

It's mid-year and it looks like the re-runs have already

Started... But it's not true though! SumProduct celebrates that two of its gang retain their MVP status and we celebrate with the announcement of an old favourite: Excel Virtually Global! And to keep the "Oldies But Goodies" theme, we even revisit one of Excel's least understood functions, **AGGREGATE**.

This month, we also include all the usual newsletter goodies such as the Beat the Boredom Challenge, Charts & Dashboards, Visual Basics, Power Pivot Principles, Power Query Pointers, Excel Updates, literally the **D**educe our A to Z of Keyboard Shortcuts and **LOG** the A to Z of Excel functions.

As always, happy reading and remember: stay safe, stay happy, stay healthy.

Liam Bastick, Managing Director, SumProduct



MVP Renewal





SumProduct is pleased to announce that two of our Directors, **Liam Bastick** and **Tim Heng**, have been re-awarded Microsoft's Most Valuable Professional (MVP) award for Excel for 2023-24. Not unluckily for Liam, he receives his 13th award, whilst Tim forges ahead with his sixth. This award recognises exceptional technical community leaders from around the world who voluntarily share their high quality, real world expertise with others. Microsoft MVPs are a highly select group of experts representing technology's best and brightest who share a deep commitment to community and a willingness to help others.

Worldwide, there are over 100 million participants in technical communities; of these participants, there are c.4,000 active Microsoft

MVPs. In Excel, we believe there are approximately 80 that have received this award.

Microsoft's MVP Award evaluates technical expertise and voluntary community contributions for the past year, considering the quality, quantity and level of impact of contributions. It's a difficult award to attain and just as difficult to retain.

At SumProduct, you can rely on our experience and willingness to help - simply drop us a line at contact@sumproduct.com.



Excel Virtually Global 2023



We don't have all the details yet – but it's time to make an announcement it's "coming soon"!!

The MVPs and other experts are back to passionately share their knowledge with the community. They are always on the "bleeding edge" and have an unstoppable urge to get their hands on new, exciting technologies.

How much would you be prepared to pay for the likes of Excel (and other) MVPs, Microsoft staff and other industry experts to present on a variety of Excel topics **in your house**?

Well, it's an option. For the fourth year running, we are remaining virtual (maybe next year...). And it still remains for charity.

This virtual conference presents Excel, Data Platform and PowerPoint MVPs and other experts, together with other acknowledged experts from Microsoft and / or around the globe to present, answer questions and demonstrate the future of Excel and how it will make your life easier, personally and professionally. And it's a big year this year, with Excel, ChatGPT, Fabric, Copilot, Power Apps and financial modelling in Power BI all staking their claims in the modelling world.

Topics and presenters have not yet been agreed, but you know the drill! We'll round a few up and get them to entertain you. Dates will

be announced SOON, but we anticipate sessions to begin in the week commencing Monday 9 October 2023.

Each session (including Q&A) will last no more than an hour and topics cover all expertise levels, from novice to expert. Most presenters are well known in their spheres, and have written blogs, books and articles and / or present video sessions.

Most sessions will be recorded so you may watch them later with downloads aplenty – there are no medals for staying up to watch the entire event live! That's just as well, as we plan to beat last year's marathon (no guarantees), which lasted the best part of two [2] days.

From your own favourite chair, bring a laptop, an inquisitive mind and your sense of humour. Be prepared to learn heaps. And remember, it's not just value for money, we will be asking for donations to charity this time around – all profits will be donated to a global COVID-19 research charity.

More details will be available in the News section of our website soon: www.sumproduct.com/news.

Hopefully, we'll see you there!

AGGREGATE: Possibly the most complicated Excel function ever..?

AGGREGATE() first appeared in Excel 2010. And ever since, it has caused constant consternation amongst the modelling fraternity. Never mind ChatGPT, **LET** and **LAMBDA**, some of the most common questions we get here at SumProduct HQ emanate from the wonderful **AGGREGATE** function. Therefore, we thought we would revisit it this month, as it often seems so *neglected*.

For those who desire greater sesquipedalian loquaciousness (look it up!), its syntax may give some comfort as it has two forms:

- Reference: =AGGREGATE(function_number, options, ref1, [ref2],...)
- Array: =AGGREGATE(function_number, options, array, [optional_argument])

where:

• **function_number** denotes function that you wish to use. Similar to **SUBTOTAL**, **function_number** allocates integer values to various Excel functions:

Comp	arison	
SUBTOTAL	AGGREGATE	Function
1	1	AVERAGE
2	2	COUNT
3	3	COUNTA
4	4	MAX
5	5	MIN
6	6	PRODUCT
7	7	STDEV.S
8	8	STDEV.P
9	9	SUM
10	10	VAR.S
11	11	VAR.P
	12	MEDIAN
	13	MODE.SNGL
	14	LARGE
	15	SMALL
	16	PERCENTILE.INC
	17	QUARTILE.INC
	18	PERCENTILE.EXC
	19	QUARTILE.EXC

• options specifies which values may be ignored when applying the chosen function to the range. If the options parameter is omitted, the AGGREGATE function assumes that options is set to zero [0]. The argument options can take any of the following values:

Option	Behaviour
0	Ignore nested SUBTOTAL and AGGREGATE functions
1	Ignore hidden rows, nested SUBTOTAL and AGGREGATE functions
2	Ignore error values, nested SUBTOTAL and AGGREGATE functions
3	Ignore hidden rows, error values, nested SUBTOTAL and AGGREGATE functions
4	Ignore nothing
5	Ignore hidden rows
6	Ignore error values
7	Ignore hidden rows and error values

- ref1 is the first numeric argument for the function when using the reference syntax
- ref2,... is optional. Numerical arguments may number two [2] through 253 for the function when using the reference syntax
- **avrray** is an array, array formula or reference to a range of cells when using the array syntax
- optional_argument is a second argument required if using the LARGE, SMALL, PERCENTILE.INC, QUARTILE.INC, PERCENTILE.EXC or QUARTILE.EXC when using the array syntax, *viz*.

Function	Optional Argument Required
LARGE	LARGE(Array,k)
SMALL	SMALL(Array.k)
PERCENTILE.INC	PERCENTILE.INC(Array,k)
QUARTILE.INC	QUARTILE.INC(Array,Quart)
PERCENTILE.EXC	PERCENTILE.EXC(Array,k)
QUARTILE.EXC	QUARTILE.EXC(Array,Quart)

AGGREGATE is analogous to an extension of the SUBTOTAL function insofar that it uses the same function_number arguments, simply adding another eight [8]. SUBTOTAL allows users to use the 11 functions including / excluding hidden rows which results in 22 combinations. AGGREGATE goes further and takes the 19 functions and allows for eight

alternatives for each, which results in 152 combinations – and that's not even considering the reference or array syntax approaches!

It just all sounds, well, tremendously complicated.

In practice, it's not that bad. This is because since this function was created for Excel 2010 and later, screen tips will appear as you type in order to nudge you in the right direction. For example, let's say you wanted the third largest number in the following list:

	А
1	List
2	5
3	-2
4	12
5	#REF!
6	dog
7	#DIV/0!
8	#NAME?
9	4
10	11
11	

From inspection, the third largest value is the amount in cell A2 (the value '5'), but if you use the usual formula for this **=LARGE(A2:A10,3)** you will get the value *#REF!* as this is the first error that Excel comes across as it works down the list.

This is where you can use **AGGREGATE()** to ignore these errors. If you type in **=AGGREGATE(** you will get the following screen tip scroll list:



By typing '14' or selecting '14 – LARGE' from the pop-up list, you now know you are on the right track. After typing a 'comma', Excel then continues to help you:

× ✓ f _x =AGGREGATE(14	,				
E F AGGREGATE(fun	ction_num, options , array, [k])	L	М	N	0
AGGREGATE(fun	😡 0 - Ignore nested SUBTOTAL and	d AGGREGATE f	unctions		
	🖾 1 - Ignore hidden rows, nested	SUBTOTAL and	AGGREGATE	functions	
	🖾 2 - Ignore error values, nested S	UBTOTAL and	AGGREGATE f	unctions	
	🖾 3 - Ignore hidden rows, error va	lues, nested St	JBTOTAL and	AGGREGATE	functions
	🖾 4 - Ignore nothing				
	🖾 5 - Ignore hidden rows				
	🖾 6 - Ignore error values				
	🖾 7 - Ignore hidden rows and erro	or values			

Again by either typing a number or pointing and clicking an appropriate choice may be made. I want to ignore errors, so I need to choose '2', '3', '6' or '7', depending upon what else should be ignored. I will choose '6' – ignore error values only and then type another comma so that the screen tips keep coming thick and fast:

\times	🗸 fs	c :	=AGGREGATE(14,6,
Е	F		AGGREGATE(function_num, options, array, [k])
			AGGREGATE(function_num, options, ref1, ref2, [ref3],)

Now, Excel is seeking the references for evaluation. It appears to be possible that this can be in the form of a list (the array) or else discrete cell references and / or values. In this example, I will enter the range and type another comma:

\times	$\checkmark f_x$	=AGGREGATE(14,6,A2:A10,
Е	F	AGGREGATE(function_num, options, array, [k])
		AGGREGATE(function_num, options, ref1, ref2, [ref3], [ref4],)

Now, Excel appears to be looking for the other argument for LARGE() or else another reference. This is not correct. The screen tip does not update automatically. The syntax required is now just as it would if we had typed in the underlying function, *i.e.* =LARGE(array, k). In this instance, this syntax <u>always</u> requires the fourth value to be k, the integer denoting the kth largest item in the list.

In this example, I will just type the value '3' and close brackets. Therefore, we arrive at the following formula,

=AGGREGATE(14, 6, A2:A10, 3)

which generates the correct answer '5'. The formula might look counterintuitive, but Excel has helped us every step of the way. As my oft-misquoted English teacher always used to say, practice makes prefect.

Word to the wise

Like **SUBTOTAL**, the **AGGREGATE** function is designed for columns of data (vertical ranges), not for rows of data (horizontal ranges). For example, when you subtotal a horizontal range using option one [1], such as **AGGREGATE(1, 1, ref1)**, hiding a column does not affect the aggregate sum value, although hiding a row in vertical range does affect the aggregate.

If a second **ref** argument is required but not provided, **AGGREGATE** returns an *#VALUE!* error. If one or more of the references are threedimensional references, **AGGREGATE** returns the *#VALUE!* error value.

Beat the Boredom Challenge

With many of us currently "working from home" / quarantined, there are only so Zoom / Teams calls and virtual parties you can make before you reach your (data) limit. Perhaps they should measure data allowance in blood pressure millimetres of mercury (mmHg). To try and keep our readers engaged, we will continue to reproduce some of our popular **Final Friday Fix** challenges from yesteryear in this and upcoming newsletters. One suggested solution may be found later in this newsletter. Here's this month's...

This month's challenge involves automating the generation of multiple worksheets from a data list. For example, we have a data list that contains the names of the worksheets that we are going to create, as shown below:

Worksheets to be create	d
Jul 2019 Inventory	
Aug 2019 Inventory	
Sep 2019 Inventory	
Oct 2019 Inventory	
Nov 2019 Inventory	
Dec 2019 Inventory	
Jan 2020 Inventory	
Feb 2020 Inventory	
Mar 2020 Inventory	
Apr 2020 Inventory	
May 2020 Inventory	
Jun 2020 Inventory	

We need to create multiple worksheets with the names shown in the data list above, so that the result will look like this:

 Summary
 Jul 2019 Inventory
 Aug 2019 Inventory
 Sep 2019 Inventory

We want to automate this process without manually adding each worksheet and changing the worksheet name individually. A job for VBA, perhaps..?

Sounds easy? Try it. One solution just might be found later in this newsletter – but no reading ahead!

Charts and Dashboards

It's time to chart our progress with an introductory series into the world of creating charts and dashboards in Excel. This month, we discuss dashboard design [nice alliteration – Ed.].

The key to a good dashboard / report is creating one that is tailored to the end users, so that it fulfils all their needs. For example, there is no point for a sales team to be bombarded with other information that they go not need to do their job, such as:

- depreciation analysis
- debt / equity ratios
- budget variances in costs
- segmental margins analysis,

if it isn't relevant.

The same point goes for all other staff, so that they have more time to focus on doing their job, be it to order more stock or provide analytical reports. That's not to say this data is not essential to management, but a key idea in developing your narrative is determining your audience.

Therefore, we need to be able to identify who they are and what we think they will need to see. When identifying our target audience, we should consider the following:

- Granularity: how detailed the data has to be for them to do their job
- Level of information required: what sort of information do they need to accomplish their goal? (high level overview or more detailed?)
- Timescale: how much data do they need to achieve their task
- Leading and lagging metrics: are historical metrics sufficient or are projections required as well?
- Decision making required: which decisions they must make after looking at the data.

For instance, sales teams and lower management probably need to see day to day inventory stock and day to day customer traffic amounts, e.g.

- Granularity: high granularity of data
- Level of information: very low
- Timescale: short
- Leading and lagging metrics: historical data and short-term projections
- Decision making required: stock ordering, economic order quantities.

Meanwhile, manager level staff will probably need to see monthly, or even quarterly, sales and inventory stock amounts for their reports:

- Granularity: medium
- Level of information: overview of sales performance
- Timescale: medium
- Leading and lagging metrics: this is more likely to be summary (lagging) data, concentrating on historical results
- Decision making required: resource management and reporting issues to higher management.

Senior level management will want to see quarterly, or even yearly data:

- Granularity: low
- Level of information: overview of key metrics
- Timescale: long
- Leading and lagging metrics: historical summary with possibly a high-level projection
- **Decision making required:** supply chain solutions, staff performance management, reporting to top level management, restructure of branches, project approval, areas of improvement.

Top level management will want to see annual data and forecasts:

- Granularity: very low
- Level of information: high overview of key metrics
- Timescale: very long
- Leading and lagging metrics: historical summary, with possibly a high-level projection
- Decision making required: company direction, areas to grow the company, areas for company to pull out from, company investments.
- Timescale: very long
- Leading and lagging metrics: historical summary, with possibly a high-level projection
- Decision making required: company direction, areas to grow the company, areas for company to pull out from, company investments.

Other dashboard design considerations include which types of charts, how to use colour to your advantage and how to create memorable charts.

Now, we will consider an example of a bad and a good dashboard. For example, a manager is requesting to see metrics of their income. They also want to see some insights of the sales breakdown and performance in a financial year.

A "bad dashboard" might look like this:



Look at it. It has many colours, but it is not eye-catching:

- the charts are not organised
- the charts are not relevant to the end users
- the charts contain too much information, more than 7 + 2
- the information provided on the charts does not really help the end users
- the dashboard has arguably a terrible use of colour
- axes make results and comparisons difficult
- good point: the dashboard does actually depict seasonal trends.

Compared to the example bad dashboard, the below dashboard is enhanced:



Key things to note from this dashboard:

- a harmonious colour scheme is used
- key metrics pop out to the user: All important information can be found in five seconds
- the charts are organised
- the appropriate charts have been selected to display the respective data
- the dashboard displays seasonal trends.

More next month...

Visual Basics

We thought we'd run an elementary series going through the rudiments of Visual Basic for Applications (VBA) as a springboard for newer users. This month we go back to basics with the first in a continuing series.

VBA (Visual Basic for Applications) is a programming language developed by Microsoft and is built into Excel and other Office programs. It enables building your own functions (known as User Defined Functions or UDFs for short), automating processes and interacting with libraries to work with the Windows operating system. It is also used to write some of the custom add-ins for Office applications.

In Office for Mac, VBA was upgraded in 2016 but some features and certain commands do not function correctly and herein lies the problem: it doesn't work *everywhere* – but lots of people use it as a readily accessible porthole for Microsoft Office and often Excel in particular.

You can't say "VBA" without talking about macros. A macro is simply a sequence of actions that can be executed together, written in VBA. Office applications (apart from PowerPoint) allow the "recording of macros" where every single step performed is recorded and translated to Visual Basic code. After recording / writing a macro, these bits of code can be reused to automate these actions.

This is all well and good, but macros are disabled by default in the Office applications. This is because VBA scripts may be automatically executed whenever a spreadsheet is opened – and that's not good given all those nasty people out there. Some scripts can be malicious and cause issues on your machine. For example, some VBA scripts can delete files and your Outlook email address book.

To change the security settings for macros, these may be accessed in 'Excel Options' (**ALT** + **T** + **O**) in the 'Trust Center' group in the resulting left-hand column of the dialog box. Once there, click on the 'Trust Center Settings...' button, *viz*.

Excel Options			?	×
General	Help keep your documents safe and your computer secure and healthy.			
Formulas	×			
Data	Security & more			
Proofing	Visit Office.com to learn more about protecting your privacy and security.			
Save	Microsoft Trustworthy Computing			
Language	Microsoft Excel Trust Center			
Ease of Access	The Trust Control and the second science attings. These attings have been been			
Advanced	computer secure. We recommend that you do not change these settings.	<u>I</u> rust Cente	r Setting	s
Customize Ribbon				
Quick Access Toolbar				
Add-ins				
Trust Center				
		ОК	Car	icel

Under the 'Macro Settings' group, a set of options is presented:

Trust Center		?	×
Trusted Publishers Trusted Locations Trusted Locations Trusted Add-in Catalogs Add-ins ActiveX Settings Macro Settings Protected View Message Bar External Content File Block Settings Privacy Options	Macro Settings □ Disable all macros with notification □ Disable all macros except digitally signed macros □ Enable all macros (not recommended; potentially dangerous code can run) Developer Macro Settings □ Trust access to the YBA project object model	?	×
	ОК	Can	cel

Excel defaults to 'Disable all macros with notification'. This means that whenever a workbook has a macro (only .xls, .xlsb and .xlsm files may have macros) a pop-up warning window will appear before opening a file:

AutoSave	On •	ر م	୯	& -	÷		
File	Home	Insert	Draw F	Page Layo	out Formu	ılas Data	a Reviev
	🔏 Cut		Calibri		• 11 •	A	,
Paste	🖹 Copy ؇ Form	at Painter	В	Ι	<u>U</u> - <u>-</u> -	<u>⊘</u> - A	• =
	Clipboard	Fa			Font		Est.
I SECU	SECURITY WARNING Macros have been disabled. Enable Content						
C7						× v	fx
A	В	С	D	E	F	G	н

This is a little confusing for older users of Excel as the default is similar to Excel 2003, even if the setting starts with 'Disable'. It's not the only thing you have to do, mind you.

To fully utilise VBA in Excel, you need to have access to the 'Developer' tab, which shows the VBA tools available. By default, the Developer tab of the Ribbon is not made visible. To enable this as well, right-click on the Ribbon and select 'Customize the Ribbon...':

AutoSave) <i>(</i> ?	€ - ÷								
File	Home Insert	Draw	Page Layout	Formulas	Data	Review	View	Help	₽ Tell ı	me what you want to do	
Paste	Add to Quick Acco Customize Quick A Show Quick Acces	ess Toolbar Access Too is Toolbar B	lbar Below the Ribbon	À - &	Ă A -			= *	, 	ab c ↔ Wrap Text ಈ Merge & Center	¥
	Customize the <u>R</u> ibbon				G.			AI	ignment		5
	Collapse the Ribbo	<u>n</u>		r i 🗙	V 3	÷					

The 'Excel Options' menu will pop up. On the right-hand side, you'll see "Customize the Ribbon" where you can click which tabs are to be visible. Click on the check box next to 'Developer' and select 'OK'.



Then we'll see the 'Developer' tab on the screen.

File	Home	Insert	Draw	Page L	.ayout	Formulas	Data	Review	View	Develop	er H	lelp	${\cal P}$ Tell me what you wa	nt to do
<u> </u>		Record	Macro			, pr				E Propertie	es		Map Properties	import
Visual	Macros	🛐 Use Rel	ative Referer	nces	Add-	Excel	COM	Insert	Design	Q View Co	de	Source	Expansion Packs	Export
Basic		🔔 Macro S	Security		ins	Add-ins	Add-ins	*	Mode	📋 Run Dial	og		Refresh Data	
		Code				Add-ins			Cont	rols			XML	

You're good to go!

More next month.

Power Pivot Principles

We continue our series on the Excel COM add-in, Power Pivot. This month, we consider how to include filters in the MAXX function.

Last newsletter we covered how the MAXX functions works. This time, we'd like to expand on the MAXX function a little and show you how we may use other functions that return with a table to alter the MAXX function's results.

For this example, let's look at the following Table (the capitalisation is deliberate):

	А	В	С		D	E	
3							
4		Customer 📃 🔽	Customer Type 🔽	Price	*	Purchase Volume 💌	
5		Abiel	1	\$	31.00	4	
6		Beverly	1	\$	10.00	10	
7		Craig	3	\$	9.00	6	
8		David	1	\$	96.00	5	
9		Frank	2	\$	69.00	10	
10		Ellie	2	\$	85.00	4	
11		Niel	2	\$	77.00	3	
12		Maddie	1	\$	18.00	10	
13		Henry	2	\$	91.00	7	
14		Lester	2	\$	5.00	5,	
15							

As a quick refresher, the following measure calculates the greatest amount spent on apples:

=MAXX(

'AppleSalesCustType',

```
'AppleSalesCustType'[Price] * AppleSalesCustType[Purchase Volume]
```

```
)
```

Measure			?	×
Table name: AppleSalesCu	ıstType			•
Measure name: MAXX				
Description:				
Formula: f_X Check form	ula			
=MAXX('AppleSale: '/)	sCustType', AppleSalesCustType	e'[Price]*AppleSalesCustType[Purchase	Volum	ne]
Formatting Options				
Category:				
General Number	Format:	Decimal Number		-
Currency	Decimal places:	2 🕂		
TRUE/FALSE	☑ Use 1000 separator (,)			
		ОК	Canc	el

This measure returns with the value of \$690.00, which is the greatest amount spent on apples without any filters.

What we did not cover last time is that the MAXX function can work with other functions too. For instance, we may use the FILTER function to filter out customers that do not fulfil the criterion 'Customer Type' = 1.

```
=MAXX(
FILTER(
'AppleSalesCustType',[Customer Type]=1
),
'AppleSalesCustType'[Price] * AppleSalesCustType[Purchase Volume]
```

Measure					? ×
Table name: Measure name: Description:	AppleSalesCus MAXX Filtered	tType			•
Formula: f_X	Check formu	la			
=MAXX(Fil	_TER('App),	oleSalesCustType',[Cu 'AppleSalesCus	istomer Type]=1 stType'[Price]*AppleSales	CustType[Purchase	→ Volume]
Formatting Optio	ns				
Category: General Number Currency Date TRUE/FALSE		Format: Decimal places: I Use 1000 separator (.)	Decimal Number		•
				ОК	Cancel

The **FILTER** function returns with a **table** (quoting the **MAXX** syntax from last time). Therefore, we are able to use these two functions together. Exporting this to a PivotTable yields the following result:

1 PivotTable Fields 2 MAXX Filtered 3 480.00 4 Choose fields to add to report: 5 Choose fields to add to report: 6 Customer 9 Customer Type 10 Price 11 Purchase Volume 12 f_X MAXX 13 f_X MAXX Filtered 14 T 15 T 16 T 17 T 18 T 19 T 20 T 21 T 23 T 24 T 25 T		А	В	1 🔺					
2 MAXX Filtered 3 480.00 4	1				PivotTa	able Fields		•	×
3 480.00 4 Choose fields to add to report: 5 Choose fields to add to report: 6 \bigcirc 7 \bigcirc 8 \bigcirc 9 \bigcirc 10 \bigcirc 11 \bigcirc 12 \bigcirc 13 \bigcirc 14 \bigcirc 15 \bigcirc 16 \bigcirc 17 \bigcirc 18 \bigcirc 19 \bigcirc 20 \bigcirc 21 \bigcirc 22 \bigcirc 23 \bigcirc 24 \bigcirc 26 \bigcirc	2		MAXX Filtered		Active	All			
4 Choose fields to add to report: 5 Search 6 \bigcirc 7 Search 8 \bigcirc 9 \bigcirc 10 \bigcirc 11 \bigcirc 12 \bigcirc 13 \bigcirc 14 \bigcirc 15 \frown 16 Drag fields between areas below: 17 \bigcirc 18 \bigcirc 19 \bigcirc 20 \bigcirc 21 \bigcirc 22 \bigcirc 23 \bigcirc 24 \bigcirc 26 \bigcirc	3		480.00			<u> </u>			_
5	4				Choose field	ds to add to report:		- 19	1 ×
6 7 8 9 10 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	5				Search				0
7 AppleSalesCustType 8 Customer 9 Customer Type 10 Price 11 Price 12 Purchase Volume 12 f_x MAXX	6								
8 Image: Customer 9 Image: Customer Type 10 Image: Customer Type 10 Image: Customer Type 11 Image: Customer Type 12 Image: Customer Type 12 Image: Customer Type 12 Image: Customer Type 12 Image: Customer Type 13 Image: Customer Type 14 Image: Customer Type 14 Image: Customer Type 15 Image: Customer Type 16 Image: Customer Type 17 Image: Customer Type 18 Image: Customer Type 19 Image: Customer Type 20 Image: Customer Type 21 Image: Customer Type 22 Image: Customer Type 23 Image: Customer Type 24 Image: Customer Type 25 Image: Customer Type 26 Image: Customer Type	7				🔺 🎞 Appl	eSalesCustType			
9 \Box	8				C C	ustomer			
10Image: price11Image: price12Image: price12Image: price13Image: price14Image: price15Image: price16Image: price17Image: price18Image: price20Image: price21Image: price22Image: price23Image: price24Image: price25Image: price26Image: price	9				C C	ustomer Type			
11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20 I 21 I 22 I 23 I 24 I 25 I 26 I	10				P	rice			
12	11				D P	urchase Volume			
13 Image: state of the	12					MAXX			
14 16 15 16 17 18 19 20 21 22 23 24 25 26	13					MAXX Filtered			
15	14				⊻ J.				-
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17 18 T Filters III Columns 19 20 21 22 21 22 23 24 24 25 26 MAXX Filtered	16				Drag fields	hetween areas held			
18 19 20 21 22 23 24 25 26	17				Diagneias	between areas bere			
19	18				▼ Filters		III Columns		
20	19								
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24 25 26 Image: Second seco	23				-				
25 MAXX Filtered	24				Rows		≥ Values		
26	25						MAXX Filtered		*
	26								

The greatest amount spent on apples by customers who fall into the '1' category is \$480.00.

That's it for this month; more next time.

Power Query Pointers

Each month we'll reproduce one of our articles on Power Query (Excel 2010 and 2013) / Get & Transform (Office 365, Excel 2016 and 2019) from www.sumproduct.com/blog. If you wish to read more in the meantime, simply check out our Blog section each Wednesday. This month, we look at some useful logical **M** functions which convert data into dates or vice versa.

To conclude our series on dates, let's take a look at some functions that we may use to convert a date into a different data type. For example, one such data type would be text, so that we may use a date as part of a reference. We will also look at functions that perform the opposite process, converting dates into text.

Date.FromText

Date.FromText(date as nullable text, optional culture as nullable text) as nullable date

This returns a date value from text (**date**) in a recognised date format according to the **culture**, following the ISO 8601 format standard.

It's probably helpful to know what formats would be accepted here. For en-US culture, text in the form **yyyy-MM-dd** is accepted, as is **yyyyMMdd** and **M/d/yyyy**. Cultures such as the UK and Australia prefer

to put the day before the month, so it helps to know the windows culture being used: this may be specified in any of the formulas we are looking at today.

As an illustration, we have some data from our fictional sales person, John. He has decided to embed the date in a column and we need to extract it and convert it into data type date so that we may link the data to other tables.



The current **Expense Type** is a text field that contains the date. We want to extract the date part of the text column and convert it to a date. We'll begin by extracting the date using the 'Extract' option in the 'From Text' section on the 'Add Column' tab.

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We could now just convert this to a date by using the Transform menu, but instead we will enter the formula directly to create a new custom column.

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The ${\bf M}$ formula used is

= Date.FromText([First Characters])

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The date has been converted correctly. But why would we ever need to use a formula instead of just using a transformation? Suppose we had the next dataset coming in...

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Well that doesn't look good. We need to alter the **Expense Date** formula. We will add a new column that will tell Power Query to use en-US culture, as John has clearly used US date formatting.

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The formula used is:

= Date.FromText([First Characters], "en-US")

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The date has been calculated correctly because we have specified the culture used.

Date.ToText

Date.ToText(date as nullable date, optional format as nullable text, optionalculture as nullable text) as nullable text

This returns a textual representation of **date**. This function takes in an optional **format** parameter.

The full list of formats that are supported are supposedly in the Microsoft

help pages, but Lord Lucan is a little easier to find; we'll give a couple of examples in the exercise that follows.

We may use this **M** function to format dates ready to add them to a reference or to display them in a required format for a report. We will format **Correct Expense Date** in a couple of ways to show how this function can be used.

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The M formula used is



We have to mention the **culture** because the date is held using the US date format.

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Now we will use a shorter form.

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6 COL	UMNS, 5 ROWS			PREVIEW DOWNLOADED AT 14:0

The **M** formula used is



= Date.ToText([Correct Expense Date], "ddd", "en-US")

This gives an idea of the range of different texts that may be produced.

Date.From

Date.From(value as any , optional culture as nullable text) as nullable date

This returns a date value from a value.

Similar to Date.FromText(), the main advantage that this function has over the standard menu option of transforming a number to a date, is that it can specify the culture. Below, a column has been inserted that contains the expense date in a numeric format:

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We add a new column where the number is converted to a date.

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The **M** formula used is

=Date.From([Date as Number])

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The date is shown in its proper format for our system.

Date.ToRecord

Date.ToRecord(date as date) as record

This returns a record containing parts of a **date** value.

This is more for the techies amongst us, as it will create a record containing the year, month and day as entries. We will do this for Correct Expense Date.

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The **M** formula used is

= Date.ToRecord([Correct Expense Date])

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We can see the records and what is in them by expanding the **Data Record** column:

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This is a nice way to extract the year, month and day all in one move.

More next time.

Power BI Updates

It seems a little quieter this month – not surprising given how much we reported in last month's newsletter! Nevertheless, let's get you up to date. The full list is as follows:

Reporting

- Smoothed and Leader lines updates
- On-Object Interaction updates in Preview:
 - o Customise the Pane Switcher
 - CTRL Click to open multiple panes in the Pane Switcher
 - Treemap sub-selections now supported
 - o Noteworthy bug fixes

Modelling

- Edit your Data Model into the Power BI Service updates in Preview:
 - o Relationship validation

Data connectivity

- Google Analytics (connector update)
- Oracle Database (connector update)
- Azure Databricks / Databricks (connector update)
- Denodo (connector update)
- EQuIS (connector update)
- Anaplan (connector update)

Service

• Dataset details page revamp

Mobile

• Datasets are coming to Power BI Mobile Apps

Developers

Boost your Custom Visuals performance

Visualisations

- New visuals in AppSource
- Elevate Your Map Charts with Drill Down Map PRO
- "All-in-one" Multi Target KPI card

Other

• WebView2 now Generally Available.

Let's look at each in turn.

Smoothed and Leader lines – updates

Report creators may now create smoother line and area charts, providing a more polished look to their visualisations. To access this setting, go to Lines -> Shape -> Line Type:



Power BI has recently added leader lines for both line and area charts. This new feature creates a visual connection between each data point and its corresponding label. To access this feature, simply navigate to the **Data labels -> Options -> Leader lines**.



Apparently, these features are just the beginning of several improvements coming soon for graphs, charts, plots and markers.

On-Object Interaction – updates in Preview

The new On-Object Interaction feature was released in Preview back in March. This month sees more improvements and bug fixes.

CUSTOMISE THE PANE SWITCHER

Power BI has now added a new '+' button on the Pane Switcher to quickly add new panes directly from the Pane Switcher without having to go to the View tab on the Ribbon. This menu also provides you with a brief

description of what panes are available and what their functions are. Furthermore, the panes added to the Pane Switcher are saved across reports. Therefore, you only need to set configurations once.



You can also access the two [2] preference settings released in last month's update to 'Always show the Pane Switcher' and re-attach the Build menu as a pane by using the gear icon.

CTRL CLICK TO OPEN MULTIPLE PANES IN THE PANE SWITCHER

In addition to the right-click option 'Open in new pane', it is now even easier to open multiple panes from the Pane Switcher by simply holding down the **CTRL** key and **Click**ing the pane you wish to open.

TREEMAP SUB-SELECTIONS NOW SUPPORTED

As demonstrated below:



NOTEWORTHY BUG FIXES

These include:

- overlap of the On-Object buttons on the Formula bar has finally been resolved
- the visual ToolTip shows when opening the Build menu automatically, blocking the Formatting On-Object button is now fixed
- selected visual type is now reflected in the Ribbon visual gallery accordingly
- the mini-toolbar's fill colour icon now reflects conditional formatting gradient as well.

Edit your Data Model into the Power BI Service - updates in Preview

Data Model editing in the Power BI Service feature was released in Preview back in April. Microsoft has made one improvement this month...

RELATIONSHIP VALIDATION

Microsoft is adding relationship validation into the Service, making it easier to create and edit relationships on the web. Like Power BI Desktop, as you define the properties of your relationship, the system will automatically validate it and offer appropriate choices for cardinality and cross filter selections.

Google Analytics (connector update)

The Google Analytics connector has been updated to support Google Analytics Data API (Google Analytics 4). To use this new functionality, use 'Implementation 2.0' when connecting. Existing connections will not be affected.

Oracle Database (connector update)

The Oracle connector has been updated to enable Azure AD-based Single Sign-On functionality through the on-premises data gateway. This will require the July release of the on-premises data gateway.

Azure Databricks / Databricks (connector update)

The Azure Databricks and Databricks connectors have been updated. The following amendments have been made:

- added a new DSRHandler to databricks-multicloud
- fixed C_NOT_ENABLED and Catalog 'spark' not found' error in legacy code path using Databricks.Contents.

Denodo (connector update)

This new version adds graphical support for the specification of native SQL queries at data source creation time.

EQuIS (connector update)

The EQuIS connector has been updated. The following adjustments have been made:

- removed 'Beta' attribute
- retrieved report content as .csv to remove the row limitation of .xlsx files
- optimised handling of facility groups in the Navigation tree
- now show report and / or location folders in Navigation tree, even if one or the other is empty.

Anaplan (connector update)

This version of the Power BI connector for Anaplan includes backend changes for compatibility with ongoing Anaplan infrastructure updates. However, there is no change to user facing connector features.

Dataset details page revamp

Now, when you click on a dataset item in the OneLake data hub and workspace view, you will be directed to the redesigned page that not only enhances the look and feel but also introduces new capabilities for an improved user experience.

Here's what you can expect to find on the dataset details page:

- Actions: you will find various actions that can be performed on the dataset, such as creating a report and refreshing the dataset. With this release, there is now the option to view the Refresh history under the Refresh menu
- Dataset Metadata: gain insights into the dataset through its description and last refresh time
- Related Items: explore existing related items associated with the dataset
- Dataset Schema: obtain a comprehensive view of the dataset's tables and columns. Clicking on a table provides a table preview, with export capabilities available using paginated reports behind the scenes.

Additionally, there are now significant improvements to the related items list. It now showcases all the downstream and upstream dependencies for the dataset. This enhancement allows you to easily identify the sources of the dataset, composite model relations, reports and dashboards associated with it.



Datasets are coming to Power BI Mobile Apps

In the next Power BI Mobile App release, Microsoft is adding a longwaited feature that will help dataset owners and report creators to manage their dataset directly from their phone. That means you will be able to see in your mobile device datasets. Go to a workspace, make sure to select the 'dataset'" pill at the top and get the list of datasets that you have access to in that workspace.

When tapping on a dataset, you will get the dataset metadata pane,

which includes the name, owner, sensitivity label and also the latest refresh status. From this pane you may also trigger a dataset refresh all directly from your mobile application.

Dataset owners will also get push notifications when the scheduled refresh fails. They will be able to view the failure details and be able to re-try the refresh while they are on-the-go.



Boost your Custom Visuals performance

Microsoft has announced techniques to improve the performance of custom visuals, discussing the performance improvements made in both visual rendering and load times. They have identified and addressed certain bottlenecks in the code, and these improvements are available for any visual that has been updated to API version 4.2 and onwards. Along with these fixes, Microsoft has also provided code practices and techniques that can greatly enhance the performance of rendering custom visuals. It is recognised that getting the visual to render as quickly as possible is critical when writing the code.

Having said all this, as the Power BI platform continues to be improved and enhanced, new versions of the API will constantly be released. In order to get the most out of the Power BI visuals' platform and feature set, it is recommended that you keep up-to-date with the most recent version. To find out which version you're using, check the **aversion** in the **pbiviz.json** file.

In the meantime, here are some recommendations for achieving optimal performance for your custom visual.

REDUCE PLUGIN SIZE

A smaller custom visual plugin size results in:

- faster download times
- faster installation whenever the visual is run.

CHECK RENDER TIME OF THE VISUAL

Measure the render time of your visual in various situations to see which, if any, parts of the script require optimisation.

POWER BI DESKTOP PERFORMANCE ANALYZER



Use the Power BI Desktop Performance Analyzer (sic) (View -> Performance Analyzer) to check how your visual renders in the following cases:

- first render of the visual
- thousands of data points
- a single data point / measure (to determine the visual render overhead)

- filtering
- slicing
- resizing (this may not work in the Performance Analcczer).

If possible, compare these measurements with those of a similar core visual to see if there are parts that may be optimised.

USE THE USER TIMING API

Use the User Timing API to measure your app's JavaScript performance. This API can also help you decide which parts of the script need optimisation.

OTHER WAYS TO TEST YOUR CUSTOM VISUAL

There are various ways to test you custom visual:

- code instrumentation: use the following console third party tools to gather data about your custom visual's performance:
 - console.log()
 - o console.dir()
 - o console.time()
 - console.timeEnd()
 - the following web developer tools may also help measure your visual's performance, but keep in mind that they profile Power BI as well:
 - o Metrics
 - o JavaScript profiler.

Once you determined which parts of your visual need optimisation, you can then implement these further tips.

UPDATE MESSAGES

When you update the visual:

- don't re-render the entire visual if only some elements have changed. Render only the necessary elements
- store the data view passed on update. Render only the data points that are different from the previous data view. If they haven't changed, there's no need to re-render them
- resizing is often done automatically by the browser and doesn't require an update to the visual.

CACHE DOM NODES

When a node or list of nodes is retrieved from the DOM (Data Object Model), think about whether you can reuse them in later computations (sometimes even the next loop iteration). As long as you don't need to add or delete more nodes in the relevant area, caching them can improve the application's overall efficiency.

To make sure that your code is fast and doesn't slow down the browser, keep DOM access to a minimum. For example, instead of:

JavaScript

```
public update(options: VisualUpdateOptions) {
    let axis = $(".axis");
}
try:
JavaScript
public constructor(options: VisualConstructorOptions) {
    this.$root = $(options.element);
    this.xAxis = this.$root.find(".xAxis");
}
public update(options: VisualUpdateOptions) {
    let axis = this.axis;
}
```

AVOID DOM MANIPULATION

Limit DOM manipulations as much as possible. Insert operations like **prepend()**, **append()** and **after()** are time-consuming and should only be used when necessary. For example, instead of:

JavaScript

```
for (let i=0; i<1000; i++) {
    $('#list').append('<li>'+i+'');
```

}

try making the above example faster by using html() and building the list beforehand:

JavaScript

```
let list = '';
for (let i=0; i<1000; i++) {
    list += ''+i+'';
}
$('#list').html(list);
```

RECONSIDER JQUERY

Limit JS frameworks and use native JS whenever possible to increase the available bandwidth and lower your processing overhead. Doing this might also decrease compatibility issues with older browsers.

ANIMATION OPTIONS

For repeated use of animations, consider using Canvas or WebGL instead of SVG. Unlike SVG, with these options, performance is determined by size rather than content.

CANVAS PERFORMANCE TIPS

You should read up on third party sites for tips on improving canvas performance, such as"

- faster load times
- improving HTML5 Canvas performance
- optimising canvas generally.

ANIMATION FUNCTIONS

Use requestAnimationFrame to update your on-screen animations, so your animation functions are called before the browser calls another repaint.

ANIMATION LOOPS

Does the animation loop redraw unchanged elements? If so, it wastes time drawing elements that don't change from frame-to-frame. Instead, you should update the frames selectively.

When you're animating static visualisations, it's tempting to lump all the draw code into one update function and repeatedly call it with new

data for each iteration of the animation loop. Instead, consider using a visual constructor method to draw everything static. Then, the update function only needs to draw visualisation elements that change.

In particular, Microsoft has noted that inefficient animation loops are often found in axes and legends.

Common issues

- Text size calculation: when there are a lot of data points, don't waste time calculating text size for each point. Calculate a few points and then estimate
- If some elements of the visual aren't seen in the display, there's not need to render them.

New visuals in AppSource

Yet another raft for this month:

- Spider Chart for Power BI by VisioChart
- HTML Content (Lite)
- Stacked Lipstick Bar Chart (Standard)
- Stacked Lipstick Column Chart (Standard)
- 100% Stacked Column Chart with Values instead of % (Standard)
- Dual Axis Scatter Chart (Standard)
- Category Comparison Bar Chart
- Stacked Column with Percentage and Total in Label (Standard)
- Likert Scale Chart for Power BI by ChartExpo.

Elevate Your Map Charts with Drill Down Map PRO

Drill Down Map PRO by ZoomCharts is a custom map visual for Power BI that lets you show your data on an interactive map and give it locationbased context.

Features include:

- built-in shape layers: use preset shapes for easy filtering of countries
- custom shape layer support: provide custom shapes through KML and GeoJSON files
- lasso tool: draw and save your own filter shapes on top of the map
- node clustering capabilities: clusters can be turned into Do(ugh)nut or Pie charts for category display
- map base layer: lets you choose from four [4] options:
 - o Azure maps
 - o Custom (OpenStreetMaps, Google, CartoDB etc.)
 - o Image (*e.g.* floor plans)
 - None (visualise shapes without a background)
- aura, image and custom label support.

Popular use cases:

- production: monitoring production data by location
- sales and marketing: mapping sales results by region
- public sector: visualising environmental and sociodemographic data.\



"All-in-one" Multi Target KPI card

The Multi Target KPI card works with a single query and includes three additional indications, multiple categories, a pixel perfect alignment setting and built-in conditional formatting. You can change the settings of layout type and colour conditional formatting for additional measures in the visual and it is fairly simple for non-designers to use too.

Simply select the desired measure and category, if necessary. Add up to three [3] additional indicators to provide the context you need for your metric. It will help you improve reporting performance and save you time when designing and developing supplemental measures.



by Institute of Business Intelligence

Crisp-n-clear visualization for your KPIs!

Also specific labels alignment, which is possible with separate text labels. Instead of this we developed «all-in-one» KPI card and share it with you for free.



WebView2 now Generally Available

WebView2 is now Generally Available. I think we might have said that in the heading ..?

More next month!

New Features for Excel

The latest updates saw quite a few highlights. There is 'Formula Suggestions' and 'Formula by Example' for Excel web users. 'Use Image' and Data Types in PivotTables are now available for Windows and Mac Insider users, and 'Generate an Accessible PDF' is available to all Mac users.

You can check out the full list here:

Excel for the web

- Formula Suggestions
- Formula by Example
- Support Chart Formatting via Selection and Ribbon Buttons
- Move Chart Elements within Chart Player
- Name Manager

Excel for Windows

- Office Scripts (Current Channel and Monthly Enterprise Channel)
- Get data from Dynamic Arrays (Current Channel)
- Rapid Refresh (Current Channel)
- Guided Reapply (Current Channel)
- Use Image and Data Types in PivotTables (Insiders)
- Data Validation Dropdown List Autocomplete (Current Channel)
- Paste Values directly into your workbook using a Keyboard Shortcut (Current Channel)

Excel for Mac

- Generate an Accessible PDF
- Enhanced Search Experience
- Use Image and Data Types in PivotTables (Insiders).

Let's get started.

Formula Suggestions

Back in December last year, Microsoft announced 'Formula Suggestions' was beginning to roll out to Excel web users. Now, it is available to all web users with English set as their primary language (rules me out then: I use profane). Whether you're new to Excel or have used it for years, 'Formula Suggestions' helps you create formulae more quickly and accurately by offering relevant suggestions based on your data and context. All you need to do is type "=" at the beginning of a cell, and

Formula Suggestions will show you different formulae that you can apply to your data, along with a specified range.

'Formula Suggestions' can help you in several ways. First, it can improve your productivity by reducing the time and effort you need to type and edit formulae. For example, look at how Formula Suggestions suggests a simple summation here:

1	A	В	С	D	E
1	Product	Q1 Sales			
2	Chains	2,940			
3	Socks	4,338			
4	Tights	4,194			
5	Shorts	1,829			
6	Tights	3,596			
7	Handlebars	4,132			
8	Socks	1,618			
9	Brakes	4,837			
10	Mountain Bikes	4,018			
11	Brakes	3,651			
12	Helmets	1,900			
13	Lights	2,697			
14	Locks	4,977			
15	Bottom Brackets	3,955			
16	Total	=SUM(B2:B	15)		
17		C SUM	D2.015) - 4	0 600	
18		9 30M	(02:013) = 4	0,002	
19		0		Give fe	edback

Second, 'Formula Suggestions' can provide you with robust formulas that will not break if you alter your data as it automatically adjusts the ranges to match your data structure. For example, totals are affected when you add a new row to a table. If you use Formula Suggestions, the range will automatically update to include the new row, but if you manually add the cells, it will not – as in the following example:

	Α	В	С	D	E	F	G	Н	1	J	K	L	M	N	0
1															
2		Manually					Formula S	uggestions							
3		SumProdu	ict team:				SumProdu	uct team:							
4															
5			Guanting	10				Guanting	10	D					
6			Henrique	20				Henrique	20						
7			Kathryn	30				Kathryn	30						
8			Liam	40				Liam	40						
9			Myles	50				Myles	50						
10			Oscar	60				Oscar	6						
11			Sam	70				Sam	70						
12			Talia	80				Talia	8						
13			Tim	90				Tim	9		1				
14				450					=su vi(15:	113)					
15									0 9	SUM(15:113	= 450		N		
16				=D5+D6+D7	+D8+D9+	D10+D11+	D12+D13		ė.				63		
1/									0		F				
10									0.0	500511101	L				15
20									(Tx) S	UBTOTAL					11
20															10
22									(A) S	SUM					10
23									(F) S	SUMIE					
24									9.						
25									(k) s	SUMIFS					
26											ICT				
27									Ux) S	UMPROD	UCI				
28									(h) s	SUMSO					
29									0.						
30	4													Give feedba	ck
	-														

Here, in cell D14, I have typed in the rather dreadful formula

=D5+D6+D7+D8+D9+D10+D11+D12+D13

However, in cell **114**, I have started to type the formula in to prompt 'Formula Suggestions' and then used the formula recommended. This gives similar calculations:

	А	В	С	D	E	F	G	Н	1	J
1										
2		Manually					Formula S	Suggestions		
3		SumProdu	uct team:				SumProdu	uct team:		
4										
5			Guanting	10				Guanting	10	
6			Henrique	20				Henrique	20	
7			Kathryn	30				Kathryn	30	
8			Liam	40				Liam	40	
9			Myles	50				Myles	50	
10			Oscar	60				Oscar	60	
11			Sam	70				Sam	70	
12			Talia	80				Talia	80	
13			Tim	90				Tim	90	
14				450					450	
15										
16				=D5+D6+D	7+D8+D9	+D10+D11+	D12+D13		=SUM(15:11	3)
17										

This will clearly give a better row should team members be added (rows inserted) or removed (rows deleted).

Third, 'Formula Suggestions' can help you discover new possibilities of what you can do with your data, by showing you different formulae that are relevant for your analysis. Whether you are a beginner or an expert in Excel, 'Formula Suggestions' can offer you a convenient and intuitive way to create formulae. 'Formula Suggestions' can suggest the following aggregation formulae:

- SUM
- MIN
- MAX
- AVERAGE
- COUNT
- COUNTA

These formulae are widely used in Excel to perform various calculations and analyses on data, such as finding the sum, minimum, maximum, average or count of values in a range.

For example, 'Formula Suggestions' may also assist in cell-counting tasks. The **COUNT** formula counts cells that contain numbers, whilst **COUNTA** will count all non-empty cells regardless of the type of data they contain. Using the correct formula is crucial to get the correct results, and this may be achieved by leveraging 'Formula Suggestions' ability to predict the correct formula for each of the use cases. Formula Suggestions currently provides suggestions for basic aggregation formulae, helping users who are not yet acquainted with these Excel formulae. However, experienced users may benefit greatly from this feature as well, as it suggests not only the appropriate formula but also the appropriate range for that formula. The range suggestions can save a great deal of time, and can also prevent us from selecting incorrect ranges, which may lead to wrong results.

At the time of this article, Formula Suggestions is available to Excel web users that have English set as their primary language.

Formula by Example

Last month, 'Formula by Example' started to roll out to Excel web users. 'Formula by Example' looks for patterns as the user enters data in the worksheet. When it recognises a pattern, 'Formula by Example' offers a formula to fill the rest of the column with the recognised pattern.

Consider 'Formula by Example' helping to reverse the first and last name order here, where we start typing in what we want:

Indo	Clipboard	Font
34	× ×	\checkmark fx
1	A	В
1	Full 🗹	Last, First 🛛 🖂
2	Ronald Brooks	Brooks, Ronald
3	Vincent Johnson	Johnson, Vincent
4	Kimberly Hill	
5	Teresa Chavez	
6	Patrick Torres	
7	Barbara Hill	
8	Olivia Harris	
9	Anna Sanders	
10	Margaret Ramos	
11	Adam Anderson	
12	Margaret Nelson	
13	Amy Davis	
14	Stephanie Sanders	
15	Zachary Thompson	
16	Kathryn Evans	
17	Dorothy Williams	
18	Kyle Hughes	
10	Carab Heaking	

At this stage, 'Formula by Example' interrupts us:

Undo	Clipboard	Font			Alignment			Number
B5	~ ×	$\checkmark f_X$						
1	A	В	С	D	E	F	G	н
1	Full 🗸	Last, First 🛛	*					
2	Ronald Brooks	Brooks, Ronald						
3	Vincent Johnson	Johnson, Vincent						
4	Kimberly Hill	Hill, Kimberly						\times
5	Teresa Chavez	Chavez, Teresa	Fill cell	s with this	formula?			B2:B20
6	Patrick Torres	Torres, Patrick	We've	created a fo	rmula for a	ou that n	night he he	aloful
7	Barbara Hill	Hill, Barbara	wever	created a ro	initia ior j	you that h	night be ne	eipiui.
8	Olivia Harris	Harris, Olivia	Show F	ormula				
9	Anna Sanders	Sanders, Anna						
10	Margaret Ramos	Ramos, Margaret	Apply	y × Ignore			Give Fe	edback
11	Adam Anderson	Anderson, Adam						
12	Margaret Nelson	Nelson, Margaret						
13	Amy Davis	Davis, Amy						
14	Stephanie Sanders	Sanders, Stephanie						
15	Zachary Thompson	Thompson, Zachary						
16	Kathryn Evans	Evans, Kathryn						
17	Dorothy Williams	Williams, Dorothy						
18	Kyle Hughes	Hughes, Kyle						
19	Sarah Hopkins	Hopkins, Sarah						

We can click on 'Show Formula':

Und	o Clipboard	Font			Alignment			Number		1.5	Styles		Cells		E	diting
B5	~ ×	√ fx														
	A	В	с	D	E	F	G	н	1	J	K	L	М	N	0	P
1	Full 🗹	Last, First 🛛 👻														
2	Ronald Brooks	Brooks, Ronald														
3	Vincent Johnson	Johnson, Vincent														
4	Kimberly Hill	Hill, Kimberly														×
5	Teresa Chavez	Chavez, Teresa	Fill cell	s with this	formula?										82:8	20
6	Patrick Torres	Torres, Patrick	-RIGH	T/Names[/	areulin Lei	V/Names[@IFullII) -	FIND(" " N	ames[@[F	ullin & '	* & LEET/N	ames[@[E	UIII EIND(" Names	(@IEulIII) -	1)
7	Barbara Hill	Hill, Barbara	-10011	r(rearries[e	Strouth cer	a(radifics[Soft aufity -	1140(,14	annes[@fi	unjj)) oc	, or contract	ameste fr	unjj, rinte)(, ivanies	(e-fr uill) -	.,
8	Olivia Harris	Harris, Olivia	Hide F	ormula												
9	Anna Sanders	Sanders, Anna														
10	Margaret Ramos	Ramos, Margaret	~ Appl	y × Ignore	8										Give Feedba	ack
11	Adam Anderson	Anderson, Adam														
12	Margaret Nelson	Nelson, Margaret														
13	Amy Davis	Davis, Amy														
14	Stephanie Sanders	Sanders, Stephanie														
15	Zachary Thompson	Thompson, Zachary														
16	Kathryn Evans	Evans, Kathryn														
17	Dorothy Williams	Williams, Dorothy														
18	Kyle Hughes	Hughes, Kyle														
19	Sarah Honkins	Honkins Sarah														

All you have to do now is 'Apply':

Undo	Clipboard	Font			Alignment			Number		
B5	• ×	✓ f _x =RIGHT([@Full]), LEN([@F	ull]) - FIND("	", [@Full])) 8	& ", " & L	EFT([@Full],	FIND(" ",	(@Full])	- 1)
1	A	В	С	D	E	F	G	н	1.1	
1	Full 🗸	Last, First 🛛 🗸								
2	Ronald Brooks	Brooks, Ronald								
3	Vincent Johnson	Johnson, Vincent								
4	Kimberly Hill	Hill, Kimberly								
5	Teresa Chavez	Chavez, Teresa								
6	Patrick Torres	Torres, Patrick								
7	Barbara Hill	Hill, Barbara								
8	Olivia Harris	Harris, Olivia								
9	Anna Sanders	Sanders, Anna	3							
10	Margaret Ramos	Ramos, Margaret	-							
11	Adam Anderson	Anderson, Adam								
12	Margaret Nelson	Nelson, Margaret								
13	Amy Davis	Davis, Amy								
14	Stephanie Sanders	Sanders, Stephanie								
15	Zachary Thompson	Thompson, Zachary								
16	Kathryn Evans	Evans, Kathryn								
17	Dorothy Williams	Williams, Dorothy								
18	Kyle Hughes	Hughes, Kyle								
19	Sarah Hopkins	Hopkins, Sarah								

It's Flash Fill with formulae (more on that later)!

Currently, 'Formula by Example' supports Excel tables. Support for ranges is coming in a future release. In the meantime, if you wish to try 'Formula by Example' on a range of data today, convert it into a table (select range and click **Insert -> Table** or use the **CTRL + L** keyboard shortcut – **CTRL + T** does not work in Excel for the web).

Once you have a "**CTRL + L**" Table, 'Formula by Example' suggestions will appear after you provide Excel with a few examples in a certain column.

Excel scans the column to identify a pattern in your data. When it finds a pattern, Excel will show a suggestion.

Formula by Example can recognise several patterns like text transformations, date transformations, arithmetic calculations, row numbering and forward filling. It's pretty simple:

Undo	Clipt	ooard		Font			Alig	nment		Num	ber
C5	Ŷ	$\times \checkmark f$	ř								
	А	В	С	D	Е	F	G	н	1	J	
1	First name	Last name 💌	Initials 💌								
2	Nathan	Cooper	N.C.								
3	Johnny	Phillips	J.P.								
4	Edward	Cox	E.C.								×
5	Kyle	Howard	K.H.	Fill cells	s with this	formula?				C2:C18	
6	Christopher	Nguyen	C.N.			rat namall		CTT/Table?			
7	Noah	Rivera	N.R.	=LEFI()	ables[@[Fi	ist namejj	<i>α</i> .αι	EFI(IdDIES	[@[Last fia	inejj) a .	
8	George	Patel	G.P.	Hide Fo	ormula						
9	Denise	Roberts	D.R.	0							
10	Beverly	Moore	B.M.	✓ Apply	X Ignore				G	ive Feedback	K
11	Kenneth	Bennet	K.B.								-
12	Virginia	Sanchez	V.S.								
13	George	Lopez	G.L.								
14	Lisa	James	L.J.								
15	Jacqueline	Gonzales	J.G.								
16	Kyle	Myers	K.M.								
17	Andrew	Moore	A.M.								
18	Jason	Brooks	J.B.								
10											

Undo	Clipbot	ird			Font		Alignment		Number	
E5	v	$\times \checkmark$	fx							
	A	В	С	D	E		F	G	н	1
1	Date 🔽 Da	y <mark>~</mark> M	onth 🛩 Ye	ear 💌	Date - Text	×	Last day of month 🕑			
2	7/5/2020	5	7	2020	Sunday, July 5, 2020					
3	7/14/2021	14	7	2021	Wednesday, July 14, 2021					
4	11/11/2021	11	11	2021	Thursday, November 11, 2021					×
5	2/17/2021	17	2	2021	Wednesday, February 17, 2021		Fill cells with this for	mula?		E2:E15
6	1/26/2021	26	1	2021	Tuesday, January 26, 2021		TEXT/Table4(@IDat	oll "ddd	d mmmm	(manu)
7	4/8/2022	8	4	2022	Friday, April 8, 2022		=Ticvi(ignieat@fnat	e]], duu	u, minimi	а, уууу ј
8	3/14/2021	14	3	2021	Sunday, March 14, 2021		Hide Formula			
9	10/31/2020	31	10	2020	Saturday, October 31, 2020					
10	4/25/2022	25	4	2022	Monday, April 25, 2022		✓ Apply × Ignore		Give	Feedback
11	7/20/2021	20	7	2021	Tuesday, July 20, 2021					
12	8/18/2022	18	8	2022	Thursday, August 18, 2022					
13	5/21/2022	21	5	2022	Saturday, May 21, 2022					
14	3/11/2022	11	3	2022	Friday, March 11, 2022					
15	11/30/2022	30	11	2022	Wednesday, November 30, 2022	2				
10										

'Formula by Example' will identify if you are trying to perform an arithmetic operation on different columns. Let's say we want to find the total sales by multiplying the Price by Quantity. By typing the first couple of results, Excel can complete the rest of the column with the arithmetic calculation formula:

Undo		Clipboard		Fo	nt			Alignment	
D5		• × ~	fx						
	А	В	С	D	E	F	G	Н	
1	Item 💌	Quantity 💌	Price 💌	Total Sales 💌					
2	Shoes	10	5	50					
3	Shorts	20	4	80					
4	Bikes	5	6	30				×	:
5	Jeans	10	4	40	Fill cells	with this	formula?	D2:D10	
6	Jackets	15	7	105	Salaciá	a l'Ouantit		Dricoll	
7	Coats	20	8	160	= Sales[@	Quantit	All a squeste	p[price]]	
8	T-Shirts	5	6	30	Hide	rmula			
9	Socks	8	5	40	-				
10	Skirts	15	7	105	🗸 Apply	× Ignore	Give	Feedback	
11									1
40									

You can also use 'Formula by Example' to apply different types of rounding to your numbers.

Undo	Clipboard	Font		Alignme	ent	Num	ber		Styles			Cells
F5	• × <	fx										
1	AB	C	D	E	F		G	н	1	J	K	
1	Year 💌 Category	Product	Sales (USD)	Sales rounded 💌	Nearest thousandth	~						
2	2017 Components	Chains	17,094.02	17094	17000							
3	2015 Clothing	Socks	3,162.39	3162	3000							
4	2017 Clothing	Bib-Shorts	3,418.80	3419	3000							×
5	2015 Clothing	Shorts	11,367.52	11368	11000		Fill cells	s with this	formula?		F2:F76	
6	2017 Clothing	Tights	30,769.23	30769	31000		- POUN	D/Table10	SIL and A	D)11 / 10/	00 01 + 1000	
7	2015 Components	Handlebars	1,965.81	1966	2000		=KOON	ID(Iable I[er[sales (Us	0)]] / 100	0, 0) - 1000	
8	2016 Clothing	Socks	1,965.81	1966	2000		Hide Fo	ormula				
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11	2017 Components	Brakes	4,615.38	4615	5000							-
12	2016 Accessories	Helmets	14,529.91	14530	15000							
13	2016 Accessories	Lights	18,461.54	18462	18000							
14	2016 Accessories	Locks	25 470 09	25470	25000							

'Formula by Example' allows you to create a dynamic row numbers column from example. This could come in handy in cases where you'd want your numbering to dynamically adjust if you add or remove a row.

You can also use Formula by Example to forward fill the rest of the column based on the first examples.

A5	• × ·	√ fx					
	Α	В	С	D	Е	F	
1	Item series 🛛 💌	Category 💌	Product 🖌	Sales 💌			
2	1-100	Components	Chains	\$ 17,094			
3	101-200	Clothing	Socks	\$ 3,162			
4	201-300	(×	
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6	401-500	-TEVT(100 * POWO	100 "0") 8, " " 8, 1	EVT(100 * 1	0.000 10	10 "0")	
7	501-600	= TEXT(100 ~ KOW() -	199, 0) & - & 1	EXI(100 - 1	10000-11	50, 0)	
8	601-700	Hide Formula					
9	701-800	(
10	801-900	🖌 🗸 Apply 🔀 Ignore			Give F	eedback	
11	901-1000	Accessories	Lights	\$ 3,400			
12	1001-1100	Accessories	Locks	\$ 6,300			
13	1101-1200	Components	Bottom Brackets	\$ 3,400			
14							

At the time of writing, 'Formula by Example' is available on Excel web for all US English users of OneDrive for Microsoft 365 Personal or Family. 'Formula by Example' is rolling out to users of SharePoint and OneDrive for Business. Additional language support will be available in a future release.

It should be noted that filling column data based upon a pattern is something that Excel has been able to do for many years, using a feature called Flash Fill. However, Flash Fill's suggestions are only provided as static text. If you wanted to change some of your input data or reuse the suggestion on different cells, you wouldn't be able to do so, because you wouldn't get a formula as an output. With 'Formula by Example', you will now see a formula that you can easily change, copy and reuse anywhere you want. 'Formula by Example' builds upon the technology that enables Flash Fill, leveraging logical-reasoning-based symbolic techniques to efficiently search for formulae that match the user-provided input and output examples. It then ranks the formulae to pick one that likely matches the user's intent – and if that's not the case, the user can provide additional representative examples to guide the tool.

'Formula by Example' is the next generation of the Flash Fill technology that covers a wider variety of transformations (including datetime and numeric manipulations) and generates readable Excel formulae. This formula-by-example technology has recently also been released in Power Automate and Power Apps.

Support Chart Formatting via Selection and Ribbon Buttons

You can now format your chart using the Home Ribbon Formatting controls in Excel for the web.



Move Chart Elements within Chart Player

You may now click and drag chart elements and the trend line equation to move them in a given chart in Excel for the web. This expands users' ability to customise how their chart looks.



Name Manager

You may now create named ranges from the Name Box in Excel for the web. Users may also search in the name box for any named ranges.

Data		• ×	$\checkmark f_x$	1						
Cre sub	Create a named range by selecting the range and submitting the name in the Name Box									
2										
3		1	2	3	4	5	6			
4		7	8	9	10	11	12			
5		13	14	15	16	17	18			
6		19	20	21	22	23	24			
7		25	26	27	28	29	30			
0										

Office Scripts (Current Channel and Monthly Enterprise Channel)

In Excel for Windows, you now have the ability in the Current and Monthly Enterprise channels to record repetitive spreadsheet tasks and turn them into replayable Office Scripts.

Previously, you could create and modify automations using JavaScript and TypeScript using the Office Scripts Code Editor. With the Action Recorder, you can automate repetitive worksheet tasks without needing any programming experience.

How it works:

- 1. Open any existing workbook
- 2. Select Automate -> Record Actions (Preview)

Γ	File	Home	Insert	Draw	Page Layout	Formulas	Data	Review	View	Automate	Help	Table Design	
	Record (Pre	d Actions eview)	New Script	E Scrip	ot 1 re Rows Between	Tables	Ē	Script 80	:823 ort, and F	ormat a Table		Return Table Data as JSON	Automate s a Task
L	S	cripting Too	ls							Office Scripts			Flow Templates

- 3. Record actions in your workbook
- 4. When you're done recording, click the Stop recording button in the 'Record Actions (Preview)' task pane to save the recorded actions into a script that you can run at any time on any workbook.

Not all actions are recordable at this time. Microsoft is continuing to add support to increase the number of recordable actions. They encourage you to continue trying to record actions useful to your workflow as that will help the team prioritise the order in which they add support.

To use Office Scripts, you must have the following:

- a stable internet connection
- a commercial (E3/E5) or Education Microsoft 365 subscription
- Microsoft Edge WebView2 installed.

Get data from Dynamic Arrays (Current Channel)

Also for Excel for Windows (Current Channel), 'Get Data from Table/Range' now includes Dynamic Arrays. You simply select any Dynamic Array on the grid and import it using Power Query.

Rapid Refresh (Current Channel)

'Rapid Refresh' is a feature that automatically reloads the workbook in co-authoring scenarios where the user may be prompted to refresh manually. Multi-workbook support and support in Excel for Mac will be coming shortly.

Guided Reapply (Current Channel)

In Excel for Windows previously, when co-authoring was interrupted for one reason or another, users would have to select 'Save As' (which creates another copy of the file) or else 'Discard' their changes to get back to the shared file. With 'Guided Reapply', users may review the pending changes and return to the shared file as they wish.

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UPLOAD FAILED We cannot merge with changes made by someone else. Save a	a Copy Discard Changes Learn More	×
D3 ~ ! × √ <i>f</i> x		×
A B C D E F 0 1 vxbzbbdt3 Column3 Column3 Column4 -<	G H I J K L M N O	P Unsaved Changes ~ ×
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31		
Ready Sheet 1 of 1 Workbook Statistics 🔒 General Num Lock 🐻		■ Ⅲ Ⅲ − − + 100%

Use Image and Data Types in PivotTables (Insiders)

Sum of Sales (\$)		Coun	try/Region 🔻			
Category	↓ Image			*	Gra	and Total
■		\$	434,097	\$ 82,890	\$	516,987
■ �Armchair		\$	387,932	\$ 279,825	\$	667,757
■ ♦ Console table		\$	338,252	\$ 221,312	\$	559,564
⊟ ⊗Desk	M	\$	108,000	\$ 208,376	\$	316,376
Grand Total		\$	1,268,281	\$ 792,403	\$2	2,060,684

PivotTables allow you to easily create summaries, dashboards and reports, as well as aggregate information. Whilst data types and in-cell images are a powerful part of modern Excel, PivotTables have only been able to use a text description of these modern content types. Now, the

images and data types come intact to your PivotTable rows and columns in both Excel for Windows and Excel for Mac. They also include the same interactions you have in your source data (image cards, data type icons, data type cards, *etc.*).

To use it:

- 1. Create a PivotTable with images or data types in the source data
- 2. Add your fields with images or data types to the PivotTable rows or columns.

Country/Region	↓ Flag 🚽	Sum of Sales
🗏 China	flag of China	575,690
Mexico	flag of Mexico	459,180
🗏 Canada	flag of Canada	446,620
∃Japan	flag of Japan	154,450
Germany	flag of Germany	150,410
■Vietnam	flag of Vietnam	135,880
South Korea	flag of South Korea	120,860
≡ India	flag of India	90,990
■ Ireland	flag of Ireland	Defere
■ Italy	flag of Italy	berore

Country/Region 斗 Flag		Ŧ	Sum of Sales
🗏 🛱 China	*0		575,690
🗏 🏚 Mexico	3		459,180
🗏 🛱 Canada	*		446,620
🗏 🛱 Japan	•		154,450
🗏 🛱 Germany			150,410
🗏 🏚 Vietnam	*		135,880
🗏 🛱 South Korea			120,860
🗏 🦍 India	۲		90,990
🗏 🛱 Ireland			Now
🗏 🏚 Italy			NOW

You can also paste the examples into Excel using the IMAGE function.

This feature is available to Insiders who are running:

- Windows: Version 2307 (Build 16609.20000) or later
- Mac: Version 16.74 (Build 23060401) or later.

Data Validation Dropdown List Autocomplete (Current Channel)

Dropdown lists are a handy way to make data entry and validation more efficient in Excel for Windows. Microsoft has now added AutoComplete functionality, which automatically compares the text typed in a cell to all items in the dropdown list and displays only the items that match. You should now be able to spend less time scrolling through lists, dealing with data validation errors or writing complex code to handle this task. Yay!

Paste Values directly into your workbook using a Keyboard Shortcut (Current Channel)

It's common to copy text from a web page, an email or another document, and then paste it into Excel (for Windows). Often, your goal is to match the format that is already in place in the cell or range where you're pasting. Until now, it was supposedly not possible to paste as plain text using shortcut keys (although I have been doing it using **ALT + E + S + Arrow keys**).

Likewise, when you copy a cell or range, and then want to paste values, you had a few options, but they all involved using multiple steps. You could:

- paste the copied content by pressing CTRL + V, and then select 'Paste Values' or 'Match Destination Formatting' in the 'Paste Options' dialog box
- select 'Paste Values' or 'Match Destination Formatting' in the Paste drop-down menu in the Ribbon (ALT + H + V)
- press CTRL + ALT + V to open the 'Paste Special' dialog, choose Values or Text, and then press ENTER.

Now you can simply press CTRL + SHIFT + V!

Depending on what you copied, this will either paste with 'Match Destination Formatting' or it will paste values.



This feature is rolling out to Beta Channel users running Version 2210 (Build 15726.20000) or later in Excel for Windows, and will be coming soon to Excel for Mac.

Generate an Accessible PDF

Previously when you exported to PDF in Excel for Mac, there were no tags added to communicate the structure of the document so all of the content was jumbled together. Now, the PDF service automatically creates accessibility tags, which brings the experience on par with Excel for Windows.

	Tags:		
	Where:	Desktop	
Online Locations	File Forma	t: PDF	٢
		• Workbook • Sheet • Selection	
	Option:	 Best for electronic distribution and accessibility (uses Microsoft online service) 	
		Best for Printing	

Enhanced Search Experience

In Excel for Mac, the search experience has been revamped to provide a single place to find content from multiple sources. This function provides smart search suggestions before you type as well as supporting searching for more than just text in your document, *i.e.* you can also search for commands, help articles or web results (such as definitions, media and search engine results).

The new experience:

- provides smart search suggestions before you even type
- supports searching for more than just text in your document: you may also search for commands, help articles or web results
- makes the 'Smart Lookup' pane more accessible to people who are blind or have low vision with better support for VoiceOver as well as improved keyboard navigation within groups.

To access it:

- 1. open an existing document, worksheet or presentation
- 2. click the Search box in the top-right corner of the app window, and select search suggestions

0~		Q Search (Cmd + Ctrl + U)	8
BbCcDdEe Normal	AaBbCc No Spa	Suggested Actions Word Count ab Footnote Suggested Actions Word Count b Footnote Description Page Numbers	re
Po	wer & Sir	ි Table of Contents Suggestions බී Find in this document හි Search in pictures	
		Q Open Search Pane	
			1

- 3. in the Search box, type a keyword or phrase you want to find in the document, worksheet or presentation
- 4. to search for a command, type the command name in the Search box

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4	Anne Wallace	532258026	231951785-0182689	Visa	4539087424007780	President	Executive Management	No			
5	Bonnie Kearney	533414573	948490562-6112913	MasterCard	5224643391763780	Sr. VP Sales & Marketing	Sales & Marketing	No	Q See more results for "chart"		
7	David Longmuir	169482480	980441377-8026945	MasterCard	5545665984686050	Corporate Security Officer	Operations	Yes	83	-	
8	Denis Dehenne	454814186	364684633-7519006	MasterCard	5339317533885550	Paralegal	Legal	Yes	C1		
9	Dorena Paschke	540453187	231951785-2382689	MasterCard	5437269538174900	CVP	Engineering	Yes	C2		
10	Garret Vargas	246575457	948490562-6112913	MasterCard	5111290471102490	CVP	Operations	No	C3		
11	Janet Schorr	600434056	804785034-5004276	MasterCard	5282274677793460	Product Marketing Manager	Sales & Marketing	No	D1		
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12	Robin Countr	511220208	004/00034-50495/6	Visa	4929552269082020	Auditor	Finance Color & Marketing	Tes	03		

5. to search in the document, click 'Find in this document', and then enter the word or words you want to find



6. to look for web or media results, click the 'Open Search' pane, or right-click anywhere on the document, worksheet or presentation, and then click the 'Open Search' pane in the shortcut menu.



If you prefer to use your keyboard, use the shortcuts to access the enhanced search experience:

Command	Shortcut
'Open Search' dropdown	CMD + CTRL + U
Find in document	CMD + F
'Open Search' pane	CMD + CTRL + L

It should be noted that the Search drop-down menu does not close when you click the Ribbon tabs.

This feature is available to Beta Channel users who are running Version 16.74 (Build 23043001) or later, or to any users who have a Microsoft Office 2021 license.

The updated version of the grid with all the new features is fast becoming too complicated to show clearly here. Nonetheless, you can find the interactive links at aka.ms/ExcelFeaturesFlyer.

	Excel Features Availability								
	Ins	ider	Production						
Feature	Windows Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	Windows/CC Find the latest Excel version for this platform	Windows/MEC Find the latest Excel yersion for this platform	Windows/SA Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	Web		
Block XLL Add-Ins	Version 2302 (Build 16130.20128) or later								
PivotTables: Manual Sort of Rows & Columns			Already Supported	Already Supported	Already Supported	Already Supported	February 2023		
Automatic Recalculation Optimization	Version 2208 (Build 15529.10000) or later	Version 16.64 (Build 22081401) or later							
Import Data from SOL Server Database		Version 16.68 (Build 22110801) or later							
Import Data from Additional Sources						Version 16.69 (Build 23010700) or later			
Power Query Editor						Version 16.69 (Build 23010700) or later			
IMAGE function			Version 2211 (Build 15831.20190) or later	Version 2211 (Build 15831.20252) or later		Version 16.67 (Build 22102900) or later	December 2022		
Check Formula with Value Preview Tooltips	Version 2302 (Build 16116.20000) or later	Version 16.70 (Build 230116) or later							
Office Scripts	Version 2212 (Build 15922.20000) or later	Version 16.68 (Build 22120101) or later							
Automate Tasks with Power Automate tab			Version 2301 (Build 15703.10000) or later			Version 16.66 (Build 22092500) or later			
PivotTable Show Details to XLO							January 2023		
Excel Live in Teams							December 2022		
Formula Suggestions							December 2022*		
Formula by Example.							December 2022*		
Suggested Links							December 2022		
Add search bar in queries pane							December 2022		
"Starting to roll out		Featu	res Flyer: aka.m	ns/ExcelFeature	sFlyer °	C: Current Channel: MEC: Monthly Enterprise	Channel: SA: Semi Annual Enterprise Channe All information is subject to change		

Excel Features Availability									
	Insider Production								
Feature	Windows Find the latest Excel version for this platform.	Mac Find the latest Excel version for this platform	Windows/CC Find the latest Excel version for this platform	Windows/MEC Find the latest Excel yersion for this platform.	Windows/SA Find the latest Excel version for this platform	Mac Find the latest Excel yersion for this platform.	Web		
Add keyboard shortcut to open PQ editor			Version 2211 (Build 15730.31883) or later						
Create nested PQ data types	Version 2211 (Build 15928.10000) or later								
Add Get Data from Dynamic Arrays	Version 2105 (Build 14014.20002) or later								
Data from picture			Version 2210 (Build 15723) or later	Version 2210 (Build 15726.20262) or later		Version 16.38 or later	December 2022		
Chart Data Foils							November 2022		
Show Changes			Version 2209 (Build 15703.10000) or later			Version 16.66 (Build 22092500) or later	Already Supported		
New Paste Options	Version 2210 (Build 15726.20000) or later								
Quickly Find the Command you need			Version 2206 (Build 15331.20010) or later				October 2022		
New DAX Functions	Version 2208 (Build 15504.10000) or later								
Navigation Pane			Version 2209 (Build 15629.10000) or later						
Smooth Scrolling			Version 2205 (Build 15225.20092) or later	Version 2208 (Build 15601.20230)	Version 2208 (Build 15601.20456) or later	Already Supported	Already Supported		
Check Performance							September 2022		
Share Section of Excel Workbook							September 2022		
Dynamic Array Support in Charts	Version 2209 (Build 15617.10000) or later			Version 2210 (Build 15726.20262) or later			September 2022		
Modern Comments			Version 2209 (Build 15427.20000) or later						
Manage Your Storage Accounts from Mac.		Version 16.64 (Build 22082100) or later							
		Featu	res Elver: aka m	s/EvcelFeature	sElver °	C: Current Channel; MEC: Monthly Enterprise	Channel; SA: Semi Annual Enterprise Channel		

Features Flyer: <u>aka.ms/ExcelFeaturesFlyer</u>

Excel Features Availability									
	Insider Production								
Feature	Windows Find the latest Excel yersion for this platform	Mac Find the latest Excel version for this platform	Windows/CC Find the latest Excel version for this platform	Windows/MEC Find the latest Excel version for this platform	Windows/SA Find the latest Excel version for this platform	Mac Find the latest Excel yersion for this platform	Web		
New Excel functions			Version 2208 (Build 15427.20194) or later	Version 2208 (Build 15601.20230) or later		Version 16.64 (Build 22081401) or later	August 2022		
Power Query Group operations							August 2022		
Improvements to the connected Power Bl experience.	Version 2208 (Build 15601.20028) or later						August 2022		
Add and edit rich text formatting			Already Supported	Already Supported	Already Supported	Already Supported	August 2022		
Sort by color or icon from auto filter menu			Already Supported	Already Supported	Already Supported	Already Supported	August 2022		
Edit files with legacy data connections			Already Supported	Already Supported	Already Supported	Already Supported	August 2022		
Edit files with legacy Shared Workbook feature			Already Supported	Already Supported	Already Supported	Already Supported	August 2022		
Delete chart elements							August 2022		
Multiline formula bar							August 2022		
Search within PivotTable Field List			Already Supported	Already Supported	Already Supported	Already Supported	July 2022		
Set automatic data conversions	Version 2207 (Build 15427.20000) or later								
Natural Language Query Improvements			Version 2206 (Build 15330.20230) or later	Version 2205 (Build 15225.20356) or later		Version 16.63 (Build 22070801) or later			
Resize Conditional Formatting dialog box		Version 16.64 (Build 22070600) or later							
Sheet protection			Already Supported	Already Supported	Already Supported	Already Supported	June 2022		
		Featu	res Flyer: aka.m	s/ExcelFeature	sFlyer "	Current Channel; MEC: Monthly Enterprise C	Drannel; SA: Semi Annual Enterprise Channel All information is subject to change.		

Features Flyer: <u>aka.ms/ExcelFeaturesFlyer</u>

contact@sumproduct.com | www.sumproduct.com | +61 3 9020 2071

Excel Features Availability

Down A of A

	Insi	ider		Production						
Feature	Windows Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	Windows/CC Find the latest Excel version for this platform	Windows/MEC Find the latest Excel version for this platform	Windows/SA Find the latest Excel version for this platform	Mac Find the latest Excel version for this platform	Web			
Semi-select for links creation			Already Supported	Already Supported	Already Supported	Already Supported	June 2022			
Add "PivotTable Connections to Slicer settings pane			Already Supported	Already Supported	Already Supported	Already Supported	June 2022			
Import from local text, CSV, and XLSX files						Version 16.57 (22011100) or later				
Provide automatic alt-text suggestions on charts and PivotCharts			Version 2205 (Build 15225.20288) or later	Version 2204 (Build 15128.20280) or later		Version 16.62 (22061100) or later				
Power Query refresh for selected data sources			Already Supported	Already Supported	Already Supported	Already Supported	May 2022			
Changing source file for workbook links			Already Supported	Already Supported	Already Supported	Already Supported	May 2022			
Improved Recommended PivotTable experience	Version 2204 (Build 15128.10000) or later									
Faster recalc on resource constrained devices		Version 16.62 (Build 22050804) or later	Version 2204 (Build 15128.20248) or later	Version 2204 (Build 15128.20280) or later						
Faster AutoFilter				Version 2204 (Build 15128.20248) or later	Version 2208 (Build 15601.20456) or later	Version 16.61 (22050700) or later				
Dataflow connector				Version 2203 (Build 15028.20248) or later						
Dataverse connector			Version 2204 (Build 15128.20178) or later							
Improved Find dialog and Find All						Version 16.60 (220410) or later				
LAMBDA: Helper			Version 2202 (Build	Version 2202 (Build	Version 2208 (Build	Version 16.56 (Build 211211)	Already Supported			

More next month, we're sure.

The A to Z of Excel Functions: LOGEST



Sometimes, you wish to forecast what comes next in a sequence, *i.e.* make a forecast. There are various approaches you could use:

- Naïve method: this really does live up to its billing you simply use the last number in the sequence, *e.g.* the continuation of the series 8, 17, 13, 15, 19, 14, ... would be 14, 14, 14, 14, ... Hmm, great
- Simple average: only a slightly better idea: here, you use the average of the historical series, *e.g.* for the continuation of the series 8, 17, 13, 15, 19, 14, ... would be 14.3, 14.3, 14.3, 14.3, ...
- Moving average: now we start to look at smoothing out the trends by taking the average of the last **n** items. For example, if n were 3, then the sequence continuation of 8, 17, 13, 15, 19, 14, ... would be 16, 16.3, 15.4, 15.9, 15.9, ...
- Weighted moving average: the criticism of the moving average is that older periods carry as much weighting as more recent periods, which is often not the case. Therefore, a weighted moving average is a moving average where within the sliding window values are given different weights, typically so that more recent points matter more. For example, instead of selecting a window size, it requires a list of weights (which should add up to 1). As an illustration, if we picked four periods and [0.1, 0.2, 0.3, 0.4] as weights, we would be giving 10%, 20%, 30% and 40% to the last 4 points respectively which would add up to 1 (which is what it would need to do to compute the average

Therefore the continuation of the series 8, 17, 13, 15, 19, 14, ... would be 15.6, 15.7, 15.7, 15.5, 15.6, ...

 Regression analysis: this is a technique where you plot an independent variable on the x (horizontal axis) against a dependent variable on the y (vertical) axis. "Independent" means a variable you may select (e.g. "June", "Product A") and dependent means the result of that choice or selection.

For example, if you plotted your observable data on a chart, it might look something like this:

For example, if you plotted your observable data on a chart, it might look something like this:



There is a statistical technique where you may actually draw the "best straight line" through the data using an approach such as Ordinary Least Squares. Once you have worked it out, you can calculate the gradient (**m**) and where the line cuts the **y** axis (the **y** intercept, **c**). This gives you the equation of a straight line:

y = mx + c

Therefore, for any independent value **x**, the dependent value **y** may be calculated – and we can use this formula for forecasting. Of course, this technique looks for a straight line and is known as **linear** regression

Exponential curve fitting: if the relationship is not linear, a more suitable approach may be to calculate the best fit exponential curve:



The line may be defined by

y = bm[×]

or in more complex situations,

$y = bm_1^{x1}m_2^{x2}...$

if there are multiple **x**-values, where the dependent **y**-value is a function of the independent **x**-values. The **m**-values are bases corresponding to each exponent **x**-value, and **b** is a constant value. Note that **y**, **x** and **m** can be vectors. The array that **LOGEST** returns is $\{\mathbf{m}_{n'}, \mathbf{m}_{n-1'}, ..., \mathbf{m}_{n'}, \mathbf{b}\}$.

The **LOGEST** function employs the following syntax to operate:

LOGEST(known_y's, [known_x's], [constant], [statistics]).

The **LOGEST** function has the following arguments:

- known_y's: this is required and represents the set of y-values that you already know in the relationship y = bm^x (nothing to do with bicycles)
- known_x's: this is optional and denotes the set of x-values that you may already know in the relationship y = bm^x
- constant: this argument is optional and is a logical value specifying whether to force the constant b to equal one (1)
- **statistics:** this final argument is also optional. This too is a logical value specifying whether to return additional regression statistics (see below).

It should be further noted that:

- if the range of known_y's is either in a single column or else a single row, each column of known_x's is interpreted as a separate variable
- the range of known_x's may include one or more sets of variables. If only one variable is used, known_y's and known_x's can be ranges of any shape, as long as they have equal dimensions. If more than one variable is used, known_y's must be a vector (*i.e.* a range with a height of one row or a width of one column)
- if known_x's is omitted, it is assumed to be the array {1,2,3,...} that is the same size as known_y's
- if constant is TRUE or omitted, b is calculated normally
- if constant is FALSE, b is set equal to one (1) and the m-values are adjusted to fit y = m^x
- if statistics is TRUE, LOGEST returns the additional regression statistics; as a result, the returned array is {m_n, m_{n-1}, ..., m₁, c; se_n, se_{n-1}, ..., se₁, se₂; r², se₂; r², se₂; F, df; ss_{ree}, ss_{resid}}
- if statistics is FALSE or omitted, LOGEST returns only the m-coefficients and the constant b.

With regard to the additional regression statistics, these are produced in a grid (an array) as follows:

	Α	В	 N-1	N	N+1
1	m _n	m _{n-1}	 m _z	m ₁	b
2	sen	se _{n-1}	 se ₂	se1	sec
3	r ²	sey			
4	F	df			
5	ss _{reg}	SS _{resid}			

These statistics may be described as follows:

Statistic	Description
se ₁ , se ₂ ,, se _n	Standard error values for the coefficients $\mathbf{m}_1, \mathbf{m}_2,, \mathbf{m}_n$. The standard error is a measure of the statistical accuracy of an estimate, equal to the standard deviation of the theoretical distribution of a large population of such estimates. It is usually estimated in practice as the sample standard deviation divided by the square root of the sample size (assuming statistical independence of the values in the sample), $\frac{\sigma}{\sqrt{n}}$
se _b	Standard error value for the constant ${f c}$ (but this is equal to #N/A when constant is FALSE
r²	This the coefficient of determination, which compares estimated and actual y-values and ranges, with a value between zero(0) and one (1). If it is 1, there is a perfect correlation in the sample, <i>i.e.</i> there is no difference between the estimated y-value and the actual y-value . At the other extreme, if the coefficient of determination is zero, the regression equation is not helpful in predicting a y-value . The coefficient of determination , \mathbf{R}^2 , is the proportion of the variance in the dependent variable that is predictable from the independent variable(s). There are several definitions of \mathbf{R}^2 , but they are not always equivalent (indeed, they can be negative on ocassion). One class of such cases includes that of simple linear regression where \mathbf{r}^2 is used instead of \mathbf{R}^2 . When an intercept is included, then \mathbf{r}^2 is simply the square of the sample correlation coefficient (<i>i.e.</i> r) between the observed outcomes and the observed predictor values. Here, the coefficient of determination will range between zero (0) and one (1)

Statistic	Description
se _v	Standard error for the y estimate
F	This is the F statistic or the F-observed value. You should use the F statistic to determine whether the observed relationship between the dependent and independent variables occurs by chance This may be calculated using the F.INV.RT function in Excel. An F statistic is a value you get when you run an analysis of variance (ANOVA) test or a regression analysis to find out if the means between two populations are significantly different. It's similar to a T statistic from a T-Test: a T-test will tell you if a single variable is statistically significant, whereas an F test will tell you if a group of variables are jointly significant
df	 The degrees of freedom. You should use the degrees of freedom to help you find F-critical values in a statistical table. Compare the values you find in the table to the F statistic returned by LOGEST to determine a confidence level for the model. The degree(s) of freedom is the number of independent values or quantities which may be assigned to a statistical distribution. It is is calculated as follows. When no x columns are removed from the model due to collinearity: if there are k columns of known_x's and constant = TRUE or is omitted, df = n - k - 1 if constant = FALSE, df = n - k. In both cases, each x column that is removed due to collinearity increases the value of df by one (1)
SS _{reg}	This is the regression sum of squares In regression analysis, Excel calculates for each point the squared difference between the y-value estimated for that point and its actual y-value . The sum of these squared differences is called the residual sum of squares , ss_{resid} . Excel then calculates the total sum of squares , ss_{total} . When the constant argument = TRUE or is omitted, the total sum of squares is the sum of the squared differences between the actual y-values and the average of the y-values . When the constant argument = FALSE, the total sum of squares is the sum of the squares of the actual y-values (<i>without</i> subtracting the average y-value from each individual y-value). Then, the regression sum of squares , ss_{reg} , may be found from: $ss_{reg} = ss_{total} - ssresid$. The smaller the residual sum of squares is, compared with the total sum of squares, the larger the value of the coefficient of determination, r^2 , which is an indicator of how well the equation resulting from the regression analysis explains the relationship among the variables. The value of r^2 equals ss_{reg}/ss_{total}
SS _{resid}	This is the residual sum of squares, as explained above.

To be clear:

- the more a plot of your data resembles an exponential curve, the better the calculated line will fit your data. Like LINEST, LOGEST returns an array of values that describes a relationship among the values, but LINEST fits a straight line to your data; LOGEST fits an exponential curve
- when you have only one independent x-variable, you can obtain y-intercept (b) values directly by using the following formula:

y-intercept (b): INDEX(LOGEST(known_y's, known_x's), 2)

- you can use the **y** = **bm**^x equation to predict future values of **y**, but Excel has a **GROWTH** function to do this for you
- when entering an array constant such as known_x's as an argument, use commas to separate values in the same row and semicolons to separate rows. Separator characters may be different depending upon your regional settings
- you should note that the y-values predicted by the regression equation may not be valid if they are outside the range of y-values you used to determine the equation.

Please see our comprehensive example below:

	А	В	С	D	E	F	G	н	L. C.
1	Floor Space	Offices	Entrances	Age	Assessed Value	Г			
2		x ₂		X 4	У				
3	2,310	2	2	20	\$142,000	ון	\$141,966		=\$E\$17*(\$D\$17^A3)*(\$C\$17^B3)*(\$B\$17^C3)*(\$A\$17^D3)
4	2,333	2	2	12	\$144,000		\$144,482		
5	2,356	3	1.5	33	\$151,000		\$150,595		
6	2,379	3	2	43	\$150,000		\$150,000		
7	2,402	2	3	53	\$139,000		\$138,888		
8	2,425	4	2	23	\$169,000		\$169,783		
9	2,448	2	1.5	99	\$126,000		\$126,071		
10	2,471	2	2	34	\$142,900		\$142,586		
11	2,494	3	3	23	\$163,000		\$161,179		
12	2,517	4	4	55	\$169,000		\$169,396		
13	2,540	2	3	22	\$149,000		\$149,942		
14									
15									
16	Results		{	=LOGEST(E3:E13,A3	B:D13,TRUE,TRUE)}				
17	0.9983	1.0181	1.0854	1.0002	80387.1472				
18	0.0001	0.0033	0.0025	0.0000	0.0758				
19	0.9972	0.0060	#N/A	#N/A	#N/A				
20	538.8904	6.0000	#N/A	#N/A	#N/A				
21	0	0	#N/A	#N/A	#N/A				
22									
23									
24	Statistics					ι.			
25	m ₄	m ₃	m ₂	m1	b				
26	se ₄	se ₃	sez	se1	sec				
27	r²	sey							
28	F	df							
29	SSreg	\$\$ _{resid}							

The A to Z of Excel Functions: LOGINV





A Lognormal distribution is a statistical distribution of logarithmic values from an underlying Normal distribution. A Lognormal distribution may be translated to a Normal distribution and vice versa using the associated logarithmic translations.

A Normal distribution is a symmetrical probability distribution of outcomes that forms a bell curve. In a Normal distribution, 68% of the results fall within one standard deviation and 95% fall within two standard deviations, *viz*.



While most people are familiar with a Normal distribution, they may not be as familiar with the related Lognormal distribution. A Normal distribution may be converted to a Lognormal distribution using logarithms. It should be noted that Lognormal distributions can only arise from a Normally distributed set of random variables.

There can be a few reasons for using Lognormal distributions in conjunction with Normal distributions. Most commonly, Lognormal distributions are the result of taking the natural logarithm where the base is equal to e=2.718... However, the Lognormal distribution may be scaled using a different base, if desired, which affects the shape of the Lognormal distribution.

The Lognormal distribution plots the logarithm of random variables from a Normal distribution curve. In general, the logarithm is known as the exponent to which a base number must be raised in order to produce the random variable (**x**) that is found along a Normally distributed curve. It should be noted that Lognormal distributions are positively skewed with long right tails due to low mean values and high variances in the random variables. In practice, Normal distributions may present a few problems that Lognormal distributions can solve. In particular, Normal distributions allow for negative random variables whilst Lognormal distributions include all positive variables.

Probably *(get it?)* the most common application where Lognormal distributions are used in finance is in the analysis of stock prices. A Lognormal distribution is more suitable for this purpose because asset prices cannot be negative. An important point to note is that when the continuously compounded returns of a stock follow a Normal distribution, then the stock prices follow a Lognormal distribution. The Lognormal distribution curve may therefore be used to help better identify the compound return that the stock can expect to achieve over a period of time.

The distribution is occasionally referred to as the Galton distribution or Galton's distribution, after Francis Galton. In summary, a Lognormal process is "simply" the statistical realisation of the multiplicative product of many independent random variables, each of which is positive and it is therefore the maximum entropy probability distribution for a random variate **x** for which the mean and variance of **LN(x)** are specified. And if you follow all of that, get out of here because no one likes a smartarse.

Clear as mud, yes?

The LOGINV function returns the inverse of the Lognormal cumulative distribution function of x, where LN(x) is Normally distributed with parameters mean and standard_deviation.

If **p** = LOGNORMDIST(**x**, ...) then LOGINV(**p**, ...) = **x**. It's confusing, as you might think LOGINV = EXP! The LOGINV function employs the following syntax to operate:

LOGINV(probability, mean, standard_deviation)

The **LOGINV** function has the following arguments:

- probability: this is required and represents a probability associated with the Lognormal distribution
- mean: this is also required and denotes the mean of the natural logarithm of x, LN(x)
- standard_deviation: again required, this is the standard deviation of LN(x).

It should be noted that:

- this function has been replaced by **LOGNORM.INV**. Microsoft states that the new function may provide improved accuracy, as well as provide a function name that better reflects its usage
- although this function is still available for backward compatibility, consider using LOGNORM.INV from now on, because this function may not be available in future versions of Excel
- if any argument is nonnumeric, LOGINV returns the #VALUE! error value
- if **probability** ≤ 0 or **probability** ≥ 1, **LOGINV** returns the #NUM! error value
- if x ≤ 0 or if standard_deviation ≤ 0, LOGINV returns the #NUM! error value
- the inverse of the lognormal distribution function is given by

LOGINV(p, μ , σ) = e^[$\mu + \sigma x$ (NORMSINV(p))]

Please see the example below:

	А	В	С
1	Data	Description	
2	0.269704931	Probability associated with the lognormal distribution	
3	2	Arithmetic mean of LN(x)	
4	1	Standard deviation of LN(x)	
5			
6			
7	Formula	Description	Result
8	=LOGINV(A2,A3,A4)	Inverse of the lognormal cumulative distribution function for the terms above	4.000000
9		·	

The A to Z of Excel Functions: LOGNORM.DIST



The LOGNORM.DIST function returns the Lognormal distribution of x, where LN(x) is Normally distributed with parameters mean and standard_ deviation. The LOGNORM.DIST function employs the following syntax to operate:

LOGNORM.DIST(x, mean, standard_deviation, cumulative)

The LOGNORM.DIST function has the following arguments:

- **x**: this is required and represents the value at which to evaluate the function
- mean: this is also required and denotes the mean of the natural logarithm of x, LN(x)
- standard_deviation: again required, this is the standard deviation of LN(x)
- **cumulative:** yet again, this final argument is required. This is a logical value that determines the form of the function. If **cumulative** is TRUE, **LOGNORM.DIST** returns the cumulative distribution function; if FALSE, it returns the probability density function.

It should be noted that:

- if any argument is nonnumeric, LOGNORM.DIST returns the #VALUE! error value
- if x ≤ 0 or if standard_deviation ≤ 0, LOGNORM.DIST returns the #NUM! error value
- the equation for the lognormal cumulative distribution function is:

LOGNORM.DIST (x,
$$\mu$$
, σ) = NORM.S.DIST $\left(\frac{ln(x) - \mu}{\sigma}\right)$

Please see our comprehensive example below:

	А	В	С
1	Data	Description	
2	4	Value for which you want the distribution	
3	2	Arithmetic mean of LN(x)	
4	1	Standard deviation of LN(x)	
5		-	
6			
7	Formula	Description	Result
8	=LOGNORM.DIST(A2,A3,A4,TRUE)	Cumulative lognormal distribution function for the terms above	0.269704931
9	=LOGNORM.DIST(A2,A3,A4,FALSE)	Probability lognormal distribution function for the terms above	0.082616141
10			

The A to Z of Excel Functions: LOGNORM.INV



The LOGNORM.INV function returns the inverse of the Lognormal cumulative distribution function of x, where LN(x) is Normally distributed with parameters mean and standard_deviation.

If p = LOGNORM.DIST(x, ...) then LOGNORM.INV(p, ...) = x.

The **LOGNORM.INV** function employs the following syntax to operate:

LOGNORM.INV(probability, mean, standard_deviation)

The LOGNORM.INV function has the following arguments:

- probability: this is required and represents a probability associated with the Lognormal distribution
- mean: this is also required and denotes the mean of the natural logarithm of x, LN(x)
- **standard_deviation:** again required, this is the standard deviation of LN(x).

It should be noted that:

- this function has replaces LOGINV. Microsoft states that this new function may provide improved accuracy, as well as provide a function
 name that better reflects its usage
- although LOGINV is still available for backward compatibility, consider using LOGNORM.INV from now on, because the former function
 may not be available in future versions of Excel
- if any argument is nonnumeric, LOGNORM.INV returns the #VALUE! error value
- if probability ≤ 0 or probability ≥ 1, LOGNORM.INV returns the #NUM! error value
- if **x** ≤ 0 or if **standard_deviation** ≤ 0, **LOGNORM.INV** returns the *#NUM!* error value.

Please see our comprehensive example below:

	А	В	С
1	Data	Description	
2	0.269704931	Probability associated with the lognormal distribution	
3	2	Arithmetic mean of LN(x)	
4	1	Standard deviation of LN(x)	
5			
6			
7	Formula	Description	Result
8	=LOGNORM.INV(A2,A3,A4)	Inverse of the lognormal cumulative distribution function for the terms above	4.000000
q		-	

The LOGNORM.INV function returns the inverse of the Lognormal cumulative distribution function of x, where LN(x) is Normally distributed with parameters mean and standard_deviation.

If p = LOGNORM.DIST(x, ...) then LOGNORM.INV(p, ...) = x.

The **LOGNORM.INV** function employs the following syntax to operate:

LOGNORM.INV(probability, mean, standard_deviation)

The LOGNORM.INV function has the following arguments:

- probability: this is required and represents a probability associated with the Lognormal distribution
- mean: this is also required and denotes the mean of the natural logarithm of x, LN(x)
- standard_deviation: again required, this is the standard deviation of LN(x).

It should be noted that:

- this function has replaces LOGINV. Microsoft states that this new function may provide improved accuracy, as well as provide a function
 name that better reflects its usage
- although LOGINV is still available for backward compatibility, consider using LOGNORM.INV from now on, because the former function
 may not be available in future versions of Excel
- if any argument is nonnumeric, LOGNORM.INV returns the #VALUE! error value
- if probability ≤ 0 or probability ≥ 1, LOGNORM.INV returns the #NUM! error value
- if $x \le 0$ or if standard_deviation ≤ 0 , LOGNORM.INV returns the #NUM! error value.

Please see the example below:

	А	В	С
1	Data	Description	
2	0.269704931	Probability associated with the lognormal distribution	
3	2	Arithmetic mean of LN(x)	
4	1	Standard deviation of LN(x)	
5			
6			
7	Formula	Description	Result
8	=LOGNORM.INV(A2,A3,A4)	Inverse of the lognormal cumulative distribution function for the terms above	4.000000
q		-	

The A to Z of Excel Functions: LOGNORMDIST



The LOGNORMDIST function returns the Lognormal distribution of x, where LN(x) is Normally distributed with parameters mean and standard_ deviation. The LOGNORMDIST function employs the following syntax to operate:

LOGNORMDIST(x, mean, standard_deviation)

The LOGNORMDIST function has the following arguments:

- **x:** this is required and represents the value at which to evaluate the function
- mean: this is also required and denotes the mean of the natural logarithm of x, LN(x)
- standard_deviation: again required, this is the standard deviation of LN(x).

It should be noted that:

- if any argument is nonnumeric, LOGNORMDIST returns the #VALUE! error value
- if x ≤ 0 or if standard_deviation ≤ 0, LOGNORMDIST returns the #NUM! error value
- the equation for the lognormal cumulative distribution function is:

$\text{LOGNORMDIST}(x,\mu,\sigma) = \text{NORMSDIST}\left(\frac{\ln(x) - \mu}{\sigma}\right)$

• This function has been replaced with a new function (LOGNORM.DIST) that may provide improved accuracy and whose names better reflect their usage. Although this function is still available for backward compatibility, you should consider using the new functions from now on, because this function may not be available in future versions of Excel.

Please see our final example for this month below:

	А	В	С
1	Data	Description	
2	4	Value for which you want the distribution	
3	2	Arithmetic mean of LN(x)	
4	1	Standard deviation of LN(x)	
5			
6			
7	Formula	Description	Result
8	=LOGNORMDIST(A2,A3,A4)	Cumulative lognormal distribution function for the terms above	0.269704931
~			

More Excel Functions next month.

Beat the Boredom Suggested Solution

To recap, this month's challenge was to create multiple worksheets from a data list. The intention was to dynamically create the worksheets without manual intervention. Essentially, we wanted to generate multiple worksheets with the names from the data list shown below:

Worksheets to be created
Jul 2019 Inventory
Aug 2019 Inventory
Sep 2019 Inventory
Oct 2019 Inventory
Nov 2019 Inventory
Dec 2019 Inventory
Jan 2020 Inventory
Feb 2020 Inventory
Mar 2020 Inventory
Apr 2020 Inventory
May 2020 Inventory
Jun 2020 Inventory

to become:

•	Summary	Jul 2019 Inventory	Aug 2019 Inventory	Sep 2019 Inventory

Suggested Solution

One simple way here is to use VBA to look through the value of each cell in the data list and assign the value to each worksheet created after the 'Summary' worksheet (*i.e.* the sheet with the list). The first step is to set up a named range as shown below. Here, we will define the cell range **A2:A13** as the data list and assign a name tag **Source** to this range as shown below.

1	A	В	C	D	E	F
1	Worksheets to be created	Edit Name	č.		?	×
2	Jul 2019 Inventory					885
3	Aug 2019 Inventory	<u>N</u> ame:	Source			
4	Sep 2019 Inventory	Scope:	Scope: Workbook 🗸		~	
5	Oct 2019 Inventory	Comment:				~
6	Nov 2019 Inventory					
7	Dec 2019 Inventory					
8	Jan 2020 Inventory					
9	Feb 2020 Inventory					¥.
10	Mar 2020 Inventory	<u>R</u> efers to:	=Summary!\$	A\$2:\$A\$13		1
11	Apr 2020 Inventory			OK	Car	ncel
12	May 2020 Inventory					
13	Jun 2020 Inventory					

The next step is to declare the relevant variables.

Dim wksht As Worksheet

Dim rng As Range

Dim sName As String

Then, we set the variable **wksht** as the active worksheet and turn off the **ScreenUpdating** application. If the **ScreenUpdating** property were set to False, it will speed up the macro operation.

Set wksht =ActiveSheet

Application.ScreenUpdating = False

Next, we use a 'For Loop' to look up each value in the named range and assign the range value to the string variable **sName**. Then, we use an 'If' statement to determine the length of the variable **sName**. If the length is greater than zero, then we add a new worksheet after the last page and set the worksheet name equal to the value stored in variable **sName**, *viz*.

```
For Each rng In Range("Source")
sName = rng.Value
If Len(sName) > 0 Then
Worksheets.Add after:=Worksheets(Worksheets.Count)
ActiveSheet.Name = sName
End If
Next rng
Next, we go back to the Summary worksheet and turn on the ScreenUpdating application once more.
Worksheets ("Summary").Select
Application.ScreenUpdating = True
Combing all the lines of code together, we get this:
Sub AddWorksheetsFromSelection()
    Dim wksht As Worksheet
    Dim rng As Range
    Dim sName As String
    Set wksht = ActiveSheet
    Application.ScreenUpdating = False
    For Each rng In Range("Source")
          sName = rng.Value
        If Len(sName) > 0 Then
                 Worksheets.Add after:=Worksheets(Worksheets.Count)
                 ActiveSheet.Name = sName
        End If
     Next rng
    Worksheets("Summary").Select
    Application.ScreenUpdating = True
```

End Sub

By using this method, we could create multiple worksheets from the named range without repetitive manual intervention. Until next month.

Upcoming SumProduct Training Courses - COVID-19 update

Due to the COVID-19 pandemic that is currently spreading around the globe, we are suspending our in-person courses until further notice. However, to accommodate the new working-from-home dynamic, we are switching our public and in-house courses to an online delivery stream, presented via Microsoft Teams, with a live presenter running through the same course material, downloadable workbooks to complete the hands-on exercises during the training session, and a recording of the sessions for your use within 1 month for you to refer back to in the event of technical difficulties. To assist with the pacing and flow of the course, we will also have a moderator who will help answer questions during the course.

If you're still not sure how this will work, please contact us at training@sumproduct.com and we'll be happy to walk you through the process.

Location	Course	Date	Date	Duration	Duration
Online (Australia)	Power Pivot, Power Query and Power Bl	15 - 17 Aug 2023	09:00-17:00 AEST	(-1 day) 23:00-17:00 GMT	3 Days
Online (Australia)	Excel Tips and Tricks	11 Sep 2023	09:00-17:00 AEST	(-1 day) 23:00-17:00 GMT	1 Day
Online (Australia)	Financial Modelling	12 - 13 Sep 2023	09:00-17:00 AEST	(-1 day) 23:00-17:00 GMT	2 Days
Online (Australia)	Power Pivot, Power Query and Power Bl	22 - 24 Nov 2023	09:00-17:00 AEDT	(-1 day) 22:00-17:00 GMT	3 Days
Online (Australia)	Excel Tips and Tricks	5 Dec 2023	09:00-17:00 AEDT	(-1 day) 22:00-17:00 GMT	1 Day
Online (Australia)	Financial Modelling	6 - 7 Dec 2023	09:00-17:00 AEDT	(-1 day) 22:00-17:00 GMT	2 Days

Key Strokes

Each newsletter, we'd like to introduce you to useful keystrokes you may or may not be aware of. We've started going through the alphabet actions. We earn a **D** this month...

Keystroke	What it does
CTRL + <u>D</u> ecimal	Rotates the active cell through the corners of the selection
<u>D</u> elete	Clear
CTRL + <u>D</u> elete	Clear
SHIFT + <u>D</u> elete	Cut
CTRL + <u>D</u> ivide (/)	Select array
<u>D</u> own Arrow	Move down one cell
ALT + <u>D</u> own Arrow	Open dropdown (AutoComplete, Filter or Validation)
CTRL + <u>D</u> own Arrow	Select the last cell in the area down
CTRL + ALT + <u>D</u> own Arrow	Intel chipset: invert screen (turn 180 degrees)
CTRL + SHIFT + <u>D</u> own Arrow	Extend selection down to last cell in area down
SHIFT + <u>D</u> own Arrow	Extend selection down one cell

There are c.550 keyboard shortcuts in Excel. For a comprehensive list, please download our Excel file at www.sumproduct.com/thought/keyboard-shortcuts. Also, check out our new daily Excel Tip of the Day feature on the www.sumproduct.com homepage.

Our Services

We have undertaken a vast array of assignments over the years, including:

- **Business planning**
- Building three-way integrated financial statement projections
- Independent expert reviews
- Key driver analysis
- Model reviews / audits for internal and external purposes
- M&A work
- Model scoping
- Power BI, Power Query & Power Pivot **Project finance**
- **Real options analysis**
- Refinancing / restructuring
- Strategic modelling
- Valuations
- Working capital management

If you require modelling assistance of any kind, please do not hesitate to contact us at contact@sumproduct.com.

Link to Others

These newsletters are not intended to be closely guarded secrets. Please feel free to forward this newsletter to anyone you think might be interested in converting to "the SumProduct way".

If you have received a forwarded newsletter and would like to receive future editions automatically, please subscribe by completing our newsletter registration process found at the foot of any www.sumproduct.com web page.

Any Questions?

If you have any tips, comments or queries for future newsletters, we'd be delighted to hear from you. Please drop us a line at newsletter@sumproduct.com.

Training

SumProduct offers a wide range of training courses, aimed at finance professionals and budding Excel experts. Courses include Excel Tricks & Tips, Financial Modelling 101, Introduction to Forecasting and M&A Modelling.

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