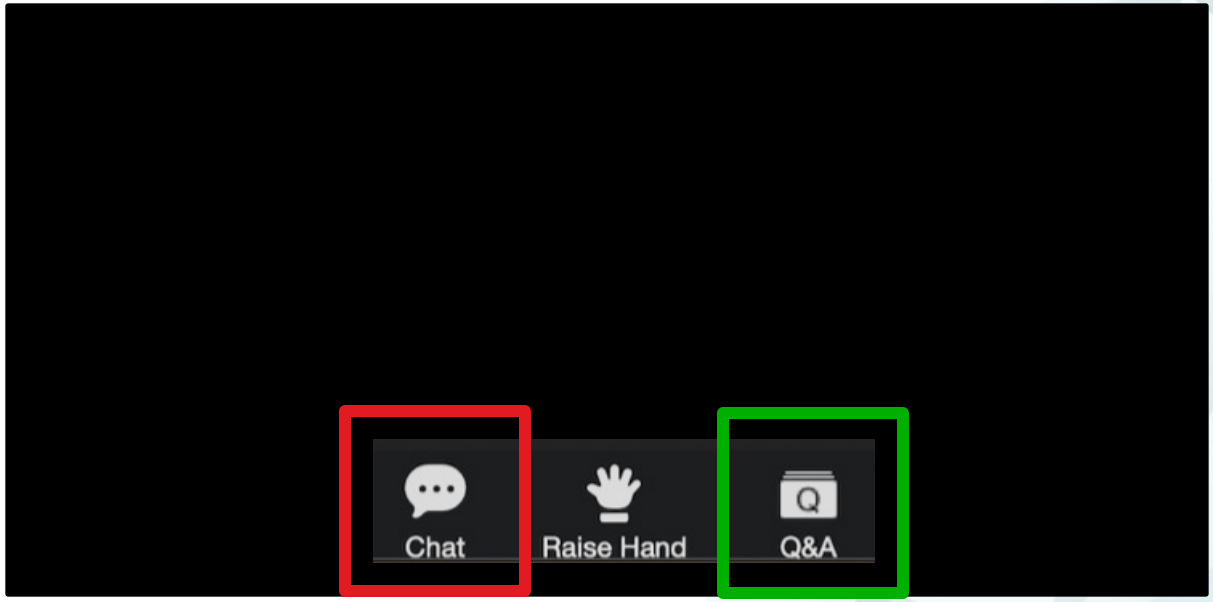
Gaining Audit Superpowers with BI Exploratory Data Visualizations

CRYSTALLIZE ANALYTICS®

eprentise®

Webinar Mechanics

- The **Audio Options** menu is in the lower-left portion of the window.
- Please submit all questions in the **Q&A** panel. Time-permitting, questions received will be answered at the end of the session.
- Please submit all **support/other** questions in the **Chat** panel.
- After the event, a follow-up email will be sent including a link to the recording of today's session and Q&A.



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Who Is eprentise?

ORACLE | Partner

In 2007 eprentise was founded on its original product, FlexField

- Enables customers to make unprecedented changes to their financial chart of accounts while maintaining transactional history and data integrity.

eprentise®

In 2009 we introduced our Consolidation, Divestiture, and Reorganization products

- Transformational software which can copy, change, filter, or merge all elements of Oracle EBS financial systems to address ever-changing business needs, such as regulatory compliance and growth opportunities.

Transformation to Optimization

One-time usage to subscription model

In 2020 we began expanding to new markets with our C Collection analytics suite, and our Audit Automation software

- C Collection analytics provides transparency and identifies potential problem areas with transactional data. This allows users to reduce costs, leverage opportunities across the enterprise, improve business processes, and increase the confidence level of the users in their data, processes, and operations.

C COLLECTION®

CRYSTALLIZE ANALYTICS®

- Automated Audit provides internal auditors and the finance team with drill-down data from a balance sheet report into the transaction-level detail. The software covers hundreds of substantive procedures for the entire enterprise domain and builds in consistent audit processes and workflows across the organization.

Automated $ Audit®

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Objectives

After completion of this presentation, you will be able to:

- **Objective 1:** Understand the difference between explanatory charts and graphs and exploratory data visualizations
- **Objective 2:** Learn five exploratory data analytics for auditors using either Power BI or Excel
- **Objective 3:** Understand how to follow up on data analytics results to develop clear and well documented audit findings

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Meet the Speakers

Harrison Figura

- Sr. Product Director & Director of Delivery Services
- eprentise
- Crystallize Analytics

Brian Lewis

- CPA & CIA
- President & CFO
- eprentise
- Crystallize Analytics

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Agenda

- Explanatory and Exploratory Data Visualizations
- Types of Exploratory Data Visualization and the Data Best Used
- Five Types of Exploratory Data Visualizations
  - Linear Regressions
  - Variances
  - Benford's Law
  - Invoice Number Format Test
  - Other Pattern Identifications

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INTERNATIONAL STANDARDS FOR THE PROFESSIONAL PRACTICE OF INTERNAL AUDITING (STANDARDS)

1210 – Proficiency

Internal auditors must possess the knowledge, skills, and other competencies needed to perform their individual responsibilities. The internal audit activity collectively must possess or obtain the knowledge, skills, and other competencies needed to perform its responsibilities.

Interpretation:

Proficiency is a collective term that refers to the knowledge, skills, and other competencies required of internal auditors to effectively carry out their professional responsibilities. It encompasses consideration of current activities, trends, and emerging issues, to enable relevant advice and recommendations. Internal auditors are encouraged to demonstrate their proficiency by obtaining appropriate professional certifications and qualifications, such as the Certified Internal Auditor designation and other designations offered by The Institute of Internal Auditors and other appropriate professional organizations.

1210.A1 – The chief audit executive must obtain competent advice and assistance if the internal auditors lack the knowledge, skills, or other competencies needed to perform all or part of the engagement.

1210.A2 – Internal auditors must have sufficient knowledge to evaluate the risk of fraud and the manner in which it is managed by the organization, but are not expected to have the expertise of a person whose primary responsibility is detecting and investigating fraud.

1210.A3 – Internal auditors must have sufficient knowledge of key information technology risks and controls and available technology-based audit techniques to perform their assigned work. However, not all internal auditors are expected to have the expertise of an internal auditor whose primary responsibility is information technology auditing.

1210.C1 – The chief audit executive must decline the consulting engagement or obtain competent advice and assistance if the internal auditors lack the knowledge, skills, or other competencies needed to perform all or part of the engagement.

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Data Visualization: A Working Definition

- What is a Data Visualization
  - "Data visualization is a way to represent information graphically, highlighting patterns and trends in data and helping the reader to achieve quick insights."

    https://www.gartner.com/en/marketing/glossary/data-visualization

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Explanatory versus Exploratory Visuals

- Explanatory Visuals
  - Used to communicate the results of your analyses
- Exploratory Visuals
  - Used when you want or need to explore data to find insights. You use these types of visualizations to help better understand your underlying data

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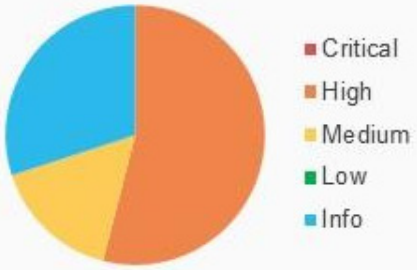
Explanatory Visual Example

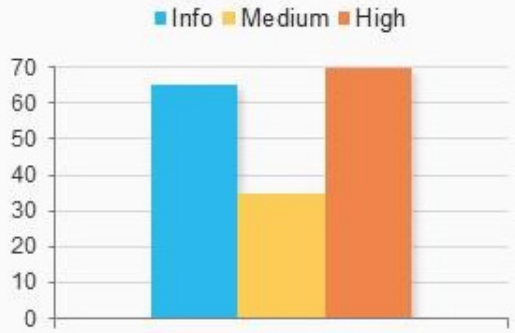
Audit Results - Audit Summary



Audit Results – Compliance Summary

	Passed	Manual Check	Failed
Check Count	65	35	70
Check Ratio	38%	21%	41%
System Count	1	1	1
System Ratio	100%	100%	100%

Audit Results – Audit Check Subnet Summary



Audit Results – Top 50 Manual Audit Checks

Plugin ID	Name	Severity	Host Total
ID 01	Name 01	Medium	1
ID 02	Name 02	Medium	1
ID 03	Name 03	Medium	1
ID 04	Name 04	Medium	1
ID 05	Name 05	Medium	1
ID 06	Name 06	Medium	1
ID 07	Name 07	Medium	1

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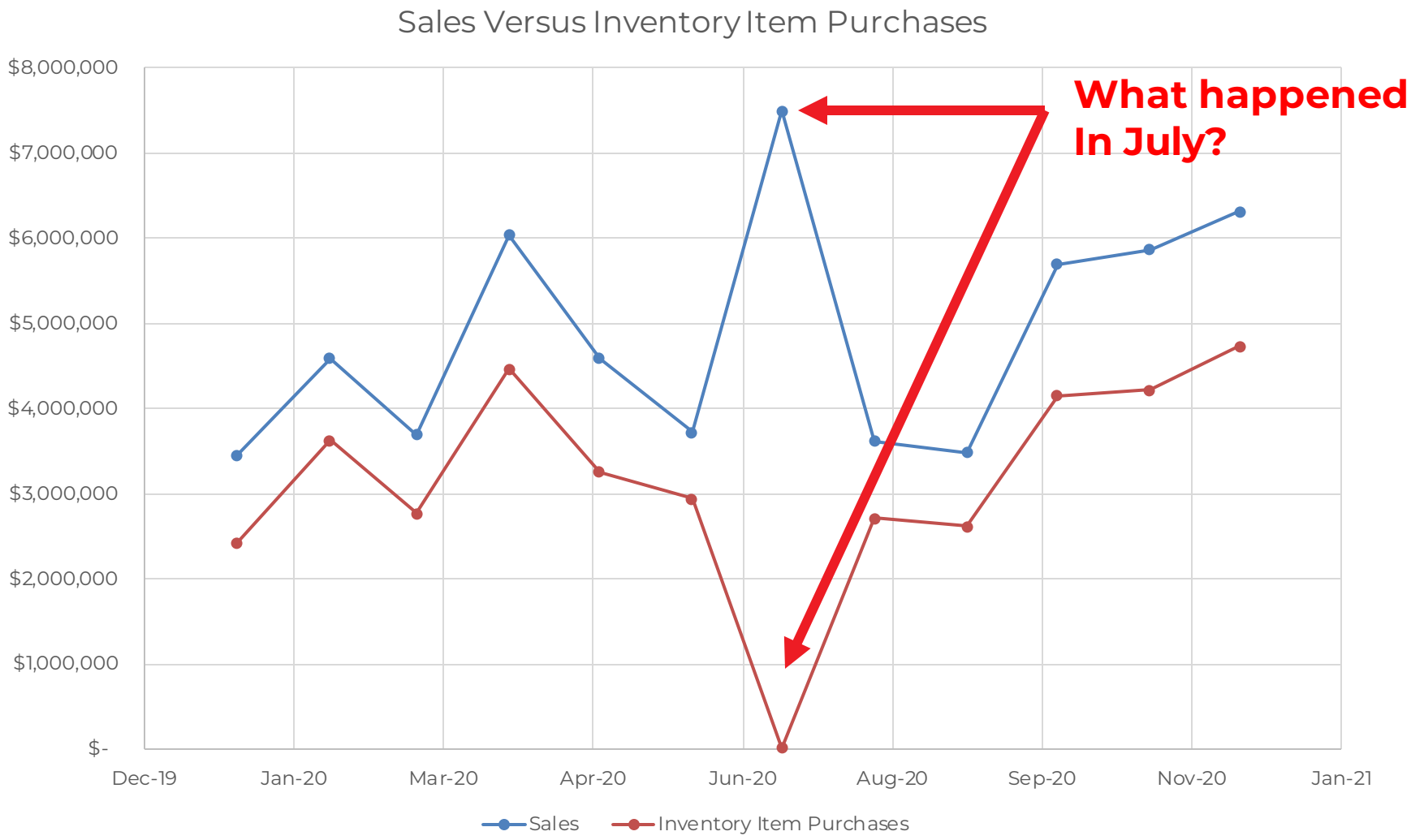
Simple Exploratory Visual Example



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Power of Exploratory Data Visualizations

- Exploratory data visualizations can allow an auditor to quickly identify indicators of audit concern
- Frequently, these indicators are not easily identified using traditional audit methods
- Properly applied, exploratory data visualizations can give an auditor super intuition to changes and arising audit risks

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Five Exploratory Data Visualization Techniques to Begin Using Today

- Regression Analysis
- Variance Identification
- Benford's Law
- Invoice Number Format Test
- Other Pattern Identifications

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Poll Question 1

If you would like to receive CPE credit for today's event, you must respond to all polling questions.

*Browsers with advanced security may prevent the poll question from popping up - if you are experiencing any difficulties, or have any questions please contact our panel via the '**chat**' function and we will assist you.*

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Regression Analysis

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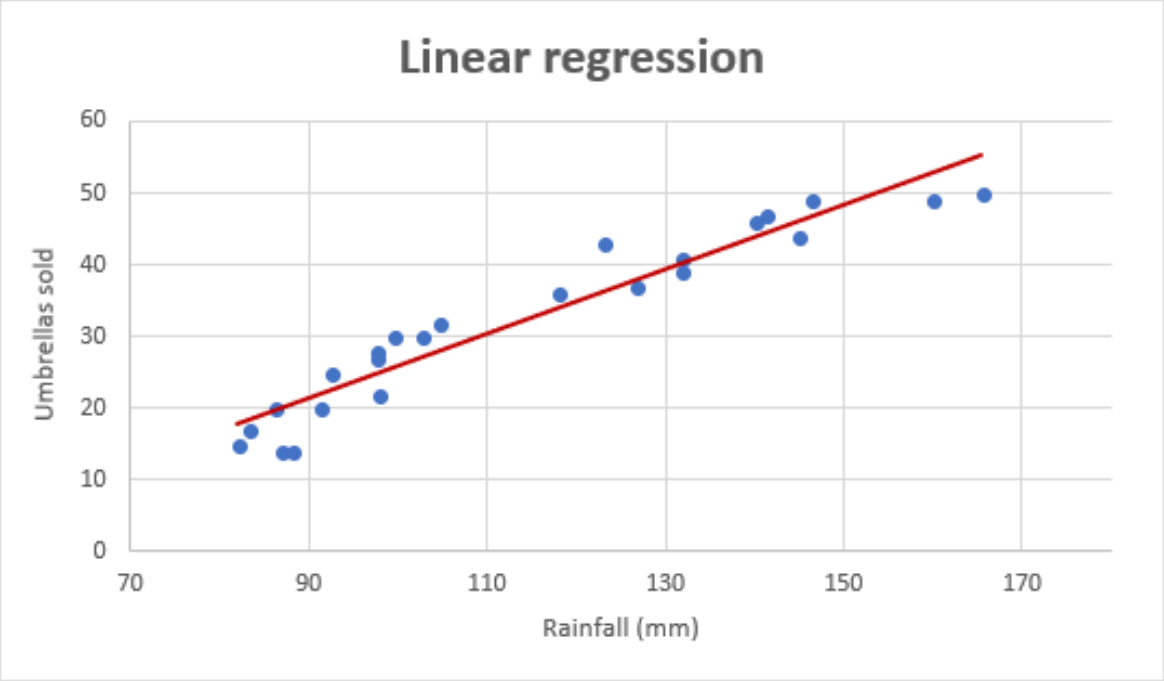
What is Regression Analysis?

- Regression Analysis is a mathematical method to test whether what is expected to occur does, in fact, occur.



https://www.ablebits.com/office-addins-blog/linear-regression-analysis-excel/

In this scatter diagram, umbrellas sold is shown to be dependent on rainfall. The red line is the linear regression showing what the expected relationship is and the blue dots are what occurred.

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Examples That Might Be Tested by Regression

- Inventory purchases to cost of sales
- Commissions paid to sales
- Raw materials used to complete finished goods
- Credit memos to returned goods
- Marketing spend to sales

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Inventory Purchases to Cost of Goods Sold – Linear Regression Example

	Base Year		Current Year	
	2019		2020	
	COGS (X)	Purchases (Y)	COGS (X)	Purchases (Y)
January	$19,990,514.69	$16,650,784.52	$16,064,740.21	$12,810,824.89
February	$18,084,414.84	$13,976,722.54	$13,098,365.32	$8,372,842.39
March	$16,103,220.39	$12,650,158.91	$12,167,967.59	$13,063,172.81
April	$14,482,269.00	$12,290,167.26	$11,122,776.49	$9,857,154.13
May	$16,312,647.51	$12,678,991.85	$11,908,662.13	$10,185,168.61
June	$23,912,283.29	$17,352,819.24	$17,823,022.79	$14,185,168.61
July	$13,311,477.08	$11,738,852.23	$10,105,176.22	$8,532,867.75
August	$13,010,816.14	$10,857,196.46	$10,357,158.95	$7,861,511.38
September	$14,102,367.91	$10,147,188.10	$10,604,415.07	$8,456,304.54
October	$15,324,067.06	$12,561,418.31	$11,382,339.85	$10,585,900.20
November	$30,142,373.62	$22,993,529.25	$20,454,824.63	$11,760,071.93
December	$15,806,283.27	$11,961,852.72	$12,199,603.62	$16,244,868.82
Total	$210,582,734.80	$165,859,681.39	$157,289,052.87	$132,707,515.70
Purchases % of COGS		78.80%		84.40%

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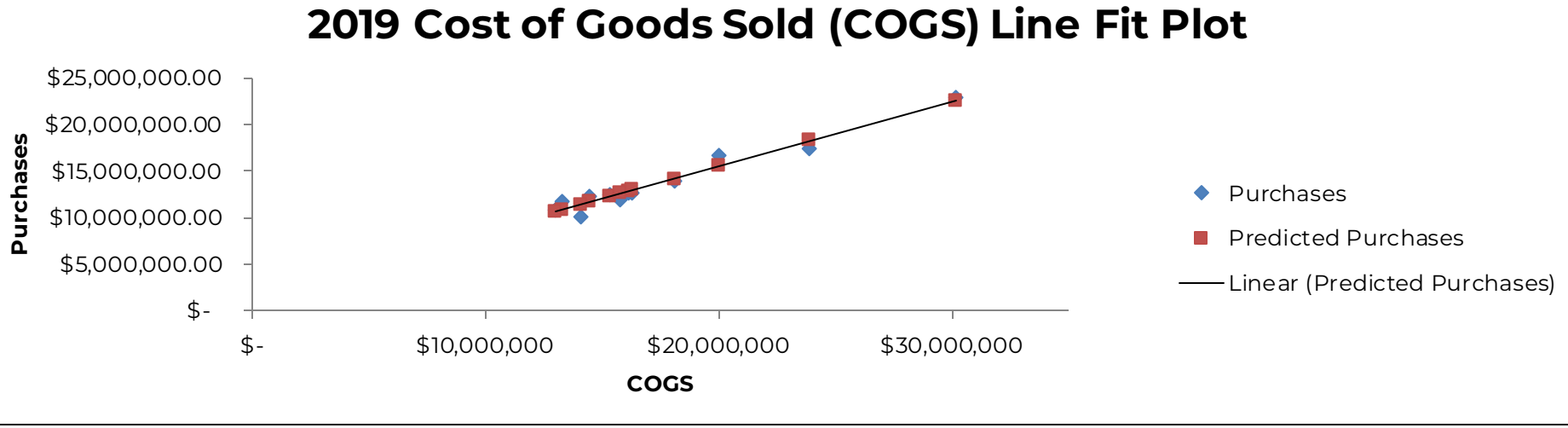
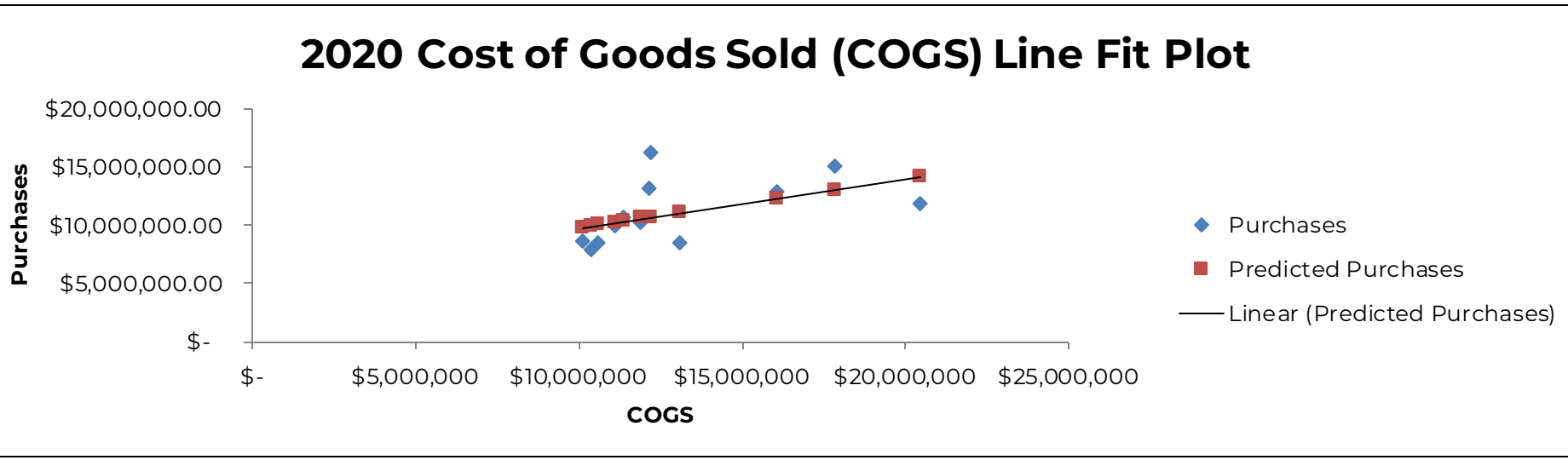
Inventory Purchases to Cost of Goods Sold – Linear Regression Example





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Steps to Linear Regression

1. **Develop a hypothesis**. For example, "Inventory Purchases should increase or decrease in direct relationship to cost of sales"
2. **Gather data** for both prior and current periods (e.g., cost of sales and inventory item purchases for the current year and the prior year)
3. **Test the hypothesis** for the prior (base) period(s) using the Excel® Data Analysis Add-In Regression Tool
4. **Conclude on the hypothesis**- is there actually a relationship between the values?
5. **Test the current period** and analyze the results
6. **Follow up on significant differences** between predicted values (predicted purchases) and actual values (actual purchases)
7. **Present the results** (Audit Findings)

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Step 1. Develop a Hypothesis

- Inventory purchases should, over a period of time, be dependent on cost of sales
  - Inventory purchases are your dependent variable (Y) - *inventory purchases are ultimately determined by sales (cost of sales)*
  - Cost of sales are your independent variable (X) – sales (cost of sales) cause inventory purchases

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Step 2. Gather Data

- Obtain a data file for cost of sales and inventory purchases for the base year (2019) and the current year (2020)

	Base Year		Current Year	
	2019		2020	
	COGS (X)	Purchases (Y)	COGS (X)	Purchases (Y)
January	$19,990,514.69	$16,650,784.52	$16,064,740.21	$12,810,824.89
February	$18,084,414.84	$13,976,722.54	$13,098,365.32	$8,372,842.39
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Purchases % of COGS		78.80%		84.40%

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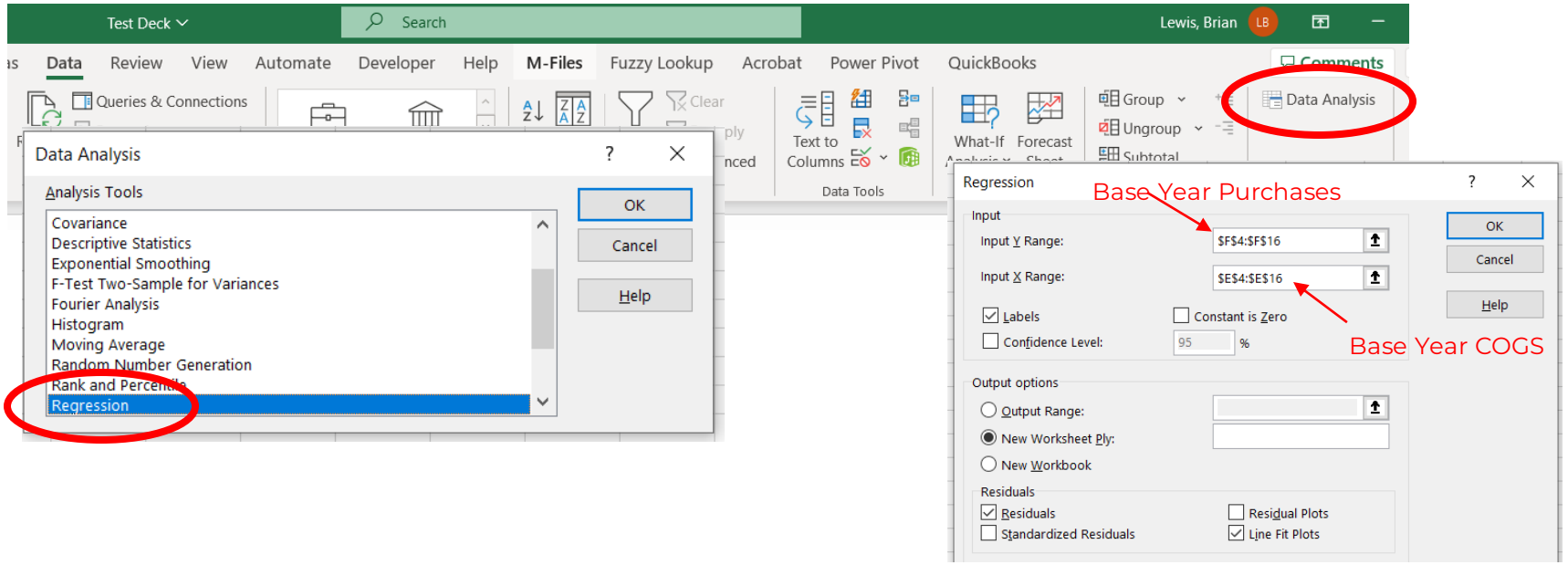
Step 3. Test the Hypothesis (Base Year)

- Select “Data Analysis” and “Regression” from the “Data” tab in Excel (you may need to add the Data Analysis Add-In) and input the X (COGS) & Y (Purchases) ranges



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Step 4. Conclude on the Hypothesis (Base Year)

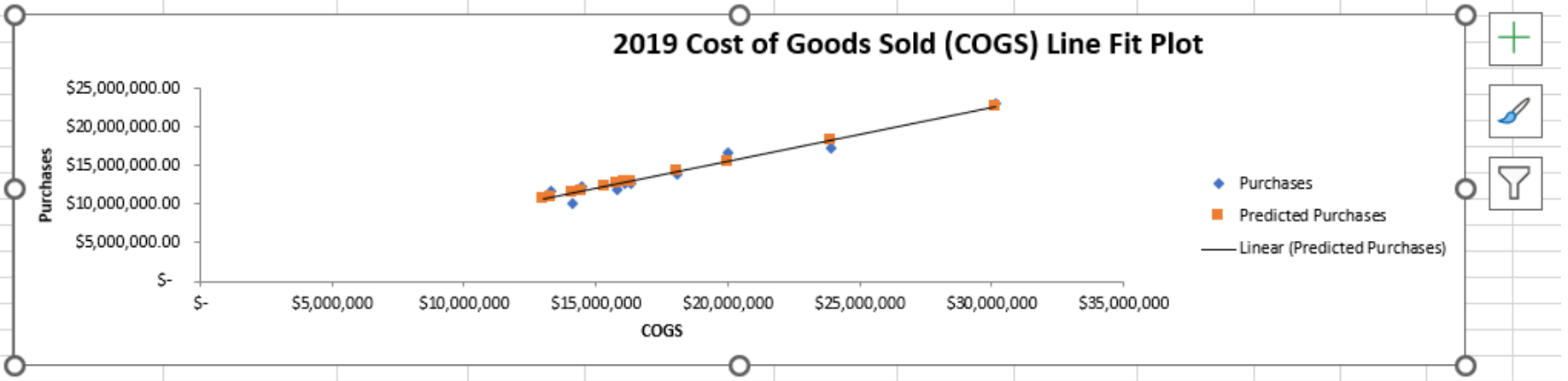
Regression Statistics		
Multiple R	0.979703059	(A Value close to 1 indicates that there is a valid relationship)
R Square	0.959818084	(A value close to 1 indicates that the data fit the relationship well)
Adjusted R Square	0.955799893	
Standard Error	753555.5896	
Observations	12	

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1.3564E+14	1.3564E+14	238.8681755	2.6221E-08
Residual	10	5.67846E+12	5.6785E+11		
Total	11	1.41319E+14			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1536695.814	824095.1545	1.86470677	0.091802809	-299502.617	3372894.25	-299502.617	3372894.25
COGS	0.700054217	0.045295236	15.4553607	2.62213E-08	0.59913014	0.80097829	0.59913014	0.80097829

Based on these results, we can conclude that purchases have a direct relationship to sales (cost of sales)



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Step 5. Test the Current Period

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.499726665
R Square	0.249726739
Adjusted R Square	0.174699413
Standard Error	2493137.807
Observations	12

(A Value significantly lower than 1 indicates a significant change in the relationship between costs of sale and purchases)

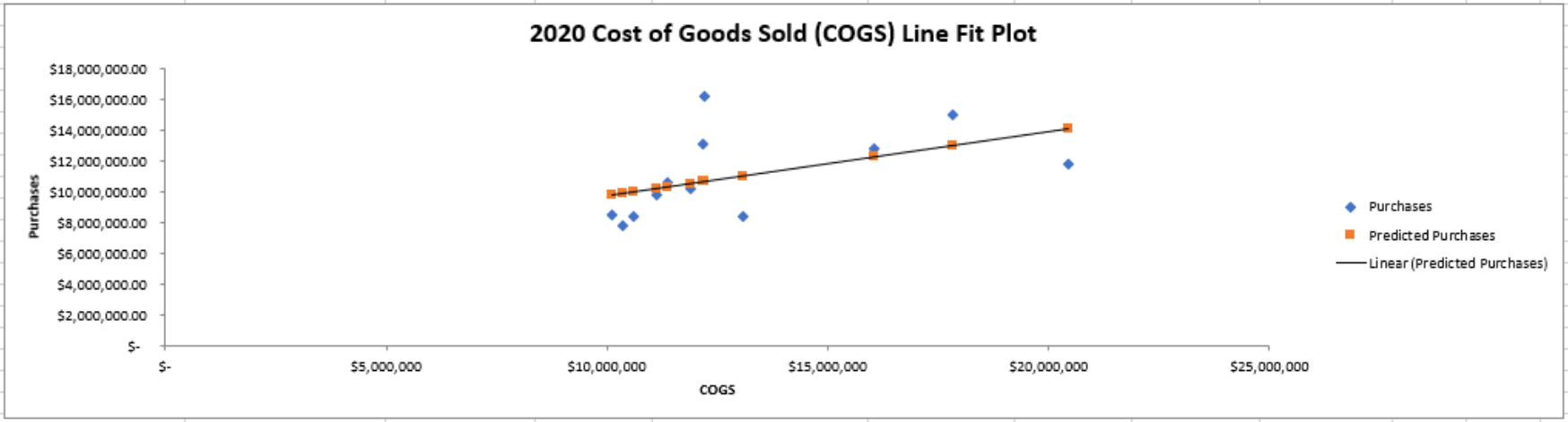
(A value significantly lower than 1 indicates that the data does not fit the relationship well)

ANOVA

	df	*SS*	*MS*
Regression	1	2.06889E+13	2.06889E+13
Residual	10	6.21574E+13	6.21574E+12
Total	11	8.28463E+13	

	Coefficients	*Standard Error*	*t Stat*					
Intercept	5567491.838	3094841.327	1.798958734	0.102225347	-1328244.365	12463228.04	-1328244.365	12463228.04
COGS	0.418958678	0.229640456	1.824411449	0.098067604	-0.092712145	0.930629501	-0.092712145	0.930629501

Based on these results, we can conclude that something significant has changed.



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Step 6. Follow Up on Significant Differences

- The relationship of inventory item purchases to cost of sales has changed significantly between 2019 and 2020 indicating potential problems
  - Inventory build up above that needed to cover customer sales?
  - Incorrect sales projection/estimations?
  - Errors in reorder points in the supply chain management system?

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Step 7. Present the Results

- **Condition**: What is the problem or issue? What is happening? (A regression result is an indicator of a condition-if it is determined that this is a condition rising to the level of an audit finding, then the regression visual should be included in the audit report as an explanatory visual)
- **Cause**: Why did the condition happen? (From a regression, a variance analysis (see next section) should be conducted to allow drill-down and determination of the periods/transactions of concern and why the problem arose)
- **Criteria**: How do we know this is a problem? What should be?
- **Effect**: Why does this condition matter? What is the impact?
- **Recommendation**: How do we solve the condition?
- **Consequence**: What is the risk or negative outcome because of the finding?
- **Corrective action**: What should management do?

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- What comes to mind when you hear “Business Intelligence”?

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Variance Identification

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Variance Identification

- Macro level tools such as regression analysis allow an auditor to identify changes to a data population, but drilling down into the underlying data to discrete periods is the starting point to understanding what caused the changes (variance)
- Variance identification is determining what was expected to occur (usually based on prior year information) and what actually occurred

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Variance Identification Example

- Using the information obtained from the regression example, a prediction can be made of purchases in the current year compared to actual purchases

	Coefficients
Intercept	**1536695.814**
COGS	**0.700054217**

- The linear equation (y=mx+b) for predicting purchases from COGS is

Purchases = COGS(.700054217)+1536695.814

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Coefficient

Regression Statistics	
Multiple R	0.979703059
R Square	0.959818084
Adjusted R Square	0.955799893
Standard Error	753555.5896
Observations	12

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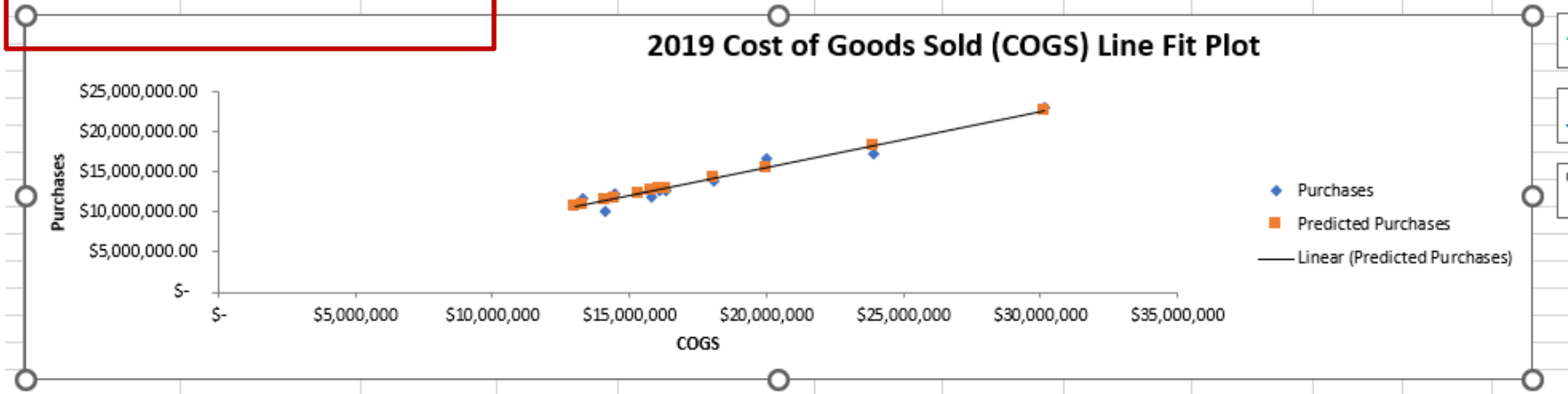

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Purchases = COGS(.700054217)+1536695.814

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Variance Identification Example

	Base Year Rate	2020	
Month	Predicted Purchases	Actual Purchases	Variance
January	$ 12,782,884.95	$ 12,810,824.89	$ (27,939.94)
February	$ 10,706,261.70	$ 8,372,842.39	$ 2,333,419.31
March	$ 10,054,932.84	$ 13,063,172.81	$ (3,008,239.96)
April	$ 9,323,242.41	$ 9,857,154.13	$ (533,911.72)
May	$ 9,873,404.96	$ 10,185,168.61	$ (311,763.65)
June	$ 14,013,778.09	$ 14,976,828.26	$ (963,050.18)
July	$ 8,610,867.04	$ 8,532,867.75	$ 77,999.29
August	$ 8,787,268.61	$ 7,861,511.38	$ 925,757.24
September	$ 8,960,361.31	$ 8,456,304.54	$ 504,056.77
October	$ 9,504,950.83	$ 10,585,900.20	$ (1,080,949.36)
November	$ 15,856,182.07	$ 11,760,071.93	$ 4,096,110.14
December	$ 10,077,079.78	$ 16,244,868.82	$ (6,167,789.04)
Predicted Purchases = COGS(0.700054217455249) + 1536695.81416027			

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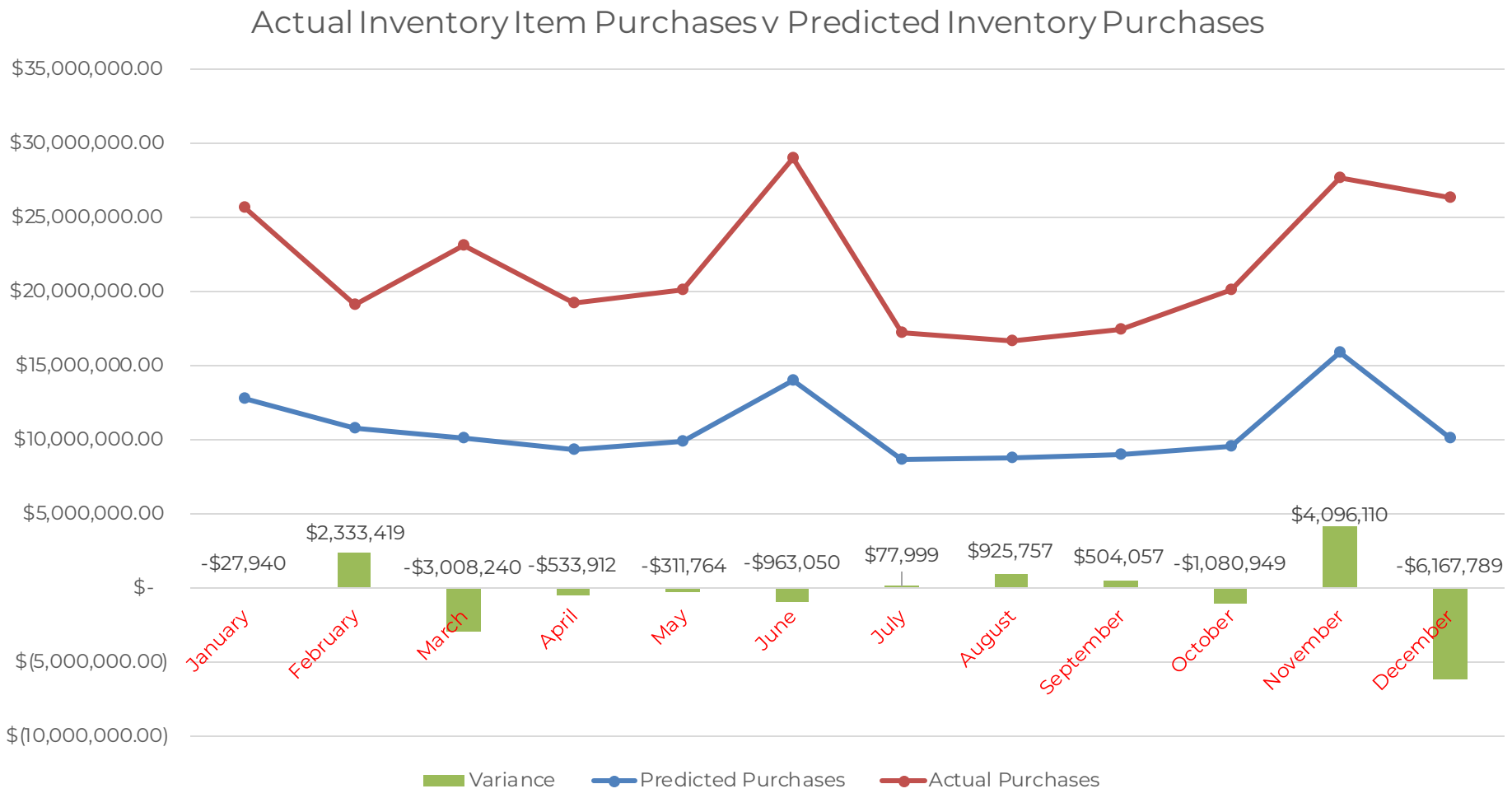
Variance Identification Example



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Benford's Law

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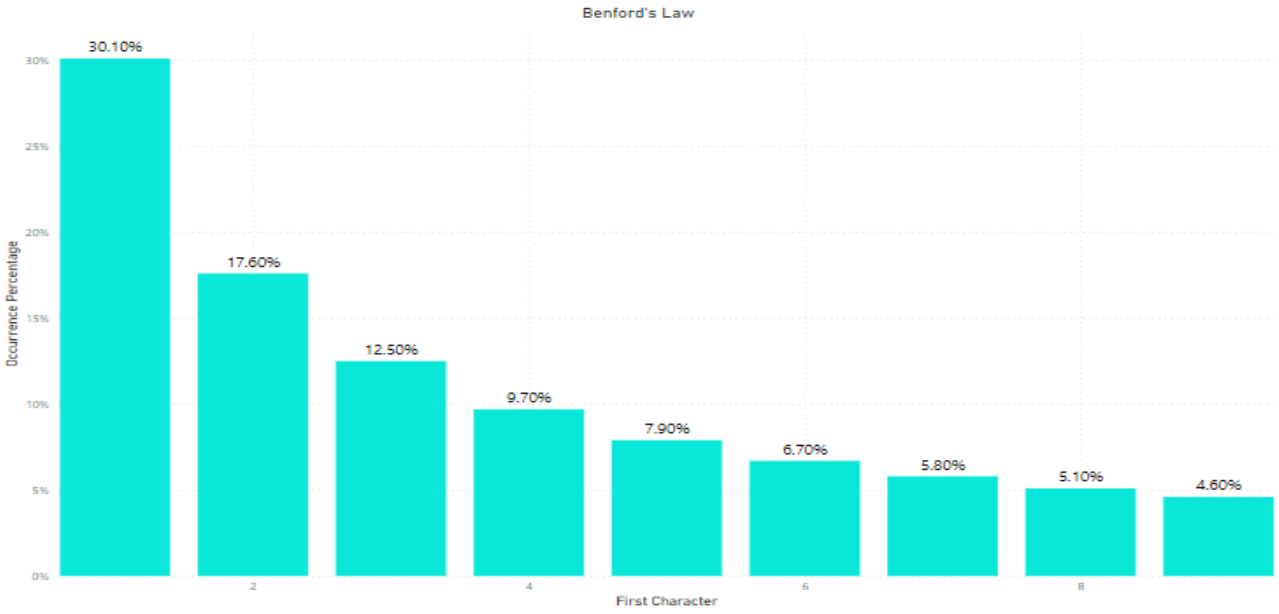
What is Benford’s Law?

- “Briefly explained, Benford's Law maintains that the numeral 1 will be the leading digit in a genuine data set of numbers 30.1% of the time; the numeral 2 will be the leading digit 17.6% of the time; and each subsequent numeral, 3 through 9, will be the leading digit with decreasing frequency. This expected occurrence of leading digits can be illustrated as shown in the chart ‘Benford's Law.’”
  - https://www.journalofaccountancy.com/issues/2017/apr/excel-and-benfords-law-to-detect-fraud.html



Genuine data sets are driven by the tendency to purchase more $1,000 items than $9,000 items. Real world purchases conform closely to the Benford’s First Digit Expected Distribution. This is true because it is harder to justify or gain permission to purchase the larger dollar amounts.

Purpose: To Identify Unusual Data Pattern in AP that May Indicate Manipulation, Errors, or Other Irregularities

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What exactly is it looking at?

- Insurance Bill 1947299
  - 1 is the first/leading digit
- Payment Amount Number -8,371
  - 8 is the first/leading digit
- Price of a Small Widget 0.25
  - 2 is the first/leading digit

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Example Data Sets That Can and Cannot be Tested Using Benford's Law

Valid

Routine, large, real-world distributions that cross numerous orders of magnitude uniformly

- ❑ Invoice Amounts
- ❑ Routine Payments
- ❑ Utility Bills
- ❑ Inventory Prices

Invalid

Small, non-routine, distributions that are almost all or entirely within one order of magnitude.

- ❑ Human Height
- ❑ IQ
- ❑ Manual Journal Entries
- ❑ Invoice Numbers

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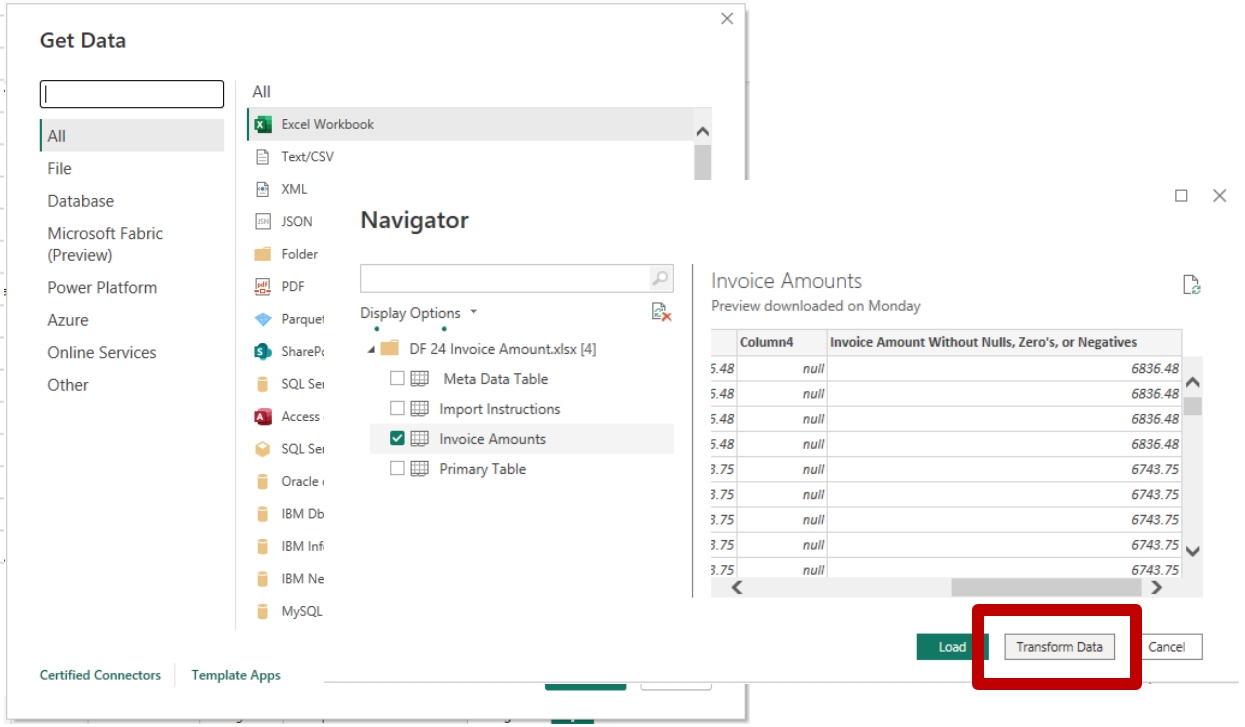
Benford's Law Example – Clean Up Data

Within Excel – Remove null values, eliminate the zeros, and negative signs

Raw Invoice Amount		Invoice Amount Without Nulls/Zero's		Invoice Amount Without Nulls, Zero's, or Negatives
		-6836.48		6836.48
31468.08		-6836.48		6836.48
5863.90		-6836.48		
19690.40		-6836.48		
46551.06		-6743.75		
34182.40		-6743.75		
		-6743.75		
46551.06		-6743.75		
		-6743.75		
		-6743.75		
		-5667.12		
4770.23		-5667.12		
		-5667.12		
1467.30		-5667.12		
		-5667.12		
		-5667.12		
		-5667.12		
28447.87		-5667.12		
		-5667.12		
		-5394.48		
2178.02		-5394.48		

Within Power BI – Extract the data from Excel and choose to Transform Data to get to Power Query



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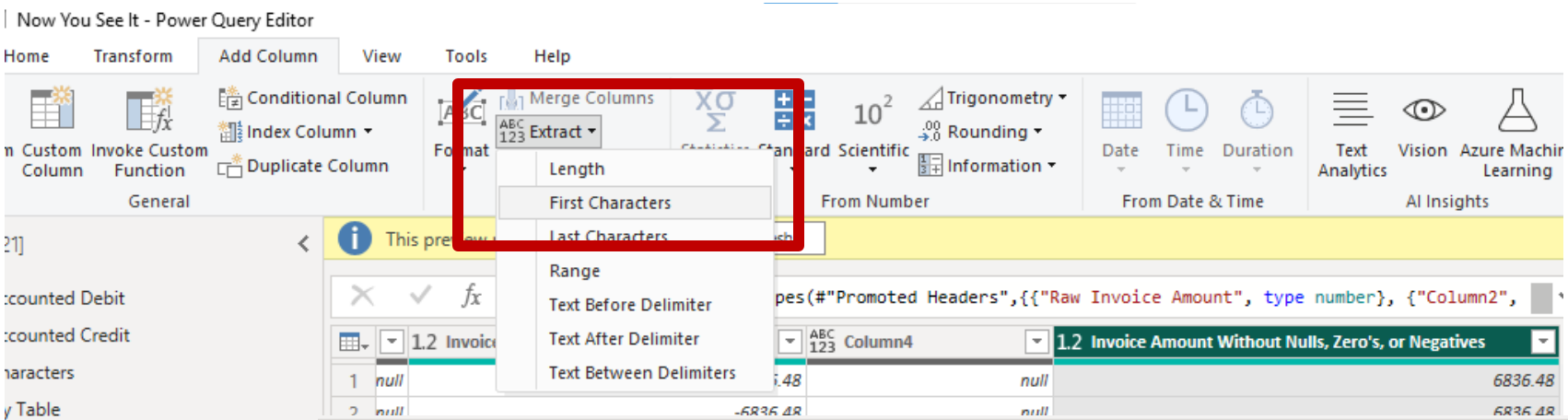
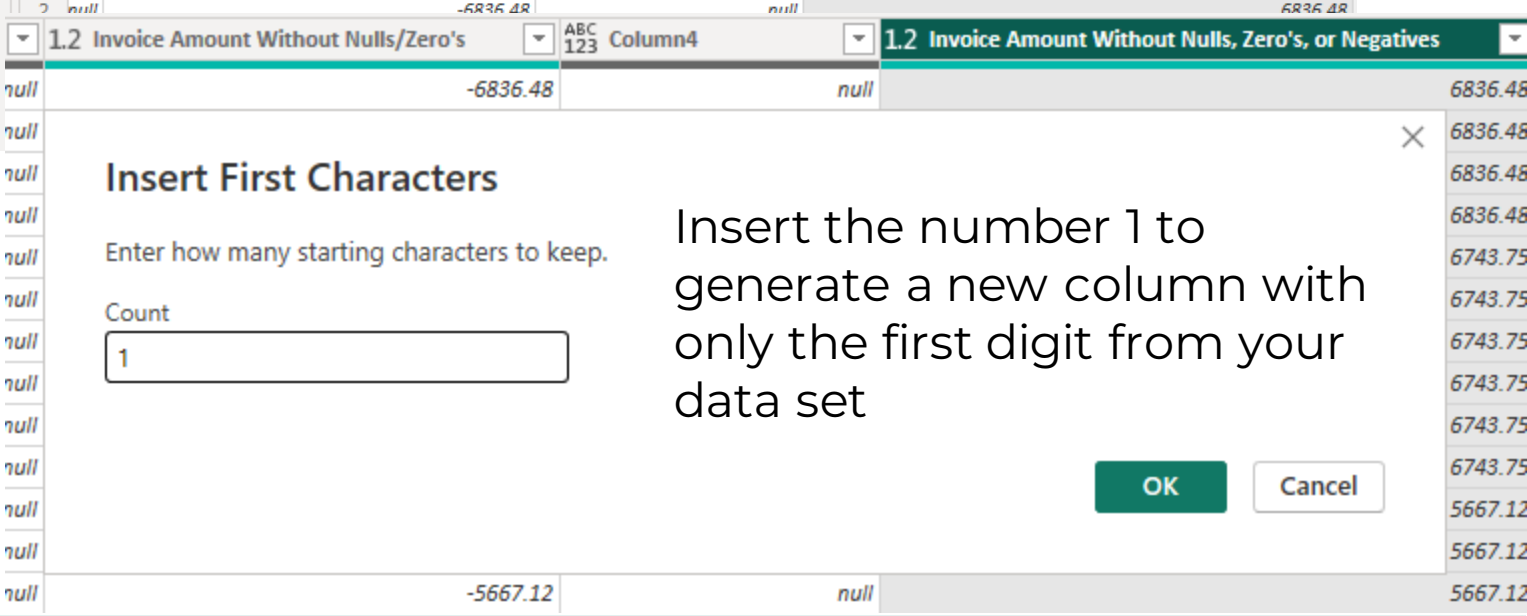
Benford's Law – Extract First Characters

Within Power Query under the Add Column ribbon, choose to Extract the First Characters





Insert the number 1 to generate a new column with only the first digit from your data set

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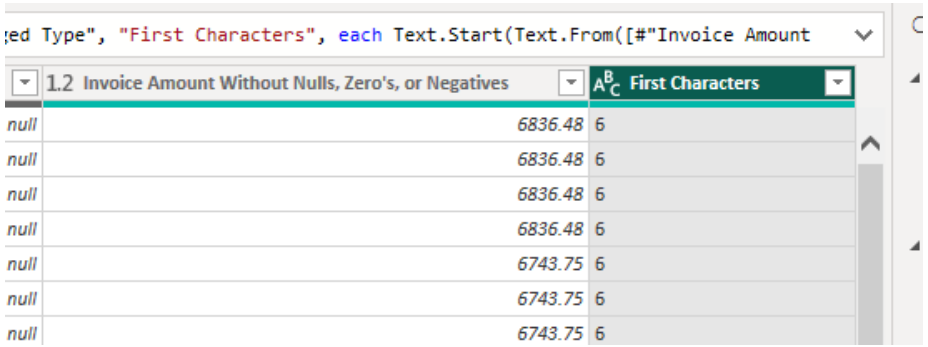
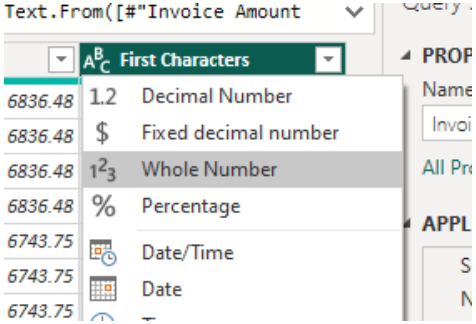
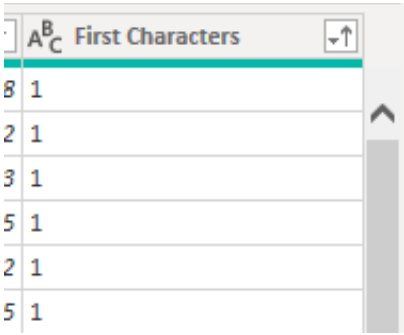
Benford's Law - Sort

Change the new column ("First Characters") to a Whole Number





Sort your First Characters data in ascending order



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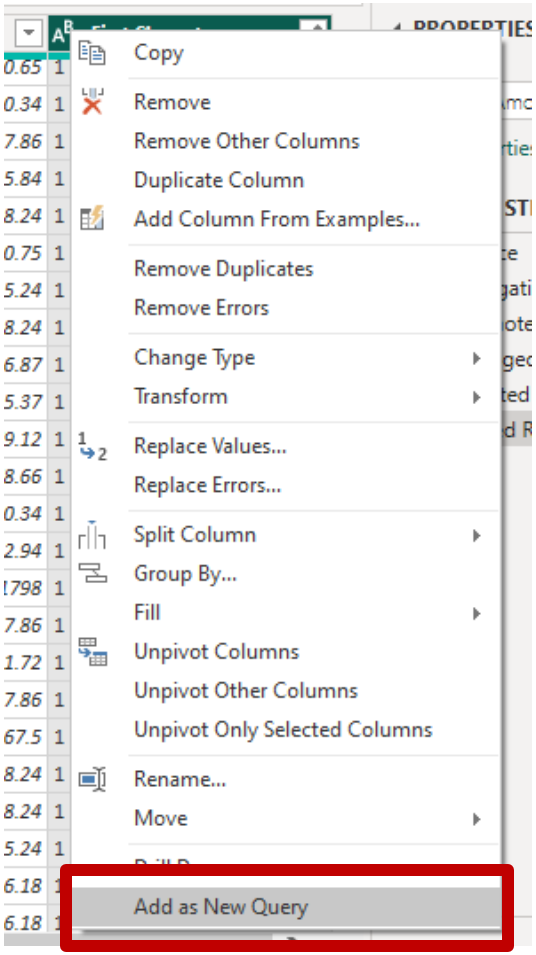
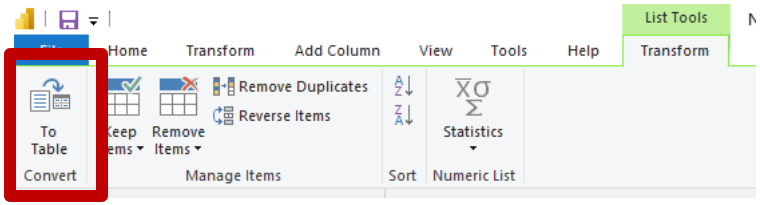
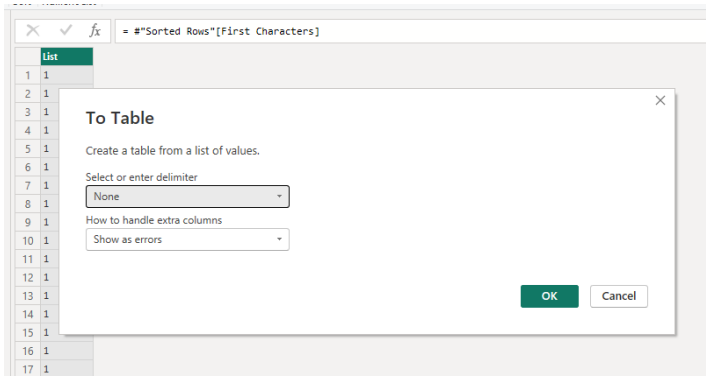
Benford's Law – Transform Into a Table

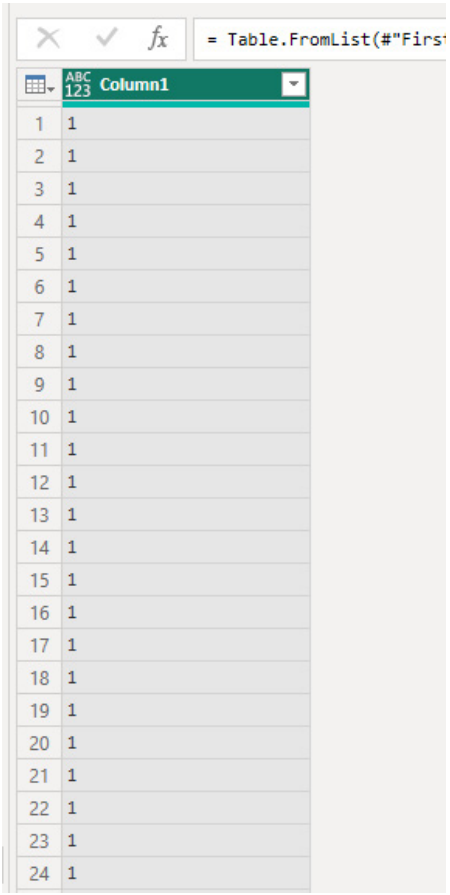
Right Click on your First Characters Column and select "Add as New Query"



Transform your list of First Characters into a Table







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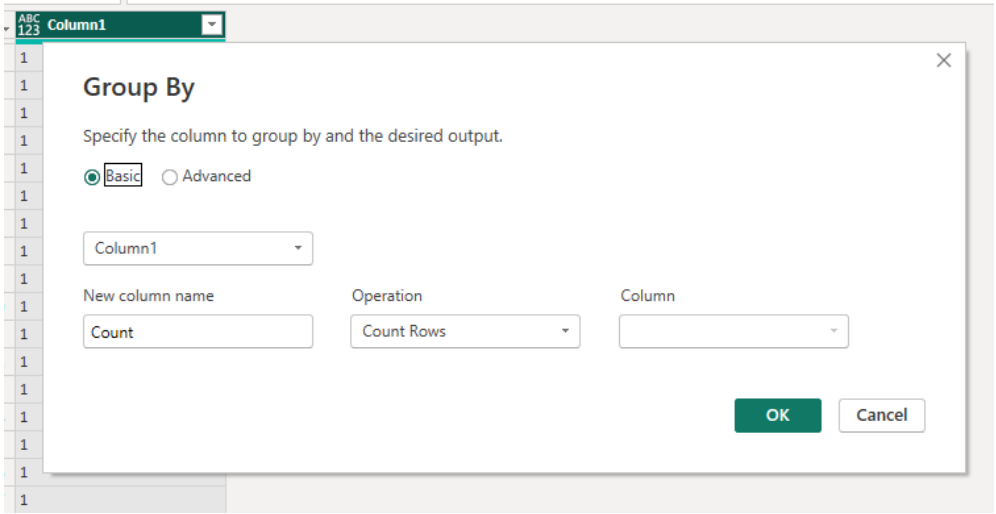
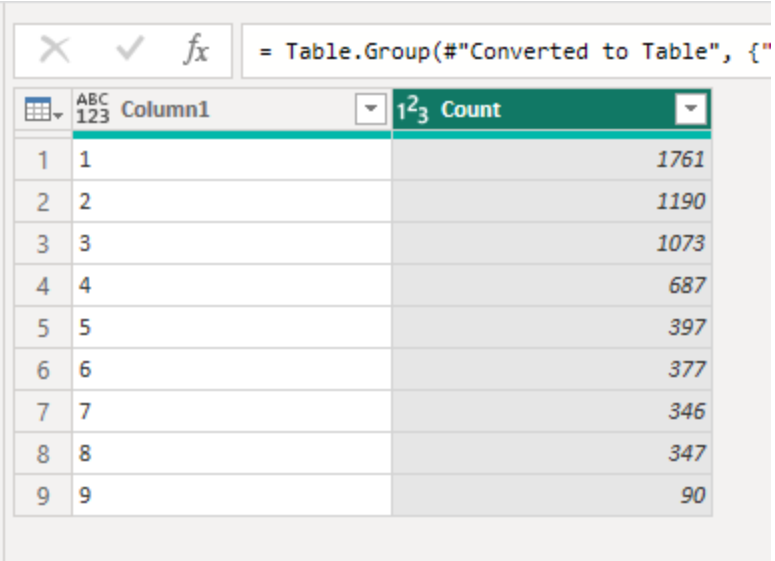
Benford's Law – Group By

Right click on your data and choose "Group By"



You should see the first digits in Column1 and the count of their occurrence in the Count column



	Column1	Count
1	1	1761
2	2	1190
3	3	1073
4	4	687
5	5	397
6	6	377
7	7	346
8	8	347
9	9	90

NOTE: Ensure your values are occurring in ascending order within Column1

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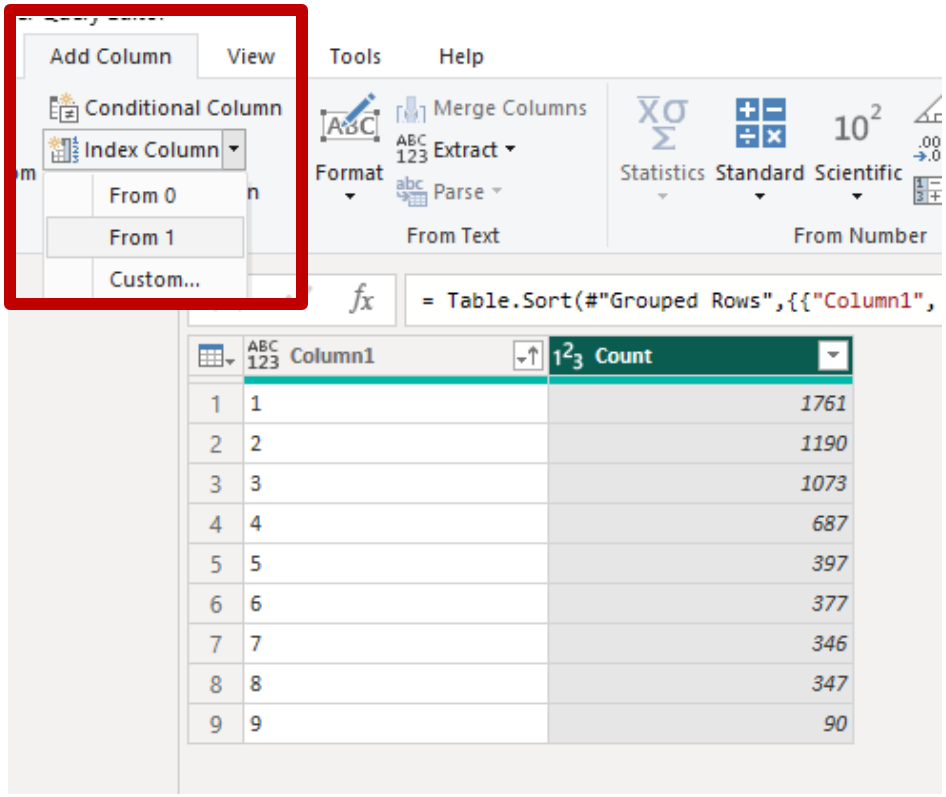
Benford's Law - Example

Establish a relationship by adding an index column on your Count column starting "From 1". This will become your X axis



	ABC 123 Column1	1²3 Count
1	1	1761
2	2	1190
3	3	1073
4	4	687
5	5	397
6	6	377
7	7	346
8	8	347
9	9	90

	ABC 123 Column1	1²3 Count	1²3 Index
1	1	1761	1
2	2	1190	2
3	3	1073	3
4	4	687	4
5	5	397	5
6	6	377	6
7	7	346	7
8	8	347	8
9	9	90	9

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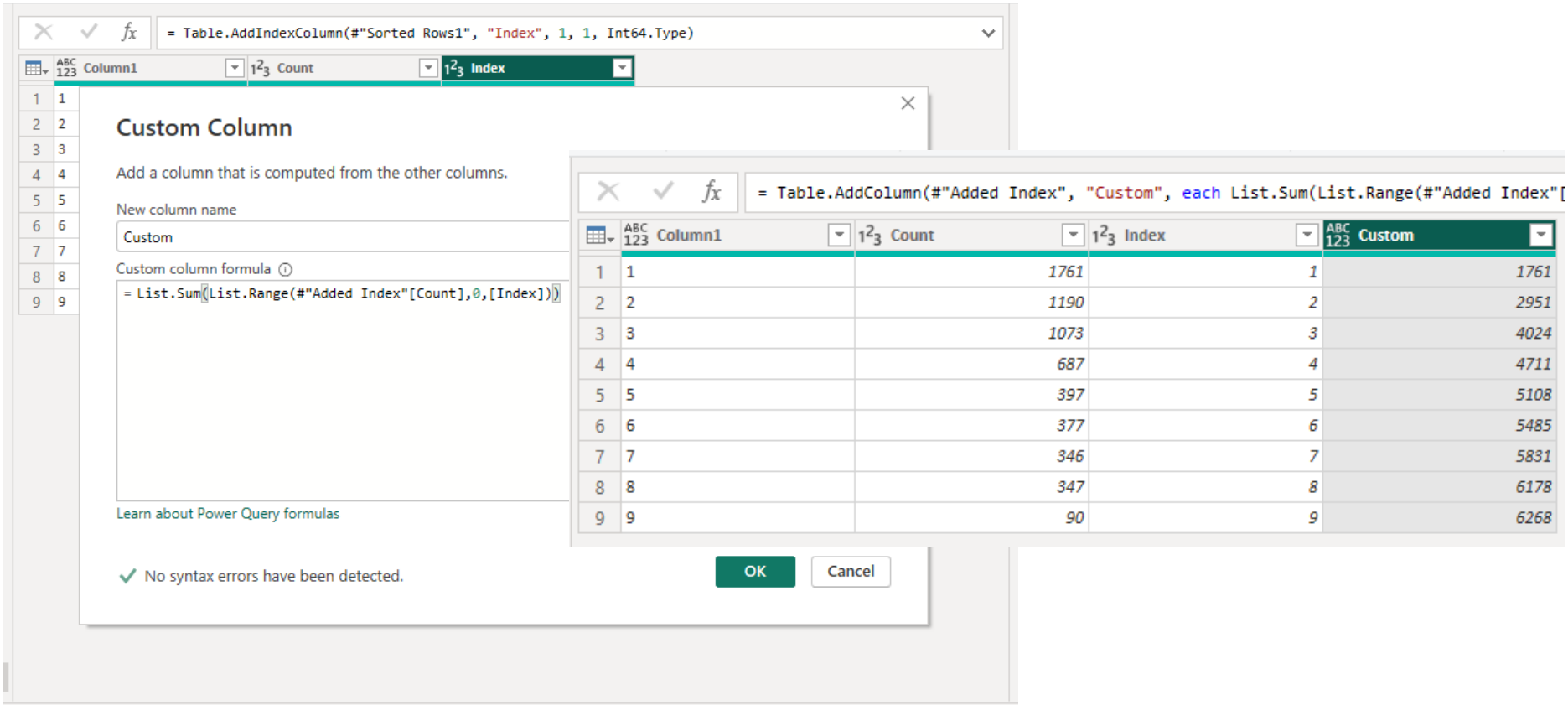
Benford's Law – Cumulative Sum

Add a custom column to calculate the cumulative sum of the Count column (DAX below)



List.Sum(List.Range(#"Added Index"[Count],0,[Index]))

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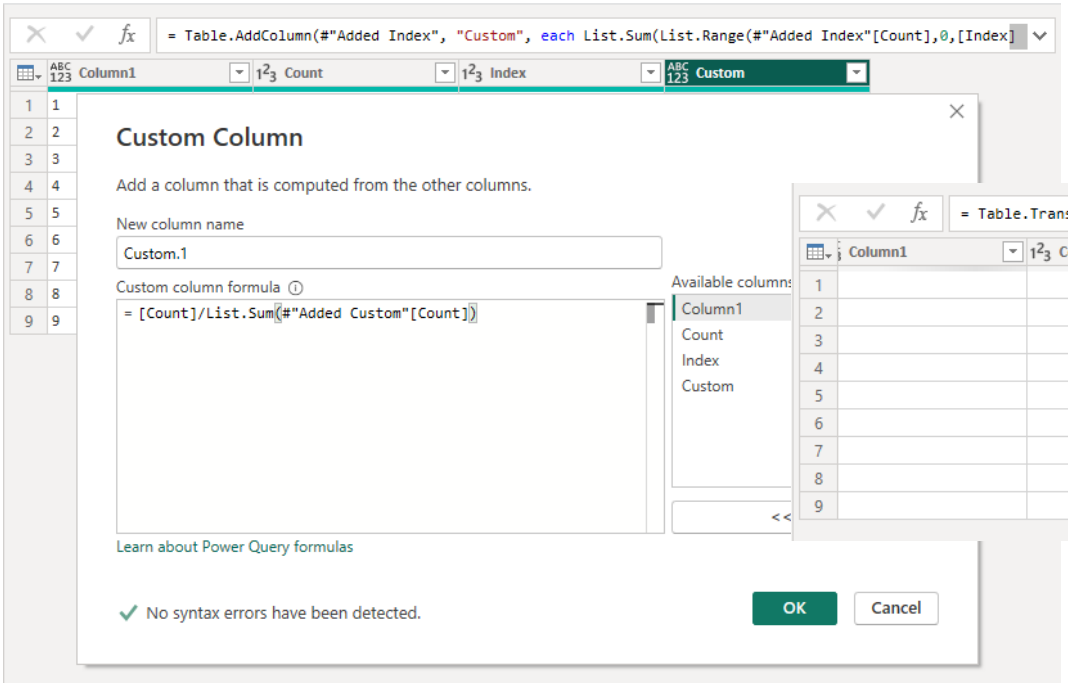
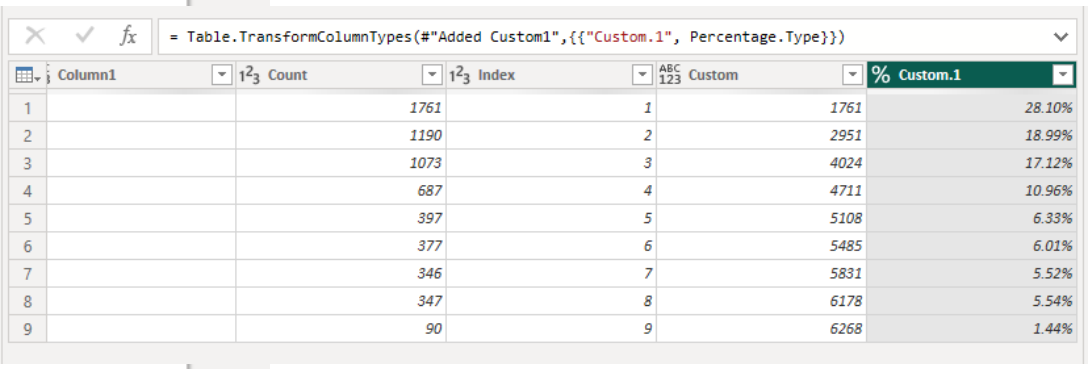
Benford's Law – Determine Percentage

Add a custom column to calculate the percentage of each first digits occurrence (DAX below)





	Column1	Count	Index	Custom	Custom.1
1		1761	1	1761	28.10%
2		1190	2	2951	18.99%
3		1073	3	4024	17.12%
4		687	4	4711	10.96%
5		397	5	5108	6.33%
6		377	6	5485	6.01%
7		346	7	5831	5.52%
8		347	8	6178	5.54%
9		90	9	6268	1.44%

This will become a column within your graph

[Count]/List.Sum(#"Added Custom"[Count])

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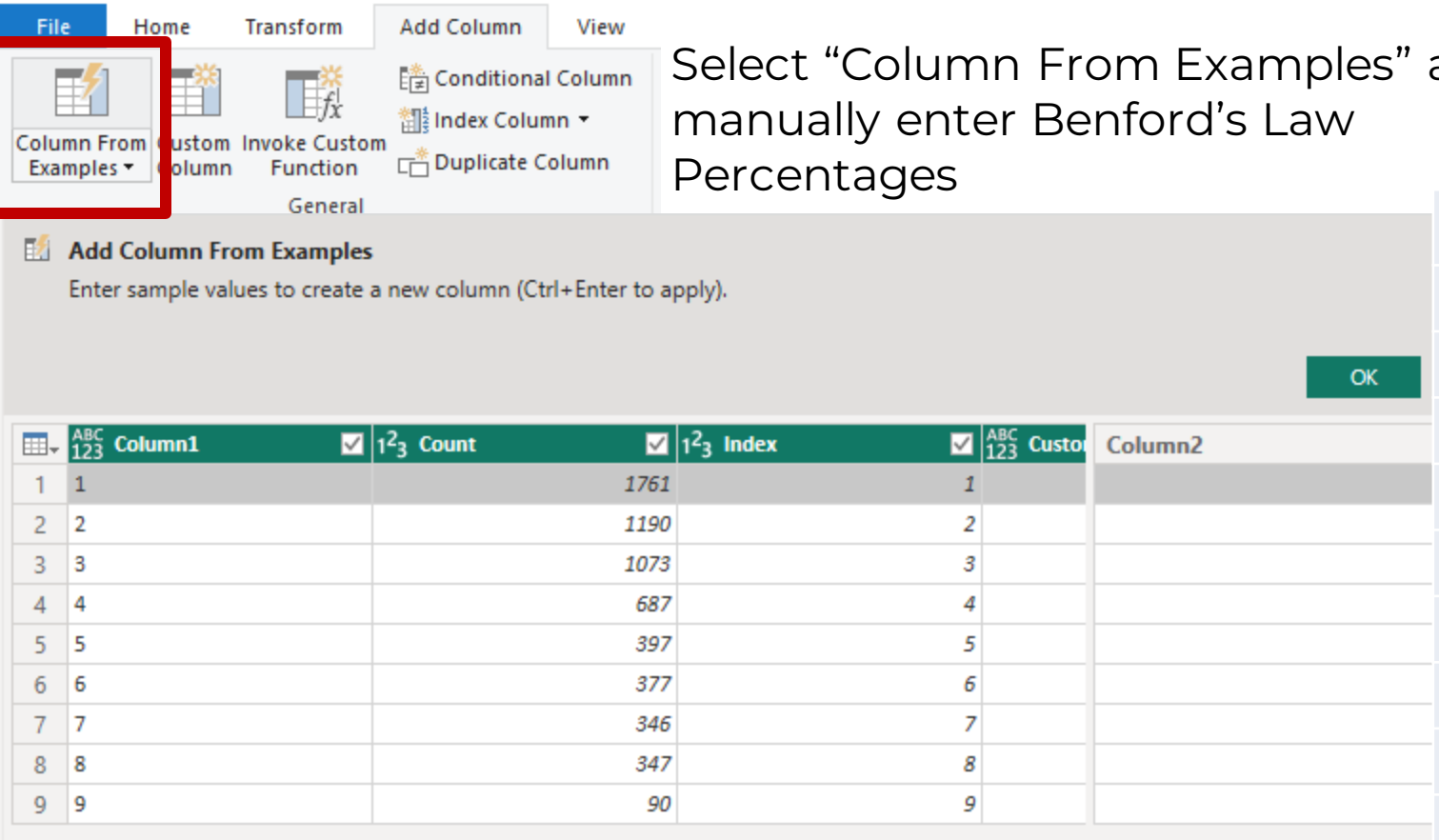
Benford's Law – Add Benford's Percentages



	Column1	Count	Index	Column2
1	1	1761	1	
2	2	1190	2	
3	3	1073	3	
4	4	687	4	
5	5	397	5	
6	6	377	6	
7	7	346	7	
8	8	347	8	
9	9	90	9	

Select "Column From Examples" and manually enter Benford's Law Percentages

Digit	%
1	30.10%
2	17.60%
3	12.50%
4	9.70%
5	7.90%
6	6.70%
7	5.80%
8	5.10%
9	4.60%

This will become a reference column within your graph

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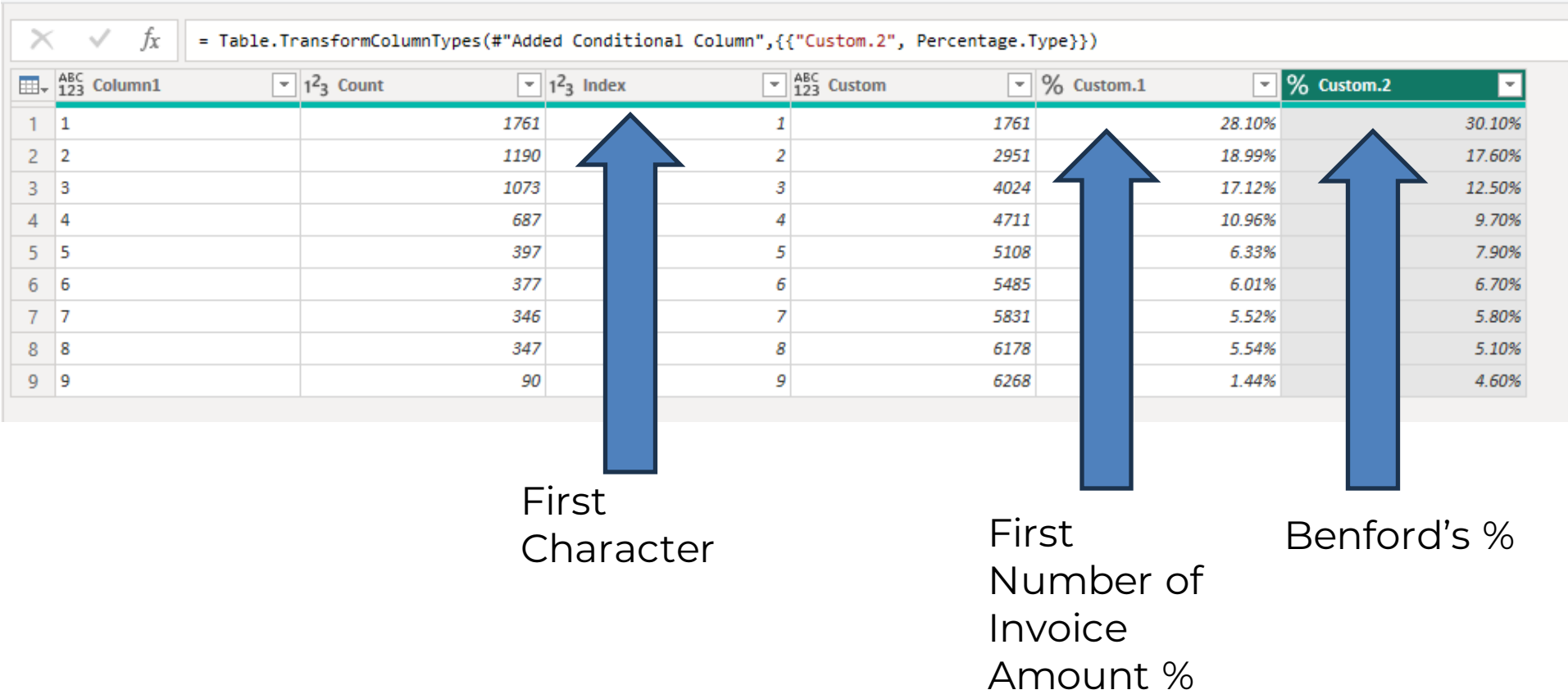
Benford's Law – Ready to Graph!

Once your data has been added you are ready to update your column names and Apply Changes



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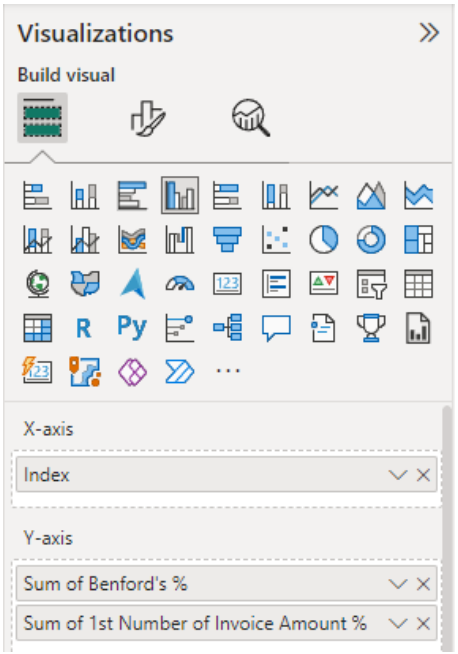
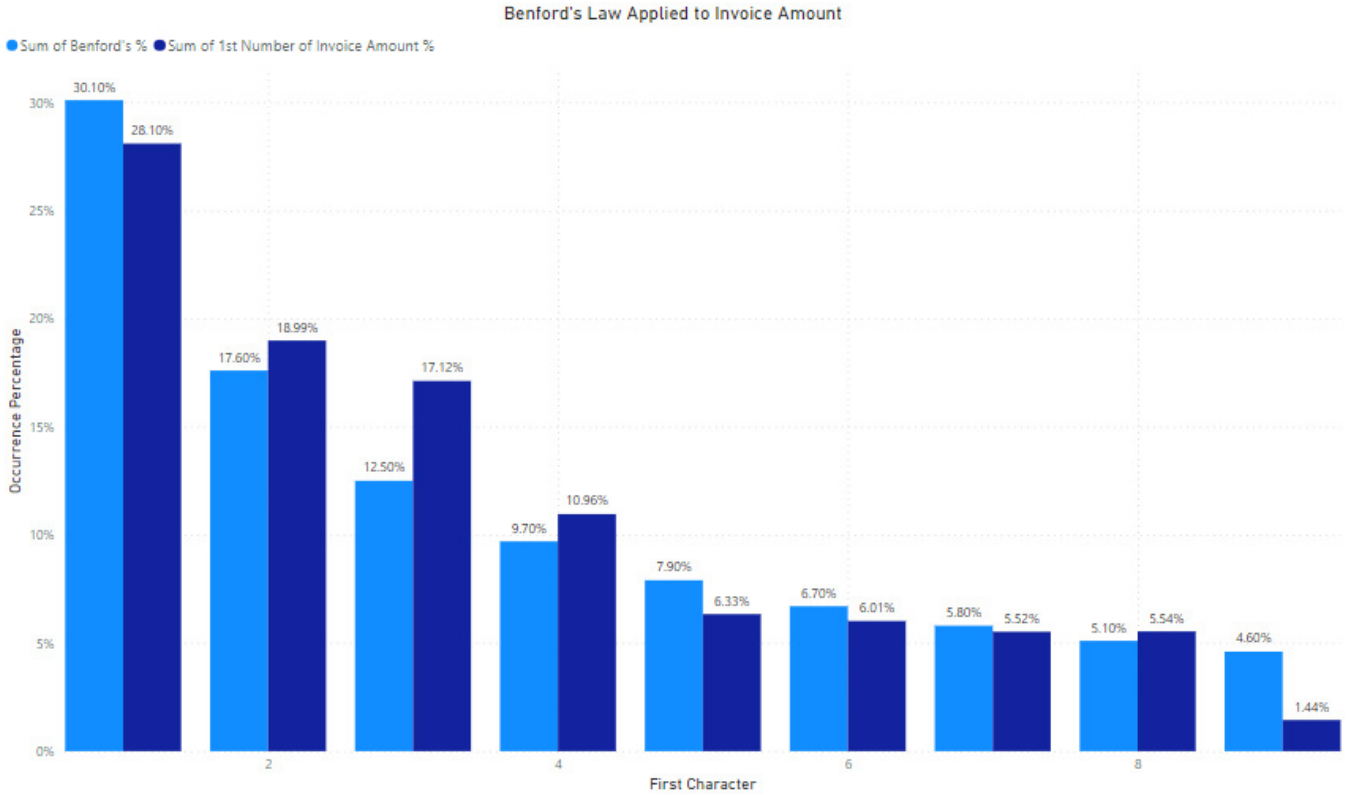
Benford's Law – The Fun Part





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Poll Question 2

If you would like to receive CPE credit for today's event, you must respond to all polling questions.

*Browsers with advanced security may prevent the poll question from popping up - if you are experiencing any difficulties, or have any questions please contact our panel via the '**chat**' function and we will assist you.*

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Invoice Number Format Test

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Invoice Number Format Test

- Invoice Number Format Test
  - Caused primarily by the invoice process urgency, one of the more common ways that invoices and payment are duplicated is altering, prefixing, or suffixing invoice number to circumvent the system control that prevents a duplicate invoice number for the same vendor.
  - Invoice numbers that are in a different format, length, or with unusual characters may indicate a fraudulent invoicing scheme.

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Invoice Number Format Test

- This test convert invoice numbers to a code where letters become “A”, numbers become “#”, and hyphens are preserved. This allows an automated audit routine to compare and identify the unusual invoice # format.

1	Trading Partner	Supplier Num	Supplier Site Name	Invoice Date	Month	Year	Invoice Num	Invoice Number Format	Invoice Amount
1157	Staples	5029	STAPLES LA	6-Oct-10	10	2010	ERS-9066-2300	AAA-####-######	127,487.50
1158	Staples	5029	STAPLES LA	8-Feb-10	2	2010	ERS-8848-2085	AAA-####-######	238,700.00
1159	Staples	5029	STAPLES LA	8-May-10	5	2010	STAPLES-01	AAAAAAA-##	238,700.00
1160	Staples	5029	STAPLES LA	7-Jul-10	7	2010	STAADJJUL-01	AAAAAAAAA-##	238,700.00
1161	Staples	5029	STAPLES LA	7-Jul-10	7	2010	ERS-9000-2198	AAA-####-######	238,700.00
1162	Staples	5029	STAPLES LA	8-Aug-09	8	2009	ERS-8740-1965	AAA-####-######	124,775.00
1163	Staples	5029	STAPLES LA	8-Aug-09	8	2009	ERS-8736-1963	AAA-####-######	124,775.00
1164	Staples	5029	STAPLES LA	8-Aug-09	8	2009	ERS-8739-1965	AAA-####-######	124,775.00
1165	Staples	5029	STAPLES LA	8-Aug-09	8	2009	ERS-8738-1964	AAA-####-######	124,775.00
1166	Staples	5029	STAPLES LA	9-Jan-09	1	2009	ERS-8544-1837	AAA-####-######	477,400.00
1167	Staples	5029	STAPLES LA	8-Jun-09	6	2009	ERS-8689-1926	AAA-####-######	477,400.00
1168	Staples	5029	STAPLES LA	8-Dec-09	12	2009	STA-02	AAA-##	455,700.00
1169	Staples	5029	STAPLES LA	9-Jan-10	1	2010	STA-01	AAA-##	455,700.00

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Invoice Number Format Test - Excel

- *Formula Explanation: If each digit, taken one at a time is a number ISNUMBER() it is replaced with a "#", if it is not a number, it is replaced with an "A", and if it is a hyphen, it remains a hyphen.*

=IF(ISNUMBER(VALUE(MID($K23,O$2,1))),"#",IF(MID($K23,O$2,1)="-","-",IF(O$2>LEN($K23),"","A")))

	K	M	O	P	Q	R	S	T	U	V
1			Digits							
2	Invoice Num	Invoice Number Format	1	2	3	4	5	6	7	8
20	W36715	A######	A	#	#	#	#	#		
21	W35365	A######	A	#	#	#	#	#		
22	W37645	A######	A	#	#	#	#	#		
23	W11625-2	A######-#	A	#	#	#	#	#	-	#
24	W38369	A######	A	#	#	#	#	#		
25	W36908	A######	A	#	#	#	#	#		
26	W36684		=IF(ISNUMBER(VALUE(MID($K23,O$2,1))),"#",IF(MID($K23,O$2,1)="-","-",IF(O$2>LEN($K23),"","A")))							
27	W36201	A######	A	#	#	#	#	#		

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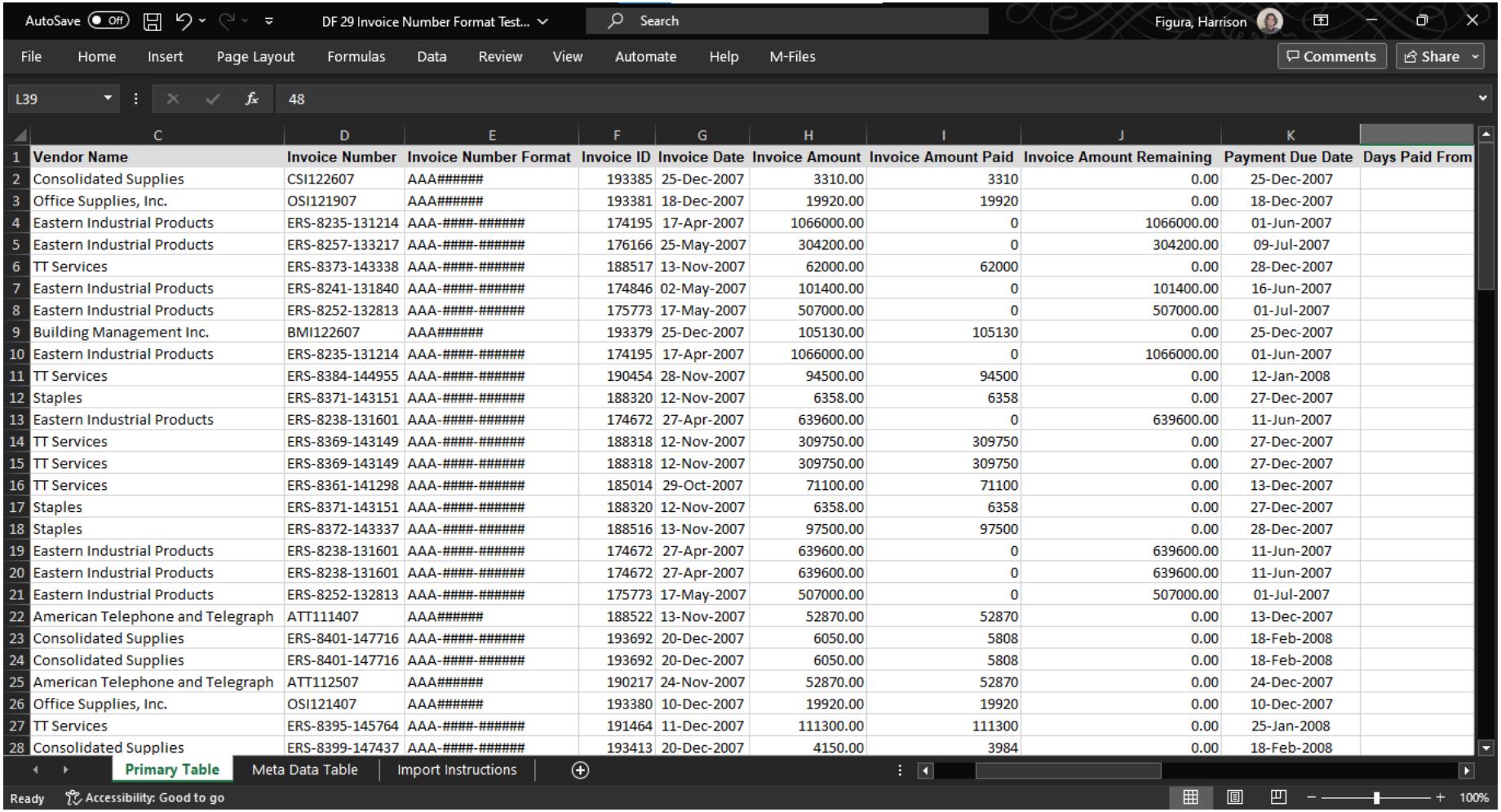
Invoice Number Format Test – Assemble Your Data



Vendor Name	Invoice Number	Invoice Number Format	Invoice ID	Invoice Date	Invoice Amount	Invoice Amount Paid	Invoice Amount Remaining	Payment Due Date	Days Paid From
Consolidated Supplies	CSI122607	AAA######	193385	25-Dec-2007	3310.00	3310	0.00	25-Dec-2007	
Office Supplies, Inc.	OSI121907	AAA######	193381	18-Dec-2007	19920.00	19920	0.00	18-Dec-2007	
Eastern Industrial Products	ERS-8235-131214	AAA-####-######	174195	17-Apr-2007	1066000.00	0	1066000.00	01-Jun-2007	
Eastern Industrial Products	ERS-8257-133217	AAA-####-######	176166	25-May-2007	304200.00	0	304200.00	09-Jul-2007	
TT Services	ERS-8373-143338	AAA-####-######	188517	13-Nov-2007	62000.00	62000	0.00	28-Dec-2007	
Eastern Industrial Products	ERS-8241-131840	AAA-####-######	174846	02-May-2007	101400.00	0	101400.00	16-Jun-2007	
Eastern Industrial Products	ERS-8252-132813	AAA-####-######	175773	17-May-2007	507000.00	0	507000.00	01-Jul-2007	
Building Management Inc.	BMI122607	AAA######	193379	25-Dec-2007	105130.00	105130	0.00	25-Dec-2007	
Eastern Industrial Products	ERS-8235-131214	AAA-####-######	174195	17-Apr-2007	1066000.00	0	1066000.00	01-Jun-2007	
TT Services	ERS-8384-144955	AAA-####-######	190454	28-Nov-2007	94500.00	94500	0.00	12-Jan-2008	
Staples	ERS-8371-143151	AAA-####-######	188320	12-Nov-2007	6358.00	6358	0.00	27-Dec-2007	
Eastern Industrial Products	ERS-8238-131601	AAA-####-######	174672	27-Apr-2007	639600.00	0	639600.00	11-Jun-2007	
TT Services	ERS-8369-143149	AAA-####-######	188318	12-Nov-2007	309750.00	309750	0.00	27-Dec-2007	
TT Services	ERS-8369-143149	AAA-####-######	188318	12-Nov-2007	309750.00	309750	0.00	27-Dec-2007	
TT Services	ERS-8361-141298	AAA-####-######	185014	29-Oct-2007	71100.00	71100	0.00	13-Dec-2007	
Staples	ERS-8371-143151	AAA-####-######	188320	12-Nov-2007	6358.00	6358	0.00	27-Dec-2007	
Staples	ERS-8372-143337	AAA-####-######	188516	13-Nov-2007	97500.00	97500	0.00	28-Dec-2007	
Eastern Industrial Products	ERS-8238-131601	AAA-####-######	174672	27-Apr-2007	639600.00	0	639600.00	11-Jun-2007	
Eastern Industrial Products	ERS-8238-131601	AAA-####-######	174672	27-Apr-2007	639600.00	0	639600.00	11-Jun-2007	
Eastern Industrial Products	ERS-8252-132813	AAA-####-######	175773	17-May-2007	507000.00	0	507000.00	01-Jul-2007	
American Telephone and Telegraph	ATT111407	AAA######	188522	13-Nov-2007	52870.00	52870	0.00	13-Dec-2007	
Consolidated Supplies	ERS-8401-147716	AAA-####-######	193692	20-Dec-2007	6050.00	5808	0.00	18-Feb-2008	
Consolidated Supplies	ERS-8401-147716	AAA-####-######	193692	20-Dec-2007	6050.00	5808	0.00	18-Feb-2008	
American Telephone and Telegraph	ATT112507	AAA######	190217	24-Nov-2007	52870.00	52870	0.00	24-Dec-2007	
Office Supplies, Inc.	OSI121407	AAA######	193380	10-Dec-2007	19920.00	19920	0.00	10-Dec-2007	
TT Services	ERS-8395-145764	AAA-####-######	191464	11-Dec-2007	111300.00	111300	0.00	25-Jan-2008	
Consolidated Supplies	ERS-8399-147437	AAA-####-######	193413	20-Dec-2007	4150.00	3984	0.00	18-Feb-2008	

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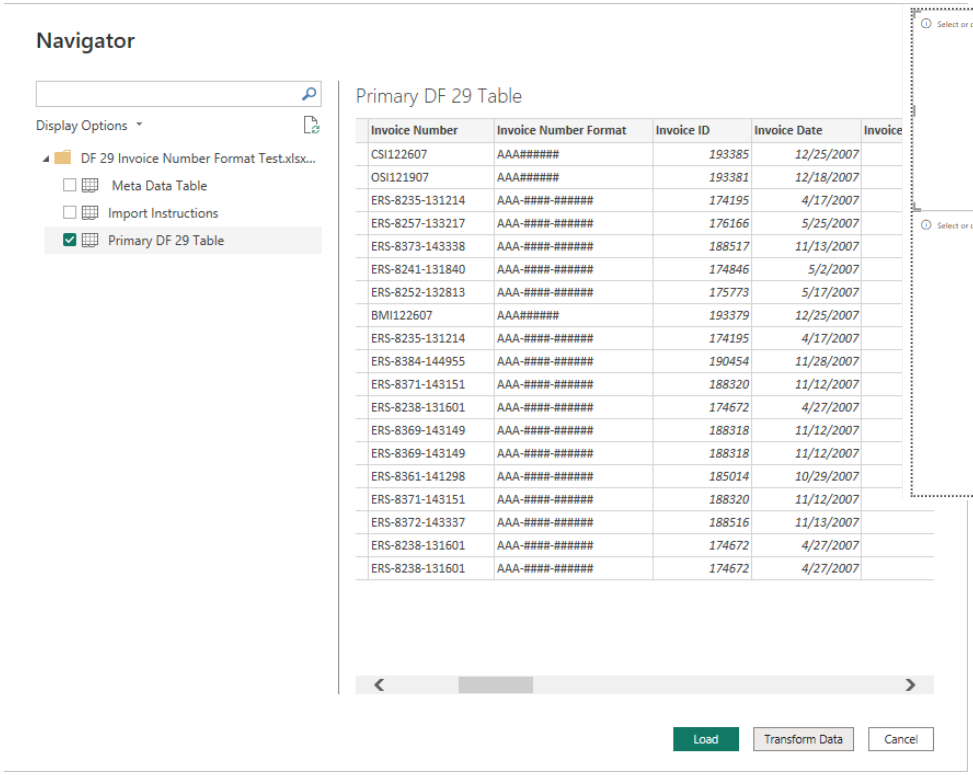
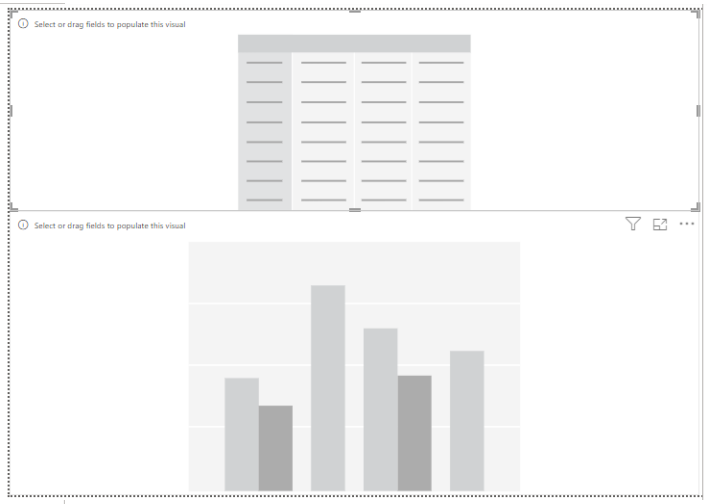
Invoice Number Format Test - Import

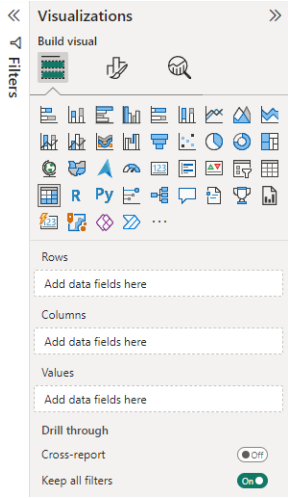
Import your data

Add a Matrix and Clustered Column Chart



Invoice Number	Invoice Number Format	Invoice ID	Invoice Date	Invoice
CSI122607	AAA######	193385	12/25/2007	
OSI121907	AAA######	193381	12/18/2007	
ERS-8235-131214	AAA-####-######	174195	4/17/2007	
ERS-8257-133217	AAA-####-######	176166	5/25/2007	
ERS-8373-143338	AAA-####-######	188517	11/13/2007	
ERS-8241-131840	AAA-####-######	174846	5/2/2007	
ERS-8252-132813	AAA-####-######	175773	5/17/2007	
BMI122607	AAA######	193379	12/25/2007	
ERS-8235-131214	AAA-####-######	174195	4/17/2007	
ERS-8384-144955	AAA-####-######	190454	11/28/2007	
ERS-8371-143151	AAA-####-######	188320	11/12/2007	
ERS-8238-131601	AAA-####-######	174672	4/27/2007	
ERS-8369-143149	AAA-####-######	188318	11/12/2007	
ERS-8369-143149	AAA-####-######	188318	11/12/2007	
ERS-8361-141298	AAA-####-######	185014	10/29/2007	
ERS-8371-143151	AAA-####-######	188320	11/12/2007	
ERS-8372-143337	AAA-####-######	188516	11/13/2007	
ERS-8238-131601	AAA-####-######	174672	4/27/2007	
ERS-8238-131601	AAA-####-######	174672	4/27/2007	





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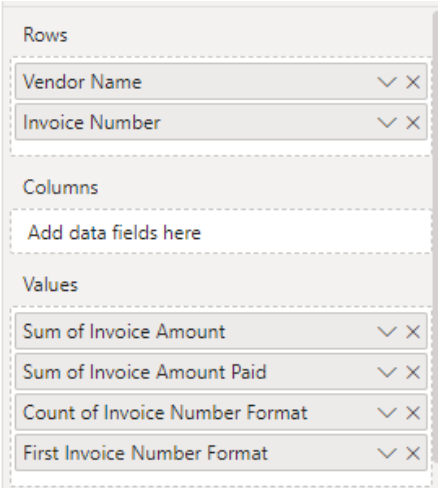
Invoice Number Format Test – Populate Your Matrix



Vendor Name	Sum of Invoice Amount	Sum of Invoice Amount Paid	Count of Invoice Number Format	First Invoice Number Format
Advanced Network Devices	598160	598160	3	AAA######
Allied Manufacturing	197879	197879	2	AAA-####-######
Consolidated Supplies	58030	56106	2	AAA######
Office Supplies, Inc.	63062	63062	2	AAA######
American Telephone and Telegraph	348570	348570	1	AAA######
Building Management Inc.	315390	315390	1	AAA######
Eastern Industrial Products	18473000	0	1	AAA-####-######
General Electric	108186	108186	1	AAA-####-######
Staples	216535	216535	1	AAA-####-######
Star Gate Ltd	43610	43610	1	AAA-####-######
TT Services	3611550	3611550	1	AAA-####-######
United Parcel Service	125460	125460	1	AAA######
Total	**24159432**	**5684508**	**5**	**AAA######**

Vendor Name	Sum of Invoice Amount	Sum of Invoice Amount Paid	Count of Invoice Number Format	First Invoice Number Format
Advanced Network Devices	**598160**	**598160**	**3**	**AAA######**
AND111407	90720	90720	1	AAA######
AND111607-O	90720	90720	1	AAA######-A
AND1125072	90720	90720	1	AAA######
AND120507	81500	81500	1	AAA######
AND121407	81500	81500	1	AAA######
AND121907	81500	81500	1	AAA######
AND122607	81500	81500	1	AAA######
Allied Manufacturing	**197879**	**197879**	**2**	**AAA-####-######**
Consolidated Supplies	**58030**	**56106**	**2**	**AAA######**
Office Supplies, Inc.	**63062**	**63062**	**2**	**AAA######**
American Telephone and Telegraph	**348570**	**348570**	**1**	**AAA######**
Building Management Inc.	**315390**	**315390**	**1**	**AAA######**
Total	**24159432**	**5684508**	**5**	**AAA######**

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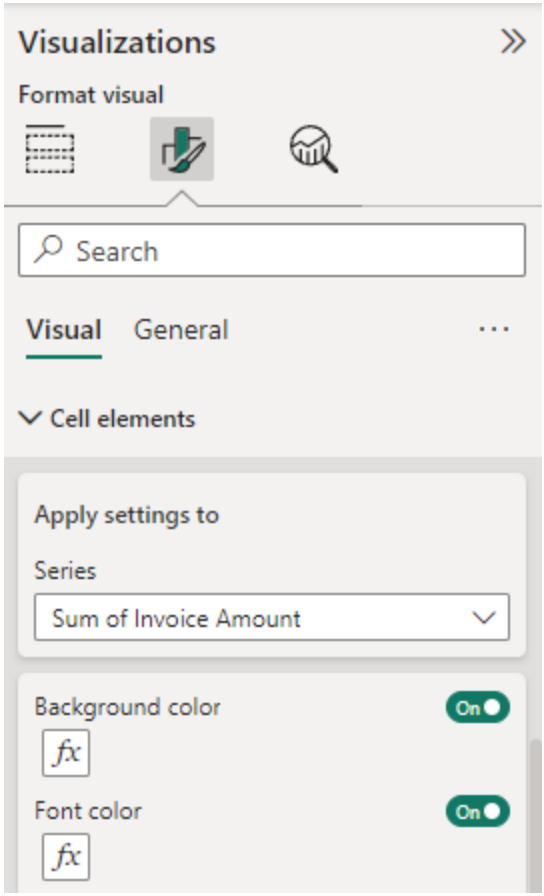
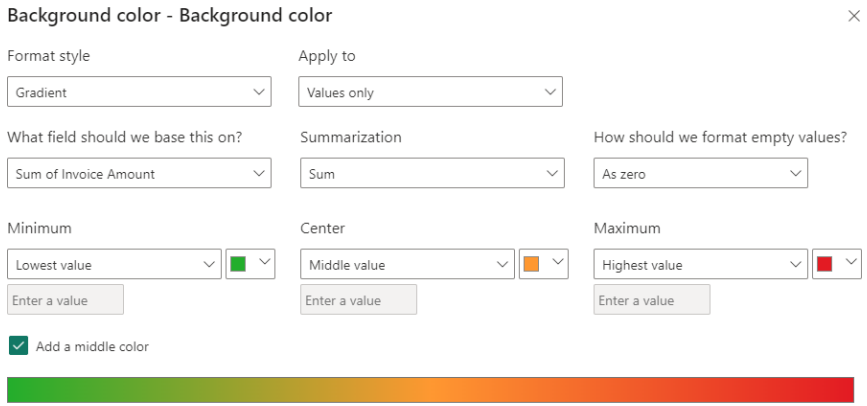
Invoice Number Format Test – Add Some Pizzazz





Vendor Name	Sum of Invoice Amount	Sum of Invoice Amount Paid	Count of Invoice Number Format	First Invoice Number Format
Advanced Network Devices	598160	598160	3	AAA######
Allied Manufacturing	197879	197879	2	AAA-####-######
Consolidated Supplies	58030	56106	2	AAA######
Office Supplies, Inc.	63062	63062	2	AAA######
American Telephone and Telegraph	348570	348570	1	AAA######
Building Management Inc.	315390	315390	1	AAA######
Eastern Industrial Products	18473000	0	1	AAA-####-######
General Electric	108186	108186	1	AAA-####-######
Staples	216535	216535	1	AAA-####-######
Star Gate Ltd	43610	43610	1	AAA-####-######
TT Services	3611550	3611550	1	AAA-####-######
United Parcel Service	125460	125460	1	AAA######
Total	**24159432**	**5684508**	**5**	**AAA######**

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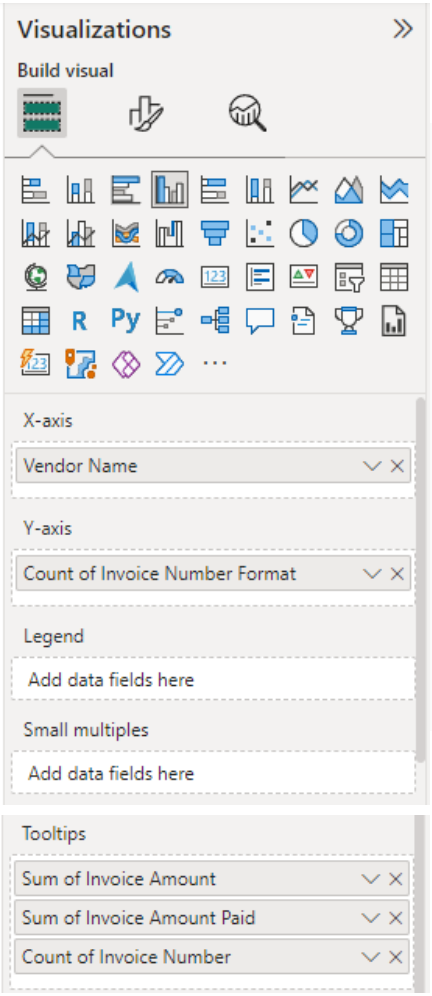
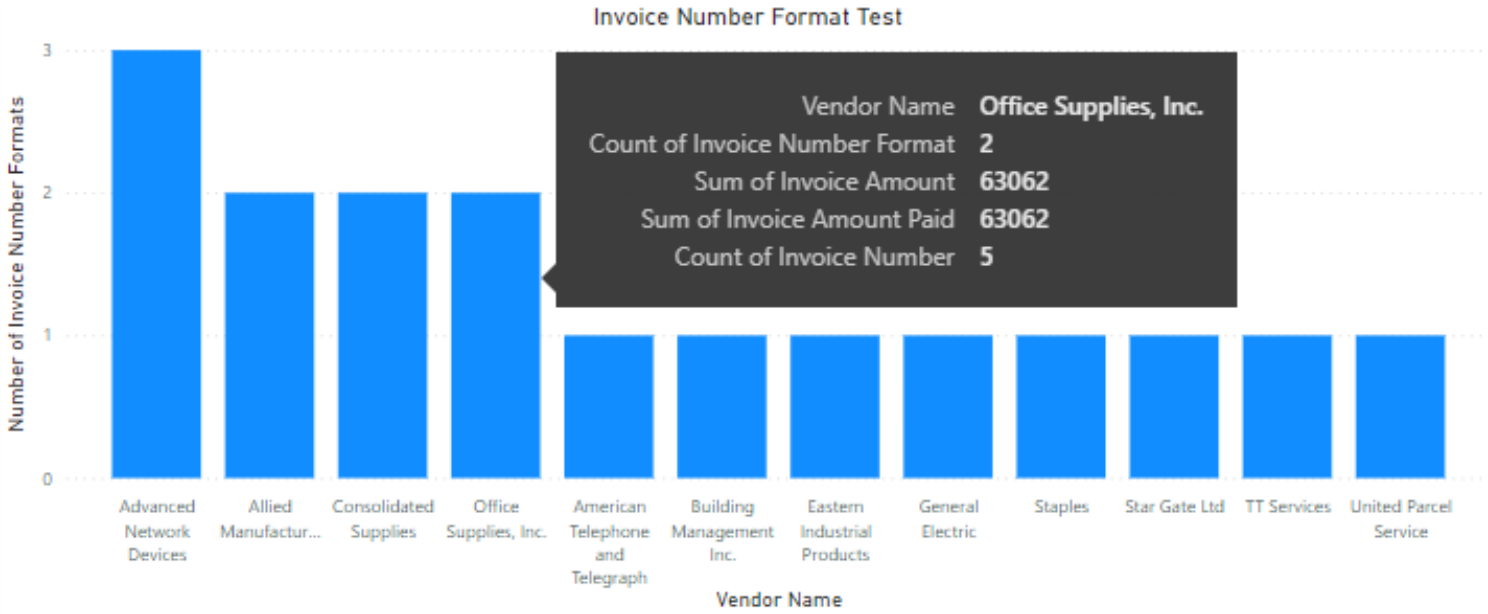
Invoice Number Format Test – Populate Clustered Column Chart





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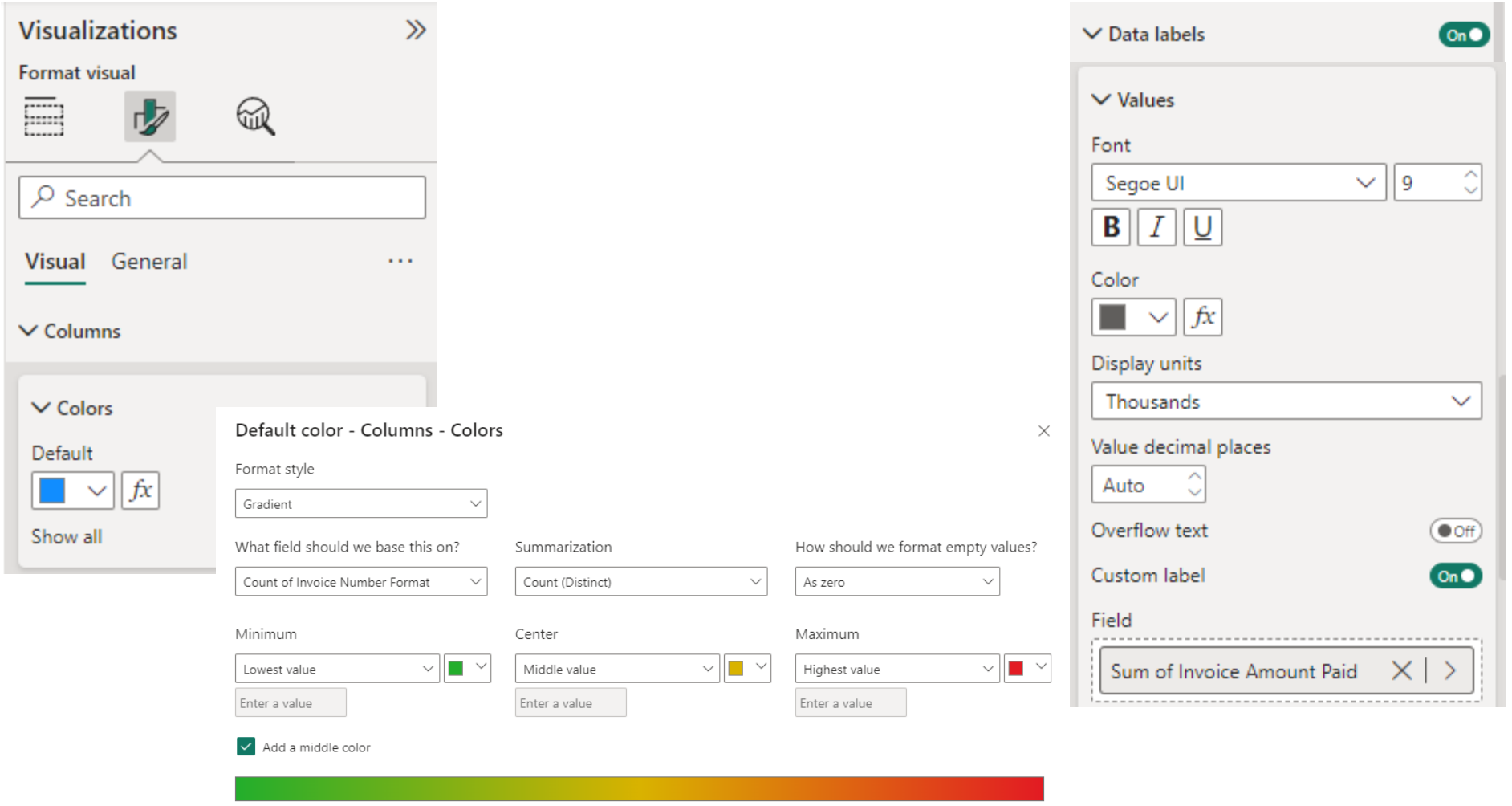
Invoice Number Format Test – Add Some Pizzazz



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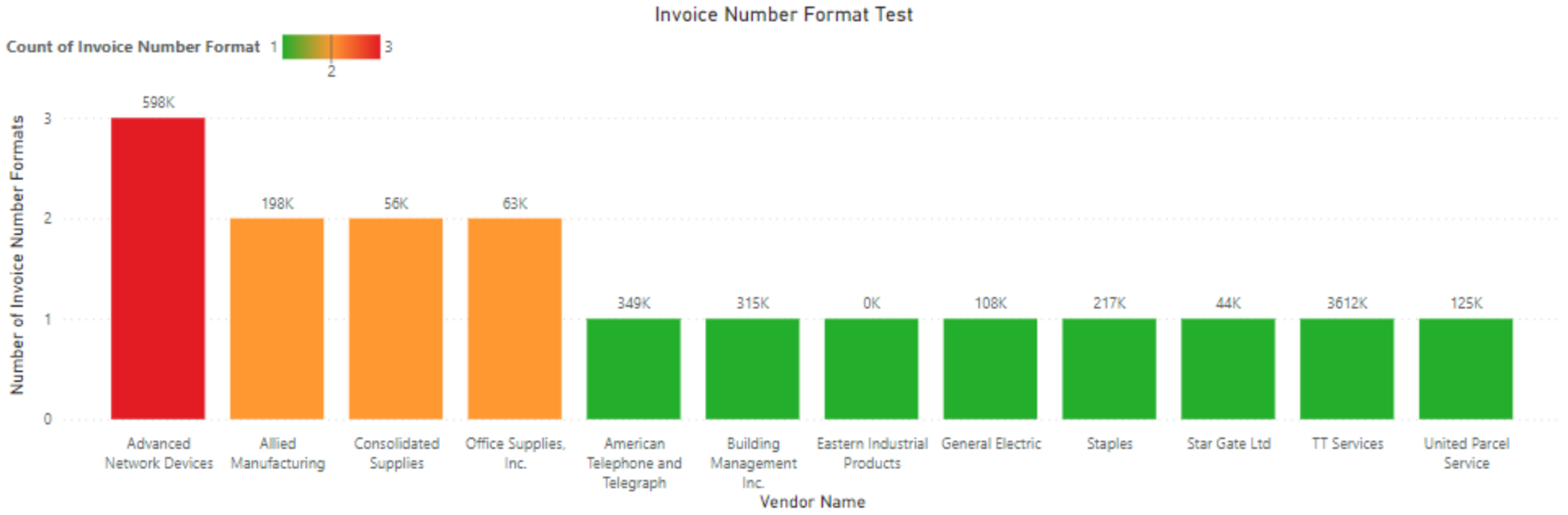
Invoice Number Format Test

Vendor Name	Sum of Invoice Amount	Sum of Invoice Amount Paid	Count of Invoice Number Format	First Invoice Number Format
Advanced Network Devices	598160	598160	3	AAA######
Allied Manufacturing	197879	197879	2	AAA-####-######
Consolidated Supplies	58030	56106	2	AAA######
Office Supplies, Inc.	63062	63062	2	AAA######
American Telephone and Telegraph	348570	348570	1	AAA######
Building Management Inc.	315390	315390	1	AAA######
Eastern Industrial Products	18473000	0	1	AAA-####-######
General Electric	108186	108186	1	AAA-####-######
Staples	216535	216535	1	AAA-####-######
Star Gate Ltd	43610	43610	1	AAA-####-######
TT Services	3611550	3611550	1	AAA-####-######
United Parcel Service	125460	125460	1	AAA######
Total	**24159432**	**5684508**	**5**	**AAA######**



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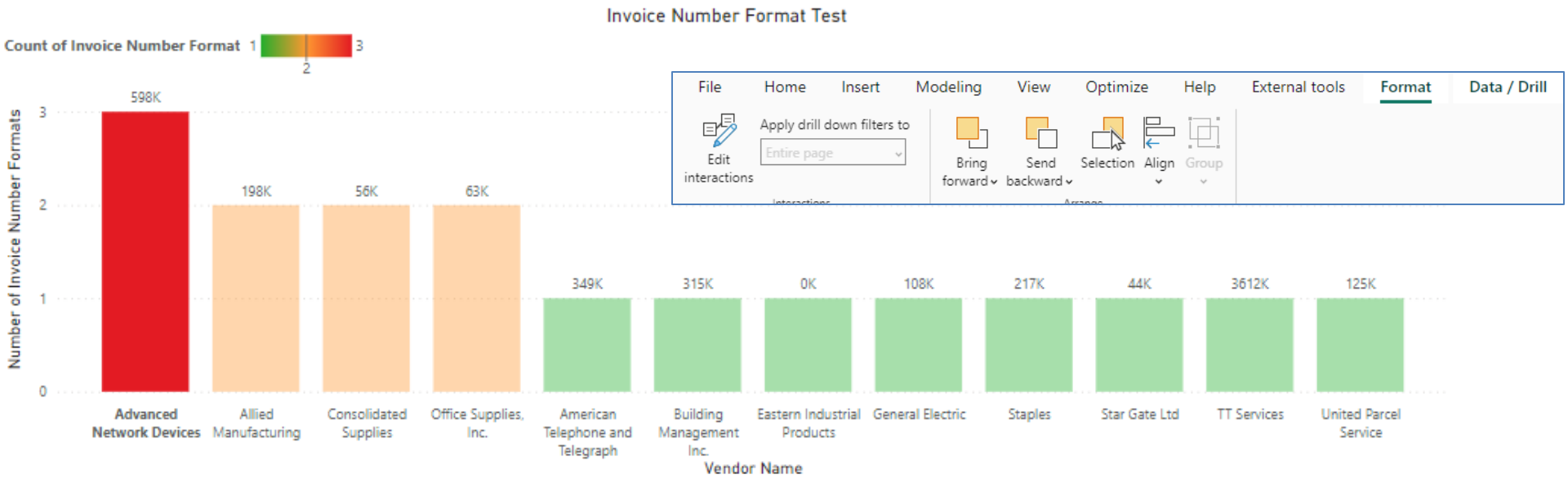
Invoice Number Format Test

Vendor Name	Sum of Invoice Amount	Sum of Invoice Amount Paid	Count of Invoice Number Format	First Invoice Number Format
Advanced Network Devices	**598160**	**598160**	**3**	**AAA######**
AND111407	90720	90720	1	AAA######
AND111607-O	90720	90720	1	AAA######-A
AND1125072	90720	90720	1	AAA#######
AND120507	81500	81500	1	AAA######
AND121407	81500	81500	1	AAA######
AND121907	81500	81500	1	AAA######
AND122607	81500	81500	1	AAA######
Total	**598160**	**598160**	**3**	**AAA######**



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Poll Question 3

If you would like to receive CPE credit for today's event, you must respond to all polling questions.

*Browsers with advanced security may prevent the poll question from popping up - if you are experiencing any difficulties, or have any questions please contact our panel via the '**chat**' function and we will assist you.*

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Other Pattern Identifications

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Pattern Identification

- Business processes (order to cash, procure to pay, manufacturing) generally follow predictable patterns
- Pattern identification is a way to visual represent these predictable patterns and identify unusual divergence from the pattern

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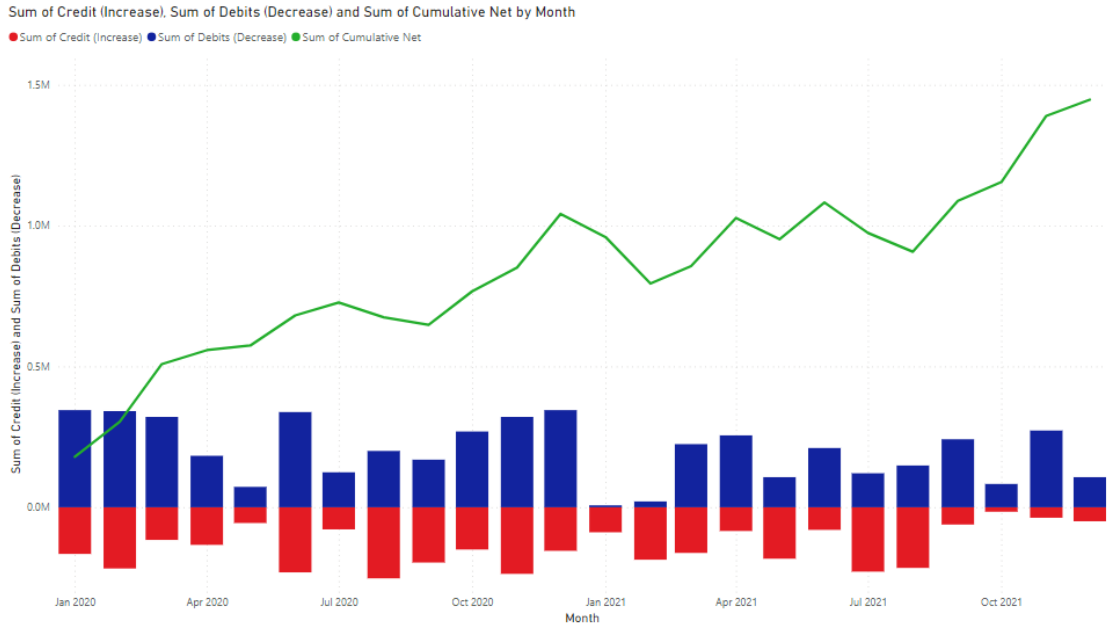
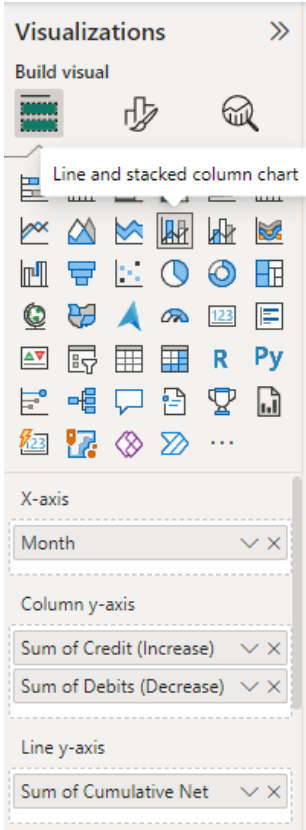
Pattern Identification – Line and Stacked Column Chart

Manual Journal Entries to Accounts Payable Accounts

Month	Debits (Decrease)	Credit (Increase)	Cumulative Net
Jan-20	$ 345,040.00	$ (165,641.16)	$ 179,398.84
Feb-20	$ 341,589.60	$ (217,375.20)	$ 303,613.24
Mar-20	$ 320,887.20	$ (115,933.44)	$ 508,567.00
Apr-20	$ 182,871.20	$ (133,530.48)	$ 557,907.72
May-20	$ 72,458.40	$ (55,896.48)	$ 574,469.64
Jun-20	$ 338,139.20	$ (231,142.30)	$ 681,466.55
Jul-20	$ 124,214.40	$ (78,496.60)	$ 727,184.35
Aug-20	$ 200,123.20	$ (252,396.76)	$ 674,910.79
Sep-20	$ 169,069.60	$ (196,258.75)	$ 647,721.63
Oct-20	$ 269,131.20	$ (149,988.89)	$ 766,863.95
Nov-20	$ 320,887.20	$ (236,455.91)	$ 851,295.23
Dec-20	$ 345,040.00	$ (154,577.92)	$ 1,041,757.31
Jan-21	$ 6,900.80	$ (88,813.30)	$ 959,844.82
Feb-21	$ 20,702.40	$ (186,149.08)	$ 794,398.14
Mar-21	$ 224,276.00	$ (162,099.79)	$ 856,574.35
Apr-21	$ 255,329.60	$ (84,189.76)	$ 1,027,714.19
May-21	$ 106,962.40	$ (182,595.17)	$ 952,081.42
Jun-21	$ 210,474.40	$ (80,221.80)	$ 1,082,334.02
Jul-21	$ 120,764.00	$ (228,554.50)	$ 974,543.52
Aug-21	$ 148,367.20	$ (215,304.96)	$ 907,605.76
Sep-21	$ 241,528.00	$ (61,279.10)	$ 1,087,854.66
Oct-21	$ 82,809.60	$ (15,837.34)	$ 1,154,826.92
Nov-21	$ 272,581.60	$ (37,195.31)	$ 1,390,213.21
Dec-21	$ 106,962.40	$ (49,685.76)	$ 1,447,489.85





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Questions?

- Exploratory data visualizations are a powerful and effective tool to audit the large data sets
- Questions?

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