ICT & MATHS

Excel 2003
in Mathematics Teaching

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Excel 2003 in Mathematics Teaching

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Please note

- Screenshots used in this manual may appear different from those on computer screens used by participants; variations in versions of the software and differing operating systems may be in use.
- The World Wide Web is constantly evolving and content and URLs (Universal Resource Locators - website addresses) change over time. It is possible that the content located at some of the URLs listed throughout this manual may change over time.
- Screenshots and software titles used throughout the manual are from a PC using Windows Vista©.
- Participants using other operating systems may encounter some differences in screen presentation and layout.

Throughout this module reference may be made to software titles and suppliers of Internet services. These references are made purely to illustrate or expound course content. Any such reference does not imply any endorsement by the NCTE of a product or company. The reader should be aware that typically there are many products and companies providing similar services in areas related to ICT. Participants should be as informed as possible before making decisions on purchases of ICT products or services.

Excel 2003 in Mathematics Teaching

Duration

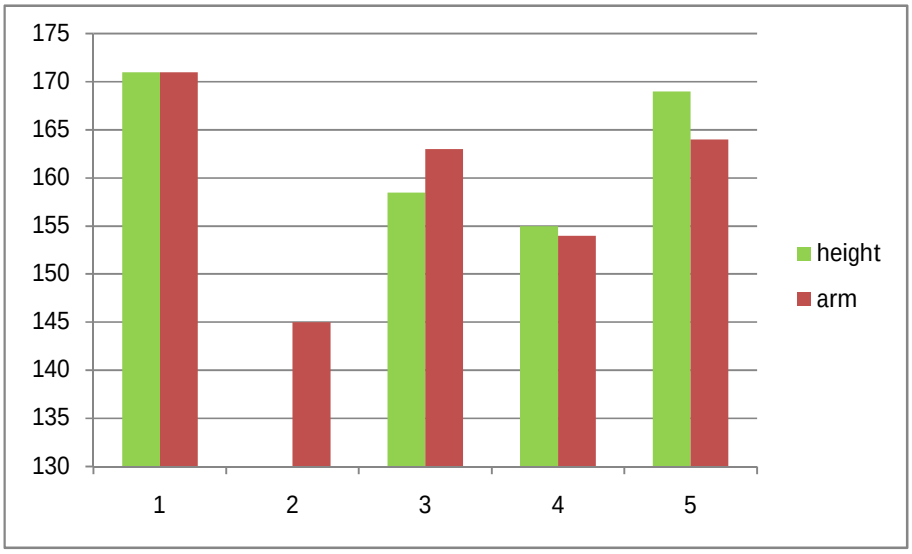
2.5 hours

Objectives

This module aims to enable the participant to:

- be familiar with basic functions of an excel sheet
- incorporate external data
- convert data to Number format
- draw a charts
- copy an Excel chart into Word or PowerPoint
- perform calculations
- draw scatter plots
- draw a line of best fit on a scatter plot
- calculate correlation
- generate a random number in a cell
- set up Pivot tables
- draw a normal curve

Excel 2003 in mathematics teaching



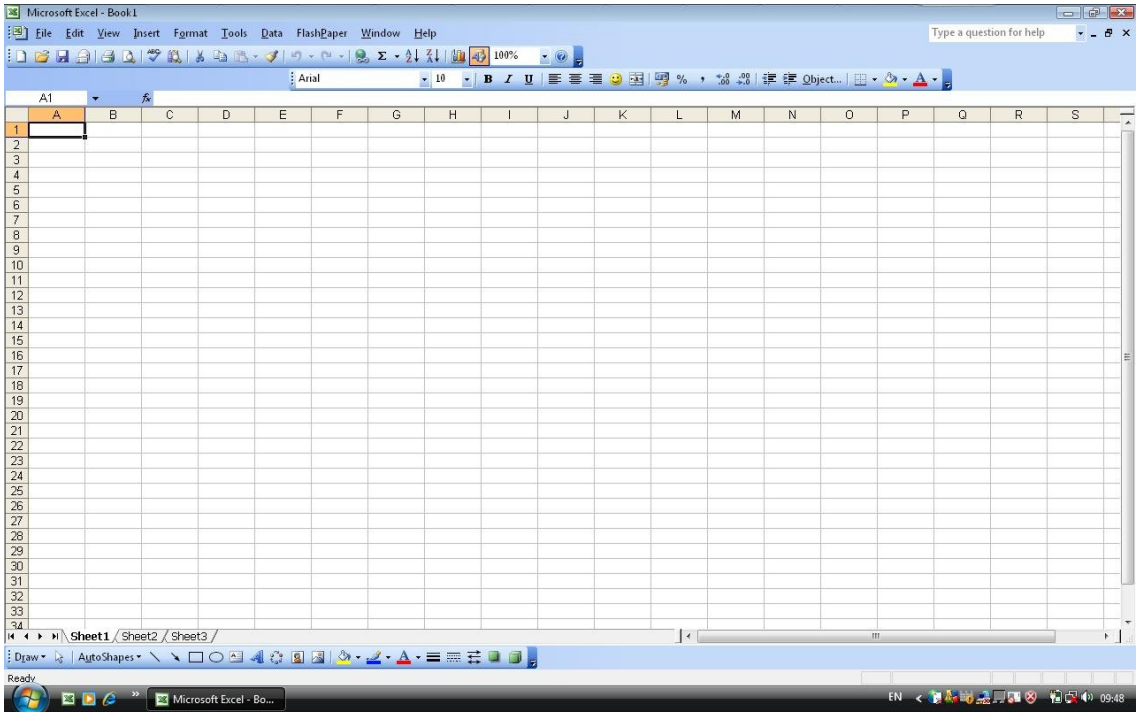
Excel 2003

Why Excel?

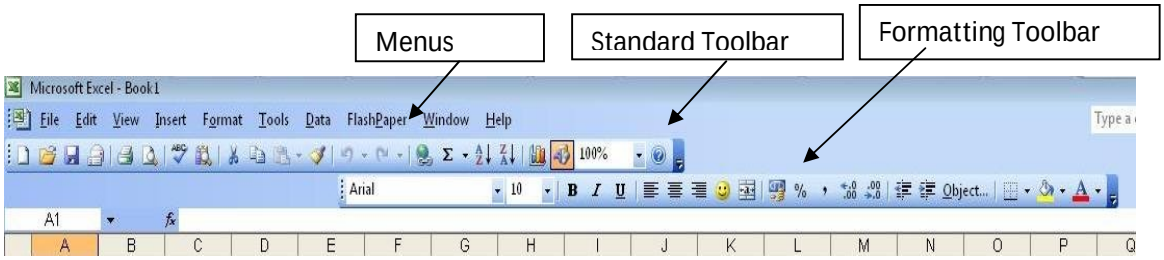
1. A lot of teachers and students are familiar with it.
2. Package is on a lot of school computers.
3. The package enables teachers and students to get instant results.
4. Values can be changed and students see the results of these changes immediately.

Introduction

The following is the Excel 2003 interface

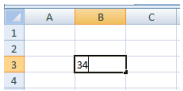


The Toolbars



By clicking on a menu item different options are available.

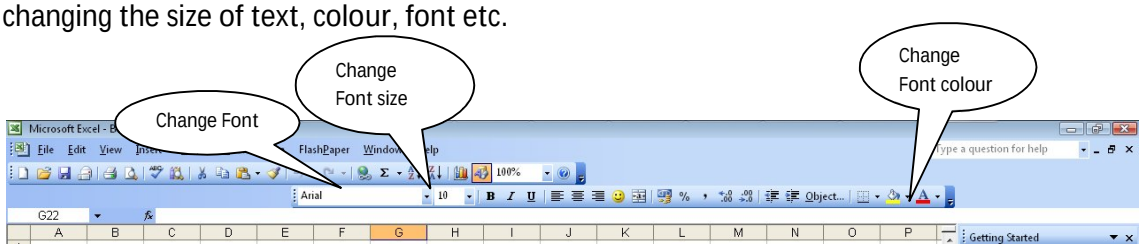
Spreadsheet

The letters going along the top denote columns and the numbers going down the side represent rows. Note cell B3 contains 34. Column first followed by row. 

To insert data

Click on the cell you want to enter the data into and type the data. To move to the next cell press the tab key  on the left of the keyboard or just click on the required cell.

Formatting can be done in usual way as for Microsoft Word or Microsoft PowerPoint, i.e. changing the size of text, colour, font etc.



To wrap text (Place text on more than one line in a cell)

If the text in a cell is too long to fit in the cell you can wrap it as follows, go to Format, Cells and with the Alignment tab open click Wrap text and click Ok.

To insert a new worksheet

Right click on one of the worksheets at the bottom of the page and choose Insert. Choose Worksheet and click OK. Worksheets can then be rearranged by dragging to the left.

To print a worksheet

Go to File and choose Print. Select the pages, number of copies, etc. that you want printed and then click OK.

To save an Excel File

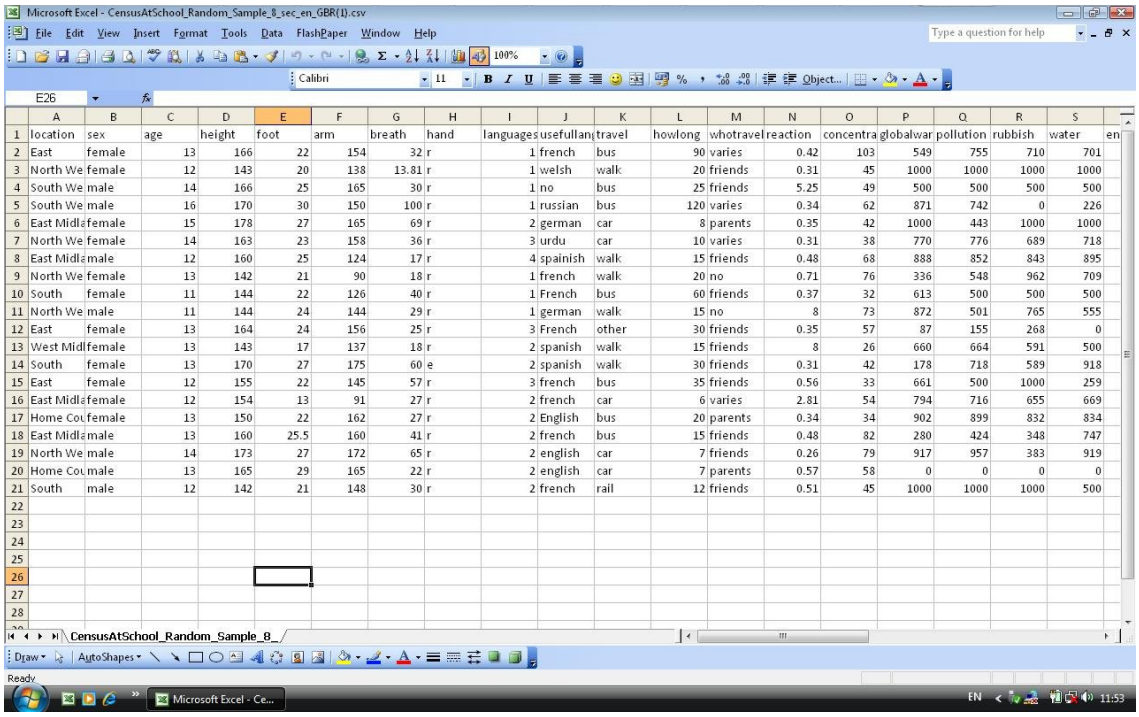
Go to File and select Save. Select the File Name etc. and then click Save.

Equals Formula

For example, if one wants to add or multiply two cells and place the results in another cell. Select the cell you want to place the answer in. Place the = symbol in the formula bar. Click on the first cell you want to add, place the + symbol beside it and click on the second cell you want to add. Press enter on the keyboard. The result will appear in the cell you first selected and if you change the value of any of the cells that were the in the formula, the corresponding answer will change.

Use of a Random Sample from Census at School

For the rest of the lesson it is assumed that teachers are working on a random sample of data from Census at School Phase 8. To access random data from Census at School go to http://www.censusatschool.ie/get-data/57-random-data-selector. For details of how to download data from census at school see Appendix A.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	location	sex	age	height	foot	arm	breath	hand	languages	usefullan	travel	howlong	whotravel	reaction	concentra	globalwar	pollution	rubbish	water
2	East	female	13	166	22	154	32	r	1	french	bus	90	varies	0.42	103	549	755	710	701
3	North We	female	12	143	20	138	13.81	r	1	welsh	walk	20	friends	0.31	45	1000	1000	1000	1000
4	South We	male	14	166	25	165	30	r	1	no	bus	25	friends	5.25	49	500	500	500	500
5	South We	male	16	170	30	150	100	r	1	russian	bus	120	varies	0.34	62	871	742	0	226
6	East Midla	female	15	178	27	165	69	r	2	german	car	8	parents	0.35	42	1000	443	1000	1000
7	North We	female	14	163	23	158	36	r	3	urdu	car	10	varies	0.31	38	770	776	689	718
8	East Midla	male	12	160	25	124	17	r	4	spainish	walk	15	friends	0.48	68	888	852	843	895
9	North We	female	13	142	21	90	18	r	1	french	walk	20	no	0.71	76	336	548	962	709
10	South	female	11	144	22	126	40	r	1	French	bus	60	friends	0.37	32	613	500	500	500
11	North We	male	11	144	24	144	29	r	1	german	walk	15	no	8	73	872	501	765	555
12	East	female	13	164	24	156	25	r	3	French	other	30	friends	0.35	57	87	155	268	0
13	West Midl	female	13	143	17	137	18	r	2	spanish	walk	15	friends	8	26	660	664	591	500
14	South	female	13	170	27	175	60	e	2	spanish	walk	30	friends	0.31	42	178	718	589	918
15	East	female	12	155	22	145	57	r	3	french	bus	35	friends	0.56	33	661	500	1000	259
16	East Midla	female	12	154	13	91	27	r	2	french	car	6	varies	2.81	54	794	716	655	669
17	Home Cou	female	13	150	22	162	27	r	2	English	bus	20	parents	0.34	34	902	899	832	834
18	East Midla	male	13	160	25.5	160	41	r	2	french	bus	15	friends	0.48	82	280	424	348	747
19	North We	male	14	173	27	172	65	r	2	english	car	7	friends	0.26	79	917	957	383	919
20	Home Cou	male	13	165	29	165	22	r	2	english	car	7	parents	0.57	58	0	0	0	0
21	South	male	12	142	21	148	30	r	2	french	rail	12	friends	0.51	45	1000	1000	1000	500
22																			
23																			
24																			
25																			
26																			
27																			
28																			

To preserve this original file remember to save under another name or do not save when exiting the tutorial.

To hide a column (Notice the difference in Hide and Delete)

Click on the letter at the top of the column that you wish to hide, right click and choose Hide. To Unhide a column, click the two columns on either side of hidden column/s (You can click two columns simultaneously by pressing the Control button on the keyboard, as you click the two columns), right click and choose Unhide.

As there is so much data in the random sample, we would like to hide Columns from P onwards and column C. Now unhide column C.

To convert data to Number format

(Note the height, arm length etc. figures in the sample are not in number format and hence cannot be used in calculations or graphs.) To convert: drag to select the data, a  symbol appears beside the data, click on the arrow beside this symbol and select Convert to number.

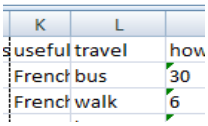
Select the Height, Foot and Arm columns and convert to Number format.

To insert data as numbers in the first instance

Select a column or range of cells. Go to Format, Cells and with the Number tab open pick Number. Note at this point one can select the number of decimal places one requires or if one requires a 1000 separator. Click OK.

To widen a column

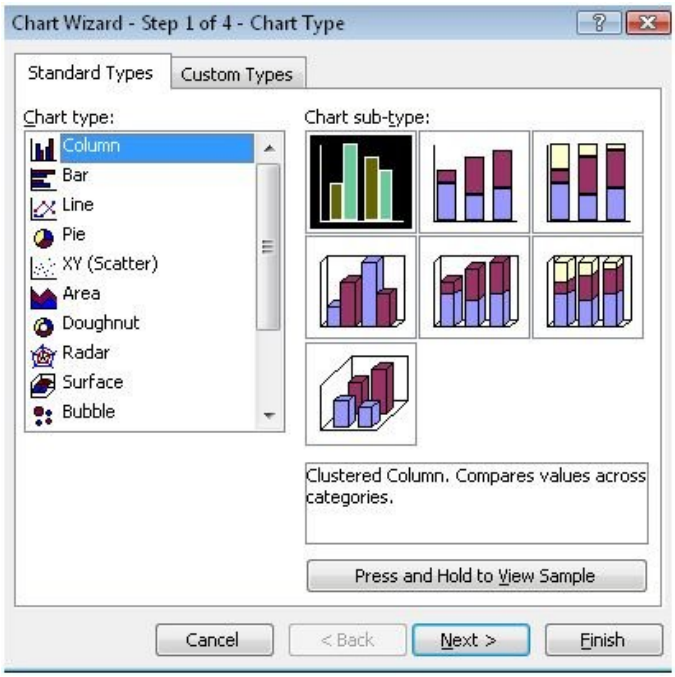
Drag the line on the right of the column to the right.



Widen the K column.

To draw a chart

Select the cells concerned. Click on  the Chart Wizard situated on the toolbar. A new dialogue box appears.



Choose the chart type of your choice. Then follow the wizard by clicking Next each time until the only option given is Finish.

Draw a Column chart of the Height of the first 4 students.

Draw a Bar chart of the arm length of the first 10 students.

To change the colour of the chart

Click on one of the sections of the chart, then right click and choose Format Data Series. With the Patterns tab open pick your chosen colour and click OK. One can also add Fill Effects to the sections of the chart by clicking on one of the sections of the chart then right click and choose Format Data Series. With the Patterns tab open click Fill Effects and choose the effect of your choice. Click OK and Ok.

To change the colour of just one section of a chart

Double click on the section you wish to change, right click and choose Format Data Point. Change the options as required: for example the colour.

To change the Plot Area of a chart

Click on the plot area, right click and choose Format Plot Area. Choose your colour or Fill Effect and click OK.

Draw a 3D Column chart of the breath of the first 8 student and insert an orange Plot Area. Note make sure the data is in number format.

To make a chart using more than one set of results (As below)

Select the data and draw the chart in the usual way.

Draw a Bar chart of the height, foot and arm of the first 5 students. See if there is any pattern.

To draw a chart using a set of data that is not immediately under the headings For example the results of students 3, 5 and 7 in the diagram below.

E	F	G	H
height	foot	arm	breath
171.00	30.00	171.00	34.00
154.00	25.00	145.00	32.00
158.50	22.50	163.00	40.00
155.00	23.00	154.00	35.00
169	24	164	30
163	23	166	46
149	25	149	61

Press Control on the keyboard and select the data required.

Draw a chart of the height and arm length of students 3, 5 and 7.

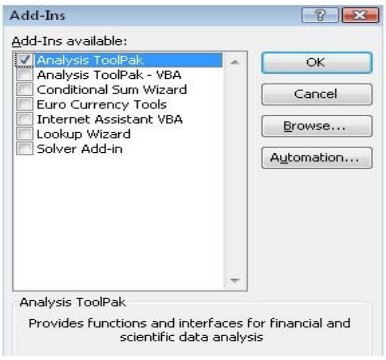
To draw a Pie Chart and show labels or Percentages

Select the cells concerned and draw the Pie Chart following the method used for other charts. Right click the chart and choose Chart Options. With the Data Label tab open click the box beside Value or Percentage as required.

Draw a Pie chart of cells L18 to L21 and adjust some of the fills etc.

To Draw a Histogram with even class intervals and ungrouped data

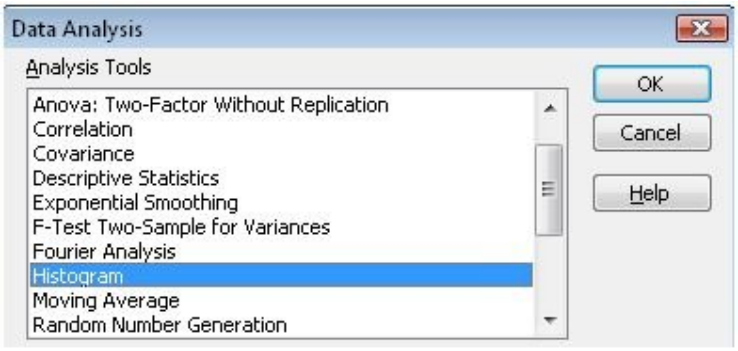
(A special tool called Analysis Toolpak has to be installed and to do this go to Tools and Add-Ins. A new dialogue box appears. Click the box beside Analysis Toolpak and click OK. Once installed unless uninstalled this tool will be available on your machine.)



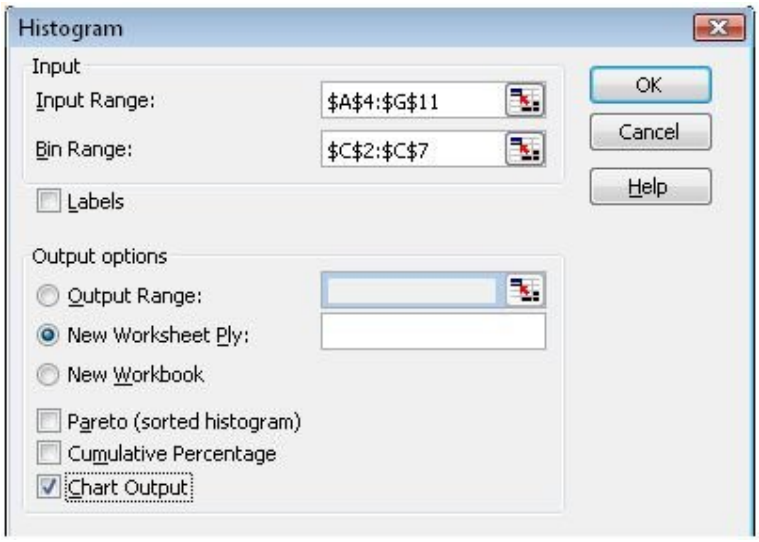
Type a table like the one opposite, with the actual values in the first columns and the interval extremes on the right. Check the intervals are equal.

	A	B	C
1	12		
2	23		9
3	45		19
4	47		29
5	12		39
6	23		49
7	45		59
8	32		
9	34		
10	23		
11	56		
12			

Go to Tools and Data Analysis. A new dialogue box appears.



Choose Histogram and click OK.



For the Inputs Range select the values and for the Bin range select the interval extremes. Make sure the Chart Output box is clicked. Click OK. Right click on the bars of the chart and choose Format Data Series. With the Options tab open, move the Gap width to zero.

Draw a Histogram for the Number of seconds students can hold their breath.

To copy an Excel chart into Word or PowerPoint

Click on the graph, right click and choose Copy. Open Word or PowerPoint and click Paste.

Open either Word or PowerPoint and copy a chart you produced into it.

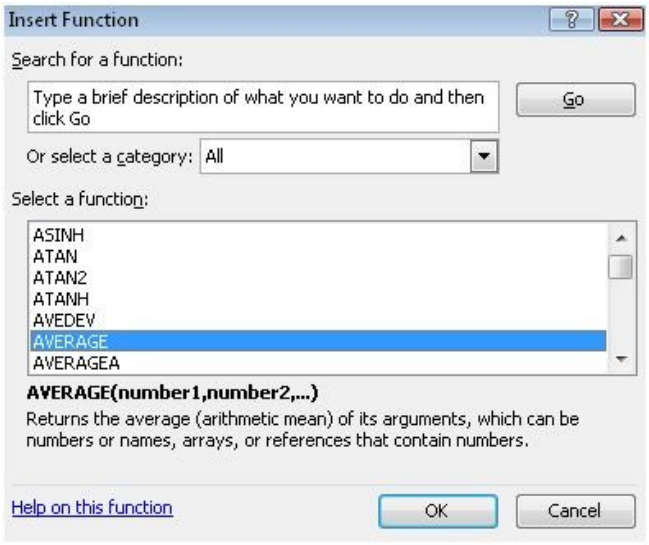
To calculate the Maximum, Minimum or Mean of a set of data

Select the set of data, right click the bar at the bottom of the screen and select Max, Min or Average (Average returns the mean.), whichever is required. The required value will now appear on this bar. Note in Excel 2003 you can only get one value at a time.

To calculate the Maximum, Minimum, Median or Average of a sample of data and insert it in a cell

Click on the cell you want to put the value into. Click on f_x at the top of the worksheet.

A new dialogue box appears.



Change the option "or select a category" to "All". Pick Max, Min, Median or Average, from the options offered.

In cell D18 type the word 'Maximum' and then click into cell E19 and insert the maximum of the cells E2 to E16. Repeat for Median etc. of heights etc.

To Fill cells with the same type of formula etc.

Select the cell that contains the formula you want to fill the other cells with, drag the box on the bottom right of this cell across or down the other cells that you want to fill. Alternatively select the cell with the formula and those that you want filled. Go to Edit, Fill and choose the direction you want the cells filled in.

By dragging the format of cell E18, find the maximum of the foot, arm and breath.

In cell E19 place a formula for the minimum of the height and by dragging this formula, place the minimum of the foot, arm and breadth in cells F19:H19. Repeat for the average.

To count the number of entries in a selection of cells

Select the cell you want to put the result in. Go to  and pick Count as the function, select the cells you want to count.

Using the Count function, place in cell L18 the number of entries in the travel column. Remove one of these entries and see the figure in cell L18 change.

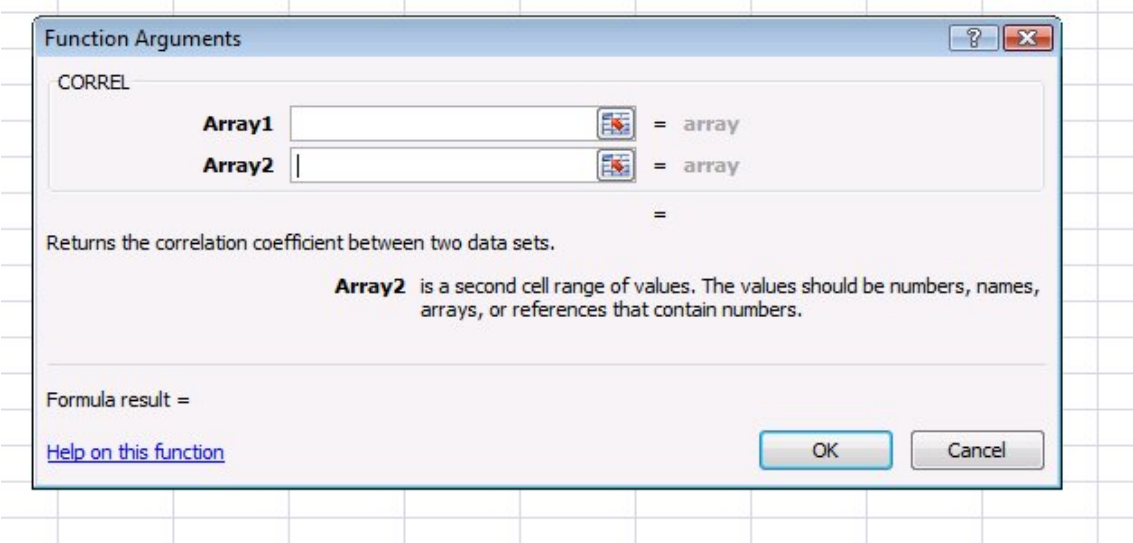
To Count the Number of people, who travel by each mode of transport

Click on the cell you want to put the result into. Go to f_x and choose COUNTIF. A new window appears on the screen. Choose your cell range and the criteria. Click OK.

For example, if you want to discover the number of people in the data set who travel by bus and place this figure in L19, the cell range would be L2:L16 and the criteria would be "bus". Change one of the non bus cells to bus and see what happens. Do the same in cell L20 and L21 and L22 for "walk", "cycle" and "car".

To calculate Correlation

1. Click in the cell you want to place the correlation value in.
2. Go f_x and follow the arrow beside "or select a category:" to All. Choose CORREL and a new window appears



3. Click beside Array 1 on this new window and then highlight the first column of data that you want to use for the correlation.
4. Click beside Array 2 on the window and then highlight the second column that you want to use for the correlation.
5. Click OK.

Find the correlation between the arm and the foot columns.

To draw a Scatter Plot

1. Highlight the two rows of data that you want to use for the scatter plot.
2. Go to Insert and Chart. For Chart type choose XY (Scatter) and for Chart sub-type pick "Scatter. Compares pairs of values". Then follow the wizard by clicking "Next" each time until the only option given is Finish.

Draw a scatter plot of the arm and foot data columns.

To draw the Line of Best Fit on a Scatter Plot

1. Right click on one of the points on the scatter plot and choose Add Trendline.
2. In the new window that appears with the Type tab open choose Linear. Click OK.
3. If you wish to show the equation of this line, highlight the line and right click. Choose Format Trendline.
4. In the Format Trendline window, open the Options tab and click Display Equation on chart. Click OK.

To find Quartiles of a data set

Click on the cell you want to put the quartile value into. Click on  at the top of the worksheet and pick Quartile from the selection of functions. A new window appears. Click in the space beside Array and select the data set (or type in the cell range for example A1:A12) of which you want to find the quartile. If it is the first quartile you require type 1 beside Quart and click OK. If it is the third quartile you require type 3 beside Quart and click OK.

Find the first and third quartile of the arm span in the data set.

To find the interquartile range

To find the interquartile range we need to the difference in the value for the third quartile and the first quartile. If the value for the first quartile is in cell B20 and the value for the third quartile is in cell B21 and you want the interquartile range value to be placed in cell B22. Click in cell B22, click beside  and type in = B21-B20 and press Enter. The interquartile range value will appear in cell B22.

Find the interquartile range of the arm span data set.

To find the Standard deviation of a data set

Click on the cell you want to put the standard deviation value into. Click on  at the top of the worksheet and pick STDEV from the selection of functions. A new window appears. Click in the space beside Number1 and select the data set (or type in the cell range for example A1:A12) of which you want to find the standard deviation. Click OK.

Find the standard deviation of some of the sets of data.

To sort a set of data

Select the data concerned. Go to the Data dropdown menu and select Sort. In the new window that appears, click the Expand the selection button, click Sort, pick your criteria by following the arrow under where it says Sort By and click OK. Note when you click the Expand the selection it means each person's records in the sample stays with that person.

Sort the dates of births in the data set.

To filter data in a column

Select the column with the items that you want to filter. Go to Data, Filter and pick Auto Filter. Click OK.

A
23
45
47
12
23
45
32
34
23
56

Follow the little arrow that has appeared on the top row and pick the criteria you require. To get all the records back, follow the arrow on the top row and select (Select All).

Filter column K in the worksheet Data, so that only those students who have usefullanguage as French. You should be left with the records of 7 students.

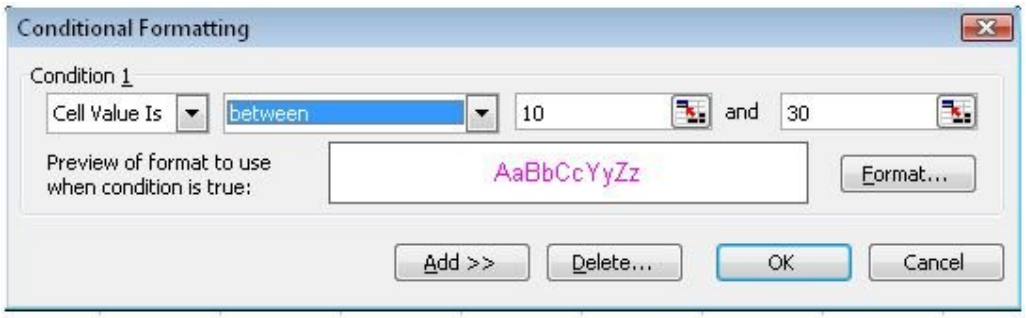
To freeze the top row in a spreadsheet

Click on the top row. Go to Window and Freeze Panes.

Freeze the top row in the worksheet Data.

To enable those cells to be coloured in which fulfil a certain criteria

Select those cells that you want judged: go to Format and Conditional Formatting. A new dialogue box appears.

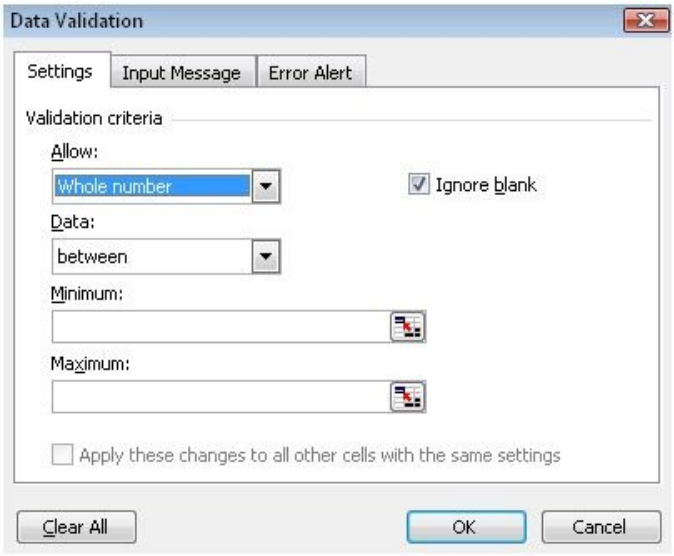


Pick your required criteria by following the two arrows at the top of the new window. Insert the conditions of the criteria. Go to Format and choose the format you require for the cells that follow the selected criteria. Then click Format and select the colour, etc. you require. Click OK.

Fill those cells in the Born column that are greater than or equal to 1994 in a pink fill and in a brown text.

Data Validation

This is where you restrict the data that can be entered in a cell or cells to ones you have decided beforehand. Select the cell or cells that you want to validate. Go to Data and pick Validation.



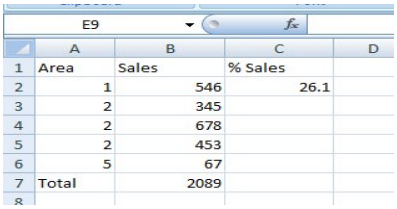
With the settings tab open in the new window, for Allow pick Whole Numbers and give a Maximum and a Minimum. Click OK. Then if you type in a number in that cell beyond those ranges you will get an error message. If you want to set it so that a cell or group of cells will only accept the days of the week, after you picked Data Validation, pick List and for Source type in the each day of the week followed by a ",".

Set up any 2 cells of your choice so that the only data that can be inputted into those cells are male and female.

Lock or Protect cells (Prevent people using the worksheet changing the contents of certain cells.)

1. Select the entire worksheet by clicking the Select All button (the gray rectangle directly above the row number for row 1 and to the left of column letter A).
2. Go to Format and chose cells. Click the Protection tab and clear the Locked check box. This unlocks all the cells on the worksheet.
3. Select just the cells you want to lock and repeat step 2, but this time select the Locked check box.
4. Go to Tools, Protection and Protect Sheet, and then click OK.

Absolute Reference



If for example cell B7 is the Total and cell B2=546 and in cell C2 you want to insert an equation to represent the percentage of the total sales that Area 1 had.

So you want to place the equation B2/B7*100 in cell C2, with cell C2 selected go to  and place = B2/B7*100 and you get the value 26.1 (Using 1 decimal point), which is correct.

Now if you try to fill the cells C3:C6, with the same formula a problem occurs. The formula that C3 is filled with is B3/B8*100, not B3/B7*100, which you wanted. To prevent this happening, when entering cell B7 in the equation for C2, you must put it in as B7. This means B7 becomes an Absolute Reference and when the fill tool is used it remains as B7.

To Print a worksheet with Gridlines

Go to File and Page Setup. With the Sheet tab open click Gridlines and OK.

To view or print a page in Landscape

Go to File and Page Setup. With the Page tab open click Landscape and OK.

To add a background to an Excel worksheet

Go to Format, Sheet and Background. Go to the folder where you have a picture suitable for backgrounds stored. Choose the background and click Insert.

Good free backgrounds are available at:

http://office.microsoft.com/en-gb/clipart/default.aspx
http://www.grsites.com/textures/
http://www.aaabackgrounds.com/textures/cloth/index.html.

Note that with some websites you should first save the file you want to download to your computer and scan it for viruses before opening it.

To find the frequency of a set of data

Create a vertical range of cells containing the upper bands into which you wish to group your data. Select the cells you want the frequencies to go into. Go to f_x and choose Frequency. For the Data Array, select the set of data that you want to find the frequency of and for the Bins Array, select the set of upper bands. Press the Control, Shift and Enter keys simultaneously on the keyboard instead of OK.

Design a frequency table for the Concentration times on the data set.

To draw the normal curve

The goal is to create a normal distribution graph with a specified mean and standard deviation. Start by entering those values in some cells in a worksheet.

The example used to illustrate the process plots a graph with a mean of 10 and a standard deviation of 2. Enter those values in cells F1 and H1.

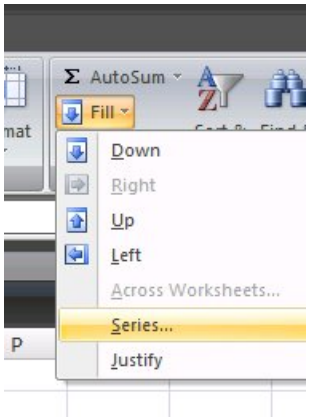
	D	E	F	G	H
1		Mean	10	Std.Dev	2
2					

Start by setting up the x-values for a standard normal curve.

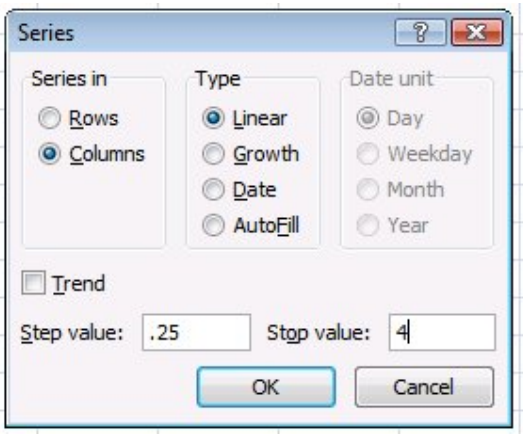
In A2, enter the number -4.

	A
1	
2	-4

Select cell A2 and then go to Edit, Fill and Series.



Set up the resulting dialog box below.



Use a step value of 0.25 and a Stop value of 4. However, if you want more data points, use a smaller number, such as 0.1 for the Step value.

	A	B	C
1			
2	-4	2	6.69151E-05
3	-3.75	2.5	0.000176298
4	-3.5	3	0.000436341
5	-3.25	3.5	0.001014524
6	-3	4	0.002215924
7	-2.75	4.5	0.004546781
8	-2.5	5	0.00876415
9	-2.25	5.5	0.015869826
10	-2	6	0.026995483
11	-1.75	6.5	0.043138659
12	-1.5	7	0.064758798
13	-1.25	7.5	0.091324543
14	-1	8	0.120985362
15	-0.75	8.5	0.150568716
16	-0.5	9	0.176032663
17	-0.25	9.5	0.193334058
18	0	10	0.19947114
19	0.25	10.5	0.193334058
20	0.5	11	0.176032663
21	0.75	11.5	0.150568716
22	1	12	0.120985362
23	1.25	12.5	0.091324543
24	1.5	13	0.064758798
25	1.75	13.5	0.043138659
26	2	14	0.026995483
27	2.25	14.5	0.015869826
28	2.5	15	0.00876415
29	2.75	15.5	0.004546781
30	3	16	0.002215924
31	3.25	16.5	0.001014524
32	3.5	17	0.000436341
33	3.75	17.5	0.000176298
34	4	18	6.69151E-05

Next, in B2, enter the formula =A2*H1+F1.
This converts the standard normal distribution to the distribution of interest i.e. z values to x values. (Since $z = \frac{x-\mu}{\sigma} \Rightarrow x = z\sigma + \mu$)

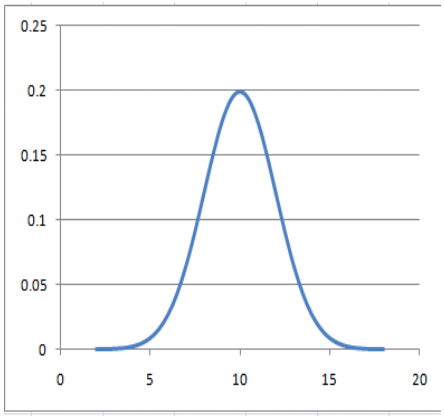
In C2, enter the formula NORMDIST(B2,F1,H1,FALSE).
This provides y-values for the distribution of interest.

Copy B2:C2 down to cover all the rows that contain data in column A.
The result should look like the spreadsheet illustrated on this page.

Select all of the values in columns B and C. Go to Insert, Chart and choose XY (Scatter). Choose Scatter with data points connected by smoothed Lines without markers.

Then follow the wizard by clicking "Next" each time until the only option given is Finish.

The result should be as on the right.



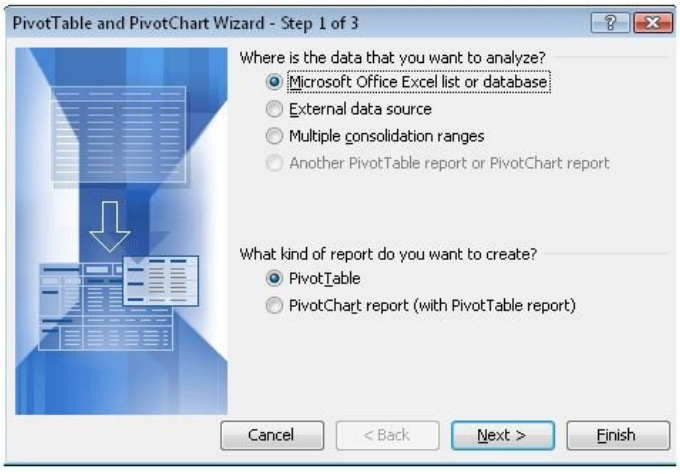
To set up a Pivot tables

Type in the data as it appears in the opposite table.

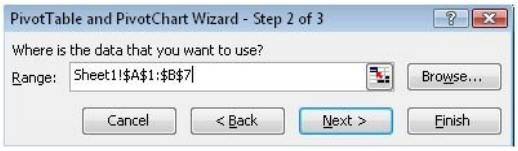
	A	B
1	Gender	Marks
2	Female	87
3	Male	86
4	Female	45
5	Female	78
6	Male	46
7	Male	78
8		

Sort the data according to Male and Female.

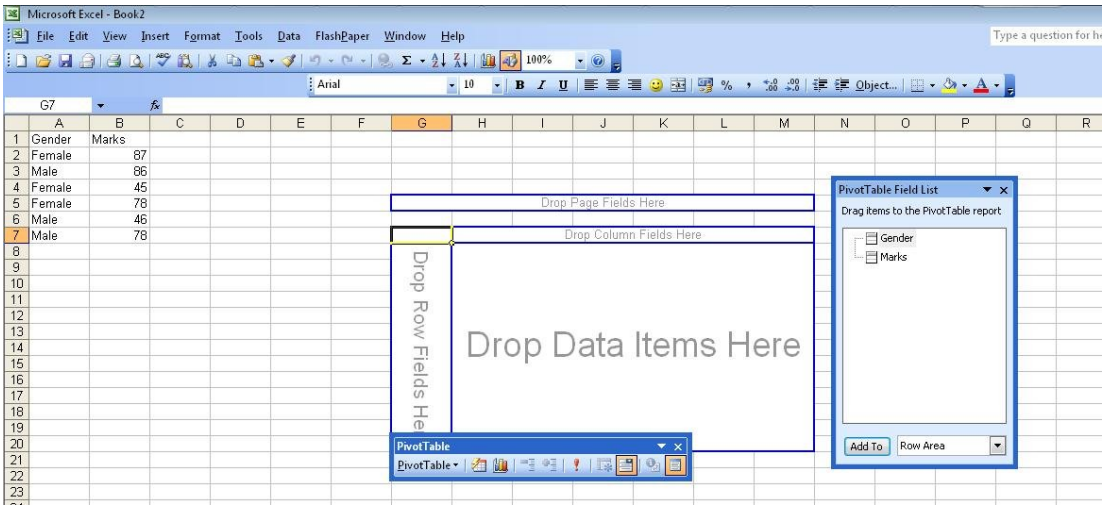
Click on a blank cell away from the inserted data. Go to Data and Pivot Table and PivotChart Report. A new dialogue box appears.



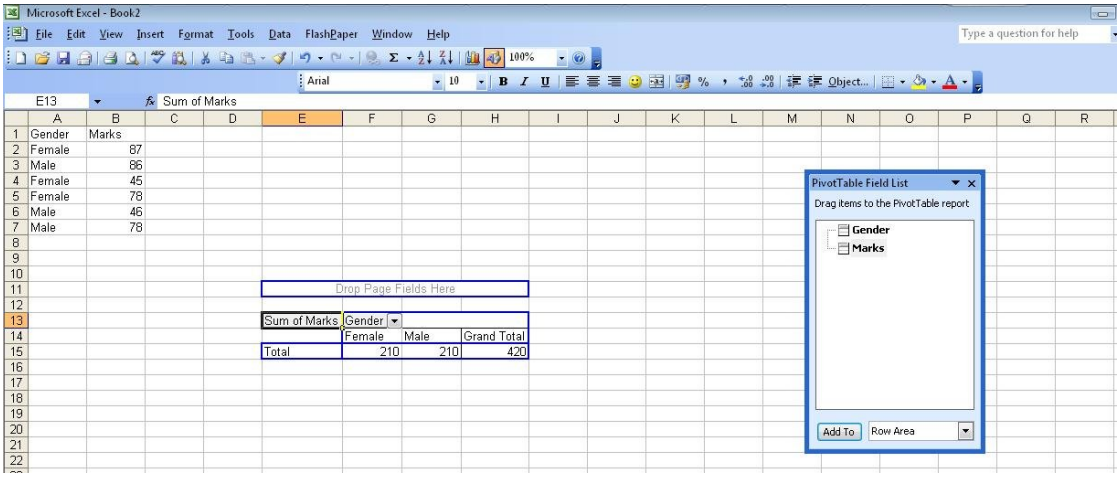
Click the box beside Pivot table. Click Next.



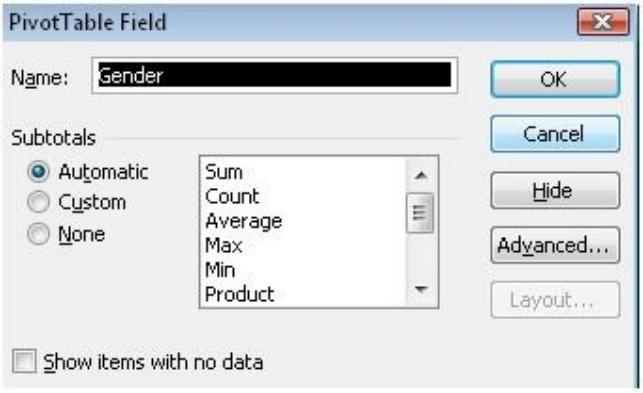
Click in the box beside Range and select the cells A1 to B7 for the above spreadsheet. Click Next, followed by Finish.



Drag the items from the Pivot Table Field List into the columns you require. For example drag Gender into Drop Column Fields Here and drag Marks into Drop Data items Here.



Click on the Pivot table and click in this case where it says “Sum of Marks”. In other Pivot table click the equivalent of this cell. A new dialogue box appears.



Select the Subtotal of your choice and click OK.

Help

Note  on the top right hand side of the excel page leads to Help or go to Help in the toolbar.

Useful web pages

http://www.teach-ict.net/software/excel/excel.htm

http://office.microsoft.com/en-us/excel/FX100646961033.aspx

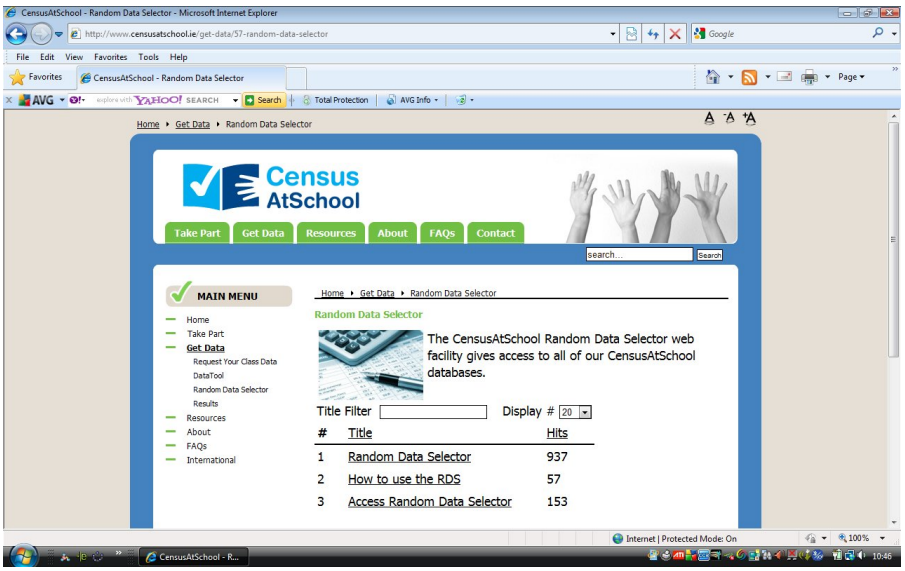
For Short Cut keys in Excel go to

http://office.microsoft.com/en-gb/excel/HP052037811033.aspx

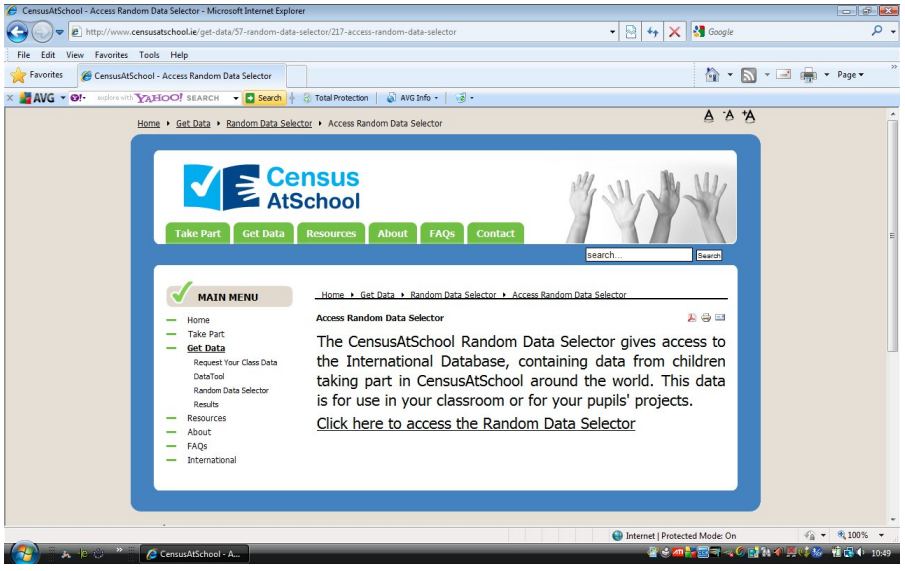
Appendix A

How to access data from www.censusatschool.ie.

Go to http://www.censusatschool.ie/get-data/57-random-data-selector.



Click on the Access Random Data Selector link. A new page appears.



Click on the link Click here to access the Random Data Selector.

Scroll down the next page that appears and insert the required details.

Click Submit.

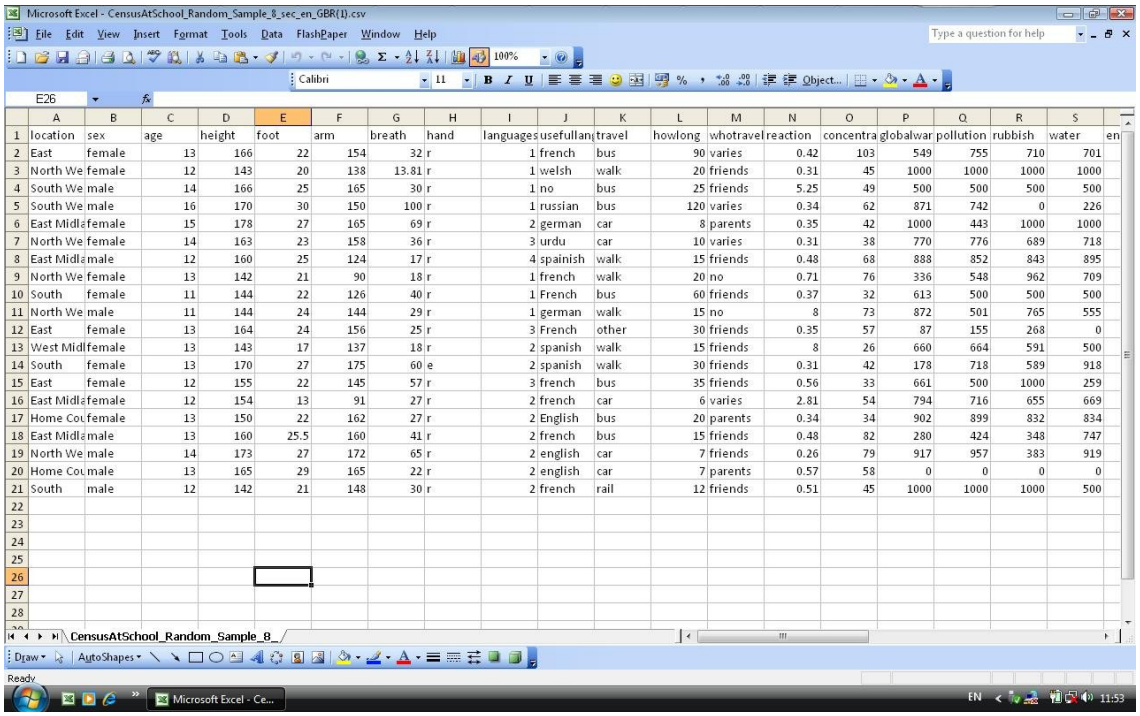
Pick the country you wish to data to come from, for example, United Kingdom.

For the Phase pick, for example, Phase 8 2007-2008 and click Submit.

Click Secondary and click Submit.

Click Sample Size and Submit.

Click Get Data. Save in a location of your choice and with a file name of your choice.



To preserve this original file remember to save under another name or do not save when exiting the tutorial.