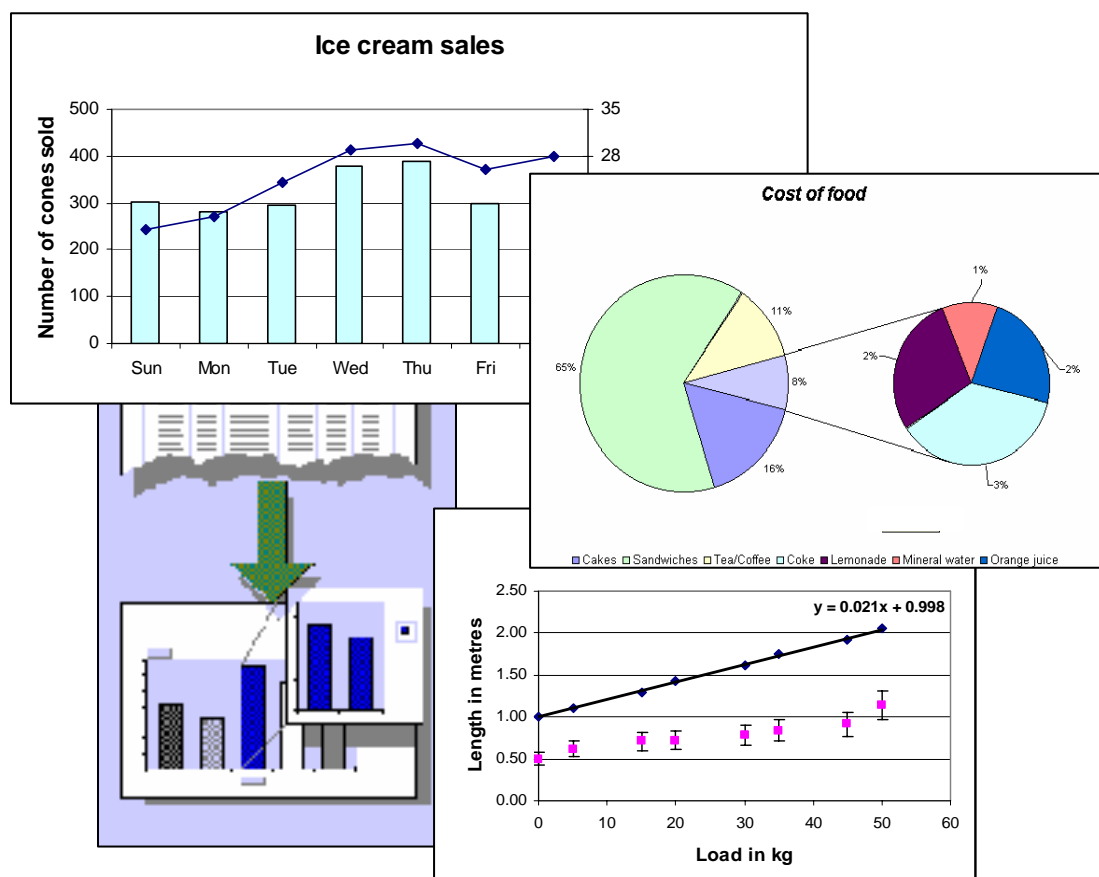


Creating charts in Microsoft Excel 2003

This guide provides an introduction to creating charts in Excel. It is assumed that the reader is familiar with the basics of Excel covered in *Guide 33: An Introduction to Microsoft Excel 2003*.

A sample workbook referred to in the document is provided on the Networked PC service. Users of stand-alone PCs can get a copy from the Web.



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Conventions:

In this document, the following conventions are used:

- A typewriter font is used for what you see on the screen.
- A **bold typewriter font** is used to represent the actual characters you type at the keyboard.
- A ***slanted typewriter font*** is used for items such as filenames which you should replace with particular instances.
- A **bold font** is used to indicate named keys on the keyboard, for example, **Esc** and **Enter**, represent the keys marked Esc and Enter, respectively.
- A **bold font** is also used where a technical term or command name is used in the text.
- Where two keys are separated by a forward slash (as in **Ctrl/B**, for example), press and hold down the first key (**Ctrl**), tap the second (**B**), and then release the first key.

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1 Charts

A chart is a graphical representation of the data in your worksheet. You can create an *embedded chart*, which appears on the worksheet beside the data, or, you can create a *chart sheet* as a separate sheet in the workbook so that it can be displayed apart from its associated data.

Whichever method you choose, your chart data is automatically linked to the worksheet from which it was created. If you change the data on the worksheet, the chart will change accordingly.

Excel offers many different chart types, each of which has several subtypes or variations.

Column	Bar	Line	Pie
XY (scatter)	Area	Doughnut	Radar
Surface	Bubble	Stock	Cone
Cylinder	Pyramid		

An Excel workbook called **Data_for_Charts.xls** has been prepared for you to use while working through this Guide. It contains data that can readily be displayed in chart form.

If you are using a stand-alone PC, you may like to get a copy of this from the ITS WWW pages under **Information | Guides | Sample Files** (<http://www.dur.ac.uk/its/info/guides/files/excel/>).

If you are using the Networked PC service:

- 1 Activate **Excel**.
- 2 From the **F**ile menu, select **O**pen.
- 3 Click on the ▼ to the right of the **L**ook in: box.
- 4 Select the drive called **workfile** on '**dudley**'(T:).
- 5 Double-click on the folder **its**.
- 6 Double-click on the folder **Excel**.
- 7 Select the file **Data_for_Charts.xls** and click the **O**pen button.

2 Creating a pie chart

Pie is probably the simplest chart type so that will be used as the first example.

A pie chart shows the relationship (proportional size) of items in a data series to the sum of all those items. It can only show one data series and is useful when you want to emphasise a significant item. To make small slices easier to see, you can group them together as one item in a pie chart and then break down that item in a smaller pie or bar chart next to the main chart.

- 1 Click on the **Food** worksheet tab.

You will see data detailing the expenditure on different types of food.

2 Click on any cell in the range **B5:C11**.

3 *Either*

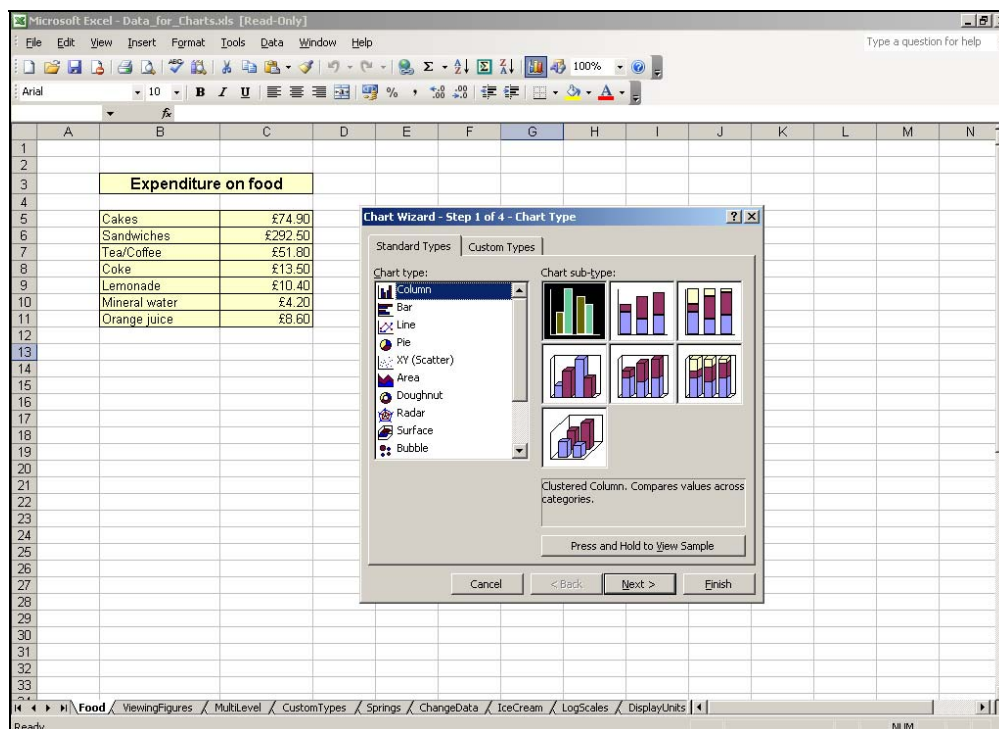
Click on the **Chart Wizard** button on the toolbar

or

Select **Chart** from the **Insert** menu.

The first **Chart Wizard** dialog box will appear.

2.1 Choosing the chart type



The **Chart Wizard – Step 1 of 4 – Chart Type** dialog box that appears has two tabs. The popular built-in chart types can be found on the **Standard Types** tab. Chart types designed by you, the user, and combination charts designed by Excel, can be found on the **Custom Types** tab (these will be dealt with in section 6.3).

1 Make sure that the **Standard Types** tab is selected.

At the moment, **Column** is selected in the **Chart type**: box. To see what your data would look like displayed as a column chart,

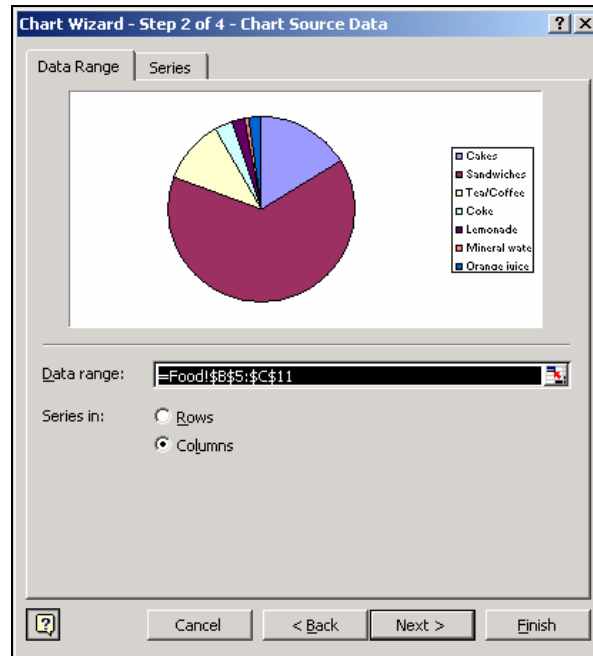
2 Hold down the mouse on the **Press and Hold to View Sample** button.

3 When you have finished looking at the chart in the **Sample**: box, release the mouse button.

4 Click on **Pie** in the **Chart type**: box.

- 5 Make sure that the first option in the **Chart sub-type:** box has been selected (is highlighted).
- 6 Click **Next>** (or press **Enter**) to move to the next step.

2.2 Specifying which data is to be plotted



Since you selected a cell in your data range before starting to create a chart, Excel should have correctly guessed that the data to be plotted is in cells **B5:C11** of the **Food** worksheet.

- 1 Check that the **Data range:** box is set to **=Food!\$B\$5:\$C\$11**.

If the range is not correct, you can change it by editing it or by selecting the range to be plotted.

- 2 Check that the **Series in:** setting is **Columns**.

Excel usually makes the correct choice for this setting. It assumes that your data has more points than series. Your data has *one* series consisting of *seven* amounts of money (points).

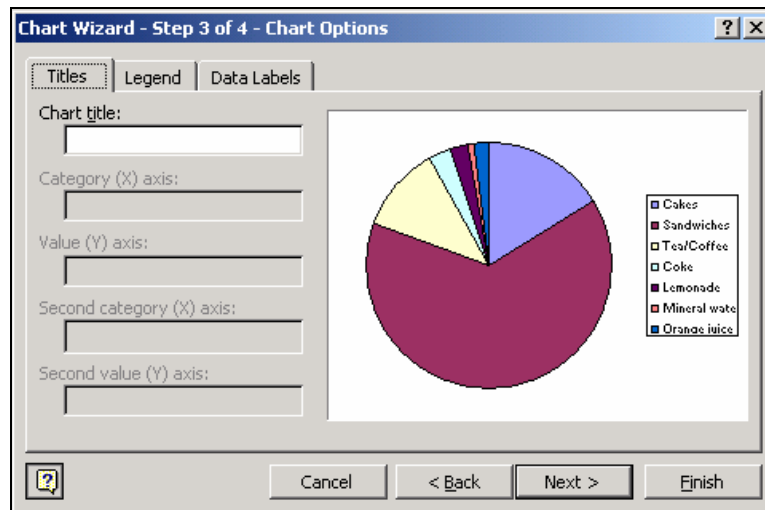
- 3 Click on the **Series** tab.

Here you can confirm that Excel believes that you have one series (**Series1**) with values in **C5:C11**. The **Category Labels:** box is set to **=Food!\$B\$5:\$B\$11**. This means that your text **Cakes**, **Sandwiches**, and so on, will be used as labels if you request them.

You could give a name to your series, which would then appear on the chart. For now though, leave the **Name:** box empty.

- 4 Click on **Next>**.

2.3 Choosing chart options



The number of tabs displayed in the **Chart Wizard – Step 3 of 4 – Chart Options** window varies, depending on the chart type. Here you have three — **Titles**, **Legend** and **Data Labels**.

First enter the text to be used as a title for your chart.

- 1 Make sure that the **Titles** tab is selected.
- 2 Click in the **Chart title:** box and type

Cost of food

A title is an ordinary text box so when the chart has been created you will be able to move, reformat and edit the title.

Next, deal with the legend (the key for the chart).

- 3 Click on the **Legend** tab.
- 4 Make sure that there is a tick beside **Show legend**.

At the moment, the legend is on the right-hand side of the chart.

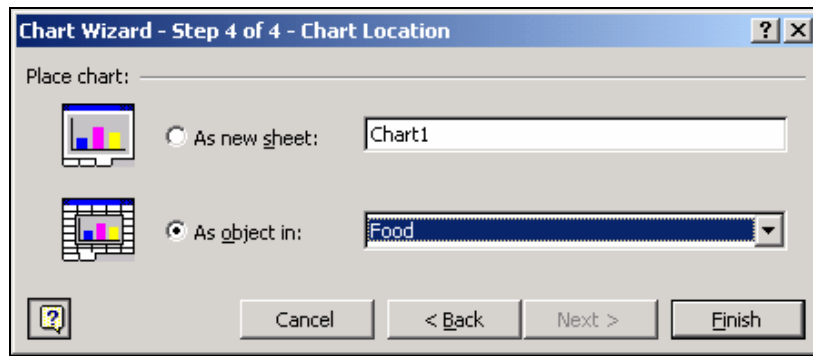
- 5 In the **Placement** area, click on **Bottom**.

Note how the legend has moved in the preview. The default is to position it on the right-hand side. Once the chart has been created, you can move the legend by dragging it and change the font of the text.

Finally, consider the data labels.

- 6 Click on the **Data Labels** tab.
- 7 Click in the **Category name** box, note the effect on the preview and then remove the tick.
- 8 Repeat for **Value** and **Percentage**.
- 9 Make sure that no boxes are ticked in the **Label Contains** pane.
- 10 Click on **Next>**.

2.4 Choosing the location of the chart

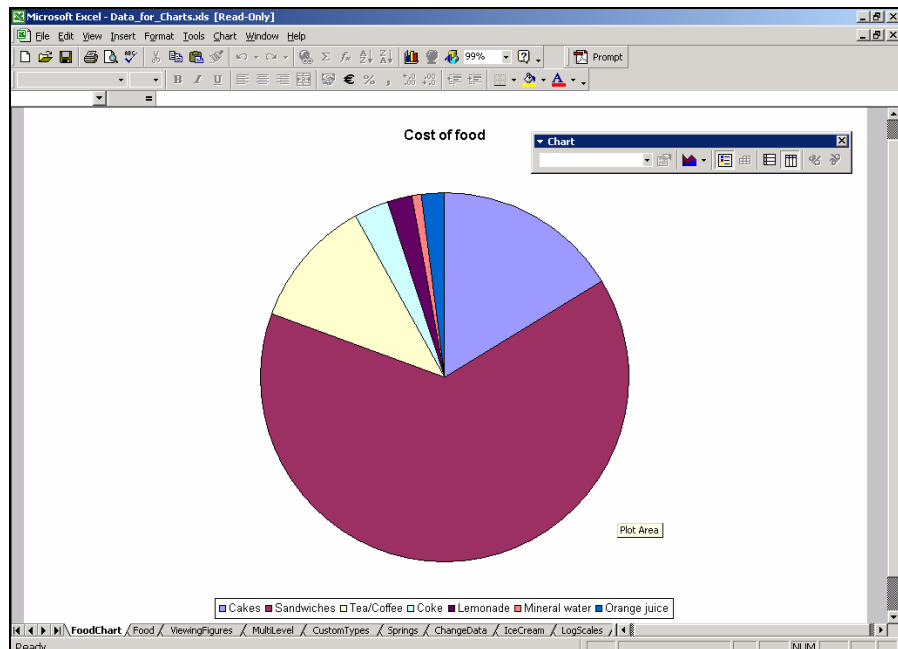


In the **Chart Wizard – Step 4 of 4 – Chart Location** window, you can specify where this new chart is to go.

You can choose to place the chart

- **As new sheet** in which case a chart sheet containing just the chart will be entered in your workbook — type a name for the sheet in the adjacent box.
- **As object in** so that the chart will be placed in an existing worksheet — the current one where your data is, or a different one (click on the down-arrow to select one).

- 1 Click the **As new sheet:** button.
- 2 Change the name **Chart1** to **FoodChart**.
- 3 Click on **Finish**.



The Chart toolbar will probably appear — just drag it to a clear region of your chart.

2.5 Controlling the size of a chart on a chart sheet

A chart placed on a chart sheet is created at a standard size and stays that size even if the window size is changed. So, if you make your window smaller, only part of the chart will be visible at any one time. However, there is a display mode in which the chart size changes when the window size changes. To demonstrate all that:

- 1 Make sure that the **FoodChart** sheet is selected.
- 2 Make the **Data_for_Charts.xls** window smaller (click on its **Restore Down** button and then drag a corner).

Only part of your chart will be visible.

- 3 Click on the **Maximize** button to return your window to its original size.

You should now be able to see all of your chart again.

Next, try using the different display mode:

- 1 Select **O**ptions from the **T**ools menu.
- 2 Click the **Chart** tab.
- 3 Tick the **Chart sizes with window frame** box.
- 4 Click **OK**.

To see what difference this makes:

- 1 Re-size your window by clicking on the **Restore Down** button.

This time, you should still be able to see the whole chart.

- 2 Click on the **Maximize** button to return your window to its original size.

3 Formatting

Before formatting a chart, it must be selected.

- 1 Make sure the **FoodChart** chart sheet is active.
- 2 Click on a blank region of the chart.

Note that:

- The border with eight small black handles indicates that the chart can be changed.
- The **C**hart menu replaces the **D**ata menu.

3.1 Changing the format of the legend

- 1 Single-click on the legend (the box containing the text **Cakes**, **Sandwiches**, and so on) to select it.

The handles are now around the legend indicating that it can be altered.

- 2 From the **Format** menu, select **Selected Legend**.
- 3 In the **Format Legend** dialog box that appears, click on the **Font** tab.
- 4 In the **Size:** box, change the font size to **11**.
- 5 Click on **OK**.

The contents of the legend are now easier to read.

3.2 Changing the format of the chart title

- 1 Click on the chart title **Cost of food**.
- 2 From the **Format** menu, select **Selected Chart Title**.
- 3 In the **Font style:** box, select **Bold Italic**.
- 4 In the **Size:** box, choose **14**.
- 5 Click on **OK**.
- 6 Click in a blank region away from the chart title to de-select it.

Note: It is possible to change the font and colour of *all* the text in a chart (title, legend, and so on) at the same time. To do this, click in the Chart Area; from the **Format** menu select **Selected Chart Area**; click the **Font** tab; make your chosen adjustments and click **OK**.

3.3 Changing a colour in the chart

You may not like the colours that Excel has chosen for the various sectors of the pie chart. It is easy to change them.

- 1 Click in the **Sandwiches** area of the pie chart.

Handles will appear around *all* parts of the pie indicating that *all* the pie is selected.

- 2 Click again in the **Sandwiches** area.

This time the handles are around just the **Sandwiches** sector indicating that only it is selected.

- 3 Click on the ▼ of the **Fill Color** button (in the formatting toolbar near the top of the screen).
- 4 Click on an appropriate colour (different from others in use in the pie chart).

Note how the new colour appears in the legend as well as in the pie chart.

- 5 Click on a blank region inside the chart's frame, but away from the pie area, to deselect that sector.

3.4 Changing the labels

Once your chart has been created, you may decide that you would like to change its data labels.

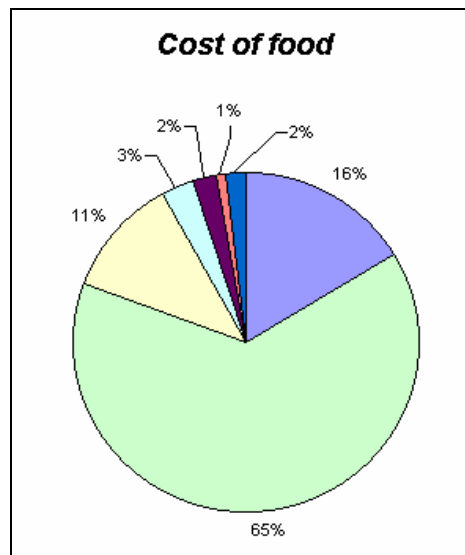
- 1 Right-click in the **Pie** area and select **Format Data Series** from the shortcut menu (or left-click in the **Pie** area and, from the **Format** menu, select **Selected Data Series**).
- 2 In the **Format Data Series** dialog box, click on the **Data Labels** tab.
- 3 Tick the **Percentage** box and then click on **OK**.

Because four of the slices are thin, their labels may be too close to each other. This can be rectified.

- 4 Click twice (slowly) to select just the **2%** label for Orange juice.
- 5 Drag an edge of this text box to reposition it in a clear area.

Note the line connecting the **2%** label to its pie slice.

- 6 Move the other data labels so that you get something like this:



3.5 Formatting the background

There are many ways of formatting the background areas of charts — the plot area, chart area, legends, titles, data labels, and so on. They include:

- formatting the border
- filling with a solid colour (as for the pie slice above)
- filling with a colour gradient
- filling with a pattern
- filling with a texture or picture

A colour gradient gives a smooth change of colour across the area you fill. There are two kinds of colour gradient:

- **one-colour** in which the chosen colour is varied by adding/subtracting luminosity
- **two-colour** in which the first colour is gradually changed as you move across the area until the second colour dominates

As an example, try shading your chart area with a colour gradient:

- 1 Click in the background area of the chart (the mouse pointer message will be Chart Area).
- 2 From the **Format** menu, select **Selected Chart Area**.
- 3 In the **Format Chart Area** dialog box, click on the **Patterns** tab.
- 4 Click on the **Fill Effects** button in the **Area** box.

Now experiment with a few settings but *do not* press the **OK** button yet.

- 5 In the **Colors** pane, click on **Two colors**.
- 6 Click on the down-arrow beside **Color 1** and select a colour.
- 7 Click on the down-arrow beside **Color 2** and select a colour.
- 8 Look at the **Sample:** box to see what effect you have created.
- 9 Experiment with different settings for **Shading styles** and **Variants**.
- 10 Click on **Preset** in the **Colors** area.
- 11 In the **Preset colors:** box, select something you like, perhaps **Daybreak**.
- 12 Now click on **OK**.
- 13 In the **Format Chart Area** dialog box, click **OK**.

3.6 Changing a border

Have a look at what could be done to the legend's border:

- 1 Click on the legend.
- 2 From the **Format** menu, select **Selected Legend**.
- 3 In the **Format Legend** dialog box, experiment with choosing different **Style**, **Color**, and **Weight** settings but don't press OK for the moment. Instead, look in the **Sample** box to see what effects you are creating.
- 4 Now, in order to remove the border from the legend, click on **None** in the **Border** area of the dialog box.
- 5 Click on **OK**.
- 6 Finally, de-select the legend by clicking outside its edge.

For most data you would probably by now have a pie chart that you were happy with. However, with this particular data there is a slightly unsatisfactory feature in that four of the slices (**Coke**, **Lemonade**, **Mineral**

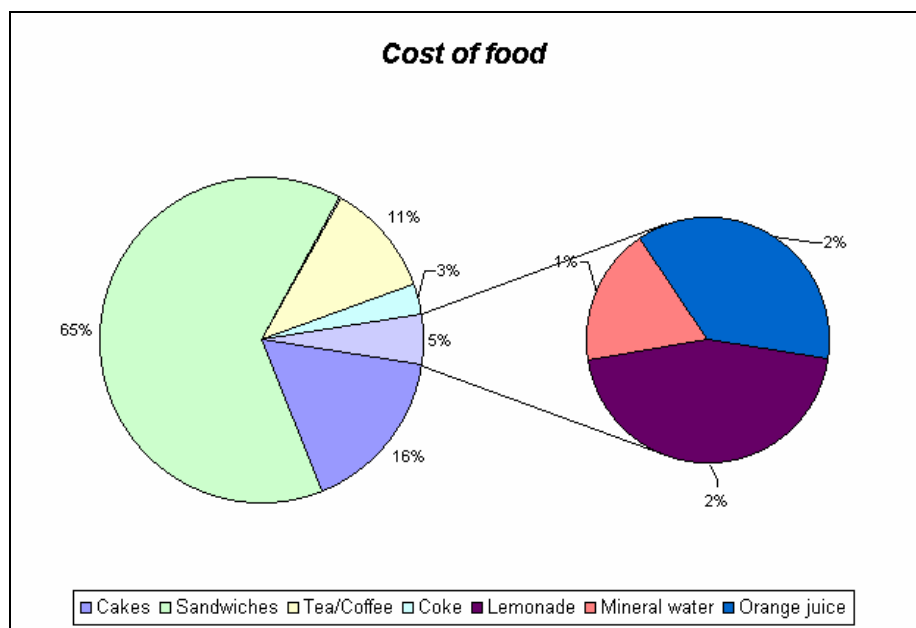
water and **Orange juice**) are very thin. It would really be better to combine these in the main pie chart (thinking of them as **Soft drinks**) and have an extra little pie chart detailing the **Soft drinks** beside the main pie chart. This is known as a **pie-of-pie** chart. You can also have **bar-of-pie** charts in which the extra chart is a bar one rather than a pie.

If you would like to learn about creating pie-pie charts, exploding pie charts, or changing the positioning of the slices in a pie chart, work through the next section. Otherwise, skip to section 5.

4 Other ways of changing a pie chart

4.1 Converting from a pie to a pie-of-pie chart

- 1 Click on the pie itself.
- 2 From the **Chart** menu, select **Chart Type**.
- 3 In the **Chart type** dialog box, check that the **Chart type** is set to **Pie**.
- 4 In the **Chart sub-type** box, select the third option in the first row.
- 5 Hold down the **Press and Hold to View Sample** button — the sample should look similar to the chart shown below.
- 6 Click on **OK**.



Excel will have merged **Lemonade**, **Mineral water** and **Orange juice** but not **Coke**. So, the next step is to include **Coke** in the right-hand detail chart.

A chart can be split by:

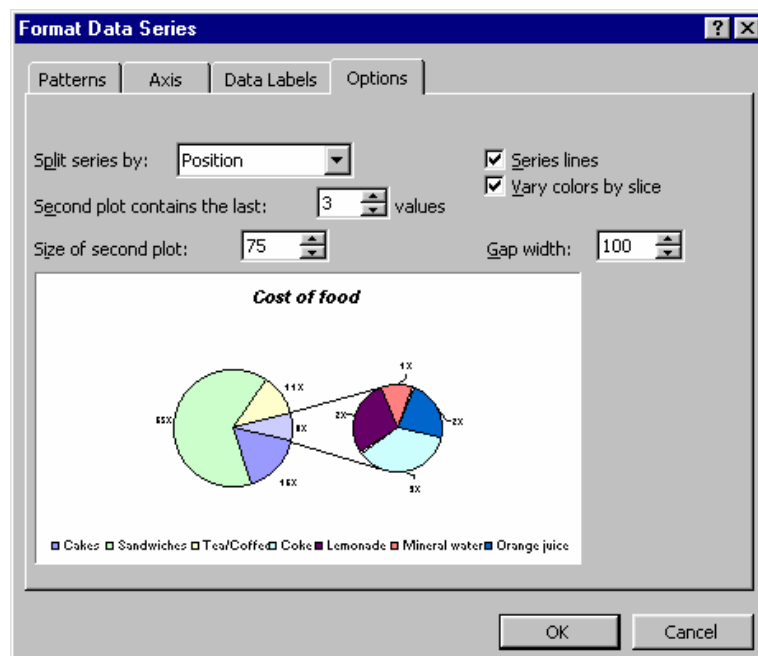
- **position** — the last *n* points in your data series go to the detail chart
- **absolute value** — all points less than a specified value *n* go to the detail chart

- **percent value** — all slices less than *n*% of the total go to the detail chart
- **manual selection** — slices can be dragged from the main to the detail chart (at the appropriate stage, select **Custom** in the **Split Series By** drop-down list)

Regardless of which way the splitting is done, Excel will redraw the main chart to show just a single slice representing *all* the slices in the detail chart. By default, lines will be drawn from the single slice to the detail chart. These lines can be removed (by deselecting the **Series Lines** checkbox at the appropriate time).

So, you need to send the last *four* data values to the detail chart (instead of the last three).

- 1 Click on the existing detail pie chart (on the right).
- 2 Select **Selected Data Series** from the **Format** menu.
- 3 In the **Format Data Series** dialog box, click on the **Options** tab.

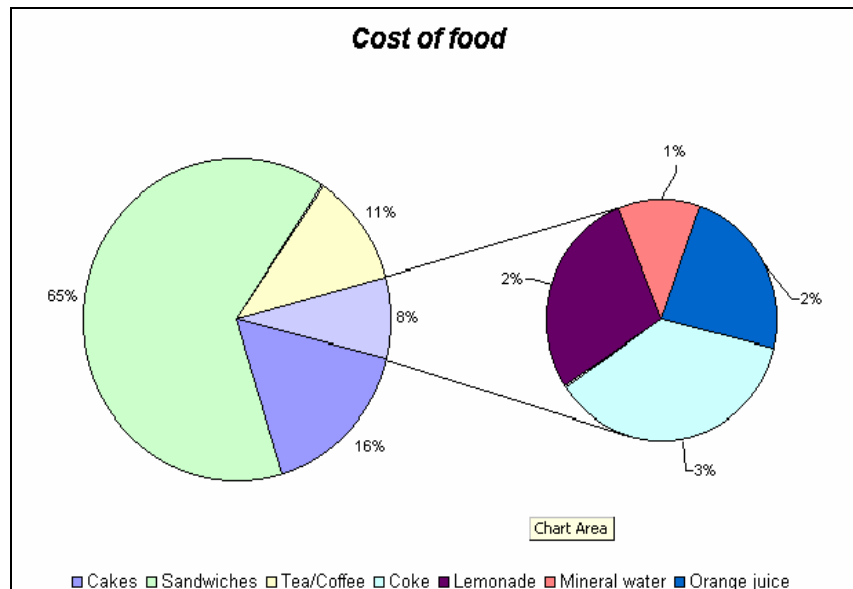


The **Size of second plot:** box, currently set to **75**, controls the size of the detail plot in relation to the main pie chart. The number can be changed.

The **Gap width:** box determines how close the detail plot is to the main plot.

- 1 Click on the down-arrow in the **Split series by:** box to see what options there are but leave the setting at **Position**.
- 2 Change the number in the **Second plot contains the last:** box to **4**.
- 3 Click on **OK**.

- 4 Change the shape of the legend and/or move the legend and/or move the data labels until you have an acceptable chart — similar to the one below.



Note: It is also possible to move a slice from/to the main pie, to/from the pie-of-pie, simply by clicking and dragging the slice.

4.2 Exploding pie charts

You can move one, several, or all, of the slices in a pie chart away from the centre.

If you would like to try this,

- 1 Scroll to the region of cell **B46** in the **Food** worksheet.

Here you will find a simple pie chart.

- 2 Point to any slice and drag it a small distance away from the centre.
- 3 Release the mouse button.

All the slices should have moved.

- 4 Either drag them back or press the **Undo** button.
- 5 Next select *just* the yellow slice (the handles will only be around that slice).
- 6 Drag it away from the centre (only that slice will move).

It is also possible to explode the outermost ring of a doughnut.

4.3 Changing the starting position

You may have noticed that pie and doughnut slices are always drawn in a clockwise order. Excel draws the radius for the beginning of the first slice in a pie (or doughnut) chart at the 12 o'clock position. You may feel that for

some particular chart you would like a different starting point. This can be arranged.

- 1 Make sure that your pie chart is not exploded.
- 2 Select all the slices.
- 3 From the **Format** menu, select **Selected Data Series**.
- 4 Click on the **Options** tab.
- 5 The **Angle of first slice:** box will be set to **0 Degrees**.
- 6 Use the up-arrow to change that to **40 Degrees** and note how the preview changes.
- 7 Click **OK**.
- 8 De-select the chart.

5 Creating a line chart

Pie charts do not have axes so, before dealing with axes, a different type of chart will have to be created.

A line chart shows trends in data *at equal intervals*.

- 1 Click on the **ViewingFigures** worksheet tab.

This is a small worksheet containing viewing figures over a six-week period in the range **B5:G8**. Note that there is no data for the week ending **14/05/00**.

- 2 Click anywhere within the table of data.
- 3 Click on the **Chart Wizard** button.

5.1 Chart type

In the **Chart Wizard – Step 1 of 4 – Chart Type** dialog box:

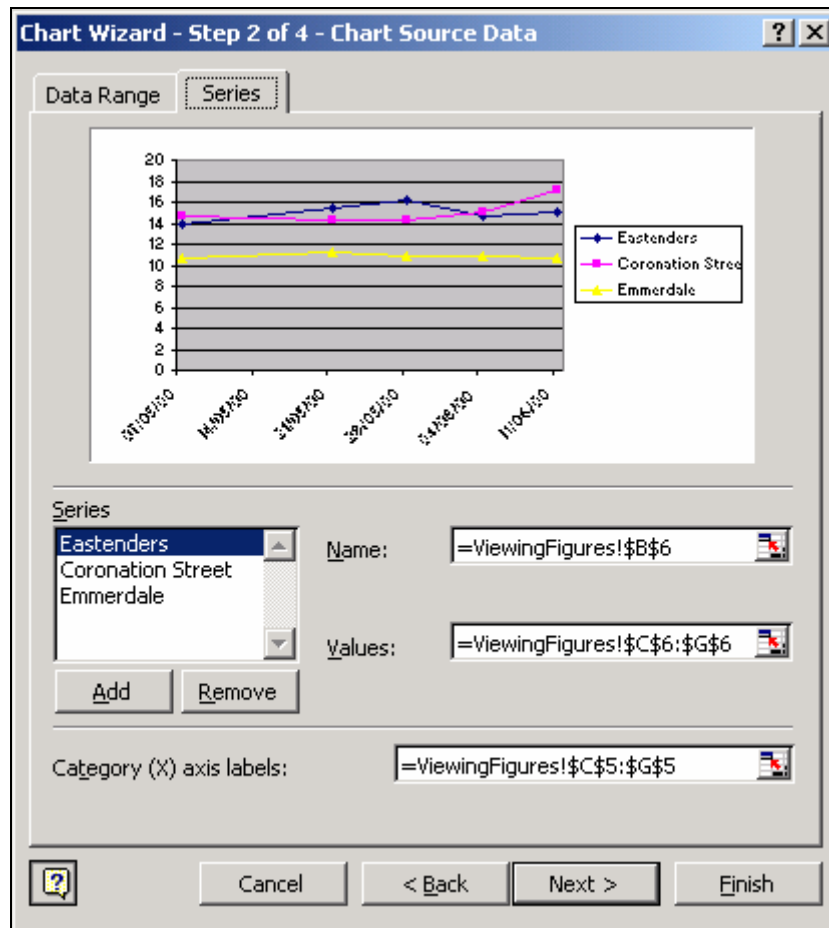
- 1 Make sure that the **Standard Types** tab is selected.
- 2 Select **Line** in the **Chart type:** box.
- 3 Check that the first **Chart sub-type** in the second row (Line with markers displayed at each data value) is selected.
- 4 Briefly hold down the **Press and Hold to View Sample** button to get a preview of your chart.
- 5 Click on **Next>**.

5.2 Source data

In the **Chart Wizard – Step 2 of 4 – Chart Source Data** dialog box:

- 1 Make sure that the **Data Range** tab is selected.

- 2 Check that the **Data range**: will pick up the values in **B5:G8**.
- 3 Check that the **Series in**: setting is **Rows** (all the values for a particular programme are in the same row).
- 4 Click on the **Series** tab.



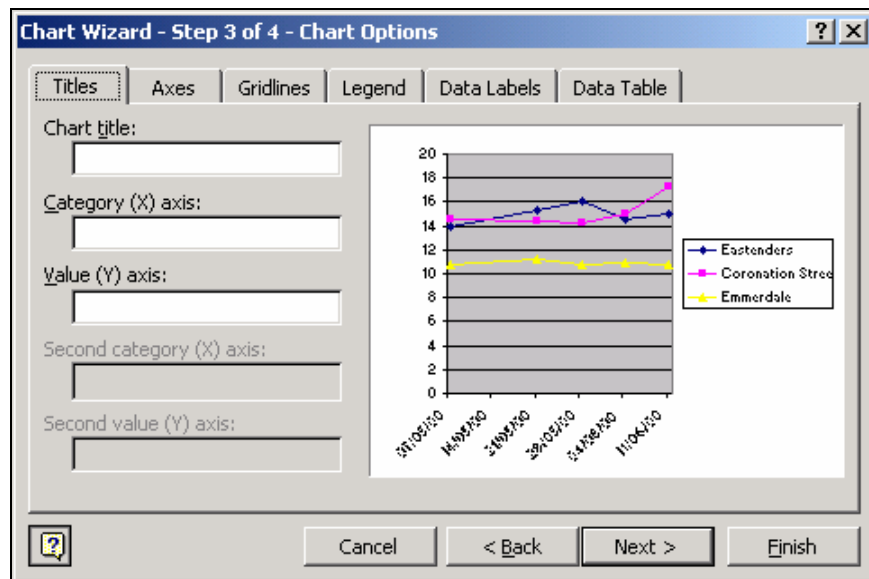
You can now see that Excel believes that you have three series (**Eastenders**, **Coronation Street** and **Emmerdale**).

Eastenders is selected and for that programme, the **Name**: is in **B6** and the associated **Values**: are in **C6:G6**.

The **Category (X) axis labels** to be used are set to **C5:G5** (the dates).

These are all correct assumptions but if something were wrong you could correct it at this stage.

- 5 Click on **Next>**.



5.3 Titles

In the **Chart Wizard – Step 3 of 4 – Chart Options** dialog box:

- 1 Click on the **Titles** tab.
- 2 In the **Chart title**: box, type a suitable heading for your chart, for example,

Viewing figures

- 3 Click in the **Category (X) axis**: box and enter some suitable text for the horizontal axis, for example,

Week ending

- 4 Click in the **Value (Y) axis**: box and enter some text for the vertical axis, for example,

Number of viewers (in millions)

5.4 Axes

- 1 Click on the **Axes** tab.
- 2 In the **Primary axis** box, click in the **Category (X) axis** box to remove the tick.

In the preview, note how the axis has been removed together with its dates. This is not a sensible thing to do for this particular chart since there is now no way of knowing which weeks are involved.

- 3 Click again in the **Category (X) axis** box to restore the tick (and the axis).

It is usually best to leave the **Category (X) axis** setting at **Automatic**. Excel will decide whether it is dealing with categories or dates/times along this axis and act accordingly.

When Excel decides that it is dealing with time scaling rather than ordinary category scaling, it:

- positions the data points in accordance with their chronological location (with categories Jan, Feb, and July, for example, Feb would appear closer to Jan than to July).
- automatically plots the data in ascending chronological order even if the data was not presented in that order
- uses the smallest time difference between data points as the base unit (but you can choose to work with a larger base unit).

Time scaling is available for line, column, bar and area charts.

Note that in your chart the week 14/05/00 is included on the axis even though there is no data for that week.

5.5 Gridlines

Gridlines are horizontal and vertical lines that help you to see where precisely a particular data marker is in relation to the axes. The defaults for most chart types involve some gridlines but you can add/remove them as you wish.

- 1 Click on the **Gridlines** tab.
- 2 Check that the **Value (Y) axis** has **Major gridlines** ticked.
- 3 Click in the **Category (X) axis** **Major gridlines** box and note the appearance of new vertical gridlines in the preview.
- 4 Click in that box again to remove the tick (and the extra gridlines).

5.6 Legend

Excel usually places a legend at the right-hand side of the chart. You can however move it or remove it.

- 1 Click on the **Legend** tab.
- 2 Leave the **Show legend** box ticked because a key is definitely needed for this particular chart.
- 3 Experiment with various settings in the **Placement** box noting the effect they have in the preview box. Make sure that **Right** is the last one chosen.

5.7 Data labels

Various kinds of labels can be attached to data points. In section 3.4 you saw how percentages can be displayed for a pie chart. For each point in a line chart, you can display its **series name** (such as Eastenders), **category name**, or **value**.

- 1 Click on the **Data Labels** tab.
- 2 All the boxes in the **Label Contains** area are currently clear.
- 3 Click in the **Value** box — the data values (**13.92, 15.37, ...**) will be displayed on the preview chart.
- 4 Remove that tick.
- 5 Click in the **Category name** box — the data labels (**07/05/00, 21/05/00, ...**) will be shown on the preview chart.

For this particular chart the display is clearer without data values or data labels so,

- 6 Remove the tick.

5.8 Data Table

For some chart types, Excel will offer to include a data table beside your chart. This contains the values from which the chart has been created.

- 1 Click on the **Data Table** tab.
- 2 Click in the **Show data table** box.
- 3 In the preview, note how the data appears underneath your line chart.
- 4 Clear the **Show data table** box.
- 5 Click **Next>**.

5.9 Location of chart

Having created a chart, it can be placed:

- on a separate chart sheet (supply a new name)
 - in an existing worksheet (choose one from the list offered)
- 1 In the **Chart Wizard – Step 4 of 4 – Chart Location** dialog box, click on the **As object in:** button and select the current worksheet (**ViewingFigures**).
 - 2 Click on **Finish**.

The chart is now complete but you will probably want to make some final adjustments.

The eight small black squares (known as handles) on the frame around the chart indicate that the chart is currently selected.

- 3 Click on the worksheet somewhere outside the chart area. This will de-select your chart and the squares will disappear.

5.10 Moving and resizing a chart

- 1 Single-click on a blank region of the chart (note the re-appearance of the handles and the Chart toolbar).
- 2 If the Chart toolbar is in the way, just drag it to a different position.
- 3 Position the mouse pointer in the chart area (avoiding the plot area, title and legend). Hold down the mouse and drag the chart to a new position on the worksheet — place the top left-hand corner of the chart in the region of cell **B14**.
- 4 Scroll down until you can point to the bottom right-hand corner of the chart (the cursor will change to a double-headed arrow).
- 5 Drag that corner down and to the right until it is in the region of cell **H33**.

Dragging a handle in the middle of one of the right or left-hand sides of a chart changes the chart's width. Similarly, dragging a handle in the middle of the top or bottom of the chart changes the chart's height. By dragging a corner, you can change both height and width at the same time.

If you want to keep the centre of a chart fixed where it is and resize around that point, hold down **Ctrl** while dragging any handle.

If you want to keep the ratio of width to height fixed (thereby maintaining the proportions of the chart), hold down the **Shift** key while dragging a corner handle.

You may find that, although you have made your chart quite large, some details are still missing or the text is too large. Try reducing the font size as follows:

- 1 Click on the ▼ in the Font Size box on the formatting toolbar and select **8** pt (for example).

5.11 Changing the size of the plot area

The size of the line graph part of the chart can be changed without changing the overall size of the chart.

- 1 Point to the line graph area (pointer message is **Plot Area**).
- 2 Click the mouse button to select that area.
- 3 Drag one of the corner handles until the area is the size you want.
- 4 Click on the **Chart Area** outside the **Plot Area**.

5.12 Changing the scale

If the purpose of this chart is to compare the three programmes, rather than concentrate on the actual numbers of viewers, it would be appropriate to start the numbering of the **Y** axis at **8** rather than **0**.

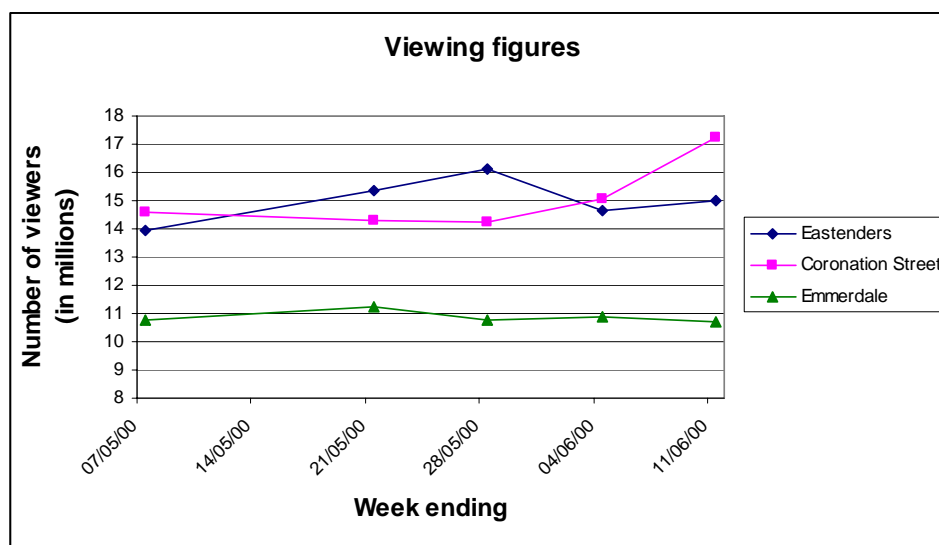
- 1 Make sure the chart is selected.

- 2 Click on the **Value axis** (numbered from 0 to 20) — be sure to check that the correct pointer message is displayed before clicking.
- 3 From the **Format** menu choose **Selected Axis**.
- 4 Click on the **Scale** tab.

This dialog box gives you control over the minimum and maximum values displayed on the axis.

- 5 For the **Value (Y)** axis scale, set the **Minimum** to **8**.
- 6 Click **OK**.

5.13 Final chart



6 Chart types

There are many other chart types, including some with a 3D effect. Not all can be considered in this document but some should get special mention. If you are creating 3-D effect column or bar charts, consider using the cone, cylinder and pyramid data markers.

If at any stage you would like to see examples of the various types of chart, proceed as follows:

- 1 From the **Help** menu, select **Microsoft Excel Help**.
- 2 Click on the **Index** tab.
- 3 In box **1**, type **gallery** and click the **Search** button.
- 4 In box **3** select **WEB: Gallery of chart examples**.
- 5 If you are offered a map, click on **United Kingdom**.

6.1 Standard chart types

The main chart types are as follows (arranged in alphabetical order):

6.1.1 Area chart

An area chart shows the relative importance of values over a period of time. It is similar to a line chart but emphasises the amount of change (magnitude of values) rather than time and the rate of change.

6.1.2 Bar chart

Bar charts illustrate comparisons between items. Although they are similar to column charts, the categories on a bar chart are displayed vertically and the values are organised horizontally. This concentrates on comparing values and places less emphasis on time. A stacked bar chart shows the relationship of individual items to the whole.

6.1.3 Bubble chart

A bubble chart is a variation on an xy scatter plot. The size of the bubble (data marker) indicates the value of a third variable. Arrange the data with x values in one column (or row) and the corresponding y values and bubble size in the adjacent columns (rows).

6.1.4 Column chart

Column charts can be used to illustrate how data changes over a period of time, and to compare various items. Categories are displayed horizontally, values vertically.

6.1.5 Doughnut chart

Doughnut charts are similar to pie charts but, unlike pie charts, can show more than one data series. Each ring represents one data series. These charts are widely used in the Far East.

6.1.6 Line chart

This shows trends or changes in data over a period of time, at even intervals. A line chart emphasises time flow and rate of change rather than the amount of change.

If you need to show trends or changes in data at uneven or clustered intervals, an xy (scatter) chart is more appropriate (see section 6.1.11).

6.1.7 Pie chart

A pie chart can only show one data series. It compares the size of individual items with the sum of them all.

6.1.8 Radar chart

This is another one widely used in the Far East. It looks like a badly-made spider's web. It shows changes or frequencies of data series relative to a centre point and to one another. Each category has its own value axis radiating from the centre point. Lines connect all the values in the same series.

6.1.9 Stock

High-low-close and **open-high-low-close** charts are often used for stock prices. The open-high-low-close is sometimes called a **candlestick** chart. The high-low-close can also be used for scientific data, for example, to record temperature changes. It is essential to organise your data in the correct order before creating one of these charts, namely, high value followed by low and then close (or open value followed by high, low and then close).

6.1.10 Surface

A surface chart can be useful if you want to find optimum combinations between two sets of data. Colours and patterns are used to indicate areas that are in the same range of values.

6.1.11 XY (Scatter) chart

This is a widely used chart type. It shows the relationship (or degree of relationship) between numeric values in several data series, or, plots two groups of numbers as one series of xy coordinates.

An xy scatter chart can deal with uneven intervals, or clusters, of data. It is frequently used for scientific data. When creating such a chart, the data is usually arranged with x values in one column (or row) and the corresponding y values in adjacent columns (or rows).

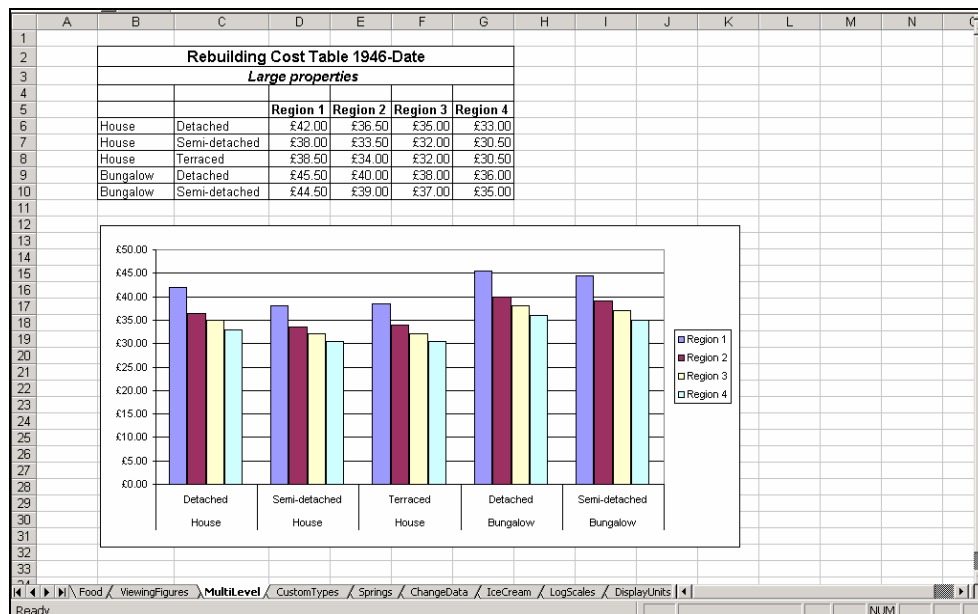
6.2 Multi-level categories

Excel allows you to categorise your categories. Look at the data and chart displayed below.

The categories are in column **C** but further categories are in column **B**. This chart was created by selecting cells **B5:G10** before creating a simple column chart.

This type of display could be useful on some occasions. For example, if you had towns as your categories, the counties could be included as well to avoid confusion between town names that occur in more than one county.

If you would like to experiment with this data, click on the **MultiLevel** worksheet tab.



6.3 Custom types

Excel provides some useful and attractive chart types under the heading of custom types. These include black and white charts, combination charts like line with column, a chart with lines on two axes, and smooth lines. Rather than list them all it is much better to look at examples.

- 1 Click on the **CustomTypes** worksheet tab.
- 2 Click in one of the cells in the range **B5:D9**.
- 3 Click on the **Chart Wizard** button.
- 4 In the **Chart Wizard – Step 1 of 4 – Chart Type** dialog box, click on the **Custom Types** tab.
- 5 In the **Chart Type** box, methodically work your way through the options, clicking each in turn and looking at the preview to see what chart is created (but don't click **Finish**). When you have looked at **Floating Bars**, scroll down to try the others.
- 6 Click **Cancel**.

If you have designed a particular kind of chart and often use that design, it would be sensible to add it to the custom types offered (see Section 9.2).

7 Scatter plots

These are very useful charts particularly for scientific data. First, a typical scatter plot will be created. Then it will be used as an example for changing the numbering on axes, adding best-fit straight lines and adding error bars.

You can have up to 32,000 points per series for any 2D charts. The maximum number of data points allowed for all the data series in one chart

is 256,000. This enables large sets of scientific or financial data to be analysed.

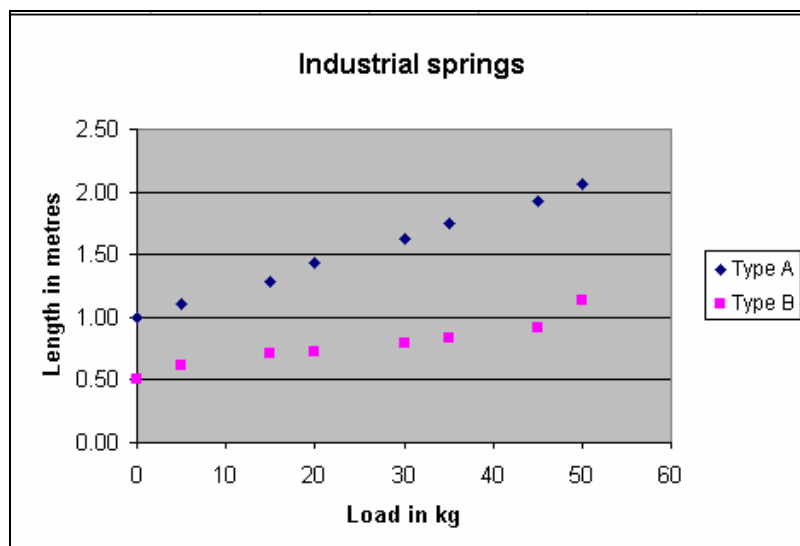
7.1 Creating a scatter plot

- 1 Click on the **Springs** worksheet tab.

Here you can see some suitable data that has already been prepared for you to use. The load values that will be plotted on the X axis are at uneven intervals (the lab only had one 5kg and three 15kg weights!).

- 2 Select cells **B6:D14** (do *not* select the **Length (in metres)** heading).
- 3 Click on the **Chart Wizard** button.
- 4 With the **Standard Types** tab selected, choose **XY (Scatter)** in the **Chart type:** box.
- 5 In the **Chart sub-type:** box, select each option in turn and hold down the **Press and Hold to View Sample** button so that you are aware of the various options (with/without lines and so on).
- 6 Select the first sub-type with description **Scatter. Compares pairs of values.**
- 7 Click **Next>**.
- 8 In the **Chart Wizard - Step 2 of 4 - Chart Source Data** dialog box, check that the **Data range:** setting is **B6:D14** (on the **Springs** worksheet) and that **Columns** is selected.
- 9 Click **Next>**.
- 10 In the **Chart Wizard - Step 3 of 4 – Chart Options** dialog box, with the **Titles** tab selected, fill in the boxes as follows:
Chart title: **Industrial springs**
Value (X) Axis: **Load in kg**
Value (Y) Axis: **Length in metres**
- 11 Click **Next>**.
- 12 In the **Chart Wizard - Step 4 of 4 – Chart Location** dialog box, leave the **Place chart: As object in:** setting at **Springs**.
- 13 Click on **Finish**.

After a few adjustments, you should have something like the following chart.



At this stage, **always** quickly check that your data has been plotted correctly.

7.2 Changing the colour of the plot area

If your chart will be seen in colour, perhaps for a presentation, you may like to change the background colour of the plot area.

- 1 Click in the plot area (make sure that the pointer shows the message **Plot Area** before you click).
- 2 From the **Format** menu, choose **Selected Plot Area...**
- 3 In the **Format Plot Area** dialog box, in the **Area** region, click on a pale colour such as turquoise blue. (If you would also like shading applied, click on the **Fill Effects** button.)
- 4 Click **OK**.

Having chosen a pale colour for the plot area, a good effect can be created by colouring the chart area in a slightly deeper shade (this leaves the plot area unchanged but gives a darker colour in the rest of the chart).

7.3 Adding grid lines

When you are in Excel and your chart is active, you can point precisely to a data point and a little message will appear telling you what values that point has. However, when you are interpreting a printed version it can sometimes be helpful if more gridlines are displayed.

- 1 Make sure your chart is selected.
- 2 From the **Chart** menu, select **Chart Options**.
- 3 Click on the **Gridlines** tab.
- 4 Change the settings of the **Value (X) axis** so that the **Major gridlines** box and the **Minor gridlines** box are ticked.

- 5 If necessary, change the settings of the **Value (Y) axis** so that the **Major gridlines** box is ticked but the **Minor gridlines** box is not ticked.
- 6 Click on **OK**.

Excel will insert minor gridlines for every 2kg. For this particular data every 5kg would be more appropriate so that will have to be changed.

7.4 Formatting an axis

- 1 Make sure the chart is selected.
- 2 Click on the **Value (X) axis** (check that the correct pointer message is displayed before clicking).
- 3 From the **Format** menu choose **Selected Axis**.
- 4 Click on the **Scale** tab.

This dialog box gives you control over the minimum and maximum values displayed on the axis, and the place where the **Y** axis crosses.

- 5 For the **Value (X) axis** scale, set the **Minor unit** to 5.
- 6 Click **OK**.

The chart should now have a vertical line through every multiple of 5kg. If you would like these extra gridlines to be numbered,

- 1 Select the **Value (X) axis**.
- 2 From the **Format** menu, choose **Selected Axis**.
- 3 Click on the **Scale** tab.
- 4 Change the **Major unit** setting to 5.
- 5 Click **OK**.

7.5 Adding a trend line

Trendlines are used for analysing problems of prediction. You can extend a trendline in a chart forwards or backwards beyond the plotted data to show a trend. You can also create a moving average, which smooths out fluctuations in data and can show the pattern or trend more clearly.

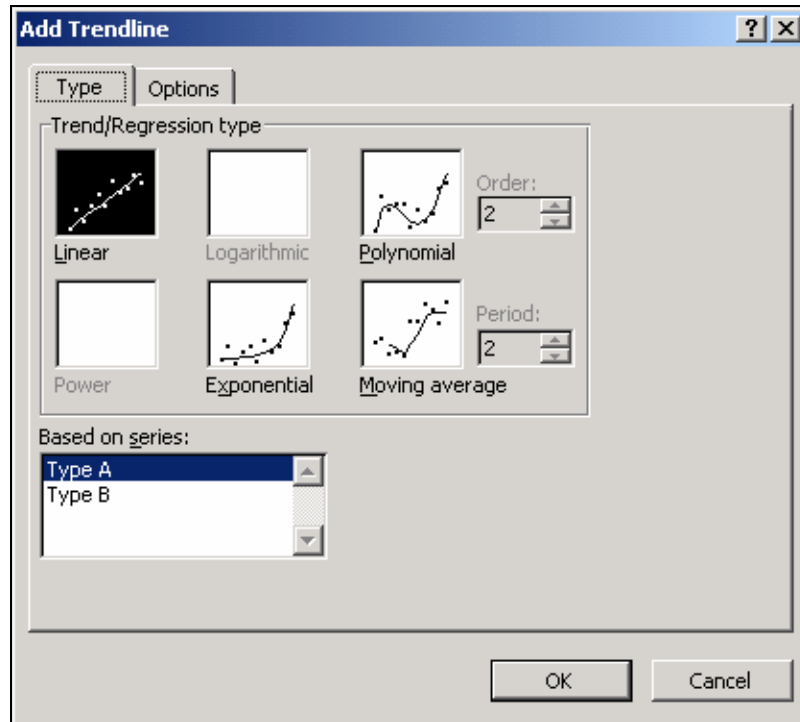
So, a trendline can be

- a regression line that best fits the plotted data (of one series)
- a line that plots a moving average of the values in a series

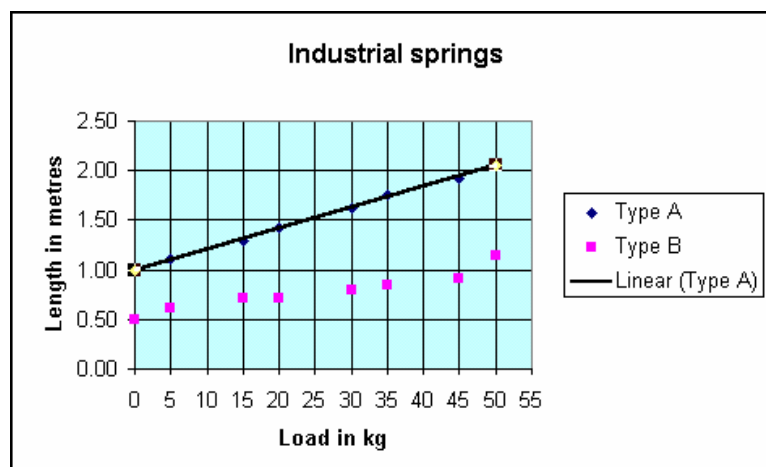
Trendlines can be added to data series in unstacked 2-D area, bar, column, line, stock, xy (scatter), and bubble charts. You cannot add trendlines to data series in 3-D, stacked, radar, pie, or doughnut charts. If you change a chart that has trendlines to a type that does not support them, the trendlines will simply disappear.

For this particular data, a regression line is appropriate and will be added to the **Type A** spring data.

- 1 Make sure the chart is selected.
- 2 Click on one of the **Type A** data points (all of them will be selected).
- 3 From the **Chart** menu, select **Add Trendline**.



- 4 Note that several types of **Trend/Regression** are offered. (Excel's built-in help has information about the equations used for the different types.) For this data the **Linear** one **Based on series Type A** is required.
- 5 Click **OK**.



- 6 Note how the regression line is now mentioned in the legend.

7.6 Displaying the equation

Having added a regression line you may decide that you would like to have its equation appear with it (this could have been arranged when the line was created).

- 1 Make sure that your chart is active.
- 2 Click on the trendline (with pointer message “**Type A**” Trendline1).
- 3 From the **F**ormat menu, select **S**elected Trendline.
- 4 Click on the **O**ptions tab.

Note that in this dialog box, you could

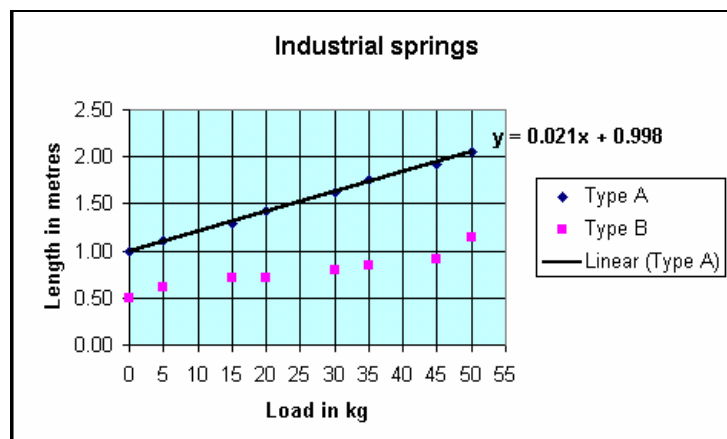
- arrange to extrapolate forwards and/or backwards
 - force a particular intercept on the y axis
- 5 Click in the **D**isplay equation on chart box.
 - 6 Click **OK**.

The equation $y = 0.021x + 0.998$ will be displayed beside the line.

Always look critically at the equation — of the form $y=mx+c$ — and ask yourself whether you were expecting that intercept (c) and slope (m).

The equation may be rather illegible when superimposed on the gridlines. You could move the equation:

- 1 Click on the equation.
- 2 Drag its text box to a clearer region in the chart area (just to the right of the end of the line).
- 3 If you want to draw attention to the equation, make sure its text box is selected and then click the **B**old button on the formatting toolbar.

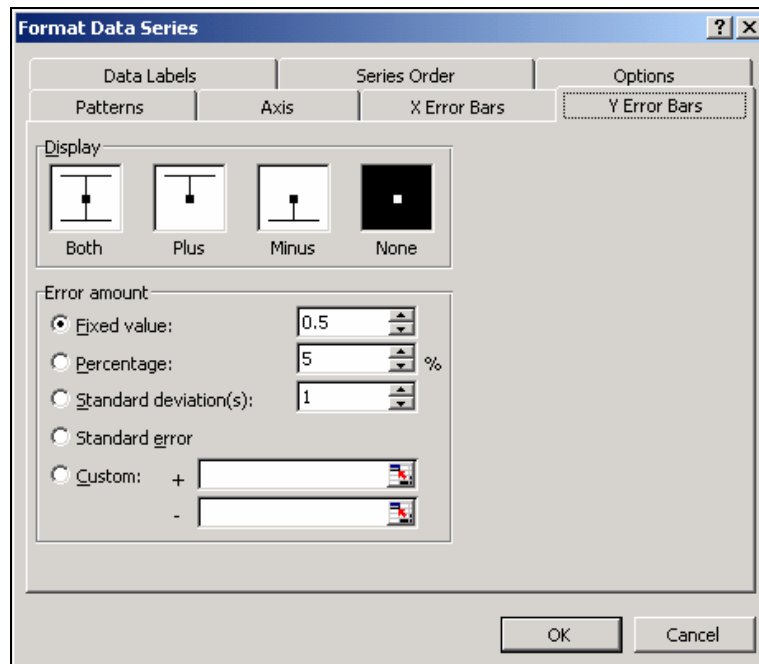


7.7 Adding error bars

Sometimes, when taking measurements, you know that errors have crept in. It can be helpful to show on the chart how confident you are in your

data. Excel can add error bars to charts. As an example, add some error bars to the **Type B** spring data.

- 1 Make sure that your chart is selected.
- 2 Click on any one of the **Type B** data points (all of them will be selected).
- 3 From the **Format** menu, select **Selected Data Series**.
- 4 Click the **Y Error Bars** tab.



In the **Display** group, there are settings to remove existing error bars (**None**) and to display the error bars as the data value

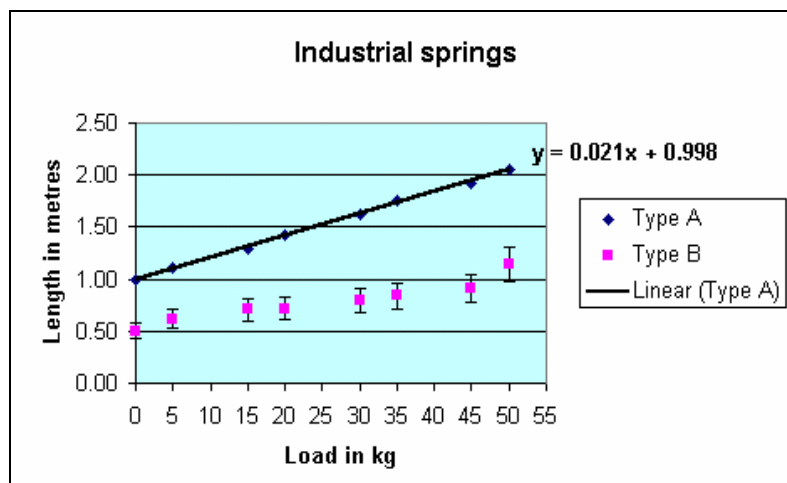
- plus and minus some amount
- plus some amount
- minus some amount
- with no error bar

- 5 Click on **Both**.

In the **Error amount** group you can indicate the size of the error bars you require. This can be a fixed amount for each point, a percentage of each value, the standard deviation, standard error or some custom one devised by you (the amount above the point could be different from the amount below).

- 6 Click in the **Percentage** box; enter the number **15** (or use the up-arrow to increase the current setting) and click on **OK**.
- 7 Click on your worksheet away from the chart to see the final effect.

Now that your chart has error bars, you may feel that it would look better without the X axis gridlines — just remove them to get the following chart.



7.8 Dragging chart markers

So far, you have used data in a worksheet to produce a chart and you know that if you change the data in the worksheet, the chart will change accordingly.

You can also change a chart and thereby change the data in your worksheet. As an example of this, move the last data point of the **Type A** spring as follows:

- 1 Look at the table in your worksheet. When the load is **50kg**, the length of the spring is given as **2.06** metres.
- 2 Move the mouse pointer to the last data point for **Type A**. The pointer message should be

Series "Type A" Point "50" (50,2.06)

Be sure to point to the data point, not the trendline.
- 3 With that message showing, click the mouse (to select all data points in that series).
- 4 Keep pointing at that point and click again (to select just that point).
- 5 Drag the data marker up the chart until the pointer message shows **2.40** as the length of the spring.
- 6 Release the mouse button.
- 7 Confirm that this new value (load **50**, length **2.40**) has replaced the old value in the table on your worksheet.
- 8 Note how the equation of the straight line has changed to deal with the new data.
- 9 Click away from the chart to de-select it.

Now you know how to "adjust" experimental results!

8 Chart data

As time goes by, charts often need to be changed. For example, new data has to be added and old data removed.

In this section, a column chart will be created and then altered in various ways as its data is changed.

8.1 Creating the initial chart

The data for this chart can be found on a separate worksheet.

- 1 Click on the **ChangeData** worksheet tab.

Here you will see the data to be charted.

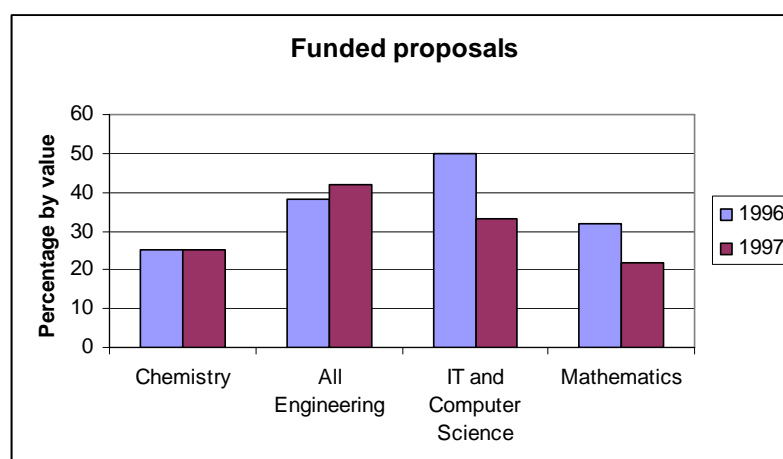
When creating a line chart in section 5, you just clicked in the table of data and the correct values were plotted. If you were to do the same here, the numbers **1996** and **1997** would be included in the chart as data points rather than as headings. So, this time it is better to *select* the data to be used in the chart.

- 2 Select cells **B7:D10** — the data points to be plotted plus the text for the categories on the X axis.
- 3 Click on the **Chart Wizard** button.
- 4 In the **Chart Wizard - Step 1 of 4 - Chart Type** window, select a **Column** chart with the first sub-type offered.
- 5 Click on **Next>**.
- 6 In the **Chart Wizard - Step 2 of 4 - Chart Source Data** window, click on the **Data Range** tab.
- 7 Check that the **Data range:** is set to **=ChangeData!\$B\$7:\$D\$10** and that **Series in:** is set to **Columns**.
- 8 Click on the **Series** tab.
- 9 Check that the **Category (X) axis labels:** are set to **=ChangeData!\$B\$7:\$B\$10**.
- 10 In the **Series** box, **Series1** is highlighted and in the **Values:** box this can be seen to refer to **C7:C10** (values for **1996**). So, the name **Series1** should be changed to a more meaningful text.
- 11 Click in the **Name:** box and then click on cell **C6** (**=ChangeData!\$C\$6** appears).
- 12 Select **Series2** in the **Series** box.
- 13 Click in the **Name:** box and then click in **D6** (for **1997** text).
- 14 Click **Next>**.

Note how the new text has appeared in the legend of the preview.

- 15 In the **Chart Wizard - Step 3 of 4 – Chart Options** window, click on the **Titles** tab.
- 16 In the **Chart title:** box, type
Funded proposals
- 17 Leave the **Category (X) axis:** box empty since the subjects (**Mathematics** and so on) are self-explanatory.
- 18 In the **Value (Y) axis:** box type
Percentage by value
- 19 The preview should now look fine so click on **Next>**.
- 20 In the **Chart Wizard - Step 4 of 4 – Chart Location** window, leave the settings so that you **Place chart: As object in: ChangeData**.
- 21 Click **Finish**.

Now, if you adjust the size of the chart, set the font size to 8pt, and make the title bold 12pt, you should have a chart similar to the following one.



8.2 Adding data

Having seen how that chart was created, it is easy to understand how extra data can be added to it. Different techniques can be used and these are explained in sections 8.2.1 and 8.2.2.

8.2.1 Dragging the fill handle

First move your chart so that its top left-hand corner is in the region of **B15**. This will ensure that you have room for extra data in your table.

- 1 In cell **B11** type
Physics

- 2 In **C11** type

54

- 3 In **D11** type

49

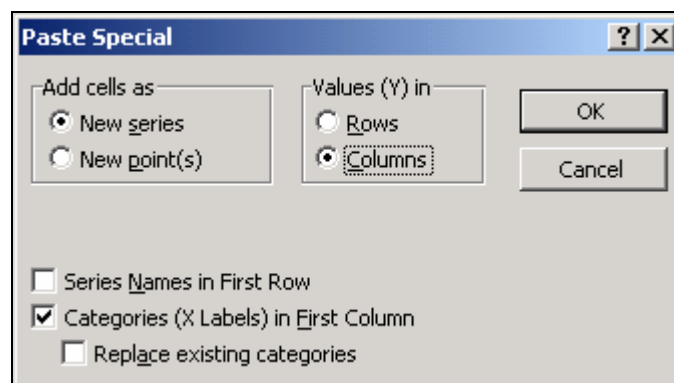
This is the new data that is to be added to your chart.

- 4 Click on your chart so that handles appear round it and note how Excel has drawn three rectangles around the data used in that chart (probably green around **1996** and **1997**; purple around the subjects and blue around the numbers in **C7:D10**).
- 5 Add your new data to the chart by dragging the fill handle in the lower right-hand corner of **D10** down to **D11**.
- 6 The rectangle should now include **Physics** and its associated values.
- 7 Look at the new chart — it should include **Physics**.

8.2.2 Using drag and drop copying

In cells **G5:I5** there is more data that is to be added to the chart.

- 1 Select those three cells.
- 2 Point to the edge of the selection so that the mouse pointer changes to an arrow.
- 3 Drag the selection to the chart and drop it there (let go of the mouse).



At the moment you have two series in your chart (**1996** and **1997**). You do not want to add another series, you want to add new points:

- 4 In the **Paste Special** dialog box, change the **Add cells as** setting to **New point(s)**. The **Values (Y) in Columns** setting is correct.
- 5 Click on **OK**.

- 6 Check that **Materials** and its associated values have been added to the chart.

Note: Another method is to click on the chart and select **Add Data** from the **Chart** menu.

8.3 Removing data

Having created a chart and perhaps added extra data to it, it is quite likely that you may decide that you want to remove some of the data.

You may wish to remove a whole series (like **1996**) or a particular category (like **Mathematics**).

8.3.1 Removing a series

To remove the 1996 data:

- 1 Make sure that the chart is selected (has handles).
- 2 Click in any one of the **1996** regions — all of them will be selected automatically.
- 3 Press the **Delete** key on the keyboard.
- 4 Check that only **1997** data is now displayed and then immediately press the **Undo** button to restore **1996** values — they will be needed later in this tutorial.

When removing a series, **do not**

- clear the data from the worksheet — a blank series will be shown in the chart
- delete the range (remove the cells) containing the **1996** values from the worksheet — you will get an error message.

8.3.2 Removing data points

There are three ways of removing data points.

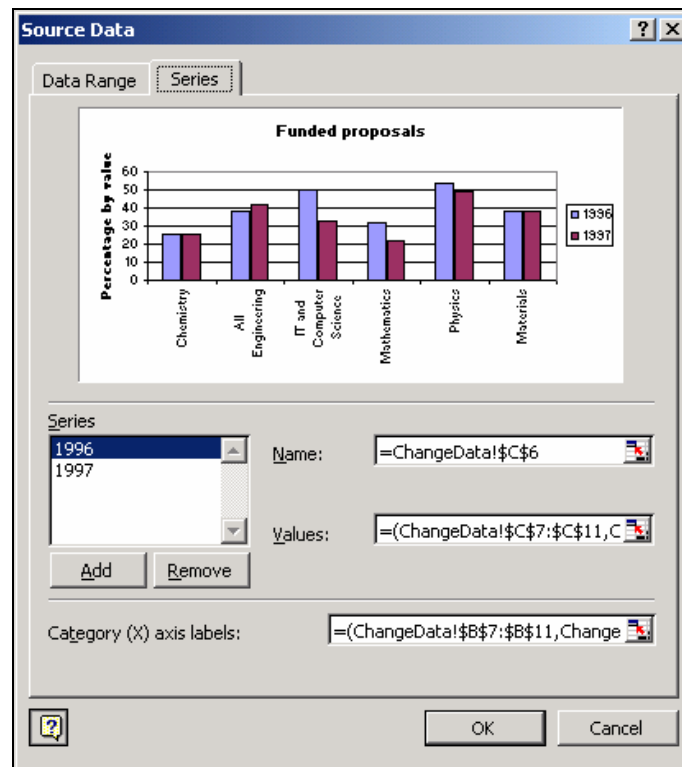
Method 1

As an example, remove **Chemistry** from the chart:

- 1 Make sure your chart is selected.
- 2 From the **Chart** menu, select **Source Data**.
- 3 Click on the **Data Range** tab.

Usually you will be able to change the setting in the **Data range:** box (either by typing or by selecting a range on the worksheet) to achieve the desired effect. However, this particular chart is more complicated than the average one — the quite separate **Materials** data was added at a later stage. So for this chart,

- 4 In this **Source Data** dialog box, click on the **Series** tab.



- 5 In the **Series** box, select **1996**.
- 6 In the **Values:** box, change **\$C\$7** to **\$C\$8** (so that Chemistry is excluded).
- 7 In the **Series** box, select **1997**.
- 8 In the **Values:** box, change **\$D\$7** to **\$D\$8** (to exclude Chemistry for that year also).
- 9 In the **Category (X) axis labels:** box, change **\$B\$7** to **\$B\$8** (to exclude the Chemistry label).
- 10 Click on **OK**.
- 11 Check that Chemistry has gone from the chart but that the other subjects are still there.

That **Series** tab gives you complete control over your chart since you can change not only the data values but also the names of the series (that appear in the legend) and the labels to be used for the Category (X) axis.

Note: You will have seen that in the **Source Data** dialog box with the **Series** tab selected, you are given the opportunity to select a series and click on a **Remove** button. This is another way of removing a *series* from a chart.

Method 2

In some circumstances, you can remove data from a chart simply by hiding, on your worksheet, those values that are to be excluded from the chart.

Try excluding **Mathematics** from the chart as follows:

- 1 Right-click on the row number **10** and select **Hide**.
- 2 Check that **Mathematics** has gone from the chart.

Method 3

You can use this method if Excel draws coloured lines around the chart's data when you select your chart. If the lines are not there (perhaps because, as in this case, the chart was built from disjoint data), you will have to use Method 1 or Method 2.

Make sure your chart is selected, then get hold of the fill handle in the bottom right-hand corner of the rectangle surrounding the data and drag it up one or more rows so that the data you wish to remove from the chart is no longer inside the rectangle. Always check that the excluded data is no longer displayed in the chart.

Clearly this method can only be used to remove data from the end of the list. So, if you want to remove data from the middle using this method, you will have to rearrange your list so that the data to be removed occurs at the end. This is somewhat fiddly so you may in such circumstances prefer to use another method.

8.4 Changing the plot order

Sometimes a chart looks better if the order in which the series are plotted is changed. Although it makes more sense in this chart to have 1996 before 1997, try changing the order as follows:

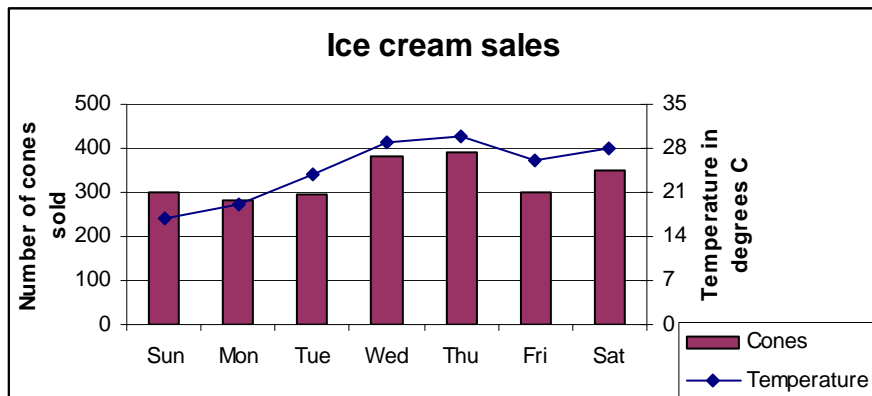
- 1 Make sure that your chart is selected.
- 2 Select the **1996** (or the **1997**) series by clicking on it.
- 3 From the **Format** menu, choose **Selected Data Series**.
- 4 Click on the **Series Order** tab.
- 5 In the **Series order:** box, select **1997** and click on the **Move Up** button.
- 6 Click on **OK**.
- 7 Look at the effect in your chart (**1997** before **1996**).

9 More about charts

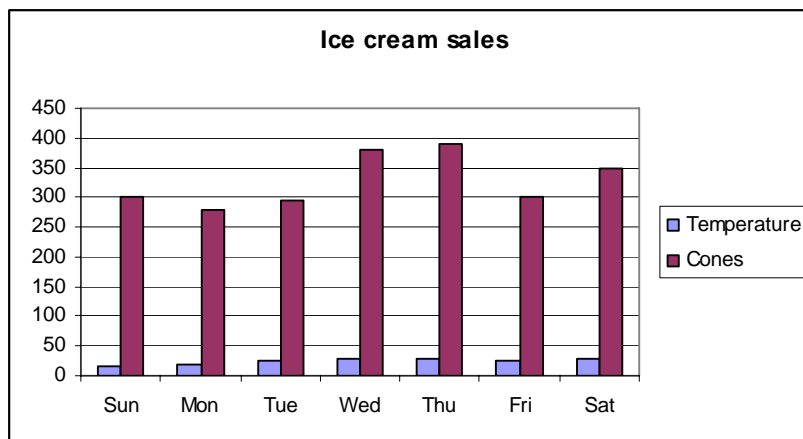
9.1 Combination charts

Two or more chart types can be used in the same chart. Some combinations, such as **line-over-column** charts, are included in the **Custom Types** on offer in the **Chart Wizard – Step 1 of 4 – Chart Types** dialog box. If you cannot find the particular combination you want, design your own.

As an example, the chart shown below can be created from the data on the worksheet **IceCream**.



- 1 Click on the **IceCream** worksheet tab.
- 2 Select the cells **B4:I6** (take care to omit the heading **Sales of ice cream cones**).
- 3 As a first step, create a column chart with chart title **Ice cream sales**.



- 4 Having done that, format the Y axis so that **500** is the maximum number rather than **450**.

The temperatures are to be displayed using markers, so

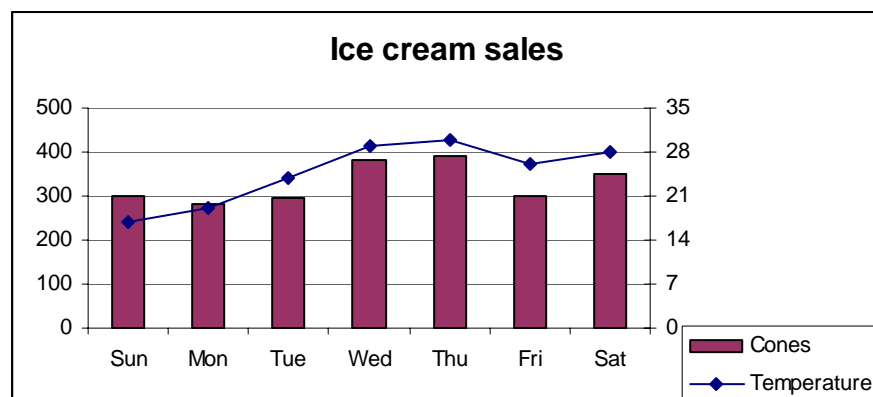
- 1 Click on one of the **Temperature** columns (all will be selected).
- 2 From the **Chart** menu, select **Chart Type**.
- 3 Choose a **Line** plot. For **Sub type** select the first one on the second row (**Line with markers displayed at each data value**).
- 4 Click **OK**.

It does not make sense to measure both the temperature and the cones on the same scale. A second scale can be introduced as follows:

- 1 Click on one of the **Temperature** data points (all will be selected).
- 2 From the **Format** menu, select **Selected Data Series**.
- 3 Click on the **Axis** tab.
- 4 In the **Plot series on** box, select **Secondary axis**.
- 5 Click on **OK**.

A new axis will appear on the right-hand side of the chart. The tick marks on this axis will probably be at every 5 degrees and so will not lie neatly on the horizontal grid lines. It would be better to put the tick marks at every 7 degrees.

- 1 Right-click on the right-hand temperature axis.
- 2 Select **Format Axis**.
- 3 Click on the **Scale** tab.
- 4 Change the **Major unit** setting to **7**.
- 5 Click **OK**.



All that now remains to be done is to add titles to the axes.

- 1 Right-click on the **Chart Area** and select **Chart Options** from the sub menu.
- 2 Click on the **Titles** tab.
- 3 For the **Value (Y) axis**: enter the title
Number of cones sold
- 4 For the **Second value (Y) axis**: enter the title
Temperature in degrees C
- 5 Click **OK**.
- 6 Click away from the chart to de-select it.

9.2 Adding your own design to the custom types

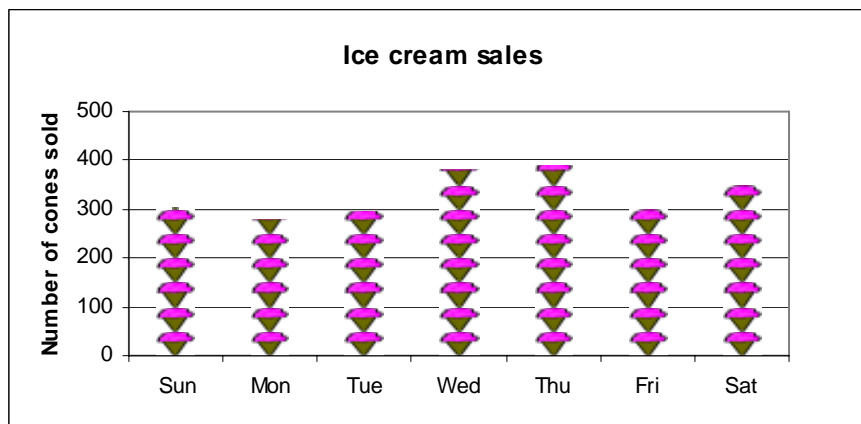
If you design a complicated chart and know that you will need to produce other charts like it in the future, you should consider adding your design to those custom types already offered.

- 1 Prepare your chart (the ice cream one could be used as an example).
- 2 Select the chart.
- 3 From the **Chart** menu, select **Chart Type**.
- 4 Click on the **Custom Types** tab.
- 5 In the **Select from** group, click the **User-defined** button.
- 6 Click on **Add**.
- 7 In the **Add Custom Chart Type** dialog box, enter a suitably descriptive name for your chart (and a few words describing it if you wish).
- 8 Click **OK**.
- 9 In the **Chart Type** dialog box, click **OK**.

Custom chart types are stored in workbooks. The built-in custom chart types are in **XL8galry.xls**; your own custom chart types are in **XLusrgal.xls**.

9.3 Picture charts

Excel can create picture charts where the values are represented by graphic images rather than ordinary columns or lines.



For example, to create the chart shown above, you would have to:

- 1 Create a column chart in the usual way — you could use the chart created in section 9.1 if you wish.
- 2 Right-click on one of the columns (all are selected).
- 3 From the shortcut menu, select **Format Data Series**.

- 4 With the **Patterns** tab selected, click on the **Fill Effects** button.
- 5 In the **Fill Effects** dialog box, click on the **Picture** tab.
- 6 Click the **Select Picture** button.
- 7 Navigate to the picture you want. The picture used for the cones in the chart above is in **T:\its\Excel\cone.bmp**
- 8 Click on **Insert**.
- 9 In the **Fill Effects** dialog box, set the **Stack and scale to:** button in the **Format** box to **50 Units/Picture**.
- 10 Click **OK**.
- 11 In the **Format Data Series** dialog box, click **OK**.

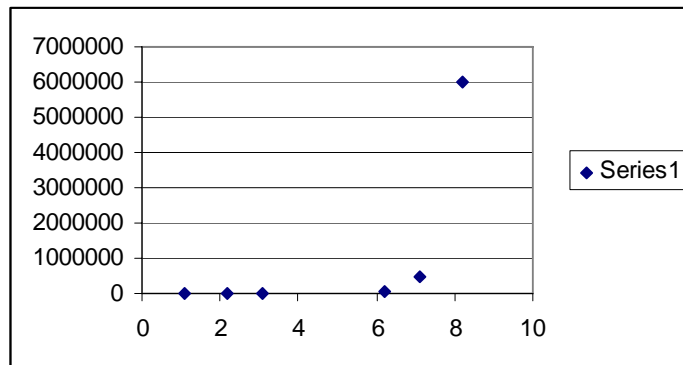
9.4 Logarithmic scales

When plotting some data, you may find that a log scale is more appropriate than a linear one. Experiment on a different worksheet as described below:

- 1 Click on the **LogScales** tab to move to a worksheet containing the following data:

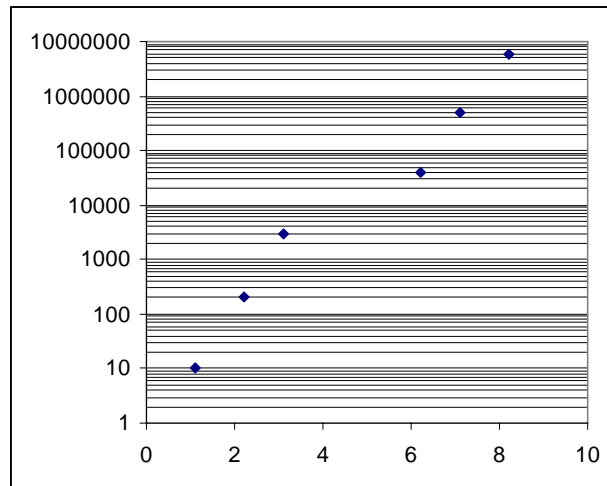
1.1	10
2.2	200
3.1	3000
6.2	40000
7.1	500000
8.2	6000000

- 2 Create a scatter plot in the usual way.



- 3 Point to the **Y** axis (pointer message **Value (Y) axis**) and right-click.
- 4 Select **Format Axis** from the shortcut menu.
- 5 Click on the **Scale** tab.
- 6 Click in the **Logarithmic scale** box.
- 7 Click **OK**.

You may like to display the Y axis minor gridlines as well as the major ones (see section 7.3) and delete the legend.



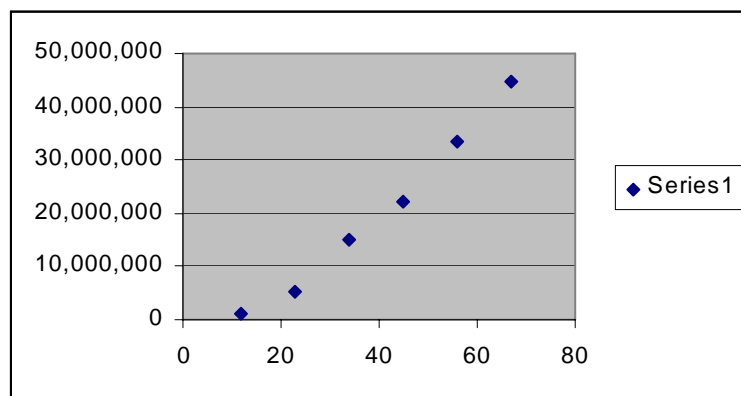
9.5 Display units

When the values on your chart are large numbers, the text on the axis can be made shorter, and more readable, by changing the display unit of the axis. Experiment on a different worksheet as described below:

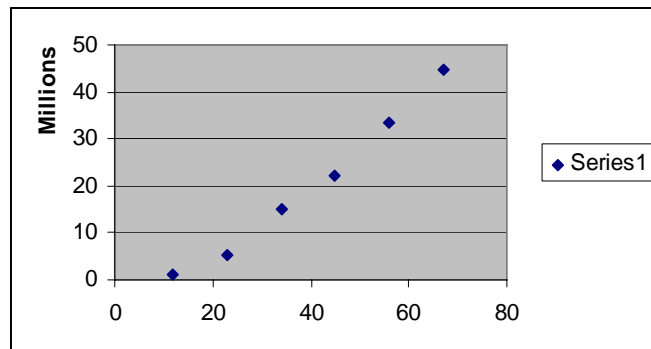
- 1 Click on the **DisplayUnits** tab to move to a worksheet containing the following data

12	1,000,000
23	5,200,000
34	15,000,000
45	22,000,000
56	33,444,000
67	44,555,000

- 2 Create a scatter plot in the usual way.



- 3 Point to the **Y** axis (pointer message **Value (Y) axis**) and right-click.
- 4 Select **Format Axis** from the shortcut menu.
- 5 Click on the **Scale** tab.
- 6 Click on the ▼ in the **Display units**: box and select **Millions**.
- 7 Click **OK**.



Numbers up to 50 are now displayed on the chart with a **Millions** label to indicate that the units express millions.

9.6 Smoothing lines

If, having created a **Line** or **XY (Scatter)** chart, you decide that you would like to smooth one of the lines:

- 1 Select the series to be smoothed.
- 2 Select **Format | Selected Data Series**.
- 3 In the **Format Data Series** dialog box, click on the **Patterns** tab.
- 4 Tick the **Smoothed Line** box.
- 5 Click **OK**.

Note: This is not the same as the exponential smoothing available in the Analysis Toolpak.

9.7 Missing values

Excel usually ignores blank cells. If you want to change the way in which missing data values are being treated:

- 1 Select the chart.
- 2 Select **Options** from the **Tools** menu.
- 3 Click the **Chart** tab.
- 4 Choose one of the settings for **Plot empty cells as**:

Not plotted (leave gaps)
Zero
Interpolated

- 5 Click **OK**.

If you interpolate, Excel will just use a straight line to bridge the missing value gap.

Note that in this dialog box you can also arrange to plot hidden cells (clear the **Plot visible cells only** checkbox).

10 PivotChart reports

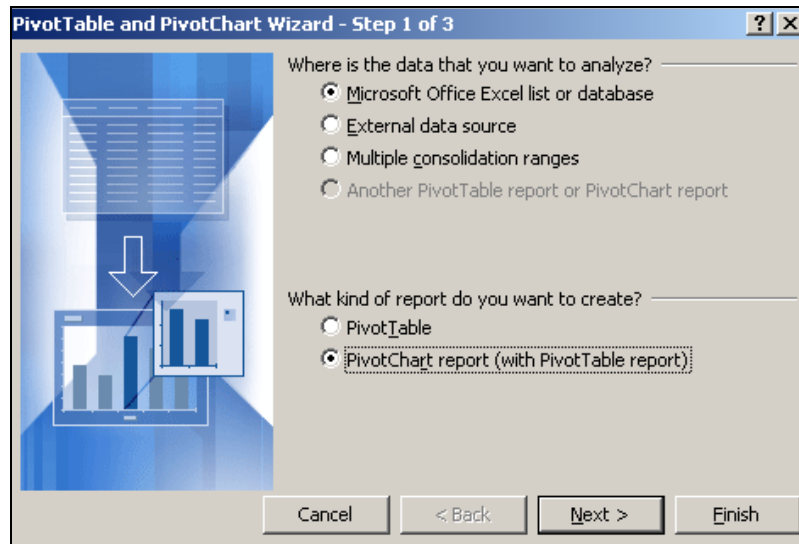
A PivotChart report combines the summary of data in a PivotTable report with the benefits of a chart. You should consider using one when you want to be able to quickly change between different ways of viewing the same data.

When you design a PivotChart report, Excel automatically creates an associated PivotTable report. Indeed, if you already have a PivotTable report, it can be used to create the PivotChart report. There is information about PivotTables in *Guide 36: Lists and data management in Microsoft Excel 2003*.

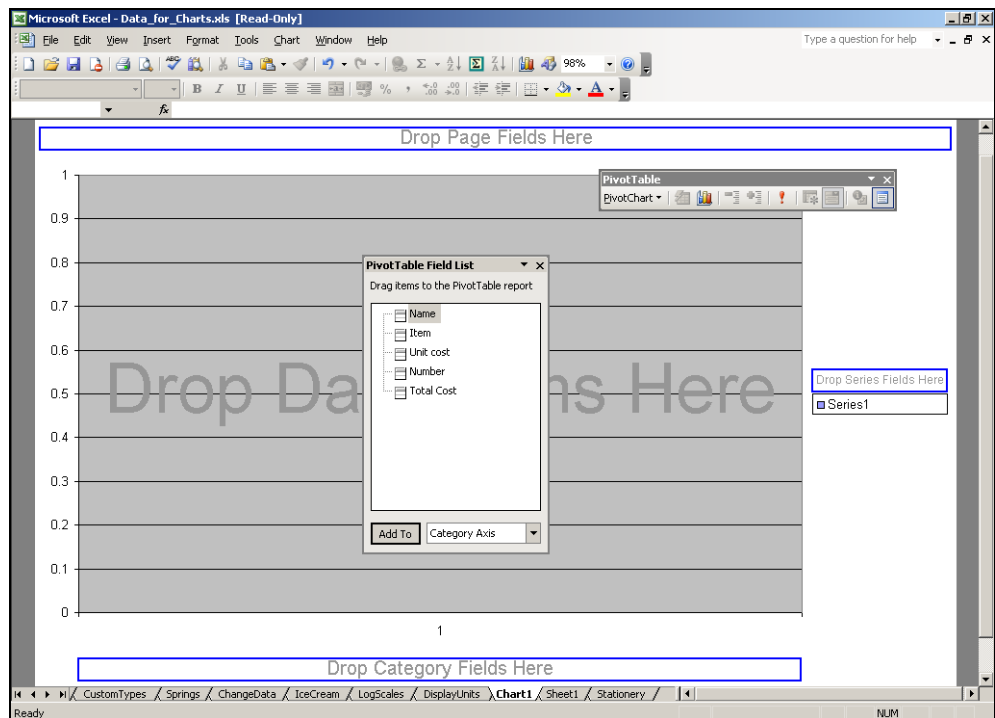
Any chart type *except for xy (scatter)*, bubble or stock, can be used for a PivotChart report.

Some suitable data with which to experiment can be found on the worksheet called Stationery.

- 1 Click on the **Stationery** worksheet tab.
- 2 To base the report on this data, click anywhere within the list.
- 3 From the **Data** menu, select **PivotTable and PivotChart Report**.
- 4 In the **PivotTable and PivotChart Wizard – Step 1 of 3** window, make sure that the **Microsoft Excel list or database** option is selected and under **What kind of report do you want to create?** select **PivotChart report (with PivotTable report)**.

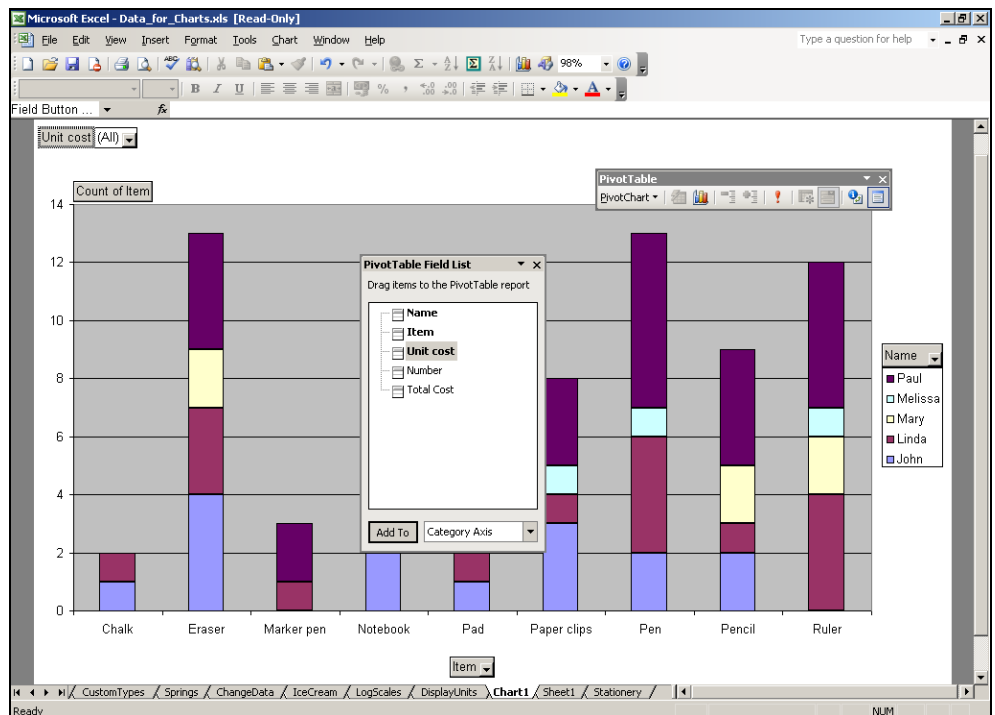


- 5 Click **Next >**.
- 6 At **Step 2**, check that the data range is set to **\$A\$1:\$E\$75** and click **Next >**.
- 7 At **Step 3**, select **New worksheet** as the place to put the **PivotTable report** and click **Finish**.

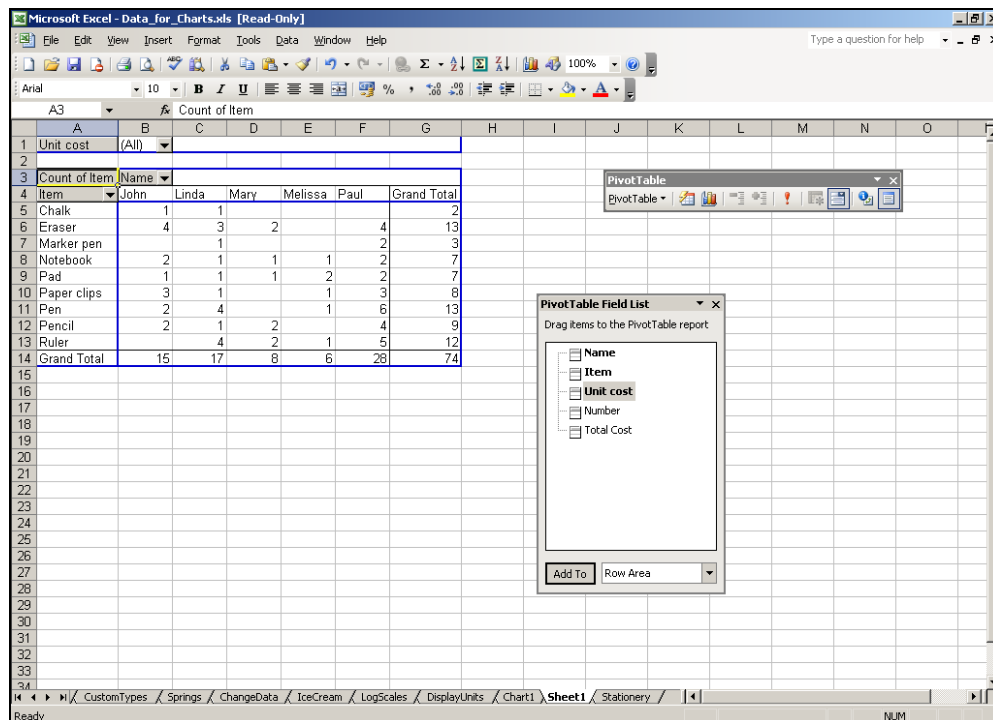


Drag items from the **PivotTable Field List** window to the chart region:

- 1 Drag **Item** to the **Drop Category Fields Here** region.
- 2 Drag **Item** to the **Drop Data Items Here** region.
- 3 Drag **Name** to the **Drop Series Fields Here** region.
- 4 Drag **Unit Cost** to the **Drop Page Fields Here** region.



- Click on the worksheet between this **Chart** sheet and the **Stationery** sheet; that is where the PivotTable report has been placed.



Now experiment with some different settings:

- On that sheet, in cell **B3**, click on the ▼ beside **Name**, remove the ticks from beside **John**, **Linda**, **Mary** and **Melissa** but leave the tick beside **Paul**.
- Click **OK** and note how the display has changed (only Paul's data is visible).
- Move to the chart sheet and see how only Paul's purchases are now displayed.
- On the chart, change the **Name** settings (perhaps to show Paul and Melissa).
- Look at the worksheet PivotTable report and note how that again reflects what is shown on the chart.

The PivotChart report and the PivotTable report stay in step.

Once you are satisfied with a particular layout, formatting can be applied to the chart in the usual way and the chart type can be changed. Formatting is not retained if you later change the layout.

11 Miscellaneous

11.1 Graphics

Graphics can easily be added to charts and are a useful way to draw attention to a particular feature or to provide an explanation. You may decide that you would like to add an arrow and some text to your chart.

Experiment using a chart you created earlier, perhaps one on the **Springs** worksheet.

Whatever you are doing, you should first make sure that the **Drawing** toolbar is visible:

- 1 Select **V**iew | **T**oolbars | **D**rawing.

There are two possible scenarios:

- the graphics are confined to the area of the chart
- the graphics are partly/completely outside the chart area

Add your graphics:

- 2 Click on the chart to select it.
- 3 Click on the **A**rrow button on the **D**rawing toolbar.
- 4 Draw an arrow on your chart.
- 5 Click on the **T**ext **B**ox button on the **D**rawing toolbar.
- 6 Draw a box and type a message in it.
- 7 Click away from the text box.

If your graphics are confined to the area of the chart, you can move the chart and the arrow and text will move with it.

If your graphics are partly outside the chart area, the arrow and text will not move with the chart unless you also:

- 1 Select the chart, arrow and text box (using **S**hift+click).
- 2 Right-click on this selection.
- 3 Select **G**rouping | **G**roup.
- 4 Click away from the selection.

Note: A quick way of adding text to a chart is to select the chart, type your text (it appears on the formula bar), press **E**nter, and drag your text (which will be in a text box somewhere on the chart) to the right place.

11.2 Printing a chart

To print a chart that is on a separate chart sheet:

- 1 Activate the chart sheet and print as usual.

To print a chart that is an object on a worksheet:

- 1 Select the chart and choose **File | Print** — the chart will be printed on its own.

or

Select an area of the worksheet containing the chart; choose **File | Print** and change the **Print what** setting to **Selection** — the chart will be printed together with the worksheet cells that were selected.

11.3 Taking a picture of part of your worksheet

Excel offers two quite different ways of taking a picture of part of your worksheet:

- using the **Camera** button
- using the **Copy Picture** command

11.3.1 Camera button

Using this technique, a picture of a range of cells can be taken and then pasted in any worksheet. Since the copy is a linked image, when the values in the original cells change, so do the values in the image cells.

To display the Camera button,

- 1 From the **View** menu, select **Toolbars**.
- 2 Select **Customize**.
- 3 In the **Customize** dialog box, click on the **Commands** tab.
- 4 Select the **Tools** category and scroll until you can drag the **Camera** button on to any existing toolbar.
- 5 Click on the **Close** button in the **Customize** dialog box.

To take the picture:

- 1 Select the range of cells.
- 2 Click the **Camera** button (the pointer changes to a cross hair).
- 3 Move to the destination worksheet.
- 4 Click the cross-hair pointer where the top left-hand corner of the picture is to be.

11.3.2 Copy Picture command

The Copy Picture command creates an image that will not change; this image is *not linked*. Pictures created in this way can be added to Excel worksheets or to documents created in any application that supports the use of the Clipboard.

- 1 Select the range of cells, object or chart that is to be copied.
- 2 Hold down the **Shift** key and from the **Edit** menu select **Copy Picture**.

- 3 In the **Copy Picture** dialog box, make sure that **As shown on screen** is selected in the **Appearance** box.
- 4 In the **Format** box, click on **Picture**.
- 5 Click **OK**.
- 6 Activate your Word document (or wherever the picture is to go).
- 7 Select either **Edit | Paste** or **Edit | Paste Special** (depending on the control you want).

12 Finally

If you wish to keep the changes you have made to the workbook, save it now.

- 1 From the **File** menu, select **Save As**.
- 2 Make sure the choices of drive and folder are suitable.
- 3 Click on **Save**.

Then close any open workbooks and quit **Excel**.

If you are using the Networked PC service, don't forget to logout.

13 Other Excel documentation

Other ITS documentation about Excel includes:

Guide 33: An introduction to Microsoft Excel 2003

Guide 35: Using formulae and functions in Microsoft Excel 2003

Guide 36: Lists and data management in Microsoft Excel 2003

Guide 39: Introduction to using macros in Microsoft Excel 2003