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Curriculum Overview: Computing

Principles and Purpose of the Computing Curriculum

The computing curriculum at Trumpington Community College aims to equip all pupils to computational thinking to solve problems logically and creatively.

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.

Why this, why now?

In the computing curriculum, we have several vertical concepts that appear in different units over the course of both Key Stage 3 and 4. The overview below explains the curriculum choices we have made, based on these concepts, and why the units have been placed in the order we have chosen.

In KS3, each module has a code made up of a number, which specifies the year, and a letter that indicates the point in that year in which the module will be taught. For example, 7A is the first module taught in year 7, followed by 7B and so on.

Programming topic Information technology topic Theory topic

Term 1	Autumn 1	Why this, why now?	Autumn 2	Why this, why now?
Year 7	7A Introduction to school systems and safe use of technology	Students learn about how the IT systems at TCC work, as well as how to use their devices safely and responsibly.	7B Introduction to programming using Scratch	Most students have encountered Scratch at KS2. This module allows students who have not programmed at KS2 to catch up, and also formally introduces concepts such as sequence, selection, iteration and subroutines.

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Year 8	8A Computation thinking	This module introduces key problem-solving skills and then consolidates core Python skills. Students learn about decomposition, abstraction and algorithmic thinking. They practice these skills first by describing algorithms as flow charts, and then in Python. Students also learn how to use trace tables as an aid to understanding Python programs	8B Vector graphics	Students learn to use a vector graphics package and use it to vectorise images. This is both a useful skill in its own right, as well providing an opportunity to practice abstraction in a visual context.
Year 9	9A Python programming with sequences of data	Students deepen their knowledge of Python, learning how to work with sequences of data. This also provides an opportunity for students who are new to the school to catch up and learn the basics of programming.	9B Cryptography	Students are taught the basics of substitution and transposition ciphers. They then practice applying cryptographic algorithms, starting with simple Caesar cipher and progressing up to RSA.
Year 10	Programming: sequence and selection Computer systems	Students review the key concepts in programming and ensure that they can use them fluently in a range of situations. Students consolidate their knowledge of the von Neuman architecture and ensure that they can apply this knowledge to a wide range of scenarios.	Programming: iteration and subroutines Computer systems	Students continue to review key concepts in programming and ensure that they can use them fluently in a range of situations. Students practice applying their knowledge of storage systems to a range of scenarios. They are introduced to logic circuits and assembly language.

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Year 11	Programming: reading and writing; data structures Cyber security	Students extend their knowledge of data structures, including records (which are implemented as dictionaries in Python), and practice applying data structures in a range of scenarios. Students practice reading data from and writing data to files. Students will learn about a range of cybersecurity threats impacting the world, our organisations, as well as us as individuals. They will explore security measures that can be put in place to protect networks and data against different forms of automated and non-automated attack.	***Mock exams I*** Ethical, legal and environmental implications of technology.	By this point students will have covered almost all the contents of the course, so the mock exam covers both paper 1 and paper 2, excluding the databases and SQL topic. Students will consolidate their understanding of the impacts of modern technology and practice applying their knowledge to long answer questions.

Term 2	**Spring 1**	**Why this, why now?**	**Spring 2**	**Why this, why now?**
Year 7	***Revision and Spring Exam*** 7C- Introduction to graphics using Python	Students are introduced to Python using turtle graphics. To strengthen understanding, the key concepts of sequence, selection, iteration and subroutines are covered again, this time in the context of Python.	7D- Spreadsheets	Students are introduced to Excel. They start by learning how to identify cells and ranges, before starting to use formulae and functions. Effective use of spreadsheets is a key life skill, so this module is consolidated in a set of homework assignments throughout KS3, and is developed further in Year 9.

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Year 8	8C- Data representation ***Revision and Spring Exam***	Students learn how symbols are used to record, process and transmit information. They are introduced to binary digits; the symbols computers use to perform these tasks.	8D- Games programming in Python	Students deepen their understanding of Python programming by following a tutorial to build a simple game using Python.
Year 9	9C- Data science ***Revision and Spring Exam***	Students build on their understanding of spreadsheets developed in Year 7 to discover how larger datasets can be processed and visualized.	9D- Animation	Students are taught how to develop 3D models and animate them using Blender. At the end of this module, student produce a short animated film.
Year 10	***Revision and Spring Exam*** Consolidation of programming skills Algorithms	Any gaps identified in the Spring exams are addressed. Students who have already mastered these skills prepare a robot for a competition over Easter. Students study four algorithms covered in the course: linear and binary searches; bubble and merge sort.	Programming: using strings and lists	Students will consolidate their knowledge lists and strings that were introduced in Year 9. Students who have already mastered these skills prepare a robot for a competition over Easter.

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Year 11	Databases and SQL **Revision**	Students learn the key terms used in a database and learn why relational databases are used to eliminate redundancy and inconsistencies that can occur in a flat file database. Next they explore increasingly challenging SQL commands where they retrieve, update and delete data in a relational database Gaps in understanding from the first mock are identified and addressed. Students with very few weaknesses prepare a robot for a competition over Easter.	***Mock exams II*** Project management **Revision**	Students attempt a more complex project to gain a better understanding of the benefits of the structured programming approach Students who find GCSE-level problems relatively simple are encouraged to prepare a robot for a competition over Easter, as this is a complex enough problem to require a structure programming approach. Gaps in understanding from the second mock are identified and addressed.

Term 3	**Summer 1**	**Why this, why now?**	**Summer 2**	**Why this, why now?**
Year 7	7E- Networks ***Revision and Summer Exam***	This unit begins by defining a network and addressing the benefits of networking, before covering how data is transmitted across networks using protocols.	7F- Persuasive use of media	Students will develop a deeper understanding of information technology and digital literacy by using their skills across the unit to create a blog post about a real-world cause that they are passionate about and would like to gain support for.

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Year 8	8E- Computer systems ***Revision and Summer Exam***	Students learn about the different layers of computing systems: from programs and the operating system, to the physical components that store and execute these programs, to the fundamental binary building blocks that these components consist of.	8F- Introduction to robotics	Students are introduced to the essentials of robotics using Kitronik mini:move robots and microbits. Their new-found skills are assessed by a series of mini robot competitions at the end of the year.
Year 9	9E – Cyber security	Students learn about the techniques that cybercriminals use to steal data, disrupt systems, and infiltrate networks. First, students consider the value their data holds and what organisations might use it for. They then learn about social engineering and other common cybercrimes, and finally look at methods to protect against these attacks.	***Revision and Summer Exam*** Artificial Intelligence	Students revise the wide range of topics they have covered during KS3 in preparation for an exam that cover all of the three years of material. After the Summer Exam, there is a short module outlining some of the main themes in AI; the basic principles of machine learning and how AI systems may impact our times in future.
Year 10	Data representation	Students build on what they learned in Year 8, including hexadecimal numbering systems and how to convert between bases. They then explore different coding systems and find out how text, images, and sound are represented in computers.	***Revision and Summer Exam*** Networks	Students will build on what they learned in Year 7, using the PacketTracer software to explore the IP and TCP protocols in more detail.

Year 11	***Revision and GCSE exams***	Preparation for GCSE exams through targeted revision program.		