

OCR Cambridge Nationals in ICT

Unit R003

Handling Data Using Spreadsheets

Microsoft[®] Excel 2010

Big Planet

THEME PARK

ENTRANCE



Introduction

Hello and welcome to *Big Planet Theme Park* – the world’s first ICT amusement park. From high-speed rollercoasters to haunted castle rides, there really is something for everyone!

OCR Cambridge Nationals in ICT: Unit R003

The aim of this guide is to provide the knowledge and skills needed to achieve the optional *Cambridge Nationals in ICT unit Handling Data Using Spreadsheets* (R003). Building upon units R001 and R002, it features a range of step-by-step exercises and problem solving activities based in and around the fictional business *Big Planet Theme Park*.

As you progress through this guide you will be introduced to many of the more powerful features of *Microsoft Excel* and see how to use the application to complete a number of simple, everyday tasks. This helps to build confidence in the application’s use and your own ability to enter, develop and organise numerical information for a variety of purposes. The practical skills learned can then be used to solve ICT problems in your own life – at home, in education and at work.

Enjoy your visit to *Big Planet Theme Park* and have fun!

Learning objectives

To get the most out of your own education and employment opportunities, you need to be able to use ICT confidently, effectively and independently. The *Cambridge Nationals in ICT* qualification seeks to give you that ability, providing the knowledge and skills needed to successfully use computing technology in all aspects of your daily life.

Remember that achieving a *Cambridge Nationals in ICT* qualification is not just about knowing how to use computing technology, but realising how to apply that practical knowledge to solve unfamiliar problems in every aspect of your life. Each of the 10 sections in this book are therefore based on authentic work-related scenarios drawn from real-world experiences, and each teaches a relevant set of skills that are highly valued in both further education and employment.

After completing this book you will be able to:

- ✱ Solve real-world problems using appropriate spreadsheet software (*Microsoft Excel*)
- ✱ Interpret requirements and create suitable spreadsheet solutions
- ✱ Apply knowledge and skills to process, manipulate and analyse unstructured data
- ✱ Use functions and outputs to communicate information and engage with others
- ✱ Present information graphically to help make decisions

Section 6

Working with Data

By the end of this section you should be able to:

- Rearrange Data by Sorting
- Reduce Data by Filtering
- Use 'What-If' Analyses
- Understand and Use Goal Seek
- Model Outcomes
- Understand and Use Scenarios

6.1 Tables

Although *Excel's* primary purpose is to record numbers and perform calculations, it is also frequently used to record simple **Tables** of data (also known as **Lists**). Similar in form to an *Access* database, each column in the table represents a single, separate piece of information. Entries in the table are then stored in rows known as a **records**.

	A	B	C	D	E	F	G
1	Survey Results						
2							
3	Surname	First Name	Sex	DOB	Age	Town	First Visit?
4	Poole	Janet	F	01/05/1998	14	Littleton	Yes
5	Robinson	Christopher	M	23/11/1985	26	Noplace	Yes
6	Allison	Brian	M	20/04/1962	50	Smallton	Yes
7	Robson	Barry	M	21/04/1966	46	Smallton	Yes
8	McKnight	Charles	M	05/03/1980	32	Noplace	
9	James	Peter	M	31/07/1997	15	Noplace	Yes
10	Frost	Marjorie	F	12/12/1987	24	Noplace	
11	Hooper	John	M	06/01/1999	13	Littleton	Yes
12	West	Gordon	M	23/11/1968	43	Littleton	
13	Luke	John	M	13/05/2003	9	Smallton	Yes
14	Curry	Basil	M	19/09/2002	10	Noplace	

Note: When creating a table in *Excel*, it is important that you enter the same type of information in each column.

As you will learn more about in this section, *Excel* features many useful and powerful tools for working with tables. In particular, it allows you to:

- * Sort data alphabetically or numerically in ascending or descending order
- * Search for matching criteria by filtering table entries
- * Search or query a table to find specific data
- * Perform statistical calculations on the data for analysis and to help with decision-making

Note: If a table becomes too large or complex, it should be noted that *Microsoft Access* is perhaps a more appropriate application to use.

Activity:

1. Open the workbook **Research**. This spreadsheet contains the results of a recent visitor survey at the theme park.
2. Examine the contents of the worksheet. It features a single table with 220 individual records. Notice the column header labels.
3. Leave the workbook open for the next exercise.

6.2 Sorting Data

Sometimes you may need to **sort** the contents of a table so that related cells are grouped together or placed in a certain order. For example, you could rearrange the contents of a staff or product list alphabetically by name.

Activity:

1. Select any cell in column **A** that contains a **Surname** and, from the **Home** tab, click the **Sort & Filter** button in the **Editing** group. From the menu that appears, select **Sort A to Z**.





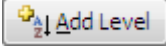
2. The records in the table are reordered alphabetically using the contents of column **A**.

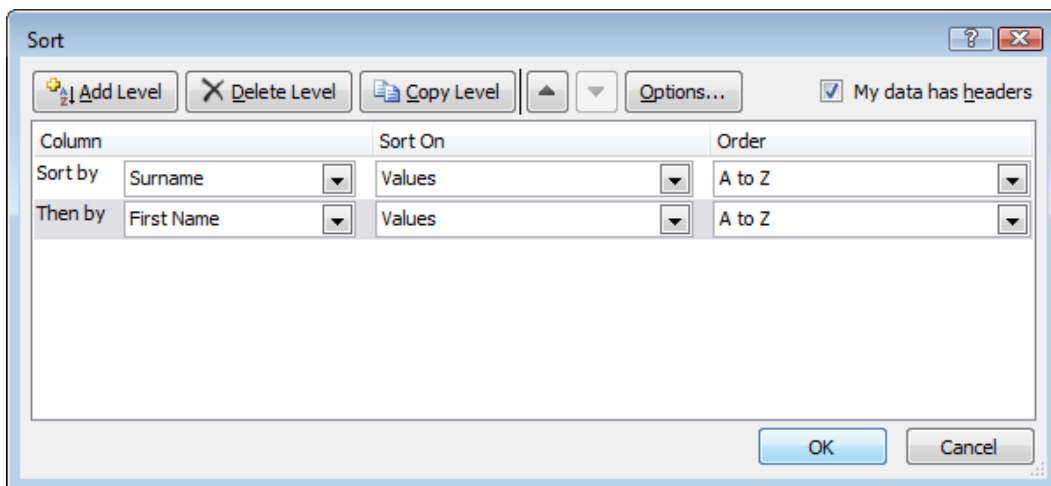
	A	B	C	D	E	F	G
1	Survey Results						
2							
3	Surname	First Name	Sex	DOB	Age	Town	First Visit?
4	Ainslie	Ruth	F	28/05/1960	52	Noplace	Yes
5	Airey	Gordon	M	09/11/1964	48	Smallton	
6	Alberti	Franco	M	30/10/1969	43	Smallton	Yes
7	Alderson	Peggy	F	16/02/1957	55	Littletown	
8	Allison	Brian	M	20/04/1962	50	Smallton	Yes
9	Allott	Geoffrey	M	07/06/1934	78	Smallton	
10	Ambrose	Shiela	F	10/07/1966	46	Smallton	

Note: *Excel* automatically detects and selects the whole table when sorting. Note also that entire records are sorted, not just the current column. However, if a range is selected first, only the contents of those cells will be sorted.

3. Select any cell in column **B** containing a **First Name** and, using the **Sort & Filter** button, select **Sort Z to A**. Records are sorted by **First Name** in *reverse* alphabetical order.
4. Select any cell in column **E** containing a number and click the **Sort & Filter** button. *Excel* recognises that the content of the selected cell is a number. Select **Sort Smallest to Largest** and the records are sorted by increasing **Age**.
5. Select any cell in column **D** containing a date and click the **Sort & Filter** button. Select **Sort Newest to Oldest** and the records are sorted by date of birth (**DOB**).
6. Using the same technique, sort the records **Oldest to Newest** by date of birth.
7. You can also create more complex, custom sorts. Select any *one* cell in the range **A4:G223** and display the **Data** tab. Examine the buttons in the **Sort & Filter** group.

Note: Notice the buttons to perform **Sort A to Z**, , and **Sort Z to A**, . These are context sensitive and will perform different functions depending on the data type of the selected cells (i.e. **Sort Smallest to Largest** or **Sort Newest to Oldest**).

- Click the **Sort** button to display the **Sort** dialog box. Select **Surname** from the **Sort by** drop-down box and make sure **A to Z** is selected in **Order**.
- Click **Add Level**, , to add another level to the sort. In **Then by**, select **First Name** and again make sure **A to Z** is selected in **Order**.



- Click **OK** to apply the sort. The records are sorted on **Surname** and then on **First Name**.

148	Purvis	Lilly	F	14/07/1969	43	Noplace	
149	Rennison	Stuart	M	01/12/1953	58	Smallton	Yes
150	Richards	Mandy	F	15/11/1970	41	Littletown	
151	Ripon	Julia	F	18/09/1968	44	Noplace	
152	Roberts	Moira	F	13/10/1968	44	Littletown	
153	Robertson	Brian	M	13/02/1959	53	Noplace	
154	Robinson	Christopher	M	23/11/1985	26	Noplace	Yes
155	Robinson	Douglas	M	17/08/1918	94	Littletown	
156	Robinson	Harold	M	26/01/1949	63	Smallton	Yes
157	Robson	Barry	M	21/04/1966	46	Smallton	Yes
158	Rogers	Patrick	M	09/06/1966	46	Littletown	Yes
159	Rogers	Richard	M	15/09/1939	73	Littletown	
160	Rogers	Thomas	M	15/03/1987	25	Smallton	
161	Rose	Victor	M	18/05/1947	65	Littletown	
162	Royal	Susan	F	05/11/1968	44	Smallton	Yes
163	Sanderson	Peter	M	17/11/1945	66	Littletown	

Note: It is now much easier to find information by visually scanning the data.

Note: Sorting a table changes the order of rows permanently. Unlike filters, which you will learn more about in the next exercise, a sort cannot be turned off at a later time to restore the table's original order.

- Save the workbook as **research sorted** and leave it open for the next exercise.

6.3 Filtering Data

Filtering is a simple technique for selecting records that match certain conditions (these conditions are known as **criteria**). Only the records that match the criteria are displayed; those that do not match are hidden. When a table is filtered, the worksheet is said to be in **Filter Mode**.

Activity:

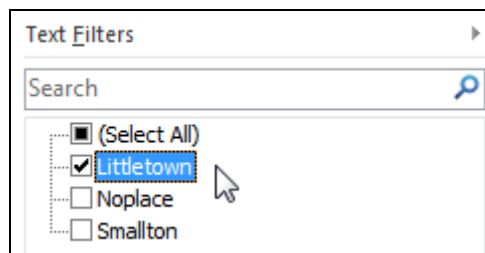
- Using the **research sorted** workbook, make sure the **Data** tab is displayed and any one cell in the range **A4:G223** is selected.
- Select **Filter** from the **Sort & Filter** group. The worksheet enters **Filter Mode** and drop-down arrow buttons appear in the column headings in row 3.



	A	B	C	D	E	F	G
1	Survey Results						
2							
3	Surname ▼	First Name ▼	Sex ▼	DOB ▼	Age ▼	Town ▼	First Visit? ▼
4	Ainslie	Ruth	F	28/05/1960	52	Noplace	Yes
5	Airey	Gordon	M	09/11/1964	48	Smallton	
6	Alberti	Franco	M	30/10/1969	43	Smallton	Yes

Note: The **Filter** tool automatically detects and selects the whole table. It also detects column header labels and then fills each drop-down filter list with all of the unique values that can be found in that column.

- Click the **Town** drop-down filter arrow.
- Then, deselect **Select All** and click to select **Littletown** instead.



- Click **OK** and only the people from **Littletown** are displayed in the worksheet.

Note: The drop-down arrows gain a filter symbol, , when the column is filtered.

- Using the **Town** drop-down filter arrow again, click **Select All**.
- Then, click **OK** to restore the table. All records reappear.
- To display all the males from **Noplace** who were visiting the park for the first time, select only **M** from **Sex**, **Noplace** from **Town**, and **Yes** from **First Visit**.

	A	B	C	D	E	F	G
1	Survey Results						
2							
3	Surname	First Name	Sex	DOB	Age	Town	First Visit?
20	Bates	Wilfred	M	16/05/1955	57	Noplace	Yes
24	Best	Gerard	M	09/02/1966	46	Noplace	Yes
25	Best	Robert	M	26/01/1969	43	Noplace	Yes
39	Carter	Nick	M	15/07/1971	41	Noplace	Yes
53	Cutter	William	M	08/05/1959	53	Noplace	Yes
101	James	Peter	M	31/07/1997	15	Noplace	Yes
112	Littlethorpe	Peter	M	17/12/1966	45	Noplace	Yes
154	Robinson	Christopher	M	23/11/1985	26	Noplace	Yes
172	Smith	Simon	M	06/11/1958	54	Noplace	Yes

Note: The number of records found, **9 out of 220**, is shown on the **Status Bar**.

- To redisplay the whole table again quickly, click the **Filter** button on the **Ribbon** to exit **Filter Mode**. The worksheet returns to its normal state.

Note: You can also apply custom criteria for even more advanced filtering.

- To only display the records of visitors who are less than 40 years old, enter **Filter Mode** again and select **Number Filters** from the **Age** drop-down list.
- Examine the types of custom filters available. Then, select **Less Than** from the menu that appears and type **40** in the criteria box.

Show rows where:
 Age
 is less than
 40
 And Or

- Click **OK** to filter the table. Only visitors less than 40 years old are now displayed.
- To restore the table, drop-down the **Age** filter, click **Clear Filter From "Age"**.
- Next, create a new filter to show only those people surveyed who are 40 years or older (i.e. greater than or equal to 40).
- Restore the full table and then create another filter to show only those people whose **Surname** begins with **B**.
- Restore the full table and then create a final filter to show only those people who were born between 01/04/1979 and 01/04/1989.
- How many of the people found were visiting the park for the *first* time?
- Save the workbook as **research filtered** and close it.

6.4 Advanced Filters

You can use standard logical operators and **wildcards** to help refine your filters and produce more precise results.

Activity:

1. Open the workbook **Bills**. A table appears containing invoices recently received by *Big Planet Theme Park's* construction department.
2. *Priti* from the construction team would like to find all records with invoice numbers that are *less than 200 or more than 300*. Select any cell in the table and then click **Filter** from the **Sort & Filter** group to enter **Filter Mode**.
3. Next, click the **Invoice No.** drop-down filter arrow and expand **Number Filters**.

Note: On the submenu that appears, *Excel* displays a selection of the most popular custom filters available. For more control, select **Custom Filter**.

4. Select **Custom Filter** to display the **Custom AutoFilter** dialog box. Complete the dialog box as shown below, making sure to select the **Or** logical operator.

Logical Operators

Wildcard Hints

Show rows where:
 Invoice No.
 is less than 200
 And Or
 is greater than 300
 Use ? to represent any single character
 Use * to represent any series of characters

5. Click **OK** and examine the 12 records found. Then, click the **Clear** button in the **Sort & Filter** group to remove the filter and restore all records.

Note: The built-in filters all produce a custom filter with the search criteria pre-selected.

6. Next, create a filter to only display records where the **Total** value is *greater than or equal to £600 and less than or equal to £1,200*. 7 records are found.
7. Click the **Clear** button in the **Sort & Filter** group to remove the filter.
8. Now, create a new filter to display records where the **Company** text *begins with* the criteria **greens**.

Company
 begins with greens

9. Examine the 5 records found. Then, click the **Clear** button to remove the filter.

Note: Wildcards are special symbols that can be used to select records containing values which are *similar* but not *exactly* the same as the search criteria. The most useful is the asterisk, *, which can be used in place of one or more characters in a query.

10. To refine the previous search, create a new filter to display records where the **Company** text *equals* the following criteria: **greens * office**.

11. Click **OK**. 3 records are found where the **Company** text starts with **greens**, ends with **office**, and has any number of other characters in between.

Note: For more control, the ? wildcard symbol can be used in place of a *single* character.

12. Click the **Clear** button in the **Sort & Filter** group to remove the filter.
13. Then, create a new filter to display records where the **Company** text *begins with* the following criteria: **j?nes**.

14. Click **OK** and examine the 6 records that are found. Due to the wildcard ? symbol, records are selected where the **Company** text starts with **j**, is followed by any other single character, and then ends with **nes**.
15. Click the **Clear** button in the **Sort & Filter** group to remove the filter.
16. Try creating filters that show the following records:

Bills where the **Invoice No.** is *between 200 and 220* (10 records).

Bills where the **Date** is *after 15/12/2012* (14 records)

Bills where the **Co. No.** (Company Number) is **134 or 345** (8 records)

Bills where the **Company** name *ends with* the text **Sons** (7 records)

Bills where the **Company** name *contains* the text **Joinery** (5 records)

Bills where the **Company** name *begins with ja* and *ends with Joinery* (4 records)

Bills where the **Total** value is *less than 1000 or more than 2000* (21 records)

17. Save the workbook as **bills filtered** and close it.

6.5 Goal Seek

Goal Seek helps you to “model” real-life situations and find answers to “**What-If**” questions such as “*What price do I charge to make a profit?*” or “*How many items do I need to sell to break even?*”. To do this, the tool automatically finds the best values to use in a formula to achieve a known, desired result.

Activity:

1. Open the workbook **Strike**. This spreadsheet shows the trading figures for a company that supplies cleaning products to the theme park.
2. Unfortunately there was a strike at the company last month. Change the **Sales** value in **C4** to **0**, the **Pay** value in **C8** to **0**, and the **Materials** value in **C10** to **0**.

Net Profit	£90	-£5,000	£4,560	-£350
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Note: The company is now making a *total* loss of **£350** for all three months (cell **F16**).

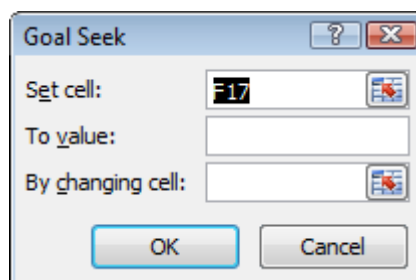
3. It is important that the company breaks even (i.e. has a total **Net Profit** of **0**). To do this, the **Price** that the company charges for its services *this month* could be increased.

Note: The value in **D5** can be changed manually and the effects observed.

4. Change the value in **D5** to **£7.00** and press <Enter>. The total **Net Profit** is now **£2,350**. However, it is unlikely customers will be happy with such a large price increase.
5. Change the value in **D5** to **£6.10** and press <Enter>. The company makes a loss again.

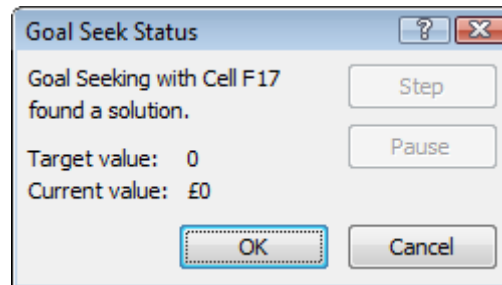
Note: You could keep altering the value in **D5** until the **Net Profit** is **0** (break even). However, this trial and error approach is haphazard and can take a lot of time.

6. To quickly find the lowest price needed to break even, the **Goal Seek** tool can be used. Click on cell **F17**, display the **Data** tab and click **What-If-Analysis** in the **Data Tools** group.
7. From the drop-down menu that appears, select **Goal Seek**. The **Goal Seek** dialog box appears with **F17** selected in the **Set cell** box.



Note: The **Goal Seek** dialog box is used to specify a cell to change to obtain (seek) a specific result (the goal).

8. Enter **0** in the **To value** box and **D5** in the **By changing cell** box. Click **OK** and the **Goal Seek** tool attempts to find a solution to the problem.



9. An exact solution is found and the worksheet updated. Notice that, by changing the value in cell **D5** to **£6.13**, the value **£0** is now obtained in cell **F17**.

Note: If *Excel* finds more than one possible solution, you can step through them using the **Step** button.

10. Click **OK** to accept the change (**Cancel** will dismiss the changes and restore the original cell values). So, if the company raises this month's prices to **£6.17** it will break even.

	A	B	C	D	E	F
1	Scrubbers Inc.					
2				Forecast		
3		September	October	This Month		Total
4	Sales	2500	0	4500		7000
5	Price	£6.00	£6.00	£6.13		
6	Turnover	£15,000	£0	£27,583		£27,583
7	Workers	20	20	20		
8	Pay	£150	£0	£150		
9	Wages	£3,000	£0	£3,000		£6,000
10	Materials	£6,850	£0	£11,400		£18,250
11	Overheads	£5,000	£5,000	£5,000		£15,000
12	Spending	£14,850	£5,000	£19,400		£39,250
13	Profit	£150	-£5,000	£8,183		£3,333
14	Tax Rate	40%	40%	40%		120%
15	Tax	£60	£0	£3,273		£3,333
16						
17	Net Profit	£90	-£5,000	£4,910		£0

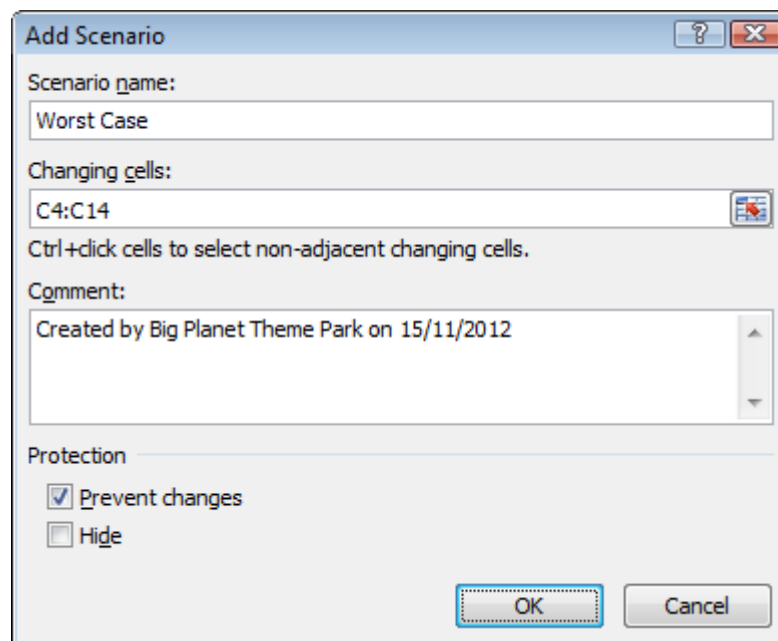
11. The company would still like to make a small profit. Use the **Goal Seek** tool to investigate how much the price in **D5** should be to produce a total **Net Profit** of **£100** in cell **F17**.
12. Save the workbook as **strike updated** and close it.

6.6 Scenarios

Excel's **Scenarios** tool is a simple feature that allows you to explore the outcomes of multiple "What-If" questions. To do this, a range of values is selected that represents a specific scenario (e.g. a best case scenario). More scenarios are then created that feature different cell values (e.g. the most likely or worse cases). You can then select each scenario at a time and see the impact that their different values have on the worksheet.

Activity:

1. Open the workbook **Forecast**. This spreadsheet has been created by *John* at the *IT Centre* to explore his department's budget for next year.
2. *John* has entered the money that he expects to spend on new IT purchases in the table (**B3:C14**). Unfortunately he has spent way too much, leaving the total budget (**F3**) overdrawn by **£13,000 (F4)**.
3. *John* would now like to create a number of different **Scenarios** to explore where savings can be made. Select the range **C4:C14**.
4. Using the **Data** tab, click the **What-If-Analysis** button. From the menu that appears, select **Scenario Manager**.
5. To start creating a new scenario, click **Add**. Enter the **Scenario** name as **Worst Case** and leave the **Changing cells** values as selected (**C4:C14**).



Note: Notice that you can enter a **Comment** to describe this **Scenario**.

6. Click **OK**. All of the values for the selected range are now shown. As this is probably the worst case scenario, leave the values as they are and click **OK** again.

7. The new scenario **Worst Case** is now displayed in the **Scenarios** list.
8. Let's create a new scenario to explore possible solutions to the problem. Click **Add**, enter the name as **Most Likely Case** and click **OK**.
9. *John* does not have the money to upgrade everyone's computer next year. Change the values for **PCs** to **£9,000**, **Laptops** to **£6000**, and **Tablets** to **£5000**

Note: Use the absolute references shown to the left of each value to identify cells.

10. Click **OK**.
11. Now, with the **Most Likely Case** scenario selected, click the **Show** button. The values on the worksheet are changed to those recorded for the **Most Likely** scenario. Notice that the **Remaining** figure in **F4** is now **£835** – within budget!

Note: The **Scenario Manager** dialog box can be moved to view cells underneath.

12. *John* thinks he can make more savings. Add a new **Scenario** called **Best Case**, make sure the range **C4:C14** is still selected, and click **OK**.
13. Using recycled printer cartridges, the cost of **Printer Ink** cost can be reduced to **£200**. Similarly, **Website** costs can be reduced to **£4,500**. Make both of these changes in the **Scenario Values** dialog box.
14. Click **OK**. There are now three **Scenarios** in the list.

15. Select each **Scenario** in turn and click **Show** to see the effect of applying each one.
16. Finally, **Show** the **Most Likely Case** and then close the **Scenario Manager** dialog box.
17. Save the workbook as **forecast scenarios** and close it.

6.7 Develop Your Skills

At the end of every section you will find a *Develop Your Skills* activity. Work through it to ensure you have fully understood the previous exercises and can demonstrate the practical skills learned.

1. Open the workbook **Temps**. This spreadsheet contains a list of temporary staff that have worked at the theme park in the past year.
2. Sort the staff members by **First Name (A to Z)**.
3. Next, create a custom sort that sorts by **First Name (A to Z)** and then by **Surname (A to Z)**.
4. Filter the employees to show only those who are *between 20 and 30* years old (4 records).
5. **Clear** the filter.
6. Next, create another filter to show only those people whose **Payroll Number** is below **901240** or above **901250** (8 records).
7. **Clear** the filter.
8. Using a wildcard, create a custom filter to find people whose **Surname** begins with the letters **Ch** and ends with the letter **r** (2 records).
9. Display the **Hours** worksheet (using the worksheet name tabs). This spreadsheet contains the details of the hours worked by temporary staff.
10. Column **C** details the number of hours that temporary staff are scheduled to work next month. Unfortunately, the **Total Cost (C16)** exceeds the available budget (**B19**).
11. Create a new **Scenario** based on the current values in the range **C5:C14**. Name it **Over Budget** and close the **Scenario Manager**.
12. Perhaps the number of hours for **Week 10** (55) can be reduced? Use **Goal Seek** to find the best value to place in this cell so that the **Total Cost** is on budget (**£2,500**).
13. Create a second **Scenario** based on the current values in the range **C5:C14**. Name it **On Budget**.
14. Create a third **Scenario** named **Under Budget**. Enter values for **Week 3** as **20**, **Week 5** as **25**, and **Week 8** and **30**.
15. Show each of the Scenarios in turn and observe the effect on the worksheet.
16. Save the workbook as **temps complete** and close it.

Note: A model solution for this activity is provided in the **Sample Solutions** data folder.

6.8 Section Summary

Well done! You have now completed all of the exercises in *Section 6: Working with Data*. Using the practical knowledge and skills learned you should now be able to:

- Analyse and manipulate data stored in tables/lists
- Rearrange data by sorting
- Reduce data by filtering
- Perform advanced filters using logical operators and wildcards
- Perform “What-If” analyses to model real-life situations
- Understand and use goal seek
- Understand and use scenarios to model different outcomes

Note: If you feel you are unsure about any of the topics covered in this section, you should revisit the appropriate exercises and try them again before moving on.