

Task 2 — Microsoft Excel

In this task we introduce Microsoft Excel 2010, a popular spreadsheet application. After working through the session, a set of Excel problems will be issued.

Read This Section Carefully

In all these sessions you can work at three different speeds:

1. Those who have appropriate previous experience may be able to fulfil the *Outline Requirements* with little or no guidance. Such people should nevertheless carry out the work, check the points on the *Check-List*, and have the output inspected by a demonstrator.
2. Those with intermediate previous experience should use the detailed notes. Concentrate on the items which are introduced with bullet points.
3. Those with less experience or those who like to be given full explanations should work through the detailed notes more carefully.

In all your Excel worksheets, **please make sure that you use an Excel formula wherever possible, rather than simply typing in a number.**

Outline Requirements

1. Log in to a MCS workstation.
2. Set up, in the MCS folder, an Excel file Flat.xls which contains a single worksheet with an embedded chart whose appearance is roughly as shown on the page after next. **Please make sure that you use an Excel formula wherever possible, rather than simply typing in the number.** In particular, the numbers in the Sq. ft. and %age columns, and in the Totals row, should all be calculated by Excel using the appropriate Excel formulae. (*Hint*: 1 square metre = 10.76 square feet)
3. Print this and show the hard-copy to a demonstrator.
4. Ask for the Excel problems and produce solutions to the first two problems: the Fibonacci Series problem and the Multiplication Table problem.

Check-List

The demonstrator will have the following questions in mind when inspecting your work:

1. Is the main heading centred across four columns? [Page 2.14]
2. Are the four columns of information centred over the embedded chart? [Page 2.18]
3. Is the entire worksheet centred horizontally? [Page 2.19]
4. Are the headings of the three numerical columns right aligned? [Page 2.10]
5. Are there always two places shown after decimal points? [Page 2.11]
6. What formula gives rise to the total 40? [Page 2.10]
7. What formula gives rise to the value 35.00%? [Page 2.12]

8. Are the slices of the pie chart labelled with both category names and percentages? [Page 2.17]
9. **Is there a footer showing your name and College?** [Page 2.19]

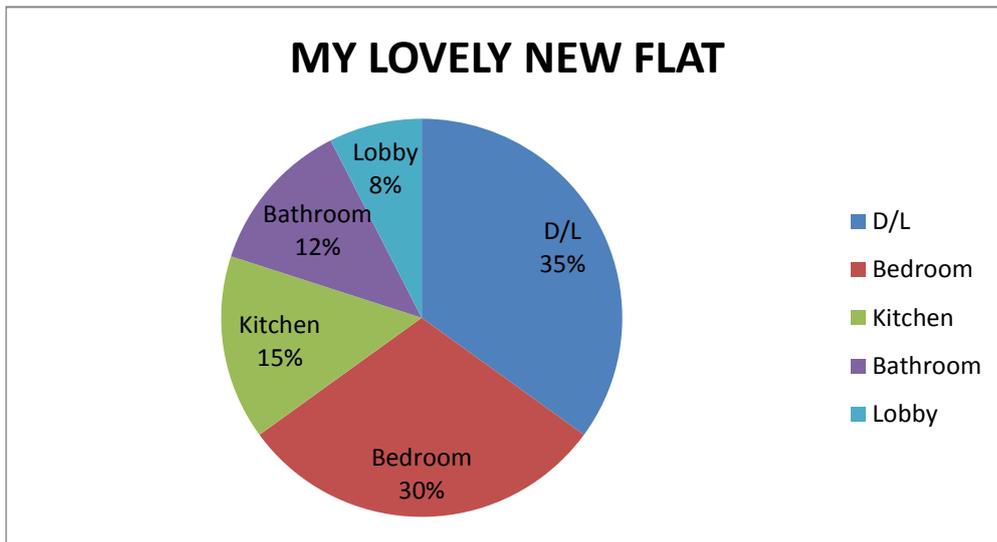
Check-List — Problems 1 and 2

The demonstrator will have the following questions in mind when inspecting your work:

1. **Is there a footer showing your name and College?**
2. What two values did you determine in answer to the questions asked in the Fibonacci problem?
3. What formula gives rise to the product 2×2 in the multiplication table worksheet?

MY LOVELY NEW FLAT

Area	Sq. m.	Sq. ft.	%age
D/L	14	150.64	35.00%
Bedroom	12	129.12	30.00%
Kitchen	6	64.56	15.00%
Bathroom	5	53.80	12.50%
Lobby	3	32.28	7.50%
Totals	40	430.40	



Task 2 — Microsoft Excel

Synopsis: The Microsoft Excel Spreadsheet application. Introducing Charting.

Briefing

This session introduces Microsoft Excel, usually simply referred to as Excel. The version of Excel we'll be using is Microsoft Excel 2010. Excel is a very popular and powerful *spreadsheet* application. Spreadsheets facilitate the production of lists, tables and charts which means they are much used by those who wish to prepare balance sheets of income and expenditure and lists of share prices and so on.

Equally, the output from many academic computer programs is in the form of tables which might tabulate anything from a mathematical function to a record of the daily supply of food to the armies of Edward III.

Most spreadsheet applications (and Excel in particular) have numerous mathematical and statistical functions built in. With a spreadsheet, you can often accomplish in a few minutes what would take you several hours if you had to write a program.

Guided Practical Session

- Log in to a MCS workstation.
- Close the Message of the Day window.

Starting Excel

The Excel application is accessed as follows:

- Click the *Start* button () to open the Start menu.
- Click the All Programs entry to get a list of all the programs you can access from the Start menu.
- Click the Spreadsheets Maths and Statistics entry. A list of programs accessible under this heading will appear.
- Click the Microsoft Excel 2010 entry and *wait!*

The Excel splash screen appears quite quickly but there may be a wait of up to a minute before very much else happens.

Eventually the Excel window appears. This is automatically maximized and fills almost the entire screen except for the taskbar which incorporates the button associated with the application.

On your *very* first entry into Excel you may be asked to supply your name and initials. If this is the case...

- Key in your name and initials as requested and click OK.

The Excel system is an application in Microsoft Office and shares some of the features of its companion application Word.

Excel — Description of the Screen

The Excel window is headed by several bars which you should learn to identify:

1. *The Title bar:*



2. *The Quick Access Toolbar (near the left end of the Title bar):*



3. *The Ribbon:*

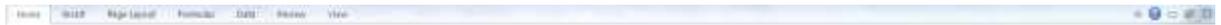


Note that the Ribbon has three parts to it:

3a. The word **File** at the top left (which gives access to the **Backstage** view (as we will see later)):



3b. A list of other *tabs* (plus a few other buttons at the far right which we won't worry about for the moment):



3c. The buttons associated with a particular tab, which are grouped together – the name of each *group* of buttons is displayed below the group (as shown on the **Home** tab below):

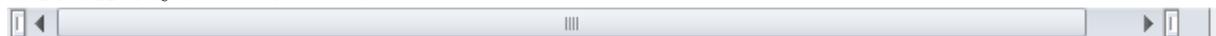


4. *The Formula Bar (well to its left, probably showing A1, is the Name Box.):*



At the bottom of the window there are two more bars associated with Excel:

5. *The Horizontal Scroll bar:*



6. *The Status bar:*



Finally, below the Status bar (which probably says **Ready**), there is the Windows taskbar whose buttons indicate what other windows are open behind the scenes.

Most of the facilities of Excel can be accessed via dialogue boxes but, by using the Quick Access Toolbar and the Ribbon, numerous shortcuts are available.

Workbooks and Worksheets

The main part of the screen is called a *workbook*. This consists of a collection of *worksheets*, initially called **Sheet1**, **Sheet2** and so on. You will see these names to the far left of the Horizontal Scroll bar near the bottom of the screen. Each name is on a *sheet tab* and it is clear that **Sheet1** is on top to begin with. This is the *active sheet*:

- Click the **Sheet2** sheet tab. This worksheet becomes the active sheet. Click the **Sheet 3** sheet tab, note what happens, then...
- Click the **Sheet1** sheet tab. This is the only worksheet which will be used in this task.

A worksheet consists of a grid of rectangular *cells* which are arranged in rows and columns. The rows are numbered downwards starting from 1 and the columns have letters starting from A. There are *column labels* at the top of the worksheet and *row labels* along the left-hand edge. Note particularly column label A and row label 1.

Initially, cell A1 is the *active cell*. It is highlighted by an emphasised border (as well as the column label for column A and the row label for row 1 being highlighted) and A1 is noted in the Name Box (to the left of Formula Bar):

- Tap the →-key to move the selection from cell A1 to cell B1. Cell B1 becomes the active cell and this is noted in the Name Box.
- Repeatedly tap the →-key and attempt to select a cell which is off the right-hand side of the window. Notice what happens. More columns appear at the right and columns A, B and so on disappear at the left.
- Note that columns A to Z are followed by columns AA to AZ and so on up to column ZZ. Column ZZ is followed by columns AAA to AZZ. The final column is XFD.

You see only part of the full worksheet which has 1,048,576 rows and 16,384 columns altogether.

- Key in Ctrl-→ and then Ctrl-↓. This makes cell XFD1048576 the active cell (as verified in the Name Box).

The standard ways of moving round the worksheet include using:

1. The mouse (clicking a cell makes it the active cell).
2. The arrow keys (with Ctrl when appropriate).
3. The Page Up and Page Down keys (next to the Home and End keys).
4. The scroll bars at the right-hand side and at the bottom of the window.

Experiment with these facilities but end with...

- Ctrl-Home to make A1 the active cell.

Keying in Data

Imagine that you have just moved into a flat and that you have measured and recorded the area of each room:

Kitchen	6
Bathroom	13
D/L	14
Bedroom	12
Lobby	3

In this list, D/L stands for Dining/Living room. The figures give the areas in square metres.

This information will now be keyed into the worksheet. The names of the rooms will go in cells A1 to A5 and the measurements will go in cells B1 to B5:

- With A1 as the active cell, key in Kitchen and notice that this appears in the cell and in the Formula Bar. Two new buttons appear to the left of the Formula Bar: the *Cancel box*, marked with a cross (X), and the *Enter box*, marked with a tick (✓).

- Click the Enter box (the one with the tick). This is to confirm that **Kitchen** is to go into cell A1.
- Tap → to make B1 the active cell and key in 6. This time press RETURN to confirm that 6 is to go into cell B1.
- Click cell A2 to make it the active cell, key in **Bathroom** and then tap →. This confirms that **Bathroom** is to go into cell A2 *and* makes B2 the active cell.
- Key 13 into cell B2.

When a cell is made active, by clicking it or by using the arrow keys, a side-effect is that the contents of the previously active cell are confirmed.

When keying in the three remaining pairs of entries, it is probably easiest to use the mouse to select each A cell and to use → to go from an A cell to the adjacent B cell:

- Key in the three remaining pairs of entries.

Making Corrections, Sub-menus

The figure for the **Bathroom** was **wrong**; it was supposed to be 5 not 13:

- Make B2 (with 13 in it) the active cell and simply key in 5 which overwrites the 13. Click the Enter box (with the tick) to confirm.

Now you decide that **Drawing Room** would be better than D/L:

- Make A3 (with D/L in it) the active cell. Key in **Drawing Room** and notice that it doesn't fit into the cell.
- Click the Cancel box (with the cross) to restore the D/L.

There are various ways of making corrections using buttons on the **Home** tab in the Ribbon:

- Make sure the **Home** tab is displayed on the Ribbon (click on **Home** to make sure).
- With A3 still selected, click on the **Clear** button in the **Editing** group of the **Home** tab.

Note that some buttons, like the **Clear** button, are followed by a ▼-sign to indicate a sub-menu. We'll also see that there are a few commands that are followed by a ►-sign to indicate a sub-menu. In addition, some commands are followed by the familiar ellipsis (...) to indicate that a dialogue box will appear.

- Note that **Clear** is followed by a ▼-sign. When you click the **Clear** button note that a sub-menu appears offering several possible options for clearing...
- Click **Clear All**. Assuming that A3 is still selected, this clears anything that is in the A3 cell.
- To bring back D/L now, click the **Undo** button () on the Quick Access Toolbar at the top of the Excel window. D/L reappears.
- With A3 still selected, click the ▼-sign on the **Delete** button in the **Cells** group of the **Home** tab. A sub-menu appears, with several options. Note that one of the menu items, **Delete Cells...**, is followed by an ellipsis (...), which means it will bring up a dialogue box. Click **Delete Cells...**

(Note that if you click the picture  above the word **Delete** then the entire cell A3 is deleted and what was cell A4 moves up to replace it. If you've done this use the Undo button  to get the old row 3 back and then click the ▼-sign on the **Delete** button.)

The **Delete** dialogue box contains four mutually exclusive *options*, each with an *option button*. The selected option button contains a black dot. It is probably **Shift cells up** and that is what happens if you...

- Click OK. The result is more drastic than before. Notice what has happened.
- Bring back D/L by clicking the Undo button  on the Quick Access Toolbar.

Insert an Extra Row

Next you decide to partition the Dining/Living room into two separate rooms and would like to replace the single pair of entries for D/L by two pairs:

Dining	7
Living	7

- Check that A3 (with D/L in it) is still the active cell. Click the ▼-sign on the **Insert** button in the **Cells** group of the **Home** tab and choose **Insert Sheet Rows** from the sub-menu that appears.

(Note that if you click the picture  above the word **Insert** then a blank row is inserted and no sub-menu appears. If you've done this use the Undo button  to undo this action and then click the ▼-sign on the **Insert** button.)

A blank row is inserted and, in consequence, D/L is now in cell A4:

- Key Dining and 7 into cells A3 and B3 and...
- Overwrite D/L and 14 by Living and 7 respectively.

Start another Column — A Formula

Suppose you now wish to add a third column giving the areas in square feet. Take one square metre to be 10.76 square feet. The first new entry will be 10.76×6 in cell C1. It is time to use a spreadsheet *formula*:

- Make cell C1 the active cell and key in $=10.76*B1$ (*the equals sign is essential*). Click the Enter box to confirm. The value 64.56 should appear in cell C1.

An Excel formula is always introduced by an equals sign. In simple cases, formulae consist of numbers, cells and arithmetic operators (principally +, -, * and /, the last two being for multiplication and division).

The formula this time notes that cell B1 contains 6 and works out that $10.76*B1$ is 64.56.

You could now key in the formula $=10.76*B2$ and so on but there is an easier way...

Array Range — Fill ▼ Down

Up until now only one cell, the active cell, has been selected at a time. By dragging, you can highlight an *array range* so that a group of cells is selected all at once. Certain operations can be performed on the group taken as a whole:

- Drag from cell C1 to cell C6. This selects the range C1:C6 (as it would normally be written). Check that a common border encloses the array of six cells.
- Note that the Fill button in the Editing group of the Home tab leads to a sub-menu.
- Click the Fill button and in the sub-menu click Down. The formula in cell C1 is copied into the other selected cells but the copying is far from naïve...
- Make cell C2 the active cell and note, in the Formula Bar, that the formula in this cell is now =10.76*B2. Check that the formula in cell C3 is now =10.76*B3 and so on.

Most, but not all, values are taken to two decimal places. This inconsistency makes the new column a little untidy and will be attended to shortly.

The Fill ▾ Down facility and a companion facility Fill ▾ Right, which works on a horizontal array of selected cells, are powerful features when setting up a spreadsheet.

Saving a Worksheet — the .xls and .xlsx File Name Extensions

Whenever you prepare a worksheet it is advisable to save it in a file fairly soon after starting and to keep saving at frequent intervals thereafter. The Title bar quotes a provisional title Book1 as a file name for your workbook. It seems more sensible to call it Flat and this file will be put in the MCS folder:

- Click on the word File at the top left of the Ribbon. This will open the Backstage view. Click Save As. You'll be presented with the Save As dialogue box. Near the bottom of this dialogue box is the Save as type drop-down list. The two most most immediately useful file types are probably Excel Workbook and Excel 97-2003 Workbook.

The native file format of Excel 2010 (Excel Workbook) is not compatible with previous versions of Excel older than Excel 2007. Since some people (and some computers elsewhere in the University) are still using earlier versions of Excel, it is probably a good idea to get into the habit of saving your Excel files in a format that can be understood by earlier versions of Excel, namely as Excel 97-2003 Workbooks. So choose Excel 97-2003 Workbook from the Save as type drop-down list.

- The list box in the Save As dialogue box shows your top-level folders including Notes.
- Double-click the Notes folder and check that the list box shows the folders contained in Notes including MCS.
- Double-click the MCS folder. No files are shown in the list box. You are working in Excel so only Excel files are listed and you don't have any yet.
- Click in the File name text box and overwrite whatever is in it with Flat and click Save. This saves the file as Flat.xls where .xls, the file name extension, is to Excel as .txt is to Notepad. Note Flat - Microsoft Excel in the Title bar.

Insert Headings

The next task is to head the three columns with **Area**, **Sq. m.** and **Sq. ft** respectively. First, a blank line must be opened up and there is a different way of doing this from that used last time:

- Click the row label 1 just to the left of the K of Kitchen. This selects the whole of row 1.

- Click the ▼-sign on the **Insert** button in the **Cells** group of the **Home** tab and choose **Insert Sheet Rows** from the sub-menu that appears. The entire collection of entries moves down one row.

Notice that the square feet values have not been disturbed. In opening up a blank row Excel automatically adjusted the formulae. You will find that the formula which yields 64.56 has changed from $=10.76*B1$ to $=10.76*B2$:

- Key the headings **Area**, **Sq. m.** and **Sq. ft** into cells **A1**, **B1** and **C1**.

Two adjustments are required. First, these headings will be changed to bold type and, in the next section, the **Sq. m.** and **Sq. ft** headings will be shifted to the right-hand sides of their cells:

- Click the row label **1** just to the left of the **A** of **Area** to select the whole of row **1**.
- Click the **B** button in the **Font** group of the **Home** tab. This makes all three headings bold.

Alignment

In Excel terminology, *Horizontal Alignment* is, by default, *General*. The contents of cells are not placed consistently to the left or to the right but are arranged so that text (names of rooms and headings and so on) is aligned at the left-hand sides of cells and numbers are aligned at the right-hand sides.

This is usually what you want but **Sq. m.** and **Sq. ft** head columns of numbers and it would look better if these headings were right-aligned:

- Drag from cell **B1** to cell **C1** to select these two heading cells only.
- Click the **Format** button in the **Cells** group of the **Home** tab and choose **Format Cells...** which results in the **Format Cells** tab dialogue box appearing.
- Click the **Alignment** tab.

The **Alignment** tab has several sections. Under **Horizontal** the **General** option is the most likely to be selected. This confirms the default.

- Click ▼ to the right of **General**. The drop-down list box which appears contains several options.
- Click the **Right (indent)** option and click **OK**. The two headings shift right.

This is hardly the best way of shifting the two cells to the right. Eight buttons to the right of the **B** button on the **Home** tab is the  button, the **Align Text Right** button (in the **Alignment** group of the **Home** tab). With the two cells selected, simply clicking this button would have saved any need to use the **Format** menu.

Nevertheless, it is important to have some familiarity with the **Format** menu so the exercise has not been wasted.

The SUM Function

Next, incorporate some totals. First:

- Make cell **A9** the active cell and key in **Totals**.

In cell B9 you could now key in =B2+B3+B4+B5+B6+B7 as the formula to add up the six areas in the second column. Instead...

- Make cell B9 the active cell and key in =SUM(B2:B7) and click the Enter box to confirm.

There are scores of *functions* built into Excel and SUM is one of them; it totals the values in the array range supplied in brackets.

An item in brackets after the name of a function is called an *argument* of the function. Here the argument B2:B7 designates the range of cells B2 to B7 inclusive.

You could now make cell C9 the active cell and key in =SUM(C2:C7) but it is easier to use the Fill ▾ Right facility:

- Drag from cell B9 to cell C9 to select these two cells.
- Click the Fill button in the Editing group of the Home tab and in the sub-menu click Right.
- Convert the three entries in row 9 to bold font.

When a formula incorporates a function, the Insert Function button, marked f_x in the Formula Bar, is sometimes useful. In the special case of the SUM function, it is better still to use the AutoSum button, labelled Σ AutoSum, in the Editing group of the Home tab. These buttons will be not discussed any further at this stage.

Formatting Numbers

In Excel terminology, the *Format Category* is, by default, *General*. This normally means that a number is shown to as many significant figures as will fit in the cell but there is an overriding rule is that any *leading* or *trailing zeros* are suppressed and an integer (a whole number) is shown without a decimal point.

In a normal-width cell 3.14159 would be written as 3.14159 but 00503.80 would be written as 503.8 (without the leading and trailing zeros). If you were to divide 100 by 3 (using the formula =100/3) the recurring decimal result would be taken to as many places as would fit in the cell.

All the numbers in the square metre column are integers so there are no decimal points. The numbers in the square feet column are integral multiples of 10.76 which normally results in two decimal places but where the second decimal place would be a zero only one decimal place is shown. It would be neater to have all values taken to two decimal places:

- Click the column label C to select the whole column.
- Click the Format button in the Cells group of the Home tab and choose Format Cells...
- Click the Number tab in the dialogue box.

Note that the *Format Category* is *General*. The next *Category* is *Number* which, by default, forces two decimal places without the suppression of trailing zeros.

- Click the *Number* category to select it and check that the number of *Decimal places* is shown as 2. Click OK.

Notice that there is no unreasonable restriction on the number of digits to the left of the decimal point. It is the number of digits on the right which is forced to always be two.

More about Formulae — The \$ Prefix

Suppose you now wish to add a fourth column showing each of the six areas as a percentage of the total:

- Make cell D2 the active cell.
- Key in the formula $=B2/B9$. Click the Enter box. The result is 0.15 which is 6/40 and needs to be converted to a percentage...
- Click the **Format** button in the **Cells** group of the **Home** tab and choose **Format Cells...** The dialogue box indicates that the **Format Category** is **General**.
- Click the **Percentage** category and again check that the number of **Decimal places** is shown as **2**. Click **OK**. The value in cell D2 changes to **15.00%**.
- Drag from cell D2 to cell D7 to select the array of six cells.
- Use **Fill ▾ Down** from the **Editing** group of the **Home** tab. The result is most unsatisfactory. The new cells contain the complaint **#DIV/0!** which means you are trying to divide by zero.
- Make cell D3 the active cell. The formula (look at the Formula Bar) is $=B3/B10$ whereas you want $=B3/B9$. Make cell D2 the active cell again.

There is a problem. The formula in D2 is $=B2/B9$ and in filling down you *want* the B2 to change to B3 but you *don't* want the B9 to change to B10. This latter cell is empty and its value is deemed to be zero, hence the complaint.

To keep the 9 of B9 from changing to a 10 you must use a *dollar prefix*. You have to modify the formula so that there is a \$ in front of the 9. The revised formula will be $=B2/B\$9$ and you can think of the dollar-sign being a modified 'S' with \$9 standing for 'Stick to 9':

- Check that D2 is the active cell. You could key in the whole of the revised formula afresh, but since it is only one character different a shortcut is advised...
- Click in the Formula Bar between the B and the 9 of B9 and then key in \$. The formula changes to $=B2/B\$9$ as required. Click the Enter box. The result in D2 is 15.00% as before.
- Drag from cell D2 to cell D7 to select the array of six cells again.
- Use **Fill ▾ Down** from the **Editing** group of the **Home** tab again. This time the entries are sensible percentages.
- Make cell D3 the active cell. The formula (look at the Formula Bar) is $=B3/B\$9$ and you will find that the formula in cell D4 is $=B4/B\$9$. The \$ really does mean that the 9 Sticks at 9.

You could have had a second \$ and included $=B3/BS\$9$ in the formula. This extra \$ forces the B to Stick to being a B but since you are filling down a column, the B won't change anyway. If you were filling a row using **Fill ▾ Right** then prefixing the B would be essential.

Computer scientists call B9 a *relative address* and $=B3/BS\$9$ an *absolute address*. (There is no commonly used term for $=B3/BS\$9$.)

Tidy up

The new column needs a heading:

- Make cell D1 the active cell, key in %age and click the Enter box. This heading will automatically be bold because the whole of row 1 was selected when the **B** button was used earlier. The heading will not be right-aligned though because only cells B1 and C1 were selected when right-aligning was imposed.
- Check that D1 is the active cell and click the Align Text Right button .

Spreadsheet Updating

The 20 values in the worksheet could of course have been typed in at an ordinary typewriter. Certainly Excel has saved you doing some multiplications by 10.76 and working out some percentages but, so far, the advantages of using a spreadsheet seem modest.

The real benefits come when you want to change your mind at a late stage. Suppose you decide that it is silly listing the Dining and Living rooms separately and wish to go back to a single area D/L of 14 square metres. The following operations will illustrate how, whenever you make a change, Excel will make any consequential changes:

- Make cell B5 the active cell and overwrite the 7 with 0. Click the Enter box. Several consequential changes occur; in particular the total area is reduced to 33 and the percentages all change.
- Make cell B4 the active cell and overwrite the 7 with 14. Click the Enter box. The total area reverts to 40 and all the percentages are restored except for the Dining and Living rooms.
- Overwrite Dining with D/L.
- Select the whole of row 5, click the ▼-sign on the Delete button in the Cells group of the Home tab and click Delete Sheet Rows from the sub-menu that appears.

A Main Heading

- Drag from row label 1 to row label 2 to select the whole of the first *two* rows.
- Click the ▼-sign on the Insert button in the Cells group of the Home tab and click Insert Sheet Rows from the sub-menu that appears. Since two rows were selected, two rows are inserted thereby producing two blank rows at the top.
- Make cell A1 the active cell, key in the heading MY LOVELY NEW FLAT and click the Enter box.

This heading now spills over to adjacent cells. Provided you don't want to use these adjacent cells no harm is done. Indeed it is common to let headings spill over like this.

Nevertheless, you will sometimes want to make a column wider to accommodate a rather long text entry or to make it narrower if all the entries are rather short...

Adjusting the Column Width

- Click the column label B to select the square metre column.
- Click the Format button in the Cells group of the Home tab and choose Column Width... The Column Width dialogue box indicates the current column width. A possible value might be 8.43 [characters wide].
- Key in 15 to replace the 8.43 (or other value) and click OK.

The whole column gets much wider and the general appearance certainly hasn't improved. You could experiment with different widths but one useful option should be explored:

- Check that column **B** is still selected (click the column letter if not).
- Click the **Format** button in the **Cells** group of the **Home** tab and choose **AutoFit Column Width**.

The **AutoFit Column Width** facility makes a column just a little bit wider than the widest entry. Very often it is sensible to apply **AutoFit Column Width** to *every* column in use:

- Drag from column label **A** to column label **D** to select the whole of the first four columns.
- Click the **Format** button in the **Cells** group of the **Home** tab and choose **AutoFit Column Width**.

This doesn't quite work as intended. Column **A** becomes enormously wide to accommodate the heading in cell **A1**. You could put matters right by selecting just column **A** and specifying a narrower width but it is worth noting an alternative approach:

- Drag diagonally from cell **A3** to cell **D10**. This selects all your entries except the top heading.
- Click the **Format** button in the **Cells** group of the **Home** tab and choose **AutoFit Column Width**.

With cell **A1** excluded, the **AutoFit Column Width** facility doesn't take the width of the top heading into account and the result is satisfactory.

The Merge & Center Button

The main heading in cell **A1** would look better if it were centred across the four columns you have used. Three buttons to the right of the **Align Text Right** button () in the **Alignment** group of the **Home** tab there is the **Merge & Center** button:

- Drag from cell **A1** to cell **D1**.
- Click the **Merge & Center** button (in the **Alignment** group of the **Home** tab). The heading is centred as required. (Note that if you click the  to the right of the label **Merge & Center** you will get a sub-menu – click **Merge & Center** on this sub-menu.)

As is implied by the name of the button, cells **A1** to **D1** have been merged into one new larger cell **A1** (and cells **B1** to **D1** have been eliminated). If the width of any or all the columns **A** to **D** is changed, the centring of the heading will be adjusted automatically.

There is another way of changing the width of the columns:

- Position the mouse pointer so that it points between the grey column labels **C** and **D**. The pointer changes to a cross shape.
- Drag rightwards so that column **C** becomes much wider. Notice that **MY LOVELY NEW FLAT** automatically moves so that it is still centred across the columns.
- Click the **Undo** button () on the **Quick Access Toolbar** to restore the previous width.

Save again

It is essential to save any work in a file every few minutes to guard against power cuts and other kinds of accident:

- Click on the word **File** at the top left of the Ribbon to open the **Backstage view** and then click **Save**. A message appears briefly in the Status bar and the **Flat.xls** file is updated.

Microsoft Excel Lists — Sorting

The term *list* is used in **Excel** to describe a labelled series of rows that contain similar data. The principal characteristics of a list are that the first row contains *column headings* and each subsequent row contains similar data. The range **A3:D8** constitutes an **Excel** list.

Other applications often use the term *database* and **Excel** documentation sometimes uses this term too. Once a list (or database) has been set up, numerous facilities are available for processing and analysing the data.

One particularly useful facility is the ability to sort data easily. In the present case, two obvious possibilities are to sort the items into alphabetical order or to sort them into size order. Each will be tried in turn.

When the items are in alphabetical order, **Bathroom** will be listed first but it is essential that the associated information (two areas and a percentage) is taken to the top too:

- Drag from cell **A3** to cell **D8**. This selects the whole list including the column headings but you don't want to include the totals at the bottom.
- Click the **Sort & Filter** button in the **Editing** group of the **Home** tab, and choose **Custom Sort...** from the sub-menu that appears. This will bring up the **Sort** dialogue box.

The **Sort** dialogue box has several columns in it, one labelled **Column** which contains an entry labelled **Sort by** and a drop-down list (indicated by ▼), which may be blank or may have **Area** selected. This drop-down list allows you to choose which column should be used for the sorting. We want to **Sort by Area** (meaning the different names in the column headed **Area** will be sorted into order). Whole rows will be shuffled in such a way that the row whose first entry is **Bathroom** comes to the top. Computer scientists call **Area** the *key* to the sort.

The dialogue box also indicates that the *sort order* will be **A to Z**, which is what you want:

- Click the first ▼ button in the dialogue box and choose **Area** from the **Sort by** drop-down list.
- Click **OK** and the data is sorted into alphabetical order of rooms.

Suppose that you now decide that it would be better to have the rooms in size order with the largest first. This time **Sq. m.** will be the key and the sort order will be **Largest to Smallest**:

- Check that the range **A3:D8** is still selected. Click the **Sort & Filter** button in the **Editing** group of the **Home** tab, and choose **Custom Sort...** from the sub-menu that appears.
- Click the first ▼ button in the dialogue box (for **Sort by**). The drop-down list will either be blank or may show that sorting is by **Area** by default but you could also sort by **Sq. m.**, **Sq. ft** or **%age**.
- Click **Sq. m.** and choose the **Largest to Smallest** from the **Order** drop-down list. Click **OK**. The data is sorted into descending order of size.

Charting — Data Series and Categories

There are numerous facilities in Excel for preparing charts and graphs. To introduce what is often called *charting*, the room area data will be presented as a *Pie Chart* with one slice of pie for each of the five areas.

Charts can be created *embedded* in a worksheet or as a separate *chart sheet*. An embedded chart will be created in this first example.

By default, charts are created from lists in which *data series* are arranged in columns. In charting terminology, the values 14, 12, 6, 5 and 3 in column B constitute a data series whose *data series name* is the column heading **Sq. m.** There are three data series in the present example; each contains five values.

The items D/L, Bedroom, Kitchen and so on are *category labels*. On an ordinary graph, these items would be written along the X-axis and each data series would correspond to a separate line on the graph, perhaps identified by its data series name.

The first step in creating an embedded chart usually involves selecting an array range in which the first row and first column are special. They contain the data series names and the category labels respectively.

The numerical values which are to be represented graphically will be below the first row and to the right of the first column:

- Drag from cell A3 to cell B8 (*not* to cell D8).

This selection means that the **Sq. m.** data series will be the *only* one considered (the other two are directly related to this anyway).

The simplest way to create a chart is to use one of the buttons in the Charts group of the Insert tab:

- Click the word **Insert** in the list of tabs at the top of the Ribbon to change to the Insert tab:



- Click the Pie button  in the Charts group on the Insert tab.
- From the sub-menu that appears click on the first entry under 2-D Pie:



(This will produce the simplest form of pie chart Excel can create and the one you are most likely to want.)

A pie chart – with five coloured and labelled slices and, on the right, a legend showing which colour relates to which category label – is inserted (embedded) into our worksheet. In the worksheet, the category labels (in cells A4 to A8) and the data series (in cells B3 to B8) are highlighted to indicate the information portrayed in the chart.

- Click on the chart. Now point at different parts of the chart and notice how you are told the name of the part being pointed at.

Note also that a series of **Chart Tools** tabs have been added to the Ribbon:

- On the newly appeared **Design** tab, click the **Select Data** button in the **Data** group. (You may need to click on the word **Design** at the top of the Ribbon to bring up the **Design** tab.)

The dialogue box shows that the array range containing the information which is to be charted is `Sheet1!A3:B8` and this is indeed the range you selected before you clicked . There is no special significance in the dollar prefixes this time. The range A3:B8 itself is now outlined by a *moving border*.

You have a chance to change this range if it isn't correct:

- As the range is correct, click **OK** to close the dialogue box.

Having created the pie chart, we are going to need to modify its *layout* (what it looks like):

- Click on the word **Layout** at the top of the Ribbon to bring up the **Layout** tab. This gives access to a set of tools that allow us to change the chart's appearance, etc.

If you examine the pie chart you should see that **Excel** has decided that **Sq. m.** is a suitable title but this is not actually appropriate. We need to change this:

- Click on the chart title (currently **Sq. m.**) shown on screen. You should find that a box has appeared around the title. Move the mouse cursor over this box until it changes into a vertical line and then click on the box. You should now be able to edit the chart title.
- Change **Sq. m.** to **MY LOVELY NEW FLAT**. When you've finished editing the title click anywhere else on the worksheet to indicate to **Excel** that you are finished and it should accept your changes.

We now want to customise other aspects of the chart's appearance:

- Click on the chart. Click the **Legend** button in the **Labels** group of the **Layout** tab. This brings up a sub-menu where you have the option of showing or not showing the *legend* which indicates which colour or which kind of shading refers to which slice of the pie. There is no need to change anything, so click the **Legend** button again to make the sub-menu go away.
- Click the **Data Labels** button in the **Labels** group of the **Layout** tab and choose **Inside End** from the sub-menu that appears. Note how the position of the labels on the chart changes.
- Click the **Data Labels** button in the **Labels** group of the **Layout** tab and choose **More Data Label Options...** from the sub-menu that appears. We are going to arrange for labels and percentages to appear...
- Click **Label Options** in the dialogue box that appears. Note that the checkboxes against **V**alue and **S**how Leader Lines probably have a tick (✓) against them – make these checkboxes unticked by clicking on them if necessary.
- Now click the checkboxes against **C**ategory Name and **P**ercentage (so a tick (✓) appears in each box) and click **Close**. Note the changes to the chart. Also note that all percentages on the chart are shown as integers. In particular 12.5% and 7.5% are rounded to 13% and 8% respectively and, to force the total to be 100%, **Excel** has changed 35% in the worksheet to 34% on the chart.

Changing the Size of the Chart

The outermost boundary of the chart has eight *handles* on it, four at the corners and four in the middles of the sides. These handles indicate that the chart is selected. A selected chart can be deleted by clicking on the **Clear** button in the **Editing** group of the **Home** tab selecting

Clear All from the sub-menu that appears or simply by pressing the **Delete**-key. If your chart is completely wrong delete it and start again.

The handles on the chart boundary can be dragged so that the edges and corners can be moved:

- Click a cell in the worksheet outside the chart. The handles disappear as the chart ceases to be selected and the newly active cell is selected instead.
- Click *just* inside the chart. The chart is again selected. Ensure that the bottom edge of the chart is exposed; use the Vertical Scroll bar if necessary.
- Point at a handle and notice how the pointer becomes a double-headed arrow.
- Drag the different handles in turn so that the border exactly fills all the cells in the range E13 to L26.

Moving the Data and the Chart

You should now have a reasonably tidy chart but the worksheet as a whole would look better if the data were moved two columns to the right and the chart moved underneath the data. The data occupy four columns and the chart occupies eight columns:

- Click cell A3 to select it (and unselect the chart).
- Click the ▼-sign on the **Insert** button in the **Cells** group of the **Home** tab and click **Insert Sheet Columns** from the sub-menu that appears. Everything moves right one column including the chart. Repeat this action to insert another column.
- Click anywhere in the chart. This selects the chart and you can then...
- Drag the chart as far to the left as it will go.
- By using the drag handles, arrange for the chart border to fill all the cells in the range A13 to H26.

The Save button

It is some time since you last saved your work but rather than going to the **Backstage View** and clicking **Save** you can use the **Save** button () in the **Quick Access Toolbar**. This is the leftmost button in the **Quick Access Toolbar**; check that the **ToolTip** says **Save (Ctrl + S)** before you...

- Click the **Save** button on the **Quick Access Toolbar**.

Previewing

- Ensure that the chart is selected; click inside it if it is not.
- Click on the word **File** at the top left of the **Ribbon** to open the **Backstage view**. Then click on **Print**. This will show a preview of what would be printed when you click the **Print** button () – *but do NOT click on this button just yet* – which, given that the chart was selected, is only the chart rather than the entire worksheet. Thus the previewer shows only the chart.
- Click on the word **Home** at the top of the **Ribbon** to close the previewer and return to your worksheet.
- Click a cell in the worksheet outside the chart (to unselect the chart).

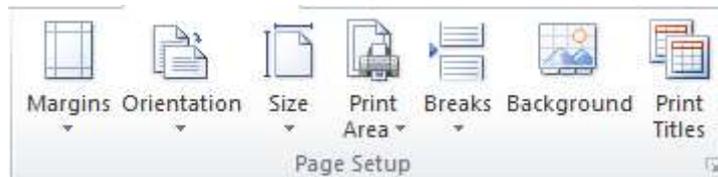
- Click on the word **File** at the top left of the Ribbon to open the **Backstage** view, then click on **Print**. A scaled-down version of a whole page of output should appear in the previewer. It gives some idea of what the printed version will be like.

Using Page Setup

To distinguish your output from those of other people, it is prudent to arrange for your name and College to be printed on the worksheet as a *footer*. It would also be tidier if the material were centred on the page.

To attend to these matters, and to make other changes to the way the spreadsheet is printed, use the **Page Setup** command:

- Click on the word **Home** at the top of the Ribbon to close the previewer and return to your worksheet.
- Click on the word **Page Layout** at the top of the Ribbon to bring up the **Page Layout** tab. Click the small arrow () in the lower right corner of the **Page Setup** group:



...to bring up the **Page Setup** tab dialogue box. Ensure that the **Page** tab is selected; click it if it is not.

- Check that the **Paper size** is correctly set to **A4**. Use the  button and the drop-down list box to set this correctly if not.
- Select the **Margins** tab.

Under **Center on page** there are two options, each with a checkbox. Checkboxes are almost the same as option buttons but are used when the options are not mutually exclusive. You can centre the worksheet **H**orizontally, **V**ertically, both or neither:

- Click the checkbox labelled **H**orizontally so that it acquires a tick (✓).

By default, each page will be printed with no Header, no Footer and no Gridlines and it is instructive to look at how the defaults may be overridden:

- Select the **Header/Footer** tab and click the *lower*  button. The drop-down list box offers numerous possible footers though none is what is required.
- Next, click the *upper*  button twice. The drop-down list box offers numerous possible headers. Click the *upper*  button again to get rid of the drop-down list box.
- Click **C**ustom Footer... A box with the title **Footer** appears.
- Click in the text box under **C**enter section. Then key in your name and College in the form **A.B. Smith of Churchill College** and then click the **OK** button in the **Footer** box.
- You should see your name and College recorded in the **Header/Footer** tab.
- Select the **Sheet** tab. Under **Print** note that **G**ridlines could be shown if you wish.
- Gridlines are not required so click **OK**.

- Click on the word **File** at the top left of the Ribbon to open the **Backstage view**, then click on **Print**. Check that the previewed version is satisfactory, with the material centred horizontally and with your name and College as the footer.
- If all is well, click the **Print** button ().
- Collect the printed worksheet from the printer.
- If the previewer has not closed itself, click on the word **Home** at the top of the Ribbon to return to your worksheet.

Using Excel's built-in Help

Some previous versions of Excel had something called the Office Assistant that provided help and suggestions. Since Excel 2007, Excel uses a redesigned help system that no longer uses the Office Assistant. To access Excel 2010's built-in help:

- Click the help button () on top part of the Ribbon at the far right.

After a short wait, a new **Excel Help** window appears and offers several possibilities. Perhaps the most useful is the search box near the top of the window: type the topic you want help on in this box and click the **Search** button. The help system will then display a list of all the articles it thinks are good matches for the topic you typed in. You can spend a good deal of time experimenting with the help features of Excel. When you have had enough...

- Click  to close the Excel Help window.

Leaving Excel

- Click on the word **File** at the top left of the Ribbon to open the **Backstage view** and then click **Exit**. You get a warning message which indicates that you have made some changes (since you last used the **Save** command) and you are asked whether you want to save these changes.
- Click **Yes** to confirm that you want the changes saved. This action will update the Flat.xls file.

Logging off

- As at the end of every session, it is important to log off in the approved way:

 | Log off

After a short wait, the screen returns to its idle state presenting the invitation to:

Press CTRL + ALT + DELETE to log on

Summary

Here are some of the more important features which were introduced in this task.

Workbook	A collection of worksheets in a single file.
Worksheet	The main work area in a spreadsheet.
Active cell	The cell in the worksheet which is selected.
Array range	A rectangular array of cells all selected at once.
Formula	An entry in a cell, introduced by '=', which results in some calculation.

Dollar prefix	When a row and/or column in a cell identifier is prefixed by \$ it will not change when the formula containing the cell identifier is copied by Fill ► Down or by Fill ► Right.
Functions	A facility such as SUM which usually operates on an array range supplied as an argument...
Argument	An item in brackets following a function name which is used for supplying information to the function.
Format category	The category of a numerical value specifies the way in which it will be interpreted, for example as a simple number or as a percentage.
Sorting	Ordering items by some key...
Key	The entries in a particular column (or row) in a collection of entries which determines the required order when the rows (or columns) containing these particular entries are sorted.
Charting	Producing a graphical representation of data.
Embedded chart	A chart embedded in a worksheet.
Data series	A series of values arranged in columns (or rows), each column (or row) is identified by a data series name; each value in a data series belongs to some category...
Category	A means of distinguishing one value in a data series from another.
Legend	Part of a chart which indicates to which items different colours or shading refers.
Handles	Little square blobs which can be dragged to alter the shape and size of a border.

Documentation

The following reference may be useful:

Microsoft® Excel® 2010 Step by Step (Curtis D. Frye; published by Microsoft Press)
<http://oreilly.com/catalog/9780735626942>

You might also note that courses on Excel are given quite frequently during Term. See <http://www.training.cam.ac.uk/ucs/theme/spreadsheets> for details.

If you are familiar with a version of Excel prior to Excel 2007, then you may also find the Excel 2003 to Excel 2010 guide at:

<http://office.microsoft.com/en-us/excel/HA101842942.aspx>

very useful.