

Computer Science	Algorithms	Programming & Development	Data & Data Representation	Communications & Networks	Hardware & Processing	Information Technology
Beginning	<p>With support:</p> <ul style="list-style-type: none"> •I design solutions (algorithms) that use repetition and two-way selection i.e. if, then and else. •I use diagrams to express solutions. •I use logical reasoning to predict outputs, showing an awareness of inputs. 	<p>With support:</p> <ul style="list-style-type: none"> •I create programs that implement algorithms to achieve given goals. •I declare and assign variables. •I use post-tested loops e.g. 'until', and a sequence of selection statements in programs, including an if, then and else statement. 	<p>With support:</p> <ul style="list-style-type: none"> •I know the difference between data and information. •I know why sorting data in a flat file can improve searching for information. •I use filters or can perform single criteria searches for information. 	<p>With support:</p> <ul style="list-style-type: none"> •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. 	<p>With support:</p> <ul style="list-style-type: none"> •I know the difference between the internet and internet service e.g. World Wide Web. •I show an awareness of, and can use a range of internet services e.g. VOIP. •I know what is acceptable and unacceptable behaviour when using technologies and online services. 	<p>With support:</p> <ul style="list-style-type: none"> •I collect, organise and present data and information in digital content. •I 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 make appropriate improvements to solutions based on feedback received, and can comment on the success the solution.
Developing	<p>With prompting:</p> <ul style="list-style-type: none"> •I show an awareness of tasks best completed by humans or computers. •I design solutions by decomposing a problem and create a sub-solution for each of these parts (decomposition). •I know that different solutions exist for the same problem. 	<p>With prompting:</p> <ul style="list-style-type: none"> •I know the difference between, and appropriately I can use if and if, then and else statements. •I use a variable and relational operators within a loop to govern termination. •I 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>With prompting:</p> <ul style="list-style-type: none"> •I perform more complex searches for information e.g. using Boolean and relational operators. •I analyse and evaluate data and information, and I know that poor quality data leads to unreliable results, and inaccurate conclusions. 	<p>With prompting:</p> <ul style="list-style-type: none"> •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>With prompting:</p> <ul style="list-style-type: none"> •I know how to effectively use search engines, and I know how search results are selected, including that search engines use 'web crawler programs'. •I select, combine and I use internet services. •I show responsible use of technologies and online services, and I know a range of ways to report concerns. 	<p>With prompting:</p> <ul style="list-style-type: none"> •I make judgements about digital content when evaluating and repurposing it for a given audience. •I know the audience when I am designing and creating digital content. •I know the potential of information technology for collaboration when computers are networked. •I use criteria to evaluate the quality of solutions and can identify improvements making some refinements to the solution, and future solutions.
Secure	<ul style="list-style-type: none"> •I know that iteration is the repetition of a process such as a loop. •I know that different algorithms exist for the same problem. •I represent solutions using a structured notation. •I identify similarities and differences in situations and can use these to solve problems (pattern recognition). 	<ul style="list-style-type: none"> •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 use a range of operators and expressions e.g. Boolean, and apply them in the context of program control. •I select appropriate data types. 	<ul style="list-style-type: none"> •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 define data types: real numbers and Boolean. •I query data on one table using a typical query language. 	<ul style="list-style-type: none"> •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. 	<ul style="list-style-type: none"> •I know how search engines rank search results. •I know how to construct static web pages using HTML and CSS. •I know about data transmission between digital computers over networks, including the internet i.e. IP addresses and packet switching. 	<ul style="list-style-type: none"> •I evaluate the appropriateness of digital devices, internet services and application software to achieve given goals. •I recognise ethical issues surrounding the application of information technology beyond school. •I design criteria to critically evaluate the quality of solutions, I can use the criteria to identify improvements and make appropriate refinements to the solution.
Confident	<ul style="list-style-type: none"> •I know a recursive solution to a problem repeatedly applies the same solution to smaller instances of the problem. •I know that some problems share the same characteristics and use the same algorithm to solve both (generalisation). •I know the notion of performance for algorithms and I know that some algorithms have different performance characteristics for the same task. 	<ul style="list-style-type: none"> •I use nested selection statements. •I know the need for, and can write, custom functions including use of parameters. •I know the difference between procedures and functions and I use them appropriately. •I use negation with operators. •I use and manipulate one dimensional data structures. •I can find and corrects syntactical errors. 	<ul style="list-style-type: none"> •I know how numbers, images, sounds and character sets use the same bit patterns. •I perform simple operations using bit patterns e.g. binary addition. •I know the relationship between resolution and colour depth, including the effect on file size. •I distinguish between data used in a simple program (a variable) and the storage structure for that data. 	<ul style="list-style-type: none"> •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. 	<ul style="list-style-type: none"> •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. •I use technologies and online services securely, and I know how to identify and report inappropriate conduct. 	<ul style="list-style-type: none"> •I justify the choice of and independently combine and use multiple digital devices, internet services and application software to achieve given goals. •I evaluate the trustworthiness of digital content and consider the usability of visual design features when designing and creating digital artefacts for known audience. •I design criteria for users to evaluate the quality of solutions, and use the feedback from users to identify improvements and make appropriate refinements to the solution. •I identify and explain how the use of technology can impact on society.
Exceptional	<ul style="list-style-type: none"> •I know that the design of an algorithm is distinct from its expression in a programming. •I evaluate the effectiveness of algorithms and models for similar problems. •I know where information can be filtered out in generalizing problem solutions (abstraction). •I use logical reasoning to explain how an algorithm works. •I represent algorithms using a structured language. 	<ul style="list-style-type: none"> •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 apply a modular approach to error detection and correction. 	<ul style="list-style-type: none"> •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. 	<ul style="list-style-type: none"> •I know that processors have instruction sets and that these relate to low-level instructions carried out by a computer. 	<ul style="list-style-type: none"> •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. 	<ul style="list-style-type: none"> •I undertake creative projects that collect, analyse, and evaluate data to meet the needs of a known user group. •I effectively design and create digital artefacts for a wider or remote audience. •I consider the properties of media when importing them into digital artefacts. •I document user feedback, the improvements identified and the refinements made to the solution. •I explain and justify how the use of technology impacts on society, from the perspective of social, economical, political legal, ethical and moral issues.
Beyond	<ul style="list-style-type: none"> •I design a solution to a problem that depends on solutions to smaller instances of the same problem (recursion). •I know that some problems cannot be solved computationally. 	<ul style="list-style-type: none"> •I 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 use two dimensional data structures. 	<ul style="list-style-type: none"> •I 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. 	<ul style="list-style-type: none"> •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. 	<ul style="list-style-type: none"> •I know the hardware associated with networking computer systems, including WANs and LANs, I know their purpose and how they work, including MAC addresses. 	<ul style="list-style-type: none"> •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.