

	Algorithms	Program Development	Data & Data Representation	Hardware & Processing	Communication & Networks	Information Technology
7-9	<ul style="list-style-type: none"> <li>Recognises that some problems share the same characteristics and use the same algorithm to solve both. (AL) (GE)</li> <li>Understands the notion of performance for algorithms and appreciates that some algorithms have different performance characteristics for the same task. (AL) (EV)</li> <li>Recognises that the design of an algorithm is distinct from its expression in a programming language (which will depend on the programming constructs available). (AL) (AB)</li> <li>Evaluates the effectiveness of algorithms and models for similar problems. (AL) (AB) (GE)</li> <li>Recognises where information can be filtered out in generalizing problem solutions. (AL) (AB) (GE)</li> <li>Uses logical reasoning to explain how an algorithm works. (AL) (AB) (DE)</li> <li>Represents algorithms using structured language. (AL) (DE) (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Understands the difference between 'While' loop and 'For' loop, which uses a loop counter. (AL) (AB)</li> <li>Appreciates the effect of the scope of a variable e.g. A local variable can't be accessed from outside its function. (AB) (AL)</li> <li>Understands the difference between, and uses, both pre-tested e.g. 'while', and post-tested e.g. 'until' loops. (AL)</li> <li>Applies a modular approach to error detection and correction. (AB) (DE) (GE)</li> </ul>	<ul style="list-style-type: none"> <li>Performs operations using bit patterns e.g. conversion between binary and hexadecimal, binary subtraction etc. (AB) (AL) (GE)</li> <li>Understands the relationship between binary and electrical circuits, including Boolean logic. (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Knows that processors have instruction sets and that these relate to low-level instructions carried out by a computer. (AB) (AL) (GE)</li> <li>Understands the von Neumann architecture in relation to the fetch-execute cycle, including how data are stored in memory. (AB) (GE)</li> <li>Understands the basic function and operation of location addressable memory.(AB)</li> </ul>	<ul style="list-style-type: none"> <li>Knows the purpose of the hardware and protocols associated with networking computer systems. (AB) (AL)</li> <li>Recognises that persistence of data on the internet requires careful protection of online identity and privacy.</li> </ul>	<ul style="list-style-type: none"> <li>Undertakes creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. (AL) (DE) (EV)</li> <li>Effectively designs and creates digital artefacts for a wider or remote audience. (AL) (DE)</li> <li>Considers the properties of media when importing them into digital artefacts. (AB)</li> <li>Documents user feedback, the improvements identified and the refinements made to the solution. (AB)</li> <li>Explains and justifies how the use of technology impacts on society, from the perspective of social, economic, political, legal, ethical and moral issues. (EV)</li> </ul>
6-8	<ul style="list-style-type: none"> <li>Understands that iteration is the repetition of a process such as a loop. (AL)</li> </ul>	<ul style="list-style-type: none"> <li>Understands that programming bridges the gap between algorithmic solutions and computers. (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Knows the relationship between data representation and data quality. (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Has practical experience of a small (hypothetical) low level programming language. (AB) (AL) (DE) (GE)</li> </ul>	<ul style="list-style-type: none"> <li>Understands how search engines rank search results. (AL)</li> <li>Understands how to construct static web</li> </ul>	<ul style="list-style-type: none"> <li>Evaluates the appropriateness of digital devices, internet services and application software</li> </ul>

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	<ul style="list-style-type: none"> <li>Recognises that different algorithms exist for the same problem. (AL) (GE)</li> <li>Represents solutions using a structured notation. (AL) (AB)</li> <li>Can identify similarities and differences in situations and can use these to solve problems (pattern recognition). (GE)</li> <li>Understands a recursive solution to a problem repeatedly applies the same solution to smaller instances of the problem. (AL) (GE)</li> </ul>	<ul style="list-style-type: none"> <li>Uses nested selection statements. (AL)</li> <li>Appreciates the need for, and writes, custom functions including use of parameters. (AL) (AB)</li> <li>Knows the difference between, and uses appropriately, procedures and functions. (AL) (AB)</li> <li>Understands and uses negation with operators. (AL)</li> <li>Uses and manipulates one dimensional data structures. (AB)</li> <li>Understands and applies parameter passing. (AB) (GE) (DE)</li> </ul>	<ul style="list-style-type: none"> <li>Understands how and why values are data typed in many different languages when manipulated within programs. (AB)</li> <li>Understands the relationship between resolution and colour depth, including the effect on file size. (AB)</li> <li>Distinguishes between data used in a simple program (a variable) and the storage structure for that data. (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Understands the concepts behind the fetch-execute cycle. (AB) (AL)</li> </ul>	<p>pages using HTML and CSS. (AL) (AB)</p> <ul style="list-style-type: none"> <li>Understands data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching. (AL) (AB)</li> <li>Knows the names of hardware e.g. Hubs, routers, switches, and the names of protocols e.g. SMTP, iMAP, POP, FTP, TCP/ IP, associated with networking computer systems. (AB)</li> </ul>	<p>to achieve given goals. (EV)</p> <ul style="list-style-type: none"> <li>Recognises ethical issues surrounding the application of information technology beyond school.</li> <li>Justifies the choice of and independently combines and uses multiple digital devices, internet services and application software to achieve given goals. (EV)</li> <li>Evaluates the trustworthiness of digital content and considers the usability of visual design features when designing and creating digital artefacts for a known audience. (EV)</li> <li>Identifies and explains how the use of technology can impact on society.</li> <li>Designs criteria for users to evaluate the quality of solutions, uses the feedback from the users to identify improvements and can make appropriate refinements to the solution. (EV)</li> </ul>
5-7	<ul style="list-style-type: none"> <li>Shows an awareness of tasks best completed by humans or computers. (EV)</li> <li>Designs solutions by decomposing a problem and creates a sub-solution for each of these parts. (DE) (AL) (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Understands the difference between, and appropriately uses if and if, then and else statements. (AL)</li> <li>Uses a variable and relational operators within a loop to govern termination. (AL) (GE)</li> <li>Designs, writes and debugs modular</li> </ul>	<ul style="list-style-type: none"> <li>Understands how bit patterns represent numbers and images. (AB)</li> <li>Knows that computers transfer data in binary. (AB)</li> <li>Understands the relationship between binary and file size (uncompressed). (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Understands why and when computers are used. (EV)</li> <li>Understands the main functions of the operating system. (DE) (AB)</li> <li>Knows the difference between physical, wireless and mobile networks. (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Selects, combines and uses internet services. (EV)</li> <li>Demonstrates responsible use of technologies and online services, and knows a range of ways to report concerns.</li> <li>Uses technologies and online services securely,</li> </ul>	<ul style="list-style-type: none"> <li>Makes judgements about digital content when evaluating and repurposing it for a given audience. (EV) (GE)</li> <li>Understands the potential of information technology for collaboration when computers are networked. (GE)</li> </ul>

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	<ul style="list-style-type: none"> <li>Recognises that different solutions exist for the same problem. (AL) (AB)</li> </ul>	<ul style="list-style-type: none"> <li>programs using procedures. (AL) (DE) (AB) (GE)</li> <li>Knows that a procedure can be used to hide the detail with sub-solution. (AL) (DE) (AB) (GE)</li> <li>Has practical experience of a high-level textual language, including using standard libraries when programming. (AB) (AL)</li> <li>Uses a range of operators and expressions e.g. Boolean, and applies them in the context of program control. (AL)</li> <li>Selects the appropriate data types. (AL) (AB)</li> <li>Detects and corrects syntactical errors. (AL)</li> </ul>	<ul style="list-style-type: none"> <li>Defines data types: real numbers and Boolean. (AB)</li> <li>Queries data on one table using a typical query language. (AB)</li> <li>Understands how numbers, images, sounds and character sets use the same bit patterns. (AB) (GE)</li> <li>Performs simple operations using bit patterns e.g. binary addition. (AB) (AL)</li> </ul>	<ul style="list-style-type: none"> <li>Recognises and understands the function of the main internal parts of basic computer architecture. (AB)</li> <li>Knows that there is a range of operating systems and application software for the same hardware. (AB)</li> </ul>	<p>and knows how to identify and report inappropriate conduct. (AL)</p>	<ul style="list-style-type: none"> <li>Designs criteria to critically evaluate the quality of solutions, uses the criteria to identify improvements and can make appropriate refinements to the solution. (EV)</li> </ul>
4-6	<ul style="list-style-type: none"> <li>Understands that algorithms are implemented on digital devices as programs.(AL)</li> <li>Designs simple algorithms using loops, and selection i.e. if statements. (AL)</li> <li>Uses logical reasoning to predict outcomes. (AL)</li> <li>Detects and corrects errors i.e. debugging, in algorithms. (AL)</li> </ul>	<ul style="list-style-type: none"> <li>Uses arithmetic operators, if statements, and loops, within programs. (AL)</li> <li>Uses logical reasoning to predict the behaviour of programs. (AL)</li> <li>Detects and corrects simple semantic errors (debugging) in programs. (AL)</li> </ul>	<ul style="list-style-type: none"> <li>Recognises different types of data: text, number. (AB) (GE)</li> <li>Appreciates that programs can work with different types of data. (GE)</li> <li>Recognises that data can be structured in tables to make it useful. (AB) (DE)</li> <li>Performs more complex searches for information e.g. Using Boolean and relational operators. (AL) (GE) (EV)</li> </ul>	<ul style="list-style-type: none"> <li>Recognises that a range of digital devices can be considered a computer. (AB) (GE)</li> <li>Recognises and can use a range of input and output devices.</li> <li>Understands how programs specify the function of a general purpose computer. (AB)</li> </ul>	<ul style="list-style-type: none"> <li>Navigates the web and can carry out simple web searches to collect digital content. (AL) (EV)</li> <li>Demonstrates use of computers safely and responsibly, knowing a range of ways to report unacceptable content and contact when online.</li> </ul>	<ul style="list-style-type: none"> <li>Uses technology with increasing independence to purposefully organise digital content. (AB)</li> <li>Shows an awareness for the quality of digital content collected. (EV)</li> <li>Uses a variety of software to manipulate and present digital content: data and information. (AL)</li> <li>Talks about their work and makes improvements to solutions based on feedback received.(EV)</li> </ul>
3-5	<ul style="list-style-type: none"> <li>Understands that algorithms are implemented on digital devices as programs.(AL)</li> <li>Designs simple algorithms using loops,</li> </ul>	<ul style="list-style-type: none"> <li>Uses arithmetic operators, if statements, and loops, within programs. (AL)</li> </ul>	<ul style="list-style-type: none"> <li>Recognises different types of data: text, number. (AB) (GE)</li> <li>Appreciates that programs can work with</li> </ul>	<ul style="list-style-type: none"> <li>Recognises that a range of digital devices can be considered a computer. (AB) (GE)</li> </ul>	<ul style="list-style-type: none"> <li>Navigates the web and can carry out simple web searches to collect digital content. (AL) (EV)</li> <li>Demonstrates use of computers safely and</li> </ul>	<ul style="list-style-type: none"> <li>Uses technology with increasing independence to purposefully organise digital content. (AB)</li> </ul>

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	and/or selection i.e. if statements. (AL) • Uses logical reasoning to predict outcomes. (AL)	• Uses logical reasoning to predict the behaviour of programs. (AL) • Detects and corrects simple semantic errors (debugging) in programs. (AL)	different types of data. (GE) • Recognises that data can be structured in tables to make it useful. (AB) (DE) • Uses filters or can perform single criteria searches for information.(AL)	• Recognises and can use a range of input and output devices. • Understands how programs specify the function of a general purpose computer. (AB)	responsibly, knowing a range of ways to report unacceptable content and contact when online.	• Shows an awareness for the quality of digital content collected. (EV) • Uses a variety of software to manipulate and present digital content: data and information. (AL) • Talks about their work and makes improvements to solutions based on feedback received.(EV)
2-4	• Understands what an algorithm is and is able to express simple linear (non-branching) algorithms symbolically. (AL) • Understands that computers need precise instructions. (AL) • Demonstrates care and precision to avoid errors. (AL)	• Knows that users can develop their own programs, and can demonstrate this by creating a simple program in an environment that does not rely on text e.g. programmable robots etc. (AL) • Executes, checks and changes programs. (AL) • Understands that programs execute by following precise instructions. (AL)	• Recognises that digital content can be represented in many forms. (AB) (GE) • Distinguishes between some of these forms and can explain the different ways that they communicate information. (AB)	• Understands that computers have no intelligence and that computers can do nothing unless a program is executed. (AL) • Recognises that all software executed on digital devices is programmed. (AL) (AB) (GE)	• Obtains content from the World Wide Web using a web browser. (AL) • Understands the importance of communicating safely and respectfully online, and the need for keeping personal information private. (EV) • Knows what to do when concerned about content or being contacted. (AL)	• Uses software under the control of the teacher to create, store and edit digital content using appropriate file and folder names. (AB) (GE) (DE) • Understands that people interact with computers. • Shares their use of technology in school. • Knows common uses of information technology beyond the classroom. (GE) •
1-3	• Uses input, output and variables in programs. • Appreciates the need to sequence instructions correctly to achieve the desired effect.	• Makes uses of input, output statements, writing them in the correct sequence. • Can make simple changes to correct bugs in programs.	• Recognises that digital content can be represented in many forms. (AB) (GE) • Distinguishes between some of these forms and can explain the different ways that they communicate information. (AB)	• Knows that a computer needs clear instructions from a user or programmer in order to operate as expected.	• Knows what to do when concerned about content or being contacted. (AL)	• Talks about their work and makes changes to improve it. (EV) • Shares their experiences of technology in school and beyond the classroom. (GE) (EV)