Strands of Computing (see also Appendix 1)

Computer Science	Information Technology	Digital Literacy	E-Safety

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
- recognise common uses of information technology beyond school
- use technology purposefully to create, organise, store, manipulate and retrieve digital content
- 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:

- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- 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

EYFS - NURSERY AND RECEPTION

EYFS	Autumn	Spring	Summer
Nursery	● Knows how to operate simple equipment, e.g. turns on CD player, uses a remote control, can navigate touch-capable technology with support ● Shows an interest in technological toys with knobs or pulleys, real objects such as cameras, and touchscreen devices such as mobile phones and tablets ● Shows skill in making toys work by pressing parts or lifting flaps to achieve effects such as sound, movements or new images ● Knows that information can be retrieved from digital devices and the internet ● Plays with a range of materials to learn cause and effect, for example, makes a string puppet using dowels and string to suspend the puppet		
Reception	● Completes a simple program on electronic devices ● Uses ICT hardware to interact with age appropriate computer software ● Can create content such as a video recording, stories, and/or draw a picture on screen ● Develops digital literacy skills by being able to access, understand and interact with a range of technologies ● Can use the internet with adult supervision to find and retrieve information of interest to them		
Statutory ELG: **None**	Children require access to a range of technologies, both digital and non-digital in their early lives. Exploring with different technologies through play provides opportunities to develop skills that children will go on to develop in their lifetimes. Investigations, scientific inquiry and exploration are essential components of learning about and with technology both digitally and in the natural world. Through technology children have additional opportunities to learn across all areas in both formal and informal ways. Technologies should be seen as tools to learn both from and with, in order to integrate technology effectively within early years practice.		
Vocabulary			

YEAR 1

YEAR 1	Autumn	Spring	Summer
Vocabulary	algorithm, bug, computer, debug, input, logical reasoning, output, program, robot. abstraction, algorithm, audio, decomposition, edit, frame, narration, pattern, story board, video camera	analogue, bitmap, digital, effect, layer, pixel, stylus, transform, undo, zoom audio, clipart, creative commons, eBook, filter, font, images, multimedia, safe search, speech synthesis, voice dictation	audio, digital, message, microphone, MIDI, piano roll, repetition, sample, sequencer, speaker, sprite, track, virtual database, dataset, field, filter, form, leaf, record, sort, table, tree
N.C. Coverage	**1.1 We are treasure hunters** That a programmable robot can be controlled by inputting a sequence of instructions. To develop and record sequences of instructions as an algorithm. To program a robot to follow their algorithm. To predict how their programs will work. To debug programs. **1.4 We are publishers** Plan a small multimedia eBook. Choose and import images. Record audio commentary. Add and format titles and other text. Think carefully about protecting their privacy. Respect other people's copyright. Revise and improve their work.	**1.3 We are digital artists** To select and set brushes and colours. To create artwork in a range of styles on iPads. To use the undo function if they make mistakes and to encourage experimentation. To use multiple layers in their art. To transform layers. To paint on top of photographs **1.2 We are TV chefs** Break down a process into simple, clear steps (an algorithm). Use different features of a video camera. Use a video camera to capture moving images. Record a video using ground rules for filming. Edit a video to include an audio commentary. Develop collaboration skills. Discuss their work and think about how it could be improved.	**1.5 We are rhythmic** Record audio on a digital device. Program sprites to playback recorded audio in ScratchJr Program ScratchJr to create repeating rhythms. Explore different effects that can be applied to audio. Create a repeating percussion pattern using a virtual drum machine. Experiment with a range of virtual instruments. **1.6 We are detectives** How data can be structured as records and fields for information. How data can be organised into groups and subgroups. How data can be structured as a tree. How data can be organised into a table. How data in a table can be filtered and searched.

YEAR 2

YEAR 2	Autumn	Spring	Summer
Vocabulary	abstraction, algorithm, bug, code, debug, event, input, output, parallel processing, program, repetition, scratch, sprite Bing, creative commons, DuckDuckGo, filter, Google, Google custom search, mind map, presentation, safe search, search engine, Wikipedia	animation, background, character, flipbook animation, frame, media assets, onion-skinning, prop, soundtrack, stage, stop-motion, storyboard adjustment, camera roll, colour value, crop, filter, iCloud, JPEG, pixel, rule of thirds, sensor	abstraction, algorithm, computational thinking, input, output, parallel processing, pattern recognition, remix, repetition, Scratch, source code, sprite binary, binary tree, branching database, classification key, data, database, geolocation data, Global Position System (GPS), pixels, tally charts
N.C. Coverage	**2.1 - We are Astronauts** Plan a sequence of instructions to move sprites in ScratchJr. Create, test and debug programs for sprites in ScratchJr. Work with input and output in ScratchJr. Use repetition in their programs. Design costumes for sprites. **2.4 - We are Researchers** Develop collaboration skills through working as part of a group. Develop research skills through searching for information on the Internet Think through the privacy implications of their use of search engines. Be more discerning in evaluating online information. Improve note-taking skills through the use of mind mapping. Develop presentation skills through creating and delivering a multimedia presentation.	**2.5 - We are Animators** How animation works. To use storyboards to plan an animation. To create their own original characters, props and backgrounds for an animation. To film, review and edit a stop-motion animation. To record audio to accompany their animation. To provide constructively critical feedback to peers. **2.3 - We are Photographers** Consider the technical and artistic merits of photographs. Use the iPad camera app. Take digital photographs. Review, reject or pick the images they take. Edit and enhance their photographs	**2.2 - We are Games Testers** Observe and describe carefully what happens in computer games. Use logical reasoning to make predictions of what a program will do and test these. Think critically about computer games. Create sequences of instructions for a virtual robot to solve a problem. Work out strategies for playing a game well. Be aware of how to use games safely and in balance with other activities. **2.6 - We are Zoologists** Sort and classify a group of items by answering questions. Collect data using tick or tally charts. Take, edit and enhance photographs. Use Google Sheets to produce basic charts. Record information on a digital map. Summarise what they have learned in a presentation.

YEAR 3

YEAR 3	Autumn	Spring	Summer
Vocabulary	Comments, creative commons, data centre, outline, personal information, Camera roll, colour value, creative commons, green screen, 'Ken Burns', pixel, resolution, rushes, search engine,	Algorithm, creative commons, debug, five pillars, hyperlinks, hypertext mark-up language, Wiki, Wikipedia Data, data centre, data protection, digital footprint, filter (database), personal information, survey,	Abstraction, algorithm, bug, code, debug, decomposition, event, input, iterative development, output, parallel processing, program, repetition, scratch, sequence, sprite, storyboard Abstraction, algorithm, bug, code, debug, decomposition, event, input, logical reasoning, output, parallel processing, program, repetition, scratch, sequence, sprite, variable
N.C. Coverage	**3.4 - We are who we are** Create a number of structured presentations. Create a narrated presentation. Consider issues of trust and privacy when sharing information. **3.3 - We are Presenters** Develop their web-based research skills. Structure, prepare and deliver a talk about a given topic or subtopic studied in another curriculum area. Record a piece to camera. Edit a movie using static images and green screen footage. Give constructive, critical feedback on recorded presentations.	**3.5 - We are co-authors** Understand the conventions for collaborative online work, particularly in wikis. Be aware of their responsibilities when editing other people's work. Become familiar with Wikipedia, including potential problems associated with its use. Practise their research skills. Write a target audience using a wiki tool. Develop collaboration skills. Develop proofreading skills. **3.6 - We are opinion pollsters** Understand some elements of survey design. Understand some ethical and legal aspects of online data collection. Use the Internet to facilitate data collection. Gain skills in using charts to analyse data. Gain skills in interpreting results.	**3.1 - We are programmers** Plan and create an algorithm for an animated scene in the form of a storyboard. Write a program in Scratch to create the animation, including characters, dialogue, costumes, backdrops and sound. Review their animation programs and correct mistakes. **3.2 - We are bug fixers** Develop a number of strategies for finding errors in programs. Build up resilience and strategies for problem solving. Increase their knowledge and understanding of Scratch. Recognise a number of common types of bugs in software.

YEAR 4

YEAR 4	Autumn	Spring	Summer
Vocabulary	Creative commons, hyperlinks, hypertext mark-up language (HTML), internet, uniform resource locator (URL), web server Beat sequencer, live loops, MIDI, piano roll, sample, stave, touch instrument, tracks, velocity, voice	Analogue, data, dataset, digital, field, filter (database), form, input, interface, record, sensor, table Algorithm, bug, debug, input, output, program, repeat loop, repetition, scratch, sequence, sprite, variable	Accelerometer, algorithm, bluetooth, if/else, JavaScript, LED, MakeCode, micro:bit, object code, runtime, simulator, source code, variable Abstraction, bitmap, fractal, pixel, repetition, sprite, tessellation, transform, turtle, vector graphics
N.C. Coverage	**4.4 - We are bloggers** Become familiar with blogs as a medium and a genre of writing. Create a sequence of blog posts on a theme. Incorporate additional media. Comment on the posts of others. Develop a critical, reflective view of a range of media, including text. **4.3 We are musicians** Create a repeating percussion rhythm. Play music using virtual instruments. Compose or edit tunes using the piano roll (pitch and duration) tool. Perform electronic music using pre-recorded loops, and create their own loops. Create a multi-track composition or performance using multiple instruments. Give feedback to others on their compositions and performances.	**4.6 We are meteorologist** Understand different measurement techniques for weather - both analogue and digital. Use computer-based data logging to automate the recording of some weather data. Use spreadsheets to create charts. Analyse data, explore inconsistencies in data and make predictions. Practise using presentation and video software. **4.1 We are software developers** Develop an educational computer game using selection and repetition. Understand and use variables. Start to debug computer programs. Recognise the importance of user interface design, including consideration of input and output.	**4.2 - We are makers** The input-process-output model of computation. About the inputs and outputs available on a BBC micro:bit. To program using the MakeCode block-based environment. To test and debug programs they write, using an on-screen simulator and the micro:bit. How to convert and transfer a program written on screen to the micro:bit. **4.5 - We are artists** Develop an appreciation of the links between geometry and art. Become familiar with the tools and techniques of a vector graphics package. Develop an understanding of turtle graphics. Experiment with the tools available, refining and developing their work as they apply their own criteria to evaluate it, and receive feedback from their peers. Develop some awareness of computer-generated art.

YEAR 5

YEAR 5	Autumn	Spring	Summer
Vocabulary	Algorithm, background, bug, code, debug, iterative development, logical reasoning, program, scratch, sprite Cipher, codes, cryptanalysis, cryptography, decrypt, encode, encrypt, message, Morse code, semaphore, transmit	Computer-aided design (CAD), creative commons, photorealistic, render Creative commons, hyperlinks, Hypertext mark-up language (HTML), hypertext transfer protocol (HTTP), Internet, Internet protocol (IP) addresses, network switch, packets of data, protocol, tag, uniform resource locator (URL), web browser, web server, world wide web	Abstraction, colour value, creative commons, hyperlink, MP3, pixel, safe search Accelerometer, augmented reality (AR), global positioning system (GPS), google cardboard, photosphere, QR code, share code, stereographic, virtual reality (VR)
N.C. Coverage	**5.1 - We are game developers** Create original artwork and sound for a game. Design and create a computer program for a computer game, which uses sequence, selection, repetition and variables. Detect and correct errors in their games. Use iterative development techniques. **5.2 - We are cryptographers** Be familiar with semaphore and Morse code. Understand the need for private information to be encrypted. Encrypt and decrypt messages in simple ciphers. Appreciate the need to use complex passwords and to keep them secure. Have some understanding of how encryption works on the Internet.	**5.3 - We are architects** Understand the work of architects, designers and engineers working in 3-D. Develop familiarity with a simple CAD tool. Develop spatial awareness by exploring and experimenting with a 3-D virtual environment to develop greater aesthetic awareness. **5.4 - We are web developers** The name and function of components making up the school's network. How information is passed between the components that make up the Internet. What the source code for a web page looks like and how it can be edited. How a website can be structured. How to add content to a web page.	**5.5 - We are adventure gamers** How to plan a non-linear presentation. To create text as part of a presentation. To add and edit images in a presentation. To use hyperlinks for navigation between the slides of a presentation. To record and add audio narration to a presentation. To use commenting tools to give feedback on a presentation. **5.6 - We are VR designers** Explore real-world and imagined locations in VR. Create 360° photosphere images. Link physical objects to digital content using QR codes. Create their own VR scene. Program objects and interactions in VR.

YEAR 6

YEAR 6	Autumn	Spring	Summer
Vocabulary	Accelerometer, bluetooth, controller, decomposition, edge connector, embedded system, input, interactive, light-emitting diode (LED), MakeCode, micro:bit, microprocessor, output, simulator, system Abstraction, algorithm, binary search, decomposition, divide and conquer, graph, greedy algorithm, linear search, quicksort, search, search algorithm, selection sort, sort	Creative commons, desktop publishing (DTP), eBook, ePub, folder, image, portable document format (PDF), text Anchor tag bias, blog, fake news, hyperlink, neutral point of view, online bullying (cyber bullying), plausible, reliability, social media, source	Creative commons, export, final cut, rough cut, rushes, storyboard Artificial intelligence, classify, decision tree, image recognition, label, layer, machine learning, model, natural language processing, neural network, node, sentiment analysis, spectrogram, speech recognition, test data, training data, Watson
N.C. Coverage	**6.1 - We are toy makers** How computers use stored programs to connect input to output. How to generate and evaluate designs in response to a brief. To plan a complex project by decomposing it into smaller parts. To work with physical components of a system. How to design and write a program for an embedded system. To use criteria to provide others with feedback on their work. **6.2 - We are computational thinkers** Develop the ability to reason logically about algorithms. Understand how some key algorithms can be expressed as programs. Understand that some algorithms are more efficient than others for the same problem. Understand common algorithms for searching and sorting a list.	**6.3 - We are Publishers** Manage or contribute to large collaborative projects, facilitated using online tools. Write and review content. Source digital media while demonstrating safe, respectful and responsible use. Design and produce a high-quality print document. **6.4 - We are connected** Understand appropriate rules or guidelines for a civil online discussion. How search results are selected and ranked. How to argue their point effectively supporting their views with sources. How to counter someone else's argument while showing respect and tolerance. How to judge the reliability of an online source. Some strategies for dealing with online bullying.	**6.5 - We are advertisers** Think critically about how video is used to promote a cause. Storyboard an effective advert for a cause. Work collaboratively to shoot original footage and source additional content. Acknowledge intellectual property rights. Work collaboratively to edit the assembled content to make an effective advert. **6.6 - We are AI developers** How decision trees can be trained automatically to classify data. How speech recognition works. How a neural net recognises images. To train a neural net to classify images. To train a machine learning system to identify sentiments. To consider some ethical principles in designing AI systems.