Progression in Computing: Overview

Computing Progression: Understanding the EYFS to KS1 progression

Organisation of knowledge	Safe, effective and competent use of technology Personal use, devices, safety	Computer science and coding Algorithms, programming	Using information effectively Personal information, software/application knowledge
Relevant ELG			
KS1 readiness objective	- Awareness of different technologies in and out of school - Awareness of the cause and effect of technology - Awareness of digital storage of information- photography, digital writing and research information - Awareness of input and outputs of devices - Can use technology to express creatively and constructively	- Awareness of the cause and effect of technology - Awareness of digital storage of information- photography, digital writing and research information - Awareness of input and outputs of devices - Can use technology to express creatively and constructively	- Awareness of different technologies in and out of school - Awareness of the cause and effect of technology - Awareness of digital storage of information- photography, digital writing and research information - Awareness of input and outputs of devices - Can use technology to express creatively and constructively

Computing Progression: National Curriculum Programme of Study

Purpose of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims of the National Curriculum

The national curriculum for computing aims to ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology.

Attainment targets

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.
Schools are not required by law to teach the example content in [square brackets].

Computing Progression: Subject Content in KS1 and KS2

Key Stage 1

Pupils should be taught to:

- understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- create and debug simple programs
- use logical reasoning to predict the behaviour of simple programs
- use technology purposefully to create, organise, store, manipulate and retrieve digital content
- recognise common uses of information technology beyond school
- use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.

Key Stage 2

Pupils should be taught to:

- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration
- use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

Computing Progression: E-Safety and Digital Citizenship

		EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
E-Safety and Digital Citizenship	Knowledge	- Trusted adults are people I know well and keep me safe. - Describe what I would do if I saw something online that made me sad, scared or worried.	- A password is a secret word or phrase that allows a user to access a website. Passwords are like toothbrushes – they should not be shared with anybody else.	- There may be people online who could make someone feel sad, embarrassed or upset. - Personal information can include my name, birthday, address, or school	- Digital consent is about asking, seeking and receiving permission online - Know positive and negative effects of technology (including screen time)	- Online scams can include free trial offers, suspicious emails or bogus pop-ups. - Information about anyone online can be search for, copied or shared by others.	- Playful joking and teasing (including **'banter'**) might be experienced by others as bullying. - Helpline services include Childline or The Mix.	- Strategies to limit the impact of technology on health (e.g. **night-shift mode**, regular breaks, correct posture, sleep, diet and exercise - Online content sometimes targets people to gain money or information illegally
	Skills	- Tell an adult when something worrying or unexpected happens while I am using the Internet. - Talk about the amount of time I spend using a computer / tablet / game device - Offer examples of how people communicate using technology.	- Identify rules around e safety and know who to tell if something concerns them online. - To keep a **password** safe. - I know who to **tell** if I see something online that upsets me. - I can explain why it is important to **log out** after using a computer.	- Identify **personal information** that should be kept private. - I can **communicate safely**, respecting and considering other people's feeling when online. - To know how to get help if I am being **bullied**. - To open and send an **email** using 2Respond. - To understand how work can be shared electronically.	- Know to tell a trusted adult and **report** anything that worries them - Know the meaning of **age restriction** symbols on media. - I can identify **appropriate behaviour** when participating or contributing to collaborative online projects for learning. - Identify **false information** in a variety of contexts (including pop-ups)	- Recognise **content** that incites violence or unacceptable behaviour - Recognise **fake websites** and scam emails (fact vs fiction) - To understand what malware is. - I can explain what an **online reputation** is. - Identify what they can do to be **kind** online, e.g. 'THINK' before posting anything online (True, Helpful, Inspiring, Necessary, Kind). - Sort acceptable and **unacceptable online behaviour**.	- Explain why it's important to keep **personal information** private online. - Understand what **cookies** do and what information people share. - Know the importance of creating **strong passwords**. - Explain what it means to have a **positive digital footprint**. - Identify **sources of support** - Identify how people put themselves at risk of breaking the law (conduct)	- Explain how communication with others can be unsafe (including knowing about **fake profiles**) - Identify techniques companies use to **persuade** people to buy things. - Explain risks of watching live **(streamed) videos** - Explain things someone can do to build a **positive digital footprint**. - Describe **strategies** they can use to respond to hurtful online behaviour (including how to calm online arguments).
	Vocabulary	Trusted adults Search Unkind Online Device Safe Healthy Stranger	Username Password Avatar Log out Uncomfortable Report	Personal information Sharing Email Search Communicate Bully	Posting Sharing Commenting Pop ups Website PEGI rating Healthy screen time Consent	Internet Computer virus Scam Phishing Identity theft Spam Web page Online reputation Spoof website Real/fake	Positive/Negative Privacy Settings Personal boundaries Bullying/banter Bystander/upstander Harassment/block Digital footprint Plagiarism Copyright	Reliability Genuine Honest Fraud Unreliable Firewall Spoof website PEGI rating Screen time

Computing Progression: Programming

		EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Programming	Knowledge	-	- Recall words that can be enacted. - Know how to match commands to outcomes - A program is a set of commands that a computer can run.	- Recall that a series of commands can be issued, before they are enacted. - Use logical reasoning to predict the outcome of a program.	- Explain what a sequence is. - Identify that the sequence of a program is a process. - The order of commands can affect a program's output. - Different sequences can achieve the same output.	- To know everyday tasks that include repetition as part of a sequence (brushing teeth, dance moves). - There are indefinite loops and count controlled loops.	- Explain that a condition can be true or false. - Explain that a condition-controlled loop will stop when a condition is met. - Explain that selection - can be used to branch - the flow of a program	- To define a 'variable' as - something that is changeable. - To identify examples of - information that is variable, for example, a - football score during a match - Variables can hold numbers or letters.
	Skills	- Make choices about the buttons and icons they press, touch or click on. - Input simple instructions to technological toys, including floor robots and onscreen sprites.	**Predicting and controlling** - Write and test simple programs (using simple arrows or directions) - Combine commands in a program. - Read a simple algorithm and predict what will happen - Create algorithms for more than one sprite. - Use blocks that have numbers (values)	**Algorithms and debugging** - Identify mistakes in an algorithm - Fix algorithms that contain bugs (debugging) - Show the difference in outcomes between two sequences that consist of the same commands - Recognise common uses of ICT beyond school.	**Sequencing** - I can detect and correct errors in algorithms and programs (debug) - Combine commands in a program. - Order commands in a sequence. - Create programs to control physical systems.	**Repetition - Games** - To plan a program that includes appropriate loops to produce a given outcome. - Use loops to produce a given outcome. - Create two or more sequences that run at the same time. - Reuse existing code on different sprites - Analyse and tackle problems by decomposing into smaller parts.	**Selection - Quizzes** - To use a condition in an 'if...then...else...' statement to produce given outcomes - To create a condition-controlled loop - Test, refine and predict the outcome of a set of commands - Use logical thinking, imagination and creativity to extend a program.	**Variables - Games** - To identify a variable in an existing program - Design and program my own game that includes variables (score and/or timer) - Decide when in a program to set a variable. - To use an event in a program to update a variable - Use different inputs and outputs (including sensors and motors) to control a device or onscreen action and predict what will happen.
	Vocabulary	Vocab relating to directions (e.g. forwards, turn) Button Run/Go -	Command Outcome Program Sequence Sprite	Algorithm Design/Test/Debug Outcome Predict Reasoning Decomposition	Sequence Costumes Multiple backdrops Events Pen extension	Repetition Indefinite loop Count control loop Repeated patterns Code snippets Procedure	Sparkle Crumble Condition Selection If...then...statement Algorithm	Variable Abstraction Micro:bit Controllable device Navigational device Emulator

Computing Progression: Digital Audience (Writing, Animating and Video)

		EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Digital Audience (Writing, Animation and Video)	Knowledge	Recognise computers can be used to create art Use age-appropriate software to create images and record sounds and videos.	- Create a picture using freehand tools - Compare painting using a computer with painting using brushes - To explain differences between writing and typing.	- Identify that computers can be used to play sounds of different instruments - Compare playing music on instruments with making music on a computer	- Explain that an animation is made up of a sequence of images. - Recognise that smaller movements create smoother movements. - A project must be exported so it can be shared.	- Changing the appearance of the font can help make things easier to read and highlight important parts of the text. - A format is the way in which something is arranged or set out - Consider the benefits of using a DTP application	- Explain the purpose of a storyboard - Identify that videos can be edited on a recording device or on a computer - Recognise projects need to be exported to be shared	- Understand the key features of a blog. - Understand that the way in which information is presented has an impact upon the audience - Understand the approval process that their posts go through and be awaren of the issues surrounding inappropriate posts
	Skills		- To use letter, number and space keys - To use 'undo' to remove changes - To make changes to a text on a computer. - To sit correctly at a keyboard. - Paint a picture using different brush sizes and colours	- Use a computer to experiment with pitch and duration - Experiment with musical patterns on a computer - Use a computer to play the same music in different ways (e.g. tempo) - Create music for a purpose. - Evaluate a musical composition created on a computer	- **Animation** - Plan an animation using a storyboard. - Use the onion skinning tool to review subject position. - Add media to enhance an animation - Review a completed animation.	- **Desktop Publishing** - To explore how font size and style can effect the impact of a text (e.g. magazine cover or poster) - To insert, rotate and resize images on my page. - Check spellings with a spell checker. - Create a template for a particular purpose. - To match a layout to a purpose	- **Video Editing** - Use different camera - angles - Use pan, tilt and zoom - Determine what - scenes will convey your - idea - Choose to reshoot a - scene or improve later - through editing - Use split, trim and - crop to edit a video	- **Blogging** - Create a blog or blog post with a specific purpose. - Post comments and blog posts to an existing class blog. - Create hyperlinks to other blogs or online sites with similar content. - Assess the effectiveness and impact of a blog
	Vocabulary	tools type left-click drag icon cursor	Bmp instrument soundtrack tempo/volume record/play keys return Spacebar right-cl	duration composition font italic bold	animation flipbook frame onion skinning stop motion	control bar loop sound library pitch/volume/tempo animation Frame	Audio, video, photo camera Angle filming techniques reshooting clips importing and editing exporting	hyperlink audience blog blog page collaborative icon

Computing Progression: Computing Systems and Networks

		EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Computing Systems and Networks	Knowledge	- Explore how to use different computing hardware. - Use age-appropriate software independently. - Talk about things that people do on digital devices, such as playing games, communicating with others and watching online videos. - Navigate to find digital content, in digital folders and online, with supervision. - Recognise that digital work can be saved, shared and accessed from other devices	- Explain how examples of technology help us - Recognise that choices are text made when using technology	- Recognise different types of computers used in school - Explain how information - technology benefits us	- Describe what an input, process and output is. - Identify how changing the processes affects the outputs. - Recognise that a network is made up of a number of components. - Suggest differences between using digital and non-digital tools	- Explain that the global interconnection of networks is the internet - Recognise that the World Wide Web is part of the Internet. - Describe the types of content that can be added, created and shared on the World Wide Web. - Explain the benefits of the World Wide Web.	- Recognise that a system is a set of interconnected parts which work together. - Recognise inputs, processes, and outputs in large IT systems - Describe the role of a particular IT system in their lives - Explain the role of web crawlers in creating an index - Explain that ranking orders search results to make them more useful	- Recognise that connections - between computers allow access to shared stored files. - Explain that data is transferred in packets - Recognise computers connected to the internet allow people in different places to work together.
	Skills		- Identify the main parts of a computer - Use a keyboard to type. - Use a keyboard to edit text. - Use a mouse in different ways.	- Identify information technology in school - Show how to use information technology safely - Sort IT by what it is used for - Use IT for different types of activities - Identify the basic parts of a search engine page	- Classify input and output devices - Explain how a computer network can be used to share information. - Demonstrate how information can be passed between devices - To identify the role of a switch, server and wireless access point in a network.		- Describe the input and output of a search engine - Demonstrate that different search terms produce different results - Evaluate the results of search terms	- Outline methods of communicating and collaborating using the internet - Choose methods of internet communication and collaboration for given purposes - Evaluate different methods of online communication and collaboration
	Vocabulary	save print printer laptop/tablet keys shut down	keyboard/monitor/ mouse device scanner speaker Internet videos, images, text	USB flashdrive chip and pin card reader traffic light crossing signal barcode/scanner search engine search bar	input process output wires Wifi mobile networks switch/network server/client	Internet network switch wireless access point (WAP) World Wide Web web page download hyperlink	digital system sensor/timer sponsored results search engine web crawlers	sender packet IP address

Computing Progression: Data Handling and Spreadsheets

		EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Data Handling and Spreadsheets	Knowledge	-	- Identify that objects can be counted - Recognise that information can be presented in different ways - Suggest appropriate headings for tally charts and pictograms	- Copying and pasting saves you entering the same information many times if you want to repeat things in different cells. - Spreadsheets can help work out costs (e.g. planning a shopping list)	- Identify attributes that you - can ask yes/no questions - about - Explain that a branching - database is an identification - tool - Suggest real-world - applications for branching - databases	- Describe cell location on a spreadsheet - Know columns run vertically, rows run horizontally. - Identify data that can be logged over time and data that can be discrete.	- Explain that tools can be - used to select data to answer - questions - Outline how 'AND' and 'OR' can be used to refine data selection - Explain that computer - programs can be used to - compare data visually	- Explain what an item of data is in a spreadsheet - Explain that formulas can be used to produce calculated data - Recognise that a cell's value automatically updates when the value in a linked cell is - changed
	Skills		**Grouping Data** - Collect simple data - Group objects to answer questions - Show I can enter data onto a computer - Use a computer to view data in different formats use a computer to answer comparison questions (graphs, tables)	**Spreadsheets** - To save and open sheets. - To use operators in a spreadsheet to calculate two numbers. - To use 2Calculate control tools: lock, move cell, speak and count - To add the count tool to count items - Use copying, cutting, pasting and totalling tools.	**Branching Databases** - To create questions with yes/no answers - To choose questions that will divide objects into evenly sized subgroups - To identify an object using a branching database - To retrieve information from different levels of the branching database - Create a branching database of the children's choice	**Spreadsheets** - Create a table of data on a spreadsheet - Combine tools to make spreadsheet activities such as timed times table tests. - Add a formula to a cell to automatically make a calculation in that cell. - Use the number formatting tools within 2Calculate to appropriately format numbers.	**Databases** - Ask questions that need more than one attribute to answer - Choose multiple criteria to search data to answer a given question (AND and OR) - Use complex searches to find answers to questions e.g. (AND, OR < >) - Contribute to a class database. - Choose suitable ways to present information to other people	**Spreadsheets** - Calculate data using a formula for each operation - Use functions to create new data - Use existing cells within a formula - Use a spreadsheet to plan how to spend and save money
	Vocabulary		spreadsheet cursor arrow key clipart count tool sort criteria	backspace key delete key cells rows columns	data bar graph cell reference move cell tool branching database question	line graph formula increase size data logging data point intervals collection	formula wizard average copy and paste shortcuts (ctrl + c) (ctrl + p) database record field sort, group, arrange	modelling simulation budgeting field record chart presentation expedia/flights

What will our pupils go on to learn?

Computing Progression: Programme of Study KS3 and KS4

Purpose of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims of the National Curriculum

The national curriculum for computing aims to ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology.

Attainment targets

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.
Schools are not required by law to teach the example content in [square brackets].

Computing Progression: Subject Content KS3

Key stage 3

Pupils should be taught to:

- design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems
- understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem
- use two or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions
- understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal]
- understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems
- understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits
- undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users
- create, re-use, revise and re-purpose digital artefacts for a given audience, with attention to trustworthiness, design and usability
- understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct and know how to report concerns.

Computing Progression: Subject Content KS4

Key stage 4

All pupils must have the opportunity to study aspects of information technology and computer science at sufficient depth to allow them to progress to higher levels of study or to a professional career.

All pupils should be taught to:

- develop their capability, creativity and knowledge in computer science, digital media and information technology
- develop and apply their analytic, problem-solving, design, and computational thinking skills
- understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to identify and report a range of concerns.