

Excel 2003



Advanced

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These notes are for Excel 2003 but may be used with
previous versions of Excel

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Changing the way a sheet is displayed

Exercise 1

- i) Open H:\Excel\SALESPR.XLS and select the worksheet named SALES
- ii) Follow the procedures below to
 - (a) split the window or freeze panes above and to the left of B8
 - (b) hide column A
 - (c) hide sheet 2
- iii) Unfreeze/unsplit panes, unhide column A and Sheet 2

Split or freeze row and/or column titles

To establish row/column titles, which remain in place as you scroll through the spreadsheet,

- i) Click the cell below and to the right of where the split is to appear
- ii) **Window** → **Split** or **Window** → **Freeze Panes**

	A	B	C	D	E	F
1	Regional M	Monthly Sales				
2						
3	1997		North	South	East	West
4						
6		Unit Price	Number of items sold			
8	January					
9						

You can now move across and down the sheet as far as you like but still show the titles.

To remove the split or freeze, **Window** → **Remove Split** or **Window** → **Unfreeze Panes**.

Hide rows or columns

Select rows/columns, right click the selection and choose **Hide**

Unhide rows/columns

Select the rows/columns on both sides of the hidden rows/columns, right click the selection and choose **Unhide**

Hide a worksheet

Select the sheet to hide then **Format** → **Sheet** → **Hide**

Unhide a worksheet

Format → **Sheet** → **Unhide** then select the sheet to unhide and click **OK**

Show all formulas

Press **Ctrl+`** (ie **Ctrl**+the key above the tab key) to show the formulas. Press **Ctrl+`** to show values again. Alternatively, **Tools** → **Options** → **View** and set the **Formulas** check box under **Window options**

Select all cells containing formulas

- i) **Edit** → **Go To** and click **Special** to display the **Go To Special** dialog box (see right)
- ii) Set the **Formulas** button
- iii) Click **OK**

The dialog box can be used to select other categories as shown.

Go To Special [X]

Select

Comments Row differences

Constants Column differences

Formulas Precedents

Numbers Dependents

Text **Direct only**

Logicals All levels

Errors Last cell

Blanks Visible cells only

Current region Conditional formats

Current array Data validation

Objects **All**

Same

OK Cancel

Auditing and annotating the worksheet

Auditing

Excel has auditing tools that can be used to check cells referred to by a formula, check formulas that refer to a cell, and trace sources of error in a formula.








Exercise 2

Follow the procedures below to:

- i) Trace the precedents of the contents of H42
- ii) Remove all arrows
- iii) Trace the dependents of B10

Tools **Formula Auditing** **Show Formula Auditing Toolbar** or **View** **Toolbars** **Formula Auditing** to display the **Auditing** toolbar:




- Click the **Trace Precedents** button,  and blue arrows will appear linked to cells which are referred to by the formula. Click again to show prior precedents and again to show more
- To remove the arrows one level at a time, click the **Remove Precedent Arrows** button, 
- For cells dependent upon the active cell, use the **Trace Dependents** button,  and the **Remove Dependent Arrows** button, 
-  will remove all arrows in one action
-  will trace precedents of a cell containing an error value. If a precedent is itself a formula that results in an error value, Excel displays red arrows originating from this precedent as well as blue arrows from its precedents. Click on  again to see the next level precedents. Double click on an arrow to move to one of the cells on its endpoints and make the necessary corrections if you find the cell to be the source of the error.

Comments

Exercise 3

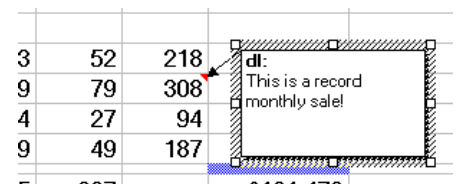
- i) Follow the procedure below to attach the comment shown to cell G29 of SALESPR.XLS
- ii) Close SALESPR.XLS

i) Select the cell to annotate

ii) **Insert** **Comment** or click  on the **Auditing** toolbar to display a comment box. A red triangle will appear in the top right corner of the cell

iii) Type a comment into the box

iv) Click outside the box



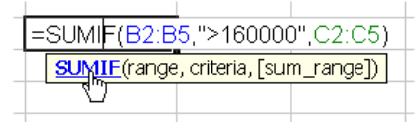
To view a comment, move the mouse pointer over the cell.




Printing comments

- i) **File** **Page Setup** and select the **Sheet** tab
- ii) From the **Comments** dropdown list, select **At end of sheet** or **As displayed on sheet**
- iii) Make any other settings required
- iv) Click **Print...**

Functions

The following covers a selection of functions from a range of categories. Full details, including examples, of all functions is available in Help. The quickest way to get help on a function whose name you have already entered is to double-click it, then click the function name in the yellow strip that appears (see right)



You can enter functions using the **Insert**  **Function...** command, the **More Functions...** command on the Autosum dropdown list,  , or by typing them in

Date and time functions

Exercise 4

In a blank worksheet, insert the following functions for today's date

TODAY

Returns the serial number of the current date. The serial number is the date-time code used by Excel for date and time calculations. Times are represented as fractions of a day.

TODAY()

By default, January 1, 1900 is serial number 1. Thus January 1, 2008 is serial number 39448. In Excel for the Macintosh, day 1 is January 2, 1904. **NOW()** is similar but includes the current time.

DAY

Returns the day of a date as an integer ranging from 1 to 31.

DAY(serial_number)

Example: If A2=15-Apr-2008 then =DAY(A2) evaluates to 15.

MONTH

Returns the month of a date as an integer, ranging from 1 (January) to 12 (December).

MONTH(serial_number)

YEAR

Returns the year corresponding to a date as an integer in the range 1900-9999.

YEAR(serial_number)

For most of the remaining functions in this section, the exercises are based upon the examples in Excel Help

Mathematical functions

SUMIF

Adds the cells specified by a given criteria.

Exercise 5

- i) Open the sheet named Property in H:\Excel\MISC.XLS
- ii) Create a formula using SUMIF to calculate the sum of the commissions for property values over 160000 (Result: 63,000)

SUMIF(range,criteria,sum_range)

Range is the range of cells to evaluate.

Criteria is the criteria in the form of a number, expression, or text that defines which cells will be added. For example, **criteria** can be expressed as 32, "32", ">32", "apples".

Sum_range are the actual cells to sum.

ROUND

Rounds a number to a specified number of digits.

Exercise 6

Round the following numbers to the specified number of digits:

(2.149, 1) (-1.475, 2) (21.5, -1)

ROUND(number,num_digits)

Number is the number to round.

Num_digits specifies the number of digits to round **number** to.

If **num_digits** is greater than 0, then **number** is rounded to the specified number of decimal places.

If **num_digits** is 0, then **number** is rounded to the nearest integer.

If **num_digits** is less than 0, then **number** is rounded to the left of the decimal point.

Statistical functions

COUNT

Counts the cells that contain numbers and also any numbers within the list of arguments.

Exercise 7

In the sheet named Count1, create a COUNT function to count the cells in the list that contain numbers

COUNT(value1,value2, ...)

value1, value2, ... are 1 to 30 arguments that can contain or refer to a variety of different types of data, but only numbers are counted.

COUNTA

Counts the number of cells that are not empty and also any values within the list of arguments.

Exercise 8

In the sheet named Count1, create a function to count the number of nonblank cells in the list

COUNTA(value1,value2, ...)

value1, value2, ... are 1 to 30 arguments representing the values to count. A value is any type of information, including empty text ("") but not including empty cells.

COUNTIF

Counts the number of cells within a range that meet the given criteria.

Exercise 9

In the sheet named Count2, create functions to count the number of cells:

- i) with apples in the first column
- ii) with a value greater than 55 in the second column

COUNTIF(range,criteria)

Range is the range of cells from which to count cells.

Criteria is the criteria in the form of a number, expression, or text that defines which cells will be counted. For example, criteria can be expressed as 32, "32", ">32", "apples".

Text functions

Exercise 10

In the sheet named Text:

- i) Use the functions below to convert the text in A1 into the various alternatives.
- ii) Enter into A7 a function to concatenate the contents of A3 and A4 into a single string:
Queen Mary, University of London

In the following functions, **text** is text enclosed in quotation marks, a formula that returns text, or a reference to a cell containing the text to process.

LOWER

Converts all uppercase letters in a text string to lowercase.

LOWER(text)

UPPER

Converts text to uppercase.

UPPER(text)

PROPER

Capitalizes the first letter in a text string and any other letters in text that follow any character other than a letter. Converts all other letters to lowercase letters.

PROPER(text)

CONCATENATE

The Concatenate function joins several text strings into one text string. The "&" operator can be used instead of CONCATENATE.

CONCATENATE (text1,text2,...)

text1, text2, ... are 1 to 30 text items that will be joined into a single item. The text items can be text strings, numbers, or single-cell references.

CONCATENATE ("Computing", " ", "Services") evaluates to "Computing Services"

If A2 contains "Computing" then **A2&" "&"Services"** evaluates to "Computing Services"

Logical functions

IF

IF is used to conduct conditional tests on values and expressions. The outcome of the test determines the value returned by the IF function.

Exercise 11

- i) Select the Expenses sheet
- ii) In the Result column, enter an IF function to determine whether Actual Expenses exceed Predicted Expenses. If they do, return the value "Over budget", otherwise return "OK"

IF(logical_test, value_if_true, value_if_false)

Logical_test is any value or expression that can be evaluated to TRUE or FALSE.

Value_if_true is the value that is returned if **logical_test** is TRUE.

Value_if_false is the value that is returned if **logical_test** is FALSE.

For example, suppose that A1 contains 3. This means that **A1>1** is TRUE, and that **A1=1** is FALSE. Then:

IF(A1>1,B6,B5) will evaluate to the contents of B6

IF(A1=1,B6,B5) will evaluate to the contents of B5

AND

Returns **TRUE** if all its arguments are **TRUE**; returns **FALSE** if one or more argument is **FALSE**.

Exercise 12

In the sheet named Logical:

- i) Enter in C1:C4 the formulas
=AND(1<A2, A3<100)
=AND(TRUE, TRUE)
=AND(2+2=4, 2+3=5)
- ii) Explain the results

AND(logical1,logical2, ...)

Logical1, logical2, ... are 1 to 30 conditions to test that can be either **TRUE** or **FALSE**.

If an array or reference argument contains text or empty cells, those values are ignored.

If the specified range contains no logical values, AND returns the #VALUE! error value.

OR

Returns **TRUE** if any argument is **TRUE**; returns **FALSE** if all arguments are **FALSE**.

Exercise 13

Evaluate the following and explain the results:

=OR(1+1=1,2+2=5)

=OR(TRUE,FALSE,TRUE)

OR(logical1,logical2,...)

Logical1,logical2,... are 1 to 30 conditions to test that can be either **TRUE** or **FALSE**.

If an array or reference argument contains text or empty cells, those values are ignored.

If the specified range contains no logical values, OR returns the #VALUE! error value.

ISERROR

Returns **TRUE** if value is an error value, otherwise **FALSE**.

Exercise 14

In the sheet named Error, create and replicate an ISERROR function to test each of the results in column A

ISERROR(Value)

Value refers to any error value (#N/A, #VALUE!, #REF!, #DIV/0!, #NUM!, #NAME?, or #NULL!)

Lookup and reference functions

VLOOKUP

Searches for a value in the first column of a lookup table and returns the corresponding value in a specified column of the table.

Exercise 15

In the sheet named Grades:

- i) In C2, enter a VLOOKUP function to look up on the Grade for Mark sheet the grade corresponding to Alpha's mark. Make sure that the `table_array` argument contains absolute references
- ii) Fill down the rest of the grade column with the contents of C2

VLOOKUP(lookup_value, table_array, col_index_num, range_lookup)

lookup_value is the value to be looked up in the first column of the table.

table_array is the range that contains the lookup table.

column_index_num is the column number (starting at 1 for the leftmost column) in **table_array** from which the matching value will be returned.

range_lookup is a logical value that specifies whether VLOOKUP is to find an exact match or an approximate match. If **TRUE** or omitted, an approximate match is returned. In other words, if an exact match is not found, the next largest value that is less than **lookup_value** is returned. If **FALSE**, VLOOKUP will find an exact match.

If **range_lookup** is **TRUE** then the values in the first column of **table_array** must be placed in ascending order: ...-2, -1, 0, 1, 2,... , **A-Z**,

FALSE, TRUE. If **range_lookup** is **FALSE** then **table_array** does not need to be sorted.

HLOOKUP

Searches for a value in the first row of a lookup table and returns the corresponding value in a specified row of the table.

Exercise 16

In the sheet named Tax:

- i) Enter into B7 an HLOOKUP function to lookup the tax rate corresponding to the income in B6
- ii) Check that it works for different values in B6

HLOOKUP(lookup_value, table_array, row_index_num, range_lookup)

lookup_value is the value to be looked up in the first row of the table.

table_array is the range that contains the lookup table.

row_index_num is the row number (starting at 1 for the top row) in **table_array** from which the matching value will be returned.

range_lookup is a logical value that specifies whether HLOOKUP is to find an exact match or an approximate match. If **TRUE** or omitted, an approximate match is returned. In other words, if an exact match is not found, the next largest value that is less than **lookup_value** is returned. If **FALSE**, HLOOKUP will find an exact match.

If **range_lookup** is **TRUE** then the values in the first row of **table_array** must be placed in ascending order: ...-2, -1, 0, 1, 2,... , **A-Z**, **FALSE, TRUE**. If **range_lookup** is **FALSE** then **table_array** does not need to be sorted.

Financial functions

PV

Returns the present value of an investment. The present value is the total amount that a series of future payments is worth now. For example, when money is borrowed, the loan amount is the present value to the lender.

Exercise 17

Open the sheet named PV in H:\FINFUN.XLS. The data represents an insurance annuity that pays £500 at the end of every month for the next 20 years. The cost of the annuity is £60,000, and the money paid out will earn 8 percent. Use the PV function to find the present value of the annuity and hence whether it would be a good investment.
Result = -£59,777.15

PV(rate,nper,pmt,fv,type)

Rate is the interest rate per period. For example, if a loan at 10 percent annual interest rate is repayed monthly, the interest rate per month is 10%/12, or 0.83%.

Nper is the total number of payment periods in an annuity. For example, a four-year loan with monthly payments, has 4*12 (or 48) periods.

Always make sure that the period units used in specifying **rate** and **nper** are the same

Pmt is the payment made each period and cannot change over the life of the annuity. For example, the monthly payment on a £10,000, four-year loan at 12 percent is £263.33. If **pmt** is omitted, the **fv** argument must be included.

Fv is the future value, or a cash balance after the last payment is made. If **fv** is omitted, it is assumed to be 0 (the future value of a loan is 0). For example, if the aim is to save £50,000 over 18 years, then £50,000 is the future value. If **fv** is omitted, the **pmt** argument must be included.

Type indicates when payments are due:

Set type to	If payments are due
0 or omitted	At the end of the period
1	At the beginning of the period

PMT

Calculates the payment for a loan based on constant payments and a constant interest rate.

Exercise 18

Open the PMT sheet in H:\FINFUN.XLS. Calculate the monthly payment on a £10,000 loan at an annual rate of 8 percent that must be paid off in 10 months
Result = -£1,037.03

PMT(rate,nper,pv,fv,type)

For a more complete description of the arguments in PMT, see the PV function.

Rate is the interest rate for the loan.

Nper is the total number of payments.

Pv is the present value, or the total amount that a series of future payments is worth now; also known as the principal.

Fv is the future value, or a cash balance to attain after the last payment is made. If **fv** is omitted, it is assumed to be 0 (zero), that is, the future value of a loan is 0.

Type is 0 or 1 and indicates when payments are due.

FV

Returns the future value of an investment based on periodic, constant payments and a constant interest rate.

Exercise 19

Open the FV sheet in H:\FINFUN.XLS. £1,000 is put into a savings account that earns 6 percent annual interest compounded monthly (monthly interest of 6%/12, or 0.5%). £100 is added at the beginning of every month for the next 12 months. How much money will be in the account at the end of 12 months?
Result = £2301.40

FV(rate,nper,pmt,pv,type)

For a more complete description of the arguments in FV and for more information on annuity functions, see PV.

Rate is the interest rate per period.

Nper is the total number of payment periods.

Pmt is the payment made each period. If **pmt** is omitted, the **pv** argument must be included.

Pv is the present value, or the lump-sum amount that a series of future payments is worth now. If **pv** is omitted, it is assumed to be 0 (zero), and the **pmt** argument must be included.

Type is 0 or 1 and indicates when payments are due.

For all the arguments, cash paid out is represented by negative numbers; cash received is represented by positive numbers.

NPV

Calculates the net present value of an investment by using a discount rate and a series of future payments (negative values) and income (positive values).

Exercise 20

Open the NPV sheet in H:\ FINFUN.XLS.
Calculate the net present value of an investment in which you pay £10,000 one year from today and receive an annual income of £3,000, £4,200, and £6,800 in the three years that follow. Assume an annual discount rate of 10 percent.
Result = £1,188.44

NPV(rate,value1,value2, ...)

Rate is the rate of discount over the length of one period.

Value1, value2, ... are 1 to 29 arguments representing the payments and income.

Value1, value2, ... must be equally spaced in time and occur at the end of each period.

NPV uses the order of **value1, value2, ...** to interpret the order of cash flows. Payment and income values must be in the correct sequence.

Arguments that are numbers, empty cells, logical values, or text representations of numbers are counted; arguments that are error values or text that cannot be translated into numbers are ignored. If an argument is an array or reference, only numbers in that array or reference are counted. Empty cells, logical values, text, or error values in the array or reference are ignored.

The **NPV** investment begins one period before the date of the **value1** cash flow and ends with the last cash flow in the list. The **NPV** calculation is based on future cash flows. If the first cash flow occurs at the beginning of the first period, the first value must be added to the **NPV** result, not included in the values arguments.

RATE

Returns the interest rate per period of an annuity. **RATE** is calculated by iteration and can have zero or more solutions. If the successive results of **RATE** do not converge to within 0.0000001 after 20 iterations, **RATE** returns the #NUM! error value.

Exercise 21

Open the **RATE** sheet in H:\ FINFUN.XLS.
Calculate the rate of a four-year £8,000 loan with monthly payments of £200.
Result = 1% (0.77 rounded) per month

RATE(nper,pmt,pv,fv,type,guess)

For a complete description of the arguments **nper, pmt, pv, fv, and type**, see **PV**.

Nper is the total number of payment periods in an annuity.

Pmt is the payment made each period and cannot change over the life of the annuity. If **pmt** is omitted, the **fv** argument must be included.

Pv is the present value — the total amount that a series of future payments is worth now.

Fv is the future value, or a cash balance to attain after the last payment is made. If **fv** is omitted, it is assumed to be 0.

Type is 0 or 1 and indicates when payments are due.

Guess is a guess for what the rate will be.

If **guess** is omitted, it is assumed to be 10 percent.

If **RATE** does not converge, try different values for **guess**. **RATE** usually converges if **guess** is between 0 and 1.

Nested functions

Nested functions use a function as one of the arguments of another function. Excel allows nesting to 7 levels.

Exercise 22


- i) In a blank worksheet, follow the steps below to enter into A1 the formula

=IF(AVERAGE(F2:F5)>50, SUM(G2:G5),0)

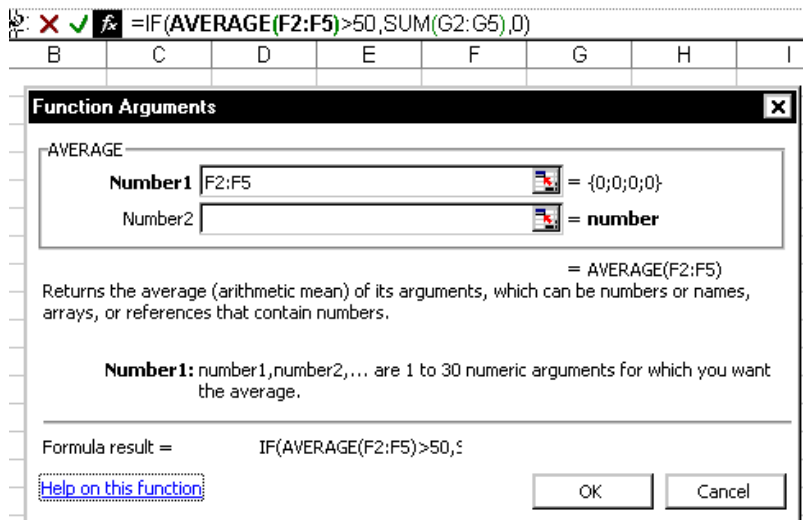
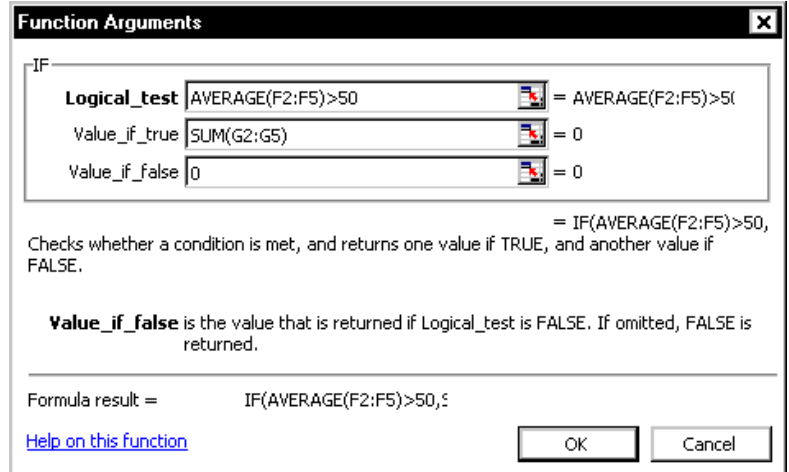
This sums a set of numbers (G2:G5) only if the average of another set of numbers (F2:F5) is greater than 50. Otherwise it returns 0.

- ii) Enter some actual numbers in the ranges specified.

- i) Click the cell which is to contain the formula




- ii) **Insert**  **Function**, select the main (outermost) function to use and click **OK**. Then:

- Enter cell references or values as arguments in the usual way
- To enter another function as an argument, enter it into the appropriate edit box (see right)
- Once the nested function has been entered, and with the **Function Arguments** dialog box open, the part of the formula which is displayed can be changed by clicking a function name in the formula bar. Those arguments can then be changed if required



The Formula Evaluator

This evaluates a nested formula one step at a time. To use it:

- i) **Tools**  **Formula Auditing**  **Evaluate Formula** or click  on the Formula Auditing toolbar
- ii) Click **Evaluate** until the each part of the formula has been evaluated

Data tables

A data table is a range of cells that shows the results of substituting different values in one or more formulas. There are two types of data table: one-variable and two-variable.

Create a one-variable data table

Formulas used in a one-variable data table must refer to an input cell. The input cell is a cell used by Excel in which each input value from a data table is substituted. Any cell on a worksheet can be the input cell. Type the list of values for Excel to substitute in the input cell either down one column (column-oriented table) or across one row (row-oriented table).

Exercise 23

- i) Open the sheet named Budget in H:\Excel\MISC.XLS
- ii) Using C1 as the input cell, follow the steps below to create a one-variable data table which calculates the increase in budget corresponding to each of the possible increases in costs

- i) Do one of the following:

- If the data table is column-oriented, type the formula in the row above the first value and one cell to the right of the column of values (see right)
- If the data table is row-oriented, type the formula in the column to the left of the first value and one cell below the row of values

	A	B	C
1	Current budget		
2	£ 1,240,000		
3			=A2*C1
4	Cost increase	1%	
5		2%	
6		3%	
7		4%	
8		5%	

- ii) Select the range of cells that contains the formulas and values to generate the table from

	A	B	C
1	Current budget		
2	£ 1,240,000		
3			£ -
4	Cost increase	1%	
5		2%	
6		3%	
7		4%	
8		5%	

- iii) On the **Data** menu, click **Table** to display the dialog box
- iv) Depending on whether the data table is row or column oriented, enter the cell reference for the input cell into the **Row input cell** box or **Column input cell** box respectively
- v) Click **OK** to generate the table

Table	
Row input cell:	<input type="text"/>
Column input cell:	<input type="text" value="\$C\$1"/>
<input type="button" value="OK"/> <input type="button" value="Cancel"/>	

	A	B	C
1	Current budget		
2	£ 1,240,000		
3			£ -
4	Increase	1%	£ 12,400
5		2%	£ 24,800
6		3%	£ 37,200
7		4%	£ 49,600
8		5%	£ 62,000

You can add additional formulas to a one-variable data table by entering them next to the first formula.

Exercise 24

- i) Enter into D3 a formula to calculate the total budget including the increase for each possible increase in costs
- ii) Recreate the data table to include the two rows of results
- iii) Save the workbook to My Documents as MISC and close it

Create a two-variable data table

Two-variable data tables use only one formula with two lists of input values. The formula must refer to two different input cells.

Exercise 25

Using a blank worksheet, follow the steps below to set up a two-variable data table which uses B1 and C1 as the input cells to generate a 12x12 multiplication table by multiplying each pair of input values

- In a cell on the worksheet, enter the formula that refers to the two input cells
- Type one list of input values in the same column, below the formula
- Type the second list in the same row, to the right of the formula

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2		=B1*C1	1	2	3	4	5	6	7	8	9	10	11	12
3			1											
4			2											
5			3											
6			4											
7			5											
8			6											
9			7											
10			8											
11			9											
12			10											
13			11											
14			12											

- Select the range of cells that contains the formula and both the row and column of values
- Data Table**
- In the **Row input cell** box, enter the reference to the input cell for the row input values
- In the **Column input cell box**, enter the reference to the input cell for the column input values
- Click **OK**

Consolidating data

To consolidate data, combine the values from several ranges of data. You might use a consolidation to roll department figures into a whole organisation sheet. Excel provides several ways to consolidate data. The most flexible method is to create formulas that refer to cells in each range of data that you're combining. Formulas that refer to cells on multiple worksheets are called 3-D formulas.

Using 3-D formulas

When you use 3-D references in formulas, there are no restrictions on the layout of the separate ranges of data. You can change the consolidation any way you need to. The consolidation updates automatically when the data in the source ranges changes. However, when the data in all source areas is arranged in identical order and location, you can consolidate by position.

Consolidating by position

Exercise 26

- Open H:\Excel\CARSVANS.XLS and display the Year worksheet
 - Follow the steps below to enter into B2 a formula that will sum B2 in each of the four quarters
 - Replicate the formula into the relevant other cells
 - Save the file as EX26
- Click in the cell that is to contain the consolidation formula
 - Type = followed by the function name and (
 - Click the tab of the leftmost worksheet to include in the formula
 - Select the cell or range to enter into the formula
 - Hold down the Shift key (⇧) and click the rightmost worksheet to include in the formula
 - Press) and then Return

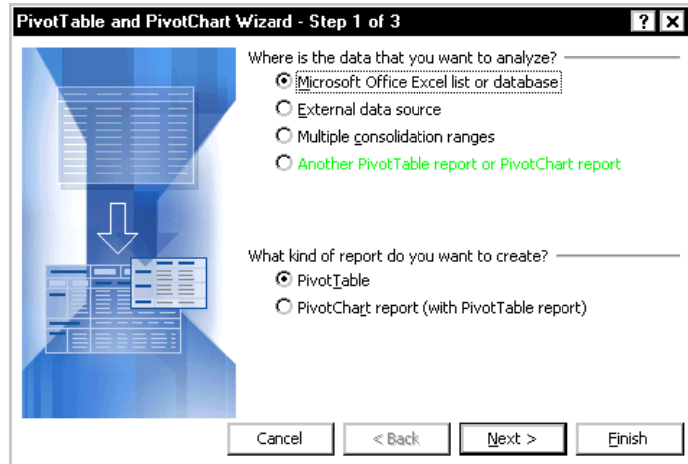
Using Pivot tables to summarise data in a list

The Pivot Table feature allows you to create a cross-tabulation summary of data in which the headings can subsequently be moved to give different views of the data

Exercise 27

- i) Open H:\EXCEL\QUOTASDONE.XLS and switch to the sheet called Three Days
- ii) Follow the steps below to set up a pivot table
- iii) Experiment by dragging fields around in the table

- i) Click in the data
- ii) **Data** > **PivotTable and PivotChart Report...** to start the PivotTable Wizard. Step 1 is displayed (see right)
- iii) Select the data location and the kind of report that you require

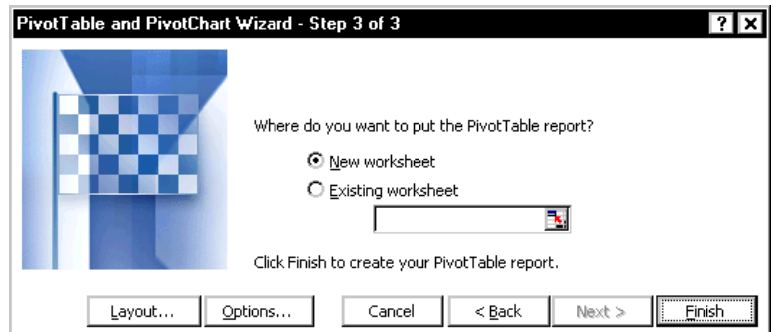


- iv) Click **Next** to display step 2 (see right)



- v) To change the worksheet range, drag through it on the sheet

- vi) Click **Next** to display step 3 (see right)

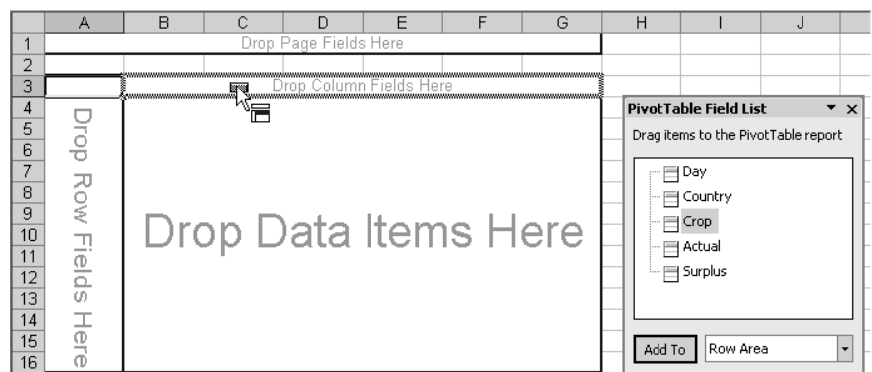


- vii) You can select **Existing worksheet**, in which case you should click the cell that will be the top left corner of the table itself. Leave two rows for the Page Fields area as well

- viii) Click **Finish** to display a blank pivot table and the **Field List**. Excel displays also the PivotTable toolbar (see right)



- ix) Drag field names to the required positions in the pivot table. Here the Crop field is being dragged to the Column Fields area



The completed pivot table is shown on the right

	A	B	C	D	E
1	Day	(All)			
2					
3	Sum of Actual	Crop			
4	Country	Carrots	Onions	Potatoes	Grand Total
5	Britain	50	30	81	161
6	France	49	23	70	142
7	Spain	43	25	68	136
8	Grand Total	142	78	219	439
9					


- x) Once the PivotTable has been built, you can drag field buttons so as to obtain a different view of the data. The following shows Crop being dragged to the position indicated by the large grey I-beam:

Day	(All)				
Sum of Actual	Crop				
Country	Carrots	Onions	Potatoes	Grand Total	
Britain	50	30	81	161	
France	52	18	71	141	
Spain	43	25	66	134	
Grand Total	145	73	218	436	

The result of this pivoting action is:

Day	(All)		
Sum of Actual			
Country	Crop	Total	
Britain	Carrots	50	
	Onions	30	
	Potatoes	81	
Britain Total		161	
France	Carrots	52	
	Onions	18	
	Potatoes	71	
France Total		141	
Spain	Carrots	43	
	Onions	25	
	Potatoes	66	
Spain Total		134	
Grand Total		436	

Updating and modifying a Pivot table

To update the pivot table after changing the data in the source list that it is based upon, click  , the Refresh Data button, or right-click the Pivot table and choose **Refresh Data**. If you add rows or columns to the source data, click in it then **Data > PivotTable and PivotChart Report...** to start the PivotTable Wizard and click **Back** to take you to step 2 so that you can modify the **Range**.

Showing all the data which underlies a summary value

To show all the data records included in a summary value, double-click the data cell containing it.

Group items in a PivotTable

Exercise 28 (Optional)

Follow the steps below to group Potatoes and Carrots

- Select one instance of each of the items to group, either by clicking and dragging, or by holding down CTRL or SHIFT while clicking
- Data > Group and Outline > Group**
- To ungroup, click on the group name and **Data > Group and Outline > Ungroup**. If the field was formerly a page field, drag it back to the page area

Preparation to group on items in a page field

- Double-click the page field and click **Advanced**
- Make sure the **Retrieve external data for all page field items** option is either selected or unavailable then click **OK**, and **OK** again
- Drag the page field to the row or column area temporarily

Pivot charts

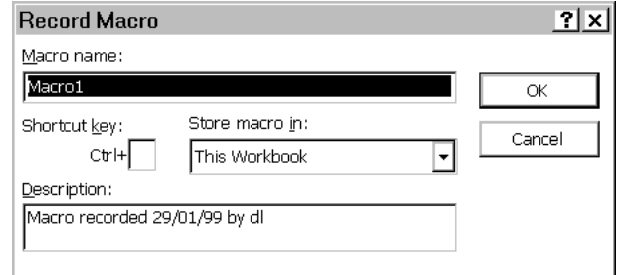
The creation and manipulation of pivot charts is analogous to pivot tables. When you create a pivot chart, the pivot table that it is based upon is created automatically at the same time.



Macros

Exercise 29

- i) Using a blank sheet, follow the steps below to record a macro called MYMACRO to select a block of four cells with the active cell as the top left hand corner cell of the block, colour their background yellow, select the cell below and to the right of the block as the active cell and enter the text "Colour done"
- ii) Run the macro to test it
- iii) Assign the macro to the Smiley button, 😊
- iv) Check that the macro works using the button

- i) **Tools** ➤ **Macro** ➤ **Record New Macro...** to display the **Record New Macro** box (right)
- ii) Type a suitable name (no spaces) into **Macro Name** and click **OK**. The **Stop Recording** toolbar is displayed:



- iii) If it fails to appear, **View** ➤ **Toolbars** ➤ **Stop Recording** to show it
- iv) To record using relative references, ensure that the **Relative References** button, , is depressed by clicking it if necessary. When not depressed, recording always uses fixed references. Everything that you do from now until you press **Stop** will be recorded
- v) Carry out all the actions to record
- vi) Click the **Stop** button, , on the **Stop Recording** toolbar to stop recording

Run a macro

- i) **Tools** ➤ **Macro** ➤ **Macros...**
- ii) Choose the macro and click **Run**

Assign a macro to a Toolbar button

- i) **Tools** ➤ **Customize**, select the **Commands** tab and choose the **Macros** category
- ii) Drag Custom Button onto a toolbar
- iii) Right-click the button and choose **Assign Macro...**. The dialog box will appear
- iv) Select the macro to assign, click **OK**, then click **Close** on the **Customize** box

Deleting a macro

Tools ➤ **Macros...**, select the macro and click **Delete**

Delete button from a toolbar

- i) **Tools** ➤ **Customize**
- ii) Drag onto the **Customize** dialog box the button that you want to remove

Resetting a toolbar

To reset a toolbar to its original installed state, **View** ➤ **Toolbars** ➤ **Customize** ➤ **Toolbars**, click on the name of the toolbar and click **Reset**

Exercise 30

Delete the macro that you just created and reset the toolbar that the button was added to

Naming ranges

Excel allows the naming of ranges of cells so that the names may be used instead of cell references. Naming can be done in a number of ways.

Exercise 31

Open H:\Excel\CARSVANS.XLS, Quarter 1 and use the procedures below to:

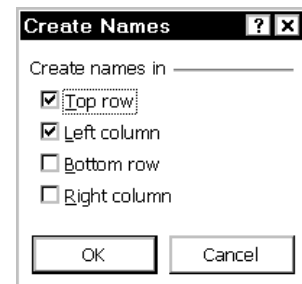
- Create names from the vehicle row labels (Astra etc) and the month column labels (Jan etc)
- Enter formulas using the names in appropriate cells to return the average number of each vehicle sold in the quarter and the total number sold in each month
- Give the Quarter Average range (E2:E7) the name QuarterAverage
- Save the file as EX31 in the My Documents folder

Convert existing row and column labels to names

- Select the range to name, including row/column labels

	A	B	C	D	
1		Jan	Feb	Mar	Quarter
2	Astra	13	17	21	
3	Fiesta	12	16	21	
4	Polo	13	14	19	
5	Trucker	3	4	7	
6	Bedford	5	7	9	
7	Transit	7	8	9	
8	Total				

- Insert **Name Create...** to display the dialog box:



- Ensure that the correct **Create names in** boxes are ticked

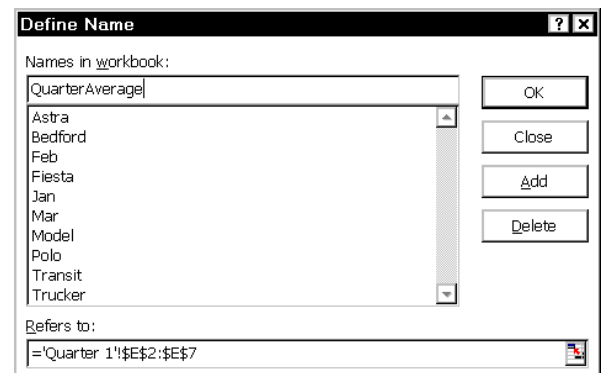
- Click **OK**

Name a cell or range of cells

- Select the range to name:

	A	B	C	D	E
1		Jan	Feb	Mar	Quarter Average
2	Astra	13	17	21	17
3	Fiesta	12	16	21	16.33333333
4	Polo	13	14	19	15.33333333
5	Trucker	3	4	7	4.66666667
6	Bedford	5	7	9	7
7	Transit	7	8	9	8
8		53	66	86	

- Insert **Name Define...** to display the **Define Name** box (see right)



- Enter a name into the **Names in workbook** box and click **Add**

- Click **OK** when finished

Alternatively, select the range, type the name into the **Name** box (immediately above the column A header) and press ↵

Delete a name

Insert **Name Define...**, select the name to delete, click **Delete** and click **OK**

Using names – some examples

Formula	Result
=Jan Astra (this formula uses the intersection operator, ie the space)	13
=SUM(Jan)	53


Note that Excel can also name text and numeric values. You can do this by entering text instead of a cell reference in the **Refers to** box of the **Define Name** dialog box.

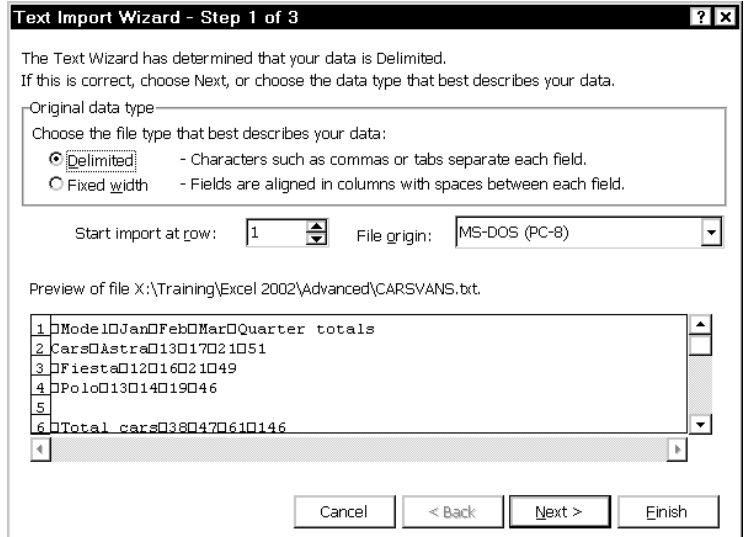
Importing text files

Text files containing suitable data can be imported into Excel via the **Text Import Wizard**.

Exercise 32

- i) Copy H:\Excel\ CV.TXT (tab delimited) into My Documents and follow the steps below to import it
- ii) Save the file as an Excel workbook named EX32

- i) **File**  **Open**
- ii) In the File of type box, select **Text Files**
- iii) Select the file to import.
- iv) Step 1 of the **Text Import Wizard** is displayed (see right)



The Text Wizard has determined that your data is Delimited.
If this is correct, choose Next, or choose the data type that best describes your data.

Original data type

Choose the file type that best describes your data:

Delimited - Characters such as commas or tabs separate each field.
 Fixed width - Fields are aligned in columns with spaces between each field.

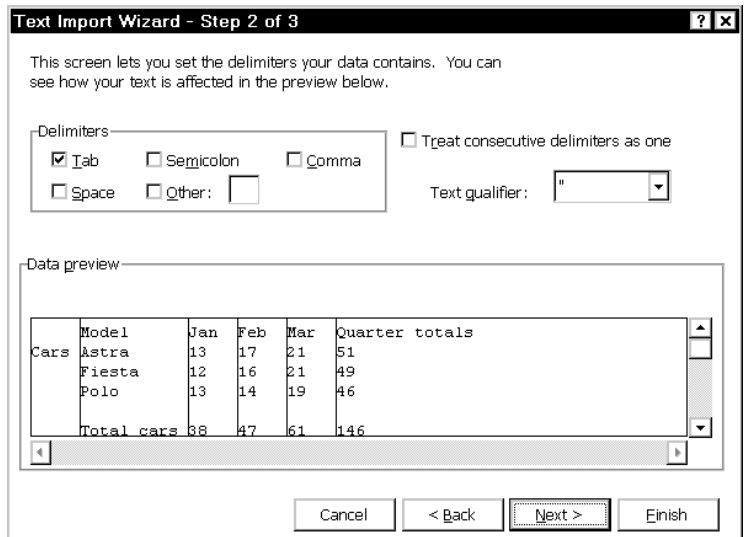
Start import at row: 1 File origin: MS-DOS (PC-8)

Preview of file X:\Training\Excel 2002\Advanced\CARSVANS.txt

1	Model	Jan	Feb	Mar	Quarter totals	
2	Cars	Astra	13	17	21	51
3		Fiesta	12	16	21	49
4		Polo	13	14	19	46
5						
6	Total cars	38	47	61	146	

Buttons: Cancel, < Back, Next >, Finish

- v) Make any changes to the various choices that are needed and then click **Next** to display step 2 of the wizard:



This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.

Delimiters:

Tab Semicolon Comma
 Space Other:

Treat consecutive delimiters as one

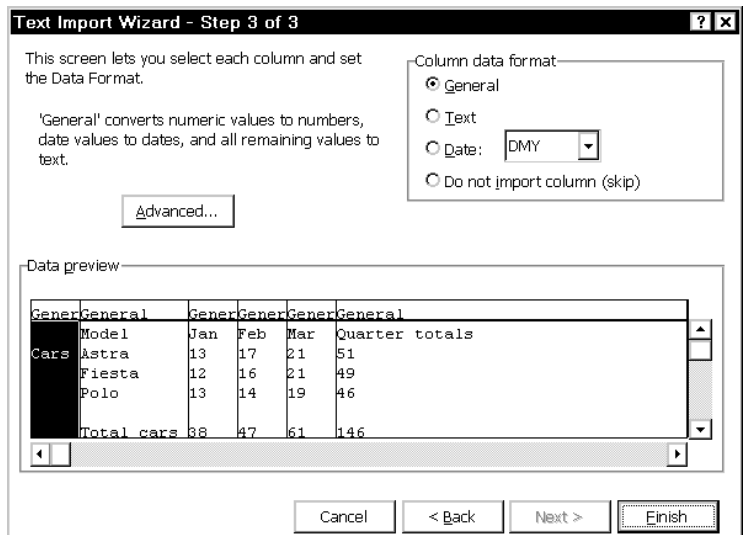
Text qualifier: "

Data preview

	Model	Jan	Feb	Mar	Quarter totals
Cars	Astra	13	17	21	51
	Fiesta	12	16	21	49
	Polo	13	14	19	46
	Total cars	38	47	61	146

Buttons: Cancel, < Back, Next >, Finish

- vi) Change the delimiter if necessary and make any other required changes then click **Next** to display step 3 of the wizard:



This screen lets you select each column and set the Data Format.

'General' converts numeric values to numbers, date values to dates, and all remaining values to text.

Advanced...


Column data format:

General
 Text
 Date: DMY
 Do not import column (skip)

Data preview

	Model	Jan	Feb	Mar	Quarter totals
Cars	Astra	13	17	21	51
	Fiesta	12	16	21	49
	Polo	13	14	19	46
	Total cars	38	47	61	146

Buttons: Cancel, < Back, Next >, Finish

- vii) To specify that a column contains specific types of data that Excel will not deal with automatically, select the column and set its data format
- viii) Click **Finish** to import the data
- ix) **File**  **Save As...**, choose Excel Worksheet to save to Excel format

Templates

Exercise 33

- i) Follow the procedures below to create a new template with the following:
 - Your name in A1 formatted in Times New Roman 11 point bold italic
 - Spreadsheet fill a light colour
- ii) Save the template as MyTemplate
- iii) Use the template to start a new workbook

Create a template

- i) Create a workbook that contains the sheets, default text (such as page headers and row and column labels), formulas, macros, styles, etc in new workbooks based on the template
- ii) **File** → **Save As...** and enter a name in the **File name** box
- iii) In the **Save as type** box, select **Template**. The **Save As** dialog box will switch to the Templates folder
- iv) Click **Save**

Use a template.

- i) **File** → **New**
- ii) Click **General Templates** in the task pane and then the tab to choose from
- iii) Click the template required and click **OK**

Edit a template

Open the template, make changes and save it

Linking and pasting

Linking data and charts between worksheets, workbooks and applications

Exercise 34

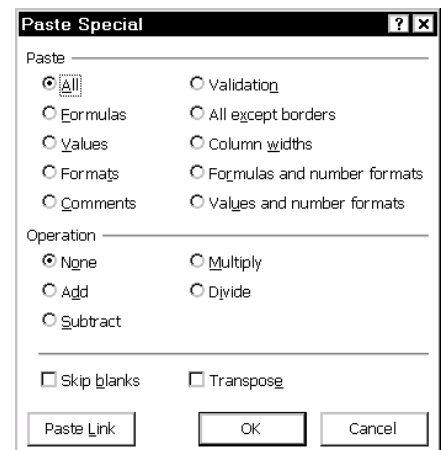
- i) Switch to EX31.XLS
 - ii) Link the chart in the Quarter 4 sheet into a Word document
 - iii) Link the data from Quarter 2 into a new Excel workbook
- i) Select the data/chart to link **Edit** → **Copy**, open the file to link the data/chart to and click where the data is to be placed
 - ii) **Edit** → **Paste Special**, click **Paste Link** and, in the case of Word, select a format to paste **As** and click **OK**

Paste special options

Exercise 35

Follow the steps below to transpose the rows of data in Quarter 2 into rows in a blank area of the sheet

- i) Select the data that is to be transposed
- ii) Select the cell that is to be the top left corner of the pasted data
- iii) **Edit** → **Paste Special** to display the dialog box (see right)
- iv) Make settings required and click **OK**



Scenario manager

You can create and save sets of input values that produce different results as *scenarios*. A scenario is a group of input values called changing cells (up to 32 per scenario) each saved with a different name. Each set of changing cells represents a set of what-if assumptions that can be applied to a workbook model to see the effects on other parts of the model. Any cell with data can be used as a changing cell.

Create scenarios

Exercise 36

- i) Open the file H:\Excel\SINESCEN.XLS and follow the steps below to create two scenarios with changing cells A1 and A3 and names Scen 1 and Scen 2 taking values (0.1,1) and (0.3,2) respectively.
- ii) Create a scenario summary report

- i) **Tools** ➤ **Scenarios...** to display the **Scenario Manager** dialog box
- ii) Click **Add** to display the **Add Scenario** box (see right)
- iii) Type a name into the **Scenario Name** box
- iv) Click in the **Changing Cells** box, click on the first changing cell to enter its reference in the box, then Ctrl+click on each additional changing cell
- v) Click **OK** and the **Scenario Values** box will be displayed
- vi) Enter desired values into the boxes numbered **1:**, **2:** etc
- vii) Click **OK**
- viii) Repeat steps (ii) to (vii) as necessary
- ix) Click **Close**

Add Scenario

Scenario name: Scen 1

Changing cells: \$A\$1,\$A\$3

Ctrl+click cells to select non-adjacent changing cells.

Comment: Created by dl on 29/01/99

Protection: Prevent changes Hide

OK Cancel

Scenario Values

Enter values for each of the changing cells.

1: \$A\$1 0.1

2: \$A\$3 1

OK Cancel Add

To display a scenario, **Tools** ➤ **Scenarios...**, select a scenario, click **Show** then click **Close**.

Create a scenario summary report

- i) **Tools** ➤ **Scenarios...** to display the **Scenario Manager** dialog box
- ii) Click **Summary** and click **OK**

Some useful techniques

Using absolute references to generate an incremental sequence

An absolute (or unchanging) reference is created by placing \$ characters in the cell reference.

Exercise 37

- Use absolute references and autofill to create the table of squares shown below. The only formulas that you need to enter directly yourself are those in A5, A6 and B5. Formulas are shown in the left table and values in the right
- Use partial absolute references (such as \$C1 and C\$1) to general a multiplication square similar to the one in the two-variable data table exercise on page 11

	A	B
1	Start value	0
2	Increment	1
3		
4	x	x squared
5	=B1	=A5*A5
6	=A5+\$B\$2	=A6*A6
7	=A6+\$B\$2	=A7*A7
8	=A7+\$B\$2	=A8*A8
9	=A8+\$B\$2	=A9*A9
10	=A9+\$B\$2	=A10*A10
11	=A10+\$B\$2	=A11*A11
12	=A11+\$B\$2	=A12*A12
13	=A12+\$B\$2	=A13*A13
14	=A13+\$B\$2	=A14*A14

	A	B
1	Start value	0
2	Increment	1
3		
4	x	x squared
5	0	0
6	1	1
7	2	4
8	3	9
9	4	16
10	5	25
11	6	36
12	7	49
13	8	64
14	9	81

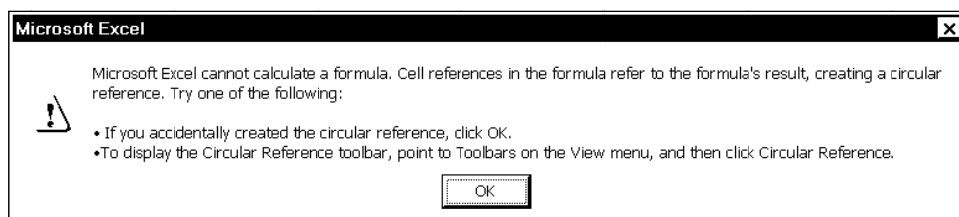
Using circular references to solve problems

A circular reference is created when a formula refers either directly or indirectly to the cell that contains it.

Exercise 38

- Open the sheet named Circular in the MISC.XLS workbook
- Enter into D2 a formula to calculate the maximum value in A4:A6 and D2 itself
- Follow the procedure below to turn iteration on
- Test the formula by entering a very large value in one of the Amount entries and then a smaller value in the same entry
- Turn iteration off and repeat the process to calculate the all time low value in the sheet named Lowest

- Enter into a cell the self-referencing formula. The following alert is displayed



- Click **OK**
- Tools** **Options** **Calculation**
- Set the **Iteration** check box and click **OK**. Excel iterates the calculation until the result is self-consistent

Further reading

John Walkenbach, *Excel 2003 Formulas*. New York: M&T Books, 2003 [this book is also available for Excel 2007]. *Excel 2003 Bible* by the same author covers much of the same ground and more features.