

Working with Charts in Microsoft® Excel 2003

This guide assumes a basic knowledge of charts, covered in “Introduction to Microsoft Excel 2003”. It explains how you can select more precisely the data used to create a statistical chart, and how a chart can be modified once created.

It also contains some useful tips for scientists creating graphs from experimental results.

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Working with Charts in Microsoft® Excel 2003

1 BEFORE YOU BEGIN

This guide supplements the document “*Introduction to Microsoft Excel 2003*”, and assumes that you have worked through it, or are familiar with the Chart Wizard in Excel.

The guide will make use of some spreadsheets that can be downloaded from the web at: <http://www.brad.ac.uk/lss/training/resources>

To download the required files:

1. Under **Working with Charts in Microsoft Excel**, click on the link [Click to download](#).
2. Click the **Run** button and then click the **Run** button again.
3. Click the **Extract** button and then click the **OK** button.

A subfolder called *Excel Charts* will be created in a folder called *Exercise Files* on your C:\ drive, and it will contain three files: - *Breath Tests.xls*, *Leisure Activities.xls*, *Chart Data.xls*.

1.1 What is covered in this Guide?

Section 2: Selecting Data – Series and Categories

This chapter introduces you to the concepts of Data Series and Categories, and shows you how to control what data is selected for your chart.

This chapter uses a tutorial approach where you can work through the topic using the file *Breath Tests.xls*.

Section 3: Modifying your Excel Chart

Having created a chart you may want to change the way it looks. This chapter explains how to do this. You can even change your mind about the type of chart, or the data you use, without having to start from scratch. You can practise using the data in the *Leisure Activities.xls* spreadsheet.

Section 4: Downloading Data from the Web explains the different formats that data is published on the Web, and how to get it onto your computer and into Excel.

Section 5: Inserting an Excel Chart into Microsoft Word explains the different ways in which this can be done.

Section 3: Tools for Scientists

Additional skills are needed for using Excel to chart experimental data. This chapter explains how to use Excel to plot an x-y graph, how to create a line of best fit through plotted points (trend line), and how to display the degree of error in your data (error bars). Other useful features are also explained. The sample spreadsheet *Chart Data.xls* demonstrates these features.

2 SELECTING DATA – SERIES AND CATEGORIES

Often the data that you want to chart is not neatly arranged in a block of cells on your worksheet. To rectify this you can cut and paste the data you want into block of cells before you create your chart. However a quicker way is to use **Step 2** of the **Chart Wizard** to select your data.

This workshop material uses as an example a spreadsheet called *BreathTests.xls* that should be in *C:\Exercise Files\Excel Charts*.

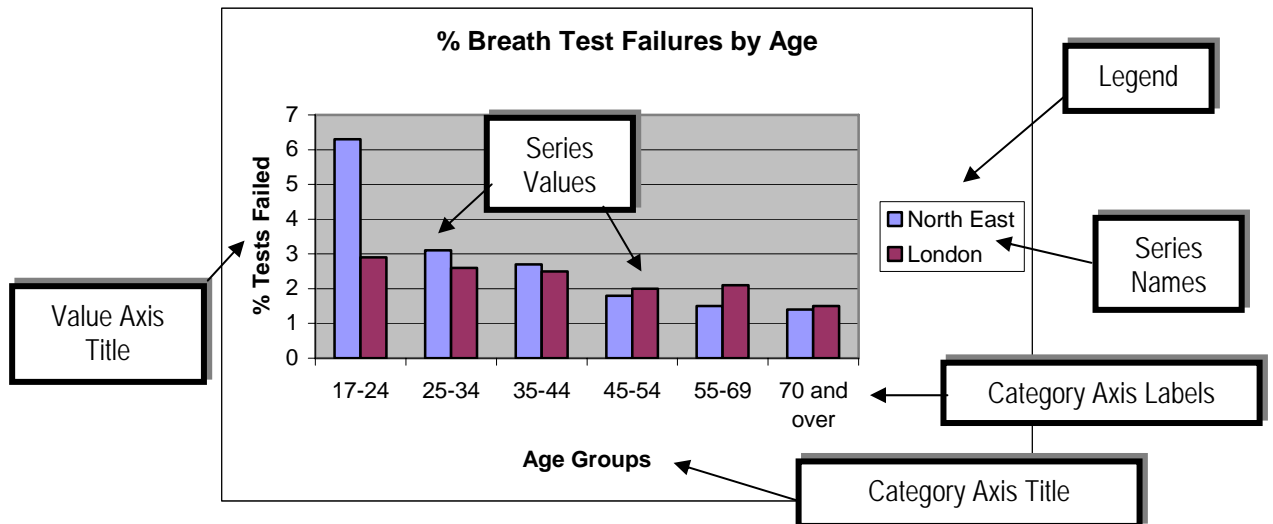
1. If you have not yet downloaded the files from the web, follow the instructions on Page 1 under 'Before you Begin'.
2. Open the file *BreathTests.xls*.

2.1 Parts of the Chart – What They are Called

The Worksheet Data

	17-24	25-34	35-44	45-54	55-69	>=70
North East	6.3	3.1	2.7	1.8	1.5	1.4
London	2.9	2.6	2.5	2	2.1	1.5

The Chart



2.2 Selecting Data for a Chart


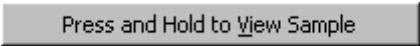
If all the data for your chart are grouped together in a convenient block (not separated by rows or columns) then if you just select any cell within the block, the **Chart Wizard** will choose all the cells in the block to make the chart.

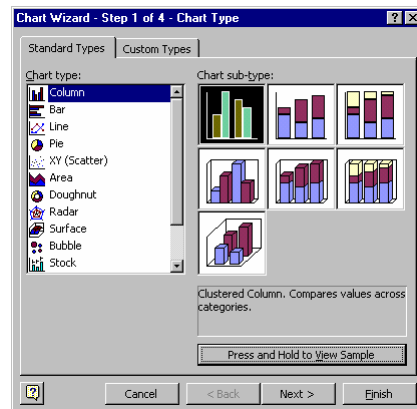
Sheet 1 in the *BreathTests.xls* workbook has data arranged like this.

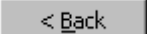
If the data that you want to chart is dispersed around the chart, then you need to use the **Chart Wizard** to find it. *Sheet 2* in the *BreathTests.xls* workbook shows the data as you are more likely to find it off the web. **This document shows you how to create a chart from the data in *Sheet 2*.**

2.3 Using the Chart Wizard

Step 1: Choosing the Chart Type

1. Make sure that you are in *Sheet 2* of the *Breath Tests.xls* workbook.
2. Select a cell in the data table.
3. Click on the **Chart Wizard**  button in the *Formatting* toolbar.
4. Select the **Chart type:** and **Chart sub-type:** from the window. (In this example we have chosen a *Column* chart.)
5. Click on the  button to get an idea of what your chart will look like.




Tip: When using the *Chart Wizard* you can always go back to earlier steps and alter settings, by clicking on the  button.

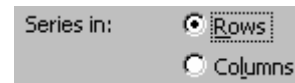
6. Click on the  button.

Step 2: Choosing the Source Data

7. Make sure that the  tab is selected.

Note: If your data is in a block of cells, then the Chart Wizard selects the whole block, eg 

You then need decide whether the Data Series (that's the different coloured bars on your bar chart) are in rows (ie across the worksheet) or in columns (down the worksheet). If you are not sure, have a look at the preview graph for each option.



If this is the data you want, you are lucky! In this example you are not, so you need to follow the steps below.

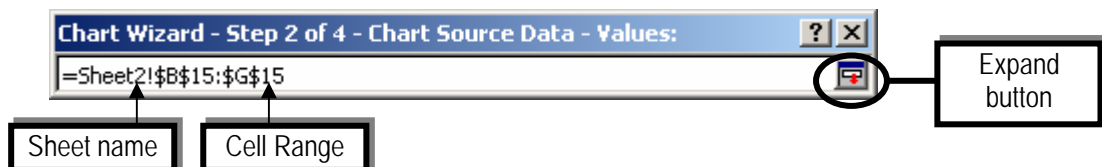
Choosing your own Series:

8. Select the contents of the **Data range** box (it should all be highlighted as in number 7 above), and press the <Delete> key.
9. Now select the **Series** tab.
10. Click on the **Add** button.
11. Click inside the **Values:** `= {1}` box.
12. Delete the contents of the **Values** box and then click on its **Collapse** button.



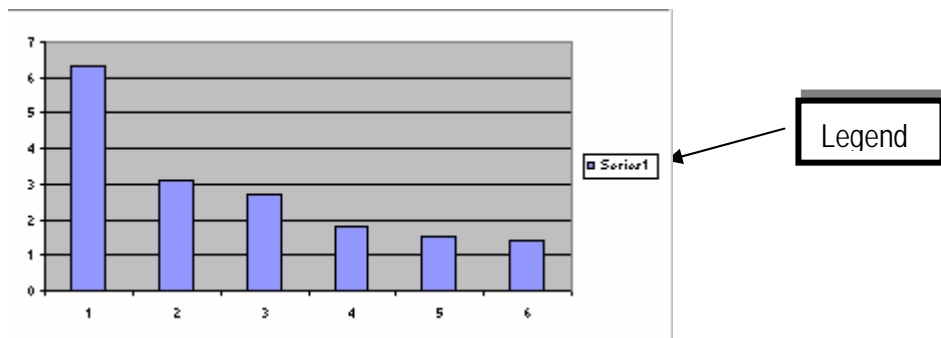
Note: This 'collapses' the window down into a single line, so that it does not cover the data on your worksheet.

13. Select the data that you want for the new series. (In this example we have chosen the data for the *North East* – cells B15:G15.)



Note: The range of cells will appear in the Values box.

14. Click on the **Expand** button to 'expand' the window to its original size. Notice how the series appears in the Preview window.

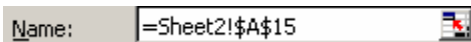


Look at the legend. At the moment the series is just called 'Series 1'. In our example we want it to be called 'North East'. We can name the series by choosing the cell that contains the series name

15. Click in the **Name** box.



16. Select the cell that contains the series name. (In our example, cell A15.)



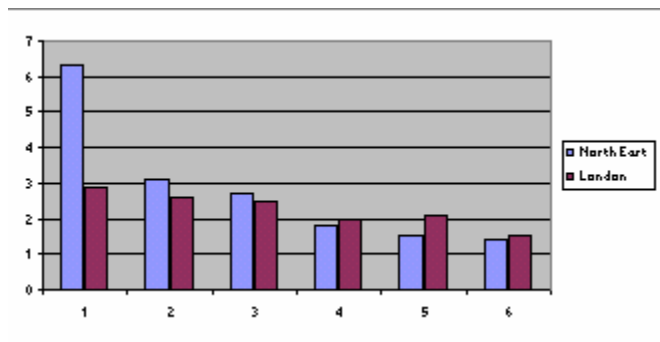
Alternatively you could type in a name for this series, eg



17. Press the <Tab> key on your keyboard to confirm the entry of this name (this is important). You have now successfully added a data series!

Now go through the steps numbered 8 to 16 again to add another series of data - this time for *London* (in row 21 of the workbook).

Your results should look like the picture below:




Selecting the Category (X) Axis Labels

Notice that at the moment the *Category Axis* is just labelled 1 to 6. To select the correct labels:

18. Click in the **Category (X) axis labels:** box.

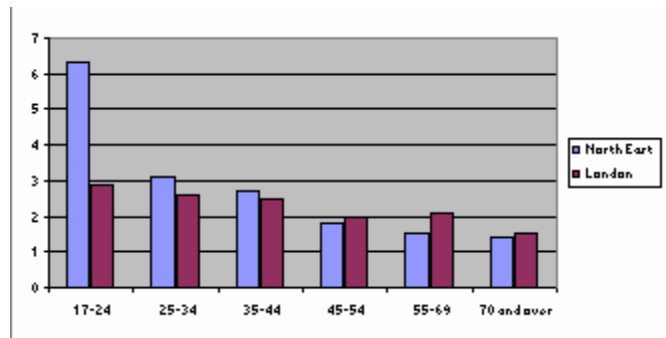


19. Click on its **Collapse** button , then select the cells that you want for the Category axis labels/ (In this example the labels are in cells B12:G12.)



20. Click on the **Expand** button  in the *Category (X) axis labels:* box.

The Chart in the Preview window should now include the Category axis labels.



Note: The Category Axis does not have to be the 'X' (horizontal) axis. If you have chosen a Bar Chart, the categories will appear on the 'Y' (vertical) axis.

Congratulations! You have finished selecting the Data for your Chart!

21. Click on the button.

Step 3: Chart Options

This step contains many options, including adding Titles to your chart, and deciding whether to include the Legend.

22. In this example, add the Titles shown in the chart on Page 2.

23. Click on the button.

Step 4: Chart Location

24. If you want your chart to fill an A4 sheet, choose As new sheet:. The chart will be created in a new worksheet.

Otherwise select the option:



The chart will be created in your existing worksheet, and can then be moved and resized. (In this example the chart was created as an object in Sheet 2.)

Well done! You have now created your Chart!

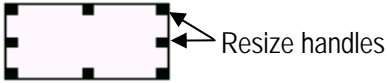
3 MODIFYING YOUR EXCEL CHART

When you create a chart, Excel decides on things like the size of the text, the colours of your chart, and the scales of the axes. If you are lucky it will look right the first time. However if it doesn't, all is not lost! It is possible to customise every element of your chart – even change your mind about the type of chart you want.

'Modifying Charts' is covered briefly in Chapter 9 of the document "*Introduction to Microsoft Excel 2003*". The following chapter gives a few more examples of how a chart can be modified. The examples are based on the workbook "*Leisure Activities.xls*", which you will have downloaded when following the steps on Page 1. If you wish, you can construct the charts given in the example and practise making the modifications.

3.1 Resizing a Chart

A simple way of changing the look of your chart is to resize it. To do this:

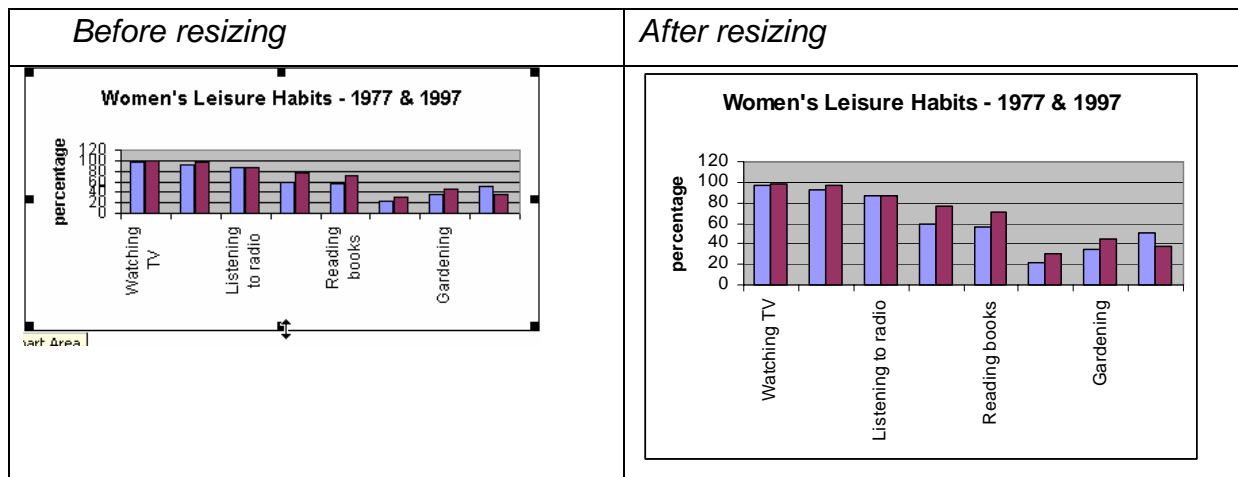
- Click just inside the border of the chart to select it. Some black squares (resize handles) will appear around its border.
- 
- Move your mouse pointer over one of the handles. The pointer will change to a double-headed arrow, eg ↔
 - Click and drag the mouse to resize the chart.

The results can be unexpected – as you resize the chart, the size of the text will automatically resize as well! (You can stop this happening – see the section on "The Font tab" below.)

Note: You cannot resize a chart if, in Step 4 of the *Chart Wizard*, you chose to place it in a new sheet.

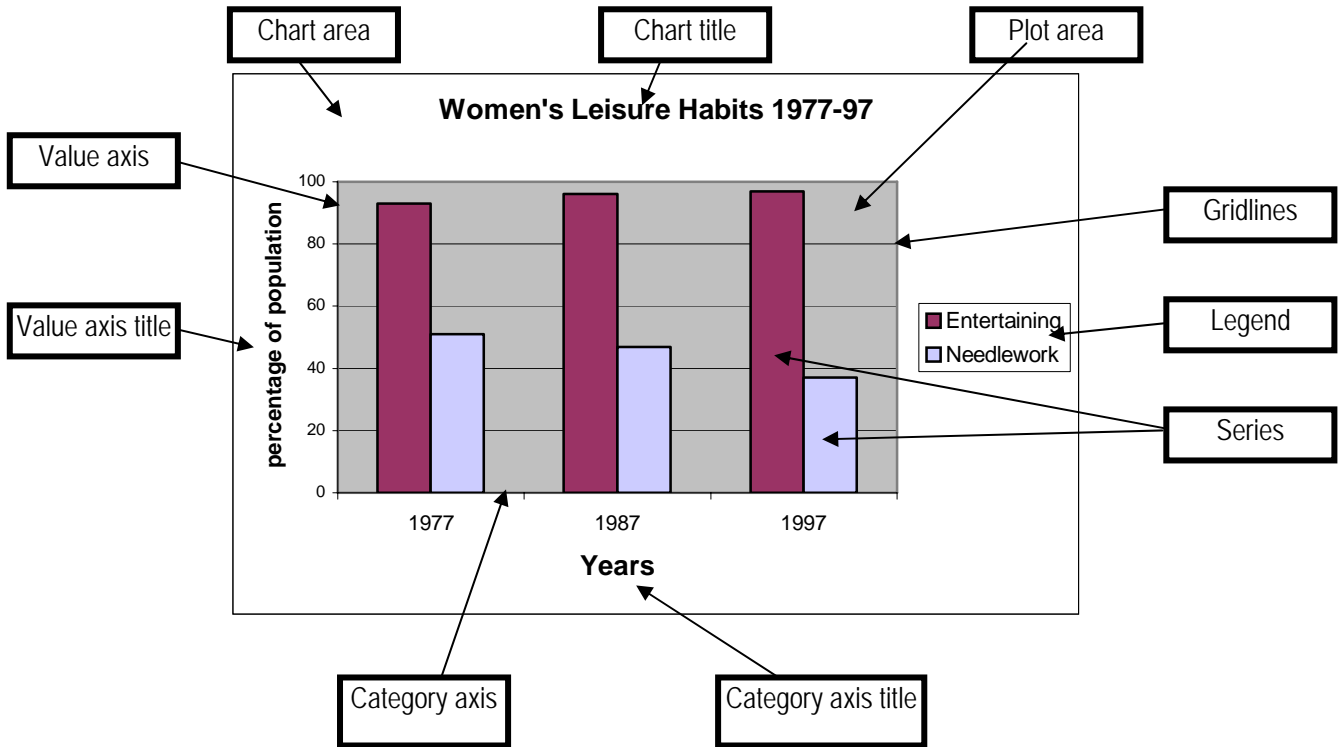
Example

The bottom resize handle has been dragged down, stretching both the chart and also the space for the category axis labels.



3.2 Chart Elements

Each chart is made up of different elements. If you move your mouse to different parts of the chart, a screen tip eg **Chart Area** will tell you which element you are looking at.



To Modify a Chart Element

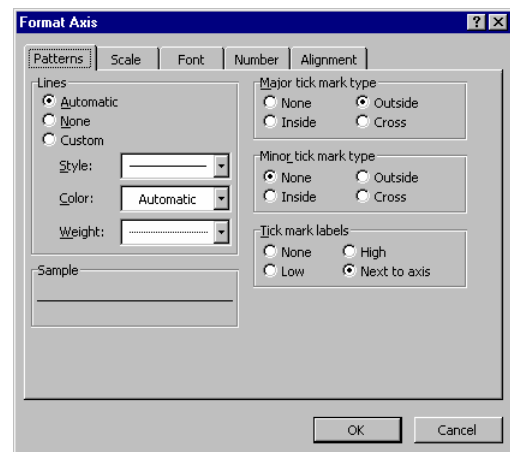
1. Move your mouse over the chart until you see the screen tip for the element you want to modify.
2. Double-click on the element. The *Format* window for that element will appear.

The Format Axis Window

The Format window looks different for each element.

The Format window for *graphical* elements (chart area, plot area, series), allows you, among other things, to alter the colour of the element.

The Format window for *text* elements (eg titles), allows you to alter the size, font and style of the text.



The Format window for the *Category* or *Value* axis contains the most number of options, and is also an element that you are very likely to modify.

At the top of the window there are a number of ‘tabs’. Clicking on each tab gives you a different set of options. These tabs are now described in more detail.

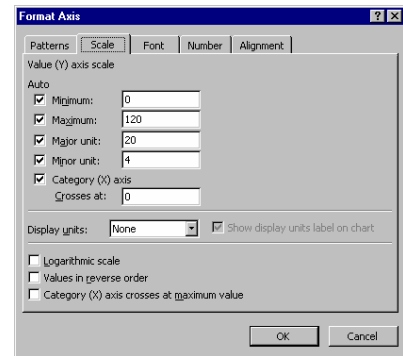
The Patterns Tab

The Patterns tab allows you to alter the style of the Axis line, and where the tick marks occur.

The Scale Tab

The Scale tab allows you to change the *Maximum* (and *Minimum*) value on your axis. If, when creating a chart you chose to have gridlines in *Step 3* of the *Chart Wizard*, you can also change the interval between the gridlines by altering the *Major* unit.

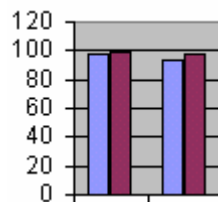
Other options are to alter where the two axes intersect, and to create a logarithmic rather than linear scale.



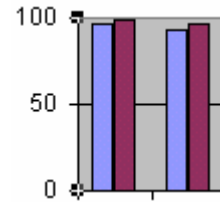
Example

This shows the effect of altering the *Maximum* value from 120 to 100, and altering the *Major* unit from 20 to 50.

Before

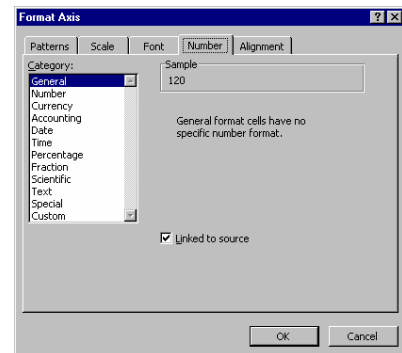


After



The Number Tab

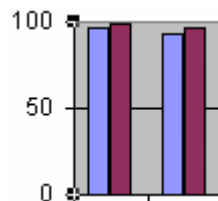
The Number tab allows you to alter the way a number or a date looks. When you choose a category (eg currency, percentage) from the *Category* box, further formatting options are displayed on the right of the window.



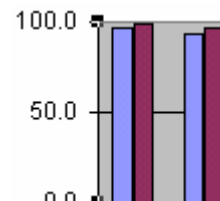
Example

By choosing the *Number* category, the number of decimal places can be altered from 0 to 1.

Before

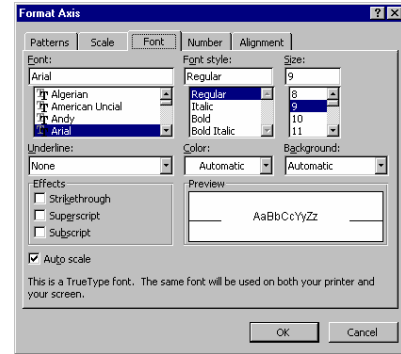


After



The Font Tab

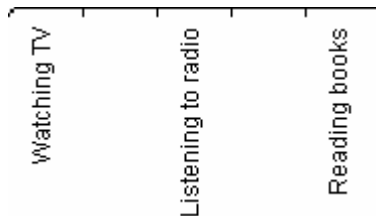
The Font tab allows you to alter the size of the text, as well as its font, colour, and style. Also, by taking the tick out of the *Autoscale* checkbox, you can stop the annoying habit of the text automatically resizing when you resize your chart.



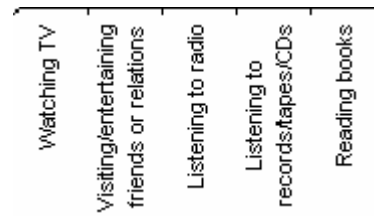
Example

When the text is too big, there is not room along the axis to show all categories. This example shows the effect of reducing the font size from 9pt to 8pt.

Before

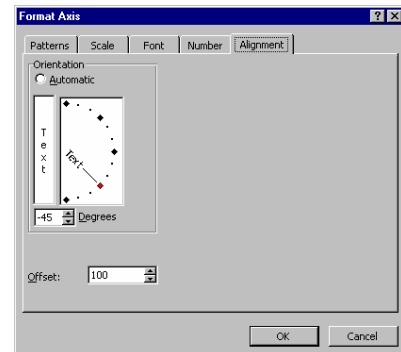


After



The Alignment Tab

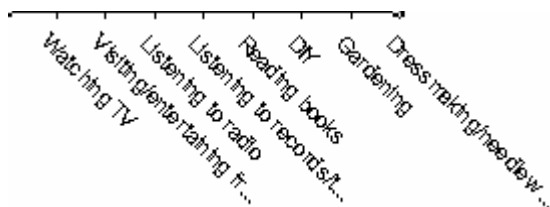
Sometimes Excel tries to fit in large amounts of text by slanting it. The Alignment tab allows you to choose exactly what orientation you want your text to be – horizontal, vertical, or slanted.



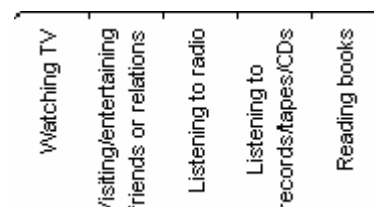
Example


In this example the slanted text is reoriented so that is vertical.

Before



After



Tip: Don't be afraid to experiment with the different settings in the *Format* windows. If you make a mistake, remember that the **Undo**  button can undo (up to) your last 16 actions!

3.3 The Chart menu

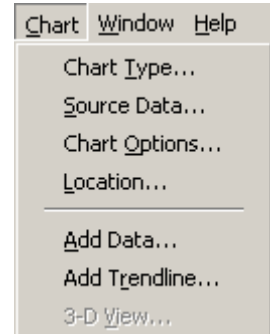
When a chart is selected, the **Chart** menu will appear in your menu bar. This provides other options for modifying your chart.

Chart Type brings up *Step 1* of the *Chart Wizard* again, allowing you to choose a different type of chart for your data.

Source Data brings up *Step 2* of the *Chart Wizard*, allowing you to change the range of data, and labels, that you have chosen.

Chart Options brings up *Step 3* of the *Chart Wizard*, allowing you to alter the titles, axes, gridlines and legend.

Location brings up *Step 4* of the *Chart Wizard*, allowing you to move your chart to a new sheet, or as an object in the existing sheet.



4 DOWNLOADING DATA FROM THE WEB INTO EXCEL

Data on the web can come in many formats which are more or less easy to download in a format that can be then opened in Microsoft Excel. The notes below give some tips.

4.1 Download as Excel File



Sometimes the data has already been saved in Excel format, and all that is needed is to click on a link.

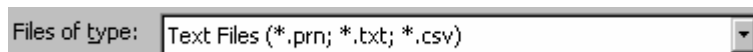
Warning: If you are using Internet Explorer as your web browser, the spreadsheet may open up directly in the browser window, making it very fiddly to work with! To avoid this, **right-click** on the link, then choose **Save Target As** You can then save the spreadsheet onto your computer and open it up using Excel.

4.2 Download as CSV File

Download CSV file

CSV stands for comma-separated variable. This is a file format that can be opened by any spreadsheet (or word processor) package. As with Excel files you may find that when you click on the link the file opens up directly in your browser window, in which case you need to follow the instructions given in the previous paragraph (section 4.1) for saving the file to your computer.

Remember, when you open the file with Excel, to select the CSV type files from the **Files of type:** box at the bottom of the **Open** window.



4.3 Copy and Paste

This method is a bit hit-and-miss. If the data is visible in rows and columns in the browser window select the data you want, then copy the data by holding down the **<Ctrl>** and **<C>** keys simultaneously. Then click in a cell (eg cell A1) in your Excel worksheet and paste the data by holding down the **<Ctrl>** and **<V>** keys simultaneously.


Note: If you use Netscape Navigator as your browser, all of the data may be pasted into a single cell!

5 INSERTING AN EXCEL CHART INTO MICROSOFT® WORD

Having created a chart in Excel you may want to add it to a report or assignment written in Word. The simplest way to do this is by copying the chart from Excel and pasting it into Word. The chart will be pasted as a picture. However if you want be able to edit the chart or the data from within Word, see section 5.1.2 OLE Objects.

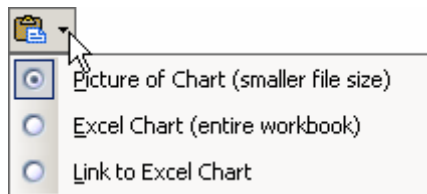
5.1 Other Paste Options

The Paste ‘Smart Tag’

When you paste a chart from Excel into Word, an icon will appear underneath your chart . This is known as the Paste ‘Smart Tag’. Moving over this icon reveals a pick-list arrow.



Clicking on the pick-list arrow produces three options:



Picture of Chart This is the recommended option. You cannot alter this chart once it is pasted, but it keeps the file size small.

Excel Chart This puts a copy of your Excel workbook into Word. If you double-click on the chart you can work on it as if you were back in Excel. However you will significantly increase the file size

Link to Excel Chart This produces a link to your Excel file, rather like a hyperlink on the Web. It will keep the file size of your Word file small, but if you copy your document to another location, you must remember to take the Excel file with it.

5.2 Formatting Pictures

Pictures can be resized, and moved to different places in your report. Formatting of pictures is covered in a Computer Centre document “*Graphics in Microsoft Word 2003*”, available from the University’s Learning Support Services website, or from the J B Priestley Library reception.

6 TOOLS FOR SCIENTISTS


Examples of each of these features are given in the workbook *Chart Data.xls*, which you will have downloaded if you followed the steps on Page 1. Use the instructions below to solve the problems in the workbook.

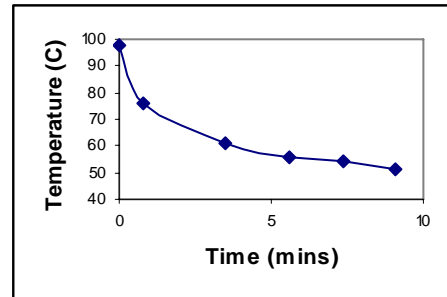
6.1 Creating an X-Y Chart

Normally an Excel chart consists of a series of values, plotted against different categories - eg number of unemployed (the 'values') against different age groups (the 'categories'). Scientists may wish to plot one value against another eg temperature against time.

For this you need a different type of chart – the X-Y Scatter.

To access

Select the data, click on the **Chart Wizard** button, then  XY (Scatter) type.

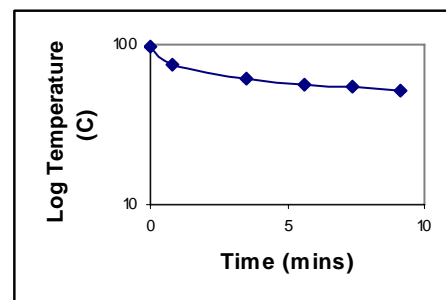


6.2 Altering the Scale of the Y Axis to a Logarithmic Scale

An exponential chart can be plotted as a straight line by giving the Y axis a logarithmic scale.

To access

Select **Value Axis** properties (see section 3.2 *Chart Elements*) – **Scale** tab - select **Logarithmic scale**.



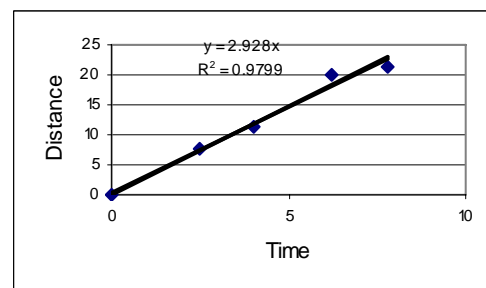
6.3 Add trend line to Chart

A Trend Line provides the line of 'best fit' through a number of points. Excel will also give you the equation of that line.

To apply

Select chart, then **Chart** menu – **Add Trendline ...** then:

- **Type** tab to select trendline type.
- **Options** tab to display equation and R^2 value on chart.



6.4 Add Error Bars to Chart

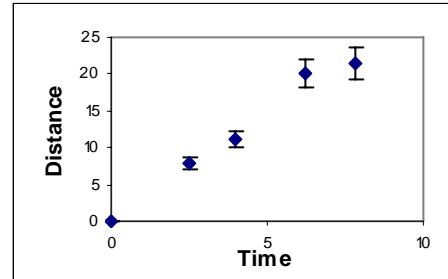
Error bars can display the amount of error you expect in your readings.

To apply

Select **Series** properties (see *section 3.2 Chart Elements*) –**Y error bars** tab.

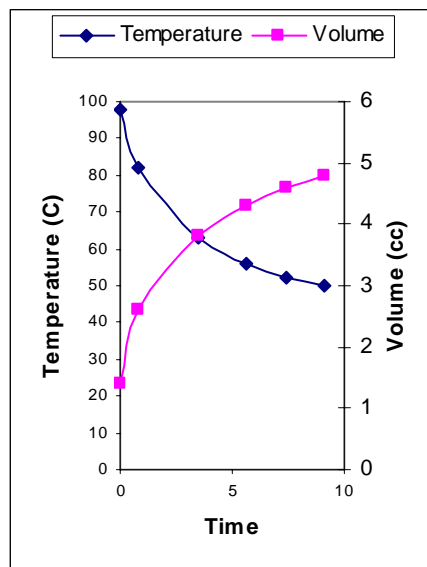
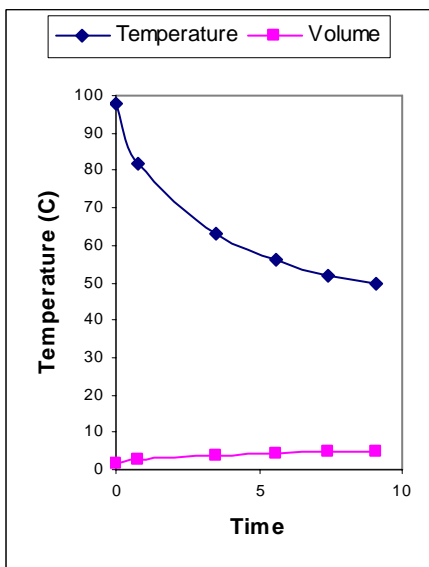
Choose **Display** and **Error amount** required.

Note: By selecting **Custom:** the error bars can represent some data in your spreadsheet, rather than just a value or percentage. For example, you may want the error bars to display the standard deviation of a range of readings.



6.5 Creating a Two Axis Plot

Two series of data may have values of different orders of magnitude. The solution is to create a secondary axis.



To apply

Select **Series** properties (see *section 3.2 Chart Elements*) for the series you want on the secondary axis (the 'Volume' series in the example above) – **Axis** tab – select **Secondary axis**.

To add a title to the secondary axis: **Chart** menu – **Chart options ...** - **Titles** tab.