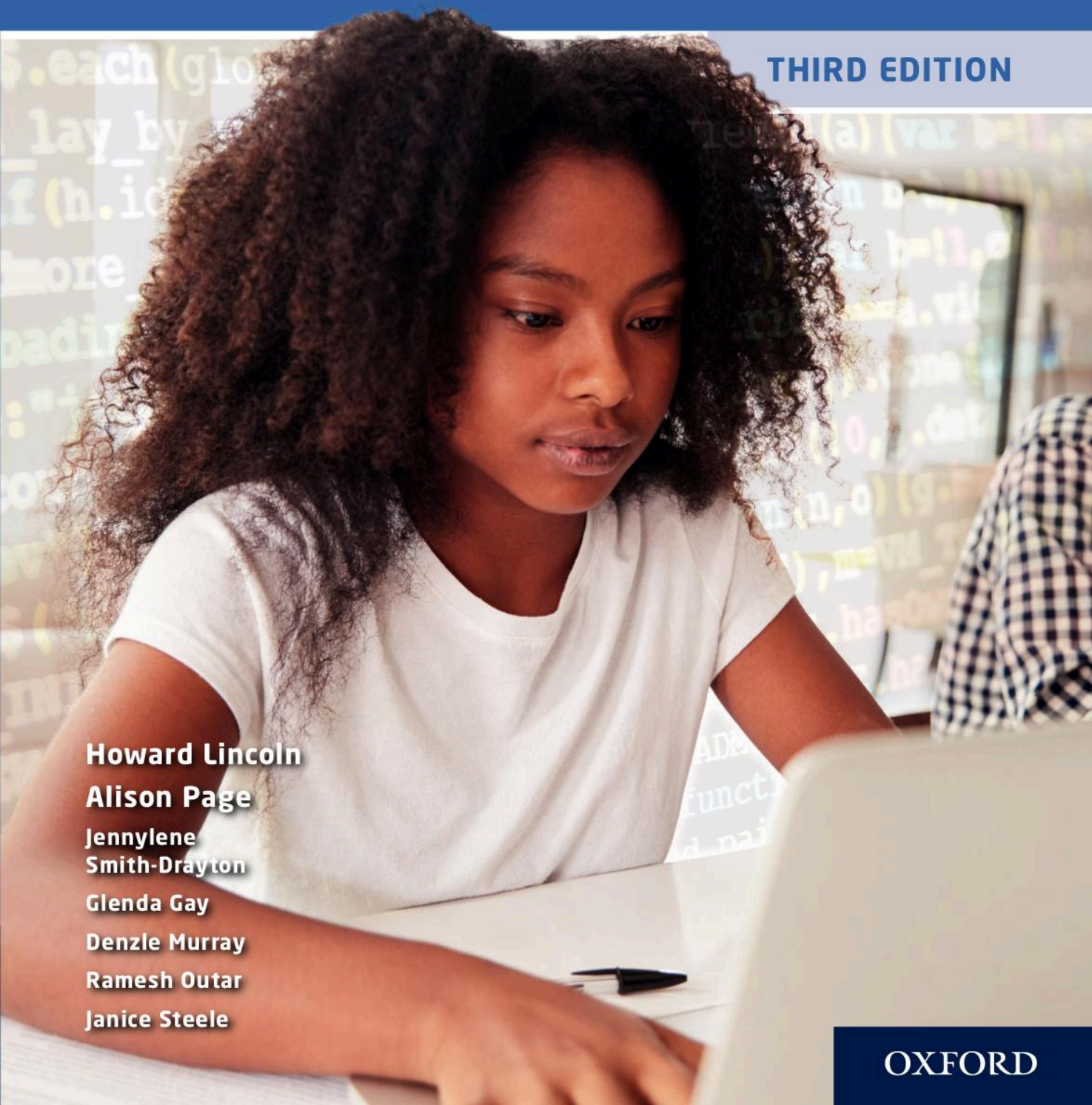
Oxford excellence for the Caribbean

Just *Click* for the Caribbean

THIRD EDITION



Howard Lincoln
Alison Page
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OXFORD
UNIVERSITY PRESS

Contents

Preface

This edition of *Just Click* has been developed to support the lower secondary IT syllabus throughout the Caribbean region. Designed to help students develop the skills and understanding required to progress to the IT for CSEC® course, it provides material to explore every aspect of the syllabus.

Each section of the book covers a year of teaching, with units aligning to strands within the curriculum. Each unit is further split into topics with clear learning objectives, with each double-page spread corresponding to a lesson of teaching.

Book features

Did you know...?

These marginal boxes, which link topics to real-world scenarios, encourage students to think more deeply about the practical applications of Information Technology.

Learning objectives

Each unit starts by providing an outline of the key concepts students can expect to cover. Each lesson further breaks this down into clear learning objectives.

Talk about

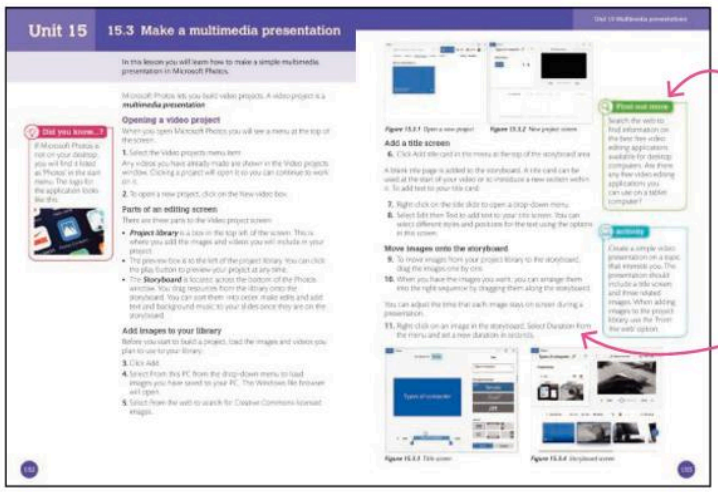
Provides stimulus for further discussion and exploration.

Glossary words

Key terms are included in bold, with full definitions at the back of the book.

Online

Further learning with online support at: oxfordsecondary.com/just-click-3e



Activities

Each lesson ends with an activity encouraging students to use and consolidate the knowledge they have developed.

Find out more

Students are presented with opportunities to use their developing IT skills to explore topics in more depth.

Tutorials

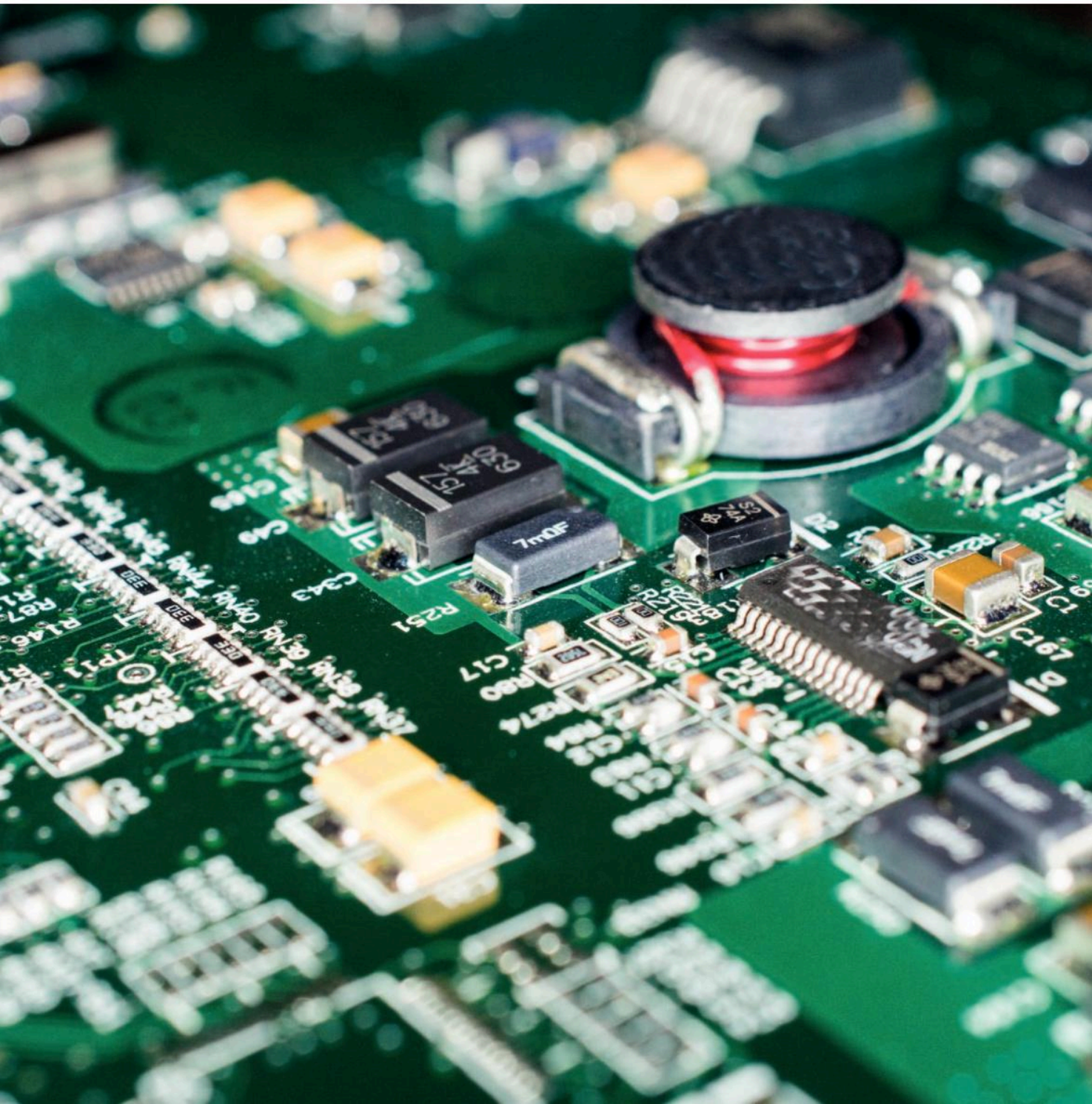
Practical skills are developed in point-by-point tutorials, which guide students through given activities.

End of section questions and activities

Each grade of teaching closes with activities and questions. Short answer 'test your knowledge' questions provide recall opportunities for each topic, while longer answer questions require students to apply their knowledge to new challenges. The activity section has opportunities to practise new skills both individually and in groups.

1

Section 1 of this book is written for those studying computing in the first year of lower secondary school. Section 1 is divided into eight units. Each unit is divided into lessons that provide an understanding of how computers work, and how they are used in business and daily life. There are also sections that develop practical skills using software applications like a word processor.



Unit 1 1.1 Danger in the computer lab

Using computers safely

In this unit you will learn about the risks to health posed by computers and other equipment such as printers. You will learn how to recognize the danger in the computer lab and avoid the consequences.

In this lesson you will learn about the immediate, long-term and environmental dangers posed by computer equipment.

Risks and dangers

Computers pose a threat to our health and safety in three ways.

1. Day-to-day health and safety risks
2. Health risks that result from regular use of equipment over a long time
3. Risks caused by damage to the environment

Health and safety risks

It is important to be aware of the risks that exist in a work environment, especially one that contains computer equipment.

1. Electrical equipment of any kind can be dangerous unless handled correctly. Irresponsible behaviour, such as opening the system unit of a ***computer system***, can lead to serious injury from an electrical shock.
2. Moving heavy equipment such as printers and ***desktop computers*** can cause injury unless they are lifted correctly.
3. Care needs to be taken to disconnect cables when moving computer equipment so that devices are not accidentally dragged to the floor.
4. The cables that connect computer equipment can create a ***trip hazard*** in a computer room if they trail on the floor.

Figure 1.1.1 Warning: high voltage

Long-term risks

Some health risks you may be exposed to arise from using computers over a long period of time. Some common conditions that fall into this category of risk are:

Repetitive Strain Injury (RSI): an injury caused to muscles, tendons and nerves by repeating the same action over a long time. It can be very painful and prevent a person from working. RSI usually affects the wrists, elbows, and shoulders of computer users. It is often caused by prolonged use of the ***keyboard*** or ***mouse***.

Carpal Tunnel Syndrome (CTS): the most common RSI. CTS is caused by damage to nerves in the wrist. It causes weakness and pain in the wrist and hand. Sometimes surgery is needed to relieve the symptoms.

Computer Vision Syndrome (CVS): caused by focusing on the computer screen for long periods of time. CVS can cause strain to the muscles that focus the eye leading to headaches and blurred vision.

Lower back pain: Sitting at a computer for a long time can cause pain in the lower back. A bad posture and an unsuitable chair that does not support the back can lead to injury.

Figure 1.1.2 *Discarded e-waste*

Environmental risks

Computers and equipment such as printers are difficult to dispose of. Disposing of computers carelessly can cause serious damage to the environment.

- Most of the material used to make computers is ***non-biodegradable***. Plastics, metals and other materials that make up the computer do not break down if computers are sent to landfill.
- Computers contain heavy metals like mercury and lead, along with toxic chemicals that can be dangerous if released into the environment.
- Valuable metals that are used to make computers, such as gold, copper, and even steel, are thrown away when they could be recycled. This means more valuable metal must be mined and processed.

Environmental damage harms us all.

Talk about

Why is it important to dispose of computers thoughtfully? What are the risks to the environment of not doing so? How could that affect you and your family?

Activity

Use the Internet to conduct research on the symptoms of computer-related RSIs. Try to list five ways RSIs may affect you.

1.2 Staying safe in the computer lab

In the last lesson you learned about some of the risks to health and safety you will encounter when using computers. In this lesson you will learn how to keep yourself and others safe.

Health and safety in the computer lab

It is important that you do not put yourself or others in danger when working with computers, whether at school or at home. Some important safety tips include:

- switch off power points at the wall before connecting or disconnecting any mains electricity cable
- never apply force when connecting or disconnecting a cable or component
- keep your work area tidy – remove any trip hazards, and keep food and drink away from your computer
- do not open the system unit of your computer
- if you lift equipment keep your back straight and lift using your legs
- do not lift heavy equipment on your own
- if in doubt, stop and ask for help.

Figure 1.2.1 *Keep your back straight and your knees bent when lifting equipment*

Take responsibility for safety in the classroom. If you see something you think is a risk, report it to a teacher or a technician.

Ergonomics for good health

Ergonomics is the way work is done so that it suits the needs of the person doing the work. That includes designing tasks, equipment and furniture to suit the individual. It also means using equipment in the correct way.

Using computer equipment and furniture correctly will reduce stress on joints and muscles. It will make injuries such as Repetitive strain injury (RSI) less likely. RSIs can cause pain and make it difficult to use a computer, which can lead to time away from work or school.

Sitting correctly at your computer

The following advice will help you to make sure you are sitting correctly at the computer:

1. Adjust the height of your chair so your feet are flat on the ground. The angle of your knee and hip joints should be about 90°.
2. Keep your back straight and your shoulders relaxed.
3. Hold your elbows close to your body, at an angle of 90°.
4. Keep your wrists in line with your arms.

5. Use a wrist rest and footrest if you need to.
6. The top of your monitor should be level with your eyes, and an arm's length away.

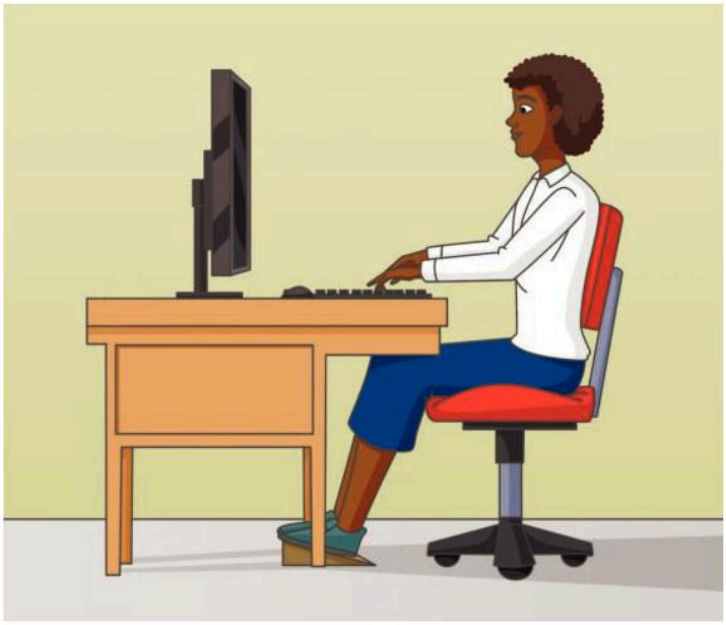


Figure 1.2.2 *Reduce strain on muscles and joints by adopting the correct posture*

Protecting the environment

Many ***non-renewable resources*** like gold and copper are used to make computers. Energy and resources are consumed in the manufacturing process. Old computers that are replaced become ***non-biodegradable waste***.

You can protect the environment by using and disposing of computer equipment responsibly. Use a specialist company to dispose of unwanted equipment. They will ***recycle*** and reuse parts of the equipment and make sure that poisonous substances are not released into the environment.

You can also reduce your computer's impact on the environment in the following ways:

- turn your computer off when you have finished using it
- do not print documents unless you really need to
- donate equipment to a charity who will find a new owner
- recycle ***laser printer*** cartridges. They are made mainly of non-biodegradable plastic. More than 350 million are thrown away each year, though 97 per cent of the material can be reused.

Find out more

Discarded computer equipment is known as e-waste. It is becoming a serious problem. Use the Internet to search and find how e-waste is being dealt with in your country/region.

Activity

Create a poster to promote safety in the computer lab. Use the health and safety tips in this lesson. Use the Internet to search for suitable accompanying images.

Unit 2 2.1 What is a computer?

In this lesson you will learn how computer systems are used to process information.

The basics of computer systems

In this unit you will learn about the components that make up a computer system, and how those components fit together. You will learn how computers have developed into the different types of computer used by individuals and organizations in the modern world.

Processing information

A computer is an electronic device that helps us to process information. Processing information means taking ***data*** and turning it into ***information***. Data is a disorganized set of facts and figures. Information is data that has been processed in some way to make it more useful.

Here are two examples:

1. Sorting words and their meanings into alphabetical order turns a disorganized collection of data into a dictionary. It is now easier to look for the meaning of a particular word.
2. A manager organizes data on accidents that occur in a factory. Accident rates can be calculated according to the different types of job and the machines being used. The manager can now introduce safety measures to reduce the number of accidents.

Figure 2.1.1 *Computers help us to quickly process data into information*

These tasks could be done without using a computer. People used to sort lists into alphabetical order and work out averages long before computers were invented. However, using a computer allows us to process more data more quickly.

The most important part of a computer is its ***processor***. Modern computer processors are very small. They are called ***microprocessors***. A microprocessor is so small it would fit on your fingernail. The microprocessor is the engine that drives every computer. You can also think of it as the brain of a computer.

Computer systems

A microprocessor is the brain of a computer, but it is not very useful on its own. The microprocessor only becomes useful when it is part of a larger system. We call this a ***computer system***.

A computer system must be able to:

- capture data from the outside world
- store the data until it is needed
- process the data, for example by organizing it or performing calculations to create information

- retrieve the right information when needed by the user
- output information in a useful form.

A computer system uses ***input devices*** to capture data from the outside world. It has ***output devices*** so that we can see the results of the computer's work. It has ***storage devices*** to save data until it is needed. At the centre of the computer system is a processor. The processor organizes data and carries out calculations.

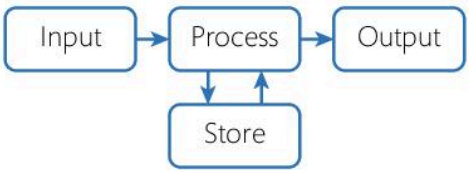


Figure 2.1.2 *A computer system relies on inputs and produces output, and stores data during the process*

Figure 2.1.3 *The various devices that make up a computer system are called computer hardware*

Activity

Look at figure 2.1.3. Identify two devices used to input information into the computer and two devices that output information to the person using the computer system.

Computer software

A computer cannot work independently; it needs instructions. The instructions a computer follows come from computer programs. A computer uses different programs for different jobs. For example, a ***word processor*** is a program used to create documents. A graphics program is used to create ***images***. Other programs control printing and make sure data is saved correctly.

Different programs are used to instruct a computer to do many different tasks. This makes the computer a powerful and flexible tool. The programs used to control the work of a computer are called ***software***.

A computer system uses ***hardware*** and software together to process data into information.

Did you know...?

A computer system uses different parts to carry out these tasks. The parts of a computer system are called devices.

Activity

Name three tasks you use computers for, either at home or at school. Give examples of software you use.

Unit 2 2.2 Types of computer

Computers vary in size, power and in cost. In this lesson you will learn about the different types of computer and what they are used for.

Personal computers

Personal computers (PCs) are designed to be used by individuals to help in their work or learning. There are different types of personal computer.

Figure 2.2.1 Laptops, smartphones and tablets have a variety of uses and functions

Desktop computers are used in offices, schools and the home. They are used for tasks like ***word processing***, ***email***, and playing games. The processor is stored in a metal case often kept on a desk. Storage devices like disk drives are also stored in the case.

Input and output devices are separate components attached with cables: devices can be chosen to suit the needs of individual users. For example, a person with disabilities can replace the ***keyboard*** with a special ***input device***.

Laptop computers are as powerful as desktop computers and are used for the same tasks.

The base of the case holds the processor, keyboard, storage devices, and a trackpad. The lid holds a screen. A laptop also has a built-in camera, ***microphone***, and speakers. A battery allows the laptop to be used without being plugged into an electrical supply. It is easy to carry around and can be used almost anywhere. The cost of a laptop computer is about the same as a desktop.

Figure 2.2.2 A touchscreen is an input and an output device combined.

Tablet computers have all their components built into a thin lightweight case. A tablet uses a touchscreen. A keyboard is displayed on screen when you want to enter text. There is no need for a mouse. You can start and control programs by tapping and sliding a finger across the screen.

Tablets are not as powerful as desktop computers, but they are lighter, smaller, cheaper and more portable. A modern ***smartphone*** is a small tablet computer.

Other types of computer

Supercomputers

The most powerful computers are called ***supercomputers***. They are built to process vast amounts of data at very high speeds. NASA uses a supercomputer to plan and control its space missions. Meteorological agencies use supercomputers to predict the weather and track the build-up of hurricanes.

Figure 2.2.3 *Supercomputers are used for important scientific, financial, and government work*

Did you know...?

Summit is a supercomputer built for Oak Ridge National Laboratory in the USA. If you were to carry out one calculation per second, it would take you over 6 billion years to do the work Summit can do in just one second.

Supercomputers are very expensive, costing as much as $100 million to build. Special air-conditioned rooms are built for super computers. A room for a large supercomputer is as big as two tennis courts.

Mainframe computers

There are some processes that a business relies on. The process must be available all the time. For example, an Internet shopping site depends on its online ordering system.

Mainframe computers are used to run this type of system. Mainframes are kept in special rooms and have large amounts of storage. The work done is usually quite simple, so it does not have to be as powerful as a supercomputer. It must be reliable and available 24 hours a day.

Activity

Create a computer fact card for one of the other computers covered in this lesson. You will need to search the Internet for a picture and a fact, and decide on star ratings for each of the categories. When you have finished trade your card with others in your class to collect a full set.

Computer fact card: Desktop

Power	★★☆☆☆
Size	★★☆☆☆
Cost	★★☆☆☆
Number of users	★☆☆☆☆
Portability	★★☆☆☆

Fact: The first computer mouse was invented in 1964 by Douglas C. Engelbart. It was made of wood. It was 20 years before his invention was used on a desktop.

Unit 2 2.3 Computer hardware

In this lesson you will learn about the physical components that make up a working computer system. This is called the computer hardware.

The processor

The processor is at the centre of a computer system. Modern computer processors are very small. They are called microprocessors. A microprocessor is a powerful device. It can create 3D games that look like real life, and can be used in devices that fly real spacecraft.

The basic component inside a microprocessor is a switch. Like the switches around your house, switches in a computer can either be on or off. There are millions of microscopic switches inside a microprocessor. They are turned on and off by electronic signals.

Each time the switches inside the processor change, an instruction is carried out. The switches change several million times every second. Processing speed is what makes a computer so powerful.

The electronic signals used by a computer processor are called ***digital data***. A computer is a ***digital device***.

Did you know...?

The world's first portable computer was the Osborne 1. It was released in 1981. The Osborne 1 was the first computer to have a keyboard, screen and storage devices built into a single case.

The Osborne 1 had a tiny 5-inch screen and weighed 11 kg, but could easily be moved around and transported in a car or plane.

The Osborne company was a failure, but its revolutionary design inspired other companies to develop the laptop computers that are so popular today.

Input devices

Input devices are used to capture data from the real world so that it can be processed by a computer. Input devices convert data into digital data. Examples of input devices include:

- **keyboard:** turns the letters and numbers you type into digital data
- **mouse:** turns its movement into digital data
- **webcam** or ***digital camera*:** turns a picture into digital data
- **microphone:** turns sound into digital data.

Output devices

Output devices turn the digital data used by the processor into a format we can use. Examples of output devices include:

- **monitor** or **screen:** turns digital data into a visual display
- **printer:** turns digital data into a printed document
- **speakers:** turns digital data into sound.

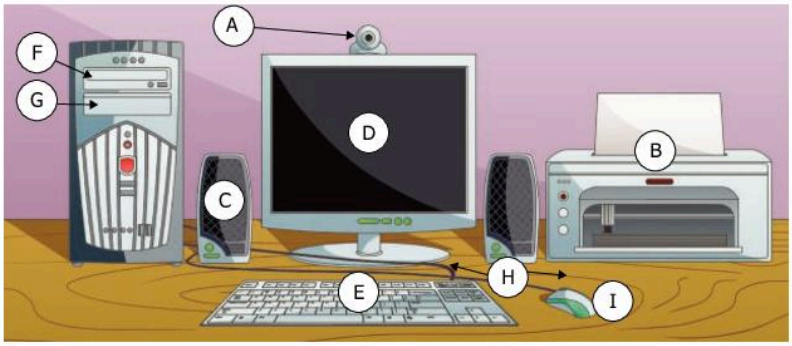
Storage devices

Storage devices are the memory of a computer. The digital data in the processor is lost when you close your work or switch your computer off. Storage devices save your work so that you can use it

again. Work is saved to a storage device as digital data. It is not in a form that people can read. Examples of storage devices include:

- **hard disk**: saves your work between lessons
- **optical drive**: can read data stored on DVDs and CDs
- **USB flash memory stick**: saves work so it can be transferred from one computer to another.

Activity



Name the components (A to I) shown in the diagram.

How hardware connects

Input, output and storage devices are called ***peripherals***. Peripheral means 'around the outside'. The image in the activity above shows peripherals around the outside of the processor. Peripherals are connected to the processor by ***cables***. The cables carry electronic signals between the processor and the peripheral.

Some peripherals are built into the computer case. In a laptop computer, the keyboard, screen and disk drive are built into a single case which is easy to carry around. Sometimes peripherals are ***wireless***. That means the signals are not sent along wires, they are sent through the air using ***radio waves***. An example is a wireless mouse.

Find out more

One of the newest types of printer is the 3D printer. What is a 3D printer used for and what does it look like? What materials does it use to create its prints?

Activity

Create a document called 'Computer hardware'. Add a title page and three ***headings***: Input, Output, and Storage. List the hardware items mentioned in this lesson under the appropriate heading and add a brief description of the device.

Search the Internet to find an image and at least one interesting fact about the device. Divide the work equally among your team members.

Unit 2 2.4 Computer software

Computer hardware consists of the physical objects that make up a computer system. A computer only becomes a useful tool when hardware and software are working together.

What is software?

Software is the name given to the instructions that tell a computer what to do. The instructions are ***grouped*** together in ***files*** called programs. A ***computer program*** is a set of instructions that work together to do a job.

An example of a computer program is a word processor. A word processor is designed to allow us to create documents. A word processor was used to create this book.

A computer program contains many instructions. For example, in a word processor program there is an instruction to underline text or make it **bold**. There are many thousands of small instructions in every program.

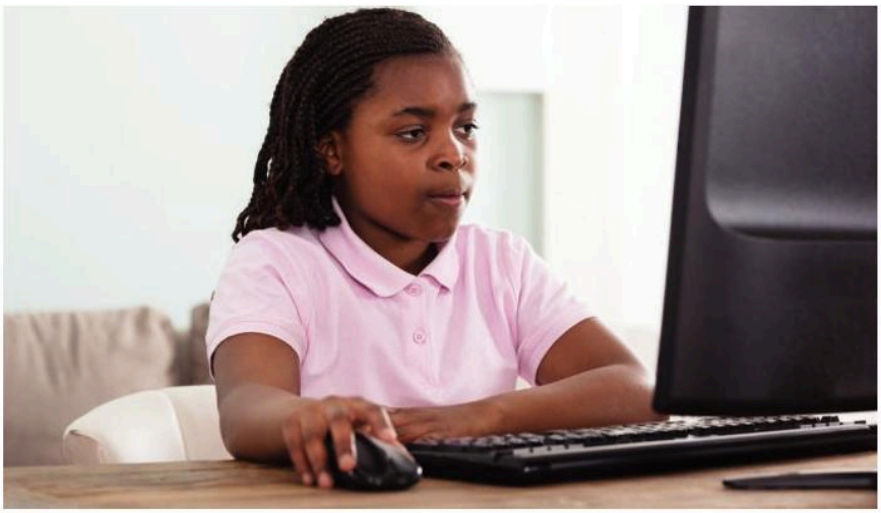


Figure 2.4.1 *We use software to give instructions to the computer*

Types of software

The two main types of software are called ***system software*** and ***application software***.

System software makes the hardware in your computer system work. For example, when you move your mouse, a cursor moves on your screen. When you type letters on your keyboard, they appear on your screen. It is system software that controls these actions.

System software:

- controls input to the computer from your keyboard and mouse
- controls output to your computer screen and printer
- allows you to save your work.

System software is usually installed on a computer when you buy it. Most of the system software programs you use are part of your computer ***operating system***. Microsoft Windows is an example of an operating system. An operating system is a collection of system software that lets you give instructions to your computer. Other operating systems you may have used include iOS on Apple computers and Android on tablets and smartphones.

Figure 2.4.2 *iOS and Android are popular smartphone operating systems*

Applications software is designed to help a person use a computer system to do work. A word processor helps you to create documents. If you need to work with numbers and do calculations, you use a ***software application*** called a ***spreadsheet***. When you need to find information on the Internet, you use a ***web browser***.

Applications software:

- is written to help you to do your work
- uses system software to communicate with computer hardware.

How software is created

Software programs are made by computer programmers. ***Programmers*** use a set of application and system software to create programs that other people can use. Software companies design software to be flexible so that it is useful to as many people and organizations as possible.

Sometimes a large organization might need software to do a job that is particular to their business. The company employs programmers to write software especially for that task.

Talk about

What application software have you used? What did you use it for? Do you have a favourite application?

Activity

What does a computer programmer do? Search the web to find out more about the work of a computer programmer. What qualifications do you need to be a computer programmer? Make notes on any key facts you discover.

Software and hardware

A computer system includes both hardware and software. These two components of a computer system need each other. Hardware needs instructions to do its work. The instructions it needs are contained in software programs. Software needs hardware to do its work. Hardware turns instructions in a software program into actions in the real world. This is called ***interdependency***.

Unit 2 2.5 Development of computers

Throughout history people have invented devices to help with calculations. In this lesson you will learn about the development of calculating machines.

Figure 2.5.1 *Valve computers were very large and created a lot of heat, so air-conditioned rooms were built to house them*

Early calculators

Mechanical calculators were developed as long ago as the 17th century. These were not computers as we know them today, but they provided important lessons for the computer scientists who came later.

- Blaise Pascal was 19 when he invented the 'Pascaline' in 1642. He invented it to help his father to calculate taxes. The Pascaline only performed addition.
- Gottfried Leibniz invented the 'Stepped Reckoner' in 1672. It could perform addition, subtraction, multiplication and division.
- Charles Babbage invented the 'Calculating and Analytical Engines' in the 19th century. Both engines were powered by steam so they would work faster than other calculators. The machines could also be programmed, but they were so complicated that they could not be built.
- Herman Hollerith invented his electrical 'tabulating machine' in the 1880s. The machine reduced the time it took to process the US population census from eight years to one year. Hollerith called his company International Business Machines (IBM). Years later, IBM became an important computer manufacturer.

Electronic computers

The first 'true' computers were developed in the 1940s. True computers are electronic devices that can be programmed to carry out different tasks.

Did you know...?

One of the earliest computers was called Colossus. It was built in 1942 in the UK during the Second World War. It was used to break secret code signals. Colossus contained 2,400 valves, 7 km of cable and weighed 5 tonnes.

Figure 2.5.2 *Early computers were too large and expensive for home users*

Valves and transistors

The first electronic computers were built in the 1940s using ***valves*** (also called ***vacuum tubes***). A valve looks like an electric lightbulb. It acts like a switch and can turn the flow of electricity on and off. Valves can be used to represent ***binary*** numbers in computers (off = 0, on = 1).

Transistors replaced valves in the 1950s. A transistor does the same work as a valve but generates less heat. Computers made with transistors were smaller and more reliable than valve computers. Transistors were available to a few organizations, but they needed specialist technical support.

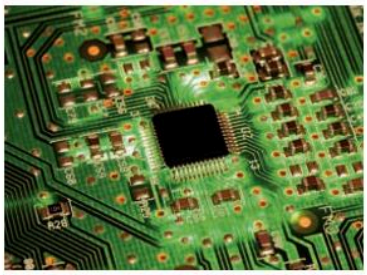


Figure 2.5.3 *Computers using integrated circuits were developed in the 1970s*

Integrated circuits

An ***integrated circuit*** is a slip of silicon that holds millions of microscopic transistors. It is usually called a silicon chip. As integrated circuits became faster and more powerful, all the processing power of a computer could be built on a single chip called a ***microprocessor***. Microprocessors are used to build smaller portable computers like laptops and tablets.

Parallel processing

More computer power is generated when several microprocessors work together. This is called ***parallel processing***. The extra computing power is being used to develop computers that can learn and act with independence. This is called ***artificial intelligence (AI)***. Processors have continued to get smaller. This allows embedded microprocessors to be used in many more devices.

Did you know...?

In 2015, scientists at Michigan University created Michigan Micro Mote, the world's smallest computer. The Mote measures 2 mm × 2 mm × 4 mm. That's the size of a grain of rice! The Mote is being used in medical implants and in driverless cars.

Activity

There have been many major developments in the history of computers. With each development computers have become smaller, faster, and more powerful.

Use the web to research key developments in computers from 1940 to today. Create a timeline to present your findings. Include information that shows the trend to increasing power and decreasing size of computers over time.

Unit 2 2.6 How computers are changing our lives

In this section you will learn how computers are changing the way we live our lives at home and at work.

Computers in the home

Household devices

Computing power is added to household devices. In the kitchen, computer processors control washing machines, ***microwave*** ovens, and even toasters. Computer powered household devices help us do housework quicker and better than before.

Robot vacuum cleaners can patrol your house while you are out. They move around without human control, sweeping up dust. They even find a power point to charge their own batteries when they run flat.

Figure 2.6.1 *Robot vacuum cleaner*

Smart devices have computer power and are also connected to the Internet. A smart refrigerator warns us if food is out of date. You can check what is in your smart refrigerator using your smartphone while you are at the supermarket. A smart fridge can email you a shopping list when items run low.

The car

A modern car can have as many as 60 computer processors. Each processor does a special job. For example, one microprocessor will manage how the car uses fuel. Others will operate the car radio or apply emergency brakes if the car gets too close to another vehicle. The car is made easier and safer to drive.

Robot cars are being developed. A robot car will not need a human driver. They are called ***autonomous vehicles***.

Computers at work

In lesson 5.1 you will learn how computers and the Internet have changed the way office work is done. But technology is bringing change to many other types of work.

Doctors

Doctors diagnose illnesses using machines that contain computer processors. A magnetic resonance imaging (MRI) scanner creates a 3D picture of the inside of a patient. A doctor can use the picture to see problems.

When an illness is diagnosed, robotic medical instruments allow doctors to carry out delicate surgery they could not do with their own hands.

Technology helps patients to recover after treatment. Patient-monitoring systems check blood pressure, temperature, and pulse rate. Nurses get an early warning if a patient needs attention.

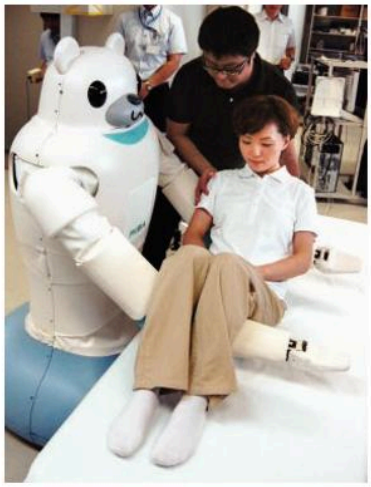


Figure 2.6.2 *Robot nurses have been developed to help nurses lift and move patients*

Manufacturing

A modern factory is full of technology. ***Robots*** are used to assemble cars. A car is moved automatically from one part of the factory to another. At each stop, robots complete work on part of the car.

Robots are used to manufacture many other goods. They are used for simple, repetitive jobs. Robots are also used to do jobs that are dangerous for humans. For example, the police use robots to investigate packages that might contain explosives.

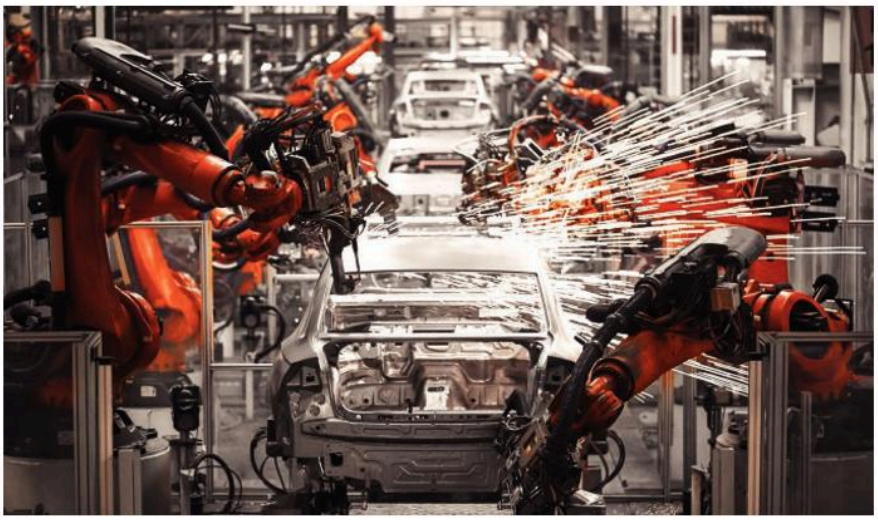


Figure 2.6.3 *Robots do work that used to be done by humans*

Retail

Many people now use the Internet to do their shopping. High street stores have set up Internet sites where people can buy goods. Some retailers do not have physical shops at all. They only sell online.

Orders made on the Internet are processed quickly by computer systems and robots. Some stores even have robot vehicles that can deliver packages without needing a delivery driver. Some people worry about the effect Internet shopping has on jobs in town centres.

Activity

Robots have become very important in industries that make cars and electrical equipment. Some people say that as many as 800 million jobs worldwide will be replaced by robots by 2030. Try to think of some jobs that robots will not be able to do.

2.7 The computer desktop

In this lesson you will investigate the desktop, which is the display that you see first when you start using the computer.

When you start up your computer, the first thing you see is the ***desktop***. The desktop is designed to make it easy for you to use the software applications on your computer so that you can do your work. Any system that helps you use your computer is called a ***user interface***.

Although there are different kinds of user interface, most modern personal computer systems work in much the same way.

Figure 2.7.1 *The main screen when you begin work is called the desktop*

Icons

On the desktop there will be some small images called ***icons***. Icons are used to show the different items that are stored on your computer. You will see icons that represent:

- ***software applications*** that you can use, like a word processor or a game
- ***computer files***, used to store work that you do on the computer. A file might contain a homework assignment you have completed or a picture you took of your family on holiday
- ***folders***, which are containers you can make on a computer to store files in. You use folders to store your work neatly. For example, you might make one folder to hold your science assignments and another to store your maths homework.

The icons in this picture represent four different software applications:

- Microsoft Word
- Microsoft Paint
- Microsoft PowerPoint
- Google Chrome.

Figure 2.7.2 *Software application icons*

There are several ways you can recognize an icon and understand what it shows.

1. The icon uses an image. You will learn to recognize the icons that you use most often simply from the image.
2. There is a label underneath the icon giving you more information.
3. If you point your mouse at the icon and hold it still, a box with more information about the icon pops up.

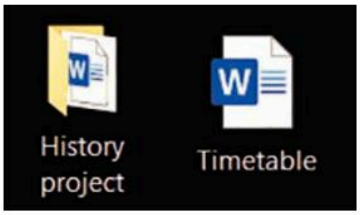


Figure 2.7.3 *Folder and file icons*

Figure 2.7.3 shows two icons. One shows a file, the other shows a folder. The icons have labels just like the software application icons. You give a file or a folder a name when you create it. That name is used as the label for the icon.

Icons

At the bottom of the home page is the ***taskbar***. It is the black bar with small icons on it. The taskbar has two purposes:

1. It contains icons for software applications you use regularly – like the desktop.
2. It shows you the documents you are currently working on. For example, if you leave a document open in which you are writing a letter, you can use the taskbar to get back to your document.

In the bottom left-hand corner is the ***Start button***. From this button you can start any software which is available on your computer.

Activity

Look at the desktop on the computer you are using. Your computer will have different applications and icons to those shown in the example.

1. What picture, colour or design does the desktop show?
2. What icons are there on the desktop? Describe and name three of them.
3. Can you find the taskbar and Start button?

2.8 Using your keyboard and mouse

In this lesson you will learn how a mouse and keyboard are used together to control your computer.

Figure 2.8.1 The mouse makes it easy and quick to operate a computer

In lesson 2.7 you looked at the computer desktop. The desktop is part of your computer's ***graphical user interface (GUI)***. A graphical user interface is designed to be used with a ***mouse***.

The mouse is a simple device. It has two buttons called the left button and right button. Between the buttons is a wheel that rolls backward and forward. On the base is a laser light or a wheel that detects how the mouse moves across your desk. The mouse is connected to your computer using a cable or by a ***wireless connection***.

How a mouse works

A mouse only has two buttons and a wheel. There are only a few things you can do with a mouse:

Figure 2.8.2 When you learn how to control your mouse you will be able to control your computer

Move	As you move your mouse an arrow moves on screen. The arrow is called the pointer.
Click	Press the mouse button until you hear it 'click', then release it straight away. You can click the left button or right button.
Double-click	Click the mouse button twice – one after the other. This only works with the left button.
Click and hold	Click the left mouse button and hold it down. This is used to select objects on screen and move them to a new position, sometimes called 'drag and drop'.

How to hold your mouse

Using your mouse is easier if you hold it properly. Rest your hand lightly on the mouse with your index finger on the left button and your middle finger on the right button. If you are left-handed, your middle finger will be on the left button.

Figure 2.8.3 Holding a mouse correctly will provide greater control and may help to avoid RSIs

Keyboard layout

Having good mouse skills will help you to control your computer. To do useful work on the computer you also need to use the computer ***keyboard***.

The computer keyboard is an ***input device***. The keyboard allows you to send commands to the computer and to type text into documents. The standard keyboard is called the ***QWERTY*** (pronounced kwer-tee) keyboard. The name comes from the first six letter keys on the keyboard.

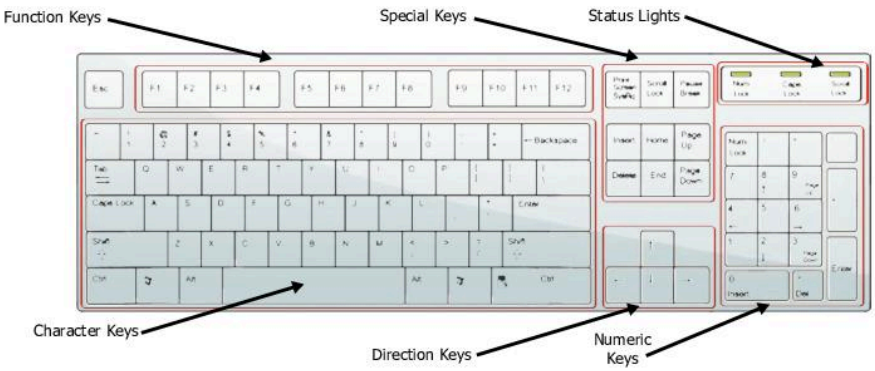


Figure 2.8.4 *The keys on your keyboard are arranged in groups*

Character keys: This is the most important set of keys. You use the keys in this block to input data into your computer. You can type letters, numbers, and punctuation characters using the keys in this block.

Function keys, Direction keys and the **Numeric keypad:** The keys in these blocks are designed for special purposes. With a few exceptions, you won't need to use them much. For now, make sure you can find them on your keyboard. If you are using a laptop, these keys may be arranged differently, combined with other keys, or not included at all.

The most important block of keys is the character block. These are the keys you will use most of the time. The next activity will help you learn a little more about the character keys.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 2.8. The exercises in the file will help you learn more about the character keys on your keyboard. Complete the exercises in the file to practise using your mouse.

Find out more

QWERTY isn't the only type of keyboard available. One alternative is the Dvorak keyboard. What is a Dvorak keyboard and how does it compare to a standard QWERTY keyboard?

2.9 Editing a document

In this lesson you will learn how to use your keyboard to enter text into a document.

How to sit at your computer

You learned in lesson 1.2 that it is important to sit correctly at your computer to avoid injury. It is also important to have your hands in the correct position to avoid damage to your wrists.

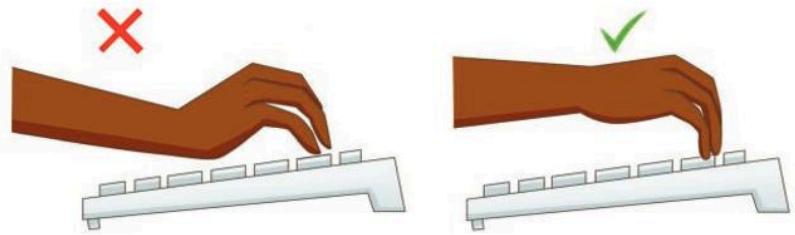


Figure 2.9.1 *You can help avoid RSIs by adopting the correct hand position*

Raise your palms so that your hands are not resting on anything. Hold your hands at a 10 to 30-degree angle when typing. Too great an angle in your wrist causes stress and may lead to ***carpal tunnel syndrome***.

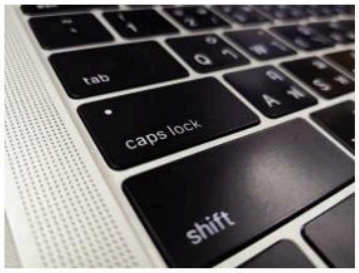


Figure 2.9.2 *The Shift and Caps Lock keys*

Entering text

The letter keys are arranged in a three-row block in the centre of your keyboard. The QWERTY layout may seem a little unusual at first. The more practice you have, the faster your typing will become.

Position your index fingers over the F and J keys so that you can see G and H between your fingertips. Use your left hand to press keys on the left of the keyboard. Use your right hand for keys on the right.

When you type a letter key, the letter appears on your screen in ***lowercase***. For example, as a 't' not a 'T'.

To get ***uppercase (capital)*** letters, hold down the ***Shift key*** while you press a letter. The Shift key is marked with an up arrow or the word 'Shift'. There are two Shift keys on your keyboard: one on the right and another on the left.

Above the Shift key on the left of the keyboard is the ***Caps Lock*** key. If you press Caps Lock, the letters you type all appear in uppercase until you press Caps Lock again. There is a light either on the key or elsewhere on the keyboard to remind you that Caps Lock is on.

Entering numbers

You can type numbers using the row of keys above the letters. There is another block of numbers in a block on the right of your keyboard.

Entering punctuation

Punctuation characters like the full stop and question mark are positioned around the edges of the keyboard. Most keys have two characters on them. For example, the 5 key has '%' above it. If you hold the Shift key and press the 5 key you get a % symbol.

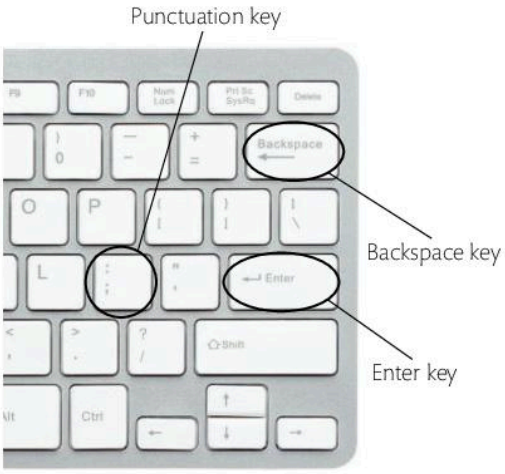


Figure 2.9.3 *More keys*

Enter key and spacebar

When you get to the end of a word you are typing, use the ***spacebar*** before you begin the next word. The spacebar is the length of several letter keys, and is in the middle of the bottom row of keys.

When you come to the end of a ***paragraph***, use the ***Enter key*** to start a new paragraph. While you are typing a paragraph your word processor will move automatically to a new line when the one you are typing is full. You do not need to press Enter at the end of every line.

If you make a mistake

You will make mistakes as you type. If you want to correct an error you can:

- use your mouse to position the cursor to the right of the error
- use the **backspace** key to erase the error. Backspace deletes the character to the left of the cursor.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 2.9 and complete the exercises. They will help you improve your keyboard skills.

Unit 2 2.10 Saving and printing a document

In this lesson you will learn more about your keyboard. You will also learn how to save and print your work.

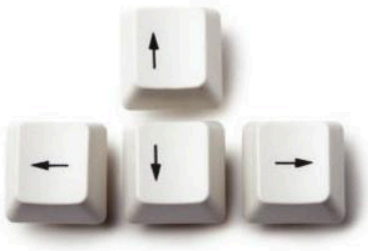


Figure 2.10.1 Cursor keys

Cursor keys

In lesson 2.8 you learned how to move your cursor around the screen using a mouse. When you are using a keyboard, it is sometimes easier to use the ***cursor keys*** to move around. The cursor moves in the direction of the arrow on a cursor key.

Scrolling

When you create or edit large documents you will notice that only part of the document is shown on screen at any time. The way to move around a big document is to use the ***scroll bar***. The scroll bar is on the right of the window.

Inside the scroll bar is a rectangle called the scroll box. If you drag the scroll box up and down, your document will scroll inside the window. You can make the document scroll one line at a time by clicking on the scroll arrows at the top and bottom of the scroll bar.

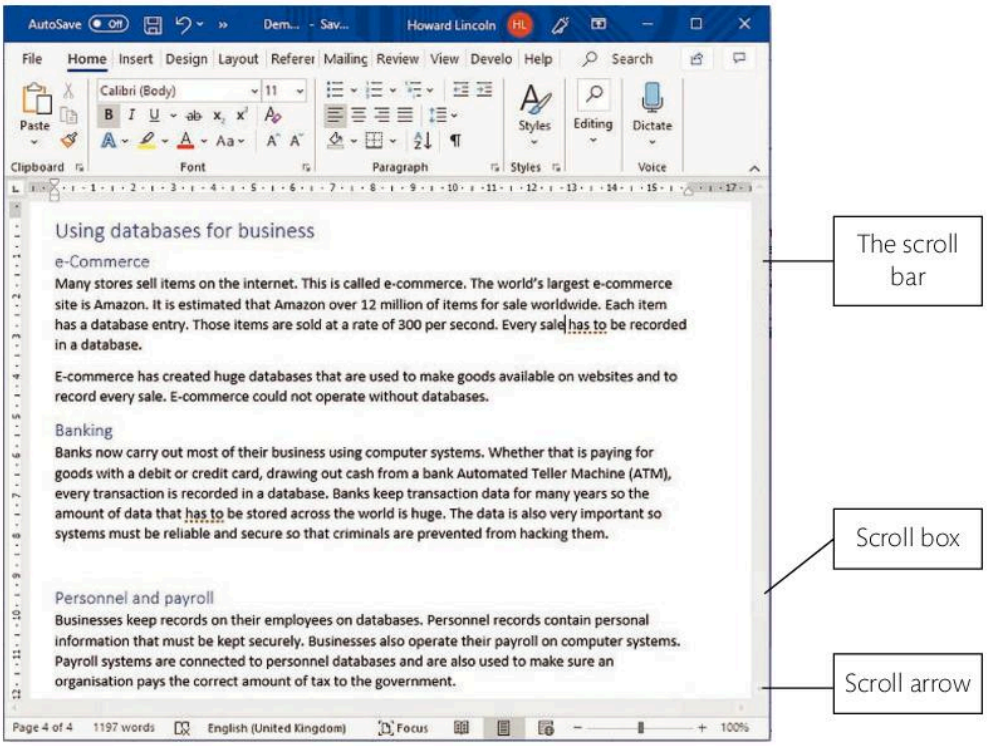


Figure 2.10.2 Scrolling through a document helps you to find the information you need

Control keys

The ***Control key*** usually has 'Ctrl' written on it. Pressing the Control key at the same time as a letter key makes the computer carry out some useful functions. A function that will be useful to you in this unit is called ***Undo***.

If you hold down Ctrl and type Z at the same time, you will undo the last thing you did on the computer. This is a very useful function if you make any sort of mistake when you are word processing: just type Ctrl + Z. The mistake will be undone as if it never happened.

Saving

When you are using a software application, your work exists in electronic form. When you exit the application, your work will be lost unless you save it. Before you exit an application or turn your computer off, you must save the file you have been working on.

Hold down the Ctrl key and press the S key at the same time: Ctrl + S. Your edited file is now saved.

The process of saving is more complicated if you are saving a file you have just created. You will need to give a name for the file and tell your computer where the file should be saved. This information will depend on how the computers in your school have been set up. Your teacher will give you the information you need.

Printing

If you are told to print your work, you can use a Control command: Ctrl + P. This will print your document.

When you send the command print, a pop-up box will appear on your screen. You will have to answer a few questions in the box before you print. The answers you give will depend on how the printers in your school are set up. Your teacher will give you the information you need.

Do not print pages unless you need to or are told to by your teacher. It wastes resources and costs your school money.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 2.10. You will complete exercises to help you develop your keyboard skills further and to learn how to move the cursor around a document.

Did you know...?

You can use 'Save as' to make a copy of any file you are working on. 'Save as' creates a new copy of your file. When you give it a new file name, the original file is unchanged. This is a good way to use an existing document as the starting point for a new piece of work.

Did you know...?

When you print a document, you can use custom print settings to print only the pages you need. Enter the page numbers for the pages you want to print, separated by commas, e.g. 1,4,6.

Unit 3 3.1 The technology of communication

In this lesson you will learn about how technology is used for data communication.

Computers and communication

In this unit you will learn how joining computers together in networks helps you to communicate. You will learn how we use the Internet to find information and communicate using email.

The data inside a computer is ***digital data***. Digital means data is stored electronically, as numbers.

Digital data can be sent between computers. This is called data communication. Data communication means computers can share:

- files, like documents, images, and music
- programs
- messages.

When data transmission takes place there must always be a:

transmitting device. This can be the computer you use to send an email or a mobile phone you use to send a text message.

receiving device. This can also be a computer or phone, but could also be a digital radio receiver, for example.

transmission medium, i.e. a way to send the message. This might be along a cable or by a wireless connection.

Data transmission

When you listen to the radio, you are receiving data from a radio station. Here is an example that describes what happens when data transmission takes place:

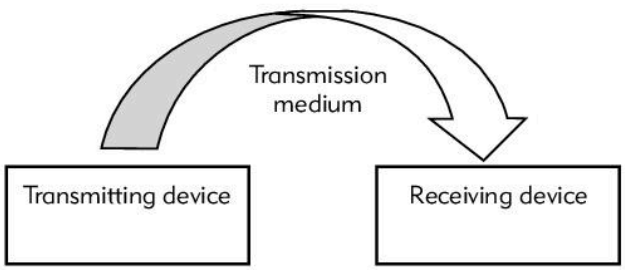


Figure 3.1.1 Data transmission

1. A DJ talks into a microphone.
2. The microphone turns the sound of the DJ's voice into electronic signals.
3. A radio transmitter converts the electric signals into ***radio waves*** and sends them through the air.
4. Your radio receiver picks up the radio waves and turns them into electronic signals.
5. Finally, your radio turns the electronic signals into sounds that you can hear through a speaker.

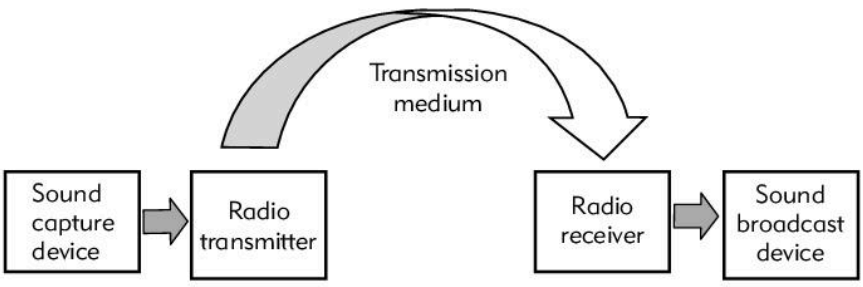


Figure 3.1.2 Radio transmission

Using computers for data transmission

When a message is sent between two computers, the same components and processes in the radio example are used. In this example, David types a message into his computer and sends it to his friend Mary:

1. David uses a keyboard to input his message.
2. David's computer converts the input into digital data.
3. A device called a ***modem*** converts the digital data into a form that can be sent along cables.
4. A modem attached to Mary's computer receives the signal and converts it into digital data.
5. Mary reads the message, which is output to her computer screen.

David types a message	Message converted	Data transmission	Message converted	Mary read the message
Input device	Modem		Modem	Output device

Figure 3.1.3 *Data transmission*

Routers and modems

A modem is used to convert digital data into a form that can be sent over cables. What the model describes is how data is sent over the Internet. To connect to the Internet, you use a device called a ***router***. If you have a home Internet connection you will use a router.

A home router contains three parts:

Wireless connection: allows messages to be sent to the router from any computer in your home.

Router: the router itself makes a connection to the Internet.

Modem: the modem takes data from your computer and converts it to be sent over telephone and ***broadband*** cables. Imagine that your computer uses one language and the cables use another. The modem converts between the two languages, like a translator will convert between English and French.

Activity

In the data transmission example, David sent a text message to Mary. Suppose he had sent a video message. What input devices would he use and what output devices would Mary use? Make a diagram to show the data communication. Add pictures of the devices they use.

3.2 Using computers to communicate

In this lesson you will learn about ways that computers are used to help people communicate.

Data communication has become an important part of our day-to-day lives. At home we use computers and smartphones to keep in touch with family and friends. At work people communicate with colleagues and customers.

The first text message was sent in 1992, just three years after the ***World Wide Web*** was invented. Since then, many methods of communicating by using computers and mobile phones have been developed.

Real-time communication

When you have a face-to-face conversation with a friend you communicate in real time. In real-time conversations you can communicate information quickly and get an immediate reply.

Real-time communication does not have to be face-to-face. Telephones allow us to communicate in real-time with people in other locations. The telephone was invented in 1876 and was the only way to carry out long distance real-time communication for more than 100 years.

The Internet has allowed new methods of real-time communication to be developed. Teleconferencing allows several people in different locations to take part in a real-time conversation. ***Video conferencing*** means that those taking part in a real-time conversations can also see each other, as they would in a face-to-face meeting. ***Web conferencing*** allows people to share software in order to create documents, and make presentations to each other.

The invention of the telephone allowed people in distant locations to talk to each other. The Internet has made it possible for people to work together in real-time as if they were in the same room.

Figure 3.2.1 *Emails can be accessed on a range of devices*

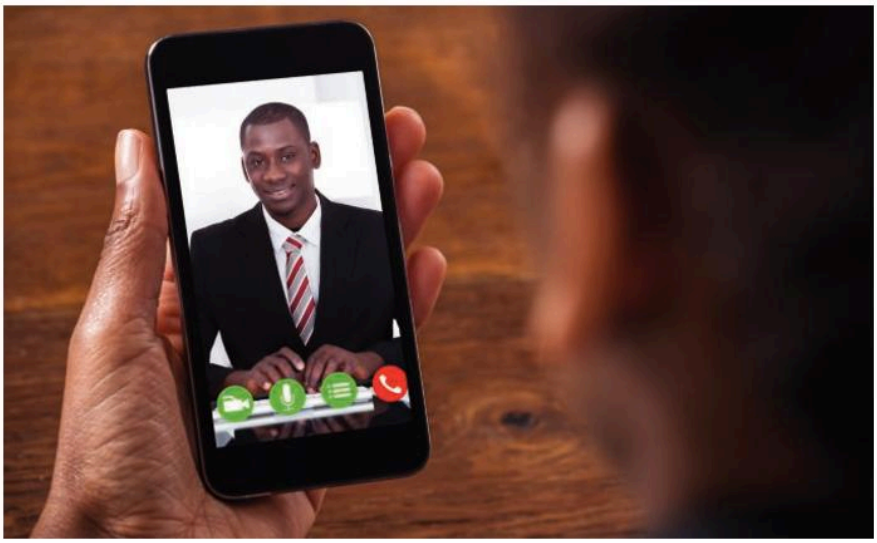


Figure 3.2.2 *Video conferencing allows for face-to-face meetings on the go*

Asynchronous communication

Not all communication takes place in real time. For example, if you send a letter to someone, it takes time to reach its destination and you wait several days for a reply. There is a gap between each step. Another name for real-time communication is synchronous communication. Sending letters is an example of asynchronous communication.

Email is one of the most common methods of communicating by computer. An email is the computer equivalent of a letter. An email is often a long and formal communication, especially when used for a business purpose. Other forms of asynchronous communication take place over the Internet:

- ***Instant messaging (IM)*** allows short, informal messages to be sent between friends and work colleagues. IM is asynchronous and there can be long gaps between replies. Where two people are online at the same time IM is often used in place of a synchronous telephone conversation.
- Emails and instant messages are addressed to individuals or groups of people. Other types of computer communication are shared more widely. ***Newsgroups***, ***bulletin boards***, and ***discussion forums*** share messages among large groups of people. They are normally used for lengthy and detailed conversations over a long period.

Did you know...?

More than 15 million SMS messages are sent every minute of every day worldwide. That does not include messages sent using ***apps*** like Facebook and WhatsApp.

Activity

Make a list of any data communication methods you have used. For each, give an example of a communication you have used the method for. What is your favourite data communication method and what is your least favourite? Say why.

Unit 3 3.3 Computer networks

In this lesson you will learn about how computer networks help us work.

What is a network?

In modern offices and schools, computers are usually connected. When two or more computers are connected, they make a ***computer network***.

What are networks for?

There are many advantages in having a network:

1. Networks help us to communicate with each other. We can send messages and emails using the network.
2. We use networks to share expensive devices like printers.
3. We save files using ***storage drives*** on the network. This means you can use your files on any computer on the network. It is easy to share files with others.

What makes a network?

There are four things needed to make a network:

1. Special ***network devices***. Some devices are needed to send messages and files from one computer to another. Other devices are used to store files and ***software***.
2. ***Cables*** to join the devices together.
3. ***Network software*** to help send instructions to the various devices.
4. **Rules** that let all the parts of a network work together.

Figure 3.3.1 *Networks are managed and maintained by network engineers*

Types of network

There are two main types of network:

- A ***Local area network (LAN)*** joins computers in a single building. A LAN lets people in a single place work together. A school network is an example of a LAN.
- A ***Wide area network (WAN)*** joins computers that are far apart. A company with offices in many cities will use a WAN to let their people work together. The Internet is an example of a WAN.

There are two other types of network you might hear about:

A ***metropolitan area network*** is a kind of WAN, but it only covers a limited area, usually a city. Metropolitan area networks are designed to provide reliable Internet service to local companies and organizations.

A ***Personal Area Network (PAN)*** is a network that is designed to connect all the devices in use by an individual person. A PAN is designed to allow an individual to work with all the devices they use including tablets, smartphones, and wearable devices.

Figure 3.3.2 *Network equipment is stored in special cabinets*

Connecting to a network

Wired connection

A network cable is used to connect a socket in the computer to an identical socket on the wall of a room.

Wireless (Wi-Fi) connection

Networks use a device called a ***Wireless Access Point (WAP)*** to provide ***wireless connection***. If you are close to a WAP you can connect to a network without using a cable. You will usually see WAPs high on a wall or on the ceiling. A place where a wireless signal is available is called a hotspot.

Laptop and tablet computers are usually connected to a network by a wireless connection. ***Desktop computers*** are connected with a cable but can also use wireless.

The Internet

Today nearly every network will connect to the Internet. A connection to the Internet allows emails and other communications to be sent outside the LAN. It can also allow people to work away from the building where the LAN is located and still access files and other services.

Activity

Do you have a network in your school? Look for clues that you have a network. Can you find network sockets in your computer rooms? Can you find a WAP? Try to arrange a tour to see the main network equipment room.

3.4 Finding information on the web

In this lesson you will learn about how to use a browser to find information on the World Wide Web (WWW).

Using the web for learning

You have probably used the **World Wide Web**. The World Wide Web is usually shortened to WWW or the web.

What is a web page?

The information on the WWW appears on web pages. A ***web page*** contains information about a single topic. A web page might be about your favourite singer or a topic you are studying at school.

A web page can contain text, images, video, sound, and ***animations***. These different types of information are called media. A web page usually combines several media formats. We say that web pages are ***multimedia***.

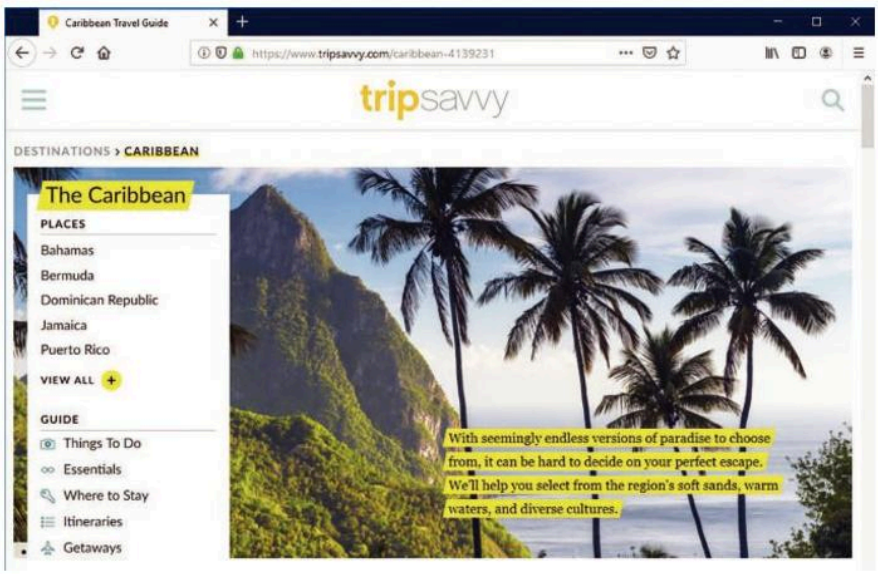


Figure 3.4.1 *Web pages are multimedia*

What is a website?

Web pages are kept together on a ***website***, like pages in a book. A website is owned by a person or organization. Governments, newspapers and TV channels also own websites. Anyone can own a website.

Every web page contains weblinks. A ***weblink*** can be a word, a picture, or a button. Clicking a weblink takes you to another web page. Weblinks are what makes the WWW special. You can follow ***links*** to find new information. This is called ***browsing***.

What is a web browser?

You use special software to browse the Internet. That software is called a ***web browser***. Some popular web browsers are Firefox, Google Chrome and Microsoft Edge.

Searching the web

Search engines

Typing a question into a search engine is a good way to find information on the web. The search engine looks at your question and provides you with a list of web pages. Some of those web pages will contain the information you need.

Tips for searching the web

1. Use a short clear description.

Think about the information you are trying to find before entering your search. Identify the ***keywords*** and use those in your search. You should be able to find information using three to five words.

2. Think about the best order for your keywords.

The most important words should come first.

3. Do not use punctuation or short, common words.

A search question does not need to be written in full. Leave out punctuation marks like commas, full stops, and question marks. You can also leave out short common words like 'and', 'the', and 'a'.

Figure 3.4.2 *You can find information on the web using a search engine*

Your teacher says, "The Nile in Africa is the longest river in the world, but what is the longest river in the Caribbean?"

Most of the words spoken are irrelevant to any search – the keywords you need to search for are: *longest*, *river* and *Caribbean*. If you enter the three keywords into a search engine, you will see a page like this:

Figure 3.4.3 *Google search result*

There will be several listed on the search page. You can look at a few pages and decide which seems to give the best information. Or, now you know the River Cauto is the answer you are looking for, you can search 'River Cauto Cuba' to find more detailed information.

Activity

Web quest – use a search engine to answer these questions:

1. What is Tungurahua, and where is it?
2. What happened at Tungurahua in March 2016?
3. How do you say Tungurahua?

Find a picture and one interesting fact about Tungurahua.

3.5 Sending an email

In this lesson you will learn about how to send an email and how to use email safely.

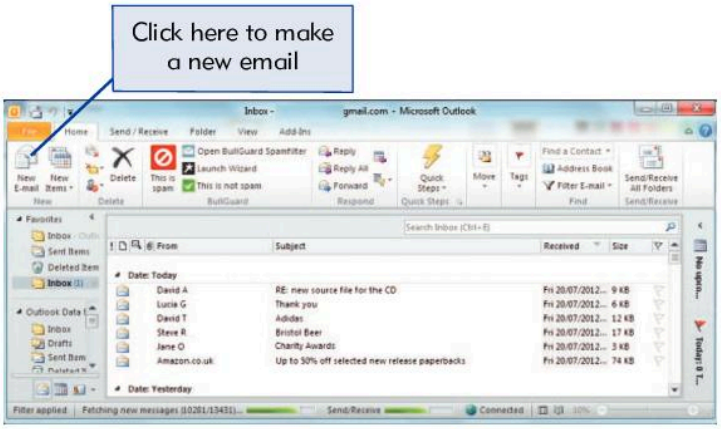


Figure 3.5.1 *One common email program is Outlook*

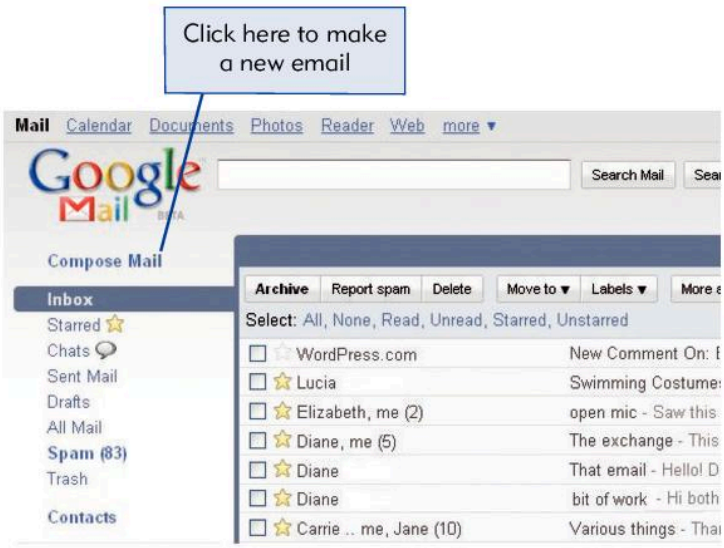


Figure 3.5.2 *An example of a web-based email system*

Email tutorial

The tutorial in this lesson uses examples of email systems. You may use different software, but you should still be able to follow the examples given here.

Before you begin, find out what your ***email address*** is. Your teacher will be able to tell you.

You will send an ***email*** to another classmate, so make sure you know the person you are going to send an email to, and what their email address is. This person is called your 'partner' in the tutorial.

1. Open the email ***application software***. When you open the software, the window may look something like figure 3.5.1. This example shows Microsoft Outlook. You may be using a web-based email application like Gmail (Google Mail), which opens in your Internet browser and looks something like figure 3.5.2.

In either system, you can see the folders that store emails you have sent and received. The contents of the selected folder are displayed in the main window. If this is the first time you have used email, these folders may be empty.

2. Look for the tool bar button called 'Create email' or 'Write new email' or something similar.

3. Click on that button.

A window will open where you can type your email. Whatever system you use, there will be space to type the email address to which you are sending the email, a subject line and a place for the contents of the email.

4. Type your partner's email address in the 'To' ***field***.

5. Type a suitable subject line such as 'Hello there' or 'My first email'.
6. In the ***body*** of the email type a message to your partner.
7. Finish with your name, as you would in a letter.
8. Click the Send button when your email is finished.

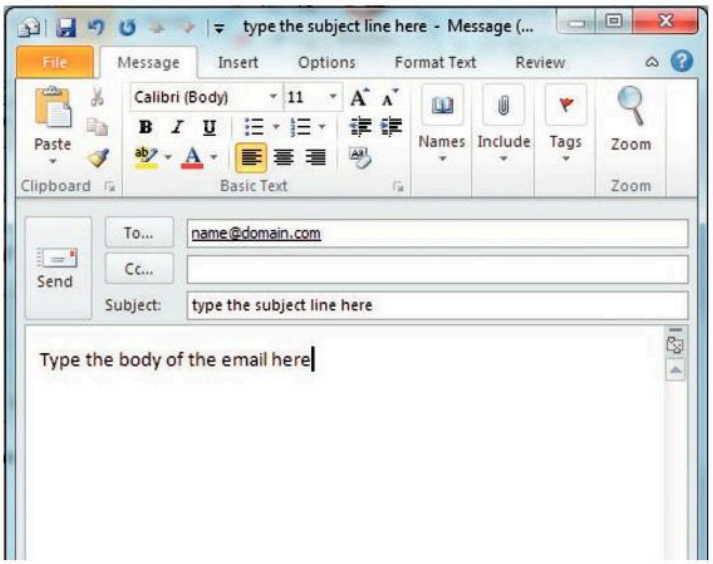


Figure 3.5.3 *Sending an email*

Look out for the email from your partner which will soon arrive in your email inbox. When you receive it, you can reply to the same address or you can forward the email to another address.

There are easy-to-find tools in all email packages that allow you to do these things. Once you have pressed either Reply or Forward, you will see a new email window. You can type new text, enter a new email address (if required) and press Send to send it.

Using email safely

Some important things to remember about using email safely are:

- do not give out your name, address or phone number on the Internet
- remember that people on the Internet might not be who or what they claim to be
- do not post items, especially pictures, that you will regret in years to come
- if someone says a nasty or upsetting thing, you do not have to get involved.

Tell an adult if you are worried about anything you have seen online, and remember you can always close the browser and walk away.

Did you know...?

You must choose a communication tool that best suits your task. Text and instant messages are a good way to chat informally with friends. If you are sending a more formal communication like a job or college application, use email.

Activity

Send your partner an email. Wait for your partner's reply to arrive, then forward this email to your teacher (who will tell you the address to use). When you receive an email from your partner, write a reply so that they can complete the activity.

Unit 4 4.1 What is ethical behaviour?

In this lesson you will learn about the values and ethics that underpin the use of computers.

Computer ethics

In this unit you will learn that it is important to behave responsibly and legally when using computers, particularly when using the Internet. You will learn how to find information on the Internet that you can trust.

In any area of life there are values and rules. These rules include laws. As well as laws, there are principles of behaviour, including good manners and moral standards. We use the word ***ethics*** to describe the standards and rules we use to guide the way we live our lives.

Values and rules apply to the use of computers just as they do to any other area of life. ***Computer ethics*** describes the standards and rules we use to guide our use of computers.

There are some issues and challenges raised by the widespread use of computers:

- The Internet means that computer users can communicate with people in different countries where laws and values are different.
- It is difficult to enforce laws across international boundaries with different police systems.
- New technology provides new ways of doing negative things, like bullying or stealing.
- New technology can make bad actions more damaging – for instance, a fraudulent message can be sent to a million people by email.

Talk about

Discuss in a small group:

1. Why is it important to behave respectfully to others when using computers?
2. What does it mean to act responsibly online?

Make a list of three examples each of responsible and irresponsible online behaviour.

Share your findings with your class.

Copying another person's work

If a person makes an item, they own it and can sell it. People make a living by making and selling things. We know that it is wrong to take items that other people own without paying for them.

Some people make things that are not tangible objects. They might write the lyrics of a song or the words of a book. The creator owns the words and ideas even though they are not physical objects. Digital music, words and video can be copied, and therefore stolen.

It is difficult to stop people copying a design, a song, or an invention. Computers have made this a big problem because computers can be used to make copies of films, songs, poems, photos, and other artistic and scientific products. Illegal copies are also sometimes shared using computer communications.

Plagiarism

Plagiarism means taking the credit for someone else's work. If someone commits plagiarism, they don't just steal another person's work – they also steal the credit for the work too. A plagiarist steals work and then pretends the work is their own.

This is taken very seriously in schools, universities and colleges. Students who commit plagiarism can be removed from their courses. In the workplace, journalists have lost their jobs for plagiarism.

Social responsibility

It is important for everyone to behave responsibly when using computers – especially if they are using the Internet. Here are some good rules to follow:

- Be polite and respectful to both friends and strangers.
- Respect differences in politics, culture, and religion.
- Do not read or distribute offensive text or pictures.
- Respect the privacy of others.
- Treat other people as you would like to be treated.

If you see bad things happening online, then tell a teacher or another adult. If somebody talks to you online in a way that you find upsetting or unsuitable, stop the conversation. If you and others are responsible and careful, using computers can be enjoyable and safe.

Activity

Design a poster to encourage students to behave responsibly when using computers.

Did you know...?

If someone bullies or frightens you on the Internet, it is called ***cyberbullying***. Cyberbullying is wrong and can be very damaging. If you think you are being bullied, report it to an adult that you trust, like a teacher, parent, or other family member. You can read more about cyberbullying and how to stay safe online in Unit 21 of this book.

4.2 Intellectual property rights

In this lesson you will learn about intellectual property and how to give credit when you use content owned by another person.

Intellectual property

The idea of ***intellectual property*** is that you own anything you have created using your mind. Intellectual property applies to:

- written work
- images and artwork
- music
- plans and designs
- computer software.

Intellectual property rights protect the creator of a piece of work from having it stolen or misused by another person. You can only use another person's work if you have permission.

Figure 4.2.1 *Intellectual property applies to all kinds of creative work*

Copyright, trademarks and patents

- ***Copyright©*** means that you have the right to copy your work. Other people must ask your permission before they can use it.
- ***Trade marks™*** are used by a company to protect a ***logo***. The Microsoft logo is an example of a trademark.
- ***Patents℗*** are used to protect new inventions. A patent stops other people from copying an invention and claiming it is theirs.
- Registered design® is used to protect designs like wallpaper and carpet patterns.

Copyright and licensing

Content comes with a ***license*** that allows you to use it. The license will tell you exactly what you can and can't do with the work. For example, sometimes you will be allowed to make changes to a program or image.

Giving credit

If you use another person's content in your own work, you must give the owner credit. You give credit by writing a ***citation***. A citation says who created the work and where you found it.

Information to include in a citation:

1. The name of the person who created the content.
2. The title of the content.
3. The web page you found the content on.
4. The web address for the page.
5. The date the information was written or updated.

You can add the information below the material that you use.

If you find information on the web, use the URL of the page with the name of the website for points 4 and 5 above. If the information is in an article, use the article name for point 2. The ***author*** name and date of publication will often be at the top of an article.

Creative commons

If you want to include images, videos, or music in your work, you should look first at content that has a ***creative commons*** license. You can use a creative commons site such as Wikimedia or add the words 'creative commons' to your search.

Creative commons content is published with a license attached. You will often find a citation or attribution is provided for you to use. You can simply ***cut*** and ***paste*** (see lesson 7.3) this into your work.

Figure 4.2.2 *Creative commons sites will often show you the information you should include in a citation*

Activity

Search the web for an article on climate change or an endangered species. Look for an example of an article published on a major news site – a major newspaper or TV channel website, for example. Take a quote from the article and write a citation for the quote, gathering as much information as you can.

Unit 4 4.3 Finding reliable information

In this lesson you will learn how to check that the information you find when researching on the web is reliable.

When you search the web, you will find many web pages that provide an answer to your questions. Some pages provide information you can trust. Others will contain information that is biased, out of date, or inaccurate. This lesson will help you to find reliable information.

Who published the page?

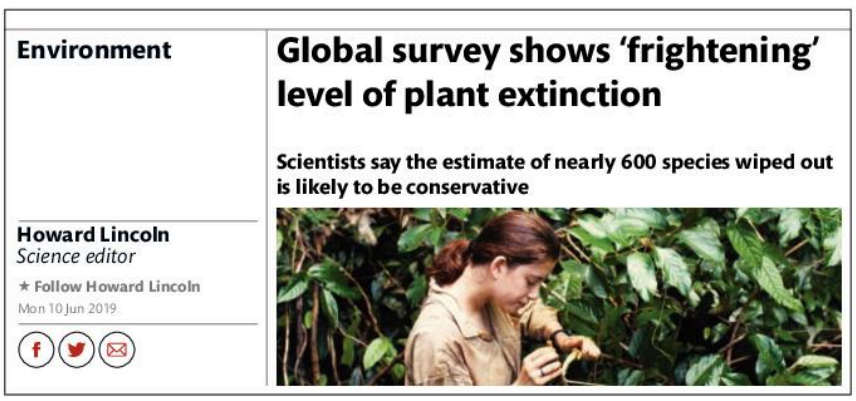
The organization that owns a website is called the ***publisher***. Look for publishers that are honest and respected. Examples will include major newspapers and news websites, government agencies, universities, and large charities. Commercial organizations can provide useful information, but could be biased toward their own products.

As you use the web more you will find websites that you trust. ***Bookmark*** reliable sites. They can be a good starting point for your research.

Who wrote the information?

A reliable article will give the name of the person who wrote it. That person is called the ***author***. You may see the author's job title and qualifications next to their name. This information can help you judge whether the author is an authority on the subject of the article.

Author contact details such as an email address and links to social media sites may be included in the article. ***Social media*** sites like Facebook and Twitter will tell you more about the author. Some websites will provide a profile of the author. The profile may link to other articles the author has written.


Environment

Global survey shows 'frightening' level of plant extinction

Scientists say the estimate of nearly 600 species wiped out is likely to be conservative

Howard Lincoln
Science editor

★ Follow Howard Lincoln

Mon 10 Jun 2019

Figure 4.3.1 *A news article's author details can tell you more about how reliable the source is*

When was the article written?

Always try to establish the date the article was written. If you are researching information on technology, an article written five years ago could be out of date and therefore misleading.

Some articles may provide the date the article was last updated. For example, a website giving Internet statistics can be updated every time a statistic is updated. Check what was included in the last update.

Can the information be checked?

You should always try to confirm the facts you find online before using them in your work. Can you find the same facts on other websites? The author of an Internet article may include links to other relevant documents. Following links from the article may help you to confirm facts, but do your own checks too.

Most authors will use citations at the bottom of an article. Citations list the sources they have researched when writing the article. Check these citations to find out if they are reliable.

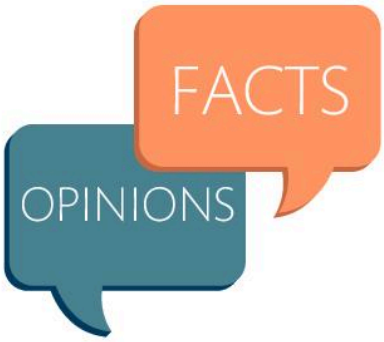


Figure 4.3.2 *Be careful not to read an opinion and treat it as fact*

Fact or opinion?

All articles you read will contain facts and opinions. Facts can be measured, checked, and proven. Opinions can be interesting, but cannot be checked.

- 'The XP345 computer has more memory than the QR287' is a fact that can be checked.
- 'The XP345 is better than the QR287' is an opinion.

Activity

Go to the website of a national newspaper and find a story that interests you.

1. What information can you find about the author?
2. Find one fact in the article. Try to check the fact.
3. Find an opinion. Explain why you cannot check it in the same way as a fact.

Unit 5 5.1 Computers and the world of work

In this lesson you will learn about the importance of computers and technology in the world of work.

Careers in computing and IT

In this unit you will learn about the jobs that you can do if you choose a career in computing or IT. You will learn how computers are affecting the way we work, whatever career we choose.

Nowadays many jobs make use of computers. Almost all office jobs and many jobs in shops, banks and hospitals use computers. Creative jobs and those in education and communication all involve the use of computer equipment.

Computers in the office

At one time, all office documents were typed using typewriters. It was hard to make corrections and changes. Copies were made with a photocopier and documents were sent by post. Nowadays all of this is done with ***word processing*** and email. There is a computer on every desk in the modern office.

Businesses keep their staff and product ***records*** on databases and use spreadsheets to analyse sales and plan their finances so the business grows and prospers. Businesses use networks and the Internet so that employees can share information and work together wherever they are in the world.

Media, news, and entertainment

Television, radio shows, newspapers, magazines, and movies all depend on computer technology. Reporters send in stories using computer communications, publishers prepare layout and designs using software, and special effects in sound and vision are made using ***computer systems***.

Figure 5.1.1 *Music and video used to be recorded on tape; today digital recordings are captured and edited using powerful computers*

Fans access music and videos using ***streaming services*** over the Internet. Websites are developed to keep fans informed about musicians, films, and popular TV shows.

Electronic publishing is used to create magazines and books that can be read over the Internet rather than on paper. Electronic readers (e-readers) are handheld devices that let you read books and newspapers. One small device can hold thousands of books.

Manufacturing

A modern car factory is full of technology. ***Robots*** are used to assemble cars. A car is moved automatically from one part of the factory to another. At each stop, robots complete a part of the car. Robots do work that used to be done by humans. In the future many people will work with robots.

Robots are used to manufacture many other goods. Your computer and TV will contain many components assembled by robots. Robots are used for simple repetitive jobs. Robots are also used to do jobs that are dangerous for humans. Police forces use robots to investigate packages that might contain explosives.

Did you know...?

A report in 2017 said that 800 million jobs worldwide will be replaced by robots by 2030. Robots and automation will change the way we work and live our lives.

Retail

Supermarkets and other large shops depend on computer technology. At the supermarket checkout, goods are scanned using a ***barcode reader***. This creates a detailed receipt for the customer. Information gathered at the checkout is used by the stores to create special offers based on the shopping habits of individual customers. The offers are used to encourage customers to return to the store.

Shops use the information read from ***barcodes*** to alert them when goods start to run low. The computer will produce a report listing goods that need to be re-ordered. Shop staff will use a barcode reader to update the computer as they restock shelves in the shop.

Activity

Choose one of the areas described in this lesson. For the area you chose, search the Internet to find:

- relevant photographs of computers and other technology equipment
- one or two interesting facts about the use of computers in that area.

5.2 A creative career in computing

In this lesson you will learn about the jobs in IT that have a strong creative emphasis.

Web designer

A ***web designer*** has the job of creating the web pages that make up the World Wide Web (web). A web designer works with:

- a wide range of media including text, images, video and sound
- data from spreadsheets and databases
- ***apps*** that add interactivity.

The web designer brings information together from many sources to make interesting and informative websites. A web designer needs to think about:

- content: the information on the site should be useful or interesting to the reader
- usability: the site should be easy to use
- appearance: the ***style*** of the site should look professional, attractive and suitable to the readers it is written for
- visibility: the site must also be easy to find by someone using a search engine.

Figure 5.2.1 *A web designer needs design, analytical, and technical skills*

Designers and writers

Many different computer applications require the skills of designers and writers who ensure that images, ***animations*** and scripts are exciting and attractive. For example, in many computer games the main characters and the background landscapes are very well designed.

Practical ***software applications*** need to be well designed so that they are clear and easy to use. Designers and writers typically have creative and artistic skills.

Music and video engineers

Today, music and video production is reliant on technology. Music and video are stored in digital files and processed using powerful computers. Websites, computer games and other applications incorporate sound and video images.

Educational technologist

An educational technologist uses computers to help people to learn other subjects. For example, you can buy special software packages that test you with maths problems or let you practise a foreign language.

Educational technologists design software and training materials that are used in the classroom. They advise teachers on how to get the most out of technology such as ***interactive whiteboards***.

Figure 5.2.2 *Video editing*

Software trainer

A ***software trainer*** teaches people how to use computer software. Trainers work with adults who need to use software as part of their job. Nowadays many software applications are designed to be easy to use, but businesses recognize that it is important for people to learn to use software properly, and it is cheaper in the long term to pay for training.

Figure 5.2.3 *Specialist software is designed by educational technologists and can help you learn about a new subject or skill*

Database administrator

A database is a collection of related data or information stored on a computer system. If a database is large and has very important information stored on it, there might be a specialist whose job it is to look after the data, make sure it is stored safely, and to help people find the information that they need.

A ***database administrator*** may have the job of keeping the information up to date and free of errors. Their job will include making regular ***backups*** of the data so that it is not lost if there is a ***hardware*** failure.

Activity

Look at one of your favourite websites. Describe a design or feature the designer has included that you think is good. Describe a feature that you think could be improved.

5.3 A technical career in computing

In this lesson you will learn about technical careers in computing and IT.

Careers in system development

An important area of work is the development of new computer software and hardware. Here are some of the main jobs in the area of development:

Programmer

A ***programmer*** is a person who writes computer programs. Writing computer programs is sometimes called 'coding'. They usually specialize in using one or two programming languages. Programmers work on new software but also work to fix existing software and keep it up to date.

Figure 5.3.1 *Computer programmers have good general problem-solving skills*

Software engineer

The job of a ***software engineer*** is to plan the software that needs to be created for an application. Software engineers must have good programming skills even though they do not write programs themselves. They make plans and designs for programmers to follow.

Systems analyst

The job of a systems analyst is to work with a business to find out what information the business needs. The ***systems analyst*** advises software engineers and others responsible for designing or buying software. The systems analyst makes recommendations about what software to buy or develop and how to make it work well.

Software tester

Software is tested thoroughly before it is used in the real world. It is important to check that the software does what it is designed to do, is

easy to use and will not harm the computer systems on which it is used.

Computer engineer

Computer engineers research, design, develop, and test computer hardware systems and components. Sometimes a computer engineer will build new systems. At other times they will build or modify components to improve existing systems.

Network engineer

A ***network engineer*** designs and plans networks for companies. Most companies depend on networks to allow their staff to do their jobs and to keep in touch with suppliers and customers. It is vitally important that the network runs properly 24 hours a day. A network engineer plans, upgrades, and maintains the network.

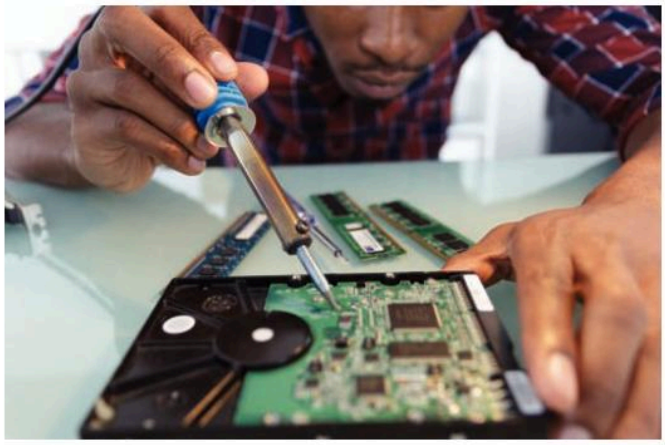


Figure 5.3.2 *Computer engineers design, develop, and improve computer hardware systems*

Figure 5.3.3 *The systems administrator makes sure the network software and hardware work properly*

Maintaining a computer system

Most computer specialists work to manage and maintain existing computer systems. They make sure systems work properly and repair them if they break down. Here are some of the jobs in this area:

Computer technician

The job of a computer technician is to maintain hardware systems, fix faults, and deal with any problems. A technician will replace parts that break, upgrade hardware when needed, and install new software.

Systems administrator

A ***systems administrator*** looks after a network and all the services that run on the network. They ensure users can access the software and files they need. In a small organization like a school, the computer technician may also act as systems administrator. The day-to-day tasks involved in running the system are often given to a ***systems operator***.

Activity

Find a sample job description for a computer technician. Write a job description for a computer technician to work in your school. Write bullet points describing jobs the technician will do, and write information about the skills and qualifications needed.

Unit 6 6.1 What is problem-solving?

In this lesson you will learn what a problem is and what steps are needed to create solutions.

Introduction to problem-solving

The methods used to describe problems and solutions are used by programmers when they create computer software.

What is a 'problem'?

Everyone has things that they want, or things that they want to happen. Sometimes it is easy to get the result you want. Sometimes it is more difficult. If there are difficulties that you must overcome to get the results you want, then that is a problem.

- A ***problem*** is a situation where there are barriers or difficulties between you and something that you want.
- The ***solution*** is a series of steps or actions that will overcome the difficulties.

Creating solutions

Although all problems are different, there are some common strategies that can help in all problem situations:

- understand the problem
- investigate ways of solving the problem
- develop a solution
- reflect and review.

Understand the problem

The first step in solving a problem is to understand and explore it. That means you need to be clear about what you want to achieve and what is stopping you from getting there.

A good question to ask is: What would success look like? In other words, when you have solved your problem, what will be different? Making sure you understand your final goal will help you to find solutions to the problem.

Here is an example: A man wants to drive to town to buy chairs, but his car will not start. It seems there is only one way to solve the problem – fix the car. But take a moment to investigate the problem. What does the man really need? What is his goal? What would success look like?

What he really needs is to have extra chairs (perhaps he has some friends coming to visit). Success would be having more chairs. Focusing on the goal like this makes it clear that there are several ways of solving a problem. Here are some examples of solutions the man can consider:

- fix the car
- find another way of getting to town, for example by taxi

Figure 6.1.1 *Solving a problem is like completing a puzzle!*

- buy chairs without going into town, for example from a local shop
- manage without buying chairs, for example by borrowing some instead.

Thinking about what success looks like rather than concentrating on the immediate problem helps you to think of more solutions. Knowing what success looks like also helps you recognize when the problem is solved.

Activity

A girl wants to buy her grandmother a bracelet that she saw in a shop, but she does not have enough money.

1. Why do you think the girl wants to buy the bracelet? What is the girl's real goal?
2. Is there another way of reaching her real goal other than buying an expensive bracelet?
3. Think of a way that the girl could give her grandmother a gift without spending so much money.
4. Think of something the girl could do to make her grandmother happy without spending any money.
5. How will the girl know when she has achieved her real goal?

Unit 6 6.2 Investigation and research

In this lesson you will learn how investigation and research play an important role in problem solving.

Figure 6.2.1 *Set a clear goal*

In lesson 6.1 you learned that you need to understand a problem before you can start to solve it. Think about the goal you need to achieve rather than the immediate problem. You may find that the problem is not what it appears to be at first sight.

For example: in the activity in lesson 6.1, the problem appeared to be that the girl did not have enough money to buy a bracelet for her grandmother. However, the real problem was that the girl needed to find a way to make her grandmother happy. There are many solutions to that problem that do not rely on the girl being able to afford a bracelet.

When you have clarified a problem that you want to solve you can set yourself a clear goal. When you set a clear goal, you can move on to start thinking about solutions to your problem.

Investigating a problem

There are several good ways to find solutions to problems:

1. Remember times that you have faced problems like this before – what solutions worked?
2. Ask other people for advice, particularly people who have experienced this problem themselves.
3. Do research to investigate the problem.
4. Make up a new and creative solution.

As well as finding out about solutions that have worked for you and for other people, it is also useful to know about attempts that failed. Here is an example:

1. A boy's older brother left his exam revision until the day before the exam.
2. He did not have enough time to do his revision.
3. He failed his exam.

That failed attempt is a very useful thing to know about. It tells the boy that he might need to spend more than one day on revision. It is well known that you can learn from your mistakes. You can learn from other people's mistakes too.

You can also ask adults for advice. Remember that some people have specialist knowledge. People who have had special training and those who have had a lot of experience of life are good people

to turn to for advice. If you have an illness that you are worried about, a doctor has special training that will make their advice more reliable. You will find people with expertise who will help you with whatever problem you are trying to solve.

Research sources

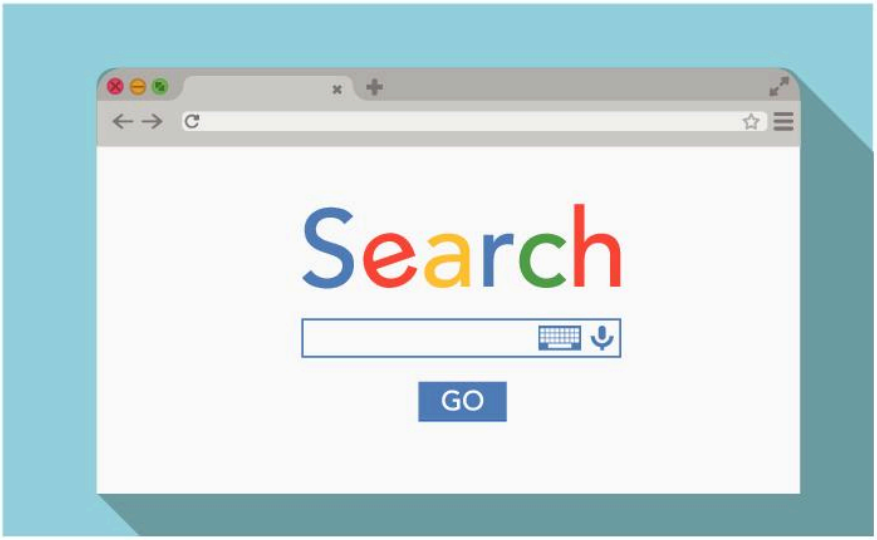


Figure 6.2.2 *Not all the information you find on the Internet is reliable*

You can investigate problems yourself. You can use books, manuals, and the Internet. Use the skills you learned in lesson 4.3 to make good judgments about the information you find.

Activity

Imagine you missed an important lesson at school because you were ill. The subject that you missed is going to be in the end-of-year exam and you are worried that you have not learned enough about it.

1. Have you ever had a problem like this in real life? If you have, explain what solution you tried. Did that solution work? If you have not, think of a solution to the problem that you could try.
2. What sources of information can you find on the Internet to solve this problem?
3. Think of a person who could give you advice about this problem. What do you think their advice would be?

Unit 6 6.3 Developing solutions

In this lesson you will learn about approaches you can take for developing solutions to problems.

You have learned about two ways to give yourself the best chance of finding a solution:

1. **Understand the problem**. What do you really want? What would success look like?
2. **Investigate approaches to the problem**. What methods have worked for others? What methods have failed?

By doing this, you increase your chances of developing a good solution. Here are three good strategies for developing a solution to a difficult problem:

- prepare and plan before you start
- think about possible risks
- keep trying.

Preparation and planning

Before you begin, make all the necessary preparations. That might mean getting tools. It might mean getting friends together to help you. It might mean making sure that your work area is neat and tidy. What preparation is needed will depend on the problem you are trying to solve.

An important part of preparation is knowing exactly what you plan to do. Sometimes it helps to write down your plan. Here are two ways to write down your plan.

1. ***Key tasks:*** Make a note of each task you need to include in your plan. What steps will you need to take to reach your goal? Don't worry at this stage about the order you will do the tasks in. That is something to think about later.

   Write the tasks down on separate slips of paper. When it comes to thinking about the detail of your plan it will help if you can lay the steps out in front of you and move them around into the correct sequence.

2. ***Storyboard:*** When you have a solution in mind you can lay it out using a storyboard. Storyboards are used to plan films, computer games and ***multimedia presentations***. They can be used for problem solving too.

A storyboard has a series of boxes where you can describe each step in your solution. Each box has:

- a line to enter the title of the step
- an area for you to draw what happens in that step
- space for a description of the step.

A storyboard lets you lay out your solution visually. It helps you think about your solution and spot any problems. For example, it may show if you have some of your steps in the wrong order.

Minimize risks

Think of what might go wrong in your plan and take precautions to avoid unnecessary risks. For instance, in a science experiment, if the students are working with flames the teacher may have a fire extinguisher on hand.

Keep trying

Many people give up if the solution does not work. But you should treat every failure as a chance to learn more about the problem. Why didn't your solution work? What can you try differently next time?

Figure 6.3.1 *Storyboarding lets you explore a problem with words and pictures*

Activity

You have promised to cook dinner for a big group of people. You have never cooked for so many people before. Answer these questions:

1. What is your goal?
2. Give two different ways that you could find helpful ideas about what to cook.
3. What preparations do you need to make before you start cooking? List as many as you can.
4. Explain one thing that could go wrong. How can you avoid it happening?

Draw a storyboard to describe how you will prepare dinner.

Unit 6 6.4 Describing solutions

In this lesson you will learn about the importance of getting your plans in the right order. You will also learn about the importance of learning lessons as you solve problems, so you will be better prepared when you face problems in the future.

In lesson 6.3 you learned how to use key tasks and storyboarding techniques to write out the steps needed to solve a problem. One thing you must be aware of when creating a plan is that the steps in a solution must be carried out in the right order or sequence.

Figure 6.4.1 *Sometimes the sequence of actions affects the outcome*

Sequence

The sequence of actions means the order that they go in. Sometimes the order of the action does not matter. For example, when you go home in the evening, you might make a drink, eat some food, and watch TV. It does not matter what order you do those things.

Sometimes actions depend on the results of previous actions. For example, think of these three actions:

1. Wake up.
2. Make breakfast.
3. Eat breakfast.

These actions must go in that *exact* sequence. No other sequence will do. You cannot make breakfast before you wake up and you cannot eat breakfast before you make it.

Activity

Here are some actions that you might take when you fix a broken plate. The actions are in the wrong order:

- work out how the pieces fit together
- leave the plate in a safe place for the glue to dry
- find the broken pieces
- glue the pieces together.

Put these actions in the right order. Even if you have never fixed a broken plate, you should be able to work it out. Just think about which actions depend on the results of previous actions.

Reflect and review

Remember that at the start of the problem-solving process you had to define what success looks like. You had to be clear about what you wanted to achieve. You can use this information to check whether you have solved the problem. Have you ended up with a solution you are happy with? If you are happy with the solution then you have solved the problem. Well done!

Figure 6.4.2 *It is important to reflect and review after a problem is solved*

After you have solved the problem you should take some time to reflect on your experience. Ask yourself:

- What have you learned from this experience?
- What approaches did you try that worked well?
- What approaches did you try that did not work so well?
- What would you do differently next time?

Taking time to think about what happened will help you next time you face a problem. Sometimes it is helpful to keep a ***record*** of what problems you faced, what you did and what the result was.

In science, for example, it is very important to keep good records. Scientists share their experiences and experimental results so that other scientists can learn from their findings.

Activity

Think of the last big piece of work that you did. Perhaps it was a piece of schoolwork or a job you did at home.

Answer these questions:

1. What was the result of your work? Was it a success?
2. Explain one thing that you did which worked well and you would try again.
3. Explain one thing that did not work out so well.
4. What would you do differently if you were to do the work again?

Unit 7 7.1 What is word processing?

Word processing

In this unit you will develop your word processing skills. You will learn how to create useful and attractive documents.

In this lesson you will learn what word processing is and what features word processing software contains.

What is word processing?

Word processing is used to create documents using a computer. A ***word processor*** is software used to make documents that are correct and well presented. Word processing is one of the most popular ways that computers are used.

Before word processing, all documents had to be written by hand or typed using a typewriter. It is difficult to make changes and corrections to a typed or handwritten document. With a word processor, it is much easier to make changes and improvements to documents. A word-processed document can be saved and printed out as many times as you like.

A word-processed document can be sent by email to reach its destination almost instantly. Handwritten and typed documents must be posted in an envelope and can take days to arrive.

The key features of a word processor

There are features you can expect to find in any word processing ***software application***:

1. Enter, edit and rearrange text in a document.
2. ***Format*** text to change the way it looks. The colour, size, and shape of text can all be changed.
3. Format entire blocks of text to change their appearance.
4. Show information in a table so that complicated data can be easily understood.
5. Arrange information in lists and columns (like a newspaper or magazine).
6. Add pictures, charts, and other graphical content to documents.
7. Check for spelling or grammar errors and correct any mistakes.

Other functions, such as ***mail merge***, which helps you to produce letters, and change tracking are also found in word processing software. All the functions in a word processor serve one purpose – they make it easier to produce professional-looking documents.

The word processor window

A word processor has many functions. It can look complicated and daunting. This diagram shows you the main parts of a word processor screen. The screens used for examples in this unit use

Microsoft Word for Office 365. If you are using a different word processor, your screen may look slightly different. You should be able to see the main parts of the screen shown in the diagram.

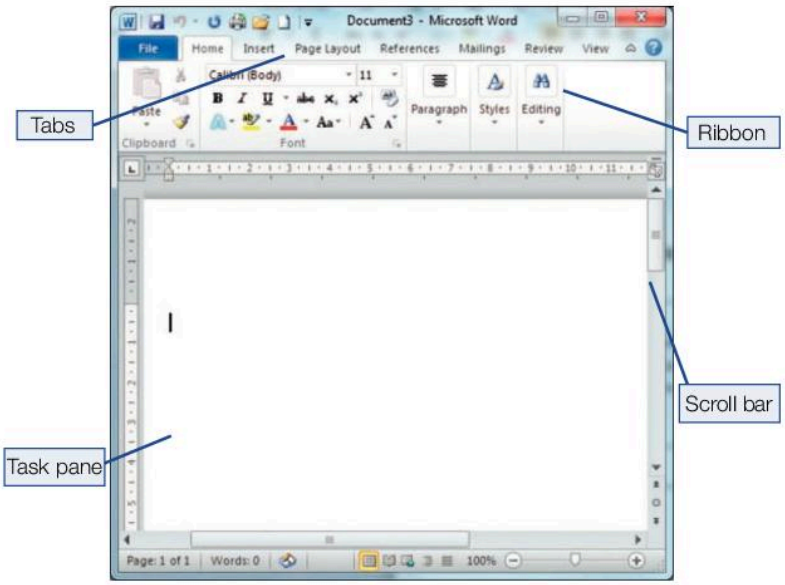


Figure 7.1.1 *A word processor window*

The four main parts of a word processor window are:

1. ***Tabs:*** The functions of a word processor are arranged in groups. Each group has its own tab. The functions you will use most often are in the Home tab.
2. ***Ribbon:*** Each tab shows a different set of ***icons*** on the ribbon. For example, the ribbon for the Home tab contains icons that change the appearance of text and make lists.
3. ***Task pane:*** The area where the document you are creating is shown. Any text you type or pictures you insert are shown here.
4. ***Scroll bar:*** Your word processor window only shows a part of your document at any time. You use the scroll bar to move forwards and backwards in your document.

Activity

Explore the Home and Insert tabs of your word processor. Find the icons to:

- insert a picture
- insert a table
- change font colour
- add a bulleted list.

7.2 Entering text

In this section you will learn how to enter text and carry out basic formatting and editing.

Did you know...?

Paragraphs are used to organize your ideas. They make a document easier for a reader to understand the points you want to communicate. A paragraph should contain text about a single idea. Two or three sentences are usually enough to make a paragraph.

In lesson 2.9 you learned to use the keyboard to enter text, numbers, and punctuation. You know how to:

- use the Shift key to enter uppercase letters
- find commonly used punctuation characters like full stop and comma
- use the Shift key to find less common punctuation
- use keyboard cursor buttons and your mouse to move around a document.

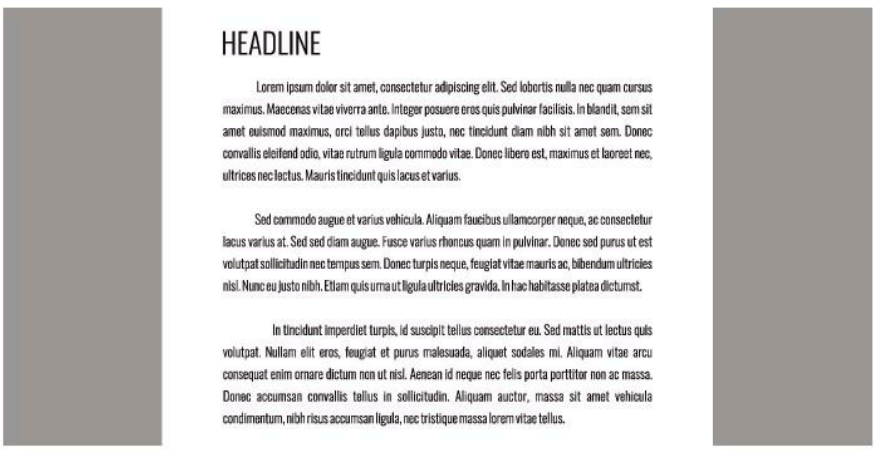
Paragraphs and word wrap

When you start to enter text into a word processor you begin a ***paragraph***. You will continue to enter text into the paragraph until you press the Enter key. When you press Enter, a new paragraph starts. If you want to split a long paragraph in to two smaller paragraphs, position the cursor where you want the new paragraph to start and press Enter.

As you type text into a paragraph, you will eventually come to the end of a line. When you reach the end of a line, the cursor automatically jumps to the start of the next line. This is called ***word wrap***.

Making mistakes

As you learn to use a word processor, or any other piece of software, you will make mistakes. Sometimes you will intend to make a small deletion and find you have accidentally removed a big block of text.



HEADLINE

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Sed lobortis nulla nec quam cursus maximus. Maecenas vitae viverra ante. Integer posuere eros quis pulvinar facilisis. In blandit, sem sit amet euismod maximus, orci tellus dapibus justo, nec tincidunt diam nibh sit amet sem. Donec convallis eleifend odio, vitae rutrum ligula commodo vitae. Donec libero est, maximus et laoreet nec, ultrices nec lactus. Mauris tincidunt quis lacus et varius.

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Figure 7.2.1 *Paragraphs in a document*

If that happens, take a deep breath and concentrate on how the problem can be solved. You usually can recover the situation, and the ***Undo*** button is there to help. Clicking Undo returns your text to how it was before your last action. The Undo icon is usually in the top left of your word processing screen.

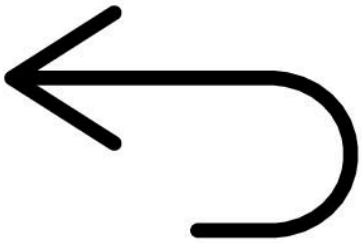


Figure 7.2.2 The Undo button

Correcting errors

As you type a document you will want to make changes to the text. You might want to correct an error. You may change your mind about a word you have used in a sentence and want to change it for a better word.

There are two keys on the keyboard that let you delete text:

	Pressing the ***Delete*** key once deletes a single letter to the right of the cursor.
	Pressing the ***Backspace*** key once deletes a single letter to the left of the cursor.

Using Delete and Backspace is a good way of making minor changes to your document as you type. Both keys work on blocks of text. For example, if you ***highlight*** a paragraph and press Backspace, the whole block of text is removed from your document.

If you are making corrections that involve larger blocks of text, it is better to use the ***Cut*** command than either Backspace or Delete. Cut places the text into an area called the ***Clipboard***. You can get text back from the Clipboard using the ***Paste*** command. Cut and paste are described in lesson 7.3.

Did you know...?

There is a keyboard shortcut for undo. Ctrl + Z does the same job as the Undo key in your word processor. Ctrl + Y does the same job as the redo key. These shortcut keys will work in almost any application.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 7.2 and follow the instructions to practise your skills in entering text.

1. What do you understand by 'word wrap'?
2. Why do we use paragraphs when making a document?
3. What keyboard button do you press to delete the character to the right of the cursor?
4. What key can you use if you have made a mistake deleting text?

Unit 7 7.3 Moving text

In this section you will learn how to use the Cut, Copy and Paste commands to move text and images in a document.

When you are creating a document, you will often want to move text. Sometimes you will want to move text within the document you are creating. In this case you are most likely to use ***Cut*** and ***Paste***.

Sometimes you will want to use text from another document. In this case you will probably use ***Copy*** and Paste. You will want to leave the text in its original document and make a copy in a new document.

Did you know...?

To select an entire paragraph of text you can place the cursor anywhere in the text of the paragraph and triple-click your mouse (that is, click the left mouse button three times).

Copy and paste

1. Select part of a file (for instance some text).
2. Click the Copy button.
3. Move your cursor to a new place in the document, or a new document.
4. Click Paste to insert the contents of the Clipboard into the document, making a copy of the original item.

Cut and paste

As well as Copy, there is a function called Cut. Cut works the same as Copy, except that the item disappears from its original location. Cut is a useful command when you want to move an item, such as a block of text, to a new location.

Cut and paste commands

There are two ways to use the Cut, Copy and Paste commands:

1. Use keyboard shortcuts.
2. Use the menu icons.

You can find the ***menu*** icons under the Home tab in the Clipboard group on the far left of the ribbon. The icons also appear in a menu if you right-click your mouse.

The Cut, Copy, and Paste buttons can only be used if you have text highlighted.

Command	Keyboard shortcut	Menu buttons
Cut	Ctrl+X	Cut
Copy	Ctrl+C	Copy
Paste	Ctrl+V	Paste

Command	Keyboard shortcut	Menu buttons
Cut	Ctrl + X	Cut
Copy	Ctrl + C	Copy
Paste	Ctrl + V	Paste

Figure 7.3.1 Select table

The Clipboard

When you cut or copy a piece of text it is saved in the ***Clipboard***. When you select Paste, the last thing you copied is inserted in your document. But everything you have cut or copied during a session on your computer is saved in the Clipboard.

1. To open your Clipboard, click the small arrow on the ribbon next to the Clipboard (in the Home tab).
2. The Clipboard opens and you see a list of everything you have cut or copied.
3. Click on an item in the Clipboard list to insert it in your document.

The Clipboard is useful if you are gathering information from one or more documents to paste into a new document. For example, suppose you are working with a team and you have all typed information you have researched in separate documents.

It can be easier to open each document and copy the text you want onto the Clipboard. Then you can paste from the Clipboard into a new document.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 7.3. Complete the activities to help you practise your skills in moving text in a word-processed document.

Did you know...?

You can cut and paste tables as well as text and pictures. To copy a table, you must select it by clicking the Select table icon in the top-left corner.

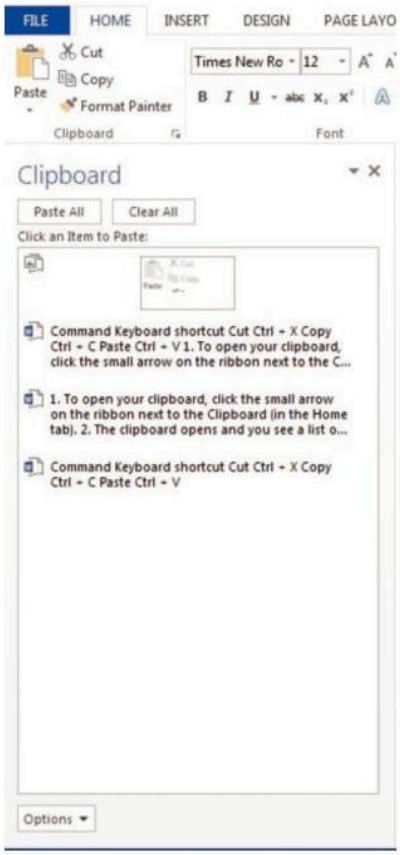


Figure 7.3.2 The Clipboard

Unit 7 7.4 Formatting text

In this lesson you will learn how to use formatting to change how your text looks.

Did you know...?

Typefaces are in two main groups: **serif** and **sans serif**. A serif is the decoration at the end of a character. 'Sans' is from the French language – it means without.

T	T
Serif	Sans-serif

What is text formatting?

Text ***formatting*** changes the appearance of the individual characters that make up your text. Changing ***font*** alters the appearance of your text. For example, the size of the characters.

Working with fonts

Microsoft Word provides tools to identify and change the fonts you use. The tools can be found in a toolbar called Font in the Home menu.

If you are using a different word processing application the toolbar may vary slightly. Your teacher will advise you of any important differences.

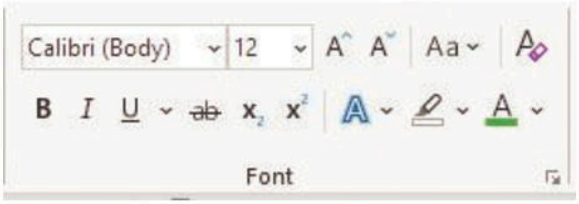


Figure 7.4.1 *The font toolbar*

Did you know...?

Font size is generally measured in ***points***. The size of normal text is usually 10, 11 or 12 points. Headings are 14 points or more.

Identifying fonts

If you are working in a document and would like to know what font is being used in a piece of text, place your cursor somewhere in the text you are investigating. The font toolbar changes to show the font used.

In figure 7.4.2 the cursor is positioned in the heading. The tool bar tells you the typeface is Arial. The font size is 16. The highlighted 'B' icon below the typeface name shows the text is ***bold***.

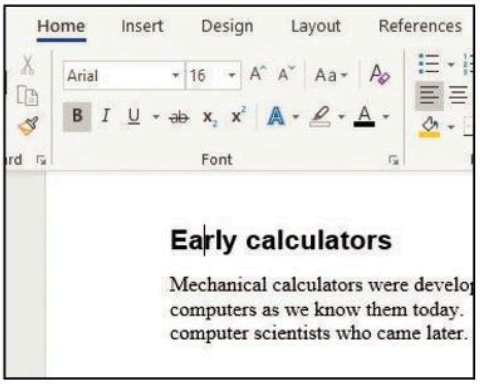


Figure 7.4.2 *Identifying fonts*

Using fonts

Fonts are applied to text using the tools in the Font toolbar. When you click an option in the toolbar, the effect you choose is applied to any text you have highlighted in your document.

Font tools work in two different ways:

1. They toggle an option on and off.
2. Drop-down menus let you choose from a range of options when you click the small black arrow to the right of the icon.

	These tools are used to set the typeface and font size. Drop-down menus list all the fonts and font sizes available.
	This set of tools is used to emphasize a piece of text. Text can be made **bold**, *italic* or underlined.
	These buttons can be used for ***subscript*** (e.g. H_2O), ***superscript*** (e.g. $3^2 = 9$) and to ~~strikeout~~ text. You won't need them often.
	This set of buttons is used to apply special effects and colour to text. Drop-down menus allow you to set text colour or to highlight a piece of text.

Good practice in text formatting

1. Choose a typeface that is easy to read for your main text. Sans serif fonts are easier to read.
2. Do not mix too many typefaces in a document.
3. Frequently using bold, ***italics*** or colour for emphasis can often reduce impact.
4. Using too much coloured text makes a document difficult to read.

Activity oxfordsecondary.com/just-click-3e

1. Complete Worksheet 7.4, Working with fonts. You will answer questions about identifying fonts.
2. Complete Worksheet 7.4, Working with fonts to improve your documents. You will choose and use fonts to improve how a document looks.

Unit 7 7.5 Using lists for layout

In this lesson you will learn how to use lists to present information more clearly.

Talk about

The order you place items in a list is important. Sometimes you want to use a list to indicate that some items are more important than others. You will put important items at the top of your list and less important items toward the bottom. Suppose the items in your list are no more or less important than each other. How can you show that in a list? Is there a better way to show the information than a list?

Why we use lists

When we speak, we often mention several items that are linked to each other. We say them one after another in a sentence. For example, your teacher might say, "The students who gained a distinction in the test are Peter, Sharon, Derek, and Valerie."

When we write a list, we often separate the list from the rest of the sentence and write each list item on a separate line. The list in the spoken sentence looks like this when it is written:

The students who gained a distinction in the test are:

- Peter
- Sharon
- Derek
- Valerie

Notice how each list item has a dot before it. The dot is called a bullet, and each item in the list is a bullet point. The list is called a ***bulleted list***.

How to create a bulleted list

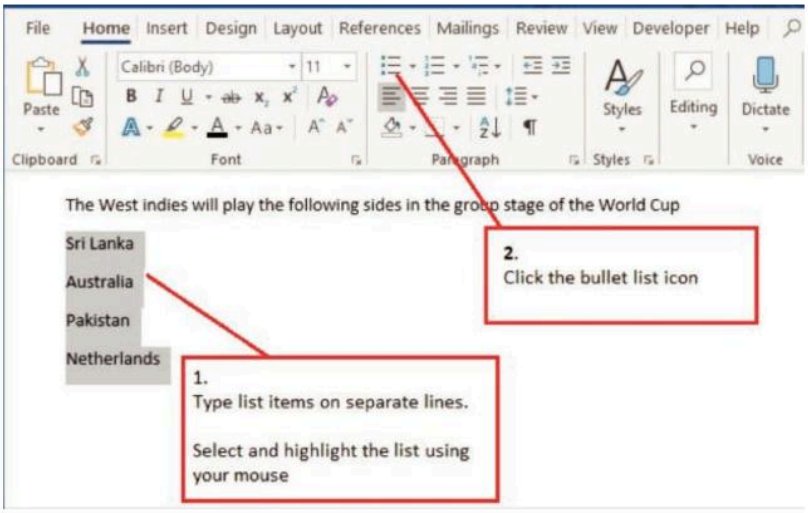
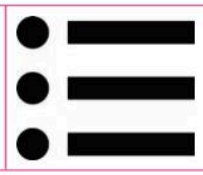


Figure 7.5.1 *Making a bullet list*

1. Type each of your list items on a new line. **2.** Highlight the list of items using your mouse. **3.** Click the bullet list icon.	

Numbered lists

Sometimes a list contains items that are in order of importance or value, or the items may be listed in the sequence they have to be carried out. Here is an example of a list that is ordered.

The three longest rivers in the world are **1.** The Nile **2.** The Amazon **3.** The Yangtze	1 —— 2 —— 3 ——

You make a numbered list in the same way as a bullet list, but click the numbered list icon instead of the bullet list icon. As with all formatting tools, these buttons can be used in two ways:

1. Type text, then select the text and click an icon to switch the formatting on or off.
2. Click an icon to turn formatting on before you type. Click the icon to turn formatting off again when you have finished.

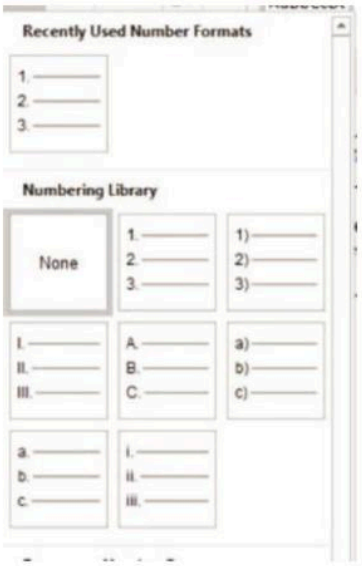


Figure 7.5.2 Numbered list menu

Drop-down menus

You will see a small 'down' arrow to the right of the bullet list and the numbered list icons. The arrow shows that there is a menu for the icon. Clicking on the icon opens the menu.

The bullet list menu lets you choose different characters to use as the list bullet.

The numbered list menu lets you choose different numbering styles for lists. You can use letters instead of numbers for a list.

Activity

1. Type a list of people in your class. Include at least ten names. Use the Tab key to separate the surnames and first names.
2. Format your text as a bulleted list.
3. Use Cut and Paste to make a copy of your list.
4. Format the copy as a numbered list. Save your work.

Activity

oxfordsecondary.com/just-click-3e

For more practice using lists, open Worksheet 7.5, Formatting lists, and complete the exercises.

7.6 Using tables for layout

In this lesson you will learn how to use tables to lay out complex data.

First Name	Surname
Thomas	Young
Rachelle	Brown
Terrence	Boyd
Jackie	Hyam
Janet	Rioche

Figure 7.6.1 Class list table

What is a table?

A ***table*** is more structured than a simple list. It has ***rows*** and ***columns***. For example, figure 7.6.1 is a class list. It is laid out as a table.

Most tables use a ***header*** row. The header row has titles which explain what information is held in each column of the table. In the example above, the two columns hold each pupil's first name and surname. The header row explains this. Tables can have more columns and rows than this simple example.

The next example shows a school timetable. Each column in the timetable stands for a different period of the school day. Each row stands for a different day in the week. There are column and row headers that make the table easy to read. The boxes formed where a row and a column meet are called ***cells***.

	9–10am	10–11am	11–12 noon	12–1pm	1–2pm	2–3pm
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						

Figure 7.6.2 School timetable

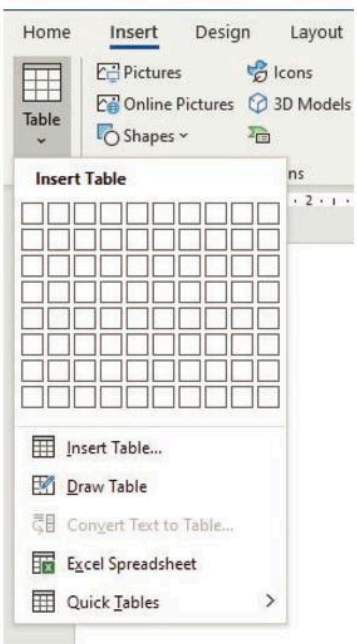


Figure 7.6.3 Table menu

In each cell of the table, there is room to show the lesson or other activity (such as lunchtime) that occurs at that time, on that day.

How to create a table

This is how you can create a table using the school timetable as an example.

1. Decide how many rows and columns your table needs. Count the rows and columns in the timetable, remembering to include the headers.
2. Create a table with that many columns and rows:
   - **a.** click on the Insert tab at the top of the screen
   - **b.** find the Table icon and click on it to open a drop-down menu
   - **c.** click on Insert Table.

You will now see a window like the one in figure 7.6.3.

3. Type the number of rows and the number of columns that you want in your table.
4. Click OK.

A blank table of the correct size will be created on your page.

5. Add some text into the cells of your table, to show:
   a. ***labels*** in the first cell of each row, showing the days of the week
   b. headers for the columns, showing the periods of the day
   c. content in each cell showing the lessons or other activities for each day of the week.
6. Save your work.

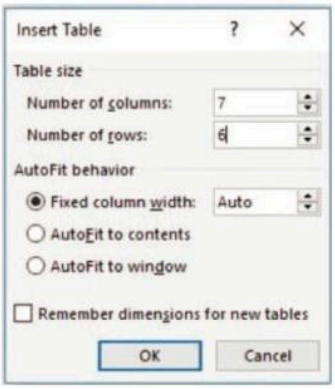


Figure 7.6.4 *Insert Table menu*

Add and delete rows and columns

When you enter text into your table, you may find that you have the wrong number of columns or rows. You can add or delete columns and rows from your table.

1. Click in a row or column where you want to insert a new row.
2. Right-click your mouse – a menu will be shown on screen.
3. Select the Insert option.

Another menu will open. You can choose to add a row above or below your cursor. You can add a column to the left or right.

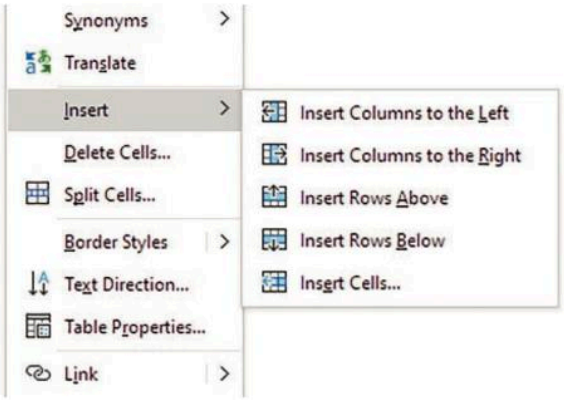


Figure 7.6.5 *Insert rows and columns menu*

Activity

Find your own school timetable. Use a table to make a copy of your own timetable.

Did you know...?

You can change the width of the columns, or the height of the rows, by using the resize pointer. Hover over the line on the right-hand side of the column you want to change. When the cursor changes to the resize pointer you have two options:

1. Click and hold the mouse button and drag the column to the right size.
2. Double-click – the column will automatically change to fit the content in the column.

Unit 7 7.7 Using columns for layout

In this lesson you will learn how to layout text in columns like a newspaper or magazine.

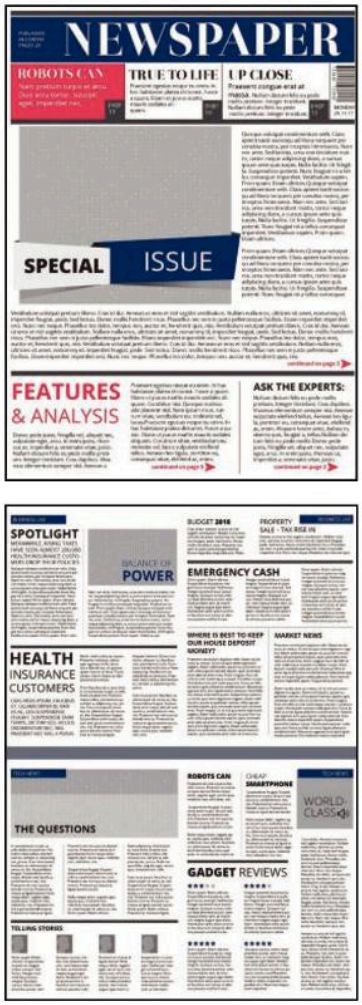


Figure 7.7.1 *Newspaper in columnar format*

Laying out text in columns

Look at a newspaper. The words are not laid out like the words in this book, stretching from one side of the page to the other. Instead the newspaper text is laid out in columns. This is called 'columnar' text. Columns are also used for magazines, newsletters, and advertising materials.

It is very easy to put text into column form. However, you need to have quite a lot of text to fill a page. In this lesson you will enter text then format it in columnar form. Before you begin, find a newspaper or magazine which has an article that you like. You are going to type out this article, so choose something you are interested in.

Make sure you are sitting at the computer with a word-processing application ready to use:

1. Type in the full text of the newspaper or magazine article that you have chosen.
2. Save your work.

You should now have a whole page or more of text. If your article is short and does not fill up a page with text, type in a second article.

3. Format the headline or heading of the article using large bold text. A font size between 18 and 24 points should be suitable for your headline.

Now you can format the text as columns. Select the whole block of text you have just typed. Do not include the headline. Select all the text below the headline.

4. Select the Page Layout tab.
5. Select the Columns icon from the ribbon.
6. Select the number of columns you want.
7. Try different column layouts until you find the one you think looks best. When you are happy, save your work.

When to use columns

Columns are used to make text look like a newspaper or magazine. Newspapers use columns for three reasons:

1. If you use short paragraphs, text looks better and is easier to read if it is laid out in columns.
2. Columns look better if you want to use small text in a document.
3. You can sometimes fit more text on a page by using columns.

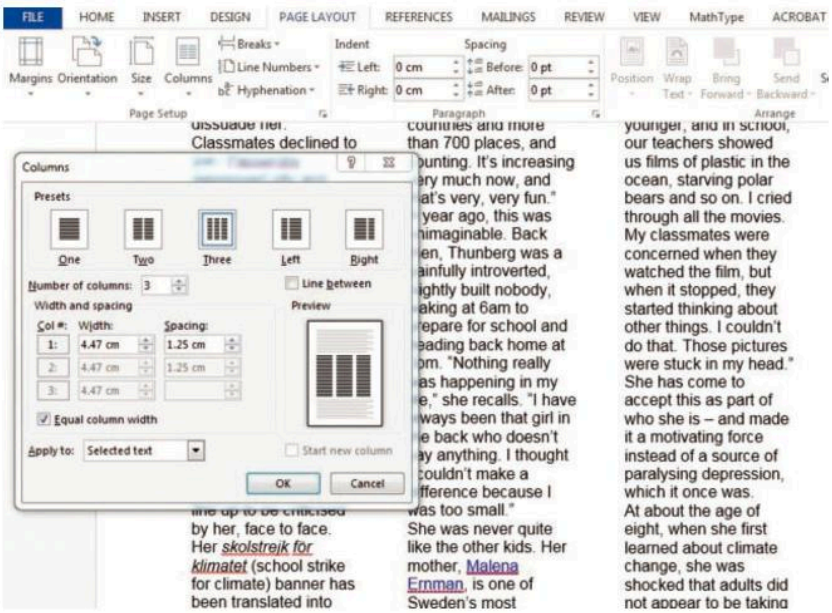


Figure 7.7.2 Columnar layout

Safety features

You are creating more files as your course progresses and you learn new skills. Perhaps you are using IT to create schoolwork in other subjects too. There are features in your software applications that are designed to keep your files safe:

Automatic save: In Word, this feature is called 'Auto-recover'. Auto-recover is on and saves your document every ten minutes by default. This means you should always have a recent version of your file available if you lose your main file.

***Backup*:** There is a 'Backup' option in most word processor applications. If you switch it on, two copies of your work are saved. One copy is for you to work on, and the other is a safe copy in case anything goes wrong with the original. In Word, you find the backup option in the File / Options / Advanced menu.

Password protection: You can password protect any Word file. Once you have set a password for a file it must be entered each time the file is opened.

These safety features are useful if your work is very important, or secret.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 7.7. The file contains text for a newsletter. Reformat the text in a three-column format. Format any headings in the document.

Unit 7 7.8 Inserting pictures

In this section you will learn how to put pictures into your word-processed documents.

Using images in documents

Word processing isn't just about text. A word-processing document can also include images. The images you can add to a word-processed document include photograph, drawings, diagrams, maps, and charts.

Images are important in text documents. They can help you when you are explaining something. A description of a place you have visited is more interesting if you include a photograph. It is much easier to describe how to get to a location if you include a map in your document.

Images also make a document more interesting to read. A page of text can be dull and hard to read. There are several ways to add images to your document.

Cut and paste

You learned how to cut and paste to move text in lesson 7.3. You can use the same technique to copy images from one place to another. If you have found an image you would like to use in a document or web page, you can copy it into your own document.

1. Place your mouse pointer over the image in the web page.
2. Right-click and select Copy image (or press Ctrl+C).
3. Move to your document.
4. Click your mouse pointer where you want to place the image.
5. Right-click and select paste (or press Ctrl+V).

Insert a saved file

Sometimes you have a file saved on your school network or on your home computer. It might be a file you found on the Internet, or one you took with a camera. It is a good idea to save important pictures to your computer.

You don't have to copy and paste a picture saved to your computer or network. You can use the menus in your word processor to insert the image.

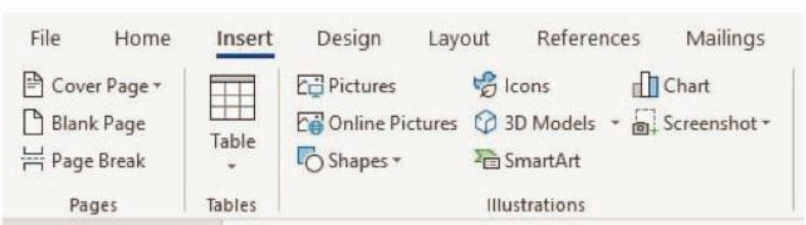


Figure 7.8.1 *Insert illustrations menu*

1. Click on the Insert tab.
2. Find the Illustrations section on the ribbon.
3. Click the Pictures icon. A file browser opens.
4. Find the file you want to load and double-click it.

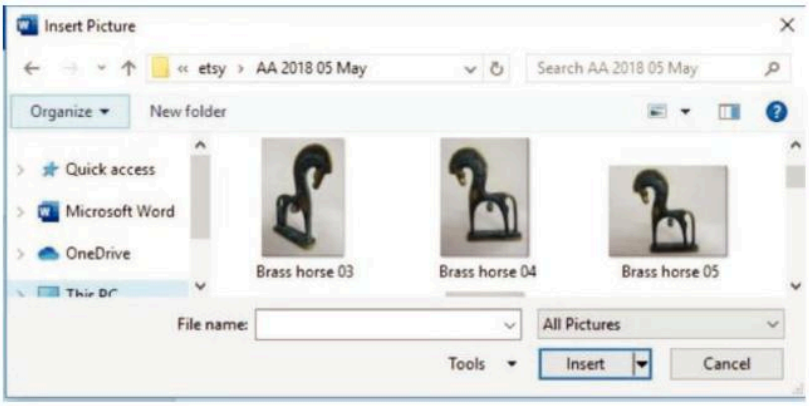


Figure 7.8.2 *File browser window*

Insert an online picture

Word processors and other applications have other tools you can use to add images to your documents. In Word you can use the Online Pictures option. You can see it just below the Pictures icon in figure 7.8.1.

The Online Pictures option opens a browser that has been specially designed to help you search for pictures to insert in your document. You can type in keywords for a picture search. There are also categories of pictures that you can browse through. 'Online Pictures' is a like a web browser, but it only shows you pictures that you can click and insert into your work.

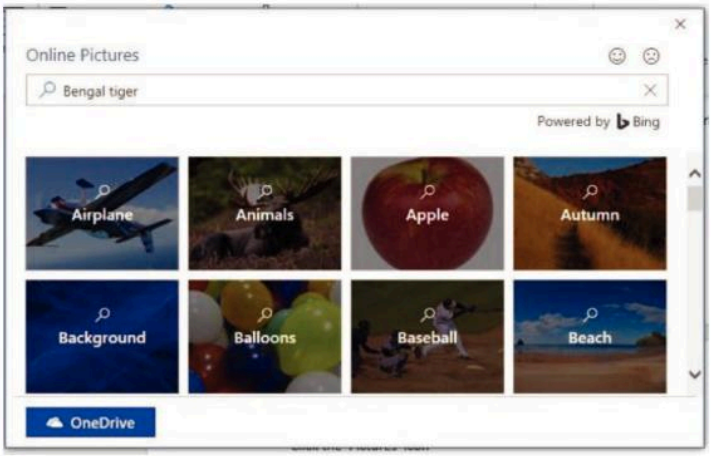


Figure 7.8.3 *Online Pictures browser*

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 7.8. The file is an information sheet about endangered species. The file contains text about two endangered species: the Bengal tiger and the axolotl. Use a web browser to search for a picture of a Bengal tiger. Download the image and insert the picture below the tiger text. Use the Online Picture browser to insert a picture of an axolotl.

Unit 7 7.9 Making changes to pictures

In this section you will learn how to change the size and position of pictures in your documents.

Changing the size of an image

A picture is often the wrong size when you put it in your document. You can easily change the size of images. If you click on a picture, an outline appears around it. This outline has eight small circles; one on each corner and one along each side.

Figure 7.9.1 *Resize an image*

You resize an image by clicking and holding your mouse pointer on one of the corner circles. Imagine there is a dot in the centre of the picture. Move your mouse so the pointer moves toward or away from the imaginary dot. Moving away makes the picture bigger. Moving toward the centre makes it smaller.

Rotating an image

When you click on an image you will see a symbol above the picture, in the middle. The symbol is a curved arrow. If you click on and hold that symbol and move your mouse, the picture will ***rotate***. Rotating an image slightly can make a page look more fun.

Activity

Open a new document and insert an image. Select the image and practise resizing and rotating the image.

Figure 7.9.2 *Rotate an image*

Moving an image

If you click on a picture and then move the cursor into the centre, a four-direction arrow appears. If you click and hold when that icon is on the screen, you can drag the image around on your page.

Page layout

When you place an image in a page of text you can tell the computer how you want the words and picture to fit together. The way that pictures and words are shown on a page is called layout.

When you click an image to select it, you will see a box appear to the top right of the picture. The box contains blue lines and a black semi-circle. Clicking this icon opens the Layout menu. The Layout menu has two sections: In-line with text and ***Text wrapping***.

When an image is in-line with text, it is placed on its own line in the document. Text wrapping allows text to flow around the image. You can see both effects in figure 7.9.4.

There is only one icon in the In-line with text section of the menu. In-line layout always looks the same. There are six different icons in the 'With text wrapping menu'. You can choose different ways of wrapping text around an image.

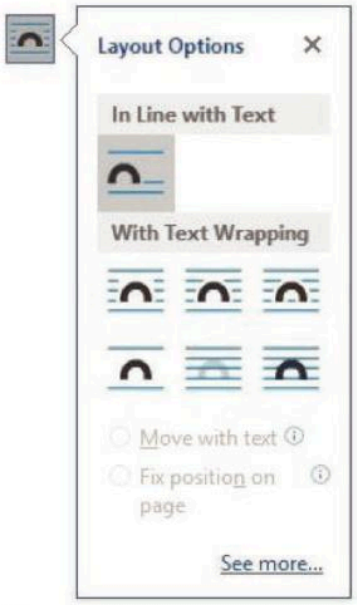


Figure 7.9.3 *Layout options*

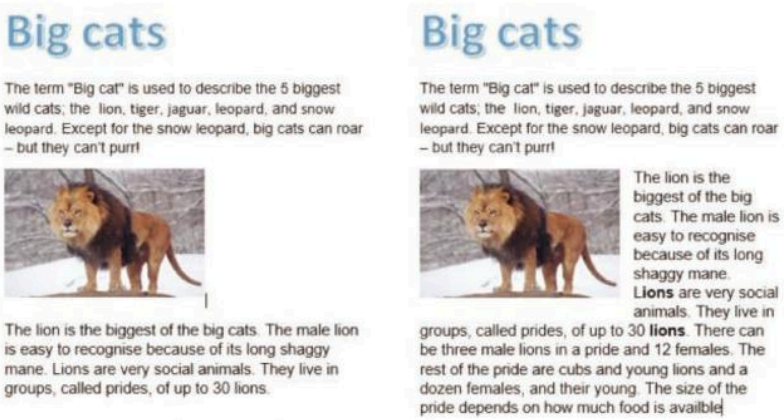


Figure 7.9.4 *In-line and Text Wrap layout*

More picture effects

There are other effects that you can use with images to improve the way they look in a document.

If you move your mouse pointer over an image and right-click, a menu opens. Two menu items you can experiment with are Insert caption and Format object.

A ***caption*** is a description of a picture that sits just below the picture to tell the reader what the image is about. You can use the Format object option to add ***borders*** and shadows to an image.

Figure 7.9.5 *Caption*

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 7.9. The file contains text about big cats. Find two pictures to illustrate the text. Insert them into a document and use the skills you have learned in this lesson to resize and position the pictures. Save your finished document in your own folder.

Unit 7 7.10 Reviewing documents

In this lesson you will learn how to use tools to help you review and improve your documents.

Proofreading your documents

When you have finished a document, you must check it for errors. This is called proofreading. The purpose of proofreading is:

- to check the accuracy of your document – have you said what you meant to say? Are there any factual errors?
- to check there are no spelling or grammatical errors.

A well-written document is easy to read and communicates exactly what you mean to say. A document that has factual and spelling errors gives a bad impression and may contain incorrect and misleading information.

A word processor has tools to help you proofread and correct your documents. Most of them are found in the ***Review*** tab.

Spell checker

A spell checker reports any spelling errors that you make. It works in three ways:

1. It automatically corrects common errors without asking you. For example, if you type 'teh' instead of 'the', the spell checker will correct your spelling.
2. It marks spelling errors by underlining them in a document as you type.
3. You can run a complete spell check when you finish your document. The spell checker will give you a list of all the errors.

In figure 7.10.1 you will see two words are underlined in red and two in blue. In Word, a red line shows a spelling error. A blue line shows a grammar error. The blue line under the word 'check' tells you that there is no full stop.

When you have finished wdriting and editing your document, you should give it a final check This is called proof reading. One off the most important checks is a spell check. Your word processor will normally chek your spelling as you type and underline words with spelling mistakes in red

Figure 7.10.1 *Spell check error marks*

To correct an error, you place your cursor over an underlined word and right-click. A box pops up to tell you what the problem is with the word. It will also offer you some suggestions for the correct word.

You can see in the image that when the mis-spelled word 'chek' is right-clicked, spell checker gives three

suggestions: check, cheek, and chef. Click the word you want, and the change is made.

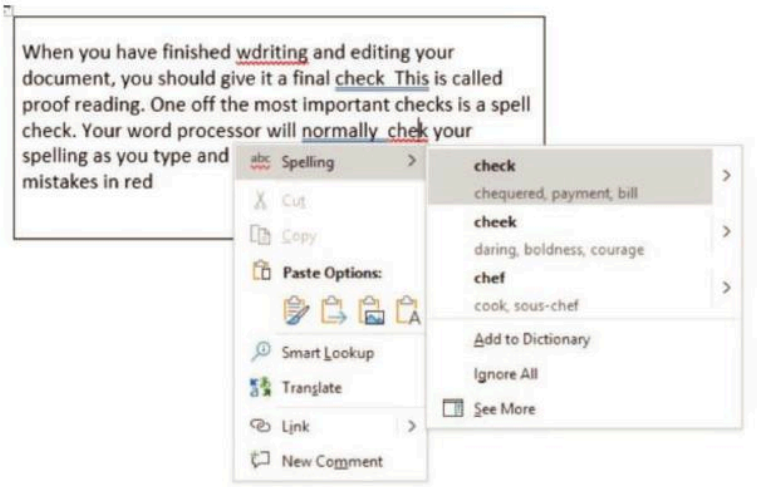


Figure 7.10.2 Spell check dialogue box

Thesaurus

Another useful tool is the Thesaurus. Sometimes it is hard to think of the right word to put in a document. If you highlight a word in your document and open the Thesaurus you will get a list of words with the same meaning.

If, for example, you think that the word 'document' isn't quite right, the Thesaurus gives you a list that includes words like text, article, and essay. If you click on one of these options, 'document' is replaced with the word you choose.

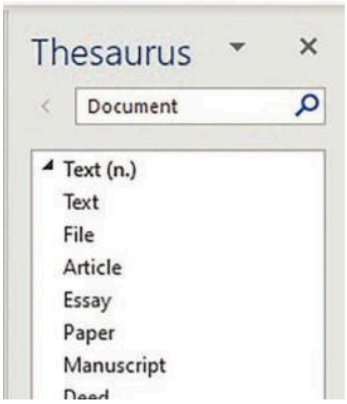


Figure 7.10.3 The Thesaurus

In Word, the Thesaurus icon can be found in the Review tab in the Proofing section of the ***ribbon***.

Find and replace

Find and replace can be a useful tool if you decide to change a word everywhere it appears in your document. Suppose you decide that you will replace the word 'document' with 'essay' every time it appears.

The Find and replace icons are in the editing section of the ribbon in the Home tab.

1. Highlight the word you want to replace.
2. Click Replace.
3. A box pops up with the word you have chosen in the Find line.
4. Fill in the word you want to replace the chosen word with.
5. Click on 'Find next' then 'Replace' if you want to replace the word.

Always proofread your document

These proofreading checks will help you to produce the best document you can. But you should still read the document carefully yourself. There may be errors that proofreading tools cannot detect.

Activity oxfordsecondary.com/just-click-3e

Open Worksheet 7.10. Follow the instructions in the document to practise your skills using proofreading tools.

Unit 7 7.11 Mail merge

In this lesson you will learn how to create a data file to use in a mail merge.

Talk about

The number of letters posted is in decline worldwide as emails and other Internet services have replaced physical mail. Postal services in many countries now rely on income from parcels and other services to survive.

1. How often do you receive a letter compared to an email?
2. What are the advantages of email over letters?
3. Are there any advantages of letters over email?
4. Do you think that email and Internet communication will totally replace letters?

What is mail merge?

Sometimes an organization wants to send out the same letter to many people. It might be an invitation to an event or an advertisement for a new product. Usually, the organization wants to add some personal details to the letter to customize it for individual customers.

For example, the letter will have the individual customer's address at the top and start with a personal greeting. A word processor uses a function called ***mail merge*** to customize letters in this way.

Mail merge uses two files:

1. The ***primary file***: a word-processed document such as a letter.
2. The ***data file***: a collection of records, for example the names and addresses of customers.

Mail merge produces many copies of the same letter. Each copy is customized for an individual customer.

Make a data file

The functions you will use to complete this activity can be found in the Mailings tab at the top of your word processor window. The first task in a mail merge is to create the data file.

1. Click on the Mailings tab.
2. Click on an icon on the ***ribbon*** called Select Recipients.
3. Click on Type New List.

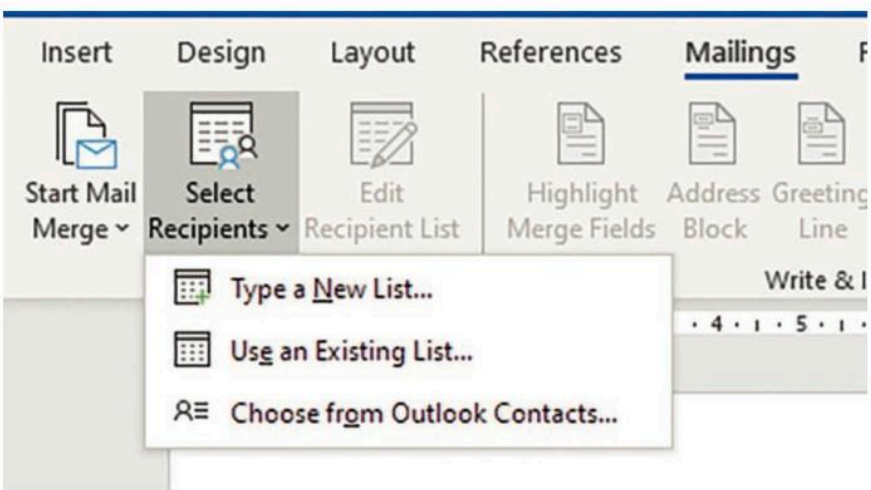


Figure 7.11.1 *Select Recipients*

A window called New Address List will open. This is where you can type the names and addresses of all the people you want to send letters to. In this demonstration we will just use the first and last names of the people we want to contact.

4. Click in the First Name column and type a first name – it can be a friend or a person you have made up.
5. Drop the cursor in the Last Name column and type a last name.

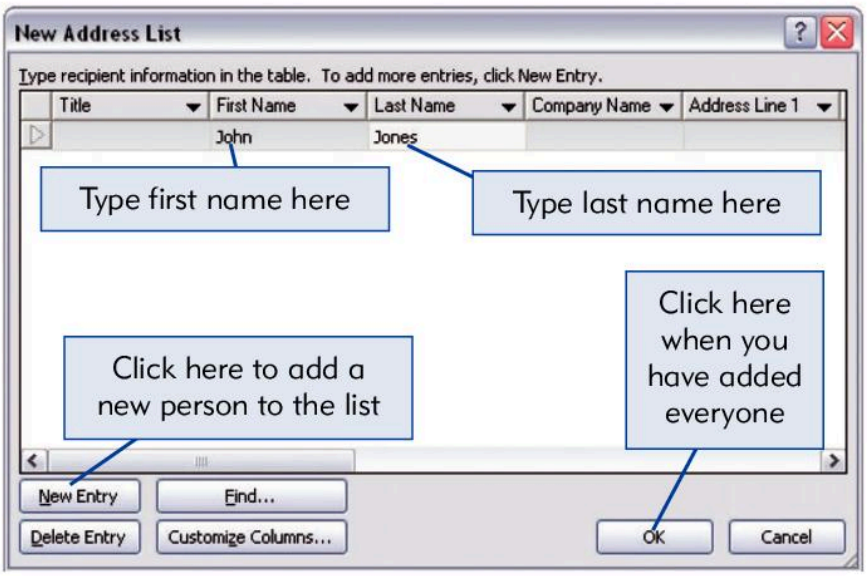


Figure 7.11.2 *Adding to the list*

To add a new person to the list:

6. Click on the button labelled New Entry.
7. Type a first name and last name into the columns. Repeat this until you have entered at least ten names.
8. When you have completed the list of ten names, click OK.

When you click OK you are asked to save the file. Select a location to save your file to and enter a filename. Use the filename 'mail_merge_demo_datafile' so that you can find the file easily in the next lesson.

You have created a simple data file. A data file is made up of records and fields.

A ***record*** is all the information about one person or thing, so in the data file you just created there were at least ten records, one for each person.

Field is the name of a single item of information stored in a data file. You used two fields in the data file you just created: first name and last name.

Unit 7 7.12 Using data files in mail merge

In this lesson you will learn how to create a primary mail-merge file and merge it with a data file.

Completing a mail merge

In the previous lesson you learned that two files are needed for a mail merge: the data file and a primary file. In this lesson you will create a primary file and complete your mail merge.

Creating a primary file

You have created a data file that contains the names of your friends. You will now use that file to send out personalized party invites.

1. Open a new document.
2. Type an invitation letter to a party you might be throwing. Your invite might look something like this one:

Please come to my party on the 15th June at 8.30pm.

From,

Bobby

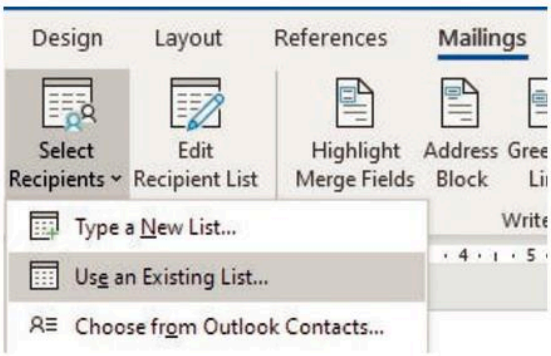


Figure 7.12.1 Selecting the data source

Adding data fields

To complete your personalized invitation, you must add data fields to your primary document. To do this you need to use the data file you created in lesson 7.10.

3. Click on the Mailings tab.
4. Click on Select Recipients.
5. Click on Use Existing List.

Use the ***navigation*** pane to select the file you saved in the last tutorial.

You will now tell the computer where you want the fields you added to your data file to appear in the document. Move the cursor to the place in the invitation where you want your friend's name to appear.

To insert the name fields into your document:

6. Click on the down arrow below Insert Merge Field.
7. Click on First Name.
8. Press the spacebar.
9. Use the same method to insert the last names.

What is inserted in your document will look something like this: «First_Name». That is the name of the field in your data source.

10. To complete your invitation, add a greeting that you would like to put before the name, such as 'Dear' or 'Hi'. Save your file.

Your letter will now look something like this:

Dear <<First_Name>> <<Last_Name>>,

Please come to my party on the 15th June at 8.30pm.

From,

Bobby

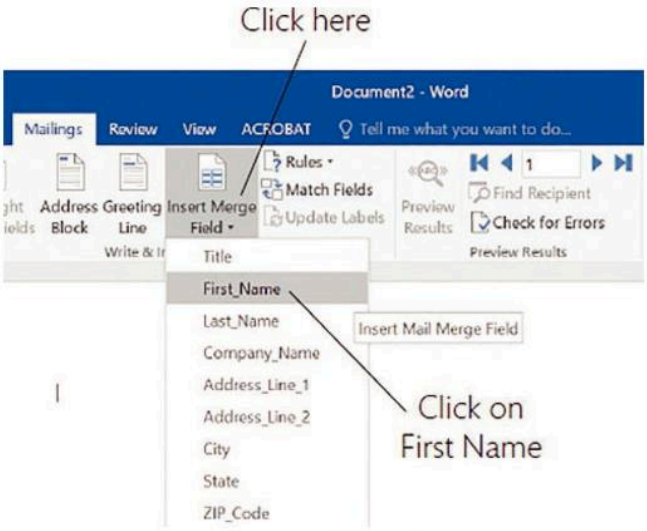


Figure 7.12.2 *Insert Merge Field window*

Complete the mail merge

The final stage of your mail merge will create ten invitations. The invitations will be identical, except that each will be personalized with the name of one of your friends.

11. Click on the Mailings tab.

12. Select the icon labelled Finish & Merge.

13. Select the Edit individual documents option.

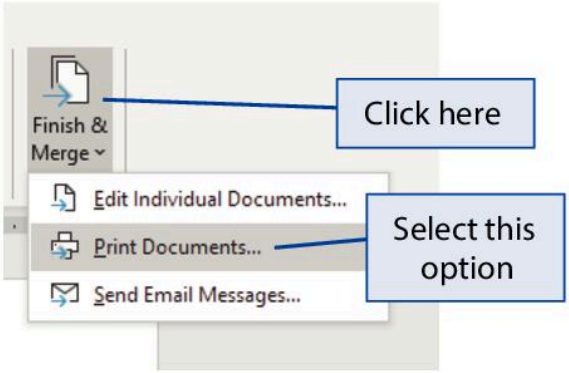


Figure 7.12.3 *Finish and Merge menu*

'Edit individual documents' creates a new file. It is probably called 'Letters 1'. If you scroll down the file, you will see that it contains ten separate personalized invites.

If you were really sending invites you would select the Print option. Because this is only a demonstration, do not select Print.

Activity

Imagine you are on work experience, working for a photographer. He wants to send a letter to everyone on a list of people who are about to get married, advertising his wedding photo service. You offer to help him by using mail merge.

You will need to create a primary file and a data file. The data file should contain at least three fields and five records. Make your primary file attractive by using fonts, colours, and images.

Unit 8 8.1 What is desktop publishing?

In this lesson you will learn what desktop publishing is and what it is used for.

Desktop publishing and presentations

In this unit you will learn how to use two software applications designed to combine images, text and other media to help you to communicate your ideas. Desktop publishing helps you produce attractive printed material. Presentation software helps create informative displays on screen.

Desktop publishing (DTP) means using the computer to:

- create materials that combine words and images
- create attractively presented documents to inform and persuade people.

DTP was one of the early uses of more powerful ***personal computers***. Together with the invention of affordable printing technologies (like colour inkjet and laser printing), it changed the way computers were used. DTP software helped computers move from being just for business and science to becoming tools for artists and designers.

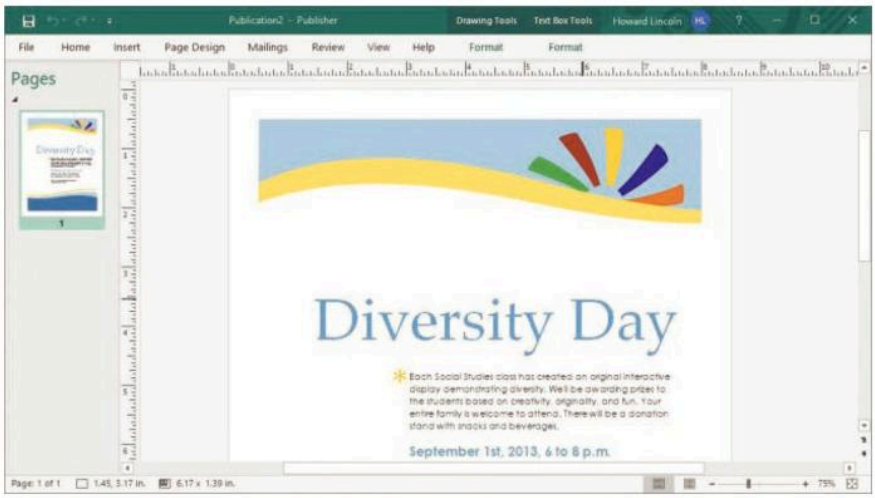


Figure 8.1.1 *The MS Publisher interface*

Before people had access to computers powerful enough for DTP, professional-looking documents that combined words and images had to be created by ***graphic designers***.

Designers would draw images by hand and arrange them with text. They would then photograph the results and print them on very large lithographic printing machines that used chemical processes. This was how images were printed before computers were invented. It was expensive and time-consuming.

Why people use DTP software

DTP software makes it easy for anyone to design materials that combine text, images, graphs, and charts. The software usually provides ***templates*** to help the user create a design for a specific purpose, for example a banner or poster. A template is a readymade blank layout or design that you can adapt by adding your own content.

Figure 8.1.2 *Magazine format*

With DTP software you can see what the result of your work will look like as you go along, and it is simple to make changes and revisions. DTP software allows you to create materials for different formats. You can print your materials onto paper or upload them onto web pages. You can also put materials into other documents, for example word-processed reports or business presentations.

DTP software is like ***word-processing*** software, but it gives you more freedom to design materials to look the way you want them to. DTP software is used to bring text and images together to create designs like fliers, invitations and magazines.

In this unit you will learn a range of useful DTP skills, building on what you already know about using word-processing software.

Figure 8.1.3 *Flier format*

Types of DTP software

There are many different types of DTP software. They include commercial products, and free and open-source software. Many commercial products are very powerful software systems made specifically for professional graphic designers.

The tutorials in this section use software called Microsoft Publisher. The most recent versions of Publisher are very similar to Word and other Microsoft applications that many of you will be familiar with already. If you are using an older version of the software, or a different type of DTP software, then the software may look different. You should still be able to carry out all the tasks.

Activity

Search the web to discover the name of the first desktop publishing software. What was the software called?

Activity

Search the Internet for information about the job of a desktop publishing specialist. What tasks does the DTP specialist do? What is the typical salary for the job? What kind of skills does the job need? Write a short report on your findings.

Unit 8 8.2 Using templates in desktop publishing

In this lesson you will learn how to use templates to create documents.

In this lesson you will use DTP software to create a flyer. You may have seen flyers for concerts, events, or shop sales. The example project in this unit is a flyer for a barbecue. You can either:

- follow the example given here, but make your own choices about the images, text and ***colour scheme*** to use
- or you can choose a different template and create a flyer for an event of your choice.

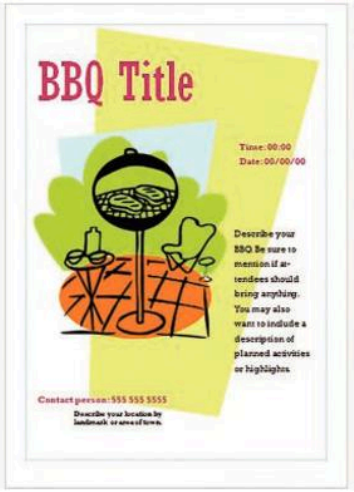


Figure 8.2.1 *A flyer is a small leaflet advertising a business or an event*

In previous activities in this book you have been given precise instructions about the work you must do. In this unit you can make more decisions for yourself. If you are confident using the computer, it might be fun to challenge yourself and try to make a flyer which is unique, perhaps advertising a real-life event.

Using templates

Templates are readymade document structures, which have colours, styles, and content already set up for you to use. You will start by opening a template. It will have words and pictures already in place. You can then change the words, the image, the colour scheme and other features.

Find and open a template

Your teacher will tell you what software to use for your project.

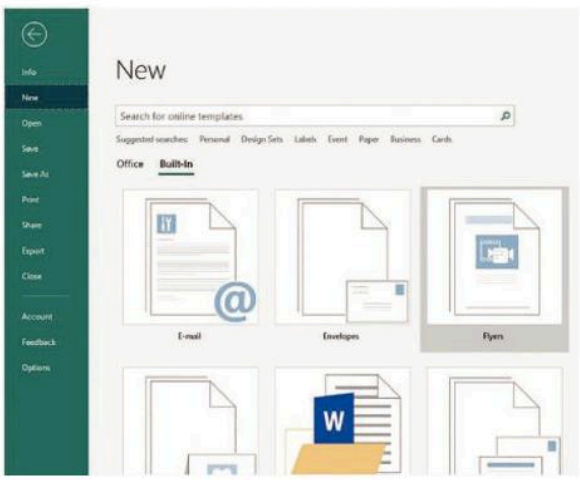


Figure 8.2.2 *The templates menu*

1. Open a DTP application, such as MS Publisher.
2. Open a new document. You will be given the option to use a template for your new document. There are many different templates to choose from. In this example, we will select a template to create a flyer for a barbecue.
3. Select the template category 'Flyers'. A selection of templates for flyers open. There are many different types, including flyers for a range of events.
4. Select the template called 'BBQ'. If you want to try something different, or if your software does not include this template, then choose another.

Changing the template to suit your project

A template is a flexible design. You can make changes to the template to suit your project. For example, there will be different colour schemes you can apply to a template. The design stays the same, but the colours change.

The colour schemes have been designed by a graphic artist, so they will look good together whichever scheme you choose. The aim of DTP software is to make it easy to produce well-designed, professional-looking documents.

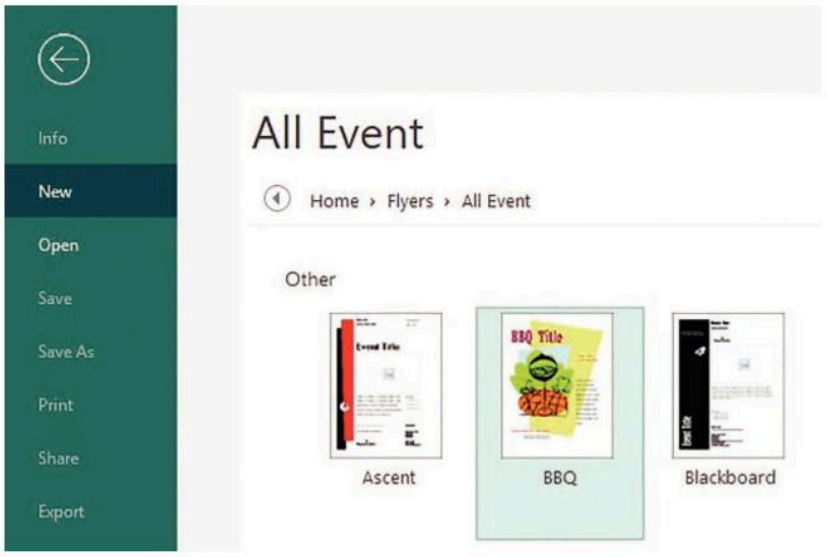


Figure 8.2.3 *There are a range of template options to choose from*

Changing the colour scheme

To change the colour scheme in a template in Microsoft Publisher, click on the ***Page design*** tab at the top of the window. You will see a selection of colour schemes in the 'Schemes' section of the ***ribbon***.

Figure 8.2.4 *Choose a colour scheme*

1. Click on different colour schemes and see how the appearance of the flyer changes.
2. Choose the colour scheme you like best.
3. Save the flyer using a suitable filename and storage location.

Activity

Choose a template for your flyer. Decide on the colour scheme you want to use. Save your flyer using a suitable filename. You will use it in the next lesson.

Before the next lesson, think about the event you are creating a flyer for. What title will you give the flyer? How will you describe the event to attract people to come? Make some notes that you can use in the next lesson.

8.3 Using text and images in desktop publishing

In this lesson you will learn how to add text and images to a DTP document.

Adding text to the flyer

Changing the text of a DTP document is like using word-processing software. You can delete and add text and change the font and colour of text. You can centre align text, use ***bullet points*** and use all the other features you have available in a ***word processor*** and other ***software applications***.

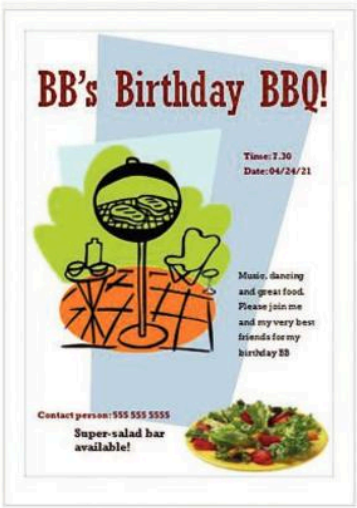


Figure 8.3.1 *It's easy to make changes to your template*

The main difference between DTP and word processing is that all text is placed in boxes. You can move the boxes around on the page to suit your design. Boxes can be ***rotated***, shrunk, or surrounded by decorative borders. They can be overlaid (placed on top of each other).

In the next tutorial you will make changes to the text of the flyer.

Changing text

There are five text boxes in the BBQ flyer:

- one box has large text giving the name of the event
- there is space to enter a date and time for the event
- there is a box to the right of the page for you to enter a description.

1. Click in each of these boxes and add the text you wrote in the activity in lesson 8.2.

You can delete any text box:

2. Click inside a text box to select it. An outline will appear around it. Press the Delete or Backspace key to delete the box.

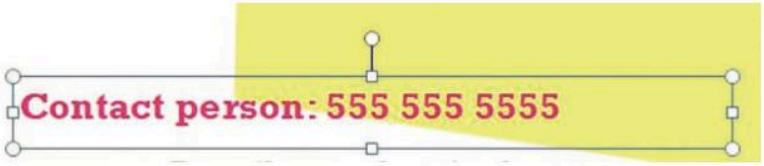


Figure 8.3.2 *Text box*

You can use the squares in the corner of the text box to resize the box. Click and hold the box to drag and move it. You can use the circle at the top of the text box to rotate it.

3. Add a new text box to the flyer:

- select the 'Insert' tab
- choose the icon for 'Draw text box'
- drag the mouse pointer across the screen to draw a new text box on the screen.

4. When you are happy with the appearance of the flyer save your work.

Adding an image to your flyer

Images can be added to any DTP document. In the example, we are going to add a picture of a salad to the bottom of the page to advertise that a salad bar will be available at the barbecue.

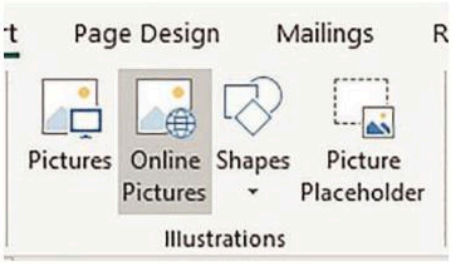


Figure 8.3.3 *Insert an illustration*

5. To add an image, first click on the insert tab. There is a section in the ***ribbon*** called 'Illustrations'.
6. To add an image, you can click the 'Pictures' icon. This allows you to add a picture you have saved on your storage area. You may want to use a picture you found on the web or that you took using a camera.

The Online Pictures icon opens a picture browser that you can use to search the web for a suitable image. You don't have to save the image; instead it is inserted directly in your DTP document.

The ***Shapes*** icon lets you draw shapes yourself and add emoticons and simple images.

7. Add a picture of a salad to your flyer. If you are working on your own example, add a relevant image.

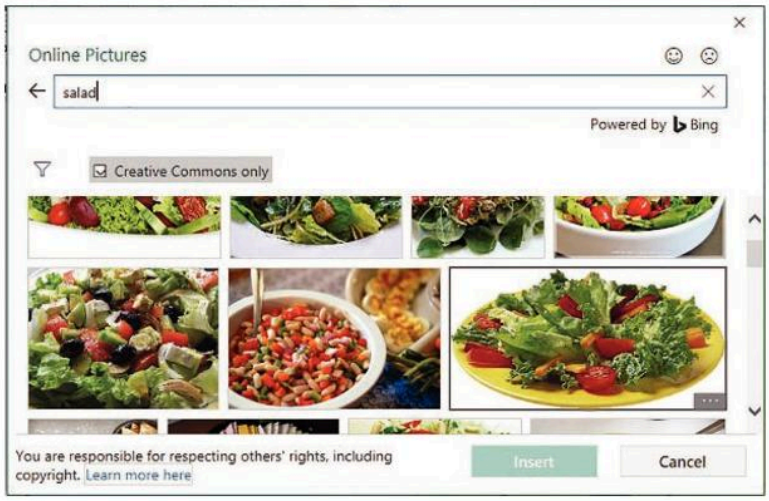


Figure 8.3.4 *Online Pictures*

Activity

- Complete your flyer, adding suitable text and images to your template. Don't forget to save the completed file.
- Find a template for a menu. Create a menu for the barbecue adding pictures and descriptions for a few of your favourite barbecue dishes.

Unit 8 8.4 Making a presentation

In this lesson you will learn what presentation software is and how it can be used to present information to an audience.

What is a presentation?

People are often asked to give presentations in school or as part of their job. A computer application called ***presentation software*** has been designed to help you give a presentation.

Presentation software helps you to:

- organize the ideas you want to communicate to an ***audience***
- present your ideas clearly
- use different media to communicate your ideas (for example, photographs and video).

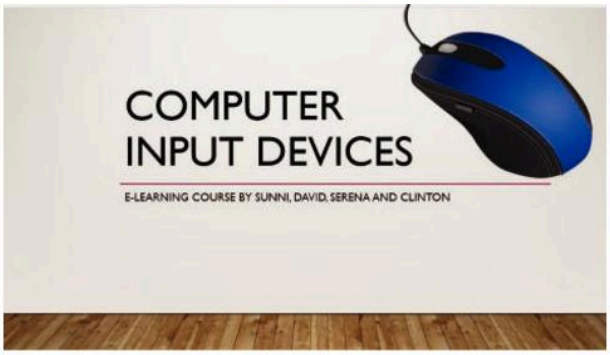


Figure 8.4.1 *Presentations are a great visual tool*

Presentation software lets you create a set of slides that can be shown to an audience. The slides are like pages but contain much less information than a word-processed page. Slides can contain text, photographs, charts, audio, and video. Presentation software is used to create ***multimedia presentations***.

The examples in this course use Microsoft PowerPoint. Your teacher will be able to help you if there are any major differences between PowerPoint and the software you use in school.

Planning your presentation

Before you start creating slides you should plan your presentation.

You will need to think about the following:

1. What is the subject of your presentation?
2. What topics will you cover in your presentation?
3. How will you make your points? Usually a slide will contain text and photographs, but you can also add video and audio.

Suppose a teacher is writing a presentation for an IT class. The **subject** of the presentation is computer input devices. The teacher decides to include three main **topics**: the keyboard, the mouse and voice input. Each topic will be on a single slide. Each slide will have a picture and three or four bullet points about the topic.

The PowerPoint screen

When you open your presentation software you will see that the screen is divided into three main areas:

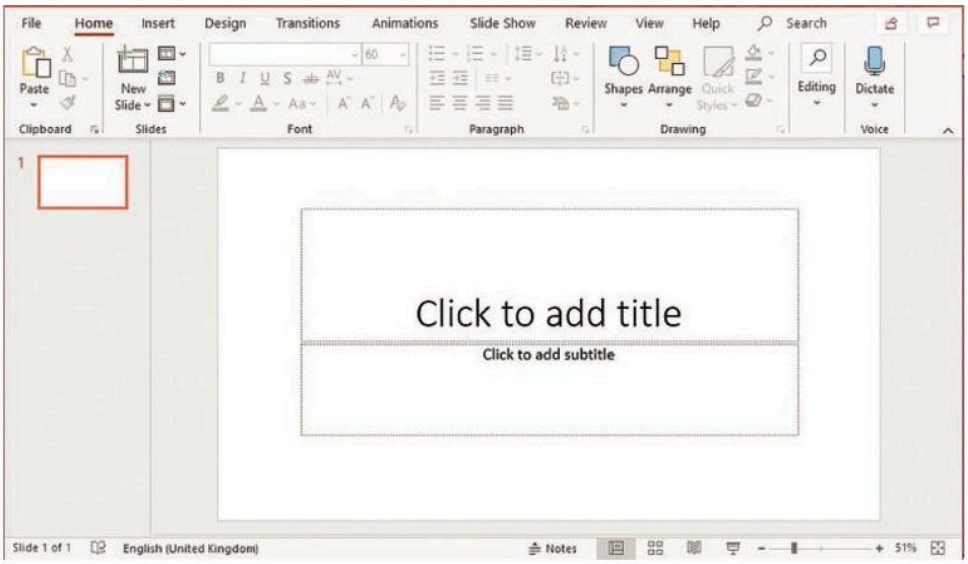


Figure 8.4.2 *The parts of a PowerPoint screen*

Along the top of the screen is the tool bar or ***ribbon***. You will be familiar with using tabs and menu icons from your work in word processing and DTP applications. The various tools you will use to make a presentation are grouped together in tabs. Each tab has a different set of tools.

The main area of the screen shows the slide that you are working on. Each slide is based on a template. You used templates in DTP. Templates help you to lay out your text and other content neatly on a slide.

To the left of the screen is an area called the ***slide sorter***. You will see a list of the slides you add to your presentation in this area. You can use the slide sorter to move from slide to slide or to change the order of your slides.

Activity

Decide on a subject for a presentation. You can choose any subject you like. It could be your hometown, your hobby or sport or a topic you are studying at school.

1. Write down a title for your presentation.

2. Write three topics that you will include in your presentation.

Open your presentation software. You should see a title page for your presentation. Add your presentation title to the slide. Save your presentation. You will use it in the next lesson.

Unit 8 8.5 Adding slides

In this lesson you will learn how to create slides for your presentation and how to add text to them.

Choosing and using slides

Title slide

When you begin a new presentation, PowerPoint assumes that you would like to start with a title slide. A title slide has two content boxes: one for a main title and one below for a subtitle. The boxes in a template for text and images are called ***placeholders***.

1. Open the file you saved in the last lesson. Check you are happy with the title you added in the last activity. Add your name to the subtitle placeholder. Save your file.

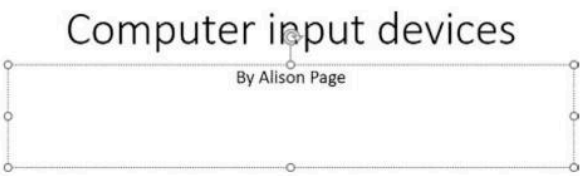


Figure 8.5.1 *The title slide*

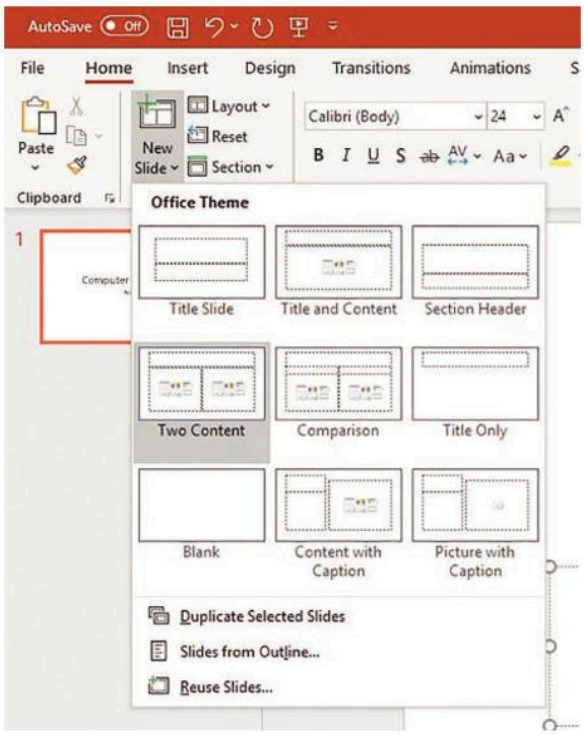


Figure 8.5.2 *The New Slide menu*

Add a new slide

When you have your title slide completed, you can move on to add content screens to your presentation. In this example, we are creating a presentation about computer input devices. Based on the plan we made in lesson 8.4 we will create slides about the keyboard, the mouse, and voice input. In this lesson we will create the first slide, about the keyboard.

Add a blank slide

2. Click the New Slide icon which is in the 'Slides' Group on the 'Home' tab. A drop-down menu of ***slide layouts*** appears.

Select a slide layout. In this example we have selected the 'Two Content' layout. When you come to make your own presentation, pick whatever design you think is most suitable. A new slide will be added to your presentation and will appear in the main area.

Add text to your new slide

3. Click in the title placeholder at the top of the page and add a title. In this example, the title is 'the computer keyboard'.
4. Click where you see the message 'Click to add text' in one of the content placeholders. Type in the text for your slide.

In this example we have used the placeholder on the right. We will add an image to the placeholder on the left in lesson 8.6. You will notice that your text is entered as ***bulleted lists***. You can turn off bullets in your own presentation if you don't want to use them.

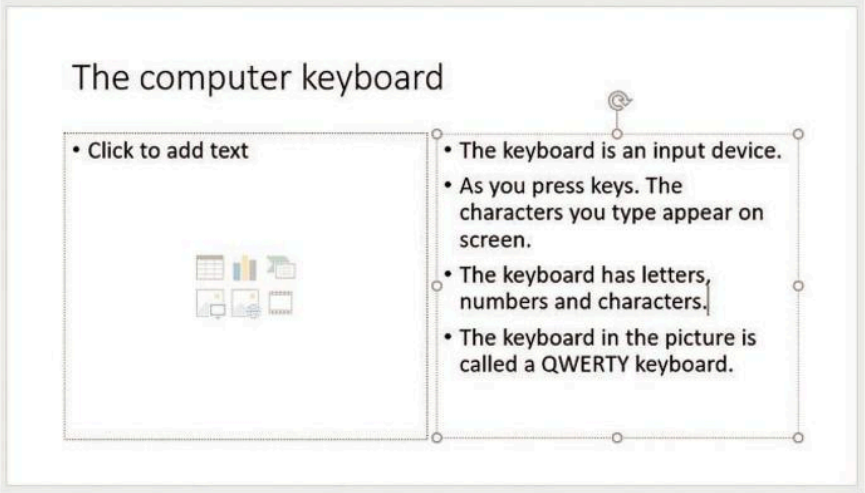


Figure 8.5.3 *Slide with text*

Slide sorter

As you add slides to your presentation you will see each new slide appear in the ***slide sorter*** bar to the left of your screen. The slide you are editing in the main part of the screen is highlighted with a red box.

You can use the slide sorter to navigate between your slides. Click on any slide in the sorter and it appears in the main screen so that you can edit it. You can also use the sorter to change the order of your slides. Click and hold your mouse on a slide and you can drag it to a new position in your presentation.

Activity

1. Open your own presentation. It should contain one slide with the title of your presentation and your name. In the activity in lesson 8.4 you wrote three topics to include in your presentation.
2. Make three slides for the topics you have chosen to include in your presentation. Each slide will have a title and some text about the topic. When you have finished, make sure you save your file.
3. You will add images and some more features to your presentation in lesson 8.6.

Unit 8 8.6 Themes and images

In this lesson you will learn how to use themes and images to improve the way your presentation looks.

Adding images

In lesson 8.5 we created a slide about the computer keyboard. The placeholder on the left-hand side of the page was left empty. We will now add an image of a keyboard to the placeholder.

In the centre of the placeholder there are six faint icons. These icons can be used to add different types of image to a placeholder. One of the icons is labelled Online Pictures.

You have used this method of inserting pictures into documents before, in lesson 7.8. If you have an image that you want to use saved on your computer, use the Pictures icon instead of Online Pictures.

You can use the Pictures and Online Pictures icons in the PowerPoint menu ribbon to insert images anywhere on your page. You will find them in the Images section on the Insert tab.

Themes

When you have finished the slides that you need for your presentation you can apply a theme. A theme is a design for your page. Themes combine background graphics, a colour scheme and fonts. The colours and images in a theme have been designed to work well together. Themes have been made by a ***graphic designer*** so that your presentations look professional.

To add a theme to your presentation

1. Click the Design tab.
2. Browse through the designs in the Theme section. As you hover over each design, the slide currently in the editor changes to show what the design looks like.
3. When you find a theme you like, click it. The theme is applied to all your slides.

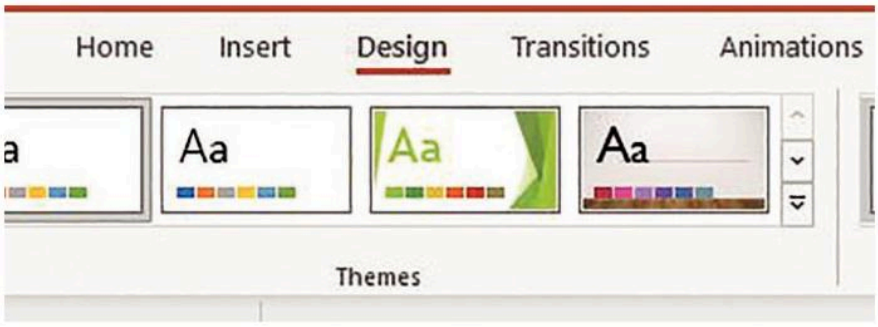


Figure 8.6.1 *The Themes menu*

Here are some guidelines you can think about when choosing a theme:

1. Choose white or pale fonts on a dark background as this will be easier to read.
2. Don't choose a theme that is too complicated. A lot of colours and graphics on screen can be very distracting.
3. Use the same themes and screen templates throughout your presentation.

Figure 8.6.2 *A completed slide*

Run your slide show

Once you have completed your slides you can run your slide show.

1. Click on the Slideshow tab.
2. Click the From beginning icon in the Start slide show section.

Your slideshow will start from the title page. The slideshow fills the whole screen. All menus are hidden until the slideshow is over.

3. Click your left mouse button to move to the next slide.
4. To end your slideshow, press the escape (Esc) key.

Activity

Open your own presentation. It should contain several slides. Each slide will have a heading and some text.

1. Add an image to some of your slides. Make sure the images are relevant to the text on the slide.
2. Add a theme to your presentation.

Save your presentation. You will add more features to your presentation in lesson 8.7.

Unit 8 8.7 Animation and transitions

In this lesson you will learn how to add animations and transitions to your presentation that will make your presentations look more attractive and professional.

Before you show your presentation to others you can add two more features that will make your presentation look more professional and make it easier to watch.

When you run your presentation, you click your mouse to show the next slide. The screen changes very suddenly from one screen to the next. ***Animations*** and ***transitions*** can make the change less sudden. They can make the presentation easier to watch.

Transitions

Transitions are used to control how one screen changes to another. For example, instead of a sudden change, you can select a transition where one screen fades out before the next screen fades gently into view. This kind of effect is sometimes used in films and TV, when one scene in a movie changes to another.

Adding transitions

1. Select the slide you want to add a transition to in the slide sorter. You can select several slides at once by holding down the Control (Ctrl) key and clicking the slides you want.
2. Click on the Transitions tab.
3. Add one of the transitions shown in the Transitions to this slide section of the ribbon.

Figure 8.7.1 *Adding transitions*

Experiment with transitions to find the ones you like. There are simple transitions such as fade and wipe. There are some more complicated transitions that are designed to grab the attention of people watching your presentation.

Complicated transitions are useful on important slides. They can signal that the slide is important, for example. However, complicated transitions can be harder to view and lose their impact if they are used on every slide.

Adding animation

Transitions add effects when a new slide is shown on screen. Animations are like transitions, but are used to add effects to items of text or images on a slide.

1. Click in a text box or on an image.
2. Click the Animations tab.
3. Select an option from the Animations section on the ribbon.

If you add an animation, your text is revealed one paragraph (or bullet point) at a time. Every time you click your mouse, the next paragraph appears. You can change that by using the Effect options button in the Animation tab. Selecting As one object makes all the text appear together.

As with transitions, there are simple animations and more complicated ones. Choose simple animations unless you have a good reason to use a complicated one.

Figure 8.7.2 *Adding animations*

Checking your work

Before you show your presentation to an audience it is important to check it carefully. You need to check:

- grammar and spelling on each slide
- that the design you have chosen is clear
- transitions and animations work as you expect them to.

Work with a partner to give each other feedback on your presentations.

Activity

Open your own presentation. It should contain your complete slideshow. It will have several slides. Each slide will have a heading and text. Some of your slides will have images added. You will have applied a theme to your presentation.

1. Add a transition to all the slides in your presentation.
2. Add animation to the text on your slides.
3. Save your file.

End of Section 1 questions and activities

These pages provides you with questions to test what you have learned during this course. The first part contains a set of short answer questions covering each of the eight topics you have studied. The second part contains questions that ask you to apply your knowledge to new challenges.

Test your knowledge

Unit 1: Using computers safely

1. List three ways that discarded computer equipment poses a threat to the environment.
2. You have been asked to move a printer to a new desk. What safety measures will you take?
3. How can using computers lead to Repetitive strain injury (RSI)?

Unit 2: The basics of computer systems

1. Draw a diagram to show the relationship between inputs, outputs, processing and storage in a computer system.
2. List one input and one output device used for: a. digital video; b. digital audio.
3. Explain the difference between application software and system software.

Unit 3: Computers and communication

1. Explain the role of a router and a modem in data communication.
2. Explain the difference between a local area network and a wide area network. Give an example of each.
3. What is a web browser used for? Give an example of a web browser.

Unit 4: Computer ethics

1. Explain what is meant by intellectual property. Give three examples of the type of work intellectual property applies to.
2. What is plagiarism and why is it wrong?
3. Why is it important to check the date that web pages were written when searching the web?

Unit 5: Careers in computing and IT

1. What is a barcode reader used for? Give an example of an organization that uses barcode readers.
2. List three tasks a computer technician carries out while doing their job.
3. Suggest three jobs in the creative industries that need good IT skills.

Unit 6: Introduction to problem-solving

1. List the four steps you should follow when solving a problem.
2. How can you use a storyboard to help when problem solving?
3. Where can you find help and advice when planning the solution to a problem?

Unit 7:Word processing

1. List three ways you can use format functions in a word processor to emphasize text.

2. What are the two types of list you can use in a word processor? Which would you choose to list the five most popular word-processing programs and why?
3. What two files are needed to do a mail merge using a word processor? What kind of information does each file contain?

Unit 8: Desktop publishing and presentations

1. How are templates useful in desktop publishing software? Give an example.
2. What are transitions used for in presentation software?
3. A picture you use in a presentation slide has a creative commons licence. Explain what that means.

Long answer questions

Each of the following long answer questions corresponds to one of the units you have studied this year. These questions require a longer answer from you.

1. What are the risks and dangers of not using computer equipment safely and responsibly? Give examples in your answer.
2. At the centre of every computer system is a computer processor. What are the other three types of hardware device needed to make a complete computer system? Describe the purpose and give at least two examples for each group.
3. For each of the situations below suggest an appropriate communication technology. Explain your reasons for choosing the technology ahead of other options.
   - **a.** Asking a local company if they offer work experience places
   - **b.** Letting your parents know you will be late home from school
   - **c.** Discussing a difficult piece of homework with a friend
4. How should a person behave if they want to be a responsible computer user? Write a list of actions that a responsible user will or will not do.
5. Your friend sends you an email. She has very good IT skills and also has good creative skills. She enjoys writing, likes to learn new things and is good at art and photography. She is starting to think about jobs she might do in the future. Write a reply to her email and suggest one or more IT jobs she might think about as a future career.
6. You plan to bake a cake for your sister's birthday. Create a storyboard or a sequence of key tasks that describes the solution to this problem. Some of the tasks you will need to think about are: choose a recipe; check ingredients; make a shopping list.
7. A car mechanic has a file listing all his customers. He wants to offer each customer a half-price oil change. Write a report explaining how the mechanic could use a word processor to make the promotion a success.
8. Create a single-page flyer or advert for a new bicycle shop in your local town or city. You can decide the name and location of the shop.

End of Section 1 questions and activities

This section provides you with activities that allow you to practise the skills you have learned in this unit both on your own and in a group.

Group project

Create a guide to using computer equipment safely when in the school computer lab. Include both immediate safety risks and long-term risks in your guide.

Split the work up among the members of your group so that each contributes at least one page to the guide. Search the Internet for images and facts to illustrate your guide.

Use desktop publishing software to complete your task.

Web research task

Choose one of the computing careers described in lesson 5.2. Pick one that interests you as a possible career.

Search the Internet to find out more about the career. What qualifications and skills are needed? What are the tasks involved in the career?

Write a report of your findings.

Practical activity

The file 'history project' contains an assignment produced by a friend of yours. She has used a word processor but does not have your skills.

1. Use a spell checker to help you to correct any errors in the file.
2. Apply headings, emphasis and any other method you choose to improve the presentation of the document.
3. Save your improvements using a new file name.

2

Section 2 of this book is written for those studying computing in the second year of lower secondary school. Section 2 is divided into nine units. Each unit is divided into lessons that provide an understanding of how computers work and how they are used in business and daily life. There are also sections that develop practical skills in using applications like a spreadsheet.

Unit 9 9.1 Maintaining your computer

In this lesson you will learn how to do basic maintenance of your computer and how to connect peripherals safely.

Maintaining your computer

In this unit you will learn about basic maintenance procedures that will keep your computer clean. You will learn about the cables that are used to connect your computer system and how to check if software you want to install is compatible with your computer.

It is important to keep your ***computer system*** clean. Here are some basic cleaning procedures to follow that will keep your computer and its ***peripherals*** in good condition. Before doing any maintenance on your computer, make sure it is turned off and unplugged from electrical power.

Cleaning the keyboard

Dust can gather between the keys of your keyboard and prevent them from working properly. To clean your keyboard:

1. Unplug the keyboard from your computer.
2. Turn the keyboard upside down and gently shake it to remove dirt and dust.
3. Moisten a cloth or paper towel and gently wipe away any dust from the keyboard. Do not pour liquid directly onto the keys.
4. Reconnect the keyboard to the computer once it is dry.

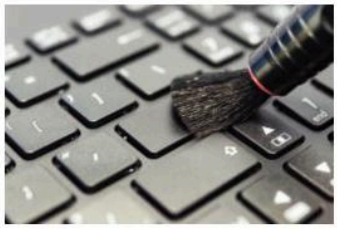


Figure 9.1.1 *A soft brush will remove dirt*

Cleaning the mouse

Dirt and dust can build up on the base of your mouse. To clean your mouse:

1. Unplug the mouse from the USB port.
2. Moisten a soft cloth and wipe the top and bottom of the mouse.

Cleaning the monitor

Grease, fingerprints and dust can make your computer screen difficult to read. Be careful cleaning screens. They often have special coatings that can be damaged by chemicals. The best method is to use a soft cloth or paper towel moistened with water.

Figure 9.1.2 *Keep your work area clean and tidy*

1. Turn off your computer and unplug the monitor from the power. If you are using a laptop, unplug it.
2. Wipe the screen with a soft cloth moistened with water.
3. Wipe the case of your computer with a moist cloth to remove dust. Be careful to clean around any fan vents.

Connecting your computer system

There are two types of cable used with computer systems: power cables and data cables.

Power cables connect your system to electrical power. Electrical power must be treated with respect. Always ensure power is turned off at the wall before disconnecting a power cable. Ensure you have saved your work before disconnecting power cables.

Data cables

There are many types of data cable. The two you will see most often are network cables and USB cables.

USB is the most commonly used cable in modern computers. USB stands for ***Universal Serial Bus.*** USB is used to connect almost every type of peripheral except for computer screens. A USB mouse, printer or keyboard can safely be connected and disconnected without turning off the computer.

USB cables can be used to connect screens but are limited in ***bandwidth*** so other cables tend to be used instead. The most popular cables for monitors are ***Video Graphics Array (VGA)***, ***Digital Visual Interface (DVI)*** and ***High-Definition Multimedia Interface (HDMI)***.

Figure 9.1.3 *USB cable*

Figure 9.1.4 *VGA is used for many business computers*

Figure 9.1.5 *HDMI is better for multimedia applications like video and games*

Activity

Create a maintenance guide to be used in your school computer room. Use the content in this lesson and do some web research of your own. Find some suitable images to illustrate your guide.

9.2 Determining system requirements

In this lesson you will learn how to find the specification of your computer.

Installing software

There will be times when you need to install software on your computer. You might want to install new graphics software to process your photographs, or perhaps install a new word processor. Before installing software you must find out if the software will run on your computer.

Software compatibility

To find out if software will function on your computer you must compare the ***system requirements*** of the software with the ***system specification*** of your computer.

A system specification is a description of the minimum components in your computer. For example, the system specification will tell you how much memory your computer has.

System requirements are a description of the components a piece of software needs to run on a computer.

If the system specification of your computer matches the system specification of a piece of software, we say the software is ***compatible***. You should check the system requirements against the components of your computer before installing it. This is for two reasons:

1. Running the software may affect the performance of your computer if the system requirements are too demanding.
2. You may waste money buying software that will not run on your computer.

Did you know...?

In Windows 10, selecting System and clicking the About menu gives you summary information about your computer's system specification. Another way to get system specification information is to search for 'System information' in the search box on the taskbar along the bottom of the screen.

System requirements

System requirements are published by the software developer. There are three places you can look for the specifications:

1. Printed documentation issued with the software.
2. The official website for the software.
3. The website of the company selling the software.

The minimum system requirements of a piece of software will look something like this:

PC: Intel Core 2, 4GB RAM (8GB recommended), Windows 7 to 10

Hard drive: 4GB

Minimum screen resolution: 1280×768 ***pixels***

Activity

List five pieces of information in the system requirements that you need to check against the system specification.

System specification

To find your system specification:

1. Right-click on the Start button or Windows icon in the bottom left of your screen.
2. Click on the ***settings*** icon.
3. In the menu that follows, click System.
4. Find About at the bottom of the menu.
5. Information about your computer will appear in the window on the right.
6. If you need information on other parts of your computer system, find and click the appropriate menu link. For example, Display gives you information about your screen settings and Storage gives information about your ***storage drives***.

Figure 9.2.1 *The settings icon*

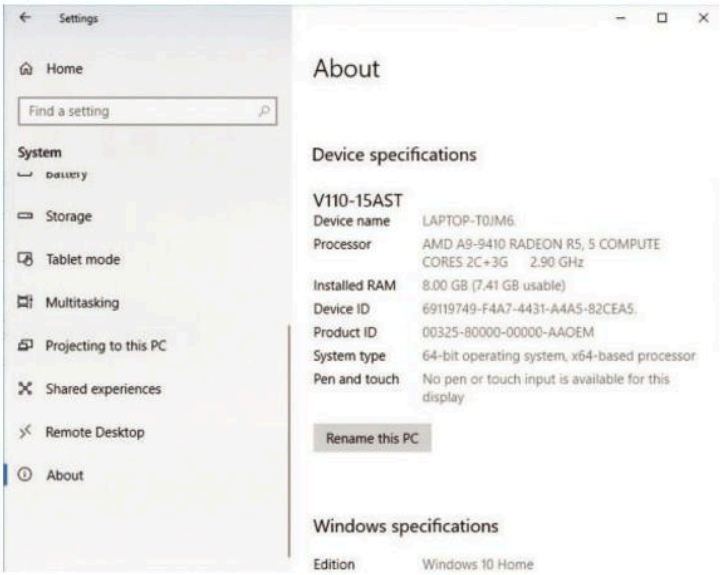


Figure 9.2.2 *The About window*

Activity

Search the web for an alternative to Microsoft Word. Choose a word processor from the alternatives you find. Find the system requirements for the word processor you have chosen. Check them against the system specification of the computer you are using. Write a report on whether your chosen application is compatible with your computer.

Unit 10 10.1 The Central Processing Unit

Hardware and software

In this unit you will learn how the main parts of a processor work together to process data and instructions. You will also learn about the components of a computer that provide memory that the processor can use.

In this lesson you will learn about the parts that are inside a computer processor. You will learn how the various parts work together to process data.

The ***processor*** is at the heart of any computer system. It takes data from the input devices and processes it before sending the results to an output device. The processor carries out instructions held in computer software. Another name for the processor is the Central Processing Unit (CPU).

CPU

There are four main parts to a CPU:

1. The ***control unit*** manages the work of the CPU. It receives instructions and makes sure they are carried out correctly.
2. The ***Arithmetic and Logic Unit (ALU)***. It makes calculations needed to carry out an instruction.
3. The ***registers*** are small areas of memory that store an instruction while it is being carried out.
4. The ***clock***. An instruction is carried out every time the clock ticks. It ticks around 3 billion times a second.

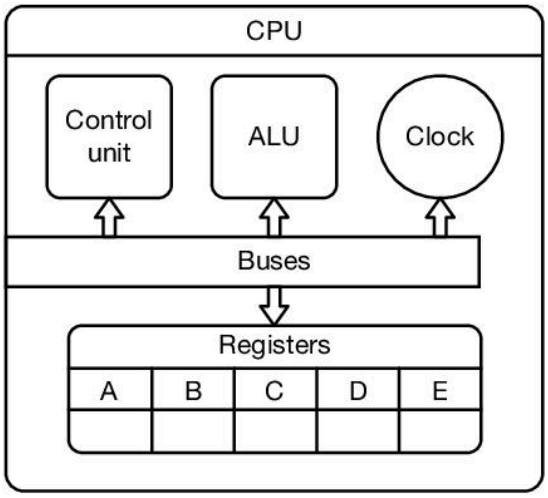


Figure 10.1.1 *There are four main parts to a CPU*

Buses

The parts of a CPU are joined together by fast connections called ***buses***. The buses also join the CPU to the computer's main memory.

Motherboard

The computer's CPU is mounted in the centre of a larger component called the ***motherboard***. The motherboard contains all the parts

needed to allow the CPU to work. It contains the computer's ***main memory***. It also contains sockets known as ports that allow the CPU to connect to input and output devices.

Figure 10.1.2 Microprocessor

The machine cycle

The way the CPU works is known as the ***machine cycle***. Every instruction is processed the same way:

1. The control unit ***fetches*** an instruction from the main memory.
2. It then ***decodes*** the instruction – working out what needs to be done.
3. Next, the control unit sends the instruction to the ALU.
4. The ALU ***executes*** the instruction.
5. The cycle starts again.

The machine cycle is also called the fetch-decode-execute cycle.

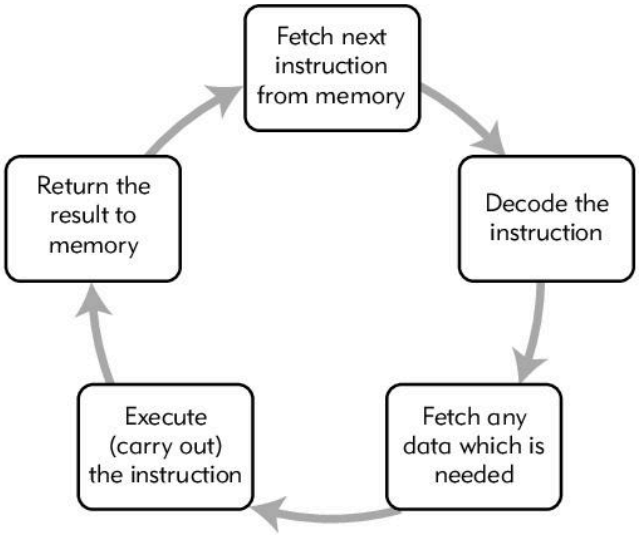


Figure 10.1.3 The fetch-execute-decode cycle

Processing speed

The speed of the processor is measured in hertz (Hz). A hertz is one cycle per second. Modern processor speeds are measured in gigahertz. A gigahertz is one billion cycles per second. ***Personal computer*** CPUs operate at around 3 gigahertz – three billion cycles per second. A faster clock speed means more instructions are carried out per second.

A ***core*** is a processor in the CPU. Instead of having one processor, a CPU will have two, four, or more processors running side by side. Multiple cores make a processor run faster.

Activity

Draw a diagram of the machine cycle explaining in your own words what happens at each step in the cycle.

Search the web for a labelled picture of a motherboard. Where is the CPU positioned? Make a list of any ports you can see. Can you see any memory?

10.2 Computer storage

In this lesson you will learn how the computer stores information. You will learn how to pick the right type of storage for your needs.

Primary storage

Primary storage is memory connected directly to the CPU. It is memory used by the computer for its own operations. You cannot save your work to primary storage. There are several types of primary storage:

Cache and registers

You learned about ***registers*** in lesson 10.1. They are used to hold the instruction the CPU is processing. Just outside the CPU is a larger area of memory called the ***cache***. The cache stores a queue of instructions ready for the CPU to use.

Random-access memory (RAM)

If you are working on an assignment, the ***word processing*** software and your document are stored in RAM so the CPU can access them quickly. RAM is 'volatile'. All data in RAM is lost when the computer is switched off.

Figure 10.2.1 *RAM contains the instructions and data for any program you are using*

Read-only memory (ROM)

ROM contains the basic instructions a computer needs to start up and operate. The programs on ROM are loaded by the manufacturer of the computer when it is built. The data held in ROM cannot be changed.

Secondary storage

Secondary storage is not directly connected to the CPU, so it takes longer for the processor to access data and instructions held there. Programs and data must be moved to RAM before the processor can access them.

Secondary storage:

- has much greater capacity than primary storage
- is not volatile – data is not lost when you switch the computer off
- is sometimes portable.

Storage drives

There are two types of storage drive: a ***hard disk drive (HDD)*** and a ***solid state drive (SSD)***.

Figure 10.2.2 *Hard disk drive*

An HDD is a mechanical drive. It contains metal disks that rotate. An arm moves over the surface to read data which is stored magnetically on the disks' surface. An SSD has no mechanical parts. It stores data electronically using electronic circuits.

HDDs are cheaper than SSDs and can store more data. SSDs are faster than HDDs and there is less chance of them breaking down.

People sometimes choose to pay extra for SSD storage because it is faster than HDD storage. SSDs are sometimes used in laptops because they are lighter.

Network and cloud storage

If your computer is joined to a school network or the Internet, you can use this link to save your work.

A ***network*** provides a large storage area for a whole network. Data stored on a network drive can be used on any computer connected to the network.

Cloud storage uses ***storage devices*** on the Internet. The devices are kept in large buildings called data centres. Storing files to 'the cloud' means you can retrieve them from any computer with an Internet connection.

Figure 10.2.3 *External storage devices can be plugged into the computer*

Activity

Create a poster about computer storage. Say what the difference is between primary and secondary storage. List the types of storage. Search the web for photographs to illustrate your poster.

Portable storage

An external device is portable and can be moved from one computer to another. You can buy external HDD and SSD devices. A ***flash memory drive*** is a small version of an SSD that is cheap and very portable.

10.3 Input devices

In this lesson you will learn about the many different types of input device and what they are for.

What is an input device?

An ***input device*** is a computer peripheral. The purpose of an input device is to:

- capture data
- convert data into digital form
- send digital data to the CPU to be stored or processed.

Talk about

Many computer systems use voice recognition to input data. You can search the web using your voice, select music from your playlist or even create and send an email.

1. Do you feel comfortable talking to a computer?
2. Can you think of any situations where voice input would be useful?
3. Are there any situations where voice control or input cannot be used?

Types of input device

Keyboard and mouse

You learned about the keyboard and mouse in Unit 2 and have used them with applications like the word processor. Key presses on the keyboard create digital data. A wireless mouse uses infrared light to detect movement and convert it into cursor movement on screen. Mouse buttons are clicked to make menu selections.

Many alternative keyboard and mouse devices have been developed. These are often used to help disabled people use computer systems. Examples are the braille keyboard, foot-mouse and eye-typer.

Modern technology allows a computer screen to be used as an input device. Touchscreens are used on every tablet and ***smartphone***. Some computers also have touchscreens. A touchscreen lets you tap a finger on the screen to select from menus, instead of using a mouse.

Figure 10.3.1 *Rollerball mouse*

Figure 10.3.2 *With sensor pressures, robots can grip delicate objects*

Sensor

A ***sensor*** measures events in the real world automatically. The sensor sends digital signals to a computer processor. In a factory, a sensor might monitor the temperature of an industrial process. If the temperature gets too high, a computer adjusts the process or sounds an alarm.

There are sensors to detect movement, heat, pressure and light. There are sensors to detect chemicals and radioactivity. ***Infrared sensors*** are used to detect how close objects are.

Camera

Digital cameras capture images as electronic digital data. Digital photographs can be stored and edited using a computer. The images can be added to documents, sent to friends as email attachments or included in ***multimedia presentations***.

A ***web camera (webcam)*** captures moving video images. Digital video can be stored and edited in the same way that digital photographs are. Digital video can also be sent live over the Internet. Video chat lets people see as well as talk to each other. In business, videoconferencing allows people to hold meetings even if they are in different countries.

Biometrics

Some features of your body are unique, for example your fingerprint. The tiny marks of the iris of your eye and the precise tone of your voice are other examples. These unique identifiers are called ***biometrics***.

Some modern input devices can read biometric data. They are used for security checks. For example, you might have to press your finger to a fingerprint detector to open a door.

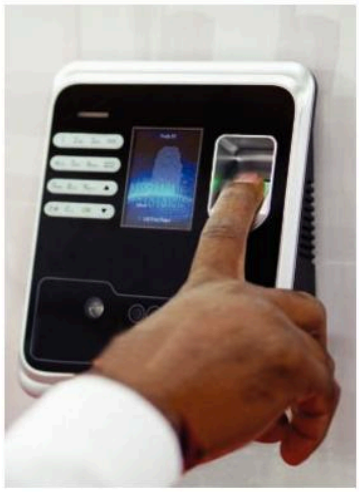


Figure 10.3.3 *Fingerprint scanner*

Audio input

A ***microphone*** can capture sound and convert it into digital data. The sound can be stored and edited as an audio file. Most music is recorded and played digitally.

Modern computer systems can be programmed to recognize speech. ***Voice recognition*** allows you to use audio input to give commands to a computer or to dictate text to a word processor.

Activity

Use the Internet to conduct research and write a report on either of these topics:

1. Computer input devices for the disabled.
2. How robots use sensors to 'see' the world around them.

10.4 Output devices

In this lesson you will learn about different types of output device and what they are used for.

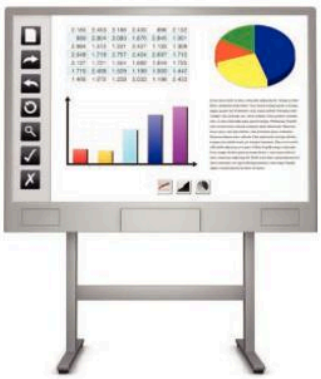


Figure 10.4.1 Interactive whiteboard

Output devices turn digital data into a form that is useful to humans. Output devices typically display the results of a computer's work so that we can see it, but there are other types of output device that have different functions.

Screens and projectors

The screen or monitor of your computer outputs text and image.

Modern screens are flat and lightweight. This makes modern computers more portable. Screens produce high-quality images. We can read text and watch video on devices as small as a smartphone.

The two main types of screen used are ***light-emitting diode (LED)*** and ***liquid crystal display (LCD)***. Both are flat and light, and produce high-quality output. LED screens use less electricity and are not as easily damaged as LCD screens.

A ***projector*** takes the image from a computer and projects it so it can be seen by a large group of people. Teachers use projectors to give multimedia presentations to whole classes. Sometimes the image is projected on to an ***interactive whiteboard***, which acts like a very large touchscreen.

Printers and plotters

Printout is sometimes called 'hard copy'. Hard copy is created by output devices called printers and plotters. The two types of printer commonly used today are:

1. ***Inkjet:*** sprays dots of coloured ink onto a page to create text and images.
2. ***Laser printer:*** draws the information on a page on a metal drum with a laser beam. The beam creates a small electrical charge which attracts a powder called toner onto the drum. Toner is transferred and heat-infused onto paper.

Both types of printer can print in colour and are quiet. Laser printers are faster and give a better quality print than ***inkjet printers***. Most organizations prefer laser printers.

Plotters work by drawing on the page with pens. Plotters create accurate technical drawings on large sheets. They are used by engineers and architects to draw plans.

Figure 10.4.2 *Plotter*

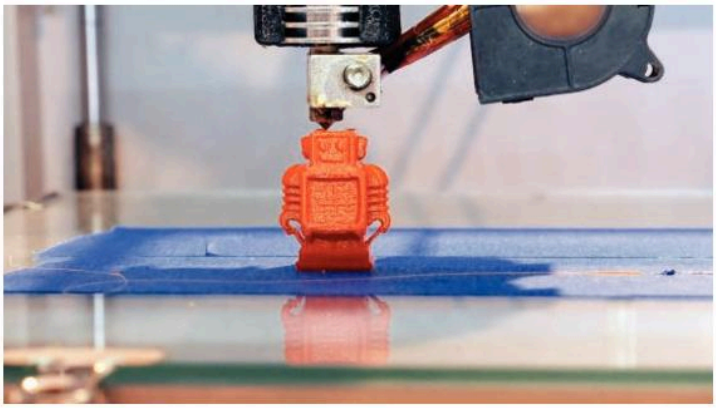


Figure 10.4.3 *3D printers create three-dimensional physical objects from digital models*

3D printers usually print in plastic, but can print other materials including metals. They are used to demonstrate designs but can also produce working objects.

Speakers and headphones

The output from a computer doesn't need to be visual. A computer can also output sounds. A computer can store and play music tracks.

Blind people rely on sound to work with a computer. Screen reader software converts digital data into sound. The screen text is read aloud to the blind user.

Virtual reality

Virtual reality (VR) is a computer-created world that surrounds the viewer. The virtual world is ***interactive*** – you can reach out and touch things. A VR world is viewed through a ***VR headset***, which means all you see is the virtual world you are in. VR is mostly used for games but can also be used to train people to complete difficult or dangerous tasks, such as landing a plane.

Activity

You are designing a computer system for use in your school IT room. Write a report with your recommendations for output devices for the room.

10.5 System software

In this lesson you will learn about system software.

There are two main types of software:

1. System software
2. Application software.

You need both types of software to use a computer.

System software

System software is software that controls the way your computer works. It has four main tasks. It:

1. Makes sure that all the pieces of computer hardware communicate with each other.
2. Takes care of the computer's memory and storage.
3. Loads application software packages.
4. Saves your work.

The software which takes care of all these system functions is called the ***operating system (OS)***.

The OS starts up as soon as you turn on the computer, and keeps running all the time you are using it. A lot of the time you do not even notice it. For example, the OS makes sure that when you type on the keyboard, the letters you type are sent to the processor.

Types of operating system

The most common OS for desktop and laptop computers is Microsoft Windows. Windows uses a GUI, and you give instructions mainly by clicking a mouse over icons and menus.

Microsoft Windows is designed to be used on computers made by many different manufacturers. It doesn't matter who has made your computer; what you will see when you start the computer is the Microsoft Windows GUI. Windows can be replaced by alternative operating systems, such as Linux.

Macintosh computers have their own operating system, called Mac OS. It is quite like Microsoft Windows in appearance, but Mac OS is not used on any other manufacturer's computers. Macintosh computers can only use Mac OS.

An OS that has become very important in recent years is Android. Android has been developed to operate on tablet computers and smartphones. It is installed on more devices than any other OS. Like Microsoft Windows, Android is used on devices made by many different manufacturers.

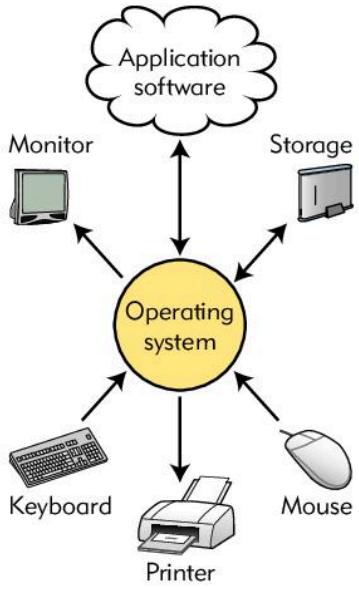


Figure 10.5.1 Operating system

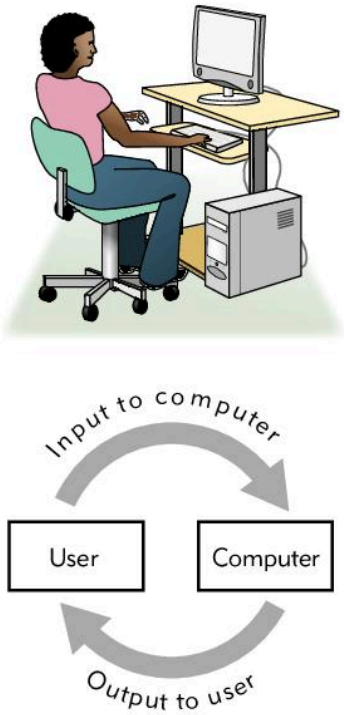


Figure 10.5.2 User interfaces

Apple's iOS operating system is designed for Apple iPhone and the iPad.

The user interface

The OS provides a user interface. The user interface is what you see when you first start up your computer. It lets you give instructions to the computer.

Today a computer interface uses graphical images such as windows and icons. You use a mouse and a keyboard together to navigate and give instructions to the computer. This type of interface is called a ***graphical user interface (GUI)***.

In older computers, the user interface was text only. You typed in commands like 'Print file' when you wanted to do a task. The computer sent messages back to you as words which appeared on the screen. This type of interface is called a ***command line interface***.

A GUI is easy to learn. It is intuitive and does not need a high level of technical knowledge. A command line interface is quite technical in comparison. It discouraged many people from using computers. The command line interface is still present in operating systems, but few people use it. It tends to be used by experts to complete technical tasks.

Activity

Research the Linux OS and write a brief report. Who owns Linux? How does it get its name? What kind of computers can it be used on? How much does it cost?

10.6 Application software

In this lesson you will learn about application software.

What is application software?

When you sit down at a computer, you might want to type an assignment or send an email. An architect may want to design a new house. A bank manager may want to calculate repayments on a loan. ***Application software*** is written to help us carry out tasks like these.

Types of application software

There are many applications that software is written for. Some of the main areas are:

- **Business applications:** word processing, spreadsheets, databases, financial planning, project management
- **Design:** computer-aided design (CAD), graphics, desktop publishing, web design, 3D design
- **Engineering and science:** computer-aided manufacturing, robotics, simulations and models
- **Entertainment:** games, video and audio editing, music and video streaming
- **Communications:** email, web browsers, ***video conferencing***.

Figure 10.6.1 *Computer-aided design*

Apps

Apps are small applications, usually written for use on tablet computers or smartphones. They are application software, but are usually written for a very limited task, like a calculator. Apps are intended to be used on mobile devices and usually linked to the Internet.

Software suites

A ***software suite*** is a set of software applications made by the same supplier. Suites usually contain business applications for word processing, spreadsheets, presentation design, and databases.

The advantage of a suite of software is that each separate piece of software will behave in a similar way. The menus will be similar. Some of the functions will be the same throughout, for example the way that text is emphasized. The similarity makes it easier to learn and use applications. Suites also make it easy to share data between different applications.

Examples of software suites are Microsoft Office, Apple iWork and Google Docs.

Off-the-shelf or bespoke software

For most purposes, individuals and organizations buy software 'off-the-shelf'. ***Off-the-shelf software*** (sometimes called general purpose software) is written by a company with the aim of making it useful to as many people as possible. The product is bought, installed and used. It can be used as soon as it is bought, but it might not do exactly what you want.

For some specialized applications, a company might decide it needs software written to do exactly what they need it to do. This is called ***bespoke software***, or sometimes custom-written software. Bespoke software is expensive and takes a long time to develop.

Figure 10.6.2 *Web design*

Commercial and free applications

Application software can be purchased outright. Purchasing software gives you a license to use it on a fixed number of computers. Another way to buy software is to pay an annual fee for a license. That can be a cheaper way to start using software, but could cost more over time than buying the software outright.

Free software applications are available. Sometimes, free software is a limited version of paid-for software. Other times, free use is time-limited to let you try the software before you buy it. There is also completely free software available: Google Docs is one example.

Activity

Look through the list in the 'Types of application software' section. Choose an application area that you are interested in.

Search the Internet for two or three programs that are widely used for your chosen purpose. Which one would you like to use? Can you find any free software that might work just as well?

Unit 11 11.1 Data communication

Data communication and networks

In this unit you will learn how data is transmitted over a network, and about the media used to carry data signals. You will learn about the practical things data transmission is used for.

In this lesson you will learn about different modes and signals used in data transmission.

Analog and digital transmission

A digital measure is one that can be expressed in whole numbers, or digits. For instance, if you count the number of coins that you have in your pocket, that is a digital value. An analog measure is one that changes smoothly over time. Time is an example of an analog measure.

The data stored by a computer is digital. A communication signal is often analog. A device called a ***modem*** enables computer communication by converting between digital and analog signals.

'Modem' is short for modulator-demodulator. It is the device that converts digital signals to analog signals – and back again – so that digital data can be sent over analog telephone networks. In modern networks, analog signals are not used as often, but modems are still needed to translate between different forms of digital data.

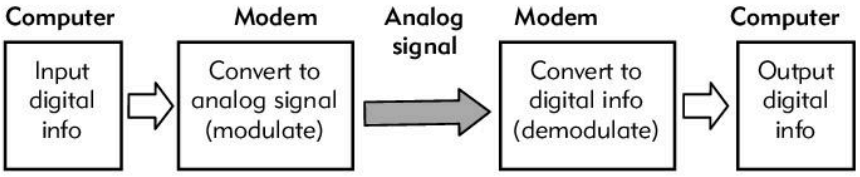


Figure 11.1.1 *Modem operation*

Bandwidth and latency

The amount of data that can be sent over a connection in a fixed time is called ***bandwidth***. The higher the bandwidth, the more data can be transmitted. Bandwidth is like water moving in pipes. Water travelling through a broad pipe will reach the other end in greater quantities than water travelling through a narrow pipe.

A data connection that carries a lot of data is called ***broadband***. Broadband can carry data such as video signals. Connections that carry less data are called ***narrowband***. ***Voiceband*** connections make use of phone lines. These have very limited bandwidth and are very limited in the amount of data they can carry.

Sometimes a high bandwidth connection is described as 'faster'. In fact, data travels at a similar speed along any connection. Bandwidth is a measure of how much, not how fast data travels. High bandwidth tells you a network will support a lot of users at the same time.

Latency is the measure of how fast a network is. Latency is the time it takes a set of data to travel to its destination and back. Bandwidth is one factor in deciding latency, but there are many more, like the condition of the ***hardware*** and cables being used, and whether or not you are connecting to the network via a ***wireless connection***.

Communication methods

Data can be transmitted using a number of methods:

- ***Simplex*** communication sends signals in one direction only, for example a public announcement (PA system, through which you can receive information, but cannot send messages).
- ***Duplex*** communication sends signals in both directions (for example a computer connected to the Internet that can receive and send information).
- ***Half-duplex*** communications work in both directions, but only one at a time. An example is a walkie-talkie, where only one person can talk at any time.
- ***Point-to-point*** communication connects two fixed points, and other users cannot hear the signal. An example is a phone conversation.
- ***Broadcast*** communication is sent out from a central point, and anyone who can pick up the signal can hear it. An example is a radio station, which can be heard by anyone with a radio.

Did you know...?

Data travels very quickly around a network – even one as large as the Internet.

Data is sent along fibre-optic cables as pulses of light. Light travels at 299,792,458 metres per second. The latency of light is 3.33 microseconds. That means it travels 1 kilometre in 0.00000333 seconds.

Light does not travel as fast along a fibre-optic cable. The latency of light along a cable is 4.9 microseconds per kilometre. At that speed, data would travel to the moon in less than 2 seconds.

Activity

Use an appropriate software package to create a diagram that shows how modems are used in communication. Add notes to describe what is happening at each stage in the process.

Unit 11 11.2 Data transmission media – wired

In this lesson you will learn about the cables that carry data around a network.

You have learned about devices that use communications technology. In this lesson you will look at the ***transmission medium*** – the channels that carry the signals between devices.

Cable

There are two types of cable used to carry data in networks. Metal cables are used to carry signals as electronic pulses. Fibre-optic cables are also used in networks. Fibre-optic cables carry data signals as pulses of light.

Copper cable

The cables used in networks are made from copper. Copper is inexpensive and easy to install. Copper has a low resistance to electricity, and is used for electrical cabling in your house.

Copper cables are vulnerable to electrical interference. They are only used over relatively short distances. The copper cables used in ***local area networks (LAN)*** are never used over distances of more than 100 metres. Beyond 100 metres, the signal suffers from interference and data transmission is unreliable.

There are two types of copper cable used in networks: twisted pair and coaxial. Both cables can carry a two-way duplex signal.

Twisted pair cables

In a ***twisted pair cable***, data is carried along pairs of thin copper wire. One wire in the pair brings data inwards and the other takes data out. The pair of wires are twisted around each other. This is to reduce interference. Some types of twisted pair cable are shielded to cut out electrical interference.

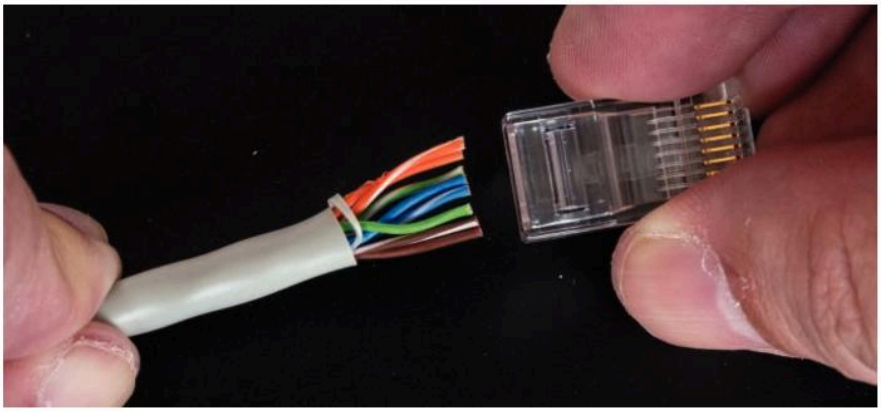


Figure 11.2.1 *Twisted pair cable*

The cables that carry data around a LAN are mostly twisted pair. They are hidden away in plastic or metal casing. Each cable ends in a network socket. The sockets allow computers and other devices to be connected to the network. Data points are the sockets on the wall you plug a computer into. The socket is called an RJ 45. The cable you see connecting a computer to a wall socket is the same twisted pair cable used throughout the network.

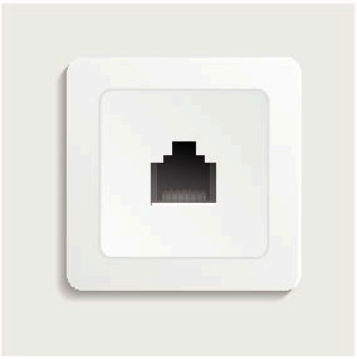


Figure 11.2.2 RJ 45 connector

Coaxial cable

In a ***coaxial cable***, the signals are carried by an inner conductor and an outer insulating layer which wraps round it. The signal is carried in the space between the two layers. Coaxial cable is strong, but more expensive than twisted pair cable. It is rarely used in modern LANs since it has been replaced by fibre-optic cable for most uses.

Fibre-optic cable

Fibre-optic cable is made of long clear strands of plastic wire covered with a reflective interior coating. Light signals pass along the inside of the fibre by bouncing off the reflective inside coating.

Optical fibres can be used for telecommunication and ***computer networks*** because they are flexible and can be bundled as cables. Fibre-optic cable is especially good for long-distance communications because light does not lose energy as it passes down the fibre, and it is not affected by electrical interference. Fibre-optic cable is used to extend LANs over longer distances than copper can.

Figure 11.2.3 Fibre-optic cables use light signals

Activity

How much data cable is in your school's computer lab? Find out how many data points (sockets) there are in the room. Assume the average length of a cable in your school is 50 metres.

Unit 11 11.3 Data transmission media – wireless

In this lesson you will learn about the technology used to transmit data without the use of cables.

Wireless data transmission

Some devices transmit data within a network without using a cable. Those devices use a ***wireless connection***. The most common forms of wireless connection are ***radio waves***, ***microwaves*** and ***infrared beams***.

Radio waves can pass through solid objects, so a radio signal can be picked up from almost anywhere. Radio signals allow portable devices like laptops and tablets to access a local area network (LAN) or the Internet.

Infrared signals are blocked by solid objects, so they are only used for short-range communication. Infrared might be used to send a signal to a device in the same room (for instance a TV remote control).

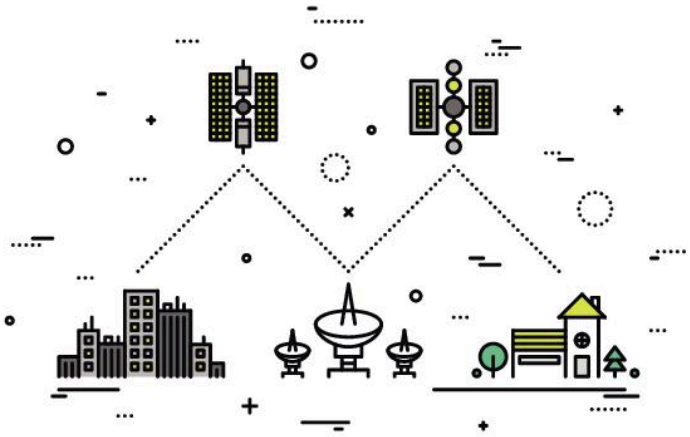


Figure 11.3.1 *Satellite signals are sent as microwaves*

People who live in areas where there are no cables in place can connect to the Internet through a ***satellite connection***. Satellite signals are sent as microwaves. Microwaves do not pass through solid objects as easily as radio waves, but because the satellite is in space, that is not a problem. However, bad weather and rain can affect the connection.

Figure 11.3.2 *Home router*

Wi-Fi network connection

A ***Wi-Fi*** enabled device such as a laptop, smartphone or tablet can connect to a LAN or the Internet when in range of a wireless Internet connection. ***Wireless network*** adapters are now built

into most laptops. Wi-Fi connections have very limited range – a maximum of 300 metres when outdoors, and much less indoors, because walls get in the way of the weak signal.

Wireless access in LANs is provided using devices called ***Wireless Access Points (WAP)***. Wireless access points are added in a network. You may see WAP around your school or other buildings you are in. They are usually located on ceilings or high on walls. You may have an Internet connection in your home. The home ***router*** that provides the service contains a WAP. The WAP lets you connect to the Internet wirelessly.

Bluetooth

Bluetooth is a protocol used to let wireless devices communicate with nearby computers, or with each other. For instance, Bluetooth will let you use a hands-free mobile headset or share files between mobile phones. Like Wi-Fi, Bluetooth has a limited range.

Mobile communications network

Mobile communications networks were introduced in the 1980s to allow people to use mobile phones. Since then, new versions (called generations) of mobile communication networks have been introduced to provide faster data and Internet access. The latest generation, 5G, was introduced in 2018. 5G has the potential to provide faster Internet access than broadband.

It is predicted that by 2020 there will be 4.75 billion mobile phone users in the world. Many use smartphones to access the Internet. Mobile phones provide access to the Internet from anywhere – you don't have to be near a WAP.

Figure 11.3.3 *Mobile phone aerial*

Activity

Make a list of ways that you access the Internet in a typical week.

Make a note of where you access the Internet, whether you use a wired or wireless connection, and what you use the Internet for. What changes would you like to see in how you access the Internet?

Unit 11 11.4 Using transmission media in the real world

In this lesson you will learn about some ways that computer networks are used in communications.

Figure 11.4.1 SMS is commonly called texting

Sending messages

Point-to-point communication systems allow us to send messages to an individual or small group of people. Point-to-point messaging is different from broadcasting, which goes out to anyone who is listening.

Short Messaging Service (SMS) carries short messages between mobile phone users. Because a single text message is only 160 characters long, people often use 'text speak', which includes abbreviations.

Instant messaging (IM) is a way of sending typed messages using the Internet. Instant messages are usually read as soon as they are sent. They are replied to quickly. IM sometimes takes place in chatrooms. Chatrooms are usually moderated, which means threatening or unsuitable language is banned.

Email is used for longer, more formal communication than SMS and IM. There is usually a delay between an email being sent and a reply being received. Large documents and images can be attached to emails. Business emails must be polite and professional. Emails should be typed carefully, with high standards of spelling and grammar. Business emails are often filed so there is a record of a communication.

Did you know...?

Text messaging is the most widely used form of data communication. In 2018 it was estimated that 16 million SMS messages were sent every minute worldwide. Texting is also the most effective communication: 99 per cent of texts are opened and read, compared with only 25 per cent of emails.

Real-time communication

In real-time communication, people interact as if they are having a face-to-face conversation.

VoIP stands for 'voice over Internet Protocol'. VoIP allows phone conversations over the Internet, but needs high bandwidth to work well. VoIP is cheaper than traditional phone systems.

Video conferencing is like a phone conversation, but the people taking part can see as well as hear each other. Webcams built into computers and smartphones let us videoconference. Some organizations set up special rooms with high-quality video and audio equipment for videoconferencing.

Web conferencing is like video conferencing, but the people taking part have extra tools they can use. People can share screens so they can create documents together even though they are in different locations. A whiteboard lets people share their ideas. ***Presentation software*** lets people share slideshows.

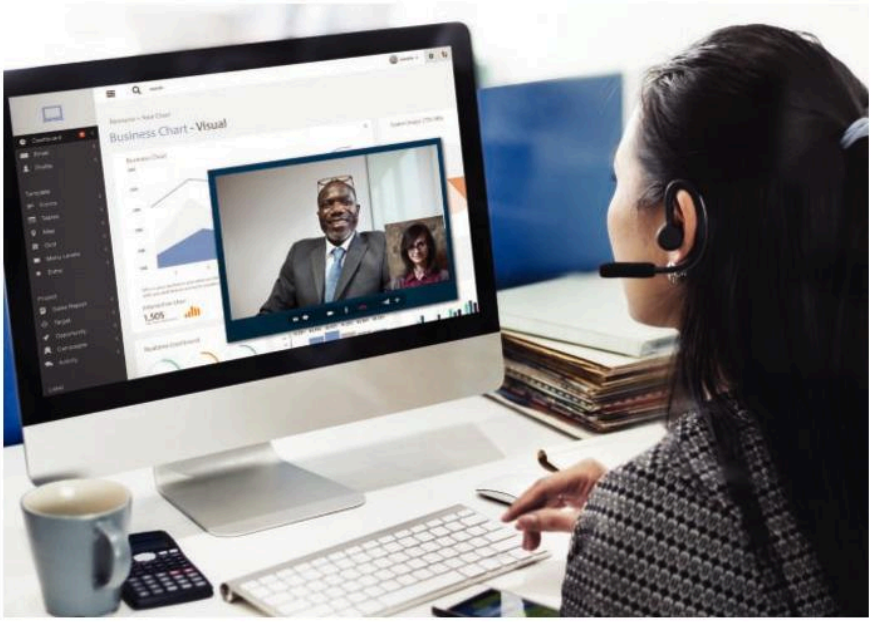


Figure 11.4.2 *A web conference lets people in distant locations hold meetings as if they were in the same room together*

A global conversation

Technology lets you take part in global conversations with a wide range of people all over the world.

Weblogs (blogs) are personal web pages that you update regularly like a diary. Blogs can be read by friends and by strangers. Readers can add comments to a blog.

Newsgroups and ***forums*** share messages among a wide group of people. They are used for more detailed conversations than SMS and IM. Typically, discussion is about a particular topic, like science, music or sport.

Activity

Use the Internet to search for at least three applications that can be used for video conferencing. Compare the advantages and disadvantages of each application in a list. Which one do you think is best?

Unit 11 11.5 Network protocols for data transmission

In this lesson you will learn what protocols are and how they are used to allow communication over networks.

Sending data over networks

Think about an email you send to a friend. To reach its destination, your email must pass through miles of cable owned by several different organizations. It will be received and then sent on by dozens of hardware devices made by different manufacturers.

The journey an email makes is very complicated, but it is almost 100 per cent certain to reach its destination. What makes that possible is that your email and all the cables, hardware and software along the route follow the same rules. Those rules are called ***network protocols***.

Network protocols

A network protocol is a set of rules that says how:

- data must be organized
- signals must be sent
- errors are detected and fixed.

Two devices must use the same protocols to be able to communicate.

Examples of protocols

There isn't a single network protocol. Different protocols are used for different purposes.

Figure 11.5.1 *Ethernet socket and cable*

Ethernet is the protocol that says how computers are linked together in local area networks (LAN). Ethernet tells us what cables and sockets can be used for LANs. You learned about network cables and sockets in lesson 3.3.

If network users send data at the same time, a data collision can occur. Data is lost in a collision. Ethernet protocols make sure that data collisions are detected and data is recovered so that it gets safely to its destination.

TCP/IP is the protocol that says how data sent over the Internet will get safely to its destination. The TCP/IP protocol has two parts:

1. ***Transmission Control Protocol (TCP)***: controls the way that data is broken into small blocks (called packets) to be sent over the Internet. Sending messages in small packets is more reliable and faster than sending them as a large block of data.
2. ***Internet Protocol (IP)*** is a method of giving all devices on the Internet an address so that messages are delivered to the correct destination.

Hypertext Transfer Protocol (HTTP) controls how web pages are formatted and sent over the Internet. HTTP makes sure that when you request a web page you can read it – no matter what browser or device you are using.

Figure 11.5.2 *HTTPS makes websites more secure*

HTTPS is a more secure version of HTTP – the 'S' stands for Secure. HTTPS was designed to protect personal data and financial transactions on the Internet. Most websites now use HTTPS.

There are many other network protocols used, including:

- simple Mail Transfer Protocol (SMTP) and POP3, which are used for sending emails
- Wi-Fi, the protocol that provides wireless connection to a network
- File Transfer Protocol (FTP), used to transfer large files between computers
- Internet Relay Chat, the protocol that allows instant messaging to take place.

For communication to take place, all the devices, software and communication media being used must comply with the appropriate protocols. Without protocols, networks would not be able to operate.

Activity

Make a list of the things you have done in the last week using a computer connected to a network. For example, have you sent an email? For each activity, write the network protocol(s) that you used.

Unit 12 12.1 Digital data

In this lesson you will learn what digital data is and why a computer must use digital data in all its processes.

Digital data and binary numbers

As you have studied this course you will have learned about the term 'digital'. You may have used it yourself in activities, assignments and class discussions. In this unit you will learn what digital data means. You will learn why a computer processor must use digital data, and how it manages to store every piece of data as a string of zeros and ones.

What is digital data?

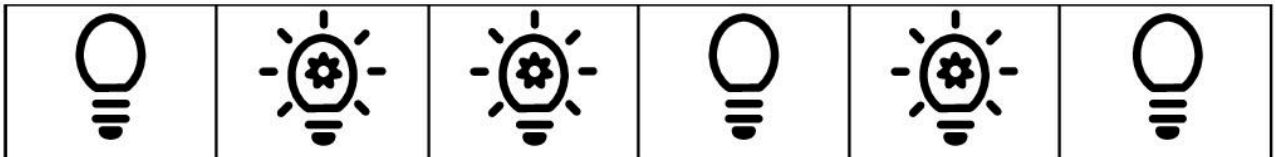
When we communicate, we use letters, numbers and punctuation. We put characters together to make words and sentences. We communicate in other ways too. We create images, still and moving. We create sounds – music, for example, helps us to communicate feelings.

A computer uses a simpler language. A computer can only communicate using numeric digits. That is where the term ***digital*** comes from. In fact, computers only use two digits in their language: zero (0) and one (1). The computer can combine digits to make words, but it can only ever use 0 and 1 in those words.

Data that is only made up of two digits is called ***digital data***.

Why computers use digital data

A ***microprocessor*** is made up of millions of tiny electronic switches. A switch in a microprocessor is like any other type of switch. A switch can be off or on. The off positions of the switches in a microprocessor are shown as 0s while the on positions are shown as 1s.



OFF	ON	ON	OFF	ON	OFF
0	1	1	0	1	0

Figure 12.1.1 *Digital data*

How a computer stores data

You have learned that the computer stores data as numbers. It uses a number system that only uses two digits, 0 and 1. This number system is called ***binary***. You will learn more about binary in lesson 12.2.

Binary is used to store every piece of data in a computer. That includes numbers, text instructions, video and audio.

Numbers: the decimal numbers you are used to can be written as binary numbers. For example, 14 in decimal is 1110 in binary. The numbers look different, but the value they hold is the same. Storing numbers is straightforward for computers.

Figure 12.1.2 *Digital data is stored as code*

Every other piece of data stored by a computer must be stored as a ***code***. Code is very important in computing. It is used to translate between human readable language and binary. Without code, people would have to learn to read and write binary to use a computer. Using code, a computer can turn a string of 0s and 1s into a high-definition ***interactive*** game with full audio.

Here is an example of how code works:

Text: when you press a key on your keyboard, your computer looks up the letter you typed in something called an ***ASCII*** (pronounced *as'-key*) table on a microchip in the keyboard. The ASCII table contains a code. Every letter on your keyboard has a binary number code which is sent to the computer processor.

So, when you type the letter A, the keyboard converts it to 01000001 and sends it to memory.

For 'A' to appear on your screen or be printed, your computer changes the ASCII code back into the letter that you can read, but stores it as ASCII.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 12.1. You will use ASCII code to do some conversion between text and binary.

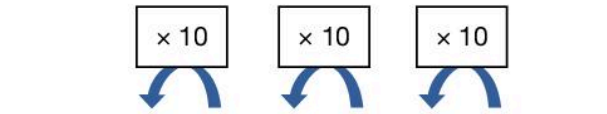
In this lesson you will learn about binary numbers and how to convert them into decimal.

Decimal and binary

In lesson 12.1 you learned that a computer must store everything it processes as digital data. We use the binary number system to understand what digital data looks like. You have seen how binary numbers look different to decimal numbers.

Decimal

The ***decimal*** number system uses 10 digits (0 to 9). The value of each column in a decimal number is 10 times greater than the previous column. Another name for decimal is ***Base 10***.

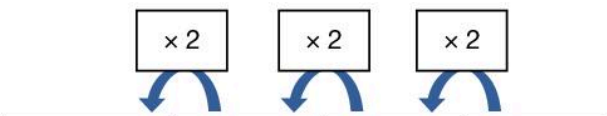


Thousands	Hundreds	Tens	Units
2	5	4	3

Figure 12.2.1 *Base 10*

Binary

The ***binary*** number system uses two digits (0 and 1). The value of each column in a binary number is two times greater than the previous column. Another name for binary is ***Base 2***.



Eights	Fours	Twos	Units
1	1	0	1

Figure 12.2.2 *Base 2*

How to read binary numbers

You can use your knowledge about Base 2 to read binary numbers. The best way to understand a binary number is to convert it into decimal. You use decimal every day, so it is much easier to understand.

The binary number used in the previous section used the binary number 1101. Here is an easy way to convert the number to decimal:

1. Draw a table like the one in figure 12.2.2. It must have enough columns to hold the binary number you want to convert.
2. In the first row of the table write the value of each column. Start with a 1 in the right-hand column then multiply by 2 as you move from right to left.

8	4	2	1

3. Enter the number you want to convert in the second row of your table.

8s	4s	2s	1s
1	1	0	1

4. Using the table you created, move your binary number along and add together the values of those columns that contain a 1. With practice, you will soon learn the column heading values and be able to convert binary numbers in your head.

   In this example you have 8 + 4 + 1 = 13

   1101 in binary is 13 in decimal.

Bits and bytes

Each digit in a binary number is called a ***bit***. There are four bits in the binary number 1101. The word 'bit' is short for binary digit. Bit combines the first letter of '**b**inary' with the last two letters of 'dig**it**'.

A bit isn't very useful on its own. It can only store one of two values: 0 or 1. To make binary more useful, computers group bits together. Eight bits grouped together is called a ***byte***. Here are some examples of data stored in a byte: 11111111, 00000000, 00110101.

When you write a byte you must show all eight digits in the number, even if the number starts with zeros. The value zero written as a byte is 00000000, not just 0 as it would be written in decimal.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 12.2. You will find plenty of fun exercises to practise your skills in converting binary numbers to decimal.

Did you know...?

When computer scientists needed a word for a group of 8 bits they invented the word byte.

Byte is a play on the word bite. Taking a byte of data is like taking a small bite of a biscuit.

Later, scientists started to use smaller groups of 4 binary digits. Four binary digits is called a 'nibble'.

Unit 12 12.3 More about binary

In this lesson you will learn how computers store large numbers in binary. You will learn how to convert decimal numbers into binary.

Larger numbers in binary

You learned in lesson 12.2 that a single binary digit is called a ***bit***. A bit is too small to be very useful, so the computer processor uses a byte as its basic 'word'. A byte is eight bits long.

The lowest value a byte can hold is 00000000, or 0 in decimal. The highest value a byte can hold is 11111111. Adding the column values in the table will show that the largest value that can be held in a byte is 255.

128	64	32	16	8	4	2	1
1	1	1	1	1	1	1	1

Storing larger numbers

A computer will often need to use larger values than 255. To store and process larger values, the computer joins bytes together.

If two bytes are joined together, the highest value that the combined bytes can hold is 65,535.

If three bytes are joined together, the highest value that the combined bytes can hold is 16,777,215.

When several bytes are joined together they are called a ***word***.

Uses for larger binary numbers

In lesson 12.1 you learned that a computer uses ASCII code to store the characters you type on a keyboard. ASCII is stored in a single byte. That means ASCII can only use 256 characters (numbered 0 to 255).

ASCII only includes English characters. To allow people to use other languages, the computer uses ***unicode***. Unicode uses two or more bytes joined together. That means unicode can support languages like Arabic and Mandarin. There are approximately 110,000 characters in unicode.

Did you know...?

The binary number system was invented by a German called Gottfreid Leibnitz in 1689, long before computers were invented. Leibnitz based much of his thinking on earlier binary systems such as the Chinese i-Ching. He believed binary numbers could be used to solve the mystery of how the Universe was created.

Today, astronomers are using supercomputers, processing billions of binary numbers a second to explore how the universe works. It is possible that Leibnitz will, one day, be proved right.

A computer stores images as digital data. A digital image is made up of tiny dots of colour called ***pixels***. In early colour computers a single byte was used to store colour. That meant only 256 colours could be used.

For simple images like emojis, 256 colours is enough. But a photograph needs many more colours to look realistic. A method called ***true colour*** is used in modern computers. True colour uses three bytes to store nearly 17 million colours – more than the human eye can see.

Converting from decimal to binary

In lesson 12.2 you learned how to convert a binary number into decimal. In this example you will see how to convert a decimal value to binary. In this example, 20 is converted to binary.

1. Create a blank binary number table like the one you used when converting binary to decimal.

128	64	32	16	8	4	2	units

2. Working from left to right, put a 0 in every column until you reach the first column that is less than or equal to the number you are converting. Put a 1 in that column. In this example, 16 is less than 20, so a 1 goes in that column.

128	64	32	16	8	4	2	units
0	0	0	1				

3. Subtract the value of the column you have put a 1 in from the number you are converting:
20 – 16 = 4

4. Continuing from the column on the right, repeat step 2 using the remainder. In this example, the remainder is 4. When the remainder is 0 you have completed the conversion. Fill in any empty columns with a zero.

128	64	32	16	8	4	2	units
0	0	0	1	0	1	0	0

Did you know...?

An early use for binary was the Braille type system. The system was invented by Frenchman Louis Braille in 1829. In Braille, a letter is shown as a group of 6 dots. The dots can be either raised or flat. The pattern of raised dots represents a letter number or punctuation character.

Braille is a printing system that uses raised dots on a page instead of ink. Braille allows blind people to read.

Figure 12.3.1 *Braille*

Activity

Convert these numbers into binary:

1. 18

2. 37

3. 146

Unit 13

13.1 Using the Internet responsibly and legally

In this lesson you will learn how to use Internet content responsibly and legally.

Using the Internet for learning

In this unit you will learn how to use advanced web search techniques. You will learn how to ensure the web content that you use is reliable. When you use content you find on the web, it is important to say where you found it. You will learn how to use citations to give credit for the content you use.

Using the Internet responsibly

Online behaviour

When you are online it is important to behave responsibly. You should behave to others as you would like them to behave toward you. Responsible online behaviour is called ***netiquette***. Examples of good netiquette include:

- being courteous in email and messaging – think about how your message will be interpreted. Talk to people online as though they were with you in person
- report any behaviour that seems upsetting, dangerous or irresponsible. Help others to report problems
- observe the rules of any website you are using
- check your messages and email regularly. Respond in a timely manner
- be open and willing to share your knowledge with others
- be safe and help others to stay safe.

Using the Internet legally

Intellectual property

The idea of ***intellectual property*** is that you own anything you have created using your mind. Intellectual property applies to:

- written work
- images and artwork
- music
- plans and designs
- computer software and games.

Fair use of intellectual property

Intellectual property is protected by copyright law. This means that you must have permission from the owner before you can use their content. Copyright law usually allows for 'fair use' of copyrighted materials. The idea of fair use allows limited use of content for a few purposes such as:

- research or study
- using a short quotation from a work
- writing a review of a piece of work
- reporting current affairs and news

Fair use allows you to use short quotes or extracts from other people's work in your school assignments without asking for permission. If copyrighted work is used it should be acknowledged with a citation. Fair use does not apply to video, film or broadcast material such as TV and radio programs.

Figure 13.1.1 *Behaving responsibly online will encourage others to behave well toward you.*

What copyright means to you

You can legally use someone else's content in your own work if you have:

- purchased the content with a license that allows you to use it
- been given permission by the owner of the work to use it.

Many content owners on the Internet use a license called ***Creative Commons***. A license is published with content so that you don't have to ask the owner for permission. Sites you can use include Wikimedia Commons, Pixabay and Unsplash.

Figure 13.1.2 *There are websites that help you to find Create Commons content*

Copyright theft

Copyright theft is a crime. Criminals make copies of music, games and films. They sell the copies on the Internet. This is called ***software piracy***. The person who created the work does not get money from the copies. Downloading unofficial files that have been pirated is illegal.

Local laws

Countries have become concerned at the levels of crime that take place on the Internet. Local laws exist in most countries to govern behaviour on the Internet. The laws cover activities such as online fraud, the publication of illegal and obscene material and copyright theft. Laws may exist that limit what people can say about others online. You need to be aware of laws that apply in your country.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 13.1. Complete activities on behaving responsibly and behaving legally when using the Internet.

Unit 13 13.2 Effective web searching

In this lesson you will learn some advanced web search skills that will make you more effective when you search for information on the web.

You have had opportunities to practise the basic web search skills you learned in lesson 3.4 while completing activities in this book. In this lesson you will learn some advanced web search skills.

Advanced search

Most search engines have advanced tools you can use to improve your web searching. In this lesson you will learn how Google's advanced search works.

In the bottom right-hand corner of the main Google search page are three links: Terms, Privacy and Settings.

1. Click Settings – a pop-up menu appears.
2. Select Advanced search from the menu.
   The Google 'Advanced search' menu comes up on screen. The advanced search box is in two parts. At the top there is a section called 'Find pages with...' Below that there is a section called 'Then narrow your results by...'

'Find pages with'

The boxes in the 'Find pages with' section tell Google what items you want to include in your search list. The table below shows an example: Mary wants to buy her grandmother a flower vase for her birthday.

Search box	Explanation	Example
all these words:	Enter your keywords in this box like you would in the main search box on the Google search page.	Flower vase blue
this exact word or phrase	Enter phrases you want to search for exactly as you want them to appear.	Cobalt blue
any of these words	Google will match any of the words you enter in this box but won't try to match them all. Imagine the word 'or' between each word.	Vintage, antique
none of these words	A page containing these words will be excluded from your search list.	Glass
numbers ranging from	Enter upper and lower numerical limits for your search. You must include a symbol for what the number stands for (e.g. $, kg, cm).	$10–$20

The example tells us Mary wants to buy a blue flower vase. She decides she likes the colour 'cobalt blue' best. In the third box Mary says she wants to buy either a vintage or antique vase. In the next box she says she doesn't want the vase to be made from glass. In the final box she says she wants to see vases that cost between $10 and $20.

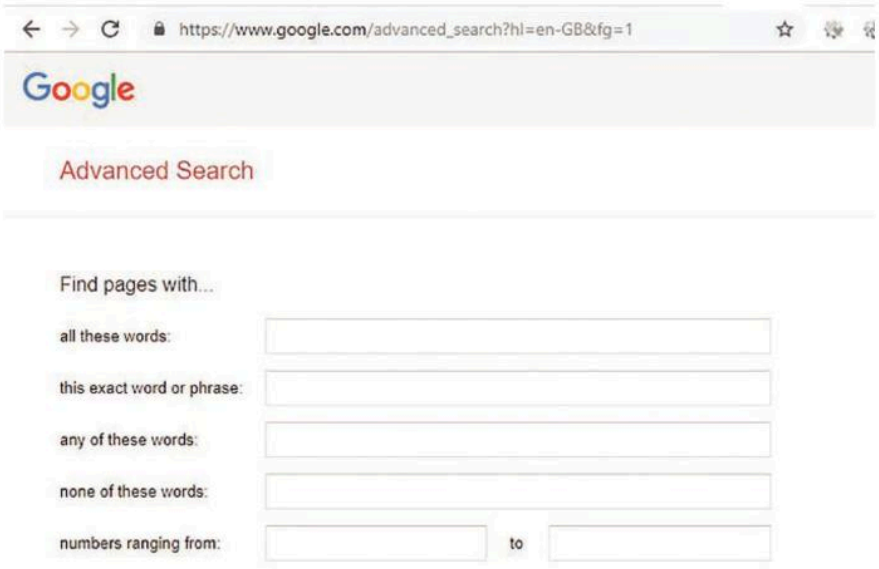


Figure 13.2.1 *Advanced search*

Activity

Do the search yourself. Add the information to the search boxes one at a time, and after completing each box click the advanced search button at the bottom of the page. Compare the results you get at each step.

'Then narrow your results by'

In this section you give Google information about the results you want to remove from your search list. Some useful options here are:

Region: The drop-down box lets you pick a country by name. This can be useful if you want to compare how issues are reported in different countries.

Last update: This lets you filter out pages that have not been recently updated. You could set this to 'up to a week ago' to search for up-to-date news reports.

Usage rights are useful if you are looking for images or other resources to use in your own work. You can set to 'free to use or share' to find Creative Commons images.

Activity

Choose a major news story you have heard about in the past week. Use Google's advanced search tools to compare how the story has been reported in your own country and in another country.

Unit 13 13.3 Choosing reliable content

In this lesson you will learn how to judge whether content you find on the web is reliable.

Figure 13.3.1 *Finding reliable information is important if you want to use the web effectively*

We use the information we find on the Internet to educate ourselves and make decisions – from what to buy to how to vote. Many Internet searches will lead to information that is reliable. However, many searches lead to information that is:

- incorrect
- out of date
- biased
- dishonest.

If you carry out the checks in this section, you will be able to test whether information is reliable.

Who owns the site?

Can you trust the person or organization who has published the information? Use sites that have been established for some time and which are associated with organizations that have a record for reliability and honesty.

Examples will include established newspapers and news sites, government agencies, universities and large charities. Commercial organizations can provide good information, but the information they provide could be biased toward their own products.

Find out who owns the site and what its purpose is.

Dan Smerilli
Fri 20 Sep 2019

Figure 13.3.2 *You should be able to find information about the author*

Who wrote the information?

Has the ***author*** of the information put their name to the article? If not, be wary about the information. It is a good sign if the author gives their contact details as well as their name. The author may give their job title and qualifications. Does the author seem to be an expert on the subject? Check if the author has written any other articles on the same subject.

Can the information in the article be checked?

Find the date the article was written. If you are researching prices of laptops, an article written five years ago could be misleading. If you cannot find out when the article was written, you should be wary of it. It could be out of date.

The author of an Internet article will usually include links to other relevant documents. Follow some of those links. The links should work and link to sites and articles that pass the same tests you are applying to the main article.

Many authors will use citations at the bottom of an article. Citations list the sources they have researched when writing the article. Check these citations to find out if they seem reliable.

During your research you will find several articles that interest you. Try to check facts in more than one article.

You will be able to follow links from a reliable article to discover how honestly it was written.

What does the article look like?

Expect a reliable article to be well written and free from spelling and grammatical errors. A site that publishes reliable information should be professionally designed too.

This does not mean poorly written information should be rejected. Nor does it mean all professionally produced content should be believed. But if an online article looks like it was carelessly written, it probably was.

Activity

Think of a topic you have studied in this course. Perform an Internet search. Pick a link from the list presented by the search engine. Ask the four questions in this section. Do you think the site you found is reliable?

13.4 Using citations

In this lesson you will learn why it is important to give credit to the owner of any content you use in your work. You will learn how citations are used to give credit.

Why citations are important

If you use content that belongs to someone else in your work, you must give credit for it. A ***citation*** is a note that appears just below or after content you have used. It tells the reader who owns the content and where you found it.

There are four reasons why using citations is important:

1. You are giving credit to the person who created the content. People are proud of their content. They want to get credit for producing it.
2. Someone reading your work can follow the link in your citation to learn more about a subject.
3. Citations make it clear what work is yours and what belongs to someone else. You must not pretend that someone else's work is your own. That is called ***plagiarism***.
4. Citations show your teacher you have carried out research to complete your school assignments.

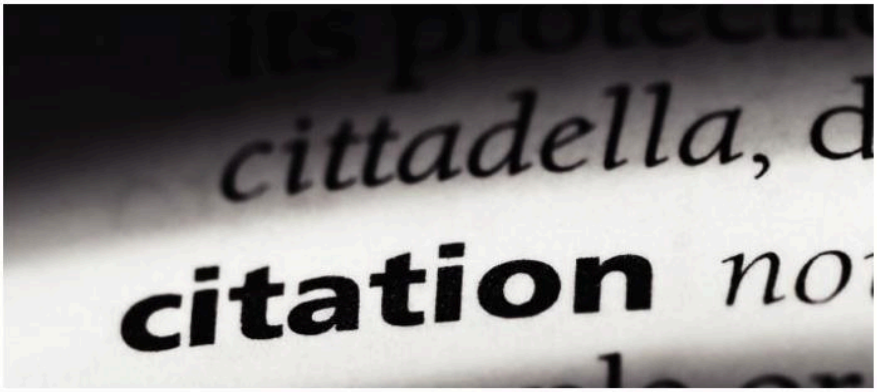


Figure 13.4.1 *Citations make it clear what work is yours and what belongs to someone else*

Writing a citation

There are four pieces of information you should include in a citation:

1. The name of the person who created the work: the author.
2. The year the work was created.
3. The title of the work you are quoting from or the name of a picture you use.
4. The URL of the site you are taking the work from. If the work you are using does not come from the Internet, use the title of the book or newspaper you have taken the work from instead.

There will be times when you won't find some of the information you need, but you should always use what you can find.

A citation for an article on a website will look like this:

> Devon Campbell, 2020, *10 rules of netiquette you should know*, www.dailynewsforstudents.org

Or this:

> Campbell, D. (2020) 10 rules of netiquette you should know. Retrieved from www.dailynewsforstudents.org on July 28, 2019

Sometimes the owner of a piece of work will not provide a citation for you to use. In that case you will have to write your own. Creative Commons images often provide a citation for you to use.

Talk about

Is stealing intellectual property through plagiarism as bad as stealing physical property from a person? How is it different?

Referencing

Sometimes you will be asked to use a recognized method such as Harvard referencing, to give citations. Two other methods used are:

Modern Language Association (MLA) referencing

MLA referencing is used widely in courses that study language and literary subjects. In MLA referencing you include a brief note in the text to say where a quote comes from. You then give more details in a list of 'works cited' at the end of the document. In the brief note in your text you provide the name of the author. If you have taken the quote from a book, you also provide the page number. If you do not know the author's name, you give the name of the work.

American Psychological Association (APA) referencing

APA referencing is used widely in social sciences. As with MLA referencing, you include a brief note in the text, which links to more details in a list at the end of the document. The note in the text should be in the following format:

> (author's surname, date of publication, page number)

More information about the book or website is provided in a references section at the end of the document.

Activity

Create a poster with the title 'Did you know...?' Search the web to find a fascinating or fun fact about computers. Add a short quote about the fact to your poster. Find an image to illustrate your quote. Add citations to your quote and image.

Unit 14 14.1 The IT department

IT in the workplace

In this unit you will learn about how the IT department in an organization operates. You will also learn about the impact IT has on people in the workplace. IT affects everyone, not just computer specialists.

In this lesson you will learn about the role of the IT department in an organization.

The work of the IT department

Organizations depend on IT systems and networks. For most organizations their IT systems must be available 24 hours a day, every day of the year.

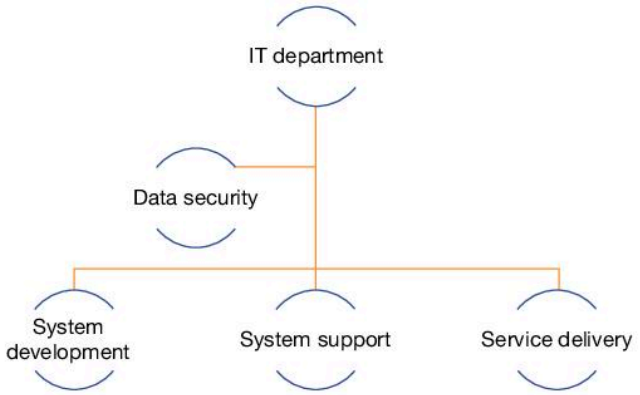


Figure 14.1.1 The **IT department** *performs three important roles*

IT departments are responsible for:

- **development** of the IT system so that computer systems meet the needs of the organization
- **support** for IT systems to ensure computer systems run efficiently and are available 100 per cent of the time
- **service delivery**, which makes sure that problems affecting system users are dealt with
- **security**, keeping hardware, software and data safe from loss or damage.

System development

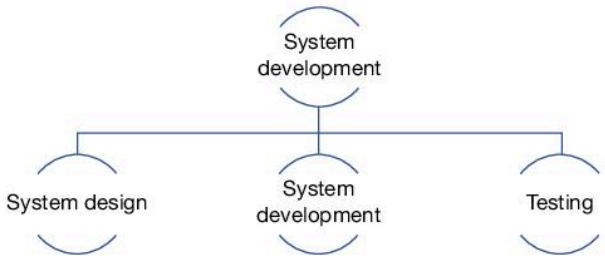


Figure 14.1.2 IT systems must change to meet new demands

The ***system development*** team is responsible for creating new systems and updating existing systems. The team helps managers in the organization to decide what new systems are needed. ***Programmers*** and ***software engineers*** will develop new software or make changes to existing software.

Sometimes software applications will be purchased rather than built from scratch. The team will evaluate new software to make sure the organization gets the software it needs.

Job roles: programmer, software engineer, ***systems analyst***, ***software tester***

Systems support

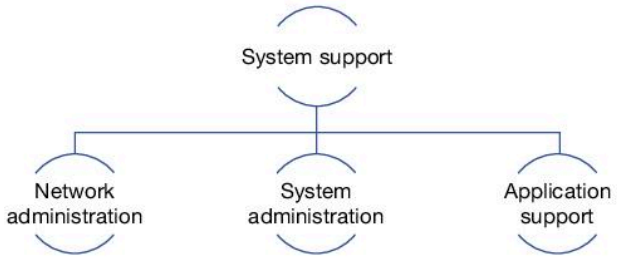


Figure 14.1.3 *The job of the* **systems support** *team is to make sure the organization's existing IT system works and is always available*

The job of the network administration team is to look after the equipment that keeps the ***local area network (LAN)*** running.

The systems administration team is responsible for the services that are available on the LAN. For example, printing and email and file storage. The application support team makes sure that application software is updated, installed and maintained.

Job roles: ***systems administrator***, network manager, computer technician, ***systems operator***

Service delivery

Both network and systems administration are ***system-facing***. That is, the main concern of those departments is the computer system itself.

Service delivery is ***customer-facing***. That is, concerned with the people who use the system.

The ***helpdesk*** staff solve problems if they can, or pass them on to the right person in the systems or network administration teams. Trainers work with people to make sure they have the IT skills they need to do their job.

Job roles: trainer, helpdesk technician, service desk manager, open learning author

Smaller teams

In small organizations, some of the functions shown in the charts in this lesson would be combined so that one person is responsible for several tasks. Sometimes a team will not have the expertise needed to complete a task. When that happens experts can be brought in from outside the organization.

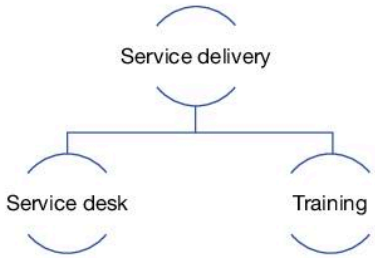


Figure 14.1.4 *The helpdesk in an organization takes calls from users who are having problems*

Activity

Which of the three areas would you consider working in? Do research to find out more about the jobs in your chosen area. Make a poster about the jobs in the area you chose – can you find typical salaries for the jobs you include?

Unit 14 14.2 The changing world of work

In this lesson you will learn how the introduction of computers into the workplace affects the way that individuals work.

The impact of technology on work

Old jobs

Technology has led to many jobs being lost. Some jobs have been lost because they are done by machines. For example, robots now carry out tasks previously done by people in car and electronics manufacturing.

Other jobs are lost because technology allows us to do things in a different way. For example, before 1970, organizations would employ typists to type letters for other people. In the modern office people use a word processor to create their own documents.

Many more jobs will be lost to automation and robots as technology advances. Taxi drivers may be replaced by autonomous cars. Agricultural jobs may be replaced with robots that are able to plough fields and pick fruit.

New jobs

As old jobs have been lost because of technology, other jobs have been created. Many jobs have been created in ***IT departments*** to develop and maintain computer systems. Many people are employed in new industries like robotics and automation, where they build, install and maintain robots and automated production lines.

New jobs have been created in the mobile phone industry. ***Web designers***, game programmers and others work in media industries such as television and music.

Figure 14.2.1 *Typists at work*

Figure 14.2.2 *Technology has also changed the way people work and interact with one another*

Changing patterns of work

It is not just the types of job that have changed: the way people work is changing too. People change jobs more often. In the past people spoke of a 'job for life', and it was not unusual for someone to do the same job for 40 or 50 years. Today people may work in a job for a few years before moving on to a new job.

Computer-based communications make it possible for people to work together even though they are not in the same building, or country. Teams are put together temporarily to complete projects. Teamwork is becoming more important. Often people working for themselves or other companies are included in teams just for the duration of a project.

Retraining

You have seen that computers in schools will help young people to develop computer skills. You will need to keep your skills up to date throughout your working life. As old jobs disappear or change, there is a need for new skills. Online courses can help you to develop technology skills. At other times you will learn on the job, adapting to new ways of working that involve technology.

Telecommuting

In many parts of the world, people must travel long distances to their jobs. Roads become very crowded. Traffic causes pollution and fuel is expensive. Travelling to work is called commuting. An alternative is ***telecommuting***. This means that people work from home, using computer communications.

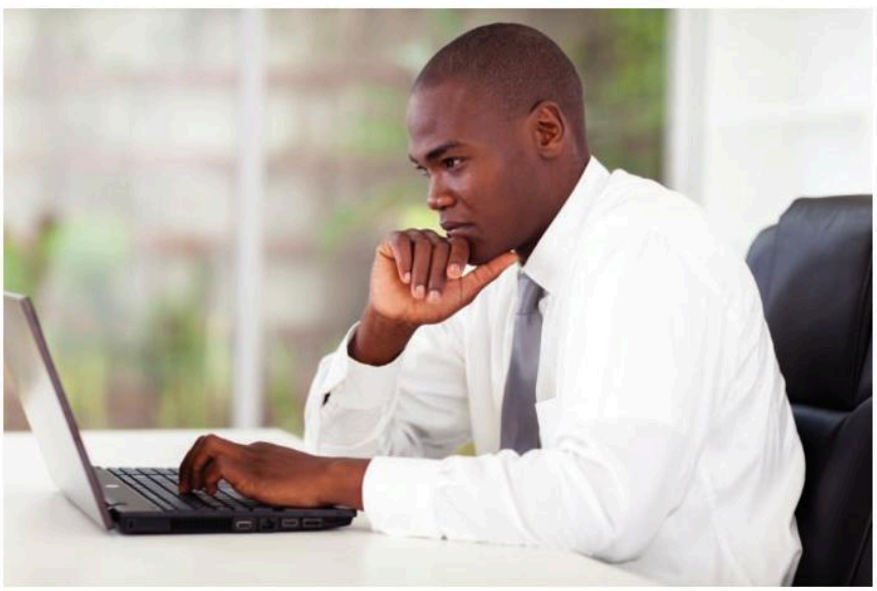


Figure 14.2.3 *Telecommuting provides a way of working when there are disasters or bad weather that stop people from being able to travel*

Activity

Talk to a parent or another adult you know about their work and the role of IT in it. What do they use IT for and how important is it? Do they expect to change jobs more or less often in the future? How often do they need to learn new IT skills?

Share your findings with your class or a small group of classmates.

Unit 15 15.1 Multimedia authoring

Multimedia presentations

In this unit you will learn what multimedia content is and what it is used for. You will create a piece of multimedia content.

In this lesson you will learn what the components of multimedia content are. You will learn what multimedia is used for.

What is multimedia authoring?

Multimedia content:

- uses two or more ***digital media***, for example images, video and sound
- is graphical – information is shown in pictures not paragraphs
- is often ***interactive***. The user can influence how the content is shown.

Creating multimedia content is known as ***multimedia authoring***. A multimedia author will use content they have created themselves and content produced by others.

Multimedia resources

Multimedia systems consist of at least two, and perhaps all, of the following types of media:

Text

Text is used alongside other media like images and video to give information. A multimedia user will not read large blocks of text as they do in a newspaper. Text is used to emphasize important points or describe other media.

Common file formats include TXT DOC, DOCX, RTF and PDF.

Images

Images like photographs, drawings or diagrams give information visually. The multimedia author can create images using tools like a camera, graphics software or a spreadsheet, which can be used for graphs and charts.

Common file formats include JPEG, PNG, TIFF and BMP.

Audio

Audio files can be used to provide background music or commentary. Audio can be added as a separate track to provide commentary on a still image, or it can be part of a video clip you include in your work.

Common file formats include MP3, WAV and WMA.

Video

Video presents moving pictures and combines images and audio that can make multimedia engaging and interesting for the user.

Other forms of moving image like GIF ***animation*** files are also used to add movement to presentations. Animations are much smaller than video files.

Common file formats include: AVI, WMV, MOV, MP4, FLV and GIF.

What is multimedia used for?

Multimedia can be used for any activity that needs interesting and high quality communication. Multimedia can be presented live to an ***audience*** or remotely over the Internet, for purposes including:

- education
- training
- marketing and sales presentations.

Figure 15.1.1 Online study

Advantages of multimedia authoring

- **Creativity:** the multimedia author can use a wide range of creative tools.
- **Diversity:** information can be presented using different media to suit the needs of different users.
- **Interactivity:** users can take different routes through content. They can complete tests and challenges and get feedback on how well they understand the content.
- **Realism:** video and audio content can add realism to a presentation. Users can see a piece of equipment in action or listen to an interview with an expert on a subject.
- **Support:** multimedia linked to the Internet can provide access to support materials or a real person to help solve problems.

However, there are also some disadvantages to multimedia. For instance, it can be costly and time-consuming to produce. Multimedia also needs a device like a computer or tablet to view it on.

Activity

Use the Internet to search for a multimedia presentation on a topic that interests you. Identify the media that is used in the presentation. What is its purpose? What was good and bad about the presentation?

15.2 Creating multimedia

In this lesson you will learn about the tools used to create multimedia content.

A multimedia team

Creating multimedia needs a wider range of tools than almost any other creative activity that uses computers and other digital technology. Professional multimedia production is seldom carried out by one person. It is an activity that brings together a wide range of skills in a team.

A professional multimedia production team can include:

- writers and editors
- ***graphic designers*** and artists
- video and sound engineers along with photographers
- ***programmers*** and testers – especially if interactivity is involved
- project managers.

Multimedia hardware

Digital camera

Cameras capture still images. All cameras work in the same way. Light enters the device through a lens and is stored so that a moment in time is captured. What has changed over the years is the way that the image is captured. Early cameras captured images on glass plates or plastic strips coated with special chemicals.

Modern ***digital cameras*** capture images as digital data. Digital images can be processed using a computer and included in documents or multimedia presentations.

Video camera

A ***video camera*** is like a digital still camera that captures moving images. A video camera works by taking many photographs, one after the other. Each image is called a frame. When played back quickly, the individual frames blend to form a lifelike moving image. Most digital cameras can take video clips.

Figure 15.2.1 *Digital camera*

Figure 15.2.2 *Video camera*

Audio recorder

An ***audio recorder*** uses a microphone to capture background sounds, interviews and instructions. Audio files are stored digitally. An audio recorder captures data in a similar way to a video recorder. It captures slices of sounds at regular intervals. The slices are called samples. Played back quickly the sound appears continuous. Most video cameras have sound recorders built in.

Figure 15.2.3 *Audio recorder*

Multimedia authoring software

Multimedia authoring software is designed to bring several forms of media together into a single presentation. Multimedia can also include interactive elements such as tests, quizzes and questionnaires.

A multimedia authoring package will include some editing tools, but those tools have limited functions. The aim of the editing tools is to allow minor changes to be made to an image, video or audio clip so that they fit together seamlessly. Other tools are available that are specifically designed to edit media more extensively.

In the next lesson you will use a multimedia authoring package. You will see that the text editing functions are very limited compared with a word processor.

Popular multimedia authoring packages include Easy Generator, Elucidat and Adobe Captivate. Many packages are designed for learning and training development – one of the main uses for multimedia.

Activity

What hardware is available in your school for recording and processing audio and video?

If you have a cell phone, what facilities does it have for recording audio, video and photographs?

This course uses Microsoft Photos to illustrate some of the skills needed to build multimedia. Is Microsoft Photos available in your school?

Make a list of the resources you will be able to use in a multimedia project.

Did you know...?

Many media files are compressed. Compression reduces file size without greatly reducing image or sound quality. Compressed files require less storage space and stream faster over the Internet. JPEG is a compressed image format that is a fraction of the file size of a non-compressed file format such as BMP.

Unit 15 15.3 Make a multimedia presentation

In this lesson you will learn how to make a simple multimedia presentation in Microsoft Photos.

Microsoft Photos lets you build video projects. A video project is a ***multimedia presentation***.

Opening a video project

When you open Microsoft Photos you will see a menu at the top of the screen.

1. Select the Video projects menu item.

Any videos you have already made are shown in the Video projects window. Clicking a project will open it so you can continue to work on it.

2. To open a new project, click on the New video box.

Parts of an editing screen

There are three parts to the Video project screen:

- ***Project library*** is a box in the top left of the screen. This is where you add the images and videos you will include in your project.
- The preview box is to the left of the project library. You can click the play button to preview your project at any time.
- The ***Storyboard*** is located across the bottom of the Photos window. You drag resources from the library onto the storyboard. You can sort them into order, make edits and add text and background music to your slides once they are on the storyboard.

Add images to your library

Before you start to build a project, load the images and videos you plan to use to your library:

3. Click Add.

4. Select From this PC from the drop-down menu to load images you have saved to your PC. The Windows file browser will open.

5. Select From the web to search for Creative Commons-licensed images.

Did you know...?

If Microsoft Photos is not on your desktop, you will find it listed as 'Photos' in the start menu. The logo for the application looks like this:

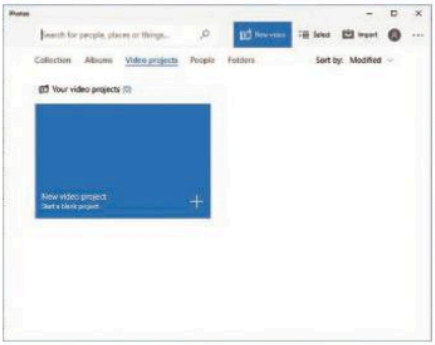


Figure 15.3.1 Open a new project

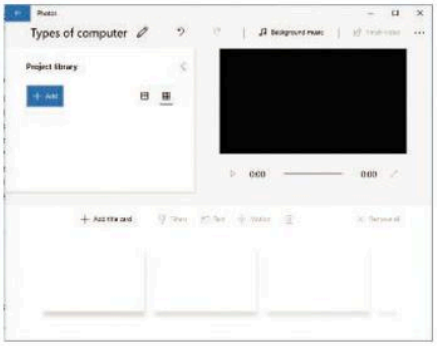


Figure 15.3.2 New project screen

Add a title screen

6. Click Add title card in the menu at the top of the storyboard area.

A blank title page is added to the storyboard. A title card can be used at the start of your video or to introduce a new section within it. To add text to your title card:

7. Right-click on the title slide to open a drop-down menu.
8. Select Edit then Text to add text to your title screen. You can select different styles and positions for the text using the options in this screen.

Move images onto the storyboard

9. To move images from your project library to the storyboard, drag the images one by one.
10. When you have the images you want, you can arrange them into the right sequence by dragging them along the storyboard.

You can adjust the time that each image stays on screen during a presentation.

11. Right-click on an image in the storyboard. Select Duration from the menu and set a new duration in seconds.

Find out more

Search the web to find information on the best free video editing applications available for desktop computers. Are there any free video editing applications you can use on a tablet computer?

Activity

Create a simple video presentation on a topic that interests you. The presentation should include a title screen and three related images. When adding images to the project library, use the 'From the web' option.

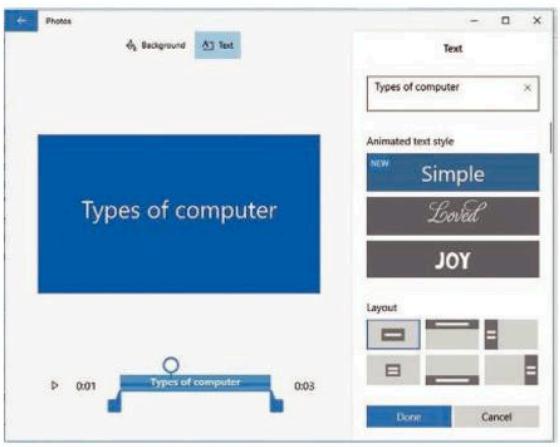


Figure 15.3.3 Title screen

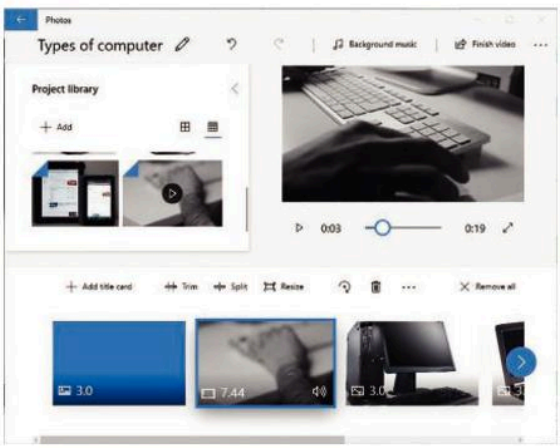


Figure 15.3.4 Storyboard screen

Unit 15 15.4 Using video in multimedia

In this lesson you will learn how to add video and audio to your multimedia presentation.

Adding video to your project

You add video to your presentation in the same way that you added images:

1. Add a video file to your library.
2. Drag the file onto your storyboard.

When you add any resource to your library it must be in a format that Microsoft Photos recognizes. MP4 and WMV are good formats to use.

Editing your video

When your video is in the storyboard you can edit it. You can add text captions to a video in the same way that you added text to your title page. You can also add captions to images.

Trim and split a video

When you right-click on a video in your storyboard a pop-up menu appears. Two menu selections you will see are Trim and Split.

Trim lets you remove frames from the start and end of a video. It also lets you cut a section from the middle of a video.

1. Drag the blue squares towards the centre of the timeline below the video. Click Done when you have finished.

Split lets you break a large video into two smaller parts. You can use the smaller clips in different parts of your project.

2. Drag the single blue squares to the point in the timeline where you want to split the video. Click Done.

When you use split or trim a new video clip is saved to your project library. Your original video file is left in its original form.

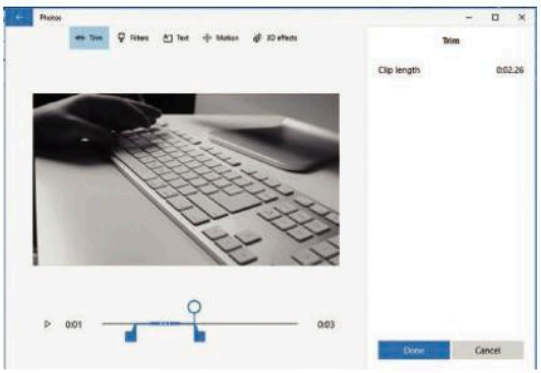


Figure 15.4.1 *Trimming a video file*

Did you know...?

A good way to find free images and video clips on the Internet is to use a search engine like Pixabay or Unsplash. Sites like Freesound provide free music and other clips, like sound effects.

Add audio to your project

When you add audio to your project it must be in a format that Microsoft Photos recognizes. MP3 and WAV are good formats to use.

There are two ways to add audio to your project:

Background music is a simple musical track that plays in the background while your presentation shows. It plays through every item in your storyboard.

1. Click on the Background music button in the menu across the top of the Microsoft Photos window. A menu will open.
2. Choose one of the music tracks in the menu. Set the volume you want.
3. Click Done.

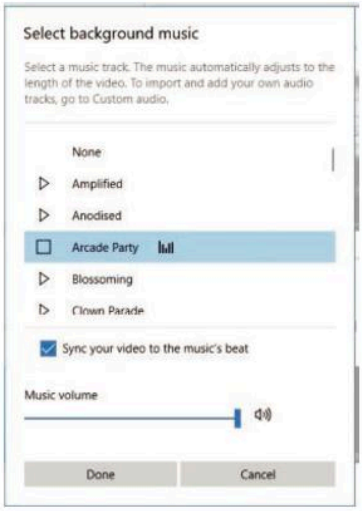


Figure 15.4.2 *Background music menu*

Custom audio allows you to add your own audio file to a project. It might be a narration you have recorded to explain an image in your project, or it could be a sound effect.

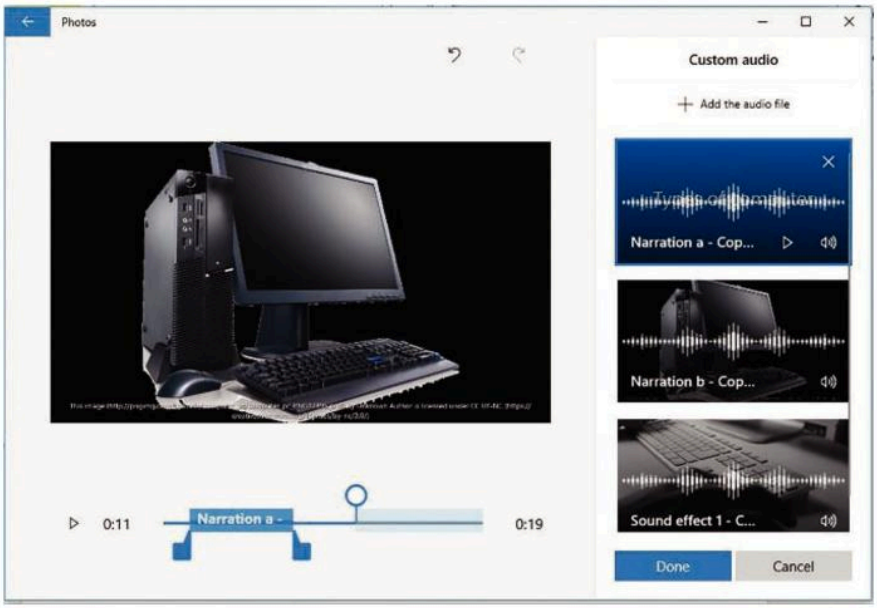


Figure 15.4.3 *Adding an audio file to a video presentation*

1. Click on the Custom audio button in the menu across the top of the Photos window. A menu will open.
2. Add your files to the custom audio area on the right of the screen. You can drag the files or click the Add files button.

Each audio file you add has a blue bar on the timeline at the bottom of the screen. Slide each audio clip around on the timeline until it is in the location you want. Preview your presentation to make sure you have everything in the right place.

Activity

Open the slideshow you created in lesson 14.3.

1. Add background music.
2. Add a video clip. Add a caption to the video clip.
3. Add some custom sound effects to your presentation.

Unit 15 15.5 Multimedia project

In this lesson you will work in a small team to create a multimedia project. The lesson has some guidelines that are important for your project to be a success.

Working on the multimedia project

Work in a team to produce a booklet or presentation. Use the Internet to find computing jobs that are related to the Internet and networks.

Your team will make an information sheet or slides for each job you research. Use your school network or the Internet to communicate with other team members whenever you can. Use email and messaging if it is available.

Jobs you can choose to research for this project include:

- network technician
- web developer
- app developer
- web graphic designer
- games developer
- data cable installer or technician.

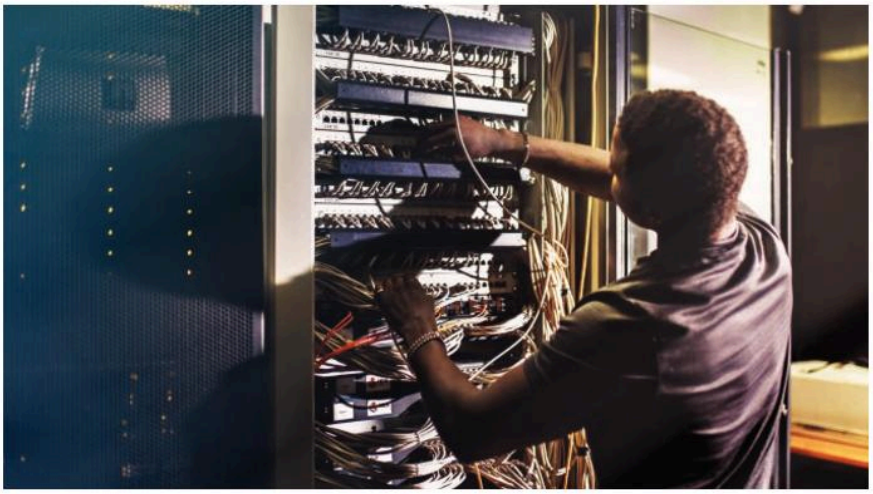


Figure 15.5.1 *Cable installation engineer*

Carry out some research using the Internet for information on the jobs your team chooses. Think carefully about your search terms. Look for information about:

- what work is involved in the job
- what sort of place you would work in
- what skills you need to do the job.

Find a picture of someone doing the job.

Making your project a success

Your project should have three stages:

1. Planning

Before you start any work make sure you have a plan. The questions you need to answer before you start working on your project are:

1. What jobs will you research?
2. How will you present your work?
3. What information will you collect about each job?
4. Will you have a team leader? Who will it be?
5. How will you divide the work? Who will do what?

Write all your decisions down. You might need to check them later.

Write a project plan. A plan lists every piece of work that you need to do. Put a name next to each item with the date the work is to be completed.

2. Execution

This stage is where the work takes place. As each piece of work on your plan is completed, note this down. This can be the job of your team leader, if you have one. Once team members have researched and collected the information on jobs, present it to your teacher.

Figure 15.5.2 *Web designers*

3. Close

To close your project, talk about how successful it was. What went well in the project? What went badly? How will you do things differently in your next project?

Activity

Meet your team to review how well it worked on the project. How well do you think you did as a team member? Make notes on things you did well. What will you try to do better in your next project?

Activity

Which of the jobs that your team researched would you most like to do? Give your reasons.

Unit 16 16.1 Using algorithms for problem-solving

In this lesson you will learn how algorithms can be used to solve problems and how they are particularly useful in helping to solve programming problems.

Problem solving with algorithms

In this unit you will learn about two methods of creating algorithms that will help you to create a well-designed program. The methods you will learn about are flowcharts and pseudocode. You will see how both methods can be used for planning programs and will have the chance to develop your own skills.

An ***algorithm*** is a process used for problem-solving operations.

Methods for creating algorithms

Input-Process-Output (IPO) model

You have seen the input model in several places in this book. It is used as a way to describe computer systems and the internal workings of the CPU. It is used in program design. The ***IPO model*** is a good tool to use when you start to think about how to solve a problem. It provides a chance to think about:

1. The outputs you need your algorithm to provide
2. What processes are needed to produce the outputs
3. What inputs are needed for the processes to work.

Although the name of the IPO model puts the word 'input' first, you should always think first about what your algorithm needs to achieve.

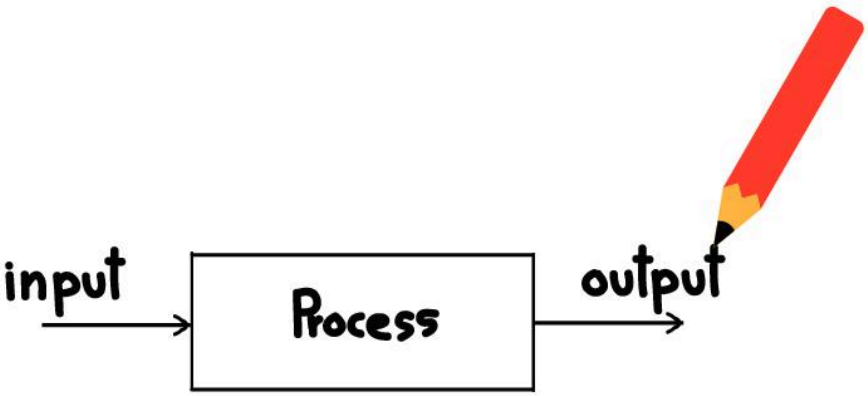


Figure 16.1.1 *The input-process-output model*

Flowcharts

A flowchart is a method used to show an algorithm. A ***flowchart*** uses boxes of various shapes to show inputs, processes and outputs. The sequence of events is shown by arrows that connect the boxes. Flowcharts are used to:

- help when you are designing a new process
- document or describe a process so that another person can understand it

- investigate a process if you want to make changes or improvements
- analyse a procedure and work out what the logical stages are.

A flowchart makes it easy for you to see how the parts of your solution fit together. It is a good way to describe your ideas to other people.

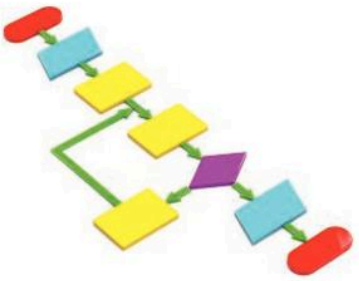


Figure 16.1.2 Flowcharts

Pseudocode

Pseudocode is a way of writing algorithms using short simple English phrases. It includes keywords to describe inputs, processes and outputs. Pseudocode is an alternative to using a flowchart. It allows you to write a more detailed algorithm that looks like computer code. It is much easier to turn pseudocode into a program than it is with a flowchart.

Variables

Whatever algorithm method you use, you will need to use ***variables*** in your solution. A variable is a name for the data items that you need to input, process or output in your algorithm.

It is important that you use meaningful names that remind you of the purpose of the variable. Examples might be Age, FirstName or Cost. Using meaningful names is a good idea because it makes it easier:

- to reuse the variable names when you write your program
- to remember how the program works
- for other people to understand the algorithm when they read it.

Activity

A teacher wants a program to calculate student grades for an IT course. The teacher will input an exam mark and assignment mark for each student.

The program will add the two marks together to give a total score. The program will output the student's name and grade.

List the variables needed in the algorithm and give each a suitable name.

Unit 16 16.2 Simple flowcharts

In this lesson you will learn what a flow chart is. You will learn how to use flowchart symbols to describe algorithms.

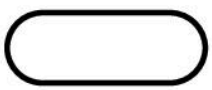
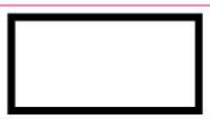
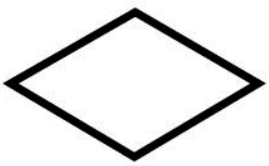
What is a flowchart?

A sequence of actions can be represented by a diagram called a ***flowchart***. A flowchart consists of a series of boxes joined by arrows.

1. The shape of the box tells you the type of action to be carried out.
2. The words inside the box tell you the exact action to be carried out.
3. The arrows that join the boxes tell you the order in which the actions must be carried out.

Flowcharts typically start at the top of the page, and the arrows point downwards. Occasionally they are drawn from left to right.

Flowchart symbols

Symbol	Name	Used for
	Terminator	Shows the start and end of the algorithm.
	Process box	The text inside the box explains what process is to be carried out.
	***Input/output box***	Used to show what data is input (e.g. typed in) or output (e.g. to screen). The first word in the box must be either 'input' or 'output'.
	Decision box	A ***decision box*** allows you to show different routes through an algorithm. The route taken is decided by a logical statement. You will learn more about decision boxes in lesson 16.3
	Directional arrow	Used to show the sequence of actions in an algorithm.

An example flowchart – calculating pay

Figure 16.2.1 shows an algorithm to calculate a person's pay by multiplying the rate of pay per hour by the number of hours worked.

Here are the actions set out in the flowchart. The numbers in this list match the numbers on the flowchart, so you can match the description to the flowchart.

1. The start of the process is shown by a 'terminator' box with the word Start in it.
2. An input box shows that a value will be typed in and stored in the variable Hours.
3. Another input box shows that a value will be typed in and stored in the variable PayRate.
4. A process box shows that the variable Pay will be calculated by multiplying the variable Hours by the variable PayRate.
5. An output box shows that the program will display the value of the variable Pay.
6. The final box is a terminator with the word Stop in it.

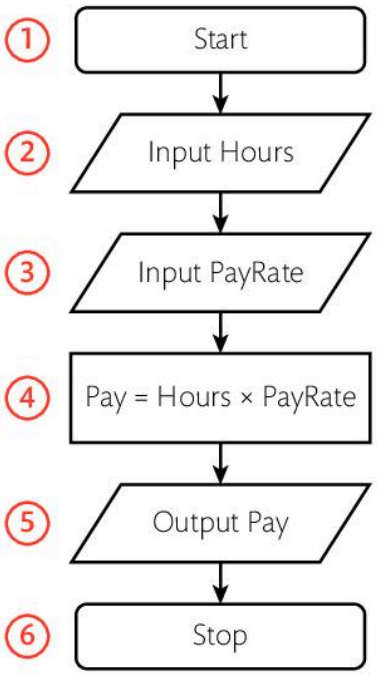


Figure 16.2.1 *Example flowchart*

Assigning values

Three variables are used in this flowchart: they are called Hours, PayRate and Pay. In 16.1 you learned that values are assigned to variables by being input or by being calculated.

- The values of the variables Hours and PayRate are input.
- The value of the variable Pay is calculated.

The statement that calculates the variable Pay looks like this:

```
Pay = Hours * PayRate
```

This statement uses the arithmetic operator *, which means 'multiply'. The statement has this structure:

- first comes the name of the variable (Pay)
- then comes an equals sign = (this stands for assigning a value)
- after the equals sign comes a statement telling you what value is to be assigned to the variable (Hours * PayRate).

All statements assigning a calculated value to a variable are shown this way.

Activity

If the value 40 is input to the variable Hours and the value 25 is input to the variable PayRate, what value is output?

Activity

Draw a flowchart that shows the steps needed to write and hand in a school assignment using a word processor.

Unit 16 16.3 Making decisions to solve problems

In this lesson you will learn how decision boxes can be used to make flowcharts more useful for solving problems.

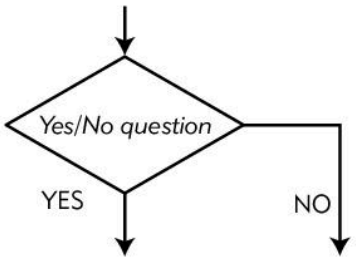


Figure 16.3.1 Decision box

Using decision boxes

The solution to many problems involves making a choice or a decision. In flowchart algorithms, decisions are shown using a ***decision box***. One arrow goes into the box, and two arrows come out of the box.

Inside the box is a yes or no question. If the answer is 'yes', the sequence of the algorithm follows the 'yes' arrow. If the answer is 'no', the algorithm follows the 'no' arrow.

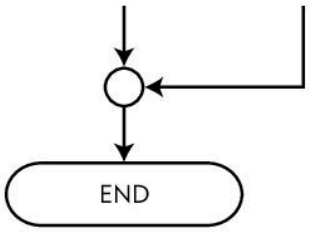


Figure 16.3.2 Connector

Connector

In most flowcharts, all events lead to a single ***terminator*** at the bottom of the chart. Where there is a decision box in your flowchart the sequence of your algorithm splits in two possible directions. The two paths must join again at some point. Where the arrows come back together a small circle is used called a ***connector***.

Here is a security procedure for checking that all the people entering a factory have a valid security pass:

- Ask to see the pass.
- If the person has a valid pass, let them enter.
- If the person does not have a valid pass, turn them away.

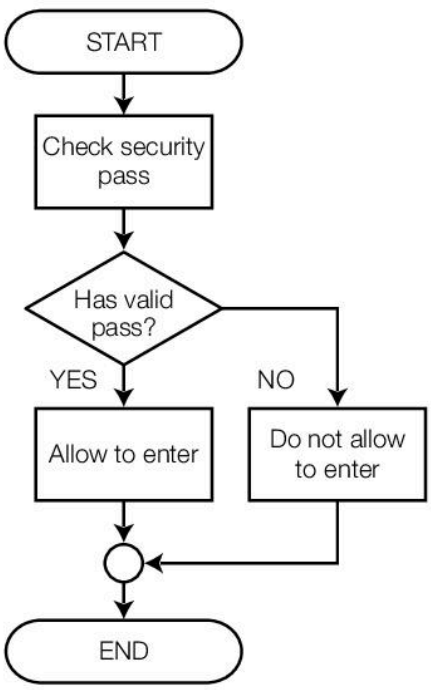


Figure 16.3.3 Security procedure algorithm

Using yes/no decisions

The decision boxes in a flowchart must use simple yes or no decisions. To show more complex decisions you must break the decision down into a series of simple decisions.

For example, think about the process for making a cup of coffee. When you make someone a cup of coffee, some of your actions depend on their preferences:

What do you want in your coffee?

- Nothing?
- Milk only?
- Sugar only?
- Milk and sugar?

When you are making flowchart, a question like 'What do you want in your coffee?' cannot be answered in a single decision box. A decision box only allows a choice between two options. To deal with a more complex problem you must break it down into a series of simple questions that have a simple yes or no answer.

In this example, you can ask two questions, one after the other: do you want sugar? Do you want milk? Asking two simple yes or no questions allows you to choose between four different courses of action:

Do you want milk?	Do you want sugar?
No	No
No	Yes
Yes	No
Yes	Yes

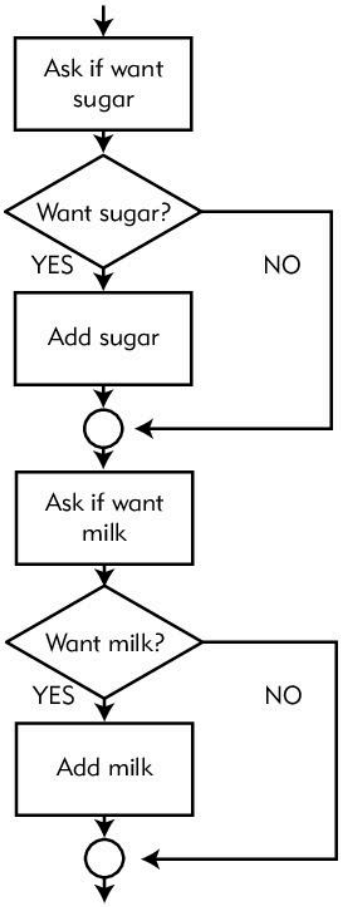


Figure 16.3.4 *What do you want in your coffee?*

Activity

Create a complete flowchart for making a cup of coffee, including the double-decision section shown here, and all the other actions such as boiling a kettle.

Activity

You order a chicken sandwich in a café. The waiter asks if you want 'everything' with the sandwich. He explains that 'everything' is salad, mayonnaise and chilli sauce.

Write a flowchart that the chef can follow to make a chicken sandwich, whatever combination of extras the customer orders.

Unit 16 16.4 Using logical tests in problem-solving

In this lesson you will learn how the use of logic makes flowcharts a good tool for planning computer programs.

Logical tests

All conditional statements depend on ***logical tests***. A logical test is one that has the answer yes or no, or true or false.

'How old are you?' is not a logical test, because it can have many different answers.

'Are you under 20?' is a logical test, because it has the answer yes or no.

In the previous lesson you turned a waiter's question, 'Would you like everything with your chicken sandwich?' into three separate logical tests: add salad (yes or no); add mayonnaise (yes or no); add chilli sauce (yes or no).

Conditional statements

Planning a computer program is no different to planning solutions to everyday problems. A program has inputs, processes and outputs like any other problem. Decisions in a computer program are written in a more formal way. They are written as ***conditional statements***.

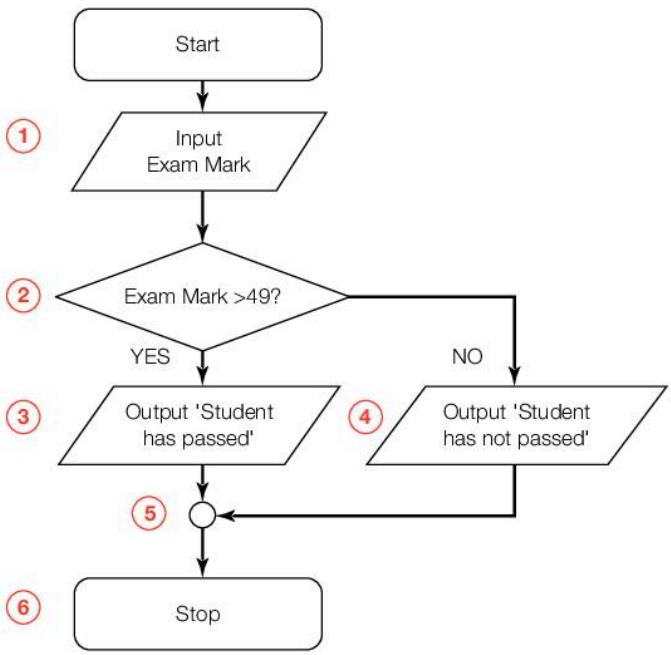


Figure 16.4.1 *Have you passed or failed the exam?*

Conditional statements use a relational operator to compare two values. The comparison gives a yes/no response which decides which of two actions is taken.

The flowchart on page 164 (figure 16.4.1) shows an algorithm that tells you whether a student has passed or failed an exam in which the pass mark is 50.

1. The student's exam mark is input.
2. A decision box asks whether the exam mark is more than 49.
3. If the answer is 'Yes', then the output is 'Student has passed'.
4. If the answer is 'No', then the output is 'Student has not passed'.
5. The two arrows rejoin at a small circle called a connector.
6. The flowchart finishes at the 'terminator' box with the word 'Stop' in it.

Relational operators

The logical test in the decision box says:

'ExamMark > 49?'

This means 'Is the exam mark greater than 49?'

> is a relational operator. The next table shows the list of relational operators you will find useful.

Operator	Meaning	Example
<	Is less than	4 < 100
>	Is greater than	0.5 > 0.25
=	Is equal to	3 * 4 = 12
<=	Is less than or equal to	Age <= 18
>=	Is greater than or equal to	Height >= 1.5 m
<>	Is not equal to (sometimes the symbol ≠ is used)	25/4 <> 10

Figure 16.4.2 *Relational operators*

Activity

The new computer game *War Machine* can only be bought by customers aged over 12. Create a flowchart that sets out the following sequence of instructions:

- Input age.
- If age is over 12, then output 'You may buy *War Machine*'.
- Otherwise, output 'You may not buy *War Machine*'.

Unit 16 16.5 Writing algorithms in pseudocode

In this lesson you will learn how to use pseudocode to describe algorithms.

Find out more

Programming languages are used to turn your program designs into useful, working programs. In the early stages of learning programming you might use a visual language like Scratch. As you progress you may use a professional language like Python.

Search the web to find information about Scratch and Python. What are they used for? What are the differences. Are there similarities? What programming language will you use in your school studies as you progress from lower to higher secondary level?

Pseudocode is a way of writing down an algorithm in words. Some people prefer pseudocode to flowcharts for planning computer programs because it looks like the code used in a computer program.

Keywords

When you draw a flowchart, you use different shaped boxes to represent different actions such as input, processing and output. In pseudocode, keywords are used instead. Keywords can be shown in upper or lowercase. In this book we will use lowercase to show keywords.

Variables

In lesson 16.1 you learned that ***variables*** are named areas of computer memory. Variables are used to store values. Variables should be given sensible names to remind you of what value they will store. In this book we will give our variables an initial capital to distinguish them from keywords.

Before a variable can be used in a calculation or output, it must be given a value. This is called initializing the variable. A variable can be initialized in one of two ways:

1. A value is input by the user.
2. A value is assigned to the variable.

Input a value to a variable

A value may be input and stored in a variable. For example, the number of hours worked may be input and stored as the variable Hours. In a flowchart, this is shown in figure 16.5.1.

Figure 16.5.1 *Input hours box*

In pseudocode, the keywords 'input' is used. For example:

```
input Hours
```

This command means input a value and save it as a variable called 'Hours'.

Assign a value to a variable

In a flowchart, a value is assigned to a variable using this type of box:

In pseudocode, the same command is used, but note that an arrow replaces the equals sign.

```
Pay ← Hours * PayRate
```

Output a value

In a flowchart, a value is output using figure 16.5.2. The value of the variable 'Pay' will be printed or displayed for the user.

Figure 16.5.2 Output Pay box

In pseudocode, the following command may be used:

```
output Pay
```

Sequence of commands

In a flowchart, the sequence of commands is shown using arrows. In pseudocode the sequence is shown by the order in which the lines are written. Start at the first line and read down the page:

```
read Hours
read PayRate
Pay ← Hours * PayRate
print Pay
```

Activity

This lesson provides you with all the parts of a pseudocode algorithm that calculates pay. Put them together then add extra code to:

- calculate tax at 20 per cent of pay (multiply Pay by 0.2)
- output the amount of tax
- calculate and output take-home pay, after tax is deducted (pay – tax).

Decisions

In pseudocode, the conditional structure begins with the words:

```
if … then
```

The logical test goes between the words 'if' and 'then'. In this case, we want to test whether a variable called ExamMark stores a value greater than 49. If the test is true, print out the message 'The pupil has passed the test'.

```
if ExamMark > 49 then
   print "The pupil has passed the test"
endif
```

The word 'endif' marks the end of the conditional statement.

Activity

A teacher wants a program to calculate grades for students. The program should let the teacher input an exam mark plus an assignment mark. The program should total the two marks, and then if the total is

- less than 40, output 'Fail'
- greater than or equal to 40, the program should output 'Pass'.

Write a pseudocode algorithm for the program.

Unit 17 17.1 What is a spreadsheet?

Using spreadsheets

In this unit you will learn what a spreadsheet is and what it is used for. You will learn how labels, numbers and formulae are combined in a spreadsheet to create useful applications for learning and work. You will also learn how to use a spreadsheet to solve a problems that involve calculation.

In this lesson you will learn what a spreadsheet is and what it is used for.

A ***spreadsheet*** is a piece of software designed to help you work with numbers. You can enter text and numbers into a spreadsheet in the same way you can enter them into a word processor. What makes a spreadsheet useful for working with numbers is that you can also enter formulae. ***Formulae*** are used to do calculations automatically.

A spreadsheet is laid out as a grid of columns and rows. A spreadsheet is a bit like a sheet of squared paper that you use to set out your maths work. Using a spreadsheet is better than using paper because it does the calculations for you.

Who uses spreadsheets?

Spreadsheets are used by:

- **scientists**, who process data from their experiments to help make new discoveries
- **business people and accountants**, who process financial data to make their businesses successful
- **engineers**, who need to make accurate calculations to ensure their designs work efficiently and are safe.

In fact, anyone who needs to work with numbers will find a spreadsheet useful.

Why are spreadsheets useful?

A spreadsheet has many advantages:

- you can lay out your work so it is easy to understand
- you can reuse a spreadsheet to help you in new situations
- if you change any of the numbers in a ***function*** or formula, the spreadsheet automatically calculates a new answer
- you can easily sort and reorganize your data
- you can create useful outputs such as graphs and charts.

Spreadsheet software

There are many good spreadsheet applications. They all look slightly different, but they all work in very similar ways. Some examples are:

- Microsoft Excel
- Open Office Calc
- Apple Number
- Google sheets.

You can follow this unit no matter which software is installed on the computers at your school. Your teacher will advise you if there are any major differences in the way the spreadsheet you use in your school works.

The main parts of a spreadsheet

Figure 17.1.1 *Example spreadsheet*

A page in a spreadsheet is called a ***worksheet***. A spreadsheet can contain several worksheets. For example, in a business spreadsheet there can be separate worksheets for every month in the year.

The worksheet is divided into ***columns***. Each column has a letter.

The worksheet also has ***rows***. Every row has a number.

Where a row and column meet, a box is formed. The box is called a ***cell***.

Each cell in the spreadsheet is named after the column letter and the row number. For example, the cell in the top left corner is called 'A1'. This is called the ***cell address***. 'A' is the column the cell is in and '1' is the row.

You select a cell by clicking it. The contents of the selected cell are displayed at the top of the spreadsheet, in an area called the ***formula bar***.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 17.1 and complete the activity. In this activity you will learn how to move around a spreadsheet. You will enter data and see how formulae can be used to make automatic calculations.

In this lesson you will learn how to enter numbers and words in a spreadsheet. You will change how data looks in your spreadsheet by using formatting commands.

Editing data

Values and labels

In lesson 17.1 you learned how to enter and edit the contents of any cell in a spreadsheet.

You can type either words or numbers into a cell:

- Numbers in spreadsheets are called ***values***. You can carry out calculations with values. You will find out how in lesson 17.3.
- Words are called ***labels***. You cannot do calculations with labels. The purpose of a label is to explain the meaning of the values.

Justification

When you type data into a spreadsheet it can be positioned on the left, on the right or in the centre of a cell. This positioning of data in a cell is called ***justification***.

When you type data into a cell:

- values are right-justified (the numbers appear on the right of the cell, and any blank space is on the left)
- labels are shown left-justified (the text appears on the left of the cell, and any blank space is on the right).

teacher		boys	girls
Mrs	Adair	13	17
Miss	Mulen	15	23

Figure 17.2.1 *Justification*

The reason for justifying text and values in this way is that it makes them easier to read. Look at the example in 17.2 2. The values in the left column are left-justified. The values in the right column are right-justified. The values on the right are easier to read because the units, tens and hundreds columns are lined up with each other.

Left justified	Right justified
34	34
29727	29727
193	193
1200001	1200001
2	2

Figure 17.2.2 *Right and left justified values*

Formatting

Formatting a cell

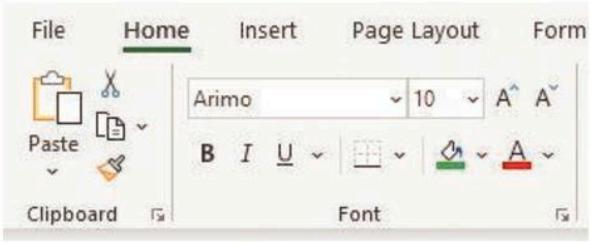


Figure 17.2.3 *Format cell menu*

You can change the appearance of the labels and values in a spreadsheet in the same way that you can format text when using a word processor. In a spreadsheet, formatting changes are applied to everything you have selected in the cell.

To change the format of a cell, use the Font menu in the Home tab on the ***ribbon***. The Font tab is like the Font menu in your word-processing software, but it usually has fewer options. To make the contents of a cell bold:

1. Click a cell to select it.
2. Click the Bold menu button in the Font section of the Home tab.

You can use the same method to change the colour, size or font of text.

Formatting a range of cells

You can apply a format to more than one cell. One way to do this is to apply a format to a ***range*** of cells. In a spreadsheet, a range is a rectangular block of cells. A range is named using the cell references in the top left and bottom right of the range. For example, we refer to the range in figure 17.2.4 as A4:B11.

	A	B	C	D
1	Beaconbury School			
2				
3	teacher		boys	girls
4	Mrs	Adair	13	17
5	Miss	Mulen	15	23
6	Mr	Tarrant	20	19
7	Mr	Fulmain	19	16
8	Mr	Gregory	12	19
9	Miss	Spall	15	22
10	Mrs	Chever	18	14
11	Mr	Holden	17	21

Figure 17.2.4 *Range of cells*

There are two ways to select a range:

1. Click and hold your mouse in the top left corner of the range, then drag the mouse pointer to the bottom right cell. Release the mouse button.
2. Click your mouse in the top left corner of the range. Hold the Shift key. Click in the bottom right corner.

Activity

oxfordsecondary.com/just-click-3e

Open Worksheet 17.2 and complete the activity. In this activity you will learn how to apply formatting to cells.

17.3 Using formulae

In this lesson you will learn how to create formulae. Formulae are instructions that tell the spreadsheet to perform a calculation and show the result.

Enter a formula

How many pupils are in Mrs Adair's class? To work this out you must add together the number of boys in cell C4 and the number of girls in cell D4. You could perform the addition yourself and type the sum into cell E4.

If you complete the calculation yourself, you will have to do it again every time the number of pupils in columns C or D changes. When using a spreadsheet, you can use a formula to create the calculation.

- A formula does the calculation for us automatically.
- If a value changes in column C or column D the formula updates the sum immediately.

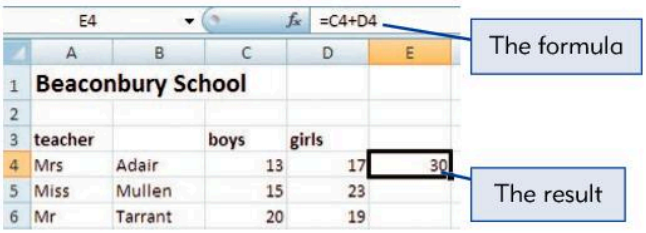


Figure 17.3.1 *Using a formula*

How to type a formula

In this example we will create a formula to add together the number of boys and girls in Mrs Adair's class.

1. Click on cell E4. This is where you want the result to appear.
2. Type the equals sign = to begin the formula. A formula always starts with this sign.
3. Type C4.
4. Type the 'plus' sign +.
5. Type D4.
6. The formula bar should show this: =C4+D4. When you are sure it is correct, press Enter.

The formula takes the value in cell C4 and adds the value in D4. The sum would be placed in the cell where you typed the formula.

In this example, you used the plus sign to add two numbers together. You can also enter formulae to add, subtract, multiply or divide values. The table shows you what signs to use for addition, subtraction, multiplication and division.

Action	Sign	To do this sum	Use this formula
Add	+	C5 plus D5	=C5+D5
Subtract	–	C5 minus D5	=C5–D5
Multiply	*	C5 times D5	=C5*D5
Divide	·	C5 divided by D5	=C5·D5

Figure 17.3.2 *Simple formulae*

The Fill command

Once you have entered a formula, you can copy it to other cells by using the Fill command. Using the Fill command means that you don't have to type the same formula in many times. Copying the formula using Fill is much quicker.

How to use Fill

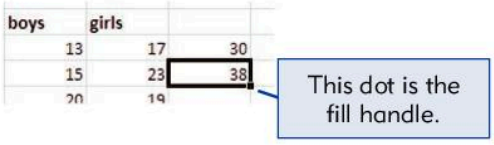


Figure 17.3.3 *The Fill command*

If you select cell E4, you will see a small square in the bottom right corner of the cell. This is called the fill handle.

1. Click on the cell E4.
2. Move the cell pointer over the fill handle. You will see the pointer turn into a cross when you are in the right place.
3. Hold down the mouse button and drag the mouse down to cell E11.
4. Let go of the mouse button.

The formula from cell E4 is copied into all the cells you selected.

Completing the worksheet

Finally, add a label for the new column you have made.

5. Select cell E3.
6. Enter the label 'all pupils' and make sure the text is bold.

Did you know...?

When you copy a formula it automatically adjusts the cell references. It makes the adjustment so that the formula works in the cell it has been copied to. The original formula is =C4+D4. When copied to row 5, the formula becomes =C5+D5. Each formula gives the correct answer for that row. This is called ***relative copying***.

Activity

Open the file you saved in lesson 17.2. Complete the steps in this lesson. Check that your formula is correct by manually calculating a few rows and checking the answer your formula produces. Save your file. You will use it again in lesson 17.4.

17.4 Spreadsheet functions

Every spreadsheet has built-in functions to help with calculations. In this lesson you will learn how to use functions.

Functions

You learned in lesson 17.3 how to write formulae using simple mathematical symbols like + and −. If you have a more complicated mathematical problem to solve you can use functions.

A ***function*** is a ready-made formula that you can use to do a mathematical calculation without having to write formulae yourself. An example is the function AVERAGE. A set of numbers is input into the AVERAGE function and the average of the numbers is output.

The SUM function

A function that you will use often is SUM. You can use the SUM function with a spreadsheet to easily add together a group of numbers. The SUM function looks like this:

= SUM(RANGE)

A function starts with an equals sign = like the formulae you used in lesson 17.3.

The word SUM follows the equals sign.

The word RANGE is replaced with a range of cells in the brackets. You learned how to define a range of cells in lesson 17.2.

Here is an example of how to use SUM. You will use the SUM function to add up the number of pupils in the school example you have already worked on in this unit.

Using the SUM function

1. Select cell A13.
2. Enter the label TOTAL and make the text bold.
3. Now select cell E13. You will enter the sum function into this cell.
4. Select cell E13. This is where the result of the SUM function will appear.
5. Type the equals sign to begin a formula.
6. Type the word SUM and an open bracket (. The formula will look like this =SUM(
7. Select cell E4 and hold down the mouse button. Drag the mouse down to cell E11. You have now selected all the cells showing numbers of pupils in each class.

8. Release the mouse button and type a closed bracket). The formula will look like this: =SUM(E4:E11).
9. Press Enter to complete the calculation.

Cell E13 now shows the total number of pupils in the school.

More functions

There are other useful functions shown in figure 17.4.1.

Use this function	To get this result
=COUNT	The number of values in the range
=MIN	The smallest value in a range
=MAX	The largest value in a range
=AVERAGE	The average value

Figure 17.4.1 *More useful functions*

The four functions in the table all work in the same way as SUM. Look at the completed spreadsheet in figure 17.4.2. The functions in the table can be used to complete the spreadsheet. Use them to calculate the:

- number of classes in the school
- size of the smallest class (use MIN)
- size of the largest class (use MAX)
- average class size (use AVERAGE).

	A	B	C	D	E
1	Beacon	bury School			
2					
3	teacher		boys	girls	all pupils
4	Mrs	Adair	13	17	30
5	Miss	Mullen	15	23	38
6	Mr	Tarrant	20	19	39
7	Mr	Fulmain	19	16	35
8	Mr	Gregory	12	19	31
9	Miss	Spall	15	22	37
10	Mrs	Chever	18	14	32
11	Mr	Holden	17	21	38
12					
13	TOTAL PUPILS				280
14	NUMBER OF CLASSES				8
15	SMALLEST CLASS SIZE				30
16	LARGEST CLASS SIZE				39
17	AVERAGE CLASS SIZE				35

Figure 17.4.2 *Completed spreadsheet*

Activity

Open the file you saved in lesson 17.3. Complete the steps in this lesson. Check that your functions are working correctly.

Try changing some of the values in the spreadsheet. You will see that the values in all the formula and function cells change automatically. This is one of the most useful features of a spreadsheet.

Once you have set up the spreadsheet, it will recalculate all the answers for you whenever you change the values. Save your file.

17.5 Starting a new spreadsheet

In this lesson you will learn how to build a new spreadsheet. You will learn some new formatting skills and make your own decisions on how to use them.

Traffic survey project

A class recorded the number of cars, taxis, buses and trucks going past their school between 10.30am and 11.30am every day of the week. Here is the data:

A traffic survey				
Day	**Cars**	**Taxis**	**Buses**	**Trucks**
Monday	20	7	2	5
Tuesday	21	12	1	8
Wednesday	13	10	2	7
Thursday	45	23	2	15
Friday	30	9	2	11

Figure 17.5.1 *Traffic survey data*

In this example you will create and format a spreadsheet to show the data. You will use the skills you have learned in this unit and learn some new formatting skills. You will have the chance to make your own decisions on how best to format your spreadsheet.

Enter the data

1. Open a spreadsheet application.
2. Put the title 'A Traffic Survey' in cell A1. Add your name or initials.
3. Enter the labels and data shown in the traffic survey data table into the spreadsheet cells.
4. Save your work.

Your spreadsheet will look something like the one in figure 17.5.2.

	A	B	C	D	E
1	Traffic Survey	by AP			
2					
3	Day	Cars	Taxis	Buses	Trucks
4	Monday	20	7	2	5
5	Tuesday	21	12	1	8
6	Wednesday	13	10	2	7
7	Thursday	45	23	2	15
8	Friday	30	9	2	11
9					

Figure 17.5.2 *Enter your data*

More formatting

In lesson 17.2 you learned how to use formatting tools in the Font menu in the Home tab. You have already used this menu to make text larger and bolder. To change the format of a cell, select a cell or range of cells, and click on a formatting button.

There are three formatting options you have not used yet:

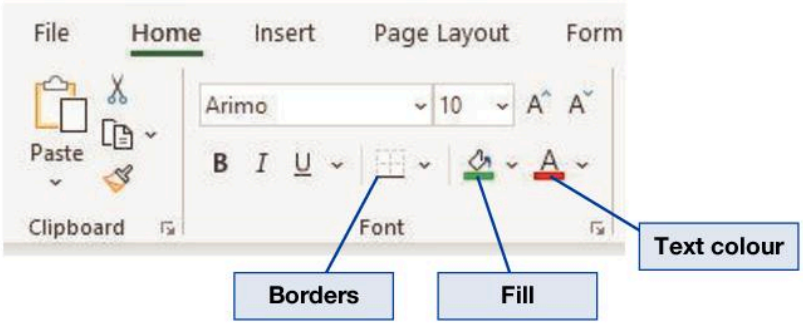


Figure 17.5.3 Font menu

Font colour: Using the font colour button will change the colour of text in selected cells. You can use this for headings or to highlight important data. Use the arrow to the right of the icon to choose a colour.

Fill: The paint pot symbol is used to change the background colour of selected cells. This can be used to highlight headings and important data like totals.

Borders: Lets you insert lines and borders into your spreadsheet. For example, you can separate labels from data with a line or put a border around important data.

Try out different effects before deciding which to use in your spreadsheet. Remember, you can use Undo (Ctrl + Z) if you make a mistake.

There is an example of a formatted spreadsheet in the Activity for this lesson. Your work does not have to look exactly like this example, but it will give you a guide.

Column width

When you first open a spreadsheet, all the columns are the same width. You can adjust the width of columns so that they are wide enough to hold the data you want to show:

1. Move your cursor on to the column heading at the top of your spreadsheet. That is the row that contains the column letters.
2. Position the cursor on the line that separates two columns.
3. Click and hold your mouse.
4. You can now drag the line – moving it changes the width of the left-hand column.

Activity

Follow the steps in this lesson to create the Traffic survey project spreadsheet.

1. Enter the data from the table at the top of page 176.
2. Use the SUM function you learned about in lesson 17.4 to add totals to each Day row and each Vehicle Type column. Make sure you include a SUM function to calculate the total number of vehicles in the survey.
3. Add formatting and adjust the width of columns to improve the look of your spreadsheet.

Your completed spreadsheet should look figure 17.5.4 below.

	A	B	C	D	E	F
1	Traffic Survey: by AP					
2						
3	***Day***	***Cars***	***Taxis***	***Buses***	***Trucks***	***All Traffic***
4	Monday	20	7	2	5	**34**
5	Tuesday	21	12	1	8	**42**
6	Wednesday	13	10	2	7	**32**
7	Thursday	45	23	2	15	**85**
8	Friday	30	9	2	11	**52**
9	***All Week***	129	61	9	46	**245**
10						

Figure 17.5.4 Traffic survey project spreadsheet

17.6 Formatting numbers

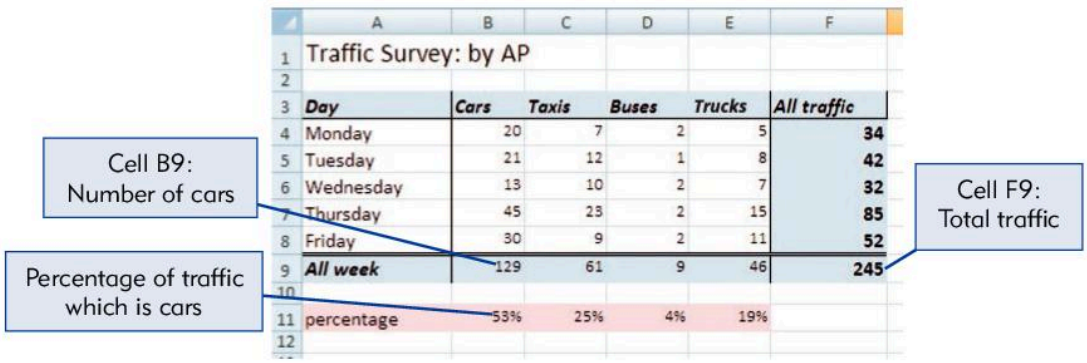
In this lesson you will learn how to format values to show percentages and numbers with a decimal point.

So far in this unit you have only used integer numbers in your spreadsheets. A spreadsheet can be formatted to display other types of numbers, like percentages.

To learn how, you will use the traffic survey spreadsheet that you created in lesson 17.5. You will add an extra row to your spreadsheet to show the percentage of cars, taxis, buses and trucks that were recorded in the survey. The finished result should look something like the spreadsheet in figure 17.6.1.

Why we use percentages

The traffic survey tells us how many vehicles passed a school in a week. We have used a formula to calculate the total number of vehicles in cell F9. We have also used a formula to calculate how many cars passed the school. That figure is in cell B9.



	A	B	C	D	E	F
1	Traffic Survey: by AP					
2						
3	***Day***	***Cars***	***Taxis***	***Buses***	***Trucks***	***All traffic***
4	Monday	20	7	2	5	**34**
5	Tuesday	21	12	1	8	**42**
6	Wednesday	13	10	2	7	**32**
7	Thursday	45	23	2	15	**85**
8	Friday	30	9	2	11	**52**
9	***All week***	129	61	9	46	**245**
10						
11	percentage	53%	25%	4%	19%	
12						

Figure 17.6.1 *Using percentages*

We know that 129 of the 245 vehicles that passed the school were cars. It is better to say 53 per cent of the vehicles that passed the school were cars. You calculate the percentage by dividing the total number of cars by the total number of vehicles. That is B9/F9. This number can be formatted and shown as a percentage.

Calculating percentages

1. Select cell A11.

2. Enter a suitable label (for example, 'Percentage').

3. Select cell B11.

4. Enter the formula: =B9/F9

The result of the formula will be shown in cell A11 as a decimal number. It will look something like: 0.52653. This number can be formatted and shown as a percentage.

Formatting numbers

You are already familiar with using the Fonts section of the Home tab to format text. In a spreadsheet, the Number section has menu buttons that you can use to format values.

1. Select cell B11.
2. Find the Number menu in the Home tab.
3. Click the button with the percentage % symbol.

The result is now shown in the cell as a percentage, something like 53% or 52.6%.

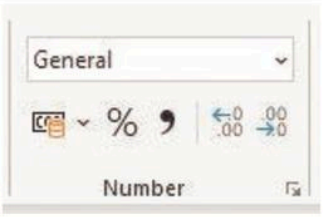


Figure 17.6.2 Number menu

Other number formats

There are other useful formats you can use in the ***Number format*** menu.

Sometimes a decimal or a percentage shows too many decimal places. To reduce the number of decimal places, click on this button on the toolbar.

If your spreadsheet contains large numbers, you may want to use commas to make the numbers more readable. Clicking the button with a comma changes a value like 172020 to 172,020.

When you perform division, you can get results that have a lot of decimal places. You can set the number of decimal places you want to show by using the buttons with left / right arrows.

There are many other formats that allow you to format cells to show:

- currency (for example, $26.50)
- dates (for example, 23/7/2020)
- times (for example, 10.00am)
- fractions (for example, 1/2).

You can see the full range of formats by clicking the down arrow you see in the Number menu. To apply a number or text format, select the range of cells the format will apply to then click the format you want.

Figure 17.6.3 Number format menu

Activity

In the same spreadsheet:

1. Format the row you have added to display as a percentage (for example, 57%).
2. Enter the date of the survey in cell D1. Enter it in the format DD/MM/YY (for example, 12/03/20). Explore the date formats available in the number menu. Choose the format you prefer.

17.7 Graphs and charts

In this lesson you will create simple graphs.

Pie chart

A ***pie chart*** shows how a total is divided up among different categories. It makes sense to use a pie chart to show how the total traffic is divided among buses, cars, taxis and trucks. Here is the data that you will use to make the pie chart.

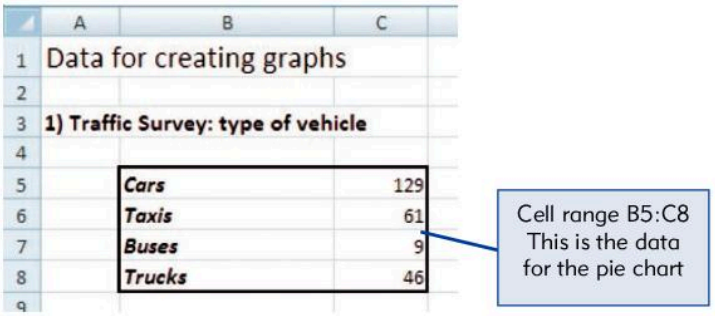


Figure 17.7.1 *Data range for pie chart*

You will find the data you need to create the other example charts in this lesson in Worksheet 17.7.

Create a pie chart

1. Using the mouse, select the cells showing vehicle types and numbers (B5:C8).
2. Select the 'Insert' tab in the ribbon.
3. In the charts section of the insert tab, click the icon called 'Insert pie'.
4. Choose the type of pie chart that you want. The chart will appear on your screen.
5. Find a tab at the top of the screen which says Layout and click on it.
6. Click on the option for Chart title and choose Above chart.
7. Type a suitable chart title in the title box.

Your finished pie chart should look something like this:

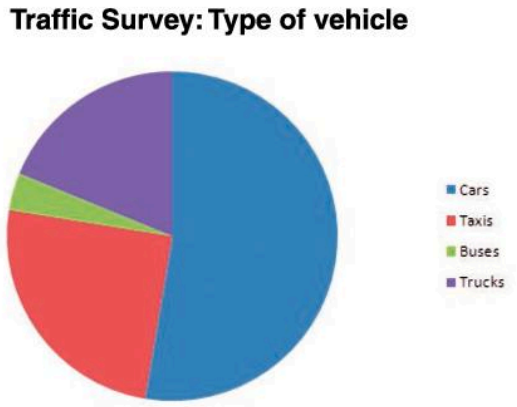


Figure 17.7.2 *Traffic survey pie chart*

Create a column or bar chart

A column or ***bar chart*** is used to show how a quantity varies between categories. It is the ideal chart to use to show how traffic varies day-to-day outside the school. A column chart is sometimes called a histogram.

Figure 17.7.3 *Data for bar chart*

1. Using the data above, select the range of cells titled Traffic survey: daily traffic in the example spreadsheet (B12:C16).
2. Use the same method as before to create a graph, this time selecting the column graph option.
3. Add the title 'Daily traffic'.
4. Find and use the command to hide the legend – you do not need it in this graph as it uses only one colour.

Your finished column chart should look something like this:

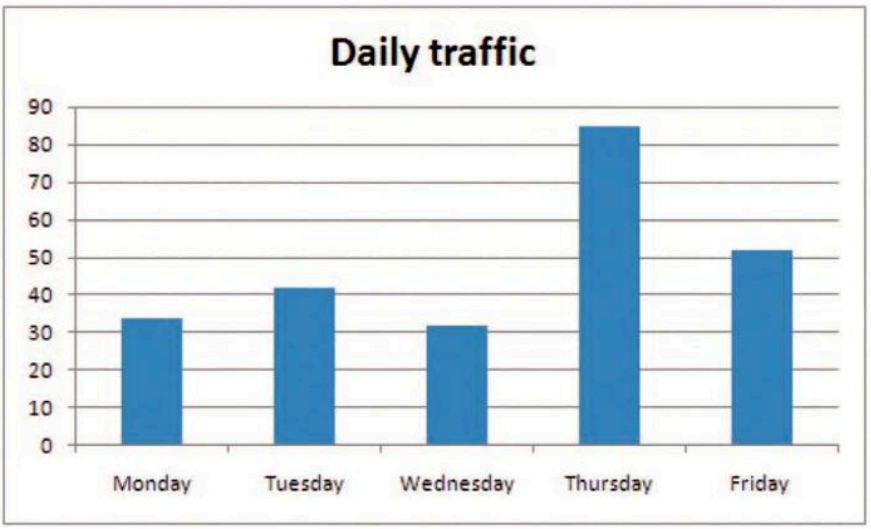


Figure 17.7.4 *Daily traffic bar chart*

Line graph

A ***line graph*** is used to show data that changes gradually over time. In this example, you will show the growth of a plant. A pupil grew two plants from seeds. One plant was grown in full light and one in dim light. The student measured the plant every week. The data looks like this:

Did you know...?

The 'legend' of a graph is the key which tells you what the different colours stand for.

	A	B	C	D
17				
18	**3) Plant growth: height of plants**			
19				
20		***date***	***full light***	***dim light***
21		19th Jan	1.2	1.1
22		26th Jan	1.8	1.5
23		2nd Feb	2.9	2.1
24		9th Feb	4.2	2.8
25		16th Feb	7.7	3.4
26		23rd Feb	11.0	5.4
27		2nd March	13.5	6.6
28				
29				
30		***height is given in cm***		

Cell range B20:D27
This is the data for this line graph

Figure 17.7.5 *Data for line graph*

- Select the range of cells titled Plant growth: height of plants in the example spreadsheet (B20:D27).
- Use the same method as before to create a graph, this time selecting the line graph option.
- Add a suitable title.

Your line graph should look something like this:

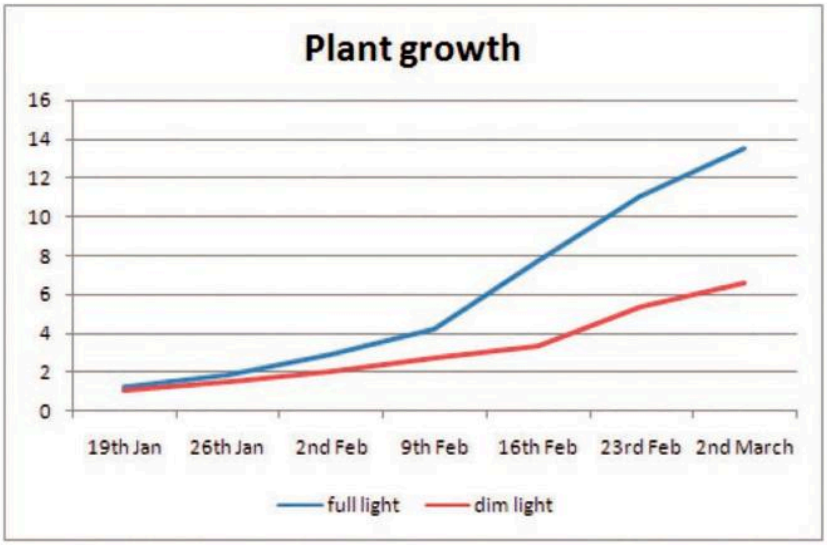


Figure 17.7.6 *Plant growth line graph*

Choosing the right type of chart

Charts are used in documents where number information needs to be explained. A chart can make it easier to see trends in numbers, how things change over time, for example. They also help us compare numbers with each other.

The type of chart you choose to show data is important if you want to make the information clear to the reader.

Pie charts are a good way to show how a whole set of data is split into groups. For example, you might do a survey of your class to find out how they travel to school. How many walk, take a bus or travel by car? A pie chart makes this kind of information easy to understand.

Line graphs are a good way to show how data changes over time. If your school is trying to encourage more students to walk to school, it might survey all students every month for a year. A line graph will show if the effort to encourage walking to school is succeeding.

Bar charts can be useful when comparing different groups. For example, you may want to know which school years are most likely to walk to school. Showing the percentage of students walking to school in each school year will show this information clearly.

Activity

oxfordsecondary.com/just-click-3e

Open the data file in Worksheet 17.7. Use the three sets of data in the spreadsheet to create the graphs shown in this lesson.

End of Section 2 questions and activities

These pages provides you with questions to test what you have learned during this course. The first part contains a set of short answer questions covering each of the nine topics you have studied. The second part contains questions that ask you to apply your knowledge to new challenges.

Test your knowledge

Unit 9 Maintaining your computer

1. Why is it important to know the system requirements of a software application?
2. Name three peripheral devices that are usually connected to a computer using a USB cable.
3. What two steps must you follow before carrying out any cleaning or maintenance on a computer?

Unit 10 Hardware and software

1. What is the ALU in a computer processor? What tasks does it carry out?
2. What is a biometric reader and what is it used for? Give an example.
3. What is a supercomputer? Give an example of where supercomputers are used.

Unit 11 Data communication and networks

1. What are the two types of cable most commonly used in a modern computer network?
2. Explain the difference between simplex, duplex and half-duplex transmission. Give an example of each.
3. What does HTTP stand for? Why is HTTP important when you are browsing the web?

Unit 12 Digital data and binary numbers

1. Convert the binary number 0101 to decimal.
2. Convert the decimal number 72 into a byte.
3. What is the biggest number that can be stored in a byte? Show your answer as both a binary and decimal number.

Unit 13 Using the Internet for learning

1. What is netiquette? Give three examples.
2. What is software piracy?
3. List the four items of information you should include in a citation when using another person's work in a project.

Unit 14 IT in the workplace

1. What is the difference between customer-facing and system-facing roles in an IT department?
2. What is the role of the helpdesk in an IT department?
3. Janelle has a young family, so her employer has agreed that she can telecommute for two days a week. What is telecommuting and how will it help Janelle?

Unit 15 Multimedia presentations

1. What is meant by the term 'multimedia'?
2. List four skills that are needed in a multimedia development team.
3. Name two input devices that can be used to create media for a multimedia presentation.

Unit 16 Problem solving with algorithms

1. What is a terminator used for in a flowchart? Draw the symbol used as a terminator.
2. An algorithm asks a user to enter their age. A conditional statement is needed to check if the person is older than 16. Draw a decision box that carries out this check.
3. Draw a flowchart box to multiply NumA by NumB.

Unit 17 Using spreadsheets

1. Explain what a cell is in a spreadsheet.
2. List three things that you can type into a spreadsheet cell.
3. What kind of graph would you choose to show the increase in the number of Internet users in the world from 2000 to the current year?

Each of the following long answer questions corresponds to one of the units you have studied this year. These questions require an extended answer from you.

Long answer questions

1. Explain the steps you need to take to find out if the software application you want to install is compatible with your computer.
2. Draw a diagram that shows how the components of a CPU are arranged. Include the control unit, ALU, clock, registers and bus. Label your diagram.
3. Instant messaging and email are two methods of communication used on computers. Explain what each method is, and explain how they are different from each other. Give examples of what each is used for.
4. Explain how computers use binary numbers to store and process letter characters and punctuation.
5. Colossus was one of the world's first programmable computers. Search the Internet for an image of Colossus. Cut and paste the image into a word document and add a suitable citation.
6. Simone is interested in working in an IT department. She has very good software skills and communicates well with people. She is not so interested in programming or the technical aspects of networks, but has a good understanding of both. She is outgoing and enjoys working with people. Describe two jobs Simone could consider for a future career in IT. For each one you choose say why you think the role will suit her.
7. Nicole does not study IT, but she is keen to use the web to help her to find facts and resources that she can use in her geography and history projects. How would you advise Nicole to write good search questions and check if the information she finds is reliable?
8. Write an algorithm for a program to calculate the price of entry to a theme park. The two inputs are number of adults and number of children. The program should calculate the total cost of entry. Each adult is charged $20 and each child $10.
9. A spreadsheet contains the values 4, 9, 23 and 12 in cells B3, B4, B5 and B6. Write two alternative formulae you can type into cell B7 to calculate the total of the four numbers. One formula should use the SUM function, the other should not.

   Which of the two formulae would you use in the spreadsheet and why?

End of Section 2 questions and activities

This section provides you with activities that allow you to practise the skills you have learned in this unit, both on your own and in a group.

Group project

Make a presentation about one of the following:

- Computer input devices
- Computer output devices
- Computer storage

Your teacher will help you decide which presentation to work on. Your presentation should include a description of the main devices in the category you are working on along with an illustration. Divide the work among your team members so that each is working on one or two slides. Leave time to bring your slides together into a single presentation.

Web research task

Choose a country in the world. It can be a country you have visited, or would like to visit. Search the web to find facts for a tourist guide to that country. Your guide should include information about:

- The geography of the country (e.g. longest river, highest mountain. Any features that are tourist attractions)
- Three cities to visit
- Food and drink
- Facts about the people and traditions that might be of interest to tourists.

Present your guide using suitable software of your choice.

Practical activity

Make a multimedia presentation to show how to connect a computer screen to a computer.

- Create text screens that describe each step in connecting a screen.
- Add an image or video to illustrate each screen in your tutorial.
- If you have the time, create your own resources using a digital camera and recorder. For example, create your own video clips and audio commentary to include in your presentation.

3

Section 3 of this book is written for those studying computing in the third year of lower secondary school. Section 3 is divided into eight units. Each unit is divided into lessons that provide an understanding of how computers work and how they are used in business and daily life. There are also sections that develop practical skills in using applications like a database management system.

Unit 18 18.1 Basic computer maintenance

In this lesson you will learn how to solve some common faults that occur when using a computer system.

Basic IT troubleshooting

Modern computer systems and networks are very reliable and will run for years without problems. When a problem does happen, there are some simple procedures you can follow.

Figure 18.1.1 Computer power switch

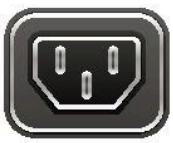


Figure 18.1.2 Power socket and cable

Stay safe

Whenever you are ***troubleshooting*** computer problems you will be working with electrical equipment. Your priority is to stay safe. Always follow your school's rules when using school computers. Always check with an adult before trying to deal with any problems with your home computer. Always follow these safety guidelines when troubleshooting:

1. Switch off power points at the wall before connecting or disconnecting any mains electricity cable.
2. Save files and close down your computer correctly before turning off electrical power points.
3. Do not open the case of your computer or any other electronic device.
4. Never use force when connecting or disconnecting a cable or component.
5. Make sure all cables are disconnected before attempting to move a device (e.g. a printer).
6. Do not lift heavy equipment on your own.
7. If in doubt, STOP and ask for help.

What to do if...

...your computer will not start when you switch it on

1. Is the power cable connected securely to the socket in the computer case and the wall socket? Check if the power socket is switched on.
2. If the cable to your computer has a power supply box along its length, check if there is a switch on the box. Is it switched on?
3. Turn off the socket, unplug the computer cable and plug in another device to confirm it is live.

Once you have confirmed that the power cable is connected properly and that the power socket is live:

4. Replace the power cable with one you know isn't faulty. If the computer still won't start, report the fault to a technician.

…your printer won't work

If your printer powers up but will not print:

1. Check that the USB cable is properly connected to the printer and the computer.
2. Check the computer screen. If a print cartridge needs replacing, there will usually be a warning message on screen. Some printers have a small screen that will also state the problem.
3. If the ink on the paper is faint, then the print cartridge needs replacing.
4. When you remove an ink or toner cartridge, take notice of how it lines up. Never apply force.

Figure 18.1.3 *If lined up properly, a cartridge will slide easily into place*

…your keyboard or mouse won't work

1. If the device is connected by a cable, check it is connected properly.
2. If the device is wireless, turn the power switch on the device off and then on to reboot the connection. Check that the USB dongle is inserted firmly in the computer.
3. Check to see if the batteries in the device need replacing.

Figure 18.1.4 *Keyboard mouse dongle*

…your computer screen is blank

Check that the cable connecting the monitor to the computer is firmly connected. If there is power to the monitor, you will see a coloured light on the case.

If there is still no display on the screen: find the brightness and contrast controls on the monitor case. Adjusting them may solve the problem.

Laptops

Sometimes, the battery in a laptop is loose. Locate the battery and press it firmly into place.

Activity

Draw a flowchart that describes the checks to carry out if your computer will not power up when you press the 'power on' switch.

Talk about

Why do you need to pay attention to safety when troubleshooting computer problems? What can happen if you don't?

Unit 18 18.2 Solving basic network problems

In this lesson you will learn how to solve problems affecting the connection between your computer and the network.

Username and password

If you are having problems logging onto a network, the first thing to do is to check you are using the correct username and password.

Passwords are usually ***case sensitive***. That means it matters if the letters you use are upper case or ***lower case***. Check you haven't left the ***Caps Lock*** key on.

If you have forgotten your password, you will see a button that says 'Forgot password?', or something similar. You can use this button to change your password. You will need an email address to verify your identity. At school, you will need to ask your IT technician to change your password.

Talk about

Describe a time when you have had problems logging onto a network. What was the problem? How did you solve it? Did you need any help to solve the problem? Who did you turn to for help?

Troubleshooting wired networks

If you are having network problems with a wired connection, check that the cable connecting your computer to the network point is connected securely at both ends.

The connection socket on your computer will usually have a small green or orange light. If this light is flashing, your computer is connected. There are two things you can check if the light isn't flashing:

1. The cable connecting your computer to the network may be faulty. Changing it for one you know is working correctly might solve the problem.
2. The network point you are connected to might not be connected to the network. Try another network point.

Only try to solve problems with your school network if your school IT policy allows it. Report the problem to the IT technician or your teacher and use another computer until the problem is fixed.

Figure 18.2.1 *Wi-Fi icon*

Troubleshooting wireless networks

If you cannot make a wireless connection to a network, check if you have wireless connectivity enabled on your computer. Find the WiFi icon on the toolbar at the bottom right of your screen. If it contains a red cross, wireless connectivity may be turned off.

Click the icon to open the ***wireless networks*** control panel. You can turn wireless on by clicking the button marked WiFi.

If you are using a tablet or smartphone you will find a similar icon on your device. If the icon is grey, wireless is turned off. Tap the icon to turn wireless on.

Figure 18.2.2 *Wi-Fi control panel*

Troubleshooting your home network

If you are having problems connecting to your home network, check the following:

- Check you are entering your password correctly.
- Check your computer to make sure that wireless connectivity is turned on.
- Check if other people in the house have a connection. If they do, the problem is likely to be with your device, rather than the ***router***.

There are some basic checks you can carry out on your home network router:

- Is the router plugged in to an electricity socket? Is the socket switched on?
- Check that any cables connected to the back of your router are secure.

If everything else fails, reset your router. Turn off the power switch or the electricity socket. Wait 30 seconds, then turn the router back on again. Do not press any button marked reset on the router.

Activity

Write an information sheet titled, 'Solving network connection problems'. Design the instructions someone new to computing might need to help them troubleshoot their connection at your school.

Make the information sheet relevant to the network system at your school. Illustrate with photographs and screenshots where you can.

Unit 19 19.1 Working with files

Managing data files

In this unit you will learn some basic and more advanced methods for using a file management tool to save and organize your data.

In this lesson you will learn where files that are saved on a computer are stored. You will learn how to save files safely so that you can find and use them again.

Data files

Different types of media can be created and used on a computer. Some of the media types used on computers are text documents, photographs, videos and music. All types of media used on a computer are stored in data files.

When you create work on a computer it is important to save it correctly. Work saved in a data file can be used repeatedly. If your work is not saved correctly it can be lost. All computer systems provide storage drives that your files can be stored on.

Where data files are stored

Computer storage

Computers typically have a ***storage drive*** built into the case. Typically, a storage drive used in a desktop computer can store 150,000 photographs or 8,500 hours of music.

Figure 19.1.1 *A storage drive can save a large amount of information*

Figure 19.1.2 *A flash drive is a small portable storage device*

Network storage

Every network has storage drives that network users can save their files to. That includes the Internet. Storage that is accessed over the Internet is called ***cloud storage***.

The advantage of using ***network storage*** is that you can access files on any computer connected to the network. If you save your work to the cloud, you can access your work on any computer connected to the Internet.

Portable storage

Portable storage is connected to a computer using a USB port. It can be used to transfer data from one computer to another computer or device.

Saving your work safely

Failing to save work correctly could mean:

- you could lose work
- you may not be able to find work when you need it again.

Rule 1: Use helpful file names

When you save a file, you must give it a name. Choose a ***filename*** that describes the information in your file. If it helps, add some date information. For example: 'Science project research April 2020'.

Rule 2: Use folders to organize your work

Using ***folders*** to organize your files can help you to find your work. For example, you could create a folder for video files, or a folder for photographs.

Rule 3: Save your work often

Get used to saving your work regularly. Don't wait until you have finished a piece of work before saving it. There will be times when you are typing, and you pause to think about what you will write next. That is a good time to save your work.

Rule 4: Be careful not to overwrite your files

Sometimes you will see a warning like the one in figure 19.1.3. This is a warning that you are about to ***overwrite*** a file you have previously saved. If you are not sure what to do, cancel and start again. If the problem continues, ask your teacher for help.

Rule 5: Make copies of important files

Sometimes you will have a file that is so important that losing it would be a disaster. You can reduce the risk of losing important work by making a ***backup*** copy of the important file. It is safest to back up files to a different storage location.

Activity

Work with a partner on this activity. How well does your partner use filename and folders? Suggest how your partner can make improvements to their file storage.

Did you know...?

Many software applications, like Microsoft Word, have an autosave function. Autosave saves a version of your work every few minutes without you having to do anything. Using autosave allows you to go back to a previous version of a file if you need to.

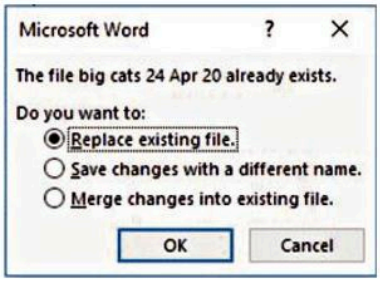


Figure 19.1.3 A file overwrite warning means you could be about to lose important work

In this lesson you will learn how to perform basic file operations such as save, copy and search.

Saving files

If you are using an application such as a word processor, there are two ways to save a file. You can use the file menu or click the save icon. If your file already has a name, it will be saved with the same name. If it is a new file, you need to enter a ***filename*** before you can save the file.

For example, you have just completed a science homework assignment on big cats. The assignment is to be handed in on 24 April 2020. A good filename is: 'Sci hwork Big cats 24 Apr 20'.

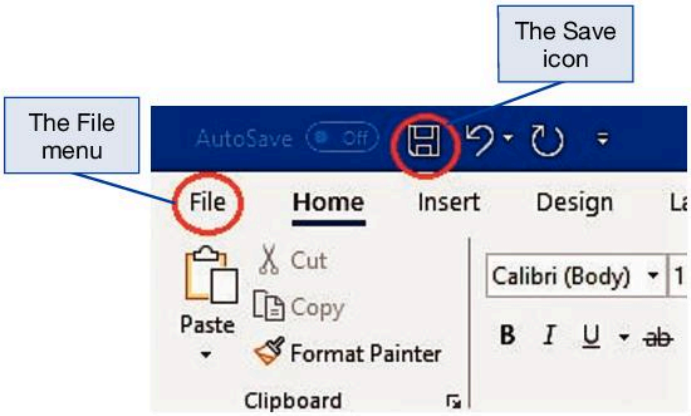


Figure 19.2.1 *Saving a file*

Using Save as...

There are times when you will open a file and make some changes to it but want to save the file using a new filename. This creates a new file with the changes you have made and leaves the file you opened unchanged. In such a case, you must use the file menu and use 'save as' when you save your file.

Figure 19.2.2 *To open File Explorer you can click the File Explorer icon on the taskbar*

Viewing your files

To view the files you have saved you can use an application called a ***file manager***. In Windows, the file management software is called ***File Explorer***.

Another way to open the File Explorer window is to hold down the Windows key on your keyboard and press 'E'.

A File Explorer window will open on your screen. How it looks will depend on how your computer has been set up, but it will look something like the window in figure 19.2.4. You will use File Explorer further in lesson 19.3.

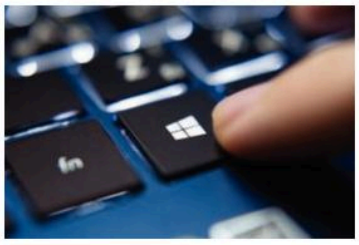


Figure 19.2.3 *The Windows key*

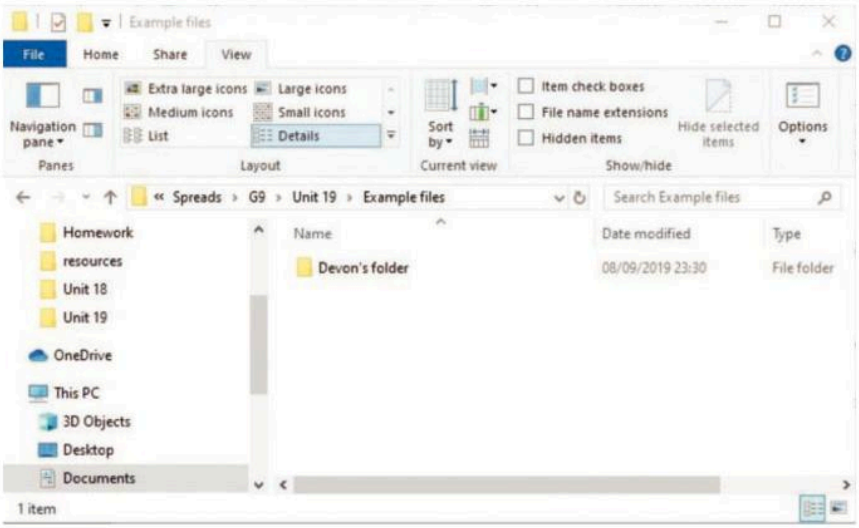


Figure 19.2.4 *Windows File Explorer*

Create a folder

Using folders can help you to organize your work. You can organize your work by subject or type. For example, Devon has set up folders for Computing, Maths and Science.

Figure 19.2.5 *Devon's folder structure*

Inside the computing folder, Devon has created folders to contain different types of work. He has created folders for homework, class notes, projects and screenshots. When a folder is created inside another folder, we call it a subfolder.

To create a folder:

1. Open File Explorer.
2. Find the folder that you want to create a subfolder for. Double click to open the folder.
3. Right-click on a blank space.
4. Select New from the menu that appears, then click Folder.
5. Enter a name for the new folder.

Did you know...?

You can also create folders in other applications. For example, you can use folders in your email application to save important emails. You can find important emails more easily when you need them later. Another useful way to use folders is when you save your favourite websites using bookmarks in your browser.

Activity

Open your work area in File Explorer, either on a school computer or at home. Create a folder called Activities. Create a test file using your word processor and save it to the Activities folder.

19.3 Organizing files using folders

In this lesson you will learn how to use a file manager to organize your files using folders.

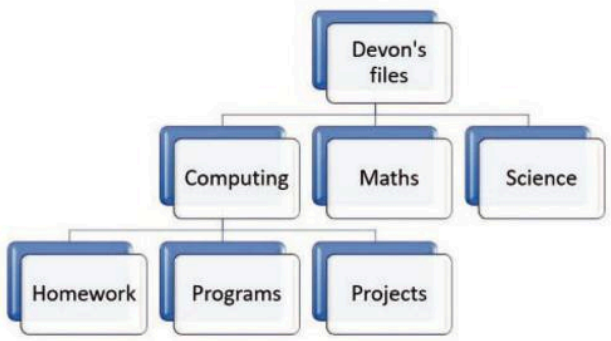


Figure 19.3.1 *Devon's folder structure*

Folder tree structure

In lesson 19.2, Devon created folders to organize his school files. His main folder on the network is called 'Devon's files'. He created folders for IT, Maths and Science.

Devon has created many files while studying his computing course. He made subfolders for Homework, Programs and Projects. The file structure Devon creates spreads out from a single folder. This is called a tree structure, because each level of folders spreads like the branches of a tree.

File paths

Once Devon has created his folder structure, he is able to use it to find files. For example, if he is looking for homework he created last term for his computing class, he follows a path through his structure:

Devon's files → Computing → Homework

When he reaches the correct folder, he only has a few files to search through to find the one he needs. As Devon clicks through his folder structure in File Explorer, the route he takes is recorded in the address bar, which is just below the ***ribbon***. You can see this in figure 19.3.2.

Folder views

You can change the way you see files in File Explorer. Different views can be applied to show different levels of detail about the files that are stored in a folder. To change the view:

1. Click the Views tab
2. Use the options in the Layout section of the ribbon to choose a view.

Devon has chosen the Details view shown in figure 19.3.2. The details view shows an icon displaying each file's type. The filename follows, and then the date the file was last saved, a full description of the file type and the file's size.

Another view, Medium icons, is shown in figure 19.3.3. The icons view is useful if you are searching for an image. The icon shows a small version of the image in the file. This is called a ***thumbnail***.

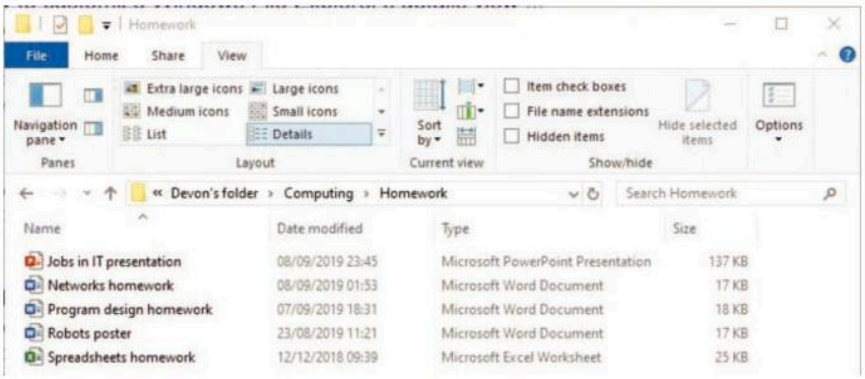


Figure 19.3.2 *File details view*

Organizing files

You can use File Explorer to organize your files in the folder structure you have created. To organize your files:

1. Click the Home tab, then click on the file you want to work on.
2. Use the options in the Organize section of the ribbon to choose an action.

Moving and ***copying*** files: Clicking on either the Move or Copy buttons on the ribbon opens a drop-down box showing all the folders you have created. Choosing one from the list will move or copy the selected file to that location. Sometimes it is easier to use cut and paste commands. For example, to move a file:

1. Right-click on the file icon in File Explorer.
2. Choose Cut (or Copy) from the menu that pops up.
3. Navigate to the folder you want to move the file to, right-click and choose Paste.

Deleting files: Using this option will remove the selected file. Use this option with care.

Rename: allows you to change the name of a file.

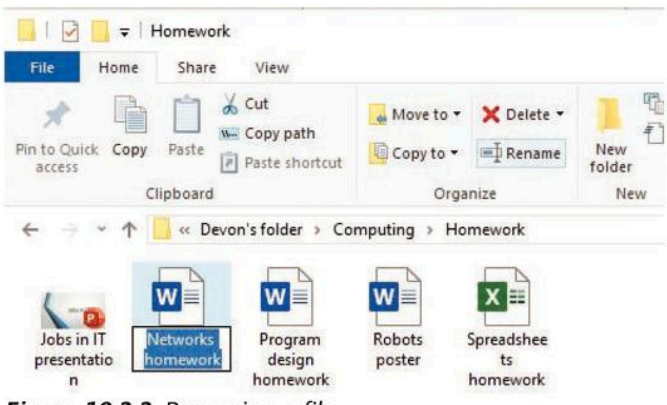


Figure 19.3.3 *Renaming a file*

Activity

Create a folder called 'Backups' in your file area. Choose two or three important files and copy them to the folder that you have created.

In this lesson you will learn how to use the recycle bin to recover any files you delete accidentally. You will also learn how to compress files before you send them by email.

Organizing folders

In lesson 19.3 you learned how the tools in File Explorer can be used to move, copy and rename files. File Explorer can also be used to organize folders. When you move a folder to a new location you also move all the files and subfolders it contains.

Deleted files

Deleting a file should always be done with care. You must be sure that you have the right file and that you will not need the file in future. Deleting a folder needs even more care, as you may be deleting many files and subfolders with a single click.

Figure 19.4.1 The Delete options in File Explorer

If you use the Delete button in the Organize section of the Home tab ribbon, you will be given two options:

1. **Recycle:** deletes the file but places it in the ***recycle bin***.
2. **Permanently delete:** Removes the file but does not put it in the recycle bin.

Deleted files that are placed in the recycle bin can be recovered if you have made a mistake or changed your mind. Always choose this option to delete. Most file delete options you use will automatically place a file in the recycle bin. To recover a file:

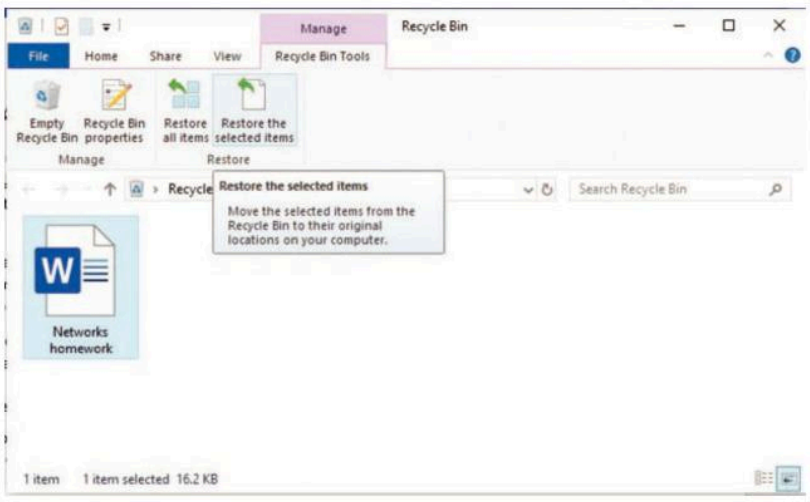


Figure 19.4.2 Restoring a file from the recycle bin

1. Open the recycle bin – it is in the top left of your computer desktop.
2. Click on the file you want to restore to select it.
3. Click the 'Restore selected items' button. The file will be returned to its original location.

Compressing files

File compression is a method developed by computer scientists to reduce the size of a data file. There are many forms of

compression. Most graphics, audio and video files are automatically compressed when they are saved. At other times you can choose to compress files. There are two advantages of compressing files:

1. Files take up less space on storage devices.
2. Files take less time to send over the Internet.

Making a zip file

File Explorer can be used to compress files. It uses a method called ***zip***. In figure 19.4.3, Devon has three images in a folder that he wants to email to a classmate.

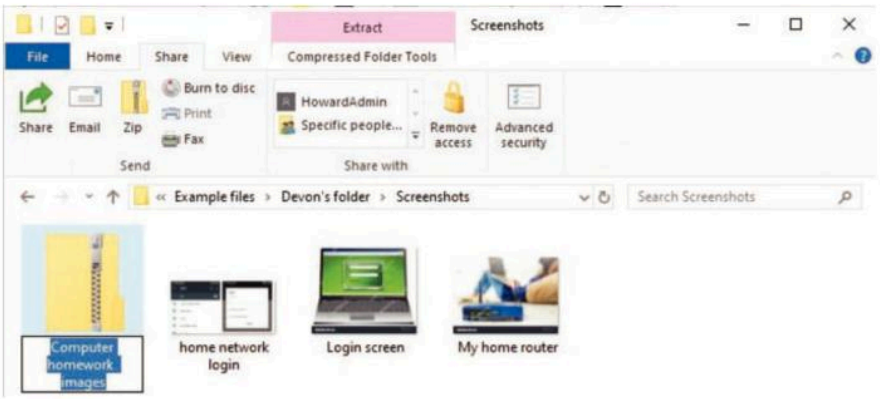


Figure 19.4.3 *Making a zip file*

To compress files:

1. Open the folder containing the files using File Explorer.
2. Click on the Share tab.
3. Hold the Ctrl key and click to select the files you want to include in the zip file.
4. Click the zip button in the Save section of the ribbon.
5. Give the zip file a suitable name.

A zip file is created as a folder. You can recognize a zip folder by the zip on the folder icon.

Extracting files from a Zip file

Devon can send the zipped file to his classmate. Before using the files, his classmate needs to extract the files. To extract files from a zip file:

1. Open the folder containing the zip file.
2. Click on the Share tab.
3. Click the zip file to select it.
4. Click the pink Extract button at the top of the screen.
5. A new ribbon will open. Click Extract all.

Activity

In lesson 19.3 you created a folder called Backups. You copied three files to the folder. Open the folder and create a zip file containing the three files.

19.5 Adding in binary

In this lesson you will learn how to do simple addition in binary.

In unit 12 you learned that ***binary*** numbers can be used to represent how data is stored in a computer. Every piece of data, whether it is text, an image, or a program, is stored as 0s and 1s. Sometimes a computer needs to process data. To do that it needs to perform mathematical operations on binary numbers.

One mathematical process a computer performs is to add two numbers together. This example shows how addition is carried out. To add two binary numbers together you must use four rules:

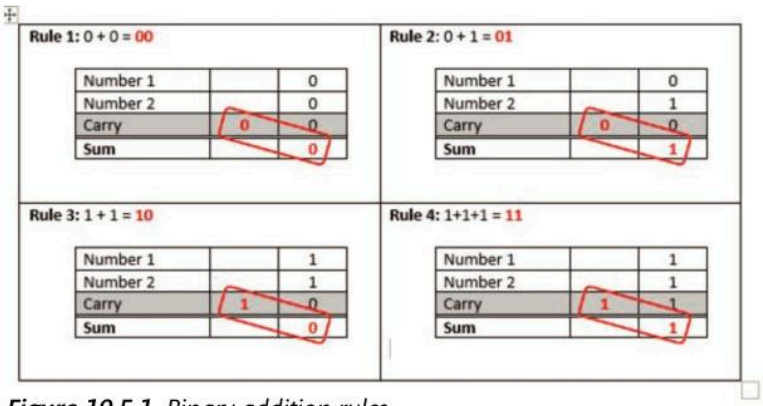


Figure 19.5.1 *Binary addition rules*

Example

In this example we will add the binary numbers 0011 and 1011. We use the four rules to help us with binary addition.

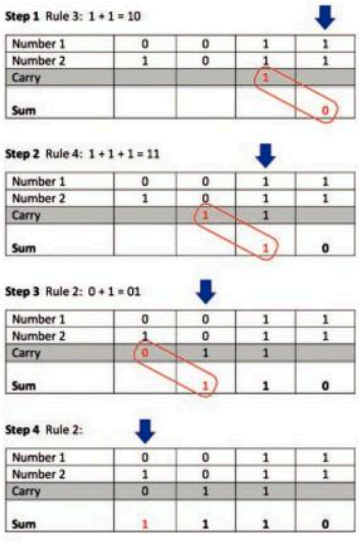


Figure 19.5.2 *Binary addition – worked example*

1. Number 1 and Number 2 both contain a 1 in the first column. Rule 3 says 1 + 1 = 10. The 1 is entered in the 'carry' row of the next column. The 0 is entered in the 'sum' row of the column you are working on.
2. In Column 2, both Number 1 and Number 2 contain a 1. There is also a 1 in the carry column. Rule 3 says 1 + 1 + 1 = 11. A 1 is entered in the carry row of the next column. A 1 is entered in the sum row of the column you are working on.
3. In Column 3 Number 1 and Number 2 contain a 0. There is a 1 in the carry column. Rule 2 says 0 + 1 = 01. It doesn't matter where the 1 appears; what matters is that it only appears once. A 0 is entered in the carry row of the next column. A 1 is entered in the sum row of the column you are working on.
4. Rule 2 says 0 + 1 = 01. A 1 is entered in the sum row of the column you are working on.

Activity

The addition in the example is 0011 + 1011 = 1110.

Use the method you learned in lesson 12.2 to convert each of the binary numbers in the calculation into decimal to check if the addition is correct.

More complicated addition

The method you have just used is a demonstration of how computers do addition. Sometimes we ask a computer to add a list of numbers, for example 7 + 8 + 4. The computer will add the first two numbers, then add the next number to the sum until it has added all the numbers.

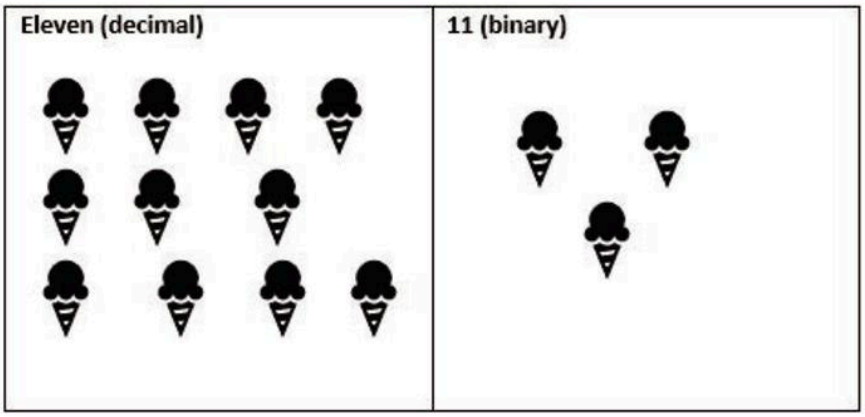


Figure 19.5.3 *Eleven and 11 compared*

Did you know...?

Ten and eleven are names we give to numbers in the decimal system. We have names for every number we use in decimal. Numbers are not given names in binary. In binary 11 is called 'one-one', not eleven. Eleven and 11 in binary are quite different.

Activity

Draw a copy of the table used in the binary addition example. Use the table to add together 1010 and 0010. Rule 1 was not used in the example, but you need to use it to find the answer in this activity.

Complete these calculations in binary:

1. 0011 + 0100
2. 0101 + 0010
3. 1001 + 0011

Unit 20 20.1 Network equipment

Network security

In this unit you will learn about the hardware used to make a network operate. You will learn about the threats criminals and hackers pose to data held on a network. You will also learn how search engines work to help you find information on the web.

In this lesson you will learn more about network hardware. When we send or receive a message over a network, we use many pieces of computer hardware that are usually hidden away.

Servers and storage

One of the most important types of ***hardware*** in any network is a server. A network server provides computer files to users like a waiter serves food to diners. Examples of the jobs that servers perform include:

- receiving a completed word-processed file and saving it to a network storage drive
- finding a spreadsheet file users ask for and sending it to their computer
- receiving an email from one person and passing it on to another
- receiving a request from a user to print a file and sending the file to a printer.

All computers need to store data. Servers are no different. They have storage devices attached to them. The storage devices used by servers are larger and faster than those used in ***personal computers***.

Switches and hubs

As messages are sent out across a network they need to be sent to the correct destination. Hubs and switches do this job in a network.

When a hub receives a message, it sends it to all the computers it is connected to. The computer that the message is meant for keeps the message. The other computers ignore the message. When a switch receives a message, it decides which computer the message is meant for. It sends the message only to that computer.

The extra messages a hub sends out can slow a network down. A hacker has more chance of intercepting and stealing messages sent by a hub. A switch is more expensive than a hub, but it is more secure and works faster. For these reasons, switches are usually used in modern networks.

Router and modem

A ***router*** joins two networks together. Routers are typically used to connect a ***local area network (LAN)*** or a home network to the Internet. A router works together with a ***modem***.

When two networks are joined together, they sometimes use different methods to send data. A modem takes data sent by one network and translates it into a form that can be understood by the second network.

Wireless access point

Most modern networks allow wireless connections. That means devices like laptops, tablets and other mobile devices can connect to a network without having to use a cable. This needs a special piece of hardware called a ***wireless access point*** (WAP). WAPs are positioned on the ceiling or high on walls.

Figure 20.1.1 *A WAP is connected to the network by a cable, but computers can connect to the WAP wirelessly, without a cable*

Network interface card

A network interface card (NIC) allows a computer or other device to connect to a network. Most devices come with an NIC installed inside the computer case, but you will see the network cable socket on the outside of the case.

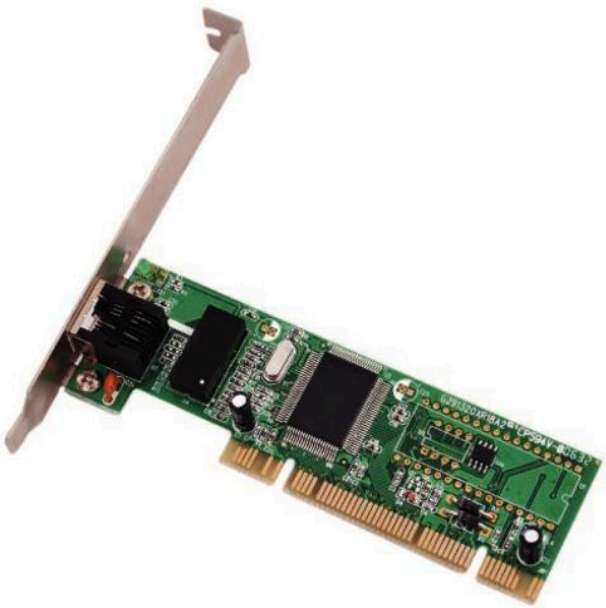


Figure 20.1.2 *Most computer devices come with an NIC fitted*

Activity

Find images of the devices described in this lesson on the web. Make a document labelling the images you find. Add a short description of the purpose of each device in a network.

20.2 How a network is connected

In this lesson you will learn how devices in a network are connected in a home network and LAN.

Home network

An Internet signal reaches a home network via a telephone line, or special ***broadband*** cables. The cables carrying a home Internet signal are connected to a home router.

A home router combines four different ***network devices*** in a small case. A home router contains:

1. **Router:** connects your home to the Internet.
2. **Modem:** converts the signals that pass along telephone or broadband cables into digital data your home network can use.
3. **Switch:** makes sure that messages coming into your home are sent to the correct computer.
4. **WAP:** lets you connect to the network wirelessly, from anywhere in your home.

Look at figure 20.2.1. The yellow cable links the Internet to the router. Three aerials are connected to the WAP to improve the wireless signal. Four sockets to the right of the case allow devices to be connected by wire to the home router's switch.

Figure 20.2.1 *Home router*

Local area network

A local area network (LAN) is bigger than a home network, but it must contain the same components. The components in a LAN are larger than those needed in a home network and there are many more of them. A local area network is not stored in a single case like a home network. LAN equipment is spread around a building, stored in cabinets that either stand on the floor or are attached to walls.

Connecting LAN components

Network components like servers and switches are connected by cables. There are two types of cable used to connect network equipment:

1. ***Copper cable*** is the most common cable in a network.
2. ***Fibre-optic cable*** is made up of thin strands of clear fibre.

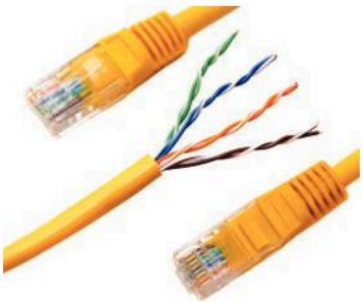


Figure 20.2.2 *Data is sent along copper cables as pulses of electricity*

Figure 20.2.3 *Data is sent along fibre-optic cable as pulses of light*

There are three important differences between the types of cable:

1. More data can be sent at faster speed along fibre cables.
2. Fibre cables can be used over longer distances than copper. Electrical pulses fade as they travel. Copper cables can only be used over distances of up to 100 metres.
3. Copper cable is cheaper.

In a LAN, copper cable is used wherever possible. It is a cheaper and easier cable to work with, so will be used wherever a cable of less than 100 m is needed to connect a device to the network. Fibre-optic cable is used for longer distances.

The server room

The ***server room*** contains all the servers in the network. It also contains hubs and switches so that the rest of the network can be connected to the servers.

Each server is connected to a hub or switch by a single cable. The switch is then connected to devices such as printers and computers. The server room is usually air conditioned. Computer equipment produces a lot of heat, and if it gets too hot the equipment may become damaged.

Activity

Next time you have a lesson in a computer room, look for evidence of a network. List the evidence you find and illustrate your list with sketches or photographs of what you see.

20.3 Network security threats

In this lesson you will learn about malware and other risks that threaten the security of data stored on networks.

People usually commit computer crime to make money. Others commit computer crimes to cause trouble in the same way that people commit vandalism: to cause trouble, to get attention or publicity, or for political reasons.

Malware

You have learned that software is the name for the instructions that make the computer work. Some people deliberately make software that will harm your computer. The general name for this is 'malware'. That is made from the words 'malicious' and 'software'.

Types of malware

Often people use the word 'virus' to mean any type of malware. In fact, there are many types of malware that are not viruses. All malware needs to stay hidden from the user. Otherwise the malware would not be able to damage the data or software. The different types of malware use different ways to stay hidden:

Type of malware	Method of hiding
Virus	Hides itself inside another file
Worm	Copies itself to other computers across the network
Trojan	Comes disguised as a 'good' file, such as a computer game or image
Rootkit	Changes your operating system so you cannot spot it
Backdoor	Switches off security software to let other malware onto your computer
Ransomware	Locks files so that they cannot be used. Criminals demand payment of money to unlock the files

Effects of malware

Malware causes serious problems for the data on computers. It can:

- delete files or wipe entire storage devices
- alter your computer settings
- make your computer carry out unwanted actions (such as sending emails).

How malware spreads

Malware spreads in two main ways:

1. It can be contained in files attached to emails. When the file is opened or saved, the malware is activated.

2. It is hidden in software, particularly games, which you install onto your computer.

Spyware

Spyware is a special kind of malware. Like a virus, spyware cannot be seen on your computer. Spyware records everything you do with your computer. The person who made the spyware can look at the record of your computer use. That might tell them every website you looked at, and what you typed on your computer.

Spyware can be used by companies and governments to monitor behaviour. Spyware is used by criminals to find out passwords and other personal details.

Figure 20.3.1 *Hackers*

Hacking

A hacker uses someone else's computer system without permission through a network connection. Some hackers break into computer systems for both malicious and non-malicious reasons.

Malicious hackers break into computer systems to commit crimes. For example, they steal money from bank accounts, commit credit card fraud, steal sensitive information or steal personal information.

Piracy

Software piracy is the illegal copying and distribution of software and media such as games and music. Piracy isn't always a security risk, but there is a risk that illegally copied software carries malware.

Here are some ways that criminals can make money from illegal copies of software:

- counterfeiting: copying and selling of software
- softlifting: buying one legal copy of software and installing it on several machines
- hard-disk loading: selling computers with illegal software on them
- software rental: renting out illegal copies of software.

Activity

Write an article for a school magazine explaining what malware is. Describe the different types of malware.

Did you know...?

Some companies employ hackers to try to hack into the company's network from outside. That way, the company can find its weaknesses and fix them before malicious hackers find them. A hacker who works to improve the security of networks is called an ethical hacker.

Unit 20 20.4 Network security countermeasures

In this lesson you will learn about physical, software and hardware measures used by network managers to counter the threat of malware and hacking.

In lesson 20.3 you learned that malware and hackers pose a threat to data security in a network. Organizations use a range of measures to protect their data against such threats.

Physical measures

Physical security is used to prevent people from accessing network equipment. Measures include locked doors, security passes and security guards.

Biometric systems provide a high-tech way of controlling access to network equipment. Two common types of biometric system are fingerprint readers and iris scanners. Both use physical features to create patterns that can be automatically read to authorize access.

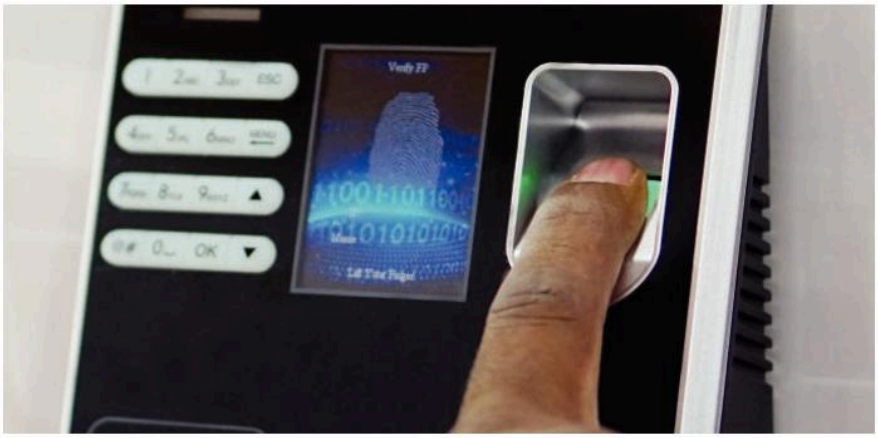


Figure 20.4.1 *Using biometrics means people don't have to carry a security card that might get lost or stolen*

Software security

Most network systems use ***intrusion detection systems (IDS).*** An IDS is software that monitors a network and warns when unauthorized access has occurred. This allows action to be taken to deal with the problem early.

Encryption is a way of converting data into a secret code. Most data sent over the *Internet* is encrypted. Encrypted data cannot be read even if it is intercepted by a criminal.

Malware protection software searches any file saved on your computer. Malware protection software places infected files in ***quarantine*** so that they cannot damage the computer or its data.

A ***firewall*** is a filter. It allows authorized communications through the filter into the network and it blocks communication from unauthorized sources.

Think of a firewall as the walls of a castle. Every gate in the wall is guarded. Guards let those who have passes into the castle. They turn others away. The guards and walls act like a firewall.

Other soldiers patrol inside the castle wall. They are constantly on the lookout for wrong-doers. When the patrols find a criminal, they lock them in the castle dungeons. These patrols act like malware protection.

Figure 20.4.2 *Malware protection software must be updated regularly so it can identify the latest viruses*

Secure working practices

Security is improved by the ways people work with computers. Users must use strong passwords that they change regularly. Passwords should not be revealed or written down.

Organizations have strict rules about what data can be stored on mobile devices such as laptops. A laptop can be lost or stolen along with all the data stored on it. It is safer to save sensitive data on network drives or on ***cloud storage***.

Individuals can protect against malware and viruses through the way they work. Email attachments from unknown sources should never be opened. Care should be taken when ***browsing*** the Internet.

Disaster recovery

Disasters such as hurricanes or major cyber-attacks can damage computer equipment or data. Organizations must have plans to recover from disasters so that they can resume normal work quickly.

A ***backup*** is a copy of all your data, stored away from your computer in a safe place. If a disaster happens and your data is lost, you can turn to your backup. Bringing back data from backup is called ***recovery***.

Activity

Carry out your own research and write a short report on the following subjects:

1. Biometric systems
2. The cost of malware attacks

In this lesson you will learn how a search engine delivers results to your computer.

How a search engine works

When you type a web search, your search terms are sent to a search engine over the Internet. The search engine uses a powerful computer to process your question. After a few seconds, a list of links is displayed on your computer screen.

A search engine would take a very long time to search all 1.9 billion websites on the web. To be able to send you a list of links quickly, the search engine must work in another way, long before you even send out your request.

Figure 20.5.1 *Search engines*

Spiders and crawlers

A search engine uses a method called 'web crawling' to search the web. Web crawling uses a piece of software called a spider. A spider is sent out to crawl around the web collecting information.

When a spider reaches a web page, it records every word on the page. The spider counts how often each word is used and creates a list of the important words on the page. The list will show which words appear most often. Those words describe what the page is about.

The spider ignores words like 'the' and 'when'. It only includes keywords in its list. This is why you only need to include keywords in a web search.

Search engine index

The information collected by a spider is sent back to the search engine. The information is stored in a special list called an index.

The index contains a count of keywords used on every page on the web. The index is a very large ***data file***.

When you type a web search, the search engine looks through the index. Searching the index is much quicker than searching the web. The search engine compares the keywords in your search with the keywords in its index.

The search engine looks for web pages where the keywords in your search appear most often. The search engine chooses those web pages for you. Those web pages will appear at the top of the search list that is sent back to you.

A search engine uses an algorithm to choose the best web pages for you. The algorithm aims to send you the most useful results when you carry out a web search. Companies like Google and Microsoft are always trying to improve their algorithm to give you better search results.

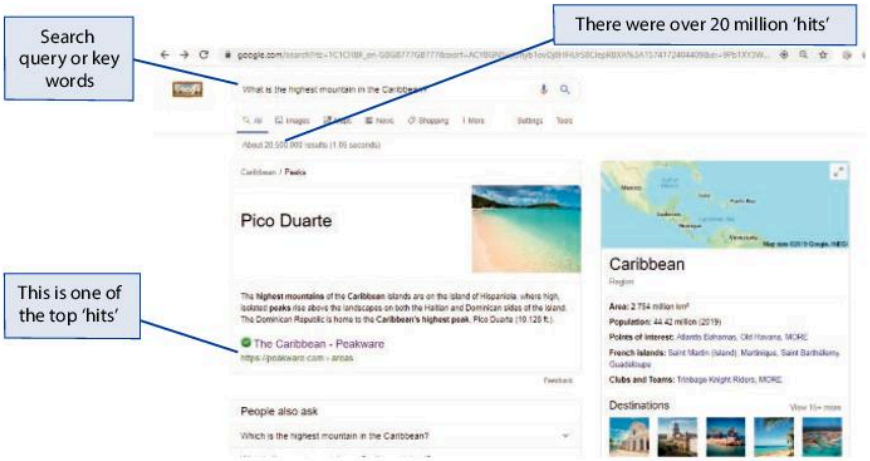


Figure 20.5.2 *Search engine results page*

Activity

Here is a web search typed by a user:

What is the longest river in Africa?

Make a copy of the search. Put a circle around all the words that the search engine will ignore.

Activity

Use the Internet to search for a video or animation that explains how a search engine works. Watch the video and make notes. Bookmark any videos that you find useful.

20.6 How search engines list results

In this lesson you will learn how search engines prioritize the pages they show you when you do a web search. You will also learn some advanced search methods.

How a search engine sorts results

When you do a web search, the search engine algorithm ***sorts*** the list of pages it finds. It tries to move the most relevant pages to the top of the list. Some factors that affect the ordering of the results include:

- Popularity: The main way that the popularity of a page is assessed is by the number of web pages that link to it.
- Currency: When you search the web, you want information that is up-to-date. A search engine will prioritize pages that are updated often and have changed recently.
- Search history: A ***web browser*** keeps a list of websites you have looked at before. The search engine uses this information to predict what websites you want to see in the future.
- Reliability: Sites that a search engine trusts are moved toward the top of a search list. This does not mean that you can believe everything you see on web pages at the top of a search list. You still need to check the facts.

Adverts

Most search engines add adverts to the top of a list of sites. The adverts are paid for by the advertiser. Adverts are not always relevant to a search and may give biased information. Adverts are usually indicated with an 'AD' symbol or the words 'sponsored link' in the title of the page.

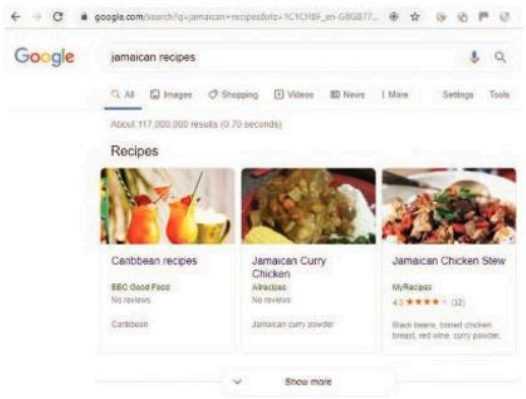


Figure 20.6.1 *The most relevant results are shown first*

Advanced search techniques

Search engines like Google have operators that you can use to carry out advanced searches to better find the information you need. Here are some examples you might find useful:

OR and AND: You can use the relation operators OR and AND as you do in other software applications and in programming. This search will find information on mountains of the islands of Jamaica OR Trinidad:

Mountains (Jamaica OR Trinidad)

Notice how brackets are used to group the OR part of the search statement. You can use AND in a search, but it isn't usually necessary. If you put two words together, a search engine assumes you mean AND. So, (Jamaica AND Trinidad) is the same as 'Jamaica Trinidad'.

NOT: You can use the NOT operator in a search string by using the minus symbol –. The example will list recipes for vegetarian pizzas but will exclude recipes for Margherita pizza.

vegetarian pizza recipe – Margherita

Quotes: You can use double quotes " " when you want to search for a phrase rather than individual words. This can be useful when searching for book or song titles.

Some more useful operators

Here are a few search engine operators you can use for very specific jobs. They can be great time-saving tools.

Define: Typing the following term gives the dictionary definition for the word 'programmer'.

Define: programmer

Site: Typing the following searches for the term 'information technology' only on the site oup.com:

information technology site:oup.com

Map: This function will find maps of specific places:

Map: Atlanta, Georgia

In: This function converts from one unit of measurement into another. In can be used for many conversions including distance, weight and currency.

400 metres in yards

Activity

Use advanced searches to discover:

- a map of the Caribbean
- information about the highest mountains in the Himalayas
- information about the world's longest rivers, excluding the Amazon.

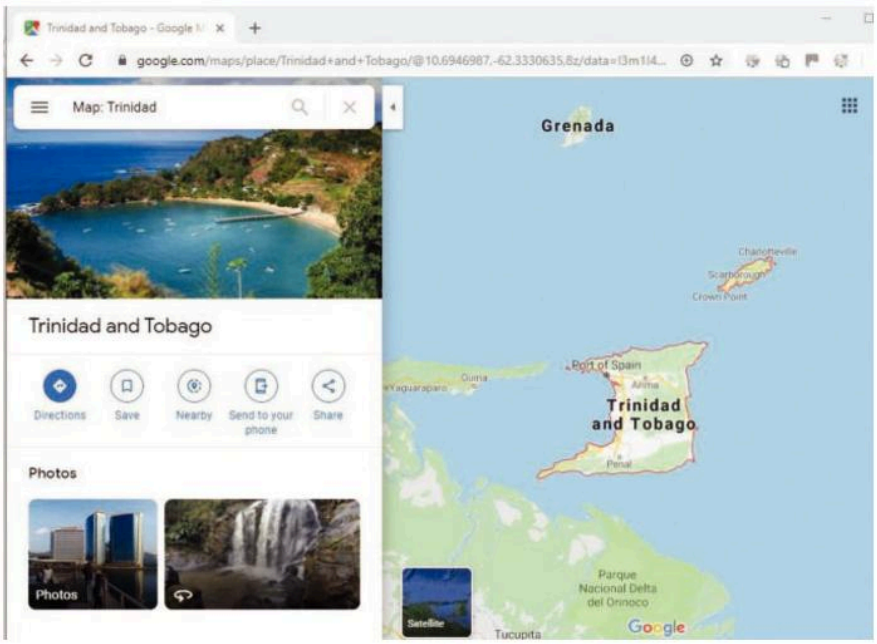


Figure 20.6.2 *Map search*

Unit 21 21.1 Cyberbullying

Staying safe online

In this unit you will learn about the risks that can occur when you use the Internet. You will learn how to act to avoid risks and cope with problems you might experience online.

In this lesson you will learn what cyberbullying is. You will learn about the damaging effects of cyberbullying and what you can do to avoid them.

What is cyberbullying

A person who uses the Internet or other electronic means to bully others is called a ***cyberbully***. Cyberbullying can take place on ***social media*** sites, but bullies will also use email and text messages. Cyberbullying is malicious and persistent. It can seem impossible to escape from a cyberbully. A bully can strike any time and anywhere, using text messages and social media posts.

A cyberbully has many ways to frighten a target. The bully will send threatening messages, often including physical threats. This is called ***online harassment***. A bully might ***impersonate*** their target and send false messages that cause trouble between the target and their friends.

A cyberbully may post public messages showing disrespect to a target, publicly humiliating them. One way a bully achieves this is through ***exclusion***, that is publicly excluding their target from a social group.

The effect of cyberbullying

Bullying over the Internet is often anonymous. Not knowing who is carrying out the bullying makes it more frightening. Cyberbullying can have several devastating effects on things like:

Confidence: Cyber bullying affects self-confidence, leading to anxiety and depression. Being the target of rumour and ridicule makes a person feel powerless and vulnerable.

Loneliness: A person who is bullied feels alone with no one to turn to. The target of cyberbullying can withdraw from their family and friends.

Performance at school: The pressure created by cyberbullying makes it hard to concentrate on schoolwork. A person may start to miss classes.

Change of personality: A target of bullying who is usually pleasant and respectful can misbehave or become aggressive. Bullying can lead to sleep and eating disorders.

What makes a cyberbully?

There are many reasons why someone might turn to cyberbullying. They may want revenge for harm they feel has been done to them, turning their own unhappiness and insecurity on to someone else.

Figure 21.1.1 *A person who uses the Internet to bully others is called a cyberbully*

Did you know...?

Many countries are considering the introduction of laws to deal with the rise of cyberbullying. In other countries, existing harassment laws have been used to prosecute cyberbullies.

Jealousy can motivate a cyberbully, or they may feel threatened by people who are different to themselves. Often, cyberbullies are seeking some sort of approval.

Dealing with cyberbullying

If you see someone being bullied, do not join in. Don't 'like' a bullying post, not even as a joke. That will encourage the cyberbully and hurt the target of the post.

Say something positive about the person being bullied. Showing your support will make the bullying easier to bear. Offer support and reassurance. Let the person being bullied talk if they need to. Encourage them to talk to an adult about the bullying.

If you are bullied yourself, collect evidence. Take screenshots so that you have a record, even if a post is deleted. Don't respond to the bullying. Retaliating can encourage the bully and escalate the problem.

Talk to someone you trust about the bullying, like a friend, family member or teacher. If you experience bullying or see someone else being bullied, stand up to the bullying. Don't stand by and let it happen. Be an ***upstander*** not a ***bystander***.

Activity

Make a list of the positive things you could do if you observe someone being bullied or if you are a victim of bullying.

Unit 21 21.2 Stay safe online

The Internet is a wonderful resource. We use it for work, for learning, and to keep in touch with friends and family. However, using the Internet has risks. In this lesson you will learn how to protect yourself online.

Staying safe

Most people using the Internet are friendly. However, there are some people using the Internet with bad intentions. Young people are particularly at risk. Some of the activities that carry the greatest risks are discussed below.

- Chatting: Do not chat with strangers. It is safer to chat to people you know well. It is safest if you chat to people you know in real life. Don't accept friend requests from strangers. If you feel uncomfortable about someone who sends you a message you can ***block*** them. Never arrange to meet a stranger.

Some people you meet online may ask you to send inappropriate messages or texts. If the person you are talking to is trying to exploit you then you should block them immediately.

- Sharing: Do not share your personal information or photographs with strangers. Never share your address, phone number or which school you attend with strangers. Be careful that the photographs you post online do not reveal your location, or the location of any other person in the picture.
- Accepting: Do not accept pictures or other files from people you don't know. The files could be infected with a virus or other malware. If you receive a message or file by email from someone you don't know, do not open it. If you are in doubt, ask an adult you trust for help.
- Settings: Social media and gaming sites allow you to set privacy levels. Privacy levels let you decide who can see what you share online. If you are unsure how to use privacy settings, ask a family member or teacher to help you. Check your friends list. Make sure you haven't added strangers by accident.

Did you know...?

You can make the time you spend online safer by carrying out regular checks on your computer.

- Turn off location sharing on your phone and browser.
- Check your privacy setting on social media sites – do not allow public access to your private information.
- Check your lists of friends on social media. Do you really know everyone on your friends list? Remove names you aren't sure of.

Digital footprint

Never type words online that you would not want family, police or employers to see. Never share pictures that you might regret sharing. Once information is posted online it can be hard to remove. This is called the ***persistence of data*** or a ***digital footprint***.

Passwords

Many websites store content that is personal to you – for example payment details or a personal profile. Nobody else should be able to access that content. Websites will protect your personal details with a password. By typing the password, you confirm your identity.

- Do not use obvious passwords such as '1234' or 'password'. Think of a password that is hard to guess.
- Make sure you can remember the password.
- Do not use the same password on every website.
- Never tell anyone else your password.

Reporting problems

If something or someone frightens or upsets you online, tell an adult. It can be scary, but you will feel better once the problem is out in the open. Your school may have a teacher responsible for dealing with online abuse and bullying.

Figure 21.2.1 *If you encounter a problem online, tell someone you trust, like a family member or a teacher.*

Activity

Search the Internet to find one or more sites that provide good information on how to stay safe online. Add the sites to your bookmark list. Share your favourite site with your class.

Unit 22 22.1 IT and your career

Planning a career in IT

In this unit you will learn about what you need to do to plan for a career in Information Technology or computing.

In this lesson you will learn about the skills you will need to be successful in finding your first job and building a career.

Computers in the workplace

Almost all jobs in offices, shops and banks use computers. Creative jobs and those in education and communications also use computer equipment. IT is not the main skill needed in these jobs, but there are few jobs that can be done without IT skills.

IT and the medical profession

Office applications are important to doctors. Doctors type patient notes using a word processor and read a patient's treatment history using databases. Doctors use email to communicate with patients and colleagues and research information on new treatments using the Internet.

Doctors use high-tech scanners to make 3D images of the inside of a patient's body so they can give better diagnoses. Robotic surgical tools are used by doctors to perform delicate procedures in parts of the body they could not otherwise reach. Doctors should keep their IT and technical knowledge up-to-date and be willing to learn new skills.

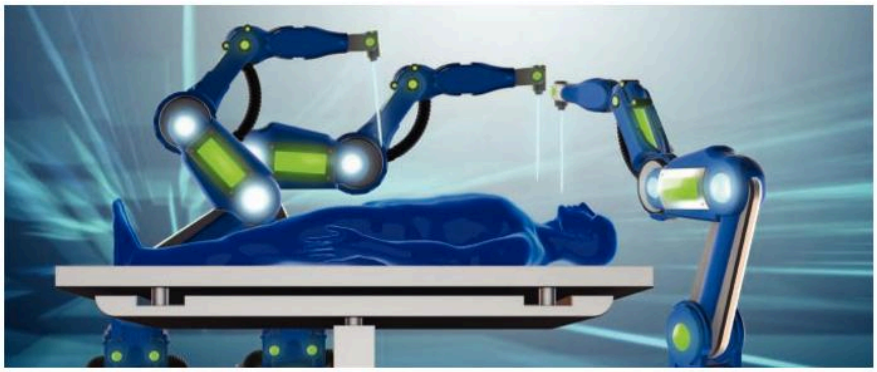


Figure 22.1.1 *Robotic surgery*

Specialist IT jobs

Specialist IT jobs are those where computer skills are the focus of the job. Examples of these roles include computer programmer and IT technician. A range of specialist IT jobs were described in Unit 5. If you are considering a career in IT or computing, there are many non-IT skills that you will need.

Modern computer professionals use a range of skills:

- **Problem-solving** skills are important. There are constant challenges in the world of IT, and you must be able to respond rationally to overcome them.
- **Good communication skills** are needed by those who work with computer users to find out their needs, and also train them to make good use of computers.
- **Writing and language skills** are essential for those who create computer manuals and websites.
- **Maths and logic skills** are used to design solutions and write computer code for ***application software***.
- **Scientific understanding and knowledge** is needed by those who design and build computer hardware systems.
- **Engineering and electronic skills** are needed by technicians who maintain, repair and improve computer systems.

Trending jobs

New industries emerge when new technologies are developed, or new applications are found for existing technologies. Innovative jobs and careers are created that can be rewarding and exciting. These are called trending jobs. You might consider working in an emerging industry in the future. Two examples include:

1. **Media**: the growth of ***digital media***, the Internet and smartphones capable of streaming ***multimedia*** has changed the way people access entertainment and news. There has been a growth in high-tech jobs in the media and entertainment industries.
2. **Robotics**: many traditional jobs will be lost to robots and automation in the coming years. At the same time, there will be many new exciting jobs created in the robotics industry, building and maintaining robots, as well as writing ***software applications*** for mobile devices.

Activity

Make a list of the skills you have developed in your IT course that will help you get a job in a non-specialist IT role. For each skill you identify, give an example of a piece of work you are proud of.

In this lesson you will learn about the skills needed in specialist IT jobs and how to plan for a career in the IT industry.

Hard skills and soft skills

When you apply for a job, an employer will be looking for evidence of both hard and soft skills. ***Hard skills*** are relevant to the job itself. For example, a software developer must be able to write computer programs. ***Soft skills*** are the qualities that make an individual a good employee. For example, being able to work in a team is an important skill for IT specialists.

Hard skills

Hard skills are the technical skills you need to do a job. Hard skills can be measured and demonstrated. An employer usually evaluates skills by looking at a candidate's qualifications. The employer will also want evidence that the candidate has the skills they are looking for. They might ask to see previous work that you have done, or set a test for you to complete.

Soft skills

Figure 22.2.1 *IT careers require both soft and hard skills*

Soft skills are the general skills that are needed to be successful in the workplace. Some of the soft skills most valued by employers are:

Communication: Good verbal and written communication is important in every job. Clear communication is essential when writing an email or report, making a training presentation or dealing with a phone enquiry.

Teamwork: Good teamwork involves cooperating and collaborating with other team members. Good listening and negotiating skills are important.

Adaptability means being able to cope well with change. An adaptable person is self-confident and calm under pressure. They have good organization and decision-making skills

Problem-solving: is one of the most important soft skills in IT and computing. Solving problems requires an analytical approach to understanding a problem and a creative approach to finding a solution. A problem solver must be able to make decisions.

Creativity: Creativity is a skill that can help you develop new solutions to problems. Creativity is important when designing new systems or products. It is helpful to have team members who can look at problems in a different way.

Interpersonal skills are the skills you need to interact and communicate with the people you work with. You need to be polite and respectful. You also need to be able to persuade people when you have a valid point to make.

Figure 22.2.2 *Teamwork can be built in different ways*

Activity

Think about the list of soft skills above.

1. What are your strong soft skills? Choose two from the list that you believe you do well. For each, describe a time when you have demonstrated your skills.
2. What are your weak soft skills? Choose two items from the list that you think you need to improve. Explain what you can do to improve your skills.

Activity

1. Choose an IT or computing job that you might want to do in the future. Use the lists of technical and creative jobs in lessons 5.1 and 5.2 to help you choose.
2. Conduct research on the Internet to find a job description for the job you have chosen.
3. Make a list of the hard and soft skills needed for the job.
4. What qualifications does the job description ask for?
5. Return to your search and review three job adverts – what is the lowest and the highest salary offered for the job?

Unit 23 23.1 The parts of a web page

Making web pages

In this unit you will learn how to design and build simple web pages using both HTML and a web authoring tool.

In this lesson you will learn how to recognize and name the parts of a web page.

How web pages are stored and read

Web server

A ***web server*** is a computer that is connected to the Internet. Web content is stored or hosted on the web server. Web content is arranged and presented on ***web pages***. A web page contains text, images and other content. A web page contains links to other web pages. Links allow us to investigate the web to find new information. This is called ***browsing***.

Web browser

We view content on the web using a ***web browser***. A web browser is a software application used to view web pages.

Website

A ***website*** is a collection of web pages on the same topic. The pages in a website are usually hosted on a single web server and have a similar design. The pages on the website are created, controlled and maintained by the same person or organization.

Web page address

The address of a web page is called the ***uniform resource locator (URL)***. For example, the URL name for the International Cricket Council (ICC) is:

https://www.icc-cricket.com/

A URL starts with the letters http://or https://

HTTP stands for 'Hypertext Transfer Protocol'. HTTP is the set of rules that determine how web pages are sent across the Internet. As you discovered in Unit 11.5, ***HTTPS*** is a secure alternative to HTTP – the 's' stands for secure.

What follows http:// is called the ***domain name*** of the website. In the example, icc-cricket.com is the domain name.

Did you know...?

Three of the most common web browsers are (Google) Chrome, (Mozilla) Firefox and (Microsoft) Edge.

The parts of a web page

A web page consists of several parts or components.

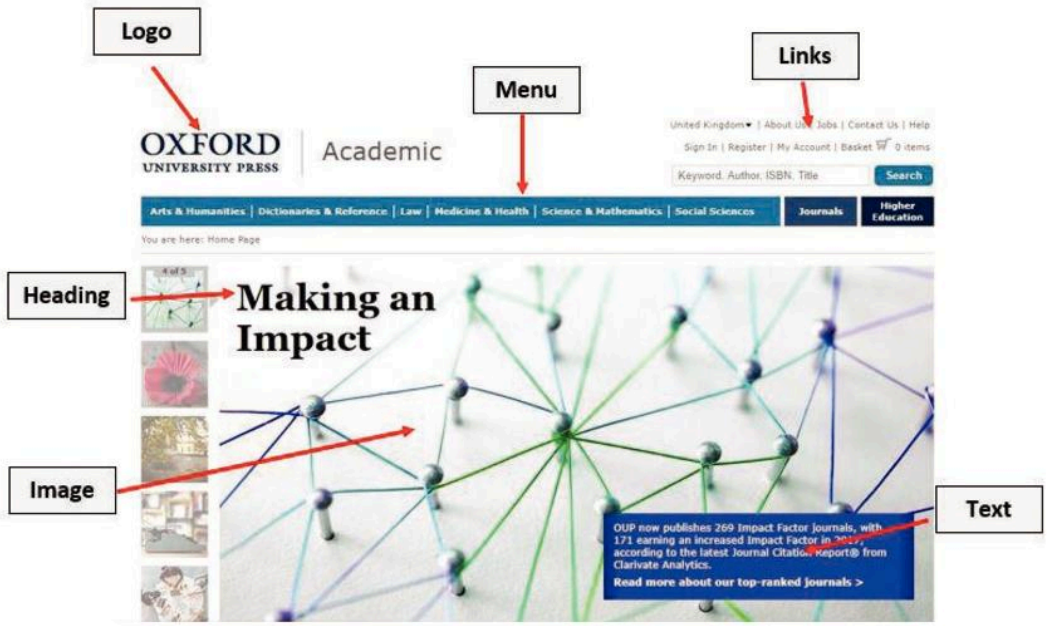


*Figure 23.1.1 Parts of a **web page***

Logos: Most websites use a logo. The logo tells you who owns the website. The logo should be on every page in a website.

Text: text is used on a web page to give information. Text should be clear and relevant to the subject of the page. Too much text makes a page difficult to read.

Headings are short descriptions that tell you what a website or a piece of text is about. A heading is larger than normal text so that it stands out.

Images: Most websites use images as well as text. Images can be photographs, drawings or cartoons. Images make the content of a web page more attractive and easier to understand.

Links: When you click on a link on a web page, you are taken to a new page. You use links to find new information on a subject. Links are also called hyperlinks. A hyperlink can be a piece of text or an image.

Menu: A menu helps you to find your way around the web pages that make up a website. Clicking on a menu option takes you directly to another part of the website.

Activity

Open one of your favourite web pages. Take a screenshot and paste the image into a word processor or graphics package. Label the web page to show the features you learned about in this lesson.

Unit 23 23.2 Planning your web pages

In this lesson you will learn what to consider when you plan your website. You will learn a few simple techniques that will help you plan a successful website.

Content and audience

Purpose

Every website is set up for a purpose. If you are creating a personal website, it might be about a hobby, your favourite singer or sports team, or about a subject or cause that interests you.

Audience

When you design a website, you must think about who will view it – its ***audience***. The website design and content should be suitable for that audience. Here are some things to think about:

- Use language that is suitable for your audience.
- Use images to make your content more interesting.
- Consider the colours and fonts you will use to appeal to your audience.

Pages

The ***homepage*** is the page your audience sees when they first connect to the website. You should design the homepage to make people want to stay and visit other pages on your website. Before you create the website, you should also decide how many pages it will have, and what content will go on each page.

Navigation

You want your website users to be able to find content on the site. You will use links and menus to guide people through your site content. It is important that people can find their way around the content on your site and always find their way back to the homepage without feeling lost.

Design methods

There are methods you can use to help plan your website. They will help you make important decisions about structure and design before you start to create your web pages.

Site structure chart

A ***structure chart*** can be useful as you start to think about how you will split your content up into pages and sections in your website. Start with a box at the top of your page, then decide how you want to

break down your content to provide more detail. If you have enough content, you may have further levels of web page. You can draw your chart by hand or insert a hierarchy chart into a word-processing document. Start with a simple design and add to it when you need to.

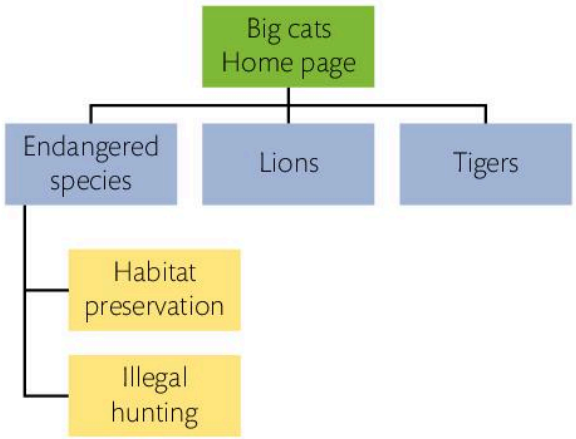


Figure 23.2.1 *Structure chart*

Wireframe

A ***wireframe*** is a useful tool to help you think about how you will lay out the various parts of a web page that you learned about in lesson 23.1. A wireframe design does not include any content. You use it to show where on your web page you will place the heading, text, images, menus and other parts of your design.

Figure 23.2.2 *A wireframe design*

Storyboard

A ***storyboard*** is like a cartoon story you find in a comic. It is made up of a sequence of drawings, with dialogue and directions. Storyboards are often used for planning ***multimedia*** resources, but can also be used in website planning. Storyboards are not used to describe your site content. They are used to show how you expect people to use your site.

Activity

Plan a website you would like to create. What is the website about? Who is it for? What can you do to make your site attractive to the audience you are creating it for? Draw a structure chart that shows the pages you will create. Draw a wireframe to plan what the homepage will look like.

23.3 Making a web page

In this lesson you will learn how to use a web page editor to create and add text to a web page.

Web page editor

A software application called a ***web page editor*** is used to create web pages. Your teacher will tell you what editor to use in school. There are free web editors you can use at home. This unit uses a web page editor called Wix as an example.

This lesson will help you to build a website about big cats. Follow the instructions then use the skills you have learned to create the website you planned in lesson 23.2. The website you build in the activities in this unit can be about any subject you choose.

Getting started

When you open your web editor for the first time you will be asked to create a new website. When you create the site, you will be asked to select a template for your site. Select a blank template. Using a blank template will make it easier for you to learn the basics of web page design.

Sections of a web page

Header: this is an area at the top of a web page. The header is used to contain a logo and the name of your web page.

Body: this is the main part of your web page. It contains the text and images you want to share.

Footer: this is an area at the bottom of the page. The footer is often used to contain links to information about the site, as well as a list of contents.

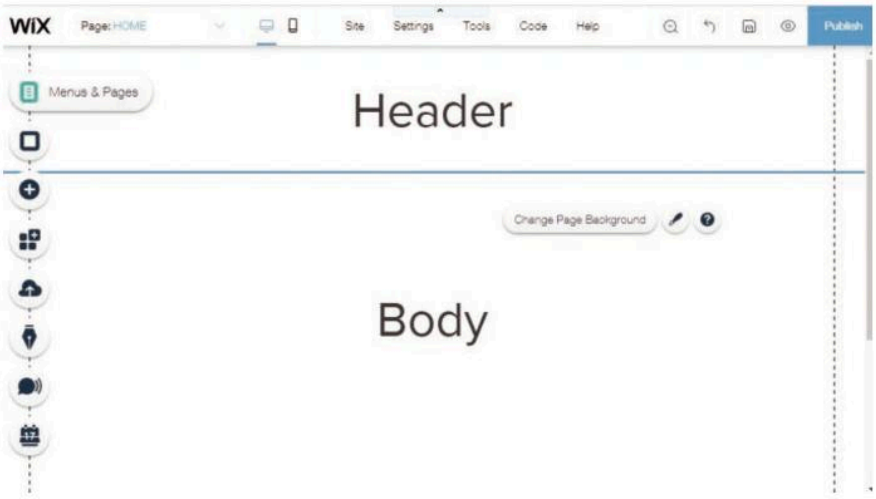


Figure 23.3.1 *Web page editor*

Adding text to your page

When you start building your web page, the first thing you will add is text. Text can be ***paragraphs***, or headings. When you are using a web page editor, you place text in boxes. Once you have created a text box you can move it around your web page to position it where you want it.

1. Choose the Add option from the toolbar on the left of the screen.
2. Choose text from the menu.
3. Choose a paragraph style from the list if you want to add body text, or choose a heading style to add a heading.
4. A box will appear on your web page. Drag the box to where you want it to appear on your page.
5. To add text to the box, click the Edit text button above the box. You can type or paste text into the box. A Text settings menu appears when you select edit. Use this to add effects like bold and coloured text.

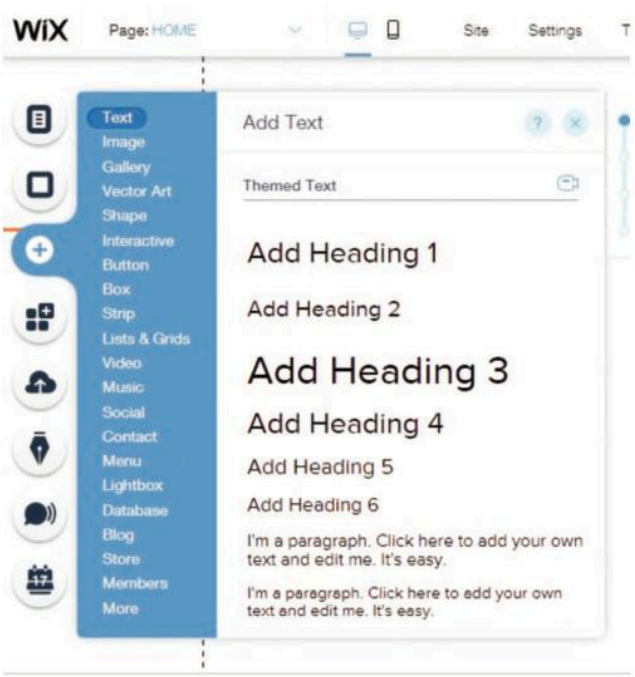


Figure 23.3.2 *The Add Text tool*

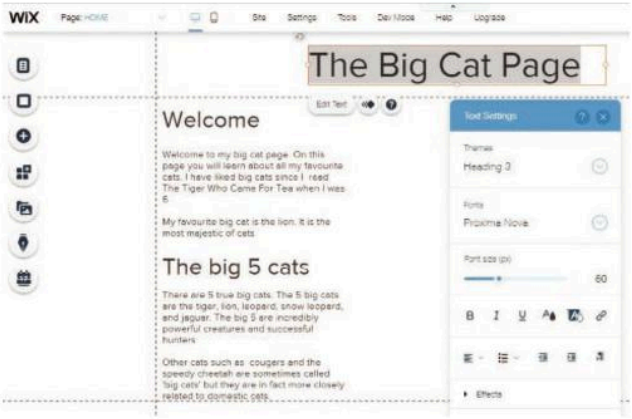


Figure 23.3.3 *Adding text to your web page*

Figure 23.3.3 shows an example web page. Notice that the main heading, The Big Cat Page is above the dotted line. It is in the page header. The rest of the text is in the body of the page – below the dotted line.

Be safe

When you publish a web page it can be read by anyone in the world. Do not include personal details in your web page. You must keep your full name, address and phone number private. Do not include any information that will allow someone to identify or locate you.

Activity

When you have completed the 'Big cats' activities on this page, try creating your own web page:

1. Add a page title in the header of your web page.
2. Add two or three short paragraphs of text in the body of your web page.
3. Add suitable headings for the body text.

Talk about

1. How many types of heading are used in the example web page?
2. Why are some headings larger than others?

Unit 23 23.4 Add images to your web page

In this lesson you will learn how to add an image to a web page.

Choosing the right images for your web page

Adding an image to a web page can make it more interesting. It can also make your page easier to understand. Choose images that are relevant to the content of your web page. Here are two paragraphs from a web page about big cats. Of the four images below, which would you choose to illustrate each paragraph?

- The adult male lion can easily be recognized by the impressive crown of hair around the head and neck. This crown, which develops after about a year, is called the mane.
- Unlike other big cats, lions are sociable and live in family groups of up to 25 individuals. This group is called a pride.

Talk about

The web designer has chosen a cute picture of a cat wearing a bow tie for the page logo. What does the logo say to you about the page? Is the cartoon lion a good choice? Why, or why not?

Big cats: an example web page

In lesson 23.3 you learned how to add text and headings to a web page. The example showed you how to position text and headings in the body and header of a web page. Figure 23.4.1 shows how the page looks with images.

Two images have been added to the page.

A **logo** has been added to the left of the web page heading. The logo is in the page header. A logo is an image used to identify your web page. Use a logo to tell users what your page is about.

An **image** has been added to the right of the text in the body of the page. The image should fit with the text on your page.

Adding images to a web page

Here are the steps to follow to insert an image on your own web page:

1. Choose the Add Images option from the toolbar on the left of the screen.
2. Use the Free Wix Images option for this activity.
3. Select an image you want to add to your page.
4. Resize the image and drag it into the position you want on your page.

Figure 23.4.1 *Adding images to your* ***web page***

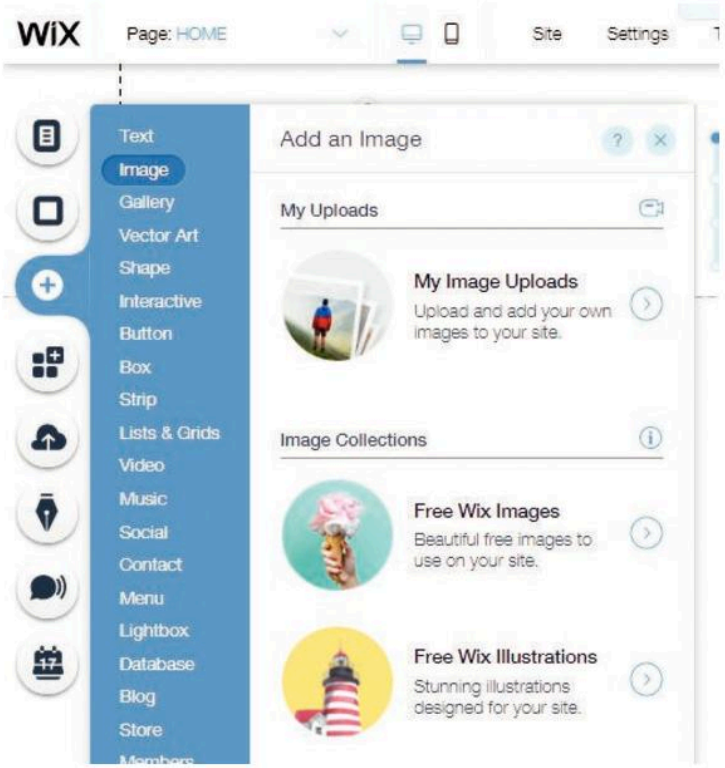


Figure 23.4.2 *The Add Images tool*

Be careful about the images you add to web pages. Do not add photographs of yourself to your web page. If you feel there is a good reason to, make sure you talk to an adult first. Never include images of friends or family without their permission.

Activity

Open the website you created in lesson 23.3. Add an image to the body of your page. Choose an image that is relevant to the text on the page. Add a logo to the header of your web page.

Did you know...?

A web page editor often provides free images that you can use in your web pages. You can use your own images by choosing the My image uploads option and using the file browser to find an image saved on your computer. Remember you need to have a creative commons license or other permission to use images that you do not own.

23.5 Adding a new page

In this lesson you will learn how to add a new page to your website and link pages using a menu.

Adding a new page to your website

So far in this unit you have created a single web page. In this lesson you will create a second page. The second page will be a gallery of big cat pictures. It will be called 'Big cat gallery'.

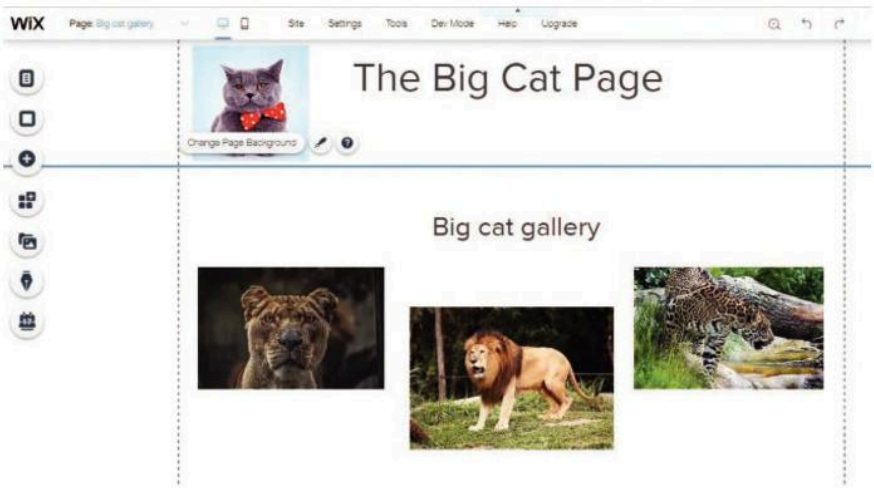


Figure 23.5.1 *Big cat gallery*

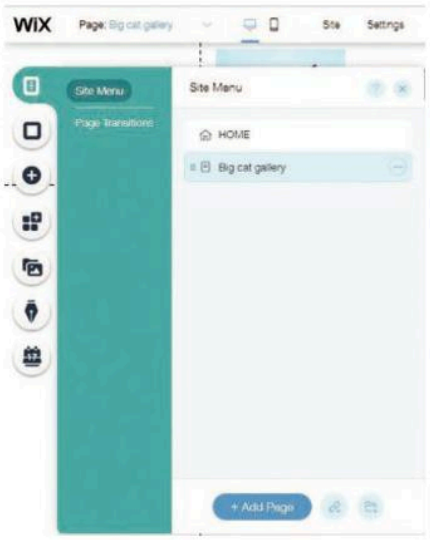


Figure 23.5.2 *The Add Page menu*

Adding a new page

1. Choose the Menus and pages option from the toolbar on the left of the screen.
2. Click Add Page at the bottom of the screen.
3. Type in a name for your new page.

If you want to move between pages in the web editor, choose the Menus and pages option. Click on a page name to go to that page.

Your homepage

You will now see two pages listed. One is called 'Big cat gallery' and the other is called 'Home'. You learned in lesson 23.2 that a collection of web pages is called a website. You have now created a website. The first page you create is always called 'Home'. It is the homepage. The homepage is the page people see first when they visit your site.

The page header

When you created the homepage in lesson 23.3 you added the name of the web page in the page header. In lesson 23.4 you added a logo to the header. When you create a new page, the information in the homepage header is automatically inserted in the header of the new page.

How to link pages

When someone visits your website, they arrive at the homepage. If you want your visitors to see your Big cat gallery, you must create a link to it. Visitors click on the weblink to visit your gallery. There are several ways to make a link from one page to another. In this lesson you will use a menu.

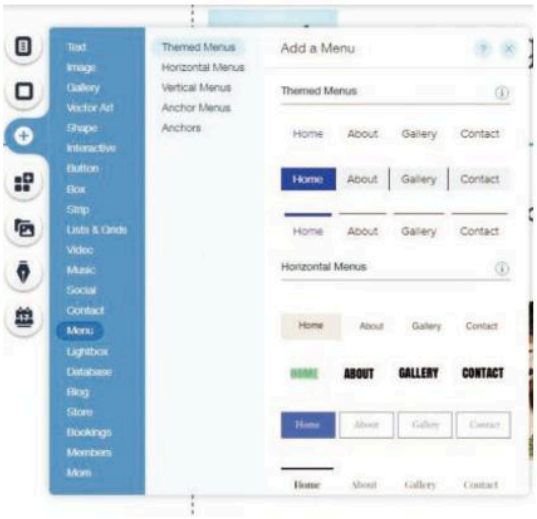


Figure 23.5.3 *The Insert menu*

Adding a menu to a web page

1. Choose Add from the toolbar on the left of the screen.
2. Select the Menu option.
3. Select the menu style you want to add to your page.

A menu will appear on your web page. Drag it into the header of your page. Placing the menu in the header means that it will appear on every page of your website.

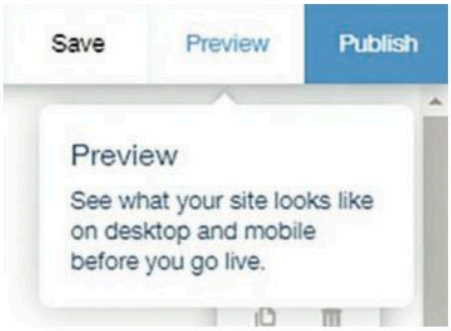


Figure 23.5.4 *The Preview button*

Preview your pages

To see how your menu works you can use the Preview button. The Preview button shows how your pages will look and work in a browser.

Activity

When you have completed the activities in this lesson, open the website you created in lesson 23.4.

1. Create a new page. You can add a page from the plan you created in lesson 23.2, or you can add a gallery page like the one in the example.
2. Add a menu to your homepage that links your pages together.
3. If you have time, add more pages from your website plan.

Unit 24 24.1 Repetition in algorithms

Writing algorithms in pseudocode

In this unit you will develop your problem-solving and pseudocode skills. You will learn how to describe problems where the solution needs events to repeat.

In this lesson you will learn about a loop and how it can be used in problem-solving.

What is a loop?

In Unit 16 you learned about program sequence, which is when commands are carried out in order. You have learned about program selection, which is when the computer uses a logical test to choose between different options. In this lesson, you will learn about program repetition.

A loop is a section of an algorithm that is repeated. The algorithm circles back on itself repeating the instructions that are contained in the loop. Using loops makes algorithms much more useful in describing real-life problems.

Exit condition

You will often find problems in real life where a series of events must repeat. You will never find a solution where something needs to repeat forever. Something must occur to make the loop end. The loop must have an ***exit condition***.

The exit condition is a logical test. It tells the algorithm when to stop repeating the loop. When you are using a loop in an algorithm, it is important that there is a way to stop the loop. You must make sure that the exit condition can be met, otherwise the loop will never stop.

Types of loop

There are two types of loop, and these two types of loop have different exit conditions:

- Counter-controlled loop: In a counter-controlled loop, the algorithm counts how many times the loop repeats. When it reaches a set number, the loop stops. You use a counter-controlled loop when you know exactly how many times to repeat the section of the algorithm. A counter-controlled loop uses a variable called the counter. The counter increases or decreases every time the loop repeats. When it reaches a specific value that you set, the loop stops.
- Condition-controlled loop: In a condition-controlled loop, you set a logical test. The result of the test tells the computer whether or not to repeat the loop. The loop might repeat once, or a million times. You use the condition-controlled loop when you do not know how many times you need to repeat the loop.

Example flowchart – a loop

In a ***flowchart***, a ***decision box*** is used to control a loop. The exit condition is written in the diamond-shaped decision box. If the condition is false, the algorithm loops back to an earlier point in the flowchart and the set of instructions that have just run is repeated. When the exit condition is true, the algorithm moves on to the next instruction.

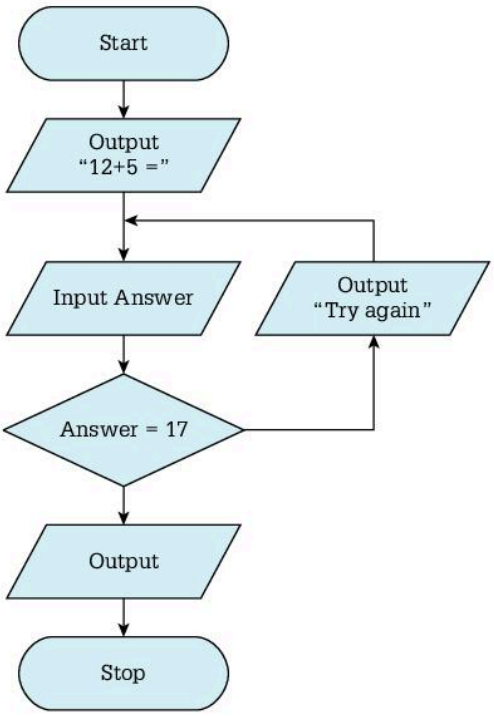


Figure 24.1.1 *An example flowchart*

This example flowchart asks a mathematics question and checks the user's answer. Note these important features:

- The exit condition uses a variable called "Answer".
- An input box inside the loop lets the user change the value of the variable "Answer".
- The algorithm asks the user 'What is 12+5?' The loop will continue until the user enters the answer that makes the condition in the decision box 'true'.

Did you know...?

Repetition is sometimes called ***iteration***. Iteration means an event that is repeated 0 or more times.

Activity

Draw a flowchart for a program that asks for a password. It loops until the user gives the correct password. You can choose what the correct password is.

24.2 Selection in pseudocode

In this lesson you will learn how to create selection structures in pseudocode.

In pseudocode, selection is achieved using logical tests. This method is very similar to the way selection is carried out in a programming language like Python. Likewise, if you have experience of using 'If' statements in a spreadsheet like Microsoft Excel, you will be familiar with how selection statements work. A spreadsheet uses a format like this:

```
=If (logical test, action 1, action 2)
```

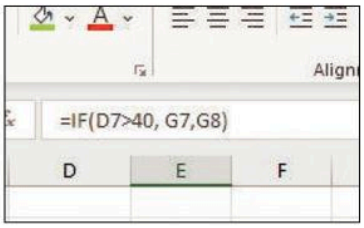


Figure 24.2.1 Spreadsheet IF statement

The first comma in the statement is equivalent to the word 'THEN' you will see used in pseudocode. The second comma is the equivalent of the word 'ELSE' in a pseudocode selection.

IF... THEN... ELSE... ENDIF

The structure of a pseudocode selection statement looks like this:

```
IF logical test THEN
     commands
ELSE
     commands
ENDIF
```

In your logical test, you will compare two values using a relational operator like '=' or '>', just as in a programming language or spreadsheet. You will see examples of logical tests used in the pseudocode examples in this lesson.

Example 1

This sample of pseudocode is for a program people use to buy tickets for a roller coaster ride in a theme park. This piece of code checks the age of the person buying tickets:

```
READ Age
IF Age < 15 THEN
     PRINT "sorry come back when you are older"
ELSE
     PRINT "you can buy a ticket at your own
     risk"
ENDIF
```

CASE

IF, THEN, ELSE is used in pseudocode where there is a choice between two courses of action. When there are many different possible actions in a selection, a CASE statement is used in pseudocode.

Most programming languages also use a case statement. Python uses the ELSE, IF (elif) command to provide the same function. There is no equivalent to case used in spreadsheets.

All the tests in a CASE statement are carried out using the same variable. You begin by saying what the variable is:

- CASE Variable OF
- Then you list all the different values for that variable, and the command that goes with each test. A colon separates the value and the commands:
  - Value: Commands
  - Value: Commands
  - Value: Commands
- The word OTHERWISE is used to say what happens if none of the values statements are true. The CASE statement ends with the word ENDCASE.

Example 2

This example shows a simple calculator pseudocode program written using the Case statement:

```
READ Num1
READ Num2
PRINT "choose the operator (+ - / *):"
INPUT Choice
CASE Choice OF
    "+": answer ← Num1 + Num2
    "-": answer ← Num1 - Num2
    "*": answer ← Num1 * Num2
    "/": answer ← Num1 / Num2
OTHERWISE
    PRINT "you didn't choose a valid operator"
    answer ← 0
ENDCASE
PRINT answer
```

Activity

Create the code for one scene from a computer game. The user must type "north", "south", "east" or "west". The computer displays an action for a different danger or challenge for each of these four options.

Unit 24 24.3 Loops in pseudocode

In this lesson you will learn about pseudocode loop structures. Loops allow you to make actions in your solution repeat.

There are three kinds of loops you can use in pseudocode.

- FOR loop – used for counter-controlled loops
- WHILE loop – used for condition-controlled loops
- REPEAT...UNTIL – used for condition-controlled loops

Talk about

Sometimes a loop is so badly written that the ***condition*** in the test can never be true. When that happens a loop will continue for ever – or until the program is closed down. This is called an infinite loop.

Here is an example of an infinite loop. Discuss in your group why the loop is infinite and what change you can make to the algorithm to correct the loop.

```
WHILE counter
< 5
  counter ← 1
  counter ←
counter + 1
ENDWHILE
```

FOR loop

A counter-controlled loop in pseudocode has a similar structure to Python. In this example, the counter variable is shown as i:

```
FOR i ← start TO stop
      Commands
NEXT i
```

Notice that:

- Command words are shown in upper case.
- An arrow is used to point to the counter variable. This assigns a value to i.
- The structure ends with NEXT i.
- In pseudocode the loop stops when it reaches the stop value.

To make a FOR loop you must use numbers in place of *start* and *stop*. Remember that in pseudocode the FOR loop counts to the stop value. The final ***iteration*** uses the stop value. Indent the lines that you want to repeat inside the loop. Here is an example:

```
READ Value
FOR i ← 1 TO 5
      PRINT Value * i
NEXT i
PRINT "The loop has stopped"
```

If the user entered the value 10, what output would be produced by this loop? Remember that in pseudocode, on the first iteration the counter value will be 1, and on the final iteration it will be 5.

WHILE loop

A WHILE loop in pseudocode is written with a logical test at the start of the loop. If the test result is 'True' the loop will continue:

```
WHILE test DO
      commands
ENDWHILE
```

To use a WHILE loop in pseudocode, replace the word *test* with a logical test. Enter commands inside the loop. The structure ends with the word ENDWHILE. Here is an example:

```
PRINT "You are stuck in a maze"
READ Direction
WHILE Direction <> "W" DO
  PRINT "You are still in the maze"
  READ Direction
ENDWHILE
PRINT "You have escaped!"
```

The test comes at the top of the loop, so you must set the value of the test variable before the loop starts. If the test result is False the commands inside the loop will not be carried out.

REPEAT... UNTIL loop

A REPEAT loop has different rules from a WHILE loop. The logical test comes at the end of the loop. If the test result is True the loop will stop. The pseudocode structure looks like this:

```
REPEAT
     commands
UNTIL test
```

Here is the game "The Maze of Doom", made using a REPEAT loop:

```
REPEAT
     PRINT "You are stuck in a maze"
     READ Direction
UNTIL Direction = "W"
PRINT "You have escaped!"
```

The test comes at the bottom of the loop. You do not have to set the test variable before the loop starts. The commands inside the loop are carried out at least once before the test.

Activity

- Write an algorithm in pseudocode that prints out the 17 times table.
- Write an algorithm for a password login, using the WHILE loop.
- Write an algorithm for a password login, using the REPEAT loop.

Unit 24 24.4 Writing good algorithms

In this lesson you will learn how to write good algorithms that you will be able to use as part of the planning process for your programs.

An algorithm is used as a plan for a computer program. A well-written algorithm will be easier to read and easier to turn into a program.

Make your algorithm readable

To make your algorithm readable you need to use good variable names. Variable names should start with a letter. They may include numbers and the underline symbol, but no other characters or spaces. It should be clear from the variable name what the variable is for. It is good practice to list all the variables at the start of the algorithm. This is called declaring the variables. In a payroll these might be:

```
declare Hours, PayRate, Pay
```

An algorithm should be clearly laid out. Use plenty of white space within and between lines to make them readable.

Data types

The data type of a variable determines what type of data you can store in that variable.

Data type	What it can store	Can also be called
Boolean	Can only store the values True or False	Logical
Integer	Can only store whole numbers	
Real	Can store any number including decimals and fractions	Float
Character	Can store a single keyboard character	
String	Can store a series of characters	Text

Figure 24.4.1 *Data type table*

You can only carry out calculations with variables if they are a numeric data type (integer or real). The data type of a variable can be set in two ways:

- When the variable is declared you can state its data type.
- When the variable is initialized, it will get the data type of the value stored in the variable.

It is good practice to declare variables and set their data type at the start of a program. That reduces the chance of incorrect data inputs. Declaring variables correctly in a pseudocode design makes it easier to transfer the design to a coding language.

In the payroll example, Hours could be an integer, while PayRate and Pay could be real numbers, as money values include a decimal point. The declaration section would be written like this:

```
declare Hours as integer
declare PayRate, Pay as real
```

Prompts to the user

An input command gets a value from the user and stores it in a variable. For example:

```
read Hours
```

It is good practice to include a message called a 'Prompt'. The prompt tells the user what value they must input. In pseudocode, the prompt is generally shown as a separate command before the input command:

```
print "Enter number of hours worked"
read Hours
```

Clear outputs

An output command can be used to display a value. For example:

```
print Pay
```

It is good practice to include some explanatory text. In pseudocode, the explanatory text is usually included in the same print command.

```
print "Total pay earned is $" Pay
```

In this example, a dollar sign has also been included to show that the value is an amount of currency. Here is an example of well-written pseudocode:

```
declare Hours as integer
declare PayRate, Pay as real
print "Enter number of hours worked"
read Hours
print "Enter rate of pay"
read PayRate
Pay = Hours * PayRate
print "Total pay earned is $" Pay
```

Activity

Write a pseudocode algorithm to deduct tax from pay. Calculate pay by multiplying an employee's rate of pay by the number of hours worked. Deduct tax from the total pay earned at the rate of 20%. Output a suitable message.

Unit 24 24.5 Testing an algorithm

In this lesson you will learn how to test your pseudocode algorithms to make sure they give the results you expect.

Dry run

The way to test an algorithm is to perform a ***dry run***. This means you read through the algorithm, step by step, following the instructions in order, noting the values stored in each variable at each stage of the process. You must decide what values to use as input – this is the ***test data***. The values of the variables are noted down using a ***trace table***.

Test data

You should perform a range of tests, using different input data, to make sure that the algorithm works as you want it to in a range of circumstances. Your tests should include:

- ***'Normal' data.*** This is the type of data you would input during normal use of the planned computer program. The algorithm should process this type of normal data to give you the answers you expect.
- ***'Extreme' data.*** These are data at the extremes or boundaries of what is acceptable in your design. For example, if 'age' is to be input and the maximum acceptable age is 18, then the important values to test are 18 and 19.
- Your tests should also include examples of 'impossible' or 'null' data. For example, what happens if you enter a negative number, or letters instead of numbers?

Make sure that in your tests you include a wide range of input data. When testing an algorithm, you need to run many tests. Even if your algorithm passes one test, that does not mean it will work correctly every time!

Trace table

A trace table has a column for each variable used in the algorithm. As you work your way through the dry run you use the trace table to note down the value of each variable at each stage of the process. In a very simple trace table (see Example 1) you might have a row for each line of the algorithm. If you are testing a slightly longer algorithm, for example, one that includes a loop (see Example 2), then typically there is one row in the table for each iteration of the loop.

Example 1: Simple algorithm

You have seen this algorithm earlier in this unit:

```
input Hours
input Rate
```

```
Pay ← Hours * Rate
output Pay
```

A pupil decided to test this algorithm using as test data 12 for Hours and 5.25 for Rate.

The following trace table shows the results.

Line	Hours	Rate	Pay
input Hours	12	-	-
input Rate	12	5.25	-
pay = Hours * rate	12	5.25	63
output Pay	12	5.25	63

Example 1: *Payroll trace table*

Example 2: Algorithm with loop

The following algorithm determines the biggest number in a sequence of ten input numbers.

```
Biggest ← 0
for i ← 1 to 10
      input Number
      if Number > Biggest
            Biggest ← Number
      endif
next i
print Biggest
```

A student decided to carry out a dry run of this algorithm.

Her test data had to be ten numbers. She chose the numbers : 6, 7, 1, 10, 6, 8, 11, 4, 2, 1

As the algorithm has a loop in it, she created a trace table with one table row for each iteration of the loop.

i	Number	Biggest
		0
1	6	6
2	7	7
3	1	7
4	10	10
5	6	10
6	8	10
7	11	11
8	4	11
9	2	11
10	1	11

Example 2: *Largest number trace table*

Activity

Create a trace table, and perform a dry run on the following algorithm, using suitable test data.

```
Total ← 0
for i ← 1 to 10
      input Number
      Total ← Total + Number
next i
print Total
```

Unit 25

25.1 What is a database?

Using a database management system

In this unit you will learn how to use a database management system to store, retrieve and present data.

In this lesson you will learn what a database management system is and how it is used to process data to create useful information.

A database is an organized store of data. Data consists of facts and figures. When facts and figures are organized and presented in a useful way, they become information. The software that is used to store and process data is called a database management system (DBMS).

Databases are useful when you have lots of data and need to find information to solve a problem. For example, a school library will contain thousands of books. A database could store the titles of all the books and a note stating what each book is about. Then if a student asks, 'Do you have a book called *Moby Dick*?' or 'Do you have a book about butterflies?', the librarian can easily find the answer by using the database.

Figure 25.1.1 *A college library*

A library database will also record information about every book that has been borrowed. The database will store the date the book is due back and who borrowed it. By using the database, the librarian can make a list of all the books that are overdue and send out a reminder to each borrower.

What is a Database Management System (DBMS)?

The functions of a DBMS can be grouped under the following headings:

- Input: data can be typed into a database, often using a specially designed input screen. Sometimes data can be added

Figure 25.1.2 A DBMS provides the tools you need to store and organize data

automatically to a database. For example a weather station might measure and record the temperature directly into its database.

- Validation: this means checking that the data which is input is of the right type. For example, if a database stores the price of an item:
  - It will let you enter a price of 10.22 (valid data).
  - It will not let you enter a price of 10.2222 (not valid data).
  - It will not let you enter a price of WW.ZX (not valid data).
- Sort: sorting means putting the records of a database into order. For example, you might arrange the records of books in a library into alphabetical order by author or title.
- Search: searching or querying a database means finding the information that you need to complete a task. For example, you might find the record of a book in a library database by searching for its title.
- Output: means printing or displaying information from the database. The output might be one record, a group of records resulting from a ***query***, or you might output all the records in the database. Output can be formatted as a ***report*** that makes the information easy to read, and can be read on screen or printed out.

Activity

The example in this lesson shows how a database is used to manage the books in a library. Can you think of two other examples where databases are used to store information? Explain what the database is used for and list some data items you think will be stored in the database.

25.2 The parts of a database

In this lesson you will learn how a database is structured and what the parts of a database are called.

Fields and records

Database systems store data in ***tables***. A database table looks like a spreadsheet. A library database might contain a table like the one below.

Each row in the example table shows information about a different book. Each row is called a ***record***. A record contains all the information about an ***entity***. An entity can be an object, person, place or event. In this example, the entity is a book. In other database tables the entity could be a customer or an item for sale.

	A	B	C	D
1	**Library Code**	**Title**	**Author Surname**	**Author first name**
2	00230	Anna Karenina	Tolstoy	Leo
3	00231	War and Peace	Tolstoy	Leo
4	00232	Les Miserables	Hugo	Victor
5	00233	Crime and Punishment	Dostoevsky	Fyodor
6	00234	Moby Dick	Melville	Herman
7	00235	Tevye the Milkman	Aleichem	Sholem

One record: all the info about a single entity

One field: a single item of information about all entities

Figure 25.2.1 *Data table*

Each column of the database shows one item of information. For example, one column contains book 'Title', another the 'Author Surname'. This is called a ***field***. Each field has a ***field name***, shown at the top of the column.

Every record (row) in the table has the same structure. That means each record contains the same fields (columns). The same type of information is stored for each record in the database.

A complete database might have more than one table in it. For example, a library database might contain tables storing data about:

- books
- people who are members of the library
- which books have been lent to which people.

Each table stores different information and will contain different records and fields.

The example database table is smaller than a real database, which might have thousands of records in it. Each table may contain many more fields than shown in the example. All tables are stored as a single database file.

Primary key

Each record in a database table must be unique. That means it must be different from every other record. Look back at the example library table in figure 25.2.1. One of the fields is called 'Library code'. This field is known as the ***primary key***. The primary key is the field which uniquely identifies each record in the database. Databases almost always include a primary key made up of numbers, text, or both. You cannot have two records with the same primary key.

A primary key is needed because the other fields might not be unique. For example, a library could have two books with the same author or the same title. To make sure the records do not get mixed up, each book has its own unique code.

Data types

When you define the structure of a database you decide which fields there will be. You give each field a name. This name appears at the top of the column in a typical database table. You also define the type of data that will be stored in the field. For example, it might store:

- text
- number
- currency (money)
- a date or a time.

Activity

Shanice wants to use a database to store information about her friends. She will use the database to remember information like phone numbers and to remind her when she needs to send birthday cards.

1. What are the entities that this database stores information about?
2. What are the fields that need to be recorded for each entity?

25.3 Create a database table

In this lesson you will create a simple database table to save library book records.

The examples in this unit use a DBMS called Microsoft Access. Your school may use a different DBMS or an earlier version of Microsoft Access. Your teacher will advise you of any difference in the way your software works.

Create a table to hold book data

You are going to create a new database with one table in it, which stores book information like the example shown in the library table on page 244. The table will have four fields:

- Book code (number data)
- Title (text data)
- Author surname (text data)
- Category (text data).

The primary key for the database is 'Book code'.

Creating a new table

Start up Microsoft Access database software. The Access start-up screen will open.

This start up screen offers you a list of database templates. In this tutorial you will create a database using a blank database.

1. Click the 'Blank database' option on the start page. A window will open like the one shown in figure 25.3.1.

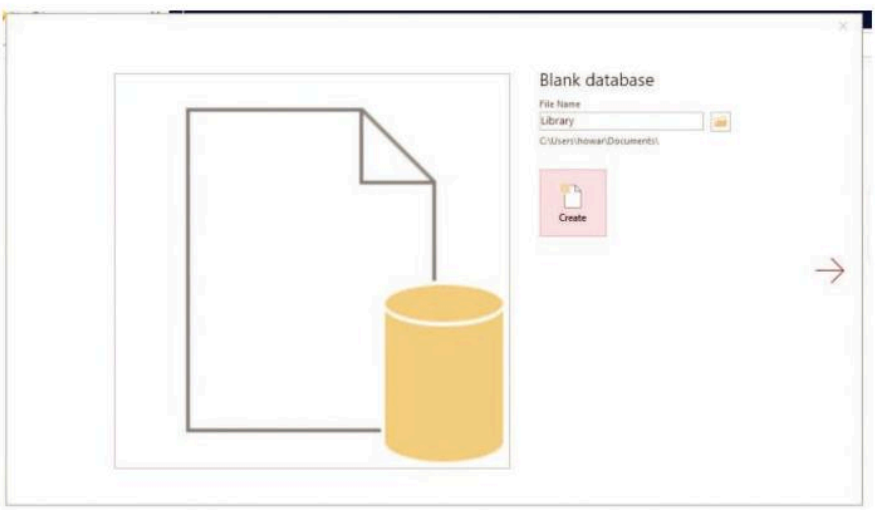


Figure 25.3.1 *Creating a new database*

2. Type a suitable name for the database, such as 'Library'.
3. Click the 'Create' button.

You have created a blank database file. You are now ready to add structure to your file. You will add a table and fields to your database.

Add a table

When you have created your new database the main Microsoft Access window opens. The layout of the window is like other applications you have used. There is a menu bar across the top of the screen. Beneath the menu is a ***ribbon*** containing the tools you need to create a database. Below the ribbon is your work area.

1. Select 'View' in the top left of ribbon and click 'Design View'.
2. A box opens asking for a name for the table you are going to create. Type 'Books' and click on the OK button.

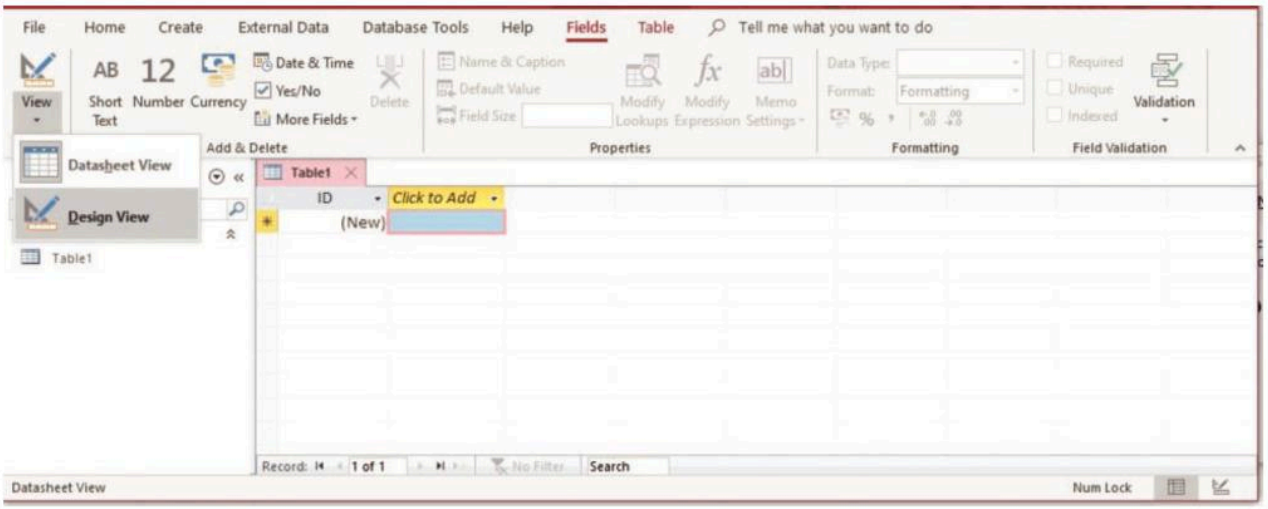


Figure 25.3.2 *Design View*

Add fields to your table

You will now see the ***Design View*** screen. You use this screen to design a new database table. To design your Books table, you will add the four fields listed at the start of this lesson. The first field you will enter is 'Book code'. Book code is a number field.

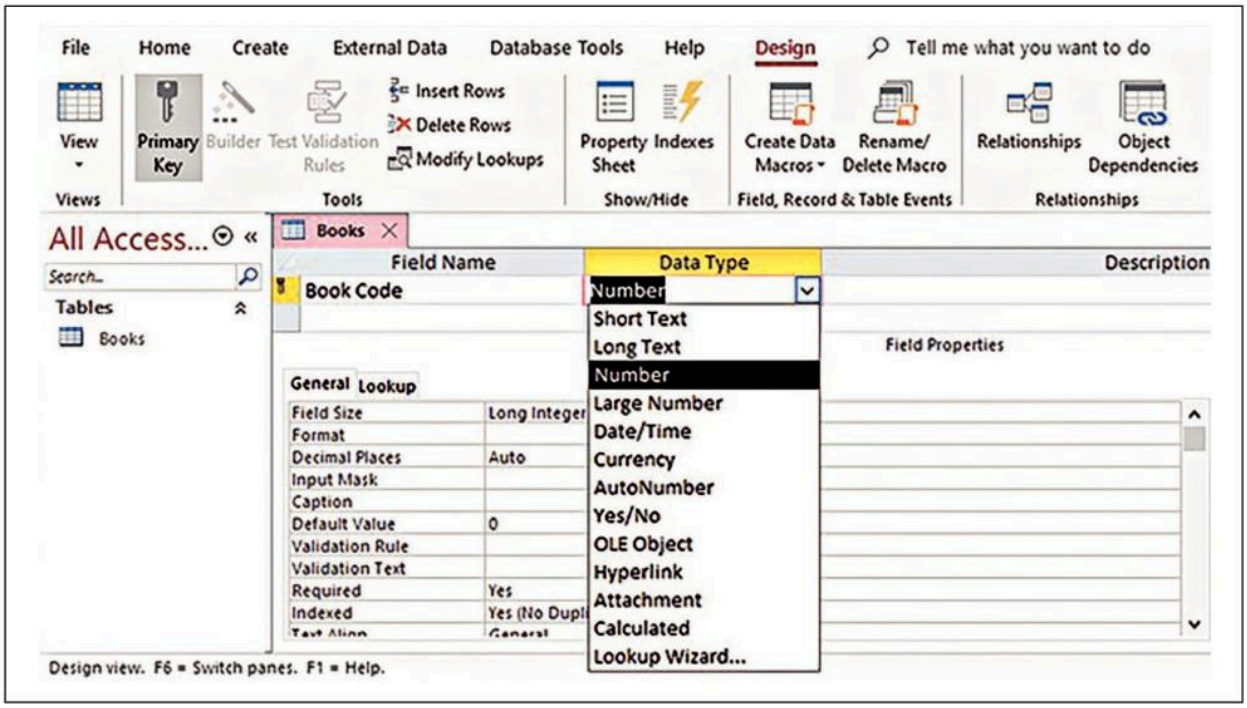


Figure 25.3.3 *Define fields*

1. Type 'Book code' in the first row of the 'Field name' column. Note: replace the label 'ID' that is in that cell.
2. Open the drop-down box in the Data Type column and select 'Number' from the list.

Now add the other three fields needed for this table: Title, Author surname and Category. Use the 'Short text' data type for each of these fields. Your table design should look like figure 25.3.4.

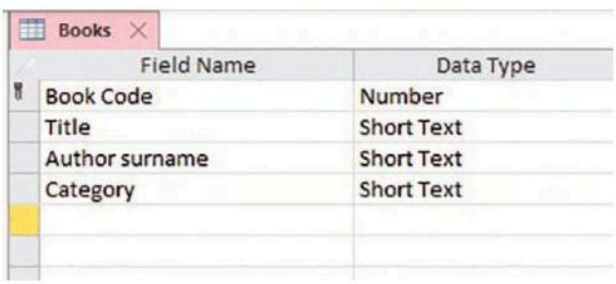


Figure 25.3.4 *Field list*

Did you know...?

Can you see the small picture of a key next to the Book code field? It tells you that the Book code is the primary key. Remember that the primary key database is the field that holds information which *uniquely* identifies each record in the table. The first field in a table is the primary key unless you choose to use another field.

Activity

Carry out the tasks in this activity to create your own copy of the library database. You will use this file in the next lesson. Make sure you check your file before saving it.

Databases in leisure and entertainment

Online media streaming

Online ***streaming services*** like Spotify, Netflix and Apple music provide access to movies and music. Some of the ways that streaming sites use databases are:

- to store information about movies and music tracks. For example, the title, a plot summary and cast of a film
- to keep a track of your preferences so that the site can recommend films or music tracks you might like
- to keep track of the music and films people watch so that royalties can be paid to artists.

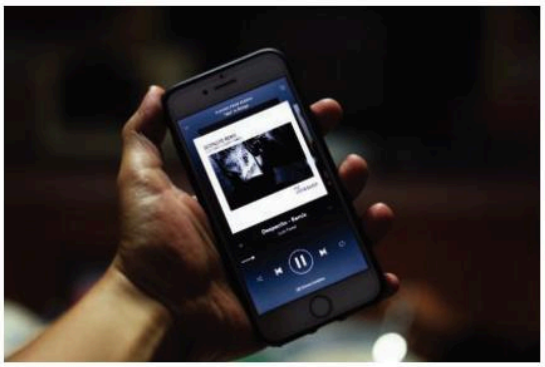


Figure 25.3.5 *Streaming music*

Talk about

How do you feel about social media sites collecting personal information about you? Do you think social media sites collect too much information? Do you worry about how they use that information?

Social Media

Whenever you use a ***social media*** platform to post a message, accept a friend request or like a post, your actions are stored in a database. Social media sites use the information they store to recommend topics, news articles and product adverts to you.

Sports

The storage of data about sports teams has become a big business. Data is collected on every game and every player that allows analysis of games and performance in minute detail. If you are a sports fan, information about the performance of your team is available to you during sports ***broadcasts*** and on websites.

More detailed information is available to team managers who use the information to help them understand their opponents' strengths and weaknesses and to plan for victory. They also use player statistics to help them decide which players to recruit. Next time your team wins, a database may have played a part in the victory.

Unit 25 25.4 Entering data into a table

In this lesson you will learn how to enter data into the fields of a database table.

In lesson 25.3 you created a simple database called Library. Now it is time to add some data to your database.

Open a file to add data

There are three methods you can use to open a database file that you have already created.

1. Open Microsoft Access. On the left of the Start window is a red panel. The panel contains a list of 'Recent' files. If your file is in the list, you click the filename to open it.
2. If your file is not in the recent file list, you can click on the 'Open Other Files' link that you can find below the recent file list. This opens a file browser that you can use to find your file.
3. Use the standard Windows file browser to find your file. When you find it double-click the file to open it.

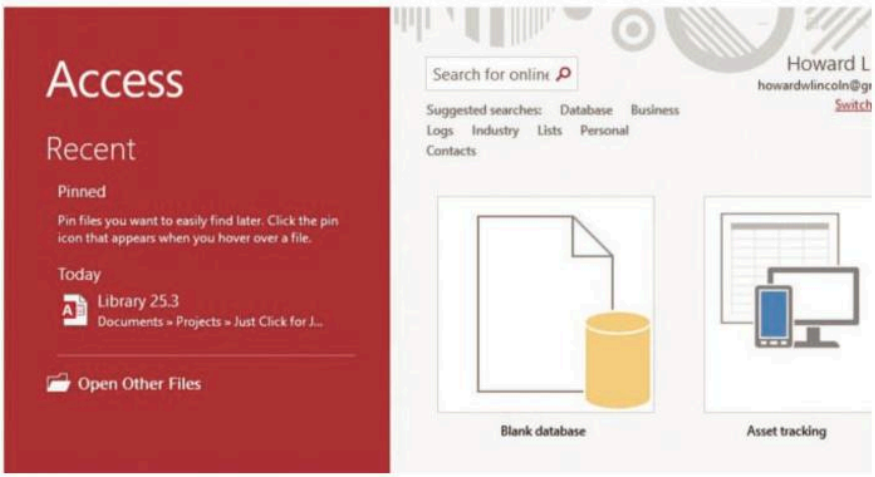


Figure 25.4.1 *Open a file*

Adding records to your table

When you have opened your database file you will see the Access main screen. You will see the table you created listed to the left of the main work area.

Double-click on the 'Books' link to open the table you created in lesson 25.3.

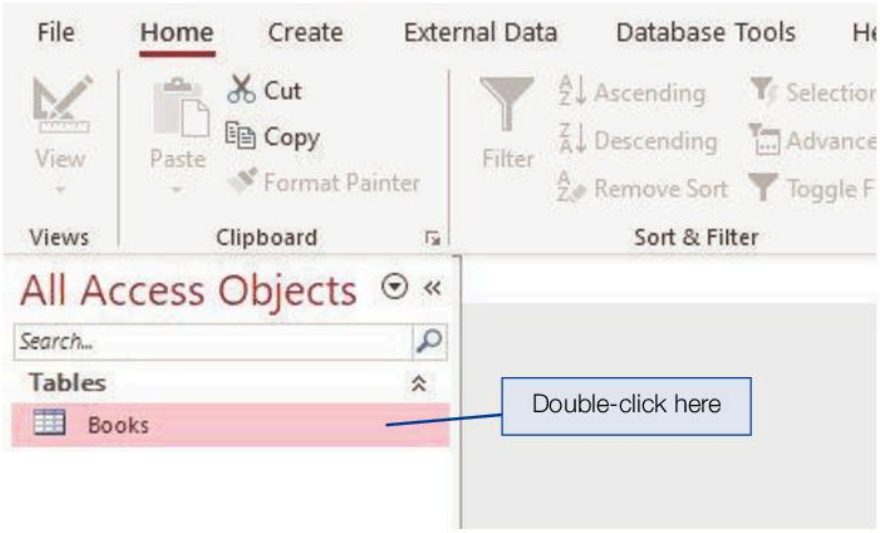


Figure 25.4.2 Open a table

Table views

There are two ways of looking at a table. They are called views. There is a tool on the tool bar which lets you toggle between the two views. You used Design view in lesson 25.3 when you added fields to your Books table.

Figure 25.4.3 Table view

The ***Datasheet view*** allows you to enter data into the table. This is the view you will use in this lesson.

1. Use the Views toggle to see the two ways of looking at a table.

2. Switch on Datasheet view.

Enter data into the table

The Datasheet View of the Books table looks a bit like a spreadsheet, with rows and columns. The columns are the fields that you created when you designed the table. Just like a spreadsheet you can type information into the cells. Here is the list of books you must enter:

Books

Book Code	Title	Author Surname	Category
1201	For Whom the Bell Tolls	Hemingway	Fiction
1202	Beloved	Morrison	Fiction
1203	Dreams From My Father	Obama	Non-fiction
1204	White Teeth	Smith	Fiction
1205	Bleak House	Dickens	Fiction
1206	A Brief History of Time	Hawking	Non-fiction
1207	Long Walk to freedom	Mandela	Non-fiction
*			

Figure 25.4.4 *Book data*

1. Type the code number and other details for the first book. You can expand the size of the cells by dragging the ***cell borders***.
2. Add the details of the other books in the list to your data table. Enter each record on a new line.

The completed table should look like this:

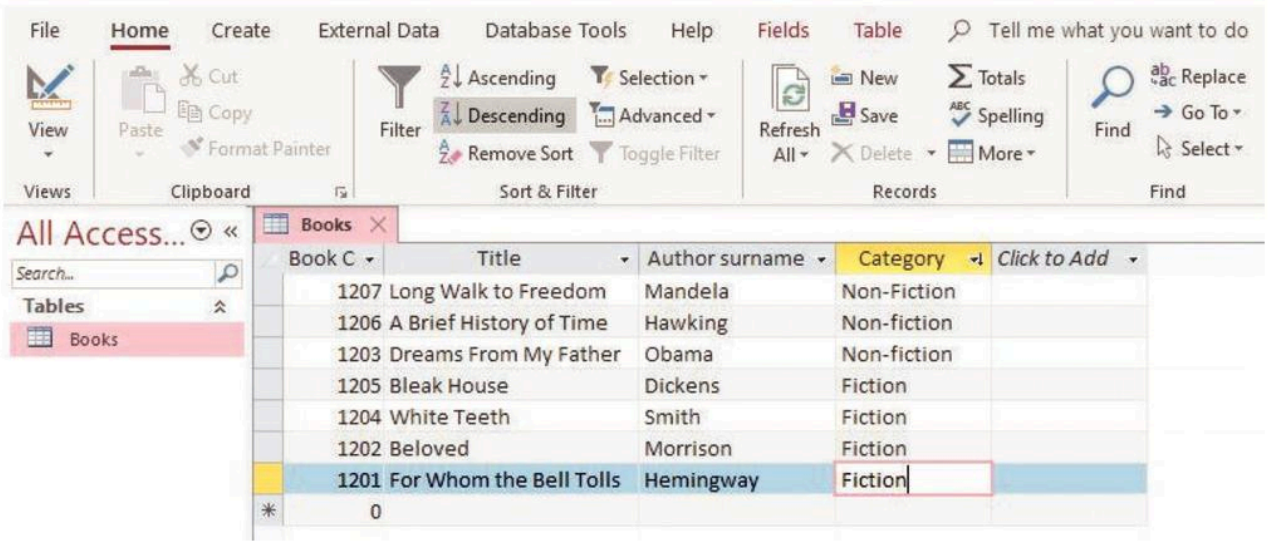


Figure 25.4.5 *Completed table*

Activity

Complete the table as shown in this lesson. You will use the file in the next lesson, so make sure you save the file safely.

Databases for research and learning

Search engines

When you send a query to a search engine, the search engine does not search the web to find an answer to your question. A search engine is continually searching the web, analysing each site it finds and recording key information about the website in a database. A search engine uses that database to answer your query.

Google is the world's most used search engine. Google's database is one of the largest in the world. It is estimated that the Google database holds more than 10 exabytes of data. A disk drive in a modern desktop computer can store up to 1 terabyte of data. You would need 10 million 1 terabyte drives to store 10 exabytes of data.

It is important that they can hold a lot of data. But it is equally important that the data you need can be found quickly. A typical Google search will find millions of links in a fraction of a second.

Museums and libraries

As you use the web to learn, you will find good reliable sites that you can revisit when you need information in the future. Many museums, libraries and other organizations put information about their collections online. The information is stored in large databases.

The British Museum online database has more than two million records describing items in its collection. More than one million have pictures of the items. Most of the information is published with a ***Creative Commons licence*** so that you can use it in your own work if you use a suitable ***citation***.

The Smithsonian Institute in the USA has a digital collection of books, images and audio, much of which can be accessed and used for free with citation.

Find out more

What are the main museums and libraries in your country? Do they have digital resources that you can access?

25.5 Data validation

In this lesson you will learn what validation is and how you can use it in a database.

Investigating validation

Validation means checking that the input data is of the correct type. If you try to enter data of the wrong type, a DBMS will display an error message.

You will look at two types of validation:

1. Data type
2. Primary key

Validate data type

Open the library database you completed in lesson 25.4. Double-click the Books table to open it.

1. Click to place your cursor in the 'Book code' field for the first record in the database.
2. Replace the existing book code (1201) with a new code that contains letters instead of numbers and press Enter.

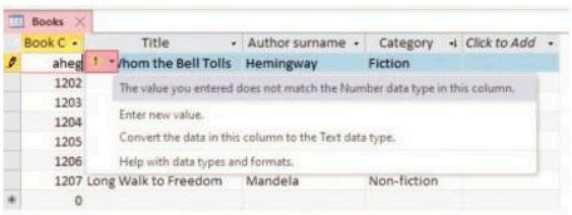


Figure 25.5.1 *Validation message*

You will see an error message. When you created the library database, you defined the Book code data type as 'number'. Microsoft Access recognizes when the data you are trying to enter is not a number and puts an error message on screen.

3. Click on Enter new value. Retype the book code, this time using the correct numerical code.

Validate primary key

Book code is the primary key of the Books table. That means each record in the table must have a unique book code.

Add this record to the end of your database:

Book code	Title	Author surname	Category
1201	Mansfield Park	Austen	Fiction

When you enter a record that contains the same primary key as another record, an error message is displayed. It says, 'The changes you requested to the table were not successful because they would create duplicate values ...'

The database has detected that there is already an entry '1201' in the Book code field. You cannot enter the same value twice because Book code is the primary key field.

Retype the book code using 1208.

Automatic numbering

To make it easy for you to give every record a unique number, DBMS software has a feature to automatically create unique code numbers for each record.

In this tutorial, you will create a new table for your database called 'Pupil records'. The table will contain records of students who can borrow books from the library.

1. Open the 'Create' menu tab and click the 'Table design' button in the ribbon. A new table opens in the work area.
2. Type the field name 'Pupil code' and set the data type to AutoNumber.
3. Make the 'Pupil code' field the primary key by clicking on the key symbol in the ribbon.
4. Add these fields to the table to complete the design: 'Pupil first name' (text), Pupil last name (text), School year (number) and their Class (text).
5. The table design looks like figure 25.5.2.
6. Save the table design by clicking on the Save symbol. Call the table 'Pupil records'.
7. Switch to the Datasheet View.
8. Add the details of at least 10 pupils to this table. You can make up the details or use the names of pupils at your school.

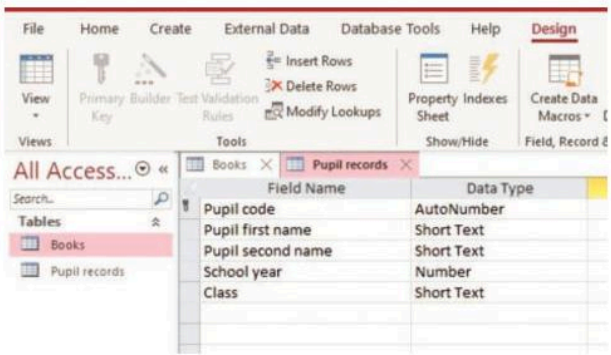


Figure 25.5.2 *Pupil records table*

Figure 25.5.3 *Add pupil details*

Activity

Follow the instructions in this lesson to add the Pupil records table to your database. Add 10 student records to the table. Save your database to use in the next lesson.

25.6 Database queries

In this lesson you will learn how to write queries. Queries are used to find data held in a database.

An important function of a database management system (DBMS) is to allow a user to find the information that they need. A ***query*** is used to find information. To create a query you must select a field and enter a ***condition*** (also called a ***criterion***).

The query finds all the records where the content of the selected field matches the condition. A simple query uses one field and one condition. A complex query combines more than one condition to find information.

Matching conditions

The simplest kind of condition looks for a simple match. You select a field, type in a word or number, and the database will find all the records that exactly match. In most database systems the equals sign (=) is used in the query to indicate an exact match. For example, if you have a database of pupils, a query like Year = 10 will find all pupils in year 10.

Other search conditions

You can also look for records which *do not* match. The symbol <> stands for 'does not match'. Other conditions use comparisons such as 'bigger than' or 'smaller than'. Comparisons are used with numerical fields. The symbol > means 'bigger than' and the symbol < means 'smaller than'.

Complex conditions are made by combining more than one condition. To find records which match two conditions you combine them with the words AND/OR. You have used ***conditional statements*** in the program design units of this book. Conditional statements are used in the same way in a DBMS.

Build a simple query

Now you can create a new query. This will be a simple query that lists only the fiction books in your database.

Select the table to query

1. Select the 'Create' tab and click 'Query Design' on the ribbon.
2. A window called 'Show Table' opens, listing all tables in your database.
3. Pick the Books table from the list and click 'Add'. The Books table appears at the top of the query area.

Select the field to query

1. Now you must pick the 'Category' field from the Books table. That is the field that tells you if a book is fiction.
2. Double-click the 'Category' field. The field 'Category' appears in the first column of the query at the bottom of the screen.

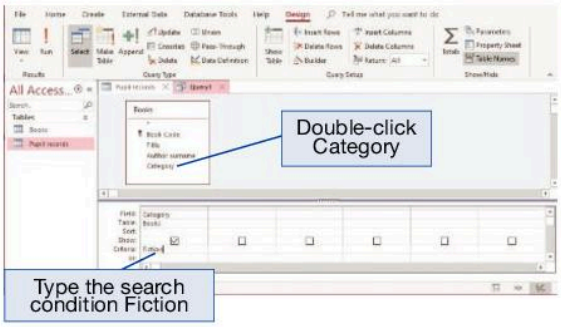


Figure 25.6.1 *Building a query*

Enter a search condition

You want the query to search for fiction books.

1. In the 'Criteria' box, type the search condition 'Fiction'.
2. Now you have to run the query. Click on the large red exclamation mark on the top left of the ribbon.
3. The query will now find all the books which have the word 'Fiction' in the Category field.

Display, save and view your query

The query will only show the 'Category' field. You also want to see the titles of these books.

1. In the Books table at the top of the screen, double-click the field 'Title'.

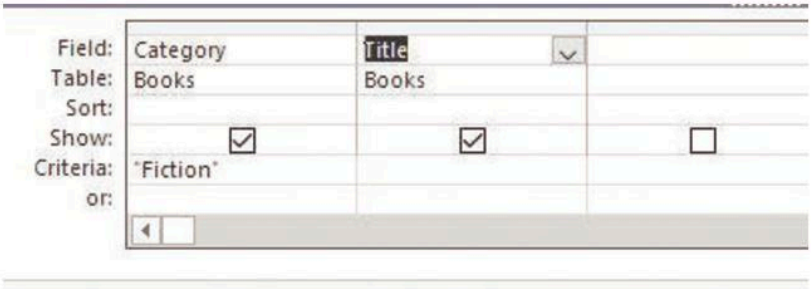


Figure 25.6.2 *A completed query*

2. Click on the 'Save' icon and save the query. Give it a suitable name such as 'fiction books'.
3. Select 'Datasheet view'. You will see the category and title fields for the records that match the criteria in your query.

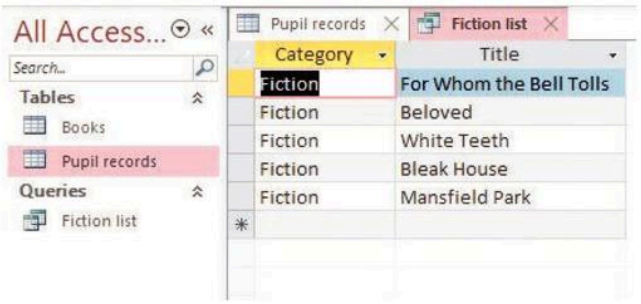


Figure 25.6.3 *Data query view*

Activity

Open the database file you completed in lesson 25.5 and add the fiction query described in this lesson. When you have finished you will find more challenges in the online activity sheet.

25.7 Database reports

In this lesson you will learn how to use report formats to make the output from your database file more attractive and easier to read.

Creating report

DBMS software like Microsoft Access allows you to produce ***reports*** that present information neatly, in a way that is easy to read. Reports use titles, headings and columns to create an attractive layout.

1. Select the Books table from the list of tables on the left of the screen.
2. Select the Create tab.
3. Click on the tool for Create Report.

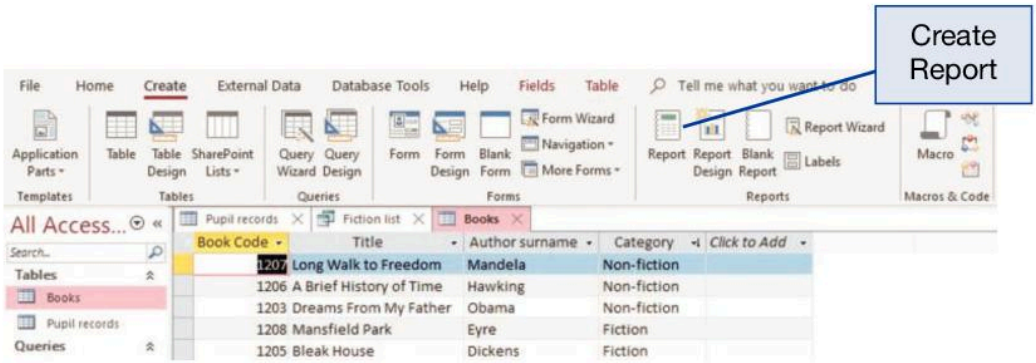


Figure 25.7.1 *Create a report*

A report design will immediately appear on the screen. The report option provides you with a simple report format that includes a title, the date and time of the report, and an image. The report is split into numbered pages for printing. The image can be replaced with one of your choice.

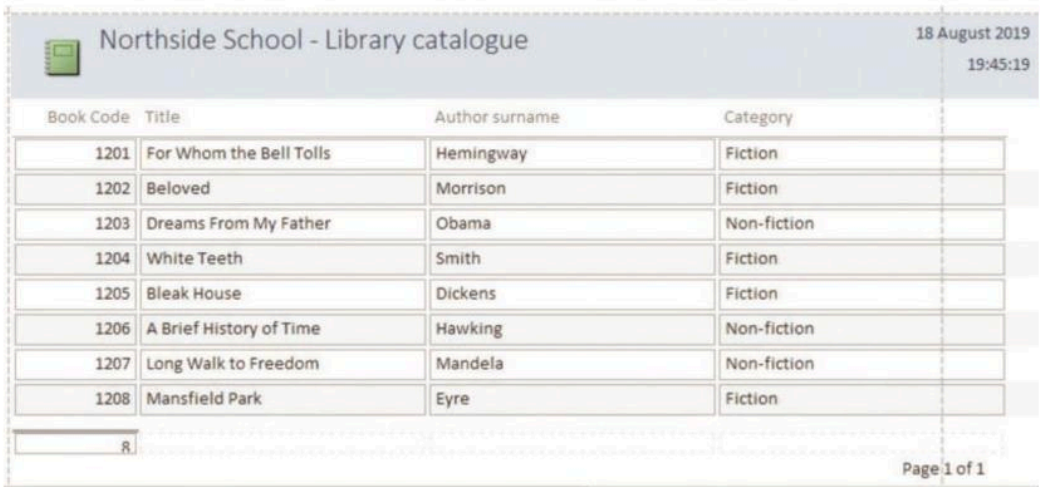


Figure 25.7.2 *A formatted report*

Modifying a report

When Access creates a report for you it applies a theme to the report. A theme is a combination of colour and font. It is professionally designed to make your report look good.

- Use the drop-down boxes in the 'Themes' group of the Design tab to change the look of the report. Try a few themes until you find the one you like best.

Figure 25.7.3 The Themes menu

Organizing a report

It is also possible to change the way that data is organized in the report. For example, the books in the report on page 258 are shown in the order they were input into the database. The report would be

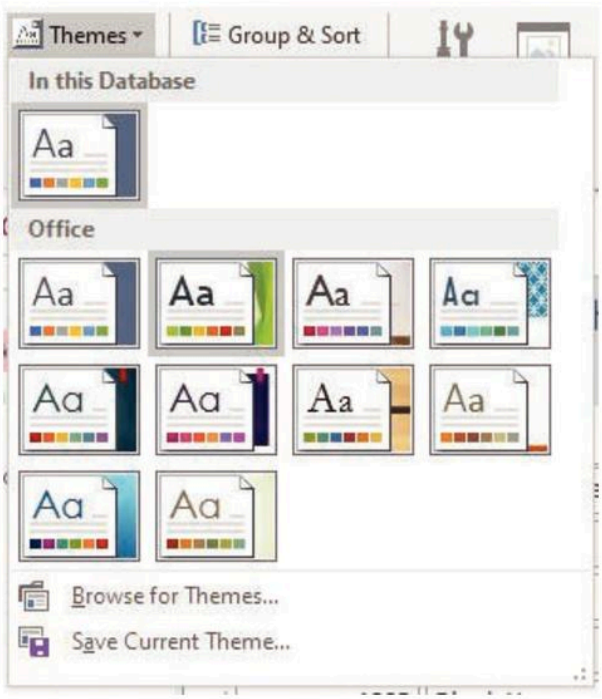


Figure 25.7.4 A standard report can be modified

much easier to use if Fiction and Non-fiction books were ***grouped***, and the books were ***sorted*** in alphabetical order by author.

Figure 25.7.5 The Group and Sort icon

To sort and group records in your report:

1. Click the 'Group & Sort' button in the design tab.
2. You will see two pink buttons appear below your report: 'Add a group' and 'Add a sort'.
3. Click the pink button marked 'Add a group'. A box appears next to the button containing the field names in the Books table.
4. Select 'Category'.
5. You will see the list change. Fiction and Non-fiction books are now listed separately in the report.
6. Click the pink button marked 'Add a sort'. A box appears next to the button containing the field names in the Books table.
7. Select 'Author'.

You will see the list change. The Fiction and Non-fiction lists are now in alphabetical order by author name.

Northside School - Library catalogue

18 August 2019
23:48:39

Category	Book Code	Title	Author surname
Fiction			
	1201	For Whom the Bell Tolls	Hemingway
	1202	Beloved	Morrison
	1204	White Teeth	Smith
	1205	Bleak House	Dickens
	1208	Mansfield Park	Eyre
Non-fiction			
	1203	Dreams From My Father	Obama
	1206	A Brief History of Time	Hawking
	1207	Long Walk to Freedom	Mandela

Figure 25.7.6 A completed report

Activity

Complete the exercises in this lesson to create a report using data in the books file. When you have finished open the Pupil records table you created in lesson 25.5. Create a report that:

- groups students by year
- sorts record by the Class field
- uses a theme of your choice.

Using databases for business

E-Commerce

Many stores sell items on the Internet. This is called e-commerce. The world's largest e-commerce site is Amazon. It is estimated that Amazon has over 12 million items for sale worldwide. Each item has a database entry. Those items are sold at a rate of 300 per second. Every sale has to be recorded in a database.

E-commerce has created huge databases that are used to make goods available on websites and to record every sale. E-commerce could not operate without databases.

Banking

Banks now carry out most of their business using computer systems. Whether that is paying for goods with a debit or credit card or drawing out cash from a bank Automated Teller Machine (ATM), every transaction is recorded in a database. Banks keep transaction data for many years, so the amount of data that has to be stored across the world is huge. The data is also very important, so systems must be reliable and secure so that criminals are prevented from hacking them.

Personnel and payroll

Businesses keep records on their employees on databases. Personnel records contain personal information that must be kept securely. Businesses also operate their payroll on computer systems. Payroll systems are connected to personnel databases and are also used to make sure an organization pays the correct amount of tax to the government.

25.8 Exporting data

In this lesson you will learn how data can be exported from a database to be used in other software applications. You will learn how to export reports and how to use a database table in a mail merge.

You often need to use the information you have created in one software application in another application. For example, it can be an advantage to export a report from Microsoft Access into a word processor. That allows you to include a report as part of a larger document or to attach a report to an email. One method you can use is to ***export*** information from an application so that it can be used elsewhere.

Exporting database objects

In lesson 25.7 you created reports using a Microsoft Access database. You have also created tables and queries in this unit. Reports, queries and tables are called ***objects*** in 'Access'. All the objects in your database are listed to the left-hand side of your work area. Clicking on an object opens it so that you can edit or add data.

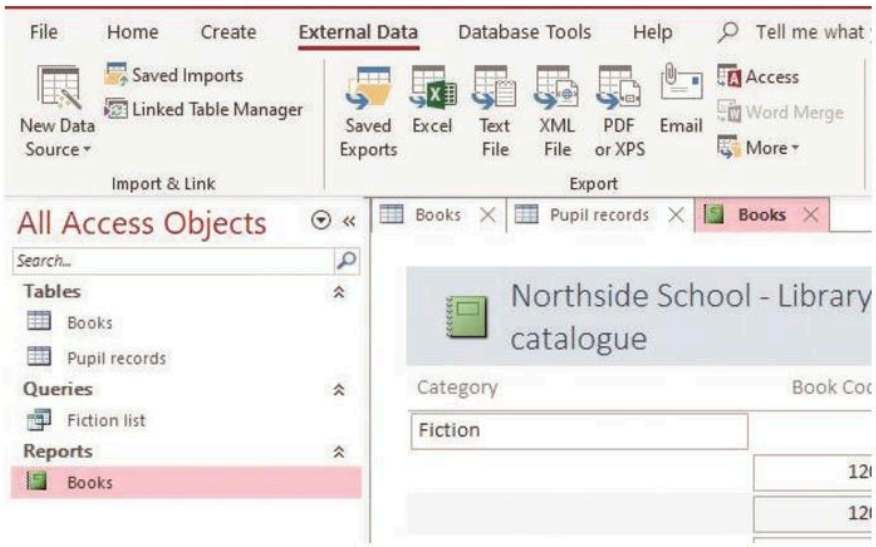


Figure 25.8.1 *Access objects*

Did you know...?

You can use the fields in Access tables and queries to create mail-merge documents. Reports cannot be used in mail-merge operations.

In this lesson you will export the 'Books' report you created in lesson 25.7 to Word.

1. Open the Library database you created in this unit.
2. Double-click the 'Books' report in the Access objects list. The report will open in your main work area.
3. Click the 'External data' tab in the Access menu.
4. Open the 'More' drop-down box in the 'Export' section of the ribbon.

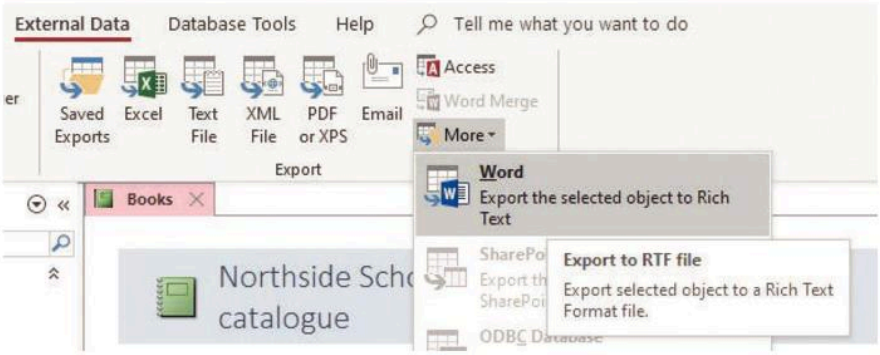


Figure 25.8.2 Export to Microsoft Word

5. Select 'Word' from the drop-down list.
6. Decide on a file name and a location to save your file to. If you tick the box marked 'Open the destination file after the export operation is complete', the report will open automatically in Word.

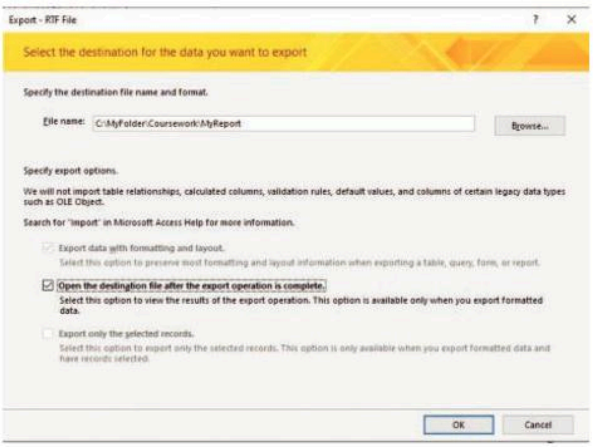


Figure 25.8.3 Export RTF

Using database files in mail merge

In lesson 7.11 you learned how to create ***mail-merge*** documents in a word processor. In that lesson you created a data file using Microsoft Word to create personalized letters. You can use data from a database table.

1. Open the Library database you created in this unit.
2. Double-click the 'Pupil records' table in the Access objects list. The table will open in your main work area.
3. Click the 'External data' tab in the Access menu.
4. Click the 'Word merge' option in the 'Export' section of the ribbon.
5. A 'Microsoft Word mail merge' wizard opens. Check the button marked 'Create a new document then link data to it'.

A Microsoft Word document will open to guide you through creating a mail-merge document, in the way you did in lesson 7.11. The 'Pupil records' data table you created in lesson 25.5 is now linked with Microsoft Word. This means that you can include fields from the data table in your mail-merge document.

Activity

oxfordsecondary.com/just-click-3e

Open the file 'Using a database table in mail merge'. The activities in the document will guide you through creating a mail-merge document that uses data from a database table.

Unit 25 25.9 More about databases

In this lesson you will learn how organizations use databases to help them work effectively.

Did you know...?

Almost everything you do in the modern world creates data. The data you create is stored in a database. Buying goods online or in-store, visiting your doctor, voting in elections: all these activities and many more create data.

Large collections of data have become known as big data. People called data analysts process big data looking for patterns. Patterns in data can provide knowledge to help organizations to make decisions. For example, analyzing data about patients can help health services learn about the causes of illnesses like cancer.

Relational databases

A database typically has several tables in it. The one you have created has two tables so far – for pupils and for books. Modern databases are typically ***relational***. That means the different tables are linked together by 'relationships' between the tables. These links typically use the primary key of each table to link it into a different table.

In the library, when a pupil borrows a book, the librarian must record:

- the date of the loan
- which book was borrowed
- which pupil borrowed the book.

Because details of books and pupils are already stored in the database, there is no need for the librarian to type the full title of the book or the name of the student. Instead, the librarian only needs to input:

- the code of the book
- the pupil code.

Automatic data entry

In a real library, the librarian might input the book code by scanning a magnetic strip inside the book cover, or a ***barcode*** at the back of the book. The librarian might input the pupil code by scanning a barcode on the library ticket. Perhaps you have seen people in shops or libraries input codes using ***handheld scanners***. This greatly speeds up the work of the librarian or shop assistant.

Figure 25.9.1 *A barcode reader*

If you see this happening, you will know that there is a database installed in the shop or library, and that the code that is scanned in is a primary key that links to a database. In a typical computerized library system, the computer will automatically add the date to each loan record. This means that the job of the librarian is made much quicker and simpler.

Uses for databases

Databases are widely used by many different organizations:

- **Governments** use databases to keep records about citizens they represent. Tax records are kept in databases, so the government has a record of who has paid or owes Income tax and National Insurance. There are many other government databases recording everything from dog licences to voter registration.
- **Police and law enforcement agencies** record details of crimes and criminals on databases. Fingerprint records are maintained on databases so that criminals can be identified from clues they leave at the scene of a crime.
- **Doctors and hospitals** store patient records in a database, keeping a history of treatment and appointments. Some medical procedures need to be carried out at regular intervals. For example, reminders for dental check-ups can be sent automatically to patients from a database.
- **Online shops** keep records of customers and orders so that they can fulfil orders and send out marketing material. A large online retailer will process millions of transactions every year. Every transaction must be stored so that company accounts are accurate.
- **Mail merge**: A major use for databases is for sending personalized mail out to customers and clients of organizations. The mail-merge operations used by major organizations can involve creating many thousands or even millions of letters and emails. Using databases means personalized mails can be produced easily and quickly.

Activity

Use the Internet to find out more about how either governments, the medical profession, or police departments use databases. Write a report that includes:

- examples of how databases are used
- advantages of using databases in the area you have chosen
- disadvantages or concerns about the use of databases in your chosen area.

End of Section 3 questions and activities

These pages provides you with questions to test what you have learned during this course. The first part contains a set of short answer questions covering each of the eight topics you have studied. The second part contains questions that ask you to apply your knowledge to new challenges.

Test your knowledge

Unit 18 Basic IT troubleshooting

1. Computer passwords are usually case sensitive. What does that mean and how can it cause problems when logging on to a network?
2. Draw the Wi-Fi connection symbol that appears on computers, tablets and smart phones.
3. Suggest three things you can check if your computer screen is blank.

Unit 19 Managing data files

1. What is meant by the term 'cloud storage'?
2. List two uses of file manager software.
3. What is a zip file, and what are the advantages of using one?

Unit 20 Network security

1. What is a Network Interface Card (NIC) used for in a computer network?
2. What are the two types of cable used to connect devices in a local area network?
3. Who is an ethical hacker? How is their work different from a malicious hacker?

Unit 21 Staying safe online

1. What is meant by the term 'digital footprint'? How might your digital footprint be harmful to you in the future?
2. How can privacy settings be used to make you safer online?
3. List three ways that cyberbullying can affect the target of the bullying.

Unit 22 Planning a career in IT

1. Describe three soft skills that are useful for a successful career in IT.
2. How do employers judge if someone has the right hard skills for a job in IT or computing?
3. How will robots affect the way we work in the future? List three potential outcomes.

Unit 23 Making web pages

1. Describe three tools that you can use to help design a web page.
2. In which section of a web page should you put information if you want it to appear on every page of your website? Give two examples of information you might want to display on every page.
3. Here is the address of a government website in the Caribbean: https://www.gov.bb
   a. What is the formal name for any website address, and what is its 3-letter abbreviation?
   b. What is the domain name in this address?
   c. What is the meaning of HTTPS in the address?

Unit 24 Writing algorithms in pseudocode

1. Describe the function of a loop in an algorithm.
2. What are the three types of loop that are used in pseudocode?
3. Write an algorithm that accepts the input of a number then continues to input numbers until the number entered is a 0.

Unit 25 Using a database management system

1. What is a key field used for in a database table?
2. A database table contains the fields: Employee_name, Date_of_birth and Salary. What data types should be used for these fields?
3. State two ways you can organize a database report to make it easier to read.

Long answer questions

Each of the following long answer questions corresponds to one of the units you have studied this year. These questions require an extended answer from you.

1. What precautions should you take to make sure you stay safe from injury and do not damage equipment when troubleshooting IT problems? Write a list of things you should do and things you should not do.
2. What is the purpose of the recycle bin on your computer desktop? Explain why you might use it.
3. Describe the hardware and software measures that an organization can take to protect its network against security threats.
4. A relative of yours has been given a laptop computer she can use at home to help her with schoolwork. Her parents are worried about online risks like cyberbullying and want to be sure she behaves responsibly and safely online. They ask for your help. Write the text of an email you can send to your relative that gives her advice on how to stay safe when using a computer online.
5. When organizations are recruiting employees, they look at a wide range of skills. What is the difference between hard skills and soft skills? Give examples relevant to IT jobs.
6. A local sports team you play for has asked you to design a website for them. The site is to give information about the team and its players, to publish results and reports, and to attract new players. Create a wireframe design for the home page of the site.
7. You have been asked to write a program that calculates the average of a list of integer values entered by a user. You will use a loop to read values from the user. The loop will terminate when the user enters a '0'. To calculate an average, you will need to count the number of values entered by the user and calculate the sum of the values entered. Write a pseudocode algorithm that solves this problem.
8. What is validation in IT systems? Describe the validation checks you would expect to be able to carry out using a database management system. Give examples.

End of Section 3 questions and activities

This section provides you with activities that allow you to practise the skills you have learned in this unit on your own and in a group.

Group project

Work with your team to create a website that students can use to find out about careers in IT. The site should have a home page that provides an introduction to jobs in IT and describes the site's purpose. The home page will have a menu that links to the other pages in the site. One team member will be responsible for creating the home page.

Other team members will each make a web page for the site that describes an IT job. See the web research task below for more detail on this task. Agree in your team what headings you will use. Agree on a design for your pages so that they all look the same and contain information using the same headings.

Web research task

Lessons 5.2 and 5.3 in this book describe creative and technical jobs in the IT industry. Choose one of the jobs that interests you. Search the web to find more detailed information about that job. The information you gather should include job title, tasks carried out, qualifications needed, skills needed, and salary range.

Write notes on the job in a Word file that you can use when creating a web page in the group project. Bookmark any useful sites you find. You may need to go back to the sites as you create your page.

Practical activity

Create a database table to hold your favourite films. Your database should include the following fields: Title, Director, Length, Actor #1, Actor #2, Rating. The rating field contains your star rating for the film (between 1 and 10). When you have created your database, enter ten films. Print out a report showing the films in order of rating, with your favourite films at the top of the list.

Glossary

3D printer a printer that outputs 3D images on a computer into solid 3D objects in plastic or other material.

Animation creating apparent movement by displaying still images one after the other at speed.

App short for application software; usually referring to software on a tablet computer or a smartphone.

Application software software designed to carry out a particular task or application (e.g. word processor).

Arithmetic and logic unit (ALU) the component in a computer processor that carries out arithmetical or logical operations.

Artificial intelligence (AI) the simulation of human intelligence by a computer system.

ASCII code a code that allows letters and other keyboard characters used in the English language to be stored and processed by a computer.

Audience the group of people a website or presentation is designed for.

Audio recorder an input device that captures sound and converts it into digital data to be processed and stored by a computer.

Author Person responsible for writing an item of content (e.g. web article).

Autonomous vehicle a vehicle that uses computer and robotics technologies to travel without human control.

Backspace keyboard key that deletes a single character to the left of the cursor.

Backup a copy of a file, usually stored in a different physical location. A backup can be used if the original is lost or damaged.

Bandwidth the amount of data that can be transmitted over a medium such as a data cable over a fixed amount of time.

Bar chart a chart that uses bars to show how often events occur over time.

Barcode a label consisting of vertical bars which, when scanned, provides information about an item for sale, such as its country of origin, manufacturer and item code.

Barcode reader a computer input device that reads barcodes on goods in shops and converts them into digital data.

Base 10 a number system using ten digits. Each column is ten times the value of the preceding column. Also called decimal or denary.

Base 2 a number system using two digits. Each column is two times the value of the preceding column. Also called binary.

Bespoke software application software created to do a particular job for a single organization.

Binary see **Base 2**.

Biometric system a computer input device that reads unique human characteristics (e.g. fingerprints) and converts it to digital data.

Bit a single binary digit that may be either a 0 or a 1.

Block prevent an individual from accessing public information published on the Internet, for example, on social media sites.

Blog short for 'web log'. A blog is an online journal or diary of an individual's opinions and latest news. It is updated regularly and displayed in chronological order.

Bluetooth a method of connecting devices to a computer wirelessly.

Body the main area of a document (e.g. word-processed document or web page) where text and images are displayed.

Bold a method of emphasizing text in a document using a strong, dark font.

Bookmark a record of a website address, saved so that the page can be found quickly in the future.

Border a blank area around the edge of a document to make it easier to read.

Broadband a transmission medium that has a high bandwidth and can carry high volumes of data.

Broadcast a method of transmitting data where transmissions can be picked up by anyone with a receiver (e.g. radio signals).

Browsing searching the web for information using a web browser.

Bulleted list a list in a document in which each list item starts with an icon, usually a dot.

Bulletin board a communication method on the Internet. Users post messages called bulletins. Any member of the group can read and respond to the message so that a conversation takes place over time.

Bus a fast link that is used to carry data between the components inside a computer processor.

Bystander a term used for someone who stands by and does nothing when they experience cyberbullying.

Byte the basic unit of storage used by a computer. A byte is a group of eight binary digits (bits).

Cable a wire used to connect the components of a computer system or devices in a network. Cables are usually made of copper though some fibre-optic cable is used in networks.

Cache a small amount of fast memory located near the computer processor. Cache holds instructions and data that are waiting to be processed.

Caps Lock the key on a computer keyboard that toggles uppercase letters on and off.

Caption text used in a document to describe content such as an image, graph or diagram.

Carpal Tunnel Syndrome (CTS) a condition that causes joint pain in the fingers and hands. CTS can be caused by prolonged use of a computer.

Case sensitive a computer function in which letter characters, in a password for example, must be typed using the correct case.

Cell a spreadsheet is divided into horizontal rows and vertical columns creating a grid of cells to hold a single piece of data (e.g. a number, label or formula).

Cell address the position of a cell in a spreadsheet. For example, the cell G34 will be found in column G of row 34.

Cell border a line around the edges of a cell, used to separate it from surrounding cells.

Citation a statement informing a reader that a piece of content in the document is from another source. A citation will describe the source, e.g. who wrote the information and when.

Click the action of pressing and releasing a mouse button to cause an action to take place in a software application (e.g. make a menu selection).

Click and hold the action of pressing and holding a mouse button to cause an action to take place in a software application (e.g. to select and move a piece of text or image in a document).

Clipboard an area where items that are copied or cut from a document are stored temporarily before being pasted into a new location.

Cloud storage computer storage that exists on the Internet.

Coaxial cable a type of copper cable used for data transmission. Rarely used in modern networks.

Code a system where a set of letters or numbers are used to represent other characters. In computing, codes are used to convert real-world data into digital data that a computer can store and process (e.g. ASCII code).

Colour scheme a design that provides a set of colours for use in text headings and other page design features.

Column A spreadsheet is divided into horizontal rows and vertical columns creating a grid of cells to hold data.

Command line interface a method of giving instruction to a computer operating system that involves typing commands line-by-line.

Compatible when the components of a computer system will work successfully together, they are said to be compatible.

Computer engineer an IT job that involves researching, designing, developing and testing computer systems.

Computer ethics the moral principles that guide how we use computers; ethical issues in computing include observing intellectual property rights and behaving responsibly online.

Computer network computers that are joined together so that they can share data, and resources such as printers and storage devices.

Computer system a set of computer hardware and software components that can be used to complete a task.

Computer Vision Syndrome (CVS) a condition caused by strain on eye muscles that can result from viewing a computer screen for long periods.

Condition A logical statement that can be judged to be true or false, e.g. age >16.

Conditional statement a statement that says what action will be taken if a condition is true. For example, if it is raining THEN put on hat.

Connector a word used to link conditional statements together. AND and OR are commonly used connectors. For example, Age > 12 AND Age < 18.

Control key a special key on a computer keyboard that is used together with letter keys to carry out commands. For example, Control + P can be used to print a document.

Control unit the component in a computer processor that controls the work of all other components.

Copper cable the most common type of cable used to make a wired connection in a computer network.

Copy a function used to place a replica of data on a virtual clipboard (while leaving the original in place) so it can be 'pasted', often multiple times, elsewhere.

Copyright legal concept designed to provide creators and owners of original works with exclusive rights to that work's use and distribution.

Creative Commons a method of licensing content shared over the web. A Creative Commons licence is published with the content so that permission does not have to be sought to use the content.

Criterion a condition used to search for records in a database, e.g. student_surname = 'Smith'.

Cursor keys four arrow keys on the keyboard that move the cursor around a document.

Customer-facing any computer system or job that is concerned with the needs of customers or users.

Cut a tool used to remove or excise data from a file or document, retaining it on a virtual clipboard so it can be 'pasted' elsewhere.

Cyber bullying using the Internet and mobile phone technology to bully and threaten others.

Data raw unprocessed facts.

Data file a collection of records holding the same type of information.

Database administrator an IT role that involves creating and managing reports using an organization's databases.

Decision box a diamond-shaped box with one line in and two lines out, used to show where a decision is made in a flowchart.

Delete a computer key or menu icon that deletes highlighted text in a document. The delete key on a keyboard deletes a character to the right of the cursor.

Desktop the working area of a computer screen that contains all the files and links a user needs when they start a computer session.

Desktop computer a personal computer system designed to be permanently located on a desktop. A desktop computer consists of a case which houses the computer processor and main storage devices. Other components such as a keyboard and screen are connected using cables.

Desktop publishing (DTP) a software application that helps a user create documents that combine text and images in graphical designs (e.g. magazines, fliers, adverts).

Digital being made up of numbers. The word usually refers to data that is stored in the form of binary numbers, using the digits 0 and 1.

Digital camera a device that captures images in digital form as files that can be stored and processed by a computer.

Digital data data that is represented using the binary digits 0 and 1. Digital data can be stored and processed by a computer.

Digital device any device that can store or process digital data, usually as part of a computer system.

Digital footprint the trail of activity a person leaves in the public domain as a result of their actions on social media and other Internet services.

Digital media the ability to create, view, distribute, modify and store data or music on digital electronics devices.

Digital recording the use of a computer input device to capture sound and convert it to a digital file that can be stored on a computer.

Digital Visual Interface (DVI) a type of socket and cable used to connect a computer screen to a computer system.

Directional arrow one of four keyboard keys used to move the cursor around a document on screen.

Discussion forum a method of online communication that involves leaving messages on a public online forum to be answered by any member of the forum.

Domain name the name of the website on which a resource may be found, e.g. oup.co.uk.

Double-click the action of pressing and releasing a mouse button twice in quick succession to cause an action to take place on a computer (e.g. opening a data file).

Dry run a method of testing a computer algorithm using test data. A dry run is used so that problems in the design can be eliminated before time is spent writing a computer program.

Duplex a form of data communication where both parties can communicate at the same time using the same connection.

Email mail or messages transmitted electronically by computers via communication channels. It is usual for such messages to be held in a central store for retrieval at the user's convenience.

Email address an address attached to an email to ensure it reaches the intended destination. For example, DavidJones@gmail.com.

Encryption a method of coding data so that it cannot be read if stolen or lost.

Enter key the key on a computer keyboard that is used to start a new line or paragraph of text when entering data.

Ergonomics the science of designing jobs and equipment to suit the needs of people.

Ethernet the rules that govern how devices communicate with each other in a local area network.

Exclusion a method of harassing a person online that involves publicly rejecting the person from social groups and events.

Exit condition a condition in a logical statement which if true causes a loop to end.

Export sending data from one software application to be used in another. For example, data from a database may be exported to a word processor to be used in a mail merge.

Extreme data a term used in testing a program or algorithm that describes data that will test the boundary of any conditional statement. For example, extreme data for the condition x>10 is x=9, x=10 and x=11.

Fibre-optic cable a type of cable used to connect network devices. Fibre-optic cable carries data as pulses of light. It can carry large amounts of data over long distances.

Field usually forming a column in a database or spreadsheet table, a field is a data element that occurs in the same format in every record of a table.

Field name a name describing the data held in a field. The field name may be used in queries, and calculations.

File a document, image or collection of data in digital format that may be saved and processed by a computer.

File compression a method used to make a file smaller. Compressed files take up less space on storage devices and can be sent more quickly over the Internet. Most image, audio and video files are compressed.

File Explorer the file manager used in Microsoft Windows operating system.

File format the method used to store a data file. Different types of file are stored using different methods. The file format is indicated by a code which follows the filename (e.g. myfile.TXT is a text file).

File manager a software tool, usually part of a computer operating system, that allows you to find, browse and open files on a storage device.

Filename the name given a file by a user. A filename helps the user find the file when they need to retrieve it.

Firewall system software that uses rules to decide which data may enter or leave a network.

Flash memory drive a small portable storage device; usually used to transfer files between devices.

Flowchart a visual algorithm that uses various shapes of box to represent input, output and processing tasks.

Folder a container used to group files of a similar type or purpose together on a computer storage device. Folders are used to organize files to make them easier to manage and retrieve.

Font the shape of a set of characters used in a document. Different fonts are used to create a design that suits the purpose of a document. The size and colour of a font can be changed within a document.

Footer an area at the bottom of each page in a document. The footer is used to hold information like the page number and date of a document.

Format the design features that have been applied to text, images and other content in a document. The format will include the font, font size, font colour and any special effects.

Formula bar a section of a spreadsheet that shows the formula that is contained in the current cell.

Forum an online area where members of a group can contribute to discussions on a subject over a long period.

Function in a spreadsheet, a pre-defined formula that carries out complex actions or calculations (e.g. AVERAGE function works out the average value of a list of numbers).

Graphical user interface (GUI) a method of using a computer operating system that uses icons and other graphics that are selected using mouse clicks.

Graphic design a job that is associated with the many IT tasks like the production of web pages and game design.

Group putting items such as data and files together so that a single process can be applied to them. For example, a group of files can be deleted.

Half-duplex form of data communication where both parties can communicate using the same connection but only one party can use the connection at any time.

Handheld scanner a scanner that is held in the hand and passed over a document to create a digital file.

Hard skills the technical skills needed to do an IT job.

Hardware the physical components of a computer system such as the CPU, memory, input, output and storage devices.

Header an area at the top of each page in a document. The header is used to hold information like the title and author of a document.

Heading a short piece of text that is used to identify a section of text in a document. Headings usually use a large font that stands out from the rest of a document.

Helpdesk a team of people with expert knowledge of an organization's computer systems who can be contacted by users to give advice and solve problems.

High-Definition Multimedia Interface (HDMI) a type of socket and cable used to connect a computer screen to a computer system. Often used for high-definition screens used for gaming and video.

Highlight applying a brightly coloured background to a block of text so that it stands out.

Homepage the first page of a website. The homepage describes what the website is about and links to other pages in the site.

Hypertext Transfer Protocol (HTTP) the set of rules that governs how web pages can be located and sent over the Internet to any browser connected to the Internet.

Hypertext Transfer Protocol Secure (HTTPS) a secure version of HTTP. HTTPS uses ciphers when sending information over the Internet so that messages cannot be read if they are intercepted.

Icon a small image used to represent a file, program or function on a computer.

Image any graphical content used in a document. Images may include photographs, maps, diagrams or charts.

Infrared sensor a sensor used in robots and other computer-controlled devices. The sensor uses infrared light to detect the distance of objects.

Inkjet printer a printer that sprays tiny dots of ink onto a sheet of paper to form words and images.

Input capturing data from the outside world and entering it into a computer to be stored and processed.

Input/output box a parallelogram (tilted rectangle)-shaped box with one line in and one line out, used to show where information is input or output in a flowchart.

Input device used to enter data into a computer.

Instant messaging (IM) a feature that exchanges text, images, video or audio messages in real time.

Integrated circuit a computer processor where all the parts are integrated onto a single silicon chip.

Intellectual property the idea that a person has ownership of any work that they create as a result of using their intellect. Includes books, photographs, etc.

Interactive a computer process that can be changed in real time as a result of the actions of the user.

Interactive whiteboard a whiteboard used for projecting a presentation onto. The whiteboard acts as an input device so that the user can interact with the content. Used by teachers and trainers.

Internet a computer network that connects computer and local networks across the world.

Internet Protocol (IP) rules that govern how data is sent across the Internet.

Intrusion detection system (IDS) software that detects when unauthorized access to a network has occurred so that measures can be taken to prevent further access.

IPO model the Input-Process-Output model is used to describe any computer system or function. All systems must include input, process and output. The model usually includes storage as a fourth element.

Italic an effect added to a font that tilts letters to the right. Used to add emphasis to text so that it is noticed by the reader.

IT department the department that is responsible for an organization's computer equipment, software and data.

Iteration a section of an algorithm or computer program that repeats 0 or more times until a pre-determined condition is met. Sometimes called a loop.

Justification in software applications, the position of text or other content displayed on a line. Content can be justified to the right, left or centre of the line it is on.

Keyboard an input device that allows a user to type messages and data into the computer system.

Label text used in a spreadsheet or database to indicate the meaning or purpose of a set of data items.

Laptop computer see definition for **Mobile device**. (Handheld device including laptops, tablets and smartphones.)

Laser printer a common type of printer that uses a laser to electrically charge areas of a metal drum with an electric charge. The charged drum attracts a powder called toner which is transferred from the drum to a sheet of paper.

Licence a legal document that gives permission for a program or item of content to be used.

Light-emitting diode (LED) an electrical component that glows when an electrical charge is passed through it. A technology used in some computer screens (LED screen).

Line graph a type of graph that uses a line to show how the quantity of something changes over time.

Link a piece of text or image in a web page that, when clicked, takes the reader to another web location.

Liquid crystal display (LCD) a technology used in modern computer and television screens.

Local area network (LAN) a network of computers connected in a small geographical area.

Logo a small image used to represent the owner of a website or document.

Lower case letters that are typed when using a computer keyboard without using the Caps or Caps Lock keys.

Mail merge word-processing tool that draws information from a database, usually a mailing list, to print multiple copies of a document. Each copy contains some common text, but each will bear, for example, different name and address details.

Main memory computer storage used by a computer to carry out its operations.

Malware protection software that is designed to prevent malware being installed onto a computer system. It is sometimes called anti-virus software.

Menu a list of options available to a user from any screen in a software application or website. Users can choose a course of action from a menu.

Metropolitan area network (MAN) a network that is large enough to extend to an area like a city or campus.

Microphone an input device that converts sound into a digital format that can be stored and processed by a computer.

Microprocessor a small chip of silicon that contains all the components of a computer processor.

Microwave a high-frequency wave used to transmit data between locations where there is a clear line of sight with no physical obstruction in the path of the transmission.

MMS messages sent between mobile phones that may contain multimedia such as images and video.

Mobile communications network a network built to carry mobile phone data and voice messages.

Modem a device used in a network to convert data from one format so that it can be transmitted in another format; used to enable data to be sent from a LAN over the Internet, for example.

Motherboard a board in a computer that holds all the main components of a computer including the central processing unit and main memory.

Mouse an input device designed to allow a user to navigate and use a graphical user interface by simply clicking mouse buttons.

Move relocating files, text, images and other content items using application or system software.

Multimedia computer documents and programs that communicate using several forms of media (text, images, video and audio).

Multimedia authoring software application software that enables the user to create multimedia resources (e.g. presentation software).

Multimedia presentation a presentation of information to an audience using a combination of several media formats.

Narrowband a method of transmitting data over a network that is only capable of carrying a small amount of data over a fixed time.

Navigation moving around a document, software application or website using menus, mouse clicks and other links.

Netiquette behaving courteously towards others when using the Internet.

Network device a hardware device that is used to allow computers and their users to communicate with each other over a network.

Network engineer an IT job that involves researching, designing, developing and testing computer networks.

Network protocol a set of rules that govern some aspect of data communication over a network. Examples include TCP/IP, HTTPS and Wi-Fi.

Network software software specifically designed to operate over a network or to manage the operation of a network. Most modern application software is designed to run over a network.

Network storage storage devices that are available to authorized users of a local area network.

Newsgroup a method of communicating information with a group of people who have shared concerns.

Non-biodegradable waste waste that does not decay naturally and creates an environmental hazard.

Normal data data used in the testing of algorithms and computer programs that represents the type of data that will normally be processed.

Number format a format used in application software that is applied to number data, e.g. currency format, the number of decimal places displayed.

Off-the-shelf software ready-made software that can be purchased by an organization more cheaply than they could have custom software created.

Online harassment continual and prolonged bullying of a person using the Internet and mobile phones.

Online shopping using the Internet to buy goods and services.

Operating system software that controls the basic operations of a computer (e.g. file storage, operation of peripherals like the keyboard and screen).

Output converting digital data that is stored and processed by a computer into a form that can be understood by people (e.g. creating a printed document).

Output device used to retrieve or generate processed information from a computer.

Overwrite existing text replaced by text typed on a keyboard when the insert key is pressed.

Paragraph a block of text in a document that is started and ended by pressing the enter key.

Parallel processing a method of increasing the power and speed of a computer by having two or more processors working together.

Paste tool used to place cut or copied data elsewhere in a document.

Patent a method used to protect the intellectual property rights of inventions.

Peripheral any hardware device connected to and controlled by the Operating System (e.g. keyboard, screen, printer).

Persistence of data refers to the fact that images and text posted on social media may remain visible for a long time and are difficult to remove.

Personal Area Network a computer network that connects all the devices an individual uses to do their job (e.g. laptop, smartphone, tablet, printer). A PAN mainly uses wireless connections like Bluetooth.

Personal computer (PC) a computer designed to be used by an individual to carry out tasks such as word processing or graphic design.

Physical security security measures that protect important equipment using physical measures such as locking it away in secure rooms.

Pie chart a chart that uses a circle divided into segments to show relative size of items being compared with each other.

Pixel a picture element – a small dot of a single colour used with many others to make up a digital image.

Placeholder an area defined in a template design where a user will insert their own text or image.

Plagiarism copying the work of another person and claiming it as your own.

Plotter a type of printer that creates images by moving pens over a sheet of paper; usually used to create plans and technical drawings.

Point-to-point a transmission method where the receiver and sender are directly linked (e.g. a telephone call).

Portable storage a storage device that can be carried and connected to computers in different locations. May be used to transfer data from one location to another.

Power cable a cable used to carry electrical power to a computer or other device.

Presentation software application software used to create slideshow presentations.

Primary file in mail merge, the file that contains the document that will be personalized using data from a data file.

Process box a rectangular box with one line in and one line out; used to show where a process takes place in a flowchart.

Processor the component in a computer that carries out the calculations and logic operations needed for a computer to complete tasks.

Programmer an IT job that involves writing the code for computer software applications.

Project library a collection of media resources used to complete a multimedia resource.

Projector an output device that projects the content on the computer screen onto a large white board so that it can be presented to a group.

Pseudocode a method of creating algorithms that uses a structured language like that used in computer programming languages.

Publisher an individual or organization responsible for making a piece of content available to be read in, for example, a document or website.

Quarantine The process of making a malware infected file safe when detected by anti-virus software.

Query a search based on criteria carried out in a database application.

QWERTY the standard keyboard used on all computers. The name comes from the first six letters on the top row of the keyboard.

Radio wave a method of transmitting a signal between a transmitting device and a receiving device.

Random-access memory (RAM) data storage used by a computer processor to support its own operations. RAM can be written to and read from by the computer processor.

Range in a spreadsheet application, a group of cells that a formula or function processes to provide an output.

Read-only memory (ROM) memory used to store the basic commands a computer needs to operate. ROM cannot be written to or changed.

Receiving device in data transmission, the device that receives a signal from a transmitting device.

Record a collection of all the data about a single entity in a database (e.g. in an employee database, a record contains all the data about a single person working for the organization).

Recovery restoring computer systems and data to their original state following a serious hardware failure or malware attack.

Recycle bin a folder in a computer operating system that is used to store files that have been deleted so that a file deleted in error can be recovered.

Register a small area of memory in a computer processor that is used to hold data during the fetch-decode-execute cycle.

Relational database a database in which data can be accessed and processed through relationships that exist between data tables.

Relative copying in a spreadsheet, relational copying changes the row (or column) references in a formula depending on the row it is copied to. For example, if the formula in cell B4 is =B2+B3, it becomes =C2+C3 when copied to the cell C4.

Rename to change the name of a file of folder.

Repetitive strain injury (RSI) pain about the body caused by, for example, lengthy or improper use of computers.

Report an output document from a database application that is well structured and designed to be easy to read.

Review to check a document for errors, using software functions like spellcheck and by reading the document carefully.

Ribbon a bar at the top of a software application that shows the menu selections available in the application.

Robot a machine that can be programmed to carry out tasks without human control.

Rotate to change the angle of an object (usually an image) on a page.

Router connects a home or local area network to the Internet.

Row a spreadsheet is divided into horizontal rows and vertical columns creating a grid of cells to hold data.

Sans serif a font that does not use serif.

Satellite connection using a satellite in space to transmit data signals.

Scroll bar bars to the side and below a document used to navigate a large document.

Sensor any device that senses conditions in the real world and inputs them in digital form to a computer system. Sensors are used in robots and control systems, e.g. temperature sensors in a computer-controlled heating system.

Serif a small decorative projection in the shape of a font.

Server room a room at the centre of a network where important network equipment like servers are stored securely.

Short Messaging Service (SMS) a method of sending short text messages using a mobile phone.

Simplex a form of data communication where communication takes place in only one direction (e.g. a loudspeaker system).

Slide sorter a function in a presentation application that allows slides to be easily accessed and sorted into the desired order.

Smart device any mechanical device that is controlled by a microprocessor and is connected to the Internet (e.g. a smart fridge).

Smartphone a mobile phone with built-in computing power, like that found in a tablet computer.

Social media web-based tools that help friends and people with shared interests to communicate.

Soft skills non-technical skills required to be successful in the workplace (e.g. team work, communication skills).

Software collection of programs, procedures and routines which direct the operations of a computer. Custom-written software is written for use in specific organizations. Specialized software is written solely for one specific task.

Software application a computer program that is designed to help people carry out a particular task (e.g. word processor).

Software engineer an IT job that involves designing, developing and testing computer software applications.

Software piracy illegally copying and distributing software without the owner's permission.

Software suite a set of software applications that are designed to work together (e.g. Microsoft Office).

Software tester an IT job that involves testing computer programs to make sure they work as they are designed to.

Software trainer An IT job that involves training people to use software applications and computer systems effectively.

Sort a function in software applications like spreadsheets and databases that sorts data records into alphabetic or numeric order.

Spacebar the keyboard key that inserts a space between words.

Spreadsheet a software application designed to process number data.

Start button a button in Windows that provides quick access to available application programs and utilities.

Storage device peripheral device used to store user data files (e.g. digital photographs, word-processed documents).

Storage drive a computer peripheral that is used to store documents and other data files.

Storyboard a planning method that uses a comic book format to plan user interaction with a website, game or application.

Streaming service a service that streams media to customers over the Internet or a phone network. Streaming supports almost instant access to video and music without the need for lengthy downloads.

Structure chart a chart with a tree or hierarchy shape that is used to show the structure of an organization or department in an organization.

Subscript a font effect that features small text appearing below the line of the main text (e.g. in H_20).

Supercomputer a very powerful computer that is used to process large amounts of data at high speed. Used for complex scientific and financial processing.

Superscript a font effect that features small text appearing above the line of the main text (e.g. in 3^2).

System development a team function in an IT department responsible for planning, building and testing new computer systems.

System-facing any computing job that is concerned with the needs of an organization's IT systems.

System requirement a description of computer characteristics needed for a piece of software or hardware to work successfully with the computer.

System specification a description of the characteristics of a computer. A specification will include the processor type, amount of memory, and types of connector available.

Systems administrator an IT job that involves responsibility for the reliable operation of computer systems.

Systems analyst an IT job that involves analysing the data and processing needs of an organization before computer systems are created.

Systems operator an IT job that involves carrying out day-to-day scheduled tasks that ensure computer systems continue to work efficiently.

System software computer programs that are designed to make the computer hardware, input and output devices and application software work together.

Systems support a team in an IT department responsible for supporting system users through functions such as a helpdesk and training.

Table a design feature in a software application that is made up of rows and columns. Tables are used to lay out structured data (e.g. a timetable).

Tablet computer a portable computer with all the peripheral components built into a slim lightweight case. A tablet usually has a touchscreen to replace the keyboard and mouse found on a standard PC.

Taskbar A bar, usually found at the bottom of the computer screen that provides links to tasks that are currently open.

Telecommuting working from home using the Internet and email.

Template a ready-made document design that includes styles and layout features.

Terminator A rectangular box with rounded corners used to indicate the start and end of a flowchart algorithm.

Test data data created to test every expected action carried out in an algorithm or computer program.

Text wrap a formatting option used to wrap text around an image inserted in a document.

Thumbnail a small image used in a graphical user interface to represent a larger document or graphic.

Trace table a table used to record the inputs, stored values and outputs when testing a program.

Transistor an electrical component that acts like a switch. Transistors replaced vacuum tubes in computers in the 1950s, leading to smaller, more powerful and more reliable computers.

Transition in a presentation, the way one slide changes smoothly to the next slide.

Transmission Control Protocol (TCP) a set of rules that allow computers and other devices to communicate with each other when connected in a network.

Transmission medium the medium by which messages are sent between two points (e.g. fibre-optic cable).

Transmitting device in data transmission, the device that sends a signal that is received by one or more receiving devices (e.g. radio transmitter).

Trip hazard a health and safety risk that can lead to people tripping and sustaining an injury. In a computer room, carelessly positioned cables can be a trip hazard.

Troubleshooting investigating problems in a computer system

True colour a method of storing colour as digital data. True colour uses three bytes to store more than 16 million shades of colour.

Twisted pair cable the type of copper cable typically used to connect devices in a network. The cable consists of pairs of thin strands of copper so that data can travel in both directions. The cables are twisted to reduce interference.

Underline A method of emphasizing text in a document by adding a line beneath the text.

Undo a button available in most software applications that reverses the last action performed by a user.

Unicode a code that allows letters and other keyboard characters used in many thousands of languages to be stored and processed by a computer.

Uniform resource locator (URL) the address of a web page, used to find and display the web page in a web browser.

Universal Serial Bus (USB) a type of socket and cable used to connect many types of peripheral device to a computer.

Uppercase (capitals) capital letters typed when holding the Shift key on a computer keyboard.

Upstander a social media user who acts positively in the face of negative or threatening online behaviour.

User interface the way that a person uses software and computer devices to operate a computer system.

Vacuum tube (valve) a large electrical component that looks like a light bulb. Used in early computers because it acts like a switch when electricity is passed through it.

Value number data in a computer system that can be used in arithmetic calculations.

Variable a named memory location in a computer program or application program. Variable names can be used in calculations and logical statements.

Video camera a camera that can capture moving images.

Video conferencing to hold meetings between people in remote locations using the Internet and computers equipped with video cameras and microphones.

Video Graphics Array (VGA) a standard used to display low-resolution graphics to a computer screen. Also used to describe the type of cable used to connect a VGA screen to a computer.

Voice recognition analysis of a human voice by a computer that enables the sound to be converted into data input or commands that control how the computer operates.

VoIP Voice Over Internet Protocol, a set of rules that allow telephone voice messages to be carried over the Internet.

VR headset an output device that completely covers the eyes creating a virtual 3-dimensional environment that the wearer can interact with.

Web browser a software application used to read web pages.

Web camera (webcam) an input device that can be used to create digital video to be stored on a computer or transmitted directly over the Internet.

Web conferencing using a range of Internet technologies to hold formal meetings where the participants are in remote locations. Web conferences can use video conference equipment, shared whiteboards, presentations and collaborative documents.

Web designer a person whose job it is to design websites, often for a number of different companies or individuals.

Web page a single page written in HTML that can be accessed over the Internet and read using a web browser.

Web page editor application software that allows a user to create HTML pages for publication on the web.

Web server a network computer that provides a service to network users. For example, a print server allows users to print documents to a network printer.

Website set of interconnected web pages, usually located on the same server, and maintained as a collection of information by a person or organization.

Wide Area Network (WAN) a network of computers connected over a large geographical area.

Wi-Fi a protocol that enables mobile computer devices like laptop computers and tablets to make a wireless connection to a network.

Wireframe a method used to design documents that shows the position of important features like headings, menus and images.

Wireless Access Point (WAP) a network hardware device that enables a computer to make a wireless connection to a network.

Wireless connection a connection to a network that does not use a cable to make the connection. Wi-Fi and Bluetooth are examples of wireless connection methods.

Wireless network a form of network that does not require cabling.

Word processing using a computer to create text documents such as letters and reports.

Word processor a type of application software used to create text documents such as letters and reports.

Word wrap a feature that automatically starts a new line of text when the text entered into a document goes beyond the margins of a page.

Worksheet a single worksheet in a spreadsheet file. A spreadsheet file can contain several linked worksheets.

World Wide Web (WWW or web) method of accessing information on the Internet using a web browser.

Zip a method of compressing data files to save storage space.

Index

Index headings in **bold** indicate concepts and key terms. Page numbers in *italics* indicate figures.

OXFORD
UNIVERSITY PRESS

Great Clarendon Street, Oxford, OX2 6DP, United Kingdom

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trade mark of Oxford University Press in the UK and in certain other countries

First published in 2020

British Library Cataloguing in Publication Data
Data available

978-1-38-200411-4

10 9 8 7 6 5 4 3 2 1

Paper used in the production of this book is a natural, recyclable product made from wood grown in sustainable forests.

The manufacturing process conforms to the environmental regulations of the country of origin.

Printed in Italy by L.E.G.O. SpA

Acknowledgements

The publisher and authors would like to thank the following for permission to use photographs and other copyright material:

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ISBN 978-1-382-00411-4