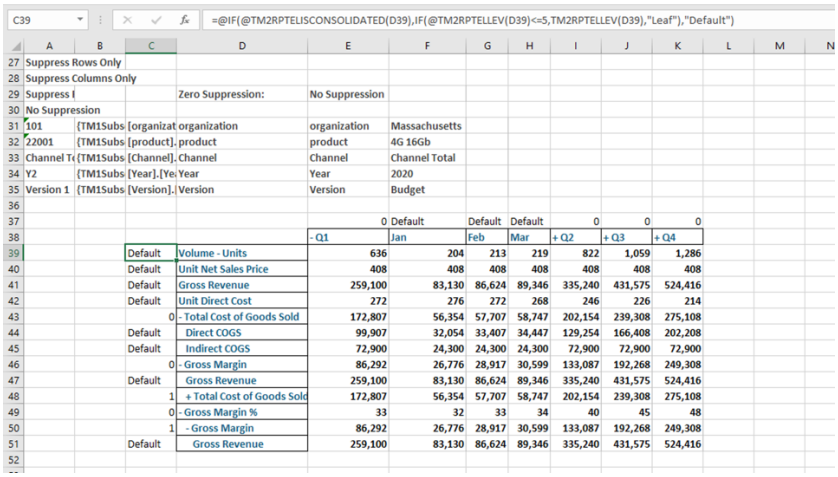


Suppress Rows Only												
Suppress Columns Only												
Suppress I			Zero Suppression:	No Suppression								
No Suppression												
101	{TM1Subs	[organizat	organization	organization	Massachusetts							
22001	{TM1Subs	[product],	product	product	4G 16Gb							
Channel T	{TM1Subs	[Channel],	Channel	Channel	Channel Total							
Y2	{TM1Subs	[Year].[Ye	Year	Year	2020							
Version 1	{TM1Subs	[Version].	Version	Version	Budget							
				0	Default	Default	Default	0	0	0		
				- Q1	Jan	Feb	Mar	+ Q2	+ Q3	+ Q4		
		Default	Volume - Units	636	204	213	219	822	1,059	1,286		
		Default	Unit Net Sales Price	408	408	408	408	408	408	408		
		Default	Gross Revenue	259,100	83,130	86,624	89,346	335,240	431,575	524,416		
		Default	Unit Direct Cost	272	276	272	268	246	226	214		
		0	- Total Cost of Goods Sold	172,807	56,354	57,707	58,747	202,154	239,308	275,108		
		Default	Direct COGS	99,907	32,054	33,407	34,447	129,254	166,408	202,208		
		Default	Indirect COGS	72,900	24,300	24,300	24,300	72,900	72,900	72,900		
		0	- Gross Margin	86,292	26,776	28,917	30,599	133,087	192,268	249,308		
		Default	Gross Revenue	259,100	83,130	86,624	89,346	335,240	431,575	524,416		
		1	+ Total Cost of Goods Sold	172,807	56,354	57,707	58,747	202,154	239,308	275,108		
		0	- Gross Margin %	33	32	33	34	40	45	48		
		1	- Gross Margin	86,292	26,776	28,917	30,599	133,087	192,268	249,308		
		Default	Gross Revenue	259,100	83,130	86,624	89,346	335,240	431,575	524,416		

An IF statement has been created, it provides a value for each row and column. This is the value that is referenced in the MS Excel custom formatting rules.

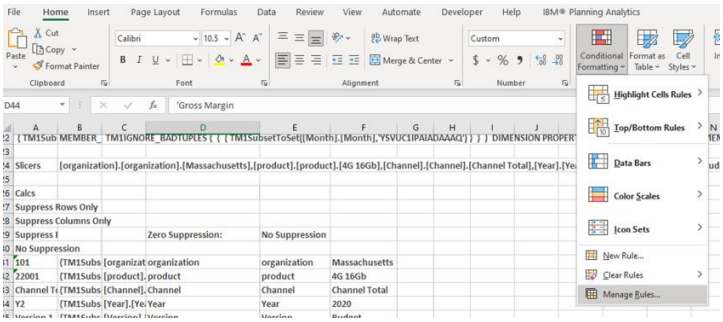
=@IF(@TM2RPTELISCONSOLIDATED(D39),IF(@TM2RPTELLEV(D39)<=5,TM2RPTELLEV(D39),"Leaf"),"Default")

TM2RPTELISCONSOLIDATED – returns the associated expansion status of a consolidated element with regards to subset adjacency
TM2RPTELLEV- Provides the subset level of the occurrence of the element in the report (note subset level is not hierarchy or mdx level)

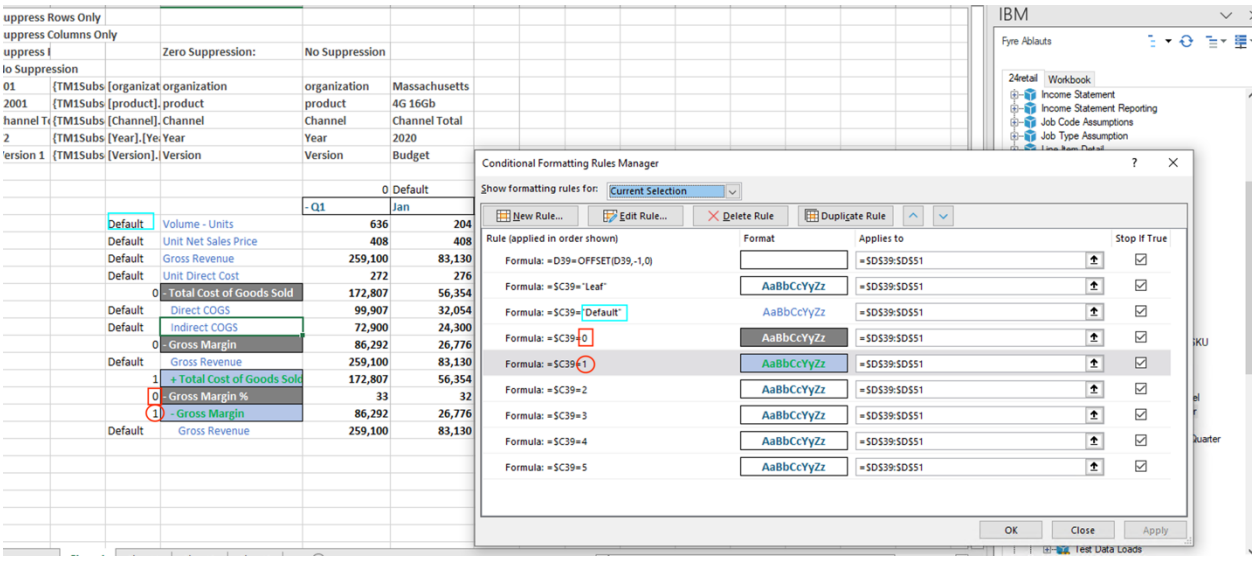


Suppress Rows Only												
Suppress Columns Only												
Suppress I			Zero Suppression:	No Suppression								
No Suppression												
101	{TM1Subs	[organizat	organization	organization	Massachusetts							
22001	{TM1Subs	[product],	product	product	4G 16Gb							
Channel T	{TM1Subs	[Channel],	Channel	Channel	Channel Total							
Y2	{TM1Subs	[Year].[Ye	Year	Year	2020							
Version 1	{TM1Subs	[Version].	Version	Version	Budget							
				0	Default	Default	Default	0	0	0		
				- Q1	Jan	Feb	Mar	+ Q2	+ Q3	+ Q4		
		Default	Volume - Units	636	204	213	219	822	1,059	1,286		
		Default	Unit Net Sales Price	408	408	408	408	408	408	408		
		Default	Gross Revenue	259,100	83,130	86,624	89,346	335,240	431,575	524,416		
		Default	Unit Direct Cost	272	276	272	268	246	226	214		
		0	- Total Cost of Goods Sold	172,807	56,354	57,707	58,747	202,154	239,308	275,108		
		Default	Direct COGS	99,907	32,054	33,407	34,447	129,254	166,408	202,208		
		Default	Indirect COGS	72,900	24,300	24,300	24,300	72,900	72,900	72,900		
		0	- Gross Margin	86,292	26,776	28,917	30,599	133,087	192,268	249,308		
		Default	Gross Revenue	259,100	83,130	86,624	89,346	335,240	431,575	524,416		
		1	+ Total Cost of Goods Sold	172,807	56,354	57,707	58,747	202,154	239,308	275,108		
		0	- Gross Margin %	33	32	33	34	40	45	48		
		1	- Gross Margin	86,292	26,776	28,917	30,599	133,087	192,268	249,308		
		Default	Gross Revenue	259,100	83,130	86,624	89,346	335,240	431,575	524,416		

Row Header Formatting
MS Excel Conditional formatting is location sensitive. To define Row Header format, click on a row header and then select Manage Rules.

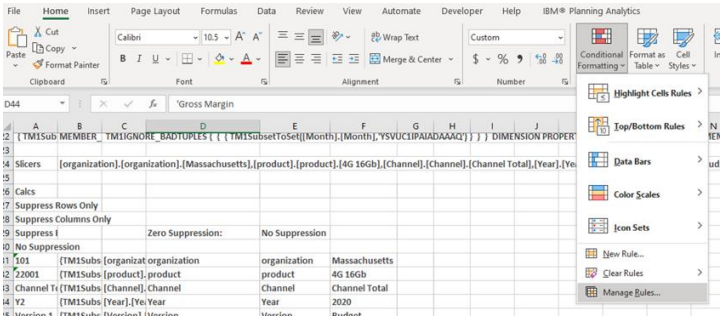


Format row readers by matching the content of the format indicator column to the Formatting rule.

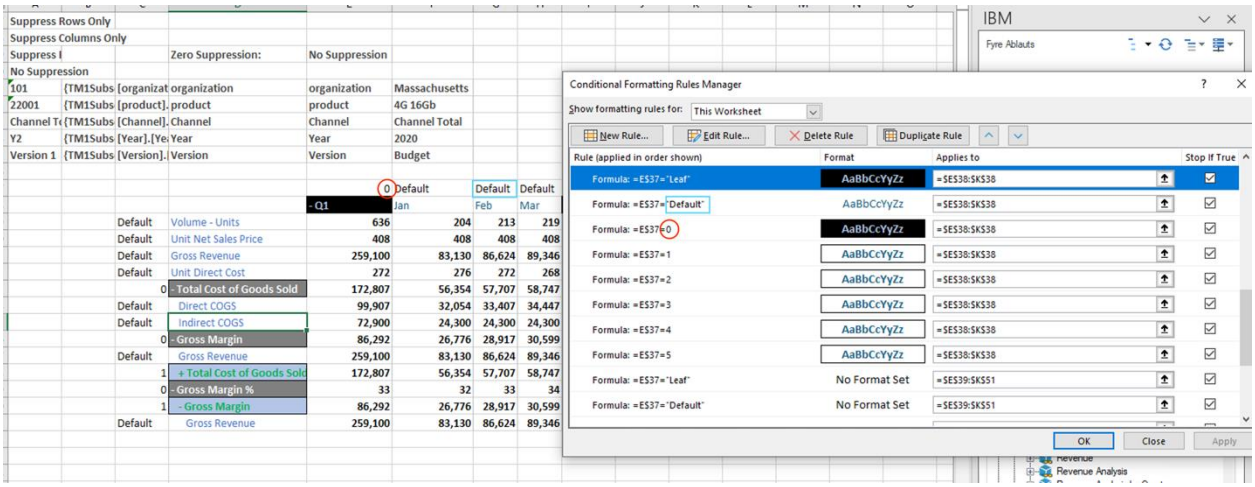


Column header format example:

Click on any Column Header on your Universal Report, and select “Manage Rules”



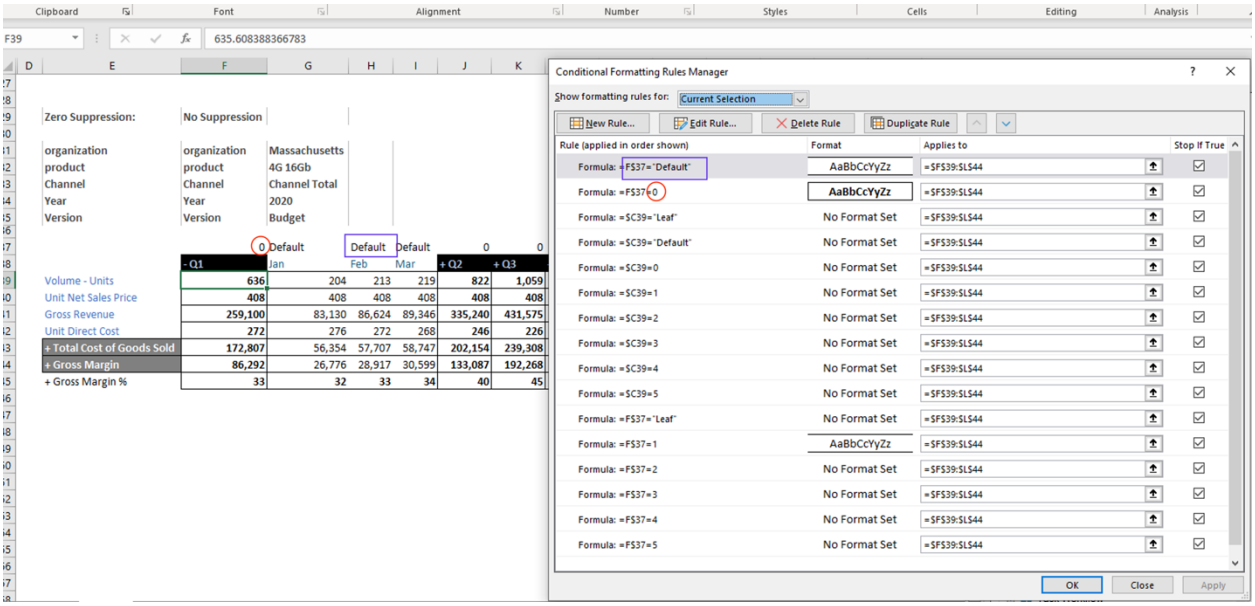
Match the MS Excel formatting rule with the Format indicator as outlined in the screen capture and apply formatting.



Data Grid Format Example

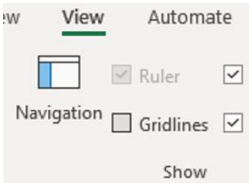
Click anywhere in the data grid and open MS Excel conditional rules manager.

For this example, we have decided to format the grid based on the level of the column header. Be cognizant that the order of the rules is important.

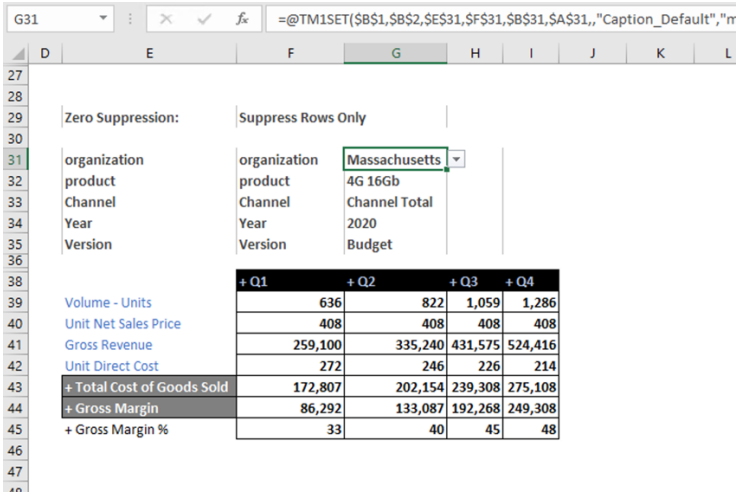


Reviewing Format and publishing Report.
Take the following steps.

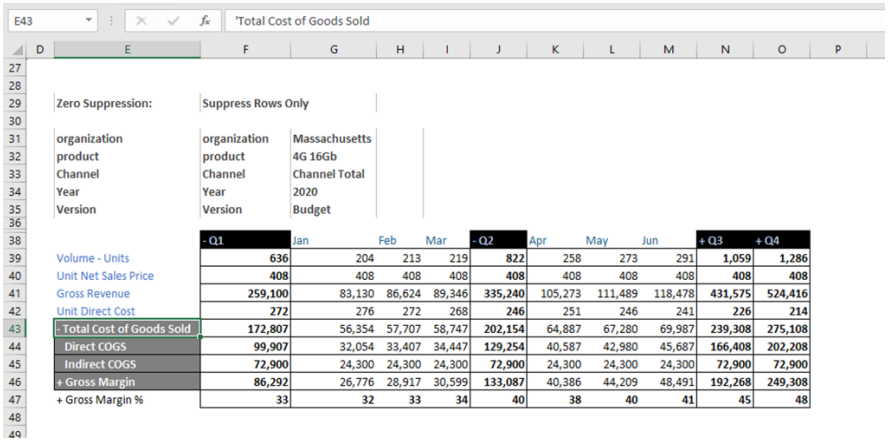
Hide the Formatting Indicator Row
Hide the Formatting Indicator Column
Remove grid lines from you book



Your report should look like as follows. (Based on your format settings). Drill down, and up on your report to ensure your formatting rules are working. Adjust the formatting rules as necessary.



Zero Suppression:	Suppress Rows Only			
organization	organization	Massachusetts		
product	product	4G 16Gb		
Channel	Channel	Channel Total		
Year	Year	2020		
Version	Version	Budget		
	+ Q1	+ Q2	+ Q3	+ Q4
Volume - Units	636	822	1,059	1,286
Unit Net Sales Price	408	408	408	408
Gross Revenue	259,100	335,240	431,575	524,416
Unit Direct Cost	272	246	226	214
+ Total Cost of Goods Sold	172,807	202,154	239,308	275,108
+ Gross Margin	86,292	133,087	192,268	249,308
+ Gross Margin %	33	40	45	48

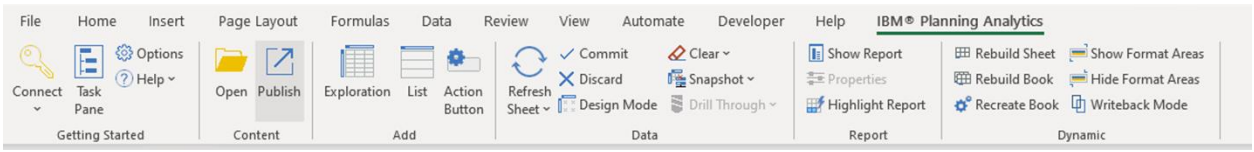


Zero Suppression:	Suppress Rows Only										
organization	organization	Massachusetts									
product	product	4G 16Gb									
Channel	Channel	Channel Total									
Year	Year	2020									
Version	Version	Budget									
	- Q1	Jan	Feb	Mar	- Q2	Apr	May	Jun	+ Q3	+ Q4	
Volume - Units	636	204	213	219	822	258	273	291	1,059	1,286	
Unit Net Sales Price	408	408	408	408	408	408	408	408	408	408	
Gross Revenue	259,100	83,130	86,624	89,346	335,240	105,273	111,489	118,478	431,575	524,416	
Unit Direct Cost	272	276	272	268	246	251	246	241	226	214	
- Total Cost of Goods Sold	172,807	56,354	57,707	58,747	202,154	64,887	67,280	69,987	239,308	275,108	
Direct COGS	99,907	32,054	33,407	34,447	129,254	40,587	42,980	45,687	166,408	202,208	
Indirect COGS	72,900	24,300	24,300	24,300	72,900	24,300	24,300	24,300	72,900	72,900	
+ Gross Margin	86,292	26,776	28,917	30,599	133,087	40,386	44,209	48,491	192,268	249,308	
+ Gross Margin %	33	32	33	34	40	38	40	41	45	48	

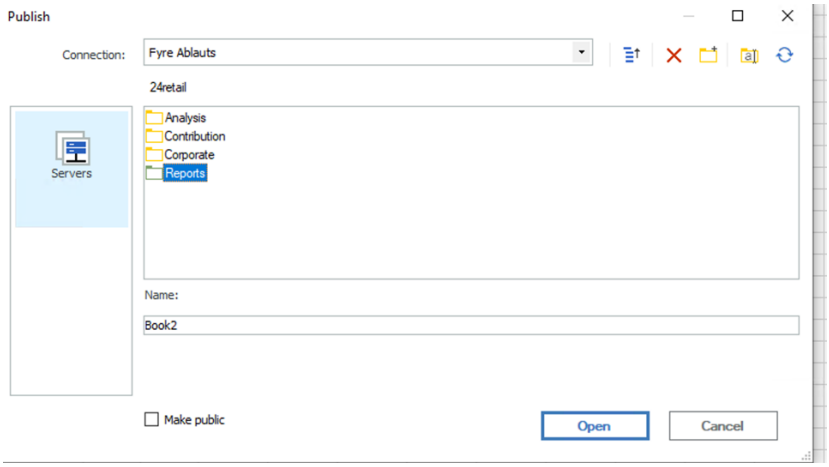
Once the formatting has been reviewed, the next step is to Publish this report to the web.

Save the report, provide a name.

Select Publish in the Planning Analytics banner.



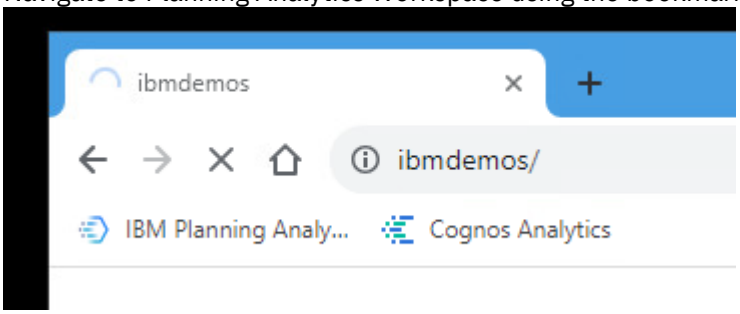
Save the Report to 24retail/Reports
Select 24retail/Reports location



2.1.4 **Reviewing the Websheet in Planning Analytics Workspace**

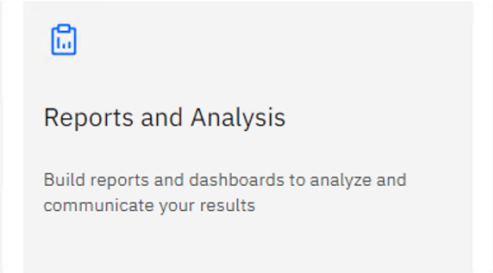
Launch the Chrome browser from the task bar

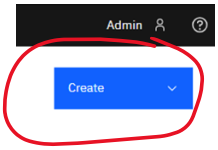
Navigate to Planning Analytics Workspace using the bookmark or type in ‘ibmdemos’



Log into Planning Analytics Workspace, use the same user id and password.
User ID: pm
Password: IBMDem0s

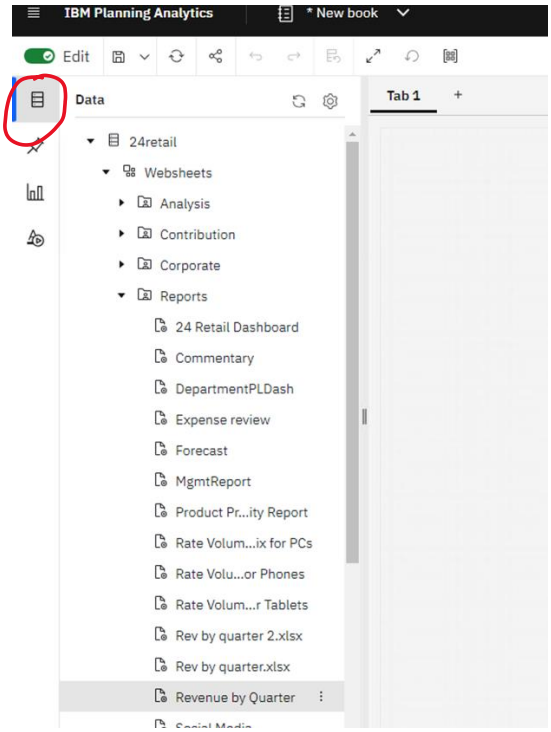
Navigate to “Reports and Analysis” and Create a new Report.



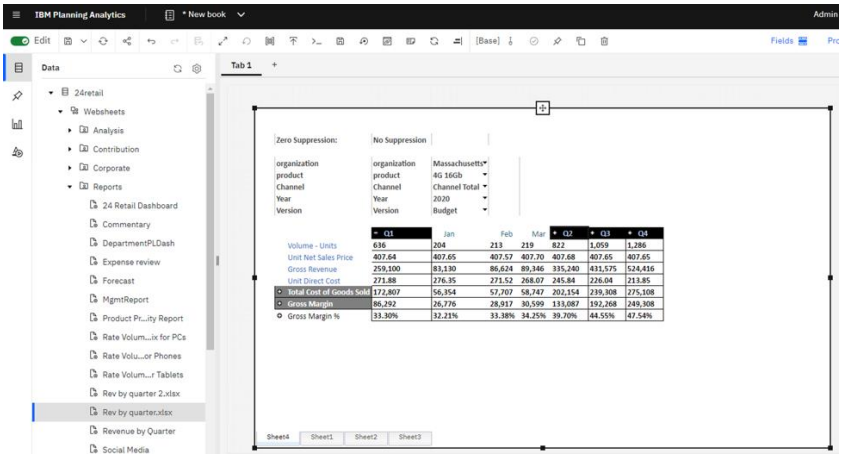


this button is located near top right after clicking Reports and Analysis

Once you’re on a new blank report screen, on the left hand side there is a databases view that you can expand.
Navigate to 24retail/Websheets/Reports and find the report you published.
Drag and drop the websheet to the report canvas.



Your report should look as follows.



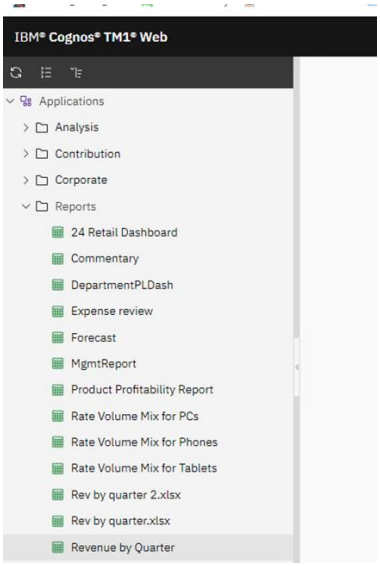
Explore your report in PAW by changing different variables, try drilling in, and out of the rows and columns.

2.1.5 **Reviewing the Websheet in TM1web**

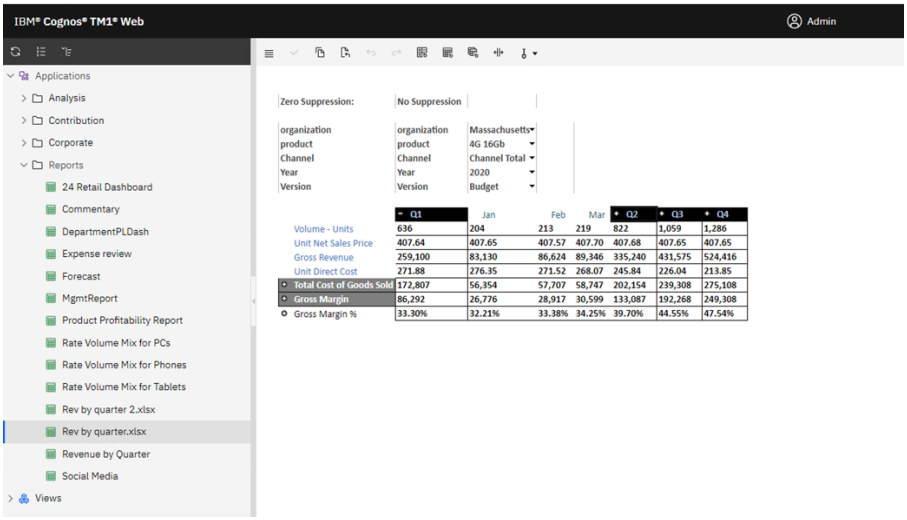
Navigate the browser to ibmdemos/tm1web/

Log into TM1 web using the same user ID and Password
User ID: pm
Password: IBMDem0s
Database: 24retail

Locate your report in Applications/Reports, click on the report to open it.



Explore your report in TM1web



Note that the Universal Report is fully functional in this environment as well, though some dialogs are limited.

3 Description of the Universal Reports specification

This section is provided as a reference, which you can read or skip to the exercise below.

While report generation/conversion is a feature of Planning Analytics for Excel, and that includes Universal Reports, there is no obligation to use them. Similar to other formula-based reporting modes, Universal Reports can also be created from scratch, to meet any custom need.

Below will be a description of each aspect of the Universal Report schema, and commentary on their intended usage.

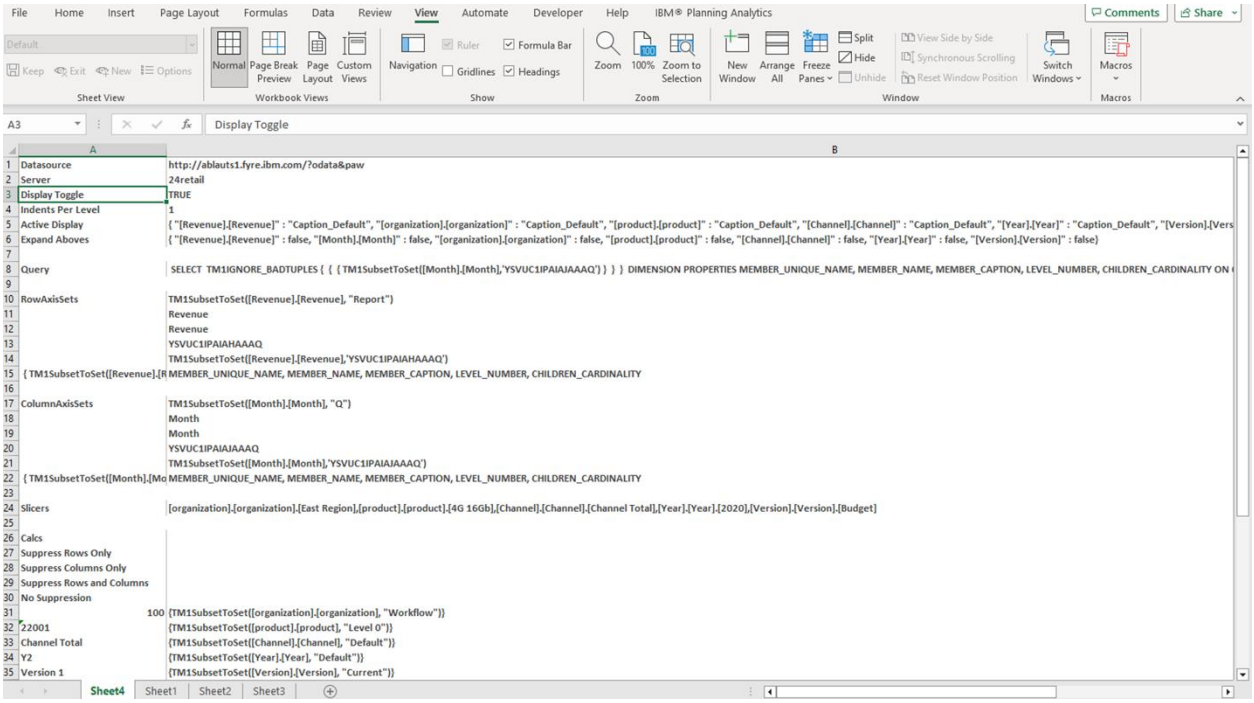
Range Name	**Utilization**	**Description**
Q – query	Req. input	Baseline MDX query for report
P – properties	Req. input: ds, db vector entries, Opt. input: all other vector entries, order preserved with empty values	Properties for report, a fixed-order vector, where the first two entries are required, for datasource host URI <string> and database name <string>, respectively. Other properties (in order), optional: Toggle <bool> - disables toggle indicators and toggling of the report Indents per level <int> - sets the Excel indentation per level for the row axis member sets Active Display <json string, string values> - sets the output appearance of the R and C metadata, per dimension-hierarchy Expand Above <json string, bool values> - sets the expand direction, per dimension-hierarchy
R – rows	Opt. output, size adjusted, UX integration	Optional output areas for the data and metadata of the report query outcome. Defines UX touchpoints for toggling, axis set editing without unhiding, and cellular
C – columns	Opt. output, size adjusted, UX integration	
D – data	Opt. output, size adjusted, UX integration	

		gestures such as writeback & spreading.
RX – row expansions	Optional, size adjusted	Expansion areas are used to duplicate and control other contents alongside the data and metadata of the report
CX – column expansions	Optional, size adjusted	
RG – row gutter (reserved)	Optional, UX integration, size adjusted	
CG – column gutter (reserved)	Optional, UX integration, size adjusted	
S – slicers	UX integration, non-runtime	Provides UX touchpoint for set editing on slicers/context of report
Calcs – calculations (reserved)	UX integration, non-runtime	

4 Description of the dynamic layout hidden areas

This section is provided as a reference, which you can read or skip to the exercise below.

After creating a new Universal Report from a view or Exploration to a new worksheet, if you unhide the hidden portions you will see quite a bit of content:



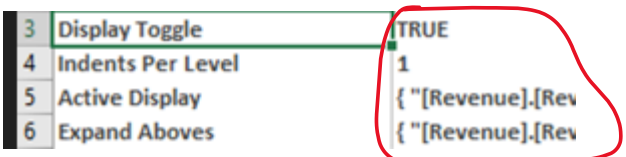
	A	B
1	Datasource	http://ablauts1.fyre.ibm.com/?odata&paw
2	Server	24retail
3	Display Toggle	TRUE
4	Indents Per Level	1
5	Active Display	{ "[Revenue].[Revenue]" : "Caption_Default", "[organization].[organization]" : "Caption_Default", "[product].[product]" : "Caption_Default", "[Channel].[Channel]" : "Caption_Default", "[Year].[Year]" : "Caption_Default", "[Version].[Vers
6	Expand Aboves	{ "[Revenue].[Revenue]" : false, "[Month].[Month]" : false, "[organization].[organization]" : false, "[product].[product]" : false, "[Channel].[Channel]" : false, "[Year].[Year]" : false, "[Version].[Version]" : false}
7		
8	Query	SELECT TM1IGNORE_BADTUPLES { { { TM1SubsetToSet([Month].[Month],'YSVUC1IPAIAJAAAQ') } } } DIMENSION PROPERTIES MEMBER_UNIQUE_NAME, MEMBER_NAME, MEMBER_CAPTION, LEVEL_NUMBER, CHILDREN_CARDINALITY ON
9		
10	RowAxisSets	TM1SubsetToSet([Revenue].[Revenue], "Report")
11		Revenue
12		Revenue
13		YSVUC1IPAIAHAAAQ
14		TM1SubsetToSet([Revenue].[Revenue],'YSVUC1IPAIAHAAAQ')
15	{ TM1SubsetToSet([Revenue].[R	MEMBER_UNIQUE_NAME, MEMBER_NAME, MEMBER_CAPTION, LEVEL_NUMBER, CHILDREN_CARDINALITY
16		
17	ColumnAxisSets	TM1SubsetToSet([Month].[Month], "Q")
18		Month
19		Month
20		YSVUC1IPAIAJAAAQ
21		TM1SubsetToSet([Month].[Month],'YSVUC1IPAIAJAAAQ')
22	{ TM1SubsetToSet([Month].[Mo	MEMBER_UNIQUE_NAME, MEMBER_NAME, MEMBER_CAPTION, LEVEL_NUMBER, CHILDREN_CARDINALITY
23		
24	Slicers	[organization].[organization].[East Region],[product].[product].[4G 16Gb],[Channel].[Channel].[Channel Total],[Year].[Year].[2020],[Version].[Version].[Budget]
25		
26	Calcs	
27	Suppress Rows Only	
28	Suppress Columns Only	
29	Suppress Rows and Columns	
30	No Suppression	
31	100	{TM1SubsetToSet([organization].[organization], "Workflow")}
32	22001	{TM1SubsetToSet([product].[product], "Level 0")}
33	Channel Total	{TM1SubsetToSet([Channel].[Channel], "Default")}
34	Y2	{TM1SubsetToSet([Year].[Year], "Default")}
35	Version 1	{TM1SubsetToSet([Version].[Version], "Current")}

These hidden areas are using formula parameterization to arrive at the necessary query and property outcomes to drive the Universal Report outcome and provide touchpoints for further customization and integration into other spreadsheet contents.

Below will be a description of each aspect of the Universal Report dynamic layout hidden area, and commentary on their intended usage.

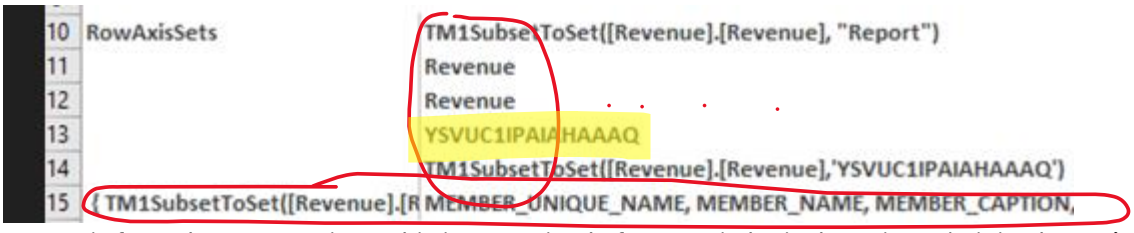
	A	
1	Datasource	http://ablauts1.fyre.ibm.com/?odata&paw
2	Server	24retail

Required P-vector values for datasource URI and database name, these are by default populated with TM1PRIMARYDATASOURCE() and TM1PRIMARYDBNAME() functions to automatically track the first source that PA for Excel is connected to – such that content will automatically retarget dev/test/prod without any editing. They can be modified to hardcoded values or customized using additional logic such as TM1User function probing for more complex source mapping strategies. In the future, generating additional reports in PA for Excel may prompt if automatic behavior using the 'primary' formulas is desired, or if the report should be anchored to a specific source (particularly if the addin is connected to multiple systems simultaneously at the time of report generation).



Optional P-vector values of fixed order, see prior section for their descriptions

Required Q-value, this typically contains the MakeQuery function which computes the ultimate query outcome for a dynamic layout Universal Report. Could contain anything that results in a syntactically valid MDX query string, whether hardcoded or compiled using custom formulas.



Row axis formula constructions, this is comprised of two main logical sections, ‘mini columns’ of formulas for each component hierarchy, going out sideways for each hierarchy, and a bottom line of formulas that assembles the axis expression, with a MakeAxis formula. The ‘mini column’ is populated by TM1SET formula, with each argument pulled out to a cell as a targetable value.

This pattern is duplicated once more for the Column axis constructions.

Next is an area for the Slicers to be formed together from the visible range, this is typically a ConcatComma formula referencing MakeMun formulas next to the visible TM1SET formulas.

Calcs defines a reserved area for query scoped calculations to go, this is a concat strings operation that would typically refer to MakeCalc formulas.

5 Exercise – Make a Universal Report from scratch

A Universal Report in contains many different named ranges that the runtime uses to make the report run as expected on the spreadsheet. However, only the properties and query named ranges, tracked by tm2_#_p and tm2_#_q respectively, are needed by PA for Excel to recognize the spreadsheet content as a Universal Report.

Start with a new sheet in Excel with the PA for Excel addin still loaded. Define the required properties to be tracked by the tm2_#_p named range you will be creating. All six of the Universal Report properties must be defined in order for PA for Excel to recognize the Universal Report in SC90.

In the first cell, add the url of the datasource that the Universal Report will execute against. The TM1PRIMARYDATASOURCE() formula can be used as well.

Next define the database name in another cell. The TM1PRIMARYDBNAME() can be used if desired.

The third cell should contain a boolean value for the display toggle property.

TRUE or FALSE

The fourth cell should contain an integer value for the indents per level property

Ex: 1

The fifth cell should be a string for each hierarchy being represented in the query and the desired display alias attribute, we can leave this fairly empty for now.

Ex: {}

Example of a populated value: { "[plan_business_unit].[plan_business_unit]" : "BusinessUnit", "[plan_chart_of_accounts].[plan_chart_of_accounts]" : "AccountName", "[plan_department].[plan_department]" : "Department", "[plan_time].[plan_time]" : "Time", "[plan_version].[plan_version]" : "VersionName"}

The sixth cell should be a string for each hierarchy being represented in the query and the desired boolean value to expand above, we can leave this fairly empty for now.

Ex: {}

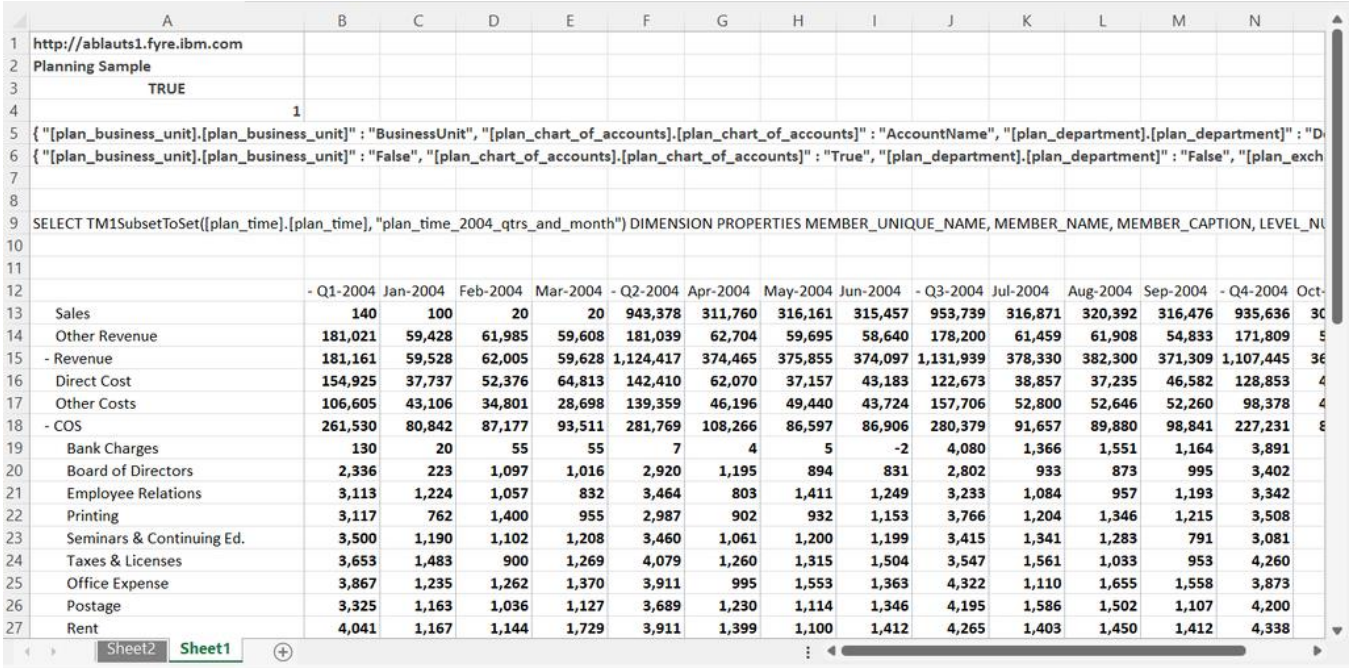
Example of a populated value: { "[plan_business_unit].[plan_business_unit]" : "False", "[plan_chart_of_accounts].[plan_chart_of_accounts]" : "True", "[plan_department].[plan_department]" : "False", "[plan_exchange_rates].[plan_exchange_rates]" : "False", "[plan_source].[plan_source]" : "False", "[plan_time].[plan_time]" : "False", "[plan_version].[plan_version]" : "False"}

Next open up Excel's named range manager and click the Define Name option. The named range must be scoped to the sheet and include those six cells defined above. Give it the name tm2_0_p where 0 is the ID to be associated with the Universal Report.

Next, you need to create the query cell to be tracked by the query named range tm2_0_q where 0 is the same ID as defined for the properties named range for the Universal Report. This must be a valid MDX expression. You can obtain a valid MDX expression by using the MDX viewer for an existing Exploration report, or creating one by hand. If the query is too long to fit in a single cell, you can use Excel's CONCATENATE() formula or use the PA accessory formulas such as MakeQuery(...) to define a query string from sub components. Once the query cell is on the spread sheet, define the named range rule to track it.

If the above steps were performed correctly, when you navigate to the Workbook tab in the task pane, under the Universal Reports folder, you will see the Universal Report that you defined there. If the Universal Report isn't appearing in that folder, try save the workbook and reopen it in Excel again. When the sheet is refreshed, PA for Excel will execute the query against PA Spreadsheet Services and it will return a cellset response with the data and axis info.

If you want to display the data, rows, columns, and slicers, you'll need to also define the tm2_0_d, tm2_0_r, and tm2_0_slicers named ranges respectively to a cell each with appropriate geometry. PA for Excel will automatically adjust the size of the named ranges to track the returned content from the query execution as appropriate. Once you add those ranges, click refresh or rebuild sheet to see the report populate the spreadsheet with that additional content. The final outcome may look something like below.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	
1	http://ablauts1.fyre.ibm.com														
2	Planning Sample														
3	TRUE														
4	1														
5	{ "[plan_business_unit].[plan_business_unit]" : "BusinessUnit", "[plan_chart_of_accounts].[plan_chart_of_accounts]" : "AccountName", "[plan_department].[plan_department]" : "D														
6	{ "[plan_business_unit].[plan_business_unit]" : "False", "[plan_chart_of_accounts].[plan_chart_of_accounts]" : "True", "[plan_department].[plan_department]" : "False", "[plan_exch														
7															
8															
9	SELECT TM1SubsetToSet([plan_time].[plan_time], "plan_time_2004_qtrs_and_month") DIMENSION PROPERTIES MEMBER_UNIQUE_NAME, MEMBER_NAME, MEMBER_CAPTION, LEVEL_N														
10															
11															
12		- Q1-2004	Jan-2004	Feb-2004	Mar-2004	- Q2-2004	Apr-2004	May-2004	Jun-2004	- Q3-2004	Jul-2004	Aug-2004	Sep-2004	- Q4-2004	Oct-
13	Sales	140	100	20	20	943,378	311,760	316,161	315,457	953,739	316,871	320,392	316,476	935,636	30
14	Other Revenue	181,021	59,428	61,985	59,608	181,039	62,704	59,695	58,640	178,200	61,459	61,908	54,833	171,809	5
15	- Revenue	181,161	59,528	62,005	59,628	1,124,417	374,465	375,855	374,097	1,131,939	378,330	382,300	371,309	1,107,445	36
16	Direct Cost	154,925	37,737	52,376	64,813	142,410	62,070	37,157	43,183	122,673	38,857	37,235	46,582	128,853	4
17	Other Costs	106,605	43,106	34,801	28,698	139,359	46,196	49,440	43,724	157,706	52,800	52,646	52,260	98,378	4
18	- COS	261,530	80,842	87,177	93,511	281,769	108,266	86,597	86,906	280,379	91,657	89,880	98,841	227,231	8
19	Bank Charges	130	20	55	55	7	4	5	-2	4,080	1,366	1,551	1,164	3,891	
20	Board of Directors	2,336	223	1,097	1,016	2,920	1,195	894	831	2,802	933	873	995	3,402	
21	Employee Relations	3,113	1,224	1,057	832	3,464	803	1,411	1,249	3,233	1,084	957	1,193	3,342	
22	Printing	3,117	762	1,400	955	2,987	902	932	1,153	3,766	1,204	1,346	1,215	3,508	
23	Seminars & Continuing Ed.	3,500	1,190	1,102	1,208	3,460	1,061	1,200	1,199	3,415	1,341	1,283	791	3,081	
24	Taxes & Licenses	3,653	1,483	900	1,269	4,079	1,260	1,315	1,504	3,547	1,561	1,033	953	4,260	
25	Office Expense	3,867	1,235	1,262	1,370	3,911	995	1,553	1,363	4,322	1,110	1,655	1,558	3,873	
26	Postage	3,325	1,163	1,036	1,127	3,689	1,230	1,114	1,346	4,195	1,586	1,502	1,107	4,200	
27	Rent	4,041	1,167	1,144	1,729	3,911	1,399	1,100	1,412	4,265	1,403	1,450	1,412	4,338	

Sheet2 Sheet1

Defining the Universal Report using these techniques may be desirable in some situations where only a lightweight version of the reporting mode is needed. Otherwise, using the PA for Excel Universal Report generator from an existing view or an Exploration report is the easiest option and the report can be adjusted from there as a starting point. Using the PA for Excel converter also will provide out of the box support for integrating features such as the Set Editor, conditional formatting row and column header id's, query parameterization using TM1Set's, and more.

6 Description of TM1SET and DefineCalc functions

These sections are provided as a reference, which you can read or skip to the exercise below.

6.1 TM1SET

TM1SET is the first major hierarchy-aware spreadsheet function added to Planning Analytics. As you've seen in the prior 'description of hidden areas' section, it operates as the heart of the dynamic layout Universal Report construction, capable of defining the both the row and column axes sets, as well as context slicers. This function operates as an improved version of the SUBNM formula, with greatly expanded capabilities. Fundamentally, it has these additional key characteristics when compared to SUBNM's.

- Can address into alternate hierarchies
- Source system can be fully defined using formulas
- Can return multiple formats of the primary output depending on use case
- Introduces additional secondary outputs system for leveraging the set editor UI flow to provide customized parameterization
- Can generate temporary reusable set constructions, for both TM1 and Planning Analytics Engine scenarios.

This function can also be integrated into other reporting options in Planning Analytics to increase the level of capabilities there (subject to each reporting mode's respective limitations), or used for arbitrary calculation.

6.1.1 **Description of function arguments**

https://www.ibm.com/docs/en/planning-analytics/2.0.0?topic=functions-tm1set

Argument	Description
Host	Enter the data source URI. The host argument allows for simultaneous use of multiple systems, even when database names would otherwise collide.
Server	Enter the TM1 server name.
Dimension	Enter the dimension name.
Hierarchy	Enter the hierarchy name.
SetExpression	Enter the MDX based dynamic set expression.
SelectedElement	Enter the selected element in the set to display.
SessionSetOut	Enter the Session Set ID that is generated by the server after the set expression runs. This is an optional argument and can be " " or null.
ActiveDisplay	Enter the corresponding alias for the member element. This is an optional argument and can be " " or null.
DisplayModeEnum	Output types affect the output value of the formula. Enter one of the following output types: – SESSIONSET - Displays the session set ID for the set that is created in TM1 server – MUN - Displays the MDX member unique name – MEMBERDISPLAY - Displays element name or alias This is an optional argument and can be " " or null.

6.1.1.1 Secondary outputs and trivial reference traversal

TM1SET arguments are automatically updated during an ‘apply and close’ cycle after making changes in the set editor UI, or when choosing a new element selection from the in-spreadsheet element selector dropdown. This is useful to allow the formula to persist edits and generate the corresponding new result value, but would otherwise limit the ability to consume those argument updates elsewhere as parameterization values for other calculations.

TM1SET improves on this, by introducing a runtime system for *secondary outputs* during such events. For arguments that are defined as basic references to another cell, the argument update activity will now traverse the reference and write the updated value there, rather than replacing the argument reference with an updated literal value. This means that parametrization of the underlying formula is preserved even through UI activities, and other formulas can also leverage those updated parameters written to discrete cells.

6.1.1.2 Remarks on session sets

Session sets are reusable artifacts created during TM1Set operation, exposed in two ways for report design opportunities.

1. As a primary output option (updated as-needed during refresh)
2. As a secondary output option (updated via reference traversal during UI 'apply and close' cycles, etc)

These temporary sets can then be reused to for additional query outcomes or as a brief reference into an inventory of members regardless of the actual size.

In MDX expressions, session set id's can be referenced via the TM1SubetToSet function. You can see examples of this in the dynamic layout Universal Reports hidden area.

6.2 DefineCalc

Similar to the MakeCalc accessory function associated with Universal Reports for constructing formula parameterized server-side calculations, the DefineCalc function was introduced to offer custom calculation support to report mode designs that are less tolerant of expressive construction. As of SC90, DefineCalc support is specifically offered for Custom Reports. Comparing the two functions, MakeCalc allows for parameterized calculation expression building, to be ultimately fed into a MakeQuery formula (giving per-query definition control), while DefineCalc defines a calculation as a runtime-injectable asset (which has a source-database-hierarchy scope granularity). A runtime injectable asset is a client-side 'registered' name such that query generation is rewritten (for eligible types), and that it should preempt the normal metadata validation flows.

Define calc has two typical use cases, although it is operated as a fully flexible system to allow for other creative uses.

1. As a forward-compatible bridge for legacy automatic subset user defined consolidations (ex: using a subset name in place of an element key in a DBRW)
2. To define custom aggregations of an arbitrary list of members

Any syntactically correct calculation definition is possible, and additional 'With member as' properties may be exposed for formula control in the future. Additionally, IBM is considering a helper UI flow to create, edit, and manage such calculations – though that is not yet available.

6.2.1 **Description of function arguments**

https://www.ibm.com/docs/en/planning-analytics/2.0.0?topic=functions-definecalc

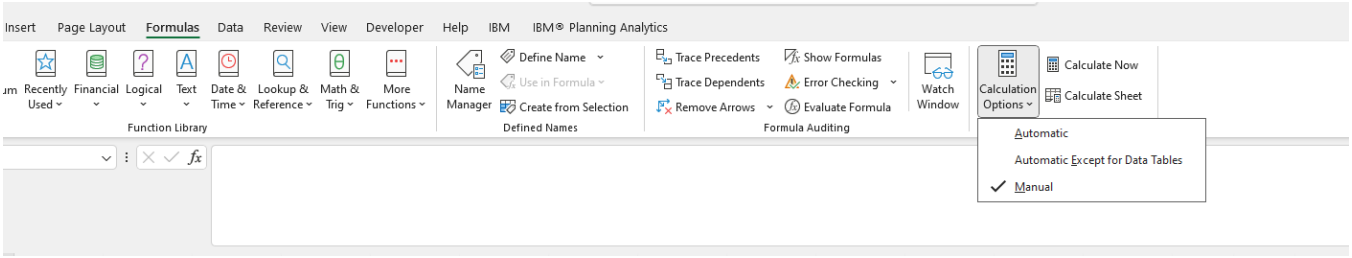
Argument	Description
`sDatasource`	Name of the datasource subject to injection. Use * if you want to apply the new calculation to all data sources.
`sServerName`	Name of the server subject to injection. Use * if you want to apply the new calculation to all databases.
`sCalcMun`	Member unique name (MUN) of the new expression that you want to register. Use valid MDX notation for the virtual member name.
`sExpression`	The expression that registers as a runtime calculation injection. The expression is injected directly into MDX queries and must be a valid MDX. If the `sExpression` is null or empty, the `sCalcMun` definition is deleted.
`bOutputMun`	By default, `bOutputMun` is set to false and returns the member name. If `bOutputMun` is set to true, it returns the value of `sCalcMun`.
`bDisableScramble`	By default, `bDisableScramble` is set to `false`, which scrambles the MUN name in the MDX. This avoids any potential collision if the MUN name collides with another existing name. When `bDisableScramble` is set to `true`, the calculation disables anti-collision MUN scrambling. Do not disable this parameter if you are injecting subset aggregates as a calculation of the same name. **Important:** When `bDisableScramble` is not set to `true`, MUN matching is white space sensitive. If a calculation refers to another calculation as part of its definition, disable scramble (set `bDisableScramble` to `true`) for the calculation that is being referenced.

7 Exercise – Combining Custom Reports, TM1SET, and DefineCalc for interactive ad-hoc aggregation

In this exercise we will combine a Custom Report with a DefineCalc to create a custom on the fly aggregation. Within the DefineCalc, we will reuse a session set as generated by a TM1Set function - such that the aggregation is not limited to a specific subset, nor a spreadsheet held list of members. Additionally, we will activate the custom tracking range (tracked area) for enabling UX integration on top of the TM1SET function such that we can use the set editor UI flow to interactively conduct the composition of the session set.

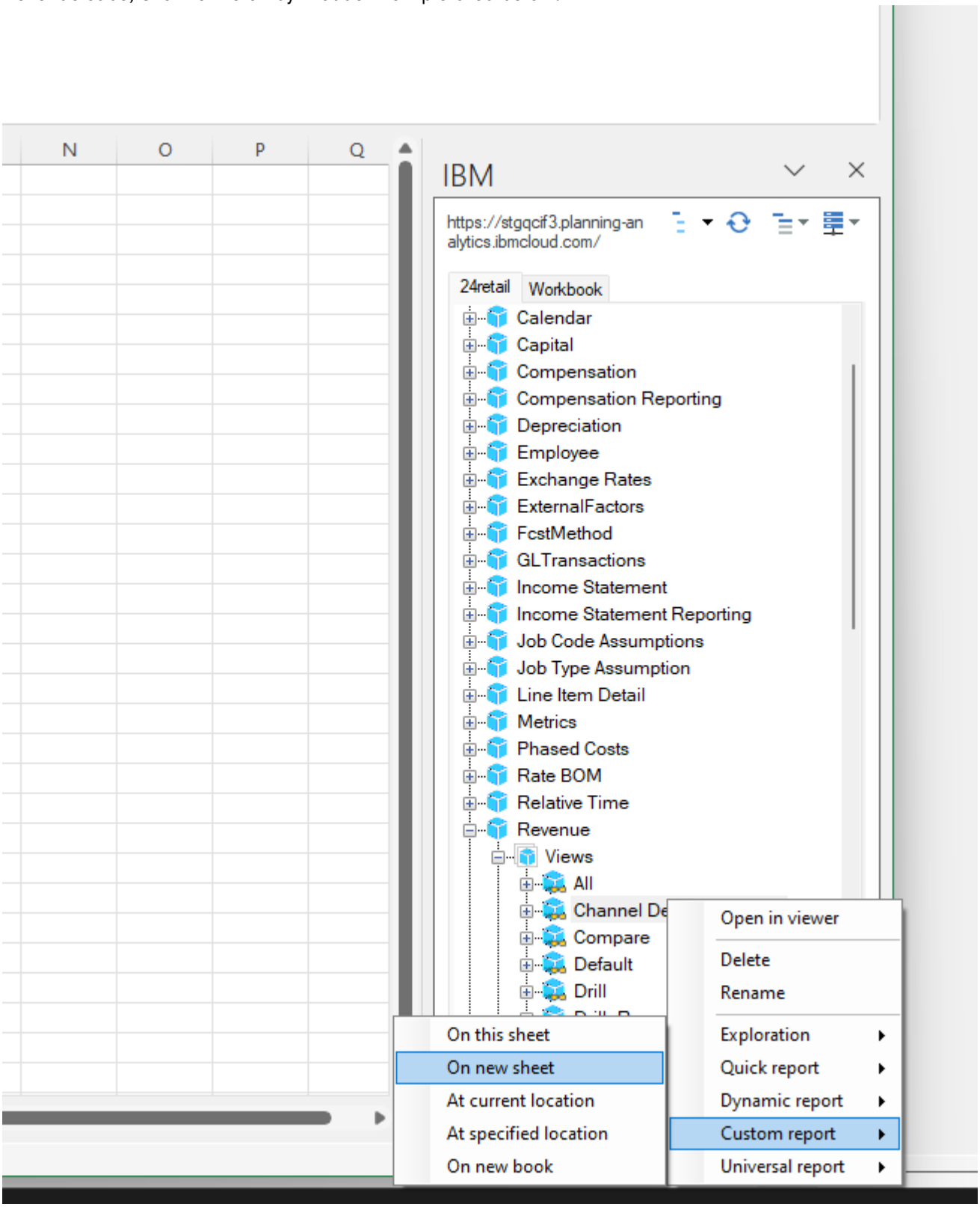
7.1.1 **Generate a Custom Report**

Create a new workbook (and close any open books), set the active calculation mode to manual (to reduce calculation noise during this exercise).



Choose a view from the task pane, right click, and create a Custom Report as new sheet

Revenue cube, Channel Detail by Product view pictured below:



You should get a Custom Report that looks like this:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	24retail:Revenue														
2	organization	Massachusetts													
3	product	4G 16Gb													
4	Revenue	Volume - Units													
5	Year	2020													
6	Version	Budget													
7															
8		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
9	Channel Total	6,373	345	359	317	436	462	491	568	597	623	689	729	755	
10	Retail	2,089	115	120	70	145	154	164	189	199	208	230	243	252	
11	Internet	2,141	115	119	123	146	154	163	190	199	207	230	243	252	
12	Distribution	2,142	115	120	123	145	154	164	189	199	208	230	243	252	
13															
14															
15															

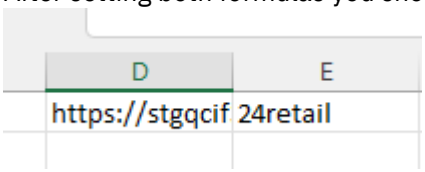
Set a formula in cell D1 to

```
=TM1PRIMARYDATASOURCE()
```

Set a formula in cell E1 to

```
=TM1PRIMARYDBNAME()
```

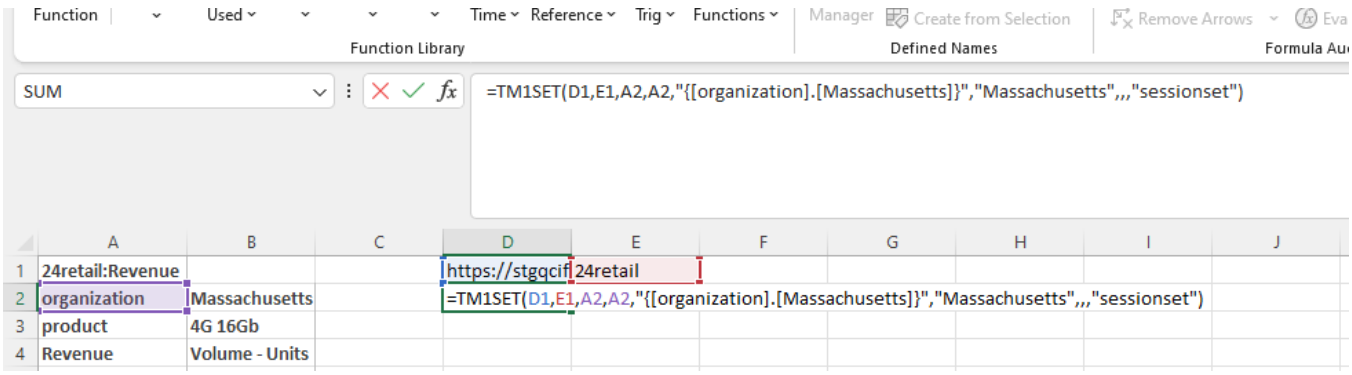
After setting both formulas you should see something like this



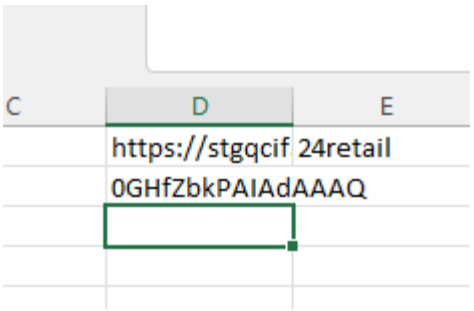
7.1.2 **Define a TM1SET function**

Next we'll define a TM1SET function for a custom organization selection in cell D2

```
=TM1SET(D1,E1,A2,A2,"{[organization].[Massachusetts]}","Massachusetts",,,"sessionset")
```



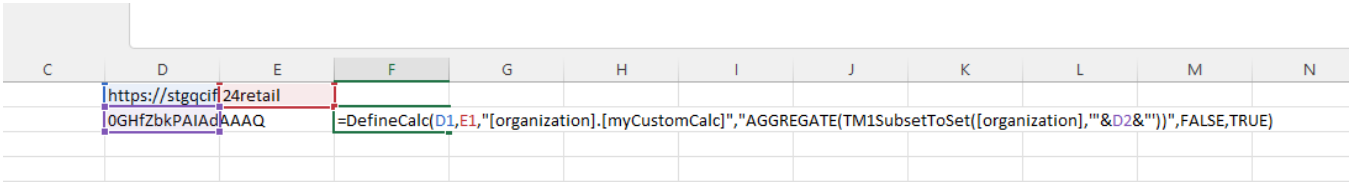
After submitting the formula, press F9 and you should see a unique session set id (the specific id returned will vary)



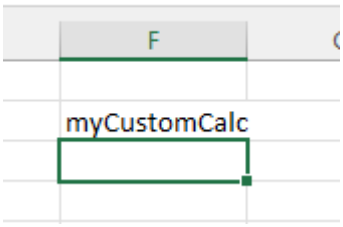
7.1.3 **Create the DefineCalc aggregation**

Next we'll create a DefineCalc function that consumes the session set id as an aggregate in cell F2, that references the id in D2, and the sources defined in D1 and E1.

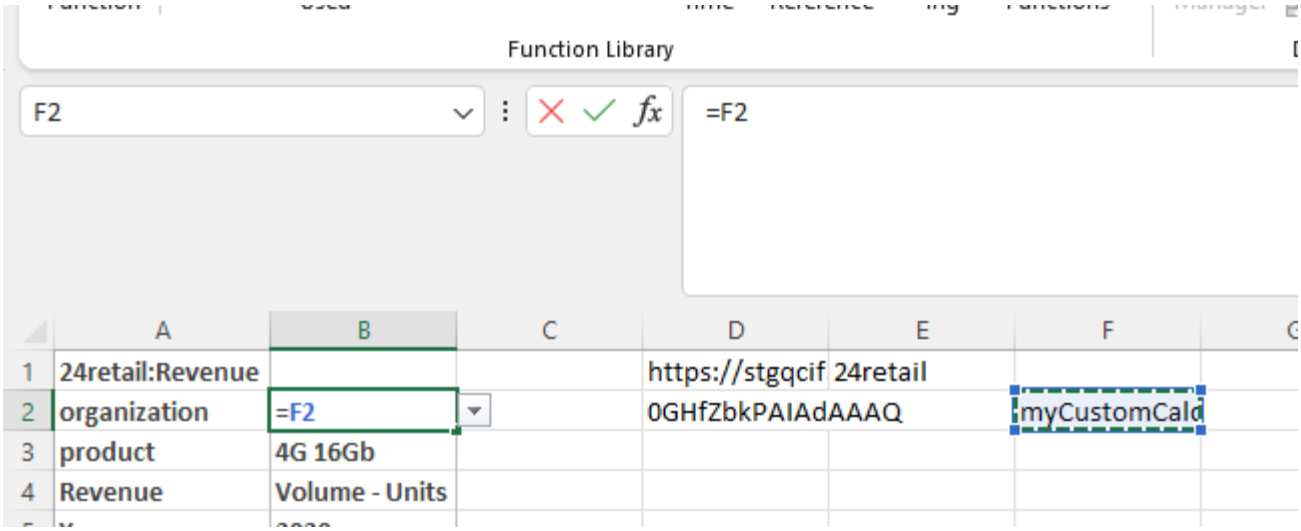
```
=DefineCalc(D1,E1,"[organization].[myCustomCalc]","AGGREGATE(TM1SubsetToSet([organization],'"
&D2&"'))",FALSE,TRUE)
```



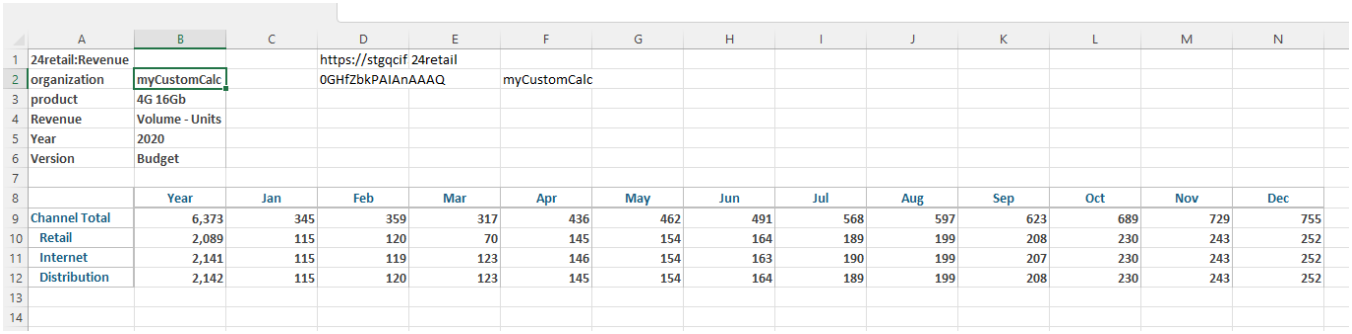
After submitting, you should see the calculated member name in the cell.



Then adjust the Custom Report to consume the new calculated member, by replacing the SUBNM for organization to reference F2.



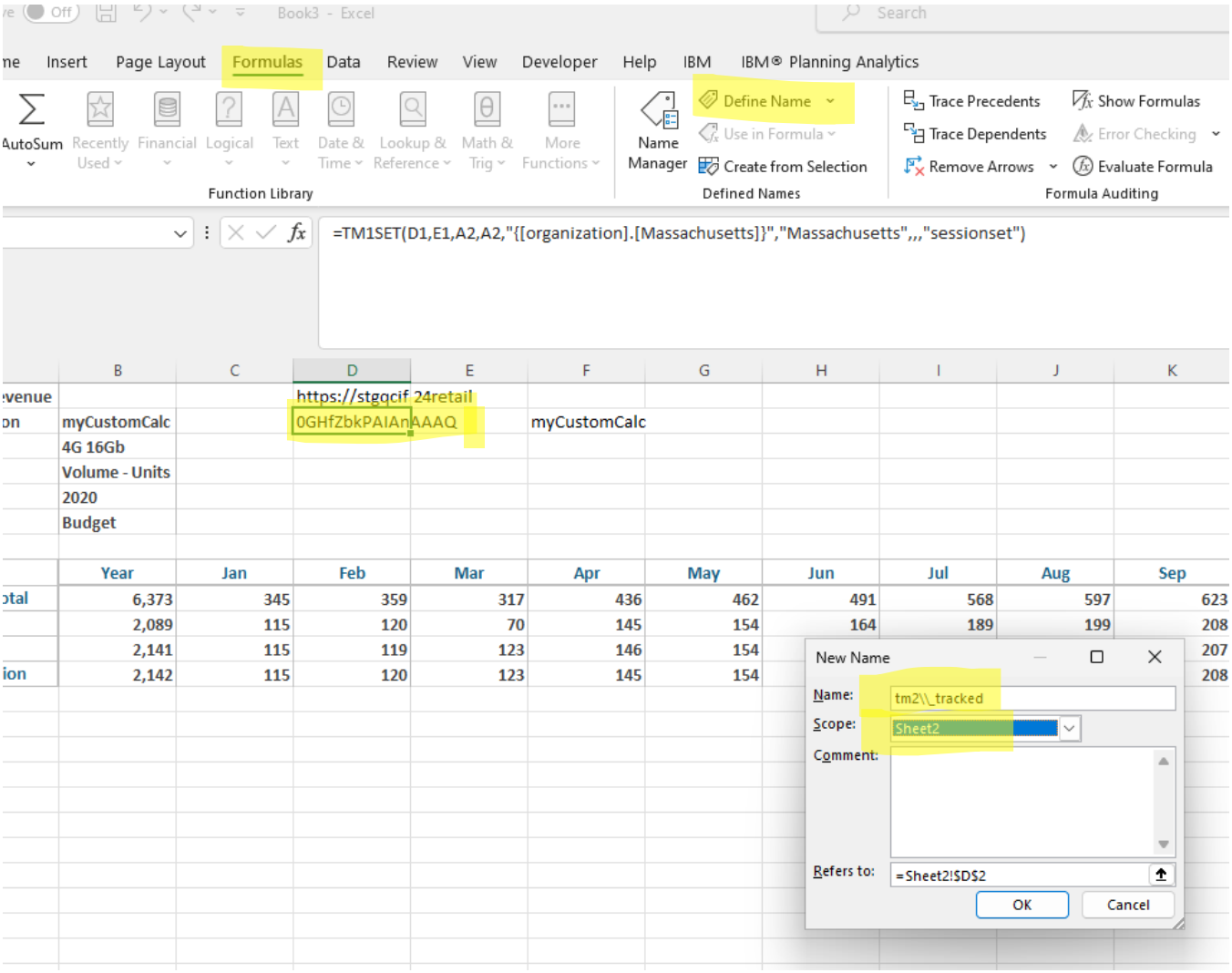
Press Alt+F9 to ensure the Custom Report is still refreshing against the custom calculation.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	24retail:Revenue			https://stgqcif 24retail										
2	organization	myCustomCalc		0GHfZbkPAIAnAAAQ		myCustomCalc								
3	product	4G 16Gb												
4	Revenue	Volume - Units												
5	Year	2020												
6	Version	Budget												
7														
8		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9	Channel Total	6,373	345	359	317	436	462	491	568	597	623	689	729	755
10	Retail	2,089	115	120	70	145	154	164	189	199	208	230	243	252
11	Internet	2,141	115	119	123	146	154	163	190	199	207	230	243	252
12	Distribution	2,142	115	120	123	145	154	164	189	199	208	230	243	252
13														
14														

7.1.4 **Define the tracked area to enable UX integration features**

Select the cell D2, and go to the formula ribbon and choose define name

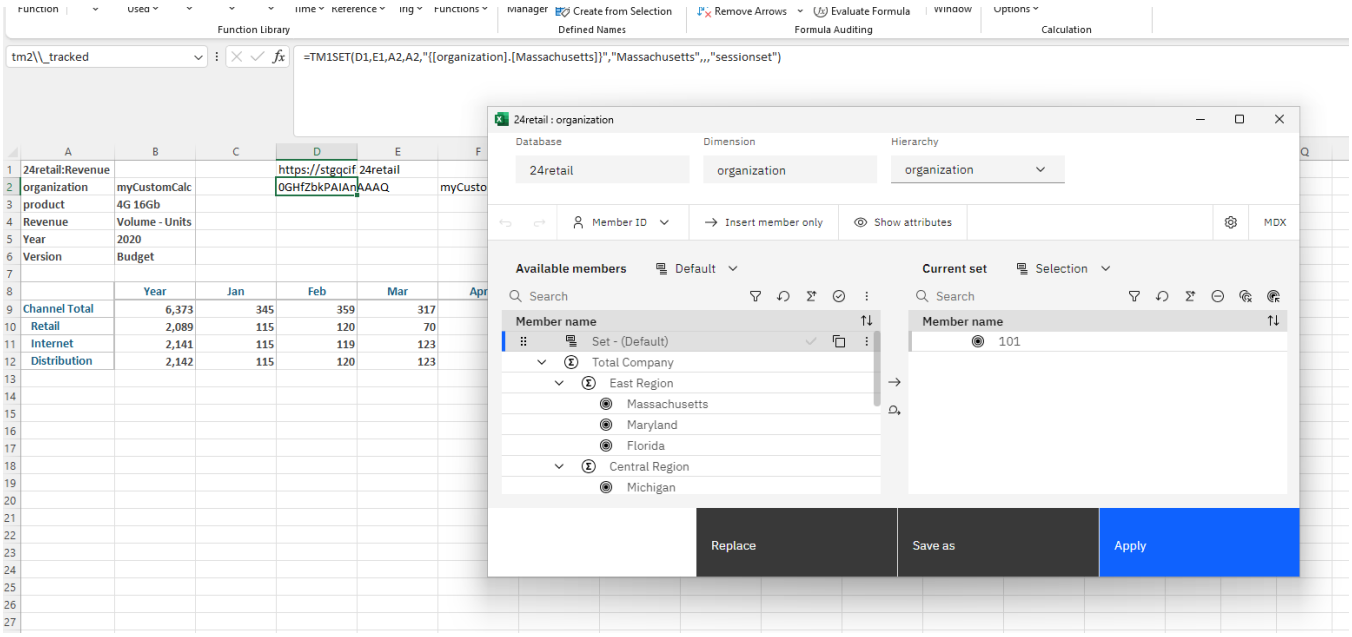


Set the name of the range as

```
tm2\\_tracked
```

and the scope to the worksheet.

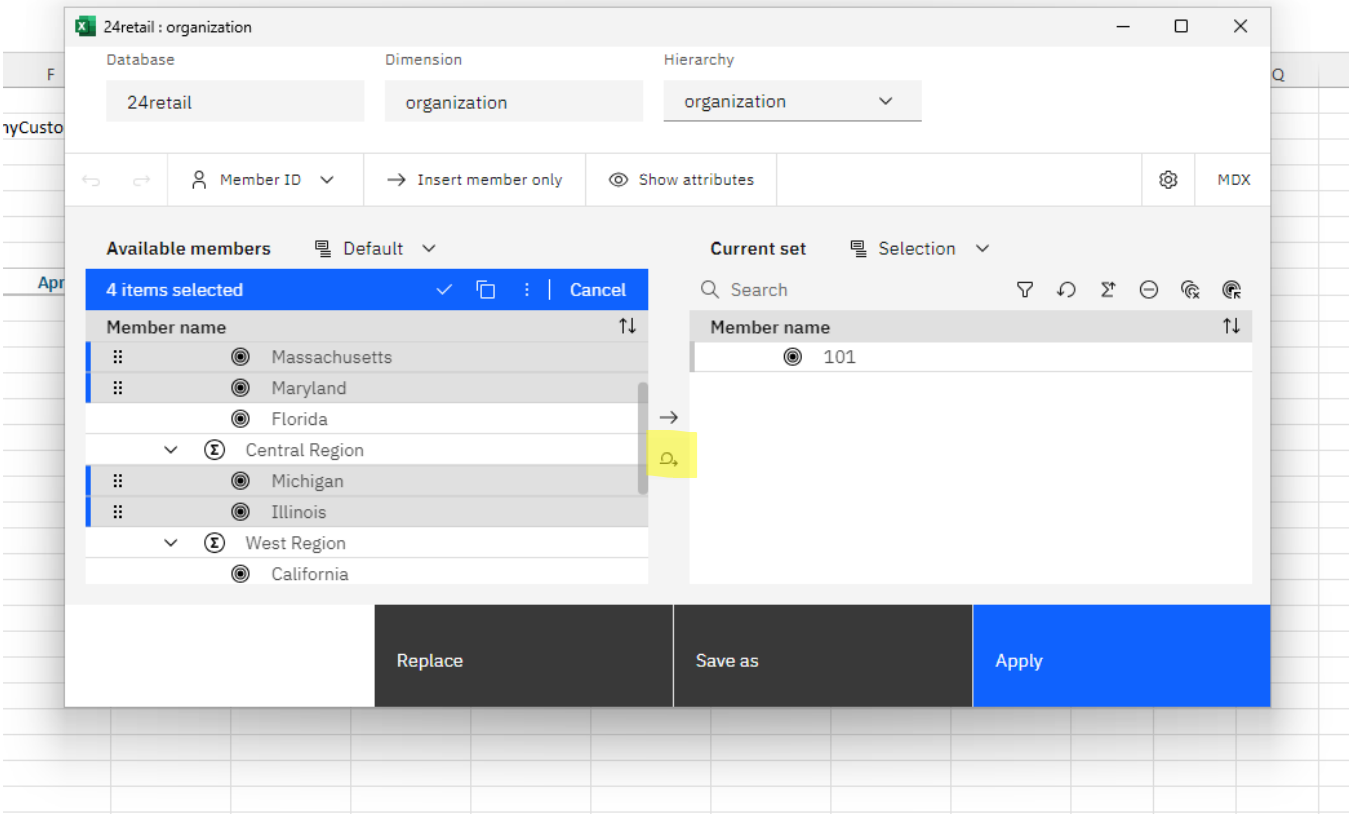
Submit the new name dialog.
Now, when you double click the TM1SET worksheet cell, the set editor should open.

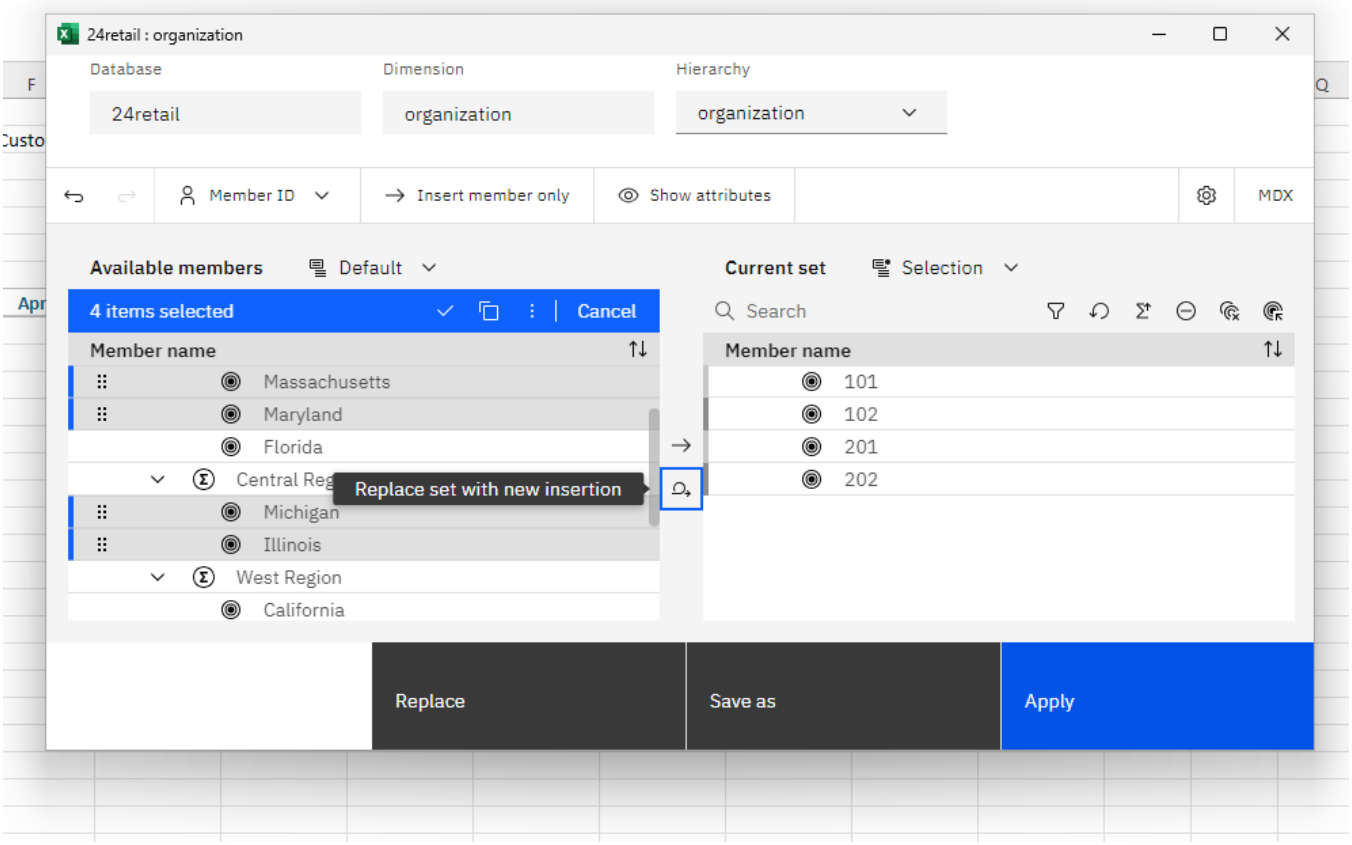


7.1.5 **Interactively recompose the composition of the recalculation**

Using the set editor, now let's edit to a new arbitrary list of members:

Ctrl click Massachusetts, Maryland, Michigan and Illinois to multi-select them
Then use the middle button to replace the set with the selection.


24retail : organization
Database
Dimension
Hierarchy
24retail
organization
organization
Member ID
Insert member only
Show attributes
MDX
Available members
Default
4 items selected
Cancel
Member name
Massachusetts
Maryland
Florida
Central Region
Michigan
Illinois
West Region
California
Current set
Selection
Search
Member name
101
Replace
Save as
Apply



Then Apply the new set to close the dialog

Press F9 as desired to fully recalculate the workbook
note the bespoke totals that are now shown.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	24retail:Revenue			https://stgqcif	24retail										
2	organization	myCustomCalc		0GHfZbkPAIAv	AQ	myCustomCalc									
3	product	4G 16Gb													
4	Revenue	Volume - Units													
5	Year	2020													
6	Version	Budget													
7															
8		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
9	Channel Total	22,682	1,169	1,234	1,206	1,261	1,554	2,136	2,010	2,399	2,434	2,171	2,443	2,666	
10	Retail	13,613	679	718	672	643	906	921	1,277	1,634	1,642	1,294	1,519	1,708	
11	Internet	6,420	343	356	370	433	454	1,009	502	525	544	600	631	654	
12	Distribution	2,650	147	161	164	186	194	206	230	240	248	277	292	304	
13															
14															