Curriculum Progression Pathway

COMPUTER SCIENCE

Computer Science
Why is the study of Computer Science important? Computer Science is the study of the principles and use of computers. Its study will make you question how the systems that you use in a modern day society work and encourage you to explore the concepts behind the technology you use and develop skills to become a creator of technology yourself. From Year 7 you will have the exciting opportunity to develop and consolidate basic ICT skills that will allow you to access more complex computer science concepts. From there you will study the four cornerstones of computational thinking. These are crucial as they can be applied to any computer science context and will provide firm foundations for other topics within the subject. From this, key programming constructs can be learnt, allowing you to develop programming skills in more than one environment; this will help you to understand key similarities between different programming environments and develop key skills in problem solving and debugging. These skills will be further consolidated and mastered in text based programming languages throughout your study, applying the cornerstones of computational thinking in a wealth of scenarios to develop your problem solving skills. Computer science theory is also explored, looking 'under the bonnet' of the computer systems that you use on a day-to-day basis. Key systems hardware are investigated, including how networks are formed, the inherent security risks that networked devices produce and how to mitigate against these risks. Computer Security, (currently one of the biggest risks to national security) is relevant, interesting, and provides you with knowledge that can help you become a responsible technology user. Across your study you will explore fundamental principles and concepts of computer science, including abstraction, decomposition, logic, algorithms, and data representation. You will analyse problems in computational terms through practical experience of solving such problems, including designing, writing and debugging programs. Furthermore, the subject will teach you to think creatively, innovatively, analytically, logically and critically and understand the impacts of digital technology to the individual and to wider society. Lessons will provide a wide range of opportunities for practical application of key concepts through a chosen programming language as well as plentiful opportunities for you to investigate how computers work. In addition, there will be opportunities for extended discussion about the ethical, moral and social implications of technology in society. Computer science offers significant challenges, this is because it is a subject that encourages technological progress and breaking new ground, but this is what makes it exciting! Can you apply the concepts, knowledge and skills you have learnt in a creative way that others haven't thought of before? Can you identify an area of computer science that provides further technological development? Seems challenging – but you are going to love it! Computer science will expand your mind.

What skills will the study of Computer Science teach you?

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 as 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

What will you know and understand from your study of Computer Science?

- How computers processes data, the architecture of a CPU (von Neumann) and the characteristics that affect the performance of computer systems
- Different types of computer system and how embedded systems are used in society
- Methods of storage within a computer system, including primary and secondary storage
- How to calculate storage requirements for a range of different types of file
- The suitability of different storage devices based on capacity, cost, speed, portability, durability and reliability
- Different types of networks and factors that affect the performance of networks
- Hardware required to create a network and the different responsibilities of the different type of hardware
- How the internet is used for access to the WWW and online storage
- How the TCP/IP (the rules used to send data across a network) stack works, the different protocols related to each layer and their roles
- Threats to network and system security and how to prevent/overcome these problems
- Different types of software (operating systems and utility software) and their roles within a computer system
- Ethical, cultural and environmental issues that have arisen due to technology
- Different legislation that relates to computers and technology
- Different searching and sorting algorithms and how they are used

- The key programming constructs (sequence, selection and iteration) and how these can be written in a text based programming language
- The use of file handling in a programming language
- How SQL (structured query language) can be used to query and interrogate data
- The use of data types, arithmetic, Boolean and string manipulation when creating programs
- Different defensive design considerations for creating robust programs and how to implement these in programming
- How to generate test plans for a range of different scenarios
- Applying computational logic to generate truth tables for logic circuits.
- How translators are used to deal with different types of programming language
- How data is represented in computers, including binary, hexadecimal, characters, images and sound
- How compression is used in computer systems.
- How to select and combine multiple applications to achieve challenging goals, including collecting and analysing data and meeting the needs of a given scenario

How does your study of Computer Science support you in other subjects?

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 problem 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.

How can you deepen your understanding of Computer Science?

The computer science department offers lots of great opportunities for you to really engage with this fabulous subject. In Year 7 & 8 we engage with an external program called iDEA (Inspiring Digital Enterprise Award). This is an online program that students can complete in addition to their lessons to develop digital and enterprise skills. It is the digital equivalent of the Duke of Edinburgh programme.

Why not attend the enrichment for the iDEA programme to complete your bronze award? See if you can complete all the badges, develop your digital literacy and enterprise skills and compete against other students in the Trust.
We have worked with GoDigital where pupils joined a team of people to explore a product design and develop a technological solution to an existing problem facing a specified company. We have also got links with the sharp project where the pupils get a tour of The Sharp Project, a creative digital careers overview and two workshops run by industry professionals. These opportunities are great for the pupils to experience an insight into the workplace.

How are you assessed in Computer Science?

Throughout the Computer Science course you are assessed using the following assessment objectives which ensure that you can cumulatively build your subject understanding in preparation for future GCSE and A Level study. There are 6 assessment points each year that we term Praising Stars©. We assess how students at their current stage of study are on track to reach their end of stage targets which are formulated on aspirational expectation from their KS2 starting points. We make an informed prediction from our holistic assessments based on our subject mapping of expectation across the computer science curriculum.

Key Assessment Objectives

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.

How can Computer Science support your future?

We offer the study of GCSE and A Level 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 A level 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 applications be they for colleges, universities, apprenticeships or employment.
Careers that the study of computer science supports include:

- Secondary School Teacher

- Database administrator
- Software Developer
- Web Application Developer
- Computer Systems Analyst
- Mobile App Developers
- Information Security Analyst
- Computer Network Architect
- Software Tester
- Network Manager

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	Term 1:1	Term 1:2	Term 2:1	Term 2:2	Term 3:1	Term 3:2
7	Topic: "The Outwood Welcome" Topic Question: How can we use Google Workspace safely and responsibly to improve our computing skills?	ICT Unit - Charlie and the Chocolate Factory (Docs and Slides) Topic Question: How can ICT be used to plan and present an idea?	Music Festival Topic Question: How can IT software be used to manage a large project?	Computational Thinking Topic Question: How does computational thinking help us to solve problems?	Block Based Programming (Micro:bit) Topic Question: How can Micro:bit be used to program images, text and functions?	Text Based Programming Small Basic Topic Question: How do I use text based programming languages to solve problems?
8	Data Representation Topic Question: What is Binary, Denary and Hexadecimal? How can I represent different types of data using binary?	Text Based Programming Python Part 1A Topic Question: How can I use the Python programming language to solve real world problems?	People in Technology Topic Question: Who are the people who have influenced the history of Computing?	Text Based Programming Python Part 1B Topic Question: How can I use the Python programming language to solve real world problems?	Media Project Topic Question: How can I use editing skills to change the genre of a film trailer?	E-Safety *E-safety will be intertwined between each unit of study*
9	Send Me A Pic Topic Question: How to respond to receiving an inappropriate image?	User Interface Design Topic Question: How can user interface design affect how users interact with a product?	Python Part 2 Topic Question: How can I use the Python programming language to solve real world problems?	Digital Forensics Topic Question: How can digital artefacts be explored and analysed to reveal information about a person?	Computer Hardware and Networking Topic Question: How can I determine what hardware I need to build a school network?	Sonic Pi Topic Question: How can music be programmed?
10	Algorithms Programming fundamentals Programming Concepts	Memory and Storage Algorithms Programming fundamentals Programming Concepts	Algorithms Programming fundamentals Producing robust programs Boolean Logic Programming languages and IDEs Programming Concepts	Algorithms Programming fundamentals Programming Concepts & Challenges	Programming Concepts & Challenges	Systems architecture Memory and storage Programming Project

11	Networks and Protocols, Layers and Security. Programming Project	System Software, Ethical & Cultural Issues. Programming Project	Exam prep	Exam Prep	Exam Prep	