HR DATA ANALYTICS

WORKSHOP NOTES

O'BRIAN EBANKS

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Data Analytics

Data Analytics is the process of organizing raw data to be able to make meaningful decisions out of the information. When used, data analytics can contribute to the optimization of performance all areas of a business.

Data Analytics comes in many forms, from complex and often expensive artificial intelligence systems to less expensive and readily available techniques using Microsoft Excel.

Data analytics is used to reveal trends using metrics on large volumes of data that can often get lost. It provides insights and helps, in a meaningful way, to make strategic decisions in many areas. In manufacturing, it may be used to determine the efficiency of a production line, or influence what to produce next based on logistical data and consumer need. In Sales it can be used to determine how to upsell to a customer based on purchasing habits. In Marketing it can be used to determine the effect of a marketing campaign on a brand or how to get a customer o like a product or click a link. In HR it can be used to determine talent retention rate, recruitment efficiency, profit per employee and the effectiveness of employee engagement efforts.

Types of Data Analytics

Data analytics is broken down into four basic types. (Frankenfield, 2019)

- **Descriptive analytics** describes what has happened over a given period of time. Have the number of views gone up? Are sales stronger this month than last?
- **Diagnostic analytics** focuses more on why something happened. This involves more diverse data inputs and a bit of hypothesizing. Did the weather affect beer sales? Did that latest marketing campaign impact sales?
- **Predictive analytics** moves to what is likely going to happen in the near term. What happened to sales the last time we had a hot summer? How many weather models predict a hot summer this year?
- **Prescriptive analytics** suggests a course of action. If the likelihood of a hot summer is measured as an average of these five weather models is above 58%, we should add an evening shift to the brewery and rent an additional tank to increase output.

Current Best Practices (Beall)

Realize there is no silver bullet, but don't do nothing.

Building an analytics culture and putting the ecosystem together takes time. It's important not to try to boil the ocean. However, it's also important not to ignore the work and simply hope success will magically happen. Companies that are measuring value with analytics are taking risks, experimenting, and finding success. It may take time.

Start with a proof of concept.

Companies succeeding with analytics often start with a model using data they are already measuring, so they can demonstrate that they can predict that model.

If you have not been collecting data, start by asking one question (this can be based on the business strategy) then look at what data would need to collect to answer the question.

Take training seriously.

Think about the skills you will require for data management, as well as the skills to build your metrics and deal with your data. With statisticians and other quants in short supply, think about what skills you'll need for the kinds of metrics you want to build. Part of the process is balancing the costs and benefits of what you are considering. Allocate your resources wisely. Training will become an important part of your next-generation strategy.

Act on your data.

Analytics without action won't yield measurable impact. Even if you aren't ready to operationalize your analysis, it makes sense to start implementing a process to act, even if it's manual action. You'll be building a more analytically driven culture.

Build a center of excellence.

A CoE can be a great way to make sure that the infrastructure and analytics you implement are coherent. CoEs can help you disseminate information, provide training, and establish or maintain governance.

Remember to monitor your analysis.

Data can get stale. Data models can get stale. It's important to revisit any kind of analysis where action is taking place on a periodic basis to make sure that your data is still relevant and that your model still makes sense.

Top Five HR Metrics (OtterSense Team, 2017)

Revenue Per Employee	•Revenue / # Employees
Employee Net Promoter Score (eNPS)	•% who are promoters — % who are detractors
Early Turnover Rate	•# employees who left within the last 12 months/ # of new hires over the last 12 months.
Overall Turnover Rate	•# employees who leave / # employees at the beginning of the period
Time to Fill	•Average of the # days between job posting to an offer signed

Readily Available Business Software – Introduction to Microsoft Excel

The Ribbon Menu

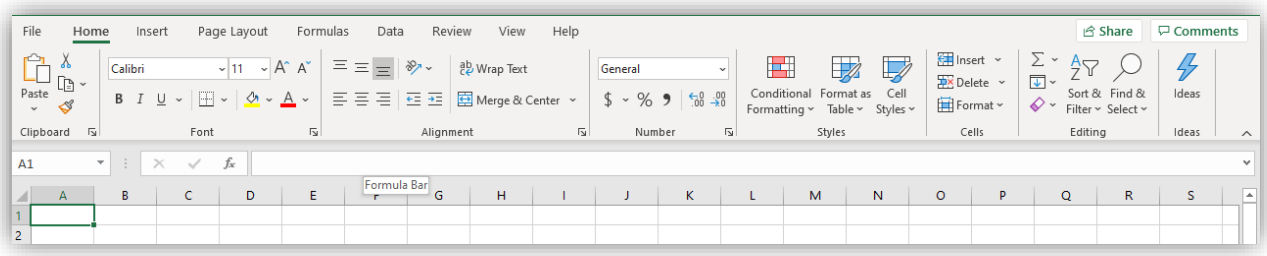

FIGURE 1 THE HOME MENU

The home menu contains the most used tools. It is where tools such as:

- Conditional formatting
- Number formatting
- Quick access functions such as sum and average
- Sort and filter data arrays

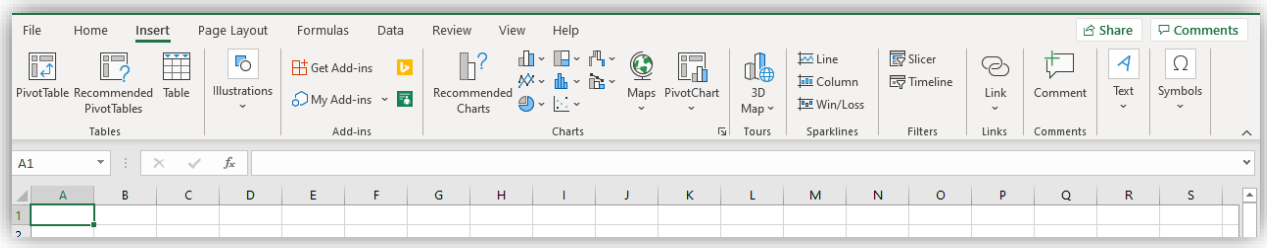

FIGURE 2 THE INSERT MENU

The insert menu contains objects that add functionality and interest to excel. Every item selected from the insert menu will generate its own specific menu bar. The insert menu contains items such as:

- Pivot tables
- Tables
- Pictures
- SmartArt
- Graphs and charts

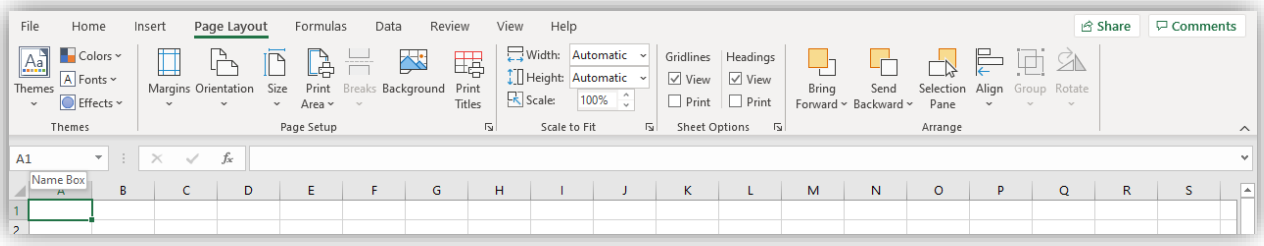

FIGURE 3 THE PAGE LAYOUT MENU

The page layout menu is all about printing. It contains tools such as:

- Page orientation
- Margins
- Scale to fit
- Print titles

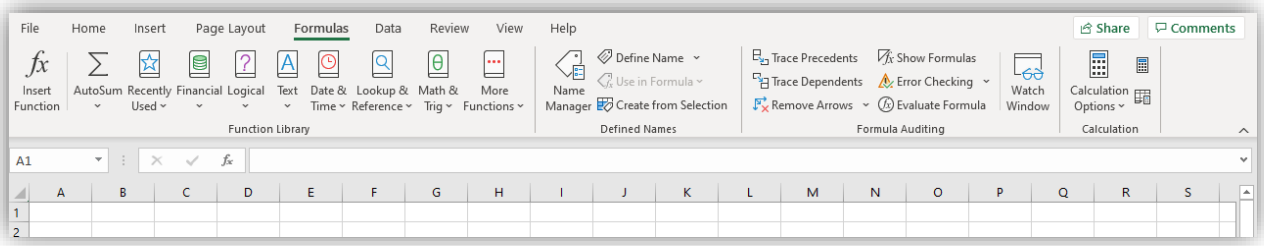

FIGURE 4 THE FORMULAS MENU

The formulas menu contains a summary of the functions that are currently available in excel nicely categorized by function type. Some of the common function categories are:

- Logical
- Text
- Date and time
- Lookup and reference

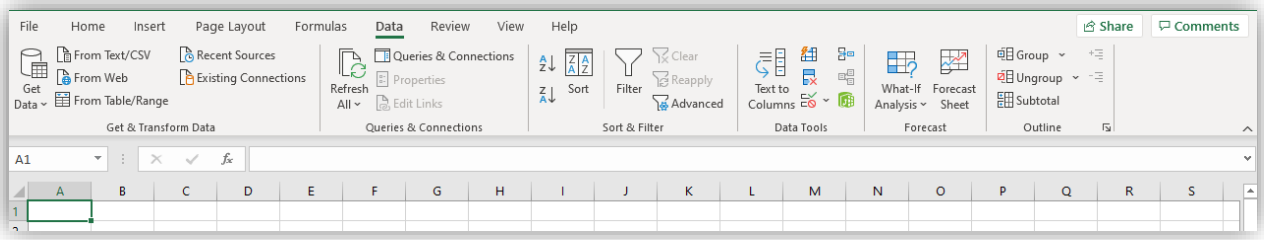

FIGURE 5 THE DATA MENU

The data menu has the data capture and transformation tools. It has very powerful tools such as:

- Get Data
- Sort and Filter (Also found on the home menu, it is that important)
- Text to column
- Data validation

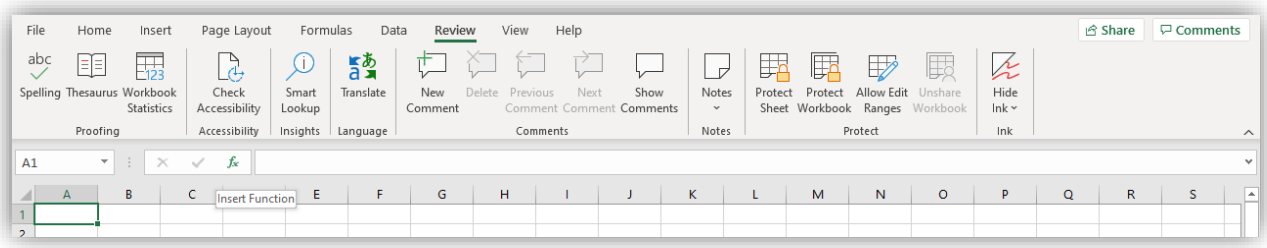

FIGURE 6 THE REVIEW MENU

The review menu is used for review or commenting on the spreadsheet. It has powerful and sometimes underutilized tools such as:

- Spell Check
- Comments and Notes
- Protect Sheet and Workbook

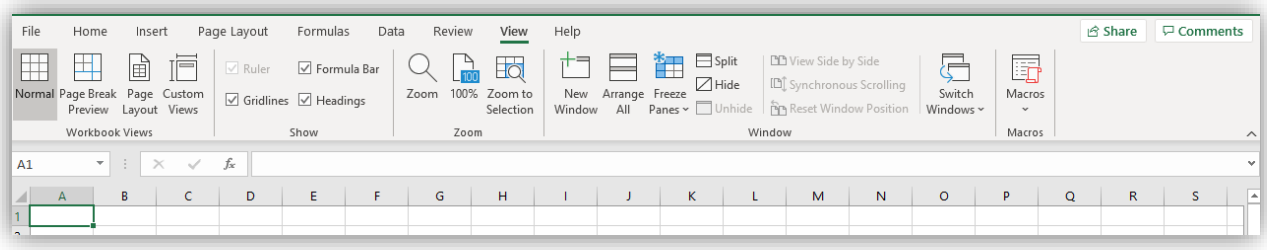

FIGURE 7 THE VIEW MENU

The view menu is all about what is seen on the screen. It is how excel is viewed on a monitor and adding features that help improve interactions with excel at a point in time. It has menu items such as:

- Page break view
- Page layout view
- Freeze Panes
- Zoom

Filling a series

Say you want to fill column A, starting in cell A2, with the values 1, 2, and so on up to 1000. There is an easy way.

To fill a column range with a series:

Enter the first value in the first cell (1 in cell A2). With the cursor in the starting cell (A2), use the menu item Edit/Fill/Series to obtain a dialog box. Change the Row setting to Column, make sure the Type setting is Linear, make sure 1 is in the Step Value box, enter the final value (1000) in the Stop Value box, and click on OK.

As you can guess from this dialog box, many other options are possible. Don't be afraid to experiment with them.

Try it! The series of days in column A should go from 1 to 25, in column D it should go from 26 to 50.

Day	Sales	Day	Sales
	$227		$167
	$157		$107
	$143		$255
	$129		$113
	$102		$186
	$116		$124
	$269		$271
	$111		$288
	$210		$273

FIGURE 8 FILL SERIES

Autofill Options

Automatically repeat values that already exist in the column

If the first few characters that you type in a cell match an existing entry in that column, Excel automatically enters the remaining characters for you. Excel automatically completes only those entries that contain text or a combination of text and numbers. Entries that contain only numbers, dates, or times are not automatically completed.

After Excel completes what you started typing, do one of the following:

- To accept a proposed entry, press Enter.

The completed entry exactly matches the pattern of uppercase and lowercase letters of the existing entry.[1]

- To replace the automatically entered characters, continue typing.
- To delete the automatically entered characters, press Backspace.

Turn Automatic Completion of Cell Values On or Off

If you don't want Excel to automatically complete cell values, you can turn off this feature.

[1] Excel completes an entry only when the cursor is at the end of the current cell contents.

Excel bases the list of potential AutoComplete entries on the column that contains the active cell. Entries that are repeated within a row are not automatically completed.

1. Click the **File** tab, and then click **Options**.
2. Click **Advanced**, and then under **Editing options**, select or clear the **Enable AutoComplete for cell values** check box to turn automatic completion of cell values on or off.

Fill Data into Adjacent Cells by Using the Fill Handle

To quickly fill in several types of data series, you can select cells and drag the fill handle  . To use the fill handle, you select the cells that you want to use as a basis for filling additional cells, and then drag the fill handle across or down the cells that you want to fill.

By default, the fill handle is displayed, but you can hide it, or show it if it's hidden.

After you drag the fill handle, the **Auto Fill Options** button is displayed. If you don't want to display the **Auto Fill Options** button every time that you drag the fill handle, you can turn it off. Likewise, if the **Auto Fill Options** button does not appear when you drag the fill handle, you might want to turn it on[2].

Drag the fill handle to fill data into adjacent cells

1. Select the cells that contain the data that you want to fill into adjacent cells.
2. Drag the fill handle across the cells that you want to fill.
3. To change how you want to fill the selection, click **Auto Fill Options**  , and then click the option that you want.

For example, you can choose to fill just cell formats by clicking **Fill Formatting Only**, or you can choose to fill just the contents of a cell by clicking **Fill Without Formatting**.

Note: If you drag the fill handle up or to the left of a selection and stop in the selected cells without going past the first column or the top row in the selection, Excel deletes the data within the selection. You must drag the fill handle out of the selected area before releasing the mouse button.

Turn Auto Fill Options on or off

1. Click the **File** tab, and then click **Options**.
2. Click **Advanced**, and then under **Cut, copy, and paste**, select or clear the **Show Paste Options button when content is pasted** check box to turn this option on or off.

Fill data into adjacent cells by using the Fill command

You can use the **Fill** command to fill the active cell or a selected range with the contents of an adjacent cell or range.

1. Do one of the following:

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[2] **Show or hide the fill handle**

1. Click the **File** tab, and then click **Options**.
2. Click **Advanced**, and then under **Editing options**, select or clear the **Enable fill handle and cell drag-and-drop** check box to show or hide the fill handle.
3. To avoid replacing existing data when you drag the fill handle, make sure that the **Alert before overwriting cells** check box is selected. If you don't want to see a message about overwriting nonblank cells, you can clear this check box.

- To fill the active cell with the contents of an adjacent cell, select an empty cell that is below, to the right, above, or to the left of the cell that contains the data that you want to use to fill the empty cell.
- To fill multiple adjacent cells, select the cell with the contents you want to fill and the adjacent cells into which you want to fill the content.

2. On the **Home** tab, in the **Editing** group, click **Fill**, and then click **Down**, **Right**, **Up**, or **Left**.

To quickly fill a cell with the contents of an adjacent cell, you can press Ctrl+D to fill from the cell above or Ctrl+R to fill from the cell to the left.

Fill formulas into adjacent cells

1. Select the cell that contains the formula that you want to fill into adjacent cells.
2. Drag the fill handle  across the cells that you want to fill.
3. To choose how you want to fill the selection, click **Auto Fill Options**  , and then click the option that you want.

Note: If automatic workbook calculation is not enabled, formulas will not recalculate when you fill cells. To check your workbook calculation options, do the following:

4. Click the **File** tab.
5. Under **Excel**, click **Options**, and then click the **Formulas** category.
6. Under **Calculation options**, look under **Workbook Calculation**.
    - **Automatic** Formulas automatically recalculate.
    - **Automatic except for data tables** Formulas recalculate, unless the formula is in a data table.
    - **Manual** Formulas never recalculate automatically.
    - **Recalculate workbook before saving** This option is available only if **Workbook Calculation** is set to **Manual**. If this check box is selected, formulas do not automatically recalculate until you save the workbook. Note that several other actions can cause the workbook to be saved, such as using the **Send To** command.

Fill in a series of numbers, dates, or other built-in series items

You can quickly fill cells in a range with a series of numbers or dates, or with a built-in series for days, weekdays, months, or years by using the fill handle or the **Fill** command.

Fill cells with a series by using the fill handle

1. Select the first cell in the range that you want to fill.
2. Type the starting value for the series.
3. Type a value in the next cell to establish a pattern.

For example, if you want the series 1, 2, 3, 4, 5..., type **1** and **2** in the first two cells. If you want the series 2, 4, 6, 8..., type **2** and **4**. If you want the series 2, 2, 2, 2..., you can leave the second cell blank.

4. Select the cell or cells that contain the starting values.
5. Drag the fill handle  across the range that you want to fill.

To fill in increasing order, drag down or to the right. To fill in decreasing order, drag up or to the left.

Note:

6. You can also specify the type of series by using the right mouse button to drag the fill handle over the range and then clicking the appropriate command on the shortcut menu. For example, if the starting

value is the date JAN-2007, click **Fill Months** for the series FEB-2007, MAR-2007, and so on; or click **Fill Years** for the series JAN-2007, JAN-2008, and so on.

7. If the selection contains numbers, you can control the type of series that you want to create.
8. You can suppress series **AutoFill** by holding down Ctrl as you drag the fill handle of a selection of two or more cells. The selected values are then copied to the adjacent cells, and Excel does not extend a series.

MS Excel Functions

Using the summation button

The SUM function is used so often to sum across rows or columns that a toolbar button (the Σ button) is available to automate the procedure. To illustrate its use, suppose you have a table of numbers in the range B3:E7. You want the row sums to appear in the range F3:F7, and you want the column sums to appear in the range B8:E8. It's easy.

To produce row and column sums with the summation button:

Select the range(s) where you want the sums (F3:F7 and B8:E8–remember how to select multiple ranges), and click on the summation button.

Note that if you select multiple cells, you get the sums automatically. If you select a single cell (such as when you have a single column of numbers to sum), you'll be shown the sum formula "for your approval" and you'll have to press Enter to actually enter it. Why does Excel do it this way–your guess is as good as ours!

Try it! Use the summation button to fill in the row and column sums.

51	94	15	7
37	6	2	41
13	83	29	88
73	64	46	32
38	11	3	80

Using range names

Range names are extremely useful for making your formulas more understandable. After all, which formula makes more sense: =B20-B21 or =Revenue-Cost? Efficient use of range names takes some experience, but here are a few useful tips.

To create a range name:

Select a range that you want to name. Then type the desired range name in the upper left "name box" on the screen. (This box is just above the column A heading. It usually shows the cell address, such as E13, where the cursor is.)

You could go through the Insert/Name/Define menu item, but typing in the name box is quicker and more intuitive. By the way, range names are not case sensitive. For example, Revenue, revenue, and REVENUE can be used interchangeably.

Try it! Name the rectangular range containing the numbers Data.

71	31	9	69	5
15	74	46	84	27
14	49	25	38	83
40	43	20	75	83
28	72	30	92	75
41	56	90	89	73
28	81	43	81	61

To delete a range name:

Use the Insert/Name/Define menu item. This shows a list of all range names in your workbook. Click on the one you want to delete, and then click on the delete button.

Try it! The numerical range is currently named Data. Delete this range name and then rename the range Database.

15	86	50	41	21
63	18	10	1	9
14	52	16	18	65
89	88	28	72	7
15	28	57	92	2
29	90	86	100	83
10	82	100	65	4

Suppose you have the labels Revenue, Cost, and Profit in cells A20, A21, and A22, and you would like the cells B20, B21, and B22 (which will contain the values of revenue, cost, and profit) to have these range names. Here's how to do it quickly.

To create range names from adjacent labels:

Select the range consisting of the labels *and* the cells to be named (A20:B22). Then use the Insert/Name/Create menu item, make sure the appropriate box (in this case, Left Column) is checked, and click on OK.

Excel tries (usually successfully) to guess where the labels are that you want to use as range names. If it guesses incorrectly, you can always override its guess.

Try it! Name the ranges A3:A8, B3:B8, and so on according to the labels in row 2.

Month	UnitsSold	UnitPrice	Revenue
Jan	100	$1.25	$125.00
Feb	150	$1.25	$187.50
Mar	200	$1.40	$280.00
Apr	230	$1.40	$322.00
May	200	$1.50	$300.00
Jun	300	$1.50	$450.00

Sometimes you have entered a formula using cell addresses, such as =B20-B21. Later, you name B20 as Revenue and B21 as Cost. The formula does *not* change to =Revenue-Cost automatically. However, you can make it change (and hence become more readable).

To apply range names to an existing formula:

Select the cell (or range of cells) with the formula(s). Then use the Insert/Name/Apply menu item, highlight any relevant range names for the formula(s) involved, and click on OK.

Try it! Apply the names of the cells B2 and B3 to the formulas in row 7.

Fixed cost	$50			
Variable cost	$2			
Month	Jan	Feb	Mar	Apr
Units produced	224	194	228	258
Total cost	$498	$438	$506	$566

To see a list of all range names and check which ranges they apply to:

Click on the down arrow at the right of the name box and click on any of the range names you see. That range will then be selected automatically.

Try it! There are five named ranges below. Locate them.

73		4	28		
92		29	10		
31		38	35		
60		2	40		
49		45	5		
22		12	44		
39		6	21		
88					
98	Junk	Junk	Junk	Junk	

Sometimes it is straightforward to use range names in formulas. For example, if B20 is named Revenue and B21 is named Cost, then entering the formula =Revenue-Cost in, say, cell B22 is a natural thing to do. But consider this situation. The range B3:B14 contains revenues for each of 12 months, and its range name is Revenues. Similarly, C3:C14 contains costs, and its range name is Costs. For each month you want that month's revenue minus cost in the appropriate cell in column D. You will get it correct if you select the range D3:D14, type the formula =Revenues-Costs, and press Ctrl-Enter. If you click on any cell in this range, you'll see the formula =Revenues-Costs.

This can be confusing. How does Excel know that the formula in D3, for example, is really =B3-C3? Let's just say that it's smart enough to figure this out. If it confuses *you*, however, you can always enter =B3-C3 and copy it down. Then you're safe, but you've lost the advantage of range names!

Try it! Enter the formula for all of D3:D14 using range names. (If you like, calculate profits again in column E in the usual way, without range names.)

Revenues	Costs	Profits
$1,600	$1,400	
$2,000	$1,800	
$2,100	$1,800	
$2,900	$2,800	
$500	$400	
$1,700	$1,500	
$2,000	$1,900	
$2,500	$2,300	

Useful functions

There are many useful functions in Excel. You should become familiar with the ones most useful to you (for example, financial analysts should learn the financial functions), but here are a few everyone should know. (By the way, we capitalize the names of these functions just for emphasis. However, they are *not* case sensitive. You can enter SUM or sum, for example, with the same result.)

To use the SUM function:

Enter the formula =SUM(*range*), where *range* is any range. This sums the numerical values in the range.

Actually, it is possible to include more than one range in a SUM formula, so long as they are separated by commas. (This can also be done with the COUNT, COUNTA, AVERAGE, MAX, and MIN functions discussed below.) For example, =SUM(B5,C10:D12,Revenues) is allowable (where Revenues is a name for some range). The result is the sum of the numerical values in *all* these ranges combined. Note that if any cells in any of these ranges contain a label (not a number), it is ignored in the sum.

Try it! Use the SUM function in cell B10 to calculate the total of all costs.

Table of costs for units produced in one month (along side)
for use in another month (along top)

	Feb	Mar	Apr	May
Jan	$5,000	$5,500	$4,400	$3,900
Feb		$6,100	$5,400	$4,700
Mar			$4,300	$6,900
Apr				$4,900
Total cost				

To use the COUNT function:

Enter the formula =COUNT(*range*), where *range* is any range. This produces the number of numerical values in the range.

There is a similar function, COUNTA, which counts all of the cells, numerical or otherwise, in the range(s). For example, if cells A1, A2, and A3 contain Month, 1, and 2, respectively, then =COUNT(A1:A3) yields 2, whereas =COUNTA(A1:A3) yields 3.

Try it! Use the COUNT and COUNTA functions to fill in cells E1 and E2. Note that there are students below the visible portion of the spreadsheet.

Student ID	Exam score	Number enrolled
3416	62	Number who took exam
6125	73	
1535	74	
2323	Absent	
577	77	
9044	57	
8403	67	
5892	90	
4242	77	

To use the AVERAGE function:

Enter the formula =AVERAGE(*range*) where *range* is any range. This produces the average of the *numerical* values in the range.

Be aware that the AVERAGE function ignores labels and blank cells in the average. So, for example, if the range C3:C50 includes scores for students on a test, but cells C6 and C32 are blank because these students haven't yet taken the test, then =AVERAGE(C3:C50) averages only the scores for the students who took the test. (It doesn't automatically average in zeroes for the two who didn't take the test.)

Try it! Use the AVERAGE function to calculate the averages in cells B1 and B2. (For B2, you'll have to replicate the exam scores in column C and make some changes.)

Average exam score (for students who took the exam)		
Average exam score (if absent students get zeroes)		
Student ID		Exam score
	1533	68
	8031	74
	9859	80
	9106	63
	3535	72
	8192	Absent

To use MAX and MIN functions:

Enter the formula =MAX(*range*) or =MIN(*range*) where *range* is any range. These produce the obvious results: the maximum (or minimum) value in the range.

Try it! Use the MAX and MIN functions to fill in the range B8:C9. For example, you want the values $2300 and $3600 in cells B8 and C9.

Sales rep	Allison	Baker	Jones	Miller	Smith	Taylor
Jan sales	$3,700	$2,400	$2,300	$3,000	$3,800	$3,700
Feb sales	$2,600	$2,200	$2,400	$2,800	$3,600	$2,300

	Min sales	Max sales
Jan		
Feb		

Using the function (f_x) button in the top toolbar

If you haven't used this button, you should give it a try. It not only lists all the functions available in Excel (by category), but it also leads you through the use of them. As an example, suppose you know there is an Excel

function that does net present value, but you're not sure what its name is or how to use it. You could proceed as follows.

To use the paste function wizard:

Select a blank cell where you want the function to go. Press the f_x button and click on the category that seems most appropriate (Financial in this case). Scan through the list for a likely candidate and select it (try NPV). At this point you can get help, or you can press the Next button and enter the appropriate arguments for the function (discount rate and one or more ranges of values).

Try it! Use the function wizard to help you determine the function in cell B6. Use the range names in cells B3 through B5 for improved readability. (Scroll to the right to see the correct formula.)

Payments for Mr. Jones, who just bought a new car	
Amount financed	$15,000
Annual interest rate	8.90%
Term (number of months financed)	36
Monthly payment	

Calculating Data with Advanced Formulas

Manage Cell and Range Names

Moving to the top of the sheet

Often you want to reorient yourself by going back to the "home" position on the worksheet.

To go to the top left of the sheet (cell A1):

Press Ctrl-Home (both keys at once).

Using range names

Range names are extremely useful for making your formulas more understandable. After all, which formula makes more sense: =B20-B21 or =Revenue-Cost? Efficient use of range names takes some experience, but here are a few useful tips.

To create a range name:

Select a range that you want to name. Then type the desired range name in the upper left "name box" on the screen. (This box is just above the column A heading. It usually shows the cell address, such as E13, where the cursor is.)

You could go through the **Formula** ribbon and under the **Defined Names** tab and select **Name Manager** item, but typing in the name box is quicker and more intuitive. By the way, range names are not case sensitive. For example, Revenue, revenue, and REVENUE can be used interchangeably.

Try it! Name the rectangular range containing the numbers Data.

71	31	9	69	5
15	74	46	84	27
14	49	25	38	83
40	43	20	75	83
28	72	30	92	75
41	56	90	89	73
28	81	43	81	61

To delete a range name:

Use the **Formula** ribbon and under the **Defined Names** tab and select **Name Manager**. This shows a list of all range names in your workbook. Click on the one you want to delete, and then click on the delete button.

Try it! The numerical range is currently named Data. Delete this range name and then rename the range Database.

15	86	50	41	21
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29	90	86	100	83
10	82	100	65	4

Suppose you have the labels Revenue, Cost, and Profit in cells A20, A21, and A22, and you would like the cells B20, B21, and B22 (which will contain the values of revenue, cost, and profit) to have these range names. Here's how to do it quickly.

To create range names from adjacent labels:

Select the range consisting of the labels *and* the cells to be named (A20:B22). Then use the Insert/Name/Create menu item, make sure the appropriate box (in this case, Left Column) is checked, and click on OK.

Excel tries (usually successfully) to guess where the labels are that you want to use as range names. If it guesses incorrectly, you can always override its guess.

Try it! Name the ranges A3:A8, B3:B8, and so on according to the labels in row 2.

Month	UnitsSold	UnitPrice	Revenue
Jan	100	$1.25	$125.00
Feb	150	$1.25	$187.50
Mar	200	$1.40	$280.00
Apr	230	$1.40	$322.00
May	200	$1.50	$300.00
Jun	300	$1.50	$450.00

Sometimes you have entered a formula using cell addresses, such as =B20-B21. Later, you name B20 as Revenue and B21 as Cost. The formula does *not* change to =Revenue-Cost automatically. However, you can make it change (and hence become more readable).

Fixed cost	$50			
Variable cost	$2			
Month	Jan	Feb	Mar	Apr
Units produced	224	194	228	258
Total cost	$498	$438	$506	$566

Calculate Data Across Worksheets

Worksheets provide a logical and intuitive way to organize your data in Microsoft Excel. Frequently, multiple worksheets are used to further separate data into categories such as date or product type.

The ability to work with data in multiple worksheets is a necessary skill for Excel users. For example, you may wonder: Is it possible to enter the same data into several worksheets without retyping or copying and pasting the text into each one? Or, how can you easily sum the cell values across multiple worksheets? Or, how can you list the names of the worksheets in your workbook?

Sum the value of a cell across multiple worksheets

Another common Excel task is to sum the value of a cell in multiple worksheets and then display the result in another cell. For example, you may want to sum the number of a particular product that customers have ordered over a period of time, such as by quarterly periods. If worksheets are formatted in the same way for each period, the total sales for the product always appears in the same cell in each worksheet.

Finding the sum in this situation is simple. You can use a formula:

1. Start Excel. A new, blank workbook appears.
2. In cell B3 in Sheet1, type 20.
3. In cell B3 in both Sheet2 and Sheet3, type 30.
4. In cell A1 in Sheet1, type the following formula:

   =SUM(Sheet1:Sheet3!B3)
5. Press ENTER. Notice that cell A1 displays 80, which is the total sum of the cells in the three worksheets.

Enter data in multiple worksheets at the same time

As an example, let's say you want to put the same title text into different worksheets. One way to do this is to type the text in one worksheet, and then copy and paste the text into the other worksheets. If you have several worksheets, this can be very tedious.

An easier way to do this is to use the CTRL key:

1. Start Excel. A new, blank workbook appears.
2. Press and hold the CTRL key, and then click Sheet1, Sheet2, and Sheet3.
3. Click in cell A1 in Sheet1, and then type: This data will appear in each sheet.
4. Click Sheet2 and notice that the text you just typed in Sheet1 also appears in cell A1 of Sheet2. The text also appears in Sheet3.

Use Specialized Functions

Analyze Data with Logical and Lookup Functions

Function	Description
AND function	Returns TRUE if all of its arguments are TRUE
IF function	Specifies a logical test to perform
IFERROR function	Returns a value you specify if a formula evaluates to an error; otherwise, returns the result of the formula
OR function	Returns TRUE if any argument is TRUE
TRUE function	Returns the logical value TRUE

AND function

Description

Returns TRUE if all its arguments evaluate to TRUE; returns FALSE if one or more arguments evaluate to FALSE.

One common use for the AND function is to expand the usefulness of other functions that perform logical tests. For example, the IF function performs a logical test and then returns one value if the test evaluates to TRUE and another value if the test evaluates to FALSE. By using the AND function as the logical test argument of the IF function, you can test many different conditions instead of just one.

Syntax

AND(logical1, [logical2], ...)

The AND function syntax has the following arguments:

- logical1 Required. The first condition that you want to test that can evaluate to either TRUE or FALSE.
- logical2, ... Optional. Additional conditions that you want to test that can evaluate to either TRUE or FALSE, up to a maximum of 255 conditions.

OR function

Description

Returns TRUE if any argument is TRUE; returns FALSE if all arguments are FALSE.

Syntax

OR(logical1, [logical2], ...)

The OR function syntax has the following arguments:

- Logical1, logical2, ... Logical1 is required, subsequent logical values are optional. 1 to 255 conditions you want to test that can be either TRUE or FALSE.

IF function

Description

The IF function returns one value if a condition you specify evaluates to TRUE, and another value if that condition evaluates to FALSE. For example, the formula =IF(A1>10,"Over 10","10 or less") returns "Over 10" if A1 is greater than 10, and "10 or less" if A1 is less than or equal to 10.

Syntax

IF(logical_test, [value_if_true], [value_if_false])

The IF function syntax has the following arguments.

Logical_test Required. Any value or expression that can be evaluated to TRUE or FALSE. For example, A10=100 is a logical expression; if the value in cell A10 is equal to 100, the expression evaluates to TRUE. Otherwise, the expression evaluates to FALSE. This argument can use any comparison calculation operator.

Value_if_true Optional. The value that you want to be returned if the logical_test argument evaluates to TRUE. For example, if the value of this argument is the text string "Within budget" and the logical_test argument evaluates to TRUE, the IF function returns the text "Within budget." If logical_test evaluates to TRUE and the value_if_true argument is omitted (that is, there is only a comma following the logical_test argument), the IF function returns 0 (zero). To display the word TRUE, use the logical value TRUE for the value_if_true argument.

Value_if_false Optional. The value that you want to be returned if the logical_test argument evaluates to FALSE. For example, if the value of this argument is the text string "Over budget" and the logical_test argument evaluates to FALSE, the IF function returns the text "Over budget." If logical_test evaluates to FALSE and the value_if_false argument is omitted, (that is, there is no comma following the value_if_true argument), the IF function returns the logical value FALSE. If logical_test evaluates to FALSE and the value of the value_if_false argument is blank (that is, there is only a comma following the value_if_true argument), the IF function returns the value 0 (zero).

Remarks

Up to 64 IF functions can be nested as Value_if_true and Value_if_false arguments to construct more elaborate tests. (See Example 3 for a sample of nested IF functions.) Alternatively, to test many conditions, consider using the LOOKUP, VLOOKUP, HLOOKUP, or CHOOSE functions. (See Example 4 for a sample of the LOOKUP function.)

If any of the arguments to IF are arrays, every element of the array is evaluated when the IF statement is carried out.

Excel provides additional functions that can be used to analyze your data based on a condition. For example, to count the number of occurrences of a string of text or a number within a range of cells, use the COUNTIF or the COUNTIFS worksheet functions. To calculate a sum based on a string of text or a number within a range, use the SUMIF or the SUMIFS worksheet functions.

VLOOKUP function

Description

You can use the VLOOKUP function to search the first column of a range of cells, and then return a value from any cell on the same row of the range. For example, suppose that you have a list of employees contained in the range A2:C10. The employees' ID numbers are stored in the first column of the range, as shown in the following illustration.

	A	B	C
1	**Employee ID**	**Department**	**Full Name**
2	35	Sales	Yossi Banai
3	36	Production	Nicole Bousseau
4	37	Sales	Aik Chen
5	38	Operations	Axel Delgado
6	39	Sales	Suroor Fatima
7	40	Production	Gerhard Goeschl
8	41	Sales	Andreas Hauser
9	42	Operations	Nattorn Jayanama
10	43	Production	Jim Kim

FIGURE 9 A RANGE OF CELLS ON A WORKSHEET

If you know the employee's ID number, you can use the VLOOKUP function to return either the department or the name of that employee. To obtain the name of employee number 38, you can use the formula =VLOOKUP(38, A2:C10, 3, FALSE). This formula searches for the value 38 in the first column of the range A2:C10, and then returns the value that is contained in the third column of the range and on the same row as the lookup value ("Axel Delgado").

The V in VLOOKUP stands for vertical. Use VLOOKUP instead of HLOOKUP when your comparison values are located in a column to the left of the data that you want to find.

Syntax

VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

The VLOOKUP function syntax has the following arguments:

- **lookup_value** Required. The value to search in the first column of the table or range. The lookup_value argument can be a value or a reference. If the value you supply for the lookup_value argument is smaller than the smallest value in the first column of the table_array argument, VLOOKUP returns the #N/A error value.
- **table_array** Required. The range of cells that contains the data. You can use a reference to a range (for example, A2:D8), or a range name. The values in the first column of table_array are the values

searched by lookup_value. These values can be text, numbers, or logical values. Uppercase and lowercase text are equivalent.

- **col_index_num** Required. The column number in the table_array argument from which the matching value must be returned. A col_index_num argument of 1 returns the value in the first column in table_array; a col_index_num of 2 returns the value in the second column in table_array, and so on.

If the col_index_num argument is:

  - Less than 1, VLOOKUP returns the #VALUE! error value.
  - Greater than the number of columns in table_array, VLOOKUP returns the #REF! error value.

- **range_lookup** Optional. A logical value that specifies whether you want VLOOKUP to find an exact match or an approximate match:
  - If range_lookup is either TRUE or is omitted, an exact or approximate match is returned. If an exact match is not found, the next largest value that is less than lookup_value is returned.

  Important If range_lookup is either TRUE or is omitted, the values in the first column of table_array must be placed in ascending sort order; otherwise, VLOOKUP might not return the correct value.

  For more information, see Sort data in a range or table.

  If range_lookup is FALSE, the values in the first column of table_array do not need to be sorted.

- If the range_lookup argument is FALSE, VLOOKUP will find only an exact match. If there are two or more values in the first column of table_array that match the lookup_value, the first value found is used. If an exact match is not found, the error value #N/A is returned.

Index/Match Function

Now that you know the basics of these two functions, I believe it has already started making sense how Excel's MATCH and INDEX work together.

The MATCH function determines the relative position of the lookup value in the specified range of cells. From there, the INDEX function takes that number, or numbers, and returns a value in the corresponding cell.

Still having difficulties to figure it out? Think about Excel INDEX / MATCH in this way:

=INDEX (*column to return a value from*, MATCH (*lookup value*, *column to look up against*, 0))

I believe it's even easier to understand from an example. Suppose you have a list of national capitals like this:

	A	B	C	D
1	Rank	Country	Capital	Population
2	1	China	Beijing	20,693,000
3	2	India	New Delhi	17,838,842
4	3	Japan	Tokyo	13,189,000
5	4	Russia	Moscow	11,541,000
6	5	South Korea	Seoul	10,528,774
7	6	Indonesia	Jakarta	10,187,595
8	7	Iran	Tehran	9,110,347
9	8	Mexico	Mexico City	8,851,080
10	9	Peru	Lima	8,481,415

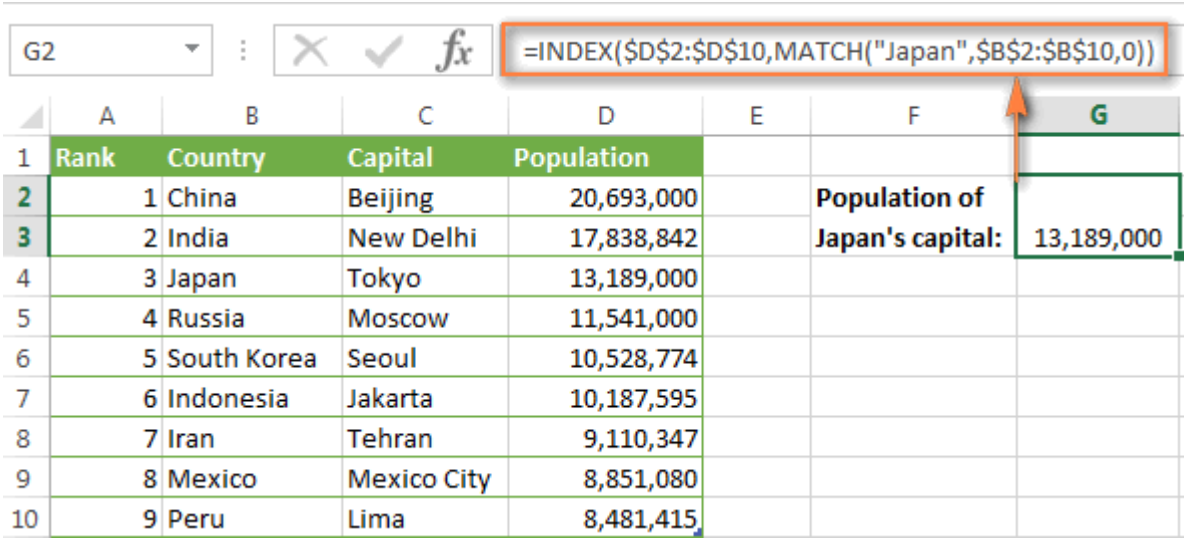
Let's find the population of some capital, say the capital of Japan, using the following Index Match formula:

=INDEX($D$2:$D$10,MATCH("Japan",$B$2:$B$10,0))

Now, let's analyze what each component of this formula actually does:

- The MATCH function searches for the lookup value "Japan" in column B, more precisely cells B2:B10, and returns the number 3, because "Japan" is the third in the list.
- The INDEX functions takes "3" in the second parameter (row_num), which indicates which row you want to return a value from, and turns into a simple **=INDEX($D$2:$D$10,3)**. Translated into plain English, the formula reads: search in cells D2 through D10 and return a value of the cell in the 3rd row, i.e. cell D4, because we start counting from the second row.

And here's the result you get in Excel:



	A	B	C	D	E	F	G
1	Rank	Country	Capital	Population			
2	1	China	Beijing	20,693,000		**Population of**	
3	2	India	New Delhi	17,838,842		**Japan's capital:**	13,189,000
4	3	Japan	Tokyo	13,189,000			
5	4	Russia	Moscow	11,541,000			
6	5	South Korea	Seoul	10,528,774			
7	6	Indonesia	Jakarta	10,187,595			
8	7	Iran	Tehran	9,110,347			
9	8	Mexico	Mexico City	8,851,080			
10	9	Peru	Lima	8,481,415			

Important! The number of rows and columns in the INDEX array should match those in the row_num or/and column_num parameters of the MATCH functions, respectively. Otherwise, the formula will return incorrect result.

Wait, wait... why don't we simply use the following Vlookup formula? What's the point in wasting time trying to figure out the arcane twists of Excel's MATCH / INDEX?

=VLOOKUP("Japan",$B$2:$D$2,3)

In this case, no point at all :) This simple example is for demonstration purposes only, so that you get a feel of how the Index and Match functions work together. Other examples that follow below will show you the real power of the INDEX MATCH liaison that easily copes with many complex scenarios when VLOOKUP stumbles.

Presenting Data Using Charts

Create a Chart

Step 1: Create a basic chart

For most charts, such as column and bar charts, you can plot the data that you arrange in rows or columns on a worksheet into a chart. However, some chart types (such as pie and bubble charts) require a specific data arrangement.

1. On the worksheet, arrange the data that you want to plot in a chart.

   The data can be arranged in rows or columns — Excel automatically determines the best way to plot the data in the chart. Some chart types (such as pie and bubble charts) require a specific data arrangement.

   Show How to arrange data on the worksheet

2. Select the cells that contain the data that you want to use for the chart.

   Tip If you select only one cell, Excel automatically plots all cells that contain data that is adjacent to that cell into a chart. If the cells that you want to plot in a chart are not in a continuous range, you can select nonadjacent cells or ranges as long as the selection forms a rectangle. You can also hide the rows or columns that you do not want to plot in the chart.

   Show How to select cells, ranges, rows, or columns

3. On the Insert tab, in the Charts group, do one of the following:

   Click the chart type, and then click a chart subtype that you want to use.

   To see all available chart types, click  to launch the Insert Chart dialog box, and then click the arrows to scroll through the chart types.

   Tip A ScreenTip displays the chart type name when you rest the mouse pointer over any chart type or chart subtype. For more information about the chart types that you can use, see Available chart types.

4. By default, the chart is placed on the worksheet as an embedded chart. If you want to place the chart in a separate chart sheet, you can change its location by doing the following:

- Click anywhere in the embedded chart to activate it.
    - This displays the Chart Tools, adding the Design, Layout, and Format tabs.
- On the Design tab, in the Location group, click Move Chart.
- Under Choose where you want the chart to be placed, do one of the following:
- To display the chart in a chart sheet, click New sheet.
    - Tip If you want to replace the suggested name for the chart, you can type a new name in the New sheet box.
    - To display the chart as an embedded chart in a worksheet, click Object in, and then click a worksheet in the Object in box.

5. Excel automatically assigns a name to the chart, such as Chart1 if it is the first chart that you create on a worksheet. To change the name of the chart, do the following:

    1. Click the chart.
    2. On the Layout tab, in the Properties group, click the Chart Name text box.

    Tip If necessary, click the Properties icon in the Properties group to expand the group.

    3. Type a new name.
    4. Press ENTER.

Analyzing Data Using PivotTables and PivotCharts

Create a PivotTable Report

A PivotTable report is an interactive way to quickly summarize large amounts of data. Use a PivotTable report to analyze numerical data in detail and to answer unanticipated questions about your data. A PivotTable report is especially designed for:

- Querying large amounts of data in many user-friendly ways.
- Subtotaling and aggregating numeric data, summarizing data by categories and subcategories, and creating custom calculations and formulas.
- Expanding and collapsing levels of data to focus your results, and drilling down to details from the summary data for areas of interest to you.
- Moving rows to columns or columns to rows (or "pivoting") to see different summaries of the source data.
- Filtering, sorting, grouping, and conditionally formatting the most useful and interesting subset of data to enable you to focus on the information that you want.
- Presenting concise, attractive, and annotated online or printed reports.

You often use a PivotTable report when you want to analyze related totals, especially when you have a long list of figures to sum and you want to compare several facts about each figure. In the PivotTable report illustrated below, you can easily see how the third-quarter golf sales in cell F3 compare to sales for another sport, or quarter, or to the total sales.

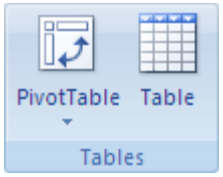
To create a PivotTable or PivotChart report, you must connect to a data source and enter the report's location.

1. Select a cell in a range of cells, or put the insertion point inside of a Microsoft Office Excel table.

   Make sure that the range of cells has column headings.

2. Select the type of report to generate by doing one of the following:

   To create a PivotTable report, on the Insert tab, in the Tables group, click PivotTable, and then click PivotTable.



Excel displays the Create PivotTable dialog box.

- To create a PivotTable and PivotChart report, on the Insert tab, in the Tables group, click PivotTable, and then click PivotChart.

Excel displays the Create PivotTable with PivotChart dialog box.

3. Select a data source

4. Specify a location by doing one of the following:

   - To place the PivotTable report in a new worksheet starting at cell A1, click New Worksheet.
   - To place the PivotTable report in an existing worksheet, select Existing Worksheet, and then specify the first cell in the range of cells where you want to position the PivotTable report.

5. Click OK.

Appendix

Keyboard Shortcuts

Ctrl+A	• Select all contents • Select the contents of a table
Ctrl+N	• Create a new workbook
Ctrl+O	• Open an existing workbook
Ctrl+S	• Save a workbook
Ctrl+F	• Search in a spreadsheet, or use Find and Replace
Ctrl+X	• Cut contents of a cell, selected data, or selected cell range
Ctrl+C	• Copy contents of a cell, selected data, or selected cell range
Ctrl+V	• Paste contents of a cell, selected data, or selected cell range

Table of Figures

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