



## Computer Science Curriculum Overview

At Key Stage 3, our Computing curriculum is designed to empower all learners with the knowledge, skills, and values they need to thrive in a digital world. Rooted in the three pillars of **Computer Science**, **Information Technology**, and **Digital Literacy**, our curriculum nurtures confident, creative, and responsible digital citizens who are equipped to: navigate and shape the digital landscape with confidence, make informed decisions about technology use, and contribute positively to their communities and the wider world.

Building on the strong foundations of Computing laid at Key Stage 3, our Key Stage 4 Computer Science curriculum is designed to deepen students' understanding of the digital world and empower them to become confident, analytical, and innovative problem-solvers. Rooted in the core principles of **abstraction**, **decomposition**, **pattern recognition** and **algorithms**; our students will explore the inner workings of computer systems, develop robust programming skills, and critically examine the role of technology in society.

|          | Year 7                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Year 8                                                                                                                                                                                                                                                                                                                                | Year 9                                                                                                                                                                                                                                                               | Year 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Year 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| Autumn 1 | <b><u>Foundations of Computing</u></b><br>Students will explore key computing concepts, including the difference between the Internet and the World Wide Web, online risks relevant to Wednesfield, and global internet censorship. They will also study core computer hardware components and their functions. Finally, students will gain an understanding of the Data Protection Act and its principles, building awareness of digital safety and responsibility. | <b><u>Building on Foundations of Computing</u></b><br>Apply online safety practices with a focus on issues relevant to Wednesfield. Develop skills in binary by converting between binary and denary and performing binary arithmetic. Explore the concept of cloud computing and understand its benefits in everyday technology use. | <b><u>Applications of Computing</u></b><br>Apply online safety practices tailored to the Wednesfield community. Develop skills in binary multiplication and division. Analyse the legal, moral, and ethical challenges linked to technology use and its development. | <b><u>Systems Architecture</u></b><br>Study CPU architecture, including the fetch-execute cycle and key components like ALU, CU, cache, and registers. Understand Von Neumann architecture and CPU performance factors such as clock speed, cache size, and cores. Explore embedded systems, their purposes, characteristics, and examples in everyday devices.<br><b><u>Algorithms</u></b><br>Explore computational thinking principles: abstraction, decomposition, and algorithmic thinking. Learn to design, create, and refine algorithms using pseudocode, flowcharts, and programming languages. Identify and fix common errors, use trace tables, and apply nesting for selection and iteration. Understand and apply standard searching algorithms (binary, linear) and sorting algorithms (bubble, merge, insertion) to solve problems efficiently. | <b><u>Producing Robust Systems</u></b><br>This unit covers defensive programming techniques to ensure programs handle all input scenarios correctly, including input validation and user authentication. It emphasizes maintainability through the use of subprograms, naming conventions, indentation, and commenting. Students learn the purpose of testing, distinguishing between iterative and final testing. They identify syntax and logic errors and select appropriate test data—normal, boundary, invalid, and erroneous—to thoroughly test programs. The unit also teaches how to refine algorithms and create test plans, ensuring programs are reliable, secure, and easy to maintain. |

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| <b>Autumn 2</b> | <b><u>Foundations of Computing</u></b><br>Students will learn to distinguish between system and application software, explore the key provisions of the Computer Misuse Act, and identify examples of computer misuse. They will also study various types of secondary storage, such as HDDs, SSDs, and USB drives, and evaluate their advantages and disadvantages.                       | <b><u>Building on Foundations of Computing</u></b><br>Explore data security through encryption and steganography. Understand and apply binary and linear search algorithms. Learn how basic logic gates function and use them to create simple circuits. Implement and evaluate the merge sort algorithm to understand efficient data sorting.                  | <b><u>Applications of Computing</u></b><br>Explore the differences between bitmap and vector images, character sets, and how analog sound is converted to digital. Develop verbal and written chains of analysis while reviewing key concepts and practicing extended response questions and curriculum-based tasks.                                                                                                    | <b><u>Memory and Storage</u></b><br>Understand primary storage including RAM, ROM, cache, and virtual memory, and their roles in computer systems. Explore secondary storage types—optical, magnetic, and solid-state—comparing advantages like capacity, speed, and durability. Learn data units from bits to petabytes and how data is stored in binary. Develop skills converting between binary, denary, and hexadecimal, and perform binary operations. Study character encoding (ASCII, Unicode), and digital representation of images and sound, including factors affecting quality and file size. Understand the need for compression, differences between lossy and lossless methods, and their impact on files. | <b><u>Closing the Gap</u></b><br>Closing the gap focuses on addressing knowledge gaps Systems Architecture, Memory, Storage and Computational Thinking, Algorithms and Programming Fundamentals. It targets understanding core concepts like CPU functions, memory types, data representation, and network basics, alongside computational thinking principles, algorithm design, and programming constructs. Emphasis is on reinforcing practical skills such as creating algorithms, handling errors, using variables and data types, and applying programming techniques. By consolidating these foundational topics, students improve their problem-solving, coding, and analytical abilities essential for success. |
| <b>Spring 1</b> | <b><u>Networks</u></b><br>Students will explore the purpose and types of computer networks, including star and mesh topologies, assessing their structures, functions, and pros and cons. They will examine peer-to-peer and client-server networks, understanding their advantages, disadvantages, and real-world applications, and learn to compare them to identify suitable use cases. | <b><u>Networks in Action</u></b><br>Identify common network threats and understand their impact on security. Explore protection measures to defend against attacks and analyse real-world data breaches to learn from past vulnerabilities. Reflect on the concept of living "offline" and assess its practicality and consequences in today's digital society. | <b><u>Python Programming Essentials</u></b><br>Refresh core programming concepts while mastering for and while loops for iteration. Learn to define and use procedures and functions to modularize code effectively. Develop skills to identify and debug syntax and logic errors. Apply defensive programming techniques, including error handling with try and except blocks, to create robust and reliable programs. | <b><u>Programming Fundamentals</u></b><br>Cover programming fundamentals including variables, constants, inputs/outputs, and operators for arithmetic and Boolean logic. Understand program flow with sequence, selection, and iteration. Learn data types like integer, real, Boolean, and strings, including casting. Develop skills in string manipulation, file handling, records, and SQL queries. Explore arrays (1D and 2D) for data storage and structured programming using functions and procedures. Practice using local/global variables, passing arrays, and generating random numbers to write efficient, well-structured code.                                                                              | <b><u>Boolean Logic</u></b><br>Boolean Logic covers the understanding and application of basic Boolean operators: AND, OR, and NOT. Students learn to recognize gate symbols, create and interpret logic diagrams, and complete truth tables. The unit emphasizes combining these operators to solve logical problems and work with multiple gates in diagrams, reinforcing foundational digital logic skills essential for computing.                                                                                                                                                                                                                                                                                   |

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| Spring 2 | <b><u>Everchanging World</u></b><br>Explore recent advancements in AI and their effects across sectors, including modern medicine. Examine how voice assistants like Alexa work and the privacy issues they raise. Understand the use of CCTV and facial recognition in Japan, weighing benefits against ethical concerns. Learn about e-waste, its global impact, and challenges faced by communities like Agbogbloshie, along with possible solutions. | <b><u>Spreadsheets and number Systems</u></b><br>Understand the hexadecimal number system and convert between hexadecimal, binary, and decimal. Use spreadsheets to perform calculations with basic arithmetic and functions like SUM and AVERAGE. Apply the IF function for conditional logic and use lookup functions such as VLOOKUP and HLOOKUP to retrieve data efficiently from tables.                                    | <b><u>Computing in Action</u></b><br>Explore programming languages and their role in instructing computers. Gain hands-on experience with Microbit hardware and coding projects. Develop an understanding of artificial intelligence, its technologies, applications, and broader implications.                                                                                                                                                                | <b><u>Networks, Connections and Protocols</u></b><br>Explore types of networks including LANs and WANs, understanding their characteristics and performance factors like bandwidth and device count. Learn key hardware components such as routers, switches, NICs, and wireless access points used to build networks. Understand internet concepts like DNS, hosting, the Cloud, and client-server versus peer-to-peer roles. Study network topologies, focusing on star and mesh, with their advantages and disadvantages. Compare wired (Ethernet) and wireless (Wi-Fi, Bluetooth) connections and their uses. Grasp encryption, IP/MAC addressing, communication protocols (TCP/IP, HTTP, FTP, SMTP), and the layered structure of network protocols for effective data transmission and security. | <b><u>Programming Languages and Integrated Development Environments</u></b><br>Focuses on understanding different programming languages and the tools used to develop software. It covers the distinctions between high-level and low-level languages, the role of translators, and the pros and cons of compilers versus interpreters. Additionally, it explores the common features of IDEs—such as code editors, error diagnostics, run-time environments, and translators—and how these tools assist programmers in writing, testing, and debugging code efficiently. |
| Summer 1 | <b><u>Computational Thinking</u></b><br>Gain a strong grasp of abstraction and decomposition to break down problems effectively. Learn to create and interpret flowcharts to represent algorithms and processes clearly. Understand the structure and purpose of pseudocode, use it to design algorithms, and translate it into working code as part of the programming process.                                                                         | <b><u>Big Data</u></b><br>Explore methods of data collection from primary, secondary, and automated sources. Understand data mining and pattern recognition techniques. Recognize the role and efficiency of sorting and searching algorithms in big data processing. Study real-world case studies like Tesco Clubcard and Spotify to learn about practical applications, impacts, and ethical considerations of data analysis. | <b><u>Multimedia Project</u></b><br>Learn the role and importance of promotional materials in business. Develop skills to create visually appealing and effective designs for both print and digital formats. Understand how to enhance materials by incorporating sound and video elements where appropriate. Recognize the differences between print and digital design and adapt promotional content to suit each medium for maximum impact and engagement. | <b><u>Network Security and System Software</u></b><br>This unit covers threats to computer systems and networks, including malware, social engineering, brute-force, DoS attacks, data interception, and SQL injection. Students learn how these attacks work and their purposes. It also explores common prevention methods like penetration testing, anti-malware, firewalls, user access controls, passwords, encryption, and physical security to reduce vulnerabilities. Additionally, the role and functions of operating systems are studied, including user interface, memory and file management, multitasking, peripheral                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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|                 |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                    |  | management, and user accounts. Utility software like encryption, defragmentation, and data compression are also covered, highlighting their importance in maintaining system health and security.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| <b>Summer 2</b> | <b><u>Scratch</u></b><br>Develop programming skills using Scratch by working with variables, iteration, and selection to control data and flow. Use arithmetic, comparison, and logical operators in code. Create and use subroutines to simplify programs, and apply these concepts to design, build, and test a simple game. | <b><u>Introduction to Python</u></b><br>Introduce Python programming by applying computational thinking to solve problems. Explore input, output, and variables, perform basic calculations, and use if statements for conditional logic. Extend conditions with logical operators to handle more complex decision-making in code. |  | <b><u>Ethical, legal, cultural and environmental impacts of digital technology</u></b><br>This unit explores the broader effects of digital technology on society, focusing on ethical, legal, cultural, environmental, and privacy issues. Students study key legislation including the Data Protection Act 2018, Computer Misuse Act 1990, Copyright Designs and Patents Act 1988, and software licensing types (open source and proprietary). They learn the purpose of these laws and the importance of software licensing. The unit encourages critical discussion on how technology impacts society and the environment, and guides students to recommend appropriate software licenses based on context. |  |

Useful websites to support Independent Study

| Key Stage 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Key Stage 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Key Stage 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <p>BBC Bitesize Computing<br/> <a href="https://www.bbc.co.uk/bitesize/subjects/zvc9q6f">https://www.bbc.co.uk/bitesize/subjects/zvc9q6f</a></p> <p>Oak National Academy – KS3 Computing<br/> <a href="https://www.thenational.academy/teachers/programmes/computing-secondary-ocr/units?keystages=ks3">https://www.thenational.academy/teachers/programmes/computing-secondary-ocr/units?keystages=ks3</a></p> <p>Teach Computing (NCCE) KS3<br/> <a href="https://teachcomputing.org/curriculum/key-stage-3">https://teachcomputing.org/curriculum/key-stage-3</a></p> <p>Computing at School (CAS) KS3 Resources<br/> <a href="https://www.computingatschool.org.uk/teaching-computing-secondary/teaching-computing-ks3-11-14-years/">https://www.computingatschool.org.uk/teaching-computing-secondary/teaching-computing-ks3-11-14-years/</a></p> <p>Code.org<br/> <a href="https://code.org">https://code.org</a></p> <p>Codecademy<br/> <a href="https://www.codecademy.com">https://www.codecademy.com</a></p> <p>Micro:bit Foundation<br/> <a href="https://microbit.org">https://microbit.org</a></p> <p>Raspberry Pi Projects<br/> <a href="https://projects.raspberrypi.org">https://projects.raspberrypi.org</a></p> <p>Can You Compute?<br/> <a href="https://www.canyoucompute.co.uk/ks3.html">https://www.canyoucompute.co.uk/ks3.html</a></p> | <p><b>OCR GCSE Computer Science Qualification Page</b><br/> <a href="https://www.ocr.org.uk/qualifications/gcse/computer-science-j277-from-2020/">https://www.ocr.org.uk/qualifications/gcse/computer-science-j277-from-2020/</a></p> <p><b>OCR GCSE J277 Specification (PDF)</b><br/> <a href="https://www.ocr.org.uk/Images/558027-specification-gcse-computer-science-j277.pdf">https://www.ocr.org.uk/Images/558027-specification-gcse-computer-science-j277.pdf</a></p> <p>Craig'n'Dave OCR GCSE Resources<br/> <a href="https://craigndave.org/ocr-gcse-j277-resources/">https://craigndave.org/ocr-gcse-j277-resources/</a></p> <p>Isaac Computer Science<br/> <a href="https://isaaccomputerscience.org">https://isaaccomputerscience.org</a></p> <p>BBC Bitesize GCSE Computer Science<br/> <a href="https://www.bbc.co.uk/bitesize/subjects/z34k7ty">https://www.bbc.co.uk/bitesize/subjects/z34k7ty</a></p> <p>Oak National Academy OCR GCSE Computer Science<br/> <a href="https://www.thenational.academy/teachers/programmes/computing-secondary-ocr/units">https://www.thenational.academy/teachers/programmes/computing-secondary-ocr/units</a></p> <p>Teach Computing<br/> <a href="https://teachcomputing.org">https://teachcomputing.org</a></p> <p>Replit<br/> <a href="https://replit.com">https://replit.com</a></p> <p>Python.org<br/> <a href="https://www.python.org">https://www.python.org</a></p> <p>CodingBat<br/> <a href="https://codingbat.com/python">https://codingbat.com/python</a></p> | <p><b>OCR A Level Computer Science Page</b><br/> <a href="https://www.ocr.org.uk/qualifications/as-and-a-level/computer-science-h046-h446-from-2015/">https://www.ocr.org.uk/qualifications/as-and-a-level/computer-science-h046-h446-from-2015/</a></p> <p><b>OCR A Level Specification (H446)</b><br/> <a href="https://www.harlingtonschoool.org/wp-content/uploads/2023/07/170844-specification-accredited-a-level-gce-computer-science-h446.pdf">https://www.harlingtonschoool.org/wp-content/uploads/2023/07/170844-specification-accredited-a-level-gce-computer-science-h446.pdf</a></p> <p>Isaac Computer Science<br/> <a href="https://isaaccomputerscience.org">https://isaaccomputerscience.org</a></p> <p>Craig'n'Dave A Level Computer Science<br/> <a href="https://craigndave.org">https://craigndave.org</a></p> <p>Teach Computing<br/> <a href="https://teachcomputing.org">https://teachcomputing.org</a></p> <p>GeeksforGeeks<br/> <a href="https://www.geeksforgeeks.org">https://www.geeksforgeeks.org</a></p> |