



PC Passport

IT Systems Student Workbook



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Introduction

This student workbook is one of a range of eight titles designed to cover topics for the refreshed PC Passport. Each title in the range covers the required subject material and exercises for candidates studying PC Passport.

This workbook covers two levels of PC Passport — Beginner and Intermediate. IT Systems is not offered at Advanced level.

There are a number of exercises associated with each subject and it is recommended that centres download and use the sample exercise files provided.

Each workbook will help prepare candidates for the assessments for the refreshed PC Passport. It is recommended that centres use the most up-to-date Assessment Support Packs appropriate for their type of centre, eg either school, FE or work-based.

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Basic Terminology Relating to Computers

The language that is used in connection with computers can be confusing for the first-time user. The aim of this section is to help you understand this language and so become comfortable with it. In the following sections you will learn about individual types of *hardware* and *software*. Below are definitions of some of the most common terms; you will find definitions of all the terms used in this workbook the first time each of them is used. New terms are shown in italics.

The *hardware* of your computer is the physical machinery ie the bits you can touch — the monitor, the keyboard, the mouse etc.

The *software* is what makes your computer perform tasks. For example, Microsoft Word is a software *program* (list of instructions) that allows you to create documents, usually for printing. Another piece of software on your computer is responsible for displaying (on-screen) the characters you type using the keyboard.

Your software programs are usually kept on your *hard disk* (the permanent disk that is part of your computer), and copied into *memory* (storage area where programs and files are kept while processing takes place) when required. You can think of your disk and memory as being like a filing cabinet and your desk: your programs are kept in the filing cabinet (disk) until you need them, when they are placed on your desk (memory) so you can work with them. When you have finished working with them, you can save them and they are returned to your filing cabinet.

Sometimes shortened to IT, *information technology* is the use of computers in the management and processing of information. This is why, in some companies, the computer department is called the IT Department.

Computer Hardware

The most common type of computer in use today is the *personal computer* (PC). This is the type of computer you may have at home, at school or in the office. Here you will find out what the various parts are called and the part they play in working the computer.

The Outside

The 'box' part of your computer is called the *system unit*. It houses the various parts that act together to make your computer work. Your system unit may be on your desktop perhaps with the monitor on top, or it may be a tower that sits on the floor, saving space on your desktop. You may also have a number of external *peripherals* (hardware that plugs into your computer) — for example, an external *modem* (device used for connecting to the internet), speakers, or a *printer* or *scanner*. Modems can be either an internal modem card installed inside your computer or an external modem connected with cables to your computer and phone line. Having an external modem can have its advantages — you can see the modem's light indicating it is working. With an internal modem you would have to look at the back of the computer to see the light flashing on the modem card.

The Inside

Inside the system unit there is a flat circuit board called the *motherboard*. Attached to this board are the vital systems of the computer, including the *CPU* (*central processing unit*), which is explained below, and the hard disk where your saved information is usually stored.

The motherboard also houses the *ROM-BIOS* chip (*read only memory – basic input output system*). The BIOS is built-in software that determines what a computer can do without accessing programs from a disk. On PCs, the BIOS contains all the code required to control the keyboard, display screen, disk drives, and a number of miscellaneous functions. It bridges the gap between the computer and the operating system program, and is responsible for communicating with all the major systems, input and output devices and software when the 'On' button is pressed.

Also inside the computer is the *RAM* (the memory), comprising a number of chips that 'plug in' to the motherboard. There will also be one or more hard disks and, if appropriate to your system, a DVD or CD-ROM drive. Depending on your system setup, you may also have other components such as an internal modem for internet access and perhaps a network card to allow you to connect to other computers.

Central Processing Unit (CPU)

The CPU is a chip on the motherboard of your computer. It is here that the processing required by your task takes place. Processors vary in speed — the faster the chip, the faster processing will be carried out. It is responsible for the running of all programs, including the operating system, and uses a small portion of memory allocated specifically to it to perform this and the millions of calculations needed to keep the system operating. This function is highly complex as the CPU must attend to the various needs of different parts of the system at the same time.

The speed of the CPU is expressed as *megahertz (MHz)*, and more recently *gigahertz (GHz)*, and the higher the rating, the faster the processor. The typical rating of a modern system is around 3,400 MHz (or 3.4 GHz), but given the rate of change in the computer world, this increases frequently.

Dual-Core Processing

‘We have embarked upon a new era in x86 PC computing.’

— so say the marketing people at CPU chip giants AMD and Intel. How will dual-core processing change the computing experience?

A *dual-core processor* is different from a single-core CPU chip in that it has two physical computer processing unit, or CPU, cores in a single package. When you buy a PC with an Intel or AMD dual-core processor, the CPU architecture will have two processor cores bridged together with the necessary electronics.

Dual-core processing is based on *parallelism*, which involves increasing PC performance by relying on more than one processor core for computing tasks. Boosting processor performance has traditionally meant increasing power consumption. This means that more fans are needed for cooling, and fans can increase noise levels. By relying on parallelism, dual-core chips help to solve the heat dilemma. They do this by sharing the computing load across the two processors. Computing performance is increased without having to increase the CPU speed — which results in very hot single-core processors.

Application programs can harness the power of two processor cores instead of one. The only major downside at the time of writing (2007) is that most software applications cannot yet take advantage of a dual-core processor design.

The latest operating systems can harness the power of these CPU chips but the software is lagging behind and you will have to wait awhile before your favourite game, office application or other software program can utilise this power.

The Connections

At the back of the computer are the connection points where you can attach the various parts of your computer, including the monitor, mouse and keyboard. These connection points are called *ports*.

The *serial* and *parallel* ports allow connection of *peripheral* devices such as a modem and/or a printer. These will be labelled COM 1 and COM 2 for the serial ports, and LPT 1, and LPT 2 for the parallel. To connect peripheral devices such as a scanner or digital camera, the *USB (universal serial bus)* port may be used. This port is designed for maximum communication efficiency and ease of connection and is only available as standard on computers produced from around 1998. Anything plugged into the computer base unit, for example, the mouse, keyboard, monitor or a scanner or printer is called a *peripheral device*.

Types of Computer System

Desktop Computers

A desktop computer is a personal computer that provides full computing capabilities while remaining semi portable. They are larger and bulkier than laptop computers and can either sit on top of the desk or underneath it. Because of their larger size this class of computer usually includes more powerful components and a larger display.

The modern desktop computer performs better than traditional laptop computers as their size allows the inclusion of more powerful components. The larger body (case) means more efficient heat dissipation which allows manufacturers to use components that would otherwise overheat during normal use. Furthermore, their increased size allows for greater expandability and features, as well as larger and brighter displays.

There are three types of desktop computer:

- ◆ home computers, or personal computers
- ◆ workstations
- ◆ internet servers

The desktop computer is currently the most affordable computer and it can be found in colleges, universities, schools, businesses and in 60% of households. They are used for performing office tasks such as word processing, database work and accounts. Other uses include organising digital photos, video editing, and internet access. Nearly all desktop computers are modular in design with components that can easily be replaced or upgraded.

Desktop computers come in a variety of case styles ranging from large vertical towers to small models that can be tucked behind an LCD monitor.

Home Computer/Personal Computer

The home computer was the description given to desktop computers that were entering the market in 1977 and became very common during the 1980s. These computers used to cost much less than business, scientific or engineering oriented desktop personal computers, and were generally less powerful in terms of memory and expandability. This is not the case today with the same machines being targeted for business and home use. For some companies, the machine that is sold as a personal computer actually costs more than those sold as business machines.

The home computer often has better graphics and sound than contemporary business computers, and is usually sold for purposes of education, game play, and personal productivity use. The machine will also tend to have more USB ports to allow for video cameras, printers, scanners etc to be connected.

Workstations

Workstation computers tend to be high specification computer systems such as a UNIX workstation, RISC workstation or engineering workstation. The work station is generally designed for technical applications where a great deal of processing power or computer memory is required.

As they are specialised machines the workstation offers higher performance than is normally seen on a personal computer, especially with respect to graphics, processing power, memory capacity and multitasking ability.

The workstation is often optimised for displaying and manipulating complex data such as 3D model rotation in real time, engineering simulation, and mathematical plots.

Computer Servers

Larger businesses or those with more complex networking needs rely on a *server-based network*. The server computer stores files for users in a central location and provides access to other network resources, such as printers, CD-ROM drives, and software. The server also provides data management, information sharing, network administration, and security features. In a client/server model, computer tasks are split between a stand-alone personal computer, which acts as the *client*, and a *server*, which can be a personal computer, a minicomputer, or a mainframe.

A server operating system is intended, enabled, or better able to run server applications. A *server computer* (often called server for short) is a computer system that has been designated for running a specific server application or applications. Server computers are devices designed to run such an application or applications, often for extended periods of time with minimal human direction. Examples of servers include file server, web servers, e-mail servers and FTP servers. The simplest servers are most often sold as dedicated appliances, for example switches, routers, gateways, print servers, net modems.

A computer that is designated for only one server application is often named for that application. For example, when FTP software is run on the company's server, the computer running it will be called an FTP server.

While any personal, desktop or workstation computer can run server operating systems and server applications, a dedicated server computer usually has special features intended to make it more suitable for this task. Distinctions often include faster processor and memory, more RAM, larger hard drives, higher reliability, redundant power supplies, redundant hard drives (RAID) etc.

A computer server is an application or device that performs services for connected clients as part of a client/server architecture. A server application is an application program that accepts connections in order to service requests by sending back responses.

The server-based network has become the standard model for networking, primarily because it provides reliable management of network resources and a common security database. This model can support thousands of users, but is managed by a central group of administrators who oversee the network operation and ensure that security is maintained.

Setting up a client/server network requires that all of the necessary hardware, protocols, settings, and services are configured properly, and you will have additional resource requirements, including:

- ◆ One or more computers to be used solely as network servers. A large network may have more than one server, depending on the number of users, volume of traffic, number of peripherals, and so on. For example, you might find a print server, a web server, and a database server all on the same network.
- ◆ Trained administrator staff to oversee network operations.

Security in this model can be set at different levels, for different groups of users. Some users may only have access to a particular printer, or the central administrator may have configured the security settings for internet access through a Proxy or Firewall.

Whilst the role of server and desktop operating systems remains distinct, improvements in both hardware performance and reliability and operating system reliability have blurred the distinction between these two classes of system. Today, many desktop and server operating systems share the same code base, and differ chiefly in terms of configuration.

Laptops

A laptop computer, or simply *laptop* or *notebook*, is a small mobile computer, which usually weighs between 2–10 pounds (1–5 kg) in weight. This depends upon the price paid and the manufacture of the computer.

Most laptops will run on a single main battery or from an external AC adapter which can charge the battery while also supplying power to the computer itself.

Laptops are now capable of the same tasks as a desktop computer, although they are typically less powerful in terms of CPU and main memory for the same price. They contain components that are similar to their desktop counterparts and perform the same functions. However, they are often miniaturised and optimised for efficient power consumption.

Newer laptops will have liquid crystal displays and most of them use different memory modules for their *random access memory (RAM)*, for instance, a computer could use either *single in-line memory modules (SIMMS)*, which hold multiple memory chips) or *dual in-line memory modules (DIMMS)*, which hold a single larger memory chip) memory circuit boards. In addition to the built-in keyboard the new machines incorporate a touchpad (known as a trackpad) for input, though an external keyboard or mouse can usually be attached to the device.

A laptop's ability to be upgraded is severely limited both for technical and economic reasons. There is no industry-wide standard for laptops. Each major laptop vendor pursues its own proprietary design and construction. The result is that laptops are difficult to upgrade and can be expensive to repair.

The computational power of the laptop has traditionally trailed that of desktops. This is due to almost all laptops sharing RAM between the program memory and the graphics display adapter. Laptops will always prioritise energy efficiency and compactness over absolute performance. For personal use, where the computer spends the majority of its time sitting idle for the next user input, laptops are generally fast enough to achieve the required performance.

Laptops are generally ideal targets of theft because they are small and portable. Theft of laptops can lead to more serious problems such as identity theft.

Palmtops

A *palmtop* is a small (pocket-size), hand-held computer, which also includes network access software, personal schedule software, and a basic word processor. There are some differences between a palmtop and a PDA device, with the palmtop providing more computer-type facilities rather than the camera, mobile phone, MP3 player add-ons that are part of some PDAs.

In order to be classed as a palmtop, the device must have a computer keyboard, a screen size greater than 480 × 240 pixels, include a flash card slot and provide wired serial or USB connectivity.

PDAs

PDA is short for *personal digital assistant*. This is a hand-held device that combines computing, telephone/fax, and networking features. A typical PDA can function as a cellular phone, fax sender, and personal organiser. Unlike a portable computer system, the majority of PDAs are pen-based and tend to utilise touch-screen technology for general operation.

However the uptake of PDAs has been slightly limited by the development of mobile phone devices with similar features and functions. A PDA also tends to cost more than a mobile phone that performs similar functions.

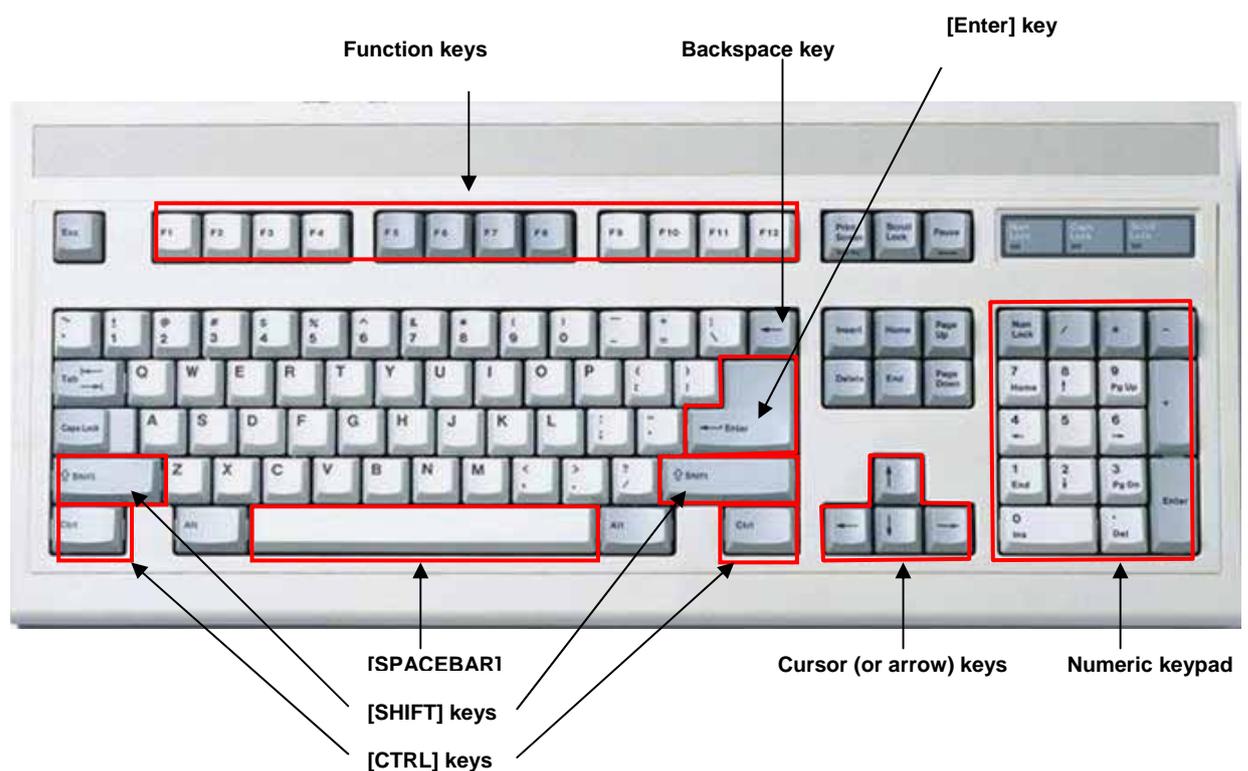
PDA's and hand-held devices are useful in an educational context for digital note taking. This allows individuals to quickly spell-check, modify, and amend their class notes or e-notes. Some educational establishments are currently able to distribute course material and notes through the use of the internet connectivity or infrared file sharing functions of a PDA. In some countries textbook publishers have begun to release electronic textbooks, which can be uploaded directly to a PDA. This eliminates the effort of carrying multiple textbooks at one time.

Using the Keyboard and Mouse

Using the Keyboard

Learning to use a keyboard is an essential part of learning to use a computer, as it is used to type text and issue commands to the computer.

A keyboard which has the top row of letters in the order Q-W-E-R-T-Y is called an *alphanumeric keyboard* or *QWERTY* keyboard. The order of the letters and numbers follows that of earlier typewriters.



Some of the main keys highlighted above are explained here:

The **[Enter]** key: This key is one of the most important keys on the keyboard. The **[Enter]** key is normally used to execute commands. In word processing programs it is used to start a new line.

The *Function* keys: These are used within different programs for different functions, but **[F1]** is usually used to access the Help system.

The **[Spacebar]**: The **[Spacebar]** lets you type spaces between words.

The **[Backspace]** key: The **[Backspace]** key is used to correct mistakes as you type.

The *cursor keys* (or *arrow keys*): When you're editing a file, these keys allow you to move around the file to the point where you want to make changes. Your position within the file is marked by the *cursor*.

The *numeric keypad*: When the **[Num Lock]** is switched on (shown by a light, usually at the top right of the keyboard), this keypad will type the numbers shown on each key. When the **[Num Lock]** is switched off, these keys act as cursor keys.

The **[Shift]** keys: When you press one of the letter keys, you will type a lowercase (small) letter. If you want to type uppercase (or capital) letters, hold down one of the **[Shift]** keys while you press the letter key. Another use for this key is typing symbols that appear at the top of keys that contain more than one symbol. For example, if you press the key on the main keypad that shows '7', a '7' will be typed. However, if you hold down **[Shift]** as you press this key, the ampersand '&' will be typed.

Note: If you want to type all in capitals rather than just one or two, you can avoid holding down **[Shift]** all the time by pressing **[Caps lock]** once, which will switch on capitals until you press **[Caps lock]** again. This key is above the left-hand **[Shift]** key.

The **[Ctrl]** keys: Along with the **[Shift]** keys and the **[Alt]** key to the left of the **[Spacebar]**, the **[Ctrl]** keys are *modifier* keys. This means that pressing a key while holding down one of these modifier keys changes what that key does.

For example, when you press the **[F]** key by itself, you type a lowercase 'f'; when you hold down **[Shift]** and press **[F]** you get a capital 'F'; when you hold down **[Ctrl]** and press **[F]**, the **Find** facility starts, and when you hold down **[Alt]** and press **[F]** the **File** menu opens.

Using the Mouse

You use the mouse to choose options and carry out tasks. If you haven't used a mouse before, you will need some practice to become comfortable with it. There are a number of basic techniques that you must master to make best use of the mouse. These are listed in the table on the next page.

Running Out of Space

When using your mouse, you may find it gets close to the edge of the desk, making it awkward to work with. If this happens, simply lift the mouse off the desk and put it down where you can move it freely again. You will find that the mouse pointer doesn't move when the mouse is lifted off the desk. If you run out of space when you're dragging, keep the button pressed while you lift and replace the mouse.

Pointing

For many tasks on the computer you have to select items so that the program knows what you want to work with. For example, if you wanted to delete a graphic, you'd have to select it first so that the correct image is removed when you choose the delete command.

The first part of selecting an item is to point to it using the mouse.

Clicking and Double-clicking

The second part of selecting an item is to click the primary mouse button. This is normally the left button. However, if you are left-handed, you may prefer to set the right button as the primary button. In this manual, we assume that the primary mouse button is the left button.

Although a single click like this will select some items, others require you to double-click, which means pressing the primary mouse button twice in quick succession. Some applications also make use of triple clicking (3 quick clicks) and even quadruple clicking (4 quick clicks) to select increasing amounts of information; however, there are always alternatives that are simpler for some people to use. When used with icons, double-clicking can also be used for opening items such as folders and for running programs.

Dragging

Dragging is a technique that involves clicking and holding down the mouse button while you pull (drag) the mouse across the desk. For example, you may drag a window to another location on the desktop, or drag over a block of cells to select the cells you want to work with.

Right-clicking

Right-clicking is the term used for clicking the secondary mouse button. This is normally the right mouse button, which is the assumption in this manual. However, if you have chosen to reverse your mouse buttons, the secondary button will be the left button. When you point to an item and click the right mouse button, you will see a small menu displaying a list of options. This is called a shortcut menu or contextual menu, as the options displayed relate to the item you are pointing to. For example, if you point to the desktop and right-click, the shortcut menu will display options to arrange icons on the desktop, and change desktop properties such as colour.

Hovering

The I-Beam character is used when the mouse's standard pointer shape is hovering over selected text.



Exercise 1: Practise Using the Mouse

If you're new to the art of using a mouse, you might find playing games is a good way to practice your technique and have fun at the same time. In fact, Windows comes with a variety of games, some for that particular purpose.

One of the games supplied with most versions of Windows is called *FreeCell*, although if you are using a computer in an office, school or public learning centre, you might find that the games have not been installed.

To Start a New Game of FreeCell

- 1 Click the **Start** button then **All Programs** then **Games**, and finally **FreeCell**. (If you're not using Windows XP, you may have to click **Start** then **Programs**, then **Accessories** then **Games** and finally **FreeCell**.)

Note: This instruction means click the **Start** button, point to the **All Programs** menu, then the **Games** menu, and then click **FreeCell**.

- 2 To start a new game, press the **[F2]** function key.
The cards will be dealt so that you can start the game.

The Object of the Game

The object of the game is to arrange the cards in order by suit (Hearts, Diamonds, Clubs and Spades) starting with the ace, on the four *home cells* that appear in the top right corner of the window. To get to the cards you need to achieve this, you can move cards onto the four *free cells* that appear in the top left hand corner of the window.

Another way to get to the cards you need is to move cards from one stack to another. However, you can only move one card onto another card if it is the opposite colour and is one value lower. For example, you can move a red 6 onto a black 7 but not a red 7.

Playing the Game

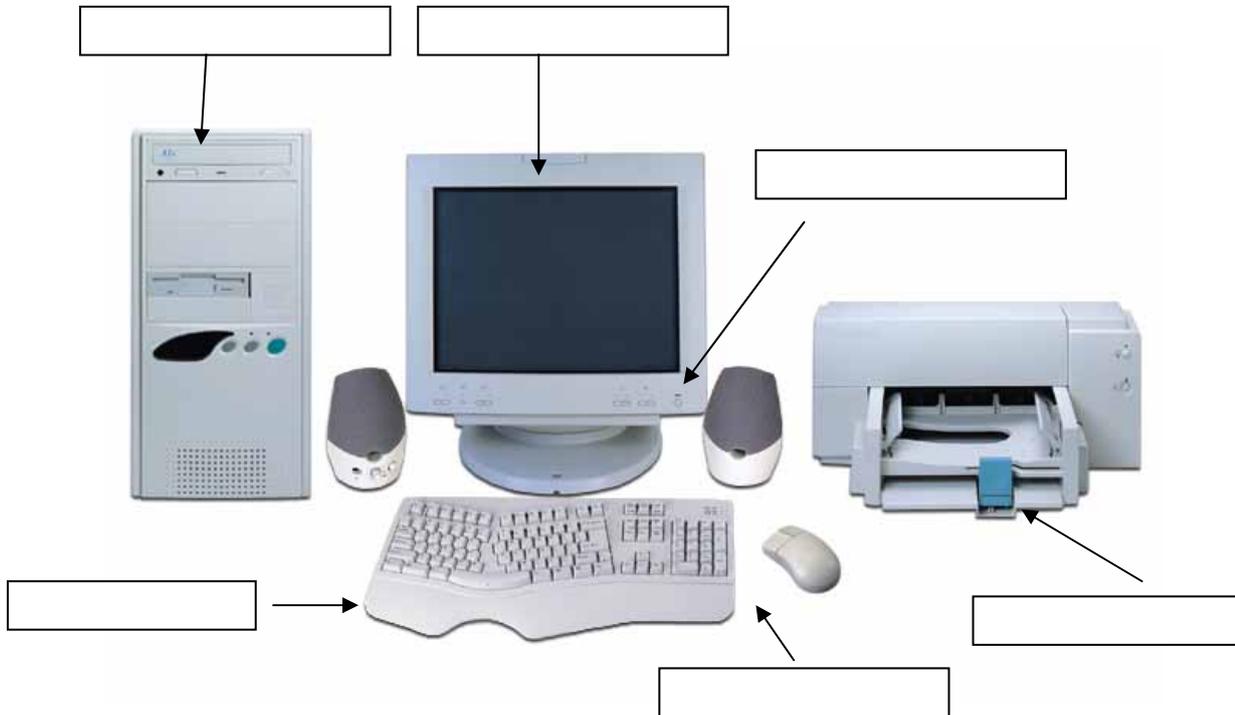
- ◆ To move a card, click it and then click the card that you would like it moved to.
- ◆ Double-clicking a card will move it onto a free cell, providing one is available.
- ◆ Right-clicking a card that's hidden under other cards will display the whole card so you can see it clearly.
- ◆ The options available from the **Game** menu will let you start a new game, restart the current game, and exit FreeCell.

Note: To become proficient in FreeCell and win your first game, you may need to play several games.



Exercise 2: Computer System Identification

1 Label the picture below.



- 2 Switch on the computer by pressing the power button, usually found on the front of the system unit.
 - 3 Switch on the monitor by pressing the power button, again usually found on the front of the monitor. A green light will indicate that the monitor is on.
 - 4 If there is a printer attached to your system, make sure this is also switched on.
 - 5 Take a moment to look at the hardware attached to your system, noting the buttons and lights on each.
-

Computer Software

The single most important piece of software on your computer is known as the *system software*, or the *operating system* (OS). This program is loaded when you first start up the computer, and is responsible for communicating and managing the software and files saved on your system. *Microsoft Windows* is the most commonly used operating system on PCs. This, like most other software programs, is updated regularly and so there are a number of different versions available, for example, 98, NT, ME, 2000, XP and Vista. When you buy a new PC, Windows will usually be part of the package. If a newer version is released, you can buy it to *upgrade* your PC's operating system.

Before Microsoft Windows, PCs used an operating system called *Disk Operating System* (DOS). The user had to understand and use special commands, and this was part of the reason that fewer people than today used personal computers. DOS is still part of many versions of Windows and can be used to interact with the computer and its components.

Application software is the name given to a program that performs a task for the user. For example, Microsoft Word and Lotus WordPro allow the creation, editing and printing of documents, while Microsoft Excel and Lotus 123 are used for creating spreadsheets and tables. This software is usually supplied separately, but simplified versions are often part of the package when you buy a new PC.

There are many different types of software and many different manufacturers. For most common applications, you will find that there are a number of programs, or *packages*, from which to choose.

When installing software it is important that there is:

- ◆ Sufficient hard disk space to hold the installed application. The software's installation procedure usually checks this for you and the disk space required is normally indicated on the box the software comes in.
- ◆ The correct operating system to support the application. This is normally indicated on the box the application software comes in.
- ◆ The correct amount of memory installed or required to allow the program to run. This is normally indicated on the box the software comes in.

It is not necessary to check for peripheral devices like printers, mice or keyboards as most will work with the software installed and the operating system software provides the interface between them and the application software.

Application software installation generally comes in four modes:

- ◆ *Minimum installation* gives only the basic features of the application and generally does not include help files and templates. It conserves hard disk space, but should only be installed by a user who understands the implications of using a minimum installation and what problems may occur if not all the features are installed.
- ◆ *Typical installation* gives the standard features of the application and includes all files necessary to help the user, so it will include help files and standard templates etc. This is the most popular method of installation which can be undertaken by even the most inexperienced user, who would simply accept all the default settings.
- ◆ *Custom installation* is for the very experienced user, who wishes to include specific custom features of the application. This type of installation should only be carried out by someone who knows exactly what they wish and how the application will be configured to run.
- ◆ *Full installation* will require the maximum amount of hard disk space and will include all the help files, templates, add-on features and extra additional tools not really required by the average user. This installation should be undertaken only if the user requires the additional features and there is sufficient hard disk space for the installation.

Operating System Software

The designers of system software decided that it would be easier if users didn't have to speak the computer's own language. So they developed what is known as a *Graphical User Interface (GUI)*, pronounced goo-ey). GUI is the common name given to the system which uses *Windows, Icons, Menus and Pointing devices (WIMP)*, which was made popular by the Macintosh computer in the 1980s. Microsoft Windows is an example of this, as are System 7 and the newer MAC OS X, used on Apple Mac computers. On GUI systems, using pictures that represent the function they carry out, the user can communicate with the computer and the application software.

The introduction of GUIs made the personal computer easier to use for 'normal' people as there was no special language to learn and the GUI was much easier to use and understand than the DOS operating system.

Since most manufacturers design their programs to look and act in a similar way to Windows, even if you have never worked with a particular application, you can quickly pick up the basics.

Operating system software is sometimes referred to as *utility software* as it provides the interface with the computer and looks after things like file and folder management. The screen that is presented to you once the system software is loaded is called the *desktop*. The main parts of the desktop are explained on the next page.

The Windows Desktop

The exact appearance of your Windows desktop will depend on when and how the operating system was installed on your computer as well as what changes have been made since it was installed, as each user can change the desktop to suit the way they work.

For example, although the Windows desktop may have a set background to begin with, you can choose from a number of other backgrounds (or *wallpapers*) or even download backgrounds from your favourite internet sites. There are further aspects that can be customised: fonts, colours etc.

Application Software

Microsoft is the main software designer for PC systems. Although users have a choice of which programs to buy and use, many choose the familiarity of the Microsoft name. However, many other companies produce similar integrated applications, including *Lotus* and *Corel*, who produce *word processing*, *spreadsheet*, and *desktop publishing* software as alternatives to Microsoft's Office range of products, and *Sage* who produce integrated *payroll* and *accounting* applications. Application software which has different types of software included, like Lotus SmartSuite, Sage or Microsoft Office are often referred to as *integrated*, because they integrate lots of applications together which have similar screen layouts and menu options.

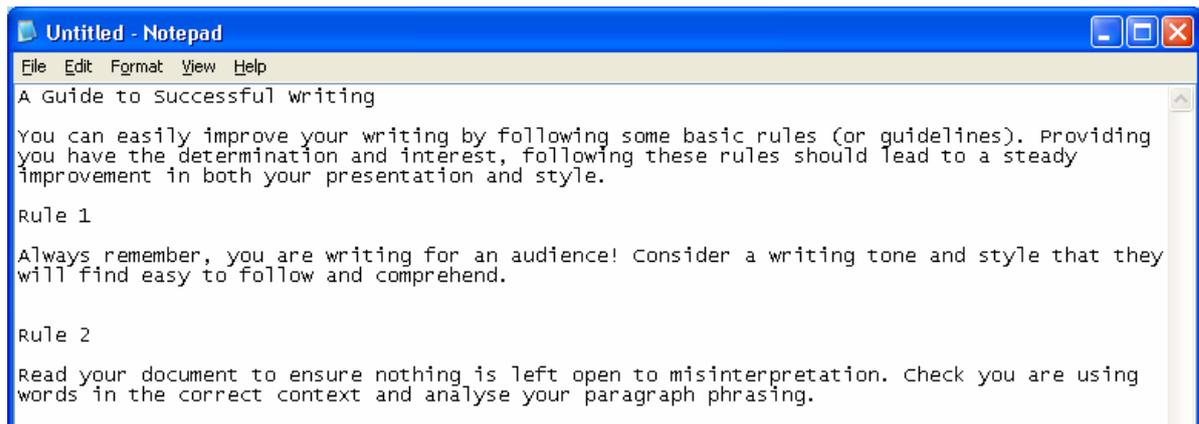
The most common types of application package are described on the next page.

Application	Examples	Typical Use
Word Processor	Microsoft Word, Lotus WordPro, and Corel WordPerfect	Creating, formatting, editing and printing documents. Examples are letters, memos, and faxes.
Spreadsheet	Microsoft Excel, Lotus 1-2-3, Apple Works and Corel Quattro Pro	Creating, calculating, formatting, editing and presenting numerical information. Examples are budgets, invoices, and payroll.
Presentation Graphics	Microsoft PowerPoint and Lotus Freelance	Creating and presenting slides for electronic slide shows or overhead projection. Also used to create simple graphics-based printed documents such as posters.
Database	Microsoft Access and Microsoft Visual FoxPro	Storing, retrieving and presenting information on a specific topic. Examples include stock control, employee information systems, and sales order processing.
Computer-based Training (CBT)	Available on a very wide range variety of topics from computer theory to word processing, this software allows you to use your computer to learn—usually using a mixture of theory and practical exercises.	Although CBT allows you to work at your own pace and at a time and place that suits you and your lifestyle, some people find the lack of interaction with others a problem, and others can find it difficult to motivate themselves.
Web Browser	Microsoft Internet Explorer and Netscape Navigator, Mozilla Firefox	This software allows you to browse the internet. (Internet Explorer comes with all versions of Windows.)
E-mail and Calendar	Microsoft Outlook, Lotus Notes, and Novell GroupWise	Sending and receiving electronic mail. Calendar programs allow you to keep track of your activities, with some offering the facility to arrange meetings with your friends and colleagues.
Anti-virus	McAfee and Symantec Norton AntiVirus	Protecting computer systems from damage by viruses by detecting their presence and alerting the computer user.



Exercise 3: Running Programs

- 1 Examine what's on your desktop. This will vary with each computer, depending on the programs on it and how it's been used in the past. All desktops, though, have a **taskbar**, usually along the bottom of the desktop. This taskbar contains the **Start** button, which can be used to access all the settings and programs on your computer.
- 2 Follow the instructions below to practise using the mouse and keyboard. First, move your mouse across the desktop until the arrow is pointing to the button that reads **Start**, usually found at the bottom left corner of the desktop.
Click the left mouse button once to display the **Start** menu.
Depending on the version of Windows you use, move your mouse so that the arrow is pointing to either **All Programs** or **Programs** on this menu and then click the left button once to show the next menu. Alternatively, rest the mouse pointer on this option for a moment and the menu will pop out by itself.
Find the **Accessories** option on the menu that pops out and move the mouse pointer to it and click or rest once again.
Now move the pointer to **Notepad** and click once.
This opens the Notepad program, which is a simple text editing program. You'll find out more about programs in the next part of the manual, but now you'll use this program to practise using the keyboard.
- 3 Type the text shown below. Remember to:
press the **[Spacebar]** when you want to type a space between words or after a punctuation mark, for example, a comma or a full stop; hold down one of the **[Shift]** keys when you want a capital letter or the top symbol from one of the keys with two characters on it; press **[Enter]** when you want to move to a new line or leave a blank line, and press **[Backspace]** when you want to correct a mistake you've just made.



- 4 Now that you've finished with the Notepad program, you should close it, so move the mouse so that the arrow is pointing to the word **File** (called the **File menu**), and click once.
- 5 Move the arrow down to the **Exit** option and click on it.
- 6 As you've asked to close the program, but you haven't saved the file you typed, Notepad asks you if you want to save it.

Point to the **No** button and click the left mouse button to discard what you have typed and close the program.

Using the Filing System

The files stored on your computer are arranged in a filing system similar to a manual filing system that uses filing cabinets, with dividers and folders within. In a computerised filing system, you may have a number of different types of disk or other storage medium that you can use for storing your files. These are usually divided up much like the drawers in a filing cabinet so that you, and other users of the system, can find where you've stored things. In a computerised system, these 'drawers' are called *folders*. Each folder can contain files and/or other folders (known as *subfolders*).

The Windows Explorer Program

Windows Explorer is an accessory that's used to work with files and folders, eg to create, move, copy, rename, search for, or delete them.

To start the program, click the **Start** button, choose **All Programs** (or **Programs**) then **Accessories** and then click **Windows Explorer**.

There are a number of alternative methods of starting this program, including right-clicking **My Computer** on the desktop, the **Start** button, or any folder, and choosing **Explore** from the shortcut menu.

The Windows Explorer window is split into two panes, with the folders list at the left and the contents pane at the right. The look of Windows Explorer is highly customisable, so your windows might vary from those shown. However, the function of the program will be the same. For example, you can use the **View** button on the toolbar to change the appearance of the items in the contents pane.

Looking Inside a Disk or Folder

To see the contents of a disk or folder, simply click its icon or description in the folders list at the left. You will then see the disk or folder's contents in the contents pane at the right. For example, to see the contents of the hard disk on your computer, you would click the **Local Disk (C:)** entry in the folders list above.

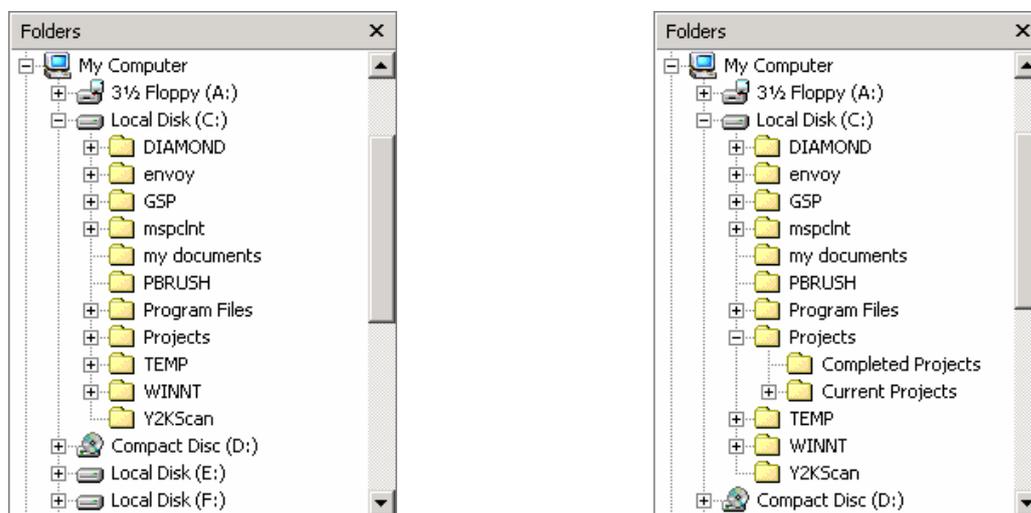
This disk may be named differently on your computer, but it will still say **(C:)** at the end of the name. If your computer has more than one hard disk, you will see these in the folders list too, with the second hard disk being identified by **(D:)**, the next **(E:)** and so on.

If you are connected to a network, you may have additional drives shown in your folders list. Files and folders stored on a network can usually be shared by everyone who has access to the network, although special *permissions* can limit access.

Note: Only disks and folders are shown in the folder list, files will appear only in the contents pane.

Expanding and Collapsing Drives and Folders

If a disk or folder contains further folders (subfolders), it has a small **plus** displayed next to it in the folders list. By clicking the **plus**, you expand the object to show its subfolders. This is often referred to as a hierarchical folder structure as there is a top level folder, followed by another folder nested within it followed by either other folders or files.



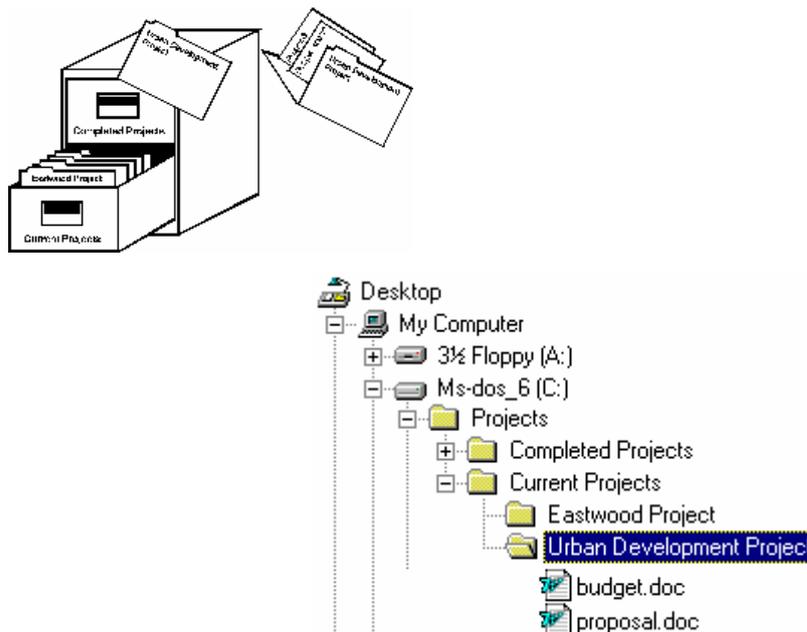
When you expand the disk or folder, the **plus** changes to a **minus**. If you click the **minus**, the object collapses and its subfolders are hidden again.

Note: The way your folders list appears to begin with depends on how you start Windows Explorer.

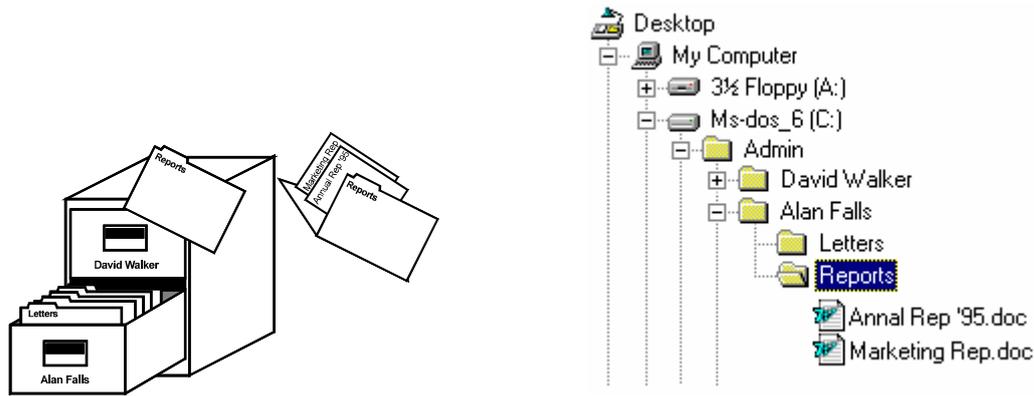
Understanding How Folders Are Organised

Below is a diagram of a manual filing system and its computerised equivalent. The computerised system is much like a manual filing system where folders are equivalent to the drawers and compartments in a very large filing cabinet, while files are the sheets of paper containing the stored information. You may have further divisions of the filed information, depending on what's the best way to file it. For example, someone working on a number of different projects may choose to create a folder to hold all their projects, and inside that, one folder for each project so that the files relating to the same project can be kept together.

This is often referred to as a hierarchical folder structure as there is a top level folder, followed by another folder nested within it followed by either other folders or files.



On the other hand, a secretary working for two business partners may create a filing system that organises documents by the partners' names and then the document type.



Copying and Moving Folders and Files

Windows Explorer can be used for managing folders and files on your system. You can move them from one place to another, or copy them to somewhere else so that you have more than one copy.

How to Copy or Move a Folder or File

- 1 Display the folder or file you want to work with.
- 2 Click the folder or file once to *select* it.
- 3 If you want to *move* the item, select the **Edit, Cut** menu option or hold down **[CTRL]** and press **[X]**.
If you want to *copy* the item, select the **Edit, Copy** menu option or hold down **[CTRL]** and press **[C]**.
- 4 Click the folder where you want to place the cut or copied folder or file.
- 5 Select the **Edit, Paste** menu option or hold down **[CTRL]** and press **[V]**.

The cut or copied item will be placed in this folder.

Note: As with most tasks in Windows and its programs, there is usually more than one way of doing things. The procedure above shows you two of the most popular ways to copy and move (one using the mouse and one using the keyboard). However, there are others you may find easier to use. These include dragging and dropping the item into the destination folder, and using the **Copy To** and **Move To** buttons if they've been added to the toolbar.

Creating Folders

You can create folders using Windows Explorer. To do this, make sure the drive or folder where the new folder is to be placed is selected then choose the **File, New, Folder** menu option. Alternatively, display the current contents of the drive or folder where the new one is to be created and then right-click in the contents pane and choose **New, Folder** from the shortcut menu.

Type a name for the folder then press **[ENTER]**.

Note: To create a folder on the desktop, you can right-click a blank area of the desktop and choose **New, Folder** from the shortcut menu.

Renaming Folders and Files

Using Windows Explorer you can change the name that you originally gave a file or folder. To do this, either click the file or folder name once, and then click it again (not a double-click), or point to the file or folder and right-click then choose **Rename** from the shortcut menu. Type the new name then press **[Enter]** to complete the task.

Note: If you are renaming files, and the file extension is visible in Explorer, you must make sure that the extension is added to the renamed file. If you rename the file with no extension, the program that was used to create the file will no longer recognise it. You will be shown a warning prompt to this effect if you do this.

Deleting Folders and Files

Windows Explorer can also be used for removing files and folders from your system when you no longer use them. If you delete a folder, any subfolders and files it contains will also be deleted.

To delete a file or folder, simply select it by clicking it and then choose the **File, Delete** menu option or press the **[DELETE]** key on your keyboard. You'll then be asked to confirm the deletion.

When you delete an item from your hard disk, it isn't permanently removed from your disk straight away. It is moved to the **Recycle Bin** and stays there until you 'empty' it. This means that you can recover a deleted item up until that point if you discover that you do, in fact, still need it.

Searching for Folders and Files

If you can't remember where you stored a file or a folder on your computer, you can use Windows Explorer's search facilities to locate it as long as you know a little about it such as its name, the program that created it, or some text that appears in it.

To start the search process, point to the drive or folder where you think the item is stored and right-click to display the shortcut menu. Choose **Search** from this menu to display the **Search Results** window. You can enter any combination of search information to help refine your search so that you narrow it down as much as possible.

Once you've entered your search information, click the **Search** button. Any files or folders that match what you asked for will be listed in the main window.



Exercise 4: Exploring Applications

- 1 Open up a minimum of three different applications (word processor, spreadsheet, presentation software etc)
- 2 Create a simple file in each application and save it to your own home folder. Include your name and date in the file.
- 3 Open up Windows Explorer and find the files you saved in your home folder.
- 4 Open each file and make sure the correct application opens to read the file.
- 5 Save and close the file in each application, by closing down the windows using any method you wish.

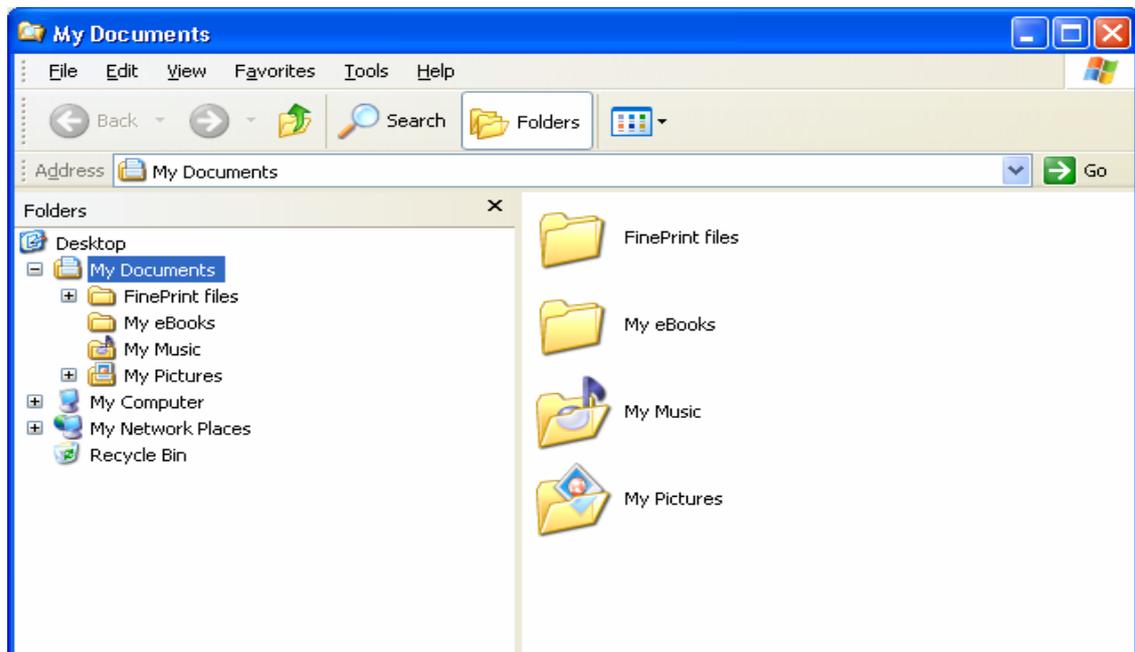
 **Exercise 5: Using Files and Folders**

Since each system can have a different file and folder structure, you will find that the files and folders shown in the illustrations in this workbook will not match your windows exactly. However, once you have located the **SS – Int 2** folder, the illustrations will match.

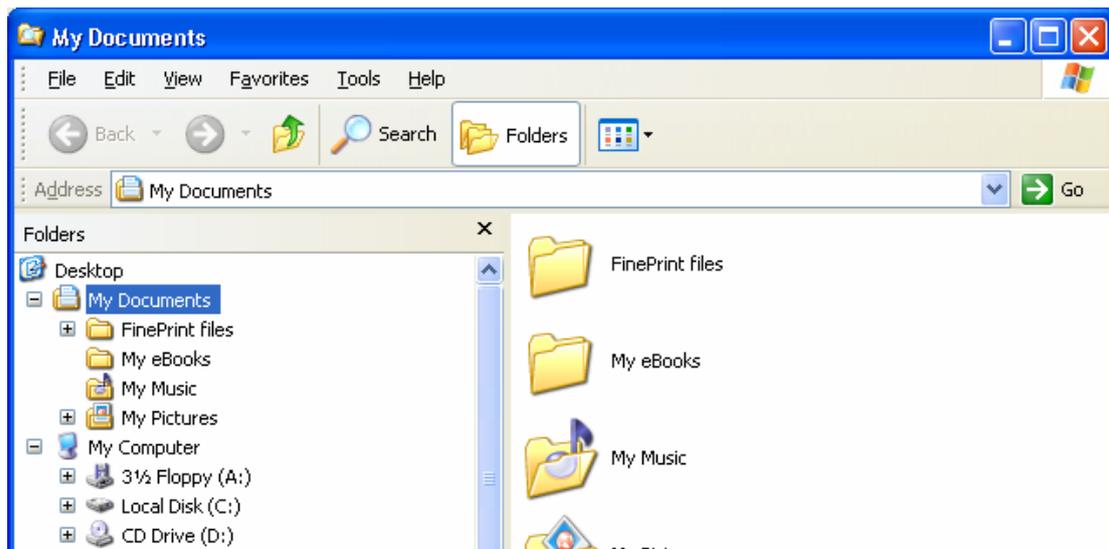
Check with your tutor to find out where the SS – Int 2 folder has been placed on your system.

- 1 First switch on your computer and open the Windows Explorer program:
Point to and click the **Start** button then choose **All Programs** (or **Programs**) from the menu.
Next, choose **Accessories** then **Windows Explorer**.

The **My Documents** folder is expanded so that you can see its contents.



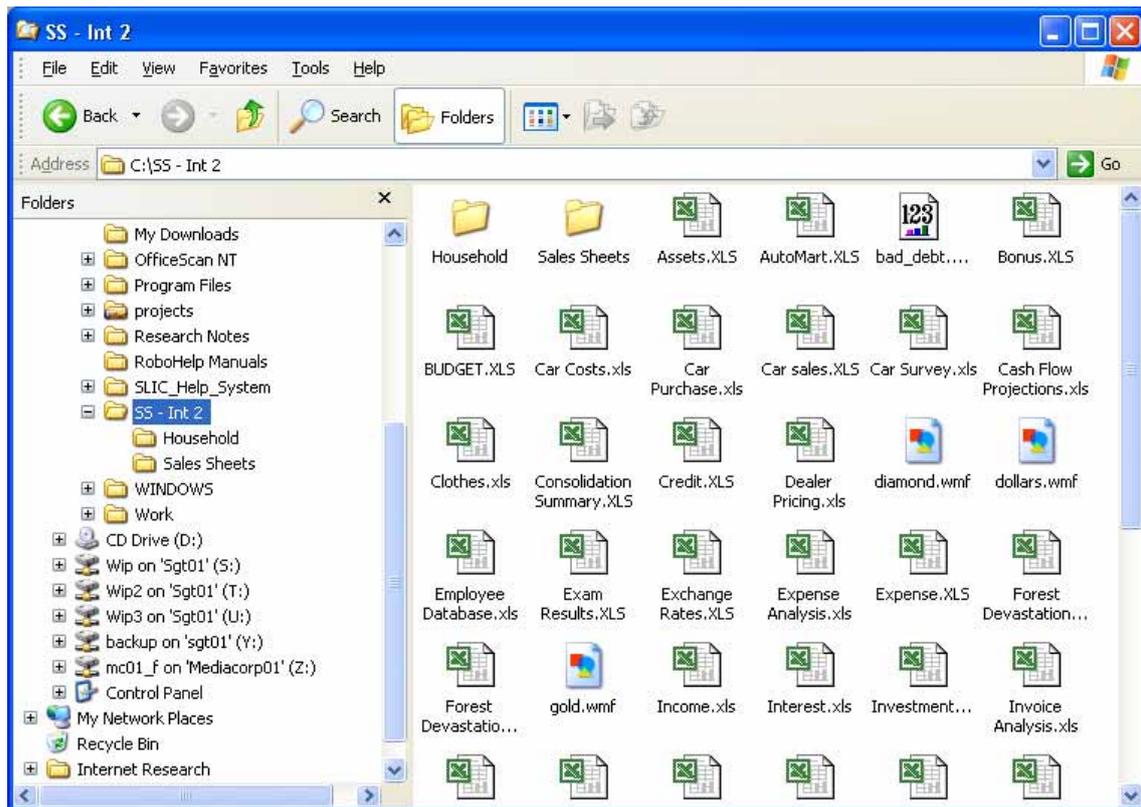
Click the plus sign to the left of **My Computer** in the folders list to see the disks that are part of your computer.



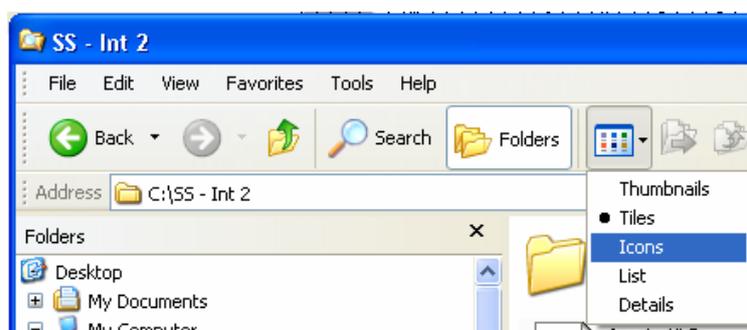
Important! On many systems you might not be allowed to access the C: drive and you may be instructed to save folders and files on another drive, eg a network drive. Do not go any further in this exercise until you know which drive your work is to be saved to.

- 2 Locate the **SS – Int 2** folder on your system then select and expand this folder so that you can see the subfolders in the **Folders** list and the subfolders and the files in the **Contents** pane.

Note: In this illustration, the **SS – Int 2** folder is stored on the C: drive. Remember that this may not be the case on your system. Also, the precise appearance of the items in the contents pane will depend on the way Explorer has been set to look — here the **Views** option that has been selected is **Icons**.

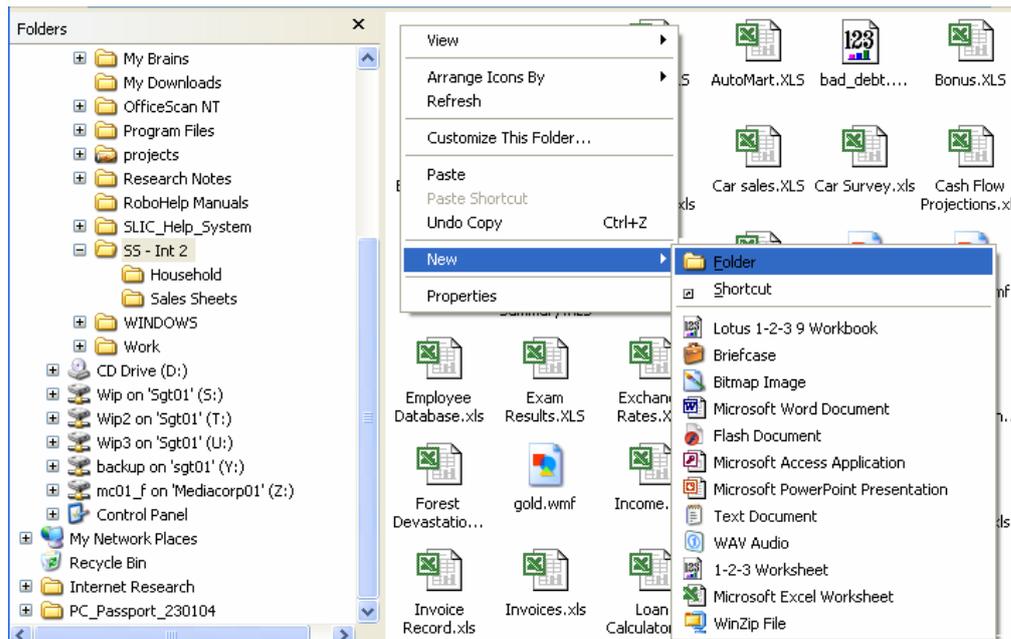


- 3 If your contents pane looks different from the one shown above, click the **Views** button on the toolbar and choose **Icons** from the list.

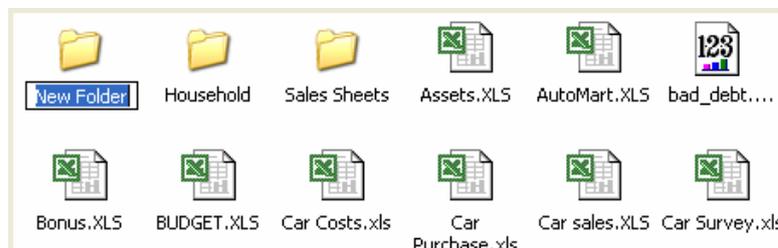


- 4 Experiment with the other options from the **Views** button and then set it to **Icons** again.
- 5 Now you'll rearrange the contents of the **SS – Int 2** folder into a structured filing system. Follow these steps to do this:

Make sure the **SS – Int 2** folder is selected in the folders list by clicking it. The first thing you'll do is create a new folder named after you, so point to a blank part of the contents pane and click the right mouse button. A shortcut menu is displayed. This menu gives you a list of options relating to where you pointed to. Point to the **New** option on the shortcut menu and then point to **Folder**.



Click **Folder** to create a new folder in the **SS – Int 2** folder, although exactly where it appears depends on where you pointed before right-clicking. This new folder appears in the contents pane, and its name is ready for editing:

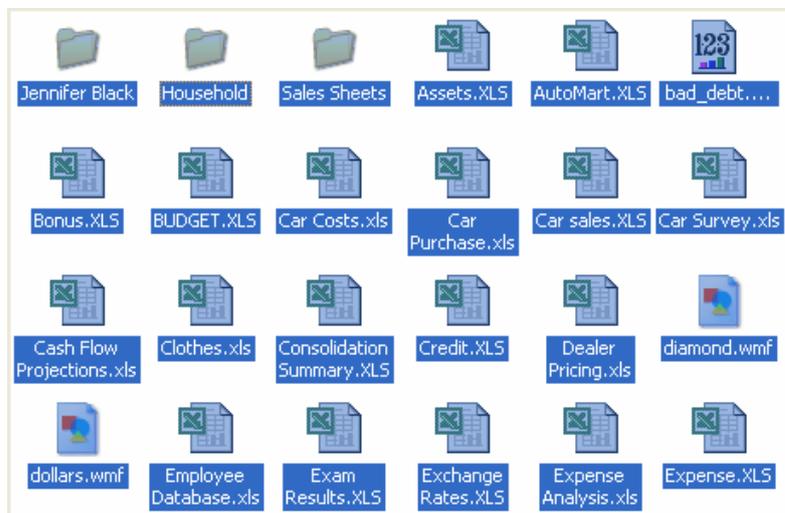


Type your first and last names and then press **[ENTER]**.

Note: For the purposes of this and future exercises, this folder will be represented by a folder with the student name **Jennifer Black**.

All the files and other subfolders in the **SS – Int 2** folder are to be moved into your new folder.

The first step is to select the items that are to be moved. Since you want all the contents of **SS – Int 2** except your folder, the quickest way to do this would be to select everything then *deselect* your folder, so hold down the **[CTRL]** key and press **[A]**. This selects everything, as you can see here:

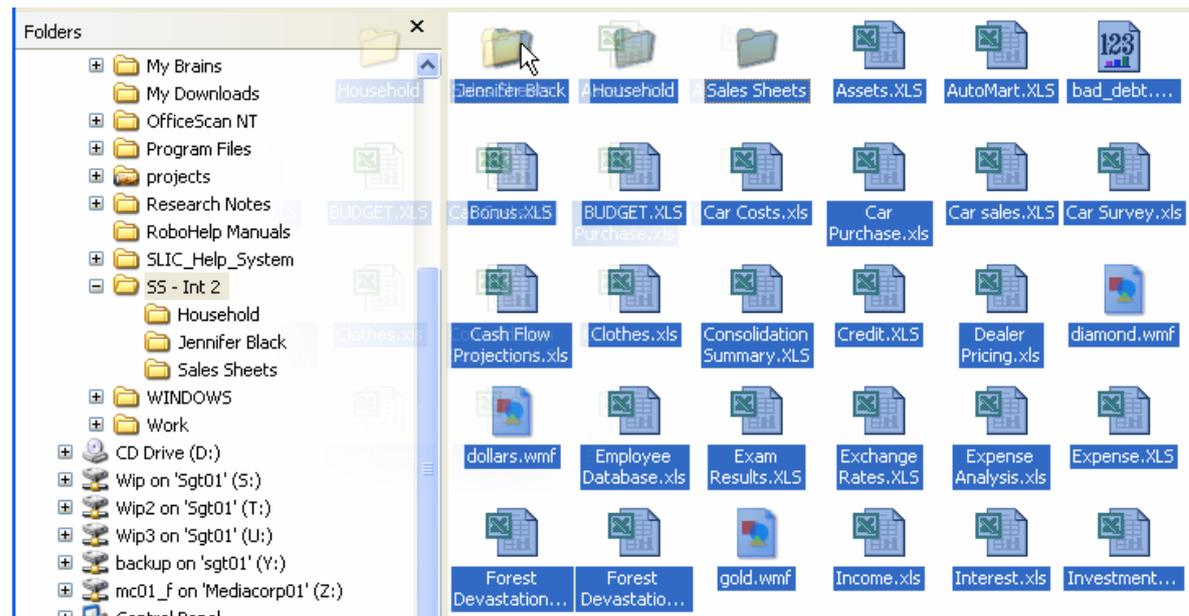


To deselect your folder, point to it then, holding down the **[CTRL]** key, click it.

Now the blue highlight is removed from your folder and everything except your folder is selected.

To move these items into your folder, point to any of the selected items then click and hold down the mouse button.

Next, still holding down the mouse button, drag the mouse pointer to your folder. As you drag, a shadow appears, and when the pointer is in the right position, your folder will appear highlighted again:



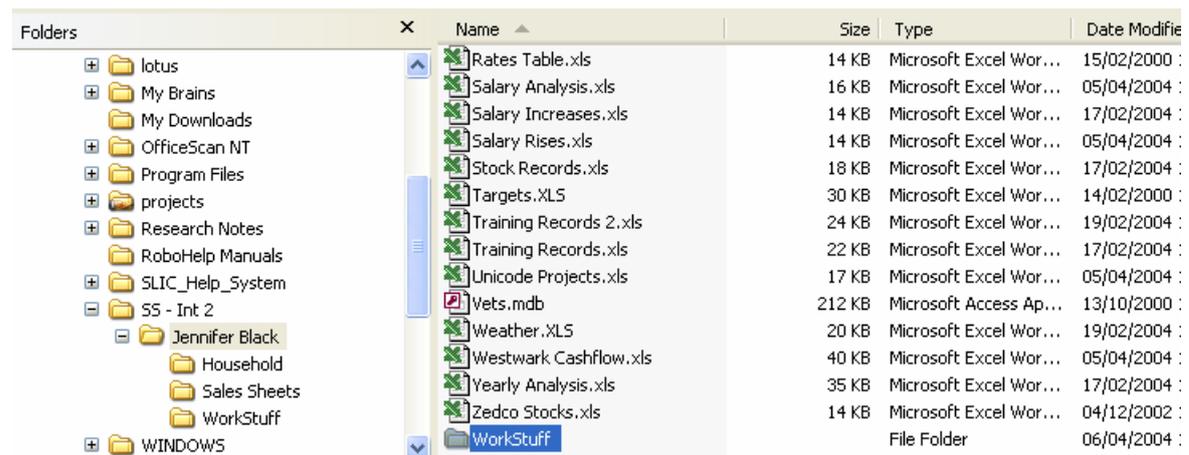
When your folder appears highlighted again, release the mouse button to move the selected items to this folder. Now the only item in the **SS – Int 2** folder is your folder:



In the **Folders** list at the left of the Explorer window, click the plus next to your folder to expand it. Now you can see that all the folders and files from the **SS – Int 2** folder are now in your folder.

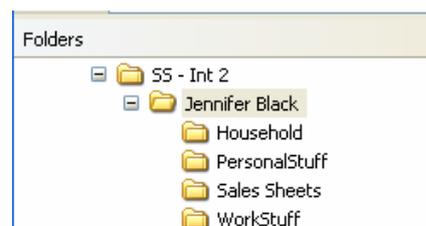
Another way to create a folder is to use the **File** menu. Click your folder in the **Folders** list to select it and then choose the **File, New, Folder** menu option to create a new folder in your folder.

Name this folder **WorkStuff**.



Create another new folder in your folder, calling this one **PersonalStuff**.

Your new folders are shown in the folders list:



Create a folder in your **WorkStuff** folder, naming it **Financial**.

Create a folder in your **PersonalStuff** folder and call it **Cars**.

Next you'll move some of the items from your folder into the subfolders you've created.

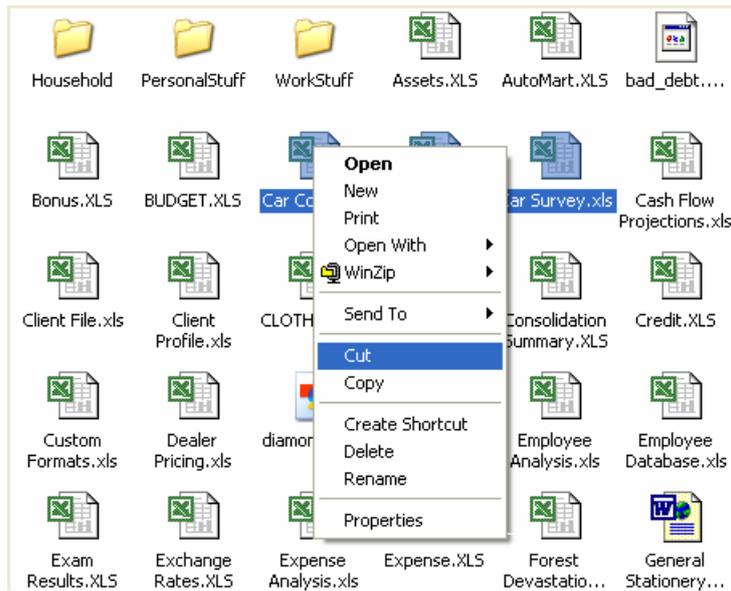
The **Sales Sheets** folder and its contents are to be moved into your **WorkStuff** folder, so click and drag this folder from the **Contents** pane to the **WorkStuff** folder in the **Folders** list.

Check that this folder has been moved and so appears only in the **WorkStuff** folder not its original location.

Make sure the contents of your main folder are displayed in the contents pane. Change the view if you want to.

Car Costs, **Car Sales** and **Car Survey** are to be moved to the **Cars** folder in your **PersonalStuff** folder, so select these files.

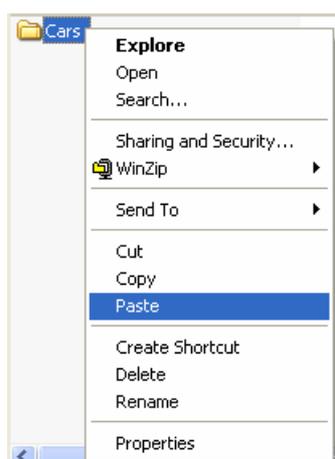
Point to one of the selected files and click the right mouse button to display the shortcut menu:



Click **Cut**. The selected files are dimmed to show that they've been cut.

Display the contents of your **PersonalStuff** folder so that the **Cars** folder is shown in the **Contents** pane.

Right-click the **Cars** folder and choose **Paste** from the shortcut menu to place the cut files here.



The files are removed from your folder and placed in the **Cars** folder.

Check that this is the case.

Move the **AutoMart** and **Dealer Pricing** files from your folder to the **Cars** folder.

Continue to file these items as shown in the table below. Where necessary, create any folder that doesn't already exist.

Move these files into the **PersonalStuff** folder:

Exam Results

Move these files into **Graphics** in the **PersonalStuff** folder:

Diamond Dollars Gold

Move these files into **Cars** in the **PersonalStuff** folder:

Car Purchase

Move these files into **Databases** in the **WorkStuff** folder:

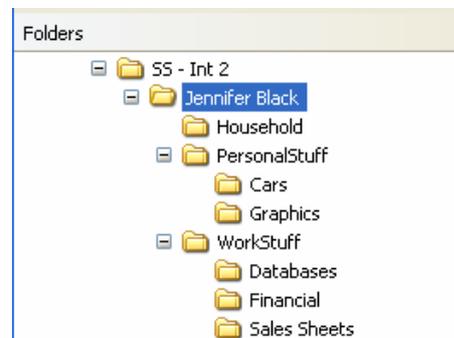
Employee Database Membership Database

Stock Records Vets

Move these files into **Financial** in the **WorkStuff** folder:

Assets	Bad Debt.wk4	Bonus
Budget	Cash Flow Projections	Consolidation Summary
Credit	Exchange Rates	Expense Analysis
Expense	Income	Interest
Investments	Invoice Analysis	Invoice Record
Invoices	Loan Calculator	Mag Sales
P&L	Pension	Premiums
Price	Profit&Loss	Projections
Rates Table	Salary Analysis	Salary Increases
Salary Rises	Westwark Cashflow	Yearly Analysis
Zedco Stocks		

The SS – Int 2 folder should now have this structure when fully expanded in the **Folders** list:



- 6 The **Sales Sheets** folder is to be renamed **Sales**. Point to this folder in either the **Folders** list or the **Contents** pane and right-click to show the shortcut menu. Choose **Rename** from the menu and edit the name to read **Sales**.
- 7 Close the Windows Explorer program by clicking the Close button.

Floppy Disks

A floppy disk was a popular way of storing data that you could carry around with you. It was quite common to have a floppy disk drive installed in your computer. Today most floppy disks have been replaced with CD-RW and DVD RW drives, or USB flash memory pen drives. You may still find computers with floppy disk drives and you will need to prepare the disks before using them. Formatting a floppy disk prepares it for use by the computer by dividing it up into usable areas called *sectors* and creating a new *root directory* and filing system on the disk. Many floppy disks are already formatted when you buy them, but if you buy unformatted disks, you'll have to format them before you can use them.

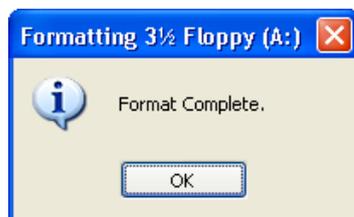
Important! Formatting a disk will delete any files or folders that are already on it, so take care if formatting a used disk and be sure the disk in the drive is the one you want to format.

To format a floppy disk, open the Windows Explorer program then right-click the floppy drive and choose **Format** from the list of options.

A dialogue box is displayed to allow you to set the conditions for the format.

When you click the **Start** button to begin the format, you'll be asked to confirm that you want to format the disk. Click **OK**.

When the disk has been formatted, you'll be alerted to any errors found on the disk. If there are no errors, you'll see a message like this:



Click **OK**.

You can now use the disk to store your files.

Creating Backups

A backup is a copy of a file kept in a different location from the original. Creating backups allows you to recover some or all of your work should anything happen to the original file. For example, if you accidentally delete a file, or if it becomes corrupted, you can use your backup copy instead. It may be that the backup is a bit out of date compared with the original, but at least you won't have to start from scratch.

How often should you back up?

This depends on how much work you do to any particular file. For example, if you have a file you use every day, you might want to back it up at the end of each day, or you may prefer to back it up twice a day — it depends on how careful you want to be. On the other hand, if you have another file that you only use once a month, then creating a backup once a month may be enough.

What should you backup?

You should back up anything you can't afford to lose.

How should you backup?

You create backups by copying files and folders using the methods described previously.

Where should you put your backup copies?

Backups should be kept on a different drive (and preferably a different computer) from the original file. This is so that, if the problem with the original was that the computer crashed or corrupted the file, the same problem won't affect the backup. Backups can be kept on any drive, so if you have access to a network you may decide to keep them there, or you might want to keep your backups on a floppy disk (or a CD-ROM for larger amounts of data if you have a CD burner).

Common File Extensions

There are a number of common file extensions which relate to software you might find on your machine. Some of these file extensions can also be found in graphics, image and picture formats that you might find on websites. A comprehensive list can be found at: <http://www.fileinfo.net/common.php>.

For example:

- ◆ A *JPEG* file format is a 24-bit compressed file format often used for web pictures or photos. Other common types include *GIF*, *TIFF* and *PNG*. These all provide compressed formats which can reduce a 24-bit image down to about 700 kb, however the JPEG file format produces better quality images.
- ◆ A *WAV* file format provides CD quality audio format for music. Sizes vary.
- ◆ An *EPS* file format that provides Postscript images graphics and text. Images can be quite large.
- ◆ A *BMP* file format produces uncompressed images that take up a lot of storage — around 1.4 Mb per 24-bit image.
- ◆ A *CSV* file format contains data separated by commas to indicate where each value could be placed in a cell if imported into a spreadsheet program.
- ◆ An *MPEG* file format is a common audio and video format used for downloading movies from the internet. Other formats defined from the Moving Pictures Expert Group (MPEG) which includes audio video and compression standards. An MPEG is typically a file containing digital audio and video which has been compressed.
- ◆ A MPEG-1 audio file format is commonly known as the MP3 file format will provide near theatre quality audio sound in stereo for most music, film played via a computer, CD or DVD. If you cannot hear the music being played it may be due to a sound problem and not related to the file format. Always check that the Master sound level on the computer has not been muted. The MPEG-1 video format provides video playback for most DVD players and the amount of compression required for playback in a PAL/NTSC system is about 7 megabits per second. Compressing video data makes the video files smaller whilst maintaining the video quality. Most video formats are now moving to MPEG-2, or MPEG-3.
- ◆ A *DBF* file format is a common database format used for DBAS and XBase database software.
- ◆ A *ZIP*, or *SIT* file format is a common file compression utility format used for compressing large files to fit onto storage media.

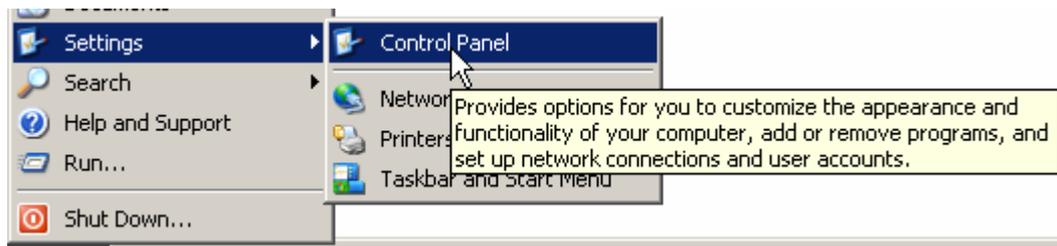
Customising Your Computer System

In order to change any of the computer system settings you will need to start up the system **Control Panel**. The contents of your Control Panel will be determined by the security settings on your machine. Some options may not be available or they may be restricted.

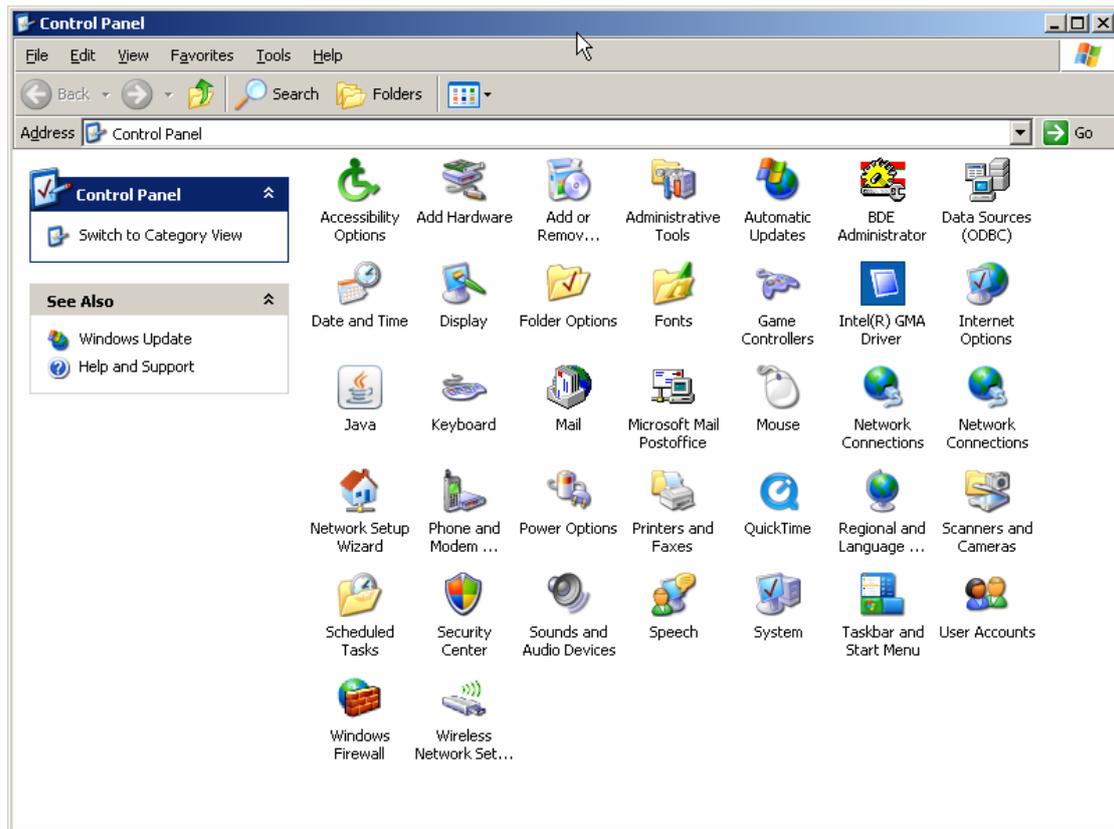
Changing the screen resolution

Bring up the **Control Panel** by

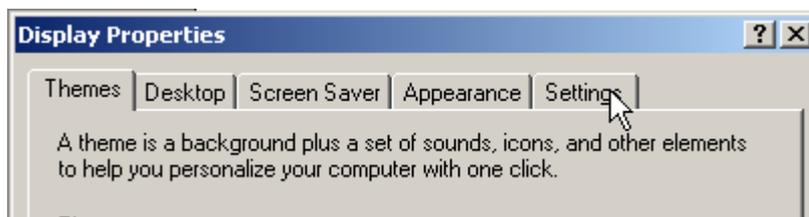
- ◆ Clicking on **Start** and selecting **Settings**
- ◆ Click on the **Control Panel** option.



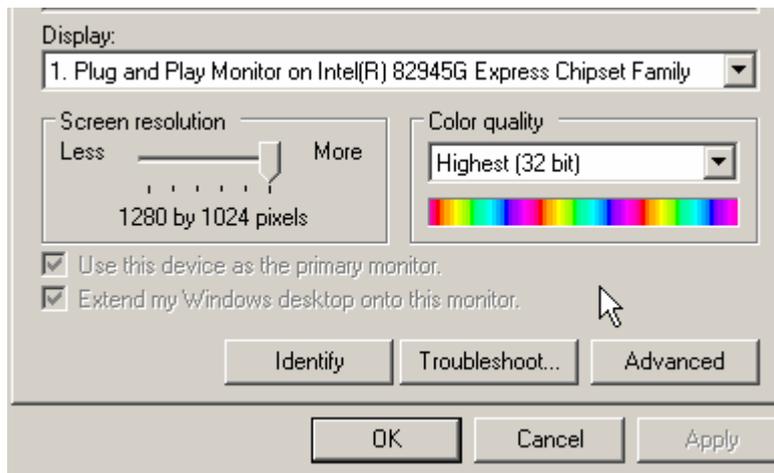
You will be presented with a panel that contains the various settings that can be customised and configured for your machine.



- ◆ Click on the **Display** icon. The icon displayed may change depending upon your operating system.
- ◆ The **Display Properties** dialogue box appears. Across the top of the dialogue box are tabs that allow you to customise the various options associated with the Display screen. Clicking each tab brings up the options for each element.
- ◆ Click on **Settings** as this is the option we are considering at this time.



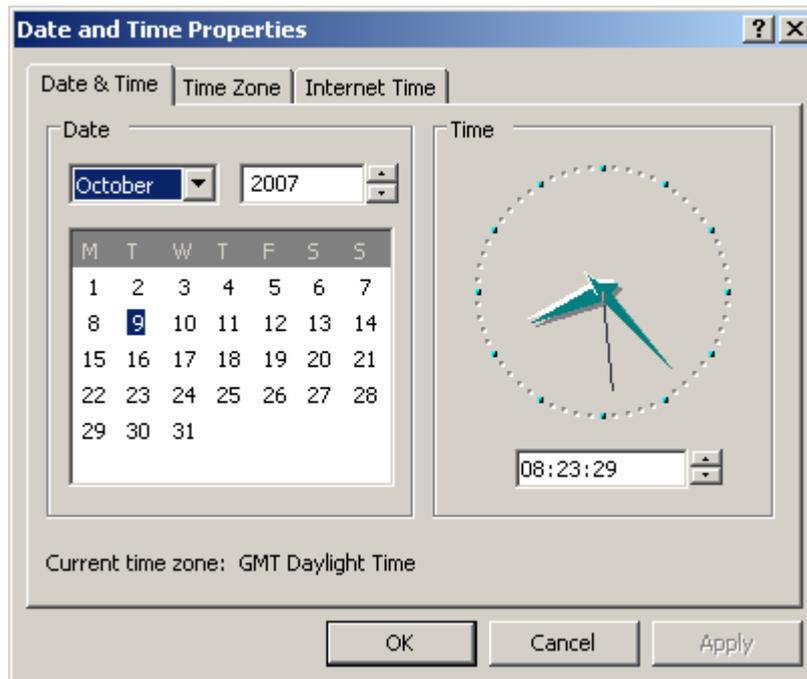
- ◆ The screen resolution slider allows you to customise the size of the screen display. Again depending upon the graphics card, and size of computer screen you may have more sizes available than those shown below. Moving the slider to the left increases the size of the text, icons etc on the computer screen. Moving to the right decreases the size of the fonts and icons.
- ◆ The colour quality can be set by clicking on the drop-down arrow and selecting from the choices available. This option sets the number of colours that can be displayed on the screen. Options are determined by your graphics display card and available graphics memory. Usually this should be set to the highest value.



- ◆ Experiment with these settings, if available to check on the impact of your changes.
- ◆ Click on **OK** to implement your changes, the screen resolution will change to reflect your settings and you will be asked to confirm the change. If you do not respond within 15–20 seconds the display is reset back to its original value.

Setting the Time and Date

The first thing to do is double-click the clock on the taskbar, you will be presented with the Windows XP **Date and Time Properties** box as shown below:



- ◆ To adjust the date, use the monthly calendar along with the month selector and year selector drop-down arrow.
- ◆ To adjust the time, click on the part of the time you want to change (hour or minutes) and then use the up and down arrows to change it. Thus if you click in the '08' section you can increase or decrease the hours. Move into the '23' section by clicking the mouse cursor in the area and increase or decrease the minutes etc.
- ◆ To adjust the time zone click on the **Time Zone** tab and then select your time zone from the selection tool provided. This lists all the defined time zones across the world.
- ◆ The **Internet Time** tab allows you to synchronise your computer system's clock with an internet server.

Once you have completed any changes then click on the **Apply** button to make the changes.

Setting Accessibility Options

The accessibility options allow you to customise your computer system for vision, sound and mobility. If you are blind or have difficulty seeing things on-screen, you can quickly set vision related options using the **Accessibility Wizard**.

If you are deaf or have difficulty hearing sounds from the computer, you can quickly set sound options. Here you can set visual warnings for system sounds, have captions displayed for speech and sounds, and more.

If you have difficulty using the keyboard or mouse, you can quickly turn on StickyKeys, MouseKeys, and FilterKeys, get extra keyboard help in programs, select the cursor size and colour options etc. The default settings means that Menus automatically keep the options you use most at the top, but if this feature does not improve accessibility, you can disable it using the wizard.

The initial settings are best set up using the Accessibility Wizard. To start the wizard, follow these steps:

- ◆ From the **Start** menu:
- ◆ Point to **All Programs**
- ◆ Point to **Accessories**
- ◆ Point to **Accessibility**
- ◆ Select **Accessibility Wizard**

The wizard takes you through the steps of setting text size, Display settings, Settings for vision, hearing and mobility etc. Once you have completed the process click on the **Finish** button and the changes are made to your computer system.

Your tutor may allow you to experiment with this wizard, to implement some changes. However, you may need to seek permission to perform this task.

Taking a Screen shot

You can use the operating system to capture screen images or you can use specialist applications that provide this facility for you. Here we are going to use the built-in operating system facilities. These are limited and you cannot take a picture of drop-down boxes, menu items, movies etc. If you wish to do this then you need specialist software to perform this. There are many commercial and free applications available.

Screen shots are useful in many ways. For example, if you receive an error message, you can take a screen shot and send your support person an exact replica of the error window. You can also use a screen shot to show someone a web page without sending them a link.

This guide uses screen shots to demonstrate how to do tasks within the operating system. If you are helping someone with a computer task or problem, and you cannot be present with that person you can use screen shots to illustrate your points.



Exercise 6: Taking a Screen Shot

- 1 Click the window you want to capture. Press **[Alt+PrtScr]** by holding down the Alt key and then pressing the Print Screen key. The Print Screen key is near the upper right corner of your keyboard. (Depending on the type of keyboard you have, the exact key names on your keyboard may vary slightly.)

Note: You can take a screen shot of your entire desktop rather than just a single window by pressing the Print Screen key without holding down the Alt key.

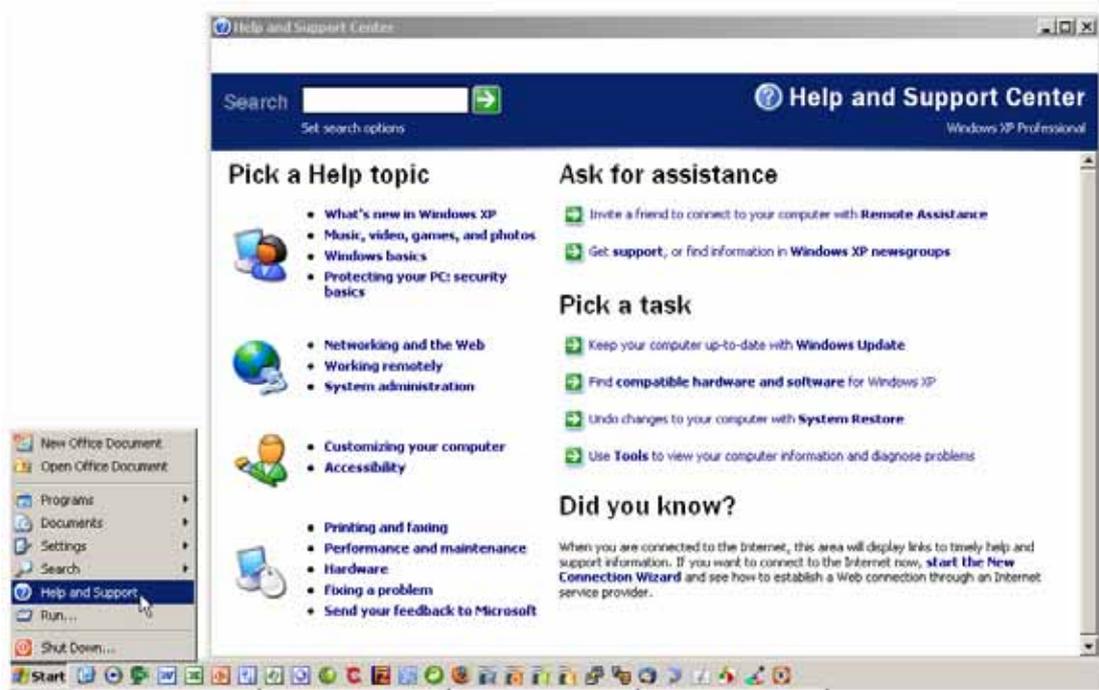
- 2 Click **Start**, click **Accessories**, and then click **Paint**. This starts up the Paint program.
- 3 In the Paint window, click **Edit**, and then click **Paste**.
- 4 When the image appears in the Paint window, click **File**, and then click **Save As**.
- 5 In the File name box, type a name for the screen shot, and then click **Save**.
- 6 You can now print or e-mail the saved screen shot just like you would any other picture.

Try out this process, by capturing:

- ◆ The complete computer screen
- ◆ A part of the computer screen such as a dialogue box, or program window.

Save the files to your disk area.

Using the help facility



The help facility supplied with the operating system gives general advice and hints that will cover around 85% of the common problems encountered whilst you are using your computer system. This exercise will familiarise you with the basics.



Exercise 7: Using the Help Facility

- 1 Start up the **Help** facility by clicking on the **Start** button, choosing **Help and Support** from the pop-up menu.
- 2 Select the Performance and Maintenance Topic.
- 3 Scroll through Performance and Maintenance tasks. Select one of the topics and follow the advice give. The right-hand side of the screen will give additional topics.
- 4 Explore the facilities.
- 5 Print one topic from the Performance and Maintenance section.

Computer Storage

Terms like computer storage, computer memory, and often, casually 'memory', refer to computer components, devices and recording media that retain data used in a computer system. Computer storage provides one of the core functions of your computer, that of information retention. This is one of the fundamental components of all modern computers.

Memory usually refers to a form of solid-state storage known as random access memory (RAM) and sometimes other forms of fast but temporary storage. Similarly, 'storage' more commonly refers to mass storage — forms of magnetic storage such as hard disks, optical storage such as DVD, CD-ROM and other types of storage which are slower than RAM, but of a more permanent nature.

Memory Capacities

The most common unit of storage is the *byte* which is equal to 8 bits. However to be useful, the numbers of bytes are talked about in kilobytes. There are divided opinions as to the value of a kilobyte with some advocating 1000 bytes. This is the approach taken by hard disk manufacturers. However for memory capacities a kilobyte is 1024 bytes which equates to 2^8 bytes.

For example, a computer with a storage space of 1,048,576 bytes (1024×1024), or one megabyte, could be used to edit a small novel. The majority of computer systems purchased today will have at least 512k–2048k of RAM supplied. Secondary storage tends to run between 80–500 Gb. There may also be a DVD R/W device and plug-in options would include flash drives from 64k–16 Gb.

RAM

Memory that ‘forgets’ when the power goes off is called *random access memory (RAM)*. There is another kind of memory called *read-only memory (ROM)* that does not suffer from this problem. ROM chips are pre-stored with information when they are manufactured, so they do not ‘forget’ what they know when the power is switched on and off. However, the information they store is there permanently so they can never be rewritten again.

In practice, a computer system uses a mixture of different kinds of memory for different purposes. The things it needs to remember all the time, like what to do when you switch on, are stored on ROM chips. When you are using your computer and it needs temporary memory for processing things, it uses RAM chips; it does not matter if this information is lost later. Any information you want to remember indefinitely is stored on its hard drive, flash drive, floppy drive etc.

It takes longer to read and write information from a hard drive than from memory chips, so hard drives are not generally used as temporary memory storage.

In gadgets like digital cameras and small MP3 players, flash memory is used instead of a hard drive. It has certain things in common with both RAM and ROM. Like ROM, it remembers information when the power is off but like RAM, it can be erased and rewritten more or less as many times as you like.

SDRAM

SDRAM stands for *synchronous dynamic random access memory*, and it is a fast method of delivering information from the computer’s memory. SDRAM runs at 133 MHz, which is much faster than the earlier RAM technologies.

The memory requires a periodic refresh to maintain the data integrity. Once all of that dynamic refreshing and storing are done with, the result is a dense package of data, one of the densest in the memory world.

Another benefit of SDRAM is what is called *pipelining*. Because the SDRAM chips are so dense and complex, they can accept more than one memory write command at a time. This means that a chip can be processing one command while it accepts another one, even if that new command has to wait its turn in the pipeline.

RAM chips are constantly changing and newer chips are faster than their predecessors. For a fuller explanation of how RAM works and the different types of RAM you can buy look at:

<http://www.howstuffworks.com/ram.htm>

A computer system usually contains several kinds of storage, each which serves a particular purpose.

Storage Media

There are a number of popular forms of data storage in use. Hard disks are stored inside the system unit of the computer. Your computer will usually have one hard disk but can have more, with the main disk usually referred to as the C: drive and any others going up the alphabet from D. A hard disk usually consists of several disks (called *platters*) plus a *read/write head* for each platter surface inside a sealed unit to protect it from dust and other hazards. This is important because a single grain of dust can cause a *head crash*, which can ruin the entire disk.

The capacity of hard disks, have changed dramatically and can range from 80 GB up to 1 terabyte in size, dependent on how much money you want to spend. You can buy both internal hard disks and external hard disks that connect through a USB port.

Some of these external hard disks have motherboards built into them and act as media centres that can connect directly to your TV to show films you may have downloaded from the internet (copyright permission assumed).

CD and DVD Rewriters

CD rewriters are devices that allow you to store music and data on to a CD. The CD can be used and once you have finished with the data it can be deleted and the disk reused. This process can be carried out a number of times using the same disk. The higher the disk quality the greater the number of times this process can reliably be carried out. These are gradually being replaced by the DVD rewriter as a CD can only hold around 750 megabytes of information. However, they are useful for producing backups of data and your programs.

DVD recorders and rewriters are well on the way to replacing the VCR, and although they have some competition from the hard disk recorder, the convenience and portability of storage on a small DVD disc make them a much more of a consumer choice.

Basically the DVD rewriter can be used in the same way as a video recorder, to record media, data, music, etc for future playback. The advantage of the DVD is of course that it can hold between 4 and 8 gigabytes of information. This makes the DVD a good backup device for the majority of home users.

There are numerous formats of recording media to choose from and there are inconsistencies between DVD rewriters, just as there are between DVD players. So you can select from DVD-R, DVD+R, DVD-ram, DVD-RW, DVD+RW. The choice is really determined from what type of rewriter you have and where you want to use the DVD that you have produced.

The single -R at the end generally means that you can write to the DVD disk once and then read from it many times. The +RW generally allows you to read from and write to the disk many times. The number of times is governed by the DVD disk quality with the more expensive disks allowing greater read/write cycles.

Removable Storage Media

There are a number of popular forms of removable data storage in use. Some of these are detailed below.

Floppy disks can be used to move or copy information from one computer to another, or to hold a backup copy of your data in case your system fails or you lose the data another way. These disks are 3½ inch plastic squares containing a thin magnetic disk. In terms of text only, you could store roughly one standard dictionary on a floppy disk. However, they are disappearing as newer storage devices are produced. Typical capacity: 1.44 Mb.

Memory sticks are a newer type of storage. Sometimes referred to as flash drives, they are small, lightweight storage devices. These come in a variety of forms and the most common type is connected to your computer via the USB port, which means that on the newer versions of Microsoft Windows, for example, you simply plug them in and use them. Like floppy disks you can use take files from one computer to another on a memory stick; however, they hold much more information. Typical capacity: 32–8 Gb.

A *Zip disk* is like a floppy disk, but is physically larger and can store more data, usually starting from 100 Mb, although you can buy disks with larger capacities. To use these disks you need a Zip drive which these days you usually plug in to your computer, but you can buy a PC that has a Zip drive built into the system unit. Again as with the floppy disk drive these devices are gradually being phased out as the memory stick drives can hold more information. Typical capacity: 100 Mb.

One *CD-ROM* (Compact Disk-Read Only Memory) can hold the same amount of data as about 500 floppies, although this varies from manufacturer to manufacturer and increases as technology advances. Using a CD-ROM drive (the device used to read/write a disk) equipped with a special laser, known as a CD-writer, the drive can write, or burn, information onto a blank disk. Using a CD-writer, a disk can only be written to once.

Using a CD-Rewriter and special CD-RW (Compact-Disk Re-Writable) format disks, the user can both write to the disk a number of times, and delete files from the disk, making it like a very large floppy disk. Typical capacity: 780 Mb.

A *DVD*, (Digital Versatile Disk, or Digital Video Disk) can hold a lot more information than a CD-ROM due to the use of a built-in second disk. The information on a DVD is read by the DVD drive at a much faster rate than a normal CD. A film, cinema quality sound and special features can all be stored on a single disk. Typical capacity: 1.4–9.4 Gb.

Tapes and tape cartridges are also widely used by large organisations although, because of their low access speeds, they are mainly used for long-term storage of data. Their main use is backing up data in case of loss. Typical capacity: 20–40 Gb.

Memory Cards

The memory card is a solid-state device that is used to provide data storage for a wide variety of electronic devices. These devices can be used in digital cameras, mobile phones, laptop computers and music players.

They are very versatile and rugged in construction so that they can be used in a variety of devices. They offer high re-record capabilities along with large storage capacities. They are also very versatile with many types of card being interchangeable with several devices. Thus your card may fit in your camera, play station or computer system.

There are also non-solid state memory cards that do not use flash memory, and there are many different types of flash memory. They have been suggested as a possible replacement for the hard disk in MP3 players, although USB flash memory drives, which work on almost any computer with a USB port, have been filling this role instead.

Some of the new laptop computers now come with flash memory cards rather than hard drives and this means that the machine can run longer, less power requirement and they are also lighter in weight as well.

Card Readers

A memory card reader is a device, which typically has a USB interface, for accessing the data on a memory card such as *compact flash (CF)*, *secure digital (SD)* or *multimedia card (MMC)*. Most card readers will also offer write capability, and together with the card, this can function as a simple pen drive.

Today card readers are categorised into three different types. This is determined by the quantity of the card slots:

- ◆ A single card reader. This will have a slot for a single card and will be proprietary for the card.
- ◆ Multi card reader. This will have a multiple number of card slots (from 9–15). This generally covers the majority of memory cards utilised in your devices. There are newer devices that claim to be able to deal with all memory card devices on the market.
- ◆ Series card reader. These again tend to deal with a specific type of memory card but allow you to have up to 4 of the same cards in the device.

The purpose of the card reader is to allow you to transfer the data on the card to your computer system or to transfer components such as music, pictures, and phone numbers from your computer onto the memory card.

File Compression

To enable file transfer to be as fast as possible a number of file compression utilities have been developed. These allow the bandwidth to be utilised more efficiently and will speed up the transfer of data or software programs. With digital photography and a wealth of information on the internet the need to store data on removable media depends on how much you can download or compress data to fit onto the media you have. There are a number of commercially available products which can compress large files like images significantly so they may fit onto a floppy disk.

The two most popular are:

- ◆ **WinZip:** a file compression utility which is freely downloadable for use for a limited period to try. It compresses files and programs to make transfer faster. Most files have a .zip extension, eg sqa.zip.
- ◆ **Stuffit:** is a file compression utility which compresses and decompresses files for sending via the web, or by e-mail. These files normally have a file extension of .sit, eg sqa.sit.

Input Devices

Keyboards and Pointing Devices

The *keyboard* is the primary input device for the computer and contains three distinct areas. The *alphanumeric* keyboard makes up the main area of the keyboard and includes the most common punctuation marks and symbols. The *function keys* run in a straight line along the top of the keyboard, and perform different commands for different programs. The *arrow keys* (also known as the *cursor keys*) provide additional navigation to supplement the use of the mouse.

The mouse is essential to modern computing as most programs are operated using a *graphical user interface (GUI)*. This type of system uses small pictures called icons to represent what tasks are linked to them. If, for example, you double-click the Microsoft Word icon, this program will start.

The mouse is so-called because of its appearance, and can include different button configurations. The basic version has two buttons, but other versions have special roller buttons for internet use. The undercarriage of the standard mouse contains a small chamber with three rollers and a ball that allow you to control the movement of the pointer on the screen, or *desktop*, by pushing the mouse along a flat surface. The most modern mouse designs are wireless, sending navigation commands via a short range radio wave, or optical, sending them via a beam of infra-red light just like a television remote control.

There are many other forms of pointing device available. On hand-held and some portable laptops, a light pen is used to point and draw items directly on to the screen, but this feature can be incorporated into any normal computer, using a special pad and compatible software. Trackballs use the same principle as the mouse, but place the ball from the underside of the mouse on top, allowing your hand to move the ball and the pointer.

This is useful for graphic designers, or anyone who requires a level of precision that the mouse cannot provide. Touch-pads and pointer-sticks are found on some laptops and function similarly. For people wishing to play games such as flight simulators or driving games, there are joysticks and steering wheels available that carry out the same tasks as real-life joysticks and steering wheels.

Speech

Not everyone can type proficiently, or quickly. The mouse has gone some way to balancing this, but it has been in the last few years, with the advent of the computer-linked microphone and speech recognition programs, that real advances have been made. It is already possible to dictate a letter using such a program. After an initial period of training the program can 'understand' and display what you say.

Graphics

Recent input devices include those that allow you to read images into your computer. This process is called *digital imaging*. Digital cameras and video cameras do not need film; instead they use a *memory card*. The software that is supplied with digital cameras allows you to copy the images from the memory card to a computer disk. They are capable of producing good to high quality pictures and video, and allow manipulation of these images using a suitable *graphics package*. This is useful for removing defects, or simply enhancing a dull photo.

Web cameras (webcams) are becoming a popular means of communication via the internet in that they can be used to see the person to whom you are speaking. For example, when time or distance issues mean you cannot meet with someone in person, you can use a webcam to see the person as you speak with them.

Scanners are used to transfer photographs, text, or other items on to your computer. There are different types of scanner. Flatbed scanners look like a photocopier, and the item to be scanned is placed on a glass plate as the scanning head passes below, allowing you to scan from books or bulky objects. Sheet-fed scanners look like fax machines, with one page at a time being fed into the machine. It is then scanned and returned. A hand-held scanner is also available. This scans when the device is dragged over text and images on a page.

Tablets (or digitising tablets to give them their proper name) can be used to draw pictures using a special pen (also known as a *stylus*) that uses electronics rather than ink to draw. Each point on the tablet represents a point on the screen and when you drag the pen over the surface of the tablet, the tablet sends a signal to the computer, allowing you to enter your drawing onto the computer. Touch pads or touch screens work in a similar way. Each touch point on the pad or screen sends a signal to the computer, allowing you to interact with a window, menu, icon or pointing device — often referred as a *WIMP* system.

Game Controllers

A *game controller* is the name given to any type of input peripheral device that is used to control a game running on your computer system. The controller is typically connected to the computer system via a USB connection; however some older devices may require a serial port connection.

The device may be the keyboard, a joystick, mouse, gamepad or any other device that is designed to provide a realistic interface to the game. Special purpose devices exist for some of the more specialist games such as a flight yoke for a flying simulation or a steering wheel for a driving game.

There are a wide variety of devices available to suit all game needs. However, the keyboard and mouse also provide reasonable input for computer games.

Touch Screens

Touch screens are devices that have the ability to display information and accept input at the same time. The display screen device performs both functions. This allows the screen to be utilised as an input device and as a touch pad. Selected areas of the screen may have buttons etc which the user can interact with to provide input to the computer system.

The use of these devices is increasing with personal digital assistants (PDAs) making use of this technology. The mobile phone industry has also started to utilise this concept.

Scanners

A scanner is an input device that takes pictures, text or even handwriting and turns it into a digital representation that can be stored in the computer system. The most common type of scanner utilised by computer systems is the flatbed scanner.

These devices use a similar technology to that used in digital cameras where a image sensor is used to identify the light and dark areas building up a bit map image of the object that has been placed in the scanner.

There are other types of scanner available but these tend to be used in specialist areas. A rotary scanner is used for high-speed document scanning. For 3 dimensional images a 3D scanner is required but this type of scanner is very expensive compared to other types of scanner.

Scanning the picture, text or object is one part of the complex process. The representation must be transferred to a computer. The amount of data generated by a scanner can be very large and is dependent upon the resolution of the scanning process. The larger the resolution the larger the resulting representation can be.

For example, a sheet of A4 scanned at 24-bit resolution, without compression would require about 100 Mb of data. In order to cope with this amount of data a fast connection is required and the newer scanners will utilise a high speed USB connection to the computer system.

MIDI Keyboard

The *MIDI keyboard* is a piano-style input device which allows the user to utilise the computer system as a musical instrument. The term MIDI is an acronym for *musical instrument digital interface*.

The device is an input device and does not produce any sound. The device generates electronic signals which are processed by the MIDI software running on the computer system which performs the complex process of converting these signals into sound to be output by the speakers attached to the computer system.

The versatility of the MIDI keyboard and the computer allows the user to use the device to simulate all types of musical instrument from a simple piano to drums to representing the string section from an orchestra.

Output Devices

Monitors

The screen, or monitor, allows you to see what is happening on your system. For example, if you were typing a letter, you would see the letters appear on-screen as you pressed the keys. There are also different types of screen or *visual display unit* (VDU). The most common is the same system used in a television called a CRT (cathode ray tube) and the most basic units are about the size of a 15' portable TV. CRT monitors tend to be cheaper and can offer good viewing angles. This unit is usually included when you buy a new computer. The second is a *liquid crystal display* (LCD), which is the same as a hand-held TV. This is usually extra to a computer package, but much thinner, with some units taking up no more than 20' x 12' x 5' on the desktop.

A good quality monitor setup correctly can often improve viewing web pages, images and programs like games, but it will also depend on the type of graphics card, video card and the drivers that are installed on the computer.

CRT Monitor

CRT is an abbreviation of Cathode Ray Tube and this describes the technology that was used in the older Television systems and computer system monitors. The CRT works by moving an electron beam back and forth across the back of the screen. Each time the beam makes a pass across the screen, it lights up phosphor dots on the inside of the glass tube, thereby illuminating the active portions of the screen. By drawing many such lines from the top to the bottom of the screen, it creates an entire screen full of images. Initially, in computing terms, this was bright green on a dark green background then black and white became popular, before the move across towards colour monitor screens.

The size and resolution of the CRT monitor determined the price of these devices. By referring to the sharpness and clarity of an image, resolution was the term most often used to describe CRT monitors. For graphics monitors, the screen resolution signifies the number of dots (pixels) on the entire screen. A 640 × 480 pixel screen was capable of displaying 640 distinct dots on each of 480 lines, or about 300,000 pixels. This translates into different dots per inch (dpi) measurements depending on the size of the screen. For example, the 15-inch VGA monitor (640 × 480) displayed about 50 dots per inch.

The main disadvantage of CRT monitors was the large size, their electricity (power) consumption, and the heat that was generated from each monitor. The picture quality was never an issue and for some applications today the CRT monitor offers a far superior display to the current LCD technologies. Technology is moving from CRT to HDLCD (High Definition LCD) screens which provide 4 pixels for every single pixel on our current LCD screens and offer sharper and higher resolutions.

TFT Monitor

This is a thin display screen for computer and TV usage. The first flat panels appeared on laptop computers in the mid-1980s, and the LCD technology became the standard. LCD screens became available for desktop computers around the mid-1990s and exceeded sales of CRTs for the first time in 2003.

Unlike analogue CRTs, flat panel screens are digital. However, although almost all new flat panel monitors accept digital inputs, many PCs continue to offer only analogue outputs. Going directly to the digital input of the display creates a sharper image.

Flat panel screens have a precise matrix of rows and columns based on the highest resolution supported, and this 'native' resolution displays the best. If you send an 800 x 600 image to a flat panel rated at 1280 x 1024, the 800 x 600 will be scaled up to 1280 x 1024. The quality of scaling algorithms between brands can differ substantially; therefore, you are better off purchasing a flat panel display with the native resolution you plan on using all the time.

Passive Display

This was called a 'passive matrix' when used for computer screens. All of the active electronics (transistors) are outside of the display screen. Passive displays have improved immensely over the years but they do not provide a wide viewing angle.

Active Display (TFT)

This technology is widely used for all LCD applications today. This includes laptop and desktop computers, TVs, etc. Known as 'active matrix' displays, a transistor is used to control each sub-pixel on the screen. So for example a 1024 x 768 colour screen requires 2,359,296 transistors; one for each red, green and blue sub-pixel (dot). The active matrix display provides a sharp, clear image with good contrast. Fabrication costs were originally higher than for the passive matrix display which caused both types to be utilised in the early days of laptop flat panel construction.

Plasma Monitor

The plasma display technology is also known as the 'gas discharge display,' system. The technology consists of a flat screen technology that uses tiny cells lined with phosphor that are full of inert ionised gas — a mixture of xenon and neon. Three of these cells make up one pixel. One cell has red phosphor, one green and the final one is blue. The cells are sandwiched between x- and y-axis panels, and a cell is selected by charging the appropriate x and y electrodes.

The charge causes the gas in the cell to emit ultraviolet light, which causes the phosphor to emit colour. The amount of charge determines the intensity, and the combination of the different intensities of red, green and blue produce all the colours required.

Plasma displays were initially monochrome, typically orange, but colour displays have become very popular and are used for home theatre and computer monitors as well as digital signs. The plasma technology is similar to the way neon signs work combined with the red, green and blue phosphor technology of a CRT. Plasma monitors consume significantly more current than LCD-based monitors and are almost at the same level as the CRT monitors in terms of power consumption.

Printers and Plotters

A printer allows you to see in hard copy the document that you have prepared. Once again there are a number of types available. Probably the most popular is the laser printer, which is faster and quieter than earlier printer types. Other types include the inkjet printer, which is a popular choice for home systems.

The price is not the only cost that you need to consider if you plan to buy a printer. You will also have to replace the disposable ink or toner cartridges when they run out. If you are planning to buy a printer, you may find it useful to find out how many pages the cartridges for that printer will print.

When it is necessary to print something unusual, or technically precise, a special machine called a *plotter* is used. This machine outputs very high quality images on various paper sizes, and would be used by design companies and architects. Whereas a printer draws lines by placing a series of dots very closely together, a plotter uses a pen to draw continuous lines.

Inkjet Printers

Inkjet printers are really an evolution of the old dot matrix printers. Instead of metal needles in the print head, they use hundreds of tiny guns to fire dots of ink at the paper instead. The characters they print are still made up of dots, just like in a dot matrix printer, but the dots are so very tiny that you cannot see them. The fact that the ink tends to flow into each other also hides this fact.

Different makes of inkjet printer fire the ink in various ways. In the Canon printers, the ink is fired by heating it so it explodes toward the paper in bubbles. This is the reason why Canon sells its printers under the brand name 'Bubble Jet'.

The Epson printers work a slightly different way. They use an effect called piezoelectricity. Tiny electric currents controlled by electronic circuits inside the printer make miniature crystals jiggle back and forth, firing ink in jets as they do so.

So you can think of inkjet printers very simply as a firing squad of minute nozzles firing off millions of dots of ink at the paper every single second.

Inkjet printers can make any letter, number, or other character from a pattern of tiny dots. The old style dot matrix printers did this too with a five by seven square of metal needles. With 64 dots (eight by eight), you can make virtually any character but things tend to look a bit 'dotty' when they are enlarged.

Laser Printers

Laser printers employ a laser beam to create an image of your page on a drum. The light of the laser changes the electrical charge on the drum wherever it gets hit. The drum is then rolled onto a reservoir of fine toner, which is picked up by the portions of the drum where the static charge has been altered. Consequently, the toner is transferred to the paper by heat and pressure, in the same way a photocopier operates.

Since an entire page is carried over to a drum prior to the toner application, laser printers are sometimes called page printers. There are two additional types of page printer that sometimes come under the category of laser printer, even though they do not use lasers.

One type uses bundles of LEDs to expose the drum, the other type employs LCDs to perform this task. However, both of them function like a typical laser printer once the drum has been charged with the page image.

A very important distinguishing feature of a laser printer is resolution. The standard resolution extends from 300 dpi (dots per inch) at the bottom end to 1,200 dpi at the top end of the scale. Some of laser printers achieve higher resolutions with techniques generally known as *resolution enhancement*. HP laser printers tend to use this technology.

A standard black and white (monochrome) laser printer employs a single toner cartridge, whereas a colour laser printer will use four toners to print in full colour. Colour laser printers are generally about five times more expensive than their black and white counterparts; however, the price of the colour laser printer is dropping.

Laser printers give a very high quality print out and are capable of printing an almost unlimited variety of fonts. All laser printers have a basic set of fonts called internal or resident fonts — however additional fonts can be added. Laser printers are very able when it comes to printing graphics but you need a good amount of memory in the printer to print very high-resolution graphics.

Printer Cartridges

Printer cartridges can be divided into two main groups: inkjet cartridges / ink cartridges for inkjet printers and laser toner cartridges for laser printers. However, these printer cartridges can be further subdivided into 3 types, namely OEM (original equipment manufacturer) cartridges, compatible cartridges and remanufactured cartridges.

OEM cartridges have been in the market since the very beginning. They are also known as Genuine OEM cartridges and are produced by the printer manufacturers or their licensed partners. These types of printer cartridge will carry the names of the printer manufacturer, such as Canon, Epson, Lexmark, etc. Although these ink or toner cartridges are generally of high quality, they also tend to be very expensive. Replacement cartridges can actually cost more than a low-price printer these days.

Compatible cartridges are specially manufactured to meet or exceed OEM specifications, offering the same quality and reliability of OEM cartridges. However, they are manufactured by third-party manufacturers and do not carry the printer brand names on the cartridges. These types of cartridges are sold at 1/2 or 1/3 of the price of the OEM cartridges. Therefore, they are cost-effective alternatives to expensive OEM cartridges.

Most compatible inkjet cartridges are manufactured 100% brand new, containing only new components. Compatible laser toner cartridges may include both new and used components unless otherwise stated.

The *remanufactured cartridges* are also called refurbished cartridges. They will tend to be OEM or third-party manufacturers' inkjet and toner cartridges which have been through one cycle of service and have been recharged. Every remanufactured cartridge will have been thoroughly cleaned, worn out parts replaced, filled with the same ink formulation, and gone through a vigorous testing process.

Remanufactured cartridges are cheaper than OEM cartridges but slightly more expensive than compatible cartridges. They are very popular among environmentally concerned customers. If you consider that on average it takes 6 pints of oil to produce a new toner cartridge and hundreds of year to decompose an old one in landfill, remanufactured ink/toner cartridges are both environmentally friendly and cost effective.

Disposal of Printer Cartridges

It is quite likely that, at home or within an organisation, you have witnessed the casual discarding of inkjet and laser printer toner cartridges which eventually add to the amount going into the rubbish bin and then onto land-fill. However, it does not need to be that way as there are ample opportunities now to get them recycled.

Good firms should be able to renovate them to a high standard, sometimes with a performance better than new. If you can get your cartridges to a collector or collection point there is a good chance that part of the deal will be that one or more charities will benefit. In some instances you can receive payment yourself or reduce the amount you pay on your next printer cartridge.

The other side of this is buying recycled cartridges. Witness the low price of printers and the frequency with which the cartridges run out, especially with a multi-colour device which may have lots of ink still left when only one colour is exhausted. It is sometimes cheaper to go out and buy a new printer with the cartridges than it is to try and obtain replacement cartridges.

However, you need to be careful when buying recycled cartridges especially if you use an inkjet style printer to produce photographs. Colour control is vital to realistic and pleasing prints and this depends on complex matching throughout from camera to final print. In this process the exact colours of the inks are a key factor. Fade resistance is also very important and something which you might only notice several months after printing.

The simple solution is only to buy from a reputable supplier who can accurately specify the products and guarantee the quality.

Data Projectors

The *data projector* is a device that takes a signal from a computer or video and projects the image onto a screen or a wall. These devices are commonly used for presentations or lectures to large groups of people using a prepared presentation.

These presentations are often produced with PowerPoint software which is designed for making slide-show like presentations.

Data projectors can only project data from a computer or a video, so if you need to project other formats such as 35 mm slides or overhead transparencies you will need to translate them into another format compatible with a computer or use an overhead projector instead.

Like any other piece of equipment, the data projector is better at some things than others. It is very good for the projection of text based PowerPoint presentations. The image quality however is not really good enough for the projection of finely detailed images such as maps with very fine lines and small text labels.

This is due to the fact that they work by projecting pixels. The best resolution that most projectors can manage is 1024 x 768. This is a good resolution to use on a large monitor but when you start enlarging the image the pixels get enlarged as well.

Data projectors are compatible with almost all computer systems. In reality all that the data projector does is act like a monitor that can get projected onto a screen or wall.

Multimedia Projectors

You may also wish to present information on the computer screen to many people at once, without printing. A useful device for this is the *multimedia projector*. This can be connected to the computer and used to display presentations or demonstrate a particular procedure as a projected image.

There are many presentation programs that lend themselves to this device; Microsoft PowerPoint and Lotus Freelance Graphics are examples of this type of program.

It is important that regular maintenance is carried to ensure your projector is well maintained, for example, check the bulb (a typical bulb lasts for about 2,000 hours), dust filters, and vents are clear and power supply cables are in good condition. Remember to power down the projector to allow the bulb to cool before turning off the power supply — this will help conserve the bulb.

Sound

Most modern PC software includes sound as a package of warning and alert sounds for programs, or as music or speech. Your PC may have a built-in speaker; however, *speakers* are needed if all sounds are to be heard. Some speakers come attached to the monitor, and some are entirely separate. Either way, these are useful for realising the full potential of the internet, your computer, and your software.

Speakers are also useful for allowing anyone who is visually impaired to operate computers. Using a sophisticated program called a *speech synthesizer*, the computer can talk to the user and tell them what is happening on-screen.

Both input and output devices (including keyboard, mouse, plotter, scanner, printer, external tape drive or Zip drive) are often referred to as *external peripheral devices*. You can also get *internal integrated peripheral devices* such as a CD-ROM drive, or internal modem. Memory, internal hard disks, motherboards etc are essential parts of the computer so are not peripherals.

Speakers

Speakers are an output device which provides an audible feedback from the computer system. They are required with the majority of computer systems that provide a multimedia experience.

Their purpose is to convert the digital sound representations utilised by a computer system into sound. This could be feedback from the computer system, music from a web page or the sound effects that accompany a computer game.

In order for speakers to function there needs to be some form of sound device present in the computer system. This will generally take the form of a *sound card* and a multitude of different types exist. Some provide stereo, digital stereo, surround sound and true Dolby digital sound. The number of speakers required will be determined by the type of sound device included with the computer system.

Video Cameras

A *video camera* is a camera that is used to capture movement. This was initially developed for the television and motion picture industry but it has now become a common device for home use as well.

The video camera is used primarily in two modes. The first is what might be called a live broadcast, where the camera feeds real-time images directly to a screen for immediate observation.

The second is to have the images recorded to a storage device for archiving or further processing; videotape was the traditional medium for this but this is getting replaced by flash memory and DVD disks. This allows you to record video which can be edited etc using application software on your computer enabling you to create home movies, shows etc.

One common type of video camera is the camcorder which combines a camera and a VCR or other recording device in one unit. These are very versatile and mobile and are widely used for home movies, electronic news gathering and similar applications.

Digital Camera

The *digital camera* is one of the most remarkable instances of the technological shift to the use of computer systems. Conventional cameras depended entirely on chemical and mechanical processes. The digital camera on the other hand has a built-in computer, and records images electronically.

This new approach has been enormously successful. However, the original film cameras can still provide a better picture quality and as a result of this digital cameras have not completely replaced conventional cameras.

As digital imaging technology has improved, digital cameras have rapidly become more popular. They have also become more versatile over the time period as well.

So if you wish to e-mail a picture to a friend all you do is take the picture using a digital camera, store on your computer system and then attach it to the e-mail. Essentially all digital images are just a collection of 1s and 0s that represent all the pixels that make up the image.

At a basic level, this is all there is to a digital camera. Just like a conventional camera, it has a series of lenses that focus light to create an image of a scene. But instead of focusing this light onto a piece of film, it focuses it onto a semiconductor device that records light electronically. A computer inside the camera then breaks down this electronic information into digital data. All the fun and interesting features of digital cameras come as a direct result of this process.

Some interesting digital camera facts:

- ◆ With a 3-megapixel camera, you can take a higher-resolution picture than most computer monitors can display. The standard today is around 6 to 8-megapixel.
- ◆ The first consumer-oriented digital cameras were sold by Kodak and Apple in 1994.



Exercise 8: Connecting a Digital Camera

Digital images taken by a digital camera can be transferred to a computer or other storage device via a USB cable. This can be either directly from the camera or by using an external memory card reader.

The majority of digital cameras come with a CD containing a device driver, an image viewer and basic photo editing software. The driver and/or viewer should generally be installed onto the computer system before making the USB connection to the computer. You may need to check your camera manual for specific instructions.

After the software has successfully been installed you attach the cable to your digital camera and plug the other end into the computer. This will either be a USB connection cable or a firewire connection cable. You then need to turn on the camera. Usually the viewer software will automatically start and begin the image transfer process. Once the transfer is complete, you can browse and view the images. Some operating systems like Windows XP provide a wizard to assist in the file transfer process.

Task

Using the digital camera that has been supplied by your tutor take a couple of digital shots and using the supplied cable, software etc. Transfer these images to your computer system.

Once you have transferred the images remove the device from the computer system using the correct procedure. Your tutor will instruct you in this process. You may also need to consult the manuals to perform this removal task.

Web Camera

If you have been surfing the internet for any length of time, then you may have run across any number of webcams in your travels. Webcams cover topics ranging from the silly to the serious, a webcam might point at a street location, or even the space shuttle launch pad. There are business cams, personal cams, private cams, traffic cams.

Webcams, like most technological items range from simple to complex. A simple webcam setup consists of a digital camera attached to your computer through the USB port.

The camera part of the webcam setup is just a digital camera. The 'webcam' nature of the camera comes with the software. The software 'grabs a picture' from the digital camera at a pre-set interval and transfers it across the internet to another location for viewing.

There are several broadcast methods available. The most common method is to turn the image into a JPEG file and upload it to a web server using the FTP protocol. If you do not have your own web server, lots of companies offer you a free place to upload your images, saving you the trouble of having to set up and maintain a web server or a hosted website.

 **Exercise 9: Connecting a Web Camera**

The best way to connect a web camera to your computer will depend on the type of camera you own. While some cameras can connect to any video capture card, others require that you use a specific capture card. The documentation that came with your web camera will help you determine what kind of capture card and connection method you will need.

Some web cameras have a built in microphone, while others do not. If your web camera does not have a built in microphone you will need a separate microphone to capture sound. You need to plug this into the mic connection on your computers sound card.

Your tutor will supply you with a web camera and allow you to connect it to your computer system. Note: You may need to install driver software before the device will function correctly. This will depend upon the computer system that you are using.

USB web camera



USB port on computer

Composite web camera



Analogue capture or S-video

Web camera without microphone



Composite or USB
Microphone in

Connecting to the Internet

Normally, your home computer will connect to the internet using a modem and a telephone line, and your computer at work will use a network and a faster connection. This might not always be the case — you might use a faster connection at home if you use the internet a great deal or you download large files, such as music or video.

To connect to the internet, you will need three items:

- ◆ a connection device such as a computer (with web browser software)
- ◆ a communication link such as a modem, cable modem, or an ISDN line
- ◆ an internet service provider (ISP) user account

Connection Devices

Although you'll usually use a computer to connect to the internet, there are other devices that can be used. For example, some modern mobile telephones are also able to connect to the internet. In this case, you don't need a modem or ISP account as these are built into the phone and the service you receive when you purchase these phones.

Your computer will use a program called a web browser. Sometimes called an internet browser, the web browser software allows you to enter and find your way around the web, displaying the web pages you are interested in. You can also bookmark pages you may want to return to later; use search facilities called search engines to find what you're after, and you can save information from the web on your own computer. There are two main browsers:

Microsoft's Internet Explorer (which is the most common because it is included with the Windows operating system) and Netscape's Navigator although there are others available such as AOL, Firefox and Opera.

Communication Links

The most common device in use in homes is the modem. However, in business, there will usually be a number of users connecting to the internet via their computer network, which can mean that a modem might not be powerful enough to handle the number of connections without difficulties with the connection speed. Therefore, businesses will usually invest in one of the faster, more powerful internet communication devices, known collectively as *broadband*.

- ◆ **Modem:** A link that plugs into a standard telephone line. You dial a supplied phone number to connect to your ISP's server (using the given username and password for your user account), which then gives you access to the internet. Modems can be either an internal modem card installed inside your computer or an external modem connected with cables to your computer and phone line. Having an external modem can have its advantages — you can see the modem's light indicating it is working. With an internal modem you would have to look at the back of the computer to see the light flashing on the modem card.
- ◆ **Cable Modem:** Communication link that uses cable TV lines because they have greater bandwidth (the amount of data that can be transmitted in a fixed time) than telephone lines and so the data transfer rates that can be reached are much higher than those of telephone line-based modems.
- ◆ **ISDN (integrated services digital network) line:** An international standard link that sends voice, video and data over digital or normal telephone lines.
- ◆ **ADSL (asymmetric digital subscriber line):** A link that allows more data to be sent using existing copper telephone lines. This type of connection needs a special ADSL modem.

Here's a rough guide to the current speeds available from each of these devices, although these are liable to change as technology advances.

Note: Modem speeds are measured in kbps (kilobits per second) and Mbps (megabits per second). A bit is the smallest unit of data that computers recognise; a kilobit is 1,000 bits, and a megabit is 1,000,000 bits.

Device	Data Transfer Rate
Cable modem	512 kbps/ 1 Mbps/ 2 Mbps/ 8 Mbps up to 24 Mbps
ISDN	64 kbps / 128 kbps
ADSL	0.5 –24 Mbps (receiving data); 16–812 kbps (sending data)
Modem	56 kbps

Note: Although it is not commonplace yet, it's also possible to use existing power lines to communicate. This requires a special modem, usually called a **home gateway** that connects to your home power supply and a special type of internet service provider.

Internet Service Providers (ISPs)

An ISP is a company that provides access to the internet. When you sign up with an ISP, they'll provide you with an account with its own username and password, and a telephone number that your communication device can use to connect to the internet, depending on which device you use (if you use a cable modem, for example, it's directly connected to the ISP's network and so you don't have to dial up, your connection is always 'live'). They'll usually also give you a CD-ROM that will help you set up your internet connection, and a support telephone number you can use if you get stuck. Some ISPs also provide you with a small amount of web space that you can use for your own web pages if you want. The ISP will also keep a track of all of its authorised users for identification and billing purposes.

Most ISPs charge a monthly fee for their service, although some are free, and you'll usually have to pay a one-off installation fee for cable modems, ISDN lines and ADSL connections, and depending on where you live, some of these services may not be available. For example, cable modems are available only in areas that have been wired for cable TV.

If your connection uses a telephone line, you'll also have to pay for the calls you make when you connect to the internet. However, the telephone number supplied by your ISP will usually be a local or freephone number to keep the call charges as low as possible, especially at off-peak times, although the charges will increase with the amount of time you spend online, just as they would if you made a long telephone call.

Examples of well-known ISPs are AOL, BTOpenWorld, Tiscali and Orange.

USB Connections

The *universal serial bus (USB)* was developed by Apple, IBM and Microsoft and was first introduced with Apple's iMac computer. The connection port is now fitted on all modern Macs and PCs and is fast becoming the standard connection method for all computer devices.

Connections are made via a special 4-way modular plug and socket. USB allows data to travel in both directions. Any information from the computer to a peripheral device is known as *downstream data*, whilst that sent from a device to the computer is called *upstream data*.

USB is designed to connect peripherals such as mice, keyboards, scanners, digital cameras, printers, hard disks, and networking components to the PC.

The universal serial bus is host controlled and there can be only one host per bus (the cable). A USB system consists of a host controller and multiple devices connected in a tree-like fashion using special hub devices. The hubs may be linked together; up to 5 levels and a maximum of 127 devices may be connected to a single host controller. However, in reality this would not be feasible as there is only a limited amount of power available for each bus connection. The USB interface was designed to remove the need for adding expansion cards into the computer's PCI or PCI-E bus, and improve plug-and-play capabilities by allowing devices to be added to the system without rebooting the computer (*hot swap*).

There are two USB standards to consider:

USB 1.0/1.1

The original USB 1.0 interface runs at between 1.5 and 12 Mbit/s, which is slower than the SCSI ports on older computers and not fast enough for a hard disk drive, although this is adequate for a modest device such as a floppy disk, flash disk or Zip drive.

USB 2.0

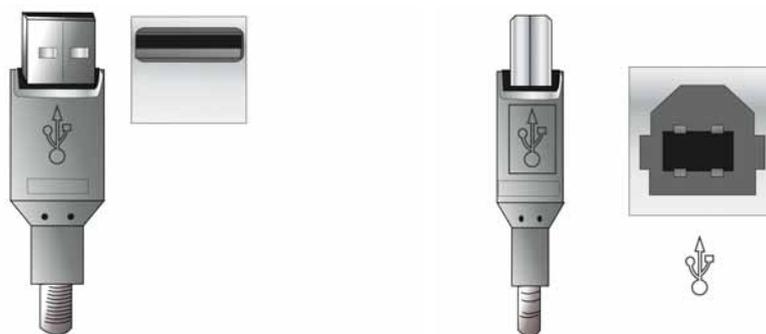
The USB 2.0 interface runs at higher rates of 60, 120, 240 or 480 Mbit/s, uses the same connector and is compatible with USB 1.0/1.1 standard, although it does not speed up your existing USB 1.0 devices.

USB 2.0 was designed to be backwards compatible with USB 1.1. This means that you can connect a USB 2.0 device to a USB 1.1 port, although the device will not work at the higher speed of USB 2.0.

When the new device first plugs in, the host interrogates it and the operating system loads the device driver necessary to run it. If the device driver is not part of the operating system then you will need a disk with the necessary drivers to enable the device to be recognised.

USB Connections and Cables

USB devices commonly have a Type A or Type B connector, or both, as shown in the picture below. The 'wide' Type A variety appears on computers (or at the output of a hub, see below) whilst the 'square' Type B version is fitted to peripheral devices (or to the input of a hub).



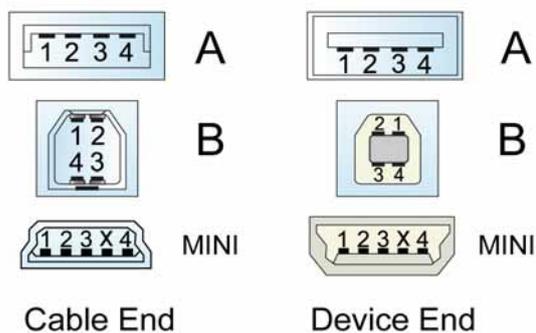
Type A connector and port

Type B connector and port

The peripheral devices are often connected via an A-B cable, with a Type A plug at one end and a Type B at the other, as shown below.



Smaller USB devices, such as a digital camera or printer, often have a mini USB connector, requiring a suitable adaptor cable. You can also connect together two devices of this kind using a mini-USB to mini-USB cable. The diagram below shows the connections that you will find on your computer system or the device you are connecting to your computer system.



USB Transfer Rates: Low Speed, Full Speed, Hi-Speed

USB supports three data rates:

Low speed (1.5 Mbits per second) that is mostly used for *human input devices (HID)* such as keyboards, mice, joysticks and often the buttons on higher speed devices such as printers or scanners.

Full speed (12 Mbits per second) which is widely supported by USB hubs, assumes that devices divide the USB bandwidth between them in a first-come first-serve basis.

Hi-speed (480 Mbits per second) was added in USB 2.0 specification.

However you should note that not all USB 2.0 devices are hi-speed.

Almost all hi-speed devices will fall back to the slower data rate of full speed when plugged into a full speed hub. This ensures compatibility with some older computer systems so that your new digital MP3 player will connect to your older system for example.

USB Powered Devices

The USB connector provides a single 5 volt wire from which connected USB devices may power themselves. A standard bus is specified to deliver up to 500 mA of current. This is often enough to power several devices, although this power must be shared among all devices downstream of an unpowered hub. So if you attach a number of devices to a USB hub you may receive a message telling you that there is not enough power available to power the device.

Some of the newer hubs include external power supplies which will power devices connected through them without taking power from the bus. When USB devices (including hubs) are first connected they are interrogated by the host controller, which enquires of each their maximum power requirements.

Connecting a Device to a Computer Using a USB Cable

You can connect the device to a computer using a USB cable. The device will generally be supplied with the correct type of cable. This will usually be 'A-B' type connections.

Plug Type A is connected in to the computer plug Type B is connected to the device.



(c) istockphoto.com/Paul Botinas



Exercise 10: Connecting a USB Device

Your tutor will ask you to connect up a supplied printer to your computer system using a USB connection.

Computer Safety

Many people now use computers, or *visual display units (VDUs)*, as part of their normal working routines. Working with VDUs does pose unique health and safety issues that must be addressed by both employers and employees to ensure that using such equipment does not affect a person's health or safety.

Where problems do occur when working with VDUs, it is often as a result of how the equipment is used rather than the equipment itself. It is also a well known fact that a computer user working in a comfortable and adjustable workstation area is more productive and efficient.

Incorrect use of VDUs can affect people's health in the following ways:

- ◆ Eyesight problems, including headaches, caused by screen glare, straining to look at VDU screens for long periods, and monitors incorrectly positioned, ie too far away or too close for comfortable viewing.
- ◆ Increased levels of stress. This is often reported by VDU users and this can usually be attributed to an increased pace of work.
- ◆ Repetitive Stress Injury (RSI) is a commonly-used term that refers to aches, pains and disorders suffered as a result of prolonged use of badly-adjusted VDU equipment. Usually these disorders do not last for long periods but in a few cases they may become persistent or even disabling.

The first step in ensuring VDU safety is for employers to assess all VDU workstations to evaluate safety and health conditions. Such assessments are a legal requirement under regulations and should include all staff that habitually use VDU equipment.

The Workstation

The ability for computer users to work in a comfortable position is important. The chair should be adjustable (both for height and back support) and enable the operator's forearms to be approximately horizontal with the VDU at the same height as the eyes. An adjustable footrest should be provided to avoid excessive pressure on the legs from the edge of the seat.

The work area should be large enough to take whatever documents or other equipment is needed and the operator should be able to adjust the arrangement of the keyboard and mouse to find and maintain a comfortable and convenient position. Often a space in front of the keyboard is useful for resting the hands and wrists.

The Environment

The monitor should be situated so as to avoid glare or bright reflections; and a position where neither the user nor screen directly faces windows or bright lights is preferable. Blinds or curtains on windows can also aid in reducing screen glare.

The monitor itself should be adjustable for brightness and contrast to suit lighting conditions and be maintained in a clean condition to aid vision. The monitor should not flicker or move; if it does then the equipment may need servicing or adjustment. The increased use of flat screen LCD monitors has reduced the flicker and movement effects.

The User

Computer users should not maintain the same posture for long periods and a certain amount of movement is desirable. As a general rule for every hour of computer work, a 5–10 minute period of non-computer work, within that hour is suggested.

The Software

When choosing software for PCs, consideration should be given as to whether it allows font colour and size adjustments so that operators can choose a scheme and size that suits their eyesight and conditions in which they work. Most modern software does allow this and users should be encouraged to try different schemes to find the most appropriate one for them.

Adopt a good posture

A good working posture is one which can be sustained with the minimum of static muscular effort. In general, a varied working position is better than a fixed working posture. However, a working position which is static and relaxed is better than one which is static and tense.

Your upper body is most comfortable when:

- ◆ Your back is supported.
- ◆ Your head is up.
- ◆ Your upper arms are relaxed.

Your hands and wrists are most comfortable when:

- ◆ Your forearm is nearly at a right angle to your upper arm.
- ◆ Your wrist is in a straight line with your hand and forearm.

Adjust your seating position

In order to improve your posture, adjust your chair so that:

- ◆ Your lower back is supported.
- ◆ Your knees are level with your hips.
- ◆ Your feet are flat on the floor.
- ◆ Your eye level is just above the top of the screen. Tilt your screen if necessary.
- ◆ The screen is directly in front of you, not at an angle.

Type using both hands or better still, learn to touch type. If your arms are raised or your wrists are bent for long periods of keyboarding, tendon and nerve disorders can result. It is worth learning to touch type because typing encourages the correct positioning of your hand and wrist so you will not overstrain your forefingers. Remember that using the mouse a great deal can put a strain on your hand and wrist muscles.

The Law

The number of computers in the workplace has increased rapidly over the last few years and it is now quite normal for most people to be exposed to computer usage. The Health and Safety at Work Act lays down legal standards for computer equipment and requires employers to take steps to minimise risks for all workers.

Workers have received substantial damages for injuries caused through use of computers where the employer could have foreseen the risk but did nothing about it. The main regulations covering the use of computer equipment include:

- 1 Management of Health & Safety at Work Regulations 1992
- 2 Health & Safety (Display Screen Equipment) Regulations 1992
- 3 Workplace (Health, Safety and Welfare) Regulations 1992
- 4 Provision and Use of Work Equipment Regulations 1992

Improving health and safety practice should be taken seriously, although it need not take much time or expense. Measures employers should take include:

- ◆ Being aware of the health risks — the government officially recognises some of the risks although there are some grey areas.
- ◆ Take steps to minimise the risk — this may only involve taking simple measures.
- ◆ Understand the law — make sure someone has a health and safety brief covering the use of computers.
- ◆ Assess the risks — using procedures set out in the law — be systematic and get help if you need it.
- ◆ Training all users to recognise the risks — if people are not made aware of the dangers they cannot take adequate precautions to protect their health.
- ◆ Take users' views seriously — if a user feels there is something wrong there often is.

Acceptable Use and Security Policies

Many centres and organisations have security and acceptable use policies that their users must adhere to as part of the terms and conditions of their use of the facilities. These can include personal use of the internet connection, awareness of copyright laws regarding the downloading of information from the internet, virus protection, use of firewalls, password policies and backing up of important files. Breaching these policies can have serious consequences, for example, you may lose your job if you use your employer's computer system to do something which is in breach of a policy.

Acceptable Use Policies

If you use a computer other than at home, you should check whether there is an acceptable use policy directing and controlling what you are able to do and what you should not do while using the system. This may include, for example, whether you're allowed to use your company's computer for personal purposes such as sending personal e-mail or perhaps checking your bank balance online during the working day.

It may be that you can use the facilities in this way during your breaks or maybe not at all. It will certainly include a section on using the system for illegal purposes such as downloading copyrighted materials such as music and video or starting arguments online (referred to as *flame wars*).

For example if you download and encode music into digital files from the internet, it is illegal for you to distribute these copies.

Copyright Issues

Although you may be able to find the information or files you would like to use on the internet, it's important that you realise that the information you find may be subject to copyright laws and you may require to either pay for it or acknowledge your sources. Check the website for copyright statements and use the downloaded information accordingly. If in doubt, do not use someone else's material without their permission.

Security Policies and Viruses

A virus is a software program that has been loaded onto your computer and run without you knowing. New viruses appear on the internet daily. What a virus does can range from just copying itself again and again until you run out of memory so that your system stops, to corrupting the files on your computer, to sending itself (usually via your e-mail system) from network to network, infecting the other systems it comes into contact with.

When you use removable storage media such as floppy disks, CDs and memory sticks to transfer files from one computer to another, you risk also transferring any virus that was infecting the original computer. Another common source of infection is the internet.

Since viruses can even bypass some security systems, anti-virus software has been created to identify, and where possible clean, any virus it recognises on your computer. When you have anti-virus software on your system, it will alert you to any potential virus from transferred or downloaded files and prevent it from infecting your system. To add another level of security, many public access systems (for example, schools or libraries) don't allow the transfer of information from other systems or the internet to help prevent viruses infecting their networks.

For example, if you used a floppy disk to 'boot' up your computer and it contained a virus it would infect your operating system and corrupt your computer. This is why it is quite common in organisations to ban the use of floppy disks in the workplace.

Another common source of infection is the internet. Many people download programs from the internet safely, however not all programs you receive from the internet can be safe. Viruses and worms are often spread when you run these programs on your computer. Many of these programs run an executable 'boot' file which corrupts your operating system.

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Although you can buy anti-virus programs, you can also find freeware versions of some of the major manufacturers' software for use on home computers on the main manufacturers' websites. Some of these are listed below:

URL	Instructions and Description
http://www.grisoft.com	From the AVG Anti-Virus home page, click the AVG Free Edition link and follow the on-screen instructions. This software offers resident protection (it runs in the background monitoring your system at all times) and e-mail scanning.
http://www.vcatch.com/download.html	From the home page, click the Free Download of VCatch Basic V5 and follow the on-screen instructions. This program checks files arriving via an e-mail, instant messaging or file sharing application.
http://www.trendmicro.com	From the home page, click the red Personal tab at the top of the screen then click the Scan Now link under the TREND MICRO Housecall heading. This is an online scan, which means that you will not install a program on your computer but simply scan it for viruses. It will not warn you if your computer becomes infected later unless you run Housecall again.

Loading and running anti-virus software isn't enough. You also have to check for updates to the software so that it continues to recognise new viruses as they are developed and released. When you purchase an anti-virus program you will be required to:

- 1 Register the product with the supplier, by giving them details of the product; they in turn will supply you with a valid product key.
- 2 After registration of your product has completed, the latest virus definitions will be downloaded. At regular intervals this will happen for the life of the product — typically one year.
- 3 The anti-virus software will perform a complete scan of your computer to detect and correct any viruses it may find. You can schedule the anti-virus software to perform scans regularly.

Important! Be sure to check the terms and conditions of use of any program you download or run online to be sure you don't break copyright laws. There are some programs which are like viruses that install themselves onto your computer, but send information about your computer and you back to a third-party (person or organisation). These programs are referred to as *spyware*. You should also check to make sure these are not installed on your computer.

Firewalls

A *firewall* can be either a software program or a hardware peripheral that prevents access to your computer system from outside sources, usually referred to as *hackers*. The firewall checks all incoming and outgoing information to see that it matches the security conditions that have been set, denying progress to any information that fails this check. In this way the information on your computer is kept safe and confidential.

Password Policies

When you use computers and the internet, you'll find that you have a number of different passwords to create and then remember. For instance, if you work on a network, you may have a password to log on to the network, another one for your e-mail system and perhaps others for websites or internet service providers that you've signed up for (*subscribed to*).

So that your personal information is kept private and confidential, it's important that you don't give anyone else your passwords or use passwords that anyone who knows you could guess, eg your name or your birthday, or your pet's name. This also stops anyone else acting in your name without your knowledge. For the same reason, you should also consider whether it's safe to leave your computer without logging off.

A good password includes a combination of letters and numbers, and if it is *case-sensitive* (it matters whether you type it in capital or small letters), you should include a combination of capital and small letters along with the numbers.

Some systems are set up to ensure that you include at least one letter and one number and have also set a minimum password length. Some systems also have a built-in check to make sure you change your password every so often, every month for example, and won't let you use the same password twice. Modern networks often implement this type of check to ensure data is secure and no one is using your password illegally. Many websites and internet service providers will record attempts you make to put in the correct user ID and password and if you fail to put the password in correctly will lock your account until you have contacted them another way to verify your account credentials to them.

The Data Protection Act

The Data Protection Act 1998 replaces the earlier Data Protection Act 1984. The purpose of the new Act is to deal with some of the things that were not envisaged when the older Act was introduced. These new things include the internet, loyalty cards and the use of huge customer databases for marketing purposes. The new Act also covers manually held data not covered by the earlier Act.

The revised Data Protection Act 1998 covers the processing of data, either in a manual form manually or by a computer system.

The Act places obligations on those people who record and process personal data; these people are referred to as *data controllers* in the Act. Data controllers must be open about their use of the data by telling the Data Protection Commissioner (the person who enforces the Act) that they are collecting personal data and how they intend to use it.

They must also follow a set of eight principles, called the Data Protection Principles.

The Data Protection Principles

The principles state that:

- 1 The personal data shall be processed fairly and lawfully and, in particular, shall not be processed unless at least one of the following conditions are met:

Processing conditions:

- ◆ The data subject has given their permission for the processing.
 - ◆ The processing is necessary for the performance of a contract which involves the data subject.
 - ◆ The data controller has a legal obligation to process the data.
 - ◆ The processing is necessary to protect the vital interests of the data subject.
 - ◆ The processing is necessary for the administration of justice or for a government department.
- 2 Personal data shall be obtained only for one or more specified and lawful purposes, and shall not be further processed in any manner incompatible with that purpose or those purposes.
 - 3 Personal data shall be adequate, relevant and not excessive in relation to the purpose or purposes for which they are processed.
 - 4 Personal data shall be adequate and, where necessary, kept up to date.
 - 5 Personal data processed for any purpose or purposes shall not be kept for longer than is necessary for that purpose or those purposes.
 - 6 Personal data shall be processed in accordance with the rights of data subjects under this Act.
 - 7 Appropriate technical and organisational measures shall be taken against unauthorised or unlawful processing of personal data and against accidental loss or destruction of, or damage to, personal data.

8 Personal data shall not be transferred to a country or territory outside the European Economic Area, unless that country or territory ensures an adequate level of protection for the rights and freedoms of data subjects in relation to the processing of personal data.

The Act mentions data called sensitive personal data, which may not be disclosed and this includes information about:

- ◆ the racial or ethnic origin of the data subject
- ◆ their political opinions
- ◆ their religious beliefs
- ◆ whether or not they are a member of a trade union
- ◆ their physical or mental health or condition
- ◆ the commission or alleged commission by them of any offence or
- ◆ any proceedings for any offence committed or alleged to have been committed by them and if they are convicted, the sentence they were given.

A data controller means a single person or a group of people who determine the purpose for which, and the manner in which, any personal data is processed. The data controller is therefore the person who decides what to do with the data once it has been entered onto the computer or manual system.

The Data Protection Commissioner, the person who enforces the Data Protection Act, must be notified by the data controller if they hold data not falling into one of the categories covered by the exemptions.

The Computer Misuse Act

The Computer Misuse Act was introduced by MP Michael Colvin and came into effect in 1990. In 2004 the All Party internet Group published its review of the law and highlighted areas for development. Their recommendations led to the drafting of the *Computer Misuse Act 1990 (Amendment)* Bill which sought to amend the CMA to comply with the European Convention on Cyber Crime. Under its terms, the maximum sentence of imprisonment for breaching the Act changed from six months to two years. It also sought to explicitly criminalise denial-of-service attacks and other crimes facilitated by denial-of-service.

The Act introduces three criminal offences in relation to computer users and systems:

Section 1 — A person is guilty of an offence if:

- a) He causes a computer to perform any function with intent to secure access to any program or data held in a computer;
- b) the access he intends to secure is unauthorised; and
- c) he knows at the time when he causes the computer to perform the function that this is the case.

Section 2 — A person is guilty of an offence under this section if he commits an offence under section 1 above ('the unauthorized access offence') with intent:

- a) to commit an offence to which this section applies; or
- b) to facilitate the commission of such an offence (whether by himself or by any other person) and the offence he intends to commit or facilitate is referred to below in this section as the further offence.

Section 3 — A person is guilty of an offence if:

- a) he does any Act which causes the unauthorised modification of the contents of any computer; and
- b) at the time when he does the Act he has the requisite intent and the requisite knowledge.

For the purposes of the Act it is an intent to cause a modification of the contents of any computer and by so doing:

- a) to impair the operation of any computer;
- b) to prevent or hinder access to any program or data held in any computer;
or
- c) to impair the operation of any such program or the reliability of any such data.

The Act was created to criminalise unauthorised access to computer systems and to deter the more serious criminals from using a computer to assist in the commission of a criminal offence or from impairing or hindering access to data stored in a computer. The most basic offence is to attempt or achieve access to a computer or the data it stores, by inducing a computer to perform any function with intent to secure access. Hackers that program their computers to search through password permutations are therefore liable, even though all their attempts to log on are rejected by the target computer.

This makes all versions of hacking code designed to crack the security in operating systems unlawful — whether or not harm is intended and no matter what the motive might be, eg simple curiosity or responding to a security system seen as a challenge. The only precondition to liability is that the hacker should be aware that the access attempted is unauthorised.

Thus, using another person's username or identifier (ID) and password without proper authority to access data or a program, or to alter, delete, copy or move a program or data, or simply to output a program or data to a screen or printer, or to impersonate that other person using e-mail, online chat, web or other services, constitute the offence.

Even if the initial access is authorised, subsequent exploration if there is a hierarchy of privileges in the system, may lead to entry to parts of the system for which the requisite privileges are lacking and the offence will be committed. But looking over a user's shoulder or using sophisticated electronic equipment to monitor the electromagnetic radiation emitted by VDUs ('electronic eavesdropping') is outside the scope of this offence.

A hacker who obtains access to a system intending to transfer money or shares, intends to commit theft, or to obtain confidential information for blackmail or extortion. Thus, the offence is committed as soon as the unauthorised access is attempted, and the section 2 offence overtakes liability as soon as specific access is made for the criminal purpose.

The section 3 offence is specifically aimed at those who write and circulate a computer virus or worm, whether on a LAN or across networks. Similarly, using phishing techniques or a Trojan to obtain identity data or to acquire any other data from an unauthorised source, or modifying the operating system files or some aspect of the computer's functions to interfere with its operation or prevent access to any data, including the destruction of files, or deliberately generating code to cause a complete system malfunction, are all criminal 'modifications'.

Directive on Waste Electrical and Electronic Equipment (WEEE)

The Waste Electrical and Electronic Equipment Directive (WEEE Directive) aims to minimise the impact of electrical and electronic goods on the environment, by increasing re-use and recycling and reducing the amount of WEEE going to landfill. It seeks to achieve this by making producers responsible for financing the collection, treatment, and recovery of waste electrical equipment, and by obliging distributors to allow consumers to return their waste equipment free of charge.

The Waste Electrical and Electronic Equipment (WEEE) Directive was agreed on 13 February 2003, along with the related Directive on Restrictions of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS). The UK Regulations implementing the WEEE Directive were laid before Parliament on 12 December 2006 and entered into force on 2 January 2007.

The WEEE Regulations apply to electrical and electronic equipment (EEE) which falls within the 10 product categories listed in the WEEE Directive:

- ◆ Large household appliances
- ◆ Small household appliances
- ◆ IT & telecommunications equipment
- ◆ Consumer equipment
- ◆ Lighting equipment

- ◆ Electrical and electronic tools
- ◆ Toys leisure and sports equipment
- ◆ Medical devices
- ◆ Monitoring and control instruments
- ◆ Automatic dispensers.

This Directive could push up hardware prices, though, as manufacturers seek to recover the costs of recycling and environmental disposal on such a massive industrial scale.

The estimated increase on a standard PC system is thought to be in the region of £60.00. However the Directive could also have implications for users of equipment. Although the penalties are attached to suppliers of hardware, their users share some of the responsibility for equipment disposal.

Computer Security

Computer security is concerned with taking care of the hardware, software and most importantly the data stored on your system. The cost of creating data from scratch can be costly and time consuming and generally outweighs the cost of any hardware and software lost.

Physical security — Computer equipment and data need to be protected as far as possible from physical harm. Hazards include natural ones such as fire or flood but can also include deliberate damage or theft.

Computer theft — There are many ways of making sure that unauthorised people are denied access to your computer system. You can use keyboard locks, passwords, fingerprint technology etc. However it is more difficult to prevent a thief from picking up the system box and stealing it. Locks, bolts and clamps are all methods of hardware protection.

However, making it harder to get from the room or building will also deter the thief. So using alarms on emergency exits, using security cameras and having keycard locks or keypad locks on all doors helps.

Other theft prevention methods could also include:

- ◆ Noting security/serial numbers of all computer systems and peripherals.
- ◆ Backing up data on a regular basis.
- ◆ Use an identity badge system for all staff etc.

There are two kinds of security: data and break-in. Data security is reasonably addressed by having a good backup system. Break-in security is often a matter of using passwords to files or systems where possible, locking systems in offices and managing internet access to your system.

Some ideas to consider are:

- 1 The use of electrical surge protectors to ensure your computers will not experience sudden surges of electricity (eg during storms) is a reasonable precaution to take if the quality of the electricity supply to your building is poor, or if the computer is turned off and on.
- 2 Protect unauthorised access to computer files by using passwords to log on to your system, if possible. Critical files can be copied onto two different backup media, computer storage areas etc.
- 3 Keep all software disks, license numbers and documentation, such as manuals and guides, stored in a central location where you can find them.
- 4 Register all new software with the vendor to ensure you receive notification of regular software version updates and your eligibility to call the supplier for technical support if needed.
- 5 Be sure to install a virus detector, firewall on your system. The detector/firewall should automatically check any new data brought into your system (for example, from disks, USB devices, downloads from the internet) and stop unauthorised access etc.
- 6 Develop a disaster recovery plan. This should have procedures to respond to events such as: a hard disk crashing, a computer not working, the network going down, or even the building being destroyed.

Recommending Hardware or Software

Whether you just require a simple personal computer, a dedicated print server to enable all your networked computers to print to a single printer, or the implementation of a complete network, there are a number of stages that you must go through.

- 1 Requirements — you will need to sit down and specify the requirements in detail. This may mean performing some detailed research to obtain the necessary information before you can look at the selection process.

So for example if you wish to increase the size of RAM in your computer you would first need to:

- ◆ Identify the type of RAM (chip) in your machine. Is it SDRAM, SRAM, DDRAM etc?
- ◆ Decide on the amount required. What use are you going to make of the additional memory?
- ◆ Does the RAM have to be banked? (This means if you have 1 Gb then does the second piece need to be 1Gb as well?)

- 2 Specification — at this stage you have a detailed list of the requirements and can now start looking at the other factors before taking purchasing decisions. So for example:

- ◆ Computer implementation. What type of system? You need to choose from: servers, desktop computers, laptop computers, printers, mobile devices, etc. In fact anything you are ever likely to need that is computer related. Typically you need to look at computers based upon industry standards.
- ◆ Network implementation. Networks can be a mystery to some and indeed they can become very complex. Whether you just need to link a couple of computers together, or install a full blown server-based network with connectivity to the outside world via a security appliance, you need to consider the following areas: firewall, anti-virus, anti-spam, and web address limiting.

- ◆ Migration of existing systems. If you already have computers then consider the migration of your existing applications and data to your new platforms. This has to be a smooth transition with continuity and the minimum disruption to your normal working.
- ◆ Security needs analysis. From the danger of computer viruses, through the intrusion of spyware, and the potential harm of malware and hackers, through to your own users deleting or even viewing files they shouldn't.
- ◆ Support of computer systems. Unfortunately, it is a fact of life that there will be occasional problems. Do you maintain the service internally or do you outsource?



Exercise 11: Research Computers

In this exercise, you must visit a minimum of three websites (eg Dixons, Comet, PC World) and look up and print specifications for three different types of:

- 1 Computers (desktop, laptop, server)
- 2 Digital cameras
- 3 Printers (inkjet, laser, colour)
- 4 Monitors (CRT, LCD TFT)
- 5 Software (operating software, application software, anti-virus software)

Finally

The student should (after consultation with their tutor) be able to do the Assessment for this Unit.

This completes all the learning outcomes for the PC Passport IT Systems subject.