This activity will show you how to use Excel to draw cumulative frequency graphs.

Information sheet

The table gives the results from a survey about hourly earnings in 2010.

Employees earning £30 per hour or more were excluded from the table.

Earnings (£x/hour)	Number of employees	
	Men	Women
$0 < x \leq 4$	46	128
$4 < x \leq 6$	280	382
$6 < x \leq 8$	761	1174
$8 < x \leq 10$	815	867
$10 < x \leq 12$	652	638
$12 < x \leq 14$	544	433
$14 < x \leq 16$	489	307
$16 < x \leq 20$	652	459
$20 < x \leq 25$	435	408
$25 < x \leq 30$	326	204

Think about…

Why do you think employees earning £30 per hour or more were excluded?

If you were going to draw a cumulative frequency graph for the men by hand, what would you do first?

Try these

Try the exercises on the next pages.

A To draw a cumulative frequency graph

Complete this cumulative frequency table for the men:

Earnings (£x /hour)	Cumulative frequency Men
$x \leq 4$	46
$x \leq 6$	326 (from 46 + 280)
$x \leq 8$	1087 (from 326 + 761)
$x \leq 10$	
$x \leq 12$	
$x \leq 14$	
$x \leq 16$	
$x \leq 20$	
$x \leq 25$	
$x \leq 30$	

Open a new **Excel** workbook.

Look for the **Standard Toolbar** with the **Chart Wizard**

and the **Chart Toolbar.**

If these toolbars are not visible, left click on **View** then **Toolbars**, then **Standard** and **Chart** to make them appear.

Now **enter the data** in columns onto an Excel spreadsheet.

Include (0, 0) as well as the values from the cumulative frequency table.

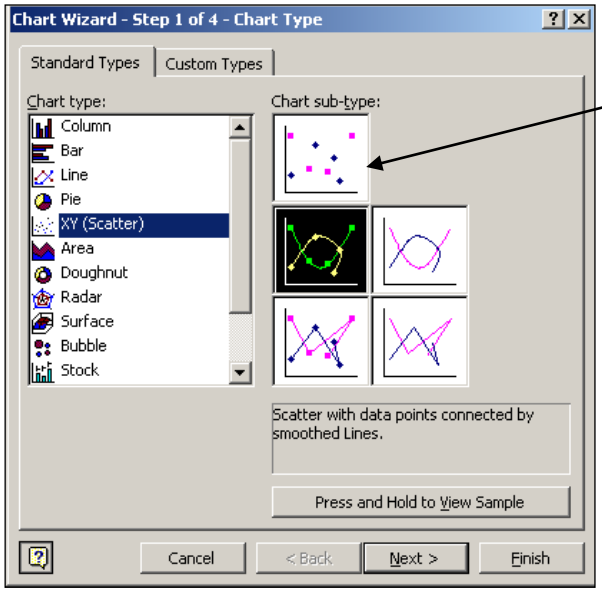
	A	B
1	**Earnings (£/h)**	**Cumulative Frequency**
2	0	0
3	4	46
4	6	326
5	8	1087
6	10	1902
7	12	2554
8	14	3098
9	16	3587
10	20	4239
11	25	4674
12	30	5000

Save your spreadsheet.

Choose a name like 'Hourly Earnings' to help you remember what it is.
Remember to save your spreadsheet regularly so you do not lose any work.

Highlight the data and use the Chart Wizard to draw a scatter graph.

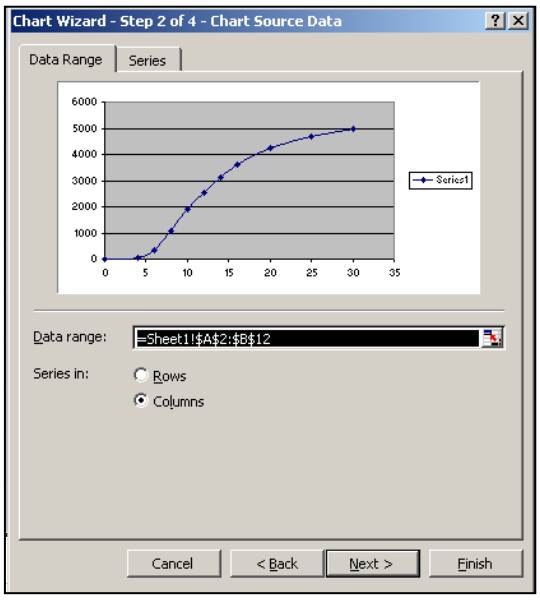
Step 1



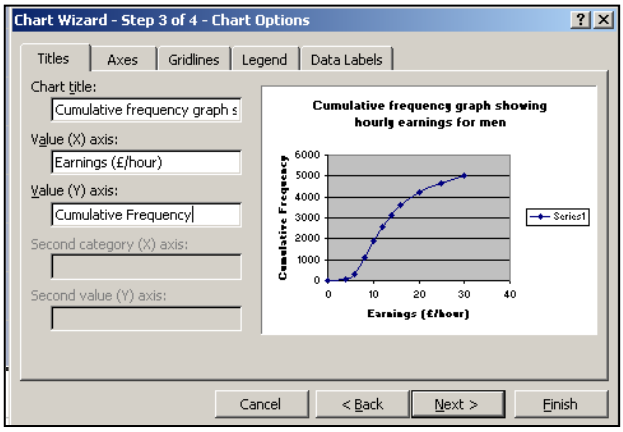
Choose the second option which gives data points joined by a smooth curve.

Step 2. Check that the data used is correct, before clicking Next.

(If the data used is not correct, you can select the correct data before continuing.)

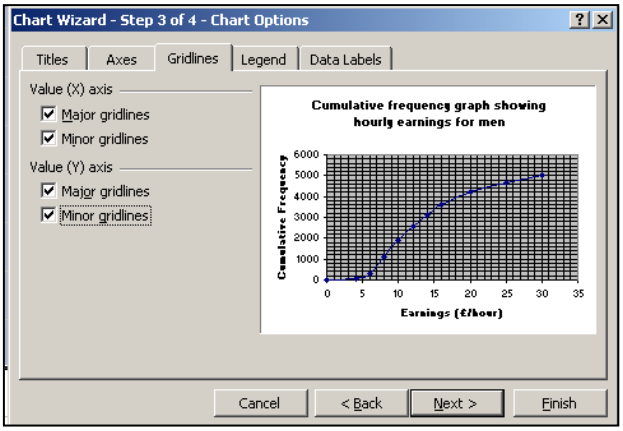


Step 3. Enter the chart's title and labels.

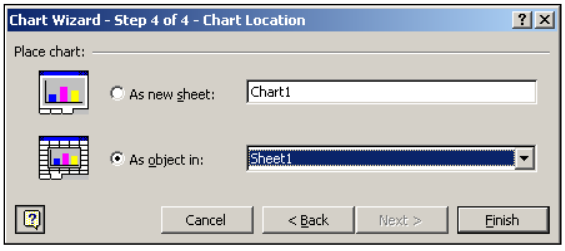


Also **Step 3**, remove the legend and opt to have both major and minor gridlines.

Then click on Next.



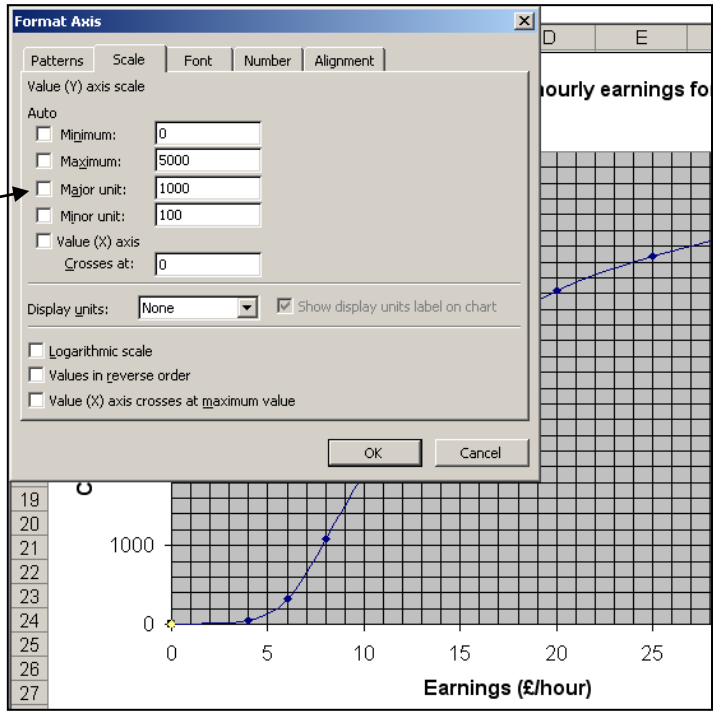
Step 4. Choose to place the chart as an object in Sheet 1, then click Finish.



B To alter gridlines and axes on a cumulative frequency graph

A right click on any part of the graph usually allows you to change it.

For example, a right click on the vertical axis gives this **Format Axis** menu from which you can change the scale and appearance of the axis.



When **Auto** is ticked, Excel chooses the Minimum and Maximum values on the axis and also the scale.

Left click on the Auto boxes to remove the ticks. Then change the values (where necessary) to those given here – this means that the values and scale on the axis will not change later if you change the size of your graph.

Left click **OK** – the vertical axis should now stop at 5000, rather than 6000.

In the same way, change the horizontal axis so that it stops at 30 and has a major unit of 10 and a minor unit of 1.

C To alter the appearance of a cumulative frequency graph

A right click on any part of the graph usually gives a format menu which allows you to change the appearance of that part.

Two examples are given below.

To change the colour of the plot area

Right click on the grey plot area, and use the Format Plot Area menu to change the colour to a lighter colour or white.

To change the colour or thickness of the gridlines

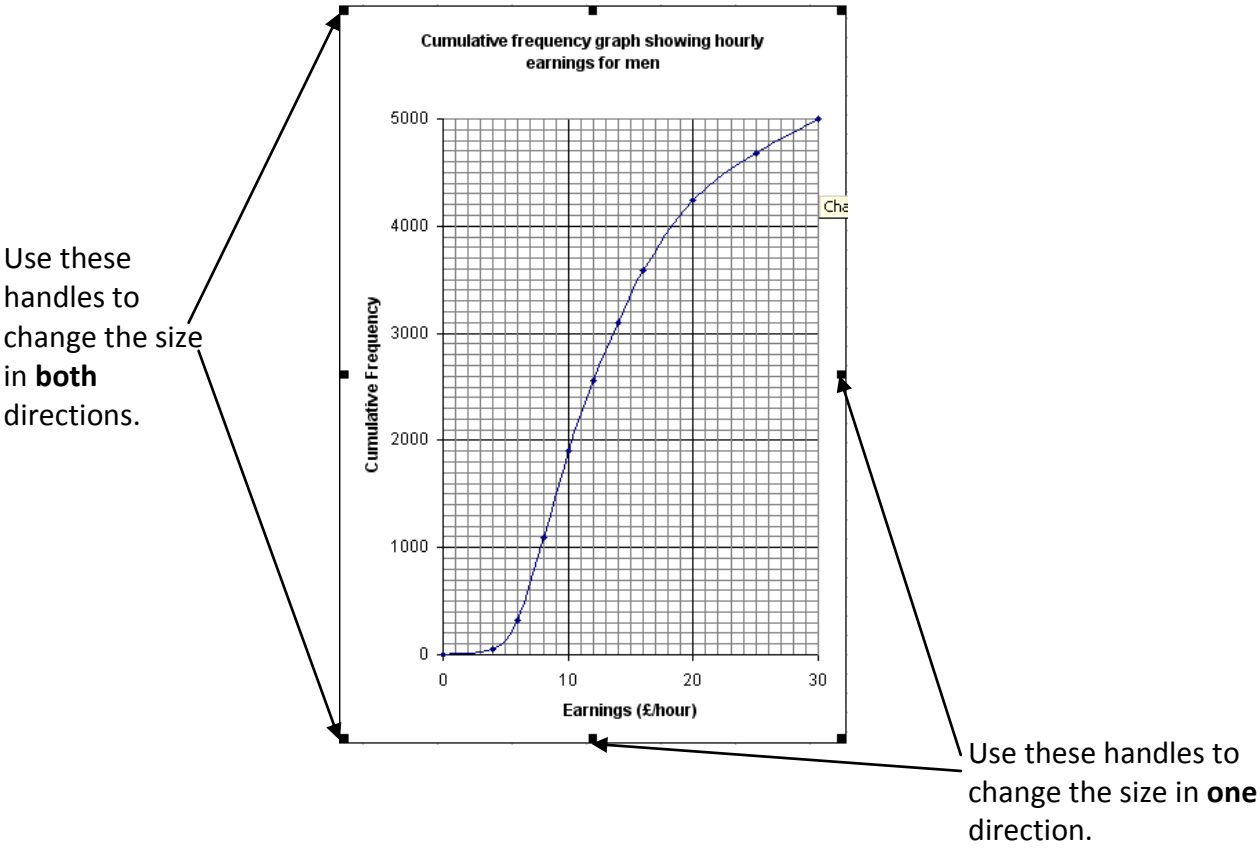
Right click on the gridlines that you want to change.

Then use the Format Gridlines menu to change their colour or thickness. Usually the graph looks better if the minor gridlines are grey, rather than black.

If you have time, **experiment** with these and other ways of changing your graph. (To undo anything you don't like, left click on the **Undo** button.)

To change the size of the graph

Use the handles, **to re-size your graph**.



D To find the median and interquartile range

Think about…

How to do this on a hand-drawn graph.

Print your graph and use it to complete the following for the men:

Median = ……

Lower quartile = ……

Upper quartile = ……

Interquartile range = ……

E To compare cumulative frequency distributions

You can draw them on the same graph, or draw them separately.

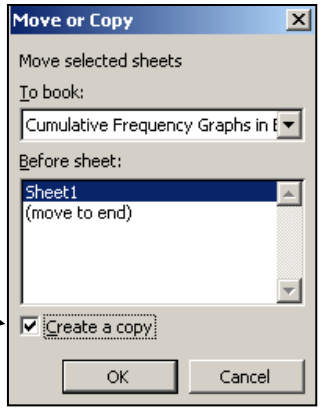
Using separate graphs

If you decide to use separate graphs, it is best to use the same scale – this makes comparing the graphs easier.

The quickest way to draw the cumulative frequency graph for the hourly earnings of the women is to make a copy of the worksheet for men and then change the cumulative frequencies and title.

To do this select **Move or Copy Sheet** from the **Edit** menu

Make sure the **Create a copy box** is ticked.



When you click OK you will have another worksheet identical to the first.

Use the data on page 1 to work out the cumulative frequencies for women. Then replace the cumulative frequencies for men on the copied worksheet with the cumulative frequencies for women. The graph will be updated, but you will need to change 'Men' in the title to 'Women'. Right click the worksheet tab at the bottom of each worksheet and change the worksheet labels to 'Men' and 'Women'.

Using the same graph

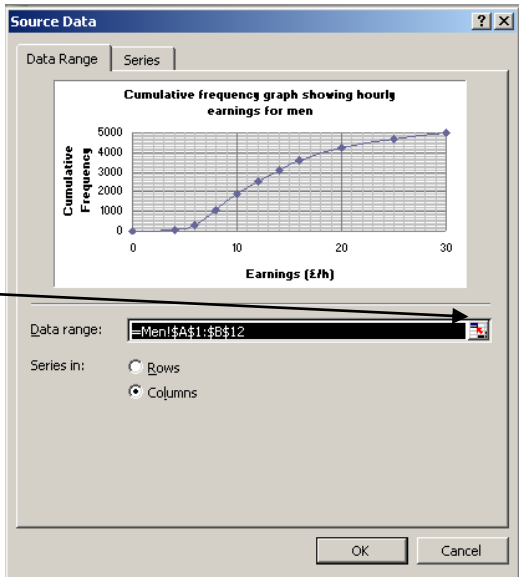
Drawing the two cumulative frequency curves on the same graph makes it easier to compare them.

To add the data for females to the graph you have already drawn for males:

Enter the female data into another column on your worksheet.

Select **Source Data** in the **Chart menu** and use this icon to add the new series to the chart.

Select **Chart Options** in the **Chart menu** and choose to show the **legend** – this will allow you to show which line represents each set of data.



Comparing hourly earnings

Using either a separate graph for women or a combined graph:

Print your graph and use it to complete the following for the women:

Median = ……..

Lower quartile = ……..

Upper quartile = ……..

Interquartile range = ……..

Describe what the results and your graph(s) tell you about the hourly earnings of men and women.

At the end of your work

Do you prefer to draw cumulative frequency graphs by hand or using Excel?

What are the advantages and disadvantages of each?

Is it easier to compare two cumulative frequency distributions when they are on separate graphs, or when they are on the same graph?

What features of the graphs are useful when making comparisons between two cumulative frequency distributions?