

4

Networks and the effects of using them

Why this unit matters

Computer networks help us to organise our data and to access information much more efficiently than simply using stand-alone computers.

Junaid works for All Computer Supplies Inc. – the company for which you produced an information sheet in Unit 1 – and is responsible for setting up computer networks. There are many different types of networks, and even stand-alone computers will link to other computers when using the internet. Junaid has to deal with all sorts of enquiries about the networked systems that All Computer Supplies Inc. helps to put together.

Here are some of the enquiries that Junaid deals with:

I access the web all the time: playing games, using VoIP to call my friends and downloading music. I also love blogging and tweeting. It just happens through Wi-Fi and Bluetooth – but I don't know how it works and would like some ideas on how I can apply it to my business. (Interior designer)



I work in a shop and I know that when I scan an item at the till, all sorts of things happen. My till connects with the ordering department, the warehouse, payment and customer loyalty records. It seems as though I'm part of a really big network. Is that true? (Cashier attendant)



Our school has a large network. I don't know how it works but I overheard someone talking about LANs and WANs. I'm not sure what all that means. I'd like to know – after all, I am the head teacher! (Head teacher)



I'm setting up a network at home so that the whole family can use the same printer and access the internet at the same time. It will be so much easier for me to do online banking and make bookings for theatre and travel tickets. How does my network connect with the business networks when I book my tickets or make a payment? (Parent)



Your practical task

All Computer Supplies Inc. has decided that it would be helpful if the company developed a series of webpages to provide details about how networks operate in personal and business environments. The company has asked you to tackle this task.

What this unit covers

Sessions		
Theory	4.1	An introduction to computer network hardware
	4.2	Computer networks
	4.3	The internet and intranets
	4.4	Computer networks in business environments (1)
	4.5	Computer networks in business environments (2)
	4.6	How does ICT help business and personal communication?
	4.7	Keeping computer network data confidential and secure
Theory review		
Practical	4.8	An introduction to website design
	4.9	Using HTML to create webpages
	4.10	Using website authoring software [1]
	4.11	Creating stylesheets using website authoring software
	4.12	Using website authoring software [2]
	4.13	Testing and publishing a website
Practical review		

By the end of the theory sessions you will be able to:

- describe the use of various devices used to set up computer networks
- describe the use of Wi-Fi and Bluetooth in networks
- define the terms LAN, WLAN and WAN, identify their characteristics and note any differences
- identify a variety of methods of communication over networks
- describe the advantages and disadvantages of the internet and intranets in business environments
- understand the advantages and disadvantages of accessing the internet using different types of computer
- understand and explain the need to use IDs and passwords

- understand and explain the need for confidentiality and data security on computer networks
- identify and explain the need for encryption and authentication techniques.

In the practical sessions you will develop and apply skills in:

- applying the theory of web development layers in your work
- website authoring and understanding the basics of HTML
- combining text, images and numeric data in your work
- using stylesheets to improve the look of your work
- how to test and publish a website.



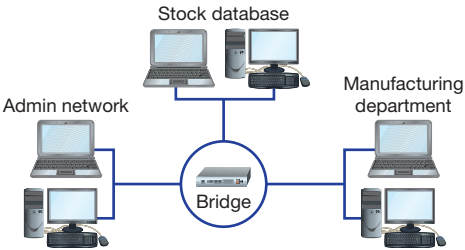

Background

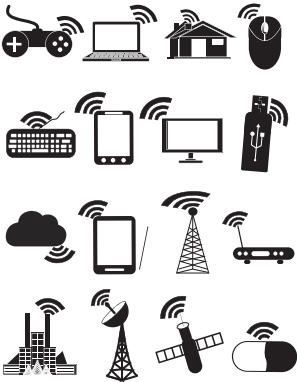

Computer networks enable computers to communicate with each other and share data and information. There are many different types of computer networks. In this session, we will look at the hardware needed for computer networks. You may recognise some of the technical terms associated with networks in this session and you will find some detail about how the hardware devices enable communication and the transfer of data.

Language

Data is often transferred in quantities called data packets. This is how most data travels over the internet (and in recent years, also over mobile phone networks).

Hardware devices

Component	Description
<p>Routers</p> 	<p>A router is a device that connects, by forwarding packets between, different computer networks. It manages the data packet by:</p> <ul style="list-style-type: none"> • deciding where it is going and the most efficient route to take by searching for and building a database (or routing table) of nearby IP addresses • deciding whether it should be transmitted or an alternative route should be taken • formatting, or translating, it to a similar protocol, so that it can be accessed by the receiving network. <p>Because routers can join very different networks together, one of the most common uses of a router is to connect a home or business network to the Internet.</p>
<p>Hub or Switch</p> 	<p>When connecting to the same network, computers, printers and storage devices are plugged into a hub or switch. A hub joins together computers in a network so that they can share files and an internet connection. It sends data packets to all computers on the network. A passive hub simply broadcasts or sends the signals. An active hub makes a signal stronger as it sends it on.</p> <p>Switches are able to look at a data packet, target the computer for which it is intended, and send it. This helps to speed up data transmission in a network.</p>
<p>Bridges</p> 	<p>In large companies, it is sometimes necessary for workers in one area to access data from other areas. In a bank, for example, the loans and insurance departments might need to look at a customer's account details to check their account history.</p> <ul style="list-style-type: none"> • A bridge allows different networks to communicate with each other. • In all connections with another network, the data packets that pass between the networks must be in the same format. • Because of this disadvantage, most modern networks use routers, not bridges.
<p>NIC</p> 	<p>The NIC enables the computer to link to the cable or to radio waves used to communicate across the network. If you look at your computer, you can see the socket into which the network cable can be inserted. If your computer already has Wi-Fi, it will have a wireless NIC built in.</p>

Component	Description
<p>Wireless technology</p> 	<p>Wireless technology allows devices to be connected to a network without physical wires, instead using radio transmitters and receivers. Two popular systems are Bluetooth and Wi-Fi, although both are designed to connect devices without wires; they are designed for slightly different purposes.</p> <p>Bluetooth technology is limited to a short range of metres and generally used to link and transfer data between mobile devices, smartphones, and computer peripherals like the keyboard, mouse and printer. This ability to directly connect devices means Bluetooth has become a common protocol that manufacturers licence to add to audio products that would benefit from audio connectivity.</p> <p>Wi-Fi technology has a much wider range, able to transfer large amounts of information and used with larger computer networks and devices as described in the next session. This ability means Wi-Fi is often used to connect devices to the internet.</p>
<p>Modems</p> 	<p>A modem is a device used to connect to the internet via a phone line. It converts the analogue signal from the phone line into a digital signal your network can understand and vice versa. There are three types of modem:</p> <ul style="list-style-type: none"> ● Cable modem: connects via a coaxial cable that links to a high-speed network designed to transmit television channels and internet. ● ADSL modem: uses traditional copper telephone lines to send and receive data fast enough for modern internet requirements. ● Dial-up modem: rarely used as broadband speeds have increased, but again uses traditional telephone lines to connect to the internet but limited to very slow speeds.

Communicating across a network

There are two different ways of transmitting data around a network: cables or wireless transmission. A wireless network will use radio waves to communicate.

Choosing media

The choice of cables or radio waves will depend on four factors:

1 The speed of data transmission required	Large computer networks are more likely to use cables because they allow a greater rate of data transfer.
2 The size of the computer network	Too many users on a wireless network will slow the speed of data transmission.
3 The distance that data will need to travel	Most NICs can only send and receive radio signals over relatively short distances.
4 The need for portability of devices	Laptop or netbook users might want access to the network as they move around. This might not be possible on a wired network, so radio waves will be used on a wireless network.

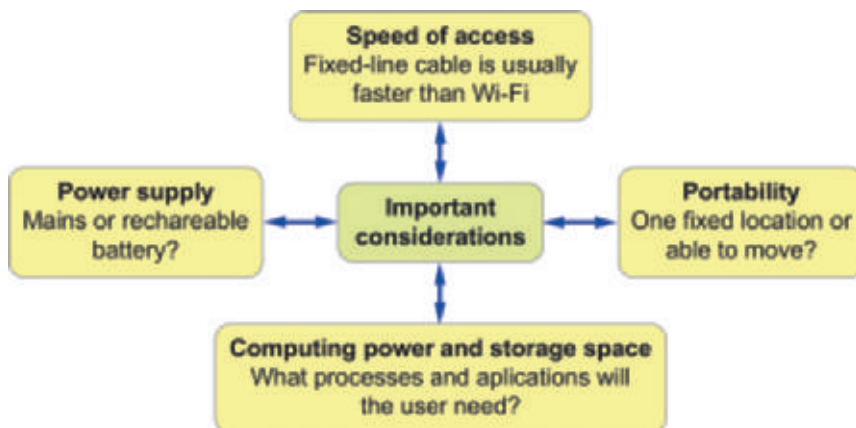
Evaluating internet-connected devices

Users can now access networks and the internet using a variety of devices. Each of the following has advantages and disadvantages and end-users must consider which would be the best for them.

- Laptop computer
- Desktop computer
- Tablet computer
- Mobile phone.

Activity 1

Read the information in the hardware devices table. Give reasons why a chain of supermarkets would find a router more useful than a bridge.



There is also a choice in the type of cable that can be used:

Twisted pair cable
This cabling usually has four pairs of copper wire. Each pair is twisted together. The pairing and twisting reduces interference caused by other electrical cables.
Fibre optic cable
Fibre optic cables carry data as light signals. This means that data can be transmitted very quickly. Light signals are not affected by interference. Fibre optic cables transmit far more data more quickly than twisted pair cables. This means that the data can be transmitted at a faster rate – more data is transferred each second.

Activity 2

- 1 A school has two ICT classrooms, one with fixed desktop computers and one with tablet computers. Explain the advantages and disadvantages of each during lessons requiring internet based activities.
- 2 A mining engineer is using a hand-held device to scan materials extracted from a test dig. She also needs to transmit the data to the laboratory that is up to 200 metres away. Explain why the system would communicate using radio waves and the devices that would be required.

Language

Interference can disrupt the transmission of data packets. This may be high-voltage electrical cables running along side network cables, or wireless signals clashing with devices using the same broadcast frequencies such as portable telephones.

Review and revise

You should now be able to:

- describe the common network devices (routers, modems, hubs, bridges and switches) and the use of Wi-Fi and Bluetooth in networks
- explain how network communications devices can be used in business organisations
- evaluate network and internet-enabled devices based on end-user requirements.

Activity 3

An international bank needs to communicate with its branches in different countries. What advantages would the bank find in using fibre optic cables, rather than twisted pair cables or wireless transmission?

Background

There are different kinds of networks designed to meet different needs. In this session, you will look at three main types of computer networks and their advantages and disadvantages.

Internet Service Providers (ISPs) and setting up a home network

Both home and business users require computer hardware, browser software, local wiring infrastructure and an Internet Service Provider (**ISP**) to connect to the internet. Users will have their own hardware computer systems and browser software, and the availability of either traditional copper wires or fibre optic cabling will depend on their location. An ISP will provide a modem or router to allow users to connect their hardware to the internet through the available wires. The modem or router will connect to the ISP's own servers and, for a monthly or annual fee, users can access the internet through them.

Providing internet access to multiple home devices and allowing them to connect to one another also requires creating a small network. One of the most common ways is using a wireless router – an easy way to share information if all devices have wireless technology. Alternatively a small LAN (see below) can be set up. Most operating systems will automatically create a small home network; linking all devices to a network name and using a common **wireless key** between them.

Internet browser and email software

Browser software converts the data from the ISP and allows users to read and view online information in a form not unlike a presentation or desktop publishing document. Email software sends messages using the internet directly from one email address to another, displaying the message in plain text to the user.

Local Area Networks

Local Area Networks (LANs) consist of computers and peripheral devices such as printers, all connected. It is 'local' because it is spread over a small area. You might find a LAN in a workplace or a school. Each computer in a LAN can work as a stand-alone computer, with its own software, and can also use software stored on the network server. The server runs the network operating system and manages resources over the network. Computers on a LAN are known as clients and are usually connected to the server by cables.

Types of LANs

There are two main types of local area networks: the client-server network and the peer-to-peer network.

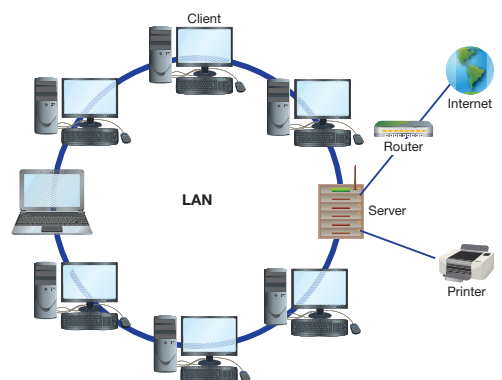
A client-server network needs a server that is linked to a number of computers. The server will be more powerful than the clients, with a faster processor, more RAM and more data storage. Large LANs could have more than one server to provide a more specific service to the clients on the network. There are three very common types.

- File server: this stores all data files created and used by the organisation. Users access all files by sending commands to the file server.
- Database server: provides multiple user and computer access to a large, singular database server.
- Print server: on larger networks, a print server will manage all jobs sent to a network printer. This allows the computers on the network to work more efficiently.

In a peer-to-peer network, every computer can communicate directly with other computers on the network. Access speeds can fall dramatically if the network has more than 10 clients. They are more common in small businesses and within departments in large organisations.

Tip

The diagram of a LAN below is a ring network. Refer to page 156 for information on network topologies.



Activity 1

Read the following statements and identify whether they are true or false descriptions of LANs:

- 1 LANs are made up of computers and peripherals that are connected.
- 2 Computers in a LAN can only communicate with the file server.
- 3 A client in a LAN cannot be connected to its own printer.
- 4 Servers are usually more powerful than the client computers in the LAN.
- 5 File servers store all the data files created and used on the LAN.

Advantages and disadvantages of LANs compared with stand-alone computers

Advantages	Disadvantages
Users can: <ul style="list-style-type: none"> ● access their own files from any computer ● share files and software ● work together on the same document ● communicate with each other by email or instant messaging. 	The cost of setting up a LAN is much higher than just buying stand-alone computers, due to the cost of the server and its maintenance. The extra cabling can be expensive. It is also likely that attached peripherals will be larger and therefore more expensive.
It is often cheaper to buy a software licence for a number of machines than to buy software for each computer.	Viruses can spread more easily from one computer to another than using stand-alone computers.
Access rights can be controlled centrally. A user could log on to a personalised screen and have access to certain files but not to others.	Changes may be made to a document, but another user may end up working on an earlier version of the document, causing problems.
Users can share hardware devices. Larger, faster and more economical printers can be attached to the network rather than having smaller printers attached to each client. This also makes it easier for the organisation to monitor what and how much is being printed.	Passwords may not be secure, which could mean that restricted files are made available to users who are not supposed to have access to them. This could lead to data security problems across the whole network. If it happened on a stand-alone computer, only the data on that computer would be affected.
Computers can be maintained remotely. A technician will be able to log on to the server or to another client and reinstall software or reset passwords.	If the server breaks down, the whole network will stop working.

Activity 2

Look at the following statements. Which of them are advantages of a LAN and which are disadvantages?

- a Data and software can be shared among many users.
- b Viruses brought into one computer can be shared quickly across the network.
- c Users can share printers and other peripherals.
- d Software licences can be less expensive.
- e Data can be corrupted because files are shared among multiple users.

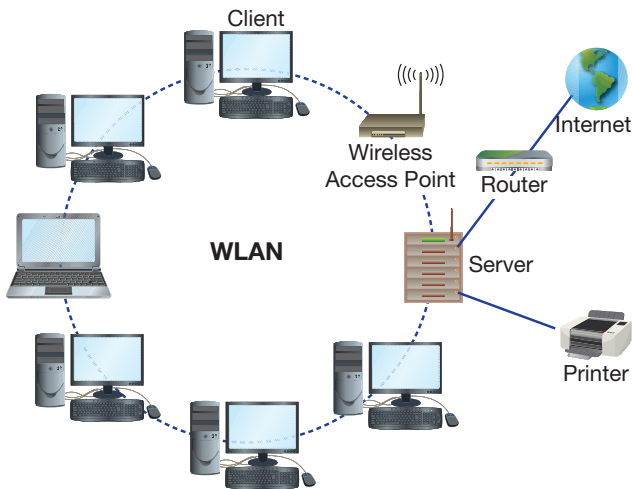
Real world

In your school, teachers will have access to data files to which students will not have access. Students are likely to have their own work area that other students should not be able to access. All of these files will be accessible through a LAN with usernames and passwords, set by the administrator of the system, allowing teachers and student access to areas that are only relevant to them.

Wireless Local Area Networks (WLANs)

WLANs are different from LANs because they use a wireless link to connect computers to the network rather than connecting them by cable. There are five types of components that may be needed to make the wireless connection possible:

- **wireless access points**
- **wireless repeaters**
- **Network Interface Cards (NIC)**
- **routers**
- **boosters (amplifiers).**

**Tip**

Routers are not essential for a WLAN. They are only needed if you want to connect a WLAN to the internet.

Wireless access points broadcast and receive signals from the NICs on the network. Routers allow several computers to access the internet through a wireless access point at the same time. This means that WLANs can be used in areas where a cabled system would not be practical, such as large warehouses and hotels. In schools there may be a need for several wireless access points, so that when you walk around with a laptop it will lock on to the most powerful signal. Although communications can be maintained over a distance of 100 metres or more, boosters are useful so that signals can be amplified. This means that a user will be able to work further away from an access point and will still be able to use the network. Wireless repeaters duplicate an access point with the same IP in a different location, increasing range.

Advantages and disadvantages of WLANs

Advantages	Disadvantages
Access to a WLAN is more flexible than access to a LAN. Users can work anywhere inside or even outside the building, as long as they are within range of a wireless access point.	WLANs are relatively slow. Other users, and sometimes other devices, could interfere with the network.
Because wireless access points are also installed in public areas – like libraries, cafes, hotels, trains – it means that people can still access the internet and email from anywhere.	Anyone with a compatible NIC could gain access to the WLAN. Network managers should ensure that access to the WLAN is not possible without the correct password.
	The distance across which computers can connect to the server is usually less than in a cabled network.

Activity 3

Sort the following list into three categories: WLANs, LANs and both WLAN and LAN.

- | | |
|---|---|
| a Users can work anywhere inside or even outside the building. | d Users can share hardware devices. |
| b Cabling can be expensive. | e People can access the internet and their company emails from anywhere. |
| c Access rights can be controlled centrally. | f You need a network interface card. |

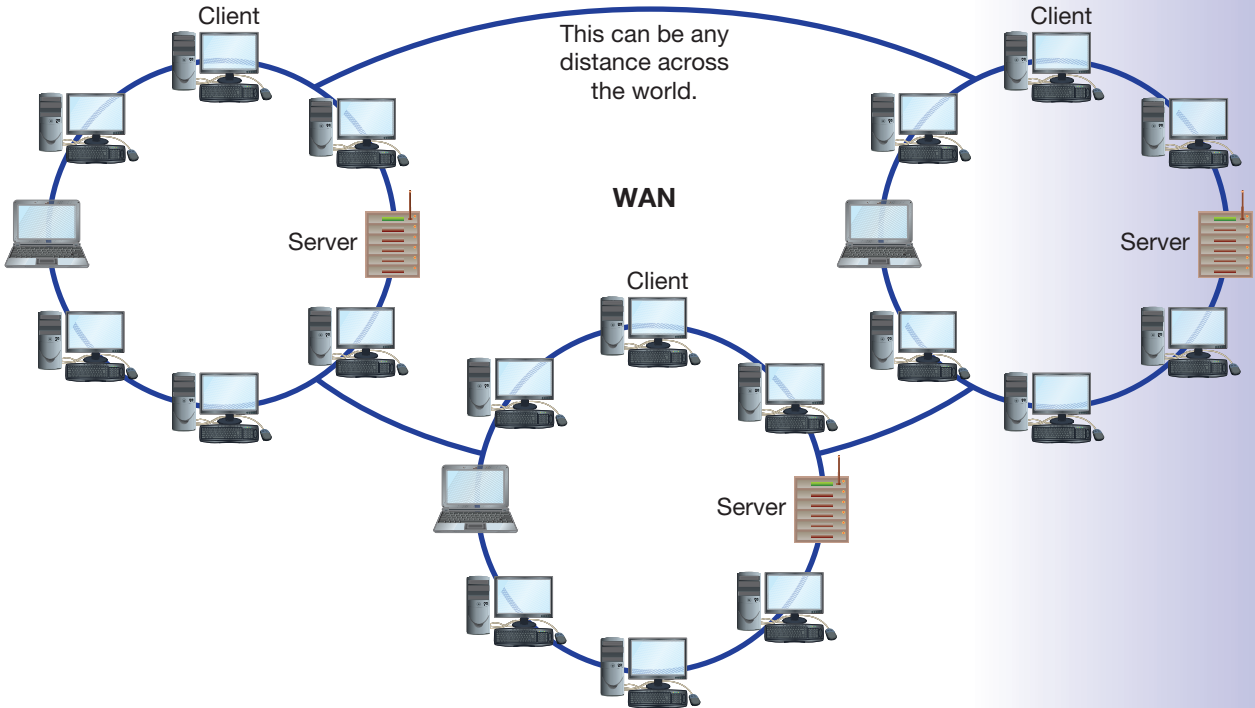
Wide Area Networks (WANs)

A wide area network, or WAN, connects local area networks to each other over a large geographical area. Each LAN connects to the WAN by means of a router or a broadband modem. The WAN could cover an area as small as a local district, or as large as a whole country, or even internationally. The internet itself is a WAN.

There are a number of different ways in which data can be transmitted across such a network, depending on the distance between one network and another:

- high-speed telephone lines
- fibre optic cables
- microwave links
- satellite links.

WANs are more likely to be used by large organisations that have branches in different countries and need to use all of these methods of transmitting data. Many WANs are developed specifically for large organisations. Others, like those set up by Internet Service Providers (ISPs), connect individuals to the internet. When you use the internet from home, you connect to a WAN managed by your ISP.



Advantages and disadvantages of WANs

Advantages	Disadvantages
Multinational organisations can share important data quickly.	If the telecommunication links fail, then communication across a WAN would not be possible. It would, however, be possible for LANs to operate in their home countries.
Transfer of data from one branch of an organisation to another is faster than by other methods.	Viruses are more commonly transmitted through a WAN than a LAN, and hackers are more likely to attack servers by accessing a WAN rather than a LAN.

Review and revise

You should now be able to:

- define the terms LAN, WLAN and WAN and the differences between them
- describe the characteristics of common network environments
- describe the advantages and disadvantages of different types of networks.

Activity 4

A bank has offices in Beijing, Hong Kong, Taipei, Islamabad, London, Washington and Dubai. Each office has its own LAN. Draw a diagram to show how each LAN is connected in a WAN. Refer to the diagram above to help you.

Background

The internet is an **international network** of computers that allows users to use email, browse the World Wide Web or to chat either by text or by voice.

Schools, banks and other organisations often restrict access to the internet, but want to provide internet-type resources and experiences to their users. They do this by setting up an intranet, best thought of as an **internal restricted access network**.

The internet

Websites

Internet browsers accessing the World Wide Web allow us to visually access some of the information stored on the Internet through websites. As of 2014 there are well over one billion websites, each containing any number of webpages.

Webpages	Websites
Documents that can be seen on a computer screen. May contain: <ul style="list-style-type: none"> • text • images • sound. • animations • video 	Lots of webpages that are linked together by hyperlinks. Clicking on a hyperlink allows a user to navigate between webpages in the website. They also allow you to move to other websites.

Each webpage has a unique address. This address helps web browsers to find them. The address is known as the **Uniform Resource Locator** or **URL**. This is how a URL is made up:

<http://www.harpercollins.co.uk/about-harpercollins/Pages/about-us.aspx>

Protocol	Host name	Domain name			File path	Filename
		Second level domain (SLD)	Sub domain	Top level domain (TLD)		
http://	www	.harpercollins	.co	.uk/	about-harpercollins/Pages/	About-us.aspx

Activity 1

Look at the following web addresses. Break them down into their component parts.

The first one is done for you.

- <http://images.example.com>
- <http://www.examples.gov.za/example/page1>
- <http://examples.mycompany.org.in/example/page5>

Protocol	Host name	Domain name			File path	Filename
		Second level domain (SLD)	Sub domain	Top level domain (TLD)		
http://	images	.example		.com		

Language

The World Wide Web is also referred to as **www**, or the **web**.

Tip

It is important that you know that the World Wide Web is part of the internet. You access the web by using a web browser like Mozilla Firefox, Google Chrome or Microsoft Internet Explorer.

Real world

You can recognise hyperlinks easily. Hyperlinks are normally shown in [blue underlined text](#) and can link to a webpage, image or any other computer file. When the mouse pointer hovers over them, it will either change to a small hand or a box will appear providing a URL to Ctrl-click and follow.

Accessing the internet

Users access the internet through an Internet Service Provider (ISP). There is usually a fee for this service. Users are allocated login details when they sign up to an ISP, including a username and a password.

Each time a user logs in, the ISP can monitor how they are using the service. In many countries, ISPs are required to keep records of the webpages, websites and emails that users access and create.

There are three main methods of connecting to the internet:

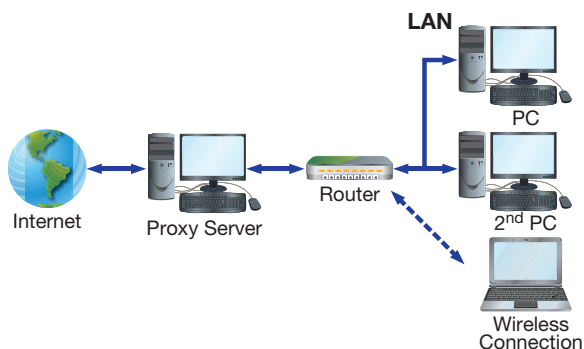
Method of internet access	Equipment required	Advantages	Disadvantages
Dial-up	Dial-up modem	Usually very cheap. Requires access to a telephone line.	Slowest connection – 56 kbps. Telephone line tied up while the modem is in use.
Cable	Cable modem	Very fast, stable connection. Access through network owned by cable television company – this means that the user benefits from other services, such as rapid access to movie and music downloads.	Often only available in cities and towns.
Broadband (Digital Subscriber Line – DSL)	ADSL modem	Fast connection. Always on – does not tie up the telephone line. Fast access means that users can benefit from movie and music downloads.	Heavy users can find download and upload limits to be too restrictive.

The internet and networks

Networks often have many users. In order for multiple users on a network to access the same internet connection, a **proxy server** is used. A proxy server acts as a gateway between network users and the internet by submitting all the internet requests for those users and then returning to them the results of their requests and the information received. You can see in the diagram below that users access the internet through the proxy server.

The proxy server:

- submits just one request for all the users to the router
- can also store copies of webpages for easy access
- restricts access to some users
- checks the source or destination of a data packet and allows or refuses access.



Access to the internet is often managed by a **firewall** to protect users from hackers. A firewall is software that prevents unauthorised communication to or from the network, usually placed between the internal network and an external network, like the internet. A firewall restricts access by identified computers by noting and blocking specific **IP addresses** or blocking certain types of internet traffic.

Language

Proxy means 'stands in for' – so a proxy server stands in for all the users.

Real world

In some organisations, like schools, there are restrictions on the webpages students are allowed to see.

Intranets

Large organisations with lots of electronic material, that needs to be accessed by staff, often use an intranet. In the same way as the internet, an intranet allows users to access web-based material, share files and send email but all communication and data transfer is confined to the local network. Data can be shared also using a WAN if required (see page 161) but data cannot be allowed to freely travel online onto the internet as it may be confidential.

Activity 2

Many schools have an intranet. Describe what a school intranet can be used for by teachers and students.

Advantages of intranets	Disadvantages of intranets
Data is relevant to the user.	Limited resources when compared with the internet.
Data has been checked and validated by the organisation.	Limited range of views offered.
Smaller size makes communication and searching for information faster. The structure will also be relevant to the organisation, so it will be easier for users to understand.	There is limited access to/by customers and other organisations.
Intranets ensure that all the material is more likely to be safe and appropriate.	Expensive to set up and maintain: technicians need to be trained to manage the intranet and staff need to be trained to upload material.

Internet or intranet?

Internet	Intranet
The internet is an international network.	Intranets are internal to companies or organisations.
The internet provides open access to many areas of interest.	Intranets provide information that is relevant to the company or organisation.
The internet is open to all users with an ISP user account. It can be accessed from anywhere.	Intranets can block access to the internet altogether, or provide limited access. This makes it much more difficult for hackers to access the data stored on the file server. Data is stored locally on an intranet, which makes it more secure.
The internet is difficult to make secure because of its size and because there are so many access points.	Intranets can usually be accessed only by password. Access points are strictly limited.

Review and revise

You should now be able to:

- define the terms 'internet', 'intranet' and 'web browser'
- describe proxy servers
- recognise and explain the structure of a web address or URL
- explain the difference between the internet and an intranet
- describe how organisations make use of the internet
- explain why organisations use intranets.

Background

In this session you will look at how networks are used in finance departments, school management systems and booking systems.

Networks in finance

Finance departments in organisations process a wide range of inputs and outputs. They:

- handle payments for materials that have been ordered
- send invoices to customers who have bought goods or services
- order new materials when stock gets low
- pay the company's employees
- deposit the money coming into the bank
- calculate how well the company is doing.

The finance department in Ace Enterprises has five areas of work:

1 Payments **2** Invoicing **3** Orders **4** Payroll **5** Banking.

The finance department also has its own LAN linked to other LANs in Ace Enterprises.

For payroll and invoicing, the finance department uses batch processing.

Payroll

Ace Enterprises pays its employees on the last day of each month. This means that they can prepare their job queue in advance and process the job overnight, so employees are paid on time. Therefore, batch processing has a number of advantages for a business:

- Processing can all be done at one time when there are fewer demands on the network.
- Jobs are completed before processing, so no further input is needed.

The payroll system calculates wages, prints wage slips and sends data to the Banking area so that wages can be paid directly into the employees' bank accounts.

Inputs	Processes	Outputs
Employee details: <ul style="list-style-type: none"> ● rate of pay ● tax details ● bank account details ● name and address. 	Calculation of gross pay	Printed pay slips
Data from timesheets that record: <ul style="list-style-type: none"> ● number of hours worked ● overtime worked ● holidays taken ● bonus payments. 	Deductions (such as tax and insurance) Calculation of net (or take-home) pay	Updating of employee details file Transfer data file to Banking

Language

Wage slips (or pay slips) are paper documents included with wages that record how much money has been earned and how much has been deducted (usually once every month).

Language

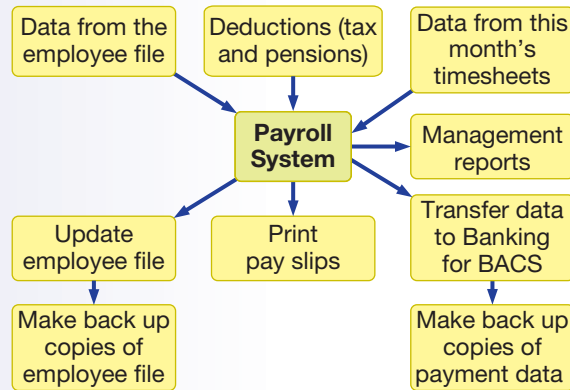
Gross pay is what is earned before tax is deducted. Net pay is what is earned after tax is deducted.

Activity 1

Using the diagram shown, decide whether each of the following Payroll System LANs:

- gets data from another LAN
- sends data to another LAN.

- 1 Employee Personal Files
- 2 Tax and Pensions
- 3 Payslip Printing
- 4 Timesheets
- 5 Management Reports
- 6 Banking (BACS)

**School management systems**

Excelsior Academy has a LAN that provides online processing for teaching and learning. Printing is handled by a printer server. All classrooms are attached to the teaching and learning network, to which students and teachers have access. Teachers keep their teaching and learning materials there. Students can access these and have space to save their own work.

Administration and management systems are managed using a separate LAN. Teachers log on to the file server for the School Management System (SMS). Students are not permitted to access this system.

The Excelsior Academy's SMS has seven modules:

- 1 School library
- 2 Human resources
- 3 Site management
- 4 Finance
- 5 Assessment, student progress, data registration and attendance
- 6 Admissions
- 7 Administration and reporting to parents.

Teachers can access class registers to record attendance at the beginning of each day, as well as attendance at each lesson. Teachers can also enter assessment data from classwork and examinations. The head teacher can access the data that teachers have entered to see how well the school and its students are doing.

Activity 2

Why do you think students are not usually permitted to access the school management system and what measures should be put in place to control access?

Booking systems

Many theatre and cinema booking systems use online processing to allow users to communicate with a central computer system, which stores data about all the seats that are available for shows, events or films. A cinema booking system uses online processing and is likely to have a WAN.

Customers log on to the cinema booking website and follow these steps:

Customer	Cinema booking system
Chooses cinema they want to visit	Cinemas appear as a drop-down list to make selection easier.
Selects the date they want to visit	Finds opening and titles of films available on that date.
Chooses the film	Film titles appear as a drop-down list to make selection easier.
Chooses the time of the screening	Database is searched to see if there are seats available.
Decides where they want to sit	Seat choice offered. Seats are temporarily reserved until customer pays, which means that no one else can choose those seats. If the customer decides not to book them, the seats become available again.
Enters personal details to confirm the booking	Checks to see whether or not the customer is a returning customer or a new customer. For a returning customer their details will be used for the booking. New customers will have to enter their details.
Selects payment method and makes the payment	Checks the payment card details and authorises payment details with customer's bank.
	Seats confirmed as booked – now no one else can book them.
	Details of booking are shown on-screen. Customer is given a reference number.
Prints email as proof of purchase	An email is sent to the customer as a record of the transaction.
Goes to the cinema and uses payment card to collect the tickets.	Checks details of payment card against transactions. If there is a match and tickets are not yet printed, then the tickets will be printed. If there is no match, the customer would need to see someone at the cinema with their proof of purchase or reference number.

Booking system advantages:

- Individual seats and showings can be booked.
- Payment can be made online.
- You don't have to visit the cinema or theatre to book.
- Returning customers can have their details and preferences saved.
- Knowing advanced numbers means cinemas and theatres can plan ahead.

Booking system disadvantages:

- Events and showings can become booked up more easily and faster.
- Not having internet access can mean you miss out.
- Some people prefer to book in person.
- An internet or system failure during booking can result in duplicate, cancelled or doubled bookings.

Review and revise

You should now be able to:

- describe the advantages and disadvantages of booking systems.

Tip

Booking systems are also used for transport and accommodation. Booking flights, trains or buses is more complicated because the customer has to make various choices.

Activity 3

- 1 What is the advantage of the cinema having a WAN?
- 2 Mr Lewis wants to book a room in the Excellent Hotel in Hong Kong for two nights. He wants a double, non-smoking room, with a harbour view. There will be two people in the room. He wants breakfast in the morning. Use the cinema booking system as an example and describe the booking process.

Background

In this session, you will look in more detail at networks in banking, medicine, weather forecasting, libraries and expert systems.

Banking

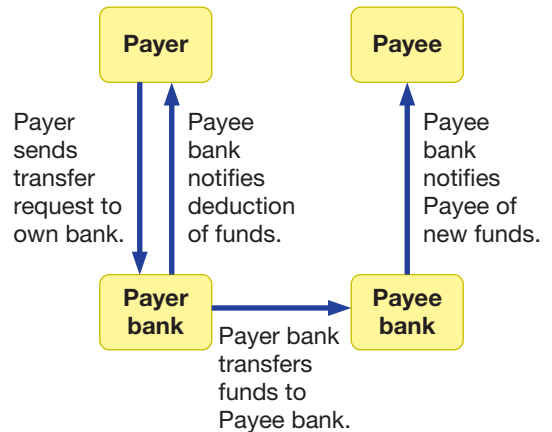
ICT is an important feature of the banking industry. Banks receive and send money by **electronic funds transfer** (EFT). When an employee receives his or her salary, or when you make a payment at a supermarket checkout, funds are moved from one account to another.

As banks have branches throughout a country, and may have international branches, they will have a WAN that utilises real-time processing.

A bank branch will have its own LAN, where ATMs (automated teller machines – see Sessions 2.1 and 3.3), terminals at each counter and office computers will all connect with the fileserver.

Each LAN will connect to the WAN, so that people can get access to banking from ATMs wherever they are.

Electronic funds transfer



Customer	Network operation
Inserts card into ATM.	Details read from magnetic stripe or embedded chip; contact is made with WAN fileserver; customer offered choice of language if appropriate.
Enters PIN by using the keypad.	Card checked; is it valid (does the card number exist, has it been stolen or is the expiry date passed?) PIN checked; is it correct?
Chooses from these options: <ul style="list-style-type: none"> ● Get money ● Change PIN ● Mobile phone services ● See balance. Decides to withdraw money, with or without a receipt.	System offers choice of cash amounts. There may be a message about the cash available 'Only multiples of £20 ...'.
Selects an amount or types in their own choice.	Customer account file is accessed; is there enough money in the account? Are they asking for more than their daily limit? If there is not enough money in the account, or the customer is going beyond their daily limit, other options will be given 'You have £50 available ...'.
Takes back the card.	Transaction completes (money is dispensed or denied); customer account is updated.
Takes money (and receipt if requested).	Receipt is printed if requested.

Banks also have their own intranets (distributed across their WAN) so that staff can communicate with one another and so that products and services can be explained and demonstrated to customers when they visit the branch.

Advantages of banking systems	Disadvantages of banking systems
Money can be accessed from anywhere in the world where there are ATM machines.	Banks aren't familiar with local customers, increasing the chance of fraud.
Balances and transactions can be done remotely using the internet and mobile phones.	Fraud can be carried out electronically from anywhere.

(continued)

Advantages of banking systems	Disadvantages of banking systems
Money can be moved between accounts quickly.	Those without access or computer systems can miss out on facilities and special offers.
Payroll dates can be set to benefit the employer and employee.	High street branches are often no longer required, affecting local communities.
Accounts can be monitored to look for suspicious activity.	Computer problems and power 'black-outs' prevent customer access.

Medicine

Dr Hallan works at a medical centre with four other doctors. They have a receptionist, who deals with entering details of each patient's appointment into the computer, and a pharmacy where patients can pick up their medicines. When seeing a patient, the doctors use their computers to access the file server and download the patient's file. Afterwards, they make changes to the file and save it again.

If medicines are prescribed, the doctors send an order to the pharmacist, who checks the stock on the computer and gets the order ready. If another appointment is needed, the doctor lets the receptionist know. The network allows the doctors access to a hospital network so that patients can be referred to specialists for hospital treatment if necessary.

Activity 1

What kind of network and processing would you recommend for Dr Hallan's surgery? How would they connect with the hospital network?

Weather forecasting

In order to record and predict weather patterns, weather stations are placed across the world. Each weather station uses sensors and measuring equipment to record atmospheric measurements including: temperature, air pressure, humidity, wind speed, direction and rain fall. Live, or regularly recorded, analogue data (See Session 2.1) is converted to digital information and then collated by national weather organisations. Each station will have its own small network but also connected to a much larger central network that in turn allows external networks to connect and analyse the data produced.

Libraries

A computer network in a library will have one file server that contains a data file of the books and one that has details of library members. If a library does not have a copy of a particular book, other library networks can be contacted and the book can be ordered from them.

Libraries often use barcode readers and online processing to access data from the book data file and the details of library members. When a library member wants to borrow a book, they hand over the book and their membership card. Books and membership cards often have barcodes printed on them. These identify the book and the member.

There are other ways of accessing information electronically:

- magnetic stripes (often seen on bank cards)
- chips (also often seen on bank and SIM cards)
- **thumb or fingerprints** (to identify people).

Activity 2

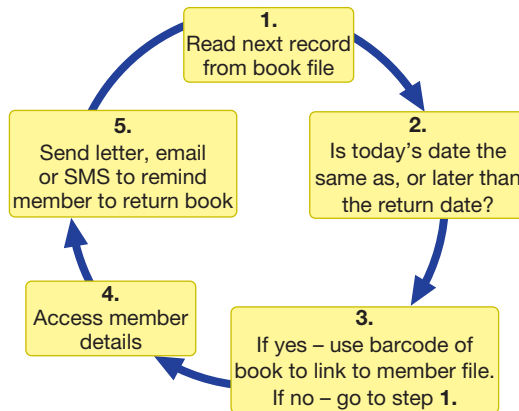
Describe the type of network an international weather system would require and what are the advantages and disadvantages of allowing external networks to connect to the central processing network rather than individual weather stations?

Activity 3

Explain why a library would have a WAN rather than a LAN.

Input	Process	Output
Membership card scanned	The member's file is accessed: <ul style="list-style-type: none"> ● Is their membership up-to-date? ● Is the member able to borrow any more books? ● Are there any books that need to be returned? 	Message output to the librarian's screen.
Book scanned	Book details checked in the book data file.	Member file and book file are both updated. The book is flagged as borrowed; the date of return is recorded in both files.

The library network will also access the member's file to check if any books are overdue for return. At regular intervals the library will run a batch process to find which books are overdue and to remind the member who has the book to return it. The network will access the member's details if a reminder is needed.

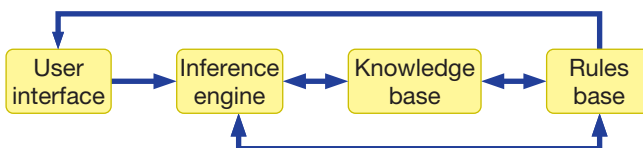


Advantages of library systems	Disadvantages of library systems
Books can be renewed electronically without visiting the library.	People can miss out on books if they are renewed remotely.
Members don't have to remember how many books they have borrowed.	Fewer books are stored on the shelf for traditional browsing.
Renewal reminders can be sent electronically via email or text.	People fear that libraries may become like film rental businesses.
The use of thumbprints means membership cards don't have to be carried.	
Books can be borrowed from other libraries.	

Expert systems

Expert systems collect knowledge from experts and make it available for others working in a particular field. People in the same field ask questions (doctors might be asked 'how do you treat a particular illness successfully?'), the answers are put into the expert system (knowledge base) to be used by others (doctors, for example). Expert systems use the combined knowledge of many experts rather than relying on one individual. In order to work the system has to be carefully designed.

Simple expert systems are made up of at least four different elements:



The **user interface** is an input screen where data is collected, as well as an output format for the expert system.

A **knowledge base** is a database that contains data that is linked together so that ideas can be checked, stored and retrieved.

Inference engines are software that use the rules base to try to get answers from the knowledge base, using a form of reasoning.

The **rules base** is made up of 'inference rules' that the inference engine can use to apply reason and make a decision. For example, IF the country is in the United Kingdom AND its name begins with W, THEN it must be Wales.

Real world

Expert systems are used in medical diagnosis, mineral prospecting, car engine fault diagnosis and game-playing computers.

Tip

A retail store might use an expert system to check the credit rating of a customer and to decide whether or not they can buy goods on credit:

IF the credit rating is good	AND the amount of the sale is less than 10,000	THEN accept the sale	ELSE reject the sale
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Setting up an expert system

Expert systems rely on an accurate and extensive knowledge base. Experts contribute to the knowledge – they help to define what is needed to create a knowledge base.

The experts would define the knowledge base and develop the inference engine, making sure that the questions that people are likely to ask can be answered. They also need to test the system. Expert systems learn from the answers. Each answer adds rules to the rules base and adds new facts to the knowledge base. It is important that the user interface is designed so that users can ask the questions they need.

Advantages of expert systems	Disadvantages of expert systems
Answers are always consistent.	Decisions are based on what the experts have provided - there is no 'common sense' to fall back on if a question is misunderstood.
Questions cannot be ignored. All questions are answered.	Mistakes in the knowledge base can lead to incorrect decisions.
Expert systems reduce the amount of time it takes to solve a problem.	It takes a lot of time and money to set up an expert system.
Expert systems do not need a highly-qualified workforce. A patient can be guided through a medical expert system without a doctor. This could be useful in areas where doctors are not available.	Operators need to have high levels of training in the use of the expert system so that they are able to 'ask the right questions' and guide users to the answers they need.

Activity 4

A car mechanic uses an expert system to check the performance of an automobile. The expert system identifies that the exhaust gases from the engine fail to meet new standards for emissions. The car needs a new part to be fitted. The mechanic uses a computer to get information about the work done on the car and about the part. Information is sent to other departments for action.

Identify which tasks will be done by the mechanic and which will be done by the service department's receptionist or by the finance department.

Task	Mechanic	Service Reception	Finance
Identify other work that has been done on the car – has this been a problem before?			
Check that the part is in stock.			
Find the price of the part.			
Inform Finance how many hours the job will take.			
Calculate the price of the job (parts + (hours × hourly rate)).			
Contact customer to inform them of the required work and how much it will cost them.			
Book the car in for the work.			

Real world

In a medical expert system, doctors are asked to contribute all they know about symptoms and conditions so that effective diagnoses can be made.

Tip

An expert system linked to a computer network would be helpful to a car mechanic, who would be able to access the server for data about the car, and to check with the parts department if replacement parts are needed. The system would also connect with the finance department to work out the bill for servicing the car.

Real world

A doctor would also apply their own experience and expertise when considering the results from the system.

Review and revise

You should now be able to:

- use the terms LAN, WLAN and WAN in a number of contexts
- describe the advantages and disadvantages of:
 - banking systems ■ library systems
 - weather systems ■ expert systems.

Background

In this session, you will learn how ICT and computer networks support and improve business communication.

Methods of electronic communication

Email

The most common method of communication in a business context is email.

All email applications allow users to:

Send	Receive
create messages	open and read messages
choose recipients – either from an address book of regular contacts or by typing the email address in	download, save and read attachments
attach files	identify the sender of the message and save their address in their regular contacts address book
send messages	save and organise their emails in folders.

Tip

Remember that both the receiver and sender of an email need access to email software but that they can use different types of email software.

Setting up an email account

Email addresses come in two parts: the name of the user and the location of the account on the internet. ISPs will offer users an email account and give them an email address, which will look something like this: **mrchangis@home.net**

Username or User ID	@	Location element	Domain type
mrchangis	@	home	.net

Tip

Some email addresses have a country code as well. For example: .uk (United Kingdom) and .sa (Saudi Arabia)

Most businesses will have an email address linked to their website domain name, therefore the location element of the email will show the name of the company. For example, Amir works for a company with the website address of www.csinc.za.com so his work email address is amir@csinc.za.com. His personal email is from a free email service that he can access on the web or from his mobile device and he chose amir201@gmail.com. He was able to fill out an online form to get an account and an email address. He gets access to his mail by entering his email address (or username) and password.

Instant messaging (IM)

One of the problems with email is that the email application has to be open for you to receive a message so you can read it. IM allows two or more people to exchange messages over the internet. Messages are transferred instantly. This type of communication is known as real-time communication and is often built into social networking applications.

Video conferencing

IM and other text-based communication methods have their disadvantages. It is hard to tell how someone is feeling about something, and easy for readers to misinterpret what you are trying to say. Video conferencing allows users to see each other's reactions; it is also more personal.

Real world

If people need to make decisions about a project quickly, IM can be a much more efficient way to communicate with others than sending many individual emails and waiting for responses. The system is very similar to texting on a mobile phone.

At its simplest level, all you need for video conferencing is:

- a webcam
- a microphone
- speakers
- an internet connection using a modem or router
- a video conferencing application.

Many modern computers, laptops and smartphones contain all of these devices.

Businesses are more likely to use specialist video conferencing software that will allow them to communicate with several people at the same time. Despite the initial investment required, time and money is saved as because people do not have to travel long distances to attend meetings.

Language

Video conferencing is sometimes known as electronic conferencing. Audio conferencing can also be termed as Teleconferencing, or Telecon.

Audio conferencing

Telephone calls have always been an essential business communication tool. Audio conferencing allows multiple users to join a single conversation from any telephone, or internet accessible, location in the world. Calls can be arranged using traditional analogue telephone lines but in recent years the use of internet telephony and voice over internet protocol (VOIP) is increasingly popular. Using VOIP systems extends the range of conversations to any location with internet access that is often much cheaper than international land-line calls and multiple-users calls are handled with software rather than expensive fixed-line hardware.

Web conferencing

Web conferencing uses internet technology to allow multiple users from any internet enabled location to meet in a virtual conference room. Users can then share any electronic content with the others in the meeting; from text, images and presentations to live voice or video streams. Web conferencing requires no special equipment as it is usually software based although a microphone and web-cam are required if not part of the computer system being used.

Real world

You may be familiar with Skype. This is a good example of how we can use a video conferencing application to communicate cheaply with friends and business colleagues all over the world.

Facsimile transmission

Facsimile or fax machines scan a document, either printed or handwritten, and transmit it to another machine. The original document is then printed as a copy of the original, leaving the original still in the hands of the sender. There are two methods of sending a facsimile:

Traditional physical faxing: The original document is converted into a single bitmap image. This image is then converted to a tonal signal that is then transmitted along traditional analogue telephone lines directly to another fax machine. Although slow, they require only a telephone landline and therefore useful where internet access is limited. These devices are still used to send important documents or signatures when there is a danger of an email being intercepted and the user requires a direct link to another party.

Electronic faxing: The process of scanning and transmitting any document to another location remains the same, but an internet connected computer, scanners and printer can replace a facsimile machine. This removes the need for a specific device and often the cost of international telephone calls can be high compared to a flat-rate internet connection.

Real world

The audio and visual quality of video conferencing depends on the speed of the internet connection. A fast broadband connection with a large bandwidth will allow for a clear smooth transmission. Attempting video conferencing over a slower connection or using mobile phone networks often results in stuttering sound and video.

Activity 1

1. Make a list of five freely available webmail providers for your region. How are their email addresses structured and how does it compare to an email address from your school?
2. Both email and facsimile machines can send a copy of a document from one location to another. Which one would be the most appropriate in the following situations and why?
 - a. Sending legal documents with a signature.
 - b. Sending engineering drawings from an architect to a customer.
 - c. Sending photos of a new baby to family members.

Activity 2

Make a comparative list of the advantages and disadvantages of the methods below in a business environment.

Method	Advantages	Disadvantages
Email		
Instant messaging		
Video conferencing		
Audio conferencing		
Web conferencing		
Facsimile transmission		

Blogs

Blogs (a shortened version of the term weblog) are personal or business online journals that are frequently updated. Normally free to set up and run, blogs offer a great opportunity to present ideas, articles and links to other websites. All content is presented in chronological order so that the most recent entry is always shown first; meaning readers can quickly see if the site is being updated. A blog without frequent updates will not attract regular readers. Readers can then be allowed to comment on the entries made, creating an interactive service similar to a forum.

Wikis

A wiki is a collaborative website that allow groups of users to build an online database on a specific topic, or range of topics. Any member of the wiki can add and edit content. The popularity of wiki sites depends on how reliable or extensive the information they present is. As with any user-generated content, questions about the validity and reliability of wikis will be asked and unlike a blog, changes or additions to the wiki do not appear in the order they were made, making it difficult to know when content has been changed.

Tweets

Twitter is a popular communication application in which users communicate with one another using messages called tweets that work in much the same way a blog. Posts generally answer the question, 'What are you doing?' and users can either respond to it or post their own message. Tweets can be published using a computer or a mobile phone but limited to 140 characters or less, so users have to choose their words wisely. Twitter users have usernames in Tweets in this format: @johnsmith. Tweets on the same topic can use a hash tag: a key word starting with a hash symbol (#), for example, #igcse. Tweet readers are known as followers or 'tweeps'.

Social networking

Social networking sites offer a way for people to communicate online in a very open and accessible way. Unlike group email, social networking sites allow users to choose to participate or not. With membership in billions, popular social networks include Facebook, QZone, Google+ and more professionally focused sites like LinkedIn.

Each social network focuses on making the experience of social networking relevant and enjoyable for their users. Users sign up to the network and describe themselves, including information such as their age, gender, likes and dislikes. This is called their 'profile'.

Real world

As blog entries can be sent from any internet enabled location or mobile phone they have become very popular with celebrities, journalists and political readers as they can quickly put messages out to younger audiences. They are also used as a more interactive extension of established web sites.

Real world

Current examples of very large and influential wiki sites are Wikipedia (an online encyclopaedia) or Wikileaks (a political information site).

Language

A Tweet is sometimes referred to as a 'micro-blog'.

Real world

Many dating sites are social networking sites that put people with similar interests and backgrounds in touch with each other. In Facebook, making a 'friend' gives you access to other people or groups that you could make friends with.

Businesses find social networking sites useful in other ways: they are a great place for advertising products and services that are likely to appeal to the target group for the social network. Some employers may investigate a job applicant's 'profile' to see if the applicant is 'the sort of person they want to employ'. Embarrassing photographs or inappropriate comments may change someone's opinion of you. Some social networking sites have settings to ensure that certain areas of the site are limited to 'friends' only but it is often up to the user to ensure the right settings are in place. Dangers linked to e-safety are discussed in more detail in Unit 8.

Mobile telephones

Mobile telephones work by linking to a signal from a radio communication mast. For a constant signal, a mobile phone needs to be within 10 kilometres of a mast (or base station), and your mobile phone will constantly search for the strongest signal. When you make a call, the signal is received by the mast, translated ready for transmission over the Public Switched Telephone Network (PSTN) and then sent to the mast nearest the phone whose number you are calling.

Many people working in business have a mobile phone so they can be contacted when they are away from an office. Many mobile phones and smartphones enable users to access the internet and their emails and to use software applications.

Using the internet for phone calls

Calls made on mobile phones or on landlines can be expensive, especially if a business handles a lot of telephone calls or is dealing with customers from other countries. Voice over Internet Protocol (VOIP) uses an internet connection to make the telephone calls through a computer with VOIP software. As most broadband users have a fixed price for their internet connection, this makes the call essentially free, other than the standard internet costs.

Users of VOIP on their computer can either use the built-in microphone and speakers usually found in most modern computers or an external headset with microphone for greater clarity.

There are some disadvantages with VOIP, sound quality can be poor, which is not so much of a problem for personal calls but it can be for important business calls. VOIP also has some potential security issues:

- Identity and service theft; other users could access your details and pretend to be you. They could also make calls that are charged to you.
- As with all internet applications, viruses and malware can cause problems.

Activity 3

Describe the social networking sites that you have used. Explain why you might choose one social networking site over another, highlighting the advantages and disadvantages of the networking sites you choose. What features would you like to see in your ideal social networking site?

Real world

Call centres sometimes use VOIP. Many call centres consist of a very large room where operators deal with phone calls. Some use operators who work from home. The calls are received from anywhere in the world to the main call centre and are redirected through VOIP to the operators working from any office or even home. This reduces the cost of the telephone service, so that companies using this system save a lot of money.

Activity 4

List three advantages and three disadvantages for businesses using VOIP or internet telephony.

Review and revise

You should now be able to:

- identify a variety of methods of communication using ICT, including: fax; the internet; email; electronic conferencing; mobile phones; internet telephony services; blogs; wikis and social networking websites
- explain some of the advantages that companies can get from using a variety of communication techniques.

Background

In this session, you are going to review network security and the confidentiality and security of data. More information specifically focussed on personal security and online systems can be found in Unit 8 on page XX.

Securing the network

Within any large organisation, and even your own school, different people have different access rights to certain information depending on their position within it. You may, for example, have access to your own area of the school network but you shouldn't be able to access a friend's area or records of student test results. The person that manages the computer network at school, setting access rights for different users, is often referred to as the **network administrator** and this is the same for any large network.

User IDs

A user ID, or username, is a short collection of letters or numbers. It should be easily remembered by the user and is sometimes based around their real name. The network administrator, who allocates each user a network user ID (or username), manages access to areas of the network. Each time a user logs in, the network system software begins by checking that the ID exists – if it does, then it will check to see what hardware and software the user can use and what files and resources are available to the user.

Activity 1

Look at your school user ID. Talk about it with a partner. Are your IDs similar? If they are, what rules do you think the network administrator put in place to create them?

Passwords

Most computer systems will not allow you to log on with only a user ID, as this is not very secure. To increase security, users are asked to create a password that has to be entered when prompted. Very often, as you type in a password, it will be hidden from view, often replaced by a display of symbols such as *****.

Accounts have passwords, linked directly to user IDs, so that only certain users can access messages or files. Passwords protect your data and are an essential part of any network or online account access, such as email. There are rules about password security: the more complex the password is, the less likely it will be that someone will guess it. Without a password you may not be able to get access to your data or the computer system.

- A password such as a pet's name or part of your home address is weak and not secure.
- A password such as 3Xjpl957R would be harder to remember but much more secure, or strong.

Real world

Operating systems, computer networks and online accounts will often ask you to change your password. Regularly changing a password is a good practice as it prevents it being guessed or calculated by those wishing to unlawfully access your data.

Activity 2

Passwords are so important as networks with multiple users often have private and confidential data.

- Why is it never a good idea to write down your password?
- What helps to make a password secure?
- Give examples of secure and insecure (strong and weak) passwords (make sure they are not ones you currently use).

Keeping your data confidential

Think about a supermarket's loyalty cards. These are cards that allow the supermarket to keep a record of what a customer buys while shoppers benefit from discounts and special offers. You might think that because your user ID and password protect your data, it is secure and confidential but this is not always the case. The loyalty card account will have details of the holder's name, age, address, gender, shopping habits and other personal data and are often used at the same time as payment cards. You should expect that the two sets of data are confidential and that a link between them could not be made. There are rules to prevent this but there are examples of organisations passing on or even selling personal data. A customer gives personal details to companies on condition that their data is held securely and is not used carelessly or shared between a company's employees who have access to the confidential data.

One of the ways in which user ID and passwords are unlawfully acquired is through **spyware**. Spyware is a computer program, usually attached as a zip file for an email or disguised alternative file installed without the knowledge of the user, that logs, records and transmits records of the activities of the user and the personal data their computers hold to an external location. Anti-spyware continuously scans a computer system for such programs, notifies the user and tries to remove it.

Data protection acts

Governments have had to act to ensure the increasing amount of data kept on networks is correctly handled. This has led to data protection acts being created all over the world and the majority follow the same principles. The examples below are typical statements:

- data should only be used for the purpose it was originally taken
- data must be kept up-to-date and accurate
- data must not be held for longer than is necessary
- data must be protected from unauthorised access, processing or damage
- data must not be transferred to any country that does not offer the same level of data protection.

Activity 2

1. You have just bought a new smartphone from a store where you have a loyalty card. What problems might occur if the store does not keep your personal details secure?
2. Banks and finance departments are supposed to keep financial transactions confidential. What might happen if this was not the case?
3. Investigate the data protection act in the country you live, how does it compare to the example given?

You can protect your access to the internet, to your email account and to your network by having a user ID and a password. You can also protect files on your computer. For example, you might want to protect a document you are typing for homework by adding a password. This gives you an extra level of security, as anyone wanting to get into your document would first have to log on as you and then enter the password for your document.

Encrypting data

In many organisations, data is **encrypted** to protect it further. Banks and government departments, for example, insist that data is encrypted so that if an unauthorised user gets access to the data, they are unable to read it.

Encryption converts data into a code by scrambling it using an encryption key and these are then transmitted separately. Unless you have the software to

Real world

Spyware, or a computer virus, can place itself onto your computer in a variety of ways:

- you may receive an email which claims to be from a friend, but unfortunately is not, that asks you to download an attachment or follow a link to a website.
- sharing portable storage, downloading files from the internet or using USB pen drives is an easy way for infected files to be passed on.

Real world

Look at the requirements that a government department has set out for its workers:

- Laptops must use a system where data can be encrypted.
- If you are using your own ICT equipment, you must keep departmental data completely separate from your own data.
- Only government supplied pen drives can be used for transferring data and must be encrypted to a certain standard.
- All paper data must be kept locked away while in your possession.
- All paper data must be shredded when no longer required.

Real world

When you pay for goods using a payment card, access to your account is limited to only those that know your Personal Identification Number (PIN). Hopefully that just means you!

Language

Encryption puts the data into code. Decryption decodes the code back into readable data.

'unscramble' or decode the data with the corresponding key, it will be meaningless. The software used to unscramble encrypted data is called decryption software.

Activity 4

Identify three advantages and three disadvantages of encryption.

Authentication techniques

Having user IDs in combination with passwords is an example of an authentication technique. Authentication techniques are used to identify users to a computer-based system or network. Each technique provides a range of methods for proving your identity, and the higher the security requirement; the more techniques may be used. There are three factors that can be used in authentication:

	Factor	Example
1	Something that you know	<ul style="list-style-type: none"> • a Personal Identification Number (PIN) • username ID • a password or phrase • a challenge response (you must provide the correct answer to a particular question).
2	Something that belongs to you	<p>These items are normally provided by the organisation providing secure access:</p> <ul style="list-style-type: none"> • a passport, bank or membership card containing a data chip • a security wrist band • a special token or key • a mobile phone • an electronic code generator.
3	Something unique about you	<p>This may be biometric data from the following unique features:</p> <ul style="list-style-type: none"> • fingerprints • voice print • iris or retina scan • facial scan. <p>Other sources such as your own DNA can be used but such a test would be time consuming and expensive.</p>

Real world

Many schools have introduced payment systems that do not need cash when something is bought. Students pay money into the system and from then on can pay for lunch or other services in school by using something that is unique to them, like a thumbprint or a magnetic stripe card.

Real world

It is possible in some airports to fast-track through passport control by registering to use your biometric data. A scanner scans your iris, verifies that you are who you say you are and allows you to pass through.



Review and revise

You should now be able to:

- explain why it is important to keep data secure and confidential
- describe the processes and practices that businesses employ to ensure that data is held securely and confidentially
- give examples of data security in finance, schools, banking and in the retail industry.

UNIT 4 Theory review

What have you covered?

In these seven theory sessions, you have:

- identified common network devices such as routers, modems, hubs, bridges, switches and proxy servers
- discovered how network communications, including wired, Wi-Fi and Bluetooth devices can be used in business organisations
- been introduced to LAN, WLAN and WAN and the differences between them
- considered the characteristics of common network environments
- compared and evaluated different types of network topologies
- considered how businesses use networks in their everyday operations and the different devices we can use to connect to them
- identified a variety of methods of communication used by businesses
- considered the benefits that companies can get from using a variety of communication techniques
- been introduced to the terms internet, intranet, web browser and ISP, web address and URL
- discovered the difference between the internet and an intranet
- considered how and why organisations make use of the internet and intranets
- considered the importance of keeping data secure and the methods that businesses employ to ensure its security and confidentiality.

Some practice questions

- 1 Connect a term on the left with the most appropriate example on the right:

LAN	A network across a university campus
WAN	A network used to connect offices of a car hire company across the country
WLAN	A network operating within company headquarters

See Session 4.2

- 2 Use the terms in the list to complete the paragraph below, which describes a school network.

client-server	network card	bridge	file server	WLAN
network cable	router			

To connect a computer to a (___), your computer needs a (_____) so that you can plug in the (____). Your school computers will be connected through a (____) to a (____). This kind of network is known as a (____) network. It is possible that although the student

and administration networks might be separate, a (____) will allow data to be passed between the two.

See Session 4.1

- 3 State whether each of these statements is true or false.

	True	False
a The internet can only connect computers within a small geographical area.		
b An intranet will only be accessed by users within a single network.		
c A WLAN requires users to be connected with a fibre optic cable.		
d An email address is needed before a user can access information on the internet.		
e A WAN could be considered as a network of networks.		
f Modems can only connect to the internet via fibre optic cable		

See Session 4.2

- 4 Explain the difference between the internet and an intranet. If your school has an intranet, what does the school use it for and explain how an organisation like a hospital might use one.

See Session 4.6

- 5 In order to keep data secure, an organisation will often use *encryption* methods when transferring data. *Usernames or IDs* and *strong passwords* may also be required in order to make sure that only authorised users have access to data. It is also common for a company to use a network *firewall* in order to further restrict access.

Explain the terms in italics.

See Session 4.7

- 6 Pete is a veterinary surgeon. He also runs a rescue centre where pet parrots, which have been abandoned by their owners, can be taken in and cared for. The rescue centre and animal hospital are built alongside his house. He has an office in his house and another in the rescue centre where his assistant works. All the files about the animals

are held on a data server in the house. Pete wants to create a network so that he can access the data on his laptop as he moves around the buildings. His assistant also needs to be able to access the same data as she monitors the birds in the animal hospital.

- What kind of network does Pete need?
- List the hardware requirements of the system that Pete will need.
- Pete wants access to the internet. Explain why he needs an ISP. He has been offered the choice between ADSL and a cable modem.
- Discuss the advantage and disadvantages of the connection types that Pete has and suggest which would be the better option for him.
- Pete has been given the email address: pete@parrotsanctuary.co.uk
Explain what the different parts of this address represent.

See Sessions 4.2, 4.5 and 4.6

Progress check

Aiming for good progress

- You are able to identify all the hardware components required to create a network.
- You understand the differences between various network types.
- You can describe the different ways in which organisations can communicate and share information.
- You understand the ways in which users can connect to the internet and the hardware and software they need to achieve this.
- You recognise that within the workings of a network, security and confidentiality of data are vital.

Aiming for excellent progress

- You can identify all hardware and components that are necessary to create a network.
- You can describe the differences between the ways in which various networks operate.
- You can identify and evaluate the different ways in which organisations communicate with each other and how they share information.
- You can describe and evaluate the ways in which the internet is made available to users, including the hardware and software required.
- You can explain the necessity for keeping data secure and confidential, and you can offer suggestions about how this can be achieved.

house style requirements. Such systems are very popular for those with little web design skills who would like a professional looking website online in a short space of time, and plan to make regular changes to their site. There is a cost involved for most commercial systems, and users are limited to how much the look of the page can be changed. As the site is already online there is no need for web hosting.

Real world

Many people now use blogs as a simple, user friendly, alternative to web design software to create an online presence. Blogs are usually free to set up, very customisable, and offer many of the advantages of an online CMS.

Activity 1

Search for as many example of web design software, either commercial or open source, and compare the features they offer.

Web design development layers

In order to create an effective website it is important to become familiar with the three web development layers. Considering these layers throughout the design, development and maintenance of a site can save time and repetitive work.

Content layer

Sometimes referred to as the structure layer, this refers to the HTML framework of a page. This will include the visual layout, placement of text and images and hyperlinks used to navigate both within the page and to external pages.

Presentation layer

The presentation layer defines the format of a page through styling elements and how it will appear to the user. This maintains visual consistency across browsers and platforms. The layer is defined through cascading style sheets (css) that can be applied to one or multiple pages.

Behaviour layer

Real time interactive or dynamic content on a site that provides users with something to do is often generated using JavaScript and this is the behaviour layer. This may include image galleries, forms, the setting of multimedia element sizes or adding a live clock, video or music track.

Activity 2

Choose one page from three popular websites and for each, analyse and describe the key elements that make up the content, presentation and behaviour layers.

Review and revise

You should now be able to:

- identify and describe alternative methods of designing websites
- identify and describe the three web development layers
- understand the function of the content, presentation and behaviour layer.

Background

The World Wide Web allows access to millions of websites, with more added every minute of every day. Stored on web servers that are interconnected via the internet, each website is made up of one or more **websites** which are linked together by hyperlinks. Webpages are created using a language called **HTML**, which stands for **Hyper Text Mark-up Language** that instructs a computer to display visual data in a user-friendly format. All webpages were originally written in HTML but web authoring software that combines visual design tools and HTML coding are becoming more popular. These programs store their pages in HTML format, but developers do not necessarily need to know the HTML language to develop effective websites.

Junaid at All Computer Supplies Inc. has asked you to create webpages by following the steps in these sessions.

Beginning to create a webpage using HTML

Use a text editor to create your first page. Open a text editing program such as *Microsoft Notepad* and type in the lines of code shown here:

1 Note the text in angled brackets <>. These are known as **tags**. Tags come in pairs and indicate the start and end of a section.

2 Note the first section after the opening <html> tag is the <head> </head> section. Here you can name the title of the web page as it appears within a web browser using the <title> </title> tag and add linked to attached style sheets. At the moment it is still called 'Untitled Document'.

```

<html>

<head>
<title>Untitled Document</title>
</head>

<body>

<h1>All Computer Supplies</h1>
<p>We can provide all of your computer needs!</p>
<p>Computers</p>
<p>Printers</p>
<p>Monitors</p>
<p>Supplies</p>

</body>
</html>

```

3 Remember that for every beginning there is an end: most tags come in pairs. For example, <p> marks the beginning of a paragraph and </p> marks the end of the paragraph.

4 Note how the file begins with <html> and ends with </html>.

You will also have spotted the <body> </body> tag which indicates the main content, or body, of the page and <h1> </h1> to indicate the heading or title of the page.

Tags

Tags are used to mark up, or describe, a webpage. A web browser such as Internet Explorer or Firefox uses tags to interpret what the page looks like. Webpages use HTML to mark up the page.

HTML elements and nesting

Everything contained in the opening and closing tag is known as the **HTML element**. HTML elements can have other elements contained within them. This is known as **nesting**. In this example the <body> </body> element is nested within the <html> </html> element.

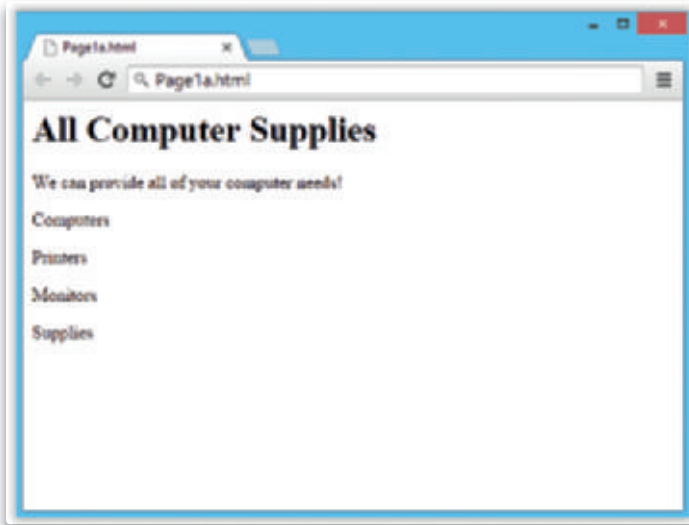
Save the file as **Page1a.txt**, a text document (.txt) in your work area. This will be important if you want to change it later; it is easier to edit a .txt file than an .html file.

Then save the file as **Page1a.html**. Make sure that you save the file in your work area with the .html extension. Now open it in a browser.

You have created your first webpage! Note:

- The use of the file extension (**.html**) is crucial as the browser will not see the file as a webpage without it.
- Sometimes the file extension is shortened to .htm – either is fine!

In the Chrome browser, the webpage that you have created looks like this:



As you can see, the browser does not display the tags but interprets them to show the page:

- The browser knows that it has some HTML to display because it is contained by `<html>` `</html>` elements.
- The main content to show is within `<body>` `</body>`.
- The heading at the top is in big letters as the HTML indicated it is a first level heading: `<h1>` `</h1>`.
- The remaining text is in separate paragraphs, as indicated by `<p>` `</p>`.

Structuring the content

Junaid recognises that this webpage needs a better layout. He decides it would be better if you could list the products he has in his shop. You change the webpage by editing your .txt file.

```
<html>
<head>
<title>All Computer Supplies</title>
</head>
<body>
<h1>All Computer Supplies</h1>
<p>We can provide all of your computer needs!</p>
<ul>
<li>Computers</li>
<li>Printers</li>
<li>Monitors</li>
<li>Supplies</li>
</ul>
</body>
</html>
```

1 By editing the `<title>` tag within the `<head>` section you can change the name that appears at the top of the page within a web browser.

2 Use two new tags `` `` and `` `` to replace the paragraph element. `` is interpreted as an unordered list. `` is a new line

3 You could also try an ordered list, replacing `` `` with `` ``. (See Activity 1)

Tip

You can display the file as a webpage by dragging the file across to the browser icon on your desktop or, if the file is shown with the browser icon, you can doubleclick on it (the .html extension will make your browser open).

Real world

Popular web browsers at the moment include:

Google Chrome
Microsoft Internet Explorer
Mozilla Firefox
Opera
Apple Safari

Activity 1

- 1 Save this as **Page 1b.txt** and then save as **Page1b.html** and view it in a browser. Write down any differences you see between the first webpage you created, and this one. What does an unordered list look like on a webpage?
- 2 Change your HTML coding to replace the unordered list with an ordered list. Save your file as **Page1c.html** so that you can monitor the changes you've made. What's the difference?

Changing the look of a webpage

Junaid and you both realise that this webpage does not look very attractive. You decide to change the appearance of the page.

```
<html>
<head>
<title>All Computer Supplies</title>
</head>
<body>
<h1>All Computer Supplies</h1>
<p>We can provide <b>all</b> of <i>your</i> computer needs!</p>
<ul>
<li>Computers</li>
<li>Printers</li>
<li>Monitors</li>
<li>Supplies</li>
</ul>
</body>
</html>
```

1 You can place new tags around all and your. What do you think these look like on a webpage?

2 There are other tags you could use.

For example, you could try `` and ``.

Other common tags include `<sup>` for superscript and `<sub>` for subscript text.

Activity 2

- Insert the tags `` `` and `<i>` `</i>`. You should find that `` `` makes text appear **bold** and that `<i>` `</i>` makes text appear *italics*.
- Experiment with other tags such as ``, ``, `<sup>` and `<sub>` in your file. Remember that HTML elements have a start and an end. Don't forget to save your file as .txt and .html. Remember also that you will need to save and refresh the view in your browser to see the changes.

Using attributes to change the look of a webpage: Colour

There are other things that you can format on the webpage by using HTML. Junaid asks you to add some colour to the page and then to change some of the formatting.

```
<html>
<head>
<title>All Computer Supplies</title>
</head>
<body>
<h1>All Computer Supplies</h1>
<p>We can provide <strong>all</strong> of <em>your</em> computer needs!</p>
<ul>
<li style="color:red">Computers</li>
<li style="color:green">Printers</li>
<li style="color:blue">Monitors</li>
<li style="color:purple">Supplies</li>
</ul>
</body>
</html>
```

1 Look carefully at how colour is added to the page, using `style` within the tag. `Style` is an attribute of the HTML element.

Note:

- The spelling of color (US spelling)
- The use of quotation marks. Used to define attributes in HTML. These should be at the beginning and end of an attribute, such as a size or a colour.
- The use of spaces. Attributes are separated by spaces or line breaks.

2 There are 17 standard colours, which all browsers can interpret correctly: aqua, black, fuchsia, blue, grey, green, lime, maroon, navy, olive, purple, red, silver, teal, white and yellow.

Activity 3

Try adding other colours to your page. Choose from the list of 17 standard colours. You must be careful to type the code correctly.

Using attributes to change the look of a webpage: Formatting

Junaid suggests you change some of the other formatting to help improve the page.

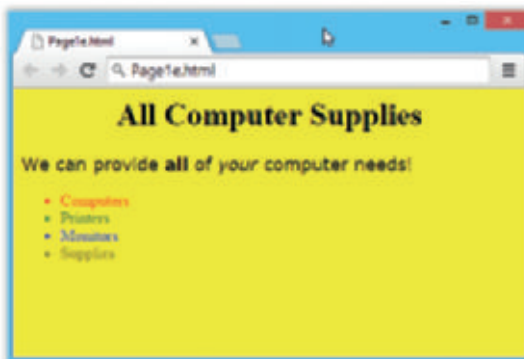
```
<html>
<head>
<title>All Computer Supplies</title>
</head>
<body style=background-color:yellow>
<h1 style="font-family:arial;text-align:center">All Computer Supplies</h1>
<p style=font-family:verdana;font-size:large">We can provide <strong>all</strong> of <em>your</em> computer needs!</p>
<ul>
<li style="color:red">Computers</li>
<li style="color:green">Printers</li>
<li style="color:blue">Monitors</li>
<li style="color:olive">Supplies</li>
</ul>
</body>
</html>
```

Note how there are different values with the style attribute in <body> <h1> and <p>.

The style attribute can have a range of different values and can be added to an HTML tag to define the content with it. The most common ones are:

- font-family, which indicates the font to be used
- font-size, which indicates the size of the font
- text-align, which indicates whether the text is aligned to the left, centre (center) or right
- font-style, which indicates normal or italic font-weight, which indicates bold or normal
- background-color, which indicates the colour of the background
- color, which indicates the colour of the text.

Previewed in Chrome, the page would look like this.



Real world

All web design colours are based on the RGB model, mixing together Red, Green and Blue. Up to 16,777,216 possible colour combinations are available using three pairs of two digit hexadecimal references in the format of #RRGGBB.

Activity 4

- 1 Type the changes into your file. Save and review in a browser. Remember the new filename! Don't forget to add .txt and .html at the end.
- 2 Experiment with different values of the style attribute and see what happens. For example, try and replace the standard named colour references with their hexadecimal equivalents. Remember, you need to save the file and refresh it in the browser to see the results.
- 3 Print the HTML code of your last page and highlight it in different colours on the printout:
 - a the opening and closing body tags
 - b the opening and closing tags of paragraphs
 - c the opening and closing lines of a list
 - d the attribute of the heading <h1>
 - e the value of the attribute for <h1>.
- 4 Answer the following questions:
 - a How does a browser know that a file is a webpage?
 - b How many standard named colours are there and how many hexadecimal references can be used?
 - c How can you tell if an HTML file contains a 'nest'?
 - d What are:
 - i HTML elements?
 - ii attributes?

If you feel confident with your understanding of HTML so far, you can learn more about font-family and font-size in the Extra support folder on the CD.



Adding a table to a webpage

Using tables is a good way to organise information. Junaid would like the three different office locations adding to the page you have made and has suggested using a table. There are no drawing tools when using HTML but the following tags allows you to specify the structure and size of the table.

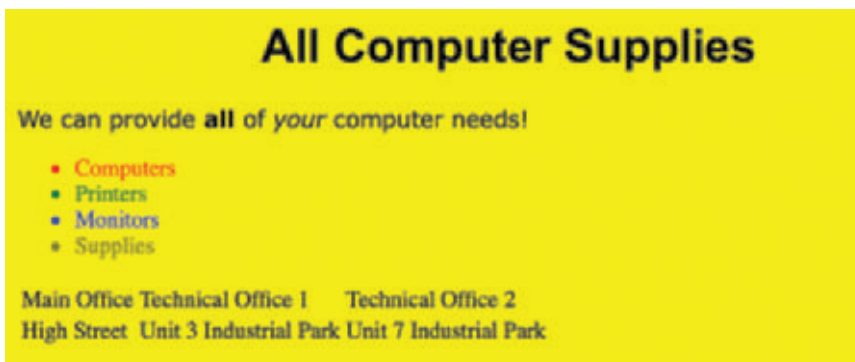
```
<html>
<head>
<title>All Computer Supplies</title>
</head>
<body style=background-color:yellow>
<h1 style="font-family:arial;text-align:center">All Computer Supplies</h1>
<p style=font-family:verdana;font-size:large>We can provide <strong>all</strong> of <em>your</em> computer needs!</p>
<ul>
<li style="color:red">Computers</li>
<li style="color:green">Printers</li>
<li style="color:blue">Monitors</li>
<li style="color:olive">Supplies</li>
</ul>
<table>
<tr>
<td>Main Office</td>
<td>Technical Office 1</td>
<td>Technical Office 2</td>
</tr>
<tr>
<td>High Street</td>
<td>Unit 3 Industrial Park</td>
<td>Unit 7 Industrial Park</td>
</tr>
</table>
</body>
</html>
```

2 The table is defined using the `<table>` `<table/>` tags.

2 Each row is defined by the `<tr>` tag and each cell within the table is defined with the `<td>` tag.

As you can see, this table will have two rows and three columns.

The page will now look like this.



Formatting a table in HTML

Once previewed, it is clear that the blocks of text in the table are quite close together. Using additional attributes, it is possible to adjust widths, add styling and allow a single cell to span more than one column.

```

<html>
<head>
<title>All Computer Supplies</title>
<style>
table, th, td {
border: 1px solid black;
border-collapse: collapse;
text-align: left;
}
</style>
</head>

<body style=background-color:yellow>
<h1 style="font-family:arial;text-align:center">All Computer Supplies</h1>
<p style=font-family:verdana;font-size:large>We can provide <strong>all</strong> of <em>your</em> computer needs!</p>

<ul>
<li style="color:red">Computers</li>
<li style="color:green">Printers</li>
<li style="color:blue">Monitors</li>
<li style="color:olive">Supplies</li>
</ul>

<table style="width:100%">
<tr>
<th>Main Office</th>
<th colspan="2">Technical Support Offices</th>
</tr>
<tr>
<td>High Street</td>
<td>Unit 3 Industrial Park</td>
<td>Unit 7 Industrial Park</td>
</tr>
</table>

</body>
</html>

```

1 Look carefully at how a single black border and left alignment has been added by adding a page style to the page in the <head> section.

2 Note how the width of the table can be defined by adding an in-line style to the <table> tag. This can be set as a percentage or in pixels.

3 By replacing the <tr> tag with <th> it now becomes a table heading.

4 If a heading applies to more than one column then one heading can be made to span multiple cells using the colspan function.

The page will now look like this.



Inserting an image in HTML

Junaid would like his new logo inserting at the top of the page. He has provided you with an image file and has specified it should be no wider than 100 pixels, whilst still maintaining the aspect ratio.

```

</head>

<body style=background-color:yellow>



```

1 Insert the tag before the main heading to add the logo. Note the additional attributes:

- The file name of the image is located in the same location as the webpage, otherwise the file path should also be included.
- The alt attribute provides an alternative text or description for the image, used if a user requires a screen reader.
- The width attribute specifies the width in pixels. The height can also be specified but if only the width is set the image ratio is automatically maintained.

This logo should now appear at the top of the screen.



Review and revise

You should now be able to:

- set up a simple webpage using HTML
- recognise and use tags to change the appearance of a webpage
- recognise and use attributes to change the appearance of a webpage
- understand when HTML commands are nested.

Language

Remember, **color** and **center** use American spelling when used in HTML.

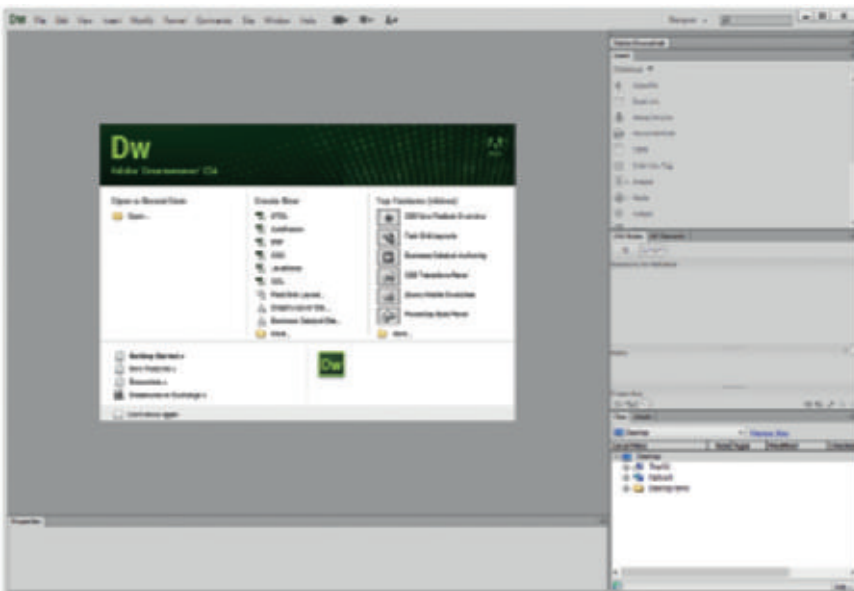
Background

In this section, you are going to use website authoring software (or a web editor) to create and modify webpages. You should find this easier; you do not need to remember so much code and the software itself will make sure that you use the correct spelling, spaces and punctuation. As described in Session 4.8, the features in this section will allow you to create the **content layer** of the web design development process.

Beginning to work with website authoring software

You may wish to use the web editor called *Adobe Dreamweaver*, as used in this unit. It is available for Windows and Apple Macintosh operating systems and has been designed so that the webpage you create looks the same on all browsers using a WYSIWYG interface.

When you start *Dreamweaver* for the first time the screen will look like this:



It is worth exploring the menus at the top. The layout looks very similar to lots of other programs, which makes it easier for you to find your way around. On the right hand side, you have panels designed for particular tasks.

The main panel always opens with the *Dreamweaver* welcome page, which is useful when deciding what sort of webpage you intend to create.

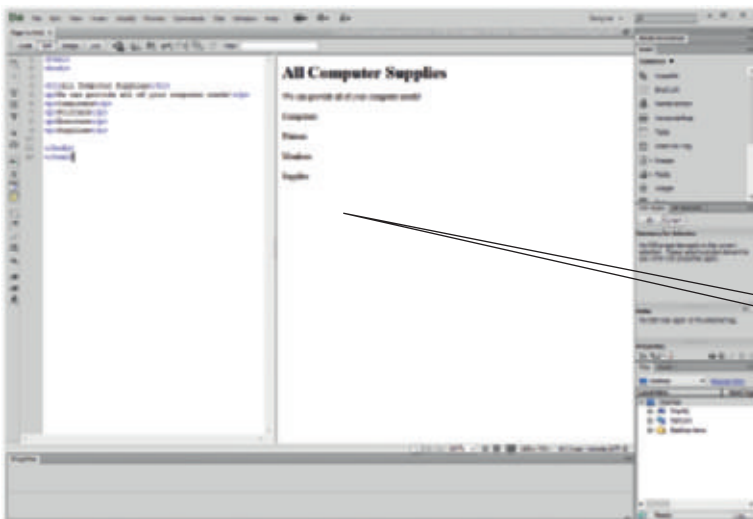
Activity 1

- 1 In the **Welcome** window, select **Create New HTML** page.
- 2 Find the icons on the menu bars that allow you to insert images.
- 3 Find the icons or options for unordered list, ordered list, bold and italic.
- 4 Find the buttons that allow you to switch between the different design views:
 - a Code
 - b Split
 - c Design
 - d Live
- e Find the drop-down menus that allow you to:
 - 5 Find the button that allows you to **preview** your website within a **browser** window.

Opening a page

Junaid asks you to change some of the work that you did last session and wants you to start by opening **Page1a.html** within *Dreamweaver* using the **Open Document** icon.

The file opens in *Dreamweaver* and the content can be viewed in four different ways using the tabs at the top of the page.

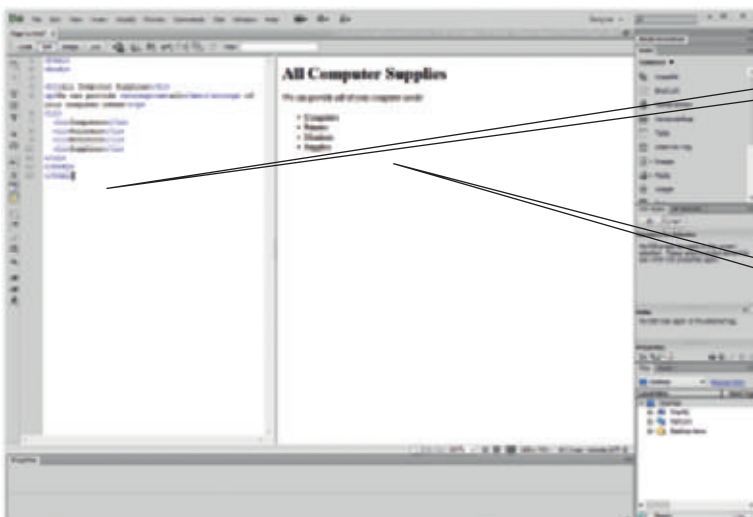


Code: Displays the page purely in HTML mode.

Split: Shows both the HTML coding and a visual representation of how it should within a browser.

Design: Displays only a visual representation of the page, no HTML.

Live: Attempts to display the page as it would look within a browser. Note the content cannot be edited in this mode.



Look at the source coding. Note how *Dreamweaver* has used different colours to show the HTML tags and content.

Look at the unordered list – *Dreamweaver* has indented the nested tags so that we can identify the nests much more quickly.

Activity 2

- 1 Highlight the word 'all' in, 'We can provide all your computer needs'.
- 2 Make it bold (strong).
- 3 Then make it italic (emphasis).
- 4 Highlight the list and click on the icon that will make it an unordered list.
- 5 Save your file as **Page1a-v2.html**.

Review and revise

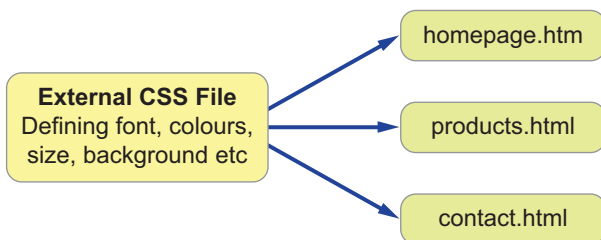
You should now be able to:

- open a new webpage using web authoring software
- navigate the main functions of the software
- open and edit a webpage using WYSIWYG functionality.

Background

The presentation layer of the web design development process defines the look of a webpage through the creation of CSS (cascading stylesheets) that can be applied to one or any number of webpages. If you are creating a single webpage, then the styles; fonts, colours and backgrounds can be set within the website authoring software for that page but CSS becomes really useful if you plan to create more than one page.

Consider a mini shopping website of three pages; an external CSS file can define how each one of them looks. Fonts, colours and background images can be set within the stylesheet meaning changing this one file changes all the files it is linked to. Imagine how useful this could be with a website of ten or fifty pages and the task of maintaining **consistency** and a particular **house style**.



In this session you will create a CSS file to define the presentation of the page you created and also apply it to pages you create in the following session.

Organisation and relative file paths

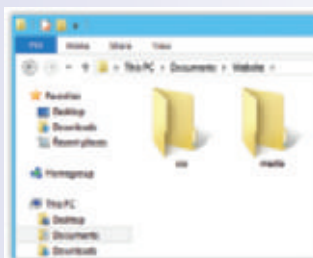
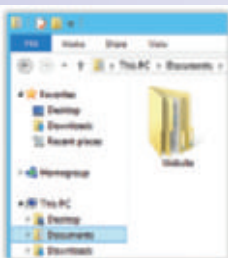
When creating any website, the organisation and location of your files is really important. Websites work most efficiently when created with **relative** file paths. This means the links between the files you create, HTML files, images, sounds and style sheets, are all relative to each other. By creating a folder structure for your website before you start, files will all have a set location and relative links will be easy to maintain.

Tip

Try to avoid moving files within a website using the file explorer of your operating system as this can break the links between relative files. Always save and modify locations within your web authoring software.

Activity 1

Create a folder in your document area called **website** and within that folder create two **sub-folders** called **CSS** and **media**.



The difference between attached stylesheets and in-line style attributes

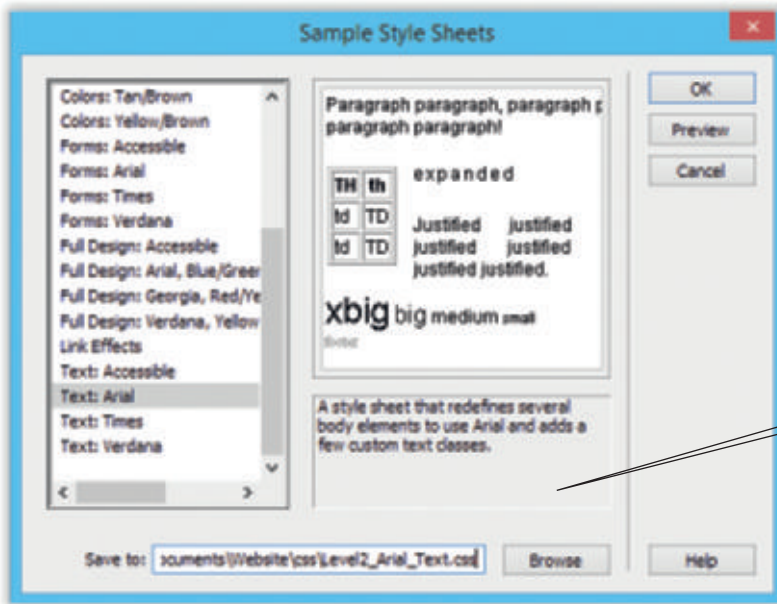
In this session you are going to create an **external** CSS stylesheet that will be attached to more than one page within your website. This allows the rules created within the stylesheet to impact upon multiple pages, saving time and coding.

Alternatively, you will have already used **in-line** style attributes to style elements of your web pages. The key difference of in-line styles are that they affect every element of the page with the same style attribute. For example, the table styling created in the **session 4.9** will affect every table in the page if more were added. In-line styling is useful for single web pages and creating HTML emails.

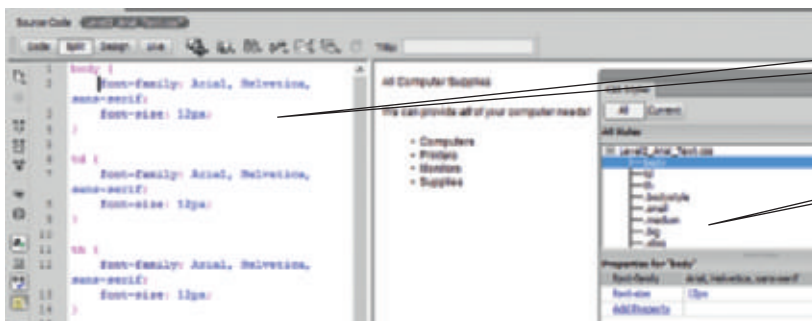
Adding a sample style sheet

Open the original file **Page1a.html** you created in the previous session and **resave** it into the **website** folder you have just created. Dreamweaver has a number of pre-installed **generic** style sheets that can be used and adapted to help experiment with using CSS for the first time.

To attach a generic style sheet, select **Format > CSS Styles > Attach Style Sheet** from the main menu and then select the **sample style sheets** option.



Select the sample file called **Basic: Arial** and select **OK**. An external stylesheet has now been created and linked to your webpage.



Activity 2

Create a sample style sheet like the one shown. Experiment with editing the sample CSS styles and adding additional properties, observing the changes that happen within the web page. Once this activity is complete, remove the style sheet from **Page1a.html** by using the **Unlink CSS Stylesheet** option at the bottom of the **CSS Styles** window.

Tip

Like .html files, .css files can also be opened and edited in *Notepad* or any other basic text editor.

The difference between a style and a class

Within the language of CSS styling can be applied in different ways. A style attribute can be applied to a specific element within the same line, often referred to as in-line styling.

A style can be attached to an id attribute of an HTML element, this means only one unique element will be affected. The # symbol is used to identify an HTML id element.

A class can be applied to multiple elements in the same page with the same class selector. A period (.) is used to identify a CSS class element.

Creating a new CSS file

Junaid would like the background of the webpage to be yellow and all the text to be in an Arial font. Creating a new style sheet for a website allows total control of these styles can be added to and edited at any time.

Look carefully at the code and you will recognise many common features. The element (body) is described by the values contained within the curly brackets {}. The names of the values are the same as those you met in the previous session for the style attribute. What is different is the way the colour is described. Rather than yellow, which you used before, it now says #FF0.

Rather than simply using sample style sheets, a new empty CSS file can be created, completed and linked to any number of webpages. Select **File > New** and select **CSS** from the list of **page types**. Once open, styles can be coded by hand and the table below lists two of the most common styles.

CSS Style	Example	Description
Body	<pre>body { font-family: Arial, Helvetica, sans-serif; font-size: 12px; background: #FF0; font-style:italic; }</pre>	The main text will use the Arial font family, be white, 12 pixels high and in italics. The background of the page will be yellow.
Table	<pre>table, th, td { width: 50%; text-align: center; border: 1px solid #000; padding: 0px; border-spacing: 0px }</pre>	<p>Any table will be 50% of the screen width with a solid black border with no padding or spacing.</p> <p>Including the th and td tags means the styling will be applied to the heading and data rows of any table.</p>

Attaching a new CSS file to an existing page

Having created and saved a new CSS file, it can now be attached to an existing web page by selecting **Format** from the main menu followed by **CSS Styles** and **Attach Style Sheet**. A new CSS file can be selected and the **link** option used so it can be attached to multiple html files.

Activity 3

- 1 Create a new blank CSS file, save it as ACSupplies.css into the css folder of your website folder.
- 2 Add body and table styles similar to the ones shown that will suit Junaid's requirements.
- 3 Attach your style sheet to Page1a.html

Tip

CSS Comments

Sometimes it is handy to add notes to explain your code at a later date. A CSS comment starts with `/*` and ends with `*/` and is ignored by web browsers.

Headers, paragraphs and lists

Website design conventions allow for many common elements to be specified: the headers, paragraph and list options are three that can be either set within your website authoring software or set using a CSS rule. There are six heading tags `<h1>` `</h1>` through to `<h6>` `</h6>` with h1 recognised as the most important and h6 the least. The tags for paragraphs and lists were outlined in **session 4.9**.

Tip

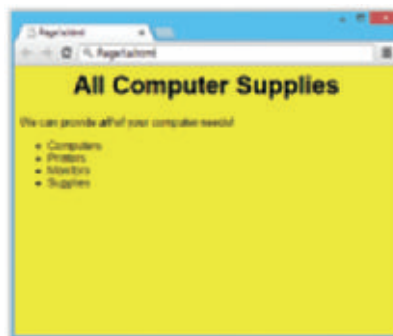
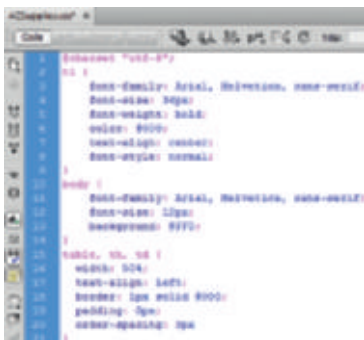
Try to avoid clashing header tags and CSS rules as all the rules you apply may not appear. Decide which is the most efficient to use for your site.

The example below shows how to add a rule by hand to the CSS script and these headings can be used instead of specifying additional styles to a title or subtitle.

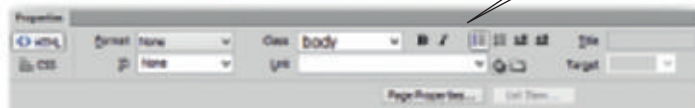
```
h1 {
  font-family: Arial, Helvetica, sans-serif;
  text-align: center;
  font-size: 36px;
  font-weight: bold;
  color: #000;
}
```

Activity 4

- 1 Open up the **Page1a.html** and its associated CSS file, **ACSupplies.css** and edit the CSS coding to add the **h1** header rule as shown. Then apply this rule to the title.
- 2 Use the tools in the Property toolbar at the bottom of the screen to add bullets to the list and make the work all stand out in bold with italics.
- 3 Preview the page using File > Preview in Browser (Selecting the one available) and it should look like the example shown below.

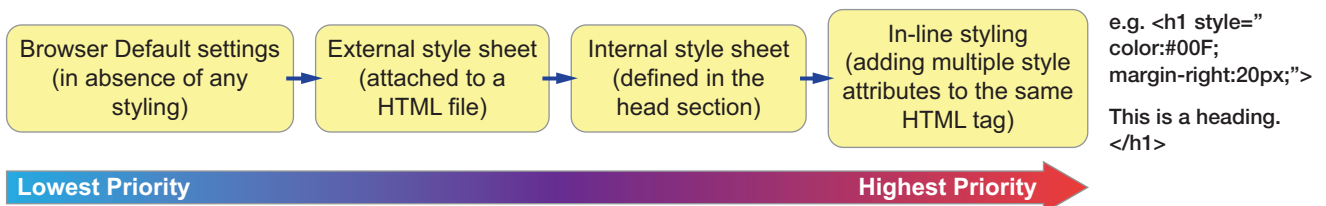


Individual elements can be set within a page using the familiar tools in the Properties toolbar.



Style sheet hierarchy and in-line styles

CSS styles can be applied to a HTML document either internally or externally but having multiple instances of styling means sometimes rules can clash and it is important to consider which element will take precedence over others. Although there can be issues relating to browsers inconsistencies that are often out of web designers hands, the general consensus is that the order of application is as follows:



This however is a very general rule; the more specific a rule is, and its placement within the HTML is also a factor. For example if an external style sheet is placed after an internal one in the HTML coding, the external one will have priority.

Review and revise

You should now be able to:

- understand the difference between internal and external HTML styling
- understand the reasons why web developers use cascading stylesheets
- describe the different elements that can be defined by stylesheets
- create and apply external stylesheets to a webpage
- explain in general terms the order in which styling is applied to a webpage when viewed through a browser.

Tip

You can learn more about web colours in the Extra support folder on the CD.



Background

You are now going to apply what you have learned and build on it by using tables to organise the layout of the webpage. You will also learn how to insert an image and a hyperlink, and keep text and images well organised when viewed in a browser. You are also going to use the skills you learned in the previous session to create and apply external style sheets to your website.

Using tables to organise webpages

Junaid needs to add **four** extra pages to the website in addition to **Page 1a**. He has asked you to put together these pages.

2. Computers			4. Monitors		
Laptop image	Details	Price	19" image	Details	Price
Desktop image	Details	Price	23" image	Details	Price
All-in-one image	Details	Price	25" image	Details	Price

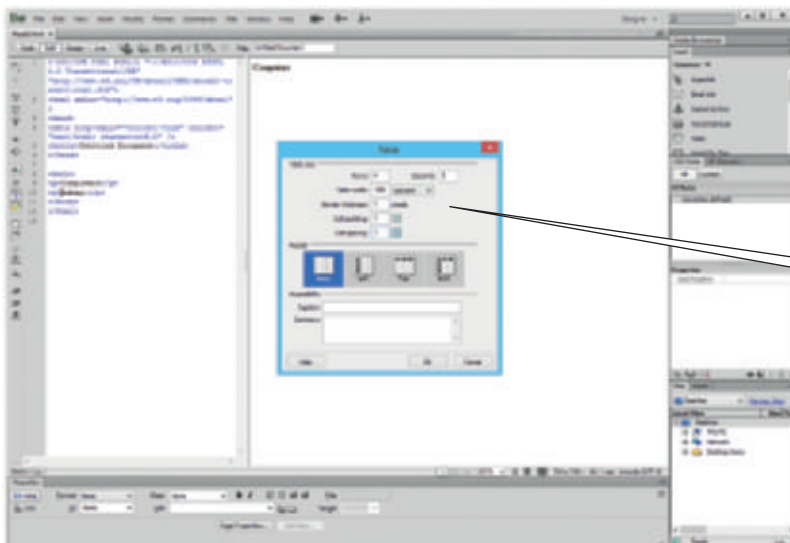
3. Printers			5. Consumables		
All-in-one image	Details	Price	A4 paper image	Details	Price
B+W Laser image	Details	Price	B+W ink image	Details	Price
Colour Laser image	Details	Price	Colour ink image	Details	Price

Each page has:

- a table with three columns and four rows, the top row is merged
- a title in the top row
- three images
- three sets of details
- a discounted and original price for each item.

So let's make a start with page 2. To create a new empty page select **File > New > Blank Page > HTML > Layout <None>** and then **Create**. Once you have created the page, select **File > Save As** and place it in the website folder as Page1a.

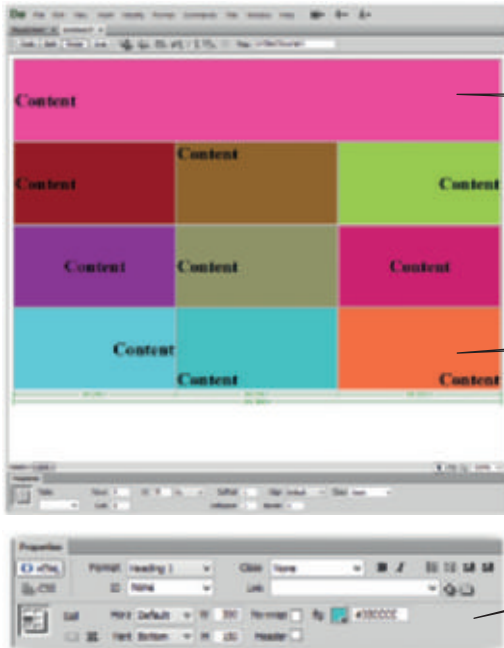
Begin by typing the heading for Page 2. You can see from Junaid's outline that it should be **Computers**. Now you can insert a table. You can either select **Insert > Table** from the main menu, or select the table icon from the **common** items in the right-hand menu on the *Dreamweaver* screen.



The table requires four rows and three columns. Set the width to 100 per cent (the whole page) and the border, padding and spacing to 1. These will be discussed later.

Table properties

A table like the one you have created can be formatted much in the same way as a table within a word processing document.



By clicking into one cell, top left for example, and dragging the cursor into the two cells to the right of it, they are all selected. Then select **Modify > Table and Merge Cells** to create a single large cell.

Selecting the table on the right hand displays the table properties bar. Here the size, number of rows/columns and how text is aligned within different area can be set.

Selecting within a **cell** and its contents can be positioned within each cell using the **Horiz** and **Vert** options, along with the colour of each cell.

Inserting an image in a webpage

With the table created, it is time to insert an image. Choose **Insert > Image** from the main menu. You can then browse for your image and add alternate text. This alternate text (Laptop) will appear as you hover your mouse over the image when previewed in a browser.

Activity 1

- 1 Copy the laptop image from the CD into the media folder within your website folder.
- 2 Create **Page2.html** as shown with a three column, four row table, with the top row having been merged into one cell, and insert a laptop image.
- 3 **Cut and paste** the **Computers** title from the top of the page into the **merged** top row of the table.

Tip

Images for using in your web design work throughout these practical sessions are available on the course CD, but before using them, copy them to your local document website folder to keep links relative. This means they will always appear in your website, even after the CD is removed.



Image sizes in webpages

When you browse any webpage with images, the images will not display properly until your computer has downloaded a copy of them. This means your browsing speed is often affected by the file size of images within a webpage and how fast your connection can download them. Digital images are measured in pixels and whereas the physical size and pixel resolution are considered when printing, only the pixel size is important in web design. A standard computer screen has a size of 1024 x 768 and upwards, and images should be scaled with this in mind.

Manipulating an image

Ideally, images for use in websites should be formatted so that their size matches the available space within a webpage. There are a number of software packages available that can perform image manipulation and a variety of image file types than can be used in web design. The following steps will guide you through using an **open source** software package called *Gimp*.

Real world

Inserting alternate text for an image is really important for businesses. It allows those with partial sight to have image descriptions to read, and it helps businesses get their sites noticed as the image descriptions are read through by popular **internet search engines**.

Image editing terminology

The following terms are often used in image editing.

Term	Description
Resizing	Changing the size of an image without editing its resolution; this normally relates to printed work and not internet images.
Resampling	Changing the pixel height and width of an image; relevant to internet use, as sizes are measured in pixels.
Colour depth	Refers to the number of colours that can be stored for a particular image. It is measured in bits and this relates to the number of computer memory bits that can be used to store colour information. <ul style="list-style-type: none"> • 2-bit allows four colours • 4-bit allows 16 colours • 8-bit allows 256 colours • 16-bit allows 65,536 colours • 24-bit allows 16,777,216 colours.
Image resolution	Normally measured in pixels per inch (ppi). The higher the value the greater the detail. Screen resolution is normally 72 or 96ppi, while 300ppi is recommended for professional printing.
Aspect ratio	The ratio between the height and width of an image. By maintaining or fixing an aspect ratio an image will look the same and not stretched when resized or resampled.

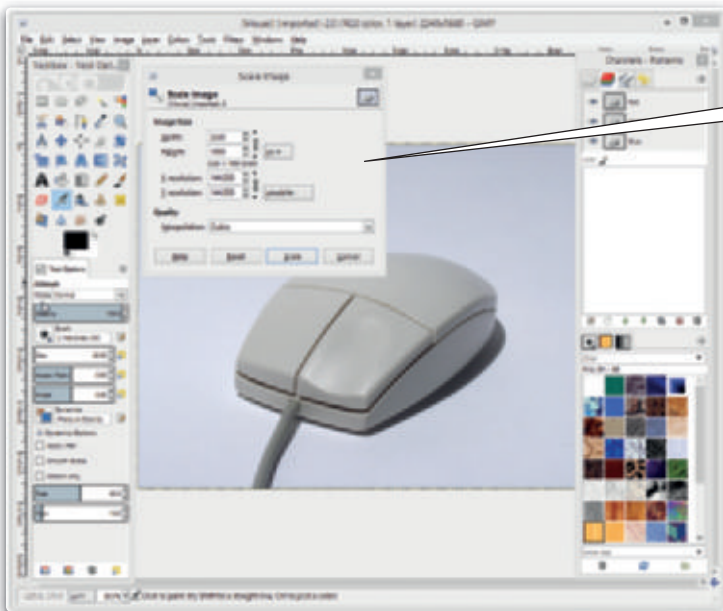
Real world



As lower cost high resolution monitors become more commonplace, the screen resolution of webpages is obviously increasing. A full HD screen for example has a resolution of 1920 x 1080. However with more smartphones and tablets displaying webpages, pages are having to be developed that can adapt to a range of different sizes. This is often referred to as adaptive or responsive web design.

Resizing an image

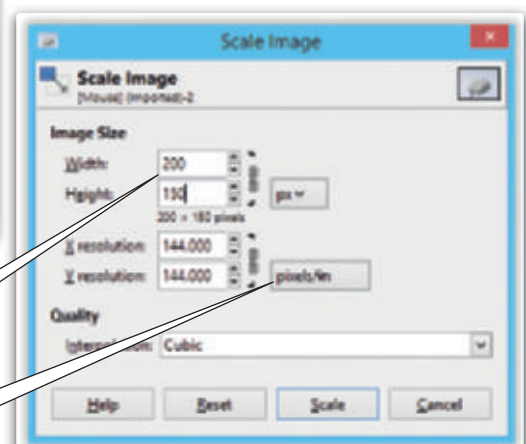
The following high-quality image needs resampling in order to fit into the cell of a table that is 200 by 200 pixels.



Open the image in your software and select **Image > Scale Image**. The size of the image can now be changed to fit within the required area.

Entering 200 pixels as the width will automatically scale the height. The size is now 200x150 pixels.

The chain symbol means the aspect ratio is locked.

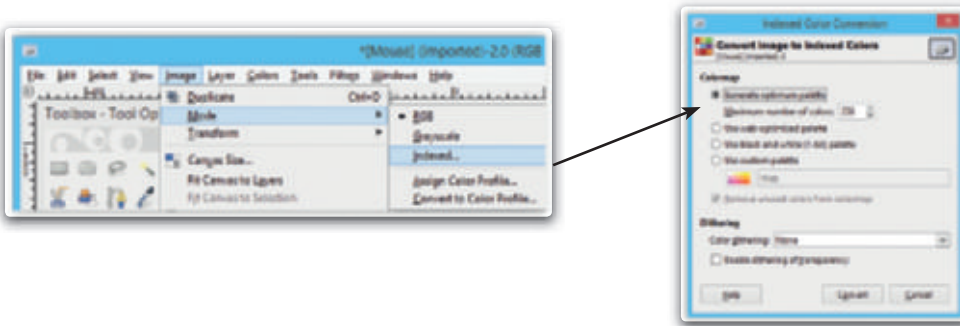


Activity 2

Find a suitable image from the internet of a desktop computer, but do not use the one on the course CD. Resample the image to the following approximate size: 250 pixels wide by 200 pixels high.

Changing the colour depth

The standard colour depth for internet images is 256 colours or 8-bit. This can be adjusted and the lower the colour depth the smaller the file size. It should be noted though that lowering the colour depth will result in loss of image quality.



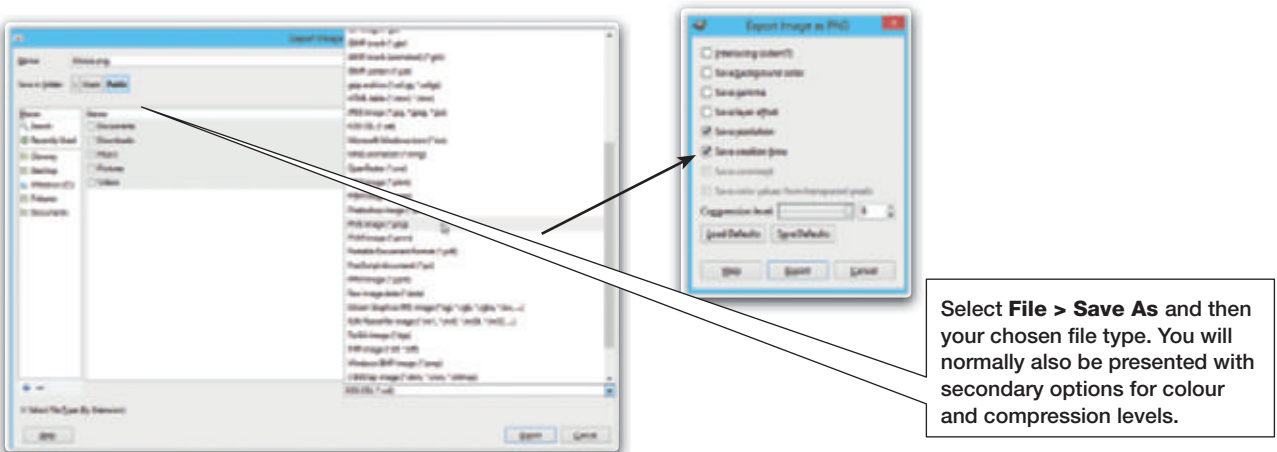
Activity 3

Experiment with the colour depth of your image from Activity 2. At what colour depth does the quality of the image become unusable?

Saving in different file types

When saving image files for use on websites it's important to choose correctly. The following are common file types.

Image file type	Description
JPEG (.jpg)	(Joint Photographic Experts Group) Designed for flat, rectangular images. Lots of compression options and the quality of the image can be selected when saved.
GIF (.gif)	(Graphics Interchange Format) Limited to 8-bit, this file is often used for diagrams or cartoon-style images. Also used in animation. Images can also have transparent areas.
PNG (.png)	(Portable Network Graphics) Similar to a GIF file but can support 16 million colours and therefore higher-quality images.
BMP (.bmp)	(Windows Bitmap) Uncompressed images created in the Microsoft Windows operating system. File sizes are often too large for internet use.



Select **File > Save As** and then your chosen file type. You will normally also be presented with secondary options for colour and compression levels.

Activity 4

Experiment with image files by resaving the original image file you found from the internet in Activity 2 into the four file types listed. Discuss with a partner the differences, if any, between the saved files. Use the image you resampled in addition to or instead of one of the images included on the CD in your website.

Tip

Compression allows smaller file sizes to be created but this reduces the quality.

Activity 5

You are going to complete Page 2. Refer back to Junaid's outline at the beginning of the session.






- 1 Find the image of the all-in-one computer on the course CD.
- 2 If necessary, resize it, adjust the colour depth and amend the file type.
- 3 Insert the image, along with the image of the desktop computer you edited in the previous activities, into Page 2.
- 4 Try to find some up-to-date information online for the details of each type of computer. Insert the text into the correct cells of the table.
- 5 In the third column, type some prices stating what the old price was and what the price is now. You might refer to where you found the details of the computers. Format the old price to strong and select the strike-through option from the **Format > Style** option on the main menu.
- 6 Attach the stylesheet you created in the previous session and use appropriately: ACSupplies.css. Choose **Format > CSS Styles > Attach Style Sheet** and add as a link.

Your final page should look similar to this:

Add a suitable title to the page, this then shows at the top of the browser when previewed.

The attached style sheet rules can be seen here.

Computers		
	This high quality entertainment Notebook PC has the following features: <ul style="list-style-type: none"> • Intel® Core™ i5-4200U processor • Windows 8.1 • Memory: 8 GB • Hard drive: 750 GB • 11.6" HD SingleView LED • Blu-ray, Wi-Fi, Bluetooth and Webcam 	Was: 6000 Now: 5749
	This high performance desktop is perfect for 3D gaming and video editing. <ul style="list-style-type: none"> • Intel® Core™ i7-3770 processor • Windows 8.1 • Hard drive: 2 TB • Memory: 16 GB • Graphics: AMD Radeon™ HD 7770 • Blu-ray, Wi-Fi, Bluetooth 	Was: 61249 Now: 6000
	This 21.5" Touchscreen All-in-One PC is space-saving and powerful enough for any home office. <ul style="list-style-type: none"> • Intel® Core™ i3-4010U processor • Windows 8.1 • Hard drive: 1 TB • Memory: 4 GB • 21.5" HD Touchscreen LED • Blu-ray, Wi-Fi, Bluetooth and Webcam 	Was: 61649 Now: 6000

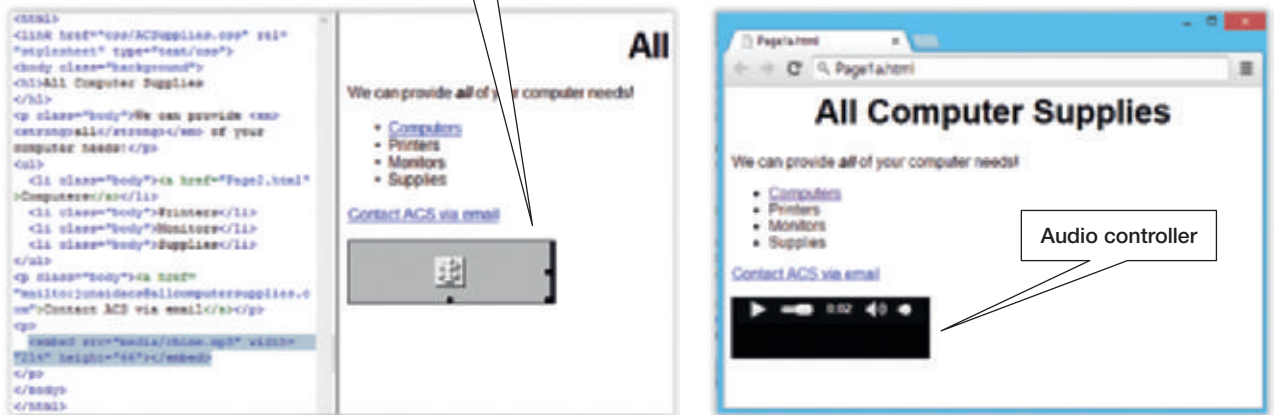
Inserting sound, video and moving images

Websites often use sound, video or animated images to enhance their website. Junaid has asked you to experiment with adding some multimedia content to Page1a.html.

Copy the sound and video from the CD into the media folder within your website folder. The example below shows how sound and video can be inserted within *Dreamweaver*.

Select **Insert > Media > Plugin** and browse for the Mp3 file in your media folder and press **OK**. The symbol that appears on screen will represent a media controller when previewed so it needs to be increased in size using the corner handles.

Once inserted, stretch the icon so that the controller will be visible in the preview screen.



Inserting video is done in exactly the same way: **Insert > Media > Plugin**. Enlarge the icon that appears to the size you would like the video to appear.

Activity 6

- 1 Insert the sound and video in your media folder onto Page1a.html, and experiment with size of the icon to be the most efficient and accessible for the viewer. Remember to preview the page within a browser to check the playback.
- 2 Use the internet to try and find some additional files that could be added. However it's important to justify any files you add, thinking of the aim of the the web site and its target audience.

Tip
Mp3 and wav files are popular sound file choices and Mp4 files are most commonly used for video when adding to webpages.

Real world
Rather than take up file space within their own websites, many web designers now prefer to **embed** content from other sites. Videos, music, games, animation, maps and utilities can be added to a site with only a few lines of code. Popular sites like **YouTube** and **Vimeo** offer **embed** codes that can be added to your HTML code.

Changing the layout of the table

You need to change the page because you do not want people to see the table border when they are looking at the webpage in a browser:

- Go to **Views > Code**
- Find the line that says: `<table border="1" style="width: 100%">`
- Change this to: `<table border="0" style="width: 100%">`
- The example below illustrates the change you should see.



Sometimes the layout of a table can be improved by using **cell padding** and **cell spacing**. Cell padding is the space between the cell contents and the border. You should see that the first line of each description is right at the edge. Cell spacing increases the space between each cell in the table. You can change this by adding some extra space.

- Make sure that you can still see the HTML source code (**Views > Code**).
- Find the line that says: `<table border="0" style="width: 100%">`.
- Place your cursor after "100%" but before `>` and type: `rules="all" cellpadding="4px" cellspacing="5px"`

This adds 4 pixels of space between the cell contents and the cell border and also increases the space between each cell in the table by 5 pixels.

You can also set the size of the table to a specific width of the screen. At the moment, the table you have created fills the whole screen. You can set it to a percentage of the screen.

Go back to the line you have just changed and place your cursor after "5px" but before `>` and type: `width="80%"`. This changes the width of the table to 80 per cent of the screen.

Then, because the pictures look untidy with all that white around them, you could to change the CSS stylesheet to match the background to the same white colour:

- 1 Open the file **ACSupplies.css**.
- 2 Find the line that includes: `background-colour` and change it to: `#FFFFFF`.
- 3 Select File and Save All to save all files.



Activity 7

Try creating Pages 3 (Printers), 4 (Monitors) and 5 (Consumables). Follow the steps that you took to create Page 2 (Computers). Look online for suitable copyright-free images of each product and the up-to-date information you need to be placed in the cells for the details of each product. Don't forget to add the prices as you did for Computers in Activity 5. If possible, try to find an animated image to represent one of your products. Tip: This will probably be an animated gif and inserted in just the same way as an image.

Inserting hyperlinks

Now you need to link all the pages together. Open **Page1a**.

Linking files is done by inserting a **hyperlink** to another page, document or website. You will see the same term can be used in spreadsheet models, presentations and desktop publishing documents.

1. Highlight the word Computers.

2. Click on the folder link icon for Insert > Hyperlink > Select Folder from main menu.

3. Browse for Page2.html.

4. Click OK

Relative and absolute file paths.
This option allows you to choose either a **relative (Document)** or **absolute (Site Root)** file path. Choose the **Document** option (more below).

Using and inserting bookmarks

Creating a **bookmark** is the process of saving a particular website title and URL address in order to revisit it. Modern website browsers have this functionality and will create a bookmark and add it to a list of saved addresses you can access at any time.

This process isn't limited to home pages, it can be used to link to any particular page within a website and also to a specific location within a single page, especially useful if a content rich page is very long.

Consider a product long listing page within the All Computer Supplies website that contains lists of laptop, desktop and tablet computers. Users may wish to jump down to the tablet section. At the point in the page where the tablet computers start, you could add the following lines to the HTML.

```
<a href="#tablets">Jump to Tablet Computers</a>
```

1. Create a bookmark within the page at the point at where the tablet computers would start using the id attribute.

```
<h2 id="tablets">Tablet Computers</h2>
```

2. At the top of the page, add a hyperlink to the bookmark.

3. By adding the specific web page to the hyperlink, the bookmark can be linked to from another page.

```
<a href="acs-products.html#tablets">Jump to Tablet Computers</a>
```

Relative and absolute file paths

A relative file path gives a directory listing in relation to the file it is being linked to. For example **Page1a.html** and **Page2.html** are in the same folder so the link would be simply **Page2.html**.

If we consider the photo of a laptop of Page2.html then the relative link of that image from Page2.html would be as follows:

```
 Named Anchor** from the main menu and give it an appropriate title (single word in lower case).



### Tip

If a hyperlink is linked to a folder higher up in a directory tree than below it as shown in the example, then the movement up the file tree is represented by '..'. For example an image placed in a webpage from a folder two levels above it would have a path of: **../Laptop.jpg**

### Real world

Although not a problem when developing websites on a **local** computer, file paths online are generally **case sensitive**, so it is good web design practice to use **lower-case** for all folders and filenames when creating any web projects. Notice the capital **L** for **Laptop** in the example shown. If the hyperlink was manually typed with a lowercase **l** then it may not work correctly if uploaded to the internet.

### Tip

As anchors are locations on a web page rather than an object, they cannot be seen when the page is previewed within a browser or **Live** view. They can only be seen when in **Design** view.

Open **Page2.html** and under the price of the laptop computer, add the term **Important Notice**. Then click the cursor below the table of computers and press **Return** at least ten times to add a space. Insert a **Named Anchor** from the **Insert** menu and give it the title notice. This should then appear as an **anchor** symbol on the page below the table. Next to the anchor, add the following message in italic:

*Prices are correct at the time of the website being written, please confirm when ordering.*

Select the **Important Notice** text under the price and then **Insert > Hyperlink** from the main menu. From the **Link** option the anchor should be listed as **#notice**, select this and press **OK**.

**Activity 8**

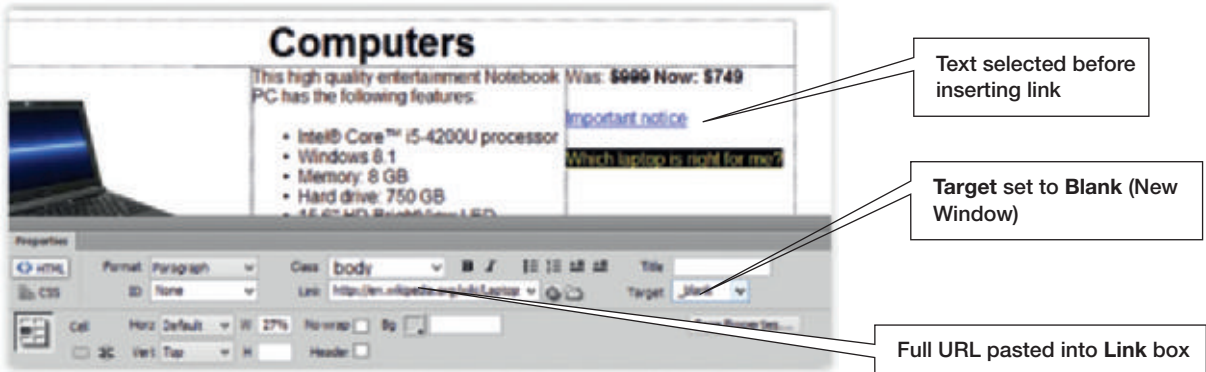
- 1 Now add the hyperlinks for Monitors and Consumables (Pages 4 and 5).
- 2 Add Important Notice anchors to each of your products.
- 3 When you've done this, save your work by selecting **File > Save All** from the drop-down menu.

**Creating an external link**

An external link works in exactly the same way as an internal link but takes the user to an online webpage rather than a local one.

**To create an external link:** Select the text or image from which to link and select **Insert > Hyperlink** or type directly into the **Link** box in the **Properties** toolbar. Enter the full URL (including **http://www**) and select **OK** or press **Return** if you are using the **Link** box.

You have decided to add some background information to each of the products to help buyers make a decision. The **Wikipedia** (<http://en.wikipedia.org/wiki/Laptop>) page on laptops provides useful information so you are going to add it as a link underneath the **Important Notice** link. You've also decided to have the link to an external site open in a new window rather than the existing one.



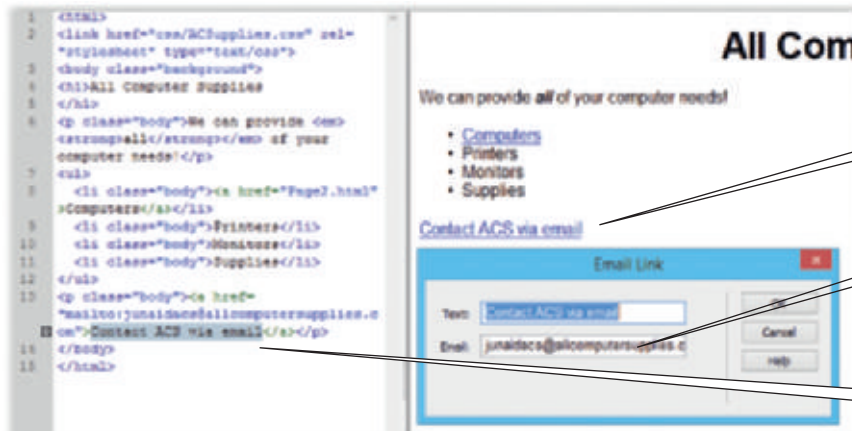
**Choosing a hyperlink target**

When linking from one webpage to another the default option is to simply open in the same page. The Target option provides the following alternatives:

| Target Option | Description                                                                                                                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _Blank        | Opens the linked file or webpage in a new browser window                                                                                                                                                               |
| New           | Opens the linked file or webpage in a new browser tab                                                                                                                                                                  |
| _Parent       | Opens the linked file or webpage the parent frame or parent window if frames are used. Note: <b>Frames</b> are not commonly used now in web design as they can cause browser problems, especially with mobile devices. |
| _Self         | Opens the linked file or webpage in the same window or tab. This is the <b>default</b> option.                                                                                                                         |
| _Top          | Opens the linked file or webpage in a new full window, removing any frames. Again frames are not used in modern web design.                                                                                            |

## Adding an email link

Junaid would like you to add an email link to the **home page (Page1a.html)** of your website. He would like the site to say: **Contact ACS via email** and when users click the address that it opens a new email message to [junaidacs@allcomputersupplies.com](mailto:junaidacs@allcomputersupplies.com) in their default email program.



### Real world

The first page of any website is normally referred to as the **home page** and is normally given the file name: **index.html**. This is the filename web browsers look for having been directed to a web server containing web pages.

Select your text on screen and choose **Insert > Email Link** from the main menu.

Add the email address to the box provided and press **OK**.

Alternatively the HTML code for adding an email address is: *mailto:addeemailaddresshere*

## Activity 9

- 1 Add background information using external hyperlinks and internal anchor points to all of your webpages.
- 2 For each of Pages 2, 3, 4 and 5, add an extra row of three cells to the bottom.
- 3 Browse the course CD for the image **home button.jpg**.
- 4 Insert the image in the centre of the bottom middle cell of each page. This icon represents the homepage (**Page1a**) and needs linking to that page.
- 5 Add a hyperlink to the homepage icon for each of Pages 2, 3, 4 and 5.
- 6 Add the email link shown to the home page of your site.
- 7 Rename the first page of your website to index.html. You will have to check and change some of your hyperlinks accordingly.

## Review and revise

You should now be able to:

- create additional web pages and attach style sheets to them
- use and format tables to organise a webpage
- insert and organise images, sound and video
- resample, resize and format images suitably for internet use
- add internal and external hyperlinks to webpages
- understand the difference between relative and absolute file paths
- insert and link to webpage anchor points
- insert email links to webpages.

## Background

In this session you will find out how a website created locally in your home, office or school computer can be uploaded to the World Wide Web for everyone to see. But before that, your site should be tested to make sure everything works correctly.

### Testing a website

It's difficult to edit a webpage after it has been uploaded to the internet so thorough testing beforehand is essential. Rather than just the simple question of "Does the site work?" a website can be broken down into its content, features and functionality in order to write a **test plan**. Consider the following elements:



| Website element                         | What can be tested?                                                             |
|-----------------------------------------|---------------------------------------------------------------------------------|
| Text                                    | Spelling, grammar, suitability of language, font choices                        |
| Images                                  | Clarity, quality of image, suitability, image file size                         |
| Hyperlinks                              | Internal and external links, anchor points                                      |
| Media files (sound, video or animation) | Clarity, quality of media, suitability, file size, playing of media content     |
| Consistency                             | Use of CSS files, commonality of styles across pages                            |
| Accessibility                           | Image descriptions, browser text accessibility tools, including zoom and speech |
| Browser compatibility                   | Appearance in different browsers, including mobile devices                      |

### Creating a test plan

A test plan is a way of formalising a series of tests to be carried out before any system is made available to a wider audience. This is not just limited to web design, the same method can be used for publishing, spreadsheet modelling, database design or game building. A test plan asks the user to consider what might, should and actually does happen when others use the site, ideally previewed within a browser. An example of a test plan with two example tests is shown on page 210.

#### Real world

Technical testing and functionality can produce more problems than accidental mistakes made during a website's construction. Websites can be created in many ways, using a wide range of hardware, software packages and operating systems, and are then expected to integrate with hosting systems running as many different systems again. Many would consider it miraculous that anything works at all!



| Test number | Description of test                                      | How can it be tested?                                                                           | Expected result                                                | Actual result                                                        | Action required                                                                                                                                                   |
|-------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1,2...      | Describe what part of the website is going to be tested. | What method could be used, simply clicking a link or watching a video or proofreading the text? | What should happen when you click a hyperlink for example?     | Describe what actually happens, even if it was the expected outcome. | If you fail a test, what needs to be done, re-do a hyperlink for example or replace an unsuitable image. If nothing is required simply add <b>none required</b> . |
| 1           | Content hyperlinks on Page1a.                            | Ask a test user to try all the links in a browser.                                              | I expect all the links to work correctly.                      | The Printers hyperlink actually took me to the Computers page.       | Delete the hyperlink on Page1a and replace it.                                                                                                                    |
| 2           | Check the quality of the printer images on Page 3.       | Ask a user to look at the images and confirm they are clear and suitable.                       | I chose the image carefully and resized it so it should be OK. | The test user says the images are clear.                             | None required.                                                                                                                                                    |

### Activity 10

- 1 Create a test plan like the one shown that covers all elements of the site you have created for Junaid. Try to cover all the elements covered at the beginning of this session.
- 2 Carry out each of the tests, making sure to note any problems and how they could be resolved.
- 3 Carry out any action points generated in order to pass all of your tests.

## Publishing a website

In order for a wider audience to access a website on the internet then it needs to be **published**, or **uploaded**, to a **web server** or **hosting company**.

A web hosting company will provide file storage space on their servers that are directly connected to the internet, in order for any web designer to upload it. One of the most common methods is to use File Transfer Protocol (FTP), this provides controlled access to a specific file space in order to copy files from a local computer to the web server.

### Real world

Large international websites may need file space and processing power far and above that offered by a traditional hosting company. A server farm is a purpose built collection of multiple networked servers that are connected together to provide centralised access to a large internet connected system.



The example below shows a piece of open-source software called *FileZilla*. It allows a user to connect to a remote web space in order to upload their files.

The screenshot shows the FileZilla interface with several callout boxes:

- Top-left callout:** "This window displays server connections, letting you know when the hosting site has been accessed." (Points to the Site Manager pane)
- Top-right callout:** "Your hosting service will provide you with the following:
  - An ftp address
  - A username
  - A password
 (Points to the Site Manager pane)
- Center callout:** "Drag and drop" (Points to the arrow between the local and remote file panes)
- Bottom-left callout:** "Here are the files contained within your website folder." (Points to the local file pane)
- Bottom-right callout:** "Here you will navigate to the correct folder on the hosting web server." (Points to the remote file pane)

### Review and revise

You should now be able to:

- understand the need for website testing
- describe the main elements of a website that can be tested
- write and carry out a test plan to ensure a website is suitable for its intended audience
- improve a website in response to failed tests if required
- understand how FTP works in relation to web design.



# UNIT 4 Practical review

## What have you covered?

In these four practical sessions, you have:

- seen how a webpage is structured in HTML
- practised the use and effect of a wide variety of <tags>
- investigated the creation and use of cascading style sheets
- created style sheets and seen how to attach them to a webpage or webpages
- investigated the creation of tables as a way to help organise webpage content
- added tables to a web page and formatted them
- practised adding content (text, images and multimedia content) to your webpage and applying styles
- discovered how to create hyperlinks from text or images and create internal hyperlinks using anchors
- written a test table and applied the tests to your webpages
- investigated how websites are uploaded to the Internet using FTP.

## Some practice questions



All relevant files can be found on the CD.

You are going to create a website for Colin, who owns a shop that sells and buys coins and banknotes.

- 1 Create a new folder called COLINCB in your personal folder.
- 2 Download the relevant source files for this review section from the CD into your folder.
- 3 Open the stylesheet **CCBShop.css** with website authoring software.
  - Change the background colour so that it has no blue element.
  - Change the font size of <h1> to be 24px.
  - Save the stylesheet with the name **CCBShopB.css** in your COLINCB folder.
- 4 Using a suitable software package, create a new webpage called **CCBShop.html**.

Create a structure that will look like this, using a table:

|   |   |   |
|---|---|---|
|   | A |   |
| B | C |   |
|   | D | E |
|   | F | G |
|   | H | I |
|   | J |   |

- 5 Attach the stylesheet **CCBShopB.css** to this webpage.
- 6 Set the table width to 95% of the width of the window.

- 7 Set cell spacing and cell padding for the table to 4 pixels.
- 8 Using the contents of the file **CCBText.txt**:
  - place the text: Welcome to Colin's Coin & Banknote Shop into cell A as style <h1>
  - place the text: Visit these recommended ... Banknote Dealers into cell B and format this as:
    - Visit these recommended sites – as style <h2>
    - The International Banknote Society (IBNS) – as style <h2>
    - Professional Coin Grading Service – as style <h2>
    - Numismatists Directory – as style <h2>
    - Rare Coin Dealers – as style <h2>
    - Banknote Dealers – as style <h2>
  - place the text: Colin's Coin Shop is one of the north of England's ... area of the dealership into cell C as style <p>
  - place the text: Treasury Notes ... 1949–1962 into cell H with each of the five lines as style <li>
  - place the text: Hammered coins ... 1658–date into cell I with each of the lines as style <li>.
- 9 In cell D, enter the text Banknotes as style <h2>.
- 10 In cell E, enter the text Coins as style <h2>.

- 11 Using the Internet, search for an image of an old bank note. Save it as **Banknote.jpg** and insert it into cell F. Set the width to 300 pixels and maintain its aspect ratio.
- 12 Again using the Internet, find an image of an old coin. Save it as **Coin1.jpg** and insert it into cell G. Set the width to 150 pixels and maintain its aspect ratio.
- 13 Add the following text in style `<p>` to cell J at the bottom of the table: last edited by (your name).
- 14 Search the internet to find the URL of the home page of the International Banknote Society. Create a hyperlink from the text: The International Banknote Society (IBNS) in cell B with this URL, so that the IBNS home page opens in a new window called `_ibns`.
- 15 Create a hyperlink from the image in cell G to open the file `CCBCoins.html` in a new window called `_CCBcoins`.
- 16 Save the page **CCBShop.html**.
- 17 Using a suitable software package, open the webpage **CCBCoins.html**.
- 18 Attach the stylesheet **CCBShopB.css** that you saved at step 3.
- 19 Replace the text Heading here with the text Hammered and Milled Coins as style `<h2>`.
- 20 Replace the text Colin Derbyshire, 01/03/2015 with your name and today's date.
- 21 Write a test plan that will cover all the major components of your webpage.
- 22 Carry out your test plan and make any improvements that are needed after these tests.
- 23 Take a screenshot of the webpage **CCBCoins.html** and save either as a .jpg file or as an insert into a word processed document.
- 24 Save and print the page **CCBCoins.html**.

## Progress check

### Aiming for good progress

- Given an outline, you can successfully create a webpage's structure with a table.
- You are able to attach a style sheet to a webpage.
- You are able to add content (text, images or multimedia elements) to the webpage.
- You can apply styles to text.
- You can create a hyperlink to another webpage or website.
- Link directly to an email address from a webpage.
- You can test the basic elements of a webpage.
- You can describe how to upload information to a web server.

### Aiming for excellent progress

- Given an outline, you can successfully create a webpage with a table.
- You can create and edit a style sheet as required and attach a style sheet to a webpage.
- You are able to add content to a webpage and, when inserting images, either crop or resize them as required.
- You can add styles to text and use heading and paragraph options.
- You can link directly to an email address from a webpage.
- You are able to control the appearance and content of a table cell using alignment, merged cells, cell spacing and cell padding.
- You can create hyperlinks to other webpages using relative file paths and control how they appear.
- You can create anchors to move to other positions within a webpage.
- You can write a detailed test plan and use it to test a website.
- You are able to explain how to upload information to a web server and the importance of file structure.