Computing Studies

Computers and the Internet

[INTERMEDIATE 1]

Alan Dunnet

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INTRODUCTION

Tutor guide

This teaching and learning material is designed to cover all the content needed by a learner to pass the Computers and the Internet unit of Intermediate 1 Computing Studies. However, it is the responsibility of the tutor to check the content coverage against the SQA unit specification.

The pack covers the knowledge and understanding required for Outcome 1 assessment, and the practical skills required for Outcome 2. There are many opportunities throughout the unit for students to demonstrate the practical skills required, and generate the required evidence, including:

Practical checklist item	Opportunities within this unit
Using basic features of the operating system	Section 2 – OS practical task – p.45
Capturing information using input devices	Section 1 – input devices task (2) – p.28
Searching the WWW for specified information	Section 1 – practical task – p.21 Section 1 – input devices task – p.28 Section 1 – printers task – p.33 Section 1 – backing storage – p.38 Section 4 – practical task – p.82
Using web authoring software to create linked web pages	All of Section 3 (including task on p. 73)

These practical tasks are not prescriptive, and can be replaced or supplemented as required.

For unit assessment, use should be made of the NAB assessment materials provided by SQA (multiple choice test and practical skills checklist).

Note that learners completing this unit as part of the Intermediate 1

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Computing Studies course should be given opportunities to develop the higher order problem solving skills required for the external course assessments (examination and practical coursework tasks). This can be done by providing past exam paper questions, and further practical tasks, such as the specimen coursework task provided by SQA.

The pack has not been designed for a student to use unsupported, although it might be possible to use it in this way. Students will need significant tutor support, particularly while attempting the practical sections of the unit. This support would include giving help with using the web authoring package chosen for Section 3, providing extra example application based tasks for Section 2, and emphasising key teaching and learning points as they occur.

It is recommended to begin with Sections 1 and 2. Section 4 could precede Section 3. Section 3 (web authoring) can be taught at any stage, either after Sections 1 and 2, or at the same time. Tutors will need to provide notes on the chosen authoring package.

Answers to questions are provided at the end of the pack.

Additional exercises to accompany this pack are available from National Qualifications Online (www.LTScotland.org.uk/NQ).

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Student guide

Computers and the Internet is a unit for the course **Computing Studies** at **Intermediate 1** level. The unit is split into **four sections**: computer hardware, computer software, the software development process and the Internet. What you will be expected to know, and be able to do, to complete these sections is briefly explained below.

Section 1: Computer hardware

You will learn what the main types of computer systems are, and what hardware devices can be used with a computer. You will also be expected to use a wide range of hardware, including digital cameras, scanners and a microphone.

Section 2: Computer software

Software is the term given to all the programs that can run on a computer system, and the files they create. Programs are made up of a list of instructions that manage and control what the computer does.

Systems software is an important type of program we will look at. The main example of this type that we will use is the **operating system**.

Section 3: Software development process

The stages of this process are followed whenever a new software product is produced. The purpose of its stages – analysis, design, implementation, testing, documentation and evaluation – is to ensure that your software will work, does what it's supposed to do, and is understood by the end users.

Section 4: The Internet

At many points in this unit you will be making use of the WWW to access information and research topics. This short section considers how computer systems gain access to the Internet, and considers the costs and some issues around gaining that access.

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Assessment

This unit is assessed in the same way as other Computing units. There is a multiple choice test, marked out of 20, and practical exercises that your tutor will observe. You will need to keep some printouts of your results as evidence for moderation purposes.

There will also be a section in the final exam that asks questions from this unit.

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SECTION 1

Computer systems

The most common types of computer system in use fall into two main categories:

- **Desktop** computers
- **Portable** computers

There are two types of portable computers that we need to know about:

- Laptop (or Notebook) computers
- Palmtop (or PDA) computers

Desktop computers

Desktop computers are often called PCs (personal computers). They are a collection of a number of different hardware devices.

This type of computer is sited permanently on a desk because its design means it can't be easily moved. The common components of a desktop PC are:

The system unit

This is the 'box' that holds important components that run the computer system, including the **processor** and **memory**. Other devices such as **sound cards** and **graphics cards** are also housed here.

Backing storage devices that allow the loading and saving of programs or files are normally found in the system unit. These computers will usually have a **CD/DVD drive** and many still have a **floppy disk drive**. There will be a **hard disk drive** inside the unit.

The monitor

This is the **output** device that allows you to see what is happening.

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Mouse and keyboard

These **input** devices allow the user to communicate with the system unit.

Printer

This is the **output** device that provides paper **hard copy** of the user's work.

Speakers

These are used for **outputting** sound.

Portable computers

These are designed to be carried around, so must be both light and small. They also must be able to work on batteries because they are often used where there is no power supply.

Portable computers can't use ordinary monitors that often come with **desktop computers** – these would be too large and heavy, and use too much power. Liquid crystal displays (LCD, also known as TFT) are fitted because they are flatter and lighter than the traditional displays.

Laptop (or notebook) computers

This type of computer is commonly used in businesses. They have the processing power and speed of desktop computers, but can be moved between rooms or buildings easily.

Laptops have a keyboard, and come with specialised pointing devices, for example **trackballs**, **touchpads** or **trackpoints**. They are needed because laptop computers are often operated in places where using a mouse is impractical.

Notebooks **can** have a mouse attached to them however, and many businesses are replacing desktop PCs with special plug in workstations designed round laptop computers because of the flexibility they offer.

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Palmtop (or PDA) computers

These types of computer are increasing in popularity, and are often called Personal Digital Assistants (PDAs). They have many capabilities, including organiser features (such as storing contact numbers, names and addresses, etc.), e-mail and wireless Internet access. The data they hold can be shared with desktop computers as they have the ability to **download** to and from PCs.

Separate software is also now available for these computers. This includes databases, dictionaries and games, as well as versions of commercial software, e.g. Microsoft Word. Special versions of software are needed for palmtops, as they have much less processing power and memory than laptops or desktops.

One problem with small computers can be the inputting of data without a mouse or standard keyboard. Instead, they often have a touch screen which can be operated by the user's finger, or by using a stylus. Sales of PDAs continue to grow, and the addition of telephone technologies may make them even more popular.

Like laptops, PDAs and palmtops are powered by batteries.

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Questions on computer systems:

1. Is this computer a desktop, a laptop or a palmtop?

2. Copy the sketch, and label clearly:

   (a) the system unit
   (b) the monitor
   (c) the mouse
   (d) the keyboard
   (e) the speakers
   (f) a printer (you will need to draw it first!)

3. Which two names can be used to describe this type of computer?

4. Describe 3 differences between this computer and a desktop computer.

5. Which two names can be used to describe this type of computer?

6. How is data input into this type of computer?

7. Why does this type of computer need special software?

8. Which two types of computer are battery powered?

9. Which two types of computer use a keyboard?

10. What do these letters stand for?

   (a) LCD
   (b) PC
   (c) PDA

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Components of a computer

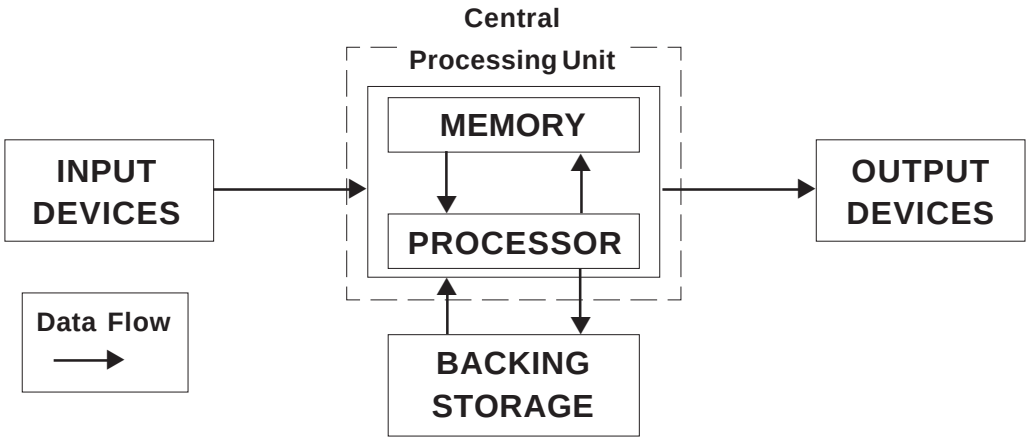
Computers are **data processing** machines. Data is fed into them, and, after processing of the data, they (usually) output useful information from the other end. Computers are not intelligent however, and only work as well as the programs that run on them.

This processing is done inside the system unit. We can display how this works in a diagram:

To achieve this computer systems are made up of many components. These can be put into the categories shown below.

- **input devices** (e.g. the keyboard) input data to process
- the **processor** is the '**brain**' that runs the programs. It is part of the **central processing unit** (or CPU)
- **memory** (another part of the **CPU**) holds the programs and data the processor needs and is using
- **output devices** (e.g. the monitor) output the information
- **backing storage devices** store programs and data even when the computer is switched off, so that they can be loaded into memory whenever required

We can update the diagram above to include these devices



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The central processing unit, or CPU

How do computer systems work?

Like people, a computer needs to have

- a '**brain'** to work things out
- **memory** to store what it has to do, what it has already done, and what it has to try to do next.

These important functions are carried out inside the **central processing unit**. This is the part of a computer system that contains the **processor** (brain) and the **memory**. The whole **computer system** will be made up of the **central processing unit**, *with other devices attached*.

Size matters

It is important when using computers to be able to compare their specifications. This means considering how much memory different computers have, how fast the processor is, and what peripherals (e.g. mouse, scanner) they are supplied with.

Instead of using thousand, million, billion . . . in Computing, we use:

Term	Size	Approximately ...
kilo	1,024	1,000
Mega	1024 x 1024	1,000,000
Giga	1024 x 1024 x 1024	1,000,000,000
Tera	1024 x 1024 x 1024 x 1024	1,000,000,000,000

The processor

The **processor** is the **hardware** inside the **CPU** that controls the operation of the computer. It is where a computer does its 'thinking'. When comparing processors the most important measure is the speed they work at. This speed is measured in Hertz (Hz), MegaHertz (MHz) or GigaHertz (GHz).

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The timeline below gives an idea of how the speed of the processors made by one company, Intel, have increased over a thirty-three year period.

Year	**1971**	**1982**	**1993**	**1997**	**1999**	**2000**	**2004**
Processor	4004	80286	Pentium	P 2	P 3	P 4	P 4
Speed	400 KHz	12 MHz	66 MHz	300 MHz	550 MHz	1.5 GHz	3.4 GHz

This means a Pentium 4 processor has a speed of over 3,400,000 KHz. In just over thirty years processors are now almost 10,000 times faster than they were in 1971.

Memory

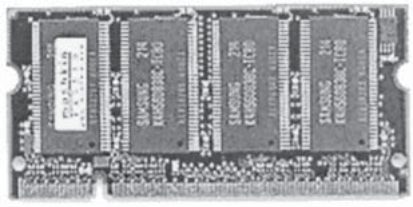
Memory is the **hardware** that allows the computer to keep track of what it is doing. It is a store for things the computer must remember. There are **two** kinds of memory:

1. **Random Access Memory**, or **RAM**
2. **Read Only Memory**, or **ROM**

The computer needs two different types because each has a different job to do.

Random Access Memory or RAM

This type of memory works like our own: the computer uses it to hold the instructions contained in programs, to hold any data that has been input, and 'remember' any changes it has made to them.



A picture of RAM

Like us, the computer can also 'forget' what is stored in **RAM** – when it is turned off all the contents of **RAM** are lost because it is only **temporary** storage.

Read Only Memory or ROM

ROM is **permanent** memory – it **does not lose** what is stored in it when the computer is turned off. All computers must have some **ROM**. If they didn't they would not know what to do when they were turned on.

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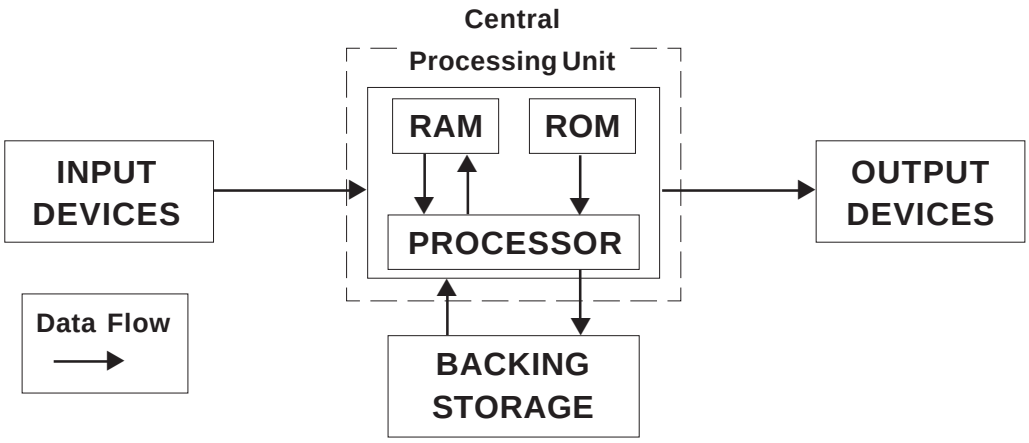
ROM is 'read only' memory: this means you can't load new programs or new data into it. This is to protect the data that it holds. If you could, then the important information it stores could be lost.

The table below summarises the main features of each type of memory.

Feature	RAM	ROM
Permanent storage for operating or control programs		√
Temporary storage for programs and data	√	
Data can be **read** from /**written to** memory	√	
Data can only be **read** from memory		√

Updated computer system diagram

The diagram has been updated below by splitting up the **memory** box to now show the data flow of both RAM and ROM.



The size of memory

The computer represents all data using just **two** numbers – **1s** and **0s**. These are called **binary digits**, or **bits**.

A **byte** is a group of **8 bits**.
An example of a byte could be **0 1 1 0 0 0 1 1**. (There are 256 different patterns of 1s and 0s possible.)

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Computer memory can store lots of bytes of data – the table below summarises the different memory sizes.

Unit	Value	Also equals . . .
bit	1 or 0	
byte	8 bits	
Kilobyte	1024 bytes	
Megabyte	1024 Kilobytes	1,048,576 bytes
Gigabyte	1024 Megabytes	1,073,741,824 bytes

Finding data in memory

Memory is made up of millions of spaces called **storage locations**. Much like houses, each storage location has its own **unique address**, though unlike houses the address is simply one number.

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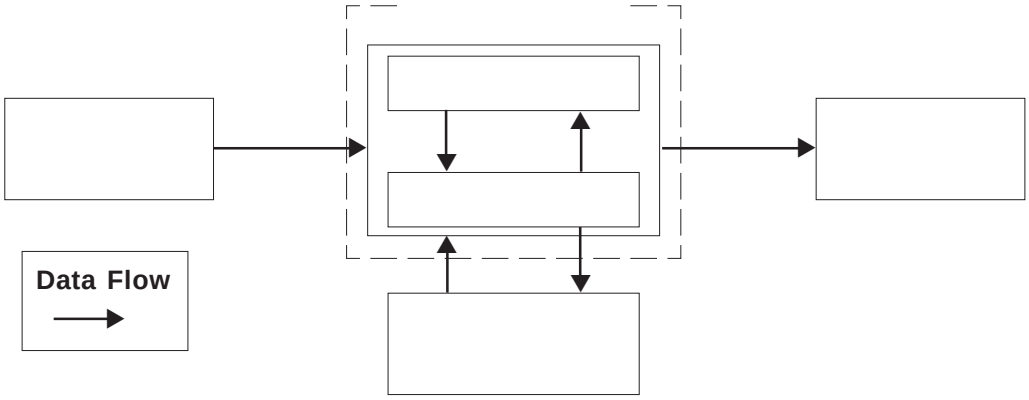
Questions on components of a computer:

1. Computers are machines that process ……

2. Complete the diagram below by filling the 6 blanks:



3. Complete this table:

Term	Size	Approximately ...
	1024	1,000
Mega	1024 x 1024	
Giga		1,000,000,000
	1024 x 1024 x 1024 x 1024	

4. What do these letters stand for?

   (a) RAM
   (b) ROM
   (c) CPU

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5. Tick the boxes to match these descriptions to either ROM or RAM:

Feature	RAM	ROM
Permanent storage for operating or control programs		
Temporary storage for programs and data		
Data can be **read** from /**written to** memory		
Data can only be **read** from memory		

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Example of a computer specification ('spec') 1

The 'advert' below was based on one found inside a computer magazine.

2004 DeskPro System

- Intel® Pentium® 4 3.0GHz Processor (512K Cache)
- Microsoft® Windows® XP Home Edition
- ASUS P4R800-VM Radeon IGP Mainboard
- 512 Mb DDR 400 Memory
- 20 Gb ATA-133 Hard Drive (7200 rpm)
- 128 Mb ATI Radeon 9200 Graphics (SMA)
- 17″ TFT Flat Panel Monitor
- Sony 48x CD Re-writer & 16x DVD-ROM Drive (Combo)
- 5.1 Surround Sound 6 Channel Audio
- V.92 56Kbps data/fax/voice modem
- Integrated 10/100 Ethernet LAN
- Internet Keyboard and Optical Mouse
- Mini Tower Case

£799.99 ex VAT

As you can see it is difficult to understand all the information we are being given. The important information (processor speed, amount of RAM, size of hard disk, etc.) is all there, but hidden among lots of less important information. You need to read carefully to find it.

The advert also tells us about other components of the system – the size of the monitor, for example, and what peripherals it comes with.

The advert will also tell you whether or not there is any software included. Usually an Operating System is included, but not always. And you will need other software too. What looks like a cheap deal is often not so good once you add on the extra cost of software.

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Study the 'spec' on the previous page, and answer these questions about the computer described:

1. Is the computer a desktop, a laptop or a palmtop?

2. What is the speed of the processor?

3. How much RAM memory does it have?

4. How much data can the Hard Drive store?

5. How big is the monitor? Is it a standard monitor or a flat screen (TFT)?

6. What input devices are included?

7. Is there any software included?

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Example of a computer specification 2

Here is another typical computer 'spec'.

2003 Notebook System

- AMD Athlon 2400XP+ 1.8GHz Processor
- Microsoft® Windows® 2000
- 256 Mb DDR SDRAM
- 30 Gb IDE HDD
- external 1.4Mb FDD
- 128 Mb ATI Radeon 9200 Graphics (SMA)
- 14.1″ TFT screen
- DVD-ROM / CD-RW Combo Drive
- Graphics and sound on board
- V.92 56Kbps data/fax/voice modem
- Integrated 10/100 Ethernet RJ45 NIC
- Microsoft Works

£849.99 ex VAT

Take a close look at this specification.

Watch out for abbreviations …

HDD = hard disk drive
FDD = floppy disk drive
SDRAM = RAM memory
NIC = network interface card

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Study the 'spec' on the previous page, and answer these questions about the computer described:

1. Is the computer a desktop, a laptop or a palmtop?
2. What is the speed of the processor?
3. How much RAM memory does it have?
4. How much data can the Hard Drive store?
5. How big is the monitor? Is it a standard monitor or a flat screen (TFT)?
6. What input devices are included?
7. Is there any software included?

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Example of a computer specification 3

Here is one more advert to study.

2004 PalmPro System

- 400 MHz Intel® XScale Processor
- Microsoft® Windows® 2003 Premium
- Outlook, Word, Excel
- 64 MB SDRAM
- Integrated Bluetooth
- Compact Flash Types 1 and 11
- 3.5″ TFT display with 62K colours
- rechargeable Li-Ion battery (900mAh)
- AC power cable supplied

£369.99 ex VAT

Take a close look at this specification, then answer the questions below:

1. Is the computer a desktop, a laptop or a palmtop?
2. What is the speed of the processor?
3. How much RAM memory does it have?
4. How much data can the Hard Drive store?
5. How big is the monitor? Is it a standard monitor or a flat screen (TFT)?
6. What input devices are included?
7. Is there any software included?

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Practical task

Collect specifications for 5 different computer systems:

- 2 different desktop computer systems
- 2 different laptop computer systems
- 1 palmtop or PDA system

You can find these in magazine adverts, by visiting computer manufacturers' websites or by visiting on-line computer retailers.

From each one, find out:

(a) the name of the system
(b) whether it is a desktop, laptop or palmtop
(c) the processor speed (in MHz or GHz)
(d) the amount of RAM (in Mb)
(e) the size of its hard disk drive (in Mb or Gb)
(f) any other storage devices (floppy drive, CD or DVD drive)
(g) type and size of monitor
(h) input devices included
(i) the price

Display the results in a table.

Embedded computer systems

Processors are not just found in computers! Many household devices now contain them too. Video recorders, washing machines, microwave ovens, games consoles . . . all have their own processors working inside them.

All will need **ROM** as well to store the processor's instructions, but **RAM** may also be present if the device, like a video recorder for example, is **programmable**.

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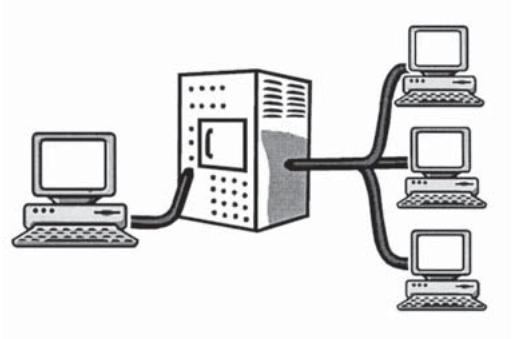
Network systems

A network is two or more computers connected together.



Networks commonly consist of a **server** computer that manages the network, and **clients** for users to connect to the network.

Server

This is a special station on a network that manages network resources. File servers, for example, can control the programs that run on individual workstations, and provides security so that users only get access to their own files when they log on to the network.

To access their own files securely each user needs to be given a unique user name. They then need to register a secret password to stop other from accessing their files.

Client

Any computer that can access the network is called a client. Most clients are **workstations**: either standalone desktop or laptop computers that are being used on the network. A **dumb terminal** is an alternative type of client that relies on the server to work.

Advantages of networking

- Sharing data and programs
  Data stored on one computer can be made available to all computers on the network. This saves time because files do not have to be placed individually on each workstation. Also parts of programs can be stored centrally which saves storage space on the workstations.

- Licensing software
  Buying individual licences to run programs can be very expensive if you have hundreds or thousands of stations. Some companies allow

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network licences that save money compared to buying the individual licence.

- Sharing peripherals
  Some expensive hardware, for example printers, can be shared using a network. Instead of buying a printer for each individual workstation one fast printer can be bought and shared by the stations.

- Communication
  Computers on a network can easily be set up so that they can communicate electronically with other terminals on the network.

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Hardware devices

There are three categories of device that can be attached to computers:

- input devices
- output devices
- backing storage devices

The uses of input devices and output devices are quite obvious – giving computers instructions and displaying results. Backing storage provides a permanent record of work completed. Files or programs saved to these devices can be loaded later.

Input

Most input devices are designed to let users give, or **input**, information to the computer. Text, numbers, sound, graphics, video, movement, heat, touch . . . can all be entered using the correct device.

Output

Output is usually limited to sound and pictures. Permanent paper copies are produced using printers and plotters.

Printers use different technologies to produce their paper **hard copies** (printouts).

Backing storage

In recent years **backing storage devices** have increased dramatically in their variety and also the amount (capacity) of storage. This has dramatically reduced the cost of storage per Gigabyte of information.

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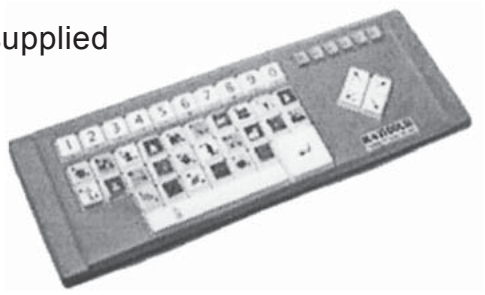
Input devices

There is a huge range of these devices. The list that follows is just a selection of some of the commonest ones.

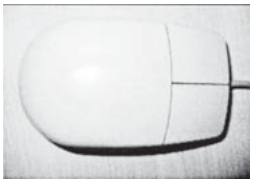
Keyboard

Keyboards are standard input devices that are supplied with computer systems. They use keys to input text and numbers. Each key sends a signal to the computer to tell it what has been pressed. The traditional (QWERTY) keyboard has been redesigned and can be bought in 'ergonomic' (easier to use) and concept designs.



Mouse and trackball

A mouse is the other standard input device supplied with **desktop** computers. It is a pointing device that allows the user to move a pointer or cursor across a monitor screen.



Recent changes to improve the functionality of mice include *cordless mice*, *optical mice*, *scroll wheels* and *extra buttons*.

A trackball is like an upside down mouse. Instead of moving the mouse round the desk you move the ball you can see in the picture.

Trackballs were commonly found on **notebook** computers, but they are sometimes replaced on them with mini-joysticks and touch pads.

Touch pad

This input device changes contact into data. Running your finger across a surface can move a cursor.

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Touch (sensitive) screen

Touch-sensitive screens are most often found on palmtop computers, where the user writes directly on the screen with a stylus. Handwriting recognition software can then read the writing. Touch screens are also found on computers in public places such as museums and railway stations.

Graphics/digitising tablet

A graphics tablet enables you to enter drawings and sketches into a computer. It consists of an electronic tablet and a cursor or pen (also called a stylus).

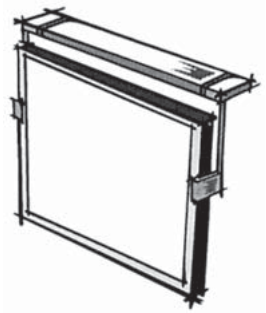
Joystick

Joysticks (and joy pads) are usually used for playing games. They consist of a combination of one or more sticks and any number of buttons.

Microphone

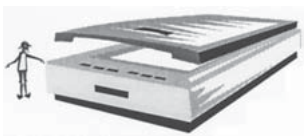
This is an input device for **sounds** such as talking, singing, 'environmental' noise, etc. It can be used for **voice input** for various purposes (e.g. voice to text for word processing, security 'passwords' . . .).

Electronic whiteboard



This input device is used with a digital projector. It is connected to a computer and allows the user to write on its surface with special pens, the results seeming to appear on the screen and the computer.
The surface can detect where it has been touched and will react as if a mouse has been clicked on that spot. It also normally features shortcut buttons to do common operations, e.g. maximise or close windows.

Scanner



A scanner is used to take information stored on paper and read it into a computer system. Scanners can be used to convert photographs, pictures and typed text into a form that can be stored in a computer.

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There are two types of scanner: **hand-held** and **flatbed**. Documents are placed face down on flatbed scanners, while handheld scanners are rolled over the page.

Scanning with OCR software

An advanced use of scanners is to take a black and white page image, and with **optical character recognition software** 'read' the text from the page. It does this by matching the black and white images to a library of letter images to help it decide what they are.

Webcam

These have become popular input devices that send low quality video across the Internet. The resolution (sharpness) of the images is kept low because video images contain a lot of information, and broadcasting this would take a long time to transfer between the computers at the transmission speeds of current modems.

Digital camera

This is a camera that stores images digitally rather than recording them on film. Once a picture has been taken, it can be downloaded to a computer system, and then manipulated with a graphics program and printed.

Digital cameras need to have their own backing storage device that works in a similar way to film in a traditional camera. Many printers can read the small backing storage cards that come out of the camera directly to make printing easier.

Digital video camera

A digital video camera (or camcorder) is like a traditional video camera, except that the video images are stored in electronic format and can be transferred directly to a computer for editing.

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Input devices – Practical task (1)

Look up some websites which sell input devices.

Try to find an example of each of the input devices listed on the previous pages.

Copy and complete a table like this:

Device	Make/model	Cost	Typical use
keyboard			
mouse			
trackball			

Input devices – Practical task (2)

Which input devices have you used?

You should try to use as many as possible – your tutor will show you how to use any that you have not used before.

Use the checklist below to record the input devices listed as you use them.

Write a brief description of the task you carried out using each device.

Device	Description of task	Date
mouse		
keyboard		
scanner		
digital camera		
microphone		
digital video camera		

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Output devices

Devices for output are connected to the computer and then used to transfer processed information out of the computer. This information comes in many forms: text, images, sounds or video, for example. Some of the possible devices used are explained below.

Monitor

A monitor shows you what you are doing – this could be playing a game, typing text, etc. The screen of a monitor can vary in size with larger ones obviously easier to see, but costing more.

There are two kinds of monitor:

- Standard CRT monitor (looking like a TV)
- LCD (TFT) monitor that is flatter and lighter than standard monitors.

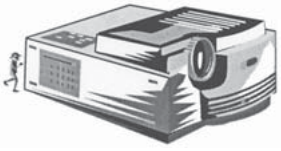
Portable computers always have **LCD** (Liquid Crystal Display) screens because they are lighter and thinner. They cost more, but as the price of this technology is decreasing, so more **desktop** computers are now sold with this type of monitor.

Speakers

Speakers are required for sound output. These can come in the form of free-standing speakers, or built in to the system unit or monitor. A useful alternative for personal listening is to use headphones instead of speakers.

Digital projector

Projectors make good output devices because they allow many people to see what is happening on a computer. The image is projected on to a white screen or wall.



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Plotter

This device draws pictures on paper using pens. As a result, it can produce continuous lines, whereas printers can only simulate lines by printing a closely spaced series of dots. Multicolour plotters use different-coloured pens to draw different colours.

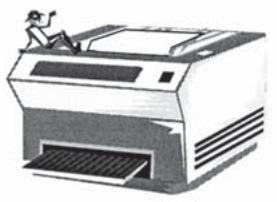
Printers

Computers were supposed to bring about the dream of a '**paperless office**'. This has not happened yet! Paper still has some advantages over computers when looking at information:

- Paper is very **portable**. The information on a sheet of paper is easily passed around, and many people can look at the information at the same time.
- Paper is cheap. Initial costs of computers means there is no comparison with the cost of using paper.
- Not everyone has computer equipment to view information, or it may be difficult to use computers in some situations.

Paper copies, or **hard copies**, of information will probably always be needed. Printers (and plotters) are used to produce these hard copies. The main different types of printer, and how they are compared against each other, are explained below.

Laser printer



This type of printer is the main one used in schools, offices and industry because it produces high quality printouts very quickly, with good resolution. The toner cartridges give many copies before needing replaced, keeping running costs down.

While it is the most expensive to buy, especially for colour, the price of this printer has fallen dramatically.

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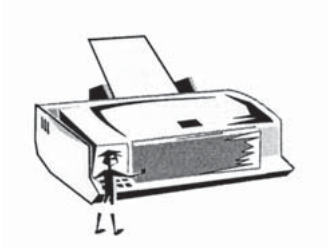
Inkjet printer



Basic models of this type of printer are cheap to buy, and let you print in colour. The quality is quite good, and can be used for photographs.
The cost of replacing ink cartridges can be high with this type of printer because they need replaced frequently. They print quite quickly, but can be quite slow when printing graphics.

Dot matrix printer

This type of printer prints by pins 'impacting' on the paper. This lets it print several sheets at once if carbon paper is used. Some businesses find this useful. However, dot matrix printers are slow and noisy while printing, and the output quality is poor, so these are mainly being replaced by inkjets and lasers.

Comparing printers

From the description of the printers above you will have noticed that we need to compare their features before we would know which type is most suitable. Things to consider include:

Set-up costs

The first cost to think about is how much money you need to spend to buy the printer. This will not be very much for a simple inkjet, but will be quite high for a colour laser.

Running costs

After you buy a printer these other costs become important. 'Consumables' (ink refills, toner for laser printers, special paper) need to be bought regularly, and the cost of these vary from printer to printer.

The cost of repairs may also need to be considered for expensive printers.

Resolution

Resolution is measured in **dots per inch** (shortened to dpi). Higher dpi means a picture is sharper to look at, but may take longer to print.

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Speed

Measured in 'pages per minute' (ppm), faster printers are normally more expensive, and are often networked to allow many users to take advantage of the speed.

Noise

Dot matrix printers work by hitting the paper with small pins. This makes them noisy to work with when compared to other printers that don't strike the page.

Comparison table

Printer	Set-up cost	Running cost	Speed	Resolution	Noise
Laser	High	Low	Fast	High	Quiet
Colour Laser	Very High	High	Fast	High	Quiet
Inkjet	Low	High	Quite Fast	Very High	Quiet
Dot Matrix	Low	Low	Slow	Low	Noisy

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Questions on output devices

1. Name 2 types of monitor, and describe a typical use for each one.

2. Name 2 devices which can produce sound output from a computer.

3. What does 'hard copy' mean?

4. Compare laser and inkjet printers by completing this table:

	Laser	Inkjet
Cheapest to buy		
Cheapest to run		
Fastest		
Highest quality		

Practical task on printers

Use the Internet to find adverts for:

- A black and white laser printer
- A colour laser printer
- An inkjet printer

For each one, try to find:

- the price of the printer
- the resolution (measured in dpi (dots per inch))
- the printing speed (measured in ppm (pages per minute))
- the cost of a replacement ink or toner cartridge
- the number of pages you can expect from each cartridge

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Backing storage devices

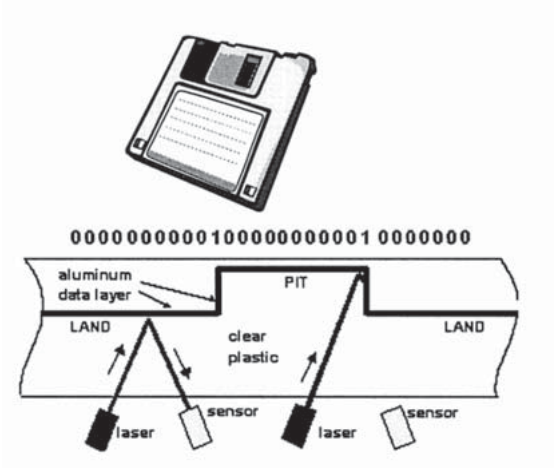
Backing storage devices are used to store the programs and data that the computer can access. Unlike RAM (or working) memory the contents of **backing storage** will **NOT** be lost when power to the computer system is turned off.

There are three main types of backing storage:

1. Magnetic drives
   - hard disk drive
   - floppy disk drive
   - magnetic tape drive

2. Optical drives
   - CD drive (ROM & RW)
   - DVD drive (ROM & RW)

3. Solid state (flash) drives



Random (direct) or sequential (serial) data access

Backing storage devices use either **direct** access or **serial** access methods.

Random access means that particular files can be jumped to without the want to read through all of the data. This is similar to selecting a track from a CD, or a scene from a DVD.

Sequential access means that you need to run through all the data to find the file you want in much the same way that you would need to fast forward to find a scene on a video tape. This means it is only really suitable for making and storing **back-up copies**.

Type of access	**Backing storage device**
Random/Direct	hard disk drive, floppy disk drive, flash drive
Random/Direct	CD & DVD drives (ROM & RW)
Sequential/Serial	magnetic tape drive

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Back-up copy

This is a second copy of a file or program that is kept in case the original is lost, damaged or stolen. Backups should be made frequently and stored in a safe place away from the computer.

Hard disk drive

The hard drive is the main storage device for programs and files on personal computers. They have very large storage space, which is usually measured in **Gigabytes**, and access to load or save data is extremely fast.

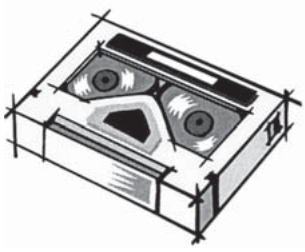
Hard drives consist of stacks of platters coated with magnetic materials each with its own read/write head.

Floppy disk drive

A floppy disk is normally 3.5 inches across, and can store up to 1.4Mb of data. It is made from a hard storage case containing a plastic disk. The disk is coated with magnetic material. The floppy disk drive is usually built in to the system unit.

Floppy disks were the most common **portable** (easy to carry between computers) backing storage media, but CD-Rs and CD-RWs have become increasingly popular because they can store much more than a floppy disk. As a result, it is becoming more and more common for computers to be sold without a floppy disk drive. If required, the user can buy an external floppy drive.

Magnetic tape drive



This storage device is mostly used for backups because, although tape can store a lot of data, it is slower to access. Having to wind through the tape when finding files would make it impractical to use as the main storage device.

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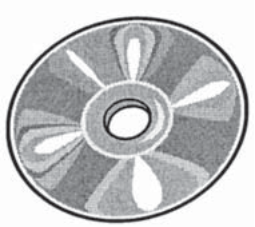
CD and DVD drives



Most software is now supplied on optical media like CD-ROMs or DVD-ROMs. The table on the next page compares the storage capacity of different media. Rewritable CD drives (CD-R and CD-RW media) have replaced floppies as the most popular storage media.

A CD-ROM has data 'burned' on to it when it is made. This data cannot then be altered or deleted by the user.

A CD-R can be 'written to' only once – then it behaves like a CD-ROM.

A CD-RW can be 'written to' as many times as required.

DVDs are like CDs, except that they can store much more data, and access is generally much faster. Like CDs, DVDs come in various forms – DVD-ROM and various types of rewritable DVDs.

Flash cards

Flash cards are small, solid state storage devices, often used in digital cameras. They can store large amounts of data and are very light and compact. There are a number of different types, and storage capacities go from 16Mb up to 512Mb or more. Card readers are available very cheaply to plug into the USB port of most computers.

USB backing storage devices

There are now a wide range of new storage devices that plug straight into the USB port on computers. They can store from 8Mb up to (currently) 2Gb of data, and are a simple and convenient way of backing up or transferring data. These are often called 'pen drives'.

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Comparing backing storage

The table below compares the storage capacity, access speed, portability and media cost of some different types of drive.

Drive	Capacity	Transfer	Portable	Drive cost	Media cost
Floppy disk	Low	Slow	Yes	Very low	Very low
Hard disk	Very high	Very fast	Some	Low/medium	-
Tape	Very high	Fast (but sequential)	Yes	High	High
CD-R	High	Fast	Yes	Low	Very low
CD-RW	High	Fast	Yes	Low	Low
Rewritable DVD	Very high	Fast	Yes	Low/medium	Low
Flash	High	Fast	Yes	Low/medium	N/A

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Backing storage task

This table features typical information from early 2004 about actual drives.

Drive	Capacity	Equivalent number of floppy discs	Transfer speed	Speed compared floppy to disc	Drive cost	Media cost
Floppy disk	1.4 Mb	1	0.04 Mbps	1	£5	10p a disk
Hard disk	100 Gb	73,124	100 Mbps	2,500 x	£50	-
Tape	30 Gb		10 Mbps		£370	£50
CD	700 Mb		30 Mbps		£25	CD-R 13p CD-RW 40p
DVD	9 Gb		30 Mbps		£70	DVD-R £1.50 DVD-RW £2.50
Flash	256 Mb		1 Mbps		£45	-

Note
Mbps = Megabytes per second

1. Copy the table above.

2. Complete the third column by using the capacity given.
   (no of floppy disks = capacity in Mb/1.4)

3. Complete the fifth column by using the transfer speed given.

4. Use current adverts (from magazines or the Internet) to update the figures in the last two columns.

5. Add a final column with the heading 'Typical use' and fill it in.

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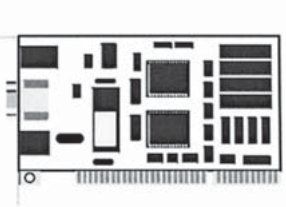
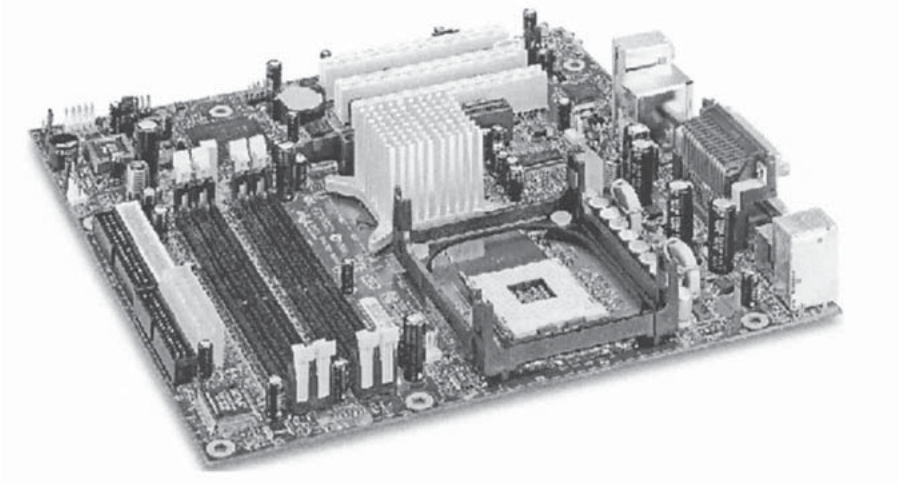
Other devices



There are a huge number of different hardware devices that a user might want to connect to the computer. These are often connected to 'cards' that plug into the **motherboard**.

The motherboard is the part of the computer filled with electronic components that links together all the other parts of the computer. The picture below of an Intel© motherboard is a typical example of how one looks.



Graphics card

As the name suggests the graphics card produces the images you see on screen. They now have memory on them that allow them to cope with the high quality video images they need to display, and can have other features such as TV-out.

Sound card

The card takes sound input from microphones, and sends sound to speakers or headphones. CD or DVD drives need to be connected to a sound card if you are to hear sound output from them.

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Modem

Modems take the digital output from a computer and change it to send through telephone lines. It then changes the data it receives back into digital input for the computer to understand. Most computers now come with a built-in modem, but for older computers, you may need to buy an external modem.

Network card (NIC)

Any computer on a network will need one of these to connect to the local area network (LAN). Wireless network cards let computers connect to a network without the need for cabling.

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SECTION 2

Types of computer software

Computers are made up of **hardware**, the actual bits and pieces that work together and make up our computer system. **Software** is the invisible data that makes the computer work for us.

File types

The **software** used on a computer is stored in one of two types of file:

1. **Program files** are lists of instructions or commands that tell the **processor** what to do.

2. **Data files** contain information created by, or needed by, programs.

Example: If you were word processing an essay, the word processing application is the program file. Both the essay you are typing up and saving and the dictionary the program uses to spell check it would be data files.

Program files

We can think of programs fitting into two general types.

1. **System software**: the programs which manage the computer and let us control its functions.

   The most important program of this type we will look at is the **operating system**, but other example of system software are utility software, such as virus checkers, icon editing programs, and disk clean-up programs.

2. **Application software**: programs that we run on the computer when we have a task to do. There are an enormous number of

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different application programs – word processors, spreadsheets, DTP applications, game software . . .

When you buy an application package, you don't just get the program and data files. In the box, you will find:

- The **media** holding the program (a CD-ROM or DVD)
- A **software licence** that gives you the right to use the program
- The **user guide** that tells you how to use the features of the program.

Other pieces of documentation may include a **tutorial guide** to teach the user about the new program and an **installation guide** to setting up the program.

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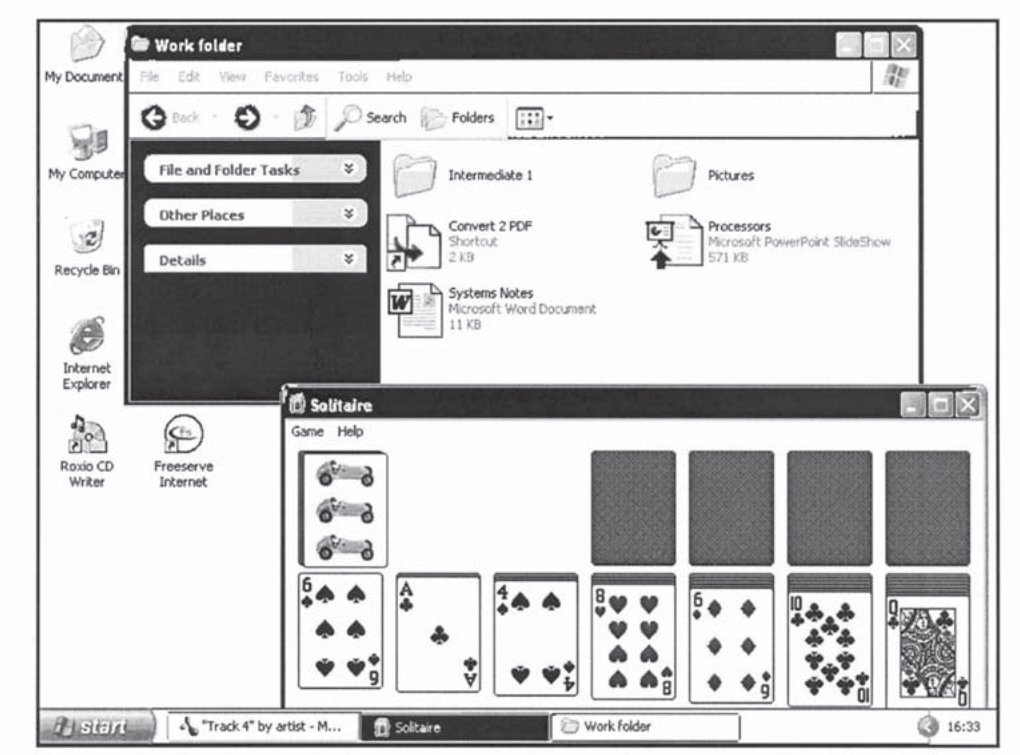
Operating systems software

The operating system is the set of programs that controls the computer for us. It loads when we turn the computer on and as a result we often take it for granted and don't realise it is a program at all.

Examples of operating systems are MacOS X for Apple Macintosh computers, Windows 95/98/XP. . . and Linux for PCs.

The screenshot below was from a computer running the Microsoft Windows operating system and a Solitaire program.



What does the operating system do?

The operating system provides an **interface**: the way the user interacts with the computer. It takes in user commands, and also provides useful information to the user. Most modern operating systems provide a **WIMP** (Windows Icons Menus Pointer) **GUI** (graphical user interface). Each active program or file is displayed in its own separate **window**. Stored programs and files are shown as **icons** (small pictures or symbols). Commands are selected from **menus**. The user controls the system by moving a **pointer** on the screen.

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The operating system also manages any **backing storage** – it allows the user to save and retrieve any files stored on floppy disks, hard disks, CDs and other storage devices. These can be named and re-named, deleted, copied, grouped together into folders, or moved from one storage device to another.

The operating system also manages **memory**. A computer may have hundreds of Megabytes of RAM memory. When the computer is being used, this RAM holds the operating system, any programs being run, and any data files being edited, as well as lots of other data that the computer needs at any time. It is the job of the operating system to make sure all this data is held in an orderly way, so that it doesn't get lost or corrupted. The user is completely unaware of all this work that the operating system is doing 'behind the scenes'.

A fourth task of the operating system is to **manage input and output**. For example, if the user moves the mouse and clicks on a file icon, the operating system will take this input and make sure everything else happens as required – in this case, the pointer has to move on the monitor, and the disk drive has to be told to load the file into memory.

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Operating systems questions

1. Identify each of the following programs as either systems software or application software, by ticking the correct column:

	Systems software	Application software
Word processing program		
Operating system		
Spreadsheet program		
Anti-virus utility		
Graphics package		
Disk clean-up program		
Database package		
Computer game		

2. Name 3 examples of operating systems.

3. Name 4 main functions of an operating system.

4. Explain the meaning of these terms:

   (a) WIMP
   (b) GUI
   (c) icon

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Operating systems practical task

Complete the following User Guide to the operating system on a computer you use:

Type of computer:

Operating system:

How to create a folder:

How to save a program into a folder:

How to rename a file:

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How to move a file to another folder:

How to delete a file:

You should demonstrate to your tutor that you can actually do each of these tasks.

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Application software

If you have completed the Computer Applications and Multimedia Applications units, you will have used many common application packages, like the ones listed below.

Word-processing software
Word processors and text processors are designed to enter, edit, format, save and print text documents. Most also allow you to include graphics within the text.

Desktop publishing (DTP)
DTP applications lay out text and graphics in boxes (frames) to produce newspapers, magazines, adverts, posters. Although they have many similar features to word-processing packages, they allow much more control over page layout.

Web authoring
Web-authoring packages are designed to allow a user to create web pages.

Spreadsheet and financial
Spreadsheets appear on screen like a large grid of rows and columns. They are used to do calculations on numbers and graphing data. Financial software has been specially designed to carry out budgeting, cash flow, and other accounting functions

Database
This application stores and organises data. It will let you search and sort through the data efficiently as well as perform calculations on it.

Communication software
The growing use of the Internet has increased the importance of this type of software. Two programs in particular have become widely used: **e-mail clients** and **web-page browsers**.

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Graphics

There are two types of graphic software.

- **Draw** programs work by creating shape objects. These objects are placed or overlapped on the page to create a picture.

- **Paint** programs change the colour of **pixels**, the small coloured dots that make up a picture.

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Application software task

Complete a brief summary report on 4 common types of application program:

- Word-processing package
- Database package
- Spreadsheet
- Graphics package

The first one has been started for you …

Type of package:	**Word processing**
Examples:	MS Word, WordPerfect
Main features:	Cut, copy and paste text Change font size and style Alter margins
Uses:	Writing letters Creating reports Writing essays

Complete the table above, and then repeat the process for the other 3 types of package.

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Application software requirements

Computer hardware has improved at a very fast pace. Everything about it – speed of processors, speed and amount of RAM, size and speed of backing storage – gets bigger or faster every year.

The writers of programs keep changing and improving their software to take advantage of these advances. Unfortunately this means that computers can quickly get out of date because they don't have enough '**spec**' to meet the requirements the new software needs to run.

Program specifications

If you buy a new piece of software you need to consider:

- *Drives*: if you only have a CD drive you shouldn't buy software on DVD
- *Backing storage space*: will you have enough room on the hard drive to install the program?
- *Processor speed*: will your computer work fast enough to run the program?
- *Amount of RAM*: does the computer have enough RAM to run the program in?
- *Operating system*: is it the correct OS? is it an up to date version?

Your computer hardware must be acceptable to the software in **ALL** the categories otherwise it won't run on it.

Things to remember

Processor speed:
This is now normally measured in GigaHertz (GHz). One GigaHertz equals 1,024 MegaHertz (MHz), so if the program needs a 400 MHz processor then a computer with 1.4 GHz processor **is** fast enough because 1.4 GHz is approximately 1,400 MHz.

Memory (RAM) size:
A computer with 128 Mb RAM will **not** be able to run a program that needs 128 Mb RAM because there would be no space left for the operating system!

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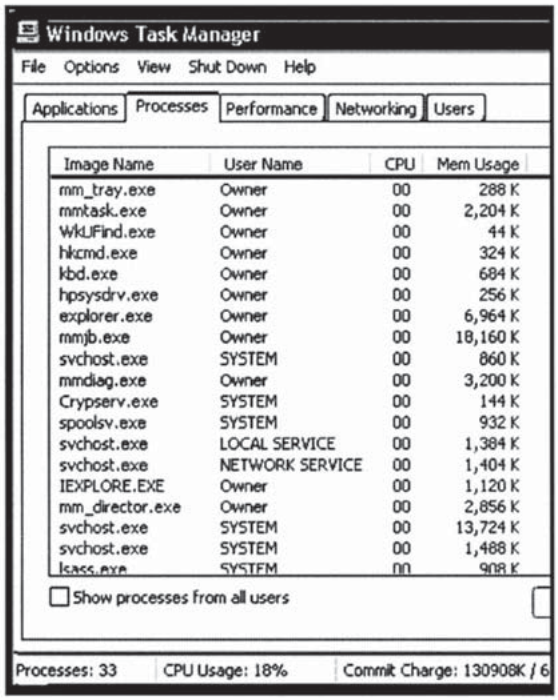
Hard disk:
It's not the size of the hard disk that counts, but how much space there is left. The size is usually measured in Gigabytes (Gb). Remember that 1 Gb is 1,024 Megabytes (Mb).

Operating system
As well as making sure that a computer has the correct operating system to run an application, it is also important to remember that the operating system itself is a program which will take up some of the computer's RAM.



The window section shown on the left is an example of the applications loaded into RAM by the Microsoft Windows XP operating system shortly after the computer has started up.

As you can see the operating system itself is using a lot of RAM, and it will need backing storage space too.

The specifications below are the minimum requirements for both Windows 98 and Windows XP

	Windows 98	**Windows XP**
Processor	Any Pentium	Pentium 233
RAM	24 Mb	64 Mb
HD space	255 Mb	1.5 Gb

This means that you must allow some space for the operating system when you are working out how much free RAM you have got.

For example, if your Windows 98 computer has 256 Mb of RAM, and the software you are wanting to run needs 240Mb of RAM, will it work?

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At first glance, you would expect the answer to be 'yes', because 256 is more than 240.

But the answer is actually 'no', because you need 264Mb: 240Mb for the software, plus 24Mb for the operating system.

Compatibility exercise

A company has bought its employees laptops to replace their existing computers. The specification of the original desktop computers and the new laptop computers is given below. They intend to keep the old computers as well as using the new ones.

Office desktop PC

Processor:	Pentium 2 266 MHz
Memory:	128 Mb RAM
Hard Drive:	4 Gb (600 Mb Free)
Op. System:	Windows 98
Media:	Floppy Disk/CD-ROM

Office laptop

Processor:	Pentium 4 2.6 GHz
Memory:	256 Mb RAM
Hard Drive:	20 Gb (18 Gb Free)
Op. System:	Windows XP
Media:	Floppy Disk/CD/DVD

Would it be worth buying software licences for both types of computer?

Applications

The four packages they intend buying are listed on the next page.

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Ability Office

Processor:	Any Pentium
Memory:	32 Mb RAM
Hard Drive:	50 Mb free
Op. System:	Windows 2000/XP
Media:	Supplied on CD-ROM

Ulead Media Studio

Processor:	Pentium 3 500 MHz
Memory:	128 Mb RAM
Hard Drive:	300 Mb free
Op. System:	Windows 98/2000/XP
Media:	Supplied on CD-ROM

FIFA Soccer

Processor:	Pentium 3 500 MHz
Memory:	64 Mb (98) 128 (XP) RAM
Hard Drive:	120 Mb free
Op. System:	Windows 98/2000/XP
Media:	Supplied on CD-ROM

Adobe Photoshop

Processor:	Pentium 2 233 MHz
Memory:	64 Mb RAM
Hard Drive:	120 Mb free
Op. System:	Windows 2000/XP
Media:	Supplied on CD-ROM

Which computers will they work on?

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Checking compatibility (1)

To check the compatibility of each program on each type of computer, fill in the following tables for each software type and computer type (eight in total). The first two have been completed as an example:

Software	Ability Office		
Computer	Desktop PC		
	Software needs ...	**Computer has ...**	**OK?**
Processor	Any Pentium	P2 266MHz	yes
RAM	32 Mb	128 Mb	yes
Hard disk space	50 Mb free	600 Mb free	yes
OS	Win 2000 / XP	Win 98	no
Media	CD-ROM	FDD, CD-ROM	yes
Conclusion:	Ability Office cannot run on this computer because it has the wrong operating system.		
Comment:	It might be possible to install Windows 2000, but this might need an RAM upgrade, and there might not be enough free hard disk space.		

Software	Ability Office		
Computer	Laptop		
	Software needs ...	**Computer has ...**	**OK?**
Processor	Any Pentium	P4 2.6 GHz	yes
RAM	32 Mb	256 Mb	yes
Hard disk space	50 Mb free	18 Gb free	yes
OS	Win 2000 / XP	Win XP	yes
Media	CD-ROM	FDD, CD-ROM, DVD	yes
Conclusion:	Ability Office can run on this computer.		
Comment:	No upgrade required.		

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Checking compatibility (2)

Software	Ulead Media Studio		
Computer	Desktop PC		
	Software needs …	**Computer has …**	**OK?**
Processor		P2 266MHz	
RAM		128 Mb	
Hard disk space		600 Mb free	
OS		Win 98	
Media		FDD, CD-ROM	
Conclusion:			
Comment:			

Software	Ulead Media Studio		
Computer	Laptop		
	Software needs …	**Computer has …**	**OK?**
Processor		P4 2.6 GHz	
RAM		256 Mb	
Hard disk space		18 Gb free	
OS		Win XP	
Media		FDD, CD-ROM, DVD	
Conclusion:			
Comment:			

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Checking compatibility (3)

Software	FIFA Soccer		
Computer	Desktop PC		
	Software needs ...	**Computer has ...**	**OK?**
Processor		P2 266MHz	
RAM		128 Mb	
Hard disk space		600 Mb free	
OS		Win 98	
Media		FDD, CD-ROM	
Conclusion:			
Comment:			

Software	FIFA Soccer		
Computer	Laptop		
	Software needs ...	**Computer has ...**	**OK?**
Processor		P4 2.6 GHz	
RAM		256 Mb	
Hard disk space		18 Gb free	
OS		Win XP	
Media		FDD, CD-ROM, DVD	
Conclusion:			
Comment:			

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Checking compatibility (4)

Software	Adobe Photoshop		
Computer	Desktop PC		
	Software needs …	**Computer has …**	**OK?**
Processor		P2 266MHz	
RAM		128 Mb	
Hard disk space		600 Mb free	
OS		Win 98	
Media		FDD, CD-ROM	
Conclusion:			
Comment:			

Software	Adobe Photoshop		
Computer	Laptop		
	Software needs …	**Computer has …**	**OK?**
Processor		P4 2.6 GHz	
RAM		256 Mb	
Hard disk space		18 Gb free	
OS		Win XP	
Media		FDD, CD-ROM, DVD	
Conclusion:			
Comment:			

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Checking compatibility (Answers)

You should have found that **all** the programs will work on the new laptop.

You would expect this because a new computer will have a minimal number of applications installed on its hard disk, and should have a fast processor and lots of RAM. It will also be sold with an up-to-date operating system.

The problem begins when a computer starts to get old. Three years is a long time in the life of a computer, but schools will make their computers last a lot longer than that. How old are the computers in your computing department, for example?

So could any of the new programs work on the old office desktop computer?

1. **Ability Office**: No. It has the wrong operating system.

2. **Ulead Media Studio**: No. The processor is too slow, and it would need all the computer's RAM, which will not all be available. Both the free HD space and OS are OK.

3. **FIFA Soccer**: No. The processor is again too slow.

4. **Adobe Photoshop**: No. The program is not compatible with the old operating system. The processor is also just above the minimum required spec, so it would have been very slow to run at times.

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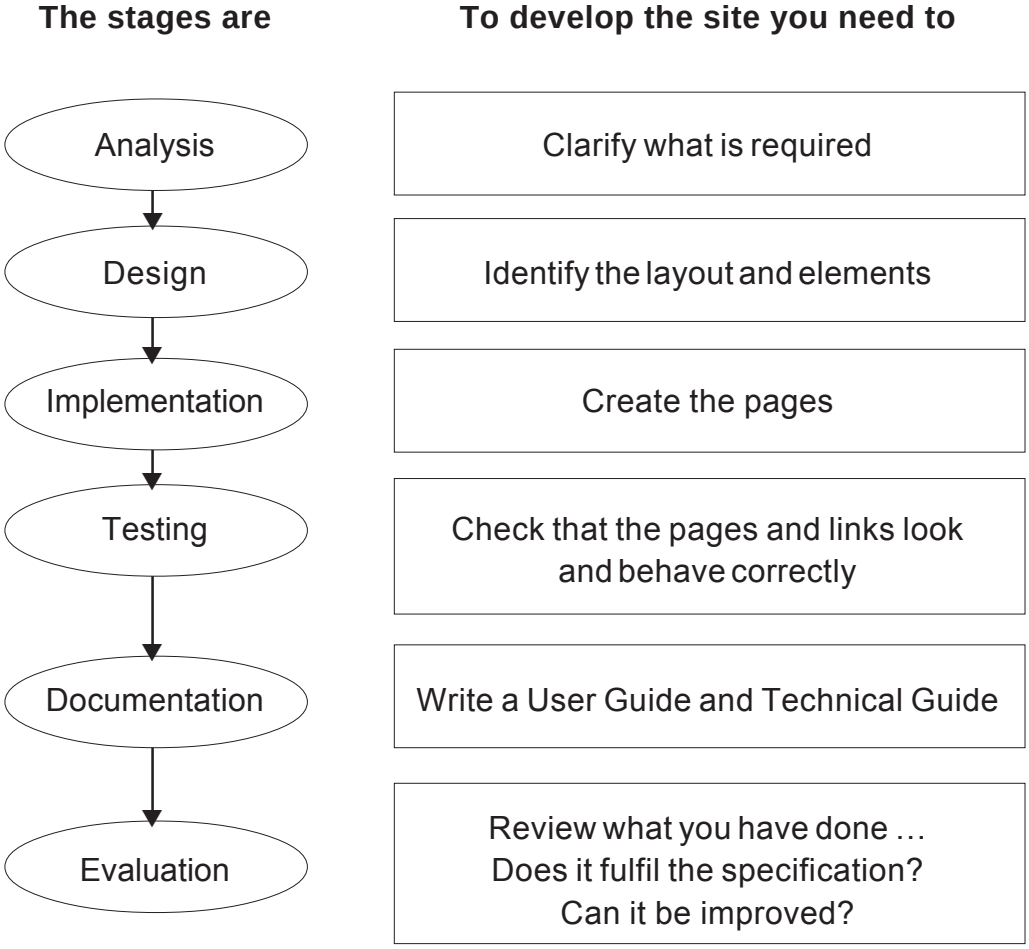
SECTION 3

The software development process

The process is a sequence of stages that are used to develop a piece of software. The purpose of this is to make sure that any software product that is developed is fit for its purpose.

The process should be followed when attempting any computing task, whether that is writing a program, creating a newsletter, or any other software task. We are going to use the **software development process** to develop a website.



The following pages show you how to work through each stage of the process to end up with a completed website.

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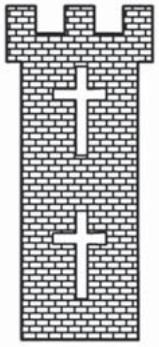
Stage 1: Analysis

When faced with a problem the most important thing you need to do to create a good solution is to make sure you fully understand what the problem is. Read through the problem below and try and work out what you are being asked to do.

The problem



There are many organisations in Scotland that are concerned with managing and maintaining the country's historic buildings. One way they raise funds to do this is by getting tourists to visit the buildings they are preserving.

You need to create a website to encourage visitors to go to **four castles** – Edinburgh, Stirling, Dunnottar and Caerlaverock.

The website should have a **home page** that *hyperlinks* to **one page for each castle**. **Each castle page** should then contain

– a heading with the castle name
– a picture of the castle
– a short history of the castle
– the location of the castle
– information about the castle's opening hours and admission charges
– a *hyperlink* back to the home page.

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Analysing the problem

We should put into our own words exactly what we need to do by picking out the important and relevant information we have been given. This will help us understand what the problem is, and how to solve it. At this stage we should also be considering who we are producing our website for: in other words, **our 'target audience'**.

SAMPLE ANSWER

Problem specification:
The problem involves creating a website to encourage visits to four famous castles – Edinburgh, Stirling, Dunnottar and Caerlaverock. The site will have five pages – a home page and one for each castle.
The pages about the castles should have information about their history, location, opening hours and any admission charges. There should also be a picture of the castle.
The home page should link directly to each castle's page, and they should link back to the home page. Other features (e.g. animations) can be added, but are not necessary.
The target audience will be tourists interested in Scottish castles and history. They will have a wide range of different computing expertise so the site should be simply laid out and easy to navigate.

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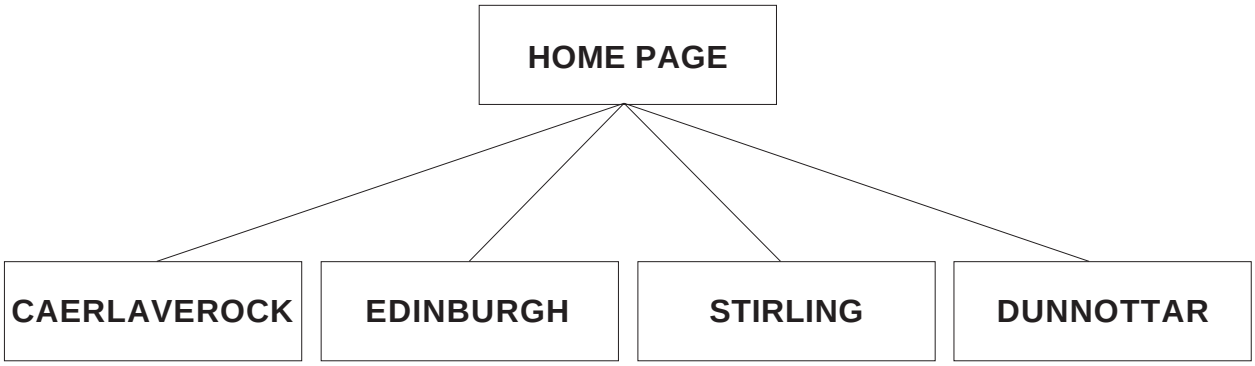
Stage 2: Design

The analysis carried out on the previous page should give a good idea of what is being asked for. The next stage is to **design** the solution to the problem.

The site is to be made up of five pages – a home page and pages about the four castles. The pages must at least link as shown below:



There are two different layouts needing to be designed:

- A home page that is the main link to pages about each castle

- Separate castle pages for each of the four castles – they should probably all follow one design so they are consistent in appearance. This would be a good idea because it makes the site easier for our user to navigate.

We need to design the pages around the target audience. To take account of the different levels of computer skill among users, it would be helpful to put consistent navigation tools (e.g. tables, text links, etc.) on all the pages.

The next page shows how the pages could look. There must be clear indications of where all the important elements are going to appear, and what hyperlinks will be put on the pages.

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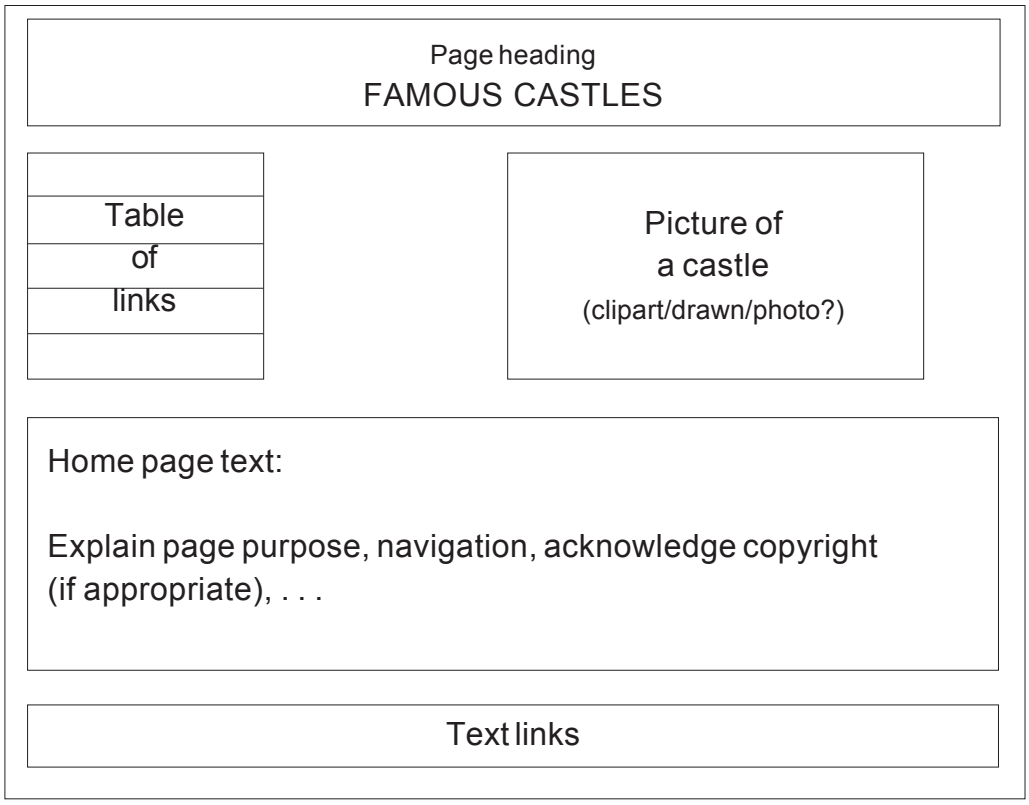
It isn't necessary to show the full content of the text or pictures at a design stage. Only give a rough outline of what each page will contain to help control the next stage – the implementation.

Note: The pages could feature links to other sites (Historic Scotland for example), more pictures, logos or animations. I haven't done this because I don't want to include elements on the page that I'm not sure I can actually do.

Index page

This is the site's home page. I have used a simple design that reflects my inexperience in both designing and creating websites



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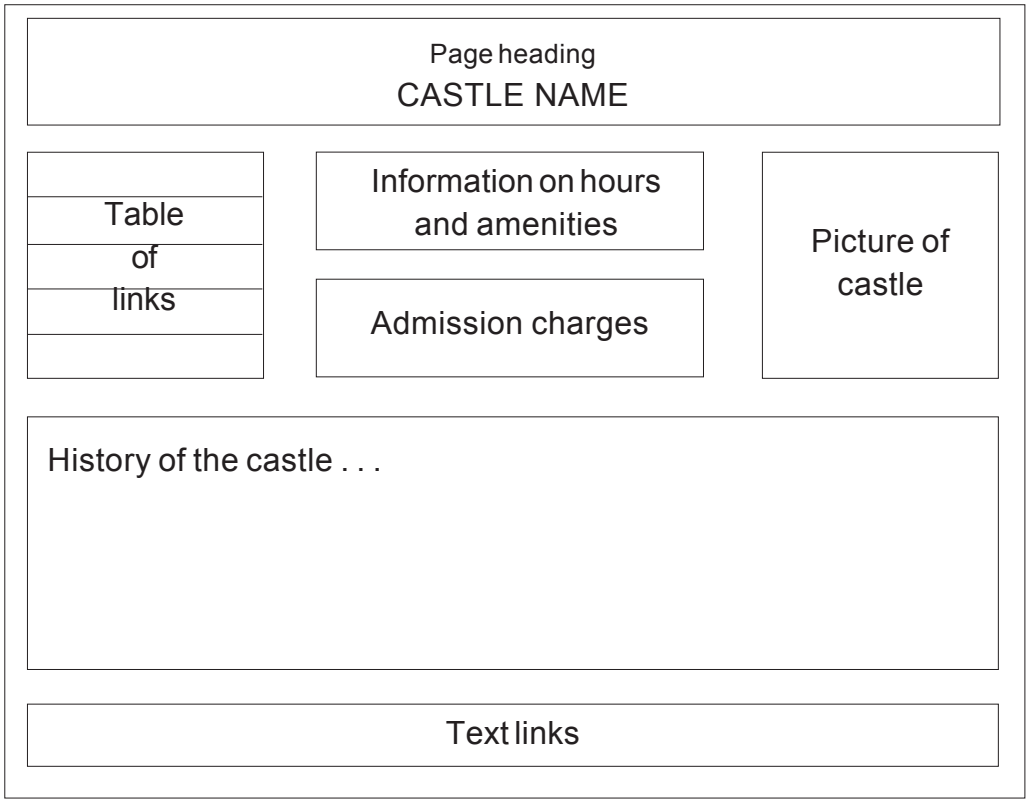
Castle pages

The castle pages have text beside the photo. This might involve a bit more work to create, but is still quite easy.



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Stage 3: Implementation

There are several different ways you can create your website. This will depend on the software that is available for you to use (and what you have experience using).

Options include:

- using specialist web-authoring software (e.g. Frontpage, Dreamweaver . . .)
- using publishing software (e.g. Publisher)
- writing in HTML code.

An example of the completed website is included on the disk. It was not created using specialist software. You will need to load up the sample website that was created for the next stage – testing.

Stage 4: Testing

When you have completed your site you need to load it into a browser (e.g. Internet Explorer, Netscape Navigator, Safari) to check that it will work.

Your testing should check that:

- all the hyperlinks work
- all pictures and text display correctly.

Some web-authoring software will also tell you how long a page will take to download using a 'dial-up' connection, a common type of connection for home users. If you can test the download time you should do so.

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Stage 5: Documentation

User Guide

The purpose of a User Guide is to help the user to understand the purpose and features of the site. These include:

- why the site has been created
- what the main features of the site are
- how you navigate between pages.

Technical Guide

This gives more technical information which might be useful for anyone who needed to maintain or develop the site. It could include:

- what software was used to create the site
- a diagram showing how pages are linked
- the file names of all the images that appear in your site, what page each one appears on, and any copyright issues that they will need to know about.

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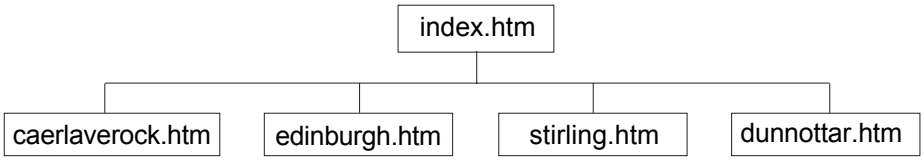
SAMPLE ANSWER

User Guide

This is a five-page website consisting of a home page and four linked pages. The site has been designed to give useful information about four castles.
Navigation between the parts of the site is done by using the hyperlinks that are located in both the table at the left-hand side of the page and the text at the foot of the page.

Technical Guide

Software used: Microsoft Publisher 98
Pages: index.htm, caerlaverock.htm, edinburgh.htm, stirling.htm, dunnottar.htm



Images

Filename	Page	Copyright
edinburgh1.jpeg	edinburgh.htm	Visitscotland gives permission for these images to be used on site. Cannot be copied to use on other sites or paper documentation
stirling1.jpeg	stirling.htm	
dunnottar.jpeg	dunnottar.htm	
caerlaverock.jpeg	caerlaverock.htm	
castle.gif	Index.htm	Copyright wholly owned by site owner

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Stage 6: Evaluation

When you have finished creating the site, tested it works, and written the documentation, the last stage is to evaluate how successful you have been in creating a solution to the problem.

Below are some hints on how to structure your report.

1. **Compare your solution with the problem specification**
   Read through all the documentation that described the problem and look at what your website does:

   - Does your website do everything that the problem required it to do?
   - If not, what can't it do? Try to explain why you didn't completely solve the problem.

2. **Compare your solution with your design**
   Now look at your design.

   - How closely do your actual web pages match up to your designed pages?
   - Can you justify any differences?

3. **Additional features**
   Did you do anything extra that you were not asked to do, but that is worth highlighting in your report?

4. **Improvements/developments**
   With knowledge of what makes a good website, combined with your opinion on how good the website you have just created is, you should be able to:

   - Recommend other web pages they could think about adding to the site that would improve it.
   - Suggest other components they could place on the site – animations, more graphics, thumbnail images . . .

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5. **Overall impression**
   Now you have seen your design turned into an actual site, could you have made a better design? If so, what would you have done differently?

The following page contains an evaluation of the sample site.

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SAMPLE ANSWER

Evaluation

My Solution v The Problem Specification
The problem involved creating a web site of at least five pages. There was to be a home page that linked to four other pages. Those pages should have links back to the home page.

The four pages were to hold information about, and pictures of, 4 castles. The information was to include some history, as well as notes on the location, admission information and opening hours.

My website successfully does all of this.

My Solution v My Design
The pages match my original design: all pictures and headings have been placed in line with the design, and the working links are both in a tabular format on the left-hand side of all the pages, and as text at the bottom of the pages.

Additional Features
The site does not contain any extra features beyond the basic specification.

Improvements / Developments
The site can easily be enlarged by adding extra pages. New links would have to be added to the table and bottom of the pages. Separate links to local maps of the castles might help visitors. Also links to external sites of interest (e.g. Historic Scotland) could be a useful addition.

The single large images on the page could be replaced by a number of smaller 'thumbnail' images. These images could be clicked on to open the full size images.

The copyrighted images could be replaced by original images. These could be made available for visitors to the site to download as wallpaper.

The design of the index page could be improved if an animation was used. This would catch the visitors' attention and encourage them to explore the site. Download times would have to be watched however.

Overall Impression
My website is a good solution to the problem. It has a simple interface, and as the pages all follow the same clear design they would be easy for a novice user to work.

It would be a simple site to extend because extra pages can easily be added and links updated.

The site might benefit from having animations added, but these can distract from the page if not well done.

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Your software development task:

Your task is to create a website advertising a computer system.

The website should have a home page with:

- a general description of the computer system
- a picture of the system
- links to four other pages

The linked pages should describe:

- the input devices of the system
- the output devices of the system
- the storage devices of the system
- the software supplied with the system

You should provide as much technical information as possible, based on research you did earlier in the unit. Where possible, include pictures.

You should submit a report covering each of the stages of the software development process, as follows:

Stage	Report should include
1. Analysis	Problem specification (see page 62)
2. Design	Site map (see page 64) Sketches of pages (see pages 65–6)
3. Implementation	Hard copies of each page
4. Testing	
5. Documentation	User guide and technical guide (see pages 68–9)
6. Evaluation	Brief report (see page 72)

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SECTION 4

Connecting to the Internet

There are five requirements for connecting to the Internet.

1. Service provider
   You will normally have to subscribe to a company that will provide you with access to the Internet through their servers.

2. Software
   Your computer must have the correct type of software to let it transmit and receive data across the Internet. You will need (at least) a browser to view web pages and e-mail software to send and receive e-mails.

3. Hardware
   The specification of the computer must be sufficient to run the software – in particular, it will need a fast enough processor, and enough RAM.

4. Connection
   You need to have a telecommunications connection – either a phone line, a cable or satellite connection or a WAP phone. Businesses may also have high speed leased lines to allow multiple users fast access to Internet services.

5. Modem
   You need a suitable device to connect your computer to the telephone line, or cable or satellite. Normally, this will be some type of modem.

Each of these is described in more detail in the following pages:

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Internet service provider (ISP)

These companies control access to the services of the Internet. There are many examples, including AOL, Wanadoo, Yahoo or Tiscali, and many more.

As well as allowing access to the World Wide Web, they may provide multiple e-mail addresses, space for hosting web pages, and 'channels' of organised information. Some also offer personal chat-type services, e.g. AOL with 'Instant Messenger'.

When you subscribe to an ISP, they will provide you with information on how to configure your computer to access their server. Whenever you want to access the Internet, your computer will then connect to the ISP's server, which is permanently connected to the Internet.

Communications software

Communication is the name given to the type of software that is used to send and receive information over the Internet. There are two main types of this software that we commonly use.

- A **browser**.
  This is a program which lets you view web pages. Most browsers also have file transfer capabilities, as well as letting you use chat services. Examples of browsers include Internet Explorer, Netscape Navigator and Safari.

- An **e-mail client**.
  This is a program which sends and receives e-mail, and gives users access to newsgroups. E-mail software also allows the user to organise messages into folders, store commonly used e-mail addresses, send and receive attachments and send e-mails to groups. Examples of e-mail clients include Eudora, Mail and Outlook Express. Most ISPs also allow users to view e-mail directly using a browser (e.g. hotmail).

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Hardware

We discovered in Section 2 that all software needs a minimum specification of computer before it can run. **Communication software** is no different. The specification of computer that is required by Netscape Navigator on both PCs and Apple Macs is shown below.

	Apple Mac	PC
Processor	266 MHz	233 MHz
Memory	64 Mb RAM	64 Mb RAM
Hard disk space	72 Mb	52 Mb
Operating system	MAC OS 10 +	Windows 98 +

As you can see by looking at the table, browsers will run on a very low specification computer – almost every computer will have the requirements to run a browser.

Connection and modems

The modem is the specialised hardware device that sends and receives data. For home users there are three main connection methods: dial-up using a standard modem and phone line, ADSL broadband using a digital modem and phone line, and broadband using a cable. In some rural areas, satellite broadband is another option.

The important difference between the types of connection is the speed of data transmission. The table below shows these differences:

Type of connection	Speed of connection	Faster than Dial-up	Availability
Dial-up	56 Kbps		anywhere
ADSL broadband	Up to 1 Mbps	20 times	most of UK
Cable broadband	Up to 3 Mbps	60 times	cities
Satellite broadband	Varies		rural areas

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Apart from the technical differences, each method also varies in terms of cost.

Dial-up access uses the standard telephone system. The modem converts the digital signals from the computer into analogue signals which can travel along ordinary phone lines. The maximum data transfer rate is 56K (56,000 kilobits per second) which is fine for text, but can be frustratingly slow for large graphics files, or software downloads.

Broadband is a general term for a range of faster digital methods of transferring data,

At present, the most common of these is ADSL broadband. This also uses the standard telephone system, but the data is transferred in digital form. BT has now upgraded almost every exchange in the UK to allow ADSL broadband. However, you need to be within 3km of an ADSL exchange, so this is not practical for rural areas.

In large towns and cities, cable TV companies have laid high bandwidth cables down many streets. If you have a connection to these cables for digital TV viewing, you can use the same cables for accessing the Internet. This is known as cable broadband.

For rural areas, the only alternative to dial-up connection with all its limitations, is to install satellite broadband. This allows high speed access to the Internet using a satellite dish to send and receive data as radio waves.

In a number of areas, experimental trials are being carried out sending data along power lines!

Most modern computers come with a built-in 56K modem. Note that 56K does not mean that you are guaranteed to be able to download information at 56,000 kilobits per second. This is the maximum theoretically possible speed. The actual speed will vary and depends on a wide range of factors, including how busy the ISP's servers are at different times of day.

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For the other types of access, you need to buy an additional external modem. Sometimes this is provided by the ISP as part of a package when you subscribe to their broadband service.

Internet costs

There are a variety of costs involved in using the Internet. We can break these down into two main groups – set-up or initial costs, and running costs.

Set-up costs

Hardware costs
- Buying or upgrading a computer
- Buying a modem (if required)
- Buying peripherals (if required)

Software costs
- Upgrading operating system (if required)
- Buying browser and e-mail software (although this is often free)
- Buying anti-virus and/or firewall software

Installation costs
- Setting-up Internet access (especially for networked systems)
- Installing or moving phone sockets
- Installing cable or satellite equipment (if required)

Training
- Training staff to use new software

Running costs

ISP subscription: either
- Pay-as-you-go subscription (typically around 1p per minute)
- 'Anytime' subscription (typically £14.99 per month unlimited access for dial-up)
- Broadband subscription (typically £20 to £40 per month unlimited access)

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Phone line
- Monthly line rental
- Call charges (some ISPs give freephone numbers)

Other costs, including
- Maintenance and repairs of equipment
- Technical support helplines (often very expensive)
- Software updates (including anti-virus subscriptions)
- Hardware updates

Security issues

The Internet has brought enormous advantages to society – anyone in the most remote part of the world can potentially access the same information and services as someone in the middle of a major city.

Unfortunately there is another side to the Internet. The Internet allows two-way access because data is both sent and received. The information we hold on our computers is at risk from

- viruses (malicious programs sent by e-mail)
- hacking (unwanted accessing into your computer files from across the Internet).

Protecting computers

1. **User IDs and passwords**. This is the simplest way to stop someone accessing your computer, but people can still gain access through e-mails or other files you download on to your hard disk.

2. **Virus checkers and filters**. A virus checker is a software application that stops threats such as viruses from getting on to your computer in the first place. Filters are lists of web addresses that you want to restrict access to or e-mail addresses of people you don't want to receive mail from.

3. **Firewalls**. Broadband allows faster access to Internet services, but also makes computers more vulnerable because they are

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always on-line. Firewalls need to be installed to provide a greater level of protection.

E-commerce websites allow customers to buy goods and services on the Internet and make use of IDs and passwords to restrict access.

Some users are still wary about buying over the Internet, especially if it means sending credit card details. To overcome this worry, e-commerce sites use secure connections to prevent hackers stealing account information. When using a secure connection, you will see a 'padlock' symbol at the bottom of the browser, and notice that the url begins with https rather than the usual http. Any data being transferred over a secure connection is encrypted so that it cannot be understood by anyone hacking into the message.

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Questions about the Internet

1. What is an ISP?
2. Name 4 ISPs.
3. What services do most ISPs provide?
4. What software is required to view web pages?
5. Describe 2 methods of viewing e-mail messages.
6. What is meant by the term 'dial-up' Internet access?
7. Describe 3 types of broadband access.

Practical task

1. Research the websites of 2 different Internet Service Providers (ISPs). For each one, compare the costs of

   (a) dial-up access
   (b) ADSL broadband access

2. Write a brief report for an older neighbour who does not have a computer, and is considering setting up Internet access.

   Identify the hardware and software required.

3. Recommend an ISP and outline the advantages and disadvantages of dial-up and broadband access.

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SECTION 5

Answers to questions on computer systems (page 8)

1. desktop
2. (labelled sketch)
3. laptop, notebook
4. battery operated(instead of mains power); LCD screen instead of monitor; trackpad instead of mouse
5. palmtop, or PDA
6. using a stylus on a touch sensitive screen
7. it has less RAM memory and a slower processor, so cannot run full application programs
8. laptop, palmtop
9. desktop, laptop
10. liquid crystal display; personal computer; personal digital assistant

Answers to questions on components of a computer (page 14)

1. Computers are machines that process data
2. see page 9
3. see page 10
4. (a) random access memory
   (b) read only memory
   (c) central processing unit

5.

Feature	RAM	ROM
Permanent storage for operating or control programs		√
Temporary storage for programs and data	√	
Data can be **read** from /**written to** memory	√	
Data can only be **read** from memory		√

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Answers to questions on computer specification 1 (page 17)

1. desktop
2. 3.0GHz
3. 512 Mb
4. 20 Gb
5. 17″ flat screen
6. keyboard, mouse
7. Windows XP only

Answers to questions on computer specification 2 (page 19)

1. laptop
2. 1.8GHz
3. 256 Mb
4. 30 Gb
5. 14.1″ flat screen
6. keyboard
7. Windows 2000, Microsoft Works

Answers to questions on computer specification 3 (page 20)

1. palmtop
2. 400MHz
3. 64 Mb
4. no hard drive
5. 3.5″ flat screen TFT
6. touch screen
7. Windows 2003 Premium; Outlook, Word, Excel

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Answers to questions on output devices (page 33)

1. standard monitor – desktop computer
   TFT / LCD flat screen – laptop or palmtop computer
2. speakers; headphones
3. print out on paper

4.

	Laser	Inkjet
Cheapest to buy		√
Cheapest to run	√	
Fastest	√	
Highest quality	√	

Answers to backing storage task (page 38)

Drive	Equivalent number of floppy discs	Speed compared to floppy disc	Drive cost	Media cost	Typical use
Floppy disk	1	1			Transferring small data files between computers
Hard disk	73,124	2,500 x			Storing applications, operating system, regularly used files
Tape	21,942	250 x			Making back-up copies of commercial data or network backups
CD	512,000	750 x			Distributing software, storing large graphic files (CD-R/W)
DVD	6,740,846	750 x			Storing video
Flash	187,245	25 x			Storing digital images form a camera

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Answers to operating system questions (page 45)

1.

	Systems software	Application software
Word processing program		√
Operating system	√	
Spreadsheet program		√
Anti-virus utility	√	
Graphics package		√
Disk clean-up program	√	
Database package		√
Computer game		√

2. Microsoft Windows, MacOS, Linux, Unix …
3. provides a user interface; manages backing storage; manages memory; manages input / output
4. (a) WIMP = Windows, icon, menu, pointer = an interface which is controlled by a mouse (or other device) and which moves a pointer on screen to select commands from menus, with all files displayed as small graphics (icons) which open up into separate windows on screen
   (b) GUI = Graphical user interface = an interface which uses pictures as well as words
   (c) Icon = a small graphic which represents a file, folder, command or other object

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Answers to questions about the Internet (page 82)

1. An Internet Service Provider (a company which provides access to the Internet)
2. Wanadoo, Tiscali, Blueyonder, Yahoo, BTInternet, …..
3. Access to the WWW, e-mail, file transfer, chat, newsgroups …
4. A browser (e.g. IE, Netscape Navigator, Safari)
5. Using an e-mail client such as Outlook Express, or using webmail
6. Connecting to the Internet using a modem and standard telephone connection
7. ADSL, cable and satellite

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