# 3   Calculations

The primary objective of Excel is to count, and the program is actually quite good at it!

To make a calculation you must write a "formula". The formula should be written into the cell showing the result. A formula is a structured piece of text that tells Excel what it has to calculate. It is not that hard to learn in small steps, so let us write a simple little formula to calculate the result of 2+3.

3.1   Formulas

In Excel one always starts a formula by typing an equal sign =. It is a sign that tells Excel that what is in the cell is a formula and not a text or a number. When you are finished typing the formula, Excel will display the result in the cell instead of the formula you have written.
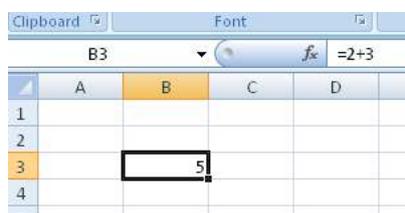
1. Place the cursor in a random cell and type = 2+3
    (See Figure 12).
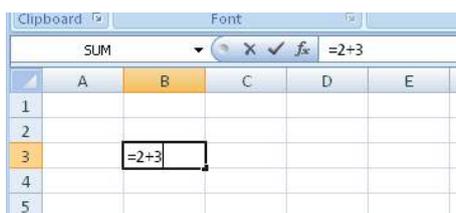
Figure 11: Your first formula.

2. Press the ENTER key on the keyboard.

It should now read "5" in the cell in which you wrote the formula. Move the cursor to the cell, and note that the Formula Bar still reads "=2+3", like shown in Figure 12.

Figure 12: The result of your formula is displayed in the cell, and the formula is displayed in the Formula Bar.

If you want to change the formula, you can click on the Formula Bar to edit it. Alternatively, you can double-click the cell or press the F2 key on your keyboard.

3.1.1   Operators

You can use the four methods of calculation (plus +, minus -, multiply * and divide /) in this way. You can also use parentheses if necessary. For example, 2 +3 * 4 is not the same as (2 +3) * 4. In this respect Excel follows the general calculation rules.

Potency is calculated by using the sign "^", written by holding down SHIFT on your keyboard and pressing the key between Z and ENTER. For example, 2^3 is written 2^3.

So far, you are probably not all that impressed with Excel's calculation capacity. Actually, we could make the above calculation much easier by using a simple pocket calculator, and it is only to show what a basic formula is.

3.2   Formulas with references

To make everything right, we must take advantage of "references" in our formulas. References are made to values in other cells. Delete everything you have written in your spreadsheet so far, and do the following:

1. In cell B2, type the number 2.
2. In cell B3, type the number 3.

Now it should look like Figure 13.
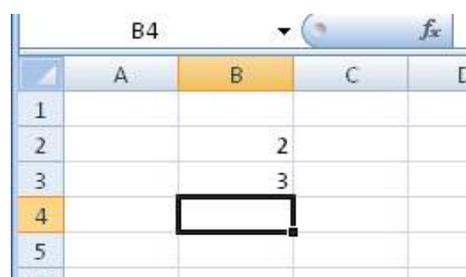
Figure 13: Type the number 2 in cell B2 and the number 3 in cell B3.

Then do the following:

3. Start by typing an = sign into cell B4 to show that you are about to write a formula. Do NOT type anything else, and do NOT press the ENTER key.
4. Take your mouse, point to cell B2 and click once with the left mouse button. Now the Formula Bar should show "= B2".
5. Press the + key on the keyboard. You are hopefully not surprised that it says "= B2 +"
6. Take your mouse again, point to cell B3, and click once with the left mouse button. Now it says "= B2 + B3" in the Formula Bar.
7. Press the ENTER key on the keyboard.

If the computer did not break down it is now possible to create a formula that adds the values in cell B2 and B3 and displays the result 5 in cell B4. You should actually be able to write exactly the same formula in a different cell in the spreadsheet, so let us try it.

8.   Choose an empty cell and type the following (without using the mouse): =B2+B3
9.   And press ENTER.

The result is of course the same, but now you have seen that you can freely choose between creating cell references by clicking with the mouse or typing them in directly. Each method has its advantages. When you click the mouse, you do not risk making typos but typing is often faster.

The great thing about the formulas is that they keep working. If you change the numbers in cells B2 and B3 the results in the cells with formulas also change. So go ahead and try writing some other numbers in cell B2 and B3.

I would suggest that you try writing some small formulas with references to get a little practice before we go any further. We have barely scratched the surface regarding formulas.

In the next section, we will try using some of Excel's built-in "functions" in our formulas.

3.2.1   References to Other Spreadsheets

You are not limited to refer to cells in the same spreadsheet. In Excel you can have multiple spreadsheets in the same Excel file, and they are, as mentioned previously, organised in the "Sheet Tabs" at the bottom of the screen.

If you refer to a cell in another worksheet, the reference must contain both a sheet reference and a cell reference.

If you type a formula in Sheet1, that uses the value from cell B2 in Ark2, the reference must be"SHEET2'!B2", not just "B2", which would be a reference to the sheet you are currently working in.

You can also refer to cells in other spreadsheet files; we will return to that eventually.

3.3   Functions

When I talk about "functions", I mean functions in formulas. These are not functions such as "Print" or "Save", but calculation functions. In the previous section you learned how to write simple formulas, where you could calculate with a few numbers. Functions enable you to add thousands of numbers together in an instant, calculate averages, make probability calculations and many other things.

Functions are used in the formulas, and you can use several functions in the same formula. If we want to be really advanced we can even use functions within other functions, but we will not go that far yet.

All functions in Excel are written in a certain way, which can be summed up in this manner

Function name(arguments)

All functions have a "function name". For example, the function that adds together numbers is called "SUM", and the function that calculates averages is called "AVERAGE". The Function Name is followed by one or more "Arguments", which are the numbers or cell references that feature must use in the calculation. If there is more than one argument in a function, they are separated by a semicolon ";". It looks like this:

Function name(argument 1;argument 2;argument 3)

Let us explore the most common functions, SUM and AVERAGE.

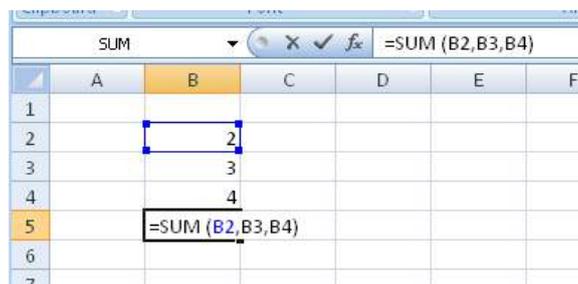### 3.3.1   The SUM Function

Now you will learn how to add together many numbers in an instant, but let us start with something simple.

1. Type the number 2 in cell B2
2. Type the number 3 in cell B3
3. Type the number 4 in cell B4

Now we will type a formula into cell B5 to add together the numbers in cells B2, B3 and B4.

4. In cell B5, write enter = SUM (B2: B3: B4). You will see that Excel colours the cell references and frames the corresponding cells in the same colour. It is helpful later when you work with more complicated formulas.
5. Press the ENTER key.

Cell B5 should now show the result "9". If it did not work, check that you remembered to write an equal sign at the beginning of the formula.

Figure 14: Writing a formula with the SUM function.

You have written a formula with a SUM function with three arguments: the three cell references are separated by semicolons. Suppose you have to add together 1000 figures using cell references, that formula would be very long. It is, therefore, possible to use a "region reference" as an argument.

A region reference consists of two cell references separated by a colon ":". Excel will add together the two cells AND all the cells between them.

1. Select cell B5 and press the F2 key on the keyboard.
2. Rewrite the formula so it reads =SUM(B2:B4 and press the ENTER key. Remember this time there should be a colon ":" in the function, not a semicolon ";".
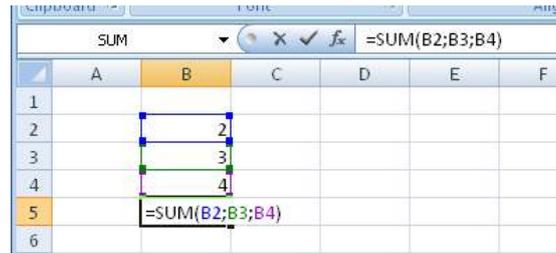
Figure 15: SUM formula with region reference.

The result is the same as last time, but you have now given one argument instead of three arguments, namely the region reference "B2: B4". Since cell B3 is between B2 and B4, it is part of the region that defines the calculation.

If the list had has 1000 numbers that were to be added together instead of three, the formula would simply be called = SUM (B2: B1001). So now you know how to add together the 1000 numbers in an instant!

By the way, the SUM function does not care if there are empty cells in the region specified.

Now you have probably made an effort to write the formulas, just like I asked you to. I can tell you, that when you write formulas Excel is completely indifferent to whether you use uppercase or lowercase. So now you do not need to think about that anymore.

3.3.2   The AVERAGE Function

The AVERAGE function is used exactly like the SUM function, but it calculates the average of the arguments instead. The nice thing about the AVERAGE function is that if there are empty cells in your arguments the AVERAGE function will ignore them. Remember in this context that an empty cell is not the same as a cell where there is a 0 value.

Now we will write a formula with an AVERAGE function, similar to the SUM function we just had. But this time we will provide the region reference using the mouse in order to get a little practice.

1. Activate cell B6 and type =AVERAGE(
2. Using the mouse, point to cell B2, press the left mouse button and hold it down.
3. Move the mouse down in order to select cell B2, B3 and B4, then release the left mouse button. Now it should say =AVERAGE(B2:B4
4. Close the brackets ")" and press ENTER.

Cell B6 should now show the result 3.

Later in the book we will review the more advanced features, but if you want a complete overview of all Excel's features, select the Formulas Tab in the Ribbon. Here you can click on the various buttons. They provide access to a wealth of different functions within arithmetic, mathematics, finance and statistics. There are also other types of functions such as logical functions and text functions, which will also be addressed later in the book.