

Cell References

Relative Cell Reference: B3

Absolute Cell Reference: \$B\$3

Mixed Cell Reference: \$B3 or B\$3

Cell references are the basic building blocks of the formulas and functions you will use in Excel 2007. Notice that each column of a worksheet is assigned a letter and each row of a worksheet is assigned a number. Each cell in a worksheet can be uniquely identified by referring to the column letter and row number that the cell is in.

Figure 1 | Cell References Explained

	A	B	C
1	2	10	
2	8	56	
3	34	42	
4			

In Figure 1 above, the number 42 is entered in **column B** and in **row 3**. The cell reference for this cell is **B3**. Notice how both the column letter (B) and row number are highlighted in light-orange; and that cell B3 has a thick black border surround it. This helps users see that cell B3 is selected. Also, in this example, the cell reference B3 appears in the name box located above the column letter A.

Cell references can get a little more involved than this, but this is the basic idea: **You can refer to a cell by its column letter and row number.**

You can use cell references as variables in the formulas and functions that you set up in your worksheets, and values stored in the referenced cells will be used in the calculations. The example, shown in Figure 2 below, shows some formulas and functions that use cell references; and Figure 3 below, shows the results of these formulas and functions.

Figure 2 | Formulas and Functions that use Cell References

	A	B	C
1	2	10	=B1/A1
2	8	56	=A2*B2
3	34	42	=(B3-A3)*10
4	=SUM(A1:A3)	=AVERAGE(B1:B3)	
5			

Figure 3 | Results of Formulas and Functions shown in Figure 2

	A	B	C	D	E	F
1	2	10	5			
2	8	56	448			
3	34	42	80			
4	44	36				
5						

Taking a closer look at some of what is going on here in Figure 2:

- The formula in cell **C1** (refer to Figure 2, above) says, “Take the contents of cell **B1** and divide it by the contents of cell **A1**, and display the results.” The value 10 in **B1** is divided by the value 2 from cell **A1**, and the result 5, is shown in cell **C1** (refer to Figure 3, above).
- The function in cell **B4** (refer to Figure 2, above) says, “Take the average of all the values stored within the range of cells that starts at cell **B1** and ends at cell **B3**, and display the results.” The values in cells **B1**, **B2**, and **B3** (10, 56, and 42) are averaged, and the result, 36, is displayed in cell **B4** (refer to Figure 3, above).

The Different Types of Cell References

There are a few types of cell references that you can use in Excel 2007: **relative cell references**, **absolute cell references**, and **mixed cell references**. The differences between these different types of cell references only come into play when you are copying a formula or function to a new cell.

Note: *If you plan to enter a formula that is not going to be copied, it would not make any difference which cell reference type you choose.*

Relative Cell References

The most commonly used of the cell reference types is the relative cell reference. When you type a cell reference using just the column letter and row number, you are using a relative reference. When a formula with a relative reference is copied to a new cell, the reference “moves” the same distance that the copied formula moves. Refer to the example in Figure 4 through 7, below.

Figure 4 | Formula Using Relative References is Typed into Cell C1

	A	B	C
1	4	16	=A1+B1
2	8	23	
3	15	42	
4			

In Figure 4 above, the formula **=A1+B1** is typed into cell **C1**. Figure 5 below, shows the result of that formula. That formula is copied, using the fill handle, to cells **C2** and **C3**. Figure 6 shows the results after the formula has been copied.

Figure 5 | Result of Formula Typed into Cell C1

	A	B	C	D	E	F
1	4	16	20			
2	8	23				
3	15	42				
4						

Figure 6 | Result of Formula Copied into Cells C2 and C3

	A	B	C	D	E	F
1	4	16	20			
2	8	23	31			
3	15	42	57			
4						

In Figure 7 below, notice that what ends up in the new cells isn't exactly what was originally typed. The formula **=A1+B1** was typed into cell **C1**, but what ends up in cell **C2** is the formula **=A2+B2**. The formula was copied down one cell, from cell **C1** to **C2**. The cell references moved down one cell also. **A1** became **A2**; and **B1** became **B2**.

Likewise, when the formula in cell **C1** (**=A1+B1**) was copied down two cells, from cell **C1** to **C3**, the cell references also moved down two cells also. **A1** became **A3**; and **B1** became **B3**.

Figure 7 | Relative Cell References Exposed

	A	B	C
1	4	16	=A1+B1
2	8	23	=A2+B2
3	15	42	=A3+B3
4			

When it comes to copying formulas, Excel 2007 understands a relative reference like this: "Take the value stored two cells to the left of the current cell and add it to the value stored one cell to the left of the current cell, and display the results." The "current cell" in the example above is cell **C1**, the cell two to the left of that cell is **A1**, and the cell one to the left of that is cell **B1**. When the formula is copied to a new location, Excel 2007 references whatever cells are two to the left and one to the left of the location the formula is copied to.

If you copy a formula three cells to the right, and two cells down, the relative references in the formula move three cells to the right, and two cells down. Everything stays the same relative distance from the cell with the formula in it.

Absolute Cell References

There are times when you are copying a formula that you do not want Excel 2007 to change certain cell references when a formula is copied (or pasted) into the new location.

Absolute Cell References don't change when a formula is copied and pasted.

The location they refer to always stays the same even though the formula moves to a new cell. A dollar sign is typed before the column letter and before the row number to indicate that the cell reference is an absolute reference (for example: \$A\$1).

Figures 8 through 11 shows a scenario where an absolute reference comes in handy. In this scenario, a company wants to give each employee a bonus this month. And, the bonus is calculated by multiplying each employees' salary times the bonus percentage.

In Figure 8 below, the formula `=B3*B1` is entered into cell **C3**. This formula uses one relative reference (**B3**), and one absolute reference (**\$B\$1**).

Figure 8 | Absolute Cell Reference

	A	B	C	D
1	Bonus	5%		
2	Name	Salary	Bonus	
3	Nick	4000	200	
4	Carol	4700		
5	John	4200		
6				

Figure 9 below shows the result is 200. And the formula, shown in the formula bar, tells us that Nick's Salary (in cell **C3**) was multiplied by the Bonus Rate (in cell **B1**). The Figure also shows us the results after this formula was copied into cells **C4** and **C5**.

Figure 9 | Absolute Cell References

	A	B	C	D
1	Bonus	5%		
2	Name	Salary	Bonus	
3	Nick	4000	200	
4	Carol	4700	235	
5	John	4200	210	
6				

The cell reference **B3** that was originally typed changed to **B4** when the formula in cell **C3** was copied into cell **C4**. And, the cell reference **B4** changed to **B5** when the formula in cell **C4** was copied into cell **C5**.

In total, the formula moved down two cells, so the relative cell reference moved down two cells. Because an absolute cell reference was used for cell **B1**, that cell reference stayed fixed in place when the formula moved. Figure 10 shows the formulas in cells **C3** through **C5**.

Figure 10 | Absolute Cell Reference Formulas

	A	B	C
1	Bonus	0.05	
2	Name	Salary	Bonus
3	Nick	4000	=B3*\$B\$1
4	Carol	4700	=B4*\$B\$1
5	John	4200	=B5*\$B\$1
6			
7			

Figure 11 below, shows what would have happened if an absolute reference had not been used in the original formula entered in cell **C3**. If the formula had just been entered as **=B3*B1**, the result in **C3** would have still been correct. But when the formula was copied to cells **C4** and **C5**, you get incorrect results.

The formula that ends up in cell **C4** is **=B4*B2** (that's 3500 times the word Salary, which results in an error message). The formula that ends up in cell **C5** is **=B5*B3** (that's John's salary times Nick's salary, giving John a bonus of 16800000).

Figure 11 | Cell Reference Error Message

	A	B	C	D	E
1	Bonus	5%			
2	Name	Salary	Bonus		
3	Nick	4000	200		
4	Carol	4700	#VALUE!		
5	John	4200	16800000		
6					

Mixed Cell References

With Mixed Cell References, you can set the column so that it stays fixed in place when the formula is copied and pasted, leaving the row free to move in relation where the formula has moved to. Or you can set the row so it stays fixed in place and leave the column free to move. A mixed reference is typed with the column letter and row number with one dollar sign placed in front of either the letter or the number.

Examples:
(\$A5 and B\$3)

When a formula containing the mixed cell reference **\$A5** is copied to a new location, it will always refer to column A, but the row number will move the same distance the formula moved.

When a formula containing the mixed cell reference **B\$3** is copied to a new location, it will always refer to row 3, but the column letter will move the same distance that the formula moved.

Toggling Between Relative, Absolute, and Mixed Cell References

Pressing the **F4** key on your keyboard lets you toggle between the different types of cell references. Pressing the **F4** key once changes a relative reference to an absolute reference. As you continue to press the **F4** key, it toggles through the reference types (absolute, mixed, relative, absolute, etc.). Press **F4** just after you typed a cell reference, or position the cursor back on a cell reference you typed previously, to use **F4** to change the reference type for that reference.

Referencing a Cell from Another Worksheet

Excel allows you to build formulas and functions that reference data stored on different worksheets within the same Excel 2007 workbook. So you can be on Sheet2, and refer back to a cell on Sheet1. When referring to a cell on a different sheet, you type the name of the sheet followed by an exclamation point (!) and then the column letter and row number.

If you are on Sheet2 and want to refer back to cell C4 on Sheet 1, the reference would look like this: **Sheet1!C4**.

If you are on a sheet named March, and you want to refer back to cell C7 on a sheet named January, the reference would look like this: **January!C7**. If you want to make that an absolute reference, it would look like this: **January!\$C\$7**.

It can get a little cumbersome to type these references into a formula or function. Excel lets you select cells that you want to include in your formula, and enters the proper cell reference for you. Once you have begun typing a formula by typing an equal sign in the cell, you can click on the tab to move to a different worksheet, and then select the cell on that worksheet that you want to reference. The cell reference, complete with the sheet name, will be entered in the formula you were working on.

Referencing a Cell from Another Workbook

Excel also allows you to reference data that is stored on a sheet in a different workbook (a different Excel file).

A cell reference to a different Excel workbook looks like this:

[Book1]Sheet1!\$E\$8

That's the workbook name in brackets, the sheet name followed by an exclamation point, and then the cell reference.

Once you have begun typing a formula by typing an equal sign in a cell, you can switch to the workbook you want to reference, click on the sheet you want to reference, and

click on the cell you want to reference; Excel will enter in the properly formatted cell reference for you.