Curriculum Progression Pathway

OPEN ELEMENT SUBJECT OVERVIEW

SUBJECT & QUALIFICATION: OCR GCSE Computer Science (9-1) J277

Computer Science is the study of the principles and use of computers. This discipline helps you understand the systems used in modern society, encouraging exploration of the underlying technology and developing skills to create new technologies.

In GCSE Computer Science, you'll learn the four cornerstones of Computational Thinking, crucial for any computer science context. These cornerstones provide a solid foundation for other topics and key programming constructs, enabling you to develop programming skills in multiple environments. This aids in understanding similarities between different programming environments and honing problem-solving and debugging skills. These skills are further mastered in text-based programming languages, applying Computational Thinking in various scenarios.

You'll also delve into Computer Science theory, examining the hardware and networks of everyday computer systems. Key topics include network formation, security risks, and mitigation strategies, with a focus on the significance of computer security to national security. This knowledge helps you become a responsible e-citizen, understanding the technological world and enhancing problem-solving resilience.

Throughout your study, you'll explore fundamental Computer Science principles, including abstraction, decomposition, logic, algorithms, and data representation. You'll analyse problems computationally, design, write, and debug programs, and think creatively, analytically, and critically. The curriculum includes practical applications through programming languages and discussions on the ethical, moral, and social implications of technology.

Computer Science poses significant challenges, fostering technological progress and innovation. It encourages creative application of concepts and skills, identifying areas for further technological development. You'll explore big questions like the impact of artificial intelligence on jobs, the digital divide, and internet-related opportunities and issues, deepening your understanding of computer science through theory and practical application.

You are a citizen in this world and you need to know how to solve problems using technology and the key concepts involved in the technology that we have become so dependent on. It will teach you to;

- Apply computational thinking techniques (abstraction, decomposition, pattern recognition, algorithms) in a range of scenarios to solve problems.
- Develop resilience by not being afraid of challenges when solving problems, but to break them down and keep trying.
- Be creative in a subject that may not be renowned for it – there is no limit to creativity when you create the solution. • How to act responsibly online to ensure that you and others stay safe online.
- Identify the key programming constructs (sequence, selection, iteration) required to solve a problem. • Apply the key programming constructs (sequence, selection, iteration) to any programming language. • Work independently and part of a team to solve complex problems.
- Construct reasoned arguments to ethical, social and moral problems that have arisen due to technology and communicate these in an effective way.
- Identify links between different elements of computer science
- Evaluate different methods of representing data and decide on the most suitable method for presentation/storage

- How computers process data, the architecture of a CPU (von Neumann), and factors affecting computer performance
- Different types of computer systems and the use of embedded systems in society
- Methods of storage within a computer system, including primary and secondary storage
- Calculating storage requirements for various file types
- Suitability of storage devices based on capacity, cost, speed, portability, durability, and reliability •

Data representation in computers: binary, hexadecimal, characters, images, and sound

- Compression in computer systems
- Different types of networks and factors affecting network performance
- Hardware required for creating a network and their responsibilities
- Internet usage for WWW access and online storage
- How the TCP/IP stack works and protocols for each layer
- Threats to network and system security and prevention methods
- Types of software (operating systems and utility software) and their roles
- Ethical, cultural, and environmental issues due to technology
- Legislation related to computers and technology
- Searching and sorting algorithms and their uses
- Key programming constructs (sequence, selection, iteration) in a text-based language
- File handling in a programming language
- Using SQL to query and interrogate data
- Data types, arithmetic, Boolean, and string manipulation in programming
- Defensive design for robust programs and implementation in programming
- Generating test plans for different scenarios
- Applying computational logic to generate truth tables for logic circuits
- How translators handle different types of programming languages
- Selecting and combining multiple applications to achieve goals, including data collection and analysis for specific scenarios

Study of any subject in our curriculum takes full advantage of links with other subject areas- we term these as interdisciplinary links and we make the most of them because we know that deep learning requires the transference of knowledge and skills from one topic of learning to another. Once you can transfer your learning across topics and subject areas then you are really mastering what you know and how to apply your understanding and skills.

Computer Science touches on so many other subjects such as mathematics as you develop skills in problems solving, including decomposition (breaking down problems), abstraction (removing unnecessary detail from a problem) and pattern recognition. All of these skills will support your teaching in Mathematics as these are very important in being able to solve mathematics problems in a range of contexts. There are also links with Science as binary logic can be applied to electrical circuits in Physics and much of the technology from Computer Science can be mapped back to core principles of Science. For example, how sensors are used to monitor motion, force and/or pressure. You will learn methods of thinking and research that are widely applicable to other subject areas helping your thinking in all subjects.

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There are half termly assessment points each year that we term Praising Stars©. At GCSE we make informed predictions informed by our holistic assessment of their progress against the key assessment objectives and their aspirational targets. These are also the basis for any appropriate support and intervention.

The GCSE course terminates with two 90 minute assessments; one for Unit 1 and one for Unit 2, both written and non-calculator papers.

The 2 key learning objectives in Computer Science are;

AO1: Demonstrate knowledge and understanding of the key concepts and principles of Computer Science.

A02: Apply knowledge and understanding of key concepts and principles of Computer Science.

A03: Analyse problems in computational terms:

- to make reasoned judgements
- to design, program, evaluate and refine solutions.

Of course we offer the study of GCSE Computer Science and we encourage your continued study in this fantastic subject. Yet we know that choice and personal interest are important aspects of worthy study. Whether you have continued your study of Computer Science into GCSE or not you will have gained access to this enriching subject and its study will have taught you to think differently and deeply.

Computer Science is offered at most prestigious universities either as a single honours or a joint honours subject studied alongside other disciplines e.g. Computer Systems Engineering, Computer Games Design, Computer Science & Artificial Intelligence, Mathematics & Computer Science and Computer Forensics. The very fact that you have been able to study Computer Science e.g. computational thinking will help your future application be it for colleges, universities, apprenticeships or employment.

- Secondary School Teacher
- Database administrator
- Software Developer
- Web Application Developer
- Computer Systems Analyst
- Mobile App Developers
- Games Developer
- Games Designer
- Information Security Analyst
- Computer Network Architect
- Software Tester
- Network Manager

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Term	Year 1	Year 2
Autumn 1	Programming with Python Unit 2.1 - Programming Theory	Unit 1.3 - Networks Unit 1.4 - System Security
Autumn 2	Programming with Python Unit 1.2 - Representation of Data Unit 2.2 - Data Types & Operators	Unit 1.5 - Systems Software Unit 1.6 - Legal, Ethical, Moral & Cultural issues Revision for Exams
Spring 1	Programming with Python Unit 2.3 - 2.5 - Creating Robust Programs, Logic	Unit 2.1 - Programming Theory Unit 2.3 Creating Robust Programs

	and Types of Language & Translators	
Spring 2	Programming with Python Unit 2.1 - Searching and Sorting Algorithms	Revision for Exams
Summer 1	Programming with Python	Revision for Exams
Summer 2	Programming with Python Unit 1.1 - Key Systems Hardware	