



The Power Modeling Bootcamp: Course Notes



Mechanics and Functions

Fixing Cell References



E4					
1	Fixing Cell References				
2					
3	in \$	Quantity	Price	Revenue	
4	Product A	50	7	350	
5	Product B	60	15		
6	Product C	70	10		
7	Total				



C7					
1	Fixing Cell References				
2					
3	in \$	Quantity	Price	Revenue	
4	Product A	50	7	350	
5	Product B	60	15	900	
6	Product C	70	10	700	
7	Total	180			



Case 1:

Because the references are not fixed, Excel automatically adjusts the column letter and the row numbers, and you won't need to do it cell by cell. The conclusion is that, if you are pasting a formula along the vertical or the horizontal axis, the program will automatically change the column and row references accordingly. Therefore, we can say the references are moving – they are not static.

Fixing Cell References



	A	B	C	D	E
1		Fixing Cell References			
2					
3		<i>in \$</i>	Quantity	Price	Revenue
4		Product A	50	7	350
5		Product B	60	15	900
6		Product C	70	10	700
7		Total	180		1950



	A	B	C	D	E
1		Fixing Cell			
2					
3		<i>in \$</i>	Quantity	Price	Revenue
4		Product A	50	7	=C4*D4
5		Product B	60	15	=C5*D5
6		Product C	70	10	=C6*D6
7		Total	=SUM(C4:C6)		=SUM(E4:E6)

Fixing Cell References



IF

	A	B	C	D	E	F	G	H	I	J
1	Fixing Cell References									
2										
3		<i>in \$</i>	Quantity	Price	Total Price		<i>in €</i>	Quantity	Price	Total Price
4		Product A	50	7	350		Product A	50	=D4*\$D\$9	
5		Product B	60	15	900		Product B	60		
6		Product C	70	10	700		Product C	70		
7		Total	180		1,950		Total			
8										
9		Conversion Rate:		0.9						
10										

F4

Case 2:

This time, I would like to calculate the prices in Euro. In cell D9 we have the USD/Euro conversion rate. I basically need to multiply these three cells by zero point nine. It is easy to calculate the price for Product A.

The way to paste the same formula below is to put a dollar sign in front of the reference you would like to keep still. Here – both the column and the row value of the conversion rate must be fixed.

The much quicker way to do that is to press F4 while typing the formula.

Fixing Cell References



Here are the results:

=D5*\$D\$9						
E	F	G	H	I	J	

	Total Price	in €	Quantity	Price	Total Price
7	350	Product A	50	6.3	
5	900	Product B	60	13.5	
0	700	Product C	70	9.0	
2	1,950	Total			

=D6*\$D\$9						
E	F	G	H	I	J	

	Total Price	in €	Quantity	Price	Total Price
7	350	Product A	50	6.3	
5	900	Product B	60	13.5	
0	700	Product C	70	9.0	
2	1,950	Total			

Fixing Cell References



Formula Bar: `=D4*(1-C$11)`

	A	B	C	D	E	F	G	H	I	J
1	Fixing Cell References									
2										
3		in \$	Quantity	Price	Total Price		\$ Prices/Month	Jan	Feb	March
4		Product A	50	7	350		Product A	<code>=D4*(1-C\$11)</code>		
5		Product B	60	15	900		Product B			
6		Product C	70	10	700		Product C			
7		Total	180		1,950					
8										
9										
10		Month	Jan	Feb	March					
11		Discount (%)	10%	20%	30%					
12										

Case 3:

Suppose the products were sold at various discount rates.

By putting a dollar sign in front of the column letter “D”, we’ll make sure that when we copy the formula to the right, this argument will remain fixed and we’ll be able to multiply the price by one minus the discount rate for the respective month correctly.

Fixing Cell References



Formula Bar: `=D4*(1-C$11)`

	A	B	C	D	E	F	G	H	I	J
1	Fixing Cell References									
2										
3		in \$	Quantity	Price	Total Price		\$ Prices/Month	Jan	Feb	March
4		Product A	50	7	350		Product A	<code>=D4*(1-C\$11)</code>		
5		Product B	60	15	900		Product B			
6		Product C	70	10	700		Product C			
7		Total	180		1,950					
8										
9										
10		Month	Jan	Feb	March					
11		Discount (%)	10%	20%	30%					
12										

2 x F4

Row references can be fixed as well. If I fix the row reference 11 after “C,” when I copy the formula downwards, the cell row will remain static.

The quicker way is to use F4 again, but this time, it should be pressed not once, but twice.

Group Columns & Rows



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2		Material Number	Material Description	Period	Brand	Size	Pack	Client	Client Type	Volume	Gross Sale	Discounts	Net Sales	Cogs	Distribution
3		11504000	Crocky 250ML 4X	201601	Crocky	250ML	4X	Kroger	Supermark	206	135.1	-2.7	132.4	-60.9193	-3.04597
4		11506000	Crocky 250ML 6X	201601	Crocky	250ML	6X	Kroger	Supermark	114	74.8	-1.5	73.3	-33.7126	-1.68563
5		11508000	Crocky 250ML 8X	201601	Crocky	250ML	8X	Kroger	Supermark	74	59.2	-1.2	58.0	-26.6874	-1.33437
6		11660150	Crocky 330ML 15X	201601	Crocky	2.25L	15X	Kroger	Supermark	50	40.0	-0.8	39.2	-18.032	-0.9016
7		11660180	Crocky 330ML 18X	201601	Crocky	2.25L	18X	Kroger	Supermark	69	55.2	-1.1	54.1	-24.8842	-1.24421
8		11660200	Crocky 330ML 20X	201601	Crocky	2.25L	20X	Kroger	Supermark	37	29.6	-0.6	29.0	-13.3437	-0.66718
9		11660100	Crocky 330ML 1X	201601	Crocky	2.25L	1X	Kroger	Supermark	101	66.3	-1.3	64.9	-29.8682	-1.49341

The professional way to hide rows and columns is by using Excel's **Group** functionality.

Group Columns & Rows



The screenshot shows the Excel ribbon with the 'Data' tab selected. The 'Outline' group on the right includes 'Group', 'Ungroup', and 'Subtotal' buttons. A blue circle highlights the minus sign icon in the top-left corner of the worksheet grid, indicating a hidden column.

Material Number	Material Description	Period	Brand	Size	Pack	Client	Client Type	Volume	Gross Sale	Discounts	Net Sale
11504000	Crocky 250ML 4X	201601	Crocky	250ML	4X	Kroger	Supermark	206	135.1	-2.7	13
11506000	Crocky 250ML 6X	201601	Crocky	250ML	6X	Kroger	Supermark	114	74.8	-1.5	7
11508000	Crocky 250ML 8X	201601	Crocky	250ML	8X	Kroger	Supermark	74	59.2	-1.2	5
11660150	Crocky 330ML 15X	201601	Crocky	2.25L	15X	Kroger	Supermark	50	40.0	-0.8	3
11660180	Crocky 330ML 18X	201601	Crocky	2.25L	18X	Kroger	Supermark	69	55.2	-1.1	5
11660200	Crocky 330ML 20X	201601	Crocky	2.25L	20X	Kroger	Supermark	37	29.6	-0.6	2

Whenever we do, a symbol will appear on the top of the sheet if we are hiding a column, and on its left side if we are hiding a row.

Group Columns & Rows



The screenshot shows the Microsoft Excel interface with the 'Data' ribbon selected. The 'Group' button is circled in blue. A blue arrow points from the 'Group' button to the column headers of a table. The table has columns A through O, with columns G through L highlighted in green. Above columns G through L, there are dots indicating they are part of a group. A thick horizontal line is drawn above columns G through L, and a minus sign is visible at the end of this line in column O.

Material Number	Material Description	Period	Brand	Size	Pack	Client	Client Type	Volume	Gross Sale	Discounts	Net Sales	Cogs	Distribution
11504000	Crocky 250ML 4X	201601	Crocky	250ML	4X	Kroger	Supermark	206	135.1	-2.7	132.4	-60.9193	-3.04597
11506000	Crocky 250ML 6X	201601	Crocky	250ML	6X	Kroger	Supermark	114	74.8	-1.5	73.3	-33.7126	-1.68563
11508000	Crocky 250ML 8X	201601	Crocky	250ML	8X	Kroger	Supermark	74	59.2	-1.2	58.0	-26.6874	-1.33437
11660150	Crocky 330ML 15X	201601	Crocky	2.25L	15X	Kroger	Supermark	50	40.0	-0.8	39.2	-18.032	-0.9016
11660180	Crocky 330ML 18X	201601	Crocky	2.25L	18X	Kroger	Supermark	69	55.2	-1.1	54.1	-24.8842	-1.24421
11660200	Crocky 330ML 20X	201601	Crocky	2.25L	20X	Kroger	Supermark	37	29.6	-0.6	29.0	-13.3437	-0.66718
11660100	Crocky 330ML 1X	201601	Crocky	2.25L	1X	Kroger	Supermark	101	66.3	-1.3	64.9	-29.8682	-1.49341
11660200	Crocky 330ML 2X	201601	Crocky	2.25L	2X	Kroger	Supermark	47	37.6	-0.8	36.8	-16.9501	-0.8475

The dots above each column show the column is part of a group. The thing is that we are not certain which group they are part of, as there can be multiple groupings. The thick line above helps us figure this out. It continues to the right, where you get to the minus sign, which would allow you to hide the group when you press it.

Group Columns & Rows



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2															
3															
4		Material Number	Material Description	Period	Brand	Size	Pack	Client	Client Type	Volume	Gross Sale	Discounts	Net Sales	Cogs	Distribution
5		11504000	Crocky 250ML 4X	201601	Crocky	250ML	4X	Kroger	Supermark	206	135.1	-2.7	132.4	-60.9193	-3.04597
6		11506000	Crocky 250ML 6X	201601	Crocky	250ML	6X	Kroger	Supermark	114	74.8	-1.5	73.3	-33.7126	-1.68563
7		11508000	Crocky 250ML 8X	201601	Crocky	250ML	8X	Kroger	Supermark	74	59.2	-1.2	58.0	-26.6874	-1.33437
8		11660150	Crocky 330ML 15X	201601	Crocky	2.25L	15X	Kroger	Supermark	50	40.0	-0.8	39.2	-18.032	-0.9016
9		11660180	Crocky 330ML 18X	201601	Crocky	2.25L	18X	Kroger	Supermark	69	55.2	-1.1	54.1	-24.8842	-1.24421
10		11660200	Crocky 330ML 20X	201601	Crocky	2.25L	20X	Kroger	Supermark	37	29.6	-0.6	29.0	-13.3437	-0.66718
11		11660100	Crocky 330ML 1X	201601	Crocky	2.25L	1X	Kroger	Supermark	101	66.3	-1.3	64.9	-29.8682	-1.49341
12		11660200	Crocky 330ML 2X	201601	Crocky	2.25L	2X	Kroger	Supermark	47	37.6	-0.8	36.8	-16.9501	-0.8475

These little numbers on the left represent the different rows in the hierarchy of the grouping. The higher the number, the more columns that will be visible! See how, when I press each one, the number of columns displayed changes. Remember this field with the group's hierarchy will always be here to help you!

Group Columns & Rows



The screenshot shows the Microsoft Excel interface with the 'Data' tab selected. The 'Group' button is highlighted in the 'Outline' group. Below it, the 'Ungroup' button is also highlighted. The table below shows data with columns B and C grouped together.

	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1														
2	Material Number	Material Description	Period	Brand	Size	Pack	Client	Client Type	Volume	Gross Sale	Discounts	Net Sales	Cogs	Distribu
3	11504000	Crocky 250ML 4X	201601	Crocky	250ML	4X	Kroger	Supermark	206	135.1	-2.7	132.4	-60.9193	-3.045
4	11506000	Crocky 250ML 6X	201601	Crocky	250ML	6X	Kroger	Supermark	114	74.8	-1.5	73.3	-33.7126	-1.685
5	11508000	Crocky 250ML 8X	201601	Crocky	250ML	8X	Kroger	Supermark	74	59.2	-1.2	58.0	-26.6874	-1.334
6	11660150	Crocky 330ML 15X	201601	Crocky	2.25L	15X	Kroger	Supermark	50	40.0	-0.8	39.2	-18.032	-0.90
7	11660180	Crocky 330ML 18X	201601	Crocky	2.25L	18X	Kroger	Supermark	69	55.2	-1.1	54.1	-24.8842	-1.244
8	11660200	Crocky 330ML 20X	201601	Crocky	2.25L	20X	Kroger	Supermark	37	29.6	-0.6	29.0	-13.3437	-0.667
9	11660100	Crocky 330ML 1X	201601	Crocky	2.25L	1X	Kroger	Supermark	101	66.3	-1.3	64.9	-29.8682	-1.493
10	11660200	Crocky 330ML 2X	201601	Crocky	2.25L	2X	Kroger	Supermark	47	37.6	-0.8	36.8	-16.9501	-0.84

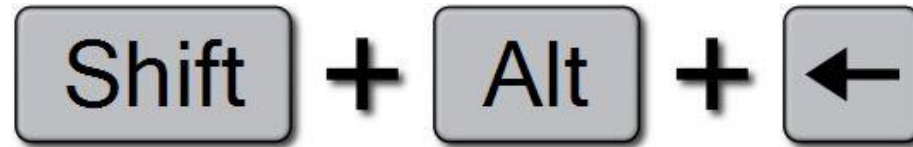
To ungroup a group, you must again select the two adjacent columns or cells that have already formed a group and then press the **Ungroup** button located just below the **Group** button in the **Data** tab.



Group:

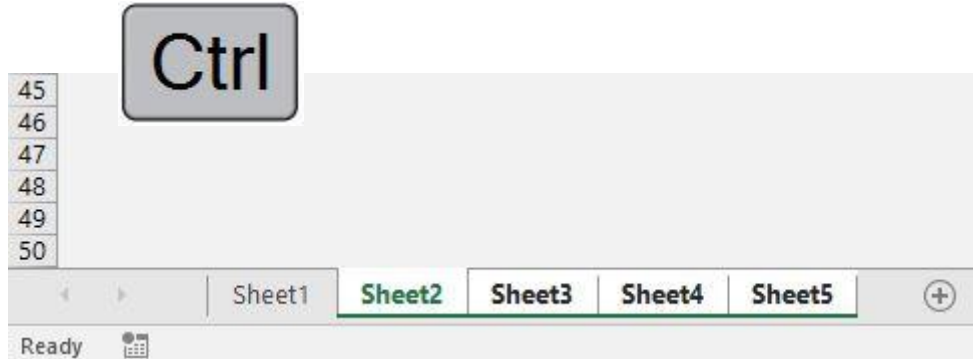


Ungroup:



Remember that grouping works only for adjacent rows and columns and never on multiple ranges. Besides, a single column or a single row can still form a group!

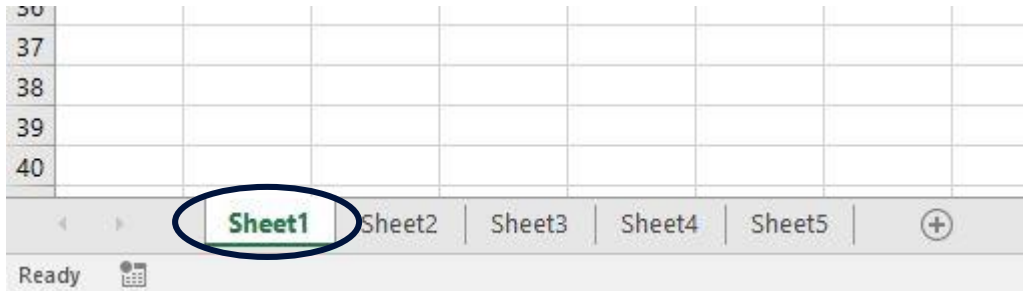
When you get accustomed to this functionality, you want to learn a shortcut and apply it faster. The shortcut for adding a group is *Alt, Shift, and Right arrow*. If you would like to remove a group, you can do that by pressing *Alt, Shift, and Left Arrow*.



Whenever you have to carry out the same operation on multiple sheets, you can use the grouping functionality.

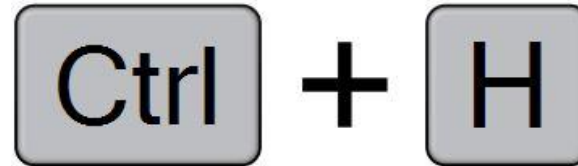
There are two ways to group sheets in Excel. The first one involves holding the Ctrl key and then selecting the other sheets, one by one. The second way is to hold the Shift key and press the last worksheet to be grouped.

Group Sheets



You should always remember that you are working in Group mode, and every time a cell in one of these sheets changes, the other sheets will change as well. Therefore, try to be alert when grouping sheets.

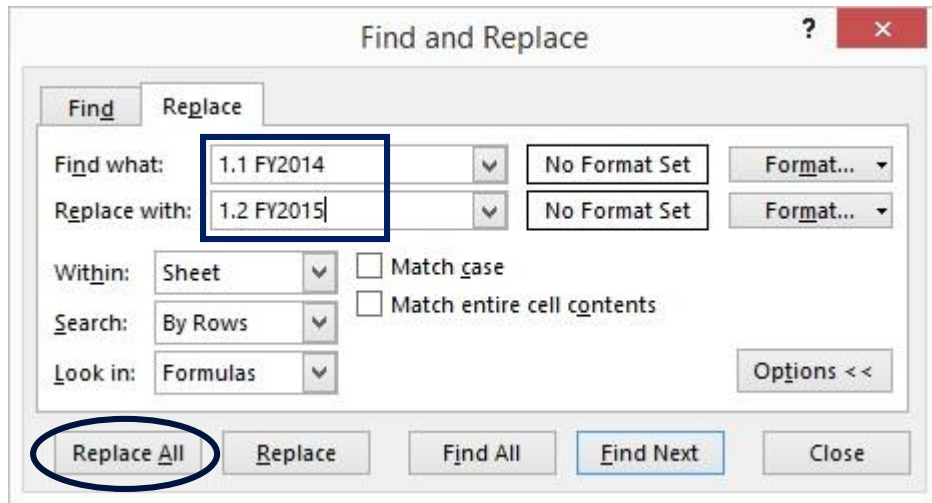
You can exit group mode easily – click on one of the sheets outside your group without using Control or Shift, and you can edit sheets as usual – one by one.



Often, you want to replace a word, name, or reference with another one. ***Find and Replace*** is Excel's go-to tool, allowing us to find and replace text. It can find and replace text in cells and formulas.

The Find & Replace is in the Home tab, under Find & Select. A much quicker way to open Find & Replace is to use the Ctrl and H shortcut.

Find and Replace - Formulas



And here we have a second tab, which is called ***Replace***.

For instance, here, you can look for “1.1 full year 2014”. You see Excel found many cells with this reference. You want to replace this sheet name with “1.2 full year 2015”, which is the name of the second sheet in this workbook.

Press the ***Replace All*** button. Done!

Find & Replace is a very, very useful tool. However, you have to be very careful too! Make sure you are not changing cells that are outside the area you would like to change. That's an important check to make that will prevent costly mistakes.

Find and Replace - Formatting



The screenshot shows the 'Find and Replace' dialog box in Excel. The 'Replace' tab is active. The 'Find what:' field is empty, and the 'Format...' button next to it is highlighted with a blue box. The 'Replace with:' field is also empty, with its 'Format...' button also highlighted. Below these fields, there are options for 'Within:' (Sheet), 'Search:' (By Rows), and 'Look in:' (Formulas). There are also checkboxes for 'Match case' and 'Match entire cell contents'. At the bottom, the 'Replace All' button is circled in blue, along with 'Replace', 'Find All', 'Find Next', and 'Close' buttons.

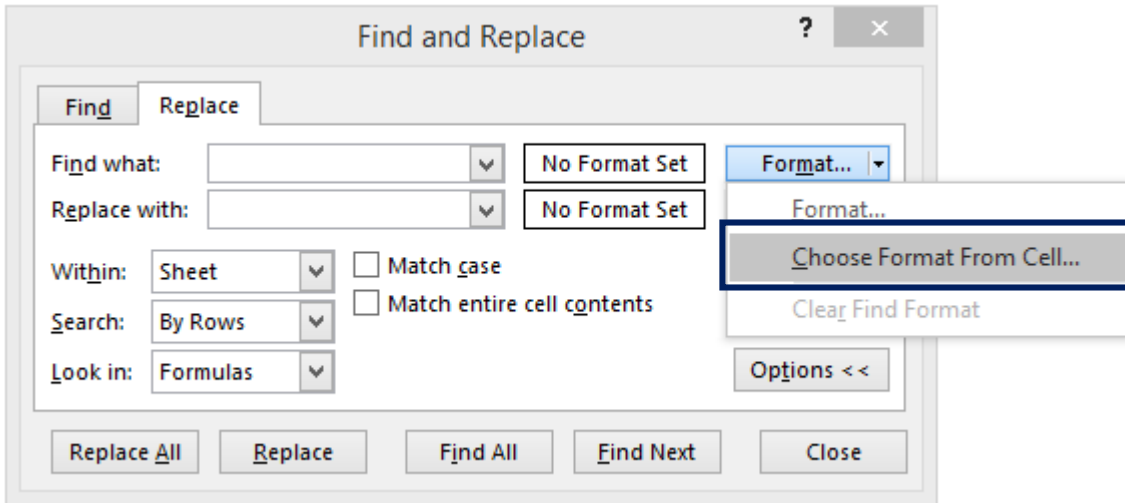
Excel allows you to find and replace the **formatting** of cells and not only their content. And this can be invaluable!

Press the **Format** button and then precisely select the format you are looking for.

You can combine a few formatting characteristics. For example, you can look for a date format, which is written in bold.

Finally, click on **Replace All**.

Find and Replace - Formatting



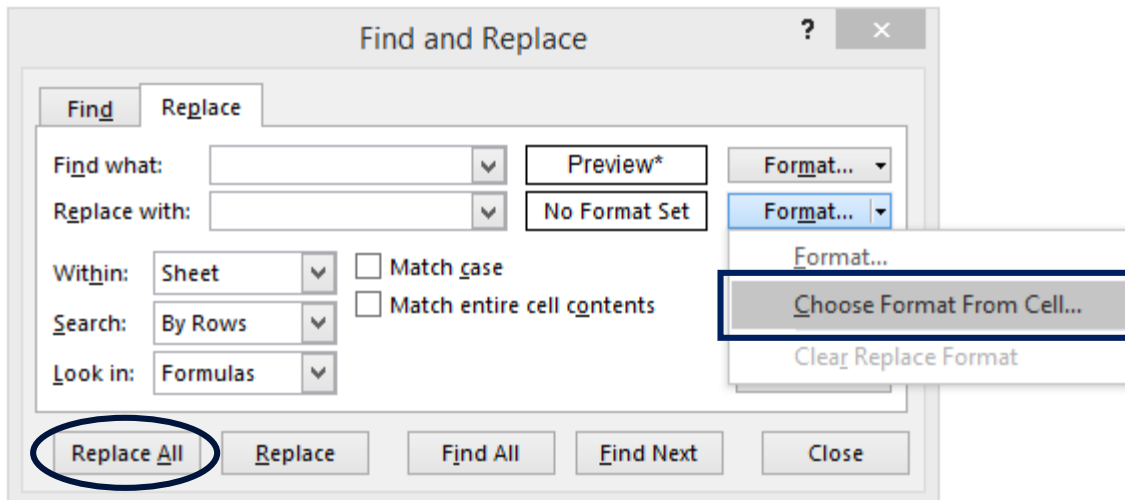
Sometimes, you can format cells differently.

You can click here and select Choose Format from Cell, which allows you to select the cell whose format you would like to assign as a find format.

Then you can select the desired cell format and press Replace All.

By doing this, you are using multiple criteria.

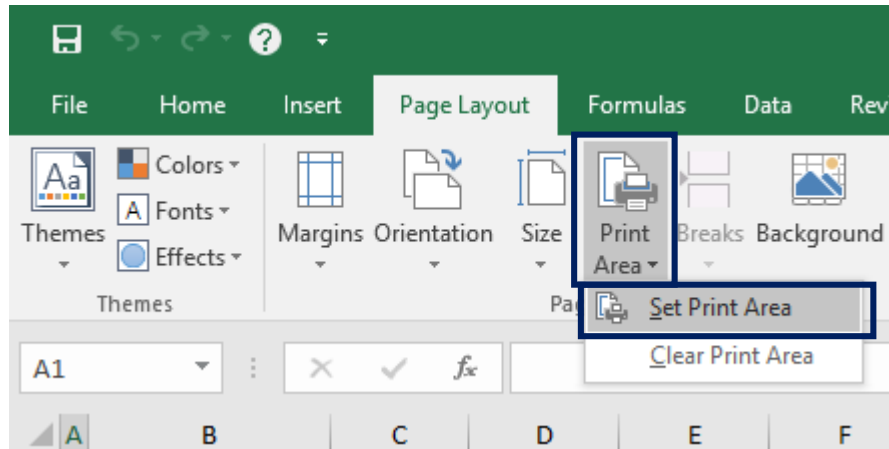
Finally, click on ***Replace All***.





How to set a print area:

- 1) Select the area that should be printed.
- 2) Go to the menu bar and select **Page Layout** where you have the **Print Area** menu. Click on it and select **Set Print Area**.



Excel will put a border to the print area of your sheet. If you print it, only the selected area will be printed.

Set Print Area



	A	B	C	D	E	F	G	H	I	J	K
1		Set print area									
2											
3											
4		Employee	Type	Position	Monthly salary (Eur in thousand)						
5		John Davis	Full-time	Managing director	6.0						
6		Paul Smith	Full-time	Accountant	3.0						
7		James Erving	Full-time	Administrator	2.0						
8		Richard Owen	Part-time	Support staff	1.5						
9		Clyde Baker	Part-time	Support staff	1.5						
10		Total			14.0						
11											
12											
13											
14		*Richard is an intern									
15		**Clyde works 4 hours per day									
16		***John has a company car									
17											
18											
19											
20											
21											
22											

Excel will put a border to the print area of your sheet. If you print it, only the selected area will be printed.

Circular References

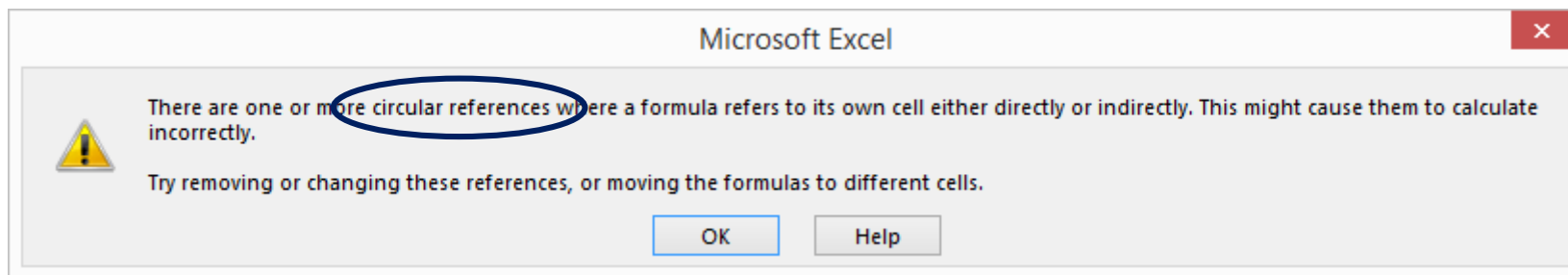
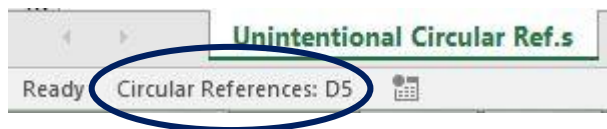


	A	B	C	D	E
1	Unintentional Circular References				
2					
3					
4				0	
5				50	
6				500	
7				5000	
8				50000	
9					
10					

A **circular reference** occurs when a formula points directly or indirectly to itself. When the output cell is included in the input we've entered into a formula, you will run into a **loop** that will be performed recurrently – an **iteration**.

When you work in Excel, there will be situations when you will run into circular references *unintentionally*.

- Excel indicates a circular reference through the blue line you can see here;
- Excel will display an error message
- In the bottom left corner, Excel will always tell you which cell contains a circular reference



Circular References



\$ in mln	31-Dec-14	31-Dec-15	31-Dec-16	Forecast				
				31-Dec-17	31-Dec-18	31-Dec-19	31-Dec-20	31-Dec-21
Beginning PP&E		632.5	632.5	659.5	719.2	780.1	842.4	906.1
D&A		(44.0)	(41.0)					
Capex		44.0	68.0	59.7	61.0	62.3	63.7	65.0
Ending PP&E	632.5	632.5	659.5	719.2	780.1	842.4	906.1	971.1
D&A as a % of Ending PP&E		-7.0%	-6.5%	-6.7%	-6.7%	-6.7%	-6.7%	-6.7%
Capex as a % of Ending PP&E		7.0%	10.8%	8.9%	8.9%	8.9%	8.9%	8.9%

In the table we have here, you can see the forecast values for Capex. Now, try to imagine if the main input for the calculation of D&A was not Beginning PP&E, but Ending PP&E. Then, the D&A should equal the product of the Ending PP&E and the D&A rate.

However, that's a circular reference - the D&A value is one of the three addenda that sum up to Ending PP&E.

To calculate it, ***allow iterative processes*** in this document.

Circular References



Open the **File** tab, and then click **Options**. In the **Formulas** section, you need to tick **Enable iterative calculation**. Press “OK”. Done!

Excel Options

Change options related to formula calculation, performance, and error handling.

Calculation options

Workbook Calculation ⓘ

- ☒ **Enable iterative calculation**
- Maximum Iterations: 100
- Maximum Change: 0.001
- ☐ Automatic
- ☐ Automatic except for data tables
- ☐ Manual
- ☒ Recalculate workbook before saving

Working with formulas

- ☐ R1C1 reference style ⓘ
- ☒ Formula AutoComplete ⓘ
- ☒ Use table names in formulas
- ☒ Use GetPivotData functions for PivotTable references

Error Checking

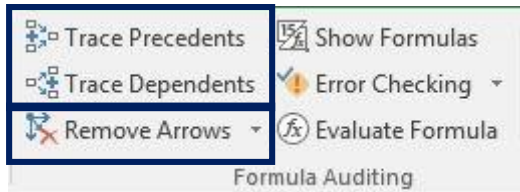
- ☐ Enable background error checking
- Indicate errors using this color:
- Reset Ignored Errors

Error checking rules

- ☒ Cells containing formulas that result in an error ⓘ
- ☒ Inconsistent calculated column formula in tables ⓘ
- ☒ Cells containing years represented as 2 digits ⓘ
- ☒ Numbers formatted as text or preceded by an apostrophe ⓘ
- ☒ Formulas inconsistent with other formulas in the region ⓘ
- ☒ Formulas which omit cells in a region ⓘ
- ☒ Unlocked cells containing formulas ⓘ
- ☐ Formulas referring to empty cells ⓘ
- ☒ Data entered in a table is invalid ⓘ

OK Cancel

Trace Precedents



You can open the **Formulas** tab and press the **Trace Precedents** button to check the input cell references of a given cell.

By clicking on **Trace Dependents**, you can verify which cells use the given cell as an input.

Industry X

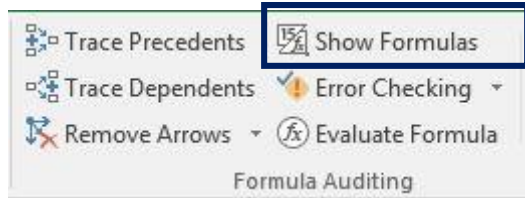
	Free Cash Flow			
\$ in mln.	2015	2016	2017	
Company A	5.50	6.00	6.20	17.70
Company B	5.70	6.20	6.15	18.05
Company C	4.80	7.40	5.10	17.30
Company D	6.70	6.50	7.90	21.10
Company E	4.40	5.50	4.40	14.30
Company F	6.60	6.50	6.20	19.30
Company G	5.20	5.40	5.70	16.30

	Percentage of Free	Amount of dividends
\$ in mln.	Cash Flow	distributed
Company A	5%	0.885
Company B	6%	1.083
Company C	4%	0.692
Company D	7%	1.477
Company E	5%	0.715
Company F	4%	0.6755
Company G	17%	2.771

The blue lines indicate input cells that serve for the calculation of the given formula.

It is important to know this functionality can be used multiple times, as long as there are more and more precedents involved in any previous calculation.

We can trace precedents and dependents at the same time too. To remove the respective arrows, click on **Remove Arrows** and all the lines across the sheet will disappear.



Ctrl + Grave

Another functionality from the Formula Auditing group that must be mentioned is **Show Formulas**. Instead of their results, the formulas will appear in the cells of the spreadsheet. After you unclick the button, the sheet will revert to its initial appearance.

The shortcut for this command Ctrl and back quote (or Ctrl and Grave). This functionality will help you when you are at a later stage of creating a worksheet, and you want to verify if your formulas are correct quickly.

Nested Functions



=IF(B8="", AVERAGE(B3:B8), SUM(B3:B8))					
F	G	H	I		

IF(logical test, AVERAGE() SUM())

 ↓ ↓

In general, we can say that functions allow the interaction between the information in different cells in a spreadsheet.

When you use functions inside of other functions, it is more appropriate to say that you've written a ***nested function***.

For instance, here Average() and Sum() are nested functions.

Sum; Sumif; Sumifs



Excel formula bar: `+SUMIF(C4:C12;C18;E4:E12)`

Formula description: `SUMIF(range; criteria; [sum_range])`

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79
Total				

Sumif: (1) Country = "Italy"

Formula components:

- C4:C12**: Range of countries
- C18**: Criteria (Italy)
- E4:E12**: Range of games played

SUM() allows Excel users to add the numbers within a given cell range.

In this example with football teams, let's say that you would like to sum the number of games played by Italian teams. You have to type **SUMIF()**: **=SUMIF(C4:C12; C18; E4:E12)**

Sum; Sumif; Sumifs



D16 +SUMIFS(F4:F12;C4:C12;C16;D4:D12;D16)

SUMIFS(sum_range; criteria_range1; criteria1; [criteria_range2; criteria2]; [criteria_range3; criteria3]; ...)

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79
Total				

England Yes 16:D4:D12;D16

**Sumifs: (1) Country = "England",
(2) Champions League = "Yes"**

SUMIFS() function is a lot like SUMIF() although it is able to work with more than one condition.

Let's say that you would like to find out how many points English teams which participated in the Champions league earned.

Sum; Sumif; Sumifs



Formula bar: `+SUMIFS(F4:F12;C4:C12;C16;D4:D12;D16)`

Function syntax: `SUMIFS(sum_range; criteria_range1; criteria1; [criteria_range2; criteria2]; [criteria_range3; criteria3]; ...)`

Team	Country	Champions league	Games played	Points earned
Borussia	Germany	Yes	34	71
Milan	Italy	Yes	38	57
Manchester United	England	Yes	38	64
Hamburger	Germany	No	34	27
Lazio	Italy	No	38	56
Fiorentina	Italy	No	38	65
Bayern	Germany	Yes	34	90
Liverpool	England	No	38	84
Arsenal	England	Yes	38	79
Total				

Criteria ranges:

- Country: C4:C12
- Champions league: D4:D12
- Points earned: F4:F12
- Criteria 1: C16 (England)
- Criteria 2: D16 (Yes)
- Sum range: F4:F12

Sumifs: (1) Country = "England", (2) Champions League = "Yes"

Therefore, your first condition is *England*, and the second one is *Yes* under “Champions League. Please note that unlike SUMIF(), SUMIFS() starts with the sum range:

`=SUMIFS(F14:F12; C4:C12; C16; D4:D12; D16)`

Round Functions



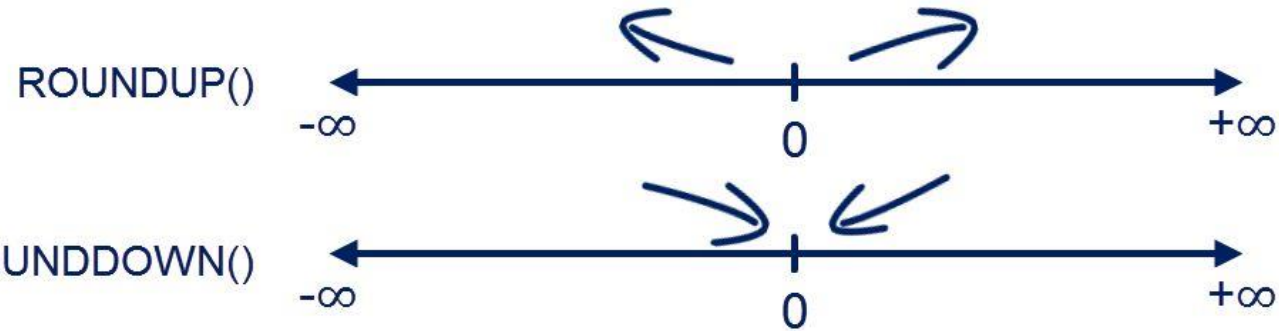
	ROUND (#, 2)	ROUND (#, 0)	ROUND (#, -1)	ROUNDUP	ROUNDDOWN	MROUND
10.247321	10.25	10	10	11	10	9
10.764345	10.76	11	10	11	10	12
22.6564	22.66	23	20	23	22	24
301	301	301	300	301	301	300
-1.36	-1.36	-1	0	-2	-1	#NUM!

To round the output of a function, you need **ROUND()**. You only have to indicate the number you would like to change and the number of digits around the decimal point you would like to consider.

Round Functions



	ROUND (#, 2)	ROUND (#, 0)	ROUND (#, -1)	ROUNDUP	ROUNDDOWN	MROUND
10.247321	10.25	10	10	11	10	9
10.764345	10.76	11	10	11	10	12
22.6564	22.66	23	20	23	22	24
301	301	301	300	301	301	300
-1.36	-1.36	-1	0	-2	-1	#NUM!



ROUNDUP(), for example, will always round numbers upwards. it pushes negative values down, towards minus infinity, away from zero. Don't fall in the trap of thinking negative values will move towards 0.

ROUNDDOWN() uses the opposite logic of ROUNDUP() – values will be rounded downwards towards zero.

Round Functions



	ROUND (#, 2)	ROUND (#, 0)	ROUND (#, -1)	ROUNDUP	ROUNDDOWN	MROUND
10.247321	10.25	10	10	11	10	9
10.764345	10.76	11	10	11	10	12
22.6564	22.66	23	20	23	22	24
301	301	301	300	301	301	300
-1.36	-1.36	-1	0	-2	-1	#NUM!

Finally, sometimes, you will see the **MROUND()** function. Its output is a number rounded to a specified multiple. Here we have chosen a multiple of three (MROUND(#,3)).

Why do we see an error at the end? That's because Excel displays a number error *whenever the multiple and the number reference are with different signs*.



=F7/\$F\$13			
D	E	F	H
ions league	Games played	Points earned	% of points earned
	34	71	13%
	38	57	10%
	38	64	11%
	34	n.a.	#VALUE!
	38	56	10%
	38	65	11%
	34	90	16%
	38	84	15%
	38	79	14%
	330	566	

In Column H has been calculated the percentage of points each team has earned out of the total of points.

There is one slight problem, though. If we suppose that the number of points Hamburger earned is not available, the formula calculating Hamburger's percentage out of the total points will display an *error message*.



=IFERROR(F7/\$F\$13;"n.a")				
D	E	F	G	H

ions league	Games played	Points earned	% of points earned
	34	71	13%
	38	57	10%
	38	64	11%
	34	n.a.	n.a.
	38	56	10%
	38	65	11%
	34	90	16%
	38	84	15%
	38	79	14%
	330	566	

F13

IFERROR() has two parts: first, you need to indicate which formula is being tested for an error, and second, you need to select a value that it should have in case there is an error:

=IFERROR(F7/\$F\$13; "n.a.")