

Excel 2002

Objectives

This unit will provide the basic introduction to the MS-Excel 2002 spreadsheet application. The emphasis is on the minimum knowledge required to work productively. The next module will concentrate on more advanced Excel skills.

At the end of this module, you should be able to:

- Explain where spreadsheets can best be used
- Identify the basic parts of a Spreadsheet
- Enter labels, values, formulas and functions into a Spreadsheet
- Construct simple business formulas using arithmetic operators, cell references and summation function.
- Copy cells containing values and formulas.
- Use relative and absolute cell references
- Change values and evaluate their impact on dependent cells
- Use the formatting commands to change the appearance of a spreadsheet including: inserting and deleting rows and columns, formatting numbers (currency, accounting, percentage), aligning text and numbers, generating borders, patterns, and font colours.
- Save and Print a Spreadsheet

Introduction to MS-Excel 2002

What Does a Spreadsheet Do?


Spreadsheets store numbers, formulas and text in a matrix (or table, grid) of rows and columns to provide solutions to quantitative problems. These problems were traditionally tackled with pen, paper and calculator and include, for example:

- Preparation of budgets and financial statements.
- Forecasting models
- Pricing and costing models

The main reason why electronic spreadsheets are far superior to their manual counterparts is that the electronic spreadsheet is dynamic. While manual spreadsheets contain text and values, all calculations are done manually through the calculator. Electronic spreadsheets are made up of text, values and formulas. If the spreadsheet is well designed, when a value is changed in a cell, all the formulas referencing that value will automatically be recalculated. This simple fact is the real reason for the power and popularity of spreadsheets.




A modern spreadsheet package such as Excel does much more than the calculator was ever capable of. Browse briefly through the advanced Excel module to get a taste for the powerful capabilities of Excel, such as interactive data analysis or charting.

Some Important Terminology.

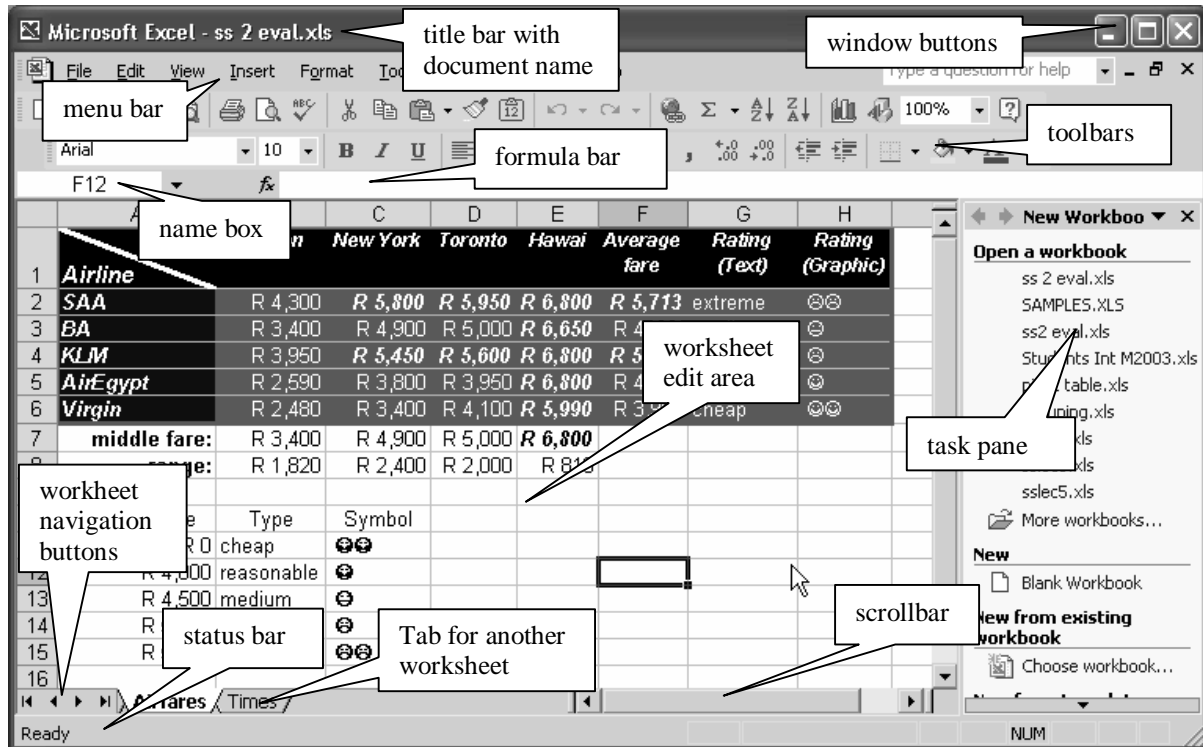
- ***Spreadsheet:*** this is a generic term which can refer to either the document that is created (as embodied in the file which is being stored) as well as the software application which is used to create this document (e.g. MS-Excel).
- ***Workbook:*** this is Microsoft's term for the spreadsheet document created by Excel. Each Excel workbook is stored in a separate file and identified by the  icon and the .xls file extension. In these notes, the terms *spreadsheet* and *workbook* are used as synonyms. The default name for a new workbook is "Book1".
- ***Worksheet:*** refers to one single page in a workbook. A workbook can consist of only one or several pages. The default name for the first worksheet in a workbook is "Sheet1".

A worksheet can be visualized as one huge sheet of paper, consisting of a matrix or table in which data can be entered. At any one time, only a small portion of the sheet is visible through your window, but you can move the window around to see different areas of your worksheet. The workbook, then, is equivalent to a stack or bundle of these worksheets, which can be shuffled at will but belong logically together and are therefore kept together in the same computer file.

The Basic Screen Layout of an Excel Spreadsheet

We assume that you know how to start Excel: either find and click the Excel application launch button  on your desktop or task bar, or select the appropriate *Program* menu option  from the *Start* menu. You can also load an existing Excel document and click on the New Document toolbar button .

The following is an example of the screen layout of a typical Excel spreadsheet.



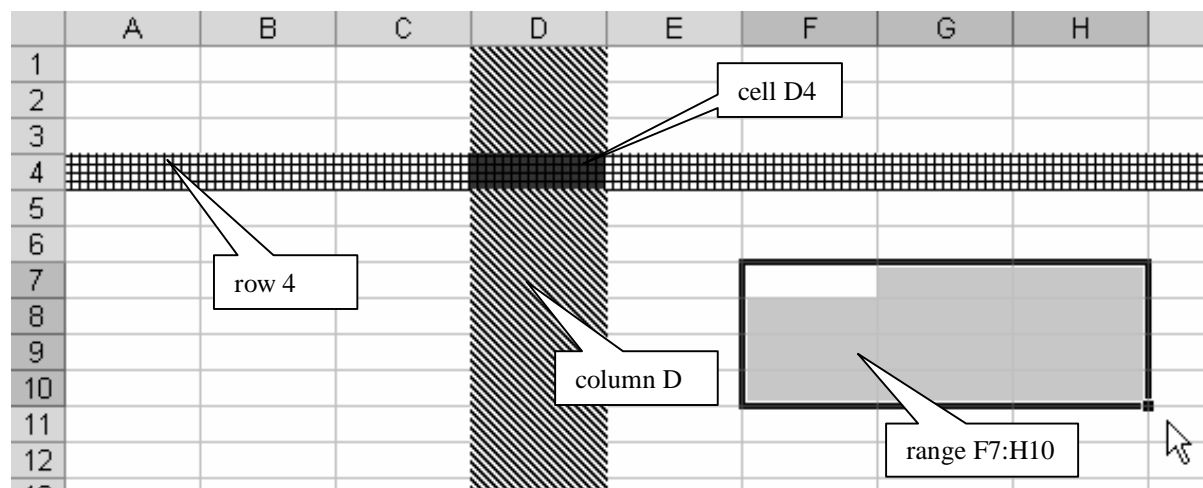
The Excel window has the same window components as any other MS-Office XP component. A brief review:

- The **menu bar** allows access to all Excel functions. Click or press the **<Alt>**-key followed by the underlined letter of the menu choice.
- The **toolbars** provide graphic buttons so that frequently used functions can be accessed by a single click. There are many toolbars available. By default the standard and the formatting toolbars will be shown. You can show/hide additional toolbars by right-clicking on an empty toolbar area or by selecting them from the **View • Toolbars** menu. Toolbars can be moved around your window by dragging the toolbar handle on the far right of the toolbar. You can customize toolbars by means of the **Tools • Customize... • Toolbars** menu.
- The **formula bar** is specific to Excel and allows the editing of a specific cell entry.
- The **worksheet edit area** shows a portion of the current worksheet.

- The **scrollbars** allow the quick navigation across a particular worksheet. The length of the scrollbar indicates the relative portion of the spreadsheet that is visible in the current worksheet edit area. Drag the solid bar to move fast, click on the empty bar area to move a screen at a time or click on the triangle arrow button to move a row or column at a time.
- The **sheet tabs** at the bottom of the worksheet allow you to switch between the different worksheets in your book. Click on a tab to switch to the sheet, drag a tab to rearrange its order in the workbook, or right-click the tab to rename, copy or delete the sheet. You can also use the worksheet navigation buttons to move one sheet left / right at a time, or move quickly to the very first or very last sheet in the workbook.
- The **name box** (to the left of the formula bar) typically indicates your current cell address (or its name) in the spreadsheet. Any data that you type will be entered in the cell indicated by that address. Whenever appropriate it will hold the name of a range or the formula more recently used.
- The **task pane**, a new feature in Office XP, provides quick access to commonly used functions such as creating a new spreadsheet (e.g. from a template), access to the new Office clipboard, or inserting clip art. However, the Excel task pane is not as useful it is in Word or PowerPoint, and in most case users prefer to see as much of the spreadsheet data as possible. For this module, the use of task pane will be ignored, since the task panes available for Excel are a subset of those already discussed in the Word module.

Columns, Rows, Cells and Ranges

The following is a more detailed view of the worksheet edit area.



The edit area contains the grid of the current spreadsheet. This grid has the following components.

Columns

A column has a name, as indicated by letters A, B, C etc. Column D is indicated with slanted lines. A spreadsheet has 255 columns. The 27th column is named AA, the 28th is AB, the 53rd is BA etc. until the 256th column which is called IV. A column's main attribute is its **width**.

Rows

Row names are indicated by numbers: 1, 2, 3, etc. A sheet has far more rows than columns: the last row is 65536 (which is 256×256 or 2^{16}). A row's main attribute is its **height**.

Cells

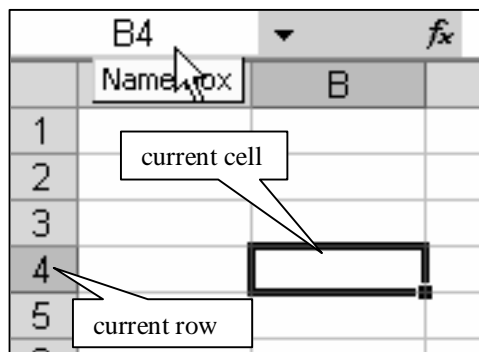
The cell is the most basic unit of a spreadsheet: it is the intersection of a column and a row. Its name (within the context of a given worksheet) is therefore the combination of its respective column and row names e.g. D4 or DZ5803. We will see further how cells can be given more natural sounding names such as *GrowthRate*. Note that other spreadsheet software may have different naming conventions, and Excel can adopt one of these e.g. R4C6 to indicate the cell at the intersection of the 4th row and the 6th column.

Range

A range is a rectangular selection of cells. It can be any number of columns wide and any number of rows high. The smallest range on a sheet is one single cell, often ranges are just one column wide or one row high, but most ranges are "true" rectangular area. A range is normally named by indicating the cell addresses of two opposite corner cells, separated by a colon. E.g. the range indicated in the example above could be referred to as any of the following: F7:H10 or F10:H7 or H7:F10 or H10:F7. A range can also be given a more natural name.

Navigating around the Worksheet

The Current Cell



Your cursor position within a worksheet is indicated by what is called the *current cell*. If you start typing data, the current cell is where the data will be stored. You can check the current cell address by looking in the name box, which is on the far left of the formula bar. Within your sheet edit area, the current cell is indicated by a heavy black border around the cell. Also, the column and row names are highlighted by a darker background colour. This is very useful if you are working on

a big monitor and your sheet edit area is very large.

Basic Navigation and Data Entry Keys

The quickest way of navigating around a worksheet is by using the mouse: clicking on a cell makes it the current cell. You can use the scroll bars to quickly move to areas of the worksheet which are not currently visible, but until you have actually clicked somewhere else on the edit area, wherever you last clicked remains the current cell.

Most of the time, you will be entering or editing data, therefore using the mouse to move the cursor is not always practical. The following keys will help you move the cursor around the current worksheet. If you have typed some data, pressing one of the navigation keys will result in the data being inserted in the current cell and then the cursor will move to the next cell as indicated.

	A	B	C	D	E	F	G	
	<Ctrl>- <Home>	<i>Keys to move to the adjacent cell</i>						
1								
2								
3		<Shift>- <Enter>				<Up>		
4	<Shift>- <Tab>	From Here	<Tab>		<Left>	From Here	<Right>	
5		<Enter>				<Down>		

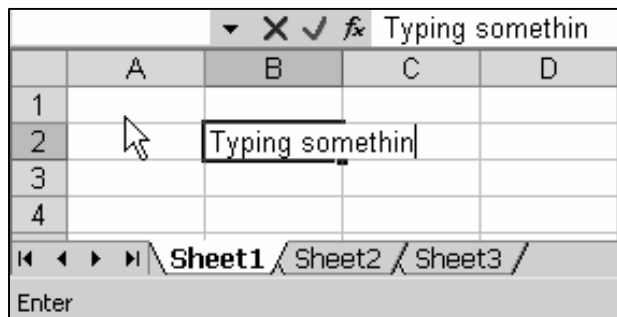
<Enter> : will move the cursor one cell down.

<Shift>-<Enter> : will move the cursor one cell up.

<Tab> : will move the cursor one cell to the right.

<Shift>-<Tab> : will move the cursor one cell to the left.


An alternative is to use the cursor (arrow) keys: e.g. pressing the <Up> or <Down> arrow key will enter the data into the current cell and then move the pointer one cell up or down respectively. Similarly, the <Left> and <Right> arrow keys will move you one cell left or right (except when you are in “edit” mode). Also note that pressing <Alt><Enter> does not enter the text into the cell but allows you instead to wrap text over several lines within the same cell.





cell.

Enter Mode.

Move your cursor to cell B2 and start typing something (anything). Notice how the typed text appears both in the cell (using the current formatting) and the formula bar. Confusingly, the mouse cursor (the

arrow ) can be at another cell (here e.g. A1), but the *edit* cursor (a vertical bar: |) is either in the current cell or in the formula bar.

When you make another cell your current cell and you start typing, you are in “Enter” mode as indicated on the left of the status bar. In “Enter” mode, the only active editing key is the <BackSpace>-key, which is the key above the <Enter>-key and usually indicated by means of a back arrow.

When you have finished entering data, you can click the  button on the formula bar to accept and insert your data (or formula) in the cell. Your text cursor will remain in the current cell. Alternatively, you can press one of the keys mentioned above (<Enter> etc.) to indicate that your cell entry is complete and move to an *adjacent* cell. Clicking the  button will reject the text which you typed in the formula bar and leave the original data, if any, in the current cell. You can also press the <Esc>-key to achieve the same effect.



Edit Mode

Edit mode allows you to edit the current cell entry without having to re-enter the entire data from the beginning. If you enter a formula with a syntax error, Excel will put you automatically in edit mode. Alternatively, you can switch to edit mode by pressing the <F2> function key. Use the following keys to edit the current cell entry.

- <Left> and <Right> : move the text cursor one character to the left / right.
- <Home> and <End> : move the text cursor to the beginning / end of the cell entry.
- <Ctrl>-<Left> and <Ctrl>-<Right> : move the cursor one *word* left / right.
- <F2> : ends edit mode again.

You can also use the mouse and click anywhere in the formula bar to edit the text at a particular position in the formula.

Building Your First Spreadsheet

To get familiar with the basic editing keys and formatting options, let us build a very simple spreadsheet. Click on the *New* toolbar button  or press the **<Ctrl>-<N>** shortcut keys or select the ***New...*** option from the ***File*** menu to start with a new spreadsheet. In Excel 2002, the *New Workbook* task pane will pop up; select the  **Blank Workbook** option.

	A	B	C
1		My shop	
2			
3			

First click on cell B1 to make it the current cell and type the text "My shop". Press the **<Enter>**-key and B2 will become your current cell as indicated by the black border and the darkened cell & column names. Press the **<Left>** arrow key to make A2 your current cell.



Now type in the different products your shop is selling as per example on the right. If you make a mistake, you can correct it by using any of the keys as discussed above. Even if you don't make any typos, you should experiment with the various cursor keys anyway! When you have entered the last product "Dates", move to cell B2 and type the three letter abbreviation for the first month of the year for which you will be capturing your sales: "Jan". Do not press the **<Enter>**-key but instead click on the *Enter* button.

	A	B	C
1		My shop	
2	Item	Jan	
3	Apples		
4	Bananas		
5	Cherries		
6	Dates		
7			

To show off some of the power of Excel, we will now automatically fill in the next 3 months

	A	B	C	D
1		My shop		
2	Item	Jan		
3	Apples			
4	Bananas			

by dragging the current cell **handle** (the little black square at the bottom right corner) horizontally across to cell E2. It takes a little practice to do it right. You know that your mouse cursor has reached the

handle and is ready for dragging it, when it changes from a **white cross**  to a **black cross**  shape. As you drag the

handle horizontally across, the names of the next few months should appear in yellow **smart tags** and when you

	A	B	C	D	E
1		My shop			
2	Item	Jan	Feb	Mar	Apr
3	Apples				
4	Bananas				

release the handle Excel will insert ("*AutoComplete*") the months Feb to Apr for you.


	A	B	C	D	E	F
1		My shop				
2	Item	Jan	Feb	Mar	Apr	
3	Apples	67	92	88	53	
4	Bananas	69	39	42	83	
5	Cherries	90	0	0	0	
6	Dates	10	7	8	5	
7						

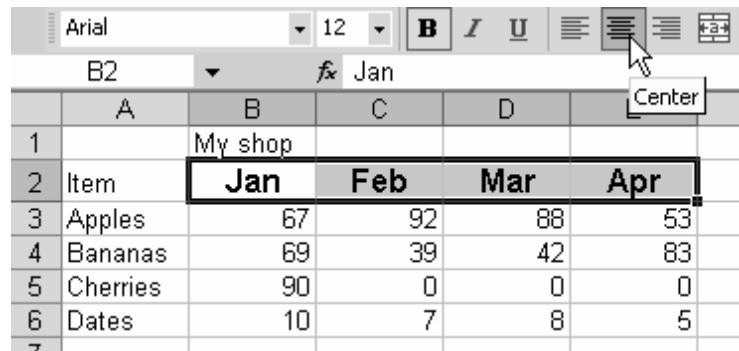
All that remains now is to complete some sales figures for each of the products and each of the months. Enter the sales amounts as shown in the example.

Simple Cell Formatting

We can now start working a little on the appearance of our mini-spreadsheet by applying some basic formatting.


Select the range B2:E2 by dragging your cursor from cell B2 to cell E2. There will be a black border around the selected range with all but the starting cell highlighted. We will be using the toolbar buttons on the formatting toolbar for the following simple formatting exercise.

Let us increase the **font size** from 10 to 12 points by clicking on the drop-down *font size list* button and selecting 12 from the drop-down list. Note how the row height of row 2 increased automatically to accommodate the taller text. We also click on the **bold** toolbar button **B** as well as on the **centre text** button . The result should be as shown.

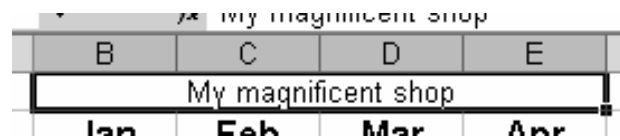


	A	B	C	D	E
1		My shop			
2	Item	Jan	Feb	Mar	Apr
3	Apples	67	92	88	53
4	Bananas	69	39	42	83
5	Cherries	90	0	0	0
6	Dates	10	7	8	5
7					



To demonstrate how to edit existing text without having to retype the whole text, click on cell B1 to make it the current cell. Note how the text “My shop” appears in the formula bar as well. Click in the white space between “My” and “shop” within the formula bar and insert the word “magnificent” and press **<Enter>**. The text in B1 now reads “My magnificent shop”. Note how text that is longer than the cell width can accommodate, flows over in the next adjacent cell (C1), at least if the latter is empty.


Let us now make the title a bit bolder. First, we will join the cells B1 to E1 together to make them one big cell: this is called **merging** cells. Select the range B1:E1 (by dragging your cursor from B1 to E1) and click on the **Merge and Center** toolbar button . The result should be as shown below.

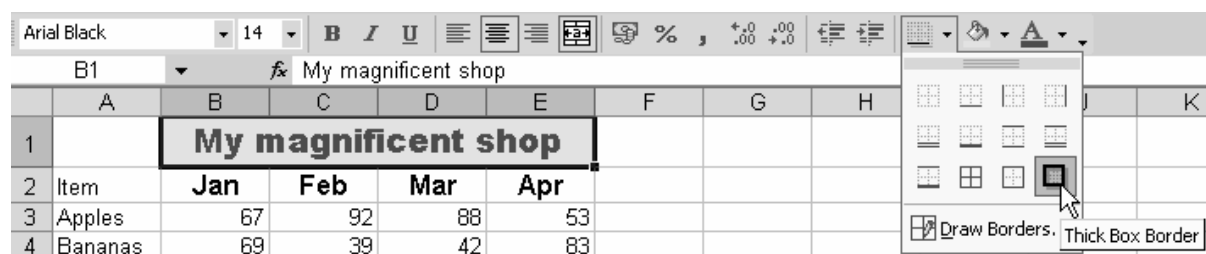
The light-grey cell boundary lines between the cells B1 to E1 have disappeared! Excel now treats the range B1:E1 as one single cell, containing the text “My magnificent shop”. Incidentally, the cell address for this *merged* cell is B1. Indeed for any merged range, the cell address will be that of the top left corner (original) cell. And yes, you can merge cells horizontally as well as vertically.




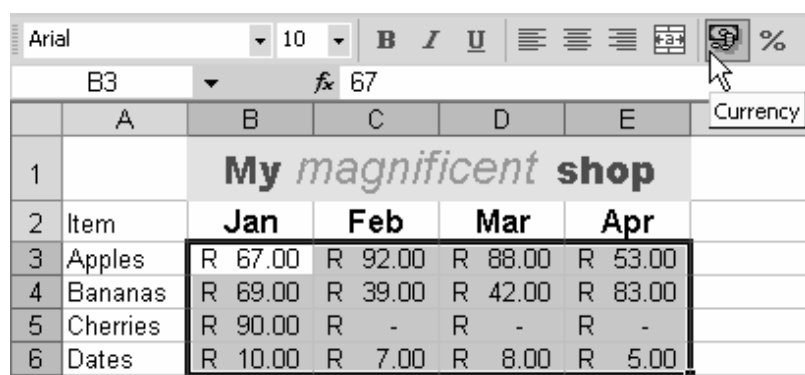
	B	C	D	E
1	My magnificent shop			
2	Jan	Feb	Mar	Apr


Let us now complete the formatting of the title. Click on the merged cell and change its font to *Arial Black*. Use a 14 point font size. Then click on the **Font Color** toolbar button  and set the font colour to *Red*. Click on the **Fill Color** toolbar button  and set the cell back-


ground to *Yellow*. Finally click on the **Borders** button  and select a *Thick Box Border* for the title cell. You should have the result as per below.



Excel also allows you to perform selected font formatting to *parts* of the contents of a cell. To illustrate this, select only the word “magnificent” in the formula bar as shown. Now click on  the appropriate toolbar buttons to change the font of only the word magnificent back to *Arial* but make it 18 points large. Also change its colour to *green* and make it *italics*. Note that only the relevant few formatting toolbar buttons are available for use – the others, such as (horizontal) cell alignment, are greyed out (or dimmed).



The last formatting we need to do, concerns our sales figures. Highlight/select the range B3:E6 and click on the **Currency** button . If your Windows has been installed for South African currency, the numbers will now show as *Rand* values, displayed with two decimal places. We

want to get rid of the two decimal places, so click twice on the **Decrease Decimal** button .

Okay, that is enough formatting for the moment. We will return to more advanced formatting at a later stage. Let us now add some complexity to our spreadsheet by putting in some formulas.

Your First Formulas


Using the AutoSum Formula

It would be very useful to know the *total sales* for each month. This is easy as pie in Excel. Click on B7 to make it your current cell, then click on the **AutoSum** toolbar button Σ which can be found on the *standard* toolbar.

Your screen should look like the one below. Excel suggests the rather complicated looking `=SUM(B3:B6)` formula. Press the **<Enter>** key to accept and enter this formula in B7.

You have just created your first formula. Let us analyse this astounding feat in some more detail.

	A	B	C	D	E
1		My magnificent shop			
2	Item	Jan	Feb	Mar	Apr
3	Apples	R 67	R 92	R 88	R 53
4	Bananas	R 69	R 39	R 42	R 83
5	Cherries	R 90	R -	R -	R -
6	Dates	R 10	R 7	R 8	R 5
7		=SUM(B3:B6)			
8		SUM(number1, [number2], ...)			

- In your worksheet edit area, cell B7 displays the calculated *value* `R 236` which is indeed the sum total of the sales for all items in January ($67+69+90+10=236$).
- The formula toolbar (if B7 is your current cell), displays the actual *formula* used to calculate the total i.e. `=SUM(B3:B6)`. The formula can be read as follows:
 - The `=` sign indicates that this is a formula, i.e. Excel has to compute something.
 - The `SUM` label indicates the nature of the formula, in this case it is a *built-in* function which adds the values contained in one or more cell ranges
 - The brackets `()` hold the argument for the function, in this case the *range* of values to be summed i.e. B3:B6.
- Before we pressed **<Enter>**, it would have been possible to change the suggested range by dragging the corners of the highlighted range (B3:B6).
- Excel provided a template of the types of arguments to be expected for the formula by means of a smart tag.
- To show the dynamic nature of Excel and its formulas, change the R67 in cell B3 to R77. Notice how the value in B7 changes automatically to reflect the new total i.e. R246. (Press **<Ctrl>-<Z>** or the **Undo** toolbar button  to change the value in B3 back to R67.)


Copying Your Formulas


We also need to calculate the totals for the other months. There are a number of different ways to do this.


	A	B	C	D	E
1		My magnificent shop			
2	Item	Jan	Feb	Mar	Apr
3	Apples	R 77	R 92	R 88	R 53
4	Bananas	R 69	R 39	R 42	R 83
5	Cherries	R 90	R -	R -	R -
6	Dates	R 10	R 7	R 8	R 5
7		R 246			
8					

Sheet1 / Sheet2 / Sheet3 /

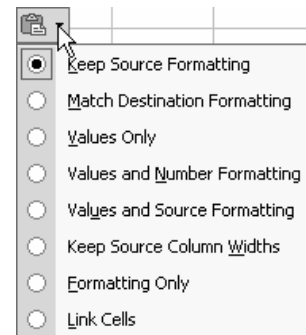
Select destination and press ENTER or choose Paste

The standard office way is to use the clipboard. Click B7 to make it the current cell (the *source*), then click the **Copy** toolbar button  (or use the **<Ctrl>-<C>** shortcut key). Excel will now draw a moving dashed border around your source cell and provide the “*Select destination and press ENTER or choose Paste*” instruction in the


status bar. Do so by selecting the range C7:E7 and pressing the **<Enter>**-key or clicking the **Paste** toolbar button . The selected cells will now be filled with their equivalent sum total

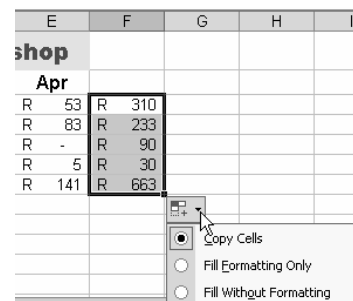
formulas: . Note that the actual formula has not been copied *exactly*: if you check cell C7, it will show the formula =SUM(C3:C6), *not* =SUM(B3:B6). Excel copies the logic underlying the formula, not the exact text of the formula!

Also note the little *Paste Options* icon appearing next to cell E7, allowing you to select various alternative paste options by clicking on its drop-down button. These options relating mainly to which formatting you wish to use in the target cells.



To illustrate an alternative way of entering formulas, let us calculate the totals for the different items. Click cell F3, then type the following text (using the keyboard): =SUM(B3:E3) and press the **<Enter>**-key. If all goes well, the result R310 should be displayed in cell F3. This illustrates that it is not necessary to use the AutoSum button to insert the formula, although it would have achieved the same effect.

Now, instead of using the clipboard, let us practice the second method of copying again: drag the cell handle (the little black square at the bottom right corner) for cell F3 down all the way to cell F7. The range should fill up with the appropriate SUM formulas. Notice how, with this method an *AutoFill Options* icon appears. 



Your Second Formula

Let us build a different type of formula: let us check how our sales grow or decline each month.

6	Dates	R	10	R	7	R
7	Total	R	246	R	138	R
8	Growth				=C7/B7	
9						

To calculate the growth from one month to the next, we use the formula:

$$\text{Growth} = \frac{\text{CurrentMonth}}{\text{LastMonth}} - 1$$

This is equivalent to the formula $\text{Growth} = (\text{Current Month} - \text{Last Month}) / (\text{Last Month})$. We will insert the correct Excel formula as follows:

- Click C8 to make it the current cell so we can insert the month-on-month growth for Feb. Check the *status* bar – it will indicate *Ready*.
- Type the [=] sign to indicate to Excel that a formula will follow.
- We now refer to the sales total for this month by *clicking on cell C7*. Note how the status bar now indicates *Point* (i.e. we are now in *cell pointing mode*) and Excel fills in the cell references C7 for us.
- Now type the mathematical operator symbol for division, the forward slash key [/],
- We now enter the divisor, last's months sales, by clicking on the appropriate cell i.e. cell B7 (as shown above). Excel is still in *pointing* mode, so it will complete the reference B7 in the formula.
- We now complete the formula by typing [-1] and pressing **<Enter>**.
- The formula in the formula bar should now read =C7/B7-1 and the result displayed in cell C8 should read 0.
- The growth (or rather, decline) in sales is not really 0, but it is only a decimal fraction of the unit. Click on the **Percent Style** toolbar button [%] to format the result as a percentage. The cell should now display [-44%] i.e. we had a 44% drop in sales.
- Drag or copy this cell (formula) across to the next 2 months to show a 0% growth for March and a meagre 2% growth for April. Obviously the end of the cherry season was very bad for business!

As a final test, change the March sales of bananas to R82. Does your overall sales total increase to R703 (cell F7) and your growth for March improve to 29%? If so, well-done! You have now built your first spreadsheet application

	A	B	C	D	E	F
1		My magnificent shop				
2	Item	Jan	Feb	Mar	Apr	Total
3	Apples	R 77	R 92	R 88	R 53	R 310
4	Bananas	R 69	R 39	R 82	R 83	R 273
5	Cherries	R 90	R -	R -	R -	R 90
6	Dates	R 10	R 7	R 8	R 5	R 30
7	Total	R 246	R 138	R 178	R 141	R 703
8	Growth		-44%	29%	-21%	

Types of Data

Note from the example a cell can contain any one of the following types of data elements.

Numeric Values.

A numeric value is a number such as 141 or 5%. All numbers are treated as constants. Any sequence of numbers, optionally containing a leading + or – symbol and decimal point, is treated as a numeric constant. Excel also allows the use of the %-sign in constants.

When working with very large or small numbers, scientists will also use the symbol “E” to multiply a number with a power of 10 e.g. 1.2E+9 is equivalent to 1.2×10^9 or 1200000000 (1.2 billion). Similarly 3E-9 is $3 \times 10^{(-9)}$ or 0.000000003 (3 billionths). Note that +3E-9 (a very small positive amount) is not the same as -3E+9 (a very large negative amount e.g. your bank balance when you owe the bank 3 billion!).

Depending on your system configuration, Excel will also accept a specific currency symbol as part of numeric value e.g. entering R3.50 in a South African spreadsheet is actually entered as the value 3.5 with currency formatting whereas \$3.50 will be taken as a text value. A PC configured for use by Americans may instead accept the \$ symbol (and treat R3.50 as a text value). Using the / or – symbols together with numbers (e.g. 3/5) may cause Excel to treat your input as dates, as discussed in the next unit.

The display format of a number does not affect the value used in subsequent calculations. E.g. 0.05 or 5% or R0.05 or 0.0500000 all mean the same thing when used in subsequent formulas. Often the result of a formula is displayed with no or a small number of decimals but the actual value stored (and used in subsequent calculations) is much more precise. E.g. even though the number 1/3 may be displayed as 0.33333 or 33% on-screen, the actual value used in calculations is really 0.3333333333333333 since Excel’s internal number precision is actually 15 digits.

Text Values

A text value or label is a string of alphanumerical symbols (letters and numbers) such as “Total” or “Cherries”. Generally, text has meaning to the user but is not normally used in numeric calculations. They typically elucidate the values contained in the spreadsheet.

Sometimes, you want to enter a text value which could be interpreted by Excel as a formula or numeric value e.g. an international telephone number such as “+27-21-6501234”, a grade symbol such as “+2” or a regional road name “R3” (with R also being the local currency) are all meant to be text. You can easily *force* Excel to treat these as text values by preceding them with a <space>, or even better by preceding them with the single quote <'> character.

Formulas

The formula provides the intelligence and dynamics to Excel spreadsheets and are discussed in the next section.

More on Excel Formulas

Introduction

Although you can use Excel just for keeping track of data in table-like structures and charting, its real power lies in the manipulation of numeric information. A critical and very important feature is Excel's ability to let the value of one cell depend *dynamically* on the value of one or more other cells.

If one cell contains the price of an item and another cell the quantity ordered, a third cell is likely to automatically calculate the total amount due by multiplying the contents of the first cell with the value of the second cell. This third cell

	A	B	C	D
1	A simple spreadsheet			
2	Price per item:	R 3	=B2*B3	
3	No of items:	5		
4	Total amount due:	R 15		
5				

will refer to the first two cells by means of a mathematical **formula** (or *equation*). If either of the two basic values (or "independent variables") changes, the result in the third cell is automatically and immediately updated. In order to become a competent business user of Excel, you are expected to be able to construct the formulas that are required in typical simple business spreadsheets. You have to be able to *conceptualise* the relationship (or dependency) between cells (e.g. how to calculate a ratio or add tax) and express these relationship in the mathematical notation required by Excel.

Note that Excel stores the formulas – also referred to as the *logic* of your spreadsheet – as well as the calculated values or results. By default, only the calculated result of the formula is shown on-screen (or printed). If you actually want to see the actual formula contained in a cell, you need to click on the cell and check the formula in the formula bar. (Pressing <Ctrl><`> will cause Excel to display the formulas in all cells instead of their values – this is very handy for debugging purposes. The <`> refers to the left-single-quote, not the more common <'> right-single-quote.)

Simple formulas and the arithmetic operators

An Excel formula has three elements:

1. It starts with the = character so that Excel knows that a formula expression will follow.
2. It contains constants (numbers) and/or references to other cells.
3. It contains mathematical operators and/or special functions, including brackets to indicate precedence.

The following are examples of valid Excel formulas.

- =3*4
- =(A1+A2)/2+3*A3

- =B7+2*E9-A2
- =B7*8/(EF9^A4+89.5)/(SUM(F5:H8,D9)-IF(A2>8,8,A2))-AVERAGE(F3:H6)

Excel's arithmetic operators

Most formulas use the standard arithmetic operators to calculate a result based on the values contained in other cells. The following table lists the important arithmetic operators.

Operator	Description	Example
+	Addition	=7+10+B8
-	Subtraction (or negative number)	=10-A7
*	Multiplication	=A7*1.14
/	Division	=B8/2
^	Exponentiation (To-the-power-of)	=A4^3 (the same as =A4*A4*A4)

Precedence

The following rules apply when Excel evaluates formulas.

- The inner-most brackets are calculated first.
- Exponentiation takes precedence over multiplication and division.
- Multiplication and division take precedence over addition and subtraction.
- Items of equal precedence get calculated from left to right.

See if you can work out how the following examples will be calculated.


$$=10+5*3-7 \quad (\text{result: } 10+15-7 = 18)$$


$$=100+5*3^(4-2)/5-20 \quad (\text{result: } 100+5*9/5-20 = 100+9-20 = 89)$$

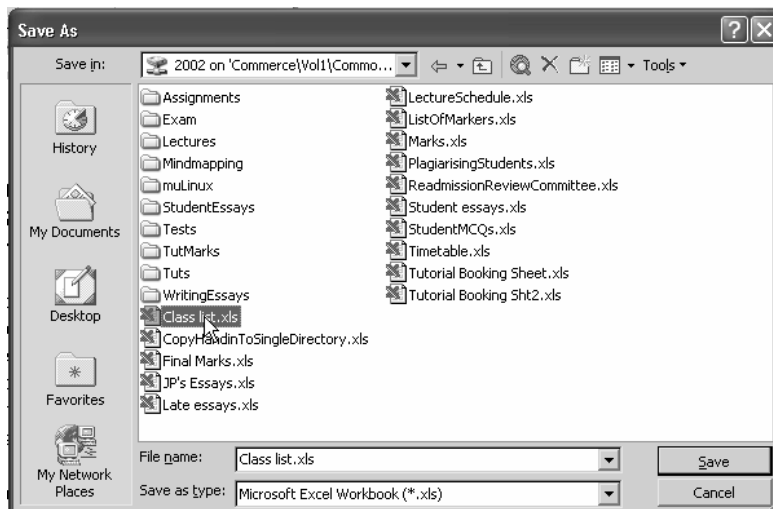
If you are unsure about the exact precedence, use brackets e.g. =1+(81/(3^2)) may be the same as =1+81/3^2 but the former expression leaves no uncertainty as to what is intended.

Saving and Printing Your Spreadsheet

Saving Your Spreadsheet

As with any document that you create on your computer, it is important that you save your work regularly. Your computer can crash due to many reasons, including power failure, hardware troubles and operating system problems. Although Excel has an AutoSave and AutoRecovery feature (see the settings on the **Tools • Options • Save** menu), it does not work as well for Excel spreadsheets and you are likely to lose substantial amounts of work should a major disaster strike. In addition, you are likely to make a number of errors during the construction of your spreadsheet and some of these errors may have devastating effects. In many cases, you can use the *Undo* feature (press the  button or use the <Ctrl>-<Z> keyboard shortcut) to recover from most errors, but this may not always work with more advanced commands. The bottom-line: save your work often!

Saving your work is done by clicking the Save button , the <Ctrl>-<S> keyboard shortcut or the **File • Save** menu option. This will present the familiar **Save As** dialogue window




where you can specify the folder in which you wish to save the file as well as the file name.

Make use of the various buttons e.g. to create new sub-folders or change the view mode. Remember that hovering your cursor over selected items will display more detailed information e.g. hover over a file name to see its size and attributes. Advanced users

will appreciate the *Save as type*: option which allows them to export spreadsheet to other applications.

Printing Your Spreadsheet

To print your spreadsheet using the default settings, click the *Print* button  to print out the current spreadsheet on your default printer. Note that hovering your mouse cursor above the button will display your default printer.

To change some print defaults, press <Ctrl>-<P> or select the **File • Print...** menu option to bring up the standard *Print* dialogue window which allows you to change the number of copies, the printer and which pages to print.

Cell Referencing

Absolute and relative addresses

Often, you want to use similar formulas elsewhere in your spreadsheet. You can make use of the *copy and paste* clipboard function or, even quicker, the *drag-to-copy* feature whereby you drag the bottom-right corner handle of a cell or range across other cells to fill these cells with copies (or, in the event of a recognised series, the *AutoFill* series).

The following example will be used to illustrate the concepts.

	A	B	C	D	E	F
1	Jean-Paul's Excel-nt Supermarket					
2				VAT Rate:	14%	
3						
4	Item	Quantity	Price	Total (excl)	VAT	Total (incl)
5	Apples	3.5	R 3.49	R 12.22	R 1.71	R 13.93
6	Bananas	1.25	R 2.99			
7	Cherries	0.75	R 9.87			
8			Total:			

Select the range D5:F5

Drag this handle down two rows

This represents a simple invoice. The first line item has already been completed. The following formulas were used (Hint: you can see all the formulas in a spreadsheet instead of their actual values or results, by pressing **<Ctrl>-<`>**).

(D5) =B5*C5 Total (excluding VAT) = quantity * price
(Note: try typing "quantity*price" in cell D5 and see what happens!)

(E5) =D5*E2 VAT = total (excl. VAT) * VAT rate

(F5) =D5+E5 Total (including VAT) = Total (excl. VAT) + VAT

The next two line items will use similar formulas, so we will try replicating them.

1. Select (or highlight) the range D5 to F5 (drag the mouse cursor or press <Shift>+<cursor>-key to select with the text cursor).
2. Move the mouse cursor to the little square drag handle at the bottom right corner of the highlighted range.
3. Drag the handle down two rows to copy the formulas in row 5 to rows 6 and 7.

You should see the following:

	A	B	C	D	E	F
1	Jean-Paul's Excel-nt Supermarket					
2				VAT Rate:	14%	
4	Item	Quantity	Price	Total (excl)	VAT	Total (incl)
5	Apples	3.5	R 3.49	R 12.22	R 1.71	R 13.93
6	Bananas	1.25	R 2.99	R 3.74	R 0.00	R 3.74
7	Cherries	0.75	R 9.87	R 7.40	#####	#/VALUE!
8			Total:			

The formulas in D6 and D7 seem to work ok: the total (excluding VAT) is indeed equal to the product of the previous two cells (on the same row). But the cells in E6 to F7 do *not* reflect the correct values. Let's examine what went wrong. Pressing **<Ctrl>-<`>** changes the view to *formula* view i.e. cells show the formula instead of their results (values).

	A	B	C	D	E	F
1	Jean-Paul's Excel-nt Supermarket					
2				VAT Rate:	0.14	
4	Item	Quantity	Price	Total (excl)	VAT	Total (incl)
5	Apples	3.5	3.49	=B5*C5	=D5*E2	=E5+D5
6	Bananas	1.25	2.99	=B6*C6	=D6*E3	=E6+D6
7	Cherries	0.75	9.87	=B7*C7	=D7*E4	=E7+D7
8			Total:			

Examine again the formulas in column **D**. When Excel copied the formula from D5 to D6, it actually *changed* the cell references: instead of B5*C5 the references were to B6 and C6. Excel realised that we (probably) wanted to multiply the values in the two cells on the *same* row and accordingly adjusted the cell references. This conserved the *structure* of the formula by maintaining the *relative position* of the cells that are referred to. Hence we call the cell references in the formula **relative cell references** (or addresses).

Similarly, the formulas in column **F** also are correct: F6 is the sum of E6 and D6 and F7 is E7 plus D7. Excel did a clever job in adjusting the relative cell references.

Now examine the formulas in column **E**. When Excel copied the formula from E5 to E6, it also adjusted those cell references: D5*E2 (in E5) became D6*E3 (in E6). Now, this is partially correct. The VAT in E6 must indeed be calculated on the (exclusive) total in D6. However, the VAT rate itself should still be taken from E2, *not* E3. We need to find a way to tell Excel that it shouldn't change any references to cell E2. This can be achieved by *fixing* the reference to cell E2; we make the cell reference **absolute**. This is done by (the somewhat arbitrary convention of) placing **\$**-signs before the cell reference: we should refer to **\$E\$2** instead of E2 in the formulas. You can test this by editing cell E5 so that the formula becomes:

(E5:) =D5*\$E\$2

Now drag the cell handle across E6 and F6 and the following spreadsheet appears:

	A	B	C	D	E	F
1	<i>Jean-Paul's Excel-nt Supermarket</i>					
2				VAT Rate: 0.14		
4	Item	Quantity	Price	Total (excl)	VAT	Total (incl)
5	Apples	3.5	3.49	=B5*C5	=D5*\$E\$2	=E5+D5
6	Bananas	1.25	2.99	=B6*C6	=D6*\$E\$2	=E6+D6
7	Cherries	0.75	9.87	=B7*C7	=D7*\$E\$2	=E7+D7
8			Total:			

You will note that Excel changed the *relative* cell reference D5 to D6 and D7 respectively, but did not touch the *absolute* reference to \$E\$2. Press **<Ctrl>-<'>** to change back to the normal view and you will see the correct values as follows. (We have also added the totals in row 8 by making use of the *AutoSum* button).

	A	B	C	D	E	F
1	<i>Jean-Paul's Excel-nt Supermarket</i>					
2				VAT Rate: 14%		
4	Item	Quantity	Price	Total (excl)	VAT	Total (incl)
5	Apples	3.5	R 3.49	R 12.22	R 1.71	R 13.93
6	Bananas	1.25	R 2.99	R 3.74	R 0.52	R 4.26
7	Cherries	0.75	R 9.87	R 7.40	R 1.04	R 8.44
8			Total:	R 23.36	R 3.27	R 26.62

The distinction between absolute and relative references is initially a fairly difficult concept to grasp but it is essential to building anything beyond the most basic spreadsheets.

Whenever you are entering or editing a formula, you can convert a relative cell address into an absolute reference by pressing the **<F4>** function key.

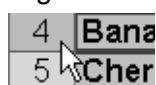
Inserting and Deleting Rows/Columns

Although you should plan your spreadsheet carefully before you start developing it, it often happens that you want to insert an additional row or column of data in your spreadsheet.

Inserting a New Row

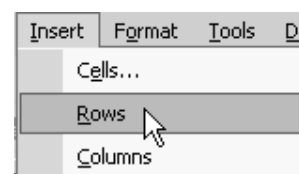
Assume that you built your spreadsheet as shown and realize that you have forgotten to enter the sales for Avocados. You want to insert a new row number 4 for the avocados and move all the other rows from “Bananas” onwards down one row. There are three alternative methods for inserting the required row.

1. Right-click on the row number

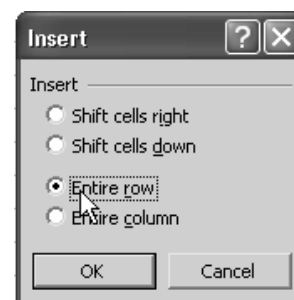
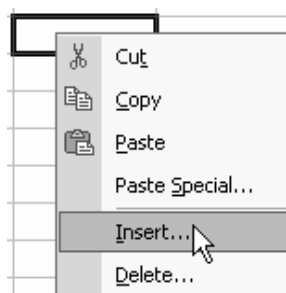
 to bring up the menu and select the **Insert** option. This will move row 4 and all the others below one row downwards and insert a new row.

	A	B	C	D	E	F
1	My magnificent shop					
2	Item	Jan	Feb	Mar	Apr	Total
3	Apples	R 77	R 92	R 88	R 53	R 310
4	Bananas	R 69	R 39	R 82	R 83	R 273
5		R -	R -	R -		R 90
6		R 7	R 8	R 5		R 30
7		R 138	R 178	R 141		R 703
8						
9						
10						
11						

2. Click any cell in row 4 and select the **Rows** option from the **Insert** menu to insert a new row.



3. Right-click any cell in row 4 and select the **Insert...** option from the right-click menu. The **Insert** window will pop up allowing you to shift selected cells or insert a row or column. Click the **Entire row** option to insert a row.



When you insert a row (or column), all formula references to cell in rows that have moved down (or right) are automatically adjusted. Where formulas contain references to *cell ranges*, these references will be adjusted as long as the row falls within range. In the example above, cell B7 contained the formula =SUM(B3:B6) before the row insert; this calculates the total sales of 4 products. After a row has been inserted, cell B8 will now contain the formula =SUM(B3:B7) i.e. this calculates the total for all 5 products. If you had instead inserted a row at row 7 i.e. where the sales total were calculated, the =SUM formula would *not* have been updated i.e. cell B8 would still (and erroneously) contain the formula =SUM(B3:B6).

Any of the three possible methods of inserting a row also allows you to insert multiple rows at once by selecting a range of rows or cells prior to selecting the **Insert Row** command.

Inserting a Column

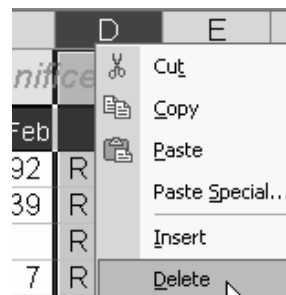
To insert a column, you can make use of exactly the same three methods.

When using the first method, right-click a column name (e.g. "D") instead of a row number and choose the ***I*nsert** option. When using the second method, choose the ***C*olumns** option from the ***I*nsert** menu or, for the third method, select the ***E*ntire *c*olumn** option on the popup window. In both case, the column in which the cell is currently located will be shifted to the right.

Deleting Columns or Rows


You will have noticed that all of the above menus also feature an option to ***D*elete** rows or columns.

Be very careful when deleting rows or columns that contain data. Not only can you loose valuable data but remember that any formula which references the deleted cells will now give the error message: "**#REF!**". This means that the formula contains an invalid cell reference.



	A	B	C
1			
2	Item	Total	
3	Apples	#REF!	
4	Bananas	#REF!	
5	Cherries	#REF!	

The example on the left shows what happens should you mistakenly delete columns B to E in the above examples, causing the range reference in the formula =SUM(B3:E3) to become meaningless.

Should this happen, you can use the *Undo* button  to restore the deleted columns.

Some Basic Business Formulas



Some calculations keep recurring, no matter what type of business spreadsheet applications you develop. It is important, therefore, that you are familiar with some of the more common business calculations.

Converting a Number to a Percentage or Vice Versa

One of the most confusing issues confronting novice Excel users is how Excel treats percentages. Forget all you have learnt at school on how to express percentage using paper and ignore completely the way the %-key works on a calculator. The rule is simple: there is ***no need to multiply or divide figures by 100 in order to obtain a percentage***. In Excel, a growth rate of +12% is exactly the same value as a growth rate of +0.12. The only difference is in the formatting: using the % format will automatically display the value, multiplied by 100 and followed by the % symbol.

If you want to enter a value (constant) you can type either, say 8% or 0.08.

The formulas =A4*14% or =A4*.14 or =A4*0.14 are entirely equivalent.

Practice this for yourself by entering 0.345 in a cell and formatting it as a percentage (should say 34.50%) or entering a percentage, say -76.54%, and formatting it as a, say fixed format. E.g. click the *Comma Style* button  on the formatting toolbar to display -0.77, then click the *Increase Decimal* button  once or twice to increase the number of decimals so you can see that the real value is indeed -0.7654.

Adding a Percentage

There are many situations where you need to add a percentage to a *base* value, e.g. when adding a growth rate, markup or VAT.

The formulas are simple:

- The **growth amount** (or addition) will be calculated as `=BASE * GROWTH%`
- The **new total** will be calculated as `=BASE + GROWTH AMOUNT`

Sometimes, you want to calculate the new total in one single step, without first having to calculate the growth amount. Calculate the final value/new total in one go as

$$= \text{BASE} * (1 + \text{GROWTH}\%) \quad \text{OR} \quad = \text{BASE} + \text{BASE} * \text{GROWTH}\%$$

Check out the formulas for the examples below. Column C displays the formulas used in column B in text form, with spaces added for readability.

	A	B	C
1	Markup	40%	
2	Cost Price	R 15,000	
3	Markup (in Rand)	R 6,000 = B2 * B1	
4	Selling Price	R 21,000 = B2 + B3	
5			
6	Sales Price excluding VAT	R 700	
7	+ VAT (14 %)	R 98 = B6 * 14%	
8	Sales Price including VAT	R 798 = B6 + B7	
9			
10	Interest rate	5%	
11	Beginning balance	R 340	
12	+ Interest	R 17 = B11 * B 10	
13	Closing balance	R 357 = B11 + B12	
14			
15	Inflation rate	8%	
16	2002 price	R 600	
17	2003 price	R 648 = B16 * (1 + B15)	

Deducting a Percentage or Discount

To deduct a percentage from an amount, or give a discount, you can use the same formulas as for adding except that you use a “-” instead of a “+”.

Calculating a Fraction or Percentage

Often, a number needs to be expressed as a fraction or percentage of another number. This is achieved simply by dividing the number into the other number.

A typical example is to express the sales of, say, a region or product line as a fraction of total sales, e.g. if the sales of non-perishables equal R 382 (million) and the total sales are R 970 (million), then non-perishables are $R\ 382 / R\ 970 = 0.393814\dots$ of the total, or 0.39 when

rounded to the nearest hundredth.

	A	B	C	D
1	Perishables	R 588		
2	Non-perishables	R 382		
3	Total Sales	R 970 = B1 + B2		
4				
5	Non-perishables/Sales	0.393814 = B2 / B3		General format
6	Expressed as a %	39.38% = B2 / B3		Percentage format
7	Expressed as a fraction	2/5 = B2 / B3		Fraction format

Where these fractions represent a portion of a total, a percentage is more commonly used. In Excel, all you have to do is to format the cell con-

taining the formula as a percentage format. In the above example, the number 0.393814 will be displayed as 39% (or possibly, with more precision, as 39.38%). The same formula is used but a different (presentation) format is applied! (Note: if you want to represent this as a *real* but approximate fraction, Excel also provides a *Fraction* format which would display this as (being approximately) 2/5th (two-fifths) – see *cell formatting* later.)

Note that fractions do not have to be less than 1 (or 100%) e.g. if the population of a large city is 3.5 million and the population of a smaller town is 240 thousand then the city's population is $3\ 500\ 000 / 240\ 000 = 14.58$ times that of the smaller town.

Finding a Growth Rate or Markup Percentage.

A problem similar to that above is where an unknown percentage has been added to (or deducted from) an amount but the total is known. Typical examples are to calculate year-on-year growth percentage given the two annual figures, or to figure out the discount given or tax added given the gross and net amounts.

Calculate the growth rate (or markup) by means of the following formula:

$$\text{Growth Rate} = (\text{New} - \text{Base}) / \text{Base}$$

The logic behind this formula is that it first calculates the growth as an amount (New – Base), and then to expresses this growth as a fraction of the original base.

An equivalent formula which does not require you to reference the Base value twice is:

$$\text{Growth Rate} = (\text{New} / \text{Base}) - 1$$

	A	B	C
12	Last year's sales	R 450	
13	This year's sales	R 520	
14	Sales growth (in Rand)	R 70	= B13 - B12
15	Sales growth rate in %	15.56%	= B13 / B12 - 1
16			
17	Cost price	R 64.34	
18	Selling price	R 87.52	
19	Markup (in %)	36%	= B19 / B18 - 1
20			
21	List price	R 85	
22	Net price (after discount)	R 80	
23	Discount rate (in %)	-6%	= B22 / B21 - 1

E.g. if last year's sales were R450 million and this year's sales are R520 million then the growth rate is: = (520 – 450) / 450 = 70 / 450 = 0.15555... (or 15.56%). A more efficient though slightly less intuitive way is to use the second formula = (520 / 450) – 1 = 1.15555 – 1 = 0.15555, since you would only enter each cell reference once. Note that the brackets are not strictly necessary for the second formula, since Excel gives a

higher priority to multiplication/division than to addition/subtraction.

A markup percentage is calculated in the same manner. So are a decline or discount rate, except that the formula will yield a negative value since the *New* value is less than the *Base* value.

Applying an Annual Interest for a Month

Interest rates are usually expressed as an annual interest rate but calculated on a more frequent basis e.g. monthly. For example, the interest rate on your savings account might be quoted as 9% (per annum) but the bank may calculate (and give you) interest each month on the outstanding balance. In this case, you can calculate the interest due to you by dividing the annual percentage by 12 (months) i.e. 9% / 12 = 0.75%. Multiply the equivalent monthly interest rate with your balance to find the interest accrued. E.g. if your balance at the beginning of the month was R 14 500, then you will have earned R 14 500 * (9% / 12) = R 108.75.

Compound Interest

A slightly more advanced but still fairly common financial calculation is where a single initial

	A	B	C	D
1	Month	Initial Balance	Interest	Month-end Balance
2	Jan	R 10,000.00	R 100.00	R 10,100.00
3	Feb	R 10,100.00	R 101.00	R 10,201.00
4	Mar	R 10,201.00	R 102.01	R 10,303.01
5	Apr	R 10,303.01	R 103.03	R 10,406.04
6	May	R 10,406.04	R 104.06	R 10,510.10
7	Jun	R 10,510.10	R 105.10	R 10,615.20
8	Jul	R 10,615.20	R 106.15	R 10,721.35
9	Aug	R 10,721.35	R 107.21	R 10,828.57
10	Sep	R 10,828.57	R 108.29	R 10,936.85
11	Oct	R 10,936.85	R 109.37	R 11,046.22
12	Nov	R 11,046.22	R 110.46	R 11,156.68
13	Dec	R 11,156.68	R 111.57	R 11,268.25

amount is invested and interest then accrues to the investment account on a regular basis. What happens is that the investment amount grows each period due to the interest which is added, which causes subsequent interest payments to increase since the balance increases each period. In effect, interest is earned on earlier interest. This is known as *compound interest*. The example on the left illustrates this using an initial investment of R 10 000 and a monthly interest rate of 1% (equivalent 12% annualised interest rate).

There exists a somewhat complicated formula which calculates your final balance using one single calculation, instead of having to build the entire table of monthly interest calculations.

$$\text{Final Balance} = \text{Initial Balance} * (1 + \text{Interest Rate}) ^ \text{Number of Periods}$$

Note that the “^” symbol is Excel’s notation for a power function e.g. 3² (i.e. the square of 3) is expressed as =3^2 in an Excel formula. The number of periods (e.g. months, days, semesters, etc.) refers to how many times interest has to be calculated and the interest rate is the actual interest percentage earned (or charged) per single period. What really happens in the formula is that the power function is shorthand for all the required multiplications.

In the above example, you could use the formula =B2*1.01^12 (with B2 the cell containing the initial balance i.e. R10 000, and 1.01 equivalent to 1 + 1%) to calculate the final December month-end balance directly.

Exercises

Exercise 1

Build the spreadsheet model displayed below. Try to build the spreadsheet example exactly as shown, including *structure, cell alignment, formatting of values, borders, column widths* etc. Use the copy (or fill) function where possible to save yourself effort (so use absolute addressing where appropriate).

Innovative Book Importers are South African importers for English textbooks. You are to build a simple spreadsheet that calculates the cost for each day's book orders.

	A	B	C	D	E	F	G	H
1	Innovative Book Importers							
2	Delivery		Import duty:	20%	on Total Cost			
3	11-05-98		Markup:	15%	on Total Cost plus			
4			Handling fee:	R200				
5								
6	Author	No. of books	Cost Price	Total Cost	Import Duty	Markup & handling	Final Price	Price (%)
7	Van Belle	400	R82.50	R33,000	R6,600	R5,150	R44,750	16.8%
8	Smith	400	R98.75	R39,500	R7,900	R6,125	R53,525	20.1%
9	Keys	200	R60.00	R12,000	R2,400	R2,000	R16,400	6.2%
10	Reagan	300	R80.00	R24,000	R4,800	R3,800	R32,600	12.2%
11	Wilson	500	R120.00	R60,000	R12,000	R9,200	R81,200	30.5%
12	Bond	700	R40.00	R28,000	R5,600	R4,400	R38,000	14.3%
13	Totals:	2500		R196,500	R39,300	R30,675	R266,475	100%

- Column A records the author's name, column B the number of books and column C the cost (in South African Rand) for each book.
- The *Total Cost* for each book represent the number of books times the cost price.
- The *Import Duty* is found by the percentage import duty times total cost.
- *Markup & Handling* is based on the total cost and consists of a fixed handling fee and the variable markup percentage of total cost.
- The *Final Price* is the sum of total cost, duty, markup & handling.
- Column H shows the final price expressed as a percentage of all the total (in G13).
- In row 13, the totals for each column are calculated.
- Cell A3 should always automatically reflect the expected *delivery date* which is six weeks (i.e. 42 days) from now. Note that your date will differ from the example.

Once you have completed entering the text, values and formula in the model try to ensure that your formatting is correct, column widths allow all data to be displayed, numbers are

displayed to the correct number of decimal places and headings and totals have borders as displayed.

- If the import duty is increased to 25%, how much would Reagan's final price be (G10)? And how much would our total Mark-up & Handling be (F13)?
- If the import duty on books were to be scrapped, how much must our profit mark-up be (in D3) in order to ensure that total mark-up (in F13) would be R40,000? Give the required mark-up (to the nearest %)
- In cell A3, we always want the expected delivery date (6 weeks from now) displayed. Use the appropriate date function (and number format)

Exercise 2

Build the spreadsheet model displayed below. Try to build the spreadsheet example exactly as shown, including *structure, cell alignment, formatting of values, borders, column widths* etc. Copy functions where possible to save yourself effort (so use absolute addressing where appropriate).

	A	B	C	D	E	F	G	H
1	ABC FastPrint: for all your printing requirements							
2	Quotation for: Mr Stoffberg						Date:	23-Mar-03
3	Number of booklets:	400	Paper cost:	R 24.35	per ream (or 500 sheets)			
4	Nr pages per book:	34	SS/DS:	2	(1=Single-Sided; 2=Double-Sided)			
5	Nr of colours:	2	Mark-Up:	40%	on cost			
6	Costing Sheet				Pricing Sheet			
7	Item Description	Rate	Quantity	Total	%			
8	Paper	R 0.0487	6800 sheets	R 331.16	7%	Total Cost:	R 5,080.49	
9	Board (for covers)	R 1.20	800 sheets	R 960.00	19%	+ Mark-Up:	R 2,032.20	
10	Labour: printing	R 80.00	9.1 hours	R 725.33	14%	=Total (Excl)	R 7,112.69	
11	Labour: setup & clean	R 80.00	17.0 hours	R 1,360.00	27%	+VAT 14%:	R 995.78	
12	Plates & negatives	R 18.00	68 plates	R 1,224.00	24%	=Total (Incl)	R 8,108.47	
13	Binding & stapling	R 1.20	400 books	R 480.00	9%			
14				Total:	R 5,080.49	100%	Cash Price	R 7,297.62

ABC FastPrint is a small business specialising in the printing of small booklets in relatively small quantities. The spreadsheet is used to prepare a quote for customers, based on the specific requirements of their job. For each quote, the details of the job are entered in rows 2 to 5. Below find the logic behind the formulas which you are expected to put into the spreadsheet (i.e. don't enter values where formulas are expected).

- The rate for the paper (in B8) is derived from the paper cost per ream (E3) divided by the number of sheets in a ream (i.e. 500). The other rates (B9 to B13) are values that are entered manually but these values tend to be fairly constant from quote to quote.
- The quantity of sheets used in a job (C8) will be the number of booklets (B3) multiplied by the number of pages (B4). If a job is printed double-sided (E4) only half of the number of pages is required.

- The quantity of boards required is twice the number of booklets (B3) i.e. one front and one back cover.
- The number of hours of labour for printing (C10) is based on the total number of pages to be printed (booklets x pages per booklet) times the number of colours (per page). A printer should be able to print 3000 pages (in one colour) per hour.
- The time required to set up and clean the printing equipment (C11) is one quarter hour per plate. The number of plates (C12) is the number of pages times the number of colours.
- The binding and stapling rate applies per booklet.
- Totals in column E are found by multiplying the quantity (column C) with the applicable rate (column B).
- Column F expresses each cost component as a percentage of the total cost (E14).

The final quote is prepared in column H as follows.

- Mark-Up on total cost (H9) as per rate in E5.
- Total exclusive of VAT (H10) = mark-up + cost
- Add 14% VAT (H11) to find the Total Inclusive of VAT (H12)
- There is a standard 10% discount off the total for cash (H14)
- H2 should always reflect the current date i.e. the day that the quote data is entered.

Once you have completed entering the text, values and formula in the model, try to ensure that your formatting is correct, column widths allow all data to be displayed, numbers are displayed to the correct number of decimal places and headings and totals have borders as displayed.

- If the mark-up (E5) were increased to 60%, how much would Mr Stoffberg's Total Quote Incl VAT be (H12)?
- If the mark-up (E5) remained at 40% but the booklet is printed single-sided and using 3 colours, how much would Mr Stoffberg's Total Quote Incl VAT be (H12)?
- If Mr Stoffberg only has R5000 cash, how many booklets could we print for that (cash) price? In other words, what must the value in B3 be to make H14 equal to R5000?
- Adjust the formula in H10 so that it rounds to the nearest R10 (i.e. R5,880 in the example).
- Adjust the formula in C8 so that it calculates the correct amount of pages required even if you print an odd number of pages double-sided (e.g. both a 7 and an 8 page booklet printed double-sided require 4 sheets of printing paper per booklet; the last sheet of the 7 page booklet has a blank side).

- For easy reference, assign the more descriptive *name* “Percentages” to the range F8:F13.

Save the file under the name ABC.

Exercise 3

Build the spreadsheet model displayed below. Try to build the spreadsheet example exactly as shown, including structure, cell alignment, formatting of values, borders, column widths etc. Use the copy/paste function where possible (i.e. use absolute/relative addressing where appropriate). It is more important to get the formulas correct than to get the exact formatting! TeleTubbies Imports are South African importers for TeleTubby dolls from the UK. You are to build a simple spreadsheet that forecasts their income for the year ahead on a quarterly basis. Note that their purchases are sourced from the UK and paid for in £ (and need to be converted to Rand) but their sales are in SA Rand.

	A	B	C	D	E	F	G
1	TELETUBBIES IMPORTS: INCOME PROJECTION					as of	14-Aug-98
2	Import Price	£4.85	The exchange rate increases by:		2.00%	per quarter	
3	Local Selling Price	R 85.99	Marketing costs decrease by:		R -5,000	per quarter	
4	Import Duty	10%	of purchase cost plus an additional		R 2	per item	
5		Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total for the Year	% change Q1=>Q4
6	Quantity bought/sold	2,000	2,500	2,100	1,950	8,550	-2.50%
7	Sales Revenue	R 171,980	R 214,975	R 180,579	R 167,681	R 735,215	-2.50%
8	Exchange rate £1=	R 10.31	R 10.52	R 10.73	R 10.94		6.12%
9	Purchase cost (£)	£9,700	£12,125	£10,185	£9,458	£41,468	-2.50%
10	Purchase cost (R)	R 100,007	R 127,509	R 109,250	R 103,475	R 440,241	3.47%
11	Import Duty	R 14,001	R 17,751	R 15,125	R 14,248	R 61,124	1.76%
12	Marketing Cost	R 35,000	R 30,000	R 25,000	R 20,000	R 110,000	-42.86%
13	Total Costs	R 149,008	R 175,260	R 149,375	R 137,723	R 611,365	-7.57%
14	Net Income	R 22,972	R 39,715	R 31,204	R 29,958	R 123,850	30.41%

- Rows 2 to 4 contain the main variables. (Note: B2 contains the value 4.85, formatted as a £ currency. Don't waste valuable time on getting the £ symbol right!)
- Column A contains the income/cost descriptions, columns B-E the data for the four quarters, column F the total for the year and column G the percentage change from the first to the fourth quarter (as detailed below).
- Row 6 contains the projected order/sales quantity (in units). These figures are based on market research and current orders.
- Row 7 contains projected sales revenue, calculated as quantity (row 6) times local selling price (B3)
- Row 8 contains the £/R exchange rate. The expected exchange rate for the first quarter is R10.31 per £ and this is expected to increase at a quarterly rate of 2% (see F2).

- Row 9 reflect the purchase cost of the TeleTubbies, expressed in £, based on the quantity bought (row 6) and the contracted purchase price per unit (B2).
- Row 10 is the revenue in Rand, based on the projected exchange rate for the quarter (in row 8) and the purchase cost (in £).
- Row 11 calculates the import duty due on the TeleTubbies. This is the sum of an ad-valorem (i.e. value-based) duty equal to 10% (B4) on the cost of the TeleTubbies, and an additional fixed import charge of R2 per item (F4).
- The marketing costs are R35,000 initially, but decrease by R5,000 per quarter (F3).
- The Total Costs are the sum of the purchase cost, import duty and marketing cost.
- Net income is calculated as the difference between sales revenue (row 7) and the total costs (row 13).
- Column G expresses how the different components (and the net income) change (as a percentage) from the first to the fourth quarter. The change is the difference between the two quarters, expressed as a percentage of the base (1st quarter).
- Cell G1 should always reflect the current date (ignore the data given on the example).

Once you have completed entering the text, values and formula in the model you will gain additional marks by ensuring that your formatting is correct, column widths allow all data to be displayed, numbers are displayed to the correct number of decimal places and headings and totals have borders as displayed.

- If the selling price would be increased to R99.99 per item how much would Net Income (in Rand) be for 3rd Quarter (D14)? How much would the Total (Annual) Net Income (F14) increase by when compare to the current Total Net Income of R 123 850? Express this increase as a percentage.
- With a Selling Price of R99.99, how much should the import price increase by so that our Total Annual Net Income (F15) will be equal to R 140 000? Give the Import Price (B2) to the nearest £0.05.

Save the file under the name TUBBY

Exercise 4

Build the spreadsheet model displayed below. Try to build the spreadsheet example exactly as shown, including structure, cell alignment, formatting of values, borders, column widths etc. Copy functions where possible to save yourself effort (so use absolute addressing where appropriate).

Custom Business Gifts is a small business specialising in making up quality pens with corporate logos printed on. The spreadsheet is used to calculate the cost and final price of the orders placed by customers. Each day the new customers and their order sizes are entered.

- The fixed cost for each order (setting up the equipment and engraved block) is the same (D2) regardless of the number of units ordered.
- The variable cost is the order size multiplied by the variable cost per unit (D3). The final Total Price consists of Total Cost plus Profit Markup, with VAT added to the total (i.e. multiply the total with 1+ the VAT rate).

	A	B	C	D	E	F	G	H	I
1	Custom Business Gifts: Daily Orders								
2	Today's Date:	Fixed cost:	R 900	per order					
3	11-Mar-99	Variable costs:	R 2.10	per unit					
4		Profit Markup:	53%	on total cost					
5		Vat rate:	14%						
6	Customer	Order size	Fixed Cost	Variable Cost	Total Cost	Markup	Tot.Price incl.VAT		
7	Pick 'n Pay Ltd	1320	R 900	R 2,772	R 3,672	R 1,946	R 6,405	30%	
8	Coca-Cola	800	R 900	R 1,680	R 2,580	R 1,367	R 4,500	21%	
9	Nike Sportswear	300	R 900	R 630	R 1,530	R 811	R 2,669	!! 12%	
10	SAA	900	R 900	R 1,890	R 2,790	R 1,479	R 4,866	23%	
11	Bar-One	380	R 900	R 798	R 1,698	R 900	R 2,962	!! 14%	
12	Totals:	3700	R 4,500	R 7,770	R 12,270	R 6,503	R 21,401	100%	
13	Today's largest order size:			1320	units.				

- Column I calculates the percentage which each order's total price constitutes as a % of the total value ordered for the day (G12).
- In row 12, the totals for each column are calculated.
- In D13 we compute the largest order placed today.
- Cell A3 should always automatically reflect the current (today's) date! (the date shown below is just an example, your date should be today!)

Once you have completed entering the text, values and formula in the model you will gain additional marks by ensuring that your formatting is correct, column widths allow all data to be displayed, numbers are displayed to the correct number of decimal places and headings and totals have borders as displayed.

If the profit markup were increased to 60%, how much would Pick 'n Pay Ltd's Order Price be (G7)? How much would the total Order Price be (G12)?

If the variable cost per unit would decrease to R2.00 per unit, how much would our profit markup have to be (in D4) in order to ensure that total markup (in F12) would be R7000? Calculated the required markup (to the nearest %).

In column H, we want to have a warning "!!" appear next to those orders where the *fixed costs* exceed the *variable costs*. Use the built-in *IF* formula for this!

Save the file under the name GIFTS

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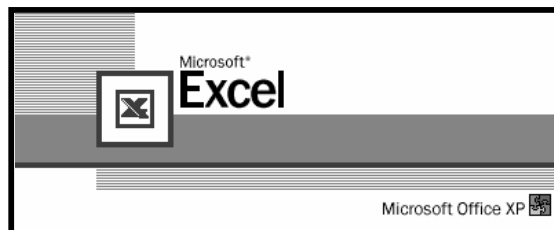
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Quick Start to Excel 2002



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