

M 365 Excel Class Video 18 & 19: How to Merge Two Fact Tables into One So All Attributes Can Be Used For Reporting and Visualization



Table of Contents

Fundamental Problem with Two Fact Tables at Different Grains.....	2
This is the Data Model with two Fact Tables that will not allow us to create reports and visuals with attributes from the three dimension tables:	3
The goal is to create PivotTable report or a set of Power BI visuals that can use attributes from the dDate, dProduct and dSalesRep tables to slice sales, discount, and shipping cost amounts, as shown here and on the next page:	3
We can solve this problem with worksheet formulas, DAX Formulas in the Data Model, or with Power Query.....	4
Worksheet Formula solution to create a single flat table that can use used in a Standard PivotTable:.....	5
DAX solution with two Calculated Columns and five Measures that converts the five tables into a Data Model that will allow the required reports:	6
Finished DAX Data Model with hidden Invoice Grain table:	9
Power Query Solution to convert the Invoice Line Item Fact Table into table with amounts at the correct grain and all the necessary foreign keys, as shown here:	10
Power Query Applied Steps:	10
Power Query M Code:.....	11

Fundamental Problem with Two Fact Tables at Different Grains

Fundamental Problem for Reporting & Visualizing:

- 1) SalesRep and Date Attributes Only Work at Invoice Grain. Product Attributes Do Not Work.
- 2) Product Attributes Only Work at Product Grain. SalesRep and Date Attributes Do Not Work.
- 3) You Cannot Create Report With Attributes From All Three Dimension Tables.

Solution:

- 1) Allocate Shipping and Discount Amounts to fProductSales Table (Product Grain).
- 2) Bring SalesRep and Date Attributes Into fProductSales Table (Product Grain).
- 3) Then We Can Create Reports With Attributes From All Three Dimension Tables.

1) Fact Table at Invoice Grain

Table Name = **fInvoice**

← Fact Table for **dSalesRep**

← Fact Table for **dDate**

Dimension Table for **fProductSales** →

2) Fact Table at Product Grain

Table Name = **fProductSales**

← Fact Table for **fInvoice**

Fact Table for **dProduct** →

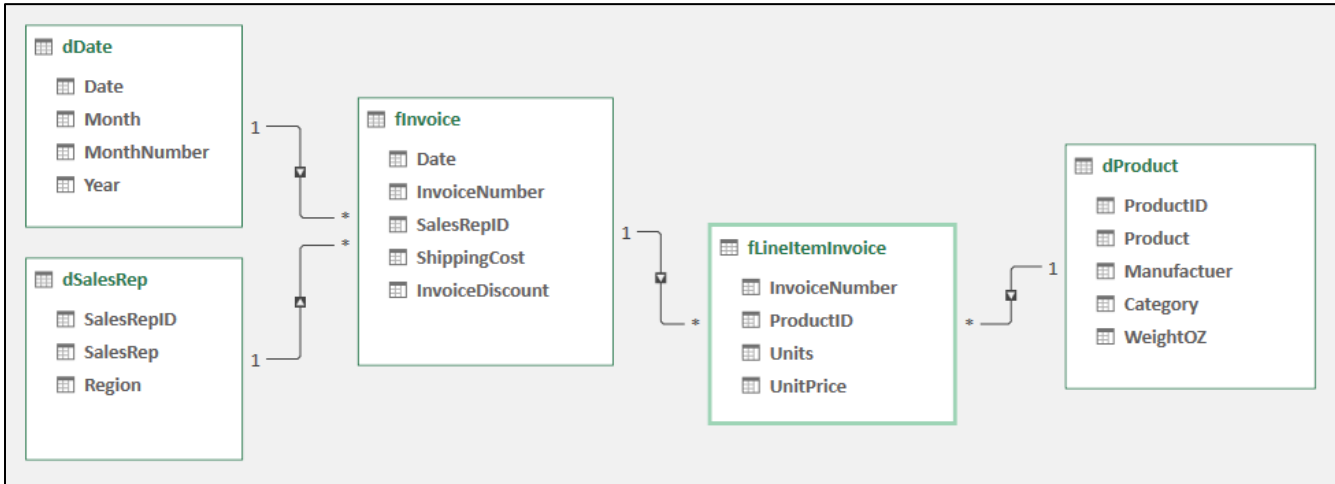
Table Name

Dimension

Year	Date	InvoiceNumber	SalesRepID	ShippingCost	InvoiceDiscount	InvoiceNumber	ProductID	Units	UnitPrice	ProductID
2017	1/1/2017	125447	5360	98.7	144.18	125447	S4409	21	22.36	A4369
2017	1/2/2017	125448	6215	26.25	73.06	125447	C4384	88	14.97	C4374
2017				207.55	437.62	125447	K4394	35	12.32	C4379
2017				262.15	542.26	125448	Q4404	53	27.57	C4384
2017				159.25	381.63	125450	C4379	25	48.75	E4389
2017				18.025	33.51	125450	C4384	34	16.22	K4394
2017	1/9/2017	125457	6080	36.4	114.08	125450	S4414	200	13.03	M4399
2017	1/11/2017	125458	5000	114.45	323.62	125451	C4374	223	11.68	Q4404
2017	1/11/2017	125459	5315	106.05	742.87	125451	S4409	224	12.58	S4409
2017	1/12/2017	125461	5315	7.35	7.43	125452	M4399	38	18.82	S4414
2017	1/13/2017	125462	5900	3.15	0	125452	Y4419	238	13.03	Y4419
2017	1/16/2017	125463	5225	103.775	315.19	125456	M4399	23	23.16	
2017	1/18/2017	125464	5765	288.925	658.78	125456	S4409	19	22.36	
2017	1/19/2017	125465	5540	146.825	599.46	125457	C4379	36	48.75	
2017	1/19/2017	125466	5090	13.125	8.72	125458	M4399	37	18.82	

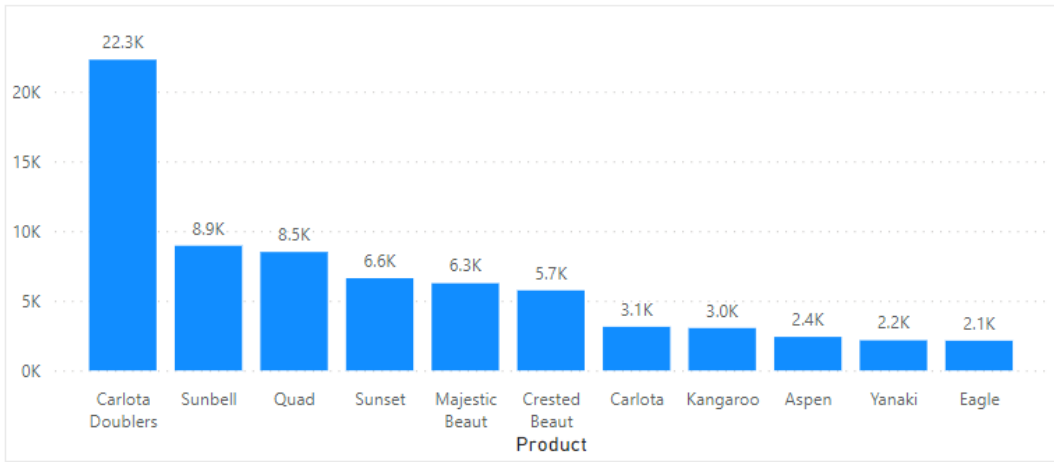
Invoice consists of one or more Product Sales.
 Invoice Grain is Aggregate of Product Grain.
 Invoice Grain >= Product Grain.

This is the Data Model with two Fact Tables that will not allow us to create reports and visuals with attributes from the three dimension tables:



The goal is to create PivotTable report or a set of Power BI visuals that can use attributes from the dDate, dProduct and dSalesRep tables to slice sales, discount, and shipping cost amounts, as shown here and on the next page:

Category	Product	TotalSales(\$)	TotalDiscount(\$)	DiscountAs%OfSales	TotalShipCosts(\$)	ShipCostsAs%OfSales
Australian Round	Majestic Beaut	6,251.14	518.06	8.29%	346.92	5.55%
	Sunbell	8,944.71	754.55	8.44%	377.90	4.22%
	Sunset	6,614.42	500.02	7.56%	245.09	3.71%
	Yanaki	2,158.28	215.83	10.00%	48.21	2.23%
Australian Round Total		23,968.55	1,988.46	8.30%	1,018.12	4.25%
Beginner	Aspen	2,403.74	162.38	6.76%	68.98	2.87%
	Crested Beaut	5,740.95	441.83	7.70%	221.07	3.85%
	Eagle	2,134.05	178.09	8.35%	102.78	4.82%
	Kangaroo	3,038.88	177.95	5.86%	116.65	3.84%
Beginner Total		13,317.62	960.25	7.21%	509.48	3.83%
Freestyle	Carlota	3,130.00	297.43	9.50%	84.04	2.68%
	Carlota Doublers	22,286.25	2,170.19	9.74%	454.16	2.04%
	Quad	8,494.54	761.48	8.96%	117.68	1.39%
Freestyle Total		33,910.79	3,229.10	9.52%	655.88	1.93%
Grand Total		71,196.96	6,177.81	8.68%	2,183.48	3.07%



Year

2017

2018

2019

Region

East	South
MidWest	SouthEast
North	West
NorthWest	

Manufacturer

Channel Craft

Colorado Booms

Gel Booms

Category	TotalSales(\$)	TotalDiscount(\$)	DiscountAs%OfSales	TotalShipCosts(\$)	ShipCostsAs%OfSales
Australian Round	23,968.55	1,988.46	8.30%	938.06	3.91%
Majestic Beaut	6,251.14	518.06	8.29%	264.21	4.23%
Sunbell	8,944.71	754.55	8.44%	344.79	3.85%
Sunset	6,614.42	500.02	7.56%	206.24	3.12%
Yanaki	2,158.28	215.83	10.00%	122.82	5.69%
Beginner	13,317.62	960.25	7.21%	551.09	4.14%
Aspen	2,403.74	162.38	6.76%	137.09	5.70%
Crested Beaut	5,740.95	441.83	7.70%	253.25	4.41%
Eagle	2,134.05	178.09	8.35%	53.45	2.50%
Kangaroo	3,038.88	177.95	5.86%	107.30	3.53%
Freestyle	33,910.79	3,229.10	9.52%	694.31	2.05%
Carlota	3,130.00	297.43	9.50%	68.78	2.20%
Carlota Doublers	22,286.25	2,170.19	9.74%	572.36	2.57%
Quad	8,494.54	761.48	8.96%	53.17	0.63%
Total	71,196.96	6,177.81	8.68%	2,183.46	3.07%

We can solve this problem with worksheet formulas, DAX Formulas in the Data Model, or with Power Query.

Worksheet Formula solution to create a single flat table that can use used in a Standard PivotTable:

Use the file named: "18-M365ExcelClassStart.xlsx".

	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
1																	
2		P16: =[@InvoiceDiscount]/SUMIFS(fLine[LineSales],fLine[InvoiceNumber],[@InvoiceNumber])															
3		Q16: =SUMIFS(fLine[LineShipWeight],fLine[InvoiceNumber],[@InvoiceNumber])															
4		W16: =[@UnitPrice]*[@Units]															
5		X16: =XLOOKUP([@ProductID],dP[ProductID],dP[WeightOZ])*[@Units]															
6		Y16: =ROUND(XLOOKUP([@InvoiceNumber],fIn[InvoiceNumber],fIn[InvoicePercentDiscount])*[@LineSales],2)															
7		Z16: =ROUND([@LineShipWeight]/XLOOKUP([@InvoiceNumber],fIn[InvoiceNumber],fIn[InvoiceShipWeight])*XLOOKUP([@InvoiceNumber],fIn[InvoiceNumber],fIn[ShippingCost]),2)															
8		AA16: =XLOOKUP([@ProductID],dP[ProductID],dP[Product])															
9		AB16: =XLOOKUP([@ProductID],dP[ProductID],dP[Category])															
10		AC16: =XLOOKUP([@ProductID],dP[ProductID],dP[Manufacturer])															
11		AD16: =XLOOKUP(XLOOKUP([@InvoiceNumber],fIn[InvoiceNumber],fIn[SalesRepID]),dSR[SalesRepID],dSR[Region])															
12		AE16: =XLOOKUP([@InvoiceNumber],fIn[InvoiceNumber],fIn[Date])															
13																	
14																	
15		InvoiceDiscount	InvoicePercentDiscount	InvoiceShipWeight	InvoiceNumber	ProductID	Units	UnitPrice	LineSales	LineShipWeight	LineShipCost	Product	Category	Manufacturer	Region	Date	
16		144.18	0.065000992	743	125447	S4409	21	22.36	469.56	136.5	30.52	18.13	Sunbell	Australian R	Gel Booms	East	1/1/2017
17		73.06	0.0499999658	159	125447	C4384	88	14.97	1317.36	484	85.63	64.29	Crested Bear	Beginner	Colorado Booms	East	1/1/2017

DAX solution with two Calculated Columns and five Measures that converts the five tables into a Data Model that will allow the required reports:

Use the file named: "18-M365ExcelClassStart.xlsx".

[PercentDisco... ▼] f_x =fInvoice[InvoiceDiscount]/
SUMX(RELATEDTABLE(fLinItemInvoice) , fLinItemInvoice[Units]*fLinItemInvoice[UnitPrice])

	D...	InvoiceNu...	SalesR...	ShippingCost	InvoiceDiscount	PercentDiscount	ShipWeight
1	1/1/20...	125447	5360	98.7	144.18	0.0650009918309199	743
2	1/2/20...	125448	6215	26.25	73.06	0.0499996578178359	159
3	1/3/20...	125450	5135	207.55	437.62	0.0999993144784438	1562
4	1/4/20...	125451	5630	262.15	542.26	0.100000737658966	2236.5
5	1/4/20...	125452	5990	159.25	381.63	0.1	1456
6	1/8/20...	125456	5945	18.025	33.51	0.0349966580332526	284.5
7	1/9/20	125457	6080	36.4	114.08	0.065002849002849	252

dSalesRep | dDate | **fInvoice** | dProduct | fLinItemInvoice | dSalesRepPQ | dDatePQ | fLinItemInvoicePQ | dProductPQ

[ShipWeight] ▼ f_x =SUMX(RELATEDTABLE(fLinItemInvoice) , fLinItemInvoice[Units] * RELATED(dProduct[WeightOZ]))

	D...	InvoiceNu...	SalesR...	ShippingCost	InvoiceDiscount	PercentDiscount	ShipWeight
1	1/1/20...	125447	5360	98.7	144.18	0.0650009918309199	743
2	1/2/20...	125448	6215	26.25	73.06	0.0499996578178359	159
3	1/3/20...	125450	5135	207.55	437.62	0.0999993144784438	1562
4	1/4/20...	125451	5630	262.15	542.26	0.100000737658966	2236.5
5	1/4/20...	125452	5990	159.25	381.63	0.1	1456
6	1/8/20...	125456	5945	18.025	33.51	0.0349966580332526	284.5
7	1/9/20...	125457	6080	36.4	114.08	0.065002849002849	252
8	1/11/2	125458	5000	114.45	323.62	0.0999987639977258	1058

dSalesRep | dDate | **fInvoice** | dProduct | fLinItemInvoice | dSalesRepPQ | dDatePQ | fLinItemInvoicePQ | dProductPQ

[UnitPrice] \sum TotalSales(\$):=SUMX(fLinItemInvoice , fLinItemInvoice[Units] * fLinItemInvoice[UnitPrice])						
InvoiceNu...	Prod...	Units	UnitPrice	LineWeight		
1	125447 S4409	21	22.36	18.13		
2	125447 C4384	88	14.97	64.29		
3	125447 K4394	35	12.32	16.27		
				TotalSales(\$): 2,120,044.55		
				TotalDiscount(\$): 179,383.91		
				DiscountAs%OfSales: 8.46%		
				TotalShipCosts(\$): 69,778.56		
				ShipCostsAs%OfSales: 3.29%		
dSalesRep	dDate	fInvoice	dProduct	fLinItemInvoice	dSalesRepPQ	dDatePQ

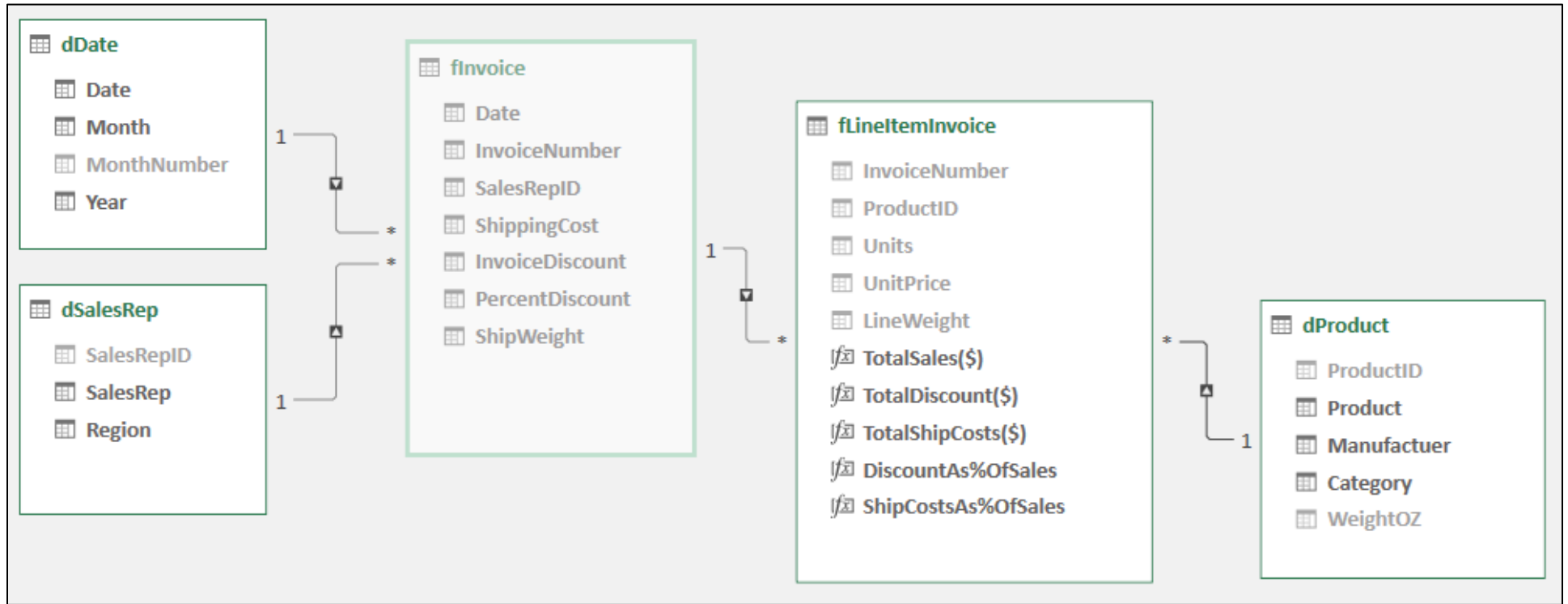
\sum TotalDiscount(\$):=SUMX(fLinItemInvoice , ROUND(RELATED(fInvoice[PercentDiscount]) * fLinItemInvoice[Units] * fLinItemInvoice[UnitPrice] , 2))						
Prod...	Units	UnitPrice	LineWeight	Add Column		
4409	21	22.36	18.13			
4384	88	14.97	64.29			
4394	35	12.32	16.27			
				TotalSales(\$): 2,120,044.55		
				TotalDiscount(\$): 179,383.91		
				DiscountAs%OfSales: 8.46%		
				TotalShipCosts(\$): 69,778.56		
				ShipCostsAs%OfSales: 3.29%		

fx TotalShipCosts(\$):=					
SUMX(
fLineItemInvoice ,					
ROUND(
RELATED(dProduct[WeightOZ]) * fLineItemInvoice[Units] / RELATED(fInvoice[ShipWeight]) * RELATED(fInvoice[ShippingCost])					
,2))					
od...	Units	UnitPrice	LineWeight	Add Column	
409	21	22.36	18.13		
384	88	14.97	64.29		
394	35	12.32	16.27		
		TotalSales(\$): 2,120,044.55			
		TotalDiscount(\$): 179,383.91			
		DiscountAs%OfSales: 8.46%			
		TotalShipCosts(\$): 69,778.56			
		ShipCostsAs%OfSales: 3.29%			

fx DiscountAs%OfSales:=DIVIDE([TotalDiscount(\$)],[TotalSales(\$)])					
od...	Units	UnitPrice	LineWeight	Add Column	
409	21	22.36	18.13		
384	88	14.97	64.29		
394	35	12.32	16.27		
		TotalSales(\$): 2,120,044.55			
		TotalDiscount(\$): 179,383.91			
		DiscountAs%OfSales: 8.46%			
		TotalShipCosts(\$): 69,778.56			
		ShipCostsAs%OfSales: 3.29%			

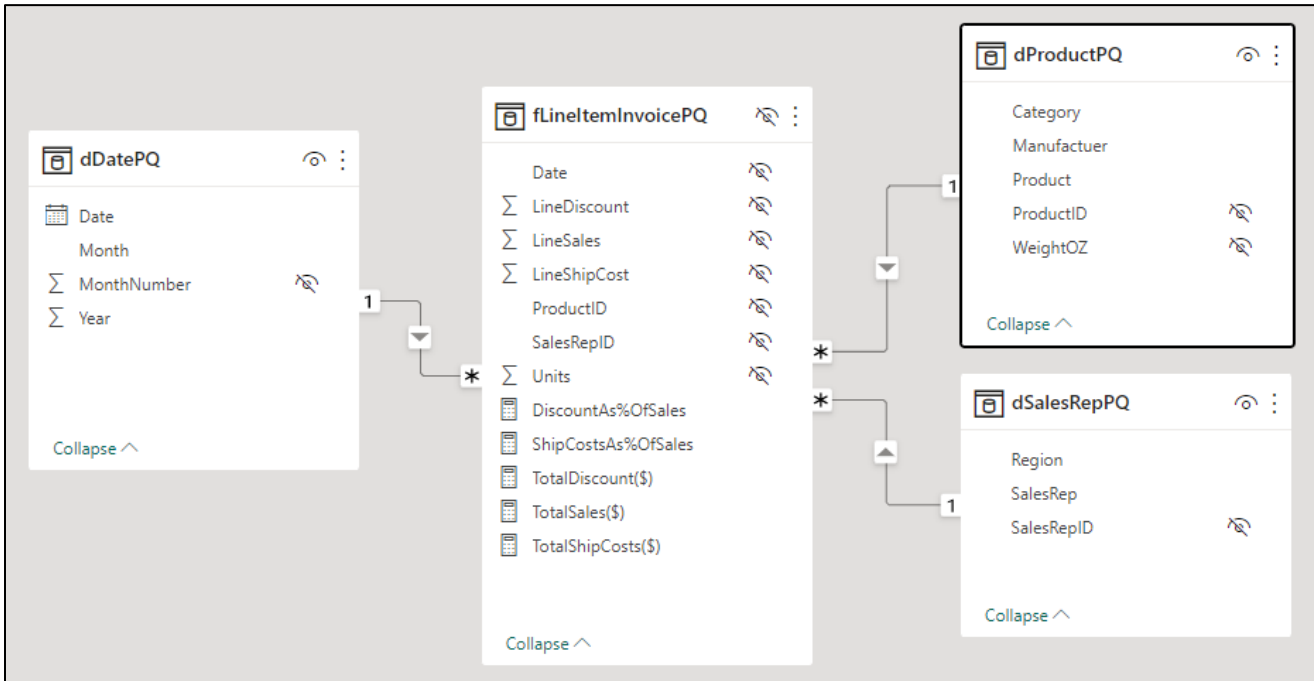
fx ShipCostsAs%OfSales:=DIVIDE([TotalShipCosts(\$)],[TotalSales(\$)])					
d...	Units	UnitPrice	LineWeight	Add Column	
409	21	22.36	18.13		
384	88	14.97	64.29		
394	35	12.32	16.27		
		TotalSales(\$): 2,120,044.55			
		TotalDiscount(\$): 179,383.91			
		DiscountAs%OfSales: 8.46%			
		TotalShipCosts(\$): 69,778.56			
		ShipCostsAs%OfSales: 3.29%			

Finished DAX Data Model with hidden Invoice Grain table:



Power Query Solution to convert the Invoice Line Item Fact Table into table with amounts at the correct grain and all the necessary foreign keys, as shown here:

Use the file named: "18-M365ExcelClassStart.pbix".



Power Query Applied Steps:

Name: fLineItemInvoicePQ

All Properties

APPLIED STEPS

- Source
- AddDataTypes
- CalcLineSales *
- LookupProductWeight
- CalcLineShipWeight *
- GroupInvoiceSalesWeight *
- LookupInvoiceAmountsForeig...
- CalcInvoicePercentDiscount *
- LookupInvoiceAmountsForieg...
- CalcLineDiscount *
- CalcLineShipCost *
- KeepForiegnKeysAndFacts *

Power Query M Code:

fLineItemInvoicePQ

```
let
    Source = Excel.Workbook(File.Contents("E:\00VideoClassStorage\218\01-218-M365\Content\Video18\downloads\use\18-M365ExcelClassPQSourceTables.xlsx"), null, true)
    {[Name="fLineItemInvoice"]}[Data],
    AddDataTypes = Table.TransformColumnTypes(Source,{{"InvoiceNumber", Int64.Type}, {"ProductID", type text}, {"Units", Int64.Type}, {"UnitPrice", type number}}),
    ClasclLineSales = Table.AddColumn(AddDataTypes, "LineSales", each [Units] * [UnitPrice], type number),
    LookupWeight = Table.ExpandTableColumn(Table.NestedJoin(ClasclLineSales, {"ProductID"}, dProductPQ, {"ProductID"}, "dProductPQ", JoinKind.LeftOuter),
        "dProductPQ", {"WeightOZ"}, {"WeightOZ"}),
    CalcLineProductWeight = Table.AddColumn(LookupWeight, "LineProductWeight", each Number.Round([WeightOZ] * [UnitPrice],2), type number),
    InvoiceGroupingSalesWeight = Table.Group(CalcLineProductWeight, {"InvoiceNumber"}, {"InvoiceSales", each List.Sum([LineSales]), type number},
        {"InvoiceShipWeight", each List.Sum([LineProductWeight]), type number}, {"LineItemGrainRecords", each _, type table
        [InvoiceNumber=nullable number, ProductID=nullable text, Units=nullable number, UnitPrice=nullable number, LineSales=number,
        WeightOZ=nullable number, LineProductWeight=number]})),
    LookupInvoiceAmountsForiegnKeys = Table.ExpandTableColumn(Table.NestedJoin(InvoiceGroupingSalesWeight, {"InvoiceNumber"}, fInvoicePQ,
        {"InvoiceNumber"}, "fInvoicePQ", JoinKind.LeftOuter),
        "fInvoicePQ", {"Date", "SalesRepID", "ShippingCost", "InvoiceDiscount"}, {"Date", "SalesRepID", "ShippingCost", "InvoiceDiscount"}),
    CalcInvoicePercentDiscount = Table.AddColumn(LookupInvoiceAmountsForiegnKeys, "InvoicePercentDiscount", each [InvoiceDiscount] / [InvoiceSales], type number),
    ExpandBackToLineItemGrain = Table.ExpandTableColumn(CalcInvoicePercentDiscount, "LineItemGrainRecords",
        {"ProductID", "Units", "LineSales", "LineProductWeight"}, {"ProductID", "Units", "LineSales", "LineProductWeight"}),
    CalcLineDiscount = Table.AddColumn(ExpandBackToLineItemGrain, "LineDiscount", each Number.Round([InvoicePercentDiscount] * [LineSales],2), type number),
    CalcLineShippingCost = Table.AddColumn(CalcLineDiscount, "LineShipCosts", each
        Number.Round([LineProductWeight] / [InvoiceShipWeight] * [ShippingCost],2), type number),
    KeepForienKeysLineAmounts = Table.SelectColumns(CalcLineShippingCost,
        {"InvoiceNumber", "Date", "SalesRepID", "ProductID", "Units", "LineSales", "LineDiscount", "LineShipCosts"})
in
    KeepForienKeysLineAmounts
```