

Core Skill	Progression Steps				
	Beginning less than 3	Emerging 3-4	Developed 5-6	Sophisticated 7-8	Excellence 8+/9
Algorithms	<p>I know what an algorithm is and I can express simple algorithms using symbols.</p> <p>I know that computers need precise instructions.</p> <p>I can show care and precision to avoid errors.</p> <p>I know that algorithms are implemented on digital devices as programs.</p> <p>I can design simple algorithms using loops, and selection i.e. if statements.</p> <p>I can use logical reasoning to predict outcomes.</p> <p>I can find and correct errors i.e. debugging, in algorithms.</p>	<p>I can design solutions (algorithms) that use repetition and two-way selection i.e. if, then and else.</p> <p>I can use diagrams to express solutions.</p> <p>I can use logical reasoning to predict outputs, showing an awareness of inputs.</p> <p>I can show an awareness of tasks best completed by humans or computers.</p> <p>I can design solutions by decomposing a problem and create a sub-solution for each of these parts (decomposition).</p> <p>I know that different solutions exist for the same problem.</p>	<p>I know that iteration is the repetition of a process such as a loop.</p> <p>I know that different algorithms exist for the same problem.</p> <p>I can represent solutions using a structured notation.</p> <p>I can identify similarities and differences in situations and can use these to solve problems (pattern recognition).</p> <p>I know a recursive solution to a problem repeatedly applies the same solution to smaller instances of the problem.</p> <p>I know that for some problems I can share the same characteristics and use the same algorithm to solve both (generalisation).</p>	<p>I know the notion of performance for algorithms and I know that some algorithms have different performance characteristics for the same task.</p> <p>I know that the design of an algorithm is distinct from its expression in a programming language (which will depend on the programming constructs available).</p> <p>I can evaluate the effectiveness of algorithms and models for similar problems.</p> <p>I know where information can be filtered out in generalising problem solutions (abstraction).</p> <p>I can use logical reasoning to explain how an algorithm works.</p> <p>I can represent algorithms using a structured language.</p>	<p>I can design a solution to a problem that depends on solutions to smaller instances of the same problem (recursion).</p> <p>I know that some problems cannot be solved computationally.</p>

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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Programming and Development</p>	<p>I know that users can write their own programs. I can create a simple program. I can run, check and change programs. I know that programs run by following precise instructions. I can use arithmetic operators, if statements, and loops, within programs. I can use logical reasoning to predict the behaviour of programs. I can find and correct simple semantic errors i.e. debugging, in programs.</p>	<p>I can create programs that implement algorithms to achieve given goals. I can declare and assign variables. I can use post-tested loops e.g. 'until', and a sequence of selection statements in programs, including and, if, then and else statement. I know the difference between, and appropriately I can use if and if, then and else statements. I can use a variable and relational operators within a loop to govern termination. I can design, write and debug modular programs using procedures. I know that a procedure can be used to hide the detail with sub-solution (procedural abstraction).</p>	<p>I know that programming bridges the gap between algorithmic solutions and computers. I have practical experience of a high-level textual language, including using standard libraries when programming. I can use a range of operators and expressions e.g. Boolean, and applies them in the context of program control. I can select the appropriate data types. I can use nested selection statements. I know the need for, and can write, custom functions including use of parameters.</p>	<p>I know the difference between, and I can use appropriately, procedures and functions. I know and I can use negation with operators. I can use and manipulate one dimensional data structures. I can find and correct syntactical errors. I know the effect of the scope of a variable e.g. a local variable can't be accessed from outside its function. I know and apply parameter passing. I know the difference between, and I can use both pre-tested e.g. 'while', and post-tested e.g. 'until' loops. I can apply a modular approach to error detection and correction.</p>	<p>I can design and write nested modular programs that enforce reusability utilising sub-routines wherever possible. I know the difference between 'While' loop and 'For' loop, which I can use a loop counter. I know and I can use two dimensional data structures.</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Data and Data Representation</p>	<p>I know that digital content can be represented in many forms. I know the difference between some of these digital forms and can explain the different ways that they communicate information. I know different types of data: text, number. I know that programs can work with different types of data. I know that data can be structured in tables to make it useful.</p>	<p>I know the difference between data and information. I know why sorting data in a flat file can improve searching for information. I can use filters or can perform single criteria searches for information. I can perform more complex searches for information e.g. using Boolean and relational operators. I can analyse and evaluate data and information, and I know that poor quality data leads to unreliable results, and inaccurate conclusions.</p>	<p>I know that digital computers use binary to represent all data. I know how bit patterns represent numbers and images. I know that computers transfer data in binary. I know the relationship between binary and file size (uncompressed). I can define data types: real numbers and Boolean. I can query data on one table using a typical query language. I know how numbers, images, sounds and character sets use the same bit patterns. I can perform simple operations using bit patterns e.g., binary addition.</p>	<p>I know the relationship between resolution and colour depth, including the effect on file size. I can distinguish between data used in a simple program (a variable) and the storage structure for that data. I know the relationship between data representation and data quality. I know the relationship between binary and electrical circuits, including Boolean logic. I know how and why values are data typed in many different languages when manipulated within programs.</p>	<p>I can perform operations using bit patterns e.g. conversion between binary and hexadecimal, binary subtraction etc. I know and can explain the need for data compression, and performs simple compression methods. I know what a relational database is, and I know the benefits of storing data in multiple tables.</p>
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Hardware and Processing</p>	<p>I know that computers have no intelligence and that computers can do nothing unless a program is run. I know that all software executed on digital devices is programmed. I know that a range of digital devices can be considered a computer. I know and can use a range of input and output devices. I know how programs specify the function of a general purpose computer.</p>	<p>I know that computers collect data from various input devices, including sensors and application software. I know the difference between hardware and application software, and their roles within a computer system. I know why and when computers are used. I know the main functions of the operating system. I know the difference between physical, wireless and mobile networks.</p>	<p>I know the function of the main internal parts of basic computer architecture. I know the concepts behind the fetch-execute cycle. I know that there is a range of operating systems and application software for the same hardware. I know the von Neumann architecture in relation to the fetch-execute cycle, including how data is stored in memory I know the basic function and operation of location addressable memory.</p>	<p>I know that processors have instruction sets and that these relate to low-level instructions carried out by a computer.</p>	<p>I have practical experience of a small (hypothetical) low level programming language. I know and can explain Moore's Law. I know and can explain multitasking by computers.</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Communication and Networks</p>	<p>I can find content from the world wide web using a web browser. I know the importance of communicating safely and respectfully online, and the need for keeping personal information private. I know what to do when concerned about content or being contacted. I can navigate the web and can carry out simple web searches to collect digital content.</p>	<p>I know the difference between the internet and internet service e.g. world wide web. I can show an awareness of, and use a range of internet services e.g. VOIP. I know what is acceptable, and unacceptable behaviour when using technologies and online services. I know how to effectively use search engines, and I know how search results are selected, including that</p>	<p>I know how search engines rank search results. I know how to construct static web pages using HTML and CSS. I know data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching. I know names of hardware e.g. hubs, routers, switches, and the names of protocols e.g. SMTP, iMAP, POP, FTP, TCP/IP, associated with networking systems.</p>	<p>I know the purpose of the hardware and protocols associated with networking computer systems. I know the client-server model including how dynamic web pages use server-side scripting and that web servers process and store data entered by users. I know that persistence of data on the internet requires careful protection of online identity and privacy.</p>	<p>I know the hardware associated with networking computer systems, including WANs and LANs, I know their purpose and how they work, including MAC addresses.</p>

Computer Science Progression Pathway

	<p>I can show use of computers safely and responsibly, knowing a range of ways to report unacceptable content and contact when online.</p>	<p>search engines use 'web crawler programs'. I can select, combine and use internet services. I can show responsible use of technologies and online services, and I know a range of ways to report concerns.</p>	<p>I can use technologies and online services securely, and I know how to identify and report inappropriate conduct.</p>		
<p>Information Technology</p>	<p>I can use software under the control of the teacher to create, store and edit digital content using appropriate file and folder names. I know that people interact with computers. I can share my use of technology in school. I know common uses of information technology beyond the classroom. I can talk about my work and make changes to improve it. I can use technology with increasing independence to purposefully organise digital content.</p>	<p>I can collect, organise and present data and information in digital content. I can create digital content to achieve a given goal through combining software packages and internet services to communicate with a wider audience e.g. blogging. I can make appropriate improvements to solutions based on feedback received, and can comment on the success of the solution. I can make judgements about digital content when evaluating and repurposing it for a given audience.</p>	<p>I can evaluate the appropriateness of digital devices, internet services and application software to achieve given goals. I can recognise ethical issues surrounding the application of information technology beyond school. I can design criteria to critically evaluate the quality of solutions. I can use the criteria to identify improvements and can make appropriate refinements to the solution. I can justify the choice of and independently combine and I use multiple digital devices, internet services and application software to achieve given goals.</p>	<p>I can design criteria for users to evaluate the quality of solutions, and can use the feedback from users to identify improvements and can make appropriate refinements to the solution. I can identify and explain how the use of technology can impact on society. I can undertake creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. I can effectively design and create digital artefacts for a wider or remote audience. I consider the properties of media when importing them into digital artefacts.</p>	<p>I know the ethical issues surrounding the application of information technology, an existence of legal frameworks governing its use e.g. Data Protection Act, Computer Misuse, Copyright etc.</p>

Computer Science Progression Pathway

	<p>I can show an awareness for the quality of digital content collected.</p> <p>I can use a variety of software to manipulate and present digital content: and information.</p> <p>I can share my experiences of technology in school and beyond the classroom.</p> <p>I can talk about my work and make improvements to solutions based on feedback received.</p>	<p>I know the audience when I am designing and creating digital content.</p> <p>I know the potential of information technology for collaboration when computers are networked.</p> <p>I can use criteria to evaluate the quality of solutions and can identify improvements making some refinements to the solution, and future solutions.</p>	<p>I can evaluate the trustworthiness of digital content and consider the usability of visual design features when designing and creating digital artefacts for known audience.</p>	<p>I can document user feedback, the improvements identified and the refinements made to the solution.</p> <p>I can explain and justify how the use of technology impacts on society, from the perspective of social, economic, political legal, ethical and moral issues.</p>	
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