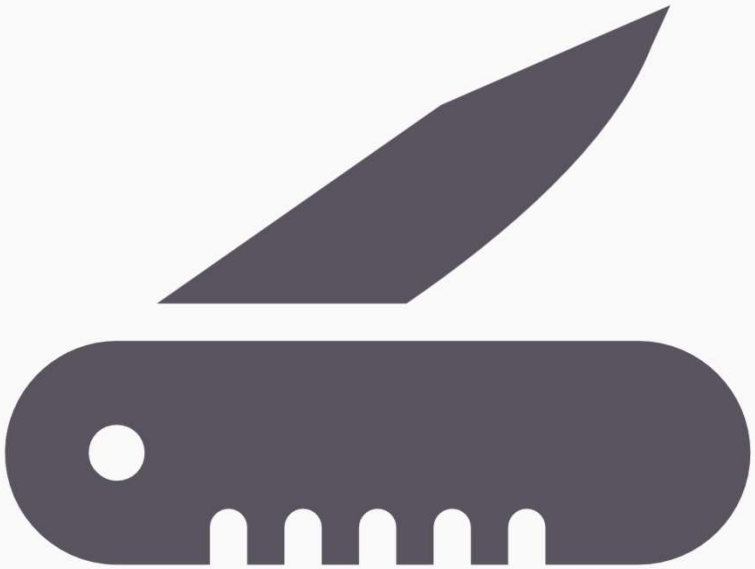
DAX 201: CALCULATE

Unfolding the Swiss Army Knife of DAX Functions

Mark Walter & Michael Hewitt

March 8, 2025

SQL Saturday Atlanta – AI & BI



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HUNT BROTHERS PIZZA

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Mark Walter
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Course Information

Hands-On Power BI Training
8 Two Hour Courses
Power Query, DAX, Visualization, Report Design

PowerBIAtWork.com/Learning

Download


DAX
Chapter 5
DAX
Chapter 5
GROK

Objectives

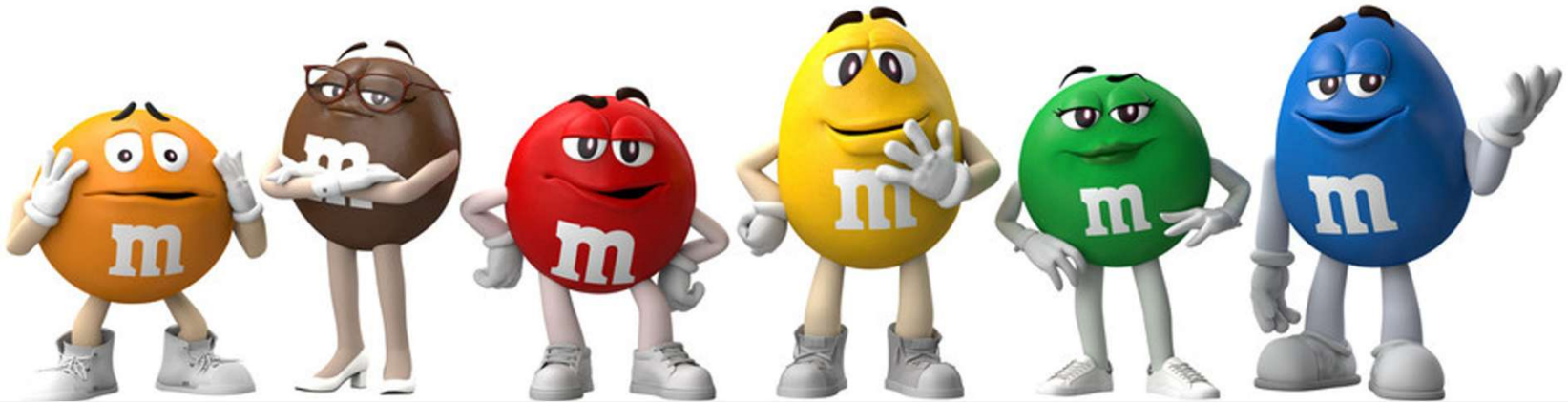
Unfold the mechanics of CALCULATE

Understand where to use CALCULATE

Understand what CALCULATE is doing behind the scenes

PARTICIPATION IS KEY!

Interact, have fun, and learn together!



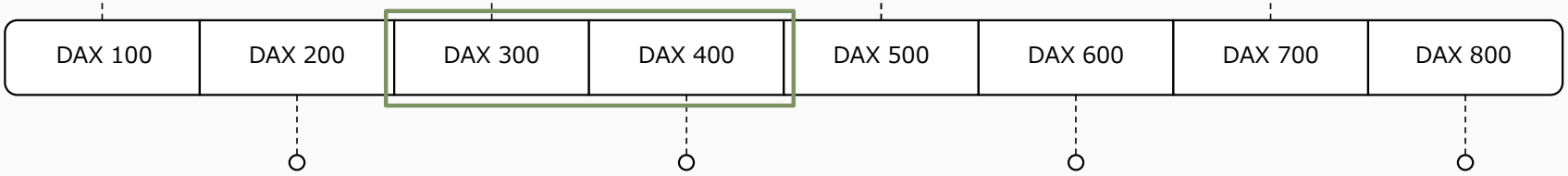
DAX LEARNING PATH

DAX Basics
Calculated Columns
Measures
Aggregations
Variables

Evaluation Context
Row Context
Filter Context
Context Transition
Forcing Filter Context

Relationships
Propagate Row Context?
Propagate Filter Context
DAX in action!

Expanded Tables
Propagating Relationships
Vs.
Mirroring filters through
expanded table concept.
Hands-on Examples



Common Table Functions
Common Table Functions
Adding Filters
Removing Filters
Mixing Table Functions

CALCULATE
= Filter Context
Filter arguments are tables
Context Transition
Hands-on Examples

Time Intelligence
Marking Date Table
Turn off Auto-Calendar
Standard Functions
Custom Time Intelligence

Many to Many
Classic M2M

slido

Please download and install the Slido app on all computers you use

Where are you on the DAX Learning Path?

ⓘ Start presenting to display the poll results on this slide.

DAX

Data Analysis eXpressions

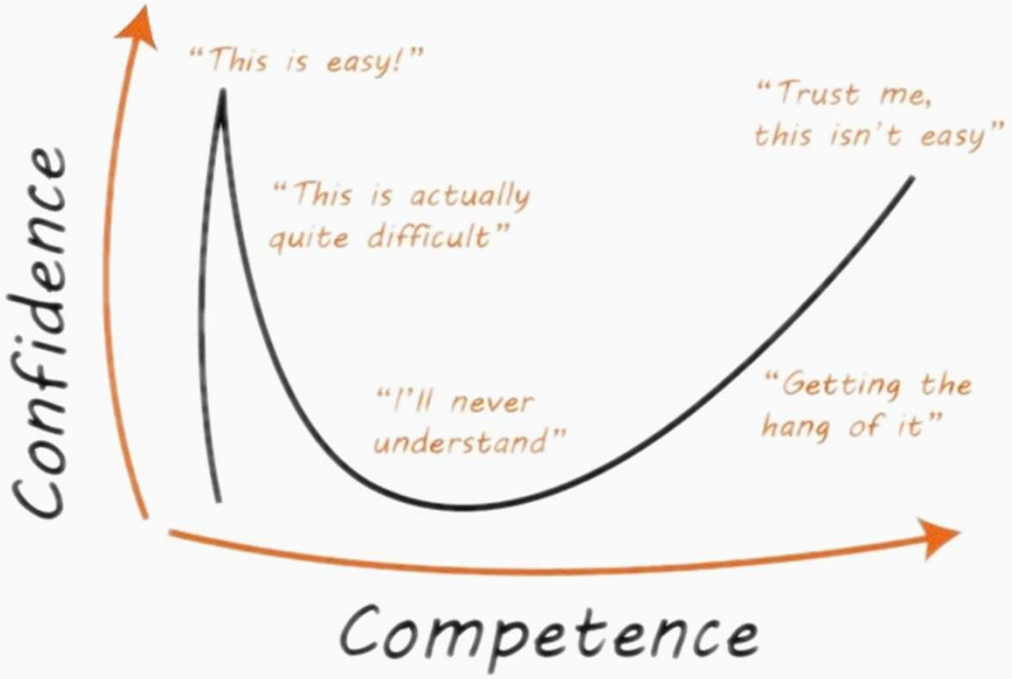
Formula and Query Language created by the SQL Server Analysis Services team at Microsoft in 2009.

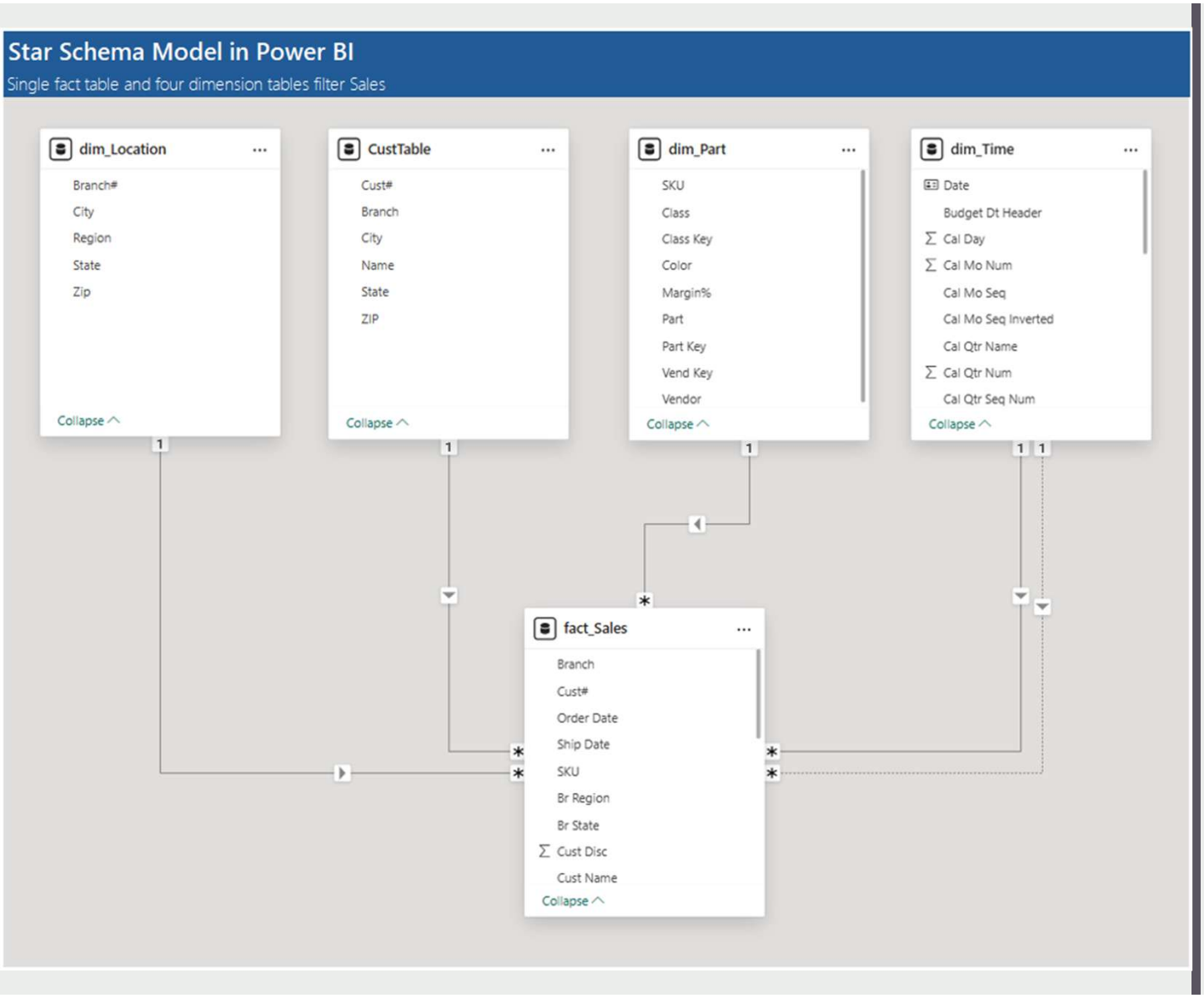
Blend of Excel formulas and MDX.

DAX is relatively simple letting business users expose the power of analysis in Power BI.

DAX

Data Analysis eXpressions





How do we go from this...

Vendor

- [x] KARPARTS
- [x] TOPCLEAN

Class

- [ ] Accessories
- [x] Cleaner
- [ ] Interior
- [ ] Liquids
- [ ] Protect
- [ ] Repair

Color

- [ ] Blue
- [ ] Green
- [ ] Red

Total Sales Report

Name	2020	2021	2022	2023	2024
Amy					
KARPARTS	12,074	10,088	7,965	8,070	5,419
TOPCLEAN	14,643	10,551	8,571	10,867	6,074
Total	**26,716**	**20,639**	**16,537**	**18,937**	**11,493**
Chris					
KARPARTS	10,932	9,782	8,214	7,494	3,520
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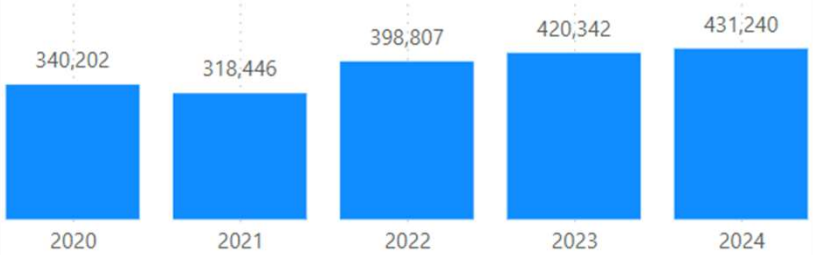
KARPARTS			890	2,785	1,098
TOPCLEAN			473	3,628	501
Total			**1,364**	**6,412**	**1,598**
Total	**340,202**	**318,446**	**398,807**	**420,342**	**431,240**

Total Sales by Cal Year



To this?

UNFOLDING THE MECHANICS OF CALCULATE

CALCULATE Order of Evaluation

1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

2
TABLE ROWS > FILTERS: Context Transition

Will remove and replace matching filters from Level 1

3
CALCULATE MODIFIERS: Modify Original Filters 1-2

REMOVEFILTERS
USERELATIONSHIP
CROSSFILTER

4
ADD EXPLICIT FILTERS

Will remove and replace filters from Levels 1-3

Table Function	Filtered by orig FC?	Invalid Blank Row?
Color = Red	Ignores FC on Col	Blank Row
ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

5
KEEPFILTERS

Order of Priority: First to Last

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

CALCULATE Order of Evaluation

5
KEEPFILTERS

Same Field Overlap

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ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

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UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

CALCULATE Order of Evaluation

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CALCULATE MODIFIERS: Modify Original Filters 1-2

REMOVEFILTERS
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Order of Priority: First to Last

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

CALCULATE Order of Evaluation

5
KEEPFILTERS

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ORIGINAL REPORT FILTERS

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UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

CALCULATE Order of Evaluation

5
KEEPFILTERS

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ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

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UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

Filter Modifier – KEEPFILTERS

CALCULATE Order of Evaluation

Standalone Protection

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KEEPFILTERS

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ADD EXPLICIT FILTERS

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1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

Order of Priority: First to Last

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

Filter Modifier – KEEPFILTERS

CALCULATE Order of Evaluation

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KEEPFILTERS

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REMOVEFILTERS
USERELATIONSHIP
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1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

Order of Priority: First to Last

PREVIEW #1

USERELATIONSHIP vs. TREATAS()

```
1 USEREL L3 = CALCULATE([Total Sales],
2             USERELATIONSHIP(fact_Sales[Order Date],dim_Time[Date]))
```

Total Sales Report

Date	Total Sales	USEREL L3
01/01/2024	4,252	$3,570
01/02/2024	3,679	$3,164
01/03/2024	3,005	$2,568
01/04/2024	2,886	$2,509
01/05/2024	2,592	$2,487
01/06/2024	2,677	$2,967
01/07/2024	2,109	$1,855
01/08/2024	3,073	$2,958
01/09/2024	2,929	$3,563
01/10/2024	2,073	$3,462
01/11/2024	3,207	$2,698

PREVIEW #1

USERELATIONSHIP vs. TREATAS()

```
1 TREATAS L4 = CALCULATE([Total Sales],TREATAS(VALUES(dim_Time[Date]),fact_Sales[Order Date]))
2 -- What is unseen here that is causing unexpected results with TREATAS?
```

Total Sales Report

Date	Total Sales	USEREL L3	TREATAS L4
01/01/2024	4,252	$3,570	$519
01/02/2024	3,679	$3,164	$567
01/03/2024	3,005	$2,568	$360
01/04/2024	2,886	$2,509	$519
01/05/2024	2,592	$2,487	$349
01/06/2024	2,677	$2,967	$310
01/07/2024	2,109	$1,855	$214
01/08/2024	3,073	$2,958	$554
01/09/2024	2,929	$3,563	$496
01/10/2024	2,073	$3,462	$409
01/11/2024	3,207	$2,698	$592

?

PREVIEW #2

SLICER NOT FILTERING LARGE ORDERS?

```
1 Order > 250 Bad = CALCULATE([Total Sales], fact_Sales[Total Sales]>250)
```

Total Sales Report

Vendor	Total Sales	Order > 250 Bad
KARPARTS		
Accessories	117,124	$66,851
Cleaner	865,827	$26,820
Interior	1,267,095	$1,178,168
Liquids	44,271	$19,380
Protect	499,794	$5,796
Repair	88,929	$2,349
Total	**2,883,041**	**$1,299,364**
SAFTEYSTAR	**1,151,000**	**$202,801**
TOPCLEAN	**1,353,488**	**$217,469**
Total	**5,387,528**	**$1,719,634**

+ Filter on sales range

32%

Order% Bad

Total Sales

$8

$1,350

PREVIEW #2

SLICER NOT FILTERING LARGE ORDERS?

```
1 Order > 250 Bad = CALCULATE([Total Sales],  fact_Sales[Total Sales]>250)
```

Total Sales Report

Vendor	Total Sales	Order > 250 Bad
KARPARTS		
Accessories	16,379	$66,851
Cleaner	478,602	$26,820
Interior	26,580	$1,178,168
Liquids	14,293	$19,380
Protect	217,524	$5,796
Repair	49,067	$2,349
Total	**802,444**	**$1,299,364**
SAFTEYSTAR	**605,972**	**$202,801**
TOPCLEAN	**868,454**	**$217,469**
Total	**2,276,870**	**$1,719,634**

Shows sales orders above $250?

76%

Order% Bad

Filters lower order sizes.

Total Sales

$8

$150


CALCULATE
In SLOW motion!

Vendor

- [x] KARPARTS
- [x] TOPCLEAN

Class

- [ ] Accessories
- [x] Cleaner
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Total Sales Report

Name	2020	2021	2022	2023	2024
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KARPARTS	12,074	10,088	7,965	8,070	5,419
TOPCLEAN	14,643	10,551	8,571	10,867	6,074
Total	**26,716**	**20,639**	**16,537**	**18,937**	**11,493**
Chris					
KARPARTS	10,932	9,782	8,214	7,494	3,520
TOPCLEAN	14,067	11,423	8,476	9,506	5,448
Total	**25,000**	**21,205**	**16,690**	**17,000**	**8,969**
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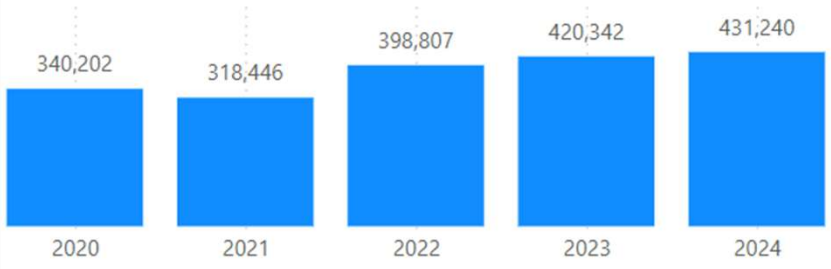
TOPCLEAN			473	3,628	501
Total			**1,364**	**6,412**	**1,598**
Total	**340,202**	**318,446**	**398,807**	**420,342**	**431,240**

Total Sales by Cal Year



1

We write a measure to total sales:

```
SUM(SalesFact[Sales])
```

(row context)

CALCULATE IN SLOW MOTION

Vendor

- [x] KARPARTS
- [x] TOPCLEAN

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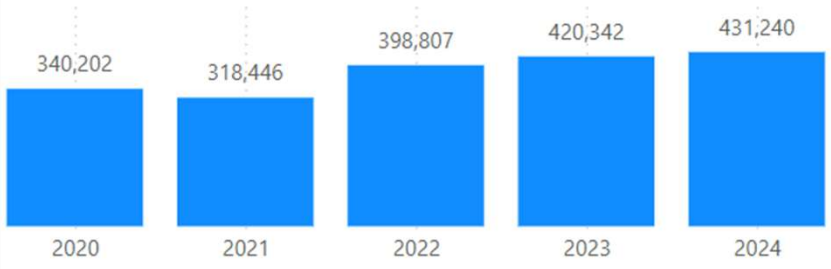

2

Under the hood iterator:

```
SUMX(SalesFact,
SalesFact[Sales])
```

(row context)

CALCULATE IN SLOW MOTION

Vendor

- [x] KARPARTS
- [x] TOPCLEAN

Class

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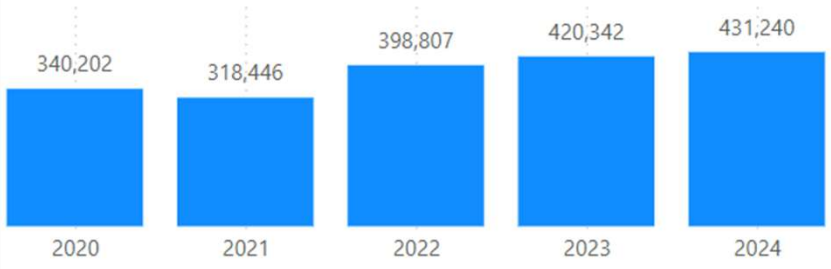


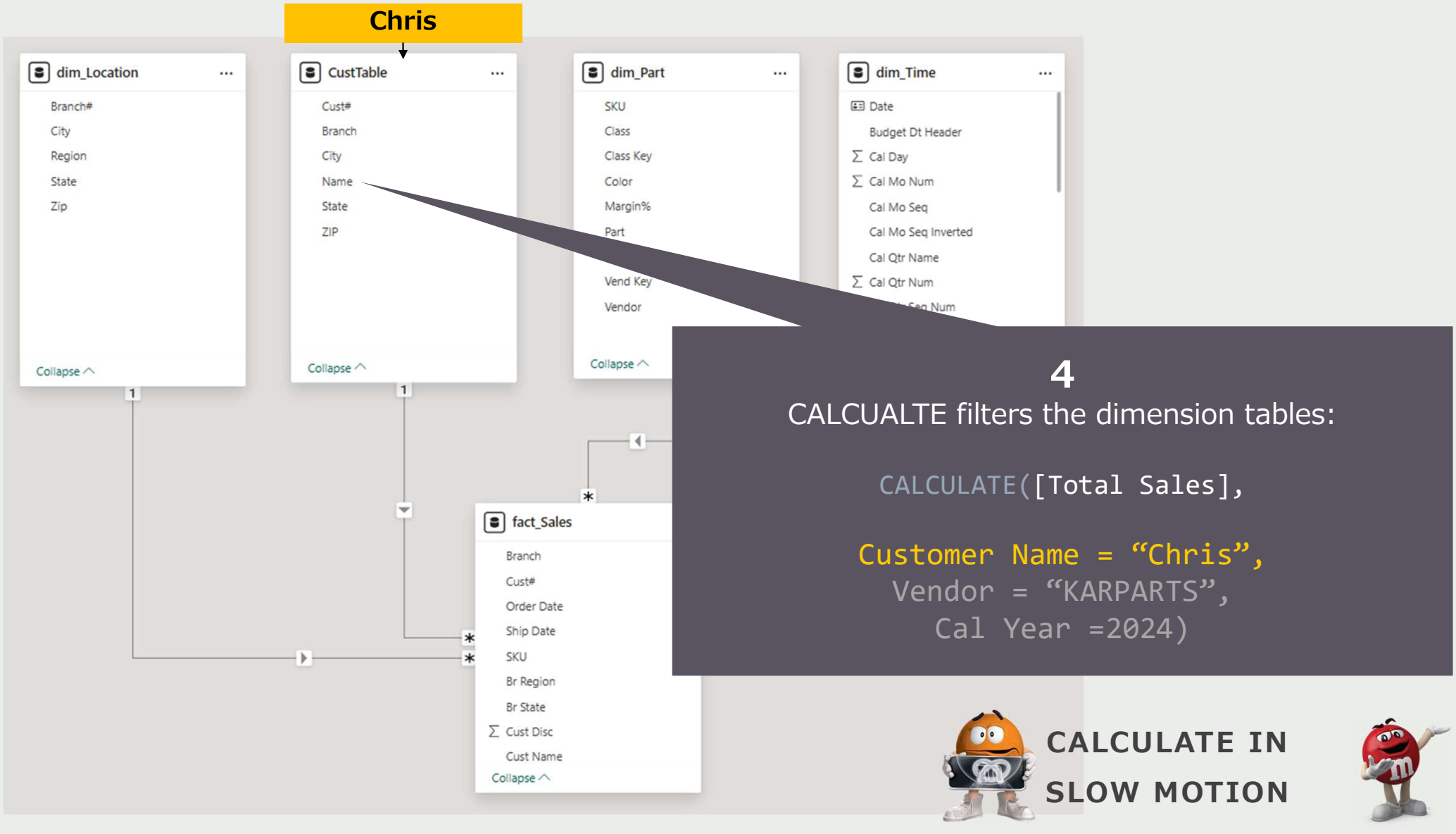
3

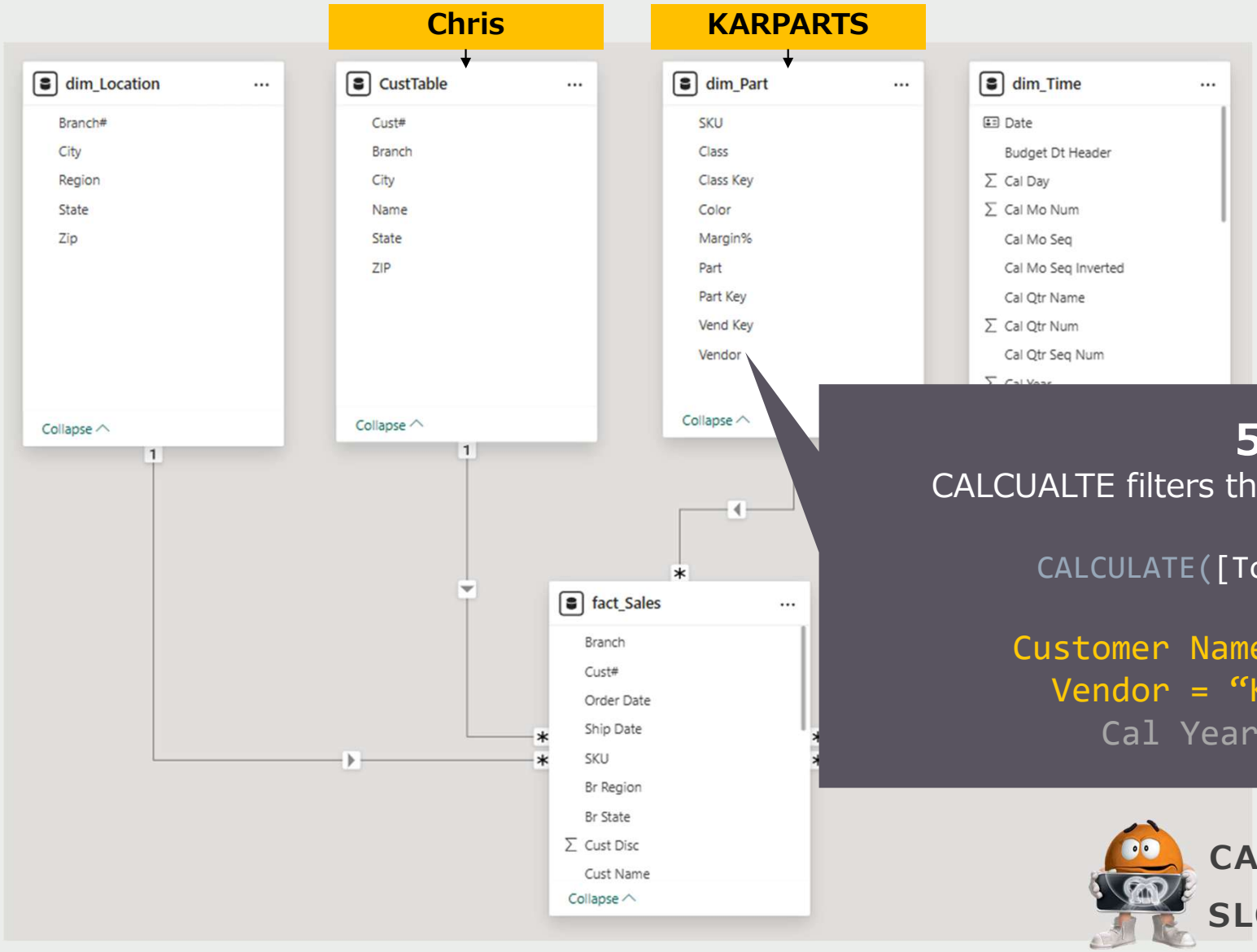
We write a measure to total sales:

```
CALCUALTE(
SUMX(SalesFact,[Sales])
<Fitlers>)
```

(filter context)

CALCULATE IN SLOW MOTION


Chris
dim_Location
Branch#
City
Region
State
Zip
Collapse
CustTable
Cust#
Branch
City
Name
State
ZIP
Collapse
dim_Part
SKU
Class
Class Key
Color
Margin%
Part
Vend Key
Vendor
Collapse
dim_Time
Date
Budget Dt Header
Cal Day
Cal Mo Num
Cal Mo Seq
Cal Mo Seq Inverted
Cal Qtr Name
Cal Qtr Num
fact_Sales
Branch
Cust#
Order Date
Ship Date
SKU
Br Region
Br State
Cust Disc
Cust Name
Collapse
4
CALCUALTE filters the dimension tables:
CALCULATE([Total Sales],
Customer Name = "Chris",
Vendor = "KARPARTS",
Cal Year =2024)
CALCULATE IN
SLOW MOTION



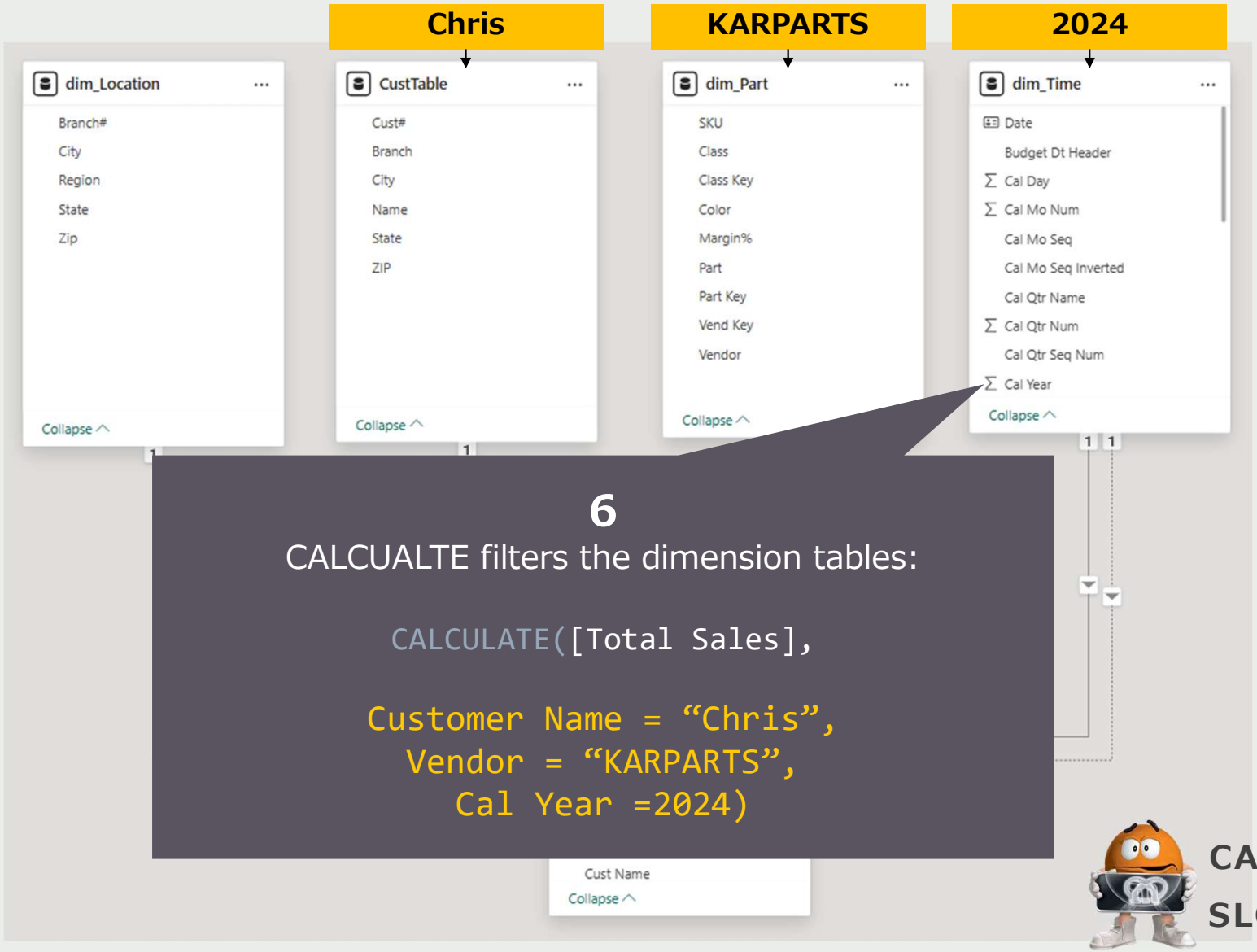
5

CALCUALTE filters the dimension tables:

```
CALCULATE([Total Sales],

Customer Name = “Chris”,
Vendor = “KARPARTS”,
Cal Year =2024)
```


CALCULATE IN SLOW MOTION



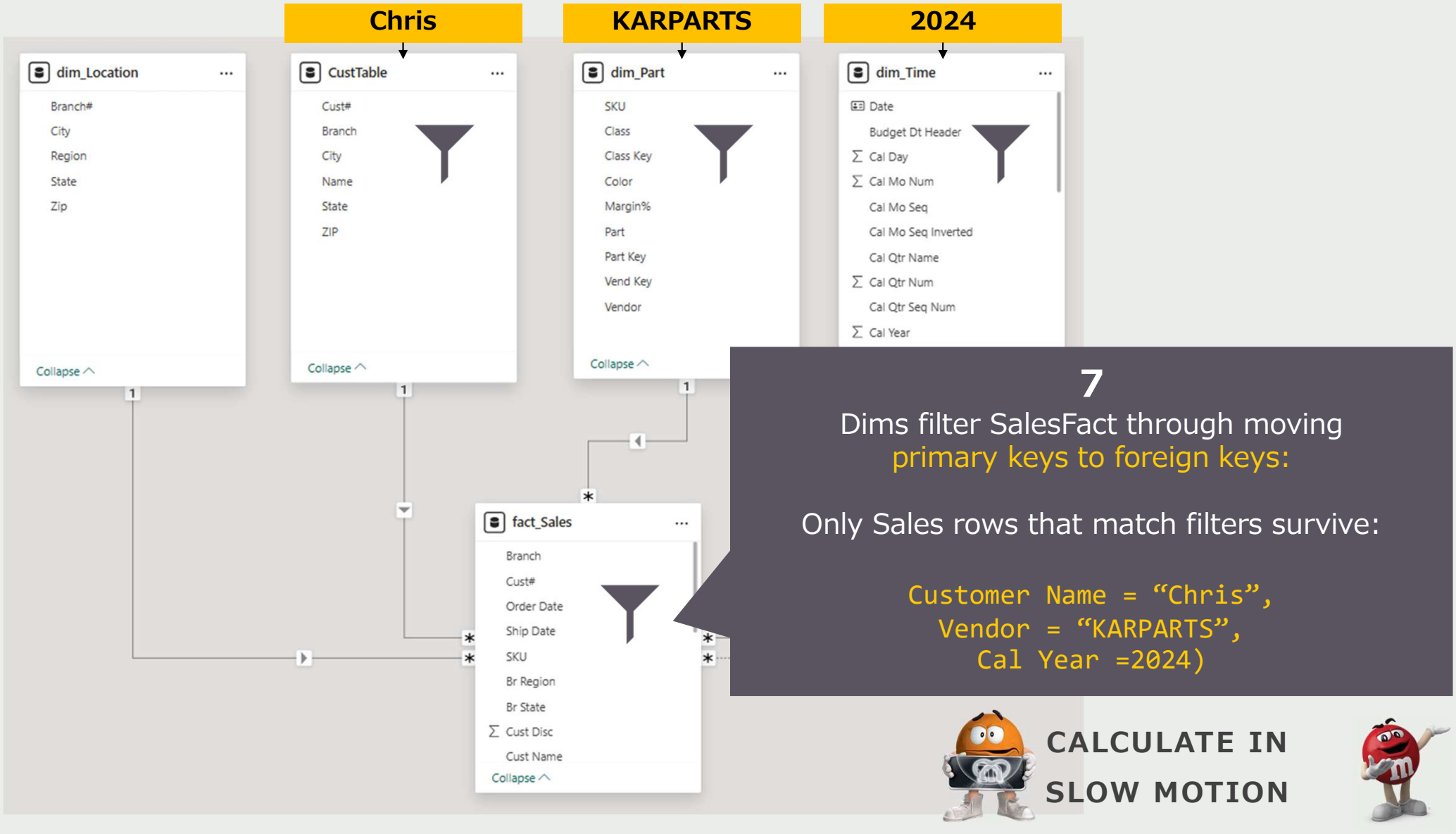
6

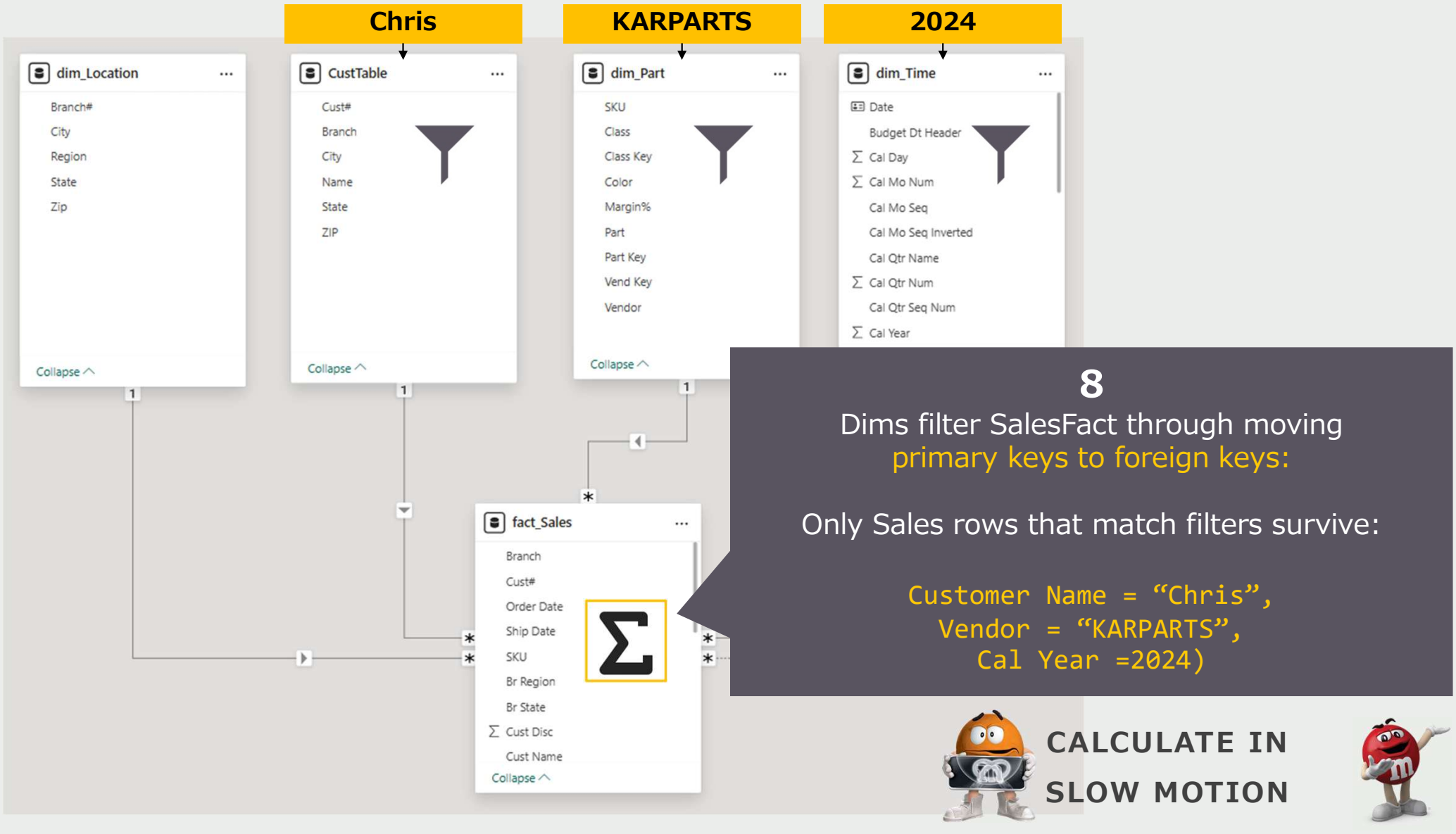
CALCUALTE filters the dimension tables:

```
CALCULATE([Total Sales],

Customer Name = “Chris”,
Vendor = “KARPARTS”,
Cal Year =2024)
```


CALCULATE IN SLOW MOTION


Chris
KARPARTS
2024
dim_Location
Branch#
City
Region
State
Zip
Collapse
CustTable
Cust#
Branch
City
Name
State
ZIP
Collapse
dim_Part
SKU
Class
Class Key
Color
Margin%
Part
Part Key
Vend Key
Vendor
Collapse
dim_Time
Date
Budget Dt Header
Cal Day
Cal Mo Num
Cal Mo Seq
Cal Mo Seq Inverted
Cal Qtr Name
Cal Qtr Num
Cal Qtr Seq Num
Cal Year
fact_Sales
Branch
Cust#
Order Date
Ship Date
SKU
Br Region
Br State
Cust Disc
Cust Name
Collapse
1
1
1
*
*
*
*
7
Dims filter SalesFact through moving
primary keys to foreign keys:
Only Sales rows that match filters survive:
Customer Name = “Chris”,
Vendor = “KARPARTS”,
Cal Year =2024)
CALCULATE IN
SLOW MOTION


Chris
KARPARTS
2024
dim_Location
Branch#
City
Region
State
Zip
Collapse
CustTable
Cust#
Branch
City
Name
State
ZIP
Collapse
dim_Part
SKU
Class
Class Key
Color
Margin%
Part
Part Key
Vend Key
Vendor
Collapse
dim_Time
Date
Budget Dt Header
Cal Day
Cal Mo Num
Cal Mo Seq
Cal Mo Seq Inverted
Cal Qtr Name
Cal Qtr Num
Cal Qtr Seq Num
Cal Year
fact_Sales
Branch
Cust#
Order Date
Ship Date
SKU
Br Region
Br State
Cust Disc
Cust Name
Collapse
1
*
8
Dims filter SalesFact through moving
primary keys to foreign keys:
Only Sales rows that match filters survive:
Customer Name = “Chris”,
Vendor = “KARPARTS”,
Cal Year =2024)
CALCULATE IN
SLOW MOTION

Vendor

- [x] KARPARTS
- [x] TOPCLEAN

Class

- [ ] Accessories
- [x] Cleaner
- [ ] Interior
- [ ] Liquids
- [ ] Protect
- [ ] Repair

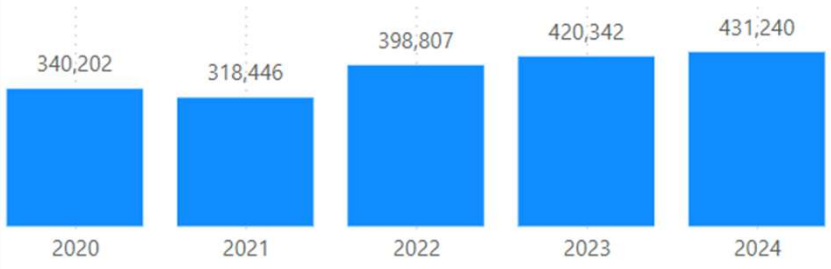
Color

- [ ] Blue
- [ ] Green
- [ ] Red

Total Sales Report

Name	2020	2021	2022	2023	2024
Amy					
KARPARTS	12,074	10,088	7,965	8,070	5,419
TOPCLEAN	14,643	10,551	8,571	10,867	6,074
Total	**26,716**	**20,639**	**16,537**	**18,937**	**11,493**
Chris					
KARPARTS	10,932	9,782	8,214	7,494	3,520
TOPCLEAN	14,067	11,423	8,476	9,506	5,448
Total	**25,000**	**21,205**	**16,690**	**17,000**	**8,969**
Dan					
KARPARTS			890	2,785	1,098
TOPCLEAN			473	3,628	501
Total			**1,364**	**6,412**	**1,598**
Total	**340,202**	**318,446**	**398,807**	**420,342**	**431,240**

Total Sales by Cal Year



9

CALCULATE returns the new filter context back to the visual under the original filter context.

1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

2
TABLE ROWS > FILTERS: Context Transition

Will remove and replace matching filters from Level 1

CALCULATE IN SLOW MOTION

Vendor
- [x] KARPARTS
- [x] TOPCLEAN

Class
- [ ] Accessories
- [x] Cleaner
- [ ] Interior
- [ ] Liquids
- [ ] Protect
- [ ] Repair

Color
- [ ] Blue
- [ ] Green
- [ ] Red

Total Sales Report

Name	2020	2021	2022	2023	2024
Amy					
KARPARTS	12,074	10,088	7,965	8,070	5,419
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Total			**1,364**	**6,412**	**1,598**
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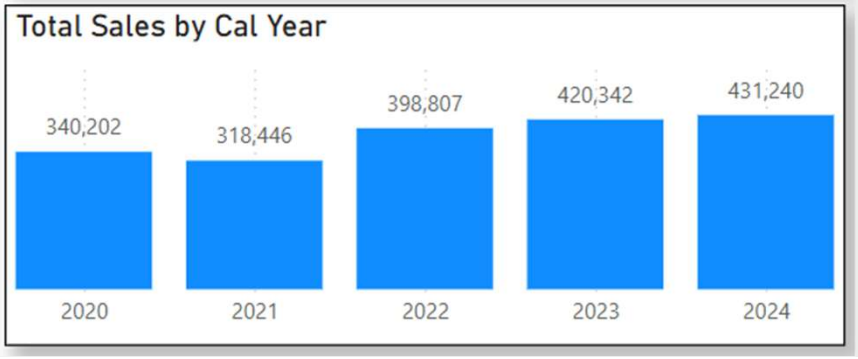



```
CALCULATE( [Total Sales] ,
Customer Name = “Chris”,
Vendor = “KARPARTS”,
Cal Year =2024)
```

```
CALCULATE( [Total Sales] ,
Customer Name = “Dan”,
Vendor = “TOPCLEAN”,
Cal Year =2023)
```

CALCULATE = Filter Context

Reusable and dynamic results to our visuals

CALCULATE IN SLOW MOTION

! THE MOST IMPORTANT CONCEPT TO KNOW IN DAX

Row Context:

Tables associate with Row Context

Evaluates row-by-row.

Row context does not propagate over filters.

Evaluates each row for math or conditions (horizontal).

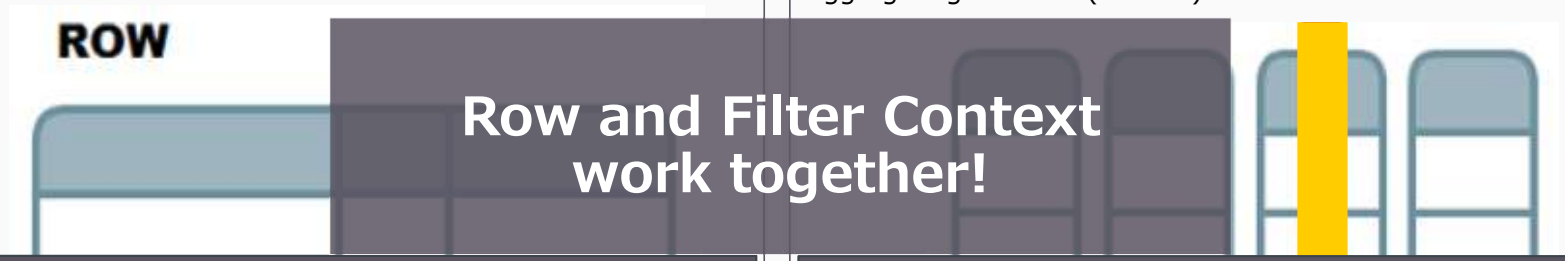
Filter Context:

Measures associate Filter Context through CALCULATE

CALCULATE collects filters over columns and tables.

Filters propagate through relationships.

Aggregating columns (vertical).



Row and Filter Context work together!

```
SUMX(SalesFact,[Sales])
     (Row Context)
```

```
CALCULATE( [Sales] ,
    Customer Name = “Chris”,
    Vendor = “KARPARTS”,
    Cal Year =2024 )
```

(Filter Context)

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

CALCULATE Order of Evaluation

5
KEEPFILTERS

1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

2
TABLE ROWS > FILTERS: Context Transition

Will remove and replace matching filters from Level 1

3
CALCULATE MODIFIERS: Modify Original Filters 1-2

REMOVEFILTERS
USERELATIONSHIP
CROSSFILTER

4
ADD EXPLICIT FILTERS

Will remove and replace filters from Levels 1-3

Table Function	Filtered by orig FC?	Invalid Blank Row?
Color = Red	Ignores FC on Col	Blank Row
ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

Order of Priority: First to Last

EXAMPLE: CALCULATE MODIFIER

REMOVEFILTERS() - RATIOS

Use of ALL() or REMOVEFILTERS() – As a modifier

1. Remove filters is not a table; it is a modifier that removes filters from our model.
2. Measures are required for computing ratios.
3. ALL() or REMOVEFILTERS() as a CALCULATE argument removes filters placed on columns.

```
1 REMOVE VenClass =
2
3 var __removeVen = CALCULATE([Total Sales],REMOVEFILTERS(dim_Part[Vendor]))
4
5 var __removeVenClass = CALCULATE([Total Sales],REMOVEFILTERS(dim_Part[Vendor],dim_Part[Class]))
6
7 return
8 __removeVenClass
```

EXAMPLE: CALCULATE MODIFIER

REMOVEFILTERS() - Ratios

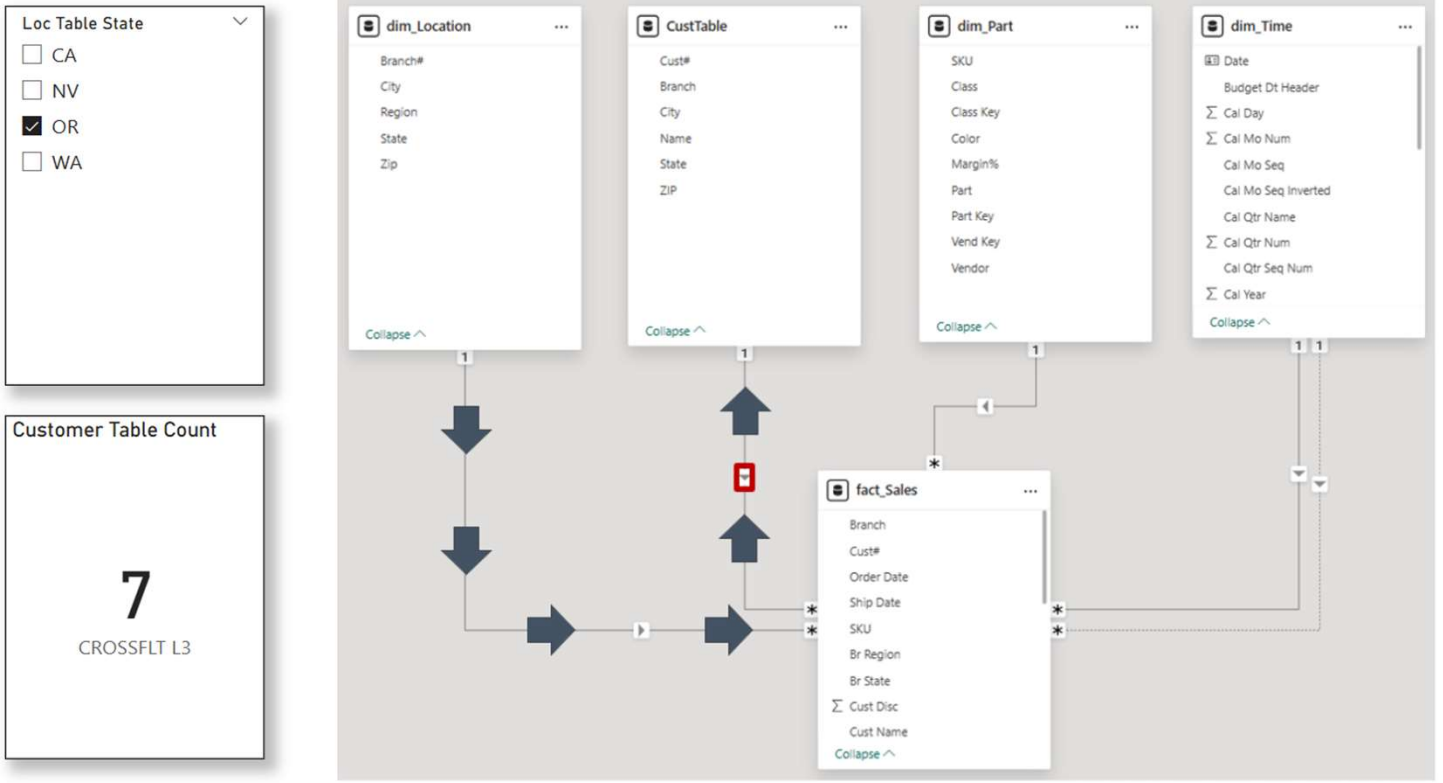
Total Sales Report

Cal Year	2023		2024	
Vendor	Total Sales	REMOVE VenClass	Total Sales	REMOVE VenClass
KARPARTS				
Accessories				
Blue	6,025	$358,843	6,528	$371,291
Green	10,623	$247,220	11,792	$255,309
Red	7,837	$566,394	8,967	$595,861
Total	**24,484**	**$1,172,457**	**27,286**	**$1,222,462**
Cleaner				
Blue	192,278	$358,843	194,858	$371,291
Total	**192,278**	**$1,172,457**	**194,858**	**$1,222,462**
Interior				
Red	271,435	$566,394	288,353	$595,861
Total	**271,435**	**$1,172,457**	**288,353**	**$1,222,462**
Liquids				
Blue	7,447	$358,843	6,795	$371,291
Total	**1,172,457**	**$1,172,457**	**1,222,462**	**$1,222,462**

EXAMPLE: CALCULATE MODIFIER

CROSSFILTER()

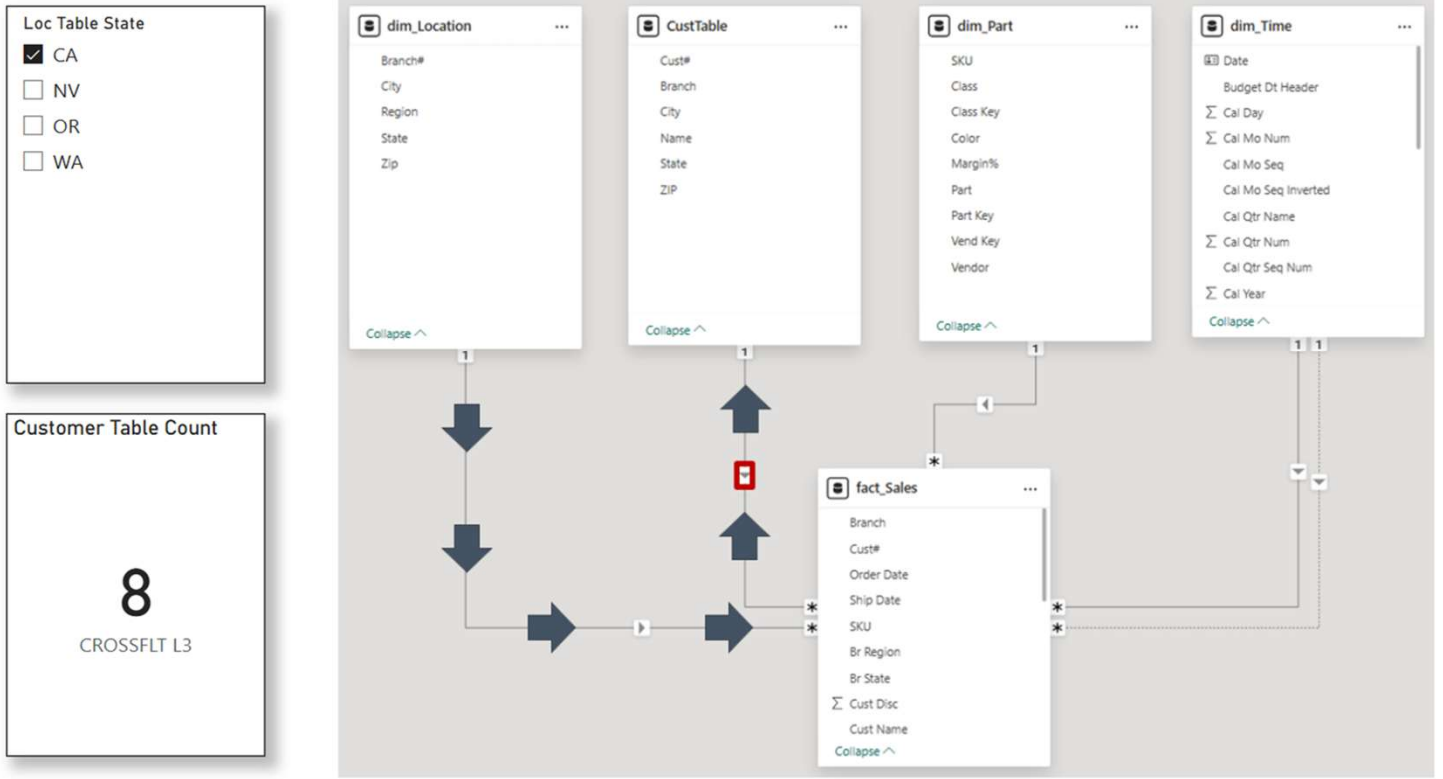
```
1 CROSSFLT L3 = CALCULATE(COUNTROWS(CustTable), CROSSFILTER(fact_Sales[Cust#], CustTable[Cust#],Both))
```



EXAMPLE: CALCULATE MODIFIER

CROSSFILTER()

```
1 CROSSFLT L3 = CALCULATE(COUNTROWS(CustTable), CROSSFILTER(fact_Sales[Cust#], CustTable[Cust#],Both))
```



UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

CALCULATE Order of Evaluation

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USERELATIONSHIP
CROSSFILTER

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ADD EXPLICIT FILTERS

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ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

Order of Priority: First to Last

EXAMPLE: COLUMN FILTER PREDICATE

WHICH TWO ARE THE SAME?

Simple filters Ignore other filters on the visual (Color = “Red”)

Which variables below are identical in evaluation?

```
1 Color Red (L4) combo =
2
3 var __filter1 = CALCULATE([Total Sales],dim_Part[Color]="Red")
4
5 var __filter2 = CALCULATE([Total Sales],FILTER(ALL(dim_Part[Color]),dim_Part[Color]="Red"))
6
7 var __filter3 = CALCULATE([Total Sales],FILTER(VALUES(dim_Part[Color]),dim_Part[Color]="Red"))
8
```

Table Iterator

Table Function

Expression

EXAMPLE: COLUMN FILTER PREDICATE

WHICH TWO ARE THE SAME?

Simple filters ignore other filters on the visual (Color = “Red”)

Which variables below are identical in evaluation?

Total Sales Report

Cal Year	2024			
Vendor	Total Sales	Color Red (L4)	Color ALL Red (L4)	Color VALUES Red (L4)
⊟ **KARPARTS**				
⊟ **Accessories**				
Blue	6,528	$8,967	$8,967	
Green	11,792	$8,967	$8,967	
Red	8,967	$8,967	$8,967	$8,967
Total	**27,286**	**$8,967**	**$8,967**	**$8,967**
⊟ **Cleaner**				
Blue	194,858			
Total	**194,858**			
⊟ **Interior**				
Red	288,353	$288,353	$288,353	$288,353
Total	**288,353**	**$288,353**	**$288,353**	**$288,353**

EXAMPLE: RESOLVING FILTER CONFLICTS

PREDICATE TABLES

First Example: Competing Filters – Impossible '**and**' set

```
1 Color Red Blue (L4) =
2
3 var __filter4 = CALCULATE([Total Sales], dim_Part[Color] = "Red", dim_Part[Color] = "Blue")
4
5 return
```

Cal Year	2024	
Vendor	Total Sales	Color Red Blue (L4)
⊟ **KARPARTS**		
⊟ **Accessories**		
Blue	6,528	
Green	11,792	
Red	8,967	
Total	**27,286**	

TREATAS()

Technically **not a CALCULATE modifier**, but a Table expression.
Gives us flexibility to assign lists of values from other columns.
It transfers column values as filters to other columns through virtual relationships.

TREATAS creates virtual relationships that transfer lineage.

TREATAS assigns the data lineage of the columns returned by the expression using the columns in the following arguments. The result can be assigned to a variable, because TREATAS is not a filter modifier. The first argument must be a table expression.

TREATAS DAX Function (Table manipulation)

Syntax | Return values | Remarks | Examples | Articles | Related

Treats the columns of the input table as columns from other tables.For each column, filters out any values that are not present in its respective output column.

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

Filter Modifier – KEEPFILTERS

CALCULATE Order of Evaluation

KEEPFILTERS builds a barrier around Level 2-4, preventing each from impacting lower-level filter arguments.

5
KEEPFILTERS

4
ADD EXPLICIT FILTERS

Will remove and replace filters from Levels 1-3

Table Function	Filtered by orig FC?	Invalid Blank Row?
Color = Red	Ignores FC on Col	Blank Row
ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

3
CALCULATE MODIFIERS: Modify Original Filters 1-2

REMOVEFILTERS
USERELATIONSHIP
CROSSFILTER

2
TABLE ROWS > FILTERS: Context Transition

Will remove and replace matching filters from Level 1

1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

Order of Priority: First to Last

EXAMPLE: INNERMOST WINS

(IN = OR)

Second Example: Competing Filters and Nested CALCULATES?

Nested filters conflict

1. Multiple filters in CALCULATE ‘merge’
2. Nested CALCULATE(s); **inner OVERWRITES** the outer (first evaluated CALC filters).
3. Use **KEEPFILTERS** to ‘keep’ the inner filter from replacing the outer filter. Intersect.

```
Compete Filters (L4) combo =

var __Compete1 = CALCULATE([Total Sales], dim_Part[Color] = "Red", dim_Part[Color] = "Blue")

var __Compete2 = CALCULATE(
                    CALCULATE([Total Sales], dim_Part[Color] IN {"Red","Blue"}),
                        dim_Part[Color] IN {"Green","Blue"})

var __Compete3 = CALCULATE(
                    CALCULATE([Total Sales], KEEPFILTERS(dim_Part[Color] IN {"Red","Blue"})),
                        dim_Part[Color] IN {"Green","Blue"})
return
__Compete1
```

EXAMPLE: INNERMOST WINS

(IN = OR)

Second Example: Competing Filters and Nested CALCULATES?

Nested filters conflict

1. Multiple filters in CALCULATE 'merge'
2. Nested multiple CALCULATE filters; **inner OVERWRITES** the outer (first evaluated CALC filters).
3. Use **KEEPFILTERS** to 'keep' the inner from replacing the outer filter. Intersect.

Total Sales Report

Cal Year	2024	Red & Blue?	IN Red & Blue!	Merge Blue & Blue
Vendor	Total Sales	Compete Filters1 (L4)	Compete Filters2 (L4)	Compete Filters3 (L4)
KARPARTS				
Accessories				
Blue	6,528		$15,495	$6,528
Green	11,792		$15,495	$6,528
Red	8,967		$15,495	$6,528
Total	**27,286**		**$15,495**	**$6,528**
Cleaner				
Blue	194,858		$194,858	$194,858
Total	**194,858**		**$194,858**	**$194,858**
Interior				
Red	288,353		$288,353	
Total	**288,353**		**$288,353**	

CHALLENGE #1

USERELATIONSHIP vs. TREATAS()

```
1 USEREL L3 = CALCULATE([Total Sales],
2             USERELATIONSHIP(fact_Sales[Order Date],dim_Time[Date]))
```

Total Sales Report

Date	Total Sales	USEREL L3
01/01/2024	4,252	$3,570
01/02/2024	3,679	$3,164
01/03/2024	3,005	$2,568
01/04/2024	2,886	$2,509
01/05/2024	2,592	$2,487
01/06/2024	2,677	$2,967
01/07/2024	2,109	$1,855
01/08/2024	3,073	$2,958
01/09/2024	2,929	$3,563
01/10/2024	2,073	$3,462
01/11/2024	3,207	$2,698

CHALLENGE #1

USERELATIONSHIP vs. TREATAS()

```
1 TREATAS L4 = CALCULATE([Total Sales],TREATAS(VALUES(dim_Time[Date]),fact_Sales[Order Date]))
2 -- What is unseen here that is causing unexpected results with TREATAS?
```

Total Sales Report

Date	Total Sales	USEREL L3	TREATAS L4
01/01/2024	4,252	$3,570	$519
01/02/2024	3,679	$3,164	$567
01/03/2024	3,005	$2,568	$360
01/04/2024	2,886	$2,509	$519
01/05/2024	2,592	$2,487	$349
01/06/2024	2,677	$2,967	$310
01/07/2024	2,109	$1,855	$214
01/08/2024	3,073	$2,958	$554
01/09/2024	2,929	$3,563	$496
01/10/2024	2,073	$3,462	$409
01/11/2024	3,207	$2,698	$592

?

CHALLENGE #1

USERELATIONSHIP vs. TREATAS()

```
1 TREATAS L4 = CALCULATE([Total Sales],TREATAS(VALUES(dim_Time[Dat                    Date]))
2 -- What is unseen here that is causing unexpected results with T
```

Total Sales Report

Date	Total Sales	USEREL L3	TREATAS L4
01/01/2024	4,252	$3,570	$519
01/02/2024	3,679	$3,164	$567
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01/04/2024	2,886	$2,509	$519
01/05/2024	2,592	$2,487	$349
01/06/2024	2,677	$2,967	$310
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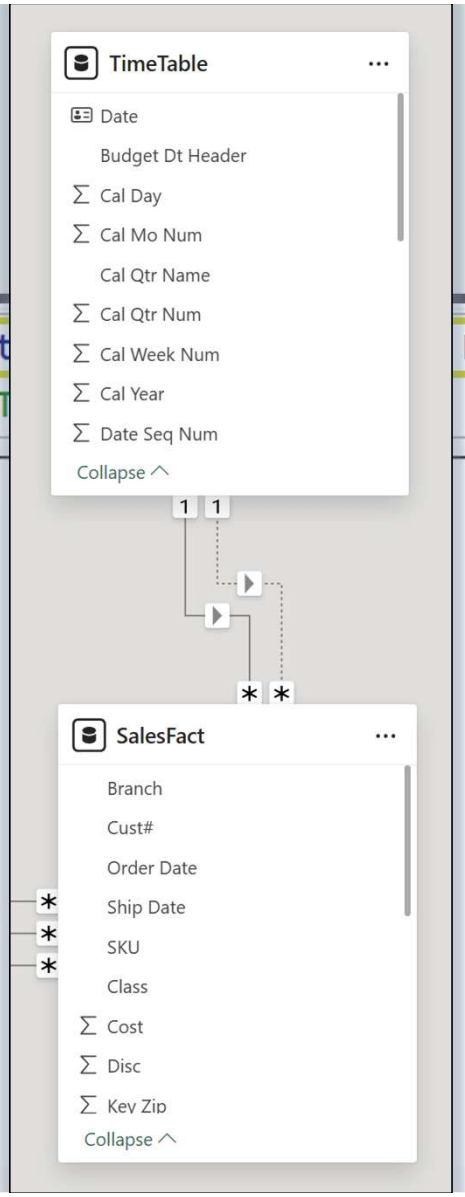
01/08/2024	3,073	$2,958	$554
01/09/2024	2,929	$3,563	$496
01/10/2024	2,073	$3,462	$409
01/11/2024	3,207	$2,698	$592

?



CHALLENGE #1

USERELATIONSHIP vs. TREATAS()

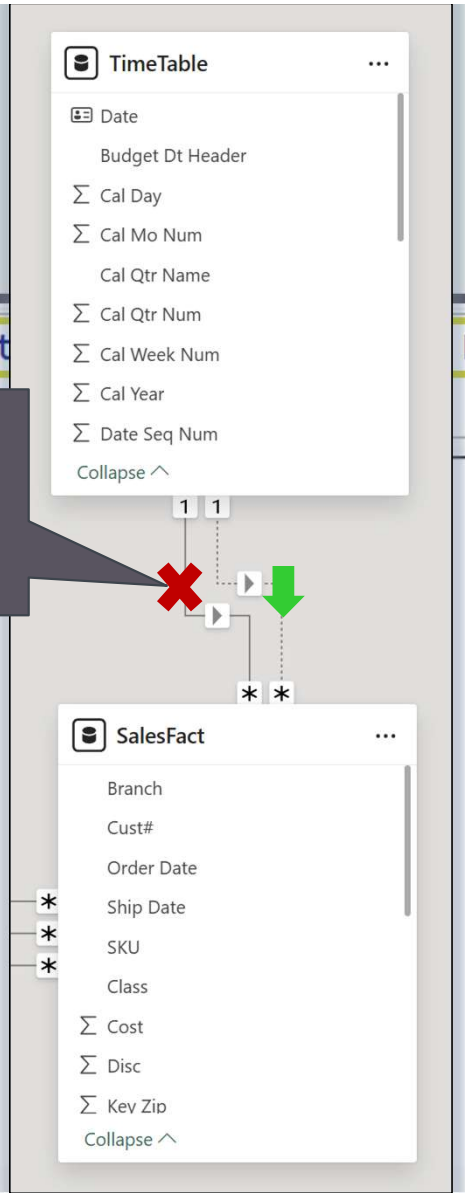
```
1 TREATAS L4 = CALCULATE([Total Sales],TREATAS(VALUES(dim_Time[Dat                    Date]))
2 -- What is unseen here that is
```

Total Sales Report

Date	Total Sales	USEREL L3	TREATAS L
01/01/2024	4,252	$3,570	$5
01/02/2024	3,679	$3,164	$567
01/03/2024	3,005	$2,568	$360
01/04/2024	2,886	$2,509	$519
01/05/2024	2,592	$2,487	$349
01/06/2024	2,677	$2,967	$310
01/07/2024	2,109	$1,855	$214
01/08/2024	3,073	$2,958	$554
01/09/2024	2,929	$3,563	$496
01/10/2024	2,073	$3,462	$409
01/11/2024	3,207	$2,698	$592

Filters follow lineage:
Eliminate original report filter to ensure only one filter from Date[Date] dim.

?



CHALLENGE #1

USERELATIONSHIP vs. TREATAS()

```
1 TREATAS L4 RF = CALCULATE([Total Sales],          ?          (dim_Time[Date]),
2                           TREATAS(VALUES(dim_Time[Date]),fact_Sales[Order Date]))
3 -- TimeTable(Date) tranfers filters to Ship & Order date at the same time.
```

Total Sales Report

Date	Total Sales	USEREL L3	TREATAS L4	TREATAS L4 RF
01/01/2024	4,252	$3,570	$519	$3,570
01/02/2024	3,679	$3,164	$567	$3,164
01/03/2024	3,005	$2,568	$360	$2,568
01/04/2024	2,886	$2,509	$519	$2,509
01/05/2024	2,592	$2,487	$349	$2,487
01/06/2024	2,677	$2,967	$310	$2,967
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01/08/2024	3,073	$2,958	$554	$2,958
01/09/2024	2,929	$3,563	$496	$3,563
01/10/2024	2,073	$3,462	$409	$3,462
01/11/2024	3,207	$2,698	$592	$2,698

CHALLENGE #1

USERELATIONSHIP vs. TREATAS()

```
1 TREATAS L4 RF = CALCULATE([Total Sales],REMOVEFILTERS(dim_Time[Date]),
2                           TREATAS(VALUES(dim_Time[Date]),fact_Sales[Order Date]))
3 -- TimeTable(Date) tranfers filters to Ship & Order date at the same time.
```

Total Sales Report

Date	Total Sales	USEREL L3	TREATAS L4	TREATAS L4 RF
01/01/2024	4,252	$3,570	$519	$3,570
01/02/2024	3,679	$3,164	$567	$3,164
01/03/2024	3,005	$2,568	$360	$2,568
01/04/2024	2,886	$2,509	$519	$2,509
01/05/2024	2,592	$2,487	$349	$2,487
01/06/2024	2,677	$2,967	$310	$2,967
01/07/2024	2,109	$1,855	$214	$1,855
01/08/2024	3,073	$2,958	$554	$2,958
01/09/2024	2,929	$3,563	$496	$3,563
01/10/2024	2,073	$3,462	$409	$3,462
01/11/2024	3,207	$2,698	$592	$2,698

```
1 TREATAS L4 RF = CALCULATE([Total Sales],REMOVEFILTERS(dim_Time[Date]),
2                  TREATAS(VALUES(dim_Time[Date]),fact_Sales[Order Date]))
3 -- TimeTable(Date) tranfers filters to Ship & Order date at the same time.
```

Attract **original report filters (Outer & Inner)**

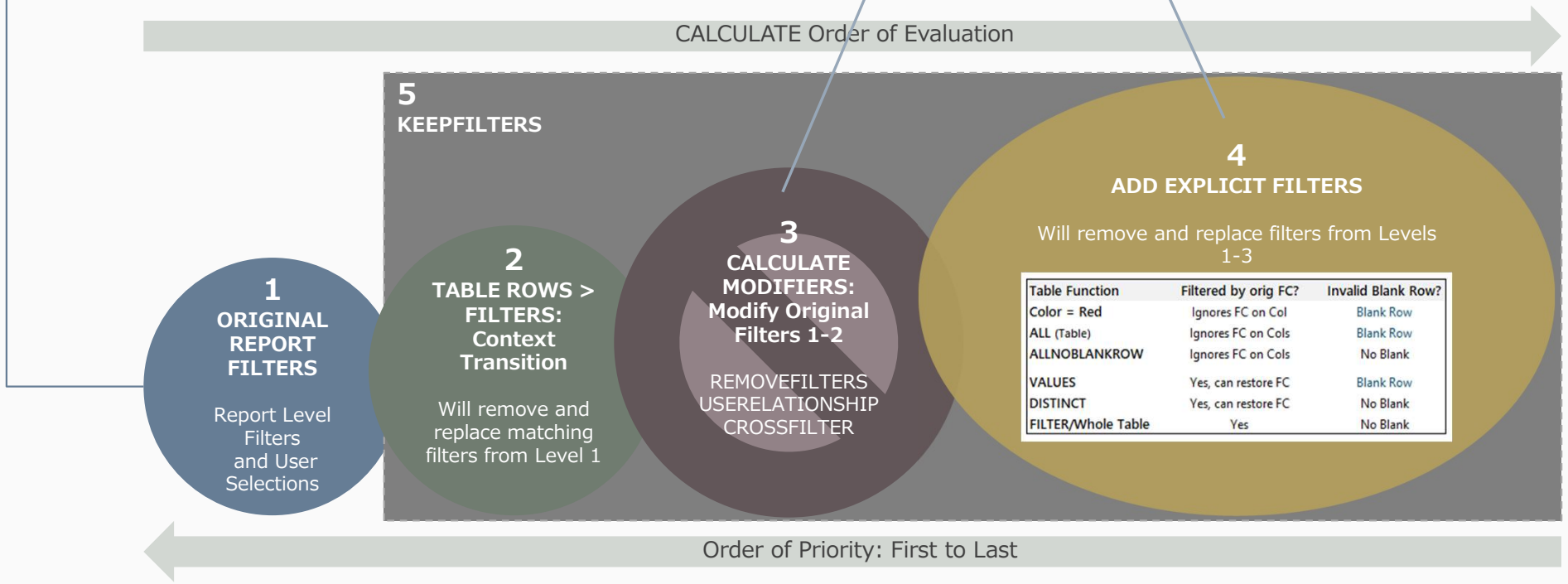


Table Function	Filtered by orig FC?	Invalid Blank Row?
Color = Red	Ignores FC on Col	Blank Row
ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

CHALLENGE #2

SLICER NOT FILTERING LARGE ORDERS?

```
1 Order > 250 Bad = CALCULATE([Total Sales],  fact_Sales[Total Sales]>250)
```

Total Sales Report

Vendor	Total Sales	Order > 250 Bad
KARPARTS		
Accessories	117,124	$66,851
Cleaner	865,827	$26,820
Interior	1,267,095	$1,178,168
Liquids	44,271	$19,380
Protect	499,794	$5,796
Repair	88,929	$2,349
Total	**2,883,041**	**$1,299,364**
SAFTEYSTAR	**1,151,000**	**$202,801**
TOPCLEAN	**1,353,488**	**$217,469**
Total	**5,387,528**	**$1,719,634**

+ Filter on sales range

32%

Order% Bad

Total Sales

$8

$1,350

CHALLENGE #2

SLICER NOT FILTERING LARGE ORDERS?

```
1 Order > 250 Bad = CALCULATE([Total Sales],  fact_Sales[Total Sales]>250)
```

Total Sales Report

Vendor	Total Sales	Order > 250 Bad
KARPARTS		
Accessories	16,379	$66,851
Cleaner	478,602	$26,820
Interior	26,580	$1,178,168
Liquids	14,293	$19,380
Protect	217,524	$5,796
Repair	49,067	$2,349
Total	**802,444**	**$1,299,364**
SAFTEYSTAR	**605,972**	**$202,801**
TOPCLEAN	**868,454**	**$217,469**
Total	**2,276,870**	**$1,719,634**

Still shows sales orders above $250?

76%

Order% Bad

Filters lower order sizes.

Total Sales

$8

$150

CHALLENGE #2

SLICER NOT FILTERING LARGE ORDERS?

```
1 Order > 250 Good = CALCULATE([Total Sales],
2                              ?       (fact_Sales[Total Sales]>250))
```

Total Sales Report

Vendor	Total Sales	Order > 250 Bad	Order > 250 Good
KARPARTS			
Accessories	16,379	$66,851	
Cleaner	478,602	$26,820	
Interior	26,580	$1,178,168	
Liquids	14,293	$19,380	
Protect	217,524	$5,796	
Repair	49,067	$2,349	
Total	**802,444**	**$1,299,364**	
SAFTEYSTAR	**605,972**	**$202,801**	
TOPCLEAN	**868,454**	**$217,469**	
Total	**2,276,870**	**$1,719,634**	

(Blank)

Order% Good

Total Sales

$8

$150

CHALLENGE #2

SLICER NOT FILTERING LARGE ORDERS?

```
1 Order > 250 Good = CALCULATE([Total Sales],
2                    KEEPFILTERS(fact_Sales[Total Sales]>250))
```

Total Sales Report

Vendor	Total Sales	Order > 250 Bad	Order > 250 Good
KARPARTS			
Accessories	16,379	$66,851	
Cleaner	478,602	$26,820	
Interior	26,580	$1,178,168	
Liquids	14,293	$19,380	
Protect	217,524	$5,796	
Repair	49,067	$2,349	
Total	**802,444**	**$1,299,364**	
SAFTEYSTAR	**605,972**	**$202,801**	
TOPCLEAN	**868,454**	**$217,469**	
Total	**2,276,870**	**$1,719,634**	

Filters sales orders only up to $150?

Filters list of lower order sizes.

(Blank)

Order% Good

Total Sales

$8

$150

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

Filter Modifier – KEEPFILTERS

CALCULATE Order of Evaluation

KEEPFILTERS builds a barrier around Level 2-4, preventing each from impacting lower-level filter arguments.

5
KEEPFILTERS

4
ADD EXPLICIT FILTERS

Will remove and replace filters from Levels 1-3

Table Function	Filtered by orig FC?	Invalid Blank Row?
Color = Red	Ignores FC on Col	Blank Row
ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

3
CALCULATE MODIFIERS: Modify Original Filters 1-2

REMOVEFILTERS
USERELATIONSHIP
CROSSFILTER

2
TABLE ROWS > FILTERS: Context Transition

Will remove and replace matching filters from Level 1

1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

Order of Priority: First to Last

UNFOLDING THE MECHANICS OF CALCULATE

Attract original report filters (Outer & Inner)

Attract original table filters - Context Transition

Alter filters – CALCULATE Modifiers

Add new table filters

Filter Modifier – KEEPFILTERS

CALCULATE Order of Evaluation

5
KEEPFILTERS

4
ADD EXPLICIT FILTERS

Will remove and replace filters from Levels 1-3

Table Function	Filtered by orig FC?	Invalid Blank Row?
Color = Red	Ignores FC on Col	Blank Row
ALL (Table)	Ignores FC on Cols	Blank Row
ALLNOBLANKROW	Ignores FC on Cols	No Blank
VALUES	Yes, can restore FC	Blank Row
DISTINCT	Yes, can restore FC	No Blank
FILTER/Whole Table	Yes	No Blank

3
CALCULATE MODIFIERS: Modify Original Filters 1-2

REMOVEFILTERS
USERELATIONSHIP
CROSSFILTER

2
TABLE ROWS > FILTERS: Context Transition

Will remove and replace matching filters from Level 1

1
ORIGINAL REPORT FILTERS

Report Level Filters and User Selections

Order of Priority: First to Last


QUESTION?
QUESTION!

@mdhewitt83

@markwaltercpa

Bonus Challenge #3:
Unexpected Total

```
1 Avg Mo SalesL2 =
2 VAR __avSales =
3     AVERAGEX ( VALUES ( TimeTable[Month Name Short] ), [Total Sales] )
4
5 RETURN
6     __avSales
7
```

Cal Year, Month Nam...

- [ ] Aug
- [ ] Sep
- [ ] Oct
- [x] Nov
- [x] Dec
- [-] 2024
  - [x] Jan
  - [x] Feb
  - [ ] Mar
  - [ ] Apr
  - [ ] May

Color

- [ ] Blue
- [ ] Green
- [ ] Red

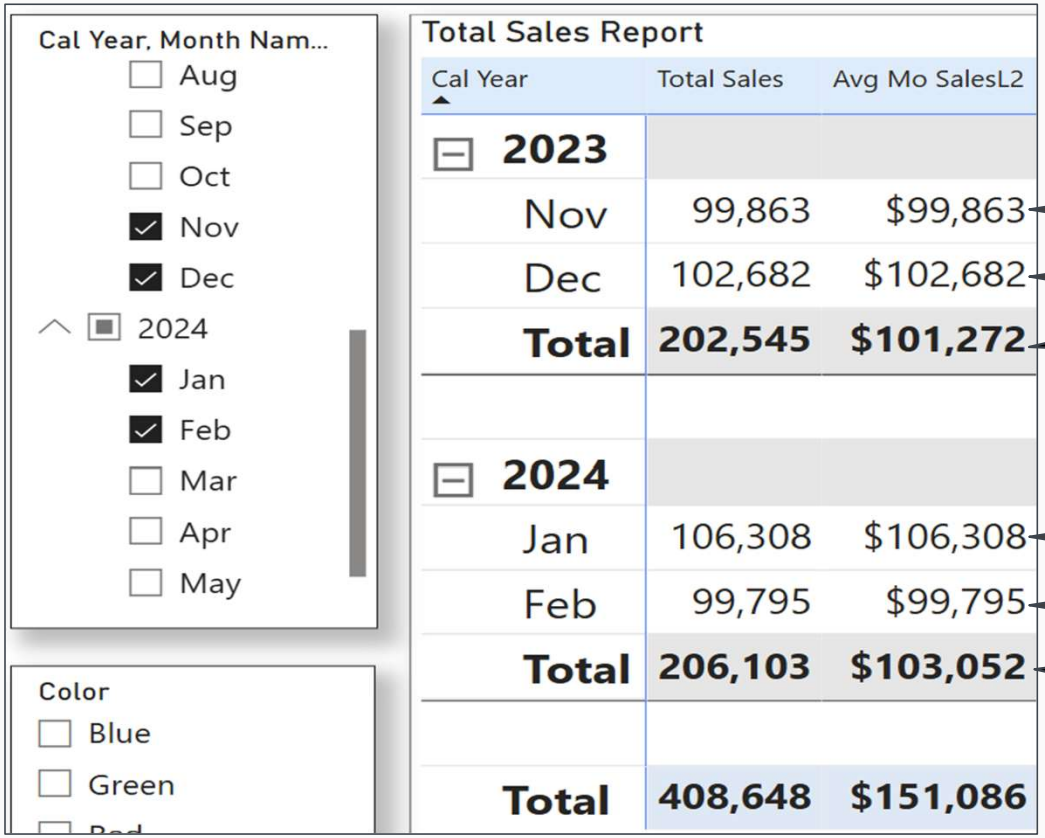
Total Sales Report

Cal Year	Total Sales	Avg Mo SalesL2
2023		
Nov	99,863	$99,863
Dec	102,682	$102,682
Total	**202,545**	**$101,272**
2024		
Jan	106,308	$106,308
Feb	99,795	$99,795
Total	**206,103**	**$103,052**
Total	**408,648**	**$151,086**

Bonus Challenge #3:

Original Filter Mo.Name

```
AVERAGEX ( VALUES ( TimeTable[Month Name Short] ), [Total Sales] )
```



Year = 2023, Month = Nov

Year = 2023, Month = Dec

Year = 2023, Month = Nov & Dec

Year = 2024, Month = Jan

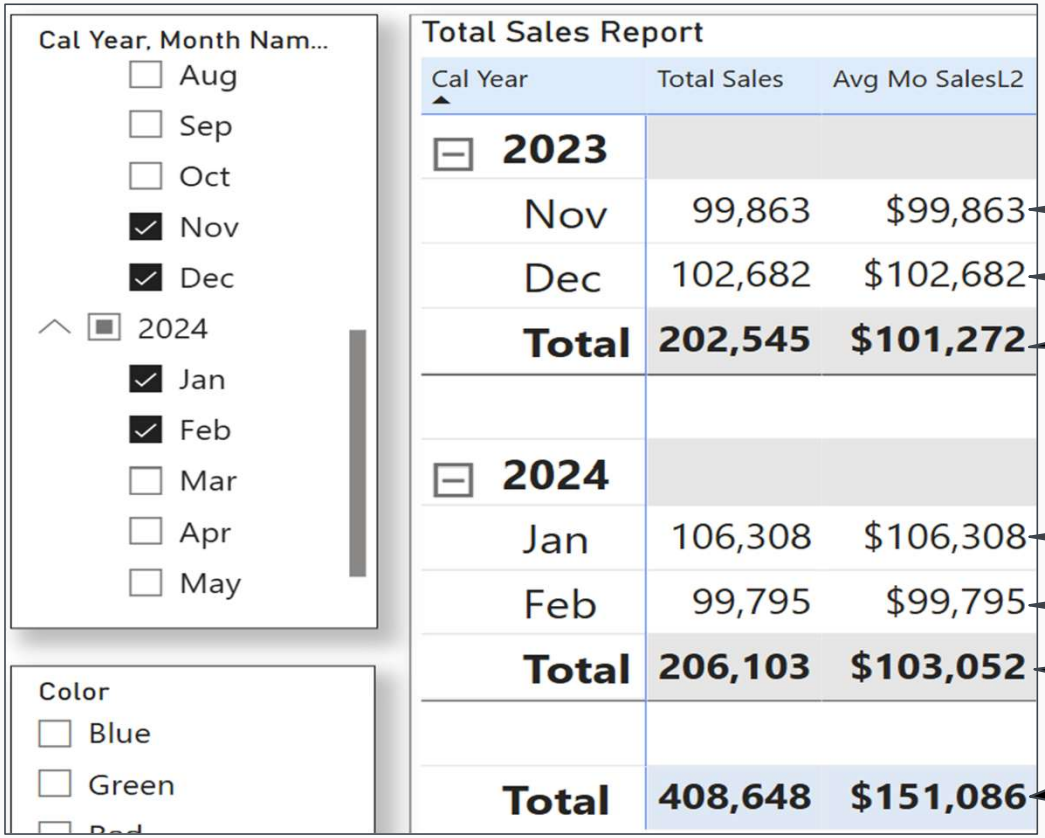
Year = 2024, Month = Feb

Year = 2024, Month = Jan & Feb

Bonus Challenge #3:

Original Filter Mo.Name **replaced by** **Iterated Mo.Name**

```
AVERAGEX ( VALUES ( TimeTable[Month Name Short] ), [Total Sales] )
```



Total Sales Report

Cal Year	Total Sales	Avg Mo SalesL2
2023		
Nov	99,863	$99,863
Dec	102,682	$102,682
Total	**202,545**	**$101,272**
2024		
Jan	106,308	$106,308
Feb	99,795	$99,795
Total	**206,103**	**$103,052**
Total	**408,648**	**$151,086**

Year = 2023, Month = Nov, Iterates = Nov

Year = 2023, Month = Dec, Iterates = Dec

Year = 2023, Month = Nov & Dec, Iterates = Nov, Dec

Year = 2024, Month = Jan, Iterates = Jan

Year = 2024, Month = Feb, Iterates = Feb

Year = 2024, Month = Jan & Feb, Iterates = Jan, Feb

Year = 2023 & 2024, Month = Nov & Dec & Jan & Feb, Iterates = Nov, Dec, Jan, Feb