



Excel 2

Calculations and Formulas

Office 2000 Version

CAL People and Computer Training
University of California, Berkeley

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Use this
space for notes

Introduction

Excel 2 is a course created for CAL PACT participants to learn more about the features of Microsoft Excel. The course covers introductory material and applies to both the Windows and Macintosh computer platforms. This document serves as a future reference for you as you continue to gain experience on your own. Some topics may not be covered in as much detail during the course as they are in this document. Documentation is available for previous versions of Excel on the CAL PACT website at <http://calpact.berkeley.edu>.

Skills you need for this course

- How to use the mouse
- Familiarity with the Windows or Mac operating systems
- Understanding of the material covered within the CAL PACT Excel 1 course
Specifically: using menus and toolbars within Excel
data entry and manipulation
basic formatting

Skills and concepts you will learn in this course

- Creating series
- Creating formulas
- Absolute vs. relative referencing
- Creating split screens
- Creating freeze panes
- Hiding rows and columns
- Outlining and presenting data

Conventions used in this document

Menus and menu commands are separated by a vertical bar (|). In the document they will appear as **Menu|Command**. An example of this is: “Select **File|New...**”

Filling

Worksheets often contain cells with similar contents. To avoid repetitive data entry, cells can be quickly duplicated. One way to do this is to select the desired cell, copy the cell, and then paste the cell over and over again.

A much quicker method of copying is available for when you want to copy the contents of a cell to adjacent cells. This process is called **filling**.

To fill a series of cells:

1. Select the cell that contains the data to be copied. Use a single-click of the mouse button to select a single cell, or a click and drag to select multiple cells.

	A
1	1
2	
3	
4	
5	

2. Without clicking the mouse button, move the mouse pointer to the lower right corner of the selection until it turns into a thin black crosshairs. This is the **fill handle**.

	A
1	1
2	
3	
4	
5	

3. Click and hold the fill handle and drag the mouse down, right, up or left to fill the data. Notice that a small yellow box appears next to the crosshairs to indicate what is being filled in the adjacent cells.

	A
1	1
2	
3	
4	
5	

4. Once the region to be filled is selected, release the mouse button. An exact copy of the original cell will appear in cells of the fill region.

	A
1	1
2	1
3	1
4	

The fill feature not only works with data, but with formatting and formulas (which will be described more in depth later).

Reminder

Remember the location of the fill handle and the appearance of the mouse pointer because the fill handle is used in a variety of Excel functions.

Series

A series is a set of data that has a logical pattern. For example, a group of numbers (such as {1,2,3,...} or {2,4,6,...}), days of the week, and months of the year can be used in a series.

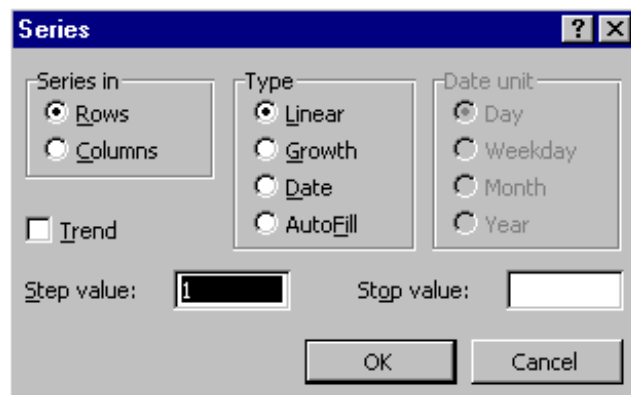
Creating a Series

Excel provides a systematic way to automatically create a simple series on a worksheet. There are two ways to do this:

- A. Use the **series function** available by selecting **Edit|Fill|Series**. Using this method takes a bit more time, but it provides more options and better control over the series being created.
- B. Dragging the **fill handle** on the lower right hand corner of a selection (similar to the fill process described earlier). Using this method is simple but provides less control.

Using the Series Function

1. Select the cell where the series will begin. Enter the value for the first item of the series (a number, date, etc.) and select this cell as the active cell.
2. Choose **Edit|Fill|Series...**, and the following dialog window will appear:



3. Select the desired direction in the **Series in** options. A series will be created extending downward in the column or to the right of the row.
4. Specify the **Type** of series that will be created. If the series will add a constant value to the previous value (e.g. a 1, 2, 3, ... series), select **Linear**. If the series will multiply a constant value by the previous value (e.g. 1, 2, 4, 8,...), pick **Growth**. If the series is a date, select **Date**. To have Excel automatically fill the series, select **AutoFill**.
5. If the series is a date series, a **Date Unit** must be specified.
6. Enter the **Step value** for the series. The step value is the incremental value for the series. In a linear series, the step value is added to the previous value. In a growth series, the step value is multiplied by the previous value.
7. Select a **Stop value** for the series. Once Excel reaches this number, the series will end. (The series may not necessarily end *on* this number).
8. Click the **OK** button once all the options have been selected.

Dragging to create a Series

- As with the series function, select the cell(s) where the series will begin. Enter the value for the first item of the series. For number series, the *first two initial values* must be entered. When applied to numbers, only linear series are created by dragging. Excel calculates the difference between the first two values and uses it as the step value for the series.

	A
1	1
2	2
3	
4	
5	

	A	B	C
1	January		
2			
3			

- Move the mouse pointer to the fill handle. The fill handle is the black square located at the lower right corner of the highlighted area. The cursor will change into a black crosshairs.

	A
1	1
2	2
3	
4	
5	

	A	B	C
1	January		
2			
3			

- Click and drag the fill handle downwards or to the right until the desired selection is highlighted. Notice that the small yellow box now shows each step in the series as the mouse is dragged. Release the mouse button and Excel will create the series in the selected region.

	A
1	1
2	2
3	
4	
5	
6	

	A	B	C
1	January		
2			
3			March

	A
1	1
2	2
3	3
4	4
5	

	A	B	C
1	January	February	March
2			
3			

Formulas

Formulas in Excel are very similar to formulas used in algebra. Formulas are equations which calculate particular values. For example, the formula to find the average of four numbers adds the numbers together and then divides the sum by four to generate one value. These formulas along with charting are Excel's most useful and powerful tools.

Creating Formulas

To create a formula, it is a good idea to first see an example.

$$=(B2 + B3)*A1$$

This formula adds the numbers in cell B2 and cell B3 and then multiplies the result by the number in cell A1. The result is shown in the cell that contains the formula.

To enter a formula, simply type the formula in the cell where the results will appear. When a formula is entered in a cell, the worksheet will only display the result. The formula is stored in the worksheet, but it is only displayed in the formula entry bar. This concept is shown in the following screen shot.

The screenshot shows an Excel worksheet with the following data:

	A	B	C	D
1	3	1	9	
2		2		
3				

The formula bar above the worksheet displays the formula $=(B1+B2)*A1$.

This is a portion of an Excel screen. Notice that cell C1 is selected. On the worksheet the cell displays the number "9". However, to see what formula is in the cell, look in the formula entry bar above the worksheet. In this case, the formula is " $=(B1+B2)*A1$ ".

Basic Rules for Formulas

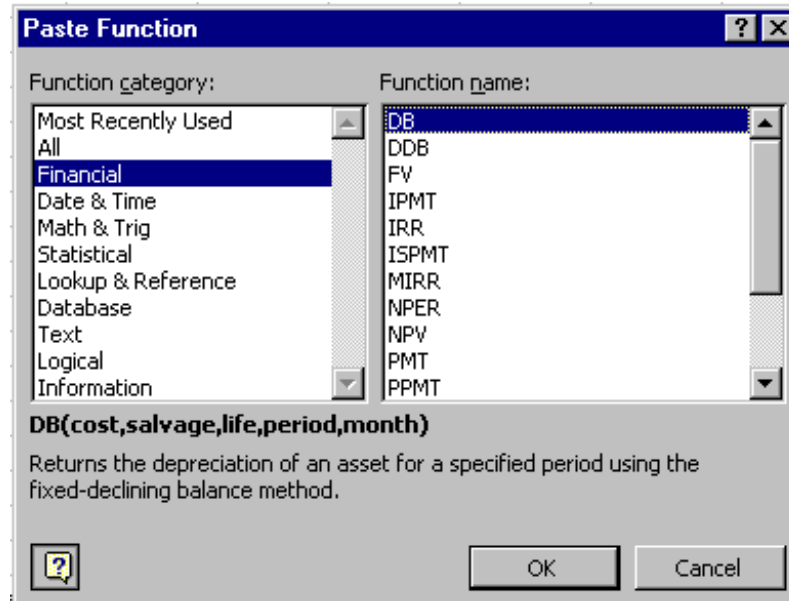
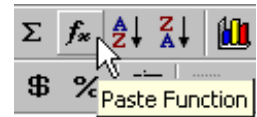
Here are some rules for writing a formula:

- Start with an equal sign (=). This tells Excel a formula is being created.
- Know what variables are going to be used. Usually they will consist of other cells such as B2, F6, C52, etc. However, you can have constants (such as 3.14) in your formulas as well.
- All groupings are done within parentheses.
- Remember this list of the common mathematical operators:

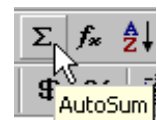
Operation	Symbol
Addition	+
Subtraction	-
Multiplication	*
Division	/
Powers	^

Functions and Ranges

In addition to common mathematical operations (+, -, /, *, ^), Excel has many other functions. These advanced functions include (but are not limited to) such things as average, round, minimum, sine, cosine, etc. Since there are so many different functions, Excel provides a tool to quickly find and use these functions. This tool is called the **Paste Function**. Start Paste Function by first selecting the cell which will display the result and then click on the Paste Function button in the toolbar.



An example of a commonly used advanced function is the **AutoSum** function. This function takes a selection of cells and adds them together. While this may sound very similar to addition, it is different because it can add a **range** of cells rather than a list of individual cells. A range is merely a group of cells defined by a starting cell and an ending cell.



Here is an example of the AutoSum function:

1. Type a few numbers down a column or across a row.
2. Select the cell where the sum will be displayed.

	A	B
1	1	
2	5	
3	6	
4	9	
5		

3. Click the **AutoSum** button in the toolbar.

Tip



Using a range like B2:C3 is perfectly valid. Ranges can span rows and columns at the same time.

- Highlight the cells that will be added together. At this point, look in the formula entry bar and notice that it shows something similar to “= SUM (A1:A4)”. This formula will add the numbers in column A from rows 1 through 4, and display the result in cell A5.

	A	B
1	1	
2	5	
3	6	
4	9	
5	=SUM(A1:A4)	

- Hit enter to insert the AutoSum into the cell and move to the next row, or click on to insert the AutoSum into the cell and keep the cell active.

	A	B
1	1	
2	5	
3	6	
4	9	
5	21	

Moving Formulas and Absolute vs. Relative Referencing

One special feature of Excel allows formulas to be moved and copied. This is accomplished by using the cut, copy, and paste commands, by dragging and dropping or by using the fill handle. When a formula is moved or copied, it is not an exact copy of the original formula.

Look at the example to the right. Cell A3 contains the formula “=A1+A2” which is the sum of the two cells above. To set B3 equal to the sum of B1 and B2, copy the formula from A3 to B3. After the formula has been copied, Excel will automatically change the formula from “=A1+A2” to “=B1+B2”.

	A	B	C	D
1	400	500		
2	200	600		
3	600			

	A	B	C	D
1	400	500		
2	200	600		
3	600	1100		

Excel automatically translates the formula so that one formula can be used in different parts of a worksheet. While this does not provide much timesaving in the simple example above, it will when the formula is longer or more complicated.

The way Excel alters a formula is determined by the distance the formula has shifted. Look back to the previous example. Since the formula moved one cell to the right, Excel changed the formula by shifting every cell reference inside the formula one cell to the right. This change applies to every cell reference within the formula by the exact distance that the formula was shifted. If the formula shifted one cell up and two cells to the left, all of the cell references within the formula would change one cell up and two cells to the left.

Relative Referencing

The system of changing the cell references is called **relative referencing**. In this case, Excel makes the assumption that the formulas are general formulas that can apply to any situation. When moving formulas, Excel assumes the cell references being used for the calculation are moving as well.

Absolute Referencing

While this feature is very helpful, there are times when relative referencing is not desirable. When this is the case, cell references in a formula can be changed to **absolute referencing**. In this case, moving the formula will not change the cell references used for the calculation.

Going back to the previous example once more, the formula “=A1+A2” can be rewritten with absolute referencing. Doing so will set up the formula to always add cell A1 and A2 no matter where the formula is copied or moved.

The symbol for absolute referencing is the dollar sign (\$). Place the \$ before each part of the cell reference. The old formula:

=A1+A2

becomes:

=\$A\$1+\$A\$2

The first reaction here may be to think there are too many dollar signs, however this is not the case. Remember that a cell can move in two directions—by its row (vertically) or by its column (horizontally). To make sure a cell reference does not change, place a dollar sign before its column component (the A) and the row component (the 1). Inside a formula, cell references do not have to conform to one referencing standard. The formula could have been written as =A1+\$A\$2 where only the cell reference to A2 is an absolute reference.

Conversely, placing a dollar sign in front of the column and row is not always necessary; a cell reference can have an absolute reference in one direction only (either horizontally or vertically).

The key to cell referencing in creating formulas is to be sure that each component is appropriately referenced, based on your needs in using absolute or relative referencing, or a combination of the two. You will become accustomed to the conventions used as you gain experience with Excel.

Split Screens

Split screens is one of many tools in Excel that help organize the way you view the spreadsheet. How the spreadsheet is viewed can be important either for presentations or to help visualize the data in a more effective manner.

Split screen allows the current sheet to be divided into halves (with one split) or fourths (with a horizontal and vertical split). Data from multiple parts of the worksheet can be viewed at the same time.

To create a split screen:

1. Select the row or column to hide by clicking on the row or column label. To split the screen vertically, select the column just to the right of where the split should appear. To split the sheet horizontally, select the row just below where the split should appear.

	A	B	C
1			
2			
3			
4			

2. Choose **Window|Split** and a gray bar will appear at the row or column specified.

	A	B	C
1			
2			
3			
4			

3. Scrolling around the window will cause the currently active section of the screen to move. The portion of the sheet that is on the other side of the split will not move. (Note that individual scroll bars appear for each split.)

	A	B	C	D	E	F	G	
1								▲
2								▼
8								▲
9								▼
10								▼

To adjust a split location, move the mouse over the gray split bar. The mouse pointer will change to a two headed arrow. Click and drag to move the split screen divider to a new location on your screen. (This doesn't affect where the split occurs in the structure of your worksheet.)

	A	B	C
1			
2			
8			
9			

To remove the split, select **Window|Remove Split**.

Note



A split screen does not create a copy of the sheet. **It only allows a different view of the same sheet.** Any changes made apply to the whole sheet, not just the cell within the current split view.

Freeze Panes

Once a split screen has been created, the split location can be “locked-in” by using the freeze pane command. Freezing the panes prevents a change in the split until the panes have been unfrozen.

In addition to locking in a split, a freeze pane will also limit how much of the worksheet will scroll in the window. Multiple views created by the split are condensed into one concise view of the bottom left pane. Thus it is important to carefully freeze the correct panes.

To create freeze panes:

1. First create a split screen (see the procedure in the previous section).

	A	B	C
1			
2			
3			
4			

2. Select **Window|Freeze Panes**.
3. Now the split screen is locked. Notice that you can only scroll through the rows below the frozen panes. (There is only one scroll bar.)

	A	B	C	D	E	F	G
1							
2							
7							
8							
9							

To unfreeze panes, select **Window|Unfreeze Panes**.

Hiding Rows and Columns

Another feature Excel offers is row and column hiding. A hidden row or column does not appear on the worksheet, but for all other purposes (such as formulas, format changes, etc.) it still exists within your file.

To hide a row or column:

1. Select the row(s) or column(s) to hide by clicking on the row or column label. More than one row or column can be selected at the same time.

	A	B	C	D	E
2	First Name	Last Name	Department	Office Number	Phone Number
3	Paul	Neese	CAL PACT	260 University Hall	3-2458
4	Joseph	Johnson	Accounting	1423 Haviland Hall	2-0002
5	John	Shioshita	CAL PACT	260 Evans Hall	3-2458
6	Jen	Ozaki	CAL PACT	214 Evans Hall	2-0559

Note



Only an entire row or column can be hidden. Individual cells or grouping of cells cannot be hidden independently on the worksheet using the hide function.

2. Select the **Format|Row|Hide** or **Format|Column|Hide** (depending on the selection).
3. Now the row or column is hidden.

	A	B	E	F
2	First Name	Last Name	Phone Number	
3	Paul	Neese	3-2458	
4	Joseph	Johnson	2-0002	
5	John	Shioshita	3-2458	
6	Jen	Ozaki	2-0559	

The row or column will no longer appear on the screen. However, hidden rows or columns can be identified by a labeling skip (such as rows labeled 1, 3, 4, etc. or columns labeled A, B, E, etc.) in the row or column headers.

To unhide a row or column:

1. Select the two rows or columns adjacent to the hidden row or column by selecting their labels.

	A	B	E	F
2	First Name	Last Name	Phone Number	
3	Paul	Neese	3-2458	
4	Joseph	Johnson	2-0002	
5	John	Shioshita	3-2458	
6	Jen	Ozaki	2-0559	

2. Select **Format|Row|Unhide** or **Format|Column|Unhide** depending on the selection).
3. Now the row or column is unhidden.

	A	B	C	D	E
2	First Name	Last Name	Department	Office Number	Phone Number
3	Paul	Neese	CAL PACT	260 University Hall	3-2458
4	Joseph	Johnson	Accounting	1423 Haviland Hall	2-0002
5	John	Shioshita	CAL PACT	260 Evans Hall	3-2458
6	Jen	Ozaki	CAL PACT	214 Evans Hall	2-0559

Outlining

Outlines are a more powerful form of hiding row and columns. Instead of selecting which rows and columns to hide, cells are grouped together and hidden or unhidden with a click of the mouse button. Similar to real outlines, a group of cells can be placed within a larger group of cells. As with hiding, both rows and columns must be outlined separately.

To group a selection of cells for outlining:

1. Highlight the rows or columns to group together. (As with hiding, entire rows or columns must be selected by clicking on their labels.)

	A	B	C
12	Sample Budget		
13	Income	January	February
14	Work salary	2000	2100
15	Work Bonus	0	0
16	Miscellaneous	200	0
17	Total Income	2200	2100

2. Select **Data|Group and Outline|Group**.
3. To indicate that these cells will be grouped together, an outline bar will appear. An outline bar appears to the left for grouped rows and to the top for grouped columns.

1 2		A	B	C
	12	Sample Budget		
	13	Income	January	February
	14	Work salary	2000	2100
	15	Work Bonus	0	0
	16	Miscellaneous	200	0
	17	Total Income	2200	2100

Repeat this process as many times as needed to properly outline the worksheet. This method can be very useful for temporarily hiding large amounts of data to make the worksheet easier to read.

To remove a group of cells from the outline:

1. Highlight the group of cells to ungroup.

1 2		A	B	C
	12	Sample Budget		
	13	Income	January	February
	14	Work salary	2000	2100
	15	Work Bonus	0	0
	16	Miscellaneous	200	0
	17	Total Income	2200	2100

2. Select **Data|Group and Outline|Ungroup**.

3. The corresponding outline bar for that section will disappear.

	A	B	C
12	Sample Budget		
13	Income	January	February
14	Work salary	2000	2100
15	Work Bonus	0	0
16	Miscellaneous	200	0
17	Total Income	2200	2100

Hiding and Unhiding Cells with Outline

To hide outlined cells, find the outline bar that marks the section to hide. There will be a button with a minus sign at the end of each group. Click on the button and the cells will be hidden. When the cells are hidden, the minus sign in the button changes to a plus sign. Press this button to unhide these cells.

To hide an individual outline, click on the minus button:

1	2	A	B
	12	Sample Budget	
	13	Income	January
	14	Work salary	2000
	15	Work Bonus	0
	16	Miscellaneous	200
	17	Total Income	2200
	18	Income After Tax	

To unhide cells, click on the plus button:

1	2	A	B
	12	Sample Budget	
	13	Income	January
	17	Total Income	2200
	18	Income After Tax	
	19		

To hide and restore outlines by level:

An alternate way to use outlines is to click on the button that identifies with the level number. Clicking on the button displays only the groupings up to that level. Many groups can be quickly hidden and unhidden this way.

Clicking the 2nd level button here will open all outlines at level 2:

1	2	A	B
	1		
	2	Expenses	January
+	11	Total Expenses	\$1,630.00
	12		
	13	Income	January
+	17	Total Income	\$2,200.00
	18	Income After Tax	\$1,628.00
	19	74%	
	20	Budget Totals	January
+	23	Total Savings	\$570.00
	24	Percentage	25.91%

1	2	A	B
	1		
	2	Expenses	January
•	3	Clothing	\$50.00
•	4	Entertainment	\$100.00
•	5	Food	\$200.00
•	6	Housing	\$600.00
•	7	Gasoline	\$80.00
•	8	Insurance	\$300.00
•	9	Miscellaneous	\$200.00
•	10	Utilities	\$100.00
-	11	Total Expenses	\$1,630.00
	12		
	13	Income	January
•	14	Work salary	\$2,000.00
•	15	Work Bonus	\$0.00
•	16	Miscellaneous	\$200.00
-	17	Total Income	\$2,200.00
	18	Income After Tax	\$1,628.00
	19	74%	
	20	Budget Totals	January
•	21	Gross Income	\$2,200.00
•	22	Total Expenses	\$1,630.00
-	23	Total Savings	\$570.00
	24	Percentage	25.91%