Computer Science Curriculum Model

Purpose of study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Aims

The curriculum for computing aims to ensure that all pupils: Can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation. Can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems. Can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems. Are responsible, competent, confident and creative users of information and communication technology

Year 7		Grooming	Cyberbullying	Radicalisation	British Values	Sexting	Cs and The Law	Digital Footprint	Online Wellbeing	Computational Thinking	Algorithms	Iteration	Selection	Functions and Procedure
	7.1 E-Safety	Students learn what grooming is, how it happens and how to protect themselves online.	What is cyberbullying, its impact and where to report it to	How the process of radicalisation can start and how to stop it	What are British values are	What is Sexting and what does the law say about it	The laws covering cyberbullying, sexting, grooming and radicalisation.	What makes up a digital footprint and how it can impact your future.	Healthy habits and ways of working with technology	Students are introduced to solving problems using a computer. They learn the steps involved in computational thinking.	Students are introduced to algorithms and writing instructions to solve a problem. They learn to write simple algorithms using Blockly	Students are introduced to loops and using loops to make code more efficient, easier to read and easier to de-bug	Students are introduced decision making in programs. This includes the correct use of comparison operators	Students are introduced to functions and why they are used.
		Computational Thinking	Algorithms	Sequencing	Iteration	Selection	Functions and Procedur	Variables	Operators	Debugging				
	7.2 Principles of Programming	An extensive project using code.org and unplugged lessons to deliver the fundamentals of programming and the processes to follow to write effective and efficient algorithms.					An early look at the application and theory behind the use of functions within a program.	How variables are used to store data within a program.	Introduction to the main operators and the logic required to get them to work efficiently.	What debugging is and why it is called debugging as well as the development of key skills to allow students to debug their code.				
		Algorithms	Sequencing	Iteration	Selection	Functions and Procedur	Variables	Data Types	Operators	Data Structures	Debugging			
	7.3 Microbit programming	Following basic algorithms to complete mini projects for a microbit computer that will be stored, work and run on your own device.												

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Key Concepts:

Programming, online safety, British Values

Year 8		Computational Thinking	Algorithms	Sequencing	Iteration	Selection	Variables	Data Types	Operators	Debugging	Reading/Writing to Text Files
	8.1 Introduction to python programming	Using the 4 stages of computational thinking in the development of algorithms for Python code	Simple algorithms using the basics of sequencing, loops and selection with user inputs and outputs are produced.				Creating and assigning values to variables is introduced and developed	Why programming languages use data types to store values and how they can be manipulated within Python code	How operators can be used in comparison and logic statements for a written language.	Introduction to the fundamental skills needed to interpret, find and fix different error types within Python.	Creating simple programs that can read and store data in text files
		Hardware Components	System Architecture	CPU	Binary and Hex	Character Sets	Software	OS			
	8.2 Understanding Computers	Introduction to the main parts of computer hardware such as the Motherboard, RAM, Hard Drives and the CPU	An introductory history of computation and the importance of data storage and instructions being stored independently of one another	For the first time students see what's inside a CPU and it's relationship to speed and the fetch decode execute cycle.	The binary number system is introduced and explained so that students can interpret binary numbers and their meaning.	A first look at the ASCII table and how it works in relation to Binary.	Introduction to Software classifications and Operating systems				
		Sequencing	Data Structures	Debugging	Reading/Writing to Tex	HTML	The Internet	Ethical use of CS			
	8.3 Web design in HTML	Using HTML code to sequence instructions correctly to make webpages	Using lists to show and view galleries of images displayed on webpages	Finding and fixing bugs in HTML code	Using text files to read CSS code for the appearance of webpages	An introduction to raw HTML code and it's relationship with CSS	Learning about how webpages are stored and saved on the internet	The ethics and reliability of information on the web is explored			
		Selection	Data Types	Operators	Cinema Project						
	8.4 Spreadsheet Project	Use of IF statements in formulas to calculate and count data from your spreadsheets	Storing data in it's correct form and format so it is displayed and calculated correctly	Use of operators in formulas to calculate and count data from your spreadsheets	Setting up and creating spreadsheets with formulas and automation for counting and calculating profit and loss						

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Key Concepts:

Programming, technology, Design.

Year 9		Computational Thinking	Algorithms	Sequencing	Iteration	Selection	Functions and Procedur	Variables	Data Types	Operators	Data Structures	Debugging
	9.1 Python Programming - The Next Steps	Another chance to apply computational thinking to solve computing problems	Creating algorithms in code that use lists and read and write to text files as well as the standard constructs of iteration and selection. Also includes work around functions and procedures									
		Algorithms	Sequencing	Iteration	Selection	Variables	Data Types	Operators	Data Structures	Debugging		
	9.2 Searching and Sorting Algorithms	The design, structure and application of searching and sorting algorithms	Using sequential programming to complete linear searches	Careful consideration and use of iteration to find and sort lists	Carefully designed and selected if statements to show when match's are found in searches	Variables used to store and compare pieces of data	Taking user inputs as integers and strings appropriately	Using operators to compare and find data	Extensive use of lists to hold and manipulate data.	Fixing problems in the logic of these algorithms		
		Hardware Components	The Internet	Topologies	Network Connectivity	Encryption	Ethical use of CS					
	9.3 Fundamentals of Networks	Routers, Wireless Access points, network cards and cabling	Hierarchy of the internet and the protocols used to communicate as well as hardware such as routers and wireless access points	Introduction and explanation of the 5 main topologies used to create networks as well as the difference between LANs and WANs, peer and client networks.	Looking at how wifi and wired connections perform and differ from one another	Applying encryption algorithms to secure data during transmission						
		Grooming	Cyberbullying	Radicalisation	British Values	Sexting	Cs and The Law	Digital Footprint	Online Wellbeing	Ethical use of CS		
	9.4 Computer Science Law and Ethics	Revisiting and expanding on the specific laws which relate to grooming, cyberbullying, radicalisation and sexting. Introducing laws for data protection, copyright and plagiarism.								An in depth look at the ethics of creating, using and disposing of technology including it's impact on the environment		

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Key Concepts:

Programming, Communication, Algorithms, Law, Ethics

Year 10/11		Computational Thinking	Algorithms	Sequencing	Iteration	Selection	Functions and Procedur	Variables	Data Types	Operators	Data Structures	Debugging	Reading/Writing to Text Files
	Unit 1 Problem Solving Unit 2 Programming	The detailed study and theory of programming concepts and their application across a wide range of examples for different purposes and functions. This includes, design, application, implementation, testing and evaluation of programs you've developed sometimes spending up to 20 hours on.											
		Data Types	Binary and Hex	Character Sets	Data Representation Image/sound								
	Unit 3 Data	A detailed look at how data is stored and converted to different forms. What data is contained in files and how file sizes are calculated.	Both Binary and Hex conversion will be revisited and practiced in this unit of work	The ASCII table, extended ASCII table and Unicode are explained to show how binary form is used to represent characters and numbers from all around the world	How waves of light and sound are captured, converted to a digital format and stored in a computer								
		Hardware Components	System Architecture	CPU	Software	OS							
	Unit 4 Computers	The study of essential components of computer systems as well as more specialised embedded systems and the models of development they follow.			Another look at the role of the operating system and it's relationship to hardware components as well as it's interaction with software.								
		Hardware Components	The Internet	Topologies	Network Connectivity	Encryption							
	Unit 5 Communication and the Internet	The study of routers, web servers, network cards, wireless access points and more in relation to computer networks.	An in-depth study of the main topologies and the implication each has for businesses and organisations using them. A more advanced look at network packets, the data they contain and how they are routed around a network using various pieces of hardware and protocols.										
		Cs and The Law	Digital Footprint	Online Wellbeing	Ethical use of CS								
	Unit 6 - The Bigger Picture	The study of legal and ethical issues both now and in the future in relation to wellbeing, artificial intelligence, disposal and recycling of technology and documents such as acceptable use policies.			Environmental advantages and disadvantages of technology and the ethics of technology use within the workplace.								

NC Links

National Curriculum

1) Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

2) Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem

3) Use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions

4) Understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal]

5) Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems

6) Understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits

7) Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users

8) Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability

9) Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report con-