



### Using Cell References in Formulas

Most formulas you create include references to cells or ranges. These references enable your formulas to work dynamically with the data contained in those cells or ranges. For example, if your formula refers to cell A1 and you change the value contained in A1, the formula result changes to reflect the new value. If you didn't use references in your formulas, you would need to edit the formulas themselves to change the values used in the formulas.

#### Using relative, absolute, and mixed references

When you use a cell (or range) reference in a formula, you can use three types of references:

- **Relative:** The row and column references can change when you copy the formula to another cell because the references are actually offsets from the current row and column. By default, Excel creates relative cell references in formulas.

- **Absolute:** The row and column references don't change when you copy the formula because the reference is to an actual cell address. An absolute reference uses two dollar signs in its address: one for the column letter and one for the row number (for example, \$A\$5).

- **Mixed:** Either the row or the column reference is relative, and the other is absolute. Only one of the address parts is absolute (for example, \$A4 or A\$4).

The type of cell reference is important only if you plan to copy the formula to other cells. The following examples illustrate this point. Figure (1) shows a simple worksheet. The formula in cell D2, which multiplies the quantity by the price, is =B2\*C2



	A	B	C	D	E	F
1	<b>Item</b>	<b>Quantity</b>	<b>Price</b>	<b>Total</b>		
2	Chair	4	\$125.00	\$500.00		
3	Desk	4	\$695.00	\$2,780.00		
4	Lamp	3	\$39.95	\$119.85		
5						
6						
7						
8						

Figure 1: Copying a formula that contains relative references.

This formula uses relative cell references. Therefore, when the formula is copied to the cells below it, the references adjust in a relative manner. For example, the formula in cell D3 is

$$=B3*C3$$

But what if the cell references in D2 contained absolute references, like this?

$$=B\$2*\$C\$2$$

In this case, copying the formula to the cells below would produce incorrect results. The formula in cell D3 would be the same as the formula in cell D2.

Now I'll extend the example to calculate sales tax, which is stored in cell B7 (see Figure 2). In this situation, the formula in cell D2 is

$$=(B2*C2)*\$B\$7$$

D2		✕ ✓ <i>fx</i>		=B2*C2*\$B\$7	
	A	B	C	D	E
1	<b>Item</b>	<b>Quantity</b>	<b>Price</b>	<b>Sales Tax</b>	<b>Total</b>
2	Chair	4	\$125.00	\$37.50	
3	Desk	4	\$695.00		
4	Lamp	3	\$39.95		
5					
6					
7	<b>Sales Tax:</b>	7.50%			
8					
9					

Figure 2: Formula references to the sales tax cell should be absolute.



The quantity is multiplied by the price, and the result is multiplied by the sales tax rate stored in cell B7. Notice that the reference to B7 is an absolute reference. When the formula in D2 is copied to the cells below it, cell D3 will contain this formula:  $= (B3 * C3) * \$B\$7$

Here, the references to cells B2 and C2 were adjusted, but the reference to cell B7 was not — which is exactly what I want because the address of the cell that contains the sales tax never changes.

Figure (3). demonstrates the use of mixed references. The formulas in the C3:F7 range calculate the area for various lengths and widths. Here’s the formula in cell C3:

$$= \$B3 * C\$2$$

		Width				
		1.0	1.5	2.0	2.5	
Length	1.0	1.0	1.5	2.0	2.5	
	1.5	1.5	2.3	3.0	3.8	
	2.0	2.0	3.0	4.0	5.0	
	2.5	2.5	3.8	5.0	6.3	
	3.0	3.0	4.5	6.0	7.5	

Figure 3: Using mixed cell references.

Notice that both cell references are **mixed**. The reference to cell B3 uses an absolute reference for the column ( $\$B$ ), and the reference to cell C2 uses an absolute reference for the row ( $\$2$ ). As a result, this formula can be copied down and across, and the calculations will be correct. For example, the formula in cell F7 is

$$= \$B7 * F\$2$$

If C3 used either **absolute** or **relative** references, copying the formula would produce incorrect results. Changing the types of your references you can enter **nonrelative** references (that is, **absolute** or **mixed**) manually by inserting dollar signs in the appropriate positions of the cell address. Or you can use a handy shortcut:



the F4 key. When you've entered a cell reference (by typing it or by pointing), you can press F4 repeatedly to have Excel cycle through all four reference types.

For example, if you enter =A1 to start a formula, pressing F4 converts the cell reference to=\$A\$1. Pressing F4 again converts it to =A\$1. Pressing it again displays =\$A1. Pressing it one more time returns to the original =A1. Keep pressing F4 until Excel displays the type of reference that you want.

### Referencing cells outside the worksheet

Formulas can also refer to cells in other worksheets — and the worksheets don't even have to be in the same workbook. Excel uses a special type of notation to handle these types of references.

#### 1. Referencing cells in other worksheets

To use a reference to a cell in another worksheet in the same workbook, use this format:

*SheetName!CellAddress*

In other words, precede the cell address with the worksheet name, followed by an exclamation point. Here's an example of a formula that uses a cell on the Sheet2 worksheet:

=A1\*Sheet2!A1

This formula multiplies the value in cell A1 on the current worksheet by the value in cell A1 on Sheet2.

#### 2. Referencing cells in other workbooks

To refer to a cell in a different workbook, use this format:

=*[WorkbookName]SheetName!CellAddress*

In this case, the workbook name (in square brackets), the worksheet name, and an exclamation point precede the cell address. The following is an example of a formula that uses a cell reference in the Sheet1 worksheet in a workbook named Budget:

=*[Budget.xlsx]Sheet1!A1*

If the workbook name in the reference includes one or more spaces, you must enclose it (and the sheet name and square brackets) in single quotation marks. For example, here's a formula that refers to a cell on Sheet1 in a workbook named Budget For 2016:

=A1\**'[Budget For 2016.xlsx]Sheet1'!A1*

When a formula refers to cells in a different workbook, the other workbook doesn't have to be open. If the workbook is closed, however, you must add the complete path to the reference so that Excel can find it. Here's an example:

=A1\**'C:\My Documents\[Budget For 2016.xlsx]Sheet1'!A1*



A linked file can also reside on another system that's accessible on your corporate network. The following formula refers to a cell in a workbook in the files directory of a computer named DataServer:

```
= "\\DataServer\files\[budget.xlsx]Sheet1"!$D$7
```