ASA Research

New in Microsoft Excel 2016 (G03)

J. Carlton Collins, CPA

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J. Carlton Collins Atlanta, Georgia 770.842.5902 Carlton@ASAResearch.com www.ASAResearch.com

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WHAT'S NEW IN EXCEL 2016?

1. New Charts - Excel 2016 has six new chart types, as follows:

Two new Hierarchy charts: Treemap Sunburst

One new Waterfall chart: Waterfall (or Stock Chart)

Three new Statistical charts: Histogram Pareto Box and Whisker.



Example Treemap Chart



Example Sunburst Chart



Example Waterfall chart



Example Histogram Chart



Example Pareto Chart



Example Box and Whiskers Chart

2. New Get and Transform Power Query

Excel 2016 provides new capabilities that were previously only available as a separate add-in called Power Query, but are available natively within Excel. This new functionality is found on the **Get & Transform** group on the **Data** tab, as pictured below.

		Book1 - Excel
File Home Insert Page Layout	Formulas Data Review	View Power Pivot Q Tell me what you want to do
From Access From Web From Other From Text Sources +	Show Queries From Table Refree Query • Recent Sources	Connections Properties L Edit Links
Get External Data	From <u>F</u> ile	Connections Sort & Filter
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	From <u>D</u> atabase	From <u>SQL</u> Server Database
1 2	From <u>A</u> zure	From Microsoft Access Database
4	From <u>O</u> ther Sources •	From SQL Server <u>A</u> nalysis Services Database
6	Combine Queries	From <u>O</u> racle Database
8	Data Catalog Search	From IBM DB2 Database
10 11	Data Source Settings	From MySQL Database
12	Query Options	From PostgreSQL Database
14		From Sybase Database
 ← Sheet1 ⊕ Ready 		From Teradata Database

3. Exponential Forecasting & One Click Forecasting

In Excel 2016, the FORECAST function has been extended to allow forecasting based on Exponential Smoothing (such as, FORECAST.ETS() ...). This functionality is also available as a new one-click forecasting button. To use this functionality, on the **Data** tab, click the **Forecast Sheet** button to quickly create a forecast visualization of your data series. From the wizard, you can also find options to adjust common forecast parameters, like seasonality, which is automatically detected by default and confidence intervals.

	А	В	С	D	E	F
	Date	Sales	Forecast(Sales)	Lower Confidence	Upper Confidence	
1				Bound(Sales)	Bound(Sales)	
2	1/1/2011	3,240,325				
3	2/1/2011	2,741,349				
4	3/1/2011	2,987,427				
5	4/1/2011	3,456,892		C		
6	5/1/2011	3,740,738	6,000,000			- +
7	6/1/2011	3,979,178				
8	7/1/2011	4,160,454	5,000,000			
9	8/1/2011	4,162,013		1. 1	nh Jahim	
10	9/1/2011	3,809,132	4,000,000	1		
11	10/1/2011	3,794,419	· /	V V		
12	11/1/2011	3,719,219	3,000,000 🗸		V ·	
13	12/1/2011	3,812,981				
14	1/1/2012	3,480,451	2,000,000			
15	2/1/2012	3,183,133				
16	3/1/2012	3,764,529	1.000.000			Ĥ
17	4/1/2012	3,500,189	_,,			
18	5/1/2012	3,389,811				
19	6/1/2012	4,348,789	11	112222288	12 14 14 13	15
20	7/1/2012	4,442,455	1/20	1/20 1/20 1/20 1/20 1/20	1/20 1/20 1/20 1/20 1/20	/20
21	8/1/2012	4,593,383	1/1			
22	9/1/2012	4,029,783	_	Sales		
23	10/1/2012	4,211,211		Earocast (Salas)		
24	11/1/2012	3,854,682	-	Forecast(sales)		
25	12/1/2012	3,554,831	-	 Lower Confidence Bo 	ound(Sales)	
26	1/1/2013	3,488,309	-	— Upper Confidence Bo	ound(Sales)	
27	2/1/2013	3,270,444				Ü
28	3/1/2013	3,709,943				
29	4/1/2013	3,655,530				
30	5/1/2013	4,097,990				
31	6/1/2013	4,472,583				
32	7/1/2013	4,531,711				
33	8/1/2013	4,504,466	_	_	_	
34	9/1/2013	4,054,338	4,054,338	4,054,338	4,054,338	
35	10/1/2013		4,264,177	3,869,915	4,658,439	
36	11/1/2013		4,033,806	3,639,542	4,428,070	
37	12/1/2013		4,033,625	3,639,358	4,427,892	
38	1/1/2014		3,767,782	3,373,510	4,162,053	

4. 3D Maps

Power Map, has been renamed to 3D Maps and is now available in all Excel 2016 versions. This functionality is available (along with other visualization tools) by clicking **3D Map** on the **Insert** tab.



NEW MAPPING TOOLS ON EXCEL 2016

Microsoft Excel 2016 another new mapping capabilities. The first mapping option is a regular two-dimensional world map. To use this map tool, highlight your data (cells A2:A5 and C2:C5 in the example below) and from the **Insert** tab select **Maps**, **Filled Map**. The resulting chart (also pictured below) is a basic world diagram displayed as a heat map, and your options for editing or enhancing this map are limited primarily to changing colors and repositioning the legend. Nonetheless, this basic mapping tool may meet your needs. (I have uploaded a YouTube video of this topic at tinyurl.com/z5sutz7.)



For more powerful mapping capabilities, Excel 2016 also offers 3-D mapping. To use the 3-D mapping tool, select your data (cells A1:C5 from the same data set pictured above) and from the **Insert** tab select **3D Map**, **Open 3D Maps** to launch the 3-D mapping tools pictured below (an internet connection is required).



After plotting your geography data in **3D Map**, you can then use the **Layer Pane** function (pictured above to the right) to edit and reformat your map. By default, the **3D Map** tool displays a column over each country, but you can change this format to instead display a **Bubble** chart, **Region** chart, or **Heat Map**. You can also rotate and zoom the 3-D map, change colors, apply filters, and add additional map layers as overlays. As an example, the simplified data set used above produces the following 3-D world map.



If desired, you can convert the 3-D map to a 2-D map, add text, and even animate the map, if dates or times are included in the data set. Once you have completed your 3-D map, built-in broadcasting tools enable you to record your voice narration describing the map as you rotate the image to view different angles and animate the map to convey data trends over time. The resulting video clip is called a "scene," which can be coupled with other scenes to produce a single video of your data set. The entire video can then be published to a variety of destinations, such as YouTube.com, using the **Create Video** option, pictured below.



The **3D Map** tool recognizes many standard location descriptions including street address, city, county, state, province, ZIP code, postal code, country, region, or even longitude and latitude coordinates.

5. PivotTable Enhancements

Power Pivot (available as an add-in since Excel 2007) and the Data Model (added in Excel 2013), provide ability to easily build sophisticated models across your data, augment them with measures and KPIs, and then calculate over millions of rows with high speed. Not only have these enhancements been added to Excel 2016, these following improvements have also been made.

- a. Automatic relationship detection Excel 2016 automatically discovers and creates relationships among the tables used for your workbook's data model, so you don't have to. Excel 2016 knows when your analysis requires two or more tables to be linked together and notifies you. With one click, it builds the relationships for you.
- **b.** Creating, editing and deleting custom measures Excel 2016 allows you to create and edit custom measures directly from the PivotTable fields list.
- c. Automatic time grouping Excel 2016 automatically groups your time-related fields (year, quarter, month) in your PivotTable. Once grouped together, you can drag the group to your PivotTable in one action to distribute your data across the different levels of time with drill-down capabilities.
- **d. PivotChart drill-down buttons** Excel 2016 allows you to zoom in and out across groupings of time and other hierarchical structures within your data.
- e. Search in the PivotTable A new field format list helps you get to the fields that are important to you across your entire data set.

- f. Smart rename Excel 2016 now enables you to rename tables and columns in your workbook's data model. With each change, Excel 2016 automatically updates any related tables and calculations across your workbook, including all worksheets.
- **g.** Delayed PowerPivot Updates A new delayed updating feature allows you to make multiple changes in Power Pivot without having to wait until each is propagated across the workbook. All applied PowerPivot changes are updated upon closing the PowerPivot window.

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Cow Labels Sum 2013 @ Qtr1 Jan Feb Mar @ Qtr2 @ Qtr3 2012 2011 2010 2010 2009	of Airport Passengers 3,204,637 2,966,477 3,593,364 11,683,917 12,304,713 44,399,885 40,927,786 39,253,999 37,338,942	Total	Date Mirport Pass Quarters Vears MORE TABLES Drag fields betw T FILTERS
irand Total	195,673,720	Jan Feb Mar Qtr1 Qtr2 Qtr3 2012 2011 2010 2009 Years ▼ Quarters ▼ Date ▼ k Forecasting 4. Time Grouping 5. New Charts ⊕ : < Drill-Down Chart Navigating	ROWS Vears Counters Date

h. Multi-select slicer - Now you can now select multiple items in an Excel slicer on a touch device (previously only one item in a slicer could be selected at a time using touch input).

Category	📒 📡
Entertainment	Multi-Select (Alt+S
Grocery	
Household	
Transportation	

6. **Publish and share your analysis with Power BI** - You can now share Power BI reports with your workgroup or clients online through with a simple button click. Once published to Power BI, you can construct interactive reports and dashboards, and display your fully formatted Excel worksheets.



7. Quick Shape Formatting – New default shape styles have been added in Excel 2016.



- 8. **Insert pictures with the correct orientation** With automatic image rotation, once you insert an image into Excel, it automatically rotates the picture to match the camera's orientation. You can manually rotate the image to any position after insertion. Note that this only affects newly inserted images and does not apply to pictures in existing documents.
- 9. Do things quickly with Tell Me You'll notice a text box on the ribbon in Excel 2016 that says Tell me what you want to do. This is a text field where you can enter words and phrases related to what you want to do next and quickly get to features you want to use or actions you want to perform. You can also choose to get help related to what you're looking for, or perform a Smart Lookup on the term you entered.





10. Insights into what you're working on - The Insights pane, powered by Bing, offers more than just definitions. When you select a word or phrase, right-click it, and choose Smart Lookup, the insights pane will open with definitions, Wiki articles, and top related searches from the web. You can also get to Smart Lookup any time by going to Review > Smart Lookup and entering a query there.



11. Ink Equations - Including math equations has gotten much easier. Now, you can go to Insert > Equation > Ink Equation, any time you want to include a complex math equation in your workbook. If you have a touch device, you can use your finger or a touch stylus to write math equations by hand, and Excel will convert it to text. (If you don't have a touch device, you can use a mouse to write, too). You can also erase and select and correct what you've written as you go.

	Header & Foote	r WordArt er • Text	Signature Line •	Dbject	T Equation Syml	Ω Symbol	
1							×
			Previe	w here			
Virite Erase	Image: Constraint of the symbol Header WordArt Signature Object B Footer Text Symbols						
						Cancel	Insert

12. **Simpler sharing** - Choose **Share** on the ribbon to share your spreadsheet with others on SharePoint, OneDrive, or OneDrive for Business. These changes bring together two key aspects of collaboration: who has access to a given document and who is currently working with you on the document. Now you can view both pieces of information in one place from the Share dialog box.

⊡ — ⊡ × A Share
Share • ×
Invite people Can edit
Include a message (optional)
Share
Owner

13. Improved version history - Now you can go to File > History to see a complete list of changes that have been made to your workbook and access earlier versions.

History	+ :	×
Current version		
Today, 2:54 PM Saved by:		
Today, September 01, 2015		
2:53 PM		
Saved by:		

Note This feature is only supported for files stored on OneDrive for Business or SharePoint.

14. New themes

Always use these	values regardl	ess of sign in to Offi
Office <u>B</u> ackground:	No Backgrou	nd 🗸
Office <u>T</u> heme:	Colorful 🗸]
	Colorful	
Start up options	Dark Gray	
Show the Start sc	White	application starts

There are now three Office themes that you can apply : Colorful, Dark Gray, and White. To access these themes, go to **File > Options > General**, and then click the drop down menu next to **Office Theme**.

15. Data Loss Protection (DLP) in Excel - Data Loss Protection (DLP) is a high-value enterprise feature that is well loved in Outlook. We are introducing DLP in Excel to enable real time scan of content based on a set of predefined policies for the most common sensitive data types (e.g., credit card number, social security number, and US bank account number). This capability will also enable the synchronization of DLP policies from Office 365 in Excel, Word, and PowerPoint, and provide organizations with unified policies across content stored in Exchange, SharePoint and OneDrive for Business.

POLICY TIP: Condition: >10 SSNs, Action: NotifyUser, Explicit Override, False Positive results in override

RULES FOR DESIGNING EXCEL WORKBOOKS

By following a common set of spreadsheet design rules, companies can produce more consistent workbooks that may be easier to review, edit, and use by others in their organizations. In this spirit, in 1987, I served on an AICPA committee that created a booklet titled *Policies and Procedures for Standardizing Spreadsheet Design*. Presented below are some of the suggestions from the committee's work, which I believe still hold true today, updated for today's technologies and including a few new suggestions of my own. (These suggestions apply more to workbooks that are frequently or heavily used; simple "scratch calculations" and "one-time only" workbooks would likely not benefit much from implementing the suggestions/measures set forth below).

- 1. Documentation. Every workbook you create should contain a documentation page that details the title, creators, reviewers, the date created, the client(s) involved (if any), and a description of what the template is designed to accomplish (if it's not obvious).
- 2. Table of contents. Larger workbooks may benefit from a table of contents page with links to the numerous worksheets, as suggested in the screenshot pictured below.



- **3. Print macro buttons.** Workbooks with numerous reports may benefit from including an assortment of print macro buttons for faster printing of various reports, or combinations of the reports, contained in the workbook, as suggested in the screenshot pictured above.
- 4. Avoid embedded assumptions. Users should avoid embedding their assumptions in formulas for several reasons. Embedded assumptions don't print to paper, so the reader can't see the assumptions used. In addition, changing embedded assumptions is more difficult (and hence less efficient) when you must track down the location of each

assumption and then edit the formulas to make the desired changes. It's also more difficult to attach error-checking formulas to assumptions that are embedded in other formulas.

5. Well-organized worksheet assumptions. Many Excel worksheets involve assumptions, such as interest rates, inflation factors, revenue and expense amounts, etc. Novice Excel users tend to scatter their assumptions throughout their workbooks, which can make the worksheet more difficult to review and later modify. The better approach may be to list worksheet assumptions only once, in a well-labeled and well-organized list of assumptions. Thereafter, formulas used throughout the workbooks should reference those assumptions. An example of well-labeled, well-organized assumptions is pictured below.



- 6. Assumptions in yellow cells. I like to organize my assumptions further by highlighting each cell containing them in yellow with a black border, which makes it easier for me, as well as those I work with who are used to my design approach, to better follow my workbooks. An example of this is pictured above.
- 7. Name assumption cells. In some cases, it can be advantageous to label your assumptions using Excel's Name Box tool. By naming the assumption cell, you can also reference the cell name when creating formulas instead of typing the cell reference. This can make the formula easier to write and review. Additionally, the Go To command (F5 key in Excel) can be used to quickly navigate to named ranges.



8.

For example, if one assumption is the consumer price index (as pictured in cell B4 above), you can name the cell that contains that assumption as CPI by selecting cell B4, and then in the **Name Box** typing CPI, and pressing Enter. An example of a resulting formula, which references the named cell CPI, is pictured below.



9. Error-checking formulas. To help prevent input errors, I like to include error-checking formulas next to my formulas when warranted. For example, if the workbook template provides cell B4 for entering an interest rate, users trying to enter, say, "5%" may not know whether to enter 5 or .05. To make sure users (including myself) get it right, I might include the error checking formula =IF(B4>1,"Error - please use a decimal number, such as .02 instead of 2","") next to the assumption, as pictured below. This formula might alert users when a mistake has been made.



10. Organize your template by worksheets. When creating an Excel workbook, the sections of your work should be organized on different worksheets. For example, your assumptions may be organized on worksheet 1, your revenue calculations on worksheet 2, your expense calculations on worksheet 3, your income statement on worksheet 4, your balance sheet on worksheet 5, etc. This approach makes it easy to tab between each section and makes it easier to print each section. Years ago, when spreadsheet applications provided only a single worksheet, extra effort was required to select print ranges from the single worksheet and force the pages to break at the desired locations. However, when your workbook is organized by worksheets, printing each section is simply a matter of selecting the desired worksheets and pressing the **Print** command. An example of a workbook with organized worksheet tabs is pictured below.

16	Interest Earnings On:				
17	Funds in Escrow	51,667	51,667		
18	Funds held by Excalibur Rental Homes, LLC	6,292	5,554		
19	Funds held in Reserves	427	464		
20	Total Interest Earnings	58,385	57,685		
	17 Funds in Escrow 51,667 51,667 18 Funds held by Excalibur Rental Homes, LLC 6,292 5,554 19 Funds held in Reserves 427 464 20 Total Interest Earnings 58,385 57,685 Image: Image of the structure of the s				
Rea	dy 🔚				

- **11. Simplify complex calculations.** When faced with the need to create a complicated formula involving numerous functions and/or cell references, consider breaking that formula into a series of simplified calculations across multiple cells. The result will be formulas that are easier to troubleshoot, and a worksheet that is easier to review.
- 12. Explanations. When the situation calls for an explanation, it can be advantageous to insert a Text Box or Balloon Callout in your worksheet to explain the underlying methodology or simply to provide instructions for using it. This can be done from the Insert tab by selecting Shapes and then in the Basic Shapes section, select Text Box, or in the Callouts section, select Speech Bubble. Not only can these explanations be useful to others, but also, I've found them useful years later as they remind me of how the worksheet is intended to be used, an example of which is pictured below.

	в	С	D	E	F	G	н	1		J	К	L	м	N
6	Last Name	First Name	Address	City	State	Zip	Phone	Pension Plan		Balance				
7	Bauchman	Stan	100 Peachtree Street	Atlanta	GA	30062	770.842.5902	Plan A	\$	157,665.00	-			со
8	Motroson	Mickey	777 Marathon Drive	Atlanta	GA	30063	770.555.5903	Plan B	\$	156,340.00				
9	Davenport	Donald	96 Thompson Rd	Atlanta	GA	30064	770.555.5904	Plan C	\$	81,480.00			Last	Nam
10	Phillips	Bessie	822 Pleasant Place	Atlanta	GA	30065	770.555.5905	Plan A	\$	202,578.00				
11	Smith	Sandra	104 Peachtree Street	Atlanta	GA	30066	770.555.5906	Plan B	\$	177,209.00			First	t Nan
12	Miller	David	333 Bay	Duluth	GA	30092	678.555.4332	Plan C	\$	212,254.23		Y	p	
13	Collins	Carlton	100 Peachtree Street	Norcross	GA	30092	770.842.5902	Plan A	\$	124,533.45		1	Add	ress
14														
15													Pho	ne
16														
17	7 Instructions For Testing This Solution Using the Data Form								Pen	sion				
18	1. Make sure to open this file as a macro enabled workbook.													
19	 1. Make sure to open this file as a macro enabled workbook. 2. Click this blue text box to display the Data Form input dialog box (click OK if prompted 													
20	to confir	m row labels	a).											
21	3 Click A	lew then en	ter data using the To	b key to ad	lvance	to each	field then pr	ess Enter						
6 Last Name First Name Address City State Zip Phone Pension Plan Balance 7 Bauchman Stan 100 Peachtree Street Atlanta GA 30062 770.842.5902 Plan A \$ 157,665.00 8 Motroson Mickey 777 Marathon Drive Atlanta GA 30063 770.555.5903 Plan B \$ 156,340.00 9 Davenport Donald 96 Thompson Rd Atlanta GA 30064 770.555.5903 Plan A \$ 202,578.00 11 10 Phillips Bessie 822 Pleasant Place Atlanta GA 30065 770.555.5905 Plan A \$ 202,578.00 11 11 Smith Sandra 104 Peachtree Street Atlanta GA 30092 678.555.4332 Plan A \$ 124,533.45 12 Miller David 333 Bay Duluth GA 30092 770.842.5902 Plan A \$ 124,533.45 14 Instructions For Testing This Solution Using the Data Form Input dialog box (cl														
23	A Click t	he Close but	ton to close the data	Form tool	lor pre	ss the ES	sr keyl							
24	F. Notico	that your av	why optored data an	nonr on th	to bott	om of th	o data rango	and in						
25	5. NOUCE		ewiy entereu uata ap	pears on u	ie bott	omoru	ie uata range,	anu in						
26	the Brow	n pension pi	an report shown to t	the right.										
27	6. Unhid	e column A a	ind rows I through 5	to check o	ut the f	rormulas	s yourself.							
		_			_				P		-			

13. Consistent look and feel. I prefer to turn off the gridlines in my Excel workbooks because I find they clutter the screen. If I want gridlines in specific areas, such as in my tables, I add them using the Borders formatting tool. I also prefer to use a standard 12- point Calibri font for all my workbooks because that font has been designed to be more readable for both text and numbers. To learn more about the Calibri font, see the April 2017 topic "What Fonts Work Best in Excel," (tinyurl.com/XXX). 14. Add File Properties. In some cases, it may be worthwhile to edit the Excel workbook's File Properties, so users can locate and identify the file more easily in searches. To do this, select the File tab, Properties, Advanced Properties, and on the Summary tab, add Keywords, Comments, and other information that might make the file easier to locate.

JofA Example	File Be	enford Pro	perties		?	×
General Sum	mary	Statistics	Contents	Custom		
Title:	Title: Example file for JofA Benford's Law article					
Subject:	Subject: Benford's law analysis					
Author:	J. Ca	lton Collins	, CPA			
Manager:						
Company:	ASA F	Research, L	LC			
Category:	JofA					
Keywords:	Benfo	rd, Collins,	JofA, Exam	ple File, 2017		
mments:	Th	vas crea ublist	ited in	nction with th in 2017	for	'd's

- **15. Cross-footing and error-checking formulas.** Whenever possible, well-labeled cross-footing totals and/or error-checking formulas should be included in the worksheet. For example, a simple IF function might be used to check to see if the balance sheet balances; if not, then the error-checking formula should display a message warning the user that the worksheet has a problem.
- 16. Worksheet protection. In some cases, it may be advantageous to turn on worksheet protection to secure the integrity of a completed workbook. To do so, first select each assumption cell in the worksheet (one at a time or all at once by holding down the Ctrl key to select multiple assumption cells), then right-click one of the selected cells, select Format Cells from the pop-up menu, and then, on the Protection tab, uncheck the box labeled Locked, as pictured below. (The previous measure of highlighting assumption cells in yellow will make it easier to identify them for unlocking purposes.)

Format Ce	lls					
Number	Alignment	Font	Border	Fill	Protection	
<mark> ∐</mark> ocked H <u>i</u> dde	d n					
Locking contracts	ells or hiding f group	ormulas h Cheet but	as no effec ito:	t until you	protect the wo	rks

Next, from the **Review** tab, select the **Protect Sheet** option, enter a password (or you can leave the password field blank to protect the worksheet with no password), and then click **OK**. Thereafter, changes can only be made to those cells that have been unlocked. To fully modify the worksheet later, you will need to turn worksheet protection off to make changes to those locked cells from the **Review** tab by selecting **Unprotect Sheet**, and enter the password, if necessary. Perhaps the best reason to protect your worksheet is to prevent accidentally deleting data. Consider the scenario in which your doughnut falls out of your hand and bounces off the spacebar and onto the floor. You don't notice that data have been deleted from your worksheet because you are on the ground hurrying to obey the five-second rule. In this case, worksheet protection will protect your data but not your doughnut.

PRINTING ALL EXCEL SHEETS

Q. I have an Excel workbook with 13 worksheets, and I want to print all the worksheets at once instead of one at a time. Should I write a macro to do this?

A. While a macro could be created to print all your worksheets as a single print job, this is not the best approach. The easiest approach is to right-click a worksheet tab, choose **Select All Sheets**, and then print normally to have the worksheets printed as a single print job. As an alternative, you could also select **File**, **Print**, **Settings**, **Print Entire Workbook** to achieve the same result.



Here are a few additional comments about printing multiple worksheets as a single print job.

- 1. **Page numbering.** Besides speed, an additional benefit of printing multiple worksheets as a single print job is that all of your pages are numbered sequentially.
- 2. Custom print settings for each worksheet. Excel's Page Layout tab's Page Setup menu allows you to customize the way each worksheet prints, even when multiple worksheets are selected for printing. For example, Sheet 1 may be set to print in a Landscape orientation, Scaled to fit the width of the paper, while Sheet 2 may be set to print in Portrait orientation with No Scaling; thereafter, each worksheet adheres to those settings, even when both worksheets are printed as a single print job. To customize a

worksheet's layout, select it and from the **Page Layout** tab, use the **Margins**, **Orientation**, **Size**, **Print Area**, **Breaks**, **Background**, and **Print Titles** tools (pictured below) to adjust each worksheet's layout settings.

File	Home	Insert	Page Lay	out	Formul	as	Data	Review	Vie	w D
Themes	Colors * A Fonts * Effects *	Margins •	Orientation	Size	Print Area *	⊧ Breaks	Backgro	ound Print Title	t S	Width: Height Scale:
A1	emes ▼ :	×	P	ortrait	Setup				121	Scal
A	в		Li	andscap	e c		F	G		н

3. **Printing selected worksheets.** Instead of printing all worksheets, you can print selected worksheets as a single print job by holding the Ctrl key and left-clicking each tab you want to print with your mouse pointer (to select them). For example, in the screenshot below, I have selected the tabs labeled **January**, **March**, **April**, and **June**, which enables me to print those four worksheets only.

32								
-) F	January	February	March	April	May	June	July
Read	ly 🛅							

 Specifying print range. By default, Excel prints all data contained on each worksheet, but you can specify a specific print range for each worksheet using the Page Layout's, Print Area, Set Print Area tool; thereafter, only the specified area will print.

THIS EXCEL FORECAST WAS BOUND TO HAPPEN

Q. Our company creates seasonally adjusted revenue forecasts in Excel 2016 based on historical data using regression analysis. I would like to improve our results by also charting the seasonally adjusted upper- and lower-bounded forecast ranges, based on a confidence level of 95%. Can you tell me how this might be done?

A. Excel 2016 provides a new tool called Forecast Sheet that automatically calculates and plots your upper and lower forecast boundaries based on your desired level of confidence, and this new tool is smart enough to also calculate and incorporate seasonality into your upper- and lower-boundary forecasts. To use this tool, highlight your historical data, including dates, as pictured in columns B and C in the example screenshot below.

Remove Duplicates V	Data Con: alidation + ata Tools	solidate Relationships What-If Forecast Analysis Sheet Forecast Forecast Outline
		Craste Forecart Worksheet
B	С	
1/21/11	142.062	
2/28/11	142,905	
3/31/11	130,639	200.000
4/30/11	147 357	500,000
5/31/11	132,259	250,000
6/30/11	192,896	200,000
7/31/11	174,845	
8/31/11	187,160	
9/30/11	126,621	100,000
10/31/11	127,296	50.000
11/30/11	142,822	
12/31/11	137,234	
1/31/12	140,319	31/13 31/17
2/29/12	147,612	
3/31/12	151,055	
4/30/12	136,528	—— Lower Confidence Bound(Revenue) —— Upper Confidence Bound(Revenue)
5/31/12	138,546	
6/30/12	185,808	Forecast End 7/31/15
7/31/12	171,563	4 Options
8/31/12	167,133	Execut Chart 7/21/02
9/30/12	150,856	
10/31/12	132,474	
11/30/12	144,101	Sevenality
12/31/12	139,483	Detect Automatically Values Range Sheet1 (2):I\$C\$1:\$C\$32
1/31/13	153,213	Set Manually 12 + Fill Missing Points Using Interpolation
2/20/13	147 500	
//30/13	157 230	Include forecast statistics Aggregate Duplicates Using Average
5/31/13	162 343	
6/30/13	213,729	Create Cancel
1,11,10	201.376	

From the **Data** tab, select **Forecast Sheet**, expand the tool's **Options** if necessary, adjust the desired level of **Confidence Interval** (95% in this example) if necessary, adjust the **Seasonality** setting as desired, and then click **Create** to produce the new forecast (on a new worksheet), an example of which is pictured below.



As you can see pictured above, the chart depicts the forecast revenue line (the bolded orange line), as well as upper and lower forecast revenue lines depicting the upper and lower boundaries of the forecast based on the specified level of confidence (the nonbolded orange lines). You can also see that historically (shown as the blue line) the company's revenue has spiked in the June–August time frame each year; accordingly, the Forecast Sheet tool has automatically factored this seasonality into both the revenue and boundary forecasts.

It is interesting to note that the Forecast Sheet tool produces the forecast results using the two new Excel 2016 functions FORECAST.ETS and FORECAST.ETS.CONFINT, as depicted in the chart's underlying data table pictured below.

C	j2 r		\times	~	1	=FORECA	\ST.ETS(A62,\$B\$2:\$B\$61,\$A\$2:\$A\$61,1,1)		
D6	j2 🔹		×	4	f _x	=C62-FO	RECAST.ETS.CONFINT(A62,\$B\$2:\$B\$61,\$A	\$2:\$A\$61,0.95,1,1) <	
	Date 💌 I	Reven	ue 🗐	Forec	ast(Re	venue) 🔻	Lower Confidence Bound(Revenue) 🔻	Upper Confidence Bound(Beven	nue) 🔻
62	1/31/16				•••	148,235	125,993	1	70,477
63	3/2/16					155,070	130,183	1	79,958
64	3/31/16					151,857	124,571	1	79,144
65	5/1/16					150,497	120,998	1	79,997
66	5/31/16					157,912	126,346	1	89,477
67	7/1/16					210,549	177,038	2	44,061
68	7/31/16					195,890	160,532	2	31,248
69	8/31/16					205,352	168,233	2	42,472
70	10/1/16					154,706	115,899	1	93,514
71	10/31/16					154,184	113,753	1	94,616
72	12/1/16					162,078	120,079	2	04,077
73	12/31/16					156,532	113,017	2	00,047
71						726	107,734	1	97,718

These new functions predict future values based on historical time-based data using the AAA version of the exponential smoothing (ETS) algorithm with the weights assigned to data variances over time in proportion to the terms of their geometric progression based on the following exponential scale {1, $(1 - \alpha)$, $(1 - \alpha)^2$, $(1 - \alpha)^3$, ...}. In lay words, this approach weights the data's seasonal variations by exponentially increasing amounts over time; hence in this example, the

revenue's seasonality in 2015 has a greater impact on the forecast than the seasonality of the data in 2014, and 2014's seasonality impacts the forecast more so than 2013's seasonality, and so on.

If you are using an older edition of Excel, and the Forecast Sheet tool and functions are not available to you, you can still adjust your forecast and boundary calculations for seasonality manually. For example, the worksheet pictured below includes actual revenue for 2015 on row 2, linear-based forecasts calculations on row 6, and simplified boundary calculations on rows 7 and 8. These calculated data are then seasonalized on rows 12, 13 and 14 based (highlighted in orange) on the actual seasonality achieved in 2015 by dividing each calculation (highlighted in green) by the total amount of revenue for 2015, and then multiplying the product by the actual revenue amounts for each respective month in 2015.

SUI	M ▼ : × ✓ f _x =\$N\$6	/\$N\$2*B2					
	А	В	С		L	М	Ν
1		1/31/15	2/28/15	.5	11/30/15	12/31/15	Total
2	Actual 2015 revenue	145,426	142,441	•	158,375	150,336	2,006,501
3							
4							
5	(Based on linear regression)	1/31/16	2/29/16	.6	11/30/16	12/31/16	Total
6	Forecast 2016 revenue	172,601	173,041	8	176,998	177,438	2,100,233
7	Upper boundary (95% confideince)	163,971	164,389		168,148	168,566	1,995,221
8	Lower boundary (95% confidence)	181,231	181,693		185,848	186,310	2,205,245
9							
10							
11	(Seasonally adjusted)	1/31/16	2/29/16		11/30/16	12/31/16	Total
12	Forecast 2016 revenue	=\$N\$6/\$N\$2	2*B2		165,773	157,359	2,100,233
13	Upper boundary (95% confideince)	144,608	141,640	//	157,485	149,491	1,995,221
14	Lower boundary (95% confidence)	159,830	156,550	0	174,062	165,227	2,205,245

Download this example workbook at carltoncollins.com/forecast.xlsx.

MODIFY AUTO-CORRECT

Q. Is there a way to turn off the auto-correct function for certain abbreviations or character strings in Outlook, Word, and other Office programs? For example, when I enter the ticker for Accenture, ACN, Word incorrectly autocorrects my entry to CAN.

A. Word's AutoCorrect function contains corrections for many commonly misspelled or mistyped words. You can remove а particular AutoCorrect setting in Word by selecting File, Options, Proofing, AutoCorrect Options, and in the resulting AutoCorrect dialog box, entering **acn** in the **Replace** box to find the unwanted entry, and then with the offending entry highlighted, clicking the **Delete** button, as indicated in the screen shot below. This action will remove the unwanted Auto-Correct setting for all Microsoft Office applications.

	utoFormat	Actions
AutoCorrect	Math AutoCorrect	AutoFormat As You Type
Show Auto	Correct Options buttons	
Correct TWo	Nitial CApitals	Exceptions
Capitalize fi	rst letter of sentences	
Canitalize fi	rst letter of table cells	Evno horo
Capitalize n	amas of days	rype nere
	anies of days	
Correct acci	dental usage of CAPS LOCK key	A TRALE LAL
100 Mer 100 - 00 - 0		2. Hignlight hel
1		
Replace text	t as you type	
Peplace:	With: Plain text OFrmat	ted text
Replace:	With: Plain text Format	ted text
✓] Replace <u>text</u> <u>Replace</u> : acn	<u>W</u> ith: Plain text Format	ted text
✓] Replace text Replace: acn acn	Mith: Plain text Format	ted text
✓ Replace text Replace: acn acn acommodate	with: Plain text Firmation can accommodate	ted text
Acn acommodate acomodate	With: Image: Plain text Formation can accommodate accommodate accommodate accommodate	ted text
Acn acn acommodate acomodate acomodate actualyl	with: Image: Plain text Formation can accommodate accommodate accommodate actually	ted text
Acn acn acn acommodate acomodate actualyl additinal	with: Plain text Formation can accommodate accommodate accommodate actually additional	ted text
Acn acn acommodate acommodate acomodate actualyl additinal additional	With: Plain text Formation Can accommodate accommodate actually additional additional	ted text
Acn acn acommodate acommodate acomodate actualyl additinal addtional	with: Plain text Fermation can accommodate accommodate accommodate actually additional additional additional additional	ted text
Acn acn acommodate acomodate acomodate actualyl additinal addtional	with: Plain text Formation can accommodate accommodate actually additional additional 3. Press Delete •	ted text
Ach Ach Ach Ach Ach Ach Ach Ach	with: Image: Plain text Formation accommodate accommodate accommodate actually additional additional additional additional	ted text

EXCEL DATING PROBLEMS

Q. When I paste a large amount of data into Excel containing dates as far back as the 1800s, the recent dates display correctly as valid dates, but the older dates automatically convert to text. I assume I need to adjust a setting in Excel, but I can't find it. Can you help?

A. Excel handles dates occurring on or after 1/1/1900 perfectly (1/1/1904 in Excel for Mac as a default), but earlier dates are problematic. You can easily see the problem simply by entering 12/31/1899 and 1/1/1900 into Excel using the Long Date format, as pictured below—notice that the earlier date is displayed as text while the later date is displayed as an actual date.



All editions of Excel have this problem in that they were never designed to handle dates earlier than 1/1/1900; Excel's date system simply numbers the days from 1/1/1900, with "1" representing Jan. 1, 1900, and so on. This anomaly is officially blamed on Lotus 1-2-3, which did not handle leap years correctly, so Excel's developers included the same errors intentionally to preserve compatibility with Lotus 1-2-3 spreadsheets. To this day, Excel displays Feb. 29, 1900, as a valid date, even though that date did not occur (1900 was not a leap year because it is evenly divisible by 100 but not by 400).

To further compound calendar problems, different parts of the United States converted from the Julian calendar system to the Gregorian calendar system (which incorporates leap years) at different times using different approaches. As examples, Arizona, California, Florida, Nevada, New Mexico, and Texas followed Spain's conversion approach, and as a result, the dates Oct. 5, 1582, through Oct. 14, 1582, are not recognized as having occurred in those states. The Mississippi Valley area followed France's approach, and as a result, that locality does not recognize the dates Dec. 10, 1582, to Dec. 19, 1582. Oregon, Washington, and the Eastern Seaboard followed England's approach, and as a result, the dates Sept 3, 1752, through Sept. 13, 1752, are considered to never have occurred. Microsoft Excel does not attempt to account for any of these missing dates; instead Excel simply treats dates before 1900 as raw text rather than true dates, thereby avoiding these complicated date conversion issues.

The most frequently occurring problem caused by this issue relates to sorting date lists composed of dates both before and after Jan. 1, 1900. To sort pre- and post-1/1/1900 dates, you can reformat them using the yyyy/mm/dd custom format; for example, July 4, 1776, would appear as 17760704 and all dates formatted in this manner would sort properly. However, if you need to perform calculations using these dates, you have a bigger problem that cannot be solved by changing the format. Two suggestions for overcoming this date issue as they pertain to date calculations are as follows.

- Microsoft provides an explanation for calculating ages dating back to before 1/1/1900 using a macro approach at <u>tinyurl.com/pq4gbft</u>.
- The free XDate Excel add-in provides eight new functions to help users work with pre-1900 dates; this add-in is available at <u>tinyurl.com/lkjmh</u>.

Also, be aware that a secondary problem caused by this date issue is Excel's WEEKDAY function returns the wrong day of the week for all dates earlier than March 1, 1900, a problem that can be resolved simply by adding 1 to the WEEKDAY function formula when referring to pre-March 1, 1900 dates, as explained on the Microsoft support page at <u>tinyurl.com/lcxIndk</u>.

MORE EXCEL DATING PROBLEMS

Q. Help! My future value calculations don't make any sense (see the attached spreadsheet). The formula in column D is the same for all rows, but for unknown reasons, it stops working after row 7. What's going on?

D8	D8 • : $\times \int f_x = FV(B8,((C8-A12)/365.25/12),A8)^*-1$									
	А	В	С	D						
	Amount									
	Invested on									
1	1/1/15	Interest Rate	Future Dates	Ending Value						
2	\$1,000	3.5%	12/31/20	\$495.59						
3	\$1,000	3.5%	12/31/21	\$578.98						
4	\$1,000	3.5%	12/31/22	\$662.61						
5	\$1,000	3.5%	12/31/23	\$746.48						
6	\$1,000	3.5%	12/31/24	\$830.82						
7	\$1,000	3.5%	12/31/25	\$915.17						
8	\$1,000	3.5%	12/31/30	(\$6,114.72)						
9	\$1,000	3.5%	12/31/35	(\$5,790.55)						
10	\$1,000	3.5%	12/31/40	(\$5,461.53)						
11										
12	1/1/15									
13										

A. Your formula is perfect, but your worksheet reveals a date problem all CPAs should be wary of relating to entering two-digit year dates. When you enter a two-digit year using the digits 00 to 29, Excel then assumes you mean 2000 to 2029; but when you enter dates into Excel using the two digits ranging from 30 to 99, Excel assumes you mean 1930 to 1999. If you expand the formatting in column C to display four-digit years, you can instantly see that the dates on rows eight through 10 refer to 1900 dates, not 2000 dates, as pictured. You only need to edit your dates to solve your problem.

5	\$1,000	3.5%	12/31/2023	\$746.48
6	\$1,000	3.5%	12/31/2024	\$830.82
7	\$1,000	3.5%	12/31/2025	\$915.17
8	\$1,000	3.5%	12/31/1930	(\$6,114.72)
9	\$1,000	3.5%	12/31/1935	(\$5,790.55)
10	\$1,000	3.5%	12/31/ <mark>19</mark> 40	(\$5,461.53)

(Note: By default, Excel displays four-digit years for all dates, so ordinarily you should have noticed this problem right away. However, in this case it appears that you have changed your default year format to display two-digit years, just as I always do with Excel so that my dates fit in the default Excel column width.)

You can avoid this type of problem in the future simply by entering four-digit years instead of two-digit years, so Excel does not have to guess which century you mean. Another option is to adjust Excel's two-digit-year interpretation settings, as follows. In Windows 8's **Control Panel**, select **Region** (or **Clock, Language, and Region** and then **Region and Language** in Windows 7 or Vista), click the **Additional Settings** button, select the **Date** tab, and then in the **Calendar** area adjust the interpretation settings for two-digit years, as pictured below. You will then need to restart Excel.

Calendar When a two-digit y	ear is entered, interpret it as a year between:						
1930 and	1930 and 2029						
First day of week:	Sunday 🗸						

This adjustment will change the default way two-digit years are handled for all of your programs that abide by your Region settings (i.e., not just Excel but additional programs such as Access and Outlook as well).

TWO-DIGIT DATE PROBLEMS

Q. Help! I imported 140,000 rows of data into Excel with each row containing two-digit-year dates formatted as text, but I need to display four-digit-year dates. I've tried numerous approaches described on the internet, but none work for all my dates. Is there actually a way to convert two-digit-year dates into four-digit years?

A. Be aware that Excel has no way of knowing whether the date 03/21/10 refers to 1710, 1810, 1910 or 2010—so the solution you seek may be beyond the scope of Excel's capabilities, depending upon the date ranges you are working with. That said, presented below are five common formula-based approaches to solving your two-digit-year date problem, all of which fall short to a certain extent. (I've explained the shortcomings for each approach below.) You can download the Excel workbook (pictured below) containing these examples at www.CarltonCollins.com/2digits.xlsx.

	A	В	С	D	E	F	G
		1. REPLACE			1	1	
	ORIGINAL 2 DIGIT YEAR, TEXT-	RIGHT/	2. LEFT/LEN/				
1	BASED DATES	LEFT/LEN	RIGHT	3. SUBSTITUTE	4. TEXT	5. TEXT/DATE	
2	05/12/84	05/12/1984	05/12/1984	05/12/1984	12/05/1984	5/12/1984	
3	06/02/60	06/02/1960	06/02/1960	06/02/1960	02/06/1960	6/2/1960	
4	12/29/59	12/29/1959	12/29/1959	12/29/1959	29/12/1959	12/29/1959	
5	01/01/80	01/01/1980	01/01/1980	01/01/1980	01/01/1980	1/1/1980	
6	03/03/15	03/03/1915	03/03/1915	03/03/1915	03/03/2015	3/3/2015	
7	01/01/99	01/01/1999	01/01/1999	01/01/1999	01/01/1999	1/1/1999	
8							
9	Result, expressed as a value	05/12/1984	30814	30814	12/05/1984	30814	
10	_						
11	-						
12	_						
13	Here are the five approaches s	hown side-by-side:					
14	1. REPLACE RIGHT/LEFT/LEN	=REPLACE(RIGHT(A2,2),1,2,LEFT(A2,LE	EN(A2)-2)&19&RIG	HT(A2,2))		
15	2. LEFT/LEN/RIGHT	=(LEFT(B13,LEN(B1	l3)-2)&"19"&RIGHT	(B13,2))+0			
16	3. SUBSTITUTE	=SUBSTITUTE(A2,"	/","/19",2)+0				
17	4. TEXT	=TEXT(A2,"dd/mm/	/yyyy")				
18	5. TEXT/DATE	=DATE(RIGHT(TEX	T(A2,"dd/mm/yyyy"	,4),MID(TEXT(A2,"	dd/mm/yyyy"),4,2),	LEFT(TEXT(A2,"dd/r	nm/yyyy"),2))
19							

- 1. **REPLACE RIGHT/LEFT/LEN approach.** The lengthy formula =REPLACE(RIGHT(A2,2),1,2,LEFT(A2,LEN(A2)-2)&19&RIGHT(A2,2)) deconstructs the text date and then reconstructs that date using a four-digit year by inserting 19 in front of the two-digit year. Unfortunately, this formula approach returns the wrong date for all dates not occurring in the 1900s. This approach also results in a text-based result that is more difficult to sort and work with than date-based results.
- LEFT/LEN/RIGHT approach. Like solution No. 1 above, the formula =(LEFT(A2,LEN(A2)-2)&"19"&RIGHT(A2,2))+0 also inserts a 19 in front of the two-digit year to solve the problem; therefore this approach also returns the wrong date for all dates not occurring in the 1900s. However, this approach does result in a date-based answer, which is an improvement over solution No. 1.
- 3. **SUBSTITUTE approach.** Like the previous two approaches, the formula =SUBSTITUTE(A2,"/","/19",2)+0 also inserts a 19 in front of the two-digit year to solve the problem; hence this approach also returns the wrong date for all dates not occurring in the 1900s. However, this approach does result in a date-based answer and is a simpler solution than approach No. 2.
- 4. TEXT approach. The function =TEXT(A2,"dd/mm/yyyy") will display your two-digit years as four-digit years, but this approach adheres to the 1900 versus 2000 assumptions explained in the previous topic related. This approach returns a better result than the three previous approaches, but the results are still text-based—hence the results are more difficult to work with.
- 5. TEXT/DATE approach. The best solution is to use the TEXT approach described in the previous paragraph, coupled with the DATE function, which converts the text-based result to date-based result, as follows: =DATE(RIGHT(TEXT(A2,"dd/mm/yyyy"), 4),MID (TEXT(A2,"dd/mm/yyyy"),4,2),LEFT(TEXT(A2,"dd/mm/yyyy"),2)). This approach produces a date-based result that follows the assumptions you specify in Excel for handling two-digit years that occur before and after 29. However, you still face the basic

problem that Excel can't tell for sure whether two-digit years are supposed to refer to the 2000s, 1900s, 1800's or earlier.

3 WAYS TO CALCULATE INTERNAL RATE OF RETURN IN EXCEL

Q. I have prepared projections for a proposed project, and I want to calculate the internal rate of return. Instead of using Excel's IRR function, should I use simple math formulas so others can follow my calculations?

A. Excel offers three functions for calculating the internal rate of return, and I recommend you use all three. The problem with using math to calculate the internal rate of return is the necessary calculations are both complicated and time-consuming. Basically, a math-based solution involves calculating the net present value (NPV) for each cash flow amount (in a series of cash flows) using various guessed interest rates on a trial-and-error basis, and then those NPVs are added together.

This process is repeated using various interest rates until you find/stumble upon the exact interest rate that produces NPV amounts that sum to zero. The interest rate that produces a zero-sum NPV is then declared the internal rate of return.

To simplify this process, Excel offers three functions for calculating the internal rate of return, each of which represents a better option than using the math-based formulas approach. These Excel functions are IRR, XIRR, and MIRR. Explanations and examples for these functions are presented below. You can download the example workbook at carltoncollins.com/irr.xlsx.

1. Excel's IRR function. Excel's IRR function calculates the internal rate of return for a series of cash flows, assuming equal-size payment periods. Using the example data shown above, the IRR formula would be

D22	▼ : × √ fx	=XIRR(D2:D14	I,B2:B	314,1%)	
	А	В	C	D	Е
				Net Cash	
1		Dates		Flow	
2	Initial investment	12/31/16		(400,000)	
3	Cash flow - month 1	1/31/17		(18,000)	
4	Cash flow - month 2	2/28/17		(18,000)	
5	Cash flow - month 3	3/31/17		15,000	
6	Cash flow - month 4	4/30/17		38,000	
7	Cash flow - month 5	5/31/17		44,000	
8	Cash flow - month 6	6/30/17		48,000	
9	Cash flow - month 7	7/31/17		52,500	
10	Cash flow - month 8	8/31/17		55,000	
11	Cash flow - month 9	9/30/17		55,000	
12	Cash flow - month 10	10/31/17		55,000	
13	Cash flow - month 11	11/30/17		55,000	
14	Cash flow - month 12	12/31/17		55,000	
15					
16	Financing rate:			5.50%	
17	Reinvestment rate:			2.25%	
18					
19	Internal rate of return ca	Iculated usi	ng:		
20					
21			IRR	12.22%	
22		х	IRR	12.97%	
23		М	IRR	17.68%	
24					

=IRR(D2:D14,.1)*12, which yields an internal rate of return of 12.22%. However, because January has 31 days, and February has either 28 or 29 days, the monthly periods are not exactly the same length, therefore, the IRR will always return a slightly erroneous result when multiple monthly periods are involved.

- 2. Excel's XIRR function. Excel's XIRR function calculates a more accurate internal rate of return because it takes into consideration different-size time periods. To use this function, you must supply both the cash flow amounts as well as the specific dates in which those cash flows are paid. Many CPAs tend to prefer XIRR over IRR because yields slightly more accurate results. In the example pictured above, the XIRR formula would be =XIRR(D2:D14,B2:B14,.1), which yields an internal rate of return of 12.97%.
- 3. Excel's MIRR function. Excel's MIRR function (modified internal rate of return) works similar to the IRR function, except that it also considers the cost of borrowing the initial investment funds as well as compounded interest earned by reinvesting each cash flow. The MIRR tool is flexible enough to accommodate separate interest rates for borrowing and investing cash. Because the MIRR function calculates compound interest on project earnings or cash shortfalls, the resulting internal rate of return is usually significantly different from the internal rate of return produced by the IRR or XIRR functions. In the example above, the MIRR formula would be =MIRR(D2:D14,D16,D17)*12, which yields an internal rate of return of 17.68%.

Note: Some CPAs maintain that the MIRR function's results are less valid because a project's cash flows are rarely fully reinvested. However, clever CPAs can compensate for partial investment levels simply by adjusting the interest rate according to the expected levels of reinvestment. For instance, if it is assumed that reinvested cash flows will earn 3.0% but only half the cash flows are expected to be reinvested, then the CPA can use an interest rate of 1.5% (half of 3.0%) as the interest rate to compensate for the partial investment of cash flows.

Rather than worrying about which method produces the more accurate result, I believe the best approach is to include all three calculations (IRR, XIRR, and MIRR) so the financial reader can consider them all. A few comments about these calculations follow.

- Negative and positive cash flow values required. All three functions require at least one negative and at least one positive cash flow to complete the calculation. The first number in the cash flow series is typically a negative number that is assumed to be the project's initial investment.
- 2. Monthly versus annual yields. When calculating the IRR or MIRR of monthly cash flows, these two functions yields a result that must be multiplied by 12 to produce an annual yield; however, the XIRR function automatically produces an annual result that does not need to be multiplied. When calculating the IRR, XIRR, or MIRR of annual cash flows, the results do not need to be multiplied. (Because the XIRR function includes date ranges, it annualizes the results automatically.)
- 3. **Guess.** The IRR and XIRR functions allow you to enter a guess as the beginning rate where the function starts calculating incrementally, up to 20 cycles for the IRR function and 100 cycles for the XIRR function, until an answer within 0.00001% is found. If an answer is not determined within the allotted number of cycles, then the #NUM! error message is returned.

- 4. **The #NUM! error.** If the IRR function returns a #NUM! error value, or if the result is not close to what you expected, Excel's help files suggest you try again with a different value for your guess.
- 5. **If you don't enter a guess.** If you don't enter a guess for the IRR or XIRR functions, Excel assumes 0.1, or 10%, as the initial guess.
- 6. **Dates.** The dates you enter must be entered as date values, not text, for the XIRR function to accurately use those dates.

EXCEL'S EVALUATE FORMULA TOOL

Q. I've accepted a new job at a property management company that uses an Excel worksheet to calculate agent bonuses for each lease agreement executed. The bonus calculation (pictured below) seems to work correctly, but the formula is so complicated (circled in red below), I can't follow it. Any suggestions?

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Fi	ile Hom	e Insert	Page Layou	t Formulas	Data	Review	View	Develop	er Q	Tell me	R	<u></u>
C11 • : X • f _x = iF(C7>1100,\$A13,0)+iF(C8>12,\$A14,0)+iF(C9>=C7,\$A15, 0)+iF(C10>700,\$A16,0)+iF(C6-C5<35,\$A17,0)+iF(AND(C7> 1100,C8>12,C9>=C7,C10>700,C6-C5<35),250,0)										5, />		
	Α			В					C			
1	Agent's	month	nly bonu	s calcula	tions							
2	Re	al estate	agent				Mi	Mike N				
3	Te	nnants					Ph	Phil & Betty Slobin N				
4	Pre	operty ad	ldress				11	1154 Rosebud Circle, Duluth, GA 4				
5	Da	te prope	rty placed	on market	:			6/12/17				
6	Me	ove in da	te per leas	e agreeme	nt						7/1/17	<u> </u>
7	M	onthly re	nt amount								1,350	\square
8	Lei	ngth of re	ental agree	ement (in r	nonth	5)					36	<u>i </u>
9	De	posit am	ount								1,350	
10	0 Tennant's credit rating										715	
11											750	
12	()	Sheet1	Sheet2	(\pm)			÷ 4					
Rea	dy 🔝			-		=	Ξ			-	+ 1	00%

A. A good approach to understanding complicated Excel formulas is to dissect them using Excel's Evaluate tool, as follows. Select the complicated formula, and then from the **Formula** tab, select **Evaluate Formula** to produce the dialog box pictured below.

Evaluate Formula			?	\times	
Reference: Sheet2!\$C\$11	Evaluation: = IF(<u>C7</u> >1100,\$A13 (C10>700,\$A16,0 >12,C9>=C7,C10	,0)+IF(C8>12,\$A14,0)+IF(C9)+IF(C6-C5<35,\$A17,0)+IF()>700,C6-C5<35),250,0)	9> = C7, \$A15,0) + IF AND(C7> 1100, C8		
To show the result of the underlined expression, click Evaluate. The most recent result appears italicized.					
	<u>E</u> valuate	Step In Step	Out <u>C</u> los	e	

Next, click the **Evaluate** button repeatedly to step through the complex calculation one step at a time. This will enable you to carefully study each step of the formula's mathematical progression from start to finish, which hopefully will aid your understanding. In this example, it takes 71 separate mathematical steps for Excel to complete the calculations contained within this one formula, so it's easy to understand why you struggled to understand it. I don't have room to show all 71 steps, but pictured below are the **Evaluate Formula** tool's mathematical progression for the 25th, 50th, and 70th steps, to give you an idea as to how the tool works.

	E <u>v</u> aluation:
=	300+IF(<u>715>700</u> ,\$A16,0)+IF(C6-C5<35,\$A17,0)+IF(AND(C7 >1100,C8>12,C9>=C7,C10>700,C6-C5<35),250,0)
	25th step
	E <u>v</u> aluation:
=	500+IF(AND(TRUE, TRUE, C9> = C7, C10>700, C6-C5<35), 250, 0)
	50th step
	E <u>v</u> aluation:
=	500+250
	70th step

With each subsequent click of the **Evaluate** button, another small part of the formula is revealed until, ultimately, the entire formula is solved. After studying the formula a few times using the **Evaluate Formula** tool, I was able to grasp the formula's intent, which is to calculate up to six possible bonuses for each lease agreement transaction executed by your sales agents, and then add them together. Those six bonus calculations are as follows:

Bonus 1 - \$100 if the agreed-upon rental rate exceeds \$1,100.

- Bonus 2 \$100 if length of lease exceeds 12 months.
- Bonus 3 \$100 if the deposit received is equal to or greater than one month's rent.
- Bonus 4 \$100 if the tenant's credit rating exceeds \$700.
- Bonus 5 \$100 if the property remains vacant for less than 35 days.
- Bonus 6 \$250 if all 5 bonuses mentioned above are earned.

As a result, leasing agents can earn up to \$750 in bonuses for each executed lease agreement they negotiate, if all the company's favorable conditions are met. I concur that the formula works properly, but it contains embedded assumptions, which is never a good idea. Further, the formula is overly complicated and should be simplified. I have found that many people write complicated formulas like this one in a single cell, when it would likely be easier to write several simpler calculations across multiple cells. Pictured below is an example of how I would restructure this bonus calculation so others could more easily follow, review, and edit this worksheet in the future.

D12		▼ : × ✓ f _x =IF(D7>1100,\$A12,0)					
	А	В	С	D	E		
1 Ag	1 Agent's monthly bonus calculations						
2		Real estate agent		Mike	Sandra	N	
3		Tennants		Phil & Betty Slobin	Porter Montgomery	N	
4		Property address		1154 Rosebud Circle, Duluth, GA	52 Flippen Trail, Suwanee, GA	4:	
5		Date property placed on market		6/12/17	6/15/17		
6		Move in date per lease agreement		7/1/17	6/30/17		
7		Monthly rent amount		1,350	1,200		
8		Length of rental agreement (in months)		36	18		
9		Deposit amount		1,350	1,000		
10		Tennant's credit rating		715	755		
B	onus		Criteria				
11 am	nount	Bonus description	amount				
12 \$	\$100	Bonus 1 if rental >\$1,100	1100	100	100		
13 \$	\$100	Bonus 2 if length of lease > 12 months	12	100	100		
14 \$	\$100	Bonus 3 if deposit received => one month's rent		100	0		
15 \$	\$100	Bonus 4 if credit rating > 700	700	100	100		
16 \$	\$100	Bonus 5 if property vacant less than 35 days	35	100	=IF(D7>C12,\$A12,0)		
17 \$	\$250 Bonus 6 if all 5 bonuses are earned		250	0 ====================================			
18		Total Bonus		750	=IF(D9>=D7,\$A14,0)		
.9			=IF(D10>C15,\$A15,0)				
				=IF(D6-D5 <c16,\$a16,0)< td=""><td></td></c16,\$a16,0)<>			
					=IF(SUM(D12:D16)=SUM(A12	:A1	
					=SUM(D12:D17)		

As you can see, I have replaced the single complicated formula (formerly in cell D11) with 27 separate cells (on rows 11 through 18), including bonus amounts, bonus descriptions, bonus criteria, formulas, and column titles. The resulting worksheet is easier to follow, and writing the six separate formulas was surely much easier and faster than creating the single gigantic formula. In addition, instead of embedding the bonus and criteria amounts in the complicated formula, I have broken those values out into separate cells for easier review and editing. I've also added yellow background and border highlights to those cells where assumptions are entered, to make it easier for others to follow and use the worksheet in the future. While the **Evaluate Formula** tool is useful, I would advise CPAs to design their worksheets in such a way that others will have

no need to use the **Evaluate Formula** function to follow their work. You can download this workbook at <u>www.CarltonCollins.com/Evaluate.xlsx</u>.

A FORMULA FOR GOING GREEN

Q. Is there a way to conditionally format Excel so that my formulas automatically display a different font color?

A. You can color-code your formulas using Excel's conditional formatting tool as follows. Select a single cell (*such as cell A1*). From the **Home** tab, select **Conditional Formatting**, **New Rule**, and in the resulting **New Formatting Rule** dialog box, select **Use a formula to determine which cells to format**. In the resulting **Format values where this formula is true** box, enter the formula =ISFORMULA(A1) (*make sure that no dollar signs appear in the formula*). Click the **Format** button (*near the lower-right portion of the dialog box*) and select a desired color from the color dropdown *box* (*I have selected green in the example below*), and then click **OK**, **OK**. (*Note: I also selected Bold from the Font style box so the formulas would stand out a little more*).

Edit Format	ting Rule	?	×		
<u>S</u> elect a Rule	: Type:				
🛏 Format a	Il cells based on their values				
🛏 Format o	only cells that contain				
🛏 Format o	only top or bottom ranked values				
🛏 Format o	only values that are above or below average	2			
🛏 Format o	only unique or duplicate values				
🛏 Use a fo	rmula to determine which cells to format				
Edit the Rule Description: Format values where this formula is true:					
=ISFORMULA(A1)					
Preview:	AaBbCcYyZz	<u>F</u> ormat	t		
	OK	Cano	el.		

In this example, we have now successfully applied conditional formatting to cell A1, which will display a bold, green font whenever a formula is entered into cell A1. Next, to apply this formatting to the entire worksheet, select cell A1, right-click cell A1, click the **Format Painter** tool icon, and then click the upper-left corner of the worksheet (*in the row and column heading area*) to apply this format to the entire worksheet. Thereafter, your entire worksheet will highlight all formulas using a bold, green font, an example of which is pictured below.

	Α	В	С	D	E
1					
2	2015	Jan	Feb	Mar	Totals
3	Dept 1	432	475	887	1,794
4	Dept 2	433	755	814	2,001
5	Dept 3	862	425	288	1,575
6	Dept 4	487	36	467	990
7	Dept 5	482	543	28	1,053
8	Dept 6	542	16	413	971
9	Dept 7	575	979	983	2,536
10	Dept 8	651	54	964	1,668
11	Dept 9	129	820	19	967
12	Dept 10	502	543	777	1,822
13		5,094	4,645	5,638	15,377
14					

You can download this example workbook at carltoncollins.com/formulacolor.xlsx.

PUT THIS CHART ON YOUR RADAR

Q. Our company is in the process of interviewing, evaluating, and hiring a group of new employees, using a detailed checklist and interviewer rating system. Now that we have all this data, is there a visual method for comparing how well-rounded one candidate is compared to another candidate?

A. Excel can produce a filled radar chart, which can be useful for comparing a multitude of attributes across multiple items, and the visual results may be the solution you seek. To illustrate this type of chart, I prepared sample data consisting of 12 measurements for three prospective employees (Ben, Sally, and Fred), and I arbitrarily assigned scores to each employee, as pictured below. (I used a Concatenate formula to include the scores totals in the column heading; for example, cell C1 contains the formula ="Ben ("&C14&")". This trick enables each employee's score total to be reflected in the resulting charts pictured farther below.)

	Α	В	С	D	E
1		Measurement Points	Ben (885)	Sally (793)	Fred (717)
2	1	Grade Point Average Overall	82	95	55
3	2	Grades in Major Course Work	77	89	33
4	3	Personality	82	44	90
5	4	Leadership Qualities	92	39	55
6	5	Quality of University	42	92	54
7	6	Personality	72	48	89
8	7	Long Range Outlook	44	74	23
9	8	Company Fit	55	50	69
10	9	Communication Skills	88	42	95
11	10	Likability Factor	92	77	77
12	11	Intangibles	77	63	27
13	12	Dedication and Drive	82	80	50
14			885	793	717

To create the first radar chart, I selected the list of measurement points in column B and the scores for **Ben** in column C (cell range B1 through C13 in this example), then from the **Insert** tab, I selected the **Filled Radar** chart option, as pictured below.



With the chart still selected, from the **Chart Tools** menu, I then applied the **Style 5** chart formatting from the **Chart Styles** box to produce a dark gray background with light blue area formatting, and I formatted the gridlines as solid lines. I repeated the process for Sally and Fred to produce side-by-side radar charts for all three candidates, which may help to visually tell the story of each candidate's strengths and weakness.



Presumably, a more circular area infers a better-rounded candidate, but only if all measurement attributes are weighted equally. In the end, remember that computers aren't intelligent (they only think they are), and because many additional factors should be considered, your final selections should be based on more than the shape of a simple computer chart. You can download this radar chart example at carltoncollins.com/radar.xlsx.



Bio for J. Carlton Collins, CPA

ASA Research <u>Carlton@ASAResearch.com</u> 770.842.5902

J. Carlton Collins, CPA is a Certified Public Accountant with experience in technology, tax, auditing, accounting systems, financial reporting, and bond financing. He is an author, lecturer, and technology & accounting systems consultant. He has published books, articles, and web pages and is the author of the monthly technology Q&A column for the <u>Journal of Accountancy</u>. As a public speaker, Mr. Collins has delivered more than 2,000 lectures in 44 states and 5 countries addressing more than 500,000 CPAs and

business professionals. As a consultant, Mr. Collins has assisted 275+ large and small companies with the selection and implementation of accounting systems. Mr. Collins has a Bachelor's degree in Accounting from the University of Georgia, is a 25+ year member of the American Institute of CPAs and the Georgia Society of CPAs, and is also a licensed realtor.

Summary of Selected Positions, Awards & Accomplishments:

- 1. Top rated author for the world's largest professional organization's national journal (73 months running)
- 2. Author of the monthly Technology Q&A column for the Journal of Accountancy.
- 3. Member of the 2016 AICPA Executive Roundtable.
- 4. Serves on the GSCPA Executive Council's Nominating Committee.
- 5. Honored as one of the CPA Industries Top 25 Thought Leaders by CPA Technology Advisor Magazine
- 6. Recipient of the 2012 AICPA "Lawler Award for Excellence in Professional Writing".
- 7. Recipient of the AICPA's "Lifetime Technical Contribution to the CPA Profession Award".
- 8. Chairman of the Southeast Accounting Show the South's largest CPA event.
- 9. Recipient of the Tom Radcliff Outstanding Discussion Leader Award.
- 10. Named "Top Ten CPA Technologists" by <u>Accounting Technologies Magazine (multiple years)</u>.
- 11. Named "Top 100 Most Influential CPAs" by Accounting Technologies Magazine (multiple years).
- 12. Has delivered more than 2,600 technology lectures around the world.
- 13. Recipient of the "Outstanding Discussion Leader Award" from the Georgia Society of CPAs.
- 14. Lead author for PPC's Guide to Installing Microcomputer Accounting Systems.
- 15. Has installed accounting systems for more than 200 companies.
- 16. Chairperson of the AICPA Technology Conference.
- 17. Recipient of the ACCPAC Partner of the Year Award.
- 18. Determined by SAP to be the country's "8th Most Influential ERP Systems Consultant".
- 19. Has delivered keynote and session lectures at dozens of accounting software conferences.
- 20. Sworn in as a Certified Public Accountant on September 18, 1985.
- 21. Member of the American Institute of CPAs since 1985.
- 22. Member of the Georgia Society of CPAs since 1982.

As an auditor, Mr. Collins has audited businesses in the areas of health care, construction, distribution, automobile dealerships, insurance, manufacturing, and general business. Mr. Collins' tax experience includes corporate, individual, partnership, fiduciary, and estate tax planning work. In the area of finance, Mr. Collins has prepared (or assisted in preparing) feasibility studies and financial forecasts for nearly 300 projects seeking more than \$3 billion in startup capital. Mr. Collins is familiar with bond issues, Medicare and Medicaid reimbursement, and conventional financing matters. In 1992, Mr. Collins contributed and demonstrated more than 500 pages of suggested design improvements to the Microsoft Excel development team of programmers - and many of those improvements are found in Excel today.

At the University of Georgia, Mr. Collins was elected President of the Phi Eta Sigma Honor Society, was initiated into the BIFTAD Honor Society, served three years in the Judicial Defender/Advocate program, and was a member of Alpha Tau Omega fraternity. At Glynn Academy High School, Mr. Collins was Senior Class President, Class Valedictorian (1 of 6), and received a principle nomination to Annapolis Naval Academy. Mr. Collins has been married for 32 years and has two children. He devotes his leisure time to family, travel, tennis, fishing, snow skiing, and riding motorcycles (both dirt and street). Mr. Collins is past president of his homeowner's association, Treasurer for the Fields Club Board, participates in the Gwinnett Clean and Beautiful program, and volunteers for Cooperative Ministries food drive.