Skills progression: Computing

	Computer Science			
	Hardware	Networks & Data Representation	Computational Thinking	Programming
Willow (EYFS)	• Learning how to operate a camera to take photographs of meaningful creations or moments. • Recognising and identifying familiar letters and numbers on a keyboard.		• Understand simple instructions and predict outcomes.	• Following instructions as part of practical activities and games. • Learning to give simple instructions.
Elm (Y1)	• Learning how to operate a camera or tablet to take photos and videos. • Learning how to explore and tinker with hardware to find out how it works. • Recognising that some devices are input devices and others are output devices. • Learning where keys are located on the keyboard.		• Learning that decomposition means breaking a problem down into smaller parts. • Using decomposition to solve unplugged challenges. • Using logical reasoning to predict the behaviour of simple programs. • Developing the skills associated with sequencing in unplugged activities. • Following a basic set of instructions. • Assembling instructions into a simple algorithm.	• Programming a Floor robot to follow a planned route. • Learning to debug instructions when things go wrong. • Using programming language to explain how a floor robot works. • Learning to debug an algorithm in an unplugged scenario
Birch (Y2)	• Understanding what a computer is and that it's made up of different components. • Recognising that buttons cause effects and that technology follows instructions. • Learning how we know that technology is doing what we want it to do via its output. • Using greater control when taking photos with cameras, tablets or computers. • Developing confidence with the keyboard and the basics of touch typing.		• Articulating what decomposition is. • Decomposing a game to predict the algorithms used to create it. • Learning that there are different levels of abstraction. • Explaining what an algorithm is. • Following an algorithm. • Creating a clear and precise algorithm. • Learning that programs execute by following precise instructions. • Incorporating loops within algorithms.	• Using logical thinking to explore software, predicting, testing and explaining what it does. • Using an algorithm to write a basic computer program. • Using loop blocks when programming to repeat an instruction more than once.
Maple (Y3)	• Understanding what the different components of a computer do and how they work together. • Drawing comparisons across different types of computers. • Learning about the purpose of routers.	• Understanding the role of the key components of a network. • Identifying the key components within a network, including whether they are wired or wireless. • Understanding that websites and videos are files that are shared from one computer to another. • Learning about the role of packets. • Understanding how networks work and their purpose. • Recognising links between networks and the internet. • Learning how data is transferred.	• Using decomposition to explain the parts of a laptop computer. • Using decomposition to explore the code behind an animation. • Using repetition in programs. • Using logical reasoning to explain how simple algorithms work. • Explaining the purpose of an algorithm. • Forming algorithms independently.	• Using logical thinking to explore more complex software; predicting, testing and explaining what it does. • Incorporating loops to make code more efficient. • Continuing existing code. • Making reasonable suggestions for how to debug their own and others' code.
Pine (Y4)	• Using tablets or digital cameras to film a weather forecast.	• Understanding that computer networks provide multiple services, such as the World Wide Web,	• Using decomposition to solve a problem by finding out what code was used.	• Creating algorithms for a specific purpose. • Coding a simple game.

	• Understanding that weather stations use sensors to gather and record data which predicts the weather.	and opportunities for communication and collaboration.	• Using decomposition to understand the purpose of a script of code. • Identifying patterns through unplugged activities. • Using past experiences to help solve new problems. • Using abstraction to identify the important parts when completing both plugged and unplugged activities.	• Using abstraction and pattern recognition to modify code. • Incorporating variables to make code more efficient.
Beech (Y5)	• Learning that external devices can be programmed by a separate computer. • Learning the difference between ROM and RAM. • Recognising how the size of RAM affects the processing of data. • Understanding the fetch, decode, execute cycle.	• Learning the vocabulary associated with data: data and transmit. • Learning how the data for digital images can be compressed. • Recognising that computers transfer data in binary and understanding simple binary addition. • Relating binary signals (Boolean) to the simple character-based language, ASCII. • Learning that messages can be sent by binary code, reading binary up to eight characters and carrying out binary calculations. • Understanding how bit patterns represent images as pixels.	• Decomposing animations into a series of images. • Decomposing a program without support. • Decomposing a story to be able to plan a program to tell a story. • Predicting how software will work based on previous experience. • Writing more complex algorithms for a purpose.	• Programming an animation. Iterating and developing their programming as they work. • Confidently using loops in their programming. • Using a more systematic approach to debugging code, justifying what is wrong and how it can be corrected. • Writing code to create a desired effect. • Using a range of programming commands. • Using repetition within a program. • Amending code within a live scenario.
Oak (Y6)	• Learning about the history of computers and how they have evolved over time. • Using the understanding of historic computers to design a computer of the future. • Understanding and identifying barcodes, QR codes and RFID. • Identifying devices and applications that can scan or read barcodes, QR codes and RFID. • Understanding how corruption can happen within data during transfer (for example when downloading, installing, copying and updating files).	• Understanding that computer networks provide multiple services.	• Decomposing a program into an algorithm. • Using past experiences to help solve new problems. • Writing increasingly complex algorithms for a purpose.	• Debugging quickly and effectively to make a program more efficient. • Remixing existing code to explore a problem. • Using and adapting nested loops. • Programming using the language Python. • Changing a program to personalise it. • Evaluating code to understand its purpose. • Predicting code and adapting it to a chosen purpose.

	Information Technology			
	Using Software	Using email and internet searches	Using data	Wider use of technology
Willow (EYFS)	• Using a simple online paint tool to create digital art.		• Representing data through physical pictograms	
Elm (Y1)	• Using a basic range of tools within graphic editing software. • Taking and editing photographs. • Developing control of the mouse through dragging, clicking and resizing of images to create different effects. • Developing understanding of different software tools.	• Recognising devices that are connected to the internet. • Searching and downloading images from the internet safely. • Understanding that we are connected to others when using the internet.	• Understanding that technology can be used to represent data in different ways: pictograms, tables, pie charts, bar charts, block graphs etc. • Using representations to answer questions about data. • Using software to explore and create pictograms and branching databases.	• Recognising common uses of information technology, including beyond school. • Understanding some of the ways we can use the internet.
Birch (Y2)	• Developing word processing skills, including altering text, copying and pasting and using keyboard shortcuts. • Using word processing software to type and reformat text. • Using software (and unplugged means) to create story animations. • Creating and labelling images.	• Searching for appropriate images to use in a document. • Understanding what online information is.	• Collecting and inputting data into a spreadsheet. • Interpreting data from a spreadsheet.	• Learning how computers are used in the wider world.
Maple (Y3)	• Taking photographs and recording video to tell a story. • Using software to edit and enhance their video adding music, sounds and text on screen with transitions	• Learning to log in and out of an email account. • Writing an email including a subject, 'to' and 'from.' • Sending an email with an attachment. • Replying to an email.	• Understanding the vocabulary to do with databases: field, record, data. • Learning about the pros and cons of digital versus paper databases. • Sorting and filtering databases to easily retrieve information. • Creating and interpreting charts and graphs to understand data.	• Understanding the purpose of emails. • Recognising how social media platforms are used to interact.
Pine (Y4)	• Building a web page and creating content for it. • Designing and creating a webpage for a given purpose. • Use online software for documents, presentations, forms and spreadsheets. • Using software to work collaboratively with others.	• Understanding why some results come before others when searching. • Using keywords to effectively search for information on the internet. • Understanding that information found by searching the internet is not all grounded in fact. • Searching the internet for data.	• Understanding that data is used to forecast weather. • Recording data in a spreadsheet independently. • Sorting data in a spreadsheet to compare using the 'sort by…' option. • Designing a device which gathers and records sensor data.	• Understanding that software can be used collaboratively online to work as a team.
Beech (Y5)	• Using logical thinking to explore software more independently, making predictions based on their previous experience. • Using software programme Sonic Pi/Scratch to create music. • Using the video editing software to animate. • Identify ways to improve and edit programs, videos, images etc. • Independently learning how to use 3D design software package TinkerCAD.	• Developing searching skills to help find relevant information on the internet. • Learning how to use search engines effectively to find information, focussing on keyword searches and evaluating search returns.	• Understanding how data is collected in remote or dangerous places. • Understanding how data might be used to tell us about a location.	• Learn about different forms of communication that have developed with the use of technology.

Oak (Y6)	• Using logical thinking to explore software independently, iterating ideas and testing continuously. • Using search and word processing skills to create a presentation. • Creating and editing sound recordings for a specific purpose. • Creating and editing videos, adding multiple elements: music, voiceover, sound, text and transitions. • Using design software TinkerCAD to design a product. • Creating a website with embedded links and multiple pages.	• Understanding how search engines work.	• Understanding how barcodes, QR codes and RFID work. • Gathering and analysing data in real time. • Creating formulas and sorting data within spreadsheets.	• Learning about the Internet of Things and how it has led to 'big data'. • Learning how 'big data' can be used to solve a problem or improve efficiency.

	Digital Literacy
Willow (EYFS)	• Recognising that a range of technology is used for different purposes.
Elm (Y1)	• Logging in and out and saving work on their own account. • When using the internet to search for images, learning what to do if they come across something online that worries them or makes them feel uncomfortable. • Understanding how to interact safely with others online. • Recognising how actions on the internet can affect others. • Recognising what a digital footprint is and how to be careful about what we post.
Birch (Y2)	• Learning how to create a strong password. • Understanding how to stay safe when talking to people online and what to do if they see or hear something online that makes them feel upset or uncomfortable • Identifying whether information is safe or unsafe to be shared online. • Learning to be respectful of others when sharing online and ask for their permission before sharing content. • Learning strategies for checking if something they read online is true.
Maple (Y3)	• Recognising that different information is shared online including facts, beliefs and opinions. • Learning how to identify reliable information when searching online. • Learning how to stay safe on social media. Considering the impact technology can have on mood. • Learning about cyberbullying. • Learning that not all emails are genuine, recognising when an email might be fake and what to do about it.
Pine (Y4)	• Recognising that information on the internet might not be true or correct and that some sources are more trustworthy than others. • Learning to make judgements about the accuracy of online searches. • Identifying forms of advertising online. • Recognising what appropriate behaviour is when collaborating with others online. • Reflecting on the positives and negatives of time spent online. • Identifying respectful and disrespectful online behaviour.
Beech (Y5)	• Identifying possible dangers online and learning how to stay safe. • Evaluating the pros and cons of online communication. • Recognising that information on the internet might not be true or correct and learning ways of checking validity. • Learning what to do if they experience bullying online. Learning to use an online community safely
Oak (Y6)	• Learning about the positive and negative impacts of sharing online. • Learning strategies to create a positive online reputation. • Understanding the importance of secure passwords and how to create them. • Learning strategies to capture evidence of online bullying in order to seek help. • Using search engines safely and effectively. • Recognising that updated software can help to prevent data corruption and hacking.

Knowledge progression: Computing

	Computing systems and networks
Willow (EYFS)	• To be able to understand what a computer keyboard is and recognising some letters and numbers. • To know that a mouse can be used to click, drag and create simple drawings. • To know that to use a computer you need to log in to it and then log out at the end of your session.
Elm (Y1)	• To know that "log in and log out" means to begin and end a connection with a computer. • To know that a computer and mouse can be used to click, drag, fill and select and also add backgrounds, text, layers, shapes and clip art. • To know that passwords are important for security. • To know that when we create something on a computer it can be more easily saved and shared than a paper version. • To know some of the simple graphic design features of a piece of online software.
Birch (Y2)	• To know the difference between a desktop and laptop computer. • To know that people control technology. • To know that buttons are a form of input that give a computer an instruction about what to do (output). • To know that computers often work together. • To know that touch typing is the fastest way to type. To know that I can make text a different style, size and colour. • To know that "copy and paste" is a quick way of duplicating text.
Maple (Y3)	• To know what a tablet is and how it is different from a laptop/desktop computer. • To understand what a network is and how a school network might be organised. • To know that a server is central to a network and responds to requests made. • To know how the internet uses networks to share files. • To know that a router connects us to the internet. • To know what a packet is and why it is important for website data transfer. • To know the roles that inputs and outputs play on computers. • To understand that email stands for 'electronic mail.' • To know that an attachment is an extra file added to an email. • To understand that emails should contain appropriate and respectful content. • To know what some of the different components inside a computer are e.g. CPU, RAM, hard drive, and how they work together.
Pine (Y4)	• To understand that software can be used collaboratively online to work as a team. • To know what type of comments and suggestions on a collaborative document can be helpful. • To know that you can use images, text, transitions and animation in presentation slides.
Beech (Y5)	• To know how search engines work. • To understand that anyone can create a website and therefore we should take steps to check the validity of websites. • To know that web crawlers are computer programs that crawl through the internet. • To understand what copyright is. • To know the difference between ROM and RAM.
Oak (Y6)	• To understand the importance of having a secure password and what "brute force hacking" is. • To know that the first computers were created at Bletchley Park to crack the Enigma code to help the war effort in World War 2. • To know about some of the historical figures that contributed to technological advances in computing. • To understand what techniques are required to create a presentation using appropriate software.

	Programming
Willow (EYFS)	• To know that being able to follow and give simple instructions is important. • To understand that it is important for instructions to be in the right order.
Elm (Y1)	• To understand that an algorithm is when instructions are put in an exact order. • To know that input devices get information into a computer and that output devices get information out of a computer. • To understand that decomposition means breaking a problem into manageable chunks and that it is important in computing. • To know that we call errors in an algorithm 'bugs' and fixing these 'debugging'. • To understand the basic functions of a Bee-Bot. • To know that you can use a camera/tablet to make simple videos. • To know that algorithms move a bee-bot accurately to a chosen destination.
Birch (Y2)	• To understand what machine learning is and how that enables computers to make predictions. • To know that loops in programming are where you set a certain instruction (or instructions) to be repeated multiple times. • To know that abstraction is the removing of unnecessary detail to help solve a problem. • To know that coding is writing in a special language so that the computer understands what to do. • To understand that the character in ScratchJr is controlled by the programming blocks. • To know that you can write a program to create a musical instrument or tell a joke.
Maple (Y3)	• To know that Scratch is a programming language and some of its basic functions. • To understand how to use loops to improve programming. • To understand how decomposition is used in programming. • To understand that you can remix and adapt existing code.
Pine (Y4)	• To understand that a variable is a value that can change (depending on conditions) and know that you can create them in Scratch. • To know what a conditional statement is in programming. • To understand that variables can help you to create a quiz on Scratch. • To know that combining computational thinking skills (sequence, abstraction, decomposition etc) can help you to solve a problem. • To understand that pattern recognition means identifying patterns to help them work out how the code works. • To understand that algorithms can be used for a number of purposes e.g. animation, games design etc.
Beech (Y5)	• To know that a soundtrack is music for a film/video and that one way of composing these is on programming software. • To understand that using loops can make the process of writing music simpler and more effective. • To know how to adapt their code while performing their music. • To know that a Micro:bit is a programmable device. To know that Micro:bit uses a block coding language similar to Scratch. • To understand and recognise coding structures including variables. • To know what techniques to use to create a program for a specific purpose (including decomposition).
Oak (Y6)	• To know that there are text-based programming languages such as Logo and Python. • To know that nested loops are loops inside of loops. • To understand the use of random numbers and remix Python code.

	Creating Media
Willow (EYFS)	
Elm (Y1)	• To understand that holding the camera still and considering angles and light are important to take good pictures. • To know that you can edit, crop and filter photographs. • To know how to search safely for images online.
Birch (Y2)	• To understand that an animation is made up of a sequence of photographs. • To know that small changes in my frames will create a smoother looking animation. • To understand what software creates simple animations and some of its features e.g. onion skinning.
Maple (Y3)	• To know that different types of camera shots can make my photos or videos look more effective. • To know that I can edit photos and videos using film editing software. • To understand that I can add transitions and text to my video.
Pine (Y4)	• To know some of the features of web design software. • To know that a website is a collection of pages that are all connected. • To know that websites usually have a homepage and subpages as well as clickable links to new pages, called hyperlinks. • To know that websites should be informative and interactive.
Beech (Y5)	• To understand that stop motion animation is an animation filmed one frame at a time using models, and with tiny changes between each photograph. • To know that decomposition of an idea is important when creating stop-motion animations. • To know that editing is an important feature of making and improving a stop motion animation.
Oak (Y6)	• To know that radio plays are plays where the audience can only hear the action so sound effects are important. • To know that sound clips can be recorded using sound recording software. • To know that sound clips can be edited and trimmed.

	Data Handling
Willow (EYFS)	• To know that a pictogram is a way of showing information.
Elm (Y1)	• To know how that charts and pictograms can be created using a computer. • To understand that a branching database is a way of classifying a group of objects. • To know that computers understand different types of 'input'.
Birch (Y2)	• To understand that you can enter simple data into a spreadsheet. • To understand what steps you need to take to create an algorithm. • To know what data to use to answer certain questions. • To know that computers can be used to monitor supplies.
Maple (Y3)	• To know that a database is a collection of data stored in a logical, structured and orderly manner. • To know that computer databases can be useful for sorting and filtering data. • To know that different visual representations of data can be made on a computer
Pine (Y4)	• To know that computers can use different forms of input to sense the world around them so that they can record and respond to data. • This is called 'sensor data'. • To know that a weather machine is an automated machine that responds to sensor data. • To understand that weather forecasters use specific language, expression and pre-prepared scripts to help create weather forecast films.
Beech (Y5)	• To know that Mars Rover is a motor vehicle that collects data from space by taking photos and examining samples of rock. • To know what numbers using binary code look like and be able to identify how messages can be sent in this format. • To understand that RAM is Random Access Memory and acts as the computer's working memory. • To know what simple operations can be used to calculate bit patterns.
Oak (Y6)	• To know that data contained within barcodes and QR codes can be used by computers. • To know that infrared waves are a way of transmitting data.

	• To know that Radio Frequency Identification (RFID) is a more private way of transmitting data. • To know that data is often encrypted so that even if it is stolen it is not useful to the thief. • To know that data can become corrupted within a network but this is less likely to happen if it is sent in 'packets'. • I know that devices or that are not updated are most vulnerable to hackers. To know the difference between mobile data and WiFi.

	Online Safety
Willow (EYFS)	•
Elm (Y1)	• To know that the internet is many devices connected to one another. • To know that you should tell a trusted adult if you feel unsafe or worried online. • To know that people you do not know on the internet (online) are strangers and are not always who they say they are. • To know that to stay safe online it is important to keep personal information safe. • To know that 'sharing online means giving something specific to someone else via the internet and 'posting' online means placing information on the internet.
Birch (Y2)	• To understand the difference between online and offline. • To understand what information I should not post online. • To know what the techniques are for creating a strong password. • To know that you should ask permission from others before sharing about them online and that they have the right to say 'no.' • To understand that not everything I see or read online is true.
Maple (Y3)	• To know that not everything on the internet is true: people share facts, beliefs and opinions online. • To understand that the internet can affect your moods and feelings. • To know that privacy settings limit who can access your important personal information, such as your name, age, gender etc. • To know what social media is and that age restrictions apply.
Pine (Y4)	• To understand some of the methods used to encourage people to buy things online. • To understand that technology can be designed to act like or impersonate living things. • To understand that technology can be a distraction and identify when someone might need to limit the amount of time spent using technology. • To understand what behaviours are appropriate in order to stay safe and be respectful online.
Beech (Y5)	• To know different ways we can communicate online. • To understand how online information can be used to form judgements. • To understand some ways to deal with online bullying. • To know that apps require permission to access private information and that you can alter the permissions. • To know where I can go for support if I am being bullied online or feel that my health is being affected by time online.
Oak (Y6)	• To know that a 'digital footprint' means the information that exists on the internet as a result of a person's online activity. • To know what steps are required to capture bullying content as evidence. • To understand that it is important to manage personal passwords effectively. • To understand what it means to have a positive online reputation. • To know some common online scams.