



## Computing – Key Skills and Knowledge

		Year 3	Year 4	Year 5	Year 6
<b>Computer Science</b>	<b>Hardware</b>	<ul style="list-style-type: none"> <li>Understanding what the different components of a computer do and how they work together.</li> <li>Drawing comparisons across different types of computers.</li> <li>Learning about the purpose of routers.</li> </ul>	<ul style="list-style-type: none"> <li>Using tablets or digital cameras to film a weather forecast.</li> <li>Understanding that weather stations use sensors to gather and record data which predicts the weather.</li> </ul>	<ul style="list-style-type: none"> <li>Learning that external devices can be programmed by a separate computer.</li> <li>Learning the difference between ROM and RAM. Recognising how the size of RAM affects the processing of data.</li> <li>Understanding the fetch, decode, execute cycle</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> <li>Understanding and identifying barcodes, QR codes and RFID.</li> <li>Identifying devices and applications that can scan or read barcodes, QR codes and RFID.</li> <li>Understanding how corruption can happen within data during transfer (for example when downloading, installing, copying and updating files)</li> </ul>



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	<b>Networks and data representation</b>	<ul style="list-style-type: none"> <li>Understanding the role of the key components of a network.</li> <li>Identifying the key components within a network, including whether they are wired or wireless.</li> <li>Understanding that websites and videos are files that are shared from one computer to another.</li> <li>Learning about the role of packets.</li> <li>Understanding how networks work and their purpose.</li> <li>Recognising links between networks and the internet.</li> <li>Learning how data is transferred</li> </ul>	<ul style="list-style-type: none"> <li>Understanding that computer networks provide multiple services, such as the World Wide Web, and opportunities for communication and collaboration.</li> </ul>	<ul style="list-style-type: none"> <li>Learning the vocabulary associated with data: data and transmit.</li> <li>Learning how the data for digital images can be compressed.</li> <li>Recognising that computers transfer data in binary and understanding simple binary addition.</li> <li>Relating binary signals (Boolean) to the simple character-based language, ASCII.</li> <li>Learning that messages can be sent by binary code, reading binary up to eight characters and carrying out binary calculations.</li> <li>Understanding how bit patterns represent images as pixels.</li> </ul>	<ul style="list-style-type: none"> <li>Understanding that computer networks provide multiple services.</li> </ul>
	<b>Computational thinking</b>	<ul style="list-style-type: none"> <li>Using decomposition to explain the parts of a laptop computer.</li> <li>Using decomposition to explore the code behind an animation.</li> <li>Using repetition in programs.</li> <li>Using logical reasoning to explain how simple algorithms work.</li> <li>Explaining the purpose of an algorithm.</li> <li>Forming algorithms independently.</li> </ul>	<ul style="list-style-type: none"> <li>Using decomposition to solve a problem by finding out what code was used.</li> <li>Using decomposition to understand the purpose of a script of code.</li> <li>Identifying patterns through unplugged activities. Using past experiences to help solve new problems.</li> <li>Using abstraction to identify the important parts when completing both plugged and unplugged activities.</li> </ul>	<ul style="list-style-type: none"> <li>Decomposing animations into a series of images. Decomposing a program without support.</li> <li>Decomposing a story to be able to plan a program to tell a story.</li> <li>Predicting how software will work based on previous experience.</li> <li>Writing more complex algorithms for a purpose.</li> </ul>	<ul style="list-style-type: none"> <li>Decomposing a program into an algorithm.</li> <li>Using past experiences to help solve new problems.</li> <li>Writing increasingly complex algorithms for a purpose.</li> </ul>



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	<b>Programming</b>	<ul style="list-style-type: none"> <li>Using logical thinking to explore more complex software; predicting, testing and explaining what it does. Incorporating loops to make code more efficient.</li> <li>Continuing existing code.</li> <li>Making reasonable suggestions for how to debug their own and others' code.</li> </ul>	<ul style="list-style-type: none"> <li>Creating algorithms for a specific purpose.</li> <li>Coding a simple game.</li> <li>Using abstraction and pattern recognition to modify code.</li> <li>Incorporating variables to make code more efficient.</li> </ul>	<ul style="list-style-type: none"> <li>Programming an animation.</li> <li>Iterating and developing their programming as they work.</li> <li>Confidently using loops in their programming.</li> <li>Using a more systematic approach to debugging code, justifying what is wrong and how it can be corrected.</li> <li>Writing code to create a desired effect.</li> <li>Using a range of programming commands.</li> <li>Using repetition within a program.</li> <li>Amending code within a live scenario</li> </ul>	<ul style="list-style-type: none"> <li>Debugging quickly and effectively to make a program more efficient.</li> <li>Remixing existing code to explore a problem.</li> <li>Using and adapting nested loops.</li> <li>Programming using the language Python.</li> <li>Changing a program to personalise it.</li> <li>Evaluating code to understand its purpose.</li> <li>Predicting code and adapting it to a chosen purpose.</li> </ul>



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<b>Information Technology</b>	Using software	<ul style="list-style-type: none"> <li>• Taking photographs and recording video to tell a story.</li> <li>• Using software to edit and enhance their video adding music, sounds and text on screen with transitions.</li> </ul>	<ul style="list-style-type: none"> <li>• Building a web page and creating content for it. Designing and creating a webpage for a given purpose.</li> <li>• Use online software for documents, presentations, forms and spreadsheets. Using software to work collaboratively with others.</li> </ul>	<ul style="list-style-type: none"> <li>• Using logical thinking to explore software more independently, making predictions based on their previous experience.</li> <li>• Using software programme Sonic Pi/Scratch to create music.</li> <li>• Using the video editing software to animate. Identify ways to improve and edit programs, videos, images etc.</li> <li>• Independently learning how to use 3D design software package TinkerCAD.</li> </ul>	<ul style="list-style-type: none"> <li>• Using logical thinking to explore software independently, iterating ideas and testing continuously.</li> <li>• Using search and word processing skills to create a presentation.</li> <li>• Creating and editing sound recordings for a specific purpose.</li> <li>• Creating and editing videos, adding multiple elements: music, voiceover, sound, text and transitions. Using design software TinkerCAD to design a product.</li> <li>• Creating a website with embedded links and multiple pages.</li> </ul>
	Using email and internet searches	<ul style="list-style-type: none"> <li>• Learning to log in and out of an email account.</li> <li>• Writing an email including a subject, 'to' and 'from.'</li> <li>• Sending an email with an attachment.</li> <li>• Replying to an email.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding why some results come before others when searching.</li> <li>• Using keywords to effectively search for information on the internet.</li> <li>• Understanding that information found by searching the internet is not all grounded in fact. Searching the internet for data.</li> </ul>	<ul style="list-style-type: none"> <li>• Developing searching skills to help find relevant information on the internet.</li> <li>• Learning how to use search engines effectively to find information, focussing on keyword searches and evaluating search returns.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding how search engines work.</li> </ul>
	Using data	<ul style="list-style-type: none"> <li>• Understanding the vocabulary to do with databases: field, record, data.</li> <li>• Learning about the pros and cons of digital versus paper databases.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding that data is used to forecast weather.</li> <li>• Recording data in a spreadsheet independently.</li> <li>• Sorting data in a spreadsheet to compare using the 'sort by...' option.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding how data is collected in remote or dangerous places.</li> <li>• Understanding how data might be used to tell us about a location.</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding how barcodes, QR codes and RFID work.</li> <li>• Gathering and analysing data in real time.</li> <li>• Creating formulas and sorting data within spreadsheets.</li> </ul>



		<ul style="list-style-type: none"><li>• Sorting and filtering databases to easily retrieve information. Creating and interpreting charts and graphs to understand data</li></ul>	<ul style="list-style-type: none"><li>• Designing a device which gathers and records sensor data.</li></ul>		
	<b>Wider use of technology</b>	<ul style="list-style-type: none"><li>• Understanding the purpose of emails. Recognising how social media platforms are used to interact.</li></ul>	<ul style="list-style-type: none"><li>• Understanding that software can be used collaboratively online to work as a team</li></ul>	<ul style="list-style-type: none"><li>• Learn about different forms of communication that have developed with the use of technology.</li></ul>	<ul style="list-style-type: none"><li>• 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.</li></ul>



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<b>Digital Literacy</b>		<ul style="list-style-type: none"> <li>• Recognising that different information is shared online including facts, beliefs and opinions.</li> <li>• Learning how to identify reliable information when searching online.</li> <li>• Learning how to stay safe on social media. Considering the impact technology can have on mood.</li> <li>• Learning about cyberbullying.</li> <li>• Learning that not all emails are genuine, recognising when an email might be fake and what to do about it.</li> </ul>	<ul style="list-style-type: none"> <li>• Recognising that information on the internet might not be true or correct and that some sources are more trustworthy than others.</li> <li>• Learning to make judgements about the accuracy of online searches.</li> <li>• Identifying forms of advertising online.</li> <li>• Recognising what appropriate behaviour is when collaborating with others online.</li> <li>• Reflecting on the positives and negatives of time spent online.</li> <li>• Identifying respectful and disrespectful online behaviour.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying possible dangers online and learning how to stay safe.</li> <li>• Evaluating the pros and cons of online communication.</li> <li>• Recognising that information on the internet might not be true or correct and learning ways of checking validity.</li> <li>• Learning what to do if they experience bullying online.</li> <li>• Learning to use an online community safely</li> </ul>	<ul style="list-style-type: none"> <li>• Learning about the positive and negative impacts of sharing online.</li> <li>• Learning strategies to create a positive online reputation.</li> <li>• Understanding the importance of secure passwords and how to create them.</li> <li>• Learning strategies to capture evidence of online bullying in order to seek help.</li> <li>• Using search engines safely and effectively.</li> <li>• Recognising that updated software can help to prevent data corruption and hacking.</li> </ul>



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<b>Computing Systems and Networks</b>		<ul style="list-style-type: none"> <li>To know what a tablet is and how it is different from a laptop/desktop computer.</li> <li>To understand what a network is and how a school network might be organised.</li> <li>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.</li> <li>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.</li> <li>To know the roles that inputs and outputs play on computers.</li> <li>To understand that email stands for 'electronic mail.' To know that an attachment is an extra file added to an email.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>To understand that software can be used collaboratively online to work as a team.</li> <li>To know what type of comments and suggestions on a collaborative document can be helpful.</li> <li>To know that you can use images, text, transitions and animation in presentation slides.</li> </ul>	<ul style="list-style-type: none"> <li>To know how search engines work.</li> <li>To understand that anyone can create a website and therefore we should take steps to check the validity of websites.</li> <li>To know that web crawlers are computer programs that crawl through the internet.</li> <li>To understand what copyright is.</li> <li>To know the difference between ROM and RAM</li> </ul>	<ul style="list-style-type: none"> <li>To understand the importance of having a secure password and what "brute force hacking" is.</li> <li>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.</li> <li>To know about some of the historical figures that contributed to technological advances in computing.</li> <li>To understand what techniques are required to create a presentation using appropriate software.</li> </ul>



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<b>Programming</b>		<ul style="list-style-type: none"> <li>To know that Scratch is a programming language and some of its basic functions.</li> <li>To understand how to use loops to improve programming.</li> <li>To understand how decomposition is used in programming.</li> <li>To understand that you can remix and adapt existing code.</li> </ul>	<ul style="list-style-type: none"> <li>To understand that a variable is a value that can change (depending on conditions) and know that you can create them in Scratch.</li> <li>To know what a conditional statement is in programming.</li> <li>To understand that variables can help you to create a quiz on Scratch.</li> <li>To know that combining computational thinking skills (sequence, abstraction, decomposition etc) can help you to solve a problem.</li> <li>To understand that pattern recognition means identifying patterns to help them work out how the code works.</li> <li>To understand that algorithms can be used for a number of purposes e.g. animation, games design etc.</li> </ul>	<ul style="list-style-type: none"> <li>To know that a soundtrack is music for a film/video and that one way of composing these is on programming software.</li> <li>To understand that using loops can make the process of writing music simpler and more effective.</li> <li>To know how to adapt their code while performing their music.</li> <li>To know that a Micro:bit is a programmable device.</li> <li>To know that Micro:bit uses a block coding language similar to Scratch.</li> <li>To understand and recognise coding structures including variables.</li> <li>To know what techniques to use to create a program for a specific purpose (including decomposition).</li> </ul>	<ul style="list-style-type: none"> <li>To know that there are text-based programming languages such as Logo and Python.</li> <li>To know that nested loops are loops inside of loops.</li> <li>To understand the use of random numbers and remix Python code.</li> </ul>





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<b>Creating</b>		<ul style="list-style-type: none"><li>• To know that different types of camera shots can make my photos or videos look more effective.</li><li>• To know that I can edit photos and videos using film editing software.</li><li>• To understand that I can add transitions and text to my video.</li></ul>	<ul style="list-style-type: none"><li>• To know some of the features of web design software.</li><li>• To know that a website is a collection of pages that are all connected.</li><li>• To know that websites usually have a homepage and subpages as well as clickable links to new pages, called hyperlinks.</li><li>• To know that websites should be informative and interactive.</li></ul>	<ul style="list-style-type: none"><li>• To understand that stop motion animation is an animation filmed one frame at a time using models, and with tiny changes between each photograph.</li><li>• To know that decomposition of an idea is important when creating stop-motion animations.</li><li>• To know that editing is an important feature of making and improving a stop motion animation.</li></ul>	<ul style="list-style-type: none"><li>• To know that radio plays are plays where the audience can only hear the action so sound effects are important.</li><li>• To know that sound clips can be recorded using sound recording software.</li><li>• To know that sound clips can be edited and trimmed.</li></ul>



		Year 3	Year 4	Year 5	Year 6
<b>Data Handling</b>		<ul style="list-style-type: none"> <li>To know that a database is a collection of data stored in a logical, structured and orderly manner.</li> <li>To know that computer databases can be useful for sorting and filtering data.</li> <li>To know that different visual representations of data can be made on a computer.</li> </ul>	<ul style="list-style-type: none"> <li>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'.</li> <li>To know that a weather machine is an automated machine that responds to sensor data.</li> <li>To understand that weather forecasters use specific language, expression and pre-prepared scripts to help create weather forecast films.</li> </ul>	<ul style="list-style-type: none"> <li>To know that Mars Rover is a motor vehicle that collects data from space by taking photos and examining samples of rock.</li> <li>To know what numbers using binary code look like and be able to identify how messages can be sent in this format.</li> <li>To understand that RAM is Random Access Memory and acts as the computer's working memory.</li> <li>To know what simple operations can be used to calculate bit patterns.</li> </ul>	<ul style="list-style-type: none"> <li>To know that data contained within barcodes and QR codes can be used by computers.</li> <li>To know that infrared waves are a way of transmitting data.</li> <li>To know that Radio Frequency Identification (RFID) is a more private way of transmitting data.</li> <li>To know that data is often encrypted so that even if it is stolen it is not useful to the thief.</li> <li>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.</li> <li>To know the difference between mobile data and WiFi</li> </ul>



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<b>Online Safety</b>		<ul style="list-style-type: none"> <li>To know that not everything on the internet is true: people share facts, beliefs and opinions online.</li> <li>To understand that the internet can affect your moods and feelings.</li> <li>To know that privacy settings limit who can access your important personal information, such as your name, age, gender etc.</li> <li>To know what social media is and that age restrictions apply.</li> </ul>	<ul style="list-style-type: none"> <li>To understand some of the methods used to encourage people to buy things online.</li> <li>To understand that technology can be designed to act like or impersonate living things.</li> <li>To understand that technology can be a distraction and identify when someone might need to limit the amount of time spent using technology.</li> <li>To understand what behaviours are appropriate in order to stay safe and be respectful online.</li> </ul>	<ul style="list-style-type: none"> <li>To know different ways we can communicate online.</li> <li>To understand how online information can be used to form judgements.</li> <li>To understand some ways to deal with online bullying.</li> <li>To know that apps require permission to access private information and that you can alter the permissions.</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>To know that a 'digital footprint' means the information that exists on the internet as a result of a person's online activity.</li> <li>To know what steps are required to capture bullying content as evidence.</li> <li>To understand that it is important to manage personal passwords effectively.</li> <li>To understand what it means to have a positive online reputation.</li> <li>To know some common online scams</li> </ul>