



Oxford
International
Primary

4

Computing

Student Book



OXFORD



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Introduction

Delivering computing to young learners

Oxford International Primary and Lower Secondary Computing is a complete syllabus for computing education for ages 5–14 (Years 1–9). By following the program of learning set out in this series, teachers can feel reassured that their students have access to the computing skills and understanding that they need for their future education.

Find out more at:

www.oxfordprimary.com/computing.

Structure of the book

This book is divided into six chapters, for Year 4 (ages 8–9).

- 1 The nature of technology:** Introduction to microprocessors and how they help us at work and at home
- 2 Digital literacy:** Finding information safely using a web search
- 3 Computational thinking:** Using variables and conditional structures in a program
- 4 Programming:** Making programs with different types of input and output
- 5 Multimedia:** Changing how a document looks
- 6 Numbers and data:** Using a spreadsheet to process data

What you will find in each unit

- Introduction: An offline activity and a class discussion help students to start thinking about the topic.
- Lessons: Six lessons guide students through activity-based learning.
- Check what you know: A test and activities allow you to measure students' progress.

What you will find in the lessons

Although each lesson is unique, they have common features: learning outcomes for each lesson are set out at the start; learning content delivers skills and develops understanding.

 **Activity** Every lesson involves a learning activity for the students.

 **Extra challenge** Activities to extend students who are able to do more.

 **Think again** Questions check students' understanding of the lesson.

Additional features

You will also find these features throughout the book:



Word cloud The word cloud builds vocabulary by identifying key terms from the unit.



Be creative Suggestions for creative and artistic work.



Explore more Extra tasks that can be taken outside the classroom and into the home.



Digital citizen of the future Advice on using computers responsibly in life.



Glossary Key terms are identified in the text and defined in the glossary at the end.

Assessing student achievement

The final pages in each unit give an opportunity to assess student achievement.

- **Developing:** This acknowledges the achievement of students who find the content challenging but have made progress.
- **Secure:** Students have reached the level set out in the programme for their age group. Most should reach this level.
- **Extended:** This recognises the achievement of students who have developed above-average skills and understanding.

Questions and activities are colour-coded according to achievement level. Self-evaluation advice helps students to check their own progress.

Software to use

We recommend Scratch for writing programs at this age. For other lessons, teachers can use any suitable software, for example: Microsoft Office; Google Drive software; LibreOffice; any web browser.

Source files

 You will see this symbol on some of the pages.

This means that there are extra files you can access to help with the learning activities. For example, Scratch programming files and downloadable images.

To access the files, click 'Download resources' at: www.oxfordprimary.com/computing.

Teacher's Guides

For more on these topics, look at the Teacher's Guide that accompanies this book.

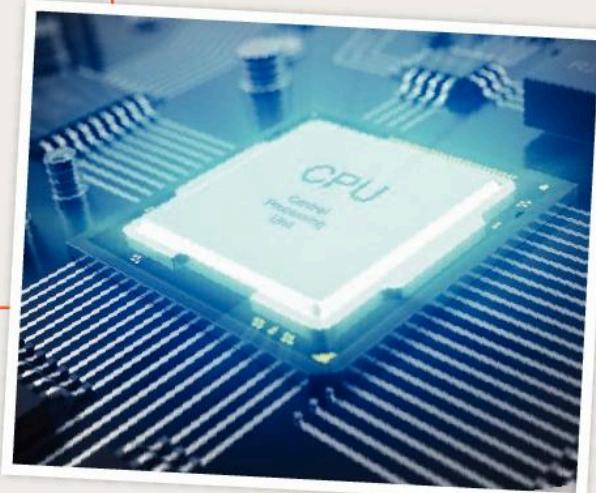
1

The nature of technology: Computers around us

You will learn

- that computer power improves how devices such as TVs and cars work
- how computers and technology improve the way people work
- about computer storage and why it is important.

Computer power is used to improve the way that devices work at home, at work and at school. TVs, cars, mobile devices, smartphones and fridges are all powered by computers. Computers are changing the way we live.



Talk about...

If all computers disappeared tomorrow...

- what would you miss about computers in your home life?
- what would you miss about computers at school?





Class activity

Make a list of the types of computers you use at home and at school. For example, do you use a tablet computer? Do you use different types of computers to do different things?

microprocessor

robot sensors

storage drive

data file back-up file

flash drive



Digital citizen of the future

Computers can improve the way we learn, work and enjoy our spare time. However, not everyone can afford to buy a computer. Some charities collect computers that are no longer used. These computers are given to people who cannot afford to buy their own. Would you donate a computer you no longer use?

Did you know?

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

1.1

The power of computers

In this lesson

You will learn:

- how computers help us to work
- how important a microprocessor is to a computer
- that microprocessors are small enough to be used in other devices.

Spiral back



Last year, you learned that there are different types of computer.

Desktop computers, laptops, tablets and smartphones are all types of computer. Now you will learn about how we use computers to help us learn, work and enjoy our free time.

How computers help us to work

You use computers at home and at school to help you to do your school work. You can use a computer to research information for a project. You use a word processor to create homework that looks good and is easy to read. Computers make it easy for you to make changes to documents.

You use computers to communicate and share ideas with other people. You use email to share your documents with classmates and your teacher.

Computers help people to do their jobs.

- People use word processors to **produce documents**, such as reports, plans and letters to customers. Spreadsheets show how much money a business is making. Attractive presentations give information to staff and customers.
- Computers help people to **find information** they need to do their jobs. Computers can store a lot of data. You can find information quickly.
- Computers send emails and messages to customers and work colleagues. Voice and video conversations mean people can **communicate** wherever they are in the world.

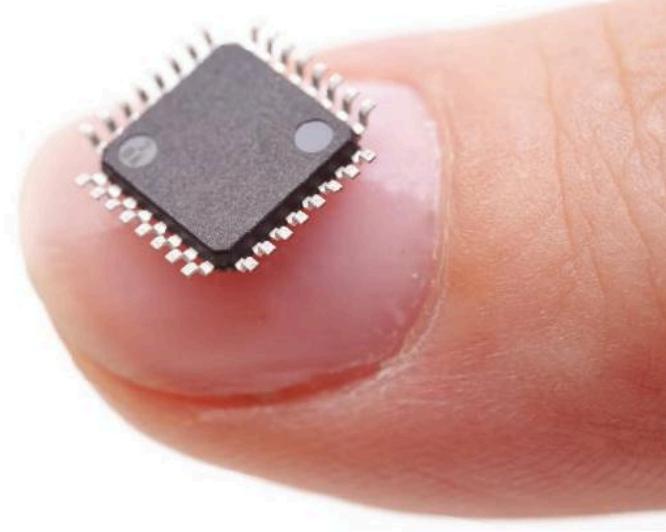


Computers help us to work quickly and accurately.
A computer is a powerful tool.

What makes a computer so powerful?

A computer has many parts inside. The most important part inside a computer is called the microprocessor.

The **microprocessor** is the computer's brain. It does all the important work inside the computer. Whenever you use a computer, everything you see on the screen or hear through the speakers has been created by the microprocessor. A microprocessor is so small it will fit on the tip of your finger.



Where else can you find microprocessors?

Microprocessors are not just used in computers – they are everywhere! A microprocessor is small enough to fit into almost any device or machine. Microprocessors are used in the home in devices like televisions. Microprocessors are used in the workplace in **robots** and other machines. Microprocessors make devices more powerful and easier to use.



Activity

List the types of computer you use at home or at school. Which type of computer do you prefer to use for your school work? Why?

Think again

Talk to a family member who is in work. What do they use computers for at work? How do computers make it easier for them to do their job?



Extra challenge

List three ways that you use computers to help you do school work. For each one, say how you would complete the work without a computer. How does using a computer make it easier to do your school work?

1.2

Microprocessors at home

In this lesson

You will learn:

- how microprocessors improve how devices work in the home and in a car.

Microprocessors in the home

TV

Microprocessors let us pause programmes or record them to watch later. TVs have remote controls to change channels and adjust the volume. You can control some TVs with your voice. These functions are controlled by microprocessors.

Washing machine

Microprocessors make sure you can wash your clothes without damaging them. They control the amount of time that the clothes are washed. They also control the speed of the spin dryer.



Fridge

Sometimes, a device with a microprocessor is also connected to the internet. A device which is connected to the internet is a **smart device**. 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.



Home systems

Microprocessors are used in home alarm and heating systems. Sensors can be installed in rooms to detect movement. A microprocessor uses information from the sensors to sound an alarm or turn on lights and heating when someone enters a room.

Microprocessors in the car

A modern car can have as many as 60 **embedded microprocessors**. Each microprocessor does a special job. For example, one microprocessor will manage how the car uses fuel. Another will operate the car radio.

Microprocessors make cars:

- easier to drive, for example, satellite navigation helps drivers get to where they want to go
- more comfortable for passengers, for example, the temperature in the car is kept at the right level
- safer, for example, brakes can be applied if the car gets too close to another vehicle.



Activity

Explore your home and make a list of the items you can find that use microprocessor technology. If a device has a display like the one in the photo of the washing machine, it probably has an embedded microprocessor.



Extra challenge

Search the internet to find out more about smart refrigerators. Make a list of the things a smart refrigerator can do.



Explore more

Pick a device from the list you made in the activity. Talk to a parent or grandparent about that device. Is it better than similar devices they used in the past? How has technology changed since your parent or grandparent was your age?

1.3

Microprocessors at work

In this lesson

You will learn:

- how microprocessors are used to improve the way people work.

Doctors

Doctors diagnose illness using machines that contain microprocessors. Two important machines are magnetic resonance imaging (MRI) and computerised axial tomography (CAT) scanners. MRI and CAT scanners create a 3D picture of the inside of a patient. A doctor can use the picture to see problems.



Technology also 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.

Being a doctor is a complex job. There is a lot to know about many illnesses. Doctors use the internet for research. They also use the internet to contact experts. Sometimes those experts work in another country.

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 work on part of the car. Robots do work that used to be done by humans.

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.



Retail

Supermarkets and other large shops depend on 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 supermarket to decide what items they need to order from their suppliers. Customers pay for their shopping using debit and credit cards. Money is transferred automatically from the customer to the shop.



Many people now use the internet to do their shopping. Orders made on the internet are processed quickly by computer systems. Goods are often delivered on the day after an order is made. Some people worry about the effect internet shopping has on shops in town centres.



Activity

Working in a group, interview your teacher to find out how using technology improves their job. Work together to write a list of three questions before you start the interview.



Extra challenge

Jobs that used to be done by humans are being replaced by automation and robots. Talk about this with classmates and your family. What are the good and bad things about automation?

Think again

Do you think your teacher could be replaced by a robot? Give reasons for your answer. How would you feel about travelling to school in a bus driven by a robot?

1.4 Computer storage

In this lesson

You will learn:

- about computer storage
- that computer storage is an important component of a computer system
- why computer storage is important.

Data files

Different types of media can be created and used on a computer.

The media types used on computers include:

- text documents (for example, homework or assignments)
- pictures and photographs
- videos
- music

All types of media used on a computer are stored in files. A file stored on a computer is called a **data file**.



Computer storage

When you create work on a computer, it is important to save it correctly. Work saved in a data file can be used over and over again. If your work is not saved correctly it can be lost.

All computers have a place to store data files. It is called computer storage.

Where data files are stored

A computer uses a device called a **storage drive** to save files. Every computer has a storage drive built into the case. A storage drive can save a large amount of information.

For example, a storage drive used in a desktop computer can store:

- 150,000 photographs or
- 8500 hours of music or
- 300,000 books.

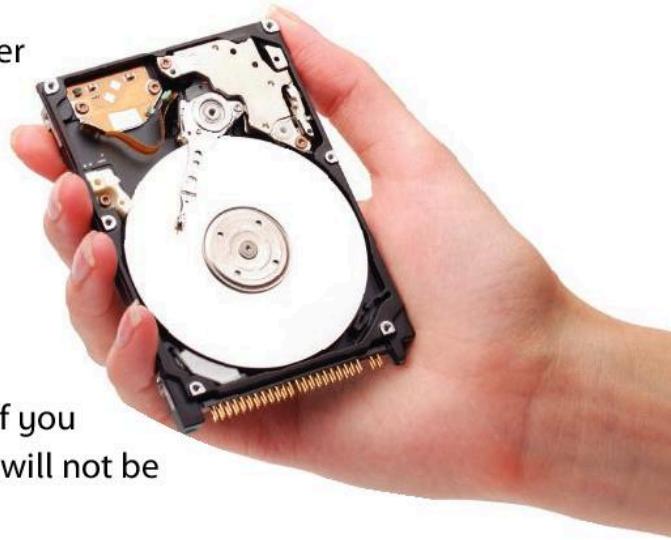
Network storage

You will probably not always use the same computer. If you save work onto the storage drive of one computer, you will not be able to use that file if you move to another computer.

Computers in schools and offices are usually connected. We call a group of connected computers a **network**. A network has its own storage drive. Everyone using a network has a special area on the **network storage** drive where they can save their work. If you save your work on your school network drive, you can use it on any computer that is connected to your school network.

Flash drives

A **flash drive** is a small portable storage device. It is small enough to fit in your pocket and can be used to move files from one computer to another. A flash drive is plugged into a computer so that a data file can be saved to it.



Activity

How could you use a flash drive to move homework from a computer at home to a computer at school? Write your answer as a list of steps.



Extra challenge

You have learned that a typical storage drive can hold 8500 hours of music. How many days would it take to play that music? (Hint: there are 24 hours in a day.)

Think again

What problems will you have if you don't save your work properly?

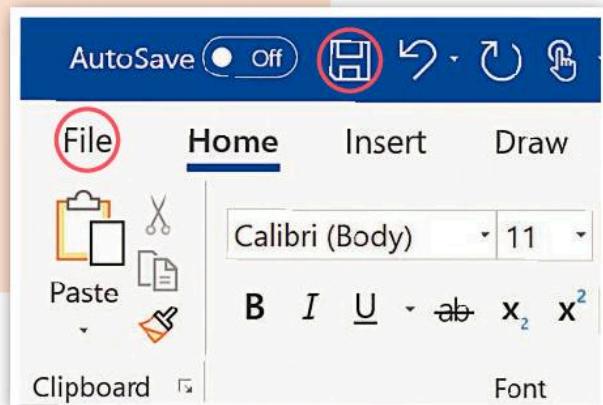
1.5

How to use and store your files

In this lesson

You will learn:

- how to use files and folders
- how to store files.



Using and storing files

How to save a file

If you are working in 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 file name before you can save the file. You will learn more about choosing a good name for your file in Lesson 1.6.

How to copy a file

You can reduce the risk of losing important work by making a copy of the file. The copy is called a **back-up file**.

- Find the file in File Explorer.
- Right click your mouse over the file, then select Copy from the menu that appears.
- Move to the folder where you want to save your back-up. Right click your mouse and select Paste from the menu.

How to find a file

File Explorer gives information to help you find a file. The image shows a list of files and information that can help you identify them.

Name	Date modified	Type
Science project	06/01/2019 10:47	File folder
Birthday list	25/05/2019 11:46	Microsoft Word Document
History homework	05/01/2019 20:18	Microsoft Word Document
Maths homework 01	05/01/2019 20:21	Microsoft Excel Worksheet
Maths homework 02	05/01/2019 20:29	Microsoft Excel Worksheet
Maths homework	05/01/2019 20:24	Microsoft Word Document

The icon tells you the type of file it is.

The name you have given the file.

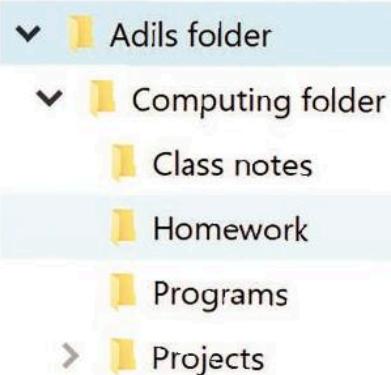
A full description of the file type.

The date the file was last saved.

Using folders

Folders can help you to organise your work. You can organise your work by subject or type. For example, you can set up a folder for your computing work.

Inside the computing folder, you can set up folders to contain different types of work. For example, you could set up folders for homework, class notes, projects and programs.



How to create a folder

In File Explorer, create a new folder by following these steps.

- 1 Go to the area where you want to add a new folder.
- 2 Right click using your mouse.
- 3 Select New from the menu that appears, then click Folder.
- 4 Enter a name for the new folder.



Activity

Look at the list of files at the bottom of page 14. Sunny is searching for a file she knows she created using Word on 5 January 2019. Which files in the list can she dismiss? For each file, say why.



Extra challenge

Open your work area in File Explorer, either on a school computer or at home. Create a folder called 'Back-ups'. Copy a file to your 'Back-ups' folder.

Think again

How do you organise your data files at home and at school? What can you do to improve the way you use folders and file names?

1.6

Tips for saving files

In this lesson

You will learn:

- why it is important to save your work correctly
- some rules to help you remember to save your work correctly.

Why saving your work is important

Saving work correctly is important. Failing to save work correctly could mean:

- you will lose work and must start again
- you may not be able to find work when you need it again.

Rules to help you when you are saving files

Rule 1: Use a helpful file name

When you save a file, you must give it a name. Choose a name that describes the information in your file.

Example: You have just completed a science homework assignment on big cats. The assignment is to be handed in on 24 April 2020.

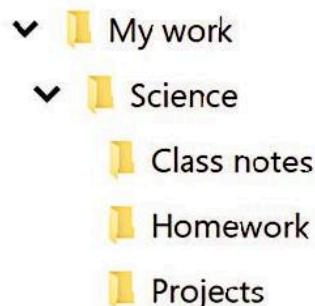
A good file name is:

- Science_homework_big_cats_24_April

Rule 2: Use folders to organise your work

Using folders to organise your files can help you to find your work. Folders also allow you to use shorter file names. You can create a folder to hold all your science work. Now your big cats file name can be shortened to:

- Homework_big_cats_24_April



Activity

There is a folder called 'Homework' shown in the directory structure. How can the file name 'Homework_big_cats_24_April' be shortened if the file is stored in that folder?

Rule 3: Save your work often

Get used to saving your work regularly and often. Don't wait until you have finished a piece of work before saving it. There will be times in between typing that 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

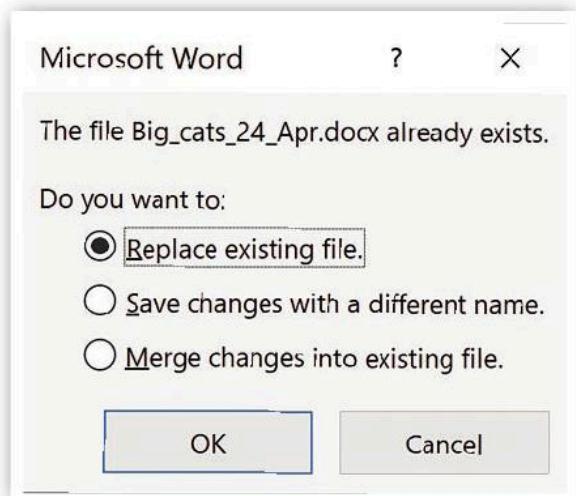
Sometimes you will see a warning on screen like the one opposite. The warning tells you that you are about to replace a file you have previously saved. You might be about to lose important work.

If you are not sure what to do, cancel the Save and start again. If the problem continues, ask your teacher for help.

Rule 5: Make copies of important files

Sometimes you have a file that is so important that losing it would be a disaster. For example, it might be an important project that has taken you a long time to complete. You can reduce the risk of losing important work by making a copy of the file.

The copy is called a back-up file.



Activity

Make an information sheet to promote good practice about saving files. Use the best practice rules in this section to help you.



Extra challenge

Work with a partner. How well does your partner use file names and folders? Suggest how your partner can make improvements to their file storage.



Explore more

Spend time at home with a family member who has work stored on a computer or tablet. How do they organise their data files? Can you suggest ways to improve how they organise their files? Can you learn anything from the way they work?

Check what you know

You have learned

- that computer power improves how devices, such as TVs and cars, work
- how computers and technology improve the way people work
- about computer storage and why it is important.

Test

- 1 You have just finished a project on your computer. Make a list of the steps you take to save your file safely.
- 2 You will find a microprocessor inside a tablet computer. What does the microprocessor do? Name two other types of computer that contain a microprocessor.
- 3 Name something that is built by robots.
- 4 Why is it important to save your computer work regularly?
- 5 List two devices used in the home and two devices used at work that use microprocessors.
- 6 List three ways that computers and microprocessors help doctors to do their jobs.
- 7 There are several ways you can save work at home so that you can use it later at school. List as many ways as you can think of. Which is the best method – and why?
- 8 Name a device used in the home that uses an embedded microprocessor. How does it make the device better to use?
- 9 How are microprocessors used to help a person drive a car?



Activities

This is a group activity. In your group, do the following.

- 1 Discuss how you have seen your teacher use computers and technology to do their job.
- 2 Write two or three questions to ask your teacher about how computer technology helps them do their job.
- 3 Interview your teacher. Make your own notes on how computers help teachers.

Self-evaluation

- I answered test questions 1–3.
- I completed activity 1. I discussed how teachers use computers and technology.
- I answered test questions 1–6.
- I completed activities 1 and 2. I wrote questions about computer technology to ask my teacher.
- I answered all the test questions.
- I completed all the activities.

Re-read any parts of the unit you feel unsure about. Try the test and activities again – can you do more this time?

2

Digital literacy: Using the world wide web

You will learn

- how to find information using a web search
- how to spot unsuitable content and behaviour on the internet and world wide web
- how you can report your concerns if you see content or behaviour that upsets you.

We use information every day. We use it to learn, to do our jobs and to enjoy our free time. The world wide web is a great source of information. In this unit you will learn how to search the world wide web to find the information you need. You will learn how to stay safe when using the world wide web.



Talk about...

- What do you like about the internet?
- What do you dislike about the internet?





Class activity

Talk about how you use the internet.

Make a list of when you:

- have used the internet for fun
- have used the internet to help with school work
- have been upset by the internet.

**world wide web web page
website web browser
search engine key word
bookmark menu link**



Did you know?

There are more than 4 billion people who use the internet worldwide. That is just over half of the world's total population.

At the time of writing, the Google search engine answers 7 billion questions every day. Google has answered around half a million questions while you were reading this!



2.1

About the world wide web

In this lesson

You will learn:

- about the world wide web.

What is the world wide web?

You have probably used the **world wide web**. If you haven't, you will have heard about it. The world wide web is usually shortened to 'www' or 'the web' (we will call it 'the web' in this unit). The web is a great source of information. If you use it in the right way, it will help you to learn at school and at home.

What is a web page?

The information on the web is 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; text and images for example. We say that web pages are **multimedia**.

What is a web link?

Every web page contains **web links**. A web link can be a word or a picture or a button. Clicking a web link takes you to another web page. Web links are what makes the web special. You can follow links to find new information.

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 organisation. Governments own websites. Newspapers and TV channels own websites. Anyone can own a website.

Spiral back



Last year, you learned how to send and receive emails. The internet is used to send emails. In this unit you will learn about another internet service. This service is called the world wide web.



Browsing the web

When you use the web, you can go to a website you like and look through the web pages on that site. Sometimes you may move from one website to another to find information you are interested in. This is called **browsing**. We will discuss it in more detail in Lesson 2.4.



What is a web browser?

You use a special application to browse the internet. The application is called a **web browser**. Some popular web browsers are Internet Explorer, Firefox and Google Chrome.

Did you know?

Tim Berners-Lee is a British computer scientist. He invented the world wide web in 1990. He called it 'a lesson for all dreamers ... that you can have a dream and it can come true'.



Activity

In a small group, make a questionnaire to find out what your class use the internet for. Here are some ideas: playing games, chatting to friends, sending emails, watching videos, doing school work.



Explore more

If you have time, ask family members to do the survey. What do the results show?



Extra challenge

Create a poster called 'A guide to the world wide web'. Your poster should explain the main terms people need to know about the web (for example 'website', 'web browser'). Try to present the information in an interesting way so that people will remember what the terms mean.

2.2

Searching the web

In this lesson

You will learn:

- how to use a search engine to carry out a basic search on the world wide web.

Search engines

Typing a question into a **search engine** is a good way to find information. 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 question

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

A web search question is not like a question you ask in conversation.

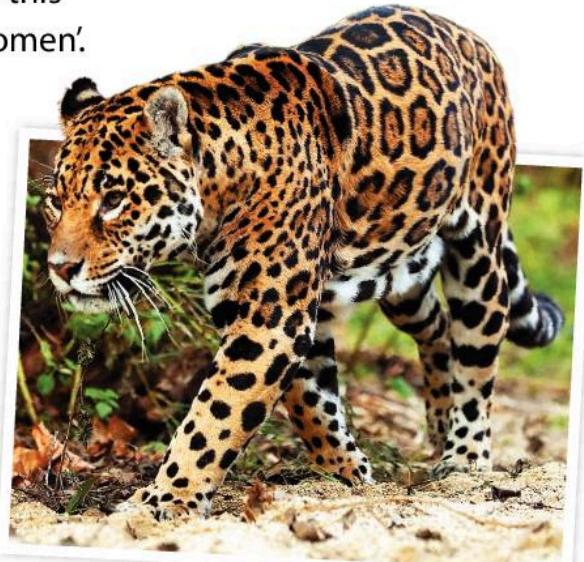
- In conversation, you might ask: Who holds the world record in the 100 metres for women?
- In a web search, you only need to use the key words. In this example, the key words are 'world record 100 metres women'.



Activity

Sunny is working on a project about big cats. He is researching the jaguar. He wants to find facts about the jaguar's diet and habitat.

Write down four or five key words that describe Sunny's task. We've included a letter/letters from some key words to help you.



b__ c__ j__ f__ d__ h__

Experiment with the key words in an internet search. Can you find the information Sunny needs? How many key words did you use? What is the best combination of key words?

2 Think about the best order for your key words

The most important key words should come first. In this example, the word jaguar should come near the start of your search.

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'.



Activity

Selina loves pizza. She wants to find a recipe for a pizza to cook at home. Her favourite pizza is margherita, but she would like to see recipes for other vegetarian pizzas.

She enters the word 'pizza' into a search engine.

Do the same, to see what results Selina got. Can you help her to write a search question that finds the information she wants?



Think again

Write down a question that you don't know the answer to. For example: How many Olympic medals did Usain Bolt win? or What is the population of China? Then swap your question with a classmate. Who can find the answer first using a search engine?



Extra challenge

In Unit 1, you learned that car factories use robots to make cars. Use a search engine to find a picture of robots at work in a car factory.

2.3

Improving your web search

In this lesson

You will learn:

- how to improve a basic web search.

In the last lesson you learned how to use key words to carry out a basic search. In this lesson you will learn how to make your searches more useful.

Removing items from a search

In the last lesson you helped Selina search for vegetarian pizza recipes. You may have used a search question like this one:

pizza recipe vegetarian

The sites you found will have included recipes for margherita pizza. Selina already knows about that type of pizza, so it isn't what she is looking for. You can remove 'margherita' from the search using a minus symbol (-). The new search looks like this:

pizza recipe vegetarian -margherita



Activity

Enter the search string 'pizza recipe vegetarian' and look at the first page of results. Now enter 'pizza recipe vegetarian -margherita'. Are there any changes in the search results?



Be creative

Use your web search skills to create an advert for your favourite pizza. Write a short paragraph that tells people how good your pizza is!



Searching for books and music

You can use other symbols to improve your search. Two symbols that are often used are quote marks ("") and an asterisk (*).

If you use double quote marks, the search engine looks for the exact text you have typed. Quote marks are very helpful if you are searching for a book or song title, for example “The Tiger Who Came to Tea”.

Use an asterisk if you aren't sure about a word in a song or book title. For example, if you are not sure of the third word in the book, *Where the Wild Things Are*, you could type “Where the * Things Are” in your search.



Activity

Search for a review of your favourite book. Use quote marks around the book title.

Use an asterisk to search for a book where you are unsure of the full title.



Extra challenge

Use your new skills to help with a piece of homework in another subject.

Searching for pictures and videos

When you have entered a search, a list of links is sent to your browser by the search engine. To see pictures and videos that match your search, click the ‘Images’ and ‘Videos’ links underneath the search box.

The screenshot shows a Google search results page for the query "robots in the motor industry". The top navigation bar includes a camera icon, a search bar containing the query, and a magnifying glass icon. Below the search bar is a menu with options: All (circled in red), News, Images (highlighted in blue), Shopping, Videos, and More. Further down are filters for Size, Color, Labeled for reuse, Type, Time, More tools, and Clear. The main content area displays three images: 1. An industrial robot arm working on a car part. Source: Industrial robot - Wikipedia en.wikipedia.org. 2. A Tesla Model S car on an assembly line with several robots. Source: Tesla auto bots.jpg - Wikimedia Commons commons.wikimedia.org. 3. A factory interior with multiple industrial robots working on a vehicle frame. Source: Roboti - Wikipedia, kamusi elezo huru www.wikipedia.org.



Explore more

Do other members of your family use the internet? You have learned some useful search skills in this unit. Share them with your family to help them when they use the internet.

2.4

Browsing and using bookmarks

In this lesson

You will learn:

- how to find your way around a website
- how to use bookmarks, so that you can find a website or web page easily.

Finding your way around a website

When you have found a website you are interested in, you can start to browse. You browse a website by moving around the web pages on the site. You don't have to move through a website page by page as you would in a book. A website provides links that take you to the information you are looking for.

- The **menu** tells you how the website is divided into sections. A menu is like the contents page in a book. Clicking on a menu tab takes you to a different section of the website.
- **Links** usually take you to another page on the website. Links can be words or pictures.
- **Search** is like the search engine you have been using, but only searches pages on the website.

The screenshot shows the homepage of the Science Kids website. At the top, there's a navigation bar with tabs: Home, Experiments (highlighted in red), Games, Facts, Quizzes, Projects, Lessons, Images, Videos, and Topics. To the right of the navigation bar is a search box labeled "Search box". Below the navigation bar, there's a large yellow banner with the text "Science for Kids!" and a subtext: "Science Kids is the home of science & technology for kids! Learn more about the amazing world of science by enjoying our fun science experiments, cool facts, online games, free activities, ideas, lesson plans, photos, quizzes, videos & science fair projects." On the right side of the page, there's a section titled "Science Topics" featuring icons for Animals, Biology, Chemistry, Physics, Space, and Weather. Arrows point from labels at the bottom of the image to specific parts of the website: a blue arrow points from the word "Menu" to the navigation bar; a red arrow points from the word "Links" to the "Science Topics" section; and a green arrow points from the word "Search box" to the search bar.



Be creative

Write a review of your favourite website. What is the site called? What is it about? What do you like about the site? Is there anything you would improve about the site? Share your review with your friends.

Bookmarks

Bookmarks save useful websites and web pages, so that you can find them again easily. Bookmarks help you get back to a website quickly.

In Lesson 1.5, you learned about saving files in folders. Folders help you to find information you have saved.



You can save your bookmarks into folders. For example, you could have one bookmark folder for each subject you study.



Activity

Work in a small team. Use your web search skills to find websites that have fact files about endangered animals. Use the menu, links and search buttons to find information on different endangered animals.

Choose one endangered animal. Create a poster about it to make people aware that the animal is in danger.

Think again

Create a bookmark folder called Computing. Save the useful sites you find in the folder as you study this course.

As you develop your web search skills, use the internet to research other subjects.



Extra challenge

Create a bookmark for the sites you used in the activity.

In this lesson

You will learn:

- how to spot unsuitable content and behaviour when using the web
- what to do if something upsets you or is confusing.

The good and bad sides of the web

You can use the web to find information and facts to help you with homework and projects. The web is also a place where you can have fun talking to friends and sharing news. You can watch films, listen to music and play games.

However, the web has a bad side too. Some of the information you find will be misleading or incorrect. You cannot trust everything you see on the web.

Be alert, act responsibly and ask for help when you need it. If you are careful, then you can enjoy learning on the web.

How to check content

Is it true?

You should ask this question every time you use the web.

Sometimes, people get facts wrong by mistake. Sometimes, people deliberately try to mislead you. Here are a few checks you can carry out to make sure your content is good quality.

- **Can you check the facts?** Check the information you find on a website against other websites before you use it.
- **When was the information written?** Check that your information is up to date.
- **Is the information on a site you trust?** As you bookmark websites, you will start to build a library of sites you have used many times and that you trust.
- **Is it fact or opinion?** Are opinions backed up by facts?

Who owns the website?

WORLD NEWS

Home | UK | World | Business | Politics

Business | Your Money | Market Data

Wooden clothes on shopping list?

Who wrote the article?

By Ella Rogers

World News global education

⌚ January 2020

When was it written?

Does it upset you?

If something on the web upsets you or seems confusing:

- close the page and do not look at it again
- do not show or send it to anyone else
- tell an adult you trust, for example a parent, family member or teacher.

Reporting something that upsets you can be difficult, but it is important that you do. It can save others from being upset in the future. It can help you deal with the problem. It is not your fault.



Activity

Find a web page from the endangered animals activity in the last lesson. When was the information written?



Extra challenge

Revisit a website you have used in this unit. Use the 'Is it true?' questions to check its content. Then write a short report about your findings.

Think again

Search engines designed for young people show fewer adverts and control the content they show you.

Search for 'child-friendly search engine'. Then explore two of the search engines from the first page of results.

2.6

Be sure, be safe

In this lesson

You will learn:

- how to stay safe when talking to people online
- how to report problems you experience when using the internet.

Staying safe

- **Chatting** Do not chat with strangers online. 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.
- **Sharing** Do not share your personal information or photographs with strangers. Never share your address or phone number with strangers.
- **Opening files** Do not open pictures or other files from people you don't know. If you receive something 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 games 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.

Be kind and respectful

The way you behave online is important. Be kind and respectful in the way you talk to people. Chat online in the same way you would chat at home or in the classroom.

If someone you know is upset or frightened by something they have seen online, offer them help. Advise them to talk to a **trusted adult**.

If you see a friend acting irresponsibly online, share your knowledge of how to stay safe with them.

Reporting problems

If something scares or upsets you online, tell an adult. You will feel better once the problem is in the open. Remember, you are not to blame, and people want to help.

- Tell a family member you trust and can talk to.
- Talk to a teacher you trust. Your school may have a teacher responsible for dealing with online abuse and bullying.

Write down what happened so you can remember the details when you talk to a trusted adult.



Activity

Read your school's advice on using the internet. Make sure you know what your responsibilities are. Make sure you know how to report a problem.



Extra challenge

Make a list of three things your school policy says you should not do when using computers.
Make a list of three things you should do when using computers in school.

Think again

How would you act if something you saw or read on the internet upset or frightened you? Think about who your trusted adults are. Who would you talk to at school and at home if you needed to?

Do you need to ask for help to manage your privacy settings? Make an action list.

Check what you know

You have learned

- how to find information using a web search
- how to spot unsuitable content and behaviour on the internet and world wide web
- how you can report your concerns if you see content or behaviour that upsets you.

Test

- 1 What is a web browser used for?
- 2 Why should you check when information on a website was written?
- 3 Who should you talk to if you are upset about something you see or read online?
- 4 Alice is researching a geography project. She needs to find out what the longest rivers in the world are, apart from rivers in Europe. Write a search question that will find the information for Alice.
- 5 How can you check if a fact you have read on a web page is true?
- 6 List four things you can do to stay safe online.
- 7 What is a bookmark and what is it used for?
- 8 List three things you can do to check if the information you find on a website is reliable.
- 9 What steps should you take if someone sends you an upsetting message online?



Activities

- 1 Research the web for information on how to stay safe on the internet. You will find some advice on this site:
www.childnet.com/young-people/primary
- 2 Use your search skills to find advice from other websites. Bookmark the best ones in a folder called 'Staying safe online'.
- 3 Use the information from your research and this unit to create an information sheet. Write the sheet to help younger children in your school stay safe on the internet.

Self-evaluation

- I answered test questions 1, 2 and 3.
- I followed the link in activity 1 and read advice about staying safe.
- I answered test questions 1–6.
- I completed activities 1 and 2. I found information on the same topic from different websites and bookmarked the best information.
- I answered all the test questions.
- I completed all the activities.

Re-read any parts of the unit you feel unsure about. Try the test and activities again – can you do more this time?

3

Computational thinking: Making a quiz program

You will learn

- how to plan and write a program that asks a question and gets your answer
- how to plan and write a program that uses variables to store values
- how to plan and write a program that uses a test to control what happens.

In this unit you will create a program that asks a quiz question. The program will check if the answer is right or wrong. The computer will output a message that tells you if the answer is right. You will learn about storing values and using logical tests to compare and check answers.



Talk about...

Sometimes you have tests in class. Does your teacher mark the tests? Could a computer program mark your answers instead? Which would you like best – answers checked by a teacher or a computer? Give reasons for your choice.





Class activity

Work on your own or with a partner. Write a quiz with several questions. Make sure you note the right answer to every question.

Challenge another team to answer your questions.

**variable logical test if... else
relational operator
conditional structure
flowchart program plan**

Did you know?

Computers can ask questions and check the answers you give.

Some computer programs are used to help doctors. They ask the patients questions about their health. From the answers, the computer can often work out what illness the patient has. This can relieve pressure on overworked doctors.

However, computers can't always solve difficult medical problems.



6.	A <input type="radio"/>	B <input type="radio"/>	C <input checked="" type="radio"/>	D <input type="radio"/>
7.	A <input type="radio"/>	B <input type="radio"/>	C <input checked="" type="radio"/>	D <input type="radio"/>
8.	A <input type="radio"/>	B <input checked="" type="radio"/>	C <input type="radio"/>	D <input type="radio"/>
9.	A <input type="radio"/>	B <input type="radio"/>	C <input checked="" type="radio"/>	D <input type="radio"/>

3.1

The input part of the program

In this lesson

You will learn:

- how to plan and create a program that asks a question.

The program you will create

A program **requirement** tells you what a program is expected to do. Here is an example:

Ask the user a quiz question. Tell them if the answer is right.

In this unit you will create a program to meet this requirement.

Planning the program

Programmers plan a program before they start to create the program. The plan helps them make the program.

- The plan guides their work.
- They can check their finished program against the plan.
- The plan helps them to share their ideas with others.

Plan for the quiz program

A **program plan** sets out the inputs, processes and outputs of a program. Here is a plan for the quiz program:

- **Input:** Ask a quiz question and get the answer.
- **Process:** Check if the answer is right.
- **Output:** Tell the user if the answer is right.

You will create a program to match this plan. In this lesson, you will complete the input part of the program.

Using scratch language

You will use the Scratch programming language. Go to the Scratch website:

<https://scratch.mit.edu/>

Spiral back



Last year, you made a program that processed user **input**. In this lesson you will start to create a program with user input. If you need help with any of the work in this lesson, look back at the lessons in Book 3.

Click 'Create' to start making Scratch programs. If you see a tutorial video on the screen you can close it. Or watch it to get some tips about Scratch.

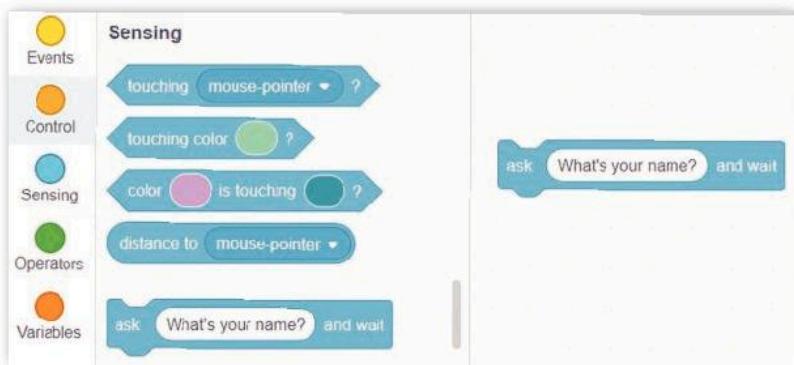
Scratch programs are made of blocks. You fit the blocks together to make the program. The program controls the sprite. The first sprite you see is a cat. You will make the cat ask a question.



What is $19 + 4$?

Input

Scratch gives you a block to make the sprite ask a question. Look on the left of the Scratch screen. Find the light blue dot, labelled 'Sensing'. Click on this block to see the light blue 'Sensing' blocks.



Find the block that says 'ask ... and wait'. Drag this block into the script area. Change the words in the block. Type a maths quiz question. In this example the question is $19 + 4$ but you can use any question you like.



Find and click on the yellow dot labelled 'Events'. An 'Events' block tells the computer when to run the program. Choose the block that says 'when this sprite clicked'. Drag this block into the script area and fit it above the question block.

When you click on the picture of the cat, the program will run.



Activity

Start Scratch. Fit the right blocks together and enter the question you chose. Run the program and make sure it works. Click on 'Save' in the file menu to save your work.



Extra challenge

Change the sprite and the background design to make the program personal to you.

Think again

Why is it a good idea to make a plan before you start to write your program? (The answer is somewhere in this lesson.)

3.2 Using variables

In this lesson

You will learn:

- how to use a variable in a program.

What is a variable?

Almost all programs use **variables**. When you make a variable, you give it a name. A program command gives the variable a value. The variable will store the value.

In this lesson you will make a variable. The variable will store the solution to the quiz question.

Choose a name that reminds you what value the variable stores. In this program the variable will store the solution to the quiz question. So, call it 'solution'.

Making a variable

Click on the dark orange dot labelled 'Variables'. You will see the blocks that help you make variables.

There is one variable ready-made for you. It is called 'my variable'. You will make a different variable.

Click on the box that says 'Make a Variable'.

Type 'solution' and click the 'OK' button.

You have made a new block called 'solution'.

Click to remove the tick. Now the variable is ready to use.



Giving the variable a value

You have made a new variable called 'solution'. Now you will give it a value. In our example the quiz question is 'What is $19 + 4$?'. So our variable has the value 23. You must choose a value based on your own question.

Find the 'set ... to ...' block. Drag it to the script area.



Choose the variable 'solution' from the drop-down list. Put the value of the variable into the space. Now fit the block into your program. It should look like this.



Activity

Create the program you see on this page. Set the value of the variable. It must store the solution to your quiz question.



Extra challenge

There is a block in the 'Looks' section that makes the sprite say "Hello!". Add this block at the end of the program. Change the program so that the sprite says the solution.

Think again

What makes a good variable name?

In Scratch there is a ready-made variable called 'my variable'. That isn't a very good name for a variable. Why not?

3.3

The output part of the program

In this lesson

You will learn:

- how to create a program with output.

Program output

In this lesson you will make the sprite say a message. The message is the program **output**. In Scratch, click on the purple dot labelled 'Looks'. You will see the 'Looks' blocks.

Find the purple block that makes the sprite say "Hello!" for 2 seconds. Drag it to the script area and fix it to the program.

Run the program. The sprite will ask the question. Enter an answer and click the tick. The sprite will say "Hello!"

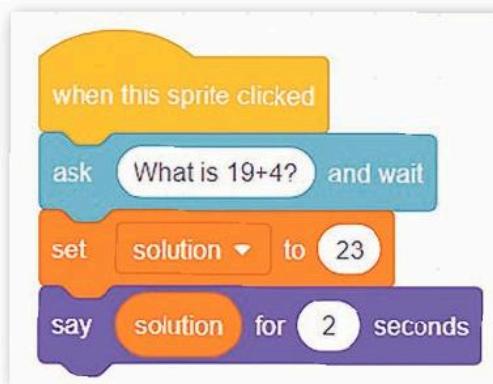
Output the solution

In the last lesson you made a variable. The variable is called 'solution'. This variable stores a value. Now you will make the sprite say the value stored in the variable.

Click on the dark orange dot labelled 'Variables' to see the variables. In the last lesson you stored a value in the 'solution' variable. Now you want the sprite to say that value. So drag the solution block into the say block. It fits neatly in place.

Using an operator

You can use **operators** in your programs. Operators process values to make the program outputs. In Scratch the operators are green blocks. Click on the green dot labelled 'Operators' to see these blocks.



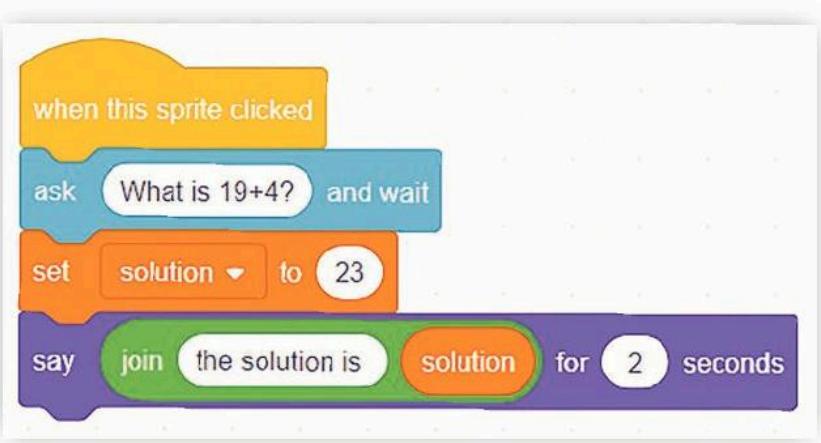
The 'join' operator lets you join two different outputs together. It says 'join apple and banana'. However, you don't want the sprite to say apple and banana. So make changes.

Write the message 'the solution is' in one half of the block. Make sure you include a space after 'is'. Put the dark orange solution block in the other half. The completed block will look like this:



join the solution is solution

Fit the 'join' operator into the 'say' block.



Run the program and see what the output is.



Activity

Create the program shown in this lesson so the sprite tells you the solution to the quiz question.

Think again

In your own words explain what the 'join' operator does.



Extra challenge

The light blue 'Sensing' blocks include a block called 'answer'. This is a variable that stores the user's answer to the question. Add an extra block which says the user's answer.

3.4

Using a logical test

In this lesson

You will learn:

- how to plan a program that uses a logical test.

What are relational operators?

Remember that programs use operators to process values. In this lesson you will learn about **relational operators**. Relational operators compare two values.

Three common relational operators are shown in this table.

Operator	What it means
=	Equal to
>	Bigger than
<	Less than

Logical test

Computer programs often include a **logical test**. A logical test is a test that has the answer True or False. You can make a logical test by comparing two values using a relational operator. For example, $5 > 3$ says '5 is bigger than 3'. This test is True.

What about the test $100 < 50$? Is it True or False?

Conditional structure

A logical test is used to control what the computer does.

- If the test is True, the computer does one thing.
- If the test is False, the computer does a different thing.

This is called an **if structure** or a **conditional structure**. Your program will use a conditional structure. You will test if the answer to the quiz question is right.

The program plan so far

This plan shows the program you have made so far.

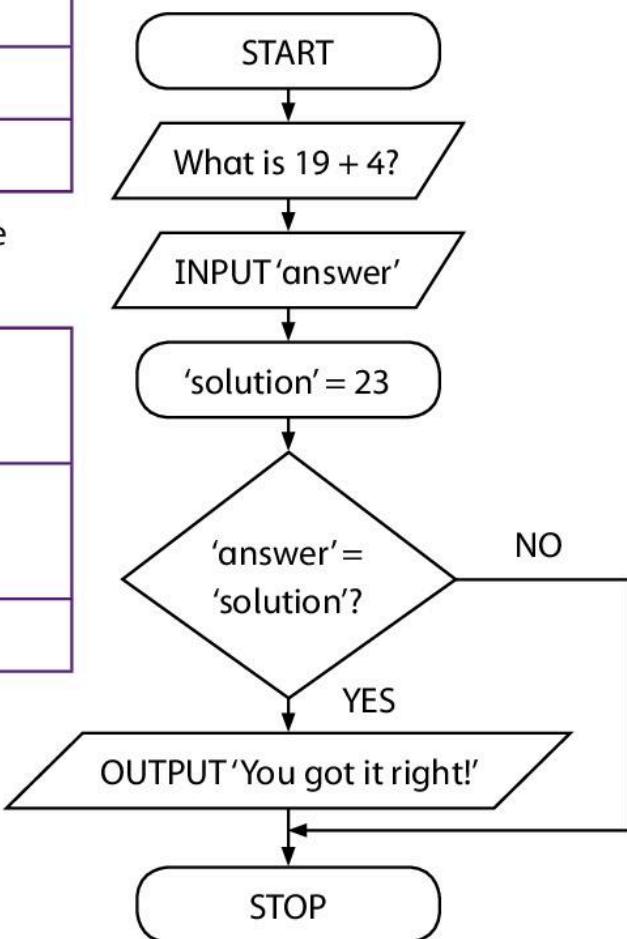
Input	Ask 'What is 19 + 4?' Input 'answer'
Processing	'solution' = 23
Output	Say 'solution'

Now we will extend the program plan to include the logical test.

Input	Ask 'What is 19 + 4?' Input 'answer'
Processing	'solution' = 23 Test 'answer' = 'solution'
Output	If True say "You got it right!"

Flowchart

Programmers sometimes draw a diagram to show a program plan. This sort of diagram is called a **flowchart**. Opposite is a flowchart that matches the plan.



Activity

Copy the program plan. Instead of 'What is 19 + 4?', use the question you set in your program.



Extra challenge

Redraw the flowchart. Change it to show the question and solution that you choose.

Think again

What shape of box is used to show a logical test?

Draw the shape.

What shape of box is used to show output?

Draw the shape.

3.5

Creating a logical test

In this lesson

You will learn:

- how to create a program that uses a logical test.

Making a program to match the plan

In this lesson you will create a program to match the plan you made in the last lesson. Your program will include a logical test and a conditional structure.

Look at the program you made before. Take away the block which makes the sprite say the solution.

Conditional structure (if... then)

Click on the light orange dot labelled 'Control' to see 'Control' blocks. You will see a block that says 'if... then'. Put that block onto your program.

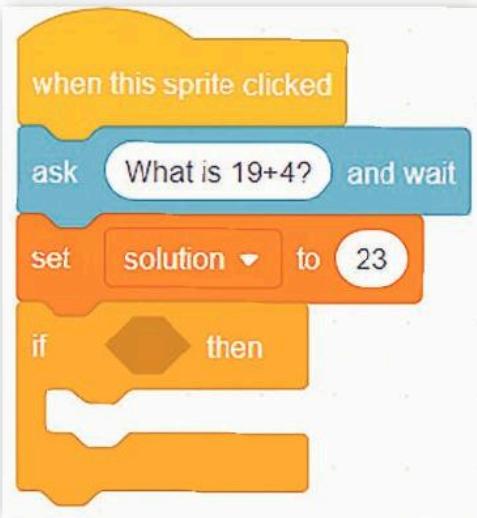
The 'if' block has two features:

- a space at the top for a logical test
- a space inside for actions if the test is true.

Logical test

Now you will make the logical test. You will use a relational operator.

Click on the green dot labelled 'Operators' to see the green operator blocks. The relational operators have pointed ends. Find the block that shows an = (equals sign) and drag it to the script area.



There are two spaces, where you can put the two values. You want the program to test if 'answer' = 'solution' (that means the answer is the same as the solution).

- The block that stores the user 'answer' is in the 'Sensing' section (light blue blocks).
- The block that stores the 'solution' variable is in the 'Variables' section (dark orange blocks).

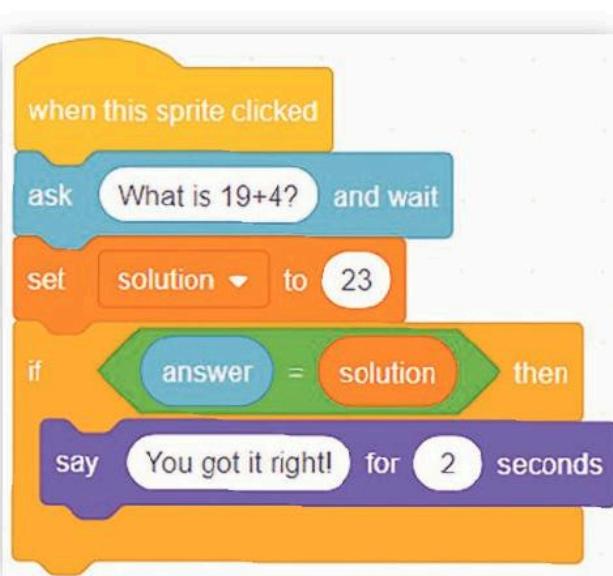
Put these two blocks into the 'equals' block. The whole thing will look like this.



Complete the program

Put the logical test you made into the 'if' block. It fits in at the top. The space at the top of the 'if' block is the same shape as the 'equals' block. A white outline appears to show when you have put it in the right place.

Now you need to make the sprite say 'You got it right!' Find the 'say' block (it is one of the blue blocks). Change the words so the sprite says the right words. Then put it into the 'if' block. When you have finished, the program will look like this.



Activity

Make the program shown in this lesson. Run the program to check it works. Save it for next time.



Extra challenge

Make a program with several different sprites that ask different questions.

Think again

In your own words, explain what the 'if' block does.

3.6

Programming with if and else

In this lesson

You will learn:

- how to write a program with if and else.

Extending the program plan

The program you made tells the user if they got the question right. What if they got it wrong?

Now you can extend the program plan to add an extra message.

Input	Ask "What is 19 + 4?" Input 'answer'
Processing	'solution' = 23 Test 'answer' = 'solution'
Output	If True say "You got it right!" If False say "You got it wrong!"

Can you see what is different about the plan?

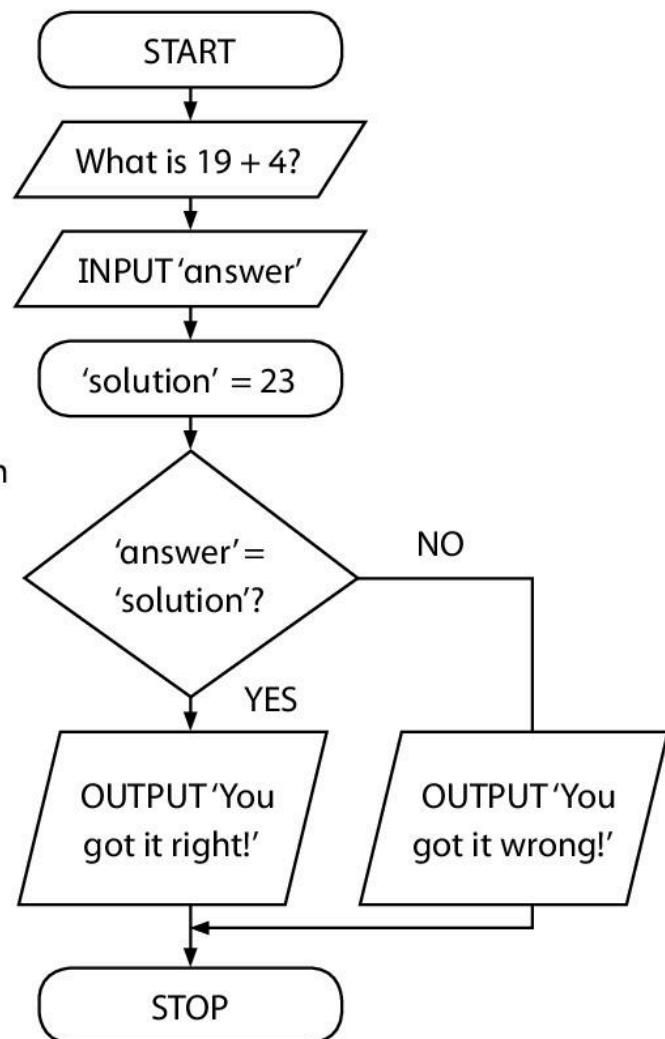
Making a flowchart

We can also show the plan as a flowchart.

If you follow the arrows down from the top, you can trace the program. There are two output choices. The computer picks one choice or the other. The choice is based on the result of the logical test.

Extending the program

Take the 'if... then' block away from the program. Replace it with the block you can see at the top of the next page. Put the logical test you made in the last lesson into the space at the top of the block.



This is the 'if... else' block. It starts with a logical test. But it has two spaces in it.

- Commands in the top space will happen if the test is True.
- Commands in the lower space will happen if the test is False.

Different outputs

The 'if... else' block has two spaces. Put 'say' blocks into the two spaces to make the sprite say the right messages if the answer is right or wrong.

The finished program with all blocks in place is opposite.



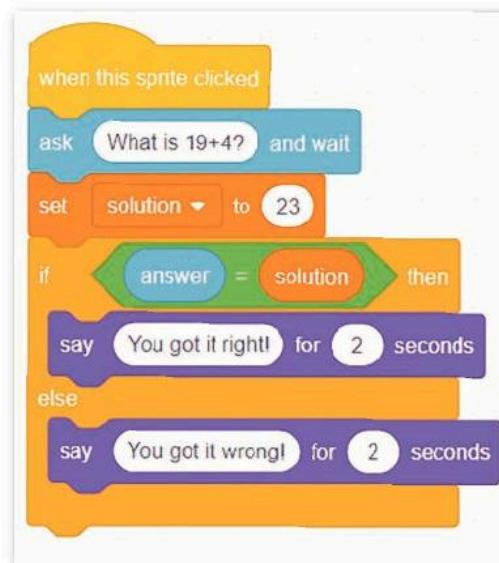
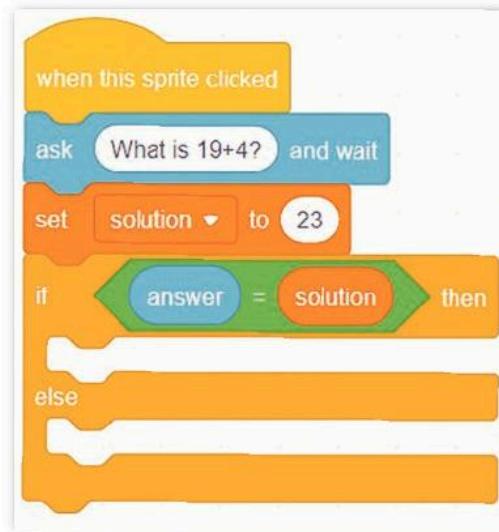
Activity

Make a program like the one shown in this lesson. The sprite should ask a quiz question and tell you if your answer is right or wrong.



Extra challenge

Extend the program to ask a second question after the first.



Explore more

Draw a large and colourful poster that shows the extended flowchart.

Or you could draw the program you made.

Make a classroom display of your plans and programs.



Be creative

Make a quiz game with a colourful background and lots of sprites that ask interesting questions. Instead of maths questions, think of questions about your favourite hobby or interest.

Check what you know

You have learned

- how to plan and write a program that asks a question and gets your answer
- how to plan and write a program that uses variables to store values
- how to plan and write a program that uses a test to control what happens.



Activities

- 1 A fairground ride is only for children older than 6. Here is a program plan. The logical test is missing.

Input	Ask "What is your age?" Input 'answer'
Processing	Test ...
Output	If the test is True, say: "You can go on the fairground ride"



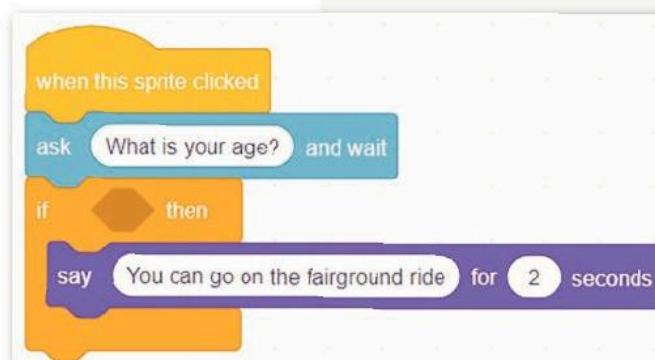
You can go on the fairground ride

Complete the program plan by filling in the rest of the 'processing' row. Say what the logical test is.

- 2 Here is a program that matches the plan. It is incomplete.

Make a program to match the program plan.

- 3 Extend the program so the sprite says a suitable message if the logical test is False.



Test

Here is a relational operator that compares two values.



- 1 This test can be True or False. What is the name for a test like that?
- 2 Say in your own words what this test does.
- 3 If the user typed the answer 12, would the test be True or False?
- 4 You need to make a variable to store how old the user is. What would be a good name for that variable?

Self-evaluation

- I answered test question 1.
- I completed activity 1 and made a program that works.
- I answered test questions 1, 2 and 3.
- I completed activities 1 and 2. I completed the program plan and made a program to match the plan.
- I answered all the test questions.
- I completed all the activities.

Re-read any parts of the unit you feel unsure about.

Try the test and activities again – can you do more this time?



Digital citizen of the future

A computer can only use tests with definite True or False answers. Many tests in real life don't have simple answers like that. For example, deciding whether to build new houses or a new hospital. Questions like this require human choices based on many complex factors.

4

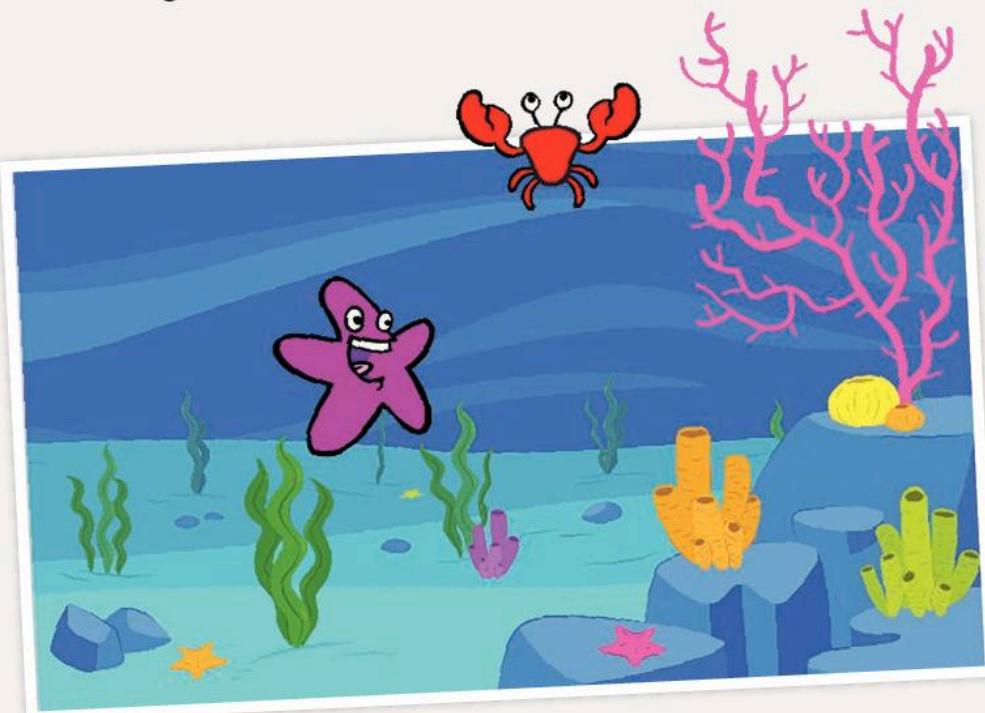
Programming: Make a game

You will learn

- how to make a program to meet a requirement
- how to improve a program by adding extra features
- how to create an interesting user experience with program inputs and outputs.

In this unit you will make a computer game using Scratch. The program you write will have several sprites. Each **sprite** will move on the screen, controlled by a different program.

You will have the chance to be creative. At the end of the unit you can invent your own computer game, and even design the sounds and pictures that you use.

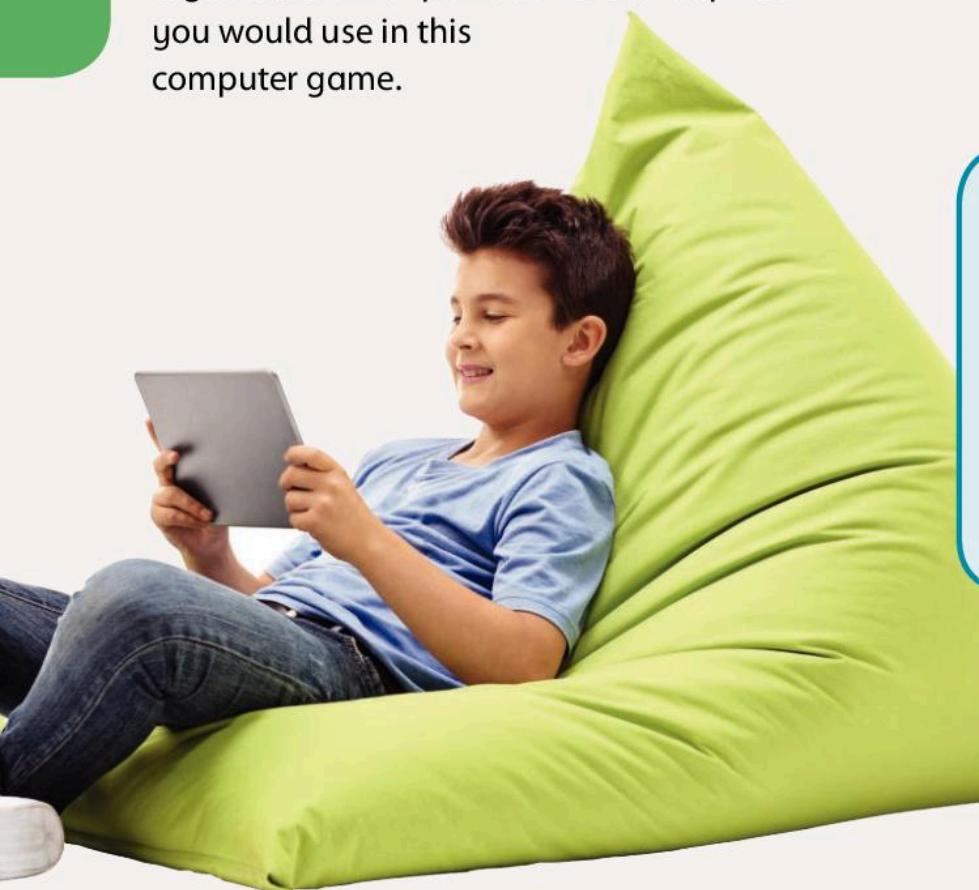




Class activity

Work with a partner. Think of an idea for a computer game that you could make with Scratch. Describe it to your partner. Working together, draw or paint some of the sprites you would use in this computer game.

sensing block clone upload



Talk about...

What are your favourite computer games? How could they be improved? If you could invent a new computer game, what features would you like it to have?



Did you know?

One of the best-selling games of all time is Minecraft. The game allows players to build with blocks in a 3D world. Other activities in the game include exploration, collecting, crafting and combat. The game has over 90 million players worldwide.



4.1

Choose the sprites and backdrop

In this lesson

You will learn:

- how to choose sprites and a backdrop
- how to set starting values.

Program requirement

In this unit you will make a space game using Scratch. Here is the requirement:

The user controls the movement of a spaceship with a mouse.

The spaceship will dodge stars and planets that are moving in space.

If the spaceship hits an obstacle, it will make a warning sound.

Choose a backdrop

The area where the sprite moves is called a stage. The **backdrop** is the picture at the back of the stage.

Make sure you are sitting at the computer. The Scratch programming window should be open on the screen. Choose a backdrop for the game by clicking on the new backdrop icon. It is at the bottom right of the screen.

A screen full of choices appears. In this book we use a backdrop called 'Galaxy'. You can choose any backdrop you like.

Choose the sprites

Also at the bottom right of the screen is the sprite. The sprite is a cat. Click on the sprite and delete it by clicking on the X next to it. Now choose a new sprite by clicking on the new sprite icon.

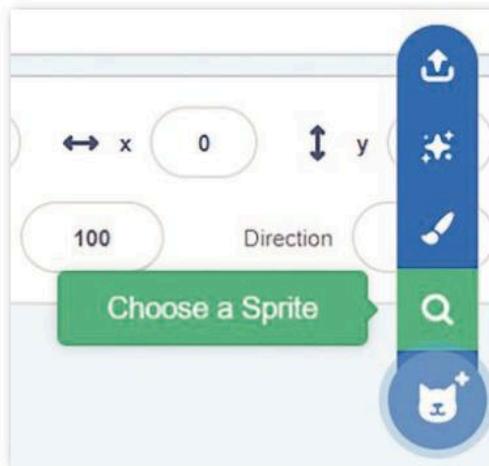
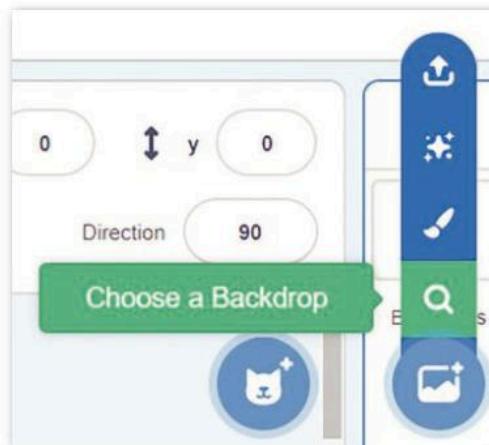
A screen full of choices appears. Click on the sprite(s) you would like to use. You can repeat this to add more sprites to the program.

Spiral back



Last year, you made a program to control the movement of a sprite.

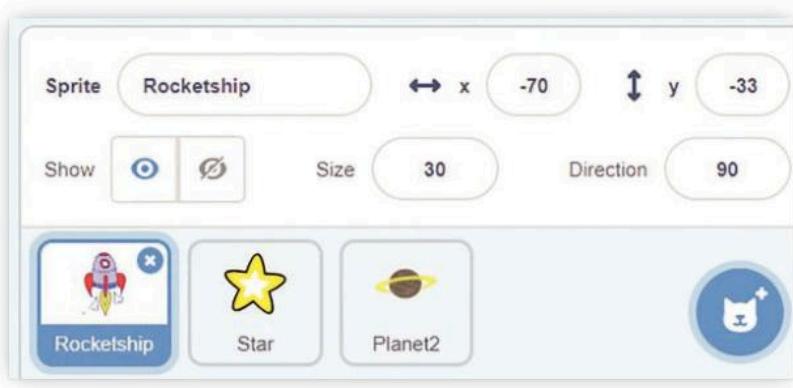
In this lesson you will use those skills to make a program with many moving sprites.



We chose:

- Rocketship
- Star
- A planet (it is called Planet2 in the list).

You can choose any that you like.

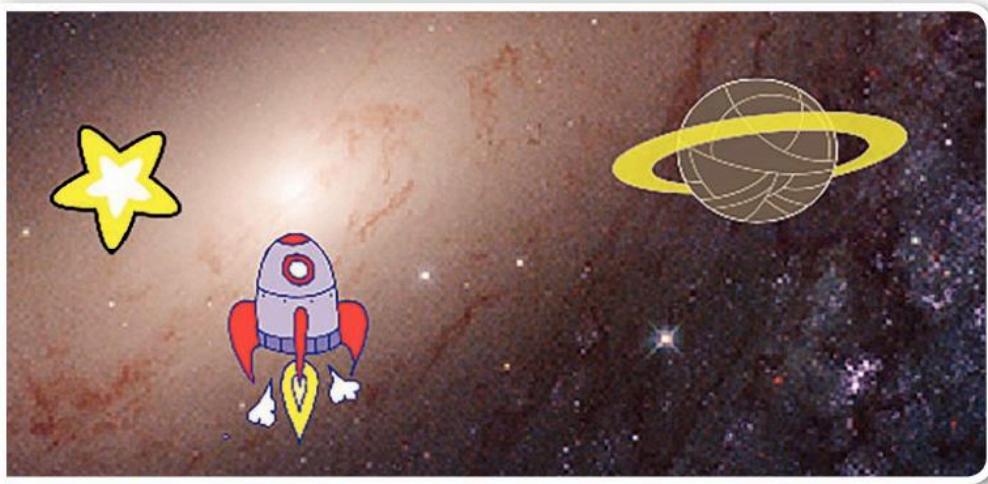


Set starting values

Below the stage you will see the sprites that you chose.

Above each sprite are the settings. You can make changes. We thought the rocketship was too big. Click on it and change 'size' from 100 to 40. You can also drag the sprites to position them on the stage.

Your stage is ready for the game.



Activity

Prepare the stage with your backdrop and sprites. Adjust the size of at least one sprite.



Extra challenge

What other sprite settings are there?
What happens if you change them?

Think again

Look at the program requirement. What are the outputs of this program?

4.2

Make sprites move

In this lesson

You will learn:

- how the user can control the movement of a sprite
- how to make a sprite move on its own.

Plan movement

You must create a program so that:

- the program will start when the user clicks the green flag
- each sprite will move to a random place on the screen
- the sprites will move 'forever' (until the program stops), so you will use a 'forever' loop.

Make the spaceship program

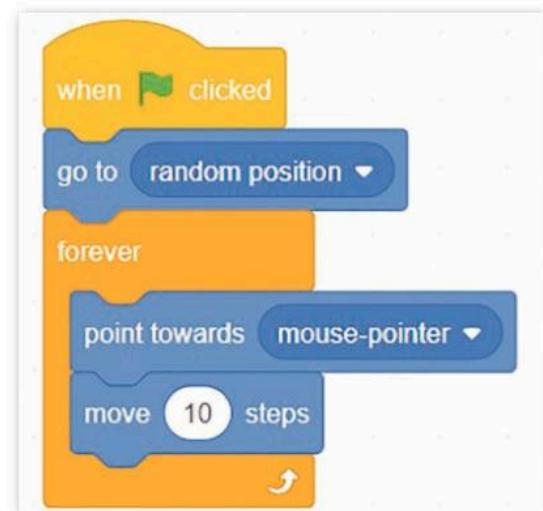
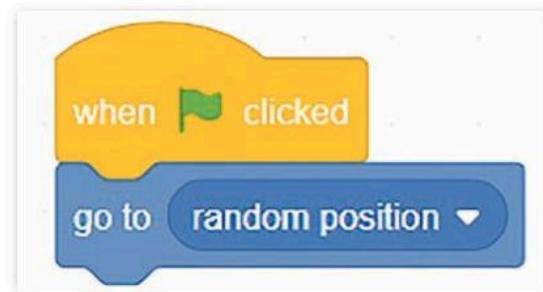
The spaceship is controlled by the user. It will follow the mouse pointer.

Select the spaceship sprite (rocketship). Start the program like this.

When the green flag is clicked, the sprite will move to a random place.

Then add a 'forever' loop. The sprite will point towards the mouse pointer. Then it will go ten steps.

Click on the green flag. Move the mouse and the spaceship will move.



Make the star program

The star will move on its own. It will bounce off the edges of the stage.

Select the star sprite. Start the program like this.

When the green flag is clicked, the star sprite will move to a random position and turn.

Then add a 'forever' loop. The star will move on its own. If it hits the edge of the stage, it will bounce off.

Click on the green flag. Now the spaceship and the star will move.



Make the planet program

Select the planet sprite. Make the same program that you made for the star.

Click on the green flag. Now all the sprites will move.



Slow down!

Each sprite has a block that says 'move 10 steps'. We think the game works best if you change this to a smaller number, such as 3. Then all the sprites move slowly, as if they are floating in space.



Activity

Follow the instructions on this page to make the sprites move on the screen. Click on the green flag to make the program run. Remember to save your work.



Extra challenge

The game is harder if the spaceship moves slower than the star and the planet. What speeds make the most enjoyable game? Write about what you found.

Think again

The user provides input to a program. State one thing the user does to control this program.

4.3

Crash detector

In this lesson

You will learn:

- how to create a program that senses if two sprites collide (crash into each other)
- how to use sound output in a program.

Program requirement

As we saw in Lesson 1, the program requirement is:

The user controls the movement of a spaceship. The spaceship will dodge stars and planets that are moving in space. If the spaceship hits an obstacle, it will make a warning sound.

Now you will extend the program to meet the final part of this requirement. If the spaceship hits an obstacle, it will make a sound.

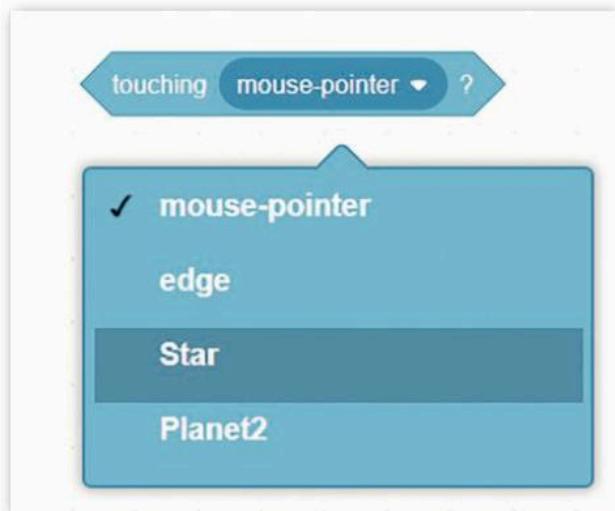
Logical test

In the last unit you learned about using 'if' blocks. An 'if' block begins with a logical test.

You need to test IF the rocketship sprite touches the star. Scratch has a '**Sensing**' **block** that will help. It can tell if the spaceship touches another sprite. This is what you need.

Click on the light blue dot labelled 'Sensing'. You will see the 'Sensing' blocks. Find the 'touching' detector block. Drag it into the rocketship's program.

Click on the drop-down menu. Set it to detect if the spaceship touches the star.



If block

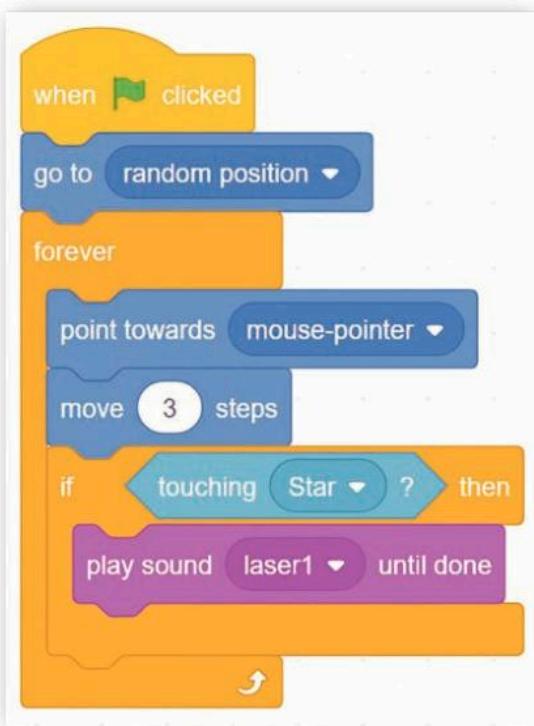
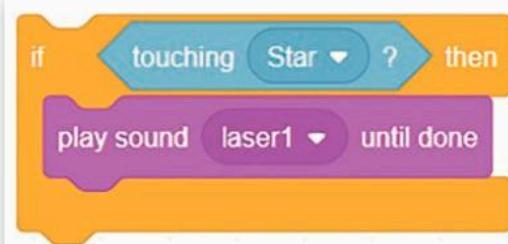
You have made a logical test. Now put the logical test into an 'if' block.

The block has a space in it. Any commands you put inside this space will be carried out if the test is true.

If the test is true, then we want the spaceship to make a noise. Click on the purple 'Sound' blocks.

Drag the 'play sound' block into the script area. Use the drop-down menu to select a suitable sound.

Now you have made a crash detector.



Activity

Make and add the crash detector so that the spaceship makes a sound if it hits the star. Run the program and check that it works. Save the file.



Extra challenge

Create a second crash detector. It will make a sound if the spaceship touches the planet. Put this second block into the forever loop.

Think again

Describe in your own words what a conditional structure is and how you used it in this program.



Digital citizen of the future

Should computer games be used in education? Or do they distract from learning? You might be a parent one day. Will you let your children play computer games?

4.4 Crash points

In this lesson

You will learn:

- how to set and change the value of a variable and display it on the screen.

Program requirement

In this lesson, you will extend the program to meet a new requirement:

The spaceship will have ten ‘crash points’. Every time the spaceship hits an obstacle, it will lose one crash point.

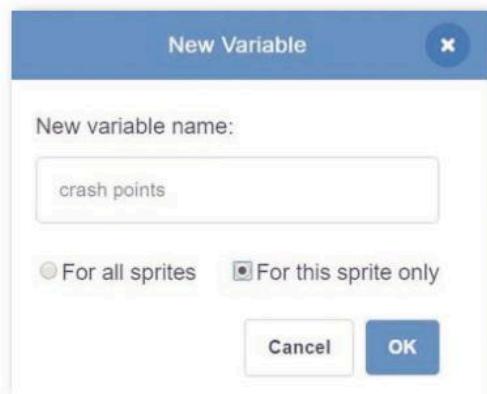
Adding points makes the game more interesting.

Make a variable

A variable stores a value. A variable should have a name that clearly explains what value it holds. In this example we have chosen the name ‘crash points’. You can choose any name you wish.

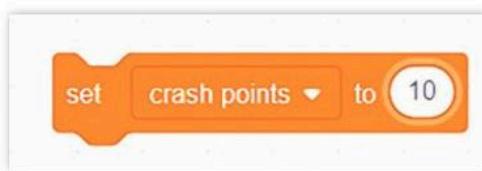
Click on the dark orange dot labelled ‘Variables’ to see the ‘Variable’ blocks. Type the name of the variable in the box.

Only the spaceship has crash points. Select ‘For this sprite only’.



Set starting value

At the start of the game the spaceship has ten crash points. Find the block that says ‘set crash points to 0’. Change the number so it sets crash points to 10.



Put this block into the program at the start of the program. This block should not go inside the forever loop. Why not?

Change variable value

If the spaceship hits a star, the crash points will go down by 1.

Find the block that changes the value of 'crash points' by 1. Change the number to -1.

change crash points ▾ by -1

Put this block into the program. It should go inside the 'if' structure. That is because the points will go down IF the spaceship hits the star.

The game is complete!

You have made a working game that you can play. Try it out for yourself.



Activity

Create a variable to store crash points.

Set the starting value.

Add a block so that 'crash points' goes down by 1 if the spaceship hits the star.

Add another block so that 'crash points' goes down if the spaceship hits the planet.

Play the spaceship game with a friend or family member. Ask them to make suggestions about how to improve the game. Make a list of possible improvements.



Extra challenge

Add an extra command to the program so that:

- if the spaceship hits the star
- it jumps to a random location.

Now add the same command if the spaceship hits the planet.

4.5

Add new program ideas

In this lesson

You will learn:

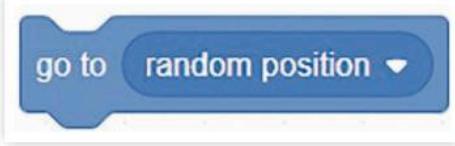
- how to develop new program code to make the game more interesting.

There are lots of activities on this page. You can do as many or as few as you want.

Random jump

Some students played the spaceship game. When the spaceship hit an obstacle, they lost a lot of points. That is because they couldn't move out of the way quickly enough.

This block makes a sprite jump to a new random location.



go to random position ▾

You will use this block to make the spaceship jump IF it hits the star. Where would you put the block into the program to make this happen? Can you make the same change if the spaceship hits the planet?

Get treasure

Change the game so there are two variables.

- **Crash points** go down if the spaceship hits the star.
- **Treasure points** go up if the spaceship hits the planet.

Make a new variable called 'treasure points'.

Find the block which makes 'crash points' go down by 1 if the spaceship hits a planet. Make changes to the block.

- Change 'crash points' to 'treasure points'.
- Change the number -1 to 1.

Run the game and see the difference.



Chase the planet

Find the program that controls the planet. Make changes to the program so the planet is quite small and moves quite fast.

Now when you play the game, it is harder for the spaceship to catch the planet.

Make more stars

You can tell any sprite to make a clone of itself.

A **clone** is an exact copy.

The code goes into the program that controls the star sprite.

This code means the star will make a copy of itself if it gets hit by the spaceship. Attach it to the star program. Soon there will be lots more space obstacles on the screen.



Activity

This lesson showed you extra features you can add to the game. Add one of these features to your game.



Extra challenge

Add more features to your game.

Think again

Describe one feature you have added to the game.

- What blocks did you use?
- What changes did you make to the blocks?
- Where in the program did you put the blocks?

4.6

Design your own game

In this lesson

You will learn:

- how to use fresh images and sounds in a program.

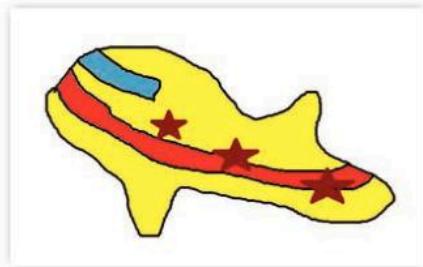
Make a sprite

Lots of sprites are available on the Scratch website.

You can also make your own sprite.

- Use graphics software to make an image.
- Scan a drawing into the computer.
- Take a photo.

Here is a sprite we made. Ours looks like a spaceship. You can use anything you like including people or animals.



Add the sprite to the game

Move the mouse cursor over the New Sprite icon. You will see a menu of choices.

Click on the top choice: 'Upload Sprite'. **Upload** means copy a file from your own computer onto an internet site. You will copy your image file to the Scratch site.

Choose the image file that you made. Your picture will become a sprite on the screen.



Make a backdrop

You can also make a backdrop for the stage. Why not take a photo of your garden or your classroom?

Make sure the picture you choose is saved using a common file type such as jpg.

Then upload it from the backdrop menu.

You have now chosen your own backdrop and sprite. So this game is your unique creation.



Make a sound

You can also change the sounds made by your program.

Click on the 'Sounds' tab at the top of the screen.

You can open the menu shown here.

This menu gives you the chance to record your own sounds. You can do this if you have a microphone attached to the computer. You can also upload sound files in most common file formats.



Activity

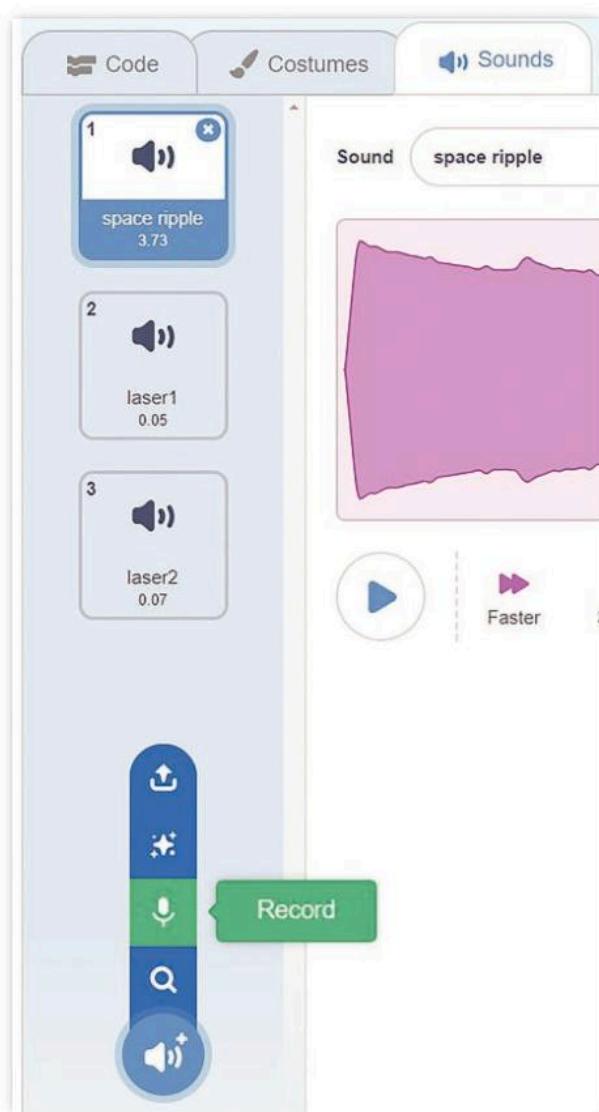
Make a new sprite design and upload it to use in this game.



Extra challenge

Take a photo (or make a picture) and upload it as the background to this game.

Record a new spaceship sound and use it in this game.



Think again

Explain how uploading files lets you change the sounds or images of a game.



Be creative

Make a new game with a different background and sprites. For example, in this game a butterfly dodges dinosaurs. What other ideas can you think of?



Check what you know

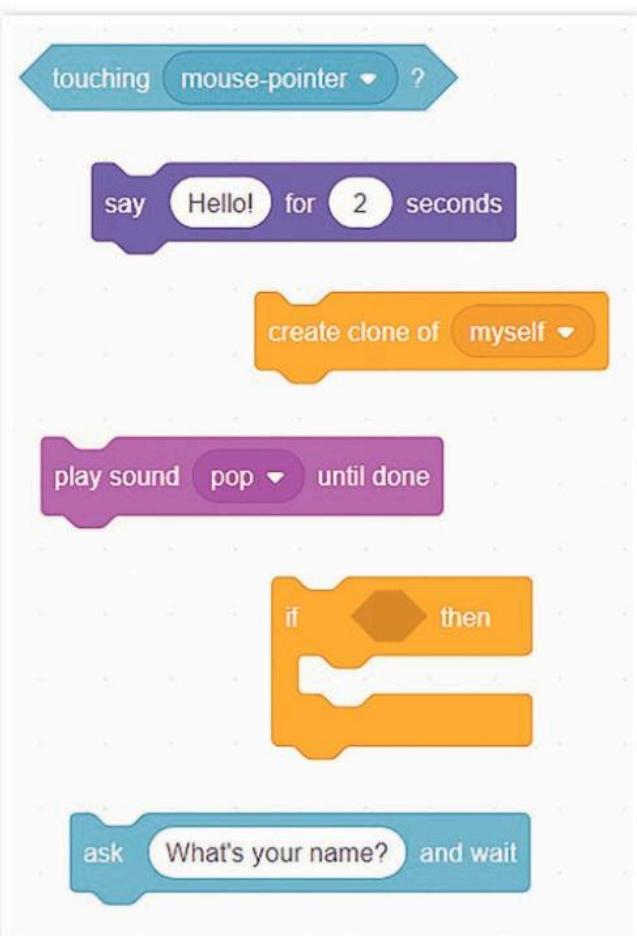
You have learned

- how to make a program to meet a requirement
- how to improve a program by adding extra features
- how to create an interesting user experience with program inputs and outputs.

Test

The answers to the questions are blocks from this selection. Say the block that matches each question.

- 1 Which block would you use if you wanted to get a typed input from the user?
- 2 Which block would you use if you wanted to detect the sprite touching the mouse pointer?
- 3 Which block would you use to make visual output?
- 4 Which block would you use to make sound output?
- 5 Which block would you use to create a conditional structure?
- 6 Which block would you use to make an exact copy of the sprite? (Hint: It's the only block that is left.)

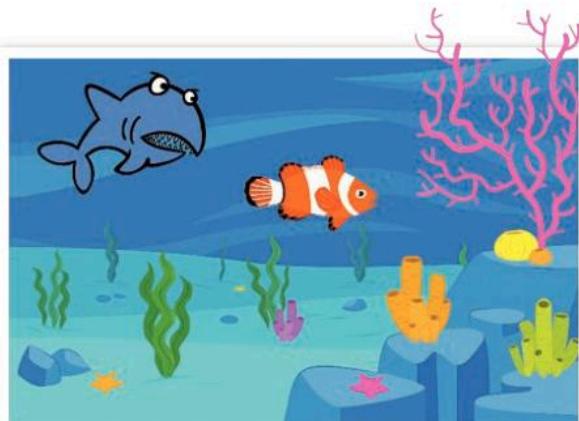




Activities

A student was asked to make a new computer game called Funny Fish. The fish must swim and dodge the shark. Here is a screenshot from the game.

- 1 Download a fish-shaped sprite. Make a program so the user can make the sprite move on screen.
- 2 Add a shark-shaped sprite. Make a program so that the shark moves around the screen on its own.
- 3 Do one or more of these extra activities:
 - Change the program so that if the fish touches the shark it makes a sound.
 - Give the fish 20 points. Take away 1 point every time the fish touches the shark.
 - Draw your own picture of a fish. Use it as the sprite in this program.



Self-evaluation

- I answered test questions 1 and 2.
- I completed activity 1. I have made a program with at least one sprite.
- I answered test questions 1–4.
- I completed activities 1 and 2. I made the Funny Fish program with a fish and a shark.
- I answered all the test questions.
- I completed all the activities. I made the Funny Fish program and did at least one extension activity.

Re-read any parts of the unit you feel unsure about. Try the test and activities again – can you do more this time?

5

Multimedia: Writing and editing a document

You will learn

- how to create a new text document
- how to change the look of a document
- how to add headings and tables of contents to a document
- how to edit a document with others
- how to check spellings within a document.

Across the world, people and businesses rely on written words. Most books and films started life as a blank page in the writer's word processor.

Your word processor can help make your writing easier to read and understand. When your writing is in a document that is easy to read, your readers will pay more attention to your words. Your writing will have more impact.

In this unit you will learn how to format and organise your documents so that they have more impact. You will also learn how you can work together to create documents that you can all be proud of.





Class activity

Working together as a class, talk about a writing project you can do. For example, your project could be a report about a school trip or activity.

When you have agreed on the project, talk about what you should put in the document. Think of some headings and titles that will help make your document easy to understand. Write down your ideas – you will need them throughout the unit.

margin

line break paragraph break

alignment screen reader

assistive technology

bullet list table of contents

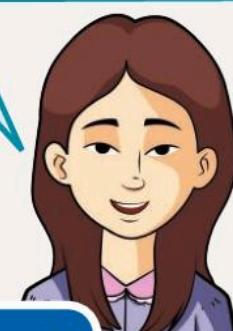
header footer

Track Changes



Talk about...

What documents do you read? Think about books, magazines, web pages and more. Talk about the things that make documents easy to read and understand.



Did you know?

Microsoft Word is the most popular word-processing program. There are around 1.2 billion users of Microsoft Word in the world.

That's a lot of words!

5.1

Setting up a new document

In this lesson

You will learn:

- how to create a text document in a word processor
- how to use page sizes, paragraphs and text alignment to help make your document look good and easy to read.

Spiral back



In Book 2 you learned how to create a document using a word processor. In this unit you will learn more about working with text. You will learn how to make your documents easy to read and understand.

Opening a blank document

When you create a new document, you will see a blank page.

The page size is normally set as A4. The word processor will set the area in which you can type. The edges of this area are called **margins**. A4 is the most common size

The table shows different paper sizes and when to use them.

Size	Measurements	Used for...
A3	297 × 420 mm	Posters, large documents
A4	210 × 297 mm	Letters, reports
A5	148 × 210 mm	Small booklets, flyers

Typing text into your document

The text you type will be added at the position of the cursor. The software will move the cursor to the next line when you reach the right-hand margin. The software will move the cursor to a new page when your text reaches the bottom margin.

If you want to start typing on a new line before you reach the right-hand margin, you can insert a **line break** or a **paragraph break**.

Type of break	Keystroke	What does it do?
Paragraph break	[ENTER]	Moves the cursor to a new line and inserts a gap between the lines
Line break	[SHIFT+ENTER]	Moves the cursor to a new line without a gap

When you are choosing a line or paragraph break, think about how a **screen reader** will use the break when reading the document. (A screen reader is an **assistive technology** that helps blind and partially sighted people.) Make sure your choice helps the reader understand the text.

Choosing how to align your text

You can choose **alignments** to suit your document.

Alignment	Button	Used for...
Left aligned		Body text in a document
Right aligned		Addresses placed on the right side of a letter
Centred		Titles and headings
Justified		Body text when you want a neat and formal look



Activity

Open a blank document and begin typing your text. Use your notes from the class activity to help.

Insert a paragraph break between two parts of the text.

Select one of the paragraphs and change the alignment. Compare it to the other paragraph. Which looks better? Can you explain why?

Save your work.



Extra challenge

If your word processor has a screen reader, use it to read your document aloud. Listen for the pauses. How are they different? Explain how you can use paragraph breaks to help users of screen readers understand your text.

Think again

A screen reader is an assistive technology. Can you think of other assistive technologies?

5.2

Selecting and changing text

In this lesson

You will learn:

- how to select text in your document
- how to change fonts, font sizes and colours
- how important your choices are in making your text readable.

Selecting text

Your word processor allows you to select any part of your text and make changes to it. You can place the cursor anywhere in your text by clicking.

The table shows you how to select different parts of text.

Part of the text	Use the...	Try this...
A word	Mouse/trackpad	Move the pointer to anywhere in the word. Double-click the mouse/trackpad button.
	Keyboard	Place the cursor before the first letter. Press CTRL+SHIFT+RIGHT ARROW.
A line	Mouse/trackpad	Move the pointer to the start of the line. Click the button and drag the mouse to the right until the line is highlighted
	Keyboard	Place the cursor at the beginning of the line. Press SHIFT+DOWN ARROW.
A paragraph	Mouse/trackpad	Move the pointer to anywhere in the paragraph. Click the button three times until the paragraph is highlighted.
	Keyboard	Place the cursor at the beginning of the paragraph. Press CTRL+SHIFT+DOWN ARROW.

Changing fonts and font sizes

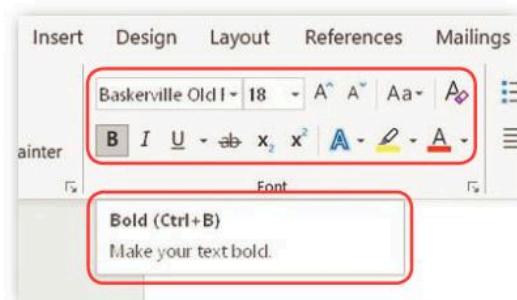
You can change the way the text looks by using the font controls in your word processor. The font controls allow you to change the text in many different ways.

- Select the text you want to change.
- Use the controls to change the font, font size and colour.
- Hover the mouse over a control to see what it does.

When you choose font styles and colours for your document, think about readability. Always try to make your document easy to read.

Look at this picture. The letter has 'serifs', which are small lines at the ends of it. Sans serif fonts don't have any serifs.

The table describes some well-known fonts.



The quick brown fox (Times New Roman)	Serif fonts are easy to read for most people. Use them anywhere in your document.
The quick brown fox (Arial)	Sans serif fonts look more modern. They are also easy to read.
<i>The quick brown fox</i> (Harlow Solid)	Fantasy fonts can be hard to read in small sizes. Use them only in titles or headings.
The quick brown fox (Courier New)	Monospace fonts make your text look like it was written using an old-fashioned typewriter.



Activity

Add a title or heading at the top of your document.

Select your body text and change the font and font size. What works best? Remember: try to make your text readable.

Save your work.

Think again

Think about your favourite clothes, food and drinks brands.

Why do you think they use special fonts on their products?



Extra challenge

Select the title and change the font and font size. Try a few different choices. Which one do you like best? Explain why.

5.3

Adding headings and lists

In this lesson

You will learn:

- how to organise your text using headings, bulleted lists and tables.

Adding sub-headings

In the last lesson, you added a title or heading to the top of your document. You can use other headings in your document to help the reader understand your text and make it easier to read. Headings inside a document are sometimes called sub-headings.

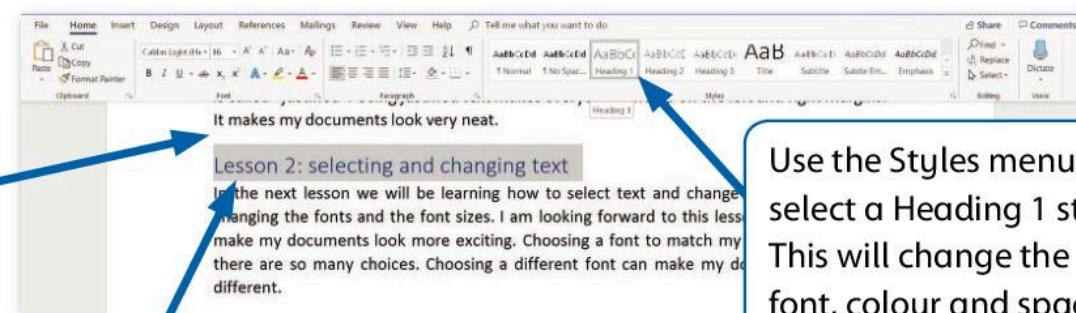
You can use a sub-heading to separate one part of your document from another. A sub-heading is like a signpost on a journey. It tells the reader what comes next. Your reader will also be able to find the text they are looking for more easily.

The table shows some sub-headings you might see in different types of documents.

Document type	Sub-headings you might find...
A story	Foreword, Chapter 1, Chapter 2 ... Epilogue
A business report	Summary, Introduction, Issues, Options, Recommendations, Conclusion
A print or web article	Any sub-headings – but keep the headings short and related to the main subject

Here is how you add a sub-heading to a document.

Add a paragraph break above the text you want to separate with your heading.



On the new line, type your heading.

Use the Styles menu to select a Heading 1 style. This will change the font, colour and spacing of your sub-heading to make it clearer.

Creating lists

Use a list to make important information in your text stand out.

There are two types of lists.

- Use a **bullet list** (like this one) when the items in the list are not in any order or sequence.
- Use a numbered list when the items in the list are in some kind of order.

Here is how you create a bullet list or numbered list.

- 1 Type each line of the list with a paragraph break at the end.
- 2 Select all the lines in the list and click or to create your list.
- 3 Change the style of your bullets or numbers by right-clicking the button and selecting from the options shown.



Activity

Open your saved document. Review your document and decide on two or more sub-headings. Add more text.

Add the sub-headings using the Styles menu.

Add a list to your document – decide on the best list format.

Explain why you chose this format.

Save your work.



Extra challenge

Use the options in the Styles menu and the Paragraph menu to change the look of your headings and lists. Try different bullet styles and number styles. Which styles work best with your document? Explain why.

Think again

Look through this book. Compare it with other books. Can you find different styles of headings and lists? Work in a group to pick out your favourite styles. Explain why you like them.

5.4

Adding headers and contents

In this lesson

You will learn:

- how to help readers find the text they are looking for in longer documents
- how to add headers and footers, page numbers and tables of contents to give your documents a professional look.

Adding headers and footers

The page margins of your document leave a small amount of space at the top and bottom of each page. The space at the top of each page is called a **header**. The space at the bottom of each page is called a **footer**. To add text in the header and footer, double-click in the space. Now you can type.

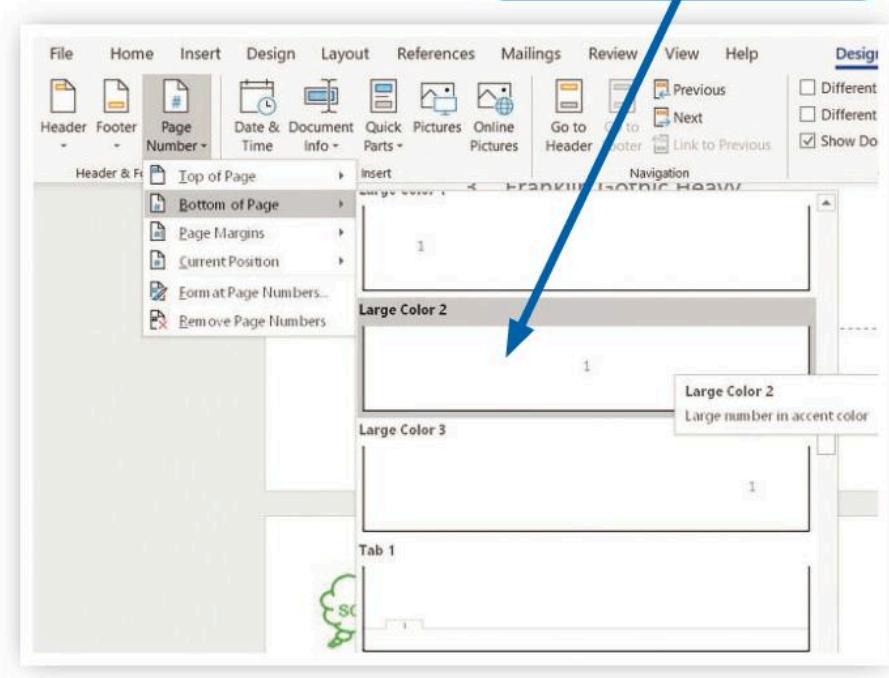
You can use these spaces to add small amounts of text that help the reader. For example, you might add:

- the document title in the header
- a company logo in the header – add a logo using the Insert menu
- page numbers in the footer.

Choose a page number style from the menu.

When you have finished working on your header or footer, double-click on the main page area.

The header and footer text is repeated on every page. Think carefully about what information will help the reader of your document.



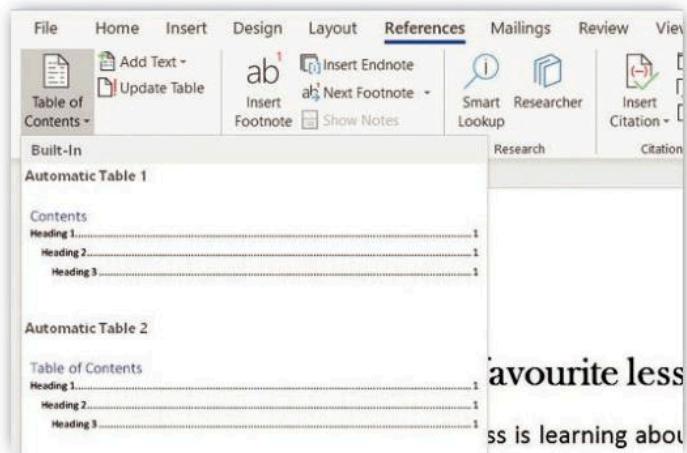
Adding a table of contents

A **table of contents** helps the reader quickly find different parts of a longer document. You will often find a table of contents in:

- school textbooks
- magazines
- business reports.

Here is how to add a table of contents.

- 1 Add some sub-headings using the Styles menu.
- 2 Go to the start of the document, below the main title. Use the References menu to choose a Table of Contents style from the drop-down menu.
- 3 The table will show all the headings you created using the Styles menu. The table will show the page numbers where the headings can be found.



Activity

Open your saved document and review the headings on all pages. Make sure you have at least three headings. Use the Styles menu for headings.

Add a header and footer to your document. Your footer should include the page number.

Add a table of contents. Check that the table shows all the headings you want.

Save your work.



Be creative

Use a drawing program to create a small logo. Save the drawing. Add your logo to the document in the header or footer.

Think again

Look at some books and magazines. Do they all have the same type of information in the header and footer? Why do you think some might be different?



Extra challenge

Move one heading to another page in the document. Your table of contents will now be wrong. Find the Update Table option and correct the table.

5.5

Editing a document

In this lesson

You will learn:

- how to share a document with others so you can edit it together
- how to use the Track Changes and Comments tools.

Editing as a team

In many jobs people share the task of creating documents.

For example, journalists work on stories for newspapers and websites, researchers work together on scientific papers and business people write reports.

Working together like this is called collaborative writing and editing.

You can collaborate with others by sharing your document while you are creating it. You can share your document by email. You can also use a **shared drive** or store it in the **cloud**.

Track changes

When you share a document with someone, you can ask them to make their changes using the **Track Changes** tool. The changes they make will be shown, together with your original text. This is called **mark-up**.

When they return the document to you, you can accept or reject these changes. When you accept a change, the change is made to your document and the mark-up disappears. When you reject a change, no change is made and the mark-up disappears. Often a document can be shared many times until everyone agrees that it is final.



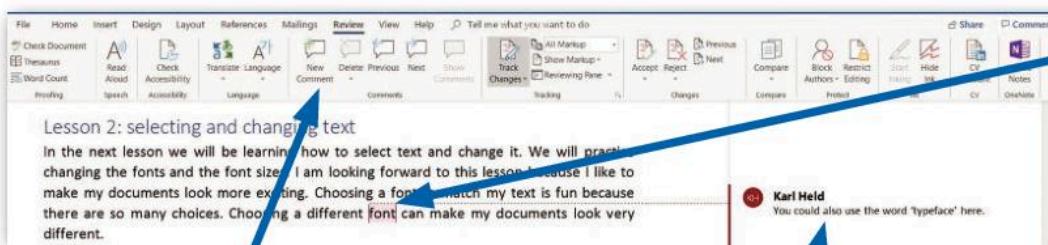
The mark-up text is shown in a different colour.

You can switch the Track Changes tool on and off with this button.

When someone deletes text, a note in the margin tells you.

Comments

You can share thoughts and ideas about the text by using the Comment feature. You can put a comment anywhere in the document by placing the cursor and selecting 'New Comment'. When you add a comment, it is shown in the page margin. The name of the person is also shown.



1 Highlight some text, then click 'New Comment'.

2 Type the comment.

3 This is the text the comment is about. You can select any text to comment on.

When you have finished working on your document, you can delete the comments.



Activity

Share your saved document with a classmate.

Ask your classmate to use Track Changes to make at least three suggested changes to your document.

Ask your classmate to use Comments to make at least one suggestion in the document.

Review your classmate's changes and comments. Decide if you want to accept the changes or reject them. Respond to the comment(s).

Explore more

Ask your parents or teachers about documents they have created collaboratively at work. How did working together help them make better documents?

Extra challenge

Collaborating on documents is not always easy! Do you agree with the changes and comments your classmate suggested? Explain why you agree or disagree.

5.6

Finalising a document

In this lesson

You will learn:

- how to edit documents using Find and Replace
- how to make final checks on your document using a spell checker.

Editing tools

Editing short documents using the mouse and DELETE and BACKSPACE keys can be quick and easy. When you are editing longer documents, it can help to use some of your word processor's editing tools.

Find and Replace

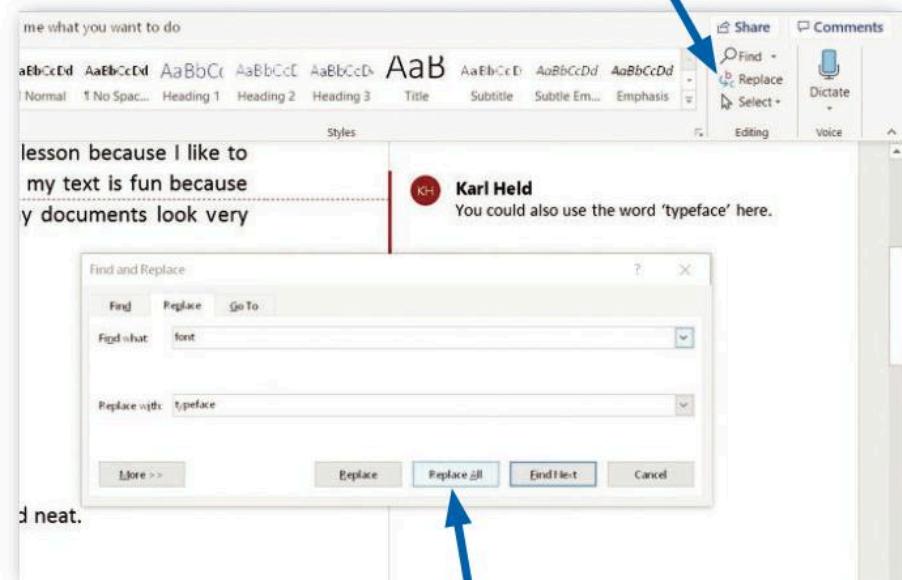
You can use Find to check you have used a word or phrase correctly. The Find tool is in the Editing section on the Home menu. You can also use CTRL+F to open a search box.

Type a word or a part of a word and let the application search for it in the document.

If you know you want to change a word you have used, use the Replace function. This works just like Find but it also replaces the original word with a new one you have chosen.

You can let the application replace the words or you can use 'Find Next' to find each one and decide if you want to replace it with your new word.

1 Click on 'Replace'.



2 Type the word you want to replace and the new word. Click on 'Find Next' or 'Replace All'.

Proofing tools

When you have finished writing and editing your document, you should give it a final check. This is called **proofing**. One of the most important checks is a spell check. Your word processor will normally:

- check your spelling as you type and underline words with spelling mistakes in red
- correct some mistakes automatically, for example when you type 'teh' instead of 'the'

You can do a final spell check of your document using the Check Document tool. This tool will find each mistake and show suggested corrections.



Activity

Review your saved document and choose a word that you can replace. For example, try replacing 'classmate' with 'friend'.

Use Find and Replace to replace the word.

Use the Check Document tool to check your spelling. Make any changes until your document has no spelling mistakes.

Save your work.



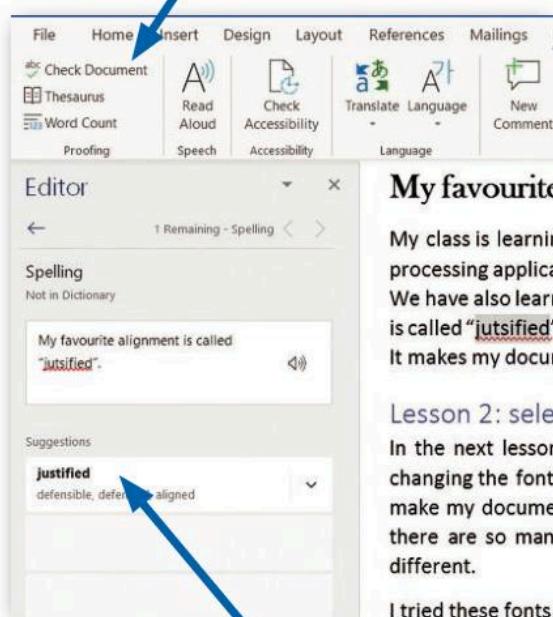
Extra challenge

Explore more functions in the Review menu. Some programs have a Read Aloud function. This helps you check that your document can be read by a screen reader.

Think again

Why is it important to check spellings in documents? Write down three reasons. Compare them with your classmates. Do you all agree?

1 Click on 'Check Document'.



2 Click on the correct suggestion to replace the mistake.

Check what you know

You have learned

- how to create a new text document
- how to change the look of a document
- how to add headings and tables of contents to a document
- how to edit a document with others
- how to check spellings within a document.

Test

- 1 What software have you used to make a document?
- 2 Think of one document you have made this year using a computer. What was the document about? What file name did you use to save the document?
- 3 What type of list is better for items that are in a sequence?
- 4 What information might you add to the footer of a page?
- 5 Give an example of a spelling mistake that might not be spotted by a computer spell check.
- 6 Explain how you can use Track Changes to edit a document with friends.





Activities

Your teacher will give you a text document. Open the document and do the activity.

- 1 Make the title stand out by using a suitable font.
- 2 Use the Find function to find out how many times these words appear in the document:
the
and
school
- 3 Add a footer to the document. Show the page number in the footer.
- 4 Review the document. How can you make it look better and easier to read? Write down your ideas using the Comments function.

Self-evaluation

- I answered test questions 1 and 2.
- I completed activity 1.
- I answered test questions 1–4.
- I completed activities 1–3.
- I answered all the test questions.
- I completed all the activities.

Re-read any parts of the unit you feel unsure about. Try the test and activities again – can you do more this time?

6

Numbers and data: Working with values

You will learn

- how to store number values in a spreadsheet
- how to use spreadsheet functions
- how to create spreadsheet formulas using cell references
- how to make pie charts and bar charts that show number values.



In this unit you are going to use a spreadsheet to calculate percentages and make charts.

A **spreadsheet** is a type of application.

A spreadsheet stores information and works out the answers to sums. A spreadsheet can draw charts for you. Showing data in charts can make them easier to read and understand.



Class activity

As a class, talk about what you want to be when you grow up. Your teacher will write a list of the 10 most popular jobs.

Put a sticker next to the job you like best.

Count how many stickers there are next to each job.

Keep this data safe. You will use the data in the lessons in this unit.

Talk about...

As a class, collect job adverts from newspapers or the internet. Which of these jobs use computer skills?

Talk about your dream job with a friend. How will computers help you to do your dream job?





AutoSum

**bar chart cell cell reference
spreadsheet formula
percentage pie chart
segment sum**

**What job do you
want to do?**



Did you know?

Employers want people with good team and problem-solving skills. They also want computer and number skills. Which of these skills are you learning at school?



6.1

Number values and labels

In this lesson

You will learn:

- what values and labels are
- how to make a spreadsheet by entering values and labels into cells
- how to format a spreadsheet.

Spiral back



Last year, you learned how to create a spreadsheet and use formulae to make calculations. In this unit you will learn more about using your spreadsheet data in other documents.

Cells and cell references

A spreadsheet is a grid of columns and rows. Where a column crosses a row, it makes a **cell**. The **cell reference** is the name of a cell. It is made of the column letter and the row number.

Values and labels

Spreadsheet cells can hold values or labels.

- **Values** are numbers and calculations. Values are displayed on the right of the cell.
- **Labels** are all other content, usually words. Labels are displayed on the left of a cell. If a label is too big it will spill into the cells next to it.

In this lesson you will make a spreadsheet with data about what you and your classmates want to be when they grow up.

This is the list of jobs. Each job label is in a different cell.

How to put data into a spreadsheet

1 Click on a cell.

2 Type your label text.

3 Press the 'Enter' key.

Repeat this to enter all the labels for your spreadsheet.

The screenshot shows a Microsoft Excel spreadsheet titled 'Class survey'. The first row contains the labels 'What do you want to be when you grow up?' and 'Doctor'. The second row contains 'Computer programmer'. The third row contains 'Business person'. The fourth row contains 'Home-maker and parent'. The fifth row contains 'Singer or actor'. The sixth row contains 'Teacher'. The seventh row contains 'Something else'. The 'Font' section of the ribbon shows 'A' selected.

1	Class survey
2	Doctor
3	Computer programmer
4	Business person
5	Home-maker and parent
6	Singer or actor
7	Teacher
8	Something else

The label in cell A1 is the heading for the spreadsheet.

Make your spreadsheet look better

You can:

- make column A wider so it is big enough for all the labels
- format the heading to stand out from the other labels.

1 Click and drag the line between column A and column B to make this column wider.

2 When you move the mouse pointer to the line between columns A and B, it will change to this shape.



What do you want to be when you grow up?	Count
Doctor	4
Computer programmer	2
Business person	7
Home-maker and parent	3
Singer or actor	6
Teacher	5
Something else	6

3 Use text formatting tools to format the cells.

4 Make the heading larger and bolder than the other labels.



Activity

Create a spreadsheet with the list of jobs from your survey. These are your labels.

In the next column enter the number of students who chose each job. These are your values.

Use the text formatting tools to make the spreadsheet look better.

What do you want to be when you grow up?	Count
Doctor	4
Computer programmer	2
Business person	7
Home-maker and parent	3
Singer or actor	6
Teacher	5
Something else	6



Extra challenge

Try using the borders and fill color menus to make your spreadsheet more interesting. Select a range of cells and use the controls in the Font area of the menu ribbon. What colours and border work best? Explain why.

Think again

Look at the top of a spreadsheet screen and then at the top of a word processor screen. Which things are the same? Why are they the same? How does that help you use the software?

6.2

The Sum function

In this lesson

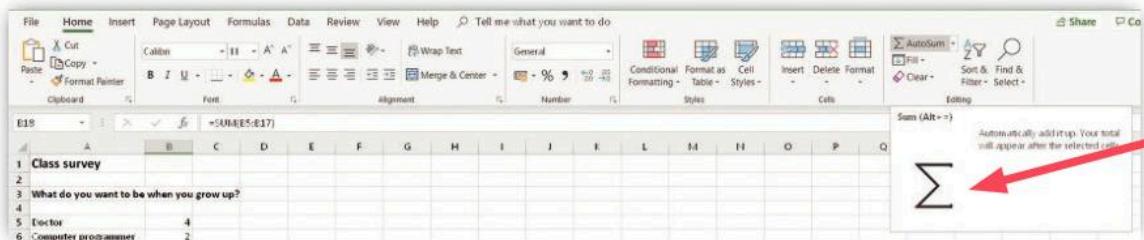
You will learn:

- what a spreadsheet function is
- what 'sum' means
- how to use the Sum function to add up a column of numbers.

What is a spreadsheet function?

We often use the word 'sums' to mean maths calculations. When we are talking about maths or spreadsheets, the word **sum** means to add up a list of numbers. The mathematical symbol for sum is the Greek letter Sigma: Σ

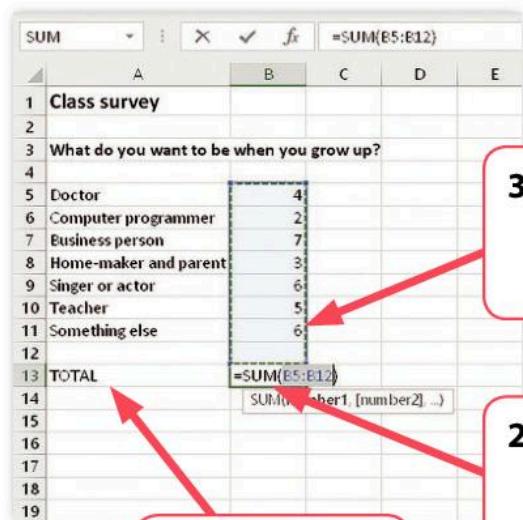
A spreadsheet function is a command that uses values in your spreadsheet to make a new value. Sum is a spreadsheet function.



The **AutoSum** button lets you add a sum to your spreadsheet.

How to use the Sum function

You can use the spreadsheet function 'Sum' to add up the total for your spreadsheet.



3 The application will add together all the numbers in these cells.

1 Add the label 'Total'.

2 Click on the cell where you want the total to appear. Then click the 'AutoSum' button.

B13 : X ✓ f_x =SUM(B5:B12)

	A	B	C	D
1	Class survey			
2				
3	What do you want to be when you grow up?			
4				
5	Doctor	4		
6	Computer programmer	2		
7	Business person	7		
8	Home-maker and parent	3		
9	Singer or actor	6		
10	Teacher	5		
11	Something else	6		
12				
13	TOTAL	33		
14				

You can change the format of these cells to make them stand out. We have used red text.

Here is the spreadsheet function.

When you press 'Enter', the total will appear in this cell.



Activity

Use the Sum function to calculate the total value for your spreadsheet.

Print the spreadsheet.

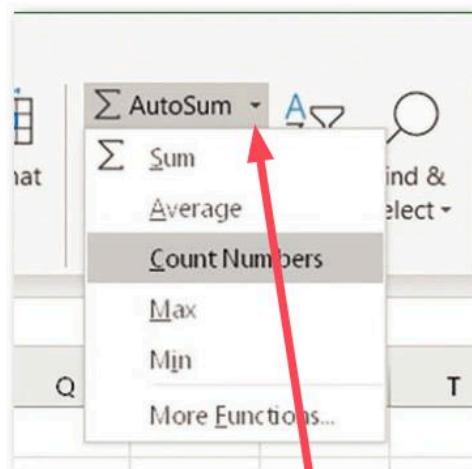
Remember to save your work.



Extra challenge

The 'AutoSum' button lets you add other functions to your spreadsheet. These include average and maximum values.

Try the different functions. What results do you get?



Click on this arrow to see the list of functions.

6.3

A spreadsheet formula

In this lesson

You will learn:

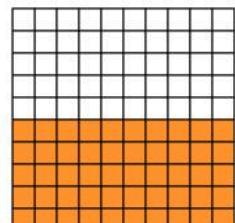
- what a percentage is
- what a spreadsheet formula is and how to make one
- how to use a cell reference in a spreadsheet formula.

In this lesson you will use a **spreadsheet formula** to work out what percentage of students want to be a doctor.

What is a percentage?

A **percentage** shows a fraction as an amount out of 100. You can work out what percentage of a total any value is. You divide the value by the total.

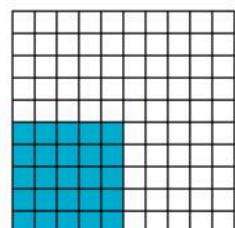
Half of 100 is 50, so 50% means 'one-half'.



What is a spreadsheet formula?

A spreadsheet formula makes the computer carry out a calculation. Every spreadsheet formula begins with an equals sign: =

One quarter of 100 is 25, so 25% means 'one-quarter'.



How to make a spreadsheet formula

This is how to work out the percentage of students who want to be a doctor.

- Start with the number of students who want to be a doctor.
- Divide by the total number of students in the class survey.

To put a value from a cell into a formula, use the cell reference. Click on the cell that holds the value. The value will be added to your formula.

Start the formula

The formula goes into the cell next to the number value. In this example, that is cell C5.

		Home	Insert	Page Layout	Formulas
File	Cut	Insert	Page Layout	Formulas	Font
Paste	Copy				
	Format Painter				
Clipboard					
SUM	X	✓	f _x	=	
	A	B	C	D	
1	Class survey				
2					
3	What do you want to be when you grow up?				
4					
5	Doctor	4	=		
6	Computer programmer	2			
7	Business person	7			
8	Home-maker and parent	3			
9	Singer or actor	6			
10	Teacher	5			
11	Something else	6			
12					
13	TOTAL	33			
14					

Type an equals sign here to start the formula.

Put a cell reference in your formula

After the equals sign you will add a cell reference. In this example, cell B5 holds the number of students who want to be a doctor.

- 1 Click on cell B5.
- 2 The application adds cell reference B5 into the formula.

Operators

Spreadsheet formulas include mathematical symbols called **operators**. They tell the application how to calculate the formula.

The table above shows the most common mathematical symbols.

In this formula you will use the divide symbol.

- 2 Click on the cell with the total number of students. In this example it is cell B13.

B13		C	D	E	F
1	Class survey				
2					
3	What do you want to be when you grow up?				
4					
5	Doctor	4 =B5/E13			
6	Computer programmer	2			
7	Business person	7			
8	Home-maker and parent	3			
9	Singer or actor	6			
10	Teacher	5			
11	Something else	6			
12					
13	TOTAL	33			
14					
15					
16					

+	add
-	subtract
*	multiply
/	divide

- 1 Type the division sign.

- 3 The application adds the cell reference to your formula.

Complete the formula

You have finished the formula. Press 'Enter' to see the result of the formula.

5 Doctor 4 0.12121



Activity

Follow the instructions to make a formula in your spreadsheet. Find out how many students want to do one of the most popular jobs.

Remember to save your work.



Extra challenge

Your formula uses values from two cells. What happens when you move the cell with the 'Total' value? Click on the cell and drag it to an empty cell. Explain what happens.

Think again

What formulas do you use every day? Think about times when you buy or share things. Write down some examples.

6.4 Percentages

In this lesson

You will learn:

- how to format a value as a percentage.

In the last lesson you used a spreadsheet formula. You divided the number of students who want to be a doctor by the total number of students. The result was shown as a decimal. In this lesson, you will change this number to a percentage.

5 Doctor 4 0.12121

↑

This result is a decimal.

Turn a decimal into a percentage

Select the cell that holds the decimal value.

The screenshot shows a Microsoft Excel spreadsheet titled 'Class survey'. The data is organized into columns A through K. Column A lists survey categories, and column B lists the count of students for each category. Column C contains the formula =B5/B13, which calculates the percentage of students wanting to be doctors. The cell C5 displays the result '12%' in bold black font. The Excel ribbon is visible at the top, and the 'Home' tab is selected. The 'Number' group on the ribbon shows a dropdown menu with a percentage symbol (%) highlighted with a red arrow. A second red arrow points from the text 'Now the cell will show the value as a percentage.' to the cell C5.

		A	B	C	D	E	F	G	H	I	J	K
1		Class survey										
2												
3		What do you want to be when you grow up?										
4												
5	Doctor		4	12%								
6	Computer programmer		2									
7	Business person		7									
8	Home-maker and parent		3									
9	Singer or actor		6									
10	Teacher		5									
11	Something else		6									
12												
13	TOTAL		33									
14												

1 Click on the button with the percentage symbol.

2 Now the cell will show the value as a percentage.



Activity

You have learned how to make a formula to divide the number of students who want to be a doctor by the total number of students. You have learned how to format the number as a percentage.

Practise your skills by entering a formula in your own spreadsheet.

- Put an equals sign in the cell where you want your formula.
- Click on the cell that holds the total number of people who want the job named in the row. In the example, this is cell B6.
- Enter the division sign and then click on the cell that holds the total of all people. In the example, this is cell B13.

Format the value as a percentage.

Enter a formula next to every number in your spreadsheet.

Format all the results, so you see percentages.

Save and print your work.

	A	B	C	D
1	Class survey			
2				
3				
4				
5	Doctor	4	12%	
6	Computer programmer	2	=B6/B13	
7	Business person	7		
8	Home-maker and parent	3		
9	Singer or actor	6		
10	Teacher	5		
11	Something else	6		
12				
13	TOTAL	33		
14				
15				

5	Doctor	4	12%
6	Computer programmer	2	6%
7	Business person	7	21%
8	Home-maker and parent	3	9%
9	Singer or actor	6	18%
10	Teacher	5	15%
11	Something else	6	18%



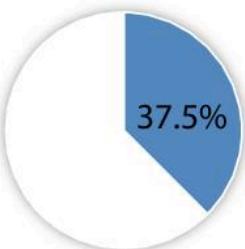
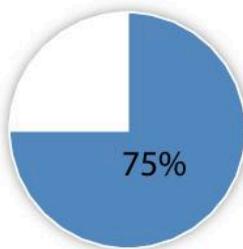
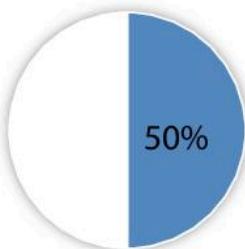
Extra challenge

Change some of the numbers stored in the spreadsheet. You will see that all the percentages change automatically. Explore the effect of changes you make. Explain why you think these automatic changes can help people who work with spreadsheets. What are the possible disadvantages?

Think again

You have learned that a percentage is a different way of writing a fraction. Match the percentages to these fractions:

- | | | |
|---------------|------------------|----------------|
| • one-half | • one-third | • three-fifths |
| • one-quarter | • three-quarters | • one-eighth. |



6.5 Pie charts

In this lesson

You will learn:

- how pie charts can show data as a graphic
- how to make a pie chart from the data in your spreadsheet.

How pie charts show data

A slice of a pie chart stands for a fraction. The bigger the fraction, the bigger the slice. A **pie chart** is split into many slices to show how a total is made up of different values. Each slice is called a **segment**.

Now you will make a pie chart that shows the data in your spreadsheet.

Make a pie chart from your data

Select the data

First, select the data for your chart. You must select:

- the labels that show the different jobs
- the numbers that show how many students chose each job.

Do not select the percentages.

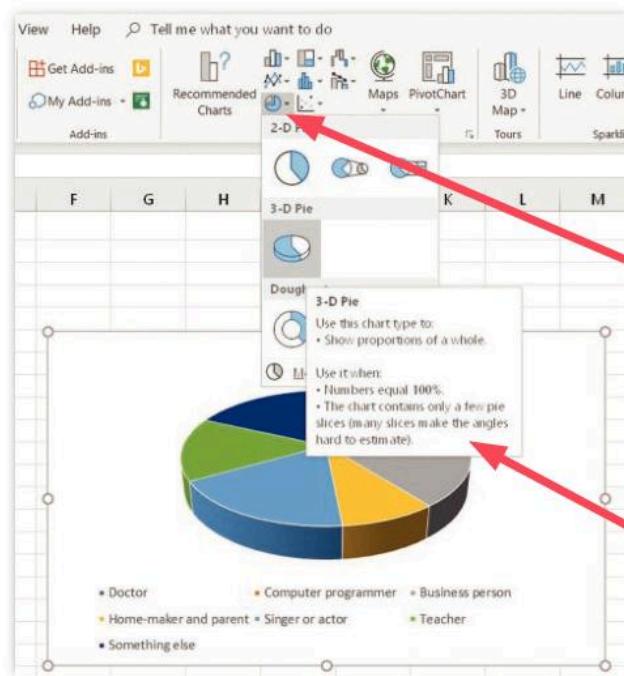
Do not select the total.

Make the pie chart

The tools you need to make a pie chart from this data are on the 'Insert' tab.

	A	B	C
1	Class survey		
2			
3	What do you want to be when you grow up?		
4			
5	Doctor	4	12%
6	Computer programmer	2	6%
7	Business person	7	21%
8	Home-maker and parent	3	9%
9	Singer or actor	6	18%
10	Teacher	5	15%
11	Something else	6	18%
12			
13	TOTAL	33	
14			

Make sure all the cells you need are highlighted.

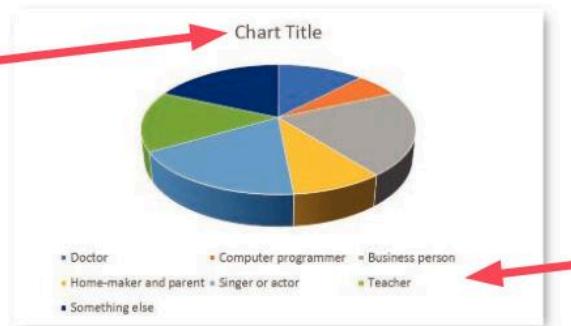




Activity

Follow the instructions to make a pie chart from your spreadsheet data.

Select the 'Chart Title' and type a new title for the chart.



This is the key (or legend). It tells you what the different colours mean.

Try different designs for the pie chart. Use the 'Chart Styles' menu to select different designs. Which looks best? Explain why.



Extra challenge

Explore how you can use the application to change the pie chart design even more. Remember to choose designs that help readers understand your document.

- Try the 'Chart Layouts' tab. Change the way the title, labels and key look.
- Use the 'Quick Layout' button to try other designs.
- Move and resize the chart on your spreadsheet. Where does it look best?

Explain the choices you make.



Be creative

Customise your chart by using the 'Add Chart Element' button. You can change features like titles, labels and legends. For some chart types you can add grid lines and other elements. Your chart should look good, but your data should be easy to understand too.

Think again

Think about what data a pie chart could show about you, your class or your family. Sketch an example. Remember to add a title, labels and a key.

6.6

Bar charts

In this lesson

You will learn:

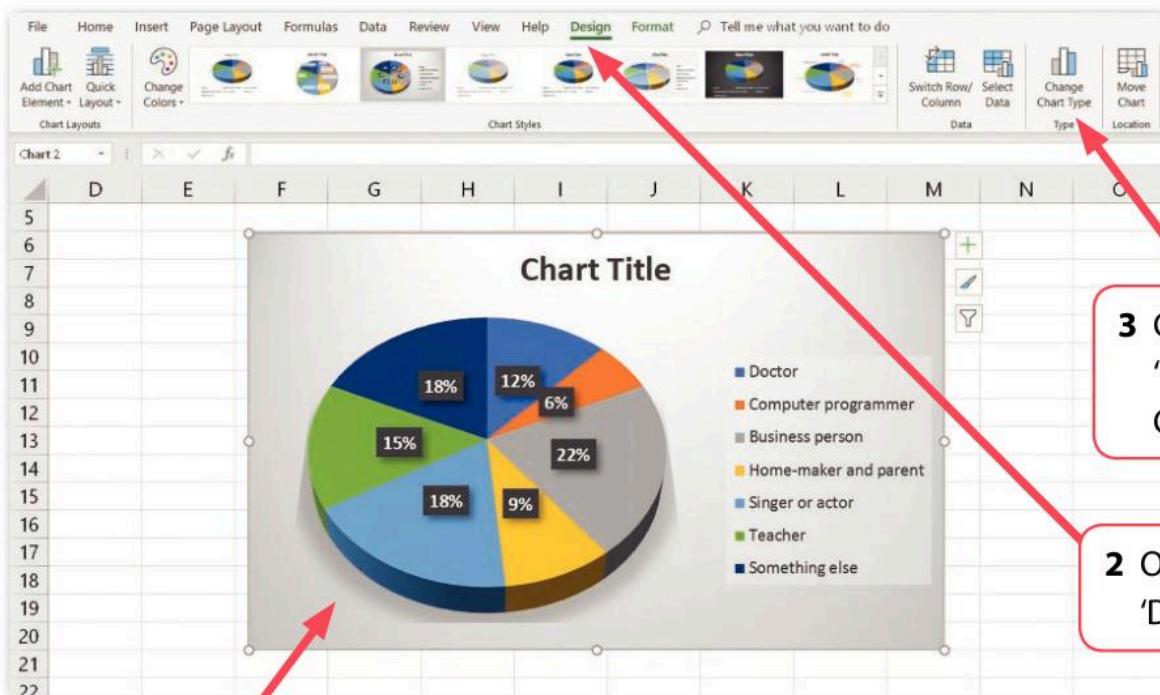
- how you can use a bar chart to show data
- how to make a bar chart
- how to use charts in other documents.

Bar charts

A **bar chart** is a useful way of comparing values. In spreadsheet applications, a bar chart is called a column chart. The bar chart shows different values using bars of different heights. You can use a bar chart to compare different values quickly by eye instead of looking at numbers.

In this lesson you will learn how to turn your pie chart into a bar chart.

How to change the chart type



1 Click on the chart to select it.

2 Open the 'Design' tab.
3 Click on 'Change Chart Type'.

Choose a bar chart and pick a colour scheme

When you click on 'Change Chart Type', a new window opens.

Choose the type of bar chart that you like.

1 Choose 'Column' chart.

2 Choose a style.

3 Click 'OK' to finish.

The 'Design' tab lets you choose a colour scheme.

Copy a chart to another document

Select your chart by clicking on it. Make sure you have selected the whole chart. Copy the chart by right-clicking and choosing 'Copy'. You can also use the keyboard and press CTRL+C.

You can now paste the chart into another document, for example in your word processor or presentation application.



Activity

Change your pie chart to a bar chart.

Try different chart designs and colour schemes. Choose the type of bar chart you like best – explain why.

Save and print your work.

Think again

What kinds of document have data in them? When is it better to use charts than numbers to show your data? Explain why.



Extra challenge

Copy your bar chart.

Open your word processor.

Create a new document and write a short sentence explaining what data your bar chart shows.

Paste your bar chart into the new document.



Digital citizen of the future

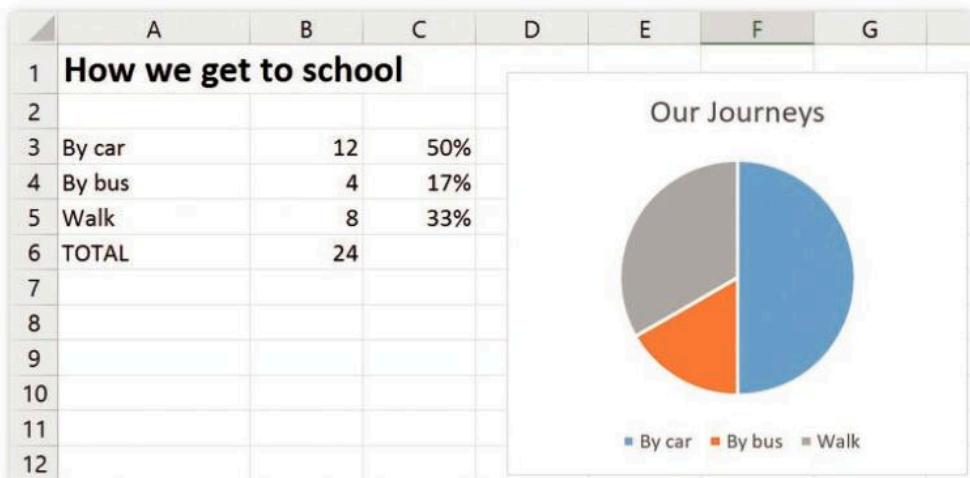
People share data and information more than ever before. They need the skills to make data easily understood across different languages, cultures and businesses. Using charts in documents can help you meet this challenge.

Check what you know

You have learned

- how to store number values in a spreadsheet
- how to use spreadsheet functions
- how to create spreadsheet formulas using cell references
- how to make pie charts and bar charts that show number values.

Test



- 1 Give one number value in this spreadsheet.
- 2 What cell holds this number value?
- 3 How would you work out the value in cell B6?
- 4 What proportion of students come to school by car? Give your answer as a percentage and a fraction.
- 5 Explain what type of chart or graph is shown in this spreadsheet.
- 6 What formulas would you use in cell C5?



Activities

A teacher wants to give students drinks at the school sports day. She asks them what drink they like best. This spreadsheet shows their answers.

- 1 Make this spreadsheet.
- 2 Use a function to add up the total number of students.
- 3 Use formulas to work out the percentage of students who chose each drink.
- 4 Make a chart to show the data.

	A	B
1	Drinks for sports day	
2		
3	Cola	6
4	Orange juice	7
5	Water	3
6	Strawberry milk	8
7	Iced tea	5
8		

Self-evaluation

- I answered test questions 1 and 2.
- I completed activity 1. I made a spreadsheet with words and values.
- I answered test questions 1–4.
- I completed activities 1–3. I made a spreadsheet with functions and formulas.
- I answered all the test questions.
- I completed all the activities.

Re-read any parts of the unit you feel unsure about. Try the test and activities again – can you do more this time?

Glossary

alignment describes how text and images line up on a page.

Alignments can be to the left, right, centre or ‘justified’

assistive technology devices and applications that help users with special needs to use computers. Screen readers, magnifiers and braille printers are examples of assistive technologies

AutoSum a spreadsheet function that automatically adds up the total of all values in a group

backdrop the sprite moves on an area of the screen called the stage. The backdrop is the picture that fills the stage. The sprite or sprites move in front of the backdrop

back-up file a copy of an important file. A back-up file is made so that important information isn’t lost if the original file is lost or damaged

bar chart a type of graph that lets you compare number values. The height of a bar represents the size of a value

bookmark a way to save a link to a web page you like. Your web browser has a button for this. The web browser saves your bookmarks. The list of bookmarks is a list of your favourite sites, so you can quickly find them again

browsing using web links and menus to find information on the world wide web

bullet list a list of things in a document. Each item is shown on a separate line. Each line has a ‘bullet point’ symbol at the start. Bullet lists make short pieces of text easier to read

cell the rectangles that make up the grid of a spreadsheet are called cells. A cell is formed by a row crossing a column

cell reference each cell in a spreadsheet has a name. This is the cell reference. The cell reference is the column letter followed by the row number

clone an exact copy of a sprite

cloud if something is cloud-based, it means you use it over the internet. A common example is cloud-based storage. This means you

store your files on a remote computer. Your files are stored through an internet connection

conditional structure another name for an if structure. It has commands that are only carried out if a logical test is True

data file a file that contains work done on a computer. A data file can contain numbers, text, images, video or audio information

embedded microprocessor a microprocessor that is built into a device. An embedded microprocessor makes a device easier and better to use

flash drive a small portable device that you can use to store files. A flash drive can be used to transfer files from one computer to another. Flash drives are sometimes called memory sticks

flowchart a way of drawing a program plan as a diagram

footer small area at the bottom of a page. A footer often shows the page number

header small area at the top of a page. A header can show the document name, the name of the author or a small logo

if... else like an if structure. It has extra commands that are carried out if the test is False

if structure starts with a logical test. If the test is True then the commands inside the if structure are carried out

input any data or instructions that the user enters into the computer. Input is also the action when we provide input

join operator joins two values together to make an output

key word a word you enter into a search engine. The search engine will find web pages that include the key word

labels text values entered into a spreadsheet cell to provide information. Labels cannot be used in calculations

line break makes a new line in a document. Word-processing software adds a line break when you reach the margin of the page. You can also add a line break yourself

link a place in a document that 'links' to another document. If you click on a link, your computer will open the new document. Links are used to move from one web page to another. A link on a web page can also be called a hyperlink

logical test a test that is either True or False. Logical tests are often made using relational operators

margin an imaginary line at the edge of the printed area of a page

mark-up words and symbols that are added to a document during editing to show corrections, comments or instructions

media all types of digital content – this can include images, sounds and video

menu in the world wide web, a menu is a list of sections on a website. Clicking on a section name in a menu opens that section in your browser

microprocessor a tiny component in a computer; the brain of the computer

multimedia where several media types are used together to communicate a single idea. Multimedia is used on web pages, in games programs and on presentation slides

network a group of computers that are connected. Computers in a network can communicate with each other to share data files, messages and software. The internet is an example of a network

network storage a device on a computer network that a user can use to store their files

operator changes or transforms values. For example, the symbols used in maths are operators. In Scratch, the operators are green blocks

output values or messages that come out of a program. They could be words on the screen or sounds

paragraph break similar to a line break, but it adds a gap between lines

percentage (percent for short) a way of expressing a fractional value as a number ‘out of a hundred’. For example, one half is fifty percent

pie chart a type of chart which compares the shares of a whole by dividing a circle into slices. A large share is shown as a large slice

privacy levels settings in social media sites (like Facebook) that allow you to choose who sees your information

program plan sets out the steps that will produce the program requirement. It usually sets out inputs, processes and outputs

proofing short for 'proofreading'. Proofing means to check a document for spelling, grammar and design mistakes. Usually, a document is proofread just before it is printed or shared

relational operator compares two values. The comparison is either True or False

requirement says what a program is expected to do. Before you start work on a program, you must know the requirement

robot a machine with a processor that controls its movements. It can move on its own without a human operator

screen reader an assistive technology that reads the text on a screen aloud. It is often used by people who are blind or partially sighted

search engine software on a website. You can enter search terms into a search box. The software finds web pages that match your search

segment a slice of a pie chart may be called a segment

sensing block a light blue block used in Scratch that 'senses' input to the program. Examples of sensing blocks include questions that the user can answer, and sensing if two sprites collide

sensors input devices that 'sense' the environment and send the data to the computer. Examples include temperature sensors and touch sensors

shared drive a storage area that is linked to more than one computer. A file in this area can be opened by more than one person. This is called file sharing

smart device a device that has an embedded microprocessor and which connects to the internet

spreadsheet computer software that can store data in cells. Spreadsheets can use formulas and functions to sort and change data. They can also make calculations using the data and show the results as charts

spreadsheet formula instructs the computer to carry out a calculation. The result is shown in the spreadsheet cell

sprite a small image that can move on the screen. Your program controls the sprite

storage drive a component of a computer that is used to store data files

sum the result of adding a group of number values together to give a total

table of contents a list of headings in a document. Each heading has a page number next to it. It helps readers find parts of the document quickly

Track Changes a word processor function that helps people collaborate when writing and editing a document. Track Changes shows what changes have been made to the document and by whom

trusted adult an adult that you can talk to if you see something upsetting or feel threatened when using the internet. A trusted adult may be one of your teachers or a family member

upload if you upload a file, the file is copied from your computer to an internet site

values in spreadsheet software, 'values' means numbers and numerical expressions

variable stores a value. The programmer gives the variable a name. If they put the name of the variable into the program, the computer uses the stored value

web browser software on your computer. A web browser is used to read web pages on the world wide web

web link a link from one web page to another web page. Web links are also called hyperlinks

web page a document that is made with HTML. The HTML comes down an internet connection to your computer. You see the web page in your browser

website a collection of web pages. A website is owned by an organisation or individual. Websites usually contain web pages about a subject or topic

world wide web made of all the web pages in the world. They are connected through the internet

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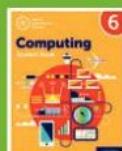
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