European Computer Driving Licence®

Syllabus 4

Module 1 - Basic Concepts of I.T.

Aims

To provide an understanding of the fundamental concepts of Information Technology.

Objectives

After completing the guide the user will be able to:

- Understand and distinguish between hardware & software

- Identify parts of a computer and its peripheral devices

- Identify and understand storage devices and memory

- Understand elements of computer performance

- Understand the purpose of an operating system

- Understand and identify software applications

- Understand the term systems development

- Understand the terms LAN & WAN

- Understand the use of telephone networks, e-mail & Internet

- Be aware of the use of computers in everyday life

- Understand the implications of health & safety issues

- Understand the need for security and backups

- Understand the term computer virus

- Understand copyright laws and the Data Protection Act

Assessment of Knowledge

At the end of this guide is a section called the **Record of Achievement Matrix**. Before the guide is started it is recommended that the user completes the matrix to measure the level of current knowledge.

Tick boxes are provided for each feature. **1** is for no knowledge, **2** some knowledge and **3** is for competent.

After working through a section, complete the matrix for that section and only when competent in all areas move on to the next section.

Contents

Section 1
General Concepts

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

Understand what is meant by IT

Identify Different Computers and their Uses

Identify Parts of a PC

Distinguish between Hardware & Software

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 1 - Types of Computer

▣ Park and Read

The Personal Computer (PC)

A computer is a machine that is used to store and process data electronically. Personal Computer (PC) has come to be used as a generic term for any small computer, small enough to sit on a desktop.

A standard PC typically comprises a processor, normally housed within a metal case, a monitor, a keyboard and a mouse (See Driving Lesson 2 - Main Parts of a PC).

Capacity	Speed	Cost	Typical Users
Capable of storing and processing quite large amounts (gigabytes) of data.	Will process data extremely quickly (gigahertz), display films and operate complex games.	Affordable by individuals.	Students, families, small businesses.

Laptop Computers

A Laptop is a much smaller version of a desktop PC approximately the size of an A4 pad, which is usually transported within a small carry case.

Laptops are portable and can be battery powered, allowing them to be used in locations where you would not normally take a desktop PC.

Capacity	Speed	Cost	Typical Users
Similar to a PC	Similar to a PC	50-100% more expensive than a PC of comparable specification.	Business people who need to work and access information while out of the office

PDA

A PDA (Personal Digital Assistant) is a version of computer, which is small enough to be held and used in the palm of a hand.

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Driving Lesson 1 - Continued

It usually uses cut-down software programs that do not have as many features.

Capacity	Speed	Cost	Typical Users
A fraction of that of a PC (megabytes).	A fraction of that of a PC (megahertz).	10-25% of the price a PC.	Student, business person.

Network Computers

PCs can operate as independent or stand alone computers or they can be connected together via cables as Networked Computers.

Connecting PCs in this way allows them to share resources, such as printers and to access programs and data stored on any PC connected to the network.

More sophisticated networks can allow a **Server** or **File Server** to be used which can provide a single, central storage point for all data, whilst the other PCs in the network provide users with access to this central data.

These workstation PCs do not then require much data storage capacity themselves.

Capacity	Speed	Cost	Typical Users
Equivalent to multiple PCs (gigabytes/ terabytes).	Similar to PCs (gigahertz.)	Relatively high. Dependent upon the size of the network.	Medium to large organisations. Schools, hotels, office suites, etc.

Mainframe Computers

These are large computer systems that store and process data centrally for entire organisations and are usually accessed via large numbers of data input terminals.

The main units of such systems will typically take up a lot of space (maybe a room or two), and can process huge quantities of data simultaneously.

Driving Lesson 1 - Continued

A permanent staff of **operators** is often required to manage the running of such installations.

Capacity	Speed	Cost	Typical Users
Huge (terabytes).	Huge. Equivalent to multiple PCs, each with multiple processors.	Huge.	Large organisations. Banks, building societies, etc.

Manoeuvres

1.   Discuss some **advantages** and **disadvantages** of laptop PCs.

2.   What benefits can be gained from using a **network server**?

3.   What type of computer would a multi-national bank tend to use?

Answers to all Driving Lessons can be found at the back of the guide.

Driving Lesson 2 - Main Parts of a PC

▣ Park and Read
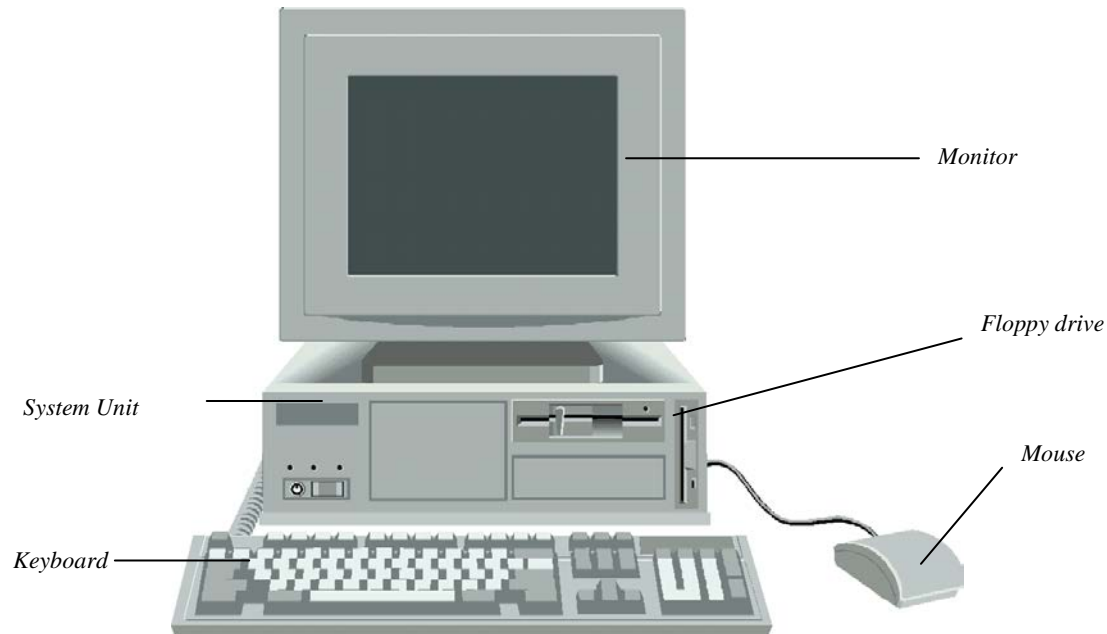
The components of a computer are:

The **Keyboard**, this is used to type (input) information.

The **Monitor** or Visual Display Unit (**VDU**) is used to view information entered into the computer. A monitor's picture quality or resolution varies depending on the number of pixels (dots of light on the screen). The higher the resolution the better the picture. Size of screen also affects the apparent quality of the picture, but price increases steeply with larger screen sizes.

The **Mouse** controls a moveable cursor on the screen, allowing data input by selecting options.

The **Computer** is normally housed in a metal or plastic casing, sometimes called the system unit, and contains the following items:

The **Electronics** such as the Central Processing Unit (CPU) and all the other microchips.

The **Hard Disk Drive** (**HDD**) is used to store programs and data.

The **Floppy Disk Drive** allows the user to insert a floppy disk (3½" diskette) to transfer files to and from the computer.

Driving Lesson 2 - Continued

CD-ROM Drive reads information from a standard Compact Disk (CD) which can contain application software, data or music.

Other forms of external storage devices other than a CD or floppy disk such as an External hard disk drive, Zip drive or tape storage cartridge may be attached to a PC.

Most computers have **speakers** attached, usually externally, to play music or listen to communications.

A **modem** can be attached externally or internally. This allows the user to connect to the telephone system and use e-mail or the Internet.

Any piece of external equipment that is attached to a PC, rather than built into it, is termed a **peripheral** device. This covers external storage devices, printers, scanners, in fact any device that enhances the capabilities of a PC system.

(For information about common input and output devices refer to Driving Lessons 6 & 7.)

(For information about types of memory refer to Driving Lesson 10.)

Manoeuvres

1.   In what ways can the **picture quality** of a computer display be described?

2.   What is the purpose of a **modem**?

Driving Lesson 3 - Hardware/Software

▣ Park and Read

Hardware is any physical part of the computer such as the monitor, keyboard, mouse, CD-ROM drive, printer, etc.

Software consists of the programs that allow you to use the computer such as the operating system, games, database management system, word processor or spreadsheet application.

You can <u>touch</u> hardware but not software.

Information Technology (IT) is an all-embracing term referring to the storage, processing or transferring of information using electronic means. The term **IT** has more recently been upgraded to become **ICT**, to include the word **Communication**. The term can be applied not only to anything concerning computers, but also facsimile transmission, telephone and multi-media presentations.

↱ Manoeuvres

1. What is the difference between **hardware** and **software**?

2. Give two examples of **hardware**.

3. Give two examples of **software**.

Driving Lesson 4 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1.   What does the term **PC** stand for?

2.   What do you understand by the terms **hardware** & **software**?

3.   To what does the term **Information Technology** refer?

4.   Describe 3 different types of computer.

5.   List the main components of a PC?

6.   What types of removable storage devices can be used?

7.   What do you understand by the term **peripheral device**?

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 2 Hardware

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

Understand the term CPU

Identify and Understand Input Devices

Identify and Understand Output Devices

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 5 - Central Processing Unit

⊡ Park and Read

The **Central Processing Unit** is the part of the computer that performs the work. It carries out the core processing, logic control and calculation work on the electronic data.

The CPU also controls the transfer of information between the secondary and main memory (See Driving Lesson 10 - Types of Memory).

A CPU that is constructed on a single chip is called a microprocessor.

The speed at which a CPU can process information is known as its **clock speed**.

This is measured in megahertz (**MHz**) or gigahertz (**GHz**). **Mega** refers to a million and **hertz** refers to frequency per second, therefore a 500MHz processor would be capable of operating at 500 million cycles per second. **Giga** refers to a thousand million (billion), therefore a 2.4GHz processor would be capable of 2,400,000,000 cycles per second.

The clock speed of the CPU is one of the limiting factors which determine how quickly a PC can perform tasks, the higher the clock speed of the processor, the faster and more expensive the PC will be.

The current market leaders (2002) in the production and sales of microprocessors are Intel (Pentium 4 range) and AMD (Athlon Series).

⇑ Manoeuvres

1.   What do the initials **CPU** stand for?

2.   What is meant by the term **clock speed**?

3.   What is **clock speed** measured in?

4.   What is the defining feature of a **microprocessor?**

Driving Lesson 6 - Input Devices

🅿 Park and Read

An **input device** is any device that allows information to be entered into a PC by typing, selecting, importing or downloading. Typical examples are the keyboard and mouse. Others include:
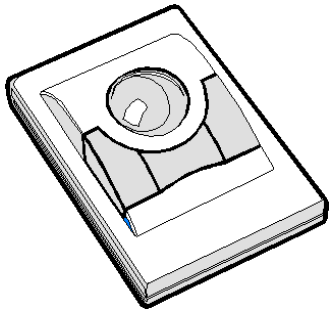
Touchpads and **trackballs** are often found built into laptop computers and perform the same function as the mouse. A touchpad senses the movement of a fingertip being dragged across it and moves the mouse pointer on the screen accordingly. A trackball is, effectively, a stationary, upturned mouse, where the ball is exposed and rotated by the fingertips rather than movement across a flat surface.

Joysticks can be used to perform manoeuvres more quickly and effectively when playing games on the PC.

A **graphics tablet** is a touch sensitive pad, which is used with a **light pen** to allow freehand drawing or writing to be entered into a PC in digitised format. Anything created on the pad with the pen appears on the monitor.
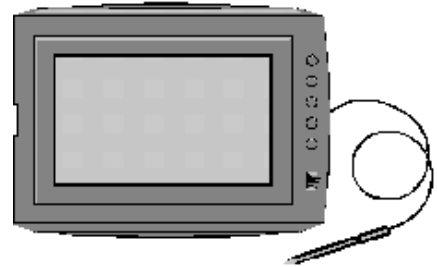
Scanners allow printed material to be converted into digitised formats suitable for importing into appropriate application software. To import printed text into a PC via a scanner, special applications software known as **O**ptical **C**haracter **R**ecognition software (**OCR**) is required. This allows hard copy text to be converted into text files within word processing applications.

Digital cameras store photographic images in digital formats, directly on to memory or magnetic media. These images can then be downloaded into a PC.

A **Microphone** in conjunction with **Voice recognition** software allows speech to be converted into text. An operator speaks into a microphone linked to a PC and appropriate software is able to translate the audio signals into digitised text. This has implications for the visually or physically impaired.

☞ Manoeuvres

1.   Explain the term, **input device**.

2.   What is a scanner used for?

Driving Lesson 7 - Output Devices

⊞ Park and Read

An **output device** is any device that allows the results of a PC's processing activity to be seen or heard. Typical examples are the VDU (visual display unit or monitor), printer, plotter, speakers and speech synthesisers.

The **VDU** is the most common form of output device with virtually all PCs being equipped with one.
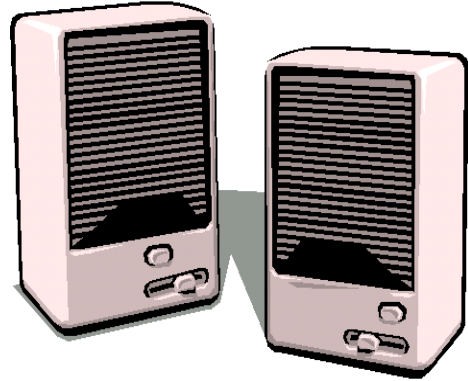
Speakers attached to a PC act in exactly the same way as speakers attached to any stereo system. As the standard PC system becomes ever more sophisticated, more are being sold as **multimedia** systems, i.e. they have the capability to act as stereo, audio-visual recording and playback systems.

Speakers may be self powered with their own small amplifier built in and they usually require a soundcard to be fitted inside the computer, to which the speakers are then connected.

Speech synthesiser software is able to translate written text from a file into audible speech. This has specialised uses, particularly relevant to those individuals with impaired vision, speech or manual dexterity.

Printers are used to produce paper copies of any text, numerical or graphics material processed by the PC.

A **Plotter** is a more specialised type of printer that uses computer software to control a pen, moving in two dimensions over the paper. They are ideally suited to produce larger, more complex prints, e.g. technical drawings, engineering or architectural plans and maps.

Touchscreens are screens (monitors or wall mounted screens) that not only display information, but can react to touch, e.g. the latest generation of pub tills, cash dispensers. These and certain other devices such as **modems**, can be classed as **Input/Output** devices.

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Driving Lesson 7 - Continued

General Information. When a new output device is first released into the market, costs are substantially higher than that of the existing technology that it is expected to supersede. This cost reflects its development, improved performance and specification as well as novelty value. After a while the price reduces quite dramatically to a level where it becomes affordable to the mass market. A typical example of this progression can be found in **Driving Lesson 9** dealing with **Storage Devices**.

Manoeuvres

1. Explain the term **output device**.

2. Name a device that is both **input** and **output**.

Driving Lesson 8 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1.   Explain the meaning of the term **CPU**.

2.   What does a CPU do and in what **unit** is its speed measured?

3.   List some of the **main input devices**.

4.   List some of the **main output devices**.

5.   What would a **plotter** be used for?

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 3
Storage

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

Identify and Understand Storage Devices

Understand Types of Memory and how it is Measured

Understand Elements of Computer Performance

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

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Driving Lesson 9 - Storage Devices

▣ Park and Read

Storage capacity uses several terms to define the increasing amounts of data that can be stored.

1 bit	The amount of storage space needed to hold either a 1 or a 0 in memory (binary numbering). This is the smallest unit of computer memory
1 byte	Equal to 8 bits, this is the amount of storage space needed to hold one character
1 kilobyte (k)	1024 bytes
1 Megabyte (Mb)	1024k or 1,048,576 bytes (approx. 1 million)
1 Gigabyte (Gb)	1024Mb or 1,073,741,824 bytes (approx. 1 billion)
1 Terabyte (Tb)	1024 Gb or 1,099,511,627,776 bytes (approx. 1 trillion)

Information is **saved** to the **Hard Disk Drive (HDD)** and remains there ready to be retrieved at some future date. Applications software packages or **programs** are also stored on the hard disk.

Hard Disk Drives can contain many Gigabytes of information, and the capacity of the HDD supplied as standard with a PC is rising continuously and quickly. A PC will usually be sold with a single HDD as an internal component, however, it is possible to purchase additional HDDs to increase storage capacity.
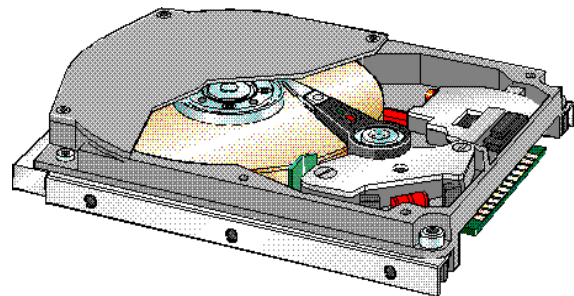
The average multimedia PC currently (2002) on sale will have an internal HDD of at least 20Gb. A supplementary HDD can be added as an internal or external unit, the external drive unit being significantly more expensive. Cost increases with capacity. HDDs are readily available with a capacity of 120Gb.

A hard disk drive with a storage capacity of 20Gb can store a huge quantity of data. The **access time** of a HDD is measured in milliseconds (**msec**). This is the time required by a hard drive to search for, identify and process data saved on the disk. In general, larger capacity hard drives tend to have faster access times than smaller ones. Also, the larger and faster the drive, the higher the cost.

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Driving Lesson 9 - Continued

A **Floppy Disk Drive** uses floppy disks (portable diskettes) to store information in a similar way to a hard drive. The most common type of floppy disk is the 3½" high-density disk, which can store 1.44Mb of data. Information can be saved on to a floppy disk to create a backup (a second copy) of important files in case the original is damaged or deleted, or carried from one computer to another, to copy or open information on a different machine.
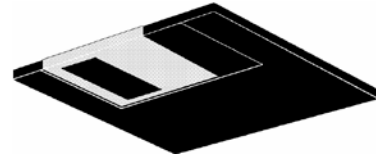
Floppy disks are a cheap and simple form of removable storage media but are gradually declining in popularity, as higher capacity options become available at reasonable cost.
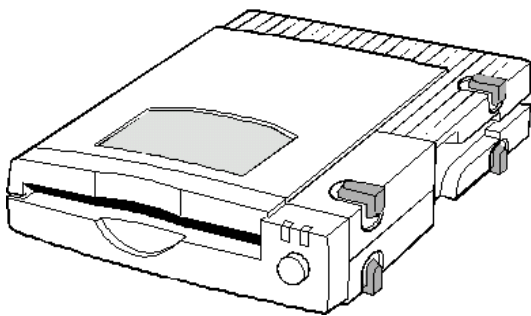
The **Zip Drive** is a type of storage device that recently became popular because it offered the convenience and portability of a floppy disk, combined with either a 100Mb or 250Mb capacity. These drives require the use of special **Zip Disks** which are similar in appearance to a floppy but are slightly larger and heavier. **Zip Disks** do tend to be rather more expensive in terms of £/Mb than other storage media. The availability of affordable recordable and rewritable **CD-ROM** drives prevented the use of **Zip Drives** becoming universal.

HDDs, floppy disks and **Zip Disks** are constructed from thin disks of non-metallic material, with a coating of magnetic medium on both sides. This allows data to be saved as magnetised dots on either surface of the disk. The dots are arranged in concentric circles called **tracks**, each of which is sub-divided into **sectors**. The process that creates these areas is called **formatting**. All hard disk drives and most floppy and Zip disks are nowadays sold **pre-formatted**, so that a user does not need to perform the **formatting** process. However, when a floppy or Zip disk has become filled to capacity with saved files that are no longer required, carrying out a **format** on that disk will effectively wipe it clean, leaving it in "as new" condition for further use. The **Microsoft**® **Windows** operating system software contains the facility to **format** a floppy disk. Our book **European Computer Driving Licence Module 2 – Using the Computer and Managing Files** contains instructions on how to do this. Zip disks usually need their own special software in order to carry out a format. This software is provided with each Zip Drive purchased. **Compact disks** and **DVD**s may need formatting, although they operate with optical rather than magnetic technology. Once again, the manufacturer will provide special software if this is required.

Warning: users should **not** attempt to format their Hard Disk Drives!

Driving Lesson 9 - Continued

Compact Disks (**CD-ROM**) have been used for some years as storage devices for computer software, as **R**ead **O**nly **M**emory, i.e. users could not save their own data to these disks, but only access information which was already stored on them, hence **ROM**. CD-ROMs were originally able to store 650Mb of information (approx. 75 min of music). Because of the read-only limitation and relatively large capacity, CD-ROMs are typically used to store data which does not need frequent updating, e.g. computer programs, clipart, graphics files, encyclopaedia, complete libraries of reference material, etc.

Developments in CD technology, increased speed of access and reductions in costs have enabled users to save, or **write**, their own data on to CD-ROMs in the same way as to a HDD. This facility however requires specialised drives and disks, which are available in two forms: **CD-R** (**R**ecordable) and **CD-RW** (**ReW**riteable). The difference being that CD-R disks can only have data saved to them once, so that it becomes permanently burnt on to the CD, while CD-RW disks allow data to be saved and retrieved on a reusable basis. **CD-RW** drives are now fitted as standard to most new PCs, with blank **CD-RW** disks costing much less than **Zip Disks**. **CD-R** disks cost approximately half as much as **CD-RW** disks.

Already **D**igital **V**ersatile (or **V**ideo) **D**isk (**DVD)** storage is beginning to supersede CD-ROMs as the next step forward in technology. **DVDs** are basically specialist drives and disks with a storage capacity of approx. 4-5Gb, that can used to store audio, video or computer program data.
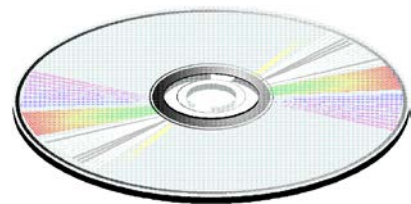
The progression from CD-ROM ➔ CD-R ➔ CD-RW ➔ DVD ➔ DVD-R is a typical illustration of how PC technology has developed since the mid-1990s. At each stage, upgraded disk drives would be required and as each subsequent development became available on the market, it would be more expensive than its predecessor. These forms of storage media provide a quicker, more convenient form of storing large quantities of data than tape cartridge devices that were traditionally used for high capacity storage. At the time of publication, **DVD-R** drives and disks are not low enough in price to become as universal as **CD-R/RW** technology.

☞ Manoeuvres

1.   What is the **smallest unit** of computer memory?

2.   What **benefits** do large capacity hard disk drives offer?

3.   Why have **Zip** disks not overtaken floppies in popularity?

4.   Describe the benefits and disadvantages of standard **CD-ROM** and **DVD** as storage media.

Driving Lesson 10 - Types of Memory

⊞ Park and Read

Random Access Memory (**RAM**) or **Main Memory** is used to store information on a temporary basis, such as a text document or a software program that is currently in use by the PC. The CPU must transfer information to RAM before software can manipulate it, e.g. **the operating system software** must be loaded from the **HDD** to **RAM** when a computer starts up and both the necessary software and appropriate file/s must be loaded into **RAM** before processing can be performed.

Memory chips, however, work only if there is a source of electricity, so that when the computer is switched off everything in the RAM is lost. This is known as **volatile** memory.

The **RAM** available for PCs is currently available in modules of **128**, **256** or **512 Megabytes** (Mb) of memory. Like many computer specifications, the typical memory capacity of a machine is constantly increasing.

Read Only Memory (**ROM**) or **Secondary Memory** is used to store important information that the CPU needs in order to keep the PC running. Information stored within ROM can only be read by the CPU and not manipulated or changed. ROM retains this information after the power is switched off, e.g. the **machine start-up software** is stored here, so that when the PC is switched on again the software is immediately available to be used again and again. This type of memory is **non-volatile**.

⮐ Manoeuvres

1. Why is **RAM** so important?

2. What is the difference between **RAM** and **ROM**?

Driving Lesson 11 - Measuring Memory

▣ Park and Read

Measurements of computer memory are:

1 bit	The amount of storage space needed to hold either a 1 or a 0 in memory (binary numbering).
1 byte	8 bits, this is the amount of storage space needed to hold one character (letter, number, symbol, space etc.).
1 kilobyte (k)	1024 bytes. This can store several paragraphs of text.
1 Megabyte (Mb)	1024k. This can store enough text for a sizeable book.
1 Gigabyte (Gb)	1024Mb.
1 Terabyte (Tb)	1024Gb.

Characters are used to build up meaningful words, numbers and pictures, this collection of text, numeric and graphic information can then be saved with a given name, referred to as a **file**. Files can contain different amounts of data in many different forms, e.g. a memo, a report, a database containing records, a program or an image. The number of characters contained within a file will determine the amount of space or memory needed to save it. Some example file sizes are given below:

Small Memo (*Microsoft Word*)	15kb
10 page report with graphics	250kb
Photo Image(jpeg format)	20 - 300kb
50 page Manual with graphics	1 Mb
Microsoft Excel program	6 Mb
Computer Game	600Mb +

In some data files, characters can be organised within the **file** into units referred to as **fields** and **records**. In a file holding personnel data, a single **record** would contain all the information for one person. Within each record there would be many fields, each **field** being a single piece of information such as a name, or date of birth. A file containing many records requires more memory than one containing a few.

In order to organise and manage files easily they can be saved in a named section on a disk called a **directory** or a **folder**. The size and number of the files that are contained within a folder determine the amount of space or memory needed to store it.

☞ Manoeuvres

1. How many **bits** are in a **byte**?

2. How many **Megabytes** are in a **Gigabyte**?

Driving Lesson 12 - Computer Performance

▣ Park and Read

The user can judge the **performance** of a PC according to how quickly tasks are performed. There are a number of factors that determine the overall operating speed of a PC:

♦   The clock speed of the CPU

♦   The capacity of the RAM

♦   The capacity and speed of the HDD (Hard Disk Drive).

♦   The number of applications running

The speed of a system is determined by any component that causes a bottleneck in the flow of data. A PC with the fastest available CPU (currently around 2.4GHz) will not operate to its full potential if the machine only has 16Mb RAM and a small, slow hard drive. Similarly, a PC fitted with 512Mb RAM and a 120Gb hard drive will not give its optimum performance if the CPU speed is 166MHz.

The relative importance of all these factors will depend on the nature and number of the tasks being performed. A task involving thousands of complex calculations will depend heavily on CPU speed, whilst one involving huge quantities of data will be more affected by RAM size and HDD access times. Tasks involving the Internet will probably be restricted by modem speed.

Although modern operating systems are designed to allow more than one application to be open and in use simultaneously, a large number of open applications will make enough demands on the CPU and RAM to produce a noticeable reduction in performance.

For a PC to operate at its optimum speed the capability of all components needs to be carefully balanced.

↰ Manoeuvres

1.   What may happen if you have lots of applications open at the same time?
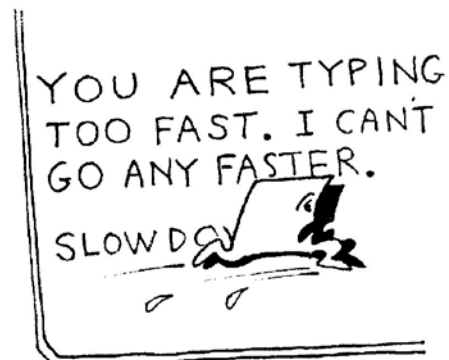
Driving Lesson 13 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1. How is computer **memory** measured?

2. List the main types of memory storage device.

3. How does hard disk memory storage **compare** with compact disk storage in terms of cost and capacity?

4. Describe the two main **types** of computer **memory**.

5. What **factors** can affect a computer's performance?

6. Why might a floppy disk need to be **formatted**?

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 4
Software

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

Understand the Purpose of an Operating System

Understand and Identify Software Applications

Understand the term Systems Development

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 14 - Operating System

▣ Park and Read

The **O**perating **S**ystem (**OS**) is a special computer program that is essential to the efficient running of all the other programs within the computer.

The operating system carries out tasks, key press instructions and controls which operations within the computer are carried out and in which order. Some common operating systems are *Windows* and *Linux*.

When the computer is switched on it carries out a **P**ower **O**n **S**elf **T**est (**POST**) and **boot-up** entirely on its own because the necessary software is in **ROM** memory. This process ensures that all the hardware components are running and that the CPU and memory are functioning correctly. A series of beeps denotes any detected errors.

The second function of the boot-up operation is to search drives for an operating system and then launch it, by reading the operating system files and copying them to the **RAM**. The operating system is not part of the PC and needs to be located at each boot-up, this makes upgrading or fixing errors in the **OS** much simpler and allows a choice of operating systems.

A **G**raphical **U**ser **I**nterface (**GUI**) is a way of showing the computer's facilities using icons (pictures) and menus (names). Instead of typing a technical instruction the mouse is used to click on an icon (picture) or menu (names) to select or perform an action.

☞ Manoeuvres

1. What do the abbreviations **POST** and **OS** mean?

2. What happens when a computer **boots** up?

Driving Lesson 15 - Application Software

Park and Read

Computer programs such as word processors, spreadsheets, games, etc. are called **applications**. Applications are separate from the operating system software but must be **compatible** with it in order to be able to operate, e.g. some applications will only run when *Microsoft$^{®}$ Windows* is running. Files will only open if they are compatible with the application used.
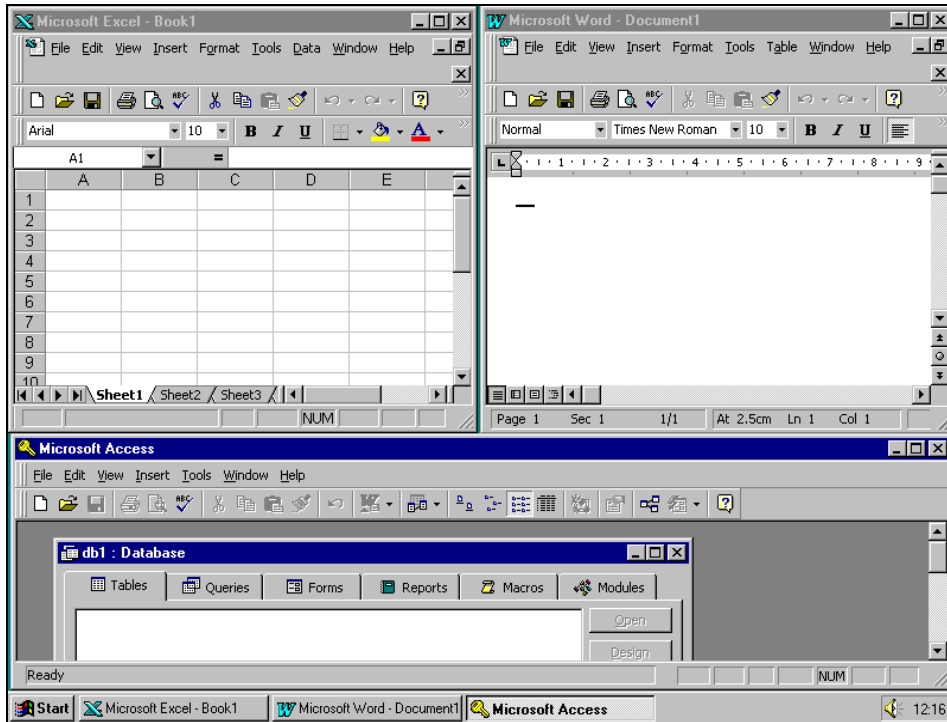
The picture above shows three separate applications open within the environment of the *Microsoft Windows* operating system.

Examples of software applications or programs are:

Microsoft Word	Word processor
Microsoft Excel	Spreadsheet
Microsoft Access	Database
Microsoft PowerPoint	Presentation tools
Microsoft Publisher	Desk Top Publishing
Microsoft Internet Explorer	Web Browsing facilities
Microsoft Outlook Express	E-mail
Microsoft AutoRoute Express	Route planning
CorelDraw!	Graphics
Sage	Accounts and Payroll

Driving Lesson 15 - Continued

Word Processing applications allow text to be typed, amended, formatted, printed and saved as a file (document), which can be reused at a later date.

Spreadsheet applications allow text, numbers and calculations to be entered into a worksheet usually in the form of rows and columns. Spreadsheets allow numbers to be amended and the resulting calculations are updated to take account of the changes, ensuring calculations are always current.

Database applications store large quantities of data that can be questioned to display only specific pieces of information. A database contains multiple fields and records. A **field** is a column of similar data, e.g. containing like information such as date of birth. A **record** is a collection of associated data, e.g. a row containing entries that relate to an individual person, object, company or stock item, etc.

Desktop Publishing (**DTP**) applications use drawing and graphic design facilities to allow greater control over the layout of pages and the appearance of text and graphics. DTP applications are used rather than word processors to create flyers, posters, cards and newsletters because of the ease of using graphics and text together. Some formatting features within DTP applications can also be found in word processing.

Presentation applications allow sophisticated presentations to be created for use as overhead projections, 35mm slides, Web pages or as an on-screen display with the option of incorporating special effects, audio and video clips.

Web Browsing applications allow users to access the information on the **Internet**; to search for, view and download text and images from the vast collection of data which comprises the **World Wide Web**.

Software versions are identified numerically to show the order of development, e.g. *Word 97* is an older version of the software than *Word 2000*, which in turn is an older version than *Word 2002* (sometimes referred to as *Word XP*.) As software is developed and updated, it is necessary for a user to be able to identify the version installed on their PC to ensure compatibility with existing files. Files created using an older version of an application may not be compatible with the latest version, and vice-versa. The exact version of a piece of software can usually be found by selecting **Help | About** from the menu bar.

Manoeuvres

1. What do you understand by the term **compatibility** in the context of **software applications**?

2. What types of **applications** software would be particularly suited to the following business uses; news-sheet production, stock control, medical practice patient records?

Driving Lesson 16 - Systems Development

▣ Park and Read

The development of computer based systems can include a variety of steps, depending largely on the size and type of the application, but a typical development path includes **analysis, programming, testing** and **documentation.**

Once the need for a computer system had been identified, the next stage would be to turn the objectives of the proposed system into formal definitions including program specifications, hardware requirements and estimates of final system size. This is the **Systems analysis** stage (performed by systems analysts) and the task would include meetings with various key members of staff to ensure that all the relevant input is considered. As a result of this analysis, a **design** for the proposed system would be generated.

It may be that the objectives of the system can be met by an off-the-shelf computer package, but if not then it will be the job of programmers to write the necessary programs to meet the supplied specification (**programming** stage). The computer language used for this task will depend on the nature of the task and integration with existing systems.

The system must be **tested**, sometimes at stages throughout its development, to ensure that it both meets the original requirements and that any **bugs**, or faults, are identified and corrected. This can be done by staff within the organisation using a variety of testing techniques and by selected outside users who can test the system in a realistic environment (known as Beta testing).

Finally **documentation** must be written for the finished system. This is usually at two levels, one detailing the technical operation of the systems and programs to enable future maintenance and the other an instructional guide for system users.

⬀ Manoeuvres

1.   What is the job of the **systems analyst**?

2.   What does the **programmer** do?

3.   What is a **bug** in a program?

Driving Lesson 17 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1. Explain the terms **operating system** and **applications software**.

2. What are the main **functions** of an operating system?

3. Why are there different versions of software?

4. List some common software applications and explain their uses.

5. Describe some of the processes involved in the development of computer-based systems.

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 5 Information Networks

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

Understand the terms LAN & WAN

Understand the term Client/Server

Understand the use of 'Phone Networks in Computing

Understand the use of E-mail and the Internet

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 18 - LAN and WAN

Park and Read

Two or more computers connected together is called a **Network**. A network allows PCs to share information and resources via that connection. As few as two and as many as several hundred can be linked together on a network.

In an office environment a network would allow e-mail messages to be sent between PCs, files containing text and graphics to be shared and resources such printers, scanners or even applications to be accessed, even if they are not directly connected to the PC in use. This would provide financial advantages - a smaller number of peripheral devices shared between a larger number of users requires less investment in hardware, together with performance benefits - the network is able to operate more efficiently.

Local Area Network (LAN)

A LAN consists of computers that are linked together by lengths of cabling within a building or other close proximity.
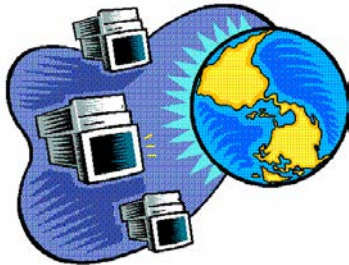
Wide Area Network (WAN)

A Wide Area Network involves computers linked up over longer distances. An example of a WAN is a computer that is linked to another by means of a telecommunications network.

A rule of thumb used by telecommunications engineers is that any network covering an area of **less than one square kilometre** is a **LAN**, while any network covering **more than one square kilometre** is a **WAN**.

Client/Server Networks

This term describes networks in which all core data is stored on a central **server** computer. The data may then be accessed by the peripheral PCs or **clients**, which allow users to interface with the server.

Manoeuvres

1.   What are some of the **advantages** of working over a **network**?

2.   What is the difference between a **LAN** and a **WAN**?

Driving Lesson 19 - The Telephone Network

▣ Park and Read

Advances in telecommunications mean that computers can be linked to telephone systems in order to produce a world-wide WAN.

The growing use of digital rather than analogue devices is responsible for on-going improvements in the capabilities of communications systems. **Digital** data is transmitted as a series of digits made up of 1 and 0. This is the format of the data that computers use. Data in digital form can be transmitted significantly more quickly than it can in analogue form. **Analogue** transmissions transfer data as electromagnetic waves, which is not only slower, but also more susceptible to corruption.

A **modem** (**mod**ulator/**dem**odulator) is a device that converts a **digital** signal from within a computer into an **analogue** (audio) signal that can be passed along a standard telephone line. The modem in the computer that receives the signal then converts it back to digital form.
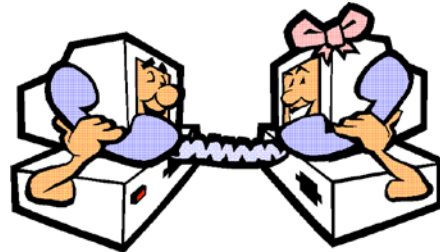
Modems have been able to operate at a variety of speeds (known as **transfer rate**), from 14,400bps (**b**its **p**er **s**econd) to the latest models that can transfer up to 56,600bps over the telephone line. Faster modems may be more expensive to buy, but can result in cheaper phone bills because of their quicker transmission rate.

The **I**ntegrated **S**ervices **D**igital **N**etwork (**ISDN**) is a system that allows transmission of digital data between telephone exchanges. No modem is required at the PC, since banks of modems at the exchange do all analogue-digital-analogue conversion. This type of telephone link allows faster data transfer rates, i.e. e-mail transmission, web page downloads, etc., than the standard **P**ublic **S**witched **T**elephone **N**etwork (**PSTN**) telephone line, as accessed by the average home user.

An **A**symmetric **D**igital **S**ubscriber **L**ine (**ADSL**) allows transfer rates up to 40 times faster than a **PSTN** line. This technology allows two different frequencies of signal to be sent down the normal line, one for telephone message transmission (including fax) and the other for high-speed **broadband** Internet communications. It is an "always on" link, which does not need a dial up connection. This type of technology requires extra expenditure on a more expensive type of **modem** and converting the telephone line to **ADSL**.

Driving Lesson 19 - Continued

Type of Network		Properties
PSTN	Public Switched Telephone Network	Standard system, analogue, dial-up connection, slow transfer rate.
ISDN	Integrated Services Digital Network	Faster than PSTN, no modem needed, no dial-up.
ADSL	Asymmetric Digital Subscriber Line	Faster than PSTN and ISDN, special modem required, no dial-up.

☞ Manoeuvres

1. Explain the term **transfer rate**.

2. What benefits does **ADSL** provide?

3. Explain the difference between **analogue** and **digital** transmission.

Driving Lesson 20 - The Internet

▣ Park and Read

The **Internet** is a Wide Area Network of computers all linked together. The **World-Wide-Web (www)** refers to the vast collection of information, stored in **web pages** within **web sites**, which is available for access by anyone connected to the Internet. Internet users can download information (pictures, sounds, information or games) and save it to their own PC, or place data from their own PCs into web pages. The Internet also allows people to leave messages for, or even talk to, like-minded groups around the world. E-mails can be sent via the Internet.

To gain access to the Internet a modem is usually required. It is also necessary to subscribe to an **Internet Service Provider** (**ISP**), who will provide the connection service, an e-mail address and the **Browser** software, e.g. Microsoft Internet Explorer or Netscape Navigator to enable the PC to connect to and use the **Internet**. The ISP acts as an Internet equivalent of a mobile telephone service provider.

In order to find specific subject matter on the world-wide-web, a user can access a web page linked to a database - called a **Search Engine** - from suppliers such as **Yahoo**, **Microsoft**, **Alta Vista** and **Excite**.
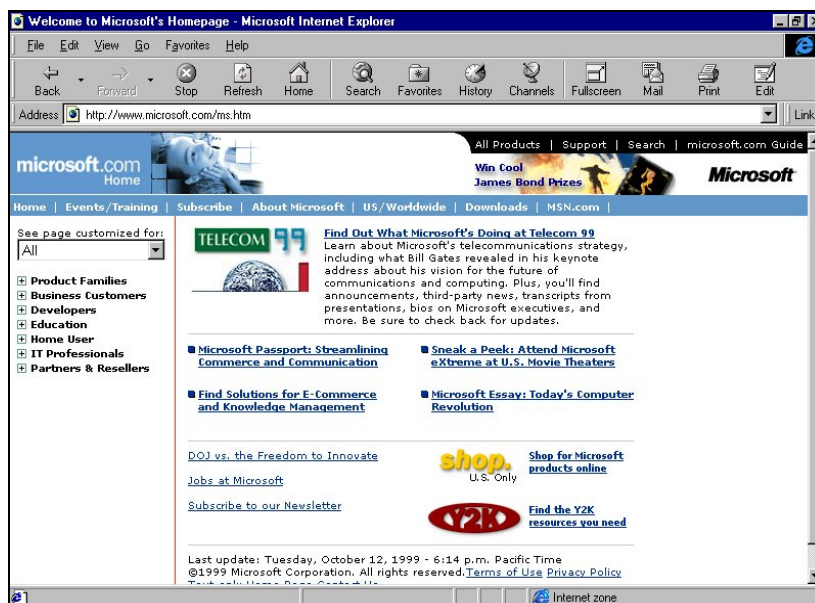
These sites enable a word or phrase to be typed and the facility will then search the web for any references to the terms entered and produce a list of web sites containing relevant references.

☞ Manoeuvres

1.   What is a **search engine**?

Driving Lesson 21 - Intranets and Extranets

▣ Park and Read

Intranets

Many medium to large organisations now operate their own internal networks that provide similar funtions to the Internet, i.e. web pages containing company information and procedures, standard forms that can be downloaded, pricing structures, newsletters, etc. Such a network is known as an **intranet** since it is effectively an internal Internet! Intranets may or may not be connected to the Internet. An intranet would only be accessible from within the organisation.

Extranets

An **extranet** is an intranet, or part of an intranet, which can be accessed by certain external users via the Internet. A company or organisation that operates an intranet may wish to make specific information such as product ranges, prices, on line order forms, etc. available to suppliers, clients or potential customers. Access to this area of the intranet would often be controlled by **usernames** and **passwords** to establish the credentials of the external user, and the specific areas of the extranet that the user is entitled to view.

⮎ Manoeuvres

1.   What is the difference between an intranet and an extranet?

Driving Lesson 22 - Electronic Mail

⊞ Park and Read

E-mail (Electronic Mail) allows messages to be sent from one computer to another, via an electronic mailbox, using an e-mail address, equivalent to the address on an envelope.

E-mail can transmit documents over the Internet very quickly to worldwide destinations at the cost of a local rate telephone call. This compares very favourably with using postal services. E-mail messages may also be used as "carriers" for files of any type or format, e.g. a word-processed document, a spreadsheet file, a scanned photograph or an audio file could be **attached** to an e-mail message and transmitted along with the e-mail. Such files are known as e-mail **attachments**. Great care must be taken when opening a received attachment since they are now the most common method of spreading computer **viruses**. (See **Driving Licence 30**.)

Used properly, e-mails are completely confidential.

In order to be able to send and receive e-mails externally, a PC must have an appropriate software application installed and must be connected to a telephone network, usually via a modem. It is also necessary to subscribe to an **Internet Service Provider** (**ISP**), who provides the connection to the Internet and holds e-mails for delivery to you and sends your e-mails.

E-mail is also used within organisations to handle internal communications, such as memos, announcements and messages between employees. These messages are carried over the local area network.

⤷ Manoeuvres

1.   What is an e-mail **address**?

2.   What does the **Internet Service Provider** (ISP) offer in relation to e-mail?

Driving Lesson 23 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1.   What is the importance of the **telephone network** to computing?

2.   Explain the terms: **www**, **modem**.

3.   To what does the term **e-mail** refer?

4.   What are the **benefits** of e-mail?

5.   What is an e-mail **attachment**?

6.   What **equipment** and **software** is needed to use e-mail?

7.   What is the **Internet** and how does it differ from the **World-Wide-Web?**

8.   Describe how the **Internet** and the **www** can be used.

9.   What is an **Intranet**?

10.   What is an **Extranet**?

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 6
The Use of IT In Everyday Life

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

Understand the use of Computers at Work

Understand the Electronic World

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 24 - Computers at Work

▣ Park and Read

Computers in business

Computers now play vital roles in commerce and industry. National and multi-national organisations use computerised systems to sell their products, track their customer base and process and store their sales records. **Airline booking systems** allow travellers to access flight times and ticket prices, choose their flights and pay for their tickets on-line. It is common for **banks** to offer current accounts that can be run totally via the Internet. Balances can be checked, deposits and payments made, direct debits and standing orders set up, all from the convenience of the account holder's PC. **Insurance companies** also utilise large-scale computer systems to provide personalised insurance quotes and increased efficiency of **claims processing**.

Computers in healthcare

Hospitals and Health Care Trusts make use of computerised **Patient Record** databases. **Ambulance Control Systems**, like those of other Emergency Services are computerised. Computers can even be used to assist with **diagnosis** and also maintaining precise control over specialist **surgical equipment** and **instruments**.

Computers in government

Government agencies use national computer database systems to store vast amounts of **public records data**. **Social security records**, **vehicle registration details**, **census information**, **revenue collection records**, **criminal records**, **NHS records**, **housing information**, etc., are all stored on computers at both local and national level. The government is currently committed to moving towards a situation where **voting** in local and national elections may be done electronically.

Computers in education

Educational establishments use software applications in order to familiarise pupils with commercial software and as teaching aids. Computer systems are now widely used to store **student records** and **registration details** and to assist with working out complicated **timetable** plans. Access to the **Internet** and computer based reference software is particularly useful to students who have **homework**/project work to complete. Word processing, spreadsheet and database software will also be of use to such individuals.

Driving Lesson 24 - Continued

Computer **B**ased **T**raining or **CBT** refers to situations where a student uses learning materials that are either provided as software that is run from CD/DVD or loaded into the students PC, or accessed via the Internet. Such learning material would consist of factual information and exercises to work through in order to test personal competence. **Distance Learning** refers to situations where students could "attend" training courses over the Internet. Course material and assignments would be viewed or downloaded from the training provider's web site, tutors would be contacted via e-mail and completed assignments submitted over the Internet.

CBT/Distance Learning	
Advantages	**Disadvantages**
Learn at own pace	Distractions around the home
Learn at times convenient to individual	Need for extra self discipline
No travelling involved	Lack of human interaction
Much more control over learning process	Potential feelings of isolation

Teleworking

This is a concept that allows employees who would otherwise be office based to work at home. Since more and more office work involves the use of computer systems and electronic communication, the necessity for such work to be done in a central office, rather than on an individual workstation in the employee's own home is being reduced. There are a number of theoretical benefits to **teleworking**, which are not dissimilar to those identified in the paragraph above, relating to **CBT/distance learning**. An employee could operate a much more **flexible schedule**, adjusting their working day to suit their own needs. If a significant proportion of the country's workforce operated at home, the amount of **commuting** would be greatly reduced with a resultant benefit to the transport network and the environment. There could be a reduction in **company space** since fewer employees would need to be accommodated in central offices. In theory, individuals would be able to **focus on a specific task**, without being side-tracked onto other matters by colleagues. Disadvantages to **teleworking** are also very similar to those listed above: distractions in the office could be replaced by distractions in the home; there could be a lack of human contact and a resultant lack of teamwork.

Teleworking	
Advantages	**Disadvantages**
Enables flexible schedules	Distractions around the home
Reduces commuting	Need for extra self discipline
Reduces company space requirements	Lack of human interaction/teamwork
Enables greater focus on specific task	Potential feelings of isolation

☞

Driving Lesson 24 - Continued

Computers or people?

Computers in business and industry can fulfil useful functions where highly accurate machining is required. For instance, repetitive tasks can be automated, fast and accurate calculations can be performed and data can be manipulated, correlated from different sources and stored or retrieved.

There are, however, situations where a human being is still a more useful worker than a computer. A computer has no initiative or common sense, it will only perform the exact function for which it is programmed. A person is more adaptable/resourceful, more capable of applying judgement to a situation and finding a more cost-effective way of carrying out a task, which is a one-off or which only occurs infrequently.

A person also provides a more acceptable customer interface than a computer. There will always be customers who prefer to speak to a human being, rather than having to navigate their way through a menu of options by pressing buttons on their telephone keypad!

Computer Systems	
Benefits	**Drawbacks**
Fast, accurate calculations	Cannot use initiative
Fast data manipulation/correlation	Cannot apply judgement
Automation of repetitive tasks	Cannot adapt to the unexpected
Highly accurate control of machinery	Lacks the human customer interface

Manoeuvres

1.   Explain the term **teleworking**.

2.   Do some research to establish how computers might be put to use in **educational establishments**.

Driving Lesson 25 - The Electronic World

Park and Read
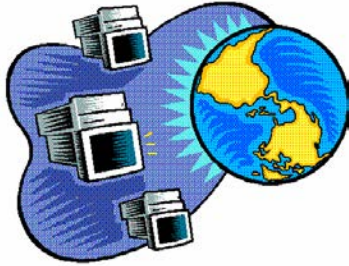
The term **Information Superhighway** is used to describe a situation where information of any kind, anywhere in the world, would be available to anyone who had access to a PC linked to the Internet.

This would create an **Information Society** in which access to unlimited amounts of information would be available without having to leave home or work or without having to look it up in huge reference books or visit libraries. Information Society can also be used to describe the situation today where an increasing proportion of the working population is employed to collect, process, store, retrieve and transfer information.

In an **e-commerce** environment, a company will advertise and display its wares on the Internet via its own web site. Potential customers are able to view this type of on-line catalogue, make their choice of **goods** or **services**, complete an on-line order form, in which they provide their **personal details** including name; address, contact telephone number, e-mail address, etc. The next stage is to specify the **payment method** electronically via secure debit card or credit card transfer. The goods will then be delivered. Organisations that operate such e-commerce web sites must conform to normal consumer protection legislation, such as allowing customers to **return unsatisfactory goods**. In the electronic world, almost anything can be bought over the Internet: the smallest component part of a computer, a book, music CD, an airline ticket, a family holiday, a new car.

On-line Purchasing	
Advantages	**Disadvantages**
Services available **24hrs a day**, 7 days a week	A **virtual store**, only pictures available, can't examine the goods
Services available world-wide	No **human interface**, can't ask for advice
Huge **range of products/services** on view	Some **risk of insecure payment methods**

Manoeuvres

1.   Explain the term **e-commerce**.

Driving Lesson 26 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1.   List some advantages and disadvantages of **CBT**.

2.   Explain the term **Distance Learning**.

3.   List some advantages and disadvantages of **on-line purchasing**.

4.   What disadvantages does a computer have compared to a human?

5.   What can computers be used for in **healthcare**?

6.   When might a person be **more appropriate** than a computer in a commercial setting?

7.   List some uses of large-scale computer applications in **government**.

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 7
Health & Safety Environment

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

Identify Health & Safety Issues

Understand how to help protect the Environment

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 27 - Health and Safety

▣ Park and Read

Ergonomics

The term **ergonomics** refers to the relationship between workers and their working environment. The following aspects of the working environment should be taken into account when assessing whether or not a working environment is suitable for computer operation and whether or not it conforms to legislation:

- Provision of adequate lighting

- Provision of adequate ventilation

- VDUs appropriately positioned with screens free from flicker and interference and images free from glare

- Provision of monitor filters/anti-glare screens if required

- Suitability and adjustability of chair to provide the prescribed posture for the user, i.e. feet on the floor and a comfortable height in relation to the desk

- Provision of a mouse mat or suitable equivalent surface

- Suitably positioned keyboard, not too far away from the user

- Provision for frequent breaks away from the computer (10mins after every 50mins work).

It is an employer's responsibility to ensure that appropriate provisions are made available, but the employee has a responsibility to ensure that he/she makes use of them and goes about their job in an appropriate manner. A workplace that has swivel chairs with adjustable positions, stable, roomy desks, etc. will provide a working environment that is comfortable and safe. Furniture and equipment needs to be suitably positioned, conducive to the type of work for which it is intended and to conform to the relevant Health and Safety at Work (**HASAW**) legislation.

Health Issues

Injuries common in an IT environment are:

- Aches and pains (especially to the **back**) due to bad posture when seated for long periods

- Repetitive strain injury (**RSI**) caused by poor ergonomics combined with repeated movements of the same joints, e.g. **wrist**, over a long period of time

- **Eye strain** which can be caused by **glare** or flickering from a VDU and by not taking regular visual breaks (10 minutes every hour is recommended) away from the screen

- Injuries due to tripping over trailing wires or other obstructions.

☞

Driving Lesson 27 - Continued

Precautions

♦   No trailing or **insecure power leads** or other cables

♦   No worn or frayed power leads

♦   No **overloaded power points**.

The Environment

It is desirable that certain steps be taken in an IT workplace to minimise the effect of working practices on the environment.

♦   Where possible **recycle waste paper**

♦   Where possible **recycle ink/toner cartridges** from printers and copiers

♦   Where possible use energy efficient monitors with **low power** options

♦   Use PC settings that enable "sleep" (or **standby**) mode for HDDs and monitors when the devices are inactive

♦   Where possible save documents in an electronic format within the computer system rather than printing out hard copies.

⮑ Manoeuvres

1.   How would you ensure that your **working environment** was safe?

2.   As an employee, what are your responsibilities towards your own **safety** in the workplace?

3.   What precautions could you take to minimise the effect of your work on the environment?

THIS IS NO REFLECTION OF YOUR ABILITIES
MR CLARKE, BUT CHIMPO HERE IS GOING
TO FIND OUT WHERE YOU'RE GOING WRONG!

Driving Lesson 28 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1. What is meant by **HASAW**?

2. Describe a **good working environment** relevant to PC use.

3. What is **RSI**?

4. Describe some **Health and Safety precautions** which should be taken when working with computers.

5. What **common injuries** might occur in such an environment?

6. What do you understand by the term **ergonomics**?

7. What two things can you do to save paper?

If you experienced any difficulty completing this S.A.E. refer back to the Driving Lessons in this section. Then redo the S.A.E.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide. Only when competent move on to the next Section.

Section 8
Security

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

Understand the need for Backing up Data

Know about Privacy Issues

Understand the Information Security Issues

Understand the Implications of Theft

Understand Computer Viruses

Be aware of Anti-virus Measures

Understand Copyright Legislation

Know about the Data Protection Act

To gain an understanding of the above features, work through the **Driving Lessons** in this **Section**.

For each **Driving Lesson**, read the **Park and Read** instructions, without touching the keyboard, then work through the numbered steps of the **Manoeuvres** on the computer. Complete the **Revision Exercise(s)** at the end of the section to test your knowledge.

Driving Lesson 29 - Security Issues

▣ Park and Read

Backing Up

In an earlier section, the fact that certain parts of a PC's memory are only temporary was discussed. It is, therefore, good practice for a PC operator to save their work to permanent storage (HDD or file server) after regular, short periods. This ensures that if a power cut occurs, only the data produced since the last save is lost. Certain software applications offer the facility to perform this task automatically.

Apart from protecting data against loss due to power failure, an organisation needs to consider the possibility of total file loss due to; a serious hardware fault, physical damage to the computer (possibly as a result of fire), infection by computer virus, theft or other malicious action.

The loss of vital files may be inconvenient to an individual using a home PC for hobby purposes, but to a business user, large or small, the loss could well be catastrophic. It is, therefore, essential for strategies to be available that enable regular, complete copies to be made of all files which are identified as being critical to an organisation. This is known as **backing up** files and may be carried out hourly, daily, weekly or in any combination thereof. Regular backing up ensures that even in the event of a total loss of data, an organisation has an almost current, duplicate set of its most important files, which it can rely upon to maintain business continuity.

Storage containing the backed up material is known as **backing store** and should be treated as the very valuable commodity that it actually is. The fundamental reason for backing up files is to ensure that they cannot be lost, or completely destroyed, while saved on the hard drive of the PC or the file server. It is, therefore, not totally secure to keep the backing store in the same room, or even building, as the source material because of the risk of fire.

For absolute security, the backing store should be removed from the working environment (off site) and more than one set of backing store media should be used in rotation. All backup media should be kept in a storage environment, which is theft-proof, fireproof and waterproof.

Driving Lesson 29 - Continued

For an individual home PC user, such sophisticated techniques are unnecessary, however some backing up should be carried out. Always try to bear in mind how much time and effort would be lost if your PC either switched itself off or blew up! If the former happened, you would lose all unsaved work, if the latter, you would lose all work saved onto your HDD as well as all application software installed on your machine. It is good practice to keep all the original media on which application software is supplied, i.e. program CDs or floppies, in a safe place.

It is highly likely that at some point, for whatever reason, you will need to re-install application software. You should also make a point of backing up all files that you have created yourself and saved to disk.

Privacy Issues

If there is any need to consider the content of certain files as being sensitive or confidential, the use of password protection should be used to prevent unauthorised persons accessing, viewing or editing the data. A **password** typically acts as a user's personal entry code to their own PC, software or files and would usually be chosen by the user and never divulged to anyone. **Passwords** should be changed regularly, to prevent the possibility of misuse by unauthorised individuals.

As well as **password** protection, most organisations or systems would require the use of a **user ID** (otherwise referred to as a **user-name** or **log-in name**.) This is another level of access code that provides evidence of a user's entitlement to access certain areas of a network or system. A **user ID** would typically be assigned to users by the relevant organisation, i.e. the owner/administrator of the system or network in question. A number of users might be given the same **user** ID. This would identify to the system the fact that the user could legitimately claim access to the network, also, it would identify the level of access to which the user was entitled. The **password** would also be necessary to identify the individual user, and provide evidence of their entitlement to access their own files, within an area of the network designated as "theirs".

It is feasible therefore, <u>if full use is made of password protection facilities</u>, for the following security measures to be in place when a user starts up a networked PC:

♦ A **password** must be typed in to gain access to the PC.

♦ A **user ID** must be typed in to gain access to the network or system

♦ A **password** must be entered to gain access to shared directory space on the network server.

Driving Lesson 29 - Continued

♦ A **password** must be typed in to gain access to a file saved in that directory space.

♦ A **password** must be typed in to gain authority to amend the file content by saving changes.

The different levels of access given by different **user ID**s are known as **access rights**. It is important that organisations have security policies in place with regard to **access rights**, in order that only appropriate personnel have access to the system and only appropriate personnel have access to sensitive parts of the system. These security precautions should be taken on top of normal, sensible physical security measures such as burglar alarms, locks and keys, etc.

Information Security

This term is used to describe methods for ensuring that data stored on a computer system is protected against being compromised, or against unauthorised access. It is important that any organisation should have an **active** policy to ensure that security is not compromised, rather than waiting to deal with any breach once it has happened. An **information security policy** should document such issues as:

♦ The details of a **user ID/password** policy as described above

♦ The **personnel responsible** for each level of security

♦ **Anti-virus** measures

♦ Penalties for **breaching security policy**

♦ Procedures for **reporting security incidents**

♦ Procedures for educating staff about their **responsibilities** regarding **information security**

As part of overall security consciousness, individuals should be aware of the sensitive nature of information stored in portable appliances such as **laptops**, **PDAs** and **mobile phones**. If such a device was lost or **stolen**, not only could **confidential files** fall into the wrong hands but personal information (addresses, **phone numbers** etc.) could be misused by the finder and **contact details** could be lost to the company. All such devices should be kept safe at all times and password protection should be applied wherever available, also, as much of the material as possible should be included in any **backup** regime.

Manoeuvres

1. Why is it good practice to **regularly save** to permanent storage?

2. Why should at least one set of **backing store** media be kept **off site**?

3. Describe the possible levels of **password protection** that may be applied to networked files.

Driving Lesson 30 - Computer Viruses

▣ Park and Read

A computer virus is a malicious piece of programming that is written specifically to cause nuisance or harm to other computer programs or files. This should not be confused with the term **bug**, which describes an error or fault in a piece of software code. The term **virus** is used because the malicious program is designed to behave like an infection, being passed on from program to program, file to file, PC to PC, system to system.

In many cases the contamination remains unnoticed in its host file until a specific event triggers off its action. Viruses can cause many levels of harm to a computer system. The least harmful might cause slightly odd things to happen to a file, for example if a user typed text into a word processed document on an infected computer, certain letters or words might appear on screen in an unexpected text format. Another manifestation of a relatively harmless virus could be the refusal of an application's software to save files to any area other than a specific folder on the HDD, rather than the desired folder on a disk in the floppy drive. The action that a virus carries out when activated is known as the **payload**.

At the other end of the scale, a virus might lie dormant until the built in clock within a PC reaches a certain time on a certain date, or possibly until the computer has been restarted a certain number of times, and then become active. This type of virus is variously known as a **time bomb** or **logic bomb**. It could then destroy the entire file structure as laid down on the HDD and render the HDD completely useless. If this type of virus infected a network, the effect could be catastrophic.

Macro viruses are those that are added to executable files within an application. The most common of these can occur within the **template** files in Microsoft Word and Excel. This is why a user is sometimes given the option of opening such a file with **macros disabled**. If the macro facility can't run, neither can any virus that might be within it!

A **worm** is a type of virus that does not affect files, but replicates itself within a system so many times that it simply clogs up the system resources.

☞

Driving Lesson 30 - Continued

A **Trojan Horse** virus is so called because it is disguised as a file that a user would be particularly tempted to open, e.g. a game or a graphics file.

Currently, the most common type of virus is one that arrives in an **e-mail attachment**, installs itself within the recipient's Outlook or Contacts Address Book and automatically e-mails itself to some or all of the e-mail addresses it finds there. These viruses are particularly effective since the recipient may not realise that the virus has arrived or they have spread the infection onwards. The new victims are less likely to be suspicious of attachments e-mailed to them by a known contact.

Viruses can only become active within a system if they are introduced to the system from outside and then subsequently activated.

It therefore follows that the only pathways available to viruses are via **input devices** such as **floppy disks**, **CDs** or **DVDs** or the **Internet**. If genuine application software from reputable sources only is installed on a PC, in theory there should be no danger. If, however, disks containing applications or files are borrowed/acquired from dubious or unknown sources, the chances of them containing viruses is much greater. As indicated above, e-mails received with file attachments are now a prime source of viruses and should be treated with particular caution, as should any files downloaded from the **World Wide Web** that have a **.exe** extension. This extension identifies **executable** files, i.e. files that are actual programs that will open up and run. If the file contains a virus, the virus will run with the program!

Anti-virus measures

Taking certain basic safety precautions will reduce the chances of infection:

♦ Install reliable **anti-virus software** and **update** it regularly.

♦ Use the software to carry out **regular scans** of the **entire system**.

♦ Use the software to scan **any removable disk** that is placed in a drive on the system **before installing or opening any files** from it.

♦ Be conscious about the **source** of any software you use!

♦ **Save any files downloaded from the Internet**, either to a floppy disk or to the HDD and **scan them with anti-virus software before opening** them.

♦ Be particularly suspicious of **any e-mail messages containing attachments** from an unknown source.

♦ Even be suspicious of **any e-mail messages** from an unknown source.

♦ **Do not open anything suspicious, virus-scan everything!**

Driving Lesson 30 - Continued

Anti-virus software

Every computer system in use now should have an **anti-virus** program installed. It is important to be aware of the **limitations** of **anti-virus** software. Virus writers modify existing viruses and create new examples almost every day. This means that the writers of **AV** software must modify their own software on almost a daily basis, in order to maintain the effectiveness of their products. This means that once a user has installed an **AV** program it should be **updated** immediately since it will have been sitting in stock for a number of weeks. Updating is typically done via the Internet. The software will have some type of interface that will allow the user to specify how and when updating takes place. At the specified time the software will access the Internet, check for current update files, download them if appropriate and automatically install the new data files. This procedure should be carried out on at least a weekly basis, to ensure that effective **AV protection** is maintained. An **AV** program, purchased and installed 18 months previously and never updated, is virtually useless!

Once an **AV** program has been installed, configured and updated, it must be used conscientiously, i.e. used regularly to scan the entire contents of the computer and set up to automatically scan any incoming e-mails and Internet downloads.

If an **AV** program detects the presence of a **virus** during a scan, one of two courses of action should be followed:

The file containing the **virus** should be **disinfected**. This means that the elements of malicious programming within the file are identified and deleted, leaving the file in its original, harmless state. An effective **AV** program will give the user the option of allowing it to do this.

If an **AV** program detects a virus that it does not recognise, i.e. a virus that has been created too recently for the **AV** updates to **disinfect**, the software should offer to **quarantine** the infected file. This means that the **AV** software will move the infected file into a protected folder within its own installation. From this **quarantine** area, the entire file can either be **uploaded** to the **AV** software supplier's web site for their attention, or simply deleted by the user so that it presents no further threat.

If, in spite of taking all the recommended precautions, a system does become infected, the **appropriate staff member should be informed**, the computer affected should be removed from any network connection and disinfected in the manner described above. If this is not effective, specialist IT support should be sought.

☞ Manoeuvres

1.   What is a computer **virus**?

2.   List some **strategies** that can reduce the risk of contamination by computer viruses?

Driving Lesson 31 - Copyright

▣ Park and Read

Software copyright legislation

This exists to give the authors/developers of software the same legal protection as the authors of published, written and musical works already enjoy. The software legislation is, if anything, more restrictive in practice than traditional copyright laws. If an individual purchases a book or music CD, copyright law prohibits them from copying that material in any way, without the express permission of the author or publisher. They are, however, able to lend their copy of the book or CD to a third party.

Software copyright operates in such a way that an individual who buys a computer program, be it a game, a piece of application software or an operating system, does not actually purchase that item but purchases the right to use it within a specific set of criteria. It is a **single user licence** that has been purchased, allowing the user to install one copy of the software on a single computer on which the program will be run, together with the right to create one backup copy of the software (unless specifically excluded). The licence details accompanying the software will also set out exactly what the user is permitted to do with it without contravening copyright laws.

With the advent of laptops and other portable PCs, some software licences allow the software to be installed on two machines as long as they are not both used simultaneously. This recognises that more and more users have a desktop PC in their office, as well as a laptop that they carry around, or a desktop machine at home. These users will need to run the same software on both machines and as (in theory) they cannot use two machines at the same time they are not forced to buy two expensive copies of the same software.

However, unlike a book or an audio CD, a piece of software cannot be loaned to a third party, since that would presumably mean that an unlawful installation of the program would have to be made in order for that third party to run it.

Files and copyright issues

The recent proliferation of **Internet** access and the availability of **multi-media Input/Output devices** such as **digital cameras** and **scanners** raises important issues relating to the copyright status of file material. Basically, any **graphic image**, **text file**, **audio file** or **video file**, unless created by, written by, composed or filmed by the user will be protected by internationally recognised copyright legislation. This means that no copy, either in paper form or digital format, of any type of material, may be created without the permission of the owner of the copyright. The copyright owner is deemed to be the author/creator of the original item, or, in the case of an organisation, the employer of the author/creator.

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Driving Lesson 31 - Continued

The effect of this legislation is that **any** text or picture **scanned** into a PC and saved; any **graphic image**, **text file**, **audio** or **video file** downloaded from the **Internet** and saved to disk is **illegal**, unless specifically identified by its owner as being **copyright-free**. This situation also applies to any digital material saved onto **removable media** such as **floppy diskettes**, **Zip disks** and **CD/DVD**s. This material must be considered to be copyright protected unless distributed by its owner, or specifically identified as being **copyright-free**. Effectively therefore, it should not be **used or distributed**!

End User Agreement

As discussed earlier, a typical piece of software would be sold with a **single user licence**, allowing only one installation of the software to be carried out. In order to cater for the situation within an organisation where a software application is standardised for all employees, multi-user **site licences** can be purchased. An organisation might use Microsoft Office 2000 as its standard software package in an environment where 25 employees could be expected to use the program at any one time. Rather than purchase 25 full copies of the software, disks and licence, the company could instead, purchase one copy of the software and disk, with a site licence to install the software on to 25 machines.

This would work out as a significantly cheaper way of installing the required number of copies of the software. Such a licence would also be required if any software were installed on to a shared directory on one file server and then accessed across a network by multiple users. Any licence would have to cover the likely maximum number of users. The penalties for infringement of software copyright laws can be very severe indeed!

When a piece of software is installed onto a computer, there is usually a point in the installation process where the user has to enter their own name and/or their company name. There is another stage when the user has to signify (usually by ticking a check box) that they have read and accepted the **End User Agreement**. This is the document mentioned earlier, which details exactly what the user is permitted to do with the software. The **End User Agreement** is usually displayed in a scrolling dialog box at the same stage as the indication of acceptance by the user. Without this acceptance, installation will not proceed.

Driving Lesson 31 - Continued

Product ID

Once a legitimate software installation has been completed, the details entered by the user are locked to that application. Each individual example of the program has its own **registration number** known as the **Product ID**. It is possible to view this information to determine which named individual is the legitimate owner of the licence for a specific example of the software. The information can usually be displayed by clicking on **Help** on the **Menu Bar** and selecting **About**.

Shareware is a type of software that can be obtained on the equivalent of a sale-or-return basis. The software is obtained and distributed free of charge and installed for a pre-determined trial period, typically 30 days. At the end of this evaluation period, the software is programmed either to cease operating, or to flash up reminders, unless a payment is made to the author/software house.

Another type of shareware is software that is available free of initial fee, but is not the fully functioning version of the program. The watered down version allows the potential of the package to be evaluated, but the operator must then pay to receive the full version, together with registration and technical support as an official user. The main advantage of shareware is its cost. Relative to major commercial packages, useful software can be acquired extremely cheaply, often in the £10-£30 price range.

Freeware is, as the term implies, available completely free of any purchase or licensing fee. It is provided by programmers, who write software for their own interest and are then prepared to make the fruits of their labours available to others. Shareware can originate from a similar source, but the author presumably has decided to recoup some reward for his/her efforts.

☞ Manoeuvres

1.   What does the purchase of a **single-user licence** allow a software user to do?

2.   Discuss some pros and cons of using **shareware/freeware**.

Driving Lesson 32 - The Data Protection Act

Park and Read

The Data Protection Act (1998) regulates the use of personal data by all businesses. It aims to promote high standards in the handling of personal information, and so to protect the individual's right to privacy. This act defines personal data as any data that can be used to identify a living individual, including names, addresses, personalised e-mail addresses and video images of such individuals.

Under the Data Protection Act (1998), a person who determines the purposes for which and the manner in which any personal data is to be processed, is the **data controller**. In a business that is not run by a sole trader, or that is not a partnership, the business itself is defined as the data controller.

The law requires data controllers to give their details to the Information Commissioner's Office for inclusion in a public register, unless their data processing is exempt. This is so that people can find out who is processing personal data about them and why they are doing so.

The Act sets out eight rules that data controllers must follow for protecting personal data; these are known as the eight principles. Personal data must be:

- Obtained and processed fairly and lawfully.

- Processed only for one or more specified and lawful purposes.

- Adequate, relevant and not excessive for those purposes.

- Accurate and kept up to date.

- Kept for no longer than is necessary for the purposes for which it is being processed.

- Processed in line with the rights of the individual.

- Secure and protected against loss, damage and inappropriate processing.

- Not transferred to countries outside the European Economic Area unless there is adequate protection for the information.

If a business does not comply with the principles, the Information Commissioner can take enforcement action against the data controller, whether it is an individual or a business.

Manoeuvres

1. What type of information is covered by the **Data Protection Act**?

2. Describe the **Data Protection Principles**.

Driving Lesson 33 - Revision

This Driving Lesson covers the features introduced in this section. Try not to refer to the preceding Driving Lessons while completing it.

1.   What does **backing store** mean and why is it important?

2.   How can **unauthorised access** to computer file systems be prevented?

3.   What can happen to **data and files** in the event of a power cut?

4.   What is the difference between a **User ID** and a **Password**?

5.   What do you understand by the term **access rights**?

6.   Detail four issues that an effective **Information Security Policy** should set out.

7.   How can a **computer virus** enter a system?

8.   Name three different types of **virus**.

9.   Explain the difference between a **virus** and a **bug**.

10.   Why is it important to update **anti-virus** software on a regular basis?

11.   What do you understand by the term **software copyright**?

12.   How do **shareware** and **freeware** differ from mainstream software?

13.   Why is it illegal to distribute files on **removable media**?

14.   Give an overview of the implications of the **Data Protection Act** for computer users.

If you experienced any difficulty completing the Revision, refer back to the Driving Lessons in this section. Then redo the Revision.

Once you are confident with the features, complete the Record of Achievement Matrix referring to the section at the end of the guide.

Sample Answers

Please note: these are example answers only.

Driving Lesson 1

Step 1 **Laptop** PCs can be transported easily and used in many locations, but are more expensive than a standard PC.

Step 2 A **network server** stores data in a central location, allowing access across the network.

Step 3 A multi-national bank would probably use a **mainframe** computer.

Driving Lesson 2

Step 1 The picture quality of a computer is known as **resolution**. Larger screens also provide a better quality picture.

Step 2 A **modem** allows connection to the Internet/e-mail via the telephone line.

Driving Lesson 3

Step 1 **Hardware** is a physical part of the computer. **Software** is the term used for the programs that allow you to use the computer.

Step 2 Hardware: **monitor**, **keyboard**, **mouse**, **CD-ROM drive**, **printer**.

Step 3 Software: **spreadsheet application**, **word processor**, **database management system**, **operating system**, **games**.

Driving Lesson 4

Step 1 **PC** stands for **personal computer**.

Step 2 **Hardware** is a part of the computer; **software** allows you to use it (programs, etc.).

Step 3 **IT** refers to the electronic storage, processing or transfer of information.

Step 4 **PC** - personal computer, sits on a desktop. **Laptop** - smaller than a PC and portable. **PDA** - palm held computer, has less features than a standard PC. **Network PC** - connected to others computers. **Server** - provides centralised storage for data used by network PCs. **Mainframe** - large system that stores and processes data for large organisations. Must be staffed by operators.

Step 5 The main parts of a PC are the **keyboard**, the **monitor**, the **mouse**, the **Central Processing Unit**, the **Hard Disk Drive**, the **Floppy Disk Drive**, the **CD-ROM drive**, **speakers** and possibly a **modem**.

Step 6   Removal storage devices such as a **floppy disk**, **CD** or **zip drive**, or a **tape storage cartridge** can be used.

Step 7   A **peripheral device** is a piece of equipment that is attached to the computer, e.g. printer or scanner.

Driving Lesson 5

Step 1   **CPU** stands for **Central Processing Unit**.

Step 2   **Clock speed** is the speed at which the CPU can process information.

Step 3   Clock speed is measured in **megahertz** or **gigahertz**.

Step 4   A microprocessor is a CPU built on a single chip.

Driving Lesson 6

Step 1   An **input device** allows information to be entered into the computer.

Step 2   A **scanner** converts printed text or pictures into a format recognised by the computer.

Driving Lesson 7

Step 1   An **output device** allows processing results to be seen or heard.

Step 2   A **touchscreen** or **modem** can be classed as both an input and output device.

Driving Lesson 8

Step 1   **CPU** means Central Processing Unit.

Step 2   A CPU processes information, performs calculations and controls the transfer of information between main and secondary memory. Its speed is measured in megahertz or gigahertz.

Step 3   Some of the main input devices are: **keyboard**, **mouse**, **touchpad**, **trackball**, **joystick**, **graphics tablet** and **light pen**, **scanner**, **digital camera** and **microphone** (also **touchscreen** and **modem**).

Step 4   Some of the main output devices are: **monitor**, **speakers**, **speech synthesiser**, **printer**, **plotter** (also **touchscreen** and **modem**).

Step 5   A **plotter** would be used to produce technical drawings, maps, or architectural/engineering plans.

Driving Lesson 9

Step 1   The smallest unit of memory is a **bit**.

Step 2   Large capacity hard disks can store vast amounts of data and access it more quickly than smaller ones.

Step 3   Zip disks are more expensive than other forms of storage and many people use CDs when more storage space is required than is available on a floppy.

Step 4   CDs can store a lot of data, but cannot be overwritten or updated. CD-RW disks allow data to be added at a later date, but are more expensive than read only disks. DVDs have larger storage space than CDs but at the moment are more expensive

Driving Lesson 10

Step 1   **RAM** must be present for processing to take place. It is where the software in use stores all its information.

Step 2   **RAM** is a temporary store for information and anything in it is lost when the computer is switched off. **ROM** is a permanent store for information that can only be read by the CPU. It cannot be manipulated or changed and is not lost when the computer is switched off.

Driving Lesson 11

Step 1   There are **8** bits in a byte.

Step 2   There are **1024** Mb in a Gb.

Driving Lesson 12

Step 1   The computer's performance may be reduced.

Driving Lesson 13

Step 1   Memory is measured in bits and bytes.

Step 2   Main types of storage device are: hard disk drive, floppy disk drive, zip drive, CD and DVD.

Step 3   A hard disk costs much more than a CD, but it can store much more data.

Step 4   The two main types of memory are **RAM** and **ROM**. **RAM** is a temporary store for information and anything in it is lost when the computer is switched off. **ROM** is a permanent store for information that can only be read by the CPU. It cannot be manipulated or changed and is not lost when the computer is switched off.

Step 5   CPU speed, RAM capacity, hard disk speed and capacity and the number of applications running can all affect a computer's performance.

Step 6   A floppy disk may need to be formatted when it becomes full of files that are no longer needed.

Driving Lesson 14

Step 1   **POST** stands for **Power On Self Test**. **OS** stands for **Operating System**.

Step 2   When a computer boots up it searches drives for the operating system and launches it.

Driving Lesson 15

Step 1   Software applications must be **compatible** with the operating system in use in order to run. Files must be **compatible** with the application software before they will open.

Step 2   A news-sheet could be produced using a DTP application. Stock control and patient records could be maintained with a database application.

Driving Lesson 16

Step 1   A **systems analyst** defines what is needed from a computer system, e.g. programs, hardware, number of computers, etc.

Step 2   A **programmer** writes the programs to meet the analyst's specifications.

Step 3   A **bug** is a fault found with the computer system during testing.

Driving Lesson 17

Step 1   An **operating system** is a specialised computer program that allows all other programs to run, e.g. *Windows*, *Linux*. **Applications** are computer programs such as database, word processor or spreadsheet.

Step 2   The main functions of an operating system are to carry out a self test, boot up the computer and provide a running platform for software applications.

Step 3   Different software versions exist to identify the age of the application, so that the user can make sure it is compatible with the files they want to use. A new version is usually an improvement on a previous version.

Step 4   **Word processing** applications are used to produce documents. **Spreadsheet** applications allow calculations to be performed on numbers. **Database** applications store lots of data and allow the user to interrogate this data to find specific information. **DTP** applications are used to produce and manipulate documents containing drawings, graphics and text. **Presentation** applications allow presentations to be created for an audience, either on screen or via overhead projectors or slides. **Web browsers** allow you to search the Internet and download text and images.

Step 5   As a computer system is developed, it goes through the following stages: **systems analysis** to identify what is needed, **design** of the system, **programming** to produce programs for the specified system, **testing** of the system and then the writing of **documentation**, both technical and for instruction purposes.

Driving Lesson 18

Step 1   A network allows many users to share files, printers, scanners, applications and to communicate via e-mail.

Step 2   A **LAN** is made up of computers connected by cables over a relatively short distance, while a **WAN** is linked via a telecommunications network, for example.

Driving Lesson 19

Step 1   **Transfer rate** refers to the speed of a modem.

Step 2   **ADSL** is up to 40 times faster than a telephone connection. It does not require a separate line for telephone calls and is always connected.

Step 3   Analogue transmits data as electronic waves, which are susceptible to corruption. Digital transmissions are much faster and use a series of digits (**1** and **0**) to transmit data.

Driving Lesson 20

Step 1   A **search engine** is a special web page linked to a database that allows you to search for any web pages containing a particular word or phrase.

Driving Lesson 21

Step 1   An **Intranet** is only accessible from within an organisation. An **Extranet** is part of an Intranet, but can be accessed by some external users via the Internet.

Driving Lesson 22

Step 1   An e-mail address is a computer's mailbox address, to which messages are sent.

Step 2   The ISP provides the Internet connection, sends and delivers e-mail.

Driving Lesson 23

Step 1   The telephone network provides a world wide connection between computers.

Step 2   **www** is the world wide web: the collection of information stored on computers that can be accessed via the Internet. A **modem** converts a digital computer signal into an analogue signal that can travel along a telephone line.

Step 3   **E-mail** refers to electronic messages sent between computers.

Step 4   E-mail allows you to communicate with people all over the world, immediately and at the cost of a local telephone call. Files can also be sent with messages.

Step 5   An e-mail attachment is a file attached to a message.

Step 6   To use e-mail a computer must be connected to a telephone network, usually via a modem. You must subscribe to an Internet Service Provider and have messaging software installed.

Step 7   The Internet is a network of linked computers. The World Wide Web is a collection of information held in web pages to which anyone connected to the Internet can gain access.

Step 8   The Internet/www can be used to gather information about almost any subject by using a search engine. Information, pictures, sounds, games, can be downloaded.

Step 9   An **Intranet** is like an internal Internet, accessible only from within an organisation.

Step 10 An **Extranet** is part of an Intranet that can be accessed by external users via the Internet.

Driving Lesson 24

Step 1   **Teleworking** is a concept that allows previously office based workers to work at home.

Step 2   Your answer may include: to teach pupils how to use commercial software, as a teaching aid, to use the Internet for research and homework, for storage of student records and registration details, to help work out timetables.

Driving Lesson 25

Step 1   **E-commerce** is the buying and selling of goods over the Internet.

Driving Lesson 26

Step 1   Advantages of CBT: can learn at your own pace, at convenient times, no travelling, more control over learning.
Disadvantages of CBT: distractions, need for self discipline, lack of interaction with others can lead to feelings of isolation.

Step 2   A **Distance Learning** course is completed over the Internet.

Step 3   Advantages of on-line purchasing: a huge range of products and services available 24 hours a day, 7 days a week, from all over the world.
Disadvantages of on-line purchasing: not able to examine the goods or ask for advice and a small risk of insecure payment methods.

Step 4   A computer can't use initiative or apply judgement. It can't adapt to the unexpected and lacks the human touch.

Step 5   In healthcare computers can be used to hold patient records, in ambulance control systems, to help in diagnosis and to help perform some surgery.

Step 6   A person would be more appropriate than a computer when judgement or initiative is needed, or when an unexpected situation arises. Many people prefer to have human contact rather than deal with impersonal computer systems.

Step 7   In government computer systems are used to store public records: social security records, vehicle registration details, criminal records, NHS records, housing information, census records, tax records.

Driving Lesson 27

Step 1   You would make sure your workplace was safe by checking for: trailing or insecure power leads or cables, worn or frayed power leads, overloaded power points.

Step 2   An employee is responsible for making proper use of provisions and going about their job in a responsible manner.

Step 3   To protect the environment you could recycle waste paper, ink and toner cartridges, use monitors with low power options and PCs with standby mode. You could also save documents rather than print out hard copies.

Driving Lesson 28

Step 1   **HASAW** is Health and Safety at Work.

Step 2   A good working environment would be well lit and ventilated, have glare free VDUs, adjustable chairs and mouse mats provided. There would be provision for breaks from the computer.

Step 3   **RSI** is repetitive strain injury.

Step 4   Check for: trailing or insecure power leads or cables, worn or frayed power leads, overloaded power points. Make sure your chair is at the correct angle for your back and your feet touch the floor, that your monitor screen is free from glare and you have regular breaks.

Step 5   Some common injuries: back ache due to poor posture, RSI, eye strain and trips or falls.

Step 6   **Ergonomics** means the relationship between workers and their environment.

Step 7   To save paper you can recycle it and save files to disk rather than print them.

Driving Lesson 29

Step 1   You should regularly save to permanent storage in case the computer crashes, there is a power failure, or some physical, permanent damage to the computer.

Step 2   At least one set of backing store media should be kept off site because of the risk of fire, theft or flood.

Step 3   Possible levels of password protection for networked files: a password to access the PC, a user ID to access the network, a password to access the directory or network server, a password to access the file, a password to amend the file content.

Driving Lesson 30

Step 1   A computer virus is a malicious program intended to cause nuisance or harm to other computer programs or files.

Step 2   Some strategies to reduce the risk:

> install and regularly update anti-virus software
>
> regularly scan the system
>
> scan removable disks before using them, be aware of where these disks came from
>
> save downloaded files to floppy or hard disk and scan before use
>
> be suspicious of e-mails from an unknown source, do not open anything suspicious before scanning it.

Driving Lesson 31

Step 1   A single user licence allows the software to be installed only once.

Step 2   Advantages of shareware/freeware: either cheaper than major commercial packages or totally free. Disadvantages: shareware is either a not fully functioning version of the software, or will shut down after a trial period unless a fee is paid.

Driving Lesson 32

Step 1   Personal information, e.g. names, addresses, financial information, etc. is covered by the Data Protection Act.

Step 2   The Data Protection Principles are conventions that must be followed by all organisations keeping information.

Driving Lesson 33

Step 1   Backing store is storage containing backed up material and is important because it may be needed due to computer failure, damage, etc.

Step 2   Unauthorised access to files can be prevented by applying passwords to every level of access.

Step 3   In the event of a power cut any changes made to data and files since they were last saved may be lost.

Step 4   A user ID lets the system know that the user is entitled to access the network and also which level of access is allowed. A password is a user's personal entry code to a computer, software or files.

Step 5   Access rights are the different levels of access allowed by different user IDs.

Step 6   Any four of the following: details of a user ID/password; the personnel responsible for each level of security; anti-virus measures specified by the security policy; penalties for breaching security policy; procedures for reporting security incidents; procedures for educating staff about their responsibilities relating to information security.

Step 7   A virus can enter a system through an e-mail attachment, floppy disk, CD or DVD, or the Internet.

Step 8   Any three of the following: time bomb/ logic bomb, macro virus, worm, Trojan Horse.

Step 9   A virus is a malicious piece of programming intended to cause harm, but a bug is an error or fault in a piece of software code.

Step 10   Anti-virus software should be regularly updated because new viruses appear every day.

Step 11   Software copyright gives authors and developers of software the same legal protection as authors of published, written and musical works.

Step 12   Shareware and freeware are cheaper than mainstream software (or free). Shareware often has a free trial period or a trial of a cut down version of the program, before the fee is payable.

Step 13   This material must be considered copyright protected and it is therefore illegal to distribute it.

Step 14   For data holders, the Data Protection Act means they must ensure the data is secure and disclosed only for legitimate purposes. They must only hold relevant material and nothing more. The data must be accurate and up to date and not held when it is no longer needed. The information must also be accessible to the individual concerned.

Glossary

1 byte	The equivalent of 8 bits (binary digits) of information.
ADSL	Asymmetric Digital Subscriber Line.
Analogue	Data that is transmitted as electromagnetic waves.
Application software	Software programs that allow a PC to perform specific tasks.
AV	Anti-Virus - Software which deletes and destroys viruses.
Backing up	Making copies of all important files.
Browser	A piece of software enabling access to the Internet.
CBT	Computer Based Training.
CD	See CD-Rom.
CD-R	Compact Disk Recordable - A Compact Disk on which it is possible to store (write) information. (Needs specific hardware).
CD-Rom	The term given to both a Compact Disk Drive and a Compact Disk itself. "CD's" can hold many hundreds of megabytes of information. (See ROM.)
CD-RW	Compact Disk Re-Writeable - CD which allows the writing of data repeatedly.
Client	A workstation computer that accesses core data from a server.
Clock Speed	The number of cycles per second (hertz) at which a processor runs.
Computer Virus	A malicious piece of code which can cause damage to computerised systems.
CPU	Central Processing Unit - The "engine" of a modern computer. The CPU carries out all information processing tasks.
Database	A store of information. Usually consisting of fields in tables.
Digital	Data stored/transmitted as a series of 1s and 0s.
DPA	Data Protection Act - 1984 (UK) Legislation designed to prevent the misuse of data.
DTP	Desktop Publishing - The process of creating professional looking documents.
DVD	Digital Versatile Disk - A high capacity storage medium used for digital media and information storage.
DVD-R	Digital Versatile Disk Recordable.
Extranet	Part of an intranet that is accessible to external users.
File server	See server.
Floppy Disk Drive	In principle, the same as an HDD though storage capacity is far smaller. Holds information on a 3.5 inch floppy disk.
Formatting	The process of preparing a storage disk for use.
GHz	See Gigahertz.
Gigabyte	1000 megabytes (approx.).
Gigahertz	1 billion hertz.
Hard Disk Drive	A form of data storage capable of holding vast amounts of information, commonly called an HDD.
Hardware	Any physical part of a computer system.
HDD	See Hard Disk Drive.
Hertz	One cycle per second.
Input device	Any device that allows a user to enter data into a computer.

Internet	A global network of linked computers.
Intranet	An organisation's internal network.
ISDN	Integrated Services Digital Network - A system which allows the transmission of data between telephone exchanges without the need for a modem at the computer.
ISP	Internet Service Provider - Companies which provide Internet access.
IT/ICT	Information Technology/Information and Communication Technology
Keyboard	An input device used to enter information into a computer.
Kilobyte	1000 bytes (approx.).
LAN	Local Area Network - A network which covers an area of less than 1 square kilometre.
Laptop	A portable, battery operated PC.
Mainframe	A very large computer system servicing an entire organisation.
Megabyte	1 million bytes (approx.).
MHz	Megahertz (1 million hertz).
Modem	Standing for Modulator - Demodulator, this is a device that converts information allowing it to pass from computer to computer via a telephone line.
Monitor	A visual display device connected to a computer.
Mouse	An input device used primarily for navigation around a computer's desktop.
Operating System	The piece of software which runs "behind" all others, the Operating System allows all other software to run. Examples are Microsoft Windows and Unix.
OS	See Operating System.
Output device	Any device that allows a user to bring stored data out of a computer.
PC	Personal Computer.
PDA	Personal Digital Assistant.
Peripheral	A device attached to a computer, e.g. printer.
POST	Power On Self Test - A process which a computer carries out as it starts.
PSTN	Public Switched Telephone Network.
RAM	Random Access Memory - Memory which can be written to and erased repeatedly, also known as volatile memory.
ROM	Read Only Memory - Memory which cannot be written too.
RSI	Repetitive Strain Injury.
Search Engine	A service which allows the searching of the web for information.
Server	A single computer on a network from which other machines derive resources.
Software	The programs that run on a computer.
Speakers	Output devices which play sounds.
Terabyte	1000 gigabytes (approx.).
Touchscreen	A monitor which allows input from the user via touching the screen.
VDU	See Monitor.
Virus	See Computer Virus.
WAN	Wide area network - A network which covers a very large area (more than 1km square).
World-Wide-Web	The collection of information stored on the Internet.
Zip Disk	A form of larger capacity disk than 3.5 inch floppy, used in a zip drive.

Index

Record of Achievement Matrix

This Matrix is to be used to measure your progress while working through the guide. This is a learning reinforcement process, you judge when you are competent.

Tick boxes are provided for each feature. 1 is for no knowledge, 2 some knowledge and 3 is for competent. A section is only complete when column 3 is completed for all parts of the section.

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Tick the Relevant Boxes **1**: No Knowledge   **2**: Some Knowledge   **3**: Competent

Section	No.	Driving Lesson	1	2	3
1 General Concepts	1	Types of Computer			
	2	Main Parts of a PC			
	3	Hardware/Software			
2 Hardware	5	Central Processing Unit			
	6	Input Devices			
	7	Output Devices			
3 Storage	9	Storage Devices			
	10	Types of Memory			
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