18 Data manipulation

In this chapter you will learn how to:

- describe flat-file and relational database structures
- create a flat-file database from an existing data file
- create a relational database from existing data files
- define database structures
- describe the key features of data entry form design
- create and edit a data entry form
- enter different forms of data into a database
- add a field to an existing table
- search for subsets of data
- extract summary data
- produce a report
- export data and reports for use within another package
- use formulae within a database
- sort data within a database.

For this chapter you will need these source files from the CD:

- cars.csv
- customers.csv
- orders.csv
- stationery.csv
- students.csv
- teachers.csv.

18.1 Create a database structure

18.1.1 What is a database?

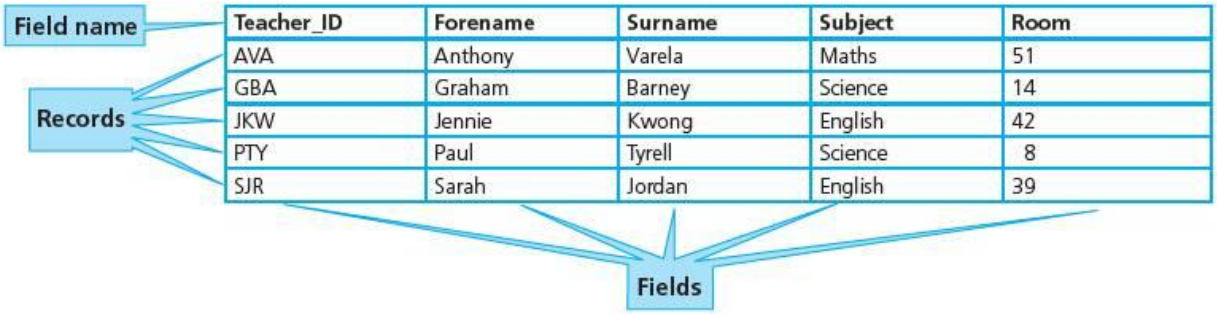
A database is an organised collection of data. A database program is software which stores and retrieves data in a structured way. This includes the data that is stored and the links between the data items. All databases store data using a system of files, records and fields:

- A **field** is a single item of data, such as a forename or date of birth. Each field has a field name that is used to identify it within the database. Each field contains one type of data, for example numbers, text or a date.
- A **record** is a collection of fields, for example all the information about one person or one item. These may contain different data types.
- A **file** (in database terms) is an organised collection of records, usually where all the records are organised so that they can be stored together. A file can have one or more tables within it.

Although all databases have these three elements in common, there are two types: **flat-file databases** and **relational databases**.

18.1.2 Flat-file databases

A flat-file database stores its data in one **table**, which is organised by rows and columns. For example, in the following database about teachers, each record (row) in the table contains data about one person. Each column in the table contains a field, which has been given a field name, and each cell in that column has the same, predefined data type.



Teacher_ID	Forename	Surname	Subject	Room
AVA	Anthony	Varela	Maths	51
GBA	Graham	Barney	Science	14
JKW	Jennie	Kwong	English	42
PTY	Paul	Tyrell	Science	8
SJR	Sarah	Jordan	English	39

18.1.3 Relational databases

A relational database stores data in more than one linked table, stored in a file. Relational databases are designed so that the same data is not stored many times. Each table within a relational database will have a key field. Most tables will have a **primary key** field that holds unique data (no two records are the same in this field) and is the field used to identify that record. Some tables will have one or more **foreign key** fields. A foreign key in one table will point to a primary key in another table.

Using the earlier example, if we wanted to add to the table the names of each student taught by each teacher using a flat-file database, the table would look like this:

Teacher_ID	Forename	Surname	Subject	Room	Student_ID	Student_FName	Student_SName
AVA	Anthony	Varela	Maths	51	G12345	Jasmine	Hall
AVA	Anthony	Varela	Maths	51	G12346	James	Ling
AVA	Anthony	Varela	Maths	51	G12348	Addy	Paredes
AVA	Anthony	Varela	Maths	51	G12349	Hayley	Lemon
AVA	Anthony	Varela	Maths	51	G12351	Jennie	Campbell
GBA	Graham	Barney	Science	14	G12345	Jasmine	Hall
GBA	Graham	Barney	Science	14	G12348	Addy	Paredes
GBA	Graham	Barney	Science	14	G12349	Hayley	Lemon
JKW	Jennie	Kwong	English	42	G12345	Jasmine	Hall
JKW	Jennie	Kwong	English	42	G12349	Hayley	Lemon
JKW	Jennie	Kwong	English	42	G12351	Jennie	Campbell
PTY	Paul	Tyrell	Science	8	G12346	James	Ling
PTY	Paul	Tyrell	Science	8	G12351	Jennie	Campbell
SJR	Sarah	Jordan	English	39	G12346	James	Ling
SJR	Sarah	Jordan	English	39	G12348	Addy	Paredes

If the data is split into two tables – one for the teachers and one for the students – that are linked together, it can be stored and retrieved more efficiently, like this:

Teachers' table

Teacher_ID	Forename	Surname	Subject	Room
AVA	Anthony	Varela	Maths	51
GBA	Graham	Barney	Science	14
JKW	Jennie	Kwong	English	42
PTY	Paul	Tyrell	Science	8
SJR	Sarah	Jordan	English	39

Students' table

Student_ID	Student_FName	Student_SName	English	Maths	Science
G12345	Jasmine	Hall	JKW	AVA	GBA
G12346	James	Ling	SJR	AVA	PTY
G12348	Addy	Paredes	SJR	AVA	GBA
G12349	Hayley	Lemon	JKW	AVA	GBA
G12351	Jennie	Campbell	JKW	AVA	PTY

These two tables are linked with a 'one-to-many' relationship, because one teacher's record is linked to many students' records. The primary key fields (which **must** contain unique data) are the Student_ID and Teacher_ID.

18.1.4 Why use a relational database?

From the example above you can see how much internal memory and external storage space is saved by not storing data more than once. Imagine the space saved for a school with over a hundred teachers and over a thousand students, or in a national database with data on every driver and every vehicle registered in a country.

There are three common types of changes which can be made to the data contained in a database. Records/data can be added, edited or deleted. Because data is not repeated in a relational database, each change to an item of data or to a record has to be made only once. It is also much easier for users to produce reports from a relational database, where data is held in two or more tables, than from two or more flat-file databases.

Although people often think that it is quicker to search using relational rather than flat-file databases (in some cases, where indexed values are used, it can be true), it is not always the case. It depends on the structure of both databases and the quantity of the data being searched.

You will need to create both flat-file and relational databases, but the data for these will be provided. You will be using *Microsoft Access*, which is part of the *Microsoft Office* suite. When used with a single table *Access* is a flat-file database, but it can also be a relational database when used with more than one linked tables.

18.1.5 Data types

When you create a new database you will set a data type for each field. The data type tells *Access* how to store and manipulate the data for each field. You will usually decide what data type should be used for each field. There are a number of data types that you can use and different packages may have different names for them. The list below shows the generic names for these data types but, depending on the package used, you may have different names. For example, in *Access* an **alphanumeric** field is called a text field. The three main types of field are **alphanumeric**, **numeric** and **Boolean**.

- **Alphanumeric** data can store alpha characters (text) or numeric data (numbers) that will not be used for calculations. In *Access* this is called a text field.
- A **numeric** data type (as the name suggests) is used to store numeric values that may be used for calculations. This does not include numeric data such as telephone numbers, which should be stored in an alphanumeric data type. In *Access* this is called a number field. There are different types of numeric field including:
  - **integer** sub-type, which store whole numbers. In *Access* you can select an integer field or a long integer field. It is wise to use a long integer field if it is going to contain three or more digits

- **decimal** sub-type, which will allow a large number of decimal places, or a specified restricted number, if this is set in the field properties when the database is created
- **currency** sub-type, which allow currency formatting to be added to the display. This includes currency symbols and regional symbols. The database does not store these symbols as this would use up valuable storage space
- **date and time** sub-type, which store a date and/or time as a number.

- A **Boolean** (or logical) data type stores data in a Yes/No (or True/False, 0/–1) format.

There are other data types, such as autonumber (which generates unique numbers) but as they are not available in all packages you do not need to worry about them. Some packages, such as *Access*, have long and short versions of their data types (for example, long text and short text) but these are still versions of alphanumeric data types.

Other data types that are not studied in depth here can often be found in commercial databases, for example placeholders for media such as images, sound bites and video clips. These are often used in web applications where a **back-end database** holds the media to be displayed in another application, such as a webpage.

As stated above, you will be using *Access*. *Microsoft Excel* is **not** suitable for database tasks as you cannot define data types.

Task 18a

You work for a small garage called 'Dodgy Dave's Motors'. This garage sells used cars. Using a suitable database package, import the file **cars.csv**. Assign the following data types to the fields.

Field name	Data type
Who manufactured the car?	Text
Model	Text
Colour	Text
Price that we bought the car for	Numeric/Currency/2 decimal places
Price that we will sell the car for	Numeric/Currency/2 decimal places
Year	Numeric/Integer
Extras	Text
Does the car need cleaning?	Boolean/Logical

Some field names are inappropriate. Create appropriate and meaningful field names for those fields. You may add another field as a primary key field if your software requires this.

Save the database.

It is important to make sure that you use the field names exactly as given in the question paper, unless you are asked to provide appropriate and meaningful field names. In this task you are asked for appropriate and meaningful field names, so start by looking at the detailed descriptions given instead of the field names, or even examine the data to work out what information the fields contains.

For this task, the descriptions help you to work out meaningful field names. These should always be short enough to allow printouts to fit easily on to as few pages as possible. The first example is Who manufactured the car?; this could be shortened to Manufacturer or even Make. Make is short, meaningful and appropriate, so use that. Price that we bought the car for could be changed to Purchase Price, Purchase, P Price, P_Price or just PPrice. Although *Access*

will allow any of these, do **not** use field names with spaces in as they may cause problems if you try to do more complex operations with the database. You could use any of the other three options, as all would be acceptable. For this task, use PPrice. Similarly, the next field can be called SPrice. Consider the final field, Does the car need cleaning?. Simply using the fieldname Clean could give the wrong idea, as it could mean 'Does the car need cleaning?' or 'Is the car clean?'. It is sensible to plan this and make the changes in the .csv file before importing the data into *Access*.

Open the **cars.csv** file in *Excel*. Move into the relevant cells and type in the new field names. Check the spelling carefully before resaving the data file. Save it with the filename **cars1.csv** so that you do not lose the original data file. Task 18a is continued in the next section.

18.1.6 Create a flat-file database from an existing file

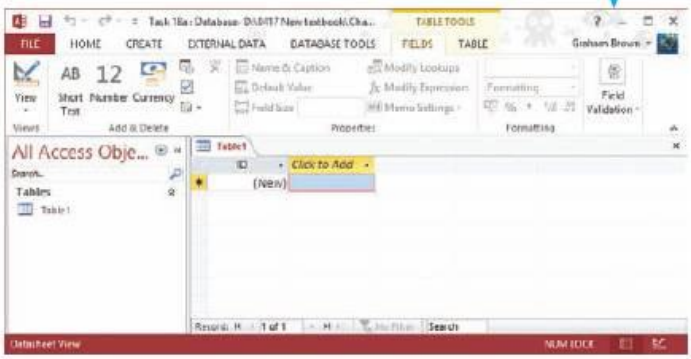
Advice

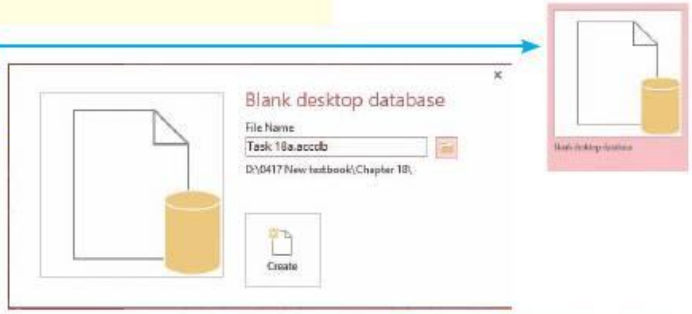
Check that the data files are in the correct format for your regional settings before attempting this section (see Introduction, page viii).

Open *Access* and select the Blank desktop database icon.

Set the filename to task18a and select Create.

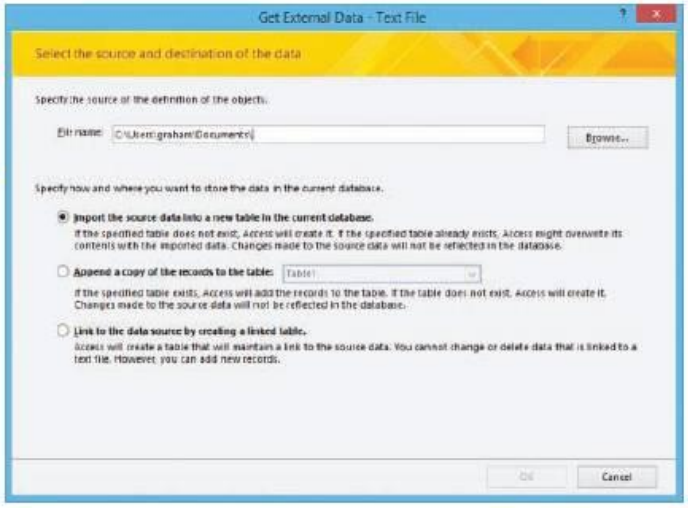
This should open a new database similar to this.





To import the file **cars1.csv** (remember, we saved it with a new filename in an earlier section) for the task, select the EXTERNAL DATA tab.

In the Import & Link section, double click on the Text File icon, as files saved in .csv format are text files with each data item separated from the next by a comma. This icon opens the Get External Data – Text File window, like this.



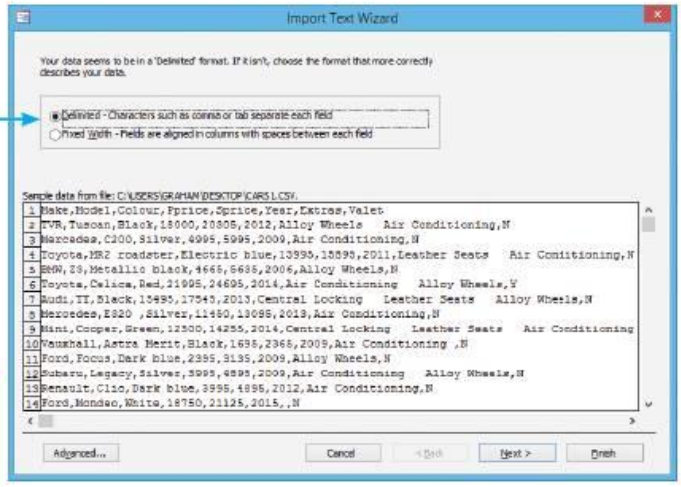
Use the Browse... button to find the file **cars1.csv** and ensure that the top radio button is selected. This will make sure that the data is saved in a new data table. Click on OPEN, then click on OK.

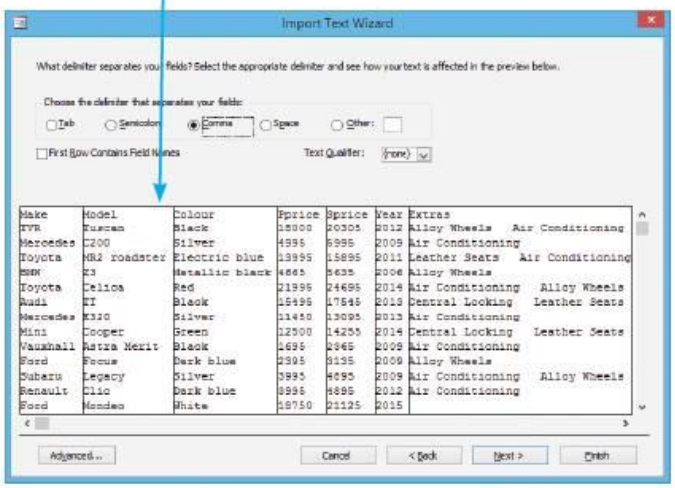
Advice

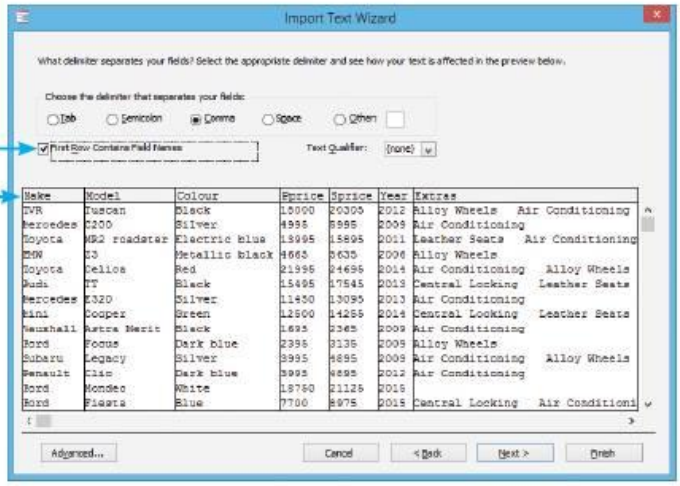
A large number of students perform poorly on these questions in examinations because they select the bottom option to link the database to data held in a spreadsheet.

The Import Text Wizard window will open. As comma separated value (.csv) files are delimited files (the comma is the delimiter), select the Delimited radio button and click on Next > .

For the next part of the wizard, make sure that Comma is selected using the radio buttons (unless you have changed the .csv file so that it uses semicolons as delimiters). Examine the first row of the data and decide whether this row contains the field names that you need or if it contains the first row of data. If the first row contains the field names click on the First Row Contains Field Names tick box. As you tick this box, the first row changes from this to this.

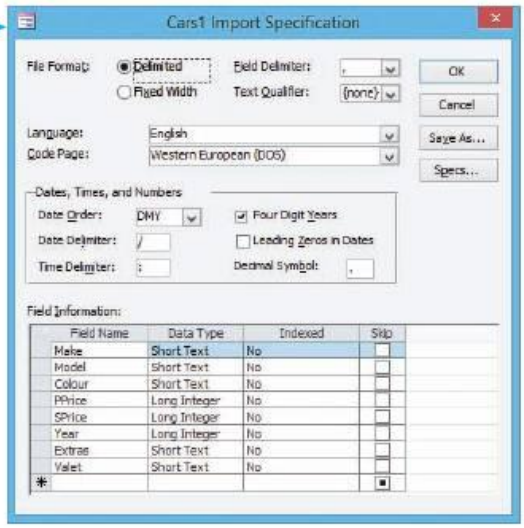






Click on Advanced... to open the Import Specification window.

Check that all the field names and data types match those specified in the task. In this case the PPrice, SPrice and Valet fields do not have correct data types. The PPrice and SPrice fields need changing to numeric (currency) fields and the Valet field needs changing to a Boolean (Yes/No) field.

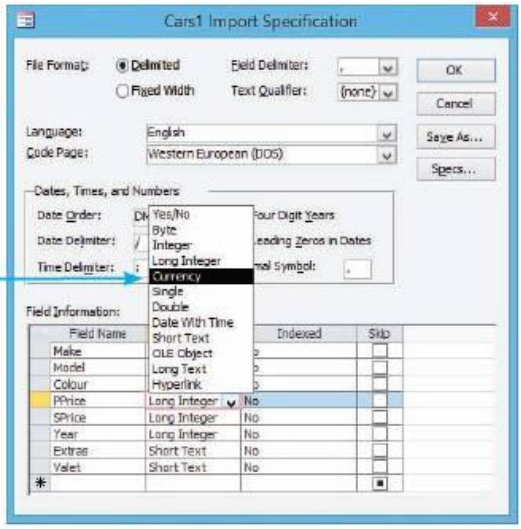


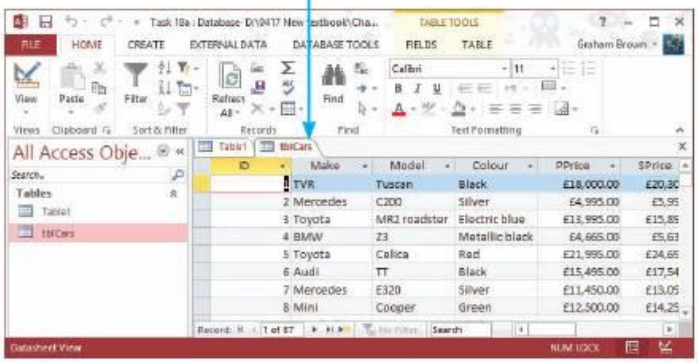
Advice

.txt and .rtf files may have different characters to separate each data item. If either of these file types is to be used, open the file in Notepad and examine the data. Work out which character is the separator and select this instead of a comma or semicolon.

To change the PPrice field into a numeric field with a currency subtype, click on the Data Type cell for this field and use the drop-down list to select the Currency data type. Repeat this process for the SPrice field.

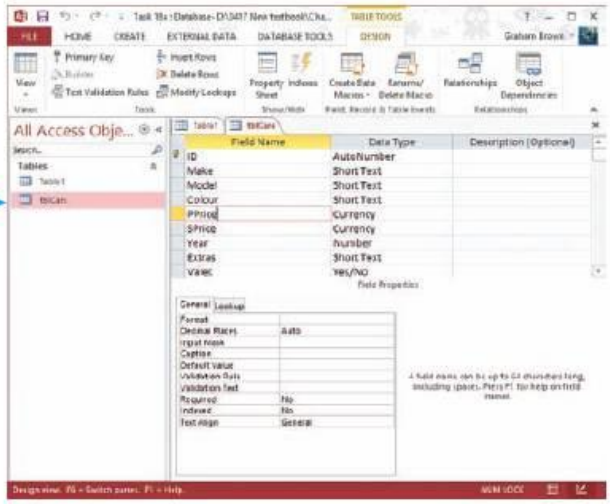
For the Valet field, use the drop-down list to change the Text data type into a Yes/No data type. When all of these changes have been made, click on OK. Select Next > twice. In the next screen, ensure that the radio button for Let Access add primary key is selected – this adds a new field called ID to the table; *Access* will use this as the primary key field. Click on Next > and in the Import to Table: box, enter tblCars. This is a meaningful table name as 'tbl' shows you that it is a table and 'Cars' gives relevance to the data. Click on Finish to import the data and on Close to close the wizard. Double click on tblCars to display the table like this.





Advice

The icon in the Views section of the HOME tab will let you change between Datasheet and Design View.



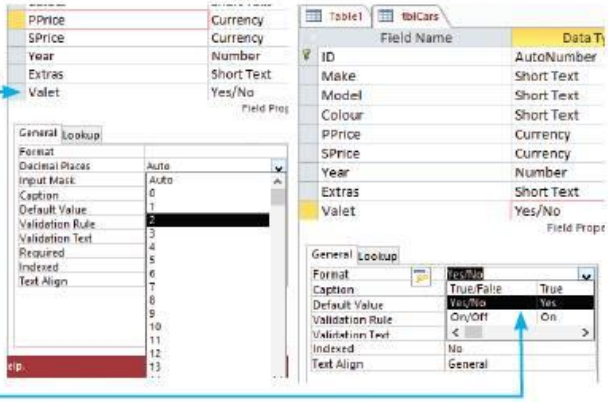
Changes to the data types or other properties can be made from the HOME tab. In the Views section click on the Design View icon.

The task instructed you to set the PPrice field to two decimal places. You can check this by clicking the left mouse button in the PPrice field and viewing the number of Decimal Places in the General tab at the bottom of the window.

This is set to automatic. Click on the cell containing Auto and use the drop-down list to set this to two decimal places. Repeat this process for the SPrice field.

To change the Boolean field so that it displays Yes or No (it does not store the data like this), click in the Valet field and, in the General tab, select the Format cell. Use the drop-down list to select the Yes/No option.

Save the database as task18a.



Advice

If you need percentage values, set an integer or long integer data type and select Percentage from the Format drop-down menu for this field.

Activity 18a

You work for a shop selling office supplies called 'Easy as ABC'. Using a suitable database package, import the file **stationery.csv**. Use these data types for each field.

Field name	Data type
Code	Numeric/Integer
Type of product to be sold	Text
Description of the product to be sold	Text
Quantity of items in each pack	Numeric/Integer
Colour	Text
Sales price	Numeric/Currency/2 decimal places
Purchase price	Numeric/Currency/2 decimal places
Discount	Boolean/Logical

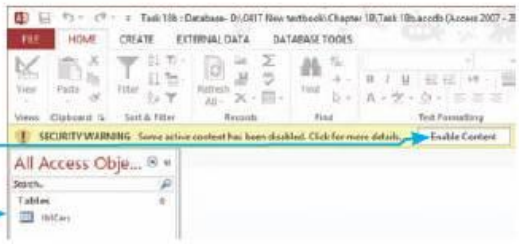
Some field names are inappropriate. Create appropriate and meaningful field names for those fields. Use the Code field as your primary key. Save the database.

18.1.7 Enter data using a table

Task 18b

Open the database that you saved in Task 18a. Add this new car to the database.

Make	Model	Colour	PPrice	SPrice	Year	Extras	Valet
Ford	Focus	Silver	1350	2285	2008	Alarm Central Locking Alloy Wheels	Yes



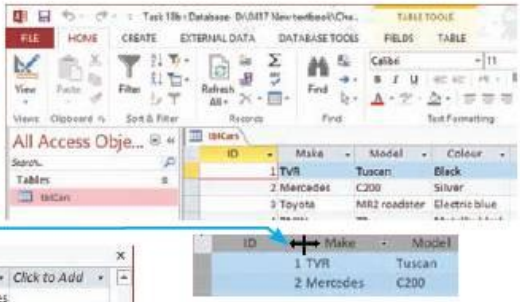
Data is normally entered into a database using a form but, if a form is not asked for, it may be quicker to use the table to enter new data.

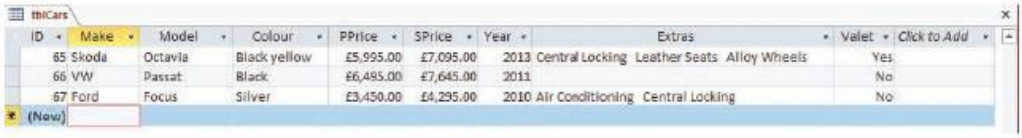
Open the database saved in Task 18a. First click on the Enable Content button.

Double click the left mouse button on the table name to open the table in Datasheet View.

To make sure that all the columns are fully visible, click the left mouse button on the grey square to the left of the ID field name to highlight the entire datasheet. Move the cursor between two field names until it looks like this and then double click.

This will adjust the display widths of the columns. Scroll down the list of cars until you reach the entry with a star next to it, which will allow you to add a New car at the bottom.





Click the cursor in the Make cell for the new car and add 'Ford'. The new ID number will automatically appear in the ID field, as you set this field as an AutoNumber type. Move the cursor and enter the Model, Colour, Year and Extras data from the task in the same way. You can always use copy and paste for

some data. For example, if you need to make sure the spelling of 'Focus' is correct, copy and paste it from record 67 above. For the PPrice and SPrice fields, enter only the numbers (and decimal point if this is required). Do not attempt to enter any other characters, such as the currency symbol. As you press the <Enter> key after adding the prices *Access* will set the data into currency format. Each time you press the <Enter> key, *Access* automatically saves the changes you made to the data. The Valet field will automatically default to 'No'. Move into this field and enter 'Yes' in this cell. *Access* will automatically save each item of data as you enter it.

Check your data entry carefully using **visual verification**. This is when you compare the original data on paper (in this case, in the Task 18b brief) with the data that you have entered into the computer. Data entry errors in a database may cause problems when you try to use the database to search or sort. Save the database as task18b.

18.1.8 Add a field to an existing table

Task 18c

Open the file that you saved at the end of Task 18b.

Add a new field to the database called PDate. Add the purchase date of 20 December 2014 for the last car added to the database.

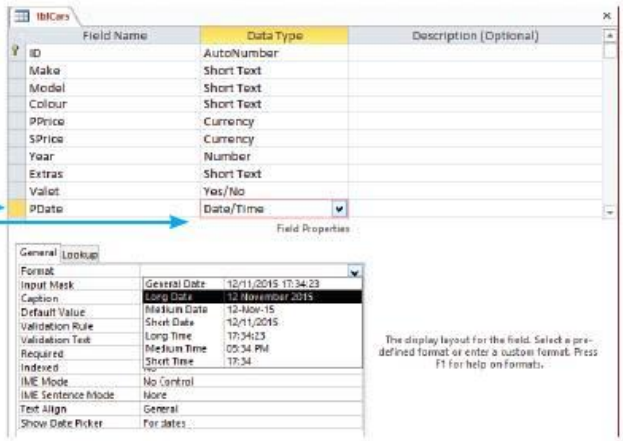
Open the database and open the table tblCars in Design View. Move to the empty row below the Valet field and enter the Field name PDate.

In the Data Type box use the drop-down list to select the Date/Time type.

Choose the most appropriate Format for the question. In this case, the task asks for a Long Date format.

Save the database as task18c and select the Datasheet View. Move the cursor into the PDate field for the new record (the Silver Ford Focus) and use the Calendar icon to select the correct date.

You may need to double click to the right of the PDate column to widen the column. Save the database as task18c.



Activity 18b

Open the file saved in Activity 18a.

Add these three items of stationery to the database.

Code	Type	Description	Quantity	Colour	SPrice	PPrice	Discount
44282	Lever Arch File	Laminated Lever Arch Files	1	Red	57.22	28.96	No
44283	Lever Arch File	Laminated Lever Arch Files	1	Yellow	57.22	28.96	No
47478	Spine Label	Eastlight Spine Lables	100		30	13.86	Yes

18.1.9 Create a relational database from existing files

Task 18d

You work for Tawara High School. You will edit some data about the Mathematics Faculty.
Using a suitable database package import the file **teachers.csv**.

Use these field names and data types:

Field name	Data type
SCode	Text
FName	Text
SName	Text
Subject	Text
Room	Numeric/Integer

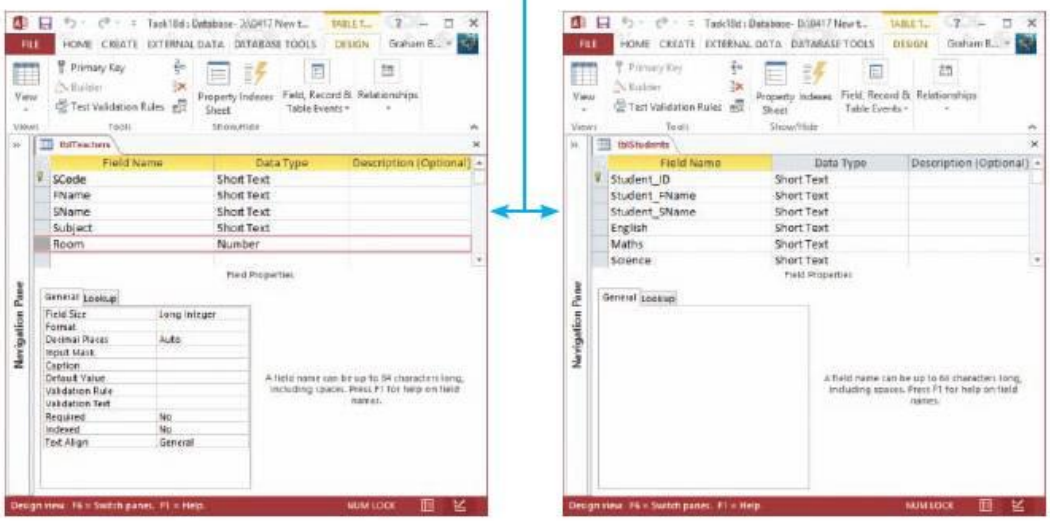
Set the SCode field as a key field.

Import the file **students.csv** as a new table in your database.

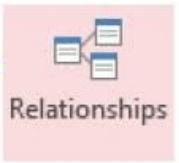
Set the Student_ID field as a key field.

Create a one-to-many relationship as a link between the SCode field in the Teachers' table and the Maths field in the Students' table.

Use the techniques you practised in Task 18a to import the two tables into the database so that each table looks like this.

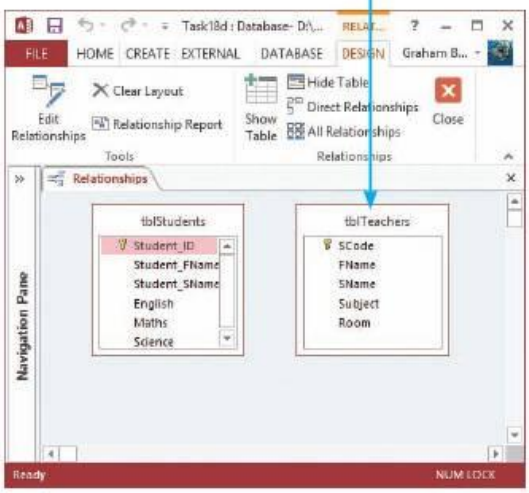


Select the DATABASE TOOLS tab and double click on the Relationships icon to open the Show Table window.

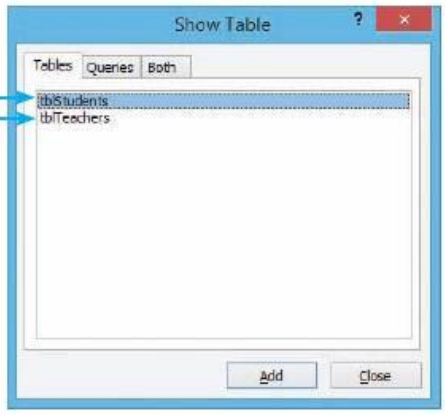


Double click on each of the table names to place the table in the Relationships tab.

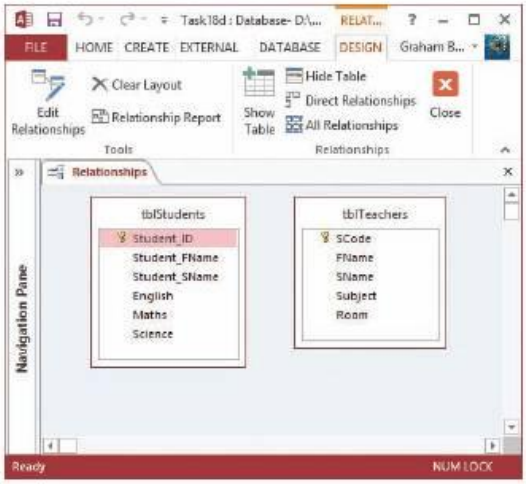
After both tables have been added, click on Close to see the Relationships tab like this.



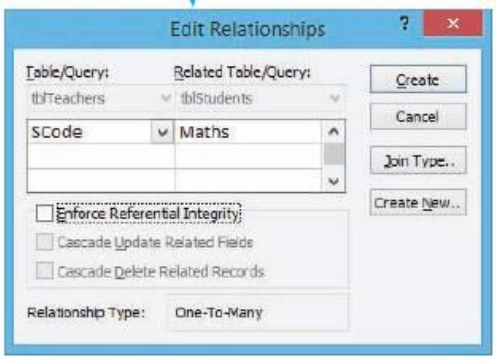
Move the cursor to sit over the bottom right corner of the Students table so that it changes to a drag arrow; expand it slightly so that all the field names are fully visible.

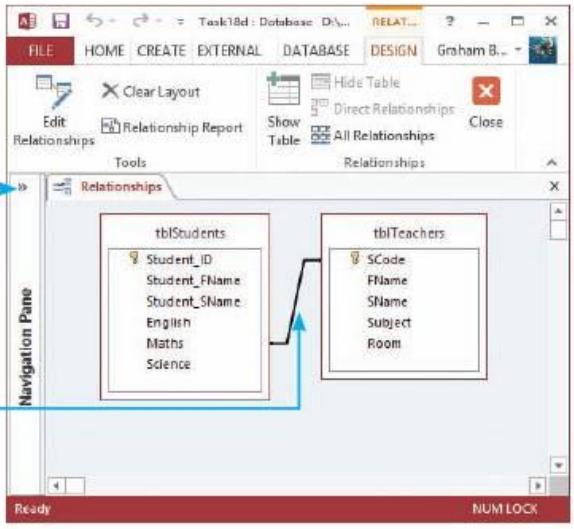


To create the one-to-many relationship between the SCode field in the Teachers' table and the Maths field in the Students' table; click the left mouse button down in the tblTeachers table on the SCode field. Hold down this button, drag the cursor and drop it in the tblStudents table over the Maths field. The Edit Relationships window will appear.



This window shows the link between the fields in both of the tables. The bottom of the window displays the type of relationship that you have created. You cannot change it here: if the relationship is not the correct type, you have probably missed setting one of the key fields. To correct this, click Cancel, add the key field and redo this task. You will be expected to show how you created the relationship. A screen shot of this window taken with the <Alt> and <Prt Scr> keys will copy this into the clipboard. Paste this into the document that you will present as evidence of your method. When you click Create the window will disappear and the Relationships tab will look like this.





In this relationship SCode is the primary key field in tblTeachers and Maths is the foreign key field in tblStudents. If you wish to view or edit the relationship again, you can double click the mouse on the relationship line that joins the two tables.

Save the database.

Activity 18c

Open the file saved in Activity 18b.

Import the file **orders.csv**. Use these field names and data types:

Field name	Data type
Order_No	Numeric/Integer
Customer_No	Text
Product_Code	Numeric/Integer
Units_Sold	Numeric/Integer

Assign a new field as a key field. Import the file **customers.csv**. Use these field names and data types:

Field name	Data type
Customer_ID	Text
Name	Text
Address_1	Text
Address_2	Text
Address_3	Text
Zip_Code	Text
Discount_%	Numeric/2 decimal places

Set the Customer_ID field as a key field. Create a one-to-many relationship between the Code field in the Stationery table and the Product_Code field in the Orders table. Create a one-to-many relationship between the Customer_ID field in the Customers table and the Customer_No field in the Orders table.

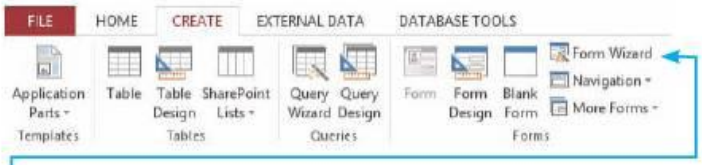
Take screen shot evidence showing the:

- field names and data types used in these two tables
- relationships between the three tables.

18.1.10 Create a data entry form

Task 18e

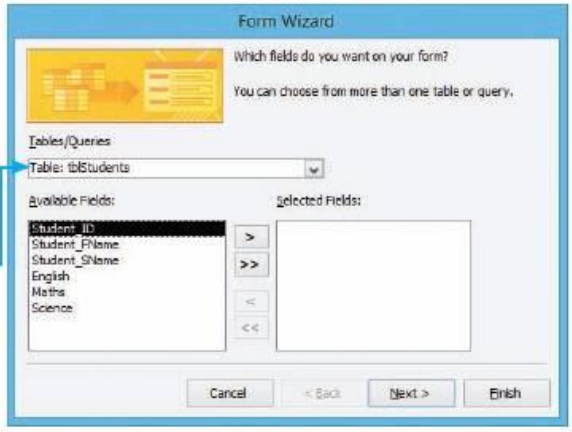
Open the file saved in Task 18d. Add new data entry forms to collect data for all fields in both of the tables.



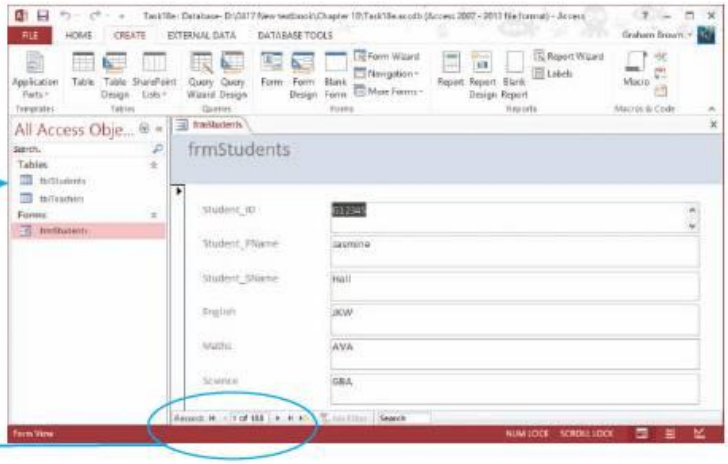
Open the file saved in Task 18d. The best way to create a data entry form is to select the **CREATE** tab, then click on the **Form Wizard**.

The **Form Wizard** window opens. Select the table that holds the fields that you will include in the form. If the form needs fields from more than one table then select a query (you will use these later in the chapter). We will create the first form by selecting **tblStudents**, so leave that selected in the top selection box.

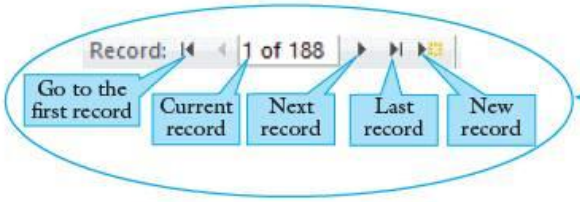
You can move each field across into the form using the > key but, as we want all the data from this table on the form, use the double arrow key.



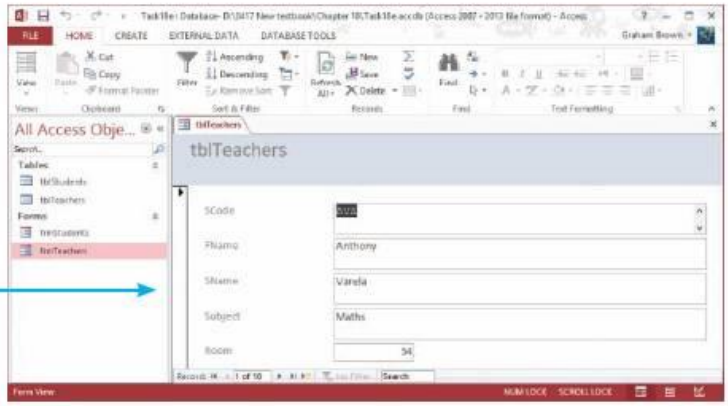
All of the fields move into the selected fields box. Click on Next >. Choose that layout of the screen that you require (I chose Columnar for this task) before clicking on Next > again. Change the title of the form to frmStudents so that you can easily tell that it is a form. Click on Finish to open the form.



The bottom of the form has a navigation bar which can be used to move from record to record like this.



Repeat this process for tblTeachers to create the second data entry form, which should look like this.



The data entry form may need editing to make it easier for a different target audience to use. Using short and meaningful field names to store the data may not be easy for other users to understand, particularly if they do not work with databases regularly. For example, if children were to add their data, simple questions would be better than encoded field names, along with instructions on how to complete the form.

Save the database as task18e.

18.1.11 Edit a data entry form

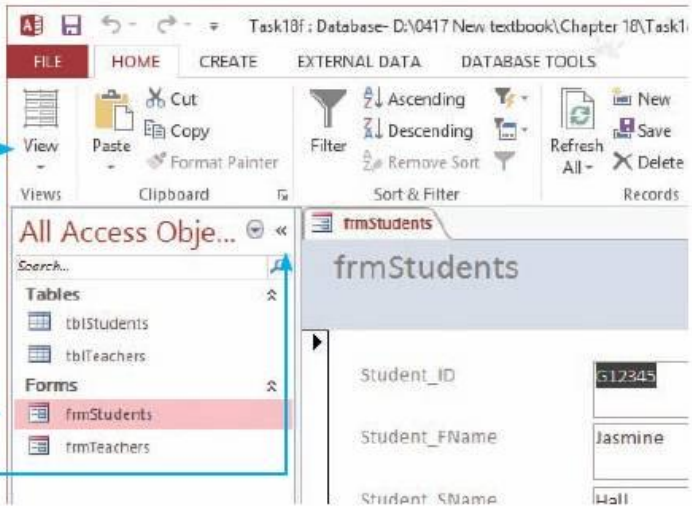
Task 18f

Open the file saved in Task 18e. Edit the data entry form for student data to make it easier for students to enter their own data.

Open the database saved in Task 18e. Double click the left mouse button on frmStudents, which is in the list of database objects under forms, on the left.

Select the HOME tab, then the drop-down arrow in the View section to pull down the different ways of viewing the form. Select Design View.

Click on the minimise button to hide the list of database objects, giving you more room to work.



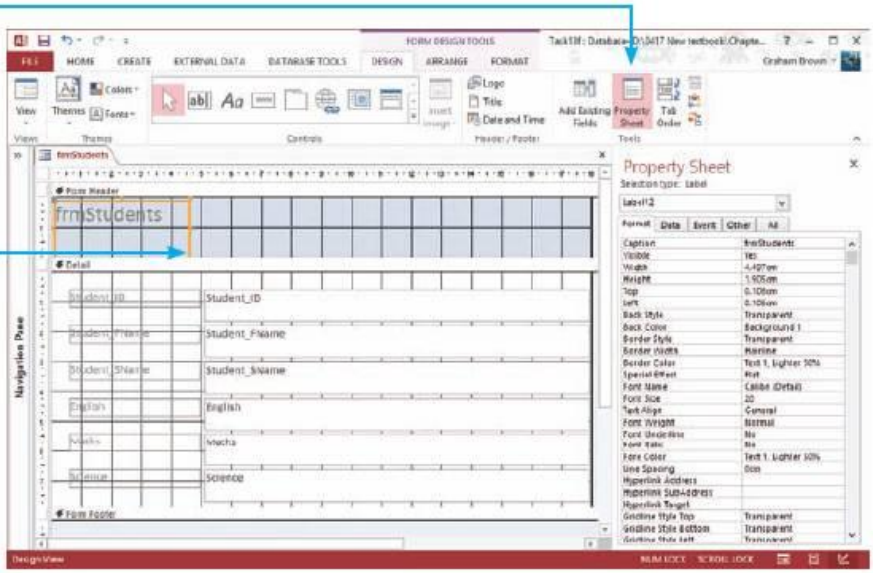
From the Tools section of the Toolbar, select the Property Sheet icon. This will open the Property Sheet for the current object. Move the cursor into the Form Header and click on the outline so that it changes to orange.

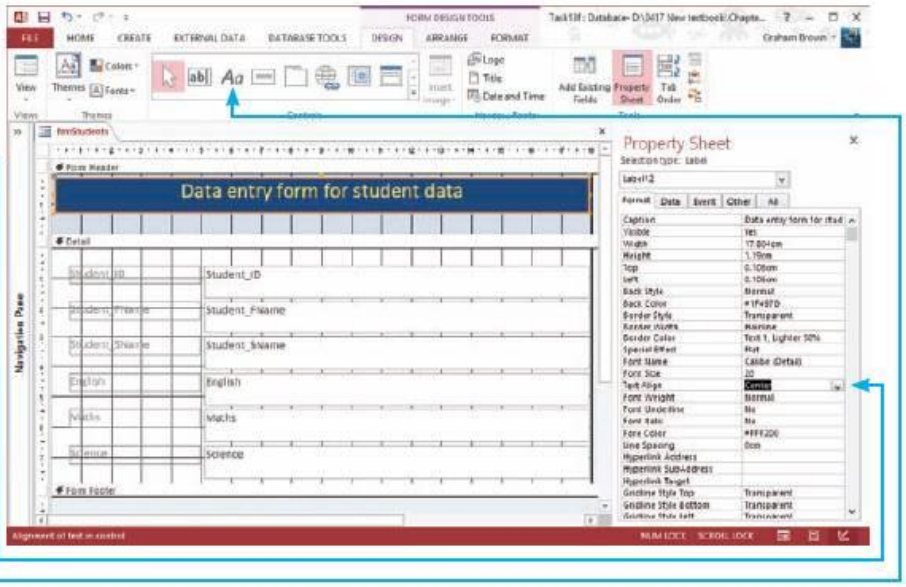
Highlight the text in this label box and change it to a more suitable heading. If the text does not fit in the label box, grab the drag handles and make it larger. You may not be able to see the lower drag handles; if you need to use them, drag the Detail bar down slightly, but remember to move it back up again later. If you wish to change the font, colours or formatting of the text (or any other form element) this can be done in the Property Sheet. In this example I have changed the Text Align to Center, Fore Color and Back Color by clicking on them, then on the . . . icon, then by choosing colours from the palette.

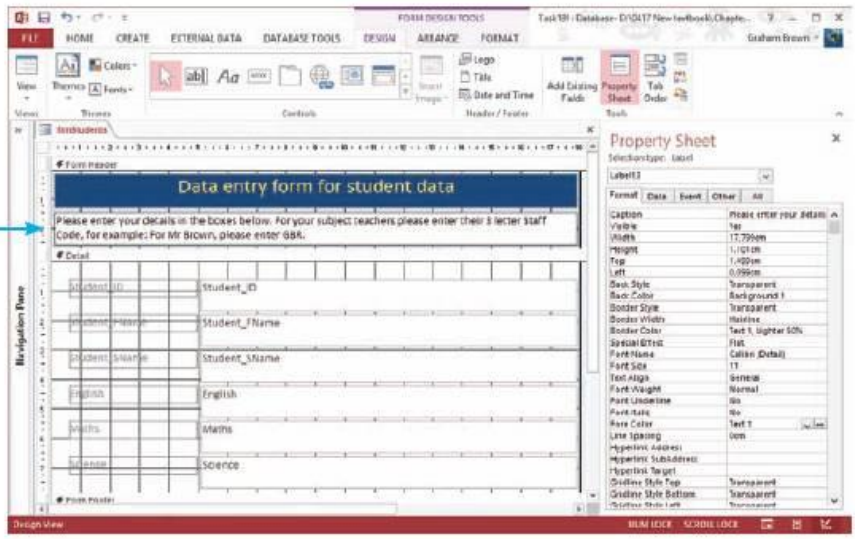
As students would be expected to enter their own data, it is important to tell them what to do. From the Controls section of the toolbar, select the Label icon.

Drag a new label box into the header and enter some instructions to help the students to understand what to enter, like this.

In the Detail row each field has two boxes: the left one is the label box and this is what is displayed to the user; the right box is a text box and this is joined to the data table. This box is where, when the form is displayed in Form View, the user will enter the data. Select each label in turn and edit the text. You may need to resize some of the label boxes so that all the text fits. Each box has a large drag handle in the top left corner that will allow you to drag the box around the form to rearrange the form without resizing the box. This is useful if you are creating your form to a particular design. From the View section of the

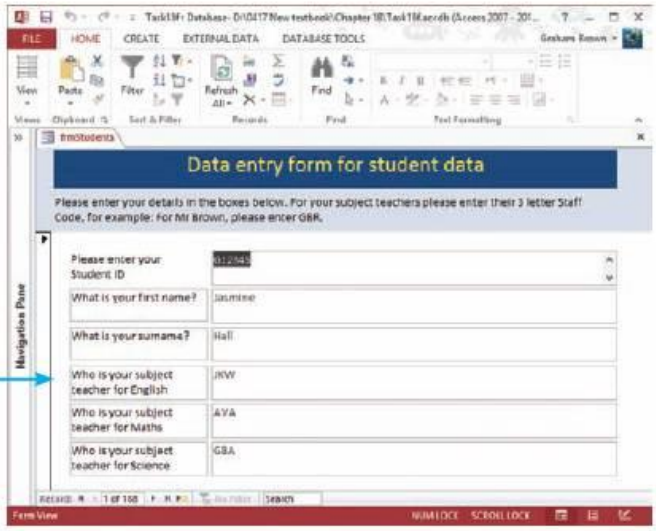






toolbar, use the drop-down arrow under the View icon to select Form View like this.

Save the database as task18f.



18.1.12 Enter a new field on to an existing form

Task 18g

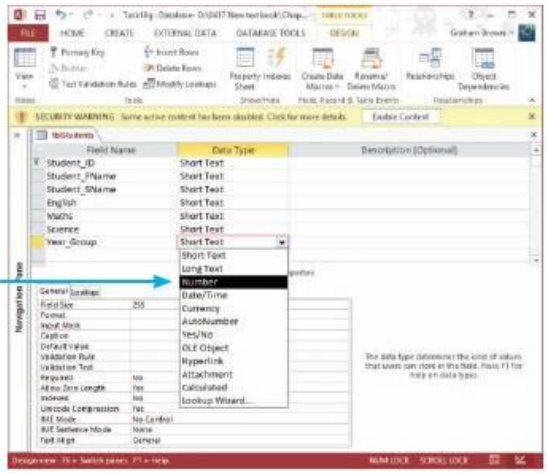
Open the database that you saved in Task 18f.

Two new fields are to be added to the students' data. Use these field names, data types and field descriptions:

Field name	Data type	Description
Year_Group	Numeric/ Integer	The school year between 7 and 11 inclusive
Tutor	Text	The name of the student's tutor

Open the database. Remember you hid the Navigation Pane. Restore it using the arrow ▶.

Open tblStudents in Design View. Enter the Field Name, Year_Group (you cannot shorten it to Year as this is a reserved word in *Access*, try it and see…). The data type always starts in Short Text format; click on that cell and use the drop-down menu to select Number.



Type the field description into the Description box. This helps to document the database. Add the new Field Name, Tutor on the next row. To help improve the form and to save lots of storage space, we know that the tutors' initials are three characters in length. In the General tab at the bottom, set the Field Size to 3. Save the changes to the table, close it and open frmStudents in Design View. Pick up the top of the Form Footer and drag it down to give enough room to add the two new fields.

The Year_Group field could appear on the form as a text box but, as this data can only hold five possible values (because Tawara High School only has years 7, 8, 9, 10 and 11) it would be a suitable field for radio buttons (*Access* calls these Option Buttons) within an option group. From the Design tab select the Option Group icon.

Drag the frame for the Option Group into the Detail section of the form, clicking the left mouse button once; this action will open the Option Group Wizard window. Enter six label names, one item on each row – in this case Year 7, Year 8, Year 9, Year 10, Year 11 and an additional option for 'No year group selected' – before clicking on Next >.

In the next window choose the top option for Yes, the default choice is: and select the option you typed in for No year group selected. Click Next >. Each label has a value assigned to it. *Access* has tried to assign values for you but we need to change all of the settings in this example. For Year 7 set the value to 7, Year 8 set to 8, and so on. For No year group selected set the value to 0. When you have changed all of the values click Next >.

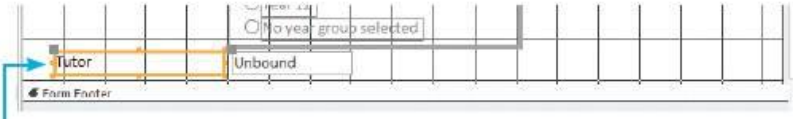
In the next window, change the radio button from the top option to **Store the value in the field:**. Using the drop-down menu to the right, select the **Year_Group** field. This will make sure that, when a radio button is selected, the value for that radio button is stored in the correct field within the table. Click Next > to choose the style of options selected (radio buttons, tick boxes or toggle buttons) and to choose how the Option box will appear on the form. Click Next > again when you have made your choices. Give the frame a meaningful caption such as **Which year group are you in?** before selecting Finish.

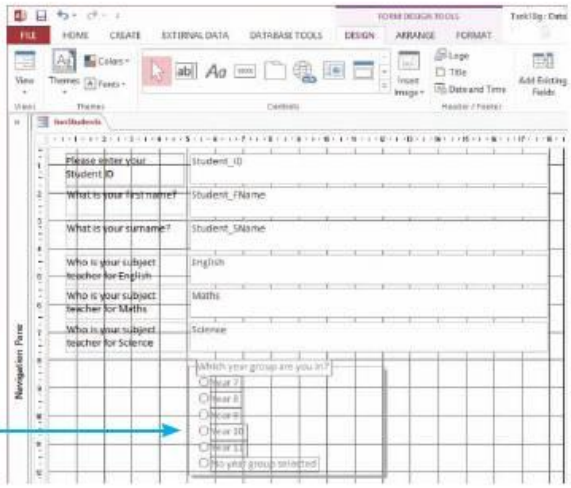
The option block will look similar to this in **Design View**.

To add the **Tutor** field to the form, select the **Text Box** icon from the toolbar.

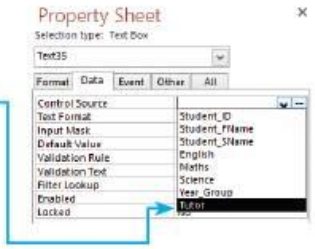
Drag the text box for the Tutor field on to the form; you do not need much space as this field only needs to hold three characters.

Resize the label box on the left and add the text 'Tutor' as the label. The text box looks like this.

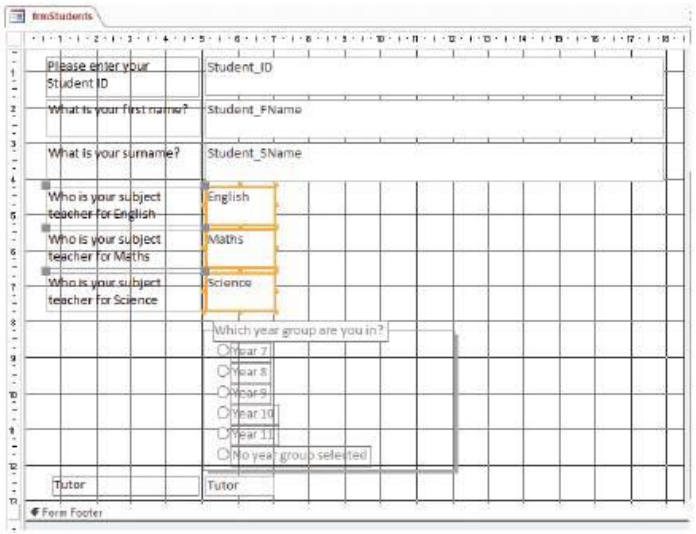


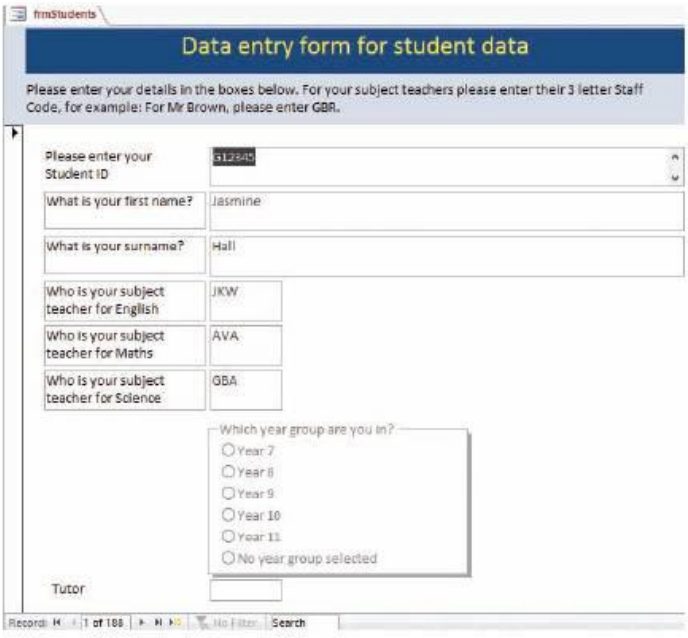


Click the cursor on the **Unbound** text box and, within the **Property Sheet** for this control, select the **Data** tab. In the **Control Source** box, use the drop-down menu to select the **Tutor** field.



The text box changes from unbound to show the **Tutor** field. The text boxes for **English**, **Maths** and **Science** are also too large as they can only contain three-lettered staff codes, so reduce these three field sizes together by selecting all three text boxes together and dragging the right edge in so that they match the **Tutor** field. Save the database. The finished **Design view** and **Form view** look like this.





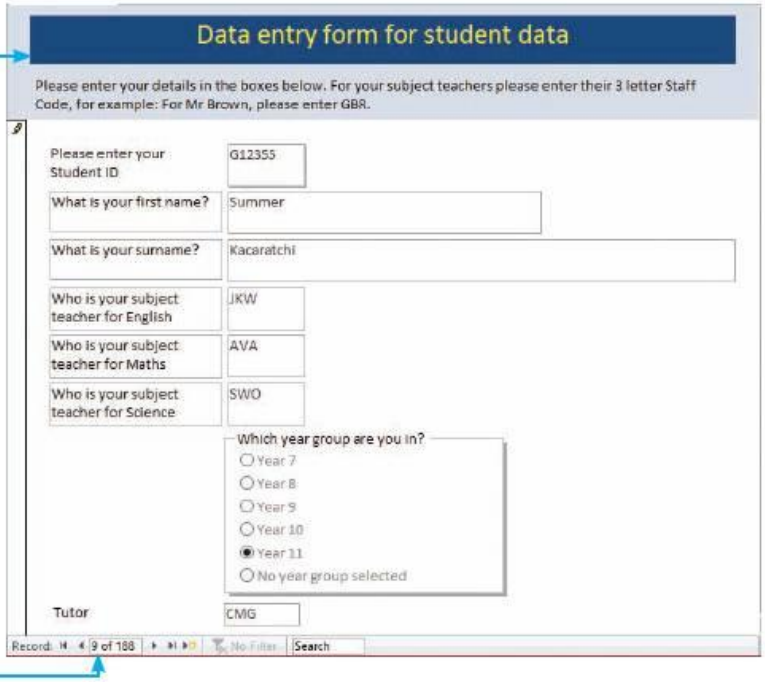
Advice

If this was a task for a practical Paper 2 question, you would need to remember to add your name, Centre number and candidate number in a new label box.

18.1.13 Key features of a well-designed form

The most important feature of form design is to keep the form simple, with clear questions, using **closed questions** where possible. This will limit the different answers to be stored in the database and will make it easier to search the database. A well-designed form has similar fields grouped, but not crowded, together with white space between each data entry box.

This form has many features of a well-designed data entry form. The form has a title that states what data is being collected. There are instructions on filling in the form. The questions are not just the field names but written questions. Each field has appropriate space for the data that will be added, and there is space between each field. The form has been appropriately filled by the text boxes but there is enough white space to keep it from being overcrowded. Radio buttons (or drop-down menus) are used where possible. There are navigation buttons on the form (already added by *Access*) to allow a user to add new records and move between records. In this form all of the data is important; in some forms key fields can be highlighted to show that this data must be completed before the record can be saved.



18.2 Manipulate data

18.2.1 Perform searches

You can search for data in *Access* using a query. This allows you to select a subset of the data stored in your table. Each query is created and saved, and can be used again later. If new data is added to the table, when you open a query again it will select the subset from all the data, including the new data.

Task 18h

Open the file that you saved at the end of Task 18c.

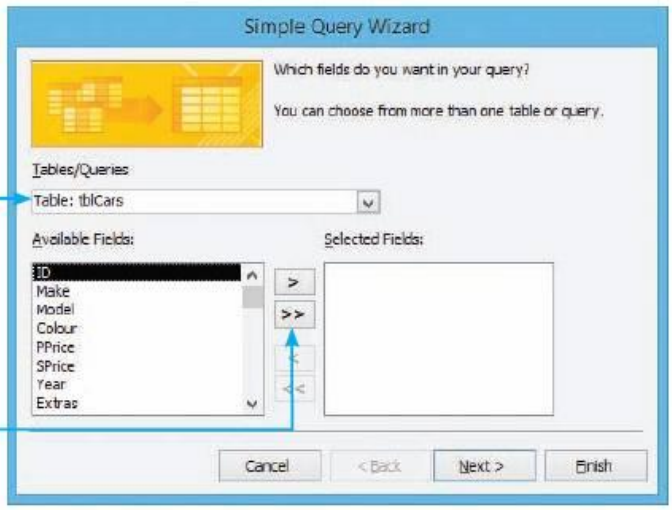
A customer would like a car made by Ford. Find the customer a list of all the cars in the garage made by Ford.

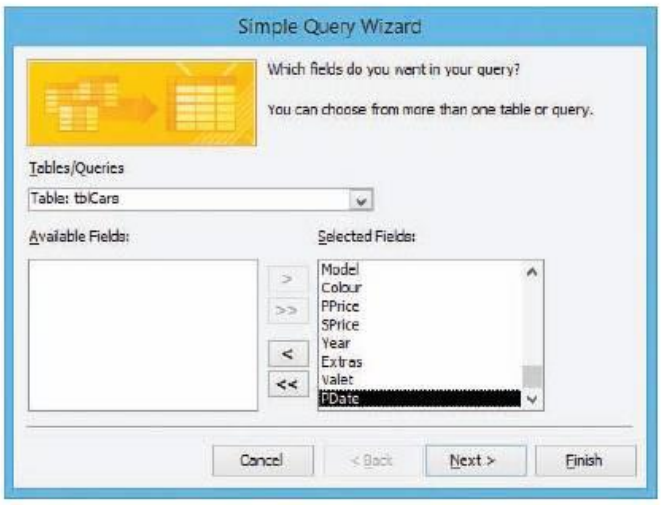
Open the database that you saved at the end of Task 18c. You do not need to open the table that you created earlier. Select the **CREATE** tab and find the **Queries** section. Click on the **Query Wizard** icon.

This is the easiest way of performing a search and opens the **New Query** window. Select the **Simple Query Wizard** and click on OK.

In the **Simple Query Wizard** window, make sure that the correct table name has been selected in the **Tables/Queries** box. As this is your first query this is the only option in this box, but each time you create a new query it will be shown here. If you select a previous query rather than the table, you are likely to get incorrect results.

For this task it would be appropriate to show the customer all the fields except the **ID** field, the price that the garage bought the car for (the **PPrice** field) and the date the garage purchased the car (the **PDate** field). Move all of the fields into the query using the double arrow key.

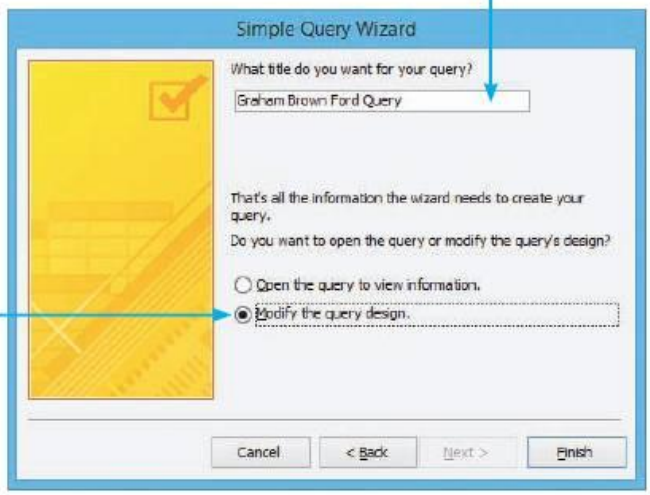




Select the **ID** field, the **PPrice** field and the **PDate** field in turn and click on the single arrow to remove them from the selection. When you have got only the required fields, click Next >. Select Next > again.

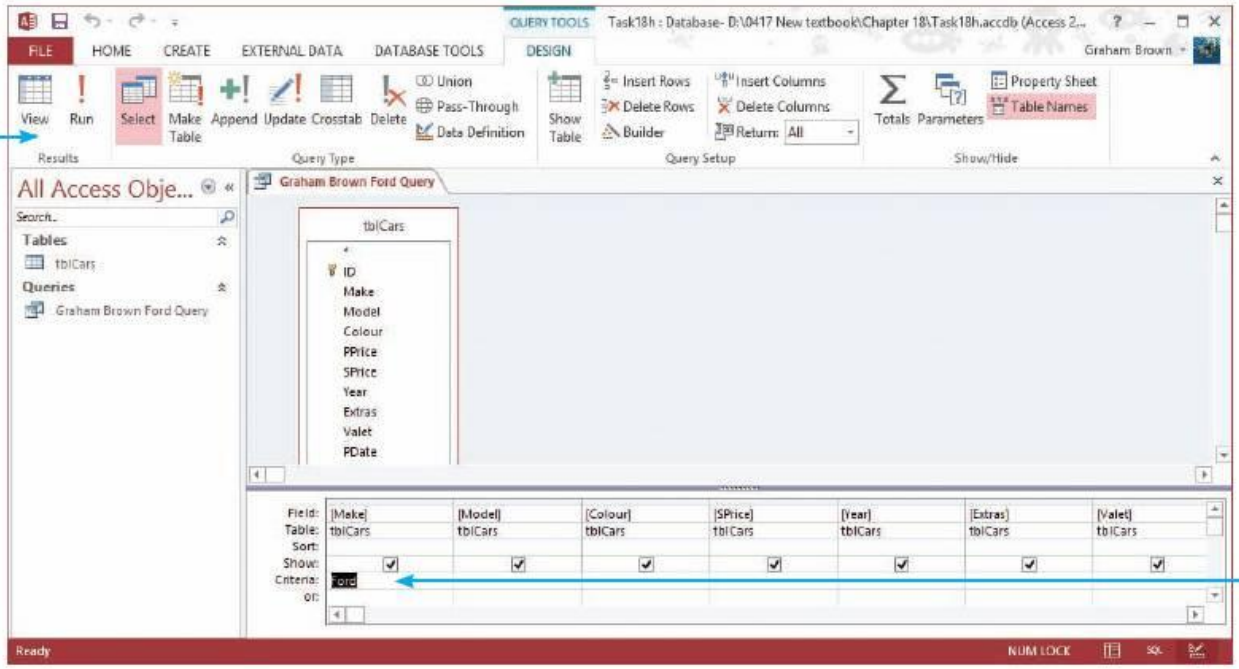
Enter a name for the query. This query may be turned into a report at some point and the name you give the query may become the title for the report. You may therefore wish to add your name to the query name, like this.

Select the radio button for **Modify the query design** before clicking on Finish.



This opens the query in Design View. Datasheet View can be seen by selecting the drop-down list under the View icon. However, at the moment the query will still contain all of the records as we have not yet performed the search, so make sure you are in Design View.

To perform the query, move the cursor into the Criteria: row of the Make field and type in Ford. You do not need to use speech marks as *Access* will put these in for you. This will extract only the cars made by Ford.



Now select the Datasheet View to see the results of the query. The number of records can be seen at the bottom of the window in this view. There should be 25 Ford cars in the query. Save the database as task18h.

Task 18i

Open the file that you saved at the end of Task 18h.

The manager would like to see all the details of all the Fords that need valeting.

Create a query in a similar way to the one for Task 18h. Make sure you have tblCars selected and not your Ford query. Select all the fields and, when in Design View, enter Ford in the Criteria: row of the Make column and Yes in the same Criteria: row for the Valet column. The selection will look like this and only two cars will be found using this search.

Field:	Make	Model	Colour	SPrice	Year	Extras	Valet
Table:	tblCars	tblCars	tblCars	tblCars	tblCars	tblCars	tblCars
Sort:							
Show:	☑	☑	☑	☑	☑	☑	☑
Criteria:	"Ford"						Yes
or:							

Advice

This is called an AND Query, because the Make has to be Ford AND the Valet field has to be Yes.

Task 18j

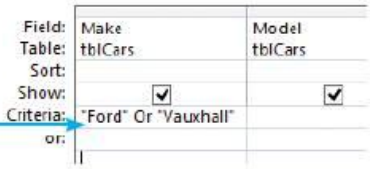
Open the file that you saved at the end of Task 18i.

The manager would like to see all the details of all the cars made by Ford or Vauxhall.

Create a query in a similar way to the one for Task 18i. In the Simple Query Wizard window, make sure that the correct table name has been selected in the Tables/Queries box. If you select one of the previous queries rather than the table, you are likely to get incorrect results.

Select all the fields and, when in Design View, enter Ford or Vauxhall in the Criteria: row of the Make column. The selection will look like this and 37 cars will be found using this search.

Save this as task18j.



Advice

Another way of doing this is to type Ford in the Criteria: row and Vauxhall in the or: row.

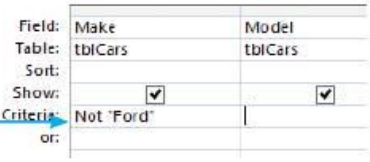
Task 18k

Open the file that you saved at the end of Task 18j.

The sales manager would like to see details of all the cars in stock **not** made by Ford.

Create a query in a similar way to the one for Task 18j. Select all the fields and, when in Design View, enter Not Ford in the Criteria: row of the Make column. The selection will look like this and 43 cars will be found using this search.

Save this as task18k.



Task 18l

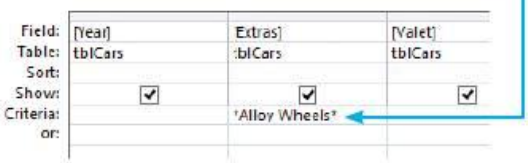
Open the file that you saved at the end of Task 18k.

The manager would like to see all the details of all the cars that have alloy wheels.

By examining the data in the database you can see that the text 'Alloy Wheels' could appear in the Extras field. It may not be the only extra that a car has – there could be other extras listed before it or after it within the field.

To find all the cars with this extra you must create a query in a similar way as for Task18k. Select all the fields and, when in Design View, enter *Alloy Wheels* in the Criteria: row of the Extras column. The stars tell *Access* that you are performing a **wildcard search**. This is a search which looks for the words 'Alloy Wheels' (including the space) anywhere in the Extras fields' contents. The selection will look like this and 35 cars will be found using this search.

Save this as task18l.



Advice

To search for something that is at the start of the data, use Text*; for example, Bl* in the Colour field will find all the cars with the first colour Blue or Black, but would not find colours such as Light Blue. Placing the star at the start of a search string will only find those things ending with the search string.

Task 18m

Open the file that you saved at the end of Task 18l.

The sales manager would like to see details of all the cars in stock for sale for less than or equal to £4125.

Create a query in a similar way as for Task 18l. Be careful not to use symbols such as < or £ in the query name. Select all the fields and, when in Design View, enter <=4125 in the Criteria: row of the SPrice column. The selection will look like this and 19 cars will be found using this search.

Field:	SPrice	Year
Table:	tblCars	tblCars
Sort:		
Show:	☑	☑
Criteria:	<=4125	
or:		

Similar mathematical formulae can be used, with < for less than, > for greater than, >= for greater than or equal to, and = for equals. These mathematical formulae cannot be used for queries involving text fields but can be used for any numeric, date or time fields.

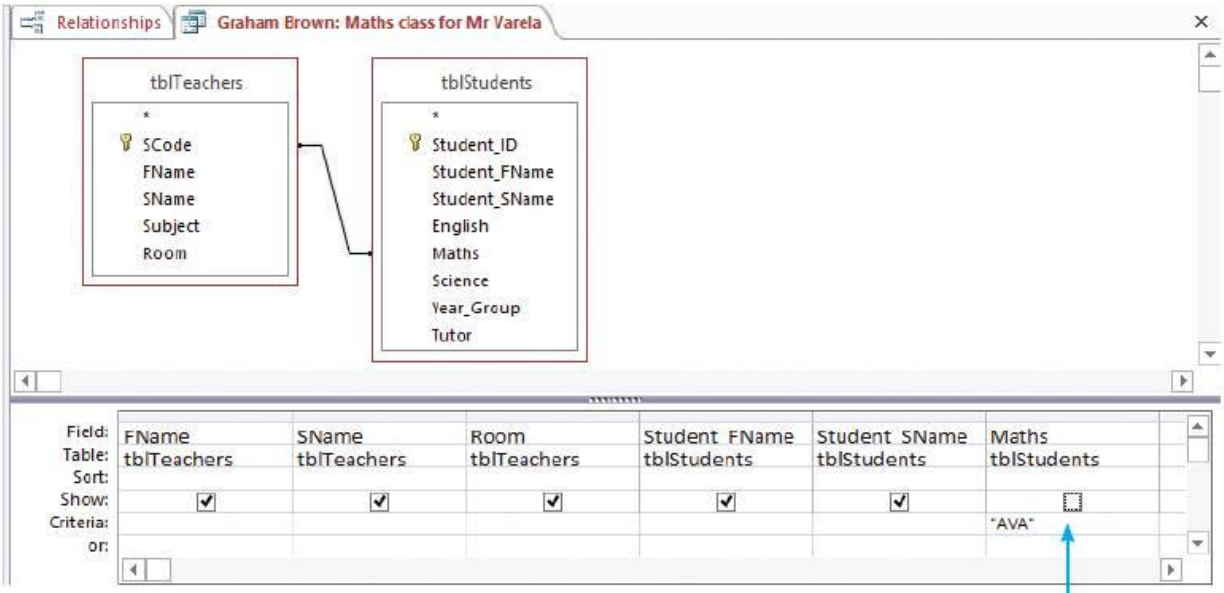
Task 18n

Open the file that you saved at the end of Task 18g.

Find Mr Varela a list of all the students that he teaches for Maths; include in this extract his full name and teaching room.

Open the database that you saved at the end of Task 18g. Create a new query using the Query Wizard. This is the easiest way of performing a search and opens the New Query window. Select the Simple Query Wizard then, in the Tables/Queries box, select the table tblTeachers. Move across to the right the FName, SName and Room fields. Move back into the Tables/Queries box and select the table tblStudents. Select (by moving them from Available fields: to Selected fields:) the Student_Fname, Student_SName and Maths fields, like this.

Click on Next >. Continue through the wizard until you get to the query in Design View. Move the cursor into the Criteria: row of the Maths field and type in AVA.



Open the query in Datasheet View to check that you have done the query as specified. The Maths field does not need to be shown; to hide it (do not delete it or the selection of the data will also be lost) move back into Design View. Move the cursor into the Show: row of the Maths field and remove the tick from the check box. This field is present in the query but will not be shown. This query should return 31 records. Save the database as task18n.

Activity 18d

Open the file saved in Activity 18c.

Search the database to find the following information for your manager. For each search show how you performed the search and the results of the search; the results must show all the fields in the stationery table.

1. Find all of the blue stationery items.
2. Find all of the blue or black stationery items.
3. Find all of the items where the colour is **not** blue.
4. Find all of the red items where the discount is 'yes'.
5. Find all of the items where the type contains the word 'file'.
6. Find all of the items where the description contains the word 'file'.
7. Find all of the items with a quantity of less than or equal to 10.
8. Find all of the items where the quantity is 10.
9. Find all of the items with a quantity of greater than 1.
10. Find all of the items with a quantity of greater than or equal to 10.
11. Find all of the items where the sale price is less than £10.

18.2.2 Use formulae in queries

You are sometimes asked to perform calculations at run time. This could be done in one of two ways. The first method is by creating a calculated field, so that each record has a calculation performed on it and the results are stored in a query. The other method is to calculate on all (or a selection of) the records, for example to add (sum) the data from a number of records.

Task 18o

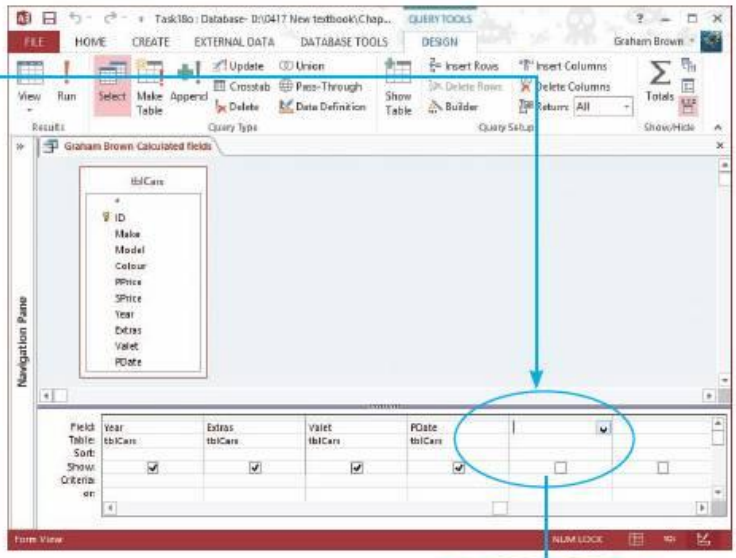
Open the file saved in Task 18m.

Produce a new extract from all the data that:

- contains a new field called **Profit** which is calculated at run time. This field will subtract the purchase price from the sale price
- contains a new field called **Percent** to calculate the percentage profit for each car at run time. This field will divide the profit by the sale price.

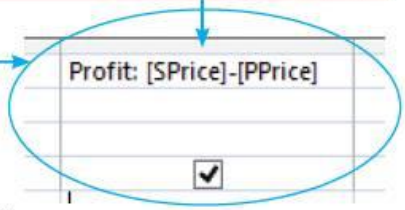
To create a field that is calculated at run time, you must first open a query. For this task the query will not be used to search for data but to perform the calculation. Select the **CREATE** tab, then click in the **New Queries** section on the **Query Wizard** icon; select the **Simple Query Wizard**. In the **Tables/Queries box** select the table **tblCars** as the source of the data. Select all fields using the double arrow key. Click on Next > twice, name the query **Profit calculation**, select the radio button for **Modify the query design**, then click on Finish.

In the **Design View** of the query, use the bottom scroll bar to scroll to the right and find the first blank field like this.



Move the cursor into the **Field** row for the first blank field. Enter the name **Profit** that you wish to give this calculated field followed by a colon. The colon tells *Access* that the next section is a calculation. Within the calculation, you must place square brackets around each field name so that *Access* looks up the data from the relevant field.

For this task, you need to subtract the purchase price from the sale price. The finished calculation will appear like this.



In the **View** section, select the **Datasheet View**. Calculate the profit for three or four cars by hand or using a calculator and compare with the results in the query to check that you have entered the formula correctly.

Advice

Use + for addition, – for subtraction, * for multiply and / for divide.

Do not worry about the formatting of the calculated field. This will be done at a later stage.

The task requires you to create a second calculated field so it would be sensible to include the new field now and complete the formatting later.

To create a new field called **Percent**, follow the same procedure, this time adding a formula to divide the profit by the purchase price. Again, check the calculations with a calculator to ensure that you have not made an error when entering the formula. When you have calculated this field and view the query in **Datasheet View**, you may see the values displayed as #####. This means the column is too narrow to see all the data. Drag the column to the right so that the data is fully visible. Save the database and close the query.

Activity 18e

Open the file saved in Activity 18d.

Produce a new extract from all the data in the stationery table that:

- contains a new field called **Profit** which is calculated at run time. This field will subtract the purchase price from the sale price
- contains a new field called **Percent** to calculate the percentage profit for each car at run time. This field will divide the profit by the sale price
- contains a new field called **UnitProfit**. This field will divide the profit by the quantity.

For each calculated field show how you performed the calculation and the results of the calculation.

18.2.3 Present summary data in queries

Task 18p

Open the file saved in Task 18o.

Select only the cars made by Audi, BMW or Mercedes. Produce a new extract from all the data which, for the each of these makes of car, calculates:

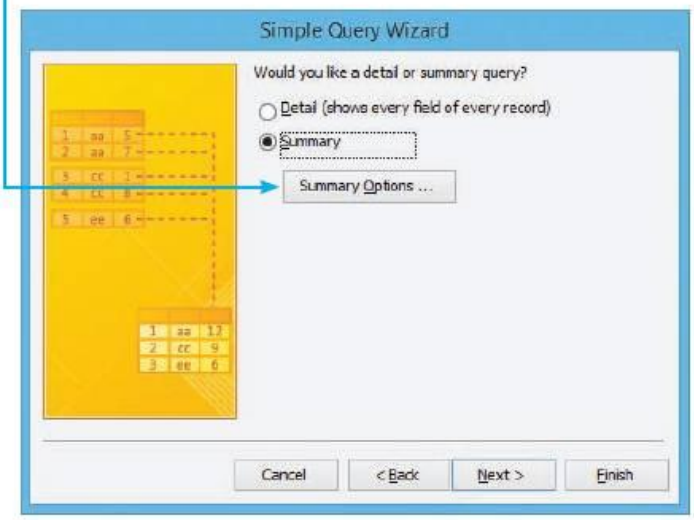
- the sum of the sale price
- the average sale price
- the number of cars in stock.

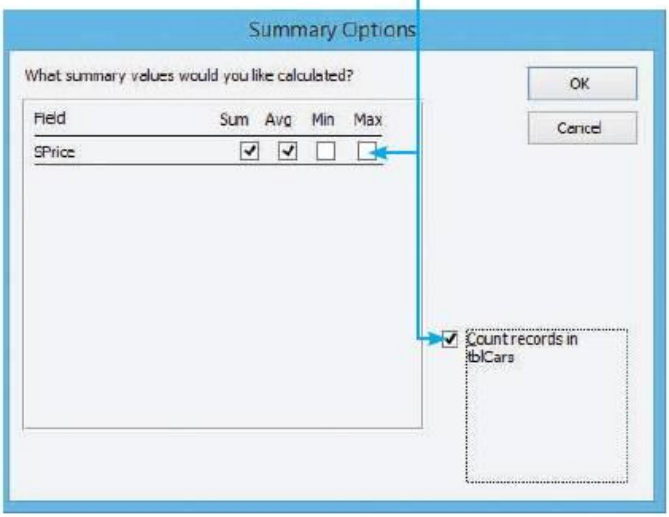
Sort this data into descending order of average sale price.

This task requires the use of summary data. Open the file and, from the **CREATE** tab, select the **Query Wizard**, then the **Simple Query Wizard** followed by [OK]. In the **Tables/Queries** box select **tblCars** and from this table select only the **Make** and **SPrice** fields before clicking on [Next >]. Click the radio button for **Summary** data, then select the **Summary Options...** button.

This opens the **Summary Options** window.

To calculate the sum of the sale prices, tick the check box for **Sum**. For the average sale price tick the check box for **Avg**. For the number of cars in stock tick the check box for **Count records** in tblCars, followed by [OK].





Click on Next >. Add a new title for the query. Select the radio button for **Modify the query design**, then click on Finish to enter **Design View**. Enter **Audi or BMW or Mercedes** in the **Criteria:** row of the **Make** column. The selection will look like this.

Field:	Make	Sum Of SPrice: SPrice	Avg Of SPrice: SPrice	Count Of tblCars: Count(*)
Table:	tblCars	tblCars	tblCars	
Total:	Group By	Sum	Avg	Expression
Sort:				
Show:	☑	☑	☑	☑
Criteria:	"Audi" Or "BMW" Or "Mercedes"			
or:				

The query results look like this.

Graham Brown Summary data on SPrice field

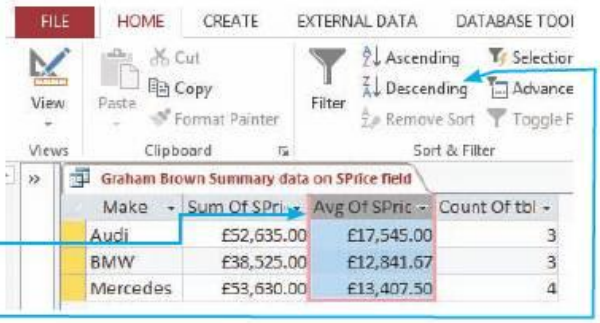
Make	Sum Of SPrice	Avg Of SPrice	Count Of tblCars
udi	£52,635.00	£17,545.00	3
MW	£38,525.00	£12,841.67	3
lercedes	£53,630.00	£13,407.50	4

Save the database as task18p.

18.2.4 Sort data in queries

This data is sorted into ascending order of **Make**, but the question told you to sort this data into descending order of average sale price. Select the **HOME** tab, then click on the column heading for **Avg of SPrice**. This will highlight this column like this.

In the **Sort & Filter** section, select the descending sort icon.



The query results will now be sorted to look like this.

Graham Brown Summary data on SPrice field

Make	Sum Of SPrice	Avg Of SPrice	Count Of tblCars
Audi	£52,635.00	£17,545.00	3
Mercedes	£53,630.00	£13,407.50	4
BMW	£38,525.00	£12,841.67	3

More complex sorting will be looked at in Section 18.3.7 as this is much easier using the report wizard, than in the queries.

Activity 18f

Open the file saved in Activity 18e.

Select all **Type** of items, except for any **Binder**. Produce a new extract from all of the stationery data which, for each **Type** of item, calculates:

- the average purchase price
- the average sale price
- the number of items in stock.

Sort this data into descending order of average purchase price.

Show how you performed the summary query and the results of the calculations.

18.3 Present data

18.3.1 Produce reports

The word 'report' can be quite confusing. A dictionary definition is 'a document that gives information about an investigation or a piece of research'. For our purposes, a report has this generic meaning: 'a document that gives information'. This is often confused with a report created in *Access*. The report created in *Access* will often be the most suitable report for a task, but sometimes it may be better to produce a report in a word processor, copying and pasting information into a document. For each task you will need to decide which method is the most suitable.

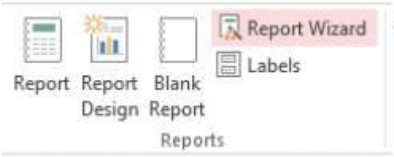
Task 18q

Open the database that you saved at the end of Task 18p.

Produce a report that:

- shows all of the cars made by Ford
- displays only the **Make**, **Model**, **Colour**, **SPrice**, **Extras** and **Valet** fields within the width of a landscape page
- has the text 'Report by' and your name on the left in the header of each page
- has a title 'All Ford cars in stock' centre aligned at the top of the first page
- has a subtitle 'request for Mr David Watson' right aligned at the top of the first page.

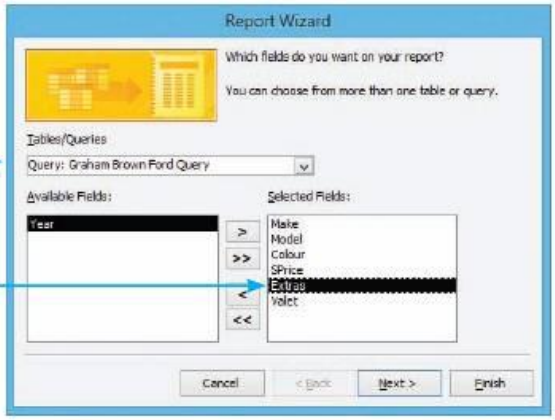
Open the database saved in Task 18p. Select the **CREATE** tab and find the **Reports** section. Click on the **Report Wizard** icon to open the **Report Wizard** window.



Advice

You must create the query first and then base the report on the query.

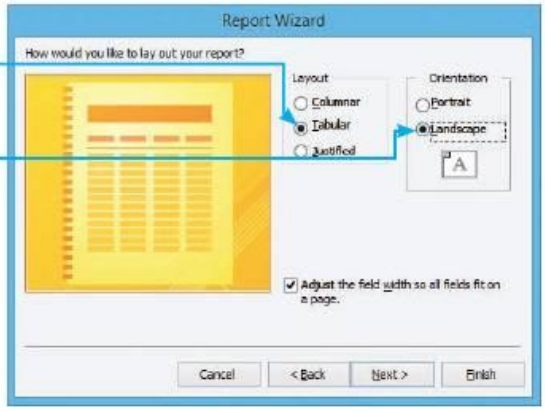
In the **Tables/Queries** box you need to select the correct query. For this task the report will be based on the query to select only the Fords (you created this query in Task18h). Use the arrow buttons to move the correct fields from **Available Fields:** into the **Selected Fields:** box like this, then click on Next >. Grouping is not needed at this level, so click on Next > again. You have not been asked to sort the report for this task (this is covered later in the chapter), so click on Next > again to get the **Report Wizard** window shown at the top of page 294.

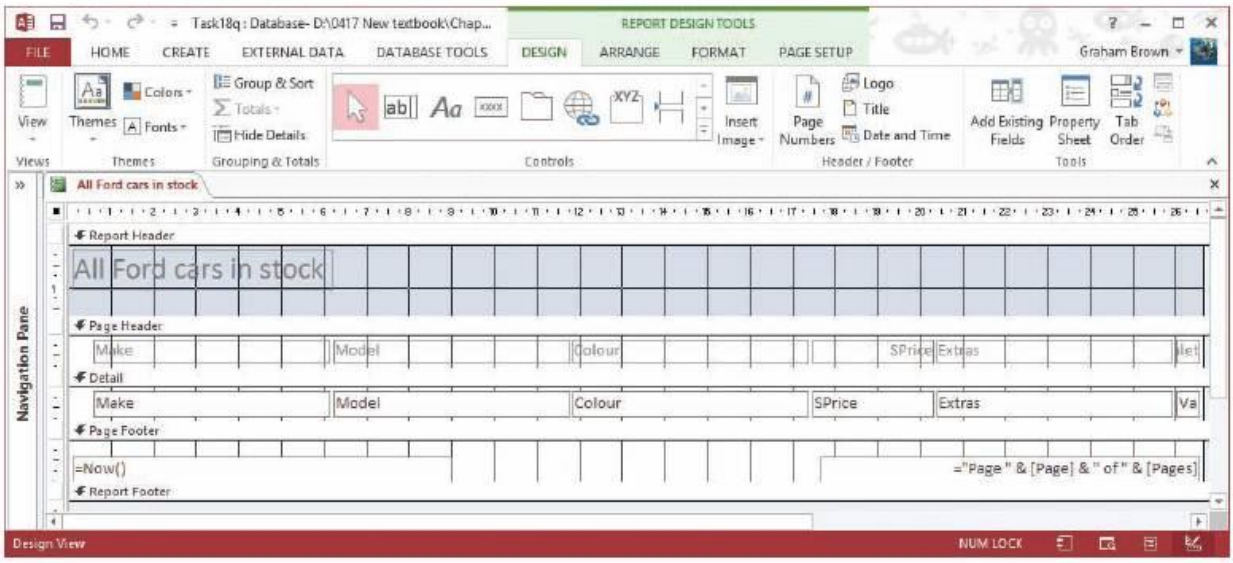


Use the **Layout** section to choose how the page will be laid out; in this case a **Tabular** format has been selected.

The task asked you to select a single landscape page. The page orientation is chosen using the **Orientation** radio buttons. Select **Landscape** then click on Next >.

Change the report name so that it reads 'All Ford cars in stock' (which is the title from the task). As you still need to add the subtitle and ensure that the layout is correct, select the **Modify the report's design** radio button and click on Finish. The **Design View** of the report will look similar to this.



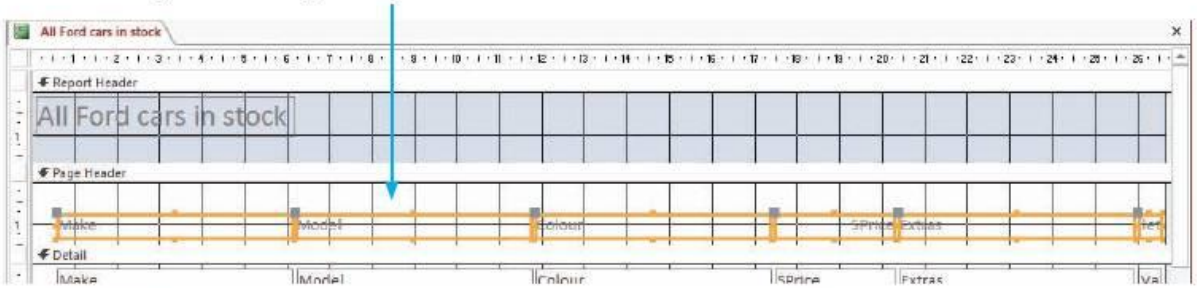


Each section of the report is shown with a light grey bar. The top section is the **Report Header**. Anything that you place in this section appears only once at the start of the document. Anything that you place in the **Page Header** is shown at the top of each page, in this case the field names. Similarly, information in the **Page Footer** is shown at the bottom of each page. The **Report Footer** appears at the very end of a report, although in this example the Report Footer is empty (it is not shown in white) and therefore will not be shown in this document. The **Detail** section is the most important, as this single row is where the data is shown for each car. This single row will appear as many rows (as many as there are Ford cars in the database) and display the details of each record.

The task asks you to place your name on the left in the header of each page. Move the cursor to the top of the light grey bar showing the **Detail** row; click on this so that the cursor changes into an arrow like this.

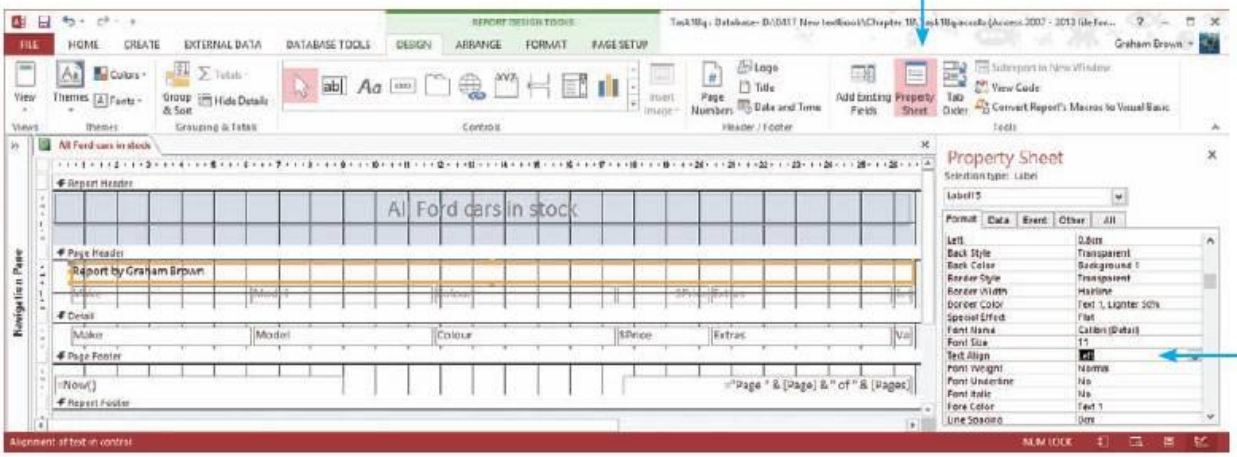
Hold the left mouse button down and drag the top of the **Detail** row down about 8 mm. Select all of the controls (objects) in the **Page Header** by dragging

(and holding) the left mouse button. Move all of these controls down the page about 8 mm, so that they look like this.



The DESIGN tab should already be selected. Find the Controls section and click on the Label icon.

Drag (to draw) a new control into the Page Header and type the text 'Report by' followed by your name into this control. This label needs editing so that the text is visible and right aligned. Select the control (the label you have just created) and, in the DESIGN tab, from the Tools section of the toolbar, click on the Property Sheet icon.



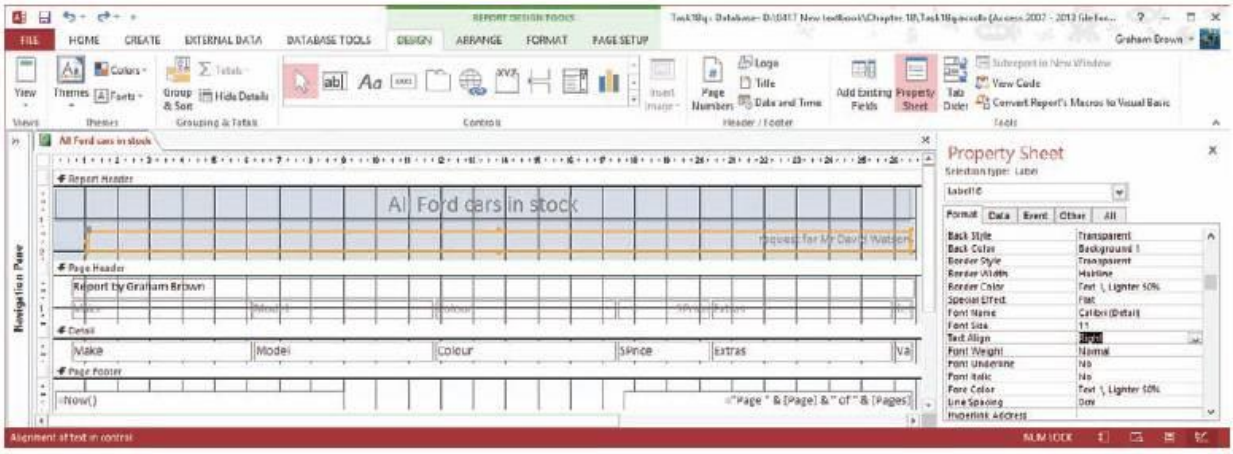
Select the Fore Color section and change the colour of the text to black; move to the Text Align section and use the drop-down menu to set the alignment to Left.

To see what the report will look like at any time, find the View section of the DESIGN tab and select the Report View. Use this section to change back to the Design View at any time.

The title 'All Ford cars in stock' needs to be centre aligned. Click on the control containing this label and use the drag handle to stretch the control to 26.5 cm (almost the edge of the page). You may need to close the Property Sheet to see this. If you stretch the control further to the right it will add another page width to the final printout, wasting paper when it is printed and no longer fitting to a single page wide. Once the control fits the page width, move to the Property Sheet and use the Text Align section to centre align the label.

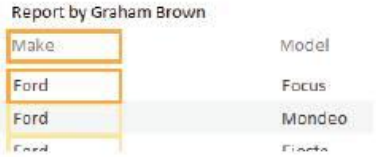
To add the subtitle, drag the light grey bar for the Page Header down about 8 mm. Add a new label, the full width of the page, in the Report Header just below the title. Type the text 'request for Mr David Watson' into this control. Set the Fore color to white as before and right align this subtitle using the Align Text Right icon or in the Property Sheet change the Text Align to Right.

The Design View of the report looks like this.

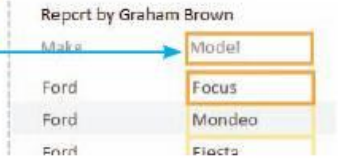


Move to the HOME tab and, in the View section, select Layout View. You can see that not all of the data within the report is fully visible.

Hold down the <Ctrl> key and click on both the control containing the field name Make and on the control containing the first car in the Detail row. Click the left mouse button again on the right edge of one of these controls. Use the drag arrow to narrow the space for these controls, making sure all the names are visible, like this.



Repeat this process to move the Model field closer to the Make field and resize it to fit the data.



Repeat this process for each field until the report looks like this.

Save the database as task18q.

Activity 18g

Open the database that you saved at the end of Activity 18f.

Produce a report that:

- displays all the data in the stationery table within the width of a landscape page
- has your name on the right in the header of each page
- has a title 'All stationery in stock' centre aligned at the top of the first page
- has a subtitle 'request for the manager' right aligned at the top of the first page.

Task 18r

Open the database that you saved at the end of Task 18q.

Produce a report that:

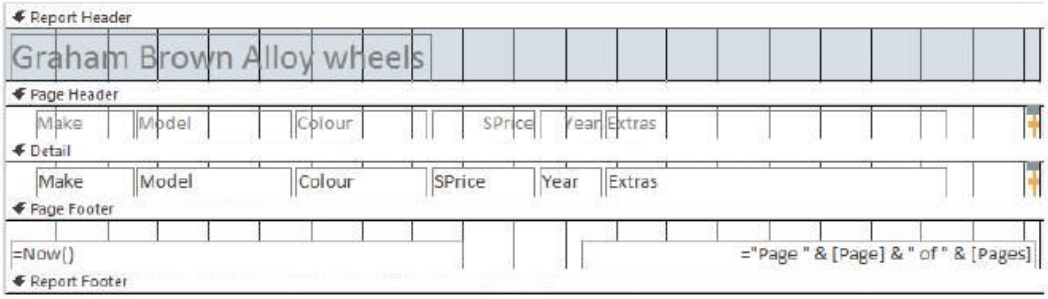
- displays all the data for the **Make**, **Model**, **Colour**, **SPrice**, **Year** and **Extras** fields for all the cars with alloy wheels from Task 18l, within the width of a portrait page
- has your name in the report header followed by 'Cars with alloy wheels'.

Open the file task18q. Select the CREATE tab and, in the Reports section, click on the Report Wizard icon. In the Report Wizard window, select the query for alloy wheels (that you created in Task 18l) in the Tables/Queries box. As the task says 'display all the data', and specifies the fields, use the arrow buttons to move only these fields from Available Fields: to the Selected Fields: box. Go through the wizard as you did for the previous task, making sure that you set the page Orientation to Portrait. When the wizard has finished, the report is created and looks similar to this.

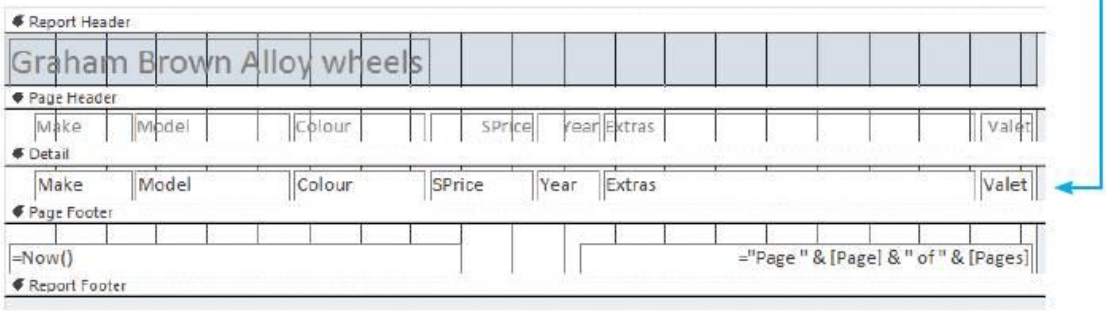
Graham Brown Alloy wheels

Make	Model	Colour	SPrice	Year	Extras
TVR	Tuscan	Black	£20,305.00	2012	Alloy Wheels Air Condit
BMW	Z3	Metallic black	£5,635.00	2006	Alloy Wheels
Toyota	Celica	Red	£24,695.00	2014	Air Conditioning Alloy
Audi	TT	Black	£17,545.00	2013	Central Locking Leather

You can see that *Access* has attempted to make all the fields fit across the page, but this has not been successful as not all of the data is fully visible. You must show all of the required data in full. Use the methods you used in Task 18l to make most of the data fit into the available space. Using both the Design View and Layout View will make this easier. In Design View you can see that the Valet field is only just visible.



Reduce the width of the Extras field (and its label) and enlarge the Valet field so that all its data can be seen.

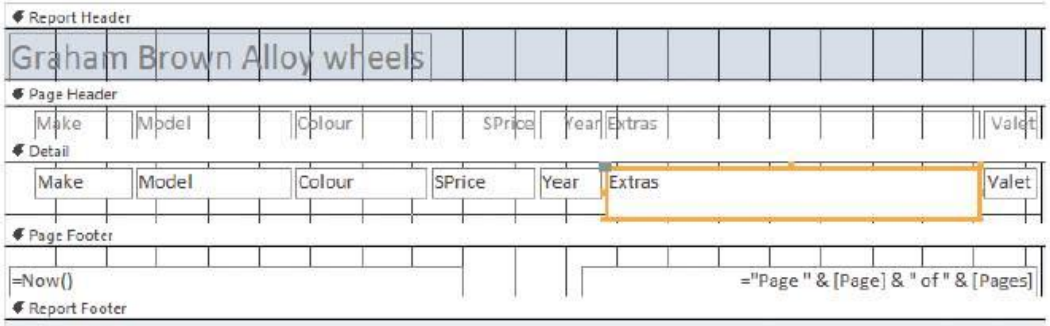


Change to Report View and check that all the data and labels fit within the width of a single page. Other than the Extras field (which holds the most data), all fields are now fully visible.

Graham Brown Alloy wheels

Make	Model	Colour	SPrice	Year	Extras	Valet
TVR	Tuscan	Black	£20,305.00	2012	Alloy Wheels Air Conditioning	No
BMW	Z3	Metallic black	£5,635.00	2006	Alloy Wheels	No
Toyota	Celica	Red	£24,695.00	2014	Air Conditioning Alloy Wheels	Yes
Audi	TT	Black	£17,545.00	2013	Central Locking Leather Seats Alloy Wheels	No
Ford	Focus	Dark blue	£3,135.00	2009	Alloy Wheels	No

We can enlarge the Extras field by making the control for that field twice as deep. Change to Design View and click the cursor on the top edge of the Page Footer. Drag this down about 8 mm. In the Detail row, click the cursor on the lower edge of the Extras control. Drag this down to double the height of this control.



Change to Report View and check that all the data and labels fit within the width of a single page, like this. Save the database as task18r.

Graham Brown Alloy wheels

Make	Model	Colour	SPrice	Year	Extras	Valet
TVR	Tuscan	Black	£20,305.00	2012	Alloy Wheels Air Conditioning	No
BMW	Z3	Metallic black	£5,635.00	2006	Alloy Wheels	No
Toyota	Celica	Red	£24,695.00	2014	Air Conditioning Alloy Wheels	Yes
Audi	TT	Black	£17,545.00	2013	Central Locking Leather Seats Alloy Wheels	No
Ford	Focus	Dark blue	£3,135.00	2009	Alloy Wheels	No

Activity 18h

Open the database that you saved at the end of Activity 18g.

Produce a report that:

- displays the data for all the items where the quantity is greater than or equal to 10, selected in Activity 18d, within the width of a portrait page
- has your name in the header of each page
- has a title 'Quantity >=10' centre aligned at the top of the first page.

Advice

The Discount field can appear as Yes/No, True/False or as a tick box. All of these would be correct for this activity.

18.3.2 Export data

Sometimes whole reports, queries or the data within them need to be exported into other packages to be manipulated as part of a report for someone, or to create a graph or chart.

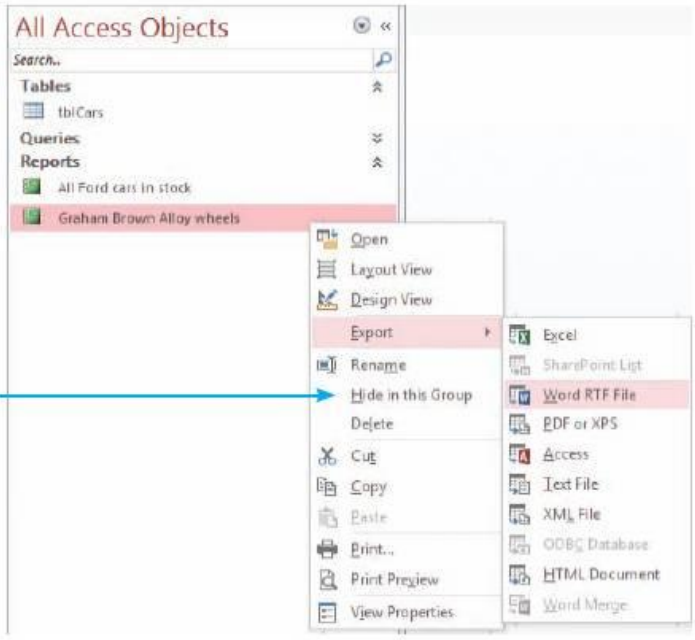
Task 18s

Export the report saved in Task 18r into rich text format so it can be included in a word-processed document.

In the Navigation pane, find the report that you saved in Task 18r and right click the mouse button on the report name to get the drop-down menu.

Select the option to Export. This will open another drop-down menu. You need to export into .rtf format, so select Word RTF File. This opens the Export – RTF File window.

Click on the Browse... button to select a folder to save the document into. You will need to use this file for another task, so select the tick box for Open the destination file after the export operation is complete, then click on OK. The exported file will appear. Close the Export – RTF File window.



Advice

If you need to export the report without any formatting, select the Text File option.

Advice

If you need to export the data into .csv format (comma separated values), export it first into *Excel*, then save it in .csv format from *Excel*.

The same technique can be used in *Office 2013* for exporting to create graphs in *Excel*. In previous versions of *Office* you had to export the query rather than the report, but the latest version allows you to export either. To do so, change from Word RTF File format into *Excel* format in the export stage.

Activity 18i

Export the report saved in Activity 18h into:

- rich text format
- a format that can be used to produce a graph
- comma separated value format.

18.3.3 Hide data in a report

There are times when information in a report needs to be hidden in some way. In real applications a single report would be created for more than one task and some data would be hidden. This process is often done automatically using a created report and a programming language. Although that is beyond the scope of this book, the ability to hide fields within a report is useful. An example of this is when an invoice is produced for a customer and the same document is used as a delivery note, so that it shows the details of the items ordered but the costs are hidden. In *Access* this can be done in one of two ways: the first is to make a control invisible; the second is to use a background colour that matches the text colour.

Task 18t

Create a new report showing all the data for all the cars in stock made by Audi, BMW or Mercedes.

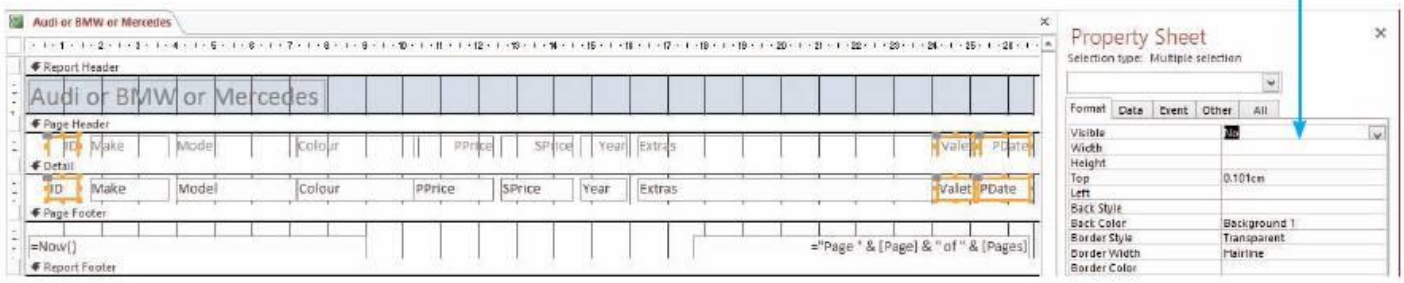
Hide all the labels and data for the ID, Valet and PDate fields from the report. Hide the PPrice data (but not the title) by setting a black background.

Using the methods used so far in this chapter, create a new query from tblCars to select the three makes of car. Create a new report set in landscape format to display all fields for these cars, like this.

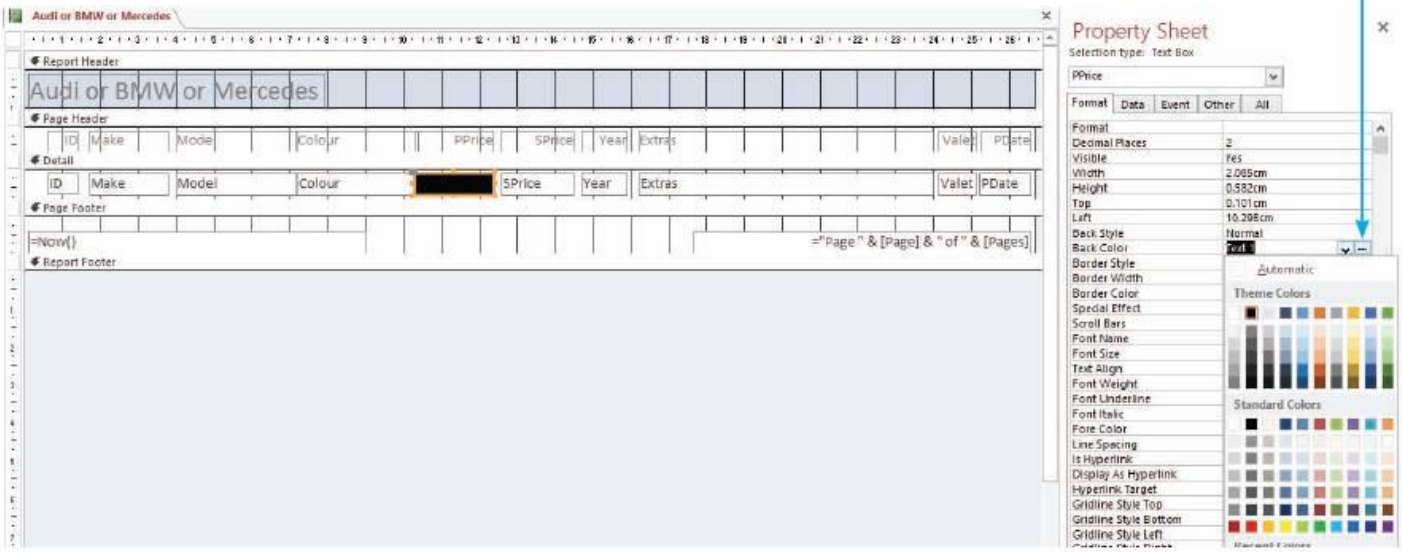
Audi or BMW or Mercedes

ID	Make	Model	Colour	PPrice	SPrice	Year	Extras	Valet	PDate
2	Mercedes	C200	Silver	£4,995.00	£5,995.00	2009	Air Conditioning	No	
4	BMW	Z3	Metallic black	£4,665.00	£5,635.00	2006	Alloy Wheels	No	
6	Audi	TT	Black	£15,495.00	£17,545.00	2013	Central Locking Leather Seats Alloy Wheels	No	
7	Mercedes	E320	Silver	£11,450.00	£13,095.00	2013	Air Conditioning	No	
26	Audi	TT	Green	£10,995.00	£12,595.00	2011	Air Conditioning Alloy Wheels	Yes	
41	Audi	TT	Blue	£19,995.00	£22,495.00	2013	Central Locking Leather Seats Alloy Wheels	No	
43	Mercedes	M class	Black	£16,995.00	£19,195.00	2011	Air Conditioning Alloy Wheels	No	
44	BMW	318i	Yellow	£15,995.00	£18,095.00	2013	Central Locking Leather Seats Alloy Wheels	No	
48	BMW	318I	Blue	£12,995.00	£14,795.00	2012	Central Locking Leather Seats Alloy Wheels	No	
50	Mercedes	Clk 320 Elegance	White	£13,495.00	£15,345.00	2010	Alloy Wheels Alarm	No	

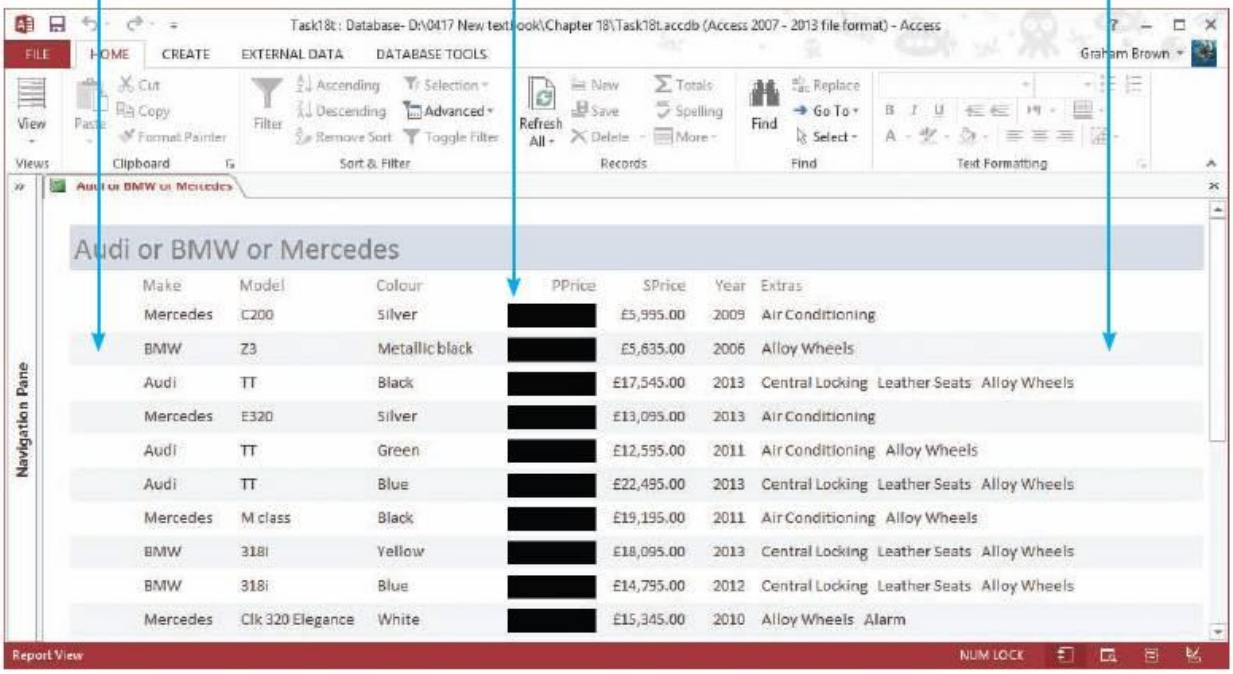
Go into the **Design View** of the report; holding down the <Ctrl> key select all the controls for the **ID**, **Valet** and **PDate** fields. Open the **Property Sheet** and, in the **Visible** section, change the setting from Yes to **No**, which will hide these controls.



To set a black background for the PPrice data, in the Detail row of the report select the control for PPrice. Move the cursor into the Property Sheet, selecting the Format tab. Find the Back Color section and use the [...] icon to select the colour palette.



Select the black colour rather than the white background. Set the Fore Color to black in the same way. Change from Design View into Report View to see the changes.



Save the changes to the report and close it.

Advice

Open the file you saved in Activity 21h. Move to All Access Objects and Reports. Use copy and paste to make a copy of the report for the quantity is greater than or equal to 10, before starting Activity 18j.

Activity 18j

Open the report created in Activity 18h.

Hide the label and data for the **Discount** field in the report and hide only the data in the **PPrice** field by setting a black background.

18.3.4 Produce labels

You may be required to produce other forms of output from your database, for example producing labels to advertise a product or address labels for mailing letters to customers.

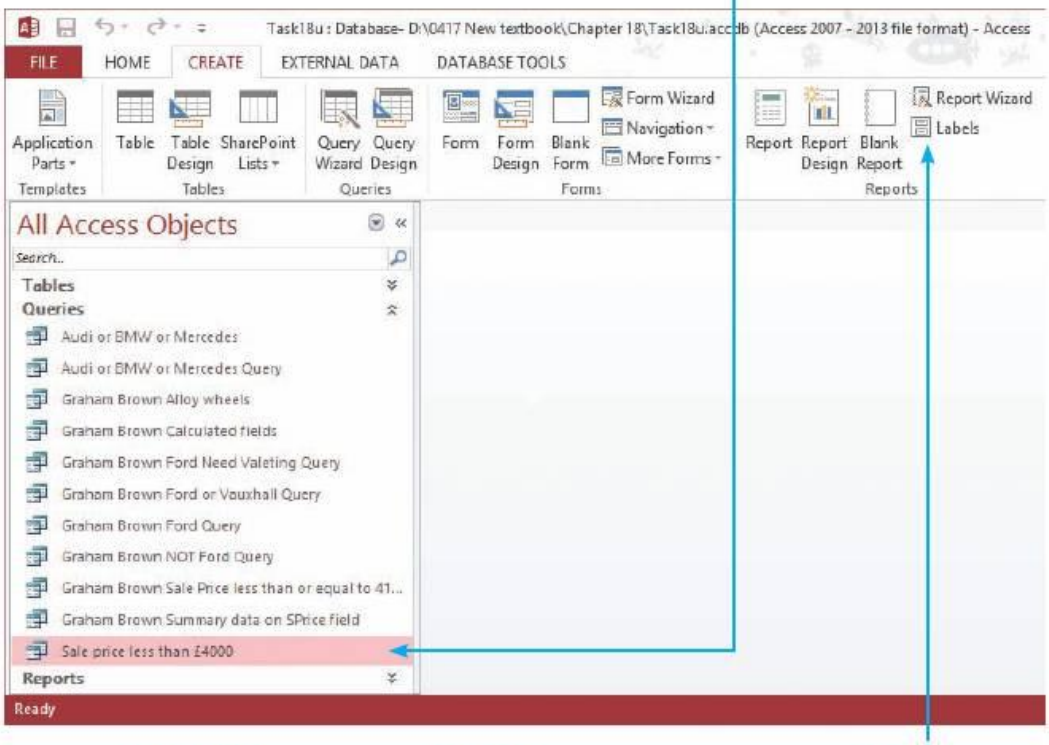
Task 18u

Open the file that you saved at the end of Task 18t.

Find all the cars with a sale price of less than £4000 and, for these cars, produce labels that:

- have a page orientation of portrait
- fit two side by side on the page
- have a 16 point, centre aligned heading 'Special Offer' at the top of each label
- show only the fields **Make**, **Model**, **Colour**, **SPrice**, **Year** and **Extras**, sorted into make and model order
- have your name at the bottom right of each label.

Design a new query to extract only the cars with a sale price of less than £4000, selecting only the **Make**, **Model**, **Colour**, **SPrice**, **Year** and **Extras** fields from the table as you step through the **Simple Query Wizard**. When you have selected these cars, close the query and click the left mouse button on the query so that it is highlighted like this.

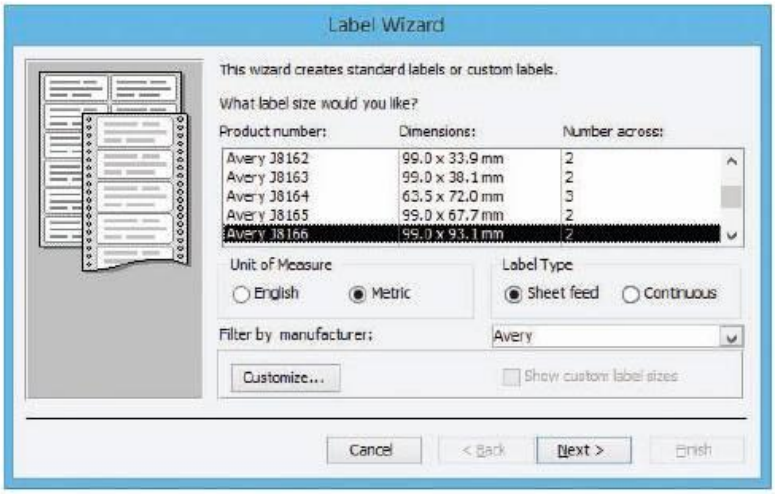


From the **CREATE** tab, find the **Reports** section and click on the **Labels** icon.

Advice

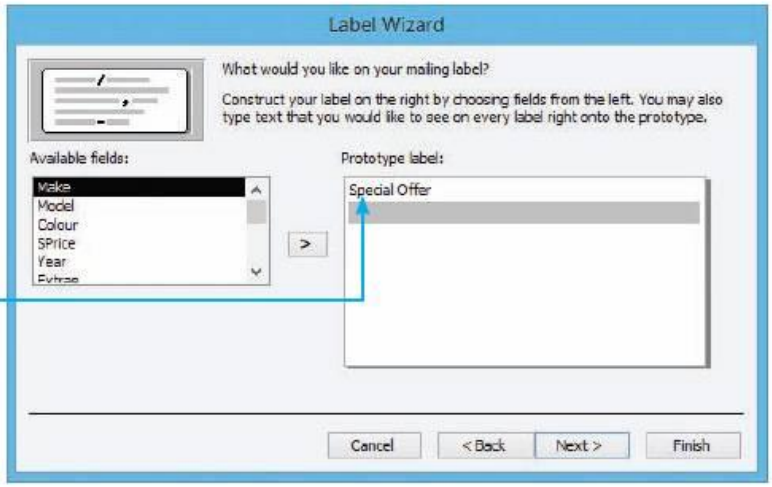
If you wish to change the display formats of any field, this can also be done in the **Property Sheet** pane using the **Format** tab. However, it is better to set the formatting for the fields in the **Design View** of the table as changing the display properties will not change the way that the data is stored, and this could lead to errors if fields are used for calculations.

This opens the Label Wizard. Select any label format that contains two labels across the page; in this case, use the Avery J8166 labels as they are slightly larger than some of the other labels (and it is therefore easier to fit all the data and labels on to each label). Click on Next >.



The next screen asks for the font size and colour of the text on the label. Leave this set to a small size (it is easier to enlarge this later, if needed, than to reduce it), such as 8 points high. Click on Next >.

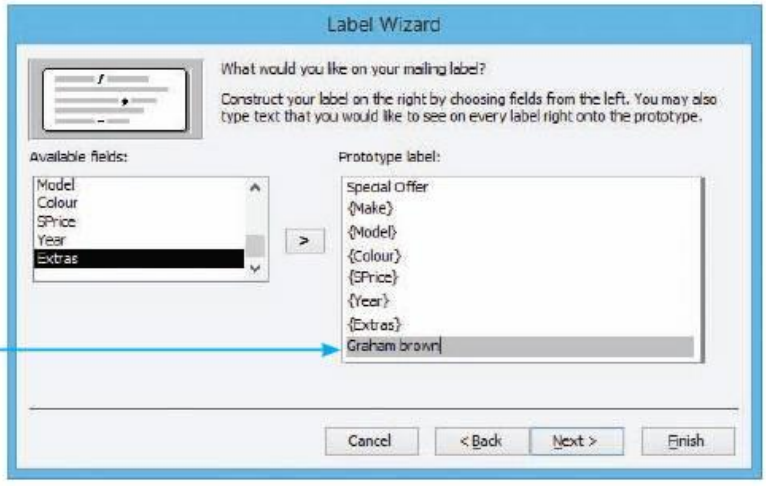
Type the text 'Special Offer' in the grey area as the top row of the label. Press <Enter> to move down to the second row. In Available fields: double click on the Make field. Press <Enter> to move to the next line. Add each field in the same way, entering the new line then the field. When all of the fields have been moved across, add a final row with your name, then click on Next >.



Move the Make, then Model fields across into the right to sort the labels by make and model as specified in the task, then click on Next >.

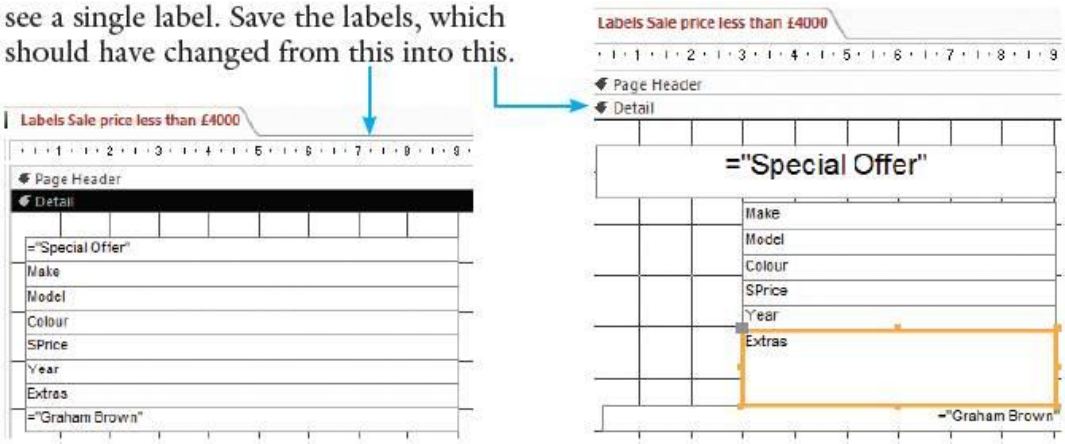
Give the labels an appropriate name and select the radio button for Modify the label design. Click on Finish.

Select all the controls except the one containing the text 'Special Offer'. Drag these down about 8 mm. Move the lower control down the label about 8 mm. Select the middle six controls and move the left edge to the right about 25 mm.



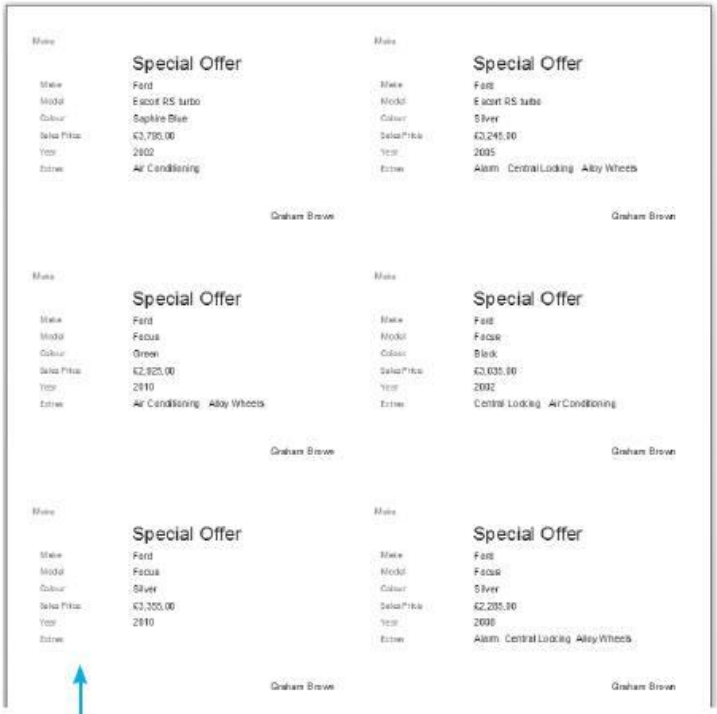
Select the control containing the text 'Special Offer' and stretch it down to give it more space. Open the Property Sheet and set the Font Size to 16 and the Text Align to Center. Stretch the Extras field down to give it more space, so that all the data should be visible. This will need checking when the labels are produced and edited again if necessary. Your name at the bottom of the label should also be right aligned by setting the Text Align to Right. Check the labels' layout from the HOME tab, using Print Preview to see all the labels set out on the sheet or Report View to

see a single label. Save the labels, which should have changed from this into this.



The six middle controls (those containing the fields) need labels. Click on the DESIGN tab and select the label box. Drag the label box out to the left of the Make field, enter the text 'Make' and, in the Property Sheet, set the Font Size to 8. Set the Height of this control to the same as the Make field control. It should now look like this.

Copy this control, paste it five times and move the new labels to the left of each field. Edit the text so that each shows what the field is. The label has changed to look like this.



Check the labels' layout from the HOME tab using Print Preview to see all the labels set out on the sheet. If need be, make any adjustments to the controls. Save the labels.

Activity 18k

Open the database that you saved at the end of Activity 18j.

Find all the stationery items where the discount is 'Yes' and the sale price more than £30. For these items produce labels that:

- have a page orientation of portrait and fit two side by side on the page
- have a 20 point, right aligned heading 'Discount Offers' at the top of each label
- show only the fields Type, Description, Colour and SPrice, sorted into colour order
- have your name centre aligned at the bottom of each label.

18.3.5 Format reports

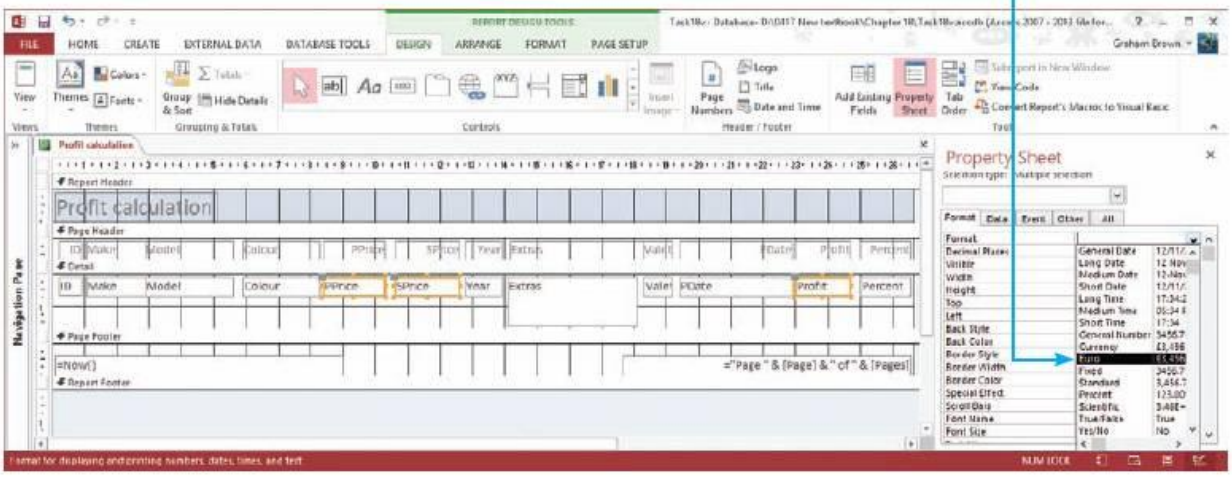
Task 18v

Open the file saved in Task 18u. Using the extract that contains the calculated fields Profit and Percent, produce a new report from all the data that:

- has the PPrice, SPrice and Profit fields formatted as Euro with two decimal places
- has the Percent field formatted as a percentage value with no decimal places.

Open the file saved in Task 18u. Create a new report from all the data in the extract using the Report Wizard. In the Tables/Queries box select the profit calculation query as the source of the data. Select all fields using the double arrow key. Click on Next > three times. Set the page Orientation to Landscape then click on Next >. Use Profit calculation as the report title. Select the radio button for Modify the report's design, then click on Finish. Adjust all the field widths so that all the data fits on the page.

Move to the Detail row of the report. Hold down the <Ctrl> key and select the PPrice, SPrice and Profit field controls. In the Property Sheet select the Format tab and use the drop-down menu in the Format section to select Euro.



Move to the Decimal Places section and select 2. Click on the View icon to go into Report View and check that the formatting for these fields is in Euro and contains two decimal places.

Repeat this process for the Percent field, left mouse click on the control for Percent in the Detail row of the report. Select the Format tab and use the drop-down menu in the Format section to select Percent from the drop-down list.

Move to the Decimal Places section and select 0. Go into Report View to check that the formatting for this field is now correct and contains no decimal places. This is fine, but some field widths may need readjusting so that all data and labels are fully visible. Adjust these before saving the completed report.

Advice

If a question asks for a currency not held in this drop-down menu, select a Currency format.

Activity 18l

Open the file saved in Activity 18k.

Using the extract that contains the calculated fields Profit, Percent and UnitProfit, produce a new report. Apply appropriate formatting to this report. All currency values must be in Euro with two decimal places. All percentage values must be set to one decimal place.

18.3.6 Use formulae in reports

Other calculations may be needed on the data selected. These include calculating the sum (total), average, maximum or minimum values of selected data, or counting the number of items present in the selected data. All of these functions can be produced within a report in *Access*.

Task 18w

Open the file saved in Task 18v.

Produce a new report from all the data that:

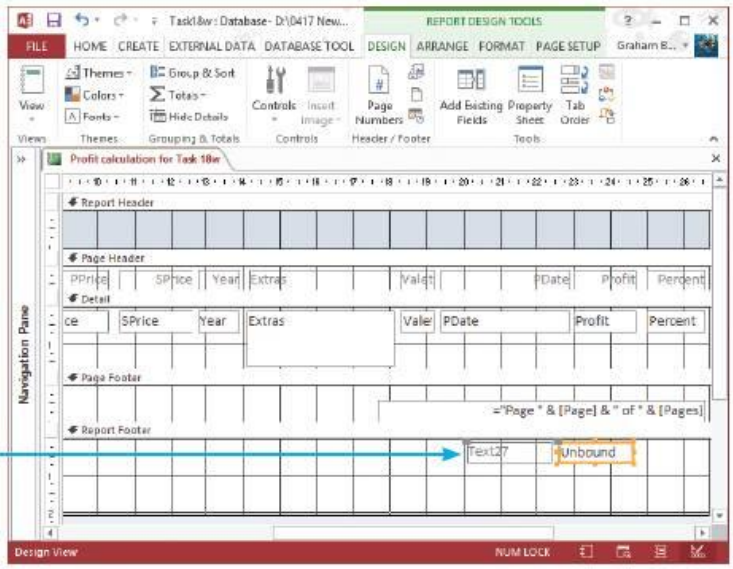
- displays at the bottom of the report the total profit if all the cars were sold
- displays at the bottom of the report the maximum, minimum and average profit values
- displays the number of cars in this report.

You can use the Profit calculation report from Task 18v to help you with this task. Close this report (if it is open) and right mouse click on it once in the Navigation pane so that you get the drop-down menu. Select Copy, then Paste a new version into the pane with a name that relates it to Task 18w. Open this report in Design View.

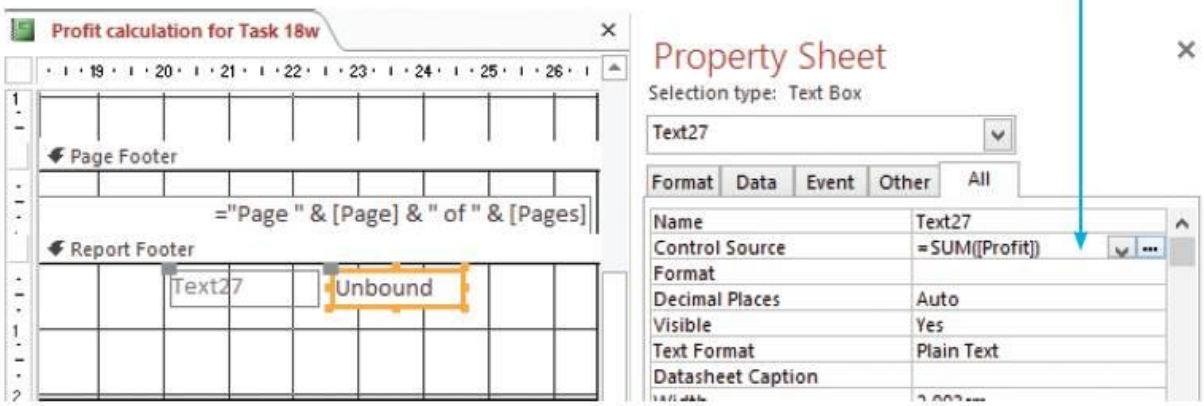
Click the left mouse button on the bottom edge of the Report Footer and drag this down about 2 cm, so that this footer is now visible. Select the DESIGN tab, move to the Controls section and select the Text Box icon.

Move down into the Report Footer, click the left mouse button and drag to place a new control, in this case a text box, directly below the Profit column. This positioning is important as this control will be used to calculate the total profit for the data in this report.

If the Properties pane is not showing, right click the mouse button on the text box that you have just created then select Properties from the drop-down menu. In the Property Sheet select the All tab, find the Control Source section and

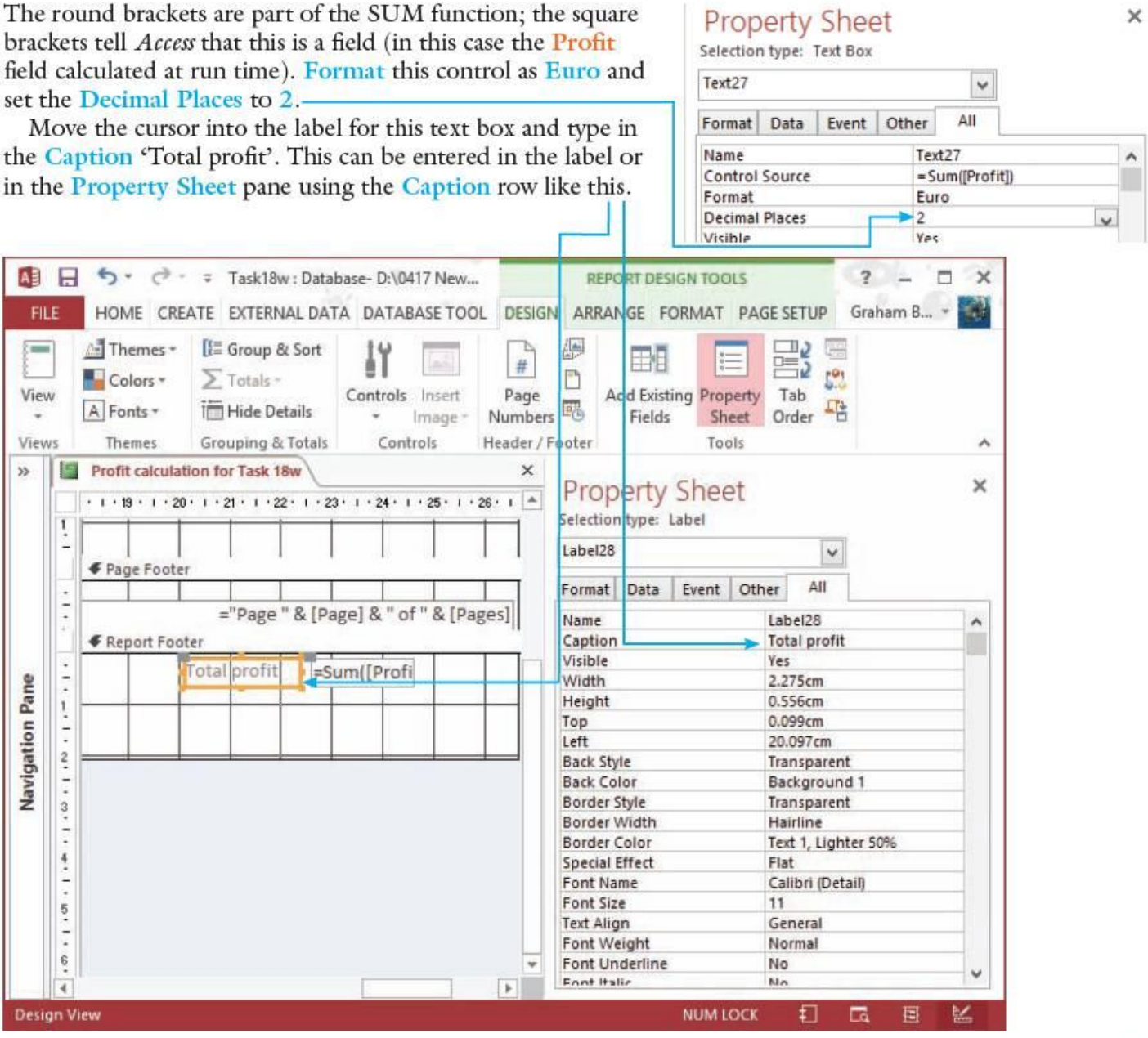


type the formula =SUM([Profit]) into this row. The Property Sheet will change to this.



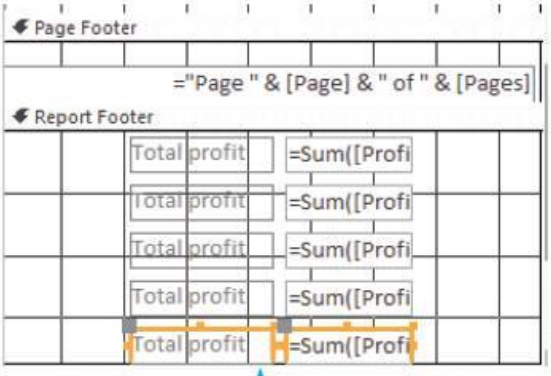
The round brackets are part of the SUM function; the square brackets tell *Access* that this is a field (in this case the Profit field calculated at run time). Format this control as Euro and set the Decimal Places to 2.

Move the cursor into the label for this text box and type in the Caption 'Total profit'. This can be entered in the label or in the Property Sheet pane using the Caption row like this.

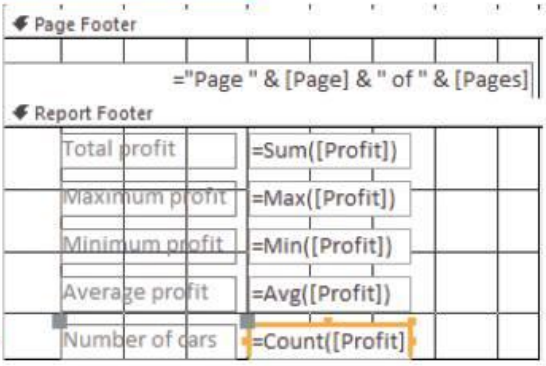


Change to Report View and make sure that the control is in the correct place and appears to give the right answer (it is not too large or too small).

Rather than repeating this process four more times, it will be quicker to copy and paste these controls and edit each one to give the required results. Use the lasso tool to highlight both the Text Box and its Label. Use <Ctrl> and <C> to copy, then use <Ctrl> and <V> to paste the copies of these controls. Using <Ctrl> and <V> pastes the new controls directly under the existing ones and you do not need to reorganise the controls. It also extends the bottom of the Report Footer as needed. If you right mouse click and use Paste from the drop-down menu, this pastes the controls in the top left-hand corner of the Report Footer and you then have to drag and position each set of controls. Repeat <Ctrl> and <V> until you have five sets of controls like this.



In the last four controls containing labels, change the Captions to 'Maximum profit', 'Minimum profit', 'Average profit' and 'Number of cars'. Select the second Text Box (for the maximum profit) and change the formula so that it becomes =MAX([Profit]). Change the formulae for the minimum profit so that it becomes =MIN([Profit]) and for the average profit so that it becomes =AVG([Profit]). In the final control to count the number of cars, change the formula so that it becomes =COUNT([Profit]). The controls should now look like this.



In the Property Sheet pane for the final Text Box, change the Format back from Currency to General Number. Set the Decimal Places for this control to 0. Check the layout and calculations in Report View. The completed calculations look like this.

Save the report. If you need to show evidence of the formulae that you used, use screen shot evidence of the calculated controls.

Advice

If you are using screen shot evidence of calculated controls, make sure that each control is wide enough to show all of the formulae in full. If you do not show all the formulae, marks will not be awarded.

Activity 18m

Open the file saved in Activity 18l.

Copy and edit the report which contains the calculated fields to produce one that:

- displays at the bottom of the report the maximum and minimum percentage profit for all the stationery items in stock
- displays at the bottom of the report the average profit per item
- displays the number of items in stock
- uses appropriate formatting for all data.

18.3.7 Sort data in reports

Although *Access* has the ability to sort data in both tables and queries, it is easier to save the sorting until the data is produced in an *Access* report.

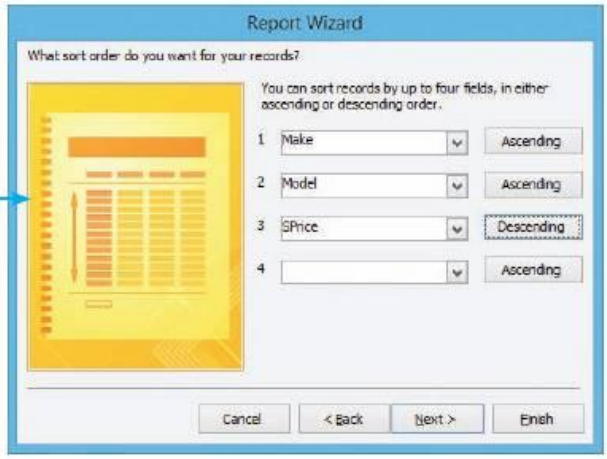
Task 18x

Open the database that you saved at the end of Task 18w.

Produce a report that:

- displays all the data for the cars made by Ford or Vauxhall
- fits within the width of a single page
- is sorted into ascending order of make and model, then into descending order of sale price
- has your name in the report header followed by 'Ford or Vauxhall'.

You created the query in Task 18j. To produce this report, select the CREATE tab and click on the Report Wizard icon. In the Tables/Queries box select the Ford or Vauxhall query. Select all fields using the double arrow key and then click on Next > twice to obtain this view.



Use the drop-down lists to select the Make field, then the Model field and, finally, the SPrice field. For the SPrice field, click on Ascending to the right of this field and it will toggle (change) to Descending. When the fields have been set as shown, click on Next >. Set the Orientation to Landscape and run through the final stages of the wizard, giving this report a suitable name. This process is the same for other data types such as dates.

Activity 18n

Open the file saved in Activity 18m.

Produce a new report from all the data that:

- displays all the blue or black stationery items
- fits within the width of a single page
- is sorted into ascending order of colour and type, and then into descending order of description
- has your name in the report header followed by 'Blue or black stationery items'.

19 Presentations

In this chapter you will learn:

- what a presentation is
- why consistency in your presentation is important
- how to open a source file
- how to use a master slide to place objects
- how to create presentation slides
- how to add and edit text
- how to insert an image
- how to create and add a chart to a slide
- how to insert other graphical features to a slide
- how to use transitions between slides
- how to animate objects on a slide
- how to display a presentation
- how to save and print a presentation.

For this chapter you will need these source files from the CD:

- html.rtf
- powerpoint.rtf
- pressound.mp3
- presvideo.avi
- slogan.jpg
- website.jpg.

19.1 What is a presentation?

A presentation is a series of slides used to give information to an audience. A presentation can be used in many different ways: to teach or inform as a visual aid in a lecture, or as a constant on-screen carousel giving information or advertising, for example in a shopping centre or mall.

The media for delivery and type of presentation developed will depend on the purpose of the presentation and the target audience. For example, you would design a presentation on road safety to a class of five-year-old children to be short (for a short attention span); have only a few simple words (as they cannot read fluently); and contain bright, colourful, moving images (to keep their attention). The medium for the delivery of this presentation would be a multimedia projector and large screen.

It is important to understand all of this information before starting to design and develop a presentation, as different media will require different screen/page sizes. Most presentations will require a consistent colour scheme and consistently applied styles to all slides. You will be given details of these colour schemes and styles.

Consistency is really important in the development of your presentations; simple themes and colour schemes using one or two fonts save presentations from being messy and disorganised. A well-structured and organised presentation usually says to the audience 'I am a well-organised and reliable person'. One way of doing this is to use a master slide.

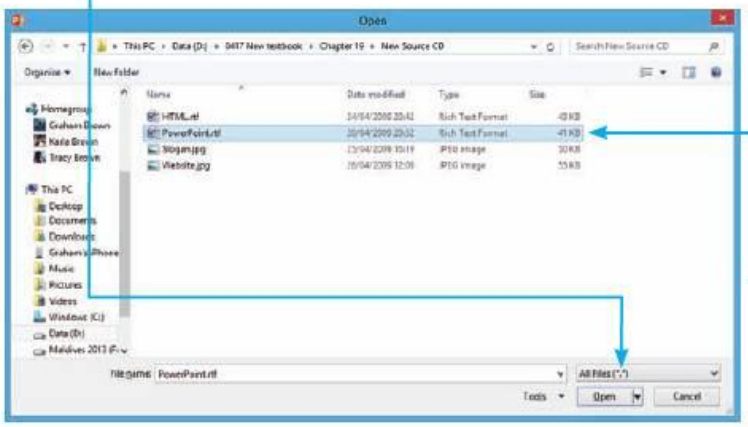
19.2 Open a source file

If you are given a source file that contains the slide contents, in older versions of *PowerPoint* the slide master/s had to be created first and the slide contents imported. In more recent versions the slide contents have to be opened and the master slide created after the contents. If new slides or slide contents are to be added by hand, then setting up the master slide would be a good starting point.

Task 19a

Open the file **powerpoint.rtf**, which will be used to create a short presentation for IGCSE students telling them how to use *PowerPoint*. The medium for delivery will be a multimedia projector with a 4:3 aspect ratio.

Open *PowerPoint* and double click the left mouse button on Blank Presentation. Select the FILE tab followed by Open. Find the source file using the Computer option, which opens the Open window. Select the correct directory and change the file type box from All *PowerPoint* Presentations to All Files.



The source files will be supplied as either text files (in .txt format) or rich text files (in .rtf format). The difference between the two is that .rtf files hold some formatting and styles (like text size and fonts) while .txt files only contain the characters and no formatting or styles.

Double click the left mouse button on the file **powerpoint.rtf**.

The file opens like this.

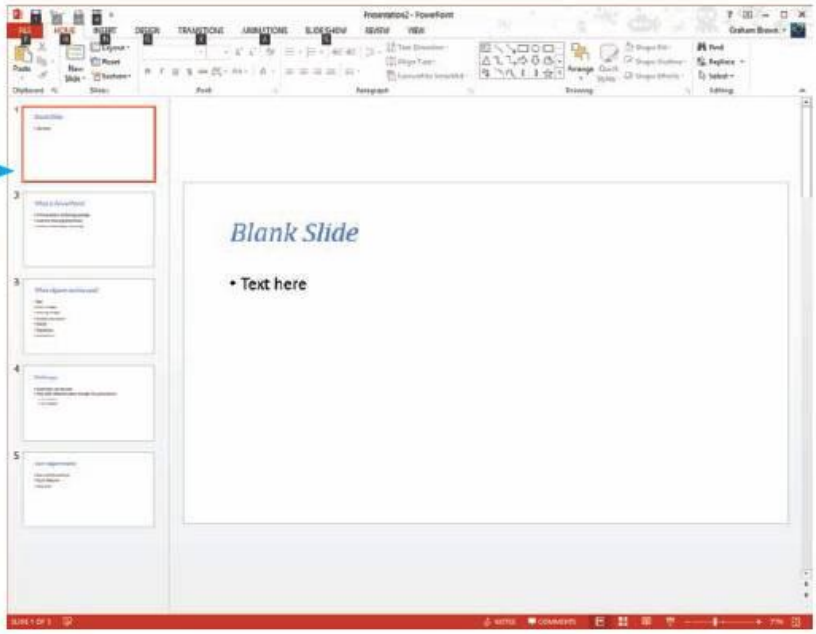
Save this as a presentation with the filename task19a.

Before changing any of the slides, you will now create and edit the master slide.

19.3 Use a master slide to place objects

A master slide allows you to design the layout of your slides before you start adding objects (such as text or images) to the slides. It holds the information on colours, fonts, effects and the positioning of objects on the slides.

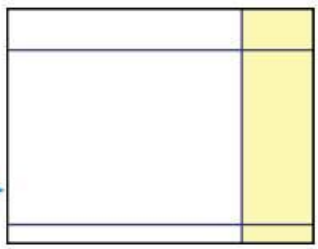
Open the file saved in Task 19a and select the View tab. Find the Master Views section and click on the Slide Master icon.



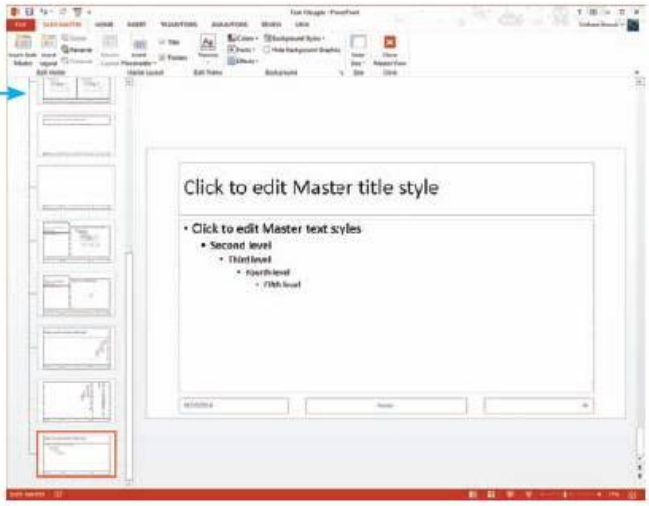
Task 19b

Open the file saved in Task 19a.

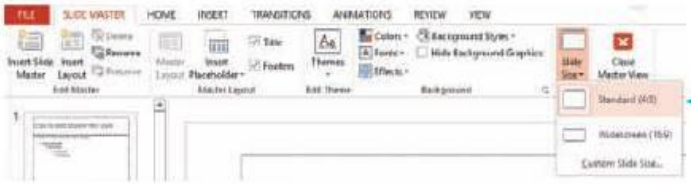
Create a master slide with a pale yellow background on the right-hand side (about a quarter of the width) with one vertical dark blue stripe as a border for the yellow background and two horizontal dark blue stripes. Each stripe should be 4 points wide. It should look like this.



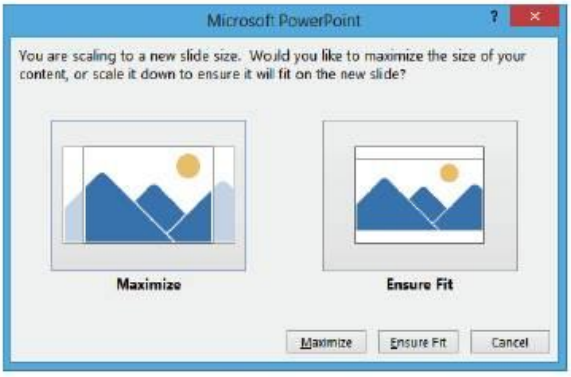
The display will change to this.



The layout of a presentation will depend on the medium for its delivery. In this task you are told that the medium for delivery will be a multimedia projector with a 4:3 **aspect ratio**. If you are not told the aspect ratio in the question, assume that it is 4:3 for multimedia projectors and 16:9 for presentations using a monitor. To change the slide size, go to the size section of the toolbar, click on the **Slide Size** icon and select the correct aspect ratio.



Because the slide contents have been opened and the default setting for *PowerPoint* on my computer is an aspect ratio of 16:9, I get this pop-up window.

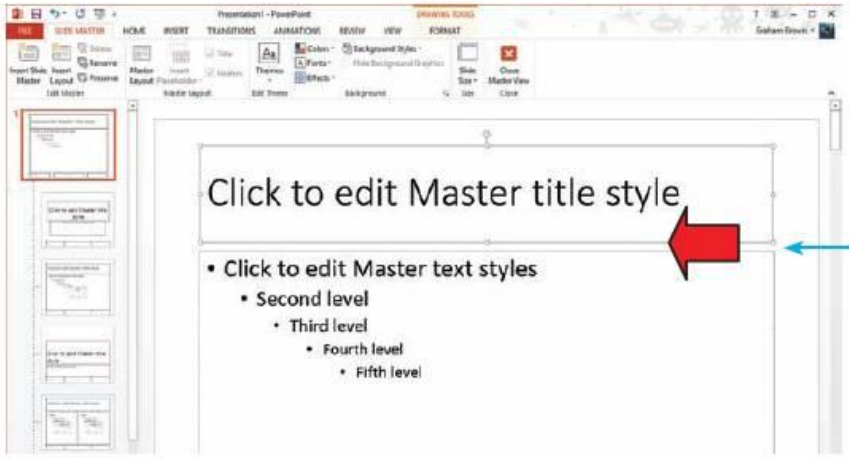


If you get this message, select the **Maximize** button.

Use the scroll bar on the left of the window to scroll to the top and select the **Primary Master Slide** (the top one). This master slide is copied by all the other sub-types that are listed below it.

For this task the master slide has to contain a number of lines and one filled area. You should start with the filled area. This will be created by placing a filled rectangle in the right place. However, this rectangle will cover some of the objects already on the slide, so these objects to be resized or moved out of the way first.

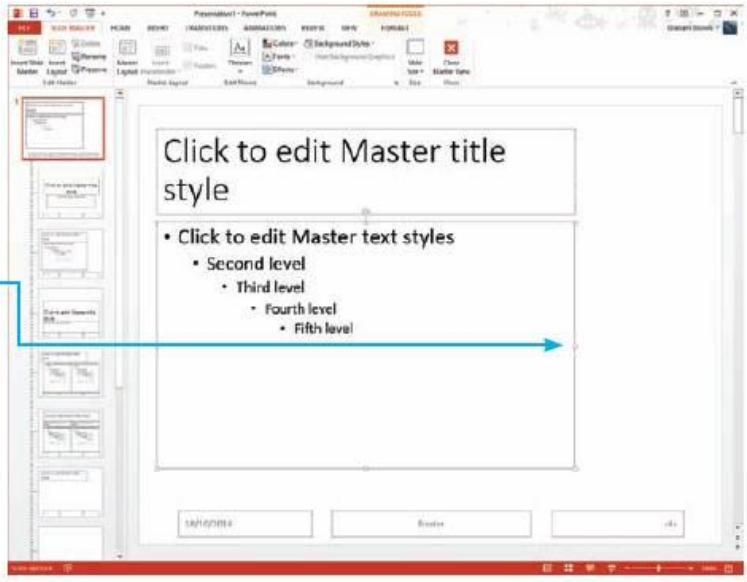
Select the title text placeholder and use the drag handle to resize this text box.



Repeat this for the body text placeholder on the master slide. This box has also been made less deep using the lower drag handle to create space to move the slide numbering.

The text box containing the slide numbering is too small to resize, so this will need to be moved from the right-hand side. Drag the entire text box into the space created below the body text box.

The page layout should now look like this.

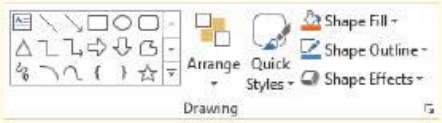


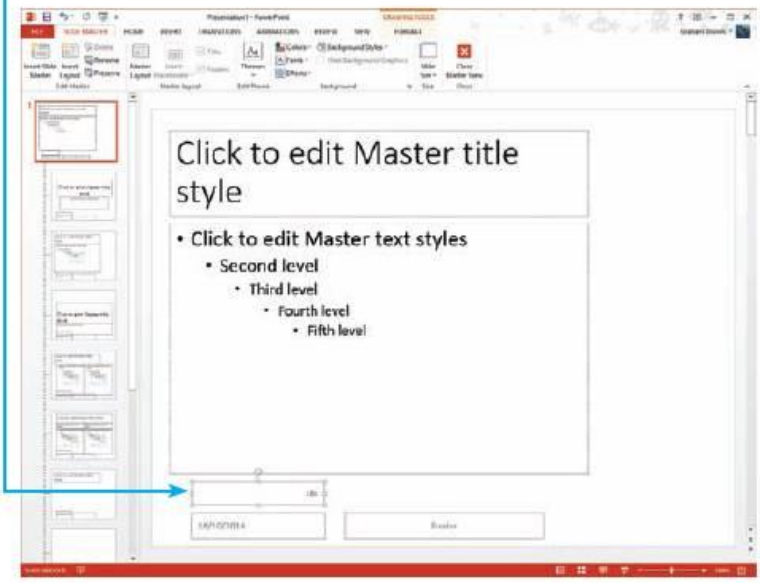
Select the INSERT tab and find the Illustrations section. Click on the Shapes icon and select the Rectangle option from the drop-down menu.

Use the drag tool to drag a new rectangle that fills about a quarter of the right-hand side of the slide. Make sure that this rectangle fits to the top, bottom and right edges of the slide and leaves no white space.

Advice

Many shapes, such as the rectangle, can also be found in the Drawing section of the HOME tab.

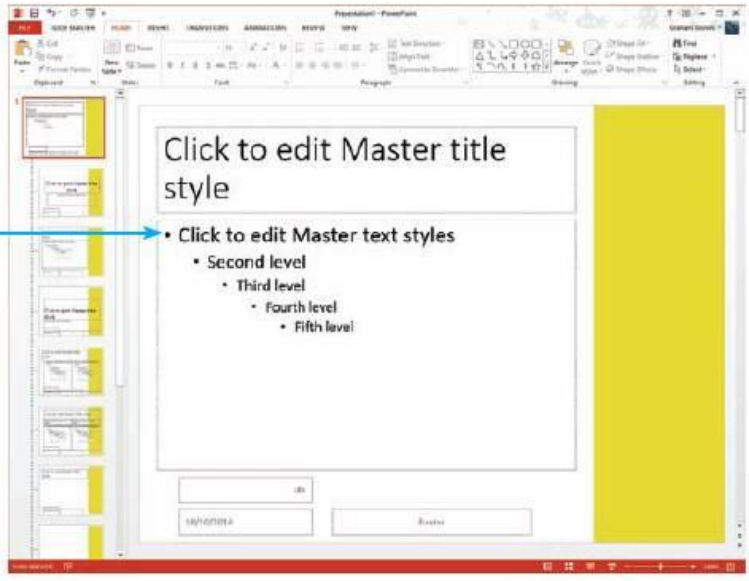




You now need to edit the appearance of the rectangle. Select the HOME tab and find the Drawing section. Use the Shape Fill icon to select the fill colour and click on the Shape Outline icon, followed by No Outline from the sub-menu, to remove the border from the rectangle. The master slide should look like this.

You will notice that all the other master slides (down the left-hand side of the window) now show the yellow background.

Next you need to add the three blue lines to the slide. Select the HOME tab then, in the Drawing section, select the Shapes icon and click on the Line option from the drop-down menu. Use the drag tool to draw a vertical line on the border between the yellow and white areas.



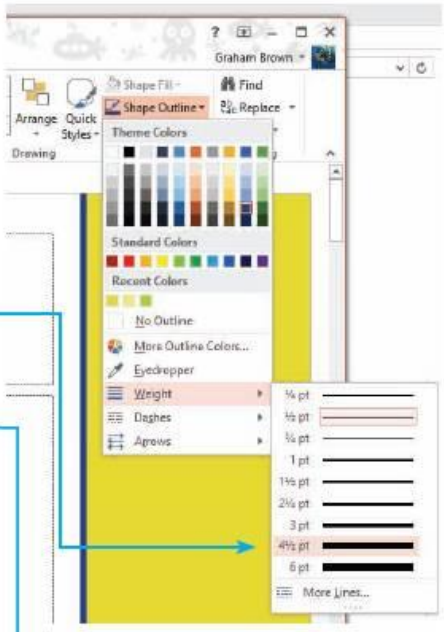
Advice

Holding down the <Shift> key while placing the line forces it to be either vertical, horizontal or at 45 degrees.

Use the Shape Outline icon to change the line colour to dark blue. The Shape Outline icon can also be used to change the line thickness. Select Weight and, from the sub-menu, select the line weight. For this task the line weight should be 4 points. This option is not available from this menu so select the nearest weight available, in this case 4½ points.

Right mouse click on the line and select Format Shape... from the drop-down menu. From the Format Shape pane adjust the line Width: to 4 points.

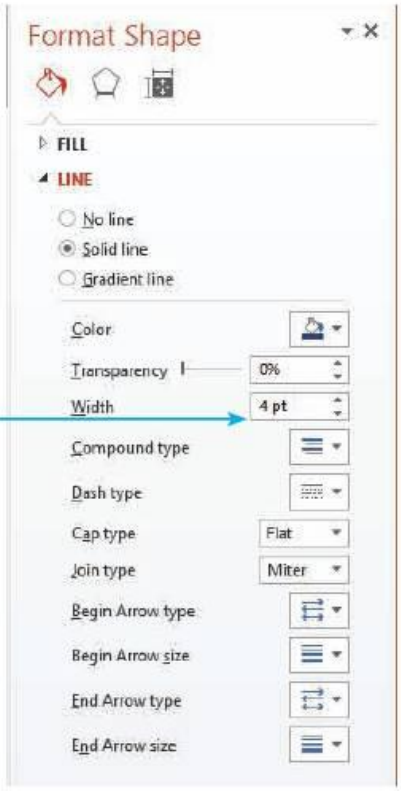
Repeat this process to add the two horizontal lines to the master slide in the positions shown in the task.



Advice

You may find it easier to copy the first line and paste it twice; rotate the two new copies and resize and place them as required by the task.

Save the presentation with the filename task19b.



Task 19c

Open the presentation that you saved in Task 19b.

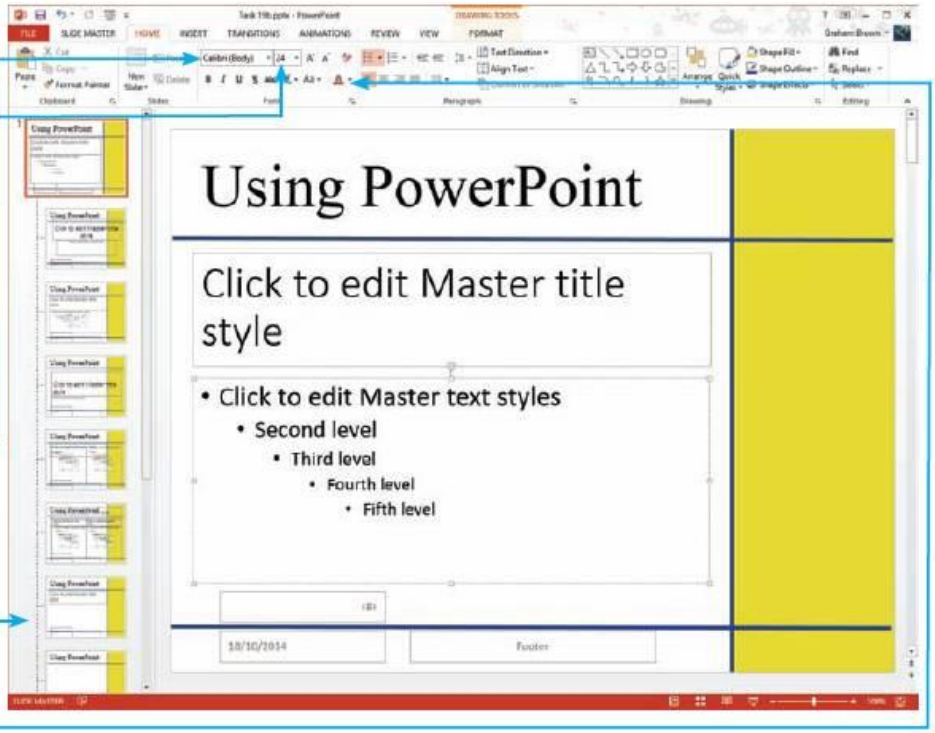
Include the heading 'Using *PowerPoint*', left aligned in a dark blue, 60 point serif font above the blue line at the top of the master slide. Include an automated slide number in the bottom left of the footer.

Enter your name, centre aligned, in the white area at the bottom of the master slide. Use a black, 14 point, serif font.

Place a clip art image of a computer or peripheral in the right-hand area. Crop and/or resize the image so that it fits within the yellow area and will not overlay the dark blue lines. Do not distort the image. Make sure that the image fills more than 50% of the available space.

Save your presentation.

To include the heading, add a new text box in the top left section of the slide. This text box will replace the title text box, so move the title text box down the slide to below the blue line. Go to the INSERT tab and click on the Text Box icon in the Text section. Drag out a new text box then select the HOME tab and find the Font section. Set the font size to 60 point and select a serif font, for example Times New Roman.



Enter the text 'Using PowerPoint' into this text box. You may need to move/resize the master text style to get this text box. The window should now look like this.

Highlight this text and set the font colour to dark blue, using the Font Color icon.

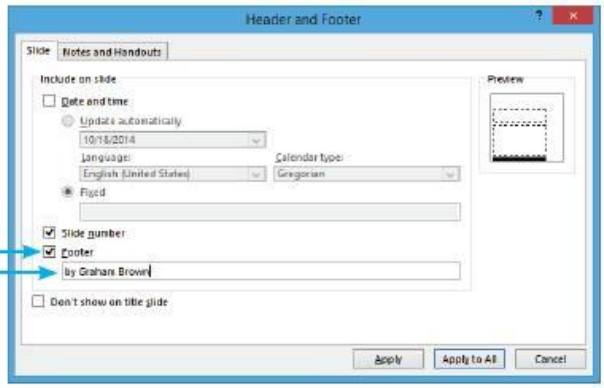
As the text is already left aligned, do not adjust the alignment. Notice how the text box has been aligned with the other objects on the slide so it can be checked that the text is left aligned.

The automated slide number is in the object moved from the right side of the footer. The task asks for this to be placed on the left in the footer. Resize this object (as shown previously) and change its alignment to left aligned by clicking on the Align Text Left icon in the Paragraph section under the HOME tab. Drag the box into the bottom left corner. As the date is not required on all pages, this object can be deleted before moving the automated slide number.

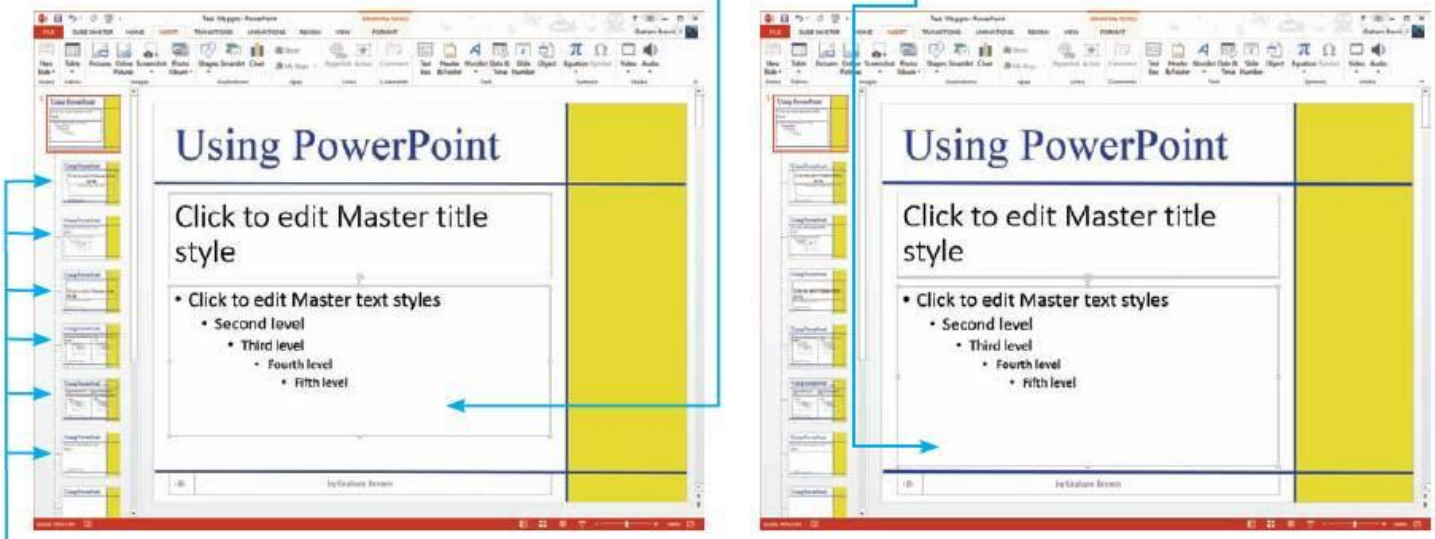
Enlarge the automated footer so that it fills the width of the white space, as shown. Make sure that you enlarge the footer so that it overlaps the slide number, which will ensure that it can be seen that the object is centre aligned. Change the text and the slide number to a black, 14 point, serif font as described above. The finished footer area should look like this.

Although you have set the footer area of the master slide, you have not yet added your name to the footer, nor told *PowerPoint* to display the page numbers. To do this, select the INSERT tab then, in the Text section, click on the Header & Footer icon. This opens the Header and Footer window.

Tick the box for Slide number and the box for Footer. Move the cursor into the text box for Footer and type in your name. To set this on all slides, click on Apply to All.



Use the drag handle to enlarge the body text box on the master slide. Now move down into each of the other master slides and resize all text boxes to ensure that they fit within the white space; for example, from this to this.



If the task requires particular font styles or sizes for each of these objects, these can also be set in these master slides as described earlier.

Depending on the presentation being created, the placeholders for the body text and title text will also need moving for some of the other master slide items. Move to each in turn and make sure that the text placeholders fit between the lines on the master slides. This will only need to be completed for the style of slides that you need for this presentation.

19.3.1 Clip art images

To insert a clip art image, return to the top Slide Master and select the INSERT tab. In the Images section click on the Online Pictures icon to open the Insert Pictures search pane.

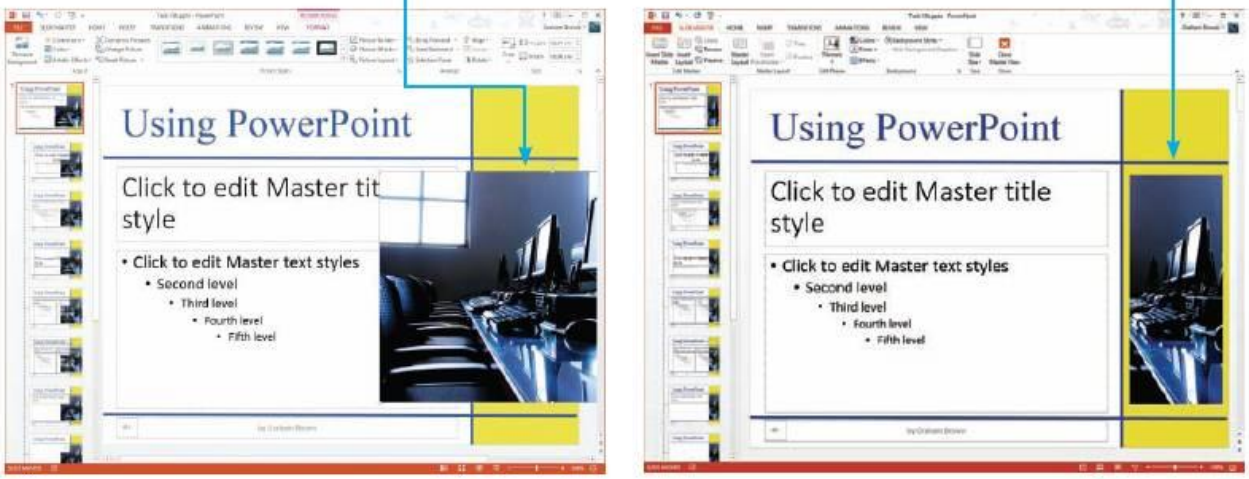
Advice

Use Insert + Pictures to insert images supplied to you rather than clip art.

For this task you need to find an image of a computer, so enter 'Computer' in the Office.com Clip Art box, then click on the search icon or press the return key.

This searches the online clip art library and finds pictures that may match what you are searching for. You can also browse your local drives for other images. Look through the images to find one that will fit well in the available space – remember that you can crop and resize the image but cannot distort it. When you have chosen the image, double click the left mouse button on it to download it. This places this clip art image on to the master slide. Move and resize it so that it fits into the correct area. To crop the image, select the image and click on the FORMAT tab. In the Size section, click on the Crop icon.

With the crop tool selected, use the drag handles of the image to crop the edges so that it changes from this to this.



When the master slide is complete, select the VIEW tab and, in the Presentation Views section, click on the icon for Normal page layout.

Save your presentation as task19c.

19.4 Create presentation slides

One method of getting the text for the slides is to open an .rtf or .txt file (as you did in Task 19a). The second method used to create presentation slides is by inserting a new slide into an existing presentation and adding the text manually.

Task 19d

Add a new slide between slides 4 and 5 of the presentation that you saved in Task 19c. This slide will contain the heading 'Ease of use', a chart and this bulleted list:

- 86% of students found it easy to use
- 120 students in the sample.

Use this data to create a chart: Easy – 103, Difficult – 12, No response – 5. Show the percentage of students in each category.

On slide 1, add the heading 'Hints and tips', and add the subheading 'for IGCSE students'.

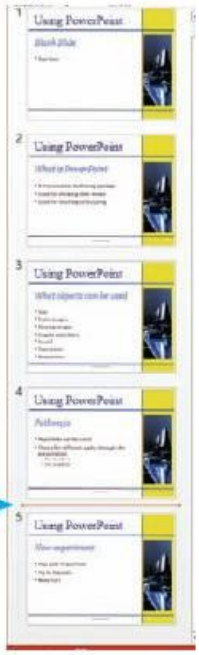
Set the following styles of text throughout the entire presentation:

- heading: dark blue, serif, left aligned, 40 point
- subheading: blue, sans-serif, centre aligned, 30 point
- bulleted list: black, sans-serif, left aligned, 24 point.

Save the presentation.

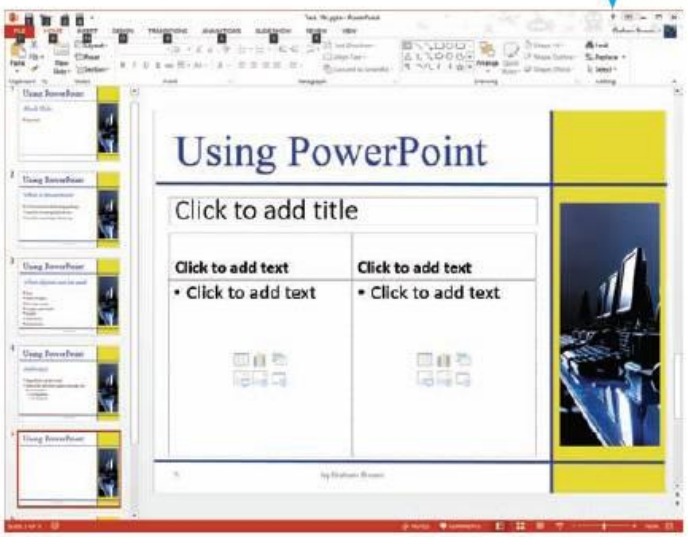
Open the presentation saved in Task 19c. Move into the left pane and select the Slides tab (if it is not already visible). Click the cursor between slides 4 and 5 so that it shows a horizontal line like this.

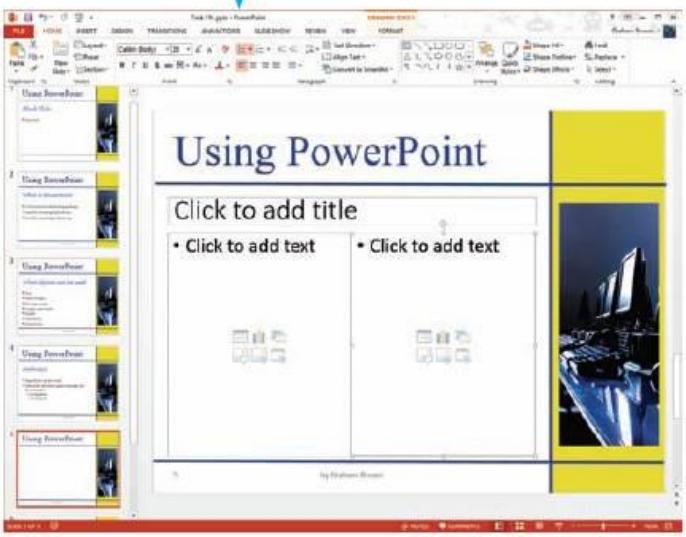
Select the HOME tab and, in the Slides section, select the drop-down menu for New Slide. Look at the different slide layouts available from this menu and



select the layout that matches the slide you are going to produce. This slide needs a small bulleted list and a chart, so the most appropriate slide type will be Comparison. Although the option for 'Content with Caption' looks correct, it is more difficult to manipulate the caption box. Click once on this icon to get the new slide.

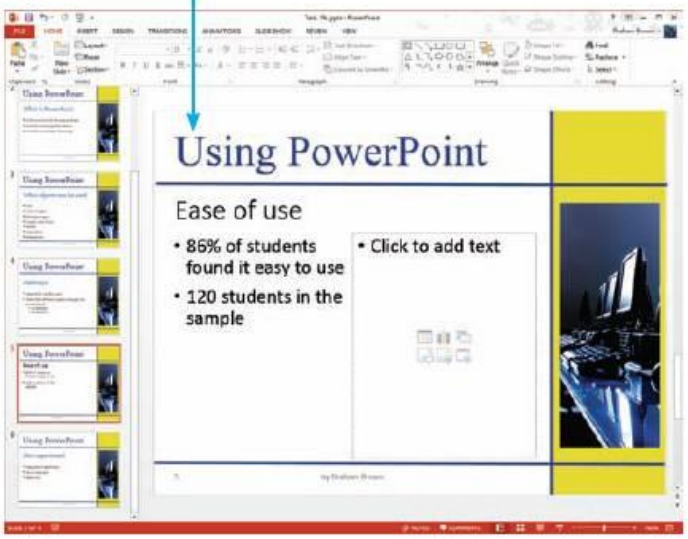
Delete both of the top text boxes that say 'Click to add text'. These are not needed in this slide. To do this click on the line for the text box and press the <Backspace> or <Delete> key. Use the drag handles to edit the two larger placeholders below them to make them fit the available space. The slide will change from this to this.

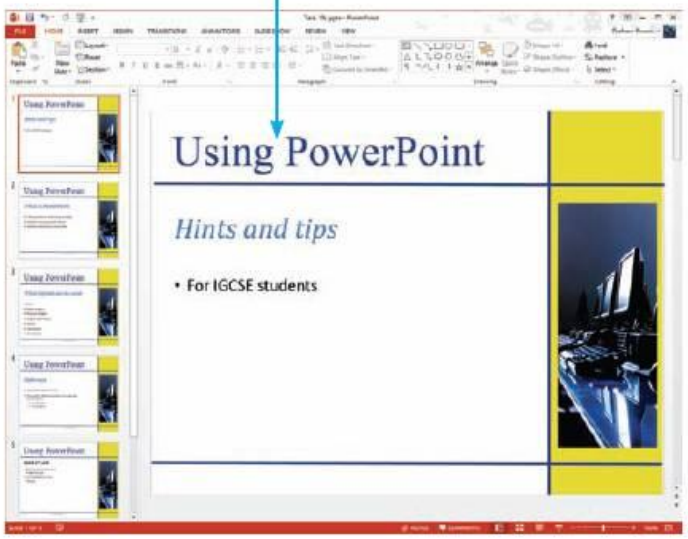




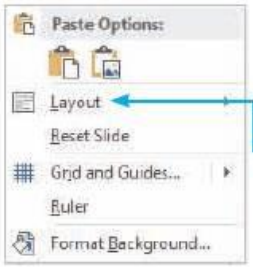
Click in the title placeholder and add the heading 'Ease of use'. Select the left object below the title. Click on the bulleted text 'Click to add text'. This will change this object into a text box. Type in the text '86% of students found it easy to use', <Return>, '120 students in the sample', so that it looks similar to this.

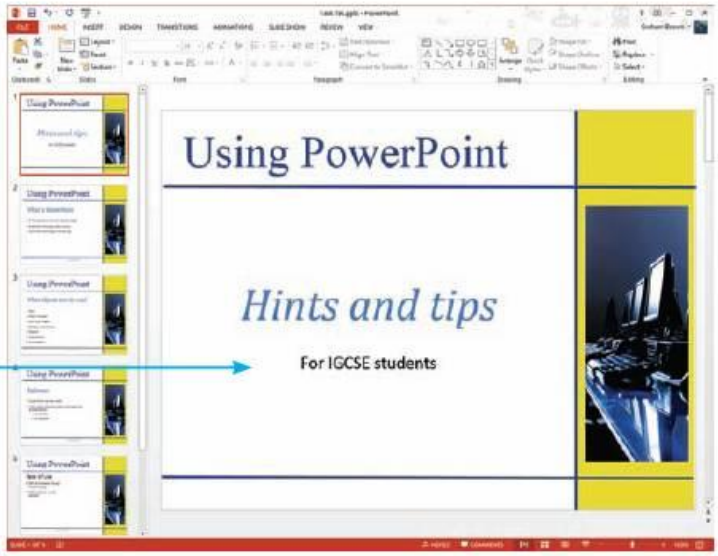
It is sensible to complete all the text parts of this task together and then add the chart at the end. Move on to slide 1. Replace the text 'Blank Slide' with the heading 'Hints and tips'. In the lower placeholder replace the text 'Text here' with 'for IGCSE students', so that slide 1 looks like this.





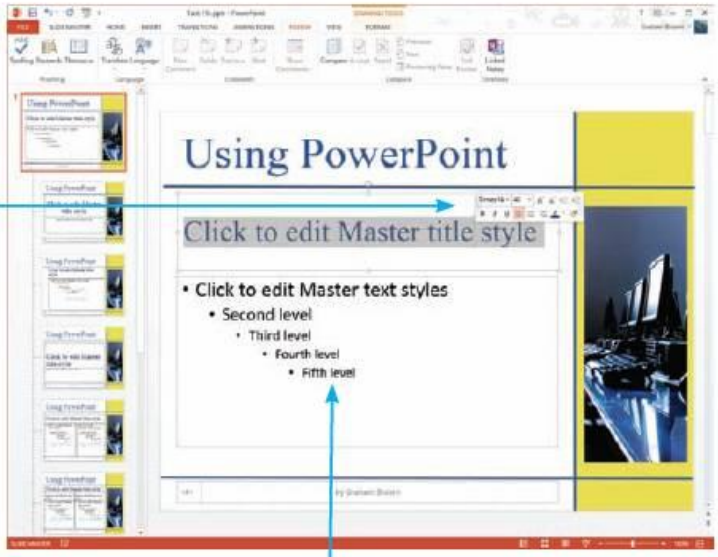
Some slides do not always import as you want them. This slide has imported as a bulleted list rather than as a title slide. To change it to a title slide, right mouse click on the slide background and select Layout. Select Title Slide from the list of available options. The slide will change to look like this.





19.4.1 Set the styles for an existing presentation

Select the VIEW tab followed by Slide Master and select the Primary Master Slide (the top master slide). Highlight all the text in the heading (title) style placeholder and click the right mouse button to obtain a drop-down menu and miniature toolbar to allow you to edit the text style.

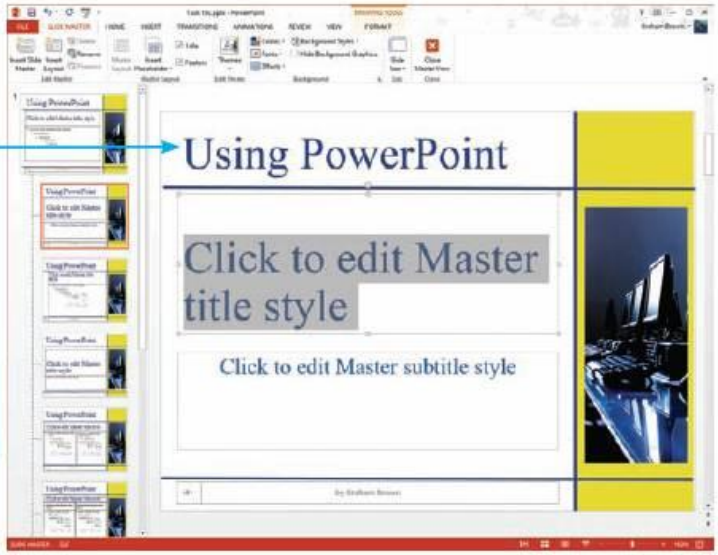


The heading style needs to be a dark blue, left aligned, serif font. Select a serif font, such as Times New Roman, using the font list. Use the Text Color icon to select a dark blue colour and (if need be) use the Align Text Left icon to change the text alignment. Use the drop-down list for the font size to change it to 40 point. The text box should now look like this.

Use a similar method to set the first level of the bulleted list to a black, sans-serif, left-aligned font (no changes are needed for these parts), 24 point high. Adjust the font sizes for the other levels of bullet points so that they are smaller relative to this one.

The subheading style is not visible in this master slide, so you need to move into the master slide for the Title Slide Layout (the first master slide down). Highlight the text for the Master subtitle style and set this to a blue, sans-serif, centre aligned, 30 point font. Use the same method as you did for the Master title style.

Move through each slide master in turn and edit any of the styles on other page layouts that need to be set.



Select the VIEW tab and the Normal icon. Check each slide carefully to make sure that the styles that you have changed have been applied to each slide of the presentation.

Advice

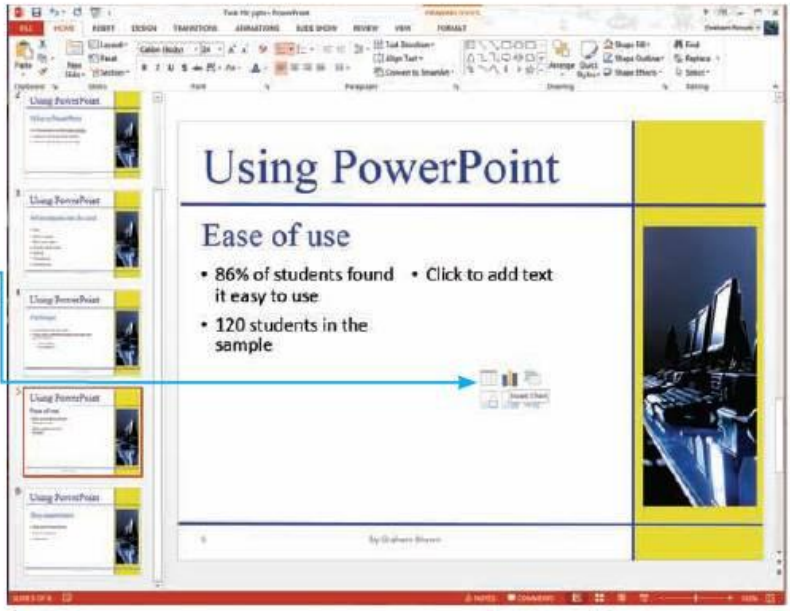
You must open the data file into *PowerPoint* before setting up your master slides and styles. The instructions given in this task may not be in the easiest order within *PowerPoint*. It is sensible to read through the task before starting.

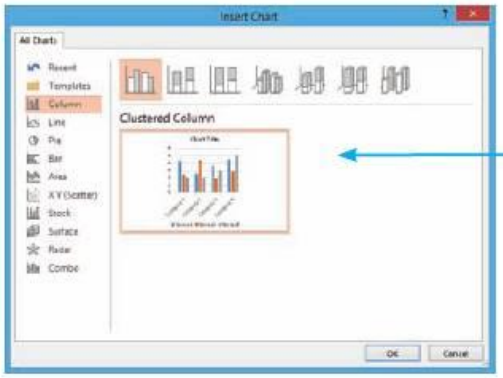
It is very important to make sure that all slides are consistent. Don't assume that the software itself will format the slides correctly and do check each slide carefully.

19.4.2 Create a chart in *PowerPoint*

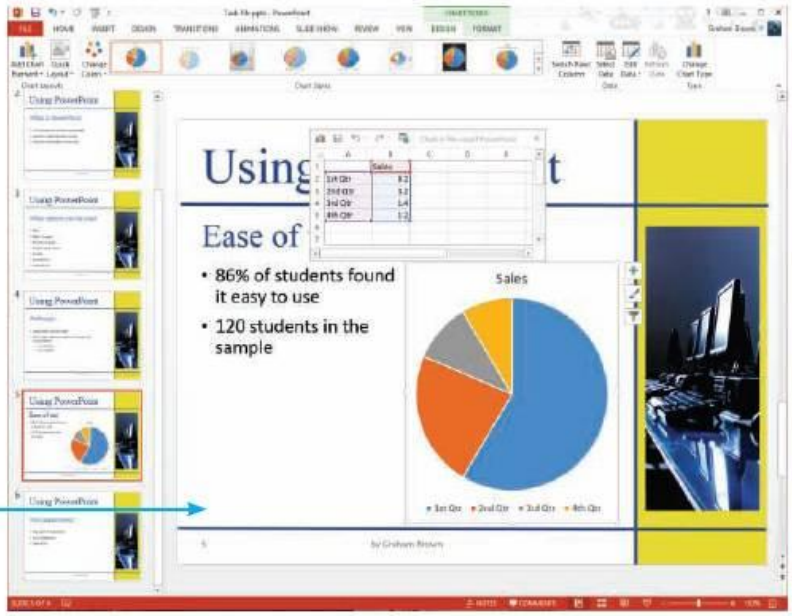
Move on to slide 5. In the task you were instructed to: 'Use this data to create a chart: Easy – 103, Difficult – 12, No response – 5. Show the percentage of students in each category.'

Click on the chart icon in the unused object on this slide. This opens the Insert Chart window.

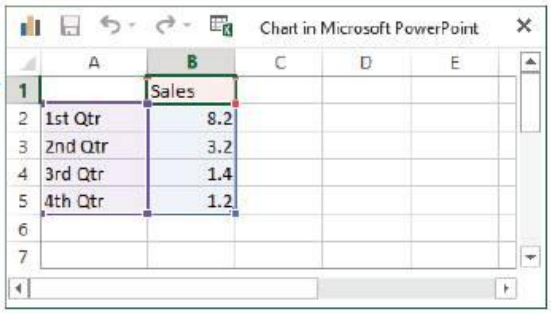




You must decide which type of chart is the most appropriate for the task. In this case, you are told to show the percentage of students in each category. There is a clue to the need for percentage values in the bullet points on the left of the slide. Because the chart needs to show percentage values (parts of a whole), a pie chart is the most appropriate type of chart. Select a simple pie chart from the available chart types and click on OK. This opens a default pie chart, but does not use the correct data. The slide should now look like this.

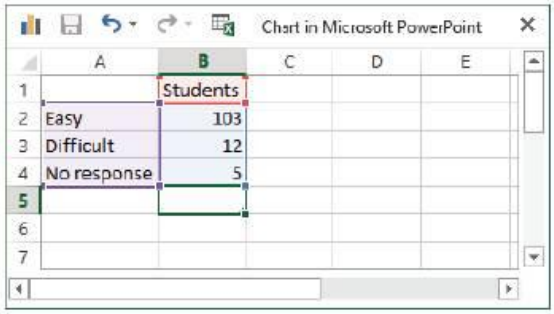


As you can see, the chart does not relate to the data for this task. Instead, it is about quarterly sales in a company. It may also open an *Excel* style spreadsheet like this that contains the data.

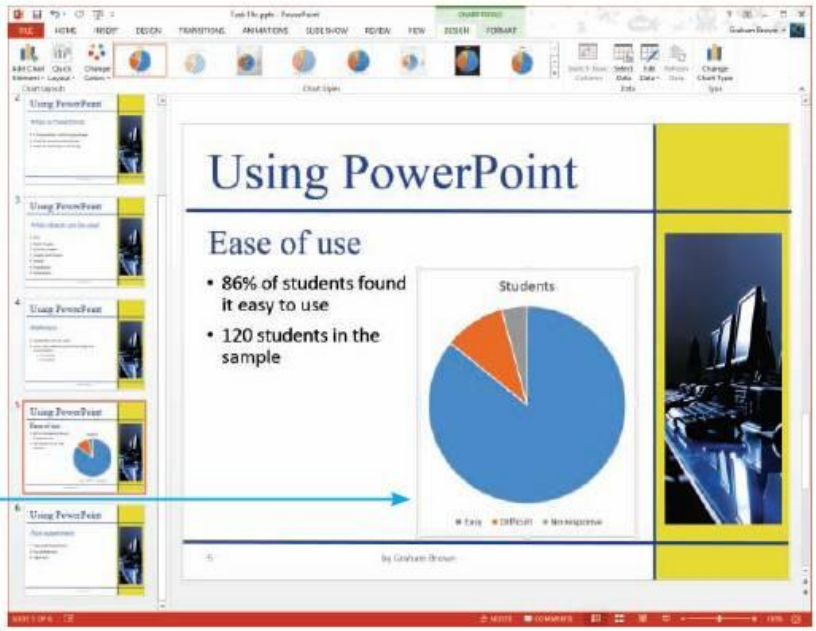


If this does not appear, select the DESIGN tab and under Chart Tools, find the Data section and click on the Edit Data icon.

Move into cell B1 and replace the label 'Sales' with the word 'Students'. In cell A2, enter the text 'Easy' so that it replaces the existing text, in A3 type 'Difficult' and, in A4, 'No response'. Replace the sales figures in B2 with 103, in B3 with 12 and, in B4, with 5. Delete the contents of cells A5 and B5. Drag the blue range marker using the drag handle so that it includes cells A1 to B4 only. It should now look like this.



The slide now contains the chart. Close the spreadsheet containing the data. Save the presentation as task19d.



Advice

Charts may be created from contiguous or non-contiguous data and can have features such as titles, legends and labels for axes and segments. All the features that you studied in Chapter 16 can be applied to a graph or chart before it is cut and pasted into the slide.

19.4.3 Use charts imported from a spreadsheet

The latest versions of *Microsoft Office* have made the process of creating a chart in *Excel* almost identical to the creation of a chart within *PowerPoint*. In *Excel* select the INSERT tab and, in the Charts section, click on Pie Chart. For more detail of the production of the chart please refer to Chapter 16. When the chart has been created and fully labelled, copy the chart in *Excel* and paste it on to a slide in *PowerPoint*. Resize the chart to fit the available space.

Activity 19a

You are going to create a short presentation for IGCSE students giving them advice on website authoring. The medium for delivery will be a multimedia projector.
Create a master slide with a green background at the top (about $\frac{1}{8}$ of the height) and at the bottom of each slide (about $\frac{1}{16}$ of the height) with a dark green horizontal line as a border between the white and green backgrounds. Add two vertical dark green lines to the left of the slide. Each line should be 6 points wide. It should look like this.

Include the heading 'HTML', right aligned, in a black, 40 point, sans-serif font at the top of the master slide (as shown above). Include an automated slide number in the green area to the left of the two vertical lines. Make this a 14 point, black, sans-serif font. Include your name right aligned in the footer in the same style as the page numbering.
Set the following styles of text throughout the entire presentation:

- heading: black, sans-serif, left aligned, 40 point, within the green 'header' section
- subheading: red, serif, centre aligned, 40 point
- bulleted list: dark green, serif, left aligned, 32 point
- level 2 bulleted list: dark green, serif, left aligned, 24 point.

Place a very small clip art image of a computer or peripheral in the bottom right corner of the white space. Crop and/or resize the image so that it fits. Do not distort the image.
Import the file **html.rtf**, placing the text as slides in your presentation software. On slide 1 add the heading 'Hints and tips' and the subheading 'for IGCSE and Level 2 students'.
Use this data to create a chart: Text editor – 42, FrontPage – 37, Dreamweaver – 31. Show the percentage of students in each category. Insert this chart into slide 4 with the heading 'Percentage of users from the survey'.

19.4.4 Audience and presenter notes

Delivery of a presentation with a multimedia projector may include the use of **audience notes** and/or **presenter notes**.

Audience notes

Audience notes are paper copies of the slides of a presentation that are given to the audience so that they can take them away and refer to them after the presentation. Sometimes people will want to write their own notes on their audience note printouts during a presentation. These can be printed in different formats, with several slides on a page, or just one slide with space for the person to add their own notes.

Presenter notes

Presenter notes are a single copy of the slides from a presentation, with prompts and/or key facts that need to be told to the audience by the person delivering the presentation. These notes are sometimes printed and not usually given to the audience.

Add presenter notes

Task 19e

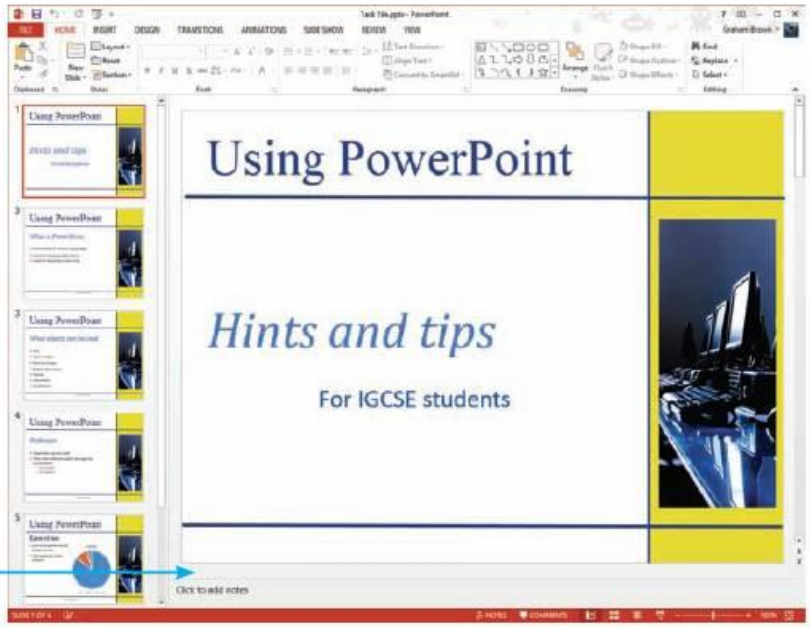
Open the presentation that you saved in Task 19d. Add the following presenter notes to the slides:

- **Slide 1**: Welcome to this presentation giving you useful hints and tips on using *Microsoft PowerPoint* for your IGCSE practical examinations.
- **Slide 2**: The presentation that you are watching has been made using *PowerPoint*.
- **Slide 4**: Hyperlinks can be used to give different paths or to open external websites or documents.
- **Slide 5**: Graphs and charts can be added to enhance a presentation.

Open the presentation that you saved in Task 19d in Normal view. In the orange toolbar at the bottom of the slide is a NOTES icon. Click on this to show the presenter notes area of the page.

Move the cursor to the Notes area of the screen. Click the cursor into this box and type the presenter notes for slide 1. Use the Slides tab to select the next slide and continue with this process until all of the presenter notes have been entered. Not all of the slides have presenter notes. These notes will not appear on the slides when the presentation is run. You will learn how to print these so that the presenter can read from them later in the chapter.

Save the presentation as task19e.



Advice

Take great care when entering data in presenter notes. Check carefully the use of capital letters and punctuation.

19.4.5 Use images and sound

Task 19f

Open the presentation that you saved in Task 19e.

Add the image **slogan.jpg** to the bottom of the final slide, above the blue line. Crop the image so that the red line and all contents below it are removed. Resize the image so that it fits about 1 cm from the left edge of the slide, 1 cm above the lower blue line and 1 cm to the left of the vertical blue line, maintaining its aspect ratio. Adjust the brightness and contrast of the image so that the background colour (pale yellow) is not visible.

In Task 19c you inserted a new image from clip art into the master slide. For this task you are going to insert an image given to you as a file.

Advice

It is easier to manipulate these objects if the ruler is showing. To select the ruler, use the VIEW tab, find the Show/Hide section and click on the tick box for Ruler.

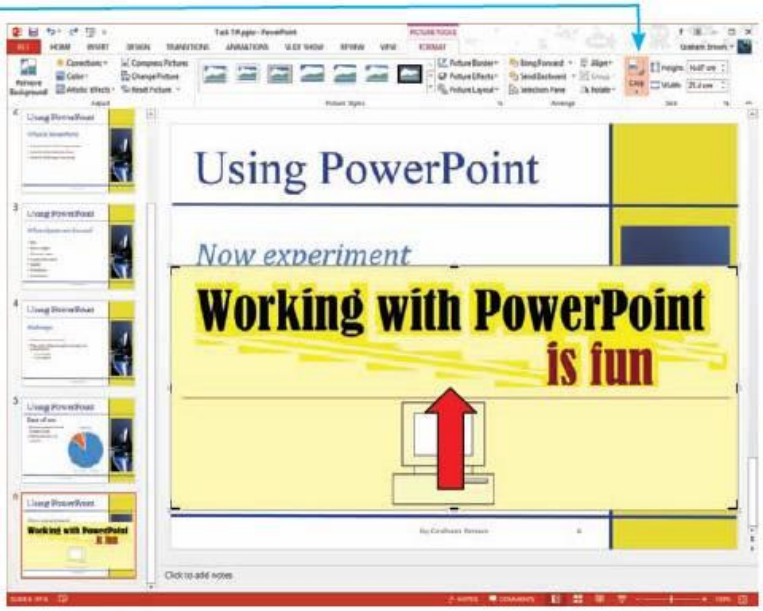
Open the presentation saved in Task 19e and use the Slides tab to open slide 7. Select the INSERT tab and then click on the Pictures icon. This opens the Insert Picture window. Search through the files until you locate **slogan.jpg**, select the file and click on Insert to insert the image into the slide. Click the left mouse button on the image and from the FORMAT tab select click on the Crop tool icon.

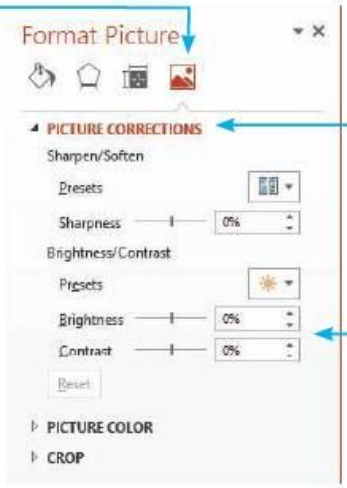
Drag the lower handle up the screen above the red line, but below the red text, to crop the image.

Click the left mouse button off the image then back on it and drag the image down so that the left and bottom edges are in the correct place on the slide.

Grab the top right drag handle and drag this to resize the image to the correct position to the left of the vertical blue line. The image should now look like this.

To remove the pale yellow background colour from this image, you need to adjust the image brightness and contrast. Click the right mouse button on the image and select Format Picture... from the drop-down menu. This opens the Format Picture pane to the right of the slide. Select the Picture option from the right. Double click on the Picture Corrections option to open this menu.



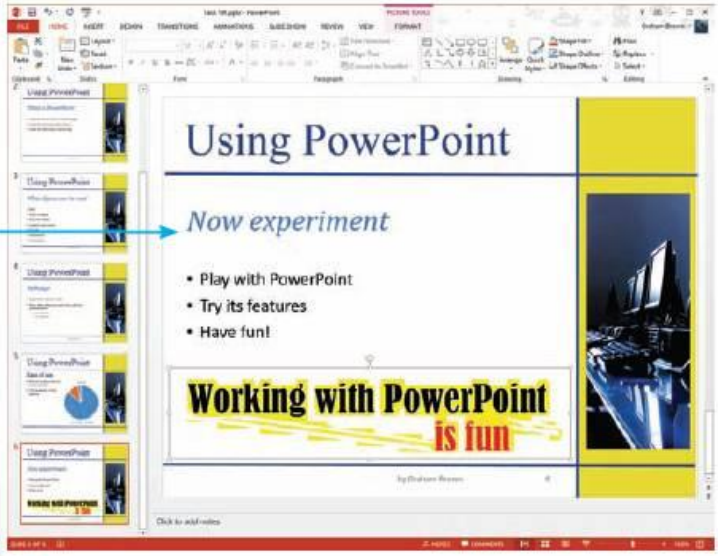


Move the sliders for the Brightness and Contrast, so that the pale yellow background disappears but the other colours remain unaffected. These figures are found using trial and error: both settings change from 0% to a brightness of around 35% and a contrast of around 75%.

When you have completed this, close the Format Picture pane. The slide should now look like this.

Notice how the red colour in the text has changed from its original dark red colour (see above) to this shade of red.

Save the presentation as task19f.



Add an animated image to a slide

To add an animated image (for example an animated gif file) to a slide, use the same method as adding a still image.

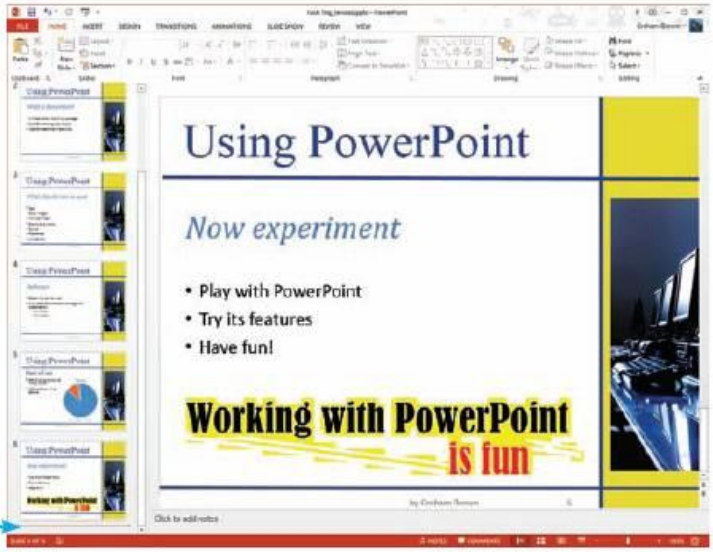
Task 19g

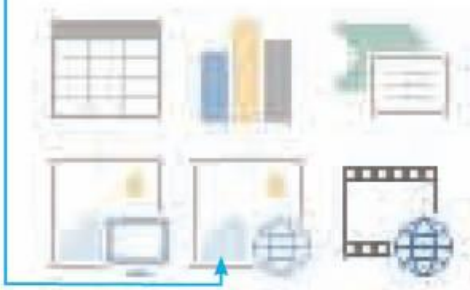
Open the presentation that you saved in Task 19f. Add a new slide at the end of the presentation into which you will place the video **presvideo.avi**. Make sure that this video plays when the slide is opened.

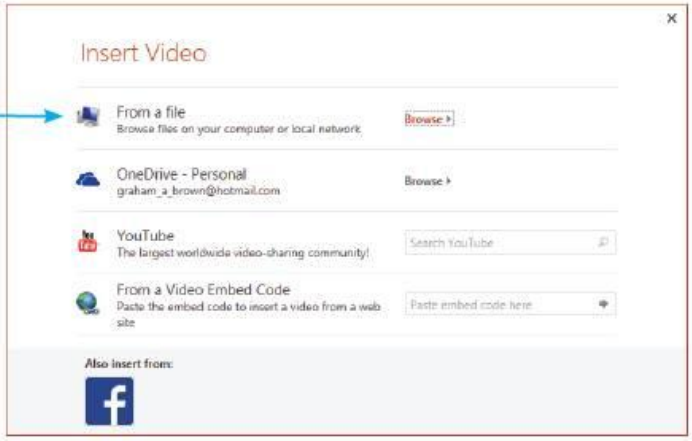
Add video to a slide

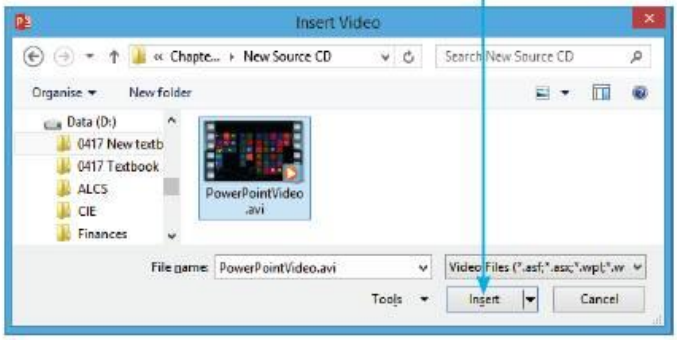
Open the presentation and scroll down to the end of the last slide. Click just below this slide to place the orange line at the bottom like this.

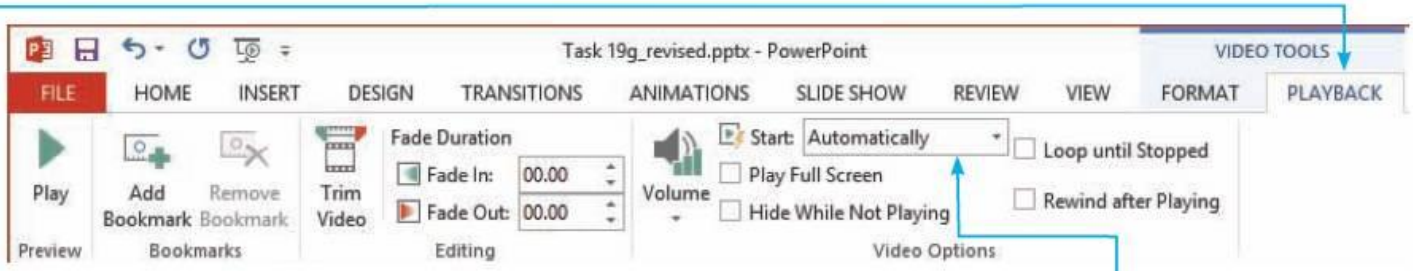
From the HOME tab select the New Slide icon then click on the Title and Content option. Add an appropriate title, such as 'Sample video', in the title placeholder. Look carefully in the centre of the content placeholder and choose the Insert Video icon. Use the From a file option to find the file **presvideo.avi**. in the Insert Video window, then click on the Insert button.











Click on the PLAYBACK tab and find the Video Options section. Set the Start setting to Automatically using the drop-down menu.

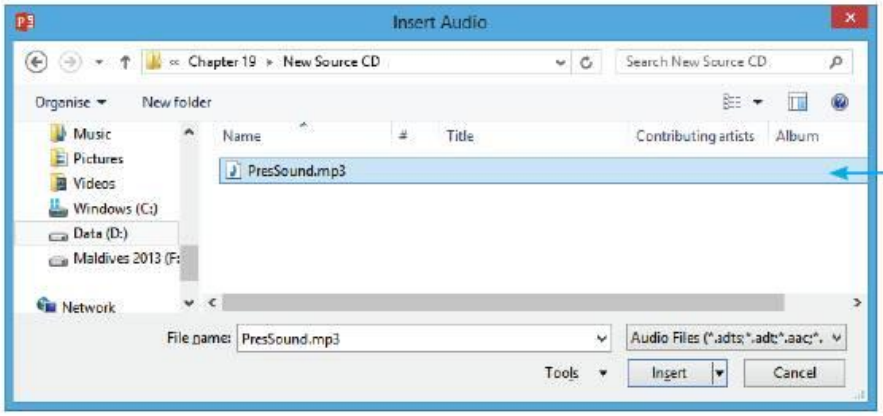
The video will now play when the slide is opened. Save the presentation as task19g.

Task 19h

Open the presentation that you saved in Task 19g. Add the sound clip **pressound.mp3** to slide 1. Play this sound track only once when the presentation is run.

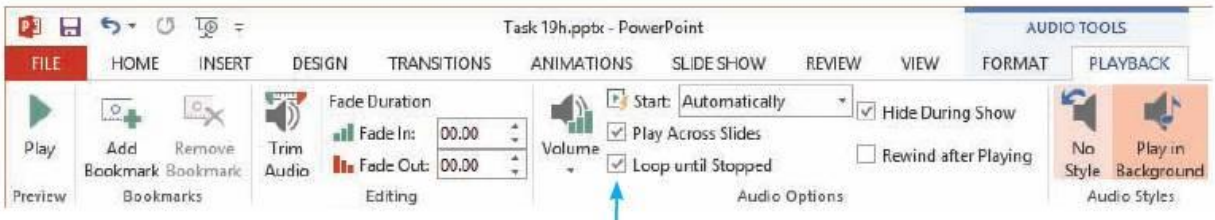
Add sound to a slide

Open the presentation in slide 1. Select the INSERT tab, click on the Audio icon, then on Audio on My PC... from the drop-down menu.



From the Insert Audio window choose the file **pressound.mp3** and click on the Insert button.

The audio file (sometimes called a sound clip) is now on this slide. Move the cursor to the AUDIO TOOLS tab and double click the left mouse button to select Play in Background.



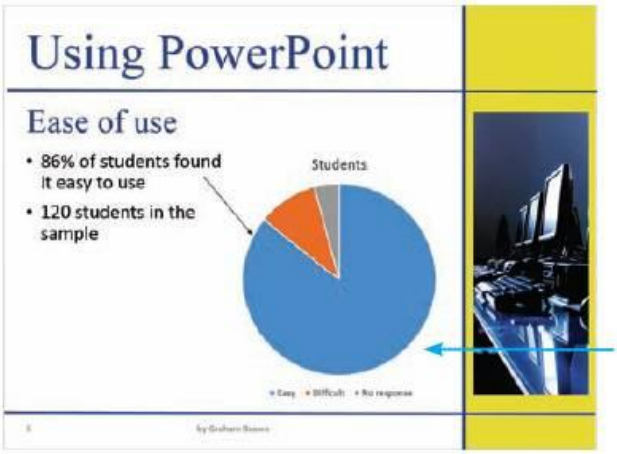
This will automatically change some of the other settings, for example the Start option changes from 'On Click' to 'Automatically' and the 'Play Across Slides' and 'Loop until Stopped' check boxes have been ticked. As the question asks for the sound track to be played only once, remove these two ticks. Test the presentation to check that it works. Save the presentation as task19h.

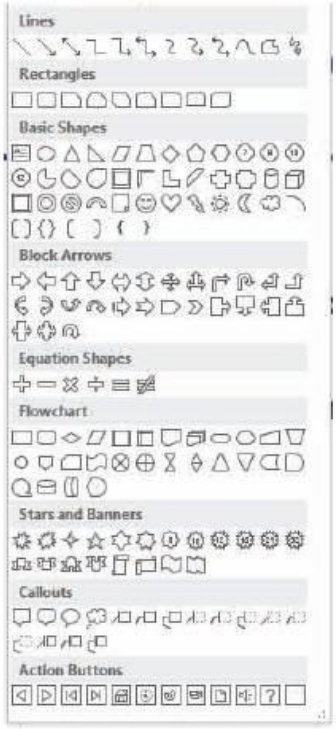
Task 19i

Open the presentation that you saved in Task 19h. Add:

- an arrow on slide 5 pointing from the first bullet point to the largest segment of the pie chart
- a callout box on slide 6 telling the reader that the image of a computer is placed on the master slide
- the text '© Microsoft' at the end of the first bullet point on slide 6 in a in a black, 12 point, sans-serif font
- a 6 point, horizontal, red line on slide 6, above the image you inserted in Task 19f.

Open the presentation and select slide 5 using the Slides tab. Select the INSERT tab and click on the Shapes icon. A drop-down menu of available shapes will appear.





Select an arrow to be included on the slide. Click the left mouse button where you want the arrow to start and drag the point of the arrow to the position that you want it to finish. The finished slide should look like this.

To place the callout box on slide 6, select slide 6 and again select the INSERT tab and Shapes icon. This time select a callout box from the Callouts section of the drop-down menu. Click on the slide and drag the callout box to draw it. It is easier if you make the box too large and reduce the size later. When you have placed the box, grab and drag the yellow handle to move the point of the callout box so that it points to the image.

Type the text that you require into the callout box (you cannot see the cursor as you can with a text box) and then resize the callout box using the drag handles. It may look similar to this.

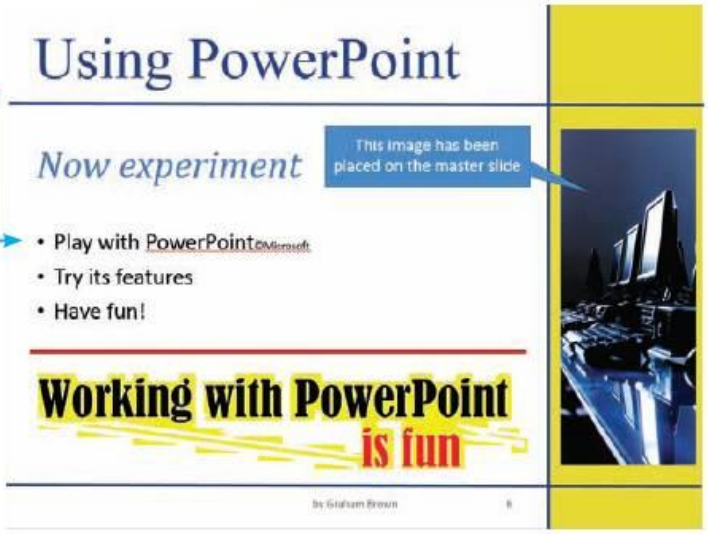
To insert the copyright symbol, click the left mouse button to place the cursor after the 't' at the end of the first bullet point. Select the INSERT tab and click on the Symbol icon.

This opens the Symbol window. Scroll through the available list of symbols until you find the '©' symbol.

Click on this symbol and then click on Insert followed by Close. Add the text 'Microsoft' after the symbol and highlight both the symbol and the new text. Set this to a black, 12 point, sans-serif font using the methods learnt earlier in the chapter.

To insert the red line, select the INSERT tab, then click on the Shapes icon and select a line. Drag the line horizontally across the page. Click the right mouse button on the line to open the Format Shape window. Use the Line outline and Line style sections to change the colour and thickness of the line. The completed slide should look similar to this.

Save the presentation as task19i.



Task 19j

Open the presentation that you saved in Task 19i. Apply transitions between all slides in your presentation. Animate all the bullets on slide 3 so that they appear one at a time.

19.4.6 Transitions between slides

Transitions between slides are the methods used to introduce a new slide. This can be simply replacing the existing slide with a new slide or using a number of different features to change from one to another. All transitions are located in the TRANSITIONS tab.

Open the presentation. Select the TRANSITIONS tab and find the Transition to This Slide section. Click the left mouse button to apply a transition and see the effect that it uses. There are more transitions available; you can use the scroll bar to see them.

Click on the icon to select the transition that you wish to use and then click on the Apply To All icon to apply the same transition to all slides.

Advice

Always use the same transition effect between slides and the same animation effect throughout the whole presentation. Consistency in these areas is just as important as using consistent styles and colour schemes.

19.4.7 Animation effects

Select slide 3 and highlight **only** the first item in the bulleted list. Select the ANIMATIONS tab and find the Animation section. Click the left mouse button to apply an animation and its effect. There are more animations available; you can use the scroll bar to see them.

Click on the icon to select the animation that you wish to use. To set each bullet to be individually animated, select them one at a time to apply the animation to each individually. To change when the bullets appear, use the Start and Delay options.

Opening the Animation Pane allows you to see the timings and to edit these by dragging the slide bars for timing (as shown) or by clicking the right mouse button on each animation.

The task instructed you to 'animate all the bullets so that they appear one at a time', so select Fade, Wipe or Float In for each bullet point. This sets the animation. The timings are set as shown above, so there is a small delay between each bullet; in this case the chosen delay was 2 seconds, but this has only been applied to the first bullets.

It is a good idea to have the Animation Pane open so that, when you need to show evidence of your animation effects, these can be seen. To test the animations, highlight those you wish to test in the Animation Pane and click on Play Selected. Save the presentation as task19j.

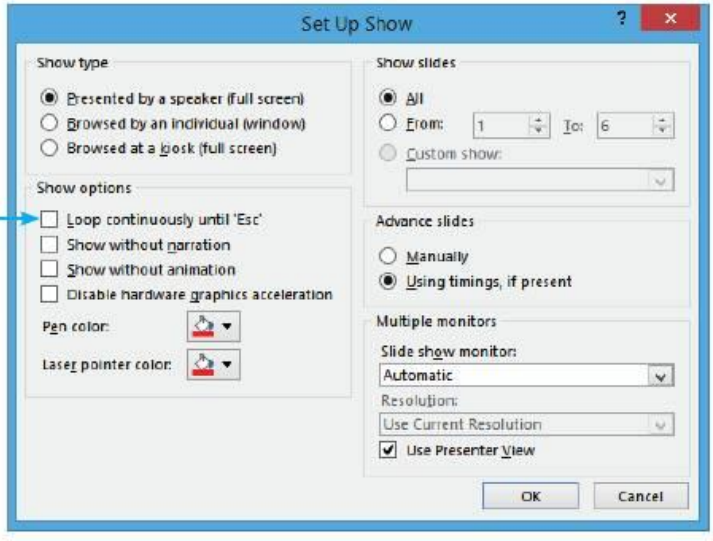
19.5 Display a presentation

The easiest way to display a presentation is to press the <F5> key, which runs the presentation from the start. An alternative is to select the SLIDE SHOW tab and choose from the options to start from the beginning, from the current slide, or to present online and allow others to download and run your presentation. To stop a presentation that is running press the <Escape> key.

19.5.1 Set up the slide show

To set up the slide show, select the SLIDE SHOW tab then click on the icon for Set Up Slide Show. This opens the Set Up Show window, which will allow you to set the show up in the way you want to deliver it. If the show is to be used as an on-screen carousel, perhaps to show messages around a building or to visitors in a foyer, it is usual to loop the show continuously. This is selected by ticking this box.

Other options for showing the presentation manually, with or without the animations running, can also be selected from this window. When you have made your choices select the OK button.



19.5.2 Save a presentation

As with all your work, make sure that you save your presentations regularly using FILE and Save.

19.5.3 Print a presentation

To print evidence of your work, you must identify what types of printouts are required. Sometimes you will be expected to print only the slides, but more often you will need to print audience or presenter notes; for these printouts you will need to select FILE and Print. Screen shots are the best way to show evidence of transitions and animations.

Task 19k

Open the presentation that you saved in Task 19j. Print your presentation showing:

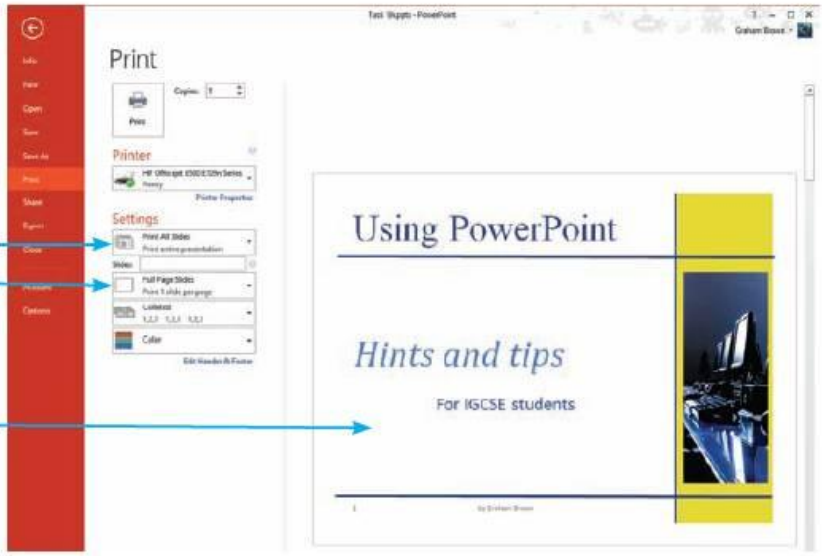
- only the slides
- presenter notes
- audience notes with three slides per page and space for the audience to make notes
- evidence of the transitions between slides
- evidence of the animations used on slide 3.

Print slides

Select FILE and Print to open the Print window. In the Settings section, select Print All Slides if all slides are required. To print only the slide/s content with no additional notes or space, select Full Page Slides.

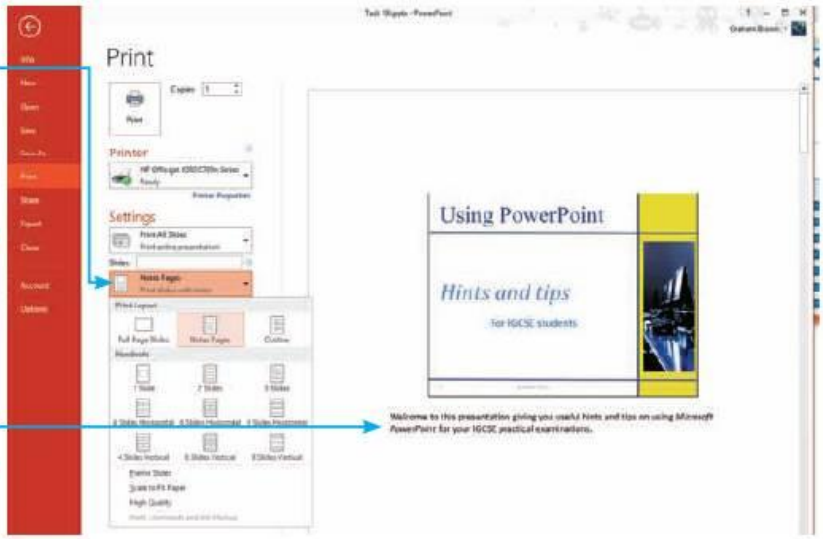
An example of the printed material (in this case slide 1) is shown here.

To send to the printer click on Print.



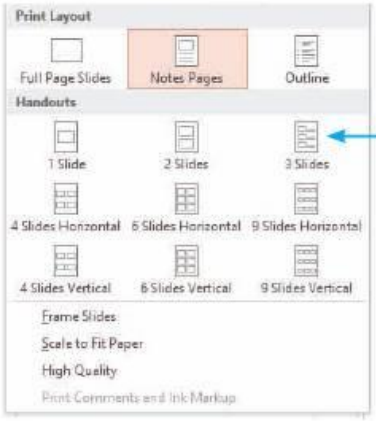
Print presenter notes

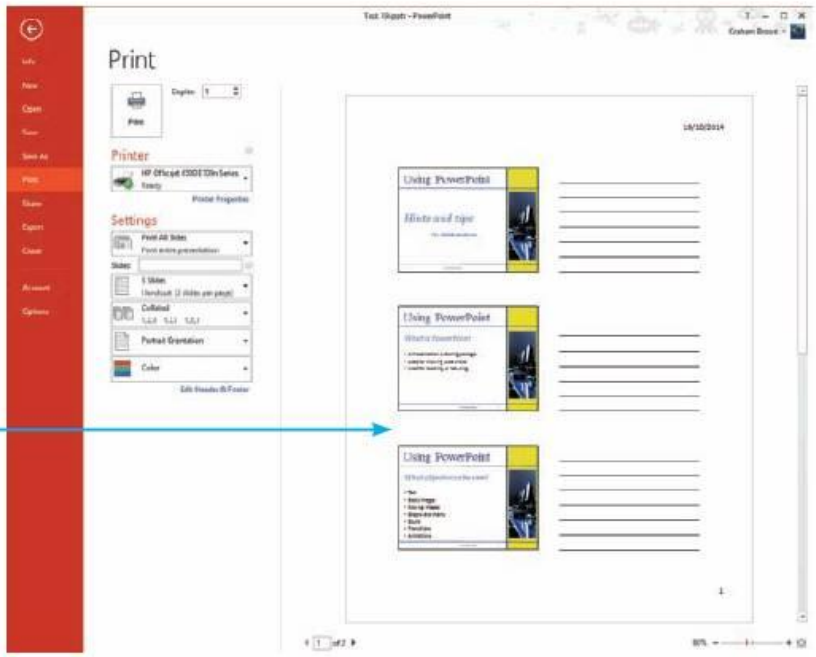
In the **Settings** section, select **Notes Pages**, which will produce a view of the slide with the presenter notes that you placed with each slide printed below the slide. Click the **Print** button.



Print audience notes

As you can see in the screen shot, the drop-down menu for the type of printing offers a wide range of options. If you require space for the audience to make their own notes, then **3 Slides** per page is the best option. This matches the printout required for the third part of Task 19k.





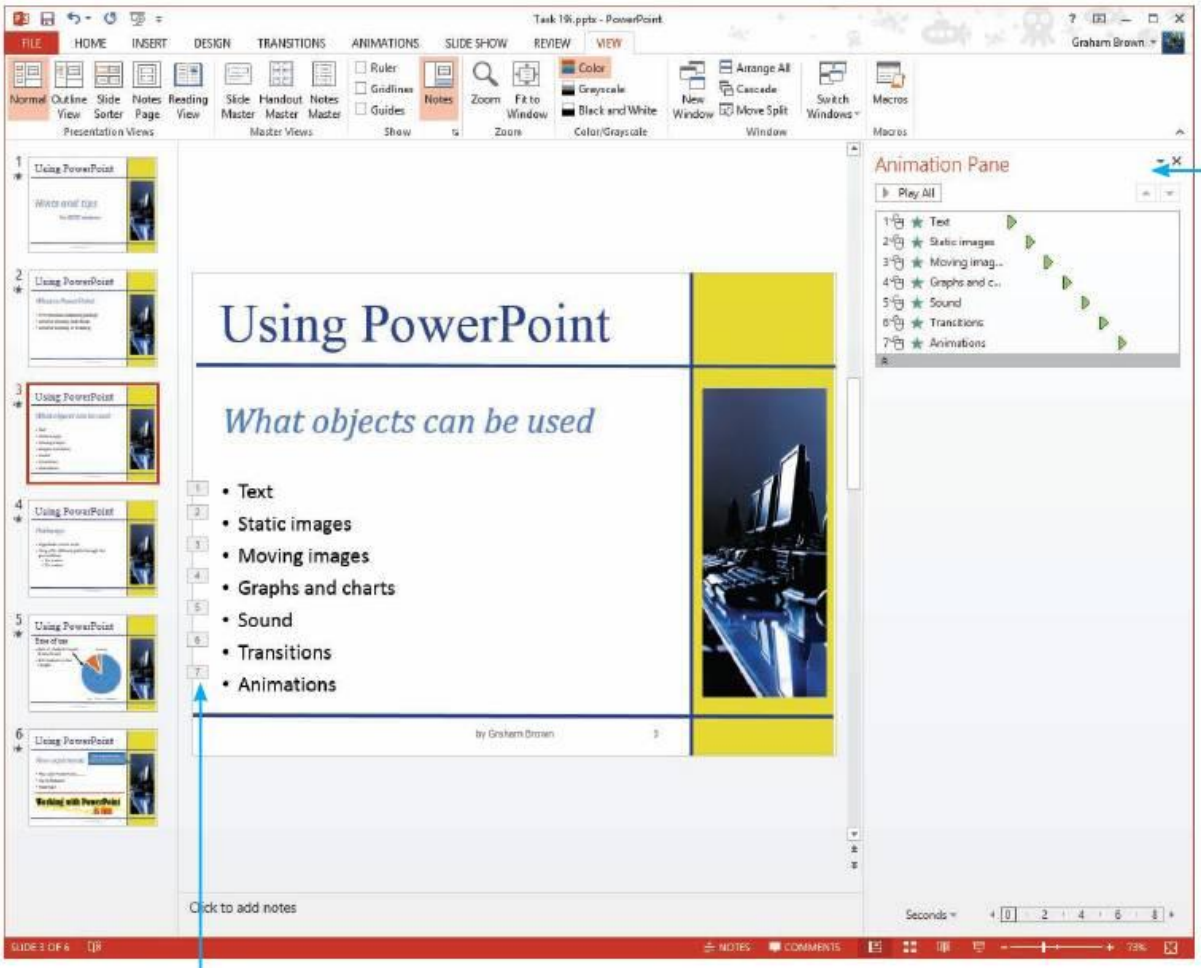
Print evidence of slide transitions

Select the VIEW tab and click on the icon for Slide Sorter view. Use the <Print Screen> key on your keyboard to copy this into the clipboard and paste the image into a word-processed document so that you can add your name and other details before sending it to the printer.

You can see from the Slide Sorter view the evidence that transitions have been added to each slide.

Print evidence of animations

Select the VIEW tab and click on the Normal icon to return to the Normal view of the slides. Select slide 3. Make sure that the Animation Pane is visible to the right of the slide. Use the <Print Screen> key on your keyboard to copy this into the clipboard. Paste the image into a word-processed document so that you can add your name and other details before sending it to the printer.



The numbering next to each bullet point shows that each bullet is animated separately from the others. Further detail about the animation of the bullets can be seen in the Animation Pane.

Activity 19b

Open the presentation that you saved in Activity 19a.

Add the following presenter notes to the slides:

- **Slide 1**: Welcome to my presentation giving tips about website authoring using HTML.
- **Slide 4**: An intranet is internal within an organisation and is managed. The internet is global and is not managed.
- **Slide 6**: There are many other websites that can offer you help.

Place the image **website.jpg** on the right side of slide 6. Crop this image so that only the crest and name are visible as shown below.

Add a red arrow, 3 points wide, from the text 'Cambridge website' to point to this image.

Apply transitions between all the slides in your presentation.

In slide 3 animate all the bullets so that they appear one at a time, in the order that they are in the list.

Print the presentation showing:

- presenter notes
- audience notes with six slides per page
- evidence of the transitions between slides
- evidence of the animations used on slide 3.

CAMBRIDGE International Examinations

20 Data analysis

In this chapter you will learn how to:

- create the layout for a spreadsheet model
- enter text and numeric data into a spreadsheet
- use editing functions, such as cut, copy and paste
- enter formulae and simple functions into a spreadsheet
- replicate formulae and functions in the spreadsheet
- test the data model
- select subsets of data within a spreadsheet
- sort data within a spreadsheet
- change the display and format of cells within a spreadsheet
- change the size of rows and columns within a spreadsheet
- adjust the page orientation
- save a spreadsheet
- print a spreadsheet displaying formulae or values.

For this chapter you will need these source files from the CD:

- classlist.csv
- client.csv
- clubs.csv
- costs.csv
- items.csv
- jobs.csv
- operators.csv
- project.csv
- rooms.csv
- salary.csv
- sales.csv
- staff.csv
- tasks.csv
- teachers.csv
- tuckshop.csv
- tutors.csv.

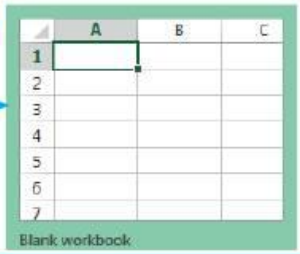
20.1 What is a data model?

For data analysis, you will use a **spreadsheet model** to explore different possible answers. These models are often financial, mathematical or scientific. It is sometimes called using a 'what if' scenario or 'what if' modelling. It lets you change data in the spreadsheet to see what will happen to the results. In a practical examination you may be asked to build a simple spreadsheet model and edit (change) the data within the model, or even change the model itself, to produce different results.

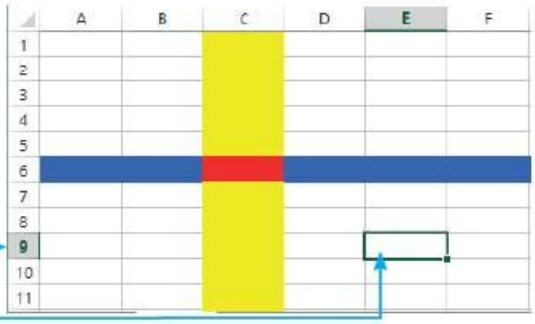
20.1.1 Spreadsheet basics

You will use *Microsoft Excel* to create your data model. Select the *Excel* icon from the desktop.

From the next screen select 'Blank workbook'.



A spreadsheet is a two-dimensional table split into rows and columns. It looks like this.



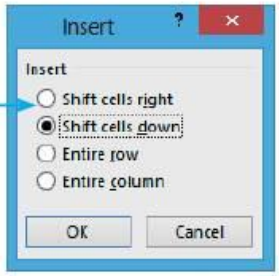
It is made up of a number of individual cells, like this.

This cell (with the darker outline) is the cell that has the cursor within it. To help us to use individual cells in a spreadsheet, each cell has an address. In this example the cell with the cursor in it is called cell E9 and the cell that has been coloured red is called cell C6. The red cell and all of the yellow cells are in column C, and the red cell and all of the blue cells are in row 6. A spreadsheet is sometimes called a sheet or even a worksheet. Many sheets can be held within a single workbook in *Excel*.

Insert cells, rows and columns

To insert a cell into a spreadsheet, **right** mouse click on the spreadsheet where you wish to insert the cell. From the drop-down menu select **Insert...** which opens the **Insert** window.

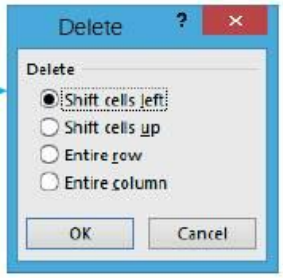
This will allow you to insert a cell (by selecting one of the top two options, which creates the space for the cell by moving all other cells to the right or down, depending on your choice) or allow you to insert a row or a column.



Delete cells, rows and columns

To delete a cell from a spreadsheet **right** mouse click on the cell you wish to delete. From the drop-down menu select **Delete...** which opens the **Delete** window.

This will allow you to delete a cell (by selecting one of the top two options, which removes the cell by moving all other cells to the left or up) or allow you to delete a row or a column.



Advice

Remember that a column holds up the roof and you can see a row of houses.

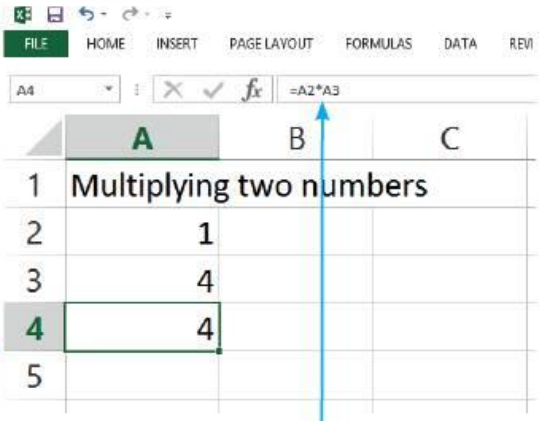
Task 20a

Create a spreadsheet to multiply any two numbers together and display the result.

The contents of a spreadsheet cell can be:

- a **number**
- text, which is called a **label**
- a **formula**, which always starts with an = sign.

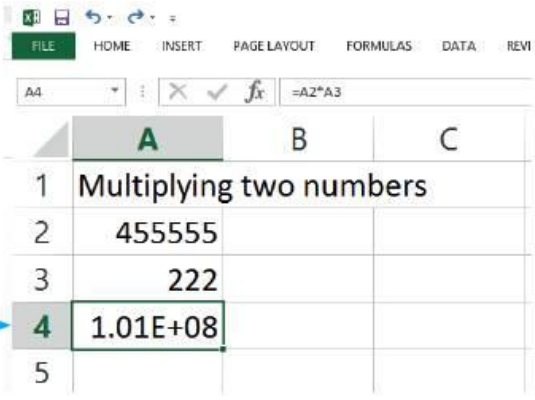
Move the cursor into cell A1 and click the left mouse button. Type in the label 'Multiplying two numbers'. Move the cursor down into cell A2 and enter a number. Repeat this for cell A3. In cell A4, enter the formula **=A2*A3** so that the spreadsheet looks like this.



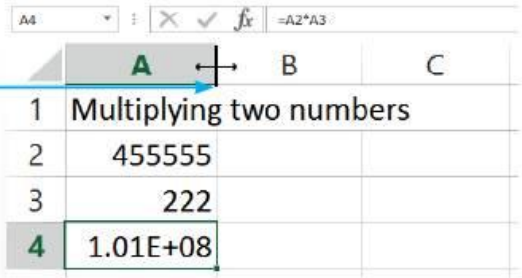
You will see that the formula is not visible in the sheet and that the cell A4 only contains the answer to the calculation within this cell. The formula for the cell containing the cursor can be seen in the formula bar.

If you have created the spreadsheet as shown, you should be able to change the contents of cells A2 and A3 to multiply any two numbers together. The changing of cells to see the results is called **modelling**.

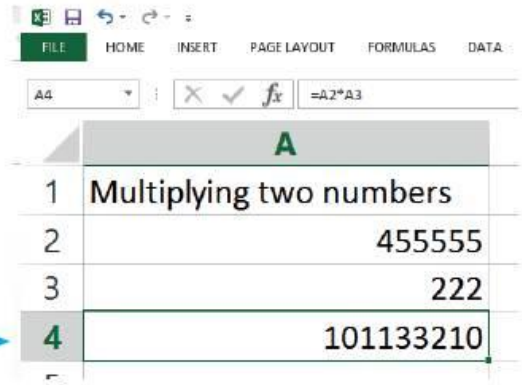
If you enter large numbers into cells A2 and A3, the result in cell A4 may not appear as you expect it to. It may look like this.



This tells you that the number is too large to fit into the column. To expand the width of the column, move the cursor to the end of the column heading for column A like this.



Double click the left mouse button to expand the column width to fit the longest item stored in this column. The spreadsheet now looks like this. You can see how the label and all of the data are fully visible.



Save your work in your Task20a folder.

Advice

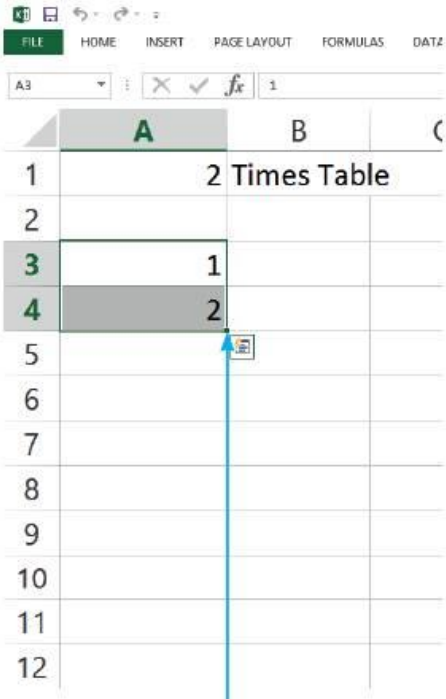
You must show the contents of all cells fully in your spreadsheet printouts so that your method and results can be seen.

20.2 Create a data model

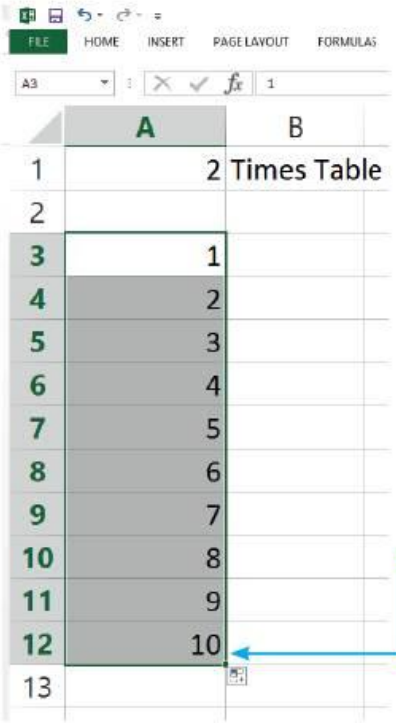
Task 20b

Create a spreadsheet to display the times table for any number you choose to enter. Print your spreadsheet, showing values and formulae.

For this task, you need to design and create the data model to calculate and display the times table for any number that you choose. You must therefore have a single cell that contains the number to use for all the calculations. In this model you can place a simple number, such as 2, in cell A1, so that you can easily tell if you have made a mistake with your formulae later on. Type the label 'Times Table' in cell A2.

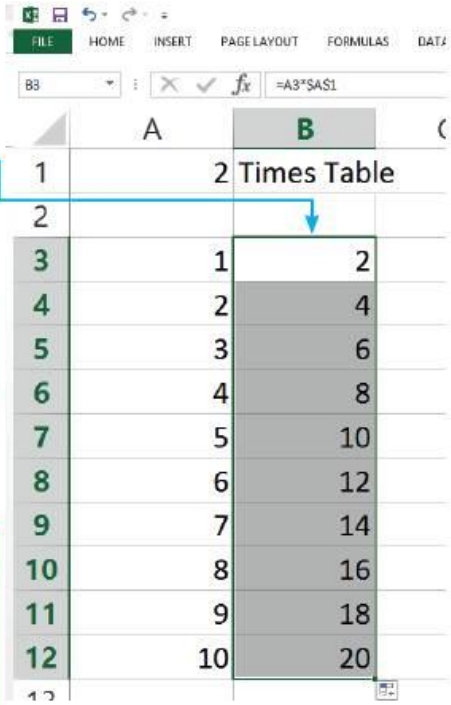


You are going to create the times table in cells A3 to B12. The cells in column A hold the number to multiply by and the cells in column B hold formulae to calculate the answer. Move the cursor into cell A3 and enter the number 1, then move into cell A4 and enter the number 2. Rather than repeating this process another eight times for the numbers 3 to 10, highlight cells A3 and A4, as shown here. Move the cursor to the drag handle in the bottom right corner of these cells.



Click and hold the left mouse button on the drag handle, dragging it down to the bottom right corner of cell A12. This replicates (copies) the cell contents. *Excel* realises that the numbers in cells A3 and A4 increase by one, so uses this pattern as it replicates the cells down.

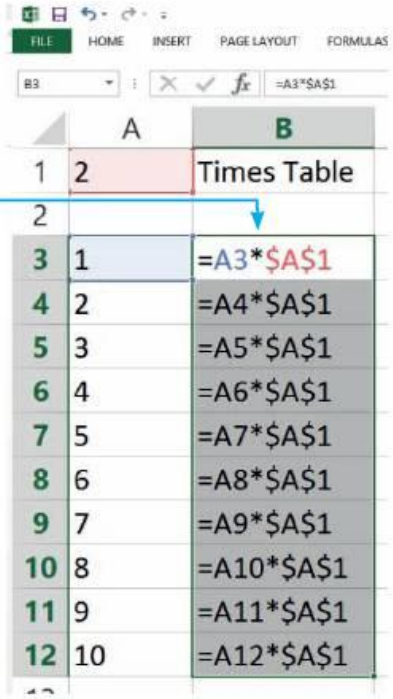
Move the cursor into cell B3 and enter the formula **=A3*$A$1**. The $ symbols in the reference to cell A1 will be used by *Excel* to keep that cell reference the same when this cell is replicated into cells B4 to B12. Use the drag handle in cell B3 to replicate this formula into the cells down to B12. The results should look like this.



Without checking the formulae, you can see that this has produced the correct results for the two times table. Change cell A1 to another number to check that the formula works correctly. Print this values view of the spreadsheet using the **FILE** tab, followed by **Print** and then the **Print** button.

20.2.1 Display formulae

To display (and then print) the formulae used in the spreadsheet, select the **FORMULAS** tab and find the **Formula Auditing** section. Click on the Show Formulas icon. The spreadsheet now looks like this.



Each of these formulae contains both absolute and relative referencing. In cell B3, the reference to cell A1 (with the $ symbols) is an **absolute reference** and the reference to cell A3 is a **relative reference**. You can see from this view that the reference in cell B3 to cell A3 has been changed as the cell has been replicated, as it uses relative referencing, but the reference to cell A1 has not been changed during the replication, because absolute referencing has been used.

To return to the view of the spreadsheet that shows the values, click on the Show Formulas icon again.

20.2.2 More editing tools

Other standard *Windows* editing tools can be used in *Excel*, such as cut, copy and paste. These can be used to copy the contents of one cell into another cell. An alternative method of replicating cell B3 into cells B4 to B12 is to enter the formula in cell B3, right mouse click on this cell and select **Copy** from the drop-down menu. Highlight cells B4 to B12 and right mouse click, selecting **Paste** from the drop-down menu. This will paste the formulae, adjusting the cell references for A3 as this is a relative reference but keeping the absolute reference for A1. The results are identical.

20.2.3 Accuracy of data entry

When you are asked to 'create a data model that looks like this', make sure that you copy the model in the question exactly as shown. Do not try to make improvements or use other features (such as colour and formatting) unless asked to do so. This is very important. Do not insert rows or columns, or remove rows or columns containing blank spaces, unless instructed to do so.

When you type data into a spreadsheet (or any other form of document) you must make sure that the data that you have entered is identical to the original source document or question. Do not rush the data entry and check carefully that it has been entered with 100 per cent accuracy. This is even more important when working in a spreadsheet because one error, for example a mistyped number or decimal point in the wrong place, could cause all of the data in the spreadsheet to be incorrect. Care must also be taken when entering a formula, as one small error is likely to stop the spreadsheet working as it is expected to.

20.2.4 Use formulae

Simple mathematical operators can be used to add, subtract, multiply, divide and calculate indices (powers) of a number. Each mathematical operator is placed in a formula, as you did in Tasks 20a and 20b.

- For addition use the + symbol.
- For subtraction use the – symbol.
- For multiplication use the * symbol.
- For division use the / symbol.

Indices are calculated using the ^ symbol, so the contents of cell A2 squared (x^2) would be typed as =A2^2.

Task 20c

Open the file **operators.csv**.

Choose two numbers. Place these in cells B1 and B2. Calculate in cell:

- B4, the sum of the two numbers
- B5, the difference between the two numbers
- B6, the product of the two numbers
- B7, the contents of cell B1 divided by the contents of cell B2
- B8, the contents of cell B1 to the power of the contents of cell B2.

Check that the formulae have worked before printing your spreadsheet showing the values and again showing the formulae used.

Open the file operators.csv in *Excel*. Extend the width of column A so that all the labels are fully visible (see Task 20a). Move the cursor into cell B1 and enter the number 4, then into cell B2 and enter the number 2. These numbers have been chosen so that you can easily check your calculations. It is wise to perform all calculations by hand before entering the formulae. This will make sure that you understand the formulae that you are using and you will be able to see the results of the calculation before the computer has shown you its results. These calculations may look like this.

Number X	4
Number Y	2

X+Y	4+2=6
X-Y	4-2=2
X*Y	4*2=8
X/Y	4/2=2
X^Y	4^2=16

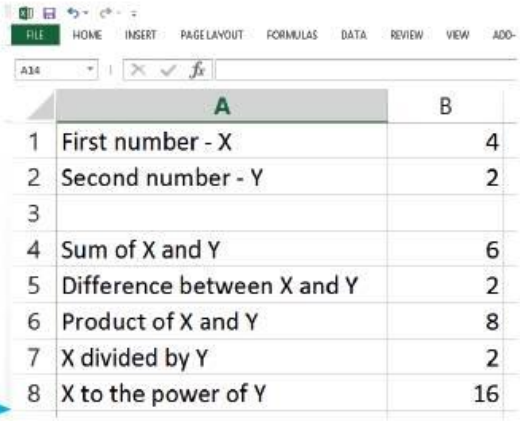
- **Addition**: move the cursor into cell B4. The sum of the two numbers is needed in this cell, which means to add the contents of the two cells together. There are two ways of doing this: one method uses the + operator and the second uses a function. You will be shown how to use the SUM function later in this chapter, but the formula to enter in this cell for the + operator is =B1+B2. This can be typed in followed by the <Enter> key, or you can type the = sign, click the cursor into cell B1, type + and click in cell B2 before pressing the <Enter> key.
- **Subtraction**: move the cursor into cell B5. The difference between two numbers is needed in this cell. Enter (using either of the methods described in the addition section above) the formula =B1–B2, followed by the <Enter> key.
- **Multiplication**: move the cursor into cell B6. The product of two numbers means to multiply the two numbers together; you need to enter the formula =B1*B2, followed by the <Enter> key.

- **Division**: move the cursor into cell B7. This cell needs a calculation to divide the contents of cell B1 by the contents of cell B2 using the formula =B1/B2, followed by the <Enter> key.
- **Indices**: Move the cursor into cell B8. This cell needs to calculate the contents of cell B1 to the power of the contents of cell B2 using the formula =B1^B2, followed by the <Enter> key.

Advice

The ^ symbol is often found using <Shift> and <6>.

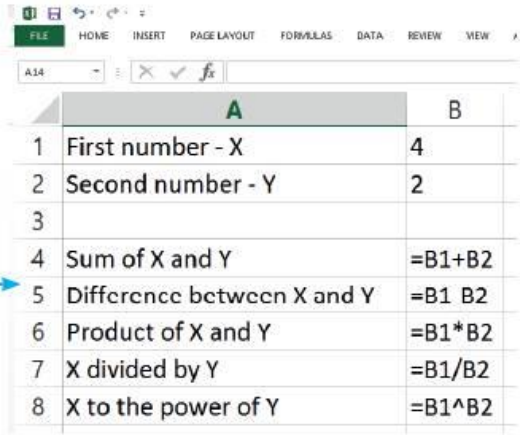
To check that the formulae are correct, compare your original paper-based calculations with the values in the spreadsheet.



	A	B
1	First number - X	4
2	Second number - Y	2
3		
4	Sum of X and Y	6
5	Difference between X and Y	2
6	Product of X and Y	8
7	X divided by Y	2
8	X to the power of Y	16

You will notice that the values chosen earlier in this task were carefully selected to make the maths easy. The more difficult calculations are likely to be the division and indices. These numbers were selected so that the 4 divided by 2 gives an easy result; 4 to the power of 2 is also reasonably easy (4×4).

Print the values, making sure that your name is fully visible on the printout. Select the FORMULAS tab, then click on the Show Formulas icon to change the display to show the formulae, which should appear like this.



	A	B
1	First number - X	4
2	Second number - Y	2
3		
4	Sum of X and Y	=B1+B2
5	Difference between X and Y	=B1 B2
6	Product of X and Y	=B1*B2
7	X divided by Y	=B1/B2
8	X to the power of Y	=B1^B2

Save and print the spreadsheet.

20.2.5 Named cells and ranges

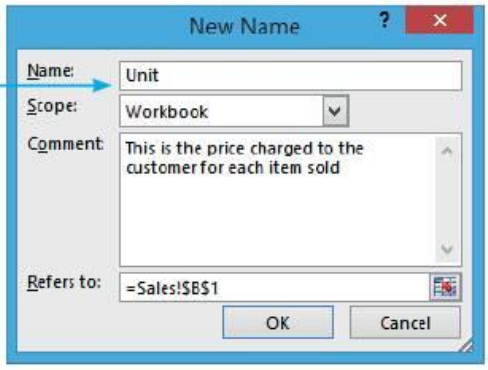
When an individual cell or an area of a spreadsheet is going to be used a number of times within the formulae of a spreadsheet, it is often a good idea to give it a name. This name should be short and meaningful. In the case of a large spreadsheet, it is easier to remember the name of a cell, for example VAT or AveMiles, rather than trying to remember the cell reference, for example AC456 or X232. Once a cell or a range of cells has been named, you can use this name in all your formulae.

Task 20d

Open the file **sales.csv**. This spreadsheet will be used to calculate bonus payments to sales staff for a small company.

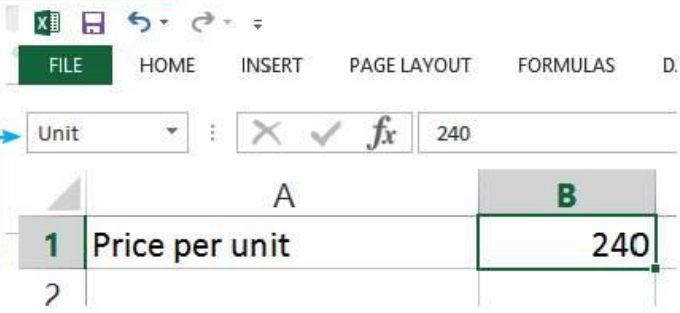
Name cell B1 'Unit'. Name cells A5 to C7 'Rate'. Name cells B11 to G18 'Sold'.

Open the file and find cell B1. You will name this cell 'Unit'. Right click on the mouse in this cell to get the drop-down menu. Select the option to Define Name... which will open the New Name window. In the Name: box, *Excel* will suggest a name for the range. It uses the layout of your spreadsheet to do this. For practical examinations, ignore this suggestion (in this case the name that it suggests is too long to be used) and overtype it with the word Unit, as instructed in the question. Add suitable text in the Comment box so that the window looks like this.

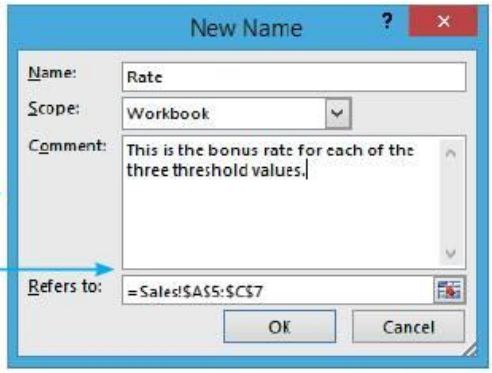


To name the range click on OK.

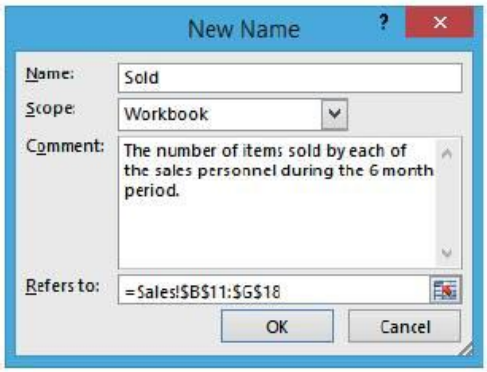
When you move the cursor into cell B1, you will see in the Name Box that it is now called Unit.



To create the named range for the rate, you must highlight the cells between A5 and C7. Do this by clicking on cell A5 and, while holding down the left mouse button, dragging the cursor to cell C7. Click the right mouse button within the highlighted range to get the drop-down menu. Change the contents of the **Name:** box to **Rate**. Check that the **New Name** window looks like this before clicking on OK. The name of the range is only visible in the **Name Box** when just the cells in the range are highlighted.



The final named range can be created in a similar way. Highlight cells B11 to G18, then name this range **Sold**. Each of these named cells and ranges will be used in other tasks.



Save this spreadsheet as Task_20d as an *Excel* workbook, **not** in .csv format.

20.2.6 Formulae and functions

A formula in *Excel* starts with an = sign. It could be a simple formula using mathematical operators, such as **=B1+B2**, a complex formula using nested statements (this will be explained later in this chapter) or a formula including functions. A function has a predefined name such as **SUM** or **AVERAGE**, to perform a particular calculation. It is an operation built into the spreadsheet. There are many of these functions in *Excel*, many of which are beyond the scope of this book, but each has a reserved function name. If a question asks you to choose your own name for a cell or range, you can not use these function names.

This section covers some of the more simple functions available in *Excel*, but does not describe all of the functions available or all those that may be used in examinations.

SUM

The **SUM** function adds two or more numbers together. In Task 20c, you used the mathematical operator + and the formula **=B1+B2** to add the contents of two cells together. As there were only two cells to be added, this was the most efficient way of doing this. If there had been more figures to add, particularly if they were grouped together in the spreadsheet, it would have been more efficient to use the **SUM** function.

Task 20e

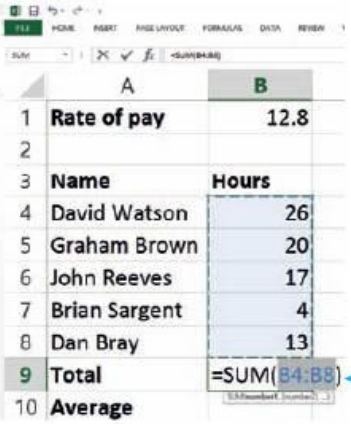
Copy this spreadsheet model and calculate:

- the total number of hours worked by all of these five people
- the average number of hours worked per person
- the maximum number of hours worked by any of these five people
- the minimum number of hours worked by any of these five people.

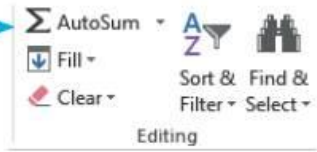
	A	B
1	**Rate of pay**	£12.80
2		
3	**Name**	**Hours**
4	David Watson	26
5	Graham Brown	20
6	John Reeves	17
7	Brian Sargent	4
8	Dan Bray	13
9	**Total**	
10	**Average**	
11	**Maximum**	
12	**Minimum**	

Open a new sheet and copy the labels and values exactly as shown in the table. Select the HOME tab and use the **B** (bold) icon to embolden the cells shown. To find the total number of hours worked you will need to click the cursor into cell B9 and use SUM to add up the list of numbers. Enter the formula =SUM(B4:B8). This should give the value 80.

An alternative way to use this function without typing it into cell B9 is for you to use AutoSum. Move the cursor into cell B9, select the HOME tab and find the Editing section. Click on the AutoSum icon.



	A	B
1	Rate of pay	12.8
2		
3	Name	Hours
4	David Watson	26
5	Graham Brown	20
6	John Reeves	17
7	Brian Sargent	4
8	Dan Bray	13
9	Total	=SUM(B4:B8)
10	Average	



This will place the SUM function into cell B9 and attempt to work out which cells you wish to add up (by looking at the layout of your spreadsheet). It does not always get this range correct, so check carefully. If the range is correct (as it is in this case) press the <Enter> key to accept the AutoSum. If it is not correct, you can highlight the cells to be added before pressing the <Enter> key.

There are many ways of using the SUM function, some of which are shown in Table 20.1.

Advice

An alternative method is to enter =SUM(then drag the cursor to highlight cells B4 to B8, then type) and press the <Enter> key.

Table 20.1 Ways of using the SUM function

Function	Equivalent formula	What it does
=SUM(B4:B8)	=B4+B5+B6+B7+B8	Adds up the contents of all the cells in the range B4 to B8
=SUM(D3,D8,D12)	=D3+D8+D12	Adds up the contents of cells D3, D8 and D12
=SUM(D5:D8,F2)	=D5+D6+D7+D8+F2	Adds up the contents of the cells in the range D5 to D8 and the contents of cell F2
=SUM(MyRange)	None	Adds up the contents of all the cells within a named range called MyRange; this can be used with any named range

As you can see, the range of cells selected within these functions can include a number of individual cells, ranges of cells, named ranges, named cells or a combination of these. The AVERAGE, MAX (maximum), MIN (minimum), and COUNT functions also work like this.

AVERAGE

To find the average (mean) number of hours worked, click the cursor into cell B10 and use AVERAGE to calculate the mean (average) of a list of numbers. Enter the formula =AVERAGE(B4:B8).This should give the value 16. There are many ways of using the AVERAGE function, some of which are shown in Table 20.2.

Table 20.2 Ways of using the AVERAGE function

Function	Equivalent formula	What it does
=AVERAGE(B4:B8)	=(B4+B5+B6+B7+B8)/5	Calculates the mean of the cells in the range B4 to B8
=AVERAGE(D3,D8,D12)	=(D3+D8+D12)/3	Calculates the mean of the cells D3, D8 and D12
=AVERAGE(D5:D8,F2)	=(D5+D6+D7+D8+F2)/5	Calculates the mean of the cells in the range D5 to D8 and cell F2
=AVERAGE(MyRange)	None	Calculates the mean of the cells in a named range called MyRange

MAX

To find the person who worked the most hours, click the cursor into cell B11 and use **MAX** to select the largest (maximum) figure within the list of numbers. Enter the formula **=MAX(B4:B8)**. This should give the value 26.

MIN

To find the person who worked the least number of hours, click the cursor into cell B12 and use **MIN** to select the smallest (minimum) figure from the list. Enter the formula **=MIN(B4:B8)**. This should give the value 4.

The finished spreadsheet should look like this. →

Save this spreadsheet as task20e.

	A	B
1	**Rate of pay**	£12.80
2		
3	**Name**	**Hours**
4	David Watson	26
5	Graham Brown	20
6	John Reeves	17
7	Brian Sargent	4
8	Dan Bray	13
9	**Total**	**80**
10	**Average**	**16**
11	**Maximum**	**26**
12	**Minimum**	**4**

Activity 20a

Open the file **tuckshop.csv**.

In cells B14 to B17, calculate the total number of days that all the students worked in the school shop, the average number of days worked, and the maximum and minimum values.

Place your name on the spreadsheet. Print your spreadsheet showing the values, then print your spreadsheet showing the formulae used.

Task 20f

John Reeves did an extra four hours work. Change the spreadsheet that you created in Task 20e to show the new figures. The manager wants to see the average number of hours worked displayed as:

- an integer value
- rounded to the nearest whole hour.

Print two copies of the spreadsheet showing these values.

Advice

Setting a cell as an integer value will remove the decimal/fraction part of the number. This is not the same as formatting a cell to 0 decimal places, which stops the decimal/fraction part from being displayed but will still be used in a calculation.

Open the file task20e. Change the contents of cell B6 to 21 to add the four extra hours that he worked. This gives an average value of 16.8 hours. Move the cursor into cell C9 and enter the text 'Integer', then move into cell D9 and enter the text 'Rounding'. To get the first value requested by the manager, we have to set cell B10 to hold an integer value.

INT

In mathematics, an integer is the word used to describe a whole number (with no decimals or fractions). In *Excel*, the **INT** function takes the whole number part of a number and ignores all digits after the decimal point. Move the cursor into cell C10 and enter the formula **=INT(B10)**. This should give the value 16.

ROUND

Move the cursor into cell D10 and enter the formula **=ROUND(B10,0)**. This uses the **ROUND** function, which takes the content of cell B10 and rounds the number to 0 decimal places: if the first digit after the decimal point is five or more the number in cell D10 will be increased by one. For example, in cell

B10 the value is 16.8, so the content of D10 is 17, as it has rounded the value to the nearest whole number. The spreadsheet should look like this.

	A	B	C	D
1	**Rate of pay**	£12.80		
2				
3	**Name**	**Hours**		
4	David Watson	26		
5	Graham Brown	20		
6	John Reeves	17		
7	Brian Sargent	4		
8	Dan Bray	13		
9	**Total**	**80**	**Integer**	**Round**
10	**Average**	**16**	**16**	**17**
11	**Maximum**	**26**		
12	**Minimum**	**4**		

Rounding can be used with any number of decimal places, for example using rounding for currencies with two decimal places can avoid calculation errors. Table 20.3 shows more examples of how you can use the ROUND function, using cell A1, which contains the number 62.5512.

Table 20.3 Ways of using the ROUND function

Function	Result of rounding	What it does
=ROUND(A1,2)	62.55	Rounds the contents of A1 to two decimal places
=ROUND(A1,1)	62.6	Rounds the contents of A1 to one decimal place. Note that the second figure 5 in 62.5**5**12 has forced the previous figure to be rounded up
=ROUND(A1,0)	63	Rounds the contents of A1 to 0 decimal places. Note that the first figure 5 in 62.**5**512 has forced the previous figure to be rounded up
=ROUND(A1,-1)	60	Rounds the contents of A1 to the nearest 10. The negative value for decimal places allows this function to round numbers in tens, hundreds, etc.
=ROUND(A1,-2)	100	Rounds the contents of A1 to the nearest 100. Note that the figure 6 has forced the previous figure to be rounded up from 0 to 1

Save and print a copy of the spreadsheet showing the average number of hours worked displayed as an integer value. Print a copy of the spreadsheet showing the average number of hours worked rounded to the nearest whole hour.

Activity 20b

Create a new spreadsheet model to calculate:

- the whole number part of 375.56411
- 375.56411 rounded to two decimal places
- 375.56411 rounded to the nearest whole number
- 375.56411 rounded to the nearest ten
- 375.56411 rounded to the nearest hundred
- 375.56411 rounded to the nearest thousand.

Task 20g

Open the file **project.csv**. This file lists some workers and below each worker is the number of jobs they have still to finish for a project.

Place a formula in cell A22 to count the number of jobs that still have to be finished for the project. Place a formula in cell A24 to count the number of workers on the project.

COUNT

For this task you will need to use functions that count different values. It is possible to count the number of numeric (number) values in a list using the COUNT function. Open the file, place the cursor in cell A22 and enter the formula =COUNT(A2:A19). This will look at the range A2 to A19 (notice that you have not counted cell A1, which contains the title, nor cell A20, which may be used for something else later) and count only the cells with numbers in them. It will not count any blank spaces and should give the value 7.

COUNTA

The **COUNTA** function works in a similar way to the **COUNT** function. Rather than counting just the number of numeric values, this function counts the number of numeric or text values displayed in the cells. It will not count any blank cells within the range. There is no count function for just text values in *Excel*, so the COUNTA and COUNT functions will both be used to calculate the number of workers on the project. Place the cursor in cell A24 and enter the formula =COUNTA(A2:A19)–COUNT(A2:A19). This will look at the range A2 to A19 and count the cells with text or numbers in them, then subtract the number of cells with numbers in to leave only the cells with text in them, in other words the names of the employees. It should give the value 9 and look like this.

21	Number of workers who have not finished
22	=COUNT(A2:A19)
23	Number of workers on the project
24	=COUNTA(A2:A19)-COUNT(A2:A19)

	A
1	Project 142
2	Laila Aboli
3	4
4	Sri Paryanti
5	7
6	David Watson
7	2
8	Graham Brown
9	12
10	John Reeves
11	
12	Brian Sargent
13	5
14	Dan Bray
15	
16	Thirumalar Asokmani
17	3
18	Lea Cabusbusan
19	2
20	
21	Number of workers who have not finished
22	7
23	Number of workers on the project
24	9

Activity 20c

Open the file **classlist.csv**. This spreadsheet lists all the students in a class. If a student has attended any clubs during the year, the number of times they have attended is recorded in the cell below their name.

Place a formula in cell A71 to count the number of students in the class. Place a formula in cell A74 to count the number of students who have attended extra clubs this year.

Task 20h

Open the file **staff.csv**. This file lists some workers on another project and lists each worker's job.

Place formulae in cells B24 to B28 to count how many of each type of worker are employed on the project. Place a formula in cell B31 to count the number of employees with less than five years' experience.
Place a formula in cell B32 to count the number of employees with ten or more years' experience.

COUNTIF

For this task, you need to count how many people have each type of job. Open the file and place the cursor in cell B24. The function needed for this task is **COUNTIF**, which looks at the cells within a given range and counts the number of cells in that range that meet a given condition. The condition is placed in the function and can be a number, text, an inequality or a cell reference. There are a number of ways the COUNTIF function can be used: any of the formulae given in Table 20.4 can be entered in cell B24 and will give the correct result.

Table 20.4 Alternative formulae using the COUNTIF function

Function	What it does
=COUNTIF($B$3:$B$21,"Director")	Counts the number of cells in the range B3 to B21 that contain the word 'Director'
=COUNTIF(Job,"Director")	Counts the number of cells in the named range Job (B3 to B21) that contain the word 'Director'. This only works if cells B3 to B21 have been named 'Job'
=COUNTIF($B$3:$B$21,A24)	Counts the number of cells in the range B3 to B21 that contain the same text as the contents of cell A24
=COUNTIF(Job,A24)	Counts the number of cells in the named range Job (B3 to B21) that contain the same text as the contents of cell A24. This only works if cells B3 to B21 have been named 'Job'

Advice

Note in examples one and three in Table 20.4 that the range $B$3:$B$21 has been set as an absolute reference so that this range is always in the same place if the formula is replicated. Also note that examples three and four have cell A24 set as a relative reference so that it will look for the next job title when the formula is replicated. Named ranges are absolute references, but you must show screen shot evidence that you have named the range correctly in practical examinations.

Replicate the function in cell B24 into cells B25 to B28. As these cells are to be replicated, methods three and four in Table 20.4 are the most efficient, as you do not have to edit each formula with a different name for each row. If a question asks you to show evidence of absolute and relative referencing, then method three would be the most appropriate. If named ranges are required, or absolute and relative referencing are not asked for in the question, method four is the most efficient.

To count the number of employees with less than five years' experience, place the cursor in cell B31 and enter the formula **=COUNTIF($C$3:$C$21,"<5")**. This will look at the range C3 to C21 and count the cells with a number value of less than 5. The speech marks around the <5 are needed to tell *Excel* that it is dealing with another formula (in this case an inequality), rather than searching for the symbols <5. The spreadsheet should show the value 7.

To count the number of employees with ten or more years' experience, place the cursor in cell B32 and enter the formula **=COUNTIF($C$3:$C$21,">=10")**. The value calculated should be 5.

Save your spreadsheet as task20h.

Activity 20d

Open the file that you saved in Activity 20c. This spreadsheet lists all the students in a class. Next to each student's name is the colour of the house that they are in.

Place formulae in cells E2 to E5 that use both absolute and relative referencing to count the number of students in each house.

Place a formula in cell E7 to count the number of students with less than five clubs.

Place a formula in cell E8 to count the number of students with 12 or more clubs.

IF

An **IF** function contains a pair of brackets and, within the brackets, three parts, each separated by a comma. An example of an **IF** function is **=IF(A1=5,A2*0.05,"No discount")**. The first part is a condition; in this example, it is testing to see if cell A1 contains the number 5. The other two parts are what to do if the condition is met, and what to do if it is not met. If the condition is met a number or label could be placed in the cell, or a reference to another cell, or even a calculation that needs to be performed. The same range of options applies if a condition is not met. In this example, if the condition is met, the result of multiplying the contents of cell A2 by the figure 0.05 is displayed in this cell. If the condition is not met this cell will display the text 'No discount'.

Task 20i

Open the file that you saved in Task 20h.

Add a new label 'Category' into cell D2.

Place formulae in cells D3 to D21 to display 'Very experienced' for employees with ten or more years' experience, otherwise to display 'Not experienced'.

Open the file and place the cursor in cell D2. Enter the label 'Category'. Place the cursor in cell D3 and enter the formula =IF(C3>=10,"Very experienced","Not experienced").
The reason that C3>=10 is used rather than C3>9 (which in many circumstances would be a more efficient formula), is because one employee has 0.2 years' experience. As the data does not only contain whole numbers, there could be an employee with 9.5 years' experience so C3>9 would not work for all data. Do not use absolute referencing in this formula as the reference to cell C3 needs to change when you replicate the formula. Replicate this formula so it is copied into cells D4 to D21. Your spreadsheet should look similar to this.

Save your spreadsheet as task20i.

	A	B	C	D
1	Project 153			
2	Name	Job	Years exp	Category
3	Laila Aboli	Programmer	3	Not experienced
4	Greg Mina	Programmer	2	Not experienced
5	Sri Paryanti	Analyst	12	Very experienced
6	Bishon Patel	Sales	5	Not experienced
7	Rupinder Singh	Engineer	7	Not experienced
8	Sergio Gonzalez	Programmer	5	Not experienced
9	Rupinder Vas	Sales	6	Not experienced
10	Henri Ramos	Sales	10	Very experienced
11	John Mortlock	Programmer	14	Very experienced
12	Cameron Garnham	Analyst	7	Not experienced
13	Brian Guthrie	Director	3	Not experienced
14	Julia Frobisher	Engineer	6	Not experienced
15	Dan McNevin	Programmer	9	Not experienced
16	Patrick O'Malley	Engineer	11	Very experienced
17	Thirumalar Asokmani	Sales	10	Very experienced
18	Sean O'Byrne	Programmer	2	Not experienced
19	Lea Cabusbusan	Programmer	1	Not experienced
20	Brian O'Driscoll	Programmer	0.2	Not experienced
21	Wim Van Hoffmann	Engineer	2	Not experienced
22				

Activity 20e

Open the file that you saved in Activity 20d.
Add a new label 'New students' into cell F1.
Place formulae in cells F2 to F6 to display 'Add to this house' if the number of students in this house is less than 6 or to display 'Full' if the number is 6 or more.

20.2.7 Nested formulae and functions

A nested formula or function is having one formula or function inside another one. Sometimes nested formulae could contain several formulae nested within each other. If the nested functions include a number of IF statements, be careful to work in a logical order. Work from smallest to largest or vice versa (depending on the question). Do **not** start with middle values; this will give incorrect results.

Task 20j

Open the file that you saved in Task 20i.
Change the formulae in cells D3 to D21 to display 'Not experienced' if they have less than five years' experience, 'Experienced' if they have five or more years' experience and 'Very experienced' for employees with ten or more years' experience.

For this task, three conditions exist. If the value for experience is:

- >=10 then display 'Very experienced'
- >=5 then display 'Experienced'
- <5 then display 'Not experienced'.

Place the cursor into cell D3 and change the formula so that it becomes
=IF(C3>=10,"Very experienced",IF(C3>=5,"Experienced","Not experienced"))

Advice

Note that as the conditions are all 'greater than', they have been placed in reverse order. For example, if the value for experience was 40 and the condition <5 was first, then >=5 next and then >=10: the first condition <5 would be not true, so it would go to the next condition; >=5 would be true, so the result displayed would be 'Experienced'; it would never get as far as the test for >=10.

Notice how the second part of the formula (highlighted in yellow) has been placed as a 'No' condition within the first formula. Be very careful to get the brackets correct: each condition has one open and one close bracket. When you work through this formula, it checks whether the value is greater than or equal to 10 first; if so, it displays the correct text. Then, if it was not true, it would check if the value is greater than or equal to 5 next; if so, it displays the correct text. As there are no other conditions that could occur, rather than having another nested statement the resulting text has been placed.

Replicate this formula into cells D4 to D21. Your spreadsheet should look similar to this.

Save your spreadsheet as task20j.

	A	B	C	D
1	Project 153			
2	Name	Job	Years exp	Category
3	Laila Aboli	Programmer	3	Not experienced
4	Greg Mina	Programmer	2	Not experienced
5	Sri Paryanti	Analyst	12	Very experienced
6	Bishen Patel	Sales	5	Experienced
7	Rupinder Singh	Engineer	7	Experienced
8	Sergio Gonzalez	Programmer	5	Experienced
9	Rupinder Vas	Sales	6	Experienced
10	Henri Ramos	Sales	10	Very experienced
11	John Mortlock	Programmer	14	Very experienced
12	Cameron Garnham	Analyst	7	Experienced
13	Brian Guthrie	Director	3	Not experienced
14	Julia Frobisher	Engineer	6	Experienced
15	Dan McNevin	Programmer	9	Experienced
16	Patrick O'Malley	Engineer	11	Very experienced
17	Thirumalar Asokmani	Sales	10	Very experienced
18	Sean O'Byrne	Programmer	2	Not experienced
19	Lea Cabusbusan	Programmer	1	Not experienced
20	Brian O'Driscoll	Programmer	0.2	Not experienced
21	Wim Van Hoffmann	Engineer	2	Not experienced
22				

Activity 20f

Open the file that you saved in Activity 20e.
Change the formulae in cells F2 to F6 to display 'Add to this house' if the number of students in this house is less than six, 'Ideal number' if there are between six and ten students, or to display 'Full' if the number is more than ten.

Task 20k

Open the file that you saved in Task 20j.
Insert the label 'Total experience for:' in cell A34, the label 'Programmer' in cell A35 and 'Engineer' in cell A36.
Insert a formula in cell B35 that uses both absolute and relative referencing to calculate the number of years' experience for the programmers.
Insert a formula in cell B36 that uses both absolute and relative referencing to calculate the number of years' experience for the engineers.

SUMIF

SUMIF works in a similar way to COUNTIF. It compares each value in a range of cells and, if the value matches the given condition, it adds the value in another related cell to form a running total.

Add the labels as required by the task into cells A34, A35 and A36. Move the cursor into cell B35 and enter the formula =SUMIF($B$3:$B$21,A35,$C$3:$C$21). The total for this cell starts at 0. This looks at the contents of each row in the range B3 to B21 and compares the value in each cell to the contents of cell A35 (which contains the text 'Programmer'). If these two items are identical it adds the value from the same row within the range C3 to C21 to the total. When all rows in this range have been checked the total is displayed in this cell. This happens within a fraction of a second as you press the <Enter> key or change any value within these ranges.

To calculate the number of years' experience for the engineers, place in cell B36 the formula =SUMIF($B$3:$B$21,A36,$C$3:$C$21). The results of these formulae should look like this.

Save the spreadsheet as task20k.

	A	B
34	Total experience for:	
35	Programmer	36.2
36	Engineer	26

Advice

You could use named ranges rather than absolute referencing for cells B3 to B21 and C3 to C21. One alternative formula in cell B35, which uses the named range 'Job' created earlier in the chapter, is =SUMIF(Job,A35,$C$3:$C$21).

Activity 20g

Open the file **clubs.csv**.
Insert a formula in cell B37 that uses both absolute and relative referencing to calculate the number of clubs attended by students in red house.
Replicate this formula in cells B38 to B40 for each house colour.

20.2.8 Use lookups

The term 'look up', as used in practical examinations, means to look up from a list. It does not mean that you should use the LOOKUP function, as there are three variations of the LOOKUP function that can be used within *Excel*. These are: LOOKUP, HLOOKUP and VLOOKUP.

LOOKUP

LOOKUP is used to look up a value using data in the first row or the first column of a range of cells and returns a relative value. For our purposes, this is probably the least useful of the three formulae.

HLOOKUP

HLOOKUP is a function that performs a horizontal look up of data. This should be used when the values that you wish to compare your data with are stored in a single **row**. The values to be looked up are stored in the rows below these cells.

Task 20l

Open the file **jobs.csv**.
Insert formulae in the Description column to look up and display the JobTitle using the JobCode as the look-up value.

Open the file jobs.csv and click the left mouse button to place the cursor in cell C6. Enter the formula =HLOOKUP(B6,$B$2:$H$3,2) into this cell. This formula will look up and compare the contents of cell B6 with the contents of each cell in the top (horizontal) row of the range B2 to H3. When it finds a match, it will take the value or label stored in the second row, which is directly under the matched cell. The '2' at the end of the formula tells *Excel* to look in the second row of the given range. Replicate this formula into cells C7 to C27. The results should look similar to this.

Save the spreadsheet as task20l.

	A	B	C	D
1	**Project 160**			
2	**JobCode**	1	2	3
3	**JobTitle**	Director	Engineer	Analyst
4				
5	**Name**	**JobCode**	**Description**	
6	Laila Aboli	5	Programmer	
7	Greg Mina	5	Programmer	
8	Sri Paryanti	3	Analyst	
9	Bishen Patel	4	Sales	
10	Rupinder Singh	2	Engineer	
11	Sergio Gonzalez	5	Programmer	
12				

VLOOKUP

VLOOKUP is a function that performs a vertical look up of data. This should be used when the values that you wish to compare your data with are stored in a single **column**. The values to be looked up are stored in the columns to the right of these cells. The look up data can be stored either in the same file or in a different file.

Task 20m

Open the file **tasks.csv**.
Insert formulae in the CurrentTask column to look up the client, using the TaskCode for the look up value and the file **client.csv**. Make sure that you use both absolute and relative referencing within your function.

Open the file tasks.csv and click the left mouse button to place the cursor in cell C3. The task instructs you to use the file **client.csv** for the look up. Open this file in a new spreadsheet. Examine the layout of this file to decide which type of look up formula to use. **client.csv** looks like this.

	A	B
1	TaskCode	Client
2	1	Rootrainer
3	2	Quattichem
4	3	Hothouse Design
5	4	Avricom
6	5	Binnaccount
7	6	LGY
8	7	Rock ICT

Because it is stored with the look up data in vertical columns, a VLOOKUP is the most appropriate formula to use. Enter the formula =VLOOKUP(B3,Client.csv!$A$2:$B$8,2,FALSE) into this cell. This formula will look up and compare the contents of cell B3 with the contents of each cell in the left (vertical) column of the range A2 to B8 within the file **client.csv**. When entering this formula, you can add the yellow highlighted section of the formula by moving the cursor into this file and dragging it to highlight all of the cells in both columns, so it includes the look up value and the result. The number '2' in the formula tells *Excel* to look in the second column of this range. The 'False' condition in the formula tells *Excel* to only display the match if it is an exact match. If you set this to 'True' it will find the nearest approximate match. When it finds a match, it will take the value or label in the second column of the range A2:B8, which is to the right of the matched cell. Replicate this formula into cells C4 to C24.

The first few results should look similar to this.

	A	B	C
1	**Current client list**		
2	**Name**	**TaskCode**	**CurrentTask**
3	Laila Aboli	6	LGY
4	Greg Mina	4	Avricom
5	Sri Paryanti	6	LGY
6	Bishen Patel	6	LGY
7	Rupinder Singh	3	Hothouse Design
8	Sergio Gonzalez	5	Binnaccount
9	Rupinder Vas	1	Rootrainer
10	Bryan Revell	1	Rootrainer
11	Henri Ramos	7	Rock ICT

Save the spreadsheet as task20m.

Advice

Experiment with these settings. Change the value in cell B24 to 5.2. See the result of this change. Now change the exact match condition from False to True in cell C24. See the result of this change. Try other numbers, like 5.9 in B24, to see what happens.

Activity 20h

Open the file **tutors.csv**. This lists a number of students and the initials for their personal tutor.
Insert formulae in the Tutor Name column to look up the tutor's name using the file **teachers.csv**.
Insert formulae in the Room Number column to look up the room number using the file **rooms.csv**.
Make sure that you use both absolute and relative referencing within all of your functions.
Save your spreadsheet.

20.3 Test the data model

Designing a test plan and choosing your test data are the most important parts of testing the data model. If you test every formulae of the spreadsheet thoroughly the number of possible errors is reduced when you use the spreadsheet with real data. Choose data that will test every part of a condition. If you are testing calculations, use simple numbers that make it easier for you to check the calculations. Be careful to test each part of the spreadsheet with **normal** data that you would expect to work with your formulae, with **extreme** data to test the boundaries, and with **abnormal** data that you would not expect to be accepted. Carefully check that each formula and function works as you expect it to by using simple test data.

For example, to test the look up used in Task 20m:

- make sure that each number between 1 and 7 (**normal** data) is used in the TaskCode
- use 0 and 8, and other **abnormal** data
- use decimal values between 1 and 7.

Write down each number and the expected results before trying each number in the TaskCode column. Check that the actual result matches the expected result for every entry. If not, change the formula before starting the whole test process again. A test plan for this formula would be similar to that shown in Table 20.5.

Advice

Always do all your calculations for the expected results by hand before attempting any testing on the spreadsheet.

Table 20.5 Sample test plan for Task 20m

Data entry in B3	Data type	Expected result	Actual result
1	Extreme/Normal	Rootrainer	
2	Normal	Quattichem	
3	Normal	Hothouse Design	
4	Normal	Avricom	
5	Normal	Binnaccount	
6	Normal	LGY	
7	Extreme/Normal	Rock ICT	
0	Abnormal	Error - value not available	
8	Abnormal	Error - value not available	
1.3	Abnormal	Error - value not available	
5.6	Abnormal	Error - value not available	
7.2	Abnormal	Error - value not available	
94	Abnormal	Error - value not available	

It is very important to check carefully ranges within formulae and functions. Check that all formulae and functions work before using real data in your model. If you find an error during testing, correct it, and then perform all of the tests again as one change to a spreadsheet can affect lots of different cells.

Advice

If a question asks you to do something and justify it, make it clear why you have made your choices and not made other choices.

20.4 Manipulate data

Selecting a subset of data means getting *Excel* to search through data held in a spreadsheet to extract only rows where the data matches your search criteria.

20.4.1 Search using text filters

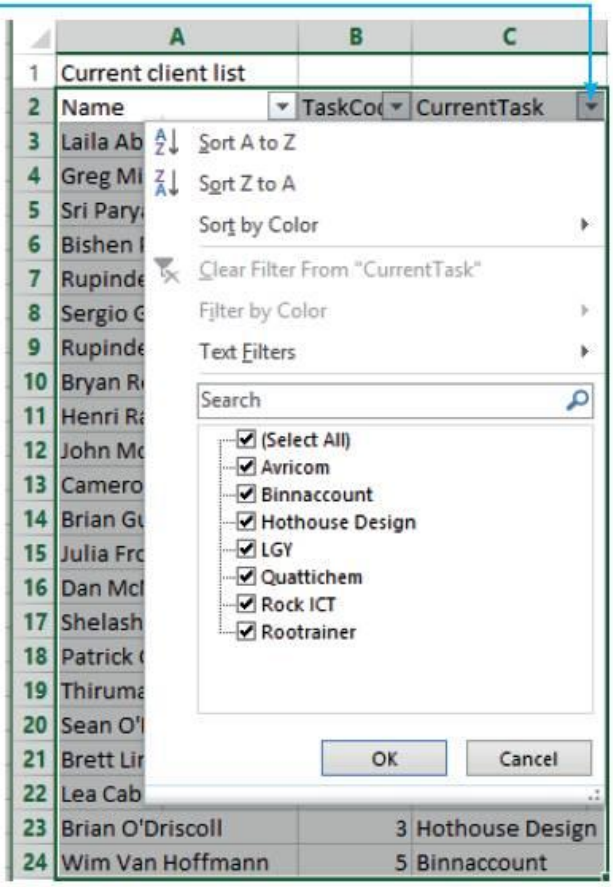
Task 20n

Open the file that you saved in Task 20m.
Select from all the data only the employees who are currently working on jobs for Binnaccount.

Open the file that you saved in Task 20m and highlight cells A2 to C24. Select the DATA tab and find the Sort & Filter section. Click on the Filter icon to display an arrow in the top right corner of each column, like this.

For this task, you need to use this arrow to select the people working on the Binnaccount task. When you click on the CurrentTask arrow, a small drop-down menu appears like this.

	A	B	C
1	Current client list		
2	Name	TaskCo	CurrentTask
3	Laila Aboli	6	LGY
4	Greg Mina	4	Avricom
5	Sri Paryanti	6	LGY
6	Bishen Patel	6	LGY
7	Rupinder Singh	3	Hothouse Design
8	Sergio Gonzalez	5	Binnaccount
9	Rupinder Vas	1	Rootrainer
10	Bryan Revell	1	Rootrainer
11	Henri Ramos	7	Rock ICT
12	John Mortlock	2	Quattichem
13	Cameron Garnham	2	Quattichem
14	Brian Guthrie	1	Rootrainer
15	Julia Frobisher	5	Binnaccount
16	Dan McNevin	1	Rootrainer
17	Shelash O'Leary	1	Rootrainer
18	Patrick O'Malley	5	Binnaccount
19	Thirumalar Asokmani	5	Binnaccount
20	Sean O'Byrne	3	Hothouse Design
21	Brett Ling	2	Quattichem
22	Lea Cabusbusan	7	Rock ICT
23	Brian O'Driscoll	3	Hothouse Design
24	Wim Van Hoffmann	5	Binnaccount



In the Text Filters section of the menu, click on the tick box for (Select All) which will remove all of the ticks from every box. Find, then tick only the Binnaccount box, before clicking on OK. This will display only the five selected rows like this.

	A	B	C
1	Current client list		
2	Name	TaskCode	CurrentTask
8	Sergio Gonzalez	5	Binnaccount
15	Julia Frobisher	5	Binnaccount
18	Patrick O'Malley	5	Binnaccount
19	Thirumalar Asokmani	5	Binnaccount
24	Wim Van Hoffmann	5	Binnaccount

The same method can be use to select more than one company from the list. By selecting different drop-down menu options, searches can be made using different criteria in different columns. Save the spreadsheet as task20n.

20.4.2 Search using number filters

Task 20o

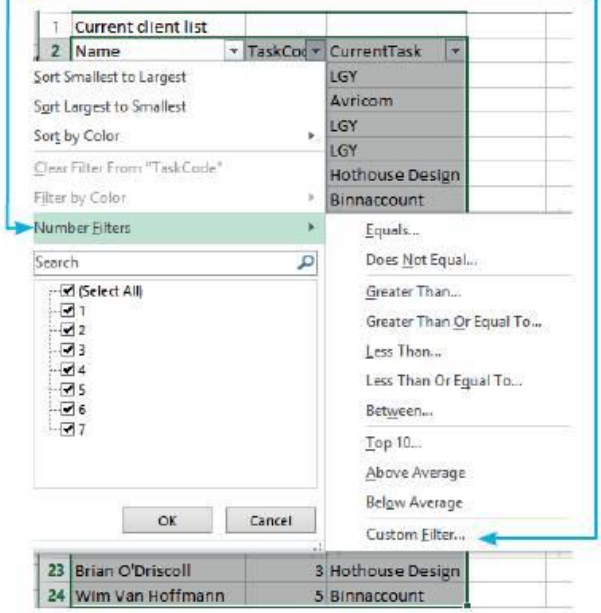
Open the file that you saved in Task 20m.
Select from all the data only the employees where the task code is between 3 and 6 inclusive.

Advice

To remove the AutoFilter, either click on the tick box for (Select All) or use select Clear Filter in the drop-down list.

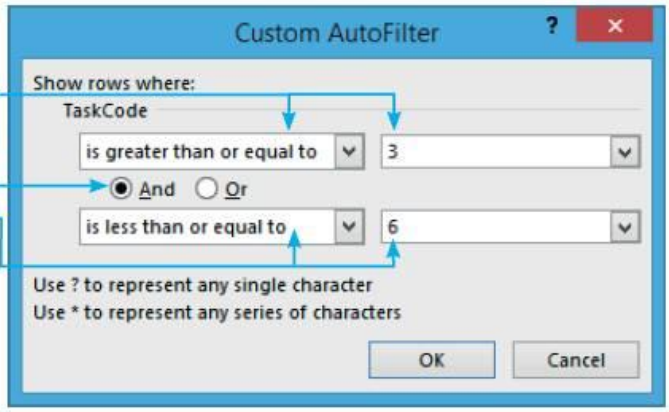
Open the file and set the AutoFilter arrows for cells A2 to C24 as in the previous task. This time the search will be performed on the TaskCode column. Select the drop-down menu for this column using the arrow followed by Number Filters to get a sub-menu, it should look like this.

Select Custom Filter... to get the Custom AutoFilter window.



This will allow you to set the search criteria to is greater than or equal to 3.
AND
is less than or equal to 6.

The drop-down options in each box of the Custom AutoFilter window can be used to select equals to, not equal to, less than or greater than, as well as the options shown.
Save the spreadsheet as task20o.



Advice

The method shown here is an alternative to selecting only the boxes for 3, 4, 5 and 6. Even though it may seem easier to click on the tick boxes for this question, you will need to use the Custom AutoFilter window when a number of options are required. The Custom AutoFilter window also allows you to select Is not equal to and to perform wildcard searches.

20.4.3 Search using more than one criteria

Task 20p

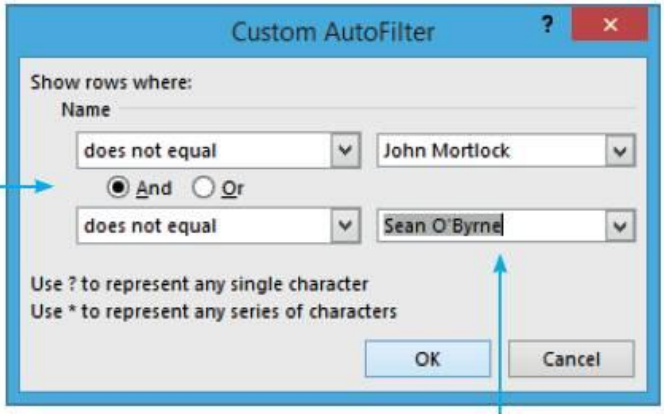
Open the file that you saved in Task 20m.
Select from the data all the employees who are currently working on jobs for Quattichem or Hothouse Design, except John Mortlock and Sean O'Byrne.

Open the file and set the AutoFilter arrows for cells A2 to C24 as in the previous task. This time the search will be performed on both the Name and CurrentTask columns. Select the drop-down arrow for the Name column, Text Filters and then select Does not equal from the sub-menu. This opens the Custom AutoFilter window; enter the initial letter 'J' in the right box (this speeds up the search). When you click on the arrow for the drop-down list it will show you all the Names starting with 'J', so select 'John Mortlock' from the list.

Select the AND operator and repeat the process for Sean O'Byrne, selecting Does not equal in the left box and typing 'S' to find Sean O'Byrne, selecting his name from the list in the right box. Click on OK.

Select the search arrow for the CurrentTask column. Select from this menu only the two tick boxes for 'Hothouse Design' and 'Quattichem', or select Text Filters and set up the OR search like this.

The results of this task should look like this:



	A	B	C
1	Current client list		
2	Name	TaskCo	CurrentTask
7	Rupinder Singh	3	Hothouse Design
13	Cameron Garnham	2	Quattichem
21	Brett Ling	2	Quattichem
23	Brian O'Driscoll	3	Hothouse Design

Save the spreadsheet as task20p.

Activity 20i

Open the file that you saved in Task 20h. Select from all the data:

- all the students with a tutor called Chris Scott
- all the students who will be using rooms numbered between 22 and 74 inclusive
- all the students except Kiah and Hartati with a tutor called Kate Morrissey or Mike Arnott.

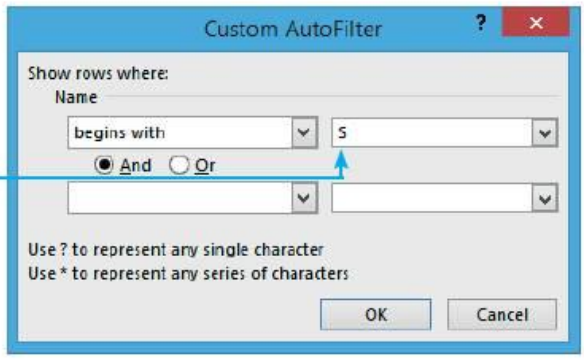
20.4.4 Search using wildcards

A wildcard is a character that is used as a substitute for other characters. The * (asterisk) character is often used to show a number of characters (including 0), while the ? (question mark) is often used to show a single character. *Excel* uses these wildcard characters but AutoFilter also contains other features that simplify some of these searches.

Task 20q

Open the file that you saved in Task 20m.
Select from all the data only the employees who have a name that starts with the letter 'S'.

Open the file and set the AutoFilter arrows for the cells A2 to C24 as in the previous task. This time the search will be performed on the Name column. Click on the drop-down arrow for this column and select Text Filters followed by Begins with... from the sub-menu. This opens the Custom AutoFilter window. Enter the initial S in the right box like this and click on OK. You should find these four rows.



	A	B	C
1	Current client list		
2	Name	TaskCo	CurrentTask
5	Sri Paryanti	6	LGY
8	Sergio Gonzalez	5	Binnaccount
17	Shelash O'Leary	1	Rootrainer
20	Sean O'Byrne	3	Hothouse Design

Save the spreadsheet as task20q.

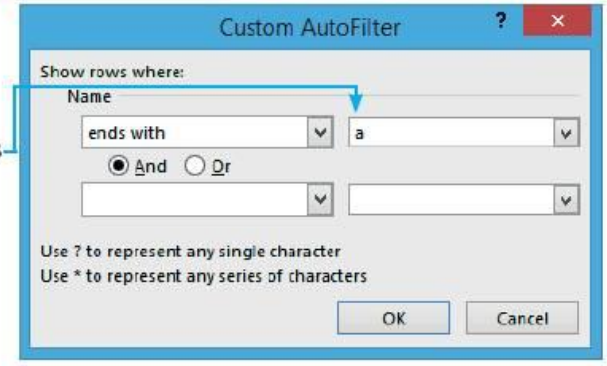
Advice

The method shown here is an alternative to selecting Text Filters, then Equals and entering S* before clicking on OK.

Task 20r

Open the file that you saved in Task 20m.
Select from all the data only the employees who have a name that ends with the letter 'a'.

This is a similar process to the previous task. Use the same process, this time selecting the Text Filters from the menu, then the Ends with... option to obtain the Custom AutoFilter window. Enter the letter a in the right box like this and click on OK. You should find this single row.



	A	B	C
1	Current client list		
2	Name	TaskCo	CurrentTask
4	Greg Mina	4	Avricom

Save the spreadsheet as task20r.

Advice

The method shown here is an alternative to selecting Text Filters, then Equals and entering *a before clicking on OK.

Task 20s

Open the file that you saved in Task 20m.
Select from all the data only the employees who have a name that contains the two characters O'.

Again, select the Text Filters from the drop-down menu in the Name column. This time select the Contains... option, enter the letter O followed by an apostrophe to the right box and click on OK.

You should find these four rows.
Save the spreadsheet as task20s.

	A	B	C
1	Current client list		
2	Name	TaskCo	CurrentTask
17	Shelash O'Leary	1	Rootrainer
18	Patrick O'Malley	5	Binnaccount
20	Sean O'Byrne	3	Hothouse Design
23	Brian O'Driscoll	3	Hothouse Design

Task 20t

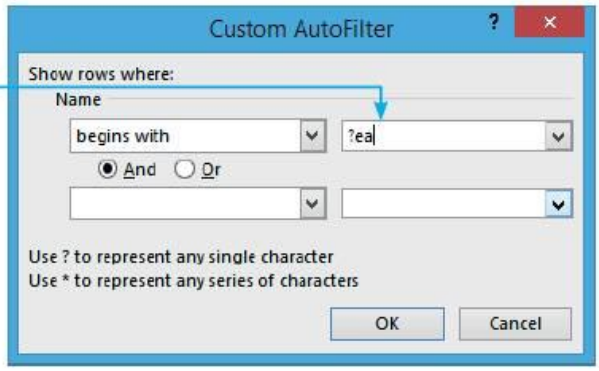
Open the file that you saved in Task 20m.
Select from all the data only the employees who have a first name that has the second and third letters 'ea'.

Advice

The method shown here is an alternative to selecting Text Filters, then Equals and entering *O'* before clicking on OK.

Using the same methods as the previous searches, select the Text Filter from the drop-down menu in the Name column. This time select the Begins with... option and add the characters ?ea to the right box before clicking on OK.

This tells *Excel* that the first letter can contain any character. Then there must be the letters 'ea' followed by any other characters. You should find these two rows.



	A	B	C
1	Current client list		
2	Name	TaskCode	CurrentTask
20	Sean O'Byrne	3	Hothouse Design
22	Lea Cabusbusan	7	Rock ICT

Advice

The method shown here is an alternative to selecting Text Filters, then Equals and entering ?ea* then clicking on OK.

Save the spreadsheet as task 20t.

Activity 20j

Open the file that you saved in Activity 20h. Select from the data:

- all the students with a forename that starts or ends with the letter 'R'
- all the students with a forename that contains the letters 'eth'
- all the students with a forename that contains the letters 'Jam' and who have a tutor who uses room 60.

20.4.5 Sort data

Before you try to sort any data, make sure that you select all of the data for each item to be sorted. One common error is to select and sort on a single column. If you were to do this, the integrity of the data would be lost. Table 20.6 gives an example showing correct and incorrect sorting on the student's name for a spreadsheet containing test results in Maths and English. The yellow shaded cells show the areas selected for the sort. Note how the results for each person have been changed when sorting without highlighting all the data.

Table 20.6 Correct and incorrect data selection for sorting

Original data

Name	Maths	English
Sheila	72	75
Marcos	64	34
Vikram	61	44
Karla	52	75

Sorted correctly with all data selected

Name	Maths	English
Karla	52	75
Marcos	64	34
Sheila	72	75
Vikram	61	44

Sorted with only the name column selected (this is an example of data integrity–the correct test scores no longer match the students)

Name	Maths	English
Karla	72	75
Marcos	64	34
Sheila	61	44
Vikram	52	75

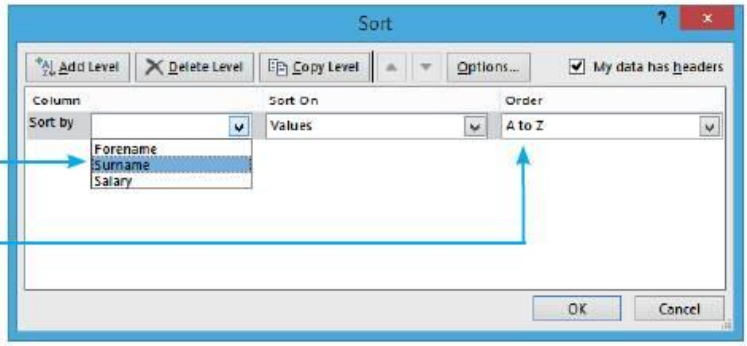
Task 20u

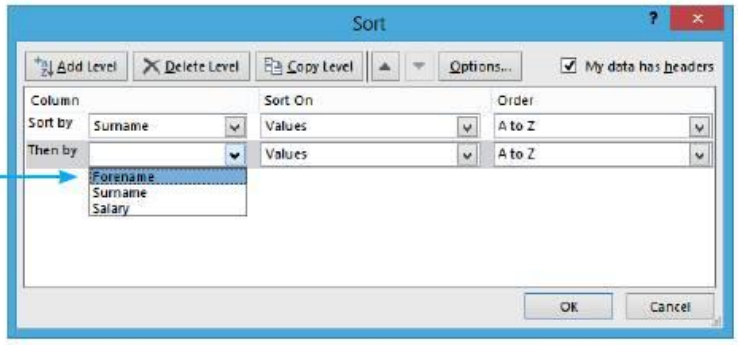
Open the file **salary.csv**.
Sort the data into ascending order of surname, then ascending order of forename.

Open the file salary.csv. Highlight all the cells in the range A2 to C43. Do not highlight row 1 because if you do the column headings will also be sorted within the employee names. Select the HOME tab and find the Editing section. Click on the Sort & Filter icon to obtain the drop-down menu.

Select Custom Sort... to open the Sort window. In the Sort by box select Surname from the drop-down list. This will be the primary sort for this task. Make sure that the Order box contains A to Z to sort the data into ascending order.

To add the secondary sort to this data you need to add a second level to the Sort window. Click on Add Level to add the second sort level. In the Then by box select Forename from the drop-down list. Again, make sure that the Order box contains A to Z to sort the data into ascending order. Click on OK to perform the sort.





The data should look like this.
Save the spreadsheet as task20v.

	A	B	C
1	Forename	Surname	Salary
2	Laila	Aboli	25000
3	Thirumala	Asokmani	10000
4	Lea	Cabusbus	28000
5	Liam	Chi	8500
6	Dan	Dare	14000
7	Julia	Frobisher	16500
8	Cameron	Garnham	36000
9	Jake	Garnham	12500
10	Lauren	Garnham	6200
11	Jack	Gonzalez	8200
12	Sergio	Gonzalez	26000

Advice

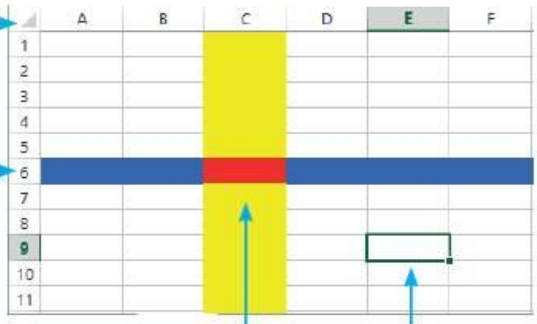
You can sort into descending order rather than ascending order by selecting Z to A rather than A to Z in the Order box.

Activity 20k

Open the file that you saved in Activity 20h.
Sort the data into descending order of tutor name, then ascending order of forename.

20.5 Present data

Many of the features described in this section can be applied to an individual cell, a range of cells, to one or more rows or columns, or to the entire spreadsheet. To apply the feature to the entire spreadsheet, click in the top left-hand corner of the sheet.



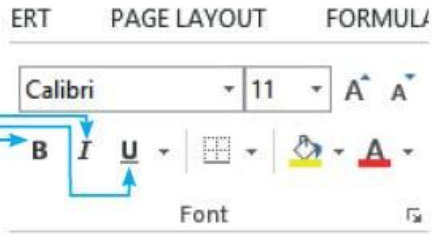
To select a row or rows, click on the number or numbers to the left of the row and it will select all the cells in that row.

To select a column or columns, click on the column letter or letters to select all the cells in the column or columns.

To select a single cell, click in that cell. To select a range of cells, drag the cursor to highlight a range of cells. If you need to select different cells or ranges from different parts of the sheet at the same time, hold down the <Ctrl> key while making your selections.

20.5.1 Enhance data

To enhance data, first select the data to be enhanced. All of the enhancement features are located using the HOME tab. The Font section contains icons that allow you to set the cell contents to underlined, *italic* (sloping) or **bold**.



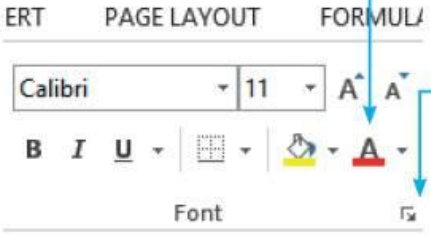
The font size of a cell can be changed by either typing a new size in the point size box or using the drop-down menu to select a suitable size.

Cells can also be enhanced using different colours for the background of the cell. Again, highlight the area to be coloured and select the drop-down menu from the Fill Color icon. The drop-down menu looks like this.

There are a number of standard colours as well as colours selected by *Excel* for the current colour schemes. If the colour that you want is not there, click on the colour palette icon.

When you are selecting colours, ensure that the foreground and background colours contrast and can be seen easily when printed. Do not use green and red to help people who are colour blind. The text colour of a cell (the font colour) can be selected in the Font section. The Font Color icon is to the right of the Fill Color icon. The drop-down menu from this icon is the same as the menu for the background colour.

If you wish to use cell shading (or other pattern fill) instead of a solid colour select the font settings arrow to open the Format cells window.

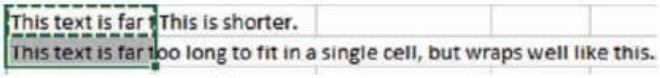


Choose the **Fill** tab along the top: this gives more options than the **Fill Color** icon. By using the **Pattern Style:** drop-down box you can select the style of shading required.

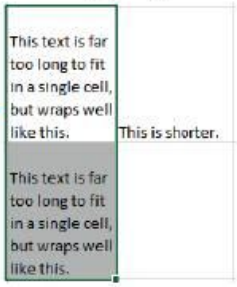
The **Format cells** window is useful for many other enhancements. After highlighting the cell/s to be formatted, selecting the **Alignment** tab will let you change the way the text fits into a cell/s, either by rotating the text direction (by dragging the red handle in the **Orientation** panel), merging cells or wrapping text within a cell.

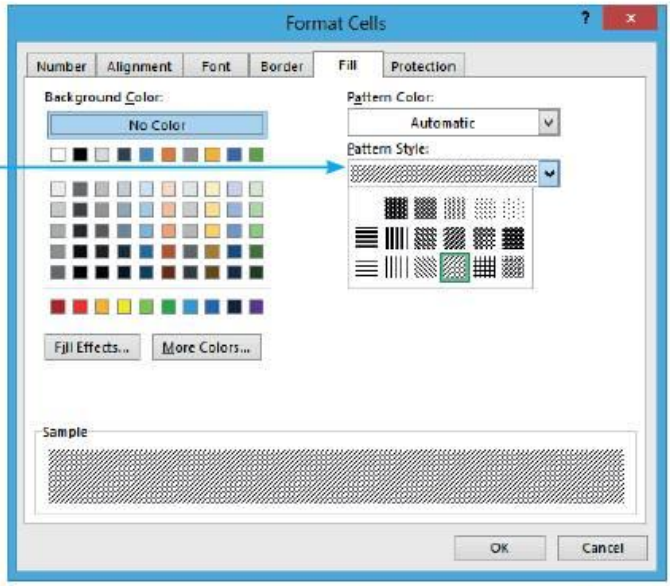
Sometimes wrapping text in the cells will be needed to make sure that all data is fully visible without making the columns too wide. Try this for yourself, for example:

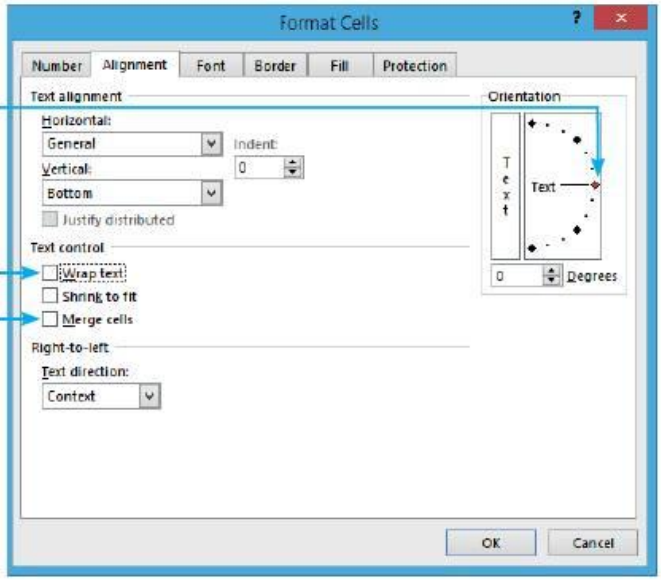
Before wrapping:



After wrapping:







Activity 20l

Open the file that you saved in Activity 20g.
Set all the cells in rows 1 and 36 to bold and italic.
Underline the cell containing your name.
Set cells A1 to C1 to have white text on a black background.
Set the background colour for each of the cells in the range A37 to A40 to match the colour of each house.

20.5.2 Format cells

Formatting cells containing numbers changes the way a cell is displayed but does not change the values held within it.

Task 20v

Create a spreadsheet model that looks like this.
Place a formula in cell C2 that multiplies the contents of cell A2 by the contents of cell B2.
Format cell A2 as an integer.

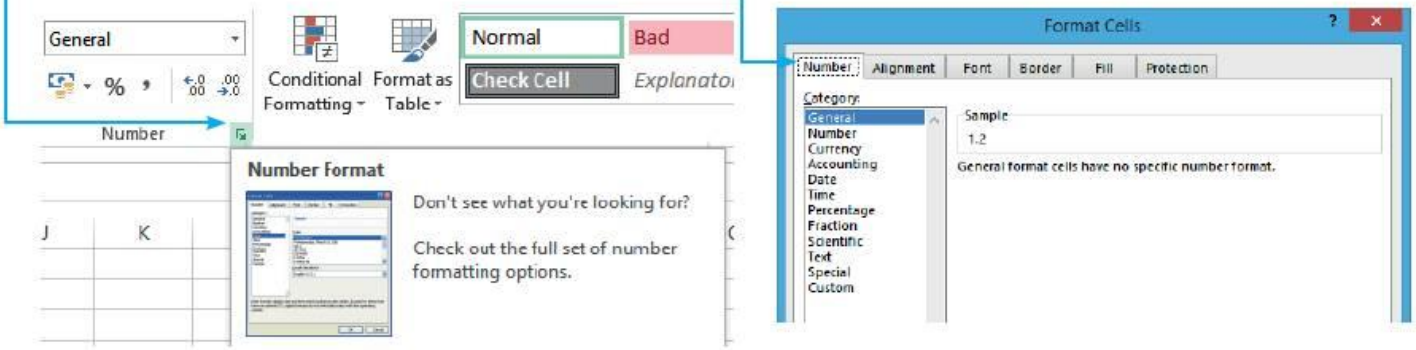
	A	B	C
1	First	Second	Product
2	1.2	5	

Create the spreadsheet as shown. In cell C2 enter the formula =A2*B2. The spreadsheet will look like this.

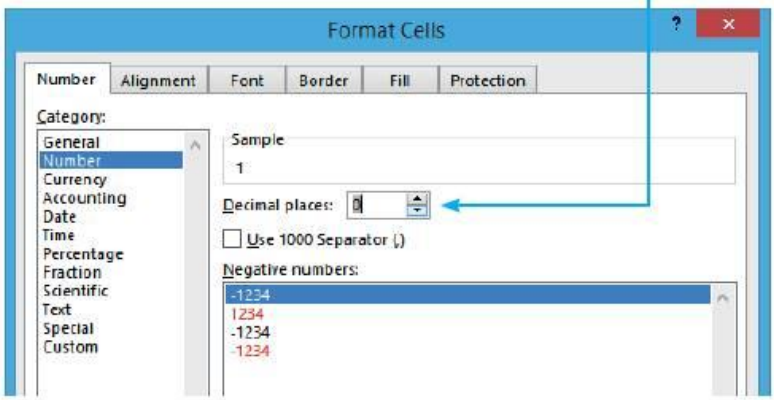
	A	B	C
1	First	Second	Product
2	1.2	5	6

To format cell A2 as an integer, place the cursor in this cell and select the HOME tab. In the Number section, click on the arrow in the bottom-right corner to open the Format Cells window.

When this window opens, it should have the Number tab selected. The Format Cells window will allow you to format cells in different currencies, into percentages or even as dates or times.



For this task, you need to format this cell as a number. Select the Number option in the Category: section. Change the cell formatting to 0 Decimal places: so that the window looks like this.



	A	B	C
1	First	Second	Product
2	1	5	6

Click on OK to set the formatting. The spreadsheet will now look like this.

If you compare the two views of the spreadsheet, you can see that cell A2 has changed. The contents still remains 1.2 but in the second view the answer for the product appears to be incorrect.

Use the INT or ROUND function to force a cell to contain whole numbers. Formatting a cell does not always appear to give the correct answer.

Original

	A	B	C
1	First	Second	Product
2	1.2	5	6

Formatted

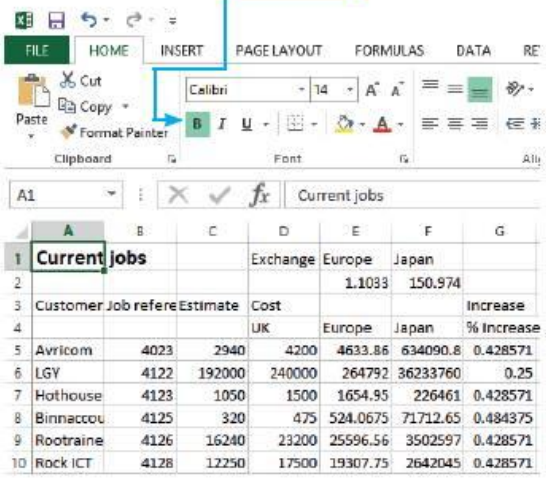
	A	B	C
1	First	Second	Product
2	1	5	6

Task 20w

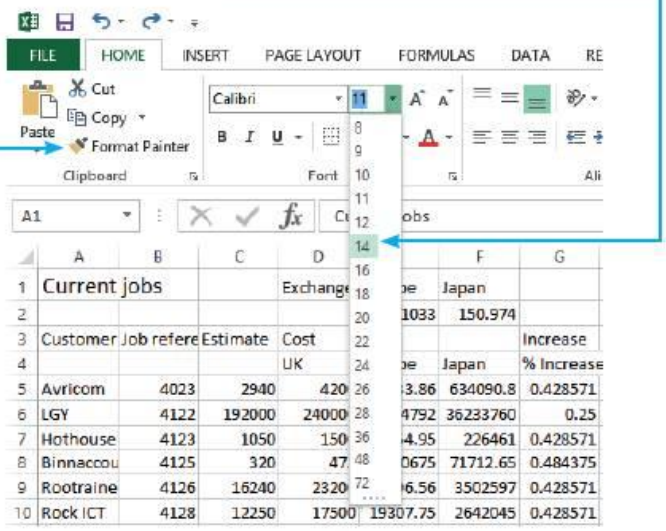
Open the file **costs.csv**.
Format cells A1, D1, D3 and G3 so that the font is bold and 14 point.
Format all numeric cells in row 2 into their respective currencies to 3 decimal places.
Format all numeric cells in columns C and D into pounds sterling with 2 decimal places.
Format the cells E5 to E15 into Euros with 2 decimal places.
Format the cells F5 to F15 into Japanese Yen with 0 decimal places.
Format all cells between G5 and G15 into percentage values with no decimal places.

Open the file costs.csv. Click in cell A1. Select the HOME tab, find the Font section, then use the drop-down list to change the size of this cell to 14 point.

Click the mouse on the Bold icon to set this cell to bold.



	A	B	C	D	E	F	G
1	Current jobs			Exchange	Europe	Japan	
2					1.1033	150.974	
3	Customer	Job refere	Estimate	Cost			Increase
4				UK	Europe	Japan	% Increase
5	Avricom	4023	2940	4200	4633.86	634090.8	0.428571
6	LGY	4122	192000	240000	264792	36233760	0.25
7	Hothouse	4123	1050	1500	1654.95	226461	0.428571
8	Binnaccou	4125	320	475	524.0675	71712.65	0.484375
9	Rootraine	4126	16240	23200	25596.56	3502597	0.428571
10	Rock ICT	4128	12250	17500	19307.75	2642045	0.428571



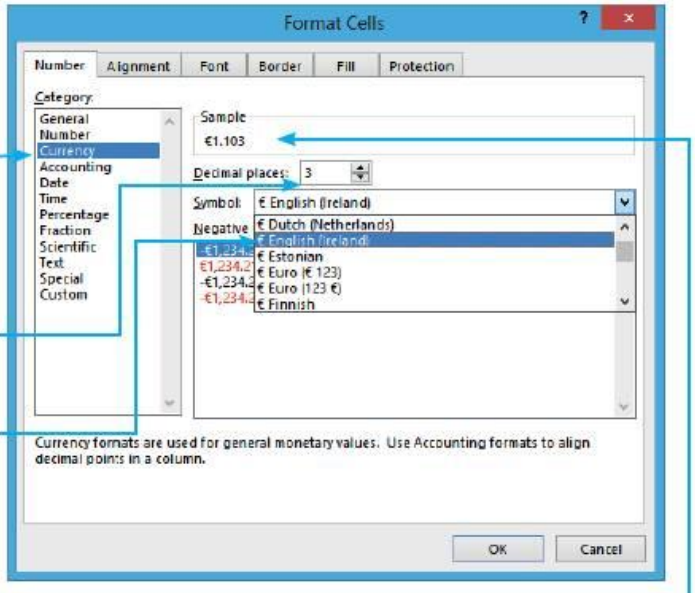
	A	B	C	D	F	G
1	Current jobs			Exchange	Japan	
2					150.974	
3	Customer	Job refere	Estimate	Cost		Increase
4				UK	Japan	% Increase
5	Avricom	4023	2940	420	634090.8	0.428571
6	LGY	4122	192000	24000	36233760	0.25
7	Hothouse	4123	1050	150	226461	0.428571
8	Binnaccou	4125	320	47	71712.65	0.484375
9	Rootraine	4126	16240	2320	3502597	0.428571
10	Rock ICT	4128	12250	17500	2642045	0.428571

Click on the Format Painter icon and then click in cell D1. Click on the Format Painter again and then click in cell D3, then Format Painter again and click in cell G3. This process should copy the formatting from cell A1 into these other three cells.

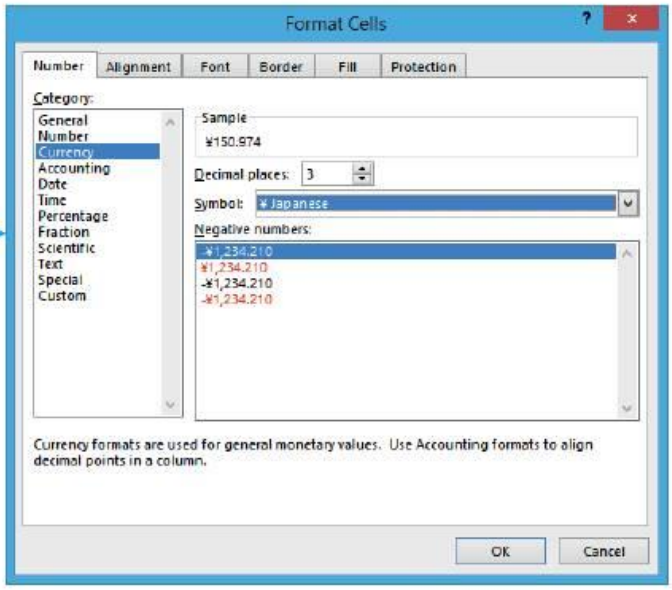
Move the cursor into cell E2. In the Number section, click on the arrow in the bottom-right corner to open the Format Cells window in the Number tab. In the Category: section, select Currency.

Set the number of decimal places to 3. Although this is not the correct number of decimal places for Euro, it was specified in the task.

In the Symbol: section, select an appropriate Euro format from the list. You may need to scroll down the list of available currencies to find it. The Sample area will show you what the formatting of the cell will look like when you click on OK. When you have checked this formatting, click on OK.



Repeat this process for cell F2, but this time selecting Japanese Yen. Some currencies, such as the Japanese Yen, have no decimal places (so would normally need to be formatted to zero decimal places) but in this task you were told to set this cell to 3 decimal places. The Format Cells window should look like this.



Click on OK.

To format all the numeric cells in columns C and D, highlight all cells in the range C5 to D15. Then open the Format Cells window and set the Category: to Currency, the number of Decimal places: to 2 and the Symbol: to pounds sterling (£). Repeat this process for cells E5 to E15, selecting Euro with 2 decimal places, and for cells F5 to F15 with Japanese Yen set to no decimal places (which are the appropriate formats for both of these currencies).

To format all cells between G5 and G15 into percentage values, highlight this range then, in the Format Cells window, set the Category: to Percentage. Set the number of Decimal places: to 0. Resize columns as necessary. The finished spreadsheet should look like this.

Advice

If the currency symbol that you are looking for (for example, ¥) does not appear in the drop-down list, there are a number of text options available. In this case you can select JPY, which is the international standard code for Japanese Yen.

	A	B	C	D	E	F	G
1	**Current jobs**			**Exchange**	Europe	Japan	
2					€1.103	¥150.974	
3	Customer	Job reference	Estimate	**Cost**			**Increase**
4				UK	Europe	Japan	% Increase
5	Avricom	4023	£2,940.00	£4,200.00	€4,633.86	¥634,091	43%
6	LGY	4122	£192,000.00	£240,000.00	€264,792.00	¥36,233,760	25%
7	Hothouse Design	4123	£1,050.00	£1,500.00	€1,654.95	¥226,461	43%
8	Binnaccount	4125	£320.00	£475.00	€524.07	¥71,713	48%
9	Rootrainer	4126	£16,240.00	£23,200.00	€25,596.56	¥3,502,597	43%
10	Rock ICT	4128	£12,250.00	£17,500.00	€19,307.75	¥2,642,045	43%
11	Quattichem	4129	£1,400.00	£2,000.00	€2,206.60	¥301,948	43%
12	LGY	4130	£10,800.00	£12,000.00	€13,239.60	¥1,811,688	11%
13	Hothouse Design	4131	£720.00	£720.00	€794.38	¥108,701	0%
14	Binnaccount	4132	£1,680.00	£2,400.00	€2,647.92	¥362,338	43%
15	Hothouse Design	4133	£4,500.00	£5,000.00	€5,516.50	¥754,870	11%

Advice

An alternative to this for percentage values with no decimal places is to highlight the cell/s, select the HOME tab and click the Percent Style icon in the Number section.

Activity 20m

Open the file that you saved in Activity 20g.
In cell A41, place the label 'Total'.
In cell B41, add the total number of times clubs were attended by people in all four houses.
In cell C36, add the label 'Percent'.
In cells C37 to C40, calculate, using absolute and relative referencing, the percentage of students in each house. Format these cells as a percentage with 1 decimal place.

Activity 20n

Open the file **items.csv**.
Format cells A4 and A5 so that the font is bold, italic and 20 point.
In cells C3 to F3, place current exchange rates for each currency shown. Use the internet (or exchange rates supplied by your teacher) to do this. Do not format these cells as currency.
For each cell in the range C8 to F22, calculate the price of each item in the correct currency.
Format each of these cells in the appropriate currency with the appropriate number of decimal places.

20.5.3 Adjust rows and columns

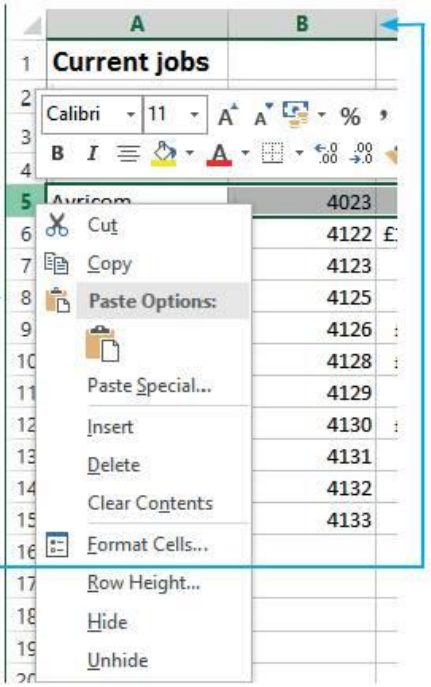
Earlier you learnt how to expand column widths using the drag handle to make sure that all data in the spreadsheet is visible. Row heights can be adjusted in exactly the same way.

The settings for row heights can also be changed by right clicking the mouse button on the row number on the left to obtain this drop-down menu.

The row can be hidden from view by selecting the Hide option, or can have a different row height set using the Row Height... option.

This option opens the Row Height window, where you can adjust the height setting before clicking on OK.

The column width can be hidden or adjusted in a similar way. To get the drop-down menu click the right mouse button on the column heading at the top of the column.



Advice

To unhide a row or column, select the rows/columns on both sides of the hidden one/s. Right mouse click on the selection and choose the Unhide option.

20.5.4 Conditional formatting

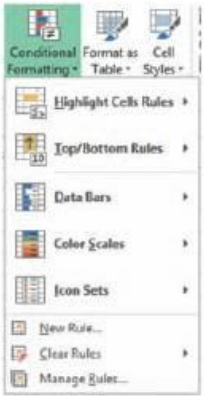
Conditional formatting is used to change the display format (usually the font or background colour within a cell), depending on the contents of the cell. There are many different methods for completing this: using rules that you apply (rather than the spreadsheet's default settings) is the recommended method and will enable you to attempt anything that may be asked at IGCSE level.

Task 20x

Open the file that you saved in Task 20k. Format the cells in column D so that:

- if they contain the text 'Not experienced' they are coloured with a red background
- if they contain 'Experienced' add an amber (orange) background
- if they contain 'Very experienced' add a green background.

Apply appropriate foreground colours to this text.

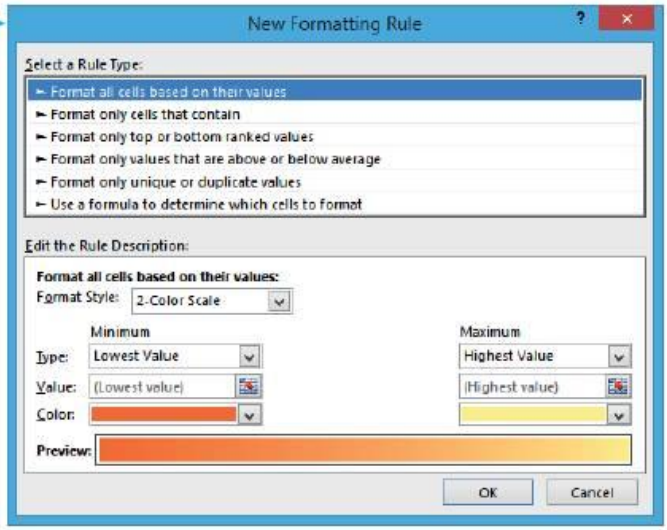


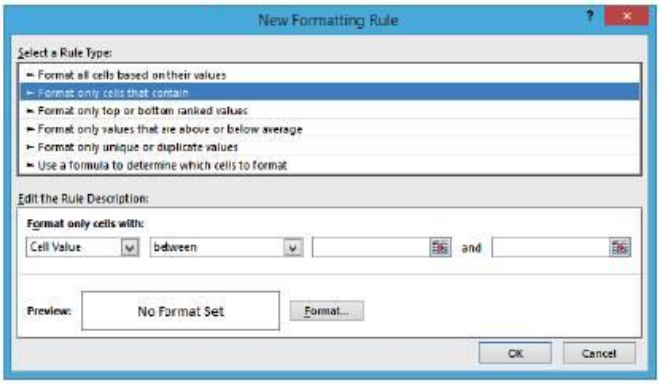
Open the file task 20k.

In previous tasks we have highlighted the range of cells to be formatted (in this case D3 to D21). This question has asked for column D, so click on the column heading (the letter D) to highlight the entire column. Select the HOME tab, find the Styles section, then select the Conditional Formatting icon, which will open this drop-down menu.

Choose New Rule... to open the New Formatting Rule window.

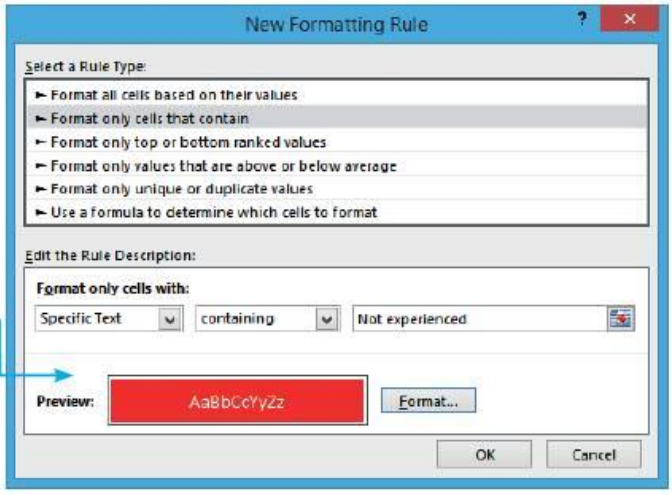
Select the second option for Format only cells that contain and the window will change to look like this.





Using the drop-down box on the left, choose Specific text (as the cells all contain labels). In the right dialogue box enter the text 'Not experienced'. Click on the Format button, select the Fill tab and a red background colour, then OK, then the Font tab and an appropriate foreground colour, then OK. You can see what the font will look like at each stage. In this case we have chosen a white font as this gives good contrast.

When you are happy that this looks good, click OK. Repeat this process for the other two items of text. Be careful with the Experienced one – it must

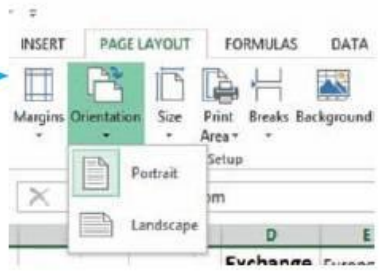


start with 'Experienced', not just contain it, or all cells will become amber. This section of the completed sheet looks like this.

Project 153			
Name	Job	Years experience	Category
Laila Aboli	Programmer	3	Not experienced
Greg Mina	Programmer	2	Not experienced
Sri Paryanti	Analyst	12	Very experienced
Bishen Patel	Sales	5	Experienced
Rupinder Singh	Engineer	7	Experienced
Sergio Gonzalez	Programmer	5	Experienced
Rupinder Vas	Sales	6	Experienced
Henri Ramos	Sales	10	Very experienced
John Mortlock	Programmer	14	Very experienced
Cameron Garnham	Analyst	7	Experienced
Brian Guthrie	Director	3	Not experienced
Julia Frobisher	Engineer	6	Experienced
Dan McNevin	Programmer	9	Experienced
Patrick O'Malley	Engineer	11	Very experienced
Thirumalar Asokmani	Sales	10	Very experienced
Sean O'Byrne	Programmer	2	Not experienced
Lea Cabusbusan	Programmer	1	Not experienced
Brian O'Driscoll	Programmer	0.2	Not experienced
Wim Van Hoffmann	Engineer	2	Not experienced

20.5.5 Adjust page orientation

You may need to change the page orientation from portrait to landscape, especially when displaying the formulae that you have used. To change this select the PAGE LAYOUT tab and find the Page Setup section. Click on the Orientation icon, then select either Portrait or Landscape from the drop-down menu.

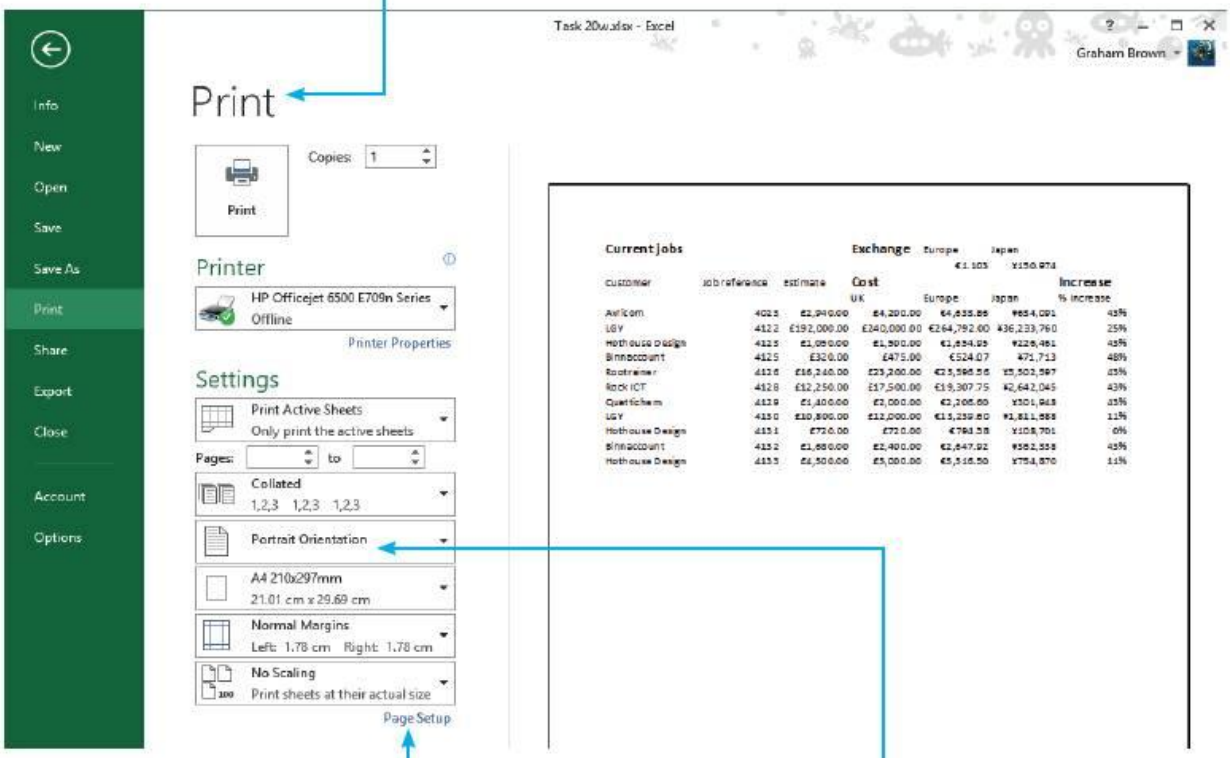


Activity 20o

Open the file that you saved in Activity 20m.
Add coloured backgrounds to show the colour of each house that are dependent on the cell contents. Apply appropriate foreground colours to this text.
Print your spreadsheet showing the values. Take screen shot evidence of the rules used to apply this formatting.

20.5.6 Prepare to print

When preparing your spreadsheet for printing, you can adjust the layout of the spreadsheet on the printed page/s before you print. To do this, select the FILE tab and then Print from the drop-down menu. The print preview will be shown to you along with options to change the Page Setup and Printer Properties.



If you need to make adjustments most can be made using the Page Setup link, which allows you to change the number of pages wide or tall in the

Advice

This window can be used as another way of changing the page orientation.

printout. Use the **Fit to:** radio button in the **Scaling** section and select the number of pages.

If you set a printout to a single page wide, ensure that that all the formulae/values and labels can be seen clearly. If the font size is so small that it is not clearly readable, you may not be awarded the marks for that section. When you have changed the page settings, click on OK. If the question asks for two pages wide and does not say how many pages tall, just set the width and clear the tall box. Do not set this manually to one as, if this is a formulae print, the font is likely to be so small it would be unreadable.

Save and print data

Save your work regularly. As recommended before, it is a good idea to save different versions, at all times each with a different version number. If you make a mistake and corrupt a file, you can always go back and redo a small part of the task without losing too much time.

When printing your spreadsheets, make sure that you have adjusted all column widths and row heights to ensure that your printouts show all:

- labels in full
- formulae in full
- data in full.

Don't forget to submit printouts showing the formulae used; check that you have worked through the section on displaying formulae near the start of the chapter. You can use screen shots to show how you achieved your results. Make sure that all printouts contain your name, candidate and Centre number.

To print, select the **FILE** tab followed by **Print** from the menu. Check your work to make sure that all the all data/formulae are fully visible before you select the **Print** button.

You may be required to export your spreadsheet data into different formats. In *Excel*, this is done by selecting the **FILE** tab followed by **Export**. If you select **Change File Type** it will allow you to export the data into common text formats like .txt (text format) and .csv (comma separated values). Although other export features exist, these should be sufficient.

21 Website authoring

In this chapter you will learn how to:

- describe the three layers used in web page creation
- use the content layer to create the web page structure
- use the presentation layer to define styles
- define and use HTML tags within the content layer
- use a text editor to create the content layer of a web page
- annotate your markup with comments
- display your web pages in a web browser
- format text using predefined styles
- design and create page layout using tables
- create, resize and format tables, including headers, footers and body sections
- embed CSS styles into an HTML page
- insert, place and manipulate an image within a web page
- manipulate an image in a graphics package
- insert animated images, videos and audio files into a web page
- apply colour to text and backgrounds
- use colour names and hexadecimal colour codes
- create numbered, bulleted and nested lists
- use hyperlinks within a web page
- use hyperlinks to external pages and to send email
- open a web page in a new window
- create a hyperlink from an image
- describe what is meant by the term cascading stylesheet
- describe the hierarchy of multiple attached stylesheets and in-line styles
- define and use CSS elements within the presentation layer
- create, edit and attach a cascading stylesheet
- add comments to a stylesheet
- format, align and enhance text using the presentation layer
- create styles using specific and generic font families
- set font sizes using absolute and relative values
- set background colours and images using the presentation layer
- use classes within a stylesheet
- create table formatting using the presentation layer
- upload and publish the content of a website using ftp
- create a test plan to test a website
- test that web page elements work when published
- test navigation within/from a web page using a test plan
- justify your test plan choices.

For this chapter you will need these source files from the CD:

- brick.css
- brick.png
- bricknblocktopia.htm
- class1.css
- colourcodes.htm
- htmltips.htm
- ptct.jpg
- remora.htm
- remora.jpg
- style1.css
- style2.css
- subscript.htm
- sun.png
- task21ai.png
- turtle.jpg
- turtlelogo.gif
- wall.png
- webpage1.htm
- webpage2.htm
- webpage3.htm
- webpage4.htm
- webpage5.htm
- webpage6.htm
- webpage7.htm
- whale.mp3
- wreck.mp4.

21.1 Web development layers

21.1.1 What is a website?

A **website** is a collection of individual but related **web pages** that are often stored together and hosted by a web server. Web pages can include different objects such as text, sound, video and still images. A web page is created using three layers:

- the **content layer** (sometimes called the structure layer)
- the **presentation layer**
- the behaviour layer (which often involves script languages, but we will not cover the practical programming of this at Cambridge IGCSE level).

You develop the content/structure layer of your web pages in a language called **HTML** and the presentation layer of your web pages in **CSS**.

21.1.2 What is HTML?

HTML is an abbreviation for HyperText Markup Language. It is a text-based language used to develop the content layer of websites. Files are written in HTML using a simple **text editor** (or **web-authoring package** such as *Macromedia Dreamweaver*, *Microsoft Visual Studio* or *Expression Web*). Files are written in text format and are usually saved with an .htm (or .html) file extension. These files are recognised by **web browsers** such as *Microsoft Internet Explorer*, *Google Chrome* or *Mozilla Firefox* as web pages. You are going to develop your own web pages using a simple **text editor**.

21.1.3 What is CSS?

CSS is an abbreviation for cascading stylesheet, a different text-based language. Styles are created and added to web pages. CSS can be written (embedded) into HTML but it is usually created in a separate file saved with a .css file extension. The stylesheet is then attached to a web page. Many websites have one or more common stylesheets attached to every page in the website. This makes all the pages have a similar appearance, with the same font styles and colour schemes, etc. You will also develop your own stylesheets using a simple **text editor**.

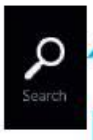
21.1.4 Getting started

A good technique for working on web pages is to tile four windows on the screen at the same time: this means to fit them side by side like tiles. Whenever you do any work in HTML and CSS, it is recommended that you open two copies of a text editor, a web browser and a list of your files in their storage folder.

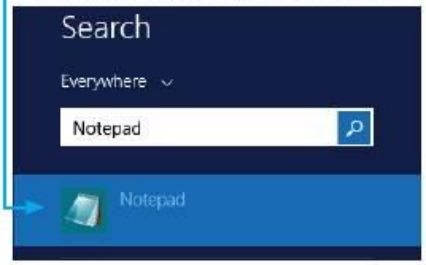
Move the cursor to the top right corner of the screen to select the Windows 8 charm bar.

Advice

To select the charm bar with the keyboard, press the Windows and C keys together.



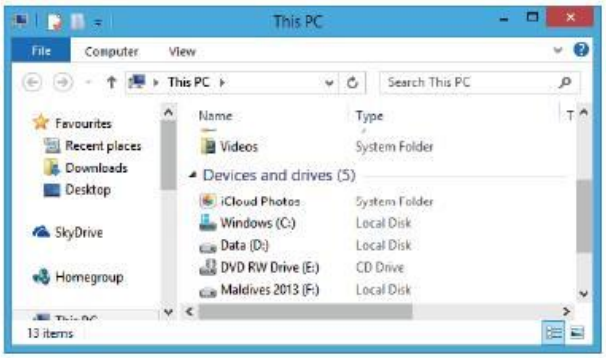
Select the Search charm then select the Everywhere search. Enter the text Notepad into the search box. The result should look similar to this.



Click the right mouse button on the Notepad icon to open the App bar, which appears at the bottom of the screen and looks similar to this.

Click on Open in new window. Place this window in the top left of the screen. Resize the window so that it fills about a quarter of the screen. Open a second copy of *Notepad* using this method. Place and resize it to fill the lower left quarter of the screen. These text editors will be where we create the **content layer** (the HTML markup) and the **presentation layer** (the Cascading Stylesheet) for each web page.

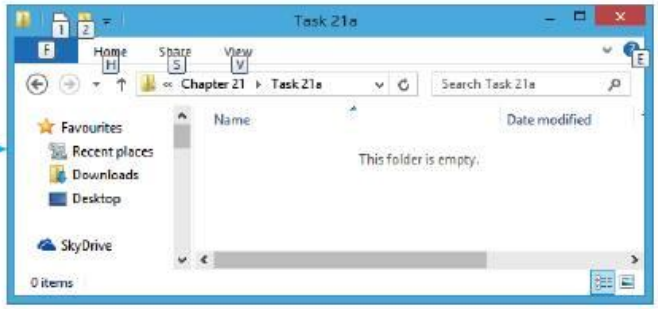
Open the File Explorer window by pressing the Windows and E keys together. Place the File Explorer window in the lower right corner of the screen and resize it to fill about half the width and a quarter of the height of the screen.



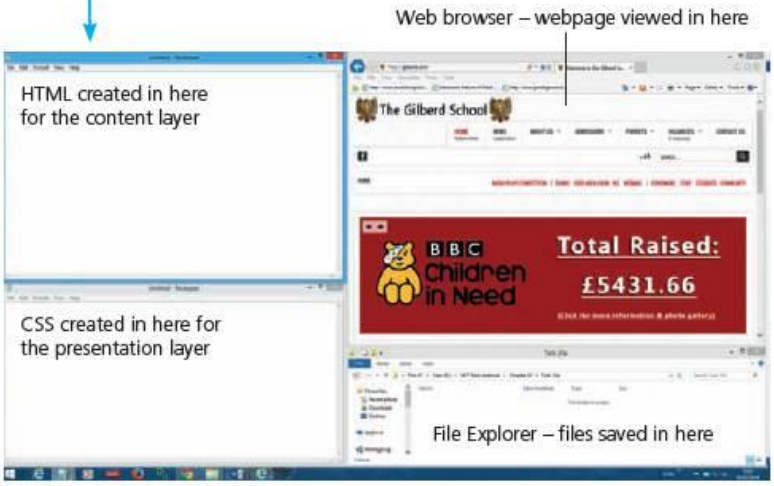
Click the left mouse button to select the drive that you will use as your work area. Then click on the New folder icon and name this folder Chapter 21.

The location of this will depend on the structure of the system you are using. Go into this folder and create new subfolders for each task in this chapter. Call these folders Task21a to Task21z, and Task21aa to Task21am. You must save all the files for each task in this chapter in the correct folder.

Make sure you are in the folder Task21a. This is where all the work from the first part of this chapter will be stored. The window should look similar to this.



Open your web browser and resize this window so that it fills the remaining area of your screen. Make sure that the windows fit together and do not overlap. The screen will look similar to this.



Although many people refer to HTML as a programming language, that is not strictly true. It is a markup language that uses a set of markup **tags** to describe a web page to the browser. HTML tags are shown using angle brackets around them like this:

```
<html>
```

The angle brackets tell the browser that this is a markup tag and not text to be placed on the web page. The browser does not display the HTML tags but uses them to display the content of the page. Most HTML commands have two tags: one to open the command and one to close it. Each tag has a pair of angle brackets around it.

21.2 Create a web page

All HTML web pages start with a <!DOCTYPE html> declaration and, although it has angle brackets, it is not an HTML tag. This is always the first thing in your markup. The <!DOCTYPE html> declaration is an instruction to the browser to tell it that the page is written in HTML rather than another markup language. The first tag that will usually appear in any web page will be <html>. This tag tells the browser that the markup following this tag will be written in hypertext markup language. The tag </html> tells the browser that this is the end

Advice

Note that all text in HTML tags should be in lower case.

of this markup language and appears at the end of the markup. The forward slash shows that it is a closing tag. All other HTML tags will appear between these tags.

Each web page will have two clearly defined sections: the **head** and the **body**. The head section starts with <head> and closes with </head> and objects between these tags are not usually displayed by the web browser. Only a few tags are universally accepted within the head section of a web page; these are: <base>, <link>, <meta>, <title>, <style> and <script>. The head section should always contain a title. This is the name displayed in the browser toolbar. It is the page title used if a page is added to your 'favorites' in your browser and is the title displayed in search engine results. The body section starts with <body> and closes with </body> and objects between these tags will be displayed in the web page. The basic structure of any web page should therefore include these tags.

Insert tags for the head section here.

Insert objects to be displayed by the browser in the body section here.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Web page name</title>
  </head>
  <body>
  </body>
<!-- This is a comment -->
</html>
```

21.2.1 Add comments to your HTML markup

Comments can be added to your markup if there are notes that you wish to make but not display on the web page. This is very useful for making sure that your name, Centre number and candidate number are on every web page, even if you are not instructed to display them. Comments start with <!-- and end with -->. As the comments do not affect the markup, they can be placed before or after any tags. Comments look similar to this.

21.2.2 The use of preset HTML styles in the content layer

Text is organised into paragraphs, with the paragraph style applied. Headings usually have different styles to the paragraph style. All text added to a web page should have a tag telling the browser what the text style should look like. There are a number of predefined styles available for use in a web page. The normal paragraph style is obtained using and ended with . Likewise, six heading styles are available and are defined with the style names <h1> to <h6>. Each item in a bulleted or numbered list can be defined with the <li> tag and finished with ; there are more details on lists later in this chapter.

Task 21a

Create and save a new web page showing paragraph and heading styles.

Click the cursor into the top text editor. Type the following markup into the editor, replacing *MY NAME HERE* with your name. Always remember to add your name, Centre number and candidate number to all of your printouts.

```
<!DOCTYPE html>
<html>
  <!-- Markup created on 06/01/2015 -->
  <head>
    <title>Task 21a</title>
  </head>
  <body>
   <p>My first web page by MY NAME HERE</p>
   <h1>This is style h1, the largest heading style</h1>
    <h2>This is style h2</h2>
    <h3>This is style h3</h3>
```

Advice

It is essential that the text is typed exactly as shown here. One typing error may cause the web page not to function as expected.

Advice

It is acceptable to use capital letters in the text that is displayed on the page, but not in the HTML tags.

```
    <h4>This is style h4</h4>
    <h5>This is style h5</h5>
    <h6>This is style h6, the smallest heading style</h6>
    <p>This is style p, the paragraph style</p>
  </body>
</html>
```

When this has been entered and carefully verified (by checking this original document with your typed copy), you must select **File** followed by **Save As...**, which will open the **Save As** window.

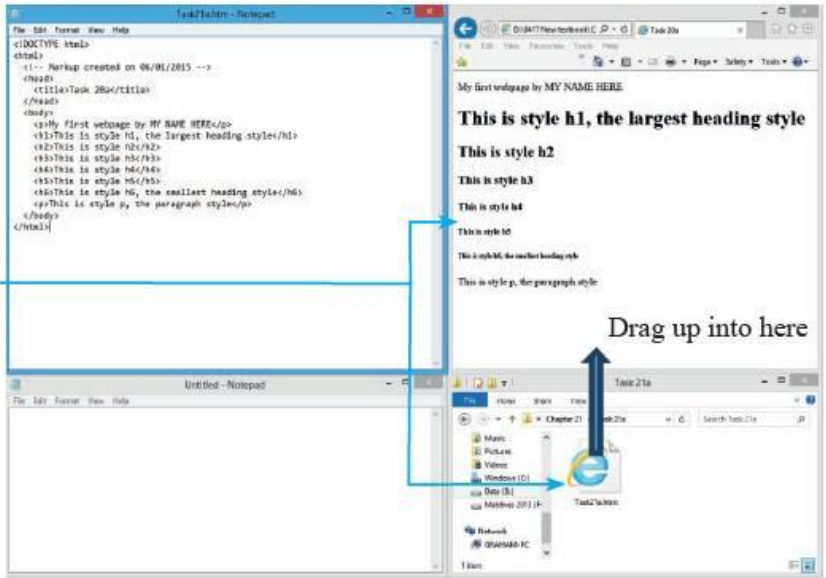
Click on the folder names until you find the Task21a folder created earlier in this chapter.

You need to enter a filename for the web page. This filename **must** be saved with an .htm extension. If you do not use a .htm file extension, this will operate as a text file rather than as a web page. Enter the filename **task21a.htm** and click on Save. The file should appear in the **File Explorer** window and may look similar to this. If the file cannot be seen, move into the Task21a folder.

Make sure that the file displays the browser (usually the, or) symbol to show that this is a web page and not a text document with a symbol. The text document symbol only appears if you forget to add the .htm extension to the filename.

Select the file task21a.htm from the **File Explorer** window and drag this file (holding the left mouse button down) into the browser window. The screen should now look similar to this.

The browser view now contains your first web page.



Advice

Some browser settings will make this open in a new browser window, rather than the one that you have just opened.

21.2.3 Open existing web pages and enhance text

To open an existing web page in both the text editor and the web browser you must find the web page in the File Explorer window. For all web page files, it is advisable to copy the files into a subfolder of your HTML directory before starting.

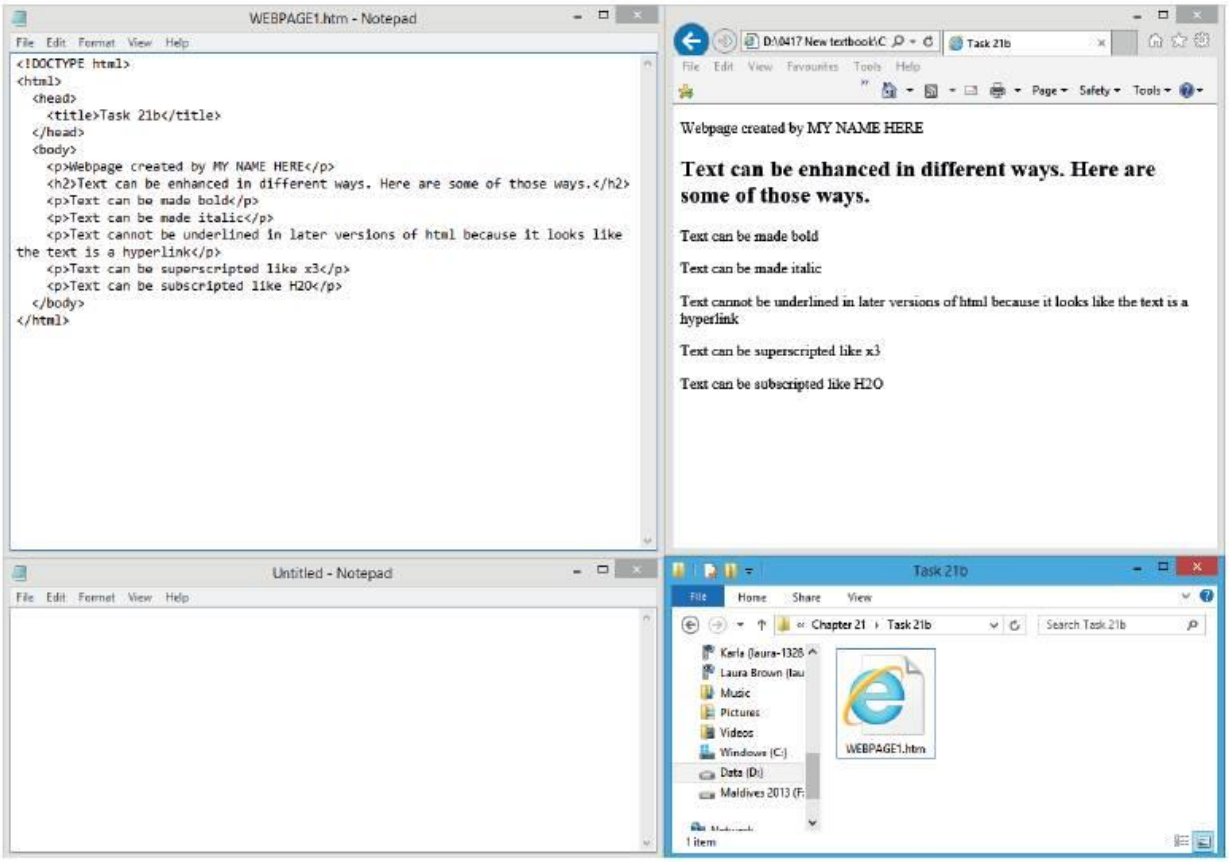
Task 21b

Open the file **webpage1.htm** and view this web page in both the text editor and browser.

Improve this web page by emboldening the word 'bold', setting the word 'italic' to an italic font, setting the '3' in x^3 as superscript and setting the '2' in H_2 as subscript.

Copy the file **webpage1.htm** into your Task21b folder. Drag this file from the File Explorer window into the top text editor. Drag another copy of this file from the File Explorer window into your browser.

The screen should look like this.



Advice

Editing is easier if you ensure that the word wrap is selected in *Notepad*. To do this, use the Format menu and check that the Word Wrap option is ticked.

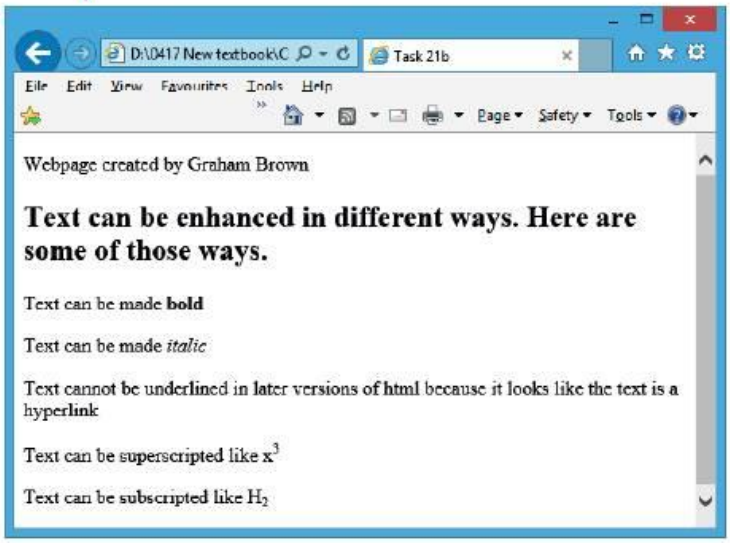
Move the cursor into the text editor window and make the following changes to the markup:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Task 21b</title>
  </head>
  <body>
    <p>Web page created by Graham Brown</p>
    <h2>Text can be enhanced in different
ways. Here are some of those ways.</h2>
    <p>Text can be made <b>bold</b></p>
    <p>Text can be made <i>italic</i></p>
    <p>Text cannot be underlined in later
versions of HTML because it looks like
the text is a hyperlink</p>
    <p>Text can be superscripted like
x<sup>3</sup></p>
    <p>Text can be subscripted like
H<sub>2</sub></p>
  </body>
</html>
```

- replace MY NAME HERE with your name
- place the tags and around the word 'bold'
- place the tags and around word 'italic'
- place the tags ^{and} around the number '3'
- place the tags _{and} around the number '2'.

When you have made all these changes to the web page, save the page by selecting the text editor, followed by **File**, **Save As...**, selecting the **Task21b** folder and entering the filename **task21b.htm** before clicking on Save. Test the web page works by dragging this new filename from the **Documents** window into the browser window.

The new browser view should look like this.



Advice

If you prefer you can click the mouse on the browser window and then press the function key <f5> to refresh the browser view each time you have saved the file.

21.2.4 Print web pages

From time to time, you will be required to print different views of your web pages. You must ensure that your name is included on the web page before it is sent to the printer, in whichever view is specified. Printing the HTML view is often required. Even if you are using a WYSIWYG (what you see is what you get) package, like *Macromedia Dreamweaver* or *Microsoft Expression Web*, you will need to open the web page in a text editor to print the HTML.

If you are printing from a web browser, make sure that your name and candidate details are fully visible on the printout. If you are using a WYSIWYG package, make sure that you test the web page in a browser and not just within the package. Some products will display what appears to be the browser view but it is only a development tool and does not necessarily display the page as it will be seen. Use screen shots of your pages, taken using the <Print Screen> button on your keyboard, to copy the screen contents into the clipboard. Then paste the clipboard into another package (often a word processor) to present evidence of your work.

Activity 21a

Open the file **subscript.htm** and view this web page in both the text editor and browser.

Replace the text MY NAME HERE with your name. Improve this website by emboldening the word 'emboldened', setting the word 'italic' to an italic font, and the word 'underlined' to an underlined font.

Set the '2' in 10 m^2 and the '3' in 500 cm^3 as superscript, and set the '2' in CO_2 as subscript. Set the text 'Enhancing Text' into style h1. Print your web page as HTML and as it is viewed in your browser.

21.2.5 Tables in the content layer

Tables are used to create the basic structure of many web pages. They are used to organise page layout and are often used in web pages even though the borders may not be visible. If you need to create a table within a web page, it is always worth planning it on paper before starting to create the markup.

Advice

This planning stage will often be given to you in the question.

Advice

It will be much easier to use WYSIWYG software to create your tables. This section is designed to ensure that you understand how to create and edit tables. You will need to understand the markup used to define tables. To begin with, this may be difficult for you if you decide to use a WYSIWYG package to develop your tables.

Task 21c

Create a new web page that looks like this and has the caption 'Colours':

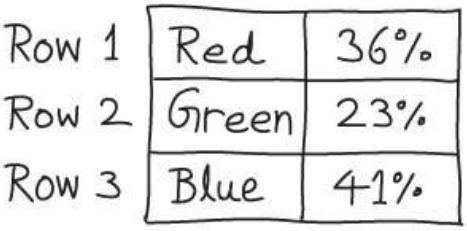
Red	36%
Green	23%
Blue	41%

Basic table structure

Tables in HTML always start with a <table> tag and end with </table>. Start by adding these tags in the body section of the markup. Make sure you replace the text 'your name' with your own name. It should look similar to this.

Everything between these tags will be included in the table, except for the caption. This is added using the <caption> and </caption> tags, which allows you to display a caption (usually centre aligned) above the table. If a caption is used it **must** be the first HTML tag after the <table> tag.

Each table is split into rows.




```
<!DOCTYPE html>
<html>
    <!-- Task 21c by your name -->
  <head>
    <title>Task 21c</title>
  </head>
  <body>
    <table>
    </table>
  </body>
</html>
```

```
<body>
  <table>
    <caption>Colours</caption>
    <tr>
    </tr>
    <tr>
    </tr>
    <tr>
    </tr>
  </table>
</body>
```

For this task, the table you need to create has three table rows. The tag for a table row is <tr>. Create the three blank rows between the caption and the end of the table like this.

Each table row will contain two cells of table data. The tag for table data is <td>. A row can have one or more <td> tags. Between each <tr> and </tr> tag, place start table data <td> and end table data </td> tags like this. This table row has two pieces of table data. A table cell can contain text, images, other tables, lists, paragraphs, forms, horizontal rules, and so on.

```
<body>
<table>
  <caption>Colours</caption>
  <tr>
    <td>
    </td>
    <td>
    </td>
  </tr>
  <tr>
    <td>
    </td>
    <td>
    </td>
  </tr>
  <tr>
    <td>
    </td>
    <td>
    </td>
  </tr>
</table>
</body>
```

Advice

It is sometimes quicker to create one complete table row first with the table data cells included, then copy this row a number of times using copy and paste.

The data can now be added to each cell like this.

Your table will look similar to this.

Colours	
Red	36%
Green	23%
Blue	41%

```
<body>
  <table>
    <caption>Colours</caption>
    <tr>
      <td>Red
      </td>
      <td>36%
      </td>
    </tr>
    <tr>
      <td>Green
      </td>
      <td>23%
      </td>
    </tr>
    <tr>
      <td>Blue
      </td>
      <td>41%
      </td>
    </tr>
  </table>
</body>
```

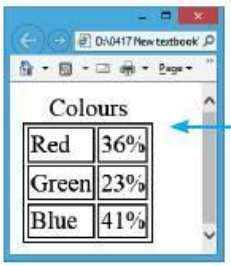
Table borders

This table has been created but does not have a visible border. The word 'border' is an attribute. To show the table gridlines you must add a border **attribute** with a value of "1". Attributes should be in lower case and attribute values should always be enclosed in quotes. Change your markup like this.

```
<body>
  <table border="1">
    <caption>Colours</caption>
```

The only valid border values in HTML5 are "1" and "":

- "1" makes the border visible
- "" hides the table border, yet allows the table to control the structure of the page.



Save this web page as task21c.htm in your Task21c folder.

Advice

This is different from earlier versions of HTML where "0" hid the border.

Headers and footers in tables

Tables can have three sections: a header, a body section and a footer. These are defined using the <thead>, <tbody> and <tfoot> tags, and closed with </thead>, </tbody> and </tfoot> respectively. Notice how these all begin with t (for table).

Task 21d

Create a new web page that looks like this and has the caption 'Fruit sales'.

Fruit	Price
Apple	$1230
Orange	$780
Pear	$240
Banana	$4235
Lemon	$75
Total	$6560

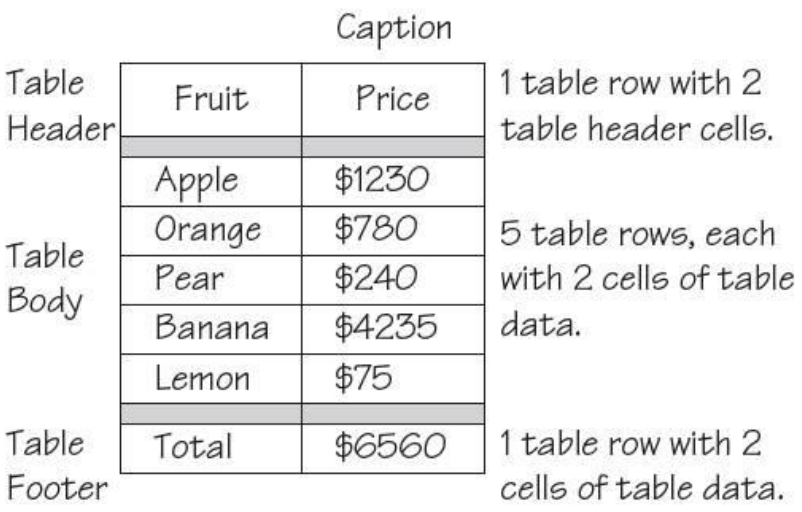
To create this web page you need to first create the open table and close table tags within the body section of the markup. Place the caption tags between these in the same way that you did when you completed Task 21c. The initial markup for this section should look like this.

```
<body>
  <table border="1">
    <caption>Fruit sales</caption>
  </table>
</body>
```

Before continuing with the markup it is worth planning the table using a hand-drawn sketch similar to this.

This will help you work out the structure needed for the markup. For this table, you will need three sections to the table.

These three sections need creating next within the markup. The header section is created using the table head tags, with <thead> to start the section and </thead> to finish the section. The footer section uses the tags <tfoot> and </tfoot>, and the body is defined with <tbody> and </tbody>. In HTML you must define the table header, footer and then body (in that order) if all three sections are to be included. Create the three sections within the table of your markup like this.



Within each section add the correct number of table rows, using the notes you made on your sketch to help you.

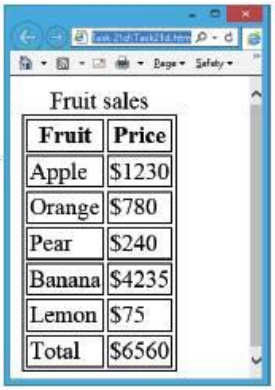
You can add the table data sections to the footer and body of the table using the tags <td> and </td>. Do not use these tags in the table header. At each stage, save your web page and check that the markup that you have written gives you the results that you expected.

In the table header, create heading cells (which are bold and centre aligned) using the tags <th> and </th> rather than the table data tags. These will set the column headings in heading style. Heading cells can be used inside the table body and table

```
<body>
  <table border="1">
    <caption>Fruit sales</caption>
    <thead>
    </thead>
    <tfoot>
    </tfoot>
    <tbody>
    </tbody>
  </table>
</body>
```

footer sections and are useful in the left column of a table if row headings are required. Don't forget to replace the text 'your name' with your own name.

Place the contents (in this case text) of the header section in the header cells and place the contents of the body and footer sections in the relevant cells. The finished markup and resulting web page should look like this.




```
<!DOCTYPE html>
<html>
<!-- Task 21d by your name -->
<head>
  <title>Task 21d</title>
</head>
<body>
  <table border="1">
    <caption>Fruit sales</caption>
    <thead>
      <tr>
        <th>Fruit</th>
        <th>Price</th>
      </tr>
    </thead>
    <tfoot>
      <tr>
        <td>Total</td>
        <td>$6560</td>
      </tr>
    </tfoot>
    <tbody>
      <tr>
        <td>Apple</td>
        <td>$1230</td>
      </tr>
      <tr>
        <td>Orange</td>
        <td>$780</td>
      </tr>
      <tr>
        <td>Pear</td>
        <td>$240</td>
      </tr>
      <tr>
        <td>Banana</td>
        <td>$4235</td>
      </tr>
      <tr>
        <td>Lemon</td>
        <td>$75</td>
      </tr>
    </tbody>
  </table>
</body>
</html>
```

Save this web page as task21d.htm in your Task21d folder. Save copies of this page as task21e.htm in your Task21e folder, as task21f.htm in your Task21f folder, and as task21i.htm in your Task21i folder.

Activity 21b

Create a new web page with a table that looks like this and has the caption 'Hours of sunshine last week'. Make sure the top row of the table is in the header section and the bottom row is in the footer section. Print your web page as HTML and as it is viewed in your browser.

Day	Hours
Monday	6
Tuesday	4.5
Wednesday	8
Thursday	7
Friday	3.5
Saturday	5
Sunday	6
Weekly total	40

21.2.6 Use embedded CSS in HTML

Although this section introduces the use of styles into your web page, this will not be covered in detail until Section 21.3.

Styles can be applied to tables and other HTML elements by placing CSS instructions in a **style** attribute within the HTML tag. This is called embedded CSS.

Task 21e

Open the file task21e.htm. Set the table to be 400 pixels wide and each row to be 50 pixels high. Set the left column to be 280 pixels wide.

Resize a table

Open the file **task21e.htm**. You have seen that each table grows to fit the data in each cell. In order to avoid this, each table, as well as each row/column within the table, can be set to a fixed width or a width related to the size of the browser window. For this task an attribute is added to either the table **<table>**, table row **<tr>** or table data **<td>** tags. This attribute is an embedded CSS **style** attribute. In the **table** tag add a second attribute named **style** with the embedded CSS property value **width:400px**, like this.

```
<body>
  <table border="1" style="width:400px">
    <caption>Fruit sales</caption>
    <thead>
```

The width of the table will now be fixed to 400 pixels. If the browser window is resized, this table size will not change; if the window is made smaller than 400 pixels the browser will display scroll bars.

Advice

Use px for pixels and do not put a space between the digits and px.

Advice

The syntax for CSS elements is the property name, colon, the value to be applied, e.g., name:value

If more than one property is to be applied these are separated with semi-colons, e.g, name1:value; name2:value

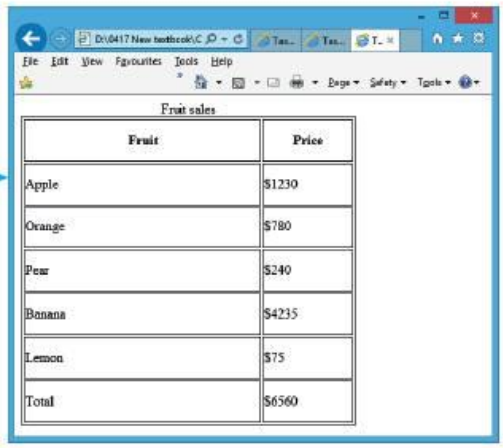
Use similar style attributes in all seven table row tags to set the row height like this.

In the first table header cell add a similar attribute to set the CSS **width** property to 280 pixels like this.

```
  <thead>
    <tr style="height:50px">
      <th style="width:280px">Fruit</th>
      <th>Price</th>
```

These two style attributes only need applying once; all other cells in the row/column will match the attribute set. The finished table looks like this.

Save this web page as task21e.htm in your Task21e folder.



Task 21f

Open the file task21f.htm. Set the table to fit to 80% of the browser window and the left column to be 75% of the width of the table. Set the top row to be 60 pixels high and the bottom row to be 40 pixels high. Align the table in the centre of the browser window. Set the names of the fruit to be centre aligned and the prices in the right column to be right aligned.

Open this web page. Set a style attribute for the table tag with the width property and a value of 80%. Use a similar 75% property for the style attribute in any table data (or table header) tag in the left column, like this.

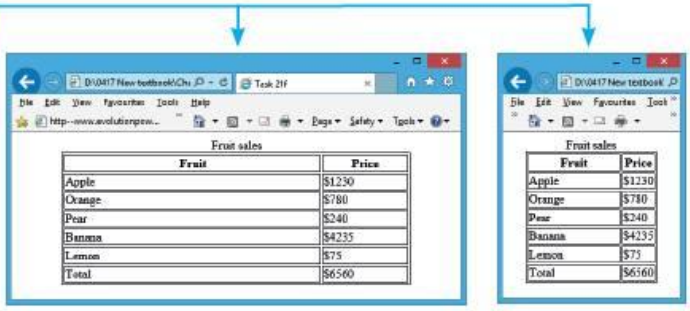
```
<body>
  <table border="1" style="width:80%">
    <caption>Fruit sales</caption>
    <thead>
      <tr>
        <th style="width:75%">Fruit</th>
        <th>Price</th>
```

Centre align a table in a window

To centre align the table within the window, two more style properties must be used with the table tag. These are to set the margin to the left to automatic and the margin to the right to automatic. In CSS, if more than one property is used, the semi-colon (;) is used between one property and value and the next. The extra properties for the table style attribute will look like this.

```
<body>
  <table border="1" style="width:80%; margin-left:auto; margin-right:auto;">
    <caption>Fruit sales</caption>
```

The table is now centre aligned inside the browser. If the browser is resized the table still has the same size and alignment like this.



Set the row height of the table header (the first row) to 60 pixels and the bottom row to 40 pixels. Use <tr style="height: 60px"> and <tr style="height: 40px"> to do this.

Horizontally align cell contents

To align the text to the centre in the left column, add the style attribute to each table data tag in the table footer and table body, so that the style has the property and value "text-align:center".

To align the text to the right in the right column, add the style attribute to the table data for each cell in this column (except the table header) so that the style has the property and value "text-align:right". The web page will now look like this.

Advice

Note the American spelling of 'center' rather than the English spelling 'centre'.

Save this web page as task21f.htm in your Task21f folder. Save copies of this page as task21g.htm in your Task21g folder and task21o.htm in your Task21o folder.

Advice

Colgroup tags to align cell elements are no longer supported in HTML5.

Activity 21c

Create a new web page with a table that looks like this and has the caption 'SupaHols visitors 2016'.

Country	Visitors
Egypt	440
India	2000
Jamaica	140
United Arab Emirates	420
Total visitors	3000

Make the company name, SupaHols, bold. Make sure the top row of the table is in the header section and the bottom row is in the footer section. Set the table to fit to 70% of the browser window and the left column to be 100 pixels wide. Set the top row to be 60 pixels high. Align the table in the centre of the browser window. Set the contents of row 1 and the names of the countries to be centre aligned and the number of visitors to be right aligned. Print your web page as HTML and as it is viewed in your browser.

Table borders

You have already studied how to set the table borders on or off with a border attribute for the table tag. To set table borders to appear as we want them we can change the border settings in the whole table or parts of the table. You will notice that all of the tables that we have created so far have a double border because the table and the table header/table data parts have separate borders.

Create a single table border

Task 21g

Open the file task21g.htm. Display the table with a single, solid border 4 pixels wide, and with internal gridlines 2 pixels wide.

Open this web page in *Notepad*. Set a style attribute for the table tag with the border-collapse property and a value collapse, like this.

```
<body>
  <table border="1" style="width:80%; margin-left:auto; margin-
  right:auto; border-collapse:collapse;">
    <caption>Fruit sales</caption>
```

The table will now look like this.

Set table border widths

Table borders can be set using embedded CSS with the style attribute with the border property and values.

To set the outside border of a table the style attribute is added to the table tag. The values assigned to this tag must set the border to solid and to 4px. To set internal gridlines style, attributes are added to the <th> and <td> tags; each of these tags must have the style attribute with border:solid 2px.

Advice

Table border settings in CSS are different from the border attribute for the table, which is only used to show if borders are visible or invisible.

```
<!DOCTYPE html>
<html>
<!-- Task 21g by your name -->
<head>
  <title>Task 21g</title>
</head>
<body>
  <table border="1" style="width:80%; margin-left:auto; margin-
right:auto; border-collapse:collapse; border:solid 4px;">
    <caption>Fruit sales</caption>
    <thead>
      <tr style="height:60px">
        <th style="border:solid 2px; width:75%;">Fruit</th>
        <th style="border:solid 2px;">Price</th>
      </tr>
    </thead>
    <tfoot>
      <tr style="height:40px">
        <td style="border:solid 2px; text-align:center;">Total</td>
        <td style="border:solid 2px; text-align:right;">$6560</td>
      </tr>
    </tfoot>
    <tbody>
      <tr>
        <td style="border:solid 2px; text-align:center;">Apple</td>
        <td style="border:solid 2px; text-align:right;">$1230</td>
      </tr>
      <tr>
        <td style="border:solid 2px; text-align:center;">Orange</td>
        <td style="border:solid 2px; text-align:right";">$780</td>
      </tr>
      <tr>
        <td style="border:solid 2px; text-align:center;">Pear</td>
        <td style="border:solid 2px; text-align:right;">$240</td>
      </tr>
      <tr>
        <td style="border:solid 2px; text-align:center;">Banana</td>
        <td style="border:solid 2px; text-align:right;">$4235</td>
      </tr>
      <tr>
        <td style="border:solid 2px; text-align:center;">Lemon</td>
        <td style="border:solid 2px; text-align:right;">$75</td>
      </tr>
    </tbody>
  </table>
</body>
</html>
```

The finished table will look like this.

Later in this chapter you will learn how to fix styles for all table cells without repeatedly entering the same style attribute for each tag.

Activity 21d

Edit the web page you created for Activity 21c so that the: table has a single border of 6 pixels, the table header and footer 4 pixels, and the table data 2 pixels. Print your web page as HTML and as it is viewed in your browser.

Vertically align table cell contents

Data held in table cells can be vertically aligned with embedded CSS so that it fits in the top, middle or bottom of the cell. The style attribute is added to the <td> tag with a property of vertical-align and a value of top, middle or bottom.

Task 21h

Create a new web page that looks like this. Set both row heights to 60 pixels. Centre align the contents of all cells. Vertically align to the top, centre and bottom of the cell as shown.

Vertical alignment		
Top	Middle	Bottom

Advice

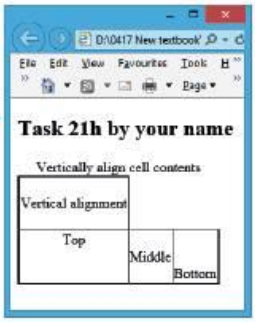
In some questions you may be instructed to vertically align to the centre of the cell; if so, always set the property value to middle.

Create a new web page that has a table with two rows. In the top row include one piece of table data and, in the second row, include three pieces of table data. Save this in your Task21h folder. It should look like this.

Find the three table data <td> tags in the second row and add the following attributes to them.

```
<tr style="height:60px; text-align:center;">
  <td style="vertical-align:top">Top</td>
  <td style="vertical-align:middle">Middle</td>
  <td style="vertical-align:bottom">Bottom</td>
</tr>
```

The text will now align in the table like this.



Extend (merge) cells

To create a single cell that spans across all three columns in the top row of the table, you need to add a colspan attribute to the table data <td> tag for this row.

```
<tr style="height:60px; text-align:center;">
  <td colspan=3>Vertical alignment</td>
</tr>
```

Save your web page as task21h.htm in your Task21h folder.

The completed table should look like this.

To merge cells vertically use the rowspan attribute in the same way.

Activity 21e

Create a new web page to look like this. Table and header borders must be 6 pixels and all other gridlines must be 3 pixels. The right column must be 50% of the width of the table.

Class 11A Exam Results		
Amir	96	Students who have performed extremely well
Belle	96	
Cai	94	
Denise	92	
Eric	66	Must do better.
Fiona	23	

Cell padding

Cell padding is the space between the cell contents and the border of the cell.

Task 21i

Open the file task21i.htm. Copy the table so that there are three tables, one above the other, on the page. Change the captions from 'Fruit Sales' to 'No padding' for the top table, 'Padding set to 25pixels' for the middle table and 'Variable padding' for the lower table. Set the cell padding of the middle table to 25 pixels and the padding of the lower table to have a top padding of 25 pixels, bottom padding of 20 pixels and left and right padding of 15 pixels.

Open the file task21i.htm. Copy the table and paste it twice. Place a <br> tag between each table to set a line break. The <br> tag does not have a close tag. Add an ID attribute to each table so we can identify them: they will be called top, middle and bottom. In the <table> tag for the middle table, add the single CSS style padding property with a value of 25 pixels like this.

```
  <br>
  <table border="1" id="middle" style="padding:25px">
    <caption>Padding set to 25 pixels</caption>
```

For the bottom table we can set the different padding by stating all four values, starting at the top and rotating clockwise like this.

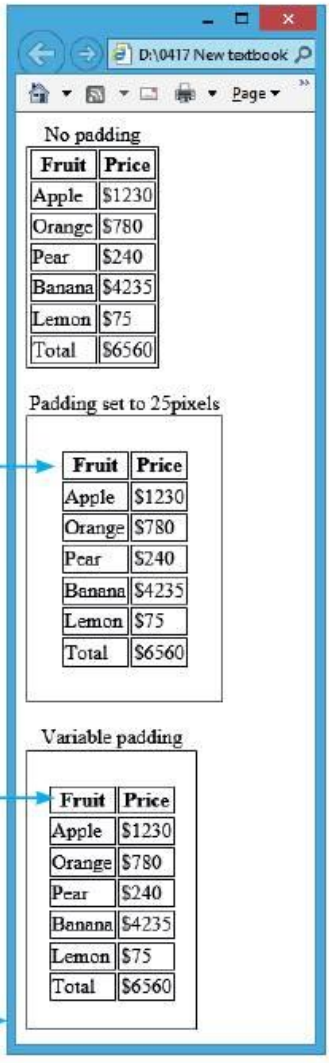
```
  <br>
  <table border="1" id="bottom" style="padding:25px 15px 20px
15px;">
    <caption>Variable padding</caption>
```

Advice

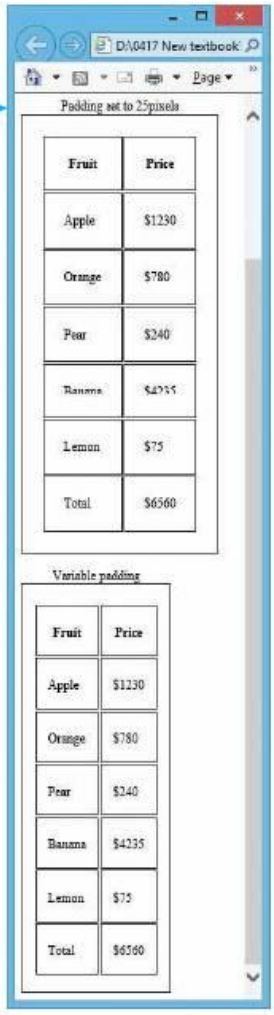
This is a shortened version of the CSS padding properties. Where padding should be specified in full, for each side it will look like this.

```
padding-top:25px;
padding-bottom:20px;
padding-right:15px;
padding-left:15px;
```

The web page now looks like this.



This has only set the padding for the table borders. To change each cell the same style attributes, properties and values will need copying and pasting into every <th> and <td> tag. This will change the tables to look like this.



Save your web page as task21i.htm in your Task21i folder, and a copy of your page as task21j.htm in your Task21j folder.

Task 21j

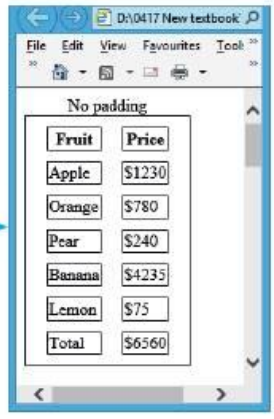
Open the file task21j.htm. Set the top table to have a horizontal border spacing of 20 pixels and a vertical border spacing of 10 pixels.

Border spacing

The spacing between the borders of individual cells is set in the <table> tag. The style attribute is used with the border-spacing property. Two values can be passed to this property: the horizontal spacing first, then the vertical spacing, like this.

```
<body>
  <table border="1" id="top" style="border-spacing:20px 10px;">
    <caption>No padding</caption>
```

The top table of the web page will look like this.



Advice

If the horizontal and vertical border spacing are the same, you can use a single value.

Activity 21f

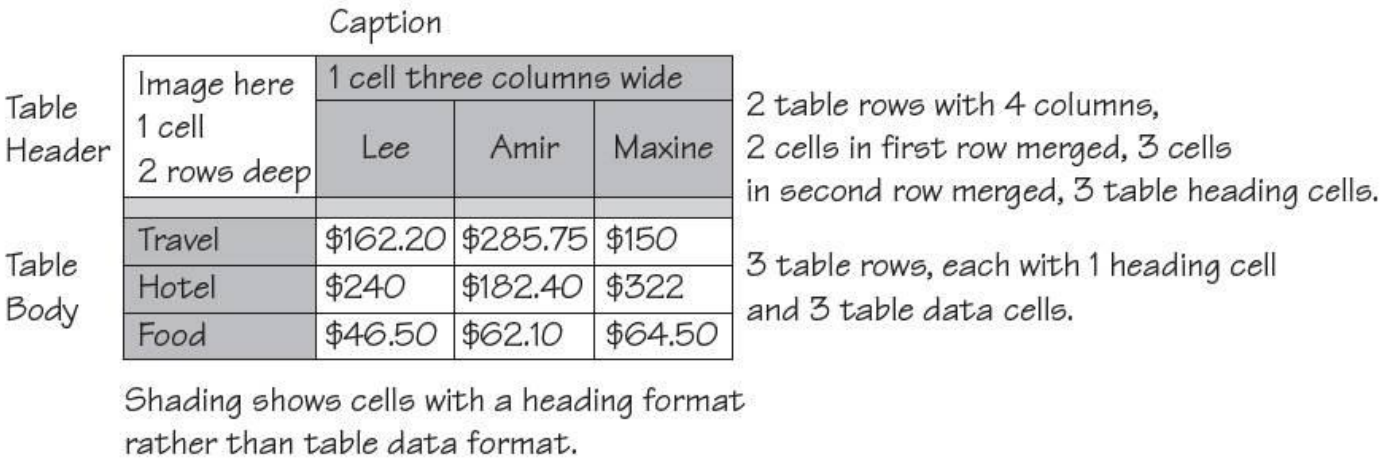
Open your finished web page from Activity 21b. For each table cell, set the padding to have a top value of 8 pixels, bottom of 12 pixels, a left value of 20 pixels and a right value of 16 pixels. Set internal and external border spacing for the table to 20 pixels.

Task 21k

Create a new web page with a table that looks like this and has the caption 'Sales team'. The image that you require is called **turtle.jpg**.

	Expenses		
	Lee	Amir	Maxine
Travel	$162.20	$285.75	$150.00
Hotel	$240.00	$182.40	$322.00
Food	$146.50	$102.10	$104.50

Plan the table using a hand-drawn sketch similar to this.



Create the basic markup as you did with the earlier tasks, starting with the table tags, the table attributes to show the borders, the caption, the header and body sections of the table, then insert the table rows. The markup so far will look like this.

```
<body>
  <table border="1" style="border-collapse:collapse; border:solid
1px;">
    <caption>Sales team</caption>
    <thead>
      <tr>
      </tr>
      <tr>
      </tr>
    </thead>
    <tbody>
      <tr>
      </tr>
      <tr>
      </tr>
      <tr>
      </tr>
    </tbody>
  </table>
</body>
```

Advice

When creating a new table like this, it is wise to add a single letter as the contents of the cell when you create it. In this case a single letter 'A' has been added to the top left cell, the letter 'B' to the next cell and so on. This is because some web browsers do not display a table cell if it is empty. By adding these single letters it allows you to test the table as you are creating it.

The top row of the table header has only two cells. The first of these is a cell that covers two rows. For this you use a **rowspan** attribute to tell the browser this cell is going to span the first two rows. The markup for this section will look like this.

The second cell in the top row is a cell that covers three columns. Use the **colspan** attribute to tell the browser that this cell is going to span three columns. This cell was identified in the sketch as a being a heading cell, so the **colspan** attribute is used within the table heading tag. The markup will look like this.

```
<thead>
  <tr>
    <td rowspan="2">A</td>
    <th colspan="3">B</th>
  </tr>
```

Using the sketch to work from, add the cells to each row of the table. In the body of the table, set the first cell of each row as a table heading and the next three cells as table data. This section of the table will look like this.

```
        <th colspan="3">B</th>
      </tr>
      <tr>
        <th>C</th>
        <th>D</th>
        <th>E</th>
      </tr>
    </thead>
    <tbody>
      <tr>
        <th>F</th>
        <td>G</td>
        <td>H</td>
        <td>I</td>
      </tr>
      <tr>
        <th>J</th>
        <td>K</td>
        <td>L</td>
        <td>M</td>
      </tr>
      <tr>
        <th>N</th>
        <td>O</td>
        <td>P</td>
        <td>Q</td>
      </tr>
    </tbody>
  </table>
</body>
</html>
```

The table structure should now look like this.

Sales team

A	B		
	C	D	E
F	G	H	I
J	K	L	M
N	O	P	Q

Enter all the text and currency values into the correct cells in the table. The web page should look like this.

Sales team

A	Expenses		
	Lee	Amir	Maxine
Travel	$162.20	$285.75	$150.00
Hotel	$240.00	$182.40	$322.00
Food	$146.50	$102.10	$104.50

Save your web page as task21k.htm in your Task21k folder.

21.2.7 Images

Images (such as pictures or icons) are often used in web pages, and are often used for hyperlinks.

Insert an image

To complete the web page for Task 21k, you need to replace the letter 'A' in the top left cell of the table with the image **turtle.jpg**. To do this you have to tell the web browser the name of the image source, which should be stored in the same folder as your web page. Make sure that you have copied the file **turtle.jpg** into your Task21k folder. Add the following to the markup. As some browsers may not display the image, you can tell the browser to replace the image with alternative text. This usually describes the image so that the user can still understand what is being shown even though they cannot see the image. The markup will look like this.

```
  <thead>
    <tr>
      <td rowspan="2"><img src="turtle.jpg" alt="Company Logo"></td>
      <th colspan="3">Expenses</th>
    </tr>
```

Where to store an image

Images must be stored in the same folder as the web page. This is called the current folder. Notice in the markup shown above how the filename **turtle.jpg** is given as the image source. This does not contain any reference to which folder the image is stored. Because there is no absolute reference to a folder, the browser automatically looks in the current folder for the image. This means that if this web page is opened on another computer, as long as the image is stored in the same folder as the web page, it will work properly.

If an absolute reference had been used for a file, for example:

```
<img src="C:/My websites/My pictures/turtle.jpg" alt="Company
Logo"></td>
```

X

This would prevent the file being found unless the folders in all the computers were structured in this way. If the file **turtle.jpg** is not in the current folder, the web page will look like this. The image has been replaced by the text 'Company Logo' to tell the user what the missing image should be.

If the image file is stored in the current folder, this will be displayed.

Save the web page as task21k.htm in your Task21k folder and save a copy as task21m.htm in your Task21m folder.

Sales team

Company Logo	Expenses		
	Lee	Amir	Maxine
Travel	$162.20	$285.75	$150.00
Hotel	$240.00	$182.40	$322.00
Food	$146.50	$102.10	$104.50

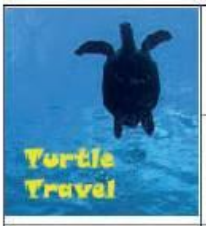
Advice

A common mistake made by students is to use absolute pathways for files, such as images, stylesheets, etc.

File types for images

There are three common file types for images used in websites. These are JPEG files, GIF files or PNG files. You can use a graphics package such as *Adobe Photoshop* to change images from one format to another by opening them and using Save As... to change the file format for the new image.

Sales team

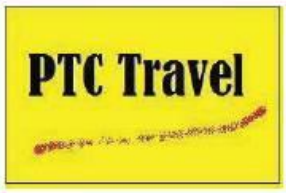
	Expenses		
	Lee	Amir	Maxine
Travel	$162.20	$285.75	$150.00
Hotel	$240.00	$182.40	$322.00
Food	$146.50	$102.10	$104.50

Advice

Image files added to web pages are usually in bitmap graphics formats such as .jpg, .gif or .png format. Many other image formats, for example vector graphics such as .tif, will not work in a web page.

Activity 21g

Create a new web page with a table that looks like this and has the caption 'Last week'. The image that you require is called **ptct.jpg**. Print your web page as HTML and as it is viewed in your browser.

	Expenses			
	Anne	Dan	Lisa	Udoka
Petrol	$182.20	$185.75	$260.00	$322.00
Food	$80.00	$62.40	$54.00	$40.00
Hotel	$420.00	$382.10	$104.50	$260.00

Resize an image

Images can be resized using two methods:

- The first method is to change the size of the displayed image in the markup. This is the easier of the two methods but often uses large image files, which are slower to upload and can delay the display of a completed web page.
- The second method is to physically resize the image in a graphics package. You did this in Task 11b. This method has the advantage of being able to

reduce the file size of an image so that a web page will be displayed more quickly. It has the disadvantage of using low-resolution images, which can appear pixelated, particularly if you wish to enlarge them.

Task 21l

Open the file **webpage2.htm**. Use both methods to resize this image to 80 pixels wide and compare the relative file sizes of the two images. Save both versions of your web page.

Resize an image in the markup

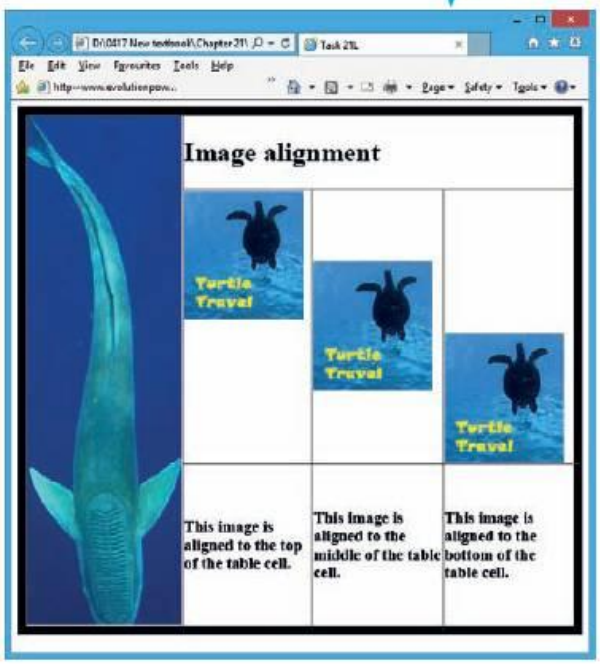
Copy the web page and supporting files **remora.htm**, **remora.jpg** and **turtle.jpg** into your Task21l folder. To change the size of an image in the markup use either the **width** or **height** attributes within the image tag. For this question the **width** needs setting to 80 pixels. If you change the width of the image to 80 pixels and do not specify a height for the image, it will maintain its **aspect ratio**. This means that it will keep the same proportions. Sometimes you may be asked to distort an image to give a different effect within a web page. This is done by specifying both **width** and **height** but not keeping the aspect ratio of the original image. Find the markup for the image **remora.jpg**, in the file **webpage2.htm**, which looks like this.

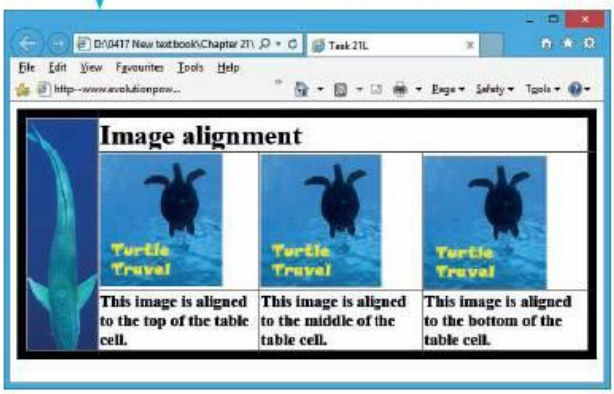
```
<tr>
  <td rowspan="3"><img src="remora.jpg" alt="Remora"></td>
  <td colspan="3"><h1>Image alignment</h1></td>
```

Add a new attribute to the image tag to specify the new width of the image, like this.

```
<tr>
  <td rowspan="3"><img src="remora.jpg" alt="Remora"style="width:80px" >
  </td>
```

Save the web page which will change from this to this.





Although the vertical alignment of all three turtle images has not been changed in the markup, the effect is to make the images appear to have the same vertical alignment. This is because the row height has been reduced to fit with the new row height for the image of the remora.

Resize an image in an external package

You have already completed this in Task 11b. Copy the image that you resized and called **remora1.jpg** from your Task11b folder into your Task21l folder.

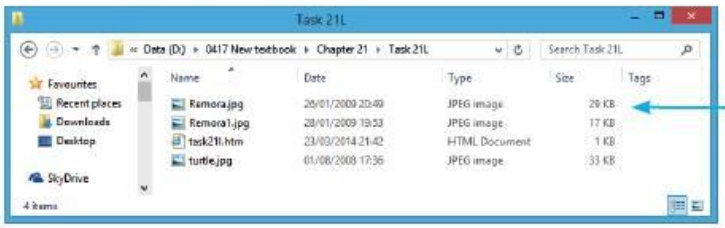
When using this technique it is useful to have a small, low-resolution image (called a thumbnail) on a web page. If the user wants to see more detail they can click on the image and a new window will open containing a high-resolution version of the same image. The web page needs to be amended so that the **width** attribute is no longer present, and the **source** attribute within the image tag points to the new filename.

```
<tr>
  <td rowspan="3"><img src="remora.jpg" alt="Remora"></td>
  <td colspan="3"><h1>Image alignment</h1></td>
```

Save your amended web page with the filename **task21l.htm**.

Comparing the two methods

Open the **File Explorer** window and navigate to the Task21l folder.



This folder contains the two image files and shows you the difference in file sizes between the two methods. Your image sizes may vary from this depending on the resolution you selected when you saved the file. As can be seen here, in this case the new image should load in less than 60% of the time the original will take.

Insert an animated image

There are two different methods used to place an animated image on a web page. If the file is an animated GIF, the method is the same as inserting a still image.

Task 21m

Edit the web page saved in Task 21k to replace the image with the moving image **turtlelogo.gif**.

Open the file **task21k.htm** in *Notepad*. Copy this file and **turtlelogo.gif** into your Task21m folder. Change the image source from turtle.jpg to **turtlelogo.gif**, like this.

```
<td rowspan="2"><img src="turtlelogo.gif" alt="Animated Company Logo"></td>
```

Save the web page as task21m.htm in your Task21m folder.
The resulting web page will look like this.

Sales team

Turtle Travel	Expenses		
	Lee	Amir	Maxine
Travel	$162.20	$285.75	$150.00
Hotel	$240.00	$182.40	$322.00
Food	$146.50	$102.10	$104.50

Insert a video file

Videos can be placed in a web page using the <video> and </video> tags. You must include width and height attributes within the <video> tag, so that the correct space is saved on the page for the video. The controls attribute shows the video controls and allows the user to control (start/pause/maximise/adjust volume, etc) the video.

The video source is different from other HTML elements as it uses a <source> tag as well as the src attribute. In the <source> tag the type attribute tells the browser the file type of the video to be shown.

You must include text between the <video> and </video> tags for browsers that do not support HTML5 or videos of this type.

Task 21n

Open the file **webpage3.htm** and save this as task21n.htm. Replace the text *Place video here* with the video **wreck.mp4**. Replace the text *Place audio here* with the sound **whale.mp3**.

Advice

Accepted video formats are .MP4, .webm and .Ogg. Many other video formats, such as .wmv, will not work with the <video> tag.

Copy the files **wreck.mp4** and **whale.mp3** into your Task21n folder. Open **webpage3.htm** in *Notepad*. Replace the text *Place video here* with this HTML.

```
<video width="300" height="224" controls>
Your browser does not support this type of video.
<source src="wreck.mp4" type="video/mp4">
</video>
```

Save the web page as task21n.htm in your Task21n folder.
The resulting web page will look like this.

Advice

The controls on the video are only shown when the cursor moves over them.

Insert an audio file (sound clip)

Audio clips can be placed in a web page using the <audio> and </audio> tags. The controls attribute works in a similar way to the video controls. It allows the user to control the sound clip.

The audio source works in a similar way to the video source. In the <source> tag the type attribute tells the browser the file type of the audio to be played.

You must include text between the <audio> and </audio> tags for browsers that do not support HTML5 or files of this type.

Replace the text *Place audio here* with this HTML.

```
<audio controls>
  Your browser does not support this type of audio file.
  <source src="whale.mp3" type="audio/mpeg">
</audio>
```

Save and test the web page. It should look like this.

21.2.8 Colour – Part 1

Colour is always defined in CSS, either embedded in the HTML or within an attached stylesheet (which you will meet later in the chapter). One method is to use colour names as the property values, such as red, green and blue within the HTML code. There are currently only 16 colour names accepted as web standards in CSS and by the World Wide Web Consortium (known as W3C). These are: aqua, black, blue, fuchsia, gray (note the American spelling), green, lime, maroon, navy, olive, purple, red, silver, teal, white and yellow. Other colour names are, however, accepted by some browsers (a table showing these colours and their names is included on the CD).This can be found on the web page called colourcodes. You can open this web page and use these colours in your own stylesheets attached to your web pages.

It is not always easy to remember the names of the colours, and many web designers prefer to use hexadecimal codes (often referred to as hex codes) to define the colour of text, backgrounds or objects. Hexadecimal is a counting system where counting is done in 16s (rather than in the tens used in the decimal system). Because we do not have 16 different characters for numbers, we use letters and numbers as shown in Table 21.1.

Table 21.1 The hexadecimal counting system

Decimal	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	…
Hexadecimal	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	10	11	12	13	14	15	16	17	18	19	1A	1B	…

Decimal	…	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	…
Hexadecimal	…	98	99	9A	9B	9C	9D	9E	9F	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	…

Advice
Check this table to help you work out which hex codes are useful.

The largest number that can be stored in a single byte (8 bits) of information is the decimal number 255, which is FF in hexadecimal.

Each pixel (dot) on a monitor or projected on to a screen is made up of three different colours. The primary colours when using light (which is very different from the primary colours used in painting) are Red, Green and Blue. You will notice that the initial letters are RGB, hence RGB monitors. Each of these colours can be off, partially on or fully on. In hexadecimal, if a colour is off it is set to 00 and if it is fully on it is set to FF. To create the colour for any pixel you must tell the computer how much red, green and blue light to show. This means that all colour codes have six characters, the first two being red, the next two green and the final two blue. This example uses the hex code for red, as the red component is fully on (FF), the green component is off (00) and the blue component is also off (00).

```
<h1 style="color:#ff0000">This is red</h1>
```

Advice
Note the American spelling of 'color', rather than the English 'colour'.

Advice

The hash symbol (#) tells the browser that the number is in hexadecimal.

All of the different combinations of red, green and blue allow more than 16 million different colours to be used.

Table 21.2 Using hex codes to create different colours

Amount of light (colour)	Hex code	Example (red only)	Colour
Fully on	FF	FF0000	
¾ on	C0	C00000	
½ on	80	800000	
¼ on	40	400000	
Off	00	000000	

The web page **colourcodes.htm** contains the hex codes (as well as the names) for the most popular colours. It is interesting to note that, working with light, mixing red and green gives yellow, green and blue gives cyan, and mixing red and blue gives magenta. If all three colours are fully on, the result is white. If no colour is on, the result is black.

Set the background colour

You must set the background colour using the CSS property background-color.

Task 21o

Open the file task21o.htm. Edit the web page to look like this. The colour codes you will need are #32879B for the header, #92CDDC for the footer and #B6DDE8 for the table body.

Fruit	Price
Apple	$1230
Orange	$780
Pear	$240
Banana	$4235
Lemon	$75
Total	$6560

Open the file task21o.htm in *Notepad*. Add a style attribute to the <thead> tag like this.

```
<thead style="background-color:#32879b">
```

Add a style attribute to the <tfoot> tag like this.

```
<tfoot style="background-color:#92cddc">
```

Add a style attribute to the <tbody> tag like this.

```
<tbody style="background-color:#b6dde8">
```

Save your web page.

Hexadecimal colour codes can be used with background and foreground colours, for example: in CSS text colours can be changed using the style attribute with a color property.

21.2.9 Lists

You can include on a web page either a numbered list, which is an **ordered list**, or a bulleted list, which is an **unordered list**. Bulleted (unordered) lists can also be nested (placed one inside the other) to give you more flexibility in the design of your web pages. Items to be placed in a list start with the markup <li> and close with . These are used in the same way as the style definitions for headings (styles h1 to h6) and paragraph styles. Each item in the list must have the list tags around it. The way each of these lists is displayed can be changed using CSS. An example of an item placed in a list would look like this.

```
<li>This is one item from a bulleted or numbered list</li>
```

Numbered lists

Numbered lists are ordered lists in HTML because they are in number order. Place the tag <ol> at the start of the numbered list and the tag at the end.

Task 21p

Create a web page containing the heading 'Fruit' and a numbered list for the following items: Apple, Orange, Pear, Banana and Lemon.

Enter this markup into your text editor.

Save the web page, as task21p in your Task21p folder, which should look like this in your browser.


```
<!DOCTYPE html>
<html>
<!-- Task 21p by your name -->
<head>
  <title>Task 21p</title>
</head>
<body>
  <h1>Fruit</h1>
    <ol>
      <li>Apple</li>
      <li>Orange</li>
      <li>Pear</li>
      <li>Banana</li>
      <li>Lemon</li>
    </ol>
</body>
</html>
```

Bulleted lists

Bulleted lists are called unordered lists in HTML. Place the tag <ul> at the start of the numbered list and the tag at the end.

Task 21q

Create a web page containing the heading 'Colours' and a bulleted list for the following items: Red, Yellow, Blue, Green and Cyan.

Enter this markup into your text editor.

Save the web page, which should look like this in your browser.


```
<!DOCTYPE html>
<html>
<!-- Task 21q by your name -->
<head>
  <title>Task 21q</title>
</head>
<body>
  <h1>Colours</h1>
    <ul>
      <li>Red</li>
      <li>Yellow</li>
      <li>Blue</li>
      <li>Green</li>
      <li>Cyan</li>
    </ul>
</body>
</html>
```

Nested lists

Task 21r

Create a web page containing the names of two resorts as a bulleted list. These resorts are Ellmau in Austria and Sharm El Sheikh in Egypt. For each resort, list the main activities.

Bulleted lists can be nested by having sub-lists. These are created by placing one unordered list within another list.

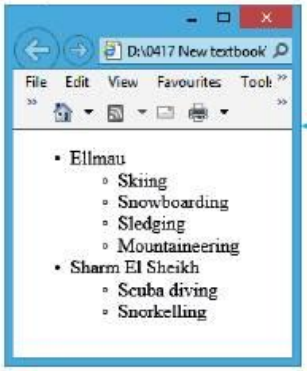
Enter this markup into your text editor to create the primary list.

```
<!DOCTYPE html>
<html>
<!-- Task 21r by your name -->
<head>
  <title>Task 21r</title>
</head>
<body>
  <ul>
    <li>Ellmau</li>
    <li>Sharm El Sheikh</li>
  </ul>
</body>
</html>
```

After each resort, enter a new sub-list that contains the activities offered in each of these places. Note that the sub-list fits between the list item name and the close tag for that item. The finished markup will look like this.

```
<!DOCTYPE html>
<html>
<!-- Task 21r by your name -->
<head>
  <title>Task 21r</title>
</head>
<body>
  <ul>
    <li>Ellmau</li>
      <ul>
        <li>Skiing</li>
        <li>Snowboarding</li>
        <li>Sledging</li>
        <li>Mountaineering</li>
      </ul>
    <li>Sharm El Sheikh</li>
      <ul>
        <li>Scuba diving</li>
        <li>Snorkelling</li>
      </ul>
  </ul>
</body>
</html>
```

Save the web page, as task21r in your Task21r folder, which should look like this in your browser.



Activity 21h

Create a new web page containing the heading 'Winter sports', a brief introduction and an unordered list of the following winter sports: skiing, tobogganing and snowboarding. For each winter sport, make a sub-list of the items of clothing required. Set these sub-lists as unordered lists. Print the web page as viewed in your browser and as HTML.

Change these sub-lists to ordered lists. Again, print the web page as viewed in your browser and as HTML.

21.2.10 Hyperlinks

A **hyperlink** is a method of accessing another document or resource from your current application. Hyperlinks do not just relate to web pages: other applications software can also use them. Hyperlinks are often used to create menu options with web pages, using either text or images. When you select a hyperlink (usually by clicking the left mouse button), the hyperlink will perform an action. It may move your position within a page, open another page either locally or on the internet, or open your email editor so that you can send an email to a specified place or company.

Anchors and divisions

A division is a point of reference within a web page. It is similar to a bookmark when using word-processing or desktop publishing software. If you create a web page that will not fit in a single window, it is useful to use one division for each section of the web page (or document), so the user can move to any section without having to scroll through the whole document. An anchor is used to set a hyperlink to allow you to navigate within the page or navigate to an external page. An anchor starts with an <a> tag and closes with an tag.

Division tags

The tag is short for a division or section of an HTML document or page. These can be used for many functions within a webpage, but at this level are used to give an identity (ID) to a part of a webpage. In previous versions of html anchors were used to hold the ID of a placeholder to define places like the top of a page. These have been replaced in HTML5 and tags to define an ID for the hyperlink. This placeholder often has an ID called 'top' or 'start'. To create a placeholder called 'top' enter this markup in the body section of the page. This anchor will work without any text between the open and close tags.

```
<div id="top">Any content could appear here</div>
```

The text *Any content could appear here* will be visible in the browser but the division will not be visible.

Advice

If the division name is visible in the browser view of the page it often means you have made a syntax error (an error in the structure of the markup).

Hyperlinks within a web page

Task 21s

Edit the web page **webpage4.htm** so that each new section contains an anchor. Use these anchors to create hyperlinks from the appropriate text in the first paragraph. Make the word 'top' in the last line a hyperlink to the top of the page. Make the words 'CIE website' a hyperlink to the website www.cie.org.uk, and the words 'W3C website' a link to www.w3.org.

Copy the file **webpage4.htm** into your Task21s folder. Open the web page in your text editor and in your web browser. Each section needs a placeholder with a different name. You should always choose short yet meaningful names for each ID. For this web page you will give each division an ID (identifier). These will be called top, 21a, 21b, 21c, 21d, 21e and 21f, as these relate directly to the sections within the web page. It is sensible to place all the division names into the document before creating the hyperlinks to each division name. Each division name is created like this.

```
<h1><div id="top"></div>Chapter 21</h1>
```

You can see that the division tags are inside the tags defining the style for the text. The initial division tag contains the division **id**, which is placed in speech marks. This ID will be used in all hyperlinks to navigate this point. Add the other anchors to the markup, one for each section of the document, like this.

```
    <hr>
    <h2><div id="21a"></div>21a Understand what HTML is</h2>
    <p>Many students sit the practical examinations without…
```

```
    <hr>
    <h2><div id="21b"></div>21b Problems with WYSIWYGs</h2>
    <p>There are many well designed WYSIWYG packages on the…
```

```
    <hr>
    <h2><div id="21c"></div>21c Use the correct terms</h2>
    <p>Over the past few years, as the practical examinations…
```

Add divisions for 21d, 21e and 21f with similar markup. In the final sentence, find the word 'top'. This will be used to create a hyperlink to the division with the name 'top' that you created earlier. The hyperlink is created using an anchor. The two anchor tags are placed each side of the word 'top'. The markup includes a hyperlink reference (the markup attribute for this is **href**) and the name of the destination anchor. This anchor name is always inside speech marks and preceded by the # symbol, like this.

```
<p>Back to the <a href="#top">top</a></p>
```

In the first paragraph find the text 'what is HTML?' Edit the markup for this text so that it creates a hyperlink to the anchor with the ID 21a. It will look like this.

```
<h3>Here is advice to try to help you succeed; if you follow this you are likely to
create better web pages. First you need to know, <a href="#21a"> what is HTML? </a> Once
you have a sound understanding of HTML, it is worth considering the use of WYSIWYGs
and the potential problems of using these packages…
```

```
<h1>Advice for practical web page creation</h1>
<h3>Here is advice to try to help you succeed; if you follow this, you are
likely to create better web pages. First you need to know <a href="#21a">
what is HTML?</a> Once you have a sound understanding of HTML, it is
worth considering the use of <a href="#21b">WYSIWYGs</a> and the potential
problems of using these packages. Make sure that you <a href="#21c">
use the right terms</a> to describe what you have done, are doing or could
be asked to do. Learn how to <a href="#21d">create and attach stylesheets
</a> to your web pages. Make sure that you can <a href="#21e">work with tables</a>.
These provide a fundamental structure to web pages and seem to be replacing frames in
many areas. There are other methods of formatting layout including the use of DIVs,
but these are currently beyond the scope of this book. Look for <a href="#21f">other
resources</a> to help you prepare for the practical examinations.</h3>
```

Now that the hyperlinks have been created, each one needs testing. Save the web page and refresh your browser, then try each hyperlink in turn and make sure that it directs you to the correct place in the web page. If the name that you have used in the hyperlink reference does not exist, your browser will go to the top of the page and the browser does not show you that there is an error.

Hyperlinks to other web pages

Hyperlinks can be created to another web page stored locally, usually in the same folder as the current web page, or to an external website on the internet. The markup for both of these links has the same syntax (structure). The only difference is the address of the web page that the hyperlink is to go to.

To complete Task 21s, two hyperlinks need adding to external web addresses. These follow a similar format, with the URL for the web address appearing as the hyperlink. The markup for these two hyperlinks is shown here.

```
  <h2><a id="21f"></a>21f Other useful links</h2>
    <p>There are other places that can be used to gain valuable information that
may help. These include the <a href="http://www.cie.org.uk">CIE website</a> and the
<a href="http://www.w3.org">W3C website</a>.</p>
    <p>Back to the <a href="#top">top</a></p>
```

Add these hyperlinks to the last section of your markup and save your web page as task21s.htm in your Task21s folder, and as task21t.htm in your Task21t folder. Test the hyperlinks to make sure they work as you expected.

References to pages stored in the same folder as your web page just have an address without the URL. To link to a local file called 'next_page.htm', you would include a hyperlink reference like this.

```
<p><a name="next_ page.htm"> Click here for the next page</a>.</p>
```

Advice

Make sure that you do not put an absolute address in a hyperlink reference (for example, <a href ="C:my documents/my folder/html/next_page.htm">) as this is only likely to work on your computer. Other computers are unlikely to have the same folder structure and filename.

Activity 21i

Open the web page **htmltips.htm** and replace the text *YOUR NAME* with your name.

Edit the web page so that each new section contains an anchor. Use these anchors to create hyperlinks from the appropriate text in the first section. Make the word 'top' in the last line a hyperlink to the top of the page.

Make the word 'CIE' a hyperlink to the website www.cie.org.uk, the words 'Hodder Education' a hyperlink to the website www.hoddereducation.co.uk and the text 'W3C' a hyperlink to www.w3.org.

Print the HTML view of this web page.

Open a web page in a new browser window

When a web page is opened, it may open in the current window or it may open in a new window. This is set using the target attribute. An attribute is something that is added to one of the markup commands to give further information/instructions to the browser. This attribute is part of the anchor and tells the browser which window to use for the web page that you are going to open. The target attribute can either be set as a default setting in the head section of the markup or as an individual setting for a hyperlink within the body section. If the target attribute is not used, the browser will decide where to open a web page.

To set a target window for a single hyperlink, add the target attribute to the first anchor. Some target attributes have specific functions. If a target name of _blank is applied, this will open in a new target window. If _self is applied it will open in the current window. Other target names, such as _parent and _top, are reserved and perform different functions with frames, which are beyond the scope of this book. Any other target name that you use will open the specified web page in a window with that target name, if it exists, or open it in a new window with that target name.

Task 21t

Using your web page task21t.htm, make the hyperlink you created to the W3C website open in the same window and the hyperlink to the CIE website open in a new window called _cie.

Open the web page task21t.htm in your text editor and in your web browser. Edit the markup for the last two hyperlinks to include the target attributes like this.

```
<p>There are other places that can be used to gain valuable
information that may help. These include the
<a href=http://www.cie.org.uk target=" _cie"> CIE website</a> and
the <a href="http://www.w3.org" target="_self"> W3C website</a>.
</p><p>Back to the <a href="#top">top</a></p>
```

Save your website and test the hyperlinks to make sure that they work as you expected, checking the tabs at the top of the browser to see if a new target window has been opened.

Use a hyperlink to send an email message

Hyperlinks from web pages, other applications packages or documents can be used to open an email editor and prepare a message to be sent to another person or company. This is very useful in a website where you can set up your email address and subject line within the markup and instruct the browser to open the email editor and insert these details into a new message when the hyperlink is selected.

The format for this is very similar to the hyperlinks shown earlier in this section. In place of the URL or path of a web page that is placed within the hyperlink reference of the anchor, the mailto: instruction is used. This is followed by the email address of the recipient. To include the subject line for the message, this is included by specifying subject= followed by the text for the subject line. The whole hyperlink reference is enclosed within speech marks.

Task 21u

Create a new web page that contains a hyperlink to prepare an email message to be sent to graham.a.brown@hotmail.co.uk with the subject line 'IGCSE Book'.

For this task you need to prepare a new markup in your text editor that contains this line.

```
<p><a href="mailto:graham.a.brown@hotmail.co.uk?subject=IGCSE%20Book">
Click here to contact us page</a></p>
```

Save this in your Task21u folder and try it in your browser. When you click on the hyperlink it will open your email editor; place the address in the To: section and the text 'IGCSE Book' in the Subject: line.

Note how the space in the text 'IGCSE Book' has been replaced in the markup with %20. This is the hex value for the ascii character 32, which represents a space. There are no spaces inside the speech marks for the hyperlink reference.

Advice

Body text could also be added by adding '&body=Add%20the%20body%20text' as an extra value at the end of the mailto property.

Hyperlinks from images

Task 21v

Open the file task21v.htm. Make the image in this web page a hyperlink to the web page **remora.htm**.

Copy all the files from your Task21l folder to your Task21v folder. Rename task21l.htm as task21v.htm. Open the file task21v.htm in *Notepad*.

Images can be used as hyperlinks in the same way as text. To create a hyperlink to the web page **remora.htm**, add this anchor tag with its href attribute and value so that it surrounds the image tab like this.

```
<tr>
  <td rowspan="3">
    <a href="remora.htm"><img src="REMORA.JPG" alt="Remora">
</a></td>
  <td colspan="3"><h1>Image alignment</h1></td>
```

This hyperlink will open the partially constructed web page called **remora.htm**. Test the hyperlink and save the web page.

Activity 21j

Edit the web page that you saved for Activity 21g. Set the border, the cell padding and cell spacing to four pixels. Print your web page as HTML and as it is viewed in your browser.

PTC Travel	Expenses			
	Anne	Dan	Lisa	Udoka
Petrol	$182.20	$185.75	$260.00	$322.00
Food	$80.00	$62.40	$54.00	$40.00
Hotel	$420.00	$382.10	$104.50	$260.00

The background colour code that you will need is #FFFF00. Make the image a hyperlink to send an email message to ptc_travel@outlook.com with the subject line 'Expenses' and the body text 'Please send me updated expenses details.' Print your web page as HTML and as it is viewed in your browser.

21.3 Use stylesheets

Using **styles** in your web pages helps you to be consistent in the way the pages look. Using styles is much quicker and easier than applying individual settings – such as font face, font size, text alignment and font colours – to every piece of text in each web page that you create.

You have already met the heading styles, h1 to h6, and the paragraph style, p, earlier in the chapter. When you used these styles the web browser did not find any of these style definitions in your HTML markup so used its own default settings. However, you can set your own definitions for each style and the web browser will attempt to apply these styles to the page.

Styles are set with HTML tags but the styles are defined in the presentation layer of the web page in CSS format. You have already embedded some presentation layer elements in the HTML using the **style** attribute. Styles are not only set for text, but can also be used to define page layout, colour schemes and default settings for other objects and links on the page. Using a consistent style is often important to give a 'corporate feel' to a website. Particular elements, such as colour schemes, table presentation, logos and font faces, are often used to aid recognition of well-known companies or brands.

Styles are always defined in the head section of a web page. They may be defined in each web page or defined in an external **stylesheet**. If stylesheets are used, the stylesheet is attached to the web page in the **head** section of the markup. As we have already seen, styles can be applied individually to each page, but it is more efficient to write, edit and attach one or more common stylesheet/s to all the pages in a website.

Styles are often gathered together and held in a stylesheet. This is a collection of styles saved in a different file in **cascading stylesheet** (.css) format.

21.3.1 What is a cascading stylesheet?

A cascading stylesheet is a simple way of adding style (for example, fonts, colours, spacing) to web pages.

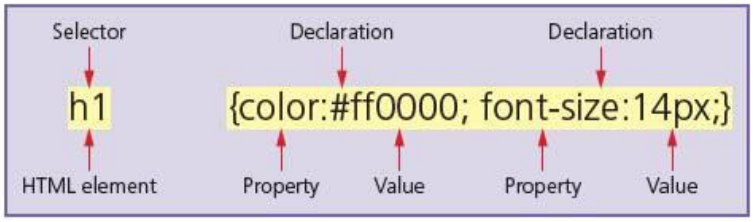
One or more of these cascading stylesheets can be attached to a web page, and the styles in the stylesheet will be applied to this page. Where more than one web

page is used, the styles only have to be defined once and attached to all the web pages. In-line styles usually over-ride styles attached from an external stylesheet. This allows companies to develop different stylesheets for specific items such as colour schemes, text styles and styles for a particular document or set of documents.

If more than one stylesheet is attached to a web page at the same time, those attached later in the markup have priority over earlier ones. If a style has more than one declaration of the same property, the last value is used for the property.

21.3.2 What is CSS format?

CSS rules have a selector and a declaration block like this.



- Each element has one or more declarations, each separated by a semicolon.
- Each declaration has a property name and a value, separated by a colon.
- Each declaration block is surrounded by curly brackets.

To make the CSS easier to read, you can put one declaration on each line, like this.

```
h1      {color:#ff0000;
        font-size:14px;}
```

Task 21w

Open a copy of the web page that you saved in Task 21g. Add an external stylesheet to this page to define the table header and table data so that they each have a solid border 4 pixels wide.

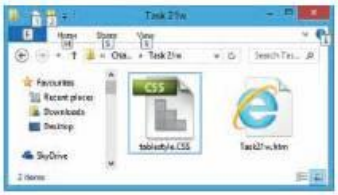
Open the web page task21g.htm in *Notepad*. Save it as task21w.htm in your Task21w folder. Copy one line of the embedded CSS from the table header and paste it in your second *Notepad* window (for the stylesheet) like this.

```
td style="border:solid 2px;
```

Edit this so the stylesheet looks like this.

```
td,th    {border:solid 4px;}
```

The element name/s, in this case td and th, are followed by curly brackets {}. In this example: you have set each piece of table data and each table header so that its border property has a solid border that is four pixels thick. By defining the two elements td and th at the same time, you have saved yourself extra work. Save this file using the filename tablestyle.css in the same folder as your web page. The saved file should look like this when viewed in File Explorer. →



Advice

Make sure that you use the .css file extension and not .htm or .txt.

Go back to the *Notepad* window for the HTML of task21w.htm and remove all the border properties and values from each of the style tags in the table header and the table body, like this.

```
    <thead>
      <tr style="height:60px">
      <th style="width:75%;">Fruit</th>
      <th>Price</th>
```

Attach an external stylesheet to a web page

Add this line of text below the title tags in the head section of the markup.

```
<link rel="stylesheet" type="text/css" href="tablestyle.css">
```

Advice

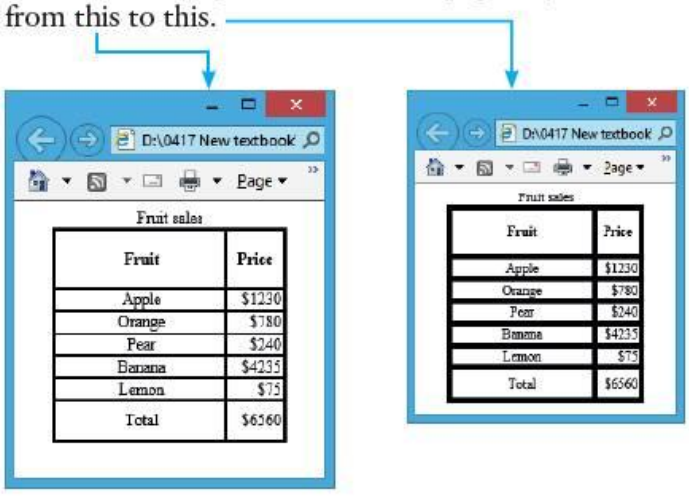
Make sure that you do not put an absolute address in a hyperlink reference (for example, `<link rel="stylesheet" type="text/css" href ="C:/my documents/my folder/css/tablestyle.css">`) as this is only likely to work on your computer. Other computers are unlikely to have the same folder structure and filename.

This defines the relationship of this link as a stylesheet, in cascading stylesheet format, and searches for the file tablestyle.css and applies this to the page. The filename in this line of markup **must** match the name of the CSS file that you saved.

The new markup should start like this.

```
<!DOCTYPE html>
<html>
<!-- Task 21w by your name -->
<head>
  <title>Task 21w</title>
<link rel="stylesheet" type="text/css" href="tablestyle.css">
</head>
```

Save this web page. View this web page in your browser; it should have changed from this to this.



Advice

Using external stylesheets saves you lots of time. One stylesheet can be attached to many web pages and one style can be attached to every element on those pages with little effort.

Activity 21k

Edit the web page that you saved for Activity 21j so that the styles in the head section are removed and edited to become a new external stylesheet called 21kstyles. Change all references for 21j to 21k. Attach this stylesheet to your web page. Print your stylesheet, and your web page, both as HTML and as it is viewed in your browser.

When you mark Activity 21k, check the answers carefully. Although both of the answers shown (in text format and as a screen shot) meet the requirements of the question, you may not be credited with this work. Why?

Answer: your name, Centre number and candidate details are not visible on the print out.

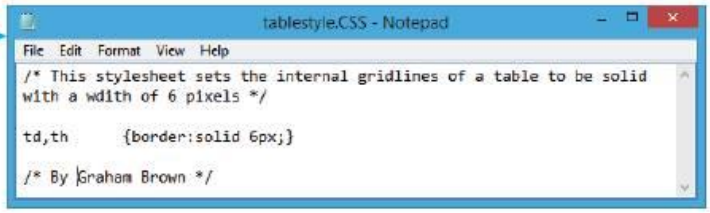
Add comments to a stylesheet

Although you will often be told to place your name and candidate details as text on the web page, this is not as easy in a stylesheet. Text placed in a stylesheet will often stop the styles from working. Any text must have /* before it and */ after it, so that the browser knows to ignore it.

Task 21x

Open a copy of the web page and stylesheet that you saved in Task 21w. Add your name and a brief description of the stylesheet as comments to the stylesheet.

Edit the stylesheet so that it looks like this.



You can see that the comments can be on a single line or on more than one line. Only one /* and */ are required for each comment. Check that the stylesheet still works with the web page.

Advice

Whenever you edit a stylesheet, save it and refresh the browser view of the web page to make sure that the changes you have made work.

Task 21y

Open a copy of the web page that you saved in Task 21a. Change the title of this page to Task 21y. Apply the stylesheet **style1.css** to this page and save this web page. Change the attached stylesheet to **style2.css** and save this with a new filename.

Select the folder called Task21y in your Documents window. Copy the file task21a.htm into this folder. Rename this file as task21y.htm. Open this file in your text editor and in your web browser. Copy the files **style1.css** and **style2.css** into this folder.

Change the title of the web page to Task 21y. To apply the styles from the stylesheet **style1.css**, you must attach it to the web page. Move the cursor to the text editor containing the HTML and add this line of text below the title tags in the head section of the markup, like this.

```
<html>
<head>
  <title>Task 21y</title>
  <link rel="stylesheet" type="text/css" href="style1.css">
</head>
<body>
  <p>My first web page by MY NAME HERE</p>
  <h1>This is style h1, the largest heading style</h1>
  <h2>This is style h2</h2>
  <h3>This is style h3</h3>
  <h4>This is style h4</h4>
  <h5>This is style h5</h5>
  <h6>This is style h6, the smallest heading style</h6>
  <p>This is style p, the paragraph style</p>
</body>
</html>
```

Save this web page. View this web page in your browser. You will notice that your web page has changed from this to this.

Advice

Your browser settings may show you different fonts to those shown here.

The page content has not changed but the styles applied to the page are very different. Notice that the font face, sizes, colours and alignment have all been specified in the stylesheet. This stylesheet is a poor example because it contains too many variations. If you change the markup to attach **style2.css** to the page rather than **style1.css**, you should see something like this.

This is the same web page again but with the slightly improved stylesheet **style2.css**, which has a background colour defined in the stylesheet. You will discover how to create and amend these stylesheets later.

21.3.3 CSS text

It is very easy to create a cascading stylesheet in your text editor. The structure of a .css file has a few very simple rules. Stylesheets do not have tags in them as they are not a markup language. Each style has a style name which is called a selector. The selector is followed by curly brackets {}. Inside these curly brackets are the property for the style, followed by a colon, then the property's value. For example, if you want to set the text in style h1 to be centre aligned, it would appear like this.

```
h1    {text-align: center}
```

Note the American spelling of 'center'.

Each style can have a number of properties and values. If there is more than one property then each property is followed by a semi-colon. For example, if you want to set the text in style h1 to be centre aligned, 16 point high and bold, it would appear like this.

```
h1    {text-align: center;
       font-size: 16pt;
       font-weight: bold}
```

If a value within a style contains more than one word, it must be placed in speech marks like this.

```
h2    {font-family: "Times New Roman", serif}
```

Stylesheets are saved with a .css format (in a similar way to saving in .htm format) from the text editor.

Font families

Individual fonts can be specified but these are not always available in all browsers, so there are a number of **generic font families**, including **serif** and **sans-serif** fonts, which can also be used. These include 'serif', 'sans-serif', 'cursive', 'fantasy' and 'monospace', which has proportional spacing.

The generic font family must always be listed after the other preferred font/s. The **font-family** property must contain a hyphen. In the example above, the **font-family** is set so that the browser will look at the list of fonts installed in the machine and will try to find Times New Roman first (it is in speech marks in the stylesheet because there are spaces in the font name); if it cannot find it, it will find any generic serif font that is available.

Advice

A serif font is one that has small lines or strokes (called serifs) at the ends of characters, like this:

A font that does not contain serifs is known as a sans-serif font.

Task 21z

Open a copy of the last web page that you saved in Task 21y.

Create a new stylesheet called serif.css that sets all the styles as generic serif fonts. Apply this stylesheet to your web page. View the web page in your browser.

Change the generic settings in the stylesheet to a different generic font style. Save the stylesheet with a new name. Try all the generic style settings to see what each one looks like.

Copy the last web page you saved in your Task21y folder into your Task21z folder and rename it task21z.htm. Open this file in your text editor and in your web browser. Edit the title of the web page so it becomes Task 21z. To attach the stylesheet to the web page, you must edit the link line in the head section of the markup so that it becomes:

```
<link rel="stylesheet" type="text/css" href="serif.css">
```

Save the web page. You are going to create the stylesheet by opening a second copy of the text editor. Enter the following style definitions into it.

```
h1    {font-family: serif}
h2    {font-family: serif}
h3    {font-family: serif}
h4    {font-family: serif}
h5    {font-family: serif}
h6    {font-family: serif}
p     {font-family: serif}
```

Carefully verify your stylesheet by checking this original document with your typed copy. Save the file using the filename serif.css. Refresh your browser so that you can see the effect that this has on the web page.

Group style definitions

As all the styles have the same values for the font-family property, you can group all of the styles together and change the value only once. This stylesheet can be simplified to this single line.

```
h1,h2,h3,h4,h5,h6,p    {font-family: serif}
```

Advice

This technique could save you time, which can be invaluable in a practical examination.

Edit it and save it so that it replaces the old version. Refresh the browser to check that it still works.

Edit this stylesheet so that it sets the font-family to 'sans-serif'. Save this file using the filename sans-serif.css. Change the markup in the HTML to link to this file and save this web page. Repeat this process for each of the other generic font families.

Font size

The font-size property must contain a hyphen and can be followed by absolute heights, by setting values relative to each other, or a mixture of both.

Absolute values can be used to set the number of points or picas, or the number of pixels high, for each character. If point sizes are used, there are 72 points to an inch, so a 28-point font will be about 1 cm tall. This will not be affected by the size or resolution of the monitor. The sizes specified are set as numbers with 'pt' to show it is in points, for example an 18-point font is written as 18pt. Some web pages are created using the measurement in picas, which is abbreviated as 'pc' and is the equivalent of 12 points, so a two-pica font size is the same as a 24-point font. A pixel is one dot on a computer monitor. This means that pages will appear differently depending on the size and resolution of the monitor used. For older style monitors, one pixel was often about the same size as one point, but high-definition (HD) monitors now mean that characters appear much smaller on these devices. The abbreviation for pixels is 'px'.

Other absolute values include 'in' to show the measurement in inches, 'cm' for centimetres or 'mm' for millimetres. Do not place a space between the number and the abbreviation: 24px sets a 24 pixel height, but 24 px will not set the value to pixels.

Task 21aa

Open a copy of the web page and stylesheet that you saved in Task 21z.

Edit this stylesheet so that style h1 is 36 point, h2 is 24 point, h3 18 point, h4 16 point, h5 14 point, h6 12 point and the paragraph style is 12 point.

Change these settings to try and get similar results using the settings for pixels (the number will depend on your monitor display settings), picas, inches centimetres and millimetres.

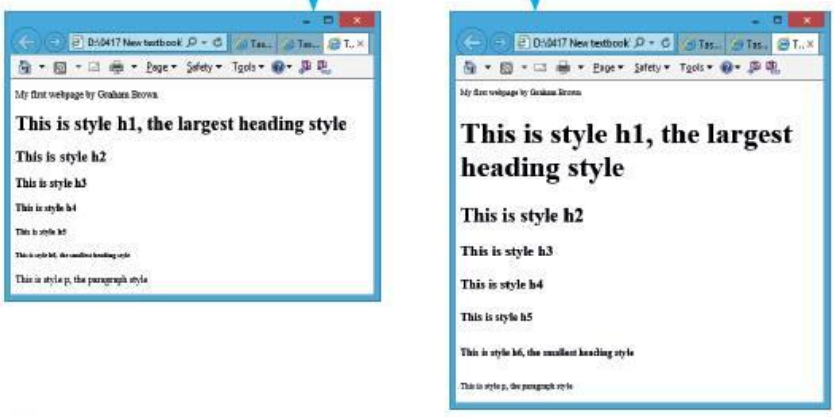
Because all of the font settings are different in this case, it is more sensible to keep all of the settings for each style together. It is possible to produce a stylesheet giving these results like this.

```
h1,h2,h3,h4,h5,h6,p    {font-family: serif}
h1                     {font-size: 36pt}
h2                     {font-size: 24pt}
h3                     {font-size: 18pt}
h4                     {font-size: 16pt}
h5                     {font-size: 14pt}
h6                     {font-size: 12pt}
p                      {font-size: 10pt}
```

Although this works, I would recommend the method below as it is easier to edit if all of the settings for each style definition were together like this.

```
h1    {font-family: serif; font-size: 36pt}
h2    {font-family: serif; font-size: 24pt}
h3    {font-family: serif; font-size: 18pt}
h4    {font-family: serif; font-size: 16pt}
h5    {font-family: serif; font-size: 14pt}
h6    {font-family: serif; font-size: 12pt}
p     {font-family: serif; font-size: 10pt}
```

Amend the markup for the web page to link to the new stylesheet **size.css**. Save this in your Task21aa folder. Save the new stylesheet as **size.css** in the same folder. Refresh your browser so that you can see the effect that this has on the web page. It should change from this to this.



Try different absolute font sizes to see what they look like in different fonts.

Relative values are often based on previously defined values for the fonts, as defined by the default browser settings. Two values are shown using the abbreviations 'em' and 'ex': One em is the same as the current font size; two em is twice the current font size, etc; one ex is about half the height of the current font size and is the measured height of the letter 'x'. This can be useful as it automatically selects the default fonts set by the user in other stylesheets or by the browser.

Task 21ab

Open a copy of the web page and stylesheet that you saved in Task 21aa.

Edit the stylesheet so that the paragraph style is 16 point. Set style h1 so that it is 3 em, h2 is 2 em, h3 is 1.5 em, h4 is 3 ex, h5 is 2 ex and h6 so that it is 1.5 ex.

Open the web page saved in Task 21aa and edit this to attach the stylesheet **size2.css** to it. Save this as **task21ab.htm** in the Task21ab folder. Open the stylesheet **size.css** and edit it so that it changes the font sizes like this.

```
p    {font-family: serif; font-size: 16pt}
h1   {font-family: serif; font-size: 3em}
h2   {font-family: serif; font-size: 2em}
h3   {font-family: serif; font-size: 1.5em}
h4   {font-family: serif; font-size: 3ex}
h5   {font-family: serif; font-size: 2ex}
h6   {font-family: serif; font-size: 1.5ex}
```

Save this stylesheet as **size2.css** in the task21ab folder. View the web page with this stylesheet attached. Notice the difference in the em and ex sizes.

Other relative values frequently used in cascading stylesheets are **percentage** values, for example setting the font size to 200% would force the font to be twice the size of the current paragraph style.

There is also a set of predefined relative sizes that can be used. These are: 'xx-small', 'x-small', 'small', 'medium', 'large', 'x-large' and 'xx-large'. Other acceptable relative values are 'smaller' and 'larger', which can be very useful if defining different classes within a style.

Task 21ac

Open a copy of the web page and stylesheet that you saved in Task 21ab.

Edit this stylesheet so that style h1 is xx-large, h2 is x-large, h3 is large, h4 is medium, h5 is small, h6 is x-small and the paragraph style is xx-small.

Open the web page saved in Task 21ab and edit this so that the stylesheet **size3.css** is attached to it. Save this as **task21ac.htm** in the Task21ac folder. Open the stylesheet **size2.css** and edit this so that it changes the font sizes like this.

```
h1   {font-family: serif; font-size: xx-large}
h2   {font-family: serif; font-size: x-large}
h3   {font-family: serif; font-size: large}
h4   {font-family: serif; font-size: medium}
h5   {font-family: serif; font-size: small}
h6   {font-family: serif; font-size: x-small}
p    {font-family: serif; font-size: xx-small}
```

Save this stylesheet as **size3.css** in the Task21ac folder. View the web page with this stylesheet attached.

Align text

A font style (or class within a style) can be aligned in one of four different ways. You can use the text-align property to format text so that it is left aligned, centre aligned, right aligned or fully justified, as shown in this sample stylesheet. The text-align property must contain a hyphen.

```
h1    {text-align: left}
h2    {text-align: center}
h3    {text-align: right}
h4    {text-align: justify}
```

Advice

For centre aligned text, note the American spelling for center.

Task 21ad

Open the file you saved in Task 21b. At the top of the page add a new title 'Aligning text' in style h1. Set the heading style h1 to be centre aligned. Set style h2 to be right aligned. Set style p to be left aligned.

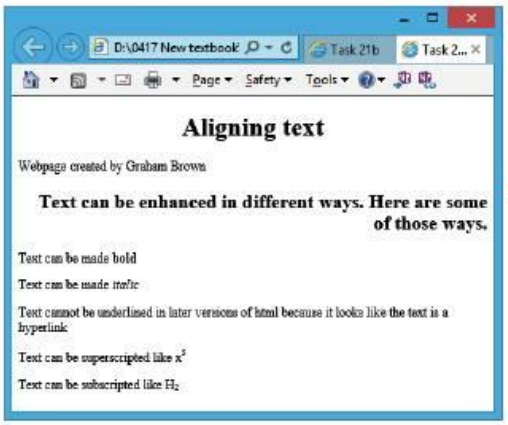
Open the web page saved in Task 21b and edit this by attaching a new stylesheet called **align.css**.

```
<link rel="stylesheet" type="text/css" href="align.css">
```

Add the title 'Aligning text' in style h1. Save this as task21ad.htm in your Task21ad folder. Create a new stylesheet like this.

```
h1    {text-align: center}
h2    {text-align: right}
p     {text-align: left}
```

Save this stylesheet as **align.css** in the Task21ad folder. Check that this works and that the styles have been applied correctly like this.



Advice

Carriage returns within the HTML have no effect on the layout of the web page.

Enhance text within a stylesheet

You are going to use some similar techniques to those used for Task 21b. This time the enhancements will apply to the whole style (or class of style as you will see later in this chapter). Each of the enhancements uses a different property setting. The default value for all three enhancements is normal.

To get bold text, set the font-weight property to 'bold', like this.

To italicise text, set the font-style property to 'italic', like this.

To underline text, set the text-decoration property to 'underline', like this.

```
h1   {font-weight: bold;
      font-style: italic;
      text-decoration: underline}
```

Advice

Although the underline command is no longer part of HTML, it can still be used by setting it within a style in the stylesheet.

Task 21ae

Create a new stylesheet called **mystyle1.css** and attach this to the web page called **webpage5.htm**. This stylesheet will set style h1 to a bold, italic, 18 point font. If 'Times New Roman' is available the browser will use that, otherwise it will choose 'Times', but if this is not available the browser's default serif font will be used. Make this text centre aligned.

Copy the file **webpage5.htm** into your Task21ae folder. Open this file in your web browser and text editor. Enter the following CSS and save it as a new stylesheet called **mystyle1.css** in the Task21ae folder. Refresh this file in your web browser.

```
h1   {font-family: "Times New Roman",Times,serif;
      font-size: 18pt;
      text-align: center;
      font-weight: bold;
      font-style: italic}
```

Advice

Notice that each property and its value/s are on a new line. This makes it easier to read and check for mistakes.

Activity 21l

Create a new stylesheet called **mystyle2.css** and attach this to the web page called **webpage6.htm**. This stylesheet will set style:

- h1 as an italic, centre aligned, 24-point font. If 'Helvetica' is available the browser will use that, otherwise it will choose 'Arial Narrow' but, if this is not available, the browser's default sans-serif font will be used
- h2 as a bold, right aligned, 16-point font. If 'Courier Narrow' is available the browser will use that, otherwise it will choose 'Courier' but, if this is not available, the browser's default proportional spaced font will be used
- h3 as an underlined, left aligned, 16-point font. If 'Courier Narrow' is available the browser will use that, otherwise it will choose 'Courier' but, if this is not available, the browser's default proportional spaced font will be used
- p as a 14-point, left aligned, serif font.

Print evidence of your stylesheet, the HTML source and the browser view of the web page with the stylesheet attached.

21.3.4 Colour – Part 2

Text colour

You can use the color property to change the colour of text within a style. Earlier in the chapter you changed text colour with an embedded CSS color property in the HTML (see Section 21.2.8). As mentioned earlier it is usual to work with hex colour codes. These are always preceded by a hash (#) symbol.

Task 21af

Edit your files for Task 21ae so that style h1 is red.

Copy both files from your Task21ae folder into the Task21af folder. Open the stylesheet **mystyle1.css** in the text editor. Edit the stylesheet to add a new color declaration with the value #ff0000, like this.

```
h1   {font-family: "Times New Roman",Times,serif;
      font-size: 18pt;
      text-align: center;
      font-weight: bold;
      font-style: italic;
      color:#ff0000;}
```

The first two characters (ff) are red, 00 for green and 00 for blue. Save the stylesheet and refresh the browser to test it.

Task 21ag

Edit your files for Task 21af so that style h1 is contains the following colour hexadecimal components: red 0, blue ff and green 00.

Copy both files from your Task21af folder into the Task21ag folder. Open the stylesheet **mystyle1.css** in the text editor. Edit the color declaration to have a new value like this.

```
color:#0000ff;}
```

The value #0000ff is correct: the single 0 for the red component has been turned into 00, and the colours have been placed in the correct RGB (red-green-blue) order. Save the stylesheet and refresh the browser to test it.

Activity 21m

Copy the files saved in Activity 21l. Edit the stylesheet so that each style has the following colours. All values are in hexadecimal, and only hexadecimal codes should be used in your stylesheet:

- h1 is blue
- h2 has a full red component, green is 45 and blue is 0
- h3 has 8B blue, 3-D green and 48 red
- h4 has 8B for red and blue, and 0 green
- p is half red and no other colour.

Print evidence of your stylesheet and the browser view of the web page with the stylesheet attached.

CSS background colour

In Task 21o you set the background colour of a table using an in-line (embedded) CSS style. It is possible to do this for each element but is much easier to define once to be applied to all pages and for all elements on the page.

Task 21ah

Edit your files for Task 21ag so that the web page has a khaki (f0e68c) background colour.

Copy both files from your Task21ag folder into the Task21ah folder. Open the stylesheet **mystyle1.css** in the text editor. Add a new selector to define the body section of the web page. Use the background-color declaration to have a new value like this.

```
body    {background-color:#f0e68c;}
```

The background-color property must contain a hyphen. Save the stylesheet and refresh the browser to test it.

The background colour can be applied to the whole page (like this), or to tables, table rows, headers or footers with a single definition in the stylesheet.

Advice

The background-color declaration can also be used with other styles to give different effects. Try defining the defining the CSS or different styles like this.

```
h1    {background-color:#0000ff;}
```

Activity 21n

Copy the files saved in Activity 21m. Edit the stylesheet so that the web page has a background colour with a red component of f2, a blue component of 8e, and e8 green. All values are in hexadecimal, and only hexadecimal codes should be used in your stylesheet. Print evidence of your stylesheet and the browser view of the web page with the stylesheet attached.

21.3.5 Background images

Background images can be applied to the body section of a web page using the background-image declaration with a value containing the Uniform Resource Locator (which is often shortened to URL) followed by the image's address or filename. This can be used to place either a single background image in the centre of the page or can be repeated to place lots of copies of an image tiled to make the background.

Task 21ai

Edit your files for Task 21ah so that the web page has the file **task21ai.png** as a single background image placed in the top right of the window.

Copy both files from your Task21ah folder into the Task21ai folder. Copy the file **task21ai.png** into your Task21ai folder.

Add to the body section of the stylesheet **mystyle1.css** new background-image and background-repeat declarations with these values.

```
body  {background-color:#f0e68c;
       background-image:
       url("task21ai.png");
       background-repeat: no-repeat;
```

Each of these properties must contain a hyphen. Save the stylesheet and refresh the browser to test it. The page will look like this.

Tiled background images

Try changing the value for the background-repeat declaration to this.

```
background-repeat: repeat;
```

Save the stylesheet. Test the following section in your browser, maximised to fill the entire screen. What do you notice?

Also test out the values repeat-x and repeat-y with the background-repeat declaration to see what effects these have. Change the background-repeat declaration so that the image is no longer tiled. Save your web page and stylesheet in your Task21ai folder.

Advice

In later browsers, more than one background-image declaration can be placed in a window at the same time.

Position a background image

A single background image can be positioned within the browser window. Add a new background-position declaration like this to the body style in **task21ai.css**.

```
background-position: right top;}
```

Although this positions the image into the top right corner of the window, some of the text overwrites the background image. In some cases this effect can be very useful (for example, a watermark) but in this case it is difficult to read all of the text, as shown here.

By adding a margin-right definition like this, you can force the contents away from the image so that the page now looks like this.

```
background-position: right top;
margin-right: 200px;}
```

Save and test the stylesheet.

Activity 21o

Open the stylesheet **brick.css** and the web page **bricknblocktopia.htm**. Edit the stylesheet so that the web page has a tiled background image using the file **brick.png**. Print evidence of your stylesheet and the browser view of the web page with the stylesheet attached.

Activity 21p

Copy the files saved in Activity 21o. Replace the background image with the file **wall.png**. Repeat this image down the left side of the web page only. Do not allow any of the text to overlap these images.

21.3.6 Use classes within a CSS

You can define different classes, which are subtypes within an element, in a stylesheet. You can define a class in the stylesheet by using the dot or full stop (.) symbol. These are very useful for adding to or changing styles without defining completely new styles. For example, this stylesheet defines the style h1 in the normal way. It also defines a class that can be used with any style to change the colour and alignment of the style that it is applied to.

```
h1      {text... ....left}
.right  {color: #0000ff;
         text-align: right}
```

Task 21aj

Open the stylesheet called **class1.css** and add a new class within this stylesheet that changes the default style to be right aligned and blue. Open the web page called **webpage7.htm** and apply this class to each line of text that starts with the word 'This'.

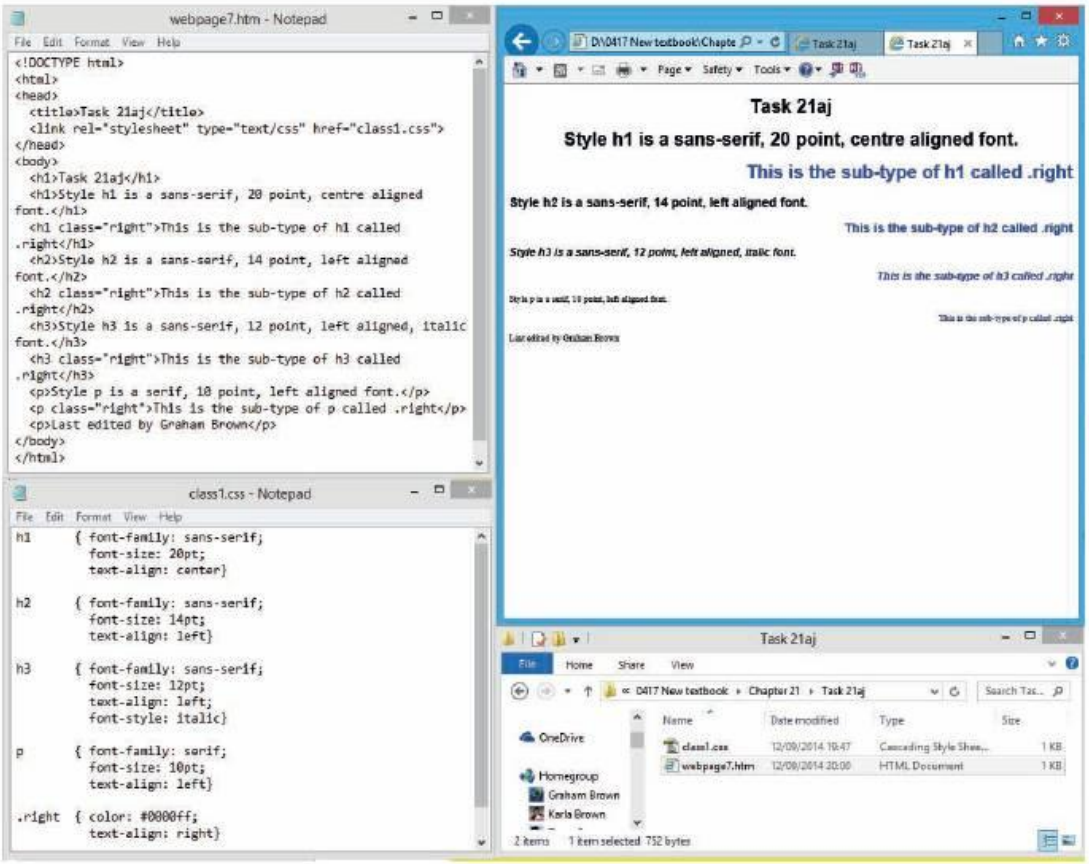
Copy the files **class1.css** and **webpage7.htm** into your Task21aj folder. Open these files in your text editor and in your web browser. Add the following markup to the stylesheet and save this in cascading stylesheet (.css) format.

```
.right  {color: #0000ff;
         text-align: right}
```

Enter the highlighted markup to the web page to add a class subtype to each line starting with the word 'This'. It should look like this.

```
<!DOCTYPE html>
<html>
<head>
  <title>Task 21aj</title>
  <link rel="stylesheet" type="text/css" href="class1.css">
</head>
<body>
  <h1>Task 21aj</h1>
  <h1>Style h1 is a sans-serif, 20 point, centre aligned font.</h1>
  <h1 class="right">This is the subtype of h1 called .right</h1>
  <h2>Style h2 is a sans-serif, 14 point, left aligned font.</h2>
  <h2 class="right">This is the subtype of h2 called .right</h2>
  <h3>Style h3 is a sans-serif, 12 point, left aligned, italic
font.</h3>
  <h3 class="right">This is the subtype of h3 called .right</h3>
  <p>Style p is a serif, 10 point, left aligned font.</p>
  <p class="right">This is the subtype of p called .right</p>
  <p>Last edited by YOUR NAME</p>
</body>
</html>
```

The screen should now look similar to this.



You can see from this printout that the original style definitions (except for the text alignment) have all been applied to the page. The text alignment and colour have been added to the styles using a class called 'right'.

21.3.7 CSS tables

Table definitions can be set in external stylesheets. The selector can be set for the whole table or for elements, such as the table header, table footer, table rows and individual cells of table data.

Task 21ak

Add an external stylesheet to your answer to Task 21d to set the following styles:

Selector	Property	Value
Web page	Background colour	#90ee90
Table	Background colour	#0000ff
Table cells	Background colour	#2eb757
Table header	Background colour	#cfcf00

All values are in hexadecimal. Show evidence of your method.

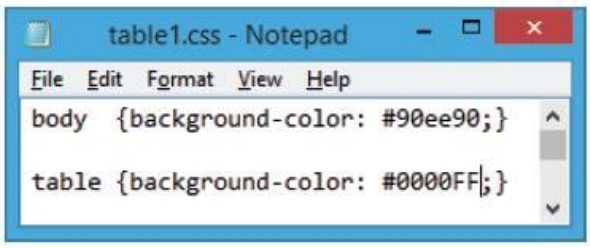
Copy the web page from your Task21d folder into your Task21ak folder. Open this file in your text editor. Add a new line to the head section to attach an external stylesheet to this web page, like this.

```
<link rel="stylesheet" type="text/css" href="table1.css">
```

In your second text editor window create in your Task21ak folder a new stylesheet called **table1.css**. For the first style the selector says the whole web page. This is the same as the body section, so create a style definition like this.

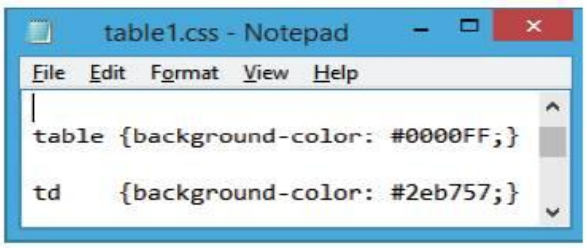
```
body {background-color: #8fbc8f;
```

Save the web page and the stylesheet and test that this has worked. At to the stylesheet the background colour for all of the table like this.



Save the stylesheet and test the web page, which should now look similar to this.

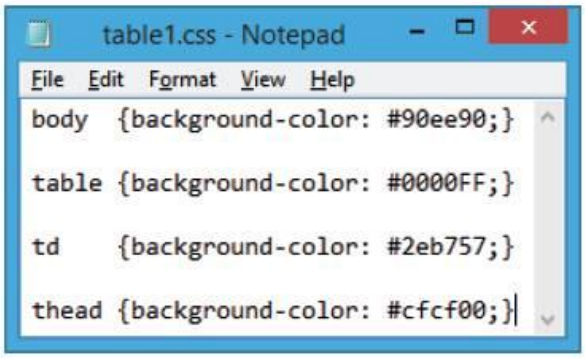
To change the table cells, add the td selector and a background-color property with a value of #2eb757 like this.



Save the stylesheet and test the web page, which should look similar to this.

You will see that the table background is still visible between the cells with the table data, but the table data is now a green colour.

Now add the thead selector and a background-color property with a value of #cfcf00 like this.



When you have saved the stylesheet and tested it in the browser your web page should look similar to this.

Advice

The technique used in this task – to do one small part, test it, correct it and test again (if need be) before going on to the next part – is ideal for any web development (or programming) and is very useful in practical examinations.

Activity 21q

Copy the files saved in Activity 21b. Attach an external stylesheet to this web page that defines the web page with a background of ff8c00 and a table with a background colour of ff4500. The table header should have a background with ffd700 and all other cells in the table should have a background with ffff00. All values are in hexadecimal. Place a single image of a sun (using the file **sun.png**) in the top right corner of the web page and make sure no other elements on the page could overwrite this. Print evidence of your method.

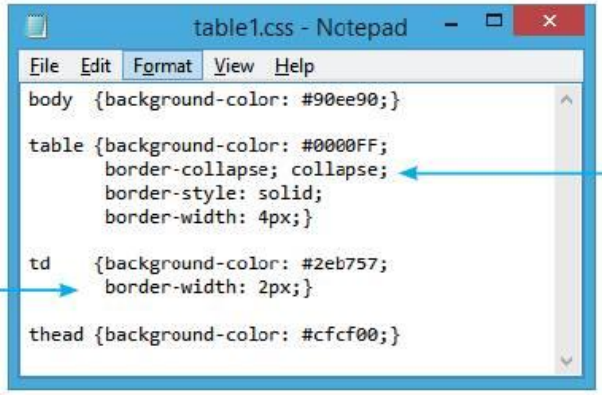
Table borders and gridlines

You may be asked to set internal gridlines and/or external table borders for tables. As you created tables earlier in the chapter, you will now be able to set the cell padding and spacing within a stylesheet as well as define table and cell borders within it. To set the border width of internal gridlines you must adjust the border width of the table data (or table header); for the external borders set the border for the table.

Task 21al

Edit the external stylesheet for your answer to Task 21ak so that the table has single external borders 4 pixels wide and internal gridlines 2 pixels wide.

Copy the files from your Task21ak folder into your Task21al folder. Open the stylesheet in your text editor. For the external borders add these three lines to table section of the CSS.



Save the stylesheet and test the web page, which should change from this to this.

For the internal gridline width add this extra line to the table data section of the stylesheet.

Again save and test to see the gridlines have reduced in width.

Experiment with other values for the border-style such as dashed, dotted or double.

Activity 21r

Copy the files saved in Activity 21q. Edit this stylesheet so that the table has a solid red border 4 pixels wide and cell padding of 10 pixels. Align all text in the table to the centre of each cell. All values must be in hexadecimal. Print evidence of your method.

21.4 Test and publish a website

Every web page that you have created has been stored in a single folder. This is to make sure that all the page elements are kept together for uploading a website to the internet. There are many ways of creating and uploading a website and its elements to the internet. It can be hosted on your computer, but this is rarely done as few of us have the hardware and enough **bandwidth** on our internet connection to do this. Many people use hosting companies in order to do this and upload a website into their hosting space.

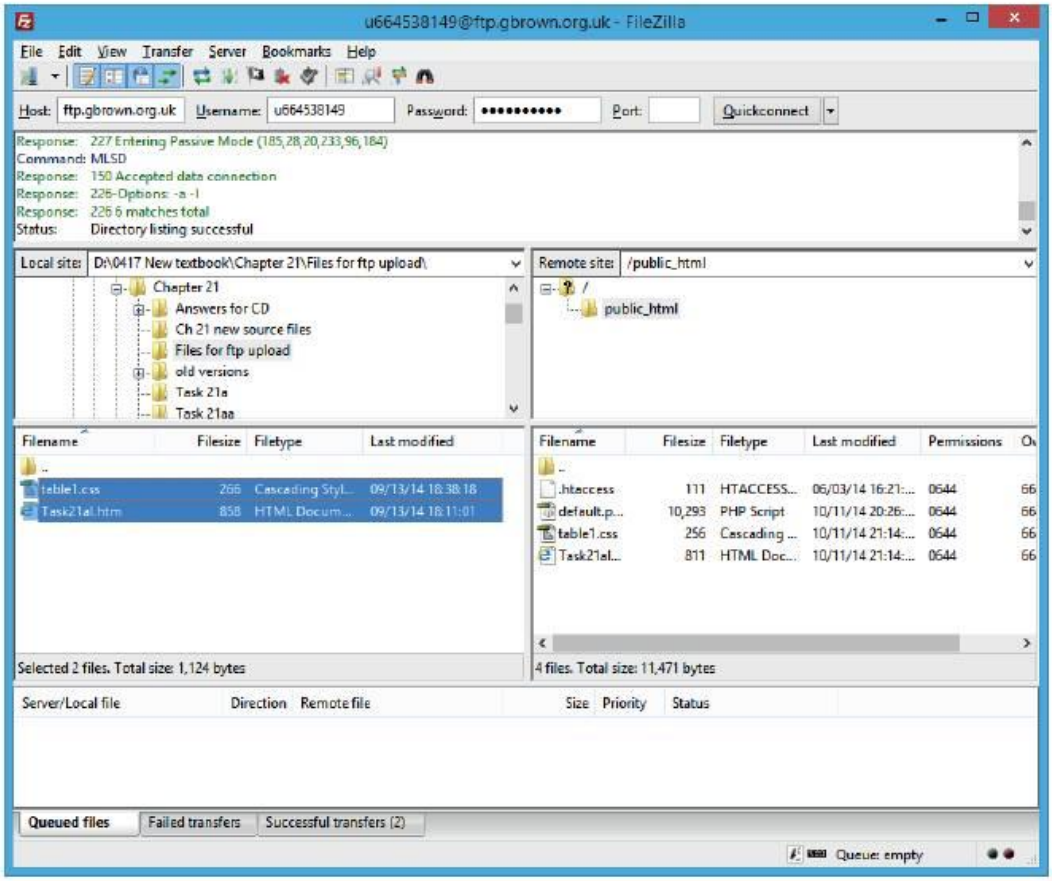
21.4.1 Publish a website

All websites have a **domain name**, such as www.hodder.co.uk, which is used to find the site. To publish your website you must register the domain name you wish to use. You will use **FTP**, which means file transfer protocol, to upload your files to your web hosting space. To move the files you will need to install FTP client software on to your computer. In the screen shot below, I have used a free client package called Filezilla that will operate with both *Microsoft Windows* and *Apple Mac* platforms.

You need to upload:

- all the files in one folder
- an FTP client
- login details to a web hosting server that includes the name of the FTP host and the port used, and the username and password for the FTP.

Once you have logged on to the FTP host server you upload the files – in this case by dragging and dropping them from your folder into your web hosting space, like this.



This will publish your website and it should appear when you open your browser and type in your domain name.

21.4.2 Test a website

Before testing takes place it is important to understand the purpose of the website and web page, and the target audience for the page. As much as possible, every element of a website should be tested before it is uploaded to the web server.

A test plan should be developed to make sure that you do not miss anything. Testing consists of two phases: functional testing and user testing. For the purposes of this book, you will use a simplified test plan.

Functional testing

All page elements must be checked to ensure that they appear as you expected. This will include for each web page:

- Is the table structure correct?
- Do all images appear as planned?
- Are all objects that are not supposed to be visible hidden from the user?
- Do all internal hyperlinks work?

For the entire website test:

- Can each page be found from the expected URL?
- Do all links between pages work as expected?
- Do all external hyperlinks open the correct web pages?

Table 21.3 gives an example of part of a test plan for a web page.

Table 21.3 Test plan for a web page

Test	Expected outcome	Actual outcome	Remedial action
Is table stylesheet attached?	Table format as in design specs	Yes	
Is font stylesheet attached?	Fonts as in design specs	No	Edit h4 to be #ff0000 rather than #f800000 Then retest.
Table structure 2 × 7	2 × 7	Yes	
Table borders hidden	Hidden	Visible	Set table attribute to border="" Then retest.
Image XX995.jpg visible	Visible	Visible	
Image XX995.jpg 400 × 250	400 × 250	Yes	
Image XX995.jpg alt attribute set to "Image of 2nd edition of the textbook"	Yes	Yes	
Hyperlink from **Click here** goes to the top of page	Returns to top	Yes	
Hyperlink from **Home** icon goes to home page	Returns to home page	Yes	
Hyperlink from **Publisher** goes to www.hodder.co.uk	Opens Hodder home page	Yes	

User testing

The plan:

1. Decide what needs to be tested.
2. Find a suitable test audience of between two and five users or potential users. If a website is not designed for a specialist audience, select a variety of different users. **Do not** use IT specialists unless that is who the site is designed for.
3. Tell the users it is the website being tested not them, and that you value their thoughts and opinions.
4. Ask the users to speak their thoughts as they work but **do not** respond.
5. Observe the test so that difficulties can be noted (**do not** help in any way).

The test may include:

- tasks to complete using the site
- questions to answer
- navigation to the page to be tested from the home page.

Here is an example of some user test questions.

Let the user view the web page for 15 seconds, then ask:

1 What are your first impressions of the web page?

Give the user sufficient time to read the web page content, then ask:

2 What is the purpose of the web page?
3 Was this purpose clear from the beginning?
4 How easy is it to read and understand?
5 It there too much or little information?
6 What did you like about the web page?
7 What did you dislike about the web page?
8 Did you experience any difficulties on the web page?
9 What was the overall quality of your experience?
10 What could be done to improve the web page content or presentation?
11 Do you have any other comments or suggestions?

Justify the choice of test plan

You must be able to identify which elements of the test plan are functional testing and which are user testing. You must be able to make decisions on why and how you might test some elements of a web page.

Task 21am

Create one element of a functional test plan and one part of a user test plan for this website. Each text item is a hyperlink to a new page and a stylesheet, **rockstyle.css**, has been used. For each element justify your choices.