Activity description

In this activity, students are shown how to draw and format cumulative frequency graphs in Excel. The student sheets were written for use with Excel 2007. They could also be used with Excel 2010, but note that some of the menus in Excel 2010 are different.

Suitability

Level 2 (Intermediate/Higher)
Level 3 (Advanced)

Time

1–3 hours depending on whether you include the alternative methods, and how much time students are given to experiment and/or draw other graphs.

Resources

Student sheets, spreadsheet (for teacher use)

Equipment

Calculators, Computers with Excel 2007 (or 2010)

Key mathematical language

Cumulative frequency, distribution, median, lower quartile, upper quartile, interquartile range
Also a range of computer terms (see student sheets)

Notes on the activity

The data used in this activity are approximately in line with information given in the Annual Survey of Hours and Earnings (December 2010) available from www.statistics.gov.uk . You could use later ASHE data to update the values used in this activity if you wish.

Students need to know how to draw cumulative frequency graphs by hand before attempting to draw them using a spreadsheet. They also need to have some knowledge of computer terminology and the use of computers (such as how to use the mouse and menus in Excel). It would also be useful if they have drawn other types of graphs or charts before.

The first sheet of the spreadsheet can be used as an introduction. It gives the data, poses some questions and gives the purpose of the activity.

It is important that students use the scatter graph option in Excel rather than the line graph option – it is advisable to emphasise this point before they start work.

During the activity

Students could work individually or in pairs. You could use the spreadsheet to demonstrate some of the methods used if you have an active board or other equipment to show the spreadsheet on a screen.

Points for discussion

Check that students remember what is important about drawing a cumulative frequency graph, including:

- how to calculate the cumulative frequency for each class

- plotting the cumulative frequency at the upper boundary of each class

- joining the points with a smooth curve.

Also check that students know how to find the median and interquartile range.

Discuss the importance of having the same graph scale when two distributions are compared if they are on separate graphs, and the advantages of having distributions drawn on the same graph.

Ensure that students know what features of cumulative frequency graphs to look at when comparing distributions, including start and end values, and steepness of curve. The graphs given in the spreadsheet can be used to aid this discussion.

At the end of the session, discuss students' findings. Also ask them whether they prefer drawing cumulative frequency graphs by hand or using Excel, and discuss advantages and disadvantages.

The reflection questions on the student sheets are also on the final sheet in the spreadsheet.

Extensions

You could ask students to find other information from their graphs. For example, they could estimate how many people earned more or less than a particular value.

Students may like to compare the results with the 2010 National Minimum Wage limits given on the right.

Provide other data that students can use to draw cumulative frequency graphs.

Consider using the median and quartiles to draw boxplots in Excel.

Age (years)	National minimum wage 2010-2011
16 – 17	£3.64 per hour
18 – 20	£4.92 per hour
21 and over	£5.93 per hour
Apprentices (1st year)	£2.50 per hour

Answers

The cumulative frequencies for men and women are given below.

Earnings (£x/hour)	Cumulative frequency Men	Cumulative frequency Women
$x \leq 4$	46	128
$x \leq 6$	326	510
$x \leq 8$	1087	1684
$x \leq 10$	1902	2551
$x \leq 12$	2554	3189
$x \leq 14$	3098	3622
$x \leq 16$	3587	3929
$x \leq 20$	4239	4388
$x \leq 25$	4674	4796
$x \leq 30$	5000	5000

The cumulative frequency graphs are as given on the teacher's spreadsheet.

Approximate values for the median, quartiles and interquartile range of the data for men and women are given in the table below.

	Men	Women
Median	£12.00/h	£10.00/h
LQ	£8.50/h	£7.00/h
UQ	£17.00/h	£14.50/h
IQR	£8.50/h	£7.50/h

These results and the graphs suggest that on average men earned more than women, and their earnings had a greater spread.